Covering 200 Questions with Explanations of all 19 Medical subjects including Image-Based and Clinical-Based Questions

The first book covering the latest and authentic recall INI-CET November 2024 Paper

INI-CET

Institute of National Importance–Combined Entrance Test

November 2024

SUPPLEMENT

(Recall)

8 Reasons to Refer to this Supplement

- Most Genuine Recall Question Paper of INI-CET November 2024
- Covering 200+ Questions from all the 19 Medical Subjects
- Includes Image-Based and Clinical-Based Questions
- All the MCQs are covered in a Subject-wise manner
- Authentic Answers with References from Standard Textbooks
- Image and Algorithm-Based Explanations with Mnemonic and Good to remember Boxes
- Vital pedagogical features are added like Tables, Figures, Flowcharts, etc.
- Quick Revision boxes highlighting summarized important Topics

Sudhir Kumar Singh

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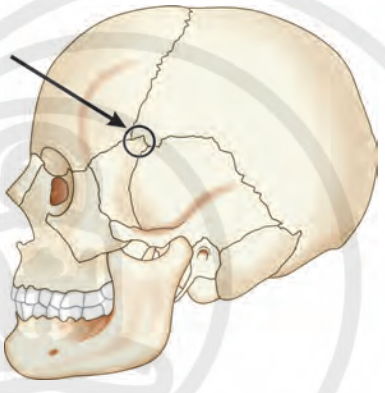
ANATOMY

1

1. Which structure lies beneath the arrow marked in the given image?



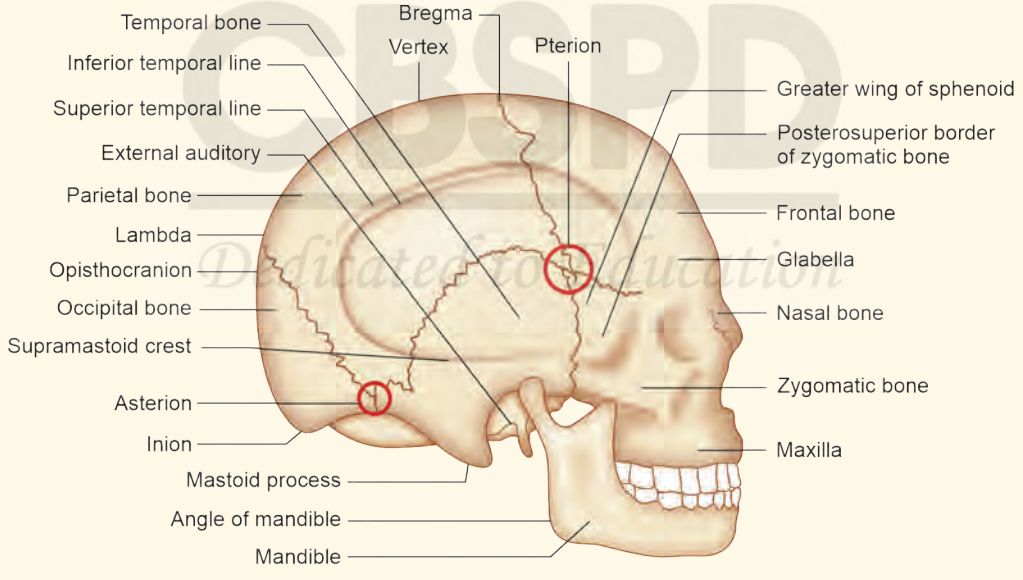
a. Pineal gland b. Stem of lateral sulcus c. Internal carotid artery siphon d. Wernicke's area

Ref: Gray's Anatomy: The Anatomical Basis of Clinical Practice 41st Ed; Page no. 436

Explanation:

The marked structure is **pterion.**

Pterion



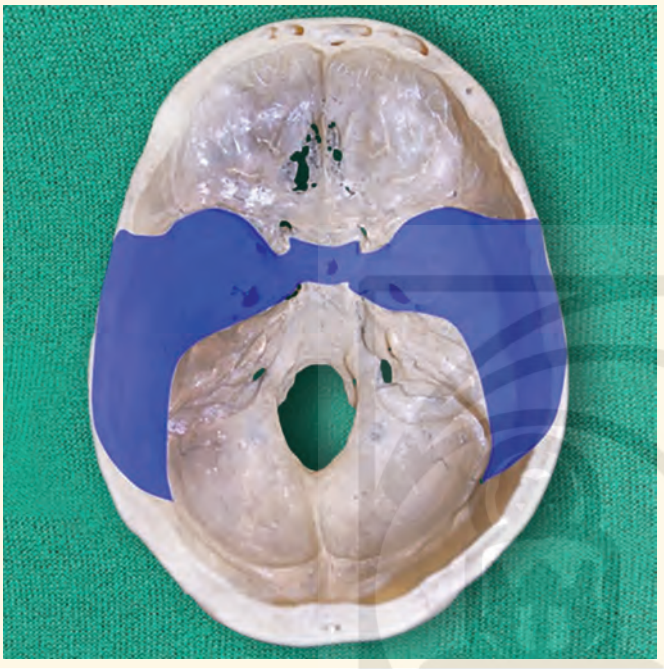
Skeletal landmarks of skull

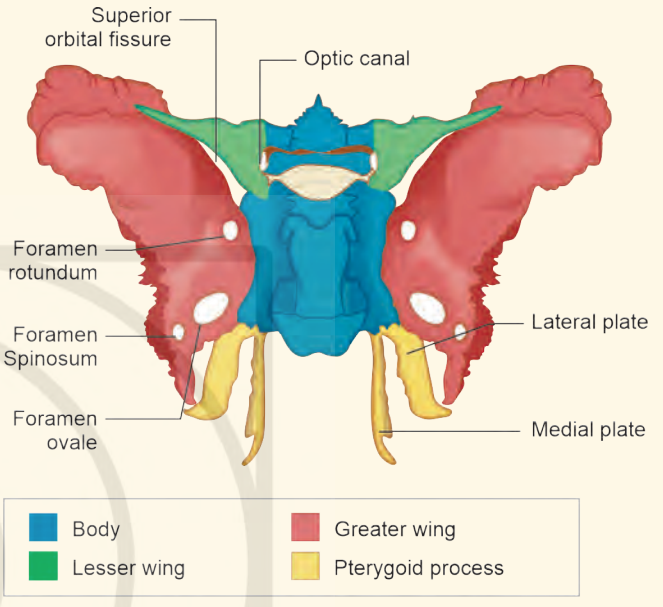
- It is a **craniometric point at the junction** of the frontal, parietal, and squamous part of the temporal bones and the great wing of the sphenoid bone.
- It is situated within a 1-cm-diameter circle centered approximately 2.6 cm posterior and 1.3 cm superior to the posterolateral margin of the zygomaticofrontal suture.

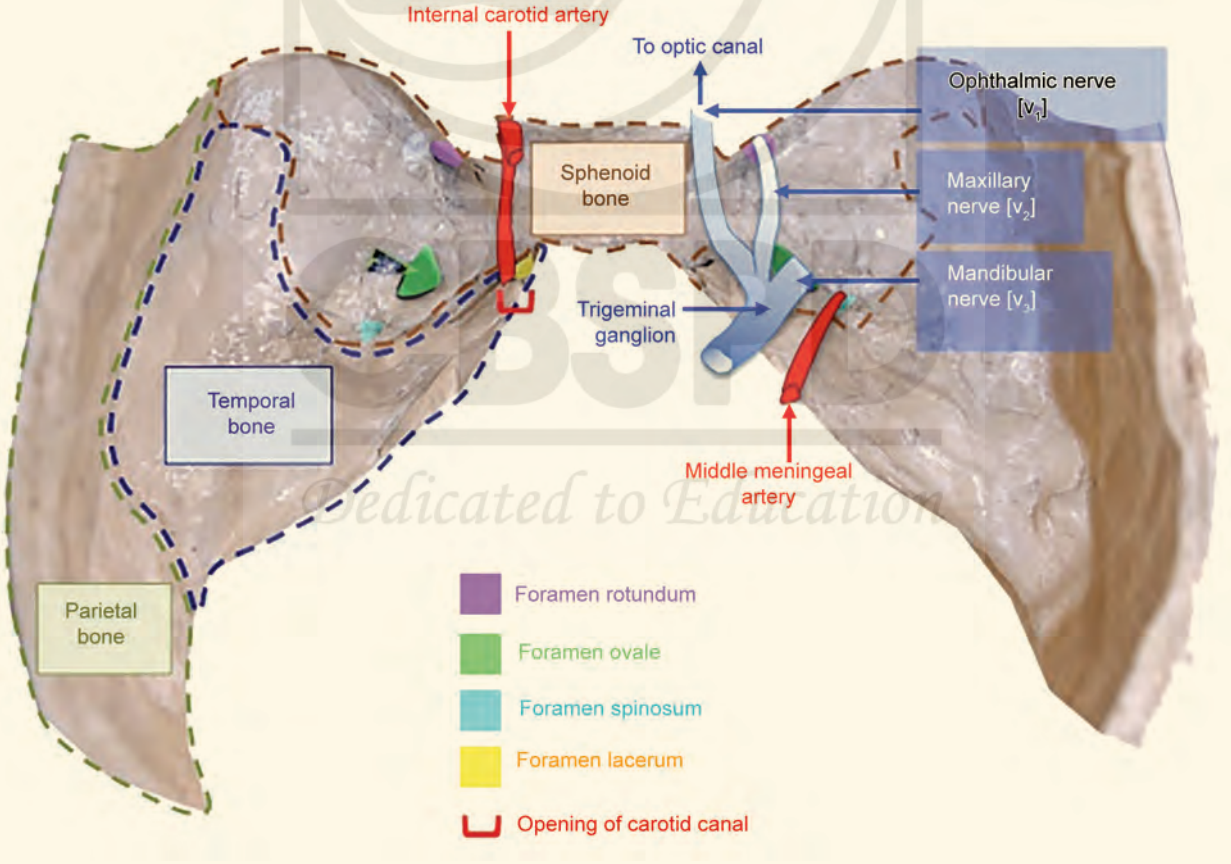
ANSWER KEY

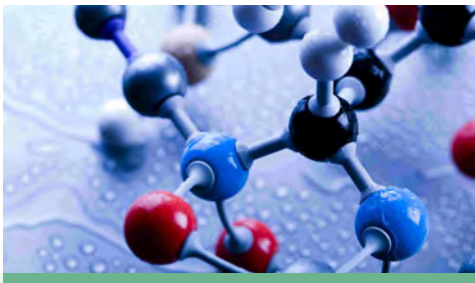
1. b

Middle Cranial Fossa









BIOCHEMISTRY

3

1. Which of the following tests can be used for the appropriate detection of aneuploidy?

1. Fluorescence In Situ Hybridization
2. Conventional karyotyping
3. Polymerase Chain Reaction (PCR)
4. Sanger sequencing

