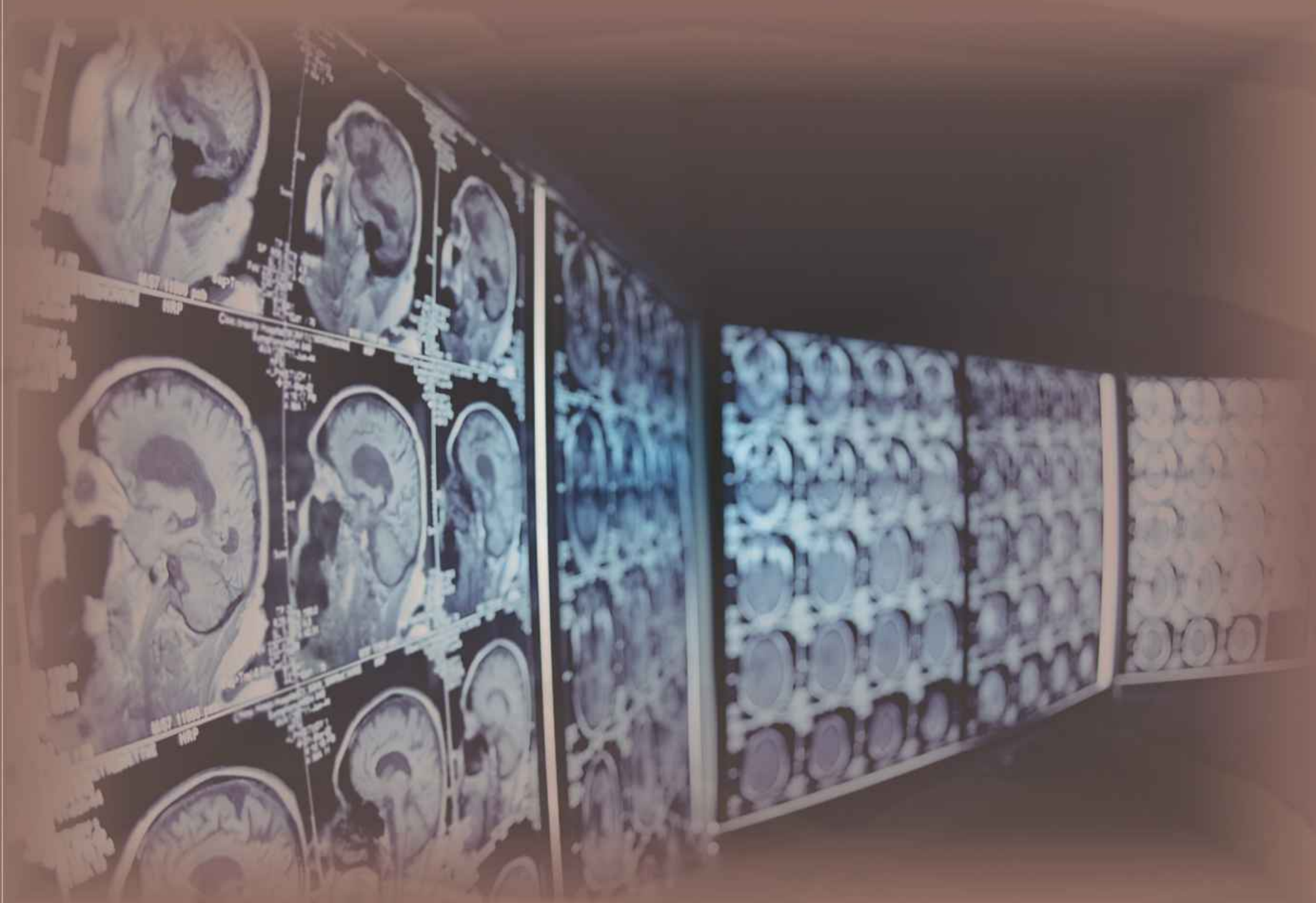


EDiR Notebook

(FOR EUROPEAN DIPLOMA IN RADIOLOGY)



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“RAPID REVIEW NOTES WITH MCQs”

EDiR Notebook

EDiR Notebook

(For European Diploma in Radiology)

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"RAPID REVIEW NOTES WITH MCQs"



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This book is dedicated to: To my Late Grandparents for their blessings. To my Parents Dr. Subhash Chander Sethi and Mrs. Karuna R. Sethi for being a constant source of encouragement and inspiration throughout. To my wife Dr. Deepti Sethi nee Bahl (MS. Gynaecology and Obstetrics) for her support and patience without which this project would never have been possible. And My Son Krish Sethi for his patience during the manuscript preparation. To my Brother Dr. Sidharth Kumar Sethi (MD Paediatrics) for his constant support, advice and constructive criticism and his wife Dr. Shilpa Singla (MS. Gynaecology and Obstetrics, AIIMS rank 14th 2003 for her valuable help in radiotherapy part of the book. To my Sister Sumati (M Pharm) for her guidance and advices throughout the preparation of this book. To all my teachers in life who have helped me reach where I could.

“Well, it all started when I was preparing for my FRCR examinations, while searching through different international qualifying courses, I got the concept of EDiR which seemed to be an excellent platform to have such an examination where it is easy to go, show your radiology skills and end up in having an international qualification all in one step.

Initially, it appeared difficult since no preparation guide was available to assist me with the exact level of difficulty however, what was more appealing was to give all the steps of the examination in just one attempt.

Since I was already in the study phase for FRCR examination, I started my preparation in the similar fashion with the help of some tips and guidance from the ESR website. Along with the study, I started preparing notes, which were modified after clearing the EDiR.

Later at a stage when I thought that I have enough content to help the other Radiologists and Radiology residents, I went to Dr Sumer Sethi to seek his further guidance in getting my contents published in the form of a guide. Dr Sumer Sethi who is a well renowned radiologist and director of DAMS institute also felt the same and we together made some hard efforts to pursue the idea.

My family members especially my wife who is also a Radiologist supported me throughout my long journey.

The aim of any postgraduate examination is to assess knowledge. Knowledge and the ability to apply it to every day clinical practice is the best measure of competency in a physician. The most important factor underpinning success is an understanding of the basic principles of imaging and disease processes so that the best answer will fall into place.

I hope this book will be of great assistance for all the Radiologists who are keen to expand their knowledge and skills and have desire to attain an international qualification of equivalent competency. I also hope that this book will become a ‘must-have’ for all candidates sitting the examination, and wish readers the best of luck.”

Dr Avinash Gupta
Author

“EDiR Note Book” is an attempt by Avinash & myself to help EDiR aspirants and is available in both print & online versions. It is our attempt to keep the book short & crisp to enable rapid revision of content. DAMS Publications are now an established name in medical exam preparation books and our hallmark is to the point literature which makes the reading and revision possible for an average student and we have a difference in his final results.

Dr Sumer K. Sethi
Author

Abbreviation

ASIS – Antero Superior Iliac Spine
AIIS – Antero Inferior Iliac Spine
AP – Antero Posterior
NEC – Necrotizing Enterocolitis
NGT – Nasogastric Tube
DJ – Duodeno-Jejunal
HPS – Hypertrophic Pyloric Stenosis
HN – Hydronephrosis
CMD – Corticomedullary Differentiation
ARPKD – Autosomal Recessive Poly Cystic Kidney Disease
UAC – Umbilical Arterial Catheter
UVC – Umbilical Venous Catheter
NAA – N-Acetyl Aspartate
PNET – Primary Neuroectodermal Tumour
WM – White Matter
DNET – Dysembryoplastic Neuroepithelial Tumour
PVL – Periventricular Leukomalacia
HIE – Hypoxic Ischemic Encephalopathy
BG – Basal Ganglia
ICA – Internal Carotid Artery
PHPV – Persistent Hyperplastic Primary Vitreous
ADEM – Acute disseminated encephalomyelitis
MS – Multiple Sclerosis
DISH – Diffuse Idiopathic Skeletal Hyperostosis
UB – Urinary Bladder
AFP – Alpha Feto Protein
ACEI – Angiotensin Converting Enzyme Inhibitor
PAN – Polyarteritis Nodosa
VUR – Vesico Ureteric Reflux
PC – Pelvic Cyst
RGU – Retrograde Urethrography
MCU – Micturating Cysto urethrography
TCC – Transitional Cell Carcinoma
ATN – Acute Tubular Necrosis
XGP – Xanthogranulomatous Pyelonephritis
TS – Tuberous Sclerosis

DCIS – Ductal Carcinoma in Situ
CC – Craniocaudal
MLO – Mediolateral Oblique
TTN – Transient Tachypnea of Newborn
PAPVR – Partial Anomalous Pulmonary Venous Return
CTR – Cardiothoracic Ratio
MAS – Meconium Aspiration Syndrome
PIE – Pulmonary Interstitial Emphysema
TOF – Tetralogy of Fallot
TGA – Transposition of great arteries
PDA – Patent Ductus Arterius
NAI – Non Accidental Injury
ICP – Intracranial Pressure
CTPA – CT Pulmonary Angiography
LAM – Lymphangioma Myomatosis
SLE – Systemic Lupus Erythematosus
RA – Rheumatoid Arthritis
CCAM – Congenital Cystic Adenomatoid Malformation
HTN – Hypertension
AV – Aortic Valve
MV – Mitral Valve
HOCM – Hypertrophic Obstructive Cardiomyopathy
LA – Left atrium
LAD – Left anterior descending
SAM – Systolic anterior motion
LV – Left ventricle
RV – Right Ventricle
IVS – Interventricular Septum
MS – Mitral Stenosis
SMA – Superior Mesenteric Artery
IMA – Inferior Mesenteric Artery
RCA – Right Coronary Artery
RAS – Renal Artery Stenosis
SCV – Subclavian Vein
HCC – Hepatocellular Carcinoma
RCC – Renal Cell Carcinoma
TIPS – Transjugular Intrahepatic Portosystemic Shunt
RHV – Right Hepatic Vein
GIST – Gastrointestinal Stromal Tumour

HPOA – Hypertrophic Pulmonary Osteoarthropathy
LCH – Langerhans Cell Histiocytosis
Ca – Carcinoma
BAC – Broncho Alveolar Carcinoma
NHL – Non Hodgkin’s Lymphoma
LNs – Lymph Nodes
FDG – Flouro Deoxy Glucose
SPN – Solitary Pulmonary Nodule
SUV – Standardized Uptake Value
SPECT – Single Photon Emission Computed Tomography
PET – Positron Emission Tomography
CP – Costophrenic Angle
LDH – Lactate Dehydrogenase
NSIP – Non Specific Interstitial Pneumonia
UIP – Usual Interstitial Pneumonia
IPF – Idiopathic Pulmonary Fibrosis
RBICD – Respiratory Bronchiolitis ICD
DIP – Desquamative Interstitial Pneumonia
PCP – Pneumocystis Carinii Pneumonia
ACE – Angiotension Converting Enzyme
B/L – Bilateral
LIP – Lymphocytic Interstitial Pneumonia
NF – Neurofibromatosis
SCA – Sickle Cell Anemia
AVM – Arterio Venous Malformation
CMV – Cytomegalovirus
HIDA – Hepatobiliary Iminodiacetic acid
CHD – Common Hepatic Duct
S/O – Suggestive of
IBD – Inflammatory Bowel disease
VHL – Von Hippel Lindau
SMV – Superior Mesenteric Vein
FAP – Familial adenomatous Polyposis
RAO – Right Anterior Oblique
FNH – Focal Nodular Hyperplasia
HSP – Henoch Schonlein Purpura
PMC – Pseudo membranous Colitis
UC – Ulcerative Colitis
ABPA – Allergic Bronchopulmonary Aspergillosis

DDH – Dysplastic Dislocation of Hip
 CPDD – Calcium Pyrophosphate Deposition Disease
 PVNS – Pigmented Villonodular Synovitis
 AVN – Avascular Necrosis
 FD – Fibrous Dysplasia
 MPS – Mucopolysaccharidosis
 ABC – Aneurysmal Bone Cyst
 GCT – Giant Cell Tumour
 MM – Multiple Myeloma
 IVD – Intervertebral disc
 SI – Sacro Iliac
 OA – Osteo arthritis
 MCP – Meta Carpophalangeal joint
 PIP – Proximal Interphalangeal
 DIP – Distal Interphalangeal
 JRA – Juvenile RA
 ACJ – Acromio Clavicular Joint
 TFCC – Triangular Fibrocartilaginous Complex
 ATTC – Anterior Tibiotalar ligament
 AS – Ankylosing Spondylosis
 SCFE – Slipped Capital Femoral Epiphysis
 SLAP – Superior Lateral Tear from Anterior to posterior
 FCU – Flexor Carpi Ulnaris
 FDM – Flexor Digiti Minimi
 ALL – Anterior Longitudinal Ligament
 FPB – Flexor Pollicis Brevis
 TM – Temporomandibular
 TF – Tibiofibular
 OCD – Osteochondritis Dissecans
 GCS – Glasgow Coma Scale
 VSD – Ventricular Septal Defect
 FT – Fallopian Tube
 IVCD – Intra Uterine Contraceptive Device
 PID – Pelvic Inflammatory Disease
 HSG – Hystero Salpingography
 VA – Vertebral Artery
 PCA – Posterior Cerebral Artery
 ACom – Anterior Communicating Artery
 MCA – Middle Cerbral Artery

ACA – Anterior Cerebral Artery
ECA – External Carotid Artery
CC – Corpus Callosum
SAH – Subarachnoid Hemorrhage
MCV – Middle Cerebral Vein
CCA – Common Carotid Artery
LOC – Loss of Consciousness
GBM – Glioblastoma Multiforme
PMC – Progressive Multifocal Leukoencephalopathy
IAC – Internal Auditory Canal
CMC – Chronic Myeloid Leukemia
EDH – Extradural hematoma
DAI – Diffuse Axonal Injury
CP – Choroid Plexus
MELAS – Mitochondrial Encephalopathy Lactic Acidosis & Stroke
MERRF – Myoclonic Epilepsy & ragged red fibre disease
CADASIL – Cerebral Autosomal dominant Arteriopathy Subcortical Infarcts & Leukoencephalopathy
VR – Virchow Robin
FMD – Fibromuscular Dysplasia
TIA – Transient Ischemic Attack
TTP – Thrombotic Thrombocytopenic Purpura
CO – Carbon Monoxide
CJ – Creutzfeldt Jacol
CP – Cerebellapontine
GM – Grey Matter
CBF – Cerebral Blood Flow
MTT – Mean Transit Time
CBV – Cereberal Blood Volume
SDH – Subdural Hemorrhage

UNIT – I
RESPIRATORY & CARDIOVASCULAR
SYSTEM

- Pulmonary mets are caused by choriocarcinoma > Wilm's > Ewings > testicular tumours.
- In Hodgkin's (mostly in mediastinum), there is contiguous spread, more thoracic & less abdominal involvement as compared to non Hodgkin's.
- Bronchial carcinoid is not associated with lymphadenopathy.
- Lamellar periosteal reaction with increased uptake along cortical margins are features of HPOA associated with bronchogenic Carcinoma squamous cell (non small cell), pulmonary metastasis, pleural fibroma, bronchiectasis & mesothelioma.
- Features to suggest malignant nodule:
Spiculated margin > Size > Age > Growth rate.
- *Stage III lung cancer causes obstructive atelectasis & involves pleura, pericardium, diaphragm & chest wall with another lesion in same lobe but stage 4 involves heart, trachea oesophagus, vertebrae, great vessels & malignant pleural effusion & lesion in another lobe of same lung.*
- Features to suggest benign nodule:
Growth rate, benign calcification, age (< 39) & non smoking history.
- Osteosarcoma, wilm's tumour & LCH are causes of pulmonary nodules & pneumothorax together.
- Choriocarcinoma, renal Ca & melanoma are causes of hemorrhagic pulmonary mets.
- Anteriorly located lingular mass results in loss of upper left heart border but preserves the outline of posterior descending aorta.
- Renal Carcinoma Causes hemorrhagic mets & does not cause cavitating pulmonary mets.
- BAC occurs mostly peripherally & shows cavitations.
- Horner syndrome occurs due to brachial plexus involvement by pancoast tumour.
- Lymphoma & its mets do not show calcification (rare).
- Adenocarcinoma occurs in non smokers.
- Ca colon, Ca bladder, melanoma & squamous Cell Ca → all are causes of cavitating lung mets.
- High signal on T2W1 is strongly in favour of malignancy than fibrosis.
- BAC does not present as endobronchial lesion (usually peripheral & subpleural).

Axial & sagittal T1WI are acquired first in case of Pancoast tumour resectibility to assess spinal canal & foraminal involvement.

- In lymphangitis carcinomatosa, there can be polygonal reticular network with central dots within.
- Isolated pulmonary consolidation may be seen in NHL but Hodgkin's will mostly show LNs as well.
- Calcified lung metastasis can occur only in osteosarcoma & chondrosarcoma.
- Lymphangitis carcinomatosa can be unilateral.
- Lobulated margin favours malignancy.
- **Lymphangitis carcinomatosa may lead to dense hemithorax with ipsilateral mediastinal shift.**
- Small cell carcinoma & lymphoma rarely calcify.
- Calcified pulmonary nodules along with calcification of chest wall vessels are due to renal Ca (chronic renal failure).
- *CECT study to differentiate benign versus malignant nodule is less helpful than FDG for a cavitation nodule.*
- Dual time point assessment of SUV is done in PET to improve characterization of lesion.
- SUV (progressively increased in malignant) remains static for benign lesions.
- Squamous cell Ca > Adenoid cystic Ca (malignancy of trachea).
- Non small cell Ca is found endobronchially & not in trachea.
- **For SPN below 1cm in size, PET study is less reliable.**
- For SPN less than 4cm, single CT within 12 months is required with no further follow up.
- TNM staging is not done for small cell Ca of lung.
- Indium – 111 octreotide SPECT is best used for bronchial carcinoid (endobronchial tumor with extraluminal

component).

- Panlobular emphysema mostly occurs in lower lobes (if smoking history is present, upper lobe predominance can be seen).
- In alveolar proteinosis, there is sparing of lung apices & CP angles with elevated LDH levels.
- LCH shows parenchymal irregular soft tissue density nodules, emphysema, thin walled cysts in upper & mid zones.
- Ground glass opacification is commonly seen in NSIP.
- Pulmonary fibrosis in subpleural location occurs in asbestosis.

Panacinar emphysema (α -1 antitrypsin deficiency) mostly occurs in lower lobe due to gravitational distribution of flow. Also there is poor visualization of margins of cysts.

In centrilobular emphysema (chronic smokers), there is upper zone predominance with well defined & marginated cysts.

- In idiopathic pulmonary fibrosis, there are reduced lung volumes with reticular interstitial changes of honey combing with traction bronchiectasis & thick walled cysts.
- IPF shows thick walled cysts with honey combing.
- Emphysema shows imperceptible cyst walls with segmental distribution.
- Lack of bronchial tapering is most sensitive sign of bronchiectasis.
- In obliterative bronchiolitis, there is hypoattenuation due to air trapping & decreased perfusion.
- In asthma, bronchiolitis & tracheal stenosis, there will be overinflation.
- Central or peripheral (paraseptal) bronchiectasis is seen in patients of cystic fibrosis.
- *Non specific interstitial pneumonitis (NSIP) is the commonest finding of systemic sclerosis.*
- RBILD is a disease of smokers with centrilobular nodules, ground glass opacities and multifocal opacities in upper lobe. Reticulation & fibrosis do not occur.
- **In NSIP, ground glass haze is more common & honey combing is less common than UIP.**
- DIP → reverse bat wing's appearance is seen. It is associated with smoking & shows ground glass haze in basal & peripheral zones.
- Pulmonary alveolar proteinosis can occur secondary to industrial dust, immunodeficiency (HIV) & underlying malignancies.
- **Pulmonary Alveolar Proteinosis occurs in males & smokers.**
- Air trapping is main feature of obliterative/constrictive bronchiolitis.
- Cirrhosis is a complication of α – 1 antitrypsin deficiency.

- Sarcoidosis mostly occurs in young adults.
- In ABPA, mostly upper lobes are involved with bronchial wall thickening & centrilobular nodules.
- Thymus is the only extranodal site for Hodgkin's lymphoma (most cases are nodular sclerosing type).
- Tree in bud appearance is mostly caused by infection (TB, staphylococcus, CMV, RSV, Aspergillosis).
- In sarcoid, there are perilymphatic nodules with beading along the fissures & architectural distortion.
- *In meliodosis, there is no pleural involvement or enlarged lymph nodes but simultaneous involvement of other organs is common.*
- Hypersensitivity pneumonitis shows ground glass opacities with air trapping with spared areas in between.
- Ground glass opacification without traction bronchiectasis is strongly associated with alveolitis.
- **Superior segments of lower lobe & posterior segments of upper lobes are most commonly involved in aspiration pneumonia (thick walled cavity with air fluid levels can also develop).**
- Active TB is mostly suggested by enlarged LN with low attenuation centres.
- In secondary TB, there is predilection for upper lobes, absent LNs with presence of cavitations.
- In hypersensitivity pneumonitis, there are no cystic spaces or thickened bronchovascular bundles.
- PCP pneumonia does not show pleural effusion & lymphadenopathy.
- Hydatid disease occurs in patient travelling abroad, reveals eosinophilia & shows grape skin like material on coughing.
- Serum ACE levels are elevated in sarcoidosis.
- In acute interstitial pneumonia, there are B/L ground glass opacities with consolidation.
- Pneumatocoles leading to pneumothorax can be seen in pneumocystis infection.

Patients on aerosolized pentamidine (prophylaxis for pneumocystis) can have apical predominance of nodular opacities.

- *Patient with stroke & swallowing difficulty is likely to have aspiration pneumonitis. (tree in bud pattern) (Also cavities with air fluid levels).*
- Thick walled cavities & pleural thickening are seen in saprophytic aspergillosis.
- Endobronchial lesion with distal atelectasis is seen in necrotizing aspergillosis. (semi invasive).
- Tree in bud opacities with bronchiolitis is seen in invasive aspergillosis.
- **Lobar consolidation is most common feature of streptococcal pneumonia.**
- In legionella, multifocal lobar opacities are seen.
- *Histoplasmosis occurs near areas of construction or bat caves. A well defined nodule with central calcification is specific for histoplasmosis.*
- Hydatid cyst rupture leads to air fluid level, a floating membrane (water lily sign), crumpled membranes & an empty cyst.
- Pneumatocoles may occur in PCP infection.
- Some air trapping can be seen in sarcoidosis.
- Cavitating lung lesions are commonly seen in Wegener's.
- Changes of aspiration pneumonitis regresses after 78 hours.
- Simple pulmonary eosinophilia (Loeffler's syndrome) is self limiting but chronic eosinophilic pneumonia is treated by steroids.
- Nodules with surrounding areas of ground glass haze is seen in Wegener's & Aspergillus.
- **Parapneumonic effusion is exudates with normal pH but empyema shows acidic pH.**
- Silicosis shows dense opacities than soft tissue.
- Cystic fibrosis is associated with meconium ileus & recurrent chest infections (Occurs in teenager).
- Bilateral diffuse fine reticular opacities are seen in PCP.
- Air bronchograms are seen in streptococcal infections but rare in staphylococcus.
- Sarcoidosis shows mid zone predominance of reticulation.

- Chronic necrotizing aspergillosis (semi invasive) causes upper lobe consolidation, multiple nodules & cavitary disease. It occurs in mildly impaired immunity (alcoholics) patients.

Invasive aspergillosis occurs in severely impaired immunity (AIDS) patients & causes progressive nodular opacities to form single or multiple homogenous consolidation with halo sign (alveolar hemorrhage around a central nodule).

- Fibrotic (chronic) process is more pronounced in mid & upper zones in hypersensitivity pneumonitis.
- Sarcoid mostly causes nodules along lymphatics, septae, fissures & bronchovascular bundles.
- Tree in bud +consolidation + Halo → Invasive aspergillosis.
- Only tree in bud pattern can be seen in TB.
- Sjogren, castleman's disease & HIV are associated with LIP.
- **LIP show thin walled cysts, ground glass haze, centrilobular/subpleural nodules & septal thickening with LNs.**
- Diffuse miliary nodules are seen in coccidioidomycosis.
- Birt – Hogg Dube syndrome shows facial fibrofolliculomas, malignant renal tumours, thin walled pulmonary cysts & spontaneous pneumothorax.
- Siderosis shows centrilobular nodules & nothing else.
- Reticular opacities with LNs are features of toxoplasmosis.
- *Bulging fissures is seen in Klebsiella, Hemophilus & Staph Aureaus.*
- Convex appearance of hila means bilateral LNs due to sarcoidosis.

- In scleroderma, there is patulous esophageal sphincter, esophageal shortening & stricture formation.
- Thymoma is isointense on T1 & hyperintense on T2W1.
- Bronchogenic cysts are thin walled & esophageal cysts are thick walled.
- Garland's triad (or 1-2-3 sign) in sarcoidosis → B/L hilar nodes & paratracheal nodes.
- Bronchogenic cysts do not cause any mass effect.
- Lesion obscuring descending aorta should be a posterior mediastinal mass.
- Posterior mediastinal LNS are mostly seen with NHL.
- Adenoid cystic carcinoma in the second most common malignancy of airway after squamous cell (both are endobronchial lesion in trachea).
- In supine CXR, deep sulcus sign is more prominent for pneumothorax.
- Hollow viscera within the chest & coiled up NGT are most commonly seen in left diaphragmatic rupture.
- **Mediastinal hematoma (or aortic rupture) causes widened mediastinum (more than 8 cm above the level of carina), left apical pleural cap & deviation of trachea to right.**
- Asthma & mechanical ventilation are risk factors for alveolar rupture with gas tracking through peribronchovascular sheath to the mediastinum.
- Lucent line along heart border & aortic arch is suggestive of pneumomediastinum.
- Bronchogenic cysts are usually asymptomatic but neuroenteric cysts are frequently symptomatic.
- *Thoracic duct drains at the junction of left subclavian & internal jugular veins, usually as 2-3 branches.*
- Tracheobronchial injury can result in persistent pneumothorax, pneumomediastinum & subcutaneous emphysema. Focal overdistention of the ETT Cuff is seen.
- Fibrosing mediastinitis shows calcification with compression of mediastinal structure.
- Aortic injury also causes esophageal shift to right, depression of left main bronchus, & left pleural effusion.
- Mediastinal hematoma following trauma is mostly due to Azygous/Hemiazygous vein or internal mammary/intercostal artery injury.
- Thymolipoma are found in young patients.
- Liposarcoma → Middle aged people and is a rare mediastinal mass (but has fat content & calcification as well).
- Diaphragmatic elevation with paradoxical motion is due to phrenic nerve palsy – mediastinal tumours.
- Tracheal narrowing with displacement to right is seen in thyroid goitre.
- **Aortopulmonary window contains ligamentum arteriosum & left recurrent laryngeal nerve & invasion of this space results in hoarse voice.**
- Swelling of face, neck & upper limbs occur due to SVC obstruction.
- Stridor & dysphagia occurs due to trachea & oesophageal involvement.
- Left superior pulmonary vein is anterior to left main bronchus.
- Left pulmonary artery is superior & posterior to left bronchus.
- Phrenic nerve lies anterior to all left hilar structures.
- Vagus nerve lies posterior to hilum, adjacent to esophagus.
- Left inferior Pulmonary vein enters left atrium & does not reach left hilum.
- **Calcification & fat fluid level in a teratoma suggest a benign rather than malignant.**
- *Spinnaker/Thymic sail sign is due to pneumomediastinum, as air outlining the thymus in children.*
- Signs of pneumomediastinum → Tubular artery sign.
- Aorta & aberrant right or left SCA can lie in retrotracheal space. Also the normal thyroid (goitre) pathology may lie in retrotracheal but not retrosternal goitre/ thyroid.
- Atypical thymoma has poor margins & aggressive but shows absence of mediastinal LNs, no invasion of great vessels & no distant mets (common for malignant tumours).
- Neuroenteric cysts are symptomatic & occurs in children but lateral meningocele are asymptomatic, occurs in adults (with NF1) & causes neural foraminal widening.

- Following a surgery of any body part, pulmonary thrombo-embolism should be suspected when patient presents with chest pain & hemoptysis with elevated D-dimer levels. Most likely CXR finding is normal appearance.
- *In pulmonary AVM, a feeding vessel of 3mm or more is an indication for embolization (coil).*
- Absolute indications of IVC filter are PEC or DVT with contraindication to coagulation, with complications of anticoagulation & recurrent DVT or PE despite anticoagulation.
- Anomalous origin of right SCA results in left 3-9th ribs notching (Coarctation between both SCA).
- Pulmonary embolism & vasculitis should be suspected in case of perfusion defects.
- In pulmonary AVM (Associated with Osler weber Rendu disease or hereditary hemorrhagic telangiectasia), there is upper GI bleeding, epistaxis, skin telangiectasia with sharp round mass showing feeding vessels from hilum.
- IV drug abuse leads to septic pulmonary emboli resulting in multiple lung cavities.
- *Aberrant right SCA & aortic aneurysm cause posterior esophageal indentation.*
- *A right sided aortic arch causes right lateral indentation on esophagus.*
- *Double aortic arch causes 'reverse S' or impression on both sides of esophagus.*
- *Aberrant left pulmonary artery causes anterior esophageal indentation.*
- Fat emboli presents 1-2days post trauma & resolves in 1-4wks.
- Multiple pulmonary emboli results in pulmonary arterial pruning and increased transradiancy in normal volume lungs.
- Tram track appearance of pulmonary artery is seen in acute pulmonary embolism.
- Reversed mismatch means reduced ventilation than perfusion (normal) occurs in pleural effusion, COPD, consolidation & lobar collapse. (It occurs due to failure of hypoxic vasoconstriction).
- Enlargement of pulmonary artery is seen in chronic pulmonary embolism & pulmonary arterial hypertension.
- **Pulmonary AVM changes size with inspiration & expiration.**
- Chronic pulmonary arterial hypertension leads to calcification of arteries.
- Two left bronchial arteries are present (arising from aorta) & one right artery causing from right third posterior intercostal artery.
- V/Q scan:
 - Matched segmental → Low probability
 - Matched non segmental → Low probability
 - Reverse mismatch → Low probability
 - Multiple small perfusion defects → Low probability
- Matched segmental + area of lung opacification → Intermediate probability.
- (Triple match) (in lower zones) → Intermediate probability.
- Two large segmental perfusion defects → high probability
- In chronic embolism, there is a peripheral filling defect forming obtuse angle with the wall.
- In settings of low probability, + ve D-dimer & - ve CTPA → No further investigation or anticoagulant is required.
- In settings of high probability with – ve CTPA, there should be either venous USG or MR venography to be performed.
- *Fat embolism resolves in 10-12 days & presents with rash, coagulopathy, & peripheral consolidation (takes 1-2 days post trauma to appear on CXR).*
- Westermark sign is regional oligemia.
- **Perfusion defect with a rim of surrounding normally perfused lung is called as stripe sign leads to low probability of Pulmonary Embolism.**
- For pregnant embolism, venous USG is performed before CTPA or V/Q scan.

- Multifocal chest wall invasion, deep myocardial invasion & subdiaphragmatic extension are contraindication for surgery of malignant mesothelioma.
- Focal interlobular fissural thickening & enhancement are signs in early detection of malignant pleural disease.
- **Metastasis to pleura is caused by Carcinoma of lung > breast > lymphoma > ovary > stomach.**
- **Features of pleural involvement in favour of malignancy are circumferential thickening > pleural thickness more than 1cm > mediastinal pleural involvement.**
- Hypertrophic osteoarthropathy (wrist pain or leg pain) is also a feature of localized mesothelioma.
- Visible pleural line is more commonly seen on erect CXR than on supine in pneumothorax.
- Commonest cause of empyema is Klebsiella.

Fibroma can also lead to HPOA (check the question if no bone erosion or a well defined pleural lesion).

- Pleural effusion & LNs are uncommon in Wegener's, PCP, alveolar proteinosis and meliodosis.

- ARDS is refractory to oxygen therapy & worsens with ventilation.
- *Pulmonary agenesis/hypoplasia is asymptomatic.*
- Polio can cause atrophy of overlying pectoral muscle.
- Chondroid calcification = Popcorn Calcification.
- Extralobar sequestration presents since birth or < 6 months, but intralobar presents at adulthood.
- *Hughes – Stovin syndrome also called as incomplete Behcet's syndrome, shows absence of oral/genital ulcers.*
- In churg-strauss syndrome, there is lobular peripheral consolidation (not homogenous), centrilobular, nodules & ground glass opacity.
- In sickle cell disease, there is ground glass opacification which does not have a lobar distribution & may have a mosaic pattern. There is microvascular occlusion causing reduction in vascular markings & infarction resulting in linear scarring.
- **Eosinophilic pneumonia, resolving pulmonary edema, desquamative interstitial pneumonia & sarcoidosis are causes of reverse bat wing's appearance.**
- **Batwing's – Pulmonary Edema, alveolar proteinosis, Sarcoidosis, lymphoma, Good Pasture's & alveolar cell Ca.**
- TB, consolidation, atypical hamartoma & scarring may give false + ve test for malignancy (PET scan) but intralobar sequestration does not give (No ventilation on V/Q scan) +ve result.
- Post transplant complications - drug toxicity occurs after 2 wks (ground glass with reticular opacities), neutropenia occurs in first two weeks, invasive aspergillosis in first 2-3 weeks, lymphoid interstitial pneumonia after 3 month. CMV can manifest at any time in 100 days.
- Pleural effusion is the commonest manifestation of RA.
- *RA is common in men (M: F = 9:1) in lungs. (RA is common in females otherwise).*
- Pulmonary contusion is the commonest manifestation of blunt trauma.
- Bronchial atresia is congenital abnormality that is discovered incidentally in adults. Airway distal to atretic segment can lead to mucocele & hyperexpanded, oligemic/hyperlucent lung.
- Commonest feature of SLE is pleural effusion.
- Lesion in right middle lobe bronchus causes right paracardiac mass with loss of right heart border.
- Lower zone fibrosis & upper lobe bullae/cyst are seen in NF1.
- Dose of IM adrenaline for anaphylaxis is 0.5ml of 1:1000 dilution.
- Scleroderma does not cause upper lobe disease.

In LCH, cysts are seen in upper 2/3 of lungs.

LAM is seen in women of child bearing age & characterized by large lungs, lung cysts, recurrent pneumothorax/hydro-pneumothorax/chylo-pneumothorax

- NF has cysts in apical location.
- After 7-10 days, approx 2/3 of the pneumonectomy space fills up with fluid & completely fill in 2-4 months.
- *Round atelectasis is called as "Folded lung or "Asbestos pseudotumour" & it makes acute angles with pleura. It usually affects the lower lobes.*
- Post pneumonectomy syndrome is seen after 1 year.
- Intralobar sequestration mostly have feeding artery directly from aorta.
- Drug toxicity & alveolar hemorrhage do not show pleural effusion.
- **Pneumothorax, lung contusion & rib fractures are most common seen in blunt chest trauma.**
- Pulmonary edema can occur due to opiate overdose in case of IV drug abuser when presents with pinpoint pupils & groin infection.
- Post pneumonectomy, contralateral mediastinal shift occurs due to bronchopleural fistula.
- In tuberous sclerosis, there are bilateral thin walled cysts in lungs > cardiac rhabdomyomas.
- *Transient & shifting opacities are seen in Loeffler syndrome (not in lofgren's).*

- Cavitating nodules may be seen in LCH but not in LAM.
- In acute rejection, there are perihilar opacities, ground glass changes, pleural effusion & septal thickening.
- Pulmonary fibrosis with bronchiectasis is seen in Sjogren syndrome.
- Transudate has protein concentration of <30g/L.
- Exudate has > 30g/L.
- Bleomycin causes pleural effusion.
- SVC obstruction is most common complication of fibrosing mediastinitis although it may also cause pulmonary artery & vein obstruction, esophageal & tracheal narrowing.
- **In case of meconium ileum (congenital), there is long term venous catheter for IV antibiotics & there can be upper lobe bronchiectasis with mucus plugging (due to cystic fibrosis).**
- Right middle lobe collapse shows a triangular opacity with apex directed towards lung hilum on lateral CXR.

Left upper lobe collapse results in volume loss in an anterior & medial direction.

Right upper lobe collapse results in volume loss in superior & medial direction.

- LCH is seen in men & smokers whereas LAM is seen in women & non smokers.
- RA shows pleural effusion, fibrosis, bronchiectasis bronchiolitis and nodules (may cavitate).
- Pleuro – pulmonary disease (effusion with pleuritic chest pain) is common in SLE.
- *Progressive massive fibrosis is more common in silicosis than coal worker's pneumoconiosis.*
- Collar sign (hour glass sign) & dependent viscera sign are seen in diaphragm rupture.
- Fallen lung sign is seen when mainstem bronchus is completely ruptured resulting in lung falling within the hemithorax.
- Liver protects the passage of abdominal content into the chest on right side.
- *Non cardiogenic pulmonary Edema will have central perihilar air space opacification (not common in cardiogenic).*
- Subtle ground glass opacification can be seen by 'black bronchus' sign.
- Pulmonary Edema shows thickened interlobular septae in subpleural location with thickened airways.

- Severe blunt trauma to chest can result in pneumatocele formation.
- **CCAM & LAM seen only in females.**
- RA shows reticular interstitial pattern with honey combing in B/L lower zones.
- NF1 & hyperparathyroidism cause inferior & superior rib notching.
- McLeod's syndrome results in diminished vascularity.
- Reticulonodular opacities with fibrosis & traction bronchiectasis can be seen in ankylosing spondylitis (in upper zones).
- Mosaic pattern is caused by abnormal ventilation (bronchiolitis obliterans, bronchiectasis, cystic fibrosis) or vascular obstruction (embolism).
- In ARDS, reticular pattern is seen in the non dependent lung (anterior aspect).
- *Acute rejection shows pleural effusion, septal thickening & perihilar opacification.*
- Round atelectasis occurs with asbestosis.
- **Centrilobular nodules, ground glass opacities, bronchial wall thickening, bronchiectasis, consolidation, & septal thickening are features of Churg Strauss syndrome.**
- Caecal, thyroid, tonsillar & uterine cavity uptake in PET can be physiological but not muscle uptake.
- Morgagni hernia can include a part of transverse colon.
- Biopsy should always be done first before starting chemo/Radiotherapy.
- Contrast swallow is better than barium swallow.
- Noxious gases or smoke inhalation causes pulmonary edema.
- Delayed washout on ventilation is seen in McLeod's.
- Eventration does not cause paradoxical motion of diaphragm.
- Pulmonary laceration appears as a rounded opacity with air fluid level.
- Post operative lung function is best assessed by ventilation scintigraphy.
- Cysts with centrilobular nodules suggest LCH.
- Left medial basal & anterior basal segments have a common bronchial origin.
- *CT pulmonary angiography has 2-3 times more dose (total body) than V/Q scan but uterine dose (fetal dose) is lesser.*
- Amiodarone lung disease occurs after 1-12 months of treatment & causes alveolar/interstitial infiltrates with high density areas of consolidation (iodine attenuation).

Penicillamine, sulphasalazines, NSAIDS & Nitrofurantoin causes pulmonary eosinophilia.

Bleomycin & cyclophosphamide & gold salts, busulphan causes diffuse alveolar damage (scattered & diffuse areas of ground glass opacities with fibrosis & honey combing with architectural distortion).

Amiodarone, methotrexate & chlorambucil causes NSIP pattern.

- Air outlining the medial diaphragm under cardiac silhouette is the earliest sign of pneumothorax in supine patient (deep sulcus sign).
- Inverted V sign is seen in pneumoperitoneum.
- *In ARDS $\rightarrow PaO_2/FiO_2 < 200$ mm Hg, there is bronchial dilatation, pneumothorax & reticular changes $\rightarrow$ (in non dependent part).*
- **Centrilobular nodules are seen in RBILD & hypersensitivity pneumonitis & LCH.**

• Amyloid & Relapsing polychondritis shows smooth tracheal calcification.

• Wegener's $\rightarrow$ Irregular tracheal calcification.

- In tracheomalacia, reduction of calibre of trachea $\rightarrow$ 50% in expiration.
- Relapsing polychondritis affects cartilage of nose, ear & joints.
- Wegener's affects the cartilage of nose.

- Availability of a cytopathologist determines the difference of core biopsy & FNAC.
- ‘Halo Sign’ with cavitation are seen in melanoma mets, Wegener’s, lymphoma, BAC & Squamous cell Ca.
- Tc labelled macro aggregates of albumin are used for hepato – pulmonary syndrome
- Fibrosis due to ARDS spares the posterior aspect of lungs.
- Acute & subacute phases of ARDS shows consolidation & atelectasis in dependent parts.
- Rapidly developing pulmonary edema occurs due to acute mitral valve insufficiency & renal failure.
- If areas of lucency are exaggerated on expiratory scans, then it is small airway disease but if they are not, then it is due to changes in vessel calibre (Pulmonary embolism, pulmonary HTN).
- In H1N1, there are 4 or more lung zones distributed peripherally B/L with central ground glass opacification → less significant.
- *In pectus excavatum, heart is shifted to left & right heart border is indistinct (due to right middle lobe consolidation), horizontal posterior ribs & steep anterior ribs giving “sevens” appearance.*

- Lower part of left heart border is formed by left ventricle which may show curvilinear calcification.
- Valvular calcification on CXR is seen within the heart shadow.

Aortic & mitral valves are seen adjacent to the spine on CXR but aortic valve is usually seen horizontally while MV is seen vertically. On lateral CXR, If a line is drawn from carina to anterior CP angle, then AV lies to be seen above it & MV below the line.

- Atrial myxoma is a pedunculated mass commonly seen in left atrium attached to inter – atrial septum.
- Atrial myxoma is hypointense to myocardium on T1W1, hypo to blood pool & hyper to myocardium on SSFP, varying enhancement & prolapsed through mitral valve on cine gradient echo imaging on four chambered long axis view.
- After 15 min of gadolinium, study should be commenced for cardiac MRI. Normal myocardium is dark, while ischemic appears bright.
- Too short TI results in loss of signal from both abnormal & normal myocardium. Too long TI causes loss of contrast.
- *In early myocarditis, enhancement pattern is typically epicardial.*
- In hypertrophic cardiomyopathy, multifocal changes are seen, commonly left ventricular free wall & its junction with interventricular septum is seen.
- Amyloidosis causes global & diffuse subendocardial involvement.
- Cardiac MRI shows dark rim artifact typically on endocardial aspect. Spike artifacts are sporadic & transient but RF artifacts are seen in all images of series. Gating is not very useful for assessing diastole function. Field inhomogeneity artifacts are more common on 3T than 1.5T.
- **Asymmetrical thickening with patchy enhancement of interventricular septum is seen in HOCM. Apposition of anterior mitral valve leaflet & interventricular septum is seen during systole.**
- *Atrial myxoma prolapse through the mitral valve but a thrombus does not.*
- Irregularly thickened pericardium with pericardial effusion occurs mostly due to malignancy.
- Tricuspid regurgitation (& sometimes tricuspid stenosis) is associated with carcinoid syndrome.
- Left atrial appendage & LA enlargement is a specific feature of rheumatic disease. Left atrial enlargement is caused by MS, VSD, PDA, ASD with shunt reversal & left atrial myxoma.
- Post cardiac transplant, following non surgical complication can occur: Infections, rejections, accelerated atherosclerosis of graft & post transplant malignancy. One of the most common infection is aspergillosis causing cavitary necrosis & a surrounding halo of ground glass haze. Systemic amphotericin is used.
- *Focal delayed enhancement of myocardium in non-coronary artery distribution (involving anterior, lateral, inferior wall or apex of ventricle) with sparing of subendocardial region is seen in myocarditis.*
- In myocardial sarcoidosis, increased focal signal intensity on T2W1 both early & delayed post contrast T1 high signal. Focal myocardial thickening is also seen.
- Hypertrophic cardiomyopathy shows involvement of IVS & LV & RV wall with delayed transmural enhancement.
- Amyloidosis shows restrictive (subendocardial aspect) cardiomyopathy.
- Left ventricular dilatation can be seen with severe mitral regurgitation.
- **Constrictive pericarditis usually causes obliteration of pericardial cavity & hence signs of pericardial effusion are absent (effacement of heart borders, bilateral hilar overlay, filling in of retrosternal space & epicardial fat pad sign).**
- Delayed enhancement is seen in myocardial infarction after few days of infarction. The myocardium appears hyperintense on T2WI.
- In HOCM, there can be good or hyperdynamic contractility with SAM partially obstructing subaortic region.
- Left atrial enlargement is seen in rheumatic aortic stenosis but not in calcific aortic stenosis.
- Arrhythmogenic right ventricular dysplasia is characterized by fibro-fatty replacement of right ventricular myocardium. It causes sudden death in young adults (more in males) on MRI, high T2W1 with dilated right ventricle, right ventricular aneurysm & segmental hypokinesia.
- *Uhl's anomaly is a very rare condition. Shows paper thin right ventricle with complete absence of any musculature.*

- **Myocardial bridging is seen when a length of coronary artery (usually LAD) taken an intramyocardial course & can cause ischemia, infarction, arrhythmia & even death.**
- Thrombus (non enhancing) is most common cardiac mass but metastasis is most common enhancing cardiac mass.
- Angiosarcoma is most common primary malignant cardiac tumour.
- Cardiac sarcoid shows high T2 signal in myocardium with sparing of subendocardial region. Early & delayed enhancement is seen.
- *Two left sided bronchial arteries arise from aorta & solitary right bronchial artery arise from right third post intercostal artery.*
- Artery to SA node arises from right coronary artery in 60% cases & from left circumflex artery in 40% of cases.
- In hypertrophic cardiomyopathy, thickness > 30 mm should be of prognostic value & wall thickness is best assessed on short axis views except for apex (long axis is better) & should be done at diastole. Left ventricular function, volume & mass is best seen on short axis oblique views.
- In myocardial perfusion imaging, adenosine is drug of choice but is not given in asthma patients (dobutamine is given).
- **Pericardial thickening > 4 mm is seen in constrictive pericarditis but normal in restrictive cardiomyopathy (normal thickness is 2 mm).**
- Mitral valve calcification with left atrial enlargement is always due to rheumatic disease.
- Left atrial myxomas typically cause enlarged LA, calcified lung nodules & pulmonary edema.

- De Bakey classification:
 - I – Ascending & descending
 - II – Ascending only
 - III – Descending only
- Mycotic aortic aneurysms (infective) are saccular & lobulated & associated with psoas abscess, discitis or osteomyelitis.
- Mycotic aneurysms show periaortic soft tissue mass.
- Displacement of descending aorta towards left is seen in left atrial enlargement.
- Mid aortic syndrome occurs in young adult & children and is a rare vascular abnormality showing narrowing of mid aorta & its branches (celiac, SMA & renal). Smooth segmental stenosis is seen.
- Takayasu mostly affects females.
- NF can cause mid aortic stenosis.
- *Post aneurysmal repair, if thickening of fluid filled bowel loop is seen, then it is suggestive aorto – enteric fistula.*
- Presence of ectopic gas beyond 4 weeks of aneurysmal repair is abnormal.
- Aortic intramural hematomas are treated in same way as aortic dissection. Urgent cardiothoracic referral for ascending aorta & follow up in descending aorta.
- Aortic injury usually are circumferential.
- A normal chest PA X-ray & a normal NCCT chest (in absence of Mediastinal hematoma) has a high negative predictive value in aortic injury.
- **Rib notching, dilatation of brachiocephalic arteries, LV enlargement & post stenotic dilatation are not seen in pseudo-coarctation of aorta.**
- Elevated left ventricular apex is seen in left ventricular hypertrophy (seen in coarctation of aorta).
- Takayasu vasculitis is a chronic inflammatory disease involving aorta (its main branches) & pulmonary arteries leading to stenosis, occlusion & dilatation.
- Endoleaks :
 - I - Leak at proximal or distal landing zones of stent
 - IA - Proximal at aortic attachment
 - IB - Distal at iliac attachment
 - II - Retrograde flow to the aneurysmal sac Via IMA (IIA) or lumbar arteries (IIB).
 - III - Leakage through the body of stent
 - IV - Aneurysmal sac opacification without identifiable source. These occur due to porous graft & are transient which resolves after withdrawal of anti-coagulation.
 - V - Continued growth of the sac without a leak.

Aorto-iliac lesions

A – Short stenosis – Endovascular therapy

B - Endovascular Therapy

C - Patient's co-morbidities, preference & local operator's long term success rate. Surgery is required.

D - Complex or long occlusions (not improved by medical therapy). Surgical bypass is required.

- Right sided aortic arch is associated with tetralogy of fallot.
- Takayasu arteritis causes stenosis/ occlusion of aorta & major vessels with irregular short or long stenotic lesions within the aorta with multi segmental dilation with segmental septation.
- Aortic valve calcification occurs due to bicuspid valve, syphilis, ageing & ankylosing spondylitis.
- De Bakey classification:

III a – descending thoracic aorta

III b – Descending thoracic aorta extending to abdominal aorta.

- *Increase in size of the Aneurysmal sac on delayed images with contrast seen in periphery of sac, not in contact with the stent is suggestive of type II endoleak.*
- **Most common anomaly of aortic arch is common origin of brachiocephalic artery & left common carotid artery.**

- Coil embolization of splenic artery aneurysm are advised to people who:-
 - Aneurysm > 2.5cm.
 - Portal HTN
 - Awaiting liver transplantation.
- Thrombin injection is preferred in cases where embolization has failed.
- *Coronary artery calcifications are seen along the upper part of left heart border & have a tram track appearance.*
- Fibromuscular dysplasia affects female resulting in hypertension. It causes multiple stenosis of mid & distal parts of renal arteries.
- Dilated pulmonary veins are not seen in reversal of normal left to right shunt (Eisenmenger).
- **Common sources of mediastinal hematoma are azygous, hemiazygous, internal mammary & intercostal vessels injury (Not Aortic injury).**

In case of pseudoaneurysm, US guided thrombin injection should be given specially in patients with heparin or warfarin rather than US guided compression. Balloon inflation may be done if neck is short & wide.

- Popliteal artery entrapment syndrome causes medial deviation of popliteal artery with stenosis & post stenotic dilatation.
- Acute left anterior descending artery occlusion is the most common cause of a true left ventricular aneurysm.
- In coronary disease, there is initially increase in outer vessel diameter due to normal lumen but increased wall thickness.
- Calcification of coronary artery is proportional to degree of stenosis present.
- Subclavian steal causes vertebro-basilar insufficiency since it steals blood from posterior circulation.
- *Bronchial artery embolization is preceded by descending thoracic aortogram to identify the number & site of origin of bronchial arteries. Bronchial angiography is performed with manual injection of contrast. Selective bronchial artery catheterization & safe positioning distal to the origin of spinal cord branches to avoid spinal cord ischemia/ infarction. Polyvinyl alcohol particles (350-500 micron) are used. Chest pain is most common complication.*
- Coil embolization is commonly used for gastro-duodenal artery. Both proximal & distal embolization should be done for pseudo aneurysm.
- Femoral artery pseudoaneurysm is contained only by the hematoma & presence of surrounding tissues. Causative factors are low femoral puncture, superficial femoral or profunda femoral puncture. Ultrasound guided thrombin injection is treatment of choice.
- *Popliteal artery aneurysms occurs bilaterally in 50-70% of cases of associated with abdominal aortic aneurysms in 30% - 50% of cases. They are more common in men in 6th -7th decade & should be repaired as soon as diagnosed.*
- **Paget- Schroetter Syndrome is also known as “ effort” syndrome, shows thrombosis of axillary & subclavian veins, usually due to compression by muscles or tendons or structures in thoracic outlet.**
- Percutaneous coronary intervention is suitable when stenosis is greater than 75% & may be suitable when 50-75%. Stenosis on CT is always overestimated. Hence 50% stenosis on CT is actually less than 50% (lifestyle & risk factor modification is required.)
- *Hypothenar hammer syndrome is post traumatic vascular insufficiency of hand. Injury to terminal ulnar artery or proximal superficial palmar arch with occlusion, aneurysm & thromboembolism is seen. Corkscrew appearance is seen on angiography.*
- NICE Guidelines
 - I-10-20% CORONARY ARTERY DISEASE (CAD)
 - History of Angina or chest pain with lack of risk factors.
 - CT calcium scoring should be done
 - If score is 1-400, then CT coronary angiography prospective study
 - If score > 400: Catheter angiography

→ II - 61-90% CAD – Catheter angiography

→ III - 30-59% CAD – Myocardial perfusion or SPECT, stress echo, MR perfusion

→ IV - > 90% CAD - Treatment is advised

(< 10% CAD - Exercise stress or chemical stress testing. No angina or risk factors.)

- **If RCA arises from left coronary sinus & passes between aorta & pulmonary artery, then it can cause sudden death. Another rare malignant anomalous course is origin of coronary artery from pulmonary** Two left sided bronchial arteries arise from aorta & solitary right bronchial artery arise from right third post intercostal artery.
- Artery to SA node arises from right coronary artery in 60% cases & from left circumflex artery in 40% of cases.
- Intrahepatic branch aneurysms are usually treated by coil embolization.
- Fibromuscular dysplasia causes beaded appearance of renal artery & RAS is treated by angioplasty. Surgical correction is done only for refractory cases.
- *Bovine arch is when left CCA arises from brachiocephalic artery.*

- Tip of subclavian line should lie within the SVC or at upper part of right heart border at the level of right hilum. Tip should not lie in SCV, brachiocephalic vein, RA or RV.
- Tip of pacemaker if lies 3cm medial to cardiac apex, then it lies in right Ventricle.
- SVC commences from first right Inter coastal space on CXR.
- Before placing a IVC filter, a double IVC should be excluded & hence contrast through left iliac vein should be pushed find to confirm.
- RV/LV diameter ratio has most widely accepted prognostic value in case of role of CT in pulmonary emboli.
- *Partial volume artifact is called as pseudolipoma which is caused by juxtacaval fat above the caudate lobe causing T1 hyperintense area in IVC, appears as a filling defect, vary in shape & location on different images.*
- Submucosal fibroids best treated by uterine artery embolization (UAE).
- Subserosal fibroids often draw their blood from adjacent viscera & hence not effectively treated by UAE.
- TI of 200 ms would nullify the signal from normal myocardium.
- Prior to IVC filter placement, there should be identification of IVC thrombus & renal vein but not hepatic veins.
- Normally, IVC filter is placed in infrarenal location but placed in suprarenal if thrombus is present.

In TIPS, usually right hepatic vein is preferred route of access to right PV which lies anterior to RHV. Flow of contrast towards porta hepatis indicated biliary puncture. Puncture of PV & hepatic artery results in contrast flowing to periphery. Shunt gradient should be < 12mm Hg. Stenosis usually occurs in hepatic vein or the shunt itself.

- **Dobutamine stress MRI is best for evaluation of myocardial hibernation (low dose protocol) & ischemia (high dose). Improvement in resting motion abnormality is suggestive of hibernation.**
- Tumour extending from IVC to Right atrium can be due to leiomyosarcoma of IVC or due to HCC or RCC.
- *Pectus excavatum is associated with Marfan Syndrome & shows steep inferior slope of anterior ribs with indistinct Right heart border with cardiac shift to left.*
- Ventricular enlargement is the commonest cause of cardiomegaly in elderly.
- Reduced distortion of tagging grid on cardiac MRI is seen in myocardial ischemic (due to reduced contractility).
- Severe mitral regurgitation is associated with opacification of airspace in right upper zone due to regurgitant flow in right upper lobe pulmonary artery.
- Chronic pulmonary HTN causes prominent central pulmonary arteries with sharp tapering peripheral vessels & asymmetrical right ventricular enlargement. There can be a triangular opacity suggestive of pulmonary infarct. Jugular venous pressure is also elevated.
- Schistosomiasis shows pulmonary HTN with tiny nodular granuloma & splenomegaly.
- **Pulmonary veno-occlusive disease shows pulmonary arterial HTN with diffuse pulmonary edema with normal left atrium.**
- Acute GI bleeding can be intermittent & failure to demonstrate active bleeding on CT Angiography does not prove cessation of bleeding.
- Reported lowest detectable rate of bleeding with MDCTA is 0.35 ml. /min.
- Protocol of MDCTA is unenhanced, arterial & portal venous phase scans.
- Intrapulmonary right to left shunt in hepato-pulmonary syndrome is diagnosed by TC99 macro-aggregates of albumin.
- Tc sulphur colloid is used in spleen imaging.
- Poland Syndrome is associated with ipsilateral syndactyly, breast aplasia & atrophy of second to fifth ribs.
- Anterior protrusion of ribs is seen in pectus excavatum & anterior protrusion of sternum is seen in pectus carinatum.
- *Intermittent claudication is muscle pain or discomfort on exercise & relieved by rest within 10 min.*
- *Typical ischemic leg pain at rest is relieved by dependency of foot due to gravity, aided blood flow.*

Critical limb ischemia is presence of rest pain or tissue loss with ulcers or gangrene & symptoms present for atleast 2 weeks (differentiate from acute ischemia). It is relieved by dependency of foot. Pulses can be absent.

- **Diabetic neuropathy is associated with burning or shooting pain in feet. It is bilateral symmetrical with cutaneous hypersensitivity & does not relive by dependency of foot.**
- *Gorlin syndrome shows basal cell carcinoma, odontogenic keratocysts, bifid ribs, ovarian & cardiac fibroma. Fibromas show delayed enhancement with foci of calcification.*
- Cardiac pacemakers, loop recorders, stents grafts are cardiac MRI compatible now.
- Cochlear implants are always contraindicated in MRI.
- Marfan's syndrome is associated with aortic regurgitation & dilated aortic root, incomplete co-arcation & ASD.
- Post embolization syndrome shows flu like illness with malaise & fever. It is most common complication of embolization. It lasts for 10 days. & self limiting.
- SVC obstruction may cause rib notching but also causes a “ nipple “ on side of aorta due to dilated collaterals (accessory hemiazygous).
- *Following embolization of Angiomyolipoma, there is propensity to rupture, which appears to be more common if polyvinyl particles are used alone without coiling.*
- If calf & thigh veins shows no thrombus but shows continuous flow with no respiratory variation, then a proximal occlusion is suspected, hence pelvis USG should be done.
- Effect of vessels calcification on CT can be reduced by curved planar reformation.
- Aneurysms become unstable if there is patchy high T1 signal suggestive of hemorrhage within the mural thrombus.
- Left brachiocephalic vein lies most anterior in the mediastinum.
- **Post transplant lymphoproliferative disorder occurs usually within 2 yrs. of transplant, shows single or multiple lung nodules with or without Mediastinal lymphadenopathy.**
- Left sided SVC usually drains into coronary sinus. It is associated with ASD & azygous continuation of IVC.
- *Patency of brachiocephalic vein can be confirmed by collapse of IJV on sniffing (valsalva) & variability of respiratory flow. A continuous monophasic flow with loss of variability suggests a proximal occlusion or stenosis.*
- Graft versus host disease (cardiac transplant) shows bronchiolitis obliterans, hyperinflation, bronchial dilatation, wall thickening, reduced vascularity & air trapping.
- Aspergillosis post transplant occurs in 30 days & CMV in first 6 months.
- Post embolization syndrome occurs within 24-48 hours & continues for 3-7 days. It causes fever, malaise, pain & vomiting. Gas may be seen in infarcted tissue after embolization.
- Right Mediastinal border is formed by right atrium, SVC & right brachiocephalic vein.

