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ENT

Fifth Edition

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Dedicated to
SAI BABA

Just sitting here reflecting on where I am and where I started I could not have done it without you Sai baba.. I praise you and love you for all that you have given me... and thank you for another beautiful day ... to be able to sing and praise you and glorify you .. you are my amazing god

Preface

"It can be very difficult to sculpt the idea that you have in mind. If your idea doesn't match the shape of the stone, your idea may have to change because you have to accept what is available in the rock.... Sometimes thinking about the carving takes longer than carving itself."

Fevereiro 1999 in Arctic Spirit

Dear Students,

I wish to extend my thanks to all of you for your overwhelming response to all the four editions of my book. I am extremely delighted by the wonderful response shown by the readers for the 4th edition and proving it again as the bestseller book on the subject. Thanks once again for the innumerable e-mails you have sent in appreciation of the book.

The year 2013 was very significant for me for not only the growth which I saw in my books but also in professional front. It was an extreme honor for me to work and help legends like Dr. I.B Singh in revision of "Text book of Neuroanatomy (revised reprint 8th edition and 9th edition-yet to be released), Text book of Embryology (10th edition) and Dr. Konar, in D.C. Dutta's in Text books of Obstetrics and Gynecology.

It now gives me immense pleasure to share with you the new (5th) edition of the book.

There is a lot of apprehension among students about the change in pattern of the examination under 'National Eligibility Cum Entrance Test (NEET). As I have always said, don't panic regarding this issue because the syllabus/the subject is still the same. If you understand the subject, then you can answer questions asked in any format. To make the subject more clear and for easy understanding in the 5th edition, I have introduced many new features.

Salient Features of 5th Edition

- Recent solved papers of AIIMS and PGI with fully explained, referenced, authenticated answers are included at end.
- For the sake of FMGE students, I have included FMGE 2013 questions with their answers.
- All references are from Dhingra 6th edition.
- The entire theory has been concised and given in a new layout.
- All chapters have been thoroughly revised and updated.
- New tables and flow charts have been added wherever necessary.
- Many new diagrams have been added, for which I thank Shri Jitendar Pal Vij (group chairman of Jaypee Brothers Medical Publishers) for allowing me to use illustrations from eminent ENT books of Jaypee Publications.
- New Questions of NEET pattern and DNB pattern have been added along with explanations.
- In the new edition of Dhingra, a chapter has been added on snoring and sleep apnea, So for the convenience of students, I have added snoring and sleep apnea in the form of Hot Topic.
- A section on color plates has been added which is a compilation of important figures and all instruments used in ENT. This will help the student to solve any figure based question on the subject.

I hope all of you will appreciate the changes and accept the book in this new format, like you have done for the previous editions. Remember there is no substitute to theory books, but hopefully you will find all relevant theory in this user-friendly book of ENT. I must admit hereby that despite keeping an eagle's eye for any inaccuracy regarding factual information or typographical errors, some mistakes must have crept in inadvertently. You are requested to communicate these errors and send your valuable suggestions for the improvement of this book. Your suggestions, appreciation and criticism are most welcome.

**New Delhi
May 2014**

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Acknowledgements

Everything what we are is the outcome of a series of factors and circumstances, in addition to ourselves.

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My Colleagues: I am grateful to all my seniors, friends and colleagues of past and present for their moral support.

- | | | |
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- **Dr Sushanta Bhanja:** Director PGEI coaching institute
- **Dr Muthu Kumar:** Director Pulse PG (Kanpur) coaching institute

My Publishers – Jaypee Brothers Medical Publishers (P) Ltd

- **Shri Jitendar P Vij** (Group Chairman) for being my role model. His drive to reach perfection and never-say die attitude has always inspired me to give the best
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- **Mr Bhupesh Arora** (General Manager Publishing) for never being a brother when it comes to delivering of books.
- **Dr Mrinalini Bakshi, Dr Swati Sinha** and **Ms Nitasha Arora** for their constant support and for accomplishing the herculean task of understanding my handwriting and editing the entire book
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Last but not the least—

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My sincere thanks to all FMGE/ UG/PG students, present and past, for there tremendous support, words of appreciation rather I should say emails of encouragement and informing me about the corrections, which has helped me in the betterment of the book.

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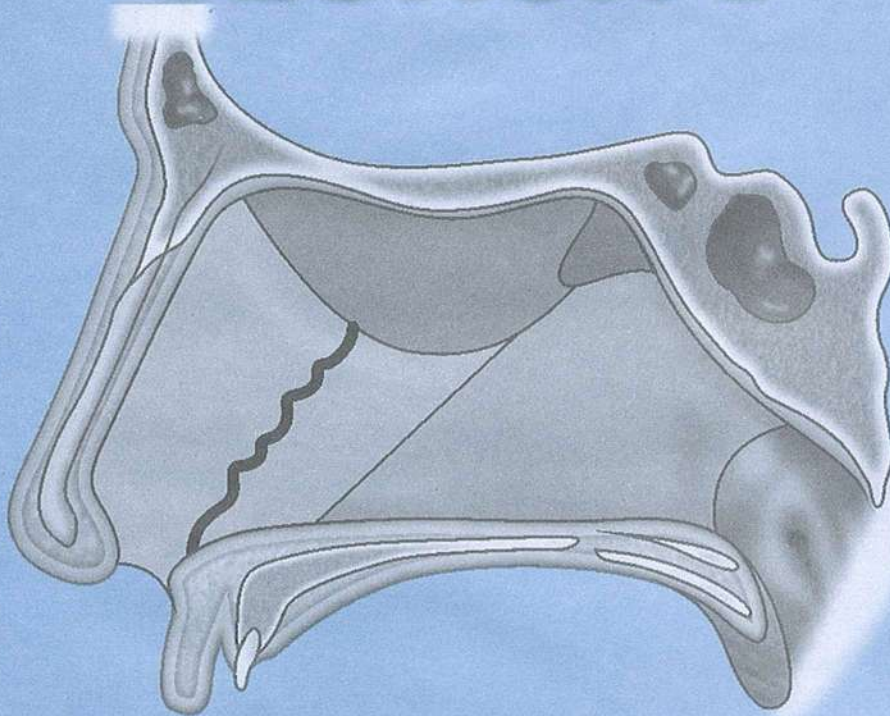
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SECTION I



NOSE AND PARANASAL SINUSES

1. Anatomy and Physiology of Nose
2. Diseases of External Nose and Nasal Septum
3. Granulomatous Disorders of Nose, Nasal Polyps and Foreign Body in Nose
4. Inflammatory Disorders of Nasal Cavity
5. Epistaxis
6. Diseases of Paranasal Sinus
 - A. Sinusitis
 - B. Sinonasal Tumor

CHAPTER

1

Anatomy and Physiology of Nose

ANATOMY OF NOSE

- Nose consists of:**
- External nose
 - Nasal vestibule
 - Nasal cavity

EXTERNAL NOSE

It is a triangular pyramid with an osteocartilaginous framework: Upper 1/3rd part is bony and Lower 2/3rd part is cartilaginous.

- **Bony part** consists of 2 nasal bones which unite with each other in the midline, with the frontal bone superiorly at the nasofrontal suture and laterally with the frontal process of the maxilla at the nasomaxillary suture.
- **Cartilaginous part** consists of upper lateral cartilages: (Hyaline cartilage) which articulate with the nasal bones, the frontal processes of maxilla and the lower lateral cartilages.
- **Limen nasi or Nasal valve or Limen vestibuli** is the junction between the upper and lower lateral cartilage and is the site for intercartilaginous incision.
- Lower lateral cartilages have two parts:
 - Lateral crura (which forms the ala) and
 - Medial crura (which forms the columella).
- **Muscles of external nose** are procerus and nasalis consisting of compressor and dilator naris. These muscles are supplied by facial nerve.
- **Nerve supply of the external nose:** Nose receives its sensory supply from the ophthalmic nerve (which supply tip of nose) and the maxillary division of trigeminal nerve (which supplies side and ala of nose).
- **Lymphatics:** drain into submandibular and preauricular group of lymph nodes.

Nose is made of 4 cartilages (mainly hyaline)—3 paired (upper lateral, lower lateral or alar cartilage, sesamoid cartilage) and one unpaired (i.e. septal) cartilage.

NASAL VESTIBULE

- It is a skin lined entrance to the nasal cavity.
- Contains hair follicles, hair (**called Vibrissae**), sebaceous glands and sweat glands.
- Furuncle of nose is due to staphylococcal infection of hair follicle.

NASAL CAVITY

Each nasal cavity has a lateral wall, medial wall, a roof and floor.

Lateral Nasal Wall

- It has 3 bony projections called as turbinates or conchae.
- From below upward they are inferior, middle and superior turbinates.
- **The inferior turbinate is a separate bone, while rest of the turbinates are a part of ethmoidal labyrinth.**
- Below and lateral to each turbinate is the corresponding meatus.
- Sometimes a **fourth turbinate** is also present just above superior turbinate. This fourth turbinate is known as supreme turbinate^(UP01). Supreme (fourth) turbine is found in 30% of population.

Inferior Meatus

- It is the largest meatus.
- Its highest point is the junction of anterior and middle 1/3rd.
- Nasolacrimal duct opens in the inferior meatus just anterior to its highest point (it is closed by a mucosal flap called **Hasner's valve**). The direction of Nasolacrimal duct is downward, backward and laterally from Lacrimal sac to nose with a length of 1.8 cms.

Middle Meatus

- Lies lateral to the middle turbinate
- Structures of importance in middle meatus
 - Hiatus semilunaris
 - Ethmoidal infundibulum
 - Anterior/posterior fontanelle
 - Uncinate process
 - Bulla ethmoidale

- **Hiatus semilunaris:** It is a semilunar groove which leads anteriorly to the ethmoidal infundibulum.
- **Ethmoidal infundibulum:**
 - It is a short passage at the anterior end of the hiatus.
 - Frontal sinus, maxillary sinus and anterior ethmoidal sinuses drain into it in that order from anterior to posterior.
- **Anterior/posterior fontanelle:**
 - Are membranous areas between the inferior turbinate and uncinate process.
 - Accessory ostia are found mostly in the posterior fontanelle.
- **Uncinate process:**
 - Thin, bony structure.
 - Runs anterosuperiorly to posteroinferiorly.
 - It articulates with the ethmoidal process of inferior turbinate.
 - It partly covers the opening of maxillary sinus.
- **Bulla ethmoidalis:**
 - It is a round prominence formed by the bulging of Middle Ethmoidal Sinuses which open on or above it.

Superior Meatus

Posterior ethmoidal sinus open into it.

Sphenoethmoidal Recess

Lies above the superior turbinate and receives the opening of the sphenoid sinus.

Osteomeatal Complex Area (Piccadilly's Circle)

- It is that area of middle meatus where sinus ostia of anterior group of sinuses (frontal/anterior ethmoidal/maxillary) are surrounded by uncinate process, ethmoidal infundibulum and bulla ethmoidalis.
- Structures contributing to its formation are:

Uncinate Process	Bulla Ethmoidalis	Ethmoidal Infundibulum	Hiatus Semilunaris	Frontal recess
------------------	-------------------	------------------------	--------------------	----------------

Even a minor pathology in this area can lead to secondary sinusitis in major sinuses by obstruction to sinus ostia. ∴ This is the site of pathogenesis of sinusitis.

Ethmoidal air cells: They give a Honeycomb appearance.

Anterior	Middle	Posterior
↓	↓	↓
2–8 in number	1–8 in number	

- **Onodi cells:** Are the most posterior ethmoidal air cells is surgically important as it is related to optic nerve in its lateral wall.
- **Haller cells:** Anterior ethmoidal air cells present in the orbital floor.

Medial Wall of Nose/Nasal Septum

Parts

Columellar septum

Medial crura of the alar cartilage

Membranous septum

Double layer of skin with no bony/cartilaginous support

Septum proper

- Septal cartilage
- Perpendicular plate of ethmoid
- Vomer

Contd...

Contd...

Other bony minor contributors are:

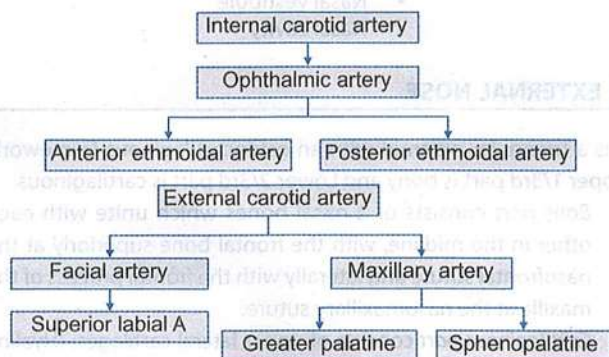
- Crest of nasal bones – nasal spine of frontal bone
- Rostrum of sphenoid – crest of palatine bone
- Rostrum of sphenoid – crest of palatine bone
- Nasal spine of maxilla

Amongst all—the nasal septum is mainly formed vomer, perpendicular plate of ethmoid and septal cartilage.

Blood Supply of the Nasal Septum (Flow chart 1.1)

Little's area is the most vascular area on the anteroinferior part of nasal septum. Branches of *anterior ethmoidal*, *sphenopalatine* (artery of *epitaxis*), *superior labial* and *greater palatine* and their corresponding veins anastomose here to form a vascular plexus called "*Kiesselbach plexus*". Blood vessels at this site lack cushioning effect and are liable to trauma causing epistaxis.

Flow chart 1.1: Blood supply of the nasal septum



Floor of Nose

Formed by palatine process of maxilla and horizontal process of palatine bone.

Nerve Supply of Nasal Cavity

- Nasopalatine/Branches of sphenopalatine ganglia supply majority of the septal area.
- Anterior ethmoidal nerve supplies the anterosuperior part.
- Anterior superior alveolar nerve supplies anteroinferior portion.
- General sensory nerves derived from the branches of trigeminal nerve are distributed to the whole of the lateral wall.

Secretomotor supply of nose is through the vidian nerve (also k/a nerve of pterygoid).

- Vidian nerve is the nerve of pterygoid canal formed by the union of greater superficial petrosal nerve and deep petrosal nerve. This is the main parasympathetic supply of nose. In vasomotor rhinitis where there is an imbalance between sympathetic parasympathetic system, one of the surgical options is Vidian neurectomy.

Lymphatic Drainage of Nasal Cavity

- Lymphatics from external nose and anterior part of nasal cavity drain into *submandibular lymph nodes* while those from the rest of nasal cavity drain into *upper jugular nodes* either directly or through the retropharyngeal node.

IMPORTANT CLINICAL VIGNETTES

DANGEROUS AREA OF FACE (FIG. 1.1)

Dangerous area of face includes upper lip and antero-inferior part of nose including the vestibule. This area freely communicates with the cavernous sinus through a set of valveless veins, anterior facial vein and superior ophthalmic vein. Any infection of this area can thus travel intracranially leading to meningitis and cavernous sinus thrombosis.

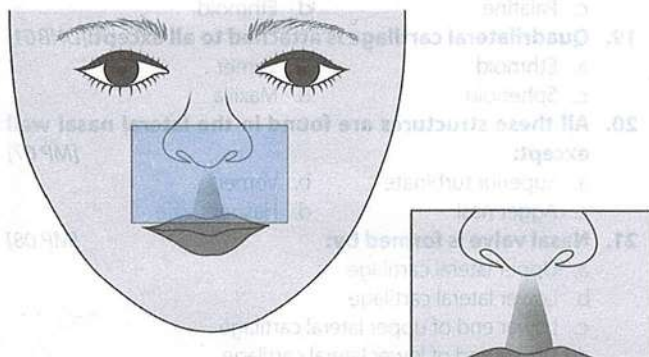


Fig. 1.1: Dangerous area of face

NASAL CAVITY MUCOSA

The mucosa of the nasal cavity is divided as (A) respiratory area (B) olfactory area.

Olfactory Area

Includes upper 1/3rd of septum, cribriform plate, and lateral wall of nose up to the superior turbinate covering an area of approximately 2–5 cm². It has specialized non-ciliated olfactory epithelium.

Olfactory area is called as dangerous area of nose as in olfactory area, olfactory nerves carry sheaths of dura pia and arachnoid along with them into the nose which is a patent communication with the subarachnoid space. An infection of the olfactory area can travel intracranially to cause meningitis, hence called as dangerous area of nose.

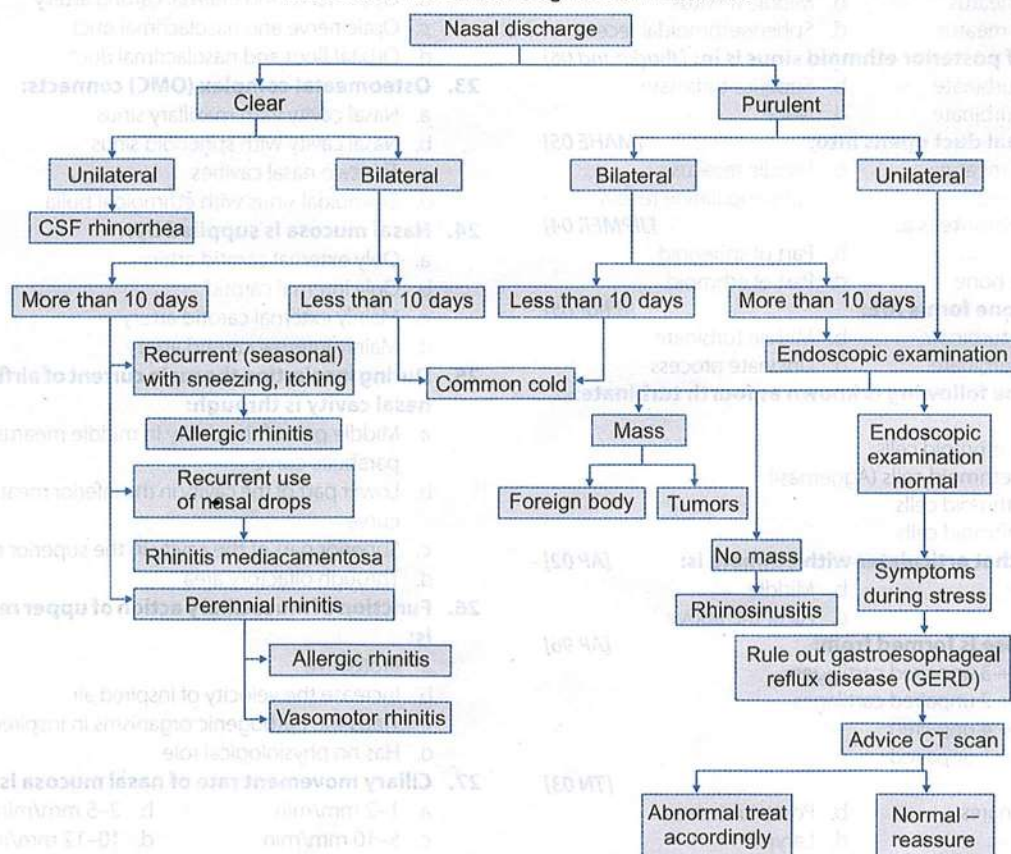
Rhinorrhea

Respiratory Area

It is covered by pseudostratified columnar epithelium (Schneiderian membrane).

Flow chart 1.2 shows clinical diagnosis of rhinorrhea.

Flow chart 1.2: Clinical diagnosis of rhinorrhea



QUESTIONS

1. **Frontonasal duct opens into:** [PGI 98]
 - a. Inferior meatus
 - b. Middle meatus
 - c. Superior meatus
 - d. Inferior turbinate
2. **Frontal sinus drain into:** [PGI 97, 98]
 - a. Superior meatus
 - b. Inferior meatus
 - c. Middle meatus
 - d. Ethmoid recess
3. **Paranasal sinus opening in middle meatus:** [PGI 03, 98]
 - a. Maxillary
 - b. Anterior ethmoid
 - c. Posterior ethmoid
 - d. Frontal
 - e. Sphenoid
4. **The maxillary sinus opens into middle meatus at the level of:** [DNB 02]
 - a. Hiatus semilunaris
 - b. Bulla ethmoidalis
 - c. Infundibulum
 - d. None of the above
5. **All drains into middle meatus except:** [DNB 02]
 - a. Lacrimal duct
 - b. Maxillary sinus
 - c. Frontal sinus
 - d. Ethmoidal sinus
6. **Hiatus semilunaris is present in:** [CUPGEE 02]
 - a. Superior meatus
 - b. Middle meatus
 - c. Inferior meatus
 - d. Sphenoidal recess
7. **Bulla ethmoidalis is seen in:** [AIIMS 92]
 - a. Superior meatus
 - b. Inferior meatus
 - c. Middle meatus
 - d. Sphenoidal recess
8. **Sphenoidal sinus opens into:** [Kerala 98]
 - a. Inferior meatus
 - b. Middle meatus
 - c. Superior meatus
 - d. Sphenoidal recess
9. **Opening of posterior ethmoid sinus is in:** [Jharkhand 06]
 - a. Middle turbinate
 - b. Superior turbinate
 - c. Inferior turbinate
 - d. None
10. **Nasolacrimal duct opens into:** [MAHE 05]
 - a. Superior meatus
 - b. Middle meatus
 - c. Inferior meatus
 - d. Sphenopalatine recess
11. **Inferior turbinate is a:** [JIPMER 04]
 - a. Part of maxilla
 - b. Part of sphenoid
 - c. Separate bone
 - d. Part of ethmoid
12. **Ethmoid bone forms A/E:** [Bihar 05]
 - a. Superior turbinate
 - b. Middle turbinate
 - c. Inferior turbinate
 - d. Uncinate process
13. **Which of the following is known as fourth turbinate:** [UP 01]
 - a. Posterior ethmoid cells
 - b. Anterior ethmoid cells (Agger nasi)
 - c. Medial ethmoid cells
 - d. Lateral ethmoid cells
14. **Turbinate that articulates with ethmoid is:** [AP 02]
 - a. Superior
 - b. Middle
 - c. Inferior
 - d. All of the above
15. **External nose is formed from:** [AP 96]
 - a. 3 paired + 3 unpaired cartilages
 - b. 2 paired + 2 unpaired cartilages
 - c. 3 paired + 4 unpaired
 - d. 1 paired + 1 unpaired
16. **Choana is:** [TN 03]
 - a. Anterior nares
 - b. Posterior nares
 - c. Tonsils
 - d. Larynx
17. **Direction of nasolacrimal duct is:** [AI 99]
 - a. Downward, backward and medially
 - b. Downward, backward and laterally
 - c. Downward, forward and medially
 - d. Downward, forward and laterally
18. **Which of the following bones do not contribute the nasal septum:** [AI 03]
 - a. Sphenoid
 - b. Lacrimal
 - c. Palatine
 - d. Ethmoid
19. **Quadrilateral cartilage is attached to all except:** [DNB 01]
 - a. Ethmoid
 - b. Vomer
 - c. Sphenoid
 - d. Maxilla
20. **All these structures are found in the lateral nasal wall except:** [MP 07]
 - a. Superior turbinate
 - b. Vomer
 - c. Agger nasi
 - d. Hasner's valve
21. **Nasal valve is formed by:** [MP 08]
 - a. Upper lateral cartilage
 - b. Lower lateral cartilage
 - c. Lower end of upper lateral cartilage
 - d. Upper end of lower lateral cartilage
22. **Onodi cells and Haller cells are seen in relation to** [AIIMS Nov 09]
 - a. Optic nerve and floor of orbit
 - b. Optic nerve and internal carotid artery
 - c. Optic nerve and nasolacrimal duct
 - d. Orbital floor and nasolacrimal duct
23. **Osteomeatal complex (OMC) connects:** [MH 02]
 - a. Nasal cavity with maxillary sinus
 - b. Nasal cavity with sphenoid sinus
 - c. The two nasal cavities
 - d. Ethmoidal sinus with ethmoidal bulla
24. **Nasal mucosa is supplied by:** [AI 92]
 - a. Only external carotid artery
 - b. Only internal carotid
 - c. Mainly external carotid artery
 - d. Mainly internal carotid artery
25. **During inspiration the main current of airflow in a normal nasal cavity is through:** [AI 07]
 - a. Middle part of the cavity in middle meatus in a parabolic curve
 - b. Lower part of the cavity in the inferior meatus in a parabolic curve
 - c. Superior part of the cavity in the superior meatus
 - d. Through olfactory area
26. **Function of mucociliary action of upper respiratory tract is:** [Kerala 94]
 - a. Protective
 - b. Increase the velocity of inspired air
 - c. Traps the pathogenic organisms in inspired air
 - d. Has no physiological role
27. **Ciliary movement rate of nasal mucosa is:** [UP 01]
 - a. 1–2 mm/min
 - b. 2–5 mm/min
 - c. 5–10 mm/min
 - d. 10–12 mm/min

- 28. Parosmia is:** [MAHE 01]
 a. Perversion of smell sensation
 b. Absolute loss of smell sensation
 c. Decreased smell sensation
 d. Perception of bad smell
- 29. Nasal septum is formed by all except:** [DNB 2005]
 a. Turbinate b. Vomer
 c. Palatine bone d. Maxilla
- 30. What drains into inferior meatus:** [DNB 2007, Raj PG 2009]
 a. Nasolacrimal duct b. Maxillary sinus
 c. Frontal sinus d. Ethmoidal sinus
- 31. Nasolacrimal duct opens into which turbinate:** [Raj PG 09]
 a. Superior b. Inferior
 c. Middle d. Lateral
- 32. All open into hiatus semilunaris except:** [DNB 2008]
 a. Posterior ethmoid sinus b. Anterior ethmoid sinus
 c. Frontal sinus d. Maxillary sinus
- 33. Nasal cycle is the cyclical alternate nasal blockage occurring:** [DPG 2009]
 a. Every 6-12 hours b. Every 4-12 hours
 c. Every 6-8 hours d. Every 12-24 hours

EXPLANATIONS AND REFERENCES

- 1. Ans. is b i.e. Middle meatus** Ref. Logan Turner 10th/ed p 379; Dhingra 5th/ed p 178, 6th/ed 136, 137; Mohan Bansal p 34, 35
- 2. Ans. is c i.e. Middle meatus** Mohan Bansal p 37
- 3. Ans. is a, b and d i.e. Maxillary, Anterior ethmoid; and Frontal**
- 4. Ans. is a i.e. Hiatus semilunaris**
- 5. Ans. is a i.e. Lacrimal duct**
- 6. Ans. is b i.e. Middle meatus**
- 7. Ans. is c i.e. Middle meatus** Ref. Dhingra 5th/ed pp 152, 153; Tuli 1st/ed pp 135-136; Logan Turner 10th/ed p 379; Mohan Bansal p 34
- Middle meatus lies between the middle and inferior turbinates and is important because of the presence of osteomeatal complex in this area.

Part of lateral nasal wall	Openings
Inferior meatus	Nasolacrimal duct
Middle meatus	Frontal sinus, Maxillary sinus, Anterior ethmoidal sinus
Superior meatus	Posterior ethmoidal sinus
Sphenoethmoidal recess	Sphenoid sinus

- 8. Ans. is d i.e. sphenoethmoidal recess** Ref. Dhingra 5th/ed p 153, 6th/ed p 138; Mohan Bansal p 38
 Sphenoethmoidal recess is situated above the superior turbinate and receives opening of sphenoidal sinus.
- 9. Ans. is b i.e. Superior turbinate** Ref. Dhingra 5th/ed 153, 6th/ed p 138
- 10. Ans. is c i.e. Inferior meatus** Ref. Dhingra 5th/ed p 150, 6th/ed p 135
 • Nasolacrimal duct opens into inferior meatus below the level of inferior turbinate⁹
 • Nasolacrimal duct is guarded at its temporal end by a mucosal valve k/a Hasner's valve
 • Frontonasal duct opens into middle meatus.
 Posterior ethmoidal sinus opens in the superior meatus which is below the superior turbinate.
- 11. Ans. is c i.e. Separate bone** Ref. Dhingra 5th/ed p 150, 6th/ed p 135; Tuli 1st/ed p 135, 2nd/ed p 140
- 12. Ans. is c i.e. Inferior turbinate** Ref. Dhingra 6th/ed p 12; Tuli 1st/ed p 135, 2nd/ed p 140
 "The inferior turbinate is a separate bone, while rest of the turbinates are a part of ethmoidal labyrinth."
- 13. Ans. is b i.e. Anterior ethmoidal cells (Agger nasi)**
 Friends – I haven't been able to get a reference for this answer – but I am pretty sure about the answer itself.
- 14. Ans. is c i.e. Inferior** Ref. Scotts Brown 7th/ed Vol 2 p 1329; Dhingra 6th/ed p 136
 Friends here it is important to read the question – the question is asking about articulation with ethmoid.
 Its discussed in previous questions:
 Middle turbinate and superior turbinate are a part of the ethmoidal bone whereas inferior turbinate articulates with the ethmoid bone, completing the medial wall of nasolacrimal duct.
- 15. Ans. b. 2 paired and 2 unpaired cartilage** Ref. Dhingra 5th/ed pp 149, 150; 6th/ed p 134; Mohan Bansal p 30
 External nose is made up of bony framework which forms upper third part and cartilaginous forms lower two-third part framework.

Cartilages of nose:

- Paired upper lateral nasal cartilages
- Paired lower nasal cartilages
- Lesser alar (sesamoid) cartilages – 2 or more in number
- Unpaired septal cartilage.

For example, there are either 3 paired and 1 unpaired cartilage or 2 paired and 2 unpaired cartilage because lesser alar (or sesamoid) cartilages can be 2 or more. In this question, 2 paired and 2 unpaired cartilage is the more close option and is the answer.

16. Ans. is b i.e. Posterior nares

Ref. Turner 10th/ed p 4; Dhingra 5th/ed p 150, 6th/ed p 135

Nasal cavity

"Nasal fossae are two irregular cavities extending from the mucocutaneous junction with the nasal vestibule in front (the anterior nares) to the junction with the nasopharynx behind (posterior nares or choanae)."

Ref. Turner 10th/ed p 4

"Each nasal cavity communicates with the external through naris or nares and with nasopharynx through posterior nasal aperture or choana."

—Dhingra 5th/ed p 150, 6th/ed 135

17. Ans. is b i.e. Downward, backward and laterally

Ref. Dhingra 4th/ed p 63; Mohan Bansal 1st/ed p 42

Nasolacrimal duct: It is a membranous passage which begins at the lower end of the lacrimal sac. It runs downward, backward and laterally and opens in the inferior meatus of the nose. A fold of mucous membrane called the valve of Hasner forms an imperfect valve at the lower end of the duct.

18. Ans. is b i.e. Lacrimal bone

Ref. BDC 4th/ed Vol 3 pp 228-229;

Dhingra 5th/ed p 162, 6th/ed p 147

Nasal septum is the osseocartilagenous partition between the two halves of nasal cavity.

Its constituents are (Fig. 1.2):

1. Osseous part

- The vomer
- Rostrum and crest of sphenoid
- Nasal crest of maxillary bone
- Perpendicular plate of ethmoid
- Nasal crest of nasal bone
- Nasal spine of frontal bone
- Nasal crest of palatine bone
- Nasal crest of maxillary bone

2. Cartilaginous part

Septal (Quadrilateral) cartilage

19. Ans. is c i.e. Sphenoid

Ref. Scott Brown 7th/ed Vol 2, p 1326; Dhingra 6th/ed p 147.

Quadrilateral cartilage forms the nasal septum. It is bounded firmly by collagenous fibers to the

- Nasal bones
- Ethmoid
- Vomer
- Maxilla

20. Ans. is b i.e. Vomer

Ref. Scott Brown 7th/ed Vol 2 pp 1329-1330; Dhingra 5th/ed pp 150-153, 6th/ed 134-138

The lateral nasal wall is composed of three turbinates

- Superior turbinate
- Middle turbinate
- Inferior turbinate

Below each turbinate is the respective meatus:

- Inferior meatus
- Middle meatus
- Superior meatus
- Above the superior turbinate lies the sphenothmoid recess.
- Just anterior to the middle meatus, is a small crest/mound on the lateral wall called as Agger nasi.
- In the inferior meatus – opens the nasolacrimal duct guarded at its terminal end by a mucosal valve k/a Hasner's valve.

21. Ans. is c i.e. Lower end of upper lateral cartilage

Ref. Scotts Brown 7th/ed Vol 2, p 1358; Dhingra 5th/ed p 150; 6th/ed p 138; Mohan Bansal p 287

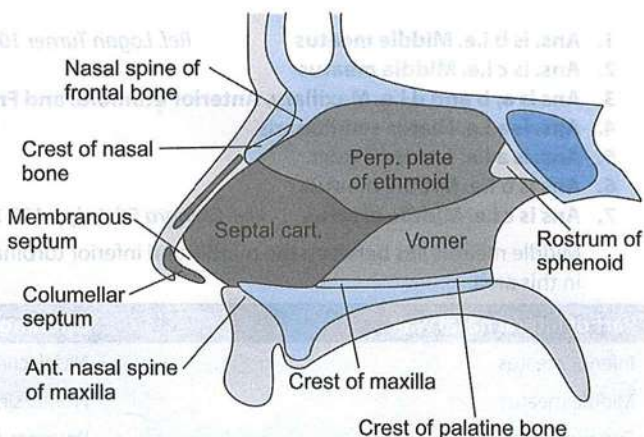


Fig. 1.2: Anatomy of Nasal Septum

Anterior Nasal Valve/Internal Nasal Valve (Fig. 1.3)

- This is the narrowest part of nose and is less well defined physiologically than anatomically.
- It is formed by the lower edge of the upper lateral cartilages, the anterior end of the inferior turbinate and the adjacent septum together with the surrounding soft tissues.

NOTE

To check the potency of nasal valve Cottle's test is done in conditions like DNS.

22. Ans. is a i.e. Optic nerve and floor of orbit.

Ref. Graji's 40th/ed p 558; Dhingra 5th/ed p 153, 6th/ed p 136;
Mohan Bansal 1st/ed p 38

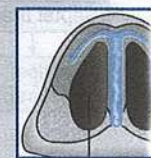
The Onodi and Haller cells are ethmoidal air cells.

Ethmoidal sinuses

- They vary from 8 to 18 in number and lie within the lateral part of ethmoid bone (between nasal cavity and orbit) called as ethmoidal labyrinth.
- Ethmoidal sinuses are divided into 2 groups:
(Note earlier there were 3 groups):
 - Anterior
 - Middle
 - Posterior

Now middle group is incorporated in anterior group.

External
nasal valve



Internal
nasal valve

Fig. 1.3: Nasal valves. (A) External nasal valve area (bounded by pyriform notch of maxilla and upper and lower lateral cartilages); (B) Internal nasal valve (inset) is bounded by septum, inferior edge of lower lateral cartilage, and anterior aspect of inferior turbinate

Courtesy: Textbook of Diseases of Ear, Nose and Throat, Mohan Bansal. Jaypee Brothers, p 287

Anterior Group		Posterior group
Anterior ethmoidal air cells	Middle ethmoidal air cells	
<ul style="list-style-type: none"> • Open into the middle meatus • 2 cells are important in this group: <ol style="list-style-type: none"> 1. Agar cells: Related to lacrimal sac and duct 2. Haller cells: Related to orbital floor <p>These ethmoid cells extend into the roof of maxillary sinus ostium. These cells remain asymptomatic or affect maxillary sinus ventilation and drainage resulting in recurrent or chronic maxillary sinusitis. They are present in 10 % of population</p>	<ul style="list-style-type: none"> • Form a round elevation k/a ethmoidal bulla on the lateral wall of nasal cavity • Middle ethmoidal sinus drains into middle meatus above the ethmoidal bulla 	<ul style="list-style-type: none"> • Posterior ethmoidal air cells drain into superior meatus and some in sphenoethmoidal recess • Most important cells of this group are: Onodi cells: They are the most posterior ethmoidal cells which lie in close association with optic nerve, in the floor of orbit. Onodi cells must be recognised during the endoscopic sinus surgery on posterior ethmoid to avoid optic nerve injury.

23. Ans. is a i.e. Nasal cavity with maxillary sinus

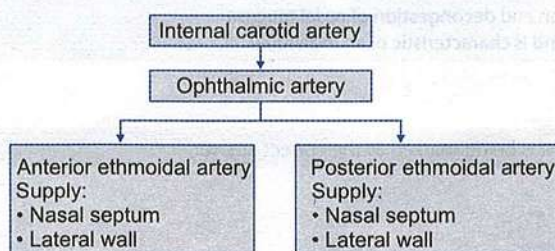
Ref. Scott Brown 7th/ed Vol 2 p 1345

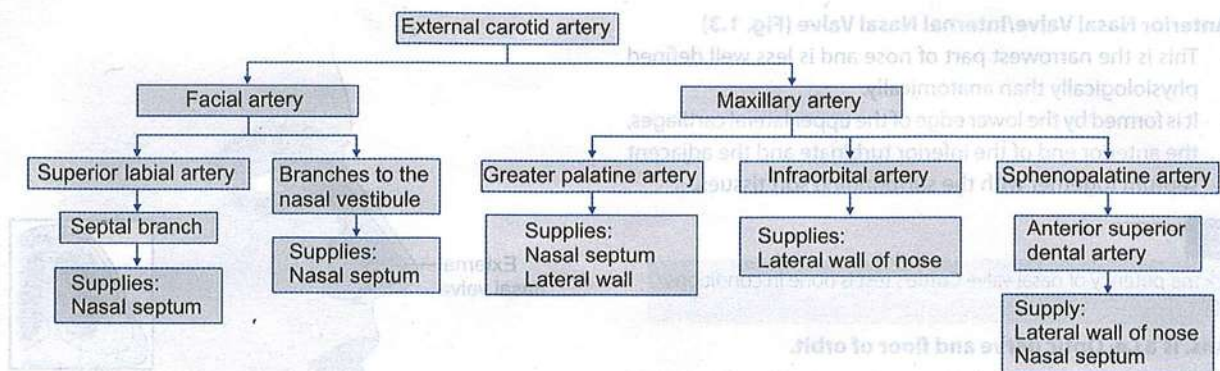
Osteomeatal complex lies in the middle meatus. It is the final common drainage pathway for the maxillary, frontal and anterior ethmoid sinuses into the nasal cavity (so will obviously connect any of these to the nasal cavity).

24. Ans. is c i.e. Mainly external carotid artery

Resf. Dhingra 5th/ed pp 189,190

Both internal carotid artery and external carotid artery supply the nose but main artery is the external carotid artery.





25. Ans. is a i.e. Middle part of the cavity in middle meatus in parabolic curve

Ref. Dhingra 5th/ed p 155; 6th/ed p 140

Nose is the natural pathway for breathing.

During quiet respiration:

- Inspiratory air current passes through middle part of nose between the turbinates and nasal septum.
- Very little air passes through inferior meatus or olfactory region of nose. Therefore, weak odorous substances have to be sniffed before they can reach olfactory area.
- During expiration, air current follows the same course as during inspiration, but the entire air current is not expelled directly through the nares.
- Friction offered at limen nasi converts it into eddies under cover of inferior and middle turbinates and thus sinuses are ventilated during expiration.

26. Ans. is c i.e. Traps the pathogenic organisms in inspired air

Ref. Dhingra 5th/ed p 156; 6th/ed p 140

27. Ans. is c i.e. 5 to 10 mm/min

In mucociliary mechanism of nasal mucosa—cilia beat constantly at speed of **5–10 mm/minute** and are in contact with serous layer of mucus which entraps the foreign bodies, allergens and carry it to nasopharynx. Beat frequency = 10 Hz
Movement is metachronous (i.e. all cilia at right angle to the direction of flow are in the direction of flow while those in the direction of flow are slightly out of phase).
Mucociliary clearance time = 5–20 mins.
The pH of mucous blanket of nose is 7.

28. Ans. is a i.e. Perversion of smell sensation

Ref. Dhingra 5th/ed p 157; 6th/ed p 142

Disorders of smell

Anosmia: Total loss of sense of smell

Hyposmia: Partial loss of sense of smell

Parosmia: Perversion of smell (Seen in recovery phase of post influenzal anosmia; intracranial tumors).

29. Ans. is a Turbinate

Ref. Dhingra 6th/ed p 147; Logan Turner 10th/ed p 5

For details see Ans 18.

30. Ans. is a i.e. Nasolacrimal duct

Ref. Dhingra 6th/ed p 135

31. Ans. is b i.e. Inferior turbinate

Dhingra 6th/ed p 135

Expl: Repeat.

32. Ans. is b i.e. Posterior ethmoid sinus:

Ref. Dhingra 6th/ed p 136 Fig. 23.4

33. Ans. is c i.e. every 6–8-hours

Ref. Dhingra 6th/ed p 140; Mohan Basal 1st/ed p 40

Nasal cycle: The alternate opening and closing of each side of nose is called nasal cycle

- Kayser first described nasal cycle in 1895
- There is rhythmic cyclical congestion and decongestion of nasal mucosa
- Nasal cycle varies every 2½–4 hrs and is characteristic of an individual.

NOTE

The closest answer here is 6–8 hours, hence it is being marked as the correct answer.

CHAPTER

2

Diseases of External Nose and Nasal Septum

SADDLE NOSE

- Nasal dorsum is depressed (sagging of the bridge of nose).
- Depressed nasal dorsum may involve either bony, cartilaginous or both bony and cartilaginous components.
- Most common etiology: Nasal trauma.

Causes of Depressed Nose/Saddle Nose

mnemonic

- H** = Hematoma
O = Operative, i.e. excessive removal of septum during submucous resection
T = Trauma
S = Syphilis
A = Abscess
L = Leprosy
T = Tuberculosis
HOT SALT

Management

Augmentation rhinoplasty i.e. filling the deformity with cartilage, bone or synthetic implant.

CROOKED/DEVIATED NOSE

Crooked nose : Midline of dorsum from frontonasal angle to the tip is curved in a C or S shaped manner.

Deviated nose : Midline is straight but deviated to one side.

CHOANAL ATRESIA

- It is due to persistence of bucconassssal membrane^Q (Right side atresia is more common than left side).^Q
- Unilateral atresia is more common.^Q
- Unilateral atresia remains undiagnosed until adult life.
- Bilateral atresia presents with respiration obstruction in newborn.
- It is more common in females.

Diagnosis

- Presence of mucoid discharge in nose.
- Absence of air bubbles in nasal discharge.
- Failure to pass a catheter from nose to pharynx.
- Putting a few drops of methylene blue dye into the nose and seeing its passage through the pharynx.
- CT scan is diagnostic

Treatment

In B/L choanal atresia: McGovern's technique → Placing a feeding nipple with a large hole.

Definitive treatment: Correction of atresia by transnasal or transpalatal approach. Done at 1½ years.

Extra Edge

Ref. Current Otolaryngology 2nd/ed p 243

- In utero exposure to methimazole can lead to choanal atresia along with other anomalies like esophageal atresia and developmental delay
- Earlier it was said choanal atresia is bony in 90% and membranous in 10% cases. But recent studies reveal that in 29% cases, choanal atresia consists of purely bony elements and in 71% cases both bony and membranous materials are present.
- On CT choanal atresia is diagnosed if posterior choanal orifice is < 0.34 cm or if posterior vomer measures > 0.55 cm.

TUMORS OF EXTERNAL NOSE

They can be divided into three categories – Congenital, benign or malignant (Table 2.1).

Classification of Swellings of External Nose and Vestibule

Table 2.1: Classification of tumors of external nose

Congenital	Benign	Malignant
Dermoid	Rhinophyma or potato tumor	Basal cell carcinoma (rodent ulcer) Squamous cell carcinoma (epithelioma).

Contd...

Contd...

Congenital	Benign	Malignant
Encephalocele or meningoencephalocele	Papilloma Hemangioma	
Glioma	Pigmented nevus	
Nasoalveolar cyst	Seborrheic keratosis Neurofibrom Tumors of sweat glands	Melanoma

Rhinophyma/Potato Tumor

- It is a slow-growing benign tumor which occurs due to hypertrophy of the sebaceous glands of the tip of the nose.
- Seen in long standing cases of acne rosacea.
- Mostly affects men past middle age.
- Presents as a pink, lobulated mass over the nose. (Color is pink/red because of vascular engorgement).

Treatment

- With CO₂ laser—bulk of tumor is removed.

- Basal cell carcinoma of external nose – It is the M/c malignant tumor of nose involving the nasal skin. The M/C sites on nose are are, nasal tip and ala.
- 2nd M/C malignant tumor of nose is squamous cell carcinoma.

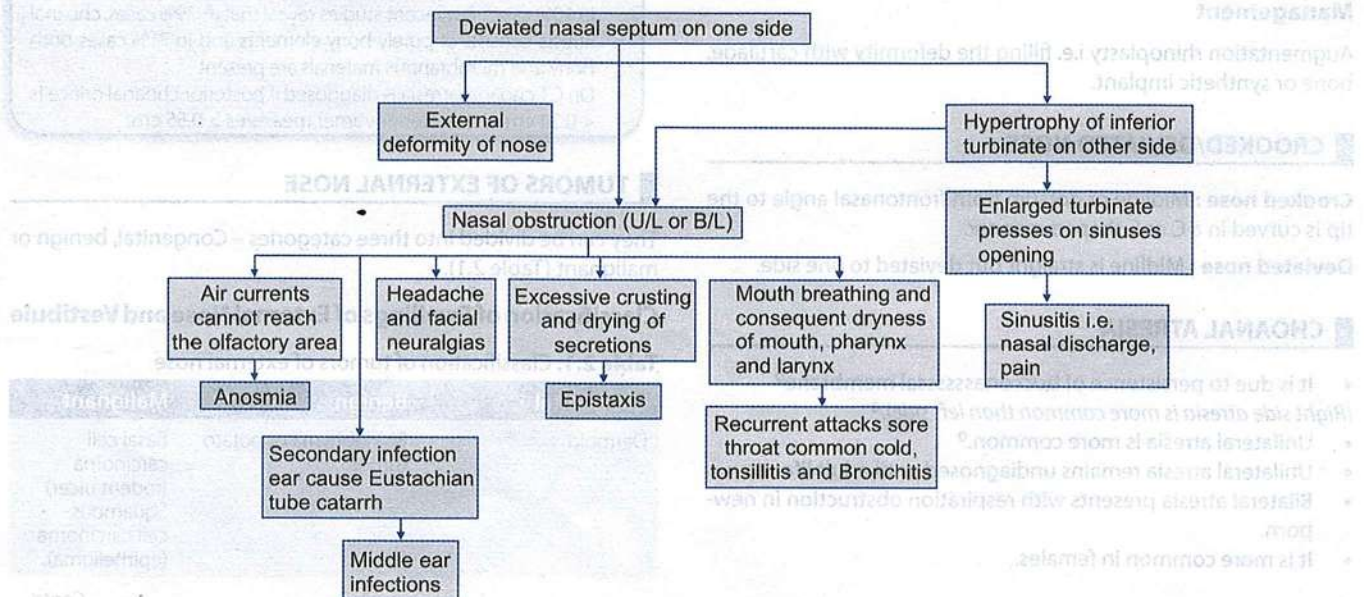
SEPTAL DEVIATIONS – DEVIATED NASAL SEPTUM

DNS is a common problem in which nasal septum is displaced.

Normally, septum lies in center therefore nasal cavities are symmetrical. In case of DNS—the cartilaginous ridge of the septum lies either toward right or left side and nasal cavities are asymmetrical.

Symptoms/Pathophysiology of Septal Deviation

Flow chart 2.1: Symptoms of septal deviation



Etiology: Septal deviation can be due to:

- **Trauma:** Birth trauma, accidental trauma and fights.
- **Developmental error:** Unequal growth between the palate and the skull base cause buckling of the nasal septum. It is seen in cleft lip and palate and in case of dental anomalies.
- **Racial factors:** Caucasians > Negroes.
- **Hereditary factors:** It runs in families.

Types

- Anterior dislocation i.e. anterior end of cartilaginous septum may project into one of the vestibules.
- C-shaped deformity
- S-shaped deformity
- **Spurs:** Sharp shelf like projection at the junction of the bone and the cartilage [may occur at the junction of vomer below and septal cartilage and/or ethmoid bone]
- **Symptoms:** See Flow chart 2.1.

- DNS is more common in males:

Cottle test:

- **Purpose:** To confirm whether the obstruction is in the nasal valve area, which is the narrowest part of the nasal cavity.
- **Method:** The patient pulls the cheeks outward and breathes quietly. If the nasal airway improves on the test side, the test is positive and indicates abnormality of the vestibular component of nasal valve.

Treatment

- No treatment is required if it is not causing any symptoms.
- **Surgical management is the treatment of choice.**
 - **Septoplasty:** conservative surgery as most of the septal framework is retained. Only the most deviated parts are removed. Rest of the septal framework is corrected and

reposited by plastic means. *It is the preferred operation in children.*

Submucous Resection: *It is done only in adults.*

NOTE

- Septal surgery is usually done after the age of 17 so as not to interfere with the growth of nasal skeleton.
- Only if a child has severe septal deviation causing marked nasal obstruction, septoplasty should be done.

SEPTAL PERFORATION

Etiology

- Trauma^o—Surgical (during and after SMR)
 - Repeated cauterization
 - Nose picking
 - Tight nasal packing
- Chronic inflammation [Wegener's granulomatosis, Syphilis, TB, Leprosy, atrophic rhinitis]
- Nasal myiasis
- Rhinolith or neglected foreign body
- As a complication of septal abscess or hematoma, if drainage is delayed.

- Poisons [cocaine, topical steroids and decongestants]
- Tumors of septum e.g. chondrosarcoma, granuloma
- Idiopathic

NOTE

Syphilis causes perforation of the bony part while lupus, tuberculosis and leprosy involve the cartilaginous part.

Symptoms

- Small anterior perforation causes whistling sound during inspiration or expiration.
- Larger perforations result in crusts formation which can obstruct the nose and lead to excessive bleeding when it is removed.

Treatment

- If perforation is asymptomatic no treatment is required.
- Small and medium sized perforation (< 2 cm in diameter): Closure is done surgically by raising flaps and stitching on the perforation.
- Large perforation (> 2 cm in diameter): Obturators or silastic buttons are used to close perforations.

QUESTIONS

1. a. **Rhinophyma is associated with:** [AI 07] [AP 96, UP 01]
 - a. Hypertrophy of the sebaceous glands
 - b. Hypertrophy of sweat glands sss
 - c. Hyperplasia of endothelial cells
 - d. Hyperplasia of epithelial cells
1. b. **True about rhinophyma:** [AI 01]
 - a. Premalignant
 - b. Common in alcoholics
 - c. Acne rosacea
 - d. Fungal etiology
 - e. Treatment is shaving, dermabrasion and skin grafting.
2. **Most common presentation of infant with bilateral choanal atresia:** [AIIMS 96]
 - a. Difficulty in breathing
 - b. Dysphagia
 - c. Smiling
 - d. Difficulty in walking
3. **Choanal atresia is associated with:** [PGI 08]
 - a. Colobomatous blindness
 - b. Heart disorder
 - c. Renal anomaly
 - d. Ear disorder
 - e. CNS lesion
4. **All are true about nasolabial cysts except:** [AIIMS Nov 08]
 - a. They are B/L
 - b. They present in adults
 - c. Derived from odontogenic epithelium
 - d. Strong female predilection
5. **Depressed bridge of the nose may be due to any of the following except:** [DNB 03]
 - a. Leprosy
 - b. Syphilis
 - c. Thalassemia
 - d. Acromegaly
6. **A crooked nose is due to:** [PAL 93]
 - a. Deviated Tip and Septum
 - b. Deviated ala
 - c. Deviated septum
 - d. Deviated dorsum and septum
7. **Percentage of newborns with deviation of nasal septum:** [PGI 93]
 - a. 2%
 - b. 10%
 - c. 20%
 - d. 50%
8. **Features associated with DNS include all of the following except:** [AI 98]
 - a. Epistaxis
 - b. Atrophy of turbinate
 - c. Hypertrophy of turbinate
 - d. Recurrent sinusitis
9. **All are complication of DNS, Except:** [AIIMS 93]
 - a. Maxillary sinusitis
 - b. Septal spur
 - c. Sphenoiditis
 - d. Hypertrophied inferior turbinate
10. **For deviated nasal septum, surgery is required for:** [PGI 01]
 - a. Septal spur with epistaxis
 - b. Marked septal deviation
 - c. Persistent rhinorrhea
 - d. Recurrent sinusitis
 - e. Prolonged DNS
11. **Thudiculum nasal speculum is used to visualize:** [TN 03]
 - a. Anterior nasal cavity
 - b. Posterior nares
 - c. Tonsils
 - d. Larynx
12. **Which is not visualized on posterior rhinoscopy:** [AI 92]
 - a. Eustachian tube
 - b. Inferior meatus
 - c. Middle meatus
 - d. Superior concha
13. **All of the following true of submucous resection operation for DNS except:** [UPSC]
 - a. Indicated in septal deviation
 - b. Mucoperichondrium is removed
 - c. Preferably done after 16 years of age
 - d. Done in some cases of epistaxis
14. **Alternative for SMR:** [DNB 01]
 - a. Tympanoplasty
 - b. Septoplasty
 - c. Caldwell-Luc operation
 - d. Turboplasty
15. **Killian's incision is used for:** [TN 04]
 - a. Submucous resection of nasal septum
 - b. Intranasal antrostomy
 - c. Caldwell-Luc operation
 - d. Myringoplasty
16. **Common indication of septoplasty:** [PGI June 04]
 - a. DNS with symptoms
 - b. Anosmia
 - c. Sluder's neuralgia
 - d. Septal spur
17. **Which is not done in septoplasty:** [St. Johns 02]
 - a. Elective hypotension
 - b. Throat pack
 - c. Nasal preparation with 10% cocaine
 - d. None
18. **Which of the following surgery is contraindicated below 12 years of age?** [MH 03]
 - a. Rhinoplasty
 - b. Antral puncture
 - c. SMR
 - d. Septoplasty
19. **To prevent synachiae formation after nasal surgery, which one of the following packings is the most useful:** [AIIMS Nov 04]
 - a. Mitomycin
 - b. Ribbon gauze
 - c. Ribbon gauze with liquid paraffin
 - d. Ribbon gauze steroids
20. **True about septal hematoma is:** [PGI 02]
 - a. Occurs due to trauma
 - b. Can lead to saddle-nose deformity
 - c. Conservative treatment
 - d. May lead to abscess formation
21. **Bony septal perforation occurs in:** [Karnataka 95]
 - a. TB
 - b. Leprosy
 - c. Syphilis
 - d. Sarcoidosis
22. **Septal perforation is not seen in:** [DNB 02]
 - a. Septal abscess
 - b. Leprosy
 - c. Rhinophyma
 - d. Trauma
23. **Nasal septum perforation occurs in all the following except:** [UP 04]
 - a. Tuberculosis
 - b. Nasal surgery
 - c. Syphilis
 - d. Rhinosporidiosis
24. **The etiology of anterior ethmoidal neuralgia is:** [AIIMS 03]
 - a. Inferior turbinate pressing on the nasal septum
 - b. Middle turbinate pressing on the nasal septum
 - c. Superior turbinate pressing on the nasal septum
 - d. Causing obstruction of sphenoid opening
25. **Cottle's test tests the patency of the nares in:** [JIPMER]
 - a. Atrophic rhinitis
 - b. Rhinosporidiosis
 - c. Deviated nasal septum
 - d. Hypertrophied inferior turbinate

EXPLANATIONS AND REFERENCES

1. a. Ans. is a i.e. Hypertrophy of the sebaceous glands.

Mohan Bansal p292

1. b. Ans. is c and e i.e. Acne rosacea; and Treatment is shaving, dermabrasion and skin grafting

Ref. Dhingra 5th/ed p 160, 6th/ed p 144; Mohan Bansal 1st/ed p 292

- Rhinophyma is a slow-growing benign tumor which occurs due to hypertrophy of the sebaceous glands^o of the tip of the nose.
- Seen in long standing cases of acne rosacea.^o
- Mostly affects men past middle age.
- Presents as a pink, lobulated mass over the nose.

Treatment

- Paring down the bulk of the tumor with a sharp knife, or carbon dioxide laser or scalpel (dermabrasions), and the area is allowed to re-epithelize.
- Sometimes tumor is completely excised and the raw area is covered with skin graft.

2. Ans. is a i.e. Difficulty in breathing

Ref. Logan/Turner 10th/ed p 379; Dhingra 5th/ed p 178, 6th/ed p 163; Mohan Bansal p 337

- Choanal atresia is usually U/L. If it occurs bilaterally the neonate presents with difficulty in breathing as infant is a nose breather and does not breathe from mouth. The neonate may have asphyxia and bilateral blockage of nose that also makes suckling difficult.
- U/L atresia presents with nasal obstruction including snoring but goes unidentified till adult life.

3. Ans. is a, b, d and e i.e. Colobomatous blindness; Heart disorder; Ear disorders; and CNS lesion

Ref. Scott Brown 7th/ed Vol 1 p 1071; Dhingra 5th/ed p 178 6th/ed p 163; OP Ghai 6th and 7th/ed pp 336,337

Choanal Atresia

- Choanal atresia is associated with CHARGE syndrome: Cloboma of eye, Heart defects, Choanal Atresia, Retarded growth, Genital defects and Ear defects.

4. Ans. is c i.e. Derived from odontogenic epithelium

Ref. <http://www.maxillofacialcentre.com/Bondbook/softissue/nasolabialcyst.html#introduction>;
Scott Brown 7th/ed Vol 2 p 1320; Dhingra 6th/ed p 146; Mohan Bansal p 292

Nasolabial Cysts/Nasoalveolar Cyst/Klestadt's Cyst

- It is a rare **non odontogenic cyst** which originates from epithelial entrapment in the line of fusion between maxillary and median nasal elevation.
- Female >Male
- Bilateral in approximately 10% of all cases.
- Usually present in 4th and 5th decades of life.
- It lies on the bone and causes an excavation. It is closely attached to floor of the nose.
- It presents as a smooth and soft bulge in the lateral wall and floor of vestibule anterior to inferior turbinate.
- Large cyst obliterates the alar facial fold (nasolabial sulcus).
- Treatment is by surgical excision using sublabial approach.

NOTE

Globulomaxillary cyst arise at the junction of the primitive palate and palatine process in the alveolaolar process between lateral incisor and canine teeth.

5. Ans. is d i.e. Acromegaly •

Ref. Dhingra 5th/ed p158, 6th/ed p143

Depressed nasal bridge results from sagging of the bridge of nose either due to injury or infection of osseous or cartilaginous part of the bridge of nose

Causes of depressed nose/saddle nose are:

H = Hematoma

O = Operative, i.e. excessive removal of septum during submucous resection

T = Trauma

S = Syphilis

A = Abscess

L = Leprosy

T = Tuberculosis

(Mnemonic – **HOT SALT**)

6. Ans. is d i.e. Deviated dorsum and septum

Ref. Dhingra 5th/ed, p 158; 6th/ed p 143; Mohan Bansal p 291

- In **crooked nose**, the midline of dorsum from frontonasal angle to the tip is curved in a C- or S-shaped manner (Fig. 2.1).
- In a **deviated nose**, the midline is straight but deviated to one side.
- **Saddle nose** is depressed nasal dorsum which may involve only cartilaginous or both bony and cartilaginous components.

7. Ans. is c i.e. 20%

Ref. Turner 10th/ed p 21

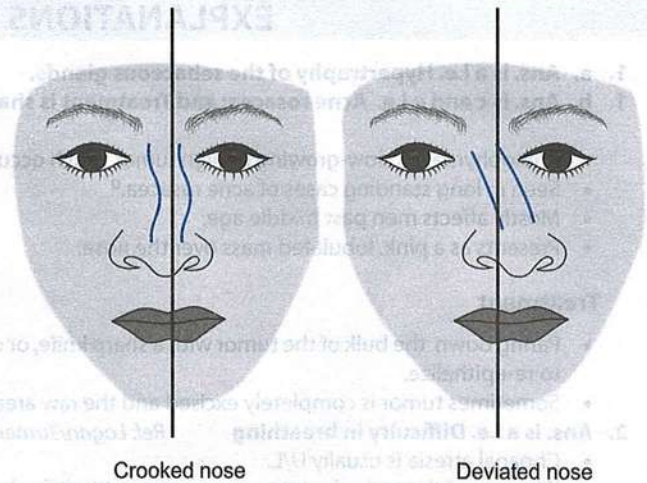
- During normal parturition the fetal head is directed caudally and passes through the pelvic brim.
- The Caucasian head is widest at the occipitonasal diameter. Up to 20% of babies born in this manner are found to have squashed noses. The majority spring back into place but about 1–2% are left with a permanently deviated septum. This may not be apparent initially but subsequently gives rise to nasal obstruction and snuffles.

8. Ans. is b i.e. Atrophy of turbinate

Ref. Dhingra 5th/ed pp 164, 165, 6th/ed p 149; Tuli 1st/ed p 153;

Mohan Bansal 1st/ed p 334, 335

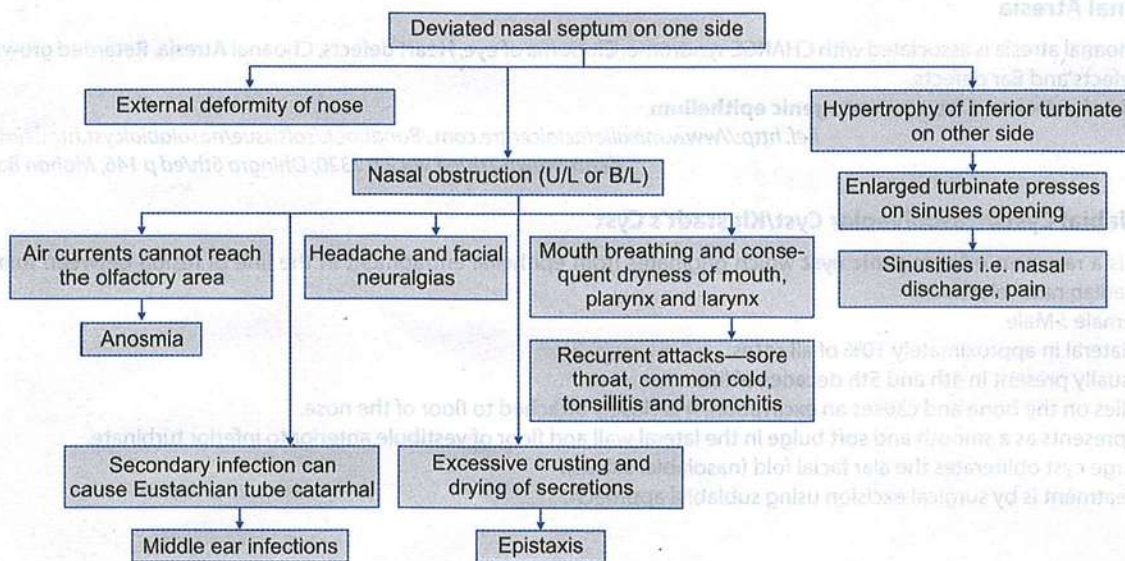
9. Ans. is b i.e. Septal spur



Crooked nose

Deviated nose

Fig. 2.1: Nasal bridge is S-shaped in crooked nose. It is straight but deviated to one side in deviated nose.



NOTE

- In deviated nasal septum, the nasal chamber on the concave side of the nasal septum is wide and shows compensatory hypertrophy of turbinates and not atrophy.
- Septal spur is a type of DNS and not its complication

10. Ans. is a, b, c and d i.e. Septal spur with epistaxis; Marked septal deviation; Persistent rhinorrhea; and Recurrent sinusitis

Ref. Dhingra 5th/ed pp 423, 425, 6th/ed p 413, 415; Tuli 1st/ed p 507, 2nd/ed p 516

Indications for Surgery in DNS

- **Persistent unilateral nasal obstruction and recurrent headaches**
- Deviation causing recurrent sinusitis or otitis media
- Recurrent epistaxis from septal spur
- Access for operation in polypectomy with DNS
- As a part of septorhinoplasty for cosmetic correction of external nasal deformities.

- As a approach to hypophysectomy
 - Septoplasty is done in children, adolescents and young female.
 - Submucous resection is indicated in adults (after 17–18 yrs).

11. Ans. is a i.e. Anterior nasal cavity

Ref. Tuli 1st/ed p 538, 2nd/ed p 503; Mohan Bansal p 281; Maqbool 12th/ed p 340

Thudiculum nasal speculum or Vienna type of nasal speculum is used for doing anterior rhinoscopy, for examination of or operation on nasal cavity.

12. Ans. is b i.e. Inferior meatus

Ref. Maqbool 11th/ed p 164

Posterior rhinoscopy:

- It is method of examination of the posterior aspect of nose and pharynx.
- Structures seen (Fig. 2.2):
- **Structures seen on posterior rhinoscopy:**
 - Both choanae
 - Opening of Eustachian tube
 - Fossa of Rosenmuller
 - Adenoids
 - Posterior end of nasal septum
 - Posterior end of superior/middle and inferior turbinates
 - Torus Tubarius
 - Roof and posterior wall and nasopharynx.

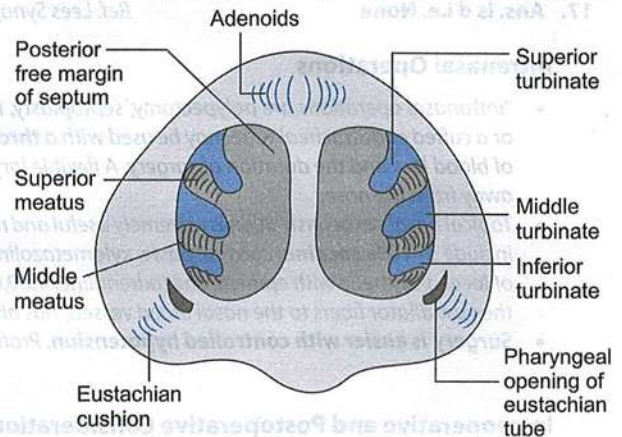


Fig. 2.2: Structures seen in posterior rhinoscopy.

NOTE

As is evident from the figure superior and middle meatus are seen on posterior Rhinoscopy but not inferior meatus.

13. Ans. is b i.e. Mucoperichondrim is removed

Ref. Dhingra 5th/ed p 423, 6th/ed p 413

Submucous Resection of Nasal Septum

Indications

- Deviated nasal septum (DNS) causing symptoms of nasal obstruction and recurrent headache.
- DNS causing obstruction to ventilation of paranasal sinuses and middle ear, resulting in recurrent sinusitis and otitis media.
- Recurrent epistaxis from septal spur.
- As a part of septorhinoplasty for cosmetic correction of external nasal deformities.
- As a preliminary step in hypophysectomy (transseptal transsphenoidal approach) or vidian neurectomy (transseptal approach).

Steps of Operation

- Generally done in adults under local anesthesia.
- Consists of elevating the mucoperichondrial and mucoperiosteal flaps on either side of the septal framework by a single incision made on one side of the septum, removing the deflected parts of the bony and cartilaginous septum, and then repositioning the flaps.
- In SMR—complete removal of septal cartilage, results in supratip depression of cartilaginous nasal dorsum.
- Submucous resection is not advocated in children up to 17 years of age as it may interfere with development of the facial bones.

14. Ans. is b i.e Septoplasty

Ref. Dhingra 5th/ed p 165, 6th/ed p 150

15. Ans. is a i.e Submucous resection of nasal septum

Deviated nasal septum with symptoms can be treated by:

- Submucous resection: done only in adults
- Septoplasty – can be done in adults as well as children

Incision used = Killian's incision

Incision used = Freer's incision

16. Ans. is a i.e. DNS with symptoms

Ref. Dhingra 5th/ed p 425, 6th/ed p 415; Maqbool 11th/ed p 185, 12th/ed p 137;

Mohan Bansal p 336

Septoplasty is a conservative approach to surgery. Here most of the septal framework is retained.

A mucoperichondrial/periosteal flap is raised generally on one side. Only the most deviated parts are removed. Rest of the septal framework is corrected and repositioned. This operation has replaced submucosal resection.

Indications of Septoplasty

- Symptomatic deviated septum.
- As a part of septorhinoplasty for cosmetic reasons.
- As an approach to hypophysectomy.
- Recurrent epistaxis due to septal spur

Most common indication for septoplasty – DNS with symptom – Maqbool 11th/ed p 185

NOTE

- Septal spur per se is not an indication for septoplasty, only when it leads to recurrent epistaxis then it should be operated.
- "Neither septal deviation nor septal deformities are by themselves an indication for a septoplasty – Scotts Brown 7th/ed Vol 2 p 1580

17. Ans. is d i.e. None

Ref. Lees Synopsis of Anaesthesia 13th/ed pp 734,735; Current otolaryngology 2nd/ed p 175

Intranasal Operations

- "Intranasal operations are polypectomy, septoplasty, rhinoplasty and functional endoscopic sinus surgery. Either a laryngeal mask or a cuffed endotracheal tube may be used with a **throat pack**, depending on the anesthetist's confidence, the surgeon, the amount of blood loss and the duration of surgery. A flexible laryngeal mask or south-facing preformed tube allows the airway to be secured away from the nose.
- Topical nasal vasoconstriction is extremely useful and may be applied by the anesthetist or surgeon. Commonly used vasoconstrictors include **5–10% cocaine**, cocaine paste, xylometazoline or ephedrine drops or spray, Moffett's solution, or dental cartridge injection of local anesthetic with epinephrine (adrenaline) 1:80,000. Vasoconstriction by block of the sphenopalatine ganglion, which carries the vasodilator fibers to the nasal blood vessels, has also been described.
- **Surgery is easier with controlled hypotension.** Profuse bleeding may cause the operation to be abandoned."

Ref. Lees Synopsis of Anaesthesia 13th/ed pp 734,735

Intraoperative and Postoperative Considerations

- "The most important consideration of nasal surgery is achieving profound vasoconstriction in the nares to minimize and control bleeding. This vasoconstriction can be achieved with **cocaine packs**, local anesthetics, and epinephrine infiltration. Since these drugs have a profound effect on the cardiovascular system, a careful monitoring of the patients cardiovascular functioning is essential, especially for older patients or patients with known cardiac disease. A vasoconstrictor can also precipitate dysrhythmias.
- **A moderate degree of controlled hypotension** combined with head elevation decreases bleeding in the surgical site. Blood may passively enter the stomach. Placing an oropharyngeal pack or suctioning the stomach at the conclusion of surgery may attenuate postoperative retching and vomiting."
- Thus in any nasal surgery:
 - Elective hypotension
 - Throat pack
 - Nasal preparation with 10% cocaine

all can be done

18. Ans is c i.e. SMR

Ref. Dhingra 5th/ed p 423, 6th/ed p 413

Submucosal Resection – Contraindications

- Patients below 17 years of age (in such cases conservative surgery i.e. septoplasty should be done)
- Acute episodes of respiratory infection
- Bleeding diathesis
- Untreated diabetes or hypertension

19. Ans. is a i.e. Mitomycin

Ref. Journal of Laryngology and Otolaryngology 06, Vol 120, p 921-923 ISN 00222151

- **After Nasal surgery** it has been seen that mitomycin drops applied over nasal mucosa decrease nasal synechia formation.
- This is the newer approach and several trials are being done on it ... but our standard textbooks have not yet included it.
- "The nasal cavities are packed with ribbon gauze impregnated with Vaseline or liquid paraffin to prevent its sticking to nasal mucosa."
- "Ribbon gauze impregnated with petroleum jelly or bismuth iodoform paraffin paste (BIPP) is inserted in the entire length of the nasal cavity in an attempt to tamponade the bleeding."

– Scott Brown 7th ed p 1602

20. Ans. is a, b and d i.e. Occurs due to trauma; Can lead to saddle nose deformity; and May lead to abscess formation

Ref. Dhingra 5th/ed pp 165,166, 6th/ed p 150; Mohan Bansal p 336

- Septal Hematoma is collection of blood within the subperichondrial plane of septum.
- Etiology: It results from nasal trauma, septal surgery or bleeding disorder.
- Clinical features: Bilateral nasal obstruction is the commonest presenting symptom. It may be associated with frontal headache and a sense of pressure over the nasal bridge.
- Examination: Reveals smooth round swelling of the septum in both the nasal fossae.
- On palpation: The mass is soft and fluctuant.
- Treatment: Small hematomas can be aspirated with a wide bore sterile needle. Large hematomas are incised and drained. Reaccumulation is prevented by intranasal packing.

Complications

- Septal hematoma, if not drained, may organize into fibrous tissue leading to a permanently thickened septum.
- If secondary infection supervenes, it results in septal abscess.
- Loss of structural support can cause depression of nasal dorsum leading to saddle nose deformity.
- Necrosis of the cartilage can cause perforation of the nasal septum —Dhingra 5th/ed, p 166

21. Ans. is c i.e. Syphilis

22. Ans. is c i.e. Rhinophyma

23. Ans. is d i.e. Rhinosporidiosis Ref. Dhingra 5th/ed p 166, 6th/ed p 151; Scott Brown Otolaryngology 7th/ed Vol 2, Chapter 124 p 1583

Septal Perforation

Traumatic (m/c cause)	Pathological	Idiopathic
Surgical trauma	a. Septal abscess b. Nasal myiasis c. Rhinolith d. Lupus vulgaris e. TB f. Leprosy g. Syphilis h. Wegner's granuloma i. Tumors of nasal septum, e.g. Chondrosarcoma	

Also know: Recreational drugs like crack or cocaine snorted nasally are becoming increasingly common cause of septal necrosis.
— Scotts Brown 7th/ed Vol 2 p 1592

Note: Cause of Perforation of:

Bony septum	Cartilaginous septum	Whole septum
Syphilis	• Lupus • Leprosy • Tuberculosis	Wegner's granuloma

24. Ans. is b i.e. Middle turbinate pressing on the nasal septum

Ref. Turner 10th/ed p 66; Dhingra, 5th/ed p 461 point 104, 6th/ed p 449

Sluder's neuralgia or the anterior ethmoidal syndrome is pain around the bridge of the nose radiating into the forehead. It is said to originate from the middle turbinate pressing on the septum.

25. Ans. is c i.e. Deviated nasal septum

Ref. Dhingra 5th/ed p 164, 6th/ed p 149; Mohan Bansal p 287

Cottle test: It is used to test nasal obstruction due to abnormality of nasal valve as in case of deviated nasal septum.

In this test, cheek is drawn laterally while the patient breathes quietly. If the nasal airway improves on the test side, the test is positive, and indicates abnormality of the vestibular component of nasal valve.

Also Know

Other tests for checking patency of nasal cavities

- Spatula test
- Cotton wool test

Various Tests of ENT

Test	Condition
• ABLB test of fowler	• To test positive recruitment as in Meniere's disease and presbycusis
• Bing test and Chimani-Moos test	• Tuning fork test to detect hearing loss
• Doerfler-Stewart test	• To detect malingering
	• Erhard's test
	• Gault's test
• Crowe-Beck test	• Done in lateral sinus thrombosis
• Tobey-Ayer test (Queckenstedt's)	• Done in lateral sinus thrombosis

CHAPTER

3

Granulomatous Disorders of Nose, Nasal Polyps and Foreign Body in Nose

GRANULOMATOUS DISEASES OF THE NOSE

Bacterial

- Syphilis
- Tuberculosis
- Lupus
- Rhinoscleroma
- Leprosy

Fungal

- Rhinosporidiosis
- Aspergillosis
- Mucormycosis
- Candidiasis
- Histoplasmosis
- Blastomycosis

Unspecified/Causes

- Wegener's granulomatosis
- Non-healing midline granuloma
- Sarcoidosis

BACTERIAL INFECTIONS

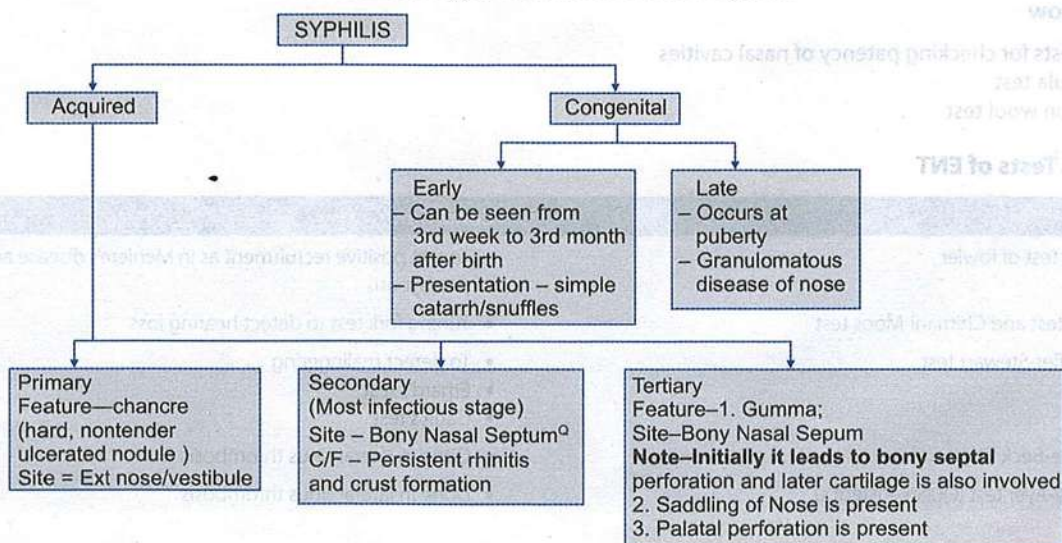
Lupus Vulgaris

- It is an indolent and chronic form of tuberculous infection.
- Female male ratio is 2:1
- Most common site is the mucocutaneous junction of the nasal septum, the nasal vestibule and the ala.

- Characteristic feature is the presence of *apple-jelly nodules* (Brown gelatinous nodules) in skin.
- *Lupus can cause perforation of cartilaginous part of nasal septum*
- Confirmation is by biopsy.

Syphilis (Flow Chart 3.1)

Flow chart 3.1: Types and clinical feature of syphilis



Rhinoscleroma

It is chronic, progressive granulomatous disease commencing in the nose and extending into the nasopharynx and oropharynx, larynx (subglottic area), trachea and bronchi.

Organism

Klebsiella rhinoscleromatis (Gram-negative Frisch bacillus).

Features

- Scleroma can occur at any age and in either sex.
- The disease has following stages:

Atrophic Stage

Resembles atrophic rhinitis and is characterized by foul smelling purulent nasal discharge and crusting.

Granulomatous Stage

- Proliferative stage
- The stage is characterized by granulomatous reactions and presence of 'Mikulicz cells'
- Painless nodules are formed in nasal mucosa.
- Subdermal infiltration occurs in lower part of external nose and upper lip giving a woody feel.

Cicatricial Stage

It is characterized by formation of:

- Adhesions fibrosis and stenosis of nose, nasopharynx and oropharynx.
- Subglottic stenosis with respiratory distress may occur.
- Pain is not a feature of this stage

NOTE

M/C symptom of Rhinoscleroma is Nasal obstruction and crusting (94%) > Nasal deformity > Epistaxis.

Diagnosis

- Biopsy shows submucosal infiltrates of plasma cells, lymphocytes, eosinophils, mikulicz cells and russell bodies.
- **Mikulicz Cells:** are large foam cells with a central nucleus and vacuolated cytoplasm containing the bacilli).
- **Russell Bodies:** are homogenous eosinophilic inclusion bodies found in plasma cells.
- Both of them are characteristic features of Rhinoscleroma.

Treatment

- Streptomycin (2 g/day) + Tetracycline (2 g/day) for a minimum of 4–6 weeks (till 2 consecutive samples are negative).
- Surgical dilatation of the cicatricial areas with polythene tubes for 6–8 weeks.

Leprosy

- M/C in lepromatous leprosy
- **M/C affected parts:** Nasal septum (anterior part) and inferior turbinate

Feature

Lead to perforation of nasal septum.

Treatment

Dapsone, Isoniazid and Rifampin.

FUNGAL INFECTIONS

Rhinosporidiosis

- It is a fungal granuloma:
- **Causative organism:** *Rhinosporidium seeberi*
- **Distribution:** India, Pakistan, Sri Lanka
- **Most commonly affected sites :** Nose and nasopharynx
- **Others:** lip, palate, uvula, maxillary antrum, epiglottis, larynx, trachea, bronchi, ear, scalp, penis, vulva, vagina.
- **Mode of affection:** dust from the dung of infected horses and cattle and through contaminated water of pond.

Features

- Young males are more affected.
- Lesions are polypoid and papillomatous friable masses which bleed easily on touch.
- They are strawberry (pink to purple) colored and studded with white dot's representing the sporangia.
- Patients complain of nasal discharge which is blood tinged, sometimes frank epistaxis is the only presenting complaint.

Diagnosis

It is made by biopsy which shows several sporangia and spores.

Treatment

- Endoscopic excision of the mass followed by cauterization of its base.
- Recurrence may occur after surgery.
- Medical management with dapsone decrease the recurrence rate

Aspergillosis

- *Aspergillosis is the commonest fungal infection of the nose and sinuses.*
- **Causative organism:** *A. fumigatus* (90%) > *A. niger* and *A. flavus*
- **Spread:** air-borne

Features

- It can affect any age group.
- Black or grayish membrane seen on nasal mucosa.
- Maxillary sinus shows a fungal ball

Treatment

Surgical debridement and antifungal drugs.

Mucormycosis

It is an aggressive opportunistic fungal infection

Predisposing Factors

- Immunosuppressed patients
- Uncontrolled diabetes

Features

- Mucormycosis differs from other fungi as it has a remarkable affinity for blood vessels and arteries leading to extensive endothelial damage and thrombosis.
- The disease begins in the nose and paranasal sinus and spreads to orbit, cribriform plate, meninges and brain.
- **Typical finding:** Black necrotic mass seen filling the entire nasal cavity.
- Erosion of the nasal septum and the hard palate may be seen.

Investigations

- Sinus radiographs show thickened sinus walls and spotty destruction of the bony walls.
- MRI detects early vascular and intracranial invasion.

Treatment

- Systemic - Amphotericin B
- Surgical debridement of the affected tissues
- **Orbital exenteration** is mandatory in case of ophthalmoplegia and loss of vision.

EXTRA EDGE

- Syphilis affects the bone, while tuberculosis affects the cartilaginous framework of nose.
- Rhinoscleroma is caused by Frisch bacillus, i.e. *Klebsiella rhinoscleromatis*. Mikulicz cells and Russel bodies are typical of the histopathological examination.
- Sarcoidosis resembles tuberculosis except for caseation, and Kveim test and biopsy are diagnostic.

Table 3.1: Types of nasal polyp

Ethmoidal polyps	Antrochoanal polyps
<p>Age group = 30–60 years Sex = Male > Female M/C Site – Ethmoid sinus (can also arise from middle turbinate and middle meatus)</p> <p>Etiology: Allergy (M/C) On examination – B/L Multiple, smooth, glistening sessile or pedunculated polyps Lining epithelium initially is columnar, later due to trauma it undergoes squamous metaplasia</p> <p>Symptoms Presenting symptom B/L nasal blockage</p> <p>Others</p> <ul style="list-style-type: none"> • Partial/complete loss of smell • Pain over nasal bridge forehead/cheek • Postnasal drip Broadening of nose (frog face deformity) <p>Note: Polyps do not present with Epistaxis/bleeding O/E</p> <ul style="list-style-type: none"> • Anterior Rhinoscopy—multiple, smooth, bluish gray grape-like masses. • On probing – All polyps are insensitive to probing and donot bleed. 	<p>• Seen in children and young adults (male > female) • Maxillary antrum (floor and medial wall)</p> <p>Etiology = Allergy + Infection On examination – U/L, pale, white, translucent It has 3 parts:</p> <ul style="list-style-type: none"> • Antral • Choanal • Nasal <p>U/L Nasal blockage (which can become bilateral when polyp grows into nasopharynx and obstructs opposite choana)</p> <ul style="list-style-type: none"> • Hyponasal voice • Nasal discharge • Conductive deafness due to (blockage of Eustachian tube) <p>Anterior Rhinoscopy: It is not visualized as they are posterior. Posterior Rhinoscopy – Smooth, white spherical masses seen in choana</p>

Contd...

NASAL POLYPS

- Polyps are non-neoplastic pedunculated masses which are sparsely cellular and are covered by normal epithelium i.e. columnar ciliated epithelium.
- **Features:** They are soft, fleshy, pale, *insensitive to pain and do not shrink with the use of vasoconstrictors*.
- They do not bleed on touch and are insensitive to probing and never present with epistaxis or bleeding from nose.
- Types of nasal polyp are described in Table 3.1.



Also know: Samters triad – It is a triad of asthma, aspirin intolerance and nasal polyps.

FOREIGN BODIES IN NOSE

May be organic or inorganic and are mostly seen in children⁹

Clinical Features

Unilateral foul smelling discharge in a child is pathognomonic of a foreign body.⁹

Treatment

- Removal under LA/GA.⁹
- In children use of oral positive pressure technique called as 'Parent's Kiss' technique is being practiced for removal of anterior nasal foreign body. (Scott Brown)

Contd...

Ethmoidal polyps

Investigation– X-ray of PNS
(Waters view and CT to exclude bony erosion)

Treatment**Surgical**

- Effective only in 50% cases
- Drug used – Intranasal corticosteroids

Medical T/t

- **Simple polypectomy:** Indicated in case of one/two polyps
- **Intranasal ethmoidectomy:** Done when polyps are multiple and sessile. Since it is a blind procedure it can give rise to orbital complications
- **Extranasal ethmoidectomy:** Indicated when polyps recur after intranasal procedures [Howarth's incision (Incision given medial to the inner canthus of the eye)]
- **Horgan's Transantral ethmoidectomy:** When polypoidal changes are also seen in the maxillary antrum.
- **Endoscopic sinus surgery:** It is the latest procedure for removal of small polyps under good illumination using 0° and 30° sinuscope i.e. Functional endoscopic sinus surgery (FESS).

Complications

- Nasal infection (vestibulitis) and sinusitis
- Rhinolith formation.
- Inhalation into the tracheobronchial tree

RHINOLITH

- It is stone formation in the nasal cavity.
- Rhinolith forms around the nucleus of a small exogenous foreign body or blood clot when calcium, magnesium and phosphate deposit around it.

Clinical Features

- More common in adults.
Presents as unilateral nasal obstruction and foul smelling discharge (often blood stained)
- Ulceration of the surrounding mucosa may lead to frank epistaxis and neuralgic pain.

Treatment

Removal under GA. Some hard and irregular rhinoliths may require lateral rhinotomy

NASAL MYIASIS (MAGGOTS IN NOSE)

- It results from the presence of ova of flies particularly *Chrysomya* species in the nose which produce ulceration and destruction of nasal structure.
- Mostly seen in atrophic rhinitis when the mucosa becomes insensitive to flies laying eggs inside

Clinical features**Initial**

- 3–4 days maggots produce
- Intense irritation
Sneezing
- Lacrimation
- Headache
- Thin blood stained discharge

Antrochoanal polyps**Treatment**

Medical
↓
No role

Surgical
treatment

Surgical Management

- **Intranasal polypectomy:** Indicated in – young patients with incomplete dentition.
- **Caldwell-Luc operation** (i.e. opening the maxillary antrum through canine fossa by sublabial approach). It is done if there is recurrence and age of patient is more than 17 years.
- Nowadays Antrochoanal polyp is being treated by FESS

Later

Maggots may crawl out of nose and there is foul smell.

Complications

- Destruction of nose, sinuses, soft tissues of face, palate and eyeball.
- Fistulae in nose and palate
- Death occurs due to meningitis

Treatment

Instillation of chloroform water and oil in nose and plugging the nose so that maggots do not crawl out.

- Patient should be isolated

ALSO KNOW

For undergraduate students:

Causes of unilateral blood stained nasal discharge in a child

- Foreign body in nose
- Rhinolith
- Nasal diphtheria
- Nasal myiasis
- Acute/Chronic unilateral sinusitis

Some important points to remember in a case of nasal polyp

1. If a polypus is red and fleshy, friable and has granular surface, especially in older patients, think of malignancy.
2. Simple nasal polyp may masquerade a malignancy underneath. Hence all polypi should be subjected to histology.
3. A simple polyp in a child may be a glioma, an encephalocele or a meningoencephalocele. It should always be aspirated and fluid examined for CSF. Careless removal of such polyp would result in CSF rhinorrhoea and meningitis.
4. Multiple nasal polypi in children may be associated with mucoviscidosis.
5. Epistaxis and orbital symptoms associated with a polyp should always arouse the suspicion of malignancy.

QUESTIONS

1. 68-year-old Chandu is a diabetic and presented with black, foul smelling discharge from the nose. Examination revealed blackish discoloration of the inferior turbinate. The diagnosis is: [AIIMS 99]
 - a. Mucormycosis
 - b. Aspergillosis
 - c. Infarct of inferior turbinated. Foreign body
2. IDDM patient presents with septal perforation of nose with brownish black discharge probable diagnosis is:
 - a. Rhinosporidiosis
 - b. Aspergillus [AI 97; RJ 06]
 - c. Leprosy
 - d. Mucormycosis
3. Rhinosporidiosis is caused by: [PGI 99; UP 00]
 - a. Fungus
 - b. Virus
 - c. Bacteria
 - d. Protozoa
4. True statement about Rhinosporidiosis is: [AI 99]
 - a. Most common organism is klebsiella rhinoscleromatis
 - b. Seen only in immunocompromised patients
 - c. Presents as a nasal polyp
 - d. Can be diagnosed by isolation of organism
5. In rhinosporidiosis, the following is true: [PGI 99]
 - a. Fungal granuloma
 - b. Grayish mass
 - c. Surgery is the treatment
 - d. Radiotherapy is treatment
6. Ideal treatment of rhinosporidiosis is: [AIIMS 97]
 - a. Rifampicin
 - b. Excision with cautery at base
 - c. Dapsone
 - d. Laser
7. Rhinoscleromatis is caused by: [PGI 99]
 - a. Klebsiella
 - b. Autoimmune
 - c. Spirochetes
 - d. Rhinosporidium
8. Mikulicz cell and russel bodies are characteristic of: [JIPMER 02; Bihar 06]
 - a. Rhinoscleroma
 - b. Rhinosporidiosis
 - c. Plasma cell disorder
 - d. Lethal midline granuloma
9. Atrophic dry nasal mucosa, extensive encrustations with woody hard external nose is suggestive of [MH 05]
 - a. Rhinosporidiosis
 - b. Rhinoscleroma
 - c. Atrophic rhinitis
 - d. Carcinoma of nose
10. Apple-jelly nodules on the nasal septum are found in case of: [MP 05]
 - a. Tuberculosis
 - b. Syphilis
 - c. Lupus vulgaris
 - d. Rhinoscleroma
11. About nasal syphilis the following is true: [PGI 02]
 - a. Perforation occurs in septum
 - b. Saddle nose deformity may occur
 - c. In newborn, it presents as snuffles
 - d. Atrophic rhinitis is a complication
 - e. Secondary syphilis is the common association
12. Killian term is used for which of the following polyp
 - a. Ethmoidal
 - b. Antrochoanal [UP 05]
 - c. Tonsillar cyst
 - d. Tonsillolith
13. All the following are true of antrochoanal polyp except: [AI 94]
 - a. Common in children
 - b. Single and Unilateral
 - c. Bleeds on touch
 - d. Treatment involves Avulsion
14. All of the following are true about antrochoanal polyp, except: [TN 07]
 - a. Single
 - b. Unilateral
 - c. Premalignant
 - d. Arises from maxillary antrum
15. Antrochoanal polyp is characterized by: [PGI Dec 03]
 - a. Usually bilateral
 - b. It is of allergic origin
 - c. It arises from maxillary antrum
 - d. Caldwell-Luc operation is treatment of choice in recurrent cases
 - e. Recurrence is common
16. The most appropriate management for antrochoanal polyp in children is: [AIIMS 02]
 - a. Caldwell-Luc operation
 - b. Intranasal polypectomy
 - c. Corticosteroids
 - d. Wait and watch
17. Treatment of choice for antrochoanal polyp in a 10-year-old child is: [PGI 96]
 - a. Caldwell-Luc operation
 - b. Intranasal polypectomy
 - c. Conservative treatment till 16 years
 - d. Exploratory rhinotomy
18. Treatment for recurrent antrochoanal polyp: [MP 2007]
 - a. Caldwell Luc operation
 - b. FESS
 - c. Simple polypectomy
 - d. Both a and b
19. The current treatment of choice for a large antrochoanal polyp in a 30-year-old man is: [AIIMS Nov 05]
 - a. Intranasal polypectomy
 - b. Caldwell-Luc operation
 - c. FESS (Functional Endoscopic Sinus Surgery)
 - d. Lateral rhinotomy and excision
20. Which of the following statements is not correct for Ethmoidal polyp: [AIIMS 02]
 - a. Allergy is an etiological factor
 - b. Occur in the first decade of life
 - c. Are bilateral
 - d. Are often associated with bronchial asthma
21. Regarding ethmoidal polyp, which one of the following is true: [Kolkata 05]
 - a. Epistaxis
 - b. Unilateral
 - c. <10 years
 - d. Associated with bronchial asthma
22. Recurrent polyps are seen in: [UP 07]
 - a. Antrochoanal polyp
 - b. Ethmoidal polyp
 - c. Nasal polyp
 - d. Hypertrophic turbinate
23. In a patient with multiple bilateral nasal polyps with X-ray showing opacity in the paranasal sinuses. The treatment consists of all of the following except: [AIIMS 02]
 - a. Epinephrine
 - b. Corticosteroids
 - c. Amphoterecin B
 - d. Antihistamines

- 24. Patient with ethmoidal polyp undergoes polypectomy. Presents 6 months later with ethmoidal polyp. Correct Rx:** [AIIMS 95]
 a. Intranasal ethmoidectomy b. Extranasal ethmoidectomy
 c. Caldwell-Luc procedure d. Polypectomy
- 25. "Bernoulli's theorem" explains:** [UP 07]
 a. Nasal polyp b. Thyroglossal cyst
 c. Zenker's diverticulum d. Laryngomalacia
- 26. Samter's triad includes:**
 a. Nasal polyps
 b. Aspirin sensitivity
 c. Bronchiectasis
 d. Bronchial asthma
 e. Immunodeficiency
- 27. In Caldwell-Luc operation the nasoastral window is made through:** [TN 04]
 a. Superior meatus b. Inferior meatus
 c. Middle meatus d. None of the above
- 28. Most common complication of Caldwell-Luc operation is:** [AP 00]
 a. Oroantral fistula b. Infraorbital nerve palsy
 c. Hemorrhage d. Orbital cellulitis
- 29. About foreign body in a child true statement is:** [PGI June 03]
 a. Unilateral fetid discharge
 b. Presents with unilateral nasal obstruction
 c. Has torrential epistaxis
 d. Inanimate is more common than animate
 e. Always removed under GA
- 30. Most common cause of U/L mucopurulent rhinorrhea in a child is:** [Kolkata 01/FMGE 2013]
 a. Foreign body
 b. Adenoids which are blocking the airways
 c. Deviated nasal septum
 d. Inadequately treated acute frontal sinusitis
- 31. What is a Rhinolith:** [AI 91]
 a. Foreign body in nose
 b. Stone in nose
 c. Deposition of calcium around foreign body in nose
 d. Misnomer
- 32. Maggots in the nose are best treated by:** [AI 98; 96]
 a. Chloroform diluted with water
 b. Liquid paraffin
 c. Systemic antibiotics
 d. Lignocaine spray
- 33. Frish bacillus causes:** [FMGE 2013]
 a. Rhinosleroma b. Rhinosporidiosis
 c. Rhinophyma d. Lupus vulgaris
- 34. A Rapidly destructive infection of nose and paranasal sinuses in diabetics is:** [DNB 2010]
 a. Histoplasmosis b. Sporotrichosis
 c. Mucormycosis d. Sarcoidosis
- 35. Multiple nasal polyp in children should guide the clinician to search for underlying:** [AP PG 2012]
 a. Mucoviscidosis b. Celiac disease
 c. Hirschsprung's disease d. Sturge weber syndrome

EXPLANATIONS AND REFERENCES

- 1. Ans. is a i.e. Mucormycosis**
2. Ans. is d i.e. Mucormycosis Ref. Dhingra 5th/ed p 175 6th/ed p 159; Mohan Bansal p 317
- **Mucormycosis** is fungal infection of nose and paranasal sinuses which may prove rapidly fatal if untreated.
 - It is seen in uncontrolled diabetes or in those taking immunosuppressive drugs.
 - It presents as black necrotic mass filling the nasal cavity and eroding the septum and hard palate.
 - **Treatment** is by amphotericin B^o and surgical debridement.

NOTE

Most common fungal infection of nose is Aspergillosis.^o

- 3. Ans. is a i.e. Fungus**
4. Ans. is c i.e. Presents as a nasal polyp
5. Ans. is a and c i.e. Fungal granuloma; and Surgery is the treatment
6. Ans. is b i.e. Excision with cautery at base Ref. Dhingra 5th/ed p 174, 6th/ed p 158, 159; Mohan Bansal 316, 317

Rhinosporidiosis is a Fungal Granuloma.^o

- Agent : *Rhinosporidium seeberi*.^o
- Source : Contaminated water of ponds.^o
- Presents as : Leafy polypoidal mass,^o pink to purple in color studded with white dots (Strawberry appearance).
- It is highly vascular and bleeds on touch.^o
- Patients complain of blood tinged nasal discharge /epistaxis
- **Diagnosis** is made by biopsy
- Biopsy shows several sporangia filled with spores.
- **Treatment** – Complete excision of mass with diathermy knife and cauterization of base.^o
- Recurrence is common after surgery.

7. Ans. is a i.e. *Klebsiella*

8. Ans. is a i.e. *Rhinoscleroma*

9. Ans. is b i.e. *Rhinoscleroma*

Ref. Dhingra 5th/ed p 172, 6th/ed 156; Scott Brown's 7th/ed Vol 2 Chapter 115 pp 1462, 1463; Mohan Bansal p 315

Rhinoscleroma

- It is a chronic granulomatous disease caused by gram-negative Frisch bacteria *Klebsiella rhinoscleromatis*.
- It is seen mostly in poor socioeconomic conditions and commonly occurs in Europe, Pakistan, Indonesia and South America.

Pathologically

- Mikulicz cells or foam cells and Russell bodies are its characteristic features.
- Russell bodies are homogeneous eosinophilic inclusion bodies found in plasma cells.
- In a patient presenting with atrophic dry nasal mucosa, extensive crusting and woody hard external nose:
 - Rhinoscleroma should be suspected.
 - For more details kindly see the preceding text

10. Ans. is c i.e. *Lupus vulgaris*

Ref. Dhingra 5th/ed p 173, 6th/ed p 157; Scott Brown's Otolaryngology 7th/ed Vol 2, Chapter 115 p 1456; Current oto rhinology 2nd/ed p 261; Mohan Bansal p 316

- Lupus vulgaris is the chronic and more common form of tubercular infection affecting the skin and mucous membrane of nose
- Apple-jelly appearances are brown gelatinous nodules and are typical skin lesions of lupus.

11. Ans. is e i.e. *Secondary syphilis is the common association*

Ref. Dhingra 5th/ed p 173, 6th/ed p 157

Nasal syphilis may be:

- **Acquired:**
 - Primary, e.g. chancre in vestibule
 - Secondary, e.g. simple rhinitis, crusting and fissuring leading to atrophic rhinitis
 - Tertiary, e.g. Gumma leads to septal perforation and saddle nose deformity (due to collapse of nasal bridge)
- **Congenital:**
 - Early (first 3 months): Presenting as snuffles, purulent nasal discharge, fissuring excoriation.
 - late (around puberty): Gumma in septum and other stigmata.
- Tertiary syphilis is a common association: primary and secondary syphilis are rare association in nasal syphilis.
- Septal perforation occurs in bony part in case of syphilis.

12. Ans. is b i.e. *Antrochoanal*

Ref. Internet search

Killian's polyp is the name given to antrochoanal polyp based on Gustain Killians

13. Ans. is c i.e. *Bleeds on touch*

14. Ans. is c i.e. *Premalignant*

15. Ans. is c and d i.e. *It arises from maxillary antrum; Caldwell-Luc operation is treatment of choice in recurrent cases*

Ref. Dhingra 5th/ed pp 186, 187, 6th/ed p 174, 175; Scott Brown 7th/ed Vol 2 Chapter 121 p 1554; Mohan Bansal pp 308, 309

- Nasal polyps are non-neoplastic masses^o of edematous nasal or sinus mucosa. They do not bleed on touch and are insensitive to probing and never present with epistaxis or bleeding from nose.
- Recurrence is uncommon in case of antrochoanal polyp.
- Antrochoanal polyps arise from maxillary artrum and then grow into choana and nasal cavity.

[For details of Antrochoanal polyps see text]

16. Ans. b i.e. *Intranasal polypectomy*

17. Ans. b i.e. *Intranasal polypectomy*

Ref. Dhingra 5th/ed p 188, 6th/ed p 174, 175; Tuli 1st/ed p 175; Maqbool 11th/ed p 206; Turner 10th/ed p 55

Management Options for Antrochoanal Polyp

Avulsion of Polyp

- The treatment of antrochoanal polyp is its complete removal along with the removal of the lining of the sinus (to avoid recurrence).
- Sometimes it is possible to grasp the stalk and avulse the polyp, but most of the time it fails to remove the polyp and its lining completely
- Therefore, it is not the treatment of choices

Intranasal Polypectomy

It was the treatment of choice for all age groups prior to the advent of endoscopic sinus surgery and is still the treatment of choice in those set-ups where endoscopic surgery is not practised.

Caldwell-Luc Operation

- It is indicated if there is a recurrence and the age of the patient is more than 17 years
- Nowadays with FESS available – Caldwell-Luc operation is avoided

Functional Endoscopic Sinus Surgery (FESS)

- These days it is the treatment of choice for all polyps and has superceded other modes of polyp removal.
- Now in none of the questions—FESS is given as an option—Therefore we will go with the second best for children which is intranasal polypectomy.

18. Ans. is d i.e. Both a and b

Ref. Dhingra 5th/ed p 188, 6th/ed 175, 2nd/e p 182, 183; Tuli 1st/ed p 175, 2nd/ed p 182, 183; Turner 10th/ed p 55

As explained in the previous question

For management of recurrent polyps, we have 2 options, i.e.

Caldwell-Luc operation

- Can be done only in patients > 17 yrs of age
- Many complications
- Not preferred nowadays

Functional endoscopic sinus surgery

- Can be done in all age groups
- Fewer complications
- TOC for recurrent polyps

NOTE

The question says "Treatment for Recurrent Antrochoanal polyp – therefore we have selected option d. i.e. both Caldwell-Luc and FESS
If the question would have been – Treatment of choice for Recurrent Antrochoanal polyp, then the answer would be – option 'b' i.e. FESS

19. Ans. is c i.e. FESS

Ref. Dhingra 5th/ed p 188, 6th/ed p 175; Maqbool 11th/ed p 206

FESS is Functional Endoscopic Sinus Surgery.

- Current treatment of choice of antrochoanal polyp is endoscopic sinus surgery which has superceded other modes of polyp removal.
- In this procedure all polyps are removed under endoscopic control especially from the key area of the osteomeatal complex. This procedure helps to preserve the normal function of the sinuses. FESS can be done under local anesthesia although general anesthesia is preferred
- Caldwell-Luc operation is avoided these days.

20. Ans. is b i.e. Occurs in the first decade of life

Mohan Bansal p 310

21. Ans. is d i.e. associated with bronchial asthma

Ref. Scott Brown 7th/ed Vol 2 Chapter 121 p 1550; Dhingra 5th/ed pp 185, 186, 6th/ed, p 172; Logan Turner 10th/ed p 373;

Mohan Bansal p 310

Mohan Bansal p 308

22. Ans. is b i.e. Ethmoidal polyp

Ethmoidal Polyps

- They are mostly seen in adults.^Q
- Etiology—usual cause of ethmoidal polyps is allergy.^Q
- "Allergic nasal polyps are rarely, if ever seen in childhood. They are only seen in childhood in association with mucoviscidosis."^Q
- Ethmoidal polyps are also associated with:
 - Bronchial asthma
 - Aspirin intolerance
 - Cystic fibrosis
 - Nasal mastocytosis
 - Syndromes like: Kartageners/Young syndrome/Churg-Strauss syndrome
- It is generally bilateral.^Q
- Appear as multiple, sessile or pedunculated masses like a bunch of grapes.^Q
- Insensitive to touch and do not bleed on probing.^Q
- Recurrence is common after removal.^Q
 - Friends many questions have been asked on differences between ethmoidal polyps and antrochoanal polyps
 - And believe me sometimes in exams there is so much mind block that simple questions like this seem confusing. So I am giving you a mnemonic which will help you in remembering the characteristics of ethmoidal polyps.

Ethmoidal Polyps – Features

m

mnemonic**Adult B M R**

Adult – It is seen in adults

B = Bilateral

M = Multiple

R = Recurrence is common

23. Ans. is c i.e. Amphotericin B

Ref. Dhingra 5th/ed p 186, 6th/ed p 173; Logan and Turner 10th/ed pp 52, 54

- This patient is having ethmoidal polyp (because polyps are multiple and bilateral)
- Main etiology of polyps is allergy.
- Medical treatment of polyps is the same as that for allergic rhinitis which consists of:
 - Antihistaminics
 - Steroids—helpful in patients who cannot tolerate antihistamine or have asthma along with polyps. It is also useful to prevent recurrence after surgery
 - Decongestants such as epinephrine, phenylephrine, xylometazoline, etc.
- Antifungals (e.g. Amphotericin B) have no role in treatment of polyps.

24. Ans. is b i.e. Extranasal ethmoidectomy

Ref. Dhingra 5th/ed p 186, 6th/ed p 173

Treatment of ethmoidal polyp

- **Simple polypectomy:** When there are one or two pedunculated polyps.
- **Intranasal ethmoidectomy:** Indicated when polyps are multiple and sessile.
- **Extranasal ethmoidectomy:** This is indicated when polyps recur after intranasal procedures.
- **Transantral ethmoidectomy:** Indicated when infection and polypoidal changes are also seen in the maxillary antrum. In this case antrum is opened by Caldwell-Luc approach and the ethmoidal air cells approached through the medial wall of the antrum.

NOTE

These days, ethmoidal polypi are removed by endoscopic sinus surgery (FESS) which is the TOC.

25. Ans. is a i.e. Nasal polyp

Ref. Fundamental of Physics, Halliday Resnic 6th/ed p 356; Turner 10th/ed p 54

"Bernoulli's theorem states that if the speed of a fluid element increases as it travels along a horizontal streamline, the fresher of the fluid must decrease and conversely."

—Fundamental of Physics, Halliday Resnic 6th/ed, p 356

Nasal polyps follow Bernoulli's theorem as—

"The increased speed of the air flowing through the nose decreases the pressure in the nasal cavity (Bernoulli's theorem) which pulls down the polyp."

26. Ans. is a, b and d i.e. Nasal polyps; Aspirin sensitivity; and Bronchial asthma

Ref. Scott Brown 7th/ed Vol 2 p 1472; Internet search – wikipedia.org; Mohan Bansal p 307

Samter's triad is a medical condition consisting of asthma, aspirin sensitivity, and nasal/ethmoidal polyposis. It occurs in middle age (twenties and thirties are the most common onset times) and may not include any allergies.

- Most commonly, the first symptom is rhinitis.
- The disorder typically progresses to asthma, then polyposis, with aspirin sensitivity coming last.
- The aspirin reaction can be severe, including an asthma attack, anaphylaxis, and urticaria in some cases. Patients typically react to other NSAIDs such as ibuprofen, although paracetamol is generally considered safe.
- Anosmia (lack of smell) is also typical, as the inflammation reaches the olfactory receptors in the nose.

Cause

The cause of Samter's triad is unknown, but it is widely believed that the disorder is caused by an anomaly in the arachidonic acid cascade, which causes undue production of leukotrienes, a series of chemicals involved in the body's inflammatory response. When prostaglandin production is blocked by NSAIDs like aspirin, the cascade shunts entirely to leukotrienes, producing the severe allergy-like effects.

Treatment

- **Medical:** The preferred treatment now is desensitization to aspirin, undertaken at a clinic specializing in such treatment. Leukotriene antagonists and inhibitors (montelukast, zafirlukast, and zileuton) are helpful in treating Samter's.
- **Surgical:** Occasionally, surgery may be required to remove polyps,[3] although they typically recur, particularly if desensitization is not undertaken.
- **Diet:** A diet low in omega-6 oils (precursors of arachidonic acid), and high in omega-3 oils, may also help.

27. Ans is b i.e. Inferior meatus

Ref. Dhingra 5th/ed p 418, 6th/ed p 411, 412; Tuli 1st/ed p 495, 2nd/ed p 459;

Scott Brown 7th/ed Vol 2 pp 1491, 1492

Caldwell-Luc Operation

- It was earlier done in case of chronic maxillary sinusitis with an aim to remove "irreversibly" damaged mucosa of maxillary sinus and to facilitate gravitational drainage and aeration via an inframeatal antrostomy.
- It was predominantly being used for persistent chronic rhinosinusitis when medication, lavage and inferiormeatal antrostomy has failed.
- But it is now not being used – as it is not the normal ciliated respiratory epithelium which replaces the nasal mucosa but fibrous tissue, which can obliterate the cavity and lead to cyst formation
- Contraindications – It should not be done in children as it can damage the secondary dentition.

Surgery	Done through
1. Caldwell-Luc operation	Inferior meatus
2. Antral puncture	Inferior meatus
3. Dacryocystorhinostomy	Middle meatus

28. Ans. is b i.e. infraorbital nerve palsy

Ref. Scott Brown 7th/ed Vol 2 p 1494

M/C Complication of Caldwell-Luc operation is injury to infraorbital nerve which occurs in 21% cases.

29. Ans. is a, b and d i.e. U/L foetid discharge; Presents with U/L nasal obstruction; and Inanimates is MC than animates

Ref. Dhingra 5th/ed 176, 6th/ed p 161; LT 10th/ed, p 62; Scott Brown 7th/ed, Vol 1, p 1186

Foreign Bodies in Children can be

Animate	Inanimate
<ul style="list-style-type: none"> • Examples are screwworms, larvae, maggots and black carpet beetles 	<ul style="list-style-type: none"> • These are more common • Examples are peas, beans, dried pulses, nuts, paper, cotton wool and pieces of pencil

Clinical Features

- Unilateral foul smelling discharge in a child is pathognomic of a foreign body
- It can lead to vestibulitis

Treatment

- Removal with forceps or blunt hook under LA

Indications of giving GA in Nasal Foreign Body Removal

- Uncooperative or very apprehensive child
- Troublesome bleeding if the foreign body is firmly embedded in granulation tissue
- Posteriorly placed foreign body.
- If a foreign body is strongly suspected but can't be found.

30. Ans. is a i.e. Foreign body

Ref. Dhingra 5th/ed p 176, 6th/ed p 161; Logan Turner 10th/ed p 63

"A unilateral nasal discharge is nearly always due to a foreign body and if discharge has an unpleasant smell, it is pathognomic."

—Logan Turner 10th/ed, p 63

"If a child presents with unilateral, foul smelling nasal discharge, foreign body must be excluded." —Dhingra 5th/ed p 176, 6th/ed 161**31. Ans. is c i.e. Deposition of calcium around foreign body in nose**

Ref. Dhingra 5th/ed p 176, 6th/ed p 161; Tuli 1st/ed, p 149; Scott-Brown 7th/ed Vol 1 p 1186; Mohan Bansal p 349

Rhinoliths are calcareous masses which result due to deposition of salts-like calcium and magnesium carbonates and phosphates around the nucleus of a foreign body.

*For more details, see text part.***32. Ans. is a i.e. Chloroform diluted with water**

Ref. Dhingra 5th/ed p 178, 6th/ed p 162

Chloroform water or vapor must be instilled in order to anesthetize or kill the maggots and so release their grip from the skin.

- Maggots are larval forms of flies, particularly of the genus chrysomya.^Q
- Patient may present as a simple case of epistaxis.^Q
- Maggots cause extensive destruction of nose, sinuses, soft tissues to face, palate or around the nose.^Q
- Death may occur from meningitis.^Q

33. Ans. is a—Rhinoscleroma

Ref. Dhingra 6th/ed p 156

Rhinoscleroma is a chronic granulomatous disease caused by Gram negative bacillus called *Klebsiella rhinoscleromatis* or Frisch bacillus**34. Ans. is c i.e. Mucormycosis**

Ref. Dhingra 6th/ed p 159

Mucormycosis

- It is a fungal infection of nose and paranasal sinuses which may prove rapidly fatal
 - It is seen in uncontrolled diabetes or in those taking immunosuppressive drugs
- For more details—refer to preceding text.

35. Ans. is a i.e. mucoviscidosis

Ref. Dhingra 6th/ed p 175

"Multile nasal polypi in children may be associated with mucoviscidosis."

—Dhingra 6th/ed p175

CHAPTER

4

Inflammatory Disorders of Nasal Cavity

RHINITIS

Classification (Table 4.1)

Table 4.1: Classification of rhinitis

Acute inflammation	Chronic Inflammation
<ul style="list-style-type: none"> Acute Rhinitis Acute nasal diphtheria 	<p><i>Specific:</i></p> <ul style="list-style-type: none"> Nasal syphilis, tuberculosis Lupus and leprosy Rhinoscleroma Rhinosporidiosis Sarcoidosis <p><i>Nonspecific:</i></p> <ul style="list-style-type: none"> Atrophic rhinitis Rhinitis sicca Rhinitis caseosa <p><i>Allergic:</i></p> <ul style="list-style-type: none"> Seasonal allergic rhinitis Perennial allergic rhinitis Vasomotor rhinitis

ACUTE INFLAMMATORY CONDITION

ACUTE RHINITIS/CORYZA

- Frequently referred to as *common cold*.
- Seen in adults and school going children.
- Caused by viruses specially rhinovirus, influenza and parainfluenza virus, ECHO virus, adenoviruses and retroviruses
- Secondary invaders are Streptococci, Staphylococci, Pneumococci, *H. influenza* and *M. catarrhalis*.

Clinical Features

- There is burning/tickling sensation at the back of the nose followed by nasal stuffiness, rhinorrhea and sneezing.
- Low-grade fever.
- Initially discharge is watery and profuse but becomes mucopurulent later due to secondary bacterial invasion.

Treatment

- Bed rest
- Vitamin C
- Antihistaminics and anti-inflammatory drugs
- Antibiotics if secondary infection occurs.

CHRONIC INFLAMMATORY CONDITIONS

- Nasal syphilis
 - Tuberculosis of nose
 - Lupus vulgaris
 - Leprosy
 - Rhinoscleroma
 - Rhinosporidiosis
- Details discussed in chapter on granulomatous disease of the nose

ALLERGIC RHINITIS

- It is an immunoglobulin E (IgE) mediated immunological response of nasal mucosa to airborne allergens.
- Clinically allergic rhinitis is of 2 types (Table 4.2).

Table 4.2: Types of allergic rhinitis

Seasonal	Perennial
<ul style="list-style-type: none"> Symptoms appear in and around a particular season generally March-May or August-September. It is because of pollens of some particular grass or flowers which act as allergen In morning symptoms are usually worse and are aggravated by dry windy condition 	<ul style="list-style-type: none"> Symptoms are present throughout the year In this case-house dust, perfumes, sprays, drugs, tobacco, smoke, chemical, fumes, etc. act as allergen Symptoms are not as severe as in seasonal type

Pathogenesis

It is a type I hypersensitivity reaction. It involves excessive production of IgE antibodies, i.e. it is an atopic reaction.

Clinical features

- No age or sex predilection
- Onset is at 12–16 years of age (i.e. adolescence). Peak prevalence is during third and fourth decade.
- Patients present with itching of eyes and nose, sneezing, profuse watery discharge, postnasal drip, concomitant coughing and wheezing, nasal obstruction.

Noe: Rhinorrhea and sneezing are more common in seasonal rhinitis than perennial rhinitis

Signs

- **Nose:**
 - Nasal mucosa is pale, boggy, hypertrophic and may appear bluish.
 - Transverse crease is present on the nose due to upward rubbing of nose (**allergic salute**).
 - Turbinates are swollen.
- **Ear:** Otitis media with effusion due to blockage of Eustachian tube is a possibility in children
- **Pharynx:** Granular pharyngitis.
- **Larynx:** Edema of the vocal cords and hoarseness of voice.
- **Eyes:** Dark circles, i.e. *allergic shiners* are seen under the eyes.

Investigations

- **Blood tests:** ↑ TLC, ↑ DLC (eosinophilia)
- **Nasal smear:** Eosinophils seen
- **Skin tests:** Are done to identify the allergen:
 - Prick test
 - Scratch test
 - Intradermal test

Noe: Prick test is preferred over the others since the other two are less reproducible, more dangerous and may give false positive result.

- **RAST (Radioallergosorbent Test):** Serum IgE measurement is done *in vitro*. (not done now)
- Newer tests like immunoCap are preferred.

Treatment

Environment Control Like

Reduce household humidity to <50%, wash linens in hot water, eliminate cockroaches, remove carpets and pets.

Medical Measures/Pharmacotherapeutic Measures

Antihistaminics

- They are frequently used as a **first-line therapy** because most of them are available without a prescription
- Antihistamines block the early phase reaction mediated by histamines

- They have no effect on nasal congestion which is a late phase reaction and is mediated by cytokines and leukotrienes
- **Side effects** – Sedation, dry mouth, decreased work performance. These side effects can be reduced by using second generation antihistaminics.

Corticosteroids

Mechanism of action: They act on the late phase reaction and prevent a significant influx of inflammatory cells. Corticosteroids can be given either

Intranasally	Systemically
<ul style="list-style-type: none"> • Minimal systemic absorption therefore no systemic side effects • Approved for use in children • Its is the DOC treatment of allergic rhinitis in young adults and children 	<ul style="list-style-type: none"> • Necessary for severe intractable symptoms • Can cause all systemic side effects of steroids • Can suppress HPA axis therefore to be used with caution

Drugs used – Triamcinolone, Budesonide, Fluticasone and Mometasone

Decongestants

Act on a adrenergic receptors of nasal mucosa and respiratory tract

↓
Vaso constriction
↓
Decrease turbinate congestion
↓
No effect on rhinorrhea or sneezing Improved nasal patency

NOTE

Intranasal decongestant, i.e. oxymetazoline can cause rebound nasal congestion and dependency if used for more than 3–4 days (rhinitis medicamentosa)^Q

Intranasal Cromolyn

It is used before the onset of symptoms and continued throughout the exposure. It is very safe mast cell stabilizer and prevents their degranulation despite the formation of antigen antibody complex.

Leukotriene Inhibitor

They are being tried for the management of allergic rhinitis but are less effective than antihistamines and intranasal steroids, e.g. Montelukast.

Immunotherapy

- Hyposensitization is done when other types of treatment are not effective.
- Subcutaneous route is used to give gradually increasing doses of known allergen.
- Immunotherapy suppresses the formation of IgE and raises the titer of IgG antibodies.
- **Disadvantage:** It has to be given for a sufficiently long time (2–3 year).

Contraindications to Immunotherapy

- Coexistent asthma
- Patients taking β -blocker
- Other medical / Immunological disease
- Age < 5 yr
- Pregnancy

Surgery

Ref. Scott Brown 7th/ed Vol 2 pp 1400, 1401

- Nasal surgery may be required when there is a marked septal deviation or bony turbinate enlargement (Grade D), which makes topical nasal sprays usage difficult.
- It is never the first line of treatment.
- Mucosal hypertrophy (Grade C) is preferably dealt medically, since after surgery the problem tends to recur within months.

VASOMOTOR RHINITIS

- Non Allergic Rhinitis
- Persists throughout year
- Tests of nasal allergy are negative.

Pathogenesis

Parasympathetic overactivity.

Symptoms

- More common in emotionally unstable persons especially in women of 20–40 years.
- Paroxysmal sneezing—just after getting out of bed in morning.
- Nasal obstruction.
- Excessive clear rhinorrhea.
- Postnasal drip.

Signs

- Congested and hypertrophic nasal mucosa.
- Mucosa of turbinates may give **mulberry like appearance** and is pale to dusky red in color.
- No eye symptoms seen.

Complications

- Nasal polyp
- Hypertrophic rhinitis and sinusitis.

Treatment (Table 4.3)

Table 4.3: Treatment of vasomotor rhinitis

Medical	Surgical
<ul style="list-style-type: none"> • Avoidance of provoking symptoms • Avoidance of provoking symptoms (oral/nasal decongestants) • Topical and nasal steroids 	<ul style="list-style-type: none"> • Treatment of complications • Vidian neurectomy

NOTE

For undergraduate students—**saline irrigation** is an important adjuvant to treatment as it helps to avert intranasal stasis and reduces crusting. Its use not only increases the efficacy of intranasal topical medications but also improves ciliary function.

Other Drugs which can be Used

- Anticholinergics like ipratropium bromide as they block parasympathetic input and so decrease rhinorrhea. Avoid in patients of narrow angle glaucoma, BPH or bladder neck obstruction.
- Azelastine spray – It works in case of vasomotor rhinitis but has a bitter taste which precludes its frequent use.

HYPERTROPHIC RHINITIS

Characterized by thickening of mucosa, submucosa, seromucinous glands, periosteum and bone.

Symptoms

- Nasal obstruction
- Thick and sticky nasal discharge.

Signs

- Hypertrophy of turbinates: especially inferior turbinates.
- **Mulberry like appearance of nasal mucosa is seen.**^Q
- Does not pit on pressure.
- Shows little shrinkage with vasoconstrictor drugs.

Treatment

To relieve nasal obstruction by reducing the size of turbinates by:

- Cauterization
- Submucosal diathermy
- Cryosurgery
- Partial or total turbinectomy
- Submucous resection of turbinate bone/laser treatment.

RHINITIS SICCA

- Seen in patients working in hot, dry and dusty surroundings.
- The respiratory ciliated columnar epithelium of anterior part of nose undergoes squamous metaplasia with atrophy of seromucinous glands.

Treatment

- Correction of occupational surroundings
- Antibiotic and steroid ointment
- Nasal douching.

ATROPHIC RHINITIS/OZAENA

Chronic inflammatory disease characterized by progressive atrophy of the nasal mucosa and the underlying bone of the turbinates. There is associated **excessive crusting** which leads to nasal obstruction in spite of abnormal patency of nasal passages.

Etiology

mnemonic

HERNIA

Hereditary

Endocrinal pathology—Starts at puberty. Stops after menopause

Racial factors—seen more in Whites and Yellow races

Nutritional deficiency: deficiency of vitamin A, D, E and iron may be responsible for it

Infective: *Klebsiella ozanae*, Diphtheroids, *P. vulgaris*, *E. coli*, *Staphylococci*, *Streptococci*

Autoimmune process—causing destruction of nasal, neurovascular and glandular elements may be the cause

Pathology

- Ciliated columnar epithelium is lost and is replaced by stratified squamous type.
- Atrophy of seromucinous glands.
- Turbinates are resorbed leading to widening of nasal chambers.

Clinical Features

- Seen in females at puberty.
- Patient herself is anosmic but a foul smell comes from her making her a social outcast.
- Nasal obstruction (in spite of roomy nasal cavities due to large crusts filling the nose) and epistaxis.

Signs

- Roomy nasal cavities with greenish large crusts with shriveled turbinates.
- Septal perforation may be present.
- Nose may show saddle deformity.
- Atrophic changes may be seen in the pharyngeal mucosa.
- Atrophic changes may be seen in the larynx - *Atrophic laryngitis*
- Eustachian tube obstruction can lead to hearing loss.

Investigations

X-ray PNS (Water's view)—Thickening of the walls of the sinuses

Treatment

Medical

- **Warm nasal alkaline solution:** 280 ml warm water + 1 part of the following powder:
 - Sodium bicarbonate (28.4 g) + Sodium baborate (28.4 g) + 2 parts of Sodium chloride (56.7 g) (**Remember—BBC**)

- The purpose of the solution is to loosen and remove the crusts and the thick tenacious secretions.

- **25% glucose in glycerin:**

- Following removal of the crust the nose is painted with 25% glucose in glycerin.
- Glucose—Inhibits proteolytic organisms, Glycerine—is a hygroscopic agent.

- **Other Local antibiotics:** *Kemicetine antiozaena solution:* 1 ml contains chloramphenicol(90 mg), estradiol dipropionate (0.64 mg), Vit D2 (900 IU) and propylene glycol

- Potassium iodide: by mouth to increase the nasal secretion
- Human placental extract is given in the form of submucosal injections

- **Other drugs:**

Rifampicin, Streptomycin to decrease the odor and crusts.

Estradiol spray to ↑ vascularity of nasal mucosa

Placental extract injected submucosally.

Surgical

- **Young's operation^o:**

- Closure of both the nostril following elevation of the nasal vestibular folds. They are opened after 6 months.

- **Modified Young's operation:**

- Partial closure of the nostril leaving behind a 3 mm hole.
- This remains for a period of 2 years.

- **Narrowing of the nasal cavity by - (Lautenslager's operation)**

- Submucosal injection of teflon paste
- Insertion of fat, cartilage, bone or teflon strips under the mucoperiosteum of floor and lateral wall of nose
- Section and medial displacement of lateral wall of nose

RHINITIS CASEOSA/NASAL CHOLESTEATOMA

It is a chronic inflammation of the nose characterized by accumulation of offensive cheesy material resembling cholesteatoma.

Features

- Usually U/L
- The nose gets filled with whitish offensive debris with invasion of the bony structures and the soft tissues of the face.

Treatment

- Removal of debris by scooping it out
- Repeated irrigation

Rhinitis medicamentosa^o

- Caused by excessive use of topical decongestant nasal drops.^o

QUESTIONS

1. **Common cold is caused primarily by:** [Karnataka 94]
 - a. Viruses
 - b. Bacteria
 - c. Fungi
 - d. Allergy
2. **Early mediators of allergic rhinitis are:** [PGI 03]
 - a. Leukotriene
 - b. IL-4
 - c. IL-5
 - d. Bradykinin
 - e. PAF
3. **In Allergic rhinitis nasal mucosa is:** [MP 03]
 - a. Pale and swollen
 - b. Pink and swollen
 - c. Atrophied
 - d. Bluish and atrophied
4. **All of the following surgical procedures are used for allergic rhinitis except:** [AIIMS 04]
 - a. Radiofrequency ablation of the inferior turbinate
 - b. Laser ablation of the inferior turbinate
 - c. Submucosal placement of silastic in inferior turbinate
 - d. Inferior turbinectomy
5. **All are implicated in etiology of atrophic rhinitis except:** [DNB 02]
 - a. Chronic sinusitis
 - b. Nasal deformity
 - c. DNS
 - d. Strong hereditary factors
6. **Which of the following organisms is known to cause Atrophic Rhinitis:** [MP 07]
 - a. *Klebsiella pneumoniae*
 - b. *Klebsiella ozaenae*
 - c. *Streptococcus pneumoniae*
 - d. *Streptococcus foetidus*
7. **Cause of nasal obstruction in atrophic rhinitis:** [PGI 00, 97]
 - a. Crusting
 - b. Polyp
 - c. Secretions
 - d. DNS
8. **All are true regarding atrophic rhinitis except:** [AP 04]
 - a. More common in males
 - b. Crusts are seen
 - c. Anosmia is notice
 - d. Young's operation is useful
9. **All are true about ozaena except:** [UP 03]
 - a. Common in female
 - b. It is usually unilateral
 - c. Nasal cavity is filled with greenish crusts
 - d. Atrophic pharyngitis
10. **Alkaline douch solution of nose does not contain:**
 - a. NaCl
 - b. Na baborate
 - c. NaHCO₃
 - d. Glucose
11. **Young's operation is done for:** [JIPMER 02] [Jharkhand 06, MP 03] [FMGE 2013]
 - a. Allergic rhinitis
 - b. Atropic rhinitis
 - c. Vasomotor rhinitis
 - d. Idiopathic rhinitis
12. **Vidian neurectomy is done in:** [CUPGEE 97]
 - a. Vasomotor rhinitis
 - b. Rhinitis sicca
 - c. Allergic sinusitis
 - d. Epistaxis
13. **Mulberry appearance of nasal mucosal membrane is seen in:** [MP 2006]
 - a. Coryza
 - b. Atrophic rhinitis
 - c. Maxillary sinusitis
 - d. Chronic hypertrophic rhinitis
14. **Merciful anosmia is seen in:** [FMGE 2013]
 - a. Atrophic rhinitis
 - b. Allergic rhinitis
 - c. Ethmoidal polypsis
 - d. Wegener's granulomatosis
15. **Rhinitis medimentosa is due to:** [NEET pattern]
 - a. Nasal decongestants
 - b. Steroid
 - c. Antihistamics
 - d. Surgery
16. **Allergic rhinitis treatment include all except:** [NEET pattern]
 - a. Antibiotics
 - b. Avoiding allergen
 - c. Corticosteroids
 - d. Surgery

EXPLANATIONS AND REFERENCES

1. Ans. is a i.e. Viruses

Common cold/coryza/Acute Rhinitis is primarily caused by viruses, e.g. Adenovirus, Picorna virus, Rhinovirus, Cocksackie and ECHO viruses. Secondary Invasion by Bacteria Occurs Later.

Ref. Dhingra 5th/ed p 168, 6th/ed p 152; Mohan Bansal p 299

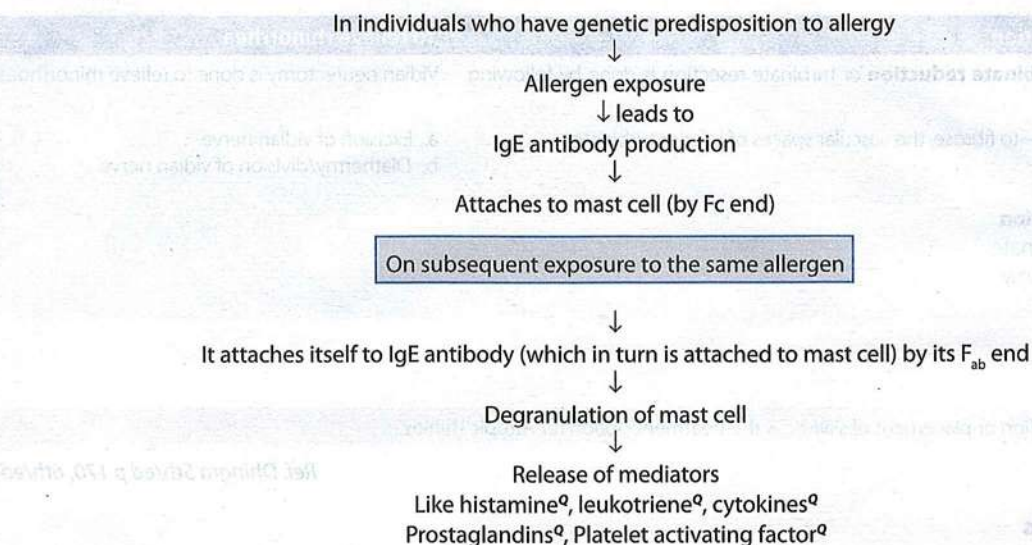
NOTE

Mode of infection:	- Droplet infection
Incubation period:	- 1-4 days
Clinical features:	- Burning sensation
	- Sneezing
	- Rhinorrhea
	- Nasal stuffiness

2. Ans. is a, b, c, d and e i.e. Leukotriene; IL4, IL5, Bradykinin; and PAF

Ref. Robin's 7th/ed pp 208,209; Current otolaryngology 2nd/ed pp 267,268; Dhingra 5th/ed p 180, 6th/ed p 197

Allergic rhinitis is Type 1 hypersensitivity reaction

Pathology**Called as Early phase/Humoral reaction**

- Early phase occurs within 10–15 mins (max 30 mins) of allergen exposure
- It is due to release of mediators viz. histamine, cytokine, Prostaglandins, leukotrienes, platelet activating factor
- Release of histamine causes symptoms like – sneezing, rhinorrhea, itching, vascular permeability, vasodilatation, glandular secretion

↓

Release of cytokines and leukotrienes in the early phase causes influx of inflammatory cells (eosinophils)

↓

Called as later phase of cellular reaction

- ↓
- Occurs 2–8 hours after initial sensitization
 - Causes symptoms like Nasal congestion and postnasal drip

3. Ans. is a i.e Pale and swollen

Ref. Scott Brown 7th/ed Vol 2 Chapter 109 p 1393; Dhingra 5th/ed p 181, 6th/ed p 167

In allergic rhinitis – on examination following features are seen.

In Nose	In Eyes	In Ear	In larynx and pharynx
<ul style="list-style-type: none"> • Nasal mucosa is pale, swollen, hypertrophic and • Turbinates are swollen • Watery and mucoid discharge is present • Allergic salute i.e. a transverse crease is seen on nose due to upward rubbing of nose 	<ul style="list-style-type: none"> • Edema of lids • Congestion and cobble stone appearance of conjunctiva • Dark circles under the eye k/a allergic shiners 	<ul style="list-style-type: none"> • Retracted tympanic membrane • Serous otitis media due to blockage of Eustachian tube 	<ul style="list-style-type: none"> • Child may show adenoid hyperplasia due to mouth breathing • Granular pharyngitis edema of vocal cords • Hoarseness of voice

4. Ans. is c i.e. Submucosal placement of sialistic in inferior turbinate

Ref. Turner 10th/ed pp 39,53; Scott Brown 7th/ed Vol 2, Chapter 104, pp 1400,1401

- Surgery is done in a case of allergic rhinitis when other methods have failed or when there is marked septal deviation or bony turbinate enlargement which makes topical nasal spray usage difficult
- It should never be used as first line of treatment.

Surgery

To relieve nasal obstruction

To relieve obstruction, **turbinate reduction** or turbinate resection is done by following methods:

- Submucosal diathermy—to fibrose, the vascular spaces of inferior turbinates
- Cryosurgery
- Laser cautery**
- Radiofrequency ablation**
- Partial excision of turbinate
- Submucosal turbinectomy
- Radical turbinectomy**

To relieve rhinorrhea

Vidian neurectomy is done to relieve rhinorrhoea:

- Excision of vidian nerve
- Diathermy/division of vidian nerve

NOTE

Submucosal injection of teflon or placement of sialistic is the treatment option for Atrophic rhinitis.

5. Ans. is c i.e. DNS

Ref. Dhingra 5th/ed p 170, 6th/ed p 153

Atrophic Rhinitis

Primary

The exact etiology is not known

It can be due to:

H = **Hereditary factors**

E = **Endocrinal disturbance** because it starts at puberty and ceases after menopause. Female > Male. Therefore endocrinal cause is possibility.

R = **Racial factors**—White and Yellow races are susceptible

N = **Nutritional deficiency** of Vit A, D and iron

I = **Infective** (organisms like *Klebsiella ozaenae*, diphtheroids,

P. vulgaris, *E. coli*, *Staphylococci*, *Streptococci*)

A = **Autoimmune** process

Secondary

Secondary rhinitis can be due to:

- Specific infections like:
 - Syphilis
 - Leprosy
 - Rhinoscleroma
- **Longstanding purulent sinusitis**
- Radiotherapy to nose
- Surgical removal of turbinates
- **Deviated nasal septum**

NOTE

DNS can lead to unilateral atrophic rhinitis on the wider side.⁹

6. Ans. is a i.e. *Klebsiella ozaenae*

Ref. Scott Brown 7th/ed Vol 2 Chapter 115 p 1465; Dhingra 5th/ed p 170, 6th/ed p 154; Mohan Bansal p 313

Organism known to cause atrophic Rhinitis are:

- *Coccobacillus foetidus ozaena*
- *Diphtheroid bacillus*
- *Klebsiella ozaenae*
- *Bordetella bronchiseptica*
- *Pasteurella multocida*
- *P. vulgaris*
- *E. coli*
- *Staphylococcus*
- *Streptococcus*

Ref. Scott Brown 7th/ed Vol 2 p 1465

Ref. Dhingra 5th/ed p 170, 6th/ed p 154

7. Ans. is a i.e. Crusting

Ref. Logan Turner 10th/ed p 40; Dhingra 5th/ed pp 170, 171; 6th/ed p 152, 154; Mohan Bansal p 313

8. Ans. is a i.e. More common in Males

Ref. Dhingra 5th/ed pp 146, 170 and 171, 6th/ed p 152, 154

9. Ans. is b i.e. It is usually unilateral

Ref. Scotts Brown 7th/ed Vol 2 Chapter 115 p 1465, Dhingra 6th/ed p 153, 164

10. Ans. is d i.e. Glucose

Ref. Dhingra 5th/ed p 171, 6th/ed p 154

11. Ans. is b i.e. Atrophic Rhinitis

Ref. Dhingra 5th/ed p 171 6th/ed p 152; Scott Brown 7th/ed Vol 2, Chapter 155 p 1466; Mohan Bansal p 314

Atrophic Rhinitis

- Characterized by excessive crusting and atrophy of nasal mucosa and turbinate bones.

- More **common in females**.^Q
- **Age**—Usually starts at puberty and ceases after menopause.^Q
- It is always **bilateral**^Q except in case of DNS where atrophic rhinitis is seen on the wider side.

Clinical Features

Due to excessive crusting and atrophy there is:

- Foul smell from nose
- Patient herself is **anosmic**^Q
- Nasal obstruction^Q
- Epistaxis if crusts are removed

O/E: • **Nasal cavity** is full of **greenish/gray black dry crusts**^Q

- Atrophy of turbinates
- Nasal mucosa is pale.
- **Pharynx**—**Atrophic pharyngitis may be seen**
- Larynx—Atrophic laryngitis may be seen which can lead to cough and hoarseness of voice
- Ear—Obstruction of Eustachian tube can cause serous otitis media
- PNS—Small/under developed and have thick walls. They appear opaque on X-ray

Management of Atrophic Rhinitis

Medical	Surgical
<ul style="list-style-type: none"> • Warm nasal Alkaline • Douche made up of : <ul style="list-style-type: none"> – Sodium bicarbonate (1 Part) – Sodium baborate (1 Part) – Sodium chloride (2 Part) <p>In water (280 ml) 25% glucose in glycerin</p> <ul style="list-style-type: none"> • Local antibiotics • Kemicetine antiozaena solution <ul style="list-style-type: none"> – Potassuim Iodide – Human placental extract 	<ul style="list-style-type: none"> • <i>Young's operation</i> <ul style="list-style-type: none"> – Closure of the both nostril following elevation of Vestibular folds. It is opened after 6 months. • <i>Modified young's operation</i> <ul style="list-style-type: none"> – Partial closure of the nostril leaving behind a 3 mm hole – This remains for a period of 2 years • Submucosal injection of teflon paste to narrow the cavity. • Lautenslager's operation <ul style="list-style-type: none"> – Surgical procedures aimed at medializing the lateral nasal wall using substances like: Paraffin, teflon, Polythene, cartilage

Also know: Kemicetine anti ozaena solution.

It contains:

- Chloromycetin
- Estradiol
- Vitamin D₂

12. Ans. is a i.e. Vasomotor Rhinitis

Ref. Dhingra 5th/ed p 183; 6th/ed p 170; Scott Brown 7th/ed Vol 2 p 1412

Excessive rhinorrhea in vasomotor rhinitis not corrected by medical therapy and bothersome to the patient, is relieved by sectioning the parasympathetic secretomotor fibers to nose, i.e. vidian neurectomy.

NOTE

The parasympathetic/secretomotor supply of the nose comes through the vidian nerve (also called the nerve of pterygoid canal). It is formed by greater superficial petrosal branch of facial nerve joining deep petrosal nerve derived from plexus around internal carotid artery (sympathetic nerve supply).

13. Ans. is d i.e. Chronic hypertrophic rhinitis

Ref. Dhingra 5th/ed p 169; 6th/ed p 153; Mohan Bansal p 337

Mulberry like appearance of nasal mucosa is seen in chronic hypertrophic rhinitis

[For details kindly see the preceding text]

14. Ans. is a i.e. atrophic rhinitis

Ref. Dhingra 6th/ed p 154

In atrophic rhinitis, there is foul smell from the nose, making the patient a social outcast though the patient himself is unaware of the smell due to marked anosmia which accompanies the degenerative changes. This is called as **merciful anosmia**.

15. Ans. is a i.e. Nasal decongestants

Ref. Mohan Bansal 1st/ed 331

Rhinitis medicamentosa: The long term use of cocaine and topical nasal decongestants (cause rebound congestion) leads to rhinitis medicamentosa.

16. Ans. is a antibiotics

Ref. Dhingra 6th/ed p 168–9; Mohan Bansal 1st/ed p 327–30

Now Friends, you actually donot need any reference or explantion to answer this question as it is obvious antibiotics donot have any role in treating allergy.

Rest all options—avoiding allergens, corticosteroids and surgery can be used as management options for allergic rhinitis for more details see the preceding text.

CHAPTER

5

Epistaxis

D

Epistaxis is bleeding from inside the nose.

AREAS OF NASAL BLEED

Little's Area

- Most common site for epistaxis in children and young adults.
- **Location:** Anteroinferior part of the nasal septum^a
- **Arteries contributing:**
 - Sphenopalatine artery^a (also called as artery of epistaxis)
 - Anterior ethmoidal
 - Septal branch of *greater palatine artery*
 - Septal branch of superior labial^a artery
- These arteries form the **Kiesselbach's plexus**.^a

This area is called as little's area as it was identified by James Little in 1879. It is also called as locus valsalvae and is the confluence of internal and external carotid artery. This vascular area is the most common site of nose bleed in children and young adults. It gets dried due to the effect of inspiratory current and easily traumatised due to frequent picking (fingering) of nose.

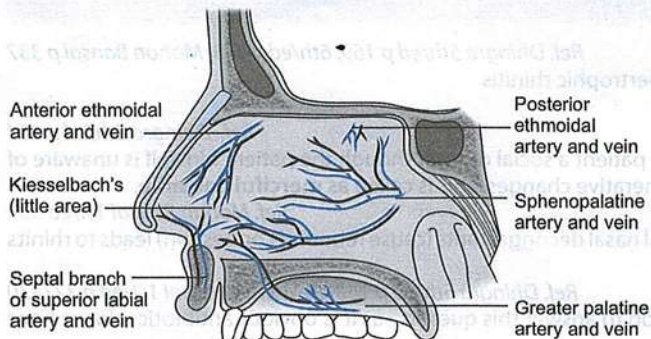


Fig. 5.1: Blood supply of nasal septum

Retrocolumellar Vein

Location: Just behind the columella at the anterior edge of the little's area.

- The retrocolumellar vein of this area then runs along the floor of the nose to anastomise with the various plexus of the lateral wall of the nose.
- **Common site of venous bleeding** in young people (<35 yrs).

Woodruffs Plexus

- **Location:** Found in the lateral nasal wall inferior to the posterior end of inferior turbinate.
- **Contributing vessels:** Anastomosis between sphenopalatine artery and posterior pharyngeal artery.
- **Browne's area:** Located at the part end of nasal septum.
- **Features:**
 - It is a venous plexus
 - Common cause of posterior epistaxis.

CLASSIFICATION OF EPISTAXIS

Classification I

According to Scott Brown 7th/ed Vol 2 p 1600

Anterior epistaxis: Bleeding from a source anterior to the plane of the piriform aperture. This includes bleeding from the anterior septum and rare bleeds from the vestibular skin and mucocutaneous junction.

Posterior epistaxis: Bleeding from a vessel situated posterior to the piriform aperture. This allows further subdivision into lateral wall, septal and nasal floor bleeding.

NOTE

For undergraduate students nobody can challenge above definition but in case a short note is asked an anterior and posterior epistaxis then the following Table 5.1, given on next page of the guide from Dhingra should also be reproduced.

Table 5.1: Types of epistaxis and their features

	Anterior Epistaxis	Posterior Epistaxis
Incidence	Blood flows out from the front of nose More common	Blood flows back into the throat Less common
Site	Mostly from Little's area or anterior part of lateral wall	Mostly from posterosuperior part of nasal cavity; often difficult to localise the bleeding point
Age	Mostly occurs in children or young adults	After 40 years of age
Cause	Mostly trauma	Spontaneous; often due to hypertension or arteriosclerosis
Bleeding	Usually mild, can be easily controlled by local pressure or anterior pack	Bleeding is severe, requires hospitalization; postnasal packing often required

Classification II

Epistaxis can also be classified as:

- **Childhood epistaxis:** i.e. if it occurs in age < 16 yrs
- **Adult epistaxis:** i.e. if it occurs in age > 16 yrs

Classification III**Primary**

Between 70% and 80% of all cases of epistaxis are idiopathic, spontaneous bleeds without any proven precipitant or causal factor. This is k/a primary epistaxis.

Secondary

Those cases where the cause of epistaxis is defined like trauma, surgery or anticoagulant overdose.

EPITAXIS IN CHILDREN

Scott Brown 7th/ed Vol 1 p 1064

- Epistaxis is common and usually innocuous event in childhood
- It is rare in children < 2 years
- Peak prevalence is in **3–8 years of age**.
- There is a seasonal variation with a higher prevalence in the winter months, due to greater frequency of upper respiratory tract infections or to the drying effect of inspired air of modern central heating systems.
- **M/C site of origin of bleed**—Anterior part of nasal septum (because this part of nasal mucosa is thin and is exposed to dry air currents).
- **M/C site of bleeding**—Little's area
- **M/C cause of Epistaxis**—Idiopathic
- **2nd M/C cause:** Digital trauma/Nose pricking in little's area which is due to crusting which occurs because of URTI.

Cause of Recurrent Epistaxis in Children

- Allergic rhinitis
- Retained nasal foreign body
- Use of nasal sprays as intranasal steroid sprays
- Hemorrhagic disease as in – ITPP, von willebrand disease
- Vascular abnormalities – A/V malformations, hemangioma
- Angiofibroma (Suspected in adolescent boys)
- Nasal parasitosis/Nasal mycosis

ADULT RECURRENT EPISTAXIS

When recurrent bleeds occur in adults, secondary epistaxis is most likely therefore the causes listed below are the same for **Recurrent/secondary Epistaxis**. Except for NSAIDs/aspirin use which can cause recurrent epistaxis

- Coagulopathy secondary to liver disease, kidney disease, leukemia or myelosuppression
- Trauma
- **Post surgery:** As after inferior turbinectomy, iatrogenic damage to anterior ethmoidal artery during endoscopic sinus surgery or damage to internal carotid artery during posterior ethmoid or sphenoid sinus surgery.
- Patients on warfarin
- Hereditary hemorrhagic telangiectasia
- Tumors—Juvenile nasopharyngeal angiofibroma hemangio-pericytoma.
- **M/C cause of epistaxis in adults:** Hypertension.

MANAGEMENT OF NOSE BLEED**First-aid Methods**

- Nasal pinching
- Applying ice cold water to head or face or give ice packs to dorsum of nose.
- **Trotter's method:** Old fashioned method of controlling epistaxis. Make the patient sit up with a cork between his teeth and allow him to bleed till he becomes hypotensive.

Treatment in Hospital**Sedation**

- Pethidine is given to allay the fear and anxiety of the patient.

Anterior Nasal Packing

- If bleeding continues, nose should be packed with a ribbon gauze soaked in neosporin antiseptic cream for 24 to 48 hours. Merocel packs can be used as an alternative to ribbon gauze packing (although costly but gives less discomfort to the patient).

Posterior Nasal Packing

- If bleeding does not stop by anterior nasal packing, it indicates posterior bleeding, and postnasal packing should be done.

Posterior nasal packing can cause cardiovascular complications like pulmonary hypertension and cor pulmonale since it leads to sleep apnea.

VESSEL LIGATION IN UNCONTROLLABLE BLEEDS

- **External carotid artery ligations:** Operation of choice in Elderly and debilitated patients in anterior epistaxis.
 - **Indication:** bleeding from the external carotid artery system when all conservative methods have failed
 - **Site for ligation:** above the origin of superior thyroid artery.
- **Maxillary artery ligation:** Performed in the pterygopalatine fossa. It is performed in posterior bleeds.
- Ligation method of choice is Endoscopic sphenopalatine artery ligation (ESPAL). It is done after exposing the sphenopalatine foramen by putting an incision in the middle turbinate and ligating the sphenopalatine artery.

- **Anterior and posterior ethmoidal arteries are ligated** between inner canthus of eye and midline of nose. **Internal maxillary artery is ligated** by Caldwell-Luc approach through its posterior wall in pterygopalatine fossa.

Hereditary hemorrhagic telangiectasia or Esler-Weber Rendu disease:

Hereditary hemorrhagic telangiectasia area involves the anterior part of nasal septum and causes recurrent episodes of profuse bleeding. It is managed by KTP or Nd Yag Laser or by septodermoplasty

Hierarchy of arteries used for ligation in uncontrollable epistaxis:

- Sphenopalatine artery (ESPAL)
- Internal maxillary artery
- External carotid artery
- Anterior/posterior ethmoidal artery

MANAGEMENT OF NOSE BLEED

First-aid Methods

- **Nasal pinching**
- Applying ice cold water to head or face or give ice packs to dorsum of nose.
- **Tyroler's method:** Old fashioned method of controlling epistaxis. Make the patient sit up with a cork between his teeth and allow him to bleed till he becomes hypotensive.

Treatment in Hospital

- Sedation
- **Anterior Nasal Packing**
 - If bleeding continues, nose should be packed with a cotton gauze soaked in neosporin antibiotic cream for 24 to 48 hours. Mucosal packs can be used as an alternative to cotton gauze packing (although costly but gives less discomfort to the patient).
- **Posterior Nasal Packing**
 - If bleeding does not stop by anterior nasal packing, it indicates posterior bleeding and postnasal packing should be done.
- **Peridine** is given to all the fear and anxiety of the patient.

EPISTAXIS IN CHILDREN

- Epistaxis is common and usually innocuous even in childhood.
- It is rare in children < 2 years.
- Peak prevalence is in 3-8 years of age.
- There is a seasonal variation with a higher prevalence in the winter months due to greater frequency of upper respiratory tract infections and the drying effect of inspired air of modern central heating systems.
- **Muc site of origin of bleed—Anterior part of nasal septum** (because this part of nasal mucosa is thin and is exposed to dry air currents).
- **Muc site of bleeding—Little's area**
- **Muc cause of Epistaxis—Idiopathic**
- **And Muc cause:** Digital trauma/nose picking in little area which is due to crusting which occurs because of URTI.

Cause of Recurrent Epistaxis in Children

- Allergic rhinitis
- Retained nasal foreign body
- Use of nasal sprays as intranasal steroid sprays
- Hemorrhagic disease as in - TTP, von Willebrand disease
- Vascular abnormalities - AV malformations, hemangioma
- Angiodysplasia (suspected in adolescent boys)
- Nasal parosteal/mucosal mycosis

QUESTIONS

1. **Common site of bleeding:** [PGI 08]
 - a. Woodruff's plexus
 - b. Brown area
 - c. Little's area
 - d. Vestibular area
2. **Woodruff's plexus is seen at:** [AP 95; TN 99; AP 03]
 - a. Anteroinferior part of superior turbinate
 - b. Middle turbinate
 - c. Posterior part of inferior turbinate
 - d. Anterior part of inferior turbinate
3. **Little's area is situated in nasal cavity in:**
 - a. Anteroinferior
 - b. Anterosuperior
 - c. Posteroinferior
 - d. Posterosuperior
4. **Main vascular supply of little's area is all except:**
 - a. Septal branch of superior labial artery
 - b. Nasal branch of sphenopalatine artery
 - c. Anterior ethmoidal artery
 - d. Palatal branch of sphenopalatine
5. **Which artery does not contribute to little's area:** [PGI 98] [FMGE 2013]
 - a. Anterior ethmoidal artery
 - b. Septal branch of facial artery
 - c. Sphenopalatine artery
 - d. Posterior ethmoidal artery
6. **Most common cause for nose bleeding is:** [AIIMS 95]
 - a. Trauma to Little's area
 - b. AV aneurysm
 - c. Posterosuperior part of nasal septum
 - d. Hiatus semilunaris
7. **M/C cause of epistaxis in 3 years old child:** [PGI 98]
 - a. Nasal polyp
 - b. Foreign body
 - c. Upper respiratory catarrh
 - d. Atrophic rhinitis
8. **In a 5-year-old child, most common cause of unilateral epistaxis is:** [PGI 97]
 - a. Foreign body
 - b. Polyp
 - c. Atrophic rhinitis
 - d. Maggot's
9. **Recurrent epistaxis in a 15-year-old female the most common cause is:** [JIPMER 90]
 - a. Juvenile nasopharyngeal fibroma
 - b. Rhinosporidiosis
 - c. Foreign body
 - d. Hematopoietic disorder
10. **Diagnosis in a 10-year-old boy with recurrent epistaxis and a unilateral nasal mass is:** [SGPGI 05]
 - a. Antrochoanal polyp
 - b. Hemangioma
 - c. Angiofibroma
 - d. Rhinolith
11. **Epistaxis in elderly person is common in:** [AI 04]
 - a. Foreign body
 - b. Allergic rhinitis
 - c. Hypertension
 - d. Nasopharyngeal carcinoma
12. **Systemic causes of epistaxis are all except:** [UP 02]
 - a. Hypertension
 - b. Anticoagulant treatment
 - c. Hereditary telangiectasia
 - d. Hemophilia
13. **A 70 years aged patient with epistaxis, patient is hypertensive with BP = 200/100 mm Hg. On examination no active bleeding noted, next step of management is:**
 - a. Observation
 - b. Internal maxillary artery ligation
 - c. Anterior and posterior nasal pack
 - d. Anterior nasal pack
14. **Source of epistaxis after ligation of external carotid artery is:** [AIIMS 93]
 - a. Maxillary artery
 - b. Greater palatine artery
 - c. Superior labial artery
 - d. Ethmoidal artery
15. **If posterior epistaxis cannot be controlled, which artery is ligated:** [Kolkata 00]
 - a. Posterior ethmoidal artery
 - b. Maxillary artery
 - c. Sphenopalatine artery
 - d. External carotid artery
16. **In case of uncontrolled epistaxis, ligation of internal maxillary artery is to be done in the:** [Kolkata 01]
 - a. Maxillary antrum
 - b. Pterygopalatine fossa
 - c. At the neck
 - d. Medial wall of orbit
17. **Treatment of choice in recurrent epistaxis in a patient with hereditary hemotelangiectasia:** [Kolkata 05]
 - a. Anterior ethmoidal artery ligation
 - b. Septal dermoplasty
 - c. External carotid artery ligation
 - d. Internal carotid artery ligation
18. **Causes of epistaxis are all except:** [NEET Pattern]
 - a. Allergic rhinitis
 - b. Foreign body
 - c. Tumor
 - d. Hypertension
19. **Most common site of nose bleed in child:** [NEET Pattern]
 - a. Woodruff area
 - b. Brown area
 - c. Little's area
 - d. None
20. **Posterior epistaxis is commonly seen in:** [NEET Pattern]
 - a. Children with ethmoidal polyps
 - b. Foreign bodies of the nose
 - c. Hypertension
 - d. Nose picking
21. **Kiesselbach's plexus is situated on the:** [DNB 2005, 11]
 - a. Medial wall of the middle ear
 - b. Lateral wall of the nasopharynx
 - c. Medial wall of the nasal cavity
 - d. Laryngeal aspect of epiglottis
22. **Posterior epistaxis occurs from:** [Kerala 2010]
 - a. Woodruff's plexus
 - b. Kiesselbach's plexus
 - c. Atherosclerosis
 - d. Little's area
23. **A child with unilateral nasal obstructin along with a mass in cheek and profuse and recurrent epistaxis:** [FMGE 2013]
 - a. Glomus tumor
 - b. Antrochoanal polyp
 - c. Juvenile nasal angiofibroma
 - d. Rhinolith
24. **which is known as artery of epistaxis**
 - a. Anterior ethmoidal A
 - b. Sphenopalatine A
 - c. Greater palatine A
 - d. Septal branch of superior labial A

EXPLANATIONS AND REFERENCES

1. Ans. is a, b and c i.e. Woodruff's plexus, Brown's area; and Little's area

2. Ans. is c i.e. Posterior part of inferior turbinate

3. Ans. is a i.e. Anterior inferior

4. Ans. is d i.e. Palatal branch of sphenopalatine artery

5. Ans. is d i.e. Posterior ethmoidal artery

Ref. Dhingra 5th/ed pp 190,191, 6th/ed p 176; Scott Brown 7th/ed Vol 2 p 1597; Mohan Bansal p 293

Common Sites of Bleeding

Site	Located	Formed by	Characteristic
Little's area (M/C site of Epistaxis)	Anteroinferior part of nasal septum	<ul style="list-style-type: none"> Anterior ethmoidal artery Septal branch of superior labial Artery Septal branch of sphenopalatine artery Greater palatine artery 	M/C site of bleeding
Woodruff's area	Under the posterior end of inferior turbinate	<ul style="list-style-type: none"> Sphenopalatine artery Posterior pharyngeal artery 	<ul style="list-style-type: none"> It is a venous plexus Common cause of posterior epistaxis
Retrocolumellar vein	Behind the columella at the anterior edge of little's area		M/C site of venous bleeding in children
Brown's area	Posterior part of septum	<ul style="list-style-type: none"> Posterior part of septum 	Site for hypertensive posterior epistaxis

6. Ans. is a i.e. Trauma to the little's area

Ref. Dhingra 5th/ed p 190, 6th/ed p 176; Mohan Bansal p 293

- Little area (also called as Kiesselbach's plexus) is a highly vascular area in the anteroinferior part of nasal septum just above the vestibule
- It is the most common site for nasal bleeding as this area is exposed to the drying effect of inspiratory current and to finger nail trauma.

7. Ans. is c i.e. Upper respiratory catarrh

Ref. Scott Brown 7th/ed Vol 1 p 1064

- Friends – I know some of you must be thinking foreign body as the answer but it is not the most common cause.
- M/C cause of epistaxis in children is idiopathic.

2nd M/C cause of epistaxis in children is

Infection/Trauma

↓
Development of crusts

↓
Nasal picking/Digital trauma

↓
Nasal bleed

Still if you have doubt read the following lines of Scotts Brown:

"Epistaxis – Children are especially susceptible to nose bleeds due to extensive vascular supply to nasal mucosa and the frequency with which they develop upper respiratory tract infections."

—Scott Brown 7th/ed Vol 1 p 1063

"Epistaxis is more common in children with upper respiratory allergies."

—Scott Brown 7th/ed Vol 1 p 1063

"There is a seasonal variation with a higher prevalence in the winter months perhaps due to the greater frequency of upper respiratory tract infections."

—Scott Brown 7th/ed Vol 1 p 1063

8. Ans. is a i.e. Foreign body

Ref. Dhingra 4th/ed p 153; 5th/ed p 176; 6th/ed 161; SK De 5th/ed p 245

Most common cause of unilateral epistaxis in children is **Foreign body**.

In case of Foreign Body of Nose **"The child presents with unilateral nasal discharge which is often foul smelling and occasionally blood-stained."**

—Dhingra 5th/ed p 176, 6th/ed p 161

Ref. Read Below

9. Ans. is d i.e. Hematopoietic disorder

As such this answer is not given anywhere but we can come to the correct answer by exclusion

Option "a" is Juvenile nasopharyngeal fibroma.

It is seen in adolescent males and is therefore the most common cause of recurrent epistaxis in males and not in females.

—Dhingra 5th/ed p 261, 6th/ed p 346

Option "b" is Rhinosporidiosis is a cause of epistaxis but usually occurs in young males from India.

—Turner 10th/ed p 61

Option "c" is Foreign body which is a cause of epistaxis in children and is not commonly seen in 15 years of age.

So we are left with hematopoietic disorder which can be seen in a 15 years old female.

—Dhingra 5th/ed p 176 6th/ed p 161

10. Ans. is c i.e. Angiofibroma

Ref. Dhingra 4th/ed p 230, 5th/ed p 261, 6th/ed p 246

Recurrent epistaxis in a 10-year-old boy with **unilateral nasal mass** is diagnostic of juvenile nasopharyngeal fibroma.

For details, see chapter on Pharyngeal Tumor.

11. Ans. is c i.e. Hypertension

Ref. Maqbool 11th/ed p 180; Mohan Bansal p 295

According to Scott Brown 7th/ed Vol 2 p 1600 – **M/C cause of adult epistaxis is idiopathic** though a number of factors increase its chances like use of NSAIDs and alcohol. It further says there is no proven association between hypertension and adult Epistaxis, but still

"Elevated blood pressure is observed in almost all epistaxis admissions. This apparent hypertension in acute admissions may be a result of anxiety associated with hospital admission and the invasive techniques used to control the bleeding."

—Dhingra 6th/ed p 167

But still the answer to this question is hypertension by ruling out other options:

- **Option a** – foreign body – is a cause of epistaxis in children and not in elderly age group

—Dhingra 5th/ed p 181

- **Option b** – allergic rhinitis – does not lead to epistaxis

- Nasopharyngeal carcinoma does cause epistaxis and is seen in elderly age group but is not the most common cause as in itself nasopharyngeal carcinoma is not common.

"Nasal tumors seldom present as epistaxis in isolation Juvenile nasopharyngeal angiofibroma and hemangiopericytoma are rare vascular tumors which can present with severe or recurrent epistaxis in association with nasal obstruction."

—Dhingra 5th/ed p 263

- Hence our answer by exclusion is hypertension.

- The answer is further supported by Maqbool 11th/ed p 180 which says:

"Hypertension is a very common disease and causes epistaxis frequently in elderly patients."

12. Ans is d i.e. Hemophilia

Ref. Scott Brown 7th/ed Vol 2 p 1605

Epistaxis in Adult

Primary	Secondary
No cause is identified but may be due to:	Cause is identified and it is due to:
<ul style="list-style-type: none"> • Use of NSAIDs • Use of alcohol • Hypertension (role not proven) 	<ul style="list-style-type: none"> • Coagulopathy secondary to liver disease/kidney disease/leukemia or myelosuppression • Trauma • Post surgery like inferior turbinectomy, Endoscopic sinus surgery • Warfarin intake (anticoagulant treatment) • Hereditary hemorrhagic telangiectasia

Hemophilia is a Secondary Cause of Epistaxis in Children

Ref. Scott Brown 7th/ed Vol 1 p 1065

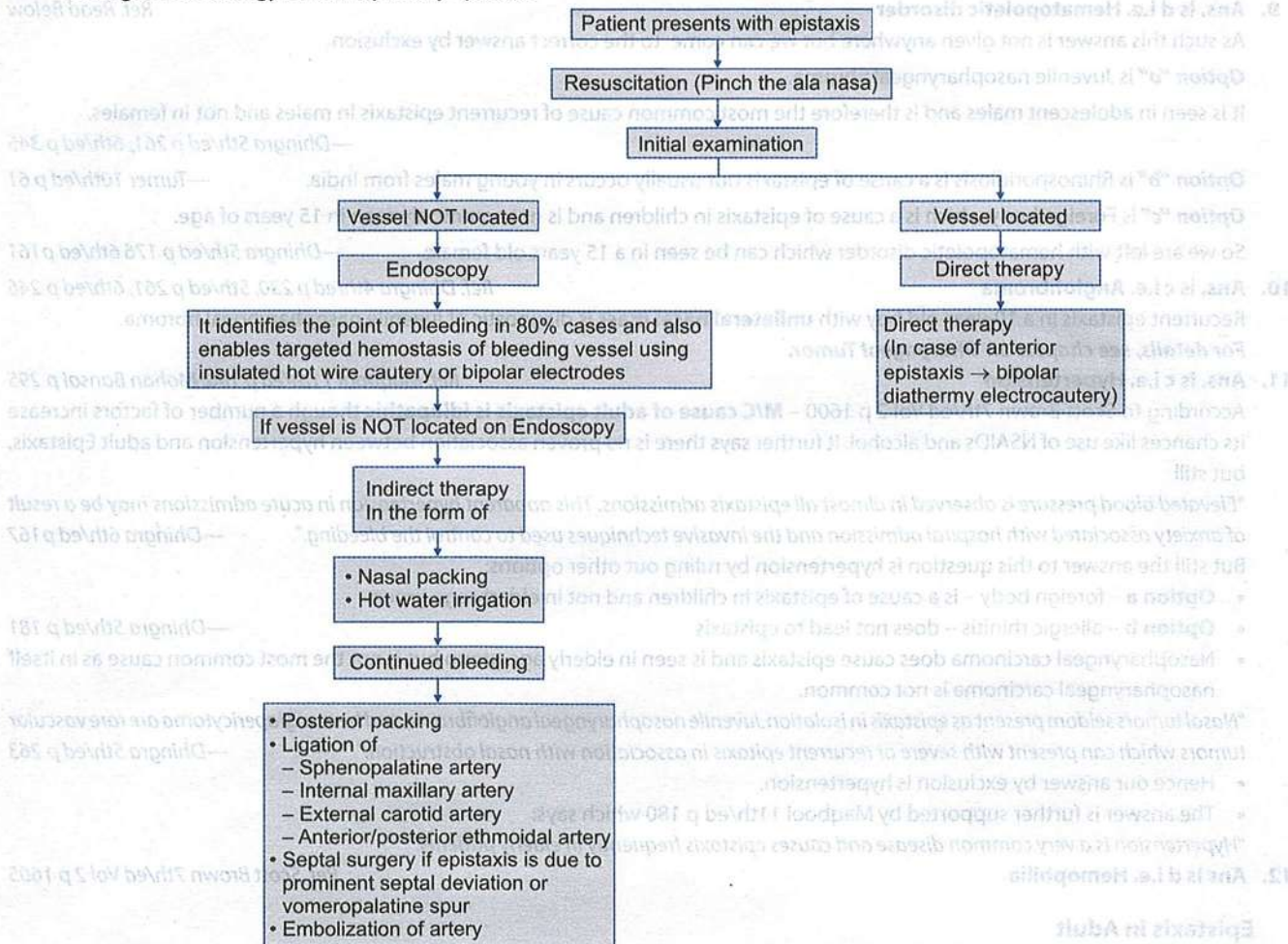
Hence the answer is d i.e. hemophilia which is not a cause of secondary epistaxis but is implicated in the etiology of primary epistaxis though its role is doubted there also.

13. Ans. is a i.e. Observation

Ref. Scott Brown 7th/ed, Vol 1 p 1065

- We do not need any reference to answer this particular question as the answer is hidden in the question only.

- The question itself says that no active bleeding is seen—so no need to do anything just observe the patient and because his B/P is 200/100 mm Hg which is quite high, give him antihypertensive drugs.