a. 1, 2 and 4 only b. 1, 3 and 4 only
c. 1 and 2 only d. 1 and 4 only

Ref: Harper's Illustrated Biochemistry 32nd Ed; Page no. 449–454

Explanation: Conventional Polymerase Chain Reaction (PCR) cannot be considered an appropriate method for detecting aneuploidy. **Quantitative Fluorescent PCR (QF-PCR)** or **Real-Time PCR (RT-PCR)** are the preferred methods for detecting chromosomal aneuploidy; therefore, it will not be the answer.

Similarly, **simple Sanger sequencing** cannot detect aneuploidy unless massive parallel sequencing is performed; hence, it will not be the answer.

Methods for Detection of Chromosomal Aneuploidy

- Conventional Karyotyping
- Fluorescence In Situ Hybridization (FISH)
- Quantitative Fluorescent-Polymerase Chain Reaction (QF-PCR) or Real-Time PCR
- Multiplex ligation-dependent probe Amplification (MLPA)

All these methods avoid the generation of cultured cells and can rapidly detect (within 1 or 2 days) the aneuploidy).

Note

Microarray cannot detect aneuploidy.

Quick Revision

Mutation detection techniques (molecular cytogenetics)	Method to detect genomic imprinting	Nucleic acid amplification techniques
• Polymerase Chain Reaction (PCR) and its versions • Ligase Chain Reaction (LCR) • Multiplex Ligation-dependent Probe Amplification (MLPA)	• Na bisulfite method: detects DNA methylation. • ChIP: Chromatin Immuno Precipitation- it detects post translational modifications of histones	• PCR (in vitro) • Branched DNA (bDNA) Signal Amplification. • LCR • MLPA • Nucleic Acid Sequence-based Amplification (NASBA)

Contd...

Mutation detection techniques (molecular cytogenetics)	Methods to detect genomic imprinting	Nucleic acid amplification techniques
• Restriction Fragment Length Polymorphism (RFLP) • Blotting • Conventional Karyotyping • Fluorescence In Situ Hybridization (FISH) • Microarray	• ChIP is used together with its large-scale variants ChIP-on-chip and ChIP-Seq • Fluorescence in situ hybridization • Methylation-sensitive restriction enzymes • PCR • Microarray	• DNA cloning/ Recombinant DNA technology (cell-based in vivo technique)

2. Which of the following is ammonia donor to sodium benzoate, used in the treatment of urea cycle disorders?

a. Glutamate b. Arginine
c. Aspartate d. Glycine

Ref: Harper's Illustrated Biochemistry 32nd Ed; Page no. 286-288

Explanation: Sodium benzoate combined with glycine to form hippuric acid (benzoyl glycine), which is excreted by the kidney and lowers the ammonia level.

Treatment of Urea Cycle Disorders

In **all urea cycle disorders, there is an accumulation of NH_3** (hyperammonemia), which is very toxic and has to be removed.

- **1st line treatment**: **Arginine**
  - It is an essential amino acid.
  - It provides ornithine (required in 2nd step of the urea cycle) which is an activator of N-Acetyl Glumates.
  - But it is contraindicated in Arginase deficiency.
- **Acylation therapy** or **using Scavenging agents:** One of the treatments for urea cycle disorder is the use of NH_3 scavenging agents. These are
  - **Phenylbutyrate**
    - Ammonia is toxic to CNS; because it reacts with α-ketoglutarate to form glutamate. Glutamate is derived from α-ketoglutarate by the addition of NH_4^+ via the glutamate dehydrogenase

ANSWER KEY

1. c **2.** d

6. Enzymes used in recombinant DNA technology are:

1. Isomerase
2. Phosphatase
3. Terminal transferase
4. CRISPR Cas9

a. 1, 2, 3 and 4
b. 1, 2 and 3 only
c. 2, 3 and 4 only
d. 1, 3 and 4 only

Ref: Harper's Illustrated Biochemistry 32nd Ed; Page no. 446

Explanation:

Enzymes Used in Recombinant DNA Research

Enzymes	Use
Phosphatases	Removal of 5'-PO_4 groups prior to kinase labeling; also used to prevent self-ligation
DNA ligase	Joining of DNA molecules
DNA polymerase I	Synthesis of double-stranded cDNA; nick translation; generation of blunt ends from sticky ends
Thermostable DNA polymerases	Polymerase chain reaction (DNA synthesis)
DNAse I	Nick translation; mapping of hypersensitive sites; mapping protein-DNA interactions
Exonuclease III	DNA sequencing; Chip-exo, mapping of DNA-protein interactions
λ Exonuclease	DNA sequencing, mapping of DNA-protein interactions
Polynucleotide kinase	^{32}P end-labeling of DNA or RNA
Reverse transcriptase	Synthesis of cDNA from mRNA; RNA (5' end) mapping studies
RNAse H	Synthesis of cDNA from mRNA
S1 nuclease	Removal of "hairpin" in the synthesis of cDNA; RNA mapping studies (both 5' and 3' ends)
Terminal transferase	Homopolymer tailing
Recombinases (CRE, INT, FLP)	Generation of specific chimeric DNA molecules works both in vitro and in vivo
CRISPR Cs9/C2c2	Genome editing, and with variations, modulation of gene expression at DNA and RNA levels

Important points on CRISPR - CAS9 System

CRISPR - CAS9 System

- Simple, cheap, genome editing tool
- CRISPR and Cas endonuclease act together to degrade the target DNA
- CRISPR—Clustered Regularly Interspersed Short Palindromic Repeats
- Cas9 → CRISPR-associated endonuclease enzyme. This is like an immune system in bacteria, which can destroy bacteriophage DNA.
- It is transmitted to the progeny.

Uses:

Has been adapted to be used in eukaryotes for various things such as, double strand breaks (gene deletion), single strand breaks, to know the function of a gene, multigene editing, gene additions (at exactly the place where we want), altering gene transcription and regulation, insertion of exogenous gene and create SNPs. This system can be used in eukaryotes for double strand or single strand breaks, knock in, knock-out, to assess gene function, altering gene regulation, create SNPs, etc.

Advantages over older techniques of DNA breaks:

- Cheap, simple, rapid, more accessible, highly efficient, and can target a specific gene.
- Guide RNA- (gRNA) brings Cas9 endonuclease near specific target DNA, which can be cut.

ANSWER KEY

6. c

PHARMACOLOGY

4

1. Which of the following drugs binds to CD4 receptor and acts on both CXCR4 and CCR5 in tropic HIV infections?

a. Maraviroc
b. Ibalizumab
c. Dolutegravir
d. Elvitegravir

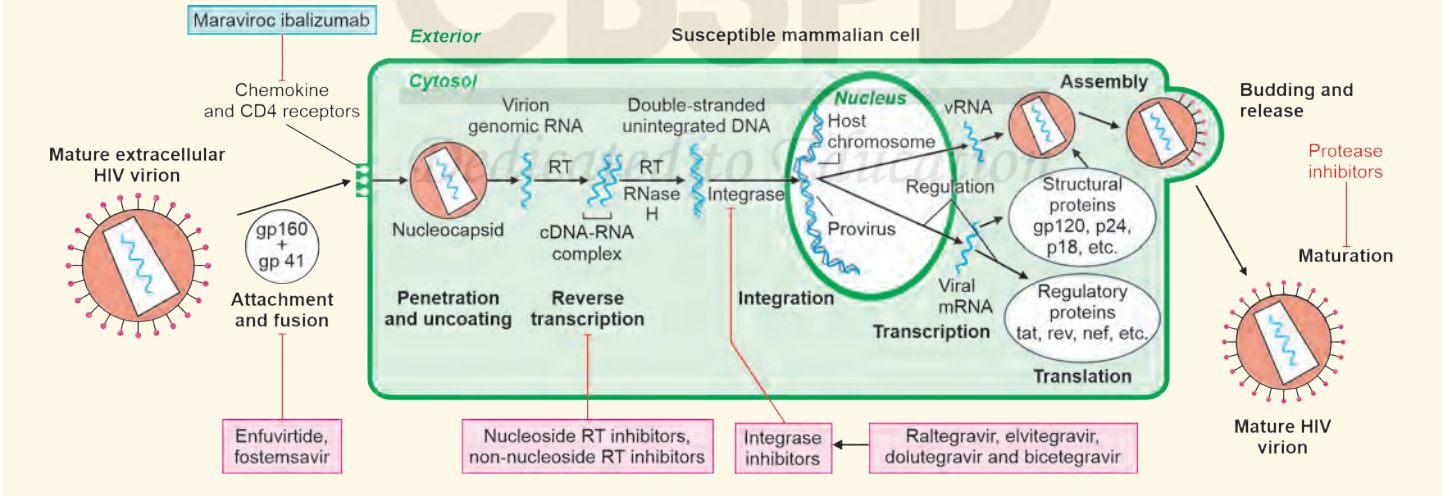
Ref: Goodman & Gilman's: The Pharmacological Basis of Therapeutics, 14th Ed; Page no. 1258