1. Which of the following are correct regarding Adult respiratory distress syndrome (ARDS):

- (a) CXR is usually normal in the first 24 h.
- (b) The lung is uniformly abnormal on CT.
- (c) Has 50% mortality.
- (d) The most common CT abnormality in survivors is a reticular pattern.
- (e) Bronchial dilatation is seen frequently on CT.

Answers:

- (a) Correct
- (b) Not correct
- (c) Correct
- (d) Correct
- (e) Correct

Explanation:

Lung involvement is heterogeneous with a gradient density. Dependent lung is more densely opacified than non-dependent lung.

2. Which of the following are correct regarding thoracic trauma:

- (a) A normal erect CXR virtually excludes acute thoracic aortic injury.
- (b) Uncomplicated pulmonary contusion on CXR begins to resolve after at least 7 days.
- (c) Air bronchograms are a common CXR feature of pulmonary contusion.
- (d) Pulmonary lacerations appear as ovoid lucent areas.
- (e) Main bronchial injuries are more common than tracheal injuries.

Answers:

- (a) Correct
- (b) Not correct
- (c) Not correct
- (d) Correct
- (e) Correct

Explanation:

Air bronchograms are usually absent in pulmonary contusions as a result of blood filling the airways.

Uncomplicated pulmonary contusions begin to resolve after 48-72 hrs. Complete resolution is seen usually by 10-14 days.

3. Which of the following are correct about thoracic aorta:

- (a) Stanford type B dissection affects the ascending aorta.
- (b) Penetrating aortic ulcers are frequently multiple.
- (c) Mycotic aneurysms are usually fusiform in configuration.
- (d) Penetrating aortic ulcers usually progress to dissection.
- (e) Type A dissection is more common than Type B.

Answers:

- (a) Not correct
- (b) Correct
- (c) Not correct
- (d) Not correct
- (e) Correct

Explanation:

Dissection affecting ascending aorta is classified as Stanford type A and accounts for 75% of aortic dissection. Acute type A is a surgical emergency to avoid fatal complications. Stanford type B dissection affects the descending aorta.

Mycotic aneurysms are usually saccular and may grow rapidly.

Penetrating atherosclerotic ulcers usually progress to aneurysmal dilatation.

4. Regarding diagnosis of pulmonary embolism (PE):

- (a) A negative D-dimer test reliably excludes PE in patients with low clinical probability.
- (b) A positive D-dimer test is highly specific for PE.
- (c) A normal isotope lung scan reliably excludes PE.
- (d) Patients with a good quality negative CTPA do not require further investigation or treatment for PE.
- (e) Digital subtraction pulmonary angiography is the investigation of choice for patients with suspected massive PE.

Answers:

- (a) Correct
- (b) Not correct
- (c) Correct
- (d) Correct
- (e) Not correct

Explanation:

A positive D-dimer test has a poor specificity for PE, especially in hospitalized patients.

CTPA or echocardiography is the investigations of choice in case of massive PE.

5. Which of the following are correct about pulmonary sarcoidosis:

- (a) Normal CXR excludes the diagnosis.
- (b) The large airways are involved in 4-5% of cases.
- (c) Subcarinal lymph nodes are characteristically spared.
- (d) Fibrosis occurs predominantly in the lower zones.
- (e) Pleural effusion is common CXR.

Answers:

- (a) Not correct
- (b) Correct
- (c) Not correct
- (d) Not correct
- (e) Not correct

Explanation:

Between 5% to 15% of patients have a normal CXR when first examined.

Pleural effusion is a rare finding (2%).

All mediastinal lymphnodes can be affected in sarcoidosis. On CT 50% of cases show enlarged subcarinal lymphnodes.

Middle and upper zone fibrosis is characteristic.

6. Which of the following are correct regarding cardiac myxoma:

- (a) Is the most common primary cardiac tumour.
- (b) 80-90% of patients have arrhythmias.
- (c) 70-80% are found in the right atrium.
- (d) Invasion of the myocardium is seen in >50% at presentation.
- (e) Have a low signal on gradient-echo MRI sequences.

Answers:

- (a) Correct
- (b) Not correct
- (c) Not correct
- (d) Not correct
- (e) Correct

Explanation:

Approximately 75% of myxomas are located in left atrium, 20% in right atrium and rare cases are found in ventricles.

The classical clinical triad of obstructive cardiac symptoms, embolic phenomena and constitutional symptoms has been described and majority of the patients have atleast one of these symptoms at presentation.

Cardiac myxomas are endocardial based masses that do not infiltrate the underlying tissues.

7. Which of the following are correct regarding pulmonary disease in AIDS patients:

- (a) Lymphocytic interstitial pneumonia usually progresses to lymphoma in children.
- (b) Bilateral perihilar infiltrates on CXR are diagnostic of Pneumocystis Carinii pneumonia.
- (c) The presence of Cytomegalovirus in bronchoalveolar lavage fluid indicates active infection.
- (d) Lymphadenopathy is seen in <5% of cases of Kaposi's sarcoma.
- (e) Thick-walled cavities are a common HRCT finding of invasive pulmonary aspergillosis.

Answers:

- (a) Not correct
- (b) Not correct
- (c) Not correct
- (d) Not correct
- (e) Correct

Explanation:

Bilateral perihilar infiltrates are a non-specific findings seen in other opportunistic infections as well like CMV and Kaposi's sarcoma. On HRCT, PCP is most commonly seen as bilateral, symmetric, patchy or confluent ground glass opacity. Less common findings on CXR and HRCT include focal areas of consolidation, mass lesions, multiple lung nodules, pleural fluid, pneumothorax, cavitation, lymphadenopathy and occasional nodal calcification.

CMV is the most common viral pathogen to cause morbidity and mortality in patients with AIDS. The HRCT findings are heterogeneous and include bilateral ground glass opacities, multiple nodules or mass like areas of consolidations and patchy bilateral consolidation.

Pulmonary KS occurs in 18% to 50% of patients with known cutaneous KS and can affect the lung parenchyma, pleural or tracheobronchial tree. Bilateral perihilar pulmonary infiltrates is the most common finding. Other common findings include intralobular septal thickening, lymphadenopathy and pleural effusion.

Lymphocytic interstitial pneumonia is a lymphoproliferative disorder seen with increased frequency in mainly children affected by AIDS. It is mostly benign and regresses spontaneously or with treatment.

8. Which of the following are correct regarding HRCT features of pulmonary alveolar proteinosis (PAP):

- (a) Usually shows a lower zone distribution.
- (b) Pleural effusion is common at presentation.
- (c) Lymphadenopathy is a common feature.
- (d) Regions of emphysema are commonly observed.
- (e) Crazy paving pattern is a specific feature.

Answers:

- (a) Correct
- (b) Not correct
- (c) Not correct
- (d) Not correct
- (e) Not correct

Explanation:

Pleural effusion is rare in untreated PAP.

Lymphadenopathy is uncommon.

Crazy paving pattern though suggestive of PAP, is also seen in ARDS, acute interstitial pneumonia and drug induced pneumonias.

9. Which of the following are correct regarding extrinsic allergic alveolitis (EAA):

- (a) A normal CXR excludes the diagnosis.
- (b) Smoking is a risk factor.
- (c) The upper zones are typically involved in acute EAA.
- (d) Ground-glass opacity is a characteristic HRCT finding.
- (e) Bronchiectasis is seen on HRCT in chronic EAA.

Answers:

- (a) Not correct
- (b) Not correct
- (c) Not correct
- (d) Correct
- (e) Correct

Explanation:

CXRs are generally normal in patients with mild symptoms and in some cases with severe symptoms.

Smokers are protected from EAA also called hypersensitivity pneumonitis. The most common forms are farmer's lung and bird fancier's lung.

Typically mid to lower zones are affected with sparing of costophrenic angles. Presentation is like pulmonary oedema with bilateral areas of increased opacity that may be heterogeneous or homogeneous.

10. Which of the following are correct regarding Langerhans' cell histiocytosis.

- (a) Primarily affects cigarette smokers.
- (b) Predominantly affects the lung bases.
- (c) Most patients are asymptomatic.
- (d) Nodular lesions frequently cavitate.
- (e) Lung volumes are reduced.

Answers:

- (a) Correct
- (b) Not correct
- (c) Not correct
- (d) Correct
- (e) Not correct

Explanation:

LCH mostly involves upper and mid zones with relative sparing of lung bases and characteristic appearance of bilateral nodular and reticulo-nodular areas.

Most patients are symptomatic with non-productive cough and/or dyspnoea.

Lung volumes are characteristically normal or increased.

11. Which of the following are correct regarding bronchopulmonary sequestration:

- (a) Intralobar sequestration (IS) typically presents in the neonatal period.
- (b) Extralobar sequestration (ES) is more common than intralobar sequestration.
- (c) The main blood supply is from bronchial arteries.
- (d) Most commonly affect the lower lobes.
- (e) Can cause recurrent chest infection in adults.

Answers:

- (a) Not correct
- (b) Not correct
- (c) Not correct
- (d) Correct
- (e) Correct

Explanation:

Bronchopulmonary sequestration is a non-functioning sequestered lung segment which has no communication with the tracheobronchial tree and has a systemic blood supply. Supply is commonly from a separate branch from the aorta and sometimes from upper abdominal vessels or coronary arteries.

IS is more common (80%) and ES is found in (20%). IS typically presents in adulthood and is often an incidental finding.

12. When a solitary pulmonary nodule is seen on computed tomography (CT), which of the following radiological features suggested it is benign?

- (a) Amorphous calcification within the nodule.
- (b) Air bronchograms within the nodule.
- (c) CT attenuation of – 10 Hounsfield units (HU).
- (d) Lobulated outline of the nodule.
- (e) Enhancement of the nodule by less than 15 HU following intravenous contrast.

Answers:

- (a) Not correct
- (b) Not correct
- (c) Correct
- (d) Not correct
- (e) Correct

Explanation:

Popcorn type calcification indicated benignity and is typical of hamartoma. Amorphous calcification is seen in upto 7% of lung carcinomas.

Air bronchograms may be seen within a tumour mainly bronchoalveolar carcinoma.

Lobulated outline and corona radiate on CT are typical of carcinoma.

13. Which of the following are true regarding malignant mesothelioma?

- (a) Selective involvement of the parietal pleura is typical.
- (b) Pleural effusions are common.
- (c) Chest wall invasion occurs in 12% of cases at presentation.
- (d) Circumferential pleural thickening is typical.
- (e) It is a cause of hypertrophic osteoarthropathy.

Answers:

- (a) Not correct
- (b) Correct
- (c) Correct
- (d) Correct
- (e) Correct

Explanation:

Nodular thickening of both parietal and visceral pleura is usual in mesothelioma.

14. Which of the following are true regarding round pneumonia?

- (a) It is most commonly associated with Klebsiella infection.
- (b) It occurs most commonly in the second and third decades of life.
- (c) It is more common in the upper lobes.
- (d) It frequently progresses to cavitation.
- (e) It is a feature of Q-fever infection.

Answers:

- (a) Not correct
- (b) Not correct

- (c) Not correct
- (d) Not correct
- (e) Correct

Explanation:

It is most commonly associated with *Streptococcus pneumoniae*.

Round pneumonia occurs most frequently in children within first decade of life.

It is usually seen in lower lobes, often abutting pleural space.

Round pneumonia evolves rapidly over a few days into segmental consolidation (sometimes with air bronchograms). Cavitation is unusual.

15. Which of the following are true regarding silicosis?

- (a) It predominantly affects the lower lobes in acute silicoproteinosis.
- (b) Emphysema is associated with the development of progressive massive fibrosis.
- (c) It mimics sarcoidosis on high resolution computed tomography (HRCT).
- (d) It is a more frequent cause of nodal egg-shell calcification on radiograph than coal miner's pneumoconiosis.
- (e) Impairment of the lung function test correlates best with the profusion of nodules.

Answers:

- (a) Not correct
- (b) Correct
- (c) Correct
- (d) Correct
- (e) Not correct

Explanation:

Acute silicoproteinosis has mid and upper zone predominance occurs from intense exposure to silica dust resulting in alveolar exudates.

Impairment of the lung function test correlates best with the degree of emphysematous change. Nodular perfusion is a weaker independent correlate.

16. When a mass-like lesion is seen on CT, which of the following findings support the diagnosis of rounded atelectasis.

- (a) An anteromedial location of the mass.
- (b) An acute angle with the pleural margins.
- (c) Localized crowding of the pulmonary vasculature.
- (d) Adjacent pleural thickening.
- (e) Absence of enhancement following intravenous contrast.

Answers:

- (a) Not correct
- (b) Correct
- (c) Correct
- (d) Correct
- (e) Not correct

Explanation:

Round atelectasis is usually seen in posterior or basal region of lower lobes and appears as a well-defined oval or round mass in subpleural location.

On Ct the mass shows uniform post intravenous contrast enhancement.

17. Which of the following are true regarding usual interstitial pneumonitis (UIP)?

- (a) It is more common in females than males.
- (b) It occurs most frequently in the sixth decade of life.
- (c) It is the most common cause of cryptogenic fibrosing alveolitis.
- (d) Areas of ground glass attenuation on HRCT in the absence of parenchymal distortion indicate reversibility.
- (e) A confident diagnosis cannot be made on HRCT without lung biopsy.

Answers:

- (a) Not correct
- (b) Correct
- (c) Correct
- (d) Correct
- (e) Not correct

Explanation:

UIP has no gender predilection. On HRCT temporal heterogeneity is characteristic of UIP and it refers to different areas of lung demonstrating different stages of inflammation and fibrosis at the same time. This helps to make confident diagnosis in majority of the cases.

18. Which of the following are true regarding cryptogenic organising pneumonia (COP)?

- (a) The disease is rarely symptomatic.
- (b) An obstructive pattern of lung function impairment is typical.
- (c) Pleural effusions are common.
- (d) Radiographic clearing occurs following steroid treatment.
- (e) Bilateral basal peripheral consolidation is a common radiographic finding.

Answers:

- (a) Not correct
- (b) Correct
- (c) Not correct
- (d) Correct
- (e) Correct

Explanation:

50% of the patients are symptomatic presenting with fever, cough, breathlessness and malaise with peak incidence in 5th and 6th decades of life. COP is also known as BOOP (bronchiolitis obliterans organizing pneumonia) or bronchiolitis obliterans with intramural polyps.

Pleural effusion is uncommon (5% cases).

19. Which of the following are true regarding blunt pulmonary trauma?

- (a) Pulmonary contusions show radiographic resolution in 48 hours.

- (b) Bronchial rupture is always accompanied by pneumothorax.
- (c) Traumatic diaphragmatic rupture is more common on the left side.
- (d) A normal chest radiograph has a good negative predictive value for aortic rupture.
- (e) Aortic rupture most commonly occurs at the aortic root.

Answers:

- (a) Correct
- (b) Not correct
- (c) Correct
- (d) Correct
- (e) Not correct

Explanations:

Bronchial rupture is frequently (70%), not always associated with pneumothorax. The falling lung sign is typical and refers to displacement of lung to the dependant position.

Aortic rupture is the most common at ductus arteriosus level.

20. Which of the following are correct regarding fibromuscular dysplasia (FMD):

- (a) Is more common in males.
- (b) Usually affects the intimal layer.
- (c) Renal artery FMD is bilateral in 5% of cases.
- (d) Can occur in veins.
- (e) May present with a transient ischaemic attack.

Answers:

- (a) Not correct
- (b) Not correct
- (c) Not correct
- (d) Correct
- (e) Correct

Explanation:

FMD is more common in females and presents between 15 to 50 yrs.

Medial fibroplasia is more common form of FMD with characteristic ‘strings of beads’ appearance. Intimal fibroplasia occurs in 10% of cases and adventitial hyperplasia is the rarest form.

Renal artery FMD is bilateral in approximately 30% of cases.

21. Which of the following are correct regarding popliteal artery disease:-

- (a) The popliteal artery is superficial to the popliteal vein on ultrasound.
- (b) Popliteal artery entrapment syndrome (PAES) is a recognized condition in athletes.
- (c) Popliteal artery aneurysms are bilateral in 50-70% of cases.
- (d) Popliteal artery occlusion is seen in 30-50% of patients with complete knee dislocation.
- (e) Balloon mounted stents are usually preferred to self-expanding stents when treating popliteal artery disease.

Answers:

- (a) Not correct

- (b) Correct
- (c) Correct
- (d) Correct
- (e) Not correct

Explanation:

Popliteal artery lies posterior to the femur and anterior to the vein, thus artery is deep to the vein when scanning the popliteal fossa with ultrasound.

Stent placement in popliteal artery is reserved for cases of failed PTA when limb viability is threatened.

Self-expanding stents are preferred because of superficial location of artery and concerns about extrinsic compression.

22. Vascular anatomy of the liver:

- (a) The middle hepatic vein divides the liver into anatomical right and left lobes (Couinaud classification).
- (b) At microscopic level, centrilobular veins drain into the portal circulation.
- (c) The portal vein bifurcation is intrahepatic in 90% of cases.
- (d) The right hepatic artery arises solely from the superior mesenteric artery in 10-15% of individuals.
- (e) In the fetus, the ductus venosus joins the right portal vein to the inferior vena cava.

Answers:

- (a) Correct
- (b) Not correct
- (c) Not correct
- (d) Correct
- (e) Not correct

Explanation:

The hepatic lobule is the basic histological unit. The triads of hepatic arterioles, portal venules and bile duct branches run at the edge of the lobule. Blood flows from periphery inwards via hepatic sinusoids and is drained by centrilobular veins which in turn drain into hepatic veins.

The portal bifurcation is extrahepatic in 40% - 80% cases.

Left portal vein is critical to fetal circulation as it receives blood from the placenta via the left umbilical vein and delivers it across the liver to the IVC via ductus venosus.

23. Which of the following are correct regarding aortic dissection:

- (a) Type A dissection is usually treated surgically.
- (b) Type A dissection involves the ascending aorta.
- (c) The true lumen is usually smaller than the false lumen.
- (d) Diagnosis is most commonly made by digital subtraction angiography.
- (e) Treatment options for type B dissection include stent grafting and balloon fenestration.

Answers:

- (a) Correct
- (b) Correct
- (c) Correct
- (d) Not correct
- (e) Correct

Explanation:

Diagnosis is mostly done by cross sectional imaging (CT or MRI) both of which have high specificity and sensitivity above 90%.

24. Which of the following are correct regarding bronchial artery embolization (BAE):

- (a) The smallest available polyvinyl alcohol (PVA).
- (b) Recurrence of haemoptysis after BAE is rare.
- (c) The bronchial arteries originate directly from the ascending thoracic aorta in 90% of cases.
- (d) An arch aortogram is usually performed prior to selective bronchial angiography.
- (e) Chest pain is the most common complication.

Answers:

- (a) Not correct
- (b) Not correct
- (c) Not correct
- (d) Not correct
- (e) Correct

Explanation:

Very small particles can freely flow through the microcirculation and shunts causing infarcts, thus 350 – 500 micro m PVA particles are used.

Long term recurrence rates are between 10% - 52% with a mean follow up period of 1 to 46 months.

The bronchial arteries originate directly from the descending thoracic aorta most commonly between T5 and T6 vertebrae. The left main bronchus is a useful landmark in angiography, marking the origin of bronchial arteries in most cases.

Descending thoracic aortogram is usually performed.

25. Which of the following are correct regarding causes of failure of uterine fibroid embolization (UFE):

- (a) Failure to catheterize both uterine arteries.
- (b) Collaterals supply from ovarian artery.
- (c) Use of a micro-catheter for particle delivery.
- (d) Embolization particle aggregation.
- (e) Use of glycerol trinitrate.

Answers:

- (a) Correct
- (b) Correct
- (c) Not correct
- (d) Correct
- (e) Not correct

Explanations:

Micro-catheters facilitate uterine artery catheterization and may help avoid spasm.

Glycerol trinitrate is a vasodilator.

26. Which of the following are correct regarding endoleaks following endovascular abdominal aortic aneurysm (AAA) repair:

- (a) Type I endoleaks present months or years after AAA repair.
- (b) Graft fracture can result in a Type III endoleak.
- (c) Type II endoleaks require urgent interventional management.
- (d) Type IV endoleaks are the result of graft porosity.
- (e) CT demonstrates the cause of Type V endoleak in 20-30% of cases.

Answers:

- (a) Not correct
- (b) Correct
- (c) Not correct
- (d) Correct
- (e) Not correct

Explanations:

Type I endoleaks usually occur early and may be seen on the on-table angiogram immediately after stent-graft deployment as they occur due to ineffective seal at the graft ends. It has poor prognosis if left untreated.

Type II endoleaks management is controversial, some favouring a conservative approach. Embolization of feeding artery may be performed.

Type V endoleaks refers to endopressure /endotension which is basically aneurysm sac expansion in absence of obvious endoleaks on follow up CT. it has been associated with aneurysm expansion and rupture.

27. Which of the following are correct regarding Thymic carcinoma:

- (a) Commonly presents with myasthenia gravis.
- (b) Extrathoracic metastases are an early feature.
- (c) The most common histology is adenocarcinoma.
- (d) Calcification is a recognized finding.
- (e) Vascular invasion on CT distinguishes thymic carcinoma from lymphoma.

Answers:

- (a) Not correct
- (b) Not correct
- (c) Not correct
- (d) Correct
- (e) Not correct

Explanation:

Thymic epithelial tumours are of three types; benign thymoma, type 1 malignant thymoma (showing local invasion or metastasis) and type 2 malignant thymoma or thymic carcinoma (showing endothoracic metastasis without extrathoracic involvement).

Thymic carcinoma is rarely associated with paraneoplastic syndromes like myasthenia gravis, pure red cell aplasia and hypogammaglobulinaemia.

Various histopathological types are squamous cell (epidermoid 36%), lymphoepithelioma like (poorly differentiated squamous cell 32%), undifferentiated (anaplastic 11%), small cell (8%), basaloid (4%), sarcomatoid (4%), clear cell (2%), mucoepidermoid (2%), carcinoma and adenocarcinoma (1%).

28. Which of the following are correct regarding features of mycotic aneurysms include:

- (a) Gradual enhancement with contrast.
- (b) Fusiform structure.
- (c) Adjacent vertebral osteomyelitis.
- (d) Adjacent reactive lymph node enlargement.
- (e) Tuberculosis is the commonest infective organism.

Answers:

- (a) Not correct
- (b) Not correct
- (c) Correct
- (d) Correct
- (e) Not correct

Explanations:

Mycotic aneurysms are saccular types showing rapid enhancement and most commonly associated with Staphylococcus aureus (IV drug abuse and subacute bacterial endocarditis).

29. Which of the following are correct regarding Buerger's disease (thrombo-angitis obliterans):

- (a) Is associated with cigarette smoking in 90-95%.
- (b) Initially affects the proximal vessels and progresses distally.
- (c) More commonly affects the upper limb.
- (d) Has multiple corkscrew-shaped collaterals on angiography.
- (e) Has skip lesions as a recognised feature.

Answers:

- (a) Correct
- (b) Not correct
- (c) Not correct
- (d) Correct
- (e) Correct

Explanations:

Buerger's disease initially affects the distal vessels and progresses proximally affecting the lower limbs more commonly.

30. Which of the following are correct regarding aortic dissection:

- (a) The Stanford Classification Type B aortic dissection involves the ascending aorta.
- (b) Aortic dissections involving the ascending aorta account for 60-70%.
- (c) There is an increased risk in Ehlers-Danlos syndrome.
- (d) Contrast-enhanced CT is more accurate than transoesophageal echocardiography at identifying aortic dissections.
- (e) Displacement of calcification in the aortic knuckle by >10mm is a useful sign.

Answers:

- (a) Not correct
- (b) Correct

- (c) Not correct
- (d) Not correct
- (e) Correct

Explanations:

Type A dissection involves the ascending aorta.

Ehlers-Danlos syndrome is associated with increased risk of aortic aneurysms and not dissection.

31. Which of the following are correct regarding renal artery stenosis:

- (a) There is an association with neurofibromatosis.
- (b) Fibromuscular dysplasia causes stenosis of the proximal renal artery.
- (c) There is elevation of the rennin levels on renal vein sampling of the affected kidney by 50%.
- (d) Duplex ultrasound is the investigation of choice.
- (e) On IVU, there is early appearance of contrast material in the affected kidney.

Answers:

- (a) Correct
- (b) Not correct
- (c) Correct
- (d) Not correct
- (e) Not correct

Explanations:

In FMD stenosis is more common in mid and distal renal artery. In atherosclerotic stenosis proximal artery is involved.

MRI is investigation of choice. Ultrasound is inadequate in 50% cases.

On IVU, there is delay due to reduced glomerular filtration rate.

32. Causes of oligoemia (decreased pulmonary blood flow) with cyanosis include:

- (a) Aortic atresia.
- (b) Truncus arteriosus.
- (c) Transposition of great vessels.
- (d) Total anomalous pulmonary venous return.
- (e) Tetralogy of Fallot.

Answers:

- (a) Not correct
- (b) Not correct
- (c) Not correct
- (d) Not correct
- (e) Correct

Explanation:

Aortic atresia, Truncus arteriosus, TGA and TAPVR show plethora with cyanosis.

33. Which of the following are correct regarding Goodpasture's syndrome:

- (a) Hilar lymph nodes may be enlarged.
- (b) Changes are commonly unilateral.
- (c) Prognosis is good.
- (d) Acute presentation is with air-space consolidation typically at the lung apices.
- (e) Signs of renal failure precede pulmonary complaints.

Answers:

- (a) Correct
- (b) Not correct
- (c) Not correct
- (d) Not correct
- (e) Not correct

Explanation:

Goodpasture's syndrome is bilateral with poor prognosis and death usually within 3 yrs of diagnosis.

Pulmonary involvement is before renal involvement with relative sparing of lung apices.

34. The following statements regarding pulmonary hamartomas are correct:

- (a) 5-10% undergo malignant transformation.
- (b) Calcification is seen in 30-35%
- (c) 80% are located endobronchially.
- (d) Central fat density is identified on Ct imaging.
- (e) 95% are identified in patients over 40 years.

Answers:

- (a) Not correct
- (b) Correct
- (c) Not correct
- (d) Correct
- (e) Correct

Explanations:

Pulmonary hamartomas are purely benign lesions with 90% presenting as intrapulmonary lesions within 2 cm of the pleura. Less than 10% of lesions are endobronchial.

35. Which of the following are correct regarding lymphangiomyomatosis (LAM):

- (a) Pulmonary abnormalities are similar to those seen in tuberous sclerosis.
- (b) It is found exclusively in females.
- (c) Cysts commonly have a bizarre outline.
- (d) Cysts show sparing of the apices.
- (e) There is an association with chylothorax.

Answers:

- (a) Correct
- (b) Correct

- (c) Not correct
- (d) Not correct
- (e) Correct

Explanations:

In LAM cysts are usually uniform and round with uniform distribution. Cysts in LCH have bizarre irregular outlines and show apical sparing.

36. Which of the following are correct regarding ventilation / perfusion imaging:

- (a) The ⁹⁹Tc-DTPA aerosol scan is performed before the perfusion study.
- (b) ⁸¹m-Krypton is the cheapest available aerosol for ventilation scanning.
- (c) Severe pulmonary hypertension is a contraindication to ventilation / perfusion scanning.
- (d) For the perfusion scan, the patient must remain in position for 15-20 minutes before particles become fixed in the lungs.
- (e) Blood should be drawn into the syringe prior to injection of radioisotope for perfusion scanning.

Answers:

- (a) Correct
- (b) Not correct
- (c) Correct
- (d) Not correct
- (e) Not correct

Explanation:

⁸¹m-Krypton is expensive with limited availability, but allows for a simultaneous V/Q scan.

Blood should not be drawn prior to injection of isotope to prevent clumping.

The patient should be in position for 2-3 minutes and then imaged in sitting position.

37. Causes of eggshell calcification of lymph nodes include:

- (a) Rheumatoid arthritis.
- (b) Silicosis.
- (c) Scleroderma.
- (d) Histoplasmosis.
- (e) Amyloidosis.

Answers:

- (a) Not correct
- (b) Correct
- (c) Correct
- (d) Correct
- (e) Correct

Explanation:

Rheumatoid arthritis rarely shows lymphnodal calcification.

38. Which of the following are correct regarding squamous cell carcinoma (SCC) at the lung:

- (a) Is the commonest lung tumour to cavitate.
- (b) Has the highest incidence of distant metastases.
- (c) Is the most likely cell type to cause a Pancoast tumour.
- (d) Is the most likely cell type to cause superior venous obstruction.
- (e) Is most often centrally located.

Answers:

- (a) Correct
- (b) Not correct
- (c) Correct
- (d) Not correct
- (e) Correct

Explanation:

Lung SCC has lowest chances of distant metastasis.

Small cell carcinoma is most likely to cause superior venous obstruction.

39. Which of the following are correct regarding bronchogenic cysts:

- (a) They are associated with spina bifida.
- (b) Mediastinal bronchogenic cysts account for 85-90%.
- (c) They may contain air fluid levels.
- (d) Mediastinal bronchogenic cysts are more common on the left.
- (e) Intrapulmonary bronchogenic cysts are found more commonly in the lower lobes.

Answers:

- (a) Correct
- (b) Correct
- (c) Correct
- (d) Not correct
- (e) Not correct

Explanation:

Mediastinal bronchogenic cysts are more common on the right side.

Intrapulmonary cysts are more common in upper lobes.

40. Features of pulmonary asbestosis include:

- (a) Increased severity in sub-pleural zones.
- (b) Hilar adenopathy.
- (c) Upper lobe massive fibrosis.
- (d) Thickened interlobular septa on HRCT.
- (e) Increased incidence of bronchio-alveolar cell carcinoma.

Answers:

- (a) Correct
- (b) Not correct
- (c) Not correct

- (d) Correct
- (e) Correct

Explanation:

Asbestosis shows lower lobe fibrosis with no hilar lymphadenopathy.

41. Causes of inferior rib notching include:

- (a) Coarctation of the aorta.
- (b) Systemic sclerosis.
- (c) Blalock-Taussig shunt.
- (d) Superior vena caval obstruction.
- (e) Neurofibromatosis Type 1

Answers:

- (a) Correct
- (b) Not correct
- (c) Correct
- (d) Correct
- (e) Correct

Explanation:

Systemic sclerosis does not cause inferior rib notching.

42. Which of the following are correct concerning lymphoma:

- (a) Lymph node calcification occurs.
- (b) Hodgkin's disease is more common in the chest than non-Hodgkin's disease.
- (c) Posterior mediastinal lymph nodes favour lymphoma rather than Sarcoidosis.
- (d) Intrapulmonary lymphoma can present with massive pneumonia – like lobar infiltrates.
- (e) Miliary nodules can be the presenting appearance on chest X-Ray.

Answers:

- (a) Correct
- (b) Correct
- (c) Not correct
- (d) Correct
- (e) Correct

Explanation:

In lymphoma anterior mediastinal lymphnodes are seen.

43. Which of the following are correct regarding Takayasu's arteritis:

- (a) External carotid artery branches are most commonly affected.
- (b) The mean interval between symptom onset and diagnosis is 2-4 months.
- (c) It is a recognised cause of fusiform aortic aneurysms.
- (d) Stenotic lesions are more commonly seen in the thoracic than abdominal aorta.
- (e) Ultrasound of the proximal common carotid artery shows circumferential thickening of the vessel wall.

Answers:

- (a) Not correct
- (b) Not correct
- (c) Correct
- (d) Correct
- (e) Correct

Explanation:

Takayasu's arteritis mainly affects main aortic branches and pulmonary arteries. External carotid artery involvement is seen in temporal arteritis. Interval between symptom onset and diagnosis is 8 yrs.

44. Which of the following are correct regarding pericardial disease:

- (a) Rheumatoid arthritis is a cause of pericarditis.
- (b) Elevation of the jugular venous pressure on inspiration is a sign of chronic pericarditis.
- (c) A pericardium of 3mm thickness is normal.
- (d) In chronic pericarditis, CT shows curvature of the interventricular septum to the right.
- (e) Renal failure is a cause of pericardial effusion.

Answers:

- (a) Correct
- (b) Correct
- (c) Correct
- (d) Not correct
- (e) Correct

Explanation:

Curvature of the interventricular septum to the left is seen in chronic pericarditis on CT.

45. Which of the following are correct regarding features of polyarteritis nodosa (PAN) include:

- (a) Multiple aneurysms.
- (b) Luminal irregularities.
- (c) Involvement of small veins.
- (d) Necrotising vasculitis involving the small and medium sized arteries.
- (e) Involvement of kidneys in 70-80%.

Answers:

- (a) Correct
- (b) Correct
- (c) Correct
- (d) Correct
- (e) Correct

Explanation:

PAN is a systemic inflammatory disease, commoner in males and presents around 5th to 7th decade of life. Main differentials include microscopic polyangiitis and SLE.

46. Regarding aortic transection (traumatic aortic injury), which of the following are correct?

- (a) The descending aorta is rarely involved.
- (b) The most common site is the ascending aorta.
- (c) The chest radiograph is normal in 30% of cases at presentation.
- (d) The 'left apical cap' sign is highly specific for aortic transection.
- (e) Chronic false aneurysm develops in 5% of cases.

Answers:

- (a) Correct
- (b) Not correct
- (c) Correct
- (d) Not correct
- (e) Correct

Explanations:

The most common site is aortic isthmus (95%). The ascending aorta is involved in 1% of cases.

The 'left apical cap' sign refers to mediastinal hematoma with extrapleural extension of blood (only 15% of mediastinal hematomas are due to aortic tear).

47. The following statements regarding alveolar cell carcinoma are correct:

- (a) Air bronchograms are a feature of both forms.
- (b) Growth is rapid.
- (c) It is associated with underlying pre-existing lung fibrosis.
- (d) The diffuse pneumonic form is commoner than the local mass form.
- (e) It is usually located subpleurally.

Answers:

- (a) Correct
- (b) Not correct
- (c) Correct
- (d) Not correct
- (e) Correct

Explanation:

Doubling time of alveolar cell carcinoma is longer than 18 months, thus slow growing.

Local mass form is more common. Pneumonic form accounts for 10% - 40 %.

48. The following statements regarding lymphangitis carcinomatosa are correct:

- (a) Chest X-Ray appearances are of multiple reticulonodular opacities.
- (b) It is associated with gastric cancer.
- (c) Kerley A and B lines are seen.
- (d) Radiological changes usually precede symptom onset.
- (e) Hilar adenopathy is seen in 80-90%

Answers:

- (a) Correct
- (b) Correct
- (c) Correct
- (d) Not correct
- (e) Not correct

Explanation:

Lymphangitis carcinomatosa presents with shortness of breath before radiological changes. Hilar adenopathy is seen in 20% - 50%.

49. Which of the following are correct regarding transposition of the great arteries (TGA)?

- (a) Pulmonary stenosis is an associated feature.
- (b) In the D loop of TGA the atria and ventricles have a normal morphological relationship.
- (c) Dextrocardia is associated with L loop of TGA.
- (d) Chest radiograph shows pulmonary plethora in D loop of TGA.
- (e) In the L loop (corrected) transposition there is physiologically corrected circulation.

Answers:

- (a) Correct
- (b) Correct
- (c) Correct
- (d) Correct
- (e) Correct

Explanation:

In the D loop of TGA the aorta arises from the right ventricle and the pulmonary artery from the left ventricle. A normal relationship exists between the atria and the ventricles.

In the L loop of TGA, there is transposition of the aorta and pulmonary arteries in addition to inversion of the left and right ventricles. The atria and coronary arteries are associated with their corresponding ventricles.

50. Regarding total anomalous pulmonary venous drainage (TAPVD), which of following are correct?

- (a) The supracardiac type is the most common.
- (b) The left atrium is not enlarged.
- (c) The infracardiac type may drain into hepatic veins.
- (d) There is an association with Scimitar syndrome.
- (e) Pulmonary oedema in presence of normal sized heart is a feature of Cardiac type TAPVD.

Answers:

- (a) Correct
- (b) Correct
- (c) Correct
- (d) Not correct
- (e) Not correct

Explanation:

Scimitar syndrome is the association of hypoplastic lung with congenital pulmonary venolobar syndrome where all or part of hypoplastic lung is drained via an anomalous vein into the subdiaphragmatic IVC, hepatic veins, portal vein or

coronary sinus.

Pulmonary oedema is a characteristic feature of infracardiac type TAPVD.

51. Which of the following are correct regarding coarctation of the aorta?

- (a) Adult coarctation is commonly associated with cardiac anomalies.
- (b) It is a rare cause of infantile heart failure.
- (c) The ductus arteriosus usually remains patent in adult type coarctation.
- (d) Rib notching is usually present by 1 yr of age.
- (e) A short segment of narrowing of ascending aorta is seen in infantile coarctation.

Answers:

- (a) Not correct
- (b) Not correct
- (c) Not correct
- (d) Not correct
- (e) Not correct

Explanation:

Adult coarctation is short narrowing at ligamentum arteriosum. It is rarely associated with cardiac anomalies and the ductus arteriosum is usually closed.

Aortic coarctation is second most common cause of infantile heart failure (most common is hypoplastic left heart).

Rib notching involves 3rd to 8th ribs and in 75% of cases seen in over 6 yrs of age.

UNIT – II

GASTROINTESTINAL SYSTEM

- Candida esophagitis occurs in upper & mid esophagus & shows longitudinally oriented filling defects on barium.
- Viral esophagitis due to herpes or CMV causes multiple discrete ulcers. CMV may show giant ulcers (>1 cm).
- Esophageal varices show serpiginous longitudinal defects on barium.
- Achalasia is due to failure of primary motility & absent relaxation of GE sphincter.
- A perforated Mallory Weis tear is Boerhaave's syndrome.

Boerhaave's syndrome is distal esophageal perforation due to vomiting or violent straining (can occur in alcoholics) and causes left hydropneumothorax, pneumomediastinum & surgical emphysema.

- Mucosal relief views on barium are suggestive of esophageal varices. Downhill varices usually involve upper half of the esophagus & uphill varices involves lower half.
- Irregular stricture should be a first consideration for carcinoma.
- Atrophic gastritis is associated with pernicious anemia & shows featureless tubular stomach, loss of parietal cells leading to achlorhydria.
- Peptic strictures are associated with hiatus hernia & show small mucosal ulcers.
- **Erosive gastritis is characterized by aphthoid ulcer in antrum & body of stomach that show central erosions collecting barium with mucosal mounds representing surrounding halo or lucencies.**
- *Menetrier's disease is characterized by hypertrophy of gastric folds affecting greater curvature & upper part of stomach with sparing of antrum. There is hypoproteinaemia, ankle edema & hypochlorhydria.*
- Lymphoma involves any part of the stomach body & antrum.
- Eosinophilic gastritis affects the stomach antrum & proximal small bowel.
- GIST presents as an extraluminal mass with heterogeneously enhancing margins & necrotic centre. Lymph nodes are not normally seen. PET uptake is seen.
- **Magenstrasse is normal longitudinal mucosal folds adjacent to lesser curvature of stomach on barium.**
- Bull's eye lesion in stomach is either carcinoma, GIST, melanoma metastasis & NF.
- *Achalasia cardia (increased by methylcellulose) gets relief of retrosternal pain by carbonated & hot drinks & amyl nitrate.*
- Post oesophagectomy there can be posterior ribs resection, a paramediastinal soft tissue density mass showing: air fluid level (due to anastomosing remnant esophagus with stomach). But a hydropneumothorax suggests leakage & hence a complication but not a normal finding.
- In esophageal cancer T3 suggests extension into adventitia/ serosa.
- Thickened mucosal folds of stomach alter their position & size in Menetrier's disease.
- Scleroderma causes smooth muscle atrophy causing hypoperistalsis in lower 2/3rd of esophagus. There can be esophageal dilatation with stricture and esophageal shortening.
- Type A & B Tracheoesophageal fistulas leads to gasless abdomen.
- Esophagus is not involved in Peutz Jegher's syndrome.
- Barrett's, squamous cell carcinoma, caustic substance ingestion & epidermolysis bullosa - all can cause mid esophageal stricture.
- Esophageal leiomyoma is a lobulated eccentric mass containing foci of calcification. They occur in young men in mid or lower third of esophagus.
- **Stomach distention is preserved in Menetrier's disease.**
- A palpable olive shaped mass is a sign of HPS.
- Target sign, nipple signs & wall thickness of > 3 mm is s/o HPS.
- Giant ulcer in esophagus in HIV patient is s/o CMV or Herpes (second choice).
- Dilated esophagus with attenuated peristalsis and widened GE junction with reflux is s/o scleroderma.
- Gastric banding is connected by tubing to a port anterior to rectus sheath. Band is perpendicular to GE junction & best assessed on AP x-ray view.
- Mallory Weiss tears are usually in lower 1/3rd of esophagus.
- *Gastric carcinoma involving posterior wall tends to involve pancreas first (body & tail).*

- *Anterior mid esophageal carcinoma tends to involve left main bronchus first.*
- Stomach GIST are seen above 50 yrs of age. They are heterogeneously enhancing exophytic mass with central necrosis.
- Gastric lymphoma shows preservation of perigastric fat planes (not seen in other tumors).
- Multiple small gastric ulcers & duodenal ulcers with a well-defined hypoechoic enhancing lesion in pancreatic head in s/o gastrinoma causing Zollinger Ellison syndrome.
- **Gastric carcinoma involving body & antrum is more likely to cause direct invasion of left lobe of liver (gastric lymphoma does not cause this).**
- In barium swallow for esophageal dysmotility, there should be avoidance of repeated swallowing as it will give false results.
- GIST shows “KIT” - a tyrosine kinase growth factor receptor.
- Cricopharyngeal Achalasia occurs due to impaired relaxation of cricopharyngeus & occurs at pharyngo - oesophageal junction (at C5-C6 level) with persistent smooth posterior bulge & mild proximal pharyngeal dilatation.
- Pharyngeal webs are thin shelf like anterior protrusions in cervical esophagus associated with Plummer Vinson Syndrome.
- Thyroid enlargement causes a smooth impression on the lateral wall of esophagus.

Five layers of esophagus on USG:

- *Innermost hyperchoic - interface of lumen & mucosa.*
- *Hypoechoic second layer - mucosa (malignancy staging - T1)*
- *Hyperchoic 3rd - Submucosa (T1)*
- *Hypoechoic 4th - Muscularis propria (T2)*
- *Hyperchoic 5th - Adventitia (T3)*

- NOTE - 5th layer in stomach, duodenum & rectum is serosa.
- Intramural esophageal pseudodiverticulosis is secondary to chronic inflammation causing dilated excretory ducts (flask shaped projection of barium extending perpendicular to esophagus).
- Zenker’s diverticulum/pharyngeal pouch is a pseudo diverticulum of posterior left hypopharyngeal wall between fibres of cricopharyngeus at level of C5-6. They appear as barium filled sac & causes halitosis, aspiration, segment & perforation.
- Traction diverticulae typically occurs in mid esophageal region & often due to mediastinal fibrosis associated with TB.
- Pulsion diverticulum occurs in epigastric region (lower 10 cm of esophagus).
- Killian Jamieson diverticulum is a true diverticulum located below the cricopharyngeus muscles anteriorly & laterally on left side or B/L. It is normally smaller (<1.5 cm) than zenker’s.
- **Idiopathic esophagitis shows a long stricture in lower esophagus with multiple distinct ring like indentations—“ringed” esophagus.**
- Peptic strictures cause incomplete fixed transverse folds with step ladder appearance due to trapping of barium between the fold.
- Nodal staging of gastric cancer
 - N1 = 1-6 nodes
 - N2 = 7-15 nodes } regional nodes
 - N3 = >15 nodes
- Non regional nodes such as para-aortic & retropancreatic nodes are considered M1.
- Incisura angularis lies between body & antrum of stomach.
- Gastric banding is an inflatable band across the proximal stomach, forming a small fundal, neo-stomach or pouch.
- Complication of gastric banding.
 - Acute concentric pouch dilatation due to band over-inflation. It requires prompt decompression of the obstructed stroma.
 - Chronic concentric pouch dilatation with widely patent stoma. It requires nutritional advice.
 - Eccentric pouch dilatation due to band slippage. It requires complete decompression & surgical replacement of band.

- Barium shows impaired mucosal coating due to hypersecretion in Menetrier's disease.

Benign ulcer

- *Projected outside the gastric contour*
- *Round*
- *Collar of edematous mucosa*
- *Gastric folds extending to the edge of ulcer crater*

Malignant

- *Does not extend beyond the confine of gastric wall*
- *Irregular*
- *Gastric folds do not extend to ulcer edge*

- Endoscopic USG is most accurate for staging of esophageal Ca.
- Lower esophageal sphincter is wide in scleroderma and narrowed in achalasia.
- Oesophageal leiomyomas show luminal abnormality on barium & shows coarse calcification.
- Bezoars are composed of poorly digested vegetable matter showing mottled appearance on barium. They are seen mostly in patient with previous gastric surgery due to diminished gastric emptying. They are mobile filling defects & may cause ball valve mechanism of obstruction.
- **Primary achalasia - reduced or absent peristalsis, dilated esophagus with smooth tapered distal narrowing, contracted lower esophageal sphincter, young patient, long duration dysphagia (several years).**
- **Secondary Achalasia - Due to malignancy, older age, short duration of dysphagia (few months).**
- **Presbyoesophagus is disorder of esophageal motility characterized by esophageal dilatation & repetitive, non-peristaltic tertiary contraction in distal oesophagus.**
- An enlarged left atrium & an aberrant left pulmonary artery can cause anterior indentation on esophagus.
- Multiple small superficial round ulcers in mid esophagus of HIV patient with normal intervening mucosa are seen in herpes esophagitis.
- Horizontally oriented oesophageal folds are s/o feline esophagus.
- *Normally there is change in mucosal appearance of esophagus at 1 cm above hiatus (Z line) & there is a slight narrowing (A line) at 2cm above hiatus due to vestibule & there is a distal bulge before the stomach.*
- Distance - teeth to hiatus is 40 cm. Origin of esophagus to hiatus is 25 cm.
- Symmetrical mound with smooth radiating mucosal folds are findings of benign ulcer. Scar retraction can also be seen.
- Oesophageal intramural pseudodiverticulosis shows multiple, tiny flask shaped collections of barium. Each diverticulum is perpendicular to lumen but all are arranged in longitudinal rows parallel to esophageal axis. They appear to "float" outside the esophagus. It is associated with diabetes & chronic alcoholism.

Uphill varices occur in lower esophagus conveying portal venous blood to azygous vein. They occur due to PV hypertension, SV thrombosis and obstruction of hepatic veins or IVC.

Downhill varices: → 1.If SVC is obstructed superior to the entry of Azygous vein, then varices are seen only in upper esophagus. 2.If SVC obstruction is below the entry of azygous then varices are seen throughout the length.

- **Borchardt triad: sudden epigastric pain, intractable retching & inability to pass a NGT. It is seen in gastric volvulus. There is markedly distended stomach & left upper quadrant is extending into the chest.**
- Epiphrenic (pulsion) diverticula occur on right lateral wall of distal oesohagus with hiatus hernia.
- **An interbronchial diverticulum is a traction diverticulum, occurs in interbronchial segment of esophagus due to adjacent fibrous adhesions due to TB.**
- **Lateral pharyngeal diverticula / pouch occur in wind instrument player due to increased pressure.**
- Zenker's diverticulum occurs between oblique & transverse fibers of cricopharyngeus (Killian's dehiscence).
- GE junction is identified by a thin shelf like ring known as B ring (Schatzki ring). 2-4 cm above this is the A - ring. Vestibule lies between A& B rings.
- Feline esophagus is due to spasm in muscularis mucosa & resolves itself.
- N2 grading is not present in esophagus carcinoma.

Polymositis & dermatomyositis involve upper 1/3rd of esophagus causing sluggish movement of barium into

oropharynx with patent & distended upper esophagus with normal lower esophagus. There can be retention of barium in vallecula with wide atonic pyriform fossa with regurgitation & nasal reflux.

- **Glycogen acanthosis is common condition affecting elderly. There are multiple, rounded plaques & nodules in mid esophagus on barium due to accumulation of glycogen in epithelial lining of esophagus. It is associated with Cowden's disease.**
- Intramural hematoma of esophagus shows an eccentric filling defect in esophageal wall on CT. There is no enhancement but HU value is 60-80 HU. It resolves in 1-2 months.
- In Barrett's, strictures are more common in distal > mid third rather than the classically described proximal third. Long stricture with fine reticular pattern adjacent to the distal aspect of stricture is seen & distal esophageal widening.

- Hemangioma shows no signal on color Doppler but centripetal enhancement on CT.
- Caudate lobe hypertrophy is seen in primary biliary cirrhosis.
- Focal hepatic steatosis occurs adjacent to GB, tip of segment IV & along ligamentum teres.
- **In hemochromatosis, liver is hyperdense on CT & hypointense on T2 & T1. There can be skin pigmentation, diabetes & arthralgia.**
- Hepatic FNH has a scar that shows late & prolonged enhancement.
- *Pyogenic liver abscess is far more common than amoebic abscess. Amoebic abscess shows septations and nodular walls.*
- Absent flow in one or more hepatic veins & IVC is due to Budd Chiari Syndrome.
- HCC derives its blood supply from hepatic artery. PV invasion is seen.
- Smaller HCC are homogeneously hypoechoic.
- Focal fatty sparing areas occur within GB fossa, falciform ligament & porta hepatis.
- Segment VI of liver lies at posterior & inferior aspect of right lobe.
- Hepatic adenoma shows rapid growth during pregnancy. It is a hypoechoic lesion with loss of signal on out of phase images. There is immediate intense enhancement with early washout.
- Carcinoid, melanoma, thyroid & renal metastasis are causes of hypervascular lesions in liver.

Hepatic artery thrombosis is the most common & serious early complication post liver transplant. Thrombolysis should be done. Parvus et tardus waveform may be seen distal to stenosis of hepatic artery with associated elevated systolic velocity at stenotic segment.

- PV thrombosis is less common in liver transplant, more common with HCC.
- Following USG guided liver biopsy, nearly 2/3rd complications occur in 2 hours & about 96% occur within 24 hours.
- Multiloculated cystic mass with few daughter cysts & echogenic debris (hydatid sand) is hydatid cyst.
- Punctate calcification occurs in majority of fibrolamellar liver Ca, but unusual in FNH.
- **Central scar of FNH is low on T1 and high on T2W1. But scar of fibrolamellar carcinoma is hypointense on T1 & T2W1.**
- Hepatic adenomas are seen in young women & associated with oral contraceptive use, mostly are solitary & large & found in right lobe. It contains fat & hence is hyperintense on T1.
- Portal vein gas is visualized in the periphery of liver & occurs due to small bowel infarction.
- Hyperdense liver as compared to spleen can be seen with use of amiodarone, cisplatin, hemochromatosis, Wilson's disease & glycogen storage disease.
- Resection of liver metastasis is contraindicated in case of peritoneal metastasis, non-treatable primary tumors, widespread pulmonary disease, loco-regional recurrence, extensive nodal disease and bone/CNS metastasis.
- Peripheral washout on delayed imaging is characteristic of hepatic malignancy & metastasis. All metastases are maximally enhancing in portal phase & shows ring enhancement on arterial phase.
- Liver adenomas are vascular lesions, may cause massive hemorrhage, active extravasation of contrast implying active bleed & hemoperitoneum. Urgent embolization is required.
- Nodular peripheral enhancement is seen in hemangioma.
- **HELLP syndrome in hemolysis, elevated liver enzymes & low platelets – causes liver infarction showing multiple wedged shaped non enhancing areas.**
- Fascioliasis is liver fluke infestation causing bile duct wall thickening & multiple hepatic abscesses.

Budd Chiari syndrome causes "flip-flop" enhancement in liver showing central liver enhancement in arterial phase & peripheral enhancement in delayed images. These can be associated with ascites, caudate hypertrophy, PV dilatation & hepatosplenomegaly.

- Calcified liver metastasis occurs rarely & most common cause is mucinous adenocarcinoma of GIT.
- Bright echogenic liver metastases are due to colonic adenocarcinoma & treated breast cancer.

- Regenerative nodules show high signal on T1W1.
- Hemangioma appears high signal on T2 & remains high even on long TE sequence.
- Early enhancement occurs in HCC.
- **Riedel's lobe of liver is a "tongue like" projection of anterior tip of right lobe of liver, extending below the right kidney.**
- Treated breast cancer metastasis to liver causes fine diffuse nodularity resembling cirrhosis (pseudocirrhosis).
- Chronic Budd Chiari syndrome, chronic PV thrombosis & pseudomyxoma cause coarse nodularity of liver.
- Delayed enhancement of the scar occurs in FNH & fibrolamellar carcinoma but scar calcifies in fibrolamellar Ca.
- There is 0.5% risk of tumor seeding down the needle track in case of HCC radiofrequency ablation.
- *Autoimmune hepatitis shows surface nodularity with enlarged preportal space.*
- Wilson's disease shows hyperdense nodules in liver on NCCT & honey combing pattern on T2W1.
- **Periportal fibrosis with signs of portal hypertension, splenomegaly & siderotic nodules are s/o hepatosplenic schistosomiasis.**
- Hepatic artery thrombosis is the most common complication of liver transplant.
- Contrast USG can be used for small HCC.
- Hepatic adenomas, HCC & FNH typically demonstrate uniform enhancement in the arterial phase.
- Acute hepatitis may appear normal mostly on USG & may appear diffusely hypoechoic.
- Post-transplant lymphoproliferative disorder occurs after one year of liver transplant & causes multiple new lesions. Low attenuation in liver with marked thickening of several small bowel loops.
- **Caroli's disease show multifocal segmental saccular dilatation of intrahepatic duct and ectasia of extrahepatic ducts. They occur in childhood & early adulthood & mostly are associated with medullary sponge kidney. On CT, multiple cystic structures with central enhancing dot represent portal vein radicles surrounded by dilated ducts.**
- Portal phase should begin (65-70 sec) after commencement of injection in spiral CT.
- When contrast is injected catheter angiogram veins, a "spider web" appearance of collateral vessels is diagnostic of Budd Chiari syndrome.
- Radiofrequency ablation of HCC normally causes transient peri-ablation hyperemia, tiny air bubbles & antero-portal shunting. A "mural nodule in cyst" indicates biloma - is a complication not normally seen.

RI of hepatic artery is 0.55 - 0.7, lower or higher value than this is abnormal. Stenosis causes high RI proximal to stenosis with reduction of end diastolic velocity disproportionately more than the peak systolic velocity before the stenosis at or immediately distal to stenosis; there is turbulent flow & jet phenomenon causing ↑↑ PSV & EDV with spectral broadening. Distal to stenosis, there is reduced PSV with tardus parvus waveform with low RI.

- SPIO2 are reticulo-endothelial agents that are phagocytosed by kupffer cells. Hence normal liver & FNH are hypointense on T2 & T2*W1. HCC & other appear relatively hyperintense automatically.
- Mangafodipir trisodium is a manganese based contrast that causes normal liver, FNH & bile ducts to appear bright on T1. Tumors appear hypointense.

Osler Weber Rendu syndrome or HHT shows angiodysplastic lesion in which there is communication between arteries & vein showing tortuous & prominent intrahepatic/extrahepatic arteries with early filling of dilated hepatic vein & IVC arterial phase shows mosaic pattern of liver with multiple enhancing foci in porto-venous phase, there is homogenous enhancement of liver.

- **Segments III, IVb, V & VI lie below the portal branch veins.**
- **Segment IVa, VII, VIII & II lie above the portal branch veins.**
- **Left hepatic vein divides left lobe into medial & lateral segments.**
- **Right hepatic vein divides right lobe into anterior & post segments.**
- **Segment caudate I lies posterior & to the right of IVC.**
- Amoebic abscess is common in countries of far-east occur in younger population shows well-defined lesion with internal echoes & acoustic enhancement.
- Pyogenic liver abscess are poorly defined with irregular wall.
- Thorotrast causes increased density of liver & spleen (seen in elderly patient since this contrast was used in 1950s).

- Hemochromatosis also causes dense liver & spleen but seen in younger age group.
- Budd Chiari causes hepatosplenomegaly with non-visualization of hepatic veins or thrombus within. Flip flop liver enhancement (early images showing central & delayed images showing peripheral enhancement) is seen.
- Caudate lobe is spared and hypertrophied in Budd Chiari due to separate IVC drainage.
- Normal liver is hypointense on T2WI after SPIO2 administration. HCC and other tumors are relatively hyper (hence signal intensity remains unchanged after SPIO2).
- Intrahepatic bile ducts are dilated when they exceed 40% of diameter of adjacent portal veins. Upper limit of normal extrahepatic bile duct is 5 mm (increases by 1 mm/decade after 60 yrs.).
- Falciform ligament divides right & left subphrenic spaces.
- Acute hepatitis causes decreased liver echogenicity with thickened GB wall.
- Acute subcapsular hematoma or hemoperitoneum can be seen with hepatic adenoma but not with FNH.
- *Tc 99 labelled sulphur colloid scan shows increased uptake of FNH (kupffer cells), liver abscess & normal liver but decreased uptake of adenoma.*
- TIPS joins PV & hepatic vein.
- Normally, post liver transplant shows mild perihepatic fluid, right pleural effusion & periportal edema that resolve in few weeks.
- *PV velocity is 12-30 cm/sec & flow is little or non pulsatile & hepatopetal flow with respiratory variation. PV flow is reversed in late stage of PV hypertension with reduced PV diameter.*
- PV thrombosis shows absent flow. Cavernoma of PV may occur chronic PV thrombosis representing a conglomerate of collateral veins.
- Calcified liver metastases are due to mucinous carcinoma of GIT. Other less common causes are osteosarcoma, carcinoid, breast carcinoma & lung carcinoma.