ALSO KNOW**Management strategy for adult primary epistaxis**

14. Ans. is d i.e. Ethmoidal artery Ref. Dhingra 5th/ed p 189, 6th/ed p 178; Mohan Bansal 1st/ed p 35; Scott Brown 7th/ed Vol 2 p 1599

Nose is Supplied by

Internal carotid artery	External carotid artery
<ul style="list-style-type: none"> Anterior ethmoidal artery Posterior ethmoidal artery 	Facial Artery <ul style="list-style-type: none"> Superior labial artery Maxillary artery <ul style="list-style-type: none"> Greater palatine artery Branches of sphenopalatine artery (nasopalatine, post nasal septal branches and posterior lateral nasal branches) Anterior superior dental artery

In the Question

- Greater palatine artery
- Superior labial artery
- Maxillary artery

Are all branches of external carotid artery.

If external carotid artery is ligated, the source of epistaxis will be **ethmoidal artery** which is a branch of **Internal carotid artery**.

15. Ans. is c i.e. Sphenopalatine artery

Ref. Scott Brown 7th/ed Vol 2 pp 1603,1606

Ligation technique is reserved for intractable bleeding where the source cannot be located or controlled by other techniques.

The hierarchy of arteries used for ligation is:

- Sphenopalatine artery
- Internal maxillary artery
- External carotid Artery
- Anterior/posterior ethmoidal artery

Earlier the most common artery ligated was maxillary artery but now endonasal sphenopalatine artery ligation (**ESPAL**) is the ligation of choice

"ESPAL is the current ligation of choice controlling bleeding in over 90% of cases with a low complication rate."

Ref. Scotts Brown 7th/ed Vol 2 p 1606

Endonasal Sphenopalatine Ligation

- It is the most popular procedure for ligation and has replaced internal maxillary artery ligation.
- Can be done under LA/GA
- Incision is given 8 mm anterior and under the posterior end of middle turbinate
- Sphenopalatine artery is ligated in the **sphenopalatine foramen**^o
- Success rate ~100%
- Complications very rare – rebleeding, infection and nasal adhesions

Internal Maxillary Artery Ligation

Earlier it was the ligation procedure of choice for uncontrolled bleeding:

- Internal maxillary artery is ligated in the pterygopalatine fossa using a Caldwell-Luc approach (3rd part of the artery is ligated)^o
- Success rate – 89%
- Complications – Sinusitis, damage to infraorbital nerve, oroantral fistula, dental damage and anesthesia, and rarely ophthalmoplegia and blindness.

External carotid artery ligation and anterior and posterior ethmoidal artery ligation is not commonly done.

16. Ans. is b i.e. Pterygopalatine fossa

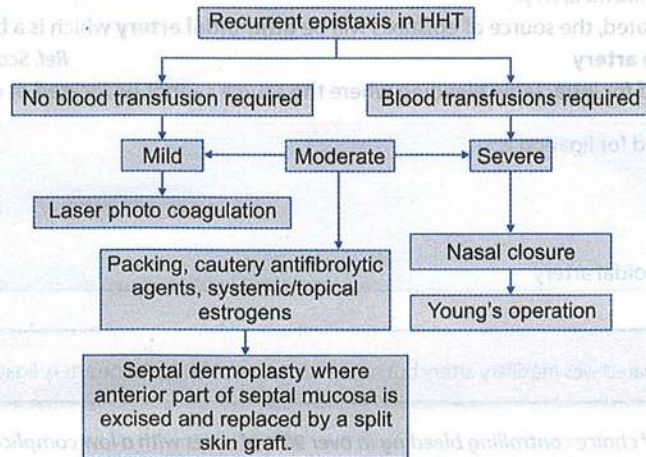
Ref. Scott Brown 7th/ed Vol 2 p 1603; Mohan Bansal p 296

Ligation of	Site
• Sphenopalatine artery	Sphenopalatine foramen
• Internal maxillary artery	Pterygopalatine fossa
• External carotid artery	Above the origin of superior thyroid artery
• Ethmoidal arteries	Between inner canthus of eye and midline of nose

17. Ans. is b i.e. Septal dermoplasty

Ref. Dhingra 5th/ed p 193, 6th/ed p 180; Scott Brown 7th/ed Vol 2, p 1605; Mohan Bansal 1st/ed p 297

- Hereditary hemotelangiectasia (HHT) or Osler-Weber-Rendu disease is an autosomal dominant condition affecting blood vessels in the skin, mucous membranes and viscera
- The genetic abnormality is located to chromosome 9 and 12
- **Classical features:**
 - Telangiectasia
 - A/V malformations
 - Aneurysms
 - Recurrent epistaxis (seen in 93% cases)

Management**18. Ans. is a i.e. allergic rhinitis**

Ref. Dhingra 6th/ed p 176, 167; Mohan Bansal 1st/ed p 294

Amongst the options given, foreign body, tumor, hypertension all can lead to epistaxis.

Remember: Many nasal problems can lead to epistaxis viz nasal trauma, viral rhinitis, chronic infections of nose (which lead to crust formation like atrophic rhinitis, rhinitis sicca, TB of nose), foreign bodies in nose (maggots and non living), DNS, neoplasms (hemangioma, papilloma, carcinoma or sarcoma).

Two nasal conditions which donot lead to epistaxis:

- Nasal polyps
- Allergic rhinitis

Pharyngeal conditions which lead to epistaxis:

- Adenoiditis
- Juvenile angiofibroma
- Malignant tumors

19. Ans. is c i.e. Little's area

Ref. Mohan Bansal 1st/ed p 294

"The most common site of bleeding in children and young people is Little's area."

20. Ans. is c i.e. hypertension

Ref. Dhingra 6th/ed p 178 Table 33.1; Mohan Bansal 1st/ed p 294

Anterior epistaxis

- In anterior epistaxis, blood flows from anterior nasal opening
- It is more common than posterior nasal bleeding
- The common sites of bleeding are Little's area and anterior part of lateral nasal wall
- It is usually mild and controlled by local pressure or anterior packing
- It mostly affects children and young adults and the M/C cause is trauma.

Posterior epistaxis

- Posterior nasal bleeding which is less common, but more severe, occurs spontaneously
- Most of the patients are more than 40 years of age
- The bleeding site which is difficult to localise is mostly posterior superior part of nasal cavity
- The M/C cause is hypertension and arteriosclerosis
- Bleeding is so severe that it requires hospitalisation and posterior nasal packing

21. Ans. is c i.e. medial wall of nasal cavity

Ref. Dhingra 6th/ed p 176

Kiesselbach's plexus is situated in the anterior inferior part of nasal septum (which forms the medial wall of nose) just above the vestibule.

22. Ans. is a i.e. Woodruffs pleux

Ref. Dhingra 6th/ed p 450

Explanation: Repeat

23. Ans. is c i.e. Juvenile nasal angiofibroma

Ref. Dhingra 6th/ed p 246

A child presenting with unilateral nasal obstruction along with mass in cheek and profuse and recurrent epistaxis should immediately raise the suspicion for Juvenile angiofibroma, details of which are dealt in chapter on 'Tumors of pharynx'.

24. Ans. is b sphenopalatine artery

Ref. internet search

The sphenopalatine artery (nasopalatine artery), a branch of maxillary artery and is commonly known as Artery of Epistaxis.

CHAPTER

6A

Diseases of Paranasal Sinus—Sinusitis

SINUSITIS

ANATOMY AND PHYSIOLOGY OF PARANASAL SINUSES

Paranasal sinuses are a group of air containing spaces that surround the nasal cavity.

Maxillary sinus

- Well developed at birth (1st to develop)
- Most common site of bacterial sinusitis
- Most common site of noninvasive fungal sinusitis
- On X-ray: visible at 4–5 months
- Completely developed by 9 year of age (at the time of second dentition)
- Largest sinus in the body

Ethmoidal sinus

- Well developed at birth
- Clinically ethmoid cells are divided by the basal lamina into anterior ethmoid group which opens into middle meatus and posterior ethmoid group which opens into superior meatus
 - Ant group includes cells : (a) Ager nasic cells (b) Ethmoidal bulla (c) Supraorbital cells (d) Fronto-ethmoid cells (e) Haller cells
 - The posterior group includes onodi cells
- Leads to orbital cellulitis
- Adenocarcinoma seen mostly in wood worker
- X-ray: visible at 1st year of age and complete by puberty
- **Most common cause of acute sinusitis in children.**

Functions of Paranasal Sinus

Possible functions of paranasal sinus (PNS) are:

- Air conditioning, i.e. warming
- Reduction of skull weight
- Increase the olfactory area (in animals)
- Heat insulation
- Vocal resonance
- Provide mechanical rigidity to skull
- Pressure dampening
- Secretion of mucus to keep nasal chambers moist.

Development

- Maxillary and ethmoid sinuses are present at birth, while sphenoid sinus is rudimentary at birth and frontal sinus is recognizable at 6 years of age and is fully developed by puberty.

Frontal sinus

- Develops 2 years after birth
- Characteristic feature—Pott's puffy tumor
- Mucocele
- Ivory osteoma
- X-ray visible at 6 years of age
- Maximum size achieved by puberty

Sphenoidal sinus

- Develops 5 years after birth
- Least common sinusitis
- Major cause of cavernous sinus thrombophlebitis
- **X-ray:** appears by 4 year of age.
- Bones of Bertin also called sphenoidal turbinates initially cover the anterior wall of sinus, but after 10 years, fuse with it.

Blood Supply and Nerve Supply of Paranasal Sinuses

Sinuses	Arteries	Nerves
Frontal	Supraorbital,	Supraorbital,
Maxillary	supratrochlear	supratrochlear
Anterior ethmoidal	Maxillary (main) and facial	Maxillary
Posterior ethmoidal	Anterior ethmoidal	Anterior ethmoidal
Sphenoidal	Posterior ethmoid and sphenopalatine	Posterior ethmoid and sphenopalatine

Development and Growth of Paranasal Sinuses

Sinus	At birth	Adult size	Growth	Radiological appearance (Age)
Maxillary	Present	15 years	Biphasic growth: Birth–3 years, 7–12 year	4–5 months
Ethmoid	Present	12 years	Size increases up to 12 years	1 year
Frontal	Absent	13–18 years	Invades frontal bone (2–4 yrs), size increases until teens	6 years
Sphenoid	Absent	12–15 years	Reaches sella turcica (7 yrs), dorsum sellae (late teens), basisphenoid (adult)	4 years

Extra Edge

- Ethmoidal sinuses are well developed at birth, hence infants and children below 3 years of age are more likely to have acute ethmoiditis; but above this age, maxillary sinusitis is more commonly seen.
- Periodicty is a characteristic feature of frontal sinus infections** in which the pain increases gradually on waking up and becomes maximum by midday, starts diminishing by evening, hence also called office headache.
- Trephination of frontal sinus** is done if pain and pyrexia persist despite of medical treatment for 48 hours.
- Antral lavage** in acute maxillary sinusitis is done only when medical treatment has failed and the patient has started showing signs of complications. This is done under cover of antibiotics, otherwise osteomyelitis of the maxilla may set in.
- Dental infections** are important cause of maxillary sinusitis because of relation of roots of molars and premolars with the floor of maxillary sinus.
- Foramina of Breschet are venous drainage channels located in the posterior wall of Frontal sinus.

ACUTE SINUSITIS

- It is acute inflammation of the paranasal sinuses of > 7 days and less than 4 weeks duration.

M/C Sinus involved in adults in order of frequency:

Maxillary > Frontal > Ethmoid > Sphenoid

- M/C sinus involved in children = Ethmoidal sinus

Etiology

Secondary bacterial infection following viral rhinitis.

Causative organisms

- M/C—*Streptococcus pneumoniae*
- 2nd M/C—*H. influenzae*
- Others—*Moraxella*

Clinical Features

As per Rhinosinusitis Task Force definition:

- Major symptoms of sinusitis** include facial pain, pressure, congestion, nasal obstruction, nasal/postnasal discharge, hyposmia, and fever.
- Minor symptoms** are headaches, halitosis, and dental pain.
- Diagnosis** requires two major criteria or one major and two minor criteria.

Maxillary sinusitis

- Pain site:** upper jaw with radiation to the gums and teeth. It is aggravated by coughing and stooping.
- Headache in Frontal region.
- Tenderness:** Over the cheeks.
- Postnasal drip.

Frontal sinusitis

- Headache:** Over the frontal sinus area in the forehead.
- Pain is typically periodical in nature.^Q
- Often called as Office Headache.**^Q as maximum pain occurs by midday and decreases by evening

- Tenderness:** Along the frontal sinus floor just above the medial canthus.
- Edema of upper eyelid.

Ethmoid sinusitis

- More often involved in infants and young children.^Q
- Pain:** Over the nasal bridge and inner canthus of eye and is referred to parietal eminence.
- Tenderness** is along inner canthus.
- Edema of the upper and lower eyelids.

Sphenoiditis

- Rare entity on its own
- Occurs subsequently to ethmoiditis/pansinusitis
- Severe occipital or vertical headache and is sometimes referred to mastoid process.^Q
- Pain** may be felt retroorbitally due to close proximity with Vth nerve.
- Postnasal drip seen on posterior rhinoscopy.

Noe: Vertical headache with postnasal discharge is suggestive of sphenoid sinusitis.

Examination

On Anterior Rhinoscopy: Red, shiny and swollen mucous membrane is seen near the ostium of the sinus, and trickle of pus may also be seen.

Investigation

Transillumination test:

- In maxillary sinus**—absence of infra-orbital crescent of light and pupillary glow indicate sinusitis.
- In Frontal sinusitis cits transillumination is not very informative
- X-ray PNS:** To demonstrate fluid level, pus or opacity.

Radiological Views for Each Sinus

Maxillary	Frontal	Ethmoids	Sphenoid
Best-Water's view (also called as occipitomental or nose chin position) and Basal view	Caldwell's view (occipitofrontal or nose forehead view)	Caldwell's view	Lateral and Basal view (but best is lateral view)

NOTE

- In acute sinusitis—diagnosis is mainly made on clinical ground and there is little role for imaging.
- The first investigation usually done in past was plain X-ray but it is not done nowadays. The plain CT scan without contrast is the first line of screening study of the nose and paranasal sinuses these days.

Treatment

- Medical:**
 - Antibiotics are given for minimum—2 weeks (10–14 days) Amoxicillin + clavulanic acid.
 - Nasal decongestants:** They should not be given for more than 2 weeks else patient may develop Rhinitis medicamentosa.
 - Analgesics
 - Steam inhalation
- Surgery:** It is not done in acute sinusitis except in case of impending complications like orbital cellulitis.

CHRONIC SINUSITIS

- When symptoms of sinusitis persist for more than 3 months—Chronic state develops.
- Organisms:** Mixed aerobic and anaerobic.

Note: Maxillary sinus is most commonly involved in chronic sinusitis.

Diagnosis

Diagnosis is done by nasal endoscopy along with endoscopy guided culture from middle meatus. This can be supplemented with CT scan of nose and PNS.

Treatment

Medical

- Antibiotics, Mucolytics, Nasal Irrigation, Corticosteroids to reduce mucosal swelling associated with the inflammatory response.

Surgical

- Indication:** If medical treatment given for a period of 3–4 weeks fail.

- Recently, endoscopic sinus surgery is replacing radical operations on the sinuses and provides good drainage and ventilation. It also avoids external incisions.

FUNGAL SINUSITIS

- Fungal infection occurs mostly in traumatic cases with compound fractures, in uncontrolled diabetics, debilitated patients, such as carcinoma, and in patients on immunosuppressants, antibiotics or steroids.
- More common fungal species are *Aspergillus* (M/C), *Actinomyces*, *Mucor*, *Rhizopus* or *Absidia* species of fungus.
- May occur in non invasive or invasive form.
- Commonest organism involved in non invasive form is *Aspergillus fumigatus* followed by *Dematiaceae* species (*Bipolaris*, *Curvularia*, *Alternaria*).
- Non invasive form may either present as a fungal ball or allergic fungal rhinosinusitis (AFRS) and usually affect immunocompetent individuals.

Complications of Paranasal Sinus Infection

Local	<ul style="list-style-type: none"> Mucocele/Mucopyocele Mucous retention cyst Osteomyelitis <ul style="list-style-type: none"> Frontal bone (more common) Maxilla
Orbital	<ul style="list-style-type: none"> Preseptal inflammatory edema of lids Subperiosteal abscess Orbital cellulitis Orbital abscess Cavernous sinus thrombosis Superior orbital fissure syndrome
Intracranial	<ul style="list-style-type: none"> Meningitis Extradural abscess Subdural abscess Brain abscess
Descending infections	<ul style="list-style-type: none"> Otitis media Pharyngitis Tonsillitis Laryngitis

ORBITAL COMPLICATIONS

- Mostly seen in children

- In children the orbital complication of sinusitis are due to ethmoiditis.
- In adults, it is due to frontal sinusitis

- Patients complain of high fever, with pain in eye on the side of lesion, chemosis, proptosis and diplopia. Vision may be diminished.

Superior Orbital Fissure Syndrome

- Occurs subsequent to sphenoiditis.

Features

- Deep orbital pain
- Frontal headache
- Progressive paralysis of III, IV and VI nerve (first nerve to get involved) cranial nerve.

Orbital Apex Syndrome

Superior orbital fissure syndrome with involvement of optic nerve and maxillary nerve.

Treatment

- Antibiotics, analgesics and nasal decongestants.
- Surgical decompression in case of visual loss.

Cavernous Sinus Thrombosis

Usually results from infection of ethmoid and sphenoid sinuses.

Clinical features:

- Onset is abrupt with fever chills and rigor
- Involvement of IIIrd, IVth, Vth and VIth cranial nerve
- Chemosis of conjunctiva (1st and 2nd division)
- Pupils are dilated and fixed (due to involvement of sympathetic plexus around carotid artery).
- Decreased vision (due to optic nerve damage).
- Decreased sensation in distribution of Vth nerve (ophthalmic division) and engorgement of retinal vessels.
- **Treatment:** Antibiotics in high doses for 4–6 weeks and drainage of involved sinus.

NOTE

Cavernous sinus thrombosis can be differentiated from other orbital complications as there is B/L involvement in cavernous sinus thrombosis.

OSTEOMYELITIS

Osteomyelitis is infection of the bone marrow.

Organism Causing

- Staphylococcus
- Streptococcus
- Anaerobes

Osteomyelitis of the Frontal Bone is Most Common as:

- It is a diploic bone and the lesion is essentially thrombophlebitis of diploic bone.
- It follows infection of frontal sinus.
- It is common in adults since this sinus is not developed in infants and children

Clinical Feature

- Fever, malaise, headache.
- Puffy swelling under the periosteum of frontal bone (Pott's puffy tumor).

Treatment

- Broad spectrum antibiotics for 4–6 weeks.
- Surgical drainage of the sinus through frontonasal duct.

Osteomyelitis of the Maxilla

More often in infants and children because of the presence of spongy bone in the anterior wall of the Maxilla.

DENTAL COMPLICATIONS

- Second premolar and the first molar are directly in relation to the floor of the Maxillary sinus.
Therefore, acute sinusitis may produce dental pain.

SYSTEMIC COMPLICATIONS

- **Toxic shock syndrome:** Is rare, but potentially fatal.
 - **Organism:** *Staphylococcus aureus*.
 - **Symptoms:** Fever, hypotension, rash with desquamation and multisystem failure.

CHRONIC COMPLICATIONS**MucoCele/Pyoceles****Definition**

Epithelial-lined; mucus-containing sac completely filling the sinus and capable of expansion.

Etiopathogenesis

Obstruction and subsequent sinus infection or inflammation

Features

- **Common in patients:** 40–70 years.
- Males > Females

- Sinuses affected in order of frequency: Frontals > ethmoids > sphenoids > maxillary

Frontal Sinus Mucocele

- **Site:** Superomedial quadrant of the orbit.
- **Symptoms:** Displacement of the eyeball—Forward, downward and laterally, diplopia, deep nasal or periorbital pain and frontal headache.
- **Features of the swelling:** cystic, non-tender, egg-shell crackling may be seen.
- **X-ray:** Clouding of frontal sinus with loss of the scalloped margins (characteristic of frontal sinus).

Mucocele of Anterior Ethmoid

- Presents as a retention cyst.
- Compress the nasolacrimal region - Epiphora
- Causes a bulge in middle meatus of nose.

Mucocele of Maxillary Sinus

Asymptomatic.

Mucocele of Sphenoid Sinus

- Presents as superior orbital fissure syndrome or orbital apex syndrome.
- Exophthalmos is always present.
- Pain is localized to orbit or forehead.
- Treatment is Endoscopic Sinus Surgery (surgery of choice) or external ethmoidectomy and sphenoidectomy.

Treatment

Frontoethmoidal Mucoceles: Radical fronto ethmoidectomy using an external modified Lynch-Howarth's incision with free drainage of frontal sinus into the middle meatus. Some can be removed endoscopically.

Remember:

- Acute sinusitis = Symptoms for < 4 weeks
- Subacute sinusitis = Symptoms for 4–12 weeks
- Chronic sinusitis = Symptoms for > 12 weeks
- Recurrent sinusitis = 4 or more episodes of sinusitis each year, lasting for more than 7–10 days.

SURGERIES FOR SINUSITIS**Indications of Nasal Endoscopic Surgery****mnemonic**

- Selected** = Selected Tumor Resection
- Indians** = Inflammation of sinus = Rhinosinusitis
- Prime** = Polyps removal (Ethmoidal/Antrochoanal)
- Minister** = Mucocele of frontoethmoid/sphenoid
- Don't** = Dacryocystorhinostomy
- Speak** = Septoplasty (Endoscopic)
- Correct** = Choanal atresia repair/CSF leak
- Fluent** = removal of Foreign body
- English** = Epistaxis (Endoscopic cautery)

FUNCTIONAL ENDOSCOPIC SINUS SURGERY (FESS)

It is the surgery of choice in most sinusitis. It uses nasal endoscopes of varying angulation (0°, 30°, 45°, 70°) to gain access to the outflow tracts and ostia of sinuses, employing atraumatic surgical techniques with mucosal preservation to improve sinus ventilation and mucociliary clearance.

FESS is based on 3 principles

- Site of pathogenesis in sinusitis is osteomeatal complex.
- Mucociliary clearance of the sinuses is always directed toward the natural ostium.
- The mucosal pathology in sinuses reverts back to normal once the sinus ventilation and mucociliary clearance is improved.

NOTE

In FESS = Opening is made via middle meatus.

The Basic Steps of FESS

Uncinectomy (infundibulotomy), anterior ethmoidectomy, middle meatal antrostomy, posterior ethmoidectomy, sphenoidotomy followed by frontal recess clearance.

Indications of FESS

FESS is indicated in rhinosinusitis, sinonasal polyposis, mucoceles, and allergic fungal sinusitis.

Contraindications

Intracranial complications following acute sinusitis, involvement of lateral wall and floor of maxillary antrum, pathology localized to lateral recesses of frontal sinus.

Complications of FESS

Major complications are orbital (Periorbital ecchymosis, Emphysema, Optic nerve injury) and intracranial injury. (CSF leak, Meningitis, carotid artery injury).

Other complications include major hemorrhage from sphenoplatine and ethmoidal arteries, injury to nasolacrimal duct, rhinorrhea anosmia, and synechiae formation.

Note: Optic nerve injury occurs in posterior ethmoidal and sphenoidal sinus surgeries, while carotid artery injury occurs in surgeries of the sphenoid sinus.

CALDWELL-LUC'S SURGERY

Maxillary antrum is entered through the sublabial route to clear the disease inside. Antrum is connected to the nose through a nasoantral window made via the inferior meatus.

Indications

- Dental origin maxillary sinusitis.
- Recurrent antrochoanal polyp in an adult (contraindicated in children)
- Foreign bodies in the antrum
- Dental cyst
- Oroantral fistula
- Fractures of maxilla
- As an approach to pterygopalatine fossa (maxillary artery ligation/Vidian neurectomy) and ethmoids (transantral ethmoidectomy).

Can you Take Biopsy by this Approach in Maxillary Carcinoma?

Note: No. Biopsy via Caldwell-Luc's is a contraindication in malignancy maxilla as it leads to spread of the neoplasm to the cheek.

M/C Complication is –

Infra-orbital anesthesia/neuralgia due to traction on the nerve.

Important Clinical Vignettes

- Lund-Mackay staging is used in radiological assessment of chronic rhinosinusitis. The scoring is based on CT scan findings of the sinuses (Maxillary, frontal, sphenoid, anterior ethmoid and posterior ethmoid)
- Lund-Kennedy Endoscopic scores –
In this staging system endoscopic appearance of nose is seen for:
 1. Presence of polyp
 2. Presence of discharge
 3. Presence of edema, scarring or adhesion and crusting.

QUESTIONS

1. Which sinus is NOT a part of paranasal sinus? [MP 09]
 - a. Frontal
 - b. Ethmoid
 - c. Sphenoid
 - d. Pyriform
2. Sinus not present at birth is: [Maharashtra 02]
 - a. Ethmoid
 - b. Maxillary
 - c. Sphenoid
 - d. None
3. Maxillary sinus achieves maximum size at: [Manipal 06]
 - a. At birth
 - b. At primary dentition
 - c. At secondary dentition
 - d. At puberty
4. Which among the following sinuses is most commonly affected in a child: [PGI 99]
 - a. Sphenoid
 - b. Frontal
 - c. Ethmoid
 - d. Maxillary
5. In acute sinusitis, the sinus most often involved in children is: [UPSC 07]
 - a. Maxillary
 - b. Sphenoid
 - c. Ethmoid
 - d. Frontal
6. Sinus least involved in: [UP 08]
 - a. Maxillary
 - b. Ethmoid
 - c. Frontal
 - d. Sphenoid
7. Common organisms causing sinusitis: [AI 01]
 - a. *Pseudomonas*
 - b. *Moraxella catarrhalis*
 - c. *Streptococcus pneumoniae*
 - d. *Staphylococcus epidermidis*
 - e. *H. influenzae*
8. Common organisms causing sinusitis: [PGI 01]
 - a. *Pseudomonas*
 - b. *Moraxella catarrhalis*
 - c. *Streptococcus pneumoniae*
 - d. *Staphylococcus epidermidis*
 - e. *H. Influenzae*
9. Which of the following is the most common etiological agent in paranasal sinus mycoses? [AIIMS May 06]
 - a. *Aspergillus sp*
 - b. *Histoplasma*
 - c. *Conidiobolus coronatus*
 - d. *Candida albicans*
10. Which among the following is true regarding fungal sinusitis: [PGI 01]
 - a. Surgery is required for treatment
 - b. Most common organism is *Aspergillus niger*
 - c. Amphoterecin B IV is used for invasive fungal sinusitis
 - d. Hazy appearance on X-ray with radiopaque density
 - e. Seen only in immunodeficient conditions
11. All of the following are diagnostic criteria of allergic Fungal sinusitis (AFS) except: [AI 08]
 - a. Areas of High attenuation on CT scan
 - b. Orbital invasion
 - c. Allergic eosinophilic mucin
 - d. Type 1 Hypersensitivity
12. Periodicity is a characteristic feature in which sinus infection: [COMED 06]
 - a. Maxillary sinus infection
 - b. Frontal sinus infection
 - c. Sphenoid sinus infection
 - d. Ethmoid sinus infection
13. Ethmoidal sinusitis is more common with: [AIIMS 97]
 - a. Fire workers
 - b. Wood workers
 - c. Chimney smokers
 - d. None
14. Sphenoid sinusitis pain is referred most commonly to:
 - a. Occiput
 - b. Vertex
 - c. Frontal
 - d. Temporal region
15. Best view for evaluating sphenoid sinus is: [PGI 98]
 - a. Water's with open mouth
 - b. Schuller's view
 - c. Towne's view
 - d. Lateral view
16. Best view for frontal sinus: [AIIMS Nov 2010]
 - a. Caldwell
 - b. Towne
 - c. Water's
 - d. Lateral view
17. For viewing superior orbital fissure-best view is: [AIMS 97]
 - a. Plain AP view
 - b. Caldwell view
 - c. Towne view
 - d. Basal view
18. Complications of acute sinusitis: [PGI 03]
 - a. Orbital cellulitis
 - b. Pott's puffy tumor
 - c. Conjunctival chemosis
 - d. Subdural abscess
 - e. Pyocele
19. Complication of sinus disease include: [AIIMS 93]
 - a. Retrobulbar neuritis
 - b. Orbital cellulitis
 - c. Cavernous sinus thrombosis
 - d. Superior orbital fissure syndrome
 - e. All of the above
20. Orbital cellulitis is a complication of: [MP 09]
 - a. Paranasitis
 - b. Faciomaxillary trauma
 - c. Endoscopic sinus surgery
 - d. All of these
21. Angular vein infection commonly causes thrombosis of: [TN]
 - a. Cavernous sinus
 - b. Sphenoidal sinus
 - c. Petrosal sinus
 - d. Sigmoid sinus
22. A patient with sinus infection develops chemosis, B/L proptosis and fever, the diagnosis goes in favor of: [PGI 99]
 - a. Lateral sinus thrombosis
 - b. Frontal lobe abscess
 - c. Cavernous sinus thrombosis
 - d. Meningitis
23. Most definitive diagnosis of sinusitis is: [AIIMS 92]
 - a. X-ray PNS
 - b. Proof puncture
 - c. Sinoscopy
 - d. Transillumination test
24. Pathognomic feature of Maxillary sinusitis is: [UP 07]
 - a. Mucopus in the middle meatus
 - b. Inferior turbinate hypertrophy
 - c. Purulent nasal discharge
 - d. Atrophic sinusitis
25. The best surgical treatment for chronic maxillary sinusitis is: [MP 02]
 - a. Repeated antral washout
 - b. Fiberoptic endoscopic sinus surgery
 - c. Caldwell-Luc's operation
 - d. Horgan's operation

- 26. Frontal mucocele presents as:** [PGI 96]
 a. Swelling above medial canthus, below the floor of frontal sinus
 b. Swelling above eyebrow lateral to glabella
 c. External proptosis
 d. Intanasal swelling
- 27. Mucocele is commonly seen in sinus:** [DNB 07]
 a. Frontal b. Maxillary
 c. Ethmoid d. Sphenoid
- 28. Most common site for osteoma is:** [MP 08]
 a. Maxillary sinus b. Ethmoid sinus
 c. Frontal sinus d. Sphenoid sinus
- 29. A 2-year-old child with purulent nasal discharge, fever and pain since 2 months. His fever is 102–103°C, and leucocyte count is 12000 cu/mm. X-ray PNS showed opacification of left ethmoidal air cells. The culture of the eye discharge was negative. Which of the following would be most useful further step in evaluation of this patient?** [AI 10]
 a. CT scan
 b. Urine culture
 c. Blood culture
 d. Repeat culture of the eye discharge
- 30. FESS means:** [Mahara 02]
 a. Factual endoscopic sinus surgery
 b. Functionl endonasal sinus surgery
 c. Factual endonasal sinus surgery
 d. Functionl endoscopic sinus surgery
- 31. Endoscopic nasal surgery is indicated in:** [Manipal 04]
 a. Chronic sinusitis b. Epistaxis
 c. Both d. None
- 32. Indications of FESS:** [NEET Pattern]
 a. Inverted papilloma b. Nasal allergic polyposis
 c. Mucocele d. Ca maxilla
- 33. Multiple Response Question:**
All are true about mucormycosis, except:
 a. Lymph invasion
 b. Angio invasion
 c. Long term deferoxanine therapy
 d. Septate hyphae
 e. May lead to blindness
- 34. Cavernous sinus thrombosis following sinusitis results in all of the following signs except:**
 a. Constricted pupil in response to light
 b. Engorgement of retinal veins upon ophthalmoscopic examination
 c. Ptosis of eyelid
 d. Ophthalmoplegia.
- 35. A 24-year-old female with long standing history of sinusitis present with fevers, headache (recent origin) and personality changes; Fundus examination revealed papilledema. Most likely diagnosis is:**
 a. Frontal lobe abscess b. Meningitis
 c. Encephalitis d. Frontal bone osteomyelitis
- 36. First paranasal sinus to develop at birth is:** [NEET Pattern]
 a. Maxillary b. Ethmoidal
 c. Frontal d. Sphenoidal
- 37. Antrum of Highmore is another name for:** [NEET Pattern]
 a. Maxillary b. Ethmoid
 c. Sphenoid d. Frontal
- 38. Bilateral proptosis and bilateral 6th nerve palsy in seen is:** [NEET Pattern]
 a. Cavernous sinus thrombosis
 b. Meningitis
 c. Hydrocephalus
 d. orbital Cellulitis

EXPLANATIONS AND REFERENCES

1. Ans. is d i.e. Pyriform

Paranasal sinuses are air containing cavities in certain bones of skull. They are four on each side. Clinically, paranasal sinuses have been divided into two groups.

Ref. Dhingra 5th/ed p 201, 6th/ed p 187; Mohan Bansal p 37

Anterior group

It includes:

- Maxillary sinus
- Frontal sinus
- Anterior ethmoidal sinus

Posterior group

It includes:

- Posterior ethmoidal sinus (opens in superior meatus)
- Sphenoid sinus (opens in sphenoethmoidal recess)

NOTE

All of them open in the middle meatus⁹

2. Ans. is c i.e. Sphenoid sinus

Ref. Scott Brown 7th/ed Vol 2, p 1320; Mohan Bansal 1st/ed p 39

Development and growth of paranasal sinuses

Sinus	At birth	Adult size	Growth	Radiological appearance (age)
Maxillary	Present	15 years	Biphasic growth: Birth–3 years, 7–12 year	4–5 months
Ethmoid	Present	12 years	Size increases up to 12 years	1 year
Frontal	Absent	13–18 years	Invades frontal bone (2–4 yrs), size increases until teens	6 years
Sphenoid	Absent	12–15 years	Reaches sella turcica (7 yrs), dorsum sellae (late teens), basisphenoid (adult)	4 years

3. Ans. is c i.e. At secondary dentition

- Maxillary sinus is the first sinus to develop at birth.
- It is completely developed by 9 years of age, i.e. approximately at the time of secondary dentition.

Ref. Maqbool 11th/ed p 148; Turners 10th/ed p 9

4. Ans. is c i.e. Ethmoid

Ref. Tuli 1st/ed p 190; Dhingra 5th/ed p 207, 6th/ed p 193

5. Ans. is c i.e. Ethmoid

Most common sinusitis in children is Ethmoid.
Most common sinusitis in adults is Maxillary.

"Ethmoidal sinuses are well developed at birth, hence infants and children below 3 years of age are more likely to have acute ethmoiditis; but after this age, maxillary antral infections are more commonly seen."

—Tuli 1st/ed p 190

"Ethmoid sinuses are more often involved in infants and young children."

—Dhingra 5th/ed p 207, 6th/ed p 193

6. Ans. is d i.e. Sphenoid

Ref. Dhingra 5th/ed p 207, 6th/ed p 193; Turner 10th/ed p 48

"Isolated involvement of sphenoid sinus is rare. It is often a part of pansinusitis or is associated with infection of posterior ethmoidal sinus."

...Dhingra 6th/ed p 193

"The sphenoid sinus is rarely affected on its own"—Turner 10th/ed p 48

In Nutshell remember:

M/c sinus affected in adults—maxillary
M/c sinus affected in children—Ethmoid
Sinus which is least affected—Sphenoid

7. Ans. is c and e i.e. *Streptococcus pneumoniae*; and *H. influenzae*8. Ans. is b, c and e i.e. *Moraxella*, *Streptococci* and *H. influenzae*

Ref. Harrison 17th/ed p 205; Scott Brown 7th/ed Vol 2 p 1441; Mohan Bansal p 299

According to Harrison 17th/ed p 205

"Among community-acquired cases, *S. pneumoniae* and nontypable *Haemophilus influenzae* are the most common pathogens, accounting for 50–60% of cases. *Moraxella catarrhalis* causes disease in a significant percentage (20%) of children but less often in adults. Other streptococcal species and *Staphylococcus aureus* cause only a small percentage of cases, although there is increasing concern about community strains of methicillin – resistant *S. aureus* (MRSA) as an emerging cause."

According to Nelson 18th/ed, pp 1749, 1750

"The bacterial pathogens causing acute bacterial sinusitis in children and adolescents include *Streptococcus pneumoniae* (= 30%), nontypable *Haemophilus influenzae* (=20%)."

According to Scotts Brown 7th/ed, p 1441

- M/C Organism causing sinusitis in adults is also *Streptococcus pneumoniae* followed by *H. influenzae*.

In children:

- M/C is *Streptococcus pneumoniae* (30–43%) followed by both *H. influenzae* and *Moraxella catarrhalis* (20–28% each)

9. Ans. is a i.e. *Aspergillus sp*

Ref. Maqbool 11th/ed p 225; Scott Brown 7th/ed Vol 1 and 2 p 1452; Mohan Bansal p 317

Most common type of fungal infection of nose and paranasal sinuses are due to *Aspergillus*.

A. fumigatus > *A. niger* > *A. flavus* are the most frequent offenders.

10. Ans. is a, c and d i.e. Surgery is required for treatment; Amphoterecin B IV is used for invasive fungal sinusitis; and Seen only in immunodeficient conditions

Ref. Maqbool 11th/ed p 225; Scott Brown 7th ed Vol 2 p 1455; Mohan Bansal p 317, 318

FUNGAL SINUSITIS

Most common cause: *Aspergillus*

Most common species: *A. fumigatus* > *A. niger* > *A. flavus*.

—Maqbool 11th/ed p 225

Other offenders are: *Mucor*, *Rhizopus*, *Alternaria*

- **Fungal infection can be of following types:**

- Fungus ball
- Allergic fungal rhinosinusitis
- Chronic or indolent invasive fungal sinusitis
- Acute fulminant fungal rhinosinusitis

Fungus Ball

- Fungus ball occurs in adults females
- **M/C agent:** *Aspergillus*
- Most common sinus involved – Maxillary > sphenoid sinus
- M/C symptom – unilateral postnasal discharge
- Most Important Investigation-CT scan
- Fungus ball is the main fungal rhinosinusitis in an immunocompetent patient.
- Surgery is the most effective treatment for fungus ball.

Allergic Fungal Rhinosinusitis

- AFS is a noninvasive fungal rhinosinusitis
- *Dermatiaceous* species are the fungal agents mostly responsible for AFRs.
- Seen in immunocompetent hosts with allergy to fungus.
- Clinical and biological criteria for diagnosis is still under debate, and include nasal polyps, thick mucin, hypersensitivity type I for fungus, eosinophilic mucin.
- Sinus opacities with bone extension are frequently seen on CT scan.
- Diagnosis of all allergic fungal rhinosinusitis is supported by allergic and fungal criteria (Refer to Ans. 11 for criteria).
- Treatment = Antifungals

Chronic or Indolent Invasive Fungal Rhinosinusitis

- Chronic invasive fungal rhinosinusitis is a rare pathology occurring mostly in immunocompetent patients.
- *Aspergillus* is the most frequent agent isolated in this pathology.

Acute Fulminant Fungal Rhinosinusitis

- Fulminant invasive fungal rhinosinusitis occurs in immunocompromised patients (HIV, diabetes, chemotherapy)
- Early diagnosis and control of primary immunological disorders is essential for the prognosis.

Thus from the above description it can be concluded

- Option – a – Surgery is required for treatment – (correct) as in all forms of fungal sinusitis – some or the other form of surgery is required.
- Option – b – M/c organism is *Aspergillus niger*.
Incorrect – M/c is *A. fumigatus* (Maqbool 11th/ed p 228)
- Option – c – Amphotericin IV is used for invasive fungal sinusitis
Correct – Ref. Dhingra 5th/ed p 210, 6th/ed p 196
- Option – d – Hazy appearance on X-ray with radiopaque density
Correct – Sinusitis gives hazy appearance on X-ray
- Option – e – Seen only in immunodeficient condition
Incorrect – only the acute fulminant form is more common in immunodeficient state whereas others are seen in immunocompetent hosts.

11. Ans. is b i.e. Orbital invasion

Ref. Current Diagnosis and Treatment in Otorhinology 2nd/ed p 276; Scott Brown 7th/ed Vol 2 pp 1452-1454; Ear Nose and Throat Histopathology 2nd/ed p 152; Patterson's Allergic Disease 6th/ed p 778; Allergy and Immunology: An Otolaryngic Approach (2001)/239

Allergic fungal sinusitis is a noninvasive form of fungal sinusitis as such orbital invasion is not its feature.

Bent and Kuhn Criteria for Allergic Fungal Sinusitis (AFS)

1. Type I hypersensitivity (confirmed by history, skin test or serology most important criteria)
2. Nasal polyposis
3. Asthma
4. Unilateral predominance
5. Eosinophilic mucus demonstrating fungal elements, charcot-leyden crystal
6. Peripheral eosinophilia
7. Positive fungal culture
8. Characteristic Radiological Findings (CT, MRI) absence of tissue invasion by fungus
9. Radiographic bone erosion

CT scan findings in AFS

Areas of High attenuation surrounded by a thin zone of low attenuation
CT scan reveals pansinusitis and polyposis

Allergic Fungal Sinusitis (AFS): Form of Chronic Sinusitis

- AFS is a unique type of noninvasive sinusitis caused by **Type I or Type III hypersensitivity reaction^o** to fungal organisms that come in contact with the nasal sinus mucosa.
- **It is seen in an immunocompetent host^o with allergy to fungus.**
- IgE levels are high in patients of AFS
- It is mostly caused by dermatiaceous species^o (*Bipolaris*, *cunicularia*, *alternaria*) and rarely by aspergillus.
- **M/C in younger age grp (≈ 30 years)**
- Clinically patients present with Nasal polyposis which can be U/L or B/L (U/L > B/L).
- The classic rhinoscopic finding in AFS is thick, tenacious peanut butter like inspissated mucus in one or more paranasal sinuses.

- Histological examination of this 'allergic mucin' reveals:
 - Embedded eosinophils^o
 - Charcot-Leyden crystals^o (eosinophil breakdown products).
 - Extramucosal fungal hyphae^o (without tissue invasion).

- **Eosinophils are increased in blood**
- X-ray shows—bony extension
- On CT scan → **Sinus opacities with extension seen**
- Treatment consists of removal of all mucin along with either topical or systemic antifungals. Prednisone is also given along with it.
- Immunotherapy is being tried for its treatment.
- Recurrence is common

Extra Edge

Stage	Endoscopic finding
Stage 0	No mucosal edema or allergic mucin
Stage 1	Mucosal edema with or without allergic mucin
Stage 2	Polypoid oedema with/without allergic mucin
Stage 3	Sinus polyps with fungal debris or allergic mucin.

12. Ans. is b i.e. Frontal sinus infection

Ref. Dhingra 5th/ed p 206, 6th/ed p 192-193

Pain of frontal sinusitis shows **characteristic periodicity**, i.e. comes upon waking, gradually increases and reaches its peak by midday and then starts subsiding. It is also called "office headache" as it is present only during office hours.

13. Ans. is d i.e. None

Ref. Dhingra 5th/ed p 207, 6th/ed p 193

Acute ethmoid sinusitis is often associated with infection of other sinuses. Ethmoid sinuses are more often involved in infants and young children. **It is the most common sinus involved in infants and children.**

Also Know

- **Pain of ethmoiditis** is localized over the bridge of the nose, medial and deep to the eye. It is aggravated by movements of the eyeball.
- **Orbital cellulitis** is an early complication in such cases.
- **Nasal discharge^o**—on anterior rhinoscopy, pus may be seen in middle or superior meatus depending on the involvement of anterior or posterior group of ethmoid sinuses.
- **Swelling of the middle turbinate.**

14. Ans. is a and b where b > a i.e. Vertex > Occiput

Ref. Dhingra 5th/ed p 207; Turner 10th/ed p 35; Maqbool 11th/ed p 208; Tuli 1st/ed p 188

Sometimes an easy seeming question like this one can be really difficult to answer.

According to Dhingra

- **Acute sphenoditis:** 'Headache – usually localized to the occiput or vertex. Pain may also be referred to the mastoid region.'

– Dhingra 5th/ed p 207, 6th/ed p 194

i.e. both options a and b are correct.

According to Tuli

"Sphenoidal pain—It gives rise to occipital or vertical headache and sometimes is referred to mastoid process. Pain may be felt behind the eyeball due to close proximity with Vth nerve."

– Tuli 1st/ed p 188

i.e. again both options a and b are correct.

According to Maqbool

"In sphenoid infection – the pain is usually referred to the vertex or occiput."

– Maqbool 11th/ed p 208

Now read what Turner has to say

"The pain of Sphenoiditis, which is relatively uncommon, is localized to the top of head. It may produce pain over the trigeminal distribution because of the close proximity of these nerve."

Turner 10th/ed p 35

So both options a i.e. occiput and option b i.e. vertex are correct, but b > a.

Also Know

Sinus	Pain felt in area
Maxillary sinus	Along the infraorbital margin and referred to upper teeth or gums on affected side (along the distribution of superior orbital nerve) Pain is aggravated on stooping or coughing.
Frontal sinus	Pain localized over forehead. It has a characteristic periodicity
Ethmoid sinus	Pain localized over the nasal bridge, inner canthus and behind the ear.

15. Ans. is d i.e. Lateral view

Ref. Turner 10th/ed p 18; Dhingra 5th/ed p 445, 6th/ed p 434

16. Ans. is a i.e. Caldwell view

"Lateral view is best for the sphenoid sinus."

ALSO KNOW**Some other views and the sinuses best seen by them:**

- Occipitomental/Water's view – Maxillary antrum.
- Occipitofrontal/Caldwell view – Frontal sinus and ethmoid sinuses
- Submentovertical /Basal view – Sphenoid, posterior ethmoid and maxillary sinus

17. Ans. is b i.e. Caldwell view

Ref. Dhingra 5th/ed p 445, 6th/ed p 434

- In plain A P view and Towne's view we can see the Temporal bone and sinus, zygoma, zygomatic arch and mandible.
- Superior orbital fissure can be seen by caldwell view and water's view.

18. Ans. is a, b, c and d i.e. Orbital cellulitis; Pott's puffy tumor; Conjunctival chemosis; and Subdural abscess

Ref. Scotts brown 7th/ed Vol 2 pp 1539, 1540; Mohan Bansal p 305

Complications of Sinusitis—Acute Sinusitis

Local (due to local spread)	Systemic (due to hematogenous spread)
<ul style="list-style-type: none"> • Frontal sinusitis can cause <ul style="list-style-type: none"> – Subperiosteal abscess/or pott's puffy tumor – Osteomyelitis • Ethmoid sinusitis can cause <ul style="list-style-type: none"> – Orbital cellulites <p>The stages of orbital cellulitis are:</p> <ul style="list-style-type: none"> – Preseptal cellulitis (infection anterior to orbital septum) – Postseptal cellulitis or orbital cellulitis without abscess (i.e. infection posterior to orbital septum) – Subperiosteal abscess (pus collects beneath the periosteum) – Orbital abscess (pus collects in orbit) – Cavernous sinus thrombosis/abscess (includes chemosis) <ul style="list-style-type: none"> • Maxillary sinusitis – no acute complications • Sphenoid sinusitis can lead to <ul style="list-style-type: none"> – Cavernous sinus thrombosis – Intracranial complications 	<ul style="list-style-type: none"> • Brain abscess (can occur as a result of local spread as well hematogenous spread secondary to maxillary sinusitis associated with dental disease) • Meningitis • Toxic shock syndrome

Mucocele and Pyocele are due to Chronic Sinusitis

NOTE

If infection in the frontal sinus spreads to the marrow of frontal bone, localized osteomyelitis with bone destruction can result in a doughy swelling of forehead, classically called as '**Pott's Puffy Tumor**'. Surgical drainage and debridement should be done in this case.

19. Ans. is e i.e. All of the above

Ref. Tuli 1st/ed p 196; Scott Brown 7th/ed Vol 2 pp 1539,1540; Mohan Bansal p 305

As Discussed in Previous Question:

- There is no confusion regarding orbital cellulitis, and cavernous sinus thrombosis being the complications of sinusitis.
- *Dhingra* does not mention Retrobulbar neuritis as one of the complications of sinusitis but according to *Tuli 1st/ed p 196*. Posterior group of sinuses can lead to neuritis with impaired vision.

Complications of Posterior Group of Sinuses

- Superior orbital fissure syndrome/orbital apex syndrome.
- Cavernous sinus thrombosis.
- Neuritis with impaired vision.
- Oroantral fistula/sublabial fistula.

20. Ans. is d i.e. All of these

Ref. Scott Brown's 7th/ed Vol 2 p 1485; Parson disease of eye 20th/ed p 457

Orbital cellulitis can occur as a complication of sinusitis and injuries. As far as endoscopic sinus surgery is concerned, it can lead to orbital and intracranial complications so orbital cellulitis can occur in it also.

21. Ans. is a i.e. Cavernous sinusRef. *Dhingra 5th/ed p 214, 6th/ed p 201; Mohan Bansal p 307***22. Ans. is c i.e. Cavernous sinus thrombosis**

Cavernous sinus thrombosis is a complication of orbital cellulites (As explanation in Ans. 18)

Cavernous SINUS INFECTION**Route of Spread**

- **Ethmoid sinus** (most common) via ophthalmic veins
- Sphenoid sinus by direct spread.
- Frontal sinus via supraorbital and ophthalmic veins.
- Orbit by ophthalmic veins.
- **Upper lid via Angular vein and ophthalmic veins.**
- Ear by petrosal venous sinuses.

Clinical Features

- Onset is abrupt with fever, chills and rigor
- It is bilateral
- Involvement of IIIrd, IVth, Vth and VIth cranial nerves
- *Chemosis of conjunctiva*
- *Proptosis of the eye with limited movements*
- Papilledema
- Pupils are dilated and fixed
- Decreased vision
- Decreased sensation in distribution of Vth nerve (ophthalmic division)
- Progressive ophthalmoplegia (specially for lateral gaze)

Treatment

It is a life-threatening condition. Antibiotics are given in high doses for 4–6 weeks.

- The incidence of all orbital complications including cavernous sinus thrombosis are common in pediatric age group.
- Visual problems are present from stage III onward of orbital cellulitis i.e. from stage of abscess formation.
- Orbital complications are almost always secondary to ethmoid rhinosinusitis but may occur with frontal rhinosinusitis also.

23. Ans. is c i.e. Sinoscopy

Ref. Scott Brown 7th/ed Vol 2 p 1442; Current Otolaryngology 2nd/ed p 277; Turner 10th/ed p 43

According to Scott Brown's 7th/ed Vol 2 p 1142

"There are many possible methods to make diagnosis of rhinosinusitis but there is much debate related to best method. It has become increasingly clear that the diagnosis of ABRS (acute bacterial rhinosinusitis) is best made on clinical grounds and criteria."

But this option is not given.

Scott Brown's further says:

"At this time, a maxillary sinus tap with cultures, revealing pathogenic organism remains the gold standard for the diagnosis of ABRS, although there is increasing interest in the role of endoscopic-guided middle meatal cultures, in lieu of maxillary sinus tap. It has even been suggested that endoscopically guided cultures may be a preferred culture technique to maxillary sinus taps, as they can identify patients with ethmoid infection."

Scott Brown 7th/ed Vol 2 p 1442

According to Current otolaryngology 2nd/ed p 277

- **In acute bacterial rhinosinusitis:** Endoscopy is useful to confirm the diagnosis and to obtain cultures at the middle meatus.
 - **In chronic sinusitis:** Gold standard is maxillary sinus aspiration (and subsequent culture of aspirated material) but endoscopy which helps in visualizing the sinus as well as obtaining, is slowly gaining importance.
- So nowadays sinuscopy is a better option than proof puncture which has become obsolete as it causes a lot of patient discomfort.

Also Know

Imaging modality of choice for sinus disease – CT scan^o

24. Ans. is a i.e. Mucopus in middle meatus

Ref. Dhingra 5th/ed p 205

- **Characteristic finding of maxillary sinusitis on Rhinoscopy** is pus or mucopus in in the middle meatus.
- Mucosa and turbinates may appear red and swollen.

Remember: Dental infections are an important source of maxillary sinusitis.

25. Ans. is b i.e. Fiber optic endoscopic sinus surgery

Ref. Current otolaryngology 2nd/ed pp 279,280; Dhingra 5th/ed pp 205, 209

Management of Acute Sinusitis (Maxillary) is Mainly Conservative with the Help of

- Antibiotics – ampicillin/amoxicillin
- Nasal decongestant drops
- Steam inhalation
- Analgesics
- Hot fomentation

- Rarely when medical management fails
- In acute maxillary sinusitis antral lavage is done.

Chronic Sinusitis

Medical management – It is the treatment of choice

- Antibiotics (depending on culture)
- Nasal and systemic steroids
- Antihistaminics
- Decongestants

Given for 4–6 weeks → Fail → Surgery indicated

Surgery

Endoscopic sinus surgery	Open surgery
"Recently endoscopic sinus surgery is replacing radical operations on the sinuses and provides good drainage and ventilation. It also avoids external incision" – Dhingra 5th/ed p 209	It is rarely required M/c operation done – Caldwell-Luc antrostomy
"The improvement in symptoms with functional endoscopic sinus surgery may be expected in > 90% patients." – Current otolaryngology 2nd/ed p 279	

26. Ans. is a i.e. Swelling above medial canthus, below the floor of frontal sinus

27. Ans. is a i.e. Frontal

Ref. Dhingra 5th/ed p 211, 6th/ed p 198; Tuli 1st/ed p 196; Scott Brown 7th/ed Vol 2 p 1531

A mucocele is an epithelial lined, mucus containing sac completely filling the sinus and capable of expansion:

- Mucocele are *most commonly* formed in Frontal sinus followed by ethmoid, sphenoid and maxillary sinuses.
- Mucocele of frontal sinus presents as a swelling in the floor of frontal sinus above the inner (medial) canthus. It displaces the eyeball forward, downward and laterally.

IOC = CT scan

TOC = Endoscopic sinus surgery

According to Dhingra, 6th/ed p 198

- Least common sinus associated with Mucocele formation is sphenoid.
- But Scott Brown 7th/ed Vol 2 p 1531 says:
 - Most of the cases of mucocele of sphenoid sinus are referred to neurosurgeons. Therefore, it seems it is less common but actually the sinus least involved by mucocele is maxilla.

28. Ans. is c i.e. Frontal sinus

Ref. Scott Brown 7th/ed Vol 2 p 1521

- Craniofacial osteomas are benign tumors often originating in the paranasal sinuses
- The frontal sinus is the most frequent location followed by the ethmoid, maxillary and sphenoid sinus, respectively
- Age of presentation = second to fifth decade with a male-female ratio – 3:1.
- **Presentation:**
 - Generally they are an incidental finding on radiography
 - It may produce symptoms like –
 - Visual impairment
 - Intracranial neurological complications like meningitis or pneumocephalus with seizure.

Management

Removal by endoscopic sinus surgery.

29. Ans. is a i.e. CT scan

Ref. PL Dhingra 5th/ed pp 213-208.

The child is presenting with fever and purulent nasal discharge with X-ray PNS showing opacification of ethmoidal sinus, i.e. probably the child is having chronic sinusitis (as it is present for the past 2 months) with an acute exacerbation. Now the most dreaded complication of ethmoidal sinusitis is orbital complication.

"Orbital complication – most of the complications, follow infection of ethmoids as they are separated from the orbit only by a thin lamina of bone – lamina papyracea. Infection travels from these sinuses either by osteitis or a thrombophlebitic process of ethmoidal veins."

– Dhingra 5th/ed p 213

The best method to assess the status of ethmoidal air cells and its complications is CT scan.

"CT is particularly useful in ethmoid and sphenoid sinus infections and has replaced studies with contrast material."

– Dhingra 5th/ed p 209

30. Ans. is d i.e. Functional endoscopic sinus surgery**31. Ans. is c i.e. Both**

Ref. Dhingra 5th/ed p 429, 6th/ed p 419; Head and Neck surgery DeSouza p 127;

Scott Brown 7th/ed Vol 2 p 1481

Endoscopic Sinus Surgery is Indicated in**mnemonic**

India's Selected Prime Minister Don't Correct Speak Fluent English

- **India's** – Inflammation of sinus, i.e. sinusitis viz.,
 - Recurrent acute sinusitis
 - Chronic bacterial sinusitis unresponsive to medical treatment
 - Fungal sinusitis
 - Polypoid sinusitis/sinonasal polyposis
 (Functional Endoscopic sinus surgery)
- **Selected** – Selected tumor resection
- **Prime** – Polyp (Antrochoanal/ethmoidal)
- **Minister** – Mucocele of frontoethmoid or sphenoid sinus
- **Don't** – Dacryocystorhinostomy
- **Speak** – Septoplasty—endoscopic
- **Correct** – Choanal atresia and CSF leak repair.
- **Fluent** – Removal of Foreign body from nose or sinus
- **English** – Epistaxis (control of epistaxis by endoscopic cautery)

—Maqbool 11th/ed, p 216

32. Ans is a, b and c i.e. inverted papilloma, nasal allergic polyposis; and mucocele

Ref. Scott Brown 7th/ed Vol 1 pp 1481, 1523-1524

Functional Endoscopic Sinus Surgeries are Indicated –

Only in sinonasal inflammatory disease including sinusitis, polyposis, mucoceles and AFRS. In case of inverted papilloma and, Ca maxilla, endonasal route/endoscopes are being used but they are not functional surgeries.

NOTE

In carcinoma maxilla, biopsy should not be taken via Caldwell-Luc as it leads to spread of the neoplasm to cheek.

33. Ans. is b, c and d i.e. angio invasion, long-term deferoxamine therapy and septate hyphae.

Ref. (Current Otolaryngology 3rd/ed p 295)

- Mucormycosis is caused by *Rhizopus* species, *Rhizomucor* and *Absidia* species.
- Initially, the disease runs a subtle course with only fever and rhinorrhea. Later on, it invades the orbit and intracranial cavity with rapid loss of vision, meningitis, cavernous sinus thrombosis and multiple cranial nerve palsies.
- It has marked predilection for vascular invasion leading to widespread thrombosis, tissue necrosis, and gangrene.
- Characteristic nasal finding is a dark necrotic turbinate surrounded by pale mucosa blackish discharge and crusts.
- M/C site is middle turbinate followed by middle meatus and septum.
- Investigation of choice is MRI, while biopsy is confirmatory.

Treatment: Includes amphotericin-B, heparin, hyperbaric oxygen, and debridement.

34. Ans. is a i.e. Constricted pupil in response to light

Ref. Dhingra 5th/ed p 214

Ptosis and ophthalmoplegia occur in cavernous sinus thrombosis due to involvement of III, IV and V cranial nerves. Retinal vessels are also engorged but pupils are fixed and dilated (not constricted).

35. Ans. is a i.e. Frontal lobe abscess

Ref. Read below

- Patient is presenting with fever, headache and personality changes which is typical of frontal lobe abscess (which is a complication of chronic sinusitis). In meningitis and encephalitis although patient presents with fever and headache, but personality changes are not seen.
- Frontal bone osteomyelitis (Pott's puffy tumor) presents as doughy swelling on forehead.

36. Ans. is a i.e. Maxillary

37. Ans. is a i.e. Maxillary

Ref. Mohan Bansal 1st/ed p 37

Maxillary sinus is also called as **antrum of highmore** and is the first to develop in human fetus. It is the largest paranasal sinus (15 ml capacity in adults).

38. Ans. is a i.e. Cavernous sinus thrombosis

Ref. Dhingra 6th/ed p 204

Friends always remember in cavernous sinus thrombosis there is bilateral orbital involvement whereas in orbital cellulitis, it is unilateral.

Differences between orbital cellulitis and cavernous sinus thrombosis

	Orbital cellulitis	Cavernous sinus thrombosis
Source	Commonly ethmoid sinuses	Nose, sinuses, orbit, ear and pharynx
Onset and progress	Show	Abrupt
Cranial nerve involvement	Involved concurrently with complete ophthalmoplegia	Involved individually and progressively
Side	Usually involve affected side eye	Involves both eyes
Toxemia	Absent	Present
Fever	Present	High temperature with chills
Mortality	Less	Very high

CHAPTER

6B

Diseases of Paranasal Sinus—Sinonasal Tumor

SINONASAL TUMOR

PREDISPOSING FACTORS

- Nickel with duration of exposure (approximately 18–36 years) predisposes to squamous cell carcinoma and anaplastic carcinoma.
- Hardwood and softwood predisposes to Adenocarcinoma of ethmoidal sinus.

Other Agents

- Hydrocarbons
- Mustard gas
- Radium dial workers: Soft tissue sarcoma
- Welding/soldering
- **Age at presentation:** 5th decade
- **Sex:** Male: Female = 2:1

1. M/C malignancy of nasal skin = Basal cell carcinoma
2. M/C benign tumor of nose = Capillary hemangioma (arises from nasal septum)
3. M/C benign tumor of paranasal sinus = Osteoma (M/C site frontal sinus)
4. M/C malignant tumor of a nose and PNS = Squamous cell carcinoma followed by adenocarcinoma.

Papilloma

- **Site:** Skin of the nasal vestibule and the anterior part of the septum.
- **Treatment:** Cautery/cryotherapy

Inverted Papilloma/Transitional cell papilloma/Schneiderian Papilloma/Ringertz tumor

- **Age:** 40–70 years (≈ 50 years)
- **Sex:** Male > Female
- **Site:** Lateral nasal wall in middle meatus rarely on the septum
- It is associated with *human papilloma virus*⁹

Features:

- **It shows finger-like** epithelial invasions into the underlying stroma of the epithelium rather than on surface so-called inverted papilloma
- It is usually unilateral and is a locally aggressive tumor.
- Patients complain of U/L nasal obstruction rhinorrhea and unilateral epistaxis
- In 10–15% cases there may be associated squamous cell carcinoma (i.e. Premalignant condition).
- **Treatment:** Medical maxillectomy is the treatment of choice. It can be performed by lateral rhinotomy or sub labial degloving approach. These days endoscopic approach is preferred.
- They have a tendency to recur after surgical removal (as it is multicentric).

MALIGNANT TUMORS OF NOSE

Squamous Cell Carcinoma is the Most Common Histological Type of Tumor

- Also known as nose pickers cancer
- **Site:** Lateral wall of nose is most commonly involved.
- Nasal cancer may be an extension from maxillary or ethmoid cancer.
- Metastasis is rare.
- **Age:** Seen in men > 50 years of age
- **Treatment:** is combination of radiotherapy and surgery.

Malignant Melanoma

- **Age:** > 50 year
- **Gross:** bluish-black polypoidal mass.
- **Most common site:** Anterior part of nasal septum
- **Treatment:** Wide surgical excision.

Olfactory Neuroblastoma (Esthesioneuroblastoma)

- Neuroendocrine tumor
- **Age:** Two peaks—one at 11–20 years and second one at 50–60 years
- It is M/C in females

- **Site:** Upper part (upper third) of the nasal cavity. It can spread intracranially; requires anterior craniofacial resection followed by RT/CT.

Adenoid Cystic Carcinoma

- **Site:** Antrum and Nose
- **On microscopic examination:** Swiss - cheese pattern is seen.
- Has a potential of perineural spread

PARANASAL SINUS TUMOR

Benign Neoplasms

Osteoma

- **Commonest site:** Mandible
- **Commonest site in the upper jaw:** Frontoethmoidal area
- **Most common sinus involved** is Frontal > Ethmoids > Maxillary sinus
- **Features:**
 - Most of them are clinically silent
 - If close to the ostium, it can lead to formation of mucocoele.

Malignant Tumors of Paranasal Sinus

Etiology

Seen more commonly in people working in:

- Hardwood furniture industry leads to adenocarcinoma of ethmoid and upper nasal cavity (called as wood workers carcinoma)
- Nickel refining leads to squamous cell Ca and anaplastic carcinoma.
- Leather industry
- Manufacture of mustard gas

NOTE

While hardwood is a carcinogen for sinonasal adenocarcinoma, softwood exposure increases risk of squamous cell carcinoma.

Histology

- 80% Squamous cell Ca^o
- **Others:** Adenocarcinoma, Adenoid cystic carcinoma, Melanoma and sarcomas
- **Site:** M/c Maxillary antrum followed by ethmoid sinus, frontal and sphenoid series
- **Age:** Seventh decade of life
- **Sex:** Male > Female
- **Symptoms:** Silent for longtime.

Early features

- Nasal stuffiness
- U/L Epistaxis
- Facial paraesthesia or pain
- Epiphora
- Dental pain leading to frequent change of dentures

Late features depend on the spread

- Medial – Nasal cavity, ethmoids
- Anterior – Cheek
- Inferior – alveolus leading to Malocclusion, loose teeth
- Superior – Orbit leading to Diplopia, Proptosis loss of vision
- Posterior – Pterygoid plates leading to trismus Intracranial spread can also occur

Lymphatic Spread

- Nodal metastases are uncommon
- Earliest metastasis occurs to Retropharyngeal lymph node
- Commonest LN involved is submandibular lymph node.

Diagnosis

- Biopsy
- CECT of Nose and PNS (Best investigation)

Classification

1. Ohngren's Classification:

- An imaginary plane drawn extending between medial canthus of eye and angle of mandible.
- Growths above this plane have poorer prognosis than those below it.

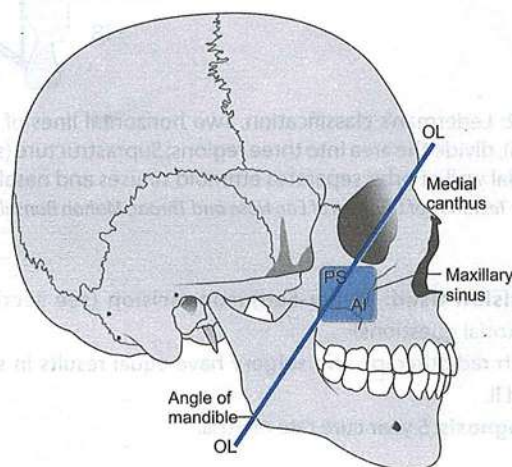


Fig. 6.1: Ohngren's classification. Ohngren's line is an imaginary line (OL), which extends between medial canthus and the angle of mandible, divides the maxilla into two regions anteroinferior (AI) and posterosuperior (PS). AI growths are easy to manage and have better prognosis than Ps tumors.

Courtesy: Textbook of Diseases of Ear, Nose and Throat, Mohan Bansal. Jaypee Brothers, p 357

2. TNM Classification and Stage groupings of the paranasal sinuses. This classification is not important from PG Entrance point of view.

3. Lederman's classification (Fig. 6.2):

2 horizontal lines of Seibileau are drawn:

- One – Passing through floors of orbit
- Other – Through floor of antra

Thus Dividing this Area into

- **Suprastructure** – ethmoid, sphenoid, frontal sinus
- **Mesostructure** – maxillary sinus and respirator area of nose
- **Infrastructure** – alveolar process

Treatment

- For squamous cell carcinoma—radiotherapy or surgery.
- Surgery—Total or Extended maxillectomy

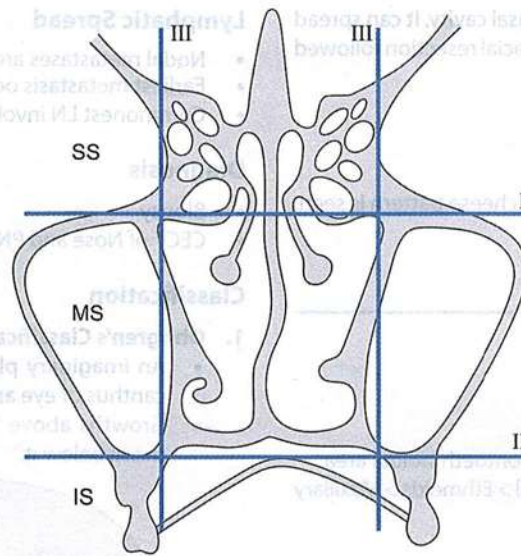


Fig. 6.2: Lederman's classification. Two horizontal lines of Sebi-leau, one passing through the orbit floors(I) and other through antral floors(II), divide the area into three regions: Suprastructure (ss), mesostructure (ms), and Infrastructure (Is). The vertical line (III) at the plane of medial wall of orbit separates ethmoid sinuses and nasal fossa from the maxillary sinuses.

Courtesy: Textbook of Diseases of Ear, Nose and Throat, Mohan Bansal. Jaypee Brothers, p 357

- **Incision Used:** Weber-Ferguson incision (see section of pictorial questions)
- Both radiotherapy and surgery have equal results in stage I and II.
- **Prognosis:** 5 year cure rate of 30%.

- **Stage III and IV:** Combined radiation and surgery. Radiotherapy can be given before or after surgery (preferably postoperatively)

Ethmoid Sinus Malignancy

- Often involved from extension of maxillary carcinoma.
- Prognosis—poor

QUESTIONS

1. **Inverted papilloma:** [PGI 02; PGI Nov 09]
 - a. Is common in children
 - b. Arises from lateral wall
 - c. Always benign
 - d. Can be premalignant
 - e. Causes epistaxis
 - f. Recurrence is rare
2. **True about inverted papilloma:** [PGI Dec 08]
 - a. Arises mainly from nasal septum
 - b. Common in children
 - c. Risk of malignancy
 - d. Postoperative radiotherapy useful
 - e. Also known as Schneiderian papilloma
3. **Inverted papilloma is characterized by all except:** [MP 06]
 - a. Also called as Schneiderian papilloma
 - b. Seen more often in females
 - c. Presents with epistaxis and nasal obstruction
 - d. Originates from lateral wall of nose
4. **Common about tumors of PNS and Nasal Ca:** [PGI Dec 06]
 - a. Squamous cell Ca is the MC type
 - b. Adeno Ca is the MC type
 - c. Melanoma can occur
5. **Most common malignancy in maxillary antrum is:** [PGI 93]
 - a. Mucoepidermoid Carcinoma
 - b. Adeno cystic Ca
 - c. Adenocarcinoma
 - d. Squamous cell Ca
6. **Wood workers are associated sinus Ca:** [PGI Dec 06]
 - a. Adeno Ca
 - b. Squamous cell Ca
 - c. Anaplastic Ca
 - d. Melanoma
7. **Early maxillary carcinom presents as:** [PGI 90]
 - a. Bleeding per nose
 - b. Supraclavicular lymph node
 - c. Tooth pain
 - d. Nasal discharge
8. **Ca maxillary sinus stage III (T3 N0 M0), treatment of choice is/Ca maxillary sinus is treated by:** [TN 06; AP 05; AIIMS 01, AIIMS 97]
 - a. Radiotherapy
 - b. Surgery + Radiotherapy
 - c. Chemotherapy
 - d. Chemotherapy + Surgery
9. **True about Basal Cell Carcinoma** [PGI 04]
 - a. Equal incidence in male and female
 - b. Commoner on the trunk
 - c. Radiation is the only treatment
 - d. Commonly metastasize
 - e. Chemotherapy can be given
10. **Which of the following nasal tumours originates from the olfactory mucosa?** [AI 12]
 - a. Neuroblastoma
 - b. Nasal glioma
 - c. Esthesioneuroblastoma
 - d. Antrochoanal polyp

EXPLANATIONS AND REFERENCES

1. **Ans. is b, d and e i.e. Arises from lateral wall; Can be premalignant; and Causes epistaxis**
2. **Ans. is c and e i.e. Risk of malignancy; and also known as Schneiderian papilloma**
3. **Ans. is b i.e. Seen more often in females**
 Ref. Dhingra 5th/ed p 216; Logan Turner 10th/ed p 56; Current Otolaryngology 2nd/ed p 289, 6th/ed p 202; Mohan Bansal p 354
 - Inverted papilloma is a transitional cell papilloma also called Schneiderian papilloma/Ringertz Tumor.
 - It is the most common benign neoplasm of the nose and paranasal sinuses.
 - It presents in the middle age (40–70 years) as soft friable mass resembling polyp.
 - More common in males (male:female = 5:1).
 - Arises almost exclusively from the lateral wall of the nose and only occasionally from the septum. Can extend into the ethmoid and maxillary sinuses.
 - It is always unilateral.^Q
 - Patients mainly complain of nasal obstruction, rhinorrhea and unilateral epistaxis—Current s 2nd/ed p 289
 - There is coincidental malignancy elsewhere in the upper respiratory tract in about 4% of the cases and malignant transformation of the tumor occurs in about 8% cases.
 - **Treatment is adequate local excision.** If it arises in maxillary sinus, then a medical maxillectomy is surgery of choice. If it arises in the ethmoidal sinus, an external ethmoidectomy is done. If it arises from nose, treatment is wide surgical excision by lateral rhinotomy.
 - It has a tendency to recur even after removal.
4. **Ans. a and c i.e. Squamous cell Ca is the most common type; and Melanoma can occur**
 Ref. Dhingra 5th/ed pp 217, 219, 6th/ed p 205
 Ref. Dhingra 5th/ed pp 219, 220, 6th/ed p 205
5. **Ans. is d i.e. Squamous cell A**
 - More than 80% of the malignant tumors of paranasal sinus and of nose are of squamous cell variety. Rest are Adenocarcinoma, Adenoid cystic carcinoma, Melanoma and various types of sarcomas.

- **Maxillary sinus is the most frequently involved sinus.** Other sites in decreasing order are nasal cavity, ethmoid sinuses, frontal and sphenoid sinus.

6. Ans. is a i.e. Adeno Ca

Ref. Dhingra 5th/ed p 219, 6th/ed p 205

- Workers of furniture industry develop adenocarcinoma of the Ethmoids and upper nasal cavity. While those engaged in Nickel refining get squamous cell and Anaplastic carcinoma.

7. Ans. is a and c i.e. Bleeding per nose; and Tooth pain

Ref. Current Otolaryngology 3rd/ed p 312; Scott Brown 7th/ed Vol 2, p 2424; Mohan Bansal p 358

Maxillary Carcinoma

- It is seen more commonly in the 7th decade of life.⁹
- Males are affected more commonly than females⁹
- Since cancer is confined to the bony walls of the sinus cavity, maxillary cancer usually present very late; the only early symptoms may be loosening of teeth, frequent change of dentures, pain in maxillary teeth, epistaxis and infra-orbital neuralgias/numbness. These are due to involvement of the alveolus, nasal cavity and infra-orbital nerve by the tumor. (Kindly read the text for more details)

8. Ans. is b i.e. Surgery + Radiotherapy

Ref. Dhingra 5th/ed p 222, 6th/ed p 205; Current Otolaryngology 2nd/ed p 290; Mohan Bansal p 358

For stage III squamous cell carcinoma, a combination of radiotherapy and surgery gives better result than either alone. As far as paranasal sinus is concerned—Radiotherapy can be given either before or after surgery, generally a full course of preoperative telecobalt therapy is given followed by surgical excision of the growth by total or extended maxillectomy (incision used—Weber-Ferguson incision).

9. Ans. is e i.e. Chemotherapy can be given

Ref. Current Otolaryngology 3rd/ed pp 238,239; Scott Brown 7th/ed Vol 2, pp 1705,1706

Basal Cell Carcinoma

- Usually seen in middle age and above (40–80 years)
- M/C in Males.
- Main etiology is UV exposure.
- Usually seen above a line joining angle of mouth and ear lobule.
- Commonest site is inner canthus of eye.
- Commonest variety is Nodular (painless shiny nodule). Later it forms an ulcer with hard raised edges.
- It is a locally infiltrating tumor which may erode surrounding tissue. Hence also known as *Rodent ulcer*.
- No lymphatic/bloodstream spread.
- Diagnostic procedure of choice is Wedge biopsy.
- Treatment of choice is wide surgical excision.
- Chemotherapy in the form of topical 5% imiquimod, topical 5 fluorouracil is also being used.
- In patients > 60 years = Radiotherapy is the treatment.

Note—Mohs Surgery is being done in Basal Cell Carcinoma

It involves sequential excision of the tumor under frozen section control with 100% evaluation of tumor margins. Specimens are evaluated on a horizontal basis (normal frozen sections give us only 10% tumor margin and specimen is evaluated on a vertical basis.)

Mohs surgery is useful for basal cell carcinoma arising in difficult areas like inner canthus where wide excision may not be practical and for recurrent tumors.

10. Ans. c i.e. Esthesioneuroblastoma

Ref. Dhingra 5th/ed p 217-218, 6th/ed p 204; Current Otolaryngology 3rd/ed p 313

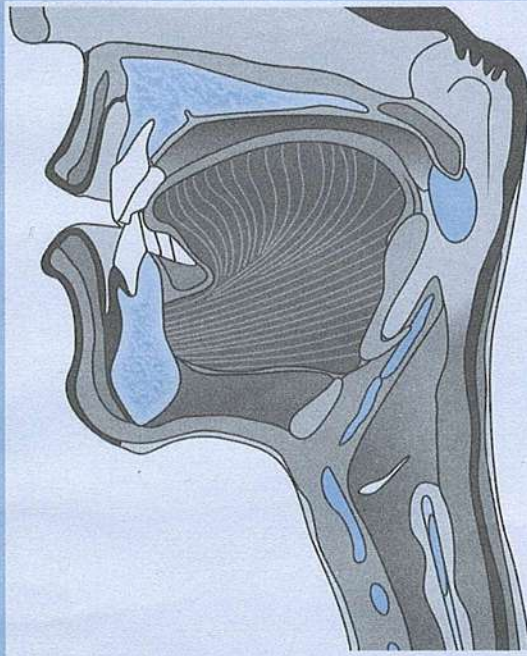
Esthesioneuroblastoma

Esthesioneuroblastoma (ENB), also known as olfactory neuroblastoma, is a rare neoplasm originating from olfactory neuroepithelium superior to middle turbinate. They are initially unilateral and can grow into the adjacent sinuses, contralateral nasal cavity and they can spread to orbit and brain. It can cause paraneoplastic syndrome by secreting vasoactive peptides. Since it can spread intracranially craniofacial resection is the surgery of choice. Combination therapy (Surgery + RT + CT) is used in management.

NOTE

Contrary to other nasal malignancies it is M/C in females

SECTION II



ORAL CAVITY

7. Oral Cavity

CHAPTER

7

Oral Cavity

SUBMUCOUS FIBROSIS

- Chronic insidious process characterized by fibrosis in **submucosal layers of oral cavity**.
- Joshi in 1953 first described this condition in India.

Etiology

- Prolonged local irritation:** Due to mechanical and chemical irritation caused by chewing betel nut, areca nut, tobacco, etc
- Dietary deficiency:** Vitamin A, Zinc and antioxidants.
- Localized collagen disease.
- Racial:** mainly affects Indians.
- In India it is *most common* in poor socioeconomic status.

Pathology

- Epithelial atrophy and submucosal fibroelastic transformation leading to trismus and difficulty in protruding the tongue.
- It is a premalignant condition.
- Leukoplakia and squamous cell carcinoma may be associated with it (malignant transformation = 3 to 7.6% cases).

Clinical Features

- Most common* in ages between 20 and 40 years.
- Intolerance to spicy food.
- Soreness of mouth with constant burning sensation.
- Redness and repeated vesicular eruptions on palate and pillars.
- Difficulty in opening mouth fully and protruding the tongue.

Blanching of mucosa over soft palate, facial pillars and buccal mucosa (the three most common sites for submucous fibrosis).

Treatment

Medical

- Avoid irritant factors.
- Treat anemia and vitamin deficiencies.
- Topical injection of steroids combined with hyalase.

Surgical

- Indicated in advanced cases to relieve trismus.
- Includes release of fibrosis followed by skin grafting or use of flaps.

TUMORS OF ORAL CAVITY

- Most common cancer of oral cavity in World: **Ca tongue**
- Most common cancer of oral cavity in India: **Buccal mucosa > Anterior tongue**
- Most common type of oral cancer: **Squamous cell carcinoma.**
—Bailey and Love 24th/ed p 704

Etiology and Risk Factors for Tumor of Oral Cavity

mnemonic: (6S)

- Smoking/tobacco chewing
- Spirititis (alcohol)
- Sharp jagged tooth and ill-fitting dentures
- Sepsis
- Syndrome of Plummer-vinson (iron deficiency anemia)
- Syphilitic glossitis
- Premalignant conditions**
 - Leukoplakia (most common)
 - Erythroplakia (maximum risk)
 - Chronic hyperplastic candidiasis
- Conditions increasing risk**
 - Oral submucosa fibrosis
 - Syphilitic glossitis
 - Sideropenic dysphagia
- Risk is doubtful**
 - Oral lichen planus
 - Discoid lupus erythematosus
 - Dyskeratosis congenita.

Investigation

- Incisional biopsy is recommended in all cases.
- Fine-needle aspiration cytology (FNAC) is done for lump in neck especially suspicious lymph nodes.
- Magnetic resonance imaging (MRI), when available, is investigation of choice.

Staging

Irrespective of site same staging is recommended for all oral cavity tumor.

T stage		CSDT 11/e, p 286
T1	Tumor 2 cm or less in greatest dimension	
T2	Tumor more than 2 cm but not more than 4 cm in greatest dimension	
T3	Tumor more than 4 cm in greatest dimension	
T4	Tumor invades adjacent structures	
N stage		
NX	Regional lymph nodes cannot be assessed	
N0	No regional lymph node metastasis	
N1	Metastasis in a single ipsilateral clinically positive node, 3 cm or less in greatest dimension	
N2	Metastasis in	
	N2a	Single ipsilateral lymph node more than 3 cm but not more than 6 cm in greatest dimension
	N2b	Multiple ipsilateral lymph nodes, none more than 6 cm in greatest dimension
	N2c	Bilateral or contralateral lymph nodes, none more than 6 cm in greatest dimension
N3	Metastasis in a lymph node more than 6 cm in greatest dimension	
M Stage		
MX	Presence of distant metastasis cannot be assessed	
M0	No distant metastasis	
M1	Distant metastasis	

Most common Site for

Carcinoma	Most common site
Lip carcinoma	Vermilion of lower lip
Tongue carcinoma	Lateral border
Cheek carcinoma	Angle of mouth
Larynx carcinoma	Glottis
Nasopharynx carcinoma	Fossa of rosenmuller
Ranula	Floor of mouth beneath the tongue
Epulis	Root of teeth

Treatment

(Ref. Current Otolaryngology 3rd/ed p 380 onward)

Squamous cell cancers of oral cavity are primarily treated surgically, while those of oropharynx are primarily treated with radiotherapy.

Carcinoma Lip (Most common cancer of oral cavity)

- T1 and T2: Surgery is TOC: – Flap reconstruction (Abbe, Estlander's flap) is done if more than 1/3rd is involved.
- T3 and T4: – Combined radiation and surgery/vermillionectomy or lip shave.

Carcinoma Tongue

T1 and T2: Transoral partial glossectomy.

T3 and T4: Transmandibular/Transcervical total glossectomy.

In case of lymph node (LN) involvement → Radical neck dissection at the time of glossectomy.

Carcinoma Mandible

- For freely mobile tumor—wide local excision
- For tumor adhered to lingual aspect—marginal mandibulectomy
- For tumor adhered to gingiva—marginal mandibulectomy
- For tumor involving alveolar margin—segmental mandibulectomy

DENTIGEROUS (FOLLICULAR CYST)

- Dentigerous is a cyst which envelops the whole or part of the crown of the uninterrupted permanent tooth.
- **Seen in:** 3rd – 4th decade.
- **Most common site:** mandibular 3rd molar tooth
- **Most common type:** Central type, i.e. the cyst surrounds the crown of the tooth
- **Cyst lining:** Non-keratinizing stratified squamous epithelium. The fluid inside is cholesterol rich
- **Radiography:** Well-defined radiolucency associated with the crown of the interrupted tooth
- **Treatment:** Enucleation with the removal of the associated tooth

DENTAL CYST

- Dental cyst (radicular cyst, periodontal cyst) are inflammatory cysts which occur as a result of pulp death especially in the permanent tooth.
- It is the most common cystic lesion in the jaw
- **Peak incidence:** - 4th decade
- 60% found in the maxilla
- **Egg-shell crackling:** May be elicitable due to cortical thinning
- **Content:** Straw-colored fluid, rich in cholesterol
- **Radiograph:** The cysts are round/ovoid radiolucencies with sclerotic margin

ODONTOGENIC KERATOCYST

- Arise from the remnant of dental lamina
- Have a tendency to recur following surgical excision
- Can arise anywhere in the mandible or maxilla
- Has a potential to become malignant

Treatment

Excision

- Radical if malignancy is suspected.
- Enucleation with mechanical, curettage using methylene blue followed by application of carnoy's solution.

SIALOLITHIASIS (STONE IN SALIVARY GLAND)

- 80–90% of calculi develop in whartons duct of submandibular gland. Stensons duct of parotid constitutes 10–20% and sublingual only 1%.
- 80% submandibular stones are radiopaque while parotid stones are radiolucent.
- **Treatment:** It depends on site:
 - If stone is lying within the submandibular duct; anterior to the crossing of lingual nerve, stone can be removed by longitudinal incision over the duct. Duct should be left open.
 - If stone is distal to lingual nerve, it should be treated with simultaneous excision of submandibular gland.
- Parotid stones are removed surgically by exposing the duct and stone is released.

SALIVARY GLAND TUMORS (TABLE 7.1)

- Major salivary gland tumor are mostly benign.
- Minor salivary gland tumor are mostly malignant.
- In children >50% salivary gland tumors are malignant.
- **Most common** tumor of major salivary glands/most common benign salivary gland tumor—pleomorphic adenoma.
- **Most common** malignant tumor of major salivary glands – Mucoepidermoid carcinoma.
- **Most common** malignant tumor of minor salivary glands – Adenoid cystic carcinoma.
- **Most common** site of minor salivary glands tumor – Hard palate.
- **Malignancy varies inversely** with the size of gland (90% of minor salivary gland tumors are malignant).
- All salivary gland tumors are mostly present in parotid gland except adenoid cystic carcinoma which is seen most commonly in minor salivary glands and squamous cell carcinoma which is seen most commonly submandibular gland.
- **Most common Benign tumor/overall tumor of salivary glands in children** is hemangioma] Scott'-Brown's 7th/ed
- **Most common** malignant salivary gland tumor in children – Mucoepidermoid] vol 1, p 1248
- 2nd **most common** malignant tumour in children—Acinic cell cancer.
- For most tumor types there is a slight female preponderance
- Most common etiological agent for salivary gland tumor is exposure to radiation
- Most salivary gland tumors are insidious in onset and grow slowly. Pain is extremely uncommon
- **Most helpful** imaging technique for salivary gland tumor are contrast enhanced computed tomography (CT) and Gadolinium MRI (is preferred)
- **Open surgical biopsy is contraindicated** in salivary gland tumors as it seeds the tumor to the surrounding tissue.
- **Investigation of choice** for salivary gland swellings – FNAC. as MRI cannot distinguish between benign and malignant lesions
- Treatment is excision not enucleation as tumor has microscopic extensions outside the capsule.
- Majority of salivary gland tumors are radioresistant.

Table 7.1: Summary of salivary gland tumor

Tumor type	Most common site	Important feature	Management
Pleomorphic Adenoma (Mixed Tumor)	Parotid gland tail (superficial lobe)	<ul style="list-style-type: none"> • M/C benign salivary gland tumor^a • M/C tumor of major salivary gland^a • Affects women around 40 years^a • In pleomorphic adenoma of sub-mandibular gland m/c age affected is 60 yrs^a • 80% of parotid pleomorphic adenomas arise in superficial lobe^a • Encapsulated but sends pseudopods into surrounding glands (so enucleation is not done as treatment) • Malignant transformation occurs in 3–5% of cases • Facial nerve infiltration indicates carcinomatous change 	<ul style="list-style-type: none"> • Superficial parotidectomy (Patey's operation)
Warthin's tumor/ Adenolymphoma	Parotid gland exclusively (M/c site being lower part of parotid overlying angle of mandible)	<ul style="list-style-type: none"> • It is the second M/C benign tumor of salivary glands • Can also arise from cervical nodes • Smoking its risk • It never involves facial nerve • It shows hot spot in 99Tcm scan which is diagnostic 	<ul style="list-style-type: none"> • Superficial parotidectomy

Contd...

Contd...

Tumor type	Most common site	Important feature	Management
Adenoid cystic Minor salivary gland carcinoma (Cylindroma)	Minor salivary gland	<ul style="list-style-type: none"> It is the only salivary gland tumor which is more common in men M/C cancer of minor salivary gland followed by adenocarcinoma and mucoepidermoid carcinoma Invades perineural space and lymphatics M/C head and neck cancer associated with perineural invasion Unlike other salivary gland tumors it is more radiosensitive 	<ul style="list-style-type: none"> Radical parotidectomy followed by postoperative radiotherapy if margins are positive
Mucoepidermoid carcinoma	Parotid gland	<ul style="list-style-type: none"> M/C malignant salivary gland tumor in children M/C malignant tumour of parotid M/C radiation induced neoplasm of salivary gland carcinoma Consists of mixture of squamous cells, mucous-secreting cells, intermediate cells and clear or hydropic cells Mucin producing tumor is low-grade type; squamous cell T/m is high grade type Rare tumor with low-grade malignancy Tends to involve the regional lymph nodes 	<ul style="list-style-type: none"> Superficial/Total parotidectomy + radical neck dissection
Acinic cell adenocarcinoma	Exclusively parotid gland affecting women mostly	<ul style="list-style-type: none"> Rare tumor with low-grade malignancy Tends to involve the regional lymph nodes 	<ul style="list-style-type: none"> Treatment is radical excision Only tumor which responds to radiotherapy so, irradiation
Squamous cell carcinoma therapy is useful	Submandibular gland	<ul style="list-style-type: none"> Arises from squamous metaplasia of the lining epithelium of the ducts 	

CERVICAL SWELLING

Midline swelling of neck (from above downward) is k/a cervical swelling

mnemonic

Lymph Node	Ludwigs angina
Sublingual	Enlarged submental lymph nodes
Likes Lipoma	Sublingual dermoid
The Thyroglossal cyst	
Sweet	Subhyoid bursitis
Girl Goiter	
Living (in)	Lipoma
Retro	Retrosternal goiter
Thymus	Thymic swelling

mnemonic

(Though a little weird but is very helpful) Lymph Nodes Sublingual Likes The Sweet Girl Living (in) Retro Thymus.

- Branchial fistulas are those derived from 2nd branchial cleft and open externally in the lower third of neck, near the anterior border of sternocleidomastoid. Its internal orifice is located in the tonsillar fossa.

Features

- Cysts and sinuses are lined by **stratified squamous epithelium**.
- Content:** Straw-colored fluid rich in cholesterol.
- Branchial cysts:** Present in the third decade.
- Branchial sinus:** Present since birth.
- Male:** Female = 3:2.
- 60% of them are present on left side.
- Sites of occurrence of the cyst:**
 - Upper neck (*most common*)
 - Lower neck
 - Parotid gland
 - Pharynx and posterior triangle

Treatment

Excision of the cyst and fistula.

BRACHIAL CYST AND BRACHIAL FISTULA

- Remnants of the brachial apparatus, present in fetal life
- Branchial cysts are characteristically found anterior and deep to the upper third of the sternocleidomastoid muscle.

THYROGLOSSAL CYST

It is a cystic swelling which arises from the remnant of thyroglossal duct.

Development of Thyroglossal Cyst

- Thyroglossal tract passes down from foramen cecum of the tongue between genioglossi muscle in front, passing behind the hyoid bone to the upper border of thyroid cartilage ultimately ending in the pyramidal lobe of thyroid gland.
- Normally this tract disappears by the 5th – 10th week except in the lower part forming isthmus of thyroid.
- Sometimes, a part of it may remain patent giving rise to a cystic swelling due to retention of secretions resulting in thyroglossal cyst.

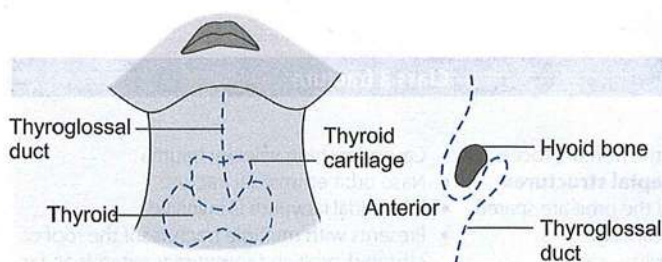


Fig. 7.1: Sites of thyroglossal duct cyst

- **Epithelial lining:** Pseudostratified ciliated/columnar squamous
- **Importance:** Squamous carcinoma may arise in the cyst.

Clinical Features

- **Age:** Although congenital can be seen at any age from birth up to 70 years. (Mostly present between 15 and 30 years).
- **Position:** Midline in 90% cases.
- In 10% cases, it occurs on one side in which 95% are on left side and 5% on right side.
- **Clinically:** Swelling moves sideways only. On protruding the tongue or on deglutition—it moves upward.

Treatment

Sistrunk's operation (stepladder surgery) in which tract is completely excised along with middle of hyoid bone.

NOTE

- If body of hyoid is **not** removed recurrence occurs in 85% cases.
- Recurrence after removal of hyoid = 2–8%
- In cases of infected thyroglossal cyst: abscess should be incised and drained.
- After complete subsidence of inflammatory reaction (approximately 6 weeks) thyroglossal cyst and its epithelial tract should be excised
- Carcinoma arising in the thyroglossal cyst are:
 - Papillary adenocarcinoma (85%)
 - Follicular adenocarcinoma (15%)
 - Adenocarcinoma
 - Squamous carcinoma

Differences between Thyroglossal Cyst and Thyroglossal Fistula

Thyroglossal cyst	Thyroglossal fistula
Congenital	Never congenital, always acquired
Present anywhere along thyroglossal tract	following infection/ inadequate cyst removal
Most common site subhyoid	Median fistula of neck
Moves upward on protrusion of tongue as well as on swallowing	Moves upward on protrusion of tongue

NECK DISSECTIONS

Types

Radical Neck Dissection (RND)

- **Structures removed:** en bloc removal of the lymph nodes and lymph bearing areas from the mandible (*above*) to clavicle (*below*) and from midline to the anterior border to trapezius.
- **Additional structures removed:**
 - Submandibular gland/tail of parotid
 - Internal jugular vein
 - Sternocleidomastoid, omohyoid
 - Spinal accessory nerve and cervical plexus

Modified Radical and Selective Neck Dissection

Modified Radical neck dissection	Selective neck dissection
Modification of RND where one or more non-lymphatic structures are preserved viz.	Modification of RND that preserves one or more lymphatic compartment normally removed as a part of RND.
<ul style="list-style-type: none"> • J – Internal Jugular vein • A – Spinal accessory nerve • S – Sternocleidomastoid muscle 	<p>Types:</p> <ul style="list-style-type: none"> • Supraomohyoid: removes LN in level I to III (indication: oral cavity primaries) • Lateral neck dissection: Removes LN level II to IV (indication: laryngeal Ca) • Posterolateral neck dissection: removes LN in level II to IV (indication: thyroid Ca)
Jugular lymphatic chain and cervical lymphatics are removed Indication: Single node < 3 cm	

Functional Neck Dissection

Preservation of all three non-lymphatic structures viz. internal jugular spinal accessory and sterno-cleidomastoid.

Extended Radical Neck Dissection

Removal of additional lymph node groups (paratracheal, superior, mediastinal parapharyngeal) and nonlymphatic structures (external carotid artery XII nerve, X nerve paraspinal muscles and parotid glands).

NOTE**Levels of lymph nodes in neck**

- **Level 1** Includes submental and submandibular lymph nodes.
- **Level 2** Nodes lie along the upper one-third of IJV between base of skull and hyoid bone
- **Level 3** Nodes along the middle third of IJV between hyoid bone and upper border of cricoid cartilage.

- **Level 4** Nodes along the lower third of IJV between cricoid cartilage and clavicle.
- **Level 5** These nodes lie in posterior triangle of neck including transverse cervical and supraclavicular nodes.
- **Level 6** These are nodes in anterior compartment including prelaryngeal, pretracheal and paratracheal groups.
- **Level 7** Includes nodes of upper mediastinum below suprasternal notch.

FRACTURE OF THE NOSE

It is the *most common* facial bone to get fractured.⁹

Classification Nasal of Fracture (Table 7.2)**Table 7.2:** Classification of nasal fracture

Class 1 fracture	Class 2 fracture	Class 3 fracture
Chevallet	Jarjavay	
<ul style="list-style-type: none"> • Depressed nasal fracture • Fracture line runs parallel to the dorsum and the nasomaxillary suture line • Nasal septum is not involved generally in this injury • It is involved only in severe cases • Features: Does not cause gross lateral • Treatment: Fracture reduction done either immediately or after 5–7 days, once edema settles 	<ul style="list-style-type: none"> • Involve the nasal bone, the frontal process of the maxilla and the septal structures • Ethmoidal labyrinth and the orbit are spared • Here, the quadrilateral cartilage gets dislocated from the maxillary crest • Treatment: Closed reduction of the nasal bone fracture with open reduction of the septum 	<ul style="list-style-type: none"> • Caused by high velocity trauma • Naso orbit ethmoidal fracture • Ethmoidal labyrinth is involved • Presents with multiple fractures of the roof of ethmoid, orbit and sometimes extends as far back as the sphenoid and parasellar regions (CSF leak and pneumocranium seen) • Treatment: Open reduction and displacement internal fixation

NOTE

- Distal part of the nasal bone is very thin and therefore more susceptible to injury.
- Untreated nasal bone fractures lasting for more than 21 days require **open reduction**
- Any cerebrospinal fluid (CSF) leak persisting for more than 2 weeks have to be considered for repair.
- Foreceps used in:
 - Reduction of nasal bone – Walsham forcep
 - Reduction of septal fracture – Asch forcep




Symptoms of Nasal Fracture

- **Most common symptom:** epistaxis
- External nasal deformity
- Nasal obstruction due to blood clot
- **Palpation:**
 - Tenderness present
 - Crepts present
- Watery nasal discharge indicates CSF leak due to fracture of cribriform plate in roof of nose.

FRACTURE OF MAXILLA

Le fort classified fracture of maxilla into three types (Table 7.3)

Table 7.3: Classification of le fort type fracture

Le Fort type 1 fractures	Type 2 (Pyramidal fracture)	Type 3 (Craniofacial dysostosis)
<ul style="list-style-type: none"> • Type 1 (transverse Guerin fracture) separates the palate from midface and by definition involve the pterygoid plates bilaterally 	This fracture involves the pterygoid plates, fronto nasal maxillary buttress and often the skull base via the ethmoid bone	Facial skeleton separates from the cranial base Fracture line passes from Root of nose
 <p>(a) Le forte 1 (Guerin)</p>	 <p>(b) Le forte 2 (Pyramidal)</p>	 <p>(c) Le forte 3 (Craniofacial dysjunction)</p>
Le Fort fractures		

Contd...

Contd...

Le Fort type 1 fractures	Type 2 (Pyramidal fracture)	Type 3 (Craniofacial dysostosis)
<ul style="list-style-type: none"> Fracture line passes through the floor of the maxilla on both sides <p>↓</p> <p>Above the nasal cavity floor</p> <p>↓</p> <p>And through the nasal septum</p> <p>↓</p> <p>Inferior parts of the medial and lateral pterygoids</p> <ul style="list-style-type: none"> This type of fracture results in a mobile palate but a stable upper midface 	<ul style="list-style-type: none"> Fracture line passes from floor of the maxilla <p>↓</p> <p>Through zygomatic maxillary suture line</p> <p>↓</p> <p>Floor of the orbit</p> <p>↓</p> <p>Lacrimal bone</p> <p>↓</p> <p>Nasion</p> <ul style="list-style-type: none"> Infraorbital nerve damaged Orbital floor is always inclined This fracture has a pyramidal appearance and results in palatal and midface mobility It is also called as 'floating maxilla fracture' 	<p>↓</p> <p>Ethmoid frontal junction</p> <p>↓</p> <p>Superior orbital tissue</p> <p>↓</p> <p>Lateral wall of orbit</p> <p>↓</p> <p>Zygomaticotemporal suture</p> <p>↓</p> <p>Temporozygomatic suture</p> <p>↓</p> <p>Upper part of pterygoid</p>

NOTE

Le fort fracture II/III are associated with CSF rhinorrhea

ZYGOMATIC FRACTURE (TRIPOD FRACTURE)

Zygomatic Fracture is the second M/C facial fracture (after nasal bone).

- Commonly called Tripod Fracture Since the Bone Breaks at three Places
- Zygomaticofrontal or Frontozygomatic suture
- Infraorbital rim
- Zygomaticotemporal suture (Fig. 7.2)

Features

- Ecchymosis of periorbital region within 2 hours of injury is pathognomic
- Step—deformity at the infraorbital margin
- Flattening of the malar prominence
- Anesthesia in the distribution of the infraorbital nerve
- Trismus
- Restricted ocular movement
- Periorbital emphysema
- Diplopia

Diagnosis

- Water's view and exaggerated water's view X-ray
- CT scan (orbit)

Treatment

- Only displaced fractures are to be treated
- Open reduction and internal wire fixation is carried out.

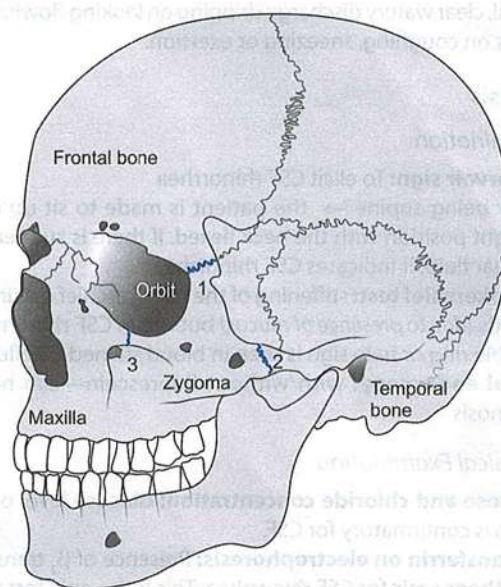


Fig. 7.2: Left zygoma (tripod) fracture showing three sites of fracture. (1) Zygomaticofrontal; (2) Zygomaticotemporal; (3) Infraorbital

Courtesy: Textbook of Diseases of Ear, Nose and Throat, Mohan Bansal. Jaypee Brothers, p 344

CEREBROSPINAL FLUID RHINORRHEA

(Scott Brown 7th/ed, vol 2 p 1636-1639)

- It is the flow of CSF from nose (due to leakage of CSF from the subarachnoid space into nasal cavity).
- Usual sites of CSF leak are cribriform plate > frontal sinus (posterior walls) > floor of the anterior cranial fossa.

Etiology

Traumatic (Acute/delayed)		Atraumatic	
Accidental ↓ In Le fort II and Le fort III Fracture	iatrogenic <ul style="list-style-type: none"> • Headlight Intranasal surgery like polypectomy • Endoscopic sinus surgery craniotomy • Transphenoidal hypophysectomy 	Due to raised ICT <ul style="list-style-type: none"> • Tumors • Hydrocephalus • Destructive bony lesions like granuloma 	Normal pressure leaks <ul style="list-style-type: none"> • Congenital dehiscence of nasal roof • Focal atrophy • Osteomyelitic erosion

NOTE

Historically the M/C cause of CSF rhinorrhea was head injury with involment of cribriform plate of ethmoid but now M/C cause is iatrogenic trauma surgery.

CSF can escape from following routes:

- Middle/posterior fossa via mastoid cavity, sphenoid sinus
- Anterior cranial fossa via:
 - Frontal, Ethmoid Sphenoid sinus
 - Cribriform plate
 - From middle ear via eustachian tube

Clinical Features

Unilateral, clear watery discharge dripping on looking down, which increases on coughing, sneezing or exertion.

Diagnosis

On Examination

- **Reservoir sign:** To elicit CSF rhinorrhea
- After being supine → the patient is made to sit up in the upright position with the neck flexed. If there is sudden rush of clear fluid, it indicates CSF rhinorrhea.
- **Handkerchief test:** stiffening of the handkerchief occurs with rhinitis (due to presence of mucus) but not in CSF rhinorrhea.
- Double ring or halo sign is seen in blood stained CSF fluid.
- **Nasal endoscopy:** with/without fluorescein—can help in diagnosis

Biochemical Examination

- **Glucose and chloride concentration:** Glucose level of > 30 mg% is confirmatory for CSF.
- **β_2 transferrin on electrophoresis:** Presence of β_2 transferrin is pathognomic for CSF rhinorrhea. This is the only test which should be used to confirm CSF rhinorrhea. Besides CSF, β_2 transferrin is present in perilymph and aqueous humor.
- Another protein called the **beta trace protein** is also specific for CSF and is widely used in Europe. It is secreted by meninges and choroid plexus. Facilities to test these proteins are not easily available everywhere.
- **Imaging modality of choice:** To diagnose the site of leak—T2 weighted MRI.

Treatment

Early cases of post-traumatic CSF rhinorrhea can be managed by conservative measures such as bed rest, elevating the head of the

bed, stool softeners, and avoidance of nose blowing, sneezing and straining. Prophylactic antibiotics can be used to prevent meningitis. Acetazolamide decreases CSF formation. These measures can be combined with lumbar drain if indicated.

Surgical repair can be done by the following:

- **Neurosurgical intracranial approach.**
- **Extradural approaches** such as external ethmoidectomy for cribriform plate and ethmoid area, trans-septal sphenoidal approach for sphenoid and osteoplastic flap approach for frontal sinus leak.
- **Transnasal endoscopic:** With the advent of endoscopic surgery for nose and sinuses, most of the leaks from the anterior cranial fossa and sphenoid sinus can be managed endoscopically with a success rate of 90% with first attempt. Principles of repair include:
 - Defining the sites of bony defect.
 - Preparation of graft site.
 - Underlay grafting of the fascia extradurally followed by placement of mucosa (as a free graft or pedicled flap).
 - If bony defect is larger than 2 cm, it is repaired with cartilage (from nasal septum or auricular concha) followed by placement of mucosa.

NOTE

CSF leak from frontal sinus often requires osteoplastic flap operation and obliteration of the sinus with fat.

BLOW OUT FRACTURE OF ORBIT

- Blunt trauma to the orbit leads to increase in intraorbital pressure and so orbit gives way through the floor and medial wall. There is herniation of the orbital contents into the maxillary antrum. This is known as orbital blow out. This herniation of orbital contents into the maxillary antrum is visualized radiologically as a convex opacity bulging into the antrum from above. This is known as **tear drop sign**.
- The symptoms include enophthalmos, diplopia, restricted upward gaze and infraorbital anesthesia.
- **Forced deduction test:** Detects extraocular muscle entrapment in blowout fractures.

FRACTURE OF MANDIBLE

Fracture of mandible is classified by **Dingmans classification** depending on location. Condylar fractures (35%) are most common followed by those of angle (20%), body (20%) and symphysis (15%) of mandible.

CLINICAL VIGNNETTES TO REMEMBER

1. Vestibule is seen in ear (in inner ear bony labyrinth), nose (skin lined portion of nose), larynx (part above ventricular bands) and oral cavity.
2. L:N of tongue is jugulomohyoid LN (as from all parts of tongue, lymphatics finally drain into jugulomohyoid LN).
3. M/C lymph node enlarged in tongue malignancy = Submandibular LN (as M/C site for Ca tongue = lateral aspect which drains into submandibular LN)
4. In XII nerve paralysis deviates to paralyzed side on protrusion due to action of unaffected genioglossus muscle on opposite side.
5. For lip reconstruction Abbe-Estlander flap (Fig. 7.4) is used which is based on labial artery. Other flaps which could be used are Karapandzic flap, Gillie's fan flap.



Fig. 7.4: Abbe estander flap

6. To delineate the area from which biopsy should be taken in oral leisons—supravital staining with toluidine blue dye is used.
7. A 40-year-old chronic cigrette smoker presents with reddish shiny plaques in the floor of mouth. Most common D/D is—Erythroplakia.
8. A 42-year-old male who is a sale's manager in a leading firm presents with grayish atropic area in the lower lip due to long standing sunlight exposure. The most important D/D is actinic cheilosis. (Note: Actinic cheilosis is common in males ≥ 40 years and can lead to squamous cell carcinoma).
9. M/C site for mandibular fracture = condylar fracture.
10. Pneumocephalus can be seen in fracture of frontal sinus.
11. 1st/Most important step in management of faciomaxillary trauma – Airway management
12. Palatal myoclonus is seen in multiple sclerosis.
13. A 14-years-old boy presents with fever, sore-throat ulcers and cervical lymph node enlargement. Throat-swab is positive for beta hemolytic streptococcus and was put on penicillin but he developed rubelliform rash and symptoms worsened—Diagnosis is – Infectious mononucleosis (also k/a glandular fever). Caused by EBV. Gold standard test for diagnosing this condition – EBV antibodies. Management—steroids.
14. In a case of recurrent edema of uvula and laryngeal edema – always suspect hereditary angioneurotic edema (HANE). Patients may also have edema of gut. It is caused due to deficiency of enzyme C1 esterase inhibitor.
15. Behcet's syndrome – is oculo oro genital syndrome characterized by a triad of—
 - Aphthous like ulcers in oral cavity. The edge of the ulcer is characteristically punched out.
 - Genital ulceration
 - Uveitis
16. Taste buds are highest in circumvallate papillae > Foliate papillae > Fungiform papillae. There are practically no buds in felfiform papillae.

Clinical Condition

- Black membrane in mouth
- Grayish white membrane on tonsils + B/L cervical lymphadenitis in a febrile patient
- Cystic translucent swelling in the floor of mouth
- Opaque swelling in midline in the floor of mouth
- Black hairy tongue
- Fissured tongue
- Wickham's striae

Seen in

- Vincent argina
- Diphtheria
- Ranula
- Dermoid cyst
- Chronics smokers, Drugs like lasanopra zole, antibiotic use.
- Syphilis, Vit B deficiency, Anemia
- Lichen planus

QUESTIONS

1. Fordyce's (Spots) Granules in oral cavity arise from:

[AIIMS 04]

- a. Mucous glands
- b. Sebaceous glands
- c. Taste buds
- d. Minor salivary glands

2. True about aphthous ulcer:

[PGI June 05]

- a. Viral predisposition
- b. Recurrent ulcer
- c. Deep ulcers
- d. Involves the mucosa of the hard palate
- e. Steroids given as treatment

3. Regarding ranula all are true except:

[MAHE 05]

- a. Retention cyst
- b. Arises from submandibular gland
- c. Translucent
- d. Plunging may be a feature

4. True regarding Ranula:

[AI 01]

- a. It is also called as epulis
- b. It is a cystic swelling in the floor of mouth.
- c. It is a type of thyroglossal cyst
- d. It is a type of mucus retention cyst

5a. Premalignant lesion of oral cavity includes: [PGI Nov 10]

- a. Erythroplakia
- b. Fordyce spots
- c. Leukoplakia
- d. Keratoacanthoma
- e. Aphthous ulcer

5b. Risk factors for oropharyngeal region carcinoma:

- a. Sideropenic dysphagia
- b. Oral submucous fibrosis
- c. Erythroplakia
- d. Leukoplakia
- e. Chronic hypertrophic candidiasis

6. Which of the following is premalignant condition:

[AIIMS 91]

- a. Chronic glossitis
- b. Submucous fibrosis
- c. Hypertrophic glossitis
- d. Aphthous stomatitis

7. The most common premalignant condition of oral carcinoma is:

[AI 95, 96]

- a. Leukoplakia
- b. Erythroplakia
- c. Lichen planus
- d. Fibrosis

8. The most common site of oral cancer among Indian population is:

[AI 04]

- a. Tongue
- b. Floor of mouth
- c. Alveobuccal complex
- d. Lip

9. Carcinoma tongue most frequently develops from:

[AI 02]

- a. Tip
- b. Lateral border
- c. Dorsal portion
- d. All portions equally

10. A patient has carcinoma of right tongue on its lateral border of anterior 2/3rd, with lymph node of size 4 cm in level 3 on left side of the neck, stage of disease is:

[AIIMS May 07]

- a. N0
- b. N1
- c. N2
- d. N3

11. A patient presented with a 1x1.5 cms growth on the lateral border of the tongue. The treatment indicated would be:

[AIIMS 02]

- a. Laser ablation
- b. Interstitial brachytherapy

- c. External beam radiotherapy

- d. Chemotherapy

12. A patient with Ca tongue is found to have lymph nodes in the lower neck. The treatment of choice for the lymph nodes is:

[AIIMS 01]

- a. Lower cervical neck dissection
- b. Suprahyoid neck dissection
- c. Teleradiotherapy
- d. Radical neck dissection

13. Carcinoma of buccal mucosa commonly drain to the following lymph nodes sites:

[AI 97]

- a. Submental
- b. Submandibular
- c. Supraclavicular
- d. Cervical

14. Metastasis of carcinoma buccal mucosa goes to:

[AIIMS 96]

- a. Regional lymph node
- b. Liver
- c. Heart
- d. Brain

15. Squamous cell carcinoma of maxilla with T3 N0NO stagina treatment is:

- a. Radiotherapy
- b. Maxillectomy
- c. Radiotherapy and maxillectomy
- d. Maxillectomy and chemotherapy

16. A 70-year-old male who has been chewing tobacco for the past 50 years present with a six months history of large, fungating, soft papillary lesions in the oral cavity. The lesion has penetrated into the mandible. Lymph nodes are not palpable. Two biopsies taken from the lesion proper show benign appearing papillomatosis with hyperkeratosis and acanthosis infiltrating the subjacent tissues. The most likely diagnosis is:

[AI 04]

- a. Squamous cell papilloma
- b. Squamous cell carcinoma
- c. Verrucous carcinoma
- d. Malignant mixed tumor

17. A 80-year-old patient present with a midline tumor of the lower jaw, involving the alveolar margin. He is edentulous. Treatment of coice:

[AI 01]

- a. Hemimandibulectomy
- b. Commando operation
- c. Segmental mandibulectomy
- d. Marginal mandibulectomy

18. An old man who is edentulous squamous cell carcinoma in buccal mucosa that has developed infiltrated to the alveolus. Following is not indicated in treatment:

- a. Radiotherapy
- b. Segment mandibulectomy
- c. Marginal mandibulectomy involving removal of outer table only
- d. Marginal mandibulectomy involving removal of upper half of mandible

19. Which Ca has best prognosis:

[AIIMS 98]

- a. Carcinoma lip
- b. Carcinoma cheek
- c. Carcinoma tongue
- d. Carcinoma palate

- 20. True statement about oral cancer is/are:** [PGI 04]
 a. Most common in buccal mucosa
 b. Systemic metastasis uncommon
 c. Responds to radiotherapy
 d. Surgery is treatment of choice
 e. Syphilis and dental irritation predisposes
- 21. In carcinoma of lower lip secondaries are seen in:** [AI 91]
 a. Upper cervical LN b. Supraclavicular LN
 c. Axillary LN d. Mediastinal LN
- 22. Calculus is most commonly seen in which salivary gland:** [AIIMS June 99]
 a. Sublingual b. Palatal
 c. Parotid d. Submandibular
- 23. The most common tumor of the salivary gland is:** [AI 02; AIIMS 98]
 a. Mucoepidermoid tumor b. Warthin's tumor
 c. Acinic cell tumor d. Pleomorphic adenoma
- 24. Most common salivary gland tumor in children:** [AIIMS 99]
 a. Lymphoma b. Adenoid cystic Ca
 c. Pleomorphic adenoma d. Mucoepidermoid Ca
- 25. All are true for pleomorphic adenoma except:** [PGI 99]
 a. Arises from parotid
 b. May turn into malignant
 c. Minor salivary gland can be affected
 d. None
- 26. Treatment of choice for pleomorphic adenoma:** [AIIMS 96, 98, 01; AI 97; PGI 95, 99]
 a. Superficial parotidectomy
 b. Radical parotidectomy
 c. Enucleation
 d. Radiotherapy
- 27. Ramavati, a 40-year-old female, presented with a progressively increasing lump in the parotid region. On oral examinations, the tonsil was pushed medially. Biopsy showed it to be pleomorphic adenoma. The appropriate treatment is:** [AIIMS 01]
 a. Superficial parotidectomy
 b. Lumpectomy
 c. Conservative total parotidectomy
 d. Enucleation
- 28. Which of the following is not an indication of radiotherapy in pleomorphic adenoma of parotid:** [AI 04]
 a. Involvement of deep lobe
 b. 2nd histologically benign recurrence
 c. Microscopically positive margins
 d. Malignant transformation
- 29. Mixed tumors of the salivary glands are:** [AI 06]
 a. Most common in submandibular gland
 b. Usually malignant
 c. Most common in parotid gland
 d. Associated with calculi
- 30. In which one of the following head and neck cancer perineural invasion is most commonly seen:** [AI 05]
 a. Adenocarcinoma
 b. Adenoid cystic carcinoma
 c. Basal cell carcinoma
 d. Squamous cell carcinoma
- 31. Acinic cell carcinoma of the salivary gland arise most often in the:** [AI 06]
 a. Parotid salivary gland
 b. Minor salivary glands
 c. Submandibular salivary glands
 d. Sublingual salivary glands
- 32. A Warthin's tumor is:** [AIIMS 03, 05]
 a. An adenolymphoma of parotid gland
 b. A pleomorphic adenoma of the parotid
 c. A carcinoma of the parotid
 d. A carcinoma of submandibular salivary gland
- 33. All of the following are true regarding Warthin's tumor except:** [AIIMS 02]
 a. More common in females
 b. Commonly involve the parotid glands
 c. They arise from the epithelial and the lymphoid cells
 d. 10% are bilateral
- 34. Treatment of choice for Warthin's tumor is:** [AIIMS 01; AI 98]
 a. Superficial parotidectomy b. Enucleation
 c. Radiotherapy d. Injection of a sclerosing agent
- 35. Mucoepidermoid carcinoma of parotid arises from:** [PGI 99]
 a. Mucus secreting and epidermal cells
 b. Excretory cells
 c. Myoepithelium cells
 d. Acinus
- 36. True statement [s] about salivary gland tumors:** [PGI 04]
 a. Pleomorphic adenoma can arise in submandibular gland
 b. Warthin's tumor arises from submandibular gland
 c. Pleomorphic adenoma is most common tumor of submandibular gland
 d. Acinic cell Ca is most malignant
 e. Frey's syndrome can occur after parotid surgery
- 37. In surgery of submandibular salivary gland, nerve often involved:** [PGI June 97]
 a. Hypoglossal b. Glossopharyngeal
 c. Facial d. Lingual
- 38. In which of the following conditions sialography is contraindicated:** [AI 05/AI 07]
 a. Ductal calculus b. Chronic parotitis
 c. Parotid obstruction d. Acute sialadenitis
- 39. Most common cause of unilateral parotid swelling in a 27yr old male is:** [AI 01]
 a. Warthin's tumor b. Pleomorphic adenoma
 c. Adenocarcinoma d. Hemangioma
- 40. True about Ludwig's angina:** [PGI 07]
 a. Involves both submandibular and sublingual spaces
 b. Most common cause is dental infection
 c. Bilateral
 d. Spreads by lymphatics
- 41. Ludwig's angina is characterized by all the following except:** [AI 94]
 a. Cellulitis of the floor of the mouth
 b. Caused by anaerobic organisms
 c. Aphthous ulcers in the pharynx
 d. Infection spreads to retropharyngeal space

42. True about quinke disease: [PGI June 05] [June 04]

- a. Bacterial infection
- b. Peritonsillar abscess
- c. Vocal cord edema
- d. Edema of uvula

43. Le Fort's fracture does not involve: [Kerala 89]

- a. Zygoma
- b. Maxilla
- c. Nasal bone
- d. Mandible

44. Craniofacial dissociation is seen in: [SGPGI 05, TN 06]

- a. Le Fort 1 fracture
- b. Le Fort 2 fracture
- c. Le Fort 3 fracture
- d. Tripod fracture

45. Tear drop sign is seen in: [SGPI 05]

- a. Fracture of floor of orbit
- b. Fracture of lateral wall of nose
- c. Le Fort's fracture
- d. Fracture on zygomatic arch

46. Clinical features of fracture zygoma is/are: [PGI Nov 09]

- a. Cheek swelling
- b. Trismus
- c. Nose bleeding
- d. Infraorbital numbness
- e. Diplopia

47. Fracture zygoma shows all the features except: [AI 97]

- a. Diplopia
- b. CSF rhinorrhea
- c. Epistaxis
- d. Trismus

48. Tripod fracture is seen in: [MP 08]

- a. Mandible
- b. Maxilla
- c. Nasal bone
- d. Zygoma

49. Which is not seen in fracture maxilla: [AIIMS 91]

- a. CSF rhinorrhea
- b. Malocclusion
- c. Anesthesia upper lip
- d. Surgical emphysema

50. CSF rhinorrhea occurs due to fracture of: [AIIMS 97]

- a. Roof of orbit
- b. Cribriform plate of ethmoidal bone
- c. Frontal sinus
- d. Sphenoid bone

51. The most common site of leak in CSF rhinorrhea is: [AI 05]

- a. Ethmoid sinus
- b. Frontal sinus
- c. Petrous part of temporal bone
- d. Sphenoid sinus

52. CSF rhinorrhea is seen in: [PGI June 03]

- a. Lefort's fracture Type I
- b. Nasal fracture
- c. Nasoethmoid fracture
- d. Frontozygomatic fracture

53. True about CSF rhinorrhea is: [PGI 02]

- a. Occurs due to break in cribriform plate
- b. Contains glucose
- c. Requires immediate surgery
- d. Contains less protein

54. Immediate treatment of CSF rhinorrhea requires: [AIIMS 97]

- a. Antibiotics and observation
- b. Plugging with paraffin guage
- c. Blowing of nose
- d. Craniotomy

55. CSF rhinorrhea is diagnosed by: [AI 07]

- a. Beta-2 microglobulin
- b. Beta-2 transferrin
- c. Thyroglobulin
- d. Transthyretin

56. The pathognomonic test for CSF in suspected CSF rhinorrhea is: [MP 07]

- a. Glucose concentration
- b. Handkerchief test
- c. Halo sign
- d. Beta-2 transferrin

57. After laparoscopic appendectomy, patient had fall from bed on her nose after which she had swelling in

nose and slight difficulty in breathing. Next step in management: [AIIMS 07]

- a. IV antibiotics for 7–10 days
- b. Observation in hospital
- c. Surgical drainage
- d. Discharge after 2 days and follow-up of the patient after 8 weeks

58. Ideal time of correcting fracture of nasal bone is:

[Kolkata 00]

- a. Immediately
- b. After few days
- c. After 2 weeks
- d. After 3–4 weeks

Miscellaneous

59. Grayish white membrane in throat may be seen in all of the following infections except: [AI 97]

- a. Streptococcal tonsillitis
- b. Diphtheria
- c. Adenovirus
- d. Ludwig's angina

60. Black color patch in the mouth is seen in: [AI 91]

- a. Acute tonsillitis
- b. Peritonsillar abscess
- c. Vincent's angina
- d. Leukemia

61. Trench mouth is: [UP 07]

- a. Submucosal fibrosis
- b. Tumor at uveal angle
- c. Ulcerative lesion of the tonsil
- d. Retention cyst of the tonsil

62. The typical characteristic of diphtheric membrane is:

[Delhi 96]

- a. Loosely attached
- b. Pearly white in color
- c. Firmly attached and bleeds on remove
- d. Fast component occasionally

63. Orodonatal fistula is most common after extraction of:

[DNB 00]

- A. 2nd incisor
- B. 1st premolar
- C. 2nd premolar
- D. 1st molar

64. Submaxillary calculi can be visualized by X-ray in:

- a. 20% cases
- b. 50% cases
- c. 60% cases
- d. 80% cases
- e. 100% cases

65. Management of persistent cases of CSF rhinorrhea is:

[FMGE 2013]

- a. Head low position on bed
- b. Straining activities
- c. Endoscopic repair
- d. All of the above

66. The most common site of oral cancer among indian population is: [NEET Pattern]

- a. Tongue
- b. Floor of mouth
- c. Alveobuccal complex
- d. Lip

67. In Jarjaway fracture of nasal bone, the fracture line is:

[NEET Pattern]

- a. Oblique
- b. Comminuted
- c. Vertical
- d. Horizontal

68. Tripod fracture is seen in: [NEET Pattern]

- a. Mandible
- b. Maxilla
- c. nasal bone
- d. Zygoma

69. A patient present with enophthalmos after a trauma to face by blunt object. There is no fever and no extraocular muscle palsy. Diagnosis is: [NEET Pattern]

- a. Fracture maxilla
- b. Fracture zygoma
- c. Blow out fracture
- d. Fracture ethmoid

EXPLANATIONS AND REFERENCES

1. Ans. is b i.e. Sebaceous gland

Ref. Scott Brown's Otolaryngology 7th/ed vol 2 p 1824; Harrison 17th/ed p 128; Dhingra 5th/ed p 205, 6th/ed p 220; Turner 10th/ed p 233; Mohan Bansal p 379

Fordyce's Spot

- Yellowish lesions in buccal and labial mucosa.
- They are ectopic sebaceous glands with no erythematous halo.
- Seen in upto 80% of population.
- No clinical significance.

Also Remember:

- **Forchhiemer spots:** seen in rubella, infectious mono nucleosis and scarlet fever.
- **Rothe's spots:** Infective endocarditis
- **Rose spots:** Typhoid fever
- **Kopliks spot:** Measles (above the second molar).

2. Ans. is a, b and e i.e. Viral predisposition; Recurrent ulcer; and Steroids given as treatment

Ref. Dhingra 5th/ed p 230, 6th/ed p 218; Mohan Bansal p 381-2

Aphthous ulcers are recurrent and superficial ulcers, usually involving movable mucosa i.e. inner surfaces of lips, buccal mucosa, tongue, floor of mouth and soft palate, while sparing mucosa of the hard palate and gingivae.

Etiology

Is unknown is but due to may be:

- Nutritional deficiency of vit. B12, folic acid and iron.
- Viral infection
- Hormonal changes

Treatment

- Topical steroids and cauterization with 10% silver nitrate

Remember:

- Recurrence is common in ulcers.
- M/C cause of viral oral ulcer = Herpes simplex type I
- Painless oral ulcers are seen in—syphilis
- Bechet's syndrome is oral ulcers + genital ulcers + eye disease (iridocyclitis and retinal vasculitis) + vascular malformation.

3. Ans. is b i.e. Arises from submandibular gland

Ref. Dhingra 5th/ed p 237, 6th/ed p 224; Surgical Short Cases 3rd/ed p 45,46; Mohan Bansal p 403

4. Ans. is b i.e. It is a cystic swelling in the floor of mouth.

Ranula

- Thin walled bluish retention cyst.^o
- Seen in the floor of mouth on one side of the frenulum.^o
- It arises due to obstruction of duct of sublingual salivary gland.
- It is almost always unilateral.

Clinical Features

- Seen mostly in children and young adults.
- Only complain—swelling in the floor of mouth
- Cyst may rupture spontaneously but recurrence is common

O/E

Bluish in color - **Brilliantly translucent**^Q

Lymph nodes are not enlarged

Types**Simple:**

Situating in floor of mouth without any cervical prolongation.

Deep/plunging:

Ranula which extends to the neck through the muscles of mylohyoid.

Such prolongation appears in submandibular region.

Management

Surgical excision of ranula along with sublingual salivary gland is the ideal treatment.

NOTE

Cavernous ranula is a type of lymphangioma which invades the fascial planes of neck

- M/C D/D of ranula = sublingual dermoid^Q (opaque midline swelling)
- During excision of ranula = M/C nerve which can be damaged is lingual nerve.^Q

5a. Ans. is a, c i.e. Erythroplakia; and Leukoplakia**5b. Ans. is a, b, c, d i.e. Sideropenic dysphagia, Oral submucous fibrosis, Erythroplakia, Leukoplakia**

Ref. Devita 7th/ed p 982; Bailey and Love 25th/ed p 735

6. Ans. is b i.e. Submucous fibrosis**Lesions and conditions of the oral mucosa associated with an increased risk of malignancy.**

Premalignant conditions	Conditions increasing risk	Risk is doubtful
<ul style="list-style-type: none"> - Leukoplakia - Erythroplakia - Speckled erythroplakia - Chronic hyperplastic candidiasis 	<ul style="list-style-type: none"> - Oral submucosa fibrosis - Syphilitic glossitis - Sideropenic dysphagia (Paterson-Kelly syndrome) 	<ul style="list-style-type: none"> - Oral lichen planus - Discoid lupus erythematosus - Dyskeratosis congenita.

... Bailey and Love 25th/ed p 735

NOTE

- Friends in the table 46.2 given in Bailey and Love, Leukoplakia is not included in conditions associated with increased risk but in the description just given below it – leukoplakia is specially mentioned.
- Premalignant lesion is morphologically altered tissue where cancer is more likely to occur e.g. Leukoplakia whereas premalignant condition is a generalised state where there is significantly increased risk of cancer, e.g. syphilis, submucous fibrosis.

7. Ans. is a i.e. Leukoplakia

Ref. Devita 7th/ed p 982; Bailey and Love 25th/ed p 735; Mohan Bansal p 376-7

"Leukoplakia is the most common premalignant oral mucosal lesion." Mohan Bansal p 377*"The malignant potential of erythroplakia is 17 times higher than in leukoplakia."* Mohan Bansal p 376**Remember:**

- *Most common* premalignant condition for oral cancer : **Leukoplakia or speckled leukoplakia**
- Premalignant condition with highest risk for oral cancer : **Erythroplakia. (M/C Site = lower alveolar margin and floor of mouth)**
- Painless oral ulcers are seen in – syphilis
- Bechet's syndrome = oral ulcers + genital ulcers + eye disease (iritocyclitis and retinal vasculitis) + vascular malformation.

Important Points on Leukoplakia

- **Clinical white patch** that can't be characterized clinically or pathologically as any other disease is leukoplakia.
- Most common **site** is buccal mucosa and oral commissures.
- Tobacco smoking and chewing are main etiological factor.
- If patient stops smoking for 1 year, it will disappear in 60% of cases.
- Features suggestive **malignant change** in leukoplakia are induration, speckled or nodular appearance.
- Chances of malignant changes in leukoplakia increases with *increases in age of lesion and age of patient*.
- **All lesions** must be biopsied and sent for histology as it has 2–8% risk of malignancy.

Lesion	Treatment
<ul style="list-style-type: none"> Hyperkeratosis Dysplasia 	Follow-up at 4 monthly interval/chemopreventive drugs Surgical excision or CO ₂ laser excision

Remember:

Chemopreventive drugs used in oral malignancy:

- Vit. A, E, C
- Betacarotene
- Isoniazid
- Celecoxib

8. Ans. is c i.e. Alveobuccal complex

Ref. ASI 1st/ed p 348; Oncology and Surgery Journal 2004 p 161

Frequency of various cancer of oral cavity in India are :

- Buccal mucosa 38%
- Anterior tongue 16%
- Lower alveolus 15%

So, most common site of oral cancer among Indian population is buccal mucosa or in this question alveobuccal complex (due to their predilection for pan chewing where tobacco is kept in lower gingivobuccal sulcus).

Remember:

- Most common site of oral cancer in world: Tongue
- Most common histological variety of oral cancer: Squamous cell carcinoma
- M/C histological variety of lip carcinoma – squamous cell carcinoma
- Oral malignancy with best prognosis = lip cancer
- M/C site for Ca lip = lower lip
- Oral malignancy with worst prognosis = floor of mouth.

9. Ans. is b i.e. Lateral border

Ref. Dhingra 5th/ed p 240, 6th/ed p 227; Scott Brown 7th/ed vol 2 p 2552; Mohan Bansal p 407

"Most common site of carcinoma tongue is middle of lateral border or the ventral aspect of the tongue followed by tip and dorsum."

Dhingra 6th/ed, p 227

Cancer	Most common site
• Lip	Vermillion of lower lip
• Tongue	Lateral border
• Cheek	Angle of mouth
• Nasopharyngeal carcinoma	Fossa of rosenmuller
• Larynx	Glottis

10. Ans. is c i.e. N2

Ref. Schwartz 9th/ed p 491; Devita Oncology 7th/ed p 665, 672, 689; Dhingra 5th/ed p 241, 6th/ed p 228; Mohan Bansal p 406

Classification of stage of tumor of oral cavity based on size of lymph node.

≤ 3cms	between 3 cm and 6 cm	> 6 cm
Stage N1	Stage N2	Stage N3

In the given question : Size of lymph node is 4 cm so it belong to stage N2

For detailed classification : See text given in the beginning.

Remember: For all head and neck cancers except the nasopharynx, the 'N' classification system is uniform.

11. Ans. is a i.e. Laser ablation

Ref. Schwartz 8th/ed p 519; 9th/ed p 492; Current Otolaryngology 3rd/ed p 382

"The carbon dioxide laser may be used for excision of early tongue cancers (T1) or for ablation of premalignant lesion."

Patient in the question has tumor of 1.5 x 1 cm. So, comes under T1.

Remember:

- Treatment of choice for **small (T1–T2)** tongue cancer is wide local excision transorally. (Transoral partial glossectomy)
- For **small T1–T2** lesions radiotherapy is not used now.—Cummings Otolaryngology 4th/ed p 1597
- T3 and T4 Stage tumors treated by transmandibular or transcervical total glossectomy.
- Tongue base tumors are treated by chemoradiation (S/B 7th/ed vol 2 p 2554)

12. Ans. is d i.e. Radical neck dissection

Ref. Bailey and Love 25th/ed p 716; Mohan Bansal p 408

Management of Neck Nodes in Oropharyngeal Cancers

If the nodes are clinically negative (i.e. there is occult metastasis)

- Generally tongue cancers and to a lesser extent floor of mouth cancers give rise to occult metastases
- It is always good to actively treat cervical lymph nodes in even absence of obvious disease.

Management

In Ca tongue with no nodes

Extended supraomohyoid neck dissection (i.e. removal of LN levels I, II, III and IV) in continuity with primary tumor

If lymph nodes are involved—options are:

- Selective supraomohyoid neck dissection (for stage N1)
- Radical neck dissection (for all other stages)

Now in the question, the size and number of nodes involved is not given but it is given that 'lymph nodes in the lower neck' are involved. So the option supraomohyoid dissection is ruled out (as it is done in case of either occult metastasis or single ipsilateral node < 3 cm) and the obvious answer is radical neck dissection.

In Ca of floor of mouth and mandibular alveolar with no nodes

Supra omohyoid neck dissection

(i.e. removal of LN levels I, II and III in continuity with primary tumor)

13. Ans. is b i.e. Submandibular

- M/C lymph node involved in any oral malignancy is Submandibular LN
- Maximum LN metastases is seen in cancer tongue followed by floor of mouth.
- Lymphatic metastasis is least in lip cancer followed by hard palate.

Ref. Dhingra 5th/ed p 240, 6th/ed p 227

14. Ans. is a i.e. Regional lymph node

Ref. Devita 7th/ed p 682; Schwartz 9th/ed p 494

Tumors of Buccal Mucosa

"Tumors in this area have a propensity to spread locally and to metastasize to regional lymphatics" —Schwartz 9th/ed pp 494, 495

15. Ans. is c i.e. Radiotherapy and maxillectomy

Ref. Scott Brown's 7th/ed vol 2 p. 2427

- For squamous cell carcinoma, a combination of radiotherapy and surgery gives better results than either alone. Radiotherapy can be given before or after surgery.
- For adenocarcinoma or melanoma of maxilla radiotherapy is ineffective so only surgery is done.

16. Ans. is c i.e. Verrucous carcinoma

Ref. Scott Brown 7th/ed vol 2 p 2561; Diagnostic Histopathology of Tumors by Fletcher 2nd/ed Vol I, pp 211, 212

Although M/C variety of buccal cancer is squamous cell cancer, Verrucous carcinoma is a variety of well-differentiated squamous cell carcinoma which is locally aggressive involving the bone but lymph node metastasis is uncommon. Histologically, these tumors show marked hyperkeratosis and acanthosis with dysplasia limited to deeper layers. Repeated biopsies report it as squamous papilloma.

"Histologically verrucous carcinoma are characterized by marked acanthosis, hyperkeratosis often with broad bullous process showing central columns of keratin. There is no cytological evidence of malignancy."

17. Ans. is c i.e. Segmental mandibulectomy

Ref. Cummings Otolaryngology 4th/ed p 1608; Oncology and Surgery 2004 p 169

- Surgery is the treatment of choice in mandible cancers.
- Radiotherapy is contraindicated as it can lead to osteoradionecrosis of mandible.
- Mandible is managed surgically by marginal or segmental resection.
- Marginal (rim) resection keeps the outer/lower rim (1 cm thick mandible intact to maintain cosmesis.)
- It is indicated when there is involvement of periosteum only or with minimal alveolar/cortical involvement.
- Segmental resection removes a full segment of mandible creating a defect which necessitates reconstruction.

Indications

- When there is gross involvement of cancellous bone
- (Even minimal involvement only in an edentulous mandible.)^o
- Involvement of inferior alveolar canal (earlier hemimandibulectomy was being done)
- In previously irradiated mandible (where marginal resection may lead to a pathological fracture of the weakened bone)

18. Ans. is a i.e. Radiotherapy

Ref. Read below

Explanation

The most appropriate answer here is Radiotherapy. The treatment of choice here is segmental mandibulectomy. From the discussion above on management of mandible in oral malignancy, it is evident that marginal mandibulectomy has little role in surgical

management of an edentulous mandible, but radiotherapy is absolutely contraindicated because it can trigger osteoradionecrosis here. Hence, it should be selected as the most appropriate answer here.

19. Ans. is a i.e. Carcinoma Lip

Ref. Cummings otolaryngology 4th/ed p 1594, 1602; Mohan Bansal p 406

Oral malignancy with best prognosis is carcinoma lips.

5-Year Survival Rates in cancer lip –

Site	Lip	Tongue	Palate	Cheek
Stage I and II	90%	75%	80%	65–75%
Stage III and IV	50%	40%	40%	50% (Stage III); 30% (Stage IV)

As is clear from above text for some stage carcinoma lip has highest 5-year survival rate or has the best prognosis.

CARCINOMA LIPS

- M/C site for Ca lips = vermilion of lower lip
- Lower lip cancer has a better prognosis than upper lip carcinoma as lower lip metastases to submental and submandibular nodes while upper lip in addition also involves preaural and parotid lymph nodes.
- M/C histological type of lip cancer (both upper lip and lower lip) is squamous cell cancer.
- Basal cell carcinoma is more common in upper lip.
- M/C etiologic factor – solar radiation
- Treatment of choice of Ca lips is = surgery
- Oral cancer with worst prognosis is floor of mouth carcinoma.

20. Ans. is b, c, d and e i.e. Systemic metastasis uncommon; Responds to radiotherapy; Surgery is treatment of choice; and Syphilis and dental irradiation predisposes

Ref. Dhingra 5th/ed p 238, 6th/ed p 226; Bailey and Love 25th/ed p 740

- **Most common site of oral cavity carcinoma in world** is tongue; **In India** it is buccal mucosa. (so option a is incorrect)
- **Tumors of oral cavity are radiosensitive but because of its serious complications (Xerostomia; Mandibular necrosis) it is not indicated as primary treatment. Surgery is the treatment of choice in tumors of oral cavity.** (So option c and d both are correct)
- As discussed in the preceding text – etiological factors for oral cancers are:
6S viz :
 - Smoking
 - Spirit
 - Sharp jagged tooth
 - Sepsis
 - Syndrome of Plummer-vinson
 - Syphilitic glossitis (option e is correct)
- Thus option i.e. is syphilis and dental irradiation predispose is correct.
- M/c method of spread of oral cancers is by local invasion and lymphatic spread.
- Systemic metastasis is rare (i.e. option b is correct)

21. Ans. is a i.e. Upper cervical LN

Ref. Dhingra 5th/ed p 239, 6th/ed p 227

- As discussed earlier M/C lymph node involved in any oral malignancy is submandibular LN. In carcinoma of lips also – submental and submandibular nodes are involved first. At later stages, deep cervical group of LN's may get involved.
- Submental and submandibular are included in upper cervical LN or level 1 lymph nodes

22. Ans. is d i.e. Submandibular

Ref. Bailey and Love 25th/ed p 755; Current Otolaryngology 2nd/ed p 299; CSDT 13th/ed pp 239–240; Mohan Bansal p 393

Stone formation is most common in submaxillary (submandibular) gland (80–90% cases) followed by parotid gland (10–20%). It can occur at any age with a predilection for men.

- **Predisposing factors for stone formation** are systemic disease (Hyperparathyroidism, hypercalcemia, gout, diabetes and hypertension) therefore submandibular calculi contain primarily calcium phosphate and hydroxyapatite and are radiopaque and visualized on X-ray
- Parotid gland calculi are less radiopaque
- M/C presentation – Recurrent swelling and pain in the submandibular gland exacerbated with eating.
- **IOC** to detect stones – CT scan (CSDT/13th/ed p 240)
- Sialography is not done routinely and is contraindicated in a patient of sialadenitis.⁹

Management

Depending on the size of stone and the site at which it is located, it can be removed by:

- Intraoral extraction
- Surgical excision
- Endoscopic removal

23. Ans. is d i.e. Pleomorphic adenoma

Ref. Devita 7th/ed p 725; Bailey and Love 24th/ed p 730; Scott's Brown 7th/ed vol 2 p 2476; Mohan Bansal p 395

"Pleomorphic adenoma is the commonest tumor found at any site and outnumbers all other tumors in major glands."

—Scott's Brown 7th/ed Vol 3rd/ed p 2476

"Pleomorphic adenomas or benign mixed tumors are the M/C neoplasms of salivary gland"

—Current Otolaryngology 3rd/ed p 329

- | | |
|--|--|
| • Most common tumor of salivary gland | : Pleomorphic adenoma |
| • Most common benign tumor of salivary gland | : Pleomorphic adenoma |
| • Most common malignant tumor of major salivary gland | : Mucoepidermoid carcinoma |
| • Most common malignant tumor of minor salivary gland | : Adenoid cystic carcinoma |
| • Most common benign and overall tumor of parotid in children (specially < 1 yr) | : Hemangioma (Current Otolaryngology 3rd/ed p 332; Maqbool 12th/ed p 209) |
| • Most common malignant tumor in children | : Mucoepidermoid (Maqbool 12th/ed p 209) |
| • Most common radiation induced neoplasm of salivary gland | : Mucoepidermoid carcinoma. |

24. Ans. is c i.e. Pleomorphic adenoma

Ref. Scott Brown 7th/ed Vol 1 p 1248

"The commonest benign tumor encountered is pleomorphic salivary adenoma accounting for approximately 30% of all pediatric salivary neoplasms. The majority occur within the parotid gland."

Most common malignant tumor of salivary gland in childhood: **Mucoepidermoid carcinoma**, approximately 50% followed by acinic cell carcinoma (20%)—Scott Brown 7th/ed Vol 1 p 1248, Current otolaryngology 3rd/ed, p 341

25. Ans. is d i.e. None

Ref. Current Otolaryngology 2nd/ed pp 307-308; 3rd/ed p 329,330; Dhingra 5th/ed p 247

Pleomorphic Adenoma

- It is the M/C benign tumor of salivary glands^o
- It can arise from the parotid^o, submandibular^o or other minor salivary glands of palate and pharynx^o
—Dhingra 5th/ed p 247; Scotts Brown 7th/ed Vol 2 p 2475
- They represent ~ 60–70% of all parotid tumors and 90% of submandibular benign tumors
- M/C age group affected is fourth decade
- M/C gland involved – parotid gland
- M/C site affected in parotid gland is – tail of parotid gland
- They are slow growing painless tumors
- Histologically, they contain both epithelial and mesenchymal elements and are therefore called as mixed tumors.
- It can rarely undergo malignant transformation (current otolaryngology 2nd/ed p 308, 3rd/ed p 330)

TOC – Surgery – Complete surgical excision of the tumor with uninvolved margins is the recommended treatment, for example, if the tumor is in superficial lobe – superficial parotidectomy is the surgery of choice.

Prognosis is excellent with a 95% non-recurrence rate.

26. Ans. is a i.e. Superficial parotidectomy

Ref. Dhingra 5th/ed p 247, 6th/ed p 234; Current otolaryngology 2nd/ed p 308, 3rd/ed, p 330 and; Short Cases of Surgery 3rd/ed p 77

Treatment of choice for pleomorphic adenoma is superficial parotidectomy but, if the deep lobe of parotid is involved, total parotidectomy is done.

27. Ans. is c i.e. Conservative total parotidectomy

Ref. Schwartz 8th/ed p 540

"For parotid tumors that arise in lateral lobe superficial parotidectomy with preservation of CN VII is indicated. If the tumor extends in to deep lobe of parotid, a total parotidectomy with nerve preservation is performed."

In this question tonsil is pushed medially i.e. deep lobe of parotid is also involved, so conservative total parotidectomy will be done.

28. Ans. is b i.e. 2nd histologically benign recurrence

Ref. Devita 7th/ed p 725

Radiotherapy is indicated for malignant recurrence not for benign recurrence.

Indications of Radiotherapy in Salivary Gland Tumor

- Low-grade neoplasm with close or positive margin
- Facial nerve involvement
- Multiple regional node metastasis
- High-grade histology
- Deep lobe involvement

- Perineural invasion
- Recurrence of malignant tumors.

29. Ans. is c i.e. Most common in parotid gland

Ref. Bailey and Love 24th/ed p 731; Robbins 7th/ed pp 791,792; Dhingra 5th/ed p 247, 6th/ed p 234; Mohan Bansal p 395

Mixed tumors of salivary glands are pleomorphic adenomas (as they have both epithelial and mesenchymal elements)

"80% of salivary gland tumor occur in parotid. Of these tumors approximately 75–80% are pleomorphic adenoma (mixed tumor)."

NOTE

M/C site for all salivary gland tumors is parotid gland except for:

- Adenoid cystic carcinoma = M/C site is minor salivary gland.
- Squamous cell carcinoma = M/C site is submandibular gland.

30. Ans. is b i.e. Adenoid cystic carcinoma

Ref. Schwartz 8th/ed p 539; Bailey 24th/ed p 685; Dhingra 5th/ed p 248, 6th/ed p 235; Current Otolaryngology 2nd/ed p 315, 3rd/ed p 338

Perineural invasion is the most constant microscopic finding in adenoid cystic carcinoma.

Adenoid Cystic Carcinoma (Cylindroma)

- Most common malignant tumor of submandibular glands.
- Most common minor salivary glands tumour.
- Most common site minor salivary gland.
- **Characterized** by its tendency to invade perineural space and lymphatics and thus causes **pain** (which may be a prominent and early symptom) and **VII nerve paralysis**.
- **Skip lesions** along nerves are common.
- It is a **treacherous tumor** as it appears benign even when it is malignant.
- It can metastasize to lymph nodes
- They are highly recurrent.
- Local recurrence after surgical excision are common and can occur as late as 20 years after surgery. Distant metastases go to lung, brain and bone.
- Treatment of choice is **radical parotidectomy** irrespective of its benign appearance under the microscopy.
- Radical neck dissection is not done unless nodal metastases are present
- Postoperative radiation is given if margins of resected specimen are not free of tumor

EXTRA EDGE

- The most common histologic subtype (44%) is the **cribriform type**, characterized by a "**Swiss - Cheese**" pattern of vacuolated area. It has intermediate prognosis
- The **tubular subtype** has the best prognosis while **solid subtype** has the worst prognosis

31. Ans. is a i.e. Parotid salivary gland

Ref. Schwartz 8th/ed p 539; Robbins 7th/ed p 794; Current Otolaryngology 2nd/ed p 315

"80–90% occur in the parotid gland and most of the remaining occur in submandibular gland" –Current Otolaryngology 2nd/ed p 316.

Remember: All salivary gland tumor are most common in parotid gland except **adenoid cystic carcinoma** (most common in minor salivary gland) and **quamous cell carcinoma** (most common is submandibular gland).

Important Points about Acinic Cell Carcinoma

- Affect exclusively **parotid gland**
- Low-grade malignancy
- Hypercellular tumor with **relative absence of stroma**. It is enclosed in a fibrous capsule
- Treatment is **radical excision**.

32. Ans. is a i.e. An adenolymphoma of parotid gland

33. Ans. is a i.e. More common in females

34. Ans. is a i.e. Superficial parotidectomy

Ref. CSDT 13th/ed p 257; Current Otolaryngology 2nd/ed p 308; 3rd/ed, 330; Dhingra 5th/ed p 248, 6th/ed p 234; Mohan Bansal p 396

- Warthin's tumor or **papillary cystadenoma lymphomatosum** or **adenolymphoma** is 2nd most common benign tumor accounting for 5% of parotid gland tumors.
- It arises **exclusively** from parotid gland.
- It almost always occur in **older males**. (in 5th to 7th decade)
- There is increased risk in smokers

- Most common **site is tail of parotid**
- It is **bilateral in 10%** cases.
- It consists of papillary cystic pattern lined with cuboidal and columnar cells with core of lymphoid tissue.
- Treatment of choice is superficial parotidectomy but because of its benign nature and since it can be easily diagnosed cytologically, **surgical removal is not always necessary especially in older or unhealthy persons.**

Remember:

- It is only salivary gland tumor that produces **hot spot in 99Tcm** scan so its **preoperative diagnosis is made without biopsy.**
- **It never involves facial nerve** i.e. it never becomes malignant.
- It is the only salivary gland tumor which is more common in males

35. Ans. is a i.e. Mucus secreting and epidermal cells

Ref. Robbin's 7th/ed p 793; Dhingra 5th/ed p 248, 6th/ed p 235; Current Otolaryngology 3rd/ed p 337

Muco epidermoid carcinoma is the M/C type of malignant salivary gland tumor.

Mucoepidermoid tumor consists of following cells:

- Squamous cells
- Intermediate hybrid cells (progenitor of other cells)
- **No myoepithelial cells are seen**
- Mucus secreting cells
- Clear or hydropic cells.

ALSO KNOW

- Mucoepidermoid tumors similar to other tumors is more common in parotid and has a female predominance.
- They are malignant tumors which are slow growing and can invade facial nerve
- Histologically, the greater is the ratio of epidermoid element, the more malignant is the behavior of the tumor
- They are more aggressive in minor salivary glands as compared to major salivary glands.
- Low-grade tumors are more common in children

Management**Low-grade Tumors**

Total parotidectomy with preservation of facial nerve

High-grade tumor

- Total parotidectomy
- Facial nerve may be sacrificed if it is invaded by tumor
- Radical neck dissection may be done.

36. Ans. is a, c and e i.e. Pleomorphic adenoma can arise in submandibular gland; Pleomorphic adenoma is the most common tumour of submandibular gland; and Frey's syndrome can occur after parotid surgery Ref. Scott Brown 7th/ed Vol 1 p 1248, MB p 395-396

Lets Analyse Each Option Separately

- **Option a** – Pleomorphic adenoma can arise in submandibular gland.
This is correct as "Pleomorphic adenoma – It can arise from the parotid, submandibular or other minor salivary glands"
–Dhingra 5th/ed p247, 6th/ed p 234
- **Option b** – Warthin's tumor arises from submandibular gland.
This is absolutely incorrect as "Warthin's tumor is found almost exclusively in the parotid gland."
–Current Otolaryngology 2nd/ed p308, 3rd/ed p 338
- **Option c** – Pleomorphic adenoma is the M/C tumor of submandibular gland
This is correct as – "Pleomorphic adenoma – represent approximated 60–70% of all parotid tumors and 90% of submandibular benign tumors."
–Current Otolaryngology 3rd/ed p 329
- **Option d** – Acinic cell Ca is most malignant
This is wrong because – "Acinic cells carcinomas are low-grade malignancies."
– Current otolaryngology 2nd/ed p 316, 3rd/ed p 338
- **Option e** – Frey's syndrome (gustatory sweating) is a universal sequelae following parotid surgery. – Bailey and Love 25th/ed p 763

Frey's Syndrome (Gustatory sweating)

- Usually manifests several months after parotid operation.
- Characterized by sweating and flushing of the preauricular skin during mastication.
- Occurs due to aberrant innervation of sweat glands by parasympathetic secretomotor fibers of parotid gland, so instead of causing salivary secretions from parotid, they cause secretions from sweat glands.

Treatment

- Mostly reassurance.
- In some cases tympanic neurectomy is done which intercepts these parasympathetic fibers at the level of middle ear.

37. Ans. is a, c and d i.e. hypoglossal, facial and lingual nerve.

Ref. Bailey and Love 25th/ed p757; Scott Brown 7th/ed Vol 2 pp 2487,88

Sub Mandibular Gland Surgery

- Unlike the parotid gland where only a part of the gland is removed, total resection of the submandibular gland is always indicated for tumors of submandibular gland.
- Before performing the surgery, the patient should be warned about the following serious or frequent complications
 - **Damage to marginal branch of facial nerve:**
 - This may result in temporary or permanent weakness of the angle of mouth.
 - **Lingual and hypoglossal nerve damage:**
 - This results more frequently, if gland is being removed for chronic sialadenitis rather than tumor
 - It leads to motor dysfunction of tongue which impairs articulation and mastication
 - **Cosmetic defects**

38. Ans. is d i.e. Acute sialadenitis

Ref. Sutton 7th/ed p 535; Diseases of Salivary Gland by Rankow and Prolayes, p 55; Current surgical diagnosis and treatment 3rd/ed p 240

Sialography:

"Use of sialography during period of an acute inflammation of salivary system is contraindicated."

—Sutton 7th/ed p 535

"Sialography is no longer routinely used and is contraindicated in patients with acute sialadenitis."

—CSDT 13th/ed p 240

ALSO KNOW – Sialography**Main Indications of Sialography**

- Salivary duct stones
- Stricture
- Fistula, penetrating injury
- Intraglandular and sometimes extra glandular mass lesions.

Contraindications

- Iodine allergy
- Acute sialadenitis

Contrast

- Water soluble media (Meglumine diatrizoate)

ALSO KNOW

- M/c organism leading to bacterial sialadenitis – *Staphylococcus*
- M/c site of sialadenitis – Parotid Gland
- M/c site of sialolithiasis – Submandibular Gland

39. Ans. is b i.e. Pleomorphic adenoma

Ref. CSDT 13th/ed p 257; Dhingra 5th/ed p 247

- Pleomorphic adenoma or benign mixed tumor accounts for 80% of parotid tumors and 60% of all salivary gland tumors.
- Most common site is parotid gland though it can arise from submandibular gland, salivary gland of palate upper lip and buccal mucosa.

Remember: Though Warthin's tumor occurs most common in males, but most common tumor in males still is pleomorphic adenoma.

40. Ans. is a and b i.e. Involves both submandibular and sublingual spaces; and most common cause is dental infection

41. Ans. is c i.e. Aphthous ulcer in pharynx.

Ref. Dhingra 5th/ed pp 277, 278, 6th/ed p 263, 264; Logan Turner 10th/ed pp 107, 108

- Ludwig's Angina is a rapidly spreading cellulitis of the floor of the mouth which involves submandibular space secondary to dental infection.
- Submandibular space is divided into sublingual space (above the mylohyoid) and submaxillary space (below the mylohyoid muscle) (Fig. 7.3).
- **Bacteriology:** Mixed infections involving both aerobes and anaerobes are common like, alpha haemolytic streptococci, staphylococci bacteriodes and *E. coli*. *H. influenzae* is a rare cause.^Q

- **Clinical features:** In Ludwig's angina, there is usually cellulitis of the tissue rather than frank abscess.
- Marked difficulty in swallowing (odynophagia).
- Varying degrees of trismus.
- On involvement of sublingual space, floor of the mouth is swollen, edematous and tongue seems to be pushed up and back.
- On involvement of the submaxillary space, the submental and submandibular regions become swollen and tender and impart woody-hard feel. Tongue is progressively pushed upward and backward threatening the airway.
- Laryngeal edema may appear, if it spreads to parapharyngeal or retropharyngeal space.

Treatment

- Systemic antibiotics
- I and D should be postponed as long as possible because pus is seldom found.
- Tracheostomy is required if airway is endangered.

NOTE

If incision and drainage for Ludwig's angina is done ↓ GA—there are increased chances of aspiration and shock as tongue is pushed up and back in Ludwig angina.

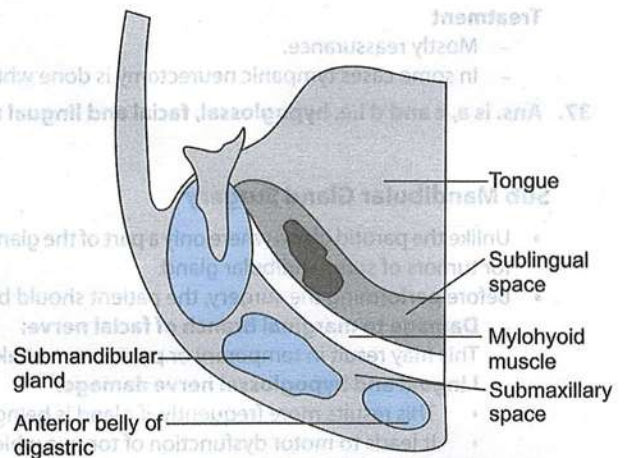


Fig. 7.3: Anatomy of submandibular space

42. Ans is d i.e. Edema of uvula

Ref. Scott Browns 6th/ed pp 4,5,10

Quincke Disease

- Acute edema of the uvula is called as **Quincke's disease**.
- Etiology is unknown; but it is related to
 - (a) Allergy
 - Other causes include
 - (b) Trauma (foreign body, iatrogenic)
 - (c) Infection
 - Viral pharyngitis
 - Syphilis
 - (d) Tumors = Squamous cell carcinoma
- Candidiasis
- TB
- **Clinical features:** Trickling or irritating sensation in the throat together with sensation of gagging.
- **Treatment:** Edema usually settles down spontaneously. IV hydrocortisone may help.
 - Collection of pus in the peritonsillar space is known as **Quinsy and not Quincke**.
 - Recurrent edema of uvula with occasional laryngeal edema is seen in hereditary angio neurotic edema (HANE).

43. Ans is d i.e. Mandible

Ref. Dhingra 5th/ed pp 198,199, 6th/ed p 185; Mohan Bansal p 346

Le Fort's Fractures Involve

- Nasal septum
- Pterygoid plates
- Superior orbital fissure
- Zygomatic processes (frontozygomatic and temporozygomatic)
- Maxilla
- Floor of orbit
- Lacrimal bone

44. Ans. is c i.e. Le Fort 3 fracture

Ref. Dhingra; 5th/ed p 199, 6th/ed p 185; Scott's Brown 7th/ed Vol 2 Chapter 128, p 1623

In Le Fort 3 fracture, there is complete separation of facial bones from the cranial bones i.e. craniofacial dissociation/dysjunction occurs.

45. Ans. is a i.e. Fracture of floor of orbit

Ref. Dhingra 5th/ed p 198, 6th/ed p 184

As discussed in theory section—"Tear Drop" sign is a radiological sign seen in blow out fracture of orbit. It signifies entrapment and herniation of orbital content through a defect in floor of orbit into maxillary antrum.

46. Ans. is a, b, c, d and e i.e. Check swelling; trismus; nose bleeding; Infraorbital numbness and diplopia.

47. Ans. is b i.e. CSF rhinorrhea

48. Ans is d i.e. Zygoma

Ref. Dhingra 5th/ed p 197, 6th/ed p 183; Mohan Bansal p 344

Clinical Features of Zygoma Fracture: (also k/a Tripod Fracture)

- Flattening of malar prominence
- Swelling of cheeks
- Ecchymosis of lower eyelids
- **Unilateral epistaxis**
- Numbness over infraorbital part of face
- **Diplopia and restricted ocular movements**
- **Trismus due to depression of zygoma on underlying coronoid process**
- Periorbital emphysema due to escape of air from the maxillary sinus on nose blowing
- Step deformity of infraorbital margin.

—Dhingra, 6th/ed p 183

—Dhingra, 6th/ed p 183

NOTE

- After nasal bones, zygoma is the second most frequently fractured bone
- The fracture and displacement can best be viewed by water's view
- T/t – only displaced fractures require open reduction and intral wire fixation.

49. Ans. is d i.e. Surgical emphysema

Ref. Dhingra 5th/ed p 199, 6th/ed p 185; Tuli 1st/ed p 201; Mohan Bansal p 344

Fracture of maxilla as we have already discussed is classified as Le Fort I/Le Fort II/Le Fort III.

Clinical Features of Maxilla—Common to All Types

- Malocclusion of teeth
- Undue mobility of maxilla
- Elongation of mid face

Specific Clinical Features

- CSF rhinorrhea is seen in Le Fort II and Le Fort III fracture as cribriform plate is injured.
- Injury to infraorbital nerve is seen in Le Fort II fracture.
- So anesthesia will be seen in area of supply of infraorbital nerve injury viz. cheek and upper lip (area of supply of infraorbital nerve).

—Tuli 1st/ed p 201

—BDC 4th/ed p 118

50. Ans. is b i.e. Cribriform plate of ethmoid bone

Ref. Logan and Turner 10th/ed p 28;

51. Ans. is a i.e. Ethmoid sinus

Scott Brown 7th/ed Vol 2 pp 1636-1639

Historically, most common cause of CSF rhinorrhea was head injury with involvement of cribriform plate of ethmoid bone however
Now most common cause of CSF rhinorrhea is iatrogenic trauma/surgery

NOTE

According to Logan and Turner 10th/ed p 28

- Most common area of fracture of CSF rhinorrhea is the cribriform plate of the ethmoid bone as it is extremely thin
- Other possible areas are –
- Posterior wall of the frontal sinus
- Floor of anterior cranial fossa
 - In the previous edition of Scott Brown – it was given most common site of leak in CSF rhinorrhea is – **roof of ethmoid sinus**
 - > **cribriform plate** > **sphenoid sinus**
 - But now in latest edition it is not given.

52. Ans. is c and d i.e. Nasoethmoid fracture; and Frontozygomatic fracture

Ref. Logan and Turner 10th/ed p 28; Dhingra 5th/ed p 199, 6th/ed p 182; Mohan Bansal p 348

CSF Rhinorrhea Occurs in

Fracture of maxilla in Le Fort type II and type III. (as cribriform plate is injured here) and also in nasal fracture class III

53. Ans. is a, b and d i.e. Occurs due to break in cribriform plate; Contains glucose and; Contains less protein

Ref. Turner 10th/ed p 28; Dhingra 5th/ed p 178, 6th/ed p 163–165

Let us see each option Separately

- **Option a** – Occurs due to break in cribriform plate. **This is correct**
- **Option b** – CSF contains glucose and **option d** It has less proteins
- In comparison to nasal secretions – CSF contains more of glucose and less of proteins (Turner 10th/ed p 28) hence both options b and d are correct

- **Option c** – Requires immediate surgery
- This is not absolutely correct as:
 - Early cases of post traumatic CSF rhinorrhea are managed conservatively. Only those cases where CSF rhinorrhea occurs persistently
 - Surgical management should be done

54. Ans. is a i.e. Antibiotics and Observation

Ref. Dhingra 5th/ed p 179, 6th/ed p 164

- **Early cases** of post traumatic CSF rhinorrhea are managed conservatively (by placing the patient in propped up position, avoiding blowing of nose, sneezing and straining) and
 - Prophylactic antibiotics (to prevent meningitis).
 - **Persistent cases** are treated surgically by nasal endoscopy or by intracranial route.
- According to Scott-Brown's 7th/ed Vol 2 p 1641 –
Endoscopic closure of CSF leak is now the treatment of choice in majority of patients but it should not be done immediately, first patient should be subjected to diagnostic evaluation and after site of leakage is confirmed, it should be closed endoscopically.

55. Ans. is b i.e. Beta-2 transferrin

56. Ans. is d i.e. Beta-2 transferrin

Ref. Scott-Brown's Otolaryngology 7th/ed Vol 2, Chapter 129 p 1638; Mohan Bansal p 348; Dhingra, 6th/ed, p 164 Table 29.1

- The only test that should be used to determine if a sample is CSF or not, is **immunofixation of beta-2 transferrin**.
- Beta-2 transferrin is a protein involved in ferrous ion transport and is found in CSF, perilymph and aqueous humor
- The sensitivity of the test is 100% and specificity 95%
- There are certain conditions which can cause abnormal transferrin metabolism and thus β_2 formation in blood which could potentially lead to false-positive result:

These conditions are:

- (a) Chronic liver disease
- (b) Inborn errors of glycogen metabolism
- (c) Genetic variant form of transferrin
- (d) Neuropsychiatric disease
- (e) Rectal carcinoma

For this reason, some authors recommend taking a simultaneous blood sample to exclude this possible source of error.

ALSO KNOW

- Imaging modality of choice to detect the site of leak in CSF rhinorrhea is **T2 weighted MRI**
- High resolution CT can detect CSF rhinorrhea in up to 84% cases but its result should be interpreted with caution, as if there is/ has been a previous skull base surgery it will almost inevitably show a large defect in absence of a true leak.
- Historically, many dyes (methylene blue, indigocarmine) were used for diagnosis of CSF rhinorrhea but in recent time only fluorescein is being used. It is used in cases where site of leak is uncertain or there is the possibility of more than one defect.

57. Ans. is c i.e. Surgical drainage

Ref. Tuli 1st/ed p 148; Current Otolaryngology 2nd/ed pp 252,253

- The patient in the question had fall from bed following which there is a swelling in nose and slight difficulty in breathing.
- This patient has probably had septal haematoma which should be drained immediately under LA.
- For details of septal hematoma–Ref. to the Chapter-Diseases of Nasal Septum.

58. Ans. is b i.e. after few days

Ref. Scott's Brown 7th/ed chapter 127 Vol 2 p 1612; Dhingra 6th/ed p 182; Tuli 2nd/ed p 208

Management Protocol for Nasal Fractures/Injuries

- Most of the patients (~70–80%) do not require any active treatment, as many do not have a nasal fracture and those that do, the fracture is not displaced.
 - Soft tissue swelling can produce the misleading appearance of a deformity which disappears as the swelling subsides. Such patients require only reassurance and topical vasoconstrictors to alleviate congestion and obstructive symptoms. A re-examination should be carried out after 5 days, if there is uncertainty about the need for reduction.
- Immediate surgical intervention in acute phase is required in case of cosmetic deformity and nasal obstruction caused by septal hematoma
- For rest of the cases the optimal time for clinical assessment is around 5 days, by which time the edema will have subsided and any underlying deformity apparent. Review at 5 days allows sensible planning for reduction of the fracture on an elective operating list within the next 2–3 days.
 - By 7 days the bony deformity will be easily palpable and still movable. Further delay makes effective reduction less likely and sometimes impossible without making osteotomies. Thus best time to reduce fracture of nasal bone is between 5 and 7 days. In children, healing can take place even more quickly and earlier intervention is indicated.

59. Ans. is d i.e. Ludwig's angina

Ref. Dhingra 5th/ed p 274; Harrison 17th/ed p 210; Mohan Bansal p 544

Membrane in Throat is Caused by

- Pyogenic organisms viz. *Streptococci*, *Staphylococci* causing membranous tonsillitis
- Diphtheria
- Vincent's angina (Caused by fusiform bacilli and spirochetes: *Borrelia vincentii*)
- Candidiasis/moniliasis/oral thrush
- Infectious mononucleosis
- Agranulocytosis
- Leukemia
- Aphthous ulcers
- Traumatic ulcers

—Maqbool 11th/ed p 280

From the above list it is clear that streptococcus (option 'a') and diphtheria (Option 'b') causes membrane over throat.