Explanation:

- **Ibalizumab** is an antibody that binds to the CD4 extracellular domain 2, causing steric hindrance of a conformational change in the gp120-CD4 complex necessary for HIV fusion and entry. It is approved for treatment of **multidrug-resistant HIV-1.** The drug is given as an **intravenous infusion** in **every 2 weeks**.
- **Maraviroc** is a **CCR-5 receptor inhibitors,** it blocks the binding of the HIV outer envelope protein gp120 to the CCR5 chemokine co-receptor. Maraviroc is approved for use in HIV-infected adults who have baseline evidence of predominantly CCR5-tropic virus. The drug has **no activity against** viruses that are **CXCR4-tropic** or **dual-tropic**.
- **Dolutegravir** and Elvitegravir are an **integrase inhibitors**; they block the catalytic activity of the HIV-encoded integrase of HIV-1 and HIV-2, preventing integration of viral DNA into the host chromosome. **Dolutegravir** is approved for use in HIV-infected adults and children older than 4 weeks of age and weighing at least 3 kg. **Elvitegravir** is approved for use in HIV-infected adults and children >12 years of age.

Entry Inhibitors

CD-4 Receptor inhibitor	CCR-5 Receptor inhibitor
• **Enfuvirtide,** a **fusion inhibitor,** was synthesized as a subcutaneous vaccine against glycoprotein 41 of virus. The vaccine misfired and rather inhibited CD-4 receptor, the target of glycoprotein 41. Hence, it is used for treatment of HIV now. Enfuvirtide is a parenteral drug used in HIV used by subcutaneous route. It can cause pain on injection. • **Ibalizumab:** It is anti-**CD-4 monoclonal antibody,** recently approved for treatment of **multi drug resistant HIV**. It binds to the CD4 extracellular domain 2, causing steric hindrance of a conformational change in the **gp120-CD4 complex necessary for HIV fusion and entry**. The drug is given as an **intravenous infusion** in every **2 weeks**.	• The drugs in this class are **maraviroc, vicriviroc and cenicriviroc**. • These drugs along with enfuvirtide are used as add-on drugs for treatment of HIV. These drugs are more effective early in the disease due to CCR-5 tropism by virus, whereas as disease progresses, virus uses CXCR-4 for entry. • Side effects associated are cough, fever, rash, dizziness and abdominal pain; these are **least with maraviroc.**



Replicative cycle of HIV-1 showing the sites of action of available antiretroviral agents
Available antiretroviral agents are shown in red. In this figure, gp 120 + gp 41 indicates extracellular and intracellular domains, respectively, of envelope glycoprotein.

ANSWER KEY

1. b

class **bococizumab** was stopped due to lesser efficacy than the current approved ones.

- **PCSK-9 (Proprotein Convertase Subtilisin Kexin-9)** binds to LDL receptors and mediate their degradation. Hence, these drugs by inhibiting PCSK-9 inhibit LDL receptor degradation, thereby increasing LDL receptors and **decreasing plasma LDL**.
- These are approved as an **add-on therapy** to statins in patients of familial hypercholesterolemia and **atherosclerotic cardiovascular disease (ASCVD)** and patients with **LDL-C levels ≥190 mg/dL**.
- Route of administration is by subcutaneous route every 2–4 weeks.
- Side effects associated are injection site reactions, nasopharyngitis and influenza.

Gemfibrozil

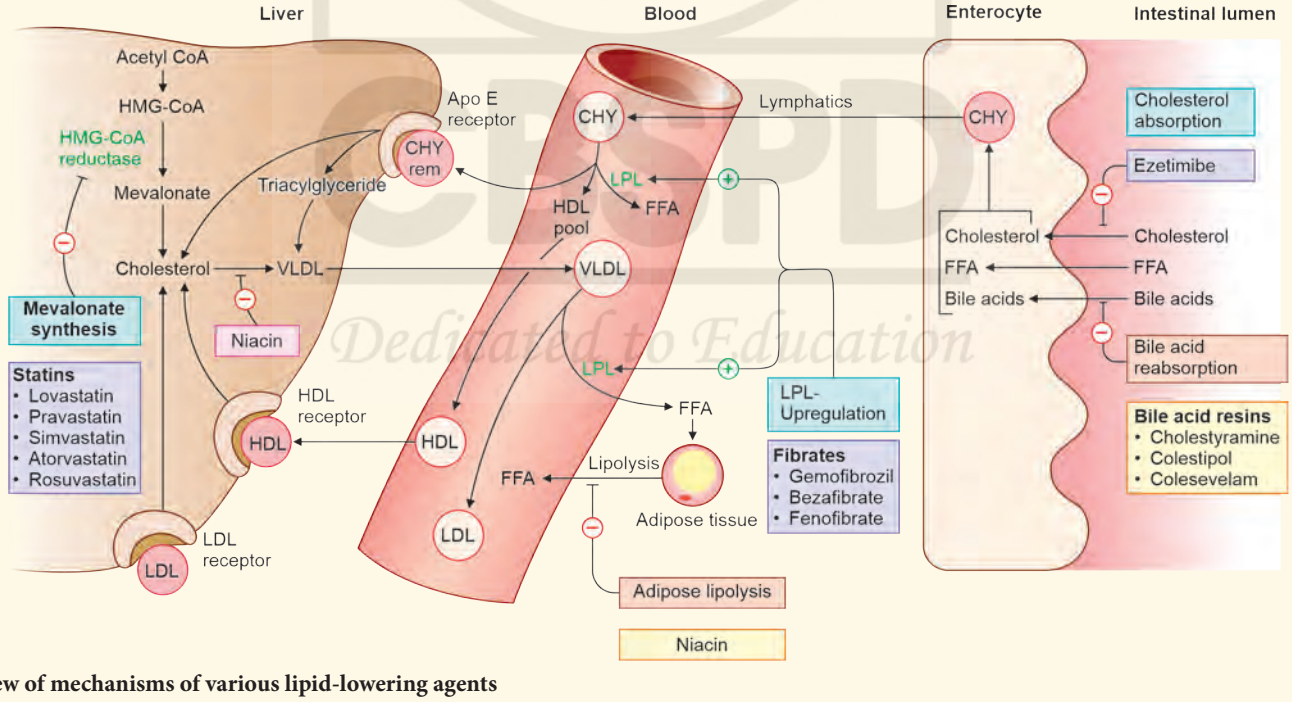
Gemfibrozil is a **Fibric Acid Derivative**. Fibric acid derivatives stimulate **PPAR-α** and **increase lipoprotein lipase (LPL) synthesis**. An increase in LPL in the capillary endothelial cell **decreases plasma triglycerides**, chylomicrons and VLDL. There is also an increase in both HDL and LDL (maximum with gemfibrozil). So, this drug is contraindicated in this case.

Fibric Acid Derivatives

- Clofibrate, fenofibrate, bezafibrate, ciprofibrate and **gemfibrozil** are the drugs in this class, which are the drugs of choice for **treatment of hypertriglyceridemia** (**fasting triglyceride >500 mg/dL**), **chylomicronemia syndrome and type III hyperlipoproteinemia.** They are usually taken 30 minutes before food as **food increases their absorption**.
- **Fenofibrate** can also decrease serum uric acid levels and hence, can be used for treatment of gout if associated with hypertriglyceridemia.
- Fibrates can themselves cause myopathy (except bezafibrate) and can increase statin-induced myopathy as well and hence, should not be combined. Fibrates competitively inhibit glucuronidation of statins and increase their plasma levels. The effect on glucuronidation is maximum with gemfibrozil and minimum with fenofibrate. Choledocholithiasis can be seen, which is maximum with clofibrate.
- Fibrates are excreted by kidney and hence are contraindicated in renal failure.

Effects of Hypolipidemic Drugs in Lipid Profile

Hypolipidemic drugs	Examples	LDL	HDL	TGS
HMG-CoA reductase Inhibitors ("statins")	Lovastatin, pravastatin, simvastatin, atorvastatin	↓↓↓	↑	↓
Bile acid binding resins	Cholestyramine, colestipol	↓↓	----	↑
Niacin	Nicotinic acid, vitamin B_3	↓↓	↑↑	↓
Fibric acid derivatives (Fibrates)	Gemfibrozil, fenofibrate, clofibrate	---	↑	↓↓↓
Cholesterol absorption inhibitors	Ezetimibe	↓↓	–	–
Anti-PCSK-9 monoclonal Antibodies	Evolocumab Alirocumab	↓↓	--	----



Overview of mechanisms of various lipid-lowering agents

CHY-rem, chylomicron remnant; FFA, free fatty acid; HDL, high-density lipoprotein; HMG-CoA, 3-hydroxy-3-methylglutaryl coenzyme A; LDL, low-density lipoprotein; VLDL, very low-density lipoprotein.