Transient hepatic intensity difference (THID) on MRI or transient hepatic attenuation difference (THAD) on CT is a pseudolesion due to alteration in hemodynamics causing enhancement in arterial phase but no abnormality on portal or venous phase. Features are peripheral location, wedge shape, straight margins & normal vessels coursing through the area.

- Mottled appearance or uptake of a hepatic lesion on PET is hemangioma.
- **Budd Chiari syndrome (causes narrowed IVC & HV) never causes dilatation of IVC or hepatic veins but passive hepatic congestion occurs due to elevated right atrial/central venous pressure causing impaired venous drainage from liver. (Dilated IVC & hepatic veins with retrograde enhancement on arterial phase and delayed enhancement on portovenous phase).**
- Portal vein air can be due to mesenteric infarction, acute bowel obstruction, perforated duodenal ulcer & due to complication of barium enema.
- Regenerative hepatic nodules enhance in arterial as well as portal & venous phases with uptake of hepatocellular & SPIO2 agent (have normal kupffer cells)
- *Right hepatic artery can arise from SMA as a variant.*
- No scar is seen in hepatic/hepatocellular adenoma.

- Primary sclerosing cholangitis shows dilated intrahepatic & extrahepatic ducts with multifocal strictures & small diverticulae formation.
- *In adenomyomatosis there is underlying increase in number & height of mucosal folds in GB. Cholesterol crystals precipitate in the bile & are trapped in Rokitansky-Aschoff sinuses giving comet tail reverberation artifact on USG.*
- Bright echogenic area in GB fundus with acoustic shadowing in absence of calculus is s/o emphysematous cholecystitis (air is bright on USG).
- Primary sclerosing cholangitis is common in young men with IBD (associated with Ulcerative Colitis more than Crohn's). Other associations are pancreatitis, liver cirrhosis & hepatitis.
- In primary biliary cirrhosis, intrahepatic ducts can be dilated but not extrahepatic ducts.
- **Choledochal cyst shows photopenic area (dilated CBD & CHD) in liver with lack of small bowel activity on HIDA scan.**
- **Congenital biliary atresia shows lack of small bowel visualization but whole liver would take up on HIDA.**
- Biliary tree gas is typically more prominent centrally & spares the periphery of liver & occurs due to gall stone ileus or cholecysto-duodenal fistula.
- *Rigler's triad: small bowel obstruction, gas in biliary tree & visible stone in small intestine.*
- Klatskin tumors are most common form of cholangiocarcinoma. A hyperchoic central porta hepatis mass on USG is typical with dilated hepatic ducts & normal caliber of CBD.

Multiple fine linear projections perpendicular to esophageal lumen on barium with a tapered stricture is s/o esophageal intramural pseudo-diverticulosis. They may float outside the esophagus when no communication with lumen is seen.

- **Mirizzi's syndrome is narrowing of common hepatic duct caused by gallstone imported in GB neck or cystic duct. It is associated with acute cholecystitis.**
- CBD always drain into major papilla.
- Iohexol does not cause increased risk of biliary tract malignancy (Thorotrast does cause).
- Acalculous cholecystitis may show layer of echogenic material within the lumen & GB can be surrounded by a rim of fluid.
- *Cholangiocarcinoma is unresectable if it involves main PV or hepatic artery, both right & left hepatic arteries, PV branch to one lobe & hepatic artery branch to another lobe.*
- GB fossa mass with no visible GB with hilar biliary obstruction is s/o gall bladder Ca. There is peripheral enhancement with LNs at porta.
- Metallic biliary stents should only be used in inoperable tumor as they cannot be subsequently removed.
- Linear hyperchoic structures in segment of liver suggest pneumobilia.
- Non visualization of GB after 2 hours is consistent with acute cholecystitis on scintigraphy. Normal GB is visualized after 20 minutes.
- Choledocoele is cystic dilatation of intra duodenal part of CBD.
- **Metallic biliary stents have a large internal diameter & have high long term patency & have low surface area (all are advantages).**
- Primary sclerosing cholangitis (PSC) shows multiple biliary strictures with small diverticulae. There is significant risk of developing cholangiocarcinoma.
- *Murphy's sign is unable to breathe deeply when (guarding on deep palpation) probe is pressed firmly over the GB in case of acute calculus cholecystitis.*
- In Mirizzi's syndrome, a gallstone in the cystic duct produces mass effect on the common bile duct forming a stricture & maybe a fistulous formation with intrahepatic biliary dilatation.
- A history of inflammatory bowel disease is associated with significantly increased risk of cholangiocarcinoma.
- **In acute cholecystitis, there is non-visualization of GB at 1 hour & 4 hours on HIDA scan.**
- **Non visualization of GB at 1 hour but seen at 4 hours is s/o chronic cholecystitis.**

- Morphine can be used in HIDA scan to relax the sphincter of Oddi. In acute cholecystitis GB is not seen at 30 mins following morphine administration.
- Axial T2 steady state GE sequence is used to differentiate pneumobilia from bile duct calculi since bile air leads to air fluid levels seen on axial images.

Xanthogranulomatous cholecystitis is caused by rupture of Rokitansky – Aschoff sinuses with subsequent intramural leak of bile causing an inflammatory reaction. It is associated with GB carcinoma in 10% of cases.

- Cholesterosis (strawberry GB) is accumulation of cholesterol esters in lamina propria of GB wall.
- Cholesterol polyps are small echogenic lesions adjacent to GB wall, with no change in position.
- For hilar bile obstruction, MRCP is investigation of choice. But for below hilar obstruction CT is investigation of choice.
- Primary sclerosing cholangitis shows “string of beads” appearance on cholangiography with alternating segments of dilatation & stenosis.
- *Glucagon increases bile flow & hence improves visualization of biliary tree at MRCP.*
- *Secretin is given prior to MRCP for better visualization of pancreatic duct system, since it stimulates pancreatic secretions & increases the tone of sphincter of Oddi.*
- Xanthogranulomatous cholecystitis shows multiple hypoattenuating intramural nodules & fibrosis due to rupture & extravasation of bile & mucous, following occlusion of Rokitansky-Aschoff sinuses.
- In gallstone ileus, obstruction is at the level of terminal ileum but fistula is seen between GB & duodenum.
- **Emphysematous cholecystitis causes curvilinear high echoes in GB wall with reverberation artifacts with echoes in lumen.**
- In Mirizzi’s syndrome there is calculus at cystic duct or GB neck with extrinsic compression of CHD with proximal dilatation of CHD & dilated IHDs. CBD is normal.
- Biliary plastic stents should be used in all cases except for inoperable malignancy.
- Klatskin tumor is a cholangiocarcinoma. It shows delayed enhancement.
- **Curvilinear echogenic line at GB margins with posterior acoustic shadowing that does not change with patient positioning is s/o porcelain GB.**

- Pancreatic divisum is the most common variant of pancreas. Dorsal duct drains into minor papilla & ventral duct with CBD drains into major papilla.
- **Insulinoma is enhancing lesion and causes starvation, recurrent hypoglycemia & loss of consciousness and relief with glucose.**
- Arterial stimulation & venous sampling is most sensitive test for localization of islet cell tumours of pancreas.
- Serous cystadenoma of pancreas is associated with VHL.
- Mucinous cystadenoma of pancreas contains large cysts (>20 mm each).
- Localized paralytic ileus in pancreatitis is sentinel loop sign.
- Primary hyperparathyroidism can cause acute pancreatitis with pancreatic calcification & renal calculi.
- Hereditary pancreatitis causes round, loose calcifications.
- **Transplanted pancreatic exocrine secretion often drains into urinary bladder because of direct anastomosis of duodenum with UB.**
- Carcinoma of pancreas is stage T3 if lesion extends beyond the boundary of pancreas. It is T4 if it invades coeliac axis or SMA.
- *Splenic injuries are associated with ipsilateral rib fractures.*
- **Insulinoma & gastrinoma, both are enhancing tumors but majority of insulinomas are less than 1 cm in size & gastrinomas are generally large (> 3 cm).**
- Pancreatic islet cell tumor & pheochromocytomas also cause hypervascular liver metastasis.
- Intraductal papillary mucinous tumor (IPMT) of pancreas occurs in elderly & can be a cause of recurrent pancreatitis.
- IPMT shows pancreatic atrophy with no calcification but dilated branch ducts & maybe main duct.

Surgery of pancreatic adenocarcinoma is absolutely contraindicated if hepatic artery is involved. Invasion of portal vein or splenic vein is relative contraindication unless they are completely occluded. Other absolute contraindications are distant metastasis, ascites, distant organ invasion, SMA/coeliac/aortic invasion.

- Gastrinoma is hyperintense on STIR images.
- In spleno-gonadal fusion, there is accessory splenic tissue attached to the left ovary or testis.
- Splenosis occurs following trauma.
- Intraductal calcification is seen in chronic pancreatitis.
- 80-90% of symptomatic pancreatic cystic lesions are pseudocysts.
- **90% of mucinous cystadenoma/ adenocarcinoma occur in body & tail region but serous cystadenomas can occur anywhere.**
- Metastasis to pancreas occurs in renal cell Ca.
- Cysts < 2cm separated by fibrosis septae coalescing into a central scar are seen in serous cystadenoma of pancreas.
- Glucagonoma & mucinous adenocarcinoma occur in body & tail of pancreas but somatostatinoma occur in head.
- **VIPoma causes watery diarrhea & hypokalemia & is mildly hypervascular.**
- IPMT can vary from hypoplasia to invasive carcinoma. Parietal nodules & focal wall thickening are indication of malignancy.
- 40 %-60% of cystic pancreatic lesions resolve spontaneously (mostly are pseudocysts).
- Pancreas is supplied by splenic artery (mainly), superior pancreaticoduodenal (part of gastroduodenal artery) & inferior Pancreaticoduodenal (part of SMA) artery.
- Massive splenomegaly with anemia & weight loss is seen in CML.

Splenic cysts are true & false pseudocysts due to presence & absence of epithelial lining. True cysts (20%) are either parasitic cysts or epidermoid cysts. Pseudocysts (80%) are mostly post traumatic & show mural calcification.

- Glucagon is a hypotonic agent used in barium enema examination. It is contraindicated in insulinoma &

pheochromocytoma.

- Neck of pancreas lies anterior to confluence of splenic vein & SMV on USG. Left renal vein passes between aorta & SMA.
- Islet cell tumors are solid tumor.
- *Central stellate scar containing dystrophic calcification is seen in serous cystadenoma of pancreas.*
- Splenunculum is accessory spleen.
- Wandering spleen is normal spleen positioned abnormally due to laxity of splenic ligaments.
- Abdominal pain with an appendicolith indicates 90% probability of acute appendicitis. But an appendicolith is seen in only 7-15% of acute appendicitis.
- Necrolytic migratory erythema is a skin condition strongly associated with glucagonoma.
- USG is indicated in mild pancreatitis when serum amylase is <1100.
- Post traumatic false cyst in spleen shows a thin wall with curvilinear rim calcification & contains low level internal echoes.
- In sarcoidosis involving spleen, there is splenomegaly > hypotenuating nodules.
- IPMT may show a T2W filling defect in pancreatic duct, likely to be tumor or concretion of mucin.
- **Groove pancreatitis is a form of chronic pancreatitis due to inflammation in pancreatico- duodenal groove with duodenal & biliary obstruction with small cystic lesions in duodenal wall.**
- **Autoimmune pancreatitis shows a diffusely enlarged gland with loss of lobular architecture, a “sausage” shape & a peripheral ‘rind’ of hypoattenuation. PD can be narrowed diffusely.**
- Cystic fibrosis causes lipomatous pseudohypertrophy of pancreas or atrophic fibrosis of pancreas.
- *Shwachman- Diamond syndrome shows pancreatic exocrine insufficiency, bone marrow dysfunction & skeletal abnormalities. It presents in infancy & early childhood.*

<i>CT grading of pancreatic injury:</i>	
◦ <i>A- Superficial laceration (< 50% pancreas thickness)(Supportive therapy)</i>	} <i>Duct is injured hence surgery or ERCP stenting is required.</i>
◦ <i>B₁- deep laceration (>50%)</i>	
◦ <i>B₂- Transaction of tail</i>	
◦ <i>C₁- Deep laceration of head</i>	
◦ <i>C₂- Transaction of head</i>	

- Pancreas, 2nd& 3rd parts of duodenum, ascending & descending colon lie in anterior pararenal space.
- Splenic laceration or subcapsular hematoma can be seen on imaging but radiological findings are not reliable in determining the need for a laparotomy.

Grading of splenic injuries:

- *I → Subcapsular hematoma < 25% of splenic surface or a laceration < 1 cm deep.*
- *II → Hematoma 25 - 50% or laceration <3 cm.*
- *III → hematoma > 50% (10 cm) or laceration >3 cm.*
- *IV → laceration extending into hilum with devascularization of 25% of spleen.*
- *V → shattered spleen with vascular avulsion & multiple lacerations.*

- **Blood gas shows metabolic acidosis in ischemic colitis. There is colonic wall thickening(>5 mm) in watershed area with non-enhancing mura or either dense mura due to hemorrhage. Pneumatosis coli, portal vein gas & perforation may also occur.**
- “Bird of prey” sign is seen in sigmoid volvulus.
- Peutz Jegher’s syndrome presents as mucocutaneous pigmentation, GIT polyposis. Polyps may lead to small bowel intussusception & anemia.
- Colonic polyposis with osteomas of skull & mandible, epidermoid cysts, abnormal dentition and desmoid tumors occurs in Gardner syndrome (now part of FAP).
- *FAP shows at least hundreds of polyps. It is autosomal dominant & polyps present around puberty & so patient presents mostly before 35-40 years and almost all patient have duodenal adenomas.*
- Turcot syndrome is a rare association between colonic carcinoma, polyps & medulloblastoma / glioblastoma.
- Adult intussusception is idiopathic, mostly due to polyps.

Duodenal diverticulum occurs along the medial concave wall of 2nd & 3rd part of duodenum & shows a filling abnormality with “two duodenal lamina” and medial displacement of pancreatic head.

- Carcinoids mainly affect terminal ileum & produce a desmoplastic reaction.
- **Mucocoele of appendix is a chronic cystic dilatation of the appendiceal lumen due to mucin collection. It is anechoic or hypoechoic & appears cystic with no surrounding inflammation.**
- Duodenal duplication cysts do not communicate with the lumen.
- Typhlitis occurs in neutropenia due to previous history of leukemia or other cancer with chemotherapy.
- Post inflammatory polyps adhere to colon by their bases and are seen in ulcerative colitis.
- Graded compression USG for appendicitis has a sensitivity of 75-90% and specificity of 86-100%.
- **Presence of severe ulceration leading to mucosal islands is a major sign of toxic megacolon. Other features are transverse colon dilatation >5 cm & caecum >9 cm.**
- Presence of haustrations in a dilated viscus & gas in appendix are features of Cecal volvulus.
- *In systemic sclerosis there is “hide bound” appearance of small bowel showing dilatation with increased number of valvulae conniventes.*
- Acute symptoms are poor (not accurate) predictors of chronic radiation enteritis. The valvulae conniventes are thickened in acute radiation enteritis & distal jejunum & ileum are most common sites. In chronic stages, bowel develops submucosal thickening & adhesions with fistulae.
- Endo-anal USG allows an accurate assessment of four layers of anal wall, mucosa, submucosa, muscularis propria & anal sphincter.
- Endometriosis may involve sigmoid colon or pelvic bowel loops showing an irregular appearance of the wall with mild extrinsic mass effect. There can be intermittent rectal bleeding.
- Perforation is a risk factor in Typhlitis & hence contrast is avoided.

Pelvic overlap & liver overlap are signs of sigmoid volvulus. Apex lies high in the abdomen underneath the left hemidiaphragm typically above level of T10.

- Cronkhite Canada & Peutz Jegher’s syndrome causes hamartomatous polyps in bowel & stomach.
- Cowden syndrome shows hamartomatous polyps in rectosigmoid area.
- **Small bowel polyps are not seen in Turcot syndrome.**
- Small bowel enteroclysis is choice of modality for low grade obstructions.
- Ulcerative colitis & pseudomembranous colitis involve rectum mostly.
- Infectious colitis does not normally affect the left sided colon.
- Ischemic colitis affects a segment of colon (mostly left sided, sparing rectum) with mucosal hyper-enhancement. Acute abdominal pain occurs.
- Jejunal dilatation with jejunalisation of ileal loops is s/o coeliac disease.

- In Whipple's disease, there is thickening of jejunum & duodenal mucosal folds but no luminal dilatation.
- **Toxic megacolon shows transverse colon dilatation > 5.5 cm, loss of normal haustral fold, thumbprinting of colon & presence of mucosal islands(pseudopolyps).**
- **Pseudo-diverticulae and pseudosacculations with rectal sparing is seen in Crohn's disease.**
- Giardiasis occurs in AIDS patient & shows thickened jejunal folds with nodularity & marked jejunal spasm. CMV affects caecum.
- Mycobacterium avium intracellulare involves ileum & jejunum but does not cause spasm.
- Cryptosporidium causes duodenal & jejunal dilatation.
- Celiac disease causes jejunal dilatation with normal mucosal folds.
- Amyloid causes dilatation with diffuse thickening of valvulae conniventes throughout small bowel.
- Whipple's & eosinophilic gastroenteritis cause mucosal thickening without dilatation.
- Small bowel Carcinoid shows eccentric calcifications & tethering of small bowel loops with thickened mesentery away from the soft tissue mass with beading of mesenteric vascular bundles.

On USG of intestine -

- *Inner hyperechoic - mucosa balloon interface*
- *Inner hypoechoic - mucosa*
- *Middle hyperechoic - submucosa*
- *Outer hypoechoic – Muscularis propria*
- *Outer hyperechoic - serosa*

- Lymphoma of GIT affects ileum causing circumferential thickening& dilatation with adjacent LNs.
- Lymphoma & intussusception associated with celiac disease affects jejunum.
- Appendix perforation is suggested by loss of visualization of hyperechoic submucosa, adjacent fluid collection & gas bubbles near appendix.
- Stricture formation with barium sacculation, mucosal thickening with low attenuation target sign appearance of proximal descending colon with sparing of right colon & rectosigmoid is s/o ischemic colitis.

Pseudomembranous colitis occurs due to Clostridium Difficile due to broad spectrum antibiotics use & shows ascites (mostly) with wall thickening(>10 mm) with a layered pattern of enhancement causing low attenuation submucosa due to edema & enhancing mucosa. Accordion sign with thickening of haustra is seen. Rectum is mostly involved.

- Pseudotumour, “pseudokidney” & “target sign” are seen in intussusception.
- Colonic pseudo-obstruction does not show any stricture.
- **Red cell scintigraphy is most sensitive in detecting active GI bleed (0.1ml/min can be detected). Catheter angiography can detect only 0.5 ml/min.**
- Colonic wall thickening is the commonest finding in pseudomembranous colitis (PMC).
- Fibrofatty mesenteric proliferation around involved colon is seen in Crohn's and not in PMC.
- **Axial T1W fat-sat before & after contrast are required to differentiate rectal tumor recurrence & fibrosis due to chemotherapy. Peripheral enhancement with central necrosis is seen in recurrence.**
- “Shock Bowel” refer to increased small bowel mucosal enhancement with mural thickening >3 mm.
- Bullous swelling involving the distal third of appendix is seen in carcinoid however adenocarcinoma involves proximal third & causes diffuse thickening of appendix wall.
- Increased permeability of blood flow/volume & decreased mean transit time (MTT) is seen in colonic tumor rather than diverticulitis.
- Duodenal diverticulum arises from medial wall in D2 segment & is mostly asymptomatic.
- Intraluminal hematoma causes smooth, regular & thickened folds in non-dilated small bowel.
- *Scleroderma, strongyloides & cystic fibrosis are causes of decreased/absent folds in small intestine.*
- Post radiotherapy, urinary bladder & rectum are thickened & edematous showing increased T2W1.
- **Meckel's diverticulum shows a single layered wall and duplication cyst shows a double layered wall.**
- **Colonic lipoma typically changes shape when compressed & is called as “squeeze sign”.**
- *Yersinia infection shows thickening of distal ileum with thickened valvulae & nodular filling defects due to lymphoid hyperplasia.*

- A polyp is of homogenous attenuation.
- Bowel wall thickening, lack of enhancement, adjacent fluid & Pneumatosis intestinalis are all signs of ischemia or strangulation in small bowel obstruction.
- 10% of small bowel obstruction (SBO) are due to hernias.
- Transition point is seen in case of obstruction due to adhesion.

Majority of strictures in ulcerative colitis are benign. In patients with UC, colorectal carcinoma typically arises from dysplastic changes & not from tubular adenoma.

- Pericolic fat stranding may or may not occur in Epiplioic appendagitis.
- *Pseudomembranous colitis often shows ascites, mucosal enhancement, wall thickening with mild pericolic fat stranding.*
- Cyst like gas pocket in hemicolon is s/o Pneumatosis cystoides intestinalis (pneumatosis coli).
- CT colonography is a safe technique done in supine & prone positions. Buscopan is used prior to gas insufflation. IV contrast is used only in symptomatic patient.
- Acute sigmoid diverticulitis shows thickened long segment with mesenteric stranding & small fluid collection. Recurrent disease seen in elderly. There is pyrexia with elevated inflammatory marker & WBC with tender left iliac fossa.
- **Turcot syndrome shows 100s of polyps of in colon (like FAP) with CNS tumor (medulloblastoma or GBM).**
- Earliest sign of active inflammation in Crohn's disease is mucosal hyper-enhancement. In later stage, this feature combines with submucosal edema gives a "stratified" appearance. Serosal hyper-enhancement may also be seen producing "target" sign.
- Segmentation & flocculation of barium in small bowel are s/o malabsorption.
- Due to celiac disease there can be dilatation, glandular appearance & jejunal – ileal reversal.
- *"Moulage" Sign of celiac disease refers to smooth tubular appearance of jejunum.*
- Whipple's amyloidosis & ischemic colitis cause thickening of small bowel loops.
- On a prone scan during CT colonography, the rectosigmoid is better distended by CO2 but other structures like caecum & transverse colon are seen better on supine.
- **Lymphoma of small intestine causes nodular thickening of mucosal folds to large masses with aneurysmal dilatation of small bowel segment.**
- In adults, a focal intraluminal abnormality with a mass within the colon with concentric rings of soft tissue & fatty attenuation with congestion of mesenteric vessels into the lesion is colo-colic intussusception secondary to lipoma of colonic wall.
- In children, 90% of intussusception are idiopathic.
- **Whipple disease, celiac & TB causes LNs with central low attenuation (necrosis in TB & high fat content in Whipple's & celiac).**
- Celiac disease commonly causes LNs with central cavitory areas but if it is complicated by lymphoma, no central low attenuation is seen.
- TB in AIDS disease causes ascites, peritoneal thickening, small bowel mural thickening with LNs.
- *Cryptosporidiosis is the most common cause of enteritis in AIDS disease patient. It causes thickening of duodenum & jejunum with LNs.*
- *CMV in AIDS disease causes terminal ileitis like Crohn's disease.*
- Amoebiasis causes right colonic wall thickening with liver abscess.
- Indium labeled WBC scintigraphy can be performed at 2-6 (> 4 hours) hours to look for suspected inflammatory bowel disease.
- TB causes longitudinal ulcer in the terminal ileum & transverse in colon.

Radiation injury to the rectum causes narrowed rectum with symmetrical wall thickening, perirectal inflammatory change, thickening of perirectal fascia with increased AP diameter of presacral space.

- **Villous adenomas are (10%) subtype of adenomatous polyps, showing broad based lesion often over 2 cm with frond like surface projections. They cause electrolyte depletion.**
- **Tubular adenomas are typically <10 mm & do not cause electrolyte depletion.**
- Solitary rectal ulcer syndrome is seen in young women & shows a polypoidal lesion with ulceration.
- Staging of rectal tumor requires T2W1 on MRI.

- GI scleroderma shows prolonged transit time, dilated loops of small bowel with normal appearing valvulae & pseudodiverticulae.
- Deep penetrating ulcers are seen in Behcet syndrome.
- *Trans-mesenteric hernia is herniation of small bowel through a defect in mesentery & is compressed against the abdominal wall. Associated with previous abdominal surgery. Some degree of compression, crowding displacement & obstruction of both bowel & blood vessels is seen. Non encapsulated dilated bowel loops are seen.*
- *In right sided paraduodenal hernia, it occurs via the jejunal mesenterico-parietal fossa of Waldeyer. A cluster of dilated small bowel loops is seen lateral & into descending duodenum.*
- *In left sided paraduodenal hernia is via the mesenteric fossa of Landzert, close to ligament to Treitz. A sac like mass of dilated bowel lateral to ligament of Treitz which displaces & indents the adjacent stomach & transverse colon.*
- Accordion sign of PMC is trapping of oral contrast between the edematous haustral folds causing alternate bands of high & low attenuation.

Celiac disease is due to alpha gliadin component of gluten causing small bowel villous atrophy. Dilated proximal small bowel with segmentation, flocculation of barium with dilution of barium due to hypersecretion of fluid.

- Pseudomembranous colitis mostly involves entire colon and ischemic colitis is segmental & affects watershed areas.
- UC causes circumferential involvement as compared to Crohn's. Thickened ilio-caecal valve is seen in Crohn's but a patulous valve is seen in UC.
- Vertical band like narrowing of third part of duodenum occur in SMA syndrome.
- **In SMA syndrome angle between SMA & aorta is 10-22° (normal is 45-65°). Patient gets relieved by lying prone or knee elbow position.**
- **Duodenal duplication cysts cause extrinsic compression of first & second parts of duodenum. Diverticulae arises from 2nd & 3rd part.**
- **Ladd's disease is associated with Malrotation & cause obstruction of second part of duodenum usually seen in infants & children.**
- Commonest cause of pneumoperitonium is perforated duodenal wall ulcer.
- Haustral markings are usually present in caecal volvulus.
- Malignant melanoma metastasis cause multiple submucosal nodules with central ulceration in small intestine stomach colon.
- Muco-cutaneous pigmentation is seen in Peutz Jegher's syndrome. Associated hamartomatous polyps & intussusception are seen.
- Appendiceal carcinoids are 50% of all carcinoids. They do not cause metastasis.

Carcinoids - 33% in small intestine

- *33% multiple*
- *33% malignant*
- *33% with secondary malignancy*

- Size of the carcinoid tumor is related to the risk of metastatic spread.
- Colorectal carcinoma causes mucosal ulceration but colon diverticular disease does not show mucosal ulcer.
- Low attenuating LNs showing fat fluid levels with splenic atrophy is seen in celiac disease.
- **Cimetidine, glucagon & pentagastrin increase the uptake of TC99pertechnetate & hence improve visualization of Meckel diverticulum.**
- Fibrosing colonopathy occurs in cystic fibrosis patients taking high dose lipase supplements. There is stricturing & longitudinal shortening of right colon.
- In angiodysplasia, there is degenerative dilatation of normal vessels in submucosa of bowel wall, mostly in right colon. Barium enema study is mostly normal.
- Stacked coin appearance of small bowel is seen due to intramural hemorrhages in HSP.

Systemic sclerosis of small intestine causes tightly packed folds of normal thickness in dilated portion of bowel. Dilated duodenum (mega duodenum) is also seen. There is Pneumatosis intestinalis & increased transit time.

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- Appendix perforation leads to adjacent abscess formation, extraluminal gas & small bowel ileus.
 - Small bowel mural hyperdensity is a feature (due to vasodilatation) in early ischemia.
 - Wall thickening in small bowel obstruction is due to increasing capillary permeability. Lack of enhancement occurs when bowel dilates & compresses the capillary bed.
 - Oral contrast is not always mandatory to demonstrate intestinal obstruction.
 - Total colonic resection with J pouch anastomosis is carried out in patients with ulcerative colitis or FAP (not in Crohn's). Pouchitis & small bowel obstruction both occur in upto 30% of patients.

- Hepatosplenomegaly is caused by Non-Hodgkin's lymphoma & not Hodgkin's.
- Spigelian aponeurosis lies between linea semilunaris laterally & rectus muscle medially.
- Ventral hernia occur through linea alba.
- **Intramuscular desmoid tumours are low signal on T1 & T2W1. There is usually a history of abdominal surgery & lesions are "rock hard" with mild enhancement.**
- *Pseudomyxoma peritonei are secondary to ruptured adenocarcinoma appendix. It causes scalloping of liver & spleen margins with low attenuation masses (cystic appearance can be there) that push the bowel loops laterally.*
- Large retrocardiac shadow with air fluid level on lateral CXR suggests hiatus hernia.
- Hemangioma is contraindicated for biopsy.
- Fibrosing mesenteritis is an ill-defined soft tissue mass in the bowel mesentery with extensive calcification & strands of soft tissue are seen radiating into the surrounding mesentery.
- Epiploic appendagitis mostly occurs around sigmoid colon. It is a 2-4 cm fat density lesion surrounded by a hyperdense rim & inflammatory fat stranding abutting the sigmoid colon.
- Lymphangioma behaves like a cyst on MRI.

Angiodysplasia is associated with aortic stenosis & commonly found in ascending colon. On arteriography a cluster of vessels are seen on the anti-mesenteric border of colon with early opacification of draining veins. Colonoscopy & barium can miss the lesion.

- Crohn's disease affects pylorus & antrum of stomach & terminal ileum.
- Carcinoid syndrome shows tumor of small bowel with liver metastasis.
- *Mesenteric cysts are rare true congenital abnormalities due to sequestration of mesenteric lymphatics. There is a soft tissue/ cystic mass displacing the bowel loops with small calcifications, multiple septations & internal echoes.*
- High attenuating fluid between bowel loops in a trauma patient suggests mesenteric hematoma.
- Enteric cyst is well-defined lobulated lesion in retro-rectal space with thin peripheral calcification. It is mostly septated & filled with mucoid content.
- Sacrococcygeal teratomas are seen in pediatric patients & dermoid cysts are seen in adults.
- Peritoneal invasion of rectal adenocarcinoma suggests T4 stage.
- *Brown fat causes PET uptake in bilateral symmetrical pattern. Benzodiazepines can be administered to reduce brown fat uptake.*
- Hemosiderosis (secondary hemochromatosis) causes involvement of liver, spleen & bone marrow. Spleen, bone marrow are not involved in primary hemochromatosis.
- FAP is associated with hamartomas in stomach, duodenal adenomas & periampullary Ca. There is 100% risk of colorectal carcinoma.
- *Marfanoid appearance, prognathism & cutaneous neuromas can be seen in MEN III (II b) and facial angiofibromas are associated with MEN I.*
- Lynch syndrome or HNPCC is associated with risk of colorectal adenomas & endometrial or GIT carcinoma.
- **Pseudomyxoma peritonei is associated with cystadenocarcinoma of appendix in males & cystadenocarcinoma of ovary in females.**
- A linear opacity in right upper quadrant on abdomen xray is due to air outlining falciform ligament in pneumoperitoneum.
- X ray should be first line investigation for toxic megacolon.
- SMA angiographic features of early opacification, cluster of vessels in antimesenteric border & slow emptying of ileo-caecal vein (early filling) are s/o angiodysplasia.
- Vitelline artery is seen in Meckel's diverticulum.

Tailgut cyst/cystic hamartoma are thin walled multiloculated dumbbell shaped mucous secreting cysts in retrorectal or presacral area within the mesorectal fascia. A long & tail like coccyx is associated.

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- **Segmental omental infarction commonly affects the right half of greater omentum. A well-defined triangular area of high attenuation, streaks in omental fat with apparent mass effect is seen.**
 - Mesenteric panniculitis is inflammation of small bowel mesentery adipose fat tissue. Fibrosis and develops showing infiltrative right tissue mass with soft tissue dense strands radiating away from it. Vessels are surrounded by low attenuation halo.
 - Desmoplastic reaction is multiple linear strands radiating out from a mass towards the bowel loops.
 - Sclerosing mesenteritis shows increased density of mesenteric fat to 40-60 HU.
 - Scalloping of liver edge is caused by pseudomyxoma peritonitis but not by sclerosing encapsulating peritonitis.
 - Internal hernia & mesenteric constriction of the R n Y limb causes small bowel obstruction after 12 months- late complication. Acute complications are jejunostomy stricture, intussusception of roux link, intraluminal hematoma & mesocolic hematoma.
 - Omental infarcts are usually large, right sided & cake like in appearance.
 - **Systemic sclerosis affects esophagus > anorectal region > small bowel.**
 - Epiploic appendagitis shows lack of flow with no adjacent free fluid. Colon adjacent to it may be normal.
 - MEN IIa is also associated with carcinoid & Cushing's syndrome.
 - Water soluble contrast should be used for checking any anastamotic leak of GIT (on CT).
 - Anterior pararenal space also contains descending colon.
 - Blood gas or flow voids can produce filling defects in MRCP.
 - Meckel's diverticulum may become inverted & act as a "lead point" for intussusception of large bowel with dilated small bowel in central region.
 - **Right paracolic gutter communicates freely with perihepatic space & pelvis.**
 - Extra sphincteric fistula arises from the rectum & passes through the levator ani muscle to reach the skin surface with no involvement of sphincter.
 - Barium sulphate preparations consist of tiny particles (less than 1 micron) in non-ionic suspension.
 - Ovarian metastasis from a GI tumor (mostly gastric adenocarcinoma is s/o krukemberg tumors). Colorectal carcinoma is second most common cause.
 - Tube angling 45° caudally & centered 5 cm above post superior iliac spines is performed to visualize sigmoid colon.

- Superparamagnetic iron oxide contrast particle causes acute severe back pain.
- Chemotherapy causes fat deposition in liver.
- Inferior Mesenteric vein drains into splenic vein and may drain into splenic/SMV confluence in 30% cases.
- Renal & pancreatic cysts with serous cystadenoma of pancreas s/o VHL.
- If a tumor is in contact with more than half of an arterial circumference, it is unlikely to be resectable.
- Peritoneal TB causes dense ascites, peritoneal nodularity & LNs with low attenuation centers.
- If a water soluble contrast examination appears normal, barium can be used as it has a higher sensitivity in identifying anastamotic leaks.

Desmoid tumors are non-malignant fibrosis tumors associated with FAP/Gardner syndrome. They appear low signal on T2W1. They are most commonly seen in small bowel mesentery > abdominal wall. Intra-abdominal dermoid may also occur in retroperitoneum & pelvis.

- **For assessment of tumor response to treatment, unidimensional long axis measurement is taken according to RECIST criteria. According to WHO, bidimensional product of longest diameter & greatest perpendicular diameter is taken.**
- Kaposi sarcoma (in AIDS disease) is a tumor of blood & lymphatics that affects skin & other organs. There are multiple raised purplish skin lesions & hyperdense CNS nodules & multiple low attenuation but hyperchoic liver nodules.
- Visipaque & isovist are nonionic iso-osmolar dimeric contrast agents.
- Unclotted blood has HU of 30-45.
- Clotted blood has HU of 45-70.
- Indications of whipple procedures → radical pancreaticoduodenectomy are periampullary carcinoma & chronic pancreatitis. Free gas, aerobilia, retroperitoneal fat stranding & transient thin walled fluid collection are commonly seen post procedure.
- *Femoral hernia protrudes through femoral ring, lying medial to the femoral vein, it is seen infero-lateral to the pubic tubercle, in contrast to inguinal hernias which lie supero-medial to the tubercle.*
- Obturator hernia protrudes between pectineus & external obturator muscles.
- Pseudomyxoma peritonei can be due to rupture of tumor of appendix, ovary, pancreas, stomach & colon. Curvilinear or punctate calcification can be seen within.
- Inferior Mesenteric vein drain rectum, sigmoid & descending colon. An IMV thrombosis may occur due to infection. Like diverticulitis or malignancy of these areas.
- To detect the source of GI bleeding, angiography is best but to detect whether there is GI bleed or not - red blood cell scintigraphy is done.
- Gastroduodenal artery arises from common hepatic artery. Its branches are pancreaticoduodenal and right gastroepiploic arteries.
- Left lateral decubitus x-ray is performed for detection of small pneumoperitoneum.
- *Right subphrenic & right subhepatic spaces communicate freely with right paracolic gutter and pelvis.*
- *Left subphrenic space communicates with left subhepatic space but is separated from left paracolic gutter by phrenico-colic ligament.*
- *Lesser sac communicates with rest of the peritoneal cavity (greater sac) by foramen of Winslow (epiploic foramen).*
- Buscopan, a smooth muscle relaxant used in barium enema should not be used in unstable cardiac disease.
- *Physiotherapy is the treatment of barium aspiration.*
- Melanin is hyperintense on T1 & hypointense on T2. Iron is hypointense on T1 & T2.
- **Sclerosing mesenteritis is a chronic inflammation, shows subtle increased attenuation of mesentery or a solid soft tissue mass. The mass may envelope vessels but there may be preservation of fat around the vessels “fat halo” sign. Central calcification can be seen.**
- Psoas muscle is displaced by pseudomyxoma retroperitonei (similar to pseudomyxoma peritonei).

- Buscopan causes cardiac arrhythmia.
- **Water intoxication due to barium enema causes drowsiness & convulsions.**
- **Venous intravasation of barium may cause pulmonary embolism.**
- Positions and views in barium:
 - Left anterior oblique (LAO) – for lesser curvature of stomach.
 - RAO - body & antrum
 - Supine - greater curvature & antrum
 - Left lateral - fundus.

Amyloidosis of GIT can occur secondary to RA. There is diffuse thickening of small bowel folds with reduced peristalsis in esophagus, stomach & intestine with narrowed gastric antrum with thickened rugal folds.

- Hemochromatosis causes low signal on GE T1W1 in phase images compared to out of phase images. GE T2W1 also shows reduced signal.

Barium densities -

- *Swallow - 150%*
- *Meal - 250%*
- *BMFT - 100 %*
- *Enteroclysis - 18%*
- *Double contrast enema - 125%*
- *Single contrast enema - 70%*

- Simethicone is an antifoaming agent in barium.
- Uniform particle size in barium helps in reducing flocculation. A heterogeneous particles size improves mucosal coating.

1. The following statements regarding acute pancreatitis are correct:

- (a) Mumps is a recognised cause.
- (b) Pancreatic necrosis demonstrated on CT is associated with a mortality of 5-10%.
- (c) Pancreatic oedema is a late sign.
- (d) Haemorrhagic pancreatitis is diagnosed by the presence of hypodense areas of 5-20 Hounsfield units on CT.
- (e) Right-sided pleural effusion is seen in 5%.

Answers:

- (a) Correct
- (b) Not correct
- (c) Not correct
- (d) Not correct
- (e) Not correct

Explanation:

Alcohol and gallstones are the commonest cause of acute pancreatitis.

Left-sided pleural effusion is seen commonly.

Pancreatic oedema is the earliest sign of acute pancreatitis.

Haemorrhagic pancreatitis is diagnosed by the presence of hyperdense areas.

2. Regarding hepatocellular carcinoma:

- (a) Haemochromatosis is a recognised cause.
- (b) It is the commonest primary visceral malignancy in the world.
- (c) Elevated alpha-fetoprotein is found in 50-60% of cases.
- (d) Has a higher incidence in macronodular than micronodular cirrhosis.
- (e) On MR, hepatoma has a well defined, hypointense capsule on T1 weighted images.

Answers:

- (a) Correct
- (b) Correct
- (c) Not correct
- (d) Correct
- (e) Not correct

Explanation:

Causes of hepato-cellular carcinoma are haemochromatosis, cirrhosis, hepatitis, Wilson's disease, alpha 1 antitrypsin deficiency.

Elevated alpha feto-protein levels are found in 50-60% cases of hepato-cellular carcinoma.

On MRI, hepatoma shows increased signal intensity on T2-weighted images with peripheral gadolinium enhancement in 20% of the cases.

3. Regarding pancreatic islet cell tumours:

- (a) Insulinoma is found predominantly in the pancreatic body and tail.
- (b) Glucagonoma is the commonest functioning islet cell tumour.

- (c) Glucagonoma is a hypervascular tumour.
- (d) Glucagonoma undergoes malignant transformation in 5-10%.
- (e) Multiple insulinomas are associated with MEN Type 1.

Answers:

- (a) Not correct
- (b) Not correct
- (c) Correct
- (d) Not correct
- (e) Correct

Explanation:

Insulinoma does not have any predilection for any part of the pancreas. The undergo malignant transformation in 5-10% of the cases.

Glucagonoma is the second commonest functioning islet cell tumour. The hypervascular and undergoes malignant transformation in 80% of the cases.

4. The following statements regarding splenic lymphoma are correct:

- (a) The spleen is involved at presentation in 30-40% of patients with non-Hodgkin's lymphoma.
- (b) When there is lymphomatous involvement of the spleen, splenomegaly is seen in 70-80%.
- (c) Focal splenic deposits are usually well defined, round lesions of increased brightness on ultrasound.
- (d) Splenic lymphoma deposits commonly calcify.
- (e) Lymph nodes are seen in the splenic hilum in 50% of patients with Hodgkin's lymphoma.

Answers:

- (a) Correct
- (b) Not correct
- (c) Not correct
- (d) Correct
- (e) Not correct

Explanation:

Splenic lymphoma shows focal deposits which are usually well defined and hypoechoic on ultrasound.

When there is lymphomatous involvement of the spleen, splenomegaly is seen in the percent of the cases. In patients with Hodgkin's lymphoma, lymph nodes are seen in the splenic hilum in 10-20% of the patients.

5. Regarding Budd-Chiari syndrome:

- (a) It can be caused by obstruction of the suprahepatic IVC.
- (b) On early CT images, the central liver enhances prominently and the peripheral liver weakly.
- (c) The caudate lobe is markedly atrophic.
- (d) A 'spider's web' appearance at hepatic venography characteristic.
- (e) On MRI images 'comma-shaped' intrahepatic collateral vessels are seen.

Answers:

- (a) Correct
- (b) Correct

- (c) Not correct
- (d) Correct
- (e) Correct

Explanation:

Caudate lobe is enlarged and hypertrophied in Budd chiari syndrome .

Flip-flop enhancement pattern is seen with central hepatic enhancement in the early phase and peripheral enhancement in the late phase.

Thrombosis in hepatic veins is more common cause than obstruction of the suprahepatic IVC.

6. The following statements concerning oesophageal carcinoma are correct:

- (a) 90% of cases are squamous cell carcinomas.
- (b) Most commonly located in the upper third of the oesophagus.
- (c) Plummer-Vinson syndrome is a recognised predisposing factor.
- (d) It is associated with ulcerative colitis.
- (e) Commonest appearance on double contrast barium swallow is of a large ulcer within a bulging mass.

Answers:

- (a) Correct
- (b) Not correct
- (c) Correct
- (d) Not correct
- (e) Not correct

Explanation:

Oesophageal carcinoma most commonly located in the middle and lower third of the oesophagus. Only 20% occur in the upper one third .

Polypoidal or fungating form is the commonest type.

Predisposing factors for oesophageal carcinoma include Barrett's esophagus, alcohol abuse, smoking, coeliac disease & Achalasia.

7. The following statements regarding Meckel's diverticulum are correct:

- (a) Is present in 2-3% of the population.
- (b) Identification of Vitelline artery is pathognomonic.
- (c) Located in the mesenteric border of the ileum.
- (d) In children, small bowel enema is the best investigation to identify it.
- (e) Can present as intussusception in children.

Answers:

- (a) Correct
- (b) Correct
- (c) Not correct
- (d) Not correct
- (e) Correct

Explanation:

Meckel's diverticulum located at the antimesenteric border of the ileum.

Best investigation diagnosed Meckel's diverticulum in children is a radionuclide technetium 99 pertechnetate scan.

8. Features of pseudomembranous colitis include:

- (a) An acute infective colitis due to *Clostridium perfringens* toxin.
- (b) Most commonly affects the transverse colon.
- (c) Bowel wall thickening is the commonest appearance on non-contrast CT images.
- (d) 'Thumbprinting' is seen on the plain abdominal radiograph.
- (e) Ascites is a recognised feature.

Answers:

- (a) Not correct
- (b) Not correct
- (c) Correct
- (d) Correct
- (e) Correct

Explanation:

Pseudomembranous colitis is caused by *Clostridium difficile* toxin.

It most commonly affects the rectum.

Ascites is a recognised feature in severe cases.

9. Regarding ischaemic colitis:

- (a) Griffith point is the most commonly affected segment.
- (b) The right colon is involved in 30% of cases.
- (c) Usually occurs in the first decade of life.
- (d) Barium enema is usually only abnormal in 50-60% of cases.
- (e) Portal vein gas is of little clinical significance.

Answers:

- (a) Correct
- (b) Correct
- (c) Not correct
- (d) Not correct
- (e) Not correct

Explanation:

Ischaemic colitis is usually seen in patients >50 years of age .

Barium enema is abnormal in 90% of the cases showing features of bowel wall thickening, loss of haustrations and thumbprinting.

Evidence of portal vein gas is seen in very rare cases and is a preterminal sign.

10. Features more in keeping with jejunum than ileum include:

- (a) Thinner walls.
- (b) Thicker valvulae conniventes.

- (c) More numerous Peyer's patches.
- (d) One or two arterial arcades with long branches.
- (e) 2.5cm width diameter.

Answers:

- (a) Not correct
- (b) Correct
- (c) Not correct
- (d) Correct
- (e) Not correct

Explanation:

Ileum is 2.5 cm in diameter and jejunum is 3-3.5 cm.

Jejunum shows a few Peyer's patches but they are larger.

Jejunum has thicker walls as compared to ileum.

11. Regarding diverticular disease:

- (a) Colonic diverticulosis affects 70-80% by 80 years of age.
- (b) Rectosigmoid colon is most commonly affected.
- (c) 10-25% of individuals with colonic diverticular disease develop diverticulitis.
- (d) Fistula formation occurs in 40-50% of cases complicating acute diverticulitis.
- (e) Moderate diverticulitis is present when the bowel wall is thickened >3mm.

Answers:

- (a) Correct
- (b) Correct
- (c) Correct
- (d) Not correct
- (e) Correct

Explanation:

Fistula formation is seen in 15% of the cases of complicated acute diverticulitis.

12. Regarding Peutz-Jeghers syndrome:

- (a) It is inherited in an autosomal recessive manner.
- (b) There is an association with intussusception.
- (c) Patients are at increased risk of gastrointestinal adenocarcinoma.
- (d) Polyps are seen in the stomach.
- (e) It is associated with pigmented lesions on the fingers

Answers:

- (a) Not correct
- (b) Correct
- (c) Correct
- (d) Correct
- (e) Correct

Explanation:

It is an autosomal dominant disease showing polyps in stomach, small intestine especially jejunum and may be seen in colon.

There is an increased risk of a adenocarcinoma but polyps themselves are hamartomatous and benign.

13. Regarding Carcinoid tumour:

- (a) Carcinoid syndrome is the presentation in only 20-30% of cases.
- (b) It is rarely multiple.
- (c) The commonest location for this tumour is the appendix.
- (d) 50% of tumours greater than 2cm in size have metastases.
- (e) Angulation of small bowel loops on small bowel follow through is a diagnostic feature.

Answers:

- (a) Not correct
- (b) Not correct
- (c) Correct
- (d) Not correct
- (e) Correct

Explanation:

Carcinoid tumour are multiple in 33% of the cases. Carcinoid syndrome is seen in only 7% of the cases and arises due to excess serotonin levels.

The 50% of tumours of 1–2 centimetres in size have metastasis, 85% of tumour was greater than 2 cm have metastasis.

14. The following statements regarding Achalasia are correct:

- (a) Dilatation of the oesophagus begins in the upper third.
- (b) Multiple non-peristaltic contractions are seen on barium swallow.
- (c) A prominent gastric air bubble is seen on erect CXR.
- (d) There is an association with plummer-Vinson syndrome.
- (e) Squamous cells carcinoma of the oesophagus is a recognised complication.

Answers:

- (a) Correct
- (b) Correct
- (c) Not correct
- (d) Not correct
- (e) Correct

Explanation:

Achalasia is not associated with Plummer-Vinson syndrome.

Gastric air bubble is usually absent on erect chest x-ray.

Dilatation of the oesophagus begins in the upper one third and progresses to involve the entire length.

15. Following statements regarding lymphoma of the gastrointestinal tract are correct:

- (a) There is an increased risk associated with ulcerative colitis.
- (b) The stomach is the most common site of involvement by non-Hodgkin's lymphoma.
- (c) In the colon the rectum is most commonly involved.
- (d) Diffuse involvement of the whole stomach is seen in 10-15%.
- (e) Presents with thickened valvulae conniventes in the small bowel.

Answers:

- (a) Not correct
- (b) Correct
- (c) Not correct
- (d) Not correct
- (e) Correct

Explanation:

Lymphoma of the gastrointestinal tract has an increased risk association with Crohn's disease, coeliac disease, AIDS and SLE.

Diffuse involvement of the stomach is seen in 50% of the cases.

Caecum is most commonly involved in colon

16. Regarding peritoneal spaces:

- (a) The right subhepatic space communicates with the lesser sac.
- (b) The left subphrenic space is separated from the right subphrenic space by the falciform ligament.
- (c) The bare area of the liver is located between reflections of the right and left coronary ligaments.
- (d) The splenorenal ligament separates the left subphrenic space from the left paracolic gutter.
- (e) The gastrocolic ligament connects the lesser curve of the stomach to the superior aspect of the transverse colon.

Answers:

- (a) Correct
- (b) Correct
- (c) Correct
- (d) Not correct
- (e) Not correct

Explanation:

Phrenico-colic ligament separates the left subphrenic space from the left paracolic gutter since it attaches to the descending colon to the left hemidiaphragm.

The gastrocolic ligament connects to the greater curvature of the stomach to the superior aspect of the transverse colon.

17. Regarding gastrointestinal stromal tumours (GIST):

- (a) The most significant criteria for predicting malignant potential is tumour size.
- (b) It is a cause of haematemesis.
- (c) The commonest location is the sigmoid.
- (d) There is an association with neurofibromatosis Type 1
- (e) Contrast enhancement is invariably uniform.

Answers:

- (a) Correct
- (b) Not correct
- (c) Not correct
- (d) Correct
- (e) Not correct

Explanation:

Gastrointestinal stromal tumour does not cause hematemesis since they are mostly exophytic.

It is commonly located at stomach. There is heterogenous enhancement with significant haemorrhage and necrosis.

18. Regarding hepatic adenoma:

- (a) It is associated with Type 1 glycogen storage disease.
- (b) Is located in the left lobe of the liver in 60-75% of cases.
- (c) Is easily differentiated from hepatocellular carcinoma on MRI.
- (d) Often reduces in size during pregnancy.
- (e) Is hypovascular.

Answers:

- (a) Correct
- (b) Not correct
- (c) Not correct
- (d) Not correct
- (e) Not correct

Explanation:

Hepatic adenoma increases in size during pregnancy.

There are hypervascular lesions with significant risk of bleeding at the biopsy and hence biopsy is contraindicated.

There are indistinguishable on all MRI sequences.

There mostly located in the right lobe of liver in 60-75% of the cases.

19. The following statements regarding primary sclerosing cholangitis are correct:

- (a) The common bile duct is usually spared.
- (b) It affects only the intrahepatic bile ducts.
- (c) Echogenic portal triads are identified on ultrasound.
- (d) There is a 10-15 times increased risk of developing cholangiocarcinoma.
- (e) It is associated with positive antimitochondrial antibodies.

Answers:

- (a) Not correct
- (b) Not correct
- (c) Correct
- (d) Correct
- (e) Not correct

Explanation:

Primary biliary cirrhosis is associated with positive antimitochondrial antibodies.

Primary sclerosing cholangitis affects intra-and extrahepatic bile ducts.

Common bile duct is always involved.

20. which of the following statements are correct about Insulinomas:

- (a) The majority are benign.
- (b) 90% are less than 2cm in diameter.
- (c) Are frequently multiple.
- (d) Are associated with MEN 1 syndrome.
- (e) More than 50% can be localized using an octreotide scan.

Answers:

- (a) Correct
- (b) Correct
- (c) Not correct
- (d) Correct
- (e) Correct

Explanation:

Only 10% of insulinomas are multiple. When multiple, the individual lesions are smaller. Malignant lesions tend to be larger than benign.

Patients with MEN 1 syndrome tend to have multiple small insulinomas.

21. Focal nodular hyperplasia (FNH):

- (a) Multiple lesions are seen in 40-60% of cases.
- (b) Is the most common benign liver tumour.
- (c) Has a low signal on T2 weighted MRI post-iron oxide administration.
- (d) Central scar is a pathognomonic feature.
- (e) Central scar is hyperdense on arterial phase CT.

Answers:

- (a) Not correct
- (b) Not correct
- (c) Correct
- (d) Not correct
- (e) Not correct

Explanation:

FNH is the second most common benign liver tumour after haemangioma. The usually occurs in young patients with more female ratio.

There are multiple in 20% of the cases.

A central scar is usually seen in FNH however it can be seen in giant haemangioma, hepato cellular carcinoma and hepatic adenoma.

Central scar of FNH is non-enhancing on arterial phase however the rest of the tumour enhances significantly.

22. Which of the following are correct about Crohn's disease:

- (a) There is an increased risk of malignancy.
- (b) Pseudo-diverticula are typically found on the antimesenteric side of the bowel.
- (c) Mural stratification on CT indicates active disease.
- (d) Colonic involvement is usually accompanied by small bowel disease.
- (e) Aphthous ulcers are an early finding.

Answers:

- (a) Correct
- (b) Correct
- (c) Correct
- (d) Correct
- (e) Correct

Explanation:

The comb sign in Crohn's disease depicts the pericolic and perienteric fat stranding due to increased mesenteric vasculature.

Disease can affect any part of the gastrointestinal tract from mouth to the anus however small intestine is most frequently involved particularly the terminal ileum.

23. Which of the following are correct about Emphysematous cholecystitis:

- (a) Gallstones are present in over 90% of cases.
- (b) The most common causative organism is staphylococcus aureus.
- (c) Is associated with diabetes in 5-10% of cases.
- (d) Intramural gas is characteristic.
- (e) Is usually successfully treated with antibiotics alone.

Answers:

- (a) Not correct
- (b) Not correct
- (c) Not correct
- (d) Correct
- (e) Not correct

Explanation:

Emphysematous cholecystitis is most commonly caused by clostridia and E. coli species.

It commonly affects older men and has association with diabetes mellitus in about 50% of the cases.

Gallstones are present less frequently. It can rapidly lead to the perforation and septic shock.

There is gas in the lumen of the gallbladder, in the wall or in the pericholecystic space in the absence of any fistula with the intestine.

24. Which of the following are correct about Caroli's disease:

- (a) Is inherited as an autosomal dominant disorder.
- (b) Is associated with autosomal dominant polycystic kidney disease.
- (c) 70-80% have extrahepatic bile duct dilatation.

- (d) Is associated with ulcerative colitis.
- (e) Cholangiocarcinoma develops in 5-10%

Answers:

- (a) Not correct
- (b) Correct
- (c) Not correct
- (d) Not correct
- (e) Correct

Explanation:

Caroli's disease is rare autosomal recessive disorder showing abnormal development of intrahepatic bile ducts.

The differential diagnosis includes primary sclerosing cholangitis. The ductal dilatation in primary sclerosing cholangitis is a rarely saccular and is typically more isolated and fusiform. 70% of the patient's with primary sclerosing cholangitis have co-existing inflammatory bowel disease.

There are multiple intrahepatic cyst that communicate with the biliary tree with intrahepatic bile duct dilatation, irregular bile duct walls, strictures and stones in Caroli's .

25. Which of the following are correct about Choledochal cyst:

- (a) Appears as a photointense area on 1-10 min HIDA scan images.
- (b) Recurrent pancreatitis affects 30-40% of patients.
- (c) The classic triad of intermittent obstructive jaundice, recurrent colicky right upper quadrant pain and palpable mass is seen in more than 50% of patients.
- (d) Portal hypertension is a known complication.
- (e) 90% affect the intrahepatic bile ducts.

Answers:

- (a) Not correct
- (b) Correct
- (c) Not correct
- (d) Correct
- (e) Not correct

Explanation:

Choledochal cyst is characterised by balloon like dilatation of the extrahepatic bile ducts. It can be associated with intrahepatic bile duct dilatation in 15% of the cases.

The classic triad of jaundice, recurrent colicky right upper quadrant pain and palpable mass is seen in 20-30% of the patients and bring the only images in a hilar scan shows a photopenic area. The cyst shows delayed filling which persists on delayed films. Large choledochal cysts may compress the gallbladder leading to non-visualisation.

26. Regarding Small bowel obstruction (SBO) in adults:

- (a) The small bowel-faeces sign is pathognomonic of SBO.
- (b) Gallstone ileus typically causes jejunal obstruction.
- (c) Hernias are the most common cause.
- (d) Intussusception is associated with an underlying pathology in >75% of cases.
- (e) Strangulation is more common in closed loop obstruction.

Answers:

- (a) Not correct
- (b) Not correct
- (c) Not correct
- (d) Correct
- (e) Correct

Explanation:

Adhesions are the most common cause of small-bowel obstruction in adults followed by hernias and neoplasms.

The small bowel-fecus sign has been described in the context of small-bowel obstruction but has also been also in other metabolic or infectious diseases.

The most common site of stone impaction in gallstone ileus is ileum followed by jejunum and duodenum.

27. A small bowel enema reveals smooth thickened folds in a 20cm segment of the small bowel. Differential diagnosis should include:

- (a) Congestive heart failure.
- (b) Radiation enteropathy.
- (c) Nephrotic syndrome.
- (d) Crohn's disease.
- (e) Lymphoma.

Answers:

- (a) Not correct
- (b) Correct
- (c) Not correct
- (d) Correct
- (e) Correct

Explanation:

Generalised thickening of small bowel usually occurs in hypoproteinaemia, congestive heart failure and nephrotic syndrome.

Long segment thickening may reflect intramural haemorrhage example ischaemia, anticoagulant therapy.

Focal thickening of small bowel should include lymphoma, mesenteric metastasis and early Crohn's disease.