This leaves us with 2 options—Adenovirus and Ludwig's angina

Harrison 17th/ed, p 210 says about Adenovirus pharyngitis:

"Since pharyngeal exudate may be present on examination, this condition is difficult to differentiate from streptococcal pharyngitis."

So adenovirus may also be associated with membrane in throat but Ludwig's angina is infection of the submandibular space and never presents with membrane over the tonsil/throat.

So amongst the given options—**Ludwig's angina is the best option.**

60. Ans. is c i.e. Vincent's angina

Ref. Logan Turner 10th/ed pp 87, 88

Vincent's Angina: (Ulcerative Gingivitis/Trench mouth)

- Was common during first world war (due to lack of oral hygiene) and is less common now.
- Caused by fusiform bacillus and spirochetes: *Borrelia vincentii*.
- It manifests as necrotizing gingivostomatitis with oropharyngeal ulcerations and dark gray membrane.

O/E

- Membrane generally present on one tonsil but may involve the gum soft, and hard palate.
- It appears as grayish black slough which bleeds when it is removed.
- Ulcers are visible on tonsil after removal of membrane.
- Membrane reforms after removal.
- Characteristic smell in breath (halitosis), so also called as Trench mouth.

Treatment

- Systemic antibiotics: *Penicillin*, *Erythromycin*, *Metronidazole*.
- Warm sodium bicarbonate gargles.
- Barrier nursing of the patient as disease is infectious.

61. Ans. is c i.e. Ulcerative lesions of tonsil

Ref. Turner 10th/ed pp 87, 88

Trench mouth/Vincent's angina is ulcerative gingivostomatitis.

62. Ans. is c i.e. Firmly attached and bleeds on removal

Ref. Dhingra 5th/ed pp 308, 309, 6th/ed p 260

- In diphtheria: membrane is dirty grey in color.
- It extends beyond the tonsils, on to the soft palate and posterior pharyngeal wall.
- It is adherent and its removal leaves a bleeding surface.
- Cervical lymph nodes particularly the jugulodigastric lymph node are enlarged and become tender, giving a bull neck appearance

63. Ans is d i.e. 1st molar

Ref. Dhingra 5th/ed 200

64. Ans is d i.e. 80% of cases

Ref. Bailey and Love 24th/ed p 723; 25th/ed p 755

80% of all salivary stones occur in the submandibular glands because their secretions are highly viscous. 80% of submandibular stones are radiopaque and can be identified on plain radiograph.

65. Ans is c i.e. Endoscopic repair

Ref. Dhingra 6th/ed p 164

As discussed in preceding text. CSF rhinorrhea can be managed by

Conservative approach

- Bed rest
- Elevating head of bed
- Stool softeners
- Avoidance of sneezing/straining activities

Surgical repair: In persistent cases surgical repair is performed by

- Neuro surgical intracranial approach
- Endoscopic repair
- Extradural approach

66. Ans is c i.e. Alveobuccal complex

Ref. ASI 1st/ed p 348

Repeat

67. Ans is d i.e. Horizontal

Ref. Login Turner 10th/ed p 21

In jaryaw fracture: The fracture line is horizontal

68. Ans is d i.e. zygoma

Ref. Dhingra 6th/ed p 183

Expl: Fracture of zygoma is called as tripod fracture as when the bone fractures, it is separated at its three processes viz zygomaticofrontal, zygomatico temporal and infraorbital.

68. Ans is c i.e. Blow out fracture

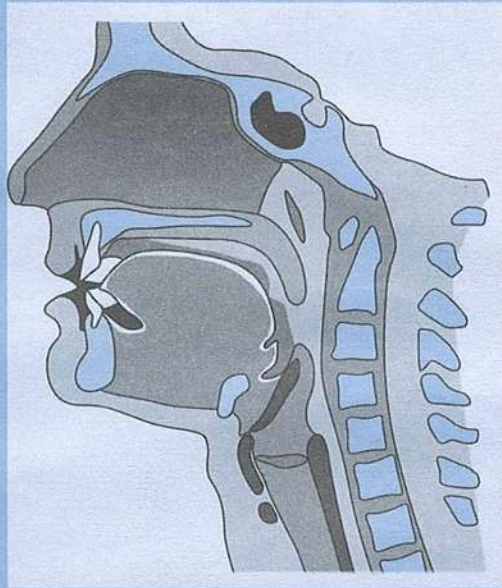
Ref. Dhingra 6th/ed p 184

Blow out fracture is isolated fracture of orbital floor, when a large blunt object strikes the globe.

It presents with:

- Ecchymosis of lid, conjunctiv a and sclera
- Enophthalmos
- Diplopia due to displacement of eye ball
- Anaesthesia of cheek and upper lip, if infraorbital nerve is involved.

SECTION III



PHARYNX

8. Anatomy of Pharynx, Tonsils and Adenoids
9. Head and Neck Space Inflammation
10. Lesions of Nasopharynx and Hypopharynx including Tumors of Pharynx
11. Hot Topics

CHAPTER

8

PHARYNX

Pharynx extends from the base of skull to lower border of cricoid cartilage. Its length is 12–14 cm and width is 3.5 cm at base to 1.5 cm at pharyngoesophageal junction, which is the narrowest part of digestive tract (apart from appendix).

Anatomically pharynx is divided into 3 parts (Fig. 8.1):

- **Nasopharynx**
- **Oropharynx**
- **Hypopharynx/Laryngopharynx**

Nasopharynx

Shape and Boundaries

- Extends from base of skull to a plane passing through hard palate or soft palate i.e. C2 level.
- Upper chamber – Large rectangular or oval shape
- Lower chamber – Tubular
- Roof – Basisphenoid and basioccipital
- Posterior wall – C₁ vertebrae
- Floor – Soft palate anteriorly
- Anterior wall – Choanae

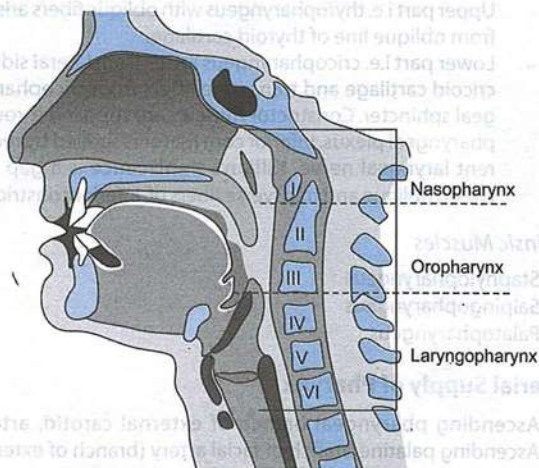


Fig. 8.1: Anatomy of pharynx

Anatomy of Pharynx, Tonsils and Adenoids

- **Lateral Wall** – Pharyngeal opening of Eustachian tube is situated 1.25 cm behind the posterior end of inferior turbinate.⁹ It is bounded above and behind by an elevation k/a torus tubaris, behind which is a recess called fossa of Rosenmuller.⁹

Contents of Nasopharynx

- **Adenoids/Nasopharyngeal tonsil:** Subepithelial collection of lymphoid tissue at the junction of roof and posterior wall of nasopharynx (Fig. 8.2).⁹
- **Nasopharyngeal Bursa:** Epithelial lined median recess extending from pharyngeal mucosa to the periosteum of basiocciput. Represents attachment of notochord to pharyngeal endoderm during embryonic life. Abscess of this bursa is called as Thornwald's disease.⁹
- **Rathke pouch:** Reminiscent of buccal mucosal invagination to form the anterior lobe of pituitary. Represented by a dimple above adenoids. A craniopharyngioma may arise from Rathke pouch.

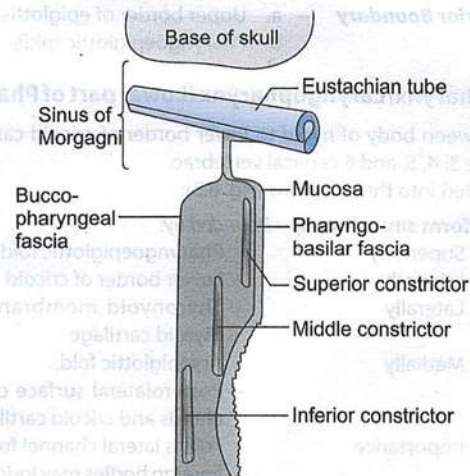


Fig. 8.2: Pharyngeal wall (Coronal section)

Courtesy: Textbook of Diseases of Ear, Nose and Throat, Mohan Bansal Jaypee Brothers, p 50

- **Sinus of Morgagni:** Space between base of skull and upper border of superior constrictor muscle (Fig. 8.2).



Structures passing through this space

- Eustachian tube
- Levator palate muscle
- Ascending palatine artery

Passavant's ridge: It is an elevation formed by fibers of palatopharyngeus and superior constrictor. Soft palate makes firm contact with this ridge to cut off nasopharynx from oropharynx during deglutition and speech.

Epithelial lining of Nasopharynx

- Functionally nasopharynx is the posterior extension of nasal cavity so it is lined by pseudostratified ciliated columnar epithelium.

Oropharynx

Extends from hard palate above to hyoid bone below:

Boundaries (Fig. 8.2)

- | | |
|--------------------------|--|
| Posterior Wall | – Posterior pharyngeal wall lying opposite C2 and C3 |
| Anterior Wall | – a. Base of tongue—posterior to circumvallate papillae
b. Lingual tonsils
c. Valleculae—is a depression lying between base of tongue and anterior surface of epiglottis. |
| Lateral Wall | – a. Palatine (faucial) tonsil
b. Anterior pillar (palatoglossal arch) formed by palatoglossus muscle
c. Posterior pillar (palatopharyngeal arch) formed by palatopharyngeus muscles |
| Inferior Boundary | – a. Upper border of epiglottis
b. Pharyngoepiglottic folds |

Hypopharynx/Laryngopharynx (Lower part of Pharynx)

Lies between body of hyoid to lower border of cricoid cartilage, opposite 3, 4, 5, and 6 cervical vertebrae.

Subdivided into three regions (Fig. 8.3):

- **Pyramidal sinus (fossa)—Bounded by:**

– Superiorly	– Pharyngoepiglottic folds
– Inferiorly	– Lower border of cricoid
– Laterally	– Thyroid membrane and thyroid cartilage
– Medially	– Aryepiglottic fold. – Posterolateral surface of arytenoids and cricoid cartilages
- Importance
 - Forms lateral channel for food
 - Foreign bodies may lodge here
 - Internal laryngeal nerve runs submucosally here thus easily accessible for anesthesia and pain

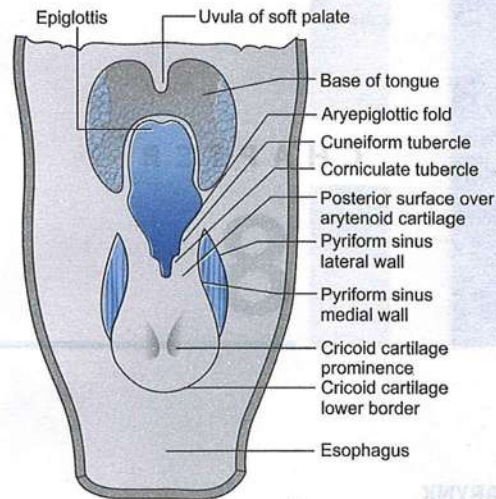


Fig. 8.3: Structures of hypopharynx. Posterior view of laryngopharynx.

Courtesy: Textbook of Diseases of Ear, Nose and Throat,

Mohan Bansal. Jaypee Brothers, p 56

is referred to ear in carcinoma pyriform sinus via this nerve.

- **Postcricoid region:**
 - Lies between upper and lower border of cricoid lamina
 - Commonest site of carcinoma in females suffering from Plummer-Vinson syndrome
- **Posterior pharyngeal wall:**
 - Extends from hyoid bone to cricoarytenoid joint.

Muscles of Pharynx

Extrinsic Muscle

Superior constrictor: It arises from pterygoid hamulus, pterygomandibular ligament and posterior end of myelohyoid line.

- **Middle constrictor:** It is a fan-shaped muscle which arises from lesser and greater cornu of hyoid bone.
- **Inferior constrictor:** It has two parts:
 - Upper part i.e. thyropharyngeus with oblique fibers arising from oblique line of thyroid cartilage.
 - Lower part i.e. cricopharyngeus arises from lateral side of cricoid cartilage and transverse fibers from cricopharyngeal sphincter. Constrictor muscles are supplied through pharyngeal plexus. Inferior constrictor is supplied by recurrent laryngeal nerve. **Killian's dehiscence** is a gap between oblique and transverse fibers of inferior constrictor.

Intrinsic Muscles

- Staphylopharyngeus
- Salpingopharyngeus
- Palatopharyngeus

Arterial Supply of Pharynx

- Ascending pharyngeal branch of external carotid, artery. Ascending palatine branch of facial artery (branch of external carotid), greater palatine branch of maxillary artery.

- Venous drainage is through pharyngeal plexus into internal jugular vein.

Nerve Supply

It is by pharyngeal plexus of nerves which is formed by:

- Branch of vagus (Xth nerve)/Motor supply.
- Branches of glossopharyngeal (IXth nerve)/Sensory supply.
- Sympathetic plexus.

Lymphatic Drainage of Pharynx

- **Nasopharynx**
 - Nasopharynx drains into upper deep cervical nodes either directly or indirectly through retropharyngeal or parapharyngeal nodes.
 - Nasopharynx also drain into spinal accessory chain of nodes in the posterior triangle of the neck.



Rouviere's node

This most superior node of the lateral group of retropharyngeal lymph nodes.

- **Oropharynx**
 - Lymphatics from the oropharynx drain into *upper jugular particularly the jugulodigastric (tonsillar) nodes*.
 - The soft palate, lateral and posterior pharyngeal walls and the base of tongue also drain into retropharyngeal and parapharyngeal nodes and from there to the jugulodigastric and posterior cervical group. Note: Lymphatics of base of tongue drain bilaterally.
- **Hypharynx**
 - **Pyiform sinus drains into upper jugular chain and then to deep cervical group of lymph nodes.** Note: Pyriform fossa have rich lymphatic network and carcinoma of this region has high frequency of nodal metastasis.
 - Postcricoid region drains into parapharyngeal and paratracheal group of lymph nodes.
 - Posterior pharyngeal wall drains into parapharyngeal lymph nodes and finally to deep cervical lymph nodes.

Waldeyer's Ring

- It is a group of lymphatic organs guarding the oropharynx and nasopharynx in the form of a ring.
- The ring is bounded above by pharyngeal tonsil (adenoids) and tubal tonsil, below by lingual tonsil and on left and right side by palatine tonsils and lateral pharyngeal bands.

PALATINE TONSIL

- **Palatine tonsil** is specialized subepithelial lymphoid tissue situated in *tonsillar sinus* on the lateral wall of oropharynx.
- It is almond shaped.
- Tonsillar fossa is bounded by palatoglossal fold in front and palatopharyngeal fold behind.
- **Tonsils are lined by:** Non-keratinized stratified squamous epithelium.⁹

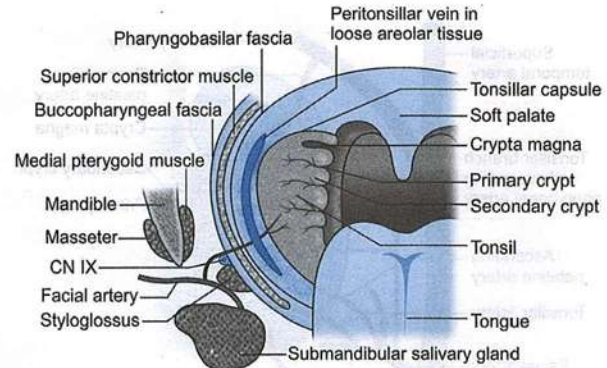


Fig. 8.4: Bed of tonsil

Courtesy: Textbook of Diseases of Ear, Nose and Throat, Mohan Bansal. Jaypee Brothers, p 54

- Medial surface of each tonsil has 15-20 crypts, the largest of which is called Intratonsillar cleft or *crypta magna* (which represents persistence of the ventral portion of the second pharyngeal pouch).
- Tonsillar bed (Fig. 8.4) is formed from within—outward by:
 - Pharyngobasilar fascia
 - *Superior constrictor (above)* and palatopharyngeus muscle
 - *Styloglossus (below)*
 - *Buccopharyngeal fascia*



Important Relationships

- The styloid process lies in relation to lower part of tonsillar fossa, therefore, a hard elongated swelling felt in the posterior wall of tonsil may be an enlarged styloid and tonsillectomy is the approach for excision of elongated styloid.
- Glossopharyngeal nerve lies in relation to posterior pole of tonsil which is the cause of earache in peritonsillar abscess and after tonsillectomy.
- Internal carotid artery lies lateral to tonsil so aneurysm of Internal Carotid Artery can cause pulsatile tonsil.

Nerve Supply

- By the tonsillar branch of the 9th nerve.
- Upper part of the tonsil is supplied by: Lesser palatine Nerve.

Blood Supply

- **Tonsillar branch of facial artery (main source) and is the most common arterial cause of bleeding during tonsillectomy.⁹**
- Ascending palatine artery (branch of facial artery.)
- Dorsal lingual branch of lingual artery.
- Greater/descending palatine branch of maxillary artery.
- Tonsillar branch of ascending pharyngeal artery (Fig. 8.5).

Venous Drainage

Paratonsillar vein: Also called as Tonsillar vein

Lymphatic Drainage

Jugulodigastric lymph nodes.

Development

Tonsils develop from ventral part of second pharyngeal pouch.

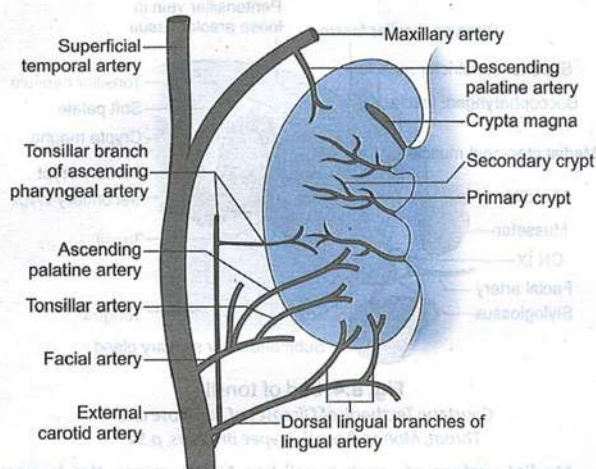


Fig. 8.5: Blood supply and crypts of tonsil

Courtesy: Textbook of Diseases of Ear, Nose and Throat, Mohan Bansal. Jaypee Brothers, p 55

DISEASES OF TONSIL

ACUTE TONSILLITIS

Most commonly seen in school going children but can be seen in adults.

Microbiology

- **Most common:** Group β -hemolytic streptococcus^o (GABHS)
- **Others:** *Staphylococcus*, *Haemophilus*, and *Pneumococcus*.
- **Viral causes:** Adenovirus > Epstein-Barr virus > Influenza virus

Types of Tonsillitis

The components of a normal tonsil are:

- Surface epithelium (continuous with oropharyngeal lining)
- Crypts
- Lymphoid tissue

Thus tonsillitis is classified depending on the component involved:

- **Acute catarrhal or superficial tonsillitis:** Tonsillitis is a part of generalized pharyngitis and is mostly seen in viral infections.
- **Acute follicular tonsillitis:** Infection spreads into the crypts which become filled with purulent material, presenting at the openings of crypts as yellowish spots.
- **Acute membranous tonsillitis:** It is a stage ahead of acute follicular tonsillitis when exudation from the crypts coalesces to form a membrane on the surface of tonsil.
- **Acute parenchymatous tonsillitis:** Here the substance of tonsil is affected. Tonsil is uniformly enlarged and red.

Prodromal Symptoms

- Fever, headache, malaise, general bodyache
- In acute phase—sore throat
- Dysphagia, earache, trismus
- Foul breath with coated tongue

Signs

- Inflamed tonsils, pillars, soft palate, uvula
- Tongue may be red i.e. strawberry tongue
- Bilateral jugulodigastric lymph nodes are enlarged and tender.^o

Diagnosis

- Pus can be squeezed from the crypts of tonsils
- Throat culture with blood agar plate

Treatment

- **Antibiotics:** Crystalline penicillin for 7–10 days.^o
- Analgesics

Complication

mnemonic

ORA (N)TGE

- O** – Acute otitis media
- R** – Rheumatic fever and scarlet fever
- A** – Abscess:
 - Peritonsillar
 - Parapharyngeal
 - Cervical
- (N) T** – Chronic tonsillitis/Chronic adenotonsillar hypertrophy
- G** – Glomerulonephritis (Post streptococcal)
- E** – Subacute bacterial endocarditis

NOTE

Recently, a temporal association between pharyngotonsillitis induced by group A, β -hemolytic streptococci and a new set of obsessive compulsive disorders (OCDs) and other tics has been recognized. This has been called as PANDAS (Pediatric Autoimmune Neuropsychiatric Disorder associated with Streptococcal infection)

Differential Diagnosis of Membrane Over the Tonsil

- Trauma
- Tumors of tonsil and aphthous ulcer
- **Infections:**
 - Candidal Infection
 - Diphtheria
 - Tonsillitis—membranous
- For rest
- VIAL**
 - **V**incent angina (Caused by fusiform bacilli and *Borrelia vincentii*)
 - **I**nfectious mononucleosis
 - **A** – Agranulocytosis
 - **L** – Leukemia

NOTE

Pyogenic membranous tonsillitis is caused by streptococci, staphylococci)

Tonsillectomy (Table 8.1)**Indications****A. Tonsillar Indications (Table 8.1)****Table 8.1:** Indications for tonsillectomy

Tonsillectomy	
Absolute Indications	Relative Indications
<ul style="list-style-type: none"> Huge hypertrophic tonsil causing oropharyngeal obstruction Suspected malignancy of tonsil 	<ul style="list-style-type: none"> Recurrent tonsillitis 2nd attack of Quinsy Chronic Tonsillitis Tonsillitis causing febrile seizures Tonsillitis in a cardiac valvular disease patient Long-term management of IgA nephropathy Severe infectious mononucleosis with upper airway obstruction

Criteria for Recurrent Tonsillitis

- Sore throat should be due to tonsillitis
- Five or more episodes of tonsillitis per year
- Symptoms for at least 1 year
- The episodes should be disabling which prevent normal functioning

B. Non-tonsillar Indications for Tonsillectomy

As an approach for elongated styloid process and glossopharyngeal nerve, complete excision of branchial fistula and as a part of uvulopalatopharyngoplasty in obstructive sleep apnea.

Contraindication (Table 8.2)**Table 8.2:** Contraindication of tonsillectomy

Absolute	Others
<ul style="list-style-type: none"> Polio epidemic Submucous cleft palate 	<ul style="list-style-type: none"> Acute tonsillar infection Age < 3 years Recent acute upper respiratory tract infection

Important Points on Tonsillectomy

- Position of patient during tonsillectomy:** Rose position.
- Method of performing tonsillectomy:** Dissection and snaring method
- M/C complication of tonsillectomy:** Hemorrhage
- Average blood loss during tonsillectomy:** 50 to 80 ml
- Average blood loss during Adenoidectomy:** 80 to 120 ml
- M/C cause of bleeding during tonsillectomy:** Paratonsillar vein (Dennis Browne vein)
- M/C arterial cause of bleeding during tonsillectomy** → Tonsillar branch of facial artery (called as artery of tonsillar hemorrhage)

PERITONSILLAR ABSCESS (QUINSY)

It is collection of pus between the fibrous capsule of the tonsil, usually at the upper pole and the superior constrictor muscles of the pharynx:

- Commonest site:** Upper pole of tonsil.
- Etiology:** Generally occurs as a complication of acute tonsillitis, but may arise *de novo* without a preceding history of tonsillitis.
- It is generally unilateral.
- Age group:** Young adults between 20 and 39 years of age. Children rarely affected.
- Organisms:** Mixed flora (anaerobes and aerobes)/Groups A beta-hemolytic streptococcus

Clinical Features

- High-grade fever with chills and rigor
- Unilateral throat pain
- Ipsilateral referred Odynophagia cranial nerve IX supplies tonsil as well as ear
- Hot potato voice/Plummy voice
- Ipsilateral earache (referred pain via IXth cranial nerve)
- Foul breath
- Trismus (due to spasm of pterygoid muscles which are in close proximity to superior constrictor)

On Examination

- Tonsils, pillars and soft palate are congested and swollen on the involved site.
- Uvula is swollen and pushed to opposite side.
- Mucopus covering tonsillar area
- Cervical lymph nodes are enlarged
- Torticollis: patient keeps neck tilted to side of abscess.

Treatment**Hospitalization**

- IV fluids, antibiotics analgesics
- I and D:** If there is bulging of soft palate or if adequate response is not seen within 24 hours of the antibiotic therapy.
- Interval tonsillectomy:** Tonsillectomy done after 6 weeks of quinsy.
- Hot tonsillectomy/abscess tonsillectomy:** Tonsillectomy performed in the acute stage

ADENOIDS (LUSCHKA TONSIL)

- Adenoids are nasopharyngeal tonsils, situated at the junction of roof and posterior wall of the nasopharynx.
- They are present at birth, enlarge up to 6 years of age and then atrophy and completely disappear by 20 years of age.
- Unlike palatine tonsils, they have no crypts and no capsule and are lined by pseudo-stratified ciliated columnar epithelium (stratified squamous in Tonsil).
- Not visible on X-ray in infants < 1 month of age. Clinically seen by the 4th month.

Blood Supply

Adenoids receive blood supply from:

- Ascending palatine branch of facial pharyngeal branch of external carotid.
- Pharyngeal branch of the third part of maxillary artery

- Ascending cervical branch of inferior thyroid artery of thyro cervical trunk

Lymphatica Drainage

Is into upper jugular nodes directly or indirectly via retro pharyngeal and parapharyngeal nodes.

Nerve Supply

Through CN IX and X (It is also responsible for referred pain to ear due to adenoiditis)

Differences between Palatine Tonsils and Adenoids

	Adenoids	Palatine Tonsils
Number	Single	One on each side
Site	Nasopharynx	Tonsillar fossa in oropharynx
Crypts or Furrows	Only furrows	Only crypts
Capsule	Absent	Present
Epithelium	Ciliated columnar	Squamous stratified
In adults after 20 years of age	Absent	present

DISEASES OF ADENOID

ADENOID HYPERTROPHY

Etiology

Rhinitis, Sinusitis, Allergy and tonsilitis

Clinical Symptoms (Table 8.3)

Table 8.3: Clinical symptom of adenoid hypertrophy

Nasal Symptoms	Aural Symptoms	General Symptoms/ Adenoid facies
<ul style="list-style-type: none"> • B/L Nasal obstruction (M/C symptom) • Wet bubbly nose • Sinusitis • Epistaxis • Voice change • Voice is toneless, loses nasal quality (Rhinolalia clausa) 	<ul style="list-style-type: none"> • Conductive hearing loss due to tubal obstruction • Recurrent attacks of acute • Otitis media • CSOM • Serous OM 	<ul style="list-style-type: none"> • Elongated dull face • Dull expression • Open mouth • Crowded upper teeth • Hitched up upper lip • Pinched appearance of nasal ala

Contd...

Contd...

Nasal Symptoms	Aural Symptoms	General Symptoms/ Adenoid facies
		<ul style="list-style-type: none"> • High arched palate • Systemic symptoms <ul style="list-style-type: none"> - Pulmonary - Hypertension

Diagnosis

Soft tissue lateral radiograph reveals size of adenoid (CT has no role in diagnosis).

Treatment

Adenoidectomy

- *Traditional method* – Transoral curettage
- *Newer method* – Endoscopic adenoidectomy with forcep, suction diathermy and microdebrider

Indications	Contraindication
<ul style="list-style-type: none"> • Obstructive sleep apnea • Glue ear 	<ul style="list-style-type: none"> • Submucous cleft of palate (as it can lead to postoperative velopharyngeal insufficiency)
Relative: <ul style="list-style-type: none"> • Snooring/UARS • Chronic sinusitis (Scott Brown's 7th/ed Vol 1 p 1084) 	

For Undergraduate Students

- **Rhinolalia clausa:** It is toneless voice with no nasal component.
Causes:
 - Adenoid hypertrophy
 - B/L nasal polyp
 - Hypertrophic turbinates
 - Nasal allergy
 - Nasopharyngeal angiofibroma.
- **Structures passing between upper border of superior constrictor muscle and base of skull—**
 - Levator veti palatani
 - Eustachian tube
 - Ascending palatine artery
- **Structures passing between superior and middle constructors—**
 - Glossopharyngeal nerve
 - Stylopharyngeus muscle
- **Structures passing between middle and inferior constrictor muscle**
 - Superior laryngeal artery and vein
 - Internal laryngeal branch of superior laryngeal nerve

QUESTIONS

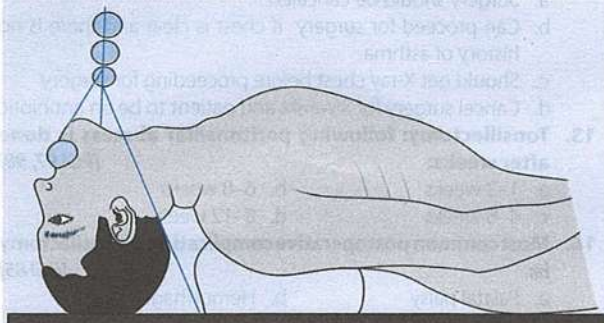
1. Which of the following part is NOT included in hypopharynx is: [UP 01]
 - a. Pyriform sinus
 - b. Post cricoid region
 - c. Anterior pharyngeal wall
 - d. Posterior pharyngeal wall
2. Which of the following structures is seen in oropharynx? [TN 06]
 - a. Pharyngotympanic tube
 - b. Fossa of Rosenmuller
 - c. Palatine tonsil
 - d. Pyriform fossa
3. The lymphatic drainage of pyriform fossa is to: [Delhi 96]
 - a. Upper deep cervical nodes
 - b. Prelaryngeal node
 - c. Parapharyngeal nodes
 - d. Mediastinal nodes
4. Killian's dehiscence is seen in: [MH 00]
 - a. Oropharynx
 - b. Nasopharynx
 - c. Cricopharynx
 - d. Vocal cords
5. 6-year-old child with recurrent URTI with mouth breathing and failure to grow with high arched palate and impaired hearing is: [AIIMS May 07, 2012]
 - a. Tonsillectomy
 - b. Grommet insertion
 - c. Myringotomy with grommet insertion
 - d. Adenoidectomy with grommet insertion
6. Regarding adenoids true is/are: [PGI 02]
 - a. There is failure to thrive
 - b. Mouth breathing is seen
 - c. CT scan should be done to assess size
 - d. High-arched palate is present
 - e. Immediate surgery even for minor symptoms
7. Indication for Adenoidectomy in children include: [AP 00]
 - a. Recurrent respiratory tract infections
 - b. Middle ear infection with deafness
 - c. Recurrent allergic rhinitis
 - d. Multiple adenoids
8. The inner Waldeyer's group of lymph nodes does not include: [AP 93 test I- General; TN 86, 00]
 - a. Submandibular lymph node
 - b. Tonsils
 - c. Lingual tonsils
 - d. Adenoids
9. The most common organism causing acute tonsillitis is: [TN 95]
 - a. Staph aureus
 - b. Anaerobes
 - c. Hemolytic streptococci
 - d. Pneumococcus
10. All of the following cause a gray-white membrane on the tonsils, except: [AIIMS May 04]
 - a. Infectious mononucleosis
 - b. Ludwig's angina
 - c. Streptococcal tonsillitis
 - d. Diphtheria
11. Tonsillectomy is indicated in: [AI 94]
 - a. Acute tonsillitis
 - b. Aphthous ulcers in the pharynx
 - c. Rheumatic tonsillitis
 - d. Physiological enlargement
12. A 5-year-old patient is scheduled of for tonsillectomy. On the day of surgery he had running nose, temperature, 37.5°C and dry cough. Which of the following should be the most appropriate decision for surgery? [AI 06]
 - a. Surgery should be canceled
 - b. Can proceed for surgery if chest is clear and there is no history of asthma
 - c. Should get X-ray chest before proceeding for surgery
 - d. Cancel surgery for 3 weeks and patient to be on antibiotic
13. Tonsillectomy: following peritonsillar abscess is done after weeks: [PGI 97, 98]
 - a. 1-3 weeks
 - b. 6-8 weeks
 - c. 4-6 weeks
 - d. 8-12 weeks
14. Most common postoperative complication of tonsillectomy is: [PGI 85]
 - a. Palatal palsy
 - b. Hemorrhage
 - c. Injury to uvula
 - d. Infection
15. Secondary hemorrhage after tonsillectomy develops: [AI 11]
 - a. Within 12 hrs
 - b. Within 24 hrs
 - c. Within 6 days
 - d. Within 1 months
16. Ramu, 15 years of age presents with hemorrhage 5 hours after tonsillectomy. Treatment of choice is: [AIIMS 99]
 - a. External gauze packing
 - b. Antibiotics and mouth wash
 - c. Irrigation with saline
 - d. Reopen immediately
17. Contraindication of adenotonsillectomy: [PGI 04]
 - a. Age < 4 yr
 - b. Poliomyelitis
 - c. Haemophilus infection
 - d. Upper RTI
18. In which of the following locations, there is collection of pus in the quinsy: [AIIMS 04]
 - a. Peritonsillar space
 - b. Parapharyngeal space
 - c. Retropharyngeal space
 - d. Within the tonsil
19. True about quinsy is: [PGI 02]
 - a. Penicillin is used in treatment
 - b. Abscess is located in capsule
 - c. Commonly occurs bilaterally
 - d. Immediate tonsillectomy should be done
 - e. Patient presents with toxic features and drooling
20. 7-year-old child has peritonsillar abscess presents with trismus, the best treatment is: [AIIMS 96]
 - a. Immediate abscess drain orally
 - b. Drainage externally
 - c. Systemic antibiotics up to 48 hours then drainage
 - d. Tracheostomy

NEET PATTERN QUESTIONS

21. A 6-year-old boy presented to ENT OPD with recurrent URTI, mouth breathing and impaired hearing. The boy was diagnosed as having adenoid hypertrophy for which adenoidectomy was done and grommet inserted; 1 week after surgery the boy was again brought to the OPD with torticollis. Which of the following are true about above clinical scenario? [NEET Pattern]

- Atlantoaxial subluxation is the cause for his torticollis
- The condition is M/C in children with Down's syndrome
- Torticollis is not a complication after adenoid surgery and it is a sheer coincidence
- Adenoidectomy should not have been done in the patient as adenoids would have spontaneously regressed

22. Figure based question



Identify the position of the patient during surgery and select the surgeries from the following list where it is used:

- Submucous Resection of nasal septum

- Tracheostomy
- Tonsillectomy
- Myringoplasty
- Adenoidectomy

23. Crypta magna is seen in: [AP PG 2011]

- Nasopharyngeal tonsil
- Tubal tonsil
- Palatine tonsil
- Lingual tonsil

24. The palatine tonsil receives its arterial supply from all of the following except: [FMGE 2013]

- Tonsillar branch of facial artery
- Ascending palatine artery
- Sphenopalatine artery
- Dorsal lingual artery

25. After tonsillectomy, secondary haemorrhage occurs: [Neet Pattern]

- Within 24 hours
- After 2 weeks
- 5–10 post operative days
- After 1 month

26. Torrential bleed during tonsillectomy is due to: [Neet Pattern]

- Facial artery
- Tonsillar artery
- Paratonsillar vein
- None

27. Tonsillectomy is contraindicated in: [DNB 2005]

- Small atrophic tonsils
- Quinsy
- Poliomyelitis epidemic
- Tonsillolith

EXPLANATIONS AND REFERENCES

1. Ans. is c i.e. Anterior pharyngeal wall

2. Ans. is c i.e. Palatine tonsil

Pharynx is divided into –

Nasopharynx	Hypopharynx/Laryngopharynx	Oropharynx
Important contents of Nasopharynx	It is further divided into	Major structures included in it are:
<ul style="list-style-type: none"> Adenoids Nasopharyngeal bursa Rathke pouch Sinus of Morgagni Passavant ridge 	<ul style="list-style-type: none"> Pyriform sinus Postcricoid region Post pharyngeal wall 	<ul style="list-style-type: none"> Liagual tonsil Palatine tonsil Soft palate Tongue base

3. Ans. is a i.e. Upper deep cervical nodes

- Pyriform sinus drains into upper jugular chain and then to deep cervical group of lymph nodes.
- Postcricoid region drains into parapharyngeal and paratracheal group of lymph nodes.
- Posterior pharyngeal wall drains into parapharyngeal lymph nodes and finally to deep cervical lymph nodes.

4. Ans. is c i.e. Cricopharynx

Ref. Scott Brown's 7th/ed Vol 2 Chapter 155 p 2045; Dhingra 5th/ed p 253, 6th/ed p 238

Killian's Dehiscence (Fig. 8.6)

- It is an area of weakness between the two parts of inferior constrictor muscle—sub thyropharyngeus and cricopharyngeus
- A pulsion diverticulum of pharyngeal mucosa can emerge posteriorly through the Killian's dehiscence called as Zenker's diverticulum or pharyngeal pouch.
- Since it is an area of weakness it is one of the sites of esophageal perforation during instrumentation and scopy—hence also called 'Gateway of Tears'.

Ref. Mohan Bansal p 56; Dhingra 6th/ed p 241

Ref. Scott Brown's 7th/ed Vol 2 pp 1944, 1945; Mohan Bansal p 52; Dhingra 6th/ed p 240

Ref. Tuli 1st/ed pp 231, 232; Dhingra 5th/ed p 257

Also Know:

- **Killian-Janieson's space** – It lies between cricopharyngeus and circular fibres of the esophagus.
- **Lamier Hackemann's space** – It lies between circular and longitudinal fibers of esophagus.

5. Ans. is d i.e. Adenoidectomy with grommet insertion

Ref. Scott Brown 7th/ed Vol 1 p 896-906

The child is having recurrent URTI with high arched palate and failure to grow which indicates child is having adenoids and since there is impaired hearing it means child has developed otitis media as a complication.

Hence logically the child should be treated with adenoidectomy with grommet insertion. This is further supported by following lines from Scott Brown.

"Current practice is to perform adenoidectomy as an adjunct to the insertion of ventilation tubes." —Scott Brown's 7th/ed Vol 1, p 902

6. Ans. is a, b, d i.e. There is failure to thrive; Mouth breathing is seen, and High arched palate

Ref. Dhingra 5th/ed pp 258, 259, 6th/ed p 243-244; Logan Turner 10th/ed p 367; Mohan Bansal p 52

Explanation

- High arched palate and mouth breathing are features of hypertrophied adenoids which leads to adenoid facies
- In adenoids as a consequence of recurrent nasal obstruction and URTI, child develops failure to thrive
- Size of adenoids may well be assessed using lateral radiograph of nasopharynx, and CT scan is not necessary (Ruling out option c). Surgery is indicated only in hypertrophy causing severe symptoms. (Ruling out option e)

7. Ans. is b i.e. Middle ear infections with deafness

Ref. Dhingra 5th/ed p 442, 6th/ed p 131

Indications for Adenoidectomy**Absolute**

- Obstructive sleep apnea
- Recurrent otitis media with effusion (glue ear)

Relative Indications

- Snoring UARS
- Chronic sinusitis

NOTE

There is growing evidence in literature for adenoidectomy as a first-line surgical intervention for chronic rhinosinusitis in children who have failed maximal medical treatment – Scott Brown 7th/ed Vol 1 p 1084

8. Ans. a i.e. Submandibular lymph nodes

Ref. Current Otolaryngology 2nd/ed pp 340, 341; Scott Brown 7th/ed Vol 2 p 1793

Explanation

Submandibular nodes do not form part of Waldeyer's lymphatic ring. They form part of the outer group of lymph nodes into which efferents from the constituents of the Waldeyer's lymphatic ring may drain.

Waldeyer ring consists of (See fig in pictorial Q's at the back):

1. Adenoids (nasopharyngeal tonsil)
2. Tubal tonsil (Fossa of Rosenmuller)
3. Lateral pharyngeal bands
4. Palatine tonsils
5. Nodules (Post pharyngeal wall)
6. Lingual tonsils

9. Ans. is c i.e. Hemolytic streptococci

Ref. Dhingra 5th/ed p 341, 6th/ed p 288; Current Otolaryngology 2nd/ed p 341

Explanation

Group A beta-hemolytic streptococci is the M/C organism causing acute tonsillitis

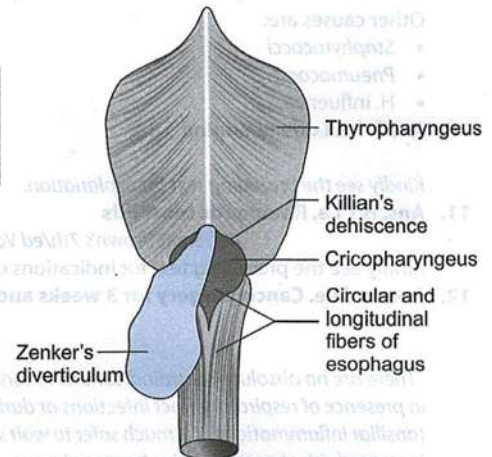


Fig. 8.6: Inferior constrictor muscle and Killian's dehiscence

Other causes are:

- Staphylococci
- Pneumococci
- H. influenza

10. Ans b i.e. Ludwig angina

Kindly see the preceding text for explanation.

11. Ans. is c i.e. Rheumatic tonsillitis

Ref. Scott Brown's 7th/ed Vol 2 pp 1989, 1990, Vol 1 p 1232; Dhingra 5th/ed p 438, 6th/ed p 428 Mohan Bansal p 567

Kindly see the preceding text for indications of tonsillectomy.

12. Ans. is d i.e. Cancel surgery for 3 weeks and patient to be on antibiotic

Ref. Logan Turner's 10th/ed pp 365, 366, Current Otolaryngology 2nd/ed, p 178, Dhingra 6th/ed p 428

"There are no absolute contraindications to tonsillectomy. As such tonsillectomy is an elective operation and should not be undertaken in presence of respiratory tract infections or during the period of incubation of after contact with one of the infectious disease, if there is tonsillar inflammations. It is much safer to wait some 3 weeks after an acute inflammatory illness before operating because of the greatly increased risk of postoperative haemorrhage."

— Turner 10th/ed pp 365, 366

Tonsillectomy and Adenoidectomy

"Patient may present with upper respiratory tract infections. Surgery for these patients should be postponed until the infection is resolved. Usually 7–14 days. These patients may develop a laryngospasm with airway manipulation. This complication carries the potential for significant morbidity and even mortality."

— Current Otolaryngology 2nd/ed p 173

13. Ans. is b i.e. 6–8 weeks

Ref. Turner 10th/ed p 86; Head and Neck Surgery by Chris DeSouza Vol 2 p 1583

- Friends, Dhingra and Turner have a different opinions on this one.
- According to Turner 10th/ed p 86—"The tonsils should be removed 6–8 weeks following a Quinsy."
- According to Dhingra 6th/ed p 265—"Tonsils are removed 4–6 weeks following an attack of Quinsy."
- According to Head and Neck Surgery-
- Quinsy – "Most people would practise interval tonsillectomy for these patients, deferring surgery for 6 weeks following resolution of an attack." — Head and Neck Surgery by Chris de Souza Vol 2 p 1583

So, after reading all the above texts – I think 6–8 weeks is a better option.

14. Ans. is b i.e. Hemorrhage

Ref. Dhingra 5th/ed p 441, 6th/ed p 430; Maqbool 11th/ed, p 288; Scott Brown's 7th/ed Vol 2 p 1994; Mohan Bansal p 571

15. Ans. is c i.e. Within 6 days

Ref. Mohan Bansal p 571, Dhingra 6th/ed p 430

- "The main complication is hemorrhage which occurs in 3–5% patients" — Head and Neck Surgery de Souza Vol 2 p 1588
- "Most common complication following tonsillectomy is hemorrhage." — Maqbool 11th/ed p 288
- "Reactionary hemorrhage is the most feared complication post tonsillectomy because of the risk of airway obstruction, shock and ultimately death." — Scott Brown's 7th/ed Vol 2 p 1994

Hemorrhage can be

Primary	Reactionary	Secondary
Occurring at the time of operation	Occurring within 24 hours of surgery	Seen between the 5th to 10th postoperative day

NOTE

Most common time of hemorrhage after tonsillectomy is within 4 hrs of surgery

16. Ans. is d i.e. Reopen immediately

Ref. Turner 10th/ed p 366

"Reactionary hemorrhage occurs within a few hours of the operation and may be severe. It may occur after operation and is treated by a return to the theater when the vessel is ligated under anesthesia."

— Turner 10th/ed p 366

Also Know

- In case of secondary hemorrhage – Generally 2° hemorrhages are self-limiting and bleeding usually stops by the time patient reaches hospital.
- Suction of the clot or gargling with diluted hydrogen peroxide is the only treatment required in most cases.
- If bleeding recurs, topical epinephrine may be applied to the tonsillar fossa. (Head and Neck Surgery Chris de Souza Vol 2 p 1589)
- Return to operation theatre for placing ligature is rarely needed

Remember

- Reactionary hemorrhage are more common in
 - Adults (> 70 years)
 - Males
 - Patients with h/o infections
 - Infectious mononucleosis
 - Recurrent acute tonsillitis

Indications for blood transfusion in a case of Tonsillectomy

- End-stage renal disease
- Hypertension
- Reduced hemoglobin and hematocrit

In all these patients, if secondary hemorrhages occur – immediately return to OT to avoid severe complications

17. Ans. is b, c and d i.e. Poliomyelitis; Haemophilus infection; and Upper RTI

Ref. Turner 10th/ed pp 365,366; Mohan Bansal p 568

- As explained earlier, Tonsillectomy should not be performed during epidemics of poliomyelitis. This is because there are evidences that the virus may gain access to the exposed nerve sheaths and give rise to the fatal bulbar form of the disease.
- It should not be undertaken in the presence of respiratory tract infections or during the period of incubation of after contact with one of the infectious disease (i.e. Haemophilus) or if there is tonsillar inflammation.
- It is safer to wait for 3 weeks after an acute inflammatory disease, before performing tonsillectomy

According to Turner - Tonsillectomy can be performed at any age, if there are sufficient indications for their removal.

According to Dhingra - 6th/ed, p 428, Children < 3 years (Not < 4 years as given in the options) are poor candidates for surgery. So tonsillectomy should not be done in them.

According to Head and Neck Surgery de Souza –

"As tonsillar tissue has a role in the development of the immune system, it is advisable that surgery should be delayed until the age of 3 whenever possible." —Head and Neck Surgery Chris de Souza Vol 2 p 1587

18. Ans. is a i.e. Peritonsillar space

Ref. Dhingra 5th/ed pp 278, 279, 6th/ed p 264

Quinsy is collection of pus in the peritonsillar space which lies between the capsule of tonsil and superior constrictor muscle i.e. peritonsillar abscess.

19. Ans. is a and e Penicillin is used in treatment and Patient presents with toxic features and drooling

Ref. Logan Turner 10th/ed p 86; Dhingra 5th/ed p 279, 6th/ed p 248; Scott's Brown 7th/ed Vol 2 pp 1996,1997

- Quinsy is collection of pus outside the capsule (not in capsule) in peritonsillar area
- It is usually unilateral
- Patient present with toxic symptoms due to septicemia as well as local symptoms (e.g. dribbling of saliva from mouth)
- Antibiotics: High-dose penicillin. (IV benzpenicillin) is the DOC. In patients allergic to penicillin, erythromycin is the DOC. If antibiotics fail to relieve the condition within 48 hours, then the abscess must be opened and drained.

20. Ans. is c i.e. Systemic antibiotics up to 48 hours and then drainage

Ref. Harrison 17th/ed p 211; Scott's brown 7th/ed Vol 2 p 1997; Turner 10th/ed p 86

Treatment of quinsy include IV antibiotics and if it fails to relieve the condition in 24–48 hours, the abscess must be opened and drained.

21. Ans. is a and b i.e. Atlantoaxial subluxation is the cause for his torticollis and the condition is M/C in children with Down's syndrome.

Ref. Current otolaryngology 3rd/ed p 363

Torticollis can occur as a complication of adenoidectomy due to ligamentous laxity secondary to inflammatory process following adenoidectomy. It is called as Grisel syndrome.

This is M/C in patients of Down syndrome as children with Down's already have asymptomatic atlantoaxial instability which manifests after surgery.

22. The position drawn in figure is 'Rose position' where patient lies supine with head extended by placing a pillow under the shoulder—Rose position is used during.

Ref. Dhingra 5th/ed pp 438,439–442; Mohan Bansal p 569

- Tonsillectomy
- Adenoidectomy
- Tracheostomy

23. Ans. is c i.e. Palatine tonsil

Ref. Dhingra 6th/ed p 257

The medial surface of palatine tonsils is covered by non keratinizing stratified squamous epithelium which dips into the substance of tonsil in the form of crypts. One of these crypts is very large and deep and is called crypta magna or intratonsillar deft.

24. Ans. is c i.e. Sphenopalatine artery

Ref. Dhingra 6th/ed p 257

The tonsils are supplied by five arteries viz.

1. Tonsillar branch of facial artery

2. Ascending pharyngeal artery from external carotid artery
3. Ascending palatine, branch of facial artery
4. Dorsal lingual branches of lingual artery
5. Descending palatine branch of maxillary artery

25. Ans. is c i.e. 5–10 post operative days

Already expalined

26. Ans. is c i.e. Paratonsillar vein

- M/C cause of bleeding during tonsillectomy: Paratonsillar vein (Denis Browne vein)
- M/C arterial cause of bleeding during tonsillectomy: Toreillar branch of facial artery (K/a artery of tonsillar haemorrhage)

27. Ans. is c i.e. Poliomyelitis epidemic

Already expalined.

Remember

- Reactionary hemorrhage are more common in Adults (> 70 years)
- Males
- Ref. Dhingra 6th/ed p 430
- Infection mononucleosis
- Recurrent acute tonsillitis

Ref. Dhingra 6th/ed p 257

- Ref. Dhingra 6th/ed p 257
- As explained earlier Tonsillectomy should not be performed during epidemics of poliomyelitis. This is because there are evidences that the virus may gain access to the exposed nerve sheaths and give rise to the fatal bulbar form of the disease.
- It should not be undertaken in the presence of respiratory tract infection or during the period of incubation of after contact with one of the infectious disease (ie. Haemophilus) or if there is tonsillar inflammation.
- It is safer to wait for 3 weeks after an acute inflammatory disease, before performing tonsillectomy.
- According to Turner - Tonsillectomy can be performed at any age. If there are sufficient indications for their removal.
- According to Dhingra - 4-58, Children < 3 years (Not < 4 years as given in the option) are poor candidates for surgery. So tonsillectomy should not be done in them.
- According to Harsh and West - Surgery is done whenever possible. — Harsh and West Surgery Child & Adult Vol 2, p 1287
- At tonsillar fossa, there is a deep cleft, the development of the immune system. It is advisable that surgery should be delayed until the age of 3.
- Ref. Dhingra 6th/ed p 257, 258, 259, 260
- 18. Ans. is a i.e. Peritonsillar space**
- Quinsy is collection of pus in the peritonsillar space which lies between the capsule of tonsil and superior constrictor muscle. i.e. peritonsillar abscess.
- 19. Ans. is a and e. Penicillin is used in treatment and Patient presents with toxic features and drooling**
- Ref. Logan Turner 10th/ed p 362, Dhingra 6th/ed p 259, 260, Scott's Brown 7th/ed Vol 2 p 1996, 1997
- Quinsy is collection of pus outside the capsule (not in capsule) in peritonsillar area.
- It is usually unilateral
 - Patient presents with toxic symptoms due to septicemia as well as local symptoms (ie. drooling of saliva from mouth)
 - Antibiotics: High-dose penicillin (IV benzathine) is the DCC. In patients allergic to penicillin, erythromycin is the DCC. If antibiotics fail to relieve the condition within 48 hours, then the abscess must be opened and drained.
- 20. Ans. is c i.e. Systemic antibiotics up to 48 hours and then drainage**
- Ref. Harrison 17th/ed p 111, Scott's Brown 7th/ed Vol 2 p 1997, Turner 10th/ed p 362
- Treatment of quinsy include IV antibiotic and if fails to relieve the condition in 24–48 hours, the abscess must be opened and drained.
- 21. Ans. is a and b i.e. Antitoxin and subluxation is the cause for his torticollis and the condition is MIC in children with Down's syndrome.**
- Ref. Current otolaryngology 3rd/ed p 303
- Torticollis can occur as a complication of adenoidectomy due to ligamentous laxity secondary to inflammatory process following adenoidectomy. It is called as Gittel syndrome.
- This is MIC in patients of Down syndrome as children with Down's already have asymptomatic atlantoaxial instability which manifest after surgery.
- 22. The position shown in figure is 'Rose position' where patient lies supine with head extended by placing a pillow under the shoulder—Rose position is used during:**
- Ref. Dhingra 6th/ed p 438, 439–442, Mohan Bansal p 269
- i. Tonsillectomy
 - ii. Adenoidectomy
 - iii. Tracheostomy
- 23. Ans. is c i.e. Palatine tonsil**
- The medial surface of palatine tonsils is covered by non keratinizing stratified squamous epithelium which dips into the substance of tonsil in the form of crypts. One of these crypts is very large and deep and is called crypta magna or intratonsillar cleft.
- Ref. Dhingra 6th/ed p 257
- 24. Ans. is c i.e. Spinothalamic artery**
- The tonsils are supplied by five arteries viz.
- i. Tonsillar branch of facial artery

CHAPTER

9

Head and Neck Space Inflammation

RETROPHARYNGEAL SPACE

Retropharyngeal space lies between the **buccopharyngeal fascia** covering the pharyngeal constriction muscles and the **prevertebral fascia** covering the vertebrae and prevertebral muscles. A midline fibrous raphe divides the space into two lateral compartments (spaces of Gillette); one on each side. This an abscess of Retropharyngeal space causes unilateral bulge (Fig. 9.1).

- **Extension:** from the skull base to the bifurcation of trachea.
- **Boundaries:**
 - **Anterior:** Buccopharyngeal fascia covering the pharyngeal constrictor muscle
 - **Posterior:** Prevertebral fascia
 - **Laterally:** Carotid sheath
- **Contents:** Retropharyngeal nodes.

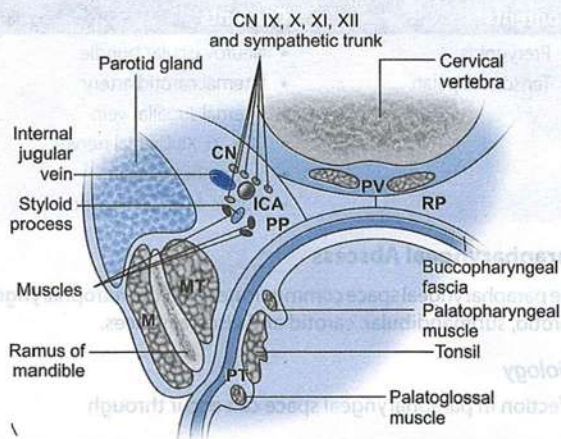


Fig. 9.1: Deep neck spaces for abscesses

Abbreviations: CN, Cranial nerves IX, X, XI and XII and sympathetic trunk; IC, Internal carotid artery; IJV, Internal jugular vein; M, Masseter muscle; MT, Medial pterygoid muscle; PP, Parapharyngeal space; PT, Peritonsillar space; PV, Prevertebral space; RP, Retropharyngeal space

Courtesy: Textbook of Diseases of Ear, Nose and Throat, Mohan Bansal. Jaypee Brothers, p 539

RETROPHARYNGEAL ABSCESS

Acute Retropharyngeal Abscess

- Most commonly seen in children below 6 years with a peak incidence between 3 and 5 years.

Cause

Suppuration of retropharyngeal lymph nodes due to infection at its draining sites—adenoids, nasopharynx, posterior nasal sinuses or nasal cavity.

Adults

Cause: Penetrating injuries to the posterior pharyngeal wall or the cervical esophagus

Rarely: Acute mastoiditis



M/c organism	: Streptococcus viridans (46%)
	: Staphylococcus aureus (26%)

Clinical Features

- Dysphagia
- Fever
- Difficulty in breathing—Stridor or Croupy cough
- Torticollis

On Examination

Unilateral bulge in the posterior pharyngeal wall (Friends, do not mug up these features—as their is abscess—obviously fever will be present).

Since it is situated in retropharynx it will—lead to a bulge in posterior pharyngeal wall and torticollis. It will press trachea and esophagus. so, it will cause difficulty in breathing and dysphagia.)

Treatment

- I and D without general anesthesia (due to risk of rupture of abscess during intubation)
- Antibiotics
- **Tracheostomy:** If large abscess causing mechanical obstruction of the airway.

Chronic Retropharyngeal Abscess

Cause

- Tuberculosis of the cervical spine
- TB of the retropharyngeal lymph nodes secondary to tuberculosis of the deep cervical lymph nodes

Features

- Discomfort in the throat
- Pain
- Fever
- Progressive neurological signs and symptoms due to spinal cord compression.
- Neck may show tubercular lymph nodes

Investigation

X-ray

Radiological criteria to diagnose retropharyngeal abscess:

- Widening of retropharyngeal space ($\geq 3/4$ th diameter of corresponding cervical vertebra)
- Straightening of cervical space
- Presence of gas shadow

Treatment

- Antituberculous therapy (ATT)
- **External drainage:**
 - Drainage through cervical incision
 - High abscess: vertical incision along the posterior border of sternocleidomastoid muscle^a
 - Low abscess: vertical incision along the anterior border of sternocleidomastoid muscle^a



Danger Space

It lies just posterior to retropharyngeal space in between the alar fascia (anteriorly) and prevertebral fascia (posteriorly). These are the two layers of prevertebral layer of deep cervical fascia. It contains only loose connective tissue and extends from skull base to mediastinum. So the infection of this space can cause mediastinitis. During the surgical drainage, both the dangerous and retropharyngeal spaces are treated as one unit. A dissecting finger is used to disrupt the partition between these two spaces.

PARAPHARYNGEAL ABSCESS (ABSCESS OF LATERAL PHARYNGEAL SPACE)

Anatomy of Parapharyngeal space (Pharyngomaxillary space)

Parapharynx lies on either side of the superior part of pharynx i.e. the nasopharynx and oropharynx.

- It is pyramidal in shape with base at the base of skull and apex at hyoid bone.
- **Relations:**
 - **Laterally:** Medial pterygoid muscle and mandible; deep lobe of the parotid

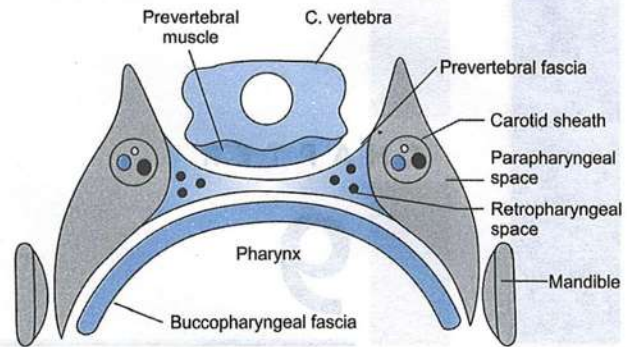


Fig. 9.2: Relation of parapharyngeal space

- **Medially:** Eustachian tube, Pharynx, and Palatine tonsil, medial pterygoid muscle
- **Posteriorly:** Vertebral and Prevertebral muscles
- **Anteriorly:** Pterygoid muscles and interpterygoid fascia (Fig. 9.2)

NOTE

Medial wall of the parapharyngeal space is the lateral wall of the peritonsillar space. It is proved by the superior constrictor muscle.

- Styloid process divides the space into 2 compartments

Anterior compartment (related to tonsillar fossa medially medial pterygoid muscle laterally) Contents	Posterior compartment (related to posterior part of lateral pharyngeal wall medially and parotid gland laterally) Contents
<ul style="list-style-type: none"> • Pterygoids • Tensor villi palati 	<ul style="list-style-type: none"> • Neurovascular bundle • Internal carotid artery • Internal Jugular vein • IX, X, XI, XII Cranial nerves • Sympathetic chain • Upper deep cervical nodes

Parapharyngeal Abscess

The parapharyngeal space communicates with the retropharyngeal, parotid, submandibular, carotid and visceral spaces.

Etiology

Infection in parapharyngeal space can occur through

- Pharynx, tonsils, and adenoids infections
- Teeth : Dental infections (Or extraction of lower third molar tooth) in 40% cases.
- Ear : Petrositis and Bezold's abscess
- External trauma : Penetrating injuries of the neck

Clinical Symptoms and Signs

Anterior compartment	Posterior compartment
<ul style="list-style-type: none"> • Tonsil is pushed medially • Trismus (due to spasm of medial pterygoid muscles) • External swelling behind the angle of the jaw (at the posterior part of middle third of sternocleidomastoid) • Odynophagia • Minimal trismus or tonsillar prolapse 	<ul style="list-style-type: none"> • Bulge in pharyngeal wall behind the posterior pillar • IX, X, XI, XII palsy • Horner's syndrome due to involvement of sympathetic chain • Parotid bulge • Torticollis

Investigation of Choice: CT scan**Treatment**

- Admission to hospital for intravenous (IV) antibiotics (penicillin/cefuroxime) is the baseline treatment
- Failure to respond to conservative treatment or clinical deterioration should prompt surgical abscess drainage
- Abscess drainage is done through a collar incision in the neck at the level of hyoid-bone under general anaesthesia

VINCENT'S ANGINA (TRENCH MOUTH/ULCERATIVE GINGIVITIS)**Organisms**

- Spirochete
- *Borellia vincentii*
- Anaerobe
- *Bacillus fusiformis*

Predisposing Factor

- Very poor dental hygiene
- Debilitated patient
- Seen in young adults and middle-aged persons

Features**Clinical**

- Necrotizing gingivitis, i.e. gums are covered with necrotic membrane
- Bleeding of gums
- Ulceration of mucosa of tonsils, pharynx and mouth
- Patients present with low-grade pyrexia and sore throat

On Examination

Grayish black membrane is present on one tonsil but may involve gum, soft and hard palate. The membrane bleeds when it is removed. It gives a characteristic smell to the breath.

Treatment

- Sodium bicarbonate gargles.
- Penicillin + Metronidazole
- Dental care

KERATOSIS PHARYNGIS**Feature—Benign Condition:**

- Horny excrescences on the tonsillar surface, pharyngeal wall or lingual tonsils which appear as white/yellow dots which cannot be wiped off.
- No constitutional symptoms
- **Treatment:** Reassurance

Thornwaldt's disease (Pharyngeal Bursitis)

Persistence of Lushka pouch (Pharyngeal bursa) causes thornwaldt's cysts which may get infected and form an abscess in the nasopharynx called as thornwaldt's disease as pharyngeal bursitis.

QUESTIONS

1. A male Shyam, age 30 years presented with trismus, fever, swelling pushing the tonsils medially and spreading laterally posterior to the middle sternocleido-mastoid. He gives H/O excision of 3rd molar few days back for dental caries. The diagnosis is: [AIIMS 01]
 - a. Retropharyngeal abscess
 - b. Ludwig's angina
 - c. Submental abscess
 - d. Parapharyngeal abscess
2. A postdental extraction patient presents with swelling in posterior one third of the sternocleidomastoid, the tonsil is pushed medially. Most likely diagnosis is:
 - a. Retropharyngeal abscess
 - b. Parapharyngeal abscess
 - c. Ludwig angina
 - d. Vincent angina
3. Parapharyngeal space is also known as: [PGI June 05]
 - a. Retropharyngeal space
 - b. Pyriform sinus
 - c. Lateral pharyngeal space
 - d. Pterygomaxillary space
4. The medial bulging of pharynx is seen in: [AI 91]
 - a. Pharyngomaxillary abscess
 - b. Retropharyngeal abscess
 - c. Peritonsillar abscess
 - d. Paratonsillar abscess
5. Trismus in parapharyngeal abscess is due to spasm to: [PGI 98]
 - a. Masseter muscle
 - b. Medial pterygoid
 - c. Lateral pterygoid
 - d. Temporalis
6. Most common cause of chronic retropharyngeal abscess: [Kolkata 01]
 - a. Suppuration of retropharyngeal lymph node
 - b. Caries of cervical spine
 - c. Infective foreign body
 - d. Caries teeth
7. True statement about chronic retropharyngeal abscess: [PGI 03]
 - a. Associated with tuberculosis of spine
 - b. Causes psoas spasm
 - c. Suppuration of Rouviere lymph node
 - d. Treatment by surgery
8. Retropharyngeal abscess, false is... [AIIMS Nov 10]
 - a. It lies lateral to midline
 - b. Causes difficulty in swallowing and speech
 - c. Can always be palpated by finger at the post pharyngeal wall
 - d. It is present beneath the vertebral fascia.
9. Infection of submandibular space is seen in: [Manipal 08]
 - a. Ludwig angina
 - b. Vincent angina
 - c. Prinzmetal angina
 - d. Unstable angina
10. Middle age diabetic with tooth extraction with ipsilateral swelling over middle one-third of sternocleidomastoid and displacement of tonsils towards contralateral side: [NEET Pattern]
 - a. Parapharyngeal abscess
 - b. Retropharyngeal abscess
 - c. Ludwigs angina
 - d. None
11. Which of the following is not true about acute retropharyngeal abscess: [NEET Pattern]
 - a. Dysphagia
 - b. Swelling on posterolateral wall
 - c. Torticollis
 - d. Caries of cervical spine is usually a common cause
12. Thornwaldt cyst: [Neet Pattern]
 - a. Laryngeal cyst
 - b. Nasopharyngeal cyst
 - c. Ear cyst
 - d. None

EXPLANATIONS AND REFERENCES

1. Ans. is d i.e. Parapharyngeal abscess
2. Ans. is b i.e. Parapharyngeal abscess

Ref. Turner 10th/ed p 106; Tuli 1st/ed p 260, 2nd/ed p 268; Mohan Bansal p 542; Dhingra 6th/ed p 267

History of dental caries

+

Trismus

+

Swelling pushing the tonsils medially

+

Swelling spreading posterior to the sternocleidomastoid or

Presenting with a swelling in middle 1/3rd of sternocleidomastoid

Indicate parapharyngeal abscess

3. Ans. is c and d i.e. Lateral pharyngeal space; and Pterygomaxillary space

Ref. Dhingra 5th/ed p 281, 6th/ed p 267; Mohan Bansal p 538

4. Ans. is a i.e. Pharyngomaxillary space

- Parapharyngeal space is also called **lateral pharyngeal space** and **pharyngomaxillary space**.
- Pharyngomaxillary abscess is a synonym for parapharyngeal abscess (which is also called **Lateral Pharyngeal abscess**).

5. Ans. is b i.e. Medial pterygoid muscle

Ref. Dhingra 5th/ed p 282, 6th/ed p 268

*Trismus in parapharyngeal abscess is due to spasm of medial pterygoid muscle.***NOTE**

- Styloid process divides the pharynx into anterior and posterior compartment.
- Trismus occurs in infection of anterior compartment whereas torticollis (due to spasm of paravertebral muscles) occurs in the infection of posterior compartment.

6. Ans. is b i.e. Caries of cervical spine**7. Ans. is a, c and d i.e. Associated with tuberculosis of spine; and Suppuration of Rouviere lymph node; and Treated by surgery**

Ref. Dhingra 5th/ed p 281, 6th/ed p 266-267

- Chronic retropharyngeal abscess is associated with caries of cervical spine or tuberculous infection of **retropharyngeal lymph nodes** secondary to tuberculosis of deep cervical nodes (i.e. suppuration of Rouviere nodes)
- It leads to discomfort in throat, dysphagia, fluctuant swelling of postpharyngeal wall.
- Retropharyngeal abscess does not lead to psoas spasm.

Treatment

- Incision and drainage of abscess
- Full course of ATT

NOTE

Most common cause of acute retropharyngeal abscess.

Children	Adults
<ul style="list-style-type: none"> • Suppuration of retropharyngeal lymph nodes secondary to infection in the adenoids, nasopharynx, posterior nasal sinuses or nasal cavity 	<ul style="list-style-type: none"> • Due to penetrating injury of posterior pharyngeal wall or cervical esophagus

8. Ans. is d i.e. It is present beneath vertebral fascia

Ref. Dhingra 5th/ed pp 280, 281, 6th/ed p 266-267; Mohan Bansal p 543

- Retropharyngeal space lies behind the pharynx between the buccopharyngeal fascia covering pharyngeal constrictor muscles and the prevertebral fascia (i.e. behind the pharynx and in front of prevertebral fascia)
- Thus option d, i.e. it lies beneath the vertebral fascia is incorrect.
- On physical examination, may reveal bulging of the posterior pharyngeal wall, although this is present in <50% of infants with retropharyngeal abscess. Cervical lymphadenopathy may also be present. There will be a smooth swelling on one side of the posterior pharyngeal wall with airway impairment.
- Dysphagia and difficulty in breathing are prominent symptoms as the abscess obstructs the air and food passages

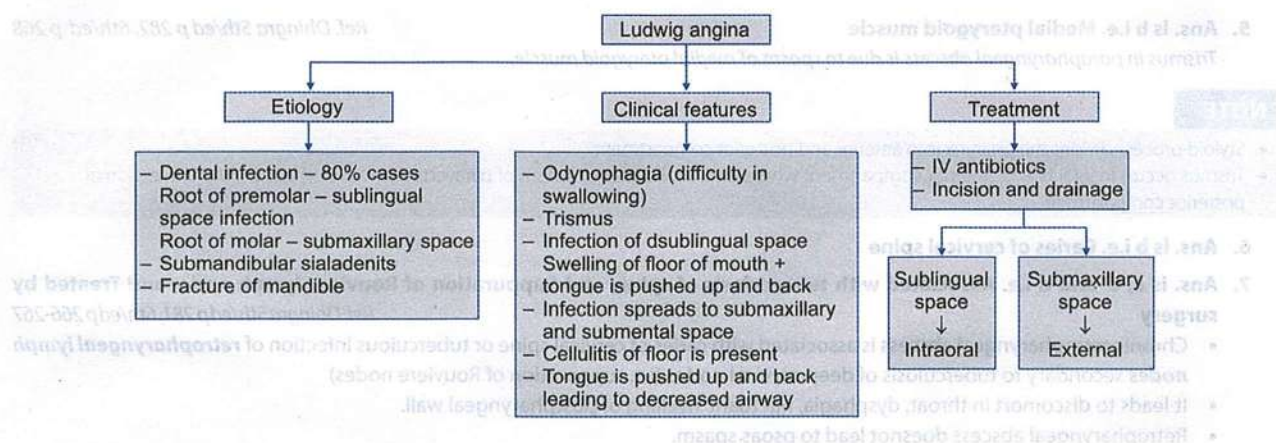
9. Ans. is a i.e. Ludwig angina

Ref. Dhingra 5th/ed p 277, 6th/ed p 263; Mohan Bansal p 543

Submandibular Space

- It lies between mucous membrane of floor of mouth and tongue on one side and superficial layer of deep cervical fascia extending between the hyoid bone and mandible on other side.
- It is divided into 2 compartments by mylohyoid muscle
 - sublingual space – above the mylohyoid
 - submaxillary space – below the mylohyoid

Infection of submandibular space is called *Ludwig angina*.**Bacteriology:** Infections involved both aerobes and anaerobes. The M/c causative organisms are hemolytic Streptococci, Staphylococci and bacteroides.



10. Ans. is a i.e. Parapharyngeal abscess

Already explained

Ref. Dhingra 6th/ed p 267

11. Ans. is d i.e. Caries of cervical spine is usually a common cause

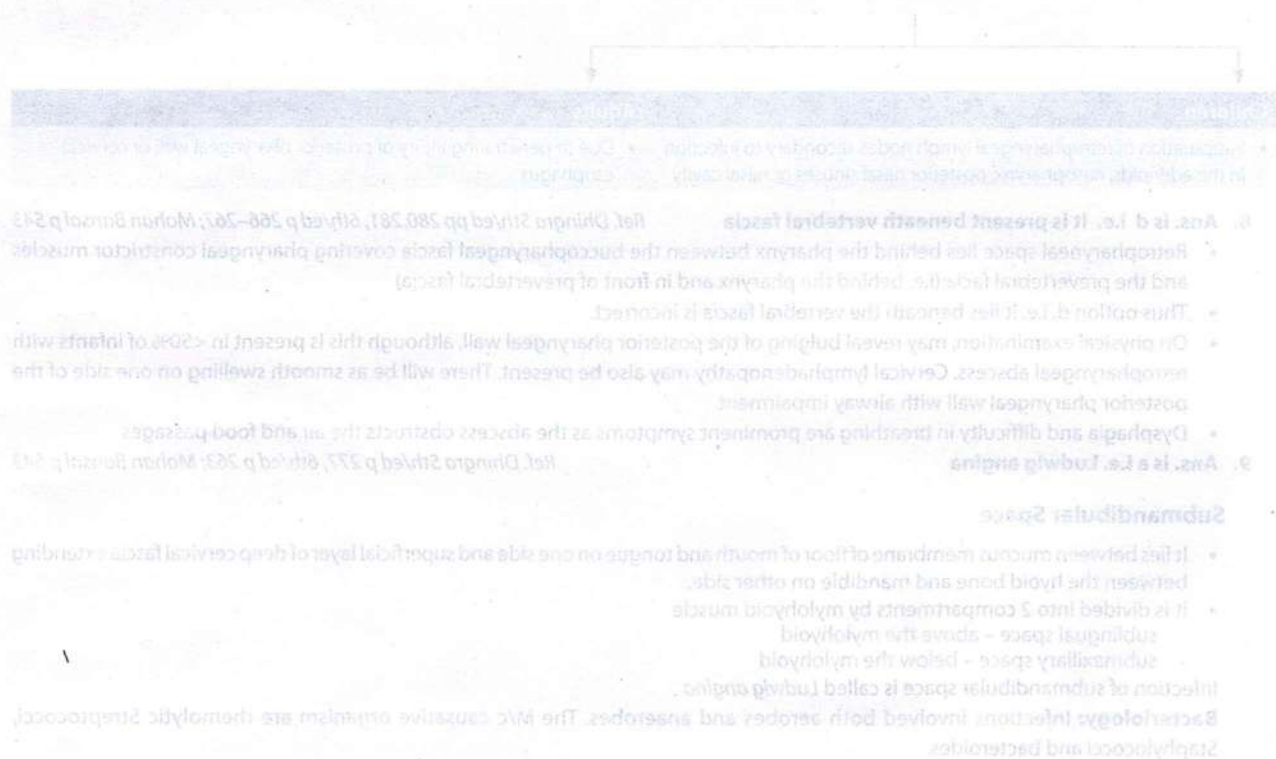
As discussed previously, M/C cause acute retropharyngeal abscess in children is suppuration of retro pharyngeal lymphnodes secondary to infection of adenoids, nasopharynx and nasal cavity.

Ref. Dhingra 6th/ed p 266

The M/C cause of acute retropharyngeal abscess in adults is penetrating injury of posterior pharyngeal wall or cervical esophagus. Rest all options are clinical features seen in acute retropharyngeal abscess.

12. Ans. is b i.e. Nasopharyngeal cyst

See preceding text for explanation.



Lesions of Nasopharynx and Hypopharynx including Tumors of Pharynx

NASOPHARYNX (ALSO CALLED AS EPIHARYNX)

ANATOMY

- Oval in shape extends vertically from the skull base (basocciput and basisphenoid) to soft palate (horizontal line passing through the hard palate)
- Posteriorly related to arch of axis (C1) vertebra and anteriorly to choana.
- Lateral wall is characterized by pharyngeal opening of Eustachian tube bounded above and behind by the torus tubarius (cartilage)

Fossa of Rosenmuller

- Also known as pharyngeal recess or lateral recess, it is a recess posterolateral to the torus.
- This is the most common site of origin of carcinoma nasopharynx.

Sinus of Morgagni

- The pharynx is covered by overlapping constrictor muscles in the entire extent except superiorly between the skull base and upper border of superior constrictor muscle, bridged only by the pharyngobasilar fascia. This area is known as sinus of Morgagni, which allows entry to Eustachian tube, levator palata, and ascending palatine artery.
- It is the route of spread of malignancy of nasopharynx outside to the parapharyngeal space.
- Passavant's ridge is formed by fibers of palatopharyngeus muscle (or sometimes by inner fibers of superior constrictor). It encircles the posterior and lateral walls of nasopharynx forming a U-shaped sling against which the soft palate is approximated to maintain competence during deglutition.

TUMORS OF NASOPHARYNX

Nasopharyngeal Fibroma/juvenile Nasopharyngeal Angiofibroma

- Most common **benign tumor** of nasopharynx (but overall angiofibroma is rare).

- Most common **site** is posterior part of nasal cavity close to the margin of sphenopalatine foramen.
- Seen almost exclusively in males of **10–20 years** (testosterone dependent tumor seen in prepubertal to adolescent males).
- **Locally invasive vasoformative** tumor consisting of endothelium lined vessels with no muscle coat.
- The major blood supply is from **internal maxillary artery**.

Clinical Features

Symptoms

Symptoms depend on spread of tumor to nasal cavity, paranasal sinuses, pterygomaxillary fossa, infratemporal fossa, cheek, orbits (through inferior orbital fissure), cranial cavity (most common site is **middle cranial fossa**).

- Most common symptom - *Spontaneous profuse and recurrent epistaxis.*
- Progressive nasal obstruction, denasal speech, hyposmia/anosmia, broadening of nasal bridge.
- Otalgia conductive hearing loss, serous otitis media, due to eustachian tube obstruction.
- *Pink or purplish mass* obstructing one or both choanae in nasopharynx.
- Tumor in the orbit causes proptosis and frog-face deformity; diplopia and diminished vision.
- Swelling of cheek
- Tumor in infratemporal fossa can cause trismus and bulge of parotid.
- II, III, IV, V, VI cranial nerve can be involved.

Juvenile nasopharyngeal angiofibroma: In an adolescent male, profuse recurrent episodes of nosebleed suggests juvenile nasopharyngeal angiofibroma until proven otherwise

Sign

- Splaying of nasal bones
- Pink or purplish mass obstructing one or both choanae in nasopharynx
- Swelling of cheek and fullness of face.

Diagnosis

- Soft tissue lateral film of nasopharynx and X-ray of paranasal sinuses, base of skull.
- **CT scan of head with contrast enhancement** is now the IOC. It shows extent, bony destruction or displacements and anterior bowing of the posterior wall of maxilla due to tumor enlarging in pterygopalatine fossa (called as *antral sign/Holman miller sign*) which is pathognomic of angiofibroma.
- MRI is done to view the soft tissue extension and is complementary to CT scan.
- Carotid angiography—Shows extent of the tumor, its vascularity and feeding vessel
- Biopsy is **contraindicated**.

Treatment

- **Surgical excision** is treatment of choice.
- **Preoperative embolization and estrogen therapy or cryotherapy or radiotherapy** reduce blood loss in surgery.

Preoperative embolization of the tumor reduces its blood supply and causes less bleeding, if tumor removal is performed within 24–48 hour of embolization before collaterals have time to develop. Preoperative angiography also helps to find any feeders from internal carotid system.

- **Approach:**
 - **Surgical approach of choice** = Midfacial degloving approach to nasopharynx.
 - Transpalatal approach is for **tumor confined to nasopharynx**. (called as Wilson approach)
 - Lateral rhinotomy done for larger tumors involving nasal cavity, paranasal sinuses.
- **Other Approaches:**
 - ♦ Transpalatine + Sublabial (Sardana's approach)
 - ♦ Extended Denker's approach.

- Recurrence is not uncommon after surgery (30–50%).
- Recurrence rates can be reduced by meticulous dissection of sphenopalatine foramen. Recurrences usually become evident within 2–3 years of initial resection.

NOTE

It is not a fast-growing tumor.

Nasopharyngeal Carcinoma

Uncommon in India except in North-East region where people are predominantly of mongoloid origin.

- M/c in southern states of China, Taiwan and Indonesia.
- It is most common tumor of head and neck which give rise to secondaries with occult primary.
- Most common **site** is *fossa of rosenmuller* in the lateral wall of nasopharynx.
- Most common **type** of nasopharyngeal carcinoma—Non keratinising undifferentiated carcinoma followed by keratinising carcinoma.

Etiology

- **Genetic:** It is most common in Southern China.
- **Viral:** *Epstein-Barr virus* has identified in tumor epithelial cells of most undifferentiated and nonkeratinizing squamous cell carcinoma.
- **Environmental:** Burning of incense or wood (polycyclic hydrocarbon); smoking of tobacco and opium; air pollution; nitrosamines from dry salted fish along with vitamin C deficient diet.

Clinical Features

- It usually affects **males**. The tumor occurs at much younger age than other cancers; its incidence begins to rise after 2nd decade and peaks by 5th decade.
- **Most common manifestation is upper neck swelling** due to cervical lymphadenopathy since nasopharynx is richly supplied by lymphatics.
- Unilateral neck swelling is more common than bilateral swelling
- **Most common lymph node** involved jugulodigastric (upper deep cervical) lymph node.
- **Earliest lymph node** involved is retropharyngeal lymphnode.

Spread of Tumor	Findings
1. Nose and orbit	– Nasal obstruction; epistaxis
2. Eustachian tube	– Serous/suppurative otitis media leading to U/L deafness and tinnitus
3. Parapharyngeal space	– Cranial nerve palsies IX, X, XI, XII; Horner's syndrome; trismus
4. Foramen lacerum and ovale	– Ophthalmic symptoms and facial pain (CN III, IV, V, VI) (Cavernous sinus thrombosis)
5. Retropharyngeal nodes	– Neck pain and stiffness
6. Krause's nodes	– These LN's are situated in the jugular foramen. Their enlargement compresses CN IX, X, and XI and produce jugular foramen syndrome.
7. Distant metastases	– Secondaries in bone (most common) lung, liver

- **Most common cranial nerve palsy** in nasopharyngeal carcinoma is **V cranial nerve** followed by VI nerve whereas M/C multiple cranial nerves involved are IX and X.

Remember

- Presence of **unilateral serous otitis media** in an adult should raise suspicion of nasopharyngeal growth.
- **Trotter's triad:** Seen in Nasopharyngeal cancer. Includes **conductive deafness; ipsilateral tempoparietal neuralgia due to involvement of CN V; palatal paralysis due to CN IX. Also called as sinus of morgagni syndrome**
- Unlike other squamous cell carcinoma, it can metastasize to posterior triangle (level V) in the absence of jugular lymph node involvement.
- **Neck is the M/C:** Site of clinically occult primary cancer of tonsillar fossa, tongue base, pyriform sinus and nasopharynx.

Diagnosis

- Most important is examination of postnasal space by nasopharyngeal mirror or nasopharyngoscope.
- Biopsy of nasopharynx is considered the first necessary investigation for nasopharyngeal canceroma if a suspected lesion is found.
- Imaging modality of choice – MRI with gadolinium and fat suppression.

Treatment

- **Irradiation** is treatment of choice (external beam radiotherapy) on as nasopharyngeal carcinoma is highly radiosensitive.
- In stage I and II only radiotherapy is done. In stage III and IV chemoradiation is the treatment stage.
- Radical neck dissection is required for persistent nodes when primary has been controlled and in postradiation cervical metastasis.

Complications of Radiotherapy

- Xerostomia of radiotherapy (M/c common complication because both major and minor salivary glands are well within the field of irradiation)
- Mucositis, altered taste sensation, dental caries
- Radiation otitis media with effusion, rhinosinusitis
- Radionecrosis of skull base
- Radiation myelitis
- Encephalomyelitic change
- Optic atrophy
- Modern radiotherapy techniques like intensity-modulated radiation therapy (IMRT) have decreased the incidences of these complications.

Lhermitte's Sign

- Uncommon complication
- **Cause:** Due to radiation to the cervical spinal cord
- **Features:** Lightning-like electrical sensation spreading into both arms, down the dorsal spin, and into both legs on neck flexion.

Rhadomyosarcoma

- It is the M/c malignant tumor of nasopharynx in children.
- Orbit is the M/c site of rhadomyosarcoma in the head and neck region.

Nasopharyngeal Chordoma

- It originates from the notochord.

HYPOPHARYNX**ANATOMY**

- Hypopharynx extends from the floor of vallecula to the lower border of the cricoid.
- It has three parts:
 1. Pyriform sinus
 2. Posterior pharyngeal wall
 3. Postcricoid (see adjacent figure)

TUMORS OF HYPOPHARYNX**Hypopharynx Cancer (Fig. 10.1)**

- Most common type of tumor of hypopharynx is – squamous cell carcinoma.⁹

Etiology

- Alcohol
- Tobacco
- Vitamin A deficiency
- Iron deficiency/plummer-vinson syndrome is an important etiology for carcinoma postcricoid.
- Low cholesterol levels.

Feature	CA Pyriform Sinus	CA Postcricoid	CA Posterior Pharyngeal Wall
	Most common of all hypopharyngeal cancer (60%)	2nd most common hypopharyngeal cancer (30%)	Least common (10%)
Age and sex	Mostly males > 40 years	<ul style="list-style-type: none"> • Mostly females • May be seen as early as 20–30 years 	<ul style="list-style-type: none"> • Mostly males > 40
Clinical features	Generally symptomless and diagnosed late		
Presenting symptoms	Pricking/sticking sensation in throat	Progressive dysphagia	Dysphagia, hemoptysis
Presenting sign	Enlarged lymph nodes		Enlarged lymph nodes
Lymphatic spread	Upper deep cervical nodes	Paratracheal lymph nodes (Bilateral)	Retropharyngeal lymph nodes
Treatment of choice	Early growth-radiotherapy	Poor prognosis with both surgery and radiotherapy	Early growths-radiotherapy Later surgery and radiotherapy

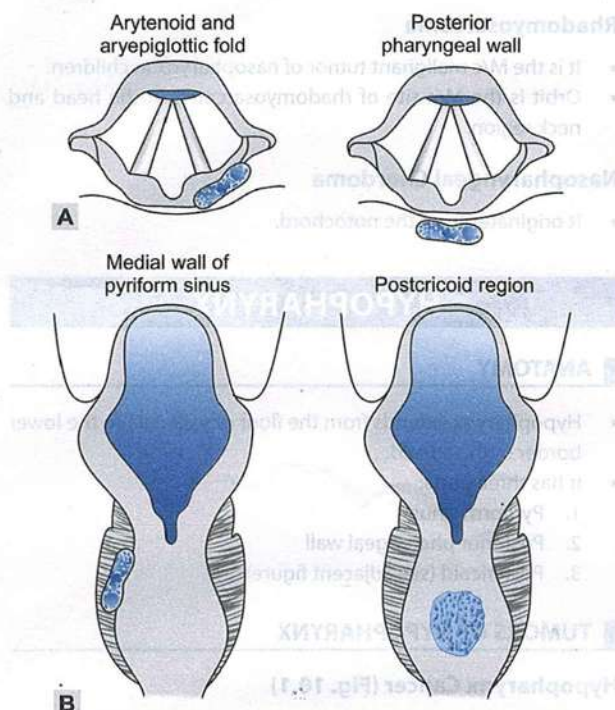


Fig. 10.1: Sites of hypopharyngeal cancer. (A) indirect laryngoscopic; (B) posterior views of laryngopharynx

Courtesy: Textbook of Diseases of Ear, Nose and Throat, Mohan Bansal. Jaypee Brothers, p 450

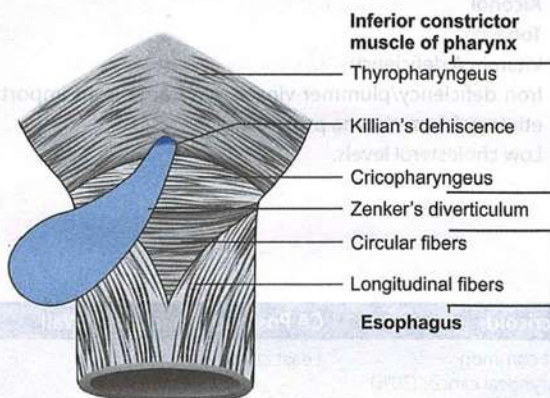


Fig. 10.2: Zenker's diverticulum of hypopharynx herniating through the Killian's dehiscence between the thyropharyngeal and cricopharyngeal parts of the inferior constrictor muscle

Courtesy: Textbook of Diseases of Ear, Nose and Throat, Mohan Bansal. Jaypee Brothers, p 463

BENIGN HYPOPHARYNGEAL LESIONS

Zenker's Diverticulum (Pharyngeal Pouch) (Fig. 10.2)

- It is a posterior pharyngeal pulsion diverticulum through the Killian's dehiscence (area of weakness), between the thyropharyngeus and cricopharyngeus parts of inferior constrictor muscle.

- There is an incoordination between the descending peristaltic wave and circopharyngeus muscle at the upper esophageal sphincter leading to abnormally high intraluminal pressure and mucosal herniation through the weak area of Killian's dehiscence.
- M/c symptom is dysphagia; initially intermittent which becomes progressive later on.
- It is associated with regurgitation of food and cough. Patient may experience halitosis and regurgling sounds in neck.
- The gurgling sensation palpation of neck is known as Boyce sign.
- Diagnosis is by Barium swallow + videofluoroscopy.
- Malignancy can develop in 0.5–1% cases.

Treatment

- Endoscopic stapling of the diverticulo esophageal septum (Earlier excision of diverticulum with cricopharyngeal myotomy was considered to be the treatment of choice)
- In patients not fit for major procedures Dohlman's surgery (Endoscopic cautery of diverticulo esophageal septum) may suffice

NOTE

Zenker's Diverticulum is not a true diverticulum

- A true diverticulum contains all layers of the esophageal wall while false diverticulum consists primarily of only mucosa and submucosa.
- Zenker's diverticulum is a pulsion diverticulum that arises because elevated intraluminal pressure forces the mucosa and submucosa to herniate through the muscle layer and hence is a false diverticulum.

Plummer-Vinson (Paterson-Brown-Kelly) Syndrome

- Mostly affects females more than 40 years.

Classical features include

- Progressively increasing dysphagia for solids (due to webs in postcricoid region).
- Iron deficiency anemia.
- Glossitis and stomatitis
- Koilonychia (spooning of nails).
- Achlorhydria
- Smooth tongue devoid of papillae.
- Cracked lips and corners of mouth.
- Barium swallow shows web in the postcricoid region due to subepithelial fibrosis in the region.
- 2% cases develop postcricoid carcinoma.

Treatment

- Correction of anemia
- Dilatation of the webbed area by esophageal bougies.

Remember

- In cancer of pyriform fossa:** The referred ear pain is through CN X (superior laryngeal nerve, branch of vagus nerve).
- Laryngeal crepitus:** Post-laryngeal crepitus is present in normal persons and absent in patients with postcricoid malignancy.

QUESTIONS

1. **Most common site of origin of nasopharyngeal angiofibroma:** [AI 00]
 - a. Roof of Nasopharynx
 - b. At sphenopalatine foramen
 - c. Vault of skull
 - d. Lateral wall of nose
2. **Nasopharyngeal angiofibroma is:** [TN 91]
 - a. Benign
 - b. Malignant
 - c. Benign but potentially malignant
 - d. None of the above
3. **A 10 years child has unilateral nasal obstruction epistaxis, swelling over cheek, the diagnosis is:** [AIIMS 99]
 - a. Nasal polyp
 - b. Nasopharyngeal carcinoma
 - c. Angiofibroma
 - d. Foreign bodies
4. **Chandu a 15-year-aged boy presents with unilateral nasal blockade mass in the cheek and epistaxis; likely diagnosis is:** [AI 01]
 - a. Nasopharyngeal Ca
 - b. Angiofibroma
 - c. Inverted papilloma
 - d. None of the above
5. **In angiofibroma of nasopharynx all are correct except:** [Kolkata 00]
 - a. Common in female
 - b. Most common presentation is epistaxis
 - c. Arises from roof of nasopharynx
 - d. In late cases frog-face deformity occurs
6. **Angiofibroma bleeds excessively because:** [DNB 01]
 - a. It lacks a capsule
 - b. Vessels lack a contractile component
 - c. It has multiple sites of origin
 - d. All of the above
7. **Clinical features of nasopharyngeal angiofibroma are:** [PGI 02]
 - a. 3rd to 4th decades
 - b. Adolescent male
 - c. Epistaxis and nasal obstruction is the cardinal symptom
 - d. Radiotherapy is the Rx of choice
 - e. Arises from posterior nasal cavity
8. **A 14 years boy presented with repeated epistaxis, and a swelling in cheek. Which of these statements may be correct:** [PGI 02]
 - a. Diagnosis is nasopharyngeal angiofibroma
 - b. Contrast CT scan should be done to see the extent
 - c. High propensity to spread via lymphatics
 - d. Arises from roof of nose
 - e. Surgery is therapy of choice
9. **True about juvenile nasopharyngeal angiofibroma:** [PGI June 06]
 - a. Surgery is treatment of choice
 - b. It is malignant tumor
 - c. Incidence in females
 - d. Hormones not used in Rx
 - e. Miller's sign positive
10. **True about nasopharyngeal angiofibroma:** [PGI Dec 03]
 - a. Commonly seen in girls
 - b. Hormonal etiology
 - c. Surgery is treatment of choice
 - d. Radiotherapy can be given
 - e. Recurrence is common
11. **Most appropriate investigation for angiofibroma is:** [AIIMS 97]
 - a. Angiography
 - b. CT scan
 - c. MRI scan
 - d. Plain X-ray
12. **A 2 years child presents with B/L nasal pink masses. Most important investigation prior to undertaking surgery is:** [AI 97]
 - a. CT Scan
 - b. FNAC
 - c. Biopsy
 - d. Ultrasound
13. **A 10-year-old boy presents with nasal obstruction and intermittent profuse epistaxis. He has a firm pinkish mass in the nasopharynx. All of the following investigations are done in this case except:** [UPSC 98]
 - a. X-ray base of skull
 - b. Carotid angiography
 - c. CT scan
 - d. Biopsy
14. **IOC for angiofibroma is:**
 - a. CT scan
 - b. MRI
 - c. Angiography
 - d. Plain X-Ray
15. **An 18-year-old boy presented with repeated epistaxis and there was a mass arising from the lateral wall of his nose extending into the nasopharynx. It was decided to operate him. All of the following are true regarding his management except:** [AIIMS 02]
 - a. Requires adequate amount of blood to be transfused
 - b. A lateral rhinotomy approach may be used
 - c. Transpalatal approach used
 - d. Transmaxillary approach
16. **Treatment of choice for angiofibroma:** [RJ 02]
 - a. Surgery
 - b. Radiotherapy
 - c. Both
 - d. Chemotherapy
17. **A 9 years boy presents with nasal obstruction, proptosis, recurrent epistaxis from 3-4 years. Management includes:** [PGI Nov 10]
 - a. Routine radiological investigations
 - b. Embolization alone should be done
 - c. Surgery is treatment of choice
 - d. Embolization followed by surgery
 - e. Conservative management is sufficient
18. **Radiotherapy is used in treatment of angiofibroma when it involves:** [MP 04]
 - a. Cheek
 - b. Orbit
 - c. Middle cranial fossa
 - d. Cavernous sinus
19. **Most common site for nasopharyngeal carcinoma:** [AIIMS 97; MP 02]
 - a. Nasal septum
 - b. Fossa of rosenmuller
 - c. Vault of nasopharynx
 - d. Anterosuperior wall
20. **Nasopharyngeal Ca involve:** [PGI 02]
 - a. Nasal cavity
 - b. Oropharynx
 - c. Oral cavity
 - d. Tympanic cavity
 - e. Orbit

EXPLANATIONS AND REFERENCES

1. **Ans. is b i.e. at Sphenopalatine foramen**

2. **Ans. is a i.e. Benign**

Ref. Dhingra 5th/ed p 261, 6th/ed p 246; Scott-Brown's 7th/ed Vol 2 p 2437; Mohan Bansal p 437

- Nasopharyngeal fibroma is the **most common benign tumor of nasopharynx**.
- Most common site is posterior part of nasal cavity close to the margin of Sphenopalatine foramen.
- Though it is a benign tumor, it is locally invasive and destroys the adjoining structures.
- Juvenile Angiofibroma is uncommon, benign and extremely vascular tumor that arises in the tissues within the sphenopalatine foramen." – Scott-Brown's 7th/ed Vol 2 p 2437

3. **Ans. is c i.e. Angiofibroma**

4. **Ans. is b i.e. Angiofibroma**

Ref. Dhingra 5th/ed p 261, 6th/ed p 246; Scott-Brown's 7th/ed Vol 2 p 2437; Mohan Bansal p 437

This is Typical Presentation of Nasopharyngeal Fibroma/Angiofibroma

- Nasopharyngeal fibroma is *most common* benign tumor of nasopharynx.
- Most common **site** is posterior part of nasal cavity close to the **margin of sphenopalatine foramen**.
- Sex** : Seen almost exclusively in males (*testosterone dependent*).
- Age** : 10–20 years (2nd decade).
- Clinical features**:
 - Most common symptom is *profuse and recurrent epistaxis*
 - Progressive nasal obstruction
 - Denasal speech
 - Conductive hearing loss and serous otitis media
 - Mass in nasopharynx
 - Broadening of nasal bridge
 - Proptosis
 - Frog-face deformity
 - Swelling of cheek
 - Involvement of *cranial nerves II, III, IV, VI*.

So friends, remember—If the Question says a boy with age 10–20 years presents with swelling of cheek and recurrent epistaxis – Do not think of anything else but – 'Nasopharyngeal fibroma'

5. **Ans. is a i.e. Common in female**

Ref. Read below

Let us see each option separately here:

Option	Correct/Incorrect	Reference	Explanation
Option a = Common in female	Incorrect	Dhingra 5th/ed p 261, 6th/ed, p 246; Scott-Brown's 7th/ed Vol 2 p 2437	It is seen almost exclusively in male
Option b = M/c presentation is epistaxis	Correct	Dhingra 5th/ed p 261, 6th/ed, p 246; Scott-Brown's 7th/ed Vol 2 p 2438	Profuse and recurrent epistaxis is the M/c presentation
Option c = Arises from roof of nasopharynx	Partly correct	Dhingra 5th/ed p 261, 6th/ed, p 246	This statement is partly correct as earlier it was thought to arise from roof of nasopharynx or anterior wall of sphenoid. But now it is believed to arise from posterior part of nasal cavity close to sphenopalatine foramen.
Option d	Correct	Dhingra 5th/ed p 262, 6th/ed, p 246	In later stages, it can lead to broadening of nasal bridge, proptosis, i.e. frog-like deformity.
In late cases frog-like deformity seen			

S/B = Scott-Brown 7th/ed

Thus option a, i.e. Common in females is absolutely incorrect and the option of choice here.

6. Ans. is b i.e. Vessels lack a contracture component

Ref. Dhingra 5th/ed p 261

Angiofibroma as the name implies is made of vascular and fibrous tissues in varying ratios "Mostly the vessels are just endothelium lined spaces with no muscle coat. This accounts for the severe bleeding as the vessels lose the ability to contract, and also, bleeding cannot be controlled by application of adrenaline."

– Dhingra 5th/ed p 261, 6th/ed p 246

7. Ans. is b, c and e i.e. Adolescent male; Epistaxis and nasal obstruction is the cardinal symptom and arises from posterior nasal cavity.

Ref. Dhingra 5th/ed pp 261-3, 6th/ed p 246; Mohan Bansal p 437-8

Nasopharyngeal Angiofibroma

- Most commonly seen in adolescent males (i.e. option b is correct)
- Most common age of presentation = second decade of life (option a incorrect)
- Arises from posterior nasal cavity close to sphenopalatine foramen (option e is correct)
- Epistaxis and nasal obstruction are the most common presentation. (correct)
- Recurrent severe epistaxis accompanied by progressive nasal obstruction are the classical symptoms of juvenile angiofibromas at the time of presentation." – Scott-Brown 7th/ed Vol 2 p 2438
- TOC is surgical excision (i.e. option d is incorrect)

8. Ans. is a, b and e i.e. Diagnosis is nasopharyngeal angiofibroma; Contrast CT scan should be done to see the extent; and Surgery is therapy of choice

9. Ans. is a and e i.e. Surgery is treatment of choice; and Miller's sign positive

10. Ans. b, c, d and e i.e. Hormonal etiology; Surgery is treatment of choice; Radiotherapy can be given; and Recurrence is common

Ref. Dhingra 5th/ed pp 261-3, 6th/ed p 246–9

Boy of 14 years presenting with repeated epistaxis with swelling in cheek points toward angiofibroma

- It is a benign tumor, so it does not spread by lymphatics but is locally invasive.
- Exclusively seen in males between 10–20 years (i.e. testosterone dependent).
- It arises from posterior part of nasal cavity (near sphenopalatine foramen).
- Contrast CT is the investigation of choice as the extent of the tumor can be seen.
- On CT scan (which is the IOC) pathognomic finding is anterior bowing of the posterior wall of the maxillary sinus, called the **Holman miller sign/Antral sign**.
- Surgery is the treatment of choice.
- Hormonal therapy with estrogen reduces the vascularity of tumor and helps in successful resection.
- Radiotherapy can also be used especially for intracranial extension and in case of recurrences

[Dhingra 5th/ed p 263], 6th/ed p, 249 Table 49.2

- Recurrence is the most common complication

- "Recurrence is by far the most common complication encountered and is reported in 25% patients"

[Scott-Brown's 7th/ed, Vol 2, p 2442]

11. Ans. is b i.e. CT scan

12. Ans. a i.e. CT scan

13. Ans. is d i.e. Biopsy

14. Ans. is a i.e. CT scan

Ref. Dhingra 5th/ed p 262, 6th/ed p 252; Mohan Bansal p 437

Diagnosis of Nasopharyngeal Fibroma

- **CT scan of head with contrast enhancement is now the IOC.** It shows the extent, bony destruction or displacements and anterior bowing of the posterior wall of maxillary sinus (called as *antral sign*) which is pathognomic of angiofibroma.
- MRI is complimentary to CT and is done especially to see the soft tissue extension.
- Carotid **angiography** shows the vascularity and feeding vessels. It is done when embolization is planned before operation.
- Biopsy is **contraindicated**.

15. Ans. is d i.e. Transmaxillary approach

16. Ans. a i.e. Surgery

17. Ans. is a, c and e i.e. Routine radiological investigations; Surgery is the IOC; and Embolization followed by surgery

Ref. Dhingra 5th/ed pp 262, 263, 6th/ed p 252

18 years male

+

Repeated epistaxis

+

Mass arising from the lateral wall of nose and extending to nasopharynx

Indicates the patient has nasopharyngeal angiofibroma

Treatment

- Surgical excision is the treatment of choice.
- Before surgery at least 2–3 liters of blood should be given.
- Preoperative embolization and estrogen therapy or cryotherapy reduce blood loss in surgery.

—Tuli 1st/ed p 253

—Dhingra 6th/ed p 249

Approach

- **Transpalatine approach**—done for tumor confined to nasopharynx.
- **Lateral rhinotomy approach**—done for large tumors involving, nasal cavity, paranasal sinuses and orbit. Nowadays, it is the best approach.

Other Approaches

- Sardana's approach – Transpalatine + Sublabial.
- Transhyoid and transmandibular approach.
- Transzygomatic approach.

ALSO KNOW

Other modalities of treatment in nasopharyngeal angiofibroma.

Radiotherapy	Hormonal	Chemotherapy
<ul style="list-style-type: none"> • For intracranial extension of tumor when it derives its blood supply from Internal carotid artery • Recurrent angiofibromas are treated with intensity modulated radiotherapy 	<ul style="list-style-type: none"> • Since tumor occurs in young males testosterone has been implicated for its growth. Antitestosterone are being tried for management • Diethylstilbestrol with Flutamide 	<ul style="list-style-type: none"> • Doxorubicin, vincristine and dacarbazine are used for residual with recurrent lesions

18. Ans. is c i.e. Middle cranial fossa Ref. Dhingra 6th/ed p 249

Radiotherapy is useful only for advanced cases of the tumor.

Extent of juvenile nasopharyngeal angiofibroma and surgical approach

Location	Approach
A. Nose and nasopharynx	Transpalatal or endoscopic
B. Nose, nasopharynx maxillary antrum and pterygopalatine fossa	Lateral rhinotomy with medial maxillectomy OR Endoscopic OR Le Fort 1
C. As in B + Infratemporal fossa	Extended lateral rhinotomy OR Infratemporal fossa approach OR Maxillary swing approach
D. As in C + Check extension	Extended lateral rhinotomy
E. As in B + C + Intracranial	Combined intracranial and extracranial approach (craniotomy + one of the extracranial approaches) OR Radiation if intracranial part is inaccessible
F. Residual or recurrent disease (extracranial)	Observation OR repeat surgery or radiation if inaccessible
G. Intracranial residual or recurrent	Stereotactic radiation (X or gamma knife)

19. Ans. is b i.e. Fossa of Rosenmuller

Ref. Dhingra 5th/ed p 264, 6th/ed p 251; Mohan Bansal p 439

Nasopharyngeal Carcinoma

- Nasopharyngeal carcinoma most commonly arises from **fossa of rosenmuller in lateral wall of nasopharynx**.
- It is mostly seen in men between **5th–7th decade**.

- Most common **type** of nasopharyngeal carcinoma is **Non keratinising undifferentiated carcinoma followed by squamous cell carcinoma**
- Most common **manifestation** is **cervical lymphadenopathy** because of rich lymphatic network.
- Most common **cranial nerve palsy** in nasopharyngeal carcinoma is **VI cranial nerve**.
- Treatment of choice is **irradiation**.

20. Ans. is a, d and e i.e. Nasal cavity; Tympanic cavity; and Orbit

Ref. Dhingra 5th/ed p 265, 6th/ed p 250

Nasopharyngeal cancer arises from fossa of Rosenmuller.⁹ In the lateral wall of nasopharynx and can spread to various sites.

Routes of Spread and Clinical Features of Nasopharyngeal Carcinoma (Fig. 10.3)

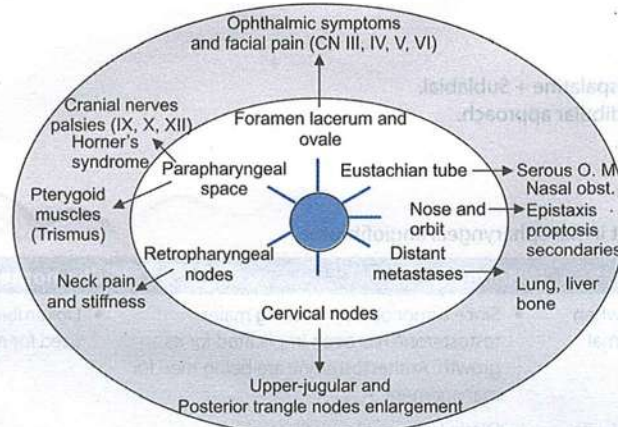


Fig. 10.3: Routes of spread and clinical features of nasopharyngeal cancer

21. Ans. is a i.e. EBV

Ref. Dhingra 5th/ed p 264, 6th/ed p 250; Mohan Bansal p 439

Etiology of Nasopharyngeal Carcinoma

- **Genetic:** It is most common in China.
- **Viral:** Epstein-Barr virus is closely associated with nasopharyngeal cancer. Epstein-Barr virus has identified in tumor epithelial cells (not lymphocytes) of most undifferentiated and nonkeratinizing squamous cell carcinoma.
- **Environmental:** Burning of incense or wood (polycyclic hydrocarbon); smoking of tobacco and opium; air pollution; nitrosamines from dry salted fish along with vitamin C deficient diet have been linked to the etiology of nasopharyngeal cancer.

22. Ans. is d i.e. Cervical lymphadenopathy

Ref. Dhingra 5th/ed p 264, 6th/ed p 252; Scott-Brown's 7th/ed Vol 2 p 2451

"The most common complain at presentation is the presence of an upper neck swelling. Unilateral neck swelling is much more common although bilateral metastasis also occur." – Scott-Brown's 7th/ed Vol 2 p 2457

23. Ans. is a i.e. Nasopharyngeal carcinoma

Ref. Dhingra 5th/ed pp 261,262, 6th/ed p 251–2

Let us see the complains and examination findings one by one.

- A 70 years male is presenting with neck nodes (which could either be due to infection or due to malignancy, but malignancy is more consistent with the age).
- **On examination**—ear shows coincidental findings viz. Tympanic membrane appears dull and audiometry shows curve B which means fluid is present in middle ear (Ruling out **option "d"** i.e. SNHL).

Fluid in Middle Ear can be Seen in

ASOM	CSOM	Serous otitis media
<ul style="list-style-type: none"> • Tympanic membrane appears red, bulging in early stages and later in the stage of resolution usually a small perforation is seen • Also here patient will have fever and excruciating earache (which is the chief complain) 	<ul style="list-style-type: none"> • On examination either cholesteatoma granulation or perforation will be seen • Neck nodes will not be the presenting So, CSOM ruled out • So, ASOM ruled out 	<ul style="list-style-type: none"> • Tympanic membrane appears dull and audiometry shows B type of curve. So, serous otitis media is a possibility

Serous otitis media/Glue ear:

It is mostly seen in school-going children. If serous otitis media is seen in adults (that too males) – always think of **Nasopharyngeal carcinoma**.

"Presence of unilateral serous otitis media in an adult should raise the suspicion of a nasopharyngeal growth"

—Dhingra 5th/ed p 264, 6th/ed p 251

The diagnosis further consolidated by -

- Age of patient = 70 years (most common age for nasopharyngeal carcinoma = 5th – 7th decade).
- Sex of patient = male (nasopharyngeal carcinoma is most common in males).
- Presenting symptom = Presence of neck nodes.
- (It is the most common presenting symptom of nasopharyngeal carcinoma).

Presence of unilateral serous otitis media in an adult should always raise suspicion of nasopharyngeal growth.

24. Ans. is c i.e Serous effusion

Ref. Dhingra 5th/ed p 264, 6th/ed p 251; Scott-Brown's 7th/ed Vol 2 p 2458

Nasopharyngeal carcinoma spreads to Eustachian tube, blocks it and causes Serous Otitis Media which in turn causes Conductive hearing loss.

25. Ans. is a i.e. Nasopharyngeal Carcinoma Metastasis

Ref. Dhingra 5th/ed p 264, 6th/ed p 251; Mohan Bansal p 439

Nasopharyngeal carcinoma can cause Horner's syndrome due to involvement of cervical sympathetic chain.

26. Ans. is c i.e. Nasopharynx

Ref. Dhingra 5th/ed p 264; Mohan Bansal p 439

27. Ans. is d i.e. Seizures**28. Ans. is a, c and d i.e. Conductive deafness; Involvement of CN X; and Palatal Paralysis**

Ref. Dhingra 6th/ed p 251; Mohan Bansal p 439

Trotter's triad – seen in nasopharyngeal carcinoma is characterised by (Fig. 10.4):

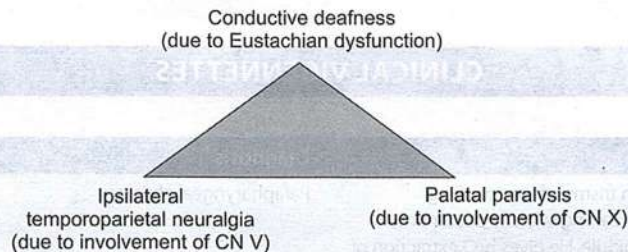


Fig. 10.4: Trotter triad

29. Ans. is b, c, d and e i.e. Unilateral serous otitis media is seen; TOC radiotherapy; Metastased to cervical LN; and EBV is responsible

Ref. Dhingra 5th/ed pp 264-6, 6th/ed p 250-251

- Epstein-Barr virus is associated with etiology of nasopharyngeal carcinoma (i.e. option e is correct)
- Most common presentation – Cervical lymphadenopathy (i.e. option d is correct)
- Most common nerve involved – VI nerve —Ref. Current Otolaryngology 2nd/ed p 365; Mohan Bansal p 439
- Nasopharyngeal carcinoma leads to obstruction of Eustachian tube and serous otitis media.
- Presence of Unilateral Serous otitis media in an adult should raise suspicion of nasopharyngeal growth.
- TOC is radiotherapy because of the difficulty in obtaining adequate surgical margins.

30. Ans. is d i.e. Adenocarcinoma is usual

Ref. Dhingra 5th/ed pp 264, 265, 6th/ed p 250-251

NOTE

Most common histological type of nasopharyngeal carcinoma – **Squamous cell carcinoma**.

Rest of the options have been explained earlier.

31. Ans. is d i.e. Nasopharyngectomy and lymph node dissection is mainstay of treatment

Ref. Dhingra 5th/ed pp 264-6, 6th/ed p 250-252

In nasopharyngeal carcinoma, radiotherapy is the mainstay of treatment. Radical neck dissection is required for persistent nodes when primary has been controlled.

For details on nasopharyngeal carcinoma, kindly see preceding text.

32. Ans. is a i.e. Radiotherapy

Ref. Dhingra 5th/ed p 266, 6th/ed p 252; Mohan Bansal p 439-40

- TOC for nasopharyngeal fibroma – Surgery
- TOC for nasopharyngeal carcinoma – Radiation
- TOC for advanced carcinoma – Chemotherapy + Radiation

33. Ans is c, i.e. Web is M/C in post cricoid region

Ref. Dhingra 5th/ed p 351, 6th/ed p 343; Mohan Bansal p 461

In Plummer-Vinson syndrome patients present with dysphagia due to web in the postcricoid region and due to incoordinated swallowing secondary to esophageal spasm
For more details see preceding text

34. Ans. is c i.e. Zenker's Diverticulum

Ref. Dhingra 5th/ed pp 289-90, 6th/ed p 274

- In Zenker's diverticulum patients present with intermittent dysphagia + regurgitation of food + foul smelling breath.
- Later on the dysphagia becomes progressive.
- In case of achalasia cardia patients present with dysphagia to liquids initially which later on progresses to involve solids also.
- In trachea esophageal fistula patients present with cough during meals causing difficulty in eating.

35. Ans. is d i.e. Outpouching of anterior pharyngeal wall above cricopharyngeus muscle

Ref. Dhingra 5th/ed pp 289-90, 6th/ed p 274

Zenker's diverticulum is an acquired **posterior pharyngeal pulsion diverticulum** in which only the mucosa and submucosa herniate through the Killian's dehiscence. It is a false diverticulum. IOC is barium study.

36. Ans. is b i.e. Angiofibroma

Ref. Dhingra 6th/ed p 246

Already explained

37. Ans. is a i.e. biopsy for diagnosis

Ref. Dhingra 6th/ed p 247

As discussed earlier biopsy is never done for diagnosis of nasopharyngeal fibroma as it is extremely vascular tumor and is attended by profuse bleeding.

38. Ans. is d i.e. Cervical lymphadenopathy

Ref. Dhingra 6th/ed p 252

Cervical lymphadenopathy is the M/C presentation of nasopharyngeal carcinoma. It may be the only manifestation in some cases.

39. Ans. is b i.e. Diplopia

Ref. Dhingra 6th/ed p 251

Nasopharyngeal can cause conductive deafness (eustachian tube blockage,) ipsilateral temporoparietal neuralgia (involvement of CN V) and palatal paralysis (CN X) collectively called Trotters triad.

40. Ans. is a i.e. Nasopharyngeal carcinoma

sRef. Dhingra p 250-2

Already explained

CLINICAL VIGENNETTES

Clinical presentation	Diagnosis
<ul style="list-style-type: none"> • A 35-year-old male, presented with trismus, fever, swelling pushing the tonsil medially and spreading laterally posterior to sternocleidomastoid toward the middle. He gives h/O extraction of 3rd molar tooth due to dental caries, a few days back. 	Parapharyngeal abscess
<ul style="list-style-type: none"> • A 14-year-old boy presented with repeated epistaxis and swelling in cheek 	Nasal angiofibroma
<ul style="list-style-type: none"> • A 70-year-old male presents with neck nodes. Examination reveals dull tympanic membrane, deafness and tinnitus on evaluation audiometry shows curve B. 	Nasopharyngeal carcinoma
<ul style="list-style-type: none"> • A 70-year-old male presents with regurgitation, no diurnal cough, dysphagia and has gurgling sensation on palpating neck. 	Zenker's diverticulum
<ul style="list-style-type: none"> • A pale emaciated 45-year-old female complains of dysphagia for both solid and liquid with absence of laryngeal crepitus and B/L pooling of saliva 	Postcricoid carcinoma
<ul style="list-style-type: none"> • A middle-aged female complains of foreign body sensation in throat. No organic lesion could be detected. 	Globus pharyngeus, (Functional disorder where patient complains of lump in throat, no true dysphagia on clinical examination) Everything is normal. T/t= Reassurance
<ul style="list-style-type: none"> • Dhingra 5th/ed, p 353 	

CHAPTER

11

Pharynx Hot Topics

SNORING

It is an undesirable disturbing sound that occurs during sleep. It is estimated that 25% of adult males and 15% of adult females snore. Its prevalence increase with age.s

Definition of Terms

- **Sleep apnea:** It is cessation of breathing that lasts for 10 s or more during sleep. Less than five such episodes is normal.
- **Apnea index:** It is number of episodes of apnea in 1 hour
- **Hypopnoea:** It is reduction of airflow. Some define it as drop of 50% of airflow from the base line associated with an EFG defined arousal or 4% drop in oxygen saturation.
- **Respiratory disturbance index (RDI).** Also called **apnea-hypopnoea index.** It is the number of apnea and hypopnoea events per hour. Normally RDI is less than five. Based on RDI, severity of apnea has been classified as mild, 5–14; moderate, 15–29; and severe ≥ 30 .
- **Arousal index.** It is number of arousal events in 1 h. Less than four is normal.
- **Sleep efficiency.** Minutes of sleep divided by minutes in bed after lights are turned off.
- **Multiple sleep latency test or nap study.** Patient is given four or five scheduled naps usually in the daytime. Latency period from wakefulness to the onset of sleep and rolling eye movement (REM) sleep are measured. It is performed when narcolepsy is suspected or daytime sleepiness is evaluated objectively.

Etiology

- In children most common cause is adenotonsillar hypertrophy.
- In adults see Table 11.1

Table 11.1: Causes of snoring in adults

Site	Cause
Nose (Nasopharynx)	<ul style="list-style-type: none"> • Septal deviation • Nasal hypertrophy • Nasal polyp • Nasal tumor
Oral cavity (oropharynx)	<ul style="list-style-type: none"> • Elongated soft palate/uvula • Large base of tongue • Tongue tumor
Larynx (laryngopharynx)	<ul style="list-style-type: none"> • Laryngeal stenosis • Omega shaped epiglottis
Others	<ul style="list-style-type: none"> • Obesity • Use of alcohol, sedatives, hypnotics

Sites of Snoring

Site of snoring may be soft palate, tonsillar pillars or hypopharynx.

Symptomatology

- Excessive loud snoring is socially disruptive and forms snoring-spouse syndrome and is the cause of marital discord sometime leading to divorce.
- In addition, a snorer with obstructive sleep apnea may manifest with:
 - Excessive daytime sleepiness (measured an epworth sleepiness scale)
 - Morning headaches
 - General fatiguesse
 - Memory loss
 - Irritability and depression
 - Decreased libido
 - Increased risk of road accidents

Treatment

- Avoidance of alcohol, sedatives and hypnotics.
- Reduction of weight.

- Sleeping on the side rather than on the back.
- Removal of obstructing lesion in nose, nasopharynx, oral cavity, hypopharynx and larynx. Radiofrequency has been used for volumetric reduction of tissues of turbinates, soft palate and base of tongue.
- **Performing uvulopalatoplasty (UPP) surgically with cold knife or assisted with radiofrequency (RAUP) or laser (LAUP).**

SLEEP APNEA

Apnea means no breathing at all. There is no movement of air at the level of nose and mouth. It is of three types:

1. **Obstructive:** There is collapse of the upper airway resulting in cessation of airflow. Other factors may be obstructive conditions of nose, nasopharynx, oral cavity and oropharynx, base of tongue or larynx.
2. **Central:** Airways are patent but brain fails to signal the muscles to breathe.
3. **Mixed:** It is combination of both types.

Pathophysiology of Obstructive Sleep Apnea (OSA)

Apnea during sleep causes hypoxia and retention of carbon dioxide which leads to pulmonary constriction leading to congestive heart failure, bradycardia and cardiac hypoxia leading to left heart failure, and cardiac arrhythmias sometimes leading to sudden death. During sleep apnea, there are frequent arousals which cause sleep fragmentation, daytime sleepiness and other manifestations.

Treatment

Non Surgical Treatment

- Change in lifestyle.
- **Positional therapy:** Patient should sleep on the side as supine position may cause obstructive apnea. A rubber ball can be fixed to the back of shirt to prevent adopting supine position.
- **Intraoral devices:** They alter the position of mandible or tongue to open the airway and relieve snoring and sleep apnea. Mandible advancement device (MAD) keeps the mandible forward while tongue retaining device (TRD) keeps tongue in anterior position during sleep. They help improve or abolish snoring. MAD is also useful in retrognathic patients.
- **CPAP (continuous positive airway pressure):** It provides pneumatic splint to airway and increase its calibre. Optimum airway pressure for device to open the airway is determined during sleep study and is usually kept at 5–20 cm H₂O. About 40% of patients find the use of CPAP device cumbersome to carry with them when travelling and thus stop using it. When CPAP is not tolerated, a **BIPAP** (bilevel positive airway pressure) device is used. It delivers positive pressure at two fixed levels—a higher inspiratory and a lower expiratory pressure. Now an auto-titrating PAP (APAP) is also available which continuously adjusts the pressure.

Surgical Treatment

It is indicated for failed or noncompliant medical therapy.

Permanent tracheostomy is the "gold standard" of treatment but it is not accepted socially and has complications of its own. It is usually not a preferred option by patients.

Surgical procedures used in OSA include:

- **Tonsillectomy and/or adenoidectomy.**
- **Nasal surgery:** Nasal obstruction may be the primary or the aggravating factor for OSA. Septoplasty to correct deviated nasal septum, removal of nasal polyps and reduction of turbinate size help to relieve nasal obstruction.
- **Oropharyngeal surgery: Uvulopalatoplasty (UPP) is the most common procedure performed for snoring and OSA. It is 80% effective in snoring but OSA is relieved only in 50%.**
- **Advancement genioplasty with hyoid suspension:** It is done in patients where base of tongue also contributes to OSA. Patients with retrognathia and micrognathia are also the candidates.
- **Tongue base radiofrequency:** Radiofrequency (RF) is used in five to six sittings to reduce the size of tongue.
- **Maxillomandibular advancement osteotomy:** Osteotomies are performed on mandibular ramus and maxilla. Osteotomy of the maxilla is like a Le Fort I procedure.

Important Clinical points to Remember

- Investigation of choice for dysphagia = Barium videofluoroscopy
- Dysphagia to solids is generally due to mechanical obstruction (e.g. tumors) → endoscopy should be done
- Dysphagia to liquids is generally due to motility disorders → esophageal manometry should be done

RIGID ESOPHAGOSCOPY

- Anesthesia – General Anaesthesia
- Position – Boyce position (Similar to direct laryngoscopy)
- C/I of rigid esophagoscopy – cervical spine injury, Aneurysm of arch of aorta, Recent MI, Trismus
In most of these cases new generations of flexible gastroscopes can be used successfully.
- M/C complication of rigid esophagoscopy – Perforation
- M/C site for perforation – Just above cricopharyngeal
- **Q.1. All are true about esophagoscopy except:** [PGI 06]
 - a. Compress the posterior part of tongue
 - b. Tip of the esophagoscope lies in pyriform fossa
 - c. Should be inserted from right side
 - d. Epiglottis should be lifted up
 - e. Incisors must act as fulcrum

Ans. is e i.e. Incisors must act as fulcrum

Ref. Dhingra 5th/ed pp 436,437

Explanation

Esophagoscopy Procedure

- Hold the scope in a pen-like fashion and introduce it into the mouth from the **right side of tongue** and then toward the midline.

- Never rotate the endoscope on the fulcrum of the upper teeth, rather it should be lifted up.
- Lift up the epiglottis after passing through the tongue base to identify the arytenoids. Tip of the scope should be introduced into the pyriform sinuses on either to inspect them before passing behind the arytenoids.
- Open up the cricopharyngeal sphincter by slow sustained pressure, never apply force on the sphincter for it can result in undue spasm and perforation
- Once the esophagus is entered keep the lumen in constant view
- Lower the head of the patient while negotiating the aortic and bronchial constrictor

- Move the head slightly to the right while passing the cardia. (Identified by redder and more velvety mucosa)

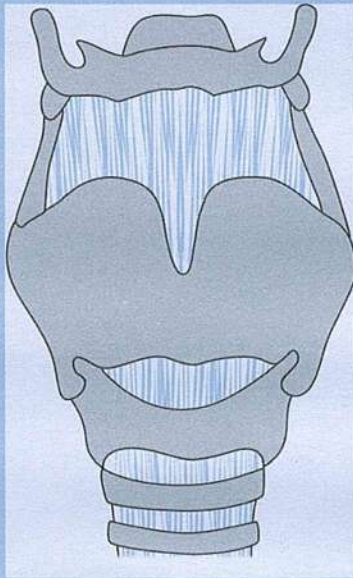
NOTE

A rigid bronchoscope can be used for performing esophagoscopy but not vice versa.

Esophageal Perforation

- **Features:** Fever after esophagoscopy.
- **Diagnosis:** Swallow study confirms the diagnosis.
- **Treatment:** Early intervention to repair is most desirable. Drain the perforation to prevent complications.

SECTION IV



LARYNX

12. Anatomy of Larynx, Congenital Lesions of Larynx and Stridor
13. Acute and Chronic Inflammation of Larynx, Voice and Speech Disorders
14. Vocal Cord Paralysis
15. Tumor of Larynx

CHAPTER

12

Anatomy of Larynx, Congenital Lesions of Larynx and Stridor

- Larynx develops from tracheobronchial groove, a midline diverticulum of foregut.
- Development starts in the 4th week of embryonic life.
- Most of the anatomical characteristics of larynx develop by the 3rd month of fetal life.
- Angle of the thyroid cartilage at birth:
 - Males : 110 degree
 - Females : 120 degree
- The angle remains till puberty.
- Level of the larynx:
 - At birth : till C3
 - By 5 years : till C6
 - 15-20 years : C7
- Descent of the larynx continues throughout life.
- Vocal cord length:
 - Infants : 6-8 mm
 - Adult males : 17-23 mm
 - Adult females : 12-17 mm

EXTERNAL FEATURES OF LARYNX

Laryngeal Cartilages

- Laryngeal cartilages are 9 in number and derived from 4th, 5th and 6th arches.

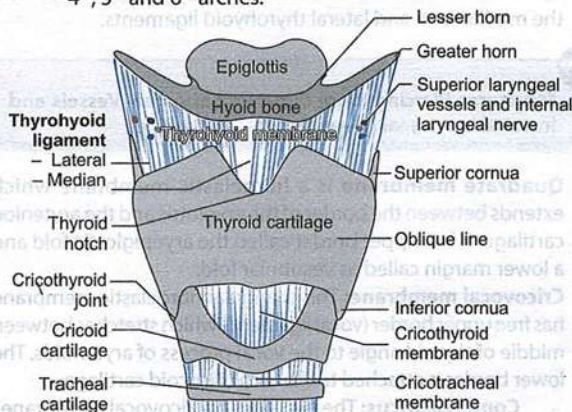


Fig. 12.1: Laryngeal framework—anterior view

Courtesy: Textbook of Diseases of Ear, Nose and Throat, Mohan Bansal. Jaypee Brothers, p 62.

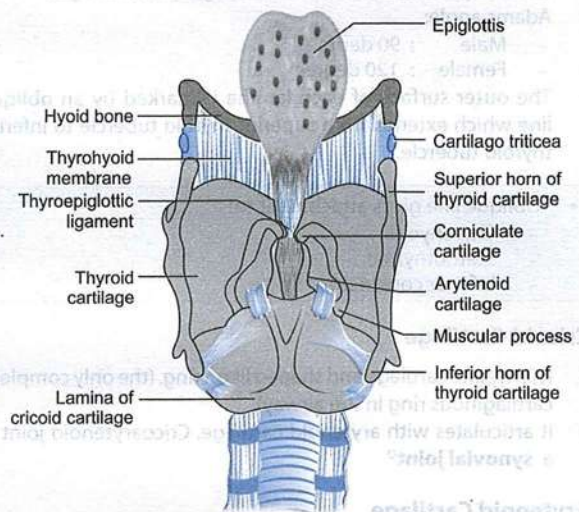


Fig. 12.2: Posterior view of larynx showing cartilages and ligaments

Courtesy: Textbook of Diseases of Ear, Nose and Throat, Mohan Bansal. Jaypee Brothers, p 62.

- Larynx has 9 cartilages of which 3 are paired and 3 are unpaired:

Paired	Unpaired
- Arytenoid	- Thyroid
- Corniculate	- Cricoid
- Cuneiform	- Epiglottis

- Ossification of the various laryngeal cartilages:

Hyoid	- 2 years
Thyroid and Cricoid	- Early 20s
Arytenoid	- Late 30s

- **Vocal process** DO NOT ossify
- No ossification occurs in the cuneiform or the corniculate cartilage.

Histology of Laryngeal Cartilages

Hyaline cartilages (ossify) Elastic cartilages (Do not ossify)

- | | |
|---|--|
| <ul style="list-style-type: none"> • Thyroid cartilages • Cricoid cartilages • Basal part of arytenoid cartilage | <ul style="list-style-type: none"> All the other cartilages |
|---|--|

NOTE

Other example of elastic cartilage is auricular cartilage

Characteristics of Individual Laryngeal Cartilages

Thyroid Cartilage

- Largest cartilage, hyaline in nature.
- It is V shaped and consists of right and left lamina. Which meet anteriorly in midline and form an angle (Adams angle)
- Adams angle:
 - Male : 90 degree
 - Female : 120 degree
- The outer surface of each lamina is marked by an oblique line which extends from superior thyroid tubercle to inferior thyroid tubercle.

- Oblique line gives attachment to:
 - Thyrohyoid
 - Sternothyroid
 - Inferior constrictor muscle

Cricoid Cartilage

- It is hyaline cartilage and shaped like a ring. (the only complete cartilaginous ring in the airway)
- It articulates with arytenoid cartilage. Cricothyroid joint is a **synovial joint**

Arytenoid Cartilage

- They are 2 small pyramid shaped cartilages. It articulates with cricoid lamina.



- It has a vocal process for : attachment of vocal folds.
- It has muscular process for : attachment of posterior cricoarytenoid and lateral cricothyroid

- Its apex articulates with corniculate cartilage.

Corniculate (Cartilage of Santorini) and Cuneiform (Cartilage of Wrisberg)

- Are fibroelastic cartilages. Corniculate cartilages are conical; cuneiform cartilages are rod shaped.
- Corniculate cartilage articulates through a synovial joint with apices of arytenoids cartilage.

Epiglottis

- It is Fibroelastic cartilage which is leaf shaped in adults and omega shaped in children.

Pre-epiglottic Space:

- Anteriorly: Thyrohyoid membrane and upper part of thyroid cartilage
- Posteriorly: Infrahyoid part of the epiglottis
- Superiorly: Hyoepiglottic ligament

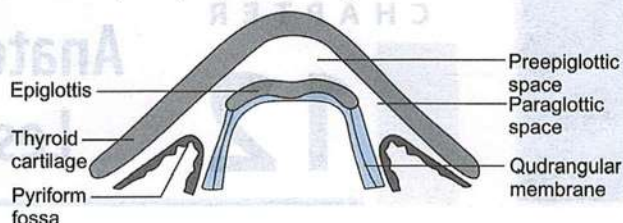


Fig. 12.3: Diagram to show pre-epiglottic and paraepiglottic space

- **Paraglottic Space** is continuous medially with the pre-epiglottic space.

- Boundaries:
- Laterally - Thyroid cartilage
 - Medially - Quadrangular membrane and Conus elasticus
 - Posteriorly - Anterior reflection of pyriform sinus.

Joints of Larynx

Cricothyroid Joint Cricoarytenoid Joint] Synovial Joints



Larynx of infants differ from the adults as:

- It is situated high up (C2-C4) and funnel shaped/conical (Adults - Cylindrical in shape) with narrow epiglottis
- Cartilages are soft and collapse easily on forced inspiration. Epiglottis is omega shaped. It has more of submucosal space
- The narrowest part of infantile larynx is the junction of subglottic larynx with trachea

Membranes of Thyroid

- **Thyrohyoid membrane:** connects the thyroid cartilage to the hyoid bone. Its median and lateral parts are thickened to form the median and lateral thyrohyoid ligaments.



Structures Piercing it are Superior Laryngeal Vessels and Internal Laryngeal Nerve

- **Quadrangle membrane** is a fibroelastic membrane which extends between the border of the epiglottis and the arytenoid cartilage. It has upper border called the aryepiglottic fold and a lower margin called as vestibular fold.
- **Cricovocal membrane:** This triangular fibroelastic membrane has free upper border (vocal ligament), which stretches between middle of thyroid angle to the vocal process of arytenoids. The lower border is attached to the arch of cricoid cartilage.
 - **Conus elasticus:** The two sides of cricovocal membranes form conus elasticus. Subglottic foreign bodies sometimes get impacted in the region of conus elasticus.

- **Cricothyroid membrane:** The anterior part of conus elasticus is thick and forms cricothyroid membrane, which connects thyroid cartilage to cricoid cartilage.



- Any airway obstruction above the vocal cord due to tumor or foreign body can be quickly, easily and effectively bypassed by piercing the cricothyroid membrane (cricothyrotomy). Subglottic foreign bodies sometimes get impacted in the region of conus elasticus.

INTERIOR OF THE LARYNX

Inlet of the larynx

Anteriorly	Bounded on sides	Posteriorly
Free edge of the epiglottis	Aryepiglottic folds	Mucous membrane over the interarytenoid fold

- Cavity of larynx extends from inlet of larynx to the lower border of the cricoid cartilage.
- Within the cavity of larynx, there are 2-folds of mucous membrane on each side. The upper fold is called as **vestibular fold** (false vocal cords) and the lower fold is called as **vocal fold** (True vocal cords).

The space between the right and left vestibular fold is called as **Rima vestibulari** and the space between vocal fold is called as **Rima glottidis**. It is the narrowest part of larynx.



Rima glottidis is the narrowest part of larynx in adults whereas in infants the narrowest part of larynx is subglottic region.

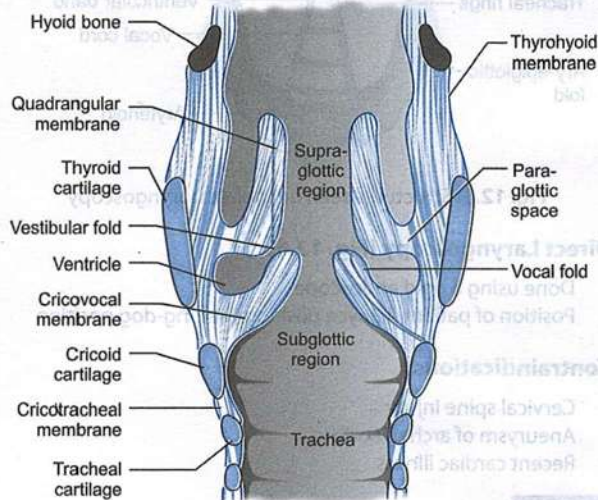


Fig. 12.4: Coronal section of larynx

Courtesy: *Textbook of Diseases of Ear, Nose and Throat*, Mohan Bansal. Jaypee Brothers, p 63.

Vestibular and vocal folds divide the cavity of larynx into 3 parts

- The part above the vestibular fold – **Vestibule of larynx/supraglottis**
- The part between the vestibular and vocal fold – **Sinus of morgagni/ventricle of larynx/glottis**
- The part below the vocal folds – **Infraglottic part**

Clinical Correlation

- Most of the laryngeal foreign bodies are seen in supraglottic region lying above the vocal cords.



The anterior part of sinus of morgagni is prolonged upward as a diverticulum between the vestibular fold and the lamina of thyroid cartilage, this extension is called as the **Sacculus of larynx**. The secretion of mucous glands in the sacculus provide lubrication for vocal cords region.

Clinical Correlation

Laryngo cole: This abnormally enlarged and distended sacculus contains air.

Retention cyst: The obstruction of duct of mucous gland in sacculus can result in retention cyst.

Vocal Folds

- Are twofold like structures which extend from the middle of the angle of the thyroid cartilage to the vocal process of the arytenoids posteriorly.



- **Mucous membrane of larynx:** The anterior surface and upper half of the posterior surface of epiglottis, the upper parts of aryepiglottic fold and the vocal folds are lined by non keratinizing stratified squamous epithelium. Rest of the laryngeal mucous membrane is covered with pseudostratified ciliated columnar epithelium.

Lymphatic drainage of the larynx

- Above the glottis : To upper deep cervical nodes
- Below the glottis : To lower deep cervical node chain through the pre-laryngeal and pretracheal lymph nodes
- Glottis : Lymphatics in vocal cords are very scanty, hence glottic carcinoma rarely shows lymphatic metastasis.

NOTE

Delphian node – Prelaryngeal LN's in the region of thyroid isthmus are called Delphian nodes.

Nerve Supply

- **Superior laryngeal nerve:** arises from the inferior ganglion of vagus and receives a branch from superior cervical sympathetic ganglion. It enters the larynx by piercing the thyrohyoid membrane.

- It divides at the level of greater cornu of hyoid into:
- **Internal laryngeal nerve:**
 - Sensory (It supplies the larynx above the vocal cords i.e. supraglottic area)
 - Secretomotor
- **External laryngeal nerve**—supplies cricothyroid muscle
 - The superior laryngeal nerve ends by piercing the inferior constrictor of pharynx and unites with ascending branch of recurrent laryngeal nerve. This branch is k/a Galen's anastomosis and is purely sensory.
- **Recurrent laryngeal nerve:**

Motor branch	Sensory branch
Supplies all the intrinsic muscles of the larynx except cricothyroid (which is supplied by external laryngeal nerve, a branch of superior laryngeal nerve).	Supplies larynx below the level of the vocal folds

NOTE

Both superior laryngeal nerves and recurrent laryngeal nerves are branches of vagus nerves (CNX) which carry the fibres of cranial part of accessory nerve (CNIX)

- **Laryngeal muscles:** All muscles are paired except transverse arytenoid

Action	Muscle Responsible
Abductor:	• Posterior cricoarytenoid
Adductor:	• Lateral cricoarytenoid • Interarytenoid (transverse arytenoids) • Thyroarytenoid (external part)
Tensor:	• Cricothyroid ^a
Relax vocal cord:	• Thyroarytenoid (internal part) • Vocalis
Opener (of the laryngeal inlet):	• Thyroepiglotticus
Closure of the laryngeal inlet:	• Aryepiglotticus • Inter arytenoids (oblique part)

Arterial Supply

- **Up to vocal folds:** by superior laryngeal artery, a branch of superior thyroid artery.
- **Below vocal folds:** by inferior laryngeal artery, a branch of inferior thyroid artery.

The cricothyroid artery is a branch of superior thyroid artery and passes across the upper part of cricothyroid ligament to supply the larynx.

Venous Drainage

Superior laryngeal vein → Internal jugular vein
Inferior laryngeal vein → Inferior thyroid vein

EXAMINATION OF LARYNX**Indirect Laryngoscopy (IL)**

Done using a laryngeal mirror

Remember — The posterior rhinoscopy mirror is smaller and its shaft is bayonet shaped, while the shaft of the laryngeal mirror is straight.

Structures which can be visualized by IL

- Larynx (with trachea rings)
- Parts of oropharynx (tongue base and vallecula)
- Hypopharynx/laryngopharynx part viz.
 - Pyriform sinus
 - Posterior wall of hypopharynx
 - Postcricoid region

Blind areas which cannot be visualized

- Laryngeal surface of epiglottis/infrahyoid epiglottis
- Ventricle of larynx
- Subglottis
- Anterior commissure
- Apex of pyriform fossa

The movements of both the cords are observed when patient takes deep inspiration (abduction of cords) and says "Aa" (adduction cords) and "Eee" (for adduction and tension)

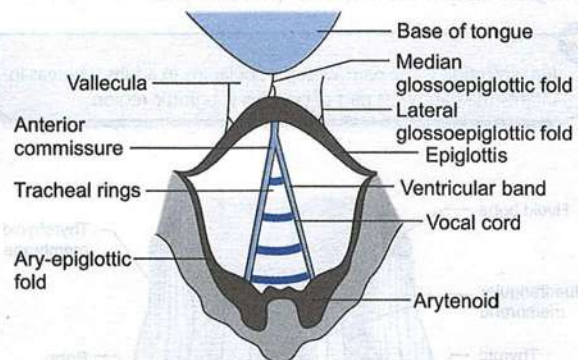


Fig. 12.5: Structures seen on indirect laryngoscopy

Direct Laryngoscopy (Fig. 12.6)

- Done using a rigid endoscope
- Position of patient – Boyce position/Barking-dog position

Contraindications

- Cervical spine injury
- Aneurysm of arch of aorta
- Recent cardiac illness

NOTE

In these condition and in voice disorders – Transnasal flexible laryngoscopy (TFL) is being done

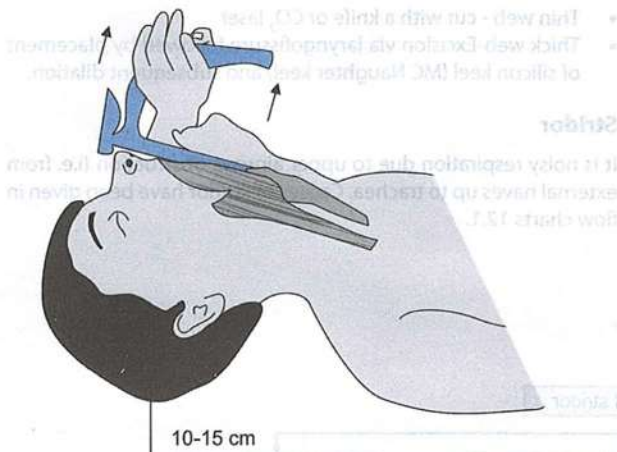


Fig. 12.6: Direct Laryngoscopy

Microlaryngoscopy

- Combination of laryngoscope and operating microscopy done for precision in surgeries on vocal cord. Focal length of the lens of microscope used in microlaryngoscopy = 400 mm.

CONGENITAL LESIONS OF LARYNX AND STRIDOR

Laryngocele

Definition

Laryngocele is an air-filled cystic swelling due to dilatation of saccule. The saccule is a diverticulum of mucous membrane which starts from the anterior part of ventricular cavity and extends upward between vestibular folds and lamina of thyroid cartilage. When it abnormally enlarges, it forms the air containing sac – Laryngocele.

Type

External 30%	Internal 20%	Mixed type 50%
Sac arises from the laryngeal ventricle and expands into the neck through the thyrohyoid membrane ^Q	The dilatation remains confined to larynx	

Causes

Raised transglottic air pressure as in trumpet players, glass blowers or weight lifters.

Clinical Features

- Majority cases are asymptomatic.
- The internal laryngocele** produces hoarseness of voice and may produce dyspnea due to pressure changes.
- The external laryngocele** presents as a cystic swelling in neck which increases in size on coughing or performing Valsalva
- It presents with hoarseness, cough and if large – obstruction to the airway.

- If neck of sac is blocked and it gets infected, pyocele is formed.

Investigation

- X-ray: Anteroposterior view with and without valsalva maneuver.
- Indirect laryngoscopy helps to make the diagnosis.

Treatment

- Excision of the saccule at its neck together with removal of the upper half of thyroid lamina.
- Endoscopic marsupialization of internal laryngocele

NOTE

In adults laryngocele may be associated with saccule carcinoma.

Laryngomalacia/Congenital Laryngeal Stridor

- Most common** congenital anomaly of larynx.^Q
- Most common** condition causing **inspiratory stridor** at or shortly after birth^Q (within first 2 weeks of life).
- In most cases, it is asymptomatic.
- M:F = 1:1
- There is abnormal flaccidity of laryngeal cartilage.^Q Stridor occurs as a result of sucking of supraglottic structures into the laryngeal inlet on inspiration
- Manifests after birth (within first 2 weeks of life) and may persist throughout infancy.^Q (peak age – 6–9 months)
- Usually disappears by two years of age.^Q
- Inspiratory stridor is worse during exertion such as crying and feeding so stridor is intermittent.^Q
- Strangely, stridor worsens during sleep, and positional variations occur—stridor is worse when patient is in supine position.*
- It decreases when child is placed in prone position and in hyperextension.*
- Sometimes associated with cyanosis – (Dhingra 5th/ed, p 34)
- Cry is normal.
- Laryngoscopy finding—Omega shaped epiglottis.^Q Aryepiglottic folds are tall, thin and foreshortened.
- Treatment is conservative:
 - Reassure the patient.
 - Early antibiotic therapy for URI.
 - 10% patients need surgical intervention which includes supraglottoplasty (ary epiglottoplasty).
- In severe cases, tracheostomy may be needed.^Q

Children with laryngomalacia have high prevalence of gastro esophageal reflux disease (50–100%) and second synchronous airway lesion (17%)

Laryngeal Web/Atresia

- Mostly congenital but may be acquired.
- Congenital web is due to incomplete recanalization of larynx.
- Most common site:** Anterior 2/3rds of the vocal cord.
- Webs have a concave posterior margin.

Symptom

The child presents with congenital airway obstruction (stridor), weak cry or apnoea.



All patients need genetic screening and cardiovascular evaluation especially of aortic arch.

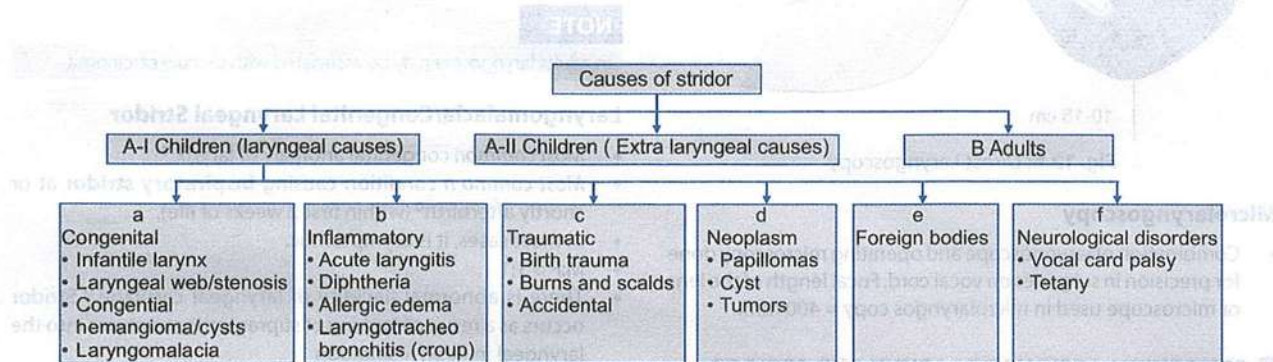
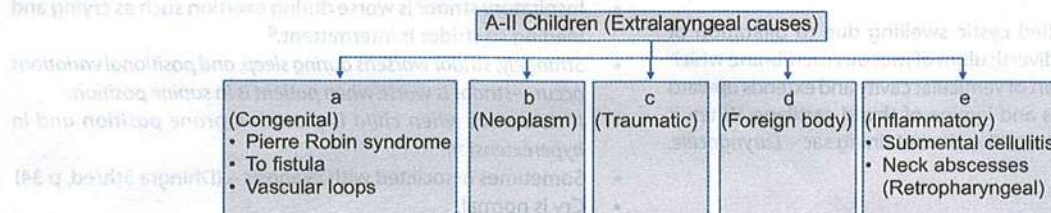
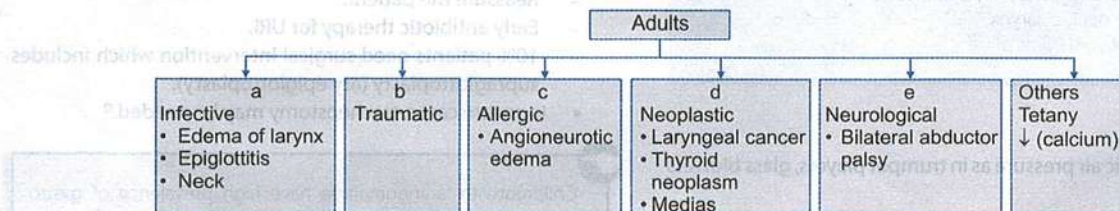
Treatment

- Tracheostomy - often required

- Thin web - cut with a knife or CO₂ laser
- Thick web-Excision via laryngofissure followed by placement of silicon keel (MC Naughton keel) and subsequent dilation.

Stridor

It is noisy respiration due to upper airways obstruction (i.e. from external nares up to trachea). Causes of stridor have been given in flow charts 12.1.

**Extralaryngeal causes in children****Causes in adults**

Flow chart 12.1 to show causes of stridor.

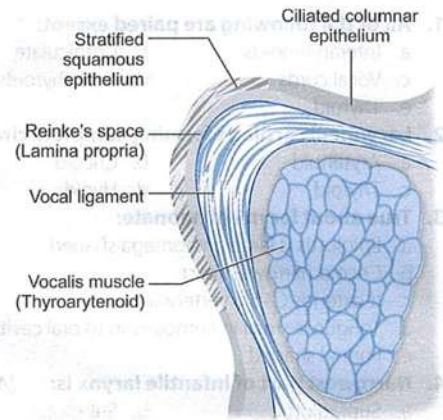


- In children, chronic stridor is due to congenital lesions, mostly due to laryngomalacia.
- In children acute stridor is mostly due to acute upper respiratory tract infection.
- In adults stridor is uncommon chronic stridor may indicate laryngeal carcinoma.

IMPORTANT CLINICAL CONCEPTS FOR NEET

- The only intrinsic muscle of the larynx which lies outside the laryngeal cartilages framework is cricothyroid.
- In thyroidectomy, the nerve commonly injured is external branch of superior laryngeal nerve.
- Posterior cricoarytenoid is the only abductor of vocal cord.
- Epiglottis is omega shaped in neonates and infants.
- Vocal cords have practically no lymphatics except for a small delphain node which lies on cricothyroid membrane (lymphatic watershed of larynx).
- Aryepiglottic fold has the richest lymphatic supply in larynx.
- Keyhole glottis is seen in thyroarytenoid weakness.
- Flag sign is seen in bilateral adductor palsy.
- In examination of neck, absence of laryngeal crepitus indicates a postcricoid growth or an abscess in the postcricoid area.
- Thyroid cartilage is hyaline cartilage and so calcifies – calcification occurs earliest in it. It starts by 20 years of age and is fully ossified by 7th decade of life. Thyroid cartilage calcifies in a figure of 8 pattern. Malignancies of larynx which invade thyroid cartilage destroy this pattern.
- **Reinke's space:** This potential space has scanty subepithelial connective tissues and lies under the epithelium of vocal cords. It is bounded by–
 - Above and below: Arcuate lines.
 - Anterior: Anterior commissure.
 - Posterior: Vocal process of arytenoids.

Reinke's edema: Edema of Reinke's space results in fusiform swelling of the membranous vocal cords.



QUESTIONS

1. All of the following are paired except: [PGI Nov 05]
 - a. Interarytenoids
 - b. Corniculate
 - c. Vocal cords
 - d. Cricothyroids
 - e. Thyroid
2. Laryngeal cartilage forming complete circle: [TN 08]
 - a. Arytenoid
 - b. Cricoid
 - c. Thyroid
 - d. Hyoid
3. True about larynx in neonate: [PGI 03]
 - a. Epiglottis is large and omega shaped
 - b. Cricoid narrowest part
 - c. It extends C4,5,6 vertebrae
 - d. Tongue is small in comparison to oral cavity
 - e. Funnel shaped
4. Narrowest part of infantile larynx is: [Assam 95, RJ 05]
 - a. Supraglottic
 - b. Subglottic
 - c. Glottic
 - d. None of the above
5. Abductor of vocal cord is: [Kerala 95]
 - a. Cricothyroid
 - b. Posterior cricoarytenoid
 - c. Lateral cricoarytenoid
 - d. Cricohyoid
6. All are elevators of larynx except: [AP 04]
 - a. Thyrohyoid
 - b. Digastric
 - c. Stylohyoid
 - d. Sternohyoid
7. Sensory nerve supply of larynx below the level of vocal cord is: [AIIMS 98; AI 95]
 - a. External branch of superior laryngeal nerve
 - b. Internal branch of superior laryngeal nerve
 - c. Recurrent laryngeal nerve
 - d. Inferior pharyngeal
8. Supraglottis includes all of the following except:
 - a. Aryepiglottic fold
 - b. False cord
 - c. Lingual surface of epiglottis
 - d. Laryngeal surface of epiglottis
9. Epilarynx include (s): [PGI Nov 10]
 - a. Suprahoid epiglottis
 - b. Infrahoid epiglottis
 - c. False cords
 - d. Posterior commissure
10. The water cane in the larynx (sacculs) are present in: [UP 07]
 - a. Paraglottic space
 - b. Pyriform fossa
 - c. Reinke's space
 - d. Laryngeal ventricles
11. Vocal cord is lined by: [Delhi 96]
 - a. Stratified columnar epithelium
 - b. Pseudociliated columnar epithelium
 - c. Stratified squamous epithelium
 - d. Cuboidal epithelium
12. Inlet of larynx is formed by: [Kolkata 03]
 - a. Ventricular fold
 - b. Aryepiglottic fold
 - c. Glossoepiglottic fold
 - d. Vocal cord
13. A neonate while suckling milk can respire without difficulty due to: [AIIMS Nov 10]
 - a. Start soft palate
 - b. Small tongue
 - c. High larynx
 - d. Small pharynx
14. Laryngocele arises from: [AIIMS May 05, 08]
 - a. Anterior commissure
 - b. Sacculs of the ventricle
 - c. True cords
 - d. False cords
15. Laryngocele arises as herniation of laryngeal mucosa through the following membrane: [AI 06]
 - a. Thyrohyoid
 - b. Cricothyroid
 - c. Cricotracheal
 - d. Crisosternal
16. Most common congenital anomaly of larynx: [TN 99; Delhi-08]
 - a. Laryngeal web
 - b. Laryngomalacia
 - c. Laryngeal stenosis
 - d. Vocal and palsy
17. Regarding laryngomalacia: [PGI 02]
 - a. Most common cause of stridor in newborn
 - b. Omega-shaped epiglottis
 - c. Inspiratory stridor
 - d. Requires immediate surgery
 - e. Stridor worsens on lying in prone position
18. Which is not true about laryngomalacia? [AI 12]
 - a. Omega-shaped epiglottis
 - b. Stridor increases on crying, but decreases on placing the child in prone position
 - c. Most common congenital anomaly of the larynx
 - d. Surgical management of the airway by tracheostomy is the preferred initial treatment
19. About laryngomalacia, all are true except: [PGI 08]
 - a. MC neonatal respiratory lesion
 - b. Decreased symptoms during prone position
 - c. Self-limiting by 2-3 years of age
 - d. Omega-shaped epiglottis seen
 - e. Surgery is treatment of choice
20. Most common mode of treatment for laryngomalacia is: [UP 07]
 - a. Reassurance
 - b. Medical
 - c. Surgery
 - d. Wait and watch
21. MC cause of intermittent stridor in a 10-day-old child shortly afterbirth is: [AI 01; AIIMS 95]
 - a. Laryngomalacia
 - b. Foreign body
 - c. Vocal nodule
 - d. Hypertrophy of turbinate
22. Most common cause of stridor in children is: [UP 07]
 - a. Laryngomalacia
 - b. Congenital laryngeal paralysis
 - c. Foreign body in larynx
 - d. Congenital laryngeal tumors
23. Causes of congenital laryngeal stridor is/are: [PGI 00]
 - a. Laryngomalacia
 - b. Laryngeal papillomatosis
 - c. Subglottic papilloma
 - d. Laryngeal stenosis
 - e. Hemangioma of larynx
24. Main treatment of congenital laryngeal stridor is: [Jipmer 04]
 - a. Tracheostomy
 - b. Steroid therapy
 - c. Reassurance to the child's parents
 - d. Amputating epiglottis

- 25. Stridor is caused by all except:** [AP 96]
 a. Hypocalcemia b. Asthma
 c. Epiglottitis d. Laryngeal tumor
- 26. A 2-year-old boy presenting with sudden severe dyspnea, most common cause is:** [Bihar 06]
 a. Foreign body b. Bronchiolitis
 c. Asthmatic attack d. None
- 27. Stridor in adults is most commonly caused by:** [Delhi 96]
 a. Reinke's edema b. Malignancy
 c. Acute severe asthma d. Toxic gas inhalation
- 28. The most common cause of laryngeal stridor in a 60-year-old male is:** [JIPMER 91]
 a. Nasopharyngeal carcinoma
 b. Thyroid carcinoma
 c. Foreign body aspiration
 d. Carcinoma larynx
- 29. Laryngofissure is:** [Jipmer 04]
 a. Opening the larynx in midline
 b. Making window in thyroid cartilage
 c. Removal of arytenoids
 d. Removal of epiglottis
- 30. In an direct laryngo scopy which of the following can be visualized:** [PGI Dec 01]
 a. Cricothyroid b. Lingual surface of epiglottis
 c. Arytenoids d. Pyriform fossa
 e. Tracheal cartilage
- 31. Which of the following is difficult to visualize or examine on indirect laryngoscopy?** [MH-PGM-CET 07; MH 08]
 a. True vocal cord b. Anterior commissure
 c. Epiglottis d. False vocal cord
- 32. Microlaryngoscopy was started by:** [MH 03]
 a. Bruce Benjamin b. Kleinsasser
 c. Chevalier Jackson d. None
- 33. The procedure that should precede microlaryngoscopy is:** [AI 91]
 a. Pharyngoscopy b. Esophagoscopy
 c. Rhinoscopy d. Laryngoendoscopy
- 34. Laryngeal mirror is warmed before use by placing:** [Karn. 89]
 a. Glass surface on flame b. Back of mirror on flame
 c. Whole mirror into flame d. Mirror in boiling water

NEET PATTERN QUESTIONS

- 35. Abductor of vocal cord is:** [NEET Pattern]
 a. Posterior cricoarytenoid b. Lateral cricoarytenoid
 c. Cricothyroid d. None of the above
- 36. Which of the following is the only intrinsic muscle of larynx that lies outside the laryngeal framework:** [NEET Pattern]
 a. Cricothyroid
 b. Superior constrictor
 c. Cricopharyngeus
 d. Lateral cricothyroid
- 37. Palpatory thud, audible slap is seen in:** [NEET Pattern]
 a. Tracheal foreign body
 b. Bronchial foreign body
 c. Laryngeal foreign body
 d. None

EXPLANATIONS AND REFERENCES

1. Ans. is a and e i.e. Interarytenoid; and Thyroid

Ref. BDC, Vol 3, 4th/ed pp 240,244; Scott-Brown's 7th/ed Vol 2 p 2133; Dhingra 5th/ed p 299, 6th/ed p 282; Mohan Bansal p 62

- All intrinsic muscles of larynx are paired except transverse arytenoid/interarytenoid.
- As far as cartilages of larynx are concerned 3 are paired and 3 are unpaired.

Unpaired cartilage	Paired cartilage
Thyroid cartilage	Arytenoid
Cricoid	Coriculate
Epiglottics	Cuneiform

Vocal cords are also paired structures.

2. Ans. is b i.e. Cricoid

Ref. BDC, Vol III, 4th/ed p 240; Dhingra 5th/ed p 299, 6th/ed p 282; Mohan Bansal p 62

Cartilage	Shape
Thyroid cartilage	V shaped on cross section. Has 2 lamina right and left which are placed at an angle of 90° in males and 120° in females
Cricoid cartilage	Ring shaped, (it is the only complete ring present in the air passages)
Epiglottic cartilage	Leaf shaped in adults, omega shaped in infants and neonates
Arytenoid cartilage	Pyramid shaped
Coriculate cartilage	Cone shaped
Cuneiform cartilage	Rod shaped

Also know: The thyroid, cricoid and basal parts of arytenoid cartilages are made up of hyaline cartilage. They ossify after the age of 25 years. The other cartilages, e.g. epiglottis, corniculate, cuneiform and processes of the arytenoid are made of elastic cartilage and do not ossify.

3. Ans. is a, b and e i.e. Epiglottis is large and omega shaped; Cricoid narrowest part; and Funnel shaped

Ref. Miller Anaesthesia 5th/ed p 2090; Tuli 1st/ed p 284; Scott-Brown's 7th/ed Vol 2 p 2131; Mohan Bansal p 67; Dhingra 6th/ed p 285

Infant's Larynx Differs from Adult in:

1. It is situated high up (C2 – C4)⁹ (in adults = C3 – C6)
2. Of equal size in both sexes (*in adults it is larger in males*)
3. Larynx is funnel shaped
4. The narrowest part of the infantile larynx is the junction of subglottic larynx with trachea and this is because cricoid cartilage is very small
5. Cartilages:
 - a. Epiglottis is **omega shaped, soft, large and patulous**.
 - b. Laryngeal cartilages are soft and collapse easily
 - c. Thyroid cartilage is flat
 - d. Arytenoid cartilage is relatively large
6. The cricothyroid and thyrohyoid spaces are narrow
7. The submucosal tissue is thick and loose and becomes oedematous in response inflammation
8. Vocal cords are angled and lie at level of C8
9. Trachea bifurcates at level of T9

NOTE

Narrowest part of adult larynx is Rima Glottidis.

4. Ans. is b i.e. Subglottis

Ref. Scott-Brown's 7th/ed Vol 2 p 2131; Dhingra 5th/ed p 303, 6th/ed p 285

The infantile larynx

"The diameter of cricoid cartilage is smaller than the size of glottis, making subglottis the narrowest part." – Dhingra 5th/ed p 303

"Rima glottidis (Glottis) is the narrowest part of larynx in adults whereas in infants the narrowest part of larynx is subglottis region."

—Mohan Bansal p 6

5. Ans. is b i.e. Posterior cricoarytenoid

Ref. BDC, Vol 3, 4th/ed p 245; Dhingra 5th/ed p 300, 6th/ed p 283

Remember: Posterior cricoarytenoid is the only abductor of vocal cord.

Adductors of vocal cord are:

T = Thyroarytenoid

A = Transverse arytenoid

L = Lateral cricoarytenoid

C = Cricothyroid

mnemonic

Add TALC i.e. Adductors are TALC.

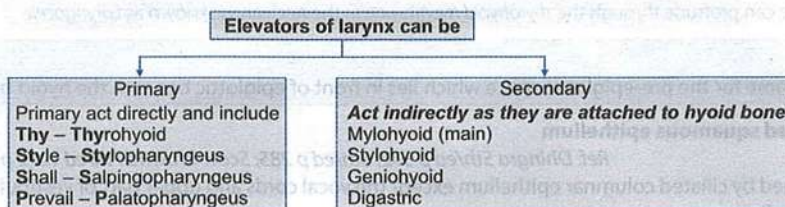
6. Ans. is a i.e. thyrohyoid

Ref. BDC 4th/ed Vol 3 p 243 Table 16.2; Mohan Bansal p 66

Elevation of larynx is carried out by – Thyrohyoid and mylohyoid – BDC 4th/ed Vol 3 p 243

Movement	Muscles
1. Elevation of larynx	Thyrohyoid, mylohyoid
2. Depression of larynx	Sternohyoid, sternothyroid, omohyoid
3. Opening the inlet of larynx	Thyroepiglotticus
4. Closing of inlet of larynx	Aryepiglotticus
5. Abductor of vocal cord	Posterior cricoarytenoids
6. Adductor of vocal cord	T – Thyroarytenoid A – Transverse arytenoids L – Lateral cricoarytenoid C – Cricothyroid
7. Tensor of vocal cord	Cricothyroid
8. Relaxor of vocal cord	Thyroarytenoid

ALSO KNOW – According to Dhingra 5th/ed p 301, 6th/ed p 284



7. Ans. is c i.e. Recurrent laryngeal nerve

Ref. BDC, Vol 3, 4th/ed p 246; Mohan Bansal p 66; Dhingra 6th/ed p 298

Nerve supply of larynx

• **Sensory:**

- The internal laryngeal nerve supplies the mucous membrane up to the level of the vocal folds.
- The recurrent laryngeal nerve supplies below the level of the vocal folds.

• **Motor:**

- All intrinsic muscles of the larynx are supplied by the recurrent laryngeal nerve except for the cricothyroid which is supplied by the external laryngeal nerve.

8. Ans. is c i.e. Lingual surface of epiglottis

Ref. Logan Turner 10th/ed p 171

- The lingual surface of epiglottis and vallecula are a part of oropharynx according to Logan Turner 10th/ed p 171

- According to Dhingra 6th/ed p 307

"Whole of epiglottis is included in supraglottic area."

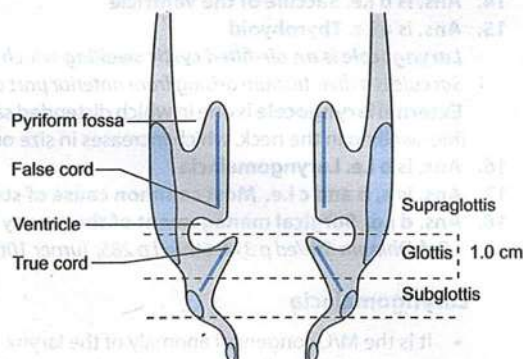
- According to Scott-Brown's 7th/ed Vol 3 p 2132 – whole of epiglottis is included in the supraglottic.
- But since here we have to choose one option. Therefore, I am going with Turner.

9. Ans. is a and c i.e. Suprahyoid epiglottis and Arytenoids

Ref. Dhingra 6th/ed p 307; Stell and Manran's
Head and Neck Surgery 4th/ed p 233

- The larynx is divided into supraglottis, glottis and subglottic region for the purpose of classification of its tumor.

- The division is based on the lymphatic drainage. The glottic area has virtually no lymphatic drainage and so acts as a watershed. The area above the glottis, i.e. supraglottic drains upward via superior lymphatics into the upper deep cervical group of nodes whereas the area below the vocal cords, i.e. subglottic, drains to the prelaryngeal and pretracheal glands.