PATHOLOGY

5

1. Epithelial to mesenchymal transition is mediated by which of the following transcription factors?

a. HNF1-α
b. Snail and twist
c. TTF 1 and TTF 2
d. Cathepsin D and MMP9

Ref: Robbins & Cotran Pathologic Basis of Disease, 10th Ed; Page no. 307

Explanation: **Snail and twist:** Encode transcription factors that promote **epithelial-to-mesenchymal transition (EMT).**

Genes that promote epithelial-mesenchymal transitions, like twist and snail, may be important metastasis genes in epithelial tumors.

Snail

- **Family:** Zinc finger transcription factors.
- **Role:** Suppresses **E-cadherin** expression, leading to loss of cell-cell adhesion and promoting EMT.
- **Importance:** Associated with cancer progression, invasion, and metastasis.

Twist

- **Family:** Basic helix-loop-helix (bHLH) transcription factors.
- **Role:** Regulates EMT by repressing **E-cadherin** and enhancing mesenchymal markers like **vimentin**.
- **Importance:** Facilitates metastasis by enabling cells to acquire migratory and invasive properties.

Option a: HNF1-α (Hepatocyte nuclear factor 1-α) is a transcription factor that plays a critical role in the regulation of genes involved in glucose metabolism, lipid metabolism, and pancreatic β-cell function. **Features of HNF1-α inactivated adenomas:**

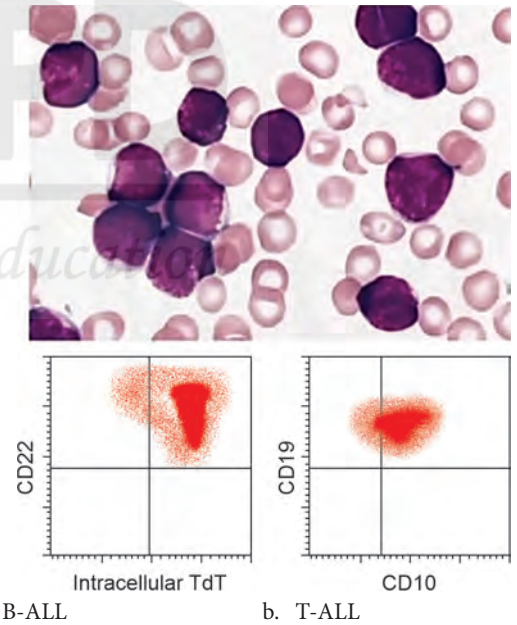
- Common in females
- Virtually **no risk of malignant** transformation
- Often associated with **OCP** use
- In individuals with **MODY3**

Option c: Thyroid transcription factor-1 (TTF-1) is a sensitive marker for pulmonary and thyroid adenocarcinomas.

Features	TTF-1 (NKX2-1)	TTF-2 (FOXE1)
Function	• A homeodomain transcription factor critical for the development and function of the **thyroid**, **lung**, and **ventral forebrain**. • Regulates genes involved in thyroid hormone synthesis (e.g., thyroglobulin, thyroid peroxidase).	• A forkhead transcription factor essential for thyroid gland development and migration. • Regulates genes involved in thyroid morphogenesis and hormone synthesis.
Clinical relevance	• **Diagnostic marker:** Commonly used as a marker in immunohistochemistry to identify **thyroid carcinoma** and **lung adenocarcinoma**. • **Mutations:** Associated with congenital hypothyroidism, lung developmental disorders, and brain malformations.	• **Mutations:** Associated with **Bamforth-Lazarus syndrome**, characterized by congenital hypothyroidism, cleft palate, and spiky hair. • Plays a role in the differentiation of thyroid follicular cells.

Option d: Degradation of ECM (basement membrane) is carried out by **matrix metalloproteinases (MMP)** type 2 and 9 also known as Type IV collagenase, **cathepsin D,** and urokinase plasminogen activator.

2. A 5-year-old boy is brought to the pediatric clinic by his parents due to bleeding gums and easy bruising over the past two weeks. Bone marrow biopsy and flow cytometry were done. What will be the likely diagnosis?



a. B-ALL
b. T-ALL
c. AML
d. CLL

Ref: Robbins & Cotran Pathologic Basis of Disease, 10th Ed; Page no. 596

ANSWER KEY

1. b **2.** a

Contd...

MICROBIOLOGY AND PARASITOLOGY

6

1. Match the causative organisms with their respective diseases.

Causative organism	Disease
A. *Klebsiella granulomatous*	1. Rat bite fever
B. *Bartonella bacilliformis*	2. Donovanosis
C. *Treponema carateum*	3. Oroya fever
D. *Streptobacillus monoliformis*	4. Pinta

a. A-3, B-2, C-4, D-3 b. A-2, B-3, C-4, D-1
c. A-2, B-3, C-1, D-4 d. A-4, B-1, C-2, D-3

Ref: Ananthanarayan and Paniker's Textbook of Microbiology 10th Ed; Page no. 384, 404-405, 419,

Explanation:

Klebsiella Granulomatous

- Earlier known as Calymmatobacterium granulomatis.
- Gram-negative rod, safety pin appearance
- It causes venereal or sexually transmitted disease (STD) named as ***donovanosis or granuloma inguinale.***
- **Lab diagnosis:** Demonstration of **donovan bodies** in Giemsa stain from lesion in the genital area.
- DOC: Tetracycline

Bartonella Bacilliformis

- *Bartonella bacilliformis* is the only species in the Bartonella genus that invades erythrocytes.
- It is a Gram-negative facultative intracellular bacterium that causes **Carrion's disease**, a biphasic illness endemic to certain regions of South America, particularly in high-altitude areas of Peru, Colombia, and Ecuador.
- It is spread by sandflies (Lutzomyia spp.).
- Causes:

Acute phase (Oroya fever)	Chronic phase (Verruga peruana)
• High fever, malaise, severe headache, muscle pain, and abdominal pain. • Acute **hemolytic anemia** due to massive invasion of erythrocytes by the bacteria. • **Treatment: Ciprofloxacin, chloramphenicol**, or **ceftriaxone**.	• Characterized by **vascular skin lesions** that appear as nodules, papules, or miliary lesions (commonly referred to as Peruvian warts). • Lesions are highly vascularized and may bleed easily. • **Treatment: Azithromycin** or **rifampin** is effective in treating skin lesions.

Treponema Carateum

- The causative agent for **Pinta** (carate or mal del pinto) is ***Treponema carateum.***
- The primary lesion is a papule which does not ulcerate but develops into lichenoid or psoriaform patch.
- It affects only skin. Secondary skin lesions are characterized by hypo or hyperpigmentation.

Pathogenic Spirochetes

Organisms	Disease caused
Treponema pallidum (Venereal)	Syphilis
Treponema endemicum (Non-venereal)	Bejel
Treponema pertenue (Non-venereal)	Yaws
Treponema carateum (Non-venereal)	Pinta
Borrelia burgdorferi	Lyme's disease
Borrelia recurrentis	Relapsing fever
Borrelia vincenti	Vincent angina
Leptospira interrogans	Weil's disease

Streptobacillus

Streptobacillary rat bite fever	Spirillary rat bite fever
• Causative agent: ***Streptobacillus monoliformis*** • Also called Haverhill fever • Gram negative, highly pleomorphic, nonmotile • Cultivable by artificial media	• Causative agent: *Spirillum minus* • Known as Sudoku • Gram negative, spirally coiled, motile • Non-cultivable

Quick Revision

Fever causing organisms

Fever	Organism
Shanghai fever	Pseudomonas
Undulant/Malta fever	Brucella
Brazilian purpuric fever	Haemophilus aegyptius
Haverhill/Rat bite fever	Streptobacillus moniliformis
Sodoku	Spirillum minus
Cat scratch disease	Bartonella henselae
Oroya fever/Carrion's disease	Bartonella bacilliformis
Goal fever/Epidemic typhus	Rickettsia prowazekii
Weil's disease	Leptospira

ANSWER KEY

1. b

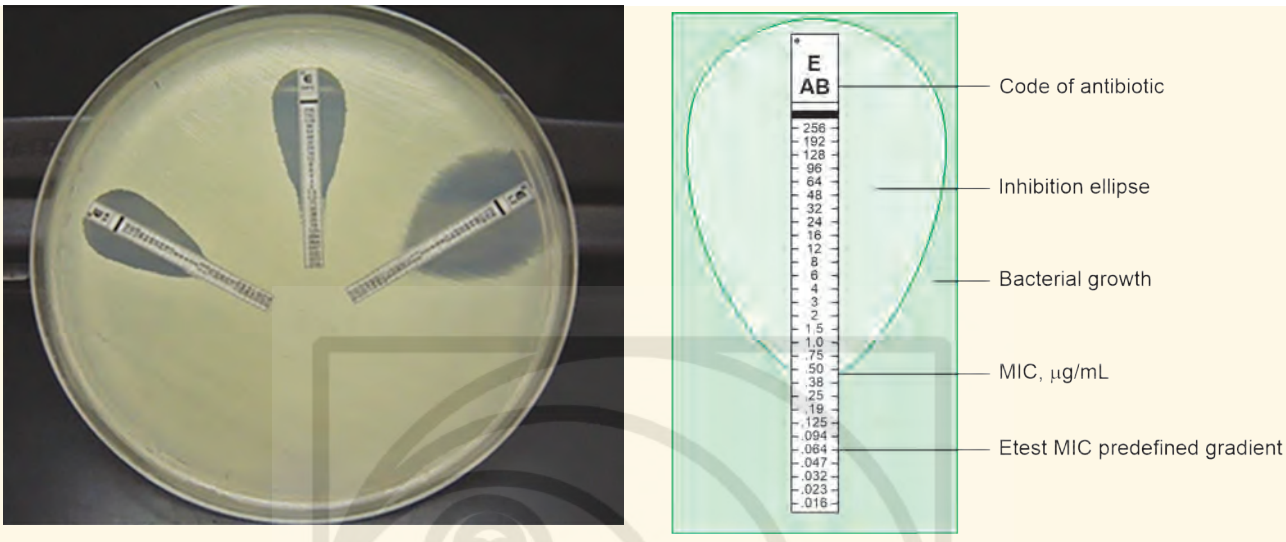


Figure: A. Image of the test setup. The applied antibiotic concentration on the strip depends on the type of antibiotic and can vary between 0.016–256 µg/mL or 0.002–32 µg/mL. B. Schematic representation of the E-test inhibition zone, indicating the MIC at 0.75 µm/mL.