28. Complications of liver transplantation:

- (a) Hepatic artery thrombosis occurs in less than 1% of transplant recipients
- (b) Portal vein thrombosis is the most common vascular complication.
- (c) Non-anastomotic biliary strictures carry a worse prognosis than anastomotic strictures.
- (d) Post-transplant lymphoproliferative disorder is frequently associated with Epstein-Barr virus infection.
- (e) Abscess formation is seen in 5-10%.

Answers:

- (a) Not correct
- (b) Not correct
- (c) Correct
- (d) Correct

(e) Correct

Explanation:

Most common vascular complication of liver transplant includes hepatic artery thrombosis which occurs in 60% of the cases of vascular complications. It occurs within 15 days of transplantation.

Portal vein thrombosis occurs in 1-2% cases of liver transplant.

29. Which of the following are correct about Carcinoid of the appendix and small bowel:

- (a) 40-50 arise in the appendix.
- (b) The incidence of metastatic disease is directly related to primary tumour size.
- (c) Small-bowel carcinoids are multiple in 30-40% of patients.
- (d) A spiculated mesenteric mass on CT is incompatible with Carcinoid.
- (e) ¹³¹I-labelled MIBG uptake is specific for carcinoid.

Answers:

- (a) Correct
- (b) Correct
- (c) Correct
- (d) Not correct
- (e) Not correct

Explanation:

Carcinoid tumours of the gastrointestinal tract are small and often difficult to detect on routine CT scans.

On CT, a carcinoid tumour appears stellate, spiculated, mesenteric mass containing calcification in the 70% of the cases.

Indium labelled MIBG scan can be used for the detection of several neuroendocrine tumours like pheochromocytoma, neuroblastoma and carcinoid tumours. Octreotide is a somatostatin analogue that can also be useful for diagnosing carcinoid tumours.

30. Which of the following are true regarding fibrolamellar hepatocellular carcinoma?

- (a) The majority are associated with elevated alpha fetoprotein.
- (b) A central scar is present in 50% of cases on ultrasonography.
- (c) There is delayed enhancement of the tumour following intravenous gadolinium on MRI.
- (d) Calcification is rarely seen on CT.
- (e) The central scar may enhance following intravenous contrast on CT.

Answers:

- (a) Not correct
- (b) Correct
- (c) Not correct
- (d) Not correct
- (e) Correct

Explanation:

Fibrolamellar carcinoma shows calcification in 40% of the cases. The tumour is unusually large, hypodense on unenhanced CT and hyperdense during the arterial phase following contrast administration.

The not associated with elevated alpha-fetoprotein levels and chronic liver disease.

On MRI, these tumours are heterogeneously hypointense on T1 and hyperintense on T2-weighted images.

31. In the imaging of acute testicular torsion, which of the following are correct:

- (a) On sonography, a reactive hydrocoele is seen after 6 hours.
- (b) Surgery is successful in 20% of patients who present between 12 and 24 hours after onset of symptoms.
- (c) Colour Doppler ultrasound may show increased blood flow in the epididymis.
- (d) Hyperperfusion of the testicle on colour Doppler ultrasonography makes testicular torsion unlikely.
- (e) Technetium-99m pertechnetate scintigraphy typically shows a halo of hyperactivity in the acute phase (first 6 hours).

Answers:

- (a) Correct
- (b) Correct
- (c) Correct
- (d) Not correct
- (e) Not correct

Explanation:

Spontaneous detorsion of testis may occur leading to unilateral testicle hypoperfusion. Surgery is still indicated in these cases.

Scintigraphy is highly sensitive and specific when performed only. In the acute phase, there is reduced perfusion in the testis with decreased activity. In the subacute phase, there is a peritesticular reactive hyperaemia with a hilar or increased tracer activity. Later, there is marked absence of tracer activity.

32. Which of the following are correct of cystic fibrosis?

- (a) Microgallbladder is a rare finding.
- (b) The most common abdominal MRI finding is fatty infiltration of the pancreas.
- (c) Pancreatic calcification is seen in 30% of patients on radiography.
- (d) Pancreatic cysts are a common finding.
- (e) Chronic liver disease is present in 75% of adults with cystic fibrosis.

Answers:

- (a) Not correct
- (b) Correct
- (c) Not correct
- (d) Correct
- (e) Not correct

Explanation:

Chronic liver disease is present in 25% of adults with cystic fibrosis and the severity increases with age.

Pancreatic calcification is seen in 8% of the patient's on radiography. MRI depicts the calcification poorly.

Microgallbladder is a common finding. In patients with cystic fibrosis, the gallbladder is typically small, trabeculated, contracted and poorly functioning. It often contains echogenic bile, sludge and cholesterol gallstones.

33. Which of the following are correct regarding mucosal associated lymphoid tissue (MALT) lymphoma of the

gastrointestinal tract?

- (a) Perforation of the stomach is a recognised feature of gastric MALT lymphoma.
- (b) MALT lymphoma is widely disseminated at the time of diagnosis in most patients.
- (c) The most common site within the stomach is the antrum.
- (d) Ulceration is a common feature on barium study.
- (e) The normal stomach does not contain lymphoid follicles.

Answers:

- (a) Correct
- (b) Not correct
- (c) Correct
- (d) Not correct
- (e) Correct

Explanation:

MALT lymphoma shows very less dissemination and generally has a better prognosis than non-Hodgkin's lymphoma.

The most common pattern on barium study is infiltrative, either focal or diffuse. Ulcerative lesions, especially in stomach are rare.

34. Which of the following are correct regarding imaging of liver transplantation?

- (a) Hepatic artery thrombosis is the most common vascular complication.
- (b) Portal vein thrombosis usually occurs within 24 hours of transplantation.
- (c) Hepatic vein stenosis is more common following living related transplants than after cadaveric transplants.
- (d) Biliary anastomotic stenosis are reliably diagnosed using magnetic resonance cholangiopancreatography (MRCP).
- (e) Periportal low attenuation on contrast-enhanced CT is a reliable sign of acute graft rejection.

Answers:

- (a) Correct
- (b) Not correct
- (c) Correct
- (d) Not correct
- (e) Not correct

Explanation:

Periportal low attenuation on contrast enhanced CT may be a feature of acute graft rejection, but it has poor sensitivity and specificity and is frequently seen with oedema of the periportal lymphatic vessels.

Portal vein stenosis or thrombosis develop slowly, presenting with varices, splenomegaly and ascites. Portal vein stenosis may be treated by balloon dilatation, but once the thrombus is extensive and reaches the periphery of the intrahepatic portal vein branches, then a repeat liver transplant is only option.

35. Which of the following are correct of pancreatic carcinoma?

- (a) The loss of a fat plane around the superior mesenteric artery is indicative of invasion.
- (b) CA 19-9 is elevated in more than 80% of patients with ductal adenocarcinoma.
- (c) Ductal adenocarcinoma has reduced signal on T1 weighted and T2 weighted MRI relative to normal pancreas.
- (d) Solid and papillary neoplasms are usually locally invasive at diagnosis.
- (e) Intraductal papillary mucinous subtypes are characterised by hyperintense pancreatic ducts on T2 weighted

MRI.

Answers:

- (a) Correct
- (b) Correct
- (c) Correct
- (d) Not correct
- (e) Correct

Explanation:

Solid and papillary pancreatic neoplasms are large tumours that are better demarcated, thick walled and have solid and cystic areas.

Imaging shows enhancement of the thick wall and lobular projections from the inner wall margins.

They are more common in the body and tail of the pancreas. Calcification may be seen at the periphery.

36. In the imaging of acute colitis, which of the following are correct?

- (a) Paucity of pericolic inflammation is more suggestive of pseudomembranous colitis than ulcerative colitis.
- (b) Toxic megacolon is not a feature of pseudomembranous colitis.
- (c) In pseudomembranous colitis, the most common site involved is the rectosigmoid.
- (d) Portal venous gas is a more specific sign of ischaemic colitis than pneumatosis cystoides intestinalis.
- (e) Neutropenic colitis (typhlitic colitis) most commonly affects the descending and sigmoid colon.

Answers:

- (a) Correct
- (b) Not correct
- (c) Not correct
- (d) Correct
- (e) Not correct

Explanation:

CT features of pseudomembranous colitis are non-specific and include mural thickening with bowel dilatation. There is pancolitis & right-sided colitis. The rectosigmoid is spared in 67% of the cases and ascites is not uncommon.

Complications include toxic megacolon on operation and peritonitis.

Typhlitis is seen in neutropenia patients and usually presents as non-specific thickening of caecum and ascending colon due to necrosis.

37. In Whipple's disease, which of the following are correct?

- (a) Females are more commonly affected.
- (b) Sacroiliitis is a feature.
- (c) Ulceration is a common finding on barium studies.
- (d) Small bowel dilatation is a typical finding.
- (e) Involved lymph nodes are hypodense on CT.

Answers:

- (a) Not correct
- (b) Correct

- (c) Not correct
- (d) Not correct
- (e) Correct

Explanation:

Males are commonly affected (9:1 = M:F).

There is absence of bowel dilatation, no ulceration and thickening of duodenum and jejunum folds due infiltration by macrophages .

38. In recurrent cervical cancer, which of the following are correct?

- (a) Hydronephrosis occurs in 70% of cases.
- (b) Para-aortic nodes are generally involved before pelvic side-wall nodes.
- (c) Liver metastases occur in 30% of cases.
- (d) The rectum is rarely involved.
- (e) Adrenal gland involvement is rare.

Answers:

- (a) Correct
- (b) Not correct
- (c) Correct
- (d) Not correct
- (e) Not correct

Explanation:

The paracervical, parametrial, obturator and iliac nodes are involved first. Later there is spread to the common iliac and para-aortic nodes with worse prognosis.

The adrenal glands is next common solid organ involvement after liver. The kidneys and pancreas are involved rarely.

The recurrent tumour commonly involve the rectum and recto-vaginal fistula may develop.

39. Which of the following are correct regarding ovarian cancer?

- (a) The liver is the most common site of haematogenous metastasis.
- (b) Serous cystadenocarcinoma contains calcification in 30% of cases on CT.
- (c) Mediastinal lymph node involvement is a rare finding.
- (d) About 75% of ovarian neoplasms are benign.
- (e) Lesions greater than 4cm on CT are suggestive of malignancy.

Answers:

- (a) Correct
- (b) Correct
- (c) Not correct
- (d) Correct
- (e) Correct

Explanation:

In the ovary cancer, lymph node spread is typically along the path of the gonadal vessels to the para-aortic nodes and along the parametrial channels to the external iliac and hypogastric group.

Mediastinal nodal involvement may be seen in one third of the cases.

40. Regarding cholangiocarcinoma, which of the following are correct?

- (a) Caroli's disease is a predisposing factor.
- (b) The majority are squamous cell carcinomas.
- (c) It typically shows delayed enhancement on CT.
- (d) Duodenal obstruction is an early feature.
- (e) Tumours are low signal relative to liver on T2 weighted MRI.

Answers:

- (a) Correct
- (b) Not correct
- (c) Correct
- (d) Not correct
- (e) Not correct

Explanation:

Cholangiocarcinoma have varied appearance on T2-weighted imaging, from very high signal to mildly increased signal relative to liver. On T1 weighted images, and isointense to low signal relative to the liver. There is moderate enhancement after gadolinium administration.

About 95% of the cholangiocarcinoma are adenocarcinoma.

The tumour spreads by local invasion and may involve the portal vein and hepatic artery.

41. Which of the following are correct regarding bladder cancers?

- (a) Urachal abnormalities are most frequently associated with squamous cell carcinomas.
- (b) MRI can identify muscle invasion.
- (c) The presence of low signal within the seminal vesicles on T2 weighted MRI is specific for tumour involvement.
- (d) Tumour extension to the cervix is common.
- (e) Bladder cancer enhances early following intravenous gadolinium- diethylenetriaminepentaacetic acid (DTPA).

Answers:

- (a) Not correct
- (b) Correct
- (c) Not correct
- (d) Not correct
- (e) Correct

Explanation:

About 90% of the bladder cancers are transitional cell tumour. Squamous cell carcinoma is associated with chronic infection and leukoplakia.

Transitional cell tumour may extend to the perivesicle fat, seminal vesicles and prostate in Males but extension to the uterus and cervix is uncommon in females

The seminal vesicles are high signal on T2-weighted images. Low signal changes may be seen with atrophy, tumour extension and fibrosis.

UNIT – III

MUSCULOSKELETAL SYSTEM

- ‘Hair on end’ appearance is uncommon in thalassemia but there is reduced pneumatisation of air spaces within skull & thinning of outer table with thickening of inner table & lateral displacement of Orbit (hypertelorism).
- Hypotelorism is seen in Down’s.
- Chronic ischemia, diabetic foot & secondary hyperparathyroidism mostly affect both feet together.
- **Achondrogenesis & homogygous achondroplasia are lethal in-utero.**
- **Pseudo achondroplasia has normal skull & medial breaking of proximal femur neck.**
- Metatrophic dwarfism shows dumbbell shaped long bones & flattened vertebrae.
- **Haemochromatosis shows hook like osteophytes on radial aspects of metacarpal heads, subchondral cysts, chondrocalcinosis, symmetrical joint space narrowing & osteopenia.**
- *In hemophilia, low signal of hypertrophied synovial membrane is seen due to hemosiderin.*
- Ochronosis involves nucleus pulposus of IV disc.
- Diabetic myopathy is usually unilateral & causes ↑↑ signal on T2 & ↑ on T1 (due to hemorrhage). On contrast, central low signal with surrounding high signal rim is seen.
- Parathyroid adenoma causes hyperparathyroidism (more common than carcinoma).
- Brown tumour are seen in both primary & secondary hyperparathyroidism (More in primary).
- Chondrocalcinosis is common in primary hyperparathyroidism but soft tissue/vessel calcification is common in secondary hyperparathyroidism.
- Thyroid acropachy changes mostly occur in upper limbs.
- **Omovertebral bone with elevated & medially rotated scapula (sprengel’s) and webbed neck are features of Klippel Feil syndrome.**
- Both marfan’s (autosomal dominant) & homocystinuria (autosomal Recessive) shows arachnodactyly.
- Osteoporosis with bowing & fracture is a feature of homocystinuria.
- Scoliosis & upward dens displacement is seen in Marfan’s.
- Patients with DDH are at increased risk of labral tears.
- Caffey’s disease affects before 6 months of age & involves mandible, clavicles & upper limb bones.
- Gracile ribs are seen in Down’s syndrome.
- Rachitic rosary is expansion of costochondral junction.
- **Thin incomplete lucent lines perpendicular to the cortex with giant sclerotic margin suggests looser’s zones of osteomalacia.**
- Juxta – articular osteoporosis (not sclerosis) is seen in hemophilia.
- McCune Albright syndrome is characterized by polyostotic FD, café-au-Lait spots & endocrine disturbance (precocious puberty).
- **Hook like osteophytes, joint space narrowing, subarticular cysts & flattening of metacarpal heads are seen in haemochromatosis.**
- Increased acetabular angle is seen in DDH.
- Iliac wings in Morquio’s Syndrome & Down’s syndrome are flared rather than square.

Milwaukee shoulder is calcium phosphate crystal deposition in elderly woman causing destruction of rotator cuff. With superior subluxation of humerus, forming pseudoarthrosis with clavicle or acromion with glenohumeral degeneration. Sphenoid shaped aggregates of hydroxy-apatite area seen. This condition can also be seen in lat. Compartment of knee.

- Joint hemarthrosis is seen in PVNS, hemophilia, hemochromatosis & gout.
- In Gout → “Rat’s bite” para-articular erosions & soft tissue calcification is seen.
- Central anterior vertebral beaking is seen in Morquio’s but antero-inferior beaking is seen in Hurler’s & achondroplasia.

Osteogenesis Imperfecta – in adult is always type I or IV.

I – Normal stature, blue sclera, hearing problem.

II – Fatal.

III – Severe, short stature

IV – Short stature, bone fragility, blue sclera in children but absent after adolescence.

- Diploe widening is seen in sickle cell, not in thalassemia.
- Gaucher's & Sickle cell disease can cause H- shaped vertebra & AVN but Gaucher's causes splenomegaly & sickle cell causes small calcified spleen.
- Continuous irregular cortical hyperostosis along the lateral margin is seen in melorheostosis.
- In gout, there are mostly non marginal erosions with features of RA & calcified soft tissue nodule (tophus).
- **Symmetrical, solid periosteal new bone formation is a feature of hypervitaminosis A.**
- Nail patella syndrome is also associated with Madelung's.
- CPPD is associated with 4Hs: Hyper parathyroidism (Primary)
 - Hemochromatosis
 - Hypothyroidism
 - Hypomagnesemia
- Crystals in CPPD are weakly positive birefringent.
- *Anteroposterior beaking is seen in Down's, Achondroplasia & Hurler's (& other MPS except Morquio's).*

- Enchondroma is expansile lytic lesion with matrix containing calcifications.
- Osteoid osteoma > 2cm is osteoblastoma – they causes periosteal reaction without cortical destruction & soft tissue mass.
- ABC shows fluid levels with no matrix calcification.
- Osteoma is densely sclerotic well defined lesion attached to parent bone cortex.

<u>Malignancy</u>	<u>Osteoporotic collapse</u>
<i>Convex posterior cortex.</i>	<i>Retropulsion of post fragment</i>
<i>Diffuse low signal on T1</i>	<i>Normal signal on all</i>
<i>High on T2</i>	<i>Band like low signal adjacent to fracture</i>
<i>Pedicle involvement</i>	<i>'Return to normal' signal after contrast.</i>

- Intraosseous lipoma is expansile metaphyseal lesion & may contain focal area of dystrophic calcification (due to fat necrosis).
- Osteoid osteoma is a small lytic lesion with central mineralization surrounded by reactive sclerosis. Central nidus shows intense uptake surrounded by less uptake (double density sign). There are relieved by aspirin.
- Lipoma arborescence shows frond like masses arising from synovium.
- Bony excrescences that do not communicate with the medullary cavity of parent bone are paraosteal lipomas.
- In a patient with remission for lymphoma, there are chances of AVN.
- Hodgkin's Lymphoma causes acro – osteosclerosis.
- Eosinophilic granuloma is cause of mixed sclerotic/lytic lesion with a button sequestrum.

Malignant transformation of osteochondroma occurs due to:-

- *New lucency*
- *Increased activity*
- *Growth after skeletal maturation*
- *Pain after puberty*
- *Cortical destruction*
- *Cartilagenous cap > 1cm.*

- Distal femur is most commonest site for GCT.
- Chemotherapy induced necrosis is more accurate predictor of response than size. Tumour size can initially increase due to intralesional hemorrhage.
- Neoadjuvant chemotherapy increases both recurrence free & overall survival.
- Chordoma is a low attenuation mass on CT. Does not arise from spinal canal usually.
- Chordoma is most common primary malignant tumour of sacrum & shows areas of calcification & hemorrhage.
- **Nidus of osteoid osteoma is usually lucent with surrounding well defined lucency (double doughnut sign).**
- Osteoid osteoma most commonly found in long bones of lower limbs.
- Chondroma (enchondroma) are usually <3cm, painless, occur in younger patients & in peripheral skeletal.
- Earliest post radiotherapy changes occur in 1-6 weeks after therapy & causes increased signal on T1 & T2 due to replacement of marrow by fat. Complete replacement occurs by 6-8wks. Regeneration of normal marrow does not occur.
- **Thick peripheral septa with nodularity, presence of osteoid matrix within nodular or septal region & aggressive growth favours telangiectatic osteosarcoma.**
- ABC occurs before 20yrs of age & GCT occurs after.
- Spinal osteoid osteomas may lead to painful scoliosis.

- Fluid levels are seen in GCT, ABC & telangiectatic osteosarcoma (TOS).
- TOS has wide zone of transition with bone destruction & presents in men at around 20yrs.
- Spinal hemangioma shows high signal on T1 & T2W1 due to fat content.
- Bronchial carcinoid & prostate Ca causes sclerotic mets in spine.
- Complication of osteochondroma are fracture, vascular compromise & malignant transformation.
- **Spheno-occipital chordoma is destructive lesion of clivus, sella, petrous & jugular fossa. Sacrococcygeal is at 4th or 5th sacral segments.**

Chondromyxoid fibroma affects proximal tibia & distal femur in 2nd 3rd decades & appears as expansile oval lesion with sclerotic margins with bone destruction with internal septation & stippled calcification.

- Sarcoma undergoing chemotherapy if shows new areas of high signal on T2W1 it, suggests recurrence.
- Metastasis in appendicular skeleton mostly arises from lung cancer.
- Well defined lytic lesion with chondroid matrix & narrow zone/wide of transition with bone expansion in proximal humerus is chondrosarcoma.
- Diaphyseal location of metastasis can be incidental but if it is a primary tumor it is symptomatic.
- **Osteosarcoma shows cloud like ossification and osteoblastoma shows punctuate calcification.**
- Outside the hand & feet, chondrosarcoma is 5 times more common than enchondroma.
- Chondrosarcoma shows periosteal reaction but enchondroma does not.
- Chondroblastoma extends from epiphysis to metaphysis.
- Greatest FDG uptake is seen in bone lymphoma & Ewing's sarcoma.
- Benign bone lesions do not show FDG uptake except for GCT, ABC, osteoblastomas & FD.
- **Plasmacytomas are destructive lytic lesions with well defined, cortical thinning with expansion & apparent trabeculae or soap bubble appearance.**
- Brown tumours are mostly seen in primary hyper parathyroidism.
- Chondrosarcoma causes deep endosteal scalloping, cortical destruction, soft tissue mass, periosteal reaction & bone scan uptake (these features are not seen in enchondroma).
- Chordoma may extend across IVD & S1 jts.
- Most common malignant sacral lesion is metastasis.
- Prostate & breast cancer causes mets in axial skeleton showing intense uptake. The lack of renal uptake (absent kidney sign) is seen.
- Multiple myeloma do not show similar findings to that of bone edema & also shows enhancement.

Staging of osteosarcoma:

T1 – Single lesion less than 8cm

T2 – >8 cm

T3 – Skip lesions of any size.

M1a – Mets to lung

M1b – Any other site.

- **Trevor's disease is osteochondroma of epiphysis in children & may cause antalgic gait with limb length discrepancy.**
- Chondrosarcoma also occurs in Paget's.
- Recurring metastasis are hyperintense on long TE sequences but rebound hematopoietic marrow is hypointense.
- Degraded blood products in the dependent part are seen in ABC.
- 90% relief is seen with radio frequency ablation in osteoid osteoma.
- Chondroblastoma, simple bone cyst & FD can also show fluid levels.
- Pseudolesion within the calcaneum mimics bone cyst.
- MM presents with anemia, renal impairment, hypercalcemia, proteinuria & monoclonal gammopathy.

MM occurs in 4 forms:

- *Plasmacytoma*
- *Myelomatosis (diffuse)*
- *Diffuse spinal osteopenia with fractures.*
- *Sclerosing myeloma (POEMS Syndrome).*

- GCT of tendon sheath is nodular form of PVNS (hypo on T1/T2 & gradient) .
- GCT shows no sclerotic rim & no periosteal reaction but ABC shows both.

Bizarre paraosteal osteochondromatous proliferation (Nora's lesion) is seen in adults in 3rd & 4th decade. They mostly occur in phalanges, metacarpals & metatarsals. They are perpendicular & do not point away from joint with absence of cartilaginous cap & have a wide base.

- Multifocal osteosarcomas occur in children.
- Soap bubble periosteal reaction is benign.

- *2nd & 3rd metatarsals are a common sites for stress fracture. Bone scans show abnormal uptake within 6-72 hours of injury. Periosteal reaction is also scan.*
- Linear uptake in ribs is due to fractures.
- Meniscal cysts are associated with meniscal tears & occur in parameniscal region.
- **Spontaneous osteonecrosis of knee (SONK) occurs after a minor injury (mostly in elders).**
- Bilateral sacral ala with pubic fractures are insufficiency fractures (H-shaped).
- In reverse bankart's, tear of post scapular periosteum is also seen.
- Alternating osteopenia & sclerosis is seen in osteitis pubis occurs due to repetitive microtrauma, with osteoclastic activity & osseous resorption. Subchondral irregularity, erosions, fragmentation with joint space widening is seen.
- Medial tibial stress syndrome occurs due to repetitive stress & shows periostitis, osteopenia & cortical fractures with cavities in anterior tibial cortex.
- *Neer classification for humeral head fracture [4 parts] → greater & lesser tuberosities, head & shaft.*
 - I - Undisplaced*
 - II – Two parts → fractures with one displaced.*
 - III – Displaced surgical neck with displaced greater or lesser tuberosity.*
 - IV – Displaced surgical neck & both tuberosities.*
- In scapholunate dissociation, there is scapholunate angle of >60° & gap of >3mm on AP view.
- In VISI, capitolunate angle is increased but scapholunate angle is decreased.
- In DISI, both scapholunate & capitolunate angles are increased.
- Barton's fracture is fracture of distal radius with dislocation of distal radiocarpal joint.
- Segond fracture is avulsion fracture of lateral aspect of proximal tibia & is associated with ACL injuries & sometimes medial meniscus.

Jefferson fracture is unstable fracture & are not usually associated with neurological deficit however there is vertebral artery injury & retropulsion of fragments with displacement of lateral masses of C1 due to transverse ligament rupture.

- Hill sach's are more common than Bankart's.
- Ulnar nerve injury at wrist lead to severe muscle degeneration, sparing opponens pollicis, superficial head of FPB & lateral two lumbricals.
- Flexion tear drop injuries are common in lower C-spine & extension tear drop injuries in upper C-spine.
- **Lisfranc ligament attaches between medial aspect of second metatarsal & lateral Surface of medial Cuneiform. Hence in lisfranc injury, second to fifth metatarsals drift laterally.**
- In sympathetic dystrophy (secondary to trauma on tumours), there is pain, swelling & hyperemia with excessive bone resorption. It usually occurs in periarticular distribution.
- Epidermal inclusion cysts are usually in distal phalangeal tuft & there is often a history of trauma.
- According to NICE guidelines, CT head should be done for head injury patient even if GCS is 15.
- Myositis ossificans is soft tissue mass with peripheral mineralization & faint calcification often history of trauma is indistinct.
- Longitudinal fracture (85%) of temporal bone are associated with conductive hearing loss, pneumocephalus, otorrhea, herniation of temporal bone & incudo-stapedial joint dislocation.
- Transverse fractures (15%) are associated with sensorineural hearing loss & facial nerve palsies.
- Hyperextension injury results in scaphoid fractures.
- *Maisonneuve fracture (weber 3) is oblique fracture of fibula with anterior TF & posterior inferior TF ligament injuries resulting medial joint space widening.*
- Fall from height causes unilateral vertical fracture through the ilium with fractures through bilateral superior & inferior Pubic rami.
- Anterior Wedge fracture of C5 with retropulsed bony fragment is seen in compression type injury.

Triplane fracture includes coronal metaphyseal fracture, horizontal fracture through physis & sagittal epiphyseal fracture (salter Harris IV).

Tillaux fracture includes horizontal fracture through growth plate & vertical epiphyseal fracture (Salter Harris III).

- Rib , sternal, scapular & metaphyseal fractures are seen in battered baby syndrome.
- **Signet ring appearance is due to rotator subluxation of scaphoid due to disruption of scapholunate ligament.**

Ulnolunate impingement comprises disruption of lunotriquetral ligament, high T2/STIR Signal in lunate, sclerosis in lunate, perforation of central portion of TFCC & positive ulnar variance.

- Partially detached osteochondral fragment comes under grade II (of OCD).
- Subchondral fracture with preserved joint space is stage III AVN.
- ACL injury is associated with bony contusion in lateral femoral condyle & posterolateral aspect of tibia.
- A vertebral fragility fracture (in elderly) increases the likelihood of further vertebral fractures by fivefold & doubles the risk of femoral neck fracture.
- Partial thickness tear shows increased signal on T1 & T2W1.
- Bunching up of PCL supports the diagnosis of ACL rupture.
- Anterior wedge fracture along is a sign of flexion injury.
- Unstable fractures are B/L facet dislocation, flexion tear drop, Jefferson's, Hangman's, odontoid (type II) & atlantoccipital dislocation.
- **Scapholunate & lunotriquetral ligaments are two important intercarpal ligament. Disruption of either of these results in communication of radiocarpal compartment with mid carpal compartment. Contrast material seen in distal radioulnar joint is suggestive of ligament disruption.**

Le Fort fractures:

I – Inferior Portion of both medial & lateral maxillary buttress → maxillary arch floating free from face.

II – Medial & lateral Max. buttress with associated # of superior Max. buttress → dissociation of entire maxilla from skull.

III – Whole face floating free from skull medial, lateral, superior & upper transverse maxillary buttress.

- Ulnocarpal impaction syndrome is due to non union of ulnar styloid process.
- *Calcaneal fractures are classified according to posterior facet of subtalar joint.*
- Bilateral calcaneal fractures only occur in 10%
- Only 10% of calcaneal fractures are associated with compression injuries of spine.
- Normal Boehler's angle is 20° - 40°.
- PCL injury is associated with reverse segond's fracture (medial meniscus may also be injures).
- 'H' sign in sacral body & ala is due to insufficiency fractures.
- Heparin leads to osteoporosis & hence leads to insufficiency fractures.
- MR arthrography distinguishes partial versus full thickness tear. (Hence fat sat T1W1)
- Patellar sleeve fracture is a pediatric injury where cartilage at the inferior Pole of patella is avulsed along with a bone fragment.
- In perilunate dislocation, there is fracture of scaphoid with triangular lunate on AP view with increased scapholunate interval.
- Stress fractures show uptake even on blood pool images but shint splints show uptake only on delayed images.
- In RTA there is dashboard injury occurs to the driver & shows bruising in anterior part of tibia, posterior patella & PCL tear.
- *Kissing knee continuous are seen in hyperextension injury → Injuries to ACL, PCL & menisci.*
- *In clip injury → Contusions in both the femoral condyles (medial & lateral) are seen.*
- *In pivot shift injury, there are contusions on lateral Aspects of femur & tibia with ACL tear.*
- In transient patellar dislocation, there is bruising in inferior Medial patella & anterior Aspect of lateral femoral condyle.
- **Radial head fractures are associated with coronoid process fractures & medial collateral ligament tear**

(terrible trial of elbow).

- **Fractures of proximal third of scaphoid do not heal in 90% cases. However most common scaphoid fracture is that of middle third.**
- A vertical oblique fracture & displacement of 1 mm shows poor progress.
- Open fracture causes non union.
- Impaction fracture does not cause non union.
- Spinal instability is due to two column malalignment or isolated middle column interruption.
- Galeazzi fracture → fracture of middle or distal 3rd of radius with dislocation of distal radioulnar joint.
- Following trauma, death may occur within 12 hrs due to abdominal haemorrhage.
- Triquetral fractures occur due to avulsion of radiocarpal ligament or due to impaction with the ulnar styloid process or hamate bone in hyper extension. A small bony fragment is seen posterior to carpal bones on lateral view.
- Post shoulder dislocation is seen in seizures & electrocution.
- Lateral third of clavicle is most common location for post traumatic osteolysis.
- Barton fracture is intra articular fracture of distal end of radius, hence it is a type of fracture – dislocation.
- Hutchinson's fracture is triangular fracture of radial styloid process.
- **Acetabular posterior wall / rim fractures are most common type with associated sciatic nerve injury due to posterior dislocation of femoral head.**
- Scaphoid AVN mostly occurs due to fracture.
- Salter Harris type II is most common.
- Maisonneuve fracture => fracture upper third of fibula, tear of distal tibiofibular syndesmosis & interosseous membrane, fracture of medial malleolus with rupture of deltoid ligament.
- *In epidural hematoma, there is a lucent interval but in DAI, there is immediate coma.*
- First rib fracture is associated with major chest injury & significant mortality.
- Most common fracture of mandible is ipsilateral body fracture with contralateral angle or condylar neck fracture.
- **Flail mandible is bilateral mandibular fracture with chances of tongue prolapsing posteriorly occluding the air way.**
- Central cord syndrome is incomplete spinal injury causing more motor deficit in upper rather than lower limb with variable affected sensory & bowel / bladder functions.
- Mallet finger is flexion deformity of DIP due to avulsion of extensor digitorum tendon by hyperflexion injury.
- Anterior dislocated disc is the cause of painful clicking at TM joint.

Spectrum of perilunate injuries:-

I/ Scapholunate dissociation with rotary subluxation of scaphoid

II/ perilunate dislocation with injury to capitoulunate joint.

III/ Triquetrolunate ligament Injury

IV/ Lunate dislocation with disruption of perilunate ligaments.

- Duodenum > Pancreas are injured in fracture of L2 vertebra.
- **Posterolateral corner of knee → Lateral collateral ligament, popliteus tendon & popliteofibular ligament are present in all but arcuate & fabellofibular ligaments are variable. Arcuate ligament is more absent.**

- Reiter is syndrome comprises urethritis, conjunctivitis & mucocutaneous lesion with B/L sacro-iliitis & involvement great toe & metatarsophalangeal joints.
- In JRA → MCP & PIP are mostly affected with periosteal reaction & widened bases of proximal phalanges.
- Bilateral seagull erosions in articular surfaces of proximal interphalangeal joints with periarticular osteoporosis occurs in erosive OA.
- In RA, there is uneven & thick synovium.
- Reflex sympathetic dystrophy causes hyperhidrosis, hypertrichosis, pitting edema, pain & patchy osteopenia with increased periarticular uptake on bone scan.
- Periarticular non marginal erosions with preserved joint space are seen in gout.
- AC joint degeneration can narrow the supraspinatus outlet.
- Jaccoud's arthritis is seen in SLE & shows similar features as RA.
- Negatively birefringent needle shaped crystals are seen in gout.
- Weakly positive birefringent rhomboid crystals are seen in CPDD.

SAPHO is synovitis, acne, pustulosis, hyperostosis & osteomyelitis. It comprises costoclavicular ligament ossification, sternoclavicular joint arthropathy, osteitis & hyperostosis of medial clavicle, sternum & upper ribs.

- Juxta articular osteopenia is seen in RA, not in psoriasis.
- Hyperextension of DIP & flexion of PIP is seen in RA (not SLE).
- Prominent subluxation of MCP joints, absence of erosion, B/L symmetrical & Jaccoud's arthropathy (similar to RA) are features SLE.
- Multiple sites involvement, soft tissue nodules, erosions at various joints with preserved joint spaces are seen in amyloidosis.
- Amyloidosis mimics RA except for preservation of joint space positive subchondral cysts & no periarticular osteopenia.
- Erosive disease is not seen in SLE.
- Pott's spine shows less sclerosis, more abscess calcification, slow progression, marked collapse & large paravertebral abscess as composed to pyogenic infections.
- **In TB arthritis, there is periarticular osteopenia, marginal erosion, late sparing of joint space, joint effusion, even & thin synovium.**
- TB involves disc at a late stage but pyogenic (staphylococcus) infection acutely infects the disc.
- TC99 scintigram is more sensitive (best invest.) & indium study is more specific for osteomyelitis.
- Staph aureus most commonly involved in septic arthritis.
- AVN & deforming arthropathy is not seen in systemic sclerosis → Acro-osteolysis with soft tissue calcification are seen.
- *Retrocalcaneal bursitis occurs in Reiter's & psoriatic arthritis.*
- Joint space narrowing is unusual in sarcoidosis.
- Central erosion with marginal osteophytes give Gull-wing appearance in erosive OA.
- Focal involvement is seen in osteomyelitis & diffuse in neuropathic joint.
- Low signal On T1 & T2 are seen in chronic neuropathy but not in osteomyelitis.
- HIV associated arthritis is oligoarticular, asymmetric & peripheral involving knees & ankles & takes duration of 1-6wks (resolves before 6wks). Periostitis & new bone formation may occur.
- Osteophytes are least to worry about in OA.
- Erosion in radio-ulnar & radio – carpal joints may be seen in RA.
- *Reactive arthritis = Reiter's*
- Telescoping of joint & arthritis mutilans seen in psoriasis.
- **Bony ankylosis of carpal/tarsal bones do not occur in RA but fibrous ankylosis do.**
- Bony ankylosis may occur in JRA.

- Joint effusion show delayed enhancement
- Chemical synovitis occurs post arthrography. It begins after 4 hrs & peaks at 12 hrs.
- Protrusio acetabuli is seen in RA not OA.
- **Z- deformity is Boutonniere's type deformity in thumb. Mallet finger is flexion deformity in thumb.**
- Parasyndesmophytes & bone marrow edema in whole vertebral body are seen in psoriatic arthropathy.
- *New bone formation with absence of periarticular osteoporosis is seen in psoriatic arthritis (reverse for RA).*

- Plantar fibromatosis presents as nodular thickening in plantar fascia. There can be single or multiple lesions. The nodule enhances (shows vascularity).
- Significant subacromial subdeltoid bursitis includes thickness > 3mm, presence of bursal fluid medial to ACJ & fluid in anterior aspect of bursa.
- The paratenon is more commonly the site of acute inflammation of Achille's tendon than the infrapatellar tendon.
- An echo poor halo around the tendon is seen in paratenonitis on USG.
- In infrapatellar tendinopathy, the tendon may be swollen & contains focal areas of reduced echogenicity.
- Inguinal lesion not changing with valsalva can be a lipoma (hyperechoic vascular mass).
- **Gas gangrene shows air in soft tissues around the compound fractures & it is caused by clostridium, coliforms & bacteroides.**
- Morton's neuroma mostly occurs between 3rd & 4th toe & appear hypoechoic non compressible lesion on USG with absent vascularity.
- Peripheral nerve sheath tumours are mobile.
- **Anteromedial ankle impingement syndrome occurs due to inversion & shows amorphous signal in ATTL with heterotopic bone formation & small corticated ossicles with synovitis & fibrosis. Tibialis posterior tendon may be displaced medially.**

Deltoid ligament of ankle comprises:-

Superficial

Tibiocalcaneal

Tibionavicular

Tibiospring

Posterior superficial tibiotalar lig.

Deep

ATTL

Posterior Deep tibiotalar ligament

- In PVNS, extrinsic erosion is most common osseous abnormality. Mostly manifest as soft tissue mass.
- **Morton's neuroma occurs mostly in third metatarsal space (between 3rd & 4th metatarsals) with associated bursitis.**
- Soft tissue malignant fibrous histiocytoma is most common primary malignant soft tissue tumour in adults & it shows calcification with adjacent bony cortical erosion.
- **GCT of tendon sheath commonly affects the fingers & is an extra articular form of PVNS (low signal – on T1/T2) due to hemosiderine deposition.**
- Oval shaped calcification aligning in direction of muscle fibers is cysticercus.
- PVNS shows articular erosions but space is preserved.
- Plantar fascitis show intermediate signal on T1 & high on T2, USG shows caliber >4mm, loss of reflectivity of ligament.
- Convex anterior margin of Achille's suggests partial tear.
- Heterotopic ossification = Myositis ossificans (can present around acetabulum, with peripheral mineralization).
- Ulnar impaction syndrome is a degenerative condition due to excessive loading & shows positive ulnar variance with TFCC tear & bone edema with chondromalacic changes.

Adhesive capsulitis results in restriction of elevation & external rotation. There is thickened coracohumeral ligament, joint capsule & axillary recess is significantly reduced in volume. Obliteration of fat between coracohumeral ligament & coracoid process is seen.

- Lucent cleft between the soft tissue mass & bony cortex is seen in parosteal osteosarcoma but in myositis, there is a thick lucent zone.
- Polymyositis gives high T2 signal in muscles but usually does not give erosions.

- Morton's neuroma is intermediate sig on T1 & low on T2W1 with variable enhancement.
- **Enthesitis is seen in interspinous & supraspinous ligaments in AS.**
- Ganglion cysts can be multilocular.
- Ganglion cyst mostly occurs in periarticular location.
- HPOA also causes increased soft tissue thickness with increased longitudinal curvature of fingernails in hands.
- *Post operative fibrosis enhances with contrast on MRI (for upto 2 yrs.)*
- Loss of abduction with numbness on lateral aspect of arm is due to axillary nerve palsy.

- Patients with renal osteodystrophy have extensive soft tissue calcifications in periarticular location with superscan appearance.
- ‘Soap bubble’ appearance is fluid level on MRI.
- Hemangiomas are high signal on T1 & T2WI.
- Gaucher’s disease causes AVN, splenomegaly pancytopenia, anemia & Erlenmeyer flask deformity.
- HPOA shows symmetrical uptake along the cortical margins of diaphysis & metaphysis (mainly).
- In pelvis, Paget’s causes thickening of iliopectineal line with acetabular protrusion & sclerosis. (mostly unilateral occurrence).

Paget’s disease results in unilateral cortical thickening with bowing & shows intense uptake with raised serum Alkaline phosphatase levels. It can be monostotic or polyostotic (calvarium, pelvis & long bones can be simultaneously affected).

- Types of acromion classification:-
 - Type 1 – Fat – (12%)
 - Type 2 – Concave – (56%)
 - Type 3 – Hooked – (29%) (More associated with rotator cuff tear).
 - Type 4 – Inferior convex – (3%).
- Osteonecrosis occurs in epiphysis but bone infarct occurs in metaphysis or diaphysis.
- SCFE is a type 1 Salter Harris classification.
- Scleroderma causes terminal phalangeal resorption, soft tissue calcification (intra-articular) & multiple swelling in hands.
- Recent tooth extraction always shows increased uptake. Hemangioma, leukemia & myeloma may show increased uptake.
- Superior rib notching → RA, SLE, Scleroderma, sjogren, Marfan’s, hyperparathyroidism & osteogenesis imperfecta.
- NF & hyperparathyroidism can cause superior & inferior Rib notching.
- Ewing’s, syphilis & infantile cortical hyperostosis show parallel spiculated (Hair on end) periosteal reaction.

Grading of chondromalacia patellae

I – Focal hyperintense area not extending to cartilage

II – Extending to cartilage surface with sharp normal cartilage margin.

III – Extending to articular surface but not down to osseous surface.

IV – Focal hypointense area extending from subchondral bone to cartilage surface.

- SLAP lesions are classically located at the biceps anchor, they occur with repetitive overarm activity & benign in the post aspect of superior labrum.
- **Triangular area of high signal at the patellar enthesis when imaged on gradient echo is of no clinical significance.**
- Psoriasis, diabetes, PVC & hyperparathyroidism causes acro-osteolysis.
- *Hyperparathyroidism, pregnancy, trauma, osteitis pubis, mets, infection, early ankylosing spondylosis & RA causes widened symphysis pubis.*
- **Nasopharyngeal space (anterior to C1) is 10 mm. Retropharyngeal space (C2 – C4) is 5-7mm. Retrotracheal space (C5 – C7) is 22mm.**
- An osseous lump at the femoral head – neck junction is present in 50% of cam-type femoro-acetabular impingement (FAI) & 33% of pincer type.
- Alpha angle is formed by a line from centre of femur head to centre of neck & a line from centre of head to head – neck junction (normal is 45°).

- Alpha angle $>55^\circ$ is seen in Cam – type FAI.
- Post vertebral scalloping is not a feature of sickle cell disease.
- **Pachydermo-periostitis causes symmetrical periosteal reaction in long bones in adolescence.**
- Abductor pollicis brevis is supplied by median nerve.
- Abductor digiti minimi, adductor pollicis, FCU & FDM are supplied by ulnar nerve.
- Myeloma, hyper PTH, mets, cleidocranial dysostosis, RA & Gorlin Syndrome – all causes absence of outer ends of clavicles.
- Mets, RA, infection, lymphoma, EG & sarcoma causes destruction of medial ends of clavicles.
- *Paget's can cause fracture of femoral neck in elderly (Banana fractures along convex side & also compression fracture of vertebra).*
- *Best position for visualizing supraspinatus tendon is adduction & internal rotation (asking the patient to put back of their hand onto their back).*
- In spine, bulky vertically oriented soft tissue ossification giving “floating” osteophyte appearance is seen in psoriasis.
- **Loss of lamina dura is caused by hyper PTH, Scleroderma, Casting's, Paget's, LCH, leukaemia and mets.**
- Thickening of lamina dura is caused by osteopetrosis & hypoparathyroidism.
- Triple contrast CT study should be advised for penetrating abdominal trauma.
- Communication between hip joint capsule & iliopsoas bursa is normal in 15%.
- Diluted solution of 0.4mmol/L. Gadolinium is used for MR arthrography.
- **Hot spots on bone scan are: Fibrous dysplasia, Paget's brown tumours, ABC, osteoid osteoma, chondroblastoma & fractures after 24-48 hrs & tooth extraction.**
- T2 coronal is best view for TFCC tear.
- *Bowing of PCL & medial patellar plica is seen normally.*
- Tuberous sclerosis shows bony islands thickening of diploe, expansion & sclerosis of ribs & periosteal thickening of long bones.
- BMD can be measures by Z score or T score. T score less than 2.5 suggests osteoporosis.
- *Patella Baja is associated with polio, Achondroplasia & Juvenile chronic arthritis.*
- **Subtrochanteric & lesser trochanter fractures are pathological.**
- Mazabraud's syndrome is polyostotic FD & soft tissue myxoma.
- Increased activity throughout skeleton with absent renal activity suggest prostate Ca mets.
- Normal alignment is second metatarsal with the middle cuneiform.
- *Callus formation is seen in osteoporotic fracture but not in ostomalacia.*
- **Supraspinatus & infraspinatus are present around spinoglenoid notch.**
- Low signal on T1W1 is s/o AVN.
- Disruption of Klein's line is a feature of SCFE.
- Crescent sign in femur head (subchondral fissuring), epiphyseal collapse, fragmentation & sclerosis are features of perthe's.
- Lymphatic filling into the joint space supports the diagnosis of adhesive capsulitis of shoulder.
- Limbus vertebra is well defined triangular area of bone.
- Longitudinal arch of foot is formed by tibialis posterior.
- *In DISH, there can be preserved disc space height, normal SI joints & apophyseal joints.*
- Magic angle refers to increased signal on T1 & PDW1.
- Accessory soleus muscle can be seen in pre Achille's fat pad.
- **Osteitis condensans, Psoriasis & Ankylosing Spondylitis cause symmetrical sacroilitis but Reiter's cause asymmetric & infection (TB) cause unilateral sacro – ileitis.**
- Flame shaped lucencies in long bones are seen in Paget's.
- Sickle cell disease causes sclerosis of both humeral heads, pulmonary infiltrates, elevated position of splenic flexure & H-shaped vertebra.
- In transient regional osteoporosis, femoral heads show edema with normal acetabuli & joint spaces.
- In transient osteoporosis, there is loss of subchondral cortex with marrow edema & intense uptake.
- Osteophytes are not seen in ankylosing spondylitis but ALL calcification can be seen.
- False negative for rotation cuff tear on USG are limited mobility, incorrect transducer, poor focusing. False

positives are due to anisotropy, acoustic shadowing, poor transducer positioning.

- **FD shows ground glass involvement of medulla symmetrical distribution, soft tissue mass, cyst like changes, involvement of paranasal sinuses, maxilla, sphenoid & orbit (All these are not seen in Paget's).**
- Bone within bone is also seen in physiological neonates, nutritional disturbance & metastasis, hypervitaminosis D, healing rickets [not seen in renal osteodystrophy].
- In adults, red bone marrow is seen in axial skeleton, proximal humerus & femur metaphyses.
- In neonates, red marrow is present in all skeleton.
- Vertebroplasty is done for compression fracture, painful osteoporosis, hemangiomas & tumours (mets/myeloma) (not for osteoid osteoma).
- *Superscan refers to diffuse osseous uptake with reduced renal & soft tissue uptake (Mostly due to mets of prostate & breast Ca, renal osteodystrophy, hyper PTH, Paget's, myelofibrosis). Poor renal function can also demonstrate false positive superscan. Prostate Ca with urinary tract obstruction can have increased renal activity (false negative scan).*

Tibiocalcaneal angle is 60° - 90° .

- *Less angle → Congenital vertical talus & Rocker Bottom feet.*
- *More angle → Equinus deformity.*

Talo calcaneal angle is 15° - 40° .

- *Less → varus – Hindfoot*
- *More → Valgus - Hindfoot.*

- Normally, metatarsals overlap. If metatarsals are not overlapping, then forefoot varus is present.
- If first metatarsal is most plantar, then forefoot valgus is present.
- **Clubfoot = Hindfoot equines & varus (More tibiocalcaneal angle & less talocalcaneal angle).**
- **Pes plano valgus = Hind foot & forefoot valgus.**
- **Pes cavus = Hindfoot valgus.**
- Long gracile bones with overtubulation with diminished weight bearing is seen in cerebral palsy, JRA & Marfan Syndrome.

- Sustentaculum tali is present on medial aspect of calcaneum.
- Acute pain crisis & stroke can occur in sickle cell disease.
- HPOA causes dia-metaphyseal lamellar periosteal reaction with burning pain & swelling.
- Cortical thickening with trabecular coarsening is seen in Paget's.
- Cemented acetabular cup with uncemented femoral stem is reverse hybrid total hip replacement.
- Hybrid = Cemented femur stem + uncemented acetabular cup.
- Unipolar hemiarthroplasty is femoral component articulating directly with native acetabular cartilage.
- Bipolar hemiarthroplasty is femoral component articulating with a cup inserted into native cartilage without fixation.
- Hip resurfacing is metallic femoral head articulating with acetabular prosthetic metal cup.
- **Looser's zones also seen in renal osteodystrophy.**
- **Looser's zones are incomplete fractures on medial side of femur.**
- Normally, popliteal vessels pass lateral to the medial head of gastrocnemius.
- Paget's & FD causes stress fractures on lateral aspects of femur.
- In popliteal artery entrapment syndrome, there is anomalous origin of the medial head of gastrocnemius or anomalous course of popliteal artery resulting in extrinsic compression of the artery.

In marfan syndrome, there is reduced upper to lower segment ratio, dissection of ascending aorta, spontaneous pneumothorax, scoliosis, pectus carinatum & excavatum, protrusion acetabuli & pes planus.

- Middle portion of the terminal pharynx is resorbed in polyvinyl chloride poisoning.
- Ankylosing spondylitis (AS) involves ankylosis at vertebral edges or centre.
- Anderson lesion in AS are late feature but Romanus lesions occur earlier.
- HPOA can be associated with pneumocystis carini infection.
- Spin echo sequences eliminates susceptibility artefact in MRI.
- **HPOA shows 'tramline' sign on bone scan.**
- Wood & plastic are radiolucent but wood is more echogenic than plastic.
- Brachial plexus nerve root avulsion appears like a pseudomeningocele on MRI.
- Abnormal enhancement within multifidus muscles is s/o nerve root avulsion.
- Progressive focal lucent area at cement bone interface is either infection or aggressive granulomatous disease.
- **Primary loosening is radiolucent zone > 2 mm at cement – bone or metal – bone interface or a progressive lucent zone at metal cement interface. The lucent zone is not rounded.**
- *In mastocytosis, there is involvement of skin, bone marrow, liver, spleen, LN & small bowel with elevated serum tryptase levels. Diffuse small bowel thickening with osteosclerosis is seen.*
- Myelofibrosis shows osteosclerosis & splenomegaly.
- Towne's view is mainly for occipital bone (caldwell view is for Orbit).
- Occipitomental (water's) view is for facial bones & sinuses & zygomatic arches.
- Submentovertical view is for zygomatic arches.
- Lateral calf & foot are supplied by L5 nerve root.
- In hypoperfusion complex, there is hyperenhancement of kidneys, adrenal glands, pancreas & bowel wall but poor perfusion of spleen
- **Sinus tarsi syndrome, patients presents with lateral foot pain with loss of fat, synovial thickening & enhancement of tarsal sinus.**
- Idiopathic osteolysis is Gorham's disease.
- Mazabraud's syndrome = FD + soft tissue myxoma.
- Marrow reconversion occurs due to sickle cell, smoking, chemotherapy, long distance running but not due to gaucher's.

“Head at risk” signs of AVN are:-

- *Gage’s sign → Radiolucent V-shape seen in lateral side of epiphysis on AP pelvis X-ray.*
- *Calcification lateral to epiphysis*
- *Lateral subluxation with increased inferomedial joint space.*
- *Horizontal growth plate.*

- Radiation necrosis shows sclerosis with no uptake on bone scan & also cause pain.
- SCIWORA → deformed cervical spine in children with cord injury but no radiological sign.
- **Brown Sequard syndrome → hemitransection causing ipsilateral motor paralysis & contralateral hyperaesthesia.**
- High T2 signal in bone underlying an osteochondral lesion is most common factor of instability.
- **Whiskering is seen at tendinous insertions in DISH.**
- Post operative fibrosis in spine is failed back syndrome.
- Hemangioma may cause mild expansion of vertebral body.
- *Anterior Cord syndrome → complete motor paralysis*
- Ollier’s disease is associated with Madelung’s. Nail Patella Syndrome also associated
- Lichtenstein – Jaffe’s disease = FD
- Axial STIR is used for disc protrusion but axial T2 is used for far lateral disc protrusion.
- Buford complex (normal variant) consists of absent anterior labrum with thickened cord like middle glenohumeral ligament.
- **Osteopoikilosis → rounded densities**
- **Osteopathia striata → linear longitudinal or sunburst**
- **Melorrheostosis → flowing wax**
- Atlanto-axial instability is seen in RA, Down’s, Morquio’s & retropharyngeal abscess (not in Achondroplasia).
- Pulmonary embolism occur 7-10days post surgery
- Fat embolism occurs within 3-6 hrs. of injury.

Femoro-acetabular impingement

Cam(common) → 3rd-4th decade in men

→ Related to previous SCFE

→ > α angle causes proximal superior femoral neck to impinge upon superior acetabular margin

→ osseous bump on superior femoral neck

→ Persistent pain

Pincer → Common in women

→ Abnormally deep acetabulum.

1. Which of the following are correct regarding intra-articular osteoid osteoma:

- (a) Most commonly affects the hip.
- (b) Typically presents with nocturnal pain.
- (c) The radiolucent nidus is surrounded by extensive reactive sclerosis.
- (d) MRI is more specific than CT in detecting the nidus.
- (e) Plain radiograph have a sensitivity exceeding 90% in detecting the nidus.

Answer:

- (a) Correct
- (b) Not correct
- (c) Not correct
- (d) Not correct
- (e) Not correct

Explanation:

Nocturnal pain is a feature of long bone osteoid osteoma and not of intra-articular lesions. It is also less responsive to NSAIDs.

Extensivereactive sclerosis surrounding the nidus is a feature of long bone lesion and not of intra-articular lesion. Nidus is often overlooked on radiographs. MRI is more sensitive than CT in detecting the nidus, however CT is more specific. MRI is sensitive as it is highly sensitive in demonstrating perilesional edema.

2. Typical feature of pigmented villonodular synovitis (PVNS) include:

- (a) Loss of bone density on plain film.
- (b) A dense joint effusion on plain film.
- (c) “blooming artefact” on gradient echo MR sequences.
- (d) Well defined erosions with preservation of joint space.
- (e) Soft tissue calcification on plain film.

Answer:

- (a) Not correct
- (b) Correct
- (c) Correct
- (d) Correct
- (e) Not correct

Explanation:

PVNS represents part of a disease spectrum that includes diffuse and localized form of giant cell tumour of the tendon sheath to the more diffuse intra-articular form that is PVNS. Thus it is characterized by synovial proliferation and hemosiderin deposits. Hence, bone density is maintained and dense joint effusion is seen.

Soft tissue calcification is uncommon in PVNS.

3. Which of the following are correct regarding ankylosing spondylitis:

- (a) The hip joints are involved in more than 20% of patients.
- (b) 90 % of patients exhibit HLA-B27 antigen.

- (c) Romanus lesions are seen in end-stage disease.
- (d) Syndesmophytes are the result of ossification of the annulus fibrosus.
- (e) Peripheral arthropathy is most common in the upper limbs.

Answer:

- (a) Correct
- (b) Correct
- (c) Not correct
- (d) Correct
- (e) Not correct

Explanation:

Romanus lesions are seen in early stages of disease and consist of inflammation at the site of anterior longitudinal ligament attachment to vertebrae and discs giving rise to erosions at discovertebral junction.

Extraspinal manifestations include enthesopathy and peripheral arthropathy favouring the lower limbs. Iritis, aortic insufficiency and pulmonary fibrosis are extraskkeletal manifestations of Ankylosing spondylitis.

4. Which of the following are correct regarding popliteal (Baker's) cysts:

- (a) Are commonly associated with meniscal pathology in adults.
- (b) Are frequently associated with osteoarthritis and rheumatoid arthritis in adults.
- (c) Ultrasound can differentiate Baker's cysts from popliteal aneurysms and ganglion cysts.
- (d) Typically extends posteriorly between the tendons of semimembranosus and the medial head of gastrocnemius.
- (e) Calcified loose bodies are a recognized complication.

Answer:

- (a) Correct
- (b) Correct
- (c) Correct
- (d) Correct
- (e) Correct

Explanation:

Popliteal cysts are fluid filled synovial lined bursa in the popliteal fossa communication with the knee joint. They are generally located at or below the joint line. Majority of them are incidental findings. Acute rupture of Baker's cyst resembles DVT in clinical presentation.

5. The following tendons / ligaments attach to the named bony prominence:

- (a) Lesser tuberosity of the humerus – infraspinatus tendon.
- (b) Anterior superior iliac spine – tendon.
- (c) Medial epicondyle of the humerus – extensor tendon origin.
- (d) Inferior pole of patella – quadriceps tendon.
- (e) Tibial eminence – anterior cruciate ligament.

Answer:

- (a) Not correct
- (b) Correct
- (c) Not correct

- (d) Correct
- (e) Not correct

Explanation:

Supraspinatus tendon attaches to lesser tuberosity of the humerus. The infraspinatus tendon attaches to greater tuberosity of humerus.

Flexor tendon origin is at medial epicondyle of humerus and extensor tendon origin is from lateral epicondyle of humerus.

The quadriceps tendon attaches to the superior pole of patella and patellar ligament attaches to the inferior pole of patella.

6. Which of the following are correct regarding giant cell tumours of bone (GCT):

- (a) Are typically subarticular in location.
- (b) Metastasise in less than 10% of cases.
- (c) Most commonly occur in the proximal humerus.
- (d) Spinal GCTs affect primarily the posterior elements.
- (e) Periosteal reaction is seen in 60-80% of cases.

