

PREP XI RR

STUDY NOTES

RADIOLOGY

11

VIDEOS

148

PAGES

PREMIUM STUDY MATERIAL

PREP XI RR

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1. BASICS OF RADIOLOGY

BIG QUESTION 1: What are the types of radiation used in medical imaging?

Broad Answer: Radiation used in medical imaging is either ionising (electromagnetic, like X-rays and gamma rays, or particulate like alpha and beta particles) or non-ionising (like ultrasound and MRI). Ionising radiation varies in its penetration and tissue damage potential.

DETAILED QUESTIONS

Q1.1: What are the different types of radiation used in imaging, and how are they classified?

Answer:

- Electromagnetic radiation (travels as photons):
 - o X-rays
 - o Gamma rays
- Particulate radiation:
 - o Alpha particles
 - o Beta particles
 - o Neutrons

These are collectively known as ionising radiation.

Q1.2: How do radiation types differ in penetration and tissue damage?

PYQ: AIIMS 2018

Answer:

- Damage: $\alpha > \beta > \text{X-ray} > \gamma$
- Penetration power: Neutrons $> \gamma > \text{X-ray} > \beta > \alpha$
- Decreased penetration means increased damage
- Gamma rays have the maximum penetration power
 - o Gamma rays cause minimal damage to the body
- Alpha rays have a minimum penetration
 - o They cause maximum damage to the body
 - o They are the most damaging/most ionising/maximum linear energy transfer (LET)

Q1.3: Which imaging modalities do not use ionising radiation?

Answer:

- These are non-ionising modalities
- Ultrasound (USG): Uses sound waves
 - o Used in FAST and Doppler (USG for blood flow)
- MRI: Uses radio waves
 - o MRCP

Q1.4: Which imaging modalities involve ionising radiation?

Answer:

- X-rays (non-nuclear origin): Used in radiography and CT scan (3D X-ray)
- Gamma rays (nuclear origin): Used in nuclear medicine
 - o Modalities include:
 - Scintigraphy
 - Radioisotope scan
 - PET
 - SPECT scan

Q1.5: Which contrast-based imaging techniques involve radiation, and what precautions are needed?

Answer:

- ERCP comes under contrast X-ray (dye studies) and has radiation exposure
 - o Procedure: We put an endoscope; it then goes to the duodenum and goes to the duct, and contrast is put, and X-ray images are taken
- Contrast X-ray for the kidney, ureter, and bladder is known as an Intravenous Pyelogram
- HSG (Contrast X-ray for uterus and Fallopian tubes): Hysterosalpingography
 - o LMP should be asked in a female before doing a CT to rule out pregnancy
 - o Rule of 10: Investigations that have radiation exposure should be done within ten days because it's certain that there is no ovulation/fertilisation/pregnancy during that time

BIG QUESTION 2: What are the differences in principles, technologies, and diagnostic applications among X-ray, USG, CT, MRI, and PET modalities?

Broad Answer: Radiological imaging modalities vary in their physics, construction, and clinical use. X-rays and CT use ionising radiation, USG uses sound waves, MRI uses magnetic resonance, and PET uses radioactive tracers.

DETAILED QUESTIONS

Q2.1: What are the components and advantages of a digital X-ray machine?

Answer:

- Produces digital images instantly
- Uses electronic detectors to capture the image, and the image is obtained on the screen.
- Can be accessed hospital-wide using PACS (Picture Archiving and Communication System)

Q2.2: What is the principle of X-ray imaging, and how is radiation produced?

Answer:

- Source: X-ray tube
- Electrons move from the cathode to the anode
- Anode has Tungsten, the nucleus of the anode is positively charged, and the incoming electron is negatively charged.
 - o Electrons get deflected by the anode nucleus: Brehmstrahlung radiation
 - o Characteristic radiation (characteristic of the material present in the anode)



Q2.3: What is the working principle of CT, and how does it differ from X-ray and MRI?

Answer:

- CT uses a rotating X-ray tube for multiple-angle imaging
- Slip ring technology enables continuous rotation (Spiral CT)

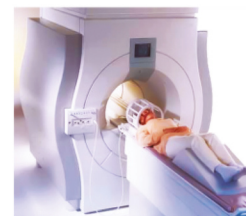
YOURWISH

- CT is faster than MRI (e.g., CT brain in 2 min vs MRI brain in 20 min)
- CT room walls are coated with lead to block radiation

Q2.4: What are the key features and contraindications of MRI?

Answer:

- Based on the gyromagnetic property of moving protons (H^+)
- Principle: NMR (Nuclear Magnetic Resonance)
- Unit to measure the strength of the magnet used in MRI: Tesla
- A tunnel is present in the MRI machine
- Contraindications:
 - o Metallic foreign body, pacemaker, cochlear/knee implants
→ MRI-compatible implants are available
 - o Claustrophobia (can use sedation)
- The MRI room is lined with a Faraday cage
 - o To prevent the disturbance from the outside radio waves from interfering with the MRI waves
- Now, MRI-compatible implants are available



Q2.5: How does ultrasound (USG) work, and what is its key component?

PYQ: INICET 2021

Answer:

- Principle: Piezoelectric effect
- In the probe, electricity is converted into sound by a crystal, which sends the sound into the patient's body, where it returns and is converted back into electricity.
- Probe crystal: Lead Zirconium Titanate
- It uses sound waves of a frequency that is outside the human audible frequency range (MHZ)



Q2.6: What is the principle of a PET scan, and what tracer is commonly used?

Answer:

- PET: Positron Emission Tomography
- Principle: Annihilation coincidence circuit
- Common tracer: ^{18}F -FDG

Q2.7: How are black and white interpreted in different imaging modalities?

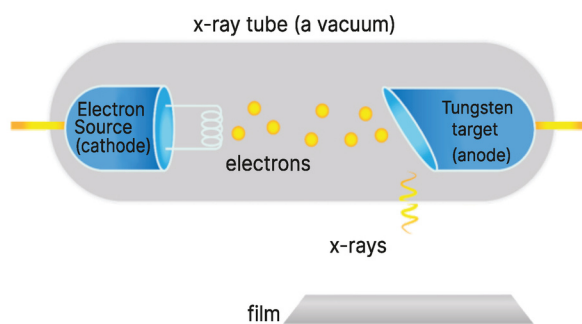
PYQ: FMGE 2019

Answer:

	Black	White
X-ray	Radiolucent - air	Radiopaque - bones
CT	Hypodense	Hyperdense - bones, calcifications and acute hemorrhage
MRI	Hypointense	Hyperintense
Ultrasound	Hypoechoic Anechoic- clear fluid (Bile)	Hyperechoic

BIG QUESTION 3: What are the construction features and diagnostic applications of X-ray tubes?

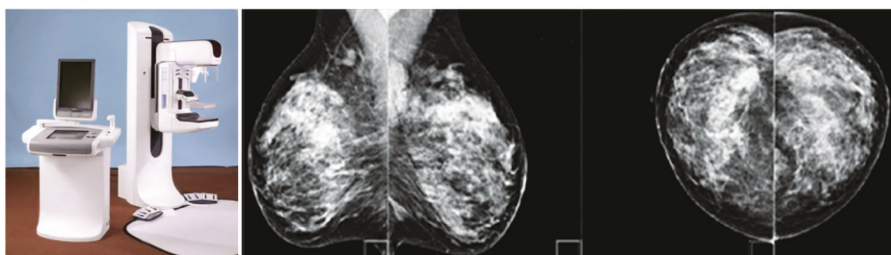
Broad Answer: X-ray imaging relies on a vacuum tube where electrons emitted via thermionic emission travel from a Tungsten cathode to a Tungsten anode, generating X-rays upon sudden deceleration. No gas should be present so that it doesn't interact with the moving electrons in the X-ray tube.



Q3.1: How is a mammography X-ray tube different from a standard X-ray tube?

Answer:

- Mammography is the X-ray of the breast
- We need a different machine in mammography because the X-ray tube construction is different, and a different potential is needed.
- Anode material: Molybdenum (lower atomic number)
- Produces low-energy X-rays (low kV) → it improves the contrast in the image.
- Detects microcalcifications
- Includes a compression plate, essential for image clarity
 - o Contraindicated in painful conditions like an abscess



Q3.2: What are the contraindications for mammography?

Answer:

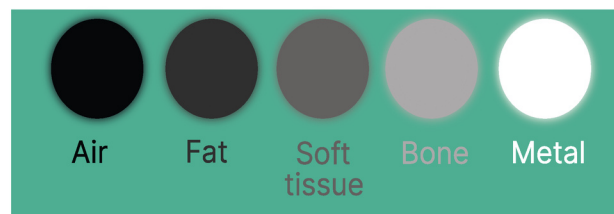
- Breast abscess - pain worsens with compression
- Young females
 - o As they have dense breasts, where calcifications are hard to detect
- Breast implant - risk of implant rupture on compression
 - o In such cases, MRI is used
 - o Lingine sign (Ruptured membranes are seen) indicates intracapsular rupture.

Q3.3: What are the five basic densities on an X-ray, and how do they affect image appearance?

Answer:

- Less dense substances = Blacker (radiolucent)
- More dense = Whiter (radiopaque)
- Density order (Whiteness increases):
 - Air < Fat < Water/Soft tissue < Bone < Metal
- Examples:

- o Air appears black
- o Metal appears white
- o Consolidation or collapse of the lung = white
- o Pneumothorax (air) = black



BIG QUESTION 4: What is the significance of Hounsfield Units (HU) in CT imaging, and how do they help differentiate tissue densities and pathology with or without contrast?

Broad Answer: HU values, based on attenuation coefficients, quantify tissue density on CT scans. Distilled water is the reference (0 HU), with negative values for less dense tissues like air and fat, and positive values for dense structures like bone and metal. HU plays a vital role in distinguishing normal and pathological tissues.

DETAILED QUESTIONS

Q4.1: What is the Hounsfield Unit (HU) and how is it measured?

Answer:

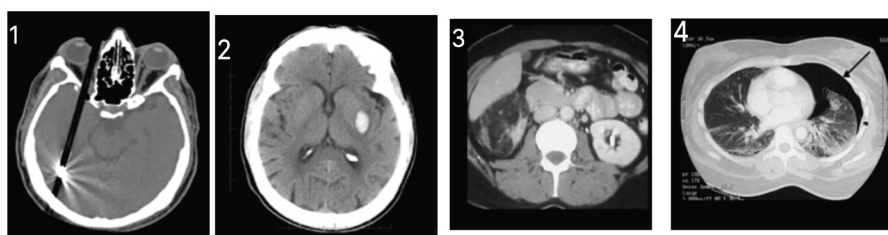
- HU stands for Hounsfield Unit, named after Godfrey Hounsfield.
- Used in CT imaging to express tissue attenuation
- Depends on the attenuation coefficient/electron density of the tissue
- Reference HU: 0 for distilled water (appears grey on CT)
- Higher attenuation = Higher HU

Q4.2: What are the typical HU values for common substances and their CT appearance?

Answer:

Substance	HU Value	CT Appearance
Air	-1000	Jet black
Fat	-50 to -100	Dirty black
Distilled Water	0	Gray
Soft tissue	+30 to +70	Light grey/white
Bone, metal	+1000 or more	White

Q4.3: Identify the substances based on the CT images.



Answer:

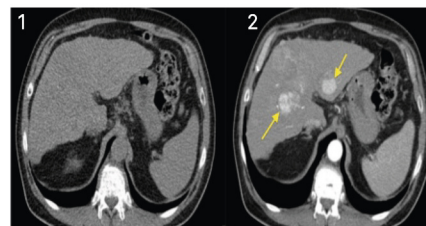
- Image 1: CT showing a Metallic foreign body (streak artefact)
- Image 2: CT showing acute haemorrhage (white)
 - o Hyperdense on non-contrast CT

- o Chronic haemorrhage: RBC lysis, the density decreases, and it becomes hypodense
- Image 3: The Kidney has the same density as subcutaneous fat
 - o Dirty black appearance, Fat-containing Angiomyolipoma
- Image 4: Jet black colour surrounding the lung - Pneumothorax

Q4.4: What is the difference between NCCT and CECT?

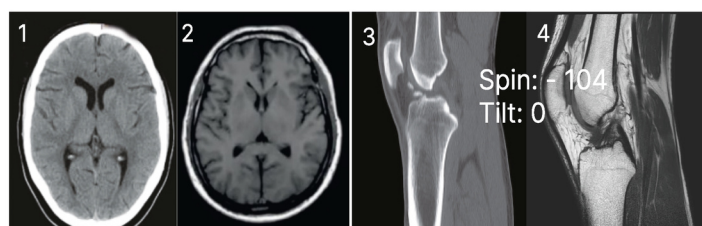
Answer:

- NCCT: Image 1
 - o No contrast used
 - o Indications for NCCT
 - Calcifications
 - Renal stones: Urinary tract stones are calcified stones
 - Gall bladder stones: Non-calcified and can be seen on USG
 - Acute hemorrhage
 - o Chronic haemorrhage: SWI MRI - this picks up the haemorrhage hemosiderin well
- CECT: Image 2
 - o Uses IV iodinated contrast
 - o Helps visualise lesions, tumours, infections, and inflammation
 - o Lesions may be camouflaged on NCCT but become enhanced on CECT



Q4.5: How do CT and MRI differ in appearance, especially in bone and fat visualisation?

PYQ: FMGE 2019



Answer: Always look for the bone cortex to differentiate CT vs MRI.

Structure	CT Appearance	MRI Appearance
Skull bone cortex	White	Black
Subcutaneous fat (scalp)	Black	White
Bone marrow fat	Black	White
Knee bone cortex	White	Dark

BIG QUESTION 5: What are the sonographic principles and vascular imaging modalities used in the diagnosis of fluid, solid lesions, blood flow, and vascular pathologies?

Broad Answer: Ultrasound distinguishes cystic and solid lesions using posterior acoustic enhancement or shadowing. Doppler studies assess blood flow direction and velocity based on Doppler shift, while elastography detects tissue elasticity. CEUS uses microbubbles and is safe in renal failure.

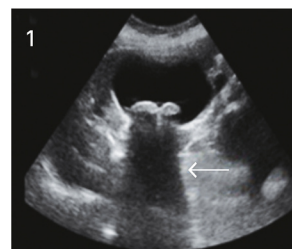
DETAILED QUESTIONS

YOURWISH

Q5.1: What is posterior acoustic shadowing, and which structures produce it?

Answer:

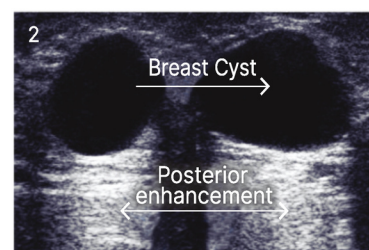
- Appears black behind poor sound conductors
- Seen in:
 - o Gallstones
 - o Renal stones
 - o Bone calcifications
 - o Air
- Mechanism:
 - o The gall bladder appears black because the fluid is black on ultrasound
 - o Gallbladder with stones → Sound reaches calculus → Sound reflected, so calculus itself is hyperreflective, hyperechoic → appears white
 - o Stones don't transmit any sound → No sound received behind stones → No sound echoed → It appears black → Posterior acoustic shadowing



Q5.2: What is posterior acoustic enhancement, and when is it seen?

Answer:

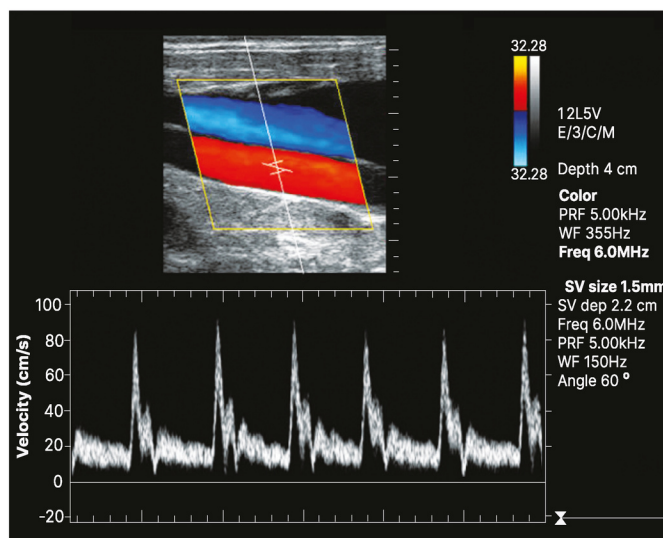
- Appears white behind good sound conductors
- Seen in cystic lesions (fluid-filled)
 - o Fluid = anechoic (black)
 - o Enhanced sound transmission causes a white area behind
- Helps differentiate solid vs cystic lesions
- Example: A patient with a breast lump is taken for an ultrasound, the lesion appears jet black, but the area behind the cyst appears white because of enhancement due to fluid transmission
- Bile doesn't give shadowing because it is a good conductor of sound
 - o Enhanced sound → more sound is echoed → it appears white



Q5.3: What is Doppler ultrasound, and how is flow direction interpreted?

Answer:

- Principle: Doppler shift
 - o A change in sound frequency by moving blood
- Colour Doppler: Colour indicates the direction of the blood flow
 - o Red = Flow towards transducer
 - o Blue = Flow away
 - o Mnemonic: Red Tower, Blue Blows Away
- Spectral/Graph/Duplex Doppler:
 - o Measures the velocity of blood flow quantitatively



Q5.4: What is elastography, and what are its clinical uses?

Answer:

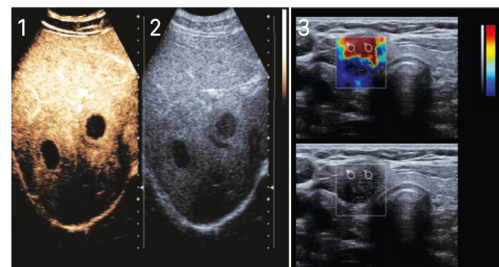
- Measures tissue elasticity or loss of elasticity (fibrosis)
- Used to evaluate:
 - o Thyroid malignancy

- o Liver fibrosis/cirrhosis
- Values expressed in kPa
- Pressure applied via probe
- Black and white USG = B-mode
- Orange colour USG = Contrast Enhanced Ultrasound (CEUS)

Q5.5: Identify the type of ultrasound in the given images and what findings can be seen?

Answer:

- Image 1: CEUS
- Image 2: B-mode of ultrasound
- Image 3: Malignant nodules of the thyroid



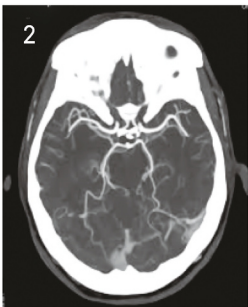
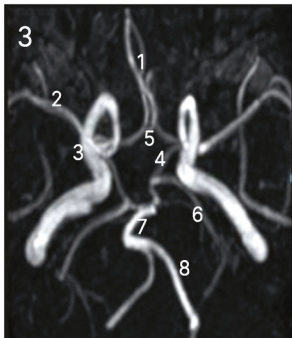
Q5.6: What are the features and advantages of CEUS?

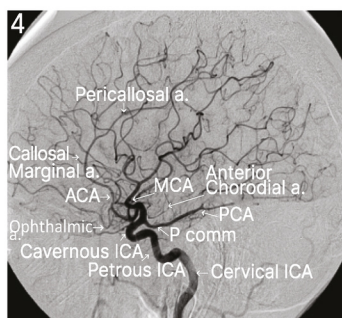
Answer:

- Uses microbubble contrast
- Common in liver lesion characterisation
- Safe in renal failure as excretion is via lungs, not kidneys
- Advantage over CT/MRI contrast (which are renally excreted)

Q5.7: What imaging modalities are used for vascular pathologies, and how do they differ?

Answer:

Modality	Use/Feature
Doppler USG 	First-line for peripheral vessels, e.g., in intermittent claudication
CT Angiography 	Faster than MR angiography; uses IV contrast, preferred in emergencies (PE, aortic dissection)
MR Angiography	Done with/without contrast; safe in renal failure

DSA

- It is done by Fluoroscopy (video X-ray can show the contrast black or contrast white)
- Contrast is given by the Intra-arterial technique
- It is more invasive
- Gold standard investigation
- Advantage:
 - It goes inside the artery
 - Any pathologies, such as a thrombus, can be removed
 - Aneurysm: Coiling or clipping can be done

BIG QUESTION 6: What are the investigation of choice (IOC) principles for different tissues and pathologies, and how are various contrast media used across imaging modalities?

Broad Answer: The selection of an imaging modality depends on tissue type and suspected pathology. CT is ideal for air, calcification, and bone cortex; MRI is superior for soft tissue and bone marrow; ultrasound is preferred for fluids. Doppler is used for vascular screening, while CT angiography is the best preoperative tool for aneurysms. Contrast agents also differ by modality.

DETAILED QUESTIONS

Q6.1: What are the investigations of choice for different tissue types and clinical conditions?

Answer:

Condition/Tissue	Investigation of Choice (IOC)
Air (e.g. Pneumothorax)	CT (USG & MRI can't image air)
Fluid	Ultrasound (fluid is anechoic, appears black)
Calcification	CT
Soft Tissue (muscle, ligament)	MRI (e.g., ACL, meniscus tears)
Cortex	CT
Bone Marrow	MRI
Medical device positioning	Chest X-ray (e.g., Pacemaker, ET tube)
Vascular pathology (screening)	Doppler
Vascular pathology (IOC)	CT Angiography
Vascular pathology (Gold standard)	DSA

Q6.2: Why is CT Angiography preferred over DSA for aneurysms preoperatively?

Answer:

- CT Angio gives the true aneurysm size, including thrombosed areas
- More accurate preoperative assessment
- DSA is invasive and may miss non-lumen parts

Q6.3: What are the different types of contrast media and their imaging modality?

Answer:

Contrast	Used In	Type	Route
Iohexol	X-ray, CT, IVP, HSG	Iodinated, water-soluble	IV
Gadolinium	MRI	Paramagnetic, non-iodinated	IV
Sonovue	Ultrasound (CEUS)	Microbubbles (SF ₆ gas)	IV (excreted by lungs)
Barium sulfate	GI studies (fluoroscopy)	Water-insoluble	Oral/Rectal only
Diatrizoate	Perforation cases	Iodinated (Gastrografin)	Oral/Rectal



Q6.4: What are the characteristics and precautions of specific contrast agents?

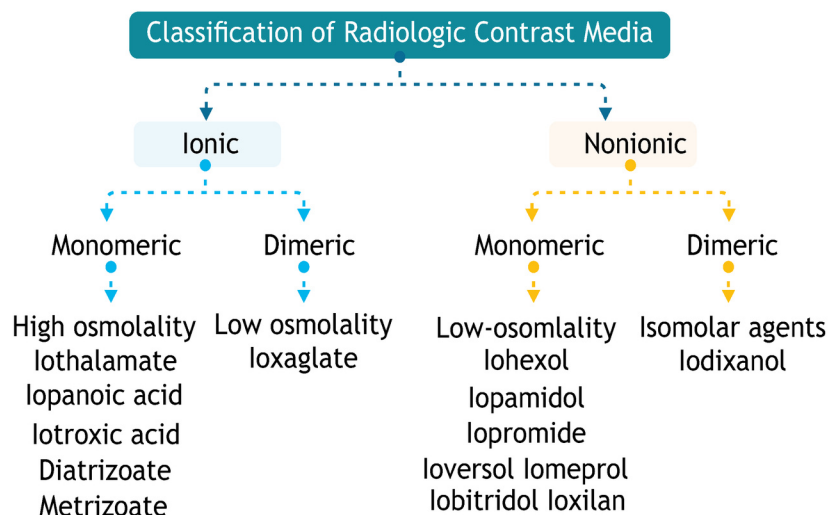
Answer:

- Iohexol (CT/X-ray contrast):
 - o Low osmolar, renal-safe
 - o Side effect: Anaphylactoid reaction (non-IgE mediated)
 - o Check serum creatinine/GFR before use
- Gadolinium (MRI contrast):
 - o Paramagnetic, nephrotoxic
 - o Used in T1-weighted imaging
- Sonovue (Ultrasound):
 - o Safe in renal failure
 - o Excreted via lungs
- Barium sulfate (GI contrast):
 - o Not IV, only for GIT
 - o Contraindicated in perforation → can cause peritonitis.
 - o Used in fluoroscopy (video X-ray for moving structures)
 - o High radiation, so lead apron must be worn



Q6.5: How are radiological contrast agents classified?

Answer:



Q6.6: How are contrast agents classified by osmolality and ionic nature?

Answer:

Type	Example	Osmolarity	Mnemonic
Non-ionic dimer	Iodixanol	Iso-osmolar	"Iso-nodi = non-ionic dimer"
Ionic monomer	(Not named)	High osmolar	"I'm high"
Ionic dimer	Ioxaglate	Low osmolar	-
Others	Most arlow-osmolarar	Low osmolar	-

BIG QUESTION 7: What are the radiation units used in imaging, and how do they relate to tissue exposure?

Broad Answer: Radiation exposure is assessed in terms of absorbed dose, equivalent dose (dependent on radiation type), and effective dose (dependent on tissue sensitivity). Conventional units start with "R" (e.g., Rad, Rem, Roentgen), while SI units do not (Grey, Sievert, Coulomb/kg).

DETAILED QUESTIONS

Q7.1: What are the stages and types of radiation exposure measurements?

Answer:

- Stages: Exposure → Absorption → Effect → Tissue damage
- Absorbed dose:
 - o Conventional unit: Rad
 - o SI unit: Grey
- Equivalent dose (depends on radiation type):
 - o Conventional: Rem
 - o SI: Sievert
- Effective dose (depends on tissue sensitivity):
 - o Conventional: Rem
 - o SI: Sievert

	DOSE	CONVENTIONAL UNITS	SI UNITS
EXPOSURE	DOSE	ROENTGEN	COULOMB/KG
RADIATION ABSORBED DOSE		RAD	GRAY
EQUIVALENT DOSE		REM	SIEVERT
EFFECTIVE DOSE		-	SIEVERT

- Conversions:
 - o 1 Gray = 100 Rad
 - o 1 Sievert = 100 Rem

Q7.2: What is the radiation exposure from common imaging studies and radionuclide studies?

Answer:

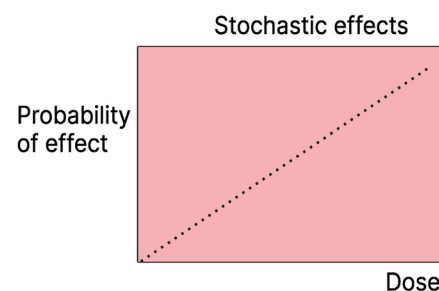
Examination	Typical effective dose (mSv)	Equivalent number of chest X-rays	Equivalent length of background exposure
X-ray			
Limbs and joints (except hip)	<0.01	<0.5	<1.5 days
Chest (single PA)	0.02	1	3 days
Skull	0.07	3.5	11 days
Lumbar spine	1.3	65	7 months
Hip	0.3	15	7 weeks
Pelvis	0.7	35	4 months
Abdomen	1.0	50	6 months
IVU	2.5	125	14 months
Barium meal	3	150	16 months
CT head	2.3	115	1 year
CT chest	8	400	3.6 years
CT abdomen or pelvis	10	500	4.5 years
Radionuclide studies			
Kidney (^{99m}Tc)	1	50	6 months
Thyroid (^{99m}Tc)	1	50	6 months
Bone (^{99m}Tc)	4	200	1.8 years
PET head (F-18 FDG)	5	250	2.3 years

Effective doses for common radiological examinations expressed in terms of the equivalent number of chest radiographs and length of exposure to background radiation that would give the same dose. IVU, intravenous urogram; PA, posterior-anterior.

- All PET and nuclear scans involve radiation exposure
- CT has more radiation than an X-ray
- Barium studies also have higher radiation than plain X-rays
- IVP has more radiation than an X-ray

BIG QUESTION 8: What are the stochastic effects of radiation?

Broad Answer: Stochastic effects occur by chance at any dose of radiation exposure (low or high). For e.g., radiation-induced cancer/mutations. As the dose increases, the probability of occurrence increases. There is no dose threshold, and it is applicable also to very small doses. It occurs due to DNA damage, and its severity is dose-independent. The probability of effect increases with dose.

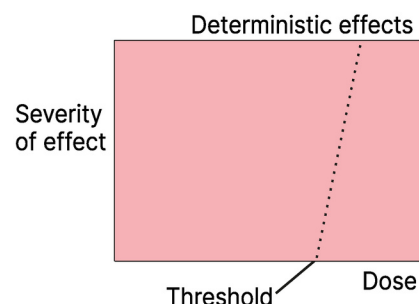


DETAILED QUESTIONS

Q8.1: What are the deterministic effects of radiation?

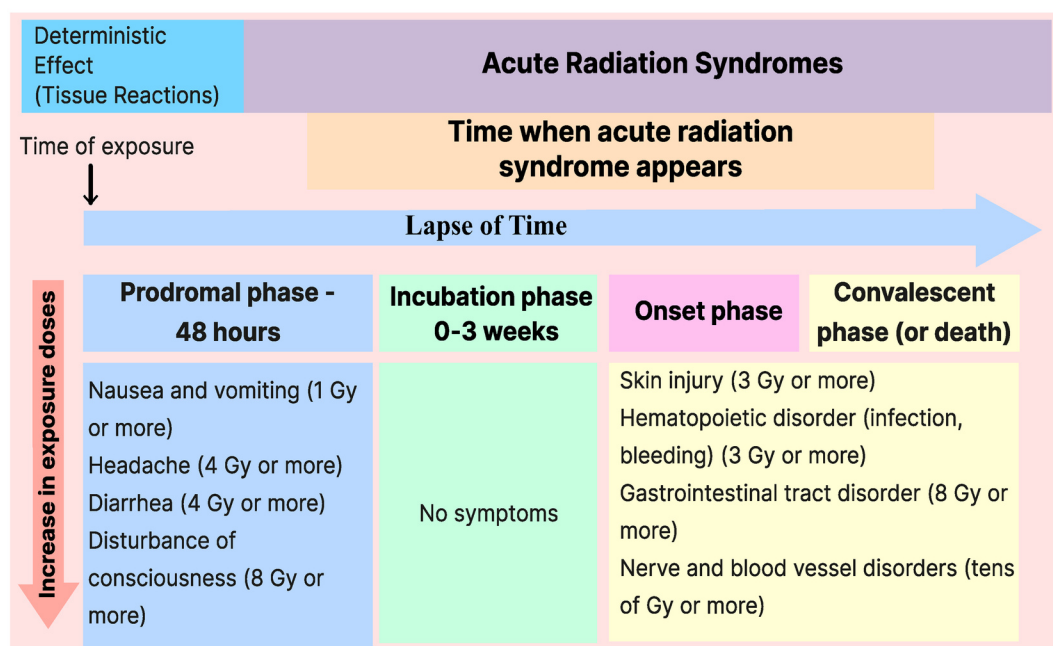
Answer:

- Deterministic effects occur only above a threshold dose
- Severity increases with increased dose
- Caused by cell killing
- Examples: Bone marrow suppression, alopecia, skin erythema
- Proliferating cells are more sensitive
 - Bone marrow, gonads, intestinal epithelium
- Resistant/Least sensitive tissues: Neurons
- Typical dose threshold: Several Greys (Gy)



Q8.2: What is Acute Radiation Syndrome (ARS)?

Answer:



- Seen when radiation exposure is >1 Grey
- Affects organ systems in sequence:
 - Bone marrow → GIT → Nervous system

Q8.3: What are the AERB guidelines for radiation protection gear?

🔍 PYQ: NEET PG 2020

Answer:

Protective Equipment	Minimum Thickness (India)	International Standard
Lead aprons & gloves	0.25 mm (0.5 mm commonly used)	0.5 mm
Gonadal shield	0.5 mm	

- TLD badge (monitoring)
 - Worn under an apron

- o Wearing it above the apron gives a false high reading

Q8.4: What are the occupational and public radiation dose limits?

Answer:

Dose Limitations		
Part of the body	Occupational Exposure	Public Exposure
Whole body (Effective dose)	20 mSv/year averaged over 5 consecutive years; 30 mSv in any single year	1 mSv/y
Lens of eyes (Equivalent dose)	150 mSv/ in a year	15 mSv/y
Skin (Equivalent dose)	500 mSv in a year	50 mSv/y
Extremities (Hands and Feet) Equivalent dose	500 mSv in a year	-
For pregnant radiation workers, after declaration of pregnancy 1 mSv on the embryo/fetus should not exceed.		

- For pregnant radiation workers, it is millisievert on the embryo or fetus maximum
- For mother: 2 mSv
- According to NCRP guidelines, for a mother: 5 mSv = 0.5 rad
- For the general public, body exposure = 1 millisievert per year for the embryo
- For occupational workers, the maximum in any single year is 30 millisieverts

Q8.5: The monitoring of the equipment shown in the photograph is done every:

- A. Monthly
- B. Bimonthly
- C. Quarterly
- D. Annually



Answer: C. Quarterly

Explanation:

- TLD batch is given in the image
- It contains a Thermoluminescent dosimeter
- It measures the dose of radiation exposure in occupational workers
- The TLD badge measures whether the radiation is within or outside the limits
- For regular monitoring, a TLD badge is given and is monitored every 3 months
- The substance in the TLD badge that holds the radiation that we receive is calcium sulphate dysprosium in India
 - o Outside India: Lithium Fluoride
- TLD should be worn below the apron to get the actual value of radiation exposure



2. RESPIRATORY RADIOLOGY

BIG QUESTION 1: Discuss the different views and key anatomical variations seen on a normal chest X-ray.

Broad Answer:

PYQ: FMGE 2019



- A routine chest X-ray includes **PA** and **AP** views.
- The **PA view** is taken in the erect position with full inspiration and is the routine view, while the
- **AP view** is used for ICU, trauma, and neonates and can cause false cardiomegaly.

DETAILED QUESTIONS

Q1.1: How can the horizontal and oblique parts of the ribs be identified on a normal chest X-ray?

Answer:

- The **horizontal part** of the rib that reaches the midline is the **posterior rib**.
- The **oblique part** of the rib that does not meet the midline is the **anterior rib**.

Q1.2: What is notable about the first and second posterior ribs on a chest X-ray?

Answer: The first and second posterior ribs are situated close to each other.

Q1.3: Define the cardiophrenic and costophrenic angles.

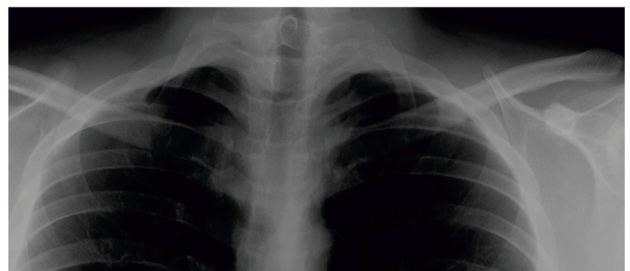
Answer:

- The **cardiophrenic angle** is the angle between the cardiac border and the phrenic border.
- The **costophrenic angle** is the angle between the ribs and the diaphragm.

Q1.4: Describe the Cervical Rib as a normal anatomical variation.

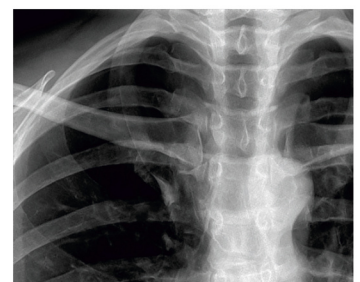
Answer:

- It arises from **C7**.
- It can be complete or incomplete, bony or fibrous, and it can lead to **Thoracic outlet obstruction**.



Q1.5: Describe the Azygos Lobe/Fissure as a normal anatomical variation.

Answer: It is located on the **right upper side**.



Q1.6: What are the characteristics of a routine PA view chest X-ray?**Answer:**

- The X-ray beam goes from **posterior to anterior**.
- It is done in an **erect position** and in **full inspiration** for better lung volume visualisation.
- The normal CTR (Cardiothoracic Ratio) is **0.5**.

Q1.7: What are the characteristics and disadvantages of an AP view chest X-ray?**Answer:**

- It is done for **ICU patients, neonates, and trauma**.
- Disadvantage: **false cardiomegaly**.
- The normal CTR is **0.6**.

Q1.8: What specialised X-ray view is taken for a foreign body, and how does it help in diagnosis?**Answer:**

- An X-ray on **inspiration + expiration** should be taken.
- Normally, lungs appear black on inspiration and white on expiration.
- If there is bronchial obstruction by a foreign body, air is not expelled on expiration, so the obstructed lung remains black, suggesting the side of obstruction.

Q1.9: What specialised X-ray view is taken for pneumothorax, and why?

Answer: An **expiratory X-ray view** is taken because it provides better contrast between the lung and the pneumothorax in expiration.

Q1.10: What is the IOC and best X-ray view for pleural effusion?**Answer:**

- The IOC is **USG**.
- The best X-ray view is the **ipsilateral decubitus view**.

Q1.11: What specialised X-ray view is used for RML collapse and the lung apex?

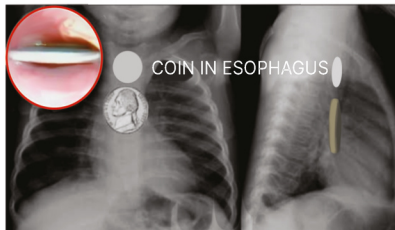
Answer: A **Lordotic view** (AP view with shoulders touching the cassette) is done for the lung apex and better visualisation of right Middle lobe collapse.

Q1.12: What is the IOC for a Pancoast tumour and a Posterior mediastinal mass?**Answer:**

- MRI is IOC for
- Pancoast tumour: Brachial plexus invasion (Nerves are better visualised in MRI)
- Posterior mediastinal mass: Neurogenic tumor(M/c)

BIG QUESTION 2: Describe the radiological features of foreign body pathologies**Broad Answer:**

- Coin in Trachea vs Oesophagus
- Button Battery
 - o On AP view: Double ring appearance
 - o On lateral view: Sloping/ Bevelled edge

Trachea	Esophagus PYQ: FMGE 2021 PYQ: NEET PG 2021, 2022
- Appears as a SLIT in AP view - Appears CIRCULAR in lateral view 	- Appears CIRCULAR in AP view - Appears as a SLIT in lateral view 

DETAILED QUESTIONS

Q2.1: How can you differentiate a foreign body in the trachea from one in the oesophagus on an X-ray?

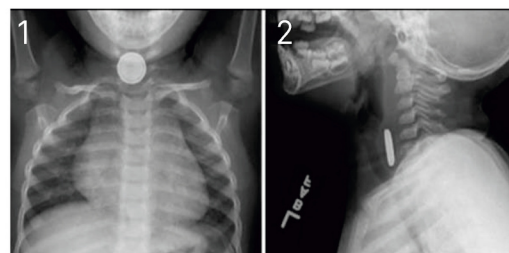
Answer:

- A foreign body in the **trachea** appears as a **slit** in the **AP** view and a **circle** in the **lateral** view.
- A foreign body in the **oesophagus** appears as a **circle** in the **AP** view and a **slit** in the **lateral** view.

Q2.2: What are the characteristic signs of a button battery on an X-ray, and what is its clinical significance?

Answer:

- On an **AP** view, it shows a **double-ring** appearance.
- On a **lateral** view, it shows a **sloping/bevelled edge**.
- A button battery is corrosive and must be removed even if the patient is asymptomatic.

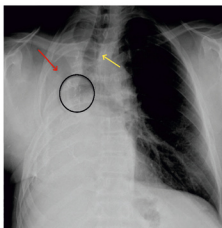
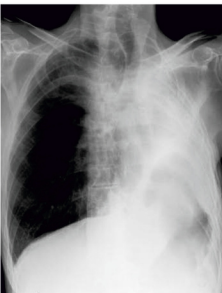


Q2.3: What is a "white out hemithorax," and what are its causes, with emphasis on the direction of tracheal shift?

Answer:

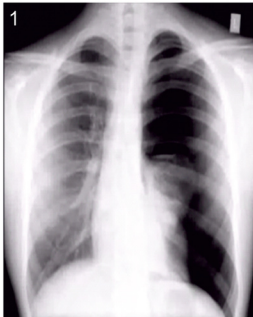
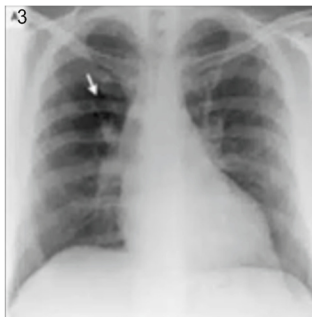
PYQ: FMGE 2021, 2020

PYQ: NEET PG 2023

	Increased density	Decreased air	Fluid
Seen in	Consolidation	Collapse Pneumonectomy	Pleural Effusion
Tracheal shift	No tracheal shift	Shift to the same side	Shift to the opposite side
		 	

Q2.4: What is a "blackout hemithorax," and what conditions can cause it?

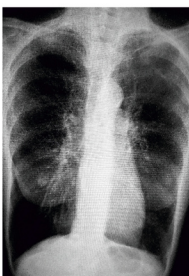
Answer:

	Increased air	Decreased density	Decreased vascular markings
Seen in	Pneumothorax Emphysema	Post mastectomy Poland syndrome	Pulmonary embolism (Westermark sign)
			

- Also seen in Swyer-James McLeod syndrome- post bronchiolitis obliterans: Also a cause of blackout hemithorax (decreased vessel markings)
- Post-mastectomy X-ray (given above image 2): The Left side is more black than the right side (because of the absence of breast tissue)
- Pneumothorax X-ray (given above image 1): No vascular markings → air outside lungs; whitish area → collapsed lung

Q2.5: What are the key radiological features of Emphysema/COPD?

Answer: The key features are hyperinflated lungs, a flat diaphragm, a tubular heart, and a barrel chest on lateral CXR.



BIG QUESTION 3: What is a pneumothorax, and what are its key features on a chest X-ray and CT scan?

Broad Answer:

- **Pneumothorax** is the presence of air in the pleural cavity, which on an X-ray presents as a black out hemithorax with a loss of vascular markings.
- On a supine X-ray, it may show a **deep sulcus sign**.
- A CT scan shows a characteristic **jet black appearance** and the **visceral pleural line**.
- On ultrasound, the normal **seashore sign**, **barcode/stratosphere sign** and **lung point sign**, which is the transition from the seashore to the barcode sign, are the most specific signs for pneumothorax.

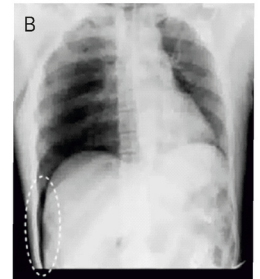
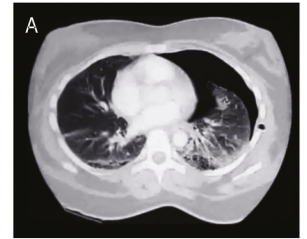
DETAILED QUESTIONS

Q3.1: What are its key features on a chest X-ray and CT scan of pneumothorax?

Answer:

YOURWISH

- On an X-ray, it presents as a black out hemithorax with **increased air**, **decreased density**, and **decreased vascular markings**.
- A CT scan shows a characteristic **jet black appearance** and the **visceral pleural line**.



Q3.2: What is the "deep sulcus sign"?

Answer: The **deep sulcus sign** is a radiological finding seen on a **supine X-ray** of a pneumothorax, where air accumulates in the costophrenic sulcus, making it appear deeper than usual.

Q3.3: How does a normal lung appear on ultrasound, and how does this appearance change in a pneumothorax?

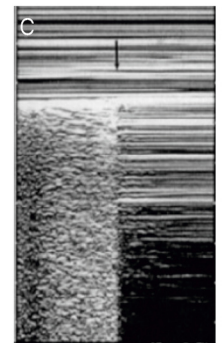
Answer:

- In a normal individual, ultrasound shows a **seashore sign** (granular appearance in the lower half).
- In a pneumothorax, this is replaced by a **barcode/stratosphere sign** (flat lines in the lower half).

Q3.4: What is the "lung point sign," and what is its clinical significance?

Answer:

- The **lung point sign** is the transition on ultrasound from the **seashore sign** to the **barcode sign**.
- It is considered the **most specific sign** for pneumothorax.



Q3.5: What is a tension pneumothorax, and how is it managed?

Answer:

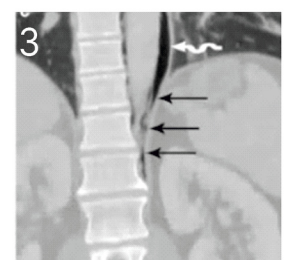
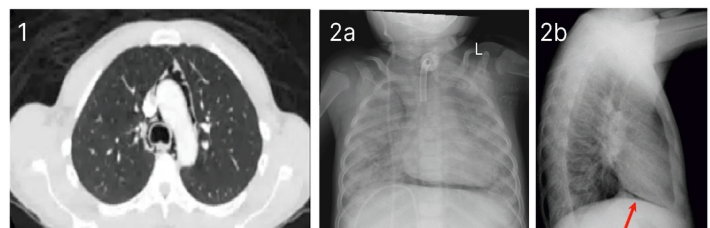
- A tension pneumothorax is a life-threatening condition where a patient is **hemodynamically unstable** due to air pressure buildup, which can cause a **mediastinal shift to the opposite side**.
- The management is an emergency **needle puncture** followed by an **ICD drain**.