MIC test:

- Detects the minimum inhibitory concentration of antimicrobial at which the organism is killed.
- Is divided into agar dilution method and broth dilution method.

Good to Remember

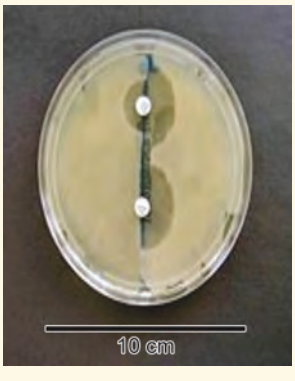
Automated systems that can detect susceptibility:

- VITEK
- MGIT
- Molecular method: PCR helps to detect the resistance genes

Kirby Bauer method

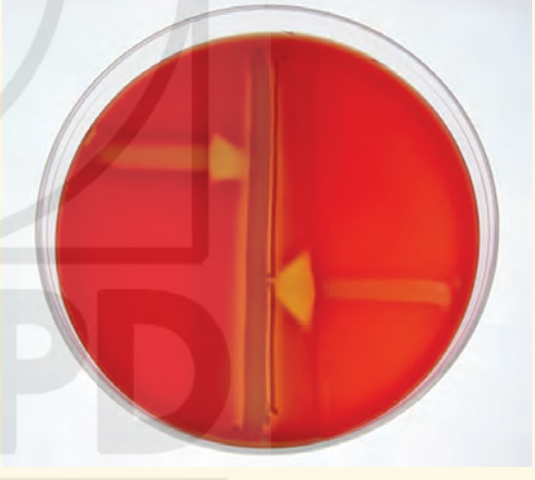
- It is the conventional method; antibiotic disks are kept at equal distance in a lawn culture of bacterium in MHA zone of inhibition is measured.
- Only five drugs need to be kept in 100 mm plate.
- Equal spacing should be given
- Zone of inhibition is to be measured after full incubation period.
- The interpretative guideline is by Clinical Laboratory Standards Institute (CLSI).

Stokes method



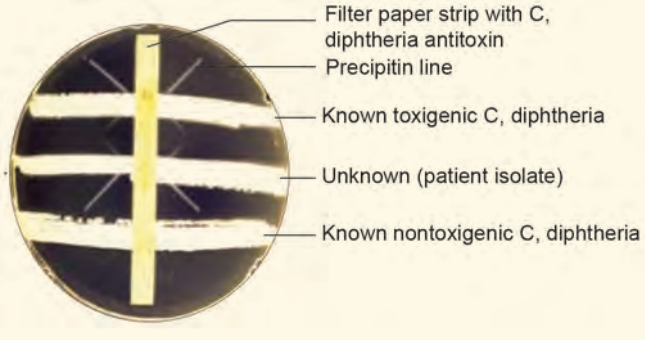
- Mueller-Hinton agar (MHA) is divided into three parts.
- Test organism was inoculated on the central one third and control strain on upper and lower thirds of the plate

Option a: CAMP test (Christie–Atkins–Munch-Peterson)



- CAMP test (Christie–Atkins–Munch-Peterson) is a test to identify group B β-hemolytic streptococci (*Streptococcus agalactiae*).
- This is demonstrated by an accentuated arrow head zone of hemolysis when *S. agalactiae* is inoculated perpendicular to a streak of *Staph. aureus* grown on blood agar.

Option c: Elek's gel precipitation



- Elek's gel precipitation test is done for demonstrating the toxicity of *C. diphtheriae.*
- It is an in vitro test to demonstrate toxigenicity.

PREVENTIVE AND SOCIAL MEDICINE

8

1. Arrange in sequence of experimental study:

1. Randomization
2. Blinding
3. Define Inclusion and Exclusion Criteria
4. Statistical analysis

a. 3 →1→2→4 b. 4→3→2→1
c. 3→2→1→4 d. 1→2→3→4

Ref: Park's Textbook of Preventive and Social Medicine 27th Ed; Page no. 90

Explanation: Define Inclusion and Exclusion Criteria : Before beginning the study, the population must be clearly defined to include those eligible for participation and exclude those who are not.

Blinding: After defining the population, blinding is planned to reduce bias during the intervention and outcome assessment.

Blinding is a technique to ensure that the outcome is assessed objectively. It takes care of subject variation, observer bias and evaluation bias. It can be single-blind or double-blind, depending on the study design.

- **Single-blind study:** The participant is not aware whether he belongs to the study group or control group.
- **Double-blind study**: Neither investigator nor participant is aware of group allocation and treatment received.
- **Triple-blind study:** The participant, investigator and the person analyzing the data are all "blind".

Must Know

The most ideal blinding technique is Triple blinding and the **most frequently used method** is double blinding.

Randomization: Subjects are randomized to ensure that the intervention and control groups are comparable and to eliminate selection bias.

Randomization Ensures

- Investigator has no control over the allocation of participants to study or control group, thus eliminating "selection bias".
- Comparability of two groups for demographic, behavioral, genetic characteristics, etc., except for exposure status.
- Equal distribution of known covariates (like **Matching**) and unknown covariates or confounders (not possible by **Matching**).
- Randomization increases the internal validity of a trial. External validity or generalizability is concerned with the clinical usefulness of the results.

Must Know

If the internal validity is rotten, there can be no meaningful external validity.

Statistical analysis: After collecting the data, appropriate statistical methods are applied to analyze the results and draw conclusions. This sequence ensures the study is scientifically rigorous and minimizes biases.

2. Which of the following is the best study in the hierarchy of evidence?

a. Cohort studies b. Case-control studies
c. RCT d. Meta-analysis

Ref: Basic epidemiology, 2nd Ed; Bonita and Beaglehole Page no. 95

Explanation: **Meta-analysis** is a statistical synthesis of data from separate but similar (comparable) studies (particularly RCT), leading to a quantifiable summary of the pooled results.

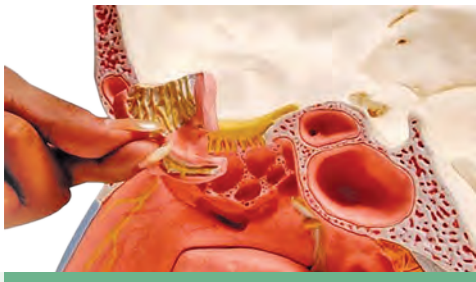
- No new data is collected; it combines the results of several trials.
- It is a retrospective research, subject to the methodological deficiencies of each included study.
- **Quorom** is the acronym used for the Quality of Reporting of Meta-analyses.
- **Prisma (Preferred reporting items for systematic reviews and meta-analyses):** These are predefined sets of items to assess systematic reviews and meta-analyses to assess the final effect of the intervention.
- **Cochrane:** As its core is the collection of Cochrane Reviews, a database of systematic reviews and meta-analyses which summarize and interpret the results of medical research.
- Steps in meta-analysis include:
  1. Formulating the problem and study design.
  2. Identifying relevant studies.
  3. Excluding poorly conducted studies or those with major methodological flaws.
  4. Measuring, combining and interpreting the results.
- It allows comparisons to be made between studies even if they used different measures of outcome.
- Advantage: No ethical issues, low cost

Purposes of Meta-analysis

- To summarize a large and complex body of literature on a topic.
- To resolve conflicting reports in the literature.
- To clarify or quantify the strengths and weaknesses of studies on a topic.
- To document the need for a major clinical trial.
- To avoid the time and expense of conducting a clinical trial.
- To make comparisons of interventions more objective and accurate.
- To identify areas in which insufficient research has been performed or additional research may not be necessary.
- To increase statistical power by combining many smaller studies.
- To improve the precision of an estimated treatment effect.
- To detect smaller treatment effects than have been reported.
- To investigate variations in treatment effects through subgroup (or stratified) analysis.
- To improve the generalizability of known treatment effects.

ANSWER KEY

1. c **2.** d



ENT

13

1. What causes maximum hearing loss?

a. Serous Otitis media
b. Partial fixation of footplate of stapes
c. Ossicular discontinuity with intact tympanic membrane
d. Ossicular discontinuity with tympanic membrane disruption

Ref: Diseases of Ear, Nose & Throat and Head & Neck Surgery by PL Dhingra 8th Ed; Page no. 34-35

Explanation:

Option a: Serous otitis media: This condition typically results in a **30–40 dB** conductive hearing loss due to fluid accumulation in the middle ear that impedes sound transmission.

Option b: Partial fixation of the footplate of the stapes: Partial fixation causes **30–40 dB** conductive hearing loss. In contrast, **complete fixation** can result in a maximum conductive hearing loss of **60 dB**.