Answer:

- (a) Correct
- (b) Correct
- (c) Not correct
- (d) Not correct
- (e) Not correct

Explanation:

Most common location of GCT is around knee joint (50%-65%) with distal femur accounting for 23%-30% cases. Proximal humerus accounts for 4-8% of the cases of GCT.

Spinal GCT primarily affects the vertebral bodies with extension into the posterior elements. Vertebral body collapse is a frequent finding.

Periosteal reaction is uncommon seen on radiograph only in 10-30% cases. Cortical penetration is however seen in 33-50% cases with associated soft tissue mass.

7. Which of the following are correct regarding synovial osteochondromatosis:

- (a) Most commonly affects the joints of the hands.
- (b) Typically presents with a painless swollen joints.
- (c) Intra-articular nodules can be hyper-intense on T2W.
- (d) Calcification is absent in 25-30% of patients.
- (e) Chondrosarcoma is a complication.

Answer:

- (a) Not correct
- (b) Not correct
- (c) Correct
- (d) Correct
- (e) Correct

Explanation:

It is a benign monoarticular disorder of unknown etiology. It is more common in men usually presenting in 3rd-5th decade. Large joints like knee, hip, shoulder and elbow are commonly involved. However smaller joints like TM joint, AC joint and interphalangeal joint can also be involved.

It presents with joint pain, swelling and restriction of movements.

8. Which of the following are correct regarding calcium pyrophosphate deposition disease (CPPD):

- (a) Haemochromatosis is a cause.
- (b) Most commonly affects the small joints of the hand.
- (c) Hyaline cartilage calcification is typically thick and irregular.
- (d) Subchondral cyst formation is a typical feature.
- (e) Destructive arthropathy is a rare manifestation.

Answer:

- (a) Correct
- (b) Not correct
- (c) Not correct
- (d) Correct
- (e) Correct

Explanation:

CPPD associated acute arthritis is known as pseudogout. 50% cases affect the knee joint. Other locations are hip, shoulder, elbow and wrist joint. Changes are usually bilateral and symmetrical.

Fibrocartilage calcification is typically coarse and irregular. Hyaline cartilage calcification is typically fine and linear following the contour of underlying bone.

9. The following MRI features favour a spinal metastatic fracture rather than an osteoporotic collapse:

- (a) Convex posterior border of the vertebral body.
- (b) Diffuse paraspinal mass.
- (c) Abnormal signal in the neural arch.
- (d) Low signal intensity band on T1W MRI.
- (e) Areas of normal marrow signal vertebral body.

Answer:

- (a) Correct
- (b) Not correct
- (c) Correct
- (d) Not correct
- (e) Not correct

Explanation:

Diffuse paraspinal mass is not helpful in differentiating between metastatic and osteoporotic collapse. However focal paraspinal mass is seen more frequently with metastatic collapse.

Low signal intensity band on T1WI and T2WI is more common in osteoporotic collapse (93%) than in metastatic collapse (44%).

Spared normal marrow signal in a vertebral body is highly suggestive of osteoporotic collapse.

10. Which of the following are correct regarding MRI of osteonecrosis (avascular necrosis) of the femoral head:

- (a) Focal areas of low signal on T1W MRI suggest an alternative diagnosis.
- (b) The “double line sign (adjacent high and low intensity line on T2W MRI) is virtually diagnostic.
- (c) Fractures typically appear as low signal intensity lines on T1W images.
- (d) Intravenous contrast should be administered routinely.
- (e) MRI is less sensitive than isotope bone scan in making the diagnosis.

Answer:

- (a) Not correct
- (b) Correct
- (c) Correct
- (d) Not correct
- (e) Not correct

Explanation:

Focal areas of homogeneous or inhomogeneous low signal on T1WI are commonly found.

Contrast enhancement differentiates hypervascularized viable tissue from hypovascularized necrotic tissue. However it is not routinely done as it can be differentiated on other sequences.

Isotope bone scan has a sensitivity of 80-85% and MRI has a sensitivity of 90-100%.

11. Which of the following are correct regarding Langerhans cell histiocytosis (LCH) in children:

- (a) Peak incidence occurs at 10-15 years of age.
- (b) The axial skeleton is spared in the majority of cases.
- (c) In chronic LCH, bony lesions typically have an aggressive osteolytic pattern.
- (d) Vertebra plana is most commonly seen in the lumbar spine.
- (e) A bevelled edge appearance is characteristic of skull lesions.

Answer:

- (a) Not correct
- (b) Not correct
- (c) Not correct
- (d) Not correct
- (e) Correct

Explanation:

In children peak incidence of LCH is 1-4 years of age with presentation ranging from newborns to 15 years of age. It involves any bone but more than 50% cases involve the axial skeleton. Of the long bones diaphysis of femur, tibia and humerus are commonly involved.

Appearance of lesion depends on phase of the disease and site of involvement. In early stage lesions are aggressive with osteolytic pattern, appear permeative with wide zone of transition and lamellated periosteal reaction.

In paediatric spine thoracic vertebrae are more commonly involved (54%) followed by lumbar (35%). The body is affected more than posterior elements.

12. Which of the following are correct regarding trauma to the upper limb:

- (a) Non-or delayed union of humeral fracture is common.
- (b) Bilateral shoulder dislocations are usually anterior.
- (c) A fixed, abducted arm on shoulder X-ray is consistent with luxatio erecta.
- (d) Humeral shaft fractures are associated with axillary nerve injury.
- (e) The brachial artery is injured in 1-5% of humeral shaft fractures.

Answer:

- (a) Not correct
- (b) Not correct
- (c) Correct
- (d) Not correct
- (e) Correct

Explanation:

Non-union or delayed union of humeral fracture is rare and occurs in cases secondary to excessive distraction of fracture fragments.

Bilateral shoulder dislocation is rare and is usually posterior, mainly due to seizures.

Humeral shaft fractures are associated with radial, medial or ulnar nerve injury. Radial nerve injury is most common (5-17%).

13. Which of the following are correct regarding knee trauma:

- (a) Anterior cruciate ligament (ACL) tears usually occur at the tibial attachment.
- (b) “Deep lateral femoral sulcus” is a specific sign of posterior cruciate ligament (PCL) disruption.
- (c) Kissing contusions at the anterior aspect of the proximal tibial and distal femur are characteristic of hyperextension injury.
- (d) O’ Donoghue triad comprises complete disruption of the medial collateral ligament, ACL and posterior horn of medial meniscus.
- (e) Dashboard injuries are typically associated with ACL tears.

Answer:

- (a) Not correct
- (b) Not correct
- (c) Correct
- (d) Correct
- (e) Not correct

Explanation:

ACL tears usually occur in middle part of ligament followed by femoral attachment.

Deep lateral femoral sulcus sign is highly specific for ACL disruption and results from impaction of the lateral femoral condyle on the posterior tibial plateau.

Dashboard injuries are typically associated with midsubstance PCL tears at the genu.

14. Which of the following are correct regarding congenital hypothyroidism ?

- (a) It is cause of posterior scalloping of the vertebral bodies.
- (b) The incidence is higher in infants with Down’s syndrome.
- (c) A radiolucent metaphyseal band is a feature.
- (d) Sclerosis of the skull base occurs.

- (e) It is more common in males.

Answer:

- (a) Not correct
- (b) Correct
- (c) Not correct
- (d) Correct
- (e) Not correct

Explanation:

Hypothyroidism is 3 times more common in females.

In hypothyroidism, the bones are slender with endosteal thickening and typically with a dense band at the metaphysis.

There may be hypoplasia of the vertebral bodies, particularly at the level of the first or second lumbar vertebrae. Posterior scalloping of the vertebral bodies is seen in acromegaly.

15. Which of the following statements are correct regarding cleidocranial dysostosis ?

- (a) It is inherited as an autosomal recessive trait.
- (b) Hypoplasia of the distal third of the clavicle is seen in the majority of cases.
- (c) It is associated with osteosclerosis.
- (d) Bladder exstrophy is a feature.
- (e) It is associated with an absent radius and fibula.

Answers:

- (a) Not correct
- (b) Not Correct
- (c) Not Correct
- (d) Not correct
- (e) Correct

Explanation:

CCD is an autosomal dominant disease. Pyknodysostosis is an autosomal recessive disease.

Hypoplasia of the distal and middle third of the clavicle is encountered in 10% of the cases.

Osteosclerosis is a feature of Pyknodysostosis.

There is delayed ossification of the pubic bones, resulting in widening of the symphysis pubis. However this does not result in full blown exstrophy.

16. Which of the following statements regarding multiple myeloma are correct?

- (a) Skeletal radiographs are abnormal in the majority of patients at the time of presentation.
- (b) Sclerotic bone lesions are more commonly seen in POEMS (polyneuropathy, organomegaly, endocrinopathy, monoclonal gammopathy and skin changes) syndrome than in multiple myeloma.
- (c) Skeletal radiographs are more sensitive than radionuclide bone scans in detecting bony lesions.
- (d) Bony involvement typically spares the mandible
- (e) Magnetic resonance imaging (MRI) of the lumbar spine is useful in the staging of patients with a normal skeletal survey.

Answers:

- (a) Correct
- (b) Correct
- (c) Correct
- (d) Not correct
- (e) Correct

Explanation:

Unlike bony metastasis, which rarely affect the mandible, involvement of the mandible is not unusual in multiple myeloma.

Technetium 99 diphosphonate bone scans are usually normal or show diminished uptake in multiple myeloma.

17. Which of the following are correct regarding osteosarcoma ?

- (a) There is an increased incidence osteopetrosis.
- (b) There an association with pineoblastoma.
- (c) Telangiectatic osteosarcoma typically demonstrates fluid-fluid levels on MRI.
- (d) It frequently metastasises to other bones.
- (e) Parosteal osteosarcoma resembles myositis ossificans on radiograph.

Answers:

- (a) Correct
- (b) Correct
- (c) Correct
- (d) Not correct
- (e) Correct

Explanation:

In osteosarcoma, metastatic spread is heterogeneous, as bones lack a lymphatic system. The lungs are the most frequent site, although bones may be involved. Lymphadenopathy occurs late in the disease and is a poor prognostic sign.

18. Which of the following statements are correct regarding congenital dislocation of the hips ?

- (a) It is more common in females
- (b) There is an association with giant cell tumour
- (c) It is most commonly seen in first-born infants
- (d) Premature osteoarthritis typically occurs between 10 and 20 years of age
- (e) It is usually bilateral

Answers:

- (a) Correct
- (b) Correct
- (c) Correct
- (d) Not correct
- (e) Not correct

Explanation:

Two thirds of the cases of congenital dislocation of the hip are unilateral. The left side is more frequently affected than the right.

Secondary osteoarthritis in congenital dislocation of hip is typically not apparent until 40-60 years of age .

19. Which of the following are correct regarding Perthe's disease ?

- (a) Bilateral hip involvement is more common in males
- (b) Female gender is associated with a poorer prognosis
- (c) There is usually a family history
- (d) An older age of onset is associated with a better prognosis
- (e) It results in coxa magna.

Answers:

- (a) Correct
- (b) Correct
- (c) Not correct
- (d) Not correct
- (e) Correct

Explanation:

Perthe's disease has no increased incidence in families. However, there is reportedly an associated increased incidence of cardiac abnormality, pyloric stenosis, renal abnormality and undescended testis.

Poor prognostic factors include the female sex, an older onset of disease, metaphysis involvement, a greater degree of epiphysis involvement and uncovering of the lateral femoral neck.

20. Which of the following are correct regarding musculoskeletal trauma.

- (a) Sternal fracture an indirect sign of thoracic spine injury
- (b) Atlanto-occipital dislocation is frequently fatal
- (c) Laceration of the dura is commonly associated with lumbar spine fracture
- (d) A scapholunate angle of more than 80° is suggestive of scapholunate dissociation
- (e) Epiphyseal plate fracture (Salter-Harris type I) are common in nonaccidental injury in children.

Answers:

- (a) Correct
- (b) Correct
- (c) Not correct
- (d) Correct
- (e) Not correct

Explanation:

Laceration of the dura is not associated with lumbar spine fracture. It is more common in patients with a burst fracture that is associated with neurological deficit and laminae fracture.

The epiphyseal plate injuries are rarely encountered in non-accidental trauma.

21. Which of the following are correct with regards to the cervical spine:

- (a) For the erect lateral view of the cervical spine the central beam is directed horizontally to the centre of C3 vertebra.
- (b) The space between the odontoid process and the anterior arch of the atlas (atlanto-dens interval) should not exceed 3 mm in adults
- (c) A Jefferson fracture is unstable

- (d) A swimmer's view can be used for better demonstration of the C1/C2 junction.
- (e) A hangman's fracture is usually secondary to a hyper-flexion injury

Answers:

- (a) Not correct
- (b) Correct
- (c) Correct
- (d) Not correct
- (e) Not correct

Explanation:

For the erect lateral view the central beam is directed to the centre of C4.

A swimmer's view is used for better visualization of C7/C8/T1.

Hangman's fracture is secondary to hyperextension resulting in bilateral fractures of pedicles of C2. It is unstable injury and accounts for 4-7% of all spinal fractures.

22. Which of the following are correct regarding anatomy of the knee joint

- (a) The popliteus muscles tendon passes through a portion of the posterior horn of the lateral meniscus.
- (b) The medial and lateral collateral ligaments are best assessed on sagittal MRI imaging of the knee
- (c) The normal medial meniscus is seen as low signal on T1W spine echo and high signal on T2W spine echo MRI images
- (d) The posterior cruciate ligament is attached to the inner aspect of the medial femoral condyle.
- (e) The commonest site of meniscal injury is the posterior horn of the lateral meniscus.

Answers:

- (a) Correct
- (b) Not correct
- (c) Not correct
- (d) Correct
- (e) Not correct

Explanation:

Both collateral ligaments are best assessed on coronal images.

Normal medial meniscus shows low signal on T1 and T2 images.

Posterior horn of medial meniscus is most common site for meniscal injury.

23. Features of diaphyseal aclasia (hereditary multiple exostosis) include:

- (a) Malignant transformation to chondrosarcoma occurs in 35-40 %
- (b) Exostoses have a cap hyaline cartilage, often with a bursa formation over the cap.
- (c) Exostoses arise from the metaphysis and point towards the joint
- (d) Exostoses stop growing when the nearest epiphyseal centre fuses
- (e) Autosomal recessive inheritance.

Answers:

- (a) Not correct
- (b) Correct

- (c) Not correct
- (d) Correct
- (e) Not correct

Explanation:

Diaphyseal aclasia is an autosomal dominant disorder presenting between 2 to 10 years of age. The exostoses arise from the metaphysis of long bones and point away from the joint. Risk of malignant transformation to chondrosarcoma is less than 5 %.

24. Which of the following are correct regarding osteochondritis dissecans:

- (a) Lesions in the knee are bilateral in 20-30%
- (b) Lesions in the knee most commonly involve the lateral aspect of the femoral condyle.
- (c) The average age of onset is within the 2nd decade
- (d) A high signal intensity line around the lesions on T2W MRI images is indicative of instability
- (e) A grade 2 osteochondritis dissecans lesions is characterised displaced a displaced fragment.

Answers:

- (a) Correct
- (b) Correct
- (c) Correct
- (d) Correct
- (e) Not correct

Explanation:

Grading of osteochondritis dissecans:

Grade 1- focal softening/fissuring

Grade 2- defect in cartilage

Grade 3- fragment partially detached

Grade 4- displaced fragment/ loose body in the joint.

25. The following statements are correct:

- (a) Paget's disease has a prevalence of 10 % in people over the age of 80 years of age.
- (b) Developmental dysplasia of the hip is more common in males
- (c) Diffuse idiopathic skeletal hyperostosis commonly presents in children
- (d) The highest incidence of fibrous dysplasia is between 30-50 %years of age.
- (e) Ankylosing spondylitis is found more commonly in Black than Caucasian populations

Answers:

- (a) Correct
- (b) Not correct
- (c) Not correct
- (d) Not correct
- (e) Not correct

Explanation:

Developmental dysplasia of hip is more common in females.

Diffuse idiopathic skeletal hyperostosis is seen in over 50 years of age.

Fibrous dysplasia presents at peak incidence of 3-15 years. 75% are seen below 30 years of age.

Ankylosing spondylitis is more common in caucasians, with a caucasian: black ratio of 3:1.

26. Which of the following are correct regarding bone metastases

- (a) Metastases can be excluded in a patient with bone scintigraphy showing no abnormal uptake.
- (b) Prostate metastases are always sclerotic.
- (c) Metastases located in the medulla are of reduced signal on T1W and increased signal on fat suppressed T2W MRI images
- (d) Identification of a 'halo' of high signal intensity around a lesion on T2W MRI suggests a benign lesion
- (e) Melanoma metastases are usually lytic.

Answers:

- (a) Not correct
- (b) Not correct
- (c) Correct
- (d) Not correct
- (e) Correct

Explanation:

Lesions which outgrow their blood supply appear photopenic on bone scintigraphy.

Small percentage of prostatic metastases can be entirely lytic.

'Halo' of high signal around a lesion on T2WI is highly suggestive of metastases.

27. Which of the following are correct regarding hyperparathyroidism (HPT):

- (a) Brown tumours occur more frequently in secondary HPT.
- (b) Rugger Jersey spine occurs more frequently in primary HPT.
- (c) Increased incidence of slipped upper femoral epiphysis is associated with HPT.
- (d) Chondrocalcinosis is seen in 15-20 %.
- (e) A normal bone scan in about 80 %.

Answers:

- (a) Not correct
- (b) Not correct
- (c) Correct
- (d) Correct
- (e) Correct

Explanation:

Brown tumours occur more frequently in primary hyperparathyroidism and Rugger Jersey spine is seen more frequently in secondary hyperparathyroidism.

28. Which of the following are correct concerning enchondromas:

- (a) In the hand, diaphysis is the most common site
- (b) Most frequent tumor found in the small bones of the hands.
- (c) Calcification is rare

- (d) MRI appearances are of low signal on T1W and high signal on T2W spine echo images
- (e) Maffuci syndrome is characterised by multiple enchondromas and soft tissue cavernous haemangiomas

Answers:

- (a) Correct
- (b) Correct
- (c) Not correct
- (d) Correct
- (e) Correct

Explanation:

Enchondromas are a relatively common benign medullary cartilaginous neoplasm, usually found in children or young adults which can lead to pathological fractures or undergo malignant degeneration. Mostly they are an incidental finding with benign imaging features.

Calcification especially chondroid type is common finding.

29. Which of the following are correct features of Paget's disease:

- (a) Thickening of ileopectineal line.
- (b) Pelvis is most commonly affected.
- (c) Increased density of vertebra – 'ivory vertebra'.
- (d) Candle flame lysis.
- (e) Sarcomatous transformation in 10-15 %.

Answers:

- (a) Correct
- (b) Correct
- (c) Correct
- (d) Correct
- (e) Not correct

Explanation:

Paget's disease of bone is a common, chronic bone disorder characterised by excessive abnormal bone remodelling. It frequently affects the pelvis, spine, skull and proximal long bones. It is relatively common and can affect up to 4% of individuals over 40 and up to 11% over the age of 80. Sarcomatous transformation is approximately 1%.

30. Which of the following are correct regarding morton neuroma:

- (a) Is asymptomatic
- (b) On ultrasound, has the appearance of an ovoid hypoechoic mass orientated to the long axis of the metatarsal bones
- (c) Is typically found in the 4th inter-metatarsal space.
- (d) Is of high signal on T2W MRI
- (e) Has a high malignant potential

Answers:

- (a) Not correct
- (b) Not correct
- (c) Not correct

- (d) Not correct
- (e) Not correct

Explanation:

Morton neuroma is a benign condition representing perineural fibrosis, likely due to chronic nerve entrapment by inter-metatarsal ligaments.

It is most commonly found in 3rd inter-metatarsal space presenting with burning/ electric forefoot pain.

On ultrasound it appears as a round to oval hypoechoic mass and on MRI as a low signal mass lesion on T1WI and T2WI with intense post contrast enhancement.

31. Which of the following are correct concerning aneurysmal bone cysts:

- (a) 60-80 % of aneurysmal bone cysts are found in under 20 year old.
- (b) Periosteal reaction is a pathognomonic feature
- (c) They demonstrate a fluid-fluid level on CT
- (d) Hyper-vascularity is usually seen in the periphery of the lesion
- (e) They have a recurrence rate of 20-30 % after surgical treatment

Answers:

- (a) Correct
- (b) Not correct
- (c) Correct
- (d) Correct
- (e) Correct

Explanation:

Aneurysmal bone cysts are benign expansile tumour like lesion. Periosteal reaction is not seen until associated with a fracture.

32. Regarding diffuse idiopathic skeletal hyperostosis which of the following are correct:

- (a) Sacroiliac joints are usually involved when the lumbar spine is.
- (b) Highest incidence in the 3rd to 5th decades.
- (c) Most commonly involves the cervical spine.
- (d) Extraspinal ligamentous hyperostosis is a feature.
- (e) In the thoracic spine the hyperostotic changes are more prominent on the right.

Answers:

- (a) Not correct
- (b) Not correct
- (c) Not correct
- (d) Correct
- (e) Correct

Explanation:

Diffuse idiopathic skeletal hyperostosis is a common condition characterised by bone proliferation at sites of tendinous and ligamentous insertion of the spine affecting elderly individuals. It commonly affects the elderly more than 50 years of age with a slight male predominance.

It most commonly involves the lower thoracic spine. Sacroiliac joints are not involved. However the appearance of spine may be similar to ankylosing spondylitis.

33. Features of rheumatoid arthritis include:

- (a) Late involvement of the 2nd and 3rd metacarpophalangeal joints
- (b) Ulnar subluxation
- (c) Central bone erosions
- (d) Juxta-articular osteoporosis
- (e) Calcification of the triangular fibrocartilage complex.

Answers:

- (a) Not correct
- (b) Correct
- (c) Correct
- (d) Correct
- (e) Not correct

Explanation:

The metallic artefact is shows marginal and central erosions.

The second and third metacarpophalangeal joints are involved in early stage of the disease.

Calcification of triangular fibrocartilage complex is not usually seen in rheumatoid arthritis.

34. The following are feature of Gaucher's disease:

- (a) Generalized osteopenia
- (b) Marked cortical thickening
- (c) Biconcave 'fish-mouth' vertebrae
- (d) Endosteal scalloping
- (e) Madelung's deformity

Answers:

- (a) Correct
- (b) Not correct
- (c) Correct
- (d) Correct
- (e) Not correct

Explanation:

There is no evidence of any significant cortical thickening seen in Gaucher's disease.

Madelung's deformity is associated with nail-patella syndrome and not with Gaucher's.

35. Regarding imaging appearances of osteomyelitis:

- (a) Klebsiella is the commonest organism isolated in adult
- (b) Chronic osteomyelitis is characterised by prominent cortical thinning
- (c) The diaphysis are often spared in patients with sickle cell disease.
- (d) Radiographic findings become evident approximately 3 days after onset infection
- (e) Periosteal reaction is the earliest sign of acute osteomyelitis

Answers:

- (a) Not correct
- (b) Not correct
- (c) Not correct
- (d) Not correct
- (e) Not correct

Explanation:

Radiographic findings of osteomyelitis become evident approximately at 1-2 weeks after onset of infection.

Soft tissue swelling and loss of normal fat planes is the earliest sign of acute osteomyelitis.

The staphylococcus is the commonest organism involved.

Chronic osteomyelitis is characterised by prominent cortical thickening.

In sickle cell disease, diaphysis is the primary focus of infection.

UNIT – IV

GENITO-URINARY SYSTEM

- *Fat necrosis, fibroadenoma, Ca & radial scar all shows contrast enhancement (Cyst does not). A cyst may show internal echoes.*
- For breast solid lesions of 15-20 mm, a core biopsy or FNAC is suggested.
- “Egg shell” calcifications showing rim of thin curvilinear area of calcification of a hollow spherical abnormality is seen in fat necrosis (secondary to trauma or post-surgery) in oil cyst.
- Disappearance of breast calcifications can occur due to surgery, chemotherapy, radiotherapy or spontaneous resolution (but not due to post menopausal changes).
- An oil cyst in breast typically shows egg shell calcification due to fat necrosis.

Interval breast cancers are depicted within 12 months after a mammographic screening which showed normal findings.

1. *Type 1 - Previous mammography normal or benign*
2. *Type 2 - Previous mammo shows minimal sign of cancer*
3. *Type 3 - Suspicious of malignancy.*

- Ill defined echogenic halo around a breast lesion is suggestive of malignancy. They also have large AP diameter than transverse.
- Post biopsy change shows delayed enhancement on T1WI (as compared to early enhancement of malignancy).
- MLO view for breast is taken with beam directed from superomedial to inferolateral.
- According To UK NHS, women between 50-70 yrs. (47- 73) are invited for screening every 3 yrs. Women over 70 yrs. are encouraged to attend by self-referral but are not invited.
- Post radiotherapy, abnormal enhancement pattern of breast Ca returns to normal within 3-6 months.
- **Paget’s disease is associated with ductal carcinoma in situ of breast.**
- **Breast metastasis occurs due to lymphoma > melanoma (commonest for hemorrhagic metastasis).**
- Fibroadenomas have homogenous echopattern (as compared to malignant lesions).
- A wide surrounding halo is more suggestive a malignant lesion of breast.
- *Lymphoma never contains osteoid tissue (Intraductal papilloma, phyllodes cystosarcoma, stromal sarcoma & adenocarcinoma can contain bone, cartilage & osteoid tissue).*
- Benign breast calcifications tend to be numerous & scattered throughout the breast.
- **Parallel lines of calcifications in breast are due to arterial calcification.**
- Acoustic shadowing, ill margins, architectural distortion, heterogeneous internal echoes & height > width are suggestive of malignant breast lesions.
- Hypervascularity of surrounding tissues are suggestive of benign breast lesion.
- Rim like enhancement & focal area of hyperintense T2 signal near lesion are suggestive of malignant breast lesion.

Breast tumour

- T1 - < 2 cm*
- T2 - >2 cm < 5 cm*
- T3 - > 5 cm.*
- N1 - Axillary node not fixed.*
- N2 - Axillary nodes fixed to one another or underlying structures.*
- N3 - Internal mammary nodes.*
- M1- ipsilateral supraclavicular nodes*

- NHS breast screening programme states 7-8 women per 1000 screened will be positive for DCIS.
- 50 yrs. is the most likely age to develop breast Ca.
- CA- 15-3 & CEA are associated with breast Ca.

- If a lesion is first time seen on mammography, then USG should be done.
- **Pure mucinous breast Ca is slow growing, rarely metastasizes & has good prognosis. Mixed mucinous Ca is a lot invasive & worse prognosis. Pure mucinous does not show LNs.**
- Multifocal breast carcinoma not seen on mammography & USG should be investigated by MRI.

Tumour response criteria: -

1. *WHO - Longest axial dimension X perpendicular dimension.*
 - *Partial response – 50% reduction*
 - *Progressive - 25% increase*
2. *RECIST - Longest axial dimension*
 - *Partial – 30% reduction*
 - *Progressive – 20% increase or New sites of disease.*

- Capsular contracture of silicone breast implant is seen as thickened T2W hypointense margin surrounding the implant.
- *Intracapsular rupture shows silicone gel with in the capsule with curvilinear strands of low T2 signal with in the capsule – Linguine sign suggestive of collapsed implant shell.*
- Extracapsular rupture shows T2 hyperintense globules surrounding the implant.
- Capsular migration occurs as inferior extension beyond infra-mammary fold.
- *Marginal T2WI hypointense radial folds with in the implant are normal.*
- Irregular or spiculated margins are suggestive of malignancy in breast lesions (84-90%).
- **Progressive enhancement (Type I) of a breast lesion is associated with benign pathology but plateau (type II) & washout (type III) curves are more suggestive of malignant disease on kinetic sequences [But there is overlap so they are not the ideal points to rule out carcinoma].**
- Punctate calcification & increased vascularity are features of malignancy of breast.
- Two lives are saved for every over-diagnosed case in UK NHS screening. There is 35% reduction in mortality from breast cancer.

For standard practice, 1) clinical examination, 2) USG & 3) biopsy are indicated for a breast lump. But in a patient of less than 35 yrs, when USG shows a benign lesion, biopsy may not be done.

- Fibroadenoma shows echogenic capsule.
- **DCIS shows linear or dot dash calcifications.**
- Egg shell calcification is seen in oil cyst.
- **Arterial breast calcifications are tubular or parallel calcifications.**
- Sedimented calcium is seen as curvilinear opacity on lateral view & smudge on CC view suggestive of benign pathology.
- Gynaecomastia shows a nodular fan shaped subareolar lesion surrounded by normal fatty tissue. Hypervascular flow is seen within the mass.
- **Calcifications suggesting breast malignancy are mixture of sizes & shapes of calcific foci, associated soft tissue opacity & serial progression & cluster of microcalcifications (0.5 mm).**
- In 80% of fibromatosis of breast, there is beta-catenin or adenomatous polyposis coli gene mutation. It is a benign lesion likely to be locally infiltrating, aggressive & proliferative & contains fibroblasts.
- *Phyllodes tumour is a rapidly growing mass appears lobulated, solid mass with cystic spaces showing posterior acoustic enhancement.*
- Fibromatosis is hypoechoic but shows posterior acoustic shadowing.
- Granular cell tumour of breast arises from Schwann cells.
- *Invasive lobular carcinoma of breast causes architectural distortion as the most common finding.*
- USG guided FNAC should be done for breast abscess (< 3 cm).
- Central, retro-areolar flame shaped density in males is gynaecomastia.
- High density, well defined mass with lobulated or spiculated margins in males is suggestive of invasive ductal carcinoma. An eccentric position is highly suspicious.
- For breast Ca metastasis, CT of neck, chest, abdomen & pelvis should be done.

- ATN occurs due to marked reduction in tubular blood flow (Not due to perfusion).
- In ATN, there are smooth enlarged kidneys with dense & persistent B/L nephrogram with absence of contrast in collecting system. Contrast injection in diabetic with glomerulosclerosis is one of the known causes.
- Spider leg appearance of calyces on IVU is due to autosomal dominant polycystic kidney disease due to elongation, displacement & deformity of calyces by cysts. Initially, a faint nephrogram with increasing dense nephrogram is seen.
- In PAN, blood picture shows leucocytosis eosinophilia & raised ESR.
- Loss of B/L CMD with lack of cortical enhancement and enhancing medulla with no excretion of contrast in collecting system is suggestive of renal cortical necrosis.
- *Small nonfunctional shrunken kidney with dystrophic calcifications is a “Putty kidney” in TB.*
- **Xanthogranulomatous pyelonephritis is a chronic suppurative infection showing replacement of renal parenchyma by lipid laden macrophages. In most cases, there is also a staghorn calculus with renal enlargement & a rim of cortical enhancement (Bear paw sign). It never causes hemorrhage.**
- A renal cortical cyst can cause hemorrhage.
- Wilm’s tumour (nephroblastoma) crosses midline, displacing & invading large vessels (neuroblastoma does not displace vessels but encase them). It may also show calcification.
- Autosomal recessive polycystic kidney disease can be diagnosed as early as 17-18 wks. of pregnancy. There will be oligohydramnios & enlarged hyperechoic kidneys with renal: abdominal circumference ratio of > 0.30 . There can be associated hepatic fibrosis.
- **Mesoblastic nephroma is a hamartoma & most common solid renal neoplasms in neonates. It involves the renal sinus with no invasion into the veins (differentiating it from Wilm’s) or collecting system. It shows focal hypoechoic areas of necrosis.**

Grading of renal trauma.

I - Contusion or subcapsular hematoma but no laceration contusions are seen.

II - Laceration < 1 cm deep

III - Laceration > 1 cm.

IV - Injury to main renal artery or vein with contained hemorrhage.

Laceration extending to renal pelvis.

V - Shattered kidney

Avulsion of renal Hilum.

- For a hemodynamically stable patient of renal trauma, a CECT should be done.
- A deep renal laceration that extends into the collecting system is suggestive of grade IV injury. It leads to extravasation of contrast from PC system on delayed images.
- Parapelvic cyst does not opacify on IVU. It may cause hydronephrosis.
- In medullary sponge kidney, there are numerous medullary cysts which communicate with tubules & hence opacify during excretion urography. The cysts contain calculi giving “bunch of grapes” appearance.
- Renal oncocytoma can extend into & engulf the perinephric fat (HU ~ -100 to -50) & can be mistaken for angiomyolipoma.
- Post contrast enhancement of > 20 HU in a renal mass is suggestive of malignancy.
- *Chronic glomerulonephritis shows small smooth kidneys with diffuse thinning of renal parenchyma. PC system is normal but increased amount of renal sinus fat is seen.*
- Acute urinary obstruction shows increasingly dense nephrogram that remains present for 6 hours.
- Uric acid & xanthine (less common) stones are radiolucent.

Papillary necrosis leads to clubbed calyces, widened fornices, calcification & sloughing of necrotic papilla & alteration in renal contour. It can occur due to diabetes, analgesic nephropathy, pyelonephritis & sickle cell disease.

- Renal cyst type III shows irregular thickened septa with measurable enhancement, coarse irregular calcification, multiloculations, nodularity, uniform wall thickness & irregular margins.
- MRI is superior in assessing renal vein invasion by RCC. CT is better for assessment of nodes.
- **Posterior & anterior pararenal spaces freely communicate with pelvic retroperitoneum.**
- Renal oncocytoma shows a central scar due to hemorrhage & infarction.
- Grade I renal injury contusions show ill defined areas of low attenuation with irregular margins.
- ATN is an early complication in cadaveric allograft & resolves spontaneously in 1-3 wks. There is preserved perfusion but poor renal function & urine excretion. In acute rejection, there is both impaired renal function & reduced perfusion.
- Renal metastasis due to gastric cancer are usually <3 cm in size & limited to cortex.
- **Anterior pararenal space lies between posterior parietal peritoneum anteriorly & Gerota's fascia posteriorly.**
- In duplex system, the upper moiety ureter is prone to ureteric obstruction & ureterocele.
- In renal tract TB, free VUR into a widely dilated upper renal tract is seen.
- Indinavir phosphate stone (not seen on CT also) is more radiolucent than uric acid.
- Acute pyelonephritis shows focal areas of reduced reflectivity in renal parenchyma.
- Multicystic dysplastic kidney is unilateral. If bilateral, it is not compatible with life. There is no uptake on MAG3 scan. Kidney is grossly enlarged with multiple cysts.
- *Renal papillary necrosis gives "egg in cup" appearance at some calyces & "tracks & horns" at other calyces. There is preserved cortical outline & enhancement.*
- *Bilateral small kidneys are caused by medullary cystic disease, acute arterial HTN, arteriosclerosis, nephrosclerosis, Alport syndrome & chronic glomerulonephritis.*
- Clear cell tumor of kidney frequently occurs as a unilocular cyst with mural nodule. 50% of patients have survival rate of 5 years.
- A lesion showing pre contrast HU value of 60 & post contrast HU value of 61 is suggestive of hemorrhagic renal cyst.
- **Acute cortical necrosis, Alport Syndrome & oxalosis causes cortical nephrocalcinosis.**
- **Hyperoxaluria, hypervitaminosis D, sarcoidosis & renal tubular acidosis show medullary nephrocalcinosis.**
- Squamous cell carcinoma (schistosomiasis) of kidney presents with renal calculi & infection in most patients. It carries poor prognosis than RCC.
- RCC causes IVC & renal vein invasion (TCC does not).

Metastasis to the kidney are usually hypovascular, small (<3 cm), multiple & confined to cortex. Most common mode is hematogenous. They do not invade renal vein or calcify. They are more infiltrative, less exophytic compared to RCC.

- Renal lymphoma demonstrates sheet like diffuse infiltration of perirenal tissues. They are usually low attenuation post contrast on CT with renal enlargement.
- T2 stage of RCC is tumour size > 2.5 cm.
- Class II F (Bosniak) have numerous class II features, should be followed up. Class III has thickened septae, nodular areas of calcification with solid non enhancing areas.
- Acute complete arterial occlusion & severe hydronephrosis cause rim nephrogram.
- E. coli & proteus (mainly) are most common causing organism for XGP.
- Acute glomerulonephritis, renal vein thrombosis & chronic severe ischemia causes faint persistent nephrogram.
- Acute ureteric obstruction, polycystic kidney disease, medullary sponge kidney & acute pyelonephritis show striated nephrogram.
- **Angiomyolipomas associated with TS are multifocal, bilateral, and larger & present in younger age group.**
- **Post obstructive uropathy causes dilated calyx with wide infundibuli. Narrow (normal) infundibuli are seen in TB, secondary to calculus, hydrocalycosis & extrinsic compression by artery.**
- Oncocytoma coexists with RCC in 10% of cases. Multifocality, bilateralism & metachronous tumors occur in 4-6 %.
- Lobster claw & signet ring signs are concerned with papillary necrosis on IVU.
- Medullary sponge kidney shows cystic dilatation of collecting ducts with nephrocalcinosis.
- Acute cortical necrosis, sickle cell disease, Alport syndrome & chronic glomerulonephritis causes cortical (chronic

rejection & oxalosis) nephrocalcinosis.

- A dromedary hump is a focal bulge on the lateral border of left kidney due to spleen.
- *Persistent fetal lobulations overlies the space between pyramids but renal scarring lies directly over the medullary pyramids.*
- A static fluid MR urogram is heavily T2W similar to MRCP, is preferred in renal failure.
- Renal sinus cyst & dilated renal collection system are not differentiable on T1 & T2WI so excretory urogram should be done.
- When hypovolemic shock occurs due to sepsis, IVC & aorta are normal in calibre but marked adrenal enhancement is seen.
- **Abnormal MIBG activity is seen in pheochromocytoma, neuroblastoma, carcinoids tumour, medullary thyroid carcinoma. & ganglioneuroma.**
- Pheochromocytomas metastasize to bone lymph nodes, liver & lung.

$\text{Absolute contrast washout} = \frac{\text{HU at 60 sec.} - \text{HU at 15 minutes}}{\text{HU 60 sec.} - \text{HU at plain CT}}$

- Angiomyolipoma does not show calcification.

- *Contrast induced nephropathy (transient) (CIN) usually peaks on day 2 or 3 following iodinated contrast infection with a return to baseline in 2 wks. No difference in risk of CIN between iso-osmolar & low osmolar contrast is seen in normal people but iso osmolar is better in diabetes & renal impairment related CIN. Vigorous hydration is done to avoid CIN. Diuresis & acetylcysteine do not improve CIN.*
- Alkaptonuria / Ochronosis are an autosomal recessive disease causing nephrocalcinosis & ureteric calculus.
- **Stauffer syndrome is renal cancer with hepato-splenomegaly without focal hepatic or splenic metastasis.**
- B/L multicentric oncocytomas are seen in Birt-Hogg-Dube syndrome & hereditary syndrome of renal oncocytosis.
- Metanephric adenoma occurs in middle age to elderly & shows a well-defined noncapsulated solitary mass, hyperdense on CT & may show calcification.
- **Reninoma or juxtaglomerular cell neoplasm shows triad of hypertension, hypokalemia & high plasma rennin levels. It is usually less than 3 cm.**

Cortico- medullary phase of kidney is useful for column of Bertin, focal renal hypertrophy, vascular malformation & pseudoaneurysm. Nephrographic phase is best for renal masses. Excretory phases are best to detect collecting system lesions.

- XGP occurs due to proteus infection > E. coli.
- Aneusymal blood vessels are seen in large angiomyolipomas.
- Papillary impressions are seen in grade IV VUR & forniceal obliteration are seen in grade V.
- Delayed increasing nephrogram or faint nephrogram is seen in renal vein thrombosis. (Most common cause of this is nephrotic syndrome/ glomerulonephritis).
- *A 'striated paintbrush' appearance of renal medulla on IVU is seen in medullary sponge kidney ('striated' and "cluster of grapes" also).*
- Sarcoidosis & multiple myeloma causes B/L medullary nephrocalcinosis but hyper PTH, renal tubular acidosis & medullary sponge kidney involves one kidney more commonly.
- **Calculi formed due to antiretroviral therapy (indinavir) in HIV patient are not seen on CT.**
- **Xanthine & uric acid stones are not seen on plain radiographs.**
- Localized cystic renal ds shows conglomeration of variable sized cysts in a part of kidney with no capsule or mural irregularity of cysts.
- **Multilocular cystic nephroma in adults is mostly seen in females (F:M=9:1) & shows hair like septae & minima mural enhancement & has a capsule. It extends into the central renal sinus. It is classified as type III Bosniak lesion.**
- Maintenance of reniform shape is more suggestive of TCC than RCC.
- Renal papillary necrosis shows clubbing or blunting of some calyces & thin tracts extending from other calyces on IVU. Filling defects are noted within a rounded and blunted calyx.
- *Complete absence of diastolic flow or flow reversal with RI > 1 & PI > 2 are suggestive of acute rejection.*
- Multicystic dysplastic kidney shows parenchymal thinning. Contralateral kidney can show other anomalies: VUR > PUJ obstruction.
- A hemorrhagic renal cyst has HU value of ~ 60 & on post contrast sequence, it is ~ 70 (nil / minimal enhancement). Masses that increase in HU more than 20 are specific for enhancement.
- Solid renal or other organ masses smaller than 1 cm should be followed up in 3-6 months by repeat scan. These are small to be biopsied.
- Aniridia & nephroblastomatosis are associated with Wilm's tumour.
- Contrast enhancement of renal laceration on pyelographic phase is suggestive of urine leak.
- **Bosniak IIF shows multiple thin enhancing (minimal or perceptible) septae, minimal smooth thickening of wall or septa, thick & nodular calcification, no enhancing soft tissue components & intrarenal non enhancing high attenuation renal mass.**
- Acute tubular necrosis occurs post transplant within 24 hours & shows normal perfusion with diminished excretion.
- **Cyclosporin renal impairment occurs after one month post transplant & can cause similar picture as ATN.**

- Both renal vein thrombosis & acute rejection can cause diminished perfusion & excretion.
- RCC is more common than hyperdense hemorrhagic renal cysts.
- Cyst with thin septum showing perceptible enhancement is seen in class II F.
- Class II F also shows cysts > 3 cm with high density contents.
- IIF should be followed up.
- Class III & IV are surgical.

Staging of RCC

- T₁ - ≤ 7cm, limited to kidney*
- T₂ - ≥ 7 cm limited to kidney.*
- T_{3a} - Perinephric tissue or adrenal gland*
- T_{3b} - Renal vein or IVC below diaphragm.*
- T_{3c} - Renal vein & IVC above diaphragm*
- T₄ - Gerota's fascia*
- N₁ - One node*
- N₂ - More than one node*

- Aorta appears “Taped down” to vertebral column in retroperitoneal fibrosis.
- Bilateral smooth renal enlargement occurs in diabetic nephropathy, sickle cell disease, AIDS, leukaemia, lymphoma, autosomal recessive polycystic disease, thalassemia, amyloidosis & myeloma.
- Polyarteritis nodosa shows positive p ANCA antibodies.

Staging of Renal TCC.

- T₁ - Invasion of subepithelial connective tissue*
- T₂ - Invades muscularis*
- T₃ - Invades peripelvic fat or renal parenchyma*
- T₄ - Invades perinephric fat or adjacent organs.*

- **Nephroptosis is ptosis of mobile kidney when erect. Can cause symptoms & underestimations of parenchymal DMSA uptake.**
- **A nutcracker kidney is caused by compression of left renal vein by aorta & SMA, it causes loin pain & hematuria.**
- Urine vanillylmandelic acid elevated levels are suggestive of pheochromocytoma.
- Adrenal injuries and hemorrhage commonly occur on right side.
- VHL shows B/L pheochromocytomas.
- A signal intensity decrease of less than 20% on chemical shift imaging is suggestive of malignancy of adrenal gland.
- **Adrenal hemorrhage is the most common cause of B/L adrenal calcification in children & in adults, it's mostly unilateral & right sided.**
- Wolman's disease is a rare disease causing enlarged calcified adrenal glands & hepatosplenomegaly.
- Signal drop on 'out phase' image is suggestive of adrenal adenoma.
- MIBG scan is used for neuroblastomas & paragangliomas.
- **Adrenal cortical carcinoma shows peripheral enhancement with necrosis & calcification with early invasion of IVC. Often atrophy of contralateral adrenal is seen.**
- Both adrenal adenoma & carcinoma can cause Cushing's syndrome.
- **Adrenal adenomas have relative (RPW) washout of more than 40 % & pheochromocytomas & metastasis have RPW < 40% & APW(absolute washout) < 60%.**
- Signal drop of > 20% on out-phase images is suggestive of intracellular lipid.
- In hypovolaemic shock due to trauma, there is lack of renal contrast excretion with collapsed IVC.

- Fibromuscular dysplasia is common in children & young adults (F>M). It mostly causes B/L renal artery stenosis & usually affects the distal renal artery with beaded appearance.
- **PAN affects medium & small arteries. Aneurysms are 2-3 mm in size which when thrombosed gives rise to moth eaten nephrogram (moth eaten calyces in TB). Angiography has high sensitivity, specificity but high negative predictive value.**
- Diastolic flow reversal (diastolic flow below baseline) in arcuate / interlobar arteries is suggestive of renal vein thrombosis.
- Slow rising parvus et tardus waveform is seen in renal artery stenosis.
- **In acute renal vein thrombosis, there is large, edematous kidney with loss of CMD. On IVU, a faint nephrogram with absent pelvicalyceal filling after 15 minutes is seen.**
- In renal artery stenosis, on ACEI renogram, the time to peak of affected kidney is increased following ACEI.
- In renal artery stenosis, angioplasty of ostial lesions has a poor prognosis than angioplasty of more distal lesions.
- B/L multiple small vessel aneurysms of renal arteries branches on renal angiogram are suggestive of polyarteritis nodosa. Main renal arteries are normal.
- Renal vein thrombosis is seen with RCC & not TCC.
- Percutaneous nephrostomy is indicated for obstructed uropathy, pyonephrosis, stones, injury & vesicovaginal fistula. One stab puncture is used. Prophylactic antibiotics should be given.
- **Retroperitoneal haemorrhage is the most common complication of angiomyolipoma of large size. Embolization should be done (for more than 4 cm).**
- In nephrostomy, the accessible lower pole calyx is usually the target for simple drainage but for ureteral nephrolithotomy & interventions a posterior calyx in mid or upper polar region is better. In an obstructed infected system, further imaging & manipulation are usually delayed after establishing drainage.
- **In MAG3 scanning, DTPA has advantage of higher renal concentration than inulin. DTPA is excreted by glomerular filtration & tubular excretion.**
- Dynamic renal scanning requires a hydrated patient to lie supine with knees flexed. Total divided renal functions are evaluated in addition to rates of transit through parenchyma & outflow track. DTPA is handled same way as inulin.

In percutaneous nephrostomy, puncture of posterior calyces in the mid & lower pole is optimal. Upper pole puncture increases the risk of pneumothorax & puncture of pelvis increases the risk of major vascular injury & urinary leak. It is best to dilate the tract 1 French size bigger than the size of intended catheter.

- Prophylactic hemodialysis in patients with renal impairment does not reduce the risk of contrast mediated nephrotoxicity (CMN) but hemofiltration does.
- *CMN is defined as an increase in serum creatinine by more than 25% above baseline within 3 days of contrast administration.*
- In renal artery stenosis, PSV > 180 cm/ sec. & RI < 0.56 should be seen. Both should be present for intervention.
- **Diagnosis of RAS on Doppler: Flow acceleration immediately distal to the site of stenosis or showing dampened/ biphasic flow in segmental arteries. PSV of main renal artery > 180 cm/sec with renal /aortic velocity ratio > 3.**
- On captopril scintigraphy (of RAS): there is differential split of renal function of more than 15% between right & left kidneys with a decrease in time to peak activity.

Immediate post- transplant renal complications are acute rejection & ATN. Both can cause PI > 1.5 & RI > 0.7. If the arterial occlusion (uncommon) is there, will be absent/ reduced flow in main renal artery but if renal vein thrombosis (common) occur, there is reduced/ absent flow in interlobar arteries due to edema.

- Normal structures take up DMSA. A hypertrophic cortex takes up DMSA & it enhances more than rest of the cortex on CT.

- In prune Belly Syndrome, there is VUR with oligohydramnios. Bladder neck is wide with a tapering dilatation of proximal posterior urethra.
- **Retroperitoneal fibrosis causes a doughnut shaped soft tissue mass surrounding the lower part of aorta with medial pulling of ureters and B/L hydronephrosis. The plaque usually begins around the aortic bifurcation & extends cephalic to the renal Hilum.**

Schistosomiasis is endemic in south & east Africa. Ova are laid into the submucosa of lower urinary tract, causing extensive fibrosis with calcification later. Ova may migrate into portal venous system causing fibrosing granulomatous reaction leading to portal HTN with esophageal varices. A curvilinear calcification in UB with B/L hydroureteronephrosis may be seen.

VUR (stages)

1. I - Reflux in ureter
2. II - Reflux in PC system without dilatation
3. III - With mild dilatation
4. IV & V - Severe dilatations & tortuosity

- Ureteric injury associated with blunt trauma typically occurs at pelvi-ureteric junction. Hyperextension with overstretching of ureter or compression of ureter against lumbar transverse process is the mechanism of injury.
- Anterior urethral injuries are more commonly due to iatrogenic or penetrating trauma than blunt trauma (it affects posterior urethra, overall more common).
- RGU should be performed before cystography in a patient of suspected urethral injury.
- In urethral injury patients, prostate is high riding.
- **Pelvic fractures with bloody urethral meatus raise the possibility of urethral injuries (RGU should be done).**
- USG is more accurate than conventional urethrography in assessment of urethral strictures.
- Membranous urethra is most commonly injured & causes high riding prostate.
- Mechanical ureteric obstruction causes elevated resistive index (RI) but pregnancy related dilatation does not.
- Chemical shift artefact causes one wall of UB to appear dark & other wall bright.
- **Normal ureter turns medially, anteriorly & inferiorly (at the region of ischial spine) to enter the bladder.**
- A fungus ball in UB shows a gas containing round lamellated mass showing multiple filling defects on post contrast IVU bladder phase.
- Malakoplakia is a benign, inflammatory condition causes multiple small oval filling defects at bladder base.
- **Obliteration of the angle between seminal vesicle & posterior wall of UB suggest the invasion of seminal vesicle by TCC of UB.**
- Bladder wall integrity in case of Ca is best evaluated on T2WI.
- Tear at the bladder dome suggests intraperitoneal bladder rupture.
- Contrast extravasation in a streaky irregular manner & pelvic fractures is seen in extraperitoneal bladder rupture.
- In schistosomiasis, the ureters become grossly dilated & tortuous which may have multiple filling defects due to either granuloma or ureteritis cystica. UB becomes small & fibrosed & shows 1-3 mm band of calcification surrounding the wall.
- Lipomas are rare in retroperitoneum but liposarcomas are the commonest sarcomas in retroperitoneum. They show minimal uptake on PET.
- **A very FDG- avid fat containing retroperitoneal tumor is hibernoma.**
- **Extraperitoneal bladder rupture can cause contrast extravasation into upper thigh & anterior abdominal wall & space of Retzius but not into the paracolic gutters.**
- Pelvic retroperitoneum is the commonest site for hematoma following injury.
- Posterior urethral injuries are seen in 20% of pelvic fractures in males. Impotence is a common complication.
- Periurethral tissue is of low signal on T2WI.

- Pyeloureteritis cystica typically produce multiple round filling defects rather than plaques.

Malakoplakia is a granulomatous infection in elderly females with history of E. coli infection. It causes numerous small filling defects in ureter & small mural plaque like defects within bladder. Leukoplakia has similar appearance but more common in males & is characterized by passage of gritty soft tissue flakes.

- Emphysematous cystitis shows thickened bladder wall with echogenic foci & acoustic shadowing on x-ray, curvilinear lucencies outlining the bladder wall are seen.
- T3a bladder tumour does not involve perivesicle fat but T3b does.
- Retroperitoneal fibrosis is common in males. Primary form responds to steroids. Primary form (66%) is more common. Secondary form occurs due to beta-blockers & methysergide.
- Ureteral endometriosis occurs in lower third.
- Papillary TCC have a broad base & frond like morphology. Their density is 8-30 HU with mild enhancement.
- *A phlebolith & a calculus can be differentiated by soft tissue rim sign, i.e. thickening of ureteric wall around the calculus due to edema. Ureteric calculus also shows asymmetric periureteric fat stranding, HN and renal enlargement (comet tail sign in phlebolith).*
- *The 'nubbin' & "drooping lily" signs are suggestive of ureteral duplication.*
- TCC is the most common tumour of urinary tract. UB> renal pelvis > lower ureter. (Endometriosis is also more common in lower ureter).
- *Urinoma, aortic aneurysm, para-aortic LNs & psoas muscle hypertrophy cause lateral deviation of upper ureter at lumbar region.*
- T1WI is useful in differentiating clot & calculi.
- Schistosomiasis is the associated with squamous cell carcinoma.
- **Secondary megaureter & primary VUR cause tortuous ureteric dilatation.**
- **Primary megaureter occurs due to developmental ureteric aperistalsis & the proximal ureter is dilated but straight.**
- Emphysematous pyelitis shows a dilated pelvis with small pockets of air extending into calyces but not in renal parenchyma (seen in emphysematous pyelonephritis). It occurs in diabetes & sepsis.
- Malakoplakia shows yellowish raised lesions on cystoscopy.
- **Ureteric dilatation around or below an intraluminal filling defect is called as "goblet sign" & is seen in TCC or endometriosis.**
- Chronic analgesic use is a risk factor for TCC.
- **Eagle Barrett syndrome = Prune Belly Syndrome, shows triad of partial or complete absence of abdominal musculature (bulging flanks), cryptorchidism & dilated posterior urethra, bladder, ureter with renal cortical thinning.**
- For urethral carcinomas – squamous cell > TCC> Adenocarcinoma.
- For bladder cancer staging, MRI of bladder plus CT of chest, abdomen & pelvis with intravenous contrast is done.

<u>Retroperitoneal fibrosis</u>	<u>Malignancy</u>
1. Tether these structures to adjacent vertebra	Mass effect displacing aorta & IVC
2. Remains caudal to renal hilum	Extend cephalic to renal hilum
3. Plaque like density	Nodular outline
4. Enhances	Enhances

- Contrast can extravasate into the scrotum or thigh in extraperitoneal bladder rupture There can be contrast in perivesical space in ' molar tooth' pattern.
- Anterior & posterior urethra is separated by urogenital diaphragm.
- UB calcification is atypical for TB. There is typical in TB.
- Acute urinary tract obstruction due to calculus will not cause perinephric & peri-ureteric fat stranding.
- **Whitaker test is a pressure flow study to evaluate ureteral obstruction. A pressure difference of more than 15 cm H₂O is abnormal.**

Lymph nodes involvement in bladder Ca

$N_1 - \leq 2\text{ cm}$

$N_2 - 2\text{-}5\text{ cm}$

$N_3 - 5\text{ cm}$

- **Small, septated multiple avascular cystic lesions in the mediastinum testis are suggestive of tubular ectasia of rete testis. These lesions are isointense (or undetectable) on T2WI.**
- Testicular microlithiasis shows hyperechoic foci with no acoustic shadowing.
- Ca prostate shows peripheral zone of low signal on T2WI (Normal is hyper on T2WI).
- Fournier's gangrene causes progressive fascitis in men with thickening of scrotal skin & air in the subcutaneous layer. (Air appears echogenic with posterior acoustic shadowing).
- *Epidermoid cyst of testis shows onion ring appearance with alternating areas of hypo & hyperchogenicity.*
- In normal prostate, peripheral zone has higher signal than central or transitional zones on T2WI.
- *Testicular tumour (seminoma) involves para-aortic nodes first (if scrotal sac is intact).*
- **Prostatic abscesses are small non enhancing lesions in peripheral zone, occur in diabetics or immunocompromised.**
- In BPH, transitional zone enlarges but central zone atrophies.
- Mullerian duct cyst lies in midline in posterior portion of prostate, superior to verumontanum. It does not communicate with UB or seminal vesicle.
- *On CT, unequivocal enlargement of prostate is seen as 2-3 cm above the symphysis pubis. As a rule, prostate is not considered enlarged if an image obtained 1 cm above symphysis pubis does not include prostate.*
- **As prostate enlarges, trigone is elevated & distal ureters form a "fish hook" or J-shape.**
- Epididymis is iso – hyperechoic compared to testis.
- Seminomas are hypoechoic to normal testis.
- Majority of extra testicular tumors are benign. Lipomas are commonest benign tumor of spermatic cord.
- CT overestimates prostatic volume than MRI.
- Bladder & rectal involvement by prostate Ca are assessed on axial & coronal images.
- Focal low signal in seminal vesicle on T2WI is suggestive of invasion by prostate Ca.
- The normal peripheral zone of prostate enhances more than central zone.
- Corpus spongiosum enhances more rapidly as compared to corpus cavernosa.
- *Surface coil (not pelvic coil) is used for staging of penile cancers.*
- Corpus cavernosa & spongiosa, both are hypo on T1WI & hyper on T2WI.
- **Complications of TRUS are hematospermia, hematuria, pain & perirectal bleeding. Pneumoperitoneum should not /cannot occur normally.**
- T3 tumour of prostate implies tumor extension through the capsule with or without seminal vesicle invasion. Bladder neck invasion occurs in T4.
- *In epididymo-orchitis, there are patchy areas of decreased echogenicity. At earlier stage, there is edema with diffuse low reflectivity.*
- Volume of prostate gland > 60 cc precludes brachytherapy.
- Seminal vesicles are low signal on T2WI when atrophic, empty or invaded by tumour.
- Adenocarcinoid tumour is most common malignant paratesticular tumour.
- Prostatic sarcomas presents in young age & presents as a solid- cystic mass with rapid hypervascular & heterogeneous soft tissue occupying all or most of prostate.
- Increased choline + creatinine /citrate ratio or choline/ citrate ratio suggests prostate Ca.

Non seminomatous testicular tumors on right side spread initially to aortocaval nodes. Left sided tumors spread to para-aortic nodes below the level of left renal vein. Echelon nodes are usually right sided, anterior to right psoas.