Classification of sites and various subsites under each site in larynx (AJCC classification, 2002)

Site	Subsite
Supraglottis	<ul style="list-style-type: none"> • Suprahyoid epiglottis (both lingual and laryngeal surfaces) • Infrahyoid epiglottis • Aryepiglottic folds (laryngeal aspect only) • Arytenoids • Ventricular bands (or false cords)
Glottis	True vocal cords including anterior and posterior commissure
Subglottis	Subglottis up to lower border of cricoid cartilage

NOTE

Suprahyoid epiglottis, infrahyoid epiglottis, aryepiglottic folds and arytenoids together are called epilarynx

10. Ans. is d i.e. Laryngeal ventricles

Ref. Dhingra 5th/ed p 301, 6th/ed p 284; BDC, Vol 3, 4th/ed p 242; Mohan Bansal p 64,65

It is a diverticulum of mucous membrane which starts from the anterior part of laryngeal ventricle extending between the vestibular folds and lamina of thyroid cartilage. The saccule has plenty of mucous glands whose main purpose is to lubricate the vocal cords (vocal cord is devoid of mucous glands) and hence is known as water can of larynx.

NOTE

When distended the sacculus can protrude through the *thyrohyoid* membrane in the neck and is known as *Laryngocele*.

ALSO KNOW

Boyer's space – another name for the pre-epiglottic space which lies in front of epiglottic beneath the hyoid bone.

11. Ans. is c i.e. Stratified squamous epithelium

Ref. Dhingra 5th/ed p 302, 6th/ed p 285; Scott-Brown's 7th/ed Vol 2 p 2137; Mohan Bansal p 65

Whole of larynx is lined by ciliated columnar epithelium except the vocal cords and upper part of vestibule which is lined by stratified squamous epithelium.

ALSO KNOW

Mucous glands are distributed all over the larynx except the vocal cords, which is lubricated by mucus from glands within the sacculus. The squamous epithelium of vocal fold is, therefore prone to desiccation if these glands cease to function as in radiotherapy.

12. Ans. is b i.e. aryepiglottic fold

Ref. BDC 4th/ed Vol 3 p 242; Dhingra 6/e p 284

Inlet of the larynx is bounded by:

- Anteriorly – Epiglottis
- Posteriorly – Interarytenoid fold of mucous membrane
- On each side by – Aryepiglottic fold

13. Ans. is c i.e. High larynx

Ref. Dhingra 6th/ed p 285

Infant's larynx is positioned high in the neck level of glottis being opposite to C3 or C4 at rest and reaches C1 or C2 during swallowing. This high position allows the epiglottis to meet soft palate and make anasopharyngeal channel for nasal breathing during suckling. The milk feed passes separately over the dorsum of tongue and the side of epiglottis, thus allowing breathing and feeding to go on simultaneously.

14. Ans. is b i.e. Sacculus of the ventricle

Ref. Dhingra 5th/ed p 34, 6th/ed p 295

15. Ans. is a i.e. Thyrohyoid

Ref. Turner 10th/ed p 168; Mohan Bansal 1st/ed p 487

Laryngocele is an air-filled cystic swelling which occurs due to dilatation of sacculus.

Sacculus is a diverticulum arising from anterior part of ventricle/sinus of larynx.⁹

External laryngocele is one in which distended sacculus herniates through the **thyrohyoid membrane**⁹ and presents as a reducible swelling in the neck, which increases in size on coughing or performing Valsalva.

16. Ans. is b i.e. Laryngomalacia

17. Ans. is a, b and c i.e. Most common cause of stridor in newborn; Omega shaped epiglottis; and Inspiratory stridor

18. Ans. d i.e. Surgical management of the airway by tracheostomy is the preferred initial treatment

Ref. Dhingra 5th/ed p 314, 6th/ed p 285; Turner 10th/ed, pp 385,386; Current Otolaryngology 2nd/ed, pp 462,463; Mohan Bansal p 514

Laryngomalacia

- It is the M/C congenital anomaly of the larynx
- It is the M/C condition causing inspiratory stridor after birth.
- The stridor worsens during sleep and when baby is in supine position (not in prone position). Rather when the child is placed in prone position it is relieved.
- On laryngoscopy – Epiglottis is omega shaped and aryepiglottic folds are floppy.

Treatment

Conservative Management

19. Ans. is b and e i.e. Decreased symptoms during prone position and Surgery is treatment of choice

Ref. Dhingra 5th/ed p 314; Current Otolaryngology 2nd/ed p 462; Mohan p 514

Option	Correct/ Incorrect	Reference	Explanation
Option a M/C neonatal respiratory lesion	Not sure	Current 2nd/ed p 462	Laryngomalacia is the most common cause of stridor in infants and is also the most common congenital laryngeal abnormality but whether it is M/c neonatal respiratory lesion is not sure.

Contd...

Contd...

Option	Correct/ Incorrect	Reference	Explanation
Option b Decreased symptoms during prone position	Incorrect	Current Otolaryngology 2nd/ed p 462; Dhingra 5th/ed p 314, 6th/ed p 295	<ul style="list-style-type: none"> – Stridor in laryngomalacia is intermittent & not constant. – It is worse during sleep or when patient is in supine position <p>It is improved in – prone position</p>
Option c Self limiting by 2–3 years of age	Correct	Dhingra 5th/ed p 314; Current Otolaryngology 2nd/ed p 462	<ul style="list-style-type: none"> – "It manifests at birth or soon after and usually disappears by 2 years of age" – Dhingra 5th/ed p 314, 6th/ed p 295
Option d – Omega shaped epiglottis seen	Correct	Dhingra 5th/ed p 314, 6th/ed p 295; Current Otolaryngology 2nd/ed p 462	<ul style="list-style-type: none"> – On direct laryngoscopy – Epiglottis is omega shaped – Aryepiglottic folds – floppy – Arytenoids – prominent
Option e Surgery is T/t of choice	Incorrect	Dhingra 5th/ed p 314, 6th/ed p 295; Current Otolaryngology 2nd/ed p 462	<ul style="list-style-type: none"> – Treatment is mostly conservative – Surgery is required in only 10% cases <p>Indications of surgery</p> <ul style="list-style-type: none"> – Severe stridor – Apnea – Failure to thrive – Pulmonary hypertension – Cor pulmonale

20. Ans. is a i.e. Reassurance Ref. Dhingra 5th/ed p 314, 6th/ed p 295; Turner 10th/ed p 386; Current Otolaryngology 2nd/ed p 463

In most patients laryngomalacia is a self-limiting condition.

Treatment of laryngomalacia is reassurance to the parents and early antibiotic therapy for upper respiratory tract infections.

Tracheostomy is required only in severe respiratory obstruction.

Surgical intervention (supraglottoplasty i.e. reduction of redundant laryngeal mucosa) is indicated for 10% of patients. Main indications for surgery are:

- Severe stridor
- Apnea
- Failure to thrive
- Pulmonary hypertension
- Cor pulmonale

21. Ans. is a i.e. Laryngomalacia Ref. Turner 10th/ed, p 385; Current Otolaryngology 2nd/ed p 462

Laryngomalacia is the most common cause of inspiratory stridor in neonates.

The stridor in case of laryngomalacia is not constantly present, rather it is intermittent. So laryngomalacia is also the M/C cause of intermittent stridor in neonates.

22. Ans. is c i.e. Foreign body in larynx Ref. Ghai 6th/ed, p 341

Read the question carefully.

It says most common cause of stridor in **children**—which is not laryngomalacia, it usually resolves spontaneously by the age of 2 years and is rare after that.

"Foreign body aspiration should always be considered as a potential cause of stridor and airway obstruction in children."

– Ghai 6th/ed, p 341

ALSO KNOW

Most common causes of chronic stridor in children is long-term intubation causing laryngotracheal stenosis.

23. Ans. is a, d and e i.e. Laryngomalacia; Hemangioma of larynx; and laryngeal stenosis

Ref. Tuli 1st/ed p 295; Current Otolaryngology 2nd/ed p 463; Mohan Bansal p 474

Causes of congenital laryngeal stridor:

- | | | |
|--------------------|---|---------------------------------|
| • Infantile larynx | • Laryngeal web/stenosis | • Vocal cord paralysis |
| • Laryngomalacia | • Laryngeal cyst | • Cricoarytenoid joint fixation |
| | • Congenital hemangioma (subglottic) | |
| | • Posterior laryngeal cleft | |

24. Ans. is c i.e. Reassurance to child's parent

Ref. Dhingra 5th/ed p 314, 6th/ed p 295

Congenital laryngeal stridor is synonymous with laryngomalacia. Hence, management remains the same i.e. reassurance to child's parent.

25. Ans. is b i.e. Asthma

Ref. Dhingra 5th/ed p 315

- First you should know what exactly upper and lower airway means:

i. **Upper airway:** The airway from the nares and lips to the lower border of larynx (includes nose, pharynx, larynx).

ii. **Lower airway:** From the lower border of the terminal bronchioles (includes various level of bronchioles up to terminal bronchioles).

- **Stridor usually implies upper airway obstruction, so the level of obstruction is above the level of trachea (P)** (from nares to the larynx).

- **Wheezing and ronchi** are signs of lower airway obstruction.

Epiglottitis and laryngeal tumors are common causes of stridor and do not need explanation.

Hypocalcemia leads to tetany which causes stridor.

Asthma leads to wheezing or ronchi (lower airway obstruction)

Also know – Stridor is a harsh noise produced by turbulent air flow through a partially obstructed upper airway.

It can be:

- Inspiratory i.e. originates from supraglottis glottis and pharynx
- Expiratory i.e. originates from thoracic trachea
- Biphasic i.e. originates from subglottis and cervical trachea

Hence, stridor is mainly of laryngeal and tracheal origin.

26. Ans. is a i.e. Foreign body

Ref. Scott-Brown's 7th/ed Vol 1 p 1117; Dhingra 5th/ed p 315, 6th/ed p 295

In case of stridor with acute airway obstruction (i.e. dyspnea) always history of any foreign body ingestion should be taken.

27. Ans. is b i.e. Malignancy

Ref. Read below

The answer to this question can be derived by exclusion.

Reinke's edema leads to hoarseness of voice and not stridor. (Dhingra 5th/ed, p 311, 6th/ed p 292) Ruling out option 'a'.

- Acute severe asthma also does not lead of stridor.
- Toxic gas inhalation does not lead to stridor. So we are left with one option i.e. malignancy.

28. Ans. is d i.e. Carcinoma larynx

Ref. Dhingra 5th/ed pp 315-317, 6th/ed p 296-297; Mohan Bansal p 474

Most common cause for stridor in 60 years old male will be carcinoma larynx as carcinoma larynx occurs in males (predominantly) at the age of 40-70 years.

Most common and earliest symptom of subglottic cancer is stridor.

NOTE

- Nasopharyngeal cancer does not lead to stridor
- Thyroid cancer causes stridor rarely.
- Foreign body aspiration is a common cause of stridor in children and not adults.

29. Ans. is a i.e. Opening the larynx in midline

Ref. Stedman Dictionary, p 937

Laryngofissure: Opening the larynx in midline.

30. Ans. is a, b, c, d and e i.e. Cricopharynx; Lingual surface of the epiglottis; Arytenoids; Pyriform fossa; and Tracheal cartilage.

Ref. Dhingra 5th/ed p 432, 6th/ed p 384; Tuli 1st/ed, p 527

Structures seen on Indirect laryngoscopy are:

- **Larynx:** Epiglottis, aryepiglottic folds, arytenoids, cuneiform and corniculate cartilage, ventricular ands, ventricles, true cords, anterior commissure, posterior commissure, subglottis and rings of trachea.
- **Hypopharynx:** Both pyriform fossae, post-cricoid region, posterior wall of laryngopharynx.
- **Oropharynx:** Base of tongue, lingual tonsils, valleculae, media and lateral glosso-epiglottic folds.

NOTE

In indirect laryngoscopy – The hidden areas of larynx viz. Anterior Commisure, Ventricle and Subglottic area are not seen properly.

31. Ans. is b i.e. Anterior commissure

Ref. Dhingra 5th/ed p 432, 6th/ed p 384 p 70; Tuli 1st/ed, p 527; Mohan Bansal p 70

Hidden areas of larynx viz. infrahyoid epiglottis, anterior commissure, ventricles and subglottic region and apex of pyriform fossa are difficult to visualize by indirect laryngoscopy.

32. Ans. is b i.e. Kleinsasser

Ref. Maqbool 11st/ed p 323

"The present day microsurgical techniques of the larynx are a credit to Kleinsasser."

– Maqbool 11th/ed p 323

33. Ans. is d i.e. Laryngoendoscopy

Ref. Scott-Brown's 7th/ed Vol 2 p 2236

The answer is not given directly but the following lines of Scott-Brown's leave no doubt about the answer—"Microlaryngoscopy concentrates mainly on the glottic area in cases where the diagnosis is already established and unlike direct laryngoscopy, is not primarily concerned with other areas of larynx which should have been assessed preoperatively."

It is clear direct laryngoscopy (or laryngoendoscopy as given in the options) should always be done prior to microlaryngoscopy.

34. Ans. is a i.e. Glass surface on flame

Ref. Tuli 1st/ed p 234

Laryngeal mirror is warmed by:

- Dipping the mirror in warm water.
- Heating the glass surface against some heat such as bulb or spirit lamp.

35. Ans. is a i.e. Posterior crico arytenoid

Ref. Dhingra 6th/ed p 283

Posterior crico arytenoids are the only abductors of vocal cord.

Adductors of vocal cord can be memorised by mnemonic TALC as discussed earlier

36. Ans. is a i.e. Cricothyroid

Ref. Dhingra 6th/ed p 284, Fig's 56.5, 56-6

Cricothyroid muscle is the only intrinsic muscle which is supplied by external laryngeal nerve and lies outside the laryngeal framework

37. Ans. is a i.e. Tracheal foreign body

Ref. Dhingra 6th/ed p 321

A foreign body in trachea may move up and down the trachea between the carina and the undersurface of vocal cords causing "audible slap" and "palpatory thud."

Symptoms and signs of foreign bodies at different levels

Site of foreign bodies	Symptoms and signs
Larynx	<ul style="list-style-type: none"> • Complete obstruction leading to death • Partial obstruction: stridor, hoarseness, cough, respiratory difficulty
Trachea	<ul style="list-style-type: none"> • Choking, stridor, wheeze, cough palpatory thud, audible slap
Bronchi	<ul style="list-style-type: none"> • Cough, wheeze and diminished air entry to lung forms a "triad" • Respiratory distress with swelling of foreign body • Lung collapse, emphysema, pneumonitis, bronchiectasis or lung abscess are late features

Acute and Chronic Inflammation of Larynx, Voice and Speech Disorders

ACUTE LARYNGOTRACHEOBRONCHITIS (CROUP)

- It is a dangerous infection seen mostly in children which involves whole of tracheobronchial tree.

Organism

- Mostly viruses (parainfluenza type 1 and 2 and influenza A).
- In adults it can be caused by:
 - H. simplex
 - Cytomegalovirus
 - Influenza virus
 - Superimposed bacterial infection [*Hemolytic streptococci*] usually occurs

Features

- Age group—most common in 6 months to 3 years although children < 7 years are susceptible.
- Male > Female

Pathology

- Mucosal swelling especially in subglottic area. Subglottic edema is most characteristic pathological feature⁹
- Production of thick tenacious mucus which can hardly be expectorated.
- Pseudomembrane formation
- All these can lead to airway obstruction.

Clinical Features

- Onset is gradual with prodrome of upper respiratory symptoms
- Fever usually low grade
- Painful croupy cough (barking cough)
- Hoarseness and stridor (initially inspiratory; then biphasic)
- Upper Airway obstruction which is visible in the form of supra-sternal and intracostal recession.

- Acute laryngotracheo bronchitis is the M/C cause of infectious respiratory obstruction in children

Investigation

- X-ray:** "Steeple sign" i.e. symmetric steeple or funnel-shaped narrowing of subglottic region.

Treatment

- Broad-spectrum penicillin (for secondary bacterial infection)
- IV steroids, if child is in distress.
- Humidified air
- IV fluids
- Nebulization with adrenaline

In despite above measures respiratory obstruction increases intubation/tracheostomy is done.

Indications for Intubation

- Rising CO_2 level
- Worsening neurologic status
- Decreasing respiratory rate

ACUTE EPIGLOTTITIS (SUPRAGLOTTIC LARYNGITIS)

- It is acute inflammatory condition of the supraglottic structures viz.
 - Epiglottitis
 - Aryepiglottic fold and arytenoids
- Most common organism in children:** *H. influenza*—type B
- In adults** it can be caused by:
 - Group A streptococci, *S. pneumoniae*, *S. aureus*, *Klebsiella pneumoniae*
 - Recently, *Neisseria meningitidis* has been recognized as a cause of fulminant life threatening supraglottitis.

Clinical Features

- Age group—mostly seen in 3–6 years but can occur in adults also.
- There is usually a short history with rapid progression.
- Starts with URI and fever (sometimes > 40°C).

- Sore throat and dysphagia are the most common presenting symptoms in adults.
- Dyspnea and stridor are the most common presenting symptoms in children.
- Child prefers sitting position with hyperextended neck (*tripod sign*).
- Drooling of saliva present as child has dysphagia.
- Voice is not affected.
- Stridor is uncommon in adults but tachycardia which is disproportionate to pyrexia is an important sign which precedes airway obstruction.

Signs

- Epiglottis found cherry red and swollen on indirect laryngoscopy
- Care should be taken when depressing the tongue for examination as it can lead to the glottic spasm.

Investigations

Lateral soft tissue X-ray of neck shows:

- Swollen epiglottis (Thumb sign)^o
- Absence of deep well-defined vallecula (vallecula sign)

Treatment

- Intubation/tracheostomy regardless of the severity of respiratory distress is the topmost priority
- Hospitalization
- Immediate I.V antibiotics ampicillin/2nd and 3rd generation cephalosporins
- Ceftriaxone is the antibiotic of choice^o
- Steroid
- Adequate hydration to be maintained
- Humidification/O₂ inhalation
- If household contacts of the patient with *H. influenzae* epiglottitis include an unvaccinated child under the age of 4, all members of the household (*including the patient*) should receive prophylactic rifampin for 4 days to eradicate carriage of *H. influenzae*.
– Ref. Harrison 17th/ed, p 213
- Main complication: Death from respiratory arrest.

PSEUDOCROUP (SUBGLOTTIC LARYNGITIS)

Age: Children < 3 years

Pathology: Mucosal swelling is found on or near the undersurface of the vocal cords and in the subglottic region.

Clinical features:

- Starts abruptly
- No fever/mild fever
- Voice is raw resembling *barking of seals*.
- Dry cough

Treatment: Moist air

CHRONIC LARYNGITIS

- Chronic inflammation of mucosa of larynx.

- Exact cause is not known.

- Can be due to:**
- Repeated attacks of acute inflammation
 - Smoking
 - Voice abuse
 - Pollution
 - Chronic cough
 - Chronic sinusitis

Types of Chronic Laryngitis

- Hyperemic
- Hypertrophic

The pseudostratified ciliated epithelium changes to squamous type. There may be hyperplasia and keratinization (leukoplakia of squamous epithelium of the vocal cords).

CONTACT ULCERS/PACHYDERMIA LARYNGITIS/CONTACT GRANULOMA

- Due to faulty voice production vocal processes of arytenoid rub against each other which leads to an area of heaped up mucosa on one vocal process which fits into ulcer like depression on the opposite side.
- It is a type of chronic hypertrophic laryngitis.
- It mainly affects posterior third of vocal fold which corresponds to vocal process of arytenoid cartilage.

Etiology

It is multifactorial:

- Vocal abuse is the main offending cause
- Seen in men who smoke/drink alcohol excessively.

Others

- Emotional stress
- Gastroesophageal reflux
- Chronic throat clearing and infections postural drip
- Allergy
- Idiopathic

Lesions

- Saucer like lesions formed by heaping of granulation tissue
- **Site:** Medial edge of the vocal cord at the vocal process
- Lesion is B/L and symmetrical

- There is no epithelial defect (as is seen in true ulcers).
- It does not undergo malignant change

Clinical Features

Seen exclusively in males > 30 years.

The only symptom is hoarseness of voice.

Diagnosis is made by biopsy which shows a canthosis and hyperkeratosis.

Treatment

- Voice rest for a long period of time and voice therapy if required
- Management of psychological stress and GERD
- Microlaryngoscopic excision of granuloma

ATROPHIC LARYNGITIS/LARYNGITIS SICCA

- Characterized by atrophy of laryngeal mucosa and crust formation.
- Usually occurs as a part of atrophic rhinitis caused by *Klebsiella ozaenae* and atrophic pharyngitis.

Pathologically

- Respiratory epithelium shows squamous metaplasia with loss of cilia, mucous producing glands and foul smelling crust formation
- **Most common site:**
 - False cords
 - Posterior region and subglottic region

Clinical Features

- **Mostly seen in females:**
 - Hoarseness of voice which improves temporarily on coughing and on removing of crust
 - There may be dry irritating cough and dyspnea due to obstructing crusts.
 - Patient may complain of blood stained thick mucoid discharge. —Maqbool 11th/ed, p 335
 - Crusts are foul smelling and mucosa bleeds when they are removed.
 - Crusts may also be seen in trachea

Treatment

- Treat the underlying cause (*poor nutrition, generalized infection rarely syphilis*).
- Laryngeal sprays with glucose in glycerine or oil of pine helps to loosen the crust.
- Microlaryngoscopic removal of crust is new modality of treatment
- Expectorants containing ammonium chloride or iodide also help to loosen the crust.

TUBERCULAR LARYNGITIS

- Commonly associated with pulmonary TB
- *Rarely:* blood-borne infection

Sites Affected

- All regions can be affected.
- Predilection for the posterior part of larynx. (Interarytenoid region > ventricular bands > vocal cord > epiglottis)

Clinical Features

- Weakness of voice with periods of aphonia is earliest symptom
- Hoarseness, cough, dysphagia, odynophagia.
- Referred otalgia

Laryngeal examination:

- Hyperemia and ulceration of vocal cord with impairment of abduction—first sign

Vocal cords show shallow ulcers with undermined edges (**mouse nibbled appearance**)—Characteristic feature

- Pseudoedema of the epiglottis called as **Turban epiglottitis**
- Swelling in interarytenoid region giving a **mammilated appearance**

Diagnosis

- Chest X-ray
- Sputum for AFB

Treatment: ATT

LUPUS OF THE LARYNX

It is an indolent tubercular infection associated with lupus of nose and pharynx.

Site affected: Anterior part of the larynx (Epiglottis > Aryepiglottic fold > ventricular bands)

Clinical Features

- It is a painless condition and the patient is asymptomatic.
- No association with pulmonary tuberculosis.

Prognosis: Good

SYPHILIS OF THE LARYNX

- All stages of disease can be manifested.
- **Primary stage:** Mucosal ulceration: Primary chancre
- **Secondary stage:** Multiple vesicles and papular lesions.
- **Tertiary stage:** Gummatous lesion

Sites affected: Anterior part of the larynx i.e. epiglottis and aryepiglottic fold.

LEPROSY

- *Most commonly* affects the anterior part of larynx.
- Epiglottis and aryepiglottic folds are affected first

REINKE EDEMA

B/L Symmetrical swelling of the whole of the membranous part of vocal cord occurring due to edema of the subepithelial space (**Reinke's space**).

Etiology

- **Chronic irritation of vocal cords due to:** Voice misuse, Heavy smoking, Chronic sinusitis, Laryngooesophageal reflex.
- Myxoedema

Clinical Features

- Seen in middle age (40–60 years).
- **Most common symptom:** hoarseness of voice.
- Patient uses false vocal cords for voice production therefore voice is low pitched and rough.

On examination: There is bilateral symmetrical swelling of the vocal cords.

Treatment

Decortication: A circumscribed strip of epithelium is removed from one side of vocal cord while preserving the vocal ligament. Other side to be operated after 3–4 weeks.

- Voice rest and speech therapy.

VOICE AND SPEECH DISORDERS**DYSPHONIA PLICA VENTRICULARIS (VENTRICULAR DYSPHONIA)**

- Features** : Voice production is by false cords (ventricular folds) rather than true vocal cord.
Cause can be functional (psychogenic) or organic eg in case of impaired function of true cords as in paralysis, fixation or tumors.
- Quality of voice** : Rough, low-pitched and unpleasant.
- Diagnosis** : On indirect laryngoscopy false cords approximate partially or completely and obscure the view of true cords on phonation
- Treatment** : Functional cases are dealt with voice therapy and psychological counseling. The condition is difficult to treat if, it is caused by laryngeal disorders.

FUNCTIONAL APHONIA

- Mostly seen in emotionally labile females (in age group 15–30 years)
- Patient communicates with whisper but coughing is normal.
- Aphonia is sudden and without any accompanying laryngeal symptoms/No vocal cord palsy^a

On Laryngoscopic examination: Vocal cords are seen in abducted position and fail to adduct on phonation; however, adduction of vocal cords is seen on coughing.

Treatment

Reassurance and psychotherapy.

PHONOSTHENIA

- Weakness of voice due to fatigue of phonatory muscles due to voice abuse or laryngitis.
- Thyroarytenoid, interarytenoid or both may be affected.

Symptoms: Easy fatiguability of voice.

Signs: Indirect laryngoscopy.

- Elliptical space between cords in weakness of thyroarytenoid.

- Triangular gap near posterior commissure in weakness of interarytenoid.
- Key hole appearance of glottis when both muscles viz. thyroarytenoid and interarytenoids are involved.

Treatment: Voice rest

HYPONASALITY

- Called as *Rhinolalia clausa*.
- Lack of nasal resonance.
- Defect is blockage of nose or nasopharynx due to common cold, nasal allergy, polyps nasal growths, adenoids or nasopharyngeal mass.

HYPERNASALITY

- It is called as *rhinolalia aperta*.
- Words with little nasal resonance are resonated through nose.
- **Defect:** failure of nasopharynx to cut off from oropharynx or abnormal communication between oral and nasal cavities.

PUBERPHONIA

- Presence of high pitched voice of childhood in adult males.
- Seen in boys who are emotionally immature, feel insecure and show excessive attachment to their mothers.

Treatment

- Training the boy to produce low-pitched voice.

CONDITIONS CAUSING SPEECH DISORDERS**VOCAL CORD NODULE (SINGER'S/SCREAMERS NODULES)**

- It is localized epithelial hyperplasia and is a bilateral condition.
- Seen symmetrically on the free edge of vocal cord, at the junction of anterior one third, with the posterior two thirds (i.e. area of maximum vibration of cord).
- Seen in singers, actors, teachers and hawkers.
- Females > males in adults whereas in children it is more common in boys.
- Most common age group = 20–30 years.
- Main cause—Misuse or abuse of voice.
- Patients complain of hoarseness of voice, which worsens by evening due to fatigue.
- Indirect laryngoscopy shows—pinkish white nodules at the junction of anterior one third and posterior two thirds.

Treatment

- Voice rest and speech therapy
- Microlaryngoscopic excision of nodules—Using microsurgical instruments or laser.

VOCAL CORD POLYP

- Usually unilateral at the junction of anterior and middle third of vocal cord.

Etiology

- Voice abuse, chronic irritation like smoking.
- Sudden shouting results in hemorrhage and submucosal edema.

Management

- Microlaryngeal excision.

EXTRA EDGE

- **Gutzmann's pressure test** if positive confirms puberphonia. In this test, thyroid prominence is pressed backwards and downwards producing low tone voice.
- **Ortner's syndrome** consists of cardiomegaly and paralysis of recurrent laryngeal nerve.

- **Mogiphonia:** It is a psychoneurotic disorder in which phonic spasm occurs in professional voice users, when they appear in public. Initially, the voice is normal but soon the vocal cords get adducted and person cannot speak.

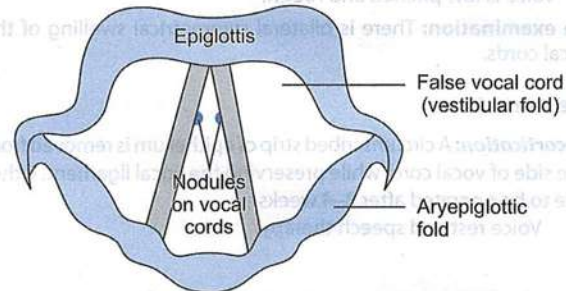


Fig. 13.1: Diagram to show vocal nodules
Bilateral vocal nodules at the junction of anterior one-third and posterior two-thirds of vocal cords

Courtesy: Text book of Diseases of Ear, Nose and Throat, Mohan Bansal. Jaypee Brothers, p 485

CONDITIONS CAUSING SPEECH DISORDERS

VOCAL CORD NODULE (SINGER'S SCREAMERS)

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- Main cause - Misuse or abuse of voice.
- Patients complain of hoarseness of voice, which worsens by evening due to fatigue.
- Indirect laryngoscopy shows - pinkish white nodules at the junction of anterior one-third and posterior two-thirds.
- Treatment:
 - Voice rest and speech therapy.
 - Microlaryngeal excision of nodules - Using microscopical instruments or laser.

- Voice production is by false cords (ventricular folds) rather than true vocal cord.
- Cause can be functional (psychogenic) or organic.
- In case of impaired function of the cord, as in psychogenic larynx or tumor.
- Quality of voice:
 - Rough, low-pitched and hoarse.
 - On indirect laryngoscopy false cords approximate partially or completely and obstruct the view of true cords on phonation.
- Treatment:
 - Functional cases are dealt with voice therapy and psychological counselling. The condition is difficult to treat if it is caused by physical disorder.

FUNCTIONAL APHONIA

- Mostly seen in emotionally labile females in age group 12-30 years.
- Patient communicates with whisper but coughing is normal.
- Aphonia is sudden and without any accompanying laryngeal symptoms (no vocal cord paresis).
- On laryngoscopic examination: Vocal cords are seen in abducted position and fail to adduct on phonation; however, adduction of vocal cords is seen on coughing.
- Treatment:
 - Reassurance and psychotherapy.

PHONOSTHENIA

- Weakness of voice due to fatigue of phonatory muscles due to voice abuse or laryngitis.
- Thyroidroiditis, intermyositis or both may be affected.
- Symptoms: Easy fatigability of voice.
- Signs: Indirect laryngoscopy.
 - Elliptical space between cords in weakness of thyroarytenoid.

QUESTIONS

1. **Epiglottitis in a 2-year-old child occurs most commonly due to infection with:** [AIIMS May 05]
 - a. Influenza virus
 - b. *Staphylococcus aureus*
 - c. *Haemophilus influenzae*
 - d. Respiratory syncytial virus
2. **Which of the following is the etiological agent most often associated with Epiglottitis in children?** [AIIMS Nov 04]
 - a. *Streptococcus pneumoniae*
 - b. *Haemophilus influenzae* type b
 - c. *Neisseria* sp.
 - d. *Moraxella catarrhalis*
3. **Thumb sign in lateral X-ray of neck seen in:** [PGI Dec 04]
 - a. Epiglottitis
 - b. Internal hemorrhage
 - c. Saccular cyst
 - d. Ca epiglottis
 - e. Vallecular cyst
4. **In acute epiglottitis, common cause of death is:** [Delhi 96]
 - a. Acidosis
 - b. Respiratory obstruction
 - c. Atelactasis
 - d. Laryngospasm
5. **The antibiotic of choice in acute epiglottitis pending culture sensitivity report is:** [01]
 - a. Erythromycin
 - b. Rofitetracycline
 - c. Doxycycline
 - d. Ampicillin
6. **A 1-year-old infant has biphasic stridor, barking cough and difficulty in breathing since 3–4 days. He has high-grade fever and leukocyte count is increased. Which of the following would not be a true statement regarding the clinical condition of the child?** [AI 10]
 - a. It is more common in boys than in girls
 - b. Subglottic area is the common site of involvement
 - c. Antibiotics are mainstay of treatment
 - d. Narrowing of subglottic space with ballooning of hypopharynx is seen
7. **Pachydermia laryngitis – M/C site of involvement**
 - a. Arytenoids cartilage
 - b. Posterior 1/3 and anterior 1/3 commissure
 - c. Anterior 1/3 commissure
 - d. Vestibular fold
8. **The cause for contact ulcer in vocal cords is:** [Kerala 94, 95]
 - a. Voice abuse
 - b. Smoking
 - c. TB
 - d. Malignancy
9. **Which of the following statements is not true for contact ulcer?** [AIIMS 03]
 - a. The commonest site is the junction of anterior 1/3rd and middle 1/3rd of vocal cord and gastroesophageal reflux is the causative factor
 - b. Can be caused by intubation injury
 - c. The vocal process is the site and is caused/aggravated by acid reflux
 - d. Can be caused by adductor dysphonia
10. **In a patient hoarseness of voice was found to be having pachydermia laryngitis. All of the following are true except:** [AIIMS 02]
 - a. It is a hyperkeratotic lesion present within the anterior 2/3rd of the vocal cords
 - b. It is not premalignant lesion
 - c. Diagnosis is made by biopsy
 - d. On microscopy it shows acanthosis and hyperkeratosis
11. **A middle-aged male comes to the outpatient department (OPD) with the only complaint of hoarseness of voice for the past 2 years. He has been a chronic smoker for 30 years. On examination, a reddish area of mucosal irregularity overlying a portion of both cords was seen. Management would include all except:** [AI 03]
 - a. Cessation of smoking
 - b. Bilateral cordectomy
 - c. Microlaryngeal surgery for biopsy
 - d. Regular follow-up
12. **Steeple sign is seen in:** [SGPGI 05; UP 05]
 - a. Croup
 - b. Acute epiglottitis
 - c. Laryngomalacia
 - d. Quinsy
13. **True about laryngitis sicca:** [PGI June 05]
 - a. Caused by *Klebsiella ozaena*
 - b. Caused by *Klebsiella rhinoscleromatosis*
 - c. Hemorrhagic crust formation seen
 - d. Antifungal are effective
 - e. Microlaryngoscopic surgery is a modality of treatment
14. **Wrong about Laryngitis sicca:** [PGI June 04]
 - a. Also known as Laryngitis atrophica
 - b. Caused by *Klebsiella ozaena*
 - c. Caused by *Rhinosporidium*
 - d. Common in women
15. **Reflux laryngitis produces:** [PGI Dec 04]
 - a. Subglottic stenosis
 - b. Ca larynx
 - c. Cord fixation
 - d. Acute supraglottitis
 - e. Laryngitis
16. **Tubercular laryngitis affects primarily:** [TN 01]
 - a. Anterior commissure
 - b. Posterior commissure of larynx
 - c. Anywhere within the larynx
 - d. Superior surface of larynx
17. **True about TB larynx:** [PGI 02]
 - a. 'Turban' epiglottis
 - b. Odynophagia
 - c. Cricoarytenoid fixation
 - d. Ulceration of arytenoids
 - e. Paralysis of vocal cord
18. **Mouse-nibbled appearance of vocal cord is seen in:** [CUPGEE 01]
 - a. TB
 - b. Syphilis
 - c. Cancer
 - d. Papilloma
19. **Infection involving anterior larynx:** [MP 01]
 - a. TB
 - b. Sarcoidosis
 - c. Syphilis
 - d. All the above
20. **Reinke's edema is seen in:** [JIPMER 98; Karn 01]
 - a. Vestibular folds
 - b. Edges of vocal cords
 - c. Between true and false vocal cords
 - d. In pyriform fossa

21. Reinke's layer is seen in: [CMC]
 a. Vocal cord b. Tympanic membrane
 c. Cochlea d. Reissner's membrane
22. Pharyngeal Pseudosulcus is seen secondary to: [AI 09]
 [AIIMS Nov 2012]
 a. Vocal abuse b. Laryngopharyngeal reflux
 c. Tuberculosis d. Corticosteroid usage
23. In dysphonia plica ventricularis, sound is produced by [AIIMS 99]
 a. False vocal cords b. True vocal cords
 c. Ventricle of larynx d. Tongue
24. Features of functional aphonia: [PGI June 06]
 a. Incidence in males
 b. Due to vocal cord paralysis
 c. Can cough
 d. On laryngoscopy vocal cord is abducted
 e. Speech therapy is the treatment of choice
25. Habitual dysphonia is characterized by: [PGI Dec 04]
 a. Poor voice in normal environment
 b. Related to stressful events
 c. Treatment is vocal exercise and reassurance
 d. Whispering voice
 e. Quality of voice is constant
26. Rhinolalia clausa is associated with all of the following except: [AI 07]
 a. Allergic rhinitis b. Palatal paralysis
 c. Adenoids d. Nasal polyps
27. In a patient with hypertrophied adenoids, the voice abnormality that is seen is: [JIPMER 00; Karn. 01]
 a. Rhinolalia clausa b. Rhinolalia aperta
 c. Hot potato voice d. Staccato voice
28. Young man whose voice has not broken is called:
 a. Puberphonia b. Androphonia
 c. Plica ventricularis d. Functional aphonia
29. Androphonia can be corrected by doing: [AI 05]
 a. Type 1 thyroplasty b. Type 2 thyroplasty
 c. Type 3 thyroplasty d. Type 4 thyroplasty
30. Key nob appearance is seen in: [MP 08]
 a. Functional aphonia
 b. Puberphonia
 c. Phonasthenia
 d. Vocal cord paralysis
31. Most common location of vocal nodule: [UP 04; PGI 00]
 a. Anterior 1/3 and posterior 2/3 junction
 b. Anterior commissure
 c. Posterior 1/3 and anterior 2/3 junction
 d. Posterior commissure
32. True about vocal nodule is/are: [PGI 00]
 a. Also known as screamer's node
 b. Occur at junction of ant. 1/3rd and post. 2/3rd of vocal cords
 c. Most common presentation is aphonia
 d. Microlaryngoscopic surgery is not useful
33. According to European Laryngeal Society, subligamentous cordectomy is classified as: [AIIMS May 11]
 a. Type I b. Type II
 c. Type III d. Type IV
34. Change in pitch of sound is produced by which muscle: [Jharkhand 04]
 a. Post cricoarytenoids b. Lateral cricoarytenoids
 c. Cricothyroid d. Vocalis
35. Following is not true about spasmodic dysphonia [AI 12]
 a. Patient with the abductor type have strained and strangled voice
 b. Botulinum toxin is the standard treatment for it
 c. Multiple sittings of botulinum toxin A is required for its treatment
 d. It affects the muscles of the larynx

EXPLANATIONS AND REFERENCES

1. Ans. is c i.e. *Haemophilus influenzae*
2. Ans is b i.e. *Haemophilus influenzae* type B
 Ref. Dhingra 5th/ed, p 307; Ghai 6th/ed, p 340; Harrison 17th/ed, pp 212,213, Scott-Brown's 7th/ed Vol 2, p 2250; Mohan Bansal p 479
 - Most common organism causing epiglottitis in children is *H. influenzae* type B.
 - Though the introduction of Hib vaccine has reduced the annual incidence acute epiglottitis but still most of the pediatric cases seen today are due to *haemophilus influenzae* B. —Harrison 17th/ed p 212
 - In adults it can be caused by group A streptococcus, *S. pneumoniae*, *S. aureus* and *Klebsiella pneumoniae*
3. Ans. is a i.e. Epiglottitis
 Ref. Dhingra 5th/ed p 308; Scott-Brown's 7th/ed Vol 2 p 2250; Mohan Bansal p 479

ALSO KNOW

Steeple sign i.e. narrowing of subglottic region is seen in chest X-ray of patients of laryngotracheobronchitis (i.e. croup).

A plain lateral soft tissue radiograph of neck shows the following specific features:

- Thickening of the epiglottis—the **thumb sign**
- Absence of a deep well-defined vallecula—the **vallecula sign**

4. Ans. is b i.e. Respiratory obstruction
 Ref. Scott's Brown 7th/ed vol-2 pg 2251; Logan Turner 10th/ed p 390; Mohan Bansal p 480

Acute Epiglottitis

"The main complication is death from respiratory arrest due to acute airway obstruction"

—Scott's Brown 7th/ed pg 225

- Respiratory arrest is more likely in patients with rapidly progressive disease and occurs within hours of onset of the illness
- Other complications are rare but include epiglottic abscess, pulmonary edema secondary to relieving airway obstruction and thrombosis of internal jugular vein (Lemierre's syndrome)

5. Ans. is d i.e. ampicillin

Ref. Turner 10th/ed p 390

Well friends, there is some controversy over this one.

- Let's, first see what Dhingra 5/e, p 308, has to say:
- Ampicillin or third generation cephalosporin are effective against *H. influenzae* and are given by parenteral route."

However, books like Turner and Harrison do not agree with Dhingra about ampicillin being the drug of choice.

Harrison 17/e, p 212 says:

"Once the airway has been secured and specimens of blood and epiglottis tissue have been obtained for culture, treatment with IV antibiotics should be given to cover the most likely organism particularly *H. influenzae*. Because rates of ampicillin resistance in this organism have risen significantly in recent years, therapy with a beta lactam / beta lactamase inhibitor combination or a second or third generation cephalosporin is recommended. Typically, ampicillin / sulbactam, cefuroxime, cefotaxime or ceftriaxone is given, with clindamycin and trimethoprim-sulfamethoxazole reserved for patients allergic to beta lactams."

So, according to Harrison **DOC are:**

- Ampicillin + Sulbactam (Not ampicillin alone)
- Cefuroxime
- Cefotaxime
- Ceftriaxone

According to Scott's Brown 7/ed vol-2 pg-2251

"The antibiotics of choice are second and third generation cephalosporin. Ampicillin was often prescribed but resistant *H. influenzae* are now emerging".

Now, let's read what Turner 10/e, p 390 has to say:

"Treatment is to put the child in an atmosphere of moist oxygen. Sedation must be given cautiously, if at all, in case the respiratory centre is depressed. Chloramphenicol is the antibiotic of choice and it should be given intramuscularly or preferably intravenously. Amoxycillin or ampicillin is no longer advised as *Haemophilus* organisms are now sufficiently often resistant to make its use inappropriate."

Neither 2nd/3rd generation cephalosporins nor chloramphenicol is given in the option. Hence we will have to opt for ampicillin as no other option is correct.

Remember: DOC for epiglottitis - 2nd/3rd generation cephalosporin. Treatment with ampicillin is not that effective due to beta lactamase production by *Hib*. Prophylaxis with Rifampicin for 4 days is advocated in unimmunized household contacts < 4 years of age and in all immunocompromised contact.

6. Ans. is c i.e. Antibiotics are mainstay of treatment

Ref. Dhingra 5th/ed p 308; Mohan Bansal p 478

CROUP (laryngotracheitis and laryngotracheobronchitis)

- Croup is a common respiratory illness in childhood.
- It is an inflammatory condition involving the larynx, trachea and bronchi.
- Most common site involved is subglottis.
- **Pathology** – There is some degree of laryngeal inflammation, loose areolar tissue of subglottis swells up; resulting in hoarseness, a barking cough and varying degrees of respiratory distress over time.
- **Etiology** – Mostly it is viral in origin. Most common viruses involved are parainfluenzae 1 and 2. Others are influenza A and B, respiratory syncytial virus, adenovirus and measles. Bacterial super-infection can occur in cases of laryngotracheobronchitis and laryngotracheobronchopneumonitis.
- **Age** – most commonly seen between the ages of 1 and 6 years with a peak incidence being around 18 months of age and the majority of cases below 3 years of age.
- It is more common in boys than girls.
- Laryngotracheitis generally starts with several days of rhinorrhea, pharyngitis, low-grade fever and a mild cough. Over the next 12 to 48 hours, a progressively worsening "barky" cough, hoarseness and inspiratory stridor are noted, secondary to some degree of upper airway obstruction and laryngeal inflammation. The onset is often rapid and typically in the early morning hours (e.g. 2:00 am).
- On examination, the child will be noted to have coryza, a hoarse voice, and varying degrees of pharyngeal inflammation, tachypnea, and stridor. More severe cases may involve nasal flaring, moderate tachypnea, retractions and cyanosis. Some children with croup may not be able to maintain adequate oral intake of fluids. Alveolar gas exchange is usually normal, with hypoxia seen only in severe cases.
- The diagnosis is usually made on clinical grounds. Laboratory studies add little to the diagnosis of croup if bacterial infection is not suspected. White blood cell counts may be elevated above 10,000 with a predominance of polymorphonuclear cells.
- Chest radiographs may show subglottic narrowing (in 50% of children with croup) called as "Steeple sign".

- The most important diagnostic consideration is distinguishing acute epiglottitis from acute laryngotracheitis. Epiglottitis describes a bacterial infection of the epiglottis. It is most commonly caused by *H. influenzae* type B. In epiglottitis fever is of very high grade, patient has a toxic look, there is marked stridor and odynophagia. On chest X-ray thumb sign is seen.

Management

- Once the diagnosis of croup is made, mist therapy, corticosteroids and epinephrine are the usual treatments. Since croup is chiefly viral in etiology, antibiotics play no role. Mist therapy (warm or cool) is thought to reduce the severity of croup by moistening the mucosa and reducing the viscosity of exudates, making coughing more productive. For patients with mild symptoms, mist therapy may be all that is required and can be provided at home.
- For more severe cases, further intervention may be required like oxygen inhalation by mask, racemic epinephrine given by nebulizer, corticosteroids and intubation or tracheostomy.

7. Ans. is a i.e. arytenoid cartilage

Ref. Scott's Brown 7th/ed vol-2 pg 2196

Pachyderma laryngitis affects the medial surface of arytenoid cartilage, in particular the vocal processes.

ALSO KNOW

Condition	Site
Tuberculosis	Posterior half of larynx
Syphilis	Anterior commissure and anterior 1/3 of vocal cord
Leprosy	Anterior part of larynx including epiglottis and aryepiglottic fold
Vocal nodule	Junction of anterior 1/3 and posterior 2/3 of vocal cord
Glottic cancer	Free edge and upper surface of anterior 1/3 of true vocal cord.

8. Ans. is a i.e. Voice abuse

Ref. Maqbool 11th/ed p 334; Mohan Bansal p 486

Aetiology of contact ulcers is multi factorial but the most important cause is:

- Voice abuse (*faulty production of voice rather than excess use*). - Maqbool
- Smoking as a cause for contact ulcer is given only in Dhingra and is not supported by Scotts Brown or Maqbool.

9. Ans. is a i.e. The commonest site is the junction of anterior 1/3rd and middle 1/3rd of vocal cord and gastroesophageal reflux is the causative factor

Ref. Scotts Brown 7th/ed Vol-2 pg 2196-2197

10. Ans. is a i.e. It is a hyperkeratotic lesion present within the anterior 2/3rd of the vocal cords

Ref. Dhingra 5th/ed p 311; Maqbool 11th/ed pg 334; Scotts Brown 7th/ed vol-2 pg 2197

The most common site for contact ulcers is vocal processes of the arytenoid cartilage.

Contact ulcers: / Vocal process granuloma / arytenoids granuloma / intubation granuloma.

- Nearly exclusively seen in men over the age of 30 years.
- Commonly located over the posterior part of vocal processes of arytenoid cartilage.
- Can be unilateral or bilateral
- **It is multifactorial in aetiology:**
 - Vocal abuse (*most important Etiological factor*) talking in a habitually low pitched creaky, hyperfunctional manner (∴ option d is correct)
 - Prolonged intubation
 - Esophageal dysfunction (*such as gastroesophageal reflux, hiatus hernia, dysmotility*).
- **Symptoms**
 - Low pitch quality of voice (most prominent feature).
 - Irritation and pain in larynx which worsens on phonation or coughing and it can radiate to ear.
- **Management**
 - Voice therapy along with anti reflux medications.
 - In persistent cases microlaryngeal excision may be required to confirm the diagnosis and exclude malignancy.

11. Ans. is b i.e. Bilateral cordectomy

Ref. Dhingra 6th/ed p 292-293,309

Middle aged man + Chronic smoking + Hoarseness of voice + Bilateral reddish area of mucosal irregularity on cords

All these indicate that either it is pachydermia laryngitis or it can be early carcinoma:

- Both the conditions can be distinguished by biopsy only so **option "c"** is correct.
- **In either conditions:** smoking is a causative factor and should be stopped.
- Regular follow up is a must in either of the conditions.
- Bilateral cordectomy is not required even if it is glottic cancer because *early stages of glottic cancer are treated by radiotherapy*.
- Management of pachydermia is microsurgical excision of hyperplastic epithelium (*cordectomy has no role*).

12. Ans. is a i.e. Croup

Ref. Ghai Pediatric 6th/ed p 339; Current Otolaryngology 2nd/ed p 472

Chest X-ray in croup (*Laryngotracheobronchitis*) reveals a characteristic narrowing of the subglottic region called *steeple sign*.**13. Ans. is a, c and e i.e. Caused by klebsiella ozaena; Hemorrhagic crust formation seen; and Microlaryngoscopic surgery**

Ref. Dhingra 5th/ed p 312; Scott Brown 6th/ed Vol. I, p 512, 513; Mohan Bansal p 481

14. Ans. is c i.e. Caused by Rhinosporidium.

Ref. Dhingra 6th/ed p 293

For details see text

15. Ans. is a, b and e i.e. Subglottic stenosis; Ca Larynx; Laryngitis

- There are lots of controversies regarding the reflux laryngitis secondary to reflux gastrointestinal disease. But now some studies document that there is a clear relation between the two.

- **Reflux laryngitis may have the following sequelae:**

- Bronchospasm
- Chemical pneumonitis
- Refractory **subglottic stenosis**
- Refractory contact ulcer
- Peptic laryngeal granuloma
- Acid laryngitis (*Heart burn, burning pharyngeal discomfort, nocturnal choking due to interarytenoid pachydermia*)
- **Laryngeal Carcinoma** (*According to recent reports laryngeal reflux is the cause of laryngeal carcinoma in patients who are life time non-smokers*).

Laryngopharyngeal Reflux

Here classical GERD symptoms are absent. Patients have more of daytime/upright reflux without the nocturnal/supine reflux of GERD. In laryngopharyngeal reflux esophageal motility and lower esophageal sphincter is normal, while upper esophageal sphincter is abnormal. The traditional diagnostic tests for GERD are not useful in LPR.

Symptom Chronic or Intermittent dysphonia, vocal strain, foreign body sensation, excessive throat mucus, Postnasal discharge and cough. *Laryngeal findings:* Interarytenoid bunching, Posterior laryngitis and subglottic edema (*Pseudosulcus*)

Sequelae of Laryngopharyngeal Reflux

- Subglottic stenosis
- Carcinoma larynx
- Contact ulcer/granuloma
- Cricoarytenoid joint fixity
- Vocal nodule/polyp
- Sudden infant deaths
- Laryngomalacia (Association)

Treatment is in similar lines as GERD, but we need to give proton pump inhibitors at a higher dose and for a longer duration (at least 6–8 months).

16. Ans. is b i.e. Posterior commissure of larynx

Ref. Dhingra 5th/ed p 312, 6th/ed p 293

Tuberculosis affects posterior part of larynx more than anterior part.

Parts affected are: Inter arytenoid fold > Ventricular bands > Vocal cords > Epiglottis**17. Ans. is a, b and d i.e. Turban epiglottitis; Odynophagia; and Ulceration of arytenoids****18. Ans. is a i.e. TB**

Ref. Dhingra 5th/ed pg 312, 6th/ed p 293; Mohan Bansal p 481

- Tuberculosis of larynx is always secondary to pulmonary TB.
- Tubercle bacilli reach the larynx by bronchogenic or haematogenous routes.
- Mostly affects males in middle age group.
- Affects posterior part of (Posterior Commissure) larynx more than anterior part.

Clinical Features

- Weakness of voice (earliest symptom), odynophagia, dysphagia.
- Pain radiates to the ears.
- **Laryngeal examination shows:**
 - **Vocal cord: Mouse nibbled ulceration**
 - **Arytenoids:** show ulceration.
 - **Interarytenoid region is swollen giving a mammillated appearance^a**
- **Epiglottis shows:** Pseudoedema and is called as '*turban epiglottis*'.
- Surrounding mucosa is pale.

NOTE

Earliest sign = Adduction weakness



Remember: Knob like epiglottis and Button hole Epiglottis is seen in leprosy

19. Ans. d i.e. all of the above

Ref. Scott's Brown 7th/ed pg 2267

Syphilis

Larynx is rarely involved. If Larynx is involved it presents as diffuse erythematous papules (secondary stage) and nodular infiltrates coalescing into painless ulcers (tertiary stage) **with epiglottis and aryepiglottic folds being principally involved** (i.e. anterior part involved).

Sarcoidosis

It is a slowly progressive disease with laryngeal involvement in less than 5% cases.

Laryngeal appearance is similar to that of T.B with **supraglottic structures being involved primarily** i.e. anterior part involved.

T: B

As discussed earlier it involves posterior part more than anterior part.

The parts being involved in the order:

- (i) Interarytenoid fold
- (ii) Ventricular bands
- (iii) Vocal cords
- (iv) Epiglottis

Hence – though less involved but anterior part of larynx may be involved.

20. Ans. is b i.e. Edges of vocal cords

Ref. Dhirgra 5th/ed p 311, 6th/ed p292; Mohan Bansal 1st/ed p 486

21. Ans. is a i.e. Vocal cord

Reinke's Edema

- It is diffuse edema of the Reinke's space (of vocal cords) leading to irreversible fusiform swelling of the vocal cord—usually bilateral.
- Commonest etiology is smoking though extra esophageal reflux, vocal strain and hypothyroidism has also been implicated.
- Patient has a *low-pitched hoarse voice*; may present as stridor in severe cases.
- *Treatment is superior cordotomy* (incising the superior surface of vocal cord preserving the medial vibrating edge) through microlaryngoscopy to decompress the edema fluid. The mucosal flap is then replaced after trimming off the excess epithelium.

22. Ans. is b i.e. laryngopharyngeal reflex

Ref. Ballenger's Otolaryngology 17th/ed p 886; Scott Brown's 7th/ed p 2238)

Vocal Sulcus/Laryngeal Sulcus

It is a groove along the mucosa and can be classified into three types:

Laryngeal sulcus

Laryngeal Pseudosulcus (Pseudosulcus Vocalis)	Laryngeal True Sulcus (Sulcus vergeture)	Sulcus vocalis
Pseudosulcus arises due to swelling of the subglottic area secondary to laryngotracheal reflux . It refers to infraglottic edema extending from anterior commissure to posterior larynx	True sulcus is related to scarring of the vocal fold in the phonatory striking zone	Seen in deeper layers of ligament
The pseudosulcus is located between the true vocal folds and the subglottic swelling	This is located within the true vocal folds at the site of the adherence of vocal fold epithelium to the vocal ligament	

NOTE

- It is believed that vocal sulcus / laryngeal sulcus are more common in Indian subcontinent.
- They frequently present with persistent dysphonia following puberty.

Management

Phonosurgical treatment, i.e. either excising the sulcus, injecting collagen or fat to boost the underlying layer or giving a parallel incision in the mucosa running in cephalad to cordal direction to break up the linear scar and vocal fold.

23. Ans. is a i.e False vocal cord

Ref. Dhingra 5th/ed pg 334, 6th/ed p 313; Mohan Bansal p 497

In dysphonia plica **ventricularis** voice is produced by false vocal cords (ventricular folds).**24. Ans. is c and d i.e. Can cough; and on laryngoscopy vocal cord is abducted**

Ref. Dhingra 5th/ed p 334, 6th/ed p 314; Mohan Bansal p 497

- Functional aphonia or hysterical aphonia is a functional disorder mostly seen in emotionally labile females in the age group of 15-30 years.
- Laryngoscopy Examination shows vocal cord in abducted position and fails to adduct on phonation, however adduction is seen on coughing, indicating normal adductor function.
- **Treatment :**
 - Reassurance of the patient of normal laryngeal function and psychotherapy.
 - Speech therapy has no role in it.

25. Ans. is a, c, d and e i.e. Poor voice in normal environment; Treatment is vocal exercise and re-assurance; Whispering voice; and Quality of voice is constant

- When a person always uses a poor voice in normal circumstances, is called habitual dysphonia. It is not related to stressful events and seems to be a habit.
- The distinguishing characteristics of habitual and psychogenic functional dysphonia are:

Habitual dysphonia	Psychogenic functional dysphonia
Quality of voice is always poor	Previous good voice quality
Very gradual onset of voice problem	Abrupt change in voice quality.
Quality of voice is nearly constant changing with circumstances	Inconstant quality of voice
The voice fails repeatedly after prolonged speaking	Voice fails repeatedly in situations of emotional stress.

Some patients with habitual dysphonia need vocal exercises and very little counseling. Others are cured by a few counseling sessions and no voice practice at all.

26. Ans. is b i.e. Palatal paralysis Ref. Dhingra 5th/ed p 334-335, 6th/ed p 315; Mohan Bansal p 497**27. Ans. is a i.e. Rhinolalia clausa**

- Rhinolalia clausa is lack of nasal resonance (hyponasality).
- It is seen in conditions which block the nose or nasopharynx. So will be seen in case of allergic rhinitis, adenoids and nasal polyps.
- Palatal paralysis will lead to hypernasality and not hyponasality.

28. Ans. is b i.e. Puberphonia

Ref. Dhingra 5th/ed p 334, 6th/ed p 315, Mohan Bansal p 497

- In males at the time of puberty, the voice normally drops by an octave and becomes low pitch.
- It occurs because vocal cords lengthen
- Failure of this change leads to persistence of childhood high pitched voice and is called as puberphonia
- It is seen in boys who are emotionally insecure and show excessive attachment to their mothers. Their physical and sexual development is normal

Treatment

Training the body to produce low pitched voice.

NOTE

- **Gutzmann pressure test:** In this test thyroid prominence is pressed backward and downward producing low tone voice.
- If this test is positive it indicates puberphonia.

29. Ans. is d i.e. Type IV thyroplasty

Ref. Dhingra 5th/ed p 321

Thyroplasty

Type	Procedure	Indication
Type 1	Medialisation of vocal cord	Unilateral vocal cord paralysis, vocal cord atrophy and sulcus vocalis
Type 2	Lateralisation of vocal cord	Spasmodic dysphonia
Type 3	Shortening (relaxation) of cord	For lowering vocal pitch as in puberphonia
Type 4	Lengthening (Stretching) of cord	For elevating the pitch as in androphonia

30. Ans. is c i.e. Phonoasthenia

Ref. Dhingra 5th/ed p 334, 6th/ed p 314

Phonoasthenia is weakness of voice due to fatigue of phonatory muscles i.e. either thyroarytenoids or intrarytenoids or both

O/E – on **Indirect laryngoscopy** – 3 features may be seen

Elliptical space between the cords in case of weakness of thyroarytenoid

Triangular gap near posterior commissure in weakness of interarytenoid

Keyhole appearance of glottis when both thyroarytenoids are involved.

31. Ans. is a i.e. Anterior 1/3 and posterior 2/3 junction

Ref. Dhingra 5th/ed p 322, 6th/ed p 303; Mohan Bansal p 485

32. Ans. is a and b i.e. Also known as screamer's node; and Occur at junction of ant. 1st/3rd and post. 2nd/3rd of vocal cords

Ref. Dhingra 5th/ed p 322, 6th/ed p 303; Current Otolaryngology 2nd/ed p 432; Mohan Bansal p 485

- Vocal nodules are also called **singers or screamers nodes**.
- They are also the most common cause of persistent dysphonia in children
- **Most common site** - at the junction of anterior 1/3 and posterior 2/3 of vocal cords.
- **Most common cause** - voice abuse.
- **Most common presentation** - Hoarseness of voice.
- **O/E** - They appear as bilateral white asymmetric nodules (< 3 mm) on the vocal cord

Management: First line of therapy is speech therapy

Microsurgical surgery should be reserved for cases which do not respond to voice therapy or if diagnosis is not clear.

33. Ans. is 'b' i.e. Type III

- The European Laryngological Society is proposing a classification of different laryngeal endoscopic cordectomies in order to ensure better definitions of post-operative results.
- The word "cordectomy" is used even for partial resections because is the term most often used in the surgical literature.
- The classification comprises eight types of cordectomies.
 - Type I: A subepithelial cordectomy, which is resection of the epithelium
 - Type II: A subligamental cordectomy, which is a resection of the epithelium, Reinke's space and vocal ligament.
 - Type III: Transmuscular cordectomy, which proceeds through the vocalis muscle
 - Type IV: Total cordectomy;
 - Type Va: Extended cordectomy, which encompasses the contralateral vocal fold and the anterior commissure
 - Type Vb: Extended cordectomy, which includes the arythnoid
 - Type Vc: Extended cordectomy, which encompasses the subglottis
 - Type Vd: Extended cordectomy, which includes the ventricle.

34. Ans. is c i.e. Cricothyroid

Ref. PL Dhingra 3rd p 337

Sorry for this one

CHAPTER

14

Vocal Cord Paralysis

NERVE SUPPLY OF LARYNX

The main cranial nerve innervating the larynx is the **vagus nerve** via its branches; **superior laryngeal nerve (SLN)** and **recurrent laryngeal nerve (RLN)**.

- **Superior laryngeal nerve:** arises from the inferior ganglion of vagus and receives a branch from superior cervical sympathetic ganglion. It enters the larynx by piercing the thyrohyoid membrane.
- It divides at the level of greater corner of hyoid into:
 - (i) **Internal laryngeal nerve:**
 - Sensory (It supplies the larynx above the vocal cords)
 - Secretomotor
 - (ii) **External laryngeal nerve:** supplies cricothyroid muscle
 - The superior laryngeal nerve ends by piercing the inferior constrictor of pharynx and unites with ascending branch of recurrent laryngeal nerve. This branch is k/a *galen's anastomosis* & is purely sensory.
- **Recurrent laryngeal nerve:**

Motor branch

Supplies all the intrinsic muscles of the larynx except cricothyroid

Sensory branch

Supplies below the level of the vocal folds

Position of the Vocal cord in Health and Disease

Position of the cord	Location of the cord from midline	Situation in	
		Health	Disease
Median	Midline	Phonation	RLN paralysis
Paramedian	1.5 mm	Strong whisper	RLN paralysis
Intermediate (cadaveric)	3.5 mm. This is neutral position of cricoarytenoid joint. Abduction and adduction take place from this position	-	Paralysis of both recurrent and superior laryngeal nerves
Gentle abductin	7 mm	Quiet respiration	Paralysis of adductors
Full abduction	9.5 mm	Deep inspiration	-

NOTE

On the right side recurrent laryngeal N originates from vagus and on left side it has a longer course since it originates in mediastinum at the level of arch of aorta and it is more vulnerable to injury.

Muscle Actions

- In order to have a better understanding of the effects of nerve palsies: a summary of the nerve supply and actions of intrinsic muscles is given. In the table:

Muscle	Supplied by	Action
Cricothyroid	SLN	Tensor, Adductor
Posterior cricothyroid	RLN	Abductor
Lateral cricoarytenoid	RLN	Adductor
Interarytenoids	RLN	Adductor
Vocalis	RLN	Adductor

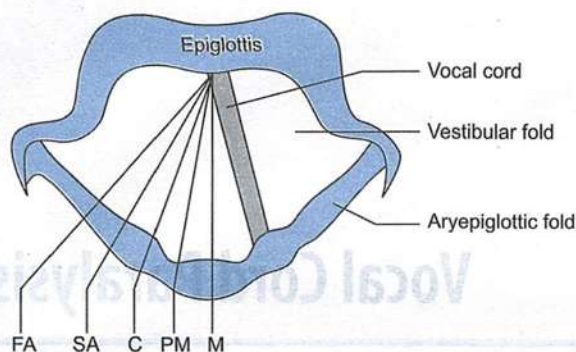


Fig. 14.1: Vocal cord positions

Abbreviations: M, Median; PM, Paramedian; C, Cadaveric (Inter-mediate); SA, Slight abduction; FA, Full abduction
 Courtesy: *Text book of Diseases of Ear, Nose and Throat*, Mohan Bansal. Jaypee Brothers, p 491

High vagal nerve palsy: Vagus nerve involvement in the skull from parapharyngeal space - till jugular foramen.

- Features: Left side is more commonly involved
- B/L paralysis occurs in 6% cases.
- Male: Female = 8:1

Causes of Vocal Cord Palsy

- Idiopathic
- **Malignancy:**
 - Bronchial (50%)
 - Oesophageal (20%)
 - Thyroid (10%)
 - Nasopharyngeal carcinoma/ 20%
 - Glomus tumor, lymphoma.
- Surgical trauma (Oesophageal, lung, thyroid, radical neck dissection).
- Non-surgical trauma (Road traffic accident, Otner's syndrome).
- **Viral factors:** Infectious mononucleosis, Influenza.
- **Bacterial causes:** T.B., syphilis.
- **Miscellaneous causes:** Hemolytic anemia, collagen disorder, Diabetes, alcoholism. Gullain Barre syndrome

LAWS RELATED TO NERVE PALSIES

- **Semons law:** States that in a gradually advancing organic lesion of recurrent laryngeal nerve or its fibres in the peripheral trunk, 3 stages can be observed.
 - 1st stage**
 - Only abductor paralyzed
 - Vocal cord in the midline
 - Adduction still possible
 - 2nd stage**
 - Additional contracture of the abductors. Cord immobilized in the median position.
 - 3rd stage**
 - Adductors paralysed. Cords are present in the cadaveric position (Intermediate position)
- **Wagner and Grossman theory:** States that in the absence of cricoarytenoid joint fixation, an immobile vocal fold lying in the paramedian position has a total Unilateral recurrent laryngeal nerve palsy, while an immobile vocal fold in the lateral (cadaveric) position has combined paralysis of superior and recurrent laryngeal nerves.

SUPERIOR LARYNGEAL NERVE PALSY

Unilateral Paralysis

Muscle affected	Cricothyroid-Adductor, Tensor
Features	<ul style="list-style-type: none"> • Voice not severely affected and recovers fast. • Pitch of the voice cannot be raised • Ipsilateral cord: <ul style="list-style-type: none"> – Bowed and floppy – Increased length – Cords sag down during inspiration and bulge up during expiration • U/L Anaesthesia of larynx above the level of vocal cord

Treatment: No treatment

Bilateral Paralysis

- Features - voice is breathy and weak.
- High chances of aspiration as there is bilateral anaesthesia of supraglottic part.

Treatment

- Tracheostomy may be required.
- Epiglottopexy to close the laryngeal inlet, to protect the lungs from repeated aspiration, may be done.

RECURRENT LARYNGEAL NERVE PALSY

U/Labductor Paralysis

Recurrent laryngeal nerve palsy leads to ipsilateral paralysis of all intrinsic laryngeal muscles except cricothyroid.

- **Affected cord:** Paramedian position (vocal cord does not move laterally on deep inspiration)
- **Features:**
 - Slight hoarseness, which improves over the days.
 - Voice tires with use.

Treatment: Speech therapy

NOTE

Causes of Left Recurrent laryngeal Nerve palsy:

- Pancoast tumor of lung
- Mitral stenoses—due to enlarged left atrium (k/a Ortner's syndrome)
- Aneurysm of arch of aorta
- Apical TB

B/L Recurrent laryngeal nerve palsy-(B/L Abductor paralysis)

M/C cause = Thyroid surgery and neuritis

Features

- Both cords lie either in the median or in the paramedian position due to unopposed action of cricothyroid muscle.
- Voice is good

- **Dyspnea/stridor:** May be present as airway is inadequate.
- Stridor becomes worse on exertion or during an attack of acute laryngitis.

Treatment

- Emergency tracheostomy as an emergency procedure
- In long term cases choice is between a permanent tracheostomy with a speaking valve or a surgical procedure to lateralize the cord. The former relieves stridor, preserves good voice but has the disadvantage of a tracheostomy hole in the neck. The latter relieves airway obstruction but at the expense of a good voice, however, there is no tracheostomy hole in the neck.
- **Widening the respiratory airway without a permanent tracheostomy (endoscopic or through external cervical approach).** Aim is to widen the respiratory airway through larynx. This can be achieved by (i) arytenoidectomy with suture, woodman procedure, Dowine procedure, (ii) arytenoidopexy (fixing the arytenoid in lateral position), (iii) lateralization of vocal cord and (iv) laser cordectomy (removal of one cord).
- These operations have now been replaced by less invasive techniques such as:
 - (i) Transverse cordotomy (kashima operation).
 - (ii) Partial arytenoidectomy.
 - (iii) Reinnervation procedures. Aim to innervate paralyzed posterior cricoarytenoid muscle by implanting a nerve-muscle pedicle of sternohyoid or omohyoid muscle with its nerve supply from ansa hypoglossi. These procedures have not been very successful.
 - (iv) Thyroplasty type II

COMBINED SUPERIOR AND RECURRENT LARYNGEAL NERVE PALSY

U/L adductor paralysis

(Both superior and recurrent laryngeal nerve gone).

There occurs unilateral paralysis of all laryngeal muscles except the inter arytenoid which receives innervation from both the sides.

- **Position of the cord:** U/L Cadaveric position (3.5 mm from midline)
- **Features:**
 - Voice produced is weak and husky

- **Treatment**
 - Chances of aspiration are present.
 - Cord medialization.
- **Surgery for medialization of the cord: (Type I thyroplasty)**
 - Intracordal injection: Teflon and collagen
 - Arytenoid rotation
 - Nerve- muscle pedicle reinnervation.
 - Recurrent laryngeal nerve reinnervation
 - Muscle / cartilage implant

B/L Adductor Paralysis (M/C Cause = Functional → Flag sign is seen)

- **Position of the cord:** B/L Cadaveric
- **Features:**
 - Aphonia
 - Inability of cough
 - Aspiration
 - Bronchopneumonia

There is also total anaesthesia of the larynx.

Treatment

- Where recovery expected:
 - Tracheostomy with cuff
 - Epiglottopexy
 - Vocal cord plication
- If neurological lesion is progressive and irreversible total laryngectomy to prevent aspiration and lung infection

Isshiki's thyroplasty: It is an innovative procedure developed to improve the laryngeal mechanics:

Types:

- Type 1: Medialization of the cord
- Type 2: Lateralization of the cord
- Type 3: Shortening the cord (lowers the vocal pitch)
- Type 4: Lengthening of the cord (to increase the pitch) to correct androphonia. The male character low pitch voice is converted to female pitch voice.

Note

Carcinoma bronchus is the most common cause of left RLN palsy, while thyroid surgery affects right RLN (as RLN is close to inferior thyroid artery, so increased chances of injury during thyroidectomy).

QUESTIONS

1. Which of the following muscle is not supplied by recurrent laryngeal nerve: [PGI Dec 08]
 - a. Post cricoarytenoid
 - b. Thyroarytenoid
 - c. Lateral cricoarytenoid
 - d. Cricothyroid
 - e. Interarytenoids
2. Cricothyroid muscle is supplied by: [Jharkhand 2003]
 - a. Superior laryngeal nerve
 - b. External laryngeal nerve
 - c. Vagus nerve
 - d. Glossopharyngeal nerve
3. Position of vocal cord in cadaver is: [DNB 2000]
 - a. Median
 - b. Paramedian
 - c. Intermediate
 - d. Full Abduction
4. Why vocal cord looks pale? [TN 2005]
 - a. Vocal cord is muscle, lack of blood vessels network
 - b. Absence of mucosa, no blood vessels
 - c. Absence of sub mucosa, no blood vessels
 - d. Absence of mucosa with blood vessels
5. Right sided vocal cord palsy seen in: [AIIMS 99]
 - a. Larynx carcinoma
 - b. Aortic aneurysm
 - c. Mediastinal lymphadenopathy
 - d. Right vocal nodule
6. The most common cause of vocal cord palsy is: [UPSC05]
 - a. Total thyroidectomy
 - b. Bronchogenic carcinoma
 - c. Aneurysm of aorta
 - d. Tubercular lymph nodes.
7. Left sided vocal cord palsy is commonly due to: [TN2005]
 - a. Left hilar bronchial carcinoma
 - b. Mitral stenosis
 - c. Thyroid malignancy
 - d. Thyroid surgery
8. Vocal cord palsy is not associated with: [AP 2003]
 - a. Vertebral secondaries
 - b. Left atrial enlargement
 - c. Bronchogenic carcinoma
 - d. Secondaries in mediastinum
9. Bilateral (B/I) recurrent laryngeal nerve palsy is/ are caused by: [PGI 00]
 - a. Thyroid surgery
 - b. Thyroid malignancy
 - c. Aneurysm of arch of aorta
 - d. Viral infection
 - e. Mitral valve surgery
10. Cause of B/L Recurrent laryngeal nerve palsy is/are: [PGI Nov, 09]
 - a. Thyroid Ca
 - b. Thyroid Surgery
 - c. Bronchogenic Ca
 - d. Aortic aneurysm
 - e. Cervical lymphadenopathy
11. Bilateral recurrent laryngeal nerve palsy is seen in: [Delhi 2008]
 - a. Thyroidectomy
 - b. Carcinoma thyroid
 - c. Cancer cervical oesophagus
 - d. All of the above
12. Which one of the following lesions of vocal cord is dangerous to life: [UPSC 01, 02]
 - a. Bilateral adductor paralysis
 - b. Bilateral abductor paralysis
 - c. Combined paralysis of left side superior and recurrent laryngeal nerve
 - d. Superior laryngeal nerve paralysis
13. In complete bilateral palsy of recurrent laryngeal nerves, there is: [AIIMS Nov. 03]
 - a. Complete loss of speech with stridor and dyspnea
 - b. Complete loss of speech but not difficulty in breathing
 - c. Preservation of speech with severe stridor and dyspnea
 - d. Preservation of speech and not difficulty in breathing
14. In bilateral abductor paralysis which of the following is seen:
 - a. Vocal cord in paramedian position
 - b. Voice is affected early
 - c. Stridor & dyspnoea occurs
 - d. Vocal cord lateralization done
 - e. Hoarseness occurs
15. The voice in a patient with bilateral abductor paralysis of larynx is: [AP 2005]
 - a. Puberophonía
 - b. Phonasthenia
 - c. Dysphonia plicae ventricularis
 - d. Normal or good voice
16. In B/L, abductor palsy of vocal cords following is done except: [PGI 98]
 - a. Teflon paste
 - b. Cordectomy
 - c. Nerve muscle implant
 - d. Arytenoidectomy
17. Injury to superior laryngeal nerve causes: [AIIMS]
 - a. Hoarseness
 - b. Paralysis of vocal cords
 - c. No effect
 - d. Loss of timbre of voice
18. Paralysis of recurrent laryngeal nerve true is: [Bihar 05]
 - a. Common in (Lt) side
 - b. 50% idiopathic
 - c. Cord will be laterally
 - d. Speech therapy given
19. Partial recurrent laryngeal nerve palsy produces vocal cord in which position: [UP 96]
 - a. Cadaveric
 - b. Abducted
 - c. Adducted
 - d. Paramedian
20. U/L vocal cord palsy treatment includes: [PGI Nov 09]
 - a. Isshiki type I thyroplasty
 - b. Isshiki type II thyroplasty
 - c. Woodmann operation
 - d. Laser arytenoidectomy
 - e. Teflon injection
21. Type I thyroplasty is for: [AI 03]
 - a. Vocal cord medialization
 - b. Vocal cord lateralization
 - c. Vocal cord shortening
 - d. Vocal cord lengthening
22. In thyroplasty type 2, vocal cord is: [AP 2004]
 - a. Lateralized
 - b. Medialized
 - c. Shortened
 - d. Lengthened

23. A 10 year old boy developed hoarseness of voice following an attack of diphtheria. On examination, his Rt vocal cord was paralysed. The treatment of choice for paralysed vocal cord will be: [AIIMS Nov. 05]

- Gel foam injection of right vocal cord
- Fat injection of right vocal cord
- Thyroplasty type-I
- Wait for spontaneous recovery of vocal cord

24. A patient presented with stridor and dyspnea which he developed after an attack of upper respiratory tract infection. On examination he was found to have a 3mm glottic opening. All of the following are used in the management except: [AIIMS 02]

- Tracheostomy
- Arytenoidectomy
- Teflon injection
- Cordectomy

EXPLANATIONS AND REFERENCES

1. Ans. is d i.e. Cricothyroid

2. Ans. is a i.e. Superior laryngeal nerve

Ref. Dhingra 5th/ed p 317, 6th/ed p 298; Scotts brown 7th/ed p 2139

All the muscles which play any role in movement of vocal cord are supplied by recurrent laryngeal nerve except the **cricothyroid muscle** which receives its innervation from the external laryngeal nerve - a branch of **superior laryngeal nerve**.

3. Ans. is c i.e. Intermediate

Ref. Dhingra 5th/ed p 318, 6th/ed p 299; Table 60.2

In cadaveric state - the position of vocal cord is intermediate (i.e. equal amount of adduction & abduction)

4. Ans. is c i.e. Absence of submucosa, no blood vessels

Ref. Maqbool 11th/ed p 310

- Vocal cord are fibro elastic bands.
- They are formed by reflection of the mucosa over vocal ligaments.
- They have stratified squamous epithelium with no submucous layer
- Their blood supply is poor and are almost devoid of lymphatics. Hence vocal cords look pale in appearance.**

5. Ans. is a i.e. Larynx carcinoma

Ref. Dhingra 5th/ed p 318; 6th/ed p 298

This question can be solved easily if you know the course of Left and Right recurrent laryngeal nerve.

As discussed in detail in text:

- Lt RLN:** Arises from vagus in the mediastinum at the level of arch of aorta loops around it and then ascends into the neck.
- Rt. RLN:** Arises from vagus at the level of subclavian artery, hooks around it and then ascends up.

So, any mediastinal causes viz mediastinal lymphadenopathy and aortic aneurysm would parlyse Lt. RLN. only (ruling out **options "b" and "d"**) Vocal nodule does not cause vocal cord palsy.

Laryngeal carcinoma especially glottic can cause U/L or B/L Vocal Cord paralysis - Conn's Current Theory

6. Ans. is a i.e. Total thyroidectomy

7. Ans. is a i.e. Left hilar bronchial carcinoma

8. Ans. is a i.e. Vertebral secondarces

Ref Schwartz surgery 8th/ed p 509; Dhingra 5th/ed p 320, 6th/ed p 299

Vocal cord paralysis is **most commonly** iatrogenic in origin following surgery to Thyroid, parathyroid, carotid or cardiothoracic structures.

Right	Left	Both
<ul style="list-style-type: none"> Neck trauma Benign or malignant thyroid disease Thyroid surgery Carcinoma cervical oesophagus Cervical lymphadenopathy 	<p>i. Neck</p> <ul style="list-style-type: none"> Accidental trauma Thyroid disease (benign or malignant) Thyroid surgery Carcinoma cervical oesophagus Cervical lymphadenopathy <p>ii. Mediastinum</p> <ul style="list-style-type: none"> Bronchogenic cancer (M/C) Carcinoma thoracic oesophagus Aortic aneurysm Enlarged left atrium Intrathoracic surgery Idiopathic 	<ul style="list-style-type: none"> Thyroid surgery Carcinoma thyroid Cancer cervical oesophagus Cervical lymphadenopathy
<ul style="list-style-type: none"> Aneurysm of subclavian artery Carcinoma apex right lung Tuberculosis of cervical pleura Idiopathic 		

9. Ans. is a, b and d i.e. Thyroid surgery; Thyroid malignancy; and Viral infection

10. Ans. is a, b and e i.e. Thyroid Ca, Thyroid Surgery and Cervical lymphadenopathy

11. Ans. is d i.e. all of the above Ref. Dhingra 5th/ed p 21, 6th/ed p 299; Turner 10th/ed p 181; Current Otolaryngology 2nd/ed p 457

Causes of bilateral recurrent laryngeal nerve palsy are:

- Idiopathic
- Post thyroid surgery
- Thyroid malignancy
- Carcinoma of cervical part of esophagus
- Cervical Lymphadenopathy

NOTE

Peripheral neuritis causes high vagal palsy which leads to both superior as well as recurrent laryngeal nerve palsy i.e. bilateral complete palsy. Turner 10/e p. 181; Dhingra 5/e p. 318; 6/e, p301

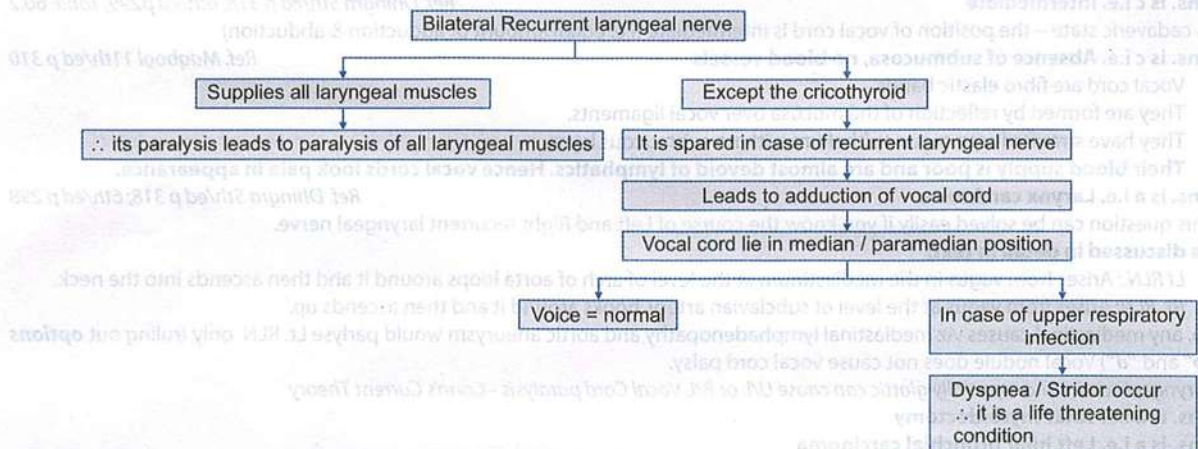
12. Ans. is b i.e. bilateral abductor paralysis

Ref. Dhingra 5th/ed p 318-319; 6th/ed p 300

- Most dangerous lesion of vocal cords is bilateral abductor paralysis (Bilateral RLN palsy).
- This is because recurrent laryngeal nerve palsy will lead to paralysis of all laryngeal muscles except the cricothyroid muscle (as it is supplied by superior laryngeal nerve). The cricothyroid muscle is an adductor & therefore this will leave both the cords in median or paramedian position thus endangering proper airway, leading to stridor and dyspnoea.

13. Ans. is c i.e. Preservation of speech with severe stridor and dyspnea**14. Ans. is a, c and d i.e. Vocal cord in paramedian position; Stridor and dyspnoea occurs; and Vocal cord lateralization done****15. Ans. is d i.e. normal or good voice**

Ref. Dhingra 5th/ed p 318; 6th/ed p 300; Current Otolaryngology p 459-460

**Management**

- Lateralization of cord by arytenoidectomy, endoscopic surgery, thyroplasty type II, cordectomy
- In emergency cases - Tracheostomy may be required

Also know

- Generally patients with bilateral recurrent laryngeal nerve palsy have a recent history of thyroid surgery or rarely an advanced malignant thyroid tumor.
- Most common presentation—Development of stridor following URI
- Since the voice of the patient is normal it is diagnosed very late.

16. Ans. is a i.e Teflon paste

Ref. Dhingra 5th/ed p 319, 6th/ed p 300

- In Bilateral Abductor paralysis (i.e. bilateral paralysis of RLN), the cords lie in median or paramedian position due to unopposed action of cricothyroid muscle.
 - Since, both the cords lie in median or paramedian position, the airway is inadequate causing dyspnea and stridor.
 - Principle for managing such cases is: lateralisation of the cord and not further medialization of cord by injection of Teflon
- For more details see the proceeding text.

17. Ans. is d i. e. Loss of timbre of voice

Ref. Dhingra 5th/ed p 320; 6th/ed p 300

Paralysis of Superior Laryngeal Nerve—causes paralysis of cricothyroid muscle which is a tensor of vocal cord.

Clinical Features

- Voice is weak and pitch cannot be raised.
- U/L Anaesthesia of larynx above the level of vocal cords causing occasional aspiration.

18. Ans. is a i.e. Common in (left) side

Ref. Dhingra 5th/ed p 318, 6th/ed p 299; Current otolaryngology 2nd/ed p 457

Unilateral Recurrent Laryngeal Nerve Palsy

- More common on left side than right side because of the longer and more convoluted course of the left recurrent laryngeal nerve (Rt side is involved only in 3-30% cases) (i.e. option a is correct)
- Most unilateral vocal cord paralysis are secondary to surgery (i.e. option b is incorrect)
- Unilateral injury to recurrent laryngeal nerve leads to ipsilateral paralysis of all intrinsic muscles except cricothyroid (which is an adductor of vocal cord). The vocal cord thus assumes a median or paramedian position which does not move laterally on deep inspiration (i.e. option c is incorrect)

Clinical Features

- Asymptomatic in 1/3rd cases
- In rest of the patients there may be some voice problem i.e. Dysphonia – the voice is hoarse & becomes weak with use. This gradually improves with time due to compensation by the healthy cord which crosses the midline to meet the paralysed one. Generally no speech therapy is required (i.e. option d is incorrect).

19. Ans. is d i.e. Paramedian

Ref. Dhingra 5/e, p 318; 6/e, p297

Nerve paralysed	Muscles affected	Position of vocal cord
• Recurrent Laryngeal Nerve	All muscles of larynx except Cricothyroid (Which is an adductor)	Median, paramedian
• Superior Laryngeal nerve	Cricothyroid	Normal but cord loses tension
• Both recurrent and superior laryngeal nerve of one side	All muscles of larynx except interarytenoid which also receives innervation from opposite side.	Cadaveric position

20. Ans is a & e i.e. Isshiki type I thyroplasty & Teflon injection

Ref: Dhingra 5th/ed pg 320; 6/e, p 300 Logan & Turner 10th/ 182, 183

Combined (Complete) Paralysis (Recurrent & Superior Laryngeal nerve paralysis): Unilateral

It leads to paralysis of all the muscles of larynx on one side except the cricoarytenoid^o which also receive innervations from the opposite side. Vocal cord of the affected side will lie in the cadavaric position^o. The healthy cord is unable to approximate the paralysed side. This results in hoarseness of voice and aspiration occurs through the glottis.

Treatment

- **Speech therapy** - With proper speech therapy the healthy cord may approximate the paralysed cord.
- Procedures to medialise the cord
 - Injection of Teflon paste, lateral to the paralysed cord^o
 - Thyroplasty type I^o
 - Muscle or cartilage implant^o
 - Arthrodesis of cricoarytenoid joint (Also known as Reversed Woodman's operation – Logan & Turner 10th/182)

NOTE

Woodman's operation^o (External arytenoidectomy) is done in bilateral abductor paralysis- Logan & Turner 10th/183

Endoscopic laser arytenoidectomy & Isshiki type II thyroplasty^o is done for lateralization of cord (in bilateral abductor paralysis)"–Dhingra 5th/318,319&362

21. Ans. is a i.e. Vocal cord medialisation Ref. Dhingra 5/e, p 321

22. Ans. is a i.e. Lateralised

Isshiki divided thyroplasty procedures into 4 categories to produce functional alteration of vocal cords:

- **Type 1** : Medial displacement of vocal cord (done by injection of gel foam/Teflon paste)
- **Type 2** : Lateral displacement of cord (done to improve the airway)
- **Type 3** : Shortening (relax) the cord, to lower the pitch (gender transformation from female to male)
- **Type 4** : Lengthening (tightening) the cord, to elevate the pitch (gender transformation from male to female)

23. Ans. is d i.e. Wait for spontaneous recovery of vocal cord

Ref. Dhingra 5/e, p 318; 6/e, p 300 Nelson 17/e, p 888-889

Unilateral paralysis of cord due to neuritis (as in diphtheria) does not require any treatment as it recovers spontaneously.

The characteristic features of diphtherial neuropathy is that it recovers completely.

24. Ans. is c i.e Teflon injection

Ref. Dhingra 5/e, p 318-319; 6/e, p 300

- Glottic diameter of 3 mm indicates that the patient is having laryngeal paralysis (due to URTI).
- Because of the narrowness of the opening, the patient is having stridor and dyspnea.
- Stridor and dyspnea can be managed by:
 - Tracheostomy
 - Fixing the cord in the lateral position by:
- Arytenoidectomy
- Arytenoid pexy
 - Vocal cord lateralisation through endoscope
 - Laser cordectomy
 - Thyroplasty type II.
- Teflon injection is a method to medialise the cord and is therefore of no use in this patient. It would rather aggravate the condition.

NOTE

For a quiet respiration the glottic diameter should be 14 mm wide.

25. Ans. a i.e. Patients with the abductor type have strained and strangled voice

Ref. Dhingra, 6/e, p 314.

- Spasmodic dysphonia (or laryngeal dysphonia) is a voice disorder characterized by *involuntary movements or spasms of one or more muscles of the larynx* (vocal folds or voice box) during speech.
- The three types of spasmodic dysphonia (SD) are adductor spasmodic dysphonia, abductor spasmodic dysphonia and mixed spasmodic dysphonia.

Adductor Spasmodic Dysphonia

- In adductor spasmodic dysphonia (ADSD), the adductor muscles of larynx go into spasm causing the vocal folds (or vocal cords) to adduct and stiffen.
- These spasms make it difficult for the vocal folds to vibrate and produce voice. Words are often cut off or difficult to start because of the muscle spasms. Therefore, speech may be choppy.
- *The voice of an individual with adductor spasmodic dysphonia is commonly described as strained or strangled and full of effort.* Surprisingly, the spasms are usually absent while laughing, speaking at a high pitch, or speaking while singing, but singers can experience a loss of range or the inability to produce certain notes of a scale or with projection. Stress, however, often makes the muscle spasms more severe.
- Larynx is morphologically normal

Abductor Spasmodic Dysphonia

- In abductor spasmodic dysphonia, sudden involuntary spasm of abductor muscle i.e. posterior cricoarytenoid causes the vocal folds to remain open.
- The vocal folds cannot vibrate when they are open. The open position of the vocal folds also allows air to escape from the lungs during speech. As a result, **the voices of these individuals often sound weak, quiet and breathy or whispery.**
- The condition is progressive and symptoms get aggravated during period of stress or when patient uses telephone.

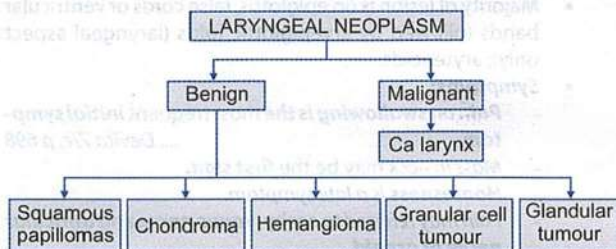
Mixed Spasmodic Dysphonia

Mixed spasmodic dysphonia involves muscles that open the vocal folds as well as muscles that close the vocal folds and therefore has features of both adductor and abductor spasmodic dysphonia.

Treatment in Adductor Dysphonia

- **Inj Botulinum toxin:** Given in thyroarytenoid muscle, by percutaneous electromyography guided route through crico thyroid space. Benefit lasts for 16 weeks so repeat injection is required. Result is good.
 - **Voice therapy.**
- Treatment in abductor dysphonia-**
- **Inj Botulinum toxin:** Given in posterior cricoarytenoid muscle by percutaneous or endoscopic route. Result: Not very good.
 - **Voice therapy**
 - **Surgery-** In patients who do not respond to botulinum injection or voice therapy-Thyroplasty type I or fat injection may be given

Flow chart 15.1: Classification of laryngeal neoplasms

**SQUAMOUS PAPILLOMAS**

Most common **benign** tumour.

It is of two types:

1. Juvenile onset/Recurrent respiratory papillomatosis (JORRP)/Multiple papillomatosis.

- Viral in origin, caused by **HPV types 6 and 11 and less commonly by subtypes 16 and 18**
- Multiple sessile / pedunculated, friable papillomas which bleed on touch.
- Occurs in infants and young children – peak age 2 to 4 years.

- Most common site – vocal fold (first and predominant site)..... CSDT 12/e, p 971

Other sites = other parts of larynx, nose, pharynx and trachea.

- Patient presents with hoarseness - Later as the lesion progresses inspiratory dyspnea with stridor develops.

NOTE

Vertical transmission also occurs.

Treatment

- **Micro endoscopic CO₂ laser excision of papillomas at fixed interval (2, 4 and 6 month) according to individual need is the treatment of choice.**

- **Interferon alfa** can also be used as an adjuvant therapy in patients with severe disease but has several side effects like fever, chills, myalgia, arthralgia, headache, weight loss and bone marrow suppression
- **Recurrence** after removal is common.

Adult onset papilloma

- Single, smaller in size, less aggressive and **donot recur** after surgery.
- Most common age affected is **30-50 years** and is more common in **males**.
- It arises from **anterior half of vocal cord or anterior commissure**.
- Hoarseness is the presenting symptom.
- Treatment is same as of Juvenile papillomas

CHONDROMA

- Most of them arise from **cricoid cartilage** and cause dyspnea or lump in throat.
- Mostly affect **men** in age group 40-60.
- CO₂ laser is useful for biopsy.
- Management is: excision of tumor.

HEMANGIOMA

Infantile hemangioma involves the **subglottic area** and presents with stridor in first 6 months of life.

- Tends to **involute spontaneously** but a tracheostomy may be needed to relieve respiratory obstruction.
- **Treated** by CO₂ laser.

Adult hemangioma involves **vocal cord** or supraglottic larynx.

- Most are **cavernous type** and can't be treated with laser.
- **No treatment** is required for asymptomatic cases, larger ones are treated by steroids or radiation therapy.

GRANULAR CELL TUMOR

- Arise from **schwann cells** and is often submucosal.
- Overlying epithelium shows pseudoepitheliomatous hyperplasia which resemble **well differentiated cancer**.

CANCER LARYNX

- More prevalent in India.
- **Age:** Most common in age group 40-70 yrs.

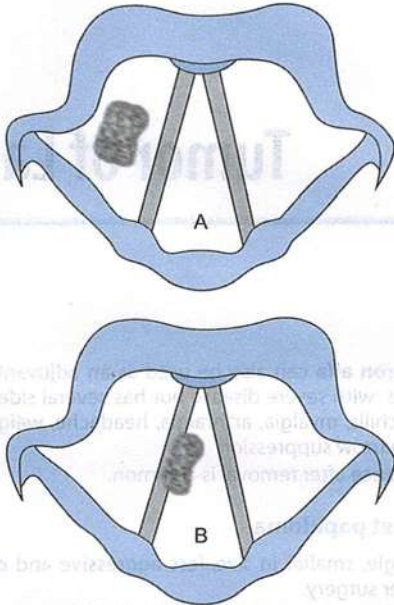


Fig. 15.1: Carcinoma larynx. (A) Supraglottic; and (B) Glottic

Courtesy: Text book of Diseases of Ear, Nose and Throat, Mohan Bansal. Jaypee Brothers, p 504

- Males > females: M/C in lower socio economic class
- **Occurrence:** Glottis (55-75%) > supraglottis (24-42%) > Subglottis (1-2%)

Etiology



- Tobacco smoking and alcohol are most important. Combination of alcohol and smoking increase the risk 15 fold.

- Previous neck irradiation.
- Occupational exposure to **asbestos, mustard gas** and petroleum products.
- HPV-16 and 18 are also implicated.
- Premalignant conditions = Solitary papilloma, leukoplakia and keratosis.

Histopathology

- 90 - 95% of Ca larynx are **squamous cell ca.**
- Cordal lesions are **well differentiated** while supraglottic ones are anaplastic.

Site of Laryngeal Tumors

As discussed previously, larynx is divided into supraglottic, glottic and subglottic regions for the purpose of anatomical classification

of carcinoma of larynx. It is an important division and is based on lymphatic drainage. The area above the vocal cords, i.e., supraglottis drains upwards via the superior lymphatic to upper deep cervical group of lymph nodes. Vocal cords, i.e., glottis has practically no lymphatics so, acts as a watershed. The area below the glottis (subglottis) drains to prelaryngeal and paratracheal glands and then to lower deep cervical nodes. Incidence of larynx cancer by site:



- Supraglottis cancer = 40%
- Glottic cancer = 59%
- Subglottic cancer = 1%

Classification

According to site Ca larynx is divided into:

a. Supraglottic cancer: Less common

- Majority of lesion is on epiglottis, false cords or ventricular bands followed by aryepiglottic folds (laryngeal aspect only); arytenoids.
- **Symptoms:**
 - **Pain on swallowing is the most frequent initial symptom.** Devita 7/e, p 698
 - Mass in neck may be the **first sign.**
 - **Hoarseness is a late symptom.**
 - Pain may referred to ear by **vagus nerve** and **auricular nerve of Arnold.**
 - Late symptoms include foul breath, dysphagia and aspiration.
 - Large tumors can cause hot potato voice/muffled voice.
 - Hemoptysis, stridor, dyspnea, aspiration pneumonia may also occur.
- **Spread:**
 - Locally to invade vallecula, base of tongue and pyriform fossa.
 - Lymphatic: Greatest incidence of nodal spread, nodal metastases occurs early and is bilateral **Upper and middle jugular nodes** are often involved.

b. Glottic Cancer (M/C)

- **Glottic cancer** is the commonest site. Mostly originates on free edge and undersurface of Anterior 1/3 of true vocal cord. Earliest to present (as hoarseness^o), least predilection for neck node involvement and has the best prognosis. Due to the paucity of lymphatics, glottic malignancy is highly radiosensitive.
- **Subglottic malignancy** is the least common site, last to present as stridor^o, has the worst prognosis since it involves the paratracheal and mediastinal nodes.

Diagnosis

IOC = Direct laryngoscopy is used to assess the extent of tumor and for obtaining biopsy of the cancer.

- **CT:** Very useful investigation to find the extent of tumor and invasion of preepiglottic or paraepiglottic space.

- **MRI:** It is less suitable than CT due to motion artifacts associated with longer scanning time.
- **Supravital staining and biopsy:** **Toluidine** blue is applied to laryngeal lesion and then washed with saline. Carcinoma *in situ* and superficial carcinoma take dye while leukoplakia does not.

Staging:

—Devita 7/e, p 698

TNM classification of cancer larynx (AJCC 2002)

Primary	Tumor (T)
Supraglottis	
T1	Tumor limited to one subsite of supraglottis with normal vocal cord mobility
T2	Tumor invades mucosa of more than one adjacent sub-site of supraglottis or region outside the supraglottis, without fixation of larynx.
T3	Tumor limited to larynx with vocal cord fixation and/or invades any of the following: postcoricoid area preepiglottic tissues, paraglottic space, and/or minor thyroid cartilage erosion (e.g. inner cortex).
T4a	Tumor invades through the thyroid cartilage and/or invades tissues beyond the larynx.
T4b	Tumor invades prevertebral space, encases carotid artery or invades mediastinal structures
Glottis	
T1	Tumor limited to one (T1a) or both (T1b) vocal cord(s) (may involve anterior or posterior commissure) with normal mobility
T2	Tumor extends to supraglottis and/or subglottis, or with impaired vocal cord mobility
T3	Tumor limited to the larynx with vocal cord fixation, and/or invades paraglottic space, and/or minor thyroid cartilage erosion (e.g. inner cortex)
T4	Same as supraglottis
Subglottis	
T1	Tumour limited to subglottis
T2	Tumor extends to vocal cords with normal or impaired mobility
T3	Tumor limited to larynx with vocal cord fixation
T4	Same as supraglottis

Regional Lymph Nodes (N)**NOTE**

Cancer larynx first spreads to the cervical nodes. The next M/C site of spread is lungs for this reason chest X-ray should be a part of the routine metastatic evaluation (in all head and neck cancers).

N_x	Regional lymph nodes cannot be assessed.
N_0	No regional lymph node metastasis
N_1	Metastasis in a single ipsilateral lymph node, 3 cm or less in greatest dimension.
N_2	Metastasis in a single ipsilateral lymph node, more than 3 cm but not more than 6 cm in greatest dimension, or multiple ipsilateral lymph nodes, none more than 6 cm in greatest dimension, or bilateral or contralateral lymph nodes, nodes, not more than 6 cm in greatest dimension.
N_{2a}	Metastasis in a single ipsilateral lymph node more than 3 cm but not more than 6 cm in greatest dimension.

Treatment**Glottic / Vocal cord carcinoma**

Stage dependent treatment include:

- **Carcinoma in Situ (CIN):** Best treated by transoral endoscopic CO_2 laser. If laser is not available stripping of vocal cord is done (Endo/microlaryngeal stripping) and the tissue is sent for bi-

opsy. If biopsy shows invasive carcinoma, radiotherapy is given otherwise regular follow up is done.

- **T₁ carcinoma:** Radiotherapy is the treatment (as voice is preserved). These days mucolaryngoscopic surgery is the treatment of choice.
 - **T₁ Carcinoma with extension to anterior commissure:** or **T₁ Ca with extension to arytenoid:** Radiotherapy is not preferred because of the possibility of developing perichondritis which would entail total laryngectomy. In such cases some form of conservation surgery like vertical hemilaryngectomy or fronto lateral laryngectomy is done to preserve the voice.
- **T₂ Carcinoma:** Treatment depends on: (i) Mobility of vocal cords, and (ii) Involvement of anterior commissure and/or arytenoid:
 - **If mobility of cord is not impaired (cord is mobile) and anterior commissure and/or arytenoid not involved:** Radiotherapy is the treatment of choice. In case of recurrence total laryngectomy or partial vertical laryngectomy is done.
 - **If mobility of cord is impaired or anterior commissure and/or arytenoid involved:** Voice preserving conservative surgery such as vertical hemilaryngectomy or frontolateral laryngectomy is done. Total laryngectomy is done if there is recurrence on follow up.

- **T₃, T₄ carcinoma:** In T₃ lesions – TOC is primary chemoradiation with total laryngectomy as salvage surgery in residual lesion.

Surgery in CA larynx

1. Conservation Surgery

- Total laryngectomy is done for most of the laryngeal cancers and the patient is left with no voice and a permanent tracheostome. Conservative laryngeal surgery is one which can preserve voice and also avoid a permanent tracheal opening. However, few cases would be suitable for this type of surgery and they should be carefully selected. Conservation surgery includes:
- Excision of vocal cord after splitting the larynx (cordectomy via laryngofissure).
- Excision of vocal cord and anterior commissure region (partial frontolateral laryngectomy).
- Excision of supraglottis, i.e. epiglottis, aryepiglottic folds, false cord and ventricle – a sort of transverse section of larynx above the vocal cords (partial horizontal laryngectomy).

2. Total Laryngectomy Includes:

- Resection of whole of larynx upto 1cm below the vocal cords.
- Resection of part of anterior wall of pharynx.
- Repair of pharyngeal wall.
- Tracheostome formation above the suprasternal notch.

Indications of total laryngectomy

- T₃ lesions (i.e. with cord fixed)
- All T₄ lesions
- Invasion of thyroid or cricoid cartilage
- Bilateral arytenoid cartilage involvement
- Lesions of posterior commissure
- Failure after radiotherapy or conservation surgery
- Transglottic cancers, i.e. tumours involving supraglottis and glottis across the ventricle, causing fixation of the vocal cord.

Vocal rehabilitation after Laryngectomy

- Oesophageal speech:
 - Rough voice but loud and understandable
- Artificial larynx:
 - Electrolarynx and trans oral pneumatic device.
- Tracheo oesophageal speech:
 - Neoglottis formation.

- It is contraindicated in patients with distant metastasis

3. Endoscopic resection with CO₂ laser:

- Carcinoma of the mobile membranes vocal cord is now a days treated with excision via CO₂ laser with better results than traditional radiotherapy.

Complication of Treatment

- **Surgery:** – Speech loss after laryngectomy.
- **Radiation:** – Laryngeal edema and odynophagia are most common complication after radiation for glottic or supraglottic lesion.

Also know

- Glottic Ca carcinoma carries the best prognosis because of the early diagnosis and relatively few lymphatics.
- Most frequent site of recurrence in glottic Ca is around tracheal stoma in the base of tongue and in neck nodes.
- CT scan is the best investigation to find out the nature and extent of growth besides direct laryngoscopy examination.

QUESTIONS

1. Premalignant conditions for carcinoma larynx would include: [PGI 01]
 - a. Leukoplakia
 - b. Lichen planus
 - c. Papillomas
 - d. Smoking
 - e. Chronic laryngitis
2. Which of the following is precancerous lesion: [UP 00]
 - a. Pachydermia of larynx
 - b. Laryngitis sicca
 - c. Keratosis of larynx
 - d. Scleroma larynx
3. Of the following statements about Recurrent Laryngeal papillomatosis are true, Except [AI-09]
 - a. Caused by Human Papilloma Virus (HPV)
 - b. HPV6 and HPV11 are most commonly implicated
 - c. HPV6 is more virulent than HPV11
 - d. Transmission to neonate occurs through contact with mother during vaginal delivery
4. True about juvenile respiratory papillomatosis: [PGI 00]
 - a. Affects children commonly
 - b. Lower respiratory tract can be involved
 - c. May resolve spontaneously
 - d. Microlaryngoscopic surgery is treatment of choice
5. True about multiple papillomatosis: [PGI Dec. 05]
 - a. HSV is causative agent
 - b. Radiotherapy treatment of choice
 - c. It is premalignant
 - d. It is more common in 15 to 33 yrs
 - e. It recurs due to parturition
6. True about Juvenile laryngeal papillomatosis:
 - a. Caused by HPV. [PGI May 2011]
 - b. No risk of recurrence after surgical removal
 - c. Tends to disappear after puberty
 - d. Interferon therapy is useful
7. Kamla 4 yrs of age presented in emergency with mild respiratory distress. On laryngoscopy she was diagnosed to have multiple juvenile papillomatosis of the larynx. Next line of management is: [AIIMS 01]
 - a. Tracheostomy
 - b. Microlaryngoscopy
 - c. Steroid
 - d. Antibiotics
8. All the following are true about Laryngeal carcinoma except: [AI 94]
 - a. More common in females
 - b. Common in patients over 40 years of age
 - c. After laryngectomy, esophageal voice can be used
 - d. Poor prognosis
9. Features of laryngeal Ca: [PGI June 05]
 - a. Glottis is the MC site
 - b. Commonly metastasizes to cervical lymph node
 - c. Lesions seen at the edge of the vocal cord
 - d. Laryngeal compartments acts as barrier
10. Supraglottic Ca present with: [PGI June 03]
 - a. Hot potato voice
 - b. Aspiration
 - c. Smoking is common risk factor
 - d. Pain is MC manifestation
 - e. Lymph node metastasis is uncommon
11. The most common and earliest manifestation of carcinoma of the glottis is: [AI 05, RJ-2006]
 - a. Hoarseness
 - b. Haemoptysis
 - c. Cervical lymph nodes
 - d. Stridor
12. Lymph node metastasis in neck is almost never seen with: [AI 96]
 - a. Carcinoma vocal cords
 - b. Supraglottic carcinoma
 - c. Carcinoma of tonsil
 - d. Papillary carcinoma thyroids
13. Which of the following carcinomas commonly presents with neck nodes: [AI 95]
 - a. Cricoid
 - b. Glottic
 - c. Epiglottis
 - d. Anterior commissure
14. True statement about Infraglottic carcinoma larynx:
 - a. Commonly spreads to mediastinal nodes [PGI 96]
 - b. Second most common carcinoma
 - c. Most common carcinoma
 - d. Spreads to submental nodes
15. The treatment of choice for stage I cancer larynx is: [AIIMS 03, PGI 98]
 - a. Radical Surgery
 - b. Chemotherapy
 - c. Radiotherapy
 - d. Surgery followed by radiotherapy
16. Treatment of Ca larynx in stage. T1, M0N0 is: [AI 00]
 - a. Radiotherapy
 - b. Surgery Total laryngectomy
 - c. Laser therapy
 - d. Micro laryngoscopic surgery
17. For a mobile tumour on vocal cord, treatment is: [AIIMS 92, AP 96]
 - a. Surgery
 - b. Chemotherapy
 - c. Radiotherapy
 - d. None of the above
18. For carcinoma larynx stage III Treatment of choice: [AIIMS 96]
 - a. Radiotherapy and Surgery
 - b. Chemotherapy with cisplatin
 - c. Partial laryngectomy with chemotherapy
 - d. Radiotherapy with chemotherapy
19. Treatment of choice in stage III carcinoma larynx is: [AI 98, RJ 2002]
 - a. Chemotherapy
 - b. Surgery + radiation
 - c. Surgery + chemotherapy
 - d. Only radiotherapy
20. Radiotherapy is the TOC for: [AIIMS Nov. 09]
 - a. Nasopharyngeal Ca T₃ N₁
 - b. Supraglottic Ca T₃ N₀
 - c. Glottic Ca T₃ N₁
 - d. Subglottic Ca T₃ N₀
21. A patient of carcinoma larynx with stridor presents in casualty, immediate management is: [AIIMS 91]
 - a. Planned tracheostomy
 - b. Immediate tracheostomy
 - c. High dose steroid
 - d. Intubate, give bronchodilator and wait for 12 hours, if no response, proceed to tracheostomy
 - e. None
22. Which of the following is not the indication of near total Laryngectomy? [AP 2007]
 - a. T3 stage
 - b. Anterior commissure involvement
 - c. Free lateral arytenoids
 - d. Interarytenoid plane involvement

23. A patient presents with carcinoma of the larynx involving the left false cord, left arytenoids and the left aryepiglottic folds with bilateral mobile true cords. Treatment of choice is: [AIIMS Nov. 07]

- Vertical hemilaryngectomy
- Horizontal hemilaryngectomy
- Radiotherapy followed by chemotherapy
- Total laryngectomy

24. A case of carcinoma larynx with the involvement of anterior commissure and right vocal cord, developed perichondritis of thyroid cartilage. Which of the following statements is true for the management of this case? [AIIMS May 06]

- He should be given radical radiotherapy as this can cure early tumours
- He should be treated with combination of chemotherapy and radiotherapy
- He should first receive radiotherapy and if residual tumour is present then should undergo laryngectomy
- He should first undergo laryngectomy and then post-operative radiotherapy

25. Treatment of choice for carcinoma Larynx T1N0M0 stage: [AI 02]

- External beam radiotherapy
- Radioactive implants
- Surgery
- Surgery and radiotherapy

26. Select correct statements about Ca larynx: [PGI 02]

- Glottic Ca is the most common
- Supraglottic Ca has best prognosis
- Lymphatic spread is the most common in subglottic Ca
- T1 tumor is best treated by radiotherapy
- Smoking predisposes

27. The preferred treatment of verrucous carcinoma of the larynx is: [UP 07]

- Pulmonary surgery
- Electron beam therapy
- Total laryngectomy
- Endoscopic removal

28. Laryngofissure is: [Jipmer 04]

- Opening the larynx is midline
- Making window in thyroid cartilage
- Removal of arytenoids
- Removal of epiglottis

29. About total laryngectomy all is correct except: [Bihar 2005]

- Loss of smell
- Loss of taste
- Speech difficulty
- Difficult swallowing

30. Laryngeal cartilage involvement, investigation of choice is: [Bihar 2003]

- CT
- MRI
- Radionuclide scans
- X-ray

31. Laser used in laryngeal work? [AI 2010]

- Argon
- CO₂
- Holmium
- Nd Yag

32. Contraindication of supraglottic laryngectomy is/are: [PGI Nov. 09]

- Poor pulmonary reserve
- Tumor involving pyriform sinus
- Tumor involving preepiglottic space
- Vocal cord fixation
- Cricoid cartilage extension

NEET PATTERN QUESTIONS

33. Juvenile papillomatosis is caused by-

- HPV
- EBV
- CMV
- HSV

34. Maintenance of airway during laryngectomy in a patient with carcinoma of larynx is best done by-

- Tracheostomy
- Laryngeal mask airway
- Laryngeal tube
- Combi tube

EXPLANATIONS AND REFERENCES

1. Ans. is a, c, and e i.e. Leukoplakia; Papillomas; and Chronic laryngitis

2. Ans. is c i.e. Keratosis of larynx

Ref. Read below

Ref. Scotts Brown 7th/ed vol-2 pg-2221; Dhingra 5th/ed pg-323, 6th/ed p 304; Mohan Bansal p 487

- Lichen planus has no malignant potential.
- Papilloma - "The malignant transformation from benign non keratinizing squamous papilloma to squamous cell carcinoma can occur in children, but is rarely seen" - Turner 10th/ed p 126
- Leukoplakia is a white patch, in which there is epithelial hyperplasia along with atypical cells. It is a premalignant condition. Another name for leukoplakia is hyperkeratosis dyskeratosis - Current Otolaryngology 2nd/ed p 471
- Smoking is a predisposing factor, not a premalignant condition. - Scott's Brown 7th/ed vol-2 p 2221
- In some cases of chronic laryngitis, the laryngeal mucosa becomes dysplastic particularly over true vocal folds and is a premalignant condition. ... Bailey 24th/ed p 765
- Chronic inflammatory conditions of larynx like chronic laryngitis may develop into malignancy. ... Maqbool 11th/ed p 359

Keratosis of larynx/leukoplakia:-

It is epithelial hyperplasia of the upper surface of one or both vocal cords.

- Appears as a white plaque or warty growth on cord without affecting its mobility

- Regarded as a precancerous condition as Ca in situ develops frequently
- T/t=stripping of cords

3. Ans. is c i.e. HPV6 is more virulent than HPV 11:

Nelson's pediatrics 18th/1772; Current Otorhinology 2nd/ed pg-435/471 'Pediatric ENT' by Graham. Scadding and Bull (2008) /258

Recurrent Laryngeal Papillomatosis / Recurrent Respiratory Papillomatosis

Etiology

- Associated with Human Papilloma Virus infection (HPV)
- HPV6 and HPV 11 are most commonly associated with laryngeal disease whereas HPV 16 and HPV 18 are less commonly associated.
- HPV11 is associated with a more aggressive disease and makes the patient more prone to malignant change
- Thus HPV 11 is more virulent

Epidemiology

- Most commonly occur in children <5 years of age (2-5 years)
- Male female ratio – same (first born vaginally delivered child of a teenage mother is most prone)

Transmission

- Exact mode of transmission is not known.
- There is recognized transmission from genital warts.
- Vertical transmission of virus from mother to child can occur either as ascending uterine infection or through direct contact in birth canal.

ALSO KNOW

Malignant transformation in a case of papilloma occurs most commonly in distal bronchopulmonary tree and prognosis is universally poor

4. Ans. a, b, c, and d i.e. Affects children commonly, Lower respiratory tract can be involved, May resolve spontaneously, and Microlaryngoscopic surgery is treatment of choice

Ref. Dhingra 5th/ed pp 324,325; Current Otolaryngology 2nd/ed p 471; Mohan Bansal p 488

As discussed in the previous questions – Juvenile respiratory papillomatosis:

- Affects children commonly, (option a is correct)
- Lower respiratory tract can be involved – though larynx is the M/C site affected – Mouth, pharynx, tracheobronchial tree and oesophagus can all be affected
Hence option b is correct
- May resolve spontaneously (Hence option c is correct)
- Micro laryngoscopic surgery is the Treatment of choice

CO₂ laser surgery, which is a form of microlaryngoscopic surgery is the Treatment of choice

Hence option d is also correct.

5. Ans. is c i.e. It is Premalignant

Ref. Current Otolaryngology 2nd/ed pg-471, 3rd/ed pg-453-454

Option	Correct / Incorrect	Reference	Explanation
HSV is the causative Agent (Option a)	Incorrect	<i>Current 2/e pg-471</i>	It is caused by infection with human papilloma virus (HPV) subtype 6 and 11 not by Herpes simplex virus i.e. HSV is not the causative agent
Radiotherapy is the TOC (Option b)	ncorrect	<i>Current 2/e pg-471</i>	The primary treatment modality for respiratory papillomatosis is surgery Current Otolaryngology 2/e pg-471
It is premalignant (Option c)	Correct	<i>Current 2/e pg-471</i>	Juvenile papillomatosis due to subtype 11,16,18 can undergo malignant transformations, though it is rare.
It is M/C in 15 to 33 yrs (Option d)	Incorrect	<i>Current 2/e pg-471 Dhingra 6/e, p 305</i>	Respiratory papillomatosis m/c seen in children between the ages 2 to 5 years although it can be seen in adults in third decade also.

Contd...

Contd...

Option	Correct / Incorrect	Reference	Explanation
It recurs cause is due to parturition (Option e)	In correct	Current 2/e pg-471 Dhingra 5/e pg-324 6/e, p 305-306	These are 2 different statements – 1. Papilloma has a tendency to recur 2. Vertical transmission can occur from mother to child at the time of parturition. Both these statements are correct individually. But – It recurs and cause of recurrence is parturition is not correct

Also Remember

- **Adult onset papilloma** – seen in adults in the third decade
- It is less aggressive, less chances of malignant transformation and less chances of recurrence.

6. Ans. is a, c and d i.e. Caused by HPV, tends to disappear after puberty and Interferon therapy is useful (Ref. Read below)

As discussed in previous questions–Juvenile Laryngeal Papillomatosis

- It is caused by HPV Ref. Dhingra 5th/ed p 324, 6th/ed p 305
- It tends to disappear spontaneously after puberty Ref. Dhingra 5th/ed p 325, 6th/ed p 306
- Interferon therapy is being tried to prevent recurrence and has been found to be useful Ref. Dhingra 5/e, p 324, 6/e o 306
- Option b.i.e no risk of recurrence after surgery is incorrect

7. Ans. is b i.e. Micro laryngoscopyRef. Current Otolaryngology 2nd/ed pg-471, 3rd/ed p 454-455

- The patient (a 4 years girl) in the question is presenting with mild respiratory distress due to multiple Juvenile papillomatosis of larynx
- The management in such a case is microlaryngoscopic surgery using CO₂ laser to ablate the lesion.
- Steroids and antibiotics have no role.
- Tracheostomy is reserved for those patients who have severe respiratory distress.

8. Ans. is a i.e. More common in females and d i.e. poor prognosisRef. Current Otolaryngology 2nd/ed pg-437 onwards; Mohan Bansal p 502,503**Cancer Larynx**

- Most common histological type of laryngeal Ca – Squamous cell carcinoma (seen in 90% cases)
- It is more common in males.
- Male: Female ratio is 4: 1) (option a is incorrect)
- Most common age = 60-70 years.

mnemonic

Aetiology: Risk factors:- Mnemonic "CA LARGES"

- C – Chronic laryngitis
- A – Alcohol
- L – Leukoplakia
- A – Asbestosis
- R – Radiation
- G – Mustard Gas
- E – Exposure to petroleum products
- S – Smoking

Prognosis of Laryngeal Cancer

- Cure for larynx cancer, defined as 5 year disease free survival is generally better than for other primary site tumors of the aerodigestive tract. This reflects the prevalence of primary glottic tumors over supraglottic tumors and the early age at which glottic tumours are diagnosed (Hence option d is incorrect)
- So option a and d are both incorrect but if one option is to be chosen, go for option 'a'.

9. Ans. is a, b, c and d i.e. All options are correctRef. Dhingra 5th/d p 302, 327; 6th/ed p 308, 309; Tuli 1st/ed p 310; Mohan Bansal pp 502,503

- As discussed previously, larynx is divided into supraglottic, glottic and subglottic regions for the purpose of anatomical classification of carcinoma of larynx.

- It is an important division and is based on lymphatic drainage.
 - The area above the vocal cords i.e. supraglottis drains upwards via the superior lymphatics to upper deep cervical group of lymph nodes.
 - Vocal cords, i.e. glottis has practically no lymphatics so, it acts as a watershed.
 - The area below the glottis, (subglottis) drain to prelaryngeal and paratracheal glands and then to lower deep cervical nodes.
- Hence option b and d are both correct

10. Ans. is a, c and d i.e. Hot potato voice; Smoking is common risk factor; Pain is the most common manifestation

Ref. Devita 7th/ed p 698; Scott's Brown 7th/ed vol-2 pg-2608; Mohan Bansal p 506

Supraglottic Cancer

- It is the second most common laryngeal cancer (most common is glottic cancer).
- Most common initial symptom - pain on swallowing. (option d is correct)
- Most common / first sign - mass in neck.
- Small supraglottic lesions not extending to glottis - may present with globus or foreign body sensation and parasthesia
- If exophytic they may cause hemoptysis
- Large tumors can cause "hot potato voice" (Option 'a' is correct)
- Hoarseness is a late symptom.
- Smoking is a risk for all laryngeal carcinomas. (option c is correct)
- Lymphatic spread occurs early in case of supraglottic cancer. (as it has rich supply of lymphatics)

NOTE

Hoarseness of voice is the presenting symptom in glottic carcinoma.

11. Ans. is a i.e. Hoarseness

Ref. Dhingra 5th/ed p 327, 6th/ed p 309; Current Otolaryngology 2nd/ed pg-441, 3rd/ed pg 460.

In glottic cancer.

"Hoarseness of voice is an early sign because lesion of cord affects its vibratory capacity."

For details see the text.

12. Ans. is a i.e. Carcinoma of vocal cords.

Ref. Dhingra 5th/ed p 327, 6th/ed p 309

"There are very few lymphatics in vocal cords and nodal metastasis are practically never seen in cordal lesions unless it has spread beyond the region of membranous cord."

13. Ans. is c i.e. Epiglottitis

Ref. Dhingra 5th/ed p 326-327, 6th/ed pg-308-309.

Supraglottic cancers:

- Have earliest neck nodes involvement.
- Presenting features is - pain on swallowing or neck mass.

Glottic cancers:

- No nodes involved presenting features is hoarseness.

Subglottic cancers:

- Nodal metastasis occurs to pretracheal, prelaryngeal nodes.
- Presenting feature is stridor.

In the options given—epiglottitis belongs to supraglottis so it will present with neck nodes.

- Remember:**
- Ca which presents with neck nodes = supraglottis Ca
 - Highest lymphnode involvement occurs in - supraglottic Ca
 - Hoarseness is the presenting symptom - Glottic Ca
 - Stridor is the presenting symptom in Subglottic Ca.
 - Laryngeal cancer with worst prognosis = subglottic Ca
 - Ca with best prognosis = Glottic Ca

14. Ans. is a i.e. Commonly spreads to mediastinal nodes

Ref. Dhingra 5th/ed p 327, 6th/ed p 309

- Subglottic cancer is the rarest of laryngeal cancer.
- Earliest presentation is a globus or foreign body sensation in throat followed by stridor or laryngeal obstruction.
- Hoarseness is a late feature and occurs due to involvement of glottis or recurrent laryngeal nerve.
- Lymphatic spread occurs to prelaryngeal, pretracheal, paratracheal and lower jugular nodes (i.e. mediastinal nodes.)

15. Ans. is c i.e. Radiotherapy

Ref. Dhingra 5th/ed p 329-330; Mohan Bansal p 504

Friends remember 2 very important concepts regarding laryngeal Ca:

- If the site of larynx cancer viz supra glottis, glottis or subglottis is not mentioned, the cancer should be considered glottic (since it is the M/C variety)
- Generally stage I, II, III, IV means stage T₁, T₂, T₃, T₄ respectively.

According to Dhingra

- Radiotherapy is the treatment of choice for all stage I cancers of larynx, which neither impair mobility nor invade cartilage or cervical nodes.
- The greatest advantage of radiotherapy over surgery in Ca larynx glottic cancer is - preservation of voice.

It does not give good results:

- If cords are fixed
 - In subglottic extension
 - In cartilage invasion
 - If nodal metastasis is present
- i.e. stages T₃ and T₄

But according to *Current otolaryngology 2/e pg-445*. Current Recommendations by the American Society of Clinical Oncology are that all patients with stage T₁ or T₂ laryngeal cancer, should be treated initially with the intent to preserve the larynx.

Microlaryngeal Surgery

i.e. endoscopic removal of selected larynx by operating microscope and microlaryngeal dissection instruments is used for treating early stages of cancer larynx.

The advantages of surgery compared to radiation are :

- A shorter treatment period (compared to 6 – 7 weeks for radiation)
- Saving the option of radiotherapy for recurrence

Drawback of Surgery – Poor Voice Quality

- Hence from above discussion it can be concluded that microlaryngoscopic surgery / Radiotherapy is the TOC for stage I of laryngeal cancer.
- In the option – Surgery and not microlaryngoscopic surgery is given.
- Hence Radiotherapy is being taken as the correct option.

16. Ans. is d i.e. Microlaryngoscopic surgery

Ref. *Current Otolaryngology 2/e pg-446,445, Scott's Brown 7/ed vol2 pg-2610*

- Now since in this question both microlaryngoscopic surgery and radiotherapy are given, we are opting for micro laryngoscopic surgery which is a better option
- The answer is further supported by the table given in

Scott Brown 7th/ed vol-2 pg-2610

Remember : Now TOC for early laryngeal cancer is microlaryngoscopic surgery.

NOTE

The CO₂ laser is used for early supraglottic lesions (*Current Otolaryngology 2/e pg-446-447*)

		Surgery (%)	Radiotherapy (%)
Five year Survival	T ₁	100	91.7
	T ₂	97.4	88.8
Five year Disease free survival	T ₁	100	71.1
	T ₂	78.7	60.1

17. Ans. is c i.e. Radiotherapy

Ref. *Dhingra 5/e, p 230-331*

According to Dhingra

- Radiotherapy is the treatment of choice for vocal cord cancer with normal mobility.
- Normal mobility of cord suggests that growth is only limited to the surface and belongs to either stage T1 or T2.
- TOC for stage T1 of glottic carcinoma - radiotherapy.
- TOC for stage T2 of glottic carcinoma - depends on mobility of the cord

If vocal cords are mobile (i.e. growth is limited to surface)
Radiotherapy/micro laryngeal surgery is TOC

If local cords mobility is impaired (i.e. deeper invasion)
Conservative surgery like vertical hemilaryngectomy or frotolateral hemilaryngectomy is TOC.

NOTE

- If cord mobility is impaired radiotherapy is not preferred because of the possibility of developing perichondritis which would entail total laryngectomy.
- According to higher books – again micro laryngoscopic surgery is TOC in early cases but since this is not an option we are going with radiotherapy.

18. Ans. is a i.e. Radiotherapy and Surgery

Ref. Dhingra 5/e, p 329-330; 6/e p 311 Current otolaryngology 2/e p. 446; MB pp 504, 504

19. Ans. is b i.e. Surgery + Radiation

Treatment of Ca Larynx

Stage	Site	Treatment
T1	All site	External beam radio therapy/Microlaryngeal surgery
T2	Glottic and subglottic lesion	Radiotherapy
	Supraglottic lesion	Supraglottic laryngectomy
T3 and T4	All sites	Total laryngectomy with neck dissection for clinically positive nodes and post operative radiotherapy if nodes are not palpable

According to current otolaryngology 2/e pg- 446

- Advance stage larynx cancer (stage III and IV) was historically treated by dual modality therapy with surgery and radiation.
- Surgery done was – Total laryngectomy

BUT NOW

In stage III – Organ preservation surgery along with radiation (radiotherapy + chemotherapy) has become a standard of care in most centres.

NOTE

- Chemotherapy used is – 3 cycles of Cisplatin and 5-FU
- In stage IV – organ preservation surgery is not useful because of cartilaginous invasion. Hence in stage IV. Total laryngectomy with radiotherapy is still being done.

As per the options given in the question – there is no such option as surgery + chemoradiation Hence we are going with surgery + Radiotherapy as TOC in stage III cancer.

20. Ans. is 'a' i.e., Nasopharyngeal Ca T3N1

Ref: Dhingra 5/e, p263-266, 6/e p 252 Cummings Otolaryngology: Head and Neck Surgery, 5/e, vol-2, Chapter-99

Treatment of nasopharyngeal carcinoma

- Stage I and II Radiotherapy
- Stage III and IV Radiotherapy + chemotherapy (preferred) or radiotherapy alone in some cases.

Now let's see about treatment of other options.

- Supraglottic T_3N_0 Total laryngectomy with neck dissection followed by radiotherapy.
- Glottic T_3N_1 Total laryngectomy \pm neck dissection \pm radiotherapy (In some centers organ preserving surgery followed by chemoradiation is preferred).
- Subglottic Ca T_3N_0 Total laryngectomy followed by post-operative radiation.

21. Ans. is b i.e. Immediate Tracheostomy

Ref: Turner 10/e, p 178

Carcinoma larynx presenting with stridor means it is subglottic laryngeal carcinoma. Ideally in such cases emergency laryngectomy should be performed.

"In the case of a large subglottic tumour presenting with respiratory obstruction a case could be made for doing an emergency laryngectomy."

But it is not given in the options:

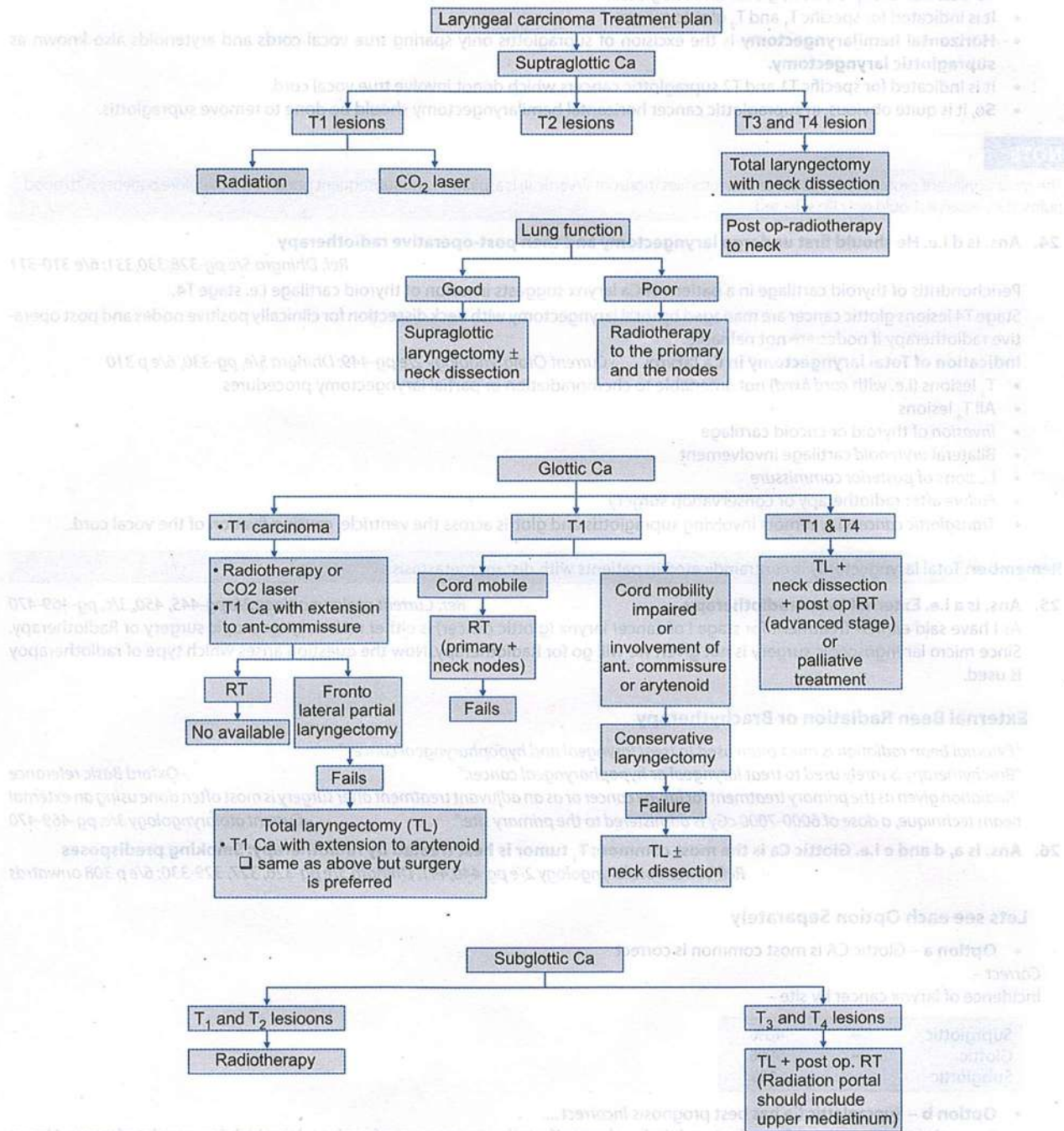
- Intubation can not be done as growth is seen in subglottic area therefore tube can not be put.
- Planned tracheostomy can not be done as patient is suffering from stridor, which is an emergency. Therefore we will have to do emergency tracheostomy. With the precaution that the area of cancer should be removed within 72 hours.

22. Ans. is b i.e. anterior commissure involvement

Ref: Current otolaryngology 2/e pg-448-449

Type of Laryngectomy	Parts Removed	Indications	Comment
Hemilaryngectomy	Removal of one vertical half of larynx.	Tumor with: <ul style="list-style-type: none"> • Subglottic extension < 1 cm below the true vocal cord • A mobile affected cord • Unilateral involvement • No cartilage invasion • No extra laryngeal soft tissue involvement • For tumors with a T stage of T₁, T₂ or T₃ by pre epiglottic involvement only 	Vocal cord reconstruction is done in this case by transposing a flap of strap muscle or microvascular free flap to provide bulk against which the remaining unaffected of cord can vibrate.
Supra glottic	Removal of the supraglottis or the upper part of larynx	<ul style="list-style-type: none"> • For tumors with a T stage of T₁, T₂ or T₃ by pre epiglottic involvement only • Vocal cords are mobile • Cartilage is not involved • Anterior commissure is not involved • Patient has good pulmonary status/reserve • The base of tongue is not involved past the circumvallate papillae • The apex of pyriform is not involved • FEV1 is predicted to be > 50% 	<ul style="list-style-type: none"> • It can be done by laser or by external approach • Side effect – Aspiration. For this reason patients with borderline pulmonary function (FEV1 < 50%) who cannot tolerate chronic aspiration are generally not considered good candidates for supraglottic laryngectomy
Supracricoid laryngectomy	It is a newer surgical technique in which voice is preserved. The true vocal cords, supra glottis, thyroid cartilage are removed and cricoid and ary-tenoid cartilage are preserved	It is done in those in which cancer is located at the anterior glottis including the commissure or those with more extensive pre epiglottic space involvement	Pulmonary function and prior radiation candidacy criteria for supraglottic laryngectomy applies for supracricoid laryngectomy as well
Near Total laryngectomy	It is more extended partial laryngectomy procedure in which only one arytenoid is preserved and a tracheo-sophageal conduit is constructed for speech.	It should not- be offered to patients whose radiation treatment has failed, those with poor pulmonary reserve or those with tumor involvement below the cricoid ring. Patients with large T3 and T4 lesions with one uninvolved arytenoid or with U/L transglottic tumors with cord fixation are candidates for this surgery.	<ul style="list-style-type: none"> • Aspiration can occur • Pt is dependent on tracheostomy for breathing
Total laryngectomy	Entire larynx + Thyroid + cricoid cartilages are removed along with some upper tracheal rings and hyoid bone, if possible.	Indications: <ul style="list-style-type: none"> • T₄ malignancy • As a salvage surgery in recurrences following chemoradiation for T3 lesion • It is TOC in perichondrites larynx 	Most important constraint is speech problem which can be obtained by tracheo oesophageal speech

23. Ans. is probably 'b' i.e. Horizontal hemilaryngectomy (ideally supraglottic laryngectomy)



In the Patient

- Involvement of unilateral false cord, aryepiglottic folds and arytenoids with mobile cord suggest supraglottic cancer in T2 stage (more than one subsites of supraglottis are involved).
- For T2 stage voice conservative surgery should be done. Supraglottis is excised by partial horizontal laryngectomy.

- **Vertical hemilaryngectomy** means excision of one half of the larynx on one side, i.e., vertical half is removed which include vertical half of supraglottis, glottis and subglottis.
- It is indicated for specific T₁ and T₂ glottic cancer
- **Horizontal hemilaryngectomy** is the excision of supraglottis only sparing true vocal cords and arytenoids also known as **supraglottic laryngectomy**.
- It is indicated for specific T1 and T2 supraglottic cancers which donot involve true vocal cord.
- So, it is quite obvious, in supraglottic cancer horizontal hemilaryngectomy should be done to remove supraglottis.

NOTE

The most significant problem with partial laryngectomies (horizontal/vertical) is aspiration and subsequent pneumonia therefore patients with good pulmonary reserve should only be selected.

24. Ans. is d i.e. He should first undergo laryngectomy and then post-operative radiotherapy

Ref. Dhingra 5/e pg-328,330,331; 6/e 310-311

Perichondritis of thyroid cartilage in a patient of Ca larynx suggests invasion of thyroid cartilage i.e. stage T4.

Stage T4 lesions glottic cancer are managed by total laryngectomy with neck dissection for clinically positive nodes and post operative radiotherapy if nodes are not palpable.

Indication of Total laryngectomy in Ca larynx - Current Otolaryngology 2/e pg-449; Dhingra 5/e, pg-330, 6/e p 310

- T₃ lesions (i.e. with cord fixed) not amenable to chemoradiation or partial laryngectomy procedures
- All T₄ lesions
- Invasion of thyroid or cricoid cartilage
- Bilateral arytenoid cartilage involvement
- Lesions of posterior commissure
- Failure after radiotherapy or conservation surgery
- Transglottic cancers i.e. tumors involving supraglottis and glottis across the ventricle, causing fixation of the vocal cord.

Remember: Total laryngectomy is contraindicated in patients with distant metastasis.

25. Ans. is a i.e. External beam radiotherapy

Ref: Current otolaryngology 2/e pg-445, 450, 3/e, pg-469-470

As I have said earlier—Treatment for stage I of cancer larynx (glottic cancer) is either microlaryngoscopic surgery or Radiotherapy. Since micro laryngoscopic surgery is not given we will go for Radiotherapy. Now the question arises which type of radiotherapy is used.

External Bean Radiation or Brachytherapy

"External bean radiation is most often used to treat laryngeal and hypopharyngeal cancer."

"Brachytherapy is rarely used to treat laryngeal or hypopharyngeal cancer."

—Oxford Basic reference

"Radiation given as the primary treatment for larynx cancer or as an adjuvant treatment after surgery is most often done using an external beam technique, a dose of 6000-7000 cGy is admistered to the primary site."

—Current otolaryngology 3/e, pg-469-470

26. Ans. is a, d and e i.e. Glottic Ca is the most common; T₁ tumor is best treated by radiotherapy; Smoking predisposes

Ref: current otolaryngology 2/e pg-440,441, Dhingra 5/e pg-326, 327, 329-330; 6/e p 308 onwards

Lets see each Option Separately

- **Option a** – Glottic CA is most common is correct

Correct –

Incidence of larynx cancer by site –

Supraglottic	–	40%
Glottic	–	59%
Subglottic	–	1%

- **Option b** – Supraglottic Ca has best prognosis *Incorrect*
- Supraglottic cancers are often silent and their only manifestation is presence of neck nodes which is a very late feature. Hence it does not have a good prognosis. (Best prongosis is with glottic cancer)
- **Option c** – Lymphatic spread is the M/C in subglottic CA
- *Incorrect*
- Lymphatic spread is more common in supraglottic CA as it has a rich lymphatic supply.
- **Option d** – T₁ tumor are best treated by radiotherapy

Correct

T₁ tumors are best treated by micro laryngoscopic surgery / radiotherapy

- **Option e** – Smoking predisposes - correct

Cigarette smoking and alcohol are 2 main predisposing factors for CA larynx

27. Ans. is d i.e. Endoscopic removal

Ref. Current otolaryngology 2/e d pg-444, 3/e, p 463 Ref. Scotts Brown 7/ed vol-2 pg-2604 – Table – 194.3 Turner 10/e, p 169

Verrucous Carcinoma

- Verrucous carcinoma makes up only 1-2% of laryngeal carcinomas.
- The larynx is the second most common site of occurrence in the head and neck after the oral cavity.
- Most common site of involvement is vocal cord.
- Grossly, verrucous carcinoma appears as a fungating, papillomatous, grayish white neoplasm.
- Microscopically, it is *well differentiated squamous cell carcinoma* with minimal cytological atypis.
- It has low metastatic potential
- Hoarseness is the most common presented symptom. Pain and dysphagia may occur but are less common.
- Treatment of most verrucous tumors is primary surgery. Endoscopic laser surgery is appropriate as the tumor is less aggressive than usual squamous cell carcinoma.

28. Ans. is a i.e. Opening the larynx in midline

Ref. Stedman dictionary, p 937

Laryngofissure: Opening the larynx in midline.

29. Ans. All are correct

Ref: Scott-Brown's Otolaryngology 7/e, vol-2 pg- 2617, 2618

Loss of functioning larynx causes problems in speech, swallowing, coughing, altered appearance, lifting, weight, laughing, crying, smelling, tasting and even kissing.

30. Ans. is b i.e. MRI

Ref: Ref. Scott-Brown's Otolaryngology 7/e, vol-2 pg- 2607

31. Ans. is b i.e. CO₂ Laser

Ref. Dhingra 5th/ed p 362, 6/e p 357

CO₂ laser is used in laryngeal surgery to excise vocal nodules, polyps, cysts, granulomas or juvenile laryngeal papilloma. Also used in case of leukoplakia, T₁ lesion of vocal cord or localized lesions of supraepiglottis and infraglottis.

ALSO KNOW

- CO₂ laser has wavelength 10,400nm
- It is the work horse laser and has been used widely in ENT
- It can cut precisely (0.3mm percision), coagulate bleeders and vaporise tissues
- Besides laryngeal surgery it is used in oropharyngeal surgery to excise benign or malignant lesions and in plastic surgery

EXTRA EDGE

Laser	Use in ENT	Comment
Argon laser	<ul style="list-style-type: none"> • Used to treat port wine stain, hemangioma and telangiectasia • Used to create hole in stapes footplate 	<ul style="list-style-type: none"> • Lies in the visible spectrum of light • Wave length 485-514 nm (blue green colour) • Easily transmitted through clear fluid eg. cornea, lens, vitreous humor • Absorbed by Hemoglobin
KTP Laser	<ul style="list-style-type: none"> • Stapes surgery • Endoscopic sinus surgery to remove polyps or inverted papillomas and vascular lesions • Micro laryngeal surgery • To remove tracheo bronchial lesions through bronchoscope 	<ul style="list-style-type: none"> • Lies in the visible spectrum of light • Wavelength 532 nm
Nd yad laser	For debulking tracheo bronchial and oesophageal lesions for palliation, hereditary hemorrhagic telangiectasia and turbinectomy	Wavelength 1064 nm (lies in infra red zone of electro magnetic spectrum)
Diode laser	Turbinectomy reduction, laser assisted stapedectomy and mucosa intact tonsillar ablation	Wavelength 600-1000 nm

Note:- Gas preferred in laser surgery-is enflurane⁹.

O₂ concentration in inhaled gases should not be more than 40%.

Donot use N₂O

32. **Ans. is a, b, d and e i.e. Poor pulmonary reserve, Tumor involving pyriform sinus, Vocal cord fixation, Cricoid cartilage extension** Ref. Dhingra 5th/308

Ref: Current otolaryngology 2/ed pg-447-448; P.L. Dhingra 5th/ed p 331; Logan and Turner 10th/ed p 174; Ballenger otolaryngology and Head-Neck 16th/ed p 1285

Supra glottic laryngectomy: Removal of the supraglottis or upper part of larynx.

It should be done if following conditions are fulfilled.

- For tumors with a T stage of T₁, T₂ or T₃ by pre epiglottic space involvement only (Thus involvement of pre epiglottic space is not a contraindication for supraglottic laryngectomy).
- Vocal cords are mobile
- Cartilage is not involved (which includes cricoid cartilage so option e is correct)
- Anterior commissure is not involved
- Patient has good pulmonary reserve (i.e. Poor pulmonary reserve is a contraindication)
- Base of the tongue is not involved past the circumvallate papillae
- The apex of the pyriform sinus is not involved. (i.e. involvement of pyriform sinus is a contraindication)
- The FEV₁ is predicted to be > 50)

So if above criteria are not filled it is a contraindication of supraglottic laryngectomy. Answer is further supported by following lines of : Bellinger

"Supraglottic laryngectomy should not be attempted if there is vocal cord fixation, extensive involvement of pyriform sinus, thyroids or cricoid cartilage invasion or extensive involvement of base of tongue (to or beyond circumvallate papilla)" -Ballenger otolaryngology and Head and Neck Surgery 16th/ed pg-1285

ALSO KNOW

Supraglottic laryngectomy can be performed endoscopically using a CO₂ laser or with a standard external approach.

33. **Ans. is a i.e. HPV**

Already explained

Ref. Dhingra 6/e p 305

34. **Ans. is a i.e. tracheostomy**

During laryngectomy, airway of a patient is maintained by tracheostomy.

Ref. Logan Turner 10/e p 178

SECTION V



EAR

- | | |
|---------------------------------------|--|
| 16. Anatomy of Ear | 24. Otosclerosis |
| 17. Physiology of Ear and Hearing | 25. Facial nerve and its lesions |
| 18. Assessment of Hearing Loss | 26. Lesion of Cerebellopalatine Angle and Acoustic Neuroma |
| 19. Hearing Loss | 27. Glomus Tumor and other Tumors of the Ear |
| 20. Assessment of Vestibular Function | 28. Rehabilitative Methods |
| 21. Diseases of External Ear | 29. Miscellaneous |
| 22. Diseases of Middle Ear | |
| 23. Meniere's Disease | |

CHAPTER

16

Anatomy of Ear

Ear can be divided into three parts: I. External ear
II. Middle ear
III. Inner ear

EXTERNAL EAR

- It consists of (A) Pinna (B) External auditory canal and (C) Tympanic membrane

PINNA/AURICLE

- It is made of single yellow elastic cartilage except at the lobule, where it is absent
- Its lateral surface has characteristic prominences and depressions (as shown in figure) which are different in every individual even among identical twins. This unique pattern is comparable to fingerprints and can allow for identification of persons.
- The cartilage of pinna is continuous with the cartilage of external auditory canal.
- The cartilage is covered with skin which is closely attached on lateral surface and slightly loose on medial surface.⁹
- The cartilage itself is **avascular** and derives its supply of nutrients from the perichondrium covering it.

Clinical importance - stripping of the perichondrium from the cartilage as occurs following injuries that cause hematoma can lead to cartilage necrosis and so-called 'boxers ear'.

- Various landmarks on the pinna: see figure 16.1
- Incisura terminalis**: Area between the crus of the helix and tragus.
 - It is devoid of cartilage
 - Clinical importance**: An incision made in this area does not cut through the cartilage and is used for endural approach in surgery.
- Pinna has **3 extrinsic muscle**: 1. Auricularis anterior, 2. Auricularis superior and (3) Auricularis posterior. These are all attached to epicranial aponeurosis and supplied by the **facial nerve**
- Intrinsic muscles** are 6 in number and are small, inconsistent and without any useful information

External auditory meatus
Scaphoid fossa
Triangular fossa
Cymba conchae
Auricular (Darwin's) tubercle
Concha
Helix
Antihelix
Tragus
Intertragic notch
Antitragus
Lobule

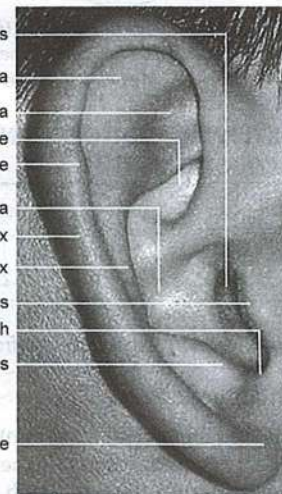


Fig. 16. 1: External features of auricle
Courtesy: Text book of Diseases of Ear, Nose and Throat, Mohan Bansal. Jaypee Brothers, p 3

Innervation of the pinna: (Fig. 16.2)

Lateral surface	Medial surface
1. Auriculotemporal nerve	1. Lesser occipital nerve —supplies upper part
2. Greater auricular nerve	2. Most of the medial surface is supplied by great auricular nerve (MAHE 07)
3. Auricular branch of vagus also called as Arnold nerve	3. Auricular branch of vagus
4. Facial nerve (VII)	4. Facial nerve

Lymphatic Drainage:

- From posterior surface – lymph node at mastoid tip
- From tragus and upper part of anterior surface – Preauricular nodes
- Rest of auricle → upper deep cervical nodes

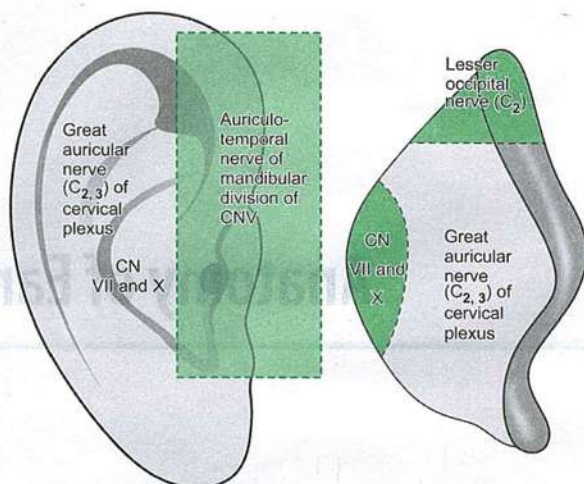


Fig. 16.2: Nerve supply of right pinna. (A) Lateral surface; (B) Medial surface
 Courtesy: Text book of Diseases of Ear, Nose and Throat,
 Mohan Bansal. Jaypee Brothers. p 4

EXTERNAL AUDITORY CANAL/EXTERNAL ACOUSTIC MEATUS

Length	: 24–25 mm ^Q	
Parts	: Lateral/outer 1/3 : Cartilaginous ^Q	
	: Medial/inner 2/3 : Osseous ^Q	
Shape	: 'S'- shaped curve	

External Auditory Canal develops from = First brachial cleft/groove^Q

Cartilaginous Part

Forms the outer/lateral 1/3 (8 mm) of external auditory canal

- Has a fissure/deficiency - in the anterior part called as **Fissures of Santorini**^Q through which parotid or superficial mastoid infection can appear in the canal and like vice versa.
- Skin covering is thick and has ceruminous glands (*modified apocrine sweat glands*^Q), pilosebaceous glands and hair.
- Ceruminous and pilosebaceous glands secrete wax (mixture of cerumen, sebum and desquamated cells is wax).
- Since hair is confined to cartilaginous part – furuncles are seen only in the outer third of canal.^Q

Bony Part

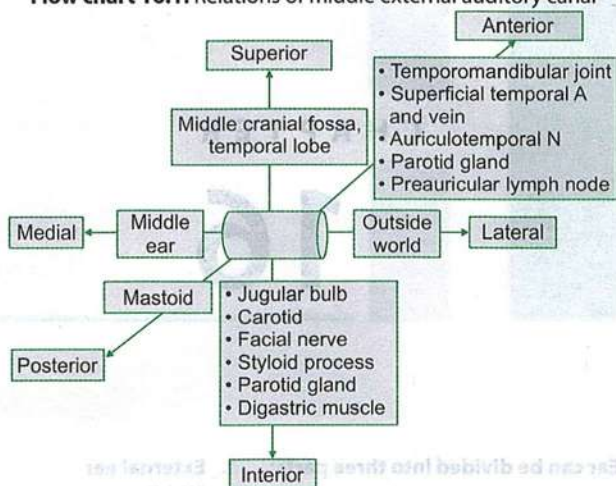
- It forms inner two-thirds (16 mm)^Q of external auditory canal.
- Skin lining the bony canal is thin and it is devoid of hair and ceruminous glands^Q.
- 5 mm lateral to tympanic membrane, bony meatus is narrow and called **Isthmus** (Applied – Foreign bodies get lodged in it and are difficult to remove).
- **Foramen of Huschke**^Q is a deficiency present in anteroinferior part of bony canal in children up to 4 years of age, permitting infection to and from the temporo mandibular joint.

Blood supply: It is also supplied by **External carotid artery**.

Lymphatic drainage—follows the auricle

Relationship of external auditory canal - see flow chart 16.1

Flow chart 16.1: Relations of middle external auditory canal



Nerve supply:

- Anterior wall and roof: **Auriculotemporal nerve**
- Floor and posterior wall: **Vagus** (arnold nerve)
- Posterior wall also receives innervation from: **Facial nerve** (Importance – Hypoesthesia of the posterior meatal wall is seen in case of facial nerve injury, known as **Hitzelberger's sign**)

TYMPANIC MEMBRANE (FIG. 16.3)

- It is the partition between external acoustic meatus and middle ear, i.e. it lies at medial end of external auditory meatus
- Tympanic membrane is 9–10 mm tall, 8–9 mm wide and 0.1 mm thick and is positioned at angle of 55° to floor.
- It is shiny and pearly gray^Q in color.
- Normal tympanic membrane is mobile with maximum mobility being in the peripheral part.^Q

It has 2 parts:

Pars tensa	Pars flaccida /Shrapnell's membrane
<ul style="list-style-type: none"> • It forms most of tympanic membrane • Periphery is thickened to form a fibro-cartilaginous ring called the annulus tympanicus • This ring is deficient above in the form of a notch called the notch of Rivinus • The central part is tented inward at the level of tip of malleus and is called as umbo • Cone of light is seen radiating from tip of malleus to the periphery in the anteroinferior quadrant.^Q 	<ul style="list-style-type: none"> • Situated above the lateral process of malleus between the notch of Rivinus and the anterior and posterior malleal folds • It is more mobile • Prussack's space is a shallow recess within the posterior part of pars flaccida

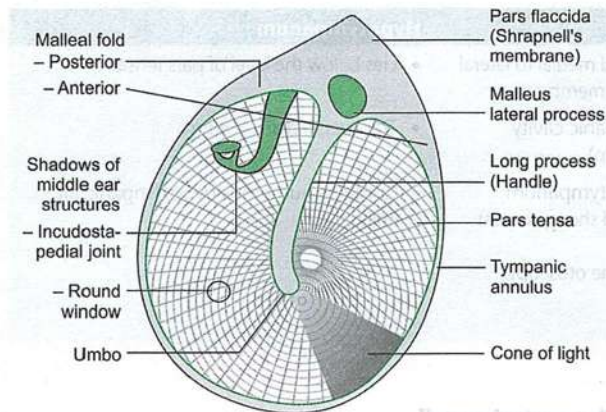


Fig. 16.3: Tympanic membrane showing attic, malleus handle, umbo, cone of light and structures of middle ear seen through it on otoscopy

Courtesy: *Text book of Diseases of Ear, Nose and Throat*, Mohan Bansal. Jaypee Brothers. p 5

Layers of Tympanic Membrane (Fig. 16.4)

- Outer – Epithelial
- Middle – Fibrous
- Inter – Mucosal continuous – the middle ear mucosa

NOTE

When a tympanic membrane perforation heals spontaneously, it heals in two layers as it is often closed by squamous epithelium before fibrous elements develop.

Arterial supply: Vessels are present only in connective tissue layer of the lamina propria.

Arteries supplying tympanic membrane are:

Mnemonic—

- M = Maxillary artery
- A = Post auricular Artery
- M = Middle meningeal branch Artery

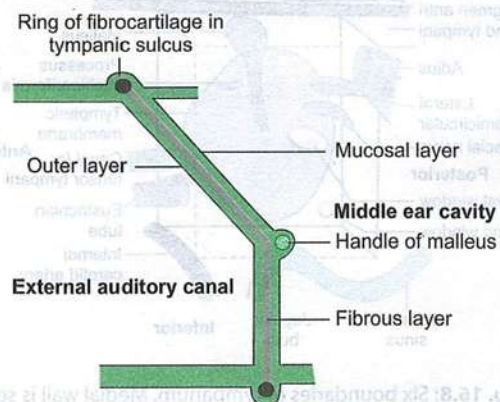


Fig. 16.4: Three layers of tympanic membrane

Courtesy: *Text book of Diseases of Ear, Nose and Throat*, Mohan Bansal. Jaypee Brothers. p 5

Nerve supply of Tympanic membrane

- Lateral/outer surface
 - Anterior half: Auriculotemporal nerve
 - Posterior half: Vagus nerve
- Medial/inner surface
 - Tympanic branch of glossopharyngeal nerve (k/a Jacobson's nerve)
- Auriculotemporal nerve (CN V3): It is a branch of mandibular division of trigeminal nerve and supplies anterior half of lateral surface of TM.
- CN X (vagus nerve): Its auricular branch (**Arnold's nerve**) supplies to posterior half of lateral surface of TM.
- CN IX (glossopharyngeal nerve): Its tympanic branch (**Jacobson's nerve**) supplies to medial surface of tympanic membrane.

MIDDLE EAR CLEFT (FIG. 16.5)

Ear cleft in the temporal bone, consists of tympanic cavity (middle ear), Eustachian tube and mastoid air cell system.

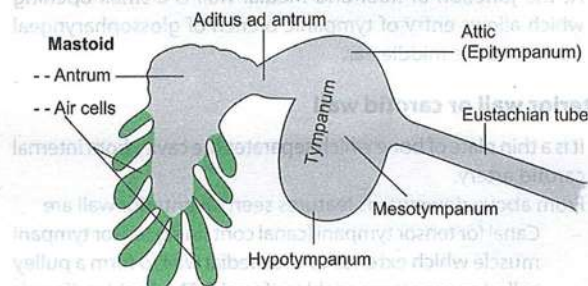


Fig. 16.5: Parts of middle ear cleft

Courtesy: *Text book of Diseases of Ear, Nose and Throat*, Mohan Bansal. Jaypee Brothers. p 6

TYMPANIC CAVITY (MIDDLE EAR)

It is divided into:

- Mesotympanum
- Epitympanum
- Hypotympanum

NOTE

- Sometimes the portion of middle ear around the tympanic orifice of the Eustachian tube is called as **protympanum**.
- Anterior tympanic recess or supratubal recess refers to a small compartment within epitympanum seen on CT imaging.
- Boundaries of middle ear.
- **Middle ear** is like a six sided box with a: roof, floor, medial wall, lateral wall, anterior wall, posterior wall

Roof

Is formed by a thin plate of bone called tegmen tympani.⁹

- It separates tympanic cavity from the middle cranial fossa.⁹
- Tegmen tympani is formed both by petrous and squamous part of temporal bone and the petrosquamous line
- which does not close until adult life can provide a route of access for infection into the extradural space in children.

Mesotympanum	Epitympanum/Attic	Hypotympanum
<ul style="list-style-type: none"> Lies opposite the pars tensa Narrowest part of middle ear^a (Transverse diam = 2 mm) Seen on routine otoscopy Contains stapes bone, malleus (neck, short process and umbo), incus (long process), oval window, round window, stapedius muscle, tensor, tympani, cochleariform process 	<ul style="list-style-type: none"> Lies above pars tensa and medial to lateral attic wall and Shrapnell's membrane It is widest part of tympanic cavity (transverse diam = 6 mm) Prussak space lies in epitympanum Contains incus (body and short process) head of malleus Cannot be seen on routine otoscopy 	<ul style="list-style-type: none"> Lies below the level of pars tensa Transverse diam = 4 mm Contains numerous hypotympanic air cells

Floor or Jugular wall (Pars tegmentalis)

It is a thin plate of bone which separates tympanic cavity from the jugular bulb.^a

- At the junction of floor and medial wall is a small opening which allows entry of tympanic branch of glossopharyngeal nerve into the middle ear.

Anterior wall or carotid wall

- It is a thin plate of bone which separates the cavity from internal carotid artery.
- From above downwards features seen on anterior wall are
 - Canal for tensor tympani (canal containing tensor tympani muscle which extends to the medial wall to form a pulley called as processus cochleariformis). The cochleariform process, serves a useful landmark and denotes the location of anterior most part of horizontal segment of facial nerve.
 - Opening for eustachian tube
 - Internal carotid artery (carotid canal)

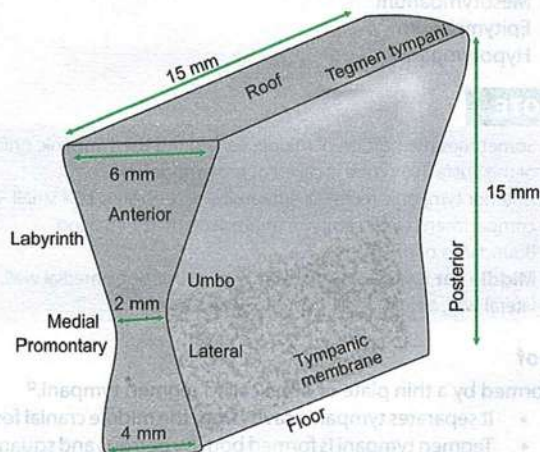


Fig. 16.6: Dimensions of tympanum

Courtesy: Text book of Diseases of Ear, Nose and Throat, Mohan Bansal. Jaypee Brothers. p

The posterior wall

It lies close to the mastoid air cells. It has the following main features:

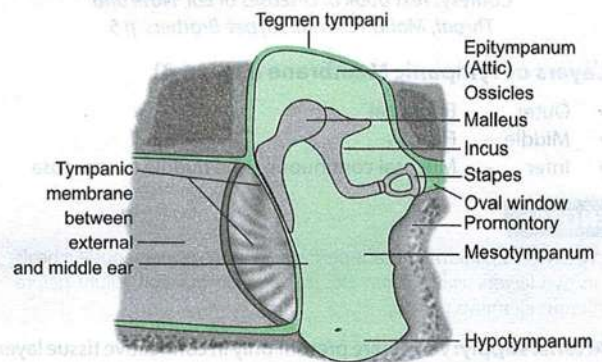


Fig. 16.7: Parts of middle ear seen on coronal section

Courtesy: Text book of Diseases of Ear, Nose and Throat, Mohan Bansal. Jaypee Brothers. p 6

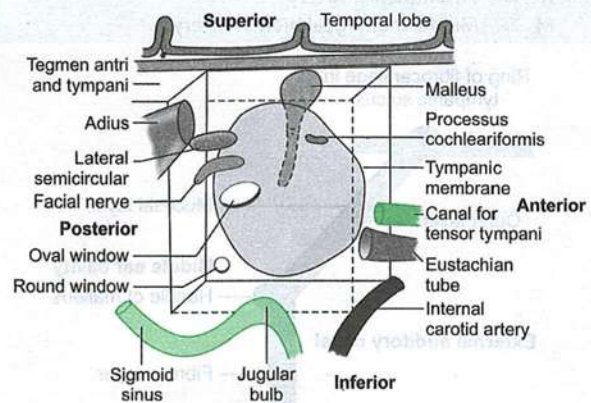


Fig. 16.8: Six boundaries of tympanum. Medial wall is seen through the tympanic membrane

Courtesy: Text book of Diseases of Ear, Nose and Throat, Mohan Bansal. Jaypee Brothers. p 7

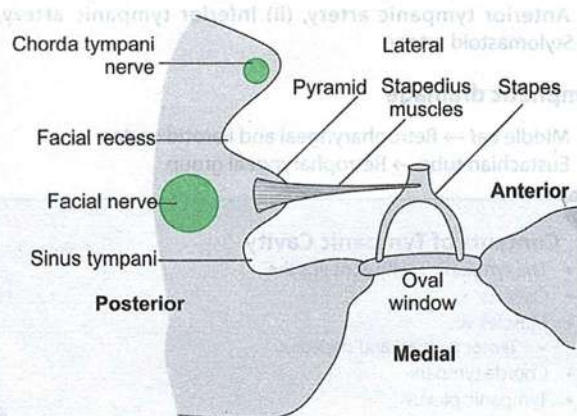


Fig. 16.9: Facial recess and sinus tympani relations with facial nerve and pyramidal eminence

Courtesy: Text book of Diseases of Ear, Nose and Throat, Mohan Bansal. Jaypee Brothers. p 7

- **Aditus**—an opening through which attic communicates with the mastoid antrum
- A bony projection called the **pyramid** which contains stapedius muscle.
- Facial nerve runs in the posterior wall just behind the pyramid.

Facial recess (Fig. 16.9) also called **suprapyramidal recess** is a collection of air cells lying lateral to facial nerve. It is bounded medially by external genu of facial nerve, laterally by chorda tympani nerve, superiorly by fossa incudis (in which lies the short process of incus) and anterolaterally by tympanic membrane.

NOTE

In the intact canal wall mastoidectomy, middle ear is approached (posterior tympanotomy or facial recess approach) through the facial recess without disturbing posterior meatal wall. (Fig. 16.10)

Sinus tympani (Infrapyramidal tympani): This deep recess lies medial to the pyramid. It is bounded by the subiculum below and ponticulus above.

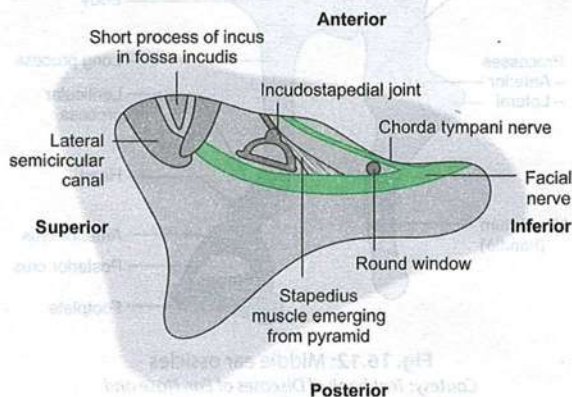


Fig. 16.10: Posterior tympanotomy. Structures of middle ear seen through the opening of facial recess

Courtesy: Text book of Diseases of Ear, Nose and Throat, Mohan Bansal. Jaypee Brothers. p 7

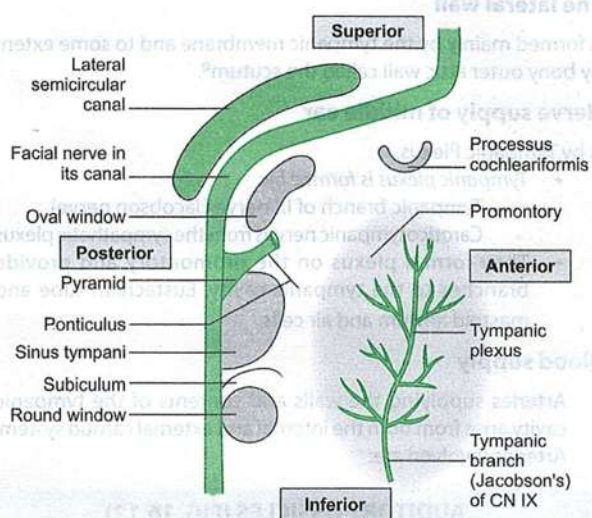


Fig. 16.11: Medial wall of middle ear

Courtesy: Text book of Diseases of Ear, Nose and Throat, Mohan Bansal. Jaypee Brothers. p 8

Medial wall

It separates the tympanic cavity from internal ear. It is formed by labyrinth. The main features on medial wall are (Fig. 16.11):

- A bulge called as **promontory** formed by basal turn of cochlea.^Q
- Fenestra vestibuli (oval window^Q) lies posterosuperior (behind and above) to the promontory and opens into scala vestibuli. It is occupied by foot plate of stapes fixed by annular ligament. Its size on average is 3.25 mm long and 1.75 mm wide
- Fenestra cochleae (round window) lies posteroinferior to the promontory and opens into scala tympani of cochlea. It is closed by **secondary tympanic membrane**. The round window is closest to ampulla of posterior semicircular canal. Round window is a triangular opening.
- Prominence of facial nerve canal (k/a Fallopian canal) lies above the fenestra vestibuli curving downward into posterior wall of middle ear.
- Anterior to oval window lies a hook-like projection called the **processus cochleariformis**^Q for tendon of tensor tympani^Q.
- The cochleariform process marks the level of the genu of the facial nerve which is an important landmark for surgery of the facial nerve.