Option d: Ossicular discontinuity with tympanic membrane disruption: When the ossicular chain is disrupted and there is tympanic membrane (TM) perforation, some sound bypasses the ossicular chain and reaches the footplate directly, resulting in **38 dB** hearing loss.

Ossicular discontinuity with an intact tympanic membrane: This condition leads to **maximum hearing loss, approximately 54 dB**, because the ossicular chain is essential for sound transmission. The intact TM limits direct sound entry, making the hearing loss more pronounced than in cases with TM perforation. Hence, Option **c** is correct because ossicular discontinuity with an intact tympanic membrane results in the **maximum hearing loss** among the options provided.

Approximate Hearing Loss in Different Conditions of the Ear

Pathology	Approximate hearing loss
Complete obstruction of the ear canal	40 dB
Perforation of tympanic membrane	10–40 dB
Ossicular interruption with intact TM	54 dB
Ossicular interruption with perforated TM	38 dB (lesser loss than above; because some sound reaching directly to the footplate through the perforation)
Complete fixation of footplate	60 dB

Rapid Q & A

Which perforation of TM leads to maximum hearing loss?

Ans: Posterosuperior perforation as it exposes the oval and round windows at the same time leading to absence of phase difference.

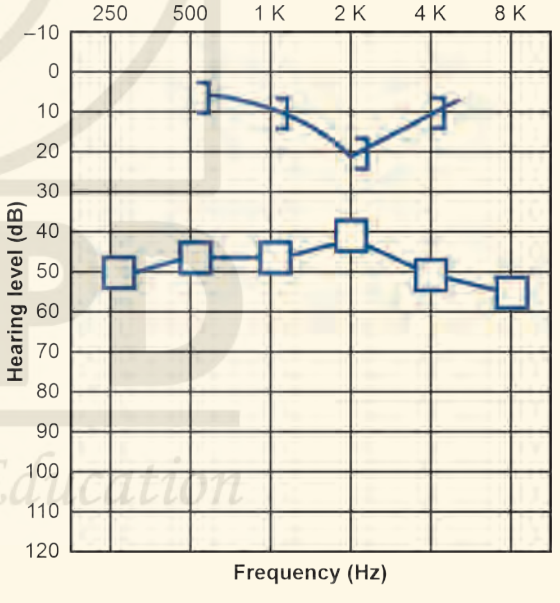
2. Carhart notch is seen in which of the following condition?

a. Otosclerosis
b. Ossicular discontinuity
c. Meniere's disease
d. Serous otitis media

Ref: Diseases of Ear, Nose & Throat and Head & Neck Surgery by PL Dhingra 8th Ed; Page no. 105

Explanation: Carhart notch is a typical dip at 2000 Hz in the bone conduction curve. This dip is because of the fixation of the footplate of stapes, the natural frequency of which is 2000 Hz. Hence, its fixation fails to transmit this frequency sound. It is seen in otosclerosis. This dip disappears after the mobilization of the footplate of stapes during the management of otosclerosis.

In Figure, the upper curve shows Carhart notch: BC threshold of approximately 5 dB, 10 dB and 15 dB at 500, 1000, and 2000 Hz respectively.



Mnemonic:

CBC; **C**arhart show dip in **B**one **C**onduction.

Pure Tone Audiometry Findings in Otosclerosis:

The audiogram of this patient shows an A-B gap >15 dB (suggestive of conductive hearing loss). Complete fixation of footplate leads to the maximum conductive hearing loss of 60 dB.

ANSWER KEY

1. c **2.** a

ORTHOPEDICS

14

1. A 45-year-old female met with an accident and was brought to trauma center and X-ray pelvis was performed and image showed intracapsular fracture of femur. What is the management in this case?

a. Open reduction and internal fixation
b. Close reduction and internal fixation
c. Hemiarthroplasty
d. Total hip arthroplasty

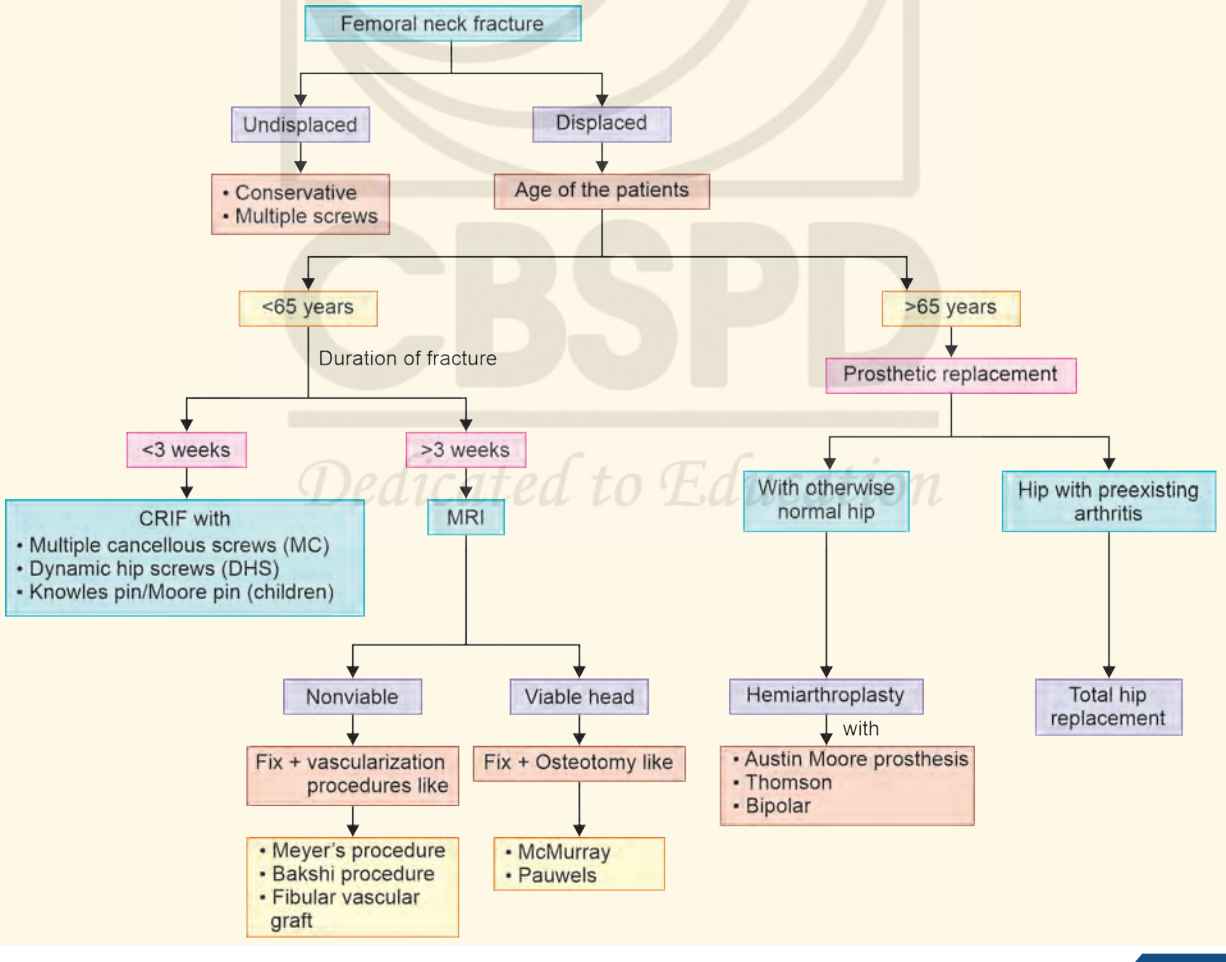
Ref: Essential Orthopaedics by J Maheshwari & Mhaskar 6th Ed; Page no. 134-135

Explanation: The treatment modality for a femoral neck fracture depends on the patient's age group and the duration since the fracture occurred. In this case, the patient is young (age <60 years) and has a displaced fracture of less than 3 weeks' duration. Therefore, the appropriate treatment is **closed reduction and internal fixation (CRIF)**.

The implants used for internal fixation include:

- Multiple cancellous screws (most commonly used).
- Dynamic hip screws.
- Multiple Knowles pins or Moore pins (primarily used in children).

Femoral Neck Fracture Management



ANSWER KEY

1. b

DERMATOLOGY

16

1. All of the following are features of psoriatic arthritis; except:

a. Presence of Diarrhea b. Enthesitis c. Dactylitis d. Nail pitting

Ref: Harrison's Principle of Internal Medicine 21st Ed; Page no. 2799

Explanation:

- Psoriatic arthritis presents as **joint involvement with a history of psoriasis.** Rheumatoid factor is absent.
- The **sacroiliac spine is involved,** as it is in all seronegative spondyloarthropathies.
- Usually asymmetric and polyarticular.
- Upper extremities are most often involved; smaller joints more common than large joints.

The following are **key features** of **psoriatic arthritis:**

- **Nail pitting**
- **Distal interphalangeal (DIP) involvement** (Remember: RA involves the proximal joint.)
- **Dactylitis** ("Sausage-shaped" digits)—occurs in > 30%
- **Enthesitis:** Inflammation of tendinous insertion sites

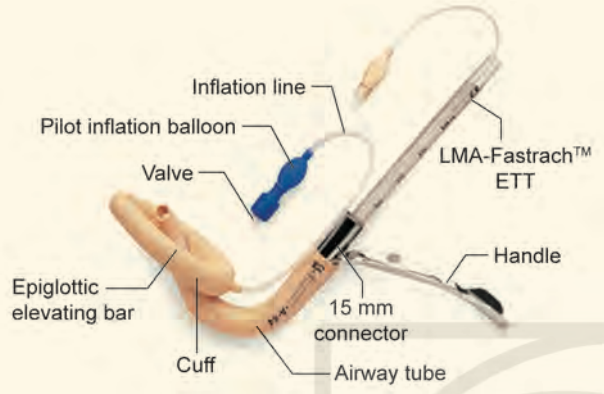
Psoriasis involvement of the nail produces pitting and yellowing, which can be mistaken for onychomycosis.