Q3.6: What is pneumomediastinum, its common cause, and what are the key X-ray signs?

PYQ: FMGE 2023

Answer:

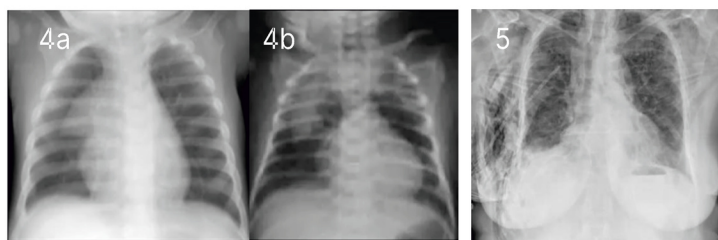
- Pneumomediastinum is **air in the mediastinum** that surrounds mediastinal structures. It is commonly caused by **oesophageal rupture** (Boerhaave's syndrome).
- Key X-ray signs include the **continuous diaphragm sign** (the entire diaphragm is visualised well, as the heart is separated from it)
- **Naclerio V sign** (lucency in the cardiophrenic region), and the **spinnaker sail sign** (separation of the thymus from the heart).



Q3.7: Describe the "Angel wing sign" and "Ginkgo leaf sign" in the context of pneumomediastinum.

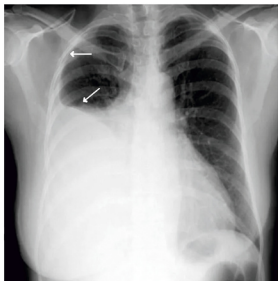
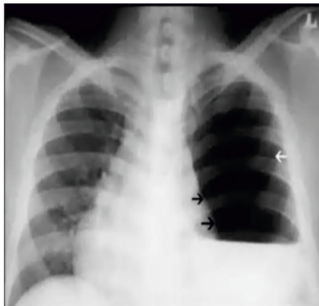
Answer:

- The **Angel wing sign** (4a,4b) is the appearance of the thymus bilaterally due to the air surrounding it.
- The **Ginkgo leaf sign** (5) indicates pneumomediastinum along with subcutaneous emphysema, where air tracks between the fibres of the pectoralis major muscle.



Q3.8: How do Pleural Effusion and Hydropneumothorax appear differently on a chest X-ray?

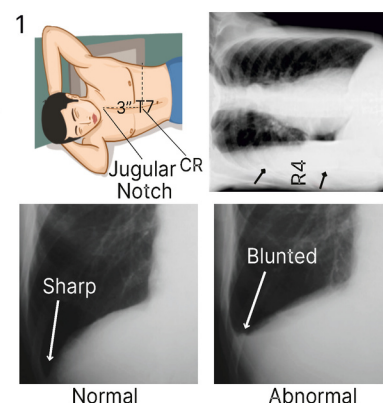
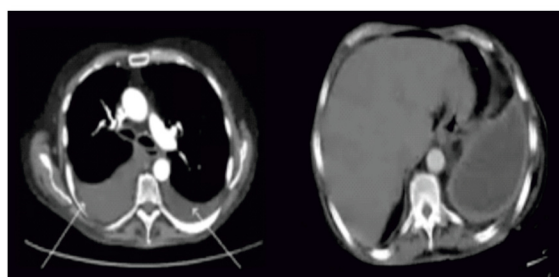
Answer:

Pleural effusion	Hydropneumothorax
 Ellis s curve Blunting of costophrenic angle	 Horizontal air fluid level

Q3.9: What are the key radiological features of pleural effusion on an X-ray and CT scan? What is the "split pleura sign"?

Answer:

- On a chest X-ray, pleural effusion shows blunting of the costophrenic angle.
- On a CT scan in a supine position, the fluid gravitates posteriorly and appears grey.
- The most sensitive investigation is USG.
- The split pleura sign is seen in empyema (infected pleural effusion) and indicates the thickening of the surrounding pleura.



BIG QUESTION 4: Discuss the localisation of pathologies on a chest X-ray..

Broad Answer:

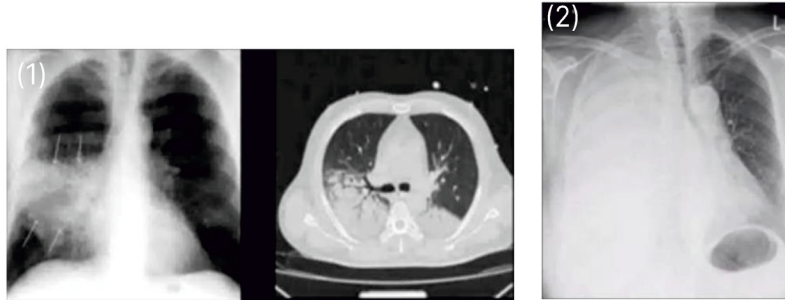
- Pathologies can be localised on a chest X-ray using the **Air Bronchogram sign**, which is present in **intraparenchymal pathologies** like consolidation but absent in extraparenchymal ones like pleural effusion or mediastinal masses.
- **Lobar localisation** is achieved by identifying the positions of the horizontal and oblique fissures.

DETAILED QUESTIONS

Q4.1: What is the "Air Bronchogram sign," and what is its significance in localising pathology?

Answer:

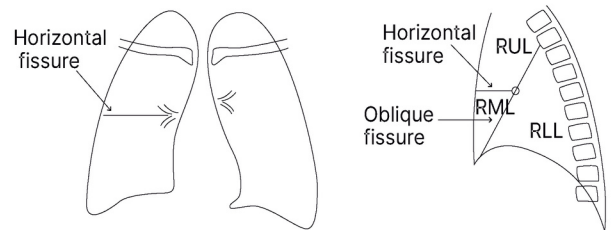
- The **Air Bronchogram sign** is seen when the lungs are white (due to opacification) and the bronchi remain patent (containing air, appearing black).
- Its presence(image1) indicates an **intraparenchymal pathology**, such as consolidation or hyaline membrane disease, while its absence(image2) suggests an **extraparenchymal pathology**, like a mediastinal mass or pleural effusion.



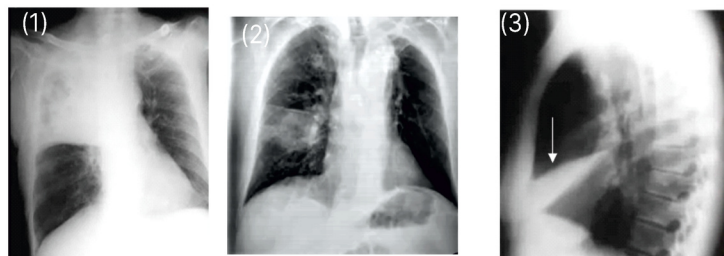
Q4.2: How are pathologies localised to a specific lobe using fissures on a chest X-ray?

Answer:

- Right lung: 3 lobes (UL, ML, LL), 2 fissures (horizontal → minor fissure, oblique)
- Left lung: 2 lobes (UL, LL), 1 fissure (oblique → major fissure)
- Extension of left upper lobe- Lingula



- In image 1,
 - A sharp limiting line is seen, suggestive of the horizontal fissure limiting the pathology from spreading.
 - Opacity is seen above the horizontal fissure
 - Hence, it is a right upper lobe pathology
 - There is no shift of the fissure, hence a Right upper lobe consolidation
- In image 2,
 - Opacity is below the horizontal fissure
 - Hence, a right middle lobe pathology
- In image 3
 - Opacity is seen above the oblique fissure
 - A wedge-shaped opacity overlying the heart is suggestive of right middle lobe pathology.

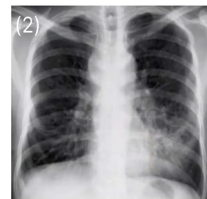
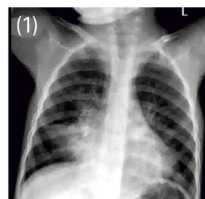


Q4.3: What is the "Silhouette sign," and how is it used to localise pathology?

Answer:

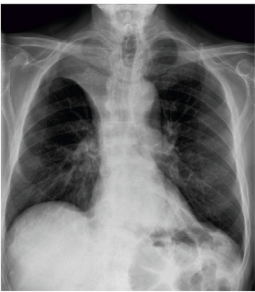
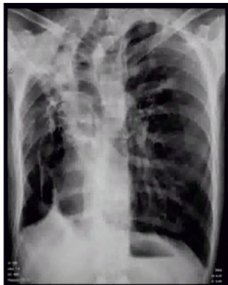
- Loss of the normally visible border of an intrathoracic structure caused by an adjacent pulmonary density

- When there is an opacity touching the right heart border- right middle lobe pathology (Image 1)
- Opacity touching the left heart border- lingula (Image 2)
- Obscured diaphragm- lower lobe pathology



Q4.4: What are the key differences between consolidation, collapse, and fibrosis on a chest X-ray?

Answer:

Consolidation	Collapse	Fibrosis
		
• No shift of structures • Opacity above the horizontal fissure • Right upper lobe consolidation	• Same side shift of the structures • Opacity above the horizontal fissure • Trachea shifted to the affected side • Right UL collapse	• Trachea shifted to the affected side • Tenting of diaphragm • Seen in TB • In fibrosed area, ribs are crowded, but hyperinflation on other side

BIG QUESTION 5: Describe Bronchiectasis and Cystic Bronchiectasis

Broad Answer:

- **Bronchiectasis** is the permanent dilatation of the bronchi. Radiologically, it is characterised by the absence of normal tapering, with the bronchi appearing parallel
- **Cystic Bronchiectasis** is a severe form where the dilated bronchi contain mucus, appearing as cysts.

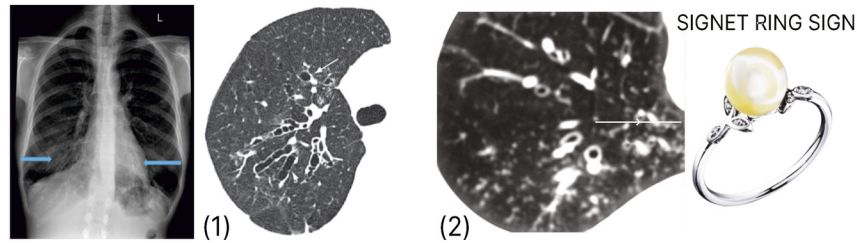
DETAILED QUESTIONS

Q5.1: What is bronchiectasis, and what are its two main radiological signs on a CT scan?

Answer:

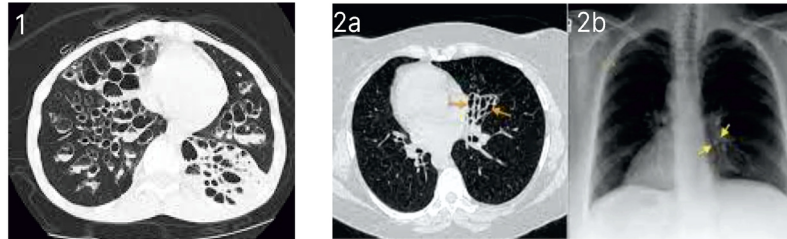
- Bronchiectasis is the **dilatation of the bronchi**.
- The main radiological signs are
 - o **Tram track sign** (bronchi remaining parallel without tapering)
 - o **Signet ring sign** (a dilated bronchus adjacent to a vessel).

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Q5.2: What are the characteristic features of Cystic Bronchiectasis?

Answer: In Cystic Bronchiectasis, some of the dilated bronchi contain mucus, making them appear as cysts, which is described as a "bunch of grapes" appearance.



Q5.3: Which disease is associated with bronchiectasis?

Answer: Bronchiectasis associated with situs inversus is known as Kartagener's syndrome.

Q5.4: What is the best investigation for diagnosing bronchiectasis?

Answer: The best investigation is a High-Resolution CT (HRCT).

BIG QUESTION 6: Discuss the radiological features of various lung infections..

Broad Answer:

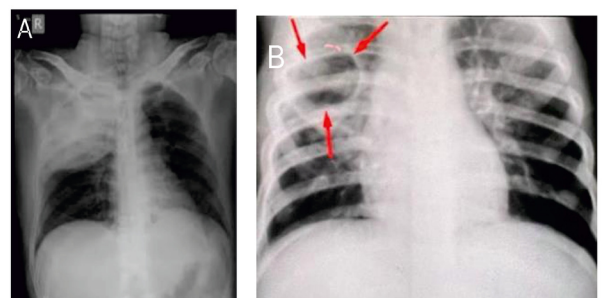
- Klebsiella pneumoniae: Bulging fissure sign.
- Staphylococcal pneumonia Answer: Pneumatocele
- Tuberculosis: fibrocavitary lesion
- Hydatid cyst: Water lily sign.
- Aspergillus
 - o Allergic Bronchopulmonary Aspergillosis (ABPA): Finger in glove sign;
 - o Aspergillom Answer: Air crescent sign
 - o Angio-invasive aspergillosis: Halo sign

DETAILED QUESTIONS

Q6.1: What is the characteristic sign of Klebsiella and Staphylococcal pneumonia on a chest X-ray?

Answer:

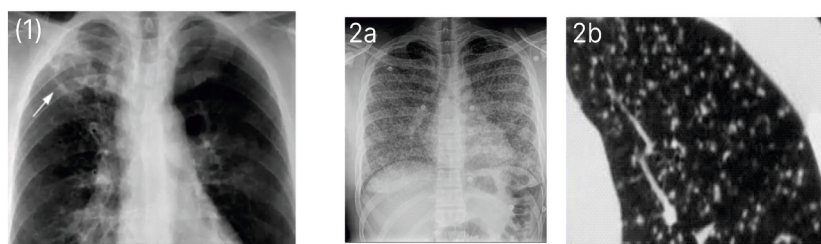
- Klebsiella pneumonia shows a **Bulging fissure sign**, where the horizontal fissure is curved.
- Staphylococcal pneumonia can cause a **Pneumatocele**, a cavity filled with air.
- Can also be seen in PCP (HIV +), along with ground glass opacity in the perihilar region



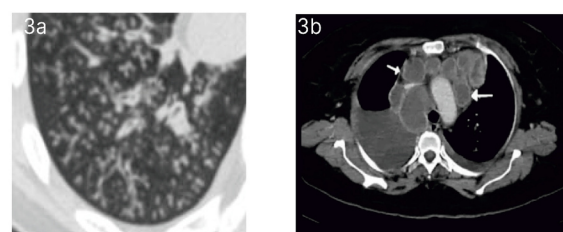
Q6.2: How does Tuberculosis present on imaging? What is the "Tree in bud sign," and what do "rim-enhancing lymph nodes" on CT suggest?

Answer:

- Fibrocavitary TB (Image 1):
 - o Generally unilateral or asymmetrical
 - o Bulky right hilum due to enlarged hilar lymph nodes
- Miliary TB (Image 2a & 2b):
 - o Due to the hematogenous spread of infection
 - o Also seen in fungal infections, silicosis, small metastasis, and hemosiderosis



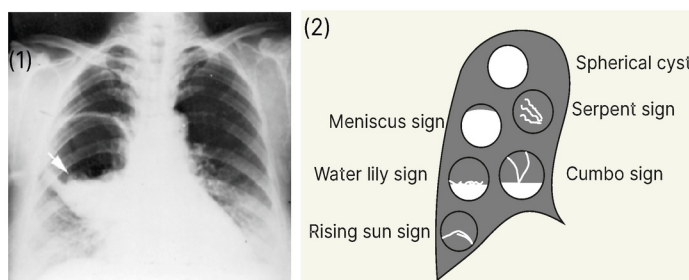
- Tree in bud sign: Seen in TB (Image 3a): Due to the endobronchial spread of infection
- Rim or peripherally enhancing lymph nodes
 - o CT scan (Image 3b) showing round structures surrounding the aorta, suggestive of Mediastinal Lymph nodes
 - o They are necrotic lymph nodes, hence not enhancing
 - o Only the margins of the lymph nodes will enhance - Ring / Peripheral enhancing lymph nodes
 - o Necrotic lymph nodes and pleural effusion → TB



Q6.3: What is a Hydatid cyst, and what is its pathognomonic radiological sign?

Answer:

- A Hydatid cyst is caused by *Echinococcus granulosus*.
- The pathognomonic sign is the **Water lily sign**, a lesion with an air-fluid level and membranes floating in the fluid.
- Other Signs (Image 2)
 - o Rising sun sign
 - o Serpent sign
 - o Cumbo sign

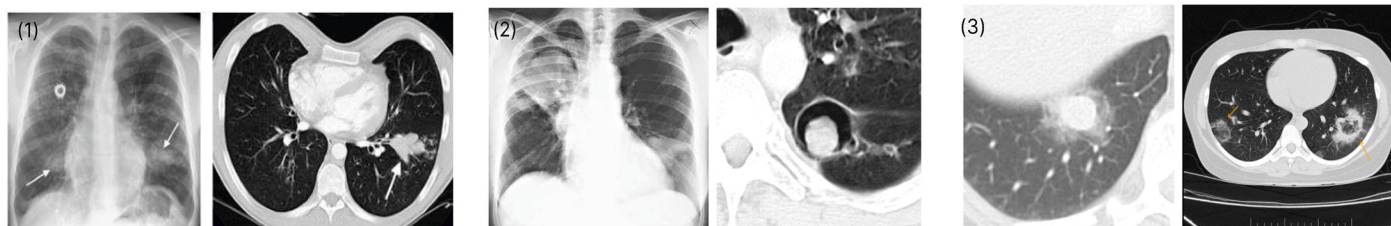


Q6.4: Differentiate between the three types of Aspergillus infections based on their radiological signs.

Answer:

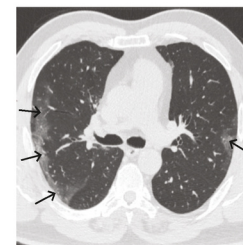
- Aspergillus: A fungus with septate and acute-angle branching hyphae
 - o Allergic Bronchopulmonary Aspergillosis (ABPA): Shows a finger-in-glove sign (dilated central bronchi filled with mucus).
 - o Aspergillosis: Shows an Air crescent sign or Monod sign in a pre-existing cavity. A prone CT can confirm this by showing the fungal ball moving to a dependent position.

- o Angio-invasive aspergillosis: Shows a **Halo sign** (central infarct surrounded by grey haemorrhage or ground-glass opacity) in an immunocompromised patient.



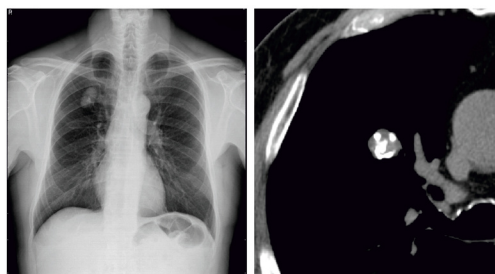
Q6.5: What is the most common HRCT finding in COVID-19?

Answer: The most common HRCT finding is **bilateral peripheral/subpleural ground-glass opacity**, which is classified as CORADS 5 (highly suspicious).



Q6.6: What is "Popcorn Calcification"?

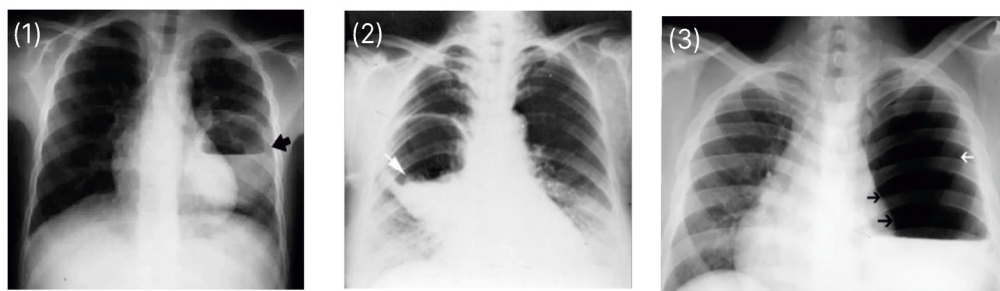
Answer: Popcorn Calcification is a characteristic radiological finding seen in **pulmonary hamartoma**.



Q6.7: What conditions can present with an air-fluid level, and how are they differentiated?

Answer:

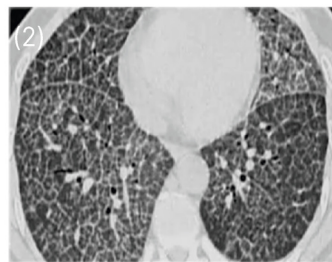
- Abscess (Image 1): Patient presents with fever
- Hydatid cyst (Image 2): Air fluid level with water lily sign
- Hydropneumothorax (Image 3): Air fluid level in the entire hemithorax



BIG QUESTION 7: Discuss the radiological features of Interstitial Lung Disease (ILD)

Broad Answer:

- Presentation: Usually, a female patient presents with a dry cough and shortness of breath associated with connective tissue disorder.
- IOC- HRCT
- Honeycombing pattern (Image 1): Air-filled cysts are laid one above the other in the UIP/IPF pattern
- In crazy pavement appearance (Image 2)- Interlobular septal thickening is seen with ground glass opacity; no air-filled cavities are seen.
- Seen in pulmonary alveolar proteinosis



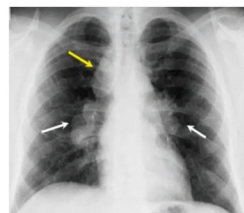
Crazy pavement pattern

DETAILED QUESTIONS

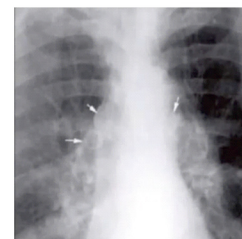
Q7.1: What are the key radiological signs of Sarcoidosis on a chest X-ray and Gallium scan?

Answer:

- On a chest X-ray, the key signs are **bilateral hilar lymphadenopathy** (also known as the **1-2-3 sign** or **Garland sign**) and **eggshell calcification** of lymph nodes.

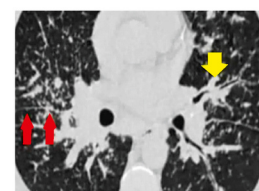


1-2-3 sign or Garland sign or Pawnbroker sign



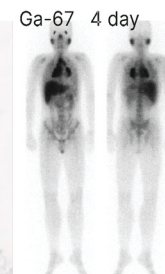
Egg shell calcification

- On HRCT
 - Fissural nodularity and bronchovascular thickening
 - Galaxy sign



HRCT: Sarcoidosis

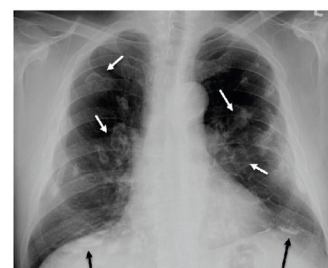
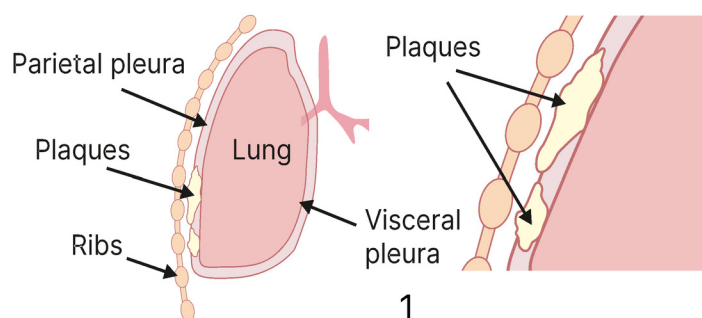
- Gallium scan
 - Done for infections/inflammations
 - Lambda sign: Enlarged lymph nodes take up the gallium
 - Panda sign: Enlarged salivary and lacrimal glands
 - Note: Panda sign on MRI brain - Wilson's disease



Scintigraphy (gallium scan)

Q7.2: What is the most common radiological finding in Asbestosis, and what is its associated cancer?

Answer:



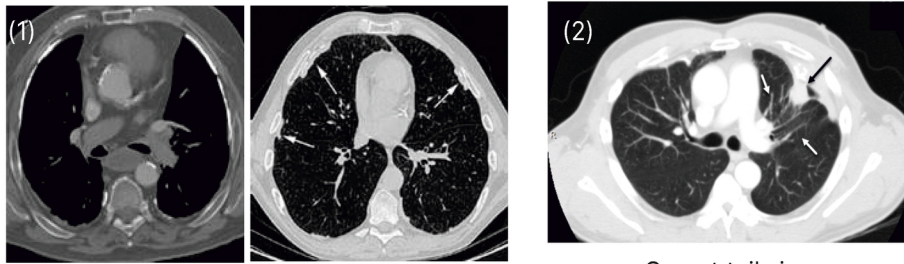
2

- The most common radiological finding is **calcified pleural plaques**, which appear as the **Holly leaf sign**.
- Asbestosis can also give rise to **Mesothelioma**.

YOURWISH

Q7.3: What is the "Comet tail sign" and in what condition is it seen?

Answer: The **Comet tail sign** is a rounded opacity with vessels pulled towards it, seen in **round atelectasis**, a condition associated with Asbestosis.



Comet tail sign

BIG QUESTION 8: Discuss Lung Cancer and its specific variants, including Pancoast Tumour and Cannon Ball Metastasis.

Broad Answer:

- History: Smoker with hemoptysis
- For **Lung Cancer**, the initial investigation of choice is a **CT scan**, while the gold standard is a **CT-guided biopsy**.
- **Pancoast tumour** is a type of lung cancer at the apex, clinically presenting with upper limb pain and Horner's syndrome, for which the investigation of choice is an **MRI** to assess for brachial plexus invasion.
- **Cannon Ball Metastasis** is a pattern of metastasis seen on a chest X-ray, presenting as bilateral circular, similar-sized structures, commonly seen in cancers like choriocarcinoma, breast cancer, and renal cell carcinoma (RCC).

DETAILED QUESTIONS

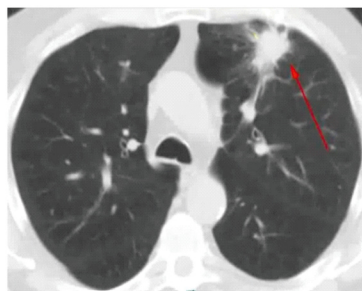
Q8.1: What is the initial investigation of choice and the gold standard for diagnosing lung cancer?

Answer:

- The initial investigation of choice is a **CT scan**.
- The gold standard is a **CT-guided biopsy**.
- To assess metastasis: PET CT.

Q8.2: What is the radiological sign suggestive of malignancy in a lung lesion?

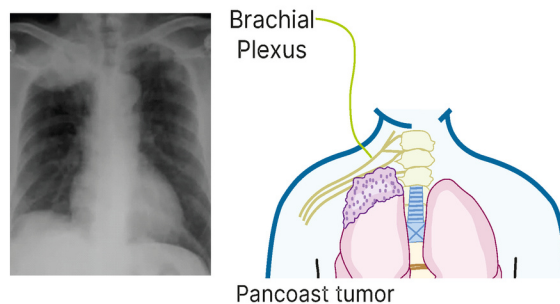
Answer: Spiculated margins are suggestive of malignancy



Q8.3: What is a Pancoast tumour, what is its clinical presentation, and what is the investigation of choice for it?

Answer:

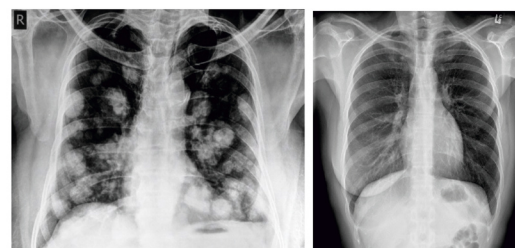
- A **Pancoast tumour** is a tumour located at the apex of the lung.
- The clinical presentation is a history of a smoker with hemoptysis, along with **upper limb pain** and **Horner's syndrome**.
- The investigation of choice is an **MRI** to visualise nerve involvement, specifically the brachial plexus invasion.



Q8.4: What is "Cannon Ball Metastasis," and what cancers is it commonly seen in?

Answer:

- **Cannon Ball Metastasis** is the appearance of **bilateral circular, similar-sized structures** on a chest X-ray.
- It is commonly seen in cancers such as **choriocarcinoma, carcinoma of the breast, and renal cell carcinoma (RCC)**.



BIG QUESTION 9: Describe the key radiological findings of Hyaline Membrane Disease and Congenital Diaphragmatic Hernia.

Broad Answer:

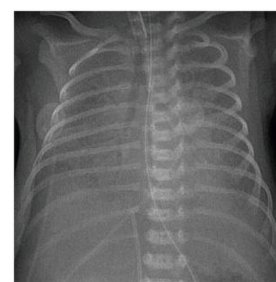
- Respiratory distress in a newborn can be caused by various conditions, including **Hyaline Membrane Disease (HMD)**, which is seen in preterm infants.
- HMD is radiologically characterised by "**white out lungs**", decreased lung volume, and the presence of an "**Air bronchogram sign**".
- **Congenital Diaphragmatic Hernia (CDH)**
- **Bochdalek** (more common, left posterolateral) and **Morgagni** (right anterior)

DETAILED QUESTIONS

Q9.1: What is Hyaline Membrane Disease, and what are its key radiological signs on a chest X-ray?

Answer:

- Hyaline Membrane Disease is a condition seen in **preterm infants**.
- The key radiological signs are "**white out lungs**", **decreased lung volume**, and the presence of an "**Air bronchogram sign**".



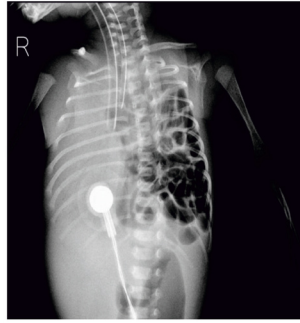
Q9.2: What are the two main types of Congenital Diaphragmatic Hernia (CDH)?

Answer: The two main types are **Bochdalek hernia**, which is more common and located on the left posterolateral side, and **Morgagni hernia**, which is located on the right anterior side.

Q9.3: What are the characteristic clinical and radiological features of Congenital Diaphragmatic Hernia?

Answer:

- The clinical features include a **scaphoid abdomen** with **respiratory distress**.
- The key radiological features are a **shift of the mediastinum to the opposite side** and the presence of **bowel loops in the chest**, which is often associated with **pulmonary hypoplasia**.



Q9.4: What is the specific contraindication for a newborn with a congenital diaphragmatic hernia?

Answer:

- **Bag mask ventilation is contraindicated** in a newborn with a congenital diaphragmatic hernia.



3. CARDIOVASCULAR SYSTEM

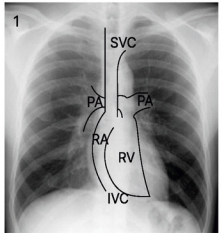
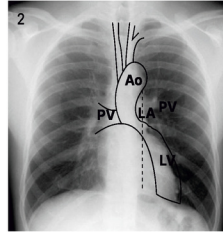
BIG QUESTION 1: How are the heart borders and chambers identified on imaging, and what are the key radiological signs of chamber enlargement and mediastinal anatomy?

Broad Answer: On X-ray, the right heart border shows the right atrium; the left shows the left ventricle and aortic arch. On CT, the right ventricle is anterior, and the left atrium is posterior. LAE shows signs like the walking man and double density. Use 'SAAP' to identify mediastinal structures.

DETAILED QUESTIONS

Q 1.1: What anatomical structures form the right and left heart borders on a chest X-ray? PYQ: FMGE 2020, 2021

Answer:

Heart Border	Structures Forming It
Right Heart Border	- Right Atrium - Superior Vena Cava - Inferior Vena Cava - Ascending Aorta (in the elderly) 
Left Heart Border	- Left Ventricle - Left Auricle - Pulmonary Artery - Aortic Arch 

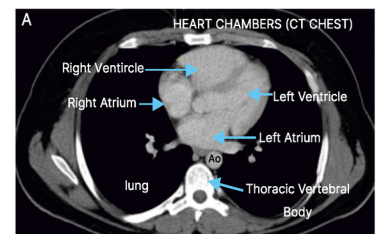
Q 1.2: What are the anatomical positions of the heart chambers as seen on a CT scan?

Answer:

PYQ: FMGE 2018

PYQ: NEET PG 2022

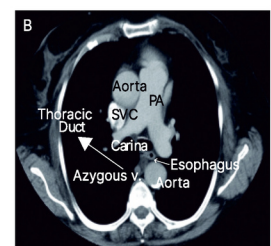
- Anterior-most chamber of the heart: Right ventricle
- Posterior-most chamber of the heart: Left atrium
- Chamber On the left: Right atrium
- Chamber on the right: Left ventricle



Q 1.3: What are the key mediastinal structures seen on imaging?

Answer:

- From right to left: Mnemonic - 'SAAP'
 - o S- Superior vena cava
 - o AA- Ascending Aorta- anteriorly, Descending Aorta- posteriorly
 - o P- Pulmonary artery



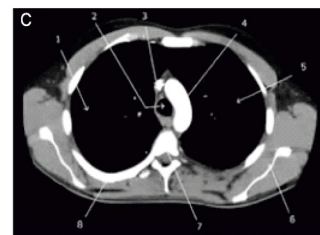
YOURWISH

- Bronchus: Two air-containing structures accompanying the pulmonary artery
- Oesophagus: Air-filled structure behind the left bronchus

Q 1.4: What are the key anatomical structures visible in Image C on a thoracic CT scan?

Answer:

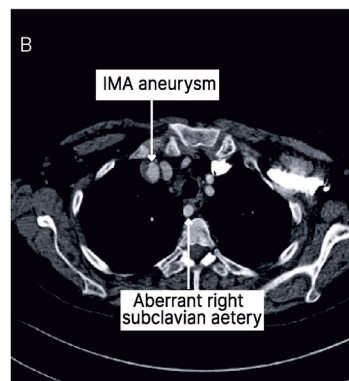
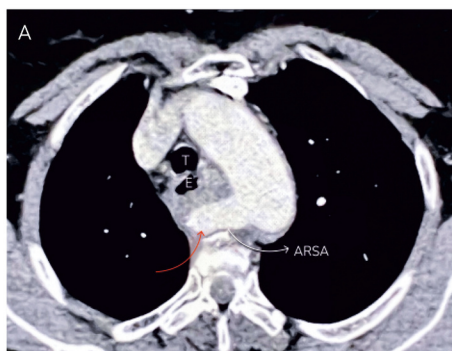
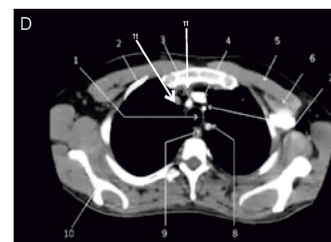
- Central air-filled structure- Trachea (2)
- Arching around the trachea - Aortic arch (4)
- Right of the aorta- Superior vena cava (3)



Q 1.5: What are the branches of the arch of the aorta and their anatomical relations, including ARSA??

Answer:

- Right to left: Mnemonic - 'BCS'
 - o B- Brachiocephalic trunk (3)
 - o C- left Common carotid artery (7)
 - o S- left Subclavian artery (8)
- Veins in front- Brachiocephalic vein (11)
- ARSA (Image A & B)- Aberrant right subclavian artery
 - o Extends behind trachea and oesophagus



Q 1.6: What is the characteristic chest X-ray finding in right ventricular hypertrophy (RVH)?

Answer: Apex points upward (apex up).

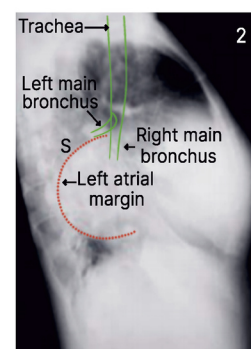
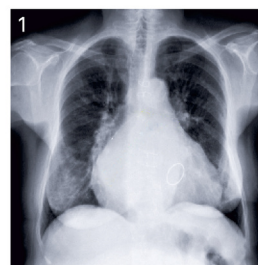
Q 1.7: How does left ventricular hypertrophy (LVH) typically affect the cardiac apex on imaging?

Answer: Apex points downward and outward (apex down and out).

Q 1.8: List the key radiographic signs associated with left atrial enlargement (LAE) or mitral stenosis.

Answer:

- Straightening of the left heart border (Image 1)
- Splaying of the carinal angle
- Double density sign (double right heart border) (Image 2)
- Walking man sign
- Third Mogul sign



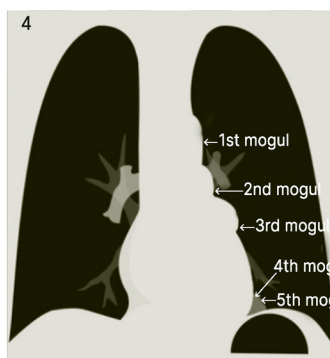
Q 1.9: What is the Walking Man sign?

Answer: Left atrium causing elevation of the left bronchus on the lateral chest x-ray



Q 1.10: What is the third Mogul Sign?

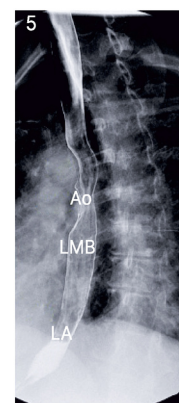
Answer: Prominent third Mogul → because of the left atrium



Q 1.11: What clinical symptom can result from oesophageal compression by the left atrium, and which imaging modality is used to evaluate the left atrium?

Answer:

- Left atrium causes oesophageal compression → causing dysphagia
- For the left atrium, Trans esophageal echocardiography (TEE) is done



BIG QUESTION 2: Describe the key radiological and clinical features of major congenital heart diseases and pericardial anomalies. Additionally, explain how congestive heart failure, pulmonary arterial hypertension, pulmonary embolism, coarctation of the aorta, and aortic dissection present on imaging and clinically.

Broad Answer: Tetralogy of Fallot shows a boot-shaped heart from RVH. Transposition of the great arteries has an egg-on-string sign. Supracardiac TAPVC appears as a snowman heart. Ebstein anomaly causes a box-shaped heart due to right atrial enlargement. Pericardial effusion shows a water bottle heart. Coarctation of the aorta has a figure 3 sign with rib notching. Aortic dissection causes chest pain and unequal arm pressures, diagnosed by CT or TEE.

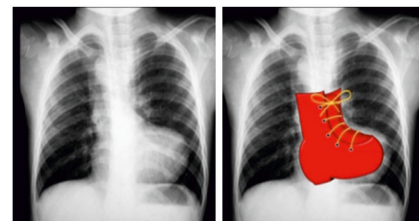
DETAILED QUESTIONS

Q2.1: What radiological sign is commonly seen in Tetralogy of Fallot?

Answer:

PYQ: INICET 2022

- Boot-shaped heart (upturned boot)
 - Seen in TOF due to RVH (because of pulmonary stenosis)
 - Leads to pulmonary oligemia



Q2.2: What is the characteristic radiological appearance of Transposition of the Great Arteries, and which maternal condition is commonly associated with it?

Answer:

- Egg on a string appearance
- Associated with maternal diabetes DM

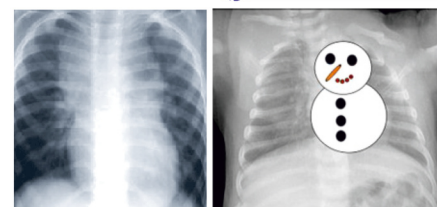


Q2.3: What are the classic radiological signs of supracardiac Total Anomalous Pulmonary Venous Connection (TAPVC), and what pulmonary condition is typically observed?

PYQ: NEET PG 2020, 2021

Answer:

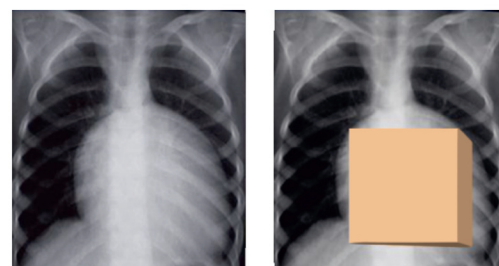
- Snowman heart/ Cottage loaf heart/ Figure of 8
- Pulmonary plethora is seen



Q2.4: What is the cause & radiological sign characteristic of Ebstein anomaly, and how does the malposition of the tricuspid valve affect the heart and lungs?

Answer:

- Cause: Teratogenic effect of lithium
- Radiological sign: Box-shaped heart
- Tricuspid valve goes down → Right atrium enlargement → Pulmonary oligemia



Q2.5: What is the classic radiological appearance of pericardial effusion on chest X-ray, and what is the investigation of choice to confirm the diagnosis?

Answer:

- Water bottle heart/ Money bag heart
- IOC: Echocardiography
- Pericardial effusion on CT



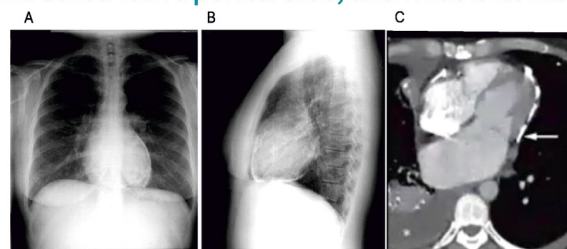
Water Bottle Configuration

CT scan

Q2.6: What is the characteristic radiologic finding in calcific constrictive pericarditis, and what is its most common cause?

Answer:

- Pericardial calcifications
- M/c cause- TB



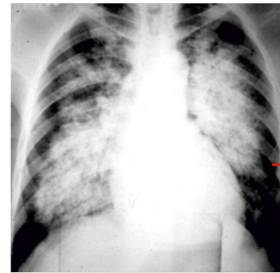
Q2.7: What is the primary mechanism behind pulmonary symptoms in left-sided heart failure?

Answer: Backflow leads to pulmonary oedema

Q2.8: What are common clinical signs in CHF?

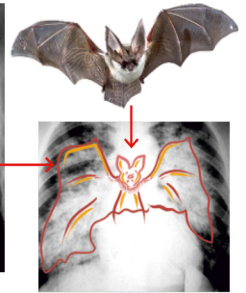
Answer:

- Cardiomegaly: CTR>0.5
- Pulmonary venous hypertension leads to cephalization of blood flow [upper lobe vessels (veins) become prominent]
- Kerley B lines represent interstitial oedema
- Bat wing appearance due to pulmonary alveolar oedema
- Pleural effusion



The above x-ray shows the presence of kerley B lines.

BAT WING APPEARANCE



Q2.9: What are common non-cardiac causes of pulmonary oedema seen in ARDS, and how does it differ from cardiogenic pulmonary oedema?

Answer:

- Non-cardiogenic pulmonary oedema: ARDS- seen in
 - o Pancreatitis
 - o Sepsis
 - o Trauma
- Differentiating features:
 - o Heart size- normal
 - o Fluid accumulation - none or minima

Q2.10: What radiological sign on chest X-ray is characteristic of pulmonary arterial hypertension (PAH)?

Answer: Jug handle appearance of the pulmonary artery



Q2.11: What is the cause of pulmonary artery dilatation?

Answer: Increased pressure

Q2.12: What is the radiological significance of “pruning of peripheral vascularity” in pulmonary arterial hypertension?

Answer:

- It refers to decreased peripheral pulmonary markings
- Leads to RVH - Obliterates the retrosternal space

Q2.13: Which CT finding is suggestive of pulmonary arterial hypertension?

Answer:

- Diameter of pulmonary artery > Diameter of aorta
- PA/AA>1



YOURWISH

Q2.14: What is the most common predisposing factor for pulmonary embolism?

Answer: Deep vein thrombosis (DVT) in bedridden or immobilised patients.

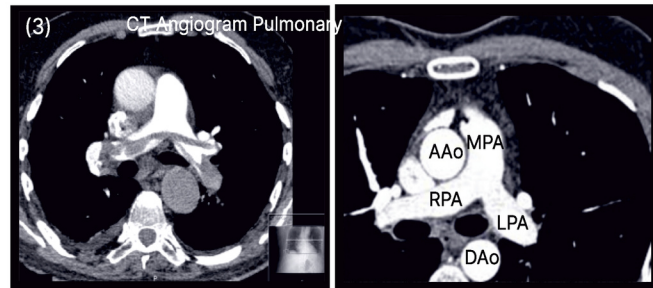
Q2.15: What is the screening investigation for pulmonary embolism?

Answer: Raised D-dimer levels

PYQ: NEET PG 2020

Q2.16: What is the investigation of choice (IOC) for pulmonary embolism?

Answer: CTPA (CT Pulmonary Angiography) or CECT



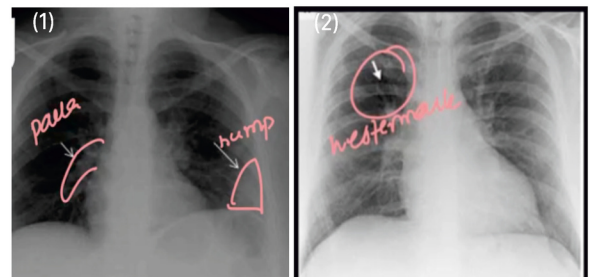
Q2.17: What radiological finding is seen in CTPA for pulmonary embolism?