EXTRA EDGE

- The round window opening is separated from the oval window opening by a bony ridge called the **subiculum**.
- The **ponticulus** – is another bony ridge below oval window.
- Medial to the pyramid is a deep recess called as **sinus tympani** which is bounded below by **subiculum** and above by **ponticulus**. It is the most accessible site in the middle ear and mastoid. Its importance is that cholesteatoma which has extended upto it is difficult to eradicate.

The lateral wall

Is formed mainly by the tympanic membrane and to some extent by bony outer attic wall called the scutum^a.

Nerve supply of middle ear

Is by Tympanic Plexus.

- *Tympanic plexus is formed by:*
 - Tympanic branch of IX nerve (Jacobson nerve)
 - Caroticotympanic nerves from the sympathetic plexus
- They form a plexus on the promontory and provide branches to the tympanic cavity, Eustachian tube and mastoid antrum and air cells.

Blood supply

- Arteries supplying the walls and contents of the tympanic cavity arise from both the internal and external carotid system. Arteries involved are:

- (i) Anterior tympanic artery, (ii) Inferior tympanic artery, (iii) Stylomastoid artery

Lymphatic drainage

Middle ear → Retropharyngeal and Parotid nodes

Eustachian tube → Retropharyngeal group

Contents of Tympanic Cavity

- The tympanic cavity contains the
- Ossicles
- Muscles viz.
 - Tensor tympani and stapedius
- Chorda tympani
- Tympanic plexus

AUDITORY OSSICLES (FIG. 16.12)

- These are malleus, incus and stapes (MIS)

Malleus

- It is shaped like a mallet
- It is placed most laterally
- It is 7.5–9 mm long
- It comprises of head, neck, anterior process, lateral process, manubrium and umbo

Incus

- It is shaped like an anvil
- It is the largest of the three ossicles
- It is placed medially to malleus
- It has body, short process, long process and lenticular process

Also know:

Lenticular process is sometimes k/a, the fourth ossicle as it is a sesamoid bone

Stapes

- It is the shortest bone of the body
- It is shaped like a stirrup
- It is placed most medially
- Footplate of stapes is held on the oval window by annular ligament
- Stapes consists of a capitulum, two crura and foot plate

- The average dimensions of foot plate are 3 mm long and 1.4 mm wide

Development of Ossicles

- Malleus and incus develop mainly from first brachial arch (Meckel's cartilage)
- Stapes develops mainly from second brachial arch except the foot plate which along with annular ligament is derived from the otic capsule.
- Ossicles ossify by fourth month of intrauterine life (first bones in the body to do so).

Joints of the Ossicles

- The incudomalleolar joint
 - Saddle joint
- Incudostapedial joint
 - Ball and socket joint

Both of them are synovial joints.

Function of Ossicle

- Ossicles conduct sound energy from the tympanic membrane to oval window and then to inner ear fluid.

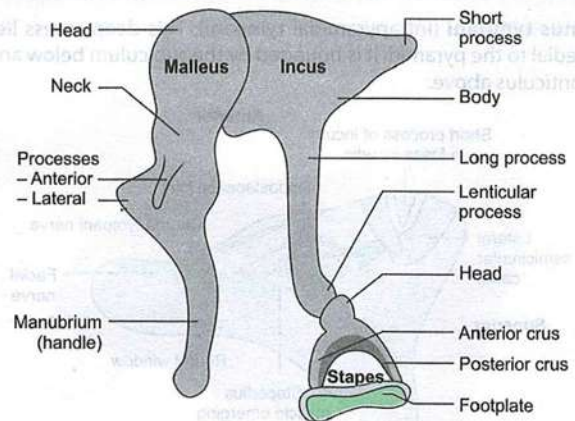


Fig. 16.12: Middle ear ossicles

Courtesy: Text book of Diseases of Ear, Nose and Throat, Mohan Bansal. Jaypee Brothers. p 8

Muscles of Tympanic Cavity: Tympanic Cavity has Two Muscles

Muscle	Origin	Insertion	Innervation	Function
Tensor tympani	Cartilaginous pharyngo tympanic tube, greater wing of sphenoid, its own bony canal	Upper part of handle of malleus		Contraction pulls handle of malleus medially, tensing tympanic membrane to reduce the force of vibrations in response to loud noise
Stapedius develops from 2nd Arch	Attached to inside of pyramidal eminence	Neck of stapes	Branch of facial nerve	Contraction usually in response to loud noises, pulls the stapes posteriorly and prevents excessive oscillation

MASTOID ANTRUM

Types

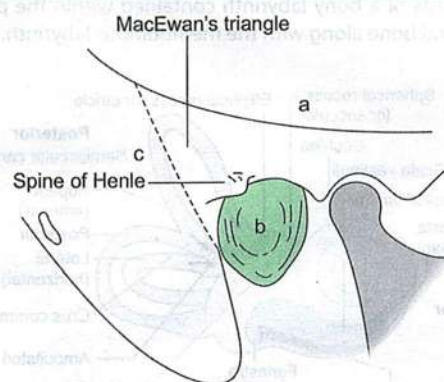
- Pneumatic (80%)
- Sclerotic (20%)
- Diploic (mixed)

- It is an air sinus in the petrous temporal bone.
- Its upper anterior wall has the opening of aditus, while medial wall is related to posterior semicircular canal (SCC).
- Posteriorly lies the sigmoid sinus.
- The posterior belly of digastric muscle forms a groove in the base of mastoid bone. The corresponding ridge inside the mastoid lies lateral not only to sigmoid sinus but also to facial nerve and is a useful landmark.
- The roof is formed by tegmen antri separating it from middle cranial fossa and temporal lobe of brain.⁹⁴
- Anteroinferior is the descending part of facial nerve canal (or Fallopian canal).
- Lateral wall is formed by squamous temporal bone and is easily palpable behind the pinna.
- Mastoid develops from squamous and petrous bone.

The mastoid antrum but not the air cells are well developed at birth. Pneumatization begins in the first year and is complete by 4 to 6 years of age.

Korner's septum – Korner's septum is persistence of petrosquamous suture in the form of a bony plate which separates superficial squamous cells from the deep petrosal cells. Korner's septum is surgically important as it may cause difficulty in locating the antrum and the deeper cells, and thus lead to incomplete removal of disease at mastoidectomy. Mastoid antrum cannot be reached unless the Korner's septum has been removed.

MacEwen Triangle	Trautman triangle
Boundaries	Boundaries
Above – supramastoid crest	Posterior – sigmoid sinus
Anteroinferior – posterosuperior margin of external auditory canal	Anterior – bony labyrinth
Posterior – Tangent drawn from zygomatic arch	Superior – superior petrosal sinus
Importance: Spine of Henle lies in the triangle. It is an important surgical landmark for locating mastoid antrum.	Importance: Infection into the posterior cranial fossa can spread through this triangle and can be approached by removing the bone in between the triangle.

**Fig. 16.13: MacEwen's triangle**

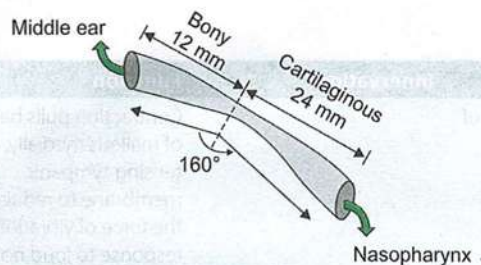


Fig. 16.14: Right Eustachian tube

EUSTACHIAN TUBE

It is a channel connecting the tympanic cavity with the nasopharynx. (Fig. 16.14)

- It is also called **pharyngotympanic tube**. It is lined by ciliated columnar epithelium.
- It helps to equalize pressure on both sides of tympanic membrane.
- Length of Eustachian tube is 36 mm (reached by the age of 7 years).
- Lateral third (i.e. 12 mm) is bony.
- Medial 2/3 (i.e. 24 mm) is fibrocartilaginous.
- In adults it is placed at an angle of 45° with sagittal plane, while in infants it is short, wide and placed horizontally.
- So in infants infections of middle ear are more common.
- **Muscles of Eustachian tube** are tensor palati^o (*dilator tube* is a part of it) supplied by branch of mandibular nerve^o and levator palati^o supplied by pharyngeal plexus through Xth cranial nerve^o.
- Arterial supply is through branches from ascending pharyngeal artery, middle meningeal artery and artery of pterygoid canal (*both branches of maxillary artery*).
- Venous drainage is to the pterygoid venous plexus.
- Nerve supply is by tympanic plexus.

INNER EAR

- It consists of a bony labyrinth contained within the petrous temporal bone along with the membranous labyrinth.

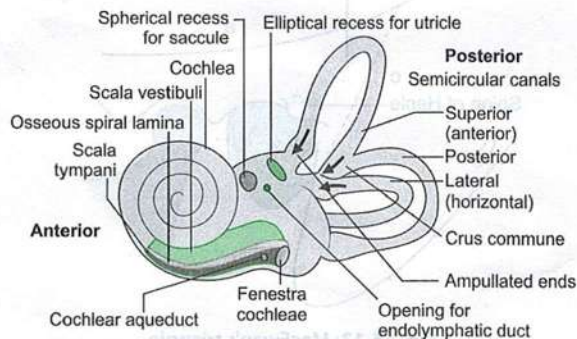


Fig. 16.15: Bony labyrinth of left side.
External features seen from lateral side

- It serves the most important function of hearing and equilibrium.
- **Parts:** A. Bony labyrinth, B. Membranous labyrinth.

BONY LABYRINTH (FIG. 16.15)

- It lies in the temporal bone
- It consists of *vestibule, the semicircular canals and the cochlea which are filled with perilymph^o*

Vestibule

- Central portion of the bony labyrinth.
- Posterosuperior wall: Has '5' openings of the semicircular canals.
- Medial wall:

Spherical recess	Elliptical recess	Pending of aquaduct of vestibule	Vestibular rest and cochlear
<ul style="list-style-type: none"> • For the macula of saccule • Carries fibers of inferior 	<ul style="list-style-type: none"> • For the macula of utricle 	<ul style="list-style-type: none"> • Carries endolymphatic duct 	<ul style="list-style-type: none"> • For the cochlear nerve

In the lateral wall lies the oval window (Fenestra vestibule)

Semicircular Canals

They are three in number, the lateral, posterior and superior, and lie at right angles to each other.

- **Ampulla:** One end of each canal dilates to form the ampulla, which contains the vestibular sensory epithelium and opens independently in vestibule.
- **Crus commune:** Formed by the non-ampullated ends of the superior and posterior semicircular canals. So the 3 semicircular canals open in vestibule by "5" openings.

Cochlea (Bony Cochlea)

- Has approximately two- and- one half turns.^o
- Coils turn about a central cone called *modiolus*.^o

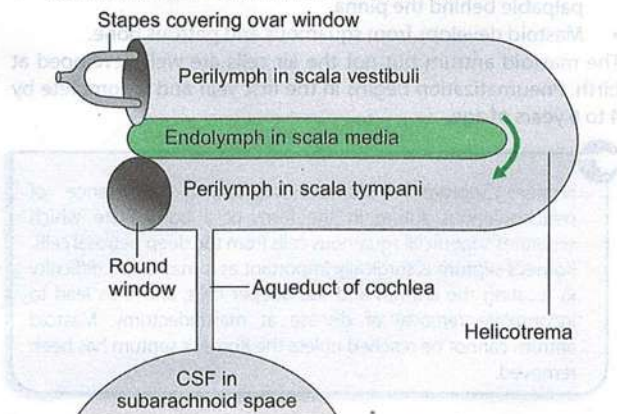


Fig. 16.16: Cochlea: Peri- and endolymphatic systems relations with cerebrospinal fluid (CSF)

Courtesy: Text book of Diseases of Ear, Nose and Throat, Mohan Bansal. Jaypee Brothers. p 14

- Cochlea converts mechanical soundwaves to electrical signal which can be transmitted to brain. This function is primarily performed by cochlea hair cells.
- The modiolus houses spiral ganglion cells destined to enervate cochlea hair cells, in an area called as Rosenthal canal.
- Arising from the modiolus is a thin shelf of bone which spirals upward within the lumen of the cochlea as the bony spiral lamina.
 - Spira lamina divides the cochlear canal into upper scala vestibuli and lower scale tympani. The scala vestibuli and tympani scala are continuous with each other through helicotrema at the apex of cochlea. (Fig. 16.16)
 - Scala vestibuli is closed by the footplate of stapes, which separates it from the air-filled middle ear.
 - The scala tympani is closed by secondary tympanic membrane.
 - Aqueduct of cochlea connects the scala tympani with the subarachnoid space.
 - Spiral lamina gives attachment to the basilar membrane.

MEMBRANOUS LABYRINTH (FIG. 16.17)

- It lies within the osseus/bony labyrinth and is filled with endolymphatic fluid.^Q
- It is separated from the bony labyrinth by perilymphatic fluid.^Q
- It consists of cochlear duct, utricle, saccule, semicircular ducts, endolymphatic duct and sac.

Cochlear Duct (Membranous Cochlea)

- Also called *membranous cochlea*^Q or the scala media.^Q It is a blind coiled tube.
- It appears triangular on cross section and has three walls formed by
 - The basilar membrane, which supports the organ of corti^Q
 - The Reissner's membrane which separates it from the scala vestibuli^Q (Fig. 16.18)
 - The stria vascularis, which contains vascular epithelium and is concerned with secretion of endolymph.^Q
- Cochlear duct is connected to the saccule by ductus reunions.^Q

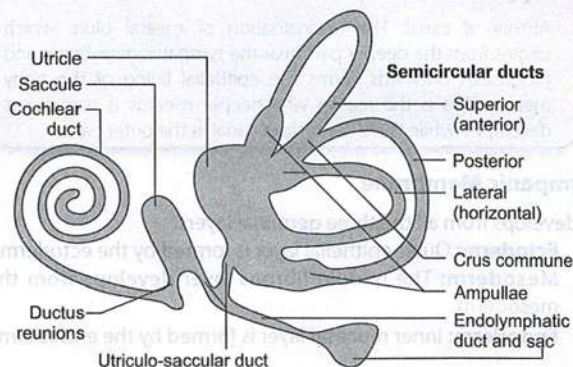


Fig. 16.17: Membranous labyrinth of left side: External features

Courtesy: *Text book of Diseases of Ear, Nose and Throat*, Mohan Bansal. Jaypee Brothers. p 15

- The length of basilar membrane increases as we proceed from the basal coil to the apical coil. So higher frequencies of sound are heard at the basal coil, while lower ones are heard at the apical coil.

Utricle and Saccule

- The utricle lies in the posterior part of bony vestibule.

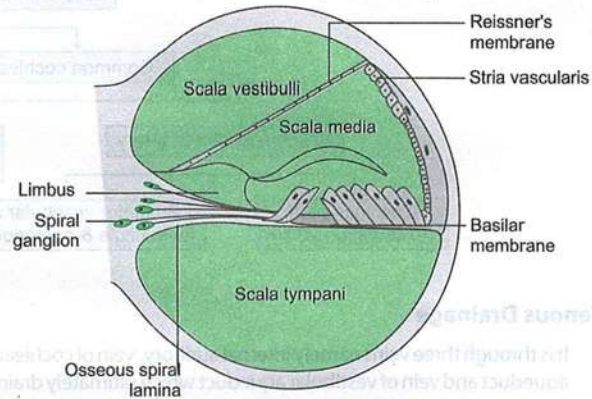


Fig. 16.18: Structure of cochlear canal after its cut section

Courtesy: *Text book of Diseases of Ear, Nose and Throat*, Mohan Bansal. Jaypee Brothers. p 15

- It receives the five openings of the three semicircular ducts.
- It is connected to the saccule through utriculosaccular ducts.^Q
- The sensory epithelium of the utricle is called the *macula* and is concerned with linear acceleration^Q and deceleration.^Q
- The saccule also lies in the bony vestibule.
- Its sensory epithelium is also called the *macula*.^Q Its exact function is not known. It probably also responds to linear acceleration^Q and deceleration.^Q

Semicircular Ducts

- They are three in number and correspond exactly to the three bony canals.
- They open in the utricle. The ampullated end of each duct contains a thickened ridge of neuroepithelium called *crista ampullaris*^Q which responds to angular acceleration.^Q

Endolymphatic Duct and Sac

Endolymphatic duct is formed by the union of two ducts, one each from the saccule and the utricle.^Q It passes through the vestibular aqueducts. Its terminal part is dilated to form endolymphatic sac which lies under the dura on the posterior surface of the petrous bone.

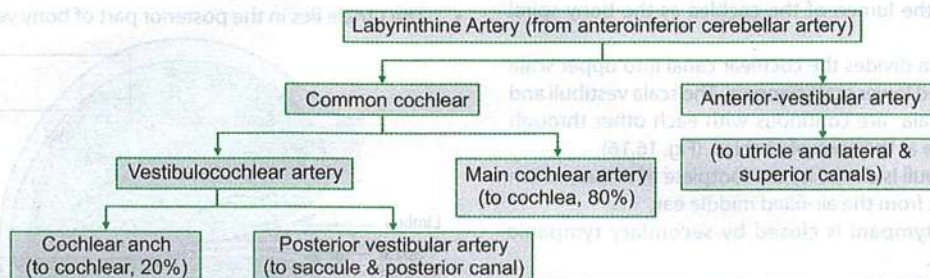
Inner Ear Fluids and their Circulation

- There are two main fluids in the inner ear, perilymph and endolymph.
- **Perilymph** resembles extracellular fluid and is rich in Na ions.^Q It fills the space between the bony^Q and the membranous labyrinth. ^Q It communicates with CSF through the aqueduct of cochlea^Q which opens into the scala tympani near the round window.

- **Endolymph** fills the entire membranous labyrinth^o and resembles intracellular fluid^o, being rich in K ions^o. It is secreted by the secretory cells of the stria vascularis^o of the cochlea and by the dark cells (present in the utricle and near the ampullated ends of semicircular ducts).

Blood Supply of Labyrinth

- Blood supply of labyrinth is through labyrinthine artery^o which is a branch of anteroinferior cerebellar artery^o but may sometimes arise from basilar artery.
- It divides in the labyrinth – as



Venous Drainage

- It is through three veins namely internal auditory, vein of cochlear aqueduct and vein of vestibular aqueduct which ultimately drain into inferior petrosal sinus and lateral venous sinus.

NOTE

- Blood supply to the inner ear is independent of blood supply to middle ear and bony otic capsule, and there is no cross circulation between the two.
- Blood supply to cochlea and vestibular labyrinth is segmental, therefore, independent ischemic damage can occur to these organs causing either cochlear or vestibular symptoms.

DEVELOPEMENT OF EAR

Pinna

- In the sixth week of embryonic life, six tubercles (Hillocks of His) appear around the first branchial cleft. They progressively grow and coalesce and form the auricle.

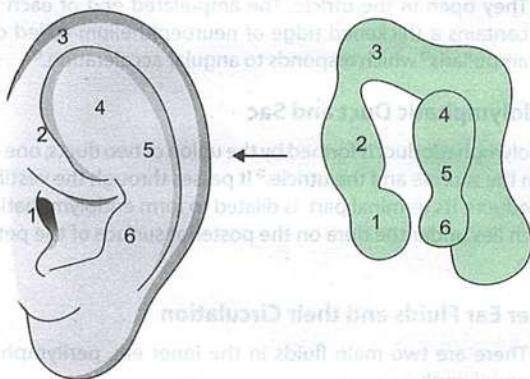


Fig. 16.19: Development of pinna (A) from six hillocks of His (B) around the first branchial cleft (1 from first and 2–6 from second branchial arch)

Courtesy: Text book of Diseases of Ear, Nose and Throat, Mohan Bansal. Jaypee Brothers. p 19

- Tragus develops from the first branchial arch. The remaining pinna develops second arch.
- By the 20th week, pinna attains adult shape.

Applied Anatomy

- Preauricular sinus: Due to defective fusion between 1st and 2nd arch hence it is situated between tragus and rest of pinna. Formed when 1st and 2nd hillocks fail to fuse. Opening is found in front of the ascending limb of the helix.
- Anotia is complete absence of pinna and usually forms a part of the first arch syndrome.
- Microtia: It is developmental anomaly where size of pinna is small.

External Auditory Canal

- External auditory canal (EAC) develops from the first branchial cleft.
- External ear canal gets fully formed by the 28th week.

Applied Anatomy

Atresia of canal: The recanalization of meatal plug, which begins from the deeper part near the tympanic membrane and progresses outwards, forms the epithelial lining of the bony meatus. This is the reason why deeper meatus is sometimes developed while there is atresia of canal in the outer part.

Tympanic Membrane

It develops from all the three germinal layers.

- **Ectoderm:** Outer epithelial layer is formed by the ectoderm.
- **Mesoderm:** The middle fibrous layer develops from the mesoderm.
- **Endoderm:** Inner mucosal layer is formed by the endoderm.

Middle Ear

- **Endoderm of Tubotympanic Recess:** The eustachian tube, tympanic cavity, attic, antrum and mastoid air cells are derived

from the endoderm of tubotympanic recess which arises from the first and partly from the second pharyngeal pouches.

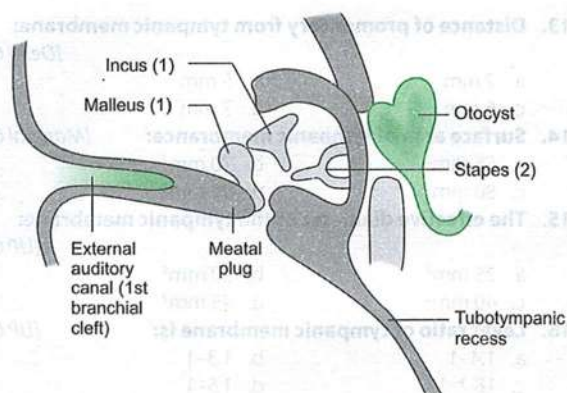


Fig. 16.20: Development of external and middle ears. 1 (Meckel's cartilage) and 2 (Reichert's cartilage) branchial arches
Courtesy: Text book of Diseases of Ear, Nose and Throat, Mohan Bansal. Jaypee Brothers. p 20

- **First Branchial Arch:** Malleus and incus develops from mesoderm of the first arch.
- **Second Branchial Arch:** The stapes superstructures develop from the second arch.
- **Otic Capsule:** The stapes footplate and annular ligament are derived from the otic capsule. See chapter for the details of Branchial Apparatus.

Inner Ear

- Development of the inner ear, which begins in third week of fetal life, is complete by the 16th week.
- **Auditory Placode:** The auditory placode, which is thickened ectoderm of hind brain, gets invaginated and forms auditory vesicle (otocyst).
- **Auditory Vesicle:** The auditory vesicle differentiates into endolymphatic duct and sac, utricle, semicircular ducts, saccule and cochlea.
- Development of pars superior (semicircular canals and utricle) takes place earlier than pars inferior (saccule and cochlea). The pars superior is phylogenetically older part of labyrinth.

- The cochlea develops by 20 weeks of gestation and the fetus can hear in the womb of the mother. The great Indian epic of Mahabharata, which was written thousands of years ago, mentions that Abhimanyu son of great warrior Arjun while in his mother's womb heard conversation (regarding the art of battle ground) of his mother and father.

Extra Edge

- **Structures of ear fully formed at birth:**

Dhingra 4th/ed p 403; 5th/ed p 462; point 106.

- Middle ear^o
- Malleus^o
- Incus^o
- Stapes^o
- Labyrinth^o
- Cochlea^o
- Area of adult tympanic membrane is 90 mm², of which only 55 mm² is functional. Area of stapes footplate is 3.2 mm². Area ratio (or hydraulic ratio) is 17:1. According to other workers, functional area is 45 mm² and area ratio is 14:1.
- Mastoid antrum lies 12–15 mm deep from the surface of suprameatal triangle in an adult. The thickness of the bone overlying the antrum is only 2 mm at birth and then increases at the rate of 1 mm per year.
- Mastoid tip does not develop till 2 years; hence postaural incision to open the mastoid before this age needs to be modified to avoid injury to the facial nerve.
- Vertical and anteroposterior dimensions of middle ear are 15 mm each while transverse dimension is 2 mm at mesotympanum, 6 mm above at the epitympanum and 4 mm below in the hypotympanum. Thus, middle ear is the narrowest between the umbo and promontory.
- Tympanic membrane develops from all the three germinal layers^o: ectoderm (outer epithelial layer) mesoderm (middle fibrous layer) and endoderm (inner mucosal layer).
- Boundaries of facial recess are facial nerve medially, chorda tympanica (laterally) and fossa incudis (above).
- Eddy currents^o in the external auditory meatus do not allow water to reach TM while swimming.
- Organ of corti is filled with cortilymph.

QUESTIONS

1. Ceruminous glands present in the ear are: [AIIMS May 05]
 - a. Modified eccrine glands
 - b. Modified apocrine glands
 - c. Mucous gland
 - d. Modified holocrine glands
2. Nerve supply for external ear are all except: [MAHE 07]
 - a. Greater occipital nerve
 - b. Greater auricular nerve
 - c. Auriculotemporal nerve
 - d. Lesser occipital nerve
3. All of the following nerves supply auricle and external meatus except: [TN 03]
 - a. Trigeminal nerve
 - b. Glossopharyngeal nerve
 - c. Auditory nerve
 - d. Vagus nerve
4. Which of the following nerves has no sensory supply to the auricle: [AI 12]
 - a. Lesser occipital nerve
 - b. Greater auricular nerve
 - c. Auricular branch of vagus nerve
 - d. Tympanic branch of glossopharyngeal nerve
5. Skin over pinna is fixed: [JIPMER 95]
 - a. Firmly on both sides
 - b. Loosely on medial side
 - c. Loosely on lateral side
 - d. Loosely on both side
6. Sensory supply of external auditory meatus is by: [PGI June 07]
 - a. Pterygomandibular ganglion
 - b. Geniculate ganglion
 - c. Facial nerve
 - d. Auriculotemporal nerve
7. Dehiscence of anterior wall of the external auditory canal cause infection in the parotid gland via
 - a. Fissure of Santorini
 - b. Notch of ramus
 - c. Petrous fissure
 - d. Retropharyngeal fissure
8. What is the color of the normal tympanic membrane? [CUPGEE 96]
 - a. Pearly white
 - b. Gray
 - c. Yellow
 - d. Red
9. The most mobile part of the tympanic membrane: [TN 98]
 - a. Central
 - b. Peripheral
 - c. Both
 - d. None of the above
10. Pars flaccida of the tympanic membrane is also called [MP 07]
 - a. Reissner's membrane
 - b. Shrapnell's membrane
 - c. Basilar membrane
 - d. Secondary tympanic membrane
11. Anterior wall of tympanic cavity contain: [PGI May 11]
 - a. Promontory
 - b. Bony part of pharyngotympanic tube
 - c. Processus cochleariformis
 - d. Pyramid
 - e. Tensor tympani muscle
12. The distance between tympanic membrane and medial wall of middle ear at the level of center is: [PGI 00]
 - a. 3 mm
 - b. 4 mm
 - c. 6 mm
 - d. 2 mm
13. Distance of promontory from tympanic membrane: [Delhi 05]
 - a. 2 mm
 - b. 5 mm
 - c. 6 mm
 - d. 7 mm
14. Surface area of tympanic membrane: [Manipal 06]
 - a. 55 mm²
 - b. 70 mm²
 - c. 80 mm²
 - d. 90 mm²
15. The effective diameter of the tympanic membrane: [UP 05]
 - a. 25 mm²
 - b. 30 mm²
 - c. 40 mm²
 - d. 45 mm²
16. Lever ratio of tympanic membrane is: [UP 01]
 - a. 1.4-1
 - b. 1.3-1
 - c. 18.2-1
 - d. 1.5-1
17. "Cone of light" is due to: [AIIMS 96]
 - a. Malleolar fold
 - b. Handle of malleus
 - c. Anterior inferior quadrant
 - d. Stapes
18. In otoscopy, the most reliable sign is: [AIIMS 92]
 - a. Lateral process of malleus
 - b. Handle of malleus
 - c. Umbo
 - d. Cone of light
19. Nerve supply of the tympanic membrane is by: [AI 95]
 - a. Auriculotemporal
 - b. Lesser occipital
 - c. Greater occipital
 - d. Parasympathetic ganglion
20. Nerve supply of tympanic membrane: [PGI Dec 02]
 - a. Auriculotemporal
 - b. Auricular branch of vagus
 - c. Occipital NV
 - d. Great auricular NV
 - e. Glossopharyngeal NV
21. Which of the following is false about tympanic membrane? [Delhi 08]
 - a. Cone of light is anteroinferior
 - b. Shrapnell's membrane is also known as pars flaccida
 - c. Healed perforation has three layers
 - d. Anterior malleolar fold is longer than posterior
22. Narrowest part of middle ear is: [PGI 97]
 - a. Hypotympanum
 - b. Epitympanum
 - c. Attic
 - d. Mesotympanum
23. Prussak's space is situated in: [MAHE 02]
 - a. Epitympanum
 - b. Mesotympanum
 - c. Hypotympanum
 - d. Ear canal
24. All are components of epitympanum except:
 - a. Body of incus
 - b. Head of malleus
 - c. Chorda tympani
 - d. Footplate of stapes
25. Sensory nerve supply of middle ear cavity is provided by: [AI 95]
 - a. Facial
 - b. Glossopharyngeal
 - c. Vagus
 - d. Trigeminal
26. Tegmen separates middle ear from the middle cranial fossa containing temporal lobe of brain by: [Karn. 06]
 - a. Medial wall of middle ear
 - b. Lateral wall of middle ear

- c. Roof of middle ear
d. Anterior wall of middle ear
- 27. Facial recess or the posterior sinus is bounded by:** [TN 2003]
a. Medially by the vertical part of VII nerve
b. Laterally by the chorda tympani
c. Above by the fossa includ is
d. All of the above
- 28. Floor of middle ear cavity is in relation with:** [2001]
a. Internal carotid artery
b. Bulb of the internal jugular vein
c. Sigmoid sinus
d. Round window
- 29. Promontory seen in the middle ear is:** [PGI June 98]
a. Jugular bulge
b. Basal turn of cochlea
c. Semicircular canal
d. Head of incus
- 30. Process cochleariformis attaches to:** [JIPMER 95]
a. Tendon of tensor tympani
b. Basal turns of helix
c. Handle of malleus
d. Incus
- 31. Mac Ewan's triangle is the landmark for:** [MP 98]
a. Maxillary sinus
b. Mastoid antrum
c. Frontal sinus
d. None
- 32. The suprameatal triangle overlies:** [JIPMER 91]
a. Mastoid antrum
b. Mastoid air cells
c. Antrum
d. Facial nerve
- 33. Anatomical landmark indicating position of mastoid antrum:** [CUPGEE 96]
a. Suprameatal triangle
b. Spine of Henle
c. Tip of the mastoid process
d. None
- 34. All of the following form the boundary of MacEwen's triangle except:** [Delhi 2008]
a. Temporal line
b. Posterosuperior segment of bony external auditory canal
c. Promontory
d. Tangent drawn to the external auditory meatus
- 35. What is the type of joint between the ossicles of ear?** [AI 08]
a. Fibrous joint
b. Primary cartilaginous
c. Secondary cartilaginous
d. Synovial joint
- 36. Stapedius is supplied by:** [JIPMER 92]
a. Maxillary nerve
b. Facial nerve
c. Auditory nerve
d. Mandibular disese
- 37. Regarding stapedial reflex, which of the following is true:** [AI 00]
a. It helps to enhance the sound conduction in middle ear
b. It is a protective reflex against loud sound
c. It helps in masking the sound waves
d. It is unilateral reflex
- 38. Tensor tympani is supplied by:**
a. Anterior part of V nerve
b. Posterior part of V nerve
c. IX nerve
d. VII nerve.
- 39. The length of Eustachian tube is:** [AP 99; TN 06]
a. 16 mm
b. 24 mm
c. 36 mm
d. 40 mm
- 40. About Eustachian tube:** [PGI June 02]
a. 24 mm in length
b. Outer 1/3rds is cartilaginous
c. Inner 2/3rds is bony
d. Inner 2/3rds is cartilaginous
e. Opens during swallowing
- 41. True about Eustachian tube is/are:** [PGI June 01]
a. Size is 3.75 cm
b. Cartilagenous 1/3 and 2/3rd bony
c. Opens during swallowing
d. Nasopharyngeal opening is narrowest
e. Tensor palati helps to open it
- 42. True about Eustachian tube:** [PGI Nov 10]
a. Length is 36 mm in adults and 1.6 to 3 mm in children
b. Higher elastin content in adults
c. Ventilatory function of ear better developed in infants
d. More horizontal in adults
e. Angulated in infants
- 43. Eustachian tube opens into middle ear cavity at:** [UP 2000]
a. Anterior walls
b. Hypotympanum
c. Superior surface
d. Posterior wall
- 44. Inner ear is present in which bone:** [PGI 97]
a. Parietal bone
b. Petrous part of temporal bone
c. Occipital bone
d. Petrous part of squamous bone
- 45. Inner ear bony labyrinth is:** [Karn. 06]
a. Strongest bone in the body
b. Cancellous bone
c. Cartilaginous bone
d. Membranous bone
- 46. Cochlear aqueduct:** [PGI June 98]
a. Connects internal ear with subarachnoid space
b. Connects cochlea with vestibule
c. Contains endolymph
d. Same as S media
- 47. Infection of CNS spread in inner ear through:** [AIIMS May 10, May 11]
a. Cochlear aqueduct
b. Endolymphatic sac
c. Vestibular aqueduc
d. Hyrtl fissure
- 48. Crus commune is in:** [Jharkhand 06]
a. Cochlea
b. Middle ear
c. Behind retina
d. Part of lens
- 49. Stapes footplate covers:** [AIIMS May 03]
a. Round window
b. Oval window
c. Inferior sinus tympani
d. Pyramid
- 50. Organ of corti is situated in:** [Kerala 98]
a. Scala media
b. Sinus tympani
c. Sinus vestibuli
d. Sacculle
- 51. Organ of corti is situated in:** [TN 06]
a. Basilar membrane
b. Utricle
c. Sacculle
d. None of the above

- 52. Endolymphatic duct connects which structure:** [Delhi 05]
 a. Scala media to subdural space
 b. Scala vestibule to aqueduct of cochlea
 c. Scala tympani to aqueduct of cochlea
 d. Scala tympani to subdural space
- 53. Site where endolymph is seen:** [Kerala 97]
 a. Scala vestibuli b. Scala media
 c. Helicotrema d. Organ of corti
- 54. Endolymph in inner ear:** [AIIMS May 10]
 a. Is a filtrate of blood serum
 b. Is secreted by striae vascularis
 c. Is secreted by basilar membrane
 d. Is secreted by hair cells
- 55. Labyrinthine artery is a branch of:** [AIIMS 97]
 a. Internal carotid artery
 b. Basilar artery
 c. Posterior cerebellar artery
 d. Anteroinferior cerebellar artery
- 56. The following structure represents all the 3 components of the embryonic disc:** [TN 98]
 a. Tympanic membrane b. Retina
 c. Meninges d. None of the above
- 57. Pinna develops from:** [MH 02]
 a. 1st pharyngeal arch
 b. 1st and 3rd pharyngeal arch
 c. 1st and 2nd pharyngeal arch
 d. 2nd pharyngeal arch
- 58. Vertical crest at the internal auditory canal is:** [AIIMS May 11]
 a. Bill's bar b. Ponticulus
 c. Cog d. Falciform crest
- 59. Eustachian tube develops from:** [PGI 97]
 a. 2nd and 3rd pharyngeal pouch
 b. 1st pharyngeal pouch
 c. 2nd pharyngeal pouch
 d. 3rd pharyngeal pouch
- 60. All of the following are of the size of adult at birth except:** [APPG 06]
 a. Tympanic membrane b. Ossicle
 c. Tympanus d. Mastoid antrum
- 61. At birth the following structures are of adult size except:** [APPG 06]
 a. Tympanic cavity b. Mastoid process
 c. Malleus d. Tympanic ring
- 62. Which of the following attain adult size before birth:** [AIIMS Nov 2010]
 a. Ear ossicles b. Maxilla
 c. Mastoid d. Parietal bone
- 63. True regarding "Preauricular sinus" is:** [MAHE 07]
 a. Improper fusion of auricular tubercles
 b. Persistent opening of first branchial arch
 c. Autosomal recessive pattern
- 64. Bone which is pneumatic:** [PGI June 07]
 a. Maxillary b. Parietal
 c. Temporal d. Frontal
 e. Ethmoidal
- 65. Nerve of the pterygoid canal is also known as:** [PGI]
 a. Arnold's nerve b. Vidian nerve
 c. Nerve of Kuntz d. Criminal nerve of Grassi
- 66. Singular nerve is a:** [AP 2007]
 a. Superior vestibular nerve supplying posterior semicircular canal
 b. Interior vestibular nerve supplying post semicircular canal
 c. Superior vestibular nerve supplying anterior semicircular canal
 d. Interior vestibular nerve supplying anterior semicircular canal
- 67. Not correctly matched pair is:** [TN 2007]
 a. Utricle and sacule – Semicircular canal
 b. Oval window – Footplate of stapes
 c. Aditus ad antrum – MacEwen's triangle
 d. Scala vestibule – Reissner's membrane
- 68. In carcinoma base of tongue pain is referred to the ear through:** [Kerala 94]
 a. Hypoglossal nerve
 b. Vagus nerve
 c. Glossopharyngeal nerve
 d. Lingual nerve
- 69. Spine of Henle is a:** [MH 2003]
 a. Cortical bone
 b. Cancellous bone
 c. Sclerotic bone
 d. Long bone with Haversian system
- 70. Which of the following is not a route of spread of infection from middle ear:** [AI 12]
 a. Directly through openings such as round window and oval window
 b. By bony invasion
 c. Osteothrombotic route
 d. Lymphatics
- 71. Lateral wall of middle ear formed by:** [FMGE 13]
 a. Tegmen tympani
 b. Mastoid process
 c. Promontory
 d. Tympanic membrane

EXPLANATIONS AND REFERENCES

1. Ans. is b i.e. Modified apocrine glands

Ref. IB Singh Histology 6th/ed p 214-215

Sweat glands are of 2 types

Eccrine / typical sweat glands	Apocrine / Atypical sweat glands
<ul style="list-style-type: none"> • Distributed all over the body • Innervated by cholinergic nerves. • They open on the skin surface 	<ul style="list-style-type: none"> • Confined to some parts of body. • Innervated by adrenergic nerves. • They open into the hair follicle. • Located on: Axilla, Mons pubis, Circumanal area, Areola, Nipple <p>Ceruminous glands of external acoustic meatus and ciliary glands of eyelids are modified apocrine glands.</p>

2. Ans. is a i.e. Greater occipital nerve

Ref. Dhingra 5th/ed p 5; 6th/ed p 4 Scott Brown 7th/ed Vol. III pp 3106–3107

3. Ans. is c i.e. Auditory nerve

4. Ans. d i.e. Tympanic branch of glossopharyngeal nerve.

Nerve Supply of Ear

External ear Auricle/pinna	External acoustic meatus	Tympanic membrane	Middle ear Cavity i.e. mucosa mastoid, muscles antrum, air cells, auditory tube.
Lateral surface <ol style="list-style-type: none"> 1. Upper 1/3 by auriculotemporal nerve 2. Lower 2/3 by greater auricular nerve 	<ul style="list-style-type: none"> • Anterior wall and roof by auriculotemporal nerve • Posterior wall and floor by auricular branch of vagus nerve • <i>Posterior wall of auditory canal also receives innervations by facial nerve through auricular branch of vagus</i> 	Lateral surface <ol style="list-style-type: none"> 1. Anteroinferior part by auriculo temporal nerve 2. Posteriosuperior part by auricular branch of vagus nerve 	Tympanic plexus formed by: <ol style="list-style-type: none"> 1. Tympanic branch of glossopharyngeal nerve. 2. Superior and inferior Carotympanic nerves (Sympathetic plexus around internal carotid) <p>Tensor tympani by: Stapedius by facial nerve</p>
Medial surface <ol style="list-style-type: none"> 1. Upper 1/3 by lesser occipital nerve 2. Lower 2/3 by greater auricular nerve 3. Root of auricle by auricular branch of vagus nerve 		Medial surface <ul style="list-style-type: none"> • Tympanic branch of glossopharyngeal nerve (Jacobson nerve) 	

NOTE

Auriculotemporal nerve is a branch of mandibular nerve (branch of trigeminal nerve)

5. Ans. is b i.e. Loosely on medial side

Ref. Dhingra 6th/ed p 2, 5th/ed p 3

Skin over the pinna is closely adherent to the perichondrium on the lateral surface while it is loosely attached on the medial surface.

6. Ans. is d i.e. Auriculotemporal nerve

Ref. Dhingra 6th/ed, p 4; 5th/ed p.5; BDC 4th/ed, Vol. IIIp - 254

7. Ans. is a i.e. Fissure of Santorini

Ref: Dhingra 6th/ed p 2, 5th/ed p 4

- The cartilaginous part of external auditory canal has 2 deficiencies – the “fissures of santorini” through which infections can pass from external ear to parotid and vice versa.
- Fissure of santorini is present in the cartilaginous part of auditory canal.
- The deficiency present in bony part is “Foramen of Huschke” seen in children up to the age of 4. Through this infections of ear can also pass to parotid gland

ALSO KNOW

In neonates, bony external meatus as the tympanic bone is not yet developed.

8. Ans. is a i.e. Pearly white

Ref. Dhingra 5th/ed p 61; Maqbool 11th/ed p 33; Turner 10th/ed p 240

Such a simple appearing question can also confuse us with its options. Most of the texts say that tympanic membrane is pearly gray in color.

"Normal tympanic membrane is shiny and pearly gray in color."

... Dhingra 6th/ed p 55; 5th/ed p 61

"Tympanic membrane appears as a greyish white translucent membrane."

... Maqbool 11th/ed p 33

"In health, the drum head presents a highly gray surface."

... Turner 10th/ed p 240

So, neither **option "a"** i.e. pearly white nor **option "b"** i.e. gray is fully correct but from ages the answer is taken as pearly white, so I am in also taking **option "a"** i.e. pearly white as the correct option.

9. Ans. is b i.e. Peripheral

Ref. Dhingra 5th/ed p 18

"Movements of tympanic membrane are more at the periphery than at the center where malleus handle is attached."

10. Ans. is b i.e. Shrapnell membrane

Ref: Dhingra 6th/ed p 2, 5/e pg-4

Pars flaccida /Shrapnell's membrane

Situated above the lateral process of malleus between the notch of Rivinus and the anterior and posterior malleal folds.

ALSO KNOW

- **Reissner's membrane** – Separates scala media from scala vestibuli in the inner ear (Dhingra 6th/ed p 10, 5th/ed p 12)

- **Basilar membrane** – Seen in scala media and supports the organ of corti (Dhingra 6/e p 10, 5/e p 12)

- **Secondary Tympanic Membrane** – Closes the scala tympani at the site of round window (Dhingra 5th/ed p 11)

11. Ans. is e i.e. Tensor tympani muscle

Ref. Dhingra 6th/ed p 7-8, 5th/ed p 6

The anterior wall has a thin plate of bone which separates the cavity from internal carotid. It also has two openings; the lower one for Eustachian tube and the upper one for the canal of tensor tympani muscle.

12. Ans. is d i.e. 2 mm

13. Ans. is a i.e. 2 mm

Ref. BDC Vol. III 4th/ed p 258; Dhingra 6th/ed p 450; point 129

"When seen in coronal section, the cavity of the middle ear is biconcave, as the medial and lateral walls are closest to each other in the center."

The distances separating them are:

- Near the roof 6 mm → Epitympanum (Attic)

- In the centre 2 mm → Mesotympanum

- Near the floor 4 mm → Hypotympanum

The medial wall of the tympanic cavity is formed by the labyrinth and the lateral wall is formed by the tympanic membrane.

14. Ans. is d i.e. 90 mm²

Ref. Maqbool 11th/ed p 19; Dhingra 6th/ed p 446; point 8, 5th/ed p 457; point 8

15. Ans. is d i.e. 45 mm²

- Area of tympanic membrane is 90 mm².

- Effective area is 55 mm² (approximately 2/3rd of the total area).

- Significance of large area of tympanic membrane – The area of tympanic is much larger than area of stapes footplate, which helps in converting sound of greater amplitude but lesser force to that of lesser amplitude and great force.

16. Ans. is b i.e. 1.3: 1

Ref. Dhingra 6th/ed p 14, 5th/ed p 18

Lever-Action of Ossicles

Handle of malleus is 1.3 times longer than process of the incus which constitutes for the lever-action.

NOTE

Area ratio of tympanic membrane is 14:1

Lever ratio = 1.3: 1

= Their product is 18:1 i.e. the pressure exerted at oval window.

This helps in the transformer action of the middle ear (impedance matching mechanism) i.e. converting sound of greater amplitude and less force to that of lesser amplitude but greater force.

17. Ans. is b i.e. Handle of malleus

Ref. Logan and Turner 10th/ed p 240

Cone of Light

- Seen in anteroinferior quadrant of the tympanic membrane is actually the reflection of the light projected into the ear canal to examine it.

- This part reflects it because it is the only part of tympanic membrane that is approximately at right angles to the meatus.

- This difference in different parts of the tympanic membrane is due to the handle of malleus which pulls the tympanic membrane

and causes it to tent inside.

Thus, the handle of malleus causes tenting and because of tenting the anteroinferior quadrant is at right angles to the meatus and thus reflects the light (leading to cone light).

18. Ans. is a i.e. Lateral process of malleus

Ref. Maqbool 11th/ed p 33

Otoscopy

- Helps to view the inside of external auditory canal.
- For proper view: Pinna is pulled
 - Backward and upward in adults.⁹
 - Downward and outward in infants.⁹
- The tympanic membrane appears as a grayish white, translucent membrane set obliquely inside the canal.

The important landmarks on membrane are:

Landmark	Importance
• The short process: (Lateral process of malleus)	It is the most important landmark as it is least obliterated in disease
• Anterior and posterior malleolar folds	Separates pars tensa from pars flaccida
• Handle of malleus: It is directed downward and backward; ending at the umbo	Cone of light radiates from it. Pars tensa is arbitrarily divided into four quadrants by a vertical line passing along the handle of malleus and horizontal line intersecting it at umbo

Since, short process/lateral process of malleus is least obliterated by diseases so I think it is the most reliable sign in otoscopy.

19. Ans. is a i.e. Auricotemporal nerve

20. Ans. is a, b and e i.e. Auricotemporal nerve; Auricular branch of vagus nerve and Glossopharyngeal nerve

21. Ans. is c i.e. Healed perforation has three layers

Ref. Dhingra 6th/ed p 2, 3, 5th/ed p 4,79

Let's see Each option one by one

Option a – Cone of light is anteroinferior

This is correct – "A bright cone of light can be seen radiating from the tip of malleus to the periphery in the antero-inferior quadrant"

– Dhingra 5th/ed p 4

Option b – Shrapnell's membrane is also called as pars flaccida. This is absolutely correct

– Dhingra 6th/ed p 2, 5th/ed p 4

Option c – Healed perforation has 3 layers

This is incorrect

- When perforation of tympanic membrane heals, it heals in two layers and not in three layers. (Dhingra 6th/ed p 55-56)
- "Healed chronic otitis media is the condition when tympanic membrane has healed (usually by two layers) is atrophic and easily retracted if there is negative pressure in the middle ear" – Dhingra 5/e p 79

Option d – Anterior malleal fold is longer than posterior fold. Well! it is not given anywhere that anterior fold is longer than posterior, but we have to eliminate one option and that definitely is option 'c'.

22. Ans. is d i.e. Mesotympanum

Ref. Maqbool 11th/ed p 20; BDC Vol. III 4th/ed p 258; Dhingra 6th/ed p 450; point 129, 5th/ed p 462; point 114

Vertical and anteroposterior dimensions of middle ear are 15 mm each while transverse dimension is 2 mm at mesotympanum, 6 mm above at the epitympanum and 4 mm below in the hypotympanum. Thus, middle ear is the narrowest between the umbo and promontory.

23. Ans. is a i.e. Epitympanum

Ref. Dhingra 6th/ed p 449; point 149, 5th/ed p 461; point 90; Maqbool 11th/ed p 13

Prussak's space lies medial to pars flaccida, lateral to the neck of malleus and above the lateral process of malleus. Anteriorly, posteriorly and superiorly, it is bounded by lateral malleal ligament. Posteriorly, it also has a gap through which the space communicates with epitympanum.

- Importance of this space is that the cholesteatoma may extend to posterior mesotympanum, under lateral incudal fold and infection here does not drain easily and causes attic pathology.

24. Ans. is d i.e. Footplates of stapes

Dhingra 6th/ed p 5 Fig. 1.8, 5th/ed p 6, Fig. 1.5

It is clearly evident from the diagram given on page 7 of the guide that footplates of stapes is a part of mesotympanum and not epitympanum.

25. Ans. is b i.e. Glossopharyngeal nerve

Ref. Dhingra 6th/ed p 8, 5th/ed p 10

- The nerve supply of middle ear is derived from tympanic plexus which lies over the promontory.

- The inferior ganglion of the glossopharyngeal nerve gives off the tympanic nerve which enters the middle ear through the tympanic canaliculus and takes part in formation of the tympanic plexus on the medial wall of middle ear.
- This distributes its fibres to the middle ear, and also to the auditory tube, aditus ad antrum mastoideum (aditus to mastoid antrum).

Glossopharyngeal nerve → Tympanic nerve/tympanic plexus

Middle ear
Auditory tube
Mastoid antrum

26. Ans. is c i.e. Roof of middle ear

- The roof of middle ear is formed by a thin plate of bone called tegmen tympani. It separates tympanic cavity from middle cranial fossa.
- Tegmen tympani is formed by squamous and petrous part of temporal bone.⁹

27. Ans. is d i.e. All of the above

Facial recess or Posterior sinus – It is a depression in the posterior wall of the middle ear.

It is bounded by:

Medially – Vertical part of VIII nerve

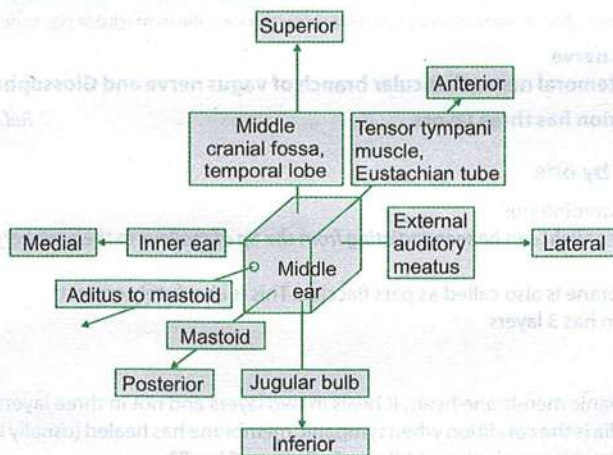
Laterally – Chorda tympani

Above – Fossa incudis

Importance – This recess is important surgically, as direct access can be made through this into the middle ear without disturbing posterior canal wall.

28. Ans. is b i.e. Bulb of internal jugular vein

Floor of middle ear separates tympanic cavity (hypotympanum) from the jugular bulb



Relation of middle ear

NOTE

- At the junction of the floor and the medial wall of the cavity there is a small opening that allows the entry of the tympanic branch of glossopharyngeal nerve into the middle ear from its origin below the base of skull
- Anterior wall separates tympanic cavity from internal carotid artery

29. Ans. is b i.e. Basal turn of cochlea

Promontory is seen in the medial wall of middle ear and is due to basal coil of cochlea.

ALSO KNOW

Medial wall of middle ear is formed by labyrinth.

The main features on medial wall are:

- A bulge called as promontory formed by basal turn of cochlea.⁹
- Fenestra vestibuli (oval window⁹) lies posterosuperior to the promontory and opens into scala vestibuli. It is occupied by foot-plate of stapes which is fixed by annular ligament. Oval window is kidney-shaped
- Fenestra cochleae (round window) lies posteroinferior, to the promontory and opens into scala tympani of cochlea. It is closed by secondary tympanic membrane. The round window is closest to ampulla of posterior semicircular canal.

- Prominence of facial nerve canal lies above the fenestra vestibuli curving downward into posterior wall of middle ear.
- Anterior to oval window lies a hook-like projection called the processus cochleariformis⁹ for tendon of tensor tympani⁹.

The **cochleariform process** marks the **level of the Genu** of the facial nerve which is an important landmark for surgery of the facial nerve.

Medial to the pyramid is a deep recess called **sinus tympani**⁹ which is bounded by the **subiculum** below and **ponticus** above.

30. Ans. is a i.e. Tendon of tensor tympani

Ref. Dhingra 6th/ed p 5, 5th/ed p 6

31. Ans. is b i.e. Mastoid antrum

32. Ans. is a i.e. Mastoid antrum

33. Ans. is a i.e. Suprameatal triangle

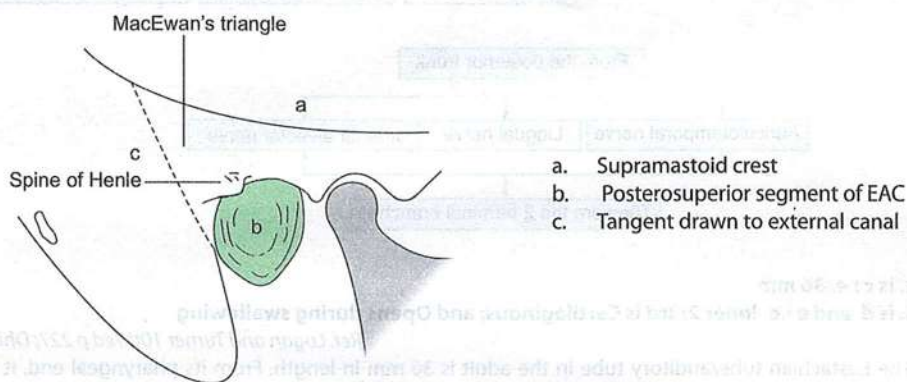
34. Ans. is c i.e. Promontory

Ref. Dhingra 6th/ed p 5, 5th/ed p 7

Mastoid antrum is marked externally on the surface by suprameatal (Mac Ewen's) triangle.

MacEwen's Triangle

It is bounded by:



- Temporal line
- Posterosuperior segment of bony external auditory canal.
- The line drawn as a tangent to the external canal.
- It is an important landmark to locate the mastoid antrum in the mastoid surgery.

35. Ans. is d i.e. Synovial joint

Ref. Grays 38th/ed pp 485, 617 and 1275

Joints of the ossicles

The incudomalleolar joint

Incudostapedial joint

Saddle joint (variety of synovial joint)

Ball and socket joint (type of synovial joint)

36. Ans. is b i.e. Facial nerve

Ref. Dhingra 6th/ed p 5, 5th/ed p 10

37. Ans. is b i.e. It is a protective reflex against loud sounds

Ref. Dhingra 5th/ed p 9-10, 30

Stapedius muscle helps to dampen very loud sound and thus prevents noise trauma to the inner ear. It is supplied by VII nerve (facial nerve). Lesions of facial nerve lead to loss of stapedial reflex and hyperacusis or phonophobia i.e. intolerance to loud sounds. For more details see chapter – physiology of hearing and assessment of hearing loss of the guide

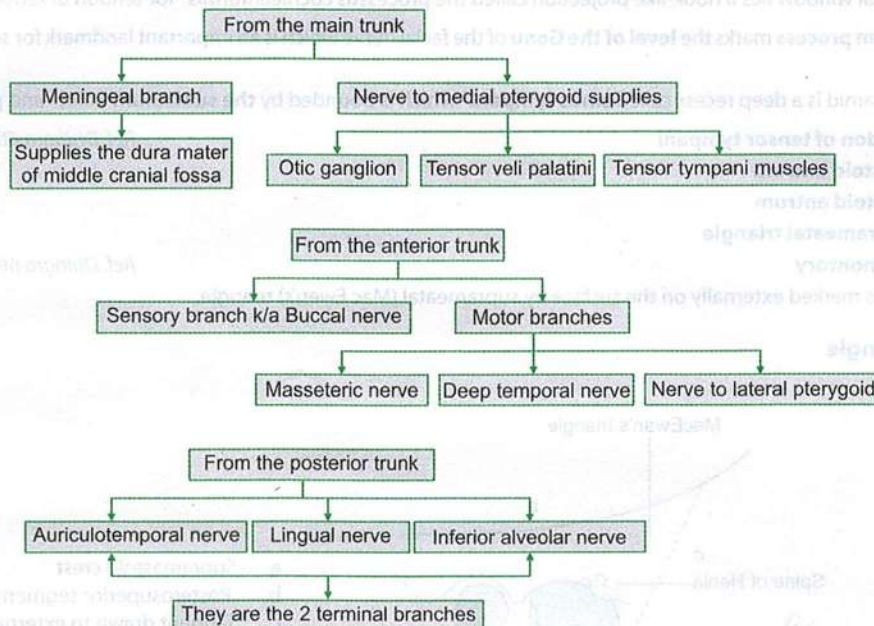
NOTE

Stapedial reflex = Acoustic reflex

38. ?

Friends – According to BDC 4/e Vol. III p 153, **mandibular nerve** has a main branch which after traveling a short course divides into 2 i.e. **anterior (small)** and **posterior trunk (large)**

Branches



39. Ans. is c i.e. 36 mm

40. Ans. is d and e i.e. Inner 2/3rd is Cartilaginous; and Opens during swallowing

Ref. Logan and Turner 10th/ed p 227; Dhingra 6th/ed p 57, 5th/ed p 63

- The Eustachian tube/auditory tube in the adult is 36 mm in length. From its pharyngeal end, it runs upwards, laterally and backward.
- In infants, the tube is shorter, wider and is more horizontal.
- It has two parts—a pharyngeal cartilaginous part which forms 2/3rd (24 mm) of its length (i.e. inner or medial part) and a tympanic bony part which forms remaining 1/3rd (outer or lateral part). (12 mm). This is just reverse of external auditory canal

Remember: Mnemonic ICE 2/3: Inner part Cartilaginous in Eustachian tube and forms 2/3 part.

- The two parts meet at **isthmus** which is the **narrowest part of tube**.
- The fibers of origin of **tensor palati** muscles are attached to lateral wall of the tube. **Contraction of this muscle during swallowing, yawning and sneezing opens the tube** and this helps in maintaining equality of air pressure on both sides of tympanic membrane. Contraction of levator palati muscles which runs below the floor of cartilaginous part also helps in opening the tube.
- It is lined by pseudostratified columnar ciliated epithelium (cartilaginous part contains numerous mucous glands).

41. Ans. is a, c and e i.e. Size is 3.7 cm; Opens during swallowing; and Tensor palati helps to open it

Ref. Dhingra 6th/ed p 57, 5th/ed p 63

- Eustachian tube is 36 mm in length, lateral 2/3 cartilaginous; isthmus is narrowest part.
- Remember mnemonic: ICE 2/3
- Normally the Eustachian tube remains closed
- Eustachian tube opens during swallowing, yawning and sneezing by the action of tensor and levator palati.

For more details, see previous answer

42. Ans. is b i.e. Higher elastin content in adults

Ref. Dhingra 6th/ed p 57, 5th/ed p 65

The Developing Humans: Kleith 8th/ed p 431-32, Langman's Embryology 10th/ed pp 317-323

"Eustachian tube serves to ventilate the middle ear and exchange nasopharyngeal air in the middle ear. In children, ET is relatively narrow. It is prone to obstruction^o when mucosa swell in response to infection or allergic challenge and it results in middle ear effusion"

—Gray's 40th/ed p 626

Eustachian Tube

- It connects nasopharynx with the tympanic cavity. In adult, it is about 36 cm long and runs downward, forward medially from its tympanic end, forming an angle of 45° with the horizontal.
- The tympanic end of the tube is body and is situated in the anterior wall of middle ear. A little above the level of floor. The pharyngeal end of the tube is slit like and is situated in the lateral wall of the nasopharynx, 1–1.25 cm behind the posterior end of inferior tubinate.^Q
- It develops from first arch and partly from second arch.

Table (Dhingra 5/e, p 65): Differences between infant and adult Eustachian tube

Length	Infant 13–18 cm birth (about half as long as in adult)	Adult 36 mm (31–38 mm)
Direction	More horizontal ^Q , At birth it forms an angle of 10° with the horizontal At age 7 and later it is 45°	Forms an angle of 45° with the horizontal
Angulation at isthmus	No angulation	Angulation present
Bony versus cartilaginous	Bony parts is slightly longer than 1/3 of the total length of the tube and is relatively wider	Bony part 1/3; cartilaginous part 32/3
Tubal cartilaginous part	Flaccid. Retrograde reflux nasopharyngeal	Comparatively rigid, Remains closed and protects
Density of elastin at the hinge	Less dense; tube does not efficiently close by recoil	Density of elastin more and helps to keep the tube closed by recoil of cartilage
Ostmann's pad of fat	Less in volume	Large and helps to keep the tube closed

43. Ans. is a i.e. Anterior wall

Ref. Dhingra 6th/ed p 5, 5th/ed p 6; Scott Brown 7th/ed Vol. III p 3114 Fig. 225.13

Anterior wall of tympanic cavity is formed by a thin plate of bone. It has 2 openings:

- Lower one for the Eustachian tube and upper one for the canal of tensor tympani muscle.
- Friends remember the diagram I have provided in Ans. 26 – It is important and helps in solving such questions.

44. Ans. is b i.e. Petrous part temporal bone

Ref. Turner 10th/ed p 228; BDC 4th/ed Vol. III p 264

Inner ear lies within the petrous part of temporal bone.

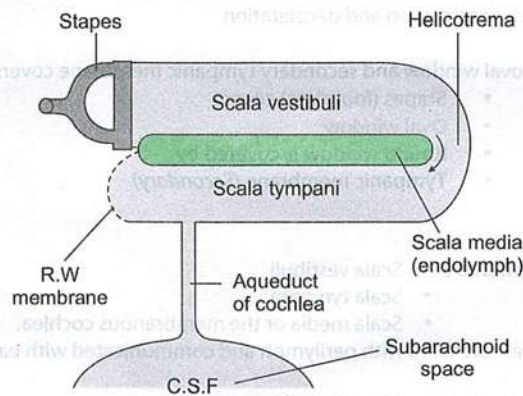
45. Ans. is b i.e. Cancellous bone

Sorry for this one

46. Ans. is a i.e. Connects internal ear with subarachnoid space

Ref. Dhingra 6th/ed p 9

Cochlear aqueduct connects scala tympani with the subarachnoid space. This is the reason why otitis media can lead to meningitis

**47. Ans. is a i.e. Cochlear aqueduct**Ref. Grey 40th/ed p635; Dhingra 5th/ed p 112; <http://Journalsleww.com/Otology>; Pediatric audiology: Diagnosis, Technology and Management by Jane R. Madell, Carol Flexer 2008, p. 28

- As we know that cochlear aqueduct (Aqueduct of Cochlea) is a connection between scala tympani (containing perilymph) and the subarachnoid space (containing CSF). On occasions, particularly in young children, the Cochlear aqueduct is large and open.
- Infection can spread to the inner ear from the infected CSF or vice versa, via the cochlear aqueduct resulting in severe profound hearing loss (meningitic labyrinthitis).

48. Ans. is a i.e. Cochlea

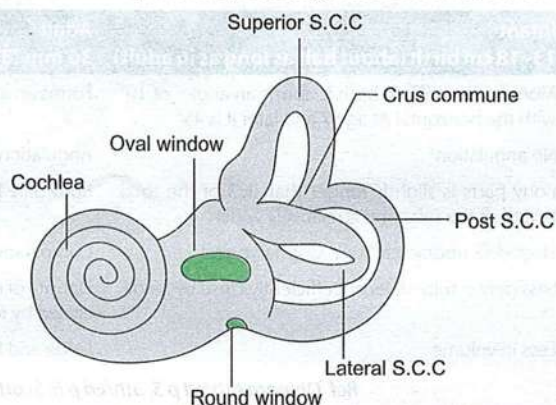
Ref. Dhingra 6th/ed p 10, 5th/ed p 11

Bony labyrinth has 3 parts —

- Vestibule
- Semicircular canals
- Cochlea

Semicircular Canals

- There are 3 semicircular canals – the lateral, posterior and superior which lie in a plane of right angles to one another
- Each canal has an ampullated end which opens independently into the vestibule and a non ampullated end



- The non-ampullated ends of posterior and superior canals unite to form a common channel called the **crus commune**. So the three canals open into the vestibule by 5 openings. Thus actually crus commune is a part of semicircular canals but since this option is not given, we are taking the next best option i.e. cochlea.

Also Remember

- Crista ampullaris: It is located in the ampullated end of the three semicircular duct and is a receptor which responds to angular acceleration.
- Utricle and saccule lie in the bony vestibule, together they are called the otolith organ. Their sensory epithelium is called as Macula which responds to linear acceleration and deceleration

49. Ans. is b i.e. Oval window

Ref. BDC 4th/ed Vol. 3, p 258

- Footplate of stapes covers the oval window and secondary tympanic membrane covers the round window.

- **Mnemonic:** SORT :
 - Stapes (footplate) covers
 - Oval window
 - Round window is covered by
 - Tympanic membrane (Secondary)

50. Ans. is a i.e. Scala media

51. Ans. is a i.e. Basilar membrane

Ref. Dhingra 6th/ed p 9, 5th/ed p 11

- Bony cochlea has three compartments :**
- Scala vestibuli
 - Scala tympani
 - Scala media or the membranous cochlea.

The scala vestibuli and scala tympani are filled with perilymph and communicated with each other at apex of cochlea through an opening called helicotrema^Q.

Scala media is the membranous cochlea or cochlear duct. It has 3 walls:

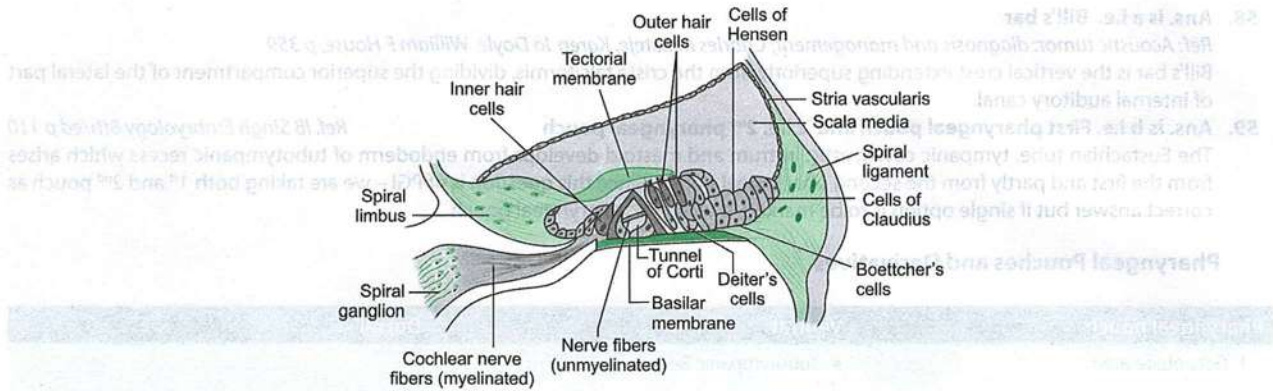
- The basilar membrane, which supports the organ of corti.
- The Reissner's membrane which separates it from the scala vestibuli.
- The stria vascularis which contains vascular epithelium is concerned with secretion of endolymph.

52. Ans. is a i.e. Scala media to subdural space

Ref. Dhingra 6th/ed p 9, 5th/ed p 12

Endolymphatic duct – It is a part of membranous labyrinth (Scala media)

- It is formed by union of saccule and utricle
- It connects scala media to subdural space
- Its terminal part is dilated to form the endolymphatic sac
- Endolymphatic sac lies between the two layers of dura on the posterior surface of petrous bone
- Surgical importance – Endolymphatic sac is exposed for drainage or shunt operation in Meniere's disease

**ALSO KNOW**

- Ductus reuniens – connects cochlear duct to saccule
- Aqueduct of cochlea – connects scala tympani to subarachnoid space

53. Ans. is b i.e. Scala media

Ref. Dhingra 6th/ed p 10, 5th/ed p 12

Scala vestibuli and scala tympani are filled with perilymph, whereas scala media/membranous cochlea is filled with endolymph.

Origin and absorption of inner ear fluids.

Origin	Absorption
<ul style="list-style-type: none"> • Perilymph (It resembles ECF and is rich in Na⁺ ions) <ul style="list-style-type: none"> – From CSF – Direct blood filtrate from the vessels of spiral ligament 	<ul style="list-style-type: none"> • Through aqueduct of cochlea to subarachnoid space
<ul style="list-style-type: none"> • Endolymph (It resembles ICF and is rich in K⁺ ions) <ul style="list-style-type: none"> – Secreted by stria vascularis or by the adjacent tissues of outer sulcus – Derived from perilymph across Reissner's membrane 	<ul style="list-style-type: none"> • Endolymphatic sac • Stria vascularis

54. Ans. is b i.e. Is secreted by striae vascularis

Ref. Dhingra 6th/ed p 10, 5th/ed p 12

Already explained, kindly see previous answer and text for the explanation.

55. Ans. is d i.e. Anterior inferior cerebellar artery

Ref. Dhingra 6th/ed p 11; 5th/ed p 13

Labyrinthine artery is a branch of anterior inferior cerebellar artery but can sometimes arise from basilar artery.

- It supplies whole of the inner ear.

Kindly see the preceeding text for more details

56. Ans. is a i.e. Tympanic membrane

Ref. Dhingra 6th/ed p 12, 5th/ed p 14

Tympanic membrane develops from all the three germinal layers. Outer epithelial layer is formed by the ectoderm, inner mucosal layer by the endoderm and the middle fibrous layer by the mesoderm.

57. Ans. is c i.e. 1st and 2nd pharyngeal arch

Ref. Dhingra 6th/ed p 11, 5th/ed p 14

Pinna

- It develops from both 1st and 2nd brachial arches
- Period of development starts from 4–6 weeks and adult configuration is attained by 20th week
- From the

1 st arch	2 nd arch
<ul style="list-style-type: none"> • Tragus • Crus of helix • Adjacent helix 	Rest of the pinna
- The tissue condensations of the mesoderm of the 1st and 2nd brachial arch form 6 hillocks of His, which fuse to form the pinna

ALSO KNOW

- External auditory canal – develops from the 1st brachial cleft/groove^o
- Tympanic membrane – develops from all 3 germ layers (Ecoderm, mesoderm and endoderm)^o

58. Ans. is a i.e. Bill's bar

Ref: *Acoustic tumor: diagnosis and management; Charles M Luteje, Karen Jo Doyle, William F House, p 359*

Bill's bar is the vertical crest extending superiorly from the crista falciformis, dividing the superior compartment of the lateral part of internal auditory canal.

59. Ans. is b i.e. First pharyngeal pouch and c i.e. 2nd pharyngeal pouch

Ref: *IB Singh Embryology 8th/ed p 110*

The Eustachian tube, tympanic cavity, attic, antrum and mastoid develops from endoderm of tubotympanic recess which arises from the first and partly from the second pharyngeal pouch. Since this question is of PGI – we are taking both 1st and 2nd pouch as correct answer but if single option is to be marked, it will be 1st pharyngeal pouch.

Pharyngeal Pouches and Derivatives

Pharyngeal pouch	Ventral	Dorsal
I Gets obliterated	• Tubotympanic Recess	
	Proximal	Distal
	Eustachian tube	Middle ear cavity tympanic antrum
II Palatine tonsil (part of this pouch persists as intratonsillar cleft)		
III Thymus	• Tubotympanic recess	• Adenoids
IV Small amount of thymus tissue	• Inferior parathyroid gland	
V Ultimobranchial body	• Superior parathyroid glands	

60. Ans. is d i.e. Mastoid antrum

Ref: *Scotts Brown 7th/ed Vol. III p 3118*

61. Ans. is b i.e. Mastoid process

Ref: *Maqbool 11th/ed p 14*

"Mastoid antrum is an air-filled sinus within the petrous part of temporal bone. It communicates with the middle ear by way of the aditus and has mastoid air cells arising from its walls. The antrum, but not the air cells is well developed at birth"

—Scott Brown 7th/ed Vol. 3 p 3118

"Development of the mastoid air cell system does not occur until afterbirth, with about 90% of air cell formation being completed by the age of six with the remaining 10% taking place up to age of 18"

—Scotts Brown 7th/ed Vol. 3 p 3122

Hence, mastoid antrum which is not complete without its air cells, development is not complete at birth.

As far as – Q. 55 is concerned

Maqbool 11th/ed p 14 says:

"The mastoid process is not present at birth and starts developing at the end of the first year and reaches its adult size at puberty."

"In infancy, the mastoid process being absent, the facial nerve emerges lateral to the tympanic portion from the stylo mastoid foramen and is likely to get injured by the usual postaural incision."

Maqbool 11th/ed p 14

NOTE

Both mastoid antrum and mastoid process are given as options in any MCQ—always mark mastoid tip, as mastoid tip is a better option because mastoid antrum per se is formed at birth but its air cells are not formed whereas whole of mastoid tip/mastoid process is not present at birth.

62. Ans. is a i.e. Ear ossicles

Ref: *Pediatric Neuroradiology, edited by Paolo Tortori Donati 1/e, p 1362*

- The ossicles begins to form during 4th week of gestation from the mesenchymal tissue.
- They originate as cartilaginous models that reach adult size by the 18th week of gestation. Ossification of malleus begins at 15th week gestation, while stapes begins to ossify at 18th week of gestation. At birth, the ossicles are of nearly adult size.

ALSO KNOW

Mastoid bone not the mastoid process is almost the adult size at birth, while maxilla and parietal bone grow in size as head grows.

63. Ans. is a i.e. Improper fusion of auricular tubercles

Ref: *Dhingra 6/e p 11, 49; 5/e p 54*

- This is commonly seen at the root of helix and is due to incomplete fusion of tubercles during
- Development of external ear
- It is a blind track lined by squamous epithelium
- It may get repeatedly infected causing purulent discharge

- Abscess may also form
- Treatment is surgical excision of the track if the sinus gets repeatedly infected.

ALSO KNOW**Collaural Fistula**

It is an anomaly of first brachial cleft:

- In this, there is one opening in the floor of external auditory meatus and another behind the angle of mandible close to anterior border of sternocleidomastoid
- Tract of fistula passes through parotid in close proximation to facial nerve
- Treatment is excision of tract

64. Ans. is a and e i.e. Maxillary; and Ethmoidal

Ref. BDC Handbook of General Anatomy 4th/ed p 32

Pneumatic bones are one which contain large air spaces lined by epithelium e.g.: maxilla, sphenoid, ethmoid, etc. They make the skull light in weight, help in resonance of voice, and act as air conditioning chambers for the inspired air.

65. Ans. is b i.e. Vidian nerve

Ref. Dhingra 5th/ed p 154; Tuli 1st/ed p 84

- Greater superficial petrosal nerve joins the deep petrosal nerve to form the nerve of pterygoid canal or also called as Vidian nerve.
- Vidian nerve reaches pterygopalatine ganglion to supply the lacrimal gland and mucous glands of nose, palate and pharynx.

Arnold nerve: It is a branch of cranial nerve X which carries fibers that supply sensory innervation to the ear canal

Jacobson nerve: It is a branch of cranial nerve IX that runs along the promontory of the middle ear supplying sensation and parasympathetic fibers to the parotid gland

66. Ans. is b i.e. Inferior vestibular nerve supplying the posterior semicircular canal

Ref. Scott Brown 7th/ed Vol. 3 p 3120

- Inferior vestibular nerve passes through the inferior vestibular foramen to supply the saccule.
- Just behind and below the inferior vestibular foramen is the *foramen of singlare*, which contains a branch of inferior vestibular nerve called as the *singular nerve*
- The singular nerve runs obliquely through the petrous bone close to the round window to supply the sensory epithelium in the ampula of the *posterior semicircular canal*.

67. Ans. is c i.e. Aditus ad antrum – Mac Ewen's triangle

Ref. Scott Brown 7th/ed Vol. 3 p 3120

Let's analyze each option separately.

Option a:

- Utricle and saccule – Semicircular canal
- Utricle lies bony vestibule and receives the five openings of the three semicircular ducts/semicircular canals
- Saccule also lies in the bony vestibule, anterior to the utricle and together both of there are called otolith organs.
- Hence, this pair is correct

Option b:

- Oval window – footplate of stapes
- Oval window is closed by the footplate of stapes.
- Hence this pair is also related to each other

Option c:

- Aditus ad antrum – MacEwen's triangle
- Aditus ad antrum is an opening through which the attic communicates with the antrum.
- Mastoid antrum and not the aditus is marked externally on by MacEwen's triangle
- Hence, this pair is not correctly matched.

Option d:

- Scala vestibule – Reissner's membrane
- Reissner's membrane separates scala vestibule from scala media
- Hence, this pair is also related to each other.

68. Ans. is d i.e. Lingual nerve

Ref. Dhingra 6th/ed p 228, 5th/ed p 241

In carcinoma base of tongue pain is referred to the ipsilateral ear because of the common nerve supply of the tongue (*lingual nerve*) and ear (*auriculotemporal nerve*) from the mandibular division of the trigeminal nerve.

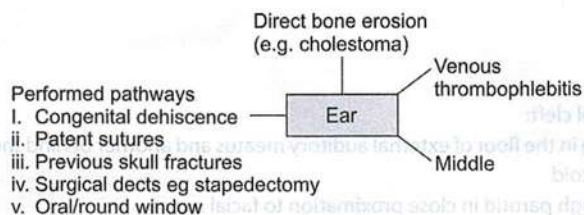
69. Ans. is b i.e. Cancellous bone

- The antum lies above and behind a projection of bone called the spine of Henle—Maqbool 11/e, p 14
- Whether spine of Henle is cancellous bone is not given in it.

70. Ans. d i.e. Lymphatics

Pathways of spread of infection from middle ear

Ref. ENT, PL Dhingra 5th/ed p 84



71. Ans. d i.e. tympanic membrane

Important Relations of middle ear:

Ref. Dhingra 6th/ed p 5

- Roof – Thin plate called as tegmen tympani
- Floor – Jugular bulb
- Anterior wall – Internal carotid artery
- Posterior wall – Lies close to mastoid air cells
- Medial wall – labyrinth
- Lateral wall – tympanic membrane

CHAPTER

17

Physiology of Ear and Hearing

PHYSIOLOGY OF HEARING - AUDITORY PATHWAY

Hair cells are innervated by dendrites of bipolar cells of spiral ganglion situated in Rosenthal canal. Axons of these bipolar cells form the cochlear division of eighth nerve

Dorsal cochlear nucleus

Ventral cochlear nucleus

Superior olivary nucleus

Lateral lemniscus

Auditory cortex ← Medial geniculate body

← Inferior colliculus

Mnemonic for auditory pathway	E	-	Eighth nerve
	C	-	Cochlear nuclei
	O	-	Superior olivary nucleus
	L	-	Lateral Lemniscus
	I	-	Inferior colliculus
	M	-	Medial geniculate body
	A	-	Auditory cortex

The auditory fibers travel via the ipsilateral and contralateral routes and have multiple decussation points. Thus, each ear is represented in both cerebral hemispheres.

The area of cortex, concerned with hearing is situated in the superior temporal gyrus (Brodmann's area 41).

Organ of Corti

It is the sense organ of hearing and is situated on the basilar membrane in scala media.

Important components of the organ of Corti are:

1. Tunnel of Corti, which is formed by the inner and outer rods. It contains a fluid called *cortilymph*.
2. Cells:

Sensory hair cells		Supporting cells
Inner	Outer	
• Primarily afferent	• Efferent	• Deiter's cells
• Resistant	• Susceptible to ototoxic drugs and noise	• Pillar cells
		• Hensen's cells

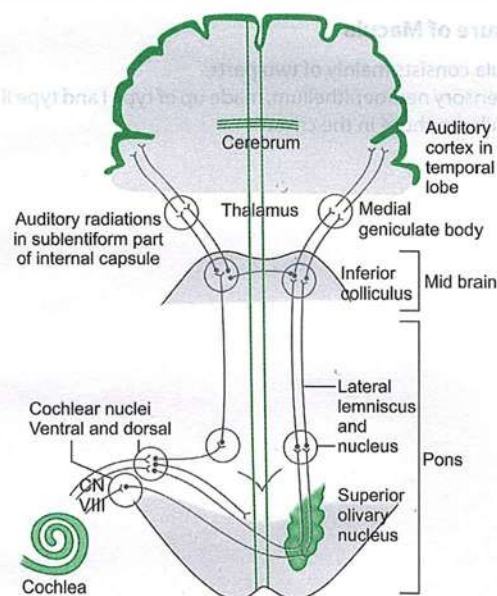


Fig. 17.1: Central auditory pathways

Courtesy: Text book of Diseases of Ear, Nose and Throat, Mohan Bansal. Jaypee Brothers. p 21

NOTE

With age hair cells at base are lost more than at the apex. Significance—so hearing loss is more for higher frequencies than lower.

3. Tectorial Membrane

It consists of gelatinous matrix with delicate fibers. It overlies the organ of Corti. The shearing force between the hair cells and tectorial membrane produces the stimulus to hair cells.

PHYSIOLOGY OF EQUILIBRIUM

Vestibular system - Peripheral receptors

They are two types:

- **Cristae:** They are located in the ampullated ends of the three semicircular canals.^o These receptors respond to **angular^o acceleration and deceleration.**^o
- **Maculae:** They are located in otolith organs (i.e. utricle and saccule).^o Macula of the utricle lies in its floor in a horizontal plane. Macula of saccule lies in its medial wall in a vertical plane. They sense position of head in response to **gravity and linear acceleration.**^o

Structure of a Crista

It has 2 types of hair cells:

- **Type 1:** Cells are flask-shaped with a single large cup-like nerve terminal, contains by polar cells.
- **Type 2:** Cell are cylindrical with multiple nerve terminals. From the upper surface of each cell, project a single hair, the kinocilium and a number of other cilia.

Structure of Macula

A macula consists mainly of two parts:

- A sensory neuroepithelium, made up of type I and type II cells, similar to those in the crista.

- An otolithic membrane, which is made up of a gelatinous mass and on the top, the crystals of calcium carbonate^o called *otoliths* or *otoconia*.^o The linear, gravitational and head tilt movements cause displacement of otolithic membrane and thus stimulate the hair cells which lie in different planes.

Vestibular Nerve

- Vestibular or Scarpa's ganglion is situated in the lateral part of the internal acoustic meatus.
- The distal process of bipolar cells innervate the sensory epithelium of the labyrinth while its central process aggregate to form the vestibular nerve.

Central Vestibular Connections

- The fibers of vestibular nerve end in vestibular nuclei and some go to the cerebellum directly.

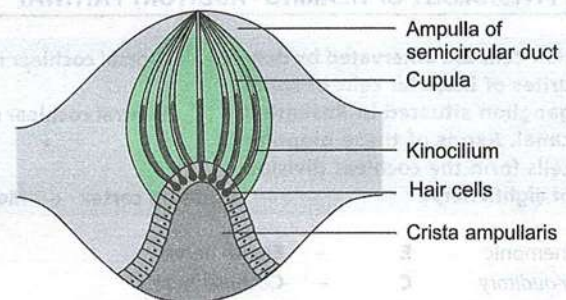


Fig. 17.2: Structure of ampullary end of semicircular duct.

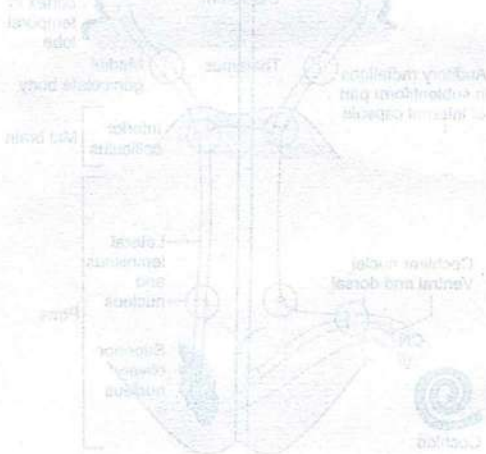


Fig. 17.1: Central auditory pathways

NOTE

QUESTIONS

1. **Otoacoustic emissions arise from:** [AIIMS May 05; AI 10]
 - a. Inner hair cells
 - b. Outer hair cell
 - c. Both inner and outer hair cells
 - d. Organ of Corti
2. **Hair cell of organ of Corti supported by:** [PGI Nov 09]
 - a. Onodi cells
 - b. Deiter cell
 - c. Hensen cell
 - d. Bullar cell
 - e. Heller cell
3. **Stapedial reflex is mediated by:** [JIPMER 92]
 - a. V and VII nerves
 - b. V and VIII nerves
 - c. VII and VI nerves
 - d. VII and VIII nerves
4. **The cough response caused while cleaning the ear canal is mediated by stimulation of:** [AIIMS Nov 02]
 - a. The V Cranial nerve
 - b. Innervation of external ear canal by C_1, C_2
 - c. The X Cranial nerve
 - d. Branches of the VII Cranial nerve
5. **Perilymph contains:**
 - a. Na^+
 - b. K^+
 - c. Mg^{++}
 - d. Cl^-
6. **Endolymph in the inner ear:** [AIIMS May 09]
 - a. Is a filtrate of blood serum
 - b. Is secreted by stria vascularis
 - c. Is secreted by basilar membrane
 - d. Is secreted by hair cells
7. **All of the following are concerned with auditory pathway except:** [AI 95]
 - a. Trapezoid body
 - b. Medial geniculate body
 - c. Genu of internal capsule
 - d. Lateral lemniscus
8. **Higher auditory center determine:** [AIIMS May 09]
 - a. Sound frequency
 - b. Loudness
 - c. Speech discrimination
 - d. Sound localization
9. **Movement of stapes causes vibration in:** [DNB 02]
 - a. Scala media
 - b. Scala tympani
 - c. Scala vestibuli
 - d. Semicircular canal
10. **Bones of middle ear are responsible for which of the following?** [MH 03]
 - a. Amplification of sound intensity
 - b. Reduction of sound intensity
 - c. Protecting the inner ear
 - d. Reduction of impedance to sound transmission
11. **Semicircular canals are stimulated by:** [MP 2000]
 - a. Gravity
 - b. Linear acceleration
 - c. Rotation
 - d. Sound
12. **Horizontal semicircular canal responds to:** [UP 2005]
 - a. Horizontal acceleration
 - b. Rotational acceleration
 - c. Gravity
 - d. Anteroposterior acceleration
13. **Angular movements are sensed by:** [JIPMER 93]
 - a. Cochlea
 - b. Sacculle
 - c. Utricle
 - d. Semicircular canals
14. **All are correctly matched except:** [TN 07]
 - a. Otolith – Made up of uric acid crystals
 - b. Position of otolith – Changes with head position
 - c. Otoliths – Stretch receptors
 - d. Otolith organs – Stimulated by gravity and linear acceleration
15. **Impedance matching occurs d/t-**
 - a. Difference of surface area of tympanic membrane and foot plate
 - b. Semicircular canal fluid
 - c. Utricle and Sacculle
 - d. None
16. **Primary receptor cells of hearing-**
 - a. Supporting cell
 - b. Tectorial membrane
 - c. Tunnel of corti
 - d. Hair cell

EXPLANATIONS AND REFERENCES

1. Ans. is b i.e. Outer hair cells

Ref. Dhingra 5th/ed, pp 32-33; 6/e p 27-28; Scott Brown 7th/ed Vol. 3 p 3277; Current Otolaryngology 2nd/ed pp 605-606

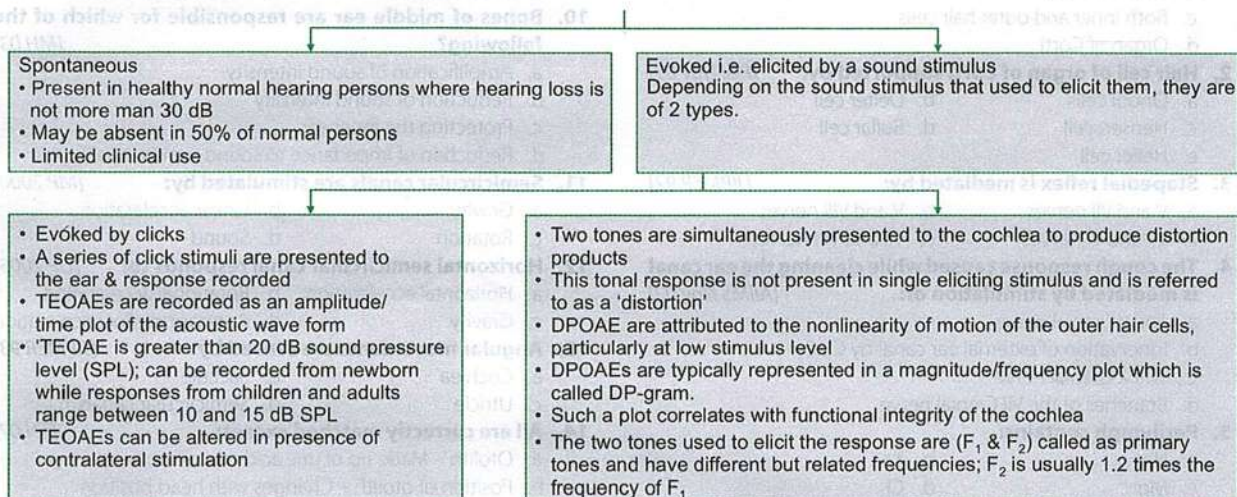
Otoacoustic Emissions (OAEs)

- Otoacoustic emissions are acoustic signals emitted from the cochlea to middle ear and into the external ear canal where they are recorded.
- They are low intensity sounds probably generated by acute mechanical contraction of the outer hair cells
- They are produced either spontaneously or in response to the acoustic stimuli
- Sound produced by outer hair cells moves in reverse direction viz:
- Outer hair cell → Basilar membrane → Perilymph → Oval window → Ossicles → Tympanic membrane → Ear canal.
- OAEs are present when outer hair cells are healthy.
- Absence of OAE indicate **structurally damaged or non-functional outer hair cells.**⁹
- They do not disappear in eighth nerve pathology as cochlear hair cells are normal.⁹

Uses

- a. OAEs are used as a screening test of hearing in neonates and to test hearing in uncooperative or mentally challenged individuals after sedation. Sedation does not interfere with OAEs.

- b. They help to distinguish cochlear from retrocochlear hearing loss as they are absent in cochlear but not in retrocochlear lesions.
- c. OAEs are also useful in diagnosing retrocochlear pathology, especially auditory neuropathy.

Extra Edge**Type of OAE – Broadly OAEs are of 2 types****2. Ans. is b, & c i.e. Deiter cell & Hensen cell**

Ref. PL Dhingra 5th/ed p 16; Logan & Turner 10th/ed pp 231-32; Maqbool 11th/ed p 18

"Supporting cell: Deiter's cells" are situated between the outer hair cells & provide support to the later. **Cells of Hensen** lie outside the Deiter's cells – PL Dhingra 5th/16

"Hensen cell: One of the supporting cells^o in the organ of Corti, immediately to the outer side of the cells' of Deiters (www.drugs.com/dict/hensen-cell)

Organ of Corti: components

Organ of Corti is the sense organ^o of hearing and situated on basilar membrane

- Tunnel of Corti: Formed by inner & outer rods
- Hair cells: They are important receptor cells of hearing & transducer sound energy into the electrical energy^o
 - Inner hair cells: Form a single row and more important in the transmission of auditory impulse
 - Outer hair cells: Arranged into three or four rows
- Supporting cell: Deiter cell & Hensen cell^o
- Tectorial membrane: Consists of gelatinous matrix with delicate fibers

Heller cells are ethmoidal air cell that extend along the medial roof of the maxillary sinus. They may exist as a discrete cells or the may open into maxillary sinus or infundibulum^o

– Cummings Otolaryngology 4th/1162

"Onodi cells are posterior & lateral extension of posterior ethmoidal cells. These cells can surround the optic nerve tract^o & put the nerve at risk during surgery"

– Cummings Otolaryngology 4th/1162

3. Ans. is d i.e. VII and VIII nerves

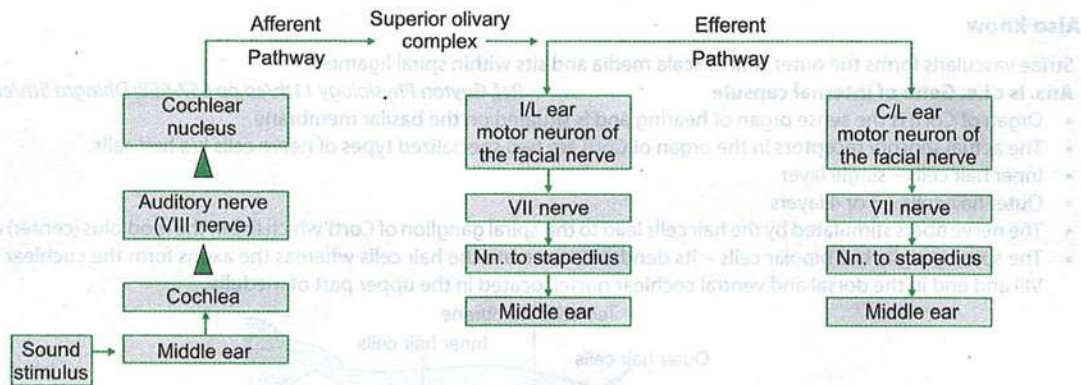
Ref. Dhingra 5th/ed p 30, 6/e, p 24-25 Current Otolaryngology 2nd/ed p 602.

Acoustic Reflex/Stapedial Reflex

It is based on the fact that a loud sound, 70–100 dB above the threshold of hearing of particular ear, causes bilateral contraction of the stapedial muscle which can be detected by tympanometry. This can be seen both in the stimulating ear (ipsilateral ear) and in the non stimulating ear (contralateral ear).

NOTE

I/L = Ipsilateral C/L = Contralateral

**Also know****Stapedial reflex can be used**

- As an objective method to test hearing in infants and young children
- To detect malingerers – as stapedial reflex is positive in people faking hearing loss
- To detect

Lesion	Test response
a. Cochlear pathology	Presence of stapedial reflex at lower intensities i.e. 40–60 dB means recruitment is positive i.e. cochlear pathology
b. VIII nerve lesion	It eliminates both the contralateral and ipsilateral acoustic reflex when the affected ear is stimulated. But contralateral and ipsilateral reflex are present if normal side is stimulated
c. VII nerve lesion	Absence of stapedial reflex in presence of normal hearing indicates lesion of VIIth nerve proximal to the nerve of stapedius
d. Brainstem lesion	If ipsilateral reflex is present but contralateral reflex is absent, it indicates lesion in the area of crossed pathway in the brainstem

4. Ans. is c i.e. The X cranial nerve

Ref. BDC 4th/ed, p Vol. 3, p 185

"Irritation of the auricular branches of the vagus in the external ear (by ear wax, syring, etc.) may reflexly cause cough, vomiting, or even death due to sudden cardiac inhibition."

Auricular branch of the vagus nerve is also known as **Arnold's nerve** or **Alderman's nerve**.

Also know

Similarly irritation of recurrent laryngeal nerve by enlarged lymph nodes in children may also produce a persistent cough.

5. Ans. is a i.e. Na⁺

Ref. Dhingra 5th/ed p 12; 6/e p 10; Current Otolaryngology 2nd/ed p 583

6. Ans. is b. i.e. is secreted by stria vascularis

[Ref. Dhingra 5/e p 12]

There are 2 main fluids in the inner ear.

Perilymph	Endolymph
<ul style="list-style-type: none"> • Fills the space between the bony and membranous labyrinth i.e. it is found in scala vestibuli and scala tympani • Resembles extracellular fluid /CSF • Rich in Na ions 	<ul style="list-style-type: none"> • Fills the entire membranous labyrinth i.e. found in scala media • Resembles intracellular fluid • Rich in K ions.

NOTE

- Marginal cells in the stria vascularis actively pump potassium into the membranous chamber to maintain the difference in the sodium & potassium concentration.
- The difference in the chemical composition between perilymph & endolymph provides the electrochemical energy which powers the activities of sensory cells.

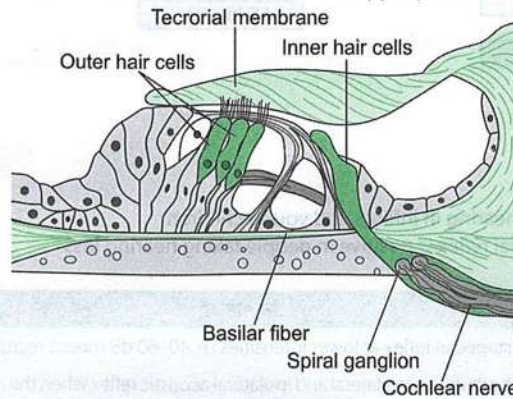
Also know

Striae vascularis forms the outer wall of scala media and sits within spiral ligament.

7. Ans. is c i.e. Genu of internal capsule

Ref. Guyton Physiology 11th/ed pp 657-658; Dhingra 5th/ed p 17, 6/e p 13

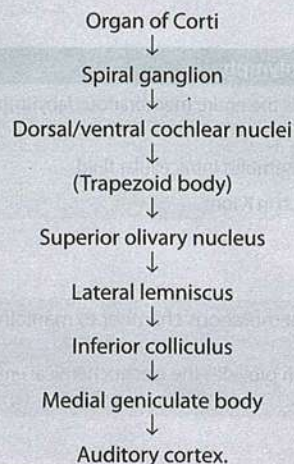
- Organ of Corti is the sense organ of hearing and is situated on the basilar membrane.
- The actual sensory receptors in the organ of Corti are two specialized types of nerve cells k/a hair cells.
- Inner hair cells – single layer
- Outer hair cells – 3 or 4 layers
- The nerve fibers stimulated by the hair cells lead to the 'spiral ganglion of Corti' which lies in the modiolus (center) of the cochlea.
- The spiral ganglia has bipolar cells – Its dendrites innervate the hair cells whereas the axons form the cochlear division of CN VIII and end in the dorsal and ventral cochlear nuclei located in the upper part of medulla.

**Auditory Pathway**

- All the fibres from the dorsal and ventral cochlear nuclei synapse (**k/a Trapezoid body**) and the 2° order neurons pass mainly to the opposite side of the brainstem to terminate in the **superior olivary nucleus**.
- A few 2° order fibers pass to the superior olivary nucleus on the same side.
- From the superior olivary nucleus, the auditory pathway passes upward through the **lateral lemniscus**.
- Some of the fibers terminate in the nucleus of the lateral lemniscus but many bypass this nucleus and travel on to the '**inferior colliculus**', where all or almost all fibers do synapse.
- From there, the pathway passes to the **medial geniculate nucleus**, where all fibers synapse.
- Finally the pathway proceeds by way of **auditory radiation** to **auditory cortex**, located mainly in the superior gyrus of temporal bone.

NOTE

In short pathway of hearing is:



Crossing over of the fibers from both sides occurs at 3 places in the brain.

- At the trapezoid body
- In the commissure between the 2 nuclei of lateral lemnisci
- In the commissure connecting the two inferior colliculi

8. Ans. is d i.e. Sound localization

Ref. Scott Brown 7th/ed Vol. 3 p 3144; Ganong 23rd/ed p 213

I. Cochlear nuclear complex:

It is subdivided into

Dorsal cochlear nucleus

It receives high frequency fibers

Ventral cochlear nucleus

It receives low frequency fibers

This shows that the frequency distribution of fibers in the auditory nerve, is maintained across the cochlear nuclei as a tonotopic map of neurons responding to progressively higher frequency from one side to other.

Dorsal cochlear nucleus is important in determining **what sounds are**.

II. Superior olivary complex – It receives binaural information and as such forms the first part of the ascending auditory pathway where major binaural comparisons are made.

It also helps in sound localization to some extent and neurons that detect differences in sound intensity are located in the lateral superior olive (LSO).

III. Inferior colliculus – It helps in understanding 'what a sound is'.

- It provides a basis for recognizing patterns in sounds.
- It also has neurons which are involved in sound localization
- It is also involved in auditory motor responses. For example—turning the head or moving the eyes in respond to sound.

IV. Auditory cortex – main function is sound localization^o

"Sound localization is markedly disrupted by lesions of the auditory cortex."
– Ganong 23/ed p. 213

9. Ans. is c i.e. Scala vestibuli

[Ref. Dhingra 5th/ed p 11 & 18, 6/e 9, Tuli 1st/ed p 18]

Friends, first let us quickly revise what is scala vestibuli, tympani and scala media.

Scala Vestibuli

It is filled with perilymph.

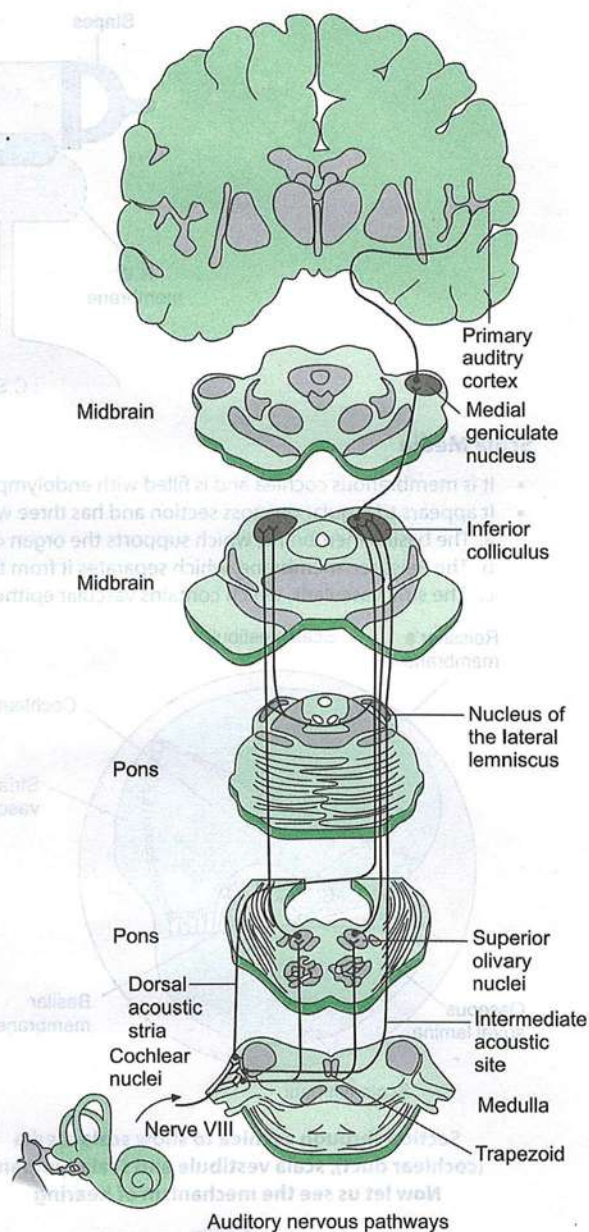
- At one end it is closed by footplate of stapes and at the other end it continues with scala tympani via the helicotrema. (So obviously even without any further knowledge we can say, by common sense that movement of stapes will cause movements in scale vestibuli).

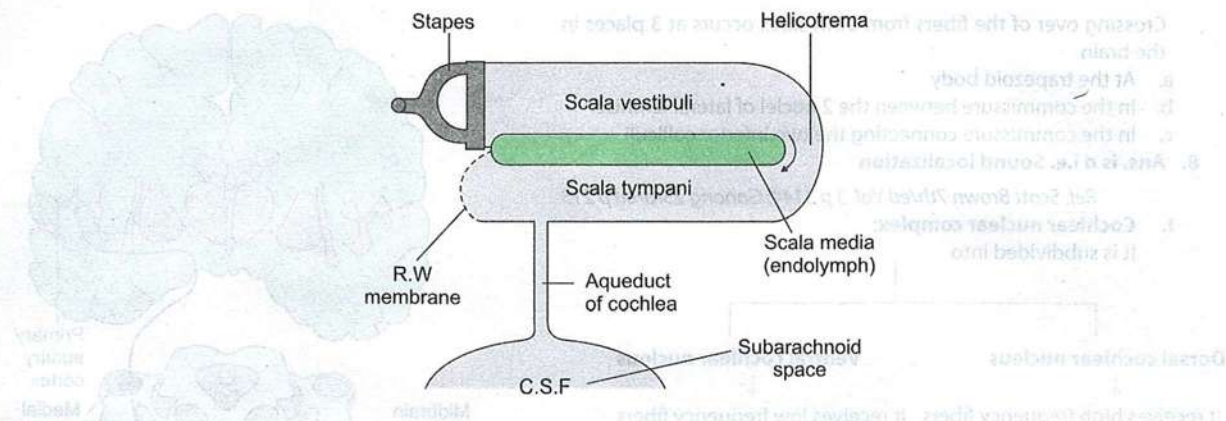
Scala Tympani

It is filled with perilymph.

- At one end it is closed by secondary tympanic membrane of round window and at one end it is connected to scala vestibuli via the helicotrema.
- It is also connected to subarachnoid space by aqueduct of cochlea

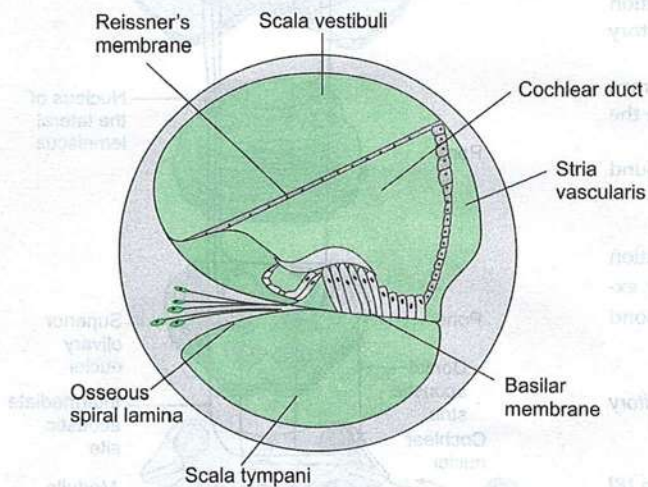
Diagrammatic representation of perilymphatic system. CSF passes into scala tympani through aqueduct of cochlea.



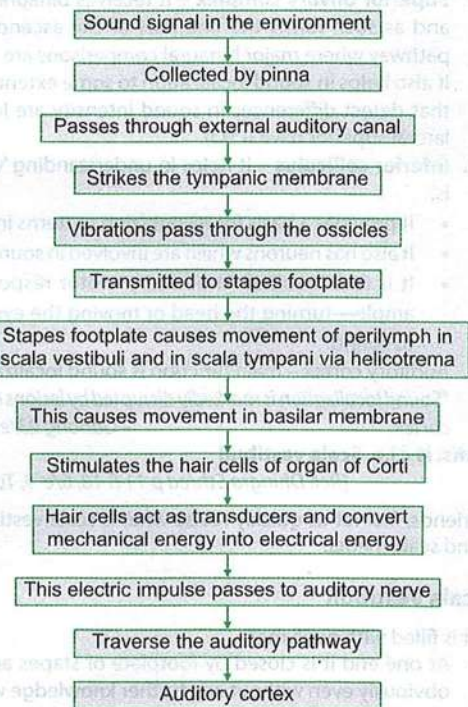
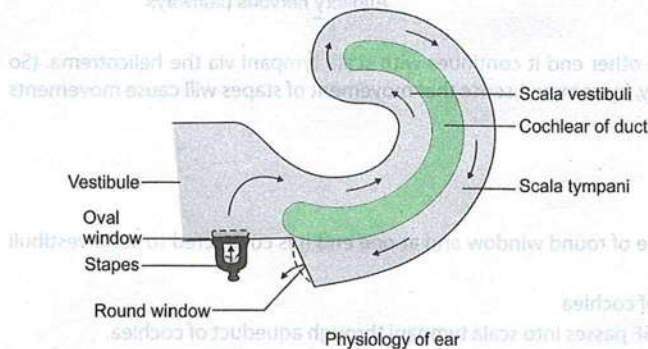


Scala Media

- It is membranous cochlea and is filled with endolymph
- It appears triangular in cross section and has three walls formed by:
 - a. The basilar membrane, which supports the organ of Corti
 - b. The Reissner membrane, which separates it from the scala vestibuli
 - c. The stria vascularis, which contains vascular epithelium and is concerned with secretion of endolymph.



Section through cochlea to show scala media (cochlear duct), scala vestibule and scala tympani Now let us see the mechanism of hearing



10. Ans. is d i.e. Reduction of impedance to sound transmission

Ref. Scott Brown 7th/ed, Vol. 3 p 3181; Dhingra 5th/ed p 18, 6/e p 14,15,16

We have discussed in detail the mechanism of hearing in the previous question.

Broadly hearing mechanism can be divided into:

- Mechanical conduction of sound (done by middle ear).
- Transduction of mechanical energy into electrical impulses (done by sensory system of cochlea)
- Conduction of electrical impulse to brain (i.e. auditory pathway)

Detailed Information**i. Conduction of sound:**

It is done mainly by middle ear. Middle ear not just simply conducts the sound but converts sound of great amplitude & less force to that of less amplitude and greater force. This function of the middle ear is called as **impedance matching mechanism** or the **transformer action**.

- This function of middle ear is accomplished by

Lever action of ossicles

Handle malleus is 1.3 times longer than long process of incus providing a mechanical advantage of 1.3.

Hydraulic action of tympanic membrane

The area of tympanic membrane is much larger than area of footplate of stapes ~21:1. But the effective vibratory area of tympanic membrane is only 2/3rd. So effective ratio is reduced to 14:1. The product of area ratio and lever ratio is $(14 \times 1.3) = 18:1$ (transformer ratio)

Curved Membrane effect

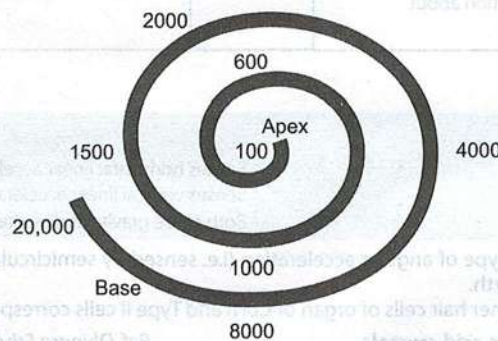
The movement of tympanic membrane is more at periphery than at center where handle of malleus is attached, this also provides some leverage.

ii. Transduction of mechanical energy to electrical impulse:

Movements of the stapes footplate causes vibrations in scala vestibuli followed by scala tympani and is transmitted to the cochlear fluids which brings about movement of the basilar membrane. This sets up shearing force between the tectorial membrane and the hair cells. The distortion of hair cells gives rise to **electrical nerve impulse**.

NOTE

- A sound wave, depending on its frequency, reaches maximum amplitude on a particular place on the basilar membrane, and stimulates that segment (traveling wave theory of von Bekesy). Higher frequencies are represented in the basal turn of cochlea and the progressively lower one toward the apex.



Frequency localization in the cochlea. Higher frequencies are localized in the based turn and the progressively decrease toward the apex.

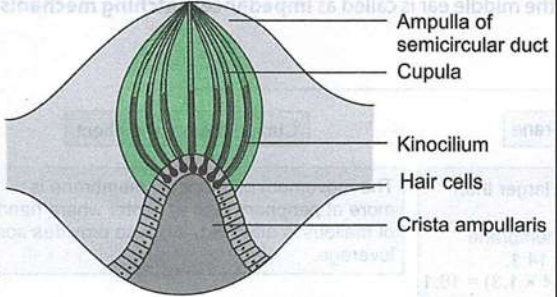
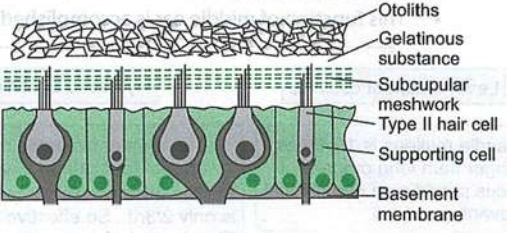
iii. Neural pathway/Auditory pathway:

- Hair cells get innervation from bipolar cells of spiral ganglion. Central axons of these cells collect to form the cochlear nerve. (Cochlear division of VIII nerve) and end in the cochlear nuclei (the dorsal and ventral on each side of medulla).
- From cochlear nuclei crossed & uncrossed fibers pass via superior olivary nucleus complex → nucleus of lateral lemniscus → inferior colliculus → Medial geniculate body & finally reach the auditory cortex of the temporal lobe.

11. Ans. is c i.e. Rotation**12. Ans. is b i.e. Rotational acceleration****13. Ans. is d i.e. Semicircular canals**

Ref. Scott Brown 7th/ed p Vol. 3 p 3211, Dhingra 5th/ed p 21, 6/e p 17-18

Vestibular systems includes

Semicircular canals/ducts	Peripheral receptors	Utricle and saccule (otolith organ)
<p>Cristae</p> <p>Located in the ampullated end of the semicircular ducts</p> <p>Angular/Rotational acceleration and deceleration</p>  <p>Ampulla of semicircular duct</p> <p>Cupula</p> <p>Kinocilium</p> <p>Hair cells</p> <p>Crista ampullaris</p> <p>It is a crest-like mound of connective tissue on which the sensory epithelial cells lie.</p> <p>Cells are of 2 types, Type I (flask-shaped) Type II (cylindrical)</p> <p>From the upper surface of each cell projects a single hair k/a kinocilium.</p> <p>When movement of the endolymph occurs toward kinocilium discharge increases, and when it occurs away from kinocilium discharge decreases</p> <p>This stimulates sensory nerve endings which send impulses upward to the brain giving information about the movement of head</p>	<p>Respond to</p> <p>Structure</p>	<p>Macula</p> <p>Linear acceleration/gravity/change in position of head</p>  <p>Otoliths</p> <p>Gelatinous substance</p> <p>Subcupular meshwork</p> <p>Type II hair cell</p> <p>Supporting cell</p> <p>Basement membrane</p> <p>It has 2 parts</p> <ul style="list-style-type: none"> • A sensory neuroepithelium made of Type I and Type II cells (similar to crista) • An otolithic membrane which is made of gelatinous mass and on the top has crystals of calcium carbonate called as otolith.^o <p>The cilia of the hair cells project into the gelatinous layer</p> <p>The linear, gravitation and head tilt movement causes displacement of the otolithic membrane and thus stimulate the hair cells which lie in different planes.</p>

Extra edge

Between the utricle and saccule:

Utricle

Saccule

Utricle + saccule

Senses horizontal linear acceleration

Senses vertical linear acceleration

Both sense gravity and position of head in space

- **Coriolis effect** – It is a specific type of angular acceleration (i.e. sensed by semicircular ducts) that causes motion sickness in space craft due to rotation of earth.
- Type I cells correspond to the inner hair cells of organ of Corti and Type II cells correspond to the outer hair cells.

14. Ans. is a i.e. Otolith is made of uric acid crystals

Ref. Dhingra 5th/ed pp 20-22, 6/e p 16, Tuli 1st/ed pp 23-24

Macula/otolith organs of utricle and saccule:

- It acts like stretch receptor^o and gravity acts as a stimulus^o
- It has 2 main parts

Sensory neuro epithelium

Which has Type I (flask-shaped) & Type II (cylindrical) cells:

- Macula/otolith organ respond to

- a. Linear acceleration^o
- b. Gravity^o
- c. Change in position of head^o

Otolith membrane

It is a gelatinous mass with embedded otoliths

Otolith/otoconia is made of crystals of calcium carbonate

Macula of the utricle responds to horizontal linear acceleration and that of saccule responds to vertical linear acceleration.

15. Ans. is a. i.e. difference of surface area of tympanic membrane and foot plate

Ref. Dhingra 6/ed, p 14

The area of tympanic membrane is much larger than area of stapes footplate, the average ratio being 21:1. As the effective vibratory area of tympanic membrane is only two thirds, the effective areal ratio is reduced to 14:1 which helps in impedance matching/transformer action.

16. Ans. is d. i.e. hair cells

Ref. Dhingra 6/ed, p 13

Hair cells: are important receptor cells of hearing and transduce sound energy into electrical energy.

Assessment of Hearing Loss

18

FUNCTIONAL ASSESSMENT OF HEARING

Tuning Fork Tests

They are:

- Qualitative test (as they indicate the type of hearing loss).
- Most common used tuning fork = 512 Hz because of - longer tone decay and distinct sound.
- Air conduction (AC) is tested by—placing tuning fork 15-20 cm in front of referred auditory meatus. It indicates integrity of tympanic-membrane system.
- Bone conduction (BC) is tested by—placing tuning fork on mastoid bone or on forehead. It indicates integrity of inner ear.

Rinne Test

In this test, AC is compared with BC of the patient. Tuning fork is struck and placed in front of external auditory meatus. When the patient stops hearing, move it on to the mastoid bone and ask the patient if he/she still hears and then reverse the process. The object is to find out whether the patient hears longer by air or by bone conduction. Rinne test will be negative in conductive deafness of more than 25 dB.

Interpretation is as follows:

- Normally, AC is 2 times better than BC - positive Rinne.
- In conductive deafness - BC > AC - negative Rinne.

NOTE

- In SNHL - AC > BC - low positive Rinne.
- In severe SNHL - BC > AC - false negative Rinne (due to transcranial transmission of sounds to the normal ear).

Weber's Test

In this test vibrating tuning fork is placed in the middle of forehead and the patient is asked about the lateralization of sound to left or right ear or in which the sound is heard better. It is a very sensitive test, and even less than 5 dB difference in 2 ears hearing level will be indicated by this test.

In Conductive Deafness

- The sound is lateralized to the deaf ear, and in bilateral conductive loss, sound is lateralized to the more deaf ear or it is centrally heard if both ears are equally deaf.
- In sensorineural hearing loss (SNHL):
• The sound is lateralized to better hearing ear or is heard equally if both ears are equally bad.

In normal ear

- No lateralization of sound occurs.
- Weber test is quite sensitive as difference of only 3-5 dB hearing level can result in lateralization. Weber test readily detects false Rinne negative.

Interpretation	AC > BC (Rinne test positive)	BC > AC (Rinne test positive)	AC > BC (Rinne test positive)
Normal	Not lateralized	Lateralized to better ear	Lateralized to better ear
ABG	25 dB or more	2 times or more	Reduced
SNHL	Equal	Lateralized	Shortened

Assessment of Hearing Loss

FUNCTIONAL ASSESSMENT OF HEARING

Tuning Fork Tests

They are:

- Qualitative test (as they indicate the type of hearing loss).
- Most common used tuning fork = 512 Hz. because of – Longer tone decay and distinct sound.
- Air conduction (AC) is tested by—placing tuning fork 1/2–1 inch in front of external acoustic meatus. (It indicates integrity of tympano-ossicular chain).
- Bone conduction (BC) is tested by—placing tuning fork on mastoid bone or on forehead. (It indicates integrity of inner ear).

Rinne Test

In this test, AC is compared with BC of the patient. Tuning fork is struck and placed in front of external auditory meatus. When the patient stops hearing, move it on to the mastoid bone and ask the patient if he/she still hears and then reverses the process. The object is to find out whether the patient hears longer by air or by bone conduction. **Rinne test will be negative in conductive deafness of more than 15 dB.**⁹

Interpretation is as Follows

- Normally, AC is 2 times better than BC— positive Rinne⁹
- In conductive deafness – $BC > AC \rightarrow$ Negative Rinne⁹

- In SNHL – $AC > BC \rightarrow$ Low positive Rinne⁹
- In severe SNHL – $BC > AC \rightarrow$ False negative Rinne (Due to transcranial transmission of sounds to the normal ear)⁹

NOTE

A negative Rinne with 256, 512 and 1024 Hz shows air bone gap of \approx 15, 30, 45 dB respectively.

Weber's Test

In this test vibrating tuning fork is placed in the middle of forehead and the patient is asked about the lateralization of sound to left or right ear or in which the sound is heard better. It is a very sensitive test⁹ and even less than 5 dB difference in 2 ears hearing level will be indicated by this test.

In Conductive Deafness

- The sound is lateralized to the deaf ear⁹ and in bilateral conductive loss, sound is lateralized to the more deaf ear or it is centrally heard if both ears are equally deaf.

In sensorineural hearing loss (SNHL):

- The sound is lateralized to better hearing ear or is heard centrally if both ears are equally bad.

In normal ear:

- No lateralization of sound occurs.
- Weber test is quite sensitive as difference of only 3–5 dB hearing level can result in lateralisation. Weber test readily detects false Rinne negative.

Test	Normal	Conductive deafness	SN deafness
Rinne	$AC > BC$ (Rinne test positive)	$BC > AC$ (Rinne test negative)	$AC > BC$ (Rinne test positive)
Weber	Not lateralized	Lateralized to poorer ear	Lateralized to better ear
ABC	Same as examiner	Same as examiner	Reduced
Schwabach	Equal	Lengthened	Shortened

Remember:

- Ideal tuning fork for testing hearing - 512 Hz.
- Gelle's test - Test for bone conduction.
 - Positive in normal persons and sensorineural deafness.
 - Negative in otosclerosis.

- Stenger's test /Chimani-Moos test/Lombard's test/Teel's test—They are tuning fork test for detecting non-organic deafness (malingering).
- Most sensitive TFT - Weber's test (5 dB difference needed to lateralize).
- Least sensitive TFT - Schwabach's test.
(TFT = Tuning fork test)

Absolute Bone Conduction Test

In this test, bone conduction of the patient is tested after occluding the external auditory meatus and compared with the BC of the examiner if he has a normal hearing.

Conclusion

- If both the patient and examiner hear equally either hearing is normal in patient or there is conductive deafness.
- If patient ceases to hear before examiner (i.e. ABC is reduced) - it indicates SNHL

Schwabach's Test

Bone conduction of the patient and examiner is compared, but meatus is not occluded.

Conclusion

- Schwabach is shortened in SNHL (Remember 35).
- Schwabach is lengthened in conductive hearing loss.

Gelle's Test

This test is done to confirm the presence of otospongiosis. In this test, BC is tested and at the same time Siegle's speculum compresses the air in the meatus. If hearing is reduced, it is normal; but in stapes fixation^q, bone conduction sound is not affected.



- Tuning fork tests are not 100% reliable, but are a useful screening test. They should be correlated with an audiogram.

**Other Tuning Fork Tests**

- Stenger's test^q
- Teel's test^q
- Lombard's test^q
- These tests are done for those patients who feign deafness but actually are normal subjects.

AUDIOMETRY**Pure Tone Audiometry**

- It is a reliable method of testing the hearing acuity and gives information about quantity and quality of hearing loss.
- Pure tones are given at various frequencies by increasing the intensity at 5 dB steps and when the patient hears the sound, it is recorded.
- Frequencies between 500 Hz and 3000 Hz are important as these are speech frequencies.^q

- Hearing is measured in decibels (dBs) which is a logarithmic scale.

Threshold of hearing at	0-10 dB	→	good hearing
Threshold of hearing at	10-30 dB	→	mild hearing loss
Threshold of hearing at	30-60 dB	→	moderate hearing loss
Threshold of hearing at	60-90 dB	→	Severe hearing loss
When	> 90 dB	→	Individual is deaf

Audiometry Symbols

- Blue line for left ear
- Red line for Right ear (Remember R-R)
- Continuous line for air conduction
- Broken line for Bone conduction (Remember B-B)

	Left ear	Right ear
Air conduction		
- Unmasked	X	○
- Masked	□	△
Bone conduction		
- Unmasked	>	<
- Masked	⌋	⌋
No response		
Air conduction		
- Unmasked	X	○
- Masked	□	△
Bone conduction		
- Unmasked	>	<
- Masked	⌋	⌋

NOTE

- One of the most important yet confusing aspect of hearing test is to ensure that the auditory function of each ear is measured independently. In some situations, a noise is presented to the non test ear to prevent it from responding to a signal presented to test ear. This is called as **masking**.

- Masking is required for air conduction when ever the difference between the air conduction presentation level and non test ear bone conduction thresholds exceed approximately 40 dB for the lower frequencies and 60 dB for higher frequencies.
- For BC testing, masking should be used when there is any difference in the AC and BC threshold.

NOTE

- Audiogram for normal ear, conductive hearing loss and serious neural hearing loss are given at the back in section on pictorial questions.

Speech Audiometry

In this audiometry, recorded spondee words are presented to the ear at various sound pressures. The patient is asked to write the words, which are then cross-checked with the list.

Speech Reception Threshold (SRT)

SRT of a person is the minimum intensity level (in dB) at which 50% of the spondee words can be repeated correctly.

Speech Discrimination Score (SDS) or Optimum Discrimination Score (ODS)

It is the maximum percentage of correct score when phonetically balanced single syllable words such as pin, day, bus, fun, and rum are used.

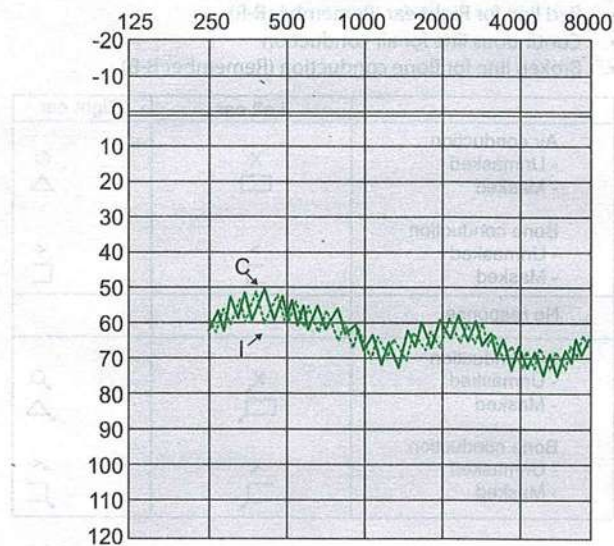
Results

- In normal subjects or conductive hearing loss, SDS is 95 – 100%.
- In cochlear lesions, SDS is low.
- In retrocochlear lesions, SDS is very poor and roll over phenomenon is present i.e. with increase of intensity, score drops.

As poor discrimination score of less than 80% affects the ability to understand speech, hence this test is useful to find out if hearing aid will be useful or not.

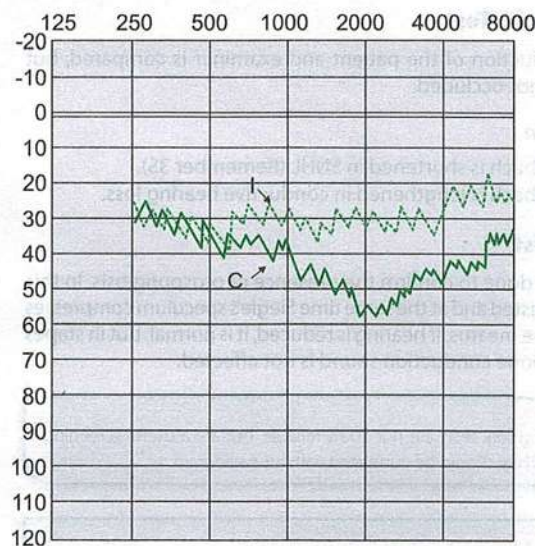
Bekesy Audiometry

- It is a self-recording audiometer in which changes in the intensity and frequency are done automatically by the audiometer.
- It is outdated these days.
- Various graphs recorded in bekesy audiometer are give in Fig's. 18.1A to 18.1 D



A Fig. 18.1

Type I tracing – Normal person or conducting hearing loss
The C and I tracings overlap in all frequencies

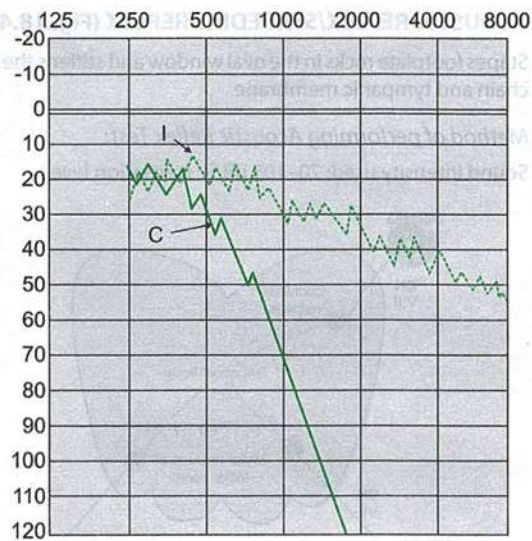


B Fig. 18.1

Type II tracing – Cochlear lesion
The C and I tracings overlaps till 1000 Hz after
which C tracing drops by 15–20 dB

Test for Recruitment

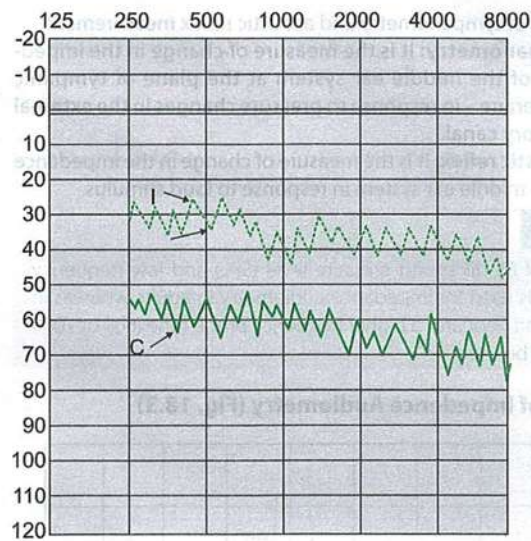
- Recruitment is an abnormally rapid increase in loudness with increasing sound intensity. Ear which does not hear low intensity sounds will hear greater intensity sounds as loud or even louder than normal ear.⁹



C

Fig. 18.1

Type III tracing – retrocochlear lesion/neural lesion
The C tracing drops to > 20 dB below Type I tracing



D

Fig. 18.1:

Type IV tracing – In acoustic nerve lesion or non organic hearing loss
The C and I tracings never overlaps

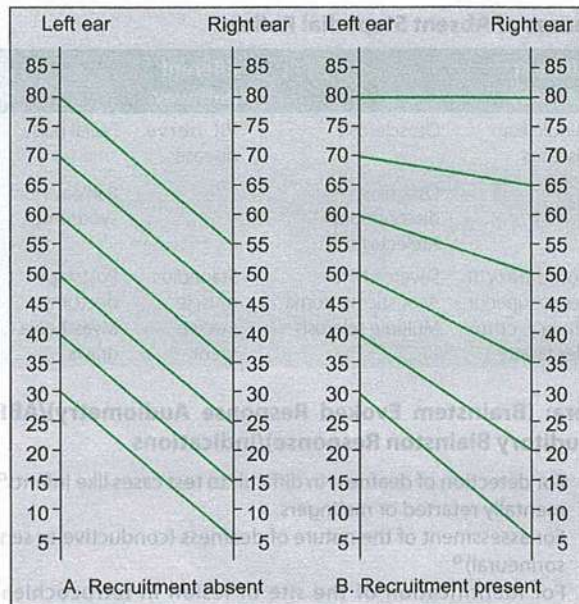


Fig. 18.2 : Recruitment phenomenon

- This phenomenon of recruitment is seen in cochlear type of SNHL, e.g. Meniere's disease^o and presbycusis^o. In normal persons and conductive hearing loss, the test is negative.

ABLB Test of Fowler (Alternate Binaural Loudness Balancing)

- In this test, a tone is alternatively played into normal and deaf ear, until the sound is heard equally in both ears.

- In positive recruitment, ladder pattern becomes horizontal at higher intensity.

Disadvantage

- Difference between the hearing thresholds of the two ears should be atleast 25 dB.
- One ear should be normal.

Tone Decay Test (or Nerve Fatigue Test)

- Measure of nerve fatigue^o and is used to detect retrocochlear lesions.^o
- Normally, a person can hear a tone continuously for 60 seconds.
- In nerve fatigue, he stops hearing earlier.
- A decay of more than 25 dB is diagnostic of retrocochlear lesions.

Impedance Audiometry

- Principle:** It measures the change in the impedance of the middle ear system at the level of the tympanic membrane as a result of changes in the air pressure in the external auditory canal.

Uses:

- To differentiate between conductive and sensorineural hearing loss.
- Differential diagnosis of conductive hearing loss.
- Measurement of middle ear pressure and evaluation of Eustachian tube function.
- To differentiate between cochlear and retrocochlear type of sensorineural hearing loss.
- To identify the site of lesion in facial paralysis.

It consists of tympanometry and acoustic reflex measurement.

- **Tympanometry:** It is the measure of change in the impedance of the middle ear system at the plane of tympanic membrane – in response to pressure changes in the external auditory canal.
- **Acoustic reflex:** It is the measure of change in the impedance of the middle ear system in response to loud stimulus.

NOTE

A tone of 85 dB sound pressure level (SPL) and low frequency (220 Hz) is used for impedance audiometry in adults whereas in infants and neonates a higher frequency probe tone (660 or 1000 Hz) must be used.

Curves of Impedance Audiometry (Fig. 18.3)

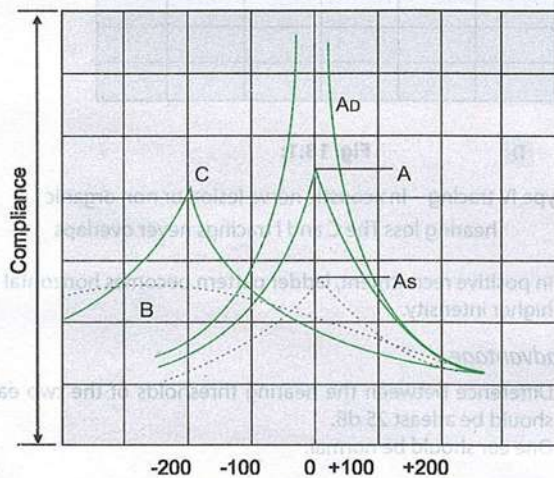


Fig. 18.3: Curves of Impedance Audiometry

Type of curve	Condition
A curve (Normal peak height and pressure).	Normal
As curve ^a (It is also a variant of normal tympanogram but may be shallow)	Eustachian tube obstruction
Ad curve (Variant of normal with high peak)	Otosclerosis ^a Tumors of middle ear Fixed malleus syndrome Tympanosclerosis
B curve (Flat or dome-shaped curve) ^a Indicating lack of compliance	Ossicular discontinuity Post stapedectomy Monometric ear drum
C curve (negative peak pressure)	Fluid in middle ear ^a Secretory otitis media ^a Tympanic membrane perforation ^a Grommet in ear ^a Retracted tympanic membrane Faulty function of Eustachian tube/ Eustachian tube obstruction

ACOUSTIC REFLEX/STAPEDIAL REFLEX (Fig. 18.4)

Stapes footplate rocks in the oval window and stiffens the ossicular chain and tympanic membrane.

Method of performing Acoustic Reflex Test:

Sound intensity used: 70–105 dB SL (sensation level).

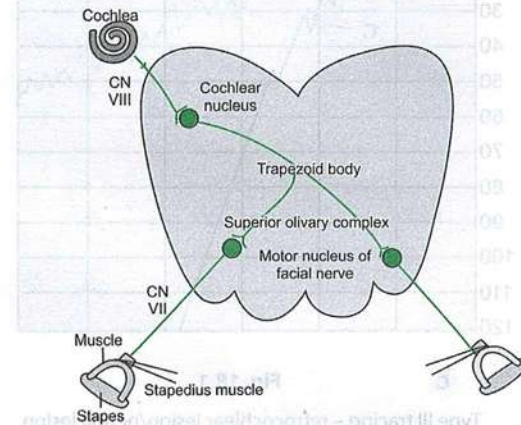


Fig. 18.4: Acoustic reflex pathways

Causes of Absent Stapedial Reflex

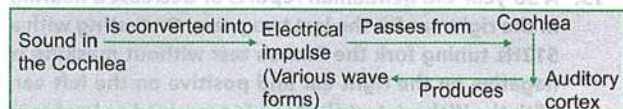
Afferent pathway		Efferent pathway	
Middle ear diseases	Otosclerosis	VII nerve diseases	Facial palsy
	Ossicular discontinuity		Ramsay Hunt syndrome
	Atelectasis		
Colchlea/VIII nerve/superior olivary complex lesion	Severe SNHL	Stapedius muscle involvement	Poststapedectomy
	Acoustic neuroma		Myasthenia gravis
	Multiple sclerosis		

Bera: (Brainstem Evoked Response Audiometry)/ABR (Auditory Brainstem Response)/Indications

- For detection of deafness in difficult to test cases like infants^a, mentally retarded or malingerers.
- For assessment of the nature of deafness (conductive or sensorineural)^a
- For identification of the site of lesion in retrocochlear pathologies^a
- To study the maturity of the CNS in newborns, objective assessment of brain-death.
- For assessing prognosis in a comatose patients.
- To diagnose brainstem pathology example multiple sclerosis or pontine tumor
- Unlike pure tone audiometry, BERA does not require subjective patient response.

Principle

It is noninvasive technique to find the integrity of central auditory pathway through the VIII nerve, pons and midbrain.



These waves are studied for latency, amplitude and morphology. Out of the following waves generated the 1st, 3rd and 5th waves are most stable and the ones which are studied.

According to *Dhingra 4th/ed p 29* and *Scott Browns 7th ed p 3283*

- Wave I = E = Distal part of eighth nerve
- Wave II = E = Proximal part of eighth nerve
- Wave III = C = Cochlear nucleus/Lower pons
- Wave IV = O = Superior olivary complex
- Wave V = L = Lateral lemniscus — Upper pons
- Wave VI-VII = Inferior colliculus

OTOACOUSTIC EMISSIONS

Otoacoustic emissions (OAE) are low-intensity sounds, which are produced by movements of the outer hair cells of the cochlea. They are produced spontaneously and in response to the acoustic stimuli, OAE are picked up by a miniature microphone, which is placed snugly in the EAC. Absence of OAE indicates disorders of outer hair cells.

This non-invasive objective test can diagnose damage to the outer hair cells due to acoustic trauma and ototoxic drugs. It aids in the assessment of hearing in infants. Sedation does not interfere with OAE.

The OAE travels through basilar membrane, perilymph, oval window, ossicles, tympanic membrane and ear canal. OAE are present in nerve hearing loss as the outer hair cells are normal.

Uses

- Screening test of hearing in neonates, uncooperative or mentally challenged patients.
- Distinguish between cochlear (acoustic trauma and ototoxic drugs) and retrocochlear hearing losses (auditory neuropathy).

QUESTIONS

1. All are tuning fork test except: [UP 02/DNB 02]
 - a. Schwabach test
 - b. Grant's test
 - c. Rinne's test
 - d. Weber's test
2. Tuning fork of 512 FPS is used to test the hearing because it is: [Karn. 06]
 - a. Better heard
 - b. Better felt
 - c. Produces over tones
 - d. Not heard
3. Gelle's test is done in: [JIPMER 98]
 - a. Senile deafness
 - b. Traumatic deafness
 - c. Otosclerosis
 - d. Serous otitis media
4. Which one of the following test is used to detect malinger-ing? [TN 07]
 - a. Stenger's test
 - b. Bunge's test
 - c. Weber's test
 - d. Rinne's test
5. Rinne's test is negative in: [AIIMS Nov 94]
 - a. Sensorineural deafness
 - b. Acoustic neuroma
 - c. Tympanosclerosis
 - d. Meniere's disease
6. Rinne's test negative is seen in: [JIPMER 92]
 - a. Presbycusis
 - b. CSOM
 - c. Labyrinthitis
 - d. Meniere's disease
7. Rinne's test is negative if minimum deafness is: [SRMC 02]
 - a. 15–20 dB
 - b. 25–30 dB
 - c. 35–40 dB
 - d. 15–50 dB
8. Positive Rinne test is seen in: [JIPMER 91]
 - a. Otosclerosis
 - b. CSOM
 - c. Wax impacted ear
 - d. Presbycusis
9. Rinne's test is positive in: [AIIMS 91]
 - a. Chronic suppurative otitis media
 - b. Normal individual
 - c. Wax in ear
 - d. Otitomycosis
10. Weber test is best elicited by: [AI 02]
 - a. Placing the tuning fork on the mastoid process and comparing the bone conduction of the patient with that of the examiner
 - b. Placing the tuning fork on the vertex of the skull and determining the effect of gently occluding the auditory canal on the threshold of low frequencies
 - c. Placing the tuning fork on the mastoid process and comparing the bone conduction in the patient
 - d. Placing the tuning fork on the forehead and asking him to report in which ear he hears it better.
11. In the right middle ear pathology, Weber's test will be: [AI 04]
 - a. Normal
 - b. Centralized
 - c. Lateralized to right side
 - d. Lateralized to left side
12. Weber's test in conductive deafness: [CUPGEE 96]
 - a. Sound louder in normal ear
 - b. Sound louder in diseased ear
 - c. Heard with equal intensity in both ears
 - d. Inconclusive test
13. A 38-year-old gentleman reports of decreased hearing in the right ear for the last two years. On testing with a 512Hz tuning fork the Rinne's test without masking is negative on the right ear and positive on the left ear. With the Weber's test the tone is perceived as louder in the left ear. The most likely patient has: [AIIMS Nov 02]
 - a. Right conductive hearing loss
 - b. Right sensorineural hearing loss
 - c. Left sensorineural hearing loss
 - d. Left conductive hearing loss
14. A middle-aged woman presented with right sided hearing loss, Rinne's test shows positive result on left side and negative result on right side Weber's test showed lateralization to left side, diagnosis is: [AIIMS June 00]
 - a. Right sided conductive deafness
 - b. Right sided sensorineural deafness
 - c. Left sided sensorineural deafness
 - d. Left sided conductive deafness
15. One man had 30 dB deafness in left ear with Weber test showing more sound in left ear and BC (Bone conduction) more on left side and normal hearing in right ear, his test can be summarized as:
 - a. Weber's test—left lateralized; Rinne test—right positive, BC>AC on left side
 - b. Weber's test—right lateralized; Rinne test—left positive, AC>BC on right side
 - c. Weber's test—left lateralized; Rinne test—false positive on right side, BC>AC on left side
 - d. Weber's left lateralized; Rinne test—equivocal, BC>AC on right side
16. A 38-year-old male presented with a suspected diagnosis of suppurate labyrinthitis. A positive Rinne's test and positive fistula test was recorded on initial examination. The patient refused treatment, and returned to the emergency department after 2 weeks complaining of deafness in the affected ear. On examination, fistula test was observed be negative. What is the likely expected finding on repeating the Rinne test. [AI 09]
 - a. True positive Rinne's test
 - b. False positive Rinne's test
 - c. True negative Rinne's test
 - d. False negative Rinne's test
17. In pure tone audiogram the symbol X is used to mark: [JIPMER 02]
 - a. Air conduction in right ear
 - b. Air conduction in left ear
 - c. Bone conduction in right ear
 - d. No change in air conduction in right ear
18. The "O" sign in a pure tone audiogram indicates: [AP 2005]
 - a. Air conduction of right ear
 - b. Air conduction of left ear
 - c. Bone conduction of right ear
 - d. Bone conduction of left ear

19. **Tone decay test is done for:** [Manipal 01]
 a. Cochlear deafness b. Neural deafness
 c. Middle ear problem d. Otosclerosis
20. **All are subjective tests for audiometry except:**
 a. Tone decay b. Impedance audiometry
 c. Speech audiometry d. Pure tone audiometry
21. **Impedance audiometry is for pathology of:** [UP 04]
 a. External ear b. Middle ear
 c. Mastoid air cell d. Inner ear
22. **Impedance audiometry is done using frequency probe of:** [Delhi 07]
 a. 220 Hz b. 550 Hz
 c. 440 Hz d. 1000 Hz
23. **A lady has B/L hearing loss since 4 years which worsened during pregnancy. Type of impedance audiometry graph will be:** [AIIMS May 07; Nov 06]
 a. Ad b. As
 c. B d. C
24. **Flat tympanogram is seen in:** [PGI 00]
 a. ASOM b. Otosclerosis
 c. Serous otitis media d. Ossicular chain disruption
25. **B-type tympanogram is seen in:** [Bihar 04]
 a. Serous otitis media b. Ossicular discontinuity
 c. Otosclerosis d. All of the above
26. **Flat and dome-shaped graph in tympanogram is found in:** [RJ 03]
 a. Otosclerosis b. Ossicular discontinuity
 c. TM perforation d. Middle ear fluid
27. **In osteogenesis imperfecta, the tympanogram is:** [DNB 03]
 a. Flat b. Noncompliance
 c. High-compliance d. Low-compliance
28. **A young man presents with an accident leading to loss of hearing in right ear. On otoscopic examination, the tympanic membrane was intact pure tone audiometry that shows an air-bone gap of 55 dB in the right with normal cochlear reserve. Which of the following will be the like tympanometry finding:** [AI 09]
 a. As type tympanogram b. Ad type tympanogram
 c. B type tympanogram d. C type tympanogram
29. **High frequency audiometry is used in:** [AIIMS May 09]
 a. Otosclerosis b. Ototoxicity [AIIMS Nov 12]
 c. Non-organic hearing loss d. Meniere's disease
30. **Which is the best test for screening of the auditory function of neonates?** [AIIMS May, Nov 12]
 a. Pure tone audiometry
 b. Stapedial reflex
 c. Otoacoustic emissions (OAE)
 d. Brainstem evoked auditory response
31. **Which is the investigation of choice in assessing hearing loss in neonates?** [AIIMS May 11]
 a. Impedance audiometry
 b. Brainstem evoked response audiometry (BERA)
 c. Free field audiometry
 d. Behavioral audiometry
32. **In infant most sensitive audiometric screening is:** [PGI Dec 98]
 a. Electrocochleography
 b. BERA
 c. Cortical evoked response audiometry
 d. Tympanometry
33. **To distinguish between cochlear and post cochlear damage test done is:** [PGI Dec 97]
 a. Brainstem evoked response audiometry
 b. Impedance audiometry
 c. Pure tone audiometry
 d. Auditory cochlear potential
34. **In normal adult wave V is generated from:** [J and K 05, Delhi 08]
 a. Cochlear nucleus
 b. Superior olivary complex
 c. Lateral lemniscus
 d. Inferior colliculus
35. **Test of detecting damage to cochlea** [MH PGM CET Jan 05; MH 00]
 a. Caloric test b. Weber test
 c. Rinne's test d. ABC test
36. **Threshold for bone conduction is normal and that for air conduction is increased in disease of:** [AP 96]
 a. Middle ear b. Inner ear
 c. Cochlear nerve d. Temporal lobe
37. **In monaural diplacusis the lesion is in the:** [AP 91]
 a. Cochlea b. Auditory nerve
 c. Brainstem d. Cerebrum
38. **Impedance audiometry is for pathology of:** [NEET Pattern]
 a. External ear b. Middle ear
 c. Mastoid air cell d. Inner cell
39. **Stapedial reflex is mediated by:** [NEET Pattern]
 a. V and VII nerves
 b. V and VIII nerves
 c. VII and VI nerves
 d. VII and VIII nerves
40. **Vestibular evoked myogenic potential (VEMP) detects lesion of:** [AIIMS May 2012]
 a. Cochlear nerve
 b. Superior vestibular nerve
 c. Inferior vestibular nerve
 d. Inflammatory myopathy
41. **In electrocochleography:** [AIIMS May 2012]
 a. It measures middle ear latency
 b. Outer hair cells are mainly responsible for cochlear microphonics and summation potential
 c. Summation potential is a compound of synchronous auditory nerve potential
 d. Total AP represents endocochlear receptor potential to an external auditory stimulus

EXPLANATIONS AND REFERENCES

1. Ans. is b i.e. Grant's test

Ref. Dhingra 5th/ed p 26, 6th/ed p 22-23

Tuning Fork tests include.

- Rinne's test – Compares air conduction of the ear with bone conduction
- Weber test
- Absolute bone conduction test – Here bone conduction of the patient is tested after occluding the meatus and then compared with BC of the examiner
- Schwabach test – Here also BC of the patient is compared with the BC of a normal hearing person but meatus is not occluded.
- Bing test – It is a test of BC and examines the effect of occlusion of ear canal on hearing (i.e. external meatus is occluded and released alternatively)
- Gelle's test – It is also a test of BC and examines the effect of increased air pressure in ear canal on hearing.

Other Tuning Fork Tests

- Stenger test
- Teel's test For detecting malingering
- Lombard's test

Also Know

- **To test air conduction** – A vibrating tuning fork is placed vertically about 2 cms away from the opening of external auditory meatus.
- Sound waves are transmitted: From tympanic membrane → middle ear → ossicles of inner ear.
- Thus **AC tests both conducting mechanism and cochlea**
- **To test bone conduction** – Vibrating tuning fork is placed on the mastoid bone.
- Cochlea is stimulated directly by vibrations conducted through the skull
- Hence – **BC is a measure of cochlear function only.**

2. Ans. is a i.e. better heard

Ref. Tuli 1st/ed p 28

Tuning fork tests can be done with tuning forks of different frequencies like 128, 256, 512, 1024, 2048 and 4096 Hz but most commonly used is 512 Hz because

- "Tests are done with various tuning forks, but 512 Hz is the most commonly used as it has longer tone decay and sound is quite distinct from ambient noise."
- Forks of lower frequencies produce a sense of bone vibration while those of higher frequency have a shorter decay time and therefore not commonly used

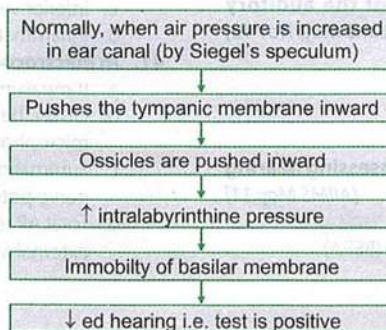
3. Ans. is c i.e. otosclerosis

Ref. Dhingra 5th/ed p 27, 6th/ed p 22

Gelle's test was once a popular test to find out stapes fixation in otosclerosis, but now it has been superseded by tympanometry. In this test, bone conduction is tested and at the same time Siegel's speculum compresses the air in the meatus.

Principle

Normally, when air pressure is increased in ear canal (by Siegel's speculum)



But if ossicular chain is fixed or disrupted, no such phenomenon occurs i.e. **test is negative.**

Gelle's test is positive: In normal individuals, SNHL.

Gelle's test is negative: In case of fixed ossicular chain (otosclerosis) or if ossicular chain is disconnected.

4. Ans. is a i.e. Stenger's test

[Ref. Dhingra 5th/ed p 42, 6th/ed p 37; Tuli 1st/ed p 31]

Malingering/Nonorganic hearing loss (also called pseudohypacusis)

- Occasionally patients wilfully or subconsciously exaggerate their hearing loss.
- This is functional hearing loss or pseudohypacusis or malingering
 - The signs in the test behavior that suggest functional component include:
 - a. Inconsistent responses
 - b. Significant differences between the threshold obtained using ascending and descending administration of test stimuli
 - c. A discrepancy of > 8 dB between the SRT (speech reception threshold) and the pure tone average of 500–2000 Hz
 - d. Positive Stenger test

Stenger Test

- It is used to identify unilateral or asymmetrical functional hearing loss. It is based on the concept that when both ears are stimulated simultaneously by a tone equal in frequency and phase, the auditory percept is lateralized to the ear with better hearing.
- If speech stimulus is used in Stenger test it is k/a Speech Stenger test or modified Stenger test.
- Other objective tests which can diagnose functional involvement are:
 - **acoustic reflexes:** Pt saying hearing loss but normal acoustic reflex indicates NOHL
 - auditory brainstem response
 - otoacoustic emission

Also Know

Other tuning fork tests which can be used to detect malingering but are now outdated are:

- Teel's test
- Lombard's test
- Chamini-Moos test
- Gault test

5. Ans. is c i.e. Tympanosclerosis

6. Ans. is b i.e. CSOM

7. Ans. is a i.e. 15 – 20 dB

Ref. Dhingra 5th/ed p 26, 6th/ed p 22

As discussed in the text in Rinnies test—air conduction of the ear is compared with its bone conduction.

Principle and Result

- In normal individuals $\Rightarrow AC > BC$ i.e. Rinne test is positive
- In case of conductive deafness \Rightarrow air conduction is decreased. Hence $BC > AC$ i.e. Rinne test negative
- In U/L SNHL \Rightarrow air conduction is normal whereas BC is further decreased. Hence $AC > BC$ i.e. Rinne test positive
- But in case of severe U/L SNHL – patients do not perceive any sound of tuning fork by air conduction but respond to bone conduction testing which is in reality due to transcranial transmission of sound from the normal ear.

Hence there is **false negative Rinne test** ($BC > AC$).

Result	Inference	Seen in
Positive	Air conduction > Bone conduction	<ul style="list-style-type: none"> • Normal individuals • SNHL
Negative	Bone conduction > Air conduction	<ul style="list-style-type: none"> • Conductive deafness
False negative		<ul style="list-style-type: none"> • Severe SNHL

NOTE

A negative Rinne test indicates a minimum air bone gap of 15–20 dB. (Ans 7)

Now lets see Qs 5 and 6

Q.5 says Rinne's test is negative in –

We know negative Rinne test is seen in case of conductive deafness. Amongst the options given, only tympanosclerosis is a cause for conductive deafness.

Again in Q.6 – only CSOM causes conductive deafness.

8. Ans. is d i.e. Presbycusis

9. Ans. is b i.e. Normal individual

Ref. Dhingra 5th/ed p 26, 41, 6th/ed p 22

Rinne's test is positive i.e. air conduction > bone conduction

It is seen in:

- Normal individuals (Ans 9)
- In case of sensorineural hearing loss (SNHL)

Amongst the options given in Q.8 only presbycusis causes SNHL and therefore gives positive Rinne test

NOTE

Presbycusis: It is sensorineural hearing loss associated with physiological aging process in the ear. It manifests at 65 years of age.

10. Ans. is d i.e. Placing the tuning fork on the forehead and asking him to report in which ear he hears better

Ref. Dhingra 5th/ed p 26, 6th/ed p 22

Test	Method of testing
Rinne's test	Placing the tuning fork on mastoid process and bringing it beside the meatus, when patient stops hearing it on mastoid
Weber's test	Placing the tuning fork on forehead and asking him to report in which ear he hears better
Absolute bone conduction	Placing the tuning fork on mastoid process and comparing the bone conduction of the patient with that of examiner after occluding the meatus
Schwabach's test	Test same as absolute bone conduction but meatus is not occluded

11. Ans. is c i.e. Lateralized to right side

Ref. Dhingra 5th/ed p 26

12. Ans. is b i.e. Sound louder in diseased ear

As discussed in the text in Weber's Test

- In normal Individuals – No lateralization of sound occurs as Bone conduction of both ears in normal and equal.
- In conductive deafness – Lateralization of sound occurs to the diseased ear (Ans 12)
- In SNHL – Lateralization of sound occurs to the better ear.

NOTE

It is a very sensitive test and even less than 5 dB difference in 2 ears hearing level can be indicated.

Also know

Bing Test Ref. Dhingra 6th/ed p 22

It is a test of bone conduction and examines the effect of occlusion of ear canal on the hearing. A vibrating tuning fork is placed on the mastoid while the examiner alternately closes and opens the ear canal by pressing on the tragus inward.

- Positive in normal and SNHL i.e. hears louder when ear canal is occluded and softer when ear canal is open.
- Negative in conductive hearing loss – i.e. no change

13. Ans. is b i.e. Right sensorineural hearing loss

14. Ans. is b i.e. Right sided sensorineural deafness

Ref. Dhingra 5th/ed p 27 Table 4.1, 6th/ed p 22, Table 4.1

Rinne's Test

Negative on right side means either there is:

- Conductive deafness of Right side or
- Severe SNHL on right side (leading to false negative Rinne test)

To differentiate between the 2 conditions: Let us see the result of Weber's test:

- Patient is complaining of decreased hearing in right ear and Weber's test is lateralized to left ear (as stated in the question) i.e. to the better ear.
- As discussed in the text: Weber's test is lateralized to the better ear in case of SNHL.

So, diagnosis is right sided severe SNHL.

Remember: If Rinne's test is negative and Weber's test shows lateralization toward healthy side, it indicates **severe SNHL**

15. Ans. is a i.e. Weber's test - left lateralized; Rinne's right positive; BC > AC on left side

Ref. Dhingra 5th/ed p 26,27, 6th/ed p 22

Let us analyze each information provided in the question.

- This man has deafness of 30 dB in left ear.
- Weber's test is lateralized to left ear i.e. deaf ear which means deafness is conductive type. (As in conductive deafness - Weber's test is lateralized to poorer ear).

This means Rinne test should be negative on left side (as in conductive deafness - Rinne test is negative). Ruling out **options "b" and "d"**.

In the question it is given hearing is normal on right side, so Rinne test will be positive on right side (because in case of normal hearing - Rinne test is positive).

In the question itself it is given, bone conduction is more on left side.

So **option "a"** is correct i.e.:

Weber's test - left lateralized, Rinne test - right positive and BC > AC on left side.

16. Ans. is d i.e. False negative Rinne's test

Ref. Dhingra 5th/ed p 26, 6th/ed p 22

In the above question: Patient was suffering from suppurative labyrinthitis which was not treated and led to total loss of hearing i.e. severe SNHL.

In severe SNHL: Rinne's test is false negative and because labyrinth is dead. Fistula test is negative.

False negative Rinne test as explained earlier occurs in case of severe SNHL because patient does not perceive any sound of tuning fork by air conduction but responds to bone conduction due to intracranial transmission of sound from opposite healthy ear.

Fistula Test

The basis of this test is to induce nystagmus by producing pressure changes in the external canal which are then transmitted to the labyrinth. Stimulation of the labyrinth results in nystagmus and vertigo. Normally the test is negative because the pressure changes in the EAC cannot be transmitted to the labyrinth.

Positive Fistula Test is seen in:

- Erosion of horizontal semicircular canal (Cholesteatoma or fenestration operation)
- Abnormal opening in oval window (post stapedectomy fistula) or round window (rupture of round window).

A positive fistula test also implies that the labyrinth is still functioning.

- False-negative fistula test: Dead labyrinth, cholesteatoma covering site of fistula.
- False-positive fistula test (Positive fistula test without Fistula): Congenital syphilis, 25% cases of Meniere's disease (Hennebert's sign.)

17. Ans. is b i.e. Air conduction in left ear

Ref. Dhingra 5th/ed p 34 Fig 5.1; 6th/ed p 30, 51; Current Otolaryngology 2nd/ed p 597

18. Ans. is a i.e. Air conduction in the right ear.

Symbols used in audiotometry—See the preceding text

19. Ans. is b i.e. Neural deafness

Ref. Dhingra 4th/ed p 28, 5th/ed p 31

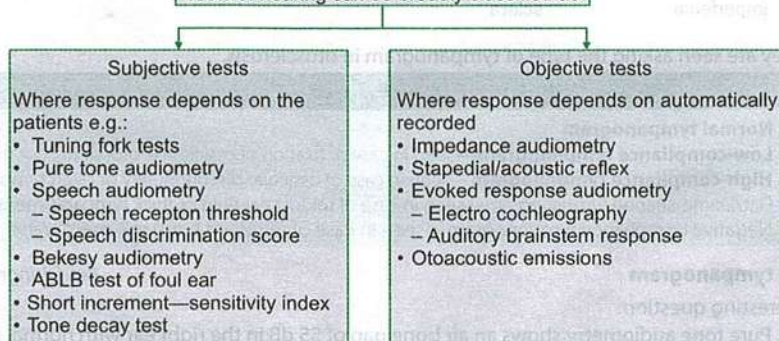
Tone decay test is a measure of nerve fatigue (i.e. neural deafness) and is used to detect retrocochlear lesions. A decay of more than 25 dB is diagnostic of retro cochlear lesion.

Method of doing the test and principle: A continuous tone of 5 dB above threshold in 500 Hz and 2000 Hz is given to the ear and person should be able to hear it for 60 sec. The result is expressed as dB by which intensity has to be increased so that the patient can hear the sound for 60 sec. If tone decay of >25 dB is present, it indicates retrocochlear lesion e.g.—acoustic neuroma.

20. Ans. is b. i.e. Impedance audiometry

Ref. Dhingra 5th/ed p 29; 6th/ed p 24; Tuli 1st/ed pp 31-35

Tests of hearing can be broadly classified as



21. Ans. is b i.e. Middle ear

Ref. Dhingra 5th/ed p 29; 6th/ed p 24; Current Otolaryngology 2nd/ed p 601

22. Ans. is a i.e. 220 Hz

Impedance Audiometry

1. It is an objective test for hearing^o
2. It is very useful in children for assessing the hearing loss.^o
3. It consists of:

Tympanometry	Acoustic reflex measurement
Principle: It is based on the amount of sound reflected back from the tympanic membrane when an 85dB sound pressure level (SPL) low frequency (220 Hz) ^o probe tone is introduced into the sealed ear canal, and pressure in the canal is varied. By changing the pressures in the sealed auditory canal and then measuring the reflected sound energy, it is possible to find the compliance or stiffness of the tympano-ossicular system and thus find the healthy or diseased status of the middle ear	Discussed in detail earlier

∴ Impedance audiometry is used for diagnosing middle ear pathology.

NOTE

- Various types of tympanograms are discussed in next question.
 - For infants and neonates, tympanograms obtained using a 220 Hz probe may erroneously appear normal.
- ∴ a higher frequency probe tone (660 or 1000 Hz) must be used - (Current Otolaryngology 2nd/ed p 601)

23. Ans. is b i.e. As

Ref. Dhingra 5th/ed p 30, 97-98, 6th/ed p 87

Bilateral hearing loss

+

Occurring in a female

+

25 years of age

+

Accentuation of hearing loss during pregnancy

All these features indicate toward otosclerosis as the cause of deafness

24. Ans. is a and c i.e. ASOM; and Serous otitis media

25. Ans. is a i.e. Serous otitis media

26. Ans. is d i.e. Middle ear fluid

Ref. Dhingra 6th/ed p 24, 5th/ed pp 30, 69, 71

- **Flat (or dome-shaped)** tympanogram is type B curve of tympanogram which is seen in case of fluid in middle ear.
- **Fluid (i.e. pus)** is seen in case of ASOM and sterile non purulent effusion is seen in case of serous otitis media. So, in both these conditions flat tympanogram/type B tympanogram will be seen.

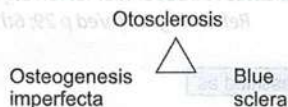
27. Ans. is d i.e. Low compliance

Ref. Scott Brown 7th/ed Vol. 3, p 3458, Dhingra 5th/ed pp 30, 97, 6th/ed p 87

This is a very interesting question – They are testing our knowledge as well as application ability.

Osteogenesis imperfecta is associated with otosclerosis.

Vander Hoeve syndrome is a triad of:



Hence – Indirectly they are seen asking the type of tympanogram in otosclerosis.

Types of Tympanogram	
Type A	Normal tympanogram
Type AS	Low-compliance tympanogram —Seen in case of fixation of ossicles i.e. otosclerosis or malleus fixation
Type Ad	High-compliance tympanogram —seen in case of ossicular discontinuity or laxated tympanic membrane
Type B	Flat/Dome-shaped tympanogram —seen in case of middle ear fluid or thick tympanic membrane
Type C	Negative compliance tympanogram —seen in case of retracted tympanic membrane

28. Ans. is b i.e. Ad type tympanogram

Ref. Dhingra 5th/ed pp 27, 30 and 34

This is also a very interesting question:

- The question says. Pure tone audiometry shows an air bone gap of 55 dB in the right ear with normal cochlear reserve.

- The air-bone gap in pure tone audiometry is a measure of total conductive deafness.
- Hence – it means there is a conductive deafness of 55 dB in the right ear.
- Next the question says – Patient has intact tympanic membrane so we have to look for a cause of this 55 dB conductive deafness.

Average hearing loss seen in different lesions of conductive apparatus *Ref. Dhingra 5th/ed p 34*

1. Complete obstruction of ear canal	30 dB
2. Perforation of tympanic membrane	10–40 dB
3. Ossicular interruption with intact drum	54 dB
4. Ossicular interruption with perforation	10–25 dB
5. Closure of oval window	60 dB

As is clear from above table – with tympanic membrane intact and a hearing loss of 55 dB is seen if ossicular chain is disrupted. Hence – it is a case of ossicular discontinuity.

Tympanogram seen in ossicular discontinuity is a high compliance tympanogram i.e. Ad tympanogram.

29. Ans. is b i.e. ototoxicity

Ref. Scott Brown 7th/ed Vol. 3 p 3572; Audiology by Ross J. Roeser, Michael Valente, Holly Hosford-Dunn 2nd/ed p 242; Ototoxicity by Peter S. Roland, John A. Rutka p 154

- Conventional audiometry tests frequencies between 0.25 kHz - 8 kHz, whereas high frequency audiometry tests in the region of 8 kHz-20 kHz. Some environmental factors, such as ototoxic medication like aminoglycosides and noise exposure, appear to be more detrimental to high frequency sensitivity than to that of mid or low frequencies. Therefore, high frequency audiometry is an effective method of monitoring losses that are suspected to have been caused by these factors. It is also effective in detecting the auditory sensitivity changes that occur with aging

NOTE

Ototoxic drugs like aminoglycosides typically affecting higher-frequency hearing first and progressing to lower frequencies.

- Otoacoustic emissions (OAE) are more sensitive at detecting auditory dysfunction than high-frequency pure tone audiometry. OAEs also have the added advantage of being practical at bedside and do not require a soundproof room.
- Distortion product OAEs are more sensitive than transient evoked OAEs for the detection of early signs of ototoxicity.

30. Ans. is c i.e. Otoacoustic emissions

31. Ans. is b i.e. Brainstem evoked response audiometry (BERA)

32. Ans. is b i.e. BERA

Ref. Logan and Turner's 10th/ed p 251, 410-415; Anirban Biswas Clinical Audio Vestibulometry 3rd/ed p 68, 99;

Dhingra 4th/ed p 117; 5th/ed p 32, 132

Dhingra 5th/131, 6th/ed p 118

Methods of hearing assessment in infants and children...