Signs and Symptoms of Psoriatic Arthritis

Dermatologic	Musculoskeletal	Neurologic
• Well-demarcated erythematous plaques with silvery scale • **Nail involvement:** Six patterns of nail involvement identified: 1. Pitting 2. Transverse or longitudinal ridging 3. Yellow discoloration of nail margins 4. Subungual hyperkeratosis 5. Onycholysis, and oil drops **Or** 6. Combination of these findings.	**5 General Patterns:** 1. Asymmetric oligoarthritis (<5 small and/or large joints affected in asymmetric distribution; most common—70%) 2. Arthritis of DIP joints with nail changes 3. Symmetric polyarthritis (similar to RA) 4. Sacroiliitis and spondylitis (usually older, male patients) 5. Arthritis mutilans (destructive and deforming small joint polyarthritis **Other Findings:** • Dactylitis • Enthesopathy • Morning stiffness >30 min (50%)	• Cauda Equina Syndrome
Cardiac and Respiratory (Late Findings)	**Radiologic**	**Ophthalmic**
Aortic insufficiency Apical lung fibrosis	• Floating syndesmophytes • Pencil-in-cup appearance at IP joints • Osteolysis, periostitis	• Conjunctivitis, iritis (anterior uveitis)

ANSWER KEY

1. a



LMA Fastrach

2nd Generation

- The **LMA ProSeal** has the addition of a channel for the suctioning of gastric contents. It also allows for 50% higher pressures without a leak. However, it does not permit blind intubation and is not currently used in the emergency setting.

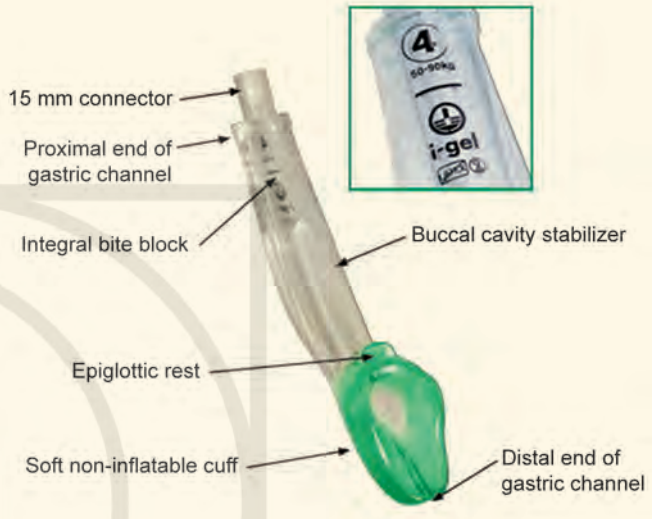
LMA ProSeal

- The **LMA Supreme,** which is a newer design, is similar to the ProSeal and has a built-in bite block.

LMA Supreme

- Another newer design is the **LMA CTrach**, which inserts like the LMA Fastrach and has built-in fiberoptics with a video screen that affords a direct view of the larynx.

- **I-gel**
  - It is an innovative supraglottic airway device with elastomer gel body, mounted on a plastic barred, with additional gastric port.



  - I-gel is made of a soft, gel-like thermoplastic elastomer that makes up the non-inflatable cuff. The cuff makes a nontraumatic tight seal over the laryngeal, pharyngeal and parapharyngeal structures. This non-inflatable cuff has a number of potential advantages, including easier insertion, minimal risk of tissue compression, and stability after insertion (i.e., no position changes with cuff inflation). It is not necessary to insert fingers into the mouth of the patient for full insertion. The smooth contiguous under the surface of the device, from the tip of the bowl and throughout the entire tube section, allows the device to easily slide along the back of the throat and securely into place.
  - Because of its simple design, the I-gel requires less technical skill than previous methods and requires little training, both initially and ongoing. Additionally, the device is only intended for single-patient use.

3. A female following an RTA injured her chest. On X-ray, there is a fracture of 3rd to 5th rib. Pain was not responsive to systemic analgesics. What would be the best next course of management?

a. Supraclavicular brachial plexus block
b. Cervical plexus block
c. Lumbar epidural block
d. Thoracic epidural block

Ref: Miller's Anesthesia 9th Ed; Page no. 2148

Explanation:

- **Thoracic epidural block** is commonly used for pain relief in rib fractures, as it helps alleviate pain without compromising respiratory function. Opioids are generally avoided because they can cause **respiratory depression**, which may worsen the respiratory difficulty already experienced by the patient due to the fracture.

ANSWER KEY

3. d

PSYCHIATRY

18

1. Match the following drugs with the conditions in which they are used.

Condition	Drugs
A. Alcohol dependence	1. Flumazenil
B. Benzodiazepines overdose	2. Acamprosate
C. Smoking cessation	3. Oxazepam
D. Delirium tremens	4. Varenicline

a. A-2, B-1, C-4, D-3 b. A-2, B-3, C-4, D-1
c. A-1, B-3, C-2, D-4 d. A-4, B-1, C-3, D-2

Ref: Kaplan and Sadock's Synopsis of Psychiatry 11th Ed; Page no. 631, 636; Kaplan and Sadock's Synopsis of Psychiatry 12th Ed; Page no. 310–311

Explanation:

Alcohol Dependence-Acamprosate

- Acamprosate**:** An NMDA receptor antagonist with modest GABA-A receptor agonistic activity; useful in maintaining abstinence and decreasing cravings of alcohol.
- Should be started postdetoxification for relapse prevention in patients who have stopped drinking.
- Major advantage is that it can be used in patients

Anticraving drugs used in alcohol deaddiction include:

- Baclofen
- Acamprosate
- Naltrexone: It is an orally active opioid antagonist.
- Newer drugs are topiramate, SSRI, and ondansetron

Deterrent Agent

- **Disulfiram** is a **deterrent agent,** not an anticraving drug. It is an irreversible **aldehyde dehydrogenase inhibitor**.
- Acetaldehyde is the first breakdown product of alcohol, which is further metabolized by aldehyde dehydrogenase. If a patient who is on disulfiram consumes alcohol, it results in toxic levels of acetaldehyde.
- This causes symptoms such as flushing, pulsating headache, nausea, vomiting, respiratory difficulties, chest pain, and autonomic manifestations, collectively termed **disulfiram ethanol reaction** (DER).
- Other deterrent agents include citrated **calcium carbamide** and **metronidazole.**

Benzodiazepines Overdose-Flumazenil

- Flumazenil is a specific and exclusive benzodiazepine antagonist. It presents and reverses in a dose-dependent name all the agonist effects of the benzodiazepine.
- Flumazenil is the first benzodiazepine antagonist approved for clinical use to reverse the effects of benzodiazepines. It is a competitive antagonist at the benzodiazepine receptor and produces antagonism that is reversible.
- Flumazenil is a very short-acting benzodiazepine antagonist used for treating benzodiazepines overdose. Use with caution when treating overdose, as it can cause seizures/status epilepticus in chronic benzodiazepine users.
- Other antidote for benzodiazepines toxicity: Consider decontamination (activated charcoal)
- Flumazenil antidote is contraindicated in combined TCA and benzodiazepine overdose.
- Flumazenil is a benzodiazepine receptor ligand which has a high affinity and specificity.
- Flumazenil is used for both diagnostic and therapeutic reversal of benzodiazepine receptor agonists.
- **Dosing schedule:** 0.3 mg IV bolus q5min x 3 doses

Smoking Cessation- Varenicline

- It is a pharmacotherapy for smoking cessation.
- **$\alpha_4\beta_4$ -partial nicotinic Ach receptor agonist**—(to reduce cravings) and partial competitive nicotinic receptor antagonist (to reduce the response to smoked nicotine)
- More effective than bupropion.
- Significant side effects may lower patient compliance
- **Doses:**
  - 0.5 mg qAM × 3 d
  - Then 0.5 mg bid × 4 d
  - Continue 1 mg bid × 12 week ± additional 12 weeks as maintenance

Delirium Tremens- Oxazepam

- Oxazepam is used for the treatment of Alcohol withdrawal symptoms and sedative-hypnotic-anxiolytic detoxification. It is not metabolized by the liver.
- The **best treatment** for delirium tremens is prevention. Patients withdrawing from alcohol **who exhibit withdrawal phenomena** should receive **benzodiazepines,** such as 25–50 mg of chlordiazepoxide every 2–4 hours until they seem to be out of danger.
- **Chlordiazepoxide** is a benzodiazepine drug used in **alcohol withdrawal** and the **detoxification** phase of management.
- Once the delirium appears, 50–100 mg of **chlordiazepoxide** should be given every 4 hours orally, or **lorazepam** should be given intravenously (IV) if oral medication is not possible.
- A **high-calorie, high-carbohydrate diet** supplemented by multivitamins is also important. Carbohydrates increase the serotonin levels similar to alcohol, lowering the rates of withdrawal seizures.