Answer: Contrast filling defect in pulmonary arteries

Q2.18: What are the X-ray signs for pulmonary embolism?

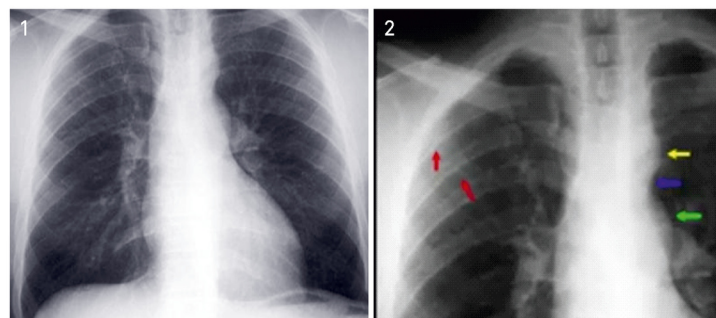
Answer:

- Palla sign: Enlarged right descending pulmonary artery
- Hampton's hump: Infarct formation
- Westermark sign: Focal oligemia



Q2.19: What is the classic chest X-ray finding in coarctation of the aorta?

Answer: Figure 3 appearance



Q2.20: What is the barium swallow finding in coarctation of the aorta? **PYQ: FMGE 2019** **PYQ: NEET PG 2020**

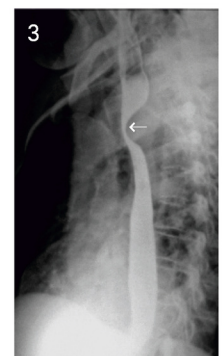
Answer: Reverse 3 sign

Q2.21: What is coarctation of the aorta?

Answer: Focal narrowing of the aorta

Q2.22: What causes inferior rib notching in coarctation of the aorta?

Answer: Intercostal arteries are present along the lower border and become prominent collaterals as compensation for coarctation of the aorta.



Q2.23: What clinical sign is seen in coarctation of the aorta due to pressure difference between limbs?

Answer: Radiofemoral delay (Lower limb BP < Upper limb BP)

Q2.24: Coarctation of the aorta is commonly associated with which genetic condition?

Answer: Turner's syndrome

Q2.25: What is the most common risk factor for aortic dissection?

Answer: Hypertension (HTN)

Q2.26: What is the typical presentation of aortic dissection?

Answer: Acute chest pain radiating to the interscapular area with unequal blood pressure in the upper limbs

Q2.27: What is the investigation of choice (IOC) in a stable patient with suspected aortic dissection?

Answer: CT angiography / CECT

Q2.28: What is the IOC in an unstable patient with suspected aortic dissection?

Answer: Transesophageal echocardiography (USG-TEE)

Q2.29: Which classification systems are used for aortic dissection?

Answer:

- DeBakey classification
- Stanford classification

Stanford A	Stanford B
Ascending aorta is involved	Below the ascending aorta
Acute management is required	Beta blockers used for management

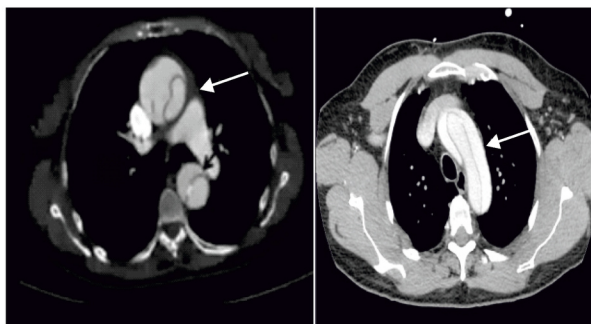


Image 1 : Stanford A

Image 2 : Stanford B

Q2.30: What is the most common risk factor for aortic aneurysm?

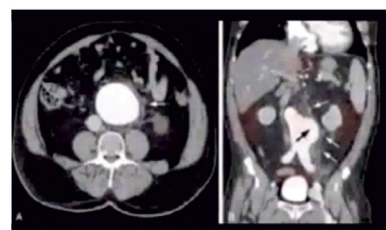
Answer: Atherosclerosis

Q2.31: At what size is an abdominal aortic aneurysm considered significant?

Answer: Greater than 3 cm

Q2.32: What is the investigation of choice before surgery for an aortic aneurysm?

Answer: CT angiography



Q2.33: What is used for surveillance of aortic aneurysm?

Answer: Ultrasound

Q2.34: What waveform pattern is seen in arteries on peripheral vessel Doppler?

Answer: Triphasic waveform

Q2.35: What waveform pattern is seen in veins on peripheral vessel Doppler?

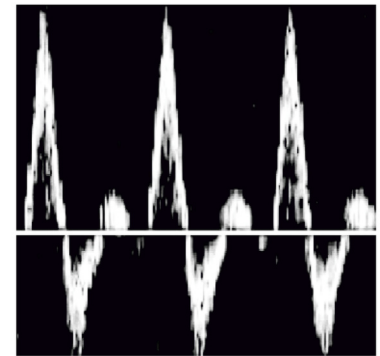
Answer: Monophasic waveform with respiratory phasicity

Q2.36: What is Deep Vein Thrombosis (DVT)?

Answer: A distended vein that is non-compressible (Normal vein is compressed)

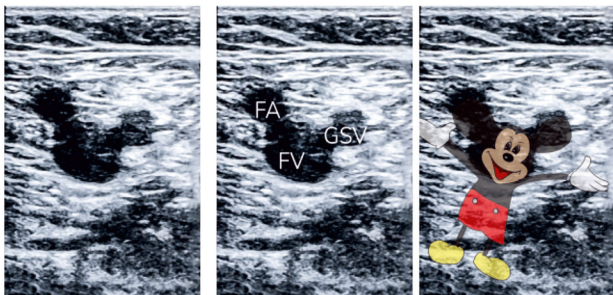
Q2.37: Where is the Mickey Mouse sign seen?

Answer:



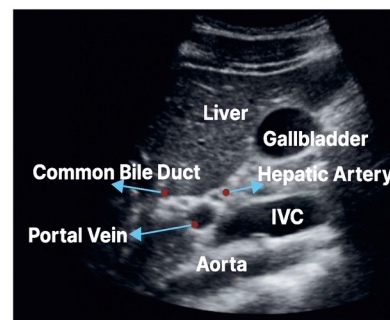
Triphasic waves

- In the groin region- saphenofemoral junction
 - Femoral vein
 - Femoral artery
 - Great saphenous vein



- Portal triad:
 - Portal vein
 - CBD
 - Hepatic artery

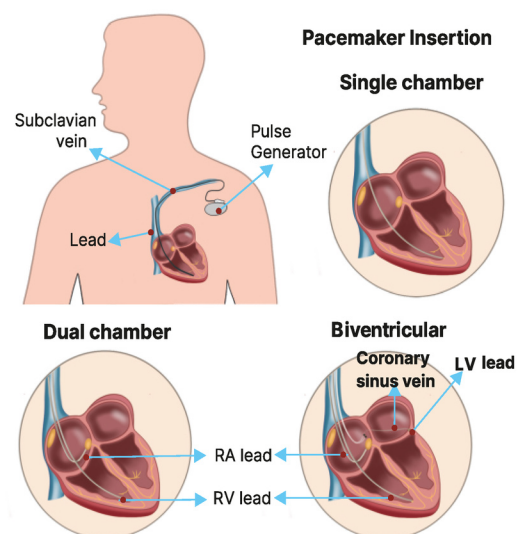
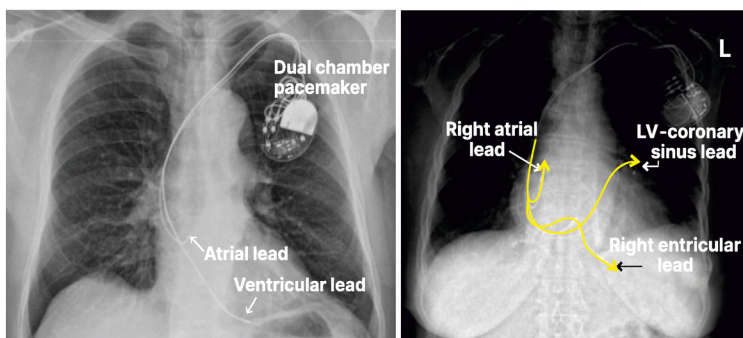
PYQ: FMGE 2020, 2021



Q2.38: Which heart chambers are paced in single, dual, and biventricular pacemakers as seen on X-ray?

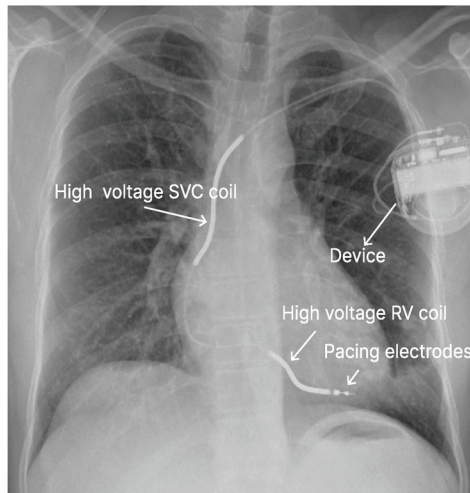
Answer:

- An X-ray is used to visualise
 - Single chamber- Right ventricle
 - Dual chamber- Right ventricle and Right atrium
 - Biventricular- Right ventricle + Right atrium + Left ventricle via the coronary sinus



Q2.39: What key feature distinguishes an intracardiac defibrillator on imaging

Answer: Presence of an Insulating coil





4. NEURORADIOLOGY

BIG QUESTION 1: Describe the fundamental principles and key radiological findings of neuroradiology, focusing on the differentiation of imaging modalities and sequences.

Broad Answer:

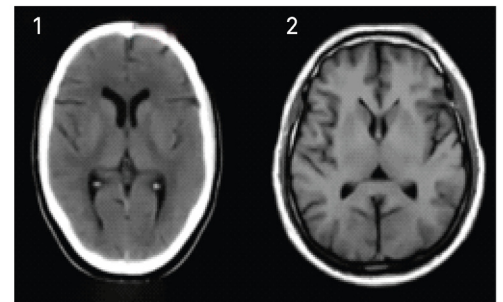
- In neuroradiology, **CT scans** are identified by a "bone white" appearance
- MRI sequences are distinguished by the appearance of water:
 - o T2-weighted
 - o T1-weighted
 - o FLAIR
- Advanced MRI techniques include **DWI** for acute infarcts (restricted diffusion), **SWI** for haemorrhages and calcification (blooming),
- **MR Tractography** for white matter tracts
- **BOLD/fMRI** for functional areas of the brain
- **MR Spectroscopy**, which provides a graph of metabolites to differentiate normal brain (NAA peak), tumours (Choline peak), and TB (Lipid peak).
- **Myelography** involves injecting contrast into the subarachnoid space to visualise the spinal cord.

DETAILED QUESTIONS

Q1.1: How can a CT scan be differentiated from an MRI scan?

Answer:

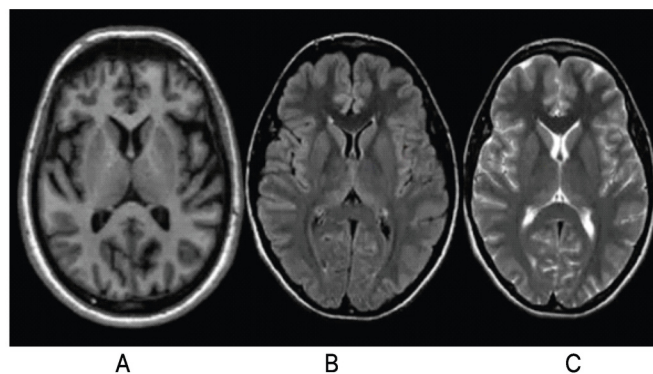
- A **CT scan** shows a "bone white" appearance.
- An **MRI scan** shows a "bone cortex black."



Q1.2: How can you identify T1, T2, and FLAIR MRI sequences?

Answer:

- **T1-weighted MRI** shows white matter as white and grey matter as grey (Image A)
- **T2-weighted MRI** shows water as white (Image C)
- **FLAIR** (Fluid Attenuated Inversion Recovery) shows all fluid, including CSF and white matter, as black. (Image B)

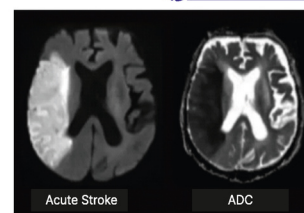


Q1.3: What is DWI (Diffusion Weighted Imaging) based on, and what does it show in an acute infarct?

Answer:

PYQ: NEET PG 2019

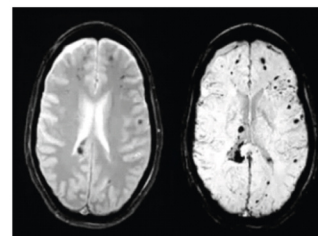
- ADC (Apparent diffusion coefficient) is based on the Brownian
- movement of protons (protons move freely like CSF → Facilitated diffusion)
- An acute infarct shows **restricted diffusion**.



Q1.4: What is SWI (Susceptibility Weighted Imaging) used for, and how do haemorrhages and calcifications appear on it?

Answer:

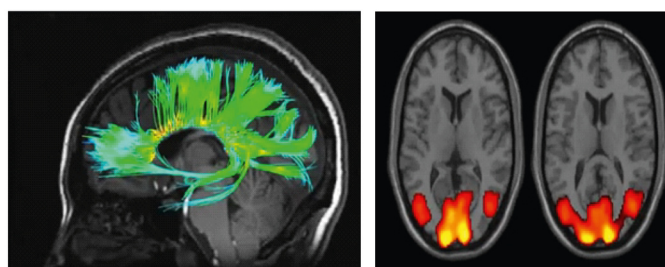
- SWI is used for identifying **haemorrhages and calcification** based on magnetic susceptibility.
- These appear as **black areas of blooming**.



Q1.5: What is the purpose of MR Tractography/DTI and BOLD/fMRI?

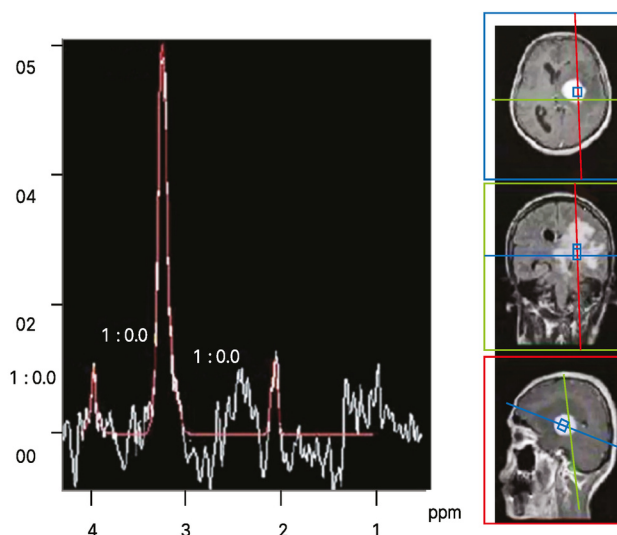
Answer:

- **MR Tractography/DTI** is done to visualise **white matter tracts** and is based on the anisotropy of these tracts.
- **BOLD/fMRI** (Blood Oxygen Level-Dependent) is useful for locating the **functional/eloquent areas of the brain** (e.g., visual cortex, speech area) to aid in neurosurgery planning.



Q1.6: What is MR Spectroscopy, and what are the characteristic metabolite peaks for normal brain, tumours, and TB?

Answer:

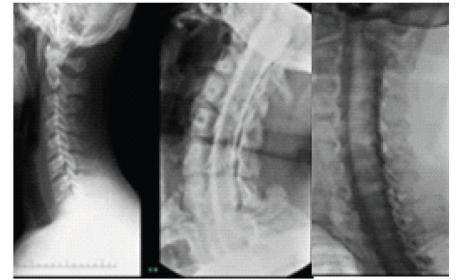


- **MR Spectroscopy** provides a graph of chemical constituents/metabolites of the brain.
- A **normal brain** has a maximum peak of **NAA**.
- A **tumour** has a maximum peak of **Choline**.
- **TB** has a maximum peak of **Lipid**.

Q1.7: What is Myelography, and how is it performed?

Answer:

- **Myelography** is an imaging technique in which a contrast agent is injected into the subarachnoid space to surround the spinal cord.
- The contrast can appear black.



Q1.8: What is the difference between a CT Myelogram and an MR Myelogram?

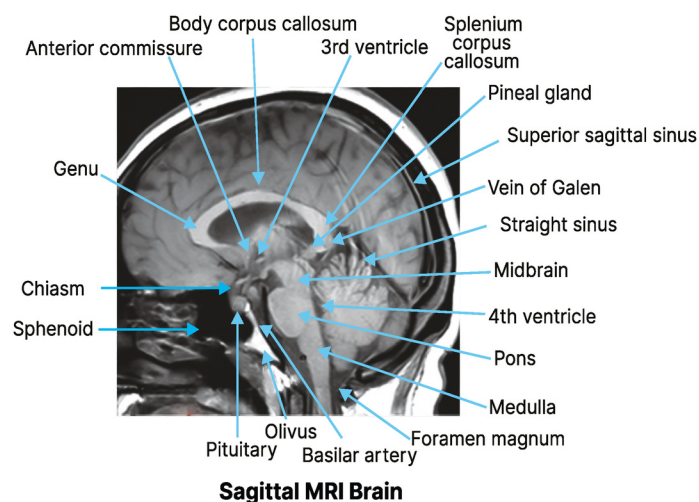
Answer:

- A **CT myelogram** also shows a white contrast.
- An **MR myelogram** does not show the white bone; it is a T2-weighted MRI that is useful for seeing CSF.



BIG QUESTION 2: Discuss the key anatomical structures of the brain as visualised in neuroradiology, including the brainstem, ventricles, and associated landmarks.

Broad Answer:



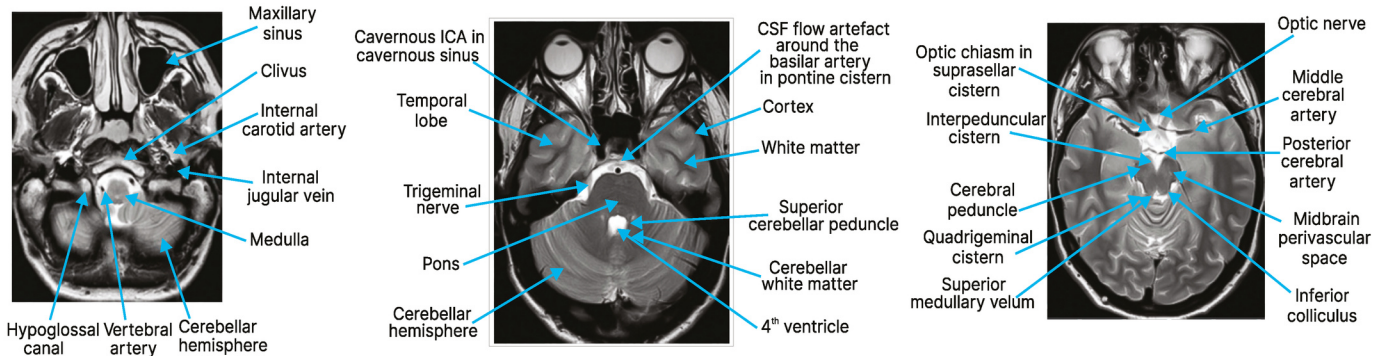
- The brainstem is composed of the upper midbrain, middle pons, and lower medulla. The 4th ventricle is a triangular area between the pons and cerebellum.
- The lateral ventricles, located beneath the corpus callosum, open into the 3rd ventricle via the foramen of Monroe.
- The pineal gland is located beneath the corpus callosum splenium, posterosuperior to the midbrain.
- The pituitary gland is adjacent to the sphenoid sinus.
- Major arteries include the vertebral arteries (black areas surrounding the medulla) and the basilar artery (in front of the pons).

DETAILED QUESTIONS

Q2.1. What are the major anatomical landmarks and structures associated with the brainstem and ventricles?

Answer:

- Brain stem: Comprises of upper midbrain, the middle pons and the lower medulla; medulla goes to the foramen magnum and continues as the brain stem
- The triangular area between the pons and cerebellum is the 4th ventricle.
- Beneath the corpus callosum → Lateral ventricle, which opens through the foramen of monroe into the 3rd ventricle
- The 4th ventricle is between the pons and the cerebellum.



Q2.2. What are the structures adjacent to the midbrain and corpus callosum?

Answer:

- Mamillary body: Present in front of the midbrain
- Posterior part of midbrain: Colliculi
- Pineal gland: Located beneath the corpus callosum splenium, behind the 3rd ventricle, posterosuperior to the midbrain
- White matter tract related to the corpus callosum: Fornix

Q2.3. What are the relationships of the pituitary gland and ventricular structures to nearby nuclei?

Answer:

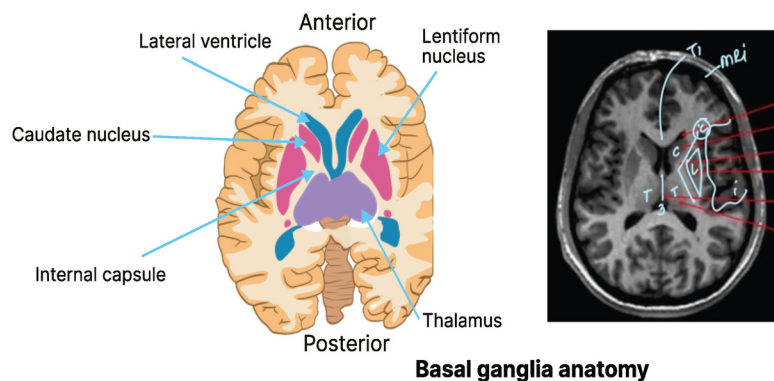
- The pituitary gland is adjacent to the sphenoid sinus.
- Frontal horn of the lateral ventricle; adjacent to that is the caudate nucleus.
- The lateral ventricle will open to the 3rd ventricle in the midline.
- Adjacent to that is the thalamus

Q2.4. What is the lateral anatomical arrangement from the thalamus outward?

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Answer:

- Lateral to both of these is the internal capsule
- Lateral to the internal capsule is the lentiform nucleus (formed by the globus pallidus and putamen)
- The lateral to the lentiform nucleus is the Insula.

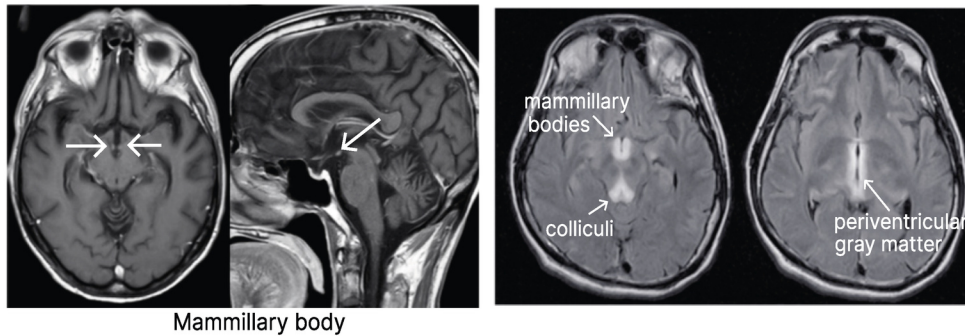
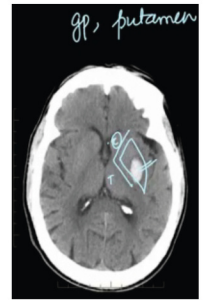


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Q2.5. What are the key radiological and vascular landmarks in the brain?

Answer:

- White area seen in the above image → acute haemorrhage; common in HTN
Surrounding the medulla oblongata, there are black areas → Vertebral arteries.
- Artery in front of pons → Basilar artery
- Classical heart-shaped/Mickey Mouse-shaped structure → Midbrain
- In front of the midbrain is the mammillary body, showing hyperintensity
- Wernicke's encephalopathy affects the mammillary body.
- MR Angiography: Useful in visualising brain circulation

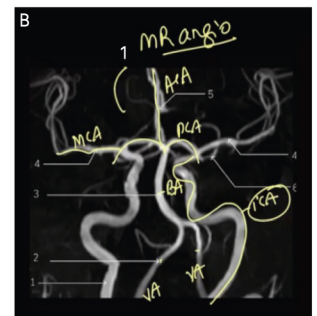
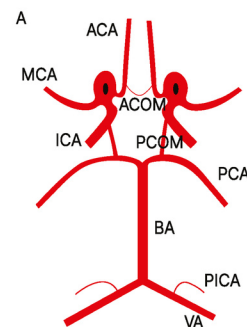


Mammillary body

Q2.6. Describe the vertebrobasilar and carotid circulation of the brain.

Answer:

- 2 Vertebral arteries unite to form an artery → Basilar artery → which in turn gives the Posterior cerebral arteries
- Anterior circulation: Internal Carotid artery (tortuous artery) → divides into middle and anterior cerebral arteries.
- Going anteriorly: Anterior cerebral artery
- Going laterally: Middle cerebral artery



Q2.7. Which is the lowest lobe in the brain?

Answer: Temporal lobe: Inferior-most lobe in the brain

BIG QUESTION 3: Discuss the different types of CNS trauma and haemorrhage, including their characteristic radiological appearances.

Broad Answer:

- The initial investigation of choice for a head injury is a **Non-Contrast CT (NCCT)**, except for Diffuse Axonal Injury (DAI), where MRI is the IOC.
- An **Extradural Haemorrhage (EDH)** is a biconvex lentiform shape
- A **Subdural Haemorrhage (SDH)** is a crescent-shaped haemorrhage caused by the rupture of bridging veins.
- **Subarachnoid Haemorrhage (SAH)** appears as blood in the subarachnoid space (Star of Death) and is commonly caused by a berry aneurysm rupture or trauma.

DETAILED QUESTIONS

Q3.1: What is the initial investigation of choice for a head injury, and what is the exception to this rule?

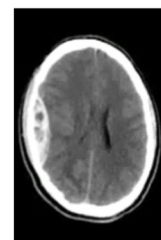
Answer:

- The initial investigation of choice is a **Non-Contrast CT (NCCT)** to look for acute haemorrhage and fracture.
- The exception is **Diffuse Axonal Injury (DAI)**, where MRI is the investigation of choice.

🔍 PYQ: NEET PG 2021 🔍 PYQ: FMGE 2020

Q3.2: What are the key features of an Extradural Haemorrhage (EDH) on a CT scan?**Answer:**

- EDH appears as a **biconvex/lentiform haemorrhage** that **does not cross the sutures**. It is caused by the rupture of the **middle meningeal artery** and is associated with adjacent bone fractures.
- A **hypodense area** ("swirl sign") within the hyperdense haemorrhage suggests active bleeding.

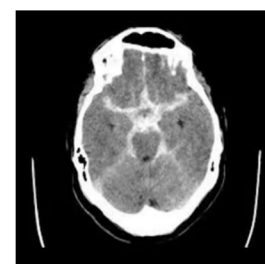
**Q3.3: What are the key features of a Subdural Haemorrhage (SDH) on a CT scan?****Answer:**

- SDH appears as a **crescent-shaped/concavoconvex/sickle-shaped haemorrhage**.
- It is caused by the rupture of **cortical bridging veins**, can be caused by trivial trauma, and may have a chronic history.

🔍 PYQ: NEET PG 2020

**Q3.4: What are the key features of a Subarachnoid Haemorrhage (SAH) on a CT scan, and what is its most common cause?****Answer:**

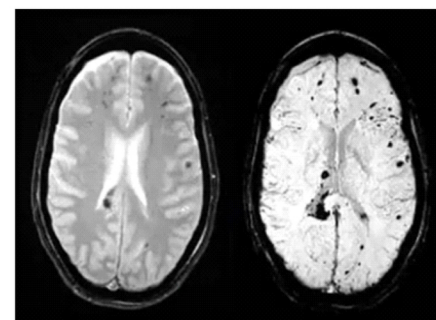
- SAH appears as blood in the subarachnoid space, which can be seen in the basal cisterns, giving a "Star of Death" appearance.
- Patients present with a "thunderclap headache."
- It is most commonly caused by **trauma**, but a ruptured **berry aneurysm** is another significant cause.

**Q3.5: What are the key features of an Intraparenchymal haemorrhage on a CT scan, and what is its most common cause and site?****Answer:**

- It appears as an acute haemorrhage (hyperdense) within the brain parenchyma.
- The most common cause is **hypertension**, and the most common site is the **putamen** (basal ganglia), due to the rupture of lenticulostriate branches. (Haemorrhage → Hyperdense; Infarct → Hypodense)

**Q3.6: What is Diffuse Axonal Injury (DAI), and how is it diagnosed?****Answer:**

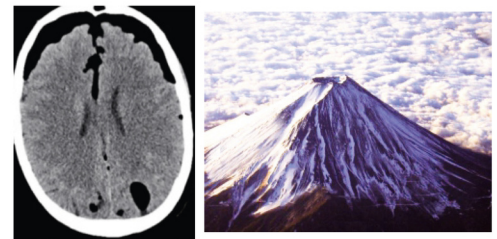
- DAI is suspected in a patient with a history of trauma, a worsening GCS, and a normal CT scan.
- The investigation of choice is **MRI**, specifically with **SWI (Susceptibility Weighted Imaging)**, which helps identify petechial haemorrhages in the grey matter-white matter interface, corpus callosum, and brainstem.

**Q3.7: How does blood appear in different phases on MRI sequences?****Answer:**

	Phase of blood	T1	T2	Flair	T2*GRE
Hyperacute	Oxyhemoglobin				
Acute (12-48h)	Deoxyhemoglobin				
Early subacute (2-7d)	Methemoglobin intracellular				
Late subacute (8d-1m)	Methemoglobin extracellular				
Chronic (>1m)	Hemosiderin and ferritin				
Hyperintense Hypointense Isointense 					

Q3.8: What is the "Mount Fuji sign"?

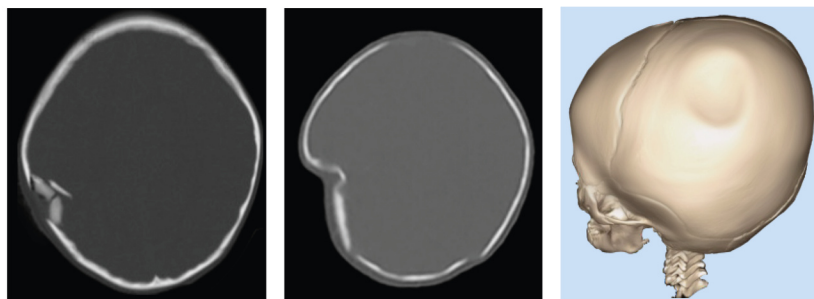
Answer: The **Mount Fuji sign** is a radiological finding seen in **Tension pneumocephalus**, a condition where air in the cranial cavity causes brain compression.



Q3.9: What is a "ping-pong fracture," and in whom is it common?

PYQ: INICET 2024

Answer: A **ping-pong fracture** (or pond fracture) is a depression in the skull bone resembling a ping-pong ball. It is common in **neonates** due to their soft skull bones.



Q3.10: What are the key differences between Cephalhematoma and Caput succedaneum?

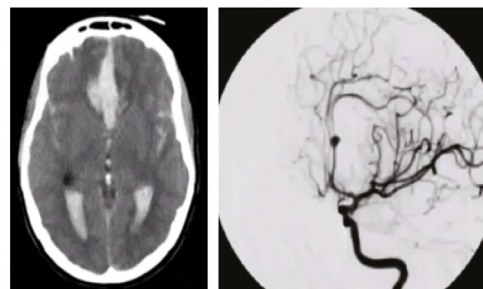
Answer:

Cephalhematoma	Caput succedaneum
- Chronic history - It is a subperiosteal hemorrhage - Can show calcification i.e. internal and peripheral calcification - Double skull sign - Does not cross the midline 	- Acute history - Crosses the midline - Resolves very fast

Q3.11: What is the significance of a "blob of contrast" on a Digital Subtraction Angiography (DSA)?

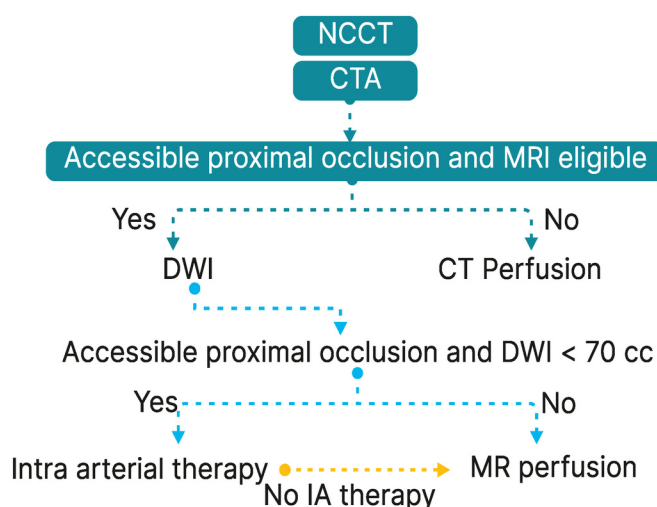
Answer:

- The investigation shown is a DSA, which shows a tortuous internal carotid artery dividing into the middle and anterior cerebral arteries.
- A "blob of contrast" indicates an **aneurysm**, the rupture of which leads to a subarachnoid **haemorrhage**.



BIG QUESTION 4: Discuss the imaging protocol for stroke, including the role of different modalities and signs.

Broad Answer: For a patient with a focal neurological deficit (stroke), the first test is **NCCT** to rule out haemorrhage, as thrombolysis is contraindicated in its presence.



DETAILED QUESTIONS

Q4.1: What is the first test to be done in a patient with a suspected stroke, and why?

Answer:

- The first test is a **Non-Contrast CT (NCCT)**.
- It is done to look for acute haemorrhage, as thrombolysis should not be performed if haemorrhage is present.

Q4.2: What is the role of CT Angiography in stroke management?

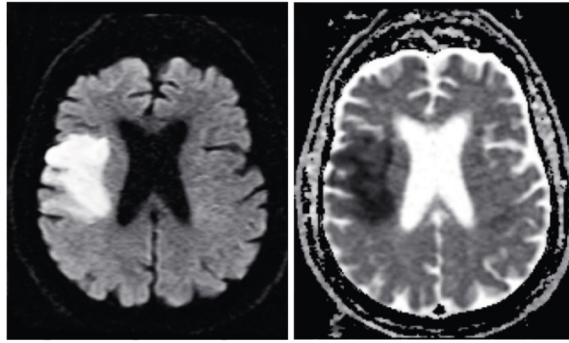
Answer:

- **CT Angiography** is done to check for a blocked vessel.
- If a large vessel is blocked, **mechanical thrombectomy** should be considered.
- CT perfusion helps to pick up penumbra, i.e. ischemic areas (that are viable and can be saved)

Q4.3: What is the most important and sensitive investigation for early infarct, and what does it show?

Answer:

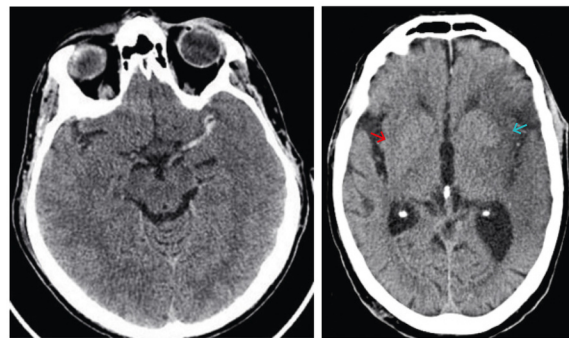
- **DWI (Diffusion Weighted Imaging) MRI** is the most important and sensitive investigation for early infarct.
- It shows **restricted diffusion**, which appears opposite to CSF.
- Chronic infarcts do not show restricted diffusion because of the presence of CSF.



Q4.4: What are the "Hyperdense artery sign" and the "Insular ribbon sign," and in what conditions are they seen?

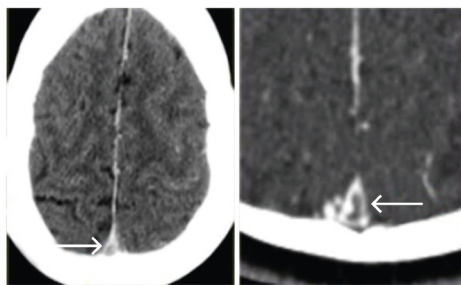
Answer:

- The **Hyperdense artery sign** is the visibility of a white, hyperdense middle cerebral artery on an NCCT, which suggests an acute thrombus.
- The **Insular ribbon sign** is a loss of the normal hypodensity of the insular ribbon, seen in an MCA infarct.



Q4.5: What are the key imaging signs of Dural Venous Sinus Thrombosis on CECT, plain CT, and MRI?

Answer:



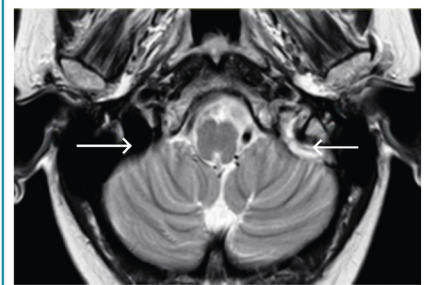
Empty delta sign

- Seen on dehydration and in females on OC pills
- Accumulation/Pooling of blood → Hemorrhagic infarct
- CECT is done to check for contrast filling defect
 - o Area of superior sagittal sinus shows filling defect → triangle(delta) is empty → Empty delta sign → seen in superior sagittal sinus thrombosis



Dense clot sign

- On plain scan → thrombus appears white → dense clot sign



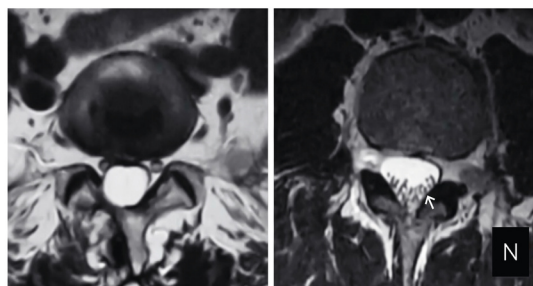
No flow void

- On MRI, the thrombosed sinus shows absent flow void → s/o thrombus

Q4.6: What is the "Empty thecal sac sign," and in what condition is it seen?

Answer: The **Empty thecal sac sign** is seen in **Arachnoiditis**, where inflammation and fibrosis of the arachnoid pull the nerve roots into the periphery, making the thecal sac appear empty of nerve roots.

Arachnoiditis



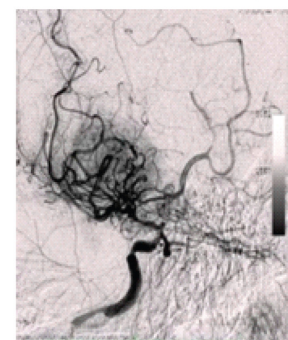
Q4.7: What are the radiological signs of raised intracranial tension (ICT) in children and adults?

Answer:

Child	Adult
• Sutural diastasis (widening of sutures) • Copper beaten / silver beaten appearance 	• Pressure goes down → Clinoid process erosion or dorsum sellae erosion • Empty sella

Q4.8: What are the characteristic findings of Moyamoya disease on a DSA (Digital Subtraction Angiography)?

Answer: On a DSA, Moyamoya disease is characterised by **black narrowed vessels** (ICA stenosis), with contrast coming out of the vessel like a "**puff of smoke**," which indicates the development of collaterals.



BIG QUESTION 5: Discuss the radiological features and associated signs of various neurocutaneous syndromes and other specific brain pathologies.

Broad Answer:

- **Tuberous Sclerosis** is characterised by **subependymal nodules** that can enlarge to form a SEGA (Subependymal Giant Cell Astrocytoma), most commonly at the foramen of Monroe.
- **Neurofibromatosis 2 (NF2)** is associated with **bilateral vestibular schwannomas**, which have a "bilateral ice cream cone appearance" in the cerebellopontine angle.
- **Sturge-Weber syndrome** shows "**Tram track calcification**" on the brain surface and is clinically associated with a port-wine stain and seizures.

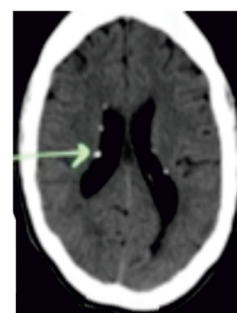
- **Corpus Callosum Lipoma** is identified by **bracket calcification**, while **Corpus Callosum Agenesis** is characterised by prominent posterior dilated lateral ventricles (the "**Racing Car sign**").
- **Huntington's disease** shows **caudate lobe atrophy**, leading to dilation of the frontal horns of the lateral ventricles, known as a "**Boxcar ventricle**." Other specific signs include the "**Eye of the tiger sign**" for Hallervorden-Spatz disease, the "**Face of Giant Panda sign**" for Wilson's disease, and the "**Hummingbird sign**" for Progressive Supranuclear Palsy.

DETAILED QUESTIONS

Q5.1: What is the key radiological finding of Tuberous Sclerosis, and what is its most common site of malignant transformation?

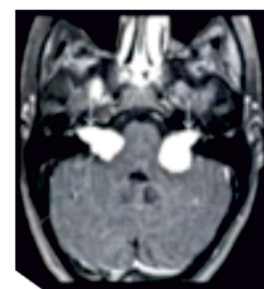
Answer:

- The key radiological finding is **subependymal nodules**.
- These can enlarge to form a **Subependymal Giant Cell Astrocytoma (SEGA)**, most commonly at the **foramen of Monroe**.



Q5.2: What is the characteristic sign of Neurofibromatosis 2 (NF2) on imaging?

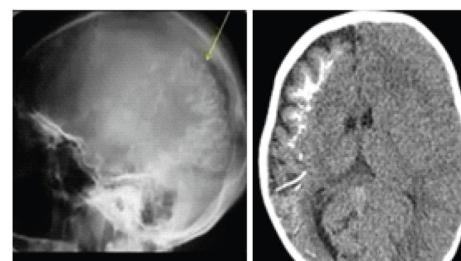
Answer: NF2 is associated with **bilateral vestibular schwannomas**, which show a **bilateral "ice cream cone appearance"** in the cerebellopontine angle.



Q5.3: What is the hallmark radiological sign of Sturge-Weber syndrome?

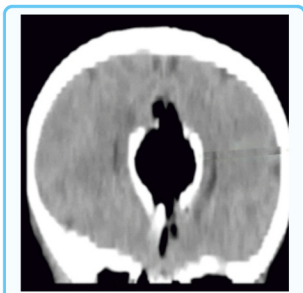
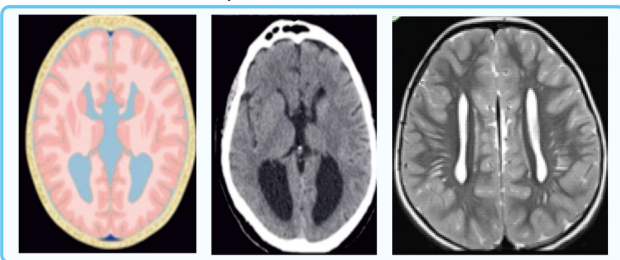
Answer:

- The hallmark sign is "**Tram track calcification**" on the surface of the brain.
- Clinically, it is associated with a port-wine stain and seizures.



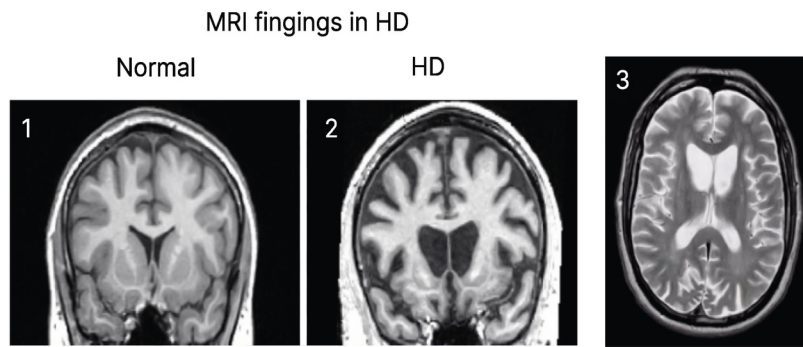
Q5.4: What is the radiological difference between a Corpus Callosum Lipoma and Corpus Callosum Agenesis?

Answer:

Corpus callosum lipoma	Corpus callosum agenesis
• Calcification is seen here i.e. bracket calcification 	• Prominent posterior dilated horns of lateral ventricles appears as a racing car back wheels → Racing Car sign • Lateral ventricles are parallel oriented 

Q5.5: What is the key radiological sign of Huntington's disease?

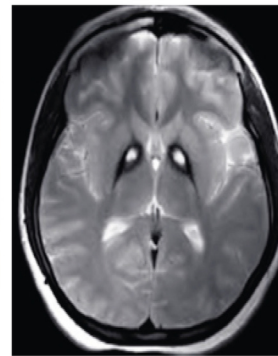
Answer: Huntington's disease shows **caudate lobe atrophy**, which leads to the dilation of the frontal horn of the lateral ventricles, resulting in a "Boxcar ventricle."