- Neonatal Screening Procedure:
 - Arousal response cradle
 - OAE
- Behavior Observation Audiometry
 - Moro's reflex
 - Cochleopapebral reflex
 - Cessation reflex
- Distraction techniques
- Condition techniques
 - Visual reinforcement audiometry
 - Play audiometry
- Objective tests
 - ABR/BERA
 - OAE
 - Impedance audiometry

Screening the Newborn for Hearing loss

- Screening newborn for hearing loss leads to earlier detection and intervention in patients with congenital hearing impairment.
- Early intervention can improve speech and language development, and educational achievement in affected patients.

Screening Tests for hearing loss

Auditory Brainstem Response (ABR/BERA)

- Measures the summation of action potential from the 8th cranial nerve (cochlear nerve) to the inferior colliculus of the midbrain in response to a click stimulus.
- Non-invasive technique to find the integrity of central auditory pathways through the 8th cranial nerve, pons and midbrain.
- Delayed or absent waves suggest a neurologic or cochlear deficit.
- Takes more time
- Child should be sedated

Otoacoustic Emissions (OAE)

- OAEs are low intensity sounds produced by outer hair cells of a normal cochlea.
- OAEs are present when outer hair cells are healthy and are absent when they are damaged.
- Help to test the function of cochlea.
- Do not disappear in 8th nerve pathology as the cochlear hair cells are normal.
- OAE helps to distinguish cochlear from retrocochlear hearing loss
- Takes less time
- Sedation not required.

Thus both ABR (or BERA) and OAE are used as a screening procedure in infants and newborn for hearing loss. In Qs 31 and 32 there is no doubt as only BERA is given in options. Q 30 asks the screening procedure of choice and both OAE and BERA are given in options. Nowhere it is mentioned which is the initial screening procedure of choice. I have chosen OAE as the answer for Q 30 as suggested by following lines of COGDT 3/e, p 625

"As such, OAE testing is commonly used in newborn hearing screening because of its speed and non invasive nature." ...COGDT 3/e, p 625

- Infants who fail a screening test, require additional audiologic evaluation.
- In infants <8 months of age should be referred for diagnostic ABR/BERA.
- Hearing loss should be confirmed by visual reinforcement audiometry (VRA), when VRA can be performed reliably (>8 months of age).
- Visual reinforcement audiometry (VRA) is the gold standard/Investigation of choice for hearing assessment for non-verbal children.
- If VRA is not given in options or in infants <8 months (even is premature infants) and mortally retarded people : Investigation of choice is BERA.

33. Ans. is a i.e. Brainstem evoked response audiometry

Ref. Dhingra 5th/ed p 32, 6th/ed p 26

BERA testing objectively assesses the neural synchrony of the auditory system from the level of eighth nerve to the midbrain

∴ It is very useful in distinguishing between cochlear pathology and retrocochlear pathology for SNHL

Cochlear SNHL – occurs due to damage of hair cells mainly

Retrocochlear SNHL – occurs due to lesion of VIIIth nerve or its central connection. Hence – BERA can diagnose a retrocochlear pathology.

34. Ans. is c i.e. Lateral lemniscus

Ref. Dhingra 5th/ed p 32, 6th/ed p 27, Scott Brown 7th/ed Vol. 3 p 3283

- In normal persons during BERA testing, 7 waves are produced in the first 10 milli second
- The 1st, 3rd and 5th wave are the most stable and are used in measurements
- These waves are studied for:
 - Absolute latency
 - Inter wave latency (between wave I and V)
 - Amplitude

Site of Origin of Waves

Wave I	-	Distal part of (Eighth nerve)	E
Wave II	-	Proximal part of Eighth cranial nerve	E
Wave III	-	Cochlear nucleus	C
Wave IV	-	Superior olivary complex	O
Wave V	-	Lateral lemniscus	L
Wave VI	-	Inferior colliculus	I
and VII			

Mnemonic **EE COLI**

35. Ans. is d i.e. ABC test

Ref. Dhingra 5th/ed p 26, 6th/ed p 22

- As discussed earlier absolute bone conduction test is a tuning fork test in which bone conduction of the patient is compared with BC of the examiner after occluding the external auditory meatus of both patient and examiner

- Bone conduction is a measure of cochlear function.

Hence, ABC test is used to detect damage to cochlea.

Rinne's test — Measure air conduction

Weber's test —

Caloric test – assesses vestibular function

36. Ans. is a i.e. Middle ear

Ref. Dhingra 5th/ed p 26

Threshold for air conduction is increased (*i.e. low frequency sounds are not heard well*) whereas that of bone conduction is normal *i.e.* Bone conduction > air conduction which is seen in conductive deafness. Conductive deafness occurs in lesions of either external ear, tympanic membrane, middle ear or ossicles up to stapedio-vestibular joint.

37. Ans. is a i.e. Cochlea

Ref. Tuli 1st/ed p 114

Subjective feeling of diplacusis, hyperacusis or fullness in the ear occurs in cochlear pathology or cochlear, sensorineural hearing loss (SNHL).

Differences between Cochlear and Retrocochlear SNHL

Cochlear SNHL	Retrocochlear SNHL
Hair cells are damaged mainly	Lesion is of VIIIth nerve or its central connections
Recruitment is present	Recruitment is absent
No significant tone decay	Tone decay is significant
SISI (Short increment sensitivity index) is positive	SISI is negative
Bekesy shows no gap between I and C tracing (Type II)	Bekesy shows wide gap between I and C tracings (Type III)
Speech discrimination is not highly impaired (SDS is low) and roll over phenomenon is not present	Speech discrimination is highly impaired (SDS very poor) and roll over phenomenon is present
Subjective feeling of diplacusis, hyperacusis or fullness in the ear	No such sensation or feeling

NOTE

SDS = Speech Discrimination Score

It is the maximum percentage of correct score when phonetically balanced single syllable words such as pin, day, bus are used.

Results

- In normal subject or conductive hearing loss, SDS is 95–100%
- In cochlear lesions SDS is low
- In retrocochlear lesions, SDS is very poor and roll over phenomenon is present (which means with increase of intensity, drop of score occurs)

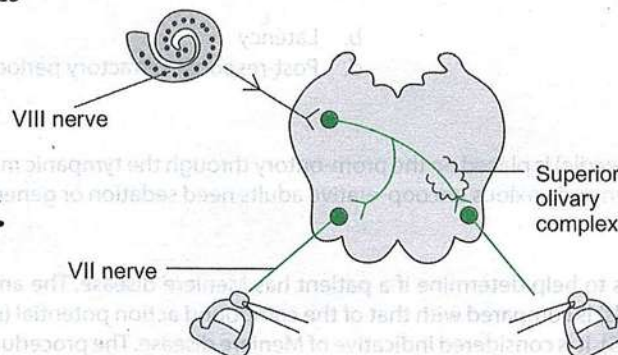
38. Ans. is b i.e. Middle ear

Ref. Dhingra 6th/ed p 24

Impedance audiometry is used to find the health or diseased status of middle ear.

39. Ans. is d i.e. VII and VIII nerves

Ref. Dhingra 6th/ed p 25



40. Ans. is c i.e. inferior vestibular nerve

Ref. Current Otolaryngology 3rd/ed p 641

Vestibular Evoked Myogenic Potentials

- The vestibular evoked myogenic potential (VEMP) are short latency electro myograms that are evoked by acoustic stimuli in high intensity and recorded from surface electrodes over the tonically contracted sternocleidomastoid muscle.
- The origin of VEMP is the saccule.
- The response pathway consists of:

- Sacculle; Inferior Vestibular Nerve, Lateral Vestibular Nucleus, Lateral Vestibulospinal Tract and Sternocleidomastoid muscle.
- The test provides diagnostic information about saccular and/or inferior vestibular nerve function.
- An intact middle ear is required for the response quality.

Waveform of the response

The VEMP waveform is characterised by a

- Wave I – positive peak at 13-15 (p13)
- Wave II – negative peak at 21-24 ms (p23)

Peak to peak amplitude of p13-23 is measured and asymmetries between the right and left side is noted (by calculating asymmetry ratio AR) Abnormal AR is seen a case of

- Saccular hydrops (AR > 36%)
- Vestibular schwannoma originating from inferior vestibular nerve.
- Vestibular neuronitis
- Superior canal dehiscence syndrome.

41. Ans. is b i.e. Outer hair cells are mainly responsible for cochlear microphonics and summation potential.

Ref. Mohan Bansal, Text book of Diseases of ENT 1st/ed p 24,25 and 145

Electrocochleography (EcoG) measures electrical potentials, which arise in cochlea and CN VIII in response to auditory stimuli within first 5 milliseconds. It consists of following three types of responses

1. Cochlear microphonics
2. Summating potentials
3. Action potential of 8th nerve

Endocochlear potential, cochlear microphonics (CM) and summating potential (SP) are from cochlea while the compound action potential (AP) is from the cochlear nerve fibers. Both CM and SP are receptor potentials similar to other sensory end-organs.

- **Endocochlear Potential:** This resting potential of +80 mV direct current (DC) is recorded from scala media. This energy source for cochlear transduction is generated from stria vascularis by Na⁺/K⁺-ATPase pump. Endolymph has high K⁺ concentration. It acts as a battery and helps in driving the current through the hair cells when they move after exposure to any sound stimulus.
- **Cochlear Microphonics:** Cochlear microphonics (CM) is an alternating current (AC) potential. Basilar membrane moves in response to sound stimulus. Changes occur in electrical resistance at the tips of OHC. Flow of K⁺ through the outer hair cells produces voltage fluctuations and called CM.

Cochlear microphonics is absent in the part of cochlea where the outer hair cells are damaged.

- **Summating Potential:** Summating potential (SP) is a DC potential, which may be either negative or positive. It is produced by hair cells. It follows the "envelop" of stimulating sound and is superimposed on cochlear nerve action potential. This is a rectified derivative of sound signal. Probably it arises from IHCs with a small contribution from OHCs.

Summating potential of cochlea helps in the diagnosis of Ménière's diseases.

- **Compound (Auditory Nerve) Action Potential:** It is the neural discharge of auditory nerve. It follows all or none phenomena so has all or none response to auditory nerve fibers. Each nerve fiber has optimum stimulus frequency for which the threshold is lowest. Amplitude increases while latency decreases with intensity over 40-50 dB range. The following features differentiate it from CM and SP:

- | | |
|-----------------|------------------------------------|
| a. No gradation | b. Latency |
| c. Propagation | d. Post-response refractory period |

Method

The recording electrode (a thin needle) is placed on the promontory through the tympanic membrane. The test can be done under local anesthesia however children and anxious uncooperative adults need sedation or general anesthesia, which has no effect on EcoG responses.

Uses

The main application of ECOG is to help determine if a patient has Meniere disease. The amplitude of the summating potential (reflecting activity of the hair cells) is compared with that of the compound action potential (reflecting whole nerve activity). If the ratio is larger than normal (0.3-0.5), it is considered indicative of Meniere disease. The procedure is considered valid only the patient is symptomatic. Now with this background lets analyse each option separately—

- **Option a** – is incorrect as ECOG is a measure of electrical potential of inner ear (and not middle ear latency).
- **Option b** – is correct as explained above – Outer hair cells are mainly responsible for cochlear microphonics and Summation Potential.
- **Option c** – is incorrect as it is not the summating potential but the action potential which is a compound of synchronous auditory nerve potential.
- **Option d** – is incorrect as Action Potential represents neural potential and not the endocochlear receptor potential which is represented by components arising from organ of corti that i.e. SP and cochlear microphonics.

CHAPTER

19

Hearing Loss

Deafness can be of two types based on its etiology viz:

- **Congenital**
- **Acquired**

Congenital causes of deafness

Prenatal	Perinatal	Postnatal
Genetic <ul style="list-style-type: none"> • Waardenburgs syndrome • Pendred syndrome • Ushers syndrome • Bing siebenmann aplasia • Mondini-alexander aplasia • Scheibe aplasia • Bartters syndrome • Klippel Feil syndrome • Treacher Collins syndrome • MELAS syndrome • Trisomy 13, 15, 21 • Cretinism 	Nongenetic <ul style="list-style-type: none"> • German measles, CMV, Rubella • Diabetes • Syphilis • Toxaemia <ul style="list-style-type: none"> – Quinine – Aminoglycosides – Thalidomide 	<ul style="list-style-type: none"> • Difficult labour • Kernicterus • Alport's syndrome • Measles • Meningitis • Head injury • Renal tubular acidosis (type 1/2 distal) • Loud noise • Ototoxic drugs

Classification of Acquired deafness

Conductive type	SN type	Mixed	Sudden
<ul style="list-style-type: none"> • External ear <ul style="list-style-type: none"> Wax/Otomycosis/foreign bodies/otitis externa/atresia/infection tumours • Ototoxicity • Middle ear <ul style="list-style-type: none"> – Meningitis – Congenital defects 	<ul style="list-style-type: none"> • Head injuries • Viral infections • Mumps, measles • Herpes • Noise trauma • Tumours 	<ul style="list-style-type: none"> • Blast injury • CSOM • Otosclerosis 	<ul style="list-style-type: none"> • Vascular • Trauma • Viral infection • Ototoxicity • Meningitis • CVA

Contd...

Contd...

Classification of Acquired deafness			
Conductive type	SN type	Mixed	Sudden
<ul style="list-style-type: none"> – Traumatic – Otitis media (OM) – Nonsuppurative OM – Tuberculosis/syphilis – Otosclerosis – Tumours – Eustachian tube block – E tube catarrh – Barotrauma 	<ul style="list-style-type: none"> • Acoustic neuroma • Meniere's disease • Ototoxicity • Presbycusis • Hypertension • CVA • Diabetes • Hypothyroidism • Smoking and alcoholism • Psychogenic deafness 		<ul style="list-style-type: none"> • Functional

Deafness can also be classified as conductive type/sensorineural type based on the site of lesion

Conductive hearing loss: Any disease process which interferes with the conduction of sound to reach cochlea causes conductive hearing loss. The lesion may lie in the external ear tympanic membrane, middle ear, ossicles up to stapediovestibular joint.

Sensorineural hearing loss: Results from lesions of the cochlea, VIIIth nerve or central auditory pathways. It may be present at birth (congenital) or start later in life (acquired).

Differences between Conductive Hearing Loss and SNHL

Conductive hearing loss	Sensorineural hearing loss
<ul style="list-style-type: none"> • Disease process is limited to external ear and middle ear, including foot plate of stapes • Rinne –ve • Weber lateralised to worse ear • ABC is normal • Pure tone audiometry shows bone air gap • Low frequencies involved • Hearing loss up to 50-60 dB • Speech discrimination score (SDS) is good (95–100%) • Test for recruitment is –ve • SISI of 15% • No tone decay • Impedance audiometry is a useful parameter • BERA not of much use 	<ul style="list-style-type: none"> • Disease process is beyond the oval window in the inner ear • Rinne +ve • Weber lateralised to better ear • ABC shortened • PTA shows no bone air gap • High frequency hearing loss • Hearing loss more than 60 dB • Poor SDS in cochlear (low score) and retrocochlear (very low score) lesion • Positive recruitment in cochlear lesion • SISI above 60% in cochlear lesion • A tone decay of 30 dB seen in retrocochlear lesion • Impedance audiometry is not of much use • BERA is a very useful diagnostic tool

Differences between Cochlear and Retrocochlear SNHL

Cochlear SNHL	Retrocochlear SNHL
<ul style="list-style-type: none"> • Hair cells are damaged mainly • Recruitment is present • NO significant tone decay • SISI is positive • Bekesy shows no gap between I and C tracings (Type II) • Speech discrimination is not highly impaired (SDS is low) and roll over phenomenon is not present • Subjective feeling of displacisus, hyperacusis or fullness in the ear 	<ul style="list-style-type: none"> • Lesion is of VIII nerve or its central connections • Recruitment absent • Tone decay is significant • SISI is negative • Bekesy shows wide gap between I and C tracings (type III) • Speech discrimination is highly impaired (SDS very poor) and roll over phenomenon is present • No such sensation or feeling

QUESTIONS

1. According to WHO classification, for severe degree of Impairment of hearing is at: [TN 2004]
 - a. 26-40 dB
 - b. 41-55 dB
 - c. 56-70 dB
 - d. 71-91 dB
2. At which level sound is painful: [Jharkhand 2004]
 - a. 100-120dB
 - b. 80-85dB
 - c. 60-65dB
 - d. 20-25dB
3. Ear sensitive to: [Jharkhand 2003]
 - a. 500-3500 Hz
 - b. 1000-3000 Hz
 - c. 300-5000 Hz
 - d. 5000-8000 Hz
4. After rupture of tympanic membrane the hearing loss is: [PGI June 99]
 - a. 10-40 dB
 - b. 5-15 dB
 - c. 20dB
 - d. 300 dB
5. Which of the following conditions causes maximum hearing loss?
 - a. Ossicular disruption with intact tympanic membrane
 - b. Disruption of malleus and incus with intact tympanic membrane
 - c. Partial fixation of the stapes footplate
 - d. Otitis media with effusion
6. Commonest cause of hearing loss in children is: [AIIMS Dec. 95]
 - a. CSOM
 - b. ASOM
 - c. Acoustic - neuroma
 - d. Chronic secretory otitis media
7. Commonest cause of hearing loss in children is: [CUPGEE 95]
 - a. Microtia with atresia of external auditory meatus
 - b. Trauma
 - c. Otitis media with effusion
 - d. Bony canal
8. Commonest cause of deafness is: [AP 97]
 - a. Trauma
 - b. Wax
 - c. Acute mastoiditis
 - d. Meniere's disease
9. All of the following can cause hearing loss except: [UP 2001]
 - a. Measles
 - b. Mumps
 - c. Chickenpox
 - d. Rubella
10. One of the following factors is not considered a high risk criteria for development of deafness: [Karn 94]
 - a. Birth asphyxia
 - b. Bacterial meningitis
 - c. Congenital [Torch] infections
 - d. Direct hyperbilirubinemia
11. Hyperacusis is defined is: [PGI Dec. 97]
 - a. Hearing of only loud soundy
 - b. Normal sounds heard as loud and painful
 - c. Completely deaf
 - d. Ability to hear in noisy surroundings
12. Conductive hearing loss is seen in all of the following except: [AI 12]
 - a. Otosclerosis
 - b. Otitis media with effusion
 - c. Endolymphatic hydrops
 - d. Suppurative otitis media
13. A patient has bilateral conductive deafness, tinnitus with positive family history. The diagnosis is: [AIIMS Nov. 93]
 - a. Otospongiosis
 - b. Tympanosclerosis
 - c. Meniere's disease
 - d. B/L otitis media
14. Conductive deafness occurs in: [UP 07]
 - a. Travelling in aeroplane or ship
 - b. Trauma to labyrinth
 - c. Stapes abnormal at oval window
 - d. High noise
15. A 55 years old female presents with tinnitus, dizziness and h/o progressive deafness. Differential diagnosis includes all except: [AIIMS Nov. 01]
 - a. Acoustic neuroma
 - b. Endolymphatic hydrops
 - c. Meningioma
 - d. Histiocytosis -X
16. Otitic barotrauma results due to: [PGI June 97]
 - a. Ascent in air
 - b. Descent in air
 - c. Linear acceleration
 - d. Sudden acceleration
17. All are ototoxic drugs except: [RJ 2000]
 - a. Streptomycin
 - b. Quinine
 - c. Diuretics
 - d. Propanolol
18. Post head injury, the patient had conductive deafness and on examination, tympanic membrane was normal and mobile. Likely diagnosis is:
 - a. Distortion of ossicular chain
 - b. Haemotympanum
 - c. EAC sclerosis
 - d. Otosclerosis
19. All are causes of sensorineural deafness Except: [2001]
 - a. Old age
 - b. Cochlear otosclerosis
 - c. Loud sound
 - d. Rupture of tympanic membrane
20. Virus causing acute onset sensorineural deafness: [PGI Dec. 04]
 - a. Corona virus
 - b. Rubella Measles
 - c. Mumps
 - d. Adeno virus
 - e. Rota virus
21. Sensorineural deafness may be feature of all, except:
 - a. Nail-patella syndrome
 - b. Distal renal tubular acidosis
 - c. Bartter syndrome
 - d. Alport syndrome
22. Sensorineural deafness is seen in: [PGI June 02]
 - a. Alport's syndrome
 - b. Pendred's syndrome
 - c. Treacher-Collins syndrome
 - d. Crouzon's disease
 - e. Michel's aplasia
23. Fluctuating recurring variable sensorineural deafness is seen in: [APPGI 06]
 - a. Serous otitis media
 - b. Haemotympanum
 - c. Perilabyrinthine fistula
 - d. Labirinthine concussion

EXPLANATIONS AND REFERENCES

1. Ans. is d i.e. 71-91dB

Ref. Dhingra 5th/ed pg 43, 6th/ed p 38 (Table 5.9)

Hearing loss and difficulty in hearing speech

WHO classification of degree of hearing Loss and Difficulty in Hearing Speech

Hearing threshold in better ear (average of 5,00, 1000, 2000 Hz)	Degree of impairment (Who classification)	Ability to understand speech
0-25	Not significant	No significant difficulty with faint speech
26-40	Mild	Difficulty with faint speech
41-55	Moderate	Frequent difficulty with normal speech
56-70	Moderately severe	Frequency difficulty even with loud speech
71-90	Severe	Can understand only shouted or amplified speech
Above 91	Profound	Usually cannot understand even amplified speech

ALSO KNOW

Common Terminology

- **Hearing loss** is impairment of hearing and its severity may vary from mild to severe or profound.
- **Deafness:** It is used when there is little or no hearing at all.

WHO Definition of 'Deaf'

- The term deaf should be applied only to those individual whose hearing impairment is so severe that they are unable to benefit from any type of amplification.
- **According to Ministry of social welfare, Govt of India.**
- **Deaf** are those in whom the sense of hearing is non functional for ordinary purposes of life.
- They do not hear/understand sounds at all even with amplified speech.
- The cases included in this category are those who have either loss more than 90dB hearing loss in better ear or total hearing loss in both ears.
- **Partially hearing** are those falling under any one of the following categories

Category	Hearing
Mild impairment	Between 30-45 dB in better ear
Serious impairment	Between 45-60dB in better ear
Severe impairment	Between 60-90 dB in better ear

2. Ans. is a i.e. 100 – 120 dB

Ref. Dhingra 5th/ed pg 23, 6th/ed p 19

Intensity

Whisper	30 dB
Normal conversation	60 dB
Shout	90 dB
Discomfort of ear	120 dB
Pain in ear	130 dB

Since the highest intensity given in the question is 100-120 dB Hence – we are taking it as our correct answer.

3. Ans. is a i.e. 500 – 3500 HZ

Ref. Guyton 11th/ed p 657

Ear best perceives sound in the frequency of 500 – 5000 HZ.

4. Ans. is a i.e. (10-40dB)

5. Ans. is a i.e. Ossicular disruption with intact tympanic membrane

Ref. Dhingra 4th/ed p 30, 5th/ed pg 34, 6th/ed p 29

Average hearing loss seen in different lesions of conductive apparatus:

Condition	Average 7hearing loss
Closure of oval window	60 dB
Ossicular interruption with intact TM	54 dB
Ossicular interruption with perforation	38 dB
Complete obstruction of ear canal	30 dB
TM perforation	10-40 dB

4. Ans. is clear i.e. rupture of tympanic membrane causes a loss of between 10-40 dB depending on the size of perforation.

Coming on to ans 5.

- Hearing loss in otitis media with effusion:
 - Mean = 20 - 30dB. ... Internet search

- Hearing loss in ossicular fixation:

- Malleus fixation = 10 - 25dB – Dhingra 5th/ed pg 34, 6th/ed p 29

- Stapes fixation = upto 50dB ... Internet search

So it is clear - ossicular disruption with intact tympanic membrane causes maximum hearing loss. **Option 'b'** (of Ans 5) can give rise to some confusion but option b is disruption of malleus and incus (with stapes intact) whereas in **option 'a' of ans 5**, malleus, incus and stapes are all disrupted which definitely will lead to more hearing loss.

6. Ans. is d i.e. Chronic secretory otitis media Ref. Ghai 6th/ed p 334; Ghai 7th/ed p 333; Current Otolaryngology 2nd/ed pg 658

7. Ans. is c i.e. Otitis media with effusion

"The most common cause of conductive deafness in children is otitis media with effusion, which is typically of mild to moderate severity."

... Ghai 6th/ed p 334; Ghai 7th/ed pg 333

Otitis media with effusion / glue ear / chronic serous or secretory otitis media -

"It is the most common cause of hearing loss in children in the developed world and has peak incidence at 2 and 5 years of age" -

Current otolaryngology 2nd/ed pg 658

For more details on Secretory otitis media or Otitis media with effusion, see Chapter: Diseases of middle ear in this book.

8. Ans. is b i.e. Wax Ref. Dhingra 3rd/ed p 68

Searching

9. Ans. is c i.e. Chicken pox

Ref. OP Ghai 7/e p. 333

"The most common postnatal cause of acquired SNHL is meningitis, while the most common prenatal cause is intrauterine infection (eg TORCH infections, syphilis, mumps, measles)".

– OP Ghai 7th/ed p 333

10. Ans. is None Ref. Dhingra 6th/ed p 115-116 and 5/e pg-128,130 Ghai 6/e, p 335, table (13.1)

Risk factors for hearing loss in children (Recommendations of Joint committee on infant hearing).

- Apgar score of 0-4 at 1 min or 0-6 at 5 mins (indicating birth asphyxia)^a
- Birth weight <1.5 kg^a
- Bilirubin (bilirubin > 20mg% damages cochlear nuclei)^a
- Craniofacial anomalies
- Drugs / ototoxic medications
- Family history of hearing loss
- Prenatal TORCH infection
- Bacterial meningitis
- Mechanical ventilation for ≥ 5 days
- Stigmata or other findings associated with a syndrome known to cause SNHL/ conductive hearing loss.

11. Ans. is b i.e. Normal sounds heard as loud and painful Ref. Logan Turner 10th/ed p 237; Maqbool 11th/ed p 31

Hyperacusis	Sensation of discomfort or pain on exposure to normal sounds. Seen in injury to nerve to stapedius and in case of congenital syphilis (Hennebert sign)
Displacusis	Condition where same tone is heard as notes of different pitch in either ear
Paracusis willisii	Condition where patient hears a sound better in presence of background noise. Seen in case of otosclerosis

ALSO KNOW

Tullio phenomenon condition where the subject gets attacks of vertigo / dizziness by loud sounds. It occurs in patients with labyrinthine fistula or those who have undergone fenestration operation.

12. Ans. c i.e. Endolymphatic hydrops

Ref. 6th/ed p 30 Table 5.1 and 5.2

Endolymphatic hydrops i.e. meniers disease leads to SNHL and not conductive hearing loss. All the rest can lead to conductive hearing loss

Congenital causes of conductive hearing loss

- Mental atresia
- Fixation of stapes footplate

- Fixation of malleus head
- Ossicular discontinuity
- Congenital cholesteatoma

Acquired causes of conductive hearing loss

- External ear** Any obstruction in the ear canal, e.g. wax, foreign body, furuncle, acute inflammatory swelling, being or malignant tumor or atresia of canal.
- Middle ear**
- (a) Perforation of tympanic membrane, traumatic or infective
 - (b) Fluid in the middle ear, e.g. acute otitis media, serous otitis media or haemotympanum
 - (c) Mass in middle ear, e.g. benign or malignant tumour
 - (d) Disruption of ossicles, e.g. trauma to ossicular chain, chronic suppurative otitis media, cholesteatoma
 - (e) Fixation of ossicles, e.g. otosclerosis, tympanosclerosis, adhesive otitis media
 - (f) Eustachian tube blockage, e.g. retracted tympanic membrane, serous otitis media.

13. Ans. is a i.e. Otospongiosis

Ref. Dhingra 6th/ed p 30, 87 5th/ed p 34, 35, 97

Conductive deafness means the disease process leading to deafness is limited to external ear tympanic membrane, middle ear including the footplate of stapes.

Bilateral conductive deafness rules out meniere's disease (as it presents with SNHL).

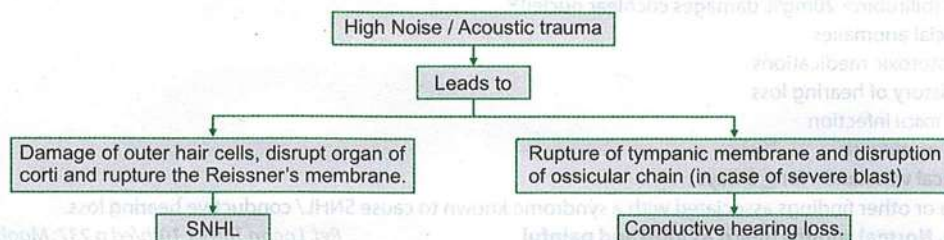
Amongst the remaining three options, positive family history is seen mainly in case of otosclerosis (Otospongiosis) so it is our answer.

14. Ans. is a, c and d i.e. Travelling in Aeroplane and Ship; Stapes abnormal at oval window; and High noise

Ref. Dhingra 5th/ed pg 74, 6th/ed p 66, 30, 33, 35

Otitic Barotrauma or travelling in aeroplane/ship leads to conductive hearing loss but sensorineural type of loss may also be seen.

- Trauma to labyrinth leads to SNHL. ... Dhingra 6th/ed pg. 66
- Abnormal attachment of stapes at oval window (otosclerosis) will lead to conductive deafness. ... Dhingra 6th/ed pg 33



15. Ans. is d i.e. Histiocytosis X

... Dhingra 5th/ed pg 40, 6th/ed p 34
Ref. Dhingra 5th/ed p 38; Harrison 17th/ed p 2603

Acoustic neuroma and endolymphatic hydrops (**Meniere's disease**) can lead to SNHL and tinnitus (Dhingra 5/e p. 38). Meningioma can cause deafness, and tinnitus as a part of Neurofibromatosis type 2 syndrome (Harrison 17th/ed p 2603) and its peak incidence occurs in middle age.

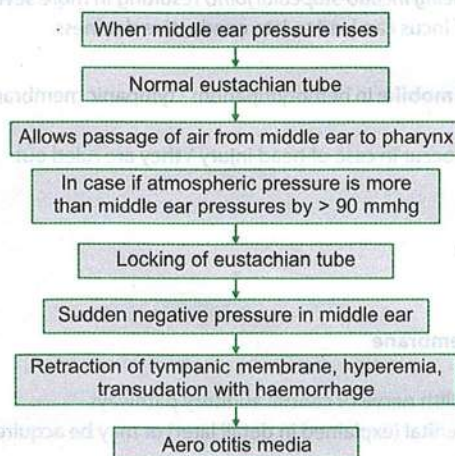
No where it is mentioned histiocytosis X causes deafness and tinnitus. Another point which goes against it is the age of patient (55 years) as histiocytosis occurs mainly in children.

16. Ans. is b i.e. Descent in air

Ref. Dhingra 5th/ed p 74, 6th/ed p 66

Otitic Barotrauma: It this condition, Eustachian tube fails to maintain middle ear pressure at ambient atmospheric level

- Etiology:**
- Rapid descent during aircraft
 - Underwater diving
 - Compression in pressure chamber.

Mechanism**Clinical Features**

- Severe earache, deafness, tinnitus, vertigo.
- On examination - Tympanic membrane is retracted, congested or there may be effusion in middle ear.
- Conductive type of hearing loss is present.

Precautions

- Avoid traveling during upper respiratory infection.
- Avoid sleep during descent.
- Do Valsalva or swallowing or yawning during descent of flight.

Treatment

- Middle ear ventilation should be restored by decongestants, catheterization or even myringotomy.

17. Ans. is d i.e. propranolol

Ref. Scott's Brown 7th/ed vol-3 pg- 3568 Table 238 d.1

Ototoxic Drugs

Class	Examples	Predominant ototoxic effects
1. Antimalarial	Quinine	Temporary hearing loss, tinnitus
2. Analgesia, Antipyretics	Aspirin	Temporary hearing loss, tinnitus
3. Aminoglycoside	Amikacin, gentamicin, kanamycin, streptomycin, Neomycin, netilmicin, tobramycin, isipamicin	Permanent hearing loss and /or vestibular injury
4. Antineoplastics	Cisplatin/Carboplatin	Permanent hearing loss and /or vestibular injury
5. Diuretics	Ethacrynic acid, furosemide	Temporary hearing loss
6. Industrial solvents	Toluene benzene	Permanent hearing loss in animals, inconclusive evidence in man.
7. Polypeptide antibiotics	Viomycin, vancomycin	Permanent vestibular injury and / or hearing loss
8. Macrolide antibiotics	Erythromycin, azithromycin clarithromycin	Temporary hearing loss

[Agents for which there have been isolated reports of ototoxicity are:

Arsenals, Bromides, chloramphenicol, chlorhexidine, erythromycin, Mercury, polymyxin B, Tetracycline, vinblastine and Vincristine

18. Ans. is a i.e. Distortion of ossicular chain

Ref. Logan Turner 10th/ed p 347

In post head injury, the conductive deafness may occur due to:

- Fracture temporal bone (more commonly longitudinal) extending to external canal: tympanic membrane is frequently torn and inner ear is spared.

- Blood or CSF in external and middle ear.
- Damage to ossicle (*most frequent being incudo-stapedial joint*) resulting in more severe and permanent conductive deafness.
- Aseptic necrosis of long process of incus can lead to late conductive deafness.

In the Question it is given:

Tympanic membrane is normal and mobile: In hemotympanum - tympanic membrane will appear red/blue [due to presence of blood pigments] so it is ruled out. ...Logan Turner 10th/ed p 441

Otosclerosis and EAC sclerosis do not occur in case of head injury \ they are ruled out

ALSO KNOW

Causes of SNHL in case of head injury:

- Labyrinthine concussion
- Vestibular damage

19. Ans. is d i.e. rupture of tympanic membrane

Ref. Dhingra 5th/ed pg 38, 6th/ed p 32

SNHL – Sensorineural hearing loss:

- It results from lesions of cochlea, VIIIth nerve or central auditory pathways
- It may be present at birth i.e. congenital (explained in detail later) or may be acquired.

Common Causes of Acquired SNHL

- Infection of labyrinth – viral, bacterial or spirochetal
- Trauma to labyrinth (as in # of temporal bone)
- Noise induced hearing loss
- Ototoxic drugs
- Old age/Presbycusis
- Meniere's disease
- Acoustic neuroma
- Sudden hearing loss
- Systemic diseases like diabetes, hypothyroidism, kidney disease, Autoimmune diseases, multiple sclerosis, blood dyscrasias
- Familial progressive SNHL.

From the above list–It is clear that Option a i.e. old age and option c i.e. loud sound-cause SNHL

Since SNHL results from lesions of cochlea – cochlear otosclerosis which is a variant of normal otosclerosis (which causes conductive deafness) will cause sensorineural deafness (i.e. option b is correct)

Perforation / Rupture of tympanic membrane causes conductive deafness and not- SNHL.

NOTE

Loud noise can lead to both SNHL and conductive deafness (which occurs only in case of severe blast).

20. Ans. is b and c i.e. Rubella / measles; and Mumps

Ref. Scott Brown 7th/ed p 3579; OP Ghai 7th/ed p 333

"The most common postnatal cause of acquired SNHL is meningitis, while the most common prenatal cause is intrauterine infection (eg TORCH infections, syphilis, mumps, measles)".

– OP Ghai 7th/ed p 333

According to Scotts Brown 7/e p. 3579 – Specific viruses like mumps and syphilis and encephalitis can cause sudden sensorineural hearing loss.

21. Ans. is None

Ref. Harrison 16th/ed p 1692; 17th/ed p 1794; Dhingra 5th/ed pg 129, 6th/ed p 30, 116; Maqbool 11th/ed p 116

22. Ans is a, b, c and e i.e. Alport's syndrome; Pendred's syndrome; Treacher-Collins syndrome and Michel's aplasia.

Causes of Congenital Deafness

Conductive

- Meatal atresia
- Fixation of stapes footplate
- Fixation of malleus head
- Congenital cholesteatoma
- Ossicular discontinuity
- Crouzon's syndrome
- Apert's syndrome

mnemonic**Sensorineural deafness****Assistant****Branch****Manager****W****A****R****K****U****T****Just****Loves****To****Have****Pineapple****And****Orange****Raita****: Aplasia****: Bartter's syndrome****: MELAS****: Waardenburg syndrome/ wildervanck syndrome****: Alport syndrome (SNHL develops by the age of 30 yrs)****: Refsum syndrome****: Klippel feil syndrome****: Ushers syndrome****: Treacher Collins syndrome****: Jervell and Lange neilson syndrome****: Leopard syndrome****: Trisomy 13, 15, 21****: Hyper pigmentation****: Pendred syndrome****: Albinism****: Onychodystrophy****: Renal tubular acidosis (Distal/Type I)****NOTE**

Stickler syndrome Treacher collins syndrome (current otolaryngology 2/e pg-700), vander hoeve syndrome, Pierre Robin syndrome can lead to both SNHL or conductive hearing loss.

Aplasia - Michels aplasia: characterised by lack of development of inner ear. External ear and middle ear may be normally functioning.

Other aplasias: Mondini aplasia/scheibe aplasia / Alexandar aplasia.

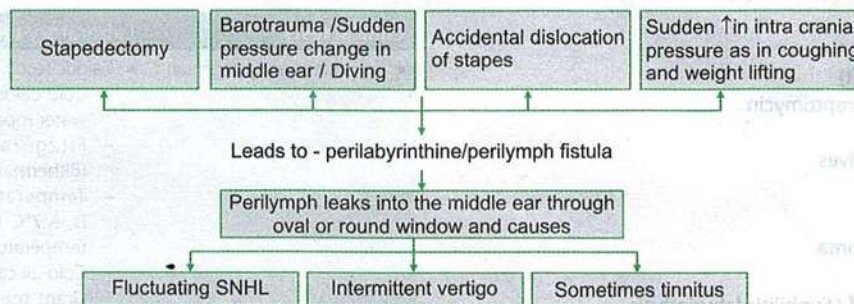
Nail Patella Syndrome

- An autosomal dominant trait⁹.
- Iliac horns develop on the pelvis
- Characterised by: multiple osseous abnormalities primarily affecting the elbows knees and nail.
- 50% patients have clinically evident nephropathy.
- It is associated with neural – sensory hearing impairment and Glaucoma.

23. Ans. is c i.e. Perilabyrinthine fistula

... Harrison 17th/ed p 1794

Ref. Dhingra 4th/ed p 46, 5th/ed pg 52



CHAPTER

20

Assessment of Vestibular Function

Derangement of Vestibular system is indicated by:

- Vertigo
- Nystagmus

VERTIGO

It is hallucination of movement i.e. one feels as if a person is moving as compared to his surroundings or vice versa.

Causes of vertigo: (VE² RT² IGO²)

- **Vascular: (V)**
 - Thromboembolic phenomenon
 - Vertebrobasilar insufficiency
 - Anaemia
 - Hyper/hypotension
- **Epilepsy: (E)**
- **Endocrinological disorders: (E)**
 - Diabetes
 - Hypothyroidism
- **Remedial drugs: (R)**
 - Antibiotics - streptomycin
 - Sedatives
 - Antihypertensives
- **Trauma - T**
- **Tumour - T**
 - Acoustic neuroma
- **Infections - I**
 - Viral / Bacterial / Syphilitic labyrinthitis.
- **Glial disease: (G)**
 - Disseminated sclerosis
- **Ocular disease: (O)**
 - High refractive error
 - Diplopia.
- **Others: (O)**
 - Menieres disease
 - Vestibular neuronitis

- BPPV (Benign Paroxysmal positional vertigo)
- Lermoyez syndrome

NYSTAGMUS

It is involuntary, rhythmical, oscillatory movements of eyes away from direction of gaze.

Nystagmus has 2 components

Quick (fast) component

Slow component

NOTE

- Nystagmus is named after quick component.
- It is eliminated under the effect of anaesthesia.

Tests for Vestibular Functions

Clinical tests	Laboratory test
<ul style="list-style-type: none"> • Spontaneous nystagmus 	<ul style="list-style-type: none"> • Caloric test <ul style="list-style-type: none"> - Cold caloric tests with ice cold water modified (Kobrak's test) - Fitzgerald-Hallpike test (Bithermal caloric test) - Temperature of water used is + 7°C from normal body temperature - Cold-air caloric test by Dundas-Grant method. Done in case of perforation of tympanic membrane.
<ul style="list-style-type: none"> • Fistula test^o • Romberg test • Gait • Past-pointing and falling^o • Hallpike maneuver (positional test) 	<ul style="list-style-type: none"> • Electronystagmography • Optokinetic test • Rotation test • Galvanic test^o • Posturography

- **Fistula test** is done by pressing the tragus and alternately releasing it or by compression of air by Siegle's speculum. Positive test is indicated by vertigo and nystagmus and signifies presence of fistulous communication between middle ear and labyrinth. Negative test signifies absence of fistula and fistula with dead labyrinth.
- **Galvanic test** is the only vestibular test which helps in differentiating an end organ lesion from that of vestibular nerve lesion.
- **Hennebert's sign:** This is positive fistula test in the absence of fistula. The causes include congenital syphilis (utricular adhesions to stapes) and some cases of Meniere's disease.
- **Romberg's sign:** It is indicative of not the cerebellum lesions but the dorsal column (somatosensory) lesions.
- **Frenzel glass:** Nystagmus is best observed in the darkened room by illuminated Frenzel glass, which is nothing but a 20 diopters lens.
- **Causes of ipsilateral (same direction) nystagmus:** Irrigation of ear with warm water and serous labyrinthitis.
- **Causes of contralateral (opposite direction) nystagmus:** Purulent labyrinthitis, labyrinthectomy and irrigation of ear with cold water.
- **Dix-Hallpike maneuver:** This test is used in patients with episodic positional vertigo. On Dix-Hallpike testing, central nystagmus appears immediately without a latent period as soon as head is in critical position.
- **Fitzgerald Bithermal caloric test:** The lateral (horizontal) semicircular canal (SCC) is stimulated (tested) by irrigating cold (30°C) and warm (44°C) water in the external auditory canal. Cold water induces opposite side nystagmus while warm water results into the same side nystagmus (COWS (Cold, opposite; Warm, same)). In a sitting position with head tilted 60° backward, lateral semicircular canal is stimulated during caloric testing. To bring the lateral SCC in vertical position, patient's head is raised 30° forward if s/he is in supine position but in a sitting position the head is tilted 60° backward.

QUESTIONS

1. Which of the following statement regarding Eustachian tube dysfunction is wrong? [AP 2000]
 - a. Undistorted light image on the anterior quadrant of tympanic membrane
 - b. No movement of the tympanic membrane on siegel's method
 - c. Malleus is easily visible
 - d. Lusterless tympanic membrane
2. Common cause of eustachian diseases is due:
 - a. Adenoids
 - b. Siegle's
 - c. Otitis media
 - d. Pharyngitis
3. All are tests to check eustachian tube patency except: [AIIMS]
 - a. Valsalva manuvre
 - b. Fistula's test
 - c. Frenzel's manuvre
 - d. Tonybee's manuvre
4. Semicircular canal involved in Positive Romberg test with eyes closed detects defect in: [AIIMS may 09]
 - a. Proprioceptive pathway
 - b. Cerebellum
 - c. Spinothalamic tract
 - d. Peripheral nerve
5. Site of lesion in unilateral past pointing nystagmus is: [AIIMS June 97]
 - a. Posterior semicircular canal
 - b. Superior semicircular canal
 - c. Flocculonodular node
 - d. Cerebellar hemisphere
6. Post traumatic vertigo is due to: [PGI June 06, 03]
 - a. Perilymphatic fistula
 - b. Vestibular neuritis
 - c. Secondary endolymphatic hydrops
 - d. Ossicular discontinuity
 - e. Benign Positional vertigo
7. Postitonal vertigo is: [UP 2001]
 - a. Lateral
 - b. Superior
 - c. Inferior
 - d. Posterior
8. What is th treatment for Benign Positional vertigo? [APPG 06]
 - a. Vestibular exercises
 - b. Vestibular sedatives
 - c. Anthistamines
 - d. Diuretics
9. Latest treatment in BPPV is: [Kerala 03]
 - a. Intralabyrinthine streptomycin
 - b. Intralabyrinthine steroids
 - c. Valsava manuvre
 - d. None
10. Vestibular function is tested by: [PGI Dec. 02]
 - a. Galvanic Stimulation test
 - b. Acoustic reflex
 - c. Fistula test
 - d. Impedance audiometry
 - e. Cold caloric test
11. Fistula test stimulates:
 - a. Lateral semicircular canal
 - b. Posterior semicircular canal
 - c. Anterior semicircular canal
 - d. Cochlea
12. On otological examination all of the following will have positive fistula test except: [AI 02]
 - a. Dead ear
 - b. Labyrinthine fistula
 - c. Hypermobile stapes footplate
 - d. Following fenestration surgery
13. A positive fistula test during Siegelisation indicates: [2000]
 - a. Ossicular discontinuity
 - b. Para-labyrinthitis due to erosion of lateral semi-circular canal
 - c. CSF leak through the ear
 - d. Fixation of stapes bone
14. False positive fistula test is associated with: (TN 2005)
 - a. Perilymph fistula
 - b. Malignant sclerosis
 - c. Congenital syphilis
 - d. Cholesteatoma
15. Hallpike test is done for: [DNB 2002]
 - a. Vestibular function
 - b. Corneal test
 - c. Cochlear function
 - d. Audiometry
16. Fitzgerald's caloric test uses temperature at: [JIPMER 92]
 - a. 30°C and 44°C
 - b. 34°C and 41°C
 - c. 33°C and 21°C
 - d. 37°C and 41°C
17. At what angle is Hallpike thermal caloric test done: [APPGI 06]
 - a. 15°
 - b. 30°
 - c. 45°
 - d. 60°
18. Cold caloric test stimulates: [AP 2008]
 - a. Cochlea
 - b. Lateral semi circular canal
 - c. Posterior semicircular canal
 - d. All
19. In 'cold caloric stimulation test1, the cold water, induces movement of the eye ball in the following direction: [AI 99]
 - a. Towards the opposite side
 - b. Towards the same side
 - c. Upwards
 - d. Downwards
20. In Fitzgerald Hallpike differential caloric test, cold-water irrigation at 30 degrees centigrade in the left ear in a normal person will include: [2000]
 - a. Nystagmus to the right side
 - b. Nystagmus to the left side
 - c. Direction changing nystagmus
 - d. Positional nystagmus
21. Which of the following is not true of caloric test? [MH 2005]
 - a. Induction of nystagmus by thermal stimulation
 - b. Normally, cold water induces nystatmus to opposite side and warm water to same side.
 - c. In canal paresis the test is inconclusive
 - d. None

- 22. Caloric test has:** [Delhi 96]
 a. Slow component only b. Fast component only
 c. Slow + fast component d. Fast component occasionally
- 23. Spontaneous vertical nystagmus is seen in the lesion of:** [Kolkatta -2005]
 a. Midbrain b. Labyrinth
 c. Vestibule d. Cochlea
- 24. True about central nystagmus:**
 a. Horizontal
 b. Direction fixed
 c. Direction changes
 d. Not suppressed by visual fixation
 e. Suppressed by visual fixation
- 25. Third window effect is seen in:** [AIIMS Nov 2012]
 a. Perforated tympanum
 b. Dehiscent superior semicircular canal
 c. Round window
 d. Oval window
- 26. Features of superior canal dehiscence are:** [PGI -2010]
 a. Positive Romberg's sign
 b. Positive Tullio's phenomenon
 c. Positive Hennebert's sign
 d. Oscillopsia
 e. Positive Dix-Hallpike Maneuver
- 27. Vertigo is defined as:** [FMGE 2013]
 a. Subjective sense of imbalance
 b. Objective sense of imbalance
 c. Both of the above
 d. Round movement
- 28. Calorie test based on thermal stimulation stimulates of which part of the semi circular canals:** [FMGE 2013]
 a. Posterior b. Anterior
 c. Lateral d. All of the above

NEET PATTERN

- 29. In cold caloric stimulation test, the cold water, induces movement of the eye ball in the following direction:** [NEET Pattern]
 a. Towards the opposite side
 b. Towards the same side
 c. Upwards
 d. Downwards
- 30. Epleys maneuver:** [NEET Pattern]
 a. Positional vertigo b. Otosclerosis
 c. ASOM d. CSOM

EXPLANATIONS AND REFERENCES

- 1. Ans. is a i.e. undistorted light image on the anterior quadrant of tympanic membrane**

Ref. Dhingra 5th/ed pg 66,61, 6th/ed p 55, 57-59

Eustachian Tube Dysfunction

- Normally Eustachian tube (ET) is closed and opens intermittently during yawning, swallowing and sneezing through active contraction of Tensor veli palatini muscle.
- It serves important functions like

Ventilation and regulation of middle ear pressure

Protection against
 • Naso pharyngeal sound pressure
 • Reflux of nasopharyngeal secretions.

• Middle ear clearance of secretions

- When ET is blocked it leads to negative pressure in middle ear and retraction of Tympanic membrane

Symptoms

- Otalgia /ear pain^o
- Hearing loss^o
- Popping sensation^o
- Tinnitus
- Disturbance of equilibrium or vertigo

O/E

- Tympanic membrane is retracted^o
- i.e. cone of light will be distorted obviously
- Congestion along the handle of malleus (i.e. malleus will be easily visible)
- Transudate will be visible behind the tympanic membrane imparting it an amber colour (i.e. it will be lusterless)
- In severe cases as in barotraumas, there may be visible haemorrhages /hemotympanum or even perforation of the tympanic membrane.

Friends here it is very important to know **features of Retracted Tympanic membrane:**

1. It appears dull and lusterless
2. Cone of light is absent or interrupted
3. Handle of malleus appears foreshortened
4. Lateral process of malleus becomes more prominent
5. Anterior and posterior malleal folds become sickle shaped.

So even if we do not know anything about Eustachian tube blockage – then also, by just remembering the features of retracted tympanic membrane, we can solve this one.

2. Ans. is a i.e Adenoids

Eustachian Tube dysfunction is commonly caused by:

- Adenoids / allergy
- Barotrauma
- Cleft palate
- Down syndrome
- Nasal condition like:
 - Polyps
 - Sinusitis
 - DNS
 - Nasopharyngeal tumor / mass

Ref. Dhingra 5th/ed pg 67, 6th/ed p 60

3. Ans. is b i.e. Fistula test

This question can be solved even if we don't know all tests for eustachian tube patency, because we know fistula test is for assessing vestibular functions and not for Eustachian tube patency. Still it is worth while knowing tests for eustachian tube patency.

Ref. Dhingra 5th/ed pg 65-66, 6th/ed p 59

Tests for Eustachian Tube Patency

Mnemonic:	PMT Is So Very Furiously Complicated
P	P olitzer test ^o
M	M ethylene blue test ^o
T	T oynbee test ^o
I s	I nflation, Deflation test ^o
S o	S onotubometry ^o
V ery	V alsalva test ^o
F uriously	F renzel manoeuvre ^o
C omplicated	C atheterization ^o

... Dhingra 5th/ed pg 458

4. Ans. is a i.e. Proprioceptive pathway

Ref. Dhingra 5th/ed pg 47; Neurological differential diagnosis by Roongrof Bhidayasiri, Michael F. Waters, Christopher C. Giza pg 94; Scotts Brown 7th/ed vol-3 pg 3731

The Romberg is a test of proprioceptive function:

- "The Romberg test explores for imbalance due to proprioceptive sensory loss. The patient is able to stand with feet together and eyes open but sways or falls with eyes closed; it is one of the earliest signs of posterior column disease."
- DeJong's the neurologic examination By William Wesley Campbell, Russell N. DeJong, Armin F. Haerer 6/e p447

Proprioceptive pathway:

- Proprioception is the ability to sense the position of one's extremities without the aid of vision.
- The peripheral sense organs are located in the muscle, tendons, and joints. The first cell body is situated in the dorsal root ganglion, going without a synapse to the ipsilateral fasciculi cuneatus and gracilis (**dorsal column**) to the lower medulla where the synapse occurs. Following a decussation of the internal arcuate fibers, the impulses ascend in the **medial lemniscus** to the thalamus, terminating in the parietal lobe, posterior to those that convey touch.

Pathophysiological basis of Romberg test:

Central postural control (equilibrium) is dependent on input from three peripheral modalities:

1. Joint position sense (proprioception), carried in the dorsal columns of the spinal cord;
2. Vision
3. Vestibular apparatus

- Disturbance in any one of these modalities can be compensated for (completely or incompletely) by input from the other two systems.

- Impaired proprioception can be overcome by visual and vestibular feedback. However, reduced visual input in the dark surroundings or due to failing vision can seriously predispose such a patient to severe incoordination (ataxial)
- Asking the patient to close his eyes during Romberg's test helps uncover any disordered proprioception that may have been masked by vision.
- Conditions commonly causing a positive Romberg test:
 - Posterior column dysfunction
 - Posterior cord compression
 - Multiple sclerosis
 - Subacute combined degeneration of the spinal cord
 - Tabes dorsalis
 - Sensory polyneuropathy
 - Idiopathic
 - Diabetes mellitus
 - Intracranial lesions
 - Less common

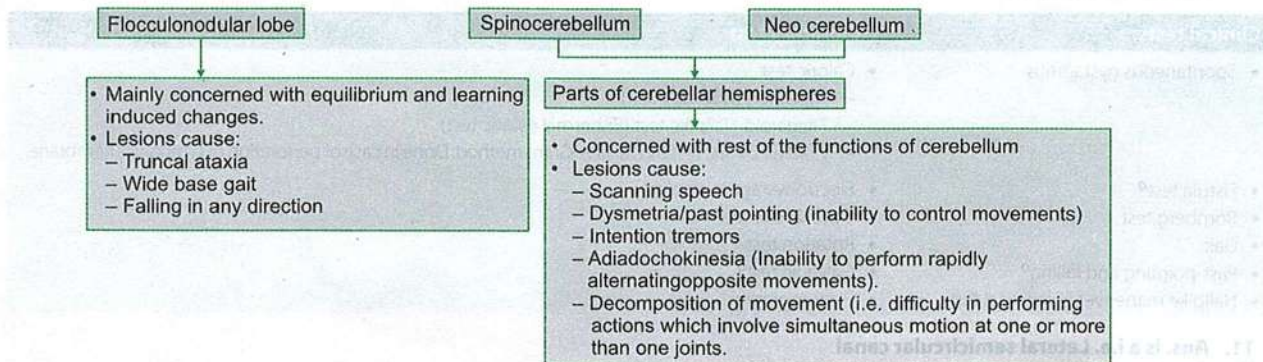
NOTE

Romberg's test is not a test of cerebellar function. Patients with cerebellar ataxia will, generally, be unable to balance even with the eyes open.

5. Ans. is d i.e. Cerebellar hemisphere

Ref. Ganong 22th/ed p 221, 222; Dhingra 6th/ed p 46

Cerebellum is Functionally Divided Into



Nystagmus can occur in both midline or hemispherical disease, but past pointing indicates hemispherical lesion.

6. Ans. is a, c and e i.e. Perilymphatic fistula, Secondary endolymphatic hydrops and BPPV

Ref. Dhingra 6th/ed p 46; Current otolaryngology 2nd/ed pg 714

Post traumatic vertigo can be seen in:

- Severe trauma to parietal skull bone
 - Longitudinal temporal bone #
 - Whiplash injury
 - Barotrauma
 - Severe acoustic trauma
- cause concussion of labyrinth or completely disrupt bony labyrinth or cause injury of VIII nerve or cause a perilymphatic fistula

In case of acoustic trauma vertigo can be due to disturbance in the vestibular end organs i.e. otitis

- **Secondary endolymphatic hydrops (secondary Meniere's disease)** is clinical presentation of Meniere's disease viz episodic vertigo, fluctuating hear loss, tinnitus and ear fullness due to conditions like head trauma or ear surgery, viral infection (measles/mumps) syphilis and Logan's syndrome.
- **Benign Paroxysmal positional vertigo:** It is most common type of peripheral vertigo which arises due to collection of debris in posterior semicircular canal. 20% patients of BPPV have an antecedent h/o head trauma.

7. Ans. is d i.e. Posterior

8. Ans. is a i.e. Vestibular exercises

9. Ans. is d i.e. None

Ref. Dhingra 5th/ed pg 51, 6th/ed p 45; Current Otolaryngology 2nd/ed pg 713-714

Benign Paroxysmal Positional Vertigo

- Characterised by vertigo when the head is placed in certain critical position.
- Not associated with hearing loss or any other symptom.
- **Caused by disorder of posterior semicircular canal.**^a (generally debris is collected in it)
- Average age of presentation -5th decade
- History of head trauma/ear infections may be present in 20% cases.
- Vertigo is fatiguable
- Vertigo may be associated with nausea
- Characteristic nystagmus (latent, geotropic, fatigable) with Dix Hallpike test

Management

Vestibular exercises (*Epley's manoeuvre*) done to reposition the debris in the utricle is the only current treatment of choice. In some patients labyrinthine sedatives like prochlorperazine, promethazine may be given.

Role of Surgery in BPPV

Surgery is reserved only for those very rare patients who have no benefit from vestibular exercises and have no intracranial pathology on imaging studies.

Surgery of choice: Posterior semicircular canal occlusion

10. Ans. is a, c and e i.e. **Galvanic test, Fistula test; and Cold caloric test**

Ref. Dhingra 5th/ed pg 46-50, 6th/ed p 43-44

Vestibular Function

Clinical tests	Laboratory test
<ul style="list-style-type: none"> • Spontaneous nystagmus • Fistula test^a • Romberg test • Gait • Past-pointing and falling^a • Hallpike maneuver (positional test) 	<ul style="list-style-type: none"> • Caloric test <ul style="list-style-type: none"> – Modified (Kobrak's test) – Fitzgerald-Hallpike test (Bithermal caloric test) – Cold-air caloric test by Dundas-Grant method. Done in case of perforation of tympanic membrane. • Electronystagmography • Optokinetic test • Rotation test • Galvanic test^a • Posturography

11. Ans. is a i.e. **Lateral semicircular canal**

12. Ans. is a i.e. **Dead ear**

13. Ans. is b i.e. **Para labyrinthitis due to erosion of lateral semi circular canal**

Ref. Dhingra 5th/ed pg 46, 6th/ed p 41; Tuli 1/ed p 39

Fistula test is done to Assess the Vestibular Function

- **Basis:** In case of fistulous communication between middle ear and labyrinth

Any pressure change in
 External auditory canal (produced by pressing tragus or by siegel's speculum)
 ↓
 will stimulate lateral semicircular canal (Ans 11 – Ref Tuli 1/e p. 939)
 ↓
 Produce nystagmus/vertigo

Fistula Test is

Positive	Negative	False positive	False negative
<ul style="list-style-type: none"> • (Means labyrinth is functioning and a fistulous communication is present between middle ear and labyrinth) 		(i.e. positive fistula test without the presence of fistula is called as Hennebert's Sign)	(i.e. fistula is present but still fistula test is negative)

Contd...

Contd...

Positive	Negative	False positive	False negative
<ul style="list-style-type: none"> In erosion of lateral semi circular canal as in cholesteatoma (Ans 13) Surgically created window in the horizontal v Abnormal opening in oval window - post stapedectomy fistula. Abnormal opening in oval window - post Abnormal opening in round window Hypermobile stapes footplate 	<ul style="list-style-type: none"> In normal individuals In dead labyrinth (Ans 12) 	Seen in: Congenital syphilis and meniere's disease	<ul style="list-style-type: none"> When cholesteatoma covers the site of fistula Ill fitting speculum.

14. Ans. is c i.e. Congenital syphilis

Ref. Dhingra 5th/ed pg 47

False Positive Fistula Test–Hennebert Sign

- Fistula test is positive without the presence of fistula.
- It is seen in case of congenital syphilis and Meniere's disease
- In congenital syphilis, stapes foot plate is hypermobile while in meniere's disease there is a fibrous band connecting utricular macula to the stapes footplate.
- In both these conditions, movements of stapes result in stimulation of utricular macula which will cause nystagmus and vertigo leading to false positive fistula test. This is called as Hennebert sign.

15. Ans. is a i.e. Vestibular function

Ref. Dhingra 5th/ed pg 47

Hallpike test/Positional Test

- It is a test for **assessing vestibular function**
- Particularly useful when patients complain of vertigo in certain head positions.
- Helps to differentiate peripheral and central lesions.

Method

- Patient sits on a couch
- Examiner holds the patients head, turns it 45° to the right and then places the patient in supine position so that his head hangs 30° below the horizontal.
- Patients eyes are observed for nystagmus
- The test is repeated with head turned to left
- Four parameters of nystagmus are observed
 - latency
 - direction
 - duration
 - fatigability

16. Ans. is a i.e. 30°C and 44°C**17. Ans. is b i.e. 30°****18. Ans. is b i.e. Lateral semicircular canal**

Ref. Dhingra 5th/ed pg 48, 6th/ed p 43; Maqbool 11th/ed pg 43

Caloric Tests: Important points

- Principle:** to induce nystagmus by thermal stimulation of vestibular system.
- Lateral semicircular canal^o is commonly tested by all these tests
- There are 3 methods of performing these tests:

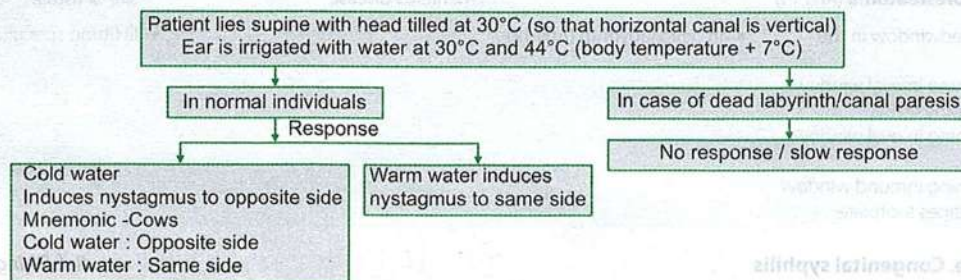
Cold caloric test (modified Kobrak test)	Fitzgerald: (Hallpike test (bithermal caloric test))	Cold air caloric test
Patient position: patient is seated with head tilted 60°C backwards (to place horizontal canal in vertical position)	Patient position: patient lies supine with head tilted 30°C	Done when there is perforation of tympanic membrane (as irrigation with water is contraindicated in these cases)
Temperature of water used - ice cold water.	Temperature of water = 30°C and 44°C	Air cooled by ethylchloride is blown into the ear by Dundas Grant tube

19. Ans. is a i.e Towards the opposite side

Ref. Dhingra 5th/ed pg 48, 6th/ed p 43

20. Ans. is a i.e. nystagmus to the right side

In caloric test: Hallpike Fitzgerald test



In Q 20:

Since cold water is used to irrigate left side: Nystagmus will be towards opposite side i.e. right side

21. Ans. is c i.e. in canal paresis the test is inconclusive

Ref. Scott Brown 7th/ed vol-3 pg 3727

As discussed in previous question:

- Nystagmus can be induced both by cold as well as thermal stimulation
- Cold stimulation causes nystagmus towards opposite side while thermal stimulation causes Nystagmus towards same side. (COWS)
- In canal paresis either there is a reduced or absent response (causes of U/L canal paresis are—U/L vestibular Schwannoma or vestibular neuritis).
- B/L absence of caloric nystagmus is seen in case of aminoglycoside ototoxicity or postmeningitis

22. Ans. is c i.e. Slow +Fast component

Ref. Dhingra 5th/ed p 48, 6th/ed p 43; Maqbool 11th/ed p 43

Caloric test is used to test vestibular function/labyrinthine function

So nystagmus induced by it is vestibular in origin.

Vestibular nystagmus has both fast (of cerebral origin) and a slow component (of vestibular origin).

23. Ans. is a i.e. Midbrain

Ref. Scotts Brown 7th/ed vol-3 Pg-3922

"Vertical nystagmus means vertical displacement of the eye, not side to side nystagmus when attempting upward or down ward gaze. As defined vertical nystagmus always indicates brainstem dysfunction".

— Scott Brown 7th/ed vol 3 p. 3922

24. Ans. is a, c and d i.e. Horizontal, Direction changes and Not suppressed by visual fixation

Ref. PL Dhingra 5th/46, 6th/ed p 42; Harrison 17th/ed pg 144-45 www.jeffmann.net/NeuroGuidemaps/nystagmus.html; Maqbool III/ed pg-43; Scotts Brown 7th/ed vol 3 pg-3724

- Nystagmus is rhythmic oscillatory movement of eye and has two components slow and fast.
- It can be of vestibular or ocular in origin
- Vestibular nystagmus is called peripheral when it is due to lesion of labyrinth or VIIIth nerve^o and central, when lesion is in the central neural pathways^o (Vestibular nuclei, brainstem and cerebellum)

Central Vestibular Nystagmus

Characteristics

- Central nystagmus may be horizontal, vertical, purely torsional or mixed^o while peripheral vestibular nystagmus is horizontal in nature.
- Nystagmus may be bi-directional, and changes direction in different directions of gaze^o.
- Nystagmus is unaffected by visual fixation^o
- Nystagmus is constant and does not wane with time (vestibular nystagmus is fatigueable)
- Impaired saccades and impaired smooth eye pursuit movements are commonly present. It is coarse in nature.
- Brainstem and cerebellar signs are commonly present
- Any associated vertigo and nausea/vomiting is mild (vestigo is a prominent symptoms of vestibular nystagmus)
- Any tendency to fall is often multi- directional, and not unidirectional
- Hearing loss is rarely present

Features	Peripheral	Central
Latency	2-20 seconds	No latency
Duration	Less than 1 minute	More than 1 minute
Direction of nystagmus ^Q	Direction fixed towards the undermost ear	Direction changing ^Q
Fatiguability	Fatiguable	Non fatiguable
Accompanying symptoms	Severe vertigo	None or slight

25. Ans. is b i.e. Dehiscent Superior Semicircular Canal.

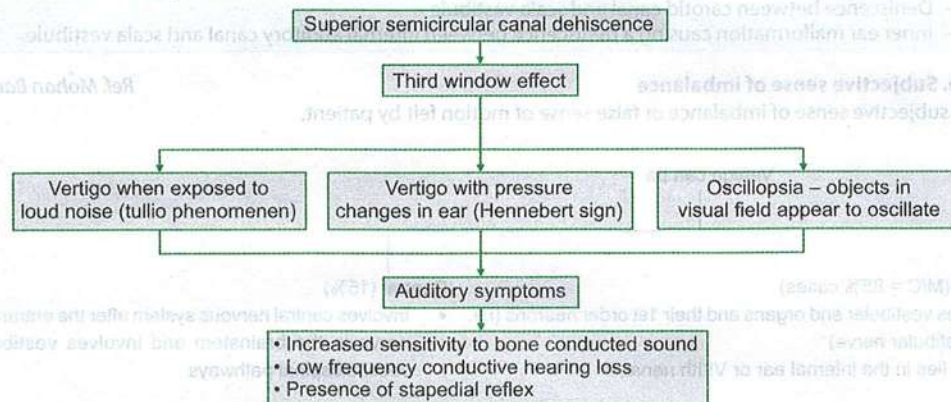
Ref. Current otolaryngology 3rd/ed p 737-738

26. Ans. is b, c and d i.e. Positive Tullio's phenomenon, Positive Hennebert's sign and Oscillopsia

Ref. Current otolaryngology 3rd/ed pg 737-738

In 1998, Lloyd minor and colleagues described sound and/or pressure induced vertigo associated with bony dehiscence of the superior semicircular canal.

- **Third window effect takes place in case of dehiscent superior semicircular canal whereby the dehiscent part of semicircular canal acts as a third window of inner ear.** As a result, endolymph within the labyrinthine system continues to move in relation to sound or pressure changes which causes activation of the vestibular system.



NOTE

The presence of stapedius reflex with low-frequency conductive hearing loss should prompt radiological imaging of the inner ear to exclude the possibility to dehiscence of the inner ear.

Patient profile

- **Age:** Although dehiscence of the superior canal may be congenital symptoms and signs usually do not present early in life; the youngest patients have been in their teen..Median age at diagnosis is 40 years.
- **Sex:** SCDS appears to affect males and females equally.
- **Symptoms:** Patients may complain of vestibular symptoms only, auditory and vestibular symptoms, or, less commonly, isolated auditory symptoms.
 - Patients report increased sensitivity to bone-conducted sounds.
 - Inner ear conductive hearing loss is common.
 - Stapedial reflex is present.
- **Pathology:** The dehiscent portion of the superior canal acts as a third mobile window allowing acoustic energy to be dissipated there. As a result, endolymph within the Inbyrthine system continue to move in relation to saound or pressure, which causes an activation of the vestibular system.
- **Imaging studies of choice** is high-resolution CT of the temporal bone.
- **Audiologic testing** demonstrates low-frequency conductive hearing loss with the presence of stapedius reflex Differential diagnosis for the condition is -Otosclerosis where although low frequency conductive hearing loss is seen but due to fixation of the stapes footplate, the stapedial reflex is absent.

Also know

"Oscillopsia" is visual disturbance in which objects in the visual field appear to oscillate. The severity of the effect may range from a mild blurring to rapid and periodic jumping. Oscillopsia may be caused by loss of the vestibulo-ocular reflex, involuntary eye

movements such as nystagmus, or impaired coordination in the visual cortex (especially due to toxins) and is one of the symptoms of superior canal dehiscence syndrome. Sufferers may experience dizziness and nausea. Oscillopsia can also be used as a quantitative test to document aminoglycoside toxicity"—en.wikipedia.org/Oscillopsia.

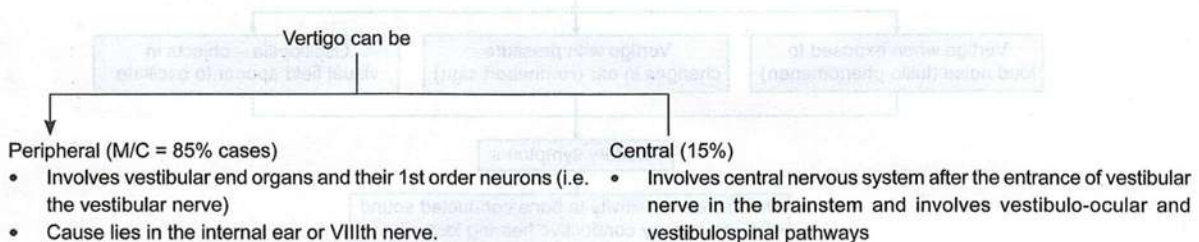
Other causes leading to third window effect

1. Anatomical third window
2. Diffuse third window
 - A. Semicircular window
 - Superior canal dehiscence
 - Posterior canal dehiscence
 - Posterior canal dehiscence
 - Lateral canal dehiscence
 - B. Vestibule
 - Large vestibular aqueduct syndrome
 - Inner ear malformation causing a dehiscence between internal auditory canal and dehiscence
 - C. Cochlea
 - Dehiscence between carotid canal and scala vestibule
 - Inner ear malformation causing a dehiscence between internal auditory canal and scala vestibule.

27. Ans. is a i.e. Subjective sense of imbalance

Ref. Mohan Bansal 1st/ed p 227

Vertigo is a subjective sense of imbalance or false sense of motion felt by patient.



28. Ans. is c i.e. Lateral

Ref. Mohan Bansal 1st/ed p 236; Point 12

Fitzgerald Hallpike Betherncaloric test: the lateral semicircular canal (SCC) is stimulated (tested) (horizontal) by irrigating cold (30°C) and warm water (44°C) in the external auditory canal warm

...Mohan Bansal 1st/ed p 236

29. Ans. is a i.e. Towards the opposite side

Ref. Dhingra 6th/ed p 43

As discussed previously:

The mnemonic 'COWS' (cold-opposite; warm-same side) is very helpful to remember the direction in which water induces nystagmus in caloric test

30. Ans. is a i.e. Positional vertigo

Ref. Dhingra 6th/ed p 45

Benign paroxysmal positional vertigo (BPPV) characterised by vertigo when the head is placed in a certain critical position, can be treated by Epley's manoeuvre.

The principle of this manoeuvre is to reposition the otoconial debris from the posterior semicircular canal back into the utricle. After manoeuvre is complete, patient should maintain an upright posture for 48 hours. Eighty per cent of the patients will be cured by a single manoeuvre.

CHAPTER

21

Diseases of External Ear

Normal Commensal Flora of the External Ear

- Staphylococcus epidermidis
- Corynebacterium species
- Staphylococcus aureus
- Streptococcus viridans

Inflammatory Conditions of the External Ear

OTITIS EXTERNA

Any inflammatory condition of the skin of the external auditory canal is otitis externa

Classification

- Localized** – furunculosis
- Diffuse otitis externa**
 - Idiopathic
 - Traumatic
 - Irritant
 - Bacterial
 - Fungal
 - Environmental
- Part of generalized skin conditions**–
 - Seborrheic dermatitis
 - Allergic dermatitis
 - Atopic dermatitis
 - Psoriasis
- Malignant Necrotizing** – otitis externa
- Other** (keratosis obturans)

A. Furunculosis (Localized Acute Otitis Externa)

Most common organism: Staphylococcus aureus

Site: Hair bearing area of the cartilaginous part of the external auditory canal

Symptoms:

- Discomfort and pain
- Aggravated by jaw/pinna movement

- May have associated deafness if canal gets occluded due to edema

Signs:

- Tragal sign positive
- In severe cases:
 - a. Retroauricular sulcus is obliterated
 - b. Forward displacement of the pinna

Treatment:

- Local—10% ichthammol glycerin pack
- Oral antibiotics → if local cellulitis is present
- Oral analgesics
- Incision and drainage → if abscess formation
- In recurrent furunculosis – Rule out diabetes mellitus

B. Diffuse Otitis Externa: (Tropical/Singapore ear)

Most common Organisms:

- Pseudomonas pyocyaneas
- Bacillus proteus
- Staphylococcus aureus
- E. coli

Diffuse otitis externa can be:

- Acute** – Signs and symptoms similar to furunculosis
- Chronic** – Symptoms:
 - Irritation in the ear
 - Constant desire to itch

Signs

- Scanty discharge in the external auditory canal
- Dried crusts
- Scaling and fissuring in the canal wall

Treatment:

- Ear toileting: most important step
- Medicated wicks (Antibiotic + steroids)
- Oral antibiotic: are indicated in case of Cellulitis and Lymphadenitis
- Analgesics for relief of pain

C. Otomycosis: It is seen in Hot and Humid Climate

Most common Organisms

- Aspergillus niger – Black-headed filamentous growth
- Candida albicans – White and creamy deposit
- A. fumigatus – Green/Blue growth
- Dermatophytes – Actinomyces

Sign: Wet blotting paper appearance

Symptoms:

- Intense itching
- Pain
- Watery discharge with musty odor

Treatment:

- Ear toileting to remove all discharge and epithelial debris
- Antifungal ear drops
- Antibiotics: As they help to reduce edema and inflammation and thus permit better penetration of anti fungal agents

D. Bullous Myringitis: Otitis Externa Hemorrhagica

Organism: Viral or mycoplasma pneumoniae

Features: Hemorrhagic blebs on the lateral surface of the tympanic membrane and the skin of the External auditory canal.

- It is painful condition⁹

Treatment:

- Analgesics
- Antibiotic: Only in case of secondary ear infection
- Blebs NOT to be incised

E. Herpetic Otitis Externa:

Organism: H. simplex
H. zoster

Features of H. zoster/Ramsay Hunt syndrome

- Site of affection:
 - Geniculate ganglion of the facial nerve
 - May also involve the V and VIII nerves

Symptoms:

- Severe otalgia
- Vesicular eruptions on pinna of the affected ear.
- Facial nerve palsy (LMN type)
- May show associated vesicular eruption in the buccal mucosa, hard palate and hypopharynx.

Treatment:

- Oral acyclovir
(to be started within 72 hours of the onset of rash)

F. Malignant Otitis Externa / Necrotising Otitis Externa

Progressive debilitating and sometimes fatal infection of the external auditory canal, characterized by granulation tissue in external auditory canal at the junction of bone and cartilage.

Most common organism: *Pseudomonas aeruginosa*

- Others:**
- S. aureus
 - S. epidermidis
 - Aspergillus
 - Actinomyces

Pathologically: characterized by necrotizing vasculitis

Features: occurs commonly in:

- Elderly diabetic
- Immunosuppressed patient/use of immunosuppressive drugs
- Patients who have received radiotherapy to skull base

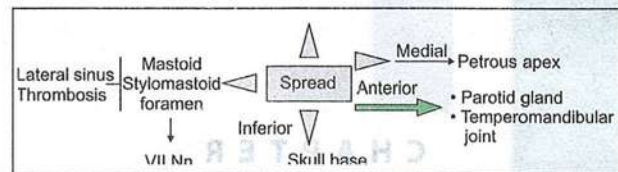


Fig. 21.1: Spread of malignant otitis externa

Spread of the infection: See Fig. 21.1

Nerves commonly involved:

- Most common nerve involved – VII.
Others – IX, X, XI, XII,

- Investigation: CT scan, gallium and technetium-99 scintigraphy

Prognosis:

- It has high mortality rate (So termed as malignant)
- Death due to intracranial complications like sigmoid sinus thrombosis

Treatment: Includes correction of immunosuppression (when possible), local treatment of the auditory canal, long-term systemic antibiotic therapy, and in selected patients, surgery.

- In all cases, the external ear canal is cleansed and a biopsy specimen of the granulation tissue sent for culture.
- IV antibiotics is directed against the offending organism.
- For *Pseudomonas aeruginosa*, the most common pathogen, the regimen involves an antipseudomonal penicillin or cephalosporin (3rd generation piperacillin or ceftazidime) with an aminoglycoside. A fluoroquinolone antibiotic can be used in place of the aminoglycoside.
- Ear drops containing antipseudomonal antibiotic e.g. ciprofloxacin plus a glucocorticoid is also used.
- Early cases can be managed with oral and otic fluoroquinolones only.
- Extensive surgical debridement once an important part of the treatment is now rarely needed.

TUMORS OF THE EXTERNAL AUDITORY CANAL

- Benign:**
- Papilloma
 - Adenoma
 - Fibroma
 - Exostoses
 - Osteoma
- Ceruminoma
 Sebaceous adenoma

Exostoses (Most common benign tumor of external auditory canal)

- Multiple
- Sessile hemispherical elevations
- B/L condition
- Arises in the bony meatus

Osteoma

- Rounded, pedunculated
- U/L condition
- Arises at the junction of bony and cartilaginous meatus

MISCELLANEOUS CONDITIONS OF EXTERNAL EAR

Impacted Wax/cerumen

- Secreted by ceruminous and sebaceous glands in the cartilaginous part of external canal.

- **Clinical features:** sense of blockage
Itching
↓ hearing
Tinnitus
Vertigo
- **Treatment:** If hard, soften it by wax solvents like soda glycerin and removed by syringing with sterile water at body temperature, or with wax hook.

NOTE

For syringing pinna is pulled upward and backward and a stream of water from the ear syringe is directed along the posterior superior wall of the meatus.

Important Points

- Syringing is indicated in patients with ear symptoms where wax obstructs the view of the tympanic membrane.
- Malignant otitis externa is caused by pseudomonas and is seen in early diabetic patients.
- Herpes zoster oticus also called Ramsay Hunt syndrome is caused by chickenpox virus, varicella and affects geniculate ganglion.
- Cholesteatoma of external auditory meatus is also called Keratosis obturans and is characterized by hyperaemia and irritability of canal skin.
- Singapore ear also known as Telephonist ear or Tropical ear is a type of diffuse otitis externa due to hot and humid climate
- Exostosis is the most common benign tumor of the external auditory meatus.
- Osteomas are usually single and arise at bony and cartilaginous junction of external auditory canal, while exostosis are multiple bony outgrowths from bony meatus.
- The M/c congenital anomaly of ear is Bat ear.
- The M/c rarest congenital anomaly of ear is Polyotia.

QUESTIONS

1. **Common causes of otitis externa:** [PGI 08]
 - a. Aspergillus
 - b. Mucor
 - c. Candida
 - d. Pseudomonas
 - e. Klebsiella
2. **External otitis is also known as:** [DNB 2003]
 - a. Glue ear
 - b. Malignant otitis externa
 - c. Telephonists ear
 - d. ASOM
3. **Causes of Otomycosis:** [PGI-08]
 - a. Candida
 - b. Aspergillus
 - c. Thermophilus
 - d. Staphylococcus
4. **Fungus causing otomycosis most commonly is:** [Delhi 96]
 - a. Aspergillus fumigatus
 - b. Candida
 - c. Mucor
 - d. Penicillin
5. **Myringitis bullosa is caused by:** [AI 93]
 - a. Virion
 - b. Fungus
 - c. Bacteria
 - d. Virus
6. **In Ramsay Hunt syndrome, all nerves are involved except** [RJ 2002]
 - a. 5
 - b. 7
 - c. 8
 - d. 9
7. **Haemorrhagic external otitis media is caused by:** [PGI Dec. 98]
 - a. Influenza
 - b. Proteus
 - c. Staphylococcus
 - d. Streptococcus
8. **A patient has come with furuncle of ear. What is the commonest method of treatment?**
 - a. Ear pack with 10% ichthammol in glycerin wick
 - b. Antibiotic and rest [Orissa 99]
 - c. Antibiotic and drainage
 - d. Analgesic
9. **Malignant otitis externa is caused by:** [AP 96; Comed 07]
 - a. S. aureus
 - b. S. albus
 - c. P. aeruginosa
 - d. E. coli
10. **True statement about malignant otitis externa is:**
 - a. Not painful [PGI 96]
 - b. Common in diabetics and old age
 - c. Caused by streptococcus
 - d. All of the above
11. **Malignant otitis externa is:** [PGI Dec. 99]
 - a. Malignancy of external ear
 - b. Caused by hemophilus influenzae
 - c. Blackish mass of aspergillus
 - d. Pseudomonas infection in diabetic patient
12. **Malignant otitis externa is characterized:** [PGI Dec. 03; June 06]
 - a. Caused by pseudomonas aeruginosa
 - b. Malignancy of external auditory canal
 - c. Granulation tissue is seen in the floor of extra auditory canal
 - d. Radiotherapy can be given
 - e. Gallium scan is helpful for monitoring treatment
13. **An elderly diabetic present with painful ear discharge and edema of the external auditory canal with facial palsy, not responding to antibiotics. An increased uptake on technetium bone scan is noted. The most probable diagnosis is** [AI 12]
 - a. Malignant otitis externa
 - b. Malignancy of the middle ear
 - c. Infective disease of the middle ear
 - d. Malignancy of nasopharynx with Eustachian tube obstruction
14. **An old diabetic male presented with rapidly spreading infection of the external auditory canal with involvement of the bone and presence of granulation tissue. The drug of choice for this condition is:** [AIIMS May. 08]
 - a. Ciprofloxacin
 - b. Penicillin
 - c. Second generation cephalosporin
 - d. Aminoglycosides
15. **Which of the following is not a typical feature of malignant otitis externa?** [AIIMS May 06]
 - a. Caused by Pseudomonas aeruginosa
 - b. Patients are usually old
 - c. Mitotic figures are high
 - d. Patient is immunocompromised
16. **Facial nerve palsy is seen in:** [Jipmer 03]
 - a. Seborrheic otitis externa
 - b. Otomycosis
 - c. Malignant otitis externa
 - d. Eczematous otitis externa
17. **A female diabetic have severe ear pain, granulation tissue in external ear with Facial palsy is due to:** [Bihar 2004]
 - a. Malignant otitis externa
 - b. Herpes zoster otitis
 - c. Otomycosis
 - d. None
18. **Keratitis obturans is** [TN 2007]
 - a. Foreign body in external auditory canal
 - b. Desquamated epithelial cell + Cholesterol
 - c. Cholesterol crystals surrounded by calcium
 - d. Wax in external auditory canal
19. **Chondritis of aural cartilage is most commonly due to:** [NIMHANS 06]
 - a. Staphylococcus
 - b. Pseudomonas
 - c. Candida
 - d. Both staphylococcus & Pseudomonas
20. **Cauliflower ear is:** [Manipal 06]
 - a. Keloid
 - b. Perichondritis in Boxers
 - c. Squamous cell carcinoma
 - d. Anaplastic cell carcinoma
21. **Not true about auricular hematoma** [PGI May 2011]
 - a. All case should receive antibiotic
 - b. Commonly seen in rugby player
 - c. Resolve spontaneously

22. Direction of water jet while doing syringing of ear should be: [Mahara 02]

- a. Anterior
- b. Posterior
- c. Anterosuperior
- d. Posteroinferior

23. A newborn presents with bilateral microtia and external auditory canal atresia. Corrective surgery is usually performed is: [AI 07]

- a. < 1 year of age
- b. 5-7 years of age
- c. Puberty
- d. Adulthood

24. Features of moderately retracted tympanic membrane are all except: [MH 2005]

- a. Handle of malleus appearance foreshortened
- b. Cone of light is absent or interrupted
- c. Lateral process of malleus becomes more prominent
- d. None

EXPLANATIONS AND REFERENCES

1. Ans. is a, c and d i.e. *aspergillus*, *candida* and *Pseudomonas*

Ref. Current otolaryngology 2nd/ed pg 629, 630

- Otitis externa is an inflammatory and infectious process of the external auditory canal which is seen in all ages and both sexes.
- M/C organism causing otitis externa are
 - a. *Pseudomonas aeruginosa*^Q
 - b. *Staphylococcus aureus*
- Less commonly isolated organisms are –
 - a. *Proteus* species
 - b. *Staphylococcus epidermidis*
 - c. *Diphtheroids*
 - d. *E. coli*

Fungal Otitis Externa/Otomycosis

- It is responsible for ~ 10% of the cases of otitis externa
- In 80% of cases organism is *aspergillus*^Q
- 2nd M/C organism is *candida*

Other more rare fungal pathogens include

- *Phycomycetes*
- *Rhizopus*
- *Actinomyces*
- *Penicillium*

2. Ans. is i.e. Telephonists ear

Ref. Internet search

Humidity and hot climate are one of the predisposing factors for otitis externa. Hence – otitis externa is also k/a Singapore ear (where climate is hot & humid) or Telephonist ear as talking on phone causes humidity around ear) or Swimmers ear.

Also know

Pseudomonas aeruginosa is a normal inhabitant of external ear. Its numbers are kept in balance by the normal acidity of EAC. Prolonged swimming or abusive use of cotton typed ear buds can alter the pH, producing a more basic environment in which *pseudomonas* grows rapidly.

3. Ans. is a and b i.e. *candida* and *aspergillus*

4. Ans. is a i.e. *aspergillus niger*

Ref. Dhingra 5th/ed pg 58, 6th/ed p 52; Current otolaryngology 2nd/ed pg 630; Scotts Brown 7th/ed vol 3 pg 3355

Otomycosis

- It is fungal otitis externa
- Accounts for » 9- 10% cases of otitis externa
- In 80% of these cases, the etiologic agent is *aspergillus* (*A. niger* > *A. fungatus*) whereas *candida* is the next most frequently isolated fungus.
- Other more rare fungal pathogens include
 - *Phycomycetes*
 - *Rhizopus*
 - *Actinomyces*
 - *Penicillium*

ALSO KNOW

- Otitomycosis is common in hot and humid climate.
- It also occurs in patients using topical antibiotics for treatment of otitis externa or middle ear suppuration.
- Clinical feature:
 - Intense itching
 - discomfort
 - discharge with musty odor.
- On examination:
 - A niger appears as black-headed filamentous growth.
 - A fumigatus: as pale blue or green growth
 - Candida: as white / creamy deposit.

5. Ans. is d i.e. Virus

Ref. Turner 10th/ed p 323; Dhingra 5th/ed pg 62, 6th/ed p 55

Myringitis bullosa hemorrhagica is a painful condition.

Characterized by formation of hemorrhagic blebs on tympanic membrane and deep meatus. It is probably caused by virus or mycoplasma pneumoniae (Dhingra 6th/ed p 62) but according to Turner 10th/ed p 323

"Myringitis bullosa hemorrhagica occurs in presence of viral infection, usually influenzae."

NOTE

Myringitis granulosa is associated with impacted wax, long standing foreign body or external ear infection.

External ear condition	Most common organism
Furunculosis	Staphylococcus
Otomycosis	Aspergillus niger (M/c); Candida albicans (2 nd M/c)
Otitis externa hemorrhagica	Influenza virus
Myringitis bullosa	Influenza virus Less commonly Mycoplasma pneumoniae
Malignant otitis externa	Pseudomonas aeruginosa
Perichondritis	Pseudomonas
Myringitis granulosa	Impacted wax Foreign body

6. Ans. is d i.e. 9

Ref. Dhingra 5th/ed pg 107, 6th/ed p 52, 96; Scotts Brown 7th/ed vol 3, 260, 3379-3382

Herpes zoster oticus / Ramsay Hunt syndrome –

- It is herpetic vesicular rash on the cochlea, external auditory canal or pinna with lower motor neuron palsy of the ipsilateral facial nerve.
- It is k/a Ramsay Hunt syndrome following the first description of 60 cases by John Ramsay hunt in 1907.
- It may be accompanied by anesthesia of face, giddiness and hearing impairment due to involvement of Vth and VIIIth nerve.

7. Ans. is a i.e. Influenza

Ref. Dhingra 5th/ed pg 58, 6th/ed p 52

Hemorrhagic external otitis media: (Otitis externa hemorrhagica) is caused by influenza virus.

- Characterised by formation of haemorrhagic bullae on tympanic membrane.
- **Clinical features:** severe pain and blood stained discharge.
- **Treatment:** Analgesics + antibiotics.

8. Ans. is a i.e. Ear Pack with 10% ichthammol in glycerin wick

Ref. Dhingra 5th/ed p 57, 51; Turner 10th/ed p 272

Furuncle (Boil) is due to staphylococcal infection of the hair follicle.

Management

- Local heat + sedatives
- Packs of 10% ichthammol (acts as antiseptic) and glycerin (hygroscopic action decreases edema). It is the commonest treatment and most of the furuncles burst spontaneously by this treatment.
- Antibiotics (Flucloxacillin) is given for 5 days
- If abscess is formed: Incision and drainage is done
- In case of recurrent furunculosis - Rule out diabetes and staphylococcal skin infection.

9. Ans. is c i.e. *P. aeruginosa*

10. Ans. is b i.e. Common in diabetics or old age

11. Ans. is d i.e. *Pseudomonas* infection in diabetic patient

12. Ans. is a, c and e i.e. Caused by *pseudomonas aeruginosa*; Granulation tissue is seen in the floor of external auditory canal; and Gallium scan helpful for monitoring treatment

Ref. Dhingra 5th/ed pg 58, 6th/ed p 52 Scott's Brown 7th/ed vol 3 pg 3336-3339; Harrison 17th/ed pg 208

Malignant Otitis Externa: Brief summary

- It is an inflammatory condition of external ear.⁹
- Most commonly caused by *Pseudomonas*.
- Other organisms responsible are: *S. aureus*, *S. epidermidis*, *Aspergillus*, *Actinomyces*.
- Seen in elderly diabetics⁹ /immuno compromised patients⁹ /patients on immunosuppressive drug.⁹
- Called as *malignant* because it behaves like a tumor in causing destruction of tissues of canal and pre and post auricular region by various enzymes.⁹
- Characterised by presence of granulation tissue in external auditory canal⁹, at the junction of bony and cartilaginous part.⁹
- It is very painful
- It can spread to base of skull and temporal bone (*causing osteomyelitis of temporal bone*).
- As the infection spreads to temporal bone, and base of skull, it may involve cranial nerves (*most common being facial nerve*).
- Gold standard for diagnosis: positive technetium 99 bone scan.
- **Treatment:** high dose IV antibiotics
- **DOC**
- Cefepime / ceftazidime (3rd generation cephalosporin).
- Antipseudomonal penicillin with an aminoglycoside / fluoroquinolone.

13. Ans. a i.e. Malignant otitis externa

Ref. Dhingra 5th/ed p 58, 6th/ed p 52 Scott's Brown 7th/ed vol 3 p 3336-3339

An elderly diabetic patient
+
Painful ear discharge
+
Facial N palsy
+
No Response to treatment
+
↓ed uptake on Technetium bone scan

All are highly suggestive of malignant otitis externa

NOTE

- Gold standard for diagnosis of malignant otitis externa is technetium 99 scan
- In refractory cases of otitis externa if it is not responding to antibiotics even after 7-10 days of treatment always suspect malignant otitis externa
- M/c organism causing malignant otitis externa = *Pseudomonas*

14. Ans. is b i.e. Penicillin

Ref. Harrison 17th/ed p 208

Rapidly spreading infection of external auditory canal, seen in diabetic patient with involvement of bone and presence of granulation tissue point towards malignant otitis externa as the diagnosis.

Treatment

- Includes correction of immunosuppression (when possible), local treatment of the auditory canal, long-term systemic antibiotic therapy, and in selected patients, surgery:
- In all cases, the external ear canal is cleansed and a biopsy specimen of the granulation tissue sent for culture.
- IV antibiotics is directed against the offending organism.
- For *Pseudomonas aeruginosa*, the most common pathogen, the regimen involves an antipseudomonal penicillin or cephalosporin (3rd generation piperacillin or ceftazidime) with an aminoglycoside. A fluoroquinolone antibiotic can be used in place of the aminoglycoside.
- Ear drops containing antipseudomonal antibiotic e.g. ciprofloxacin plus a glucocorticoid is also used.
- Early cases can be managed with oral and otic fluoroquinolones only.
- Extensive surgical debridement once an important part of the treatment is now rarely needed.

15. Ans. is c i.e. Mitotic figures are high

Ref. Dhingra 5th/ed pg 52, 6th/ed p 52; Harrison 17th/ed p 208

"Malignant otitis externa is a misnomer where the term malignant does not indicate malignant pathology". It is an inflammatory condition caused by pseudomonas infection. (So high mitotic figures will not be seen).

16. Ans. is c i.e. malignant otitis externa

17. Ans. is a i.e. Malignant otitis externa

Ref. Dhingra 5th/ed pg 58, 6th/ed p 52

Malignant otitis externa – can cause destruction of tissues of canal, pre and post auricular region by various enzymes like lecithinase and hemolysin. Infection can spread to skull base and jugular foramen causing **multiple cranial nerve palsies in which most common is facial nerve palsy.**

18. Ans. is b i.e. desquamated epithelial cell + cholesterol

Ref. Scott's Brown 7th/ed pg/ed vol-3 pg-3342 Dhingra 5th/ed pg 61

Keratosus Obturans

- It is accumulation of a large plug of desquamated keratin in the external auditory meatus
- Seen between 5 and 20 yrs of age (i.e. younger age as compared to cholesteatoma which is seen in middle age)
- May be U/L or Bilateral (occasionally)
- It may be associated with bronchiectasis and chronic sinusitis.

Clinical Features

- Pain in the ear (severe otalgia)
- Hearing loss (of conductive type)
- Tinnitus
- Ear discharge – sometimes

O/E

- Pearly white mass of keratin is visible in the ear canal
- Tympanic membrane is thickened
- Ear canal is ballooned

Treatment

- Removal by syringing / Instrumentation
- Periodic checkup should be done to see reaccumulation
- If it recurs – keratolytic agent – 2% salicylic acid in alcohol can be tried.

NOTE

The answer to this question should have been 'desquamated epithelium' only but since it is not given in options – we are choosing the next best option.

19. Ans. is b i.e. Pseudomonas

Ref. Turner 10th/ed p 263; Harrison 17th/ed p 207

"Perichondritis of auricle is most commonly caused by pseudomonas pyocyanea".

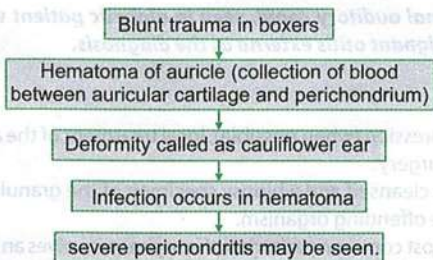
... Turner 10th/ed p 263

"It is most commonly caused by pseudomonas aeruginosa and staphylococcus aureus."

... Harrison 17th/ed p 207

20. Ans. is b i.e. Perichondritis in boxers

Ref. Dhingra 5th/ed pg 56, 6/e, p50; Current Otolaryngology 2th/ed pg 649



21. Ans. is c i.e. Resolve spontaneously

Ref. Current Otolaryngology 2nd/ed p 649; Dhingra 5th/ed pg 54, 6th/ed p 49

Hematoma of auricle

- M/c seen in boxers, wrestlers and rug by players
- Accumulation of blood in subperichondrial space, secondary to blunt trauma lifting the perichondrium away from cartilage

- As cartilage lacks its own blood supply and relies on the vascularity of the perichondrium
- It leads to necrosis of cartilage and predisposing to infection
- New cartilage may then form at the perichondrium creating a rather thick deformed, unattractive ear called as cauliflower ear
- Treatment is aspiration of hematoma under aseptic condition and carefully packing the auricle
- All cases should receive prophylactic antibiotics

22. Ans. is b i.e. Posterior or none

Ref. Dhingra 5th/ed pg 60, 6th/ed p 53

In syringing (done to remove impacted wax) pinna is pulled upwards and backwards and a stream of water from the ear syringe is directed along the posterosuperior wall of the meatus.

So the ans is either the option b – posterior wall or none

23. Ans. is b i.e. 5 - 7 years

Ref. Current Diagnosis and Treatment in Otorhinology 2nd/ed p 627

Microtia: Here the patient presents at birth with obvious auricular malformations

Classification

Grade I	Grade II	Grade III
Mild deformity like	All pinna structures are present but tissue deficiency and significant deformity exist	Also k/a classic microtia or peanut ear.
<ul style="list-style-type: none"> • Low set ear (i.e. inferiorly angled auricular cartilage) • Cupped ear (Has a deep conchal bowl) 		There is no recognizable landmark of auricle. It includes anotia also

Treatment

Classical treatment involves auricular reconstruction in multiple stages. Patients undergo observation until the age of 5 years to allow for growth of rib cartilage which is harvested for reconstruction. This approach offers the benefit of reconstruction with autogenous material which ultimately requires little or no maintenance. Typically reconstruction occurs in 4 stages.

Stages in reconstruction of Microtia

A.	Stage I	Auricular Reconstruction	Goal – Symmetry in position of the reconstructed cartilaginous ear framework with normal ear Note – Watch for pneumothorax postoperatively (as Rib is used)
		After 2 – 3 months ↓	
B.	Stage II	Lobule Transposition After 3 months	Goal – To align the lobule with the reconstructed cartilage framework
C.	Stage III	Post Auricular skin grafting	Goal – A post auricular sulcus is created to allow the ear to project away from mastoid. Note – skin for creation of sulcus is harvested from groin, lower abdomen, buttocks, contralateral posterior sulcus or back
		After several months ↓	
D.	Stage IV	Tragal Reconstruction and soft tissue debulking	

24. Ans. is d i.e. none

Ref. Dhingra 5th/ed pg 61-62, 6th/ed p 55

Retracted Tympanic Membrane

It is the result of negative intratympanic pressure when Eustachian tube is blocked

Characteristics

- It appears dull and lusterless^o
- Cone of light is absent or interrupted^o
- Handle of malleus appears foreshortened^o
- Lateral process of malleus becomes more prominent^o
- Anterior and posterior malleal folds become sickle shaped^o
- It is immobile or has limited mobility when tested with pneumatic otoscope or siegle's speculum.

Features of Normal Tympanic Membrane

- It is shiny and pearly grey in colour
- Has concavity on its lateral surface
- Cone of light seen in antero – inferior quadrant
- It's transparency varies

It is mobile when tested with pneumatic otoscope or siegle's speculum.

Stages in reconstruction of Microtia

Classical treatment involves multiple stages. Patients undergo observation until the age of 2 years to allow for growth of rib cartilage which is harvested for reconstruction. This approach offers the benefit of reconstruction with autogenous material which ultimately reduces risk of no maintenance. Typically reconstruction occurs in 4 stages.

Stage	Procedure	Goal
A. Stage I	Auricular Reconstruction	Goal – Symmetry in position of the reconstructed cartilage – ear framework with normal ear. Note – Watch for pneumothorax postoperatively (as Rib is used)
B. Stage II	Lobule Transposition After 3 months	Goal – To align the lobule with the reconstructed cartilage framework
C. Stage III	Post Auricular skin Grafting	Goal – A post auricular skin is grafted to allow the ear to project away from the scalp. Note – Skin for creation of sulcus is harvested from the lower abdomen, buttock, contralateral posterior thigh or back
D. Stage IV	Final reconstruction and soft tissue debulking	After several months

Ref: Otorhinolaryngology, 6th ed, 2012, p 65

Retracted Tympanic Membrane

It is the result of negative intratympanic pressure when Eustachian tube is blocked

CHAPTER

22

Diseases of Middle Ear

1. *Otitis media* refers to an inflammatory process within the middle ear cleft.
Otitis media can be either acute or chronic. There is no absolute time limit, but in general, disease that persists for more than 3 months should be considered as **chronic**.
2. Eustachian tube is central to the pathogenesis of all forms of OM (with the possible exception of cholesteatoma). Any anatomic or functional obstruction of Eustachian tube can cause otitis media.
3. The more acute angle of ET in children as compared to adults is responsible for more prevalence of OM in children
4. In patients of Down syndrome, ET is abnormally patent or short and it loses its normal protective function against reflux of nasopharyngeal contents which results in more cases of OM in this population.

ACUTE SUPPURATIVE OTITIS MEDIA (ASOM)

Acute inflammation of middle ear cleft < 3 weeks, infective in origin.

Organism

- *Streptococcus pneumoniae* (Most common)
- *H. influenzae* (2nd most common)
- *Moraxella catarrhalis*
- Viral
 - Syncytial virus
 - Influenza virus
 - Rhino and adeno virus
- It is one of the most common infectious disease seen in children
- Peak incidence – first 2 years of life

Stages

Stage of tubal Occlusion	Stage of Pre-suppurative	Stage of Suppuration	Stages of Resolution/ complication
Symptoms: Deafness, Earache	• Deafness • Deafness • Fever	• Excruciating pain • Tympanic membrane bulges and finally ruptures • Fever	• Earache is relieved

Signs

- Tympanic membrane appears red and bulging with loss of landmarks (**cartwheel appearance seen**)^o.
- 85% of the tympanic membrane rupture occurs in the antero-inferior quadrant.
- Closure of the perforation in 90% of cases occurs in one month.
- Tuning fork tests show conductive deafness.
- Facial paralysis in A.S.O.M is rare.

Treatment

Watchful waiting

The current practice guidelines advise on an initial watchful waiting without antibiotic therapy for healthy 2 yr old or older children with non severe illness (mild otalgia and fever < 39°C) because AOM symptoms improve in 1-3 days. Watchful waiting is not recommended for children < 2yrs even in case of uncertain diagnosis.

- **Antibiotics:** Penicillin group – Amoxicillin (80 mg/kg/d) given in 3 divided doses x 10 day is the drug of choice
- Analgesics
- Aural toileting
- **Myringotomy:**

Indications of Myringotomy:

- a. Tympanic membrane bulging and there is acute pain.
- b. Incomplete resolution with antibiotics and patient complains of persistent deafness
- c. Persistent effusion > 12 wk

Prognosis

Most of the cases resolve without any adverse outcome. Rarely it may lead to the following complications.

Complications

Intratemporal	Intracranial
Facial paralysis	Extradural abscess
Labyrinthine infections	Subdural abscess
Mastoiditis	Lateral sinus thrombophlebitis
Petrositis	Otitic hydrocephalus

Recurrent AOM is defined as ≥ 3 episodes of ASOM in a 6 month period or ≥ 4 episodes in a 12 month period, with complete resolution of symptoms and signs in between the episodes.

ACUTE NECROTISING OTITIS MEDIA

Variant of ASOM, often seen in children suffering from measles, scarlet fever or influenza

Organism	: β hemolytic streptococcus
Age group	: Infants, young children
Predisposing factor	: Children acutely ill with scarlet fever, measles, pneumonia, influenzae
Features	: Necrosis and sloughing of the tympanic membrane, ossicles and mastoid air cells VII N palsy seen
Symptoms	: Profuse foul smelling discharge (due to necrosis of the tympanic mucoperiosteum)
Treatment	: I.V. penicillin In fulminant cases: i.m. gamma globulin is given In resistant cases: If acute mastoiditis supervenes cortical mastoidectomy is done

NON SUPPURATIVE OTITIS MEDIA

A. Serous Otitis Media/ Secretory Otitis Media/Otitis Media with Effusion/Mucoid Otitis Media/Glue Ear/Silent Otitis Media

- Characterised by accumulation of non purulent effusion in middle ear cleft.
- It is common in 2-6 years of age.

Symptoms

- Painless condition.
- **M/c symptoms** is - Deafness: mild and often detected only with audiogram (It is the most common cause of hearing loss in children in the developed world)
- Delayed and defective speech.
- Feeling of blocked ears

Signs

- **Tympanic membrane** appears dull with thin leath of blood vessels at the periphery.
- It is Yellow / dull grey in colour
- It is light reflex is absent
- Retracted and its mobility is restricted
- Fluid levels and air bubbles are seen through it

NOTE

In case of glue ear - fluid is sterile.

Investigations

- Tuning fork test: conductive hearing loss (20 - 40db)
- Audiometry shows conductive hearing loss provides an assessment of the severity of hearing loss and is
- Hence important in monitoring the progress of the condition and providing useful information for management decision
- Impedance audiometry shows Type B curve. It is a very useful investigation in children.
- X-ray mastoid: clouding of air cells

Treatment

- **Medical:**
 - Topical decongestants
 - Antiallergics
 - Antibiotics - effect is short lived
- **Surgical:**
 - Myringotomy and grommet Insertion (Treatment of choice)
 - Surgical management of causative factor i.e. adenoidectomy / tonsillectomy.

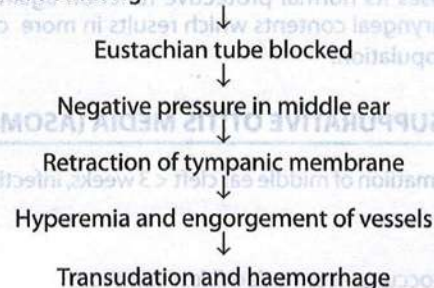
B. Aero-otitis media/Otic Baro trauma

Aetiology

- Rapid descent during air flight
- Under water diving
- Compression in pressure chamber

Pathogenesis

Atmospheric pressure increases more than that of middle ear by critical level of 90mm Hg.



Symptoms

- Severe earache
- Deafness
- Tinnitus

Signs

Air bubbles or haemorrhagic effusion in middle ear.

Treatment

- **Medical:**
 - Oral and topical decongestants
 - Antihistaminics
- **Surgical:**
 - Myringotomy

Preventive Measures

- Avoid air travel in presence of upper respiratory infection.
- Do not sleep during descent.
- Chewing gum exercises should be done during descent.
- Autoinflation of eustachian tube by valsalva should be done.
- Use vasoconstrictor nasal spray and systemic decongestant half an hour before descent in case of previous history of similar episode.

NOTE

Barotrauma cannot occur in who have perforation of tympanic membrane

EXTRA EDGE

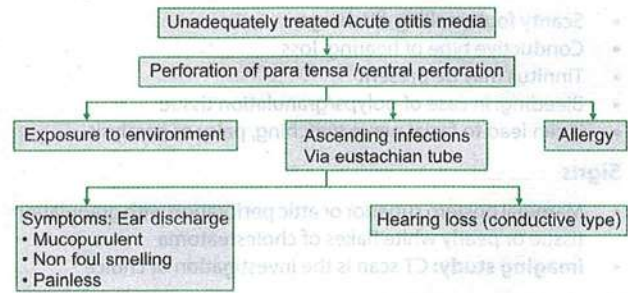
- Lighthouse sign and pulsating otorrhea are seen in ASOM and acute mastoiditis following ASOM.
- Silent otitis media or otitis media with effusion (OME) shows fluid level and air bubbles with no perforation in TM with B type (flat) curve on impedance audiometry.
- In chronic adhesive otitis media, adhesions form between drum and middle ear, while in atelactatic ear there is complete collapse of thin drum on the promontory.
- Best treatment of adhesive otitis media is hearing aid.
- Fluctuating deafness of conductive nature is seen in secretory otitis media, while fluctuating SNHL is a feature of Meniere's disease.
- **Potbelly tympanic membrane is a feature of secretory otitis media.**

CHRONIC SUPPURATIVE OTITIS MEDIA

It is of 2 Types: A. Tubotympanic
B. Atticoantral

A. Tubotympanic Type

- It is particularly prevalent in developing countries and is most common in low socio economic group
- Most common organisms isolated are – *P. aeruginosa*, *S. aureus* and proteus species.
- It is safe or benign type of CSOM and involves anteroinferior part of middle ear cleft. i.e. Eustachian tube and mesotympanum and is associated with central perforation.
- There is no risk of serious complication.
- M/C in children.

Pathogenesis of Tubotympanic type**Flow chat 22.1: Pathogenesis of Tubotympanic variety****Treatment****Medical****Treatment of choice:**

- Aural toilet – It is an important step in treatment and should not be missed
- Topical and systemic antibiotic
- Surgical: done at a later stage to correct the hearing loss

Prerequisites

- Ear dry for 6 weeks without antibiotics
- Eustachian tube function normal
- Normal middle ear mucosa

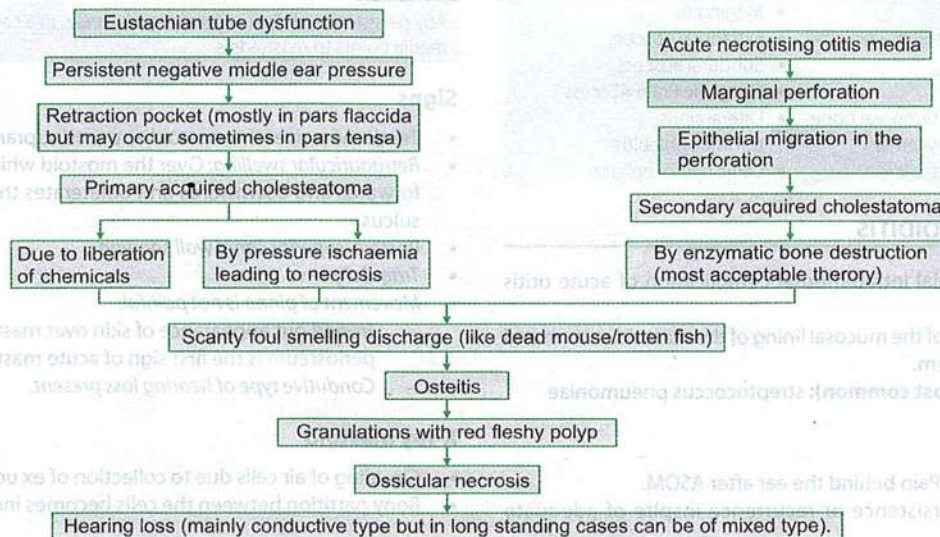
Procedure of choice: myringoplasty – if ossicle chain is intact;
tympanoplasty – if ossicular chain is disrupted

B. Atticoantral Type: Unsafe or Dangerous Type

- Involves posterosuperior part of middle ear cleft i.e. attic, antrum and mastoid
- Associated with an attic or a marginal perforation.
- Associated with cholesteatoma:
- Risk of complication is high

Cholesteatoma is the presence of keratinising stratified squamous epithelium within the middle ear cleft.

Pathogenesis: see flow chart 22.2.

Flow chart 22.2: Pathogenesis of atticoantral type

Clinical Features

- Scanty foul smelling discharge.
- Conductive type of hearing loss
- Tinnitus may be present
- Bleeding: in case of polyps/granulation tissue
- It can lead to facial nerve twitching, palsy or paralysis

Signs

- Marginal postero superior or attic perforation with granulation tissue or pearly white flakes of cholesteatoma
- **Imaging study:** CT scan is the investigation of choice

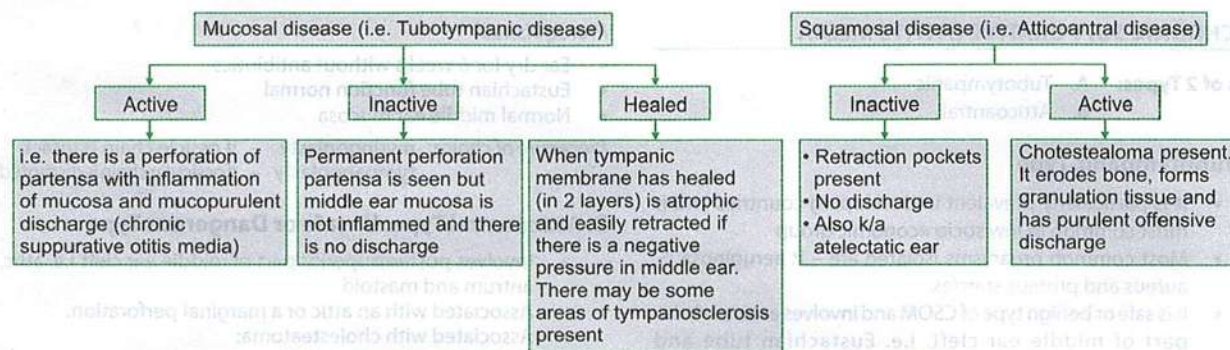
Treatment

- **Surgical:** It is the mainstay of treatment.^Q
- Primary aim is removal of disease by mastoidectomy to make ear safe followed by reconstruction of hearing at a later stage.
- **Surgery of choice:** Modified Radical mastoidectomy^Q

Extra Edge

- Ciliated columnar epithelium lines the eustachian tube, anterior mesotympanum and inferior hypotympanum, while cuboidal epithelium lines the attic, mastoid and posterior mesotympanum.
- Simple patch test helps to find out the integrity of ossicular chain, hence to decide whether myringoplasty or tympanoplasty needs to be done in case of safe CSOM.
- Hearing in CSOM is better when the ear is discharging due to shielding effect of round window or discharge covering the perforation.
- Posterior perforation tends to have more hearing loss due to loss of sound protection for round window. Larger the perforation, greater the loss of surface area on which sound pressure can act.
- In safe CSOM perforation lies in pars tensa.
- In unsafe CSOM perforation lies in pars flaccida.

The newer classification of Chronic otitis media



COMPLICATIONS OF OTITIS MEDIA

Extra cranial complications

- Mastoiditis
- Petrositis / Gradenigo syndrome
- Facial paralysis
- Labyrinthitis
- Osteomyelitis of temporal bone
- Septicaemia or pyaemia
- Otogenic tetanus

Intracranial complications

- Meningitis
- Extradural abscess
- Subdural abscess
- Otogenic Brain Abscess
- Lateral sinus thrombophlebitis
- Otitic hydrocephalus

ACUTE MASTOIDITIS

- M/C extracranial intratemporal complication of acute otitis media.
- Inflammation of the mucosal lining of the mastoid antrum and its air cell system.
- **Organism (most common):** streptococcus pneumoniae

Symptoms

- Recurrence of Pain behind the ear after ASOM.
- Fever (Its persistence or recurrence inspite of adequate treatment).

- Discharge becomes profuse and increases in purulence. It may be pulsatile (light house effect)

NOTE

Any persistence of discharge beyond 3 weeks, in a case of acute otitis media points to mastoiditis.

Signs

- Tenderness over the mastoid antrum / suprameatal triangle
- **Retroauricular swelling:** Over the mastoid which pushes pinna forwards and downwards and obliterates the retro auricular sulcus
- **Postero-superior canal wall sagging**
- **Tragal sign –ve**
- **Movement of pinna is not painful:**
 - Ironed out appearance of skin over mastoid due to thick periosteum is the first sign of acute mastoiditis
 - Conductive type of hearing loss present.

X-ray Mastoid

- Clouding of air cells due to collection of exudates in them
- Bony partition between the cells becomes indistinct.

Type of Acute Mastoiditis

- Acute mastoiditis can be staged as:
 - 1. Acute mastoiditis without periostitis/osteitis**
 - It is the extension of the pathological process of acute middle ear infection. No periostitis or osteitis of the mastoid is present.
 - 2. Acute mastoiditis with periostitis**
 - Infection within the mastoid spreads to periosteum covering the mastoid process. The route of infection from the mastoid cells to the periosteum is by venous channels, most commonly the mastoid emissary vein.
 - 3. Acute mastoiditis with osteitis**
 - Also called as *acute coalescent mastoiditis* or *acute surgical mastoiditis*. Basic pathology is osteitis, in which necrosis and demineralization of the bony trabeculae occur. From this stage onward disease progression depends on the direction in which the erosive process goes:
 - Most commonly, mastoid cortex is eroded and a subperiosteal abscess develops.
 - Medial progression causes petrositis and Gradenigo's syndrome.
 - Anterior progression can compromise the fallopian canal or labyrinth causing facial palsy or vertigo.
 - Infection in the cranium causes intracranial complications meningitis, abscess, lateral sinus thrombophlebitis, otitic hydrocephalus.
 - Classically, the term mastoiditis referred to acute coalescent mastoiditis with superiosteal abscess lateral to the mastoid cortex occurring 2 weeks after onset of ASOM.
 - Positive mastoid reservoir sign is seen in coalescent mastoiditis in which there is rapid re-accumulation of discharge after cleaning up occurs i.e., pus fills up again on mopping.

Abscesses in Relation to Mastoid Infection

Postauricular Abscess	
Zygomatic Abscess	Due to Infection of the zygomatic air cells
Bezolds Abscess	Pus passes through Sternocleidomastoid sheath
Citellis Abscess	Pus passes from Mastoid inner table Posterior belly of digastric/occipital bone
Meatal (Luc's) Abscess	Pus passes between the antrum and external osseous meatus

Treatment

- I.V. antibiotics
- Myringotomy: If pus under tension
- Cortical mastoidectomy:
 - In case of intracranial / intratemporal complications
 - If patient's condition deteriorates after 24 hours despite adequate treatment

NOTE

If a subperiosteal abscess or an intracranial extension of disease is suspected, surgery in combination with high dose 1/v antibiotics should be 1st line of therapy.

PETROSITIS/GRADENIGO'S SYNDROME

i.e. Infection of ear/mastoid spreads to petrous part of temporal bone.

Classical presentation of petrositis is gradenigo's syndrome i.e., triad of (3D)

- Persistent ear Discharge: otorrhoea
- Diplopia (due to VI nerve involvement)
- Deep seated orbital or retro-orbital pain (due to Vth nerve involvement)

Sudden disappearance of symptoms in gradenigo syndrome suggests intracranial rupture.

NOTE

Persistent ear discharge in cases of cortical or modified radical mastoidectomy is due to Petrositis

FACIAL PARALYSIS

For details see chapter: Facial Nerve and its disorders.

LATERAL SINUS THROMBOPHLEBITIS/SIGMOID SINUS THROMBOSIS

May occur as a complication of:

- Acute coalescent mastoiditis
- CSOM and cholesteatoma

Clinical Features

Patient presents with:

- Picket fence type of fever** with rigors i.e. fever rises twice during day reaching 104° or 105°F and comes to normal.
 - Fever coincides with release of septic emboli into blood stream.
 - Patient is alert with sense of well-being in between bouts of fever.
- Headache**

Signs

Progressive anaemia and emaciation:

- Torticollis of neck**
- Griesinger's sign:** due to thrombosis of mastoid emissary vein. There is oedema over posterior part of mastoid.
- Tobey - Ayer test (queckenstedt's test):** compression of jugular vein on thrombosed side does not produce any change in CSF pressure. Whereas compression of jugular vein on healthy side raises CSF pressure.
- Crow - Beck test**

Compression of jugular vein on healthy side

Engorgement of retinal veins and supraorbital veins. If there is a thrombosed sinus, no such change is seen.

- Tenderness along jugular vein.
- Contrast enhanced CT/MRI show a typical *delta sign*. It is a triangular area with rim enhancement and central low density area is seen in posterior cranial fossa on axial cut.

INTRACRANIAL COMPLICATIONS

EXTRADURAL ABSCESS

It is collection of pus between bone and dura. It is called:

Epidural abscess

If abscess lies medial to sigmoid sinus

Perisinus abscess

If abscess, encloses the sinus

SUBDURAL ABSCESS

Collection of pus between dura and arachnoid

MENINGITIS

- It is the second most common complication of otitis media Turner 10/e, p 311
- Most common organism responsible for otic meningitis are – *S. pneumoniae* and – *H. influenza Type B*
- Positive kernig's sign i.e. painful extension of leg on flexed thigh
- Positive brudzinski's sign i.e. flexion of neck causes flexion of hip and knee.
- Positive babinski sign i.e., extension of big toe on stimulation of lateral aspect of sole.

BRAIN ABSCESS

- It is the most common complication of chronic otitis media. ... Turner 10/e, p 311
- Conversely ear infections are the most common cause of brain abscess. ... Turner 10/e, p 311-312
- 50% brain abscess in adults and 25% brain abscess in children are otogenic in origin

Brain abscess is of 2 types

Cerebral abscess
(M/C temporal abscess)

Cerebellar abscess

- Cerebral abscess is seen twice as frequently as cerebellar abscess and M/C site of cerebral abscess is Temporal lobe
- Cerebellar abscess can develop as direct extension through Trautmann's triangle.
- **Microbiology:** G-ve organism (proteus, E. Coli, Pseudomonas) and aerobic bacteria along with staphylococci

Clinical Feature

- **Temporal lobe abscess can present as:**
 - Nominal aphasia
 - Homonymous hemianopia (earliest focal sign).
 - Contralateral motor paralysis
 - Epileptic fits
 - Hallucinations of taste and smell
 - Oculomotor palsy
- **Cerebellar abscess:**
 - Ipsilateral spontaneous nystagmus
 - Ipsilateral ataxia
 - Past pointing
 - Intentional tremors
 - Dysidiadochokinesia

Treatment

- Medical = high dose 1/v antibiotics + for raised ICT → dexamethasone or mannitol.
- Surgical
 - Drainage of abscess
 - In the associated ear = Modified Radical mastoidectomy in CSOM with cholesteatoma

OTITIS HYDROCEPHALUS

Rare complication:

- Characterised by raised intracranial pressure with normal CSF findings.
- Caused due to thrombus extending to superior sagittal sinus which impedes the function of arachnoid villi to absorb CSF and therefore cause ICT.



Remember:

- MRI is the IOC in extradural, Bezold and cerebral abscess. CT is the IOC in cases of coalescent mastoiditis.

SURGICAL MANAGEMENT OF MIDDLE EAR SUPPURATION

INCISIONS FOR EAR SURGERY

- Postaural (William Wilde's) and endaural (Lempert's) incisions are used in mastoidectomy and tympanoplasty.
- Endomeata (Rosen's) incision is used in stapedectomy and in tympanoplasty.

MYRINGOTOMY

- Incising the tympanic membrane to drain the middle ear.
- Can be coupled with insertion of ventilation tube (grommet)

Indication

1. Acute otitis media: Indications in AOM are:
 - Severe pain (bulging red tympanic membrane)

- AOM going in for complications
 - Unresolved AOM
 - AOM occurring during antibiotic therapy
 - AOM in immunodeficiency
 - **Recurrent AOM** (along with grommet insertion):
More than 3 episodes of ASOM in 6-6 episodes in 12 months. Patient should be free of infection in between the episodes. Predisposing causes include adenoid hypertrophy, nasal allergy, chronic sinusitis, cleft palate, and other causes of velopharyngeal insufficiency, craniofacial anomalies, immunodeficiency, and GERD.
2. Otitic barotrauma for drainage and unblocking Eustachian tube.

Myringotomy is coupled with grommet insertion in:

- Suppurative or serous otitis media
- Recurrent Acute otitis media
- Adhesive otitis media
- Meniere's disease

Preferred Site for Myringotomy

Condition	Site
Acute Suppurative Otitis Media (ASOM)	Circumferential incision is made in the postero-inferior quadrant of tympanic membrane, midway between handle of malleus and tympanic annulus. A small radial incision is given in antero-inferior quadrant.
Serous Otitis Media ± grommet insertion	

NOTE

- Myringotomy was first performed by astley cooper for serous otitis media
- Myringotomy is contraindicated in case of suspected intratympanic glomus tumor- In such a case tympanotomy should be done.

MYRINGOPLASTY

Repair of tympanic membrane defect (In Pars tensa)

- Commonest graft material used is temporalis fascia.
- Other materials include tragal perichondrium, Fat and vein (autografts), or cadaveric dura and vein (homografts).

Indication

Is a perforated tympanic membrane with only mild conductive hearing loss, which implies a normal ossicular chain.

Contraindications

- Active discharge from middle ear

- Nasal allergy
- Otitis externa
- Ingrowth of squamous epithelium into the middle ear
- When the other ear is dead or not suitable for hearing aid rehabilitation
- Children < 3 years

TYMPANOPLASTY

Eradication of disease from middle ear along with repair, which includes ossicular reconstruction with or without myringoplasty. Possibly it is the commonest surgery done in CSOM.

Types of Tympanoplasty

Wullstein and zollner (1953) classified tympanoplasty into types:

- **Type I:** It differs from simple closure of perforation (myringoplasty) in that here middle ear is also examined to rule out any pathology.
- **Type II:** It is done where there is disease in atticointral region with mild erosion of malleus or incus Temporalis fascia graft is placed on the incus or remnant of malleus.
- **Type III: M/C type of tympanoplasty (Columellar type or effect):** It is done when malleus and incus are destroyed but stapes is healthy. Graft is placed on the head of stapes. It is also called myringostapediopexy/columella effect. This columellar effect is usually present in birds.
- **Type IV:** All ossicles including stapes head are eroded. Graft is placed in such a way that a small air-containing cavity with Eustachian tube and round window is created (cavum minor). Footplate of the stapes should be mobile and is left exposed to sound waves.
- **Type V:** It is also called fenestration operation. Here footplate of stapes is fixed, but round window is functioning. In such cases another window is created on horizontal semicircular canal. Commonest ossiculoplasty material is autograft incus (incus transposition). Others are autograft tragal/septal cartilage, homograft ossicle and prosthetic materials. Prosthetic materials are made up of Teflon, ceramic, titanium, gold.

CORTICAL MASTOIDECTOMY/SIMPLE MASTOIDECTOMY/SCHWARTZ OPERATION

Simple mastoidectomy/Schwartz operation.

Involves exenteration of all accessible mastoid air cells without taking down the posterior meatal wall.

Indication

- Acute coalescent mastoiditis
- Incompletely resolved otitis media with reservoir sign
- Masked mastoiditis
- As an initial step to perform:
 - Endolymphatic sac surgery
 - Decompression of facial nerve
 - Translabyrinthine or Retrolabyrinthine procedure, for acoustic neuroma.

RADICAL MASTOIDECTOMY

Aims at exenteration and exteriorization. No reconstruction is attempted.

The disease from the middle ear and mastoid is exenterated, middle ear, attic, antrum, and mastoid air cells are covered into a single cavity by taking down the posterior canal wall and thus exteriorized. The whole mucosa of the middle ear, remnants of tympanic membrane, and ossicles except stapes are removed. The middle ear is closed off by curetting the Eustachian tube and plugging with muscle. No attempts are made to pressure hearing.

Indications

- Malignancy of the external ear and middle ear.
- Unresectable cholesteatoma, scarring, eustachian tube orifice, and producing severe sensorineural hearing loss.
- If previous attempts to eradicate cholesteatoma have failed

Modified Radical Mastoidectomy

- Here in addition to exenteration and exteriorization, reconstruction of the hearing mechanism is also attempted. So in addition to creating an open cavity as in radical mastoidectomy

all healthy mucosa, remnants of tympanic membrane and ossicles are preserved to facilitate tympanoplasty later on.

- This is the treatment of choice for attic artrum disease and resectable cholesteatoma of middle ear and mastoid including complications.

Measures to Avoid Injury to Facial Nerve during Mastoidectomy

- Change to higher power of microscope near facial nerve.
- Adequate irrigation to avoid thermal injury.
- Avoid using cutting burr near the nerve (use diamond burr instead).
- Use the burr along the direction of the nerve – never across.
- Never pull out granulations on the nerve.



- Mastoidectomy is one of the commonest causes of iatrogenic facial palsy
- Commonest site of injury to the facial nerve during mastoidectomy is the 2nd genu).

Focal Length of the Objective Lens of the Operating Microscope Used for Ear Surgeries

200-250 mm.

Note: It is 300 mm for nasal surgeries and 400 mm for microlaryngeal surgeries

Another way of classifying mastoidectomy is based on the approach to mastoid

Canal wall up procedure

- Posterior canal wall is left intact
- Middle ear is approached through facial recess in mastoid
- Includes posterior tympanotomy and simple/cortical mastoidectomy (Schwartz operation) Consists of complete exenteration of all accessible mastoid air cells and converting them into a single cavity
- Middle ear structures are not disturbed

Indications – (MAM)

- M Acute coalescent mastoiditis
- A Acute otitis media with reservoir sign
- M Masked mastoiditis

Drawback:

Associated with high incidence of residual/recurrent cholesteatoma

Canal wall down procedure

Posterior canal wall is removed thereby exteriorizing the mastoid into the external ear. It can be done as

Modified radical mastoidectomy

Attempt is made to preserve as much hearing as possible.

Steps:

- Post meatal wall and lateral attic wall are removed
- TOE i.e. Tympanic membrane remnant, Ossicles and Eustachian, Tube functions are preserved.

Indications:

- Cholesteatoma confined to attic and antrum
- Localised chronic otitis media

Radical mastoidectomy

No attempts are made to preserve hearing

Steps:

- Post meatal wall is removed
- TOE are all removed
- Entire area of middle ear, attic, antrum and mastoid are converted to a single cavity

Indications:

- When cholesteatoma can not be removed safely or if previous attempts have failed

"A canal wall up mastoidectomy with ossicular reconstruction may be considered only in patients with chronic otitis media without any evidence of evidence of cholesteatoma". Otolaryngology and Neurology, Inc, Vol. 2615, Sept. 05, p 1045-1051

More importantly canal up technique is the surgical approach for cochlear implant

SUPRAMEATAL (MACEWEN'S) TRIANGLE

It is bounded superiorly by the supra mastoid crest, anteriorly by the posterosuperior canal wall and a tangential line from here to the supramastoid crest completes the triangle. Antrum lies approximately 1.5 cm deep to the triangle in adults. It is the Surgical Landmark for Mastoid Antrum during Mastoidectomy.

CITELLI'S ANGLE

Citelli's angle is **sino dural angle** (angle between the plate of bone separating the sigmoid sinus from the mastoid cavity (sinus plate) and the plate of bone separating middle cranial fossa dura from the mastoid cavity [dural plate]). This is a common site of residual/recurrent disease after surgery.

QUESTIONS

ACUTE SUPPURATIVE OTITIS MEDIA

1. Commonest cause of acute otitis media in children is:

[AIIMS June 00; Delhi- 06; UP-03]

- a. H. influenzae
- b. S-pneumoniae
- c. S aureus
- d. Pseudomonas

2. Commonest causative organism for ASOM in 2 years child is:

[AIIMS Dec. 95; 91]

- a. Pneumococcus
- b. H. influenzae
- c. Staphylococcus
- d. Streptococcus

3. True statement about ASOM is: [AI 99]

- a. Most frequently it resolves without sequelae
- b. Commonly follows painful parotitis
- c. Radical mastoidectomy is required for treatment
- d. Most common organism is pseudomonas

4. Cart Wheel sign is seen in:

[MP 2008]

- a. ASOM
- b. AOM
- c. OME
- d. CSOM

5. Acute suppurative otitis media is treated using all except:

[AIIMS 91]

- a. Erythromycin
- b. Penicillin
- c. Streptomycin
- d. Cephalosporin

6. A child presents with barotrauma pain. There is no inflammation of middle ear, management is:

[Jharkhand 03]

- a. Antibiotics
- b. Paracetamol
- c. Suppurative
- d. Grommet tube insertion

7. Pulsatile otorrhoea seen in:

[AP 97]

- a. Glomus tumour
- b. CSF otorrhea
- c. ASOM
- d. Fistula

NON SUPPURATIVE OTITIS MEDIA

8. A boy with ASOM undergoing treatment with penicillin therapy for 7 days now presents with subsidence of pain and persistence of deafness, diagnosis is: [Kolkatta 2003]

- a. Ototoxicity
- b. Secretory otitis media
- c. Adhesive otitis media
- d. Tympanosclerosis

9. Cause of U/L secretory otitis media in an adult is:

[PGI Dec. 99 / UP-04]

- a. CSOM
- b. Nasopharyngeal carcinoma
- c. Mastoiditis
- d. Foreign body of external ear

10. Acute non suppurative otitis media in adults is due to:

[UP 2003]

- a. Allergic rhinitis
- b. URTI
- c. Trauma
- d. Malignancy

11. Glue ear:

[DNB 2003]

- a. Is painful
- b. Is painless
- c. Radical mastoidectomy is required
- d. NaF is useful

12. Secretory otitis media is diagnosed by:

[PGI June 98]

- a. Impedance audiometry
- b. Pure tone audiometry
- c. X-ray
- d. Otoscopy

13. Bluish tympanic membrane is seen in:

[JIPMER 93]

- a. Early ASOM
- b. Glue ear
- c. Cholesteatoma
- d. Cholesterol granuloma

14. Treatment of choice for glue ear is:

[AIIMS May 07]

- a. Myringotomy with cold knife
- b. Myringotomy with diode laser
- c. Myringotomy with ventilation tube insertion
- d. Conservative treatment with analgesics and antibiotics

15. 6 year old child with recurrent URTI with mouth breathing and failure to grow with high arched palate and impaired hearing is:

[AIIMS May 07]

- a. Tonsillectomy
- b. Grommet insertion
- c. Myringotomy with grommet insertion
- d. Adenoidectomy with grommet insertion

16. A child presenting with recurrent respiratory tract infection, mouth breathing and decreased hearing Treatment is:

[PGI-08]

- a. Tonsillectomy
- b. Adenoidectomy
- c. Grommet insertion
- d. Myringotomy
- e. Myringoplasty

17. Following statements are true about otitis media with effusion in a child:

[PGI Dec. 03]

- a. Immediate myringotomy is done
- b. Type B tympanogram
- c. The effusion of middle ear is sterile
- d. Most common cause of deafness in a child in day care patients

18. In serous otitis media which one of the following statements is true?

[2000]

- a. Sensorineural deafness occurs as a complication in 80% of the cases
- b. Intracranial spread of the infection complicates the clinical courses
- c. Tympanostomy tubes are usually required for treatment
- d. Gram-positive organisms are grown routinely in culture in the aspirate

19. All except one are true in a case of secretory otitis media:

[MAHE 07]

- a. Blue TM
- b. B Shaped tympanogram
- c. Marginal perforation most common
- d. Rinne test + ve

20. Medical treatments is NOT effective in which type of suppurative media:

[UP 07]

- a. Tuberculous OM
- b. Secretory OM
- c. Acute suppurative OM
- d. Chronic suppurative OM

21. Which of the following is characteristic of T.B otitis media:

[AIIMS May 95]

- a. Marginal perforation b. Attic perforation
- c. Large central perforation d. Multiple perforation

22. Tuberculous otitis media is characterized by all except:

[(AIIMS 1994) (AMU 2000) (AP 1996) (Delhi 1985, 1991, 1992, 2003) (Kerala 1998) (PGI 1999 Dec, PGI 1996) (AP 2004)]

- a. Multiple perforations b. Pale granulations
- c. Pain d. Thin odourless fluid

CHRONIC SUPPURATIVE OTITIS MEDIA**23. Cholesteatoma is commonly caused by:** [AI 94]

- a. Attico-antral perforation
- b. Tubotympanic disease
- c. Central perforation of tympanic membrane
- d. Meniere's disease

24. Cholesteatoma is usually present at: [Delhi 01]

- a. Anterior quadrant of tympanic membrane
- b. Posteroinferior quadrant of tympanic membrane
- c. Attic region
- d. Central part

25. Cholesteatoma occurs in: [AIIMS May 94]

- a. CSOM with central perforation
- b. Masked mastoiditis
- c. Coalescent mastoiditis
- d. Acute necrotizing otitis media

26. Cholesteatoma is seen in: [RJ 2006]

- a. ASOM b. CSOM
- c. Secretory otitis media d. Osteosclerosis

27. Most accepted theory for the formation of cholesteatoma: [DNB 2001]

- a. Congenital
- b. Squamous metaplasia
- c. Ingrowth of squamous epithelium
- d. Retraction pocket

28. Perforation of tympanic membrane with destruction of tympanic annulus is called: [Bihar 2004]

- a. Attic b. Marginal
- c. Subtotal d. Total

29. What is true in case of perforation of pars flaccida:

[AIIMS May 93]

- a. CSOM is a rare cause
- b. Associated with cholesteatoma
- c. Usually due to trauma
- d. All of the above

30. Treatment of choice in central safe perforation is:

[AI 94]

- a. Modified mastoidectomy
- b. Tympanoplasty
- c. Myringoplasty
- d. Conservative management

31. True about CSOM: [PGI Dec. 00]

- a. Etiology is multiple bacteria
- b. Oral antibiotics are not affected

c. Ear drops are best

d. Otitic hydrocephalus is a known complication

e. Common in females than males

32. Levinson's criteria for diagnosing congenital cholesteatoma includes: [PGI Nov. 2010]

- a. Whitish mass behind intact TM
- b. Normal pars tensa and pars flaccida
- c. Recurrent attacks of otorrhea
- d. Prior otitis media is not an exclusion criteria

33. Scanty, foul smelling, painless discharge from the ear is characteristic feature of which of the following lesions:

[AIIMS Nov. 00; 04]

- a. ASOM b. Cholesteatoma
- c. Central perforation d. Otitis externa

34. True about cholesteatoma is/are: [PGI Dec. 02; 06]

- a. It is a benign tumour
- b. Metastasizes to lymphnode
- c. Contains cholesterol
- d. Erodes the bone
- e. Malignant potential

35. Cholesteatoma commonly perforates: [PGI 00]

- a. Lat. Semicircular canal b. Sup. semicircular canal
- c. Promontory d. Oval window

36. Cholesteatoma (Atticoantral) true about: [PGI June 06]

- a. Scanty, malodorous discharge
- b. Otagia
- c. Central perforation
- d. Ossicular involvement
- e. Eustachian tube dysfunction

37. The treatment of choice for atticoantral variety of chronic suppurative otitis media is: [AIIMS Nov. 02]

- a. Mastoidectomy b. Medical management
- c. Underlay myringoplasty d. Insertion of ventilation tube

38. Treatment of choice for Perforation in pars flaccida of the tympanic membrane with cholesteatoma is: [AI 96]

- a. Myringoplasty
- b. MRM
- c. Antibiotics
- d. Radical mastoidectomy

39. The postero superior retraction pocket, if allowed to progress, will lead to: [AI 03]

- a. Sensori-neural hearing loss
- b. Secondary cholesteatoma
- c. Tympanosclerosis
- d. Tertiary cholesteatoma

40. Most difficult site to remove cholesteatoma in sinus tympani is related with: [Kolkatta 2001]

- a. Anterior facial ridge b. Posterior facial ridge
- c. Epitympanum d. Hypotympanum

41. A child presents with ear infection with foul smelling discharge. On further exploration a small perforation is found in the pars flaccida of the tympanic membrane. Most appropriate next step in the management would be: [AIIMS Nov. 07]

- a. Topical antibiotics and decongestants for 4 weeks
- b. IV antibiotics and follow up after a month

- c. Tympanoplasty
d. Tympano-mastoid exploration
- 42. A 5 year old boy has been diagnosed to have posterior superior retraction pocket. All would constitute part of the management except:** [AI 03]
a. Audiometry b. Mastoid exploration
c. Tympanoplasty d. Myringoplasty
- 43. Ossicle M/C involved in CSOM:** [Kolkatta 04]
a. Stapes
b. Long process of incus
c. Head of malleus
d. Handle of malleus

COMPLICATION OF OTITIS MEDIA

- 44. The most common complication of chronic suppurative otitis media is:** [UPSC 05]
a. Meningitis b. Intracerebral abscess
c. Cholesteatoma d. Conductive deafness
- 45. Commonest complication of CSOM is:** [Comed 08, DNB-07]
a. Sub periosteal abscess b. Mastoiditis
c. Brain abscess d. Meningitis
- 46. Commonest complication of CSOM is:** [Karn 96]
a. Conductive deafness b. Meningitis
c. Temporal lobe abscess d. Cholesteatoma
- 47. Most common complication of acute otitis media in children:** [SRMC 02]
a. Deafness b. Chronic mastoiditis
c. Cholesteatoma d. Facial nerve palsy
- 48. Extracranial complications of CSOM:** [PGI Dec. 02]
a. Epidural abscess
b. Facial nerve palsy
c. Hearing loss
d. Labyrinthitis
e. Sigmoid sinus thrombosis
- 49. Extracranial complication(s) of CSOM:** [PGI June 01]
a. Labyrinthitis
b. Otitic hydrocephalus
c. Bezold's abscess
d. Facial nerve palsy
e. Lateral sinus thrombophlebitis
- 50. Most common extra-cranial complication of ASOM is:** [UP 2001]
a. Facial nerve paralysis b. Lateral sinus thrombosis
c. Sub periosteal abscess d. Brain abscess
- 51. Mastoid reservoir phenomenon is positive in:** [PGI June 99]
a. CSOM b. Petrositis
c. Coalescent otitis media d. Coalescent mastoiditis
- 52. Acute mastoiditis is characterized by all except:** [AP 97]
a. Clouding of air cells
b. Obliteration of retroauricular sulcus
c. Deafness
d. Outward and downward deviation of the pinna

- 53. Essential radiological feature of acute mastoiditis is:** [UP-03]
a. Temporal bone pneumatization
b. Clouding of air cells of mastoid
c. Rarefaction and thinning of petrous bone
d. Thickening of temporal bone
- 54. In Mastoiditis tenderness is/are present at:** [PGI Nov. 2010]
a. Tragus
b. Concha
c. Mastoid tip
d. Root of Zygoma
e. Mastoid antrum
- 55. Mastoid tip is involved in:** [UP- 06]
a. Bezold abscess b. Luc abscess
c. Citelli abscess d. Parapharyngeal abscess
- 56. Bezolds abscess is located in:** [AIIMS 92, DNB-07]
a. Submandibular region b. Sternomastoid muscle
c. Digastric triangle d. Infratemporal region
- 57. The diagnosis in a patient with 6th nerve palsy, retro orbital pain and persistent ear discharge is:** [PGI June 99]
a. Gradenigo's syndrome b. Sjogrens syndrome
c. Frey's syndrome d. Rendu osler weber disease
- 58. All are true for Gradenigo's syndrome except:** [AI 05]
a. It is associated with conductive hearing loss
b. It is caused by an abscess in the petrous apex
c. It leads to involvement of the Cranial nerves V and VI.
d. It is characterized by retro-orbital pain
- 59. Gradenigo's syndrome characterised by:** [PGI Dec. 02]
a. Retroorbital pain
b. Profuse discharge from the ear
c. VII nerve palsy
d. Diplopia
- 60. Treatment of cholesteatoma with facial paresis in child is:** [AIIMS 93]
a. Antibiotics to dry ear and then mastoidectomy
b. Immediate mastoidectomy
c. Observation
d. Only antibiotic ear drops
- 61. Treatment of choice for CSOM with vertigo and facial nerve palsy is:** [AI 96]
a. Antibiotics and labyrinthine sedative
b. Myringoplasty
c. Immediate mastoid exploration
d. Labyrinthectomy
- 62. Most potential route for transmission of Meningitis from CNS to Inner ear is:** [AI-09]
a. Cochlear Aqueduct
b. Endolymphatic sac
c. Vestibular Aqueduct
d. Hyrtle fissure
- 63. Commonest cause of brain abscess:** [PGI June 00]
a. CSOM b. Pyogenic meningitis
c. Trauma d. Chr. sinusitis

- 64. True about otogenic brain abscess is are:** [AI 2011]
- H. influenzae is most common causative organism
 - CSOM with lat. sinus thrombosis intum can cause brain abscess
 - Most common complication of CSOM
 - Temporal lobe abscess is associated with personality changes
- 65. Patient is having scanty, foul smelling discharge from middle ear, develops fever, headache and neck rigidity. CT of the temporal lobe shows a localized ring enhancing lesion, which of the following is least likely cause of this condition:** [AI 2011]
- S. aureus
 - Pseudomonas
 - S. pneumoniae
 - H. influenza
- 66. Lateral sinus thrombosis is associated with all except:** [AP 2008]
- Greisinger sign
 - Gradenigo sign
 - Lily-Crowe sign
 - Tobey Ayer test
- 67. Griesinger's sign is seen in:** [TN 03]
- Lateral sinus thrombosis
 - Meningitis
 - Brain abscess
 - Cerebellar abscess
- 68. Light house sign is seen in:**
- ASOM
 - CSOM
 - Menieres disease
 - Cholesteatoma
- 69. A child was treated for H. Influenza meningitis for 6 month. Most important investigation to be done before discharging the patient is:** [AI 99]
- MRI
 - Brainstem evoked auditory response
 - Growth screening test
 - Psychotherapy
- 70. A patient of CSOM has choleastatoma and presents vertigo with. Treatment of choice would be:** [AI 98]
- Antibiotics and labyrinthine sedative
 - Myringoplasty
 - Immediate mastoid exploration
 - Labyrinthectomy

SURGICAL MANAGEMENT OF MIDDLE EAR SUPPURATION

- 71. A-7 year child presenting with acute otitis media, does not respond to ampicillin. Examination reveals full and bulging tympanic membrane, the treatment of choice is:** [AI 98]
- Systemic steroid
 - Ciprofloxacin
 - Myringotomy
 - Cortical mastoidectomy
- 72. A 3 year old child presents with fever and ear ache. On examination there is congested tympanic membrane with slight bulge. The treatment of choice is:** [AI 95]
- Myringotomy with penicillin
 - Myringotomy with grommet
 - Only antibiotics
 - Wait and watch

- 73. Procedure for serous otitis media is:** [AP 2002]
- Trmpanoplasty
 - Mastoidectomy
 - Myringotomy
 - Medical treatment
- 74. Grommet tube is used in:** [TN 2002]
- Secretory otitis media
 - Mucoid otitis media
 - Serous otitis media
 - All of the above
- 75. For ASOM, myringotomy is done in which quadrant:** [AI 95]
- Antero-inferio
 - Antero-superior
 - Postero-superior
 - Postero-inferior
- 76. Ideal site for myringotomy and grommet insertion:** [CUPGEE 02]
- Anterior superior aquadrant
 - Anterior inferior quadrant
 - Posterior superior
 - Posterior inferior
- 77. Myringoplasty is plastic repair of:** [PGI]
- Middle ear
 - Internalear
 - Eustachian tube
 - Tympanic membrane
- 78. Myringoplasty is done using:** [PGI 97]
- Temporalis fascia
 - Dura mater
 - Perichondrium
 - Mucous membrane
- 79. Columella effect is seen in:** [TN 2005]
- Tympanoplasty
 - Septoplasty
 - Tracheostomy
 - None of the above
- 80. Surgery on ear drum is done using:** [Kerala 91]
- Operative microscope
 - Laser
 - Direct vision
 - Blindly
- 81. Which focal length in the objective piece of microscope is commonly used for ear surgery:** [AIIMS May 05]
- 100 mm
 - 250
 - 450
 - 950
- 82. Schwartz operation is also called as:** [PGI 97]
- Cortical mastoidectomy
 - Radial mastoidectomy
 - Fenestration operation
 - Myringotomy
- 83. Simple mastoidectomy is done in:** [MP 2004]
- Acute mastoiditis
 - Cholesteatoma
 - Coalescent mastoiditis
 - Localized chronic otitis media
- 84. Cortical mastoidectomy in indicated in:** [AIIMS 93]
- Cholesteatoma without complication
 - Coalescent mastoiditis
 - CSOM with brain abscess
 - perforation in Pars flaccida
- 85. Radical mastoidectomy is done for:** [DNB 2000]
- ASOM
 - CSOM
 - Atticoantral cholesteatoma
 - Acute mastoiditis
- 86. All of of the following steps are done in radical mastoidectomy except:** [AI 97]
- Lowering of facial ridge
 - Removal of middle ear mucosa and muscles

- c. Removal of all ossicles of eustachian tube plate
d. Maintenance of patency of eustachian tube
- 87. Radical mastoidectomy includes all except:** [AIIMS 00]
a. Closure of the auditory tube
b. Ossicles removed
c. Cochlea removed
d. Exteriorisation of mastoid
- 88. Nerve damaged in radical mastoidectomy is:** [MH 2000]
a. Facial
b. Cochlear
c. Vestibular
d. All
- 89. Modified radical mastoidectomy is indicated in all except:** [MP 2000]
a. Safe SCOM
b. Unsafe CSOM with atticointral disease
c. Coalescent mastoiditis
d. Limited mastoid pathology
- 90. A 30-year old male is having Attic cholesteatoma of left ear with lateral sinus thrombophlebitis. Which of the following will be the operation of choice?** [AI 06]
a. Intact canal will be the operation of choice
b. Simple mastoidectomy with Tympanoplasty
c. Canal wall down mastoidectomy
d. Mastoidectomy with cavity obliteration
- 91. Treatment of choice of cholesteatoma with sensorineural deafness is:** [AIIMS Dec. 94]
a. Radical mastoidectomy
b. Myringoplasty
c. Tympanoplasty
- 92. All of the following techniques are used to control bleeding from bone during mastoid surgery except:** [AIIMS Nov. 04]
a. Cutting drill over the bleeding area
b. Diamond drill over the bleeding area
c. Bipolar cautery over the bleeding area
d. Bone wax

EXPLANATIONS AND REFERENCES

ACUTE SUPPURATIVE OTITIS MEDIA

1. Ans. is b i.e. Strepto-pneumoniae

Ref. Harrison 17th/ed p 208; Current Otolaryngology 2nd/ed pg 656

2. Ans. is a i.e. Pneumococcus

Most common cause of acute otitis media:

- Streptococcus pneumonia / pneumococcus (35–40% cases)
- H. influenza (25–30%)
- M. catarrhalis (10–20%)

3. Ans. is a i.e. Most frequently it resolves without sequelae

Ref. Turner 10th/ed p 424, 428; Dhingra 5th/ed pg 69, 70, 6th/ed p 62, 63; Current Otolaryngology 2nd/ed pg 656–658

- ASOM is the most common infectious disease seen in children. Peak incidence is 2 yrs of age.
- Most common predisposing factor for ASOM is; recurrent attacks of common cold, upper respiratory tract infections and exanthematous fevers like measles, diphtheria, whooping cough.
- Others include: tonsillitis, adenoids, rhinitis, sinusitis, allergy, cleft palate, down syndrome, Tumors of nasopharynx
- Painful parotitis (mumps) most commonly leads to orchitis, oophritis, aseptic meningitis, pancreatitis and not ASOM

... Harrison 17th/ed p 1220

- Most common organism for ASOM is: S. pneumonia (35–40%)
- H. influenza (25–30%) and M. catarrhalis (15%) are less common.
- Treatment of ASOM is Essentially Medical (not surgical) and involves:
 - Antibiotics – Penicillin group of antibiotics
 - Analgesic and antipyretics
 - Ear toileting

- Some cases may require: Myringotomy
 - Mastoidectomy is not done in case of ASOM
 - As far as complications are concerned.

Turner 10/e, p 424, 428 says **"Prognosis of ASOM is good, most cases recover completely. Whether in infants or children."**

Current otolaryngology 2/e pg-658 says "The vast majority of uncomplicated episodes of AOM resolves without any adverse outcome"

4. Ans. is a i.e. ASOM Ref. Dhingra 5th/ed pg 70; 6th/ed p62–63

Otoscopy Signs for ASOM:

- There is congestion of pars tensa

- Leash of blood vessels appear along the handle of malleus and at the periphery giving it a **cartwheel like appearance**.
- Translucency is reduced.
- Later tympanic membrane appears red and bulging with loss of landmarks.
- Tympanic membrane is immobile n pneumatic otoscopy

5. Ans. is c i.e. Streptomycin Ref. Turner 10th/ed p 281, Dhingra 6th/ed p 63

Medical management is the Treatment of choice in a case of ASOM

Antibiotics of choice are:

Other which can be used

- Ampicillin or amoxicillin (DOC)
- Cotrimoxazole
- Cefaclor
- Erythromycin
- Penicillin

6. Ans. is c i.e. Supportive Ref. Turner 10th/ed p 349

Barotraumatic otitis media

"Treatment consists of teaching the patient valsalva manoeuvre. If this fails, politzerization or Eustachian tube catheterization is carried out.

If fluid is present a myringotomy may be necessary and occasionally in resistant cases, grommet insertion may be required until the middle ear mucosa has returned to normal."

... Turner 10th/ed p 349

7. Ans. is c i.e. ASOM Ref. Tuli 1st/ed p 53

ASOM - In stage of suppuration-pulsatile otorrhea is present.

Light house sign: Seen in ASOM when pulsatile otorrhea reflects light intermittently on otoscopy.

NON SUPPURATIVE OTITIS MEDIA

8. Ans. is b i.e. Secretory otitis media Ref. Dhingra 5th/ed pg 72, 6th/ed p64

- Inadequate antibiotic treatment of acute suppurative otitis media may inactivate infection but fail to resolve it completely.
- Low grade infection lingers on which acts as a stimulus for the mucosa to secrete more mucus which leads to development of serous/secretory otitis media.

ALSO KNOW

- Secretory otitis media is characterized by accumulation of non-purulent effusion in the middle ear cleft.
- The fluid collected in serous otitis media is sterile^q
- It is most commonly seen in children between 2 to 5 years of age^q
- It is the most common cause of hearing loss in children in developed world^q

9. Ans. is b i.e. Nasopharyngeal carcinoma Ref. Dhingra 5th/ed pg 72, 6th/ed p 251; Current Laryngology 2nd/ed p 659

Unilateral serous otitis media in an adult should always raise the suspicion of a benign / malignant tumor of nasopharynx

"In adults presenting with a unilateral middle ear effusion the possibility of a nasopharyngeal carcinoma should be considered".

— Current Otolaryngology 2nd/ed pg 659

10. Ans. is d i.e. malignancy Ref. Scotts Brown 7/e vol 3 p 3389

"A high incidence of NPC (Nasopharyngeal Carcinoma) in South East Asia and Southern China correlates with the high incidence of OME (Otitis Media with Effusion) in adults in these regions." — Scotts Brown 7th/ed vol 3 p. 3389

"Presence of unilateral serous otitis media in an adult should raise suspicion of nasopharyngeal growth". Ref. Dhingra 6/e p257

11. Ans. is b i.e. Is painless Ref. Dhingra 5th/ed pg 72, 6th/ed p 64; Current Otolaryngology 2nd/ed pg 658

Glue Ear/serous Otitis Media

- Glue ear/serous otitis media is a painless condition patients are generally asymptomatic and the condition is detected on routine audiologic screening. (It is also k/a silent otitis media)
- M/C symptom of Glue ear is hearing loss. Older children may complain of reduced hearing, but in many cases the hearing loss is noticed by parents, teachers or caretakers
- There may be delayed speech development or child may have behavioral problems
- There may be a blocked feeling of the ear which may cause infants and young children to pull at their ears
- As far as other options are concerned:
- NaF is not used for its treatment
- Radical mastoidectomy is not done in glue ear.

For details on management see later questions

12. Ans. is a i.e Impedance audiometry Ref. Current Otolaryngology 2nd/ed pg 659, 3rd/ed p 676

- **Pure tone audiometry:** gives information about the quantity and quality of hearing loss.

- **In secretory otitis media:** conductive deafness of 20-40 dB is seen (which is not a specific finding as conductive deafness can be seen in many other conditions). Therefore, pure tone audiometry is not diagnostic of serous otitis media but provides an assessment of the hearing loss and is therefore important in monitoring the progress of the condition and provides information useful for management decisions
- On otoscopy: Tympanic membrane appears dull, opaque with loss of light reflex (which again is not diagnostic).
- X-ray mastoid: Shows clouding of air cells.
- Impedance audiometry is an accurate way of diagnosing serous otitis media. It shows type B tympanogram which is diagnostic of fluid in ear^Q.

13. Ans. is b i.e. Glue ear

Ref. Dhingra 5th/ed p 72, 6th/ed p 64

In glue ear (serous otitis media) Tympanic membrane is dull opaque with loss of light reflex and appears yellow / grey / blue in colour.

- Normal colour of tympanic membrane is pearly grey.
- Congested membrane with prominent blood vessels (cartwheel sign) is seen in early stages of acute otitis media.
- Bluish discoloration is seen in haemotympanum.
- Flamingo pink color is seen in otosclerosis.

14. Ans. is c i.e. Myringotomy with ventilation tube insertion

Ref. Logan Turner 10th/ed p 437; ENT by Tuli 1st/ed p 75-76; Current Otolaryngology 2nd/ed pg 660; Dhingra 6th/ed p 64, 5th/ed p 73
Treatment of choice for glue ear is insertion of grommet (i.e., ventilation tube insertion).

Tympanotomy / cortical mastoidectomy has a very limited role. and is not done nowadays for serious otitis media.

Myringotomy and aspiration of middle ear effusion without ventilation tube insertion has a short lived benefit and is not recommended

– (Current otolaryngology 2nd/ed pg 660)

"From three trials, myringotomy with aspiration has not been shown to be effective in restoring the hearing levels in children with OME"

– Scott Brown 7th/ed pg 896

15. Ans. is d i.e. Adenoidectomy with grommet insertion

16. Ans. is b, c and d i.e. Adenoidectomy, Grommet insertion and myringotomy

Ref. Scott Brown 7th/ed vol I p 896-904

Child is presenting with mouth breathing. Palate is high arched. There is nasal obstruction and recurrent respiratory tract infections along with hearing impairment. All these features are suggestive of adenoid hyperplasia. In case of adenoid hyperplasia impairment of hearing is due to secretory otitis.

Thus the logical step in the management would be myringotomy with grommet insertion (to treat SOM) and adenoidectomy (to remove the causative factor). Now since in Q.16 all 3 are given in option, we are going for all three but in Q. 15 choice is between myringotomy with grommet insertion and adenoidectomy and grommet insertion better option is adenoidectomy and grommet insertion (as it is obvious grommet cannot be inserted in tympanic membrane without myringotomy).

17. Ans. is b, c, and d i.e. Type B tympanogram; The effusion of middle ear is sterile; and Most common cause of deafness in a child in day care patients

Ref. Dhingra 5th/ed pg 71-73, 6th/ed p 64-65; Current Otolaryngology 2nd/ed pg 658-659; Ghai 6th/ed p 332

Otitis Media with Effusion/Secretory Otitis Media

- Most common cause of deafness in children (specially school going children)^Q... Current otolaryngology 2/e pg-658.
- Characterised by accumulation of non purulent, sterile fluid in middle ear^Q.

Clinical feature:

- Conductive deafness - Presenting symptom^Q
- Delayed and defective speech

Tympanogram: Type B curve^Q / flat or dome shaped curve^Q.

Management: Grommet insertion is the TOC^Q but should not be performed immediately.

According to Ghai

- "Since 50% of serous middle ear effusions resolve spontaneously within 3 months, newly diagnosed effusions should be observed for this period in nearly all cases.
- Use of antihistaminics and decongestants has been abandoned based on adequate scientific data demonstrating lack of efficacy. The benefit of brief steroid administration is unproven.
- **If effusion persists beyond 3 months, tympanostomy tube insertion may be considered for significant hearing loss (>25 dB). Other indications of tube placement are ear discomfort or pain, altered behavior, speech delay, recurrent acute otitis media or impending cholesteatoma formation from tympanic membrane retraction**".... Ghai 6/e, p 332

According to Current otolaryngology 2nd/ed pg 659

"A large number of patients with OME (otitis media with effusion) require no treatment, particularly if the hearing impairment is mild. Spontaneous resolution occurs in a significant proportion of patients. A period of watchful waiting for 3 months from the onset (if known) or from the diagnosis if onset unknown), before considering intervention is advisable."

ALSO KNOW

Indications for early insertion of Tympanostomy tube/grommet tube:

- Cases where spontaneous resolution is unlikely as predicted by season of presenting to OPD (i.e. between July to December) and a B/L hearing impairment of >30 dB
- It is causing significant delay in speech and language development
- OME is present in an only hearing ear.
- Recurrent otitis media.

18. Ans. is c i.e. tympanostomy tube's are usually required for treatment

Ref. Scott's Brown 7th/ed vol-I pg 879-893-896; Current Otolaryngology 2nd/ed pg 658-662; Dhingra 5th/ed pg 71-72, 6th/ed p 64-65

Lets see at the options one by one:

Serous otitis media:

Option a

Sensori neural deafness occurs as a complication in 80% of cases

This is **not correct** because serous otitis media leads to conductive type of hearing loss.

Option b

Intracranial spread of the infection complicates the clinical course

This is not true as complications of serous otitis media are:

- Adhesive otitis media
- Atrophy of tympanic membrane
- [Tympanosclerosis (chalky white deposits seen on membrane)]
- Atelectasis of middle ear
- Ossicular necrosis
- Cholesteatoma due to retraction pockets
- Cholesterol granuloma due to stasis of secretions

Option c

Tympanostomy tubes are usually required for treatment:

- This is quite **correct** as myringotomy and aspiration of middle ear effusion without ventilation tube/Tympanostomy tube/grommet insertion has a short lived benefit and is not recommended. —Current otolaryngology 2nd/ed pg 660
- Hence if otitis media with effusion / serous OM is not resolved spontaneously, tympanostomy tube is inserted.

Option d

- Gram positive organism are grown routinely in culture in the aspirate
- Absolutely incorrect because fluid collection in serous otitis media is sterile —Dhingra – 5th/ed pg 71

19. Ans. is d i.e. Rinnie test positive

Ref. Dhingra 5th/ed p 72, 26, 6th/ed p 64, 22

Secretory otitis media is associated with conductive type of hearing loss. So, Rinnie's test will be negative.

20. Ans. is b i.e. Secretory otitis media

Ref. Current Otolaryngology 2nd/ed pg 662

Treatment summary for otitis media

– Current Otolaryngology 2nd/ed pg 662

	Acute otitis media	Otitis media with effusion	CSOM
Watchful waiting	Upto 72 hours with analgesia/antipyretics if non severe and patient > 2 yrs old	For 3 months from onset or diagnosis	NI
Medical Therapy	Antibiotic (amoxicillin)	NI	Aural toileting and topical antibiotics (Quinolones)
Surgical intervention	Myringotomy for refractory AOM Cortical mastoid oectomy in non responding cases	VT insertion if unresolved after 3 months Aderoidectomy on second VT insertion	• Tympanoplasty • Tympano mastoid surgery if refractory to medical therapy

NI = not indicated; VT = ventilation tube

21. Ans. is d i.e. Multiple perforation

22. Ans. is c, or d i.e. pain, or Thin odourless fluid

Ref. Dhingra 5th/ed pg 83, 6th/ed p 74; Scott's Brown 7th/ed vol-3 pg 3447-3448

Tubercular Otitis Media

• Important points:

- Seen mainly in children and young adult^Q
- It is secondary to pulmonary tuberculosis.^Q
- Route of spread - Mainly through eustachian tube (not blood borne).^Q

• Symptoms:

1. Patients often present with chronic painless otorrhoea (usually foul smelling) which is resistant to antibiotic treatment^Q
3. Severe conductive type hearing loss^Q. (sometimes due to involvement of labyrinth may be SNHL)
4. Facial nerve palsy may be the presenting symptom in children^Q
5. Cough; fever and night sweats may be present in patients with tuberculous infection in other organ system.

• O/E

- Multiple perforations^Q in tympanic membrane (This feature was once considered characteristic of TB but now is seldom seen).
- Middle ear and mastoid are filled with pale granulation tissue^Q (It is a characteristic of tuberculous otitis media)

• Complications: (Early onset of these symptoms is seen)

- Mastoiditis
- Osteomyelitis
- Postauricular fistula
- Facial nerve palsy

Coming to the Qs Now

Ans. 21 is obvious - i.e. multiple perforations.

As far as Ans 22 is concerned - there is confusion between option c i.e. pain and option d i.e. thin odourless fluid

Pain

According to Scott's Brown 7th/ed vol-3 pg 3447 "Otagia may or may not be present but is usually mild"

According to Dhingra 5th/ed p. 83, 6th/ed p 74; Earache is characteristically absent, but discharge is often foul smelling due to underlying bone destruction. Then discharge is not present, it is thick.

Hence answer 22 can be either c-i.e pain or d i.e then odourless fluid.

CHRONIC SUPPURATIVE OTITIS MEDIA

23. Ans. is a i.e. Attico-Antral

Ref. Dhingra 5th/ed p 77, 6th/ed p 69; Pediatric Otolaryngology 2nd/ed p 478

Tubotympanic type (safe or benign type)

- It is associated with central perforation of tympanic membrane and involves the anterior inferior part of middle ear cleft (eustachian tube and mesotympanum).
- There is no association with cholesteatoma.
- Tubotympanic type is also called safe or benign type as there is no risk of serious complications.

Attico-antral type (unsafe or dangerous type)

- It is associated with an attic or a marginal perforation of the tympanic membrane and involves postero-superior part of middle ear cleft (attic, antrum and mastoid).
- The attico-antral disease is characterized with cholesteatoma which erodes the bone.
- Risk of intracranial extension of infection, and thus the risk of complication, is very high, therefore it is called dangerous or unsafe ear.

24. Ans. c i.e. Attic region

Ref. Dhingra 5th/ed p 77, 6th/ed p 72

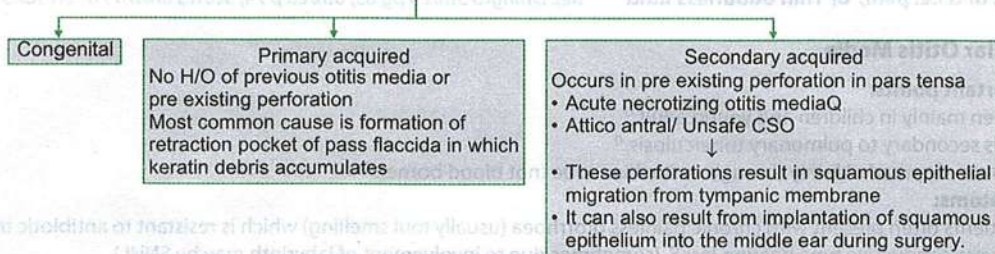
Atticoantral type or marginal or unsafe otitis media involves posterosuperior part of middle ear cleft (attic, antrum, posterior tympanum and mastoid) and is associated with cholesteatoma.

25. Ans. is d i.e. Acute necrotising otitis media

26. Ans. is b i.e. CSOM Ref. Dhingra 5th/ed pg 81, 6th/ed p 67-68

Cholesteatoma is presence of keratinising squamous epithelium in middle ear.