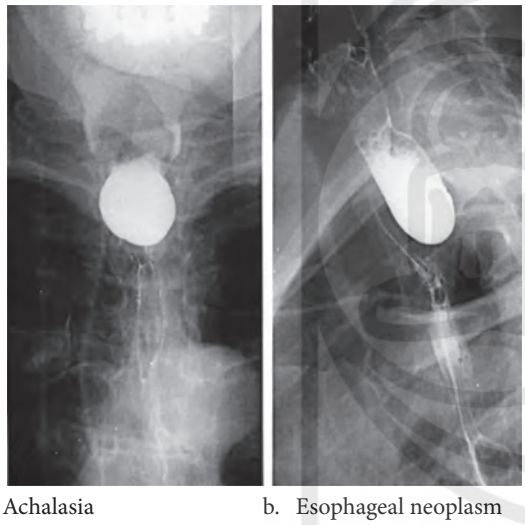
ANSWER KEY

1. a

RADIOLOGY

19

1. A 64-year-old man has bad breath and long-standing dysphagia for 7 months. The barium swallow image is shown below, what will be the diagnosis?



a. Achalasia
b. Esophageal neoplasm
c. Zenker's diverticulum
d. Diffuse esophageal spasm

Ref: Sutton's Radiology and Imaging for Medical Students 7th Ed; Page no. 547; Grainger & Allison's Diagnostic Radiology 6th Ed; Page no. 615, 624

Explanation: The above barium sallow image depicts a **posterior outpouching** from the esophagus as seen here with a history of **bad breath** and **long-standing dysphagia**-suggests **Zenker's diverticulum**. So option c is correct.

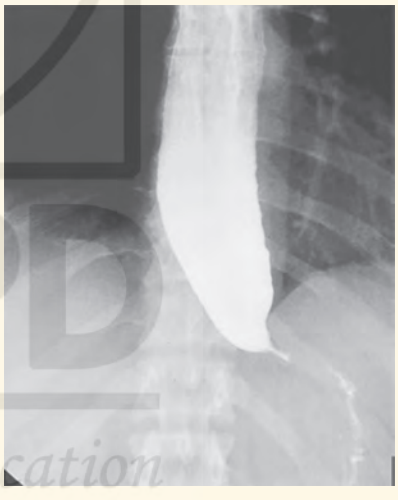
Zenker's Diverticulum

- It is a false diverticulum arising at the Killian's dehiscence above the cricopharyngeus muscle.
- Mucosal out pouchings through the triangular bare area in between upper oblique fibers. (Thyropharyngeus) and lower horizontal fibers (cricopharynx) of the inferior constrictor muscle of larynx.
- This defect is known as Killian's dehiscence.
- An anterior/anterolateral diverticulum that arises below the cricopharyngeus muscle is known as the Killian-Jamieson diverticulum.
- Due to neuromuscular incoordination between two fibers diverticulum occurs.

Other Options

Option a: Achalasia

- Associated with Chagas disease and CREST syndrome.
- Failure of dilatation of the lower esophageal sphincter along with loss of distal esophageal peristalsis.
- Secondary achalasia/pseudoachalasia obstruction of the distal esophagus due to a tumor
- **Plain radiograph:** Air-fluid level in thorax usually central in the mediastinum/retrocardiac area due to food-filled dilated esophagus.
- **Fluoroscopy with barium swallow:**
  - Bird beak sign: Smooth elongated narrowing of the dilated contrast-filled esophagus in the distal portion.
  - Pencil tip
  - Abrupt cut



Bird beak appearance

Entrance Corner

- X-ray chest-presence of mediastinal gas fluid level behind heart shadow
- X-ray abdomen: Absent fundus gas shadow
- Radiologic investigation of choice: Fluoroscopy with barium swallow
- Investigation of choice (IOC): High resolution manometry

ANSWER KEY

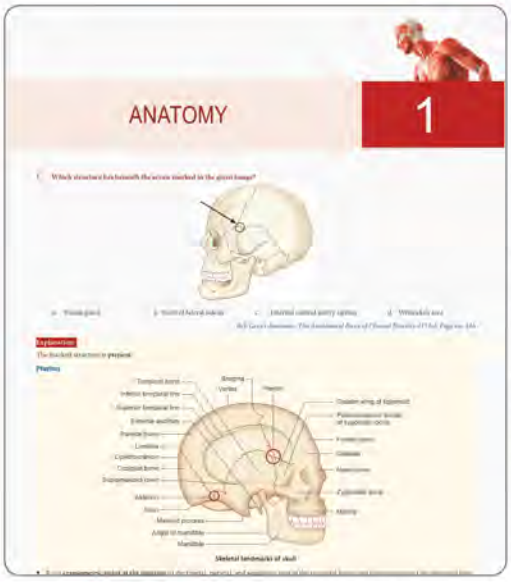
1. c

INI-CET November 2024

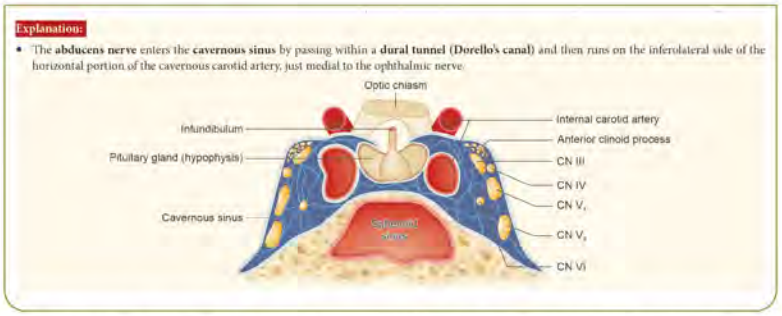
Institute of National Importance-Combined Entrance Test

SUPPLEMENT *(Recall)*

Why to refer to this Book?



Subject-wise coverage of 200 Qs of all 19 Medical Subject Specialties.

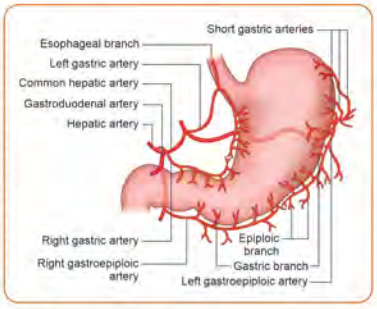


Each question and its answer is accompanied by concise Explanation to enhance the clarity of concepts.

6. **A 24-year-old athlete with a BMI of 17.5 kg/m2 presents with secondary amenorrhea and primary infertility. Her laboratory value reveals LH=0.3 IU/L, FSH=2 mIU/mL, Prolactin 20 ng/mL, and TSH: 1.2 mIU/mL. What is the underlying cause of this condition?**
   a. Primary Ovarian Insufficiency
   b. Hypogonadotropic Hypogonadism
   c. Hypogonadotropic Hypergonadism
   d. Normogonadotropic Normogonadism

Ref: Shaw's Textbook of Gynaecology 18th Ed, Page no. 208-209; William's Gynecology 3rd Ed, Page no. 381, 463

Every question is supplemented with **References** from standard textbooks for authenticity.



Good to Remember

- Meiosis II is not reduction division, because only DNA number is reduced from 2N to N.
- Polar body II (rarely formed) formed only if fertilization occurs.
- LH surge occurs usually 36 hours before ovulation.
- LH peak is associated with release of 1st polar body and occurs 12 hours before ovulation
- Sperms are viable for 48 hours inside the female genital tract and secondary oocyte in metaphase arrest waits for 24 hours. So,

Good to remember facts covered for quick glance over important points before examination.

Mnemonic:

PSaMMoma

- **P**: Papillary adenocarcinoma of the thyroid
- **P**: Prolactinoma
- **P**: Papillary Serous cystadenocarcinoma of the ovary
- **S**: Somatostatinoma
- **M**: Meningioma
- **M**: Mesothelioma

Text is supplemented with easy to recall **Mnemonic** boxes for quick memorization of the concepts.

Complications of Splenectomy

Immediate complications	Intermediate complications	Delayed complications
• Hemorrhage • Gastric distension • Hematemesis	• Most common complication overall is left lung atelectasis • Pancreatic fistula • Gastric fistula • Subphrenic abscess	• Thromboembolic manifests • OPSI • PV thrombosis

500+ Vital pedagogical aids, including **Flowcharts, Diagrams, Images and Tables** are added for easy memorization and quick revision.

Clinical Pearls

- **If the patient's pain is more severe; then diagnose with:**
  - Doppler studies looking for a pressure gradient (ankle-brachial index [ABI] <0.90)
  - Arteriogram to identify stenosis
- If the patient describes **disabling symptoms** (affects work or activities of daily living) or if there **is impending ischemia to the extremity**, then **surgery is indicated**. This involves the following:

Theory with integrated Clinical aspects covered under **Clinical Pearls** emphasizing the applied perspective.

Entrance Corner

- X-ray chest-presence of mediastinal gas fluid level behind heart shadow
- X-ray abdomen: Absent fundus gas shadow
- Radiologic investigation of choice: Fluoroscopy with barium swallow
- Investigation of choice (IOC): High resolution manometry

Key facts as one-liners Highlighted in **Entrance Corner** Boxes.

Quick Revision

- Aortoiliac obstruction causes claudication pain in both/ bilateral calf, thigh and buttocks.
- Arterial disease with aortoiliac involvement (**Leriche syndrome**) – patient presents with gluteal claudication and impotence.
- **Leriche syndrome (Aortoiliac Disease)** = Buttock claudication + Impotence
- **Iliac disease**= Buttock claudication
- **Femoral Disease** = Calf claudication

High-yield information designed for rapid review and easy recall under **Quick Revision** Boxes.

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