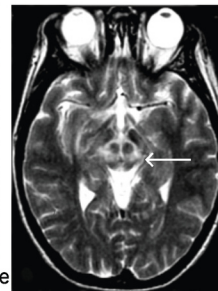
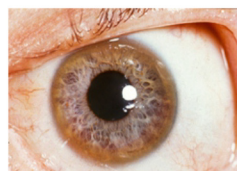
Q5.6: What are the specific radiological signs for Hallervorden-Spatz disease, Wilson's disease, and Progressive Supranuclear Palsy?

Answer:

- Hallervorden-Spatz Disease: "Eye of the tiger sign."



- Wilson's Disease: "Face of Giant Panda sign" (clinically associated with a KF ring in the eyes).



T2 MRI the 'face of the giant panda' in the midbrain (arrow).

- Progressive Supranuclear Palsy: "Hummingbird sign" (midbrain atrophy with bulging of the pons).
 - o The patient has a history of frequent falls.

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Q5.7: What is the radiological finding for Hemangioblastoma, and with which syndrome is it associated?

Answer: Hemangioblastoma appears as a cystic lesion with an enhancing mural nodule. It is associated with Von-Hippel-Lindau (VHL) syndrome.



BIG QUESTION 6: Discuss the radiological features of central nervous system (CNS) infections

Broad Answer:

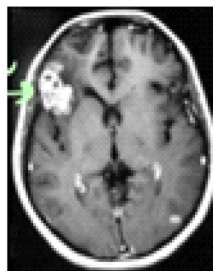
DETAILED QUESTIONS

Q6.1: What are the key imaging findings of CNS Tuberculosis?

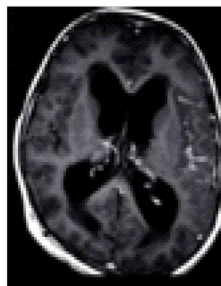
Answer:

CNS TB can present with

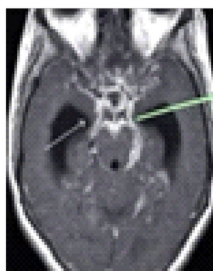
- Conglomerate lesions with necrotic tuberculomas



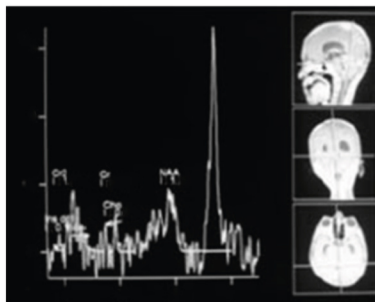
- Hydrocephalus due to dilated ventricles



- Thick and enhanced meninges in TB meningitis (due to basal exudates).



- On MR Spectroscopy, a Lipid peak is seen.

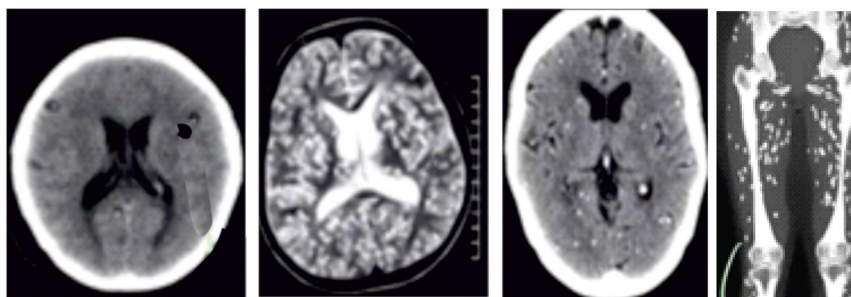


Q6.2: What are the characteristic radiological signs of Neurocysticercosis?

PYQ: INICET 2020

Answer:

- Neurocysticercosis is identified by a "cyst with a dot inside," which represents the scolex of *Taenia solium*.

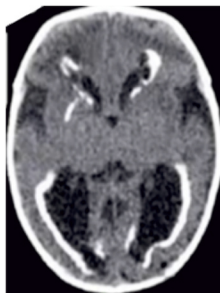


- In its end stage, it can cause a "starry sky appearance" due to calcification, or "rice grain calcification" if it spreads to the muscles.

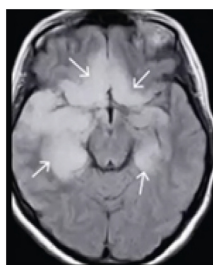
Q6.3: What are the characteristic radiological findings for congenital CMV and HSV encephalitis?

Answer:

- Congenital CMV is associated with periventricular calcification.
- Congenital CMV



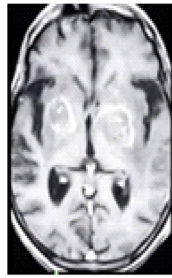
- HSV encephalitis causes encephalitis that specifically affects the temporal lobes.
- DOC: Acyclovir



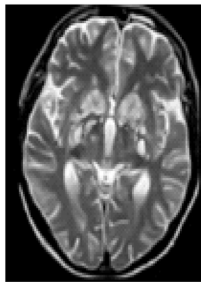
Q6.4: What are the characteristic radiological signs of infections in HIV-positive patients?

Answer:

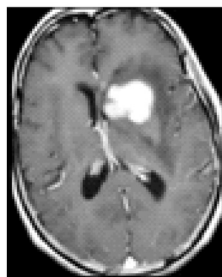
- In HIV-positive patients, **toxoplasmosis** shows an **eccentric target sign** (most commonly in the basal ganglia).



- **Cryptococcosis** shows a "soap bubble appearance."



- **CNS lymphoma** presents as a solitary enhancing lesion in the peripheral region.



BIG QUESTION 7: Discuss the radiological features and associated signs of demyelinating lesions and vascular malformations

Broad Answer:

- Multiple Sclerosis, a demyelinating disease, is characterised by "Dawson's fingers" on MRI, which are finger-like projections at the calloso-septal interface. The investigation of choice for MS is a contrast-enhanced MRI.
- **Vein of Galen Malformation (VOGM)** is an AV fistula that presents in a neonate with hydrocephalus and heart failure.
- On imaging, **Arteriovenous Malformation (AVM)** appears as multiple prominent vessels giving a "bag of worms" appearance, and an angiography shows an entanglement of vessels called a **nidus**.
- A **Cavernoma (Cavernous Angioma)** has a characteristic "popcorn appearance" on MRI..

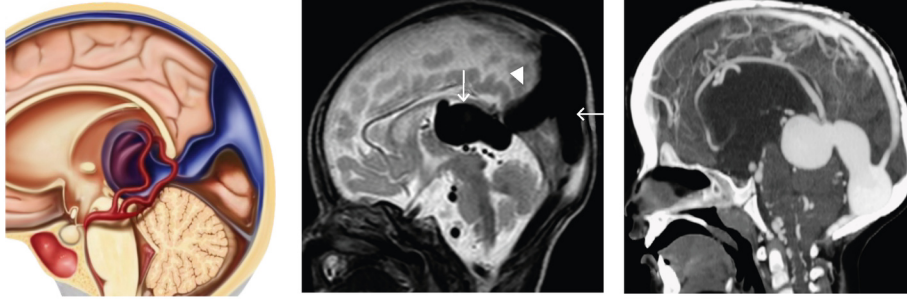
DETAILED QUESTIONS

Q7.1: What is a Vein of Galen Malformation (VOGM), and how does it typically present in a neonate?

Answer:

PYQ: NEET PG 2018

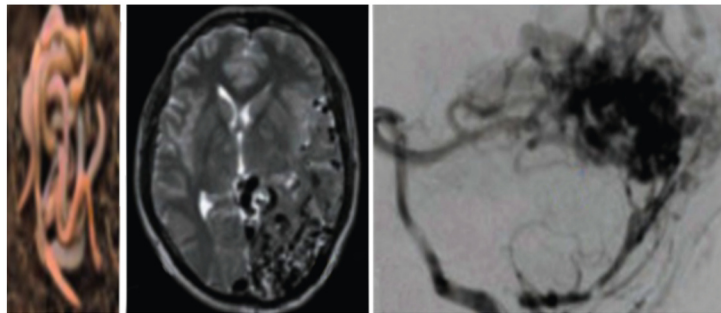
- A **VOGM** is an **arteriovenous (AV) fistula**.
- It presents in a neonate with **hydrocephalus and heart failure**.



Q7.2: How does an Arteriovenous Malformation (AVM) appear on imaging?

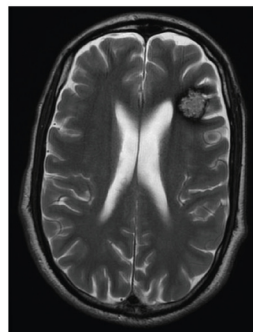
Answer:

- An AVM appears as multiple prominent vessels, giving a "bag of worms" appearance
- On angiography, an entanglement of vessels called a nidus is seen.



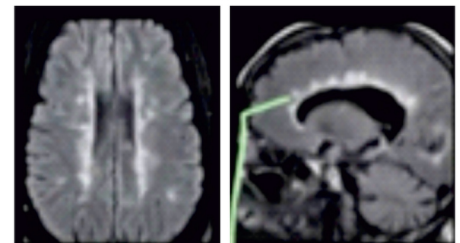
Q7.3: What is the characteristic appearance of a Cavernoma (Cavernous Angioma) on an MRI?

Answer: A Cavernoma has a "popcorn appearance" on MRI.



Q7.4: What are "Dawson's fingers," and what condition are they seen in?

Answer: "Dawson's fingers" are finger-like projections seen at the calloso-septal interface on MRI. They are a characteristic sign of **Multiple Sclerosis**, a demyelinating lesion that affects white matter and oligodendrocytes.



Q7.5: What is the investigation of choice for Multiple Sclerosis?

Answer: The investigation of choice for Multiple Sclerosis is a Contrast-Enhanced (CE) MRI.

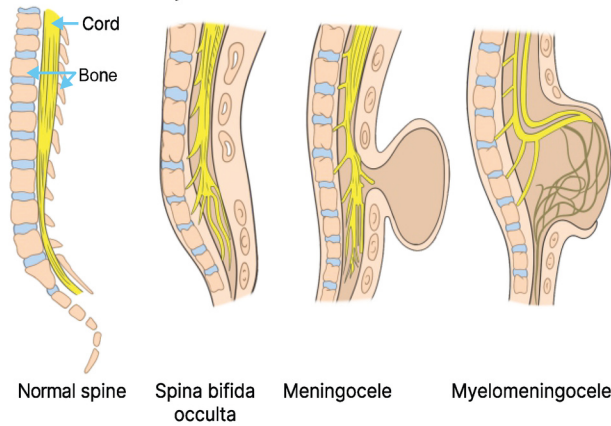
BIG QUESTION 8: Discuss the radiological features of various brain tumours and spinal dysraphisms.

Broad Answer:

- Brain tumours have distinct imaging features.
 - A **Meningioma** is a vividly enhancing, extra-axial lesion with a "dural tail sign."

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- o A **Glioblastoma Multiforme (GBM)** is an irregular tumour with central necrosis that often crosses the midline, forming a **"Butterfly Glioma."**
- o The most common posterior fossa tumour in children is a **Medulloblastoma**, a hyperdense tumour arising from the 4th ventricle, causing hydrocephalus.
- o **Craniopharyngioma** is more common in children, is midline and suprasellar, and contains calcification and cystic components.
- o A **Pituitary Adenoma** widens the sella turcica and can appear as a "Figure of 8 appearance."
- Spinal dysraphisms can be differentiated by their contents.

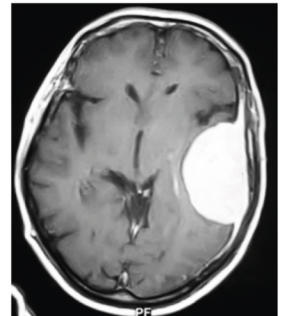


DETAILED QUESTIONS

🔍 PYQ: FMGE 2020

Q8.1: How can a Meningioma be identified on a contrasted CT or MRI?

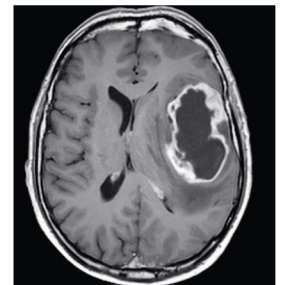
Answer: A **Meningioma** is a vividly enhancing lesion that is **extra-axial**, with a characteristic **"dural tail sign."**



Q8.2: What are the key features of a Glioblastoma Multiforme (GBM)?

Answer:

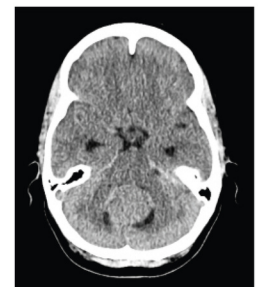
- A GBM is a tumour with **irregular borders** and **central necrosis**
- It often crosses the midline via the corpus callosum, giving it a **"Butterfly Glioma"** appearance.



Q8.3: What is the most common posterior fossa tumour in a child, and what are its key imaging features?

Answer:

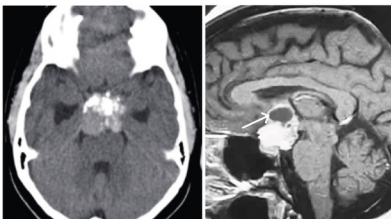
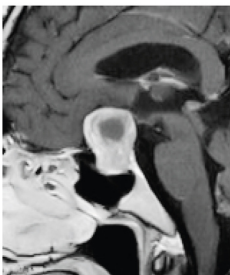
- The most common posterior fossa tumour in a child is a **Medulloblastoma**.
- It is highly cellular, appearing **hyperdense** on CT, and arises from the **4th ventricle**, which can cause upstream hydrocephalus.



Q8.4: Differentiate between a Craniopharyngioma and a Pituitary Adenoma.

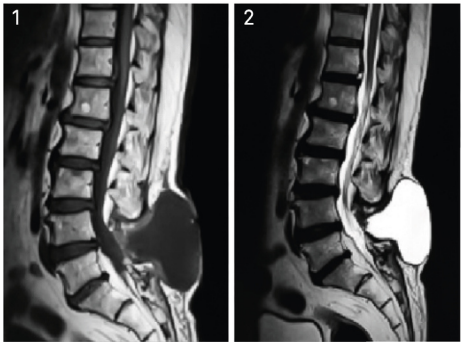
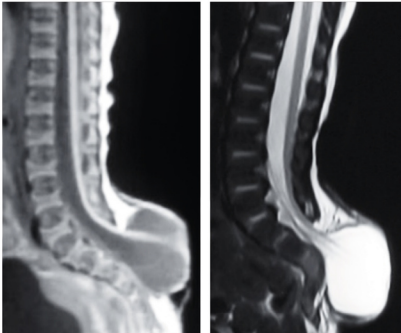
Answer:

🔍 PYQ: NEET PG 2019 🔍 PYQ: FMGE 2020

Craniopharyngioma	Pituitary adenoma
• More common in a child • It is in the center /midline • It has calcification • It has cystic components • Seen in suprasellar region 	• Widened sella turcica • Figure of 8 appearance • Its s/o primary pituitary macroadenoma 

Q8.5: What are the key imaging differences between a Meningocele and a Meningomyelocele?

Answer:

Meningocele	Meningomyelocele
• Only meninges i.e. only CSF is present  • On T2 uniform white (Image 2) • On T1 → dark (Image 1)	• Spinal part, nerve roots are also present  • Black nerve roots are going along with sac



5. HEAD AND NECK

BIG QUESTION 1: What are the key radiological views and findings in Paranasal Sinus (PNS) and orbital imaging?

Broad Answer:

- Different X-ray views (like Water's, Caldwell's, Rhese, and Towne's) are used to visualize specific sinuses and orbital structures—e.g., Water's view for the maxillary sinus and Rhese view for the optic canal.
- CTPNS, especially HRCT, is the investigation of choice before FESS.

DETAILED QUESTIONS

Q 1.1: What are the different X-ray views used in PNS and orbital imaging, and which anatomical structures can be visualized in each?

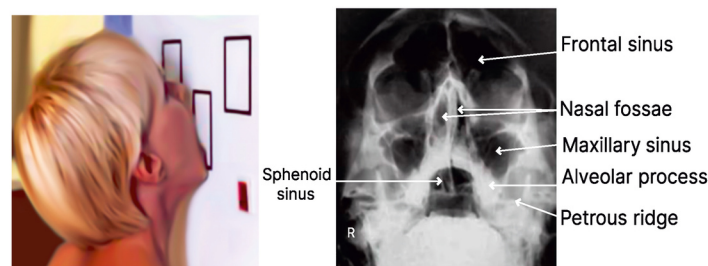
Answer:

View	Use
Caldwell's view (nose-forehead position; occipitofrontal view)- More elongated view	• Superior orbital fissure • Frontal sinus
Towne's view	• Inferior orbital fissure
Rhese view	• Optic canal • Optic foramen
Water's view (nose-chin position; occipitomental view)- More rounded view • Closed mouth • Open mouth: Pierre's View	• Maxillary sinus • Floor of orbit

PYQ: FMGE 2021

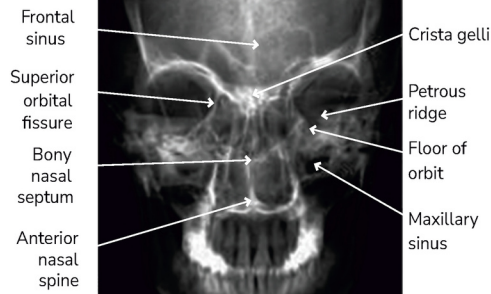


Water's view with closed mouth

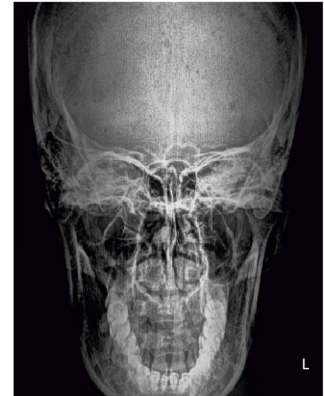


Water's view with open mouth

Patient Position in Caldwell Method :



Caldwell's View



Towne's View

Q 1.2: In which X-ray views can the sphenoid sinus be visualized?

Answer:

- With an open mouth, the sphenoid sinus can also be visualized
- Other views where the sphenoid sinus can be visualized: Basal view and Submentovertical view

Q 1.3: What is the investigation of choice before performing Functional Endoscopic Sinus Surgery (FESS)?

Answer: HRCT

Q 1.4: What is the HRCT finding of PNS?

Answer:

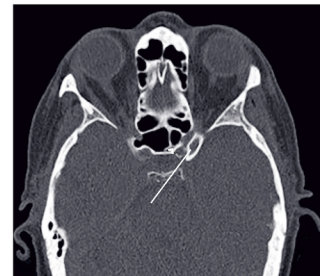
1. Concha bullosa (Pneumatization of middle turbinate)

- Concha- turbinate
- Bulla- air containing



Pneumatization of superior turbinate

2. Onodi cell: Air cell related to optic nerve

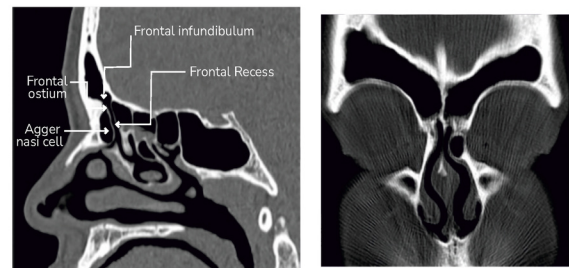


Onodi Cell location

3. Haller cell: Infraorbital air cell



4. Agger nasi: Anterior-most ethmoidal cell



BIG QUESTION 2: What are the common radiological pathologies seen in the paranasal sinuses (PNS), and how are they identified on imaging?

Broad Answer: Key imaging signs include the double density sign in allergic fungal sinusitis, the black turbinate sign in mucormycosis, and the tear drop sign in orbital floor fractures. Antrochoanal polyps extend into the nasopharynx,

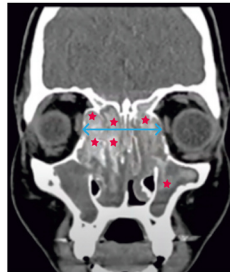
YOURWISH

mucocoeles appear as expansile lesions, and JNA shows the Holman-Miller sign. CT is the investigation of choice for most of these conditions

DETAILED QUESTIONS

Q 2.1: What is the characteristic imaging sign of allergic fungal sinusitis?

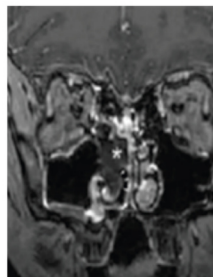
Answer: Double density sign/ serpiginous sign: Gray mucous with white fungal matter



CT of Allergic Fungal Sinusitis

Q 2.2: What is the key imaging feature of mucormycosis?

Answer: Black turbinate sign: Due to necrosis- no enhancement

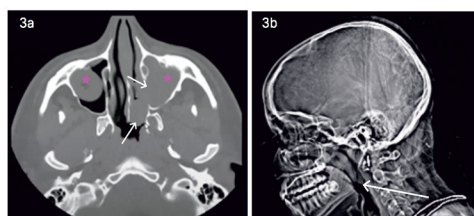


Q 2.3: What is an antrochoanal polyp, and how is it differentiated from other nasopharyngeal masses?

Answer:

PYQ: FMGE 2021

- Antrochoanal polyp: Polyp in the maxillary sinus extending into the nasopharynx
- Dodd sign: Differentiates primary from secondary nasopharyngeal mass

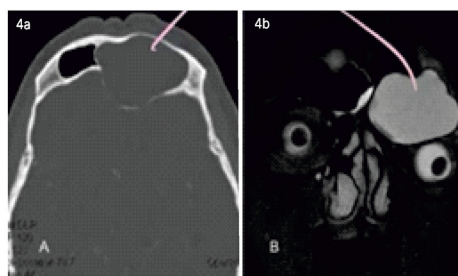


CT of Antrochoanal Polyp

Q 2.4: What are the key features of a mucocoele in the paranasal sinuses and its possible complications?

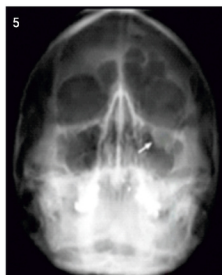
Answer:

- A mucocoele is characterized by an expanded sinus with a thinned-out wall filled with mucus.
- Possible complication: Frontal mucocoele can lead to proptosis and can occur post-trauma



Q 2.5: What radiological sign is typically seen in a blowout fracture of the floor of the orbit?

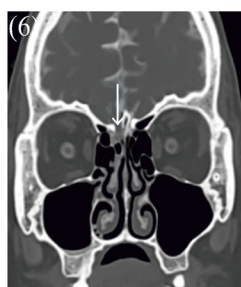
Answer: Teardrop sign



Q 2.6: How is cerebrospinal fluid (CSF) rhinorrhea diagnosed using imaging?

Answer:

- Contrast in sulcal spaces: CT cisternogram
 - o To check for CSF leaks

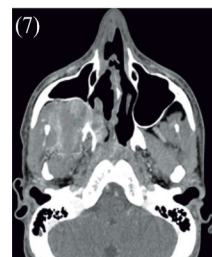


CT cisternogram of skull

Q 2.7: What are the important radiological/ diagnostic signs and management considerations for Juvenile Nasopharyngeal Angiofibroma (JNA)?

Answer:

- Holman Miller sign: Anterior bowing of the posterior wall of the maxillary sinus due to mass
- IOC: CT with contrast or CT angio
- Abiopsy shouldn't be done, as it is a highly vascular mass

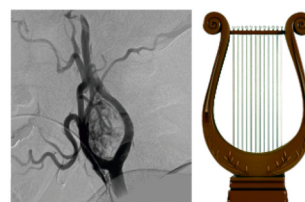


Q 2.8: What is the characteristic imaging sign and nature of a carotid body tumor?

PYQ: NEET PG 2022

Answer:

- Lyre's sign: Splaying of carotids
- Highly vascular tumor

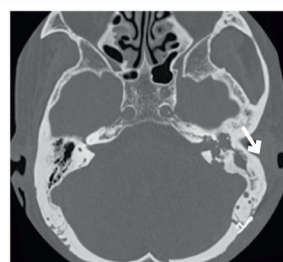


Lyre's sign

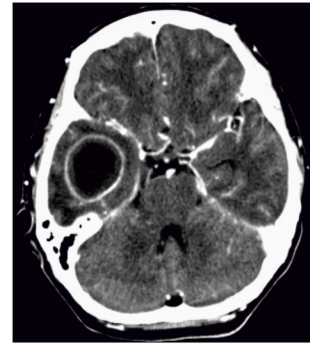
Q 2.9: What are the common complications of chronic suppurative otitis media (CSOM), and how are they identified on imaging?

Answer:

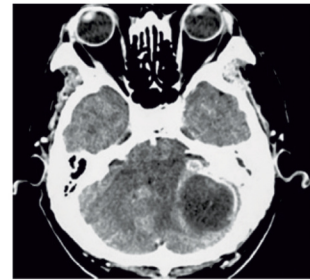
Sclerosis of the mastoid bone



Peripheral enhancement of the abscess is seen
Temporal lobe abscess

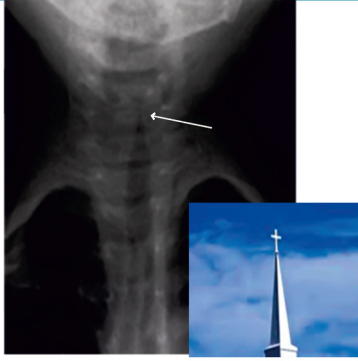


Cerebellar lobe abscess



Q 2.10: How can epiglottitis be differentiated from croup (laryngotracheobronchitis) based on clinical and radiological features? PYQ: FMGE 2019, 2020, 2021 PYQ: NEET PG 2021, 2022 PYQ: INICET 2022, 2023

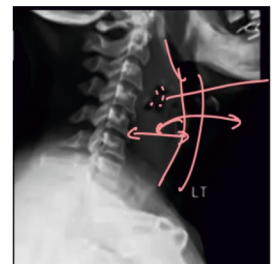
Answer:

Epiglottitis	Croup
Inflammation of the epiglottis	Inflammation of the airway
Thumb sign: Edematous and thickened epiglottis	Steeple sign: Narrowed lumen due to wall edema
	

Q 2.11: What are the radiological signs of a retropharyngeal abscess on a lateral neck X-ray? PYQ: FMGE 2019, 2021

Answer:

- Increased thickening of prevertebral soft tissues
 - At C2 > 7mm
 - At C7 > 22mm

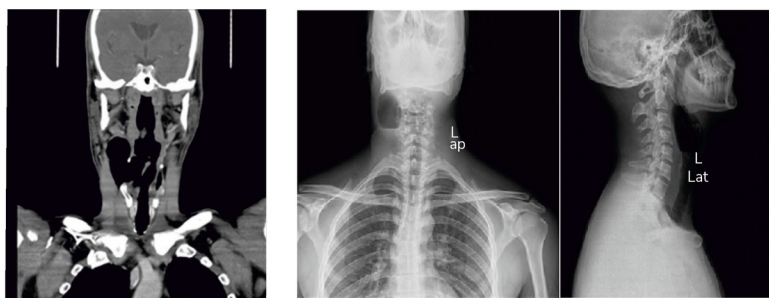


Q 2.12: What is a laryngocele, and in which group of people is it commonly seen?

Answer:

- It is an air-filled diverticulum from the larynx that develops due to increased pressure

- Commonly seen in trumpet blowers



Air filled swelling

Q 2.13: What is the characteristic imaging sign of Graves' ophthalmopathy, and what does it indicate?

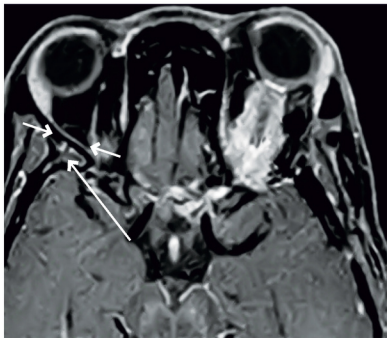
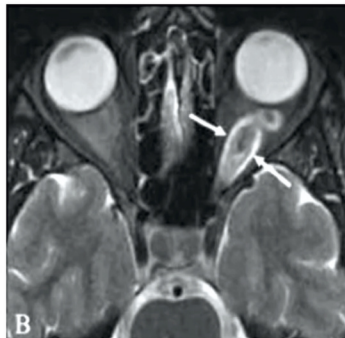
Answer: Coke bottle sign: Indicates tendon-sparing enlargement of the muscle



Coke-bottle sign

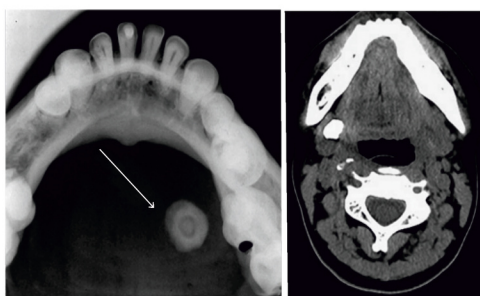
Q 2.14: How can optic meningioma be differentiated from optic glioma on imaging?

Answer:

Optic meningioma	Optic glioma
Thickened enhancing meninges	Nerve enhancement
Tram track sign	Fusiform swelling of the nerve
	

Q 2.15: How is submandibular calculus seen on radiological modality?

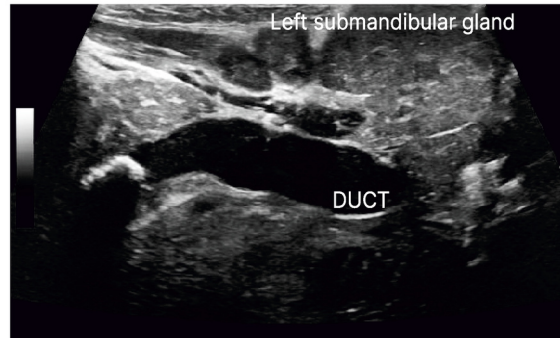
Answer:



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Q 2.16: What is sialolithiasis, and how does it affect the submandibular duct?

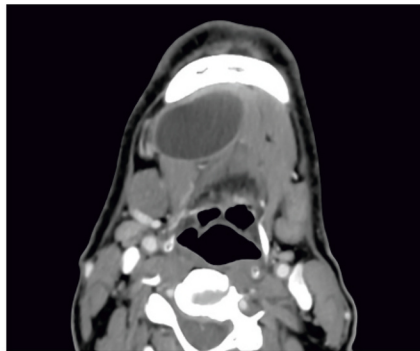
Answer: Stone in the submandibular gland → Submandibular duct enlargement



Q 2.17: What is a ranula?

Answer: A fluid-filled cystic lesion in the floor of the mouth

 PYQ: FMGE 2022



6. GASTROINTESTINAL TRACT AND HEPATOBILIARY PANCREAS



BIG QUESTION 1: What are the key radiological investigations used for evaluating gastrointestinal pathologies, and how are they selected based on anatomy or clinical condition?

Broad Answer:

- Radiological investigations for the GI tract include endoscopic ultrasound for T-staging, barium swallow for the oesophagus, barium meal for the stomach, barium follow-through for the small intestine, and barium enema for the colon.
- Enteroclysis and CT enterography are used for detailed small bowel assessment. CECT is useful for abdominal organ and vascular evaluation.

DETAILED QUESTIONS

Q 1.1: What anatomical structures can be seen on a barium swallow, and what causes indentations in the oesophagus?

Answer:

- Esophagus
- Indentations in the oesophagus from above and below
 - o Aortic arch
 - o Bronchus (left)
 - o Cardiac- left atrium



Q 1.2: What is a barium meal used for in radiological investigations?

Answer:

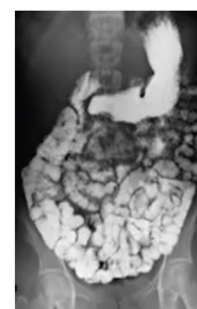
- For stomach



Q 1.3: What is the purpose of a barium meal follow-through study, and how can jejunal and ileal loops be differentiated radiologically?

Answer:

- Purpose: To evaluate the small intestine
- Bowel loops in the left upper quadrant with a feathery appearance are jejunal loops due to the presence of valvulae conniventes
- Ileal loops do not have a feathery appearance.



Q 1.4: What is the use of a barium enema, and when is it contraindicated?**Answer:**

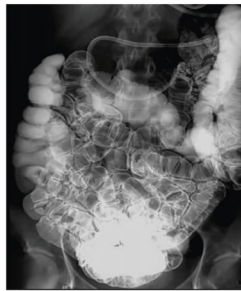
- Used to visualise the colon
- Barium is given transrectally
 - o Haustrations are seen in the large intestine
 - o Double contrast = Barium (appears white) + Air (appears black)

**Q 1.5: When is a barium enema contraindicated, and what is used in its place?****Answer:**

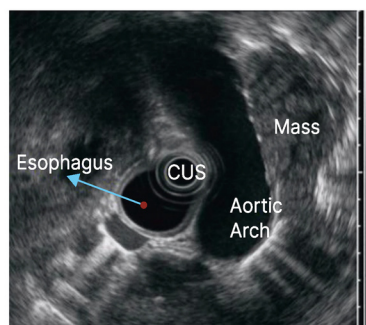
- Barium studies are contraindicated in case of perforation, as they cause peritonitis.
- o In case of perforation, iodinated contrast is used as it is water-soluble common iodinated contrast used is Iohexol > Gastrografin

Q 1.6: What is the use of enteroclysis, and what is its route of administration?**Answer:**

- Used to visualise the small intestine
- Barium is not given orally; it is given via naso-jejunal tube

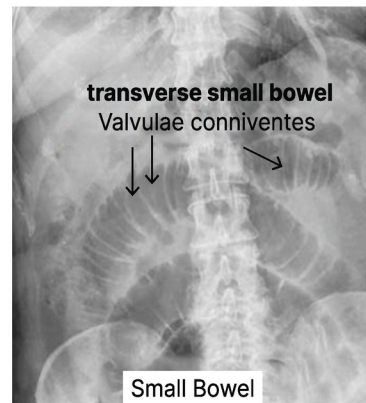
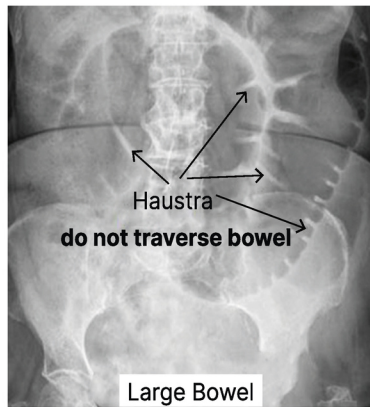
**Q 1.7: What is the role of endoscopic ultrasound in the evaluation of gastrointestinal masses?****Answer:**

- Helps to evaluate T-staging/ depth of mass

**Q 1.8: How can you differentiate the large bowel from the small bowel on a radiograph?****Answer:**

🔍 PYQ: NEET PG 2021 🔍 PYQ: FMGE 2023

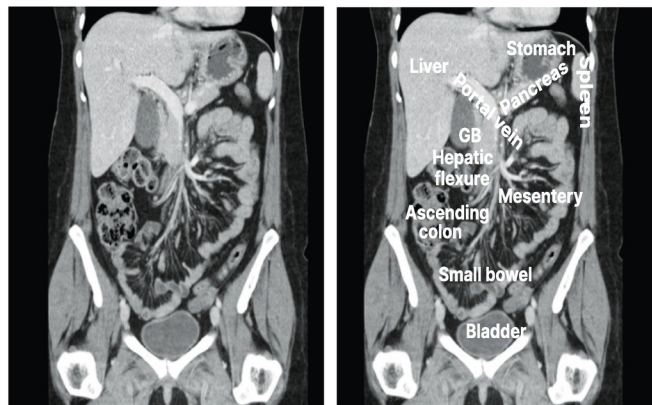
Large bowel	Small bowel
Haustrations- Incomplete markings	Valvulae conniventes - Complete circular markings
Peripheral in location	Central in location



Q 1.9: What are the characteristic features of key abdominal organs on contrast-enhanced CT?

Answer:

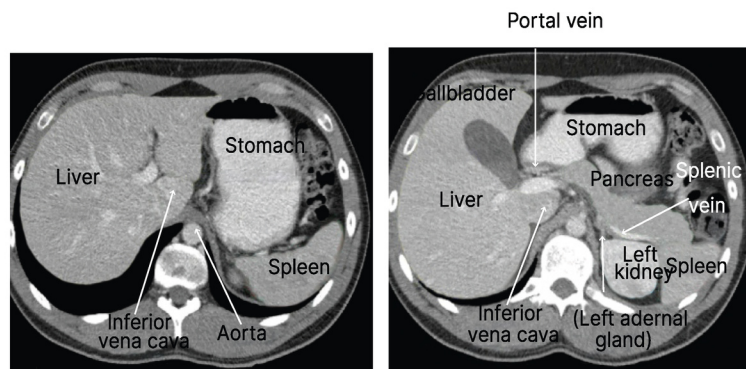
- Major blood supply to liver- Portal vein (bile duct contains bile and will appear grey on CT)
- Gall bladder and urinary bladder - Shows grey water fluid density
- Stomach- Fluid+ air



Q 1.10: What key anatomical structures are identified on axial CT at the level of the upper abdomen, and how can they be differentiated based on their location and appearance?

Answer:

- The stomach is identified by the presence of air (blackish area), which is not seen in other structures.
- In the 2nd image, behind the stomach, there is the pancreas, which is directed towards the spleen.
- At the pancreas level, the artery rising is the Superior mesenteric artery (coming from the aorta)
- Posterior-most - Left kidney; Right kidney is not visible at this level because the left kidney is higher.
- To the right of the aorta, the IVC is seen, and anterior to the IVC, the portal vein is seen. The adrenal gland is seen related to the kidney.

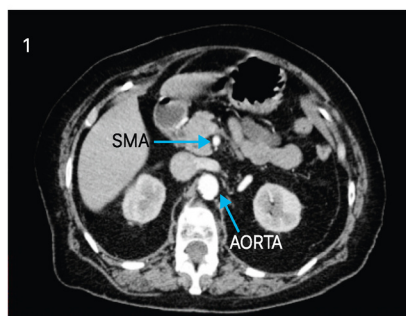


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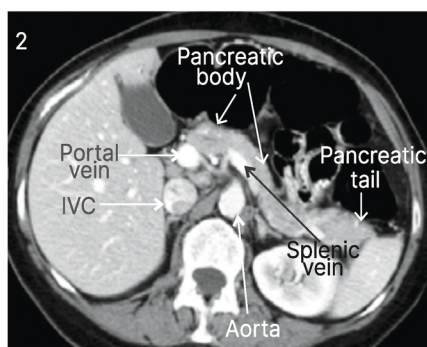
Q 1.11: Which major abdominal artery is visualised on the given axial CT?

Answer:

- Superior mesenteric artery



Q1.12: What vascular and anatomical structures are visualised on a given axial CT?



Answer:

- The pancreas is going from right to left, towards the spleen
- IVC is seen to the right of the aorta
- The portal vein is seen in front of the IVC
- Splenic vein is seen posterior to the pancreas (Splenic V + Superior mesenteric V → Portal V)

Q1.13: What is the role of mannitol in enterography, and how does it aid in the detection of intestinal pathologies?

Answer:

- In enterography, mannitol is used as a hygroscopic agent, i.e., it causes accumulation of water in the intestine, which causes distention
- The mucosal surface is better visualised.
- Mucosal Pathologies, i.e., polyps and Crohn's disease, can be detected on Enterography.

BIG QUESTION 2: How do various radiological investigations help in identifying abdominal and gastrointestinal pathologies?

Broad Answer:

- Pneumoperitoneum, caused by perforation of a hollow viscus, is identified on X-ray by signs such as free air under the diaphragm (erect chest X-ray), the **football sign**, **Rigler's sign**, **Cupola sign**, and ligament-related signs (e.g., falciform ligament sign).
- In contrast, **pseudo-pneumoperitoneum** mimics true free air but involves **air within the bowel**, often seen in **Chilaiditi syndrome**, where the colon is interposed between the liver and diaphragm. Recognising bowel markings and anatomical relationships helps differentiate the two

DETAILED QUESTIONS

Q 2.1: What is pneumoperitoneum?

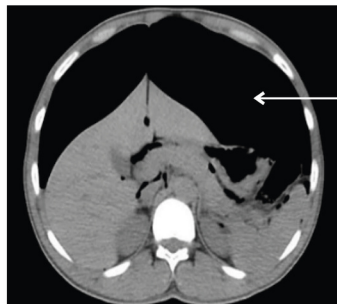
Answer:

- Air in the peritoneal cavity due to rupture of a hollow viscus organ (perforation, post-laparoscopy)

Q 2.2: What radiological sign is typically seen on a Chest X-ray?

Answer:

- On erect chest X-ray: Free air under the diaphragm



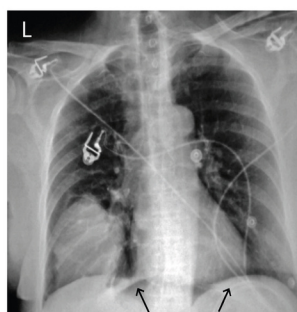
🔍 PYQ: AIIMS 2018 🔍 PYQ: NEET PG 2019

🔍 PYQ: FMGE 2020 🔍 PYQ: INICET 2022

On CT, jet black appearance shows air indicating pneumoperitoneum

- Decubitus abdomen sign
- Football sign
- Rigler's sign
- Cupola sign: Air beneath the central diaphragm

The Cupola Sign



- Dome-like
- Air accumulation beneath the central tendon of the diaphragm



- Ligament sign
- Inverted V sign: Paired umbilical ligament sign (seen because of the air around the ligament)



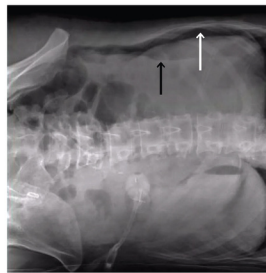
Q 2.3: What is a decubitus abdominal sign?

Answer:

- Left lateral decubitus position with horizontal beam of X-ray:

- o Provides a good contrast against the liver
- o Air around the lesser sac area can escape through the epiploic foramen
- o Black air is seen above the liver in the given image → pneumoperitoneum

Decubitus Abdomen Sign



- Left Lateral decubitus
- Air-fluid level
- White arrow = free air between the abdominal wall and the liver
- Black arrow = free fluid in the peritoneum

Q 2.4: What does the football sign in radiology suggest?

Answer:

- Patient in supine → Air beneath the abdominal wall; anteriorly suggestive of Massive pneumoperitoneum



Supine X-ray

Q 2.5: What is Rigler's sign on an abdominal X-ray?

Answer:

- Double bowel sign
- Due to the presence of air inside and outside the bowel, the bowel loops are visualised.

Q 2.6: Where is Rigler's triad typically seen?

Answer:

- In gallstone ileus

Q 2.7: What is the ligament (falciform ligament) sign on X-ray, and what does its presence indicate?

Answer:

- The falciform ligament connects the anterior abdominal wall and the liver
- Ligament is visualised due to the presence of air on either side of the ligament
- All ligament signs are seen in pneumoperitoneum

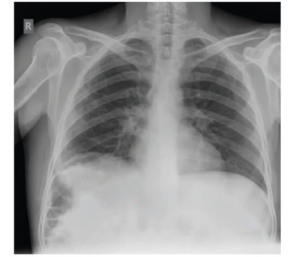
Falciform Ligament Sign



Q 2.8: What is pseudo pneumoperitoneum, and how can it be distinguished from true pneumoperitoneum on imaging?

Answer:

- Pseudoperitoneum: Air in the bowel beneath the diaphragm
- Bowel markings are seen (not seen in pneumoperitoneum)



Q 2.9: What is Chilaiditi syndrome?

Answer:

- Presence of a colonic loop between the diaphragm and the liver
- Colonic interposition

BIG QUESTION 3: What are the common diagnostic features and investigative approaches used to identify major gastrointestinal pathologies, including oesophageal disorders, bowel obstructions, and inflammatory conditions?

Broad Answer:

- Gastrointestinal pathologies are diagnosed based on clinical symptoms and characteristic imaging findings. Oesophageal disorders like diverticula, achalasia, and carcinoma show distinct signs on barium studies and manometry.
- Bowel obstructions and volvulus present with specific radiographic signs and dilatation patterns on X-rays and CT scans.
- Inflammatory diseases and infections are evaluated using targeted imaging (USG, CECT) and sometimes biopsy, with hallmark signs guiding diagnosis and management.

DETAILED QUESTION

Q 3.1: What is the triad of Zenker's Diverticulum?

Answer:

- Triad of
 - o Dysphagia
 - o Regurgitation
 - o Halitosis

Q 3.2: Where anatomically does Zenker's Diverticulum occur, and why is it considered a false diverticulum?

Answer:

- Upper esophagus
- False diverticulum - Seen in Killian's dehiscence; directed posteriorly towards the vertebra

Q 3.3: Which age group is most commonly affected in Zenker's Diverticulum?