- Buscopan is contraindicated in myasthenia gravis, paralytic ileus, pyloric stenosis & prostatic enlargement.
- Prostatic tumour is dark on ADC & bright on high b-value DWI. Obturator nodes are first to be involved.
- **Chronic testicular torsion leads to hypoechoic small & hard testis, absence of hydrocele & normal scrotal wall/skin.**

- Right testis is more susceptible to blunt trauma.
- Penetrating injuries cause bilateral testicular injuries.
- An atrophic testis is more likely to dislocate.
- Intratesticular hematoma needs to be followed until resolution to rule out any neoplasm.
- **B/L smoothly enlarged testis with diffuse hypoechoic areas are suggestive of lymphoma in 62 yrs. old. (Seminoma is seen around 40 years of age)**
- Non seminomatous testicular tumours show elevated AFP& beta-HCG.
- Penile malignancies enhance less than corpora cavernosa & spongiosa & appear hypo on T1 & T2WI.

Organs descending below pubococcygeal line by 1-2 cm are abnormal. Enterocoele is small bowel descending 2 cm or more between vagina & rectum. Rectocoele is anterior bulging of rectal wall > 3 cm. UB descent of > 1 cm is cystocoele.

- Lymphoma is the most common testicular neoplasm over 60 yrs. of age with common involvement of epididymus & spermatic cord.
- Seminomas are rarely (2%) bilateral.
- *Tubular ectasia of rete testis is frequently bilateral & occurs in posterolateral aspects appear hypoechoic with multiple cystic areas giving “sponge like consistency” with no flow. It occurs adjacent to mediastinum testis with associated epididymal cysts & spermatoceles.*
- **In staging of prostate Ca, large FOV- T1W sequence is useful for demonstrating haemorrhage, lymph node & bony metastasis. Small FOV-T2W is used for zonal anatomy. Cancer shows restricted diffusion, increased contrast wash in rate, increased choline plus creatine/ citrate ratio & enhancement.**
- Post biopsy haemorrhage can cause low signal in peripheral zone of prostate on seminal vesicle. Hence, a repeat scan is required (to differentiate it from Ca).
- Classification of urethral injuries.

I	<i>Stretching of intact posterior urethra</i>	<i>On IVU, there is intact but stretched urethra.</i>
II	<i>Posterior urethral disruption above urogenital diaphragm (membranous urethra intact).</i>	<i>Contrast extravasation above urogenital diaphragm (No contrast in perineum).</i>
III	<i>Disruption of membranous urethra extending to anterior urethra (bulbar)</i>	<i>Contrast extending from pelvis below urogenital diaphragm possibly into perineum.</i>
IV	<i>Bladder neck injury extending into proximal urethra</i>	<i>Extraperitoneal contrast extravasation.</i>
IVa	<i>Bladder base injury</i>	<i>Periurethral contrast extravasation.</i>
V	<i>Isolated anterior urethral injury</i>	<i>Contrast extravasation below urogenital diaphragm</i>

- HIFU acts through coagulation necrosis.
- **Prostate cancer shows elevated choline peak with reduced citrate & polyamine peaks & unchanged creatine.**
- Seminomas are generally lobulated masses with hypoechoic fibrovascular septations in which color flow can be visible.
- *Non seminomatous germ cell tumors post orchidectomy should be followed by serial tumour marker measurement with 3 monthly CT of chest, abdomen & pelvis for one year followed by 6 monthly CT for one year.*
- **In a patient of B/L testicular microlithiasis with one atrophic testis due to treated tumour – a follow up clinical examination & surveillance sonography should be done.**
- **Peyronie’s disease cause thickening of Buck’s fascia & septum between Corpora cavernosa. Calcified plaques are seen at periphery of corpora cavernosa.**
- Zoon’s Balanitis is an idiopathic lymphocytic inflammatory condition of penis.
- **Balanitis xerotica obliterans is severe form of penile lichen sclerosis causing phimosis & urinary retention.**
- High insertion of tunica vaginalis on spermatic cord is bell clapper deformity & is bilateral in 50-80% of times. It causes intravaginal torsion.
- Tunica albuginea surrounds corpora cavernosa & spongiosa – Its involvement/ breach with involvement of corpora leads to T2 staging of penile cancer. T₃ is involvement of urethra.
- Bilateral prostate confined Ca is T2C. Internal iliac, obturator, external iliac & sacral are regional nodal groups.

Common iliac, para-aortic & inguinal LNs are metastasis.

- MRI for penile Ca is done for local staging.
- Testicular rupture is surgical emergency.
- **Lymph from scrotum & penile body drains to superficial inguinal LNs, proximal penis drains to deep inguinal LNs & testes drains to para-aortic nodes.**
- Enlarged cystic LN in mediastinum in case of a testicular tumour is due to malignant teratoma & other non seminomatous tumors.
- USG of scrotum is mostly normal in hematospermia.
- Schistosoma japonicum & mansoni affects GIT but haematobium affects GUT.

- Junctional zone thickness of >12 mm with foci of high signal on T1WI & overall low or high T2W signal is suggestive of adenomyosis.
- **Asherman's Syndrome causes synechiae or intrauterine adhesions due to uterine curettage or evacuation of retained products of conception, On HSG, there are multiple, irregular, constant filling defects in the uterine cavity which cannot be obscured by contrast filling into cavity.**
- Malignant ovarian tumors have solid & cystic components. Solid components show blood flow with low resistive index.
- Cervical cancer is hyperintense on T2WI & shows enhancement.
- Saddle shaped fundus of uterus is seen in arcuate uterus on HSG.
- Immediately after menstruation, the endometrium is 1-4 mm thick. In proliferative phase, the ET is 7-10 mm. It is 8-12 mm in follicular phase & 8-16 mm in luteal phase.
- Endometrioma causes recurrent cyclical pain & appears high on T1, T2 & STIR images due to blood products. On USG, it may show internal echoes, septations & echogenic material.
- Undulating or folded tubular structures which are extra ovarian are suggestive of B/L hydrosalpinx.
- Endometriosis is seen in surgical scars or needle tracts. Most cases of subcutaneous endometriosis occur in Pfannensteil incisions. It is rare & causes cyclical pain & lump and can arise many years after surgery.

Staging of Ca cervix

1. *I - Confined to cervix*
2. *Ia - Upper third of vagina*
3. *Ib - Parametrium*
4. *III - a) lower third of vagina &/or
b) Lateral pelvic wall*
5. *IV - Bladder & rectum*

- Recent tubal surgery (within 6 wks.), menstruation, infection, pregnancy, immediate pre & post menstrual phases & contrast allergy are contra indications for performing HSG.
- **Commonest cause of vaginal bleeding in pre-pubertal girls is vaginal foreign body. Other causes are rhabdomyosarcoma, precocious puberty, hemangioma & vascular malformation.**
- Dermoid, endometrioma, mucinous cystic neoplasm, hemorrhagic cyst & ovarian Ca are hyperintense on T1WI.
- Fibroids appear low signal on T2WI.
- **Adenomyosis shows enlarged globular uterus with a heterogenous appearance of myometrium. There are diffuse echogenic nodules in myometrium, subendometrial echogenic linear striations & cysts. Speckled pattern of increased vascularity seen on Doppler.**
- Endometrial cancer demonstrates delayed/ little enhancement compared to the normal surrounding myometrium on post contrast T1WI.
- In ovarian hyperstimulation, enlarged edematous ovaries with multiple packed follicles are seen with free fluid.
- Mass showing papillary projections is malignant.

Criteria for PCOD:

1. *Twelve or more follicles (3-12mm) in an ovary (either peripheral or diffusely arranged)*
2. *Ovarian volume >10 ml when no follicle measures over 10 mm.*

- Enlarged ovary with multiple enlarged follicles and echogenic stroma with peripheral vascularity with free fluid is suggestive of torsion. Peripheral flow may be absent with infraction.
- Follicular cysts can be as large as 7 cm but they show spontaneous regression within 4-6 wks.
- Endometrial polyps are hyperechoic lesions which may contain cystic spaces. A feeding vessel is demonstrated. A central fibrous core that enhances post contrast is also seen.

- **Gartner duct cysts are seen in upper vagina in anterolateral aspect. They may be associated with Herlyn-Werner-Wunderlich Syndrome (ipsilateral renal agenesis & ipsilateral blind vagina) & ectopic ureter inserting into the cyst.**
- Bartholin cysts are located at lateral introitus adjacent to labia minora.
- **Meig's syndrome is ovarian fibroma, pleural effusions & ascites. Fibromas are solid hypo echoic lesions with posterior acoustic enhancement /shadowing (if cystic).**
- Stage III b of cervical Ca causes pelvic side wall involvement, with or without hydronephrosis.
- Adenomyosis shows contrast enhancement but to a lesser degree than surrounding myometrium. There is pseudo widening of endometrium due to increased myometrial echogenicity.
- In endometrial Ca, the thickened endometrium enhances less than the adjacent myometrium.
- Poor delayed contrast enhancement is seen in ovarian fibroma.
- Mucinous ovarian tumors rupture causes pseudomyxoma peritonei. They are second most common benign epithelial neoplasm (after serous neoplasm) of ovary.
- Salpingitis isthmica nodosa shows small diverticular outpouchings in isthmic portion of fallopian tube with distal tube occlusion. It is associated with PID & ectopic pregnancy.
- Cystadenoma/ carcinoma, dermoid, endometriosis & ectopic are examples of cystic ovarian masses.
- Endometrial tumors are usually isointense to myometrium on T1WI & hypointense on T2WI. They show slower enhancement than myometrium.
- Splenic & liver metastases are poor outcome of recurrent endometrial Ca.
- Granulosa cell ovarian tumors show variable appearance from uniloculated cystic masses to solid masses. They are 70% of malignant sex cord stromal tumors. Adult type is most common.
- *Yolk sac tumors are well enhanced with mixed solid- cystic tissue & hemorrhage. A bright "dot" sign is demonstrated with well enhanced dilated vessel. They are second most common malignant germ cell tumour after dysgerminoma. They carry a poor prognosis than any other.*
- **B/L sharply marginated oval ovarian tumour preserving ovarian contour with hypointense enhancing solid contents & foci of cysts are suggestive of krukensberg tumor (Look for omental nodules).**
- Granulosa cell tumors are most common ovarian tumors with estrogenic manifestations (pseudoprecocious, genital bleeding, breast development & pubic hair growth, enlarged uterus with thick endometrium).
- Thecomas are also estrogen producing tumor but occurs in post-menopausal women.
- **Sclerosing stromal tumors are hypervascular tumors in young women with early peripheral enhancement & centripetal progression.**
- A well-defined oval shaped thin walled anechoic fluid filled structure adjacent to lateral wall of uterus, showing incomplete septations is a hydrosalpinx.

An endometrial thickness of ≤ 3 mm can exclude endometrial cancer in women who:

- 1. Have never used HRT*
- 2. Have not used any HRT $\geq$ one year*
- 3. Are using continuous combined HRT*

- **Hematocolpos causes a large cystic mass in the region of vagina with cranial displacement of uterus. It contains large echogenic fluid & fluid debris levels with compression of bladder.**
- Cloacal malformation is single perineal orifice for bladder, vagina & rectum.
- Hydrometra is fluid in uterus due to cervical or vaginal dysgenesis.
- An ET of 5 mm (upto 8 mm) can exclude endometrial Ca in patients using sequential combined HRT.
- Endometrioma can be hyperintense on T1WI & faint or hypo on T2WI due to high protein & iron concentration from hemorrhage.

Mayer- Rokitansky- Kuster- Hauser Syndrome describes uterine agenesis accompanied by hypoplastic proximal / middle third of vagina but normal tubes & ovaries. 40% of these patients have pelvic kidneys.

- **Tamoxifen is used for breast Ca & it causes multicystic adnexal mass containing fluid-fluid levels (endometrium), subendometrial cystic atrophy, endometrial hyperplasia, polyps & adenomyosis.**
- Simple adnexal cyst of < 5 cm resolves spontaneously hence a repeat USG is done after 3 months.

- Large fibroid after menopause raises the possibility of sarcomatous degeneration (leiomyosarcoma).
- Commonest cause of B/L distal fallopian tube blockage is PID.
- **CA-125 & AFP are associated with hepatocellular Carcinoma but Ca-125 alone with ovarian Carcinoma.**
- T3 of endometrial Ca if mucosa (T4) of bowel & bladder are spared but other layers are involved.
- Premenopausal uterus has high T2W endometrium, dark junctional zone & intermediate outer myometrium. Cervix lumen is bright, mucosa is bright, fibromuscular layer is dark & outer stoma is intermediate.

Pelvic floor has 3 compartments.

1. Anterior -Bladder & urethra

2. Middle -Vagina

3. Posterior -Rectum

- Utero-ovarian arterial anastomosis is seen in 10-30% of cases.
- Uterine artery arises as the first or second branch of anterior division of interior iliac artery in 51% of cases.
- Internal iliac artery trifurcates as uterine artery, anterior & posterior divisions in 15-40% of cases.
- Ovarian artery arises from aorta just below the renal arteries & has a characteristic corkscrew appearance. Normal ovarian arteries (small calibre) are not seen on angiography.
- Ipsilateral ovarian artery often replaces absent uterine artery.

- Dermoid ovarian cyst shows layering of low & high signal on T1WI with suppression of high signal on fat saturation. They are hyper on T2 with few low intensity nodules (Rokitansky nodules or dermoid plugs). Surgery is indicated.
- Bartholin cysts are seen in postero-lateral aspect of distal vagina, behind labia minora.
- Pseudothickening of junctional zone can mimic adenomyosis in the menstrual phase & hence scanning should not be done at this time. High T2W signal is not seen.
- *Focal thickening of myometrium due to contractions can also mimic focal adenomyosis. (Focal thickening of junctional zone). These are transient & will not persist on other sequences. High T2W signal is not seen.*
- Ovarian fibrothecoma on USG shows acoustic shadowing but no calcification.
- Sertoli-leydig cell ovarian tumours secrete androgens & cause virilisation in females.
- **Dermoid cyst (mature cystic teratoma) often shows hyperechoic lines & dots suggestive of dermoid mesh with fluid levels & floating globules.**
- *Unilocular ovarian cyst of >3 cm in pre-menopausal & > 5 cm in post-menopausal women should be followed up after 6 wks, even if some internal echoes suggestive of haemorrhagic cyst is seen.*
- Mullerian duct anomalies (anomalies of uterus, cervix, vagina, FT) are associated with renal tract anomalies in 30% of cases.
- **Upper 2/3 of vagina drains to pelvic nodes & lower 1/3 drains to inguinal nodes.**
- **Clear cell carcinoma of vagina is a rare form of adenocarcinoma in young patients with in-utero diethylstilbestrol exposure.**
- *Adenocarcinoma (15%) vagina involves pelvic & supra clavicular nodes but squamous cell (85%) carcinoma metastasize to liver & lungs.*
- Endometritis is the commonest cause of gas in uterus or an infected submucosal fibroid or a fistula to GI tract can cause gas.
- Ovarian gas is seen with infection within an ovarian neoplasm.

Vaginal tumours staging:

1. T1 - do not breach the low T2 vaginal wall
2. T2 - Involve vaginal wall & extend into paracolpal fat.
3. T3 - Reach pelvic side wall or serosa of other organs.
4. T4 - Extend beyond the true pelvis or involve UB or rectal mucosa.

- Ovarian hyper stimulation syndrome is seen with human gonadotrophin therapy & clomiphene. Ascites & pleural effusions are mostly seen.
- Normal ovarian volume is less than 18 cm³ before menopause & less than 8 cm³ after.

Endometrium thickness

1. During menses = < 4 mm
2. After menstruation till day 14 = 4-8 mm
3. 14-28 days = 7-14 mm

- **Features of ovarian cyst suggesting malignancy are thick irregular walls & thick septations (≥ 2 mm), large size, solid elements, high peak systolic velocity with $R1 < 0.4$ & $P1 < 1$.**
- Endometrial & myometrial hyperplasia with enlarged uterus can be caused by tamoxifen therapy for breast Ca.
- Pelvic congestion syndrome causes dilated ovarian & pelvic veins & varices resulting from left renal vein reflux. It causes thickened myometrium containing multiple large signal voids.

If the ablation zone remains same or increase in size, recurrence should be suspected. Following ablation, the treatment zone is normally larger than original lesion but it should reduce in size over time. Any nodular or

central enhancement in the ablation zone is also suggestive of recurrence.

- Cervical Ca causes lymphangitis carcinomatosa in lungs.
- *Minimal deviation adenocarcinoma of cervix (adenoma malignum) is associated with Peutz Jegher's Syndrome & appears as a multicystic lesion with a solid component in cervical stroma.*
- On HSG, adenomyosis appears as small diverticula extending from the endometrial cavity into myometrium.
- Multiple uterine synechiae (linear filling defects in uterine cavity) is Asherman's Syndrome.
- Some degree of communication between the 2 horns is seen in bicornuate uterus.
- Brenner tumours (adnexal lesion) show low T1 & T2 signals.
- B/L ovarian masses (cystic with solid) with peritoneal disease with absent gynae tumour markers are suggestive of Krukenberg tumour.
- Endodermal sinus (yolk sac tumour) are rarely bilateral.
- **Ovarian dysfunction is a known complication of fibroid embolization.**
- Fibroids are low signal on T1 & T2WI. Benign metastasizing leiomyoma is an unusual variant with tumour in lungs, peritoneum nodules & lymph nodes.
- **B/L hydrosalpinx are high T2W signal C-shaped cystic masses with thin longitudinally oriented folds along their interior in both adnexae.**
- *To check for the IUCD, firstly USG should be done & if not seen within the uterus, then abdomen X-ray should be done.*
- Cervical stenosis occurs following the treatment of cervical Ca or endometrial Ca by radiation or curettage. Endometrial cavity is distended by secretions & blood products.
- Bilateral endometrioid ovarian tumours are seen with concomitant endometrial adenocarcinoma.
- **In ovarian cancer staging, T3 involves liver capsule deposits but T4 causes liver parenchymal deposits & malignant pleural effusion.**
- MRI is technique of choice for local staging of cervical Ca.

Perineal injury grading:

1 - involves skin only

2 - Perineal muscle

3_a - Involving less than 50% of external sphincter

3_b - > 50%

3_c - Internal sphincter.

4 - Anal epithelium

- Local staging of Ca cervix includes size of lesion, distance from internal os & cervical length & size of uterus.

In carcinoma of vulva,

N₁ - Ipsilateral femoral or inguinal lymph nodes & all pelvic nodes.

N₂ - B/L nodes.

- Deposits less than 1 cm can show false negative results on PET.

LNs measurement criteria's by cancers:

≥ 7 mm - Internal iliac

≥ 8 mm - Obturator

≥ 9 mm - Common iliac

≥ 10 mm - External iliac, inguinal

≥ 12 mm - Retroperitoneal

- For cervical cancers, T2_a involves upper 2/3 of vagina & T3a involves lower 1/3.
- For ovarian malignancy metastasis staging – CT of abdomen & pelvis should be done.

- Herniation of midgut into the umbilical cord at 8-11 wks can be a part of normal pregnancy.
- **Deflated yolk sac or a large yolk sac & a very large Gestational sac relative to the embryo suggest complicated pregnancy.**
- *CRL should be more than 6 mm for accurately assessing the heart beat on TVS (10mm for TAS).*
- **G-sac diameter of >20 mm with no yolk sac & >25 mm with no visible embryo is suggestive of abortion or failed pregnancy on TAS.**
- Fetal CCAM, esophageal atresia & maternal diabetes causes polyhydramnios.
- VSD, polycystic kidney disease, PU valves & IUGR cause oligohydramnios.
- Ampullary portions of FT is commonest location for ectopic.
- Pregnancy related hydronephrosis occurs in 90% times in 3rd trimester & disappears postpartum. Right sided hydronephrosis is more common.
- **In molar pregnancy, patients with low PI of umbilical artery are more prone to become resistant to single drug therapy with methotrexate (increased AV shunting).**
- Pre-eclampsia, IUGR, infection & chromosomal abnormality can cause decrease in placental size.
- Enlarged placenta (>5 cm) is seen in maternal diabetes & anemia, fetal thalassemia, twin- twin transfusion syndrome & chronic infection.
- Gadolinium crosses the placental membrane & circulates through the amniotic fluid.
- USG is modality of choice for pregnant patients.
- **In case of abdominal ectopic if placenta is continuous with the bowel wall, then repeat follow up MRI is suggested to ensure that the placenta involutes following delivery & no abscess is formed. It is not removed surgically as it could cause arterial haemorrhage.**

A complete mole has no fetal parts & has 46 XX or 46 XY configurations with higher malignant potential than partial mole which has fetal parts & 69 chromosomes. 50% of cases of moles are associated with large septated thecal lutein cyst. On Doppler, moles have prominent associated vessels with low resistance & high peak systolic velocity. No regional nodes are seen.

- In postpartum stage, 80 % of thrombosis occurs on right side – ovarian vein thrombosis, IVC thrombosis & pulmonary embolism.
- **Succenturiate placenta is an additional lobule separate from the main bulk of placenta.**
- **Circumvallate placenta has a chorionic plate smaller than the basal plate with associated rolled placental edges. There are increased chances of placenta abruptio & haemorrhage.**
- Bilobed placenta is two evenly sized lobes connected by a thin bridge of placental tissue.
- *Placenta membranacea is a thin membranous structure circumferentially occupying the entire periphery of chorion. There are increased chances of placenta previa.*
- **Placenta accreta occurs when there is superficial invasion of chorionic villi of placenta into basalis layer of uterine wall. Deeper invasion into myometrium is ‘increta’. Involving serosa is “percreta”**
- Acute abruptio placenta is hyperechoic or isoechoic & difficult to distinguish from adjacent placenta. It becomes complex hypoechoic in one week & completely anechoic in 2 wks.
- Trisomy 18 is associated with single artery umbilical cord (2 vessels cord).
- Numerous gas filled spaces are seen in vaginal submucosa & exocervix in pregnancy & called as ‘vaginitis emphysematosa’.

Major makers of Down Syndrome:-

- Hydrothorax
- VSD
- Cystic Hygroma
- Omphalocele
- Duodenal atresia

- *Corpus callosum agenesis*
- *Imperforate anus*
- *Cerebral ventricular dilatation*

- For cord entanglement, twins must be in same amniotic sac (monochorionic monoamniotic).
- Heart activity of fetus should be seen on TVS when GSD is 18 mm & CRL is 5 mm or more.
- A “ double decidual sac sign” suggestive of intrauterine pregnancy.
- An incompetent cervix (shortened) can be seen during second & third trimester due to either cervical trauma or exposure to oestrogen or diethylstilbestrol.
- BPD is best for evaluating fetal age in 2nd & 3rd trimester. AC is least accurate.
- Vanishing twin occurs at less than 13 wks, when one twin is completely resorbed with no residuum on USG.
- **Fetus papyraceus - One twin is compressed & seen plastered to adjacent membranes.**
- *Placenta increta shows marked myometrial focal thinning with interruption of junctional zone with intact serosa.*
- An underdeveloped or absent decidua is seen in placenta accreta.

1. Which of the following are correct of multicystic dysplastic kidneys?

- (a) Antenatal ultrasound reveals a paraspinal mass with multiple communicating cysts.
- (b) Approximately 30% of contralateral kidneys are abnormal.
- (c) It is more common in infants of diabetic mothers.
- (d) Upto 20% of cases have residual renal function in the affected kidney on scintigraphy.
- (e) Nephrectomy is usually required, as it cannot be differentiated from cystic Wilms tumour.

Answers:

- (a) Not correct
- (b) Correct
- (c) Correct
- (d) Correct
- (e) Not correct

Explanation:

Antenatal ultrasound shows multiple non-communicating cysts of variable size. Serial ultrasound scans of multicystic dysplastic kidney show renal involution. Nephrectomy is required if it fails to involute or if there is uncontrolled hypertension.

Multicystic dysplastic kidney is the second most common cause of neonatal abdominal mass (first is hydronephrosis).

2. Regarding medullary sponge kidney, which of the following are correct?

- (a) The cystic areas in the medulla do not communicate with the collecting ducts.
- (b) The changes are unilateral in 25% of cases.
- (c) It is a feature of Meckel-Gruber syndrome.
- (d) Medullary nephrocalcinosis is visible radiographically in 10% of cases.
- (e) There is an association with Ehlers-Danlos syndrome.

Answers:

- (a) Not correct
- (b) Correct
- (c) Not correct
- (d) Not correct
- (e) Correct

Explanation:

Medullary sponge kidney is a common sporadic condition affecting young to middle aged adults. There is dysplastic cystic dilatation of papillary and medullary collecting ducts.

Meckel- Gruber syndrome is an autosomal recessive syndrome comprising of multicystic dysplastic kidneys, occipital encephalocele and polydactyly.

Medullary nephrocalcinosis is visible radiographically in 40% - 80%.

3. Concerning renal papillary necrosis, which of the following are correct?

- (a) Necrosis involves the overlying cortex in 10% of cases.

- (b) It may result from aspirin use.
- (c) A single papilla is affected in approximately 15% of cases.
- (d) It is associated with a higher incidence of renal tract squamous cell carcinoma.
- (e) Medullary sponge kidney is a cause.

Answers:

- (a) Not correct
- (b) Correct
- (c) Correct
- (d) Correct
- (e) Not correct

Explanation:

Cortex is not involved in renal papillary necrosis. It involves pyramids and medullary papilla. Medullary sponge kidney causes renal papillary calculi not necrosis.

4. Which of the following are correct regarding renal cell carcinoma?

- (a) About 75% of tumours less than 3cm in size are hyperechoic on ultrasonography.
- (b) Von Hippel-Lindau syndrome is risk factor.
- (c) Calcification and cystic change occur in the minority of cases.
- (d) About 30% of tumours are hypovascular on angiography.
- (e) The lungs are the most common site for metastatic spread.

Answers:

- (a) Correct
- (b) Correct
- (c) Correct
- (d) Not correct
- (e) Correct

Explanation:

5% of RCC are hypovascular on angiography. Tumours cause neovascularity. Renal vein or IVC extension of tumour is also seen on angiography.

5. Concerning ureterocoeles, which of the following are correct?

- (a) About 80% of ectopic ureterocoeles occur in duplicated systems.
- (b) In children, a pseudoureterocoele most commonly results from an impacted stone.
- (c) They can be indistinguishable from bladder diverticula during voiding.
- (d) A simple ureterocoele never occurs in an ectopic ureter.
- (e) A single simple ureterocoele can cause bladder outlet obstruction.

Answers:

- (a) Correct
- (b) Correct
- (c) Correct
- (d) Correct
- (e) Correct

Explanation:

Ureterocoele is a congenital dilatation of distal most portion of ureter. In minority of cases it is an isolated finding and seen in adults. On IVP it shows 'cobra head' sign.

Complications include obstructive cystic renal dysplasia.

6. Which of the following are correct regarding retroperitoneal fibrosis?

- (a) When the ureters are involved, there is typically only mild pyelocaliectasis.
- (b) The fibrotic plaque usually originates around the aortic bifurcation.
- (c) On CT, the aorta is typically enveloped and anteriorly displaced by a fibrotic mass.
- (d) An increase in signal intensity on T2 weighted imaging indicates a good response to steroid treatment.
- (e) It is associated with primary sclerosing cholangitis.

Answers:

- (a) Correct
- (b) Correct
- (c) Not correct
- (d) Not correct
- (e) Correct

Explanation:

On CT, the aorta is engulfed by the fibrotic mass but not displaced. Displacement is seen in malignancy.

Steroid treatment causes a decrease in signal intensity on T2WI indicating a good response.

7. In prune belly syndrome, which of the following are correct?

- (a) The condition is more common in females.
- (b) The inheritance is autosomal recessive.
- (c) It is characterised by markedly distended and obstructed ureters.
- (d) There is an association with Hirschsprung's disease.
- (e) Death occurs within 1 year of birth in the majority of cases.

Answers:

- (a) Not correct
- (b) Not correct
- (c) Not correct
- (d) Correct
- (e) Not correct

Explanation:

Prune belly syndrome is a sporadic nonhereditary condition, exclusively affecting males. It is characterized by triad of absent anterior abdominal wall muscles, non-obstructed megaureters and cryptorchidism (due to bladder distension).

In 20% cases death occurs in first month of life and another 30% within 2 yrs of life. Mild cases survive into adulthood.

8. Regarding testicular ultrasound, which of the following are correct?

- (a) Absent testicular blood flow on colour Doppler imaging is pathognomonic of testicular torsion.
- (b) There is an association between testicular microlithiasis and Klinefelter's syndrome.
- (c) Testicular cysts are seen in upto 10% of testicular ultrasound studies.
- (d) The epididymis is typically enlarged, hypervascular and hyperechoic when inflamed.
- (e) The normal epididymis is slightly hypoechoic to the normal testis.

Answers:

- (a) Not correct
- (b) Correct
- (c) Correct
- (d) Not correct
- (e) Not correct

Explanation:

In paediatric patients intratesticular flow can be difficult to demonstrate on colour Doppler. Power Doppler may be helpful in such cases.

When inflamed epididymis is typically enlarged, hypervascular and hypoechoic. Orchitis is seen in 20% cases and shows similar appearance.

The normal epididymis is isoechoic to slightly hyperechoic to normal testis.

9. Which of the following are correct regarding screening tests for breast cancer in the general population?

- (a) Screening mammography has been shown to reduce mortality from breast cancer.
- (b) Screening using ultrasound has been shown to reduced breast cancer mortality in patients less than 35 years old.
- (c) Two views of the breast are obtained for all screening assessments.
- (d) Cancers showing casting linear calcifications on mammography are associated with a poorer prognosis.
- (e) In the UK, mammographic screening is currently advocated for women aged over 40 years.

Answers:

- (a) Correct
- (b) Not correct
- (c) Not correct
- (d) Correct
- (e) Not correct

Explanation:

Two views of each breast are taken as baseline, but single view is taken as follow up. However two views are recommended as follow up as it increases lesion detection.

Ultrasound currently has no role as a screening tool in any age group.

In UK, screening is available for patients from 50-65 yrs.

10. Which of the following are correct regarding invasive breast cancers?

- (a) Rim calcification is frequently seen in medullary carcinoma.
- (b) There is an association between tubular carcinoma and radial scar.
- (c) The most common invasive cancer in the male breast is invasive lobular carcinoma.
- (d) Colloid carcinoma has a worse prognosis than invasive ductal carcinoma.

- (e) The likelihood of axillary spread of invasive ductal carcinoma depends on the size of the tumour.

Answers:

- (a) Not correct
- (b) Correct
- (c) Not correct
- (d) Not correct
- (e) Correct

Explanation:

Medullary carcinoma presents as well defined mass which may show lobulated margins or halo sign. Calcification is not a feature.

The most common invasive cancer in male breast is invasive ductal carcinoma.

Colloid carcinoma is seen in older age group (over 60 yrs) and has a good prognosis as tumour is slow growing.

11. Which of the following are correct regarding calcification detected on mammography?

- (a) Skin calcifications typically have central lucent centres.
- (b) Mild of calcium has a typical appearance on the cranio-caudal view.
- (c) “Bilateral scattered punctate calcifications are probably benign.
- (d) Rim calcification is a feature of fat necrosis.
- (e) Sutural calcification are usually linear in appearance.

Answers:

- (a) Correct
- (b) Not correct
- (c) Correct
- (d) Correct
- (e) Correct

Explanation:

Milk of calcium appears amorphous and ill-defined on cranial caudal view.

On medial-lateral oblique view it is typically sharply defined, semilunar or crescent shaped and upwardly concave.

12. Which of the following statements are correct regarding fibroadenomas?

- (a) They occur bilaterally in 25% of cases.
- (b) The incidence is higher in women receiving hormone replacement therapy.
- (c) The typically demonstrate posterior acoustic shadowing on ultrasonography.
- (d) Internal septations are typical on gadolinium-enhanced MRI.
- (e) They are clinically palpable in the majority of cases.

Answers:

- (a) Not correct
- (b) Correct
- (c) Not correct
- (d) Correct
- (e) Correct

Explanation:

Fibroadenomas are multiple in 10%- 20% of cases but are found bilaterally in only 4 % of cases.

They are well circumscribed masses with homogenous internal echoes but variable posterior acoustic pattern.

13. Which of the following are correct regarding sclerosing adenosis?

- (a) It has an association with lobular carcinoma.
- (b) It is a condition with high premalignant potential.
- (c) Biopsy is required to make a definitive diagnosis.
- (d) It presents with a palpable mass in the majority of cases.
- (e) It commonly presents as focal or diffuse calcification.

Answers:

- (a) Correct
- (b) Not correct
- (c) Correct
- (d) Not correct
- (e) Correct

Explanation:

Sclerosing adenosis is only mildly associated (2.5 folds) with increase in risk of infiltrating breast cancer. The condition in itself is non-malignant.

It is frequently detected only on mammography, though may present as a palpable mass.

14. Regarding ultrasonography in the first trimester of pregnancy, which of the following are correct?

- (a) Gestational sac volume is the most accurate estimate of gestational age in the first 8 weeks of pregnancy.
- (b) The diameter of the yolk sac should not be more than 5mm.
- (c) The yolk sac is normally identified before the foetal pole.
- (d) A normal intrauterine gestational sac and foetal pole exclude an ectopic pregnancy.
- (e) Cardiac pulsation becomes visible at the beginning of the eighth postmenstrual week.

Answers:

- (a) Not correct
- (b) Correct
- (c) Correct
- (d) Not correct
- (e) Not correct

Explanation:

Once the fetus can be identified (5-6wks) then crown to rump length (CRL) is the most accurate measurement.

The biparietal diameter becomes the most accurate towards end of the first trimester.

Cardiac pulsation is visualized as soon as a fetal pole is visualized i.e. at 6 weeks postmenstrual week on TAS.

A coexistent intrauterine and ectopic pregnancy (heterotopic pregnancy) is extremely rare (1 in 30000 pregnancy).

15. Which of the following statements are correct?

- (a) An empty gestational sac with a mean sac diameter of 10mm and an elevated β human chorionic gonadotrophin (HCG) is consistent with a blighted ovum.
- (b) Beta-HCG levels double every week in the first 8 weeks of pregnancy.
- (c) An absent intrauterine pregnancy on ultrasonography and β -HCG levels between 1000 and 2000 IU is highly suspicious of an ectopic pregnancy.
- (d) Vaginal bleeding is not usually associated with an ectopic pregnancy.
- (e) The risk of a second ectopic pregnancy is 10%.

Answers:

- (a) Correct
- (b) Not correct
- (c) Correct
- (d) Not correct
- (e) Not correct

Explanation:

Beta-HCG levels double every 2-3 days in the first 8 weeks of pregnancy.

Vaginal bleeding is seen in 75%-85% cases of ectopic pregnancies. The risk of second ectopic pregnancy is 25%.

16. An axial ultrasonographic section through the foetal head measurement of the biparietal diameter (BPD) should include which of the following?

- (a) The third ventricle.
- (b) The thalami.
- (c) The cavum septum pellucidum.
- (d) A continuous echogenic midline.
- (e) The cerebellum.

Answers:

- (a) Correct
- (b) Correct
- (c) Correct
- (d) Not correct
- (e) Not correct

Explanation:

BPD is used for estimating the gestational age after 12 weeks. Its accuracy declines after 28 weeks after which it is combined with second measurement like femur length.

17. Regarding uterine leiomyomas, which of the following are correct?

- (a) Simple leiomyomas can metastasise.
- (b) Cystic degeneration occurs in 30% of cases.
- (c) Red degeneration is associated with the contraceptive pill.
- (d) Calcification is usually peripheral.
- (e) They are typically of low T2 signal relative to the surrounding myometrium.

Answers:

- (a) Correct
- (b) Not correct
- (c) Correct
- (d) Not correct
- (e) Correct

Explanation:

In leiomyomas (fibroids) cystic degeneration is rare, seen only in 4 % cases.

Calcification is seen associated with red degeneration, and is typically scattered and amorphous marking the site of hyaline degeneration.

18. Which of the following statements are correct?

- (a) The risk of an ectopic pregnancy is higher in patients with a unicornuate uterus.
- (b) Nabothian cysts occur in the posterolateral wall of the lower third of the vagina.
- (c) The uterus is derived from the paired mullerian ducts.
- (d) A unicornuate uterus is rarely associated with other anomalies.
- (e) Gartner's duct cysts are typically located anterolateral to the upper two thirds of the vagina.

Answers:

- (a) Correct
- (b) Not correct
- (c) Correct
- (d) Not correct
- (e) Correct

Explanation:

Bartholin's cyst occurs in posterolateral wall of lower third of vagina.

Mucous retention within endocervical glands is known as nabothian cyst and can be seen in any wall of cervix.

40% cases of unicornuate uterus is associated with renal and ureteric anomalies.

19. Which of the following statements are correct?

- (a) Haematocolpos refers to a uterine cavity distended with blood.
- (b) After puberty, the most common cause of haematocolpos is vaginal atresia.
- (c) A fluid collection within the endometrial cavity of a neonate is abnormal.
- (d) Congenital haematometocolpos is usually associated with other anomalies.
- (e) Haematometra is a cause of ureteric obstruction.

Answers:

- (a) Not correct
- (b) Not correct
- (c) Not correct
- (d) Correct
- (e) Correct

Explanation:

Hematocolpos refers to vagina distended with blood and hematometra refers to uterine cavity distended with blood.

An imperforate hymen is the most common cause of hematocolpos.

Approximately 25% of neonates have a fluid collection within the endometrial cavity, thus a normal finding.

20. Regarding polycystic ovaries, which of the following are correct?

- (a) Cysts of 5-8mm are characteristically present throughout the ovary.
- (b) They are seen in patients with trophoblastic disease.
- (c) There is an increased risk of endometrial carcinoma.
- (d) The ovaries are enlarged on ultrasonography in 95% of cases.
- (e) There is a decrease in the ratio of luteinising hormone to follicular stimulating hormone.

Answers:

- (a) Not correct
- (b) Not correct
- (c) Correct
- (d) Not correct
- (e) Not correct

Explanations:

The cysts are typically subcapsular in polycystic ovaries with central stroma showing increased echogenicity.

In 25% cases ovaries are hypoechoic with no demonstrable follicle. The ovaries are bilaterally enlarged (more than 14 cm³) in 70% cases and of normal size in 30% cases.

There is increase in ratio of luteinising hormone to follicular stimulating hormone resulting in immature follicles.

Trophoblastic disease typically causes hyperstimulation of ovaries with multiseptated cysts secondary to increased HCG levels.

21. Regarding foetal anomalies, which of the following are correct?

- (a) The nuchal-fold thickness is most prominent between 11 and 13 weeks.
- (b) Endocardial cushion defects are strongly associated with Down's syndrome.
- (c) The triple screen for Down's syndrome refers to the combination of maternal alpha-fetoprotein, oestriol and HCG levels.
- (d) Short femur and humerus lengths are indicators of Down's syndrome.
- (e) Separation of the big toe from the remaining toes is a strong sign of Down's syndrome.

Answers:

- (a) Correct
- (b) Correct
- (c) Correct
- (d) Correct
- (e) Not correct

Explanation:

Other associations with Down's syndrome are membranous ventricular septal defects, ostium primum atrial septal defects, cleft mitral valve, patent ductus arteriosus, 11 pairs of ribs and hypersegmented manubrium (90%).

Separation of the big toe from the remaining toes (sandal sign) is a weak sign of Down's syndrome.

22. The following are correct regarding transabdominal ultrasound in early pregnancy:

- (a) Yolk sac is only visible from 7 weeks onwards.
- (b) Gestational sac should be visible at 4 weeks.
- (c) The earliest ultrasound sign of pregnancy is fundal endometrial thickening.
- (d) Cardiac movement should be identifiable in the foetus at 6.5 weeks.
- (e) Biparietal diameter can be used to predict gestational age from 7 weeks.

Answers:

- (a) Not correct
- (b) Not correct
- (c) Correct
- (d) Correct
- (e) Not correct

Explanation:

Yolk sac is visible from 6 weeks onwards and gestational sac from 5 weeks onwards.

Biparietal diameter is used to predict gestational age from 12 to 28 weeks.

23. Which of the following are correct regarding xanthogranulomatous pyelonephritis:

- (a) Is more commonly diffuse than segmental.
- (b) May be caused by *Proteus mirabilis* infection.
- (c) Pyuria is associated in less than 50%.
- (d) Is not usually associated with calculi.
- (e) Causes reduced size of the affected kidney.

Answers:

- (a) Correct
- (b) Correct
- (c) Not correct
- (d) Not correct
- (e) Not correct

Explanation:

Pyuria is associated in 95 % cases of xanthogranulomatous pyelonephritis. There is global enlargement of kidney with centrally obstructing calculi seen in 75% of the cases.

24. Which of the following are correct regarding pheochromocytoma:

- (a) Is associated with gastric haemorrhage.
- (b) Affects the bladder.
- (c) Is bilateral in 20-40% of cases.
- (d) Is extra-adrenal in 20-30% of cases.
- (e) Is associated with tuberous sclerosis.

Answers:

- (a) Correct
- (b) Correct

- (c) Not correct
- (d) Not correct
- (e) Correct

Explanation:

The pheochromocytoma follows 10% rule. It is bilateral in 10% cases, 10% cases are extra adrenal, 10% are malignant, 10% are in children, 10% are familial, 10% are not associated with hypertension and 10% show calcification.

25. Which of the following are correct regarding schistosomiasis:

- (a) Calcification is the most important single imaging feature.
- (b) The bladder usually has a reduced capacity in the early stages.
- (c) Is endemic in parts of the Eastern Mediterranean.
- (d) Ureteral calculi are rarely seen.
- (e) In the earliest stage, dilatation of the ureter is confined to the upper third.

Answers:

- (a) Correct
- (b) Not correct
- (c) Correct
- (d) Not correct
- (e) Not correct

Explanation:

Schistosomiasis is commonly associated with ureteric calculi, dilatation of lower ureter in early stage and reduced bladder capacity in advanced stages.

26. Features of von Hippel-Lindau (VHL) disease include:

- (a) Renal cysts are present in over 50%.
- (b) Renal angiomas may be distinguished from renal cell carcinoma by imaging.
- (c) Renal impairment is common.
- (d) Renal cell carcinomas are usually solitary.
- (e) A cyst with an enhancing nodule is suspicious for malignancy.

Answers:

- (a) Correct
- (b) Not correct
- (c) Not correct
- (d) Not correct
- (e) Correct

Explanation:

Renal angiomas cannot be distinguished from renal cell carcinoma on imaging.

In VHL renal impairment is uncommon and renal cell carcinomas are usually bilateral and multicentric.

27. Concerning developmental abnormalities of the kidneys which of the following are correct:

- (a) Accessory renal arteries normally enter the upper and mid poles.
- (b) Duplication of the collecting system is seen in 10-12% of people.
- (c) Horseshoe kidney is seen in 1 in 200 births.
- (d) Horseshoe kidneys are more prone to trauma.
- (e) Accessory renal arteries are less common in patients with horseshoe kidney.

Answers:

- (a) Not correct
- (b) Not correct
- (c) Not correct
- (d) Correct
- (e) Not correct

Explanation:

Accessory renal arteries commonly enter the lower pole below the hilum and are more common in patients with horseshoe kidney. Incidence of horseshoe kidney is 1 in 700 births.

Duplication of collecting system is seen in only 4% of people.

28. Which of the following are correct regarding ovarian cancer:

- (a) It is the commonest gynaecological malignancy.
- (b) It is associated with colorectal cancer.
- (c) CA-125 is specific for ovarian cancer.
- (d) CT only has a pre-operative staging accuracy of 50%.
- (e) Doppler ultrasound may help with differentiating benign from malignant disease.

Answers:

- (a) Not correct
- (b) Correct
- (c) Not correct
- (d) Not correct
- (e) Correct

Explanation:

Endometrial cancer is the most common gynaecological malignancy.

CA-125 is not specific for ovarian cancer, it is increased in benign conditions like fibroids, endometriosis and inflammatory pelvic disease.

CT only has a pre-operative staging accuracy of 70% - 90%.

29. Which of the following are correct regarding gestational trophoblastic disease:

- (a) Young maternal age is a risk factor.
- (b) It is associated with theca-lutein cysts.
- (c) A predominantly echo-poor mass is seen on ultrasound.
- (d) Invasive mole develops in approximately half of cases.
- (e) Raised human chorionic gonadotrophin is seen in upto 80% of cases.

Answers:

- (a) Not correct
- (b) Correct
- (c) Not correct
- (d) Not correct
- (e) Not correct

Explanation:

Gestational trophoblastic disease is associated with increased maternal age, presents as an echogenic mass with invasive mole developing in 12%-15% of cases.

Raised human chorionic gonadotrophin is seen in 100% cases.

30. Which of the following are correct regarding pheochromocytoma:

- (a) Is bilateral in 25%
- (b) When symptomatic tends to be large at presentation.
- (c) Is associated with pulmonary hamartomas.
- (d) Usually has CT attenuation values of <10 Hounsfield units (HU) on unenhanced scans.
- (e) Is of high signal intensity on T2 weighted MR.

Answers:

- (a) Not correct
- (b) Not correct
- (c) Correct
- (d) Not correct
- (e) Correct

Explanation:

Pheochromocytoma are bilateral in 10% cases, and symptomatic lesions tend to be smaller in size.

They rarely contain enough fat to reduce the attenuation value <10 HU units.

31. Which of the following are correct regarding benign and malignant adrenal masses:

- (a) Chemical shift MR utilises T1 weighted sequences.
- (b) Approximately one third of benign adenomas have HU of >10 on unenhanced CT.
- (c) Adenomas tend to show delayed enhancement with IV contrast.
- (d) Adenomas tend to show delayed clearance of IV contrast.
- (e) Lesions >4cm tend to be malignant.

Answers:

- (a) Correct
- (b) Correct
- (c) Not correct
- (d) Not correct
- (e) Correct

Explanation:

Adenomas (benign) show rapid enhancement and rapid washout of contrast media on post contrast study.

32. Which of the following are correct regarding concerning ovarian teratomas:

- (a) Mature teratomas are usually multi-loculated.
- (b) They are a known cause of peritonitis.
- (c) Fat attenuation on CT is diagnostic for mature cystic teratomas.
- (d) Sebaceous fluid has low signal on T1 weighted MR.
- (e) Calcification indicates a malignant teratomas.

Answers:

- (a) Not correct
- (b) Correct
- (c) Correct
- (d) Not correct
- (e) Not correct

Explanation:

Mature Teratomas are unilocular.

Sebaceous fluid has high signal on T1WI.

Calcification outside the mural nodule is suspicious of malignancy.

33. Which of the following are correct regarding omphalocele:

- (a) Is a midline abdominal wall defect.
- (b) Is usually an isolated abnormality.
- (c) Is associated with a normal umbilical cord insertion.
- (d) Has no covering over the herniated contents.
- (e) Is associated with Beckwith-Wiedemann syndrome.

Answers:

- (a) Correct
- (b) Not correct
- (c) Not correct
- (d) Not correct
- (e) Correct

Explanation:

Omphalocele is usually associated with other anomalies in over 80% cases, with umbilical cord insertion at the apex and covered by peritoneum and amnion.

34. Which of the following are correct regarding multicystic dysplastic kidney:

- (a) Is the second commonest cause of a neonatal abdominal mass.
- (b) Is associated with PUJ obstruction.
- (c) Is usually unilateral.
- (d) The renal cysts communicate.
- (e) Intervening normal renal parenchyma is present.

Answers:

- (a) Correct

- (b) Correct
- (c) Correct
- (d) Not correct
- (e) Not correct

Explanation:

Multicystic dysplastic kidney shows non-communicating cysts with no normal renal parenchyma.

35. Which of the following are correct regarding metastases to breast:

- (a) Rhabdomyosarcoma is the most frequent primary in adolescent females.
- (b) Lymphoma is the most common primary in adults.
- (c) Are associated with skin changes in more than 75% of cases.
- (d) The majority are located in the lower outer quadrant.
- (e) Are characteristically hypoechoic and have a well-defined posterior wall on ultrasound examination.

Answers:

- (a) Correct
- (b) Correct
- (c) Not correct
- (d) Not correct
- (e) Correct

Explanation:

50% of metastases are superficial with no associated skin changes. Diffuse skin involvement is seen in melanoma.

The metastases are more commonly located in outer upper quadrant, without speculation, calcifications or desmoplastic reaction as in primary carcinoma.

36. Which of the following are correct regarding urinary tract stones:

- (a) Craniocaudal size is underestimated on CT.
- (b) Urinary tract obstruction cannot be diagnosed on unenhanced CT.
- (c) Pure matrix stones are not visualized on unenhanced CT.
- (d) Renal failure is a common clinical presentation.
- (e) A plain abdominal X-Ray (KUB) has a sensitivity of 80%.

Answers:

- (a) Not correct
- (b) Not correct
- (c) Correct
- (d) Not correct
- (e) Not correct

Explanation:

Partial voluming tends to overestimate the size of stone on CT.

Unenhanced CT shows ureteric and collecting system dilatation, nephromegaly and perinephric and periureteric fat standing, which are all signs of obstruction.

Plain X-ray KUB has only 45% - 58% sensitivity.

Renal failure is rare and is secondary to bilateral obstructing calculi.

37. Which of the following are correct regarding contrast media nephrotoxicity (CMN):

- (a) 0.45% saline infusion before and after contrast media injection reduces the risk of nephrotoxicity.
- (b) Nephrotoxic effect of contrast media is dose dependent.
- (c) Prophylactic haemodialysis prevents nephrotoxicity.
- (d) Is usually benign and resolves within 1-2 weeks.
- (e) Acetylcystein is a potent vasoconstrictor.

Answers:

- (a) Correct
- (b) Correct
- (c) Not correct
- (d) Correct
- (e) Not correct

Explanation:

Hemodialysis can induce hypovolaemia which worsens renal ischemia.

Acetylcystein is an antioxidant and scavenger of oxygen free radicals. It enhances the biological effect of the endogenous vasodilator nitric oxide.

38. Which of the following are correct regarding imaging of prostate cancer:

- (a) Can be reliably detected by transrectal ultrasound.
- (b) Intravenous contrast is used routinely in MRI.
- (c) Normal zonal anatomy of the prostate gland is best seen on T1 weighted MRI.
- (d) Usually appears as a high signal intensity lesion on T2 weighted MRI.
- (e) Is usually hypoechoic on TRUS.

Answers:

- (a) Not correct
- (b) Not correct
- (c) Not correct
- (d) Not correct
- (e) Correct

Explanation:

Only cancer located in the peripheral zone can be reliably detected on TRUS, with 60%-70 % appearing hypoechoic, 40% are isoechoic and 1% - 5% are hyperechoic.

Intravenous contrast is not used routinely in MRI as it has no superiority of T2WI. T2WI best demonstrates zonal anatomy with cancer appearing as lesion of low signal within the high signal of peripheral zone.

All the zones have intermediate signal on T1WI on MRI.

39. Which of the following are correct regarding angiomyolipoma (AML):

- (a) Is the most common benign tumour of the kidney in adults.
- (b) A high attenuation lesion on unenhanced CT excludes the diagnosis.
- (c) The absence of fat-content on unenhanced CT excludes the diagnosis.

- (d) Prolonged enhancement on delayed post-contrast CT favours a diagnosis of AML rather than renal cell carcinoma.
- (e) Calcification is a common feature.

Answers:

- (a) Correct
- (b) Not correct
- (c) Not correct
- (d) Correct
- (e) Not correct

Explanation:

AML with minimal fat content can have high attenuation on unenhanced CT. Fat content is characteristic of AML but 5% have predominance of blood vessels or immature fat. Calcification is a rare feature of AML.

40. Which of the following are correct regarding testicular microlithiasis:

- (a) Extratesticular scrotal calcification is usually benign.
- (b) Acoustic shadowing is observed in most cases.
- (c) Is associated with infertility.
- (d) Is usually unilateral.
- (e) May be associated with neurofibromatosis.

Answers:

- (a) Correct
- (b) Not correct
- (c) Not correct
- (d) Not correct
- (e) Correct

Explanation:

Acoustic shadowing is not seen due to small size of calcification. Infertility is not associated with microlithiasis (association is 1% same as general population).

Unilaterality is seen only in 2.7% to 27%.

41. Which of the following are correct regarding testicular epidermoid cysts:

- (a) Are usually multiple and bilateral.
- (b) The majority occur in the elderly.
- (c) Concentric layers of calcification are characteristic on ultrasound.
- (d) A bull's eye pattern is a recognized appearance on MRI.
- (e) Are typically treated by orchidectomy.

Answers:

- (a) Not correct
- (b) Not correct
- (c) Correct
- (d) Correct
- (e) Not correct

Explanation:

1% of intratesticular tumours are epidermoid and most commonly seen between 20-40 yrs.

They are usually solitary and unilateral, but cases of multiplicity and bilaterality have been recognized.

42. Which of the following are correct regarding phyllodes tumour:

- (a) Typically presents in women between 30 years and 50 years of age.
- (b) Benign phyllodes tumours do not recur after excision.
- (c) Axillary nodal metastases are common at presentation.
- (d) Calcifications are commonly seen at mammography.
- (e) 1-5% contain areas of malignant degeneration at histology.

Answers:

- (a) Correct
- (b) Not correct
- (c) Not correct
- (d) Not correct
- (e) Not correct

Explanation:

Phyllodes tumour presents as a large well circumscribed oval or lobulated mass which may have radiolucent halo on mammography. Coarse plaque like calcification is rare. On ultrasound it appears as inhomogeneous solid appearing mass. Cystic spaces within the mass with posterior acoustic enhancement are typical of phyllodes tumour.

On histology it appears like a giant fibroadenoma, with upto 25% containing areas of malignant degeneration with infiltrative borders. 10% of phyllodes tumours are true sarcomas presenting with hematogeneous spread. Nodal spread is rare. Both benign and malignant have a tendency to reoccur if not widely excised.

43. Which of the following are correct regarding mullerian duct abnormalities:

- (a) The upper two thirds of the vagina arise from the mullerian ducts.
- (b) Affect 1-5% of women of reproductive age.
- (c) Uterus didelphys is the most common anomaly.
- (d) Septate uterus is associated with infertility.
- (e) Are associated with renal agenesis.

Answers:

- (a) Correct
- (b) Not correct
- (c) Correct
- (d) Correct
- (e) Correct

Explanation:

0.1% to 0.5% women of reproductive age are affected by congenital abnormalities of uterus. Approximately 25% of patients with anomaly have sub-fertility.

44. Which of the following are correct regarding characteristic MRI features of adenomyosis:

- (a) Foci of high signal within the myometrium on T1 weighted MRI.
- (b) Focal thickening of the junctional zone.
- (c) Foci of high signal within the myometrium on T2 weighted MRI.
- (d) Significant displacement of the endometrial cavity.
- (e) Large feeding vessels.

Answers:

- (a) Correct
- (b) Correct
- (c) Correct
- (d) Not correct
- (e) Not correct

Explanation:

On MRI adenomyosis and leiomyoma have overlapping features. Features favouring adenomyosis are:

- 1) poorly defined borders
- 2) oval shaped lesion along endometrium
- 3) minimal mass effect on endometrium relative to size of lesion
- 4) linear striations perpendicular to endometrium radiating into myometrium
- 5) absence of large feeding vessels.

45. Which of the following are correct regarding imaging of silicone-gel breast implants:

- (a) The incidence of rupture increases with increasing implant age.
- (b) A reverberation band parallel to the anterior surface of the implant is a sign of on ultrasound.
- (c) The majority of ruptures are extracapsular.
- (d) Water-suppressed inversion-recovery T2 weighted MRI images are useful.
- (e) The linguine sign on MRI implies intracapsular rupture.

Answers:

- (a) Correct
- (b) Not correct
- (c) Not correct
- (d) Correct
- (e) Correct

Explanation:

A band of linear striated reverberation in the anterior aspect of implant approximately equal in thickness to the breast tissue overlying the implant is a normal finding indicating an intact silicone gel implant.

Ultrasound signs of intracapsular rupture include the 'stepladder sign' (a series of parallel horizontal echogenic lines indicating a collapsed implant shell).

A 'snowstorm' pattern has been described in extracapsular rupture indicating free silicone droplets within the breast tissue.

22% of ruptures are extracapsular.

46. Which of the following are correct regarding genitourinary tuberculosis (TB):

- (a) Is the most common manifestation of extrapulmonary TB.
- (b) In renal TB: calyceal dilatation is usually accompanied by pelvic dilatation.

- (c) The endometrium is affected in >70% of women with genital TB.
- (d) Papillary necrosis is a recognized feature.
- (e) A raised CA-125 level excludes tubo-ovarian TB.

Answers:

- (a) Correct
- (b) Not correct
- (c) Correct
- (d) Correct
- (e) Not correct

Explanation:

In renal TB earliest IVU abnormality is a 'moth eaten' calyx due to erosion, followed by papillary necrosis.

Dilatation of one or more calyces without pelvic dilatation typically occurs due to infundibular stenosis.

Tubo-ovarian involvement is usually caused by hematogenous or lymphatic spread, mimicking ovarian cancer clinically and radiologically. Diagnosis is generally made post-operatively.

47. The following transvaginal ultrasound findings are compatible with pregnancy failure:

- (a) Double decidual reaction.
- (b) A 2mm embryo lacking a cardiac heartbeat.
- (c) A gestational sac of 20mm containing no yolk sac.
- (d) Grossly distorted sac shape.
- (e) A gestational sac of 25mm containing no embryo.

Answers:

- (a) Not correct
- (b) Not correct
- (c) Correct
- (d) Correct
- (e) Correct

Explanation:

Double decidual reaction consists of two concentric rings surrounding the intra-endometrial fluid and is a sign of normal pregnancy.

Cardiac activity begins by 5 weeks of gestation hence heartbeat is seen in 5 mm or bigger embryo on transvaginal scan. Thus in embryos smaller than 5 mm repeat ultrasound is suggested.

48. Which of the following are correct regarding autosomal dominant polycystic kidney disease (ADPKD):

- (a) 35-50% of patients develop end-stage renal failure.
- (b) 2.5% of nephrons are affected by cystic change.
- (c) Hepatic cysts are seen in 5-10% by 60 years of age.
- (d) 2-10% of patients sustain subarachnoid haemorrhage.
- (e) Cyst density >30 HU on post-intravenous contrast CT suggests malignant change.

Answers:

- (a) Correct

- (b) Correct
- (c) Not correct
- (d) Correct
- (e) Not correct

Explanation:

Hepatic cysts are seen in 70%-75% by 60 yrs of age.

The most common cause of increased density of cyst is haemorrhage (HU of 50-90). ADKPD patients on dialysis have an increased risk of cancer relative to population.