Origin



27. Ans. is d i.e. Retraction pocket

Ref. Current Otolaryngology 2nd/ed pg 666

Most common accepted theory for formation of **cholesteatoma is formation of a retraction pocket**. According to this theory, chronic negative middle ear pressure (which occurs due to poor Eustachian tube function and chronic inflammation of the middle ear) leads to retractions of the structurally weakest area of the tympanic membrane, the pars flaccida. Once the retractions form, the normal migratory pattern of the squamous epithelium is disrupted, resulting in the accumulation of keratin debris in the cholesteatoma sac.

28. Ans. is b i.e. marginal

Ref: Dhingra 5/e pg-78 fig-11.5

29. Ans. is b i.e. Associated with cholesteatoma

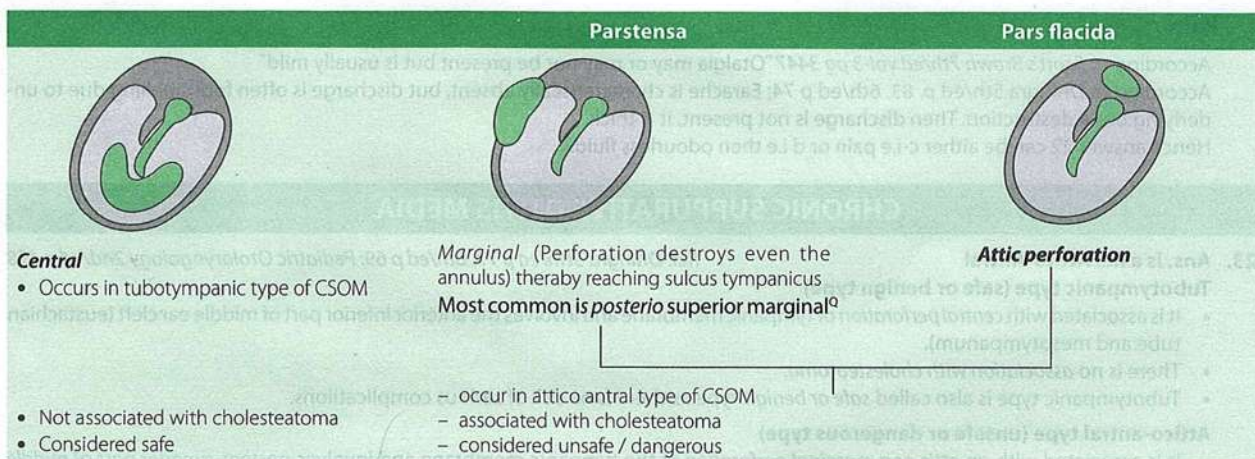
Ref. Dhingra 6/e p59, 5th/ed pg-78

Tympanic membrane can be divided in 2 parts:

Parstensa : It forms most of the tympanic membrane. Its periphery is thickened to form fibro cartilaginous ring called as annulus tympanicus.

Pars Falccida : It is situated above the lateral process of malleus between the notch of Rivinus and the anterior and posterior malleolar fold.

Perforation in tympanic membrane can be in



NOTE

Most common cause of perforation is chronic otitis media. Ref: Dhingra 4th/ed p 55

mnemonic
FAMOUS

- F** - Perforation of Pars **Fl**accida.
- A** - Seen in Atticoantral/marginal perforation
- M** - Associated with CSOM (of atticoantral type) or acute necrotizing otitis **m**edia
- O** - Associated with Cholesteatoma
- U** - Unsafe type
- S** - Surgery is TOC.

30. **Ans. is d i.e. Conservative management** Ref. Turner 10th/ed p 285; Scott's Brown 7th/edd vol 3 pg 3421 and 3424

There are 2 schools of thought as far as this question is concerned – Some believe that:

- TOC of central perforation is myringoplasty.
- TOC of tubo tympanic CSOM is conservative management.

But according to Turner 10/e, p 285 - central perforation/ tubo tympanic CSOM are both managed conservatively by antibiotics and by keeping the ear dry.

"If there is recurring discharge or if there is deafness sufficient to cause disability, closure of the perforation by myringoplasty should be considered."

According to Scott's Brown (7th/ed vol-3 pg-3421)

- Dry perforations that are symptom free do not require usually require closure.
- If the only symptom is a hearing impairment, the chances of improving hearing with surgery should be considered carefully, not just the hearing in the operated ear but the overall hearing ability of the patient.
- In patients with a H/O intermittent activity, surgery to close the perforation is probably indicated to minimize future activity.
- So from all above discussions it is clear that TOC for central safe perforation is conservative management.

31. **Ans. is a i.e. Etiology is multiple bacteria**

Ref. Dhingra 5th/ed p 77, 78, 80, 6th/ed p 70

- CSOM is caused by multiple bacteria - both aerobic and anaerobic.^Q - Dhingra 5/e p. 78
- There is no sex predilection in CSOM - both sexes are affected equally.^Q
- Treatment of Tubotympanic type of CSOM is aural toileting and antibiotic ear drops.

Dhingra 5th/ed p 77, 6th/ed p 70

Dhingra 5th/ed p 80, 6th/ed p 71

As far as oral antibiotics are concerned.

"They are useful in acute exacerbation of chronically infected ear, otherwise role of systemic antibiotics in the treatment of CSOM is limited." ... Dhingra 5th/ed pg 80, 6th/ed p 72

- Otitic hydrocephalus - is a rare complication of CSOM.

... Turner 10th/ed p 309

32. **Ans. is a, b and c i.e. Whitish mass behind intact TM, Normal pars tensa and pars flaccida, Recurrent attacks of otorrhea**

Ref. Internet

Levenson Criteria for Congenital Cholesteatoma

- White mass medial to normal TM
- Normal pars flaccida and tensa
- No history of otorrhea or perforations
- No prior otologic procedures
- Prior bouts of otitis media (no ground for exclusion)

33. **Ans. is b i.e. Cholesteatoma**

Ref. Dhingra 5th/ed pg 81, 6th/ed p 72

Cholesteatoma / attico antral type of CSOM / marginal perforation is characterised by scanty foul smelling, painless discharge from the ear. The foul smell is due to saprophytic infection and osteitis

34. **Ans. is d i.e. Erodes the bone**

Ref. Dhingra 5th/ed p 75-76, 6th/ed p 72

- Normally middle ear is not lined by keratinising squamous epithelium. If keratinising squamous epithelium is present anywhere in the middle ear or mastoid, it is called as **cholesteatoma**.
- The term cholesteatoma literally means - **"Skin in the wrong place."** It is a misnomer because neither it contains cholesterol crystals nor it is a tumor.^Q

Cholesteatoma has 2 parts:

- **Matrix:** made of keratinising squamous epithelium.^Q
- **Central white mass** - made of keratin debris.] Hence also k/a epidermosis or keratoma
- Cholesteatoma has the property to destroy bones (due to the various enzymes released by it and not by pressure necrosis).

- Dhingra 5th/ed pg 76, 77, 6th/ed p 68

35. **Ans. is a i.e. Lateral semicircular canal**

Ref. Logan Turner 10th/ed p 287

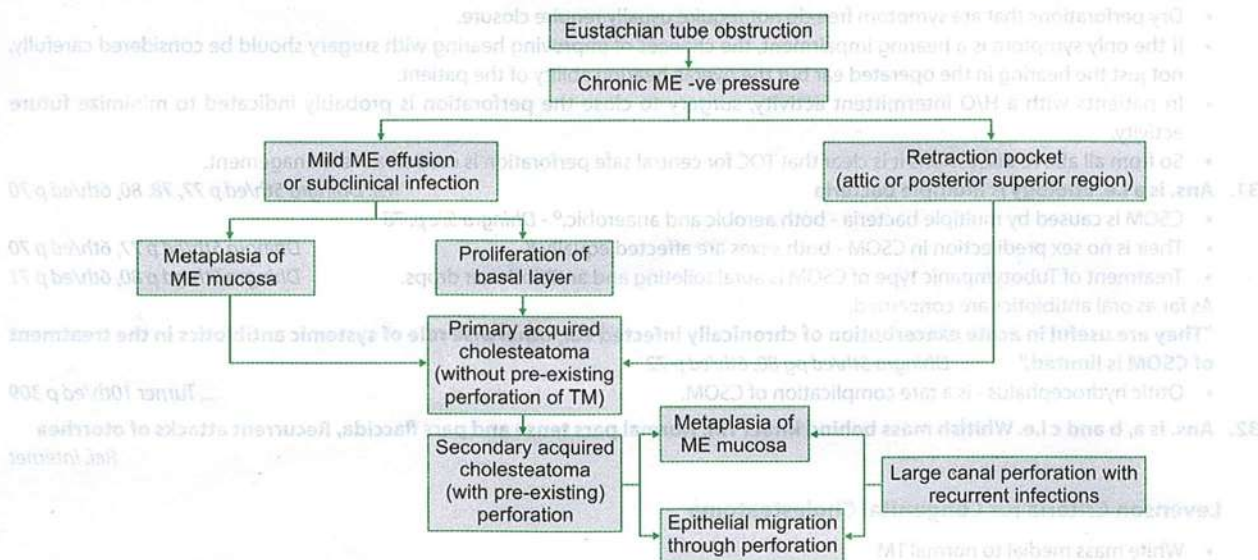
- Cholesteatoma has the property to destroy the bone by virtue of the various enzymes released by it.
- **Structures immediately at the risk of erosion are:**
 - Long process of incus.^Q
 - Fallopi canal containing facial nerve.^Q
 - Horizontal / lateral semicircular canal.^Q

36. Ans. is a, d and e i.e. Scanty, malodorous discharge; Ossicular involvement; and Eustachian tube dysfunction

Ref. Dhingra 5th/ed p 77, 81, 6th/ed p 68, 72; Current otolaryngology 2nd/ed pg 666, 3rd/ed p 683-684; Mohan Bansal p 211

- Cholesteatoma is associated with atticotympanic type of CSOM / atticotympanic or marginal perforation (and not central perforation).
- Cholesteatoma leads to destruction of bones therefore there is scanty foul smelling discharge and ossicular necrosis.
- Hearing loss occurs if ossicles are involved.
- It is of conductive type but if complications like labyrinthitis intervene, SNHL may also be seen.
- Bleeding may occur from granulations or polyp.
- Otalgia is not seen in case of cholesteatoma.

Etiopathogenesis of primary and secondary acquired cholesteatoma



NOTE

Cholesteatoma can also cause facial nerve palsy and labyrinthitis.

37. Ans. is a i.e. Mastoidectomy Ref. Dhingra 5th/ed pg 77, 6th/ed p 73

38. Ans. is b i.e. Modified Radical Mastoidectomy [MRM] Ref. Dhingra 5th/ed p 82, 6th/ed p 73; Logan Turner 10th/ed p 291

CSOM is of Two Types

	Tubotympanic or safe type	Atticotympanic or unsafe type or dangerous type
Discharge	Profuse, mucoid, odourless	Scanty, purulent, foul-smelling ^Q
Perforation	Central ^Q	Attic or posterosuperior marginal ^Q
Granulations	Uncommon	Common
Polyp	Pale	Red and fleshy
Cholesteatoma	Absent	Present ^Q
Complications	Rare ^Q	Common ^Q
Audiogram	Mild to moderate conductive deafness ^Q	Conductive or mixed deafness ^Q

- TOC for atticotympanic variety of CSOM is surgery i.e. .
- TOC for tubotympanic type of CSOM is mainly conservative in the form of aural toileting and systemic antibiotics and once the ear is dry myringoplasty can be done.

NOTE

- Perforation of pars flaccida leads to attic perforation which is considered dangerous and should be managed with modified radical mastoidectomy

39. Ans. is c i.e. Tympanosclerosis

Ref. Dhingra 4th/ed p 60, 5th/ed p 76

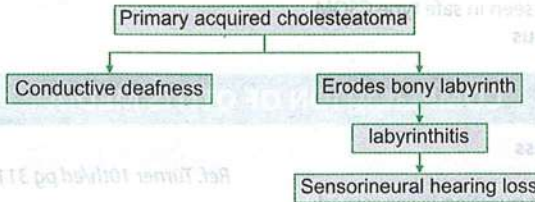
In ventilation of the middle ear cleft, air passes from eustachian tube to mesotympanum, from there to attic, aditus, antrum and mastoid air cell system.

Any obstruction in the pathways of ventilation can cause retraction pockets or atelectasis of tympanic membrane, e.g.:

- Obstruction of eustachian tube * Total atelectasis of tympanic membrane
- Obstruction in middle ear * Retraction pocket in posterior part of middle ear while anterior part is ventilated
- Obstruction of isthmi * Attic retraction pocket

Depending on the location of pathologic process, other changes such as thin atrophic tympanic membrane, (due to absorption of middle fibrous layer), cholesteatoma, **tympanosclerosis**, and ossicular necrosis

A posterior superior retraction pocket - if allowed to progress leads to primary acquired cholesteatoma and not secondary cholesteatoma.



So, tympanosclerosis and sensorineural hearing loss are both correct but tympanosclerosis is a better option than SNHL (which occurs very late when retraction pocket gives rise to cholesteatoma which later causes labyrinthitis)

ALSO KNOW**Tympanosclerosis**

- It is hyalinisation and later calcification in the fibrous layer of tympanic membrane.
- Tympanic membrane appears as chalky white plaque.
- Mostly, it remains asymptomatic.
- It is frequently seen in cases of serous otitis media, as a complication of ventilation tube and in CSOM
- Tympanosclerosis mostly affects tympanic membrane but may be seen involving ligaments, joints of ossicles, muscle tendons and submucosal layer of middle ear cleft and interferes in the conduction of sound.

40. Ans. is b i.e. Posterior facial ridge

Ref. Scott's Brown 7th/ed vol 3 pg 3112-3113

The sinus tympani (Posterior facial ridge) is the posterior extension of the mesotympanum and lies deep to both the promontory and facial nerve.

The medial wall of sinus tympani becomes continuous with the posterior portion of the medial wall of the tympanic cavity. This is the worst region for access because it is above pyramid, posterior to intact stapes and medial to facial nerve.

A retro facial approach via mastoid is not possible because the posterior semi circular canal blocks the access.

41. Ans. is d i.e. Tympano mastoid exploration

Ref. Dhingra 5th/ed pg 82, 6th/ed p 73

Child presenting with foul smelling discharge with perforation in the pars flaccida of the tympanic membrane suggests unsafe CSOM. Conservative management is not of much help in these cases; surgery is the mainstay of treatment.

Tympano mastoid exploration is the ideal option in such cases.

- Tympano-mastoid exploration can be done through various procedures:
 - Canal wall down procedures:** Atticotomy, and rarely radical mastoidectomy.
 - Canal wall up procedures:** Cortical mastoidectomy

Preferred treatment would be

ALSO KNOW

Reconstruction of hearing mechanism by tympanoplasty is only the second priority.

42. Ans. is d i.e. Myringoplasty

Ref. Dhingra 5th/ed p 82, 6th/ed p 72-73; Logan turner 10th/ed p 289

Myringoplasty consists of closing a 'central perforation' in the tympanic membrane in the 'tubotympanic type' or 'safe type' of chronic suppurative otitis media. It is not indicated in unsafe or dangerous type of otitis media with posterosuperior attic perforation.

- The patient in question is a case of dangerous or unsafe type of CSOM as signified by the presence of posterosuperior retraction pocket cholesteatoma.

- The mainstay in treatment of this type of CSOM is surgery.
 - Primary aim is to remove the disease and render the ear safe.
 - Secondary aim is to preserve or reconstruct hearing, but never at the cost of the primary aim.
 - (Mastoid exploration) is the operation of choice.
 - Tympanoplasty: forms part of secondary aim to reconstruct hearing after a primary mastoid exploration.
 - Dangerous type CSOM is associated with a perforation in attic or posterosuperior region of T.M. along with variable extent of destruction of ossicles and other middle ear contents. Reconstruction of hearing in this type of CSOM thus requires variable extent of ossicular reconstruction besides closure of perforation.
 - Audiometry forms an important step in evaluation of disease process preoperatively.
- Although myringoplasty also forms a type of tympanoplasty its use is limited to closure of perforation in the pars tensa of tympanic membrane which is seen in safe type CSOM.

43. Ans. is b i.e. Long process of incus

Ref. Scott's Brown 7th/ed vol 3 pg 3421

COMPLICATION OF OTITIS MEDIA

44. Ans. is b i.e. Intracerebral abscess

45. Ans. is c i.e. Brain abscess

Ref. Turner 10th/ed pg 311-312; Scotts Brown 7th/ed vol 3 pg 3435

There is no confusion as far as this question is concerned:

- According to Turner 10th/ed pg 311-312
- "Most common complication of CSOM is brain abscess (intracerebral)".
- According to Scotts Brown 7th/ed vol 3 pg 3435
- "In a large series of 268 patients with complications of COM, the incidence of extracranial complications was 32%, intracranial complications was 56% and combined intracranial and extracranial was 12%"

Relative Incidence of Complications in Active Mucosal and Squamous COM

Extracranial %		Intracranial	
Post auricular abscess	75	Subdural abscess	51
Facial palsy	06	Brain abscess	20
Bezold abscess	02	Extradural abscess	10
Petrous apicitis	0.2	Lateral sinus thrombosis	20
Meningitis	12		

So from above text of Scotts Brown it is clear that Intracranial complications are more common than extracranial and amongst intracranial as is clear from the table – M/C is Brain abscess

Hence there is no doubt regarding this answer.

NOTE

- Most common complication of acute otitis media → Acute mastoiditis
- Most common intracranial complication of acute otitis media → Meningitis
- Most common extracranial complication of CSOM → Post-auricular abscess
- Most common intracranial complication of CSOM → Brain (intracerebral abscess)

46. Ans. is c i.e. Temporal lobe abscess

Ref. Turner 10th/ed pg 311-312; Scott Brown 7th/ed pg 3435

- Brain abscess is the most common complication of ear disease (CSOM)^Q.
 - (as discussed in previous question)
 - Also ear disease, is the most common cause of brain abscess^Q.
 - Cerebral abscess is twice as common as cerebellar abscess^Q.
 - Temporal lobe abscess is most common type of cerebral abscess^Q.
- Hence our Answer is Temporal lobe abscess

47. Ans. is b i.e. chronic mastoiditis

Ref: Current Otolaryngology 2nd/ed pg 663, 3th/ed p 679; Dhingra 5th/ed pg 85, 6th/ed p 76/77

Firstly – Remember there is no such term as chronic mastoiditis

Mastoiditis is of 2 Types

Acute	Masked / Latent mastoiditis
It typically presents as a complication of Acute otitis media in a child. Treatment options	It results from inadequate treatment of AOM and is less severe.
<ul style="list-style-type: none"> Antibiotics Myringotomy Cortical mastoidectomy (required under special circumstances) 	TOC – Cortical mastoidectomy along with 1/V antibiotics

48. Ans. is b and d i.e. Facial nerve palsy; and Labyrinthitis

Ref. Dhingra 5th/ed p 85, 6th/ed p 75-76; Tuli 1st/ed p 66

49. Ans. is a, c and d i.e. Labyrinthitis; Bezold's abscess and Facial nerve palsy

Extra cranial complications of CSOM are:

- Petrositis (gradenigo syndrome)
- Labyrinthitis
- Osteomyelitis of temporal bone
- Septicemia / pyaemia
- Otogenic Tetanus.
- E. Facial nerve palsy
- Acute Mastoiditis:
 - Postaural sub periosteal abscess
 - Zygomatic abscess
 - Luc's abscess
 - Citelli abscess
 - Bezold abscess

Mnemonic: Pakistan LOST First Match

Remember: M/C Extra cranial complication - mastoiditis (postaural abscess)
Overall M/C complication - Brain abscess (Temporal lobe abscess).

Friends here it is important to note that 'hearing loss' will not be include in the complications of CSOM. As it is a sequelae and not complication of CSOM

Sequelae of CSOM

These are the direct result of middle ear infection and should be differentiated from complications:

- Perforation of tympanic membrane
- Tympanosclerosis
- Cholesteatoma formation
- Ossicular erosion
- Atelectasis and adhesive otitis media
- Conductive hearing loss (d/t ossicular erosion/fixation)
- SNHL
- Speech impairment
- Learning disabilities

Hence – hearing loss, cholesteatoma and conductive deafness are not included in the complications of otitis media.

50. Ans. is c i.e. Subperiosteal abscess

Ref: Scott Brown 7/ed vol-3 pg-3435

As discussed earlier the relative incidence of various extracranial complications in a case of chronic otitis media are:

Extracranial complication	Percentage
Post auricular abscess	75
Facial palsy	6
Bezold abscess	2
Petrous apicitis (Petrositis)	0.2
Meningitis	12

So M/C complication is post auricular abscess

Now what is **post auricular abscess**

There are many abscesses in relation to mastoid –

Post aural subperiosteal abscess	Zygomatic abscess	Bezold abscess
<ul style="list-style-type: none"> It is the commonest abscess that forms over the mastoid Pinna is displaced forward, out ward and downward In infants and children abscess forms over McEwan's triangle 	<ul style="list-style-type: none"> Posterior root of zygoma is involved Swelling lies in front of and above the pinna Associated oedema of upper eye lid Pus lies superficial or deep to temporalis muscle. 	<ul style="list-style-type: none"> Passes through the tip of mastoid into sterno cleido mastoid muscle in the upper part of neck.^Q
Citelli abscess	Lucs abscess (Meatal abscess)	
Pus passes through inner table of mastoid process into the digastric triangle ^Q	In this case, pus breaks through the bony wall between the antrum and external osseus meatus. Swelling is seen in deep part of meatus. ^Q	Lateral sinus thrombosis

So As is clear from above explanation – M/C. Extra cranial complication is – Post Aural sub periosteal abscess: If this option is not given then the next best option would be **Mastoiditis**.

51. Ans. is d i.e. Coalescent mastoiditis

Ref. SK De, p 107, 98

- Mastoid reservoir phenomenon is the latent infection in the mastoid resulting from inadequate treatment of ASOM. (Also called as **masked / latent mastoiditis**).
- It is a slow process of destruction of mastoid air cells without acute features.

Clinical features:

- Patient** is a child, not entirely feeling well with persistence of hearing loss, and mild pain in mastoid region in a treated case of ASOM.

On examination:

- Tympanic membrane appears dull and thick with loss of translucency
- X-ray mastoid - clouding of air cells with loss of cell outline.

Management:

- Cortical mastoidectomy with full doses of antibiotics.

52. Ans. is none

53. Ans. is b Clouding of air cells of mastoid

54. Ans. is c, d and e i.e. Mastoid tip, root of zygoma and Mastoid atrium

Ref. Dhingra 5th/ed pg 86, 6th/ed p 76; Current Otolaryngology 2nd/ed pg 663, 3rd/ed, pg 679

Mastoiditis

- It is a complication of acute otitis media in a child.
- Pain and tenderness over the mastoid process are the initial indicators of mastoiditis.
- Signs:**
 - Mastoid tenderness:** Tenderness is present over *mastoid process, mastoid, tip, posterior border or root of zygoma*
 - Mucopurulent / purulent pulsatile discharge (light house effect).
 - Sagging of postero superior meatal wall.^Q
 - Perforation of pars tensa of tympanic membrane.
 - Obliteration of retroauricular sulcus due to swelling over mastoid.^Q
 - Pinna is pushed forward and downward (antero inferior).
 - Conductive type of hearing loss is always present.^Q
- X-ray mastoids shows clouding of air cells.

IOC is CT scan

Mgt – Antibiotics, myringotomy (If pus is under tension) and cortical mastoidectomy

Cortical Mastoidectomy Indications in Case of Mastoiditis

- Sub periosteal abscess
- Sagging of postero superior meatal wall
- Positive reservoir sign (i.e. meatus immediately fills with pus after it has been mopped out).
- No change in condition of patient or it worsens inspite of adequate medical treatment for 48 hours.
- Mastoiditis leading to complications eg facial nerve palsy, labyrinthitis or intracranial complications.

55. Ans. is a i.e. Bezold abscess

56. Ans. is b i.e. Sternocleidomastoid

Ref. Dhingra 5th/ed pg 87, 6th/ed p 78-79; Tuli 1st/ed pg 56

Bezold abscess – Pus passés through the **tip of mastoid** into the sternocleidomastoid muscle in the upper part of neck.

Here in 55 some of you may confuse the answer with cielli's abscess – this is becoz the language given in Dhingra is very confusing.

For all purposes

Remember : • In citelli's abscess – pus is seen in digastric triangle after passing through inner table of mastoid process.

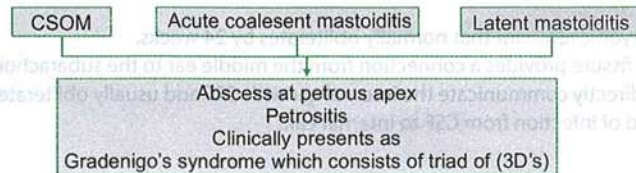
57. Ans. is a i.e. Gradenigo syndrome

58. Ans. is a i.e. It is associated with conductive hearing loss

59. Ans. is c i.e. VII nerve palsy

Ref. Dhingra 5th/ed p 89, 6th/ed p 79

Gradenigo's Syndrome is the Clinical Manifestation of Petrositis



- **Diplopia** (due to VI nerve palsy)
- **Deep seated ear / retro orbital pain** (due to Vth nerve irritation)
- **Persistent ear Discharge**

∴ Answer 57 is obvious i.e. Gradenigo's syndrome.

- As far as Ans 58 is concerned, though conductive deafness may also be seen in petrositis (as petrositis is a complication of CSOM); but since we have to exclude one option, it is the answer of consensus here.

Management: – Antibacterial therapy
– Surgery - Cortical / Modified Radical / Radical mastoidectomy.

60. Ans. is b i.e. Immediate mastoidectomy

Ref. Dhingra 5th/ed p 90, 6th/ed p 80

61. Ans. is c i.e. Immediate mastoid exploration

Ref. Dhingra 5th/ed p 90, 6th/ed p 80

Facial Palsy and CSOM

In CSOM, facial palsy may be due to erosion of fallopian canal by cholesteatoma (which erodes fallopian canal) osteitis, or demineralization. The treatment should be urgent mastoid exploration, with decompression of the facial nerve in the fallopain canal.

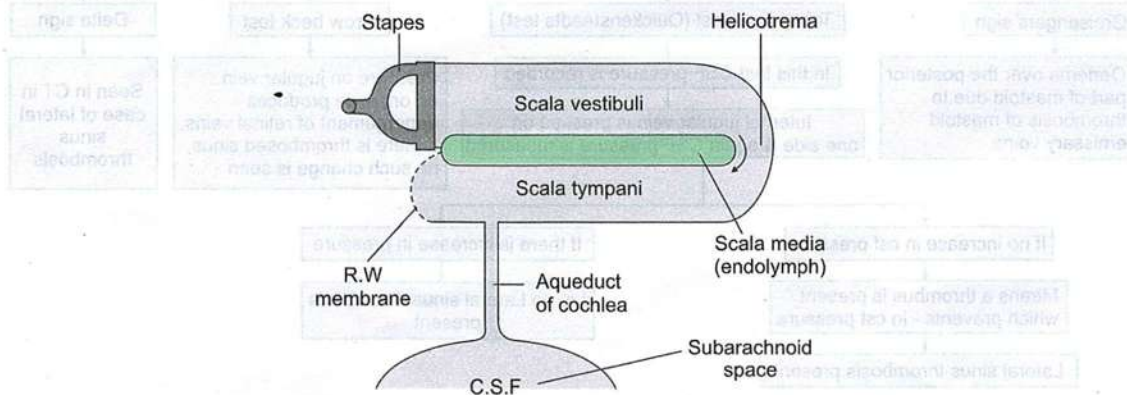
NOTE

- However, the scenario is not the same in ASOM. An acute inflammatory process cannot effectively erode the bony fallopian canal within the short period of time. Hence, the only possibility in a patient with ASOM to develop facial palsy is the presence of a congenitally dehiscant fallopian canal (facial nerve without a bony canal), which is the commonest congenital malformation of temporal bone.
- Thus in this case the treatment is myringotomy to relieve pressure on the exposed nerve or sometimes cortical mastoidectomy.

62. Ans. is a i.e. Cochlear Aqueduct:

Ref: Dhingra 5th/ed p 11, 12, 6th/ed p 9, 10 Current, Diagnosis and Treatment in Otorhinology 2nd/143

Cochler aqueduct is a bony canal that connects the cochlea to the intracranial subarachnoid space. Perilymph within the cochlear aqueduct is in direct continuation with the CSF and hence Cochlear Aqueduct is the most important route for meningitis to spread to the inner ear.



Vestibular Aqueduct

- Vestibular Aqueduct is also a bony connection between the cerebral subarachnoid space and the inner ear.
- Vestibular Aqueduct contains the endolymphatic duct which contains the endolymph. The endolymph within the endolymphatic duct does not however communicate freely with the CSF as it forms a closed space and ends in a cul-de-sac.
- Because the endolymph does not directly communicate with the CSF. Vestibular aqueduct is less important in allowing spread of meningitis from CSF to inner ear than Cochlear Aqueduct.

Hyrtle's Fissure

- Hyrtle's fissure is an embryonic remnant that normally obliterates by 24 weeks.
- When persistent, Hyrtle's fissure provides a connection from the middle ear to the subarachnoid space
- Hyrtle's fissure does not directly communicate the internal ear with CSF and usually obliterates early in life and hence is not an important route of spread of infection from CSF to internal ear.

Endolymphatic Sac

Endolymphatic sac is a cul-de-sac containing endolymph that does not directly communicate with CSF.

63. Ans. is a i.e. CSOM

64. Ans. is b and c i.e. CSOM with lateral sinus thrombosis intum can cause brain abscess; and Most common complication of CSOM

Ref. Turner 10th/ed p 311-312; Dhingra 5th/ed p 92-93, 6th/ed p 82

- Commonest organisms in otogenic brain abscess include gram-negative (Proteus, E.coli, Pseudomonas) and anaerobic bacteria along with Staphylococcus and Pneumococci.
- M/C complication of CSOM = Brain abscess.
- Lateral sinus thrombosis is usually preceded by a perisinus abscess, which may lead later on to cerebellar abscess.
- Temporal lobe abscess is usually associated with hallucinations, visual field defects, and nominal aphasia, while personality change is not a feature of temporal lobe abscess. (It is a feature of frontal lobe abscess.)

65. Ans. d i.e. H. influenzae

Ref. Dhingra 5th/ed p 92-93, 6th/ed p 82; Turner 19th/ed p 311-312

- Commonest organisms in otogenic brain abscess include gram negative (Proteus, E coli, Pseudomonas) and anaerobic bacteria along with Staphylococcus and Pneumocci.
- H. Influenza infection is a rare cause.

66. Ans. is b i.e. Gradenigo sign

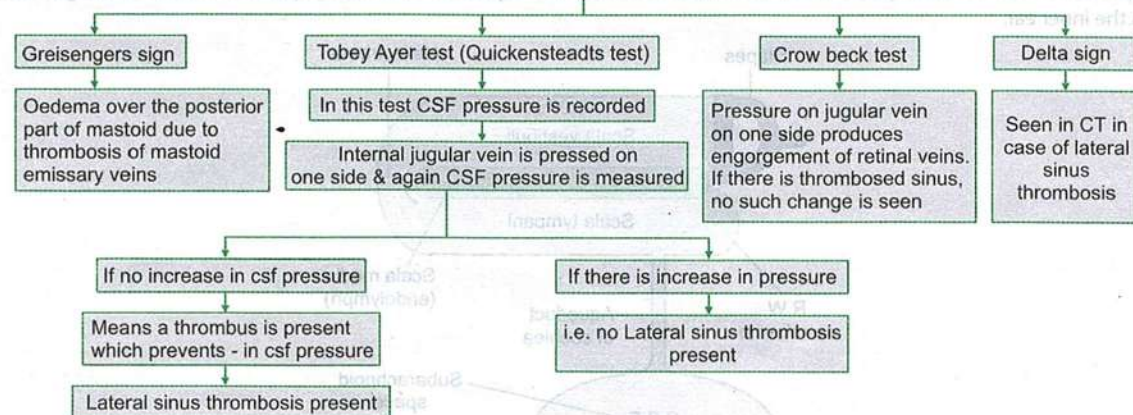
67. Ans. is a i.e. Lateral sinus thrombosis

Ref. Dhingra 5th/ed pg 95, 6th/ed p 84

Lateral Sinus Thrombophlebitis

- It is inflammation of the walls of sigmoid sinus (lateral sinus) with the formation of thrombus
- Aetiology
 - Complication of acute coalescent mastoiditis or masked mastoiditis
 - Chronic SOM with cholesteatoma

Many signs/ tests are associated with lateral sinus thrombophlebitis



68. Ans. is a i.e. ASOM *Ref. Tuli 1st/ed p 53; Dhingra 5th/ed p 86, 6th/ed p 62*
 • Light house sign is seen in acute ASOM and in acute mastoiditis following ASOM.
 • The is mucopurulent or purulent discharge, often pulsatile
 • Onotoscopy examination of ear, this pulsatile discharge reflects light which called as light house effect
69. Ans. is b i.e. Brainstem evoked auditory response *Ref. Ghai 6th/ed p 518; Dhingra 5th/ed p 132*

H. Influenza Type Meningitis

"It is frequent in children between the ages of 3 and 12 months. Residual auditory deficit is a common complication."

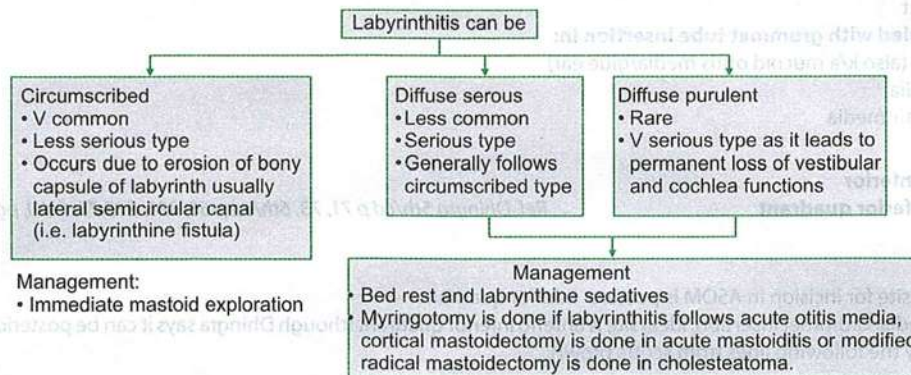
... Ghai 6th/ed p 518

- Since, residual auditory deficit is a common complication of H. influenza meningitis so audiological test to detect the deficit should be performed before discharging any patient suffering from H. influenza meningitis.
- In children best test to detect hearing loss is brainstem evoked auditory response.

"Auditory brainstem response is used both as screening test and as a definitive hearing assessment test in children"

... Dhingra 4th/ed p 117

70. Ans. is c i.e. Immediate mastoid exploration *Ref. Turner 10th/ed p 301; Scott's Brown 7th/ed Vol 3 p 3437*
"Patient of CSOM with cholesteatoma when complains of vertigo – means cholesteatoma has given rise to labyrinthitis."
 ... Dhingra 5th/ed p 90-91, 6th/ed p 80



Since circumscribed labyrinthitis is the most common type, so immediate mastoid exploration will be the option of choice.

Since circumscribed labyrinthitis is the most common type, so immediate mastoid exploration will be the option of choice.

The answer is further supported by **Scotts Brown 7th/ed vol-3 pg-3437** which says.

"Chronic low grade imbalance with or without detectable nystagmus, implies the development of a labyrinthine fistula"
 – Scotts Brown 7th/ed vol-3 pg-3436

Patients with active squamous COM (i.e. Cholesteatoma present) and a suspected labyrinthine fistula should have early surgical management to prevent deterioration of inner ear function. Most surgeons recommend a canal wall down mastoidectomy."

– Scotts Brown 7th/ed vol-3 pg-3437

SURGICAL MANAGEMENT OF MIDDLE EAR SUPPURATION

71. Ans. is c i.e. Myringotomy *Ref. Dhingra 5th/ed pg 71, 6th/ed p 63*
 Child presenting with acute otitis media which is not relieved by antibiotics and bulging tympanic membrane is an indication for myringotomy.
- Indications of myringotomy in acute otitis media:**
- Drum is bulging + acute pain.
 - Incomplete resolution despite antibiotics when drum remains full with persistent conductive deafness.
 - Persistent effusion beyond 12 weeks.
72. Ans. is a i.e. Myringotomy with Penicillin *Ref. Dhingra 5th/ed pg 71, 6th/ed p 63*
Fever + earache + congested and bulging tympanic membrane in a four year old child points towards Acute suppurative otitis media as the diagnosis.
- Antibiotics (Penicillin) form the mainstay of treatment of acute otitis media and should be administered in a child with Acute otitis media and once tympanic membrane is bulging, my ringotomy should be done.

- Grommet insertion is not indicated in Acute suppurative otitis media. It may be used in cases of myringotomy for serous or secretory otitis media.

73. Ans. is c i.e. Myringotomy Ref. Dhingra 5th/ed p 407, 6th/ed p 65; Scotts Brown 7th/ed vol 1 pg. 896 and vol 3 pg 3392
Friends, all of us know that in serous otitis media – myringotomy (i.e. incising the tympanic membrane in order to drain the suppurative effusion of the middle ear) is done.

In Children

TOC of serous otitis media → insertion of grommet/ventilation tube along with adenoidectomy (if features of adenoid hyperplasia are present)

In Adults (Scotts Brown 7th ed vol 3 pg. 3392)

In case of serous otitis media without nasopharyngeal carcinoma.

Myringotomy with ventilation tube insertion is done (In adults ventilation tube improves hearing for a very short term < 1 yr)

If there is nasopharyngeal cancer along with serous otitis media

Then there are two treatment options: (i) Hearing aid (ii) Myringotomy without ventilation tube insertion

Recently, CO₂ laser assisted tympanic membrane ventilation has been advocated for the treatment of adult OME.

74. Ans. is d i.e. all of the above Ref. Dhingra 5th/ed p 71, 73, 6th/ed p 65, 66; Scotts Brown 7th/ed vol/pg 896-897

As discussed in the text

Myringotomy is coupled with grommet tube insertion in:

1. Serous otitis media (also k/a mucoid otitis media/glue ear)
2. Adhesive otitis media
3. Recurrent acute otitis media
4. Meniere's disease

75. Ans. is d i.e. Postero Inferior

76. Ans. is b i.e. Anteroinferior quadrant

Ref. Dhingra 5th/ed p 71, 73, 6th/ed p 65, 398; S1B 7/ed Vol, pg 896-897

Explanation

- As discussed- Ideal site for incision in ASOM is postero inferior quadrant
- For serious otitis media/Grommet insertion, ideal site is antero inferior quadrant (though Dhingra says it can be posterior inferior also) as is proven by the following lines from scotts brown:

Site of insertion of grommet

"Insertion of the ventilation tube posterosuperiorly is not recommended because of the potential for damaging the ossicular chain. It makes no difference to the extrusion rate as to whether the tube is inserted through a radial or circumferential incision and whether sited anterosuperiorly rather than antero-inferiorly.

- *Placement antero-inferiorly compared with placement postero-inferiorly lengthens the time a ventilation tube is in situ.*

To maximise the duration of potential tube function, the preferred insertion site is anteroinferior through a circumferential or radial incision.

Ref. Scott Brown 7th/ed vol/pg 896-897

77. Ans. is d i.e. tympanic membrane

78. Ans. is a and c Temporalis fascia and perichondrium

Ref. Dhingra 5th/d, pg 409, 416, 6th/ed p 406-407

- Myringoplasty is repair of a perforation of the tympanic membrane (the pars tensa).
- Tympanoplasty is ossicular reconstruction with or without myringoplasty.
- Myringoplasty is done using the graft made of either of the following materials.

- Temporalis Fascia (most common)
- Perichondrium from tragus
- Tragal cartilage
- Vein

79. Ans. is a i.e. tympanoplasty

Ref. Dhingra 5th/ed p 35, 6th/ed p 30; Tuli 1st/ed p 491

As discussed- columella effect is seen in Type III tympanoplasty

Type III tympanoplasty is also the M/C type of tympanoplasty performed

80. Ans. is a i.e. Operative microscope

Ref. Maqbool 11th/ed p 62

Myringotomy i.e surgery on Ear Drum is performed under the operating microscope under general anaesthesia.

81. Ans. is b i.e. 250 mm

Ref. Temporal Bone Surgery by MS Taneja 1st/ed p 16

Focal length of objective lens:

- For ear surgery - 200 mm/ 250 mm
- For Nose / Paranasal sinus surgery - 300 mm
- For Laryngeal surgery-400 mm

82. Ans. is a i.e. cortical mastoidectomy

83. Ans. is c i.e coalescent mastoiditis

84. Ans. is b i.e coalescent mastoiditis

Schwartz operation in another name for cortical/sample mastoidectomy

Explanation: See preceding text for indications of cortical mastoidectomy

85. Ans. is c i.e. Atticoantral cholestotoma

86. Ans. is d i.e maintenance of patency of eustachian tube

87. Ans. is c i.e Cochlea removed

Ref. Dhingra 5th/ed pg 411, 6th/ed p 401

Ref. Dhingra 5th/ed pg 413-414, 6th/ed p 405

Explanation

- Radical mastoidectomy is a procedure to eradicate disease from middle ear and mastoid without any attempt to reconstruct hearing.
- It is rarely done these days – Its only indications are:
 - Malignancy of middle ear
 - When cholesteatoma cannot be removed safely eg if it invades eustachian tube, round window or perilyabyrinthine cells
 - If previous attempts to eradicate cholesteatoma have failed

Following steps are done in radical mastoidectomy:

1. **Posterior meatal wall is removed** and the entire area of middle ear, attic, antrum and mastoid is converted into a single cavity, by removing the bridge and lowering the facial ridge.
2. All remnants of tympanic membrane, ossicles (except the stapes foot plate) and mucoperiosteal lining are removed (Not cochlea)
3. Eustachian tube is obliterated by a piece of muscle or cartilage
4. The diseased middle ear and mastoid are permanently exteriorised for inspection and cleaning.

Remember: Bridge is the most posterosuperior part of bony meatal wall lateral to aditus and antrum, which overlies the Notch of Rivinus while facial ridge lies lateral to fallopian canal. Bridge is removed and ridge is lowered in radical or modified radical operation.

88. Ans. is a i.e. Facial nerve

Complications of mastoid surgery- are actually very uncommon

1. Facial palsy (rare)

2. Total hearing loss/dead ear

Ref. Scotts Brown 7th of vol 3 pg 3434

NOTE

The incidence of facial palsy is widely accepted to be rare in the hands of expert surgeons, however, total loss of hearing also occurs in the hands of expert.

89. Ans. is c i.e. Coalescent mastoiditis

Now, this is one of those questions where we can get the answer by exclusion.

Here we know- management of coalescent mastoiditis is cortical mastoidectomy so obviously is not done in this case.

Indications of are:

1. Cholesteatoma confined to the attic and antrum
2. Localised chronic otitis media

90. Ans. is c i.e. Canal wall down mastoidectomy

Ref. Dhingra 5th/ed pg 82, 6th/ed p 73; Turner 10th/ed pg 304; Current Otolaryngology 2nd/ed pg 670 5th/B 7th/ed Vol 3, pg 3432-3433

As discussed in attic cholesteatoma we do and if cholesteatoma invades eustachian tube or perilyabyrinthine tissue then management is Radical Mastoidectomy. Now whether we perform radical mastoidectomy or modified radical mastoidectomy both are canal wall down procedures.

91. Ans. is a i.e.

- CSOM / cholesteatoma generally presents with conductive type of hearing loss.
- If cholesteatoma (CSOM) is presenting with sensorineural hearing loss, it means it is associated with some complications or it can be due to the use of potentially ototoxic ear drops.
- **Management** would still remain.

Ref. Scott's Brown 7th/ed vol-3 pg-3436

92. Ans. is a i.e. Cutting drill over the bleeding area

Ref. Internet

Here the answer is obvious as Cutting drill over the bleeding area will increase the bleeding instead of stopping it.

- Diamond drill over the bleeding area will produce heat and stop the bleeding.
- Bipolar cautery can be used to control bleeding during mastoid surgery (Not monopolar cautery).
- Bone wax is also commonly used to control bleeding during mastoid surgery (It seals the bleeding site).

CHAPTER

23

Meniere's Disease

MENIERE'S DISEASE (ENDOLYMPHATIC HYDROPS)

It is a disease of the membranous inner ear characterised by triad of fluctuating deafness, episodic vertigo and fluctuating tinnitus. The additional symptom of aural fullness has been added to the current definition.

Incidence

- Males affected more than females.
- **Age of onset:** 35–60 years (*Peak:* 5–6th decade)
- **Generally unilateral** (no predilection for left or right side)

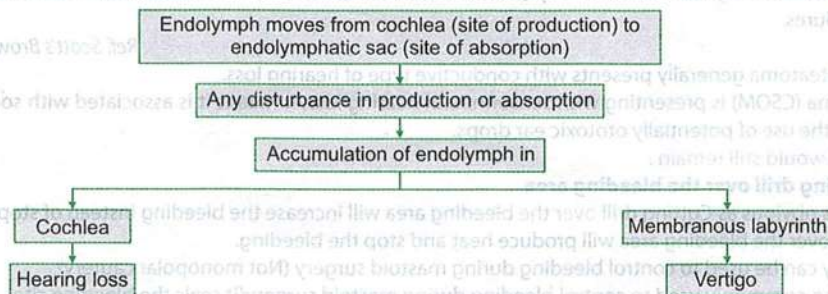
Pathology

Membranous labyrinth contains endolymph and in Meniere's disease the membranes containing this endolymph are dilated like a balloon due to increase in pressure. This is called **hydrops**. So, the main pathology in Meniere's disease is distension of endolymphatic system mainly affecting the cochlear duct (scala media) and the saccule, and to a lesser extent the utricle and semicircular canals. Therefore, Meniere's disease is also called endolymphatic hydrops.

Pathophysiology

See flow chart 23.1:

Flow Chart 23.1: Pathophysiology meniere's disease.



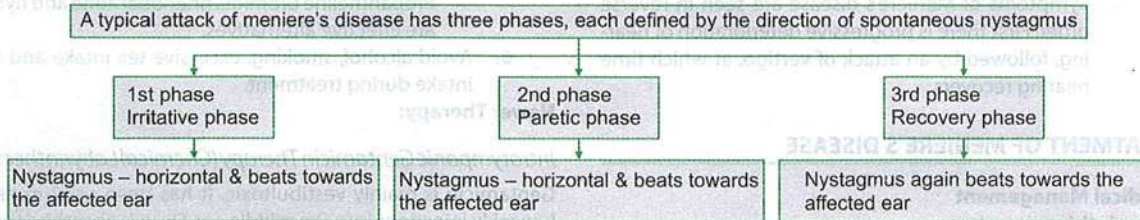
Clinical Features

- **1st Symptom Vertigo:** Onset sudden
 - Episodic in nature. It typically increases over a period of minutes and then usually lasts for several hours.
 - Associated with nausea, vomiting, pallor, sweating, diarrhoea and bradycardia
 - No loss of consciousness.
- **Fluctuating Hearing loss:**
 - Fluctuant and progressive SNHL
 - Initially – low frequency losses
 - Later both – high and low frequency are involved
- **Diplacusis:** sounds perceived as of abnormal high pitch.
 - Intolerance to loud sounds due to recruitment phenomenon (therefore these patients are poor candidates for hearing aids).
- Tinnitus: roaring type and fluctuating in nature.
- Aural fullness.

Other Features

- **Tullios phenomenon:** seen in some cases of **Meniere's disease:** Subjective imbalance and nystagmus observed in response to loud, low frequency noise exposure.
- **Henneberts sign:** False positive fistula test seen in Meniere's disease

• **Nystagmus:**



Investigations

- **Tuning fork tests** - show sensorineural hearing loss
 - **Pure tone audiometry:** SNHL with affection of lower frequencies in early stages and the curve is of rising type. When higher frequencies are involved, curve becomes flat or falling type.
 - 42% Flat audiogram
 - 32% Peaked pattern
 - 19% Down ward sloping
 - 7% Rising pattern
 - **Speech audiometry** – Discrimination score 55-85%
 - **Recruitment:** present
 - **BERA:** Shows reduced latency of wave V
 - **Electochochleography (ECoG): Most sensitive and diagnostic.** Records the action potential and the summing potential of the cochlea through a recording electrode placed over the round window area.
 - Normal width of summing potential / action potential = 1.2 - 1.8 msec.
 - Widening greater than 2 msec is usually significant
 - Summing potential (SP) / Action potential (AI) = 1:3 = 0.33 (Normal) < 30%
 - In Menieres > 30-40%
- The sensitivity of the test can be increased by giving the patient 4 g of oral sodium chloride for 3 days prior to electro cochleography
- **Caloric tests:** shows canal paresis (reduced response on affected side)
 - **Glycerol test:**
 - Glycerol is given parenterally.
 - It produces a decreases in the intralabyrinthine pressure and also improves the cochlear blood flow resulting in improvement of hearing loss or increase in discrimination score by 10.
 - **Reverse glycerol test:**
 - Performed using acetazolamide
 - Shows deterioration in the pure tone thresholds and speech discriminaton scores.

NOTE

- The diagnostic evaluation in menieres disease primarily includes (1) Audiometry (2) Fluorescent treponemal antibody absorption (FTA – ABS) to rule out syphilis as syphilis can imitate Meniere's disease.

- **Committee on Hearing and Equilibrium of the American Academy of of Otolaryngology—Head and neck surgery (AA OHNS) classified the diagnosis of Meniere's disease as follows**

1. **Certain:** Definite Meniere's disease confirmed by histopathology.
2. **Definite:** Two or more definitive spontaneous episodes of vertigo lasting 20 mm or longer.
 - a. Audiometrically documented hearing loss on at least one occasion.
 - b. Tinnitus or aural fullness in the affected ear.
 - c. All other causes excluded.
3. **Probable**
 - a. One definitive episode of vertigo.
 - b. Audiometrically documented hearing loss on at least one occasion.
 - c. Tinnitus or aural fullness in the treated ear.
 - d. Other causes excluded.
4. **Possible**
 - a. Episodic vertigo of Meniere's type without documented hearing loss (vestibular variant) or
 - b. Sensrineural hearing loss, fluctuating or fixed, with dis-equilibrium but without definitive episodes (cochlear variant).
 - c. Other causes excluded.

Variants of Meniere's Disease

- There are some variants of Meniere's disease in which clinical presentation is not that classical of Meniere's disease. These variants are:
 1. **Cochlear hydrops**
 - Only the cochlear symptoms and signs of Meniere's disease are present. Vertigo is absent and it appears only after several years. There is block at ductus reuniens, therefore increased endolymphatic pressure is confined to cochlea only.
 2. **Vestibular hydrops**
 - Patient gets typical episodes of vertigo while cochlear function remains normal. Typical picture of Meniere's disease develops with time.
 3. **Drop attacks (Tumarkin's otolithic crisis)**
 - There is sudden drop attack without loss of consciousness. There is no vertigo or fluctuation in hearing loss. Possible mechanism is deformation of the otolith membrane of the utricle or saccule due to change in endolymphatic pressure.

4. Lermoyez syndrome

- Symptoms of Meniere's disease are seen in reverse order. First there is progressive deterioration of hearing, followed by an attack of vertigo, at which time hearing recovers.

5. Other drugs

- Propantheline bromide, phenobarbitone and hyoscine are effective alternatives.

- Avoid alcohol, smoking, excessive tea intake and coffee intake during treatment.

Newer Therapy:

Intratympanic Gentamicin Therapy (Chemical Labyrinthectomy)

Gentamicin is mainly vestibulotoxic. It has been used in daily or biweekly injections into the middle ear. Drug is absorbed through the round window and causes destruction of the vestibular labyrinth. Total control of vertigo spells has been reported in 60–80% of patients.

Microwick

It is a small wick made of polyvinyl acetate and measures 1 mm × 9 mm. It is meant to deliver drugs from external canal to the inner ear and thus avoid repeated intratympanic injections. It requires a tympanostomy tube (grommet) to be inserted into the tympanic membrane and the wick is passed through it. When soaked with drug, wick delivers it to the round window to be absorbed into the inner ear. It has been used to deliver steroids in sudden deafness and gentamicin to destroy vestibular labyrinth in Meniere's disease.

II. Labyrinthine Exercises

Cooksey-Cawthorne exercise for adaptation of labyrinth:

III. Surgical Management

Surgery in meniere's disease can be conservative or destructive (see table 23.1)

SECONDARY ENDOLYMPHATIC HYDROPS OR D/D OF MENIERE DISEASE

Endolymphatic hydrops is not unique to Meniere's disease. Meniere's disease also called as Primary Endolymphatic hydrops as the cause of menieres disease is not known. Other conditions producing endolymphatic hydrops (*secondary endolymphatic hydrops*) are viral infection, syphilis, endocrine (hypothyroidism), autoimmune, trauma, allergy, Paget's disease, acoustic neuroma, vertebrobasilar insufficiency and migraine, (CNS disease).

TREATMENT OF MENIERE'S DISEASE

I. Medical Management

II. Labyrinthine exercises

III. Surgical

I. Medical Management

- Initial treatment of meniere's disease is with medical management.
- Medical treatment controls the condition in over two third of patients.
- Medical management includes:
 - Antihistamine labyrinthine sedatives (vestibular sedatives)**
 - Many cases can be controlled by vestibular sedatives like prochlorperazine, promethazine, and cinnarizine.
 - Anxiolytic and tranquillizers**
 - Many patients are anxious, therefore they may be helped by anxiolytic and tranquillizers like diazepam.
 - Vasodilators**
 - Betahistine hydrochloride** the most useful recent addition to the medical management and is routinely prescribed for most patients. It increases labyrinthine blood flow by releasing **histamine**.
 - Other vasodilators employed include nicotinic acid, thymoxamine, inhaled carbogen** (5% CO₂ with 95% O₂), and **histamine drip**.
 - Vasodilators increase vascularity of endolymphatic sac and its duct and thereby increases reabsorption of endolymphatic fluid.**
 - Diuretics (furosemide)**
 - Diuretics with fluid and salt restriction can help to control recurrent attacks if not controlled by vestibular sedatives or vasodilators.

Table 23.1 Surgical management of Meniere's of disease

Conservative operation

- Done where vertigo is present, but hearing can be preserved
- Indications
 - B/L disease
 - Young patient
- Decompression of endolymphatic sac.
- Shunt operation, i.e. endolymphatic mastoid shunt, endolymphatic mastoid shunt, endolymphatic subarchnoid shunt
- Sacculotomy (Fick's operation and Cody tack procedure)
- Vestibular nerve section
- Laser/ultrasonic cause partial destruction of labyrinth without hearing loss

Destructive operations – rationale is to control vertigo

- Endolymphatic hydrops causes fluid to accumulate which leads to pressure in inner ear and that disturb vestibulate nerve leading to vertigo. Destruction of inner ear/vestibular nerve prevents these abnormal signals.
- Labyrinthectomy (hearing loss is permanent)
- Intermittent low pressure pulse therapy (Meniett device therapy)
- Here first as grommet is placed through myringotomy and then the apparatus is placed in ear canal which influences the round window membrane pressure and thus bring down endolymphatic pressure

QUESTIONS

1. Which of the following is not a typical feature of meniere's disease? [AIIMS May 06]

- a. Sensorineural deafness
- b. Pulsatile tinnitus
- c. Vertigo
- d. Fluctuating deafness

2. Menier's disease is characterised by all except:

[AIIMS Dec. 98]

- a. Diplopia
- b. Tinnitus
- c. Vertigo
- d. Fullness of pressure in ear

3. All are manifestations of Meniere's disease except:

[AI 97]

- a. Tinnitus
- b. Vertigo
- c. Sensorineural deafness
- d. Loss of consciousness

4. Meniere's disease is manifested by all of the symptoms except: [Delhi 96]

- a. Tinnitus
- b. Vertigo
- c. Deafness
- d. Otorrhoea

5. Meniere's disease is characterized by:

[AI 04]

- a. Conductive hearing loss and tinnitus
- b. Vertigo ear discharge tinnitus and headache
- c. Vertigo, tinnitus hearing loss and headache
- d. Vertigo, tinnitus and hearing loss

6. True about Meniere's disease:

[PGI June 03]

- a. Tinnitus
- b. Episodic vertigo
- c. Deafness
- d. Diarrhoea
- e. Vomiting

7. Meniere's disease is characterised by:

[PGI Dec. 03]

- a. Fluctuating hearing loss
- b. Also called endolymphatic hydrops
- c. Tinnitus and vertigo most common symptom
- d. It is a disease of inner ear
- e. Endolymphatic decompression is done

8. The dilatation of Endolymphatic sac is seen in: [AI 2011]

- a. Meniere's disease
- b. Otosclerosis
- c. Acoustic neuroma
- d. CSOM

9. Meniere's disease is:

[PGI June 99]

- a. Perilymphatic hydrops
- b. Endolymphatic hydrops
- c. Otospongiosis
- d. Coalescent mastoiditis

10. True about Endolymphatic hydrops:

[PGI June 06]

- a. B/L Condition
- b. Females more common
- c. 3rd to 4th decades
- d. Conductive deafness

11. Glycerol test is done in:

[AP 1995, TN 2000]

- a. Otosclerosis
- b. Lateral sinus thrombosis
- c. Meniere's disease
- d. None of the above

12. In a classical case of Meniere's disease which one of the following statement is true: [Karn 01]

a. Carhart's Notch is a characteristic feature in puretone audiogram

b. Schwartz's sign is usually present in the tympanic membrane

c. Low frequency sensorineural deafness is often seen in pure tone audiogram

d. Decompression fallopian canal is the treatment of choice

13. Recruitment phenomenon is seen in?

[DNB 2007/Kolkatta 2002]

- a. Otosclerosis
- b. Meniere's disease
- c. Acoustic nerve schwannoma
- d. Otitis media with effusion

14. Vasodilators in Menieres disease are useful because they: [Kerala 94]

- a. Dilate lymphatic vessels
- b. Decrease endolymph secretion
- c. Increase endolymph reabsorption
- d. Are of no use

15. Vasodilators of internal ear is:

- a. Nicotinic acid
- b. Histamine
- c. Serotonin
- d. Kinins

16. Endolymphatic decompression is done in: [Delhi 2006]

- a. Tinnitus
- b. Acoustic neuroma
- c. Meniere's disease
- d. Endolymphatic fistula

17. Destructive procedures for Meniere's disease are:

- a. Fick's procedure
- b. Cody tack procedure
- c. Vestibular neurectomy
- d. Trans- labyrinthine neurectomy
- e. Labyrinthectomy

18. Differential diagnosis of Meniere's disease are all expect:

[UP 07]

- a. Acoustic neuroma
- b. CNS disease
- c. Labyrinthitis
- d. Suppurative otitis media

19. A 55 year old female presents with tinnitus, dizziness and n/o progressive deafness, which of the following is not a D/D: [AIIMS 2001]

- a. Acoustic neuroma
- b. Endolymphatic hydrops
- c. Meningitis
- d. Histiocytosis 'X'

20. Initial mechanism of action of intra-tympanic gentamicin microwick catheter inserted into inner ear in treatment of menier's disease: [AIIMS Nov. 2012]

- a. Damage outer hair cell
- b. Binds to hair cell $\text{Na}^+\text{-K}^+$ ATPase channel
- c. Acts on melanoreceptors of outer hair cell
- d. Bind to Mg^{2+} channel

EXPLANATIONS AND REFERENCES

1. Ans. is b i.e. Pulsatile tinnitus
2. Ans. is a i.e. diplopia
3. Ans. is d i.e. Loss of consciousness
4. Ans. is d i.e. Otorrhoea
5. Ans is c i.e. Vertigo, tinnitus, hearing loss and headache
6. Ans. is a, b, c, d, e i.e. Tinnitus, Episodic vertigo; Deafness, Diarrhea and vomiting

Ref. Dhingra 5th/ed pg 112, 6th/ed p 100, 101; Tuli 1st/ed p 127; Harrison 17/e, p 202, Turner 10/r, p 335

Miniere's Disease is Characterised by

- Fluctuating tinnitus.
- Fluctuating deafness of sensorineural type
- Episodic vertigo (accompanied by nausea vomiting and vagal disturbances like abdominal cramps, diarrhea and bradycardia)
- Aural fullness.
- Emotional disturbances, headache and anxiety.

NOTE

- Pulsatile tinnitus is seen in glomus jugulare, AV shunts, aneurysms, stenotic arterial lesions. It may also occur in secretory otitis media.
- In the early stages of disease most patients are well in between the attack. As the disease progresses patients may have persistent hearing loss, tinnitus and postural imbalance between the attacks of vertigo
- Some patients in the later stages develop drop attacks k/a Tumarkin or otolithic crisis due to otolith dysfunction
- During this attack patient simply drops without a warning. There is no associated vertigo or loss of consciousness

7. Ans. is a, b, c, d and e i.e. Fluctuating hearing loss; Also called endolymphatic hydrops; Tinnitus and vertigo are most common symptoms. It is a disease of inner ear; Endolymphatic decompression is done

Ref. Dhingra 6th/ed p 100-101

Meniere's Disease

- It is a disease of inner ear²
- It is characterized by distension of the endolymphatic system mainly affecting the cochlear duct (Scala media) and the saccule, and to a lesser extent the utricle and the semicircular canals
- Hence it is also k/a Endolymphatic hydrops
- Because the pathology lies in the endolymphatic system so endolymphatic sac decompression can be used as a management option
- Endolymphatic sac surgery may result in a reduction in the frequency, duration and intensity of vertigo attacks. Although popular, it is not always effective in stopping the vertigo attacks and has no benefits for the auditory symptoms
- Fluctuating hearing loss and tinnitus and vertigo are all seen in meniere's disease.

8. Ans. is a > c i.e. Meniere's disease > Acoustic neuroma

Ref. Dhingra 5th/ed p 111, 6th/ed p 103

9. Ans. is b i.e. Endolymphatic hydrops

Ref. Dhingra 5th/ed pg 111, 6th/ed p 103

Ménière's disease, which is an idiopathic lesion, is a clinical diagnosis. The following conditions, which are included in Ménière's syndrome or secondary Ménière's disease, can mimic the clinical features of Ménière's disease and should be kept in mind.

- Migraine and basilar migraine
- Autoimmune disease of inner ear and otosclerosis
- Syphilis and Cogan's syndrome
- Cardiacogenic
- Vertebral basilar insufficiency
- Trauma: Head injury or ear surgery
- Acoustic neuroma

Also Know

- Lermoyez syndrome is a variant of Meniere's disease, where initially there is deafness and tinnitus, vertigo appears later when deafness improves.

10. Ans. is c i.e. 3rd to 4th decade Ref. Dhingra 5th/ed p 112, 6th/ed p 100-101

- Meniere's disease lead to sensorineural hearing loss and not conductive type.
- Generally unilateral
- Age = Most common 35-60 years.
- It is more common in males

Also remember:

• Otosclerosis	– Bilateral condition, more common in females
• Bells palsy	– Unilateral condition with equal sex distribution
• Acoustic neuroma	– Unilateral with condition equal sex distribution
• Glomus tumor	– More common in females

11. Ans. is c i.e. Meniere's disease Ref. Dhingra 5th/ed p 113, 6th/ed p 102

Glycerol is a dehydrating agent. When given orally, it reduces endolymph pressure and causes improvement in hearing as evidenced by an improvement of 10 dB or 10% gain in discrimination score in menieres disease patients.

12. Ans. is c i.e. Low frequency sensores neural deafness is often seen in pure tone audiogram

Ref. Dhingra 5th/ed p 113, 6th/ed p 101

- Carharts' Notch and Schwartz's sign are seen in otosclerosis - Dhingra 5/e pg-98-99, 6/e p87
- Decompression of endolymphatic sac (and not fallopian canal) is done in Menieres disease. - Dhingra 5/e pg-116, 6/e p104
- Decompression of Fallopiian canal is done in traumatic facial nerve palsy.
- Meniere's disease is associated with - SNHL which affects low frequencies first, followed by higher frequencies later. This is visible on pure tone audiogram.

ALSO KNOW

- Conductive deafness often involves all frequencies (high as well as low) whereas sensorineural hearing loss such as presbycusis affects higher frequencies more than lower frequencies. Meniere's disease is an exception which affects lower frequencies more.
- **Hennebert's sign:** False positive fistula test is seen in Meniere's disease.

13. Ans. is b i.e. meniere's disease Ref. Dhingra 5th/ed pg 31, 113, 6th/ed p 101

Recruitment Phenomenon

- It is a phenomenon of abnormal growth of loudness^o
- The ear which does not hear low intensity sound begins to hear greater intensity sounds as loud or even louder than normal hearing ear.
- Thus a loud sound which is tolerable in normal ear may grow to abnormal levels of loudness in the recruiting ear and thus become intolerable^o
- Recruitment is typically seen in lesions of cochlea^o i.e. meniere's disease^o, presbycusis.^o
- Patients with recruitment are poor candidates for hearing aids.^o

14. Ans. is c i.e. Increase endolymph reabsorption Ref. Dhingra 5/e, p 115, 6/e p104

15. Ans. is a and b i.e. Nicotinic acid and histamine

Ischaemia of endolymphatic sac

↓
absorption of endolymph

Endolymphatic hydrops/menieres disease

Vasodilators improve labyrinthine circulation, So, increase endolymph reabsorption.

Vasodilators Used

During acute attack:

- Carbogen (95% O₂ + 5% CO₂)
- Histamine (contraindicated in asthmatics)

During chronic attack:

- Nicotinic acid
- Betahistine

16. Ans. is c i.e. Meniere's disease Ref. Dhingra 5th/ed p 116, 6/e p104

As explained in Text:

- Decompression of endolymphatic sac is done in menieres disease

17. Ans. is e i.e. Labyrinthectomy

Ref. Dhingra 5th/ed pg 116, 6th/ed p 104

Surgical Procedures for Meniere's Disease

- Surgical therapy for Meniere's disease is reserved for medical treatment failures and otherwise contraindicated.
- Surgical procedures can be divided into main categories
 - Destructive surgical procedures
 - Nondestructive surgical procedures
- **Destructive surgical procedures:** rationale to control vertigo Endolymphatic hydrops causes fluid pressure accumulation within the inner ear, which causes temporary malfunction and misfiring of the vestibular nerve. These abnormal signals cause vertigo. Destruction of the inner ear and/or the vestibular nerve prevents these abnormal signals. The procedures performed are:
 - **Labyrinthectomy**^o
 - Intermittent low pressure pulse therapy (Meniett device therapy)
- **Conservative surgical procedure :** are used in cases where vertigo is disabling but hearing is still useful and needs to be preserved. They are:
 - Decompression of endolymphatic sac
 - Endolymphatic shunt operation^o
 - Sacculotomy (Fick's operation^o and **Cody tack procedure**^o)
 - **Vestibular neurectomy**
 - Ultrasonic destruction of vestibular labyrinth to preserve cochlear function.

18. Ans. is d i.e suppurative otitis media

Ref. Logan Turner 10th/ed p 334, 337, 338

Differential Diagnosis of Vertigo + Tinnitus + SNHL Deafness – Includes:

- Meniere's disease (Endolymphatic hydrops)
- Syphilis
- Labyrinthitis
- Labyrinthine trauma due to fracture of temporal bone, postoperatively after stapedectomy
- Cogan syndrome
- Labyrinthine hemorrhage due to blood dyscrasia
- Acoustic neuroma/meningioma (CP angle lesion),
- Multiple sclerosis,
- Hypothyroidism/Hyperlipidemia

NOTE

In serous otitis media these symptoms may be seen but then hearing loss will be of conductive variety and not SNHL.

19. Ans. is d i.e. Histiocytosis 'X'

Ref. Current Otolaryngology 2nd/ed p 616

Delayed Endolymphatic Hydrops

- Hydropes sometimes develop in patients who have lost their hearing in one or both ears previously. The causes of hearing loss vary, from head injury, meningitis or any other etiology. Patient subsequently develops attacks of vertigo similar to that seen in Meniere's disease in a delayed fashion.
- Histiocytosis X belong to the group of disorders collectively termed inflammatory reticuloendotheliosis characterized by multiple osteolytic lesions involving skull, temporal bone, long bones, ribs, and vertebrae. There is generalized lymphadenopathy, hepatosplenomegaly, and in severe cases involvement of the bone marrow. Involvement of temporal bone leads to features mimicking complicated like otorrhea, mastoiditis, facial palsy, and labyrinthitis.

20. Ans. is b i.e. direct damage to outer hair cells

Ref. Dhingra 5/e p116, 6/e p 104

Intratympanic Gentamicin Therapy

- Gentamicin is mainly vestibulotoxic.
- It has been used in daily or biweekly injection into the middle ear.
- Drug is absorbed through round window and causes destruction of vestibular labyrinth.
- Total control of vertigo spells has been reported in 60-80% of patients with some relief from symptoms in others.
- Hearing loss, sometimes severe and profound, has been reported in 4 to 30% of patients treated with mode of therapy.

CHAPTER

24

Otosclerosis

ANATOMY PERTAINING TO LABYRINTH

1. **Otic labyrinth:** Also called membranous labyrinth or endolymphatic labyrinth. It consists of utricle, saccule, cochlea, semicircular ducts, endolymphatic duct and sac. It is filled with endolymph.
2. **Periotic labyrinth or perilymphatic labyrinth (or space).** It surrounds the otic labyrinth and is filled with perilymph. It includes vestibule, scala tympani, scala vestibuli, peri-lymphatic space of semicircular canals and the priotic duct, which surrounds the endolymphatic duct of otic labyrinth.
3. **Otic capsule.** It is the bony labyrinth. It has three layers.
 - a. **Endosteal:** The innermost layer. It lines the bony labyrinth.
 - b. **Enchondral:** Develops from the cartilage and later ossifies into bone. It is in this layer that some islands of cartilage are left unossified that later give rise to otosclerosis.
 - c. **Periosteal:** Covers the bony labyrinth.

OTOSCLEROSIS

It is a hereditary localised disease of the bony labyrinth (bony otic capsule) characterised by alternating phases of bone resorption and formation. Here the normal dense enchondral layer of the bony otic capsule gets replaced by irregularly laid spongy bone.

Etiology

- Autosomal dominant^o. 50% cases are hereditary
- Male: Female is 1:2 but in India it is 2:1
- Age group affected
 - 20-45 years (maximum between 20-30 years)
- Puberty pregnancy and menopause, accelerate the condition
- Races:
 - White > Negroes - More in the Caucasians
- In 70-85% Bilateral.

- Site - Most common is fissula ante fenestrum (anterior to the oval window)^o

Other sites:

- Round window area - Stapedial footplate
- Internal auditory canal - Semicircular canal

Types of Otosclerosis

Stapedial (Fenestral)	Cochlear (Fenestral)	Histological type
Most common type	Involves round window	Lesion detected only on post-mortem
Most common site		
Fissula antefenestrum ^o		

- On histopathology "Blue mantles" are characteristic.

Clinical Feature

Symptoms:

- **Deafness:** Slowly progressive B/L conductive deafness, in a female aggravated by pregnancy generally suggests otosclerosis. U/L hearing loss may occur in 15% cases
- **Paracusis willisi^o:** patient hears better in noisy surrounding.
- **Tinnitus:** Indicates sensorineural hearing loss (**cochlear otosclerosis**).
- **Voice of the patient:** Quiet voice, low volume speech because they hear their own voices by bone conduction and consequently talk quietly.
- **Vertigo:** Generally not seen.
- In cochlear otosclerosis—there may be vertigo, tinnitus and SNHL

Signs

- **On otoscopic examination:** tympanic membrane is normal^o and mobile in most of the cases.

- In 10% cases flamingo-pink blush is seen through the tympanic membrane called as Schwartz's sign.
- Importance of schwartz sign: It is indicative of active focus with increased vascularity.
- Surgery is contraindicated in patients with schwartz sign and is an indication for sodium fluoride therapy.

Tests

- Tuning fork tests show **conductive type of hearing loss**.
 - **Rinne's**: negative (first for 256 Hz and then 512 Hz).
 - **Weber's**: lateralised to the ear with greater conductive loss.
 - **Absolute bone conduction**: normal (can be decrease in cochlear otosclerosis).
 - **Gelles test**: No change in the bone conduction threshold when air pressure is increased by Siegel's speculum.

Tympanometry /Audiometry

It is one of the important tools in evaluating a patient suspected of otosclerosis

- A. **Impedance audiometry**: Patients with early disease may show Type A tympanogram (because middle ear aeration is not affected)
Progressive stapes fixation results in AS type curve.

- B. **Acoustic reflex**: It is one of the **earliest signs of otosclerosis** and precedes the development of an air bone gap

In the normal hearing ear: The configuration of the acoustic reflex pattern is one of a sustained decrease in compliance owing to the contraction of the stapedial muscle that lasts the duration of stimulus

In otosclerosis: In early stages

A characteristic diphasic on-off pattern is seen in which there is a brief increase in compliance at the onset and at the termination of stimulus occurs. **This is pathognomonic for otosclerosis.**

In later stages: The Reflex is absent – Stapedial reflex is absent

- C. **Pure Tone audiometry**: Normally in otosclerosis – bone conduction is normal but in some cases there is a dip in bone conduction which is maximum at 2000 Hz and is called the **Cahart's notch**.

Remember: Caharts notch disappears after successful stapedectomy

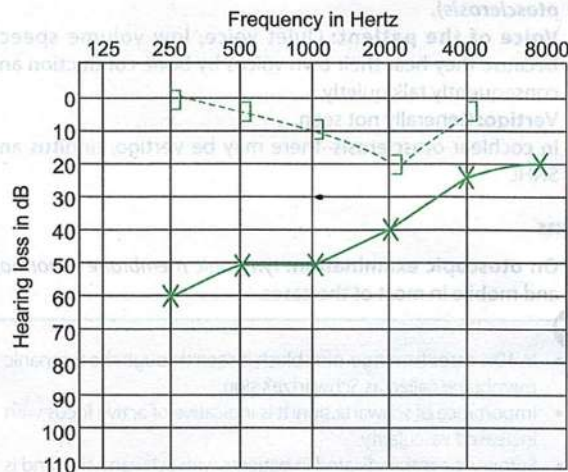


Fig. 24.1: Caharts Notch

Classic audiometric findings in otosclerosis

Low frequency conductive hearing loss.^Q

Caharts notch^Q

Type A or As tympanogram^Q

Diphasic or absent acoustic reflex^Q

Negative Rinne test

EXTRA EDGE

- **Histological otosclerosis**: The gold standard for the reporting of the incidence of histological otosclerosis is the study of **bilateral temporal bone**.^Q
- **Imaging studies**: Imaging modality of choice is **high resolution CT scan**.^Q

Treatment

a. Observation:

- It is the least risky and least expensive option.
- Preferred for patients with (i) unilateral disease (ii) Mild conductive hearing loss
- If the patient is not concerned about the hearing loss, then no intervention is required.
- Audiograms are obtained on yearly basis.
- Hearing loss typically progresses slowly, ultimately requiring intervention

b. Medical therapy:

- (i) **Sodium fluoride therapy**

- It is given in doses of 50 to 70 mg/day for 1 to 2 years.

Role

- It reduces osteoclastic bone resorption and increases osteoblastic bone formation. (It hastens the maturity of active focus)
- It inhibits proteolytic enzymes that are cytotoxic to cochlea (may lead to SNHL)

Dangers of Fluoride Therapy

- Fracture long bone and spine (due to fluorosis)
- So X-ray spine and X-ray of long bones are done as a routine for observing the thickening of trabeculae.

Indications

- Cochlear otosclerosis i.e. Malignant otosclerosis (rapidly progressive cochlear otosclerosis)
- Radiologically active focus^Q (New onset disease)
- Patients with a positive schwartz sign^Q
- **Adverse effect** - most common GI disturbances

Contraindications

- Chronic nephritis
- Chronic rheumatoid arthritis
- Pregnant women / lactating women
- Children

(ii) **Bisphosphonates** (e.g. Alendronate, Etidronate)

- They are anti resorptive agents that are helpful for the prevention and treatment of osteoporosis and other conditions characterized by increased bone remodeling. They are being tried for use in otosclerosis. They inhibit osteoclastic activity without affecting bone deposition
- Common bisphosphonates used are

Main side effect – GI symptoms like nausea and diarrhea

(iii) **Hearing Aids:** Most patients with otosclerosis have a normal cochlear function with excellent speech discrimination and are therefore good hearing aid candidatesc. **Surgical treatment:**• **Selection of patients for stapes surgery**

- Air bone gap of at least 15dB (the larger the air bone gap, the more there is to gain by surgical intervention)
- Hearing threshold should be ≤ 30 dB or worse.
- Rinne Negative (both for 256 and 512 Hz.)
- Speech discrimination score $\geq 60\%$.
- It is also indicated in patients with profound hearing loss but with good speech discrimination, score, so as to enable them to use a hearing aid)

• **Stapedectomy with prosthesis replacement was earlier the TOC**

Here the fixed otosclerotic stapes is removed and a prosthesis inserted between the incus and oval window. Prosthesis can be of teflon[®], stainless steel, platinum or titanium. Disadvantage—associated with high incidence of perilymph leak and SNHL.

• **New treatment of choice is stapedotomy[®]:** Here a hole is made in centre of footplate of stapes and a teflon prosthesis inserted between incus and foot plate.• **Other surgeries which can be done:**

- Laser stapedotomy (CO₂ Argon and KTP)
- Stapes mobilisation
- Lemperts fenestration operation: (outdated procedure).

Contraindications for surgery

- Only hearing ear (**Absolute CI**)
- Occupation
 - Athletes, Working
 - Divers in noisy
 - Frequent surroundings
 - Air travelers
 - Associated meniere's disease
- As rapid change in middle ear pressure can lead to dislodgement of prosthesis and perilymph leak.
- Pregnancy, young children
- Otitis externa/Otitis media
- Tympanic membrane perforation
- Inner ear malformation/exostosis
- Medically unfit
- Active/malignant otosclerosis (It is an indication for fluoride therapy)

Relative contraindications**NOTE**

Most important complication of stapes surgery – hearing loss so second operation is considered 6 months after surgery

Patients who refuse surgery or are unfit for surgery can use hearing aid.

QUESTIONS

1. **Otospongiosis is inherited as:** [AI 95]
 - a. Autosomal dominant
 - b. Autosomal recessive
 - c. X-linked dominant
 - d. X-linked recessive
2. **True about otosclerosis:** [PGI June 03]
 - a. 50% have family history
 - b. Males are affected twice than female
 - c. More common in Negro's and African's
 - d. Deafness occurs in 20 - 30 yrs but less in before 10 yrs and after 40 yrs
 - e. Pregnancy has bearing on it
3. **Common age for otosclerosis is:** [UP-06]
 - a. 5 - 10 yrs
 - b. 10 - 20 yrs
 - c. 20 - 30 yrs
 - d. 30 - 45 yrs
4. **Commonest site of otosclerosis is:** [Comed 07]
 - a. Round window
 - b. Oval window
 - c. Utricle
 - d. Ossicles
5. **The part most commonly involved in Otosclerosis is:** [PGI June 99 / Rohtak 98/UP-08]
 - a. Oval window
 - b. Round window
 - c. Tympanic membranes
 - d. Malleus
 - e. Ossicles
6. **Most common site for the initiation of otosclerosis is:** [Karn. 06]
 - a. Foot plate of stapes
 - b. Margins of stapes
 - c. Fissula antefenestrum
 - d. Fissula post fenestrum
7. **Otospongiosis causes:** [AI 96]
 - a. U/L conductive deafness
 - b. B/L conductive deafness
 - c. U/L Sensorineural deafness
 - d. B/L sensorineural deafness
8. **Paracusis willisii is feature of:** (MHPGMCET 2002, JIPMER 2000 March, MH 2005)
 - a. Tympanosclerosis
 - b. Otosclerosis
 - c. Meniere's disease
 - d. Presbycusis
9. **A patient hears better in Noise. The diagnosis is:** [Karn. 95]
 - a. Hyperacusis
 - b. Hypoacusis
 - c. Presbycusis
 - d. Paracusis
10. **In otosclerosis tinnitus is due to:** [Bihar 2005]
 - a. Cochlear otosclerosis
 - b. Increased vascularity in lesion
 - c. Conductive deafness
 - d. All of the above
11. **In majority of the cases with otosclerosis the tympanic membrane is:** [Kerala 94]
 - a. Normal
 - b. Flamingo pink
 - c. Blue
 - d. Yellow
12. **Schwartz sign seen in:** [MAHE 05, PGI -98]
 - a. Glomus Jugulare
 - b. Otosclerosis
 - c. Meniere's diseases
 - d. Acoustic neuroma
13. **Gelle's test is for:** [Bihar 2006]
 - a. Otosclerosis
 - b. NIHL
 - c. Sensorineural deafness
 - d. None
14. **Feature in otosclerosis includes:** [AP 2003]
 - a. Sounds not heard in noisy environment
 - b. Normal tympanum
 - c. More common in males
 - d. Malleus is most commonly effected
15. **Carharts notch in audiogram is deepest frequency of:** [AI 03; TN 03]
 - a. 0.5 KHz
 - b. 2 KHz
 - c. 4 KHz
 - d. 8 KHz
16. **Carhart's notch in audiometry is seen in:** [MAHE 05]
 - a. Ocular discontinuity
 - b. Haemotympanum
 - c. Otomycosis
 - d. Otosclerosis
17. **Acoustic dip occurs at:** [TN 95]
 - a. 2000 Hz
 - b. 4000 Hz
 - c. 500 Hz
 - d. 1500 Hz
18. **Lady has B/L hearing loss since 4 years which worsened during pregnancy. Type of impedance audiometry graph will be:** [AIIMS May 07]
 - a. Ad
 - b. As
 - c. B
 - d. C
19. **All are true about otosclerosis except:** [PGI June 06, June 05]
 - a. Increased incidence in female
 - b. Sensorineural deafness
 - c. Irreversible loss of hearing
 - d. Carhart's notch at 2000 Hz
 - e. Family history positive
20. **Characteristic feature of Otosclerosis are all except:** [AIIMS June 97]
 - a. Conductive deafness
 - b. Positive Rinne's test
 - c. Paracusis willisi
 - d. Mobile ear drum
21. **A 30- year old woman with family history of hearing loss from her mother's side developed hearing problem during pregnancy. Hearing loss is bilateral, slowly progressive, Pure tone audiometry bone conduction hearing loss with an apparent bone conduction hearing loss at 2000 Hz. What is the most likely diagnosis?** [AIIMS May 06]
 - a. Otosclerosis
 - b. Acoustic neuroma
 - c. Otitis media with effusion
 - d. Sigmoid sinus thrombosis
22. **Medication which may prevent rapid progress of cochlear otosclerosis is:** [Karn. 94]
 - a. Steroids
 - b. Antibiotics
 - c. Fluorides
 - d. Vitamins
23. **All are true statements regarding use of sodium fluoride in the treatment of otosclerosis except:** [AI 2011]
 - a. It inhibits osteoblastic activity
 - b. Used in active phase of otosclerosis when Schwartz sign is positive
 - c. Has proteolytic activity (bone enzymes)
 - d. Contraindicated in chronic nephritis

24. A 31 year old female patient complains of bilateral impairment of hearing for the 5 year. On examination, tympanic membrane is normal and audiogram shows a bilateral conductive deafness. Impedance audiometry shows As type of curve and acoustic reflexes are absent. All constitute part of treatment, except:

- a. Hearing aid
- b. Stapedectomy
- c. Sodium fluoride
- d. Gentamicin

25. Following operations are done in case of otosclerosis:

[PGI Dec. 03]

- a. Stapedectomy
- b. Fenestration
- c. Stapedotomy
- d. Sacculotomy
- e. Mastoidectomy

26. In otosclerosis during stapes surgery prosthesis used is:

[UP 06]

- a. Teflon biston
- b. Grommet
- c. Total ossicular replacement
- d. All of the above

NEET PATTERN QUESTIONS

27. Schwarte sign seen in:

[NEET Pattern]

- a. Glomus jugulare
- b. Otosclerosis
- c. Meniere's diseases
- d. Acoustic neuroma

28. A pure tone audiogram with a dip at 2000 Hz is characteristic of:

[NEET Pattern]

- a. Presbycusis
- b. Ototoxicity
- c. Otosclerosis
- d. Noise induced hearing loss

EXPLANATIONS AND REFERENCES


1. Ans. is a i.e. Autosomal dominant

Ref. Dhingra 5th/ed pg 97, 6th/ed p 86

The exact etiology of otosclerosis is not known. In otosclerosis family history/heredity plays an important role. About 50% of patients of otosclerosis have a positive family history.

- It is an autosomal dominant condition^o
- Shows incomplete penetrance^o and variable expression^o

Also Remember: It may be associated with Vander Hoeve syndrome

Blue sclera  Osteogenesis imperfecta
Otosclerosis

2. Ans. is a, d and e i.e. 50% have family history; Deafness occurs in 20-30 years but less in before 10 years and after 40 years; and Pregnancy has bearing on it

3. Ans. is c i.e. 20 to 30 yrs Ref. Dhingra 5th/ed pg 97, 6th/ed p 86

- 50% of patients of otosclerosis have positive family history.
- Females are more commonly affected than males. (Note unless and until the Question says in India always mark female > male as the correct option)
- Whites are affected more than negroes.
- Age = Most common between 20-30 years (Ans. 3) and is rare before 10 and after 40 years.
- Deafness is increased by pregnancy, menopause, trauma and major operations.
- Viruses like measles virus have also been associated with it.

4. Ans. is b i.e. Oval window

5. Ans. is a i.e. Oval window

6. Ans. is c i.e. Fissula antefenestrum. Ref. Dhingra 5th/ed pg 97-98, 6th/ed p 86-87

- | | |
|---|--|
| • Most common type of otosclerosis | – Stapedial otosclerosis |
| • Most common site of otosclerosis | – Fissula ante fenestram (i.e. just in front of oval window) |
| • Most common site for stapedial otosclerosis | – Fissula ante fenestram (i.e. just in front of oval window) |
| • Most common site for cochlear otosclerosis | – Round window |

7. Ans. is b i.e. Bilateral conductive deafness

8. Ans. is b i.e. Otosclerosis

9. Ans. is d i.e. Paracusis

10. Ans. is a i.e. Cochlear Otosclerosis

Ref. Dhingra 5th/d, p 98, 6th/ed p 87; Current Otolaryngology 3th/ed p 690

Symptoms of Otosclerosis

- **Hearing loss** – It is the presenting symptom. Hearing loss is painless and has insidious onset. It is bilateral conductive type and usually starts in twenties.
- **Paracusis willisi** – Patient hears better in noisy than quiet surroundings
- **Tinnitus** – More in cochlear otosclerosis i.e. it indicates sensorineural degeneration
- **Vertigo** – Uncommon
- **Speech** – Monotonous, well modulated soft speech



Paracusis	Patient hears better in noise. Seen in otosclerosis.
Presbycusis	SNHL associated with aging. Manifests at 65 years of age. (It is physiological)
Hyperacusis	Sensation of discomfort/pain on exposure to loud noises. Seen in injury to nerve to stapedius.
Diplacusis	Patient hears same tone as of different pitches in either ear (distortion of sound). Seen in Meniere's disease

EXTRA EDGE

- **Paracusis:** Scotts Brown 7th/ed vol-3 pg-3596
- Paracusis refers to auditory dysfunction, in which the perception of volume, pitch, timbre or other quality of sound may be altered.
- In majority of cases, paracusis are attributed to abnormalities at the auditory periphery (as in otosclerosis) However, they have also been reported in CNS lesions including temporal lobe (This is because 'Timbre' of a sound is perceived by well defined regions of posterior Heschl's gyrus and superior temporal sulcus extending into the circular insular sulcus, of both left and right hemisphere)

11. **Ans. is a i.e. Normal**

12. **Ans. is b i.e. Otosclerosis**

Ref. Dhingra 5th/ed pg 98, 6th/ed p 87; Current Otolaryngology 2nd/ed pg 674, 3rd/ed p 690

In Otosclerosis on Otoscopy

- Tympanic membrane is normal in appearance mostly, middle ear space is well pneumatized and malleus moves with pneumatic otoscopy (i.e. mobility is normal)
- Sometimes a reddish hue / Flamingo pink may be seen on the promontory and oval window niche owing to the prominent vascularity associated with an otospongiotic focus. This is k/a Schwartz sign.

13. **Ans. is a i.e. Otosclerosis**

Ref. Dhingra 5th/ed pg 27, 6th/ed p 22

Gelle's Test

This test was earlier done to confirm the presence of otospongiosis. In this test, BC (bone conduction) is tested and at the same time Siegel's speculum compresses the air in the meatus. In normal individuals hearing is reduced after this; i.e. Gelles test is positive; but in stapes fixation, sound is not affected. i.e Gelles test is negative.

Basis of the Test

In normal individuals	In case of otosclerosis
↑ in air pressure in ear canal by siegel's speculum	↑ air pressure in ear canal by siegels speculum
↓	↓
Push the tympanic membrane and ossicles inward	Push the tympanic membrane
↓	↓
↑ Intralabyrinthine pressure	But ossicles are fixed
↓	Hence this ↑ ed pressure is not transmitted further
↓	↓
↓ Immobility of basilar membrane	Hence no ↓ in hearing (i.e. test is negative)
↓	
↓ hearing (i.e. test is positive)	

NOTE

Gelles test will also be negative in case of ossicular discontinuity

14. Ans. is b i.e. Normal tympanum

Ref. Dhingra 5th/ed pg 97-98, 6th/ed p 87; Current Otolaryngology 2nd/ed pg 673, 674, 3rd/ed p 689, 90

Already explained

15. Ans. is b i.e. 2 kHz**16. Ans. is d i.e. Otosclerosis**

Ref. Dhingra 5th/ed p 98, 6th/ed p 87; Scott's Brown 7th/ed vol-3 pg 3461-3462

Carharts notch

- Bone conduction is normal in otosclerosis.
- In some cases there is a dip in bone conduction curve which is maximum at 2000 Hz / 2 KHZ called as Carharts notch.
- Carharts notch is seen only in bone conduction curve
- It disappears after successful stapedectomy/stapedotomy

EXTRA EDGE

- The reason why it disappears after successful surgery is that when the skull is vibrated by bone: conduction sound, the sound is detected by the cochlea via 3 routes
- Route (a) - is by direct vibration within the skull
- Route (b) is by vibration of the ossicular chain which is suspended within the skull
- Route (c) - is by vibrations emanating into the external auditory canal as sound and being heard by the normal air-conduction route
- In a conduction type of hearing loss (as in otosclerosis) the latter two routes are deficient but regained by successful reconstruction surgery. Hence bone conduction thresholds improve following surgery.

ALSO KNOW

- Dip in noise induced hearing loss is seen at 4 KHZ.
- In noise induced hearing loss - Dip is seen in both air and bone conduction curves.
- Trough shaped audiogram is seen in congenital SNHL.
- Flat audiogram with moderate to severe SNHL is characteristic of presbycusis.

17. Ans. is b i.e. 4000 Hz

Ref. Dhingra 5th/ed pg 40, 6th/ed p 35; Tuli 1st/ed p 115

Acoustic dip is the dip seen in pure tone audiometry due to noise trauma, which is seen typically at 4 kHz i.e. 4000 Hz.

18. Ans. is b i.e. As curve

Ref. Dhingra 5th/ed pg 97, 98, 99, 6th/ed p 87, 88 Current Otolaryngology 2nd/ed pg 677, 3rd/ed p 691

Lady presenting with hearing loss

Bilateral in nature

Which worsens during pregnancy

Leaves no confusion - for otosclerosis being the diagnosis.

In otosclerosis - impedance audiometry shows As type of curve.

NOTE

In the early disease since middle ear aeration is not affected patient shows Type A curve).

19. Ans. is b and c i.e. Sensorineural deafness; and Irreversible loss of hearing

Ref. Dhingra 5th/ed pg 97-99, 6th/ed p 88-89; Current Otolaryngology 2nd/ed pg 673-674, 3rd/ed p 689, 690-91

- In otosclerosis - 50% cases have positive family history.
- Females are affected more than males
- Bilateral conductive deafness seen in otosclerosis is not irreversible as it can be successfully treated by stapedectomy / Stapedotomy
- Sensorineural hearing loss occurs when later in the course of time osteosclerotic focus reaches the cochlear endosteum but actually most common hearing loss seen is conductive type.
- Carhart notch is seen in bone conduction curve at 2000 Hz.

20. Ans. is b i.e. Positive rinne's test

Ref. Dhingra 5th/ed pg 98-99, 6th/ed p 87-88; Current Otolaryngology 2nd/ed pg 675-677

Otosclerosis causes conductive deafness. (i.e. option a is correct)

Tuning Fork Tests in Otosclerosis

- Rinnes test - negative (i.e. option b is incorrect)
- Webers test - lateralised to ear with greater conductive loss

- Absolute bone conduction - normal (It is decreased in cochlear otosclerosis)
- Pure tone audiometry - shows loss of air conduction more for lower frequency.
 - Bone conduction is normal. In some cases there is a dip in bone conduction maximum at 2000 Hz (called as Caharts notch)
- Acoustic reflex - shows a biphasic peak or it is absent
- Speech audiometry - Normal discrimination score
- Impedance audiometry - As type of curve

Also Remember:

- Tympanic membrane is normal and mobile in 90% cases. (i.e. option d is correct).
- Schwartz sign - Flamingo cases pink colour of tympanic membrane is seen in 10% cases. It indicates active focus with increased vascularity.
- Stapes footplate - Shows a rice grain / biscuit type appearance
- Blue mantles are seen histopathologically.

21. Ans. is a i.e. Otosclerosis

Ref. Dhingra 4th/ed p 86-87, 6th/ed p 86-87, 5th/ed pg 97-98-99

30 years female
+
Bilateral slowly progressive hearing loss
+
Positive family history
+
Loss apparent during pregnancy
+
Cahart's notch at 2000 Hz

All these leave no doubt about otosclerosis being the diagnosis.

22. Ans. is c i.e. Fluorides

23. Ans. is a i.e. It inhibits osteoblastic activity

Ref. Current Otolaryngology 2nd/ed pg 677, 3rd/ed p 693; Tuli 1st/ed pg 81 and 82, Otosclerosis and stapedectomy, Diagnosis, Management and treatment by Gasscock 1st/ed p 61, 62

The most useful medication which prevents rapid progression of cochlear otosclerosis is sodium fluoride

SODIUM FLUORIDE THERAPY

Mechanism of Action

- It reduces osteoclastic bone resorption and increases osteoblastic bone formation, which promote recalcification and reduce bone remodelling in actively expanding osteolytic lesion.
- It also inhibits proteolytic enzymes that are cytotoxic to cochlea and lead to SNHL (Hence specially useful in cochlear otosclerosis).
"Fluoride therapy has been found to significantly arrest the progression of SNHL in the low and high frequencies"
– Current Otolaryngology 2nd/ed pg 678
– Tuli 1st/ed p 82
"Sodium fluoride therapy has a role in helping maturity of active focus to arrest cochlear loss"
- **Dose:** Initially 50 mg daily followed by 25 mg daily for maintenance
- **Duration of treatment** = 1 - 2 years
- **Indications for Sodium Fluoride Therapy:**
 - Patients with progressive sensorineural deafness disproportionate with age (whose audiometric pattern indicates the possibility of cochlear-otosclerosis)
 - Patients with radiological evidence of a demineralized focus in the cochlear capsule (demonstration of spongiotic changes in the cochlear capsule by popytomography).
 - Patients with positive Schwartz sign (indicates activity of otosclerotic focus).
 - Patients who have otosclerosis and are diagnosed to prevent with secondary hydrops.
- **Contraindications for Sodium Fluoride Therapy:**
 - Patients with chronic nephritis with nitrogen retention
 - Patients with chronic rheumatoid arthritis
 - Pregnant or lactating women
 - In children before skeletal growth has been achieved.
 - Patients with skeletal fluorosis
 - Patients allergic to fluoride.

- **Response is evidenced by:**
 - Reduced tinnitus
 - Reduced dizziness
 - Fading of Schwartz sign
 - Radiological signs of recalcification
- **Side effects**
 - M/C Gastrointestinal side effects like nausea and vomiting
 - It can lead to skeletal fluorosis so X-ray spine and long bones should be done routinely

24. Ans. is d i.e. Gentamicin

Ref. Dhingra 5th/ed p 99; Current Otolaryngology 2nd/ed pg 678-679

Bilateral conductive hearing loss

+

Normal tympanic membrane

+

As type of impedance audiometry curve

Suggest otosclerosis as the diagnosis

Gentamicin is used to treat Meniere's disease. Rest all options are managements for otosclerosis

25. Ans. is a, b and c i.e. Stapedectomy; Fenestration and stapedotomy

Ref: Scotts brown 7th/ed vol-3 pg-3468 onwards; Current otolaryngology 2/e pg-678-680

Role of surgery in a case of otosclerosis

Surgery forms the mainstay of management in a case of otosclerosis

Surgical Options**Stapedectomy / stapedotomy**

(Surgery of choice)

Lemperts fenestration procedure

Fenestration of the lateral semicircular canal is done. It is reserved for cases where foot plate cannot be mobilized during stapedectomy (Outdated nowadays)

Stapes mobilization

It is done in those cases only in which there is partial ankylosis of footplate of stapes although reankylosis tends to develop a although reankylosis tends to develop a

NOTE

For mobilization procedure - a prerequisite is (a) lack of ankylosis at posterior stapediovestibular joint (b) otosclerosis limited to fissula ante fenestram

26. Ans. is a i.e. Teflon piston

Ref: Current otolaryngology 2/e pg-679, Tuli 1/ed pg-82, Scotts; Brown 7th/ed vol-3 pg-3479

The currently used prosthesis in otosclerosis surgery are:

- Teflon (M/C used)
 - Stainless steel
 - Platinum
 - Gold
 - Titanium
- All are MRI compatible
- The prosthesis is placed between the long process of incus and foot plate of stapes

27. Ans. is b i.e. Otospongiosis

Ref. Dhingra 6th/ed p 87

Schwartz sign is seen in otosclerosis. (already discussed)

28. Ans. is c i.e. Otosclerosis

Ref. Dhingra 6th/ed p 87

Already explained

CHAPTER

25

Facial Nerve and its Lesions

FACIAL NERVE

- It is the nerve of second brachial arch.
- It is a mixed nerve and has both Motor and sensory components.

Motor component	Sensory component
<ul style="list-style-type: none"> • Supplies the muscles of facial expression (except levator palpebrae superioris) and muscles of the 2nd pharyngeal arch 	<ul style="list-style-type: none"> • Secretomotor to submandibular, sublingual, salivary and lacrimal glands Carries taste fibres from the anterior 2/3rd of the tongue and palate General somatic sensations from the retroauricular skin

ALSO KNOW

- At birth facial nerve is located just beneath the skin near the mastoid tip as it emerges from the temporal bone and is vulnerable to the post auricular incision in a young child. As

the mastoid tip forms and elongates during childhood, the facial nerve assumes a more medial and protected position.

- In unilateral UMN (upper motor neuron) lesions of facial nerve, upper part of face is spared due to B/L cortical representation unlike. Lower motor neuron lesion, where both upper and lower faces are involved. Also there is a lack of emotional facial movements in UMN lesions.

Course

- **Intracranial part:** From pons to internal auditory meatus (15-20 mm)
- **Intrameatal Part/Labyrinthine segment:** Part present in the internal auditory meatus (8-10 mm).
- **Intratemporal part:** From internal auditory meatus to stylomastoid foramen. It has 3 subparts:
- **Extracranial part:** From stylomastoid foramen to its peripheral branches.
- At the stylomastoid foramen, the facial nerve passes into parotid gland as a single trunk and then divides into peripheral branches.

Labyrinthine segment / first segment

(3 - 5 mm)

- Facial nerve pierces meatal foramen to enter labyrinthine segment
- It extends from internal auditory meatus to the geniculate ganglion
- Shortest and thinnest segment, therefore any infection of this segment can lead to temporary/ permanent paralysis of nerve.
- Hence this is the site of lesion in Bell's palsy. Since the very 1st segment of facial nerve is the site of pathogenesis all intratemporal functions of facial nerve are impaired in bells palsy.
- No branches arise from this part.

Intratemporal segment

Horizontal segment (10 - 12 mm)

- From geniculate ganglion to oval window
- This portion of facial N is 10 mm long
- Landmarks for the nerve at this segment include the Cochleariform process which gives rise to tensor tympani and the 'cog' a small bony prominence projecting from the roof of epitympanum.
- Dehiscences are more commonly seen in this segment

Vertical segment (9 - 16 mm)

- From oval window to stylomastoid foramen

Branches of Facial Nerve

In the Fallopian canal/Intratemporal branches	At its exit from stylomastoid foramen	Communicating branches
Note: From the lateral end of the internal auditory canal to its exit out the stylomastoid foramen, the nerve travels ~3 cms within the fallopian tube.		
I. Greater superficial petrosal nerve (It arises from geniculate ganglion) • It joins with deep petrosal nerve to form vidian nerve ^a (nerve of pterygoid canal) which supplies: – Lacrimal gland – Nasal gland – Palate gland – Pharynx gland II. Nerves to stapedius - supplies the stapedius muscle. Its injury leads to hyperacusis. III. Chorda Tympani (It arises from the vertical /descending segment of the facial nerve, 4-6 mm above the stylomastoid foramen. As it arises from the facial nerve it makes a 30° angle and delineates a triangular space k/a facial recess.) • It is the terminal branch of nerves intermedius. • Enters the tympanic cavity through the posterior canaliculus and exits through the petrotympanic fissure (Canal of Huguier). • Carries taste fibres from the Anterior 2/3 of the tongue and also supplies secretomotor fibres to submandibular and sublingual glands.	I. Posterior auricular nerve: Supplies posterior auricular muscle, occipital belly of occipitofrontalis along with muscular branches to stylohyoid and posterior belly of digastric	Terminal branches: I. Temporal (innervate eye brows and allows for voluntary raising of eye brows. II. Zygomatic (innervates orbicularis oculi muscles and is critical for proper eye closure) III. Buccal (Innervate buccinator and orbicularis oris allowing for proper mouth closure) IV. Mandibular (innervates platysma) V. Cervical All terminal branches supply the muscle of face and neck.

Electrodiagnostic Tests to Predict Prognosis in Facial Palsy

- **Electrophysiological testing:** Includes *electroneuronography*, *maximal stimulation test*, and *electromyography*.
- These assess the percentage of nerve fibers that have undergone degeneration along with signs of recovery. This is diagnostic as well as prognostic, e.g. in Bell's palsy there is maximum degeneration within the 1st 10 days after which there is recovery. Hence, if degeneration persists beyond 10 days, Bell's palsy is unlikely and it carries a poor prognosis. Hence, electrophysiological testing should be done in those cases of suspected Bell's palsy not responding to steroids.
- This also predicts the feasibility of surgical decompression of facial nerve.

Site of Injury of Facial Nerve

- We have read about the branches of facial nerve and their site of origin. So we can easily make out the site of injury from the symptoms of the patient. First see the major symptoms of facial nerve palsy.
 - **Loss of lacrimation:** Due to involvement of greater superficial petrosal nerve.
 - **Loss of stapedial reflex:** Due to involvement of nerve to stapedius.
 - **Lack of salivation:** Due to chordatymapani

- **Loss of taste sensation from Anterior 2/3 of tongue:** Due to chorda tympani.
- **Paralysis of muscle of facial expression:** Due to terminal (peripheral) branches.
- Now we can make out the site of injury:
 - **All the 5 symptoms (i to v) are present:** Injury is at or proximal to geniculate ganglion (as all the branches of facial nerve are involved).
 - **There is no loss of lacrimation (greater superficial petrosal nerve is spared) but symptoms (ii to v are seen):** Injury is distal to second genu but proximal to origin of chorda tympani, i.e. Injury is between second genu and mid portion of vertical segment.
 - **Only (vth) symptom is present:** Injury is distal to the origin of chorda tympani, which may be at the level of stylomastoid foramen.

Presentation of Facial Nerve Paralysis

Facial nerve paralysis produces following manifestations:

- Weakness of the muscle of the facial expression and eye closure, which results in:
 - Absence of nasolabial fold*
 - Epiphora*
 - Wide palpable fissure*
 - Voluntary eye closure may not be possible and can produce damage to the conjunctiva and cornea.*

- v. *Loss of wrinkles of forehead*
- vi. *The face sags and is drawn across to the opposite side on smiling*
- vii. *Drooping of angle of mouth*

Types of Facial Lesion

A. Central or Upper Motor Neuron (UMN) Facial Paralysis

- It causes paralysis of only the *lower half of face on contralateral side*
- Forehead muscles are retained due to bilateral innervation of frontalis muscle.

B. Peripheral or Lower Motor Neuron (LMN) Facial Paralysis

- All muscles of the face are involved on the side of lesion (*ipsilateral side*)
- Site of lesion may be:
 - i. **Supratemporal:** Lesion is proximal to the bony canal, which may be:
 - a. **At the level of nucleus:** There is associated VI nerve involvement
 - b. **At the cerebellopontine angle:** There is associated vestibular and auditory defects and other cranial nerve involvement Vth, IXth, Xth, XIth.
 - ii. **Intratemporal:** Lesion is in the bony canal, from internal acoustic meatus to stylomastoid foramen.
- The side can be localized by topographic tests:

Topographic Tests for Intratemporal Lesion

- **Schirmer's test (for lacrimation):** Decreased lacrimation when lesion is at or proximal to geniculate ganglion.
- **Stapedial reflex:** Lost if lesion is proximal to the nerve to stapedius.
- **Taste test:** Impaired taste when lesion is proximal to chorda tympani.
- **Submandibular salivary flow test:** Impaired when lesion is proximal to chorda tympani.
- iii. **Intratemporal:** Lesion is outside the temporal bone in the parotid area. *Only the motor functions of nerve are affected.*
- Test for identifying whether the patient has *upper motor neuron (UMN) or lower motor neuron (LMN)*
 - *In a LMN lesion the patient cannot wrinkle their forehead, i.e. the final common pathway to the muscle is destroyed. Lesion must either in the pons, or outside brainstem (posterior fossa, bony canal, middle ear or outside skull).*
 - *In an UMN lesion, the upper facial muscles are spared because of alternative pathways in the brainstem, i.e., the patient can wrinkle their forehead (unless there is bilateral lesion) and the sagging of the face seen with LMN palsies is not as prominent.*

BELL'S PALSY

- Commonset cause of acute onset LMN facial palsy.
- Sudden in onset
- It is unilateral

- Was thought to be idiopathic, but there are recent evidences indicating Herpes simplex virus as the causative agent.
- H/O viral prodromal symptoms
- Rapidly progresses within 1st 10 days put complete recovery is a rule.
- Facial muscles on one side are paralysed.
 - a. Inability to close eye.
 - b. On attempting to close eye, eye ball turns up and out—*Bells phenomenon*.
- Ipsilateral loss of salivation and lacrimation.
- Hyperacusis is present.
- Taste may be affected.
- Ear and other CNS functions are normal.
- Recurrences both ipsilateral and contralateral occur in upto 12% patients.

Treatment

Conservative:

- **Steroids:** Prednisolone (1 mg/kg/days × 10 days and then taper for next 5 days)
- **Acyclovir:** Adults: 200–400 mg five times/ day
- **Care of the eye**
- Physiotherapy
- Vitamin B1, B6 and B12 combinations.

Surgery (Nerve decompression): Done if medical therapy fails and there is no recovery in 8–12 weeks.



Prerequisites for Surgery

BAD syndrome:

- Lack of Bell's phenomenon
- Corneal anesthesia
- Dry eyes

HERPES ZOSTER OTICUS/RAMSAY HUNT SYNDROME

- Reactivation of dormant herpes zoster virus the geniculate ganglion of facial nerve and spiral and vestibular ganglion VIIIth nerve.
- It is characterized by vesicles around the external ear canal, pinna, and soft palate sensorineural hearing loss and vertigo due to involvement of VIIIth nerve along with facial palsy. This is called as Ramsay Hunt syndrome.
- In comparison to Bell's palsy, progression begins by 11th to 14th day but prognosis is poor. Recovery is seen only in 40% of patients.
- Treatment is acyclovir 800 mg 5 times/day.

TEMPORAL BONE FRACTURES

- 80% of the temporal bone fracture is of longitudinal type^Q.
- 10–30% are transverse fractures^Q.
- 40–50% of the transverse fractures cause facial nerve injury^Q.
- Facial nerve involvement is rare with longitudinal fracture^Q.

IMPORTANT CLINICAL CONCEPTS FOR NEET

1. Total length of facial nerve is 60-70 mm.
 - Intracranial segment : 15-20 mm
 - Meatal segment : 8-10 mm
 - Labyrinthine segment : 3-5 mm
 - Tympanic segment : 8-10 mm
 - Mastoid segment : 15-20 mm
 - Extratemporal segment : 15-20 mm
2. Vidian nerve^o is formed by greater superficial petrosal nerve joining deep petrosal nerve (sympathetic) for supplying the lacrimal glands, mucous glands of nose, palate and pharynx^o.
3. M/C tumor of facial nerve is Schwannoma
4. Schirmer's test, taste sensation or salivation test give information about the probable site of lesion in facial nerve injury.
5. Crocodile tears^o while eating are due to misdirection of secretomotor impulses meant for salivary gland and are treated by tympanic neurectomy.
6. Melkersson's syndrome^o is characterised by recurrent facial nerve palsy, swelling of lips and furrowing of tongue.

7. Heerfordts syndrome^o: There is bilateral parotid enlargement with uveitis and transient facial palsy due to sarcoidosis.
8. Bannwarth's syndrome / Lyme's disease: There is rash, fever, myalgias, arthralgia, pharyngitis and lymphadenopathy with facial nerve palsy. It is due to spirochaetes infection.
9. Genu of Facial Nerve: The sharp turns made by facial nerve is called as genu. 1st genu is thickened to form the geniculate ganglion, surface landmark being processus cochleariformis. Surface landmark for 2nd genu is horizontal semicircular canal. Tympanomastoid suture line is the landmark for descending portion. These landmarks are used in mastoid surgery. 1st genu is the commonest site of injury to facial nerve in trauma, while 2nd genu is the commonest site of injury to facial nerve in mastoid surgery.
10. Facial nerve palsy at stylomastoid foramen causes deviation of angle of mouth to opposite side (due to paralysis of muscles of facial expression) and absence of corneal reflex.
11. Causes of B/L facial palsy: Guillain-Barre Syndrome, infectious mononucleosis, amyloidosis, Sarcoidosis, Skull trauma, acute porphyria, lyme's disease and botulism.

CAUSES OF FACIAL PALSY

1. Intracranial causes of facial nerve palsy are most commonly caused during:
 - a. Myelography
 - b. Stapedectomy
 - c. Mastoidectomy
 - d. Craniotomy
2. Which fracture of the petrous bone will cause facial nerve palsy?
 - a. Longitudinal fracture
 - b. Transverse fracture
 - c. Mastoid
 - d. Facial nerve injury is always complete
3. Facial nerve palsy is seen in this condition: (JIPMER 03)
 - a. Separation of the external acoustic meatus
 - b. Fracture of the external acoustic meatus
 - c. Fracture of the internal acoustic meatus
 - d. Fracture of the petrous part of the temporal bone
4. Which part of the facial nerve is commonly exposed through natural dehiscence in the fallopian canal? (2002)
 - a. Horizontal part
 - b. Upper part of the vertical part
 - c. Lower part of the vertical part
 - d. Labyrinthine part
5. Most common cause of facial palsy:
 - a. Post-operative
 - b. Trauma
 - c. Paraneoplastic syndrome
 - d. Bell's palsy
6. Most common cause of lower motor neuron facial palsy (JIPMER 2004) is:
 - a. Horizontal part
 - b. Upper part of the vertical part
 - c. Lower part of the vertical part
 - d. Labyrinthine part

7. Intratemporal lesion of chorda tympani nerve results in: (JIPMER Dec 03)
 - a. Loss of taste sensation from tip of tongue
 - b. Loss of taste sensation from middle 2/3 of tongue
 - c. Loss of taste sensation from posterior 1/3 of tongue
 - d. Loss of sensation from the submandibular gland
8. Dryness of mouth with facial nerve injury - site of lesion is at: (JIPMER 2008)
 - a. Geniculate ganglion
 - b. Horizontal part
 - c. Vertical part
 - d. Stylomastoid foramen
9. Facial nerve palsy at stylomastoid canal can cause: (JIPMER June 09)
 - a. Loss of corneal reflex at side of lesion
 - b. Loss of corneal reflex sensation anterior 2/3 of ipsilateral tongue
 - c. Loss of sensation at side of lesion
 - d. Hyperacusis

QUESTIONS

BRANCHES AND SITE OF LESION

1. **First branch of the facial nerve is:** [UP 2004]
 - a. Greater petrosal nerve
 - b. Lesser petrosal nerve
 - c. Chorda-tympani nerve
 - d. Nerve to the stapedius
2. **All the following muscle are innervated by the facial nerve except:** [AIIMS May 03]
 - a. Occipito-frontalis
 - b. Anterior belly of digastric
 - c. Risorius
 - d. Procerus
3. **Lacrimation is affected when facial nerve injury is at:** [AI 98]
 - a. Geniculate ganglion
 - b. In semicircular canal
 - c. At sphenopalatine ganglia
 - d. At foramen spinosum
4. **A patient presents with hyperacusis, loss of lacrimation and loss of taste sensation in the anterior 2/3rd of the tongue. Oedema extends up to which level of facial nerve:** [2001]
 - a. Vertical part
 - b. Vertical part beyond nerve to stapedius
 - c. Vertical part and beyond nerve to stapedius
 - d. Proximal to geniculate ganglion
5. **Dryness of eye is caused by injury to facial nerve at:** [AI 96]
 - a. Chorda tympani
 - b. Cerebellopontine angle
 - c. Tympanic canal
 - d. Geniculate ganglion
6. **Hyperacusis in Bell's palsy is due to the paralysis of the following muscle:** [AIIMS May 06]
 - a. Tensor tympani
 - b. Levator palatii
 - c. Tensor veli palatii
 - d. Stapedius
7. **Intratemporal lesion of chorda tympani nerve results in:** [AIIMS Dec. 94]
 - a. Loss of taste sensations from papilla of tongue
 - b. Loss of taste sensations from anterior 2/3rd of tongue
 - c. Loss of taste sensations from posterior 1/3rd of tongue
 - d. Loss of secretomotor fibres to the submandibular salivary gland
8. **Dryness of mouth with facial nerve injury – site of lesion is at:** [UP 2008]
 - a. Chorda tympani N
 - b. Cerebellopontine angle
 - c. Geniculate ganglion
 - d. Concussion of Tympanic membrane
9. **Facial nerve palsy at sternomastoid canal can cause:** [AIIMS June 99]
 - a. Loss of corneal reflex at side of lesion
 - b. Loss of corneal taste sensation anterior 2/3 of ipsilateral tongue
 - c. Loss of lacrimation at side of lesion
 - d. Hyperacusis

CLINICAL FEATURES

10. **Right upper motor neuron lesion of facial nerve causes:** [AIIMS 95]
 - a. Loss of taste sensation in right anterior part tongue
 - b. Loss of corneal reflex right side
 - c. Loss of wrinkling of forehead left side
 - d. Paralysis of lower facial muscles left side
11. **Which one of the following statements is correct in facial paralysis?** [MP 2009]
 - a. The naso labial fold is obliterated on same side
 - b. The naso labial fold is obliterated on opposite side
 - c. The face deviates to the same side
 - d. The face deviates to the opposite side
12. **Which test can detect facial nerve palsy occurring due to lesion at the outlet of stylomastoid:** [AIIMS Nov. 93]
 - a. Deviation of angle of mouth towards opposite side
 - b. Loss of taste sensation in anterior 2/3 of tongue
 - c. Loss of sensation over right cheek
 - d. Deviation of tongue towards opposite side
13. **Crocodile tears is due to:** (Delhi 2005)
 - a. Cross innervation of facial nerve fibers
 - b. Cross innervation of trigeminal nerve fibers
 - c. Improper regeneration of trigeminal nerve
 - d. Improper regeneration of facial nerve

CAUSES OF FACIAL PALSY

14. **Iatrogenic traumatic facial nerve palsy is most commonly caused during:**
 - a. Myringoplasty
 - b. Stapedectomy
 - c. Mastoidectomy
 - d. Ossiculoplasty
15. **Which fracture of the petrous bone will cause facial nerve palsy:** [AI 07]
 - a. Longitudinal fractures
 - b. Transverse fractures
 - c. Mastoid
 - d. Facial nerve injury is always complete
16. **Facial nerve palsy is seen in this condition:** [JIPMER 03]
 - a. Seborrhic otitis externa
 - b. Otomycosis
 - c. Malignant otitis externa
 - d. Cerebellar abscess
17. **Which part of the facial nerve is commonly exposed through natural dehiscence in the fallopian canal?** [2005]
 - a. Horizontal part
 - b. Upper half of the vertical part
 - c. Lower half of the vertical part
 - d. Labyrinthine part
18. **Most common cause of facial palsy:**
 - a. Post operative
 - b. Trauma
 - c. Ramsay Hunt syndrome
 - d. Bells palsy
19. **Most common cause of lower motor neuron facial palsy is:** [MP 2004]
 - a. Post operative
 - b. Trauma
 - c. Ramsay Hunt syndrome
 - d. Bells palsy

- a. Cholesteatoma
- b. Cerebello-pontine angle tumours
- c. Bell's palsy
- d. Postoperative (ear surgery)

BELLS PALSY

- 20. Bell's palsy is paralysis of:** [Comed 07]
 a. UMN V nerve b. UMN VII nerve
 c. LMN V nerve d. LMN VII nerve
- 21. Which of the following is not true about Bell's palsy?** [Delhi 2008]
 a. Acute onset
 b. Always recurrent
 c. Spontaneous remission
 d. Increased predisposition in Diabetes Mellitus
- 22. Which one of the following statements truly represents Bell's paralysis:** [AIIMS May 05; AI 04]
 a. Hemiparesis and contralateral facial nerve paralysis
 b. Combined paralysis of the facial, trigeminal, and abducens nerves
 c. Idiopathic ipsilateral paralysis of the facial nerve
 d. Facial nerve paralysis with a dry eye
- 23. All of the following are seen in bell's palsy except:** [SGPGI 05]
 a. Ipsilateral-facial palsy
 b. Ipsilateral-loss of taste sensation
 c. Hyperacusis
 d. Ipsilateral ptosis
- 24. True about lower motor neuron palsy of VIIth nerve:** [PGI Nov. 05]
 a. Other motor cranial nerves also involves
 b. Melkersson's syndrome cause recurrent paralysis
 c. Eye protection done
 d. Prognosis can be predicted by serial electrical studies
 e. Bell's palsy is commonest cause
- 25. Bell's palsy patient comes on day 3. Treatment given would be:** [AIIMS Nov 09, May 2010]
 a. Intratympanic steroids b. Oral steroids + vitamin B
 c. Oral steroids + Acyclovir d. Vitamin B Vasodilator
- 26. A case of bells palsy on steroids, shows no improvement after two weeks. Next step in manangement is: [MP2000]**
 a. Vasodilators and ACTH

- b. Physiotherapy
- c. ↓ Steroids dose
- d. Electrophysiological Nerve testing

27. Treatment of choice for mastoid fracture with facial nerve palsy is: [AIIMS June 99, Sept 96]

- a. Nerve decompression
- b. High dose of steroid
- c. Sling operation
- d. Repair the fracture and wait and watch

28. A patient presents with facial nerve palsy following head trauma with fracture of the mastoid: best intervention here is: [AI 01]

- a. Immediate decompression
- b. Wait and watch
- c. Facial sling
- d. Steroids

RAMSAY HUNT SYNDROME

29. A man presents with vesicles over external acoustic meatus with ipsilateral facial palsy of LMN type. The cause is [AP 2005]

- a. Herpes zoster
- b. Herpes simplex virus-I
- c. Varicella
- d. None

30. Ramsay hunt syndrome is caused by: [PGI Dec. 98]

- a. H. simplex
- b. H. Zoster
- c. Influenza
- d. Adenovirus

31. Ramsay hunt syndrome all are true except: [SGPGI 05]

- a. VII Nerve is involved
- b. Facial muscle are involved
- c. Facial vesicle is seen
- d. Herpes zoster is etiologic agent

32. All of the following are true for Ramsay hunt syndrome, except: [AI 02]

- a. It has viral etiology
- b. Involves VIIth nerve
- c. May involve VIIIth nerve
- d. Results of spontaneous recovery are excellent

33. True about Ramsay-hunt syndrome except: [UP 2000]

- a. Involves VII nerve
- b. May involves VIII nerve
- c. Surgical removal gives excellent prognosis
- d. Causative agent is virus

EXPLANATIONS AND REFERENCES

- 1. Ans. is a i.e. greater petrosal nerve** Ref. Dhingra 5th/ed pg102, 6th/ed p 90; Current Otolaryngology 2nd/ed pg 836
 • Greater superficial petrosal nerve: It is the first branch and arises from geniculate ganglion (i.e. first genu). It joins the deep petrosal nerve to form vidian nerve (nerve to pterygoid canal) and carries secretomotor fibres to the lacrimal gland, nasal gland, Palate gland and pharyngeal gland.
- 2. Ans. is b i.e. Anterior belly of digastric** Ref. BDC Vol. III 4th/ed p 139-140

Facial Nerve Supplies

Forget = Facial muscles except levator palpebrae Superioris (Which is supplied by 3rd nerve).

Pediatric (Pd) =	Posterior belly of Digastric
Surgery =	Stapedius
Always =	Auricular muscles
Opt For =	Occipito Frontalis
Plastic =	Platysma
Surgery =	Stylohyoid
Mnemonic:	Forget Pediatric Surgery Always Opt for Plastic Surgery.

NOTE

- Anterior belly of digastric is supplied by nerve to mylohyoid.
- Procerus and Risorius are muscles of face.

3. Ans. is a i.e. Geniculate ganglion

Ref. Dhingra 5th/ed pg 102, 6th/ed p 90-91

For lacrimation greater superficial petrosal nerve which is a branch of facial nerve is responsible

It arises from the geniculate ganglion, / any lesion occurring at the level of geniculate ganglion will injure this branch and will lead to dryness of eyes.

ALSO KNOW

For locating the site of injury of facial nerve:

- First see the major symptoms of facial nerve palsy:

i. **Loss of lacrimation:** Due to involvement of greater superficial petrosal nerve.

ii. **Loss of stapedial reflex:** Due to involvement of nerve to stapedius.

iii. **Lack of salivation:** Due to chordatympani.

iv. **Loss of taste sensation from Anterior 2/5 of tongue:** Due to chordatympani.

v. **Paralysis of muscle of facial expression:** Due to terminal (peripheral) branches.

- Now you can make out the site of injury:

– **All the 5 symptoms (i to v) are present:** Injury is at or proximal to geniculate ganglion (as all the branches) of facial nerve are involved)

– **There is no loss of lacrimation (greater petrosal and nerve to stapedius are spread) but symptoms (ii) to (v) occur:** Injury is distal to geniculate ganglion but proximal to or at the level of second genu from where the nerve to stapedius arises.

– **Only symptoms (iii) to (v) are present (greater petrosal and nerve to stapedius are spread):** Injury distal to second genu but proximal to origin of chorda tympani, i.e., Injury is between Second genu and mid portion of vertical segment.

– **Only (vth) symptoms is present:** Injury is distal to the origin of chorda tympani, which may be at the level of stylomastoid foramen.

4. Ans. is d i.e. Proximal to geniculate ganglion

Ref. Current Otolaryngology 2nd/ed pg 836-838, 3rd/ed p 865-67

In the question patient is presenting with

i. hyperacusis which means nerve to stapedius is involved which arises from the vertical / descending part of facial nerve.

ii. loss of lacrimation – i.e. greater superficial petrosal Nerve which arises from geniculate ganglion is involved.

iii. Loss of taste sensation in anterior 2/3 of tongue – i.e. chorda tympani nerve which arises from vertical/descending part of facial nerve is involved.

Remember:

- Any lesion will lead to paralysis of all Nerves distal to it and will spare proximal nerves
- Hence – we will have to look for the most proximal lesion which in this case is geniculate ganglion
- So lesion is either at or proximal to geniculate ganglion

5. Ans. is d i.e. Geniculate ganglion**6. Ans. is d i.e. Stapedius**

Ref. Tuli 1st/ed p 87

Hyperacusis (Phonophobia) occurs due to undue sensitivity to loud sounds.

- Stapedius muscle dampens excessive vibrations of the stapes caused by high pitched sounds in order to protect the internal ear.
- If this protective reflex is not elicited it indicates stapedius paralysis and results in hyperacusis.

Test	Level of lesion of facial nerve palsy
Schimers test of lacrimation (↓ed on paralysed side)	Geniculate ganglion
Hyperacusis/Phonophobia (undue sensitivity to loud sounds)	Nerve to Stapedius involved
↓ed taste sensation	Chorda tympani nerve involved
Salivation test (↓ed salivation on paralysed side)	Terminal branches-Nerve to submandibular gland involved

7. Ans. is d i.e. Loss of secretomotor fibres to the submandibular salivary gland

8. Ans. is a i.e. Chorda tympani nerve.

Ref. BDC Vol. III 3rd/ed p 113, 127

Chorda Tympani Nerve Carries

Preganglionic secretomotor fibres to submandibular ganglion

Responsible for salivary secretion from submandibular & sublingual gland

Taste fibres from anterior 2/3rd of tongue

So, Ideally a lesion of chorda tympani should impair both these functions but – sensations from ant 2/3rd of tongue are not impaired as an alternate pathway passing through the nerve of pterygoid canal to the otic ganglion exists (which does not pass through middle ear) which is preserved in lesions of chorda tympani.

Any lesion of chorda tympani thus leads to dryness of mouth

9. Ans. is a i.e. Loss of Corneal reflex at the side of lesion

Ref. Dhingra 5th/ed p 102, 6th/ed p 90-91

Course of Facial Nerve

- Below stylomastoid foramen, facial nerve gives following branches: Posterior auricular branch, muscular branches (stylohyoid and posterior belly of digastric) and terminal (peripheral) branches.

• Lesion at sternomastoid foramen

i. Will spare:

- Greater superficial petrosal nerve → Lacrimation present.
- Nerve to stapedius → Normal stapedial reflex and no hyperacusis.
- Chorda tympani → Normal salivation and taste sensation in anterior 2/3 of tongue.

ii. Will involve:

Terminal (peripheral) branches → Paralysis of muscles of facial expression. **Corneal reflex will also be lost** because efferent fibres of corneal reflex are derived from peripheral branches of facial nerve (it is a LMN type lesion).

Remember:

- Corneal Reflex:**
- **Afficient:** Trigeminal nerve
 - **Efferent:** Peripheral branches of facial nerve

10. Ans. is d i.e. Paralysis of lower facial muscles at left side

Ref. Macleods clinical examination 12th/ed p 282, Dhingra 5th/d, p 105-106

It is a General Rule that:

- **UMN lesion cause** • Contralateral paresis
- **LMN lesion cause** • Ipsilateral paresis

So, right upper motor neuron lesion of facial nerve will lead to paresis / deformity of left side. (Ruling out options "a" and "b")

In Right UMN Palsy

- Facial muscles of opposite side (left side) will be affected
- Upper facial (forehead) muscles will be spared
- So patient will have paralysis of lower facial muscles on contralateral (left) side.

11. Ans. is a i.e. nasolabial fold is obliterated on the same side

Ref. Dhingra 5th/ed pg 106

Always remember: Lower motor neuron type of facial paralysis is much more common than upper motor neuron type. If any question is asked on facial paralysis unless and until it mentions 'UMN type, all paralysis should be taken as LMN type.

LMN type facial paralysis causes ipsilateral facial paralysis.

Following features are seen in Facial nerve paralysis:

- Loss of wrinkles (on ipsilateral side in LMN type paralysis)
- Wide palpebral fissure (on ipsilateral side)
- Epiphora (on ipsilateral side)
- Absence of nasolabial fold (on ipsilateral side)
- Drooping of angle of mouth (on ipsilateral side)

NOTE

In facial nerve paralysis – the peripheral branches supplying the facial muscles will be paralysed which will lead to, paralysis of facial muscles on the ipsilateral side and angle of mouth will be deviated to opposite side (Not the whole face so option d is incorrect)

- 12. Ans. is a i.e. Deviation of angle of mouth towards opposite side** Ref. Dhingra 5th/ed pg 102, 6th/ed p 95
- Lesion occurring at the outlet of stylomastoid foramen means **LMN palsy** so face sags and is drawn across to opposite side. Chorda tympani nerve is spared at this level hence taste sensation over anterior 2/3 of tongue preserved

- 13. Ans. is d i.e. improper regeneration of facial nerve**

Ref. Dhingra 5th/ed pg 110, Current Otolaryngology 2nd/ed pg 839, 3rd/ed p 870

Crocodile tears (gustatory lacrimation) There is unilateral lacrimation with mastication

- It is due to faulty regeneration of parasympathetic fibres which normally travel through chorda tympani but are misdirected towards greater superficial petrosal nerve and instead of going to salivary glands reach the lacrimal glands. This results in unilateral lacrimation with mastication
- Treatment – Sectioning the greater superficial petrosal nerve or tympanic neurectomy

ALSO KNOW

- Frey's syndrome (gustatory sweating) – There is sweating and flushing of skin over the parotid area during mastication.

Remember:

Irreversible axonal injury and aberrant patterns of regeneration are more common from grade III degree of Sunderland classification of facial nerve degeneration^a

- 14. Ans. is c i.e. Mastoidectomy**

Ref. Logan Turner 10th/ed p 359

"All ear operations run the risk of facial nerve damage, particularly if the nerve is exposed. In particular a mastoidectomy has a high risk because a sharp cutting rotating burr is used in close proximity to the nerve."

Other Operations where Facial Nerve may be Damaged

- Stapedectomy
- Removal of acoustic neuroma

- 15. Ans. is b i.e. Transverse fracture**

Ref. Dhingra 5th/ed p 108, 6th/ed p 97

Fracture of petrous temporal bone can be longitudinal or transverse. Facial palsy is seen more often with transverse fracture^a.

	Longitudinal	Transverse
Frequency	Most common (80%)	Less common (20%)
Bleeding from ear	Present	Absent (as tympanic membrane is intact)
Csf otorrhoea	Present	Absent
Structures injured	Tegmen, ossicles and Tympanic Membrane	Labyrinth or CN VIII
Hearing loss	Conductive	SNHL
Facial paralysis	Less common, (10% cases)	More common (40-50%)
Onset of paralysis	Delayed onset paralysis	Immediate onset of paralysis
Part of facial nerve injured	Distal to geniculate ganglion	Proximal to geniculate ganglion
Vertigo	Less often	More often

In these cases it is important to know whether paralysis was of immediate or delayed onset –

Immediate onset paralysis is treated conservatively.

Delayed onset paralysis – requires surgery in the form of decompression, reanastomosis of cut ends or cable nerve grafts.

- 16. Ans. is c i.e. Malignant otitis externa**

Ref. Dhingra 5th/ed p 58, 6th/ed p 52

Facial paralysis is seen in malignant otitis externa as discussed in previous chapters.

- 17. Ans. is a i.e. Horizontal part**

Ref. Scotts Brown 7th/ed vol-3 pg 3888; Current Otolaryngology 2nd/ed pg 837

Explanation: The Horizontal/tympanic part of facial nerve

- Is most susceptible to injury during surgery.
- Maximum bone dehiscence occur in this part adjacent to oval window.

- 18. Ans. is d i.e. Bells Palsy**

- 19. Ans. is c i.e. Bells Palsy**

Ref. Scotts Brown 7th/ed vol 3 pg 3891; Harrison 17th/ed pg 2585

"The commonest cause of facial palsy in adults is Bells palsy"

It is unilateral and infranuclear type of palsy. It is also the M/C cause of LMN facial palsy

– Scotts Brown 7th/ed vol-3 pg 3891

– (Harrison 17th/ed pg 3891)

- 20. Ans. is d i.e. LMN VII nerve**

- 21. Ans. is b i.e. Always recurrent**

Ref. Dhingra 5th/ed pg 105, 106, 6th/ed p 95; Current Otolaryngology 2nd/ed pg 847, 854, 855; Scotts Brown 7th/ed vol-3 pg 3885; Harrison 17th/ed pg 2584

Bells Palsy

- It is the commonest cause of facial palsy in adults
- Lower motor neuron type paralysis^Q
- It is idiopathic in nature^Q
- Bells palsy manifests as an acute, **unilateral**^Q paresis or paralysis of the face.
- The onset and evolution are rapid – typically less than 48 hours.^Q
- The incidence reaches a maximum between the ages 15 and 45 years. It has a predominance in women younger than 20 years and a slight predominance in men older than 40 years, although it is more or less equal.^Q
- Recurrence rate of Bells palsy is 4.5-15% (i.e. it is not always recurrent)^Q
- Familial incidence = 4.1%
- Bells palsy is uncommon in pregnancy, however the prognosis is significantly worse in pregnant women with Bells palsy than among non pregnant women with palsy.
- Several authors have also demonstrated, a correlation between diabetes mellitus and Bells palsy in developing countries.
- Infectious causes have also been implicated in the origin of Bells palsy – viz:
 - HSV 1 and HSV 2, human herpes
 - Varicella zoster virus
 - Influenza B
 - Adenovirus
 - Cox sackie virus
 - Epstein Barr virus

Recently it has been demonstrated that an inactivated intranasal influenza vaccine increased the risk of Bells palsy.

- Normal function is usually regained within 3 months in about 2/3 rd of patients
- No further recovery is expected after a period of 6 months.
- Majority of the patients with Bell's palsy recover completely

22. Ans. is c i.e. Idiopathic, ipsilateral paralysis of the facial nerve

Ref. Dhingra 5th/ed pg 105, 6th/ed p 95; Harrison 17th/ed p 2585; Scott's Brown 7th/ed vol-3 pg 3883, 3885

- Bells paralysis is a LMN type of facial nerve palsy of unknown etiology i.e. idiopathic nature.
- Lower motor neuron type of palsy causes ipsilateral paralysis therefore bells palsy causes ipsilateral facial paralysis.
- Other neurological examinations are normal in Bells palsy

23. Ans. is d i.e. Ipsilateral ptosis

Ref. Harrison. 17th/ed p 2585; Dhingra 5th/ed pg 105-106, 6th/ed p 95

Bell's palsy is an acute onset lower motor neuron type of palsy – their will be ipsilateral loss of :

- Taste sensation, lacrimation and salivation
- Facial paralysis
- Noise intolerance (hyperacusis)
- Eye balls will turn up and out (Bells phenomenon) on attempting to close eyes but ptosis will not be seen.

NOTE

In Bells palsy – Facial paralysis is usually preceeded by pain behind the ear.

24. Ans. is a, b, c, d and e i.e. Other cranial nerves also involved, Melkersson's syndrome cause recurrent paralysis, Eye protection done, Prognosis can be predicted by serial electrical studies, Bell's palsy is commonest cause

Ref. Dhingra 5th/ed p 105-06, 6th/ed p 95, 96; BDC 4th/ed vol III/p 54; Current Otolaryngology 2nd/ed p 847, 3rd/ed p. 876

- Most common cause of lower motor neuron (LMN) type of facial palsy is Bell's palsy.
 - Melkersson's syndrome consists of a triad of: (i) Facial paralysis, (ii) Swelling of lips, (iii) Fissured tongue, Paralysis may be recurrent.
 - As patient is unable to close the eye, eye protection is required to protect cornea and conjunctiva.
 - The prognosis in acute facial palsy can be accurately determined by serial electrical testing. The response to electrical tests have been found to be most useful in the first 5 days after the onset.
 - As far as option 'a' is concerned – other cranial nerves also involved – current otolaryngology 3rd/ed p 876 says –
 - "There may also be subtle but frequent associated dysfunction of cranial nerves V, VIII, IX and X in association with Bells palsy."
- i.e option a is correct.

25. Ans. is c i.e. Oral steroids + Acyclovir

Ref. Current Otolaryngology 2nd/ed pg 856; Scott's Brown 7th/ed vol-3 pg 3886, 3rd/ed p 884-887

Management of Bells Palsy –

A. Medical Management

B. Physical management

C. Surgical management

Medical Management -

I. Steroid therapy:

- Oral prednisolone has been used extensively to treat patients with Bells palsy.
- Proof of efficacy is however controversial.
- Steroids are considered useful because they have an anti inflammatory response.
- Because the cost of therapy is less and it has low risk of side effects, **prednisolone is commonly started at the initial visit**
- **Initiation of therapy during the first 24 hours of symptom confers a higher likelihood of recovery**

II. Antiviral therapy:

- It represents a newer adjunct in treating acute facial palsy of viral origin (Both Bells palsy and Ramsay hunt syndrome)
- Oral acyclovir is the DOC
- *Some studies have shown that patients who receive prednisolone plus oral acyclovir have a higher recovery rate and reduced rates of synkinesis in comparison to those who receive prednisolone alone.*
- Based on above evidence most surgeons advocate combination of steroids and antiviral drugs.

The usual recommended regime is prednisolone 1mg/kg/day for five days followed by a ten day taper and oral acyclovir (200-400 mg 5 times daily) for ten days.

Physical Management

Includes :

- **Electrical stimulation:** It is done to maintain membrane conductivity and reduce muscle atrophy
- It is generally used in patients left with partial defects
- **Eye care:** The cornea is vulnerable to drying and foreign body irritation in acute facial palsy due to orbicularis oculi dysfunction. So measures conferring corneal protection are recommended. Like:
 - Artificial tears drops at daytime
 - Ocular ointment at night
 - Use of sunglasses etc

In long standing cases: Reducing the area of exposed cornea by implanting a gold weight in the upper lid (tarsoraphy) is done.

Surgical Management

Nerve decompression

- **Principle used behind it** – Axonal ischemia can be reduced by the decompression of nerve segments presumed to be inflamed and entrapped.
- Decompression of the facial nerve is done in cases who have a poor prognosis for complete recovery with medical treatment alone.

26. Ans. is d i.e. Electro physiological nerve testing

Ref. Current Otolaryngology 2nd/ed pg 858, 842, 3rd/ed p. 887, 870, 872

In a patient who has had no improvement in steroids after 2 weeks of use will not benefit from an increase in dose of steroid

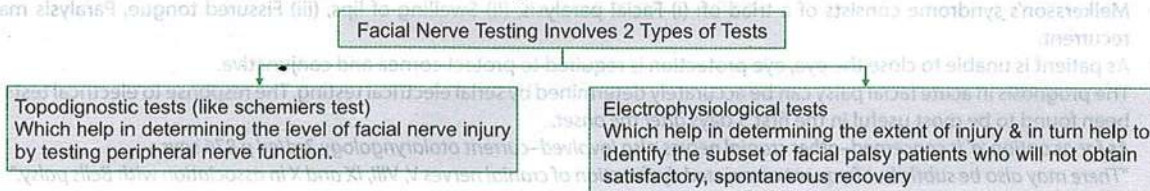
Also vasodilators and ACTH have no role in management of Bells palsy

Hence they are also ruled out.

So now we are left with 2 options viz-

- Electrophysiological nerve testing
- Surgical decompression

Firstly Remember: Electro physiological nerve testing is **not the same as Electrical stimulation**



Nerve decompression – Surgical management of acute facial nerve palsy is based on the principle that axonal ischemia can be reduced by decompression of nerve segments presumed to be inflamed and entrapped. Nerve decompression is not done in all cases of acute facial palsy.

Prerequisite for Nerve decompression (Read very carefully)

To identify those patients who may benefit from nerve decompression, electro physiological testing should be done prior to it (Current otolaryngology 3/e, p 887)

The test done is – Evoked electro myography (EEMG). Surgical treatment is offered when evoked response amplitudes are 10% (or less) of the normal side.

So now after understanding all this lets see the question once again –

It says – a case of bells palsy on steroids, shows no improvement after 2 weeks, **next step in management** would be –

Next step would obviously be electrophysiological testing for two reasons:

1. Bells palsy as a rule recovers after 10 days and responds after steroid, the diagnosis has to reviewed to rule out other causes like herpes zoster oticus (which can be indicated by the pattern of degeneration on electro physiological nerve testing)
2. If electro physiological testing predicts poor prognosis for recovery. It is an indication for nerve decompression.

27 Ans. is a i.e. Nerve decompression

Ref. Dhingra 5th/ed p 107

Traumatic Injury to Facial nerve

Traumatic Injury to Facial nerve

Nerve decompression – Reanastomosis
of cut end/cable nerve graft

Delayed onset paralysis

High dose steroids

ALSO KNOW

As a general rule management of facial nerve paralysis following trauma is generally deferred until the patient is both medically and neurologically stable.

28. Ans. is a i.e. Immediate decompression

Ref. Scotts Brown 7th/ed vol- 3 pg 3888

In case of Temporal bone trauma

"In case of acute complete paralysis, surgical exploration is warranted if ENOG shows > 90% denervation within 6 days of the onset of paralysis and the patient is neurologically stable"

29. Ans. is a i.e. Herpes zoster

30. Ans is b i.e. H. zoster

Ref. Dhingra 5th/ed pg 107, 6th/ed p 96; Scotts Brown 7th/ed vol-3 pg 3886; Current Otolaryngology 2nd/ed pg 847,849

Ramsay Hunt syndrome / Herpes zoster oticus is a lower motor neuron type of facial palsy due to varicella zoster (herpes zoster). It is characterised by vesicles around the external canal, pinna and soft palate, SNHL and vertigo due to involvements of VIIIth nerve along with facial nerve palsy.

31. Ans. is c i.e. Facial vesicle is seen

Ref. Dhingra 5th/ed pg107, 6th/ed p 96; Current Otolaryngology 2nd/ed pg 849, 3rd/ed p 878

- Vesicles in Ramsay hunt syndrome are seen in the preauricular skin, the skin of ear canal the soft palate and not on facial skin
- All other options are correct and explained in the preceding text.

32. Ans. is d i.e. Results of spontaneous recovery are excellent

33. Ans. is c i.e. Surgical removal gives excellent prognosis

Ref. Scotts Brown 7th/ed vol-3 pg 241

We have already discussed Ramsay hunt syndrome. is **ipsilateral facial nerve palsy accompanied by an erythematous vesicular rash on the ear or in mouth (soft palate).**

- It is caused by Herpes zoster virus
- It may involve other cranial nerves viz- V, VIII, IX and X also. (current otolaryngology, 3rd/ed p 878)
- Ramsay Hunt syndrome can be differentiated from Bells by characteristic cutaneous changes and a higher incidence of cochleosaccular dysfunction due to involvement of VIII nerve.
- The prognosis of Ramsay Hunt is worse than Bells palsy. Persistent weakness is observed in 30-50% of patients and only 10% recover completely after complete loss of function without treatment.
- Treatment recommended – is steroids (oral prednisolone) for 5 days followed by a ten day taper combined with or oral acyclovir
- It is seen that Ramsay hunt syndrome patients treated with prednisone and acyclovir within 3 days of onset showed statistically significant improvement.
- Surgical decompression is **not indicated** in Ramsay hunt syndrome.

CHAPTER

26

Lesion of Cerebellopontine Angle and Acoustic Neuroma

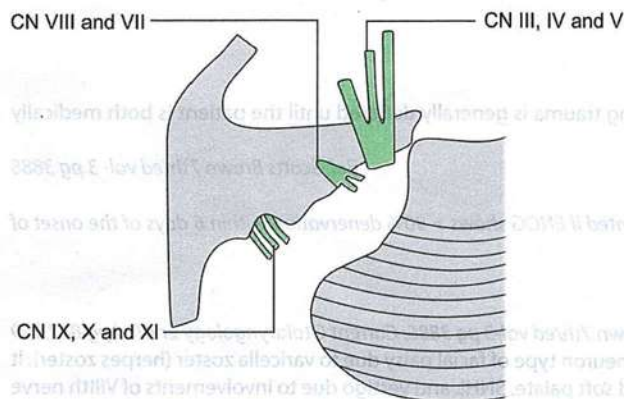


Fig. 26.1: Cerebellopontine Angle

ANATOMY OF CEREBELLOPONTINE ANGLE (CPA)

- It is a triangular area bounded anterolaterally by petrous temporal bone, medially by pons and brainstem, posteriorly by cerebellum and flocculus.
- Contents of the angle are: Anterior Inferior cerebellar artery^Q and VII, VIII cranial nerve^Q
- Immediately superior to is the V cranial nerve and III, IV, VI are further up.
- Inferiorly lies IX, X, XI cranial nerve: Thus in lesions of CPA all these nerves can be involved.

Lesions of CP angle

- M/C Acoustic neuroma = 80%
- Meningoma = 10%
- Congenital cholesteatoma = 5%
- Others = 5%

VESTIBULAR SCHWANNOMA/ACOUSTIC NEUROMA

- It is the **most common intracranial schwannoma**.
- Constitutes **80% of all cerebellopontine angle** tumors^Q and 10% of all brain tumors

- It is **benign**, encapsulated, extremely slow growing tumor.
- Most common site of acoustic neuroma:**
 - Inferior vestibular nuclei^Q > superior vestibular nuclei^Q > Cochlear nuclei^Q (rare)
 - Bilateral vestibular schwannoma is **diagnostic of Neurofibromatosis 2**.
- It originates in the Schwann cells of the inferior or superior vestibular nerves at the transition zone (**Obersteiner Redlich Zone**) of the central and peripheral myelin.

Clinical Features

- Age** most common in 40-60 years^Q. (occurs in 20-30 years of age when the tumour is found in association with) **Neurofibromatosis type 2**
- Both sexes are affected equally^Q.
- Tumour is **radioresistant**^Q.
- In 90% cases it is **Unilateral**, may be bilateral in **Von Recklinghausen disease/Neurofibromatosis**.^Q

Clinical Symptoms

- Earliest symptom:** Cochleovestibular symptoms (deafness, tinnitus).
- Most common symptom:** Progressive unilateral sensorineural (retrocochlear) hearing loss (present in 95% patients) often^Q accompanied by tinnitus (Present in 65% patients).

There is marked difficulty in understanding speech out of proportion to the pure tone hearing loss. This is characteristic of acoustic neuroma^Q.

- May also present with sudden hearing loss. (in 20% cases)
- True vertigo is seldom seen^Q.

Signs

- Ear:** Oscopic findings: normal
- Cranial nerve:**
 - V nerve:** Earliest nerve to be involved^Q (when tumor grows 2.5 cms in size) Corneal reflex is impaired (Earliest sign^Q)
 - Motor functions are rarely affected

- **VII nerve:**
 - Sensory fibers are affected first^Q
 - **Hitselberger's sign:** Loss of sensation in the postero-superior aspect of the external auditory canal^Q. Inability to bury eyelashes on the affected side.
 - Motor fibres are affected later. Remember – Though VIIth nerve is involved there is never facial nerve palsy (If CP angle tumor presents with facial nerve palsy always rule out more aggressive tumors like meningioma rather than Acoustic neuroma which is a slow growing tumors)
- **IX, X Nerves:** Palatal, pharyngeal and laryngeal paralysis
- **Eyes:** Nystagmus may be seen
- Features of brainstem, cerebellar involvement and raised intracranial tension are also present viz–Past pointing, positive romberg test, ataxia, exaggerated tendon reflexes^Q.
- In terminal stages, there is:
 - Herniation of cerebellar tonsils
 - Failure of the vital centers in the brainstem

Histopathology

- Histopathological examination shows two morphological tissue patterns.
 - **Antoni A Pattern:** It has closely packed cells with small spindle shaped and densely stained nuclei called as Verocay Body
 - **Antoni B Pattern:** It has loose cellular aggregation of vacuolated pleomorphic cells.
- In any particular VS, one type of cellular pattern may predominate or both types can be completely admixed.

Classification of VS According to Size

Intrameatal Tm	Extrameatal size	2n millimetres
Grade I	Small	1–10
Grade II	Medium	11–20
Grade III	Moderately large	21–30
Grade IV	Large	31–40
Grade V	Giant	> 40

Investigations

- **Audiological test:** Show features of retrocochlear hearing loss.
 - Recruitment negative^Q
 - Speech discrimination score poor^Q (speech discrimination score becomes worse at higher speech intensity and this phenomenon is k/a roll over phenomenon.

- **BERA** – Delay of > 0.2 msec in Wave V between the 2 sides. (Important)

- **Acoustic reflex:** Shows stapedial reflex decay.
- **Vestibular test:** Caloric test usually show diminished or absent response^Q but may be normal if tumour is very small.
- **Investigation of choice = Gadolinium enhanced MRI = 100% diagnostic yield**

Treatment:

- **Surgery is the treatment of choice^Q.**

Surgical Approach	Indication
Hearing preservation	
• Retro sigmoidal approach	- Patient has good hearing and tumor is large > 3 cm size
• Middle cranial fossa approach	- Patient has good hearing and tumor size is < 1.5 cm (i.e. small tumors)
• Retro labyrinthine	- Small CPA tumor not extending into lateral part of internal auditory canal
Hearing ablation	
Translabyrinthine approach	- Suitable for tumors < 3 cms but disadvantage is SNHL

Hearing rehabilitation following tumour excision:

- Cochlear implant^Q
- Auditory brainstem implant - In cases of bilateral acoustic neuroma^Q.

Stereotactic radiosurgery/Gamma knife (Radiation is derived with Co-60):

- **Stereotactic radiotherapy:** Concentrates high dose radiation on the tumor so that its growth is arrested without affecting surrounding tissue
- Used in patients who refuse surgery^Q
- Source of radiation = cobalt 60.

Advantages:

- No morbidity of surgery.
- VII nerve functions preserved
- Hearing preserved.

Now due to its low morbidity gamma knife surgery or stereotactic RT is taken as an alternative to surgery in tumors less than 3 cms in size

- Modification of Gamma knife is X-knife where source of radiation is linear accelerator

Cyber knife:

- It is a type of – Robotic Surgery where the surgery is done by computer controlled robotics

QUESTIONS

1. Most common cerebellopontine angle tumour is:

[Kerala 91]

- a. Acoustic neuroma b. Cholesteatoma
c. Meningioma d. All of the above

2. Cerebellopontine angle tumor produces: [PGI 2005]

- a. Tinnitus b. Deafness
c. Absent corneal reflex d. Trigeminal neuralgia

3. Schwannoma involves the: [AI 99]

- a. Vestibular part of VIIIth nerve
b. Cochlear part of VIIIth nerve
c. Vagus nerve
d. Hypoglossal nerve

4. Acoustic neuroma commonly arise from:

[AI 11, AI 10, AIIMS Nov. 09] [AIIMS Dec. 98, Jand K - 05]

- a. Superior vestibular nerve b. Inferior vestibular nerve
c. Cochlear nerve d. Facial nerve

5. In acoustic neuroma cranial nerve to be involved earliest is: [AI 07, UP-08]

- a. 5 b. 7
c. 10 d. 9

6. The earliest symptom of acoustic nerve tumor is:

[AI 95, Delhi -05, Karnataka - 09]

- a. Sensorineural hearing loss
b. Tinnitus
c. Vertigo
d. Otorrhea

7. Earliest sign seen in Acoustic neuroma is: [UPSC 05]

- a. Facial weakness b. Unilateral deafness
c. Reduced corneal reflex d. Cerebellar signs

8. Acoustic neuroma causes: [PGI June 99]

- a. Cochlear deafness b. Retrocochlear deafness
c. Conductive deafness d. Any of the above

9. Hitzelberger's sign is seen in: [AI 08]

- a. Vestibular schwannoma b. Mastoiditis
c. Bells palsy d. Cholesteatoma

10. In acoustic neuroma all are seen except: [MP 2000]

- a. Loss of corneal reflex b. Tinnitus
c. Facial palsy d. Diplopia

11. In a patient with acoustic neuroma all are seen except: [SGPGI 07]

- a. Facial nerve may be involved unilateral deafness
b. Reduced corneal reflex
c. Cerebellar signs
d. Acute episode of vertigo

12. Earliest ocular finding in acoustic neuroma: [PGI 00]

- a. Diplopia b. Ptosis
c. Loss of corneal sensation d. Papilloedema

13. Vestibular neuroma not correct: [AP 2005]

- a. Nystagmus
b. High frequency sensorineural deafness
c. Absence of caloric response
d. Normal corneal reflex

14. True about Acoustic neuroma: [PGI June 04]

- a. Malignant tumor
b. Arises from vestibular nerve
c. Upper pole displaces IX, X, XI nerves
d. Lower pole displaces trigeminal cranial nerve

15. Progressive loss of hearing, tinnitus and ataxia are commonly seen in a case of: [SGPGI 05]

- a. Otitis media b. Cerebral glioma
c. Acoustic neuroma d. Ependymoma

16. Acoustic neuroma of 1 cm diameter, the investigation of choice: [Kerala 97]

- a. CT Scan b. MRI Scan
c. Plain X-ray Skull d. Air encephalography

17. A patient is suspected to have vestibular schwannoma the investigation of choice for its diagnosis is: [AIIMS 04]

- a. Contrast enhanced CT scan
b. Gadolinium enhanced MRI
c. SPECT
d. PET scan

NEET PATTERN QUESTION

18. Neurofibromatosis type 2 is associated with:

- a. B/L acoustic neuroma
b. Cafe-au-lait spots
c. Chromosome 22
d. Lisch nodule
e. Posterior subcapsular lenticular cataract

EXPLANATIONS AND REFERENCES

1. Ans. is a i.e. acoustic neuroma

Ref. Current Otolaryngology 2nd/ed pg 765; 3rd/ed p 791-92; Turner 10th/ed pg- 39; Dhingra 5th/ed p.124, Dhingra 6th/ed p. 112



M/C CP angle tumour is Acoustic neuroma = 80%
2nd M/C CP angle tumor is meningoma $\geq 10\%$

2. Ans. is a, b, c, d i.e. Tinnitus, Deafness, Absent corneal reflex and d. Trigeminal neuralgia

Ref: current otolaryngology 3/e p.792

The two most common CP angle tumors are:

Acoustic neuromas	Meningiomas
<ul style="list-style-type: none"> M/C symptom = U/L Deafness 2nd M/C symptom Tinnitus M/C nerve involved = Facial nerve \therefore absent corneal reflex is seen 	<ul style="list-style-type: none"> M/C symptom = U/L Deafness (80%) followed by vertigo (75%) and tinnitus = 60% In meningiomas <p>Unlike Acoustic neuroma – Trigeminal neuralgias, facial paresis, lower cranial nerve deficits and visual disturbances are more common.</p>

Hence all the above features are seen in CP angle tumors.

3. Ans. is a i.e. Vestibular part of VIIIth nerve

Ref. Logan Turner 10th/ed p 339

4. Ans. is a i.e. Inferior vestibular nerve

Ref. Glasscock-Shambaugh, Surgery of the Ear, 6th/ed p 644

- Vestibular schwannomas are benign, well circumscribed, encapsulated tumors that arise from Schwann cells of the vestibular nerve, hence the term vestibular schwannoma or vestibular neurilemmoma.
- Historically, the superior vestibular nerve sheath was thought to be the site of origin, giving rise to nearly two-thirds of tumors. More recent reviews show the inferior vestibular nerve to be the predominant site of origin for these tumors.
- The nerve or origin is identifiable in 33 to 74% of cases, and when clearly seen, shows the tumor originating from the inferior vestibular nerve over twice as often and in upto 94% in some reports.
- Rarely the cochlear portion of the eight cranial nerve/facial nerve is the site of schwannoma origin.

5. Ans. is a i.e. 5 nerve Ref. Dhingra 5th/ed pg 124, 6th/ed p 112

6. Ans. is a i.e. Sensory neural hearing loss

7. Ans. is c i.e. Reduced corneal reflex. Ref. Dhingra 5th/ed pg 124; Turner 10th/ed pg 341

Remember:

- Most common nerve from which vestibular schwannoma arises
- Earliest symptom
- Earliest cranial nerve to be involved by acoustic neuroma
- Earliest presentation of Vth nerve involvement/
- Earliest sign of Acoustic neuroma
- Significance of Vth nerve involvement
- 2nd earliest cranial nerve to be involved by acoustic neuroma
- Earliest presentation of VIth nerve involvement
- Inferior vestibular nerve
- Progressive unilateral sensorineural hearing loss often accompanied by tinnitus
- Vth nerve
- Decreased corneal sensitivity
- Implies that tumour is atleast 2.5 cm in size and occupies cerebellopontine angle
- Facial nerve (VII nerve)
- Involvement of Sensory fibres leading to hyposthesia of posterior meatal wall (Hitzelberger sign)

NOTE

Although facial nerve is involved facial nerve palsy is rarely seen

8. Ans. is b i.e. Retrocochlear deafness

Ref. Tuli 1st/ed pg 114

• SNHL can be:

a. Cochlear SNHL

– Hair cells are mainly damaged.

b. Retrocochlear SNHL

– There is lesion of VIIIth nerve or its central connections.

- Acoustic neuroma cause retrocochlear type of SNHL as it damages VIIIth nerve.
- Meniere's disease causes cochlear deafness

NOTE

- **Important features of Retro Cochlear hearing loss /Acoustic Neuroma:**

- Sensorineural hearing loss more marked in high frequencies.
- Poor discrimination score (0-30%).
- Recruitment phenomenon absent and roll over phenomenon present i.e. discrimination score further decreases when loudness is increased beyond a particular point.
- Short increment sensitivity index (SISI) test will show a score of 0-20% in 70-90% cases.
- Tone decay significant

9. Ans. is a i.e. Vestibular Schwannoma

Ref. Dhingra 5th/ed pg 124, 6th/ed p 112

Hitzelberger's sign is hypoaesthesia of posterior meatal wall seen in vestibular Schwannoma /acoustic neuroma due to involvement of sensory fibres of VIIIth nerve.

10. Ans. is c i.e. Facial palsy

Ref. Scott's Brown 7th/ed vol-3 pg 3959; Dhingra 5th/ed pg 124-125, 6th/ed p 112, 113

In Acoustic Neuroma

- Loss of corneal reflex is seen – due to the involvement of Trigeminal nerve
- Tinnitus – due to pressure on cochlear nerve
- Large tumors can cause diplopia

Turner 10th/ed pg 341

As far as facial nerve palsy is concerned – Scott Brown 7th/ed vol-3 pg 3931

"Vestibular schwannomas, although inevitably grossly distort the VIIIth nerve, very rarely present as a VIIIth nerve palsy. If there is a clinical evidence of a cerebellopontine angle lesion and if the VIIIth nerve is involved, alternative pathology is more likely".

Hence although Acoustic neuroma may involve the 7 nerve but complete palsy is never seen

11. Ans. is d i.e. acute episode of vertigo

Ref. Dhingra 5th/ed pg 124

Lets see Each Option Separately

- **Option a** – Facial nerve may be involved –
This is correct as we have discussed in previous Questions., facial nerve may be involved but complete palsy doesnot occur
- **Option b** – Reduced corneal reflex –
This is correct reduced corneal reflex is the **first sign of Trigeminal nerve involvement**
- **Option c** – Cerebellar signs – This is correct
- **Option d** – Acute episodes of vertigo

"Vestibular symptoms seen in acoustic neuroma are imbalance or unsteadiness. True vertigo is seldom seen"

–Dhingra 5th/ed p 124, 6th/ed p 112

Acute episode of vertigo is a rare presenting feature in acoustic neuroma since it is a slow growing tumor so there is adequate time for compensation.

12. Ans. is c i.e. Loss of corneal sensation

Ref. Dhingra 5th/ed pg 124; Turner 10th/ed p 341

- **Earliest nerve involved by acoustic neuroma** – Vth nerve / trigeminal nerve.
- Earliest manifestation of Vth nerve involvement is decreased corneal sensitivity leading to loss of corneal reflex.

13. Ans. is d i.e. Normal corneal reflex

Ref. Dhingra 5th/ed pg 125

As far as the answer is concerned – I am sure no one has any doubts about it because corneal reflex is absent in acoustic neuroma But lets focus on option c. i.e. Absence of caloric response –

In acoustic neuroma –

Caloric test will show diminished or absent response in 96% patients due to vestibular involvement.

Hence option c i.e. correct

Also Know

Criteria of suspicion for Acoustic neuroma (Turner 10th/ed pg 341)

- Unilateral deafness of less than 10 years.
- Sudden deafness with retrocochlear involvement which does not respond to steroids
- Poor speech discrimination score in relation to pure tone threshold
- Spontaneous nystagmus with eyes closed on electronystagmography without a history of disequilibrium
- Absence of caloric response in case of normal hearing
- Hearing loss with reduced corneal reflex
- Local pain

NOTE

If hearing loss is the only symptom and it is of more than 10 years duration, an acoustic neuroma is most **unlikely** as a tumor which has been growing for longer than this period because it will give features of other cranial nerve or brainstem involvement also.

14. Ans. is b i.e. Arises from vestibular nerve

Ref. Dhingra 5th/ed p 114, 5th/ed p 134

Explanation

Here **Option a** i.e. malignant tumor is incorrect as acoustic neuroma is a benign tumor.

Option b: It arises from vestibular nerve is correct

Option c: Upper pole displaces IX, X and XI nerve—incorrect, as is evident from the diagram given in the text: Upper pole displaces III, IV and V nerve whereas lower pole displaces IX, X and XI nerve.

15. Ans. is c i.e. Acoustic neuroma

Ref. Dhingra 5/e, p 124

Already explained

16. Ans. is b i.e. MRI scan**17. Ans. is b i.e. Gadolinium enhanced MRI scan**

Ref: Current Otolaryngology 2/e pg-767, Dhingra 5/ed pg-126

Investigations to be done in Case of Acoustic Neuroma

Initial step in evaluation includes an audiology testing with pure tone audiometry, speech discrimination score (S D S), acoustic reflex threshold and acoustic reflex delay. If these tests suggest a retrocochlear lesion, then imaging of the CPA is performed.

Imaging Tests in CPA tumor/Acoustic Neuroma**1. MRI – MRI with gadolinium contrast is the gold standard for the diagnosis or exclusion of vestibular Schwannoma**

- It also allows for surgical planning
- MRI can detect intracanalicular tumor of even a few millimeters

2. CT scan – CT scan can diagnose CPA tumors which are larger than 1.5 cms or have atleast a 5 mm CPA components. It can miss tumors that are intracanalicular unless there is bony expansion of the internal auditory canal.**ALSO KNOW****Auditory Brainstem response / BERA:**

- In patients with vestibular Schwannoma or retrocochlear lesion – ABR is either fully or partially absent or there is a delay in the latency of wave V in the affected ear
- **CSF examination** – Shows increased proteins in acoustic neuroma.

18. Ans. a, b, c, and e i.e. B/L acoustic neuroma, cafe au lait spot, chromosome 22 and posterior subcapsular cataract (Ref. Current Otolaryngology 3/e pg. 801, 802)

B/L acoustic neuromas are a hallmark of Neurofibromatosis 2

- Neurofibromatosis Type 2 is an autosomal dominant highly penetrant condition
- Gene for NF-2 is located on chromosome 22q.
- Patients with NF2 present in second and third decade of life, rarely after the age of 60.
- M/C symptom/Presenting symptom = Hearing loss
- Skin tumors are present in nearly two thirds of patients of NF-2

"Cafe au lait spots, which are a hallmark of NF-1, are also frequently found in patients with NF2. In contrast to patients with NF1, patients with NF2 invariably have fewer than six of these hyperpigmented lesions. Juvenile posterior sub capsular lenticular opacities are common and have been reported in up to 51% of patients with NF 2."—Current Otolaryngology 3/e, p 801-802

So as is clear from above lines—cafe au lait spots and posterior subcapsular lenticular opacity are seen in NF-2 also.

Remember: Diagnostic criteria for NF-2**I. Bilateral Acoustic neuroma**

or

II. Family history of NF- 2 and

U/L Vestibular schwannoma/acoustic neuroma

or

III. Any two of the following:

- Meningioma
- Glioma
- Neurofibroma
- Schwannoma
- Posterior subcapsular lenticular opacity

CHAPTER

27

Glomus Tumor and Other Tumors of the Ear

GLOMUS TUMOUR

- Glomus tumor are the most common benign tumors of middle ear.
- Resemble carotid body therefore also k/a chemodectoma
- Consists of paraganglionic cells derived from **neural crest** (Paragangliomas)
- It usually **arises** from dome of jugular bulb as **glomus jugulare** or from promontory along the course of tympanic branch of IX cranial nerve (Jacobson's nerve) and along the course of branch Xth cranial nerve (Arnold's nerve) as **glomus tympanicum**.
- Sometimes it may be multicentric.
- Most common site in middle ear: **hypotympanum**

Features

- *Slow growing locally invasive, noncapsulated tumor which causes destruction of the bone and facial nerve.*
- Highly vascular—Main Blood supply: *ascending pharyngeal artery*
- Commonly affect middle-aged females (typically in 4th or 5th decade of life)
- *Malignant transformation and metastasis are rare*
- *Some may show endocrine activity: secrete catecholamine (similar to pheochromocytoma).*

Pathologically

They originate from the 'chief cell' which contains acetylcholine, catecholamine and serotonin

- Classic findings are clusters of chief cells k/a **Zellballen**, with a rich vascular plexus throughout the entire Tumor. Therefore, they are highly vascular and may bleed substantially during surgical excision
 - Bilateral tumors occur in 1–2% cases
 - Can be hereditary also
 - Also associated with pharyngeal paragangliomas (neurologic disease with cutaneous manifestations like von Recklinghausen neurofibromatosis, sturge-weber syndrome, tuberous sclerosis and von Hippel-Lindau disease)
- Also associated with MEN Type I syndrome.

Spread of Tumor

Site of Spread	Presentation
• Tympanic membrane	– Vascular polyp
• Labyrinth, petrous, pyramid and mastoid	– Hearing Loss
• Jugular foramen and base of skull	– Cranial nerve palsies VII, VIII, IX to XII
• Eustachian tube	– Mass on nasopharynx
• Intracranially spreads	
• Lung, liver lymph nodes	

Note: M/C cranial nerve involved = **Facial nerve followed by the last four cranial nerves.**

Clinical Features

When tumor is intratympanic:

1. **Earliest symptoms are deafness** (conductive) and **tinnitus** (pulsatile and of swishing character, synchronous with pulse and can be temporarily stopped by carotid pressure).
2. Otoscopy shows **red reflex; rising sun appearance**, tympanic membrane appears **bluish and bulging**.
3. **Pulsation sign/Browne sign/Blanching sign** is positive (when ear canal pressure is raised with Siegel's speculum, tumor pulsates vigorously and then blanches; reverse happens with release of pressure).
4. **Aquino sign** – It is blanching of the mass with manual compression of ipsilateral carotid artery.