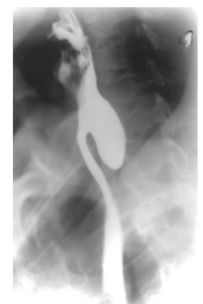
Answer:

- Elderly (with weak Killian's dehiscence)

Q 3.4: What is the investigation of choice for diagnosing Zenker's Diverticulum?

Answer:

- Barium Swallow



YOURWISH

Q 3.5: What causes the narrowing of the lower oesophageal sphincter in Achalasia Cardia, and what are the typical symptoms?

Answer:

- Contraction of the lower oesophageal sphincter → Narrowing of LES
- Typical symptom: Dysphagia to liquids > solids

 PYQ: FMGE 2018

Q 3.6: Which diagnostic sign is seen on imaging in Achalasia Cardia, and what is the gold standard investigation?

Answer:

- Bird beak sign/ Rat tail sign
- Gold standard- Manometry

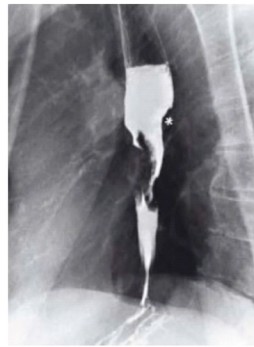


Q 3.7: What are the characteristic clinical and imaging features of carcinoma oesophagus?

Answer:

- Clinical feature: Dysphagia to solids > liquids
- Radiological feature: Irregular narrowing with a shoulder-like appearance of the oesophagus
- Also called apple core

 PYQ: NEET PG 2020

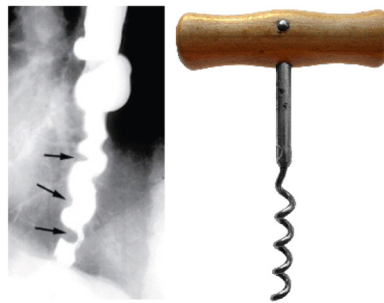


Q 3.8: What is the typical radiological appearance of diffuse oesophageal spasm on imaging studies?

Answer:

- Corkscrew appearance

 PYQ: FMGE 2021



 PYQ: NEET PG 2018

Q 3.9: What is meant by "Feline Oesophagus," and in which conditions is it commonly observed?

Answer:

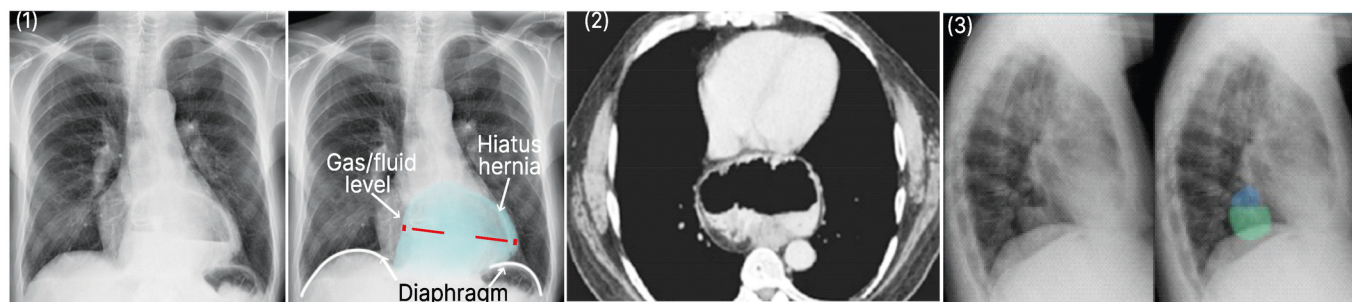
- Prominent Transverse folds in the oesophagus
- Seen in GERD, eosinophilic esophagitis



Q 3.10: How is a hiatus hernia typically identified on imaging?

Answer:

- Retrocardiac opacity containing an air fluid level



Q 3.11: What causes pyloric stenosis, and how is it typically present in infants?

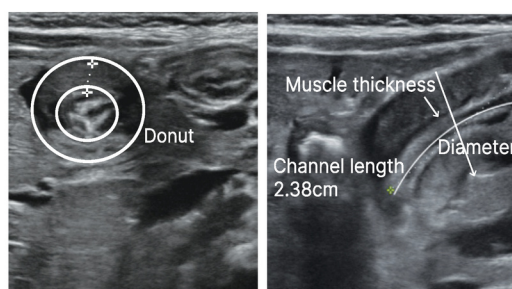
Answer:

- Occurs due to the hypertrophy of the circular muscle layer of the pylorus
- It is a Medical emergency: Correct fluid electrolyte imbalance with NS
- It presents at 2-4 weeks with non-bilious vomiting

Q 3.12: Which imaging modality is the investigation of choice for pyloric stenosis, and what are its key ultrasound signs?

Answer:

- IOC: USG- Target / Doughnut sign
 - o Muscle >4mm thick
 - o Pylorus >16mm long



Q 3.13: Describe the “string sign” and “mushroom sign” seen in pyloric stenosis imaging.

Answer:

- String sign- narrowing of the pylorus
- Mushroom sign- narrow pylorus entering the duodenum



String Sign

Q 3.14: What does the single bubble sign indicate on an abdominal X-ray, and which condition is it associated with?

Answer:

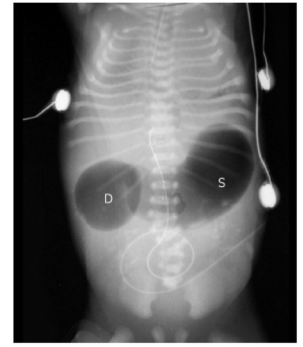
- Air inside the stomach → stomach obstruction: Pyloric stenosis



Q 3.15: What conditions does the double bubble sign associate with, and how does it present?**Answer:**

PYQ: NEET PG 2021,2022

- Duodenal atresia
 - o Bilious vomiting
 - o Presents immediately after birth
- Also seen in annular pancreas compressing the duodenum

**Q 3.16: What does the triple bubble sign on imaging represent?****Answer:**

- Jejunal atresia

**Q 3.17: What does the multiple bubble sign indicate on imaging?**

PYQ: FMGE 2023

Answer:

- Ileal atresia

**Q 3.18: How do you differentiate between small and large bowel obstruction on imaging?****Answer:**

- Small bowel and large bowel obstruction are differentiated by valvulae conniventes and haustrations.

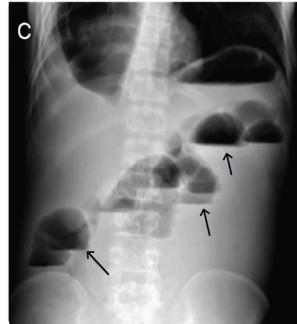
Large Bowel Obstruction	Small Bowel Obstruction
• Haustrations of the colon	• Valvulae conniventes of the jejunum

Q 3.19: What 3-6-9 rule regarding bowel obstruction?**Answer:**

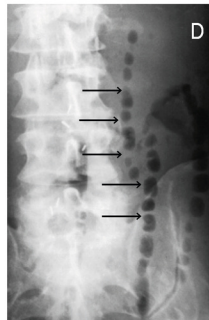
- 3-6-9 rule
 - o >3 cm dilatation: small bowel obstruction
 - o >6 cm dilatation: colonic obstruction
 - o >9cm dilatation: caecal obstruction

Q 3.20: What are the key radiological signs of small bowel obstruction?**Answer:**

- Multiple air fluid levels, i.e., Step ladder pattern
 - o >3 air fluid levels in the Step ladder pattern indicate small bowel obstruction



- String of pearl sign
 - o Air locules are arranged one behind the other due to the dilated bowel pushing the air in between the valvulae conniventes to the periphery.

**Q 3.21: What is intussusception, and in which age group is it most common?****Answer:**

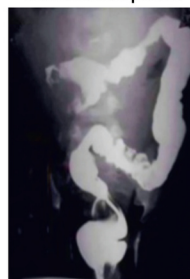
- Intussusception is the telescoping of a bowel loop
- M/c in the weaning age group

Q 3.22: What are the classic clinical and imaging signs of intussusception?**Answer:**

- Clinical presentation: Red currant jelly stools
- Radiological signs
 - o Target/ doughnut sign on USG
 - o Barium enema sign:
 - Claw sign
 - Coiled spring sign



Claw Sign
Intussusception



Coiled spring
sign



? PYQ: NEET PG 2022

? PYQ: FMGE 2021, 2022

YOURWISH

Q 3.23: What is the investigation of choice (IOC) for diagnosing intussusception?

Answer:

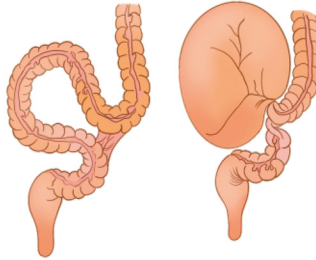
- IOC:
 - o USG in children
 - o CT scan in adults

Q 3.24: What is sigmoid volvulus?

PYQ: INICET 2022

Answer:

- Twisting of the sigmoid colon



Q 3.25: What signs of sigmoid volvulus are seen on abdominal radiographs?

Answer:

- Coffee bean sign



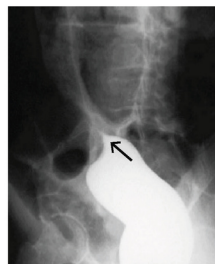
- Omega sign



Q 3.26: What sign of sigmoid volvulus is seen on barium enema?

Answer:

- Bird beak sign/ Bird of prey sign



Bird beak sign

Q 3.27: What is caecal volvulus, and what is its characteristic imaging sign?

Answer:

- Haustrations present with a single loop
- Embryo sign

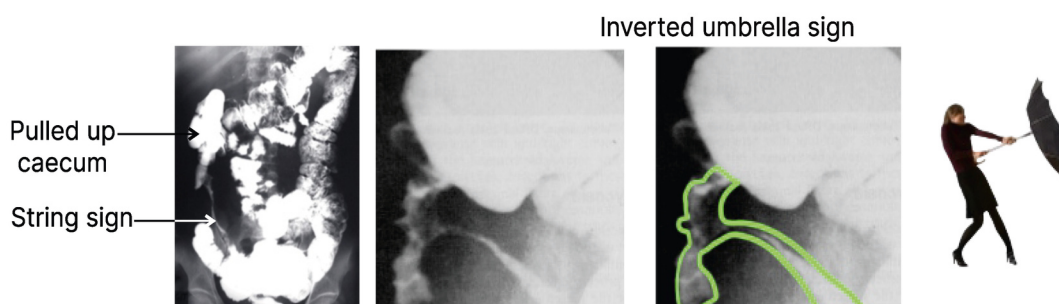


Embryo sign

Q 3.28: What are the key radiological signs of ileocecal tuberculosis?

Answer:

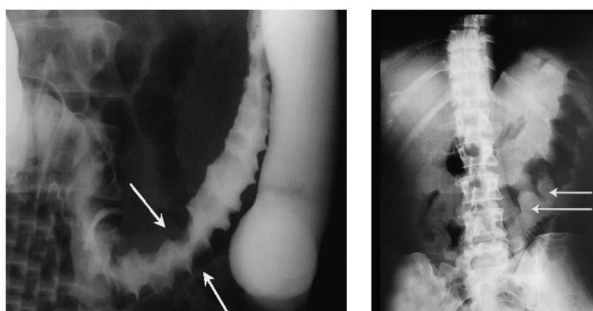
- Narrowing of the terminal ileum- Stricture: String sign
- Pulled up contracted caecum (because of fibrosis)
- Inverted umbrella sign/ Fleischner sign: widening of the ileocecal valve



Q 3.29: What is the characteristic X-ray sign seen in ischemic colitis, and what causes this appearance?

Answer:

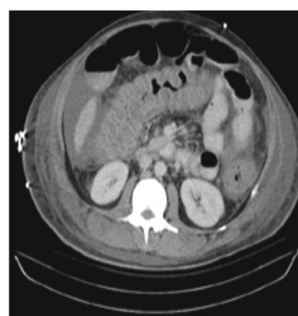
- On X-ray → in colonic loops → Haustrations become thick and edematous- Thumbprint sign.



Q 3.30: Which organism causes pseudomembranous colitis, and what is the characteristic imaging sign?

Answer:

- Caused by *Clostridium difficile*, causing diarrhoea
- Accordion sign → Thick edematous bowel



Q 3.31: What is the characteristic imaging sign of colon carcinoma?

Answer:

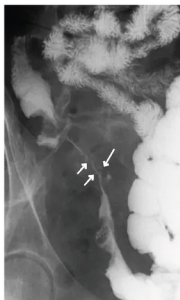
- Apple core sign



Q 3.32: What are the key differences in findings between ulcerative colitis and Crohn's disease in inflammatory bowel disease?

Answer:

🔍 PYQ: FMGE 2021, 2022 🔍 PYQ: NEET PG 2022, 2023

Ulcerative colitis	Crohn's disease
Affects colon	M/c site- terminal ileum
No skip lesions	Skip lesions are seen
Lead pipe colon: Haustrations are lost	String of Kantor
	

Q 3.33: What is the most common site affected by diverticulosis?

Answer:

- Sigmoid colon

Q 3.34: How does diverticulosis usually present clinically?

Answer:

- Asymptomatic

Q 3.35: What is IOC for diverticulosis?

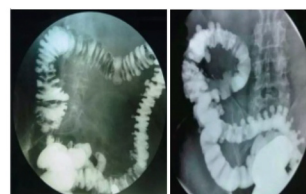
Answer:

- Barium enema

Q 3.36: What is the typical appearance of diverticulosis on imaging?

Answer:

- Saw tooth appearance



Q 3.37: What is diverticulitis?**Answer:**

- Inflammation of a diverticulum

Q 3.38: What is the common clinical presentation of diverticulitis?**Answer:**

- Pain

Q 3.39: What is the IOC for diagnosing diverticulitis?**Answer:**

- Contrast-enhanced CT scan (CECT)

**Q 3.40: Which classification system is used for diverticulitis?****Answer:**

- Hinchey's classification

Q 3.41: What is Hirschsprung's disease, and what are its radiological features?**Answer:**

- Aganglionic megacolon
- Only a segment of the colon is affected
- Transition zone is seen (Normal colon to dilated colon)
- Rectosigmoid ratio <1 (normal rectosigmoid ratio > 1)

Q 3.42: What is a common clinical sign of Hirschsprung's disease?**Answer:**

- No passage of meconium

Q 3.43: What is the gold standard diagnostic test for Hirschsprung's disease?**Answer:**

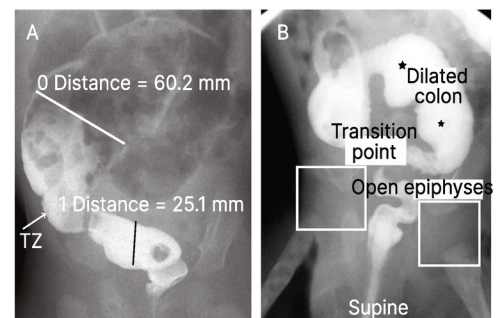
- Rectal biopsy

Q 3.44: What is the classical clinical presentation of acute appendicitis?**Answer:**

- Pain in the right iliac fossa (RIF) with tenderness at McBurney's point

Q 3.45: What is the first-line investigation in acute appendicitis?**Answer:**

- Ultrasound



Q 3.46: What is the best imaging modality to diagnose acute appendicitis?

Answer:

- CECT (helps to visualise retrocecal appendix)

Q 3.47: What are the key CT findings of acute appendicitis?

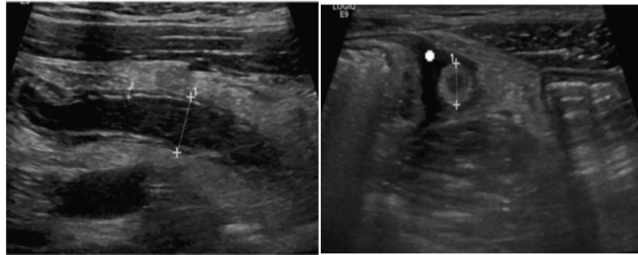
Answer:

- Distended appendix >6mm with surrounding fluid
- An inflamed appendix is non-compressible

 PYQ: FMGE 2021,2022

 PYQ: NEET PG 2022

 PYQ: INICET 2022



Acute Appendicitis



7. MUSCULOSKELETAL RADIOLOGY

BIG QUESTION 1: How do different imaging modalities help in diagnosing musculoskeletal conditions, and what are their key indications?

Broad Answer:

- X-ray is the first-line modality for evaluating fractures and bone alignment.
- ACT scan provides detailed imaging of cortical bone and complex fractures.
- MRI is superior for diagnosing soft tissue and marrow pathologies, such as osteomyelitis, avascular necrosis, and stress fractures.
- Ultrasound is useful for assessing joint effusions and screening for developmental dysplasia of the hip (DDH).
- Each modality is chosen based on the tissue type and suspected pathology, ensuring accurate diagnosis and targeted treatment.

DETAILED QUESTIONS

Q1.1 Which is the 1st imaging modality in musculoskeletal diagnosis?

Answer: X ray

Q1.2 Which imaging modality is used for the bone cortex?

Answer: CT scan

Q1.3 Which bone marrow pathologies can MRI detect?

Answer:

- Osteomyelitis
- Avascular necrosis
- Ankylosing spondylitis
- Stress fractures

Q1.4 Which musculoskeletal pathologies can Ultrasonography detect?

Answer:

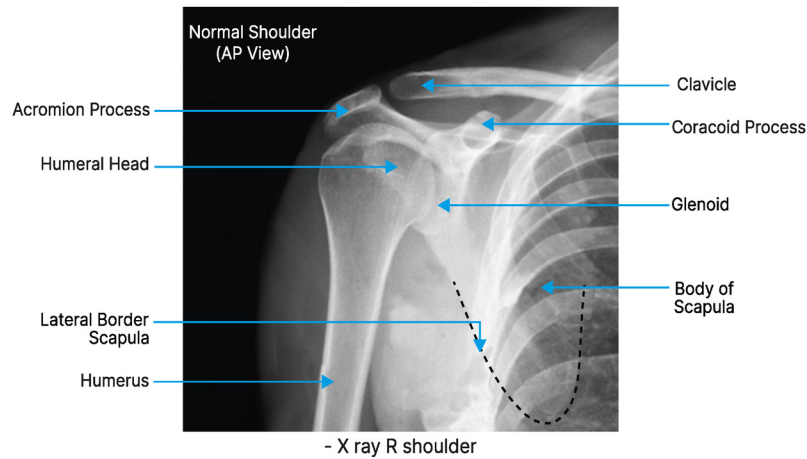
- To screen for DDH (developmental dysplasia of the hip)
- To look for joint effusion

Q1.5 What are the key anatomical landmarks seen on an X-ray of the shoulder, and how are they clinically significant?

PYQ: FMGE 2023

Answer:

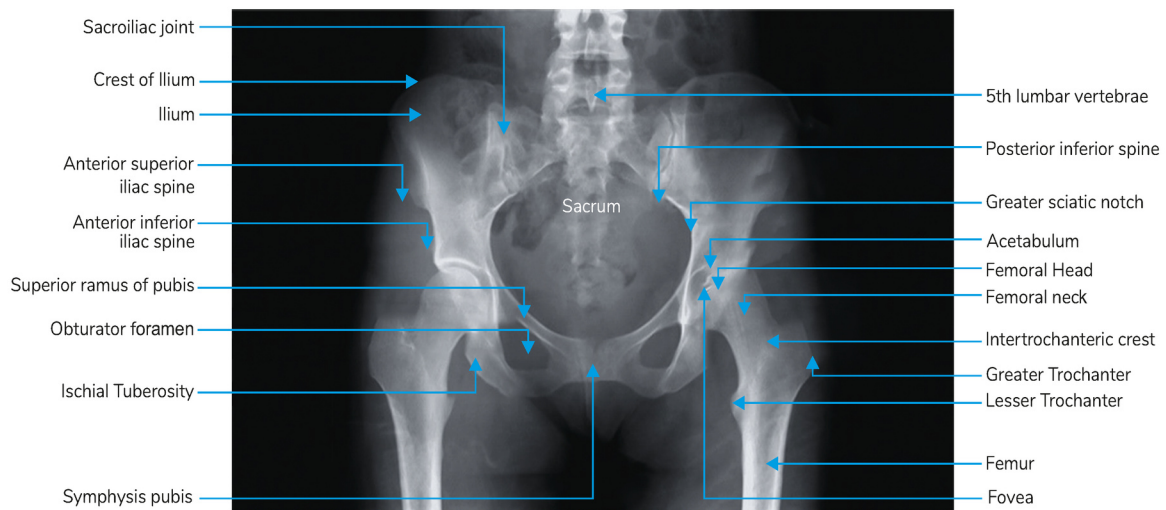
- The clavicle articulates with the acromion process to form the acromioclavicular joint.
- The clavicle and acromion are normally present at the same level/plane
- If not situated at the same plane, it is suggestive of an AC joint dislocation
- Part of the scapula that is palpable in the infraclavicular region: Coracoid process



Q1.6 What are the key anatomical landmarks seen on an X-ray of the PBH (Pelvis with Bilateral Hips)?

Answer:

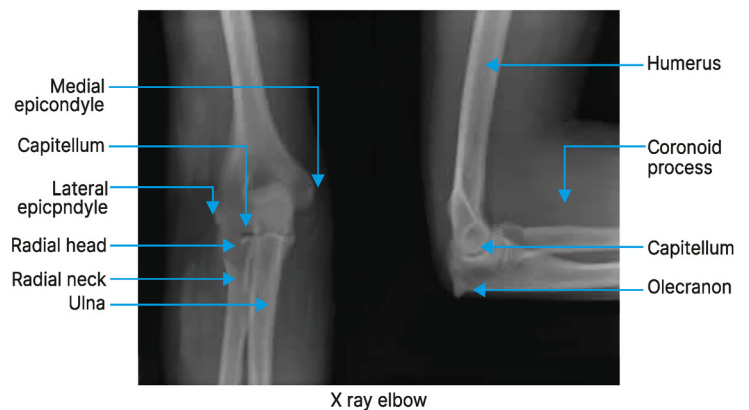
- The sacroiliac joint is affected first in Ankylosing spondylitis.
- Shenton's line: Along the medial border of the neck of the femur and the inferior border of the superior pubic ramus
- Pubic symphysis: A type of secondary cartilaginous joint
- Iliopsoas attaches to the lesser trochanter



Q1.7 What are the key anatomical features visible on an X-ray of the elbow joint, and what is their orientation?

Answer:

- Ulna (medially located) - towards humerus
- Radius (laterally located) - flat end
- Part of the humerus adjacent to the head - Capitulum



X ray elbow

Q1.8 What are the carpal bones of the wrist?

Answer:

- Carpal bones: (Mnemonic: She Looks Too Pretty Try To Catch Her)

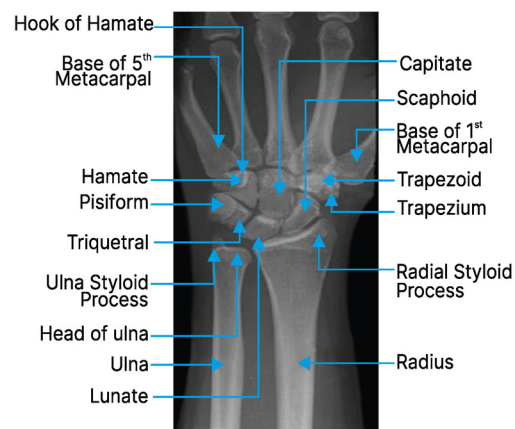
- From lateral to medial

- o Proximal row (lateral to medial):

- Scaphoid
- Lunate
- Triquetrum
- Pisiform

- o Distal row (lateral to medial):

- Trapezium
- Trapezoid
- Capitate
- Hamate



Q1.9 Which is the largest carpal bone?

Answer: Capitate

Q1.10 Hook of hamate fracture can lead to which nerve injury

Answer: Ulnar nerve injury

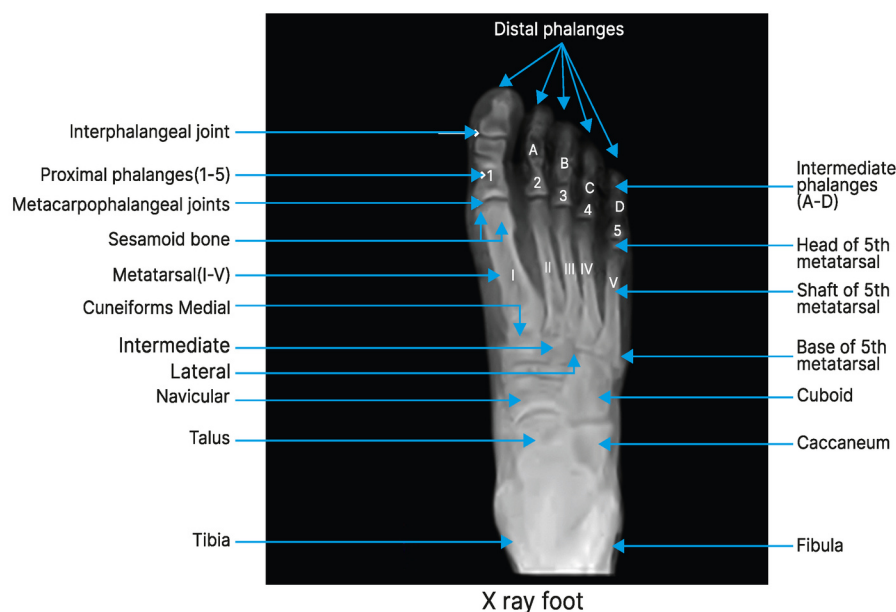
Q1.11 What is the most common complication of an undiagnosed or untreated scaphoid fracture?

Answer: Avascular necrosis (AVN)

Q1.12 Describe the key bones involved in the formation of the ankle and midfoot joints and their clinical relevance.

Answer:

- The tibia articulates with the Talus to form the ankle joint
- Calcaneum: Bone forming the heel
- Navicular: Situated in front of the talus
- Cuboid: Situated in front of the calcaneum, forming the calcaneo-cuboid joint



YOURWISH

BIG QUESTION 2: Compare the radiological features and causes of scurvy, rickets, and osteomalacia.**Broad Answer**

- **Scurvy** is due to **vitamin C deficiency**, showing the white line of Frankel, Wimberger's ring, Trummerfeld's zone, Pelkan spur, pencil-thin cortex, and subperiosteal hemorrhage.
- **Rickets** occurs in children with **vitamin D deficiency**, showing splaying, cupping, fraying of metaphyses, widened growth plate, and genu varum (bow legs).
- **Osteomalacia**, the adult counterpart of rickets, also results from **vitamin D deficiency** and is characterized by Looser's zones (pseudofractures), triradiate pelvis, and fish mouth vertebra.
- Radiology helps differentiate these conditions early and guides treatment.

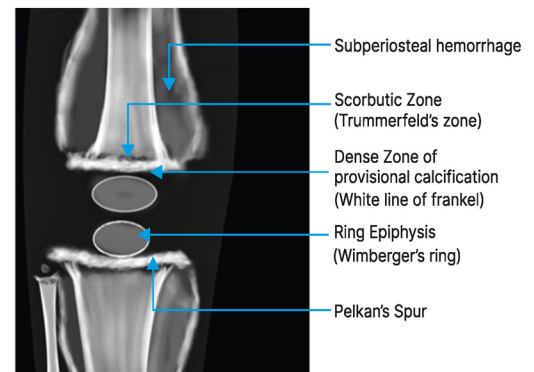
DETAILED QUESTIONS**Q2.1 Scurvy is caused by which vitamin deficiency?**

Answer: Vitamin C deficiency

Q2.2 Describe the radiological features and underlying pathology of scurvy.

Answer:

- White line of Frankel: Helps to differentiate scurvy from active rickets and is seen in healing rickets.
- Wimberger's ring: Ring appearance of epiphysis
- Trummerfeld's zone is seen adjacent to the white line of Frankel.
- Pelkan spur: Metaphysis, which forms a spur
- Pencil-thin cortex
- Subperiosteal hemorrhage- can lead to bone pain: Pseudoparalysis

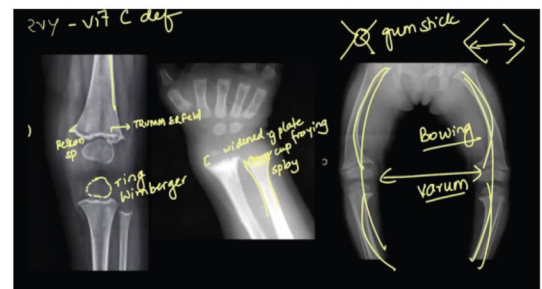
**Q2.3 Rickets is caused by which vitamin deficiency?**

Answer: Vitamin D deficiency in children

Q2.4 Describe the radiological features and underlying pathology of rickets

Answer:

- Splaying: Widening of the bone
- Cupping: Concavity of the bone
- Fraying: Irregular border of the bone
- Growth plate: Widened
- Bowing of the legs: Genu varum

**Q2.5 Describe Genu valgum**

Answer:

- When the
- knees are towards each other
- other- Knock knees

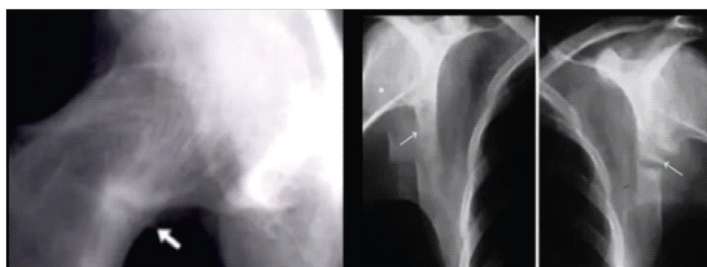
Q2.6 Osteomalacia is related to which vitamin deficiency?

Answer: Vitamin D deficiency in adults

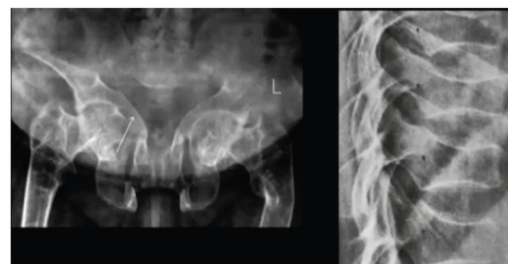
Q2.7 What are the radiological features of osteomalacia, and how do they reflect its underlying pathology?

Answer:

- Looser's zone: Pseudofracture with surrounding sclerosis
- Triradiate pelvis
- Biconcave vertebra: Fish mouth/ codfish vertebra (also seen in osteoporosis)



Stress fractures



Protrusio acetabuli & Triradiate pelvis

Codfish or fish mouth vertebrae

Q2.8 Which is the MC site of osteomalacia?

Answer: Neck of the femur

Q2.9 What is the gold standard investigation for measuring bone mineral density (BMD)?

Answer: DEXA scan.



Q2.10 Why are biochemical tests often not sufficient to diagnose osteoporosis?

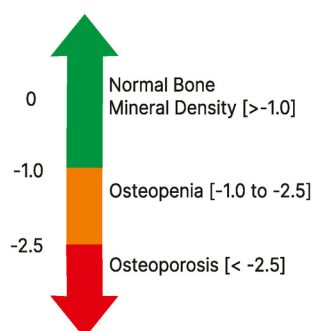
Answer: Because they are usually within normal limits in osteoporosis.

Q2.11 What imaging method, besides DEXA, can be used to assess bone mineral density?

Answer: Quantitative CT (QCT).

Q2.12 According to WHO, what T-score defines osteoporosis?

Answer: T-score less than -2.5 standard deviations.



Q2.13 What T-score range is considered normal?

Answer: Up to -1 SD.

Q2.14 What is a “fish mouth” vertebra, and what condition is it seen in?

Answer: A biconcave vertebra is seen in osteoporosis, due to vertebral collapse and concave end plates.

Q2.15 What type of dwarfism is seen in achondroplasia?

Answer: Rhizomelic dwarfism (proximal limb shortening).

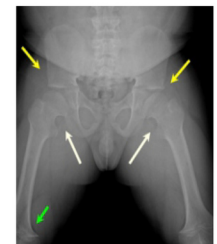
Q2.16 What is the typical hand deformity seen in achondroplasia?

Answer: Trident or Starfish hand - increased gap between the middle and ring fingers.



Q2.17 What pelvic feature is described as "champagne glass pelvis"?

Answer: A radiological feature of achondroplasia with a narrow pelvic inlet.



Q2.18 What is meant by the tombstone appearance of iliac blades?

Answer: Flattened and squared iliac bones are seen on X-ray in achondroplasia.

Q2.19 What is the shape of the acetabulum in achondroplasia?

Answer: Flat acetabulum.

BIG QUESTION 3: What are the key radiological features of endocrine and metabolic bone disorders like Acromegaly, Hyperparathyroidism, and Paget's disease?

Broad Answer:

- Acromegaly, excess growth hormone causes increased heel pad thickness, spade-shaped phalanges, prognathism, and expanded sinuses.
- Hyperparathyroidism shows subperiosteal bone resorption (earliest at the middle phalanx), salt & pepper skull, and brown tumors.
- Paget's disease presents with osteoporosis circumscripta, cotton wool skull, blade of grass lesion in the femur, and picture frame vertebrae.
- Skull changes like punched-out lesions suggest multiple myeloma, while a hair-on-end appearance is seen in hemolytic anemias.

DETAILED QUESTIONS

Q3.1 What is the effect of increased growth hormone in adults?

Answer: It leads to increased growth of bones and soft tissues, resulting in acromegaly.

Q3.2 Which radiological feature of acromegaly is seen in the phalanges?

Answer: Spade phalanx, due to overgrowth of the distal phalanx.



Spade phalanx

Q3.3 Which radiological feature of acromegaly is seen in the heel?

Answer: Increased heel pad thickness.



Increased heel pad thickness

Q3.4 What causes prognathism in acromegaly?

Answer: Overgrowth of the mandible due to excessive growth hormone.



Prognathism & Frontal bossing prognathism

Q3.5 What is the appearance of the paranasal sinuses in acromegaly?

Answer: Expansion of the sinuses due to bony overgrowth.

Q3.6 What is the earliest radiological sign of hyperparathyroidism?

Answer: Subperiosteal bone resorption.

Q3.7 Where is subperiosteal bone resorption most commonly seen in hyperparathyroidism?

Answer: Radial aspect of the middle phalanx on hand X-ray.

Q3.8 What are the radiological features of Hyperparathyroidism?

Answer:

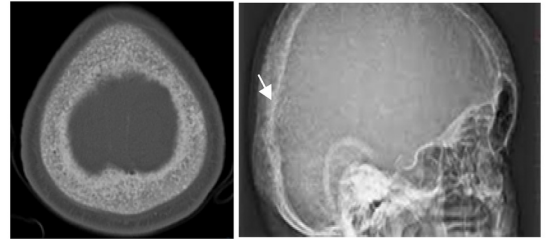


YOURWISH

- Concavity of bone due to subperiosteal resorption.
- Salt and pepper appearance (Image 2 and 4) in the skull or pepper pot skull due to lytic lesions present.
- Brown tumor or osteitis fibrosa cystica (Image 3).
- Ochronosis (Image 5): Intervertebral disc calcification, also seen in alkaptonuria

Q3.9 What condition is classically associated with the salt and pepper appearance of the skull? ? PYQ: NEET PG 2018

Answer: Hyperparathyroidism.

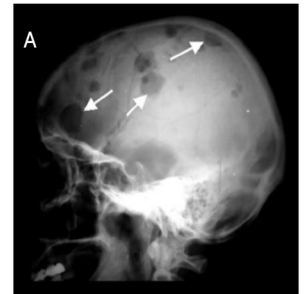


Q3.10 Describe the radiological features of skull lesions in multiple myeloma and their clinical significance.

Answer:

? PYQ: INICET 2020

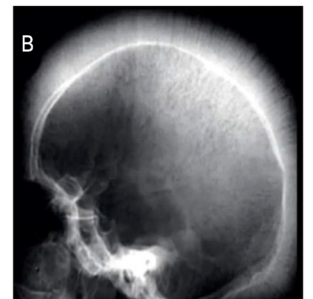
- Punched out lytic lesion/raindrop lesion (Image A)
 - o Well-defined lytic lesions in the skull involving the outer and inner tables equally- seen in multiple myeloma
 - o It is a lytic lesion → no new bone formation → no increase in
 - o ALP → No hot spots on bone scan



Q3.11 Explain the radiological basis and clinical relevance of the "Hair-on-end" or "Crew-cut" appearance.

Answer:

- Seen in hemolytic anemias, e.g., sickle cell anemia, thalassemia
- Hemolysis causes a compensatory increase in hematopoiesis



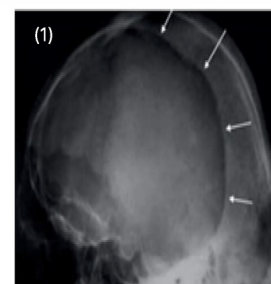
Q3.12 What are the phases of Paget's disease?

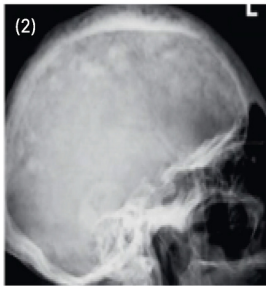
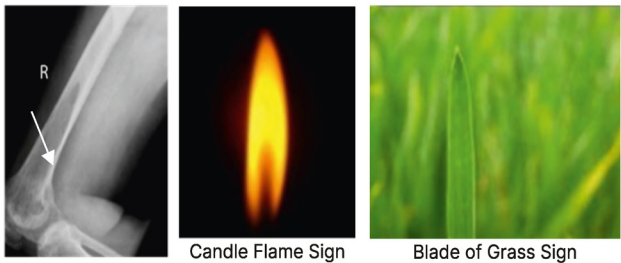
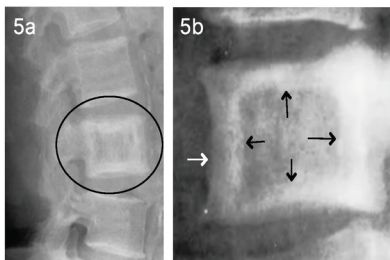
Answer: Can have a lytic phase, a blastic phase, or a mixed phase

Q3.13 Describe the radiological findings in Paget's disease of bone and their pathological basis.

Answer:

Osteoporosis circumscripta, i.e., well-defined lytic lesion.



Cotton wool appearance of the skull	
Blade of grass appearance or candle flame sign, i.e., lytic lesions in the femur shaft	 Candle Flame Sign Blade of Grass Sign
Picture frame vertebrae - thickened vertebra- hallmark of Paget's disease	
Ivory vertebrae	

Q3.14 In which case is the bone within bone appearance seen?

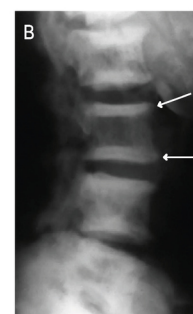
Answer: Seen in osteopetrosis: Abnormal osteoclast activity



Q3.15 What is Rugger Jersey Spine? In which condition is it seen?

Answer:

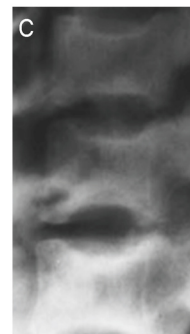
- Alternate black and white striations
- Seen in renal osteodystrophy- secondary hyperparathyroidism



Q3.16 What is an H-shaped vertebra, and what is its clinical significance?

Answer:

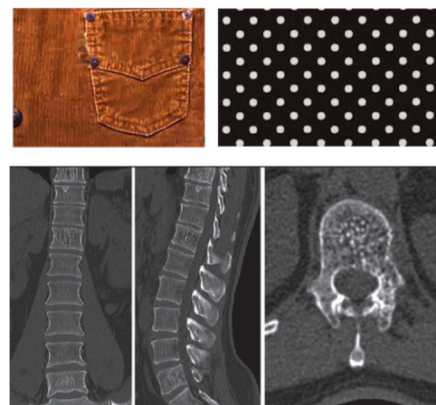
- Depressed end plate predominantly in the center, the lateral part is flat
- Seen in sickle cell anemia
- In the later stages: Fish mouth vertebra



H-shaped Appearance or Lincoln Log Vertebrae seen in Sickle Cell Anemia

Q3.17 Where is the Polka dot appearance/ corduroy appearance/ jail bar appearance?

Answer: Seen in vertebral hemangioma



Corduroy/Jail Bar Appearance

Polka Dot Appearance

BIG QUESTION 4: Explain the key radiological features of various metabolic and hematological bone disorders, and differentiate them from common traumatic skeletal injuries.

Broad Answer:

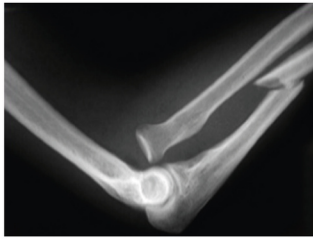
- Radiological evaluation helps in identifying specific patterns linked to systemic bone disorders.
- Subperiosteal bone resorption in the middle phalanx is an early sign of hyperparathyroidism, often accompanied by a salt and pepper skull.
- Multiple myeloma shows punched-out lytic skull lesions, while hair-on-end appearance is seen in hemolytic anemias due to marrow hyperplasia.
- Paget's disease presents with a cotton wool skull, picture-frame vertebrae, and blade of grass lesions.
- Osteopetrosis shows a bone-within-bone appearance due to defective osteoclasts. Traumatic injuries like Monteggia and Galeazzi fractures, or Colles vs Smith vs Barton's fractures, are recognized by the site and direction of bone displacement on X-rays.

DETAILED QUESTIONS

Q4.1 Differentiate between the Monteggia and Galeazzi fractures

Answer:

Monteggia	Galeazzi
Involves the ulna	Involves the radius
Constitutes proximal radioulnar joint dislocation i.e., radius head dislocation.	Constitutes distal radioulnar joint dislocation.



Monteggia fracture



Galeazzi fracture

Q4.2 Describe how to identify a Colles fracture

Answer: Colles fracture

- The fracture is angulated to the dorsal side
- The dorsal aspect can be identified by having minimal soft tissue on the dorsal side
- The palmar aspect has more soft tissue, and the concave surfaces of the bone face the palmar aspect



Colle's fracture

Q4.3 Describe how to identify Smith's fracture

Answer:

- The fracture is angulated towards the palmar surface/volar surface
- Hence, it is a Smith's fracture.



Q4.4 Describe how to identify a Barton's fracture

Answer:

- Fracture involving the articular surface is seen



Q4.5 How to identify volar Barton's fracture/ Reverse Barton's fracture on radiology.

Answer: The fracture involves the volar aspect

Q4.6 What is a bipartite patella, and how does it develop?

Answer:

- Bipartite Patella is partitioned into two during development:
 - o Smooth regular wall
 - o Classical location of the non-fused segment: Superolateral

PYQ: NEET PG 2021



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Q4.7 Describe a patellar fracture.

Answer:

- A lucency line is seen in the patellar region, which is suggestive of a patellar fracture.
- As the patella is being overlapped by the femur, it is not visualized well.



Q4.8 What is the special view used for a patellar fracture?

Answer: Skyline view

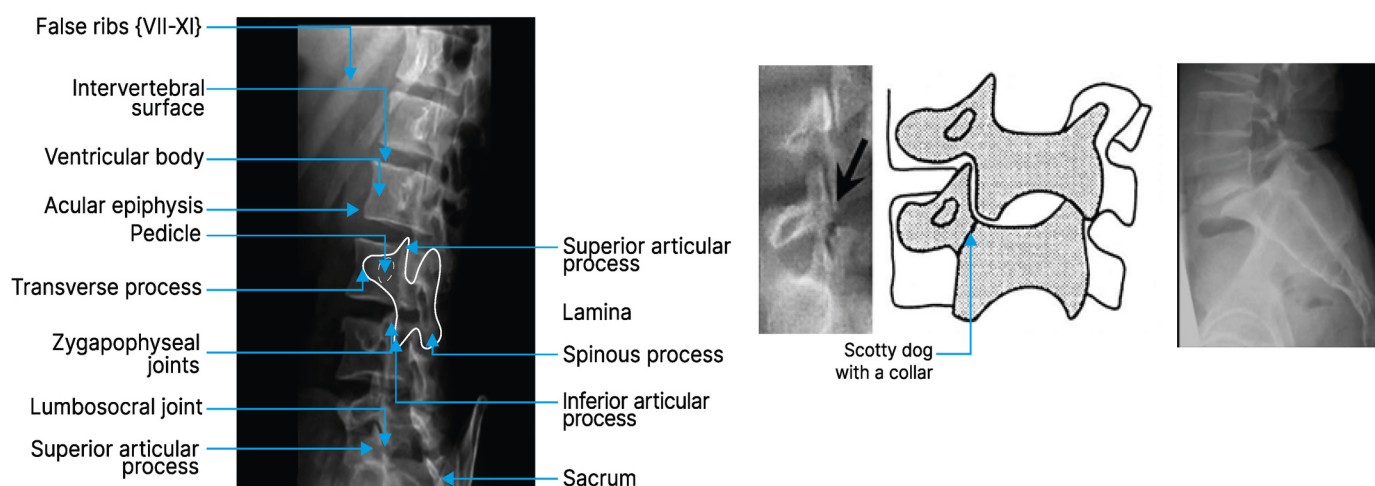
Q4.9 What is spondylosis, and what are the typical MRI findings?