49. Which of the following are correct regarding causes of cortical nephrocalcinosis:

- (a) Chronic glomerulonephritis.
- (b) Hyperparathyroidism.
- (c) Chronic transplant rejection.
- (d) Acute cortical necrosis.
- (e) Hypervitaminosis D.

Answers:

- (a) Correct
- (b) Not correct
- (c) Correct
- (d) Correct
- (e) Not correct

Medullary nephrocalcinosis is seen in hyperparathyroidism, hypervitaminosis D, renal tubular acidosis, medullary sponge kidney, renal papillary necrosis, hypercalciuria and primary hyperoxaluria.

UNIT – V
PAEDIATRIC SYSTEM

- **Congenital diaphragmatic hernia shows gasless abdomen with multiple tubular lucencies in one side of the chest.**
- In neonates with CCAM, chest radiograph may show a soft tissue mass which becomes filled with air as fluid is reabsorbed in few hours (No hyperexpansion seen).
- Hyperexpansion of lung with flattening of diaphragm in a neonate is due to congenital lobar emphysema.
- *CCAM communicates with bronchial tree & most lesions are confined to single lobe.*
- Sequestration does not contain air (unless infected in intralobar type).
- Round pneumonia (not round atelectasis) has ill-defined margins with no air bronchogram (air bronchogram may be seen sometimes).
- *Mycoplasma infections give reticular-nodular shadowing or segmental consolidation.*
- Transient tachypnea of newborn shows hyperinflated lungs with prominent interstitial markings & prominent horizontal fissure. These findings resolve in 3 days.
- **Pulmonary interstitial emphysema is associated with premature babies treated with positive pressure mechanical ventilation. Pneumothorax may be seen.**
- Congenital lobar emphysema initially seen as a hazy opacity which becomes hyperlucent later & causes contralateral shift (causes are bronchial dysplasia, inspissated mucus & bronchial web).
- Right sided diaphragmatic hernia is fatal.
- Bochdalek hernias are common, left sided, posterior & larger. Small bowel is the commonest viscera to herniate.
- Cystic fibrosis causes cylindrical bronchiectasis, segmental atelectasis, branching intralobular soft tissue & hilar LNs.
- Paraseptal emphysema is seen in cystic fibrosis (may be centrilobular emphysema).
- Mature teratomas (benign) can be seen in posterior mediastinum & shows rim enhancement with fat fluid level sign (uncommon) but they are often inseparable from thymus.

Recurrent pneumothorax is seen in LCH & it mainly initiates as centrilobular nodules, which cavitate to form thick walled cysts & then thin walled cysts with fibrosis in upper zones.

- Persistent upper lobe pneumonia with finger like opacity projecting from the hilum is suggestive of bronchial atresia.
- Extralobar sequestration drains into right atrium, not left. It appears as a left basal opacity devoid of air bronchogram.

In CCAM: Cysts > 2cm – type I (most common)

- *0.5- 2 cm – type II*
- *0.3- 0.5 cm – type III*

- Congenital abnormalities occur in 15 % of intralobar sequestration & 50% of extralobar sequestration.
- Congenital diaphragmatic hernia & Scimitar syndrome are associated with pulmonary hypoplasia.
- Scimitar syndrome shows similar features as that of ASD & causes increased pulmonary vascularity.
- CCAM appears as a multi-cystic lesion filled with fluid.
- Cystic fibrosis shows hilar enlargement due to pulmonary hypertension as a late presentation.
- Lung metastases in children are due to Wilm's & in adolescents or young adults is due to testicular tumour.
- Round pneumonia has ill- defined margins & lacks air bronchogram.
- **In meconium aspiration syndrome, there is patchy consolidation with areas of hyperinflation seen. Pneumothorax & pneumomediastinum are commonly seen.**
- Bochdalek hernia is left sided, posterior & large.
- **Chylothorax is the commonest cause of pleural effusion in newborn. Other causes are hydrops & cardiac failure.**
- TTN shows hyperinflated lungs with increased pulmonary interstitial markings.

- In neonate, ribs tend to be more horizontal resulting in cylindrical shape & CTR can be 65%. The thymus may involute if child is given steroid treatment.
- Tracheo-esophageal fistula is usually found above the level of carina.
- Imaging for Tracheo-esophageal fistula is best performed in prone position with horizontal beam.
- Thymic/ nodal malignant infiltration is an anterior mediastinal lesion causing posterior displacement of trachea. Normal thymus does not cause this.
- *PAPVR shows superior or inferior pulmonary vein draining anomalously in SVC, IVC, right atrium, brachiocephalic vein or coronary sinus.*
- **Scimitar is a subset of PAPVR when associated with ipsilateral lung hyperplasia (hypogenetic lung syndrome).**
- *Multiple cystic structures in lungs with central linear densities in between is s/o pulmonary interstitial emphysema (bronchopulmonary bundle surrounded by air within the interstitial space).*
- **Viral pneumonia shows hyperinflation, peribronchial wall edema, air trapping, subsegmental atelectasis & perihilar haze. In children, it resolves spontaneously & nothing is to be done.**
- Multiple cysts with apparent ipsilateral lung hypoplasia is seen in CCAM (Contralateral mediastinal shift also seen).
- Chylothorax in neonate are usually right sided & mostly idiopathic > birth trauma > lymphangiectasia.
- Pulmonary hypoplasia shows matched marked reduction in ventilation & perfusion or their complete absence in severe cases.
- In total lung collapse, ventilation would be reduced or absent with reduced but better perfusion.
- Bacterial pneumonia can show cavitation, pneumatoceles, pneumothorax & LNs but viral pneumonia does not show these.

Unilateral pulmonary stenosis causes dilatation of pulmonary trunk & post stenotic dilatation of affected pulmonary artery but other pulmonary artery is normal. Calcification of affected pulmonary wall is seen.

- In hyaline membrane disease, granularity in both lungs is the first abnormal features in x-ray.
- Wilson- Mikity syndrome is similar to bronchopulmonary dysplasia in preterm infants without mechanic ventilation.
- **Foreign body aspiration causes overinflation, atelectasis, lucent area with air trapping mainly in affected lower lobe (mostly right) with contralateral mediastinal shift.**
- Congenital lobar emphysema (CLE) & bronchiolitis obliterans also cause hyperinflation with air trapping but CLE mostly seen in left upper zone & bronchiolitis causes lung volume loss.
- *William Campbell syndrome is a congenital deficiency of bronchial cartilage, shows cystic bronchiectasis in periphery & bullous changes.*
- Cystic fibrosis shows mucous plugging, cystic bronchiectasis, bullous changes, peribronchial thickening & collapse/ consolidation.
- Spontaneous pneumothorax in newborn occurs mostly with renal anomalies.
- Air bronchogram is seen in RDS but not in meconium aspiration syndrome.
- Meconium aspiration syndrome is commonest cause of respiratory distress in full term neonates (more than 37 wks).
- *BPD shows bubbly lucencies (also seen in PIE) but prior to this, there should be surfactant deficiency, perihilar granular opacities & then streaky linear opacities.*
- **Reduced lung volumes with granular opacities and reduced transradiancy with mild to moderate effusion is s/o neonatal pneumonia due to beta-hemolytic streptococcal pneumonia.**
- Increased lung volume with streaky perihilar densities are seen in neonatal pneumonia due to other causes, TTN & MAS.
- NSIP in children mainly involves upper zones.

- TAPVC causes pulmonary plethora as well as cyanosis.
- Pulmonary oligemia & cyanosis is caused by TOF & tricuspid atresia.
- Turner syndrome shows coarctation of aorta.
- **“Egg on string” sign is seen in TGA.**
- **“Boot shaped heart” is seen in TOF.**
- **“Snowman’s heart” is seen in supracardiac TAPVC.**
- Other causes of pulmonary plethora & cyanosis are Truncus arteriosus, Tricuspid atresia (with ASD), transposition of great vessels, single ventricle & common atrium.
- In right sided isomerism, both atrial appendages are short & broad & bilateral IVC are seen.
- Double SVC (right sided isomerism) is the most common congenital abnormality of SVC.
- Fullness of main pulmonary artery is seen in TOF.
- PDA shows pulmonary plethora in a child.
- Eisenmenger due to large PDA occurs in adulthood.
- *Ebstein’s anomaly shows apical displacement of septal leaves of tricuspid valve with atrialization of right ventricle with ASD & right to left shunt.*
- For aortic coarctation repair, MRI is modality of choice.
- Most common CXR appearance in D- TGA is normal because it presents early with cyanosis & is surgically corrected (otherwise egg on string is seen).
- Pulmonary valve hyperplasia is seen in TOF.
- **Elevated cardiac apex (due to right ventricular enlargement) is the commonest x-ray finding in TOF (tetralogy of Fallot). Concavity at pulmonary trunk can also be seen.**

TAPVR

I - Supracardiac & II - Infracardiac

- Four pulmonary veins draining into one vertical vein which drains into left brachiocephalic vein.
- Forms showman’s heart shadow
- Head of showman → dilated vertical vein & Brachiocephalic vein & SVC

Body → Enlarged right atrium.

During normal development, truncus divides into aortic & pulmonary trunks which undergo 150° anticlockwise rotation. In situs inversus, there is 150° clockwise rotation. In TGA, 30° anticlockwise in D type & 30° clockwise in L-type rotation is there. Double outlet right ventricle is due to 90° anticlockwise rotation.

- Central line tip should lie at or above the level of carina.
- In an operated case of TOF, pulmonary valve function with right ventricular function is most important to be assessed.

- SCFE is mostly seen in obese black male children with hip & referred knee pain.
- Cortical spurs & widening of growth plate is seen in rickets.
- Metaphyseal corner fractures are pathognomic of battered baby syndrome.
- Rectus femoris is attached to anterior inferior iliac spine.
- Galeazzi fracture is fracture of distal shaft radius with dislocation at distal radio-ulnar joint.
- Ewing's sarcoma is seen in meta-diaphyseal region.
- LCH causes vertebra plana (flattened sclerotic vertebra) with sparing of disc spaces.
- Tillaux fracture is a Salter Harris type III fracture of anterolateral distal tibial epiphysis showing partial fusion of medial part of distal tibial epiphyseal plate.
- Pilon fractures occur in distal tibia and shows comminuted fractures of tibial plafond.
- Le Fort (Weber type 2) fracture involves distal fibula in anteromedial aspect & anterior tibiofibular ligament.
- Maisonneuve fracture involves tearing of syndesmosis, fracture posterior malleolus, capsular injury & fracture of proximal Fibula.
- *NOF is a well defined, eccentric, lucent lesion with thin sclerotic border in medulla of a long bone with no periosteal reaction. It gives low signal on T1 & T2WI.*
- persistent hepatic uptake is seen in biliary atresia.
- *Anterior vertebral body scalloping is seen in Down's syndrome. Also there is squaring of vertebral body & atlanto-axial subluxation seen.*
- Posterior Vertebral body scalloping is seen in syringomyelia, Marfan's, Hurler's, Morquio's, Osteogenesis imperfecta & NF.
- Alpha angle should measure $> 60^\circ$ & Beta angle $< 55^\circ$ in a normal hip joint of child. Alpha angle is formed between straight edge of ilium & bony acetabular margins. Beta angle is between straight edge of ilium & fibrocartilaginous acetabulum.
- Less than 33% coverage of femoral head in acetabulum is abnormal & 33% - 58% is indeterminate. Acetabular angle $> 30^\circ$ strongly suggests hip dysplasia (normal is 15-30).
- Ewing's sarcoma shows metastasis to lung, bones & LNs.
- Achondroplasia does not cause "bone within bone" appearance.
- "Bone within bone" appearance seen in thalassemia, acromegaly, Paget's, rickets, scurvy, hypothyroidism, Gaucher's, hypoparathyroidism, sickle cell disease, osteopetrosis & lead poisoning.
- Widening of medial hip joint space is seen in Perthe's disease.
- *Toddler's fracture is spiral fracture of tibia.*
- Parietal fracture in infants is not seen in NAI.
- Scapula fracture, posterior ribs fractures & subdural hematoma are features of non accidental injury.
- Extramedullary haematopoiesis is seen in thalassemia & show unilateral rounded masses in paravertebral region from T8 - T12.
- Cupping of distal ulna may be a normal variant.
- Scurvy shows radiolucent metaphyseal band but hypothyroidism & hypervitaminosis D shows radio-dense band.
- If C-spine radiograph is not clear in a trauma patient, then MRI should be done.

Cleidocranial dysostosis shows wormian bones, delayed ossification of midline structures, hypoplasia or absence of lateral portion of clavicle, elongated metacarpals, short distal phalanges & absent radius & ulna.

- Enchondroma has a ground glass appearance & contains dystrophic calcification with no periosteal reaction or cortical break.
- Scoliosis in children or adolescent is idiopathic in 70% of cases.
- Congenital scoliosis is associated with vertebral anomalies.
- Wide cranial sutures are seen in cleidocranial dysostosis, osteogenesis imperfecta, pyknodysostosis, hypoparathyroidism & raised ICP.
- Wormian bones are seen in cleidocranial dysostosis, osteogenesis imperfecta, pyknodysostosis, hypothyroidism,

Down's & pachydermoperiostitis.

- Hair on end appearance of skull is caused by neuroblastoma, sickle cell disease, thalassemia major, G6PD deficiency, iron deficiency anemia & spherocytosis.
- Diskitis causes decreased marrow intensity on two consecutive vertebrae on T1WI.
- Alternating radiolucent & dense metaphyseal bands are seen in osteopetrosis, growth arrest lines, chemotherapy, rickets, chronic anemia & treated leukemia.
- Dense metaphyseal band is seen in hypervitaminosis D, heavy metal poisoning, congenital hypothyroidism & normal infants.
- Small sacral notch & narrow foramen magnum are seen in Achondroplasia.
- *Morquio's causes central anterior vertebral beaking, rest of MPS cause antero-inferior beaking.*
- USG is modality of choice in DDH for < 3 months of age because femoral epiphysis ossifies after that.
- Subcortical lucency & fissuring of epiphysis is seen in Perthe's & not in SCFE.
- SCFE shows widening of proximal femoral growth plate, medial displacement of femoral epiphysis and loss of epiphyseal height, scalloped and irregular metaphlasia.

Juvenile dermatomyositis shows punctuate or sheet like calcification (low signal on all sequences). It affects thighs > upper limbs (anterior & lateral) > medial compartment. Atrophy & increased fatty infiltrates can be seen.

- Sternal fracture, scapula fracture, ribs fracture & metaphyseal fractures are s/o NAI.
- Punched out lesions with sclerotic (seen or may not be seen) borders is seen in LCH.
- Lambdoid & sagittal sutures are examined on Towne's view.
- Widening of physis is seen in rickets.
- Fractures of lateral third of clavicle & spinous process are suggestive of NAI.
- Juvenile idiopathic arthritis shows widened intercondylar notch due to joint effusion & synovial hypertrophy. Ankylosis of carpal bones & juxta-articular osteopenia is seen.
- AP & frog-leg lateral views are taken for SCFE.
- Alpha angle of 55-59° can be normal in infant upto 4 wks of age.
- LCH can cause maculopapular rash.
- Subchondral lucency is "Crescent sign" & is the earliest visible finding in Perthe's.
- ABC, osteoid osteoma & osteoblastoma occur in posterior elements of spine. Osteoblastoma shows intense uptake, lucent > 2 cm lesion with sclerotic rim and no periosteal reaction.
- Loose bodies are associated with osteochondritis dissecans.
- Thalassemia causes Erlenmeyer Flask deformity, "bone within bone" appearance with widening of diploic spaces.
- For bone malignancy in children- isotope bone scan, CT chest & MRI of affected bone should be done.
- The radiocapitellar line should intersect on all views (Unless dislocation is there).
- Metaphyseal corner fracture (or bucket handle fracture) & posterior rib fracture are most specific for NAI.
- Flattening of vertebral bodies, widened metaphysis with shortened femora & humeri are seen in achondroplasia.
- Cleidocranial dysostosis (dysplasia) causes lack of development of pubic bones, absence/ hypoplasia of clavicles & presence of wormian bones.
- Chondrodysplasia punctata causes stippled epiphysis & rhizomelic dwarfism.
- *Jeune's syndrome results in respiratory distress, very short ribs, metaphyseal irregularity (beaking) & trident acetabulum.*
- Irregular or thick cap (> 2 cm in adults, > 3 cm in children) of exostosis increase the risk of malignant transformation.
- Growth of exostosis ceases at skeletal maturity but if it doesn't happen, then risk of malignant transformation is there.
- NOF are eccentrically, well defined cortically based lucent lesions with marginal sclerosis. They heal spontaneously no nothing should be done.
- No periosteal reaction is seen in LCH.
- Elbow is most common dislocated joint in children (shoulder & interphalangeal joint in adults) & if there is posterior dislocation, medial epicondyle fracture is mostly associated.
- Most common fracture of elbow in children is supracondylar & in adults is radial head if dislocation is absent.

75% of cases of osteochondritis dissecans occur in posterolateral aspect of medial condyle (LAM). Instability on MRI is suggested by fragments > 1 cm, cysts larger than 5 mm, high T2WI signal between fragment & donor site & loose bodies within the joint.

- Distal femoral cortical irregularity is called as cortical desmoid is a defect in posterior aspect of medial cortex of distal femoral metaphysis at the insertion of adductor magnus.
- Avulsion of anterior tibial spine in children is equivalent of an ACL tear.
- *Hypophosphatasia is a disorder of decreased tissue, nonspecific alkaline phosphatase & is refractory to Vitamin D treatment. There are irregular lucent extensions into metaphyses representing uncalcified bone matrix.*
- Anterior wedging of C3 & pseudo-subluxation of C2 over C3 & C3 over C4 is normal in children.
- Prevertebral soft tissue at C6 level is abnormal if >100% of AP diameter of vertebra in adults but can be normal in children.

Trevor's disease affects boys > girls, shows single or multiple osteochondromas arising from epiphysis. There are ossifications lying within the epiphyseal cartilage with epiphyseal irregularity & multiple abnormal ossifications around affected epiphyses. Either medial or lateral aspects of ossification centres are involved only.

- Pyknodysostosis shows wormian bones, short limbs, mandibular hypoplasia, poorly pneumatized PNS, non segmentation of C1-2 & L5-S1 & clavicular dysplasia.
- **Thanotophoric dysplasia shows narrow chest with very short ribs that do not extend beyond the anterior axillary line, platyspondyly with curved (H or U) vertebral bodies, short curved humeri & polydactyly.**
- Incomplete fractures & plastic bowing is seen in pediatric skeleton due to thick periosteum & presence of growth plates.
- William syndrome is idiopathic hypercalcemia of infancy – It includes elfin like facies, renal stones, learning disability, colonic or bladder diverticuli, aortic & pulmonary valve stenosis, cardiac septal defects & osteosclerosis.
- *Potential instability of hip with concentrically or eccentrically local joint is suggested when alpha angle is < 50°.*
- Inverted labrum is seen in very severe cases of DDH.
- Discitis shows reduced disc height with loss of clarity of adjacent endplates.
- Down's syndrome shows flaring of iliac wings (mickey mouse or elephant ears), flattening of acetabular roof, decreased acetabular & iliac angles, abnormal iliac index, elongation & tapering of ischia.
- *Osteomalacia (rickets) in children causes looser's zones, bowing, insufficiency fractures, osteopenia but increased trabeculae are not seen (instead decrease number of trabeculae are seen).*
- Small epiphyses with increased opacity in proximal (metaphyseal blanch sign) metaphysis with widened growth plate is seen in SCFE.
- Metaphyseal corner fracture is most specific for NAI but mostly diaphyseal transverse fracture is seen in NAI.
- Hallmark of NAI are multiple fractures at different sites and different ages.
- *Fracture of radial head usually occurs due to compressive forces but never due to avulsion.*
- Osteogenesis imperfecta causes micromelic dwarfism, bowing of long bones, multiple fractures, cortical thinning, callus formation, pseudoarthrosis & deficient trabeculations.
- Rickets shows coarse trabecular pattern with abnormal metaphysis (No callus formation or micromelic dwarfism).
- Ribs are involved in 30% of cases of Ewing's (Askin tumour) under 10 yrs of age. Neuroblastoma is seen in less than 5 yrs of age.
- Spiral fracture of long bone in infant is NAI but in toddlers it can be normal.
- Posterior & lateral rib fractures are seen in NAI.
- Elevation of anterior humeral fat pad is seen in supracondylar fracture (60% of child elbow fracture).
- Loss of overlap between medial femoral metaphysis & acetabulum is seen in SCFE.
- Widening of joint space is seen in Perthe's & not in SCFE.
- Coxa Plana & Coxa Magna seen in Perthe's but narrowing of physis can be seen in SCFE.

Muscle attachments:

1. Ischial tuberosity or pubic ramus – Hamstrings (Adductors)

2. *ASIS – Sartorius*
3. *AIIS – Rectus femoris.*
4. *Symphysis pubis – Adductors*
5. *Lesser trochanter – Iliopsoas*

- Bony metastasis of neuroblastoma shows uptake on MIBG scan. It must be supplemented by bone marrow biopsy.
- *Any child under 1yr showing physical abuse signs should undergo CT brain. Skeletal survey should be done within 24hrs under normal hour timings.*
- MRI should be done for a suspected X-ray finding of osteosarcoma in children. Also CT chest & bone scan should be done.

- Hepatoblastoma shows calcification in 50% of cases and is the most common primary malignant hepatic tumour in children before 3 yrs of age. It presents as a large hepatic mass displacing the retroperitoneal structures but no extrahepatic invasion is seen. It also shows heterogeneous enhancement.
- Sickle cell disease causes splenic infarct, gallstones, cardiomegaly & central end plate depression of vertebrae.
- Corrugated or saw tooth recto-sigmoid with abnormal recto-sigmoid index is seen in Hirschsprung's disease. Delayed evacuation of contrast medium is seen.
- Sterile chemical peritonitis due to perforation of bowel resulting in prenatal leak of meconium in the peritoneal cavity usually shows a well rounded area of calcification in abdomen. On USG, there can be cyst with wall calcification & echogenic material in the cyst. Highly echogenic material between the bowel loops is also seen.
- In meconium ileum, thick meconium obstructs the ileum & water soluble enema may relieve the impaction. Microcolon is often seen with dilated small bowel loops and "rabbit pellet" filling defects in ileum.
- Meconium plug syndrome is functional immaturity of colon. There is temporary functional obstruction at the splenic flexure & is the commonest cause of neonatal obstruction.
- In acute intussusception, USG is the most useful investigation since it can access viability.
- *Malrotation with midgut volvulus shows D-J flexure on right side & a "whirl sign" of SMV & mesenteric vessels around SMA.*
- Double bubble sign is seen in duodenal atresia, annular pancreas & midgut volvulus but absence of gas in rest of the abdomen is suggestive of duodenal atresia (2nd common – annular pancreas).
- In Gastroschisis, herniated bowel does not have a peritoneal lining & floats freely within the amniotic fluid.
- Meconium ileus shows empty microcolon.
- Polyhydramnios, fetal ascites, scattered calcifications throughout fetal abdomen in between bowel loops & bowel dilatation are features of meconium peritonitis.

Tc pertechnetate investigation for Meckel's diverticulum gives false negative results either due to insufficient mass of ectopic gastric mucosa or from residual barium from recent investigation or dilution of intraluminal activity from rapid bowel transit.

- Reduced hepatic uptake on HIDA scan is suggestive of hepatitis but normal persistent uptake with absent bowel activity is seen in biliary atresia.
- Currarinos triad includes anorectal malformation, lumbosacral anomalies & presacral mass.
- Enteric duplication cyst shows layered echogenic debris within the cyst. They are most commonly seen in ileum.
- Transition segment is a short segment in Hirschsprung's disease.
- *Commonest TO Fistula is esophageal atresia with proximal atretic portion & distal location of fistula.*
- In HPS, there is elongated pyloric channel >16 mm with gastric hyperperistalsis.
- Triangular cord sign in biliary atresia suggests fibrotic remnant of common duct.
- Caroli syndrome = Caroli's disease + hepatic fibrosis.
- Hemangioendothelioma shows normal AFP levels (Fibrolamellar HCC in adults also show normal levels).
- Hepatoblastoma shows elevated AFP & solid heteroechoic lesion with spoke wheel pattern due to fibrous septae radiating from central hub.
- To confirm esophageal atresia – Pass a NGT and then inject a small amount of air followed by supine chest X-ray.
- Pneumatic reduction (more effective) of intussusception has a lower radiation dose than that of barium reduction.
- Down's syndrome is seen in 30% of patients of duodenal atresia or annular pancreas.
- Duodenal atresia is more common than duodenal stenosis

In Hirschsprung's, on enema the aganglionic segment extends to the recto-sigmoid junction in 70-80%, of cases. Skip lesions & short segment disease are unusual. (Catheter balloon should never be inflated due to risk of perforation).

- In Tc⁹⁹ pertechnetate study, activity in Meckel's appears at the same time & same intensity as gastric mucosa.
- Success rate (relieving the obstruction) of gastrograffin enema in a patient with meconium ileus is 60% with

perforation rate of 5%.

- *In NEC, a persistent, solitary dilated loop is an indicator of impending perforation. PV gas is seen in 10% of cases & its disappearance may indicate impending perforation.*
- A normal GB which distends with fasting excludes biliary atresia.
- In HSP, there is hypoechoic thickened small bowel wall with echogenic areas.
- Appendix appears larger than normal in cystic fibrosis with early stage liver cirrhosis & GB stones on USG.
- CF causes distal intestinal obstruction.
- Choledochal cyst shows multiple low reflective areas suggestive of bile duct takes with a portal vein seen as a central echogenic dot (Caroli's).
- In meconium ileus, distal ileum is small in caliber with pellets of meconium with dilated proximal ileum.
- Midgut volvulus seen in malrotation gives rise to corkscrew pattern of duodenum & jejunum.
- Hepatoblastoma shows centripetal & heterogeneous enhancement & shows spoke wheel pattern due to enhancing septae.
- 50% of all omphaloceles are associated with other chromosomal abnormalities.
- *Duodenal hematoma & jejunal perforation are both recognized sequelae of NAI.*
- Peutz Jegher syndrome is associated with intussusception in 50% cases.
- Cronkite Canada syndrome mainly causes polyps in stomach & colon.
- *Complications of Meckel's are volvulus, intussusception & diverticulitis (first complication is bleeding).*
- Water soluble contrast enema is not helpful in NEC. Supine x ray is the primary method for evaluation of NEC. A "Jumbled" pattern may be seen secondary to bowel wall edema which compresses & dilates the bowel lumen. "Bubbly" or linear pneumatosis may be seen.
- Air in PV in NEC does not alter the morbidity or mortality.
- Left lateral decubitus & supine cross table X-rays are used for complications of NEC (bowel perforation).
- USG is used in acute setting of NEC.
- Pancreatic duct dilatation is the most useful diagnostic feature of pancreatitis (> 1.5 mm at 1-6 yrs, > 1.9 mm at 7-12 yrs & > 2.2 mm at 13-18 yrs).
- Content of omphalocele may vary from a single loop of small bowel to entire GI tract including liver but covered by peritoneum.
- In gastroschisis, normally positioned umbilicus is seen because defect is paraumbilical. Contents include stomach, midgut & occasionally urinary tract (not liver).
- Omphalocele may be associated with Beckwith-Wiedemann syndrome.

HPS criteria – Length > 16 mm

- *thickness > 3 mm*
- *Diameter > 10 mm*
- *Ratio of WALL THICKNESS/DIAMETER > 0.27*

- Retrograde hyperperistaltic gastric contractions are seen in HPS.
- Well defined dense mass with multiple calcifications is seen in child abdomen in meconium peritonitis. Meconium ileus results in abdominal calcification but they are intramural in location.
- GIT duplication cysts show outer hypoechoic & inner echogenic walls. Mostly arise from small bowel & colon but do not communicate with lumen (may communicate in case of rectum).
- Choledochal cyst communicates with either common hepatic or intrahepatic duct.
- Kawasaki syndrome is a multisystem vasculitis with predilection for coronary arteries under 5 yrs. of age. There is acute hydrops of gall bladder due to transient obstruction of cystic duct. Enlarged, dilated & tender GB with thin walls is seen. There are maculopapular rashes on extensor surface.

Ascaris (roundworm) are 15-35 cm in length. Tapeworms (taenia) are longer (many feet). Ascaris may ingest the barium & shows central linear filling of barium but tapeworms have no alimentary canal so do not ingest barium.

- Ankylostoma (hookworm) are 8-13 mm & cannot be visualized on barium studies.
- Anisakiasis (herring worm disease) shows small bowel thickening with luminal narrowing.
- Strongyloides shows pipestem appearance of jejunum.

- Normally, D-J junction lies to the left of left pedicle of vertebral body at or above the level of duodenal bulb.
- In malrotation, D-J junction is medially & inferiorly displaced.
- Less intracolonic pressure is given by hydrostatic reduction for intussusception (elevation of 150 cm is required).
- In pneumatic reduction, a rare potential complication, tension pneumoperitoneum is seen.
- Obstruction is mostly incomplete in annular pancreas.
- HPS is treated by pyloromyotomy.
- Persistent corrugated appearance of rectal mucosa is seen in Hirschsprung's disease.
- Juvenile polyposis is commonest cause of colonic polyps in children (5 or more polyps).
- Non rotation causes small bowel on right & large bowel on left side with a common mesentery between both bowel loops. SMV lies left of SMA.
- *Malrotation causes SMV to lie anterior to SMA with abnormal position of D-J junction to right & inferiorly with cephalic position of caecum.*
- *Reverse rotation causes colon lying posterior to SMA with duodenum & jejunum in front of it.*
- SMV wraps around SMA in clockwise direction forming a whirlpool sign in midgut volvulus.
- Heterotopic gastric mucosa is present in 10% -30% of Meckel's diverticulum but 98% of those present with bleeding.
- Duodenal duplication cyst may contain gastric mucosa & hence give false positive on Tc99 pertechnetate but appear as larger area in upper abdomen.

Duodenal intramural hematoma in children occur mostly due to injury (can be NAI or accidental) or may be spontaneously in Henoch-Scholein purpura (HSP) but skin rashes & other symptoms should be present.

- HSP shows intestinal bleeding due to multifocal areas of bowel thickening due to intramural haemorrhage & edema. Rarely bowel infarction & perforation occur.
- Mesenteric rupture following trauma shows free fluid with a more focal collection at mesenteric root with mesenteric stranding & focal bowel wall thickening with diffuse hyper-attenuation of pancreas, kidney & bowel wall (due to hypoperfusion).
- Viral gastro-enteritis is the commonest cause of intussusception in childhood & polyps in adults.
- In children for intussusception, ileocolic > ileoileal, but reverse in adults.
- Ill-defined complex, heterogeneous lesion in liver of (≤ 6 months) child with multiple vascular channels and surrounding connective tissue stroma is s/o hemangioendothelioma.
- Phenobarbital is given 5 days prior to HIDA scan to stimulate biliary secretion.
- Kasabach-Merritt syndrome is seen in 10% of cases of hemangioendothelioma & shows early peripheral & delayed central enhancement.
- *Mesenteric lymphadenitis in children may show a blind ending, compressible, fluid filled, tubular structure - normal appendix to exclude appendicitis.*
- In liver, malignancy in children $\rightarrow$ hepatoblastoma > HCC > undifferentiated embryonal sarcoma.
- Benign lesions $\rightarrow$ Hemangioendothelioma > hamartoma.
- Small left colon is a subtype of Meconium plug syndrome but it does not show any filling defect causing obstruction as in case of meconium plug syndrome. Also transverse colon is normal.
- Infantile hepatic hemangioma occurs as echogenic mass with hypoechoic vascular channels.
- Neonatal hepatitis shows decreased liver parenchymal extraction on HIDA scan.
- On USG, biliary atresia can be diagnosed by absent or small GB on fasting state, GB with irregular & echogenic walls or a large GB that does not empty post feed.
- Duodenal web is same as intraduodenal diverticula.
- In midgut volvulus, jejunum is twisted clockwise around SMA with right sided D-J flexure and duodenal obstruction.
- Pancreatic insufficiency in cystic fibrosis shows fatty infiltration/ replacement with fibrosis. Microcysts may be seen.
- Corkscrew appearance of duodenum & jejunum are specific for malrotation leading to midgut volvulus.
- *In pancreatic divisum, there is longer dorsal duct with larger caliber draining via minor papilla & shorter & narrowed ventral duct draining via major papilla.*
- Hemangioendothelioma = Infantile hepatic hemangioma.
- Mesenchymal hamartoma of liver in infants is seen as multicystic multilocular mass with enhancement of only the

septae & solid portions.

- Encasing of aorta & IVC may be seen in neuroblastoma in children (Lymphoma in adults)
- Posterior urethral valves show ‘bullet’ shaped dilated posterior urethra, thick walled & trabeculated urinary bladder & B/L VUR.
- MAG3 scan shows split renal functions of 80% normal side & 20% affected side in case of congenital PUJ obstruction.
- Prune belly syndrome (dilated ureters, cryptorchidism and anterior wall defect) is a congenital hereditary multisystem disorder seen exclusively in men.
- Tip of umbilical arterial line should be above the level of celiac axis (T6-T10) or below the renal arteries (L3-L5).
- Tip of umbilical vein line should lie above the liver (at the level of T7-T8) & not passed into a tributary vein.
- *In autosomal recessive polycystic kidney disease, usually no cysts are seen on USG. Both kidneys are enlarged & hyperchoic.*
- Wilm’s tumour shows lung metastasis but neuroblastoma shows bony metastasis and thyroid metastasis.
- Neuroblastoma displaces the kidney but Wilm’s tumour infiltrates the kidney.

Stages of Neuroblastoma

I. Tumour confined to organ of origin.

II. Regional spread not crossing the midline

III. Extension across midline

IV. Metastasis

IVS. Patient less than 1 year of age with no crossing of midline & disease confined to liver, skin & bone marrow without evident skeletal metastasis.

- Hydronephrosis is a common cause of a palpable abdominal mass in children. Causes are PUJ obstruction (more on left side) > PU valves > ectopic ureterocele.
- Wilm’s tumour enhances to a lesser degree than the normal kidney.
- Hemolytic uremic syndrome is the cause of acute renal failure in children necessitating dialysis. There is also thrombocytopenia seen.
- *DMSA is static renal scintigraphy. There is uptake in proximal convoluted tubules within 2 hours (50% uptake) with no significant excretion. Excellent images of cortex are seen & hence cortical scarring is evaluated.*
- Mesoblastic nephroma occurs in neonate & shows infiltrative growth without involving vascular structures & collecting system (differentiates from Wilm’s) & rarely calcify (differentiates from neuroblastoma).
- A detorsed testis often demonstrates hyperaemia (hence cannot exclude torsion).
- Bowel malrotation, cystic renal dysplasias, intestinal atresia, pulmonary hypoplasia & cardiac anomalies can be seen in Prune belly syndrome.
- Duplex kidneys may have more than one renal artery & vein.
- Mesoblastic nephroma and meconium peritonitis causes polyhydramnios in pregnancy. Cystic areas of necrosis, hemorrhage & calcification are rare.
- *Wilm’s tumor is associated with nephroblastomatosis, Beckwith – Wiedemann syndrome, Trisomy 18 & chromosome 11 abnormalities, hemihypertrophy & Drash syndrome.*
- Beckwith – Weidemann syndrome shows exomphalos, macroglossia, gigantism & hepatomegaly.
- Both neuroblastoma & Wilm’s enhance less than adjacent renal parenchyma.
- Umbilical vein in a newborn or fetus drains into left portal vein.
- Enlarged kidney with loss of CMD, reversal of end diastolic arterial flow with adrenal hemorrhage is seen in renal vein thrombosis.
- Both the ureters in a crossed fused ectopia, enter the bladder in a normal position.
- *Renal pelvis dilatation in a fetus is seen when pelvis AP measures > 50% of longitudinal length of kidney or > 5 mm in second trimester or > 10 mm in third trimester.*
- DTPA is done in follow up of renal transplant, establishing divided renal function, renography with captopril stimulation & postoperative evaluation of a collecting system.

- Cystic mass in flank in a child in case of normal bowel gas pattern is mostly hydronephrosis.
- XGP shows high signal on T2W necrotic areas with medium signal on TIWI.
- Wilm's enhances moderately (but less than kidney) but nephroblastomatosis is non enhancing.
- Neuroblastoma can arise from sympathetic chain tumour & hence seen in posterior mediastinum.
- MCU should be done postnatally in case of antenatal HN & full bladder because of suspected PU valves.
- For repeated urinary tract infections, MCU should be done if age < 6 months, otherwise Tc DMSA should be done.

Enlarged ovary is the most constant USG finding of ovarian torsion. Other findings are small cysts arranged peripherally (string of pearl's sign). Coexistent mass, free fluid & twisted pedicle (Whirlpool sign), decreased or absent venous flow with or without reduced arterial flow may also be seen.

- Bicornuate uterus shows external fundal cleft > 1 cm deep & inter-cornual distance of > 4 cm.
- Bicornuate bicollis shows 2 separate cervical canals & distinguished from uterine didelphys by a greater degree of fusion between the horns in lower uterine segment.
- Septate uterus is the most common uterine anomaly. The external fundal contour can be convex, flat or minimally concave (less than 1 cm deep).
- Bilateral seminal vesicle agenesis is associated with bilateral agenesis of vas deferens & Cystic fibrosis.
- Bilateral calcified vas deferens is seen in diabetes.
- Congenital megacalycosis shows dilated, multifaceted & polygonal calyces (spherical calyces are seen in obstructive hydronephrosis) but infundibulum, renal pelvis & ureter are normal in caliber.
- Unilateral seminal vesicle agenesis or cyst is associated with unilateral renal agenesis.
- Piriformis muscle passes through greater sciatic foramen & divides into suprapiriformis foramen (superior gluteal vessels & nerve) & infrapiriformis foramen (inferior gluteal vessels & nerves sometimes pudendal & sciatic nerves).
- The pudendal nerve & internal pudendal vessels pass through lesser sciatic foramen.
- Severity of testicular ischemia in torsion depends on duration & degree of torsion (180-720 degrees).
- Bell clapper deformity is high attachment of tunica vaginalis to spermatic cord leads to intravaginal torsion.
- Drash Syndrome causes Wilm's, male pseudohermaphroditism & progressive glomerulonephritis.
- Tip of UVC lies at T7-T9 level or above it and lie on either side of UAC depending on whether it reaches the IVC or remains in left lobe of liver.
- Adrenal hemorrhage is most common neonatal adrenal mass, appears as avascular heterogeneous mass which becomes cystic & smaller in weeks time. A hyperechoic rim showing peripheral calcification can be seen.
- Neuroblastoma is usually hyperchoic.
- Blunting of forniceal angles is seen in grade IV VUR but their obliteration is seen in grade V.
- Torsion of testis is the commonest acute pain problem in prepubertal age group. Below 20 yrs of age, epididymitis: Torsion is 3:2 but is 9:1 above 20 yrs.

Staging of adrenal cortical carcinoma.

T1 - ≤ 5cm

T2 - > 5 cm

T3 - extend outside adrenal into fat

T4 - invade adjacent organs.

- Adrenal cortical carcinoma (double peak like lymphoma & craniopharyngioma) occurs in either childhood or in 4-5th decade. There is precocious puberty & cushingoid features due to MEN syndrome. Cystic areas due to hemorrhage & necrosis can be seen.
- Ovarian cysts in newborn are more common than enteric duplication cysts or choledochal cysts. They may have daughter cysts (follicles along wall) within & may be come echogenic due to hemorrhage. It has thin walls.
- Normally urachus obliterates to become umbilical ligament.
- Urachal sinus & urachal diverticulum are patent portions of urachus at umbilical & bladder ends respectively.

Abnormal fetal renal pelvis is > 4 -5 mm at 20 wks, > 7 mm at 33 wks & > 10 mm at berth. Hence, USG within 24 hrs of birth is done if abnormal renal pelvis is seen antenatally.

If USG is abnormal, then MCU should be done. If MCU shows reflux, then DMSA & repeat USG are done at 6

wks. If no reflux is seen on MCU, then MAG3 is done within 6 wks to look for obstruction. If USG at birth within 24 hrs shows renal pelvis < 10 mm, then an USG after 6 wks is repeated.

- Liquid discharge from umbilicus in infant is due to patent urachus.

Renal lymphangiectasia is a rare malformation due to failure of developing kidney lymphatics. These are mostly bilateral cystic lesions with septations around both kidneys with scalloping of renal outline. They can occur in parapelvic & retroperitoneal regions as well.

- Alport's syndrome is chronic hereditary nephritis causing B/L small & smooth kidneys, ocular abnormalities, cataract, nystagmus, myopia with nerve deafness, polyuria & hematuria. It is transmitted through parents showing progressive renal impairment.
- Amputated ovary occurs as a result of ovarian torsion & infarction. It appears atrophied with stippled calcification.
- Medially oriented long axis of kidney is seen in horseshoe kidney with isthmus at L4-L5 level, because renal ascent is arrested by inferior mesenteric artery.

In horseshoe shaped kidneys, the ureters & renal pelvis are anterior & PUJ obstruction is more common. It is associated with trisomy 18 & Turner syndrome, hypospadias, undescended testis, bicornuate uterus & ureteral duplication.

- Percentage of transfer risk of ARPKD from normal parents & affected siblings is 1 in 4.
- Large hyperechoic renal medullary pyramid if seen in kidney of newborn is s/o abnormality.
- Hematometrocolpos occurs due to transverse vaginal septum or imperforate hymen.
- Cervical dysgenesis & obstructed uterine horn would produce hematometra.
- Undescended testis mostly lies in inguinal canal (Superficial inguinal ring) > prescrotal region.
- Meckel Gruber syndrome shows triad of B/L enlarged cystic kidneys, occipital encephalocele & polydactyly.
- Bardet – Biedl syndrome is associated with enlarged cystic dysplasia of kidneys with polydactyly.
- Juvenile granulosa cell tumour affects prepubertal girls & secretes estrogen resulting in precocious puberty. It appears as mixed solid cystic lesion with 'sponge' like appearance showing innumerable cystic areas.
- Enlarged calcified adrenal glands maintaining their triangular configuration are seen in Wolman's disease.

Congenital adrenal hyperplasia (CAH) is the most common cause of ambiguous genitalia causing virilisation in females & precociousity in males. There are elevated 17 hydroxyprogesterone levels. Stippled echogenicity of enlarged adrenal glands with "cerebriform pattern" is characteristic on USG.

- Gartner duct cyst lies above pubic symphysis & do not displace or deform urethra.
- Bartholin cyst lies at or below pubic symphysis. Skene cysts lie below pubic symphysis, lateral to external urethral meatus.
- ARPKD shows hepatic fibrosis, the severity of which is inversely proportional to renal abnormality. Severe respiratory distress is the immediate cause of death in perinatal group (not the renal distress). Oligohydramnios with potter facies (low set with flattened ears, short & snubbed nose, deep eye creases & micrognathia) & clubfoot are associated.

- Craniopharyngiomas contain highly proteinaceous fluid, cholesterol & blood products causing high signal on T1, T2 & FLAIR images. There can be mild to minimal peripheral enhancement & fluid-fluid levels.

Periventricular & subependymal calcifications are commonly seen in congenital CMV infections but in toxoplasmosis, diffuse calcification is seen. (Lymphoma lesions in periventricular and subependymal locations show no calcification).

- Calcifications in tuberous sclerosis are seen in adolescents in periventricular & subependymal locations.
- Sacrococcygeal teratoma (or germ cells tumor) extends in between the sacral segments & encase the sacrum with rare direct invasion of surrounding structures.
- Fibromatosis coli presents as a mass in sternocleidomastoid muscle for 2 or more weeks after birth due to birth trauma (forceps, vaginal delivery). Torticollis may be associated.
- Rhabdomyosarcoma is most common primary orbital tumour in childhood. It is extraconal & shows patchy enhancement.
- Thyroglossal cyst moves with tongue protrusion.
- Craniopharyngiomas have bimodal age distribution (5-10 yrs & 50-60 yrs). High signal on T1 & T2 are due to cholesterol crystals in the cyst. Solid portions enhance.
- *Subcortical tubers in tuberous sclerosis generally calcify (but less than the subependymal nodules).*
- Klippel – Treunaunay Syndrome shows port wine stains, gigantism & varicose veins in affected limb.
- Diffuse brainstem glioma shows a non enhancing mass causing expansion of pons with engulfing of basilar artery.
- Scalp dermoid shows a central lucent area with sclerotic margins.
- Astrocytoma is the most common spinal neoplasm in children. As compared to ependymoma, astrocytoma shows eccentric position with tumor irregularity.
- Pilocytic astrocytomas are associated with NF1 & they may show calcification (not seen in hemangioblastoma).
- Epidermoid and dermoid cysts both cause scalloping and sclerosis with destruction of adjacent bone. Epidermoid calcify rarely but dermoid cysts calcify commonly.
- Conjunctival choristomas (dermolipomas) are less dense than solid dermoids & contain more adipose tissue.
- Fibromatosis coli occur solely within the sternocleidomastoid muscle. Spontaneous regression by 2 years is seen usually.
- Intraventricular meningiomas are seen above 20 years of age.
- *Choroid plexus papilloma shows a mildly hyperdense homogeneous mass at the trigone of lateral ventricle with intense homogeneous enhancement. It is hyperintense on T1WI & slightly hypointense on T2WI.*
- Diffusion sequence has no role in differentiating or diagnosing white matter leukodystrophies.
- Canavan's disease (involves juxtracortical U fibres) shows diffuse symmetric increased WM signal throughout with relative sparing of internal & external capsules & corpus callosum. Both globus pallidus show high signal but sparing of putamen & caudate nuclei are seen. NAA peak is raised spectroscopy & on urine analysis.
- Macrocrania is seen in Canavan's & Alexander's.
- Hypothalamic hamartoma extends into suprasellar cistern or interpeduncular cistern.
- *LCH in skull gives ovoid lesion with bevelled edge without marginal sclerosis, giving a punched out appearance. There may be an associated soft tissue mass overlying the lytic process which is often palpable. It may affect the long bones in children commonly (diaphysis).*
- Medulloblastoma are hyperdense midline vermian mass at the roof of 4th ventricle causing hydrocephalus.
- PNET (Medulloblastoma & pineoblastoma) shows calcification, haemorrhage & necrosis (like craniopharyngioma) but they are mostly seen in posterior fossa.
- Craniopharyngioma can cause visual problems, diabetes insipidus & growth problems due to pressure/mass effect on optic chiasm, pituitary & hypothalamus.

Persistent hyperplastic primary vitreous shows unilateral leukocoria but can be bilateral in Norrie's disease. There is micro-ophthalmia with enhancing soft tissue band extending from the lens through vitreous body to the back of orbit. Small optic nerve is seen. No calcification is seen.

- Retinoblastoma shows macro-ophthalmia, enlarged optic nerve, calcification & leukocoria.
- DNET arises from cortex in temporal > frontal region, appears as hypodense mass with remodelling/thinning of underlying inner table. Intratumoral cysts giving “bubbly” appearance is seen. Minimal enhancement or mass effect is seen.
- Juvenile angiofibroma starts in pterygopalatine fossa, causes local bone erosion with widening of pterygopalatine fissure. It is highly vascular.
- In mild to moderate hypoxic brain injury in a full term neonate, there is sparing of brainstem, cerebellum & deep grey structures.
- Severe hypoxic injury involves ventral & lateral thalamus, posterior putamen, perirolandic cortex of corticospinal tract.
- In adrenoleukodystrophy, there is symmetrical low densities seen in occipito – parieto-temporal WM with thin curvilinear enhancing rims. There is adrenal gland insufficiency with increased pigmentation & raised ACTH levels.
- In Dandy walker variant, posterior fossa is not enlarged but partial vermian hypoplasia with partial obstruction to 4th ventricle is seen.
- Juvenile Angiofibroma causes widening of superior & inferior orbital fissures & pterygopalatine fossa & invasion of sphenoid sinus.

NICE guidelines for children

- *3 or more episodes of vomiting.*
- *CSF otorrhoea*
- *(Age > 1yr) - GCS < 14 (In emergency room)*
- *Age < 1yr, paediatric GCS < 15.*
- *Head injury as a result of dangerous mechanism (RTA, fall from 3 meters or projectile injury)*

- In children, astrocytoma is most common intramedullary spinal neoplasm. It can appear as eccentric irregular tumour cysts, polar cysts & syrinx.
- Drop metastasis of medulloblastoma most commonly occurs in subarachnoid space.
- *High riding 3rd ventricle, enlarged foramen of Monro & sunburst gyral pattern with interhemispheric cyst is seen in agenesis of corpus callosum.*
- Sacrococcygeal teratoma is a lobulated heterogeneous sacral mass lesion covered by skin with minimal presacral component.
- Choroid plexus is attached to inferomedial aspect of ventricular floor, shows tapering towards caudothalamic groove & never anterior to foramen of Monro.
- Neuroblastomas produce catecholamines in 95% of cases. Peak age is < 3 yrs. & there is better prognosis in older children. It arises from adrenals > chest > neck.
- Esthesioneuroblastoma is a very malignant tumor from olfactory fossa.
- Teratomas may enhance but dermoid cysts do not. Dermoids are usually extra-axial & teratomas are usually around pineal region, floor of 3rd ventricle, posterior fossa & spine.
- Rhabdomyosarcoma appears isointense on T1 & hyperintense on STIR & T2WI with poorly defined margins & heterogeneous contrast enhancement. It causes local edema, extension & destruction.
- *Myelination changes are seen on T1WI till 10 months when it shows similar pattern to adult. Further changes are assessed on T2WI.*
- Optic nerve gliomas occur commonly in optic nerve rather than in chiasm & tumor extends into the subarachnoid space.
- Subdural empyema due to meningitis appears as enhancing material showing higher signal than CSF on T1 & T2WI. It requires urgent drainage.
- Normal skull suture width is > 10 mm at length, 3mm at 2 yrs. & 2mm at 3 yrs.
- *Triad of “Shaken baby syndrome” (NAI) is retinal hemorrhage, subdural hemorrhage & encephalopathy.*
- Choroid plexus tumour occurs adjacent to the trigone of ventricles, appearing hyperdense, enhancing & causing hydrocephalus.
- Hypoxic (severe) damage at term affects putamen, thalami & adjacent WM.
- B/L areas of increased T2WI signal in subcortical WM & cerebellum & deep grey matter are seen in ADEM.
- Brachycephaly is associated with a higher incidence of neurological abnormality composed with scaphocephaly

(more common).

- Sagittal suture is most commonly affected in craniosynostosis.
- Agenesis of corpus callosum shows absence of cavum septum pellucidum, colpocephaly, high riding 3rd ventricle, widening of interhemispheric fissure & delay in sulcation.
- Abnormal sulcal morphology may cause periventricular nodular heterotopia & parenchymal T2WI signal hypointensity.
- Brainstem abnormalities are seen in association with cerebellar abnormality.
- Parotitis occurs in mumps & shows diffusely enlarged gland with heterogeneous echotexture.
- Warthin tumour is bilateral or multifocal solid cystic lesions mostly towards the tail of parotid gland.
- Hemangioma of salivary gland are usually seen in first 6 months of age, have a female predilection & shows variable degree of vasculature.
- Pleomorphic adenoma is the most common salivary gland tumour in children & adolescence & shows painless hypoechoic mass with foci of calcification & mild enhancement.

Non neoplastic causes of leukocoria called as pseudoretinoblastomas include PHPV, Coat's disease, & toxocara endophthalmitis. None of these show calcification. (95% of retinoblastoma shows calcification).

- Coat's disease show hyperattenuating globe with enhancing subretinal exudate.
- PHPV shows micro-ophthalmic with enhancing retrolental mass.
- *Moya Moya syndrome occurs in Japanese with episodes of transient hemiparesis & declining intellect due to narrowing of distal ICAs & lenticulostriate collaterals which causes flow voids in basal ganglia on MRI "puff of smoke" on angiography.*
- Irregular beading of extracranial ICA is seen in fibromuscular dysplasia.
- Unilateral fusion of lambdoid suture is seen in plagiocephaly (lopsided skull).
- Intrauterine closure of coronal, sagittal & lambdoid suture s/o cloverleaf skull, seen in thanatophoric dysplasia.
- Sudden back pain & shooting leg pain in adolescent athletes is due to spondylolisthesis.
- Once retinoblastoma extends beyond the orbit, mortality is 100%.

Three patterns of HIE:-

- 1) Periventricular leukomalacia due to prolonged partial asphyxia in preterm or term. It affects watershed areas, near trigone of lateral ventricles*
- 2) Acute profound asphyxia causes lesions in deep grey matter, hippocampus or dorsal brainstem.*
- 3) Multicystic encapthalomacia due to encephalopathy & brain edema.*

- Thyroglossal cyst shows pertechnetate uptake on nuclear scan,
- Ectopic thyroid tissue should not be excised.
- Myelination pattern follows caudal to cranial, posterior to anterior & deep to superficial.
- Myelination begins with brainstem & cerebellum, then BG & then peripheral cortical WM.
- Petechial spontaneous bleed in a lesion can be seen in a child with cancer or its treatment. It is commonly seen in thrombocytopenia or DIC. Gradient echo sequence is most important. If there is hyperleukocytosis (TLC > 100,000/mm³) then it causes vascular thrombosis & hence CT/ MR venography is required.
- Chiari I malformation shows elongated but normal 4th ventricle.
- Chiari II malformation shows caudal displacement of 4th ventricle.

Vein of Galen aneurysm is in-utero condition due to high output, cardiac failure & it causes mass effect on aqueduct causing hydrocephalus & hydrops. It is of 3 types:-

- 1. I – AV fistula*
- 2. II - Angiomatous malformation of BG, thalami & midbrain.*
- 3. III – Both I & II*

- Cephalhematoma occurs during delivery & shows a crescent shaped firm non pitting parietal mass that does not cross sutures & lie adjacent to outer table.
- Caput succedaneum is localized scalp edema that crosses suture lines.
- Cephalocele is a skull defect through which meninges, brain & CSF protrude out.

- Germinal matrix haemorrhage is located anterior to caudothalamic groove & inferior to lateral ventricles.
- *In mesial temporal sclerosis, asymmetrical atrophy of hippocampus with high T2 signal with atrophy of fornix & mamillary body is seen. Coronal T2W is required.*
- Juvenile angiofibroma are supplied by internal maxillary artery.
- Unmyelinated white matter is bright on T2W & can disguise pathological lesions.
- Oxycephaly is fusion of all cranial sutures & leads to high head. Plagiocephaly is unilateral craniosynostosis.
- NF1 shows renal artery aneurysm & stenosis & abdominal coarctation (Mid aortic syndrome).
- Low lying conus with thickened filum terminale and scoliosis & spinal lipoma are part of tethered cord.
- Calcifications can be seen in both dermoids & epidermal cysts. Focal low attenuation on CT is seen in dermoid & diffusely low attenuation in epidermoid.
- Leukodystrophies

<i>Metachromatic</i>	<i>U fiber sparing with tigroid pattern due to perivascular sparing</i>
<i>Krabbe's</i>	<i>Thalamic & caudate nuclei high attenuation on CT with U fiber sparing.</i>
<i>MPS</i>	<i>Well defined high T2 signal foci in corpus callosum & basal ganglia</i>
<i>X-linked adrenoleukodystrophy</i>	<i>Symmetrical peritrigonal & splenium high T2 signal. Peripheral contrast enhancement.</i>
<i>MELAS</i>	<i>Multiple cortical & subcortical infarcts like lesion.</i>
<i>Canavan's</i>	<i>U Fibres affected mostly</i>
<i>Alexander</i>	<i>Frontal lobe predilection Subcortical WM affected</i>

- First branchial cleft cyst lies inferior & posterior to tragus.
- Cystic hygroma occurs as cystic mass posterior to SCM in posterior triangle.
- Unilateral cerebral atrophy with leptomeningeal enhancement and developmental venous anomaly is seen in Sturge weber syndrome.
- *The anterior aspects of spinous processes of C1, C2 & C3 should line up within 1 or 2 mm of each other on flexion & extension.*
- Transmantle heterotopia can be confused with closed lip schizencephaly.
- Cervicomedullary kinking is seen both Chiari I & II malformation.
- *In Chiari II, vermis herniates through foramen magnum but tonsils lie lateral to medulla. In Chiari I, caudal displacement of tonsils is seen.*
- Bilateral frontal enlargement of subarachnoid space in children is due to benign external hydrocephalus.
- Cafe au lait spots are seen in McCune Albright Syndrome (unilateral FD, precocious puberty & skin problems).
- PVL shows white matter necrosis, multiseptated cystic lesions in periventricular WM with exvacuo dilatation of ventricles.
- Supratentorial arachnoid cyst occurs in Sylvian fissures.

1. Regarding hypertrophic pyloric stenosis, which of the following are correct:

- (a) It is frequently diagnosed in premature infants.
- (b) Males and females are equally affected.
- (c) The peak incidence is between 2 and 6 months of age.
- (d) It is associated with gastric pneumatosis.
- (e) An elongated pyloric canal measuring 14 mm on ultrasound supports the diagnosis.

Answers:

- (a) Not correct
- (b) Not correct
- (c) Not correct
- (d) Correct
- (e) Not correct

Explanation:

Hypertrophic pyloric stenosis is typically seen in first born males with peak incidence between 2 and 6 weeks of age. It is rarely seen in premature infants.

To make a diagnosis on ultrasound the pyloric canal length should be 17mm, pyloric wall thickness atleast 3 mm and transverse diameter of pylorus atleast 13 mm.

2. Regarding infantile polycystic kidney disease, which of the following are correct?

- (a) The most common age of presentation is between 2 and 5 years of age.
- (b) It is inherited as an autosomal dominant condition.
- (c) Severe infantile polycystic disease is associated with severe hepatic fibrosis.
- (d) Is typically reveals a striated nephrogram on the delayed excretory urogram.
- (e) Infantile polycystic kidneys are echopoor on ultrasound.

Answers:

- (a) Not correct
- (b) Not correct
- (c) Not correct
- (d) Correct
- (e) Not correct

Explanation:

Infantile polycystic kidney disease is inherited in an autosomal recessive pattern with antenatal form being the most common type. This type presents in utero and progresses to renal failure and pulmonary hypoplasia (Potter sequence) with majority of patients dying within 24 hrs of life.

The milder forms are neonatal, infantile and juvenile presenting in the first few years of life. They are associated with more severe hepatic fibrosis and less severity of renal disease.