When tumor present as polyp:

1. History of **profuse bleeding** from the ear either spontaneously or on attempts to clear it.
 2. Dizziness, vertigo, facial paralysis, earache otorrhea.
- **Audible bruit:** Heard by stethoscope over mastoid at all stages.

- Some glomus tumor secrete catecholamines and produce headache, sweating flushing, etc.
- Patient may show features of cranial nerve IX and X, involvement viz. dysphagia or hoarseness.

Investigations

- **Examination under microscope:** Pulsatile mass seen.

- **CT scan:** investigation of choice. Helps to distinguish glomus jugulare from glomus tympanicum with the help of *Phelps sign*: absence of normal crest between the carotid canal and jugular fossa on lateral tomography, in case of glomus jugulare

- **HRCT and gadolinium enhanced MRI** is used to delineate the intracranial extent of tumor.
- A combination of CT scanning and contrast MRI is the imaging regimen of choice for glomus jugular tumor.
- Audiogram will show conductive deafness if the middle ear space is invaded with tumor. If inner ear is invaded SNHL is seen
- **Angiography:** It is necessary when CT scan shows involvement of jugular bulb, carotid artery or intracranial extension. Following procedures are done:

- For carotid artery: Carotid arteriography
- For jugular bulb: Jugular venography
- For intracranial extension: Vertebral arteriography

Treatment

Surgery – Microsurgical total tumor removal is the treatment of choice for most patients. Patients with functionally secreting tumors need to be alpha-blocked with phentolamine before and during surgery to prevent life threatening hypertension as the alpha adrenergic hormones are released with tumor manipulation.

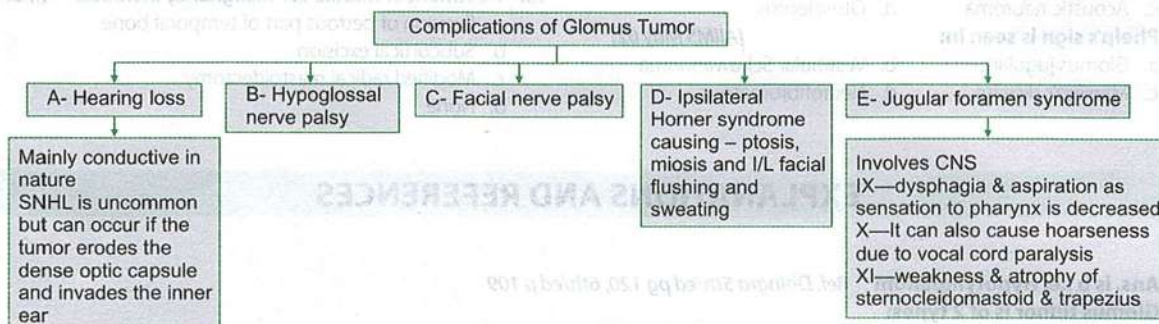
Other Conditions Causing Pulsatile Tinnitus

Arterial – Glomus tumor, AV malformation of temporal bone, aberrant internal carotid artery, carotid/subclavian atherosclerosis
Venous – High jugular bulb, benign ICT.

- **Embolization:** Is the sole treatment in inoperable patients who have received radiation.
- Preoperative embolization is done to decrease vascularity of tumor before surgery
- **Radiation:** is reserved for inoperable lesions, old age and unfit patients.

Complications: See Flow Chart 27.1

Flow Chart 27.1: Complication of Glomus tumor



QUESTIONS

1. The usual location of Glomus jugular tumor is:

[Delhi 90, UP-03]

- a. Epitympanum b. Hypotympanum
c. Mastoidal cell d. Promontory

2. Earliest symptom of glomus tumor is:

[UP 06]

- a. Pulsatile tinnitus b. Deafness
c. Headache d. Vertigo

3. Pulsatile tinnitus in ear is due to:

[TN 01]

- a. Malignant otitis media b. Osteoma
c. Mastoid reservoirs d. Glomus jugulare tumor

4. True about Glomus jugulare tumor:

[PGI June 04]

- a. Most common in male
b. Arises from non-chromaffin cells
c. Lymph node metastasis seen
d. Multicentric
e. Pulsatile tinnitus and conductive type of hearing loss seen

5. All are true about glomus jugulare tumors except:

[UP 03]

- a. Common in female
b. Causes sensory neural deafness
c. It is a disease of infancy
d. It invades labyrinth, petrous pyramid and mastoid

6. Brown sign is seen in:

[AI 07]

- a. Glomus tumor b. Meniere's disease
c. Acoustic neuroma d. Otosclerosis

7. Phelps's sign is seen in:

[AIIMS May 02]

- a. Glomus jugulare b. Vestibular Schwannoma
c. Maniere's disease d. Neurofibromatosis

8. The glomus tumor invasion of jugular bulb is diagnosed by

[UP 05]

- a. Carotid angiography b. Vertebral venous venography
c. X-ray d. Jugular venography

9. A patient presents with bleeding from the ear pain tinnitus and progressive deafness. On examination, there is a red swelling behind the intact tympanic membrane which blanches on pressure with pneumatic speculum. Management includes all except:

[AIIMS Nov. 01]

- a. Radiotherapy b. Surgery
c. Interferons d. Preoperative embolization

10. Which is the most pulsatile tumor found in external auditory meatus which bleeds on touch:

[AIIMS 95]

- a. Squamous cell ca of pinna
b. Basal cell ca
c. Adenoma
d. Glomus tumor

11. Mass in ear, on touch bleeding heavily, causes:

[DNB 01]

- a. Glomus Jugulare b. Ca mastoid
c. Acoustic neuroma d. Angiofibroma

12. Most common bony tumour of middle ear is:

[UP 07]

- a. Adenocarcinoma b. Squamous cell carcinoma
c. Glomous tumor d. Acoustic neuroma

13. Treatment of middle ear malignancy includes:

[Mahe 07]

- a. Excision of petrous part of temporal bone
b. Subcortical excision
c. Modified radical mastoidectomy
d. None

EXPLANATIONS AND REFERENCES

1. Ans. is b i.e. Hypotympanum Ref. Dhingra 5th/ed pg 120, 6th/ed p 109
Glomus tumor is of 2 types:

Glomus jugulare

Arises from:

- Dome of jugular bulb
- Hypotympanum

Invades:

- Jugular foramen therefore involves cranial nerves IX to XII and compresses jugular vein

Clinical features:

- Signs of compression of cranial nerves IX to XII

Glomus tympanicum

Arises from

Promontory of middle ear

Clinical features:

- Aural symptoms sometimes with facial paralysis

2. Ans. is a i.e. Pulsatile tinnitus

Ref. Dhingra 5th/ed pg 120, 6th/ed p 109; Current Otolaryngology 2nd/ed pg 799, 3rd/ed p 815

"The two most common presenting symptoms of paraganglioma of temporal bone (Glomus tumor)^Q are **conductive hearing loss^Q and pulsatile tinnitus^Q**"

— Current Otolaryngology 3rd/ed p 815

Hearing loss is conductive and slowly progressive Tinnitus is **pulsatile^Q** and of **swishing character^Q**, **synchronous with pulse^Q**, and can be **temporarily stopped by carotid pressure^Q**.

Thus, both pulsatile tinnitus and deafness are seen in glomus tumor.

According to Turner 10/e, p 214

"The earliest symptom of a glomus tumor is pulsatile tinnitus."

3. Ans. is d i.e. Glomus jugulare tumor

Pulsatile tinnitus – Seen in Glomus tumor

Pulsatile otorrhea – Seen in ASOM

4. Ans. is b, d and e i.e. Arises from non-chromaffin cells; Multicentric; and Fluctuating tinnitus and conductive type of hearing loss seen

Ref. Dhingra 5th/ed pg 120, 6th/ed p 109
Ref. Dhingra 5th/ed pg 120, 6th/ed p 109-110; Current Otolaryngology 2nd/ed pg 794-800, 3rd/ed pg 814, 815, 816

Explanation

- Glomus tumor is more common in females.
- Glomus tumor is also referred to as chemodectoma or nonchromaffin paraganglion.
- Glomus tumor is a benign tumor, therefore lymph node metastasis is not present.
- Multicentric tumors are found in 3-10% of sporadic cases and in 25-50% of familial cases.
- Fluctuating (Pulsatile) tinnitus and conductive hearing loss are the earliest symptoms of glomus tumor.

5. Ans. is c i.e. It is a disease of infancy

Ref. Dhingra 5th/ed pg 120-121, 6th/ed p 109-110

Let us see each option separately

Option a – Common in females

It is correct as females are affected five times more than males.

Option b – Causes sensorineural deafness

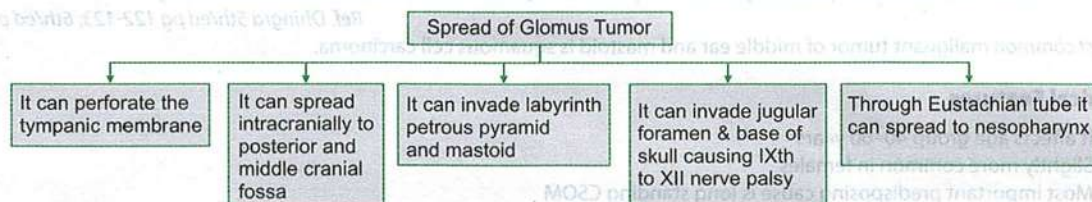
This is partially correct as glomus tumor leads to mainly conductive type hearing loss. Sensorineural hearing loss is uncommon but can occur if the tumor erodes the dense otic capsule bone and invades the inner ear.

Option c – It is a disease of infancy

This is incorrect as Glomus tumor is seen in middle age (40-50 years)

Option d – It invades labyrinth, petrous pyramid and mastoid.

This is correct



6. Ans. is a i.e. Glomus tumor

Ref. Dhingra 5th/ed pg 120, 6th/ed p 109

7. Ans. is a i.e. Glomus tumor

Phelp's sign

Rising sun sign

Pulsation sign/brown sign

Aquino sign

are all seen in Glomus tumor

Phelp sign This sign is seen on CT scan

In CT – in case of glomus jugulare tumor the normal crest between the carotid canal and jugular tumor is absent whereas it is not so in case of glomus tympanicum

For details of other sign see the preceding text

8. Ans. is d i.e. Jugular venography

Ref. Dhingra 5th/ed pg. 121, 6th/ed p 110

MRI – gives soft tissue extent of tumor; Magnetic Resonance Angiography (MRA) shows compression of the carotid artery whereas magnetic resonance venography shows invasion of jugular bulb by the tumor (For more details on imaging techniques used in case of Glomus tumor – see the preceding text)

Remember: Preoperative biopsy is never done in case of glomus tumor as it can lead to bleeding.

9. Ans. is c i.e. Interferons

Ref. Dhingra 5th/ed pg 121, 6th/ed p 110; Current Otolaryngology 2nd/ed pg 801, 802

Patient presenting with progressive deafness, tinnitus and bleeding from ear

+

Red swelling behind the intact tympanic membrane (i.e. rising sun sign)

+

Swelling blanches on pressure with pneumatic speculum (i.e. Brown's sign)

↓

Indicate Glomus tumor as the diagnosis

Management options for Glomus tumor

Surgery	Radiotherapy	Embolization
Microsurgical total tumor removal is the TOC	<ul style="list-style-type: none"> Does not cure the tumor Reduces the vascularity of tumor and arrests its growth Used for <ul style="list-style-type: none"> Inoperable tumor Residual tumor Recurrences after surgery Elderly patients 	<ul style="list-style-type: none"> Pre-operative embolization after digital subtraction angiography, reduces the vascularity of the tumor prior to surgery Used as sole treatment in inoperable cases who have received prior radiotherapy

10. Ans. is None or d i.e. Glomus tumor

Ref. Turner 10th/ed p 215; Dhingra 5th/ed p 120, 6th/ed p 109

It is worth noting here that though the glomus tumor is the neoplasm of middle ear, it may perforate the tympanic membrane and appears as a polypus in the external auditory meatus which bleeds profusely if touched.

11. Ans. is a i.e. Glomus Jugulare

Ref. Dhingra 5th/ed pg 120, 6th/ed p 109

The answer to this question is quite obvious as Glomus tumors are highly vascular tumors and bleed on touch.

12. Ans. is b i.e. Squamous cell carcinoma**13. Ans. is a and c i.e. Excision of petrous part of temporal bone; and Modified radical mastoidectomy**

Ref. Dhingra 5th/ed pg 122-123, 6th/ed p 110-111

Most common malignant tumor of middle ear and mastoid is squamous cell carcinoma.

Clinical Features

- It affects age group 40–60 years
- Slightly more common in females
- Most important predisposing cause is long standing CSOM
- Patient may present with chronic foul smelling blood stained discharge
- Pain is severe and comes at night.
- Facial palsy may be seen
- O/E – Friable, hemorrhagic granulation or polyp are present.
- Diagnosis** – made only on biopsy

CT and angiography are done to see the extent of disease.

Metastasis occurs to cervical lymph nodes later.

Treatment of carcinoma of middle ear is combination of surgery followed by radiotherapy.

Surgery consists of radical mastoidectomy / subtotal or total petrosectomy depending on the extent of tumor.

CHAPTER

28

Rehabilitative Methods

HEARING AIDS

Hearing aids are devices to amplify sounds reaching the ear. Suitable for patients with conductive hearing loss. In SNHL, there may be distortion of sound due to recruitment.

Hearing Aid Components

Microphone	Amplifier	Receiver
Collects the sound & transforms into electric energy	Intensifies electrical impulses	Electrical impulses translated to louder sounds

Types of Hearing Aid

- **Conventional type:** Increases the volume of all incoming sounds with minor adjustments.
- **Programmable analogue:** Programmed by computer, has some flexibility for adjustment based on preferences and listening environment.
- **Digital type:** The software is programmed by an audiologist to allow dramatic flexibility in adjustments. Soft sounds are distinguished from loud sounds. Clarity is enhanced.

Hearing Aid Styles

Hearing Aid Styles

Completely in the canal [CIC]

- Smallest type
- Used for mild to moderate hearing loss
- Most difficult to
- Place & adjust

In the canal type [ITC]

- Larger than CIC
- Used for mild to moderate hearing loss
- Easier to use

Contd...

Contd...

In the ear type [ITE]

- Larger than ITC
- Fills the bowl of the ear
- Used for wide variety of hearing impairment
- Easier to use than CIC & ITC

Behind the ear [BTE]

- Circuit & the microphone fit behind the ear
- Used for wide range of hearing loss
- Good for children

Indications

- **Absolute Indication:** Congenital deafness, for proper development of speech and language:
- Patient who has hearing problem which is not treatable by medical or surgical methods.
- Conductive deafness patients who do not want surgery/unfit for surgery.

- In SNHL - results are not very good particularly in those with recruitment positive.

Disadvantages of conventional hearing aids

- Cosmetically unacceptable due to visibility.
- Acoustic feedback.
- Spectral distortion.
- Occlusion of external auditory canal.
- Collection of wax in the canal and blockage of insert.
- Sensitivity of canal skin to earmoulds.
- Problem to use in discharging ears.

BONE ANCHORED HEARING AID (BAHA)

Newer Advanced Hearing Aid

It acts by directly stimulating cochlea, bypassing external and middle ear since it is anchored to bone.

Indications for BAHA

1. When air-conduction (AC) hearing aid cannot be used:
 - Canal atresia, congenital or acquired, not amenable to treatment.
 - Chronic ear discharge, not amenable to treatment.
 - Excessive feedback and discomfort from air-conduction hearing aid.
2. Conductive or mixed hearing loss, e.g. otosclerosis and tympanosclerosis where surgery is contraindicated.
3. Single-sided hearing loss.

VIBRANT SOUND BRIDGE/IMPLANTABLE HEARING AID

It is an implantable hearing aid which directly stimulates the ossicles, bypassing external ear and tympanic membrane. The implanted part consists of transducer attached to incus.

Candidate profile:

Appropriate candidates for direct drive middle ear hearing devices include adult aged 18 years and older with moderate-to-severe sensorineural hearing loss. Candidates should have experience of using traditional hearing aids and should have a desire for an alternative hearing system.

Advantage

Better sound quality and less wax related problems and less feedback.

COCHLEAR IMPLANTS**Cochlear Implant**

- It is an electronic device that converts the mechanical sound energies into electrical signals that can be directly delivered into the auditory nerve in severe or profoundly hearing impaired individuals, who cannot benefit from hearing aids (i.e. it bypasses the cochlea)

Components of Implants:

External component	Internal component
<ul style="list-style-type: none"> • Microphone • Speech processor • Transmitter • It remains outside the body 	<ul style="list-style-type: none"> • Receiver/stimulator (implanted under the skin) • Electrode is implanted in <ul style="list-style-type: none"> • ↓ Scale tympani of the cochlea⁹ via cochleostomy and if is not possible it can be assessed through the round window. It may be placed at other locations like promontory or round window but these are inferior locations than cochlea.

Current cochlear devices are FDA approved for implantation in children 12 months and older, with no upper age restrictions. Furthermore, it has been shown that outcomes in adults > 65 yrs are no better or no worse than those in young adults. The earlier the implantation is done in children, the more favorable the results.

Prerequisites:

- Intact VIII nerve and higher auditory pathways
- At least 1 year of age.
- Postlingual deaf patients tend to do better than prelingual deafs.

Surgical approach to place the electrode:

- M/C used is facial recess approach (posterior tympanotomy).
- **Recently Vera technique is gaining popularity.**

AUDITORY BRAINSTEM IMPLANTS

- It is designed to stimulate the cochlear nuclear complex in the brainstem directly by placing the implant in the lateral recess of fourth ventricle. Such an implant is needed when CN VIII has been severed in surgery of vestibular schwannoma. In these cases, cochlear implants are of no use.

In unilateral acoustic neuroma, ABI is not necessary as hearing is possible from the contralateral side but in bilateral acoustic neuromas as neurofibromatosis type 2 rehabilitation is required by ABI.

- **Site of implant = Lateral recess of fourth ventricle**

NOTE

In some patients, where auditory brainstem implant is not possible due to tumor induced damage to cochlear nucleus after acoustic neuroma surgery; inferior colliculus of midbrain can be stimulated—This is called as Auditory midbrain implant.

QUESTIONS

1. Which of the following would be the most appropriate treatment for rehabilitation of a patient, who has bilateral profound deafness following surgery for bilateral acoustic schwannoma: [AIIMS Nov 03]
 - a. Bilateral high powered digital hearing aid
 - b. Bilateral cochlear implant
 - c. Unilateral cochlear implant
 - d. Brainstem implant
2. A child aged 3 years, presented with severe sensorineural deafness was prescribed hearing aids, but showed no improvement. What is the next line of management:
 - a. Fenestration surgery
 - b. Stapes mobilisation
 - c. Cochlear implant
 - d. Conservative
3. 10-year-old boy Rajan is having sensorineural deafness, not benefited by hearing aids. Next best management is: [AIIMS 01]
 - a. Cochlear implant
 - b. Stapes fixation
 - c. Stapedectomy
 - d. Fenestration
4. In cochlear implants electrodes are most commonly placed at:
 - a. Oval window
 - b. Round window
 - c. Horizontal semicircular canal
 - d. Cochlea
5. Cochlear implant is done in: [Bihar 05]
 - a. Scala vestibuli
 - b. Scala tympani
 - c. Cochlear duct
 - d. Endolymphatic duct
6. Which of the following statement regarding cochlear implant is true: [AIIMS Nov 10]
 - a. Cochlear malformation is not a CI to its use
 - b. Contraindicated in children < 5 yrs of age
 - c. Indicated in mild-moderate hearing loss
 - d. Approached through oval window
7. Absolute indication for cochlear implantation is: [AIIMS Nov 12]
 - a. Outer hair cell
 - b. Inner hair cell
 - c. Spiral ganglion cell
 - d. Auditory nerve

EXPLANATIONS AND REFERENCES

1. Ans. is d i.e. Brainstem implant

Ref. Harrison 17th/ed p 204

Hearing loss

- Conductive hearing loss
- Mild / moderate SNHL
- Bilateral severe to profound SNHL with word recognition score < 30%
- Bilateral damage to eighth nerve by trauma / bilateral vestibular schwannoma

Rehabilitative measure

- Corrective surgery / Hearing aids
- Hearing aids
- Cochlear implants
- Brainstem auditory implants (placed near cochlear nucleus)

2. Ans. is c i.e. Cochlear implants

Ref. Dhingra 5th/ed p 139, 6th/ed p 125; Current Otolaryngology 2nd/ed pg 882

3. Ans. is a i.e. Cochlear implant

B/L severe or profound hearing loss not benefited by hearing aid and it is an indication for use of cochlear implants

Criteria for the use of Cochlear implants

Prelingual and Postlingual Children

- Bilateral severe to profound hearing loss (only profound hearing loss in children < 2 years of age)
- Lack of auditory development with a proper binaural hearing aid trial
- Properly aided open-set word recognition scores < 20–30% in children capable of testing
- Suitable auditory developmental education plan
- Lack of medical contraindication

Postlingual Adults

- 18 years of age
- B/L severe to profound hearing loss
- Properly aided recognition scores < 40%
- Lack of medical contraindication, with cochlea and auditory nerve present

Prelingual Adults

- 18 years of age
- Bilateral profound deafness
- Minimal benefit from properly fitted hearing aid
- Lack of medical contraindication, with cochlea & auditory nerve present

NOTE

Postlingually deaf adults and children benefit most by implants, but it can be used in prelingually deaf patients also.

4. Ans. is d i.e. Cochlea

Ref. Dhingra 5th/ed pg 140, 6th/ed p 126

5. Ans. is b i.e. Scala tympani

M/C site of electrode placement in cochlear implant is scala tympani of cochlea via cochleostomy (i.e. opening basal turn of cochlea). This allows the electrodes to be in close proximity to the spiral ganglion cells and their dendrites. Round window is a route for approach to cochlea in those cases where a separate cochleostomy cannot be drilled.

NOTE

M/C Surgical approach for placing cochlea implant = Facial Recess approach (Posterior tympanotomy) which involves doing a cortical mastoidectomy. Recently Vera technique (Non-Mastoidectomy technique) is gaining popularity for cochlear implantation. It uses transcanal approach.

Advantage of Vera technique

- Simple
 - Less chances of injuring facial nerve
 - Suitable in young children where mastoid has not developed fully.
 - Minimal bone trauma \therefore fast healing and less complication rate
- 6. Ans. is a i.e. Cochlear malformation is not a CI to its use** Ref. Current Otolaryngology 3rd/ed p 856; Dhingra 5th/ed p 139-140

Explanation

- As discussed earlier Cochlear implants are useful in B/L severe to profound hearing loss and not in mild-moderate hearing loss \therefore Option C is incorrect (Dhingra 5th/ed p 139), 6th/ed p 125
- Cochlear implants can be implanted in children at 12 months of age, rather early implantation gives better results. (Dhingra 5th/ed p 139), 6th/ed p 125
"The timing of implantation is very important. Earlier implantation in children generally yields more favorable results and many centers routinely implant children under 12 months of age." – Current Otolaryngology 3rd/ed p 856.
 So friends—Option b—C/I in children < 5 years of age is incorrect.
- Approach for cochlear implants is via facial recess, where a simple cortical mastoidectomy is done first and short process of incus and lateral semicircular canal is identified.
 The facial recess is operated by performing a posterior tympanotomy. A cochleostomy is then done inferior to round window (Not oval window) with the goal of affording access to scala tympani (where the electrode has to be placed).
 Thus option d i.e. it is approached through oval window is incorrect.
 So by exclusion are answer is a i.e. cochlear malformation is not a contradiction to its use.

7. Ans. is d i.e. Auditory Nerve –

Ref. Mohan Bansal Textbook of Diseases of Ear, Nose and Throat 1st/ed p 178

Cochlear Implants

- *"They are indicated for patients of profound binaural SNHL (with non functional cochlear hair cells) who have intact auditory nerve functions and show little or no benefit from hearing aids."* ...Mohan Bansal 1st/ed p 178

CHAPTER

29

Miscellaneous

1. Laser uvulopalatopharyngoplasty is the surgery done for which of the following?

- Snoring
- Recurrent pharyngotonsillitis
- Cleft palate
- Stammering

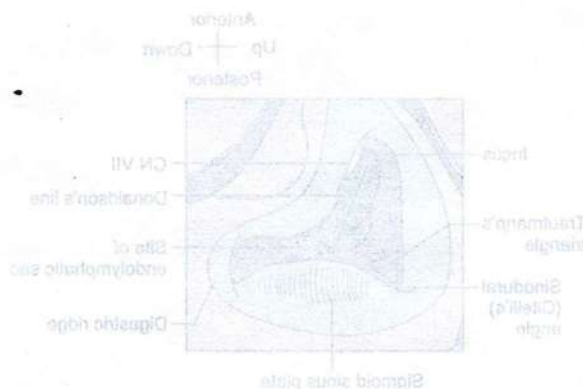
1. Ans. is a i.e. snoring of diseases of Ear Ref: Mohan Bansal Textbook of Diseases of Ear, Nose and Throat 1/e, p 435

Snoring: Noisy breathing, a rough, rattling inspiratory noise produced by vibration of pendulous soft palate or occasionally of vocal cords, during sleep.

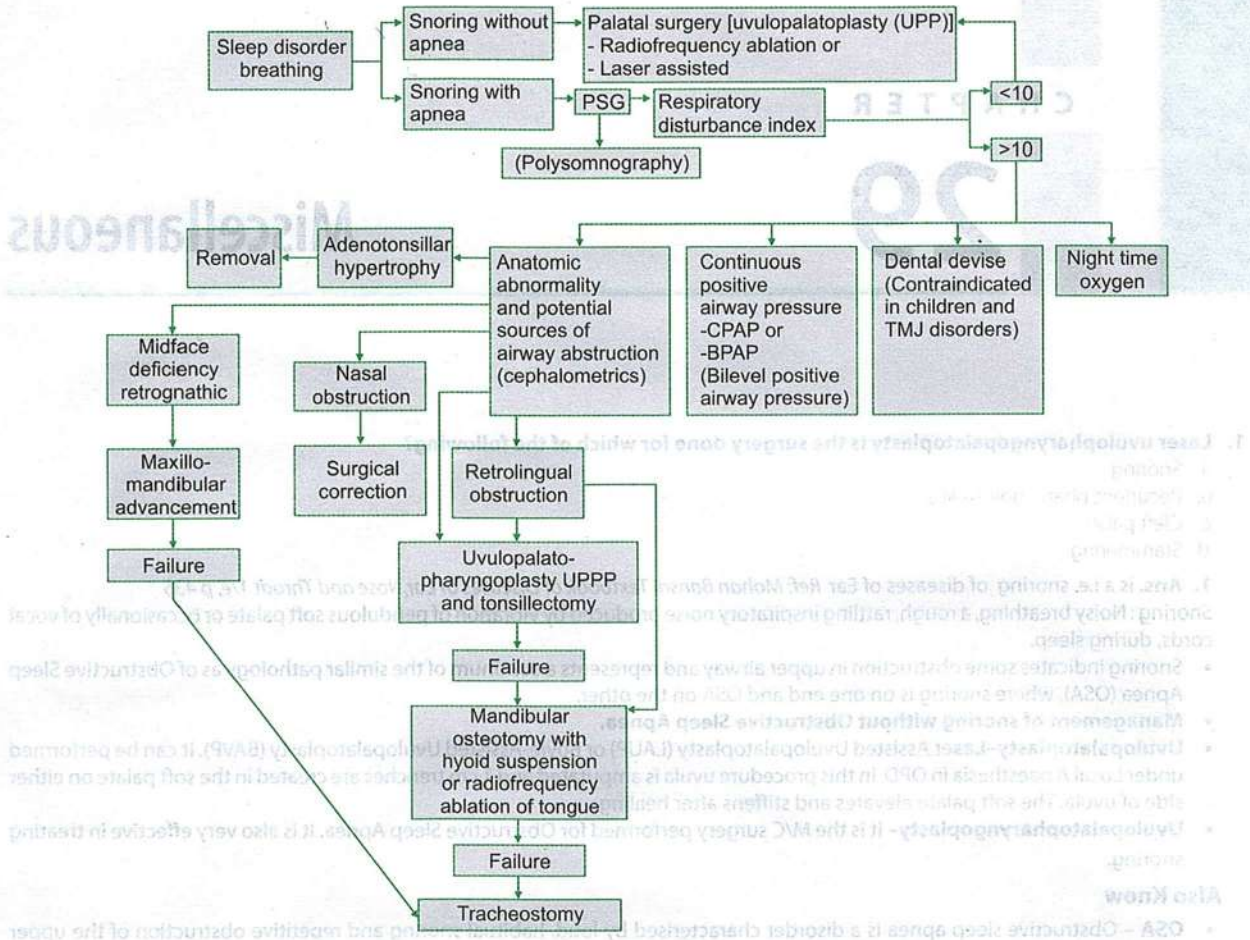
- Snoring indicates some obstruction in upper airway and represents a continuum of the similar pathology as of Obstructive Sleep Apnea (OSA), where snoring is on one end and OSA on the other.
- **Management of snoring without Obstructive Sleep Apnea.**
- **Uvulopalatoplasty**—Laser Assisted Uvulopalatoplasty (LAUP) or Bovie-Assisted Uvulopalatoplasty (BAVP). It can be performed under Local A naesthesia in OPD. In this procedure uvula is amputated and 1 cm trenches are created in the soft palate on either side of uvula. The soft palate elevates and stiffens after healing.
- **Uvulopalatopharyngoplasty**—It is the M/C surgery performed for Obstructive Sleep Apnea. It is also very effective in treating snoring.

Also Know

- **OSA** – Obstructive sleep apnea is a disorder characterised by loud, habitual snoring and repetitive obstruction of the upper airway during sleep, resulting in prolonged intervals of hypoxia and fragmented sleep.
- Gold standard test in evaluation of OSA – Polysomnography. It differentiates snoring without OSA from snoring with OSA and also identifies the severity of apnea.
- Mullers maneuver – This test is done before uvulopalatopharyngoplasty to know whether the patient will benefit from the surgery or not.



FLOW CHART OF MANAGEMENT OF SNORING BOTH WITH OR WITHOUT OSA.



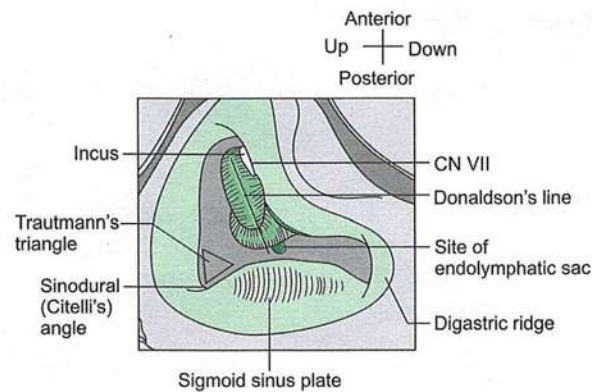
2. Citellis angle is:

- Sold angle
- CP angle
- Sinodural angle
- Part of MC Evans triangle

2. Ans. is c i.e. Sinodural angle

As seen from the figure Citellis's angle is Sinodural angle

Ref. Dhingra 6th/ed p 402; Fig. 79.5



3. Which of the following is a features of tympanic membrane perforation (printed esophageal rupture in paper): [UP 00]

- a. Tinnitus
- b. Vertigo
- c. Conductive deafness
- d. Fullness in ear

3. Ans. is c i.e. Conductive deafness

Ref. Dhingra 5th/ed pg 34; Turner 10th/ed pg 284

Tympanic membrane perforation is associated with a conductive hearing loss of 10-40 dB.

4. Which among the following is not a feature of retracted tympanic membrane: [PGI June 99]

- a. Loss of cone of light
- b. Shortening of handle of malleus
- c. Draping of tympanic membrane over handle of malleus
- d. Degeneration of head of malleus

4. Ans. is d i.e. Degeneration of head of malleus

Ref. Dhingra 4th/ed p 54, 5th/ed pg 61-62

Normal tympanic membrane

- Shiny and pearly gray in color with a concavity on its lateral surface
- Cone of light is present in anteroinferior quadrant
- It is mobile

Retracted tympanic membrane

- Dull and lusterless
- Cone of light is absent or interrupted
- Lateral process of malleus becomes very prominent
- Anterior and posterior malleal folds become sickle shaped

NOTE

- A retracted tympanic membrane is the result of negative intratympanic pressure when Eustachian tube is blocked.
- Most important landmark for otoscopy - Lateral process of malleus.
- Cone of light is formed by handle of malleus.

5. Chalky white tympanic membrane is seen in:

- a. ASOM
- b. Otosclerosis
- c. Tympanosclerosis
- d. Cholesteotoma

[RJ 01]

5. Ans. is c i.e. Tympanosclerosis:

Ref. Dhingra 5th/ed p62

Tympanosclerosis is hyalinization and later calcification in the fibrous layers of tympanic membrane. It appears as chalky white plaque. It is seen in cases of serous otitis media as a complication of ventilation tube and is generally asymptomatic.

6. Direction of water jet while doing syringing of ear should be:

[MH 02]

- a. Anterior
- b. Posterior
- c. Anterosuperior
- d. Posterosuperior

6. Ans. is d i.e. Posterosuperior

Ref. Dhingra 4th/ed p 53; 5th/ed pg 60

"Pinna is pulled upward and backward and a stream of water from the ear syringe is directed along posterosuperior wall of the meatus." - Dhingra 5th/ed p 60

7. Use of Siegel's speculum during examination of the ear provides all except:

- a. Magnification
- b. Assessment of movement of the tympanic membrane
- c. Removal of foreign body from the ear
- d. As applicator for the powdered antibiotic of ear

7. Ans. is c i.e. Removal of foreign body

Ref. Dhingra 5th/ed p 383; SR Mowson Disease of Ear 4th/ed p 93-94; Maqbool 11th/ed p 34

Uses of Siegel's Pneumatic Speculum

Mnemonic: 3T - 3 M

3T's are:
 [] Fistula test
 [] Gelle's test
 [] Powder test

3M's are:
 [] For magnification
 [] For instillation of medicines into middle ear
 [] To assess the mobility of tympanic membrane

NOTE

Periphery of tympanic membrane has maximum mobility².

- 8. The focal length of the mirror used in head lamp:** [APPGI 06]
 a. 85 mm b. 150 mm
 c. 250 mm d. 400 mm
Ans. is c i.e. 250 mm Ref. Dhingra 5th/ed pg 379
 • Head mirror is a concave mirror used to reflect light from the bull's eye lamp onto the part being examined
 • It has focal length of ~ 25 cm (= 10 inch) The examiner sees through the hole in the centre of the mirror
 • Diameter of central hole = 19 mm (3/4 inch)
- 9. Focal length of head mirror used in ENT-OPD:** [Bihar 2005]
 a. 9 inch b. 10 inch (25 cm)
 c. 11 inch d. 12 inch
Ans. is b i.e. 10 inch (25 cm) Ref. Dhingra 4th/ed p 336, 5th/ed p 379
- 10. Diameter of head mirror in ENT is:** [Bihar 2005]
 a. 20 cm b. 22 cm
 c. 10 cm d. 26 cm
Ans. is c i.e. 10 cm Ref. Dhingra 4th/ed p 336, 5th/ed p 379
 Diameter of the head mirror used in ENT is 89 mm (3 and half inch).
- 11. 40 db compared to 20 db is:** [DNB 01]
 a. Double b. 10 times
 c. 100 times d. 1000 times
Ans. is b i.e. 10 Times Ref. Dhingra 4th/ed p 20, 5th/ed pg 23
 Decibel is 1/10th of bel.
 In audiology, sound is measured as sound pressure level (SPL)
- $\text{Sounds in dB} = 20 \log$

SPL of S1
 SPL of S0
- S1 = Sound being described
 S0 = Reference sound
- If a sound has an SPL of 1000 i.e., 103 times the reference sound, it is expressed as $20 \times 3 = 60 \text{ dB}$.
 - Similarly a sound of 1000,000 i.e., (106) times the reference sound, it is described as $20 \times 6 = 120 \text{ dB}$ working on the same principle.
 - 20 dB = will come. If sound has SPL of 10 times the reference sound (20×1).
 - 40 dB will come if sound has SPL of 100 times the reference sound (20×2).
 - So 40 dB is 10 times more than 20 dB.
- 12. Impedance denotes:** [PGI 99]
 a. Site of perforation b. Disease of cochlea
 c. Ds. of ossicles d. Higher function disorder
Ans. is c i.e. Disease of Ossicles Ref. Tuli 1st/ed p 35
 "Impedance audiometry, measures the resistance of tympanic membrane and middle ear and also compliance of tympanic membrane and ossicular chain to sound pressure transmission. Tympanogram is the graphic representation of compliance and impedance of tympanic ossicular system with air pressure changes."
 From above text it is quite obvious impedance is for disease of ossicles.
- 13. During normal conversation sound heard at 1 meter distance is:** [Bihar 2004]
 a. 80dB b. 60dB
 c. 90dB d. 120dB
Ans. is b i.e. 60dB Ref. Dhingra 4th/ed p 20, 5th/ed p 23
- | | |
|-----------------------|--------|
| Whisper | 30 Db |
| Normal conversation | 60 Db |
| Shout | 90 Db |
| Discomfort of the ear | 120 Db |
| Pain in the ear | 130 dB |
- 14. Normal conversation sound level:** [Bihar 2005]
 a. 20-25dB b. 60-65dB
 c. 80-85dB d. 90-100dB
Ans. is b i.e. 60-65dB Ref. Dhingra 4th/ed p 20; 5th/ed pg 23
- 15. Prolonged exposure to noise levels greater than the following can impair hearing permanently:** [Karnat 96]
 a. 40 decibels b. 85 decibels
 c. 100 decibels d. 140 decibels

15. Ans. is c i.e. 100 decibels

Ref. Park 19th/ed p 599

"Repeated or continuous exposure to noise around 100 decibels may result in a permanent hearing loss." ... Park 19th/ed p 599

"A noise of 90 dB SPL, 8 hours a day for 5 days per week is the maximum safe limit as recommended by ministry of labour, govt of India-rules under factories act." ... Dhingra 4th/ed p 35; 5th/ed pg 40

NOTE

Impulse noise (single time exposure) of more than 140 dB is not permitted.

16. A man Rajan, age 70 yrs, presents with tinnitus. Most probable diagnosis is:

[AIIMS Nov 00]

- Acoustic neuroma
- ASOM
- Labrynthitis
- Acoustic trauma

16. Ans. is a i.e. Acoustic neuroma

Ref. Dhingra – read below

Condition	Points in favour	Points against
Acoustic neuroma	Presenting symptom – Tinnitus – Age of patient	Associated with SNHL hearing loss (which is not given in the question) – No history of ear ache, fever and hearing loss
ASOM (Dhingra 4th/ed p 61)	Tinnitus may be seen in stage of presupperation	Tinnitus is not the presenting symptom
Labyrinthitis	Tinnitus may be seen	It is common in infants and children
Acoustic trauma		Tinnitus is not seen – No history of trauma – It is associated with varying degree of hearing loss which is not given

Amongst the options given, acoustic neuroma is the best option here. If presbycuses would have been given in the options, we would have chosen it

17. Gustatory sweating and flushing (Frey's syndrome) follows damage to the:

[JIPMER 80; DNB 91]

- Trigeminal nerve
- Facial nerve
- Glossopharyngeal nerve
- Vagus nerve
- Auriculotemporal nerve

17. Ans. is e i.e. Auriculotemporal nerve

Ref. Maqbool 11th/ed p 276; S. Das Short Cases of Clinical Surgery 3rd/ed p 82

Auriculotemporal syndrome (Syn. Frey's Syndrome)

Partial injury to the auriculotemporal nerve gives rise to such syndrome. This type of injury:

- May be congenital, possibly due to birth trauma.
- May be accidental injury.
- May be caused by inadvertent incision for drainage of parotid abscess.
- May occasionally follow superficial parotidectomy.

Clinical features: There is flushing and sweating of the skin innervated by the auriculotemporal nerve particularly during meal and presence of cutaneous hyperaesthesia in front and above (the ear the area supplied by the auriculotemporal nerve.)

The Explanation of this syndrome is:

- The postganglionic parasympathetic fibres become united to the sympathetic nerves from the superior cervical ganglion which are concerned to supply vessels and sweat glands of that region. This causes flushing and sweating of the skin.
- Following injury to the auriculotemporal nerve, postganglionic parasympathetic fibres from the otic ganglion grow down the sheaths of the cutaneous filaments, so hyperaesthesia follows stimulation of the secretomotor nerves.

Treatment: If the symptoms persist, the treatment is avulsion of the auriculotemporal nerve in front of the auricle where it lies just posterior to the superficial temporal vessels.

18. CSF otorrhoea is caused by:

[AIIMS 92]

- Rupture of tympanic membrane
- Fracture of cribriform plate
- Fracture of parietal bone
- Fracture of petrous temporal bone

18. Ans. is d i.e. Fracture of Petrous temporal bone

Ref. Logan and Turner 10th/ed p 347

- Fracture of petrous temporal bone can lead to CSF otorrhea.
- CSF otorrhea mostly ceases spontaneously.
- Systemic antibiotics which cross blood brain barrier should be used (like – cotrimoxazole).
- Rarely surgical closure of the tear of dura in middle fossa is required.

19. The most common cause of cerebrospinal otorrhea is:

[UP 97]

- a. Rupture of tympanic membrane
- b. Fracture of petrous ridge
- c. Fracture of mastoid air cells
- d. Fracture of parietal bone

19. Ans. is b i.e. Fracture of Petrous ridge

Ref. Logan Turner 10th/ed p 347

20. A patient has bilateral conductive deafness, tinnitus with positive family history. The diagnosis:

[AIIMS 93]

- a. Otospongiosis
- b. Tympanosclerosis
- c. Meniere's disease
- d. Bilateral otitis media

20. Ans. is a i.e. Otospongiosis

Ref. Dhingra 5th/ed pg 97-98

21. Presbycusis is:

[TN 2007, 205]

- a. Loss of accommodation power
- b. Hearing loss due to aging
- c. Noise induced hearing loss
- d. Congenital deafness

21. Ans. is b i.e. Hearing loss due to aging

Ref. Dhingra 5th/ed pg 41; Scott-Brown's Otolaryngology 7th/ed vol 3, Chap 238 p 3539

It is mid to late adult onset, bilateral, progressive sensorineural hearing loss, where underlying causes have been excluded.

22. Second primary tumor of head and neck is most commonly seen in malignancy of:

[AIIMS May 2012]

- a. Oral cavity
- b. Larynx
- c. Hypopharynx
- d. Paranasal sinuses

22. Ans. is a i.e. oral cavity.

Ref. internet search

- Patients with **head and neck squamous cell carcinoma (HNSCC)** are at increased risk for the development of second primary malignancies compared with the general population.
- These second primary malignancies typically develop in the **aerodigestive tract** (lung, head and neck, esophagus).
- The most frequent second primary malignancy is lung cancer.
- The highest relative increase in risk is for a second head and neck cancer.
- The site of the index cancer influences the most likely site of a second primary malignancy.
 - In patients with an index malignancy of the larynx, the second primary tumor was commonly seen in lung, while
 - In patients with an index malignancy of the oral cavity, the second primary tumor was commonly seen in head and neck or esophagus.

The criteria for classifying a tumor as a second primary malignancy are:

- Histologic confirmation of malignancy in both the index and secondary tumors.
- There should be at least 2 cm of normal mucosa between the tumors. If the tumors are in the same location, then they should be separated in time by at least five years.
- Metastatic tumor should be excluded.

23. In right handed person, direct laryngoscope is held by which hand?

[AIIMS May 2012]

- a. Left
- b. Right
- c. Both
- d. Either of these

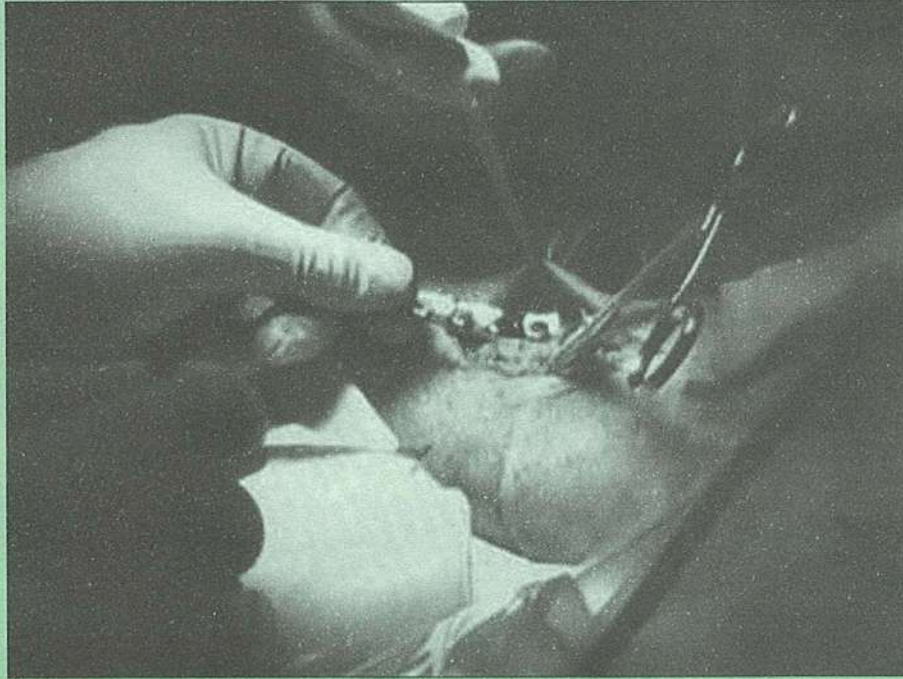
23. Ans. is a i.e. Left

Ref. Dhingra 5th/ed p ss432

"Laryngoscope is held by the handle in the left hand. Right hand is used, to retract the lips and guide the laryngoscope and to handle suction and instruments."

—Dhingra

SECTION VI



OPERATIVE SURGERY

30. Important Operative Procedures

CHAPTER

30 Important Operative Procedures

UPPER AIRWAY OBSTRUCTION AND TRACHEOSTOMY

Diagnostic sign of upper airway obstruction is stridor

- Other symptoms can be restlessness, Hoarseness (as in laryngeal pathology), Nostril flaring, suprasternal/intercostal retraction, Coughing or wheezing (as in trachea bronchial pathology)
- Investigation of choice in upper airway obstruction – Fiberoptic endoscopy

Table 30.1: Management of Upper airway Obstruction

Immediate maneuvers	Medical Management	Alternate airway
<ul style="list-style-type: none"> – Heimlich maneuver – Jaw Thrust 	<ul style="list-style-type: none"> – O₂ inhalation through laryngeal – Mask/Nasal cannula – Heliox (80% helium and 20% oxygen) – Principle – It converts the turbulent flow at the site of obstruction into laminar pattern 	<ul style="list-style-type: none"> – Oral airway – Nasopharyngeal airway – Endotracheal intubation (C/I in fracture of cervical spine, facial/oral trauma, laryngeal trauma) – Laryngeal mask ventilation C/I = Large retropharyngeal tumors, Retropharyngeal abscess, Hiatus hernia Pregnancy – Cricothyrotomy (Figure 1B) – Emergency procedure done by piercing the cricothyroid membrane called as minitracheostomy

TRACHEOSTOMY

- Site—2nd, 3rd and 4th tracheal rings which lie under the isthmus of thyroid gland.
- If tracheostomy is done above this, it is called as **high tracheostomy**; it can lead to perichondritis of cricoids cartilage and subglottic stenosis. If it is made below isthmus, it is called **low tracheostomy** and may injure great vessels of neck and the apical pleura especially in children.
- **Elective high tracheostomy** is done in malignancy of larynx presenting with stridor where a laryngectomy has to be done later. This is because after laryngectomy, a new tracheostoma has to be created lower down.
- **Elective low tracheostomy** is done in patients with laryngeal trauma to prevent aggravation of the laryngeal injury and in laryngeal papillomatosis to avoid implantation.

Management of Upper airway Obstruction

See Table 30.1

NOTE

Most definitive management of upper airway obstruction = Tracheostomy

Features of Tracheostomy Tubes

- **Material:** Silicon is the preferred material especially in children since it is flexible and it reduces risk of mucosal trauma and skin injury around the stoma. Metal tubes (made of german silver) and Portex tube also available. Portex tube (PVC tube/Nonmetallic tubes) is the best tube during radiotherapy
- **Cuff:** Inflatable cuffs prevent aspiration of blood or saliva and form a seal to prevent leakage of ventilating gases during anesthesia or prolonged mechanical ventilation. But cuffs can be associated with the risk of subglottic stenosis. For this reason Low P ressure Cuffs are preferred. **In children, cuffed tracheostomy tube should not be used.**
- **Inner Tube:** It projects 2–3 mm beyond the main outer tube and helps in periodic cleaning without disturbing the patency of the main tracheostomy. So they are the best for home tracheostomy care.

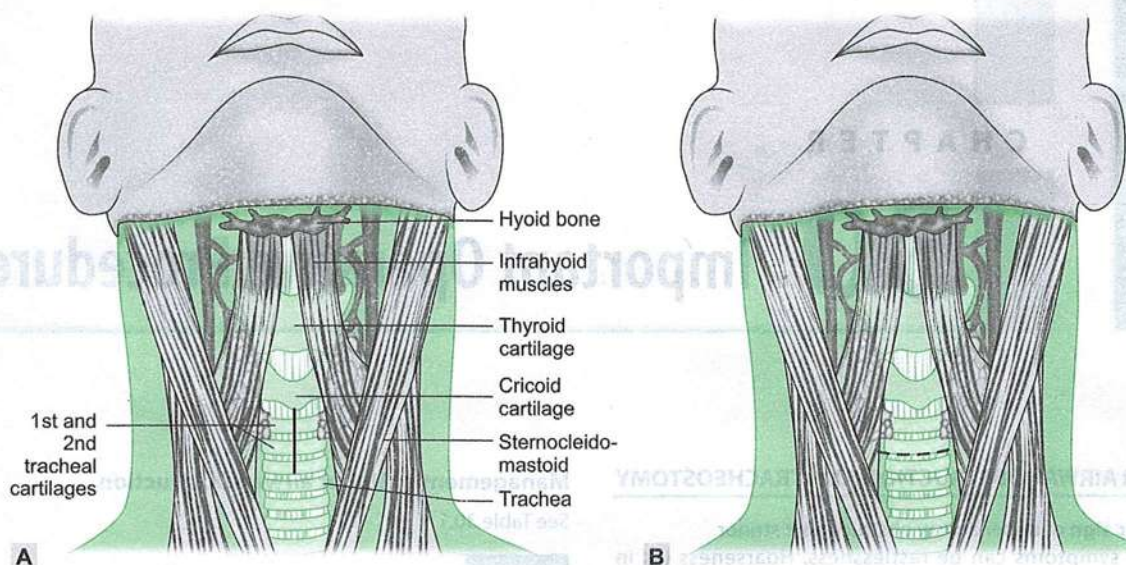


Fig. 30.1: Incisions for tracheostomy. (A) Surface landmarks for the midline skin vertical incision for tracheostomy; (B) Horizontal skin incision for cricothyrotomy

Courtesy: Textbook of Diseases of Ear, Nose and Throat, Mohan Bansal. Jaypee Brothers, p 511.

- **Fenestration:** Allows air to pass through the tube and aids phonation, it is the tube of choice in children. Drawback—Oral contents and stomach contents can enter the lungs through these fenestrations.

Disadvantage: Patient who are at risk of aspiration and are on IPPV should not be given fenestrated tube.

Structures Damaged in Emergency Tracheostomy

1. Isthmus
2. Left brachiocephalic vein, Jugular vein
3. Pleura
4. Thymus
5. Inferior ima artery
6. Esophagus

Drawbacks

1. Post tracheostomy apnea—it is due to wash out of CO with rapid improvement in oxygenation after tracheostomy. Treatment is Carbogen inhalation which is a mixture of 95% oxygen and 5% CO₂.
2. Emphysema—In Immediate postoperative period surgical emphysema is either due to tight skin closure or large opening on the trachea. Immediate management is to release the skin sutures.
3. Bleeding—Anterior jugular vein and inferior thyroid veins are the commonest sites of bleeding.
4. Difficult decannulation—Patients who are on tracheostomy for long time, develop psychological dependence. This is the commonest long term complication in children.

Types of Tracheostomy Tube

See Table 30.2

FOREIGN BODIES OF UPPER AERODIGESTIVE TRACT

- Foreign body aspiration is more common in children in <4 yrs (vegetable foreign bodies even peanuts are the M/C foreign body)
- M/C Site for lodging of foreign body of upper digestive tract—Cricopharynx—since it is the narrowest part.
- Other sites of foreign body impaction are—Tonsil, Vallecula and Pyriform sinus.

Presentation

- In foreign body in cricopharynx - B/L pooling of saliva
- In foreign body in pyriform sinus - U/L pooling of saliva

FOREIGN BODY OF LARYNX

1. A smaller foreign body may present as hoarseness, stridor and cough.
2. But a large laryngeal foreign body is an emergency since it leads to total airway obstruction and patient may asphyxiate to death, if first-aid measures are not taken.

Management

- Emergency measure is Heimlich's maneuver. In children pounding the back after turning the patient head down can be tried.

Table 30.2: Classification of Tracheostomy Tube

- On the basis of cuff
 - Uncuffed
 - Cuffed tubes
 - Single cuff tube
 - Double cuff tube
 - Low pressure cuff tube
 - On the basis of fenestra at the upper curvature of the tube
 - Tubes without fenestra
 - Single fenestrated tube
 - Multiple fenestrated tube
 - On the basis of length of the tube
 - Standard length
 - Extra length tracheostomy tube
 - Adjustable flange long tub
 - On the basis of number of lumens (cannula)
 - Single lumen (cannula) tube – Nonmetallic
 - Double lumen (cannula) tube – Jackson and Fuller
 - Suction-aided tracheostomy tubes – metallic
 - On the basis of the material
 - Metallic
 - Jackson
 - Fuller
 - Nonmetallic
 - Polyvinyl chloride (pVc)
 - Silicone
 - Siliconized pVc
 - Silastic
 - Rubber tube
 - Mixed
 - Armored tubes
- When these measures fail, cricothyrotomy (Laryngotomy) is done to gain rapid entry to airway and is converted into a normal Tracheostomy once the patient is shifted to a primary care set-up since it can lead to laryngeal stenosis later on.

FOREIGN BODY OF BRONCHUS**Presentation**

- Initial choking, cyanosis followed by cough and wheeze.

Other Features Which Point Towards Foreign Body in Bronchus are—unexplained or unilateral wheeze, or unexplained cough or hemoptysis or obstructive emphysema (if it leads to partial obstruction), or to atelectasis which in turn can cause pneumonitis (if it leads to complete obstruction)

NOTE

Foreign bodies are more common on right side as right bronchus is short, wide and more in line with the trachea.

Management**Bronchoscopy****Rigid bronchoscopy**

Done via mouth
Structures seen—Uvula, Epiglottis, vocal cords, tracheal rings, carina and segmental bronchi

Advantage—in removal of foreign body and in children due to problem of ventilation and in establishing emergency airway

Flexible fiberoptic bronchoscopy

Done through nose
Structures seen—Posterior choana, pharynx, larynx, tracheal rings, carina, segmental bronchi and subsegmental bronchi

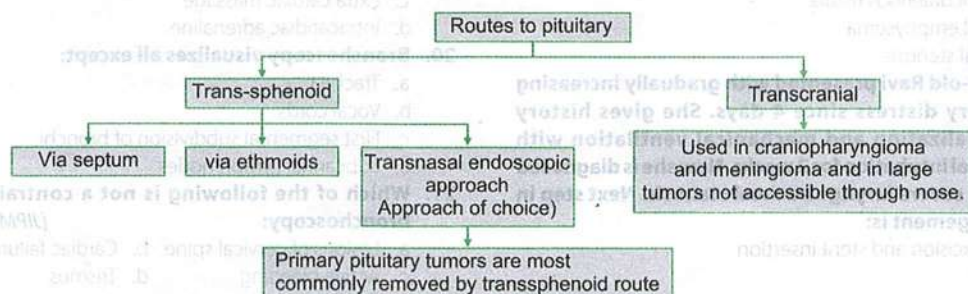
Advantage—Better magnification and better vision, can be used in conditions where rigid bronchoscopy is C/I like in cervical spine instability, trismus, micrognathia, recent MI, and it is useful in bedside examination of the critically ill patients. It can be passed easily through endotracheal tube or tracheostomy opening.

NOTE

Flexible fiberoptic bronchoscopy is replacing rigid bronchoscopy but its utility limited in children because of the problems of ventilation.

Named Incisions used in Nasal Surgeries:

Incision	Surgery
• Killian's incision	• Submucous resection
• Weber ferguson incision	• Total maxillectomy
• Freer's incision	• Septoplasty
• Moure's incision	• Lateral rhinotomy

Pituitary Surgeries

QUESTIONS

1. **Tracheostomy is indicated in all except:** [AI 91]
 - a. Tracheal stenosis
 - b. Bilateral vocal cord palsy
 - c. Foreign body larynx
 - d. Uncomplicated bronchial asthma
2. **Tracheostomy is indicated in all except:** [MP 97]
 - a. Carcinoma larynx
 - b. Uncomplicated bronchial asthma
 - c. Diphtheria
 - d. Comatose patient
3. **The most common indication for tracheostomy is:** [JIPMER 91]
 - a. Laryngeal diphtheria
 - b. Foreign body aspiration
 - c. Carcinoma
 - d. Asthma
4. **Tracheostomy is not indicated in:** [Rajasthan 97; TN 04]
 - a. Emphysema
 - b. Bronchiectosis
 - c. Atelectasis
 - d. Pneumothorax
5. **A high tracheostomy may be indicated in:** [SGPGI 05]
 - a. Scleroma of the larynx
 - b. Multiple papillomatosis of larynx
 - c. Bilateral vocal cord paralysis
 - d. Carcinoma of larynx
6. **True about tracheostomy tube are all except:** [AI 99]
 - a. Double tube
 - b. Made of titanium silver alloy
 - c. Cuffed tube for IPPV
 - d. Has to be changed ideally in every 2 to 3 days
7. **All are true about tracheostomy tube except:** [MP 2001]
 - a. Jackson's tube has 2 lumens
 - b. Removal of metallic tube in every 2-3 days
 - c. Cuffed tube is used to prevent aspiration of pharyngeal secretion
 - d. Made up of titanium-silver alloy
8. **Montgomery tube used in ENT procedure is a:**
 - a. Double barrel tube
 - b. Lobster tail tube
 - c. Airway tube
 - d. Silicone tube
9. **In emergency tracheostomy following structures are damaged except:** [AIIMS Nov 07]
 - a. Isthmus of thyroid
 - b. Inferior thyroid vein
 - c. Inferior thyroid artery
 - d. Thyroid ima
10. **Most common complication of tracheostomy is:** [PGI 97]
 - a. Tracheoesophageal fistula
 - b. Tracheocutaneous fistula
 - c. Surgical emphysema
 - d. Tracheal stenosis
11. **A 30-year-old Ravi presented with gradually increasing respiratory distress since 4 days. She gives history of hospitalization and mechanical ventilation with orotracheal intubation for 2 weeks. Now she is diagnosed as having severe laryngotracheal stenosis. Next step in the management is:**
 - a. Laser excision and stent insertion
 - b. Steroid
 - c. Tracheal dilation
 - d. Resection and end-to-end anastomosis
12. **Topical Mitomycin C is useful in treatment of?** [AI 09, 10, 12]
 - a. Angiofibroma
 - b. Tracheal stenosis
 - c. Skull base Osteomyelitis
 - d. Laryngeal carcinoma
13. **Which of the following statements regarding Heliox are correct:** [AI 09]
 - a. It is inert
 - b. Has low viscosity
 - c. Decreases airway resistance
 - d. Safe in pulmonary HT
14. **The commonest site of aspiration of a foreign body in the supine position is into the:** [PGI 99]
 - a. Right upper lobe apical
 - b. Right lower lobe apical
 - c. Left basal
 - d. Right medial
15. **"Gold standard" surgical procedure for prevention of aspiration is:** [AIIMS Nov 03]
 - a. Thyroplasty
 - b. Tracheostomy
 - c. Tracheal division and permanent tracheostome
 - d. Feeding gastrostomy/jejunostomy
16. **Best management for inhaled foreign body in an infant is:** [AI 97]
 - a. Bronchoscopy
 - b. IPPV and intubation
 - c. Steroid
 - d. Tracheostomy
17. **Openings of the tube of bronchoscope are known as:** [MH 03]
 - a. Holes
 - b. Apertures
 - c. Vents
 - d. Any of the above
18. **In a one-year-old child intubation is done using:** [MP 2002]
 - a. Straight blade with uncuffed tube
 - b. Curved blade with uncuffed tube
 - c. Straight blade with cuffed tube
 - d. Straight curved blade with cuffed tube
19. **A 2 year old child with intercostal retraction and increasing cyanosis was brought with a history of foreign body aspiration which might be a lifesaving in this situation:** [AIIMS 99]
 - a. Oxygen through face mask
 - b. Heimlich's manoeuvre
 - c. Extra cardiac massage
 - d. Intracardiac adrenaline
20. **Bronchoscopy visualizes all except:** [AI 2010]
 - a. Trachea
 - b. Vocal cords
 - c. First segmental subdivision of bronchi
 - d. Subcarinal Lymph nodes
21. **Which of the following is not a contraindication for bronchoscopy:** [JIPMER 79, Delhi 83]
 - a. Lesions of cervical spine
 - b. Cardiac failure
 - c. Active bleeding
 - d. Trismus

22. A 2-year-old child develops acute respiratory distress. O/E breath sounds are decreased with wheeze on right side. Chest X-ray shows diffuse opacity on right side—

Most probable diagnosis:

- a. Pneumothorax
- b. Foreign body aspiration
- c. Pleural effusion
- d. U/L emphysema.

23. A 5-year-old boy having dinner suddenly becomes aphonic and is brought to casualty for the complaint of respiratory difficulty. What is the most appropriate management?

- a. Cricothyroidotomy
- b. Tracheostomy
- c. Humidified O₂
- d. Heimlich maneuver

24. Rigid esophagoscopy is not done in: [PGI 01]

- a. Cervical spine rigidity
- b. Aortic aneurysm
- c. Carcinoma esophagus
- d. Esophageal web
- e. Lung abscess

25. Route of approach of glossopharyngeal neurectomy: [Kolkata 00]

- a. Tonsillectomy approach
- b. Transpalatal approach
- c. Transmandibular approach
- d. Transpharyngeal approach

EXPLANATIONS AND REFERENCES

1. Ans. is d i.e. Uncomplicated bronchial asthma

2. Ans. is b i.e. Uncomplicated bronchial asthma

Ref. Maqbool 11th/ed p 351–352; Dhingra 5th/ed p 337, 6th/ed p 317; Head and Neck Chris deSouza Vol 2 p 1643

Indications for Tracheostomy

a. Respiratory obstruction:

- Infections :
 - Acute laryngotracheobronchitis, acute epiglottitis, diphtheria
 - Ludwig's angina, peritonsillar, retropharyngeal or parapharyngeal abscess, tongue abscess.
- Trauma:
 - External injury to larynx and trachea
 - Trauma due to endoscopies especially in infants and children
 - Fractures of mandible or maxillofacial injuries
- Neoplasms: Benign and malignant neoplasms of larynx, pharynx, upper trachea, tongue and thyroid.
- Foreign body in larynx
- Edema larynx due to steam, irritant fumes or gases, allergy (angioneurotic or drug sensitivity), radiation.
- Bilateral abductor paralysis
- Congenital anomalies:
 - Laryngeal web, cysts, tracheo-oesophageal fistula
 - Bilateral choanal atresia.

b. Retained secretions:

- Inability to cough:
 - Coma of any cause, e.g. head injuries, cerebrovascular accidents, narcotic overdose.
 - Paralysis of respiratory muscles, e.g. spinal injuries, polio, Guillain-Barre syndrome.
 - Spasm of respiratory muscles, tetanus, eclampsia, strychnine poisoning.
- Painful cough : Chest injuries, multiple rib fractures, pneumonia.
- Aspiration of pharyngeal secretions : Bulbar polio polyneuritis, bilateral laryngeal paralysis.

c. Prolonged ventilation/For assisted ventilation (m/c indication these days)

Note: If IPPR is expected to prolong beyond 12 hours, tracheostomy is preferred over endotracheal intubation.

- d. Respiratory insufficiency – chronic lung conditions – viz emphysema, chronic Bronchitis, bronchiectasis, atelectasis
- e. As a part of other surgeries

3. Ans. is b i.e. Foreign body aspiration / none

Ref. Head and Neck Surgery – Chris deSouza Vol 2 pg. 1643; Mohan Bansal p 510; Scotts Brown 7th ed Vol 2 pg. 2293

Friends – earlier – when this Question was framed – the answer was Foreign body aspiration but now in to days scenario – the answer is ... (Read for yourself)

"Historically, the main indication for a tracheostomy was to bypass upper airway obstruction caused by a foreign body or infection, particularly diphtheria. Nowadays upper airway obstruction is the least common indicator for tracheostomy. Almost two thirds of tracheostomies are currently performed on intubated intensive care patients, mainly to aid removal of secretions from the distal tracheobronchial tree and to facilitate weaning from distal tracheobronchial tree in acute respiratory failure and prolonged ventilation"

– Head and Neck Surgery Chris De Souza 2nd/ed p 1643

"Today, prolonged intubation usually with mechanical ventilation is the most common indication for tracheostomy formerly it was upper respiratory obstruction." —Mohan Bansal p 510

4. Ans. is d i.e. Pneumothorax

Ref. Dhingra 5th/ed p 36, 339

Friends, it is quite obvious that pneumothorax can be a complication of tracheostomy (if not performed properly) rather than an indication.

5. Ans. is d i.e. Carcinoma of larynx

Ref. Dhingra 5th/ed p 337; Scott Brown 7th/ed vol 2 pg. 2295; Mohan Bansal p 510

"It is important (in tracheostomy) to refrain from causing any damage in the region of cricoid cartilage.

An exception to this rule is when a patient has laryngeal malignancy and under these circumstances tracheostomy should be placed high so as to allow resection of tracheostomy site at the time of laryngectomy". — Scott Brown 7th/ed vol 2 pg. 2295

"The high tracheostomy is generally avoided because of the postoperative risk of peri-chondritis of the cricoid cartilage and subglottic stenosis. In cases of carcinoma larynx with stridor when total laryngectomy would be done, high tracheostomy is indicated."

—Mohan Bansal p 510

6. Ans. is d i.e. Has to be changed ideally in every 2 to 3 days

7. Ans. is b i.e. Removal of metallic tube in every 2-3 days

Ref. Mohan Bansal pp 592, 593; Maqbool 11th/ed p 354; Turner 10th/ed 195; Head and Neck Surgery Chris DSouza vol 2 pg. 1647

A tracheostomy tube may be metallic or nonmetallic

Metallic Tracheostomy Tube

Metallic tubes are formed from the alloy of silver, copper phosphorus (option b in Q6 and option d in Q7).

Has an inner and an outer tube. The inner tube is longer than the outer one so that secretions and crusts formed in it can be removed and the tube reinserted after cleaning without difficulty. However, they do not have a cuff and cannot produce an airtight seal.

Nonmetallic Tracheostomy Tube

- Can be of cuffed or noncuffed variety, e.g. rubber and PVC tubes.

Cuffed Tracheostomy Tubes

- A cuff is a balloon-like device around the distal end of the tracheostomy tube. Most cuffed tubes now available have low pressure cuffs with a high volume. This significantly reduces the possibility of pressure necrosis and potential stenosis formation. Pediatric tubes do not have a cuff. Cuffed tubes are used in situation where positive pressure ventilation is required, or when the airway is at risk from aspiration. (In unconscious patient or when patient is on respiration).

The cuff should be deflated every 2 hours for 5 mins to prevent pressure damage to the trachea.

Uncuffed Tracheostomy Tubes

As the name suggest, this tube does not have a cuff that can be inflated inside the trachea. It is suitable for a patient who has returned to the ward from a prolonged stay in intensive care and requires physiotherapy and suction via trachea. This type of tube is not suitable for patients who are unable to swallow due to incompetent laryngeal reflexes, and aspiration of oral or gastric contents is likely to occur. An uncuffed tube is advantageous in that it allows the patient to breathe around it in the event of the tube becoming blocked. Patients can also speak with an uncuffed tube.

"Jackson and Fuller tracheostomy tube have two lumens (see the box given in the text)."

—Mohan Bansal p 592

"Tracheostomy tubes should not be disturbed for the first 48-72 hours, but thereafter the tube is changed daily and cleaned at regular intervals."

... Turner 10th/ed, p 195

According to S/B 7th ed vol 2 pg. 2298

"The frequency with which the inner tube needs to be cleaned will vary. In the early post operative period. It may need cleaning every couple of hours."

8. Ans. is d i.e. Silicone tube

Ref. Internet Search

Montgomery tracheal tube is designed to give the surgeon a complete program for creating a secondary airway - from initial incision through long-term tracheostomy care. It is a tracheal cannula system used in place of tracheostomy tubes. The system provides long-term access to the tracheal airway in situations that require an artificial airway or where access is needed for pulmonary hygiene.

- It is so designed that the thin inner flange of the cannula is shaped to fit snugly against the contour of the inner anterior tracheal wall. No tube projects into the tracheal lumen.
- All tracheal cannulas are made of flexible implant grade silicone to assure patient comfort and safety while reducing complications.

9. Ans. is c i.e. Inferior thyroid artery

Ref. Keith L Moore 5th/ed p 1100

Structures which lie below the midline viz. isthmus of thyroid and thyroid ima artery can be damaged in emergency tracheostomy. Inferior thyroid veins emerge at the lower border of the isthmus form a plexus in front of the trachea and drains into brachiocephalic vein can be damaged during tracheostomy but inferior thyroid artery, a branch of thyrocervical trunk of subclavian artery lies laterally away from midline and can thus escape injury.

10. Ans. is a, b and c i.e. a. Hemorrhage; Displacement of tube of obstruction; and Surgical emphysema

Ref. Dhingra 5th/ed p 339-340; Scotts Brown 7th/ed vol 2 p. 2300-2301; Current Otolaryngology 3rd/ed p. 542

Complications of Tracheostomy

Most common complication of tracheostomy is hemorrhage. The commonest cause of bleeding during tracheostomy is Anterior jugular vein.

Other Immediate Complication of tracheostomy

- Air embolism
- Cardiac arrest
- Pneumothorax (d/t injury to apical pleura)
- Apnea (due to sudden release of retained CO₂)
- Local damage to structures

INTERMEDIATE

During first few hours or days

- Dislodgement/Displacement of the tube
- Surgical emphysema :
 - May occur as the air may leak into the cervical tissues.
 - This is occasionally found in the immediate postoperative period.
 - Presents as a swollen area around the root of the neck and upper chest, which displays crepitus on palpation. It is due to overtight suturing of the wound and is not dangerous unless it leads to mediastinal emphysema and cardiac tamponade.
- Pneumothorax/pneumomediastinum
- Tubal obstruction by Scabs/crusts
- Infection (tracheitis and tracheobronchitis, local wound infection).
- Dysphagia :
 - This is fairly common in the first few days after tracheostomy.
 - In normal swallowing a positive subglottic pressure is created by the closing of the vocal cords - which is why one cannot speak during swallowing. This is not possible with a tracheostomy tube in place, and thus swallowing is incoordinate.
 - Another reason for dysphagia is that if an inflatable cuff is blown up it will press on and obstruct the oesophagus.
- Tracheal necrosis
- Tracheo arterial (Tracheal innominate artery fistula) / Tracheoesophageal fistula
- Recurrent laryngeal nerve injury.

LATE

- Hemorrhage due to erosion of major vessels
- Stenosis of the trachea (at the level of stoma)
- Laryngeal stenosis due to perichondritis of cricoid cartilage.
- Difficulty with decannulation
- Tracheocutaneous fistula/scars.

NOTE

According to Scott-Brown's 7th vol 2 p. 2301 - Tracheoarterial fistula / Tracheoesophageal fistula are intermediate complications and not late complications like tracheocutaneous fistula.

11. Ans. is d i.e. Resection and end-to-end anastomosis.**Laryngeal Stenosis**

- M/C cause - Endotracheal intubation followed by in tracheostomy
- M/C site - Subglottis at the level of cricoid cartilage

Management

- Mild stenosis (No cartilage involved) - Repeated dilatation, removal of stenosis with CO₂ laser or intralesional steroid injection
- Moderate stenosis - Laryngotracheal reconstruction/self-expanding stents
- Severe stenosis - Partial cricotracheal resection + anastomosis

12. Ans. is b i.e Tracheal stenosisRef. Internet search: www.bcm.edu/oto/grand.htm

- Laryngotracheal stenosis treated by (serial dilatation using Jackson bronchoscopes/laser have tendency to recur and hence adjuvant methods are done to decrease the rate of restenosis.
- Mitomycin C is an example of one of these adjunctive agents. It is a chemical derived from the *Streptomyces caespitosus* bacterium. It is an alkylating agent which has both antineoplastic and antiproliferative properties and inhibits fibroblast production and thus prevents restenosis.

13. Ans. is a, b and d i.e. Mixture of helium and oxygen; inert gas; and decreases airway resistance

Ref. Current Otolaryngology 3rd/ed p 538

- Heliox is a mixture of 80% helium and 20% oxygen
- It has low density and high viscosity which decreases airway resistance
- It converts turbulent flow at the site of obstruction to a regular flow, which ensures better oxygen delivery to tissues and thus serves as a temporary method to improve ventilation until definitive control of airway can be achieved.

**14. Ans. is b i.e. Apical lobe of right lung
Foreign Body Aspiration**

Supine position	Erect or sitting position
<ul style="list-style-type: none"> • Right upper lobe posterior segment • Right lower lobe superior segment • Left lower lobe superior segment 	<ul style="list-style-type: none"> • Right posterior basilar segment of lower lobe

Site of aspiration and foreign body in lung depends upon position of patient due to anatomical elation of lung:

- If the patient has aspirated in upright or sitting position basilar segment of lower lobe is most likely to be involved
- In supine position either the posterior segment of upper (apical) lobe or superior segment of lower lobe is likely to be involved.
- In both cases right side is more likely to be involved due to straight and shorter course of right bronchi.

15. Ans. is c i.e Tracheal division and permanent tracheostomeRef. Scotts Brown 7th/ed vol 1 pg. 1278; Internet search – www.bcn.edu/oto/grad**Aspiration is the passage of foreign material beyond the vocal cords:**

- The larynx has 3 distinct functions – respiration, phonation and airway protection. Dysfunction of larynx can lead to aspiration.
- The primary goal of treatment of aspiration is to separate the upper digestive tract from the upper respiratory tract for a short period of time or in some cases, permanently.
- There are 3 broad categories of treatment.

Temporary/Adjunct Treatments

- Medical Therapy – in the form of antibiotics is important to prevent aspiration pneumonia.
- It is important to make the patient NPO, to avoid further aspiration and to find an alternate feeding route to maintain the patients nutritional status. A nasogastric tube (feeding gastostomy/jejunostomy) is commonly placed, but this may actually increase the aspiration reflux by making the lower esophageal and upper esophageal sphincters incompetent.

But Still

"Tubal feeding (either by nasogastric tube or gastrostomy) however is often unavoidable." – Scotts Brown 7th/ed vol 1 pg. 1278

- Here it is important to note that feeding Gastrostomy / jejunostomy are not the gold standard methods of preventing aspiration but rather are done to maintain the nutritional status of patient and prevent further aspiration. In fact according to most texts – they are a common cause of aspiration.
- Vocal cord medialization (by injecting Gel foam) is useful in unilateral paralysis. This is helpful but is rarely curative, if there is a serious aspiration problem.
- Tracheostomy will often make aspiration worse by preventing laryngeal elevation on swallowing. It does however, allow easy access to the chest for suctioning. Even a cuffed tube doesn't prevent aspiration as secretions pool above the cuff and the seal is never perfect" – Scotts Brown 7th/ed vol 1 pg. 1278

Definite – Reversible Procedures

- **Endolaryngeal stents:** They function like a cork in the bottle. Their job is to seal the glottis and therefore they need to be used in conjunction with a tracheostomy tube. But they are not often used as they are effective only as a short term solution, plus there is risk of glottic stenosis.
- **Laryngotracheal separation:** The procedure involves transecting the cervical trachea and bringing out the lower end as a permanent end stoma
- **According to Scotts Brown and Internet sites:** It is the procedure of choice as it is reversible. But it has disadvantage of sacrificing voice.
- Alternative procedure is Tracheoesophageal diversion but has higher complication rates.

Definite – Irreversible Procedure

It includes: Narrow field laryngectomy: it was considered as a gold standard prior to 1970s, when the irreversible procedures like laryngo tracheal separation were not done.

Also Know

- Investigation of choice for diagnosing aspiration = Fiberoptic endoscopic evaluation of swallow (FEES)
 - Videofluoroscopic modified Barium swallow (often called as ideofluoroscopy)
- 16. Ans. is a i.e. Bronchoscopy** *Ref. Scotts Brown 7th/ed vol 1 pg. 1188-1190; Dhingra 5th/ed p 344*
- The peak incidence of inhaled foreign bodies is between the ages of one and three years with a male to female ratio of 2:1
 - Only 12% of the inhaled bodies impact in the larynx while most pass through the cords into the tracheobronchial tree.
 - In contrast to adults, where objects tend to lodge in the distal bronchi or right main bronchus, in children they tend to lie more centrally within the trachea (53%) or just distal to the carina (47%)
 - The treatment of choice for airway foreign bodies is prompt endoscopic removal with a Bronchoscope.
 - "In children – The choice of either using a rigid or flexible endoscope remains controversial. Otolaryngologists traditionally believe rigid endoscopes to be the optimal instrument for tracheobronchial foreign bodies. However, there are certain objects that may be more suitably removed with flexible fiberoptic instruments or a combination of rigid and flexible techniques."
 - "The treatment of choice for airway foreign bodies is endoscopic removal with a rigid instrument" – Nelson 18/ed pp 169,170
- 17. Ans. is c i.e. Vents** *Ref. Bronchology by Lukomsky, 40*
- Bronchoscope is similar to esophagoscope, but has openings at the distal part of the tube, called Vents which help in aeration of the side bronchi.
- 18. Ans. is a i.e. Straight blade with uncuffed tube** *Ref. Scotts Brown 7th ed vol 1 pg. 511*
- Pediatric Airway Management – Equipment
- Tracheal intubation remains the standard for airway maintenance during many procedures.
 - Generally, a tracheal tube of the largest possible internal diameter should be chosen to minimize resistance to gas flow and avoid an excessive leak around the tube. It is important, however, to avoid inserting too large tube, which may cause mucosal damage.
- The length of the tube is calculated as:**
- | | |
|------------------|-----------------------------|
| Length = + 12 cm | For orotracheal intubation |
| Length = + 15 cm | For nasotracheal intubation |
- Uncuffed tubes are used in children – as there is potential for mucosal damage with the cuffed tubes (with high volume, low pressure cuffs)
 - In older children approaching puberty – Cuffed endotracheal tubes are used, reflecting the anatomical development of the airway.
 - Endotracheal tubes are available in a variety of materials although the use of PVC and silicone rubber is now almost universal.
 - As far as blades are concerned – A huge range of laryngoscopes blades are available. Anatomical considerations and to some extent personal choice, determine the most appropriate blade to use. In general position of the infant larynx and the long epiglottis makes intubation easier with a straight blade and are often used in children under 6 months of age.
- So from above description, it is clear that in children straight blade with uncuffed tube is the best for intubation.
- 19. Ans. is b i.e. Heimlich's maneuver** *Ref. Dhingra 5/e, p 344, Scotts Brown 7th ed vol 1 p. 1188*
- The child is presenting with cyanosis and intercostal retraction which indicates that the foreign body is lodged in the larynx.
 - Initial management for a foreign body lodged in trachea/larynx is Heimlich's maneuver where a person stands behind the child and places his arms around his lower chest and gives four abdominal thrust.
 - In infants, lying the child on its back on the adults knee and pressing firmly on the upper abdomen is the preferred maneuver.
 - If Heimlich's manoeuvre fails, cricothyrotomy or emergency tracheostomy should be done.
 - Once acute respiratory emergency is over foreign body can be removed by direct laryngoscopy or by laryngofissure, if it is impacted.

NOTE

- Tracheal and bronchial foreign bodies are removed by bronchoscopy with full preparation and under GA.
- Emergency removal of bronchial foreign bodies is not indicated.

20. Ans. is i.e. d i.e. Subcarinal lymph nodes*Ref. Read below*

- Carina – midline partition between the two bronchi is the first endobronchial landmark during bronchoscopy. Subcarinal lymph nodes cannot be visualized on bronchoscopy but widening of carina is suggestive of subcarinal lymphadenopathy, and pulsations of the carina may be seen in aneurysm of arch of aorta
- Rest all structures viz. vocal cord, trachea and first segmental subdivision of bronchi can be visualized.

NOTE

Rigid bronchoscope visualises only up to segmental bronchus while it is possible to inspect the 2nd to 5th order subsegmental bronchi or beyond using the flexible bronchoscope.

21. Ans. is c i.e. Active bleeding

Ref. Tuli 1st/ed p 529

Bronchoscopy is a procedure used for endoscopic examination of tracheobronchial tree.

Contraindications of Bronchoscopy

- Emergency bronchoscopy has no contraindication as it may be a lifesaving procedure.
- Elective bronchoscopy may have the following contraindications:
 - General contraindications such as HT, DM, bleeding disorders, active infections.
 - Trismus
 - Aortic aneurysm
 - Cervical spine problems
 - Active recent massive hemoptysis
 - Metastatic involvement of cervical spine
 - Pulmonary hypertension.

Although, cardiac arrest has not been mentioned as one of the contraindication but it is a very important complication of bronchoscopy. Hence, in patients of cardiac arrest bronchoscopy should not be performed.

NOTE

Bronchoscopy should always be preceded by laryngoscopy during which the subglottis should be examined.

22. A is b i.e. Foreign body aspiration

Foreign body aspiration is a very common problem in pediatric age group (< 4 years). In the question, child is presenting with sudden onset respiratory distress and there is U/L decreased breath sounds + U/L wheezing and on chest X-ray a diffuse opacity is seen on right side i.e. there is clinical and radiological evidence of bronchospasm and collapse suggestive of a foreign body in bronchus

23. Ans. is d i.e. Heimlich's maneuver

Ref. Scotts Broun 7/e, p 1188-1191, Emergency medicine 6/e, p 68, 69; Dhingra 5th/ed p344; Emergency medicine (American college of Emergency Physicians) 6th/ed pp 68, 69

- Aphonia (inability to speak) and sudden respiratory distress in a young boy while having food, suggests obstruction of the airway with a large bolus of food. Heimlich's maneuver is the recommended, initial procedure of choice for relieving airway obstruction due to solid objects.
- Cricothyroidotomy or tracheostomy should be performed if the Heimlich's maneuver fails

24. Ans. is a and b i.e. Cervical spine rigidity; and Aortic aneurysm

Ref. Dhingra 5th/ed p 436

Contraindications of esophagoscopy (rigid type):

- Trismus
- Aneurysm of aorta
- Receding mandible
- Advanced heart, liver, kidney diseases (relative contraindication).
- Diseases of cervical spine, e.g. cervical trauma, spondylitis, TB, osteophytes, kyphosis, etc.

25. Ans. is a i.e. Tonsillectomy approach

Ref. Dhingra 5th/ed p 438

Tonsillectomy is done as a part of the following operations:

- Palatopharyngoplasty which is done for sleep apnea syndrome
- Glossopharyngeal neurectomy—tonsil is removed first and then IX nerve is severed in the bed of tonsil
- Removal of styloid process.

SECTION VII

RECENT LATEST PAPER

PGI – Nov 2012

AIIMS – May 2013

PGI – May 2013

PGI – May 2012

Latest Paper

PGI – NOV 2012

1. Which intervention is best in patients operated for bilateral acoustic neuroma for hearing rehabilitation:

- a. Brainstem hearing implant
- b. Bilateral cochlear implant
- c. Unilateral cochlear implant
- d. High power hearing aid
- e. Myringoplasty

2. All of the following constitute supraglottic cancer except:

- a. Vallecula
- b. Lower border of the cricoids
- c. False vocal cords
- d. Aryepiglottic fold
- e. Posterior commissure

3. What are the boundaries of Trauttmann's triangle:

- a. Bony labyrinth anteriorly
- b. Bony labyrinth posteriorly
- c. Sigmoid sinus posteriorly
- d. Sigmoid sinus anteriorly
- e. Superior petrosal sinus superiorly

4. Perforation of palate is/are seen with:

- a. Minor aphthous ulcers
- b. Major aphthous ulcers
- c. Tertiary syphilis
- d. Cocaine abuse

EXPLANATIONS AND REFERENCES

1. Ans. a i.e. Brainstem hearing implant

Ref. Dhingra 6th/ed p 127

Auditory brainstem implant (ABI)

"This implant is designed to stimulate the cochlear nuclear complex in the brainstem directly by placing the implant in the lateral recess of the fourth ventricle. Such an implant is needed when CN VIII has been severed in surgery of vestibular schwannoma. In these cases, cochlear implants are obviously of no use"

"In unilateral acoustic neuroma, auditory brainstem implant (ABI) is not necessary as hearing is possible from the contralateral side but in bilateral acoustic neuroma as in neurofibromatosis-2, rehabilitation is required by ABI"

Dhingra 6th/ed p127

Note: Brainstem implant is currently used only in patients with NF-2 and is always implanted simultaneously with tumor removal (usually during excision of the patient's second tumor). It is useful in patients who have had both cochleovestibular nerves sacrificed, since this implant stimulates the cochlear nuclear complex in the brainstem directly.

2. Ans. a, b and c i.e. a. Vallecula; b. Lower border of the cricoids; c. Posterior commissure

"The **supraglottic** includes the laryngeal surface of the epiglottis, aryepiglottic fold, arytenoids, false cords and ventricle. The lingual surface of the epiglottis and valleculae are in the oropharynx. The **glottis** comprises the vocal cords and the anterior and posterior commissures. **Subglottis** is a small area extending from the lower border of the cricoids to the under surface of the vocal cords"

—Logan Turner 10th (1st Indian edition/171)

According to Dhingra:—

Table: AJCC 2002 classification of carcinoma larynx

[Dhingra 6th/ed p 307]

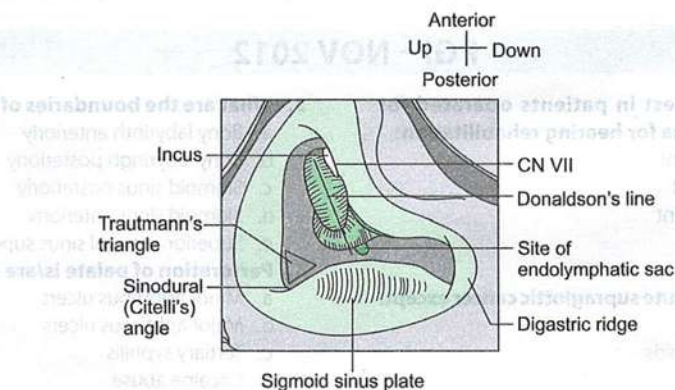
Site	Subsite
Supraglottic	<ul style="list-style-type: none"> • Suprahoid epiglottis • Infrahoid epiglottis • Aryepiglottic folds (laryngeal aspect only) • Arytenoid • Ventricular bands (or false cords)
Glottis	True vocal cords including anterior and posterior commissure
Subglottis	Subglottis up to lower border of cricoids cartilage

3. Ans. is a, c and e, i.e. a. Bony labyrinth anteriorly; c. Sigmoid sinus posteriorly; e. Superior petrosal sinus superiorly

Ref. Dhingra 6th/ed p 450 point 122

"Trautmann's triangle is bounded by the bony labyrinth anteriorly, sigmoid sinus posteriorly and the dura or superior petrosal sinus superiorly"

—PL Dhingra 6th/ed p 450 point 122



4. Ans. is c and d i.e. c. Tertiary syphilis; d. Cocaine abuse

Internet search

Causes of palatal perforation

- **Developmental:** During the sixth week of prenatal period, palatal shelves coalesce to form the hard palate. Failure to this integration results in cleft palate. Some syndromes, maternal alcohol consumption and cigarette smoking, folic acid deficiency, corticosteroid use and anticonvulsant therapy are some causative agents for this abnormality.
- **Infectious:** Leprosy, tertiary syphilis, tuberculosis, rhinoscleroderma, naso-oral blastomycosis, leishmaniasis, actinomycosis, histoplasmosis, coccidiomycosis and diphtheria.
- **Autoimmune:** Lupus erythematosus, sarcoidosis, Crohn's disease and Wegener's granulomatosis.
- **Neoplastic:** Different tumors can extend from maxillary sinus or nasal cavity and perforate the palate. Although these neoplasms usually form a mass, but in advanced cases perforation of palate may occur in course of disease or following treatment.
- **Drug related:** Palatal perforation due to cocaine abuse is a well-known situation. Other drugs (heroin, narcotics) can be responsible for palatal perforation.
- **Iatrogenic:** Sometimes following a tooth extraction an oro-antral fistula remains. Other procedures such as tumor surgery (maxillectomy), corrective surgeries (e.g. septoplasty) or intubation can cause palatal perforation.
- **Rare causes:** Rhinolith can result in palatal perforation. Patients with psychologic problems may present with a fictitious palatal perforation.

Note: Aphthous ulcers involve soft palate whereas spare the mucosa of hard palate and gingivae.

AIIMS – MAY 2013

1. **75 year old diabetic patient with granulation tissue at external auditory canal, diagnosis is?**
 - a. Malignant otitis externa
 - b. Keratosis obturans
 - c. Squamous cell carcinoma of ear canal
 - d. Simple wax
2. **True About BAHA**
 - a. Useful in canal atresia and microtia
 - b. Useful in bilateral severe SNHL
 - c. Useful after surgery in neurofibromatosis 2 for acoustic neuroma
 - d. It can bypass cochlea
3. **A 70 year old man presented with left sided conductive hearing loss, o/e TM intact and Type B curve on tympanogram. Next step is:**
 - a. Myringotomy and grommet insertion
 - b. Conservative management
 - c. Type 3 tympanoplasty
 - d. Endoscopic examination to look for nasopharyngeal causes
4. **60 year old man presented with left sided ear discharge for 7 years with dull ear ache. O/e intact tympanic membrane on both sides, mass is seen in the posterior canal wall on left side. Diagnosis is?**
 - a. Keratosis obturans
 - b. CSOM
 - c. External otitis
 - d. Carcinoma of external auditory canal
5. **Mr. Ramu presented with persistent ear pain and discharge, retro-orbital pain, modified radical mastoidectomy was done to him. Patient comes back with persistent discharge, what is your diagnosis?**
 - a. Diffuse serous labyrinthitis
 - b. Purulent labyrinthitis
 - c. Petrositis
 - d. Latent mastoiditis
6. **A child with features of upper respiratory infection, on investigations is found to have 'thumbprint sign, diagnosis is:**
 - a. Acute laryngotracheobronchitis
 - b. Acute epiglottitis
 - c. Acute laryngeal diphtheria
 - d. Laryngomalacia
7. **True regarding Bell's palsy is all except**
 - a. Steroids are used
 - b. U/L facial weakness
 - c. Role of herpes simplex in etiology
 - d. Immediate surgical decompression is required

EXPLANATIONS AND REFERENCES

1. **Ans is a i.e. Malignant otitis externa** Ref. Dhingra 6th/ed p 52
Granulation tissue in a diabetic patient in external auditory canal indicates malignant otitis externa. For details see chapter – Diseases of External ear of the guide.

2. **Ans is a i.e. useful in canal atresia and microtia** Ref. Dhingra 6th/ed p 122-123
BAHA: Bone anchored hearing aid is a type of hearing aid which is based on the principle of bone conduction. BAHA uses a surgically implanted abutment to transmit sound by direct conduction through bone to cochlea, bypassing the external auditory canal and middle ear.

Indications for BAHA

- When air-conduction (AC) hearing aid cannot be used:
 - Canal atresia, congenital or acquired, not amenable to treatment.
 - Chronic ear discharge, not amenable to treatment.
 - Excessive feedback and discomfort from air-conduction hearing aid.
- Conductive or mixed hearing loss, e.g. otosclerosis and tympanosclerosis where surgery is contraindicated.
- Single-sided hearing loss.

Note: For severe bilateral SNHL—Cochlear implant is used.

For bilateral acoustic neuromas in Neurofibromatosis – auditory brainstem implant is used.

3. **Ans is d i.e. endoscopic examination to look for nasopharyngeal causes** Ref. Dhingra 6th/ed p 251
A 70 year old man is presenting with U/L conductive deafness and on O/E—Tympanic membrane is intact (i.e. any otology cause for conductive deafness ruled out) and Type B tympanogram (i.e. serous otitis media is present which has to be due to a cause other than ear because tympanic membrane is intact).

Always Remember—

"Presence of a unilateral serous otitis media in an adult should raise suspicion of nasopharyngeal growth." Dhingra 6th/ed p 251

4. **Answer is a, i.e. Keratosis obturans** Ref. Dhingra 6th/ed p 108, 54

Explanation:

Presence of mass seen in the ear canal, with a long history of symptoms rules out carcinoma of ext. auditory canal.

Option D:—

- **Carcinoma of external ear canal**

Squamous carcinoma is the most frequent neoplasm in the external auditory canal (EAC), about four times more common than basal carcinomas. This ratio is reversed in the pinna.

Basal cell carcinoma, adenocarcinoma, ceruminoma, and malignant melanoma are the other types of cancers seen in external auditory canal.

Most squamous cell carcinomas occur in the fifth and sixth decades of life. Foul smelling blood stained discharge is the primary symptom, and there is severe otalgia, hearing loss, and bleeding.

These tumors have an aggressive nature and spread along preformed vascular and neural pathways, invading adjacent structures like facial nerve labyrinthine, cranial nerves IX, X, XI and XII. Treatment usually combines surgery with free margins and radiotherapy.

Duration of the symptoms being 7 years and these features not occurring, rules out this option.

- **Option b: CSOM**

Normal tympanic membrane and absence of deafness are against CSOM.

- **Option c: Presence of mass does not support the diagnosis of chronic external otitis.**

- Thus by exclusion our answer is keratosis obturans (option a).

- **Keratosis Obturans:** Also known as canal wall cholesteatoma.

It is seen commonly in younger age groups, due to defective epithelial migration from the tympanic membrane to posterior meatal wall, which results in collection of pearly white epithelial debris in deep meatus.

It can cause pressure effects, enlargement of bony canal and sometimes facial palsy.

Usually patients with conductive deafness and earache.

Treatment is removal of entire keratotic mass.

Recurrence is common.

5. Answer is c, i.e. petrositis

Ref. Dhingra 6th/ed p 79

In the question patient is a case of CSOM, with local spread of infection.

Dhingra clearly mentions in a patient with CSOM, persistent ear discharge with or without deep seated pain in spite of an adequate cortical or modified mastoidectomy points towards petrositis.

Persistent ear discharge with or without deep seated pain in spite of an adequate cortical or modified radical mastoidectomy also points to petrositis.

Petrositis: Important Points

- Spread of infection from middle ear and mastoid to the petrous part of temporal bone is petrositis
- It can also involve adjacent 5th cranial nerve and 6th cranial nerve when it produces classical triad of symptoms – 6th nerve palsy, retro orbital pain (5th nerve) and persistent discharge from the ear, known as **Gradenigo's syndrome**

Note: All the three classical components of Gradenigo's syndrome are not needed for diagnosing petrositis.

- **Treatment**

Adequate drainage is the mainstay of treatment along with specific antibiotic therapy. Modified radical or radical mastoidectomy is often required if not done already. The fistulous tract should be identified, curetted and enlarged to provide free drainage.

6. Answer is b, i.e. a/c epiglottitis

Ref. Dhingra 6th/ed p 289-290

Thumbprint sign, is a classic radiologic sign found on a lateral cervical-spine radiograph suggestive of epiglottitis. This sign is caused by the thickened free edge of the epiglottis.

Therefore our answer is b, i.e. acute epiglottitis.

7. Answer is d, i.e. Immediate surgical decompression is required

Explanation:

Surgical decompression of facial nerve in Bells palsy is needed only in indicated cases, i.e.

- In case of complete paralysis and
 - If electroneurography of facial nerve shows >90% of degeneration. When done it should be within 2 weeks of onset of palsy.
- Rest all options are correct and have been discussed in detail earlier.

ALSO KNOW

Surgical decompression of facial nerve

Approaches: Transmastoid, transcanal, via middle fossa

All indications of facial nerve decompression

- Complete paralysis (>90% by ENG in case of Bell's palsy)
- Tumours of facial nerve
- Cholesteatoma causing facial palsy
- Traumatic facial palsy.

PGI – MAY 2013

1. Method of speech communications after laryngectomy include:

- a. Electrolarynx
- b. Oesophageal speech
- c. Tracheo-oesophageal speech
- d. Tracheal speech
- e. Transoral pneumatic device

2. Most common site of laryngeal papilloma in adult:

- a. Anterior commissure
- b. Posterior commissure
- c. Anterior half of vocal cord
- d. Middle of vocal cord
- e. False vocal cords

3. Most common site of vocal nodule of larynx:

- a. Anterior part of epiglottis
- b. False vocal folds
- c. Anterior commissure
- d. Posterior commissure
- e. On true vocal cord at junction of A 1/3 with P 2/3

4. True about benign paroxysmal positional vertigo:

- a. Hearing loss is often present
- b. Most commonly seen in 2nd decade
- c. Hallpike maneuver is not helpful in diagnosis
- d. Epley maneuver is used for treatment
- e. Disorder of posterior semicircular canal

5. Most common cause of B/L recurrent laryngeal paralysis:

- a. Thyroid surgery
- b. Cancer cervical oesophagus
- c. Blow from nasal cavity
- d. Thyroid cancer
- e. Bronchogenic carcinoma

6. True about otosclerosis:

- a. Most common site is footplate of stapes
- b. More common in female
- c. Schwartz sign indicate active focus
- d. Autosomal recessive
- e. Corhort not becomes negative after successful stapedectomy

7. Most common location of nasal hemangioma:

- a. Nasal Septum
- b. Inferior turbinate
- c. Vestibule
- d. Uncinate process
- e. Nasopharynx

8. Veins not involved in spreading infection to cavernous sinus from danger area of face:

- a. Lingual vein
- b. Pterygoid plexus
- c. Facial vein
- d. Ophthalmic vein
- e. Cephalic vein

EXPLANATIONS AND REFERENCES

1. Ans. is a, b, c and e i.e. Electrolarynx, oesophageal speech, transoesophageal speech and transoral pneumatic device.

Ref. Dhingra 6th/ed p 312

Methods of communication in laryngectomized patients

- Oesophageal speech
- Electrolarynx
- Transoral pneumatic device
- Tracheo-oesophageal speech
 - Blom-Singer prosthesis
 - Panje prosthesis

2. Answer is a and c i.e. anterior commissure and anterior half of vocal cord

Ref. Dhingra 6th/ed p 306

Adult onset papilloma usually arise from the anterior half of the vocal cord or anterior commissure.

They are usually single, small in size, less aggressive and do not recur after surgical removal.

M/C in males (2:1), in age group 30-50 year.

3. Ans is e i.e. or true vocal cord at function of anterior 1/3 with posterior 2/3.

Ref. Dhingra 6th/ed p 303

Vocal nodules appear symmetrically on the free edge of vocal cord, at the junction of anterior one-third with the posterior two-thirds, as this is the area of maximum vibration of the cord and thus subject to maximum trauma.

4. Answer is d and e i.e. Epley maneuver is used for treatment and disorder of posterior semicircular canal.

BPPV:

- It is characterised by vertigo when head is placed in a certain condition.
- There is no hearing loss or other neurologic symptoms.
- It occurs as a result of disorder of posterior semi-circular canal though patients may have history of head trauma and ear infection.

- Within the labyrinth of the inner ear lie collections of calcium crystals known as otoconia or otoliths. In patients with BPPV, the otoconia are dislodged from their usual position within the utricle and migrate over time into one of the semicircular canals (the posterior canal is most commonly affected due to its anatomical position).
- When the head is reoriented relative to gravity, the gravity-dependent movement of the heavier otoconial debris (colloquially "ear rocks") within the affected semicircular canal causes abnormal (pathological) fluid endolymph displacement and a resultant sensation of vertigo.
- Although BPPV can occur at any age, it is *most often seen in people over the age of 60*.
- The vertigo is fatiguable on assuming the same position repeatedly but can be induced again after a period of rest.
- Diagnosis is by – Typical history and by performing the Hallpike maneuver.
- Management is by Epley maneuver. The principle of this maneuver is to reposition the otoconial debris from the posterior semicircular canal to utricle.

5. Ans is a, i.e. Thyroid surgery

Ref. Dhingra 6th/ed p 300

Bilateral Recurrent Laryngeal Paralysis:

"Neuritis or surgical trauma (thyroidectomy) are the most important causes of bilateral abductor paralysis or recurrent laryngeal nerve paralysis."

Dhingra 6th/ed p 300

Other causes of B/L Recurrent laryngeal Nerve:

- Carcinoma thyroid
- Cancer cervical oesophagus
- Cervical lymphadenopathy

6. Is b, c and e, i.e. more common in females, Schwartz sign indicates active focus and Carhart's notch becomes negative after successful stapedectomy

Ref. Dhingra 6th/ed p 86-87

Otosclerosis:

- M/C site: Anterior to oval window (fissula ante fenestrum). (thus option a is correct)
- M/C is females (option b is correct)
- 50% cases have a positive family history. Genetic studies reveal it is autosomal dominant trait. (option d incorrect).
- In 10% cases: Tympanic membrane may exhibit reddish hue on the promontory—"schwartz sign" which is indicative of active focus with increased vascularity. (option is correct).
- **Generally in otosclerosis:** Bone conduction is normal but in some cases there is a dip in bone conduction which is maximum at 2000 Hz and is called **Cahart's Notch**.
Cahart's Notch disappears after successful stapedectomy (option e is correct).

7. Answer is a, i.e. septum

Ref. Dhingra 6th/ed p 203; Mohan Bansal 1st/ed p 354

Nasal Hemangiomas:

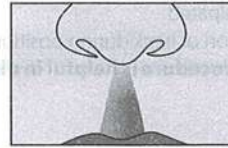
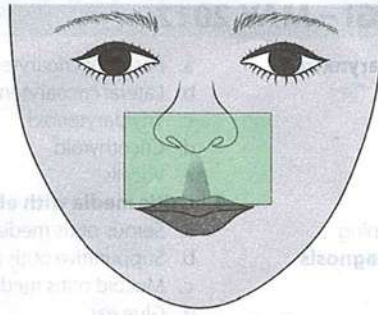
- **Capillary hemangioma:** This bleeding polyp of the anteroinferior part of nasal septum is a soft, dark red pedunculated or sessile tumor.
 - It presents with recurrent epistaxis and nasal obstruction.
 - This smooth growth may become ulcerated.
 Treatment: It needs local excision with a cuff of surrounding mucoperichondrium.
- **Cavernous hemangioma:** It arises from the turbinates.
 - Treatment: It is treated by surgical excision with preliminary cryotherapy. Extensive lesions may need combined radiotherapy and surgical excision.
 Now since the question says, M/C site: we will have to choose between nasal septum (site for capillary hemangioma) and turbinate (site for cavernous hemangioma).
Capillary hemangioma is more common type of nasal hemangioma hence M/C site is nasal septum as is indicated by the following lines:—
- Haemangiomas are benign vascular tumours, which originate in the skin, mucosae and deep structures such as bones, muscles and glands. They are of two major types, capillary and cavernous. When these neoplasms rarely arise in the nasal cavity, they are *predominantly capillary and are found attached to the nasal septum*. Cavernous haemangiomas, on the other hand, are more likely to be found on the *lateral wall of the nasal cavity*.

8. Ans is a i.e. lingual vein and e i.e. cephalic vein

Ref. BD Chaurasia p 62-63; Maqbool 11th/ed p 172

Dangerous area of face

Dangerous area of face includes upper lip and anteroinferior part of nose including the vestibule. This area freely communicates with the cavernous sinus through a set of valveless veins, anterior facial vein and superior ophthalmic vein. Any infection of this area can thus travel intracranially leading to meningitis and cavernous sinus thrombosis.



Vein draining dangerous area

M. Maqbool 11th/ed p 172

- Through facial veins communicating with ophthalmic veins (both having no valve)
- Through the pterygoid plexus of veins which communicate with facial vein on one hand and the cavernous sinus through emissary vein on the other hand.

According to B.D. Chaurasia Vol 3, 5th/ed p 62

Deep connections of the facial vein include:

- A communication between the supraorbital and superior ophthalmic veins.
- Another with the pterygoid plexus through the *deep facial vein* which passes backwards over the buccinator.

The facial vein communicates with the cavernous sinus through these connections. Infections from the face can spread in a retrograde direction and cause *thrombosis* of the cavernous sinus. This is especially likely to occur in the presence of infection in the upper lip and in the lower part of the nose. This area is, therefore, called the *dangerous area of the face*.

PGI – MAY 2012

1. All are true statement about tracheostomy and larynx in children except:
 - a. Omega shaped epiglottis
 - b. Laryngeal cartilages are soft and collapsable
 - c. Larynx is high in children
 - d. Trachea can be easily palpated
 - e. Avoid too much extension of neck during positioning
2. Which of the following procedure is helpful in diagnosis of choanal atresia:
 - a. Anterior rhinoscopy
 - b. Passing red rubber catheter
 - c. Breath sounds by stethoscope
 - d. Endoscopy of nose
 - e. Acoustic rhinometry
3. A patient met with recurrent laryngeal nerve palsy while undergoing thyroid surgery. Which of the following muscles of larynx is/are affected;
 - a. Posterior cricoarytenoid
 - b. Lateral cricoarytenoid
 - c. Thyroarytenoid
 - d. Cricothyroid
 - e. Vocalis
4. Otitis media with effusion is also known as:
 - a. Serous otitis media
 - b. Suppurative otitis media
 - c. Mucoid otitis media
 - d. Glue ear
 - e. Secretory otitis media
5. Tests of balance include(s):
 - a. Dysdiadochokinesia
 - b. Romberg's sign
 - c. Weber's test
 - d. Unterberger's test
 - e. Finger nose test

EXPLANATIONS AND REFERENCES

1. Ans is d i.e. Trachea can be easily palpated
Infant's larynx differs from adult in:

- It is situated high up (C2 – C4).^Q (in adults = C3 – C6)
- Of equal size in both sexes (in adults it is larger in males)
- Larynx is funnel shaped
- The narrowest part of the infantile larynx is the junction of subglottic larynx with trachea and this is because cricoid cartilage is very small
- Epiglottis is omega shaped, soft, large and patulous.
- Laryngeal cartilages are soft and collapse easily
- Short trachea and short neck.
- Vocal cords are angled and lie at level of C4
- Trachea bifurcates at level of T2
- Thyroid cartilage is flat. The cricothyroid and thyrohyoid spaces are narrow.

Ref. Dhindra 6th/ed p285; Logan and Turner 10th/ed p 396

Tracheostomy in Infants and Children

Dhingra 5th/ed p338

"Trachea of infants and children is soft and compressible and its identification may become difficult and the surgeon may easily displace it and go deep or lateral to it injuring recurrent laryngeal nerve or even the carotid."

"During positioning, do not extend too much as this pulls structures from chest into the neck and thus injury may occur to pleura, innominate vessels and thymus or the tracheostomy opening may be made too low near suprasternal notch"

Tracheostomy in Infants and Children

Logan and Turner 10th/ed p396

"The incision is a short transverse one, midway b/w lower border of thyroid cartilage and the suprasternal notch. The neck must be well extended"

"A incision is made through two tracheal rings, preferably the third or fourth."

2. Ans is b, c, d and e i.e. Passing red rubber catheter, breath sounds by stethoscope, endoscopy of nose and acoustic rhinometry

"Structure normally seen on posterior rhinoscopy are choanal polyp or atresia"

Dhingra 5th/ed p385

"Choanal atresia: Posterior rhinoscopy may be undertaken in older children and will show the occlusion."

Logan and Turner 10th/ed p380

Thus posterior rhinoscopy and not anterior rhinoscopy are useful in the diagnosis of choanal atresia.

"Acoustic rhinometry is a new technique which evaluates nasal obstruction by analysing reflections of a sound pulse introduced via the nostrils. The technique is rapid, reproducible, non-invasive and requires minimal cooperation from the subject. A graph of nasal cross-sectional area as a function of distance from the nostril is produced, from which several area and volume estimates of the nasal cavity can be derived. The role of acoustic rhinometry in diagnosis is somewhat limited compared to nasal endoscopy, but it

is useful for nasal challenge and for quantifying nasal obstruction. It is helpful in *evaluating childhood nasal obstruction*, as it is well tolerated by children as young as 3 years old—a group of patients to whom objective tests have hitherto been difficult to apply."

—www.ncbi.nlm.nih.gov/PMC/129

Choanal Atresia

It is due to persistence of bucconasal membrane and may be unilateral or bilateral, complete or incomplete, bony (90%) or membranous (10%). Unilateral atresia is more common and may remain undiagnosed until adult life. Bilateral atresia presents with respiratory obstruction as the newborn, being a natural nose breather, does not breathe from mouth. Diagnosis of choanal atresia can be made by (i) presence of mucoid discharge in the nose, (ii) absence of air bubbles in the nasal discharge, (iii) failure to pass a catheter from nose to pharynx, (iv) putting a few drops of a dye (methylene blue) into the nose and seeing its passage into the pharynx, or (v) flexible nasal endoscopy, (vi) installing radio-opaque dye into the nose and taking a lateral film, and (vii) computed tomography (CT) scan in axial plane is more useful.

3. Ans is a, b, c and e i.e. Posterior cricoarytenoid, lateral cricoarytenoid and thyroarytenoid, Vocalis Dhingra 6th/ed p 298

All muscles which move the vocal cord (abductors, adductors or tensors) are supplied by the recurrent laryngeal nerve except the cricothyroid muscle which is supplied by external laryngeal nerve (a branch of superior laryngeal nerve).

4. Ans is a, c, d and e i.e. Serous otitis media, mucoid otitis media, glue ear and secretory otitis media Dhingra 6th/ed p 64

Otitis media with effusion is also called as serous otitis media, secretory otitis media, mucoid otitis media and glue ear.

5. Ans is a, b, d and e i.e. Dysdiadochokinesia, romberg sign, unterberger test and finger nose test Ref. Internet

Weber test is for hearing and not for balance. All the tests given in the options are tests for balance.

Tests for balance

- Romberg test
- Unterberger test
- Positional test
 - Tandem walking
 - Finger nose test
 - Finger to finger test
 - Dysdiadochokinesia
 - Post-pointing and falling

ALSO KNOW

The Unterberger test, also Unterberger's test and Unterberger's stepping test

- It is a test used in otolaryngology to help assess whether a patient has a vestibular pathology. It is not useful for detecting central (brain) disorders of balance.
- Method: Stepping on one spot with the eyes closed.
- Result:
 - Peripheral lesions: rotation of the body axis to the side of the labyrinthine lesion.
 - Central disorders: the deviation is irregular.
 - Deviations of greater than 40 degree are significant.
- If the patient rotates to one side they may have a labyrinthine lesion on that side, but this test should not be used to diagnose lesions without the support of other tests.

SECTION VIII

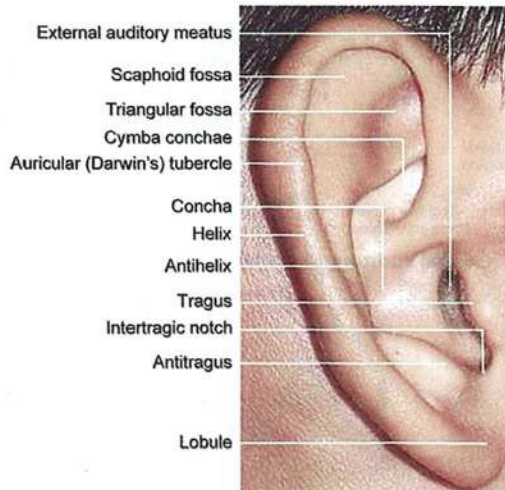
COLOR PLATES

Color Plates

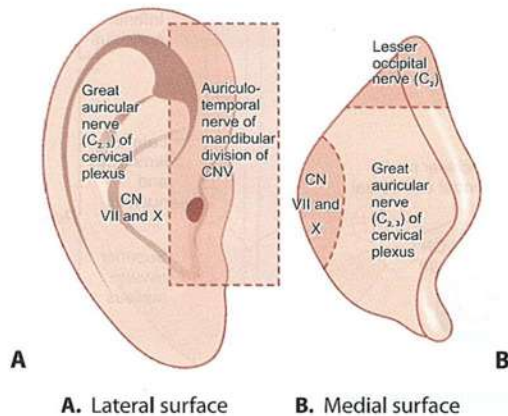
IMPORTANT PICTURES FOR PICTORIAL QUESTIONS

EAR

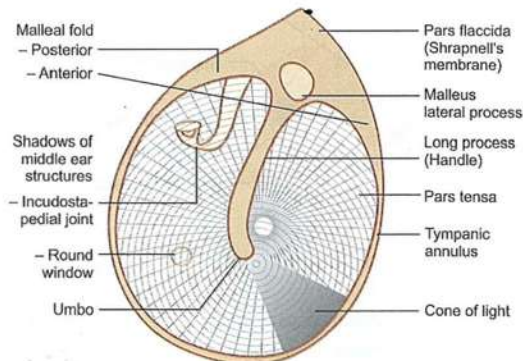
1. Auricular cartilage: external features



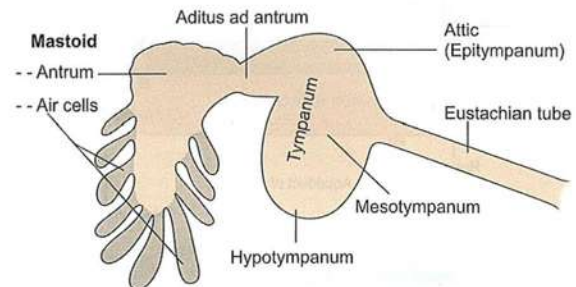
2. Nerve supply of Pinna



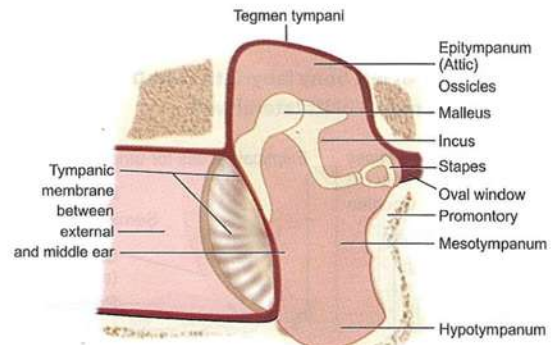
3. Tympanic membrane as seen on otoscopy



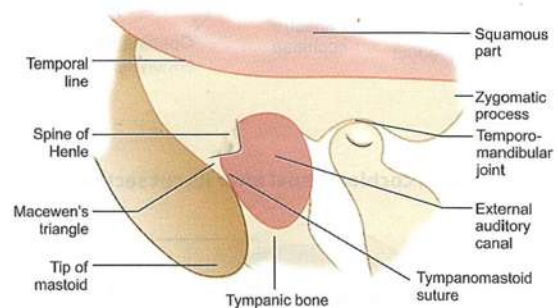
4. Parts of middle ear cleft



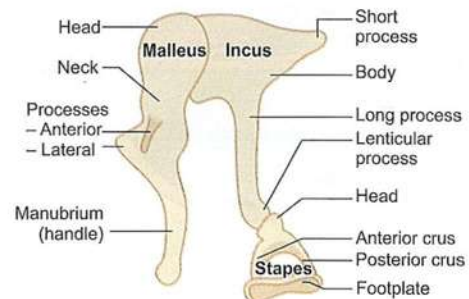
5. Parts of middle ear as in seen on coronal section



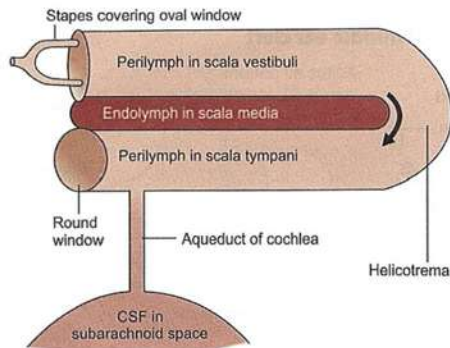
6. Mc-Ewan triangle: Surface landmark for mastoid antrum



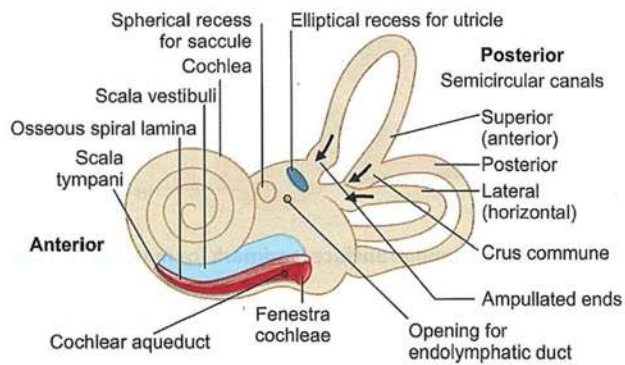
7. Middle ear ossicles



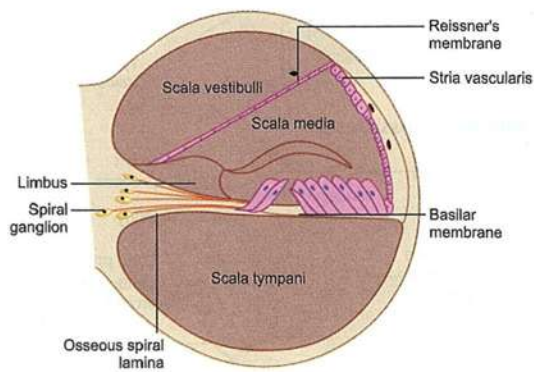
8. Cochlea: Peri and endolymphatic systems: relation



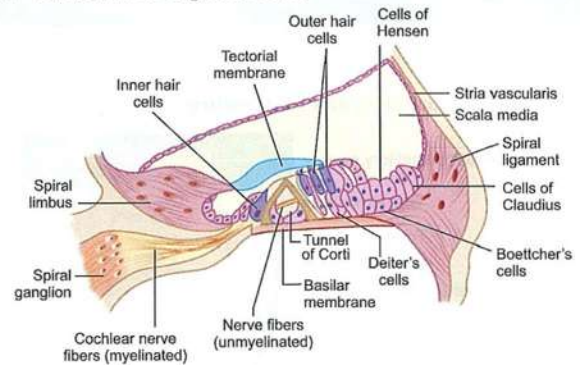
9. Medial wall of left bony labyrinth seen from lateral side after the removal of its lateral wall



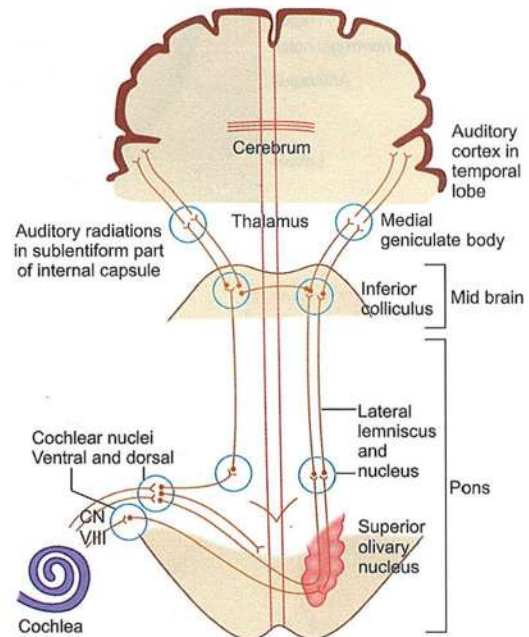
10. Structure of cochlear canal after its cut section



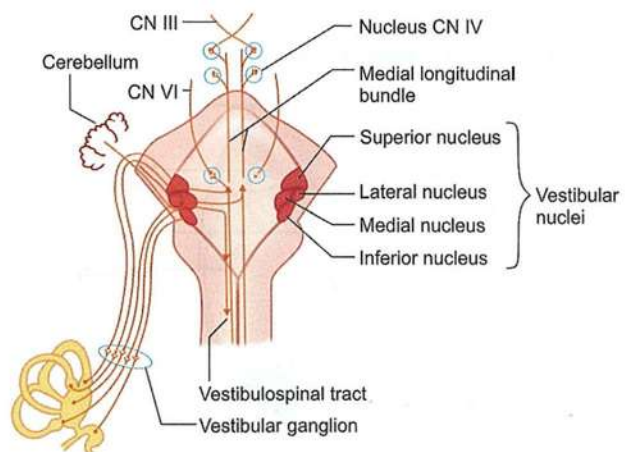
11. Structure of Organ of Corti



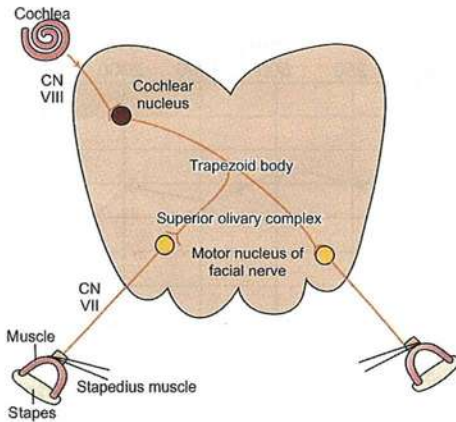
12. Central auditory pathway



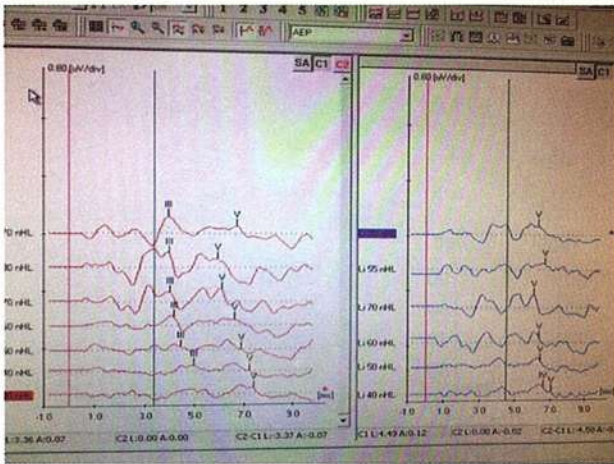
13. Vestibular pathway



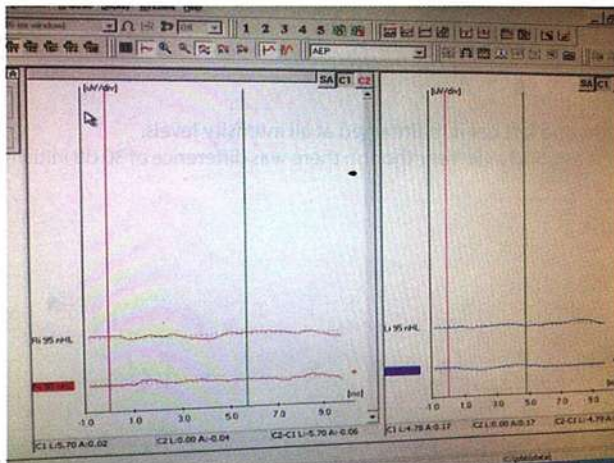
14. Acoustic reflex pathway



15. BERA



A. Normal with normal latency

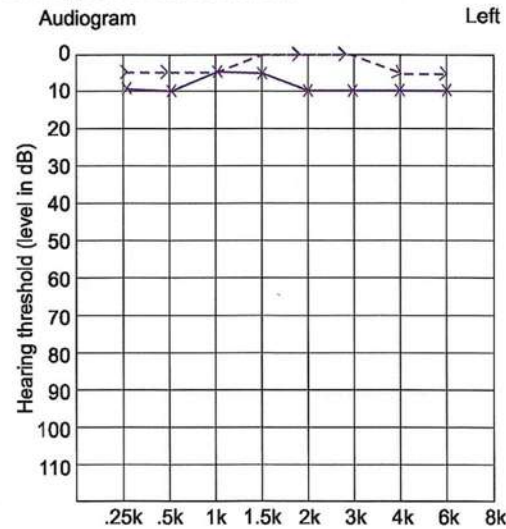


B. BERA in severe hearing loss. Note: No peaks seen

16. Symbols used in audiogram charting

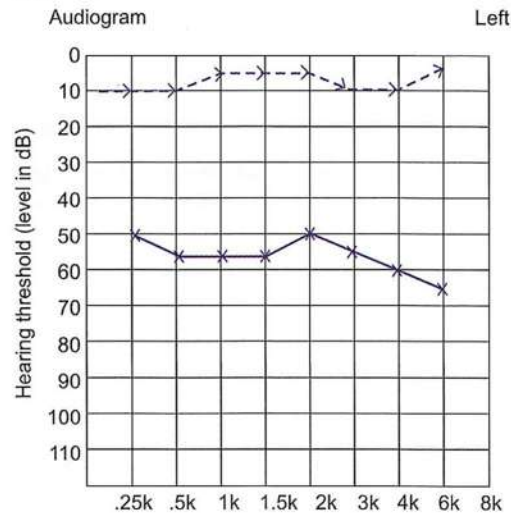
Modality	Ear	
	Right	Left
AC unmasked	○	×
AC masked	△	□
BC unmasked	<	>
BC masked	┐	┌
No response	↻	↻

17. Audiogram of left normal ear



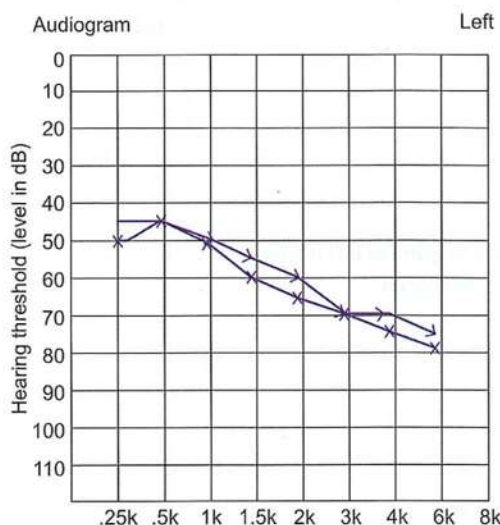
In normal persons, hearing threshold values with both air and bone remain between 0 and 10 dB

18. Audiogram of left ear with conductive hearing loss



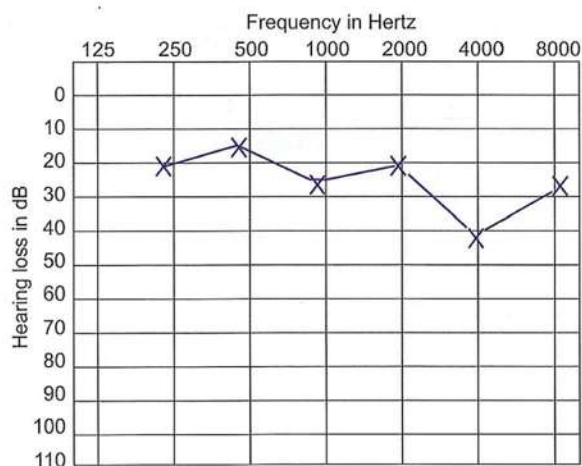
In this graph, bone-air gap is seen which means a patient can hear by bone under 10-20 dB, while with air hearing is much below, depending on the severity, indicating conductive hearing loss.

19. Audiogram of left ear with SNHL



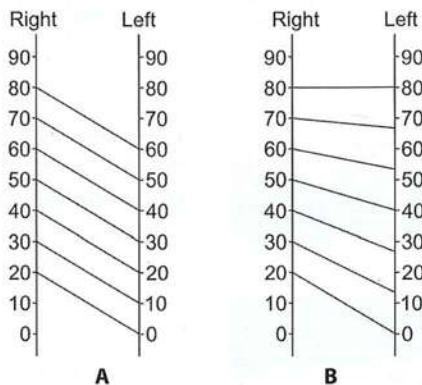
In SNHL, both bone and air conduction values are decreased and may even overlap each other.

20. Audiogram in Early case of noise-induced hearing loss.



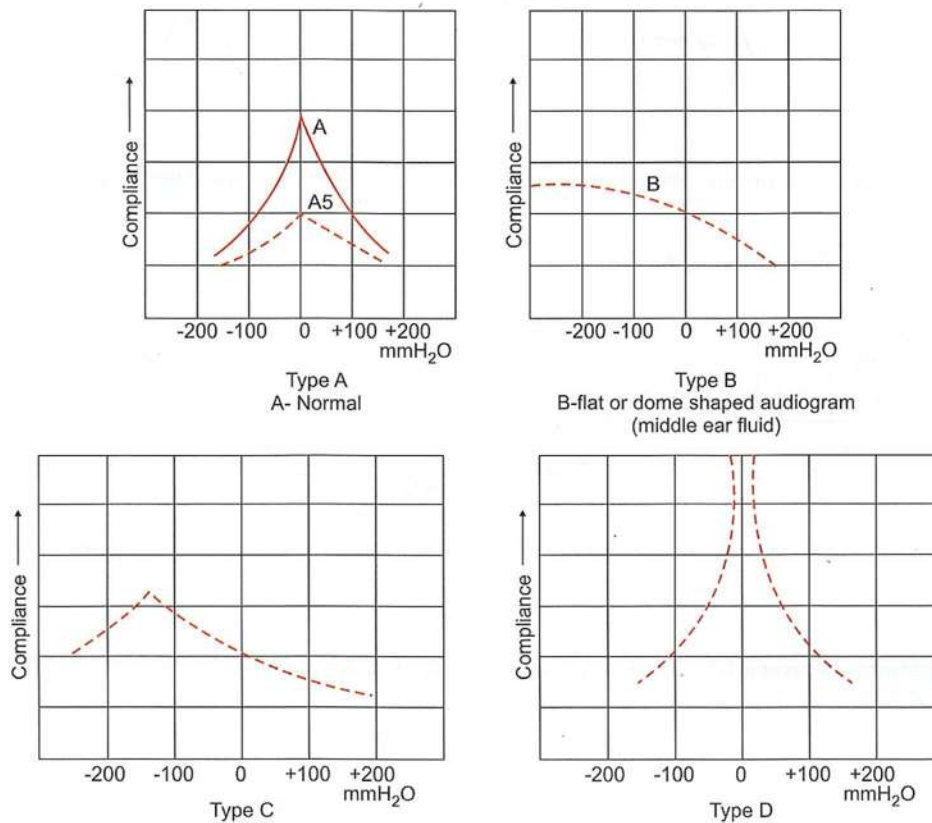
In acoustic trauma, there is a sudden dip at 4000 Hz both in air and bone conduction values

21. Alternate binaural loudness balance test



- (A) Nonrecruiting ear. The initial difference of 20 dB between the right and left ear is maintained at all intensity levels.
 (B) Recruiting ear right side. At 80 dB loudness perceived by right ear is as good as left ear though there was difference of 30 dB initially

22. Types of Tympanogram: Impedence Audiometry Curves:



Types of curve

A curve

(Normal peak height and pressure)

As curve^o

(It is also a variant of normal tympanogram but may be shallow)

Ad curve

(Variant of normal with high peak)

B curve

(Flat or dome-shaped curve)^o
Indicating lack of compliance

C curve

(negative peak pressure)

Conditions seen in

Normal

Eustachian tube obstruction

Otosclerosis^o

Tumors of middle ear

Fixed malleus syndrome

Tympanosclerosis

Ossicular discontinuity

Post stapedectomy

Monometric ear drum

Fluid on middle ear^o

Secretory otitis media^o

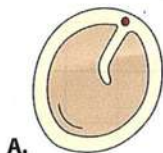
Tympanic membrane perforation^o

Grommet in ear^o

Retracted tympanic membrane

Faulty function of Eustachian tube/ Eustachian tube obstruction

23. Incisions for myringotomy



A.

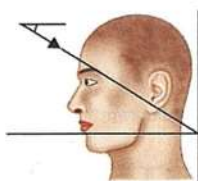
In case of Acute Suppurative Otitis Media (ASOM)



B.

In case of Serous Otitis Media \pm grommet insertion

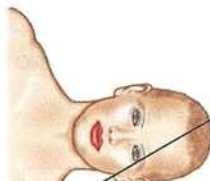
23. Different view of X-ray for diseases of the ear



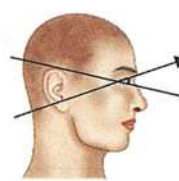
A.



B.



C.

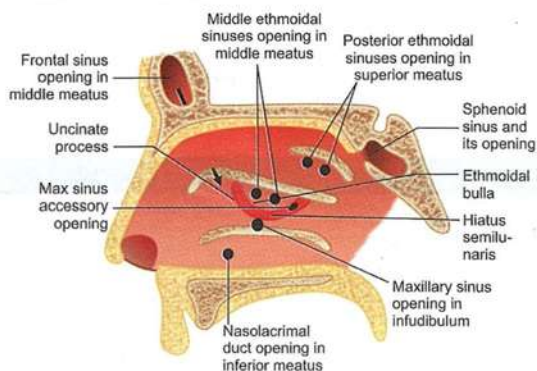


D.

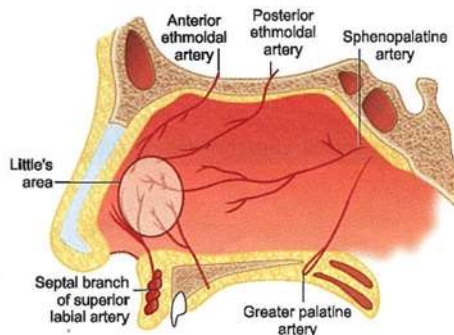
(A) Towne's (Fronto-occipital); (B) Submento-vertical view, (C) Stockholm-B view (Lateral-oblique); (D) Stenvers view (Oblique-posterior anterior)

NOSE

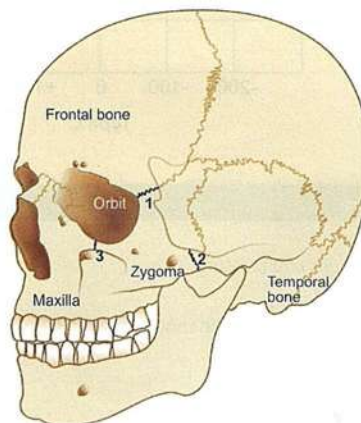
1. Openings of paranasal sinus as in lateral wall of nose after removal of turbinates



2. Blood supply of nasal septum

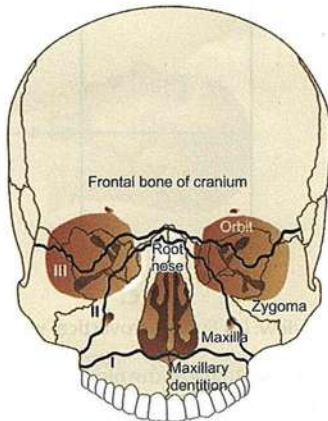


3. Tripod fracture



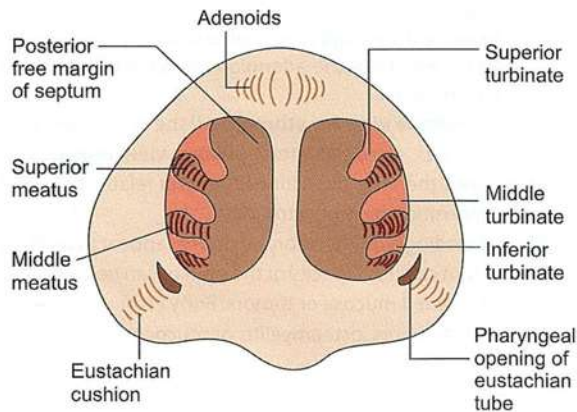
Left zygoma (tripod) fracture showing three sites of fracture. (1) Zygomaticofrontal; (2) Zygomaticotemporal; (3) Infraorbital

4. Le fort classification of fracture of nasomaxillary complex

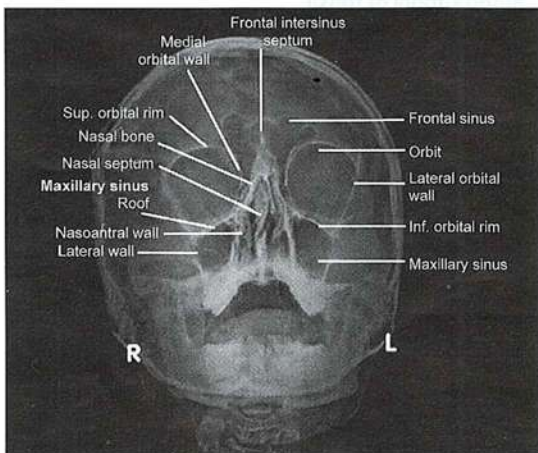


Le Fort classification of fractures of nasomaxillary complex crossing nasal septum and pterygoid plates. (I) Transverse (separating maxillary dentition); (II) Pyramidal (fracture of root of nose, medial wall and floor of orbit and maxilla), (III) Craniofacial disjunction (separating face from the cranium)

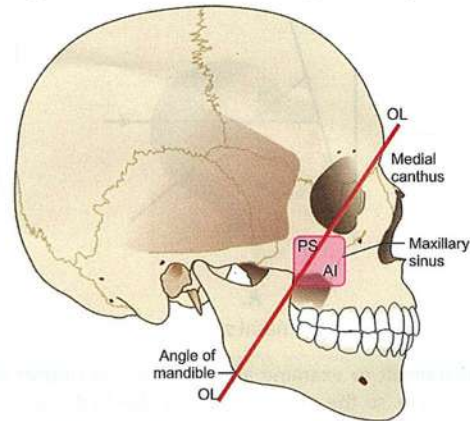
6. Structures seen on posterior rhinoscopy



8. X-ray: PNS, Water's view

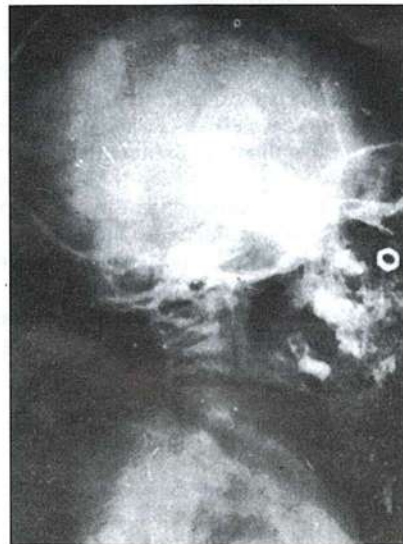


5. Ohngrens classification for malignant neoplasm of PNS

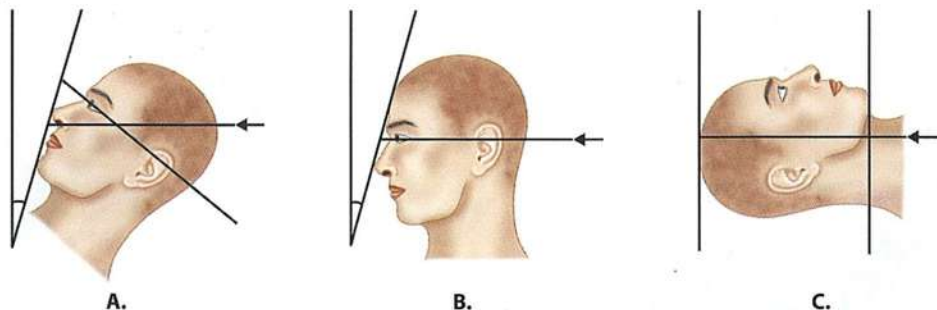


Ohngren's classification: Ohngren's line is an imaginary line (OL), which extends between medial canthus and the angle of mandible, divides the maxilla into two regions anteroinferior (AI) and posterosuperior (PA). AI growths are easy to manage and have better prognosis than PS tumors

7. A radiopaque foreign body in the nose of a child



9. View for the paranasal sinuses



Radiology of nasal structures: (A) Occipitomental view: (B) Occipitofrontal view: (C) Submentovertical view

It is difficult to examine all the paranasal sinuses on one projection, so the examination of individual sinus requires many views. The few standard views that are taken, which give an adequate idea about the condition of paranasal sinuses are as follow:

- **Occipitomental view (Waters view):** The X-ray is taken in the nose-chin position with an open mouth. The film demonstrates mainly the maxillary sinuses, nasal cavity, septum, frontal sinuses and few cells of the ethmoids. The view taken in the standing position may show fluid level in the antrum (Fig. A)
- **Occipitofrontal view (Caldwell view):** The patient's forehead and tip of the nose are kept in contact with the film. This view is particularly useful for frontal sinuses. A portion of the maxillary antrum and nasal cavity are also shown (Fig. B)
- **X-ray, the base of the skull (Submentovertical view):** The neck and head are fully extended so that vertex faces the film and the rays are directed beneath the mandible. The view is useful for demonstrating sphenoid sinuses, ethmoids, nasopharynx, petrous apex, posterior wall of the maxillary sinus and fracture of the zygomatic arch (Fig. C)
- **Lateral view:** The patient's head is placed in a lateral position against the film and the ray is directed behind the outer

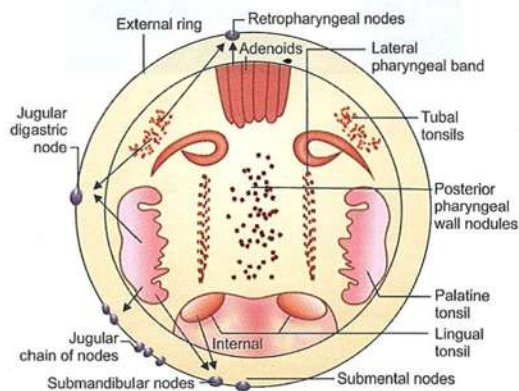
canthus of the eye towards the film.

The maxillary, ethmoidal and frontal sinuses superimpose each other but this film is useful for the following purposes:

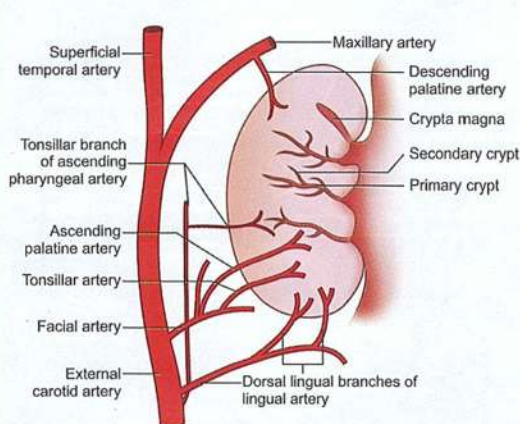
- To demonstrate the extent of pneumatization of the sphenoid and frontal sinuses.
 - To demonstrate the position of a radiopaque foreign body in the nasal cavity or nasopharynx.
 - To demonstrate the thickness of soft tissues of the nasopharynx which should not normally be more than 5 mm.
 - To show the nasopharyngeal airway.
 - To demonstrate the adenoid mass or a tumor in the nasopharynx.
- **Lateral oblique view for ethmoids:** If the disease involves the ethmoids, a special lateral oblique view provides an idea about the ethmoidal air cells, being relatively free of superimposition by other structures.
- On plain radiography, the normal sinuses appear as air filled translucent cavities. Opacity of the sinuses can be caused by fluid, thickened mucosa or tumors. Bony erosion can occur because of tumors, osteomyelitis or mucocoeles.

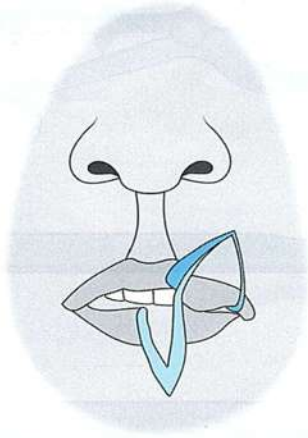
PHARYNX

1. Waldeyers ring

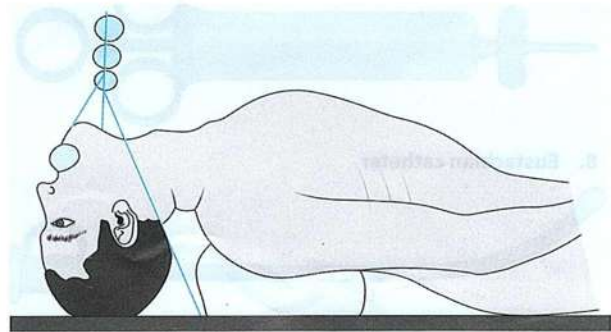


2. Blood supply of tonsil

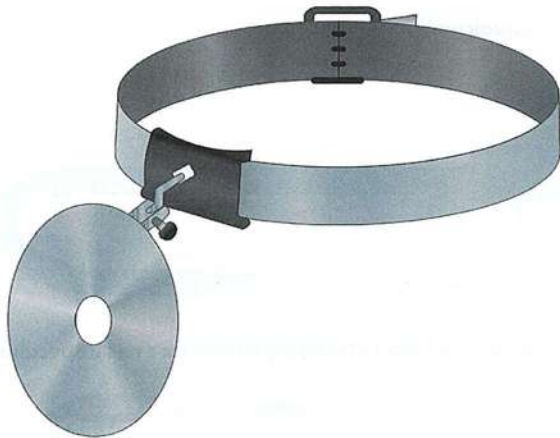
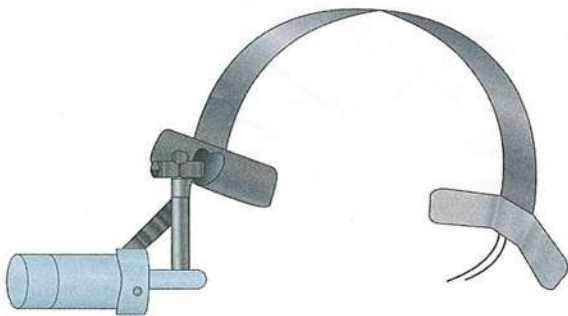
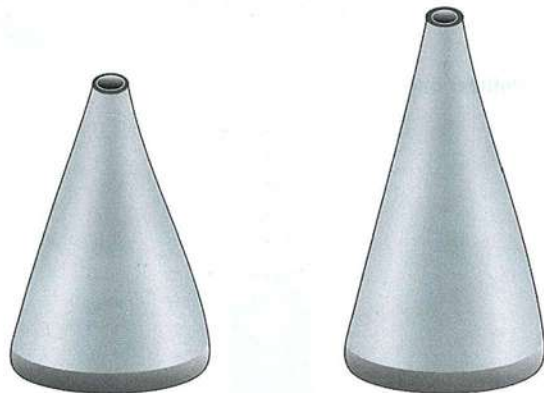
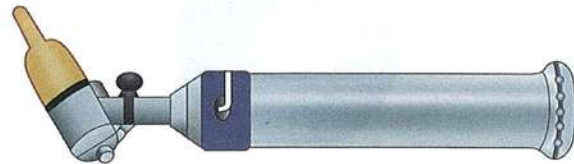
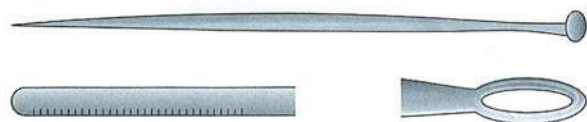


IMPORTANT INCISIONS AND POSITION IN ENT SURGERY**1. Abbe estander flap**

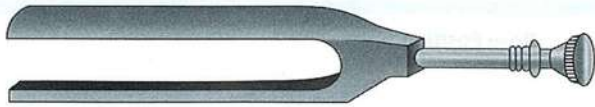
Used for lip reconstruction

2. Rose Position

Used during I. Tonsillectomy II. Abenoidectomy III. Tracheostomy

INSTRUMENTS**1. Head mirror****2. Head light****3. Aural speculum****4. Electrical otoscope****5. Jobson's aural probe**

6. Tuning fork



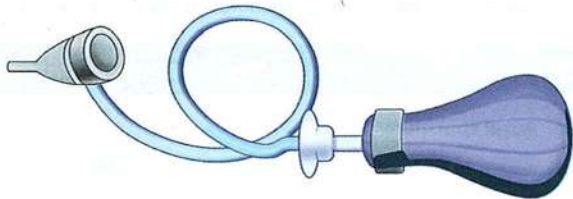
7. Aural syringe



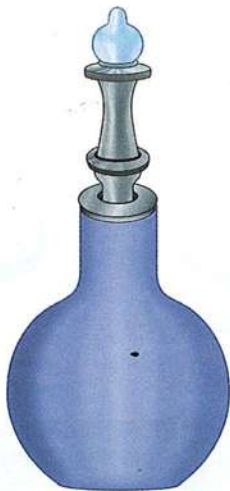
8. Eustachian catheter



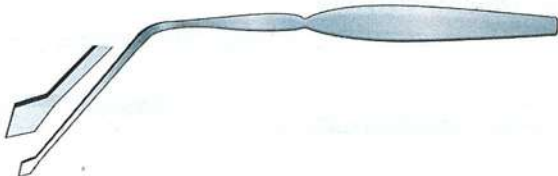
9. Siegel's pneumatic speculum



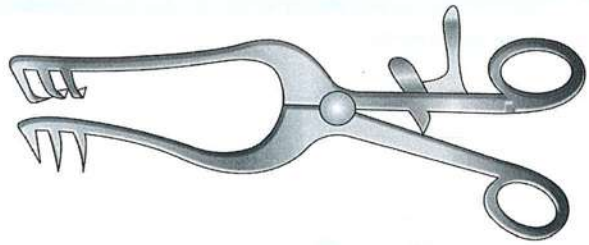
10. Politzer bag



11. Myringotome



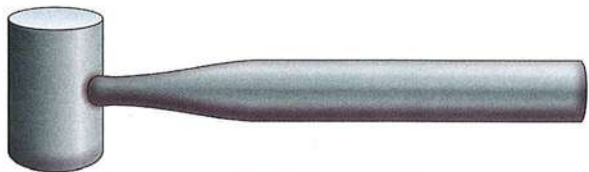
12. Mastoid retractor



13. Mastoid gouge



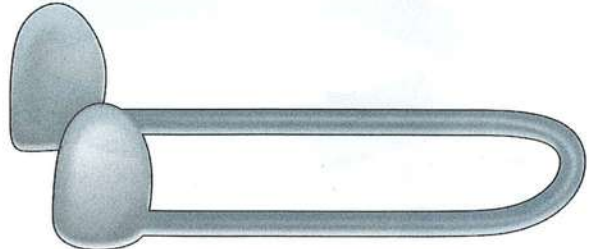
14. Mallet



15. Mastoid cell seeker with scoop



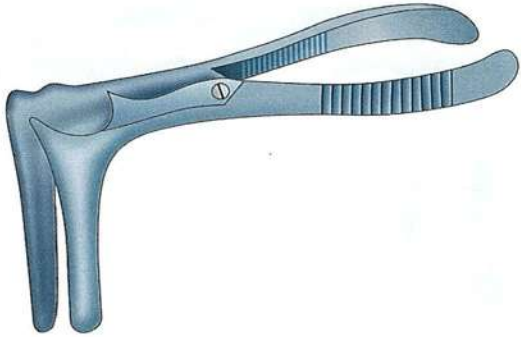
16. Thudicum's nasal speculum



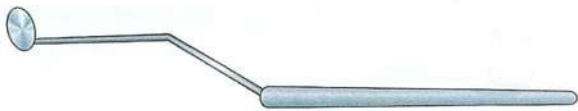
17. Correct method of holding Thudicum's nasal speculum



18. St Clair-Thompson's nasal speculum



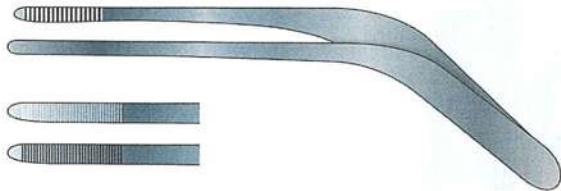
19. Posterior rhinoscopy mirror



20. Nasal foreign body hook



21. Nasal packing, forceps



22. Antral trocar and cannula



23. Antral cannula



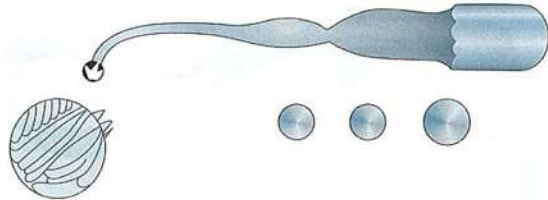
24. Antral perforator



25. Myle's nasoantral perforator



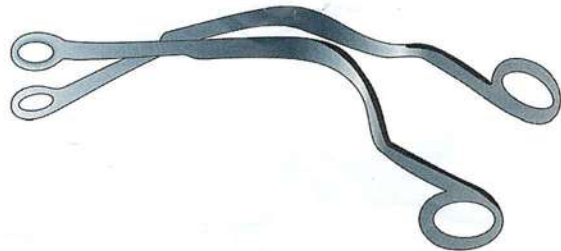
26. Antral burr



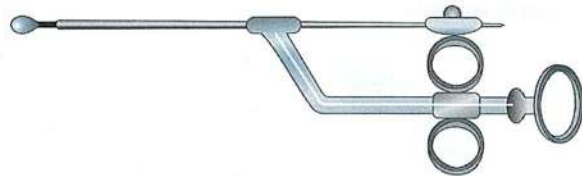
27. Antral wash cannula



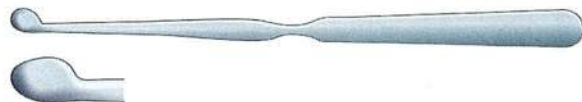
28. Luc's forceps



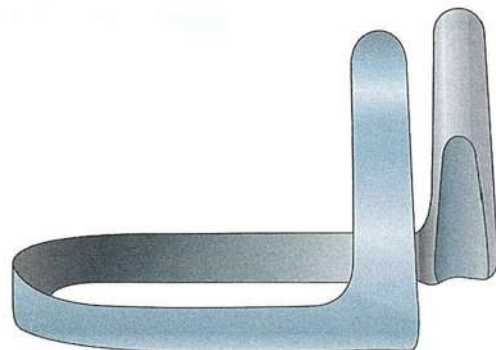
29. Nasal snare



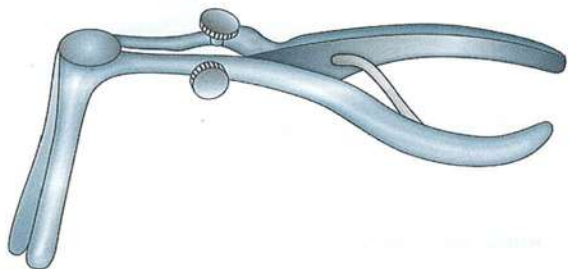
30. Freer's septal knife



31. Long-bladed nasal speculum



32. Killian's nasal speculum



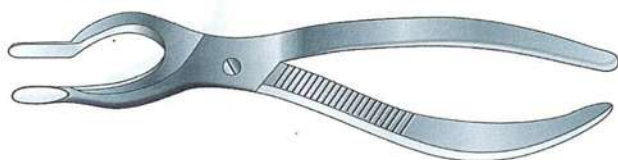
33. Ballinger's swivel knife



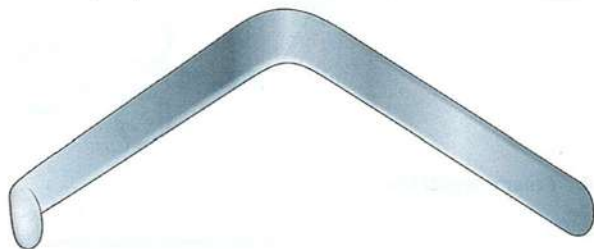
34. Bayonet-shaped gouge



35. Walsham's forceps



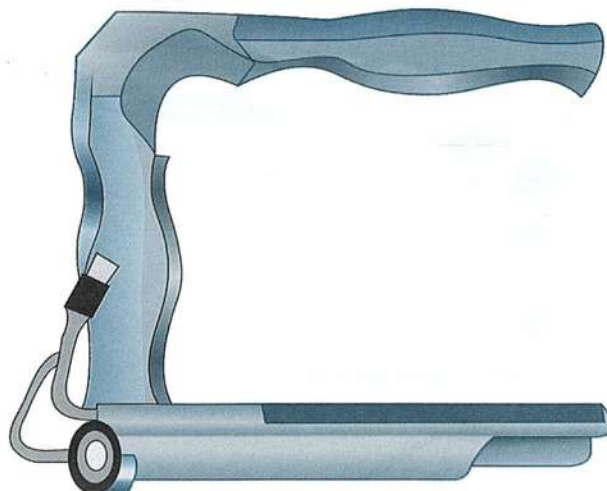
36. Lack's spatula



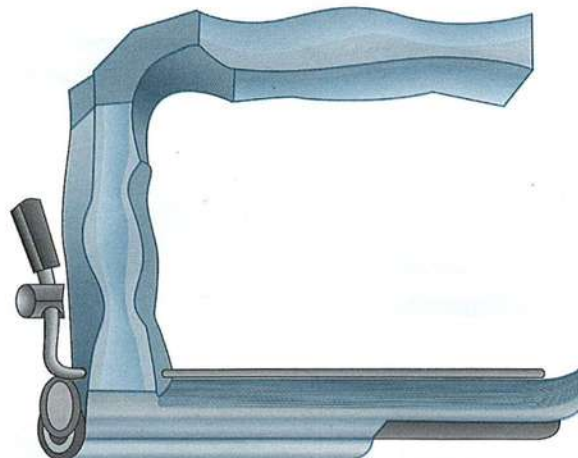
37. Laryngeal mirror



38. Direct laryngoscope



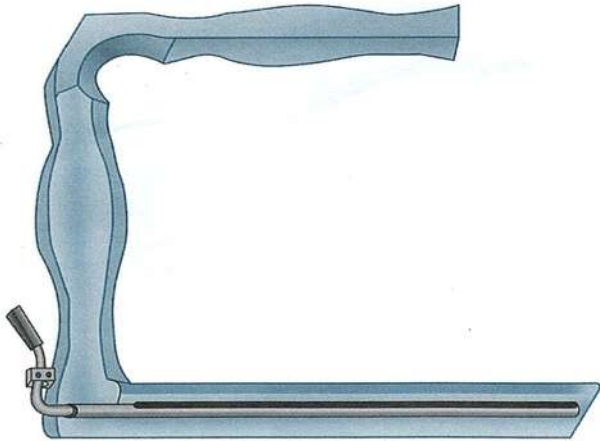
39. Chevalier-Jackson laryngoscope with removable slide



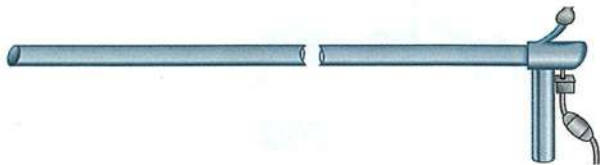
40. Distal light arrangement



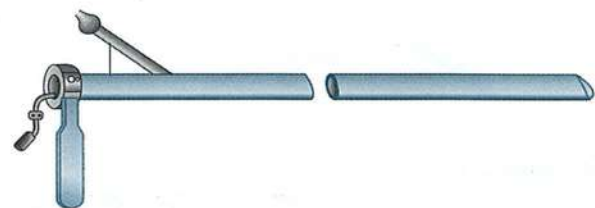
41. Anterior commissure laryngoscope



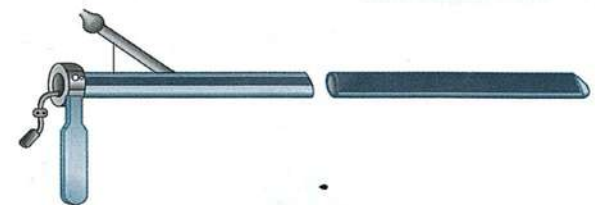
42. Negus bronchoscope



43. Chevalier-Jackson bronchoscope



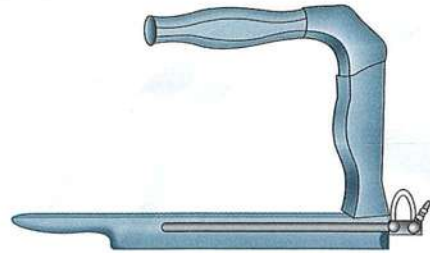
44. Chevalier-Jackson esophagoscope



45. Negus esophagoscope



46. Esophageal speculum



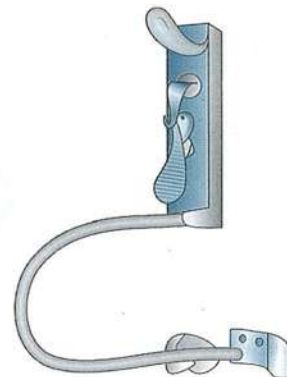
47. Laryngeal forceps



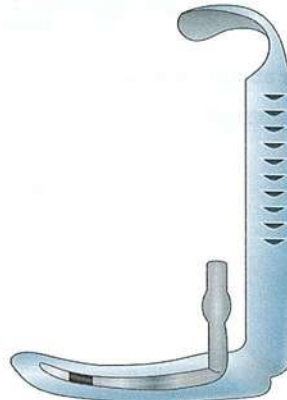
48. Crocodile punch biopsy forceps



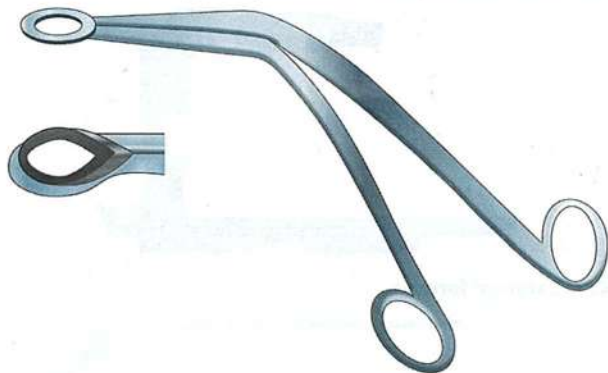
49. Boyle-Davis mouth gag



50. Tongue plate with throat suction



51. Tonsil holding forceps



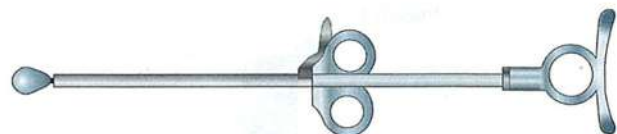
52. Tonsillar suction



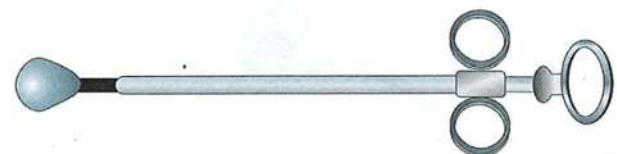
53. Tonsil pillar retractor and dissector



54. Tonsillar snare



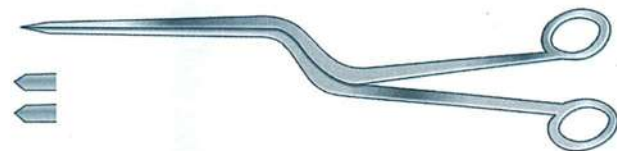
55. Guillotine



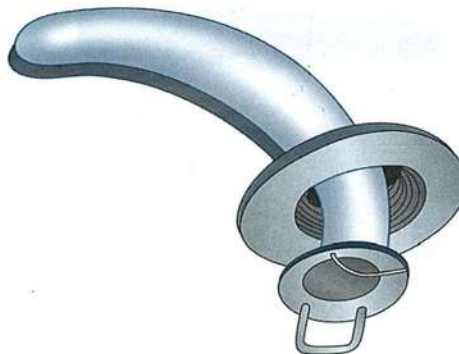
56. Adenoid curette with cage



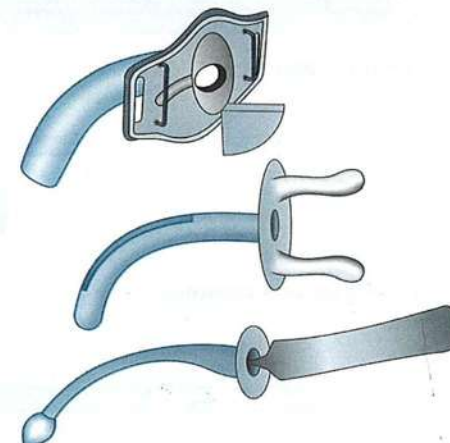
57. Peritonsillar abscess drainage forceps



58. Fuller's tracheostomy tube



59. Jackson's tracheostomy tube



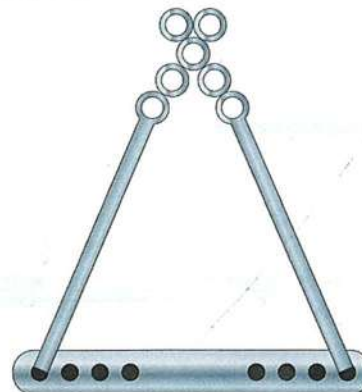
60. Blunt tracheal hook



61. Sharp tracheal hook



62. Draffin bipod stand with plate



SELF ASSESSMENT & REVIEW

ENT



The 5th edition of the book covers the entire ENT in a holistic yet focussed approach to cater the needs of PG aspirants. After a high yield synopsis of topics in each chapter, there are detailed explanations of the MCQ's from AIIMS (2000–2013), All India (2000–2011) and PGI (2000–2013). The new edition of the book also includes explanatory Questions from DNB and FMGE.

Keeping in mind the recent trend, NEET pattern questions and color plates with all important figures and instruments are included, to increase the utility of the book.

Must Read for:

- Undergraduates
- Foreign medical graduates
- Interns
- All post graduate medical aspirants
- Any exam of ENT

Salient Features:

- Best selling book on ENT
- Contains lucid presentation of text in a new layout
- Includes recent AIIMS and PGI Questions (2013)
- Includes DNB, FMGE and NEET pattern questions.
- Hot Topic–Snoring and sleep apnea included
- Color plates with all important illustrations and instruments are given in a separate section.

Sakshi Arora MBBS DGO is a consultant Obstetrician and Gynecologist in New Delhi. She has done her post graduation from MLN Medical college, Allahabad. She has been a very popular and prominent faculty for various coaching classes preparing students for PG entrance examinations. She is presently working as Chief Development Editor for a prestigious publishing house. In her capacity as Chief Development Editor, she has helped eminent authors in the revision of various textbooks.



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