Answer: Spondylosis- degenerative changes in the spine, desiccated disc, disc bulge, best seen on MRI

Q4.10 What is spondylolysis, and what are the typical MRI findings?

Answer:

- Spondylolysis- fracture in the vertebra in the pars interarticularis: The part which is in between the superior and inferior articular facet
- Scotty dog with a collar- indicates a break- seen in spondylolysis.



Q4.11 What is spondylolisthesis, and what are the typical MRI findings?

Answer:

- Spondylolisthesis- slipped vertebra because of spondylolysis
- Beheaded scotty dog: Spondylolisthesis- slip of a vertebra due to detachment of the head
- The vertebrae are not in the same line, i.e. bone is displaced, suggestive of spondylolisthesis.



Q4.12 On which radiological view is the "Scotty dog" appearance seen?

Answer: Oblique lumbar spine X-ray

Q4.13 What condition is Trethowan's sign used to diagnose?

Answer: Slipped Capital Femoral Epiphysis (SCFE)

Q4.14 What does a positive Trethowan's sign indicate?

Answer: The line does not intersect the femoral head Suggestive of SCFE.

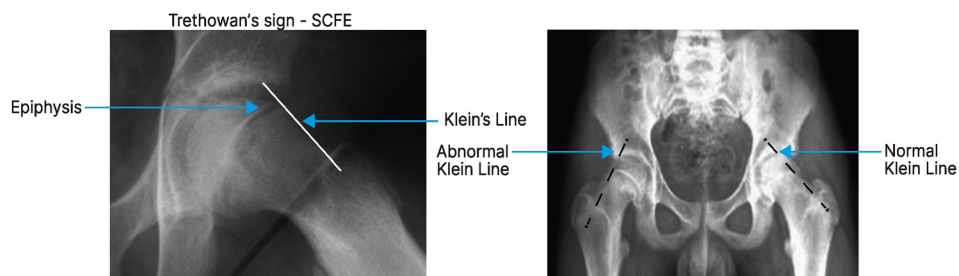
Q4.15 What imaging view is preferred to assess Trethowan's sign?

Answer: AP view of pelvis.

Q4.16 In Trethowan's sign, where is the line drawn?

Answer:

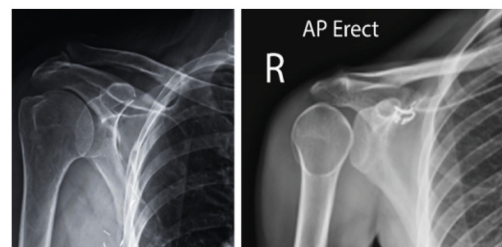
- Along the superior/lateral cortex of the femoral neck.



Q4.17 Describe the salient features of shoulder dislocation.

Answer:

- Normally, an overlap between the humerus head and the glenoid is seen
- In the image to the right, overlapping is not seen- abnormal
- Light bulb sign: Posterior dislocation of the shoulder



Q4.18 What are the features of an Anterior dislocation of the hip?

Answer:

- Attitude: Flexion, Abduction, and External rotation of the thigh (FABER). The lesser trochanter is prominent in external rotation.
- Lengthening of the limb is seen.
- Abduction is seen as the femur going away from the midline on an X-ray.



Q4.19 What are the features of Posterior dislocation of the hip?

Answer:

- Attitude: Flexion, Adduction, and Internal rotation of the thigh (FADIR).
- The lesser trochanter is not visualized when the femur is internally rotated.
- Shortening of the limb is seen
- Adduction is seen as the femur going towards the midline on an X-ray



BIG QUESTION 5: How are bone tumors classified based on their anatomical location, and what are the key radiological and clinical features of each type?

Broad Answer: Bone tumors are classified based on the location they predominantly affect:

- **Epiphysis:** *Chondroblastoma* (pediatric, unfused epiphysis) and *Giant Cell Tumor* (adults >30 years, soap-bubble appearance, involves articular surface).

- **Metaphysis:** *Osteosarcoma* (sunburst appearance, 16-20 years), *Simple Bone Cyst* (fallen leaf sign), *Aneurysmal Bone Cyst* (expansile, unfused).
- **Diaphysis:** *Ewing's Sarcoma* (onion-peel periosteal reaction, fever, mimics osteomyelitis). Imaging features like periosteal reactions and lesion expansion help in differentiation, and treatment often includes curettage, grafting, or ablation.

DETAILED QUESTIONS

Q5.1 What are the salient features of Chondroblastoma?

 PYQ: NEET PG 2023

Answer:

- Pediatric age group
- Unfused epiphysis



Q5.2 What are the features of a Giant cell tumor?

Answer:

- Adults > 30 years
- Involves the articular surface (only tumor involving the articular surface)
- Fused skeleton
- Soap bubble appearance
- Expansile lesion involving the epiphysis
- Treatment: ECBG (extended curettage with bone grafting)



Q5.3 Describe an Aneurysmal bone cyst

 PYQ: FMGE 2021

Answer:

- Unfused metaphysis
- Expansile



Q5.4 Give the features of a Simple bone cyst/ Unicameral bone cyst

Answer:

- The lesion is not expansive
- Fallen leaf sign: Fracture in the cyst causes a bone fragment to fall into the dependant part



Q5.5 What are the features of Osteosarcoma?

Answer:

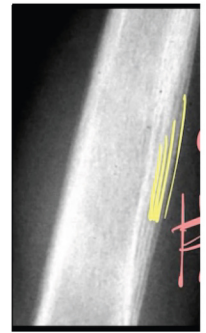
- Sunburst or sunray periosteal reaction
- Age group: 16-20 years
- The distal femur is commonly involved



Q5.6 What part of the long bone is commonly involved in Ewing's sarcoma?

Answer:

Diaphysis



Q5.7 What is the characteristic periosteal reaction seen in Ewing's sarcoma?

Answer:

Lamellated or Onion peel appearance

Q5.8 Which age group is most commonly affected by Ewing's sarcoma?

Answer:

Affects children

Q5.9 What is the hallmark imaging feature of osteochondroma on X-ray?

Answer:

A bony outgrowth continues with the native bone cortex and medulla.



Q5.10 Why does the clinical size of osteochondroma appear larger than the X-ray size?

Answer:

Because the cartilaginous cap is not visualized on X-ray.

Q5.11 Which imaging modality is preferred to assess malignant change in osteochondroma?

Answer:

MRI

Q5.12 What MRI finding suggests malignant transformation in osteochondroma?

Answer:

Cartilage cap thickness > 2 cm

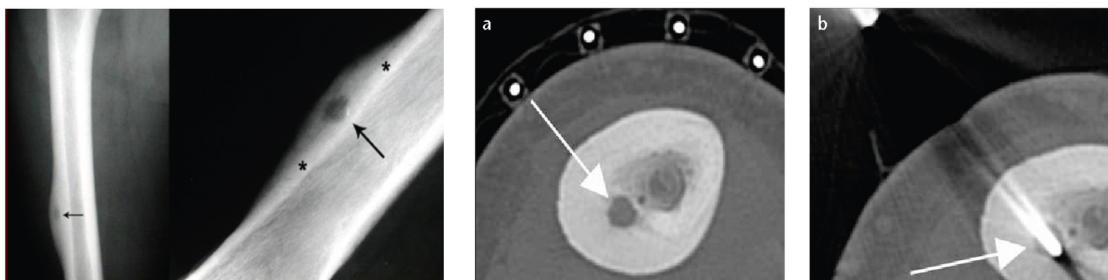
Q5.13 What are the features of Osteoid osteoma, and specify its treatment?

Answer:

- It is a cortical tumor

YOURWISH

- CT is the investigation of choice
- Central nidus is seen- causes night pain- due to the release of prostaglandins from the nidus (PG production is maximum at night)
- Pain is relieved by aspirin or NSAIDs
- Treatment: Radiofrequency ablation



Q5.14 What are the features of Enchondroma?

Answer:

- Involves the five fingers
- Lesions involving the small bones of the hand
- Hemangiomas will show the presence of phleboliths

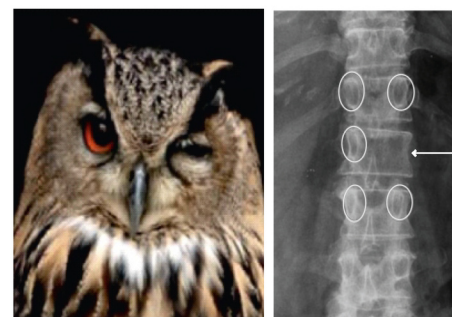
Q5.15 What are Ollier's disease and Maffucci syndrome?

Answer:

Ollier's disease	Maffucci syndrome
Lesions are all multiple enchondromas	Lesions are enchondromas and hemangiomas
 Ollier's disease	 Maffucci syndrome

Q5.16 Which sign is seen in vertebral metastasis involving the pedicle?

Answer: Winking owl sign is seen: One pedicle is destroyed by metastasis.



Winking owl sign

Q5.17 Which radiological features are seen in Fibrous dysplasia?

Answer:

- Expanded bone with ground glass matrix
- Shepherd crook deformity: The Femur becomes curved



Shepherd crook deformity

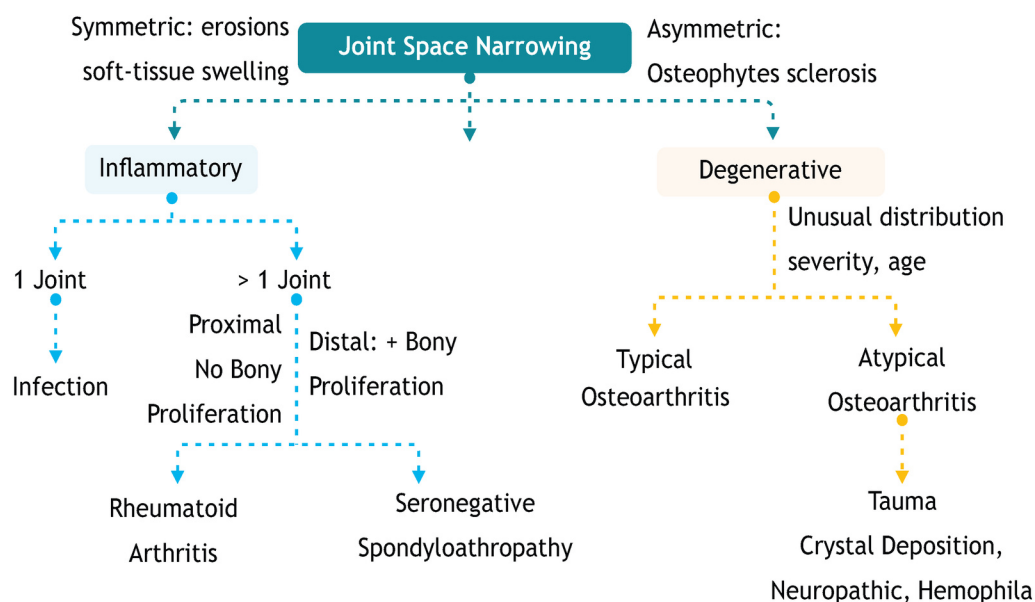
Q5.18 Which syndrome is associated with Fibrous dysplasia?

Answer:

- McCune-Albright syndrome is associated with fibrous dysplasia
 - o Polyostotic fibrous dysplasia
 - o Precocious puberty
 - o Pigmented lesions: Cafe au lait spots

BIG QUESTION 6: Write a short note on arthritis

Broad Answer:



- In the majority of arthritis, there is joint space narrowing except few

DETAILED QUESTIONS

Q6.1 Describe Degenerative arthritis

Answer:

- There is asymmetric bone involvement (ex, in typical osteoarthritis of the knee, the medial compartment is involved first), osteophytes,
- sclerosis.
- Pain increases with activity
- Decreases in rest

Q6.2 What are the features of Inflammatory arthritis?

Answer:

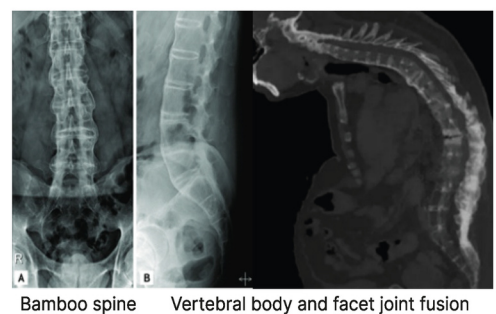
- Morning stiffness: Hallmark of inflammatory arthritis
- Inflammatory markers cause erosions
- Swelling +
- Symmetrical involvement
- Septic
- Rheumatoid arthritis DIP is spared
- Seronegative spondyloarthropathy: RF is negative

Q6.3 What is the earliest joint involved in Ankylosing Spondylitis?

Answer: Sacroiliac joints.

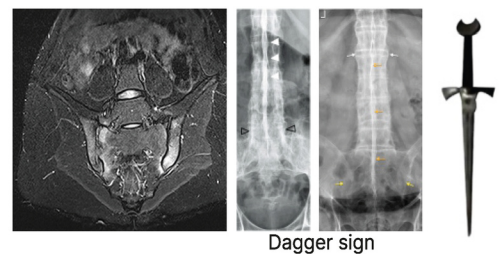
Q6.4 What is the 'Bamboo Spine' appearance and what causes it?

Answer: It is the fusion of vertebrae by syndesmophytes, giving the spine a bamboo-like appearance on X-ray.



Q6.5 What is the Dagger Sign and what does it indicate?

Answer: A midline dense line on X-ray due to ossification of the interspinous ligaments; seen in advanced AS.



Q6.6 Which MRI sequence is best for detecting early changes in AS?

Answer: STIR-MRI (detects bone marrow edema).

Q6.7 What extra-articular manifestation may present as a red eye in AS?

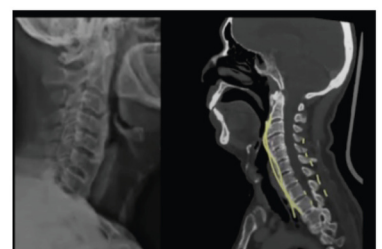
Answer: Anterior uveitis.

Q6.8 What structure leads to spinal fusion in AS?

Answer: Syndesmophytes, which form anteriorly and posteriorly.

Q6.9 What is Diffuse idiopathic skeletal hyperostosis (DISH)/Forrester's disease?

Answer: Fusion of vertebrae anteriorly: Flowing wax ossification



Q6.10 What is Degenerative osteoarthritis?

Answer:

- Asymmetrical involvement
- Formation of osteophyte
- Subchondral sclerosis
- It can involve the IP joint
- 1 CMC joint involvement is seen in osteoarthritis

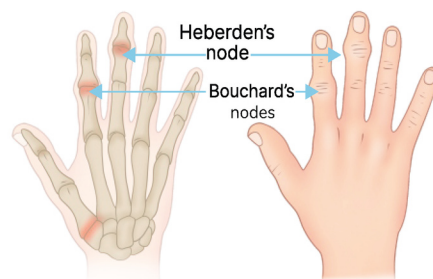


1st CMC Joint Involvement

Q6.11 Differentiate between Heberden's node and Bouchard's node.

Answer:

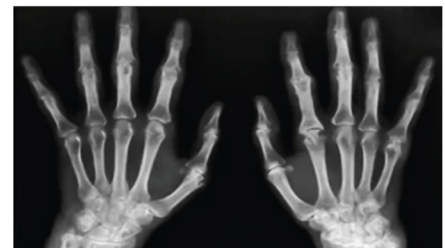
Heberden's node:	Bouchard's node:
Distal interphalangeal joint	Proximal interphalangeal joint



Q6.12 Enlist the features of Rheumatoid arthritis

Answer:

- Juxta-articular osteopenia and erosions are seen
- MCP joints are mainly involved
- Bilateral symmetrical involvement
- DIP is spared
- Swan neck deformity
- Boutonniere deformity

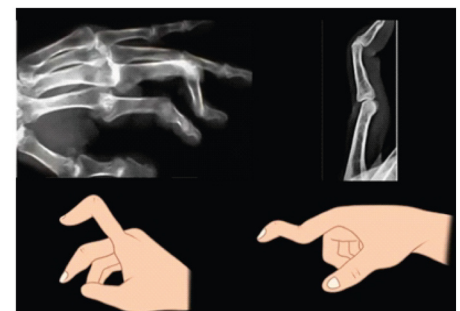


Prominent periarticular osteopenia

Q6.13 Differentiate between Swan neck deformity and Boutonniere deformity

Answer:

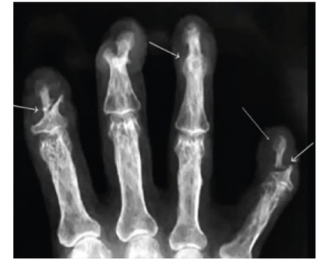
Swan neck deformity	Boutonniere deformity
flexion at the distal interphalangeal joint with hyperextension at proximal interphalangeal joint.	flexion at the proximal interphalangeal joint with hyperextension at distal interphalangeal joint.



Boutonniere deformity Swan-neck deformity

Q6.14 Which radiological finding is seen in Psoriatic arthritis?

Answer: Pencil-in-cup deformity



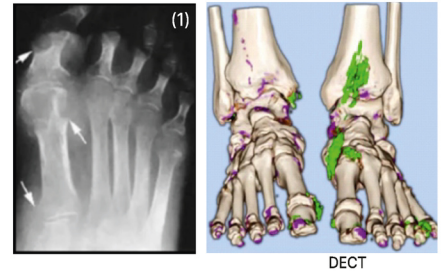
Q6.15 What are the features of Gout?

Ⓜ PYQ: NEET PG 2023

Ⓜ PYQ: FMGE 2022

Answer:

- Involvement of the great toe (Image 1) (first metacarpophalangeal joint)
- Rat bite erosions/Martel sign: Erosions with overhanging edges
- Uric acid deposition is seen in gout
- Uric acid is radiographically invisible
- DECT (dual energy) helps in identifying uric acid deposits



Q6.16 In which condition is meniscal calcification observed?

Answer:

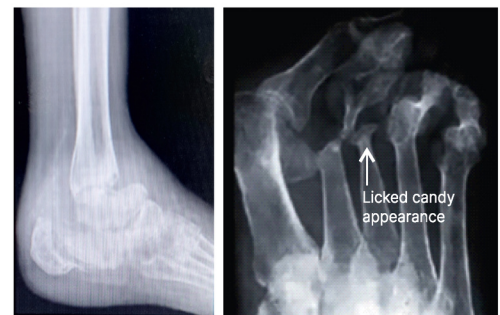
- Chondrocalcinosis of the knee joint
- Seen in pseudogout



Q6.17 What are the features of Charcot's Arthropathy?

Answer:

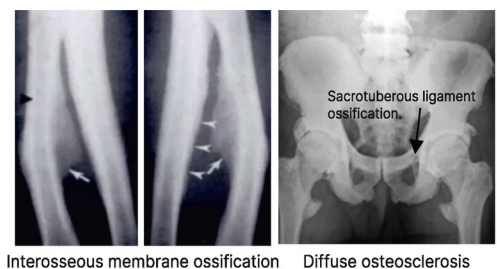
- Associated with a European joint
- Sensations are lost
- 6 D's:
 - o Distension of the joint
 - o Destruction
 - o Debris
 - o Dislocation
 - o Deformity
 - o Normal/ Increased bone density
- Licked candy appearance (Image 2)- also seen in leprosy



Q6.18 Specify the radiological features of Fluorosis

Answer:

- Diffuse osteosclerosis
- Interosseous membrane ossification
- Sacrotuberous ligament ossification



Interosseous membrane ossification

Diffuse osteosclerosis

BIG QUESTION 7: How do chronic osteomyelitis, tubercular spondylitis (Pott's spine), and avascular necrosis (AVN) differ in pathology, imaging findings, and diagnosis?

Broad Answer:

- Chronic osteomyelitis shows sequestrum (radio-opaque dead bone) and involucrum (new reactive bone) with a discharging sinus via a cloacal opening.
- Brodie's abscess is a subacute form showing a lytic lesion with a sclerotic rim in the tibia.
- Tubercular spondylitis (Pott's spine) is paradiscal, involves the intervertebral disc, may spread to form a psoas abscess, and is best seen on T2 MRI.
- AVN of the femoral head is linked to steroids or alcohol, shows early marrow changes on MRI, and later flattened femoral head on X-ray.
- In AVN, the head appears denser due to dead bone; MRI is the investigation of choice.
- X-ray is delayed in all three; MRI gives early diagnosis in AVN and spinal TB.

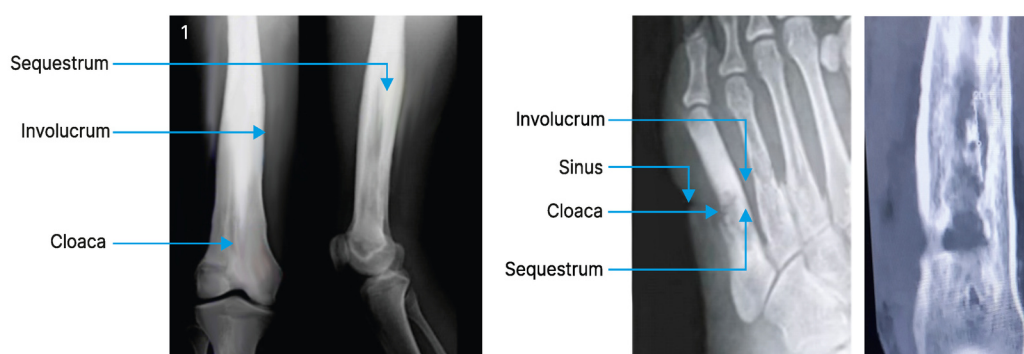
DETAILED QUESTIONS

Q7.1 What are the features of chronic osteomyelitis?

PYQ: NEET PG 2020 PYQ: FMGE 2020

Answer:

- Discharging sinus: In the bone, there is a cloacal opening forming the sinus
- Dead bone is sequestered- Sequestrum- radio opaque (as there is no blood supply, there is no resorption)
- Surrounding periosteal reaction- Involucrum (new healing bone)



Q7.2 What are the features of Subacute osteomyelitis?

Answer:

- Brodie's abscess: Lytic lesion with a sclerotic margin, classical vertically oval along the length of the tibia

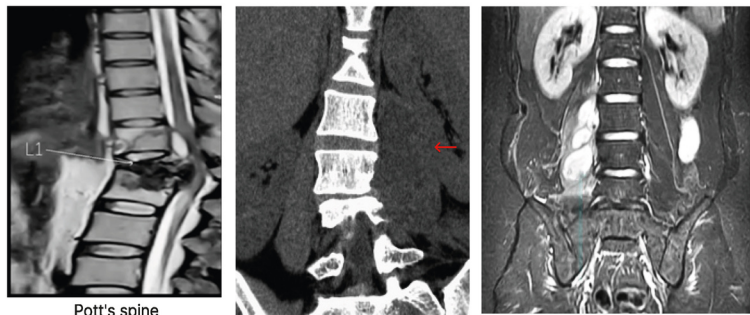


Q7.3 Specify the features of tuberculosis on T2-weighted MRI.

PYQ: NEET PG 2021 PYQ: FMGE 2021

Answer:

- The intervertebral disc is involved
 - o Most common type of TB: Paradiscal
 - o Pott's spine - can spread to the surrounding structures- can lead to Psoas abscess



Pott's spine

Q7.4 What are the risk factors for Avascular necrosis?

Answer:

- Long-term steroid use
- Alcohol intake

Q7.5 Describe the IOC for Avascular necrosis

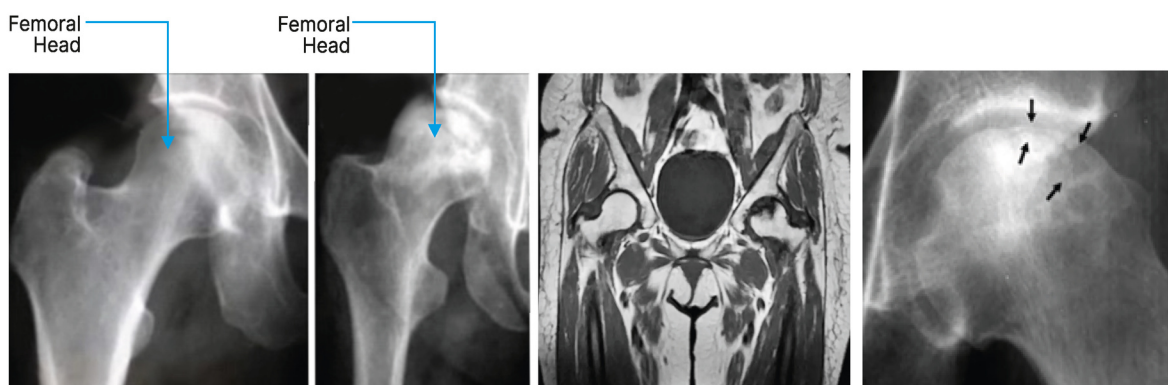
🔍 PYQ: NEET PG 2022

Answer:

- MRI: Early bone marrow changes can be visualized
- X-ray: Late changes

X-ray

- Normally, the femur is rounded
- In AVN, the femur is relatively flat, i.e., there is a collapse of the head that appears more dense, due to the presence of dead bone.



Crescent sign



8. NUCLEAR MEDICINE AND RADIOTHERAPY

BIG QUESTION 1: What are the various nuclear medicine imaging modalities?

Broad Answer:

- Nuclear medicine is a functional imaging technique using radiolabeled ligands to assess organ function. The radioisotope emits gamma or positron radiation that is detected by cameras like gamma cameras (in scintigraphy and SPECT) or PET scanners. Imaging can identify hypofunctioning (cold spots) or hyperfunctioning (hot spots) tissues.

DETAILED QUESTIONS

Q1.1: What is the difference between Scintigraphy, SPECT, and PET?

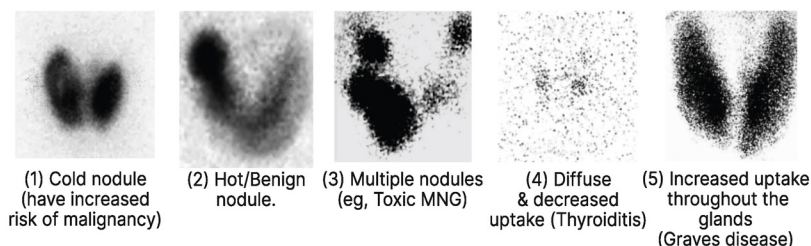
Answer:

- Scintigraphy: Also called radioisotope scanning, uses gamma rays and is detected by a gamma camera (e.g., Tc99m scans)
- SPECT: Single-photon emission computerised tomography; has high resolution and provides 3D imaging (e.g., HMPAO SPECT for cerebral perfusion)
- PET: Positron emission tomography; uses positron-emitting tracers (e.g., F18-FDG) for high-resolution functional imaging

Q1.2: What are the thyroid imaging findings and associated diagnoses?

Answer:

- Cold nodule (white area): May indicate malignancy
- Hot nodule (black area): Usually benign
- Multiple hot nodules: Toxic multinodular goitre
- Diffuse increased uptake: Grave's disease
- Diffuse decreased uptake: Subacute thyroiditis



Q1.3: What are the radioisotopes used in thyroid imaging and their features?

PYQ: FMGE 2023

Answer:

Half-life	Isotope
13.2 hours	Iodine 123 Used for diagnosis purposes
60.14 days	Iodine 125

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	• Used for implant Brachytherapy • E.g. Carcinoma prostate
8.04 days	Iodine 131 • Used for radio ablations. • The therapeutic effect of I 131 is due to b rays • I 131 emits b plus gamma rays • So it is not a pure b emitter

Q1.4: How is hyperparathyroidism diagnosed in nuclear medicine?**Answer:**

- Tc99m Sestamibi (MiBi) scan is used. Increased uptake suggests a hyperfunctioning parathyroid gland, often presenting with a history of stones, moans, and groans.

Q1.5: What are the types of renal scans and their clinical use?**Answer:**

- DMSA: Static scan
 - o Used to detect scarring, the morphology of the kidney, and an ectopic kidney
 - o does not assess renal function
- DTPA: Evaluates GFR (glomerular function)
- MAG3: Assesses both GFR and tubular function, overall renal performance

Q1.6: What are the applications and interpretation of a bone scan?**Answer:**

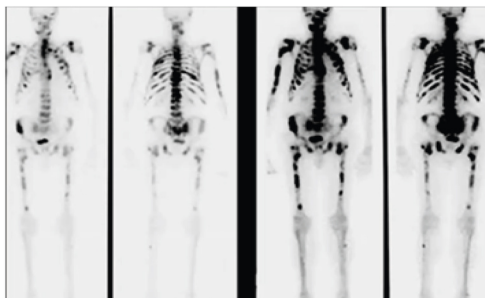
- Radiotracer: Tc99m bound to MDP (methylene diphosphonate)
- Increased uptake (hot spots): Seen in new bone formation, such as:
 - o Fractures (callus)
 - o Osteomyelitis
 - o Osteoblastic metastasis
- Lytic metastasis (PET-sodium fluoride or MRI preferred)
- Cold spots:
 - o Multiple myeloma, due to a lack of new bone formation

BIG QUESTION 2: What are the specialised nuclear medicine scans?**Broad Answer:**

- Nuclear medicine provides organ-specific imaging using unique radiotracers. Superscans indicate diffuse skeletal uptake with absent kidney visualisation, often seen in osteoblastic metastases or metabolic bone disease. Tc99m pertechnetate is used for Meckel's diverticulum and other ectopic gastric mucosa. Cardiac imaging involves scans like Thallium (ischemia), MUGA (LV function), and PET (viability). HIDA scans assess biliary patency, while sulphur colloid uptake is characteristic of lesions with Kupffer cells, like FNH.

DETAILED QUESTIONS**Q2.1: What is a superscan, and in which conditions is it seen?****Answer:**

- Superscan is when the bone shows diffuse increased uptake
- Very high uptake, i.e., everything is going to the bones, and nothing goes to the soft tissues or kidneys
- No kidney uptake
- Seen in diffuse metastasis: Osteoblastic metastasis
- E.g.: Prostate cancer-causing osteoblastic breast cancer
- It can be seen with metabolic disorders like Hyperparathyroidism, especially secondary hyper-PTH with osteosclerosis
- There is no visualisation of the kidneys

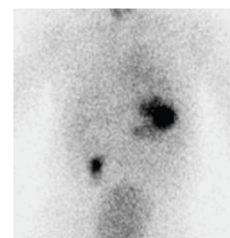


Hotspots in multiple bones without kidney uptake

Q2.2: What is a Tc99m pertechnetate scan used for, and what are its uptake sites?

Answer:

- Tc99m pertechnetate is taken up by the thyroid, stomach, and salivary glands.
- It is the scan of choice for Meckel's diverticulum, where ectopic gastric mucosa uptake is seen in the right iliac fossa.
- In thyroid cancer, uptake is decreased (cold nodule)
- Most salivary gland tumours show cold spots, except Warthin's tumour, which shows a hot spot



Q2.3: What are the nuclear scans used for cardiac function and viability?

Answer:

🔍 PYQ: INICET 2021 🔍 PYQ: FMGE 2019, 2023

- Ischemia/perfusion: A Thallium scan can be used
 - o Wherever there is ischemia, Thallium will not be taken up
 - o The stress test is done
 - o With the stress, ischemia is induced, and Thallium will not be taken up
 - o On the rest, Thallium will be taken up
 - o A reversible defect is suggestive of ischemia
- Nuclear scan for Left ventricular function (Ejection fraction) - MUGA scan
 - o MUGA scan is a Multiple Gated Acquisition
- A scan in which the infarct shows a hotspot is a Pyrophosphate scan
- The best test for cardiac viability is a PET scan
 - o It helps to differentiate whether it is hibernating myocardium / scar / infarct.
 - o Metabolism and perfusion PETs have to be compared
- The most accurate for LV function: Cardiac MRI

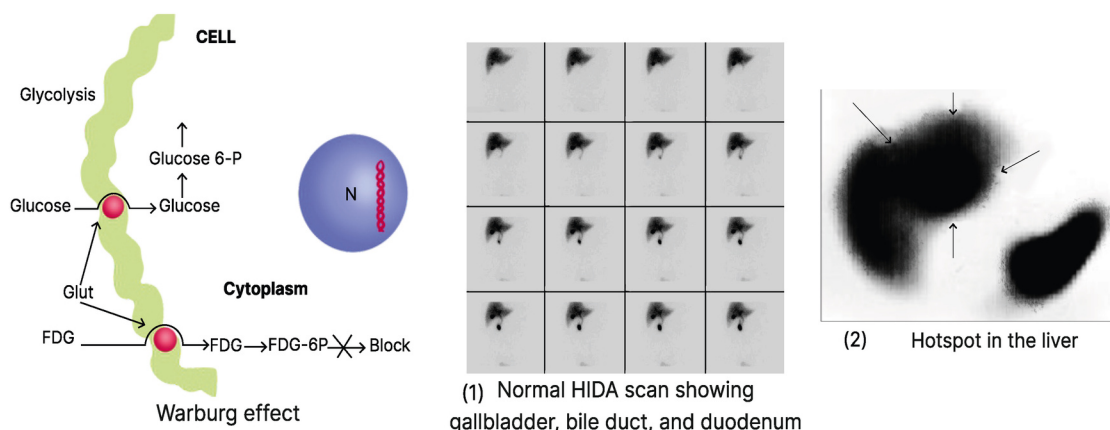
Q2.4: What is the role of HIDA scan and sulphur colloid in hepatobiliary imaging?

🔍 PYQ: FMGE 2020

Answer:

- HIDA scan shows biliary tract patency via uptake in the gallbladder, duodenum, and intestine
 - o No uptake in the biliary tract suggests biliary atresia

- Sulphur colloid scan is taken up by the reticuloendothelial system (Kupffer cells)
 - o FNH shows a hotspot due to Kupffer cells
 - o Hepatocellular carcinoma (HCC) does not take up sulphur colloid
 - o Splenosis, abscesses, and macrophage-rich lesions can also show uptake



Q2.5: How are pheochromocytomas evaluated using nuclear imaging?

Answer:

- MIBG scan is used for pheochromocytomas and works by mimicking catecholamine synthesis
- Clinical features: Palpitations, hypertension, headache, sweating
- Adrenal pheochromocytoma: Best seen on MRI
- If not visualised in the adrenals, a whole-body MIBG scan or DOPA PET is done to detect extra-adrenal sites.

BIG QUESTION 3: What is the principle of a PET scan, and how is it used in oncology imaging?

Broad Answer:

- PET (Positron Emission Tomography) is a functional imaging technique that uses positron-emitting isotopes like F18, commonly labelled with deoxyglucose (FDG). Cancer cells show increased FDG uptake due to the Warburg effect. The technique is based on the annihilation of positrons with electrons, producing dual 511 keV photons detected by a coincidence circuit. PET-CT, a hybrid imaging modality, is used for cancer staging, monitoring response to therapy, and detecting recurrence.

DETAILED QUESTIONS

Q3.1: What is the radioisotope and ligand used in PET scans, and why?

Answer:

- F18 is the most commonly used positron emitter (half-life: 110 minutes)
- Deoxyglucose (FDG) is the ligand
- Cancer cells show increased FDG uptake due to the Warburg effect (increased glucose metabolism)

Q3.2: Why can't Tc99m be used in PET scans?

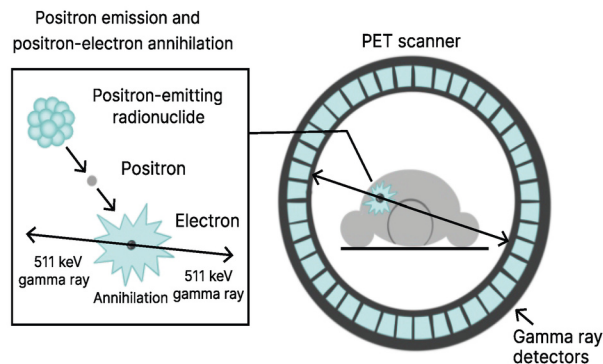
Answer:

- Tc99m emits gamma rays, not positrons, so it is not suitable for PET
- PET requires positron emitters like F18 to function

Q3.3: What is the principle behind PET scan detection?

Answer:

- Based on an annihilation coincidence circuit
- F18 emits a positron, which annihilates with an electron, producing two 511 keV gamma rays in opposite directions (180°)
- These gamma rays are detected simultaneously by detectors, confirming the location of tracer uptake.



Q3.4: What conditions can lead to false positives and false negatives in PET scans?

Answer:

- False Negative:
 - Low-grade tumors
 - Low-grade typical carcinoid
 - Bronchoalveolar carcinoma
- False Positive:
 - Infections
 - Inflammations

Q3.5: What are the physiological sites of FDG uptake in PET?

PYQ: NEET PG 2022

Answer:

- Urinary bladder, kidneys, and urinary tract (due to excretion)
- Brown adipose tissue in the bilateral supraclavicular areas

Q3.6: What are the requirements before performing a PET scan?

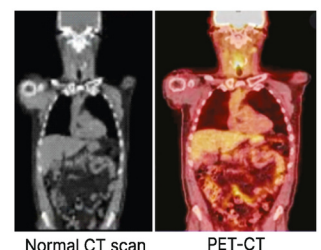
Answer:

- A normal blood glucose level is essential
 - If blood glucose is high, FDG uptake is reduced as cells preferentially take up glucose instead of FDG

Q3.7: What is PET-CT, and what are its clinical uses?

Answer:

- PET-CT is a hybrid imaging modality combining functional (PET) and anatomical (CT) imaging
- Used for:
 - Cancer staging
 - Assessing treatment response
 - Detecting recurrence



Normal CT scan

PET-CT

YOURWISH

BIG QUESTION 4: What are the types and techniques used in radiotherapy?

Broad Answer: Radiotherapy uses ionising radiation, primarily X-rays, for cancer treatment. The most common machine is the LINAC (Linear Accelerator), which produces X-rays or electrons. Radiotherapy can be delivered through teletherapy (external), brachytherapy (internal), or systemic routes.

DETAILED QUESTIONS**Q4.1: What are the major types of radiotherapy and their delivery mechanisms?****Answer:**

1. Teletherapy:
 - o The source is at a distance
 - o Machines: Cobalt-60 machine, LINAC (produces X-rays and electrons)
2. Brachytherapy:
 - o "Brachy" means short; the radiation source is at a short distance
 - o Source is on, near, or within the tumour
 - o Includes implant brachytherapy (temporary or permanent implants)
3. Systemic radiotherapy:
 - o Given orally or by injection
 - o Radioiodine ablation of the thyroid uses I-131
 - I-131 emits beta + gamma rays (not a pure beta emitter)

Q4.2: What are pure β -emitters used in systemic radiotherapy?**Answer:**

- Mnemonic: PSY
 - o P - Phosphorus-32
 - o S - Strontium (for bone metastasis)
 - o Y - Yttrium

Q4.3: What isotopes are used in permanent brachytherapy implants?**Answer:**

- Mnemonic: CIGYR P
 - o C - Caesium-131
 - o I - Iodine-125
 - o G - Gold
 - o Y - Yttrium
 - o R - Radon-222
 - o P - Palladium
- These implants have short half-lives and can be temporary or permanent

Q4.4: What is LINAC, and what are its features?**Answer:**

- LINAC has an electron beam, and the particles that come out are X-rays
- It can rotate around the patient
- It is a linear accelerator

- The concept of afterloading is used in brachytherapy
- Rather than the person handling the radioisotope and getting unnecessary radiation exposure, a robotic system that puts the implant into the patient's body is used



Q4.5: What agents are used in radiotherapy, and what are their clinical applications?

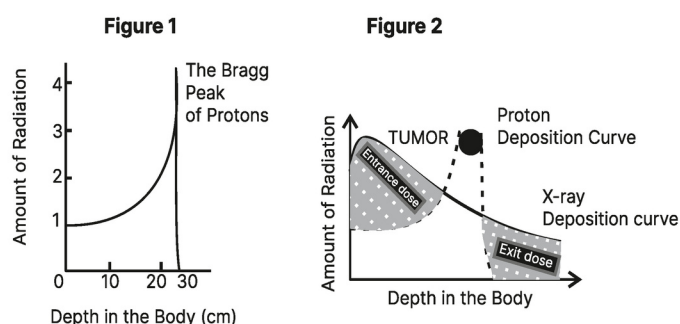
Answer:

- X-rays & Gamma rays
- Protons: Used for targeted therapy; minimal skin damage; show Bragg peak (high local radiation at tumour site)
- Electrons: Used for skin tumours like cutaneous T-cell lymphoma, Mycosis fungoides

Q4.6: What is the Bragg peak, and how is it relevant in proton therapy?

Answer:

- The Bragg peak is the point where maximum energy deposition occurs by proton beams.
- It allows precise targeting of tumours with minimal damage to surrounding tissues.
- Used in pencil beam proton therapy



Q4.7: What are the important radioisotopes in radiotherapy and their half-lives?

PYQ: NEET PG 2018

Answer:

Isotope	Half-life	Use
Radium-226	1600 years	First used in humans
Cesium-137	30 years	Brachytherapy
Cobalt-60	5.26 years	Teletherapy/Brachytherapy
Iridium-192	74.2 days	Brachytherapy
Iodine-125	60.2 days	Implant brachytherapy
Tc-99m	6 hours	Diagnostic imaging
F-18	110 minutes	PET scan

BIG QUESTION 5: What are the specialised techniques and biological principles of radiotherapy?

Broad Answer:

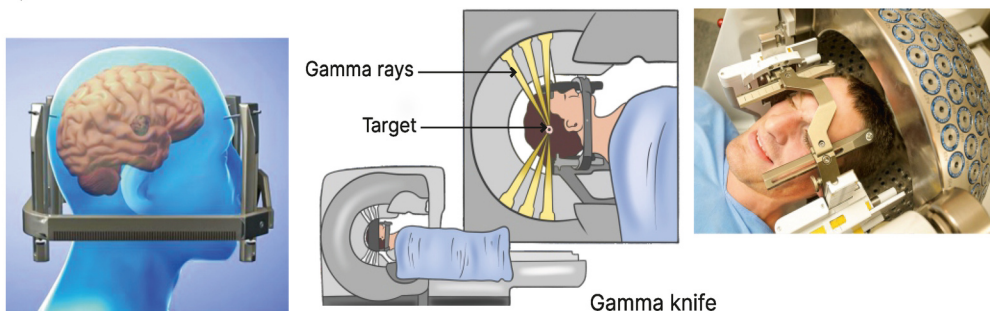
- Radiotherapy includes advanced techniques like Gamma Knife and Cyber Knife for precise, non-invasive tumour ablation. Gamma Knife uses focused gamma rays on brain lesions via stereotactic localisation (Leksell frame), while Cyber Knife employs X-rays and is applicable to the whole body. Craniospinal irradiation is used in tumours prone to spinal spread. Fractionated radiotherapy improves efficacy by allowing reoxygenation and enhancing cancer cell kill over multiple sessions.

DETAILED QUESTIONS

Q5.1: What is Gamma Knife radiosurgery, and how does it work?

Answer:

- The Gamma Knife is a form of stereotactic radiosurgery (SRS) using focused gamma rays
- No actual surgery is done
- Uses the Leksell frame to localise brain lesions via MRI coordinates
- All gamma rays are focused to ablate the lesion
- Indications include:
 - o Vestibular schwannoma
 - o Trigeminal neuralgia
 - o AV malformations
 - o Pituitary microadenoma
 - o Non-accessible brain lesions
 - o Localised, non-metastatic cancers



Q5.2: How does Cyber Knife differ from Gamma Knife?

Answer:

- Cyber Knife uses X-rays, not gamma rays
- No frame is required
- Can be used for tumours in the entire body, not just the brain

Q5.3: What is craniospinal irradiation, and in which conditions is it used?

PYQ: FMGE 2020, 2023

Answer:

- Used when tumours have a high chance of spinal spread
- Indications:
 - o Medulloblastoma
 - o Ependymoma
 - o ALL (Acute lymphoblastic leukaemia)
 - o Small cell lung carcinoma (extensive metastasis)

Q5.4: What are the endocrine side effects and cancer risks of head and neck radiation?**Answer:**

- First hormone deficiency: Growth hormone
- Radiation-associated thyroid cancer: Papillary carcinoma

Q5.5: What is fractionated radiotherapy and its types?**Answer:**

- Divides the total dose into multiple smaller doses (fractions).
- Conventional fractionation:
 - o Once daily, 5 days/week, 1.8-2 Grey/day
- Hyperfractionated:
 - o 2 fractions/day
- Hypofractionated:
 - o Fewer fractions, larger dose per session
- Reoxygenation helps make previously resistant cancer cells more sensitive in later fractions

Q5.6: According to the Law of Bergonie, which cells and tissues are most radiosensitive and radioresistant?**Answer:**

- Radiosensitive (actively dividing):
 - o Most sensitive tissue: Bone marrow
 - o Most sensitive blood cell: Lymphocyte
 - o Most sensitive organ: Gonads
 - o Most sensitive cell cycle phase: Mitosis (G2/M phase)
- Radioresistant (non-dividing):
 - o Most resistant tissue: Neurons
 - o Most resistant blood cell: Platelet
 - o Most resistant organ: Vagina
 - o Most resistant cell cycle phase: S phase

Q5.7: What is the Inverse Square Law in radiotherapy?**Answer:**

- Radiation intensity is inversely proportional to the square of distance
 - o Double the distance → $1/4^{\text{th}}$ the radiation
 - o Triple the distance → $1/9^{\text{th}}$ the radiation

Q5.8: Which tumours are highly radiosensitive and which are highly radioresistant?**Answer:**
 PYQ: FMGE 2021

 PYQ: NEET PG 2021

Highly radiosensitive tumors	Highly radioresistant tumors
Mnemonic: WELMS • Wilms tumor • Ewing's tumor • Lymphoma • Multiple myeloma • Seminoma (Testicular) - o Counter part of seminoma in ovary is Dysgerminoma	Mnemonic: MORPH • Melanoma • Osteosarcoma • RCC • Pancreatic cancer • HCC



9. HEPATOBILLIARY AND PANCREAS IMAGING

BIG QUESTION 1: What are the different cholangiographic investigations, and how do they differ in their principles and features?

Broad Answer: Cholangiographic investigations include ERCP, MRCP, T-tube cholangiogram, and PTC. These are used to visualize the biliary and pancreatic ducts for diagnostic or therapeutic purposes. ERCP is endoscopic and therapeutic but invasive with radiation exposure. MRCP is non-invasive, purely diagnostic, and based on T2-weighted MRI. T-tube cholangiogram is used post-cholecystectomy, and PTC involves contrast injection via the hepatic radicles.

DETAILED QUESTIONS

Q1.1: What are the features of ERCP?

Answer:

- Endoscopic Retrograde Cholangiopancreatography
- The endoscope enters the duodenum
- CBD and the pancreatic duct are seen
- Invasive procedure using contrast X-ray (radiation exposure)
- The **gold standard** as it is both diagnostic and therapeutic

Q1.2: What are the characteristics of MRCP?

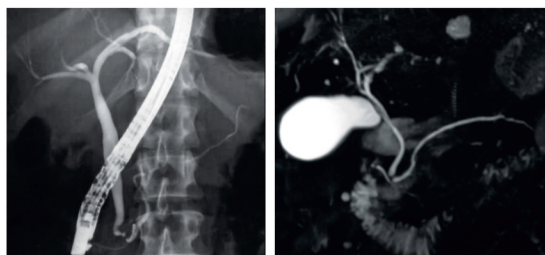
Answer:

- Magnetic Resonance Cholangiopancreatography
- No endoscope involved
- CBD, pancreatic duct, and gallbladder are visualized

Q1.3: What is the difference between ERCP and MRCP?

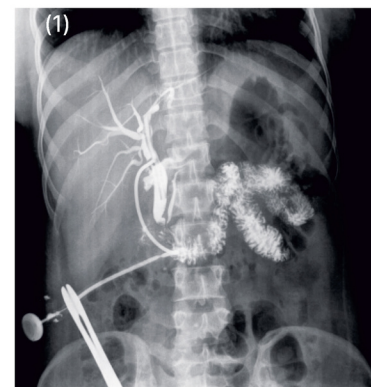
Answer:

ERCP	MRCP
• It has radiation exposure because Contrast X-ray done	• It has no radiation exposure because MRI is done
• Invasive (gold standard)	• Non-invasive (IOC)
• Advantage- Therapeutic	• Advantage - Diagnostic only
• T2 weighted MRI is not used	• It is a T2 weighted MRI in order to view bile, pancreatic juice, water
• Contrast X-ray is done	• Water appears white on MRI



Q1.4: What is a T-tube cholangiogram, and when is it used?**Answer:**

- The T-tube is inserted post-cholecystectomy
- Diverts bile drainage
- Seen as a T-shaped tube entering the CBD in imaging
- Uses contrast for visualization



T-tube cholangiogram

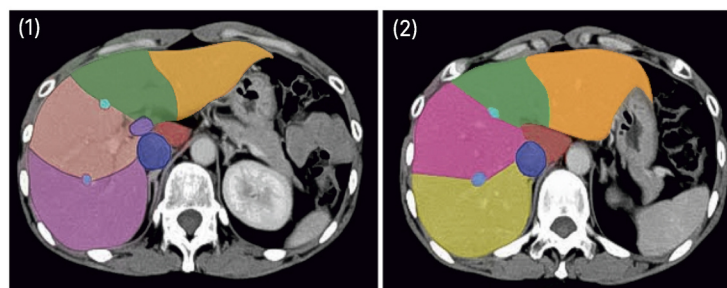
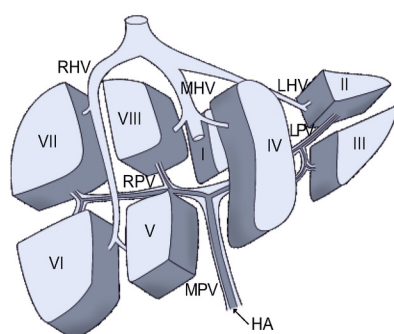
Q1.5: What are the identifying features of PTC?**Answer:**

- Percutaneous Transhepatic Cholangiogram
- The catheter comes through the liver
- Passes into the peripheral intrahepatic radicles
- Used when ERCP is not feasible
- Invasive, contrast-based imaging technique

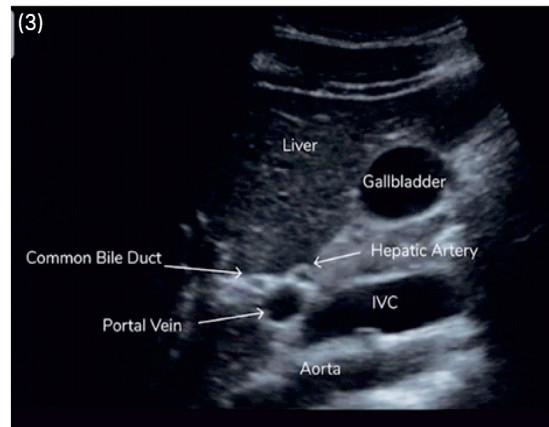
**BIG QUESTION 2: What is the liver's segmental anatomy, vascular landmarks, and key sonographic features?**

Broad Answer: The liver is anatomically divided into right and left lobes by the Cantlie line (middle hepatic vein). It is further segmented based on the portal and hepatic vein orientations. Segmental positioning depends on imaging planes, with segment identification changing with the level of the kidney.

PYQ: FMGE 2023 PYQ: FMGE 2020

**DETAILED QUESTIONS****Q2.1: What divides the liver into right and left lobes?****Answer:**

- The middle hepatic vein, lying along Cantlie's line, divides the liver into right and left lobes.



Q2.2: How is the liver divided into upper and lower parts, and what segments lie in each?

Answer:

- The portal vein divides the liver into upper and lower halves.
 - o Upper segments (when the kidney is not seen): 2, 4, 7, 8
 - o Lower segments (when the kidney is seen): 3, 4, 5, 6

Q2.3: What are the segmental divisions of the liver lobes?

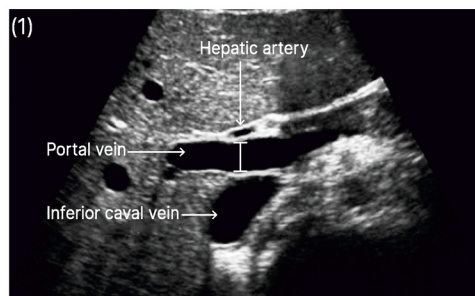
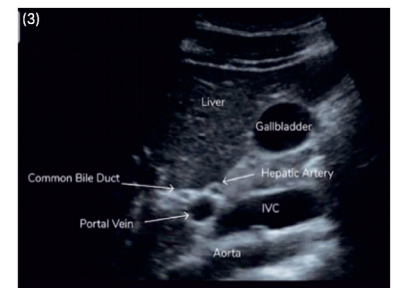
Answer:

- Left lobe: Left medial (segment 4) and left lateral (segments 2, 3)
- Right lobe:
 - o Right anterior: segments 5, 8
 - o Right posterior: segments 6, 7

Q2.4: What is the Mickey Mouse sign in liver imaging, and which structures form it?

Answer:

- Formed by the **portal triad**:
 - o Portal vein (largest and central)
 - o Hepatic artery (smaller, anterior-medial)
 - o Common bile duct (antero-lateral)
- Hepatic veins do not appear in the portal triad.



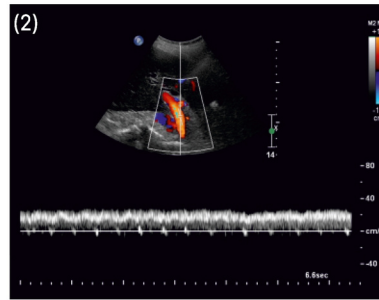
- The largest vein supplying the liver is the portal vein
- Adjacent to the one, the smaller one is the hepatic artery
- Behind the portal vein is the inferior vena cava

Q2.5: What are the Doppler waveform characteristics of the portal vein and hepatic artery?

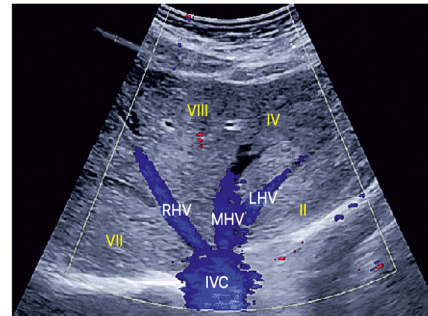
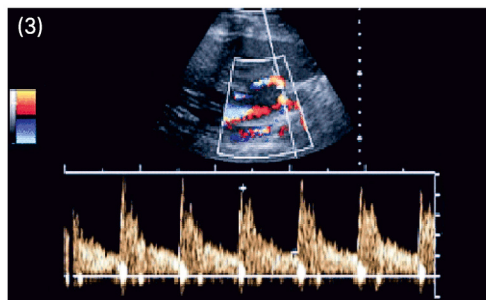
Answer:

- Portal vein waveform:

- o Monophasic, always above baseline (forward flow)
- o No negative (reverse) flow



- **Hepatic artery waveform:**
 - o Has systolic upstrokes and diastolic flow



- Three veins draining into the IVC are the hepatic veins

BIG QUESTION 3: What are the common cystic lesions of the liver, their imaging characteristics, and how are they differentiated using CT phases and clinical history?

Broad Answer: Cystic liver lesions are primarily fluid-filled and appear gray on CT. Differentiation is based on wall thickness, internal features (e.g., water lily sign, daughter cysts), enhancement patterns on triple-phase CT, and clinical context (e.g., history of dysentery, oral contraceptive use). Specific signs help narrow the diagnosis.

DETAILED QUESTIONS

Q3.1: How do cysts appear on CT, and how can they be differentiated from abscesses?

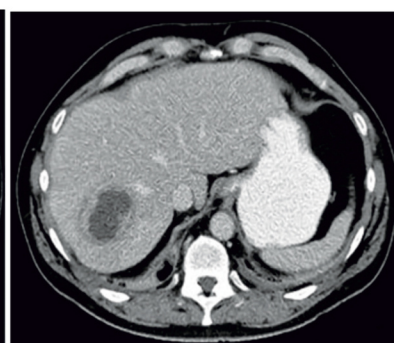
Answer:

🔍 PYQ: INICET 2022 🔍 PYQ: FMGE 2020

- Cysts contain water, so they appear grey on CT
 - o The cyst wall is thin
- The abscess wall is thick due to inflammation and granulation tissue
 - o A history of dysentery followed by liver abscess suggests amoebic liver abscess



Simple Cyst



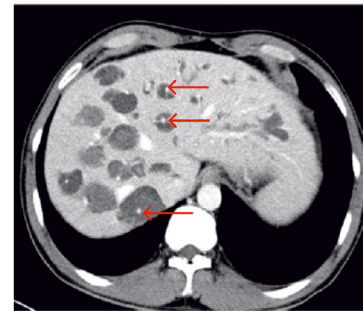
Liver Abscess

YOURWISH

Q3.2: What is the central dot sign, and where is it seen?

Answer:

- **Central dot sign:**
 - Central portal vein remnant inside a dilated intrahepatic duct.
- Seen in Caroli's disease, which is a Type 5 choledochal cyst.



Caroli's Disease

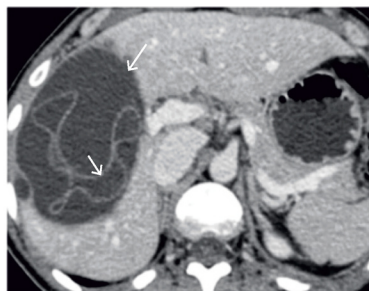
Q3.3: What are the imaging signs of a hydatid cyst on ultrasound and CT?

Answer:

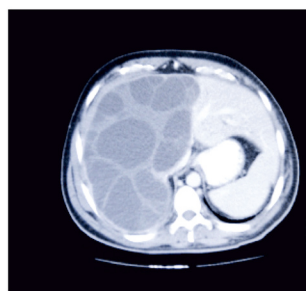
- **Water lily sign:** Floating membranes inside a cyst (seen in ultrasound) (Image 1 & 2)
- Mother cyst with daughter cysts (Image 3)
- **Calcified cyst** in the liver (does not calcify in the lung) (Image 4)



1



2



3

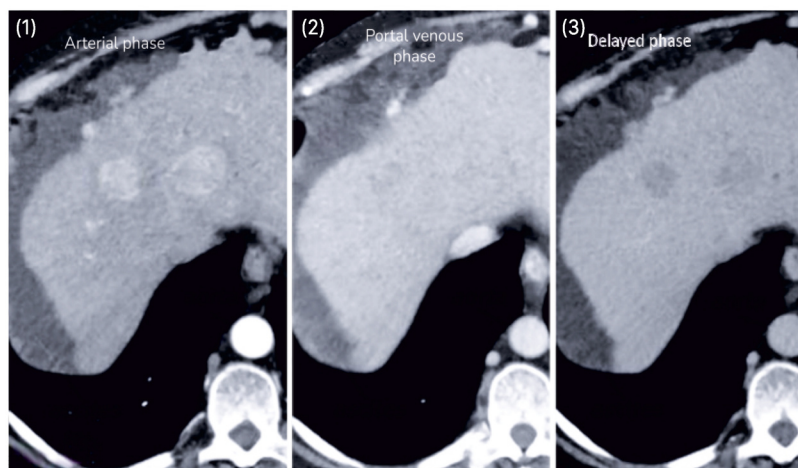


4

Q3.4: What is the role of triple-phase CT in liver lesion evaluation?

Answer:

- **Triple-phase CT:** Includes plain, arterial, and portal/venous phases
- A plain scan is taken first, and then IV contrast is given, and the timings of the scan's images are noted
- Depending upon when the lesion in the liver is enhanced with contrast
 - **Early enhancing lesions** are supplied by the **hepatic artery**
 - In this way, different lesions like Haemangiomas and HCC can be differentiated
 - In the arterial phase (Image 1), if the lesions become white (more white than the surrounding liver) - **Early arterial enhancement**
 - The normal liver is supplied by the portal vein, so it will be enhanced later
 - In the **late phase** (Image 3), HCC shows **contrast washout** and becomes dark
 - The liver has an irregular surface, and ascites
 - This indicates underlying cirrhosis



Q3.5: What liver lesion is associated with oral contraceptive use in females?**Answer:**

- **Hepatic adenoma** is commonly associated with oral contraceptive pills (OCPs) in females.

BIG QUESTION 4: What are the key imaging features and clinical findings in gallbladder and bile duct pathologies?

Broad Answer: Gallbladder pathology is evaluated primarily using ultrasound and includes findings such as gallstones (posterior acoustic shadowing), polyps (non-shadowing, non-mobile), and signs of inflammation (e.g., thickened wall, pericholecystic fluid). A HIDA scan is the gold standard for acute cholecystitis. MRCP and ERCP are used for bile duct evaluation, with ERCP offering therapeutic options. Specific signs like the comet tail (cholesterolosis) and beaded appearance (PSC) assist in diagnosis.

DETAILED QUESTIONS**Q4.1: How does a gallbladder appear on ultrasound, and what is a Phrygian cap?****Answer:**

- The gallbladder appears black due to its bile content
- A Phrygian cap is a normal folding inside the gallbladder

**Q4.2: How do you differentiate a gallstone from a gallbladder polyp on ultrasound?****Answer:**

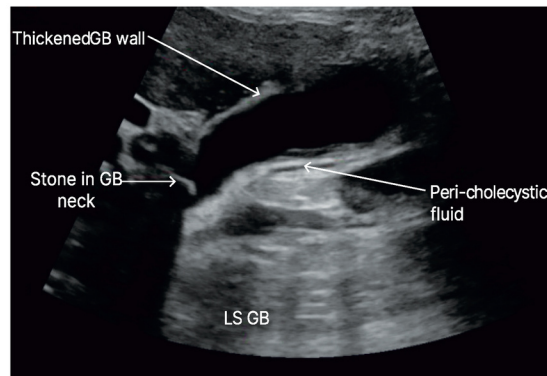
PYQ: FMGE 2021

Feature	Gallstone	Gallbladder Polyp
		
Shadowing	Posterior acoustic shadowing is present	No shadowing
Mobility	Mobile	Non-mobile
Attachment	Free-floating or mobile in the lumen	Attached to the wall

Q4.3: What are the clinical and imaging features of acute cholecystitis?

Answer:

- Clinical features: Right hypochondriac pain, positive Murphy's sign
- Investigation of choice: Ultrasound
 - Thick gallbladder wall (>3 mm), overdistended gallbladder, pericholecystic fluid, stone in neck
- Gold standard: HIDA scan (shows non-visualization of gallbladder due to cystic duct obstruction)

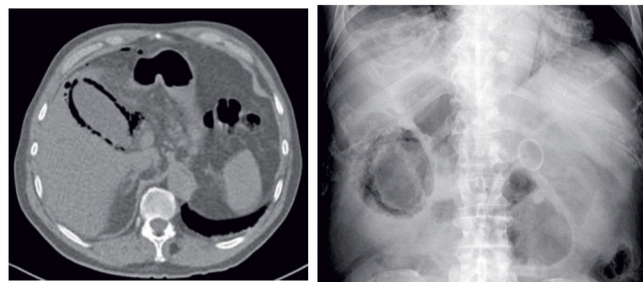


Acute cholecystitis

Q4.4: What is emphysematous cholecystitis, and how does it appear on CT?

Answer:

- The presence of air in the gallbladder wall is known as emphysematous cholecystitis
- Air appears black on CT

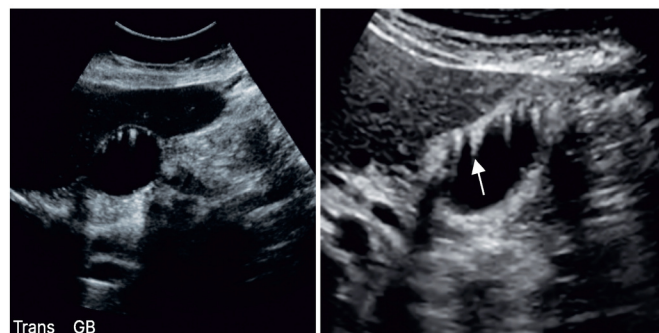


Emphysematous cholecystitis

Q4.5: What is the comet tail sign, and what does it indicate?

Answer:

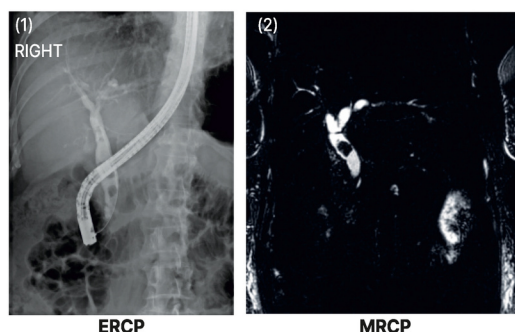
- Comet tail appearance: Echogenic lines from the wall
- Seen in Cholesterolosis, a form of adenomyomatosis
- Gross appearance: Strawberry gallbladder



Gallbladder Adenomyomatosis/Cholesterolosis

Q4.6: What imaging findings suggest choledocholithiasis?

Answer:



- Seen as lucent filling defects on ERCP
- Dilated CBD on imaging
- MRCP is the investigation of choice
- ERCP is done after MRCP for therapeutic intervention

🔍 PYQ: FMGE 2021

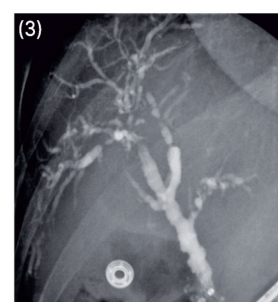
🔍 PYQ: NEET PG 2022

🔍 PYQ: INICET 2022, 2023

Q4.7: What is the beaded appearance of the bile ducts and their significance?

Answer:

- **Beaded + pruned tree appearance of biliary tree:** Primary sclerosing cholangitis (PSC)
- Involves multiple areas of narrowing in intrahepatic and extrahepatic ducts
- PSC is associated with ulcerative colitis



Beaded appearance

BIG QUESTION 5: What are the key imaging features and clinical distinctions in pancreatic diseases, including acute and chronic pancreatitis, pseudocysts, and pancreatic malignancies?

Broad Answer: Pancreatic conditions present with distinct imaging findings on ultrasound, CT, and MRCP. Acute pancreatitis shows a bulky pancreas with peripancreatic fluid, while chronic pancreatitis shows atrophy, ductal dilatation, and calcifications. Pseudocysts form after 4 weeks in non-necrotizing pancreatitis.

DETAILED QUESTIONS

Q5.1: What is the difference between the imaging findings of acute and chronic pancreatitis?

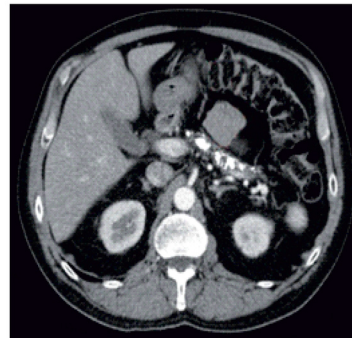
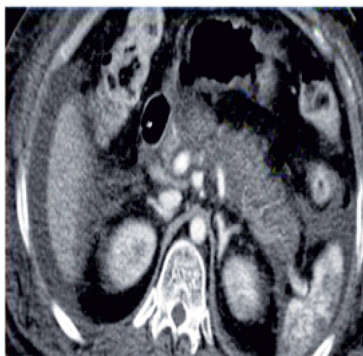
Answer:

🔍 PYQ: NEET PG 2022

🔍 PYQ: FMGE 2019, 2020

Acute Pancreatitis	Chronic pancreatitis 🔍 PYQ: INICET 2023
• Bulky pancreas • Pancreatic duct is not dilated	• Pancreas with fibrosis, shrinkage- atrophic pancreas with dilated pancreatic duct
• No calcifications and chain of lakes appearance here	• Calcifications and chain of lakes appearance is seen
• Peripanceatic fluid accumulation is seen here ◦ This fluid can form a wall around itself and is called Pseudocyst • Pseudocyst is the collection in non necrotising pancreatitis after 4 weeks	• Peripancreatic fluid accumulation is not seen here

YOURWISH



Q5.2: What is a pseudocyst, and when does it form?

Answer:

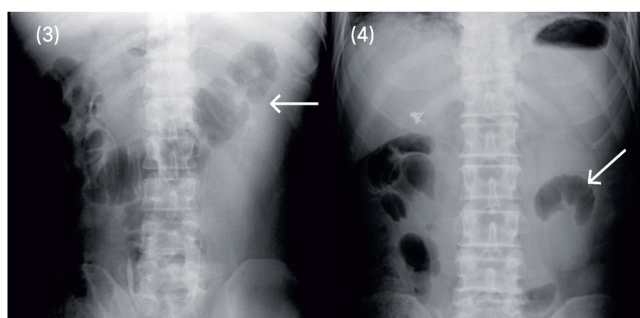
- Encapsulated fluid collection with a wall, seen as a grey lesion on CT
- Develops after 4 weeks in non-necrotising acute pancreatitis



Q5.3: What are the colon-related signs seen in acute pancreatitis?

Answer:

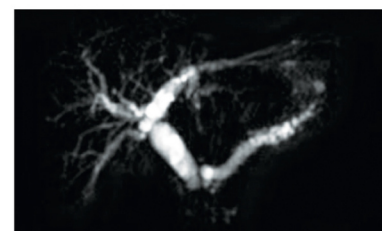
- **Colon cut-off sign:** Air in the colon suddenly stops at the splenic flexure due to inflammation
- **Sentinel loop sign:** Isolated, prominent bowel loop near the inflamed pancreas
- A gasless abdomen may also be present



Q5.4: What is the “double duct sign” and what does it indicate?

Answer:

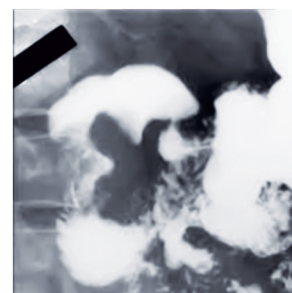
- Simultaneous dilation of the CBD and the pancreatic duct
- Suggests periampullary carcinoma, including carcinoma of the head of the pancreas



Q5.5: What is the reversed 3 sign on the duodenum, and what does it indicate?

Answer:

- Seen when a mass in the head of the pancreas pulls the duodenal wall in.
- Smooth C-loop becomes a reversed figure of 3
- Suggests malignancy in the periampullary region



Q5.6: What is the role of CTSI in pancreatitis?

Answer:

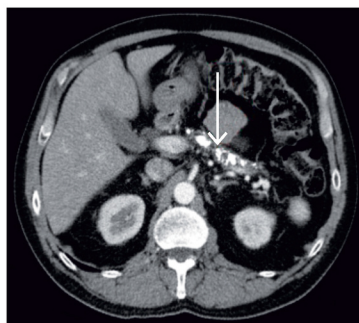
- The CT Severity Index (CTSI) is used to grade the severity of pancreatitis
- Assesses inflammation, necrosis, and fluid collections

Q5.7 What does the given image indicate?



Answer:

- Atrophic pancreas with calcification (Chronic pancreatitis)





10. URINARY TRACT IMAGING

BIG QUESTION 1: What are the key types and advantages of contrast X-ray studies and advanced imaging modalities used in evaluating urinary tract diseases, and how do they aid in diagnosing conditions like urolithiasis, hydronephrosis, and congenital abnormalities?

Broad Answer:

- Contrast X-rays (dye studies) include IVP, RGP, RGU, and MCU, each highlighting different parts of the urinary tract. CT scans, especially non-contrast CT scans, are best for detecting urinary calculi due to their high sensitivity for calcifications.
- MRI urography offers detailed images without radiation or contrast risk, ideal for patients with renal failure.
- These modalities help diagnose conditions like hydronephrosis (fluid dilation of the kidney), congenital abnormalities (e.g., PUJ obstruction, VUR), and infections, improving detection and guiding treatment.

DETAILED QUESTIONS

Q 1.1: What are the four main modalities included in contrast X-rays (dye studies)?

Answer:

- IVP, RGP, RGU, and MCU

Q 1.2: In an IVP (Intravenous Pyelogram), how is contrast administered, and is the urethra visible?

Answer:

- Contrast is given intravenously, and the urethra is not visible.

Q 1.3: Show imaging modality for RGP (Retrograde pyelogram).

Answer:



Q 1.4: What is the procedure and main indications for MCU/VCUG?

Answer:

- Distend the bladder with contrast using a Foley's
- Investigation of choice for:
 - o Vesicoureteral reflux (VUR)
 - o Posterior urethral valve (PUV)



Q 1.5: What is the procedure and clinical utility of Retrograde Urethrogram (RGU)?

Answer:

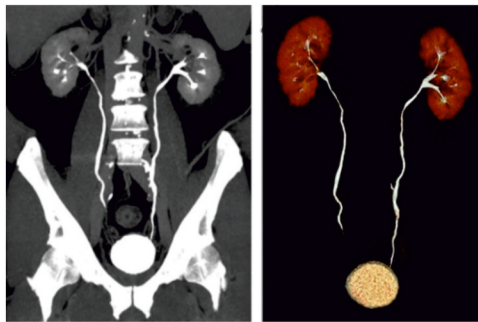
- Cannulation at the external urethral meatus
- Contrast flows from down upwards
- No bladder distension with contrast
- RGU is the preferred modality for:
 - Anterior urethra evaluation for strictures
 - Investigation of urethral pathologies, e.g., urethral strictures, urethral injury/rupture



Q 1.6: What does a CT-IVU or CT-IVP show in urinary tract imaging?

Answer:

- KUB, along with white bone, is observed
- Colourful imaging can be produced from the CT-IVU



Q 1.7: What are the advantages of MR-Urography in urinary tract imaging?

Answer:

- KUB is seen without the bone
- Urine present in the urinary tract appears white even without the use of contrast.
- Safe to use in renal failure as it does not require contrast



Q 1.8: What is the best investigation for detecting urinary tract calculi?

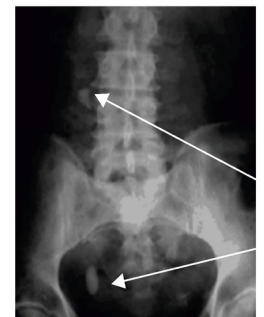
Answer:

- CT

Q 1.9: What are the radiological and clinical features of ureteric calculi?

Answer:

- White areas indicate calcifications observed in the paravertebral location, suggestive of ureteric calculi.
- The ureter runs in the paravertebral location
- A ureteric stone is generally vertically oval
- In ureteric calculi, the pain moves from the loins to the groin



Q 1.10: What is the radiological appearance of a vesical (bladder) calculus?

Answer:

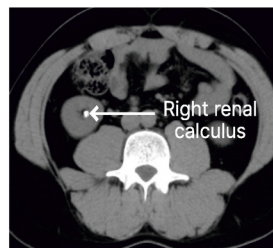
- Dense calcification in the centre of the pelvis
- Indicates the presence of a bladder stone or vesical calculus



Q 1.11: How does a renal calculus appear on an abdominal CT scan?

Answer:

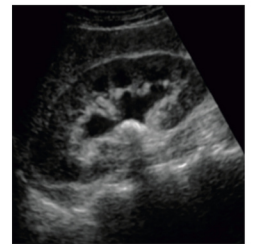
- Renal calculus: The right kidney is observed with the psoas major muscle located posteromedially
 - o A white area is seen in the right kidney
 - o Presents the right renal calculus, seen in non-contrast CT scans



Q 1.12: What is observed on the following abdominal USG?

Answer:

- Ultrasound showing the kidney
- The echogenic area is seen with a shadow behind it
- The shadow represents the posterior acoustic shadowing that suggests a renal calculus
- Renal calculus is obstructive, causing hydronephrosis



Q 1.13: What are the findings on the following Abdominal CT?

Answer:

- Hydronephrosis
 - o The left kidney shows a grey colour density representing fluid, i.e. hydronephrosis.
 - o The enhancing rim observed on the left kidney is the renal parenchyma
 - o This is known as the rim sign seen in hydronephrosis



Q 1.14: What type of kidney stone takes the shape of the renal pelvis and calyces and is usually made of triple phosphate?

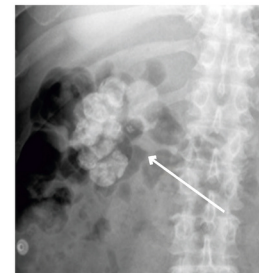
Answer:

- Staghorn Calculus



Q 1.15: What are the radiological features, and in which condition is a putty kidney seen?**Answer:**

- Appears white like cement (putty)
- Observed in the later stages of tuberculosis infections leading to non-functional kidney and autonephrectomy.
- Sterile pyuria is seen in urinary TB

**Q 1.16: What are the radiological features of B/L medullary nephrocalcinosis?****Answer:**

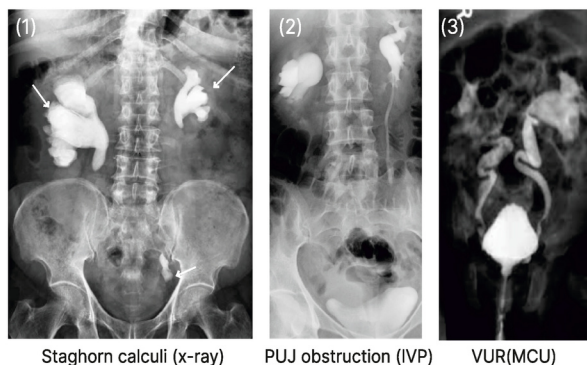
- Lucent areas are observed between opaque areas

**Q 1.17: What condition is associated with B/L medullary nephrocalcinosis?****Answer:**

- Hyperparathyroidism

Q 1.18: Differentiate between Stag Horn Calculus, PUJ Obstruction and VUR based on imaging**Answer:**

- In diagnosing PUJ obstruction
 - Contrast excretion should be analysed
 - If the contrast does not go beyond the pelvic-ureteric junction, this indicates obstruction
- IVP is used to diagnose PUJ obstruction (Image 2)
- Non-visualisation of the ureter is seen in this IVP X-ray, even in the delayed scan
- The affected kidney is dilated with hydronephrosis due to obstruction.
- The affected ureter is not seen, indicating PUJ obstruction
- In PUJ obstruction, there is hydronephrosis without hydroureter
- The IVP image is not used to diagnose stag horn calculus. It is seen on plain X-ray (Image 1)
- DMSA scan for scarring
- MCU is the preferred investigation for VUR (Image 3)



Staghorn calculi (x-ray)

PUJ obstruction (IVP)

VUR(MCU)

Q 1.19: What is popcorn calcification, and where is it observed?**Answer:**

- Incomplete calcification
- Observed in the pelvis

**Q 1.20: What does popcorn calcification in the pelvis typically indicate in post-menopausal females?****Answer:**

- Calcific degeneration of a uterine fibroid

Q 1.21: What are the symptoms seen with pyelonephritis?**Answer:**

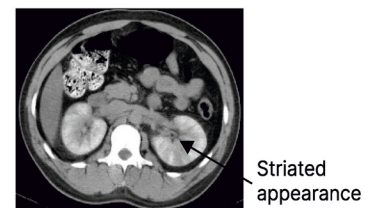
- Fever, dysuria, and flank pain

Q 1.22: How does the size of the kidney differ in acute versus chronic pyelonephritis?**Answer:**

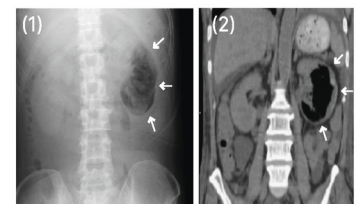
- In acute pyelonephritis, the kidney is enlarged
- In chronic pyelonephritis, the kidney is shrunken

Q 1.23: How does the kidney appear in imaging in acute pyelonephritis?**Answer:**

- Enlarged edematous kidney
- A striated appearance is observed

**Q 1.24: How does emphysematous pyelonephritis appear on imaging, and what are the conditions associated with it?****Answer:**

- Black areas are observed in the X-ray images.
- Air is contained within the kidney and surrounds it
- Common in diabetes mellitus and can turn fulminant and septic

**Q 1.25: What is the earliest IVP finding in renal tuberculosis?****Answer:**

- Moth-eaten calyx.

Q 1.26: What does a moth-eaten calyx on IVP suggest in renal TB?**Answer:**

- Irregularity and destruction of the calyx.

Q 1.27: What pathological processes are caused by urinary tract TB?**Answer:**

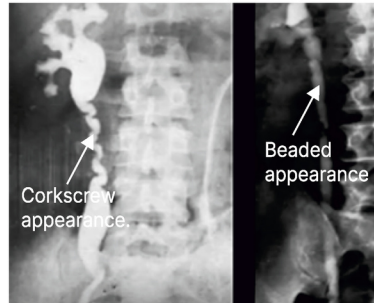
- Destruction and fibrosis

Q 1.28: What is a putty kidney?

PYQ: NEET PG 2023

Answer:

- Kidney with a lobulated appearance, indicating parenchymal calcification, i.e. putty kidney
- Putty kidney is the amorphous calcification in the kidney in the case of renal TB

**Q 1.29: What causes the corkscrew or beaded appearance of the ureter on imaging?****Answer:**

- Multiple ureteric strictures

Q 1.30: What is the appearance of the normal distended bladder on imaging?**Answer:**

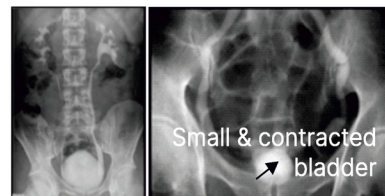
- It fills up the pelvic cavity



Normal bladder

Q 1.31: What is the term for a small, contracted bladder seen in urinary tract tuberculosis?**Answer:**

- Thimble bladder



Normal bladder Thimble bladder

Q 1.32: Which condition shows the cobra head or adder head appearance on imaging?

PYQ: NEET PG 2019

PYQ: FMGE 2020

Answer:

- Ureterocele
- Bilateral ureterocele (both ureters are dilated)



Bilateral ureterocele

Q 1.33: What causes the cobra head appearance in the ureterocele?**Answer:**

- Dilatation of the distal ureter at its insertion into the bladder

Q 1.34: What is the name of the radiological appearance seen in the duplication moiety?**Answer:**

YOURWISH

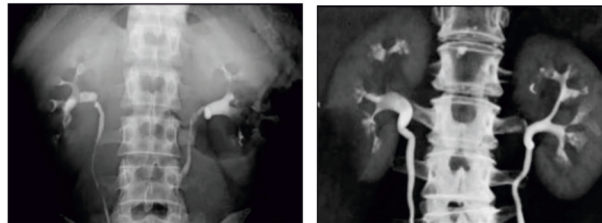
- Drooping lily appearance
 - o When there is complete duplication, and the upper pole moiety is obstructed and non-functioning, a drooping lily appearance occurs
 - o The drooping lily is the lower moiety of complete duplication caused by pressure from the upper moiety.



Q 1.35: What is the characteristic IVP appearance of medullary sponge kidney?

Answer:

- Paintbrush or bouquet of flowers appearance
 - o Medullary collecting ducts are dilated and accumulate the contrast



Q 1.36: What is the characteristic imaging appearance of Autosomal Dominant Polycystic Kidney Disease (ADPKD) due to cysts separating the renal calyces?

Answer:

- Spider leg appearance



BIG QUESTION 2: Describe the characteristic imaging features and clinical significance of the following urinary tract conditions: Retroperitoneal Fibrosis, Retrocaval Ureter, Renal Papillary Necrosis, Schistosomiasis-related bladder calcification, and common Renal Masses.

Broad Answer:

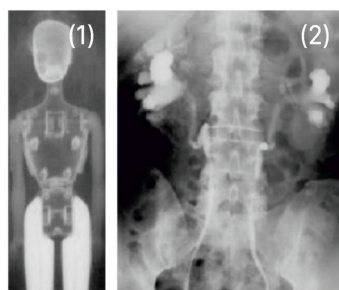
- Retroperitoneal fibrosis causes medial ureteral deviation ("maiden waist"). Horseshoe kidney shows fused poles near the vertebra ("joining hands").
- Retrocaval ureter has an S-shaped ureter, causing hydronephrosis.
- Renal papillary necrosis shows a signet ring sign. Neurogenic bladder has a Christmas tree pattern. PUV shows a keyhole sign on the MCU.
- Schistosomiasis causes bladder calcifications. Urethral strictures narrow the urethra; ruptures show contrast leakage. Bladder ruptures have molar tooth or bowel loop signs.
- Renal masses include cysts, angiomyolipomas, and carcinomas with distinct imaging.

DETAILED QUESTIONS

Q 2.1: What is the characteristic imaging appearance of retroperitoneal fibrosis on ureteral imaging?

Answer:

- Maiden waist appearance



Q 2.2: How does retroperitoneal fibrosis affect the position of the ureter relative to the vertebrae?

Answer:

- The ureter medially deviates at a particular point and overruns the vertebrae.
- Retroperitoneal fibrosis pulls the ureter towards itself, causing medial deviation.

Q 2.3: What imaging appearance is characteristic of a horseshoe kidney?

Answer:

- Two kidneys appear to come close together towards the vertebrae and join
- This is known as joining hands, or handshake, or flower vase appearance



IVP X-ray of
horseshoe kidney

CT-scan

Q 2.4: Which syndrome is commonly associated with a horseshoe kidney?

Answer

- Turner's syndrome

Q 2.5: What is a retrocaval ureter?

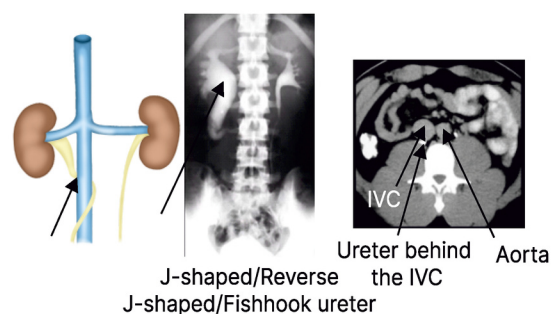
Answer:

- The affected ureter on the right side passes behind the inferior vena cava

Q 2.6: What are the characteristic imaging features of retrocaval ureter?

Answer:

- Hydronephrosis and hydroureter of the proximal ureter are seen
- Known as an S-shaped or reverse S-shaped, fishhook ureter



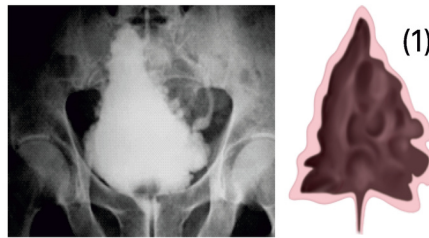
J-shaped/Reverse
J-shaped/Fishhook ureter

Ureter behind
the IVC Aorta

Q 2.7: Where is the Christmas tree appearance seen, and what are its radiological features on imaging?

Answer:

- Seen in a neurogenic bladder
- The tone of the bladder is affected, causing a shape change from round to elongated.
- Multiple diverticuli are present.



Elongated bladder with multiple diverticuli

Q 2.8: What causes the teardrop or pear-shaped appearance of the bladder on IVP imaging?

Answer:

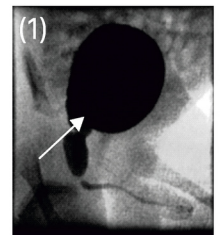
- Extrinsic compression of the bladder
- Any pelvic cause, e.g., pelvic lipomatosis, pelvic abscess, pelvic hematoma, pelvic lymphadenopathy, pelvic vessel aneurysm



Q 2.9: What is the key imaging sign seen in posterior urethral valves (PUV)?

Answer:

- Keyhole appearance



Q 2.10: Which investigation is preferred to diagnose PUV?

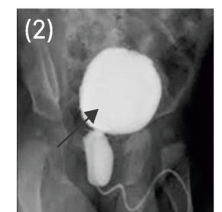
Answer:

- Micturating Cystourethrogram (MCU)

Q 2.11: What does contrast entering the ureter on the MCU indicate in a patient with PUV?

Answer:

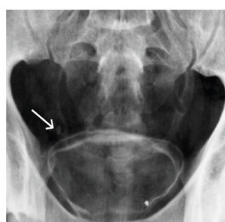
- It indicates vesicoureteral reflux (VUR) along with PUV.



Q 2.12: What causes fetal skull calcification of the urinary bladder, and where does the organism reside?

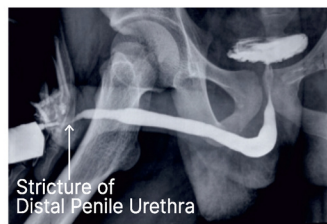
Answer:

- Seen in schistosomiasis
- Schistosoma haematobium resides in the vesical venous plexus of the bladder.



Q 2.13: Show bulbar urethral stricture on imaging.**Answer:****Q 2.14: How is a stricture of the distal penile urethra diagnosed radiologically?****Answer:**

- Diagnosed by a urethrogram showing narrowing in the distal urethra

**Q 2.15: What is the investigation of choice for anterior or distal urethral strictures?****Answer:**

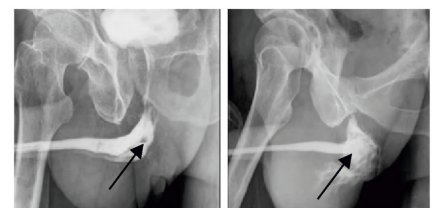
- Retrograde urethrogram (RGU).

Q 2.16: Which investigation is preferred for evaluating posterior or proximal urethral strictures?**Answer:**

- Micturating cystourethrogram (MCU)

Q 2.17: What are the types of urethral rupture associated with pelvic fracture and straddle injury, and how is it detected?**Answer:**

- In a pelvic fracture, the membranous urethra ruptures
- In straddle injury, the bulbar urethra ruptures
- Detected by contrast flows out of the urethra

**Q 2.18: What are the two types of bladder rupture?****Answer:**

- Extraperitoneal or intraperitoneal

Q 2.19: Which part of the bladder is involved in intraperitoneal rupture, and how does it appear on imaging?**Answer:**

- The intraperitoneal part of the bladder is the dome of the bladder
- Intraperitoneal rupture is less common
 - Seen when the bladder is distended, and abdominal wall injury occurs
 - Contrast is seen in the paracolic gutters and the inter-bowel loops area



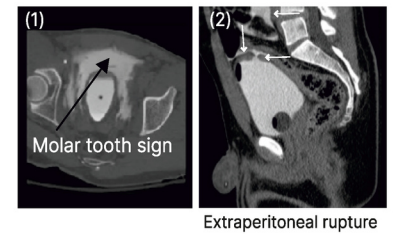
Intraperitoneal rupture

YOURWISH

Q 2.20: What imaging sign is associated with extraperitoneal bladder rupture?

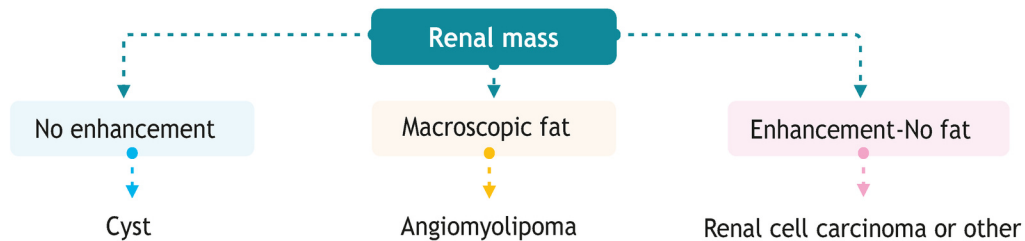
Answer:

- Extraperitoneal rupture is more common
- Contrast accumulates around the bladder
- This is known as the molar tooth sign



Q 2.21: How do you differentiate renal in an adult on CT?

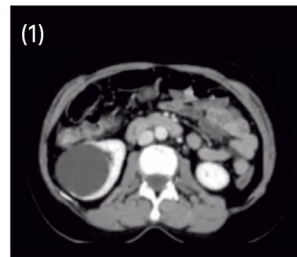
Answer:



Q 2.22: What classification system is used to assess the malignancy risk of renal cysts?

Answer:

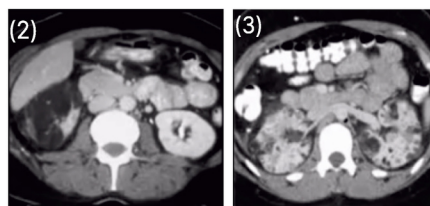
- Bosniak classification



Q 2.23: What are the key CT features of angiomyolipoma, and with which condition are bilateral angiomyolipomas associated?

Answer:

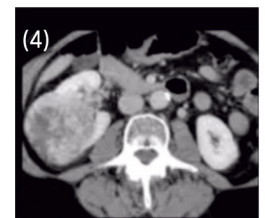
- Angiomyolipoma has fat that looks dirty black on CT
- B/L angiomyolipomas are associated with tuberous sclerosis



Q 2.24: What is the typical imaging appearance of renal cell carcinoma, and which subtype is the most common?

Answer:

- Solid enhancing lesion
- Clear cell carcinoma is the most common
 - o It is hyper-enhancing



Q 2.25: What are the main types of renal cystic lesions?

Answer:

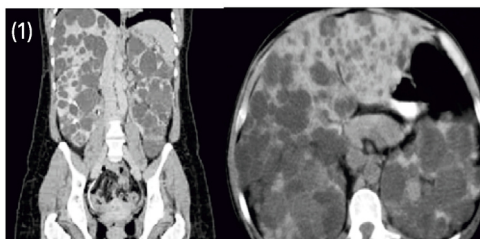
- Autosomal dominant polycystic kidney disease (ADPKD)
- Autosomal recessive polycystic kidney disease (ARPKD)
- Multicystic dysplastic kidney

Q 2.26: What does ultrasound typically show in Autosomal Dominant Polycystic Kidney Disease (ADPKD)?**Answer:**

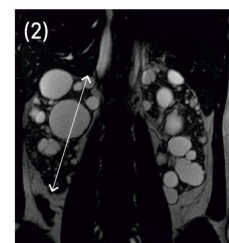
- Enlarged kidneys
- Kidney parenchyma has multiple cysts
- Multiple hypodense regions

Q 2.27: How do ADPKD kidneys appear on a CT scan?**Answer:**

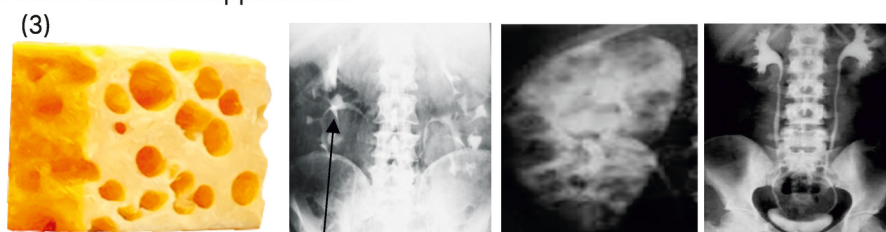
- White bone observed
- Both kidneys are enlarged in size and have multiple cysts.

**Q 2.28: What characteristic appearance does ADPKD show on MRI?****Answer:**

- Black bone observed
- Both enlarged kidneys have multiple cysts

**Q 2.29: What is the typical finding of ADPKD on Intravenous Pyelogram (IVP)?****Answer:**

- Initial or nephrogram phase: Multiple cysts do not take up the contrast, forming filling defects in the kidney.
- This is known as the Swiss cheese appearance.



Spider leg appearance Swiss cheese appearance

Q 2.30: What is the characteristic ultrasound appearance of the kidneys in Autosomal Recessive Polycystic Kidney Disease (ARPKD)?**Answer:**

- Striated appearance or sunray appearance of the kidneys
- The kidney appears echogenic on ultrasonography

Q 2.31: What are the two major renal vascular pathologies?**Answer:**

- Renal artery stenosis and fibromuscular dysplasia

Q 2.32: What is the most common cause of renal artery stenosis?**Answer:**

- Atherosclerosis affecting the ostium

Q 2.33: What is the first investigation for renal artery stenosis in young patients?

Answer:

- Renal Doppler

Q 2.34: What is the gold standard investigation for renal artery stenosis?

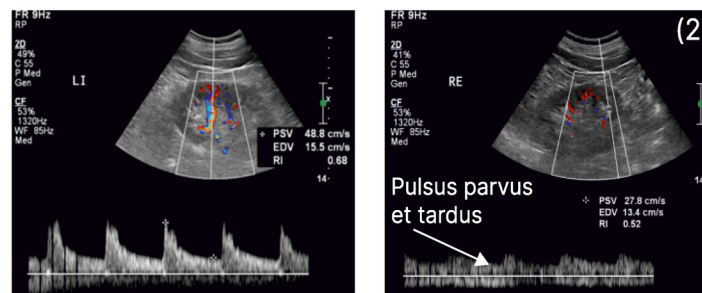
Answer:

- Digital Subtraction Angiography (DSA).

Q 2.35: What Doppler finding is seen in renal artery stenosis?

Answer:

- Renal artery stenosis has a slow and blunted uptake, i.e. pulsus parvus et tardus waveform (normal renal artery has a quick upstroke)



Normal

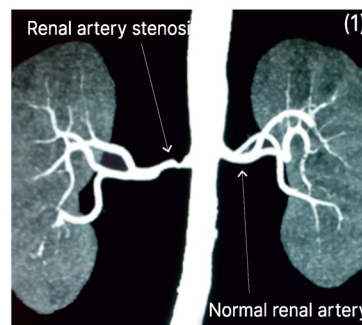
Renal artery stenosis

Comparison of normal renal artery and renal artery stenosis.

Q 2.36: What is the 2nd investigation done for renal artery stenosis?

Answer:

- CT angiography or MR-angiography

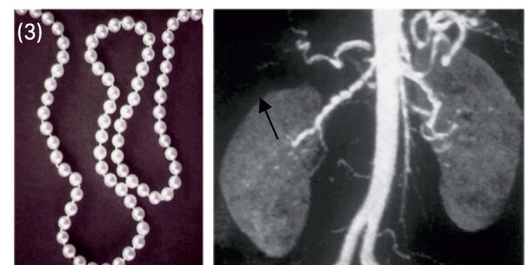


MR angiography

Q 2.37: What does a beaded appearance on MR angiography indicate, and in which condition and patient population is it commonly seen?

Answer:

- Indicates multiple strictures in the renal artery
- Seen in fibromuscular dysplasia
- Common in young adult females
- Also presents with hypertension (similar to renal artery stenosis)



Q 2.38: What is the typical shape of the adrenal gland on CT, and where is it located?

Answer:

- Inverted Y-shape or V-shape
- On the right side, it lies behind the inferior vena cava

Q 2.39: What is the most common incidental adrenal lesion?

Answer:

- Adrenal adenoma.

Q 2.40: What is a key CT feature of an adrenal adenoma?

Answer:

- Fat-containing lesion with rapid wash-in and wash-out of contrast.

Q 2.41: What Hounsfield Unit (HU) value suggests an adrenal adenoma?

Answer:

- HU <10 or negative.

Q 2.42: Which adrenal lesion shows a light bulb sign on T2-weighted MRI?

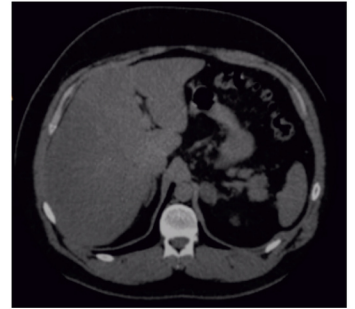
Answer:

- Pheochromocytoma.

Q 2.43: How does pheochromocytoma appear on T2-weighted MRI?

Answer:

- Hyperintense (bright)





11. OBGY AND BREAST IMAGING

BIG QUESTION 1: Describe the Hysterosalpingogram (HSG) and the two main approaches for a pelvic ultrasound, specifying the patient preparation required for each and the rationale behind it.

Broad Answer:

- A **Hysterosalpingogram (HSG)** is a contrast X-ray used to check for **tubal patency** in cases of infertility & is ideally performed on **Day 9 of the menstrual cycle** to avoid the risk of pregnancy.
- A normal result is indicated by the **spill of dye** into the peritoneal cavity, while a lack of spill suggests a tubal block, such as a **cornual block**.
- A pelvic ultrasound can be performed using two main approaches:
 - o **Transabdominal (TAS)** and **Transvaginal (TVS)**

DETAILED QUESTIONS

Q1.1: What is the purpose of a Hysterosalpingogram (HSG)?

Answer: An HSG is a **contrast X-ray** used to check for **tubal patency** in the investigation of **infertility**.

Q1.2: When is the preferred time to perform an HSG, and why?

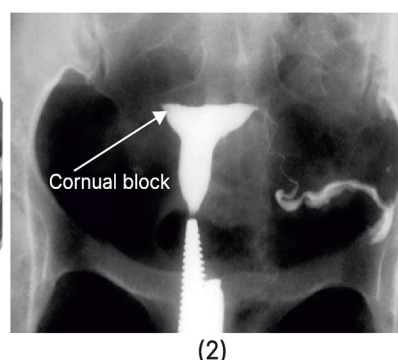
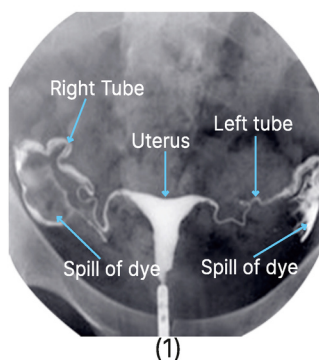
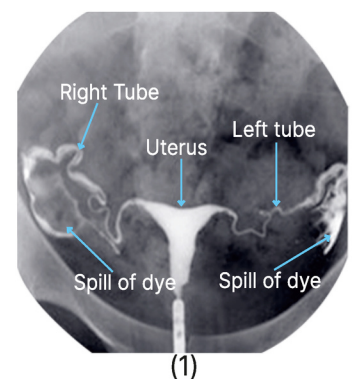
Answer:

- The preferred time is on **Day 9 of the menstrual cycle**.
- This timing is chosen because the menstrual phase is over and there is no risk of pregnancy.

Q1.3: What finding on an HSG indicates a normal, patent fallopian tube?

Answer:

- The **spill of the dye** into the peritoneal cavity indicates normal tubal patency.
- Peritoneal image (2) shows- **Cornual block** on Rt side



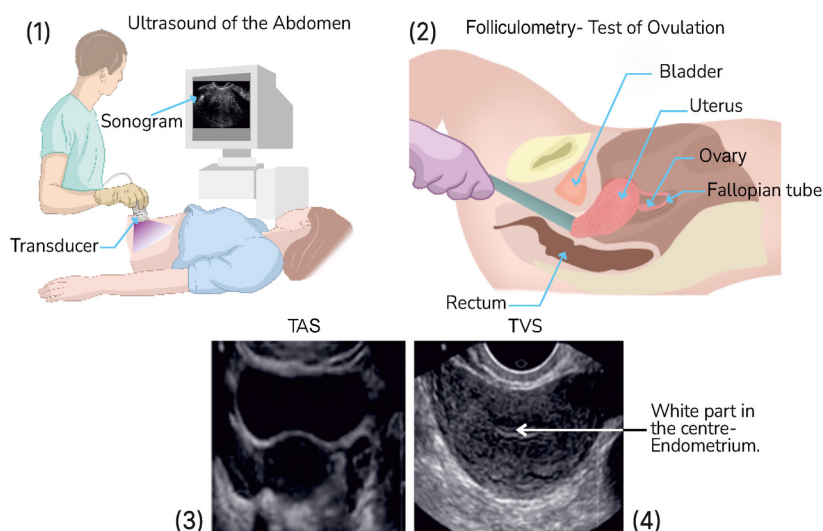
Q1.4: What two approaches are used for a pelvic ultrasound, and what patient preparation is needed for each?

Answer: Ultrasound (USG) is done to observe the uterus and ovaries using two approaches:

- **Transabdominal (TAS):**
 - o Ultrasound passes through the abdomen via a **full bladder**.
 - o The bladder fluid enhances sound transmission, making the uterus appear clearer.

- **Transvaginal (TVS):**

- o Done with an **empty bladder** to reduce pressure on the uterus and vagina, allowing easier examination.



BIG QUESTION 2: What are the typical ultrasound findings in early normal pregnancy, and how do they differ from ectopic, molar, and twin pregnancies?

Broad Answer: In early normal pregnancy, USG shows a thick endometrium with the double decidual sac sign, then a gestational sac, yolk sac (definitive sign of intrauterine pregnancy), double bleb sign (yolk sac + amnion), and finally the fetal pole with cardiac activity on M-mode. Ectopic pregnancy shows an adnexal mass with a tubal ring or “bagel/blob sign” and peripheral vascularity (“ring of fire”). Complete molar pregnancy appears as a “snowstorm” pattern of multiple cystic spaces without fetal parts, often with high B-hCG and theca lutein cysts. In twin pregnancy, chorionicity is determined by signs: the T sign indicates monochorionic diamniotic twins, while the Lambda or twin-peak sign indicates dichorionic diamniotic twins with a thicker intertwin membrane.

DETAILED QUESTIONS

Q2. 1: What is the sequence of normal early pregnancy findings on a transvaginal ultrasound?

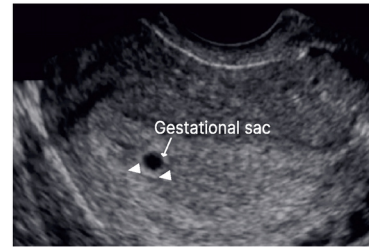
PYQ: INICET 2021

Answer:

Findings	USG
• Thick endometrium • Double decidual sac sign- suggestive of Intrauterine Pregnancy • Fluid present in between- Endometrial fluid	

- The sequence begins with a **thick endometrium** and a **double decidual sac sign**.
- This is followed by the appearance of the **gestational sac**, then the **yolk sac** (the definitive sign of intrauterine pregnancy).
- The **double bleb sign** (yolk sac and amnion) appears next, and finally, fetal cardiac activity is detected.

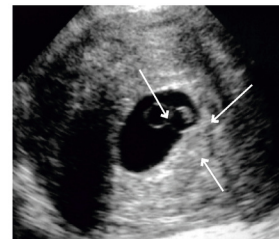
- **1st thing to appear in normal pregnancy**
- Round small structure- **Gestational sac**
- True gestational sac- more eccentrically located



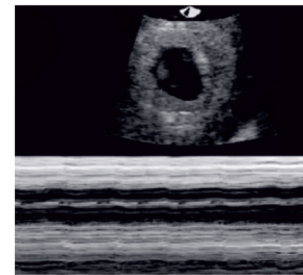
- Within gestational sac another structure appears known as Yolk Sac
- Yolk sac: **Definitive sign of Intrauterine Pregnancy**
- Size of Gestational sac keeps increasing



- 2 circular structures- **Double bleb sign**
- Structures are- Yolk sac and Amnion (contains fetal pole)



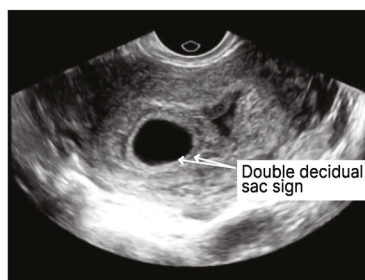
- Fetal cardiac activity/ FHR- detected by **M mode of USG**
- Doppler should not be used in early pregnancy- might cause thermal effect on embryo



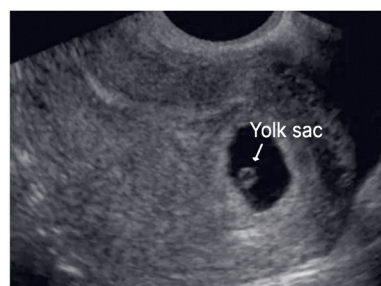
Q2.2: What are the key USG signs that suggest an intrauterine pregnancy?

Answer:

- A **double decidual sac sign** is suggestive of an intrauterine pregnancy.

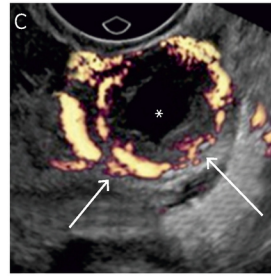


- The **yolk sac** is the definitive sign of an intrauterine pregnancy, and it is located eccentrically within the gestational sac.



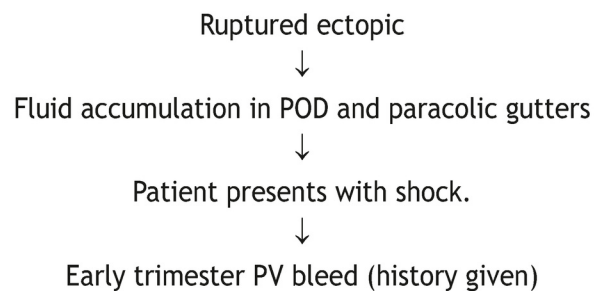
Q2.3: What are the key USG and Doppler findings for an ectopic pregnancy?

Answer:

Findings	USG
- An adnexal mass is present - On doppler examination- surrounding peripheral vasculature is seen- Ring of Fire Sign	
Surrounding the ectopic sac there is echogenic tubal ring, known as Tubal ring / Bagel / Blob sign	

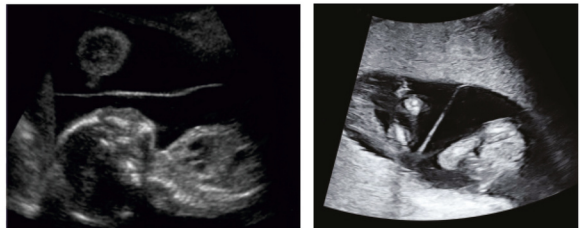
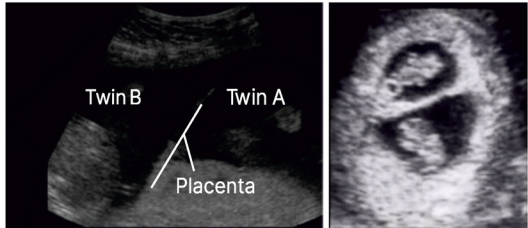
Q2.4: What is the sequence of events in a ruptured ectopic pregnancy?

Answer:



Q2.5: What are the USG findings in twin pregnancy?

Answer:

Findings	USG
T sign is present- Monochorionic Diamniotic Pregnancy	 "T-Sign" in monochorionic diamniotic pregnancy
- Lambda sign / Twin peak sign is present- Dichorionic Diamniotic Pregnancy - Membrane is thick - There cannot be a Dichorionic Monoamniotic Pregnancy	 Lambda or twin peak sign of dichorionic pregnancy

YOURWISH

BIG QUESTION 3: Discuss the ultrasound findings of a complete molar pregnancy and the purpose, timing, and key findings of a nuchal translucency (NT) scan.

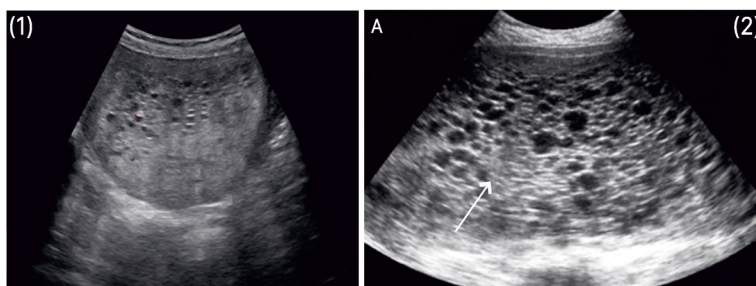
Broad Answer: A complete molar pregnancy on ultrasound is characterized by multiple cystic spaces in the uterus with **no fetal parts**, creating a "snowstorm appearance." High levels of B-hCG in these cases can stimulate the ovaries, leading to the formation of **Theca Lutein Cysts**. The **nuchal translucency (NT) scan**, also known as the Nasal bone NT scan, is a first-trimester screening for **Down's syndrome**. It is performed between **11 and 13 weeks** of gestation. An increased NT thickness ($>3\text{mm}$) and the absence of a nasal bone raise the risk of Down syndrome, but **karyotyping** is required for a definitive diagnosis.

DETAILED QUESTIONS

Q3.1: What are the key ultrasound findings of a complete molar pregnancy?

PYQ: NEET PG 2023

Answer: The key ultrasound finding is the presence of **multiple cystic spaces** in the uterus with **no fetal parts**, which is described as a "snowstorm appearance."



Q3.2: What is the hormonal effect of a complete molar pregnancy on the ovaries?

Answer: The increased B-hCG levels associated with a complete molar pregnancy stimulate the ovaries and induce the formation of **Theca Lutein Cysts**.

Q3.3: What is the purpose and timing of a nuchal translucency (NT) scan?

Answer:

- The **NT scan** is a first-trimester screening test for **Down syndrome** and other chromosomal abnormalities.
- It is performed between **11 and 13 weeks** of gestation.

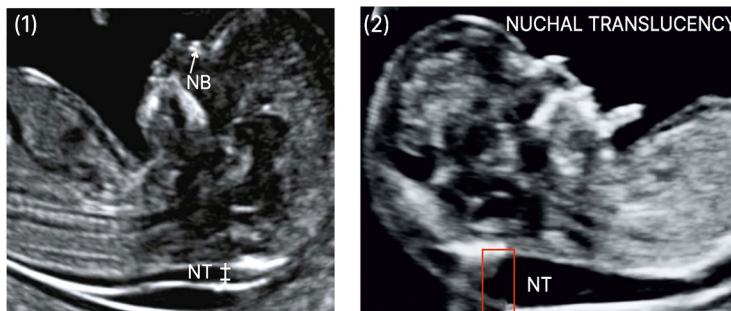
PYQ: NEET PG 2020

Q3.4: What are the key findings of an NT scan that suggest an increased risk of Down syndrome?

PYQ: FMGE 2019

Answer:

- An **increased NT thickness ($>3\text{mm}$)** (Image 2) and the **absence of a nasal bone** increase the risk of Down syndrome.
- However, these are screening findings, and **karyotyping** is necessary to confirm the diagnosis.



BIG QUESTION 4: Describe fetal anomalies and the role of Doppler in determining Intrauterine Growth Restriction (IUGR).

Broad Answer:

- Fetal anomalies like **Anencephaly** (earliest to be detected) show a "**Frog Eye Sign**" and an open calvarium on ultrasound.
- **Neural Tube Defects (NTDs)** like Myelomeningocele can be identified by the "**Lemon Sign**" (concave frontal bones) and "**Banana Sign**" (curved cerebellum).
- **Omphalocele** is a midline defect with a sac and a cord, while **Gastroschisis** is an abdominal wall split adjacent to the cord without a sac.
- **Intrauterine Fetal Demise (IUFD)** is diagnosed by the "**Spalding Sign**" and "**Robert's sign**".
- Doppler is used in the third trimester (32 weeks) to assess :
 - o Umbilical Artery
 - o Uterine Artery
 - o Middle Cerebral Artery

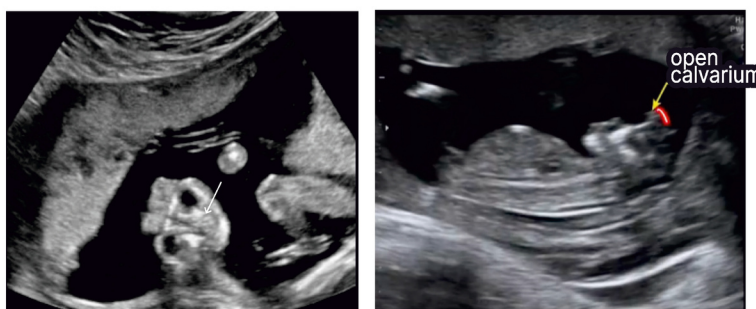
DETAILED QUESTIONS

Q4.1: What is Anencephaly, and what are its key ultrasound signs?

 PYQ: FMGE 2021

Answer:

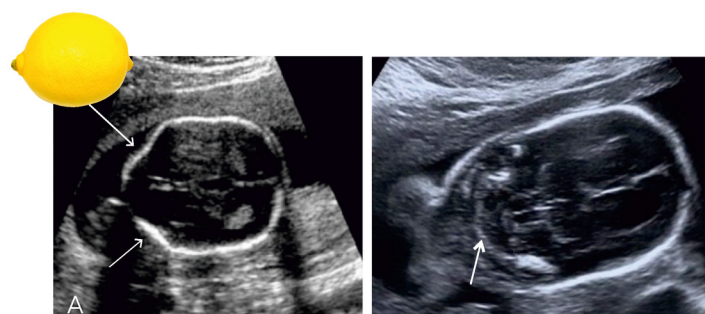
- **Anencephaly** is an anomaly with an open calvarium. It is the **earliest** anomaly detectable on ultrasound and is characterized by the "**Frog Eye Sign**."
- **Open calvarium** is present
- MTP needed to done



Q4.2: What are the key ultrasound signs of Neural Tube Defects (NTDs) like Myelomeningocele?

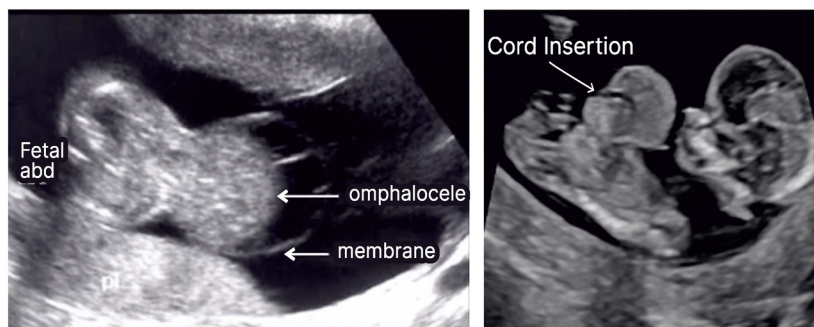
Answer: Myelomeningocele can cause a brain structure pull, which leads to the "**Lemon Sign**" (concave frontal bones) and the "**Banana Sign**" (curved cerebellum in the posterior fossa).

 PYQ: INICET 2023



Q4.3: How can an Omphalocele be differentiated from Gastroschisis on a fetal ultrasound?

Answer: **Omphalocele** is a midline defect with an attached cord and a sac covering the herniated contents.



- **Gastroschisis** is a split in the anterior abdominal wall that is adjacent to the cord and lacks a sac.

PYQ: FMGE 2020



Q4.4: What are the ultrasound signs of Intrauterine Fetal Demise (IUFD)?

Answer:

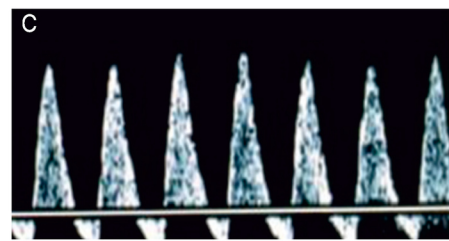
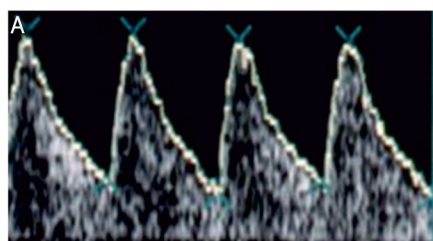
- The classic sign is the "**Spalding Sign**," which is the overlapping of fetal skull bones.
- The earliest sign is the "**Robert sign**," which is intracardiac gas.



Q4.5: How is the umbilical artery Doppler used to assess fetal well-being, and what do the different flow patterns indicate?

Answer:

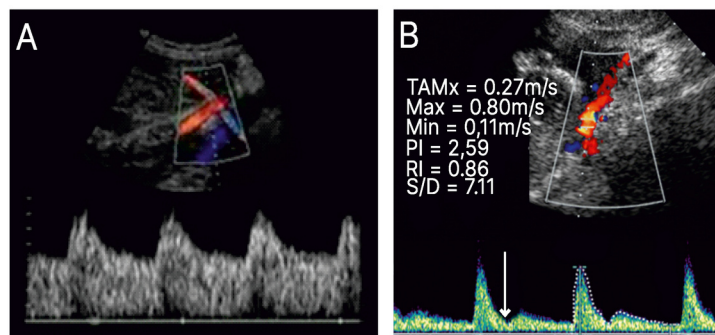
- The umbilical artery Doppler is done in the third trimester (32 weeks) to assess fetal well-being.
- **A normal flow (Image A)** is low resistance, with diastolic flow not touching the baseline.
- **High resistance (Image B)** is indicated by absent diastolic flow, while a **reversal of end-diastolic flow (Image C)** signifies a need for pregnancy termination.



Q4.6: How is the uterine artery Doppler used to assess fetal well-being, and what does a diastolic notch indicate?

Answer:

- The uterine artery Doppler should normally show low resistance with high diastolic flow. (**Image A**)
- A **diastolic notch** is a sign of high resistance flow, which suggests a high risk of preeclampsia, uteroplacental insufficiency, and IUGR. (**Image B**)



BIG QUESTION 5: Discuss various ovarian and uterine pathologies

Broad Answer:

- Multiple small follicles at the periphery of the ovary characterize Polycystic Ovary Syndrome (PCOS)
- **Theca Lutein Cysts** are associated with conditions like molar or twin pregnancy
- A **Didelphys uterus** results from a complete failure of fusion, leading to two completely separate uteri.
- A **Bicornuate uterus** has the lower parts fused while the upper parts remain widely separated.

DETAILED QUESTIONS

Q5.1: What are the key ultrasound findings of Polycystic Ovary Syndrome (PCOS)?

Answer:

- In PCOS, there are multiple follicles at the **periphery** of the ovary due to an increase in the central stroma caused by high androgen levels.
- All follicles are typically **less than or equal to 9mm**, characteristic of anovulatory cycles.



Q5.2: How can Ovarian Hyperstimulation Syndrome (OHSS) be differentiated from Theca Lutein Cysts?

Answer:

- Both conditions can present with large follicles throughout the ovary. **OHSS** is seen in patients undergoing **infertility treatment**.
- **Theca Lutein Cysts** are associated with a significant increase in β -hCG, as seen in **molar pregnancy** or **twin pregnancy**.



Q5.3: How is the uterus formed, and what causes uterine anomalies?

Answer:

- The uterus is formed when the two Müllerian ducts join, and the septum between them disappears.
- Uterine anomalies occur when there are failures in this process of fusion and septal resorption.

Q5.4: Describe the Septate Uterus, Diadelphys uterus, Unicornuate, and the Bicornuate Uterus?

Answer:

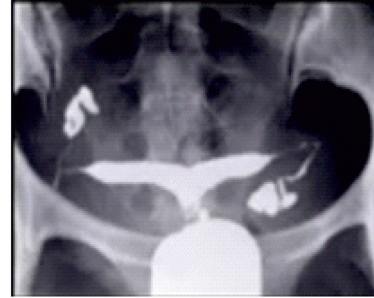
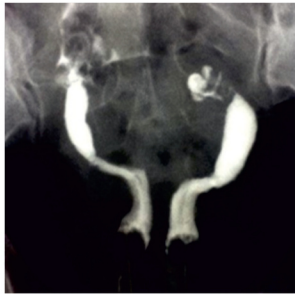
1. Didelphys Uterus

- Both ducts develop separately
- Complete separation
- **No fusion**

2. Bicornuate Uterus

PYQ: FMGE 2021

- Lower part fused, Upper part not fused
- Upper parts widely separated

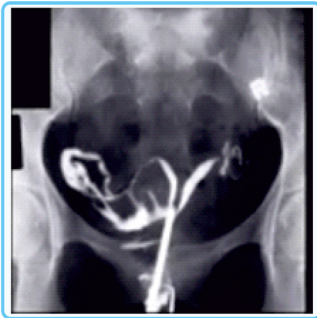


3. Septate Uterus

- 2 müllerian ducts has fused, but septum has not disappeared
- The angle of separation is small.

• PYQ: NEET PG 2022

• PYQ: FMGE 2022, 2023



4. Unicornuate Uterus

- Only 1 duct develops
- The Uterus is deviated to one side
- Also called **Banana Uterus**

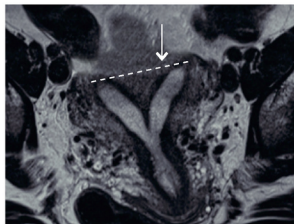


Q5.5: What is the difference between a Septate Uterus and a Bicornuate Uterus?

Answer: Done by MRI (for better results)

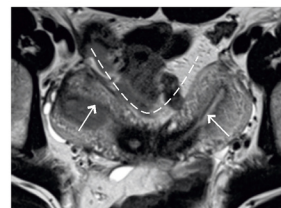
1. Septate Uterus

- Endometrium split
- Smooth outer surface (not split)
- Small angle of separation of horns



2. Bicornuate Uterus

- Endometrium split
- Outer surface split
- Bigger angle of separation of horns



Q5.5: What is the ideal IOC for uterine anomalies?

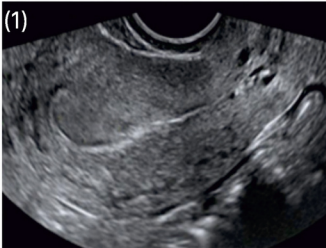
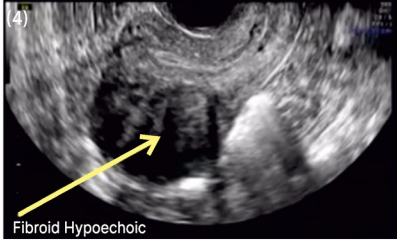
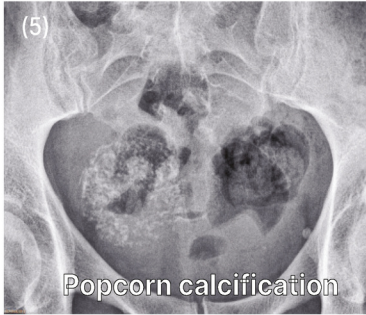
Answer:

- Ideal Investigations: Hysteroscopy + Laparoscopy > MRI > 3D USG
- HSG is not a good investigation of uterine anomalies

Q5.6: What is the difference between an Endometrial Polyp and Fibroid (submucous fibroid)?

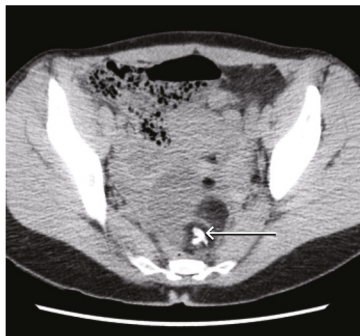
Answer:

Feature	Endometrial Polyp	Submucous Fibroid
Origin	Endometrial glands and stroma	Myometrial smooth muscle

Echogenicity on Ultrasound	Hyperechoic (bright)  (1)	Hypoechoic (dark)  (4) Fibroid Hypoechoic
Location	Within the endometrial cavity	Arises from the myometrium, may project into the endometrial cavity
Feeding Vessel on Doppler	Single feeding vessel (Feeding vessel sign)  (2)	Multiple vessels or peripheral vascularity
Saline Infusion Sonography (SIS)	Saline surrounds the polyp completely  (3)	Saline outlines the fibroid partially or distorts the cavity
Calcification	Rare	Popcorn calcification is commonly seen  (5) Popcorn calcification
Surface	Smooth, regular	Lobulated or irregular
Mobility	May be mobile with pressure	Usually fixed

Q5.7: What are the key components of a teratoma/dermoid cyst as seen on a CT scan?

Answer: The key components are **calcification** (white) and **fat** (dirty black).



BIG QUESTION 6: Discuss breast imaging modalities, techniques, and reporting system.

Broad Answer:

- **Mammography** uses compression to improve image quality by ensuring uniform density and better penetration. A **breast abscess** on ultrasound appears as a hypoechoic area with peripheral vascularity. The **Breast Imaging Reporting and Data System (BIRADS)** classifies breast lesions from 0 to 6.

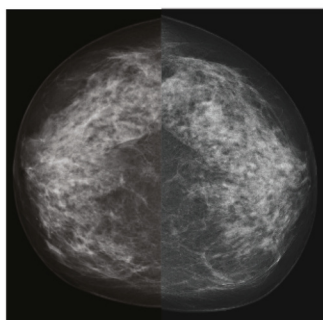
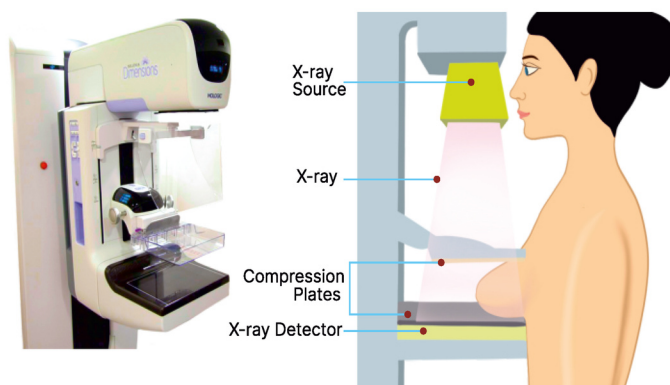
DETAILED QUESTIONS

Q6.1: What is the purpose of compression during a mammography, and when is it contraindicated?

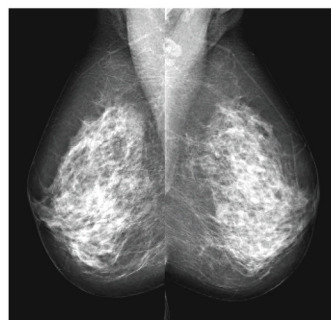
Answer:

PYQ: INICET 2023

- Compression is done to ensure **uniform density and thickness** of the breast tissue, which allows for better penetration and reduces tissue overlapping.
- It is contraindicated in acute painful conditions like **mastitis or breast abscess**.



- It is **Craniocaudal** view
- Left and Right breast is seen here.

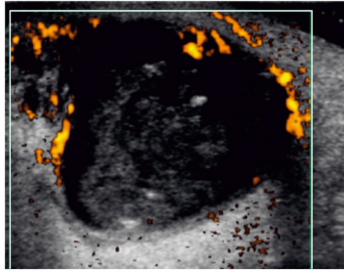


- It is **Mediolateral oblique** view
- Axillary lymph nodes is also seen

Q6.2: How does a breast abscess appear on an ultrasound?

Answer:

- Presentation: The patient is a Lactating mother with fever and pain
- A breast abscess appears as a **hypoechoic area with peripheral vascularity**.



Q6.3: What are the categories of breast lesions according to BIRADS?

Answer:

Category	Category 1	Management	Likelihood of Cancer
0-Assessment	Incomplete Assessment	Additional imaging required	Not applicable yet
1	Negative	Routine annual screening	No cancer detected
2	Benign	Routine annual screening	0%
3	Probably Benign	Follow-up scan after 6 months or earlier, as advised by your doctor	0% to 2%
4	Probably Malignant	Breast tissue biopsy recommended by the doctor	4A-2% to 10%, 4B-10% to 50%, 4C - 50% to 95%
5	Malignant	Biopsy to be done essentially	>95%
6	Biopsy-Proven Malignancy	Further treatment evaluations done by the oncologist	Cancer already present

Q6.4: What is the significance of microcalcification and popcorn calcification in the BIRADS classification system?

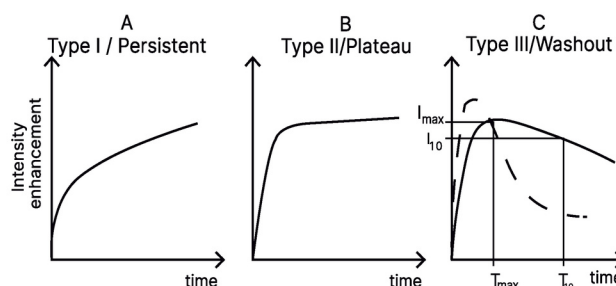
Answer:

- BIRADS: Breast Imaging Reporting And Data System.
- Microcalcification → Highly suspicious of cancer → needs to do biopsy → BIRADS 5
- Fibroadenoma → Popcorn calcification → Benign → BIRADS 2

Q6.5: What is the role of breast MRI in lesion evaluation, and what is the significance of a Type 3 kinetic curve?

Answer:

- Breast MRI is used for further evaluation of breast lesions.
- A **Type 3 kinetic curve**, characterized by a **rapid wash-in and rapid wash-out** of contrast, is highly suggestive of **malignancy**.

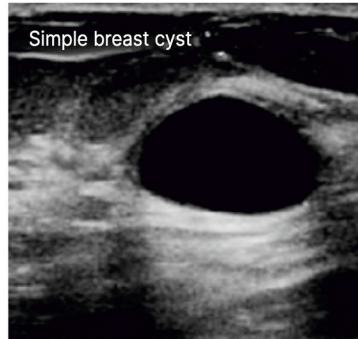


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Q6.6: How can a simple breast cyst be differentiated from a solid lesion on an ultrasound?

Answer:

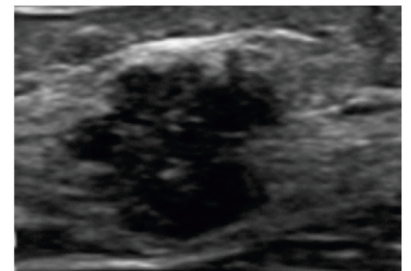
- A **simple cyst** is a fluid-containing lesion that shows **posterior acoustic enhancement**, where the area behind the lesion appears brighter.
- A solid lesion typically has **irregular or spiculated margins** and is often taller than it is wide. Taller > Wider → suggestive of malignancy



Q6.7: Identify the diagnosis: Benign or malignant?

Answer:

- This lesion has irregular / spiculated margins.
- It is Taller > Wider
- Suggestive of malignancy
- Lesion Wider > Taller (like fibroadenoma, grows in the same plane) → Benign



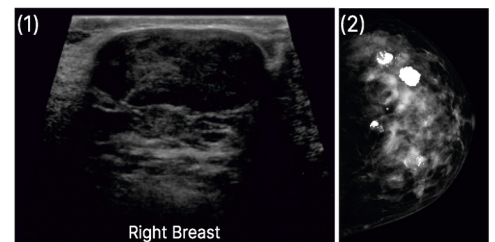
Q6.8: Identify the diagnosis: Benign or malignant?

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Answer:

- The lesion is Wider > Taller
- So, the lesion is benign
- The 2nd image shows Chunky calcification → Popcorn calcification (Fibroadenoma) → Benign
- In malignancy → Microcalcification is present



Q6.9: What is the investigation of choice for acute testicular pain, and what are the two main conditions it is used to differentiate?

Answer:

- **Doppler ultrasound** is the investigation of choice.
- It is used to differentiate between **testicular torsion** and **epididymo-orchitis**.

Q6.10: How does testicular torsion appear on a Doppler ultrasound?

Answer:

Torsion	Epididymo-orchitis
• There is twist in vascular pedicle • This causes absent blood supply	• There is presence of inflammation • Inflammation- Increased vascularity

Q6.11: How does testicular torsion appear on a Doppler ultrasound?

Answer:

- Doppler is the Investigation of Choice
- Twisted Pedicle- **Whirlpool Sign** of Torsion