The affected kidneys are replaced by multiple small elongated cysts representing dilated tubules and collecting ducts. The cysts are too small to be delineated on ultrasound, thus producing an echogenic pattern due to multiple interfaces. There is poor corticomedullary differentiation.

Adult type polycystic disease shows autosomal dominant inheritance with defects on chromosome 16 and 4.

3. In childhood which of the following are correct regarding non-Hodgkin's lymphoma?

- (a) Non-Hodgkin's lymphoma is more common than Hodgkin's disease in young children.
- (b) Splenic involvement occurs in more than 70 % of cases at presentation.
- (c) Pulmonary involvement is more common in Hodgkin's disease.
- (d) Central nervous system disease at presentation indicates a poor prognosis.
- (e) There is a higher incidence of extra-nodal disease in childhood non-Hodgkin's lymphoma than when it occurs in adults.

Answers:

- (a) Correct
- (b) Not correct
- (c) Correct
- (d) Correct
- (e) Correct

Explanation:

Abdominal involvement in non-Hodgkin's usually presents with a mass typically at ileocaecal region or intussusception causing obstruction.

Splenic involvement is seen in less than 40% of cases at presentation.

4. Which of the following statements are correct?

- (a) The normal thymus in a child is hypoechoic relative to the liver.
- (b) The thymus is highly vascular on color Doppler ultrasound.
- (c) The thymus arises from the third and fourth branchial pouches.
- (d) Teratomas comprise the most common anterior mediastinal mass in childhood.
- (e) Thymolipomas are common causes of thymic enlargement in childhood.

Answers:

- (a) Correct
- (b) Not correct
- (c) Correct
- (d) Not correct
- (e) Not correct

Explanation:

Normal thymus is hypovascular on color Doppler.

Thymic hyperplasia is the most common anterior mediastinal mass in childhood. It may be secondary to hyperthyroidism, myasthenia gravis and rebound growth following illness or stress.

Thymomas and Thymolipomas are extremely rare in childhood. Neoplastic involvement is usually secondary to infiltration by leukemia or lymphoma.

5. Which of the following statements are correct?

- (a) The 'H' type tracheo-oesophageal fistula is the most common.
- (b) Duodenal atresia usually presents with bilious vomiting.
- (c) Duplication cysts of the gastrointestinal tract are most common in the ileal region.

- (d) Duodenal duplication cysts are located on the convex border of the duodenum.
- (e) Duodenal atresia is associated with malrotation of the small bowel.

Answers:

- (a) Not correct
- (b) Correct
- (c) Correct
- (d) Not correct
- (e) Correct

Explanation:

The H type trachea-esophageal fistula is seen only in 10% cases. Upper esophageal atresia with a fistula between lower esophagus and trachea is the most common type (85%).

Duodenal duplication cysts are usually situated along the concave border where they may cause duodenal obstruction, biliary obstruction or pancreatitis.

6. Which of the following statements are correct?

- (a) Vesico-ureteric reflux usually occurs into the lower pole moiety of a complete ureteral duplication
- (b) Ectopic ureteroceles in duplex kidneys are more common in boy than girls.
- (c) An ectopic ureteral insertion may present with daytime incontinence in a girl.
- (d) Horseshoe kidneys are associated with a higher incidence of duplicated kidneys.
- (e) Ectopic ureteral insertion in boys is always supra-sphincteric.

Answers:

- (a) Correct
- (b) Not correct
- (c) Correct
- (d) Correct
- (e) Correct

Explanation:

Ureteroceles which are related to the upper pole moiety of a duplex kidney occur 8 times more frequently in girls than boys.

Ureteroceles related to non-duplicated system show an equal gender incidence.

7. Which of the following statements are correct?

- (a) Ewing's tumors rarely arise within flat bones.
- (b) Giant cell tumors of bone are most commonly seen in the 5-15 years age group.
- (c) Parosteal osteosarcomas have a peak in the 10-20 years age group.
- (d) Eosinophilic granuloma usually involves one bone only.
- (e) Ewing's tumors often demonstrate calcification on CT.

Answers:

- (a) Not correct
- (b) Not correct
- (c) Not correct

- (d) Correct
- (e) Not correct

Explanation:

About 60% of Ewing tumors arise in long bones, most common site is metadiaphysis of femur. About 40% arise in flat bones especially in pelvis, particularly in patients over 20 years age. Calcification is rare in Ewing's tumor of bone. It typically presents with an onion skin periosteal reaction on radiograph.

Majority of giant cell tumors occur in patients following fusion of the epiphysis. Thus usually occur after 18-20 years of age. They have a narrow zone of transition and usually abut the articular margin.

Parosteal osteosarcomas occur in an older age group than the periosteal type with 50% occurring after 30 years of age.

8. Regarding hepatoblastomas, which of the following are correct?

- (a) Alpha-fetoprotein levels are not elevated.
- (b) Presentation is usually after 4 years of age.
- (c) Following intravenous contrast enhanced CT, hepatoblastomas are hypodense relative to the surrounding liver.
- (d) Calcification is rarely seen.
- (e) MRI characteristics of hepatocellular carcinomas and hepatoblastomas are similar.

Answers:

- (a) Not correct
- (b) Not correct
- (c) Correct
- (d) Not correct
- (e) Correct

Explanation:

Hepatoblastomas typically present as an abdominal mass in an asymptomatic child under 2 yrs of age. Hepatocellular carcinoma presents over 4 yrs of age.

Both hepatoblastomas and hepatocellular carcinoma cause elevated alpha-fetoprotein levels. Hepatoblastomas are associated with hemihypertrophy and Beckwith-Wiedemann syndrome.

Calcification is present in 50% cases of hepatoblastomas.

9. Regarding Eosinophilic granuloma, which of the following are correct?

- (a) Bone lesions are usually solitary
- (b) The mandible is rarely involved
- (c) Vertebral pedicels are typically affected
- (d) The cranial vault is rarely involved
- (e) A periosteal reaction is not seen on plain film.

Answers:

- (a) Correct
- (b) Not correct
- (c) Not correct
- (d) Not correct
- (e) Not correct

Explanation:

EG typically involves the vertebral body, most commonly the thoracic spine, causing vertebra plana.

The skull is the most frequent site of involvement. Typically, there is round or oval lucency within the skull vault with beveled edges.

It often involves the mandible causing 'floating tooth' appearance.

A periosteal reaction is not usually seen however it is not unusual in axial skeleton.

10. Regarding wormian bones, which of the following are correct?

- (a) They typically involve the coronal suture
- (b) They are a normal finding up to 18 months of age.
- (c) They are a feature of Down's syndrome
- (d) They are seen in sickle cell anaemia
- (e) They are a feature of rickets

Answers:

- (a) Not correct
- (b) Not correct
- (c) Correct
- (d) Not correct
- (e) Correct

Explanation:

Wormian bones are a normal finding up to 6-12 months of age.

They typically involve the lambdoid and posterior Sagittal sutures, extending around the posterior fontanelle.

Sickle cell and other types of anemia cause 'hair on end' appearance of cranial vault.

11. Which of the following are correct of non-accidental injury (NAI):

- 1. Cerebral injury from shaking is most common over 2 years of age
- 2. Diaphyseal fracture are more common than metaphyseal fractures
- 3. Multiple rib fracture are highly suspicious of NAI
- 4. Spiral fracture of the tibia is highly suspicious
- 5. Inter hemispheric subdural hematoma is an atypical finding

Answers:

- 1. Not correct
- 2. Correct
- 3. Correct
- 4. Not correct
- 5. Not correct

Explanation:

Cerebral injury from shaking is common below 2 years of age.

Spiral fractures of tibia occur usually secondary to trivial twisting injuries.

Inter hemispheric subdural hematoma is highly suspicious of NAI.

12. Which of the following are correct regarding paediatric intussusception:

- (a) Accounts for over 75 % of paediatric intestinal obstruction
- (b) Plain films are typically abnormal
- (c) Typically occurs between 4-8 years of age
- (d) A lead point is identified in over 50 % of cases
- (e) Pneumoperitoneum is a contraindication to air reduction

Answers:

- (a) Correct
- (b) Not correct
- (c) Not correct
- (d) Not correct
- (e) Correct

Explanation:

In intussusception plain films can be normal in 50% cases with highest incidence between 3 months and 4 years of age. In children 95 % intussusception are idiopathic with no lead point.

13. Which of the following are correct regarding radiological features of achondroplasia

- (a) Dilatation of the lateral cerebral ventricles
- (b) Decreased interpedicular distance caudally within the spine
- (c) Short ribs
- (d) Anterior vertebral scalloping
- (e) Relative shortening of fibula

Answers:

- (a) Correct
- (b) Correct
- (c) Correct
- (d) Not correct
- (e) Not correct

Explanation:

Posterior vertebral scalloping and relative lengthening of fibula are seen in achondroplasia.

14. Which of the following are correct regarding slipped upper femoral epiphysis

- (a) Is seen typically between 4-8 years of age.
- (b) The line of Klein should intersect the normal femoral head.
- (c) Is bilateral in one third of cases.
- (d) The epiphysis slips postero-medially.
- (e) Subchondral lucency is an early sign.

Answers:

- (a) Not correct
- (b) Correct
- (c) Correct
- (d) Correct

(e) Not correct

Explanation:

It is seen usually between 8-17 years of age.

Subchondral lucency is an early sign of Perthe's disease.

15. The following are CNS features of tuberous sclerosis.

- (a) Presentation is usually with seizures.
- (b) Subependymal nodules are most common in the occipital horn of the lateral ventricles.
- (c) Pilocytic astrocytoma is a complication.
- (d) Cortical tubers are most prominent on T1W MRI.
- (e) Calcification may be seen in upto 50 % on skull X-ray.

Answers:

- (a) Correct
- (b) Not correct
- (c) Not correct
- (d) Not correct
- (e) Correct

Explanation:

In tuberous sclerosis subependymal nodules are most common along ventricular surface of caudate nucleus, with cortical tubers which are most prominent on T2W and FLAIR.

Giant cell astrocytoma is a complication.

16. Which of the following are correct regarding retinoblastoma

- (a) Is the most common intra-ocular malignancy in childhood.
- (b) Ultrasound demonstrates a hypoechoic mass in the posterior globe.
- (c) Is associated with pineblastoma.
- (d) Is bilateral in 66 %.
- (e) CT shows calcification in 90 %.

Answers:

- (a) Correct
- (b) Not correct
- (c) Correct
- (d) Correct
- (e) Correct

Explanation:

Retinoblastoma is the most common intraocular neoplasm of childhood.

It appears as hyperechoic mass on ultrasound with variable shadowing due to calcification and heterogeneity due to necrosis and/or hemorrhage.

17. Which of the following are correct regarding congenital diaphragmatic hernias

- (a) Most congenital hernias are of the Morgagni type
- (b) Defective closure of the pleuroperitoneal membranes leads to a Bochdalek hernia
- (c) Right sided hernias may have a delayed presentation
- (d) Bochdalek hernias are usually left sided
- (e) Congenital cystic adenomatoid malformation is a differential diagnosis

Answers:

- (a) Not correct
- (b) Correct
- (c) Correct
- (d) Correct
- (e) Correct

Explanation:

Bochdalek hernia is most common congenital hernia (85%-90%).

Morgagni type is seen in 10%-15% of the cases.

18. Which of the following are correct regarding congenital lobar emphysema

- (a) It commonly affects the lower lobes
- (b) Bilateral involvement is rare
- (c) It typically presents in the perinatal period.
- (d) Underlying vascular markings are present
- (e) The affected lobe is opaque after birth

Answers:

- (a) Not correct
- (b) Correct
- (c) Not correct
- (d) Correct
- (e) Correct

Explanation:

Congenital lobar emphysema most commonly affects left upper lobe. Lower lobes involvement is seen in only 2 %. In 25% cases, presentation is not seen in perinatal period.

19. Which of the following are correct regarding duodenal atresia:

- (a) The double bubble sign may be seen on ultrasound examination
- (b) The double bubble sign is specific for duodenal atresia
- (c) Polyhydramnios gas is not seen distal to the atretic segment
- (d) Bowel gas is not seen distal to the atretic segment
- (e) Over 50 % are associated with down's syndrome

Answers:

- (a) Correct
- (b) Not correct
- (c) Correct

- (d) Not correct
- (e) Not correct

Explanation:

Double bubble sign is also seen in duodenal stenosis, annular pancreas and preduodenal portal vein.

In bifid CBD insertion bowel gas may not be seen distal to atretic segment.

1/3rd of cases are associated with Down's syndrome.

20. Which of the following are correct regarding Sturge-Weber syndrome

- (a) Cortical gliosis is a feature.
- (b) It is accompanied by lepto-meningeal angiomas on the contralateral side.
- (c) Underlying cortical calcification is common.
- (d) Angiomas are more common over the frontotemporal regions.
- (e) It involves a port-wine stain affecting the trigeminal nerve distribution.

Answers:

- (a) Correct
- (b) Not correct
- (c) Correct
- (d) Not correct
- (e) Correct

Explanation:

In Sturge-Weber syndrome, lepto-meningeal angiomas are seen on ipsilateral side and angiomas are more common over parieto-occipital region.

21. Which of the following are correct regarding imaging of the testis:

- (a) An appendix is present in over 90 % of males
- (b) Examination of the contralateral testis is mandatory in possible torsion
- (c) A hydrocele may cause false positive diagnosis of torsion on scintigraphic evaluation
- (d) Torsion is most common in the neonatal age group
- (e) A tortured testis is usually of high echogenicity on ultrasound

Answers:

- (a) Correct
- (b) Correct
- (c) Correct
- (d) Not correct
- (e) Not correct

Explanation:

Torsion of testis is rare in neonates.

A tortured testis is usually hypoechoic on ultrasound due to congestion, infarction and edema.

22. The following are features of osteogenesis imperfecta:

- (a) Multiple wormian bones
- (b) Most cases involve an autosomal dominant mode of inheritance
- (c) Dense, sclerotic bones
- (d) Exuberant callus formation around features
- (e) Basilar invagination

Answers:

- (a) Correct
- (b) Correct
- (c) Not correct
- (d) Correct
- (e) Correct

Explanation:

Osteogenesis imperfecta are heterogeneous group of congenital, non-sex-linked, genetic disorders of collagen type I production, involving connective tissues and bones.

The hallmark feature of osteogenesis imperfecta is osteoporosis and fragile bones; hence bones show diffuse demineralization and cortical thinning.

23. Radiological features of rickets include:

- (a) Widening of growth plate as a late sign
- (b) Radiological sign indicate the underlying etiology
- (c) Bulbous anterior rib ends
- (d) A sclerotic rim surrounding the epiphysis
- (e) Dense metaphyseal bands.

Answers:

- (a) Not correct
- (b) Not correct
- (c) Correct
- (d) Not correct
- (e) Correct

Explanation:

Rickets essentially refers to osteomalacia in the paediatric population that occurs prior to fusion of the growth plate. The onset and presentation of rickets depends on the etiology and degree of deficiency. Typically in severe cases rickets becomes apparent in the second year of life.

However radiological signs are the same and cannot indicate underlying etiology. Widening of growth plate is an early sign.

Sclerotic rim surrounding the epiphysis is seen in scurvy.

24. Radiological features of absent corpus callosum include:

- (a) A high riding third ventricle
- (b) Enlargement of the occipital horns
- (c) Crescentic lateral ventricles
- (d) Hypoplasia of the optic nerves
- (e) Separation of pericallosal arteries on angiography

Answers:

- (a) Correct
- (b) Correct
- (c) Correct
- (d) Correct
- (e) Correct

Explanation:

Dysgenesis of the corpus callosum may be complete (**agenesis**) or partial and represents an *in utero* developmental anomaly. There appears to be a male predilection (M:F ~2:1).

Maternal alcohol consumption during pregnancy has been recognized as another risk factor.

25. Radiological findings in sickle cell disease include:

- (a) 'Hair-on-end' skull appearance
- (b) Premature conversion of red to fatty bone marrow
- (c) Salmonella osteomyelitis
- (d) Subperiosteal new bone formation in the tubular bones of the hand and feet
- (e) Enlarged kidneys.

Answers:

- (a) Correct
- (b) Not correct
- (c) Correct
- (d) Correct
- (e) Correct

Explanation:

Sickle cell disease is a hereditary condition caused by the formation of abnormal haemoglobin, which manifests as multisystem ischemia and infarction, as well as hemolytic anemia. The disease carries an autosomal recessive inheritance.

Conversion of red to fatty bone marrow is delayed. In late stages of disease kidneys can be small in size due to infarcts.

26. Features of Swyer-James syndrome include:

- (a) Increased lucency of a hemithorax
- (b) Increased hilar markings, with peripheral pruning
- (c) Mild bronchiectasis
- (d) Air trapping during expiration
- (e) Typically a lobar or segmental distribution

Answers:

- (a) Correct
- (b) Not correct
- (c) Correct
- (d) Correct

(e) Not correct

Explanation:

Swyer-James syndrome is a rare lung condition that manifests as unilateral hemithorax lucency as a result of post-infectious obliterative bronchiolitis.

It is generally characterized on radiographs by a unilateral small lung with hyperlucency and air trapping. Diminished vascular markings are seen.

27. Regarding the Dandy-Walker malformation which of the following are correct:

- (a) There is inferior displacement of the vein of Galen
- (b) There is a high lying tentorium
- (c) The cerebellar vermis is normal
- (d) The corpus callosum is absent in up to 25 %
- (e) The posterior fossa is small

Answers:

- (a) Not correct
- (b) Correct
- (c) Not correct
- (d) Correct
- (e) Not correct

Explanation:

Dandy Walker malformation is the most common posterior fossa malformation and consists of a triad of hypoplasia of vermis with cephalad rotation of vermis remnant, cystic dilatation of fourth ventricle and enlarged posterior fossa.

There is superior displacement of vein of Galen.

28. Which of the following are correct regarding features of Ewing sarcoma:

- (a) Presentation with systemic sign and symptoms is recognized.
- (b) Is usually located in the epiphyses
- (c) Most commonly affects flat bones in children
- (d) Onion skin periosteal reaction is a rare radiological finding.
- (e) MRI demonstrates a soft tissue mass in 80-90% of patient

Answers:

- (a) Correct
- (b) Not correct
- (c) Not correct
- (d) Not correct
- (e) Correct

Explanation:

Majority of Ewing sarcoma are located in diaphysis of the humerus, femur, tibia and fibula. Epiphysis is a rare location. In the first two decades lesions are predominantly located in long bones. After that time lesions in flat bones are more usual.

Ewing is an aggressive tumor with permeative or moth eaten appearance on radiograph with lamellated, onion skin or

spiculated periosteal reaction.

29. Which of the following are correct regarding developmental dysplasia of the hip (DDH):

- (a) Ultrasound diagnosis is best done in the first week of life.
- (b) Is more common in boy.
- (c) The smaller the alpha angle, the greater the degree of acetabular dysplasia.
- (d) The triradiate cartilage is hyperechoic on ultrasound
- (e) Avascular necrosis of the femoral head is a recognized complication.

Answers:

- (a) Not correct
- (b) Not correct
- (c) Correct
- (d) Not correct
- (e) Correct

Explanation:

DDH is more common in females with female to male ratio of 8:1. Most dislocations occur within first 2 weeks of life. However examination should be done only after 1st weeks of life as instability is commonly seen within first few days with as much as 6 mm motion of femoral head.

The triradiate cartilage is hypoechoic on ultrasound. The bony acetabulum, cartilaginous labrum and bony ilium are hyperechoic on ultrasound.

30. Which of the following are correct regarding radiological feature of malrotation:

- (a) Duodenojejunal flexure to the left of the spine
- (b) Superior mesenteric artery to the right of the superior mesenteric vein.
- (c) Spiral / corkscrew appearance of proximal jejunum.
- (d) Proximal jejunum located in the right side of the abdomen
- (e) Normal position of caecum excludes malrotation

Answers:

- (a) Not correct
- (b) Correct
- (c) Correct
- (d) Correct
- (e) Not correct

Explanation:

A normal DJ flexure lies to the left of spine at the same level as or more superior to the duodenal bulb. In malrotation the DJ flexure (ligament of Treitz) is abnormally positioned.

In malrotation the caecum is generally malpositioned in the right upper quadrant or in the left side of abdomen. In 20% of patients with malrotation caecum is normally positioned.

31. The following features favour a diagnosis of Wilm's tumor rather than neuroblastoma:

- (a) Presentation before 1 year of age.
- (b) Calcification

- (c) Lung metastases
- (d) Claw sign
- (e) The tumor displaces rather than engulfs the major vessels

Answers:

- (a) Not correct
- (b) Not correct
- (c) Correct
- (d) Correct
- (e) Correct

Explanation:

Peak age of Wilm's tumor is 3 years and neuroblastoma is most common in children below 2 years.

Stippled type of calcification is seen in 85% of cases of neuroblastoma. Calcification is uncommon in Wilm's and is seen as curvilinear or amorphous type in 15% cases.

32. Which of the following are correct regarding pulmonary sequestration:

- (a) 70-80 % of cases area intra-lobar
- (b) Usually communicates with the tracheobronchial tree.
- (c) The majority present in the first 6 months of life.
- (d) Blood supply is from the pulmonary arteries
- (e) The posterior part of the left lower lobe is most frequently involved

Answers:

- (a) Correct
- (b) Not correct
- (c) Not correct
- (d) Not correct
- (e) Correct

Explanation:

Pulmonary sequestration is a congenital abnormality consisting of non-functioning primitive lung tissue not communicating with tracheobronchial tree.

Intralobular form is more common and presents in adulthood with recurrent chest infections and high output cardiac failure.

The blood supply is systemic, mostly from descending thoracic aorta. Contrast enhancement at the same time as thoracic aorta is characteristic on CT.

33. The following are correct regarding umbilical catheters in neonates:

- (a) Typically, there are two umbilical veins and one umbilical artery.
- (b) Arterial catheters initially go caudally and posteriorly before coursing cephalad.
- (c) Venous catheters follow an anterior and cephalad course
- (d) The tip of a venous catheter should be placed below the right atrium
- (e) Portal vein gas is a bad prognostic sign

Answers:

- (a) Not correct
- (b) Correct
- (c) Correct
- (d) Correct
- (e) Not correct

Explanation:

Typically there are two umbilical arteries and one umbilical vein.

Air may be introduced inadvertently in intrahepatic portal venous system at time of umbilical venous catheter insertion. This is usually transient.

34. Which of the following are correct regarding renal masses in neonates:

- (a) Wilm's tumor is the most common cause of an abdominal mass in neonates.
- (b) Mesoblastic nephroma is the most common fetal renal reoplasm.
- (c) Mesoblastic nephroma is easily distinguished from Wilm's tumor on cross-sectional imaging
- (d) Extension into the renal vein is a feature of mesoblastic nephroma.
- (e) Mesoblastic nephroma is associated with oligohydramnios.

Answers:

- (a) Not correct
- (b) Correct
- (c) Not correct
- (d) Not correct
- (e) Not correct

Explanation:

Hydronephrotic kidney is the most common abdominal mass in neonates.

Mesoblastic nephroma is associated with polyhydramnios and thus premature labor. It cannot be distinguished from Wilm's tumor on cross-sectional imaging. It is benign and does not invade venous structures, hence differentiating it from Wilm's tumor.

35. Which of the following are correct regarding necrotizing enterocolitis (NEC):

- (a) Most cases occur in term neonates.
- (b) Polycythaemia is a risk factor in term neonates.
- (c) Onset is always in the first week of life.
- (d) Most commonly affects the jejunum.
- (e) Mortality rate is about 20-40%

Answers:

- (a) Not correct
- (b) Correct
- (c) Not correct
- (d) Not correct
- (e) Correct

Explanation:

NEC is predominantly a disease of premature infants weighing less than 2 kgs. Very premature infants develop NEC until 2nd or 3rd week of life or later. Most infants however develop NEC in first few days of life.

NEC is a serious neonatal disease of unknown etiology, involving predominantly the distal ileum and proximal colon characterized by mucosal or transmucosal necrosis of part of the intestine which may progress to perforation.

36. Which of the following are correct regarding Hirschprung's disease:

- (a) Failure to pass meconium in the first 24 h of life is typical.
- (b) Causes functional large bowel obstruction.
- (c) A transition zone from small caliber to dilated colon is a constant finding on enema.
- (d) The rectum has a larger caliber than the sigmoid colon.
- (e) Microcolon is a recognized feature on enema.

Answers:

- (a) Correct
- (b) Correct
- (c) Not correct
- (d) Not correct
- (e) Correct

Explanation:

The pathognomonic finding of Hirschsprung disease on contrast enema is a transition zone between normal and aganglionic bowel i.e. abnormally small rectum and distal colon to a dilated normal proximal colon. However in 25% of patients transition zone is not seen which does not rule out Hirschsprung disease.

In a normal patient rectum has the largest luminal diameter of the left sided colon. When rectum alone is involved the sigmoid colon has larger diameter than rectum.

37. Which of the following are correct regarding oesophageal atresia (OA) and trachea-oesophageal fistula (TOF):

- (a) There is an association with Hirschsprung's disease
- (b) Plain radiograph may show a gasless abdomen.
- (c) A gasless stomach is typical of H-type fistula.
- (d) Recurrent pneumonia is a feature.
- (e) H-type fistula is the most common variant.

Answers:

- (a) Not correct
- (b) Correct
- (c) Not correct
- (d) Correct
- (e) Not correct

Explanation:

OA and TOF are associated with anomalies in the VACTERL group. OA is also associated with other atresias like duodenal atresia and imperforate anus.

OA and TOF include a spectrum of anomalies involving trachea and esophagus. The most common type is N type i.e. proximal OA and distal TOF. H type is TOF without OA thus a gasless stomach is not possible.

UNIT – VI

CENTRAL NERVOUS SYSTEM

- Medulloblastoma is hyperdense & enhancing.
- Lymphoma is isodense/hyperdense with homogenous enhancement and no calcification.
- Hamartoma of tuber cinereum is seen in children < 2yr, which leads to precocious puberty. It is attached to the mamillary bodies with a thin stalk.
- Craniopharyngiomas cause growth failure & visual field defects.
- *Kallman syndrome causes hypogonadism in later age.*
- Pituitary adenomas are seen mostly in girls (9-13yrs).
- *Osmotic myelinolysis is seen in alcoholics & with rapidly correcting hyponatremia with IV fluids.*
- Colloid cysts are hyperdense on CT & hyperintense on T1 & T2WI.
- Sturge Weber causes angiomas in meninges, face & eyes. Retinal angiomas can result in retinal detachment.
- Epidermoid is non-enhancing.
- Parallel widely spaced lateral ventricles with dilated trigones & occipital horns with riding 3rd ventricle are signs of agenesis of corpus callosum.
- Schwannoma is hyperintense on T2 but meningioma is iso – hypointense.
- Schwannoma forms an acute angle with the petrous bone but meningioma forms an obtuse angle.
- Germinoma (hyperdense & enhancing) is present in pineal & suprasellar region & shows central calcification. Pineal germinoma (pinealoma) causes precocious puberty.
- Most common cause of congenital hydrocephalus is aqueductal stenosis.
- Low-grade astrocytomas do not enhance & do not show any surrounding edema.
- Cyst wall of hemangioblastoma does not usually enhance.
- Juvenile pilocytic astrocytomas are not associated with feeding vessels (hemangioblastoma shows).
- Extradural hematoma is lentiform shaped.
- Chiasmal glioma are associated with NF1 & causes enlargement and enhancement of chiasm with extension into the optic tract.
- Irregular peripheral enhancement with central necrosis is seen in GBM causing edema & mass effect.
- Lymphoma is hyperdense on CT and shows resolution by steroids or radiotherapy.
- Meningioma causes adjacent hyperostosis of bones.

Germinomas are rounded lesions arising from pineal & suprasellar region. In pineal, they are mostly seen adjacent to tectal plate & causes Parinaud syndrome → Paralysis of upward gaze due to compression of tectum. They are usually not calcified & cause precocious puberty.

- Intraventricular meningiomas (2-5%) are rare but if present they are in trigone location & in middle age females. (Hyperdense on CT).
- Pituitary macroadenoma are slightly hyperdense containing several lucent foci with bone erosions, sella expansion, compression of optic chiasm and may cause III, IV & VI cranial nerve palsy due to extension into cavernous sinus.
- Giant cell astrocytoma occurs at foramen of Monro & shows calcification & enhancement.
- TS shows subependymal hamartomas, cortical & subcortical tubers & heterotopic grey matter islands in white matter. These lesions may be calcified.
- Hemangioblastomas are large cystic masses with an enhancing mural nodule. Oedema may be absent or extensive but no calcification is seen.
- Pilocytic astrocytomas (larger > 5cm) are similar to hemangioblastomas but show calcification, occur in children & young adults. It is not associated with polycythaemia or draining vessels.
- Enlarged posterior fossa is not seen in Dandy Walker variant.
- Hematoma in the septum pellucidum is diagnostic of an aneurysm rupture of anterior communicating artery.
- Positive CT findings of subarachnoid hemorrhage are 98% at 12 hours & 75% at 3 days.
- Rathke's cysts are anterior & cephalic to Tornwaldt's cyst.
- *"Eye of the tiger" sign is seen in Hallervorden Spatz Syndrome.*

- *Hallervorden Spatz syndrome is due to accumulation of iron in globus pallidi & brainstem nuclei.*
- GBM rarely calcifies.
- Ependymomas demonstrate fluid levels due to internal haemorrhage.
- Central neurocytoma is intraventricular tumour causing hydrocephalus. The lesion is attached to septum pellucidum with foci of calcification.
- Herpes has predilection for limbic system (temporal lobe, insula, cingulate gyri).
- PML results in demyelination & hence there will be multiple lesions with no mass effect or edema. Thalamic & basal ganglia may also be involved.
- Chordoma shows 'soap bubble' appearance.
- Amyloid angiopathy occurs peripherally (corticomedullary junction) but HTN angiopathy occurs centrally (BG, thalamus, pons).
- Adrenoleukodystrophy is posterior white matter involvement with frontal and cerebellar involvement in late stages. Enhancement of lateral margins can be seen.
- ADEM is asymmetrical white matter involvement. Thalamus & brainstem may be involved.
- In AIDS patient, multiple lesions showing thin rim enhancement are seen in corticomedullary junction, BG & thalamus in toxoplasmosis with associated edema & mass effect.

Herpes encephalitis often follows a non-specific viral infection (hence, initial CT can be normal). Later tonic clonic seizures develop & there are low density areas in frontal & temporal lobes with patchy gyri-form enhancement.

- Sphenoid wing hypoplasia is a feature of NF1.
- Hypoplasia of vermis with dilated 4th ventricle is Dandy Walker malformation.
- Multifocal peripheral subcortical hemorrhages in elderly are due to amyloid angiopathy.
- In cerebral sarcoidosis, there is nodular thickening & enhancement of dura & leptomeninges with enhancing optic tracts, optic chiasm, floor of 3rd ventricle & pituitary infundibulum. Few T2 hyperintense foci are seen in periventricular white matter.
- Ependymoma is lobulated mass in 4th ventricle, extending via the foramen of Magendie into cistern magna.
- Several falls in a span of few months leads to acute on chronic SDH appearing as mixed attenuation areas overlying both hemispheres with normal ventricles with no midline shift.
- Adrenoleukodystrophy shows marginal enhancement at the anterior or lateral aspect of the lesion.
- Hydrocephalus & elongation of medulla may be seen in Chiari II malformation as well.
- Multiple hypodensities (hyperdense in lymphoma) in brainstem & periventricular white matter with ependymal enhancement is seen in CMV encephalitis.
- HIV encephalitis manifests as demyelination & gliosis characteristically in the Centrum semiovale.
- Tuberculosis in AIDS causes multiple granulomas with little enhancement & subsequent calcification with leptomeningeal disease.
- Neurinomas are nerve sheath tumours.
- Asymmetrical temporal lobe & sometimes frontal lobe atrophy is seen in Pick's disease.
- Solid hypodense mass in posterior aspect of 3rd ventricle is pineal germinoma.
- In subacute infarct, there is gyri-form enhancement.
- Cerebral hamartomas are seen in BG & Pons & appear hyperintense on T2WI.
- Tubular thickening of optic nerve is seen in meningioma but glioma causes fusiform thickening.
- *Ever after a week, infarct shows high signal on DWI & low on ADC.*
- In Sturge Weber, same sided brain involvement is seen as the port wine stain.
- In AIDS patient, lymphoma lesions are hyperdense & show homogenous / peripheral enhancement.
- *Melanoma & mucinous adenocarcinoma mets are T1 hyperintense & T2 hypointense.*
- Prolactinomas are most common functioning pituitary microadenomas arising from the anterior lobe of pituitary & show poor enhancement.
- Hyperdense focus with speckled calcification with minor patchy enhancement is seen in cavernous angioma (cavernoma) in brain.
- PML in AIDS shows asymmetrical high signal in parieto-occipital region on T2WI with no mass effect.
- Medulloblastoma is a hyperdense mass with patchy enhancement.

- EDH is common in temporo-parietal region.
- Lymphoma in AIDS patient occur in periventricular location (hyperdense) with subependymal spread & crossing of the corpus callosum with frequent ring enhancement (homogenous enhancement of lymphoma is seen in immunocompetent patients).
- PML also does not show enhancement or edema.
- Osmotic myelinolysis may also occur in basal ganglia, thalami & white matter.
- Lymphoma is usually hypointense on FLAIR.
- Mostly, abscesses are located at cortico-medullary junction in frontal & temporal lobes. Commonest organism is streptococcus.
- Smooth wall is seen in abscess but thick, nodular & irregular wall is seen in neoplasia.
- In septo-optic dysplasia, there is optic nerve hypoplasia, absent septum pellucidum with associated schizencephaly & pituitary dysfunction.

Gliomatosis cerebri involves two or more lobes with contiguous involvement. Cerebral architecture is preserved with T2 hyperintensity in white matter & deep grey nuclei with enlargement of cerebral structures. It is bilateral & symmetrical.

- Mesial temporal sclerosis shows volume loss & T2 hyperintensity of hippocampus in coronal plane.
- Congenital CMV infection leads to microcephaly, hypoplastic cerebellum, periventricular subependymal cysts & calcification in BG & white matter. There may be lissencephaly, polymicrogyria & schizencephaly.
- Wernicke's encephalopathy involves medial thalami, mamillary bodies, periaqueductal grey matter & hypothalamus.
- "Salt & Pepper" pattern of hyperintensity & hypointensity on T1 & T2WI representing multiple small tumour vessels are seen in glomus jugularae tumour as well as carotid body tumor.
- Sarcoidosis has predilection for leptomeninges & cranial nerves with abnormal enhancement of facial & optic nerves, basal meninges, hypothalamus, optic chiasm, pituitary & basal cisterns. Enhancing granulomas are seen superficially in brain parenchyma bordering the basal cisterns.
- The falx, corpus callosum & ventricular system can be normal in lobar type of holoprosencephaly but septum pellucidum is absent in all types.
- Periventricular & subependymal location is characteristic of lymphoma in AIDS patient.
- CNS lymphoma shows avid uptake on thallium scan but toxoplasmosis does not.
- Lymphoma shows increased vascularity but toxoplasmosis is hypovascular on MR perfusion studies.
- Infarcted tissue has increased risk of bleeding from thrombolysis with no chance of recovery.
- ADEM & Herpes is preceded by viral illness.
- Restricted diffusion can be seen in viral encephalitis but unrestricted diffusion is seen in GBM.
- Amyloid angiopathy is usually associated with leukoencephalopathy & atrophy.

<u>Cerebral infarct</u>	<u>Ischemia</u>
Cannot recovered	Can be recovered
CBF is ↓	CBF is ↓
MTT is ↑ (> 6 sec.)	MTT is ↑ (> 6 sec.)
CBV is ↓	CBV is ↑

- MTT is most sensitive for stroke (CBF can be used).
- CBV is used to determine whether there is infarct or reversible ischemia.
- ADEM affects children more than adults.
- A hemorrhagic hyperacute variant of ADEM is called Hurst's disease (usually fulminant & fatal finding in ADEM). There is high signal in CSF on FLAIR.
- Rathke's cleft cysts do not calcify.
- Cryptococcal meningitis do not enhance occurs in dilated perivascular spaces.
- Young patient with migraine, aura, TIA or stroke is suspicious of CADASIL & is characterized by subcortical infarcts in anterior temporal lobe & external capsule mainly.
- PRES involves cortex & subcortical WM but does not show diffusion restriction.
- Pre eclampsia causes lesions in deep & subcortical WM, pons & basilar territories. They are hyperintense,

onT2/FLAIR, may be unilateral/bilateral & mostly reversible.

<i>Cerebellar atrophy →</i>	<i>Friedreich's ataxia</i>
	<i>-Ataxia telanglectasia.</i>
	<i>-Phenytoin toxicity</i>
	<i>-Paraneoplastic atrophy.</i>

- Senile brain atrophy causes cerebral & cerebellar atrophy.
- Cavum septum pellucidum is a thin CSF density between lateral ventricles & rarely may cause obstructive hydrocephalus.
- Glioma has greatest incidence among all cranial neoplasms.
- Choroid plexus papilloma, acoustic neuroma, hemangiopericytoma, meningioma, chordoma & epidermoid are extra axial tumours.
- Ependymomas > Astrocytomas > Choroid plexus papillomas are intraventricular tumours.

Causes of low attenuation in BG:

- *Wilson's disease*
- *Carbon monoxide poisoning*
- *Hypoglycemia*
- *Barbiturate intoxication*
- *Hypoxia*

- Widened subarachnoid cistern is seen in extra- axial lesion/tumour.
- Arachnoid cyst has smooth margins but epidermoid is usually hyperdense to CSF, encases vessels & deviates from CSF.
- Cavernomas are most commonly located in subcortical region & are hypodense areas which can calcify. They can cause minimal mass effect/edema & may undergo hemorrhage. Hence they have a popcorn appearance with high signal centre on T1+T2WI.
- Colloid cyst can occasionally widen septum pellucidum.
- CJD (Creutzfeldt Jacob Disease) does not enhance & shows no white matter involvement. They cause T2↑↑ in head of caudate & putamen bilaterally leading to ataxia & progressive dementia.
- Dural meningeal carcinomatosis shows short curvilinear discontinuous thin sections of enhancement than leptomeningeal carcinomatosis.
- Squamous cell & adenocarcinoma of lung causes cystic mets to brain.
- Oligodendroglioma most commonly affects frontal lobe but corpus callosum can also be affected as butterfly glioma.
- In neurosarcoidosis, there is leptomeningeal contrast enhancement. There can be involvement of WM & GM with hypothalamus involvement. Focal epidural masses can also be seen.
- In herpes 1, there is medial temporal hypodensity with poor enhancement. Basal ganglia are spared.
- Enlarged medullary/subependymal veins with choroid angiomas are seen in Sturge Weber.
- *Meningeal nodules with high T2 deep white matter lesions with multiple solitary ring like parenchymal masses are seen in sarcoidosis.*
- *Pituitary microadenomas are typically hypointense compared on normal gland on T1WI. Contrast enhancement is seen on delayed (>20min) images.*
- Cerebellar atrophy with thinning (reduced AP diameter) of cervical spinal cord & medulla with abnormal gait, kyphoscoliosis & upper limb tremors are seen in Friedrich's ataxia.
- Glomus tumours cause pulsatile tinnitus.
- Intra axial lesion causes expansion of cortex of brain.
- CP angle meningioma makes obtuse angle with the petrous bone but schwannoma makes acute angle. Meningioma causes extension into the internal auditory canal but does not expand it.
- CP schwannoma causes extension & expansion of IAC & expansion with flaring of porus acousticus.
- Reduced perfusion in posterior parietal region bilaterally occurs in Alzheimer's in patients of mid age (~50 yrs) but B/L mesiotemporal region involvement with atrophy occurs in elderly.

- Lewy body dementia is similar to Alzheimer but occipital lobes can be involved.
- Parkinsonism dementia is also similar but involves visual cortex.
- Vascular dementia shows patchy cortical & subcortical perfusion defects with cerebellar involvement.
- Enlarged temporal horns is the most sensitive sign of early hydrocephalus on NCCT.
- Variant CJ disease is rapidly progressive spongiform encephalopathy leading to dementia & death in young patients. There is symmetrical T2/FLAIR hyperintensity in posterior aspects of thalami (pulvinar sign). Classic CJ disease occurs in old age group involving caudate nuclei (also in Huntington's chorea) & putamen.

In normal adult, maximum iron concentration is seen in globus pallidus, red nucleus, pars reticulata of substantia nigra & dentate nucleus of cerebellum. By eighth decade, iron concentration is ↑↑ in caudate nucleus & putamen (Pathological if occur before that – in Alzheimer's).

- A low attenuation lesion in brain in an acute hemiparesis patient of earlier operated lung cancer should get a contrast CT done to rule out mets vs infarct.
- *Metachromatic leukodystrophy is autosomal recessive, caused by deficiency of arylsulphatase A & causes motor sign of peripheral neuropathy, speech & co-ordination dysfunction & death in years. On T2WI, symmetrical hyperintense areas in periventricular WM sparing the perivascular WM & subcortical 'U' fibers giving a "Tigroid" appearance. Corpus callosum, internal capsule can be involved.*
- Ependymomas most commonly arise in the floor of 4th ventricle. They show calcification & extend through & widen the foramen of Luschka & Magendie.
- Calcification is not commonly seen (10-20%) in medulloblastoma. Mostly are hyperdense solid tumours.
- In an elderly, if there is temporal lobe & ento-rhinal cortex & hippocampal atrophy with increase in size of the hippocampal – choroidal fissure, then it suggest Alzheimer's disease.
- Pick's disease is also called as "fronto-temporal lobar degeneration" because of location.
- Lewy body dementia affects parietal, occipital lobes & cerebellum.

- GBM commonly spreads along white matter tracts & across the corpus callosum to involve both frontal lobes (butterfly glioma).
- PML may involve corpus callosum.

<i>HIV encephalopathy</i>	<i>PML</i>
<i>60% of encephalopathy cases in HIV</i>	<i>4 % of cases</i>
<i>Cerebral atrophy</i>	<i>Subcortical U fibers</i>
<i>White matter, asymmetrical</i>	<i>Grey matter involvement also</i>
<i>Frontal lobes</i>	<i>Posterior lobes.</i>

- Oligodendrogliomas may erode the inner table of skull. Surrounding edema is usually minimal.
- Gangliogliomas show calcification (33%) & cyst formation (50%) & occur in children & young adults (< 30 yrs) with predilection for temporal lobes.
- Astrocytomas can also show calcification but does not cause calvarial erosion.
- Ganglioglioma is most common tumour of temporal lobe epilepsy.
- DNET are associated with partial complex seizures & occur before 20yrs. There is soap bubble, multicystic lesion with remodeling of calvarium.
- Parinaud syndrome = Dorsal midbrain syndrome. It occurs due to injury or compression of midbrain especially superior colliculus with pineal germinoma.
- *Communicating hydrocephalus may be seen after 1 wk of SAH when hemorrhage causes impaired CSF absorption.*
- *Acute obstructive (non communicating) hydrocephalus after SAH (< 7days) is due to intraventricular blood & resultant ependymitis.*
- In NF1, there is hypoplasia of pedicles & posterior elements.

Lateral to the lentiform nucleus lies the white matter of external capsule & then the claustrum, a thin sheet of grey matter. The extreme capsule lies lateral to claustrum & separates it from insular cortex.

- Meningioma is most common radiation induced CNS tumour. Usually they are multiple.
- Colloid cyst causes positional headaches.
- Suprasellar meningiomas are not cystic like craniopharyngiomas.
- Epidermoid contains ectodermal component but dermoid contains ectodermal & mesodermal contents.
- CNS teratomas occur in pineal & suprasellar regions.
- Complications of meningitis are subdural empyema (sterile effusion can be seen with H. influenza), venous sinus thrombosis, infarction, cerebritis & abscess.

Descending transtentorial herniation may compress III cranial nerve, PCA, anterior choroidal arteries & midbrain with resultant contralateral hemiparesis & may be ipsilateral hemiparesis (Kernohan's notch -due to compression of contralateral cerebral peduncle against tentorial edge)

- Subfalcine herniation occurs when cingulate gyrus shifts beneath the falx. May lead to compression of ACA & internal cerebral veins.
- Sheehan syndrome is hemorrhage induced hypotension causing pituitary infarction. Visual field loss, headache, ophthalmoplegia & pituitary dysfunction occurs.
- PRES shows similar features as that in eclampsia, peripartum cerebral angiopathy & hypertensive encephalopathy.
- Torcular lambdoid inversion (elevation of torcular herophili above lambdoid suture) is seen in Dandy Walker malformation.
- In DAI, multiple small T2W ↑↑ lesions are seen in frontal & temporal white matter near grey – white matter

junctions, corpus callosum & brainstem.

- CO poisoning causes T2/FLAIR ↑↑ with restricted diffusion of B/L globus pallidus.
- Putamen is characteristically involved in methanol poisoning.
- *Delayed post anoxic encephalopathy occurs several weeks after CO poisoning & results in further T2 ↑ in corpus callosum, subcortical U fibers, internal & external capsules with low T2 on thalamus & putamen.*
- Corpus callosal lipoma is associated with its agenesis, encephalocele & cutaneous frontal lipomas.
- Interhemispheric arachnoid cysts can also occur with agenesis of corpus callosum.
- Herpes encephalitis does not enhance. There is involvement of temporal lobes, insula, orbitofrontal regions & cingulate gyrus.
- MS also involves corpus callosum, cranial nerves and cerebellar peduncles.

Cranial nerve XII involvement causes unilateral atrophy of tongue musculature causing deviation of tongue towards weak side with dysarthric speech. Supranuclear lesions cause contralateral paralysis of tongue but nuclear & infranuclear lesions cause ipsilateral paralysis.

- Empty delta sign is seen in case of venous sinus thrombosis on CECT brain (CT venography). It is common in 3 wks post partum. On NCCT, there may be hyperdense veins, grey white matter junction hemorrhage & brain edema.
- Opsoclonus – myoclonus syndrome is characterized by association with breast & Squamous cell lung Ca & neuroblastoma (children). Therefore, in children, MIBG scan should be done since MRI brain is negative.
- Central neurocytomas are benign tumours of lateral & third ventricles, attached to the septum pellucidum & contains calcification (69%) & cystic spaces. Subependymoma can have similar picture but occur in age > 40 yrs.
- Choroid plexus papilloma occurs < 5yrs of age.
- Subdural empyema shows restricted diffusion.
- Embolic infarcts occur in atrial fibrillation, cardiac valve disease, FMD, intracranial aneurysms, sickle cell disease, atherosclerosis & TTP.
- Pinealoma can cause obstruction at the level of aqueduct.
- Pinealoma is located between the splenium of Corpus callosum & tectal plate.
- Meningeal seedings are very common in pineal germinomas & pineoblastomas.
- Avid enhancement is seen in pineal germinoma. Central calcification is seen in germinoma but peripheral calcification is seen in pineoblastoma. (Both can cause parinaud syndrome).
- Symmetrical involvement of white matter is rarely seen in MS but can be seen in ADEM.
- Edema & enhancement is seen in ADEM.
- Pleomorphic xanthoastrocytomas show cysts but no calcification or hemorrhage & are seen in temporal lobe.
- VR spaces show normal surrounding brain parenchyma.
- Lacunar infarcts are mostly hyperintense on FLAIR but VR spaces are hypointense.
- Lindau tumours are retinal angiomas, hemangiomas & hamartomas seen in VHL. They can cause calcification.
- Cerebellar hemangiomas show central flow voids, but when occur in spine, no flow voids are seen.

CADASIL causes stroke in young adults, presents as migraine, TIA & cognitive decline. There are subcortical lacunar infarcts & leukoencephalopathy with frontal lobe > temporal lobe > insula predominance. Anterior temporal pole & external capsule lesions are highly sensitive & specific.

- MELAS causes B/L multiple cortical & subcortical hyperintense lesions on FLAIR.
- MERRF causes hyperintense FLAIR pathologies of BG, caudate nuclei, & watershed ischemia.
- Lymphoma in HIV can cause encasement of the ventricle, which is not seen with toxoplasma.

Hemangiopericytoma is an extra axial tumour having broad dural base & dural tail, shows heterogenous enhancement with no e/o calcification, abutting the sphenoid sinus in anterior cranial fossa with displacement & effacement of third ventricle causing dilated lateral ventricles.

- Tentorial or CP angle meningiomas are supplied by Bernasconi – Casanari artery, a branch of ICA.
- Parafalcine meningiomas or meningiomas around cerebral convexity or sphenoidal meningiomas are fed by ECA.
- Lesions around foramen magnum, clivus & posterior fossa are fed by branches of VA & ICA.

<i>Pilocytic astrocytoma</i>	<i>Medulloblastoma</i>
<i>No seeding</i>	<i>Subarachnoid seeding</i>
<i>Arise peripherally & displace</i>	<i>Arise centrally from vermis</i>
<i>4th ventricle</i>	
<i>Cystic or solid</i>	<i>Solid (not differentiating)</i>

- CSF leak or any cause of intracranial hypotension causes smooth pachymeningeal thickening mainly over convexities & falx.
- Malignant meningioma involves intraparenchymal tissue of brain as well.
- T2 hyperintense plaques are seen in bacterial meningitis. There is raised protein concentration, ↑↑ neutrophils & ↓↓ glucose in CSF.
- SAH is associated with ruptured aneurysm, AVM, hypertension, tumour hemorrhage, embolic infarct, eclampsia & infection.
- Dural enhancement is seen in infection, tumour, intracranial hypotension, idiopathic pachymeningitis, venous thrombosis, sarcoidosis, extramedullary hematopoiesis & RA.

Criteria's for NF: Atleast 2 criteria's

1. ≥ 6 cafe au lait spots
2. ≥ 2 neurofibromas or one plexiform
3. ≥ 2 lisch nodules
4. Axillary / inguinal freckling
5. Optic glioma
6. Sphenoid dysplasia or thinning of long bone cortex
7. First degree relative with NF1

- In Dandy Walker variant, there is hypoplasia of vermis only with large CSF space surrounding cerebellum.
- Cavernous sinus contains III, IV, VI & V1 & V2 nerves.
- Mammillopontine distance is decreased in hydrocephalus.
- Hallervordan Spatz disease causes hereditary movement disorder with “eye of tiger” sign in BG with decreased T2W signal in red nuclei & substantia nigra.
- Calvarial scalloping can be seen with arachnoid cyst but not with subdural hygroma.
- CADASIL causes migraine in 3rd decade, recurrent stroke & early onset dementia. White matter hypodense areas in temporal lobes without enhancement are characteristic.
- DAI involves splenium of Corpus callosum, grey –white matter junction, dorso-lateral brainstem & internal capsule.
- Peripheral enhancement can be seen in chronic hematoma.
- Normal pressure hydrocephalus shows dilated ventricles out of proportion of sulcal prominence with upward bowing of corpus callosum, pronounced aqueductal flow void, periventricular hyperintensity & reflux of In¹¹¹-DTPA into lateral ventricles.
- Pilocytic astrocytoma does not show surrounding vasogenic edema.
- NF1, optic glioma, pineal germinoma & pilocytic astrocytoma are associated with precocious puberty.
- Neurosyphilis causes multiple ischemic infarcts due to arteritis in a patient with HIV.
- *Elevated choline, reduced NAA & Choline / Creatine ratio of 2 indicates high grade tumour.*
- All demyelinating disease causes decrease in NAA but Canavan's disease causes elevated NAA.
- A petrous apex cephalocele communicates with Meckel's cave.
- Epidermoids are iso-hyperintense on FLAIR but arachnoid cysts are hypointense.
- Hamartoma of tuber cinerium causes gelastic seizures.

In Alzheimer's, PET shows early reduced activity in the precuneus/posterior cingulate gyrus & superior, middle

& inferior temporal lobe gyrus with sparing of sensorimotor & visual cortex, striatum, thalamus & cerebellum.

- Diffuse reduced activity (PET) of cortical, subcortical regions & cerebellum is seen in multi infarct dementia.
- Lewy body dementia → Reduced activity in occipital cortex (also in temporo frontal)
- Huntington's chorea → Reduced activity in caudate & lentiform nuclei.
- *White matter T2W hyperintensities & focal infarcts in a woman of childbearing age suggests cerebral lupus (SLE). Vasculitis, venous sinus thrombosis, cerebritis, hemorrhage can also occur.*
- Susac syndrome is triad of encephalopathy, retinal artery branch occlusions & hearing loss with multiple T2 hyperintense deep white matter & corpus callosum lesions.
- Lyme's disease results in T2W hyperintense periventricular white matter lesions which may enhance. (Resemble ADEM & MS).
- Ageing of MS plaques can be differentiated by pre & post contrast T1WI.
- PRES presents with seizures, headaches & loss of vision. Causes include HTN, eclampsia, preeclampsia, immunosuppression medications. It is not always reversible & may result in hemorrhage. Brainstem, BG & cerebellum may be involved less commonly.
- Normal pressure hydrocephalus may occur due to previous SAH or meningitis. There are rounded frontal horns with periventricular low attenuation in frontal & occipital regions due to transependymal CSF flow. Upward bowing of CC with aqueductal flow void sign is also seen.
- Biswanger's disease is a continuous irreversible ischemic degeneration of periventricular & deep white matter due to microinfarcts & demyelination.

In Wilson's disease, there is hyperintensity in tegmentum (except red nucleus) & hypointensity of superior colliculus to form "face of giant panda" sign. A "double panda" sign is also described with a second "panda cub face" in pons. Abnormal signal is also seen in BG & thalamus. (T1↓↓, T2↑↑).

- Hamartomas of tuber cinereum are developmental malformations which do not change in size, shape & signal intensity on follow up. No enhancement or calcification is seen.
- Foramen Rotundum → V2 (Cranial nerve 5th - second division).
- Rathke's cleft cysts are hyperintense on T1 & hypointense on T2WI. Located midline between anterior & posterior lobes of pituitary & have a kidney shape on axial images. They do not enhance.
- Acute hemorrhagic pituitary adenoma shows fluid levels.
- T2 hypointense intradural spinal lesion with patchy enhancement is calcified meningioma.
- Expanded skull vault diploic space with associated thinning of outer table can be seen in sarcoidosis.

Cruciform T2WI hyperintensity or "hot cross bun" sign in the pons is s/o multisystem atrophy & spinocerebellar ataxia. Putamen can also be involved. Clinically features are same as Parkinsonism.

- In Parkinsonism, there is narrowing of pars compacta of substantia nigra on T2WI.
- Substantia nigra atrophy is also a feature of Lewy body dementia.
- T2W hypointensity of putamen due to iron deposition is a feature of progressive supranuclear palsy.
- *Marchiafava Bignami disease is a complication of chronic alcohol consumption due to demyelination & necrosis of corpus callosum although white matter tracts (such as external capsule) may be involved.*
- In Wernicke's, there is B/L & symmetrical T2WI hyperintensities within the thalami, periaqueductal grey matter & mamillary bodies.
- Alcohol withdrawal syndrome causes volume loss in the temporal cortex & anterior Hippocampus.
- Hepatic encephalopathy causes T1↑↑ in BG, anterior thalami & midbrain.
- Perimesencephalic haemorrhage with anterior interhemispheric fissure bleed is due to ACom aneurysm rupture. Catheter angiography is the gold standard.
- MS lesions may show mass effect.
- Autoimmune hypophysitis shows loss of posterior pituitary bright spot, homogenous enhancement, & enlarged stalk.
- Normal posterior pituitary is bright on T1WI due to rich content of vasopressin neurosecretory granules.
- Schwannoma can cause erosion of adjacent porus acousticus.
- Elevated lactate on MR spectroscopy is a sign of high grade lesions.
- 1.75 is the threshold of rCBV value in MR perfusion between low grade & high grade tumours.

Cavum septum pellucidum is finger shaped CSF collection between frontal horns of lateral ventricles. Posterior extension between the fornices is called as cavum vergae. Cavum Vergae never occur in absence of CSP.

Cavum vellum interpositum is a triangular shaped CSF collection between lateral ventricles that does not extend anterior to foramen of Monro.

- Funnel shaped aqueduct is seen in aqueductal stenosis with lack of flow through it on phase contrast MRI. Flow void sign is seen in normal individuals due to increased CSF velocity through aqueduct.
- Fourth ventricle is not affected in normal pressure hydrocephalus.
- Watershed areas are affected in PRES → occurs with HTN.
- Similar features of PRES with intracerebral hemorrhage in a normotensive patient suggests postpartum cerebral angiopathy.
- Porencephalic cyst is a cystic cavity with adjacent enlargement of lateral ventricle. They develop in utero or early infancy.

- Syringomyelia is associated with Chiari I malformation.
- In MS, FLAIR is used for periventricular white matter lesions but in posterior fossa & spine cord lesions, T2WI is used (better than FLAIR).
- Myxopapillary ependymoma occurs at filum terminale.
- Spinal meningiomas do not cause hyperostosis.
- *Spinal cord infarction reveals focal high T2 signal within the cord with mild cord swelling. It causes acute lower back pain in early postoperative period of some other surgery.*
- Marked vertebral body collapse is seen in TB, not in pyogenic infection.
- Diastematomyelia is associated with bifid vertebrae & hemivertebrae.
- Plaques of MS are perpendicular to lateral ventricles & parallel to spinal cord.

Devic syndrome (neuromyelitis optica) is severe demyelinating syndrome with optic neuritis & acute myelitis. Diagnosis is made by:

- 1. Contiguous spinal cord involvement greater than or equal to 3 vertebral segments (lesions are larger than in MS).*
- 2. Brain MRI not meeting diagnostic criteria for MS.*
- 3. IgG antibodies.*

- Clumped nerve roots with lack of enhancement suggests arachnoiditis.
- Syrinx, hydrocephalus, bone & spine malformations are associated with chiari I malformation.
- Drop mets are homogenously enhancing usually dorsal & lower in location of the spinal canal. Medulloblastoma is commonest cause. A high percentage of CSF cytology is +ve.
- Osteoblastoma is a cause of solitary dense pedicle.
- *ABC, osteoid osteomas & osteoblastomas can affect posterior elements of spine.*
- Spinal tumour cause expansion of the cord but demyelination does not.
- Widened spinal canal is seen in B/L spondylolysis.
- Paravertebral soft tissue masses can occur in TB & pyogenic infection but calcification within the abscess is diagnostic of TB. (TB affects T12 – L1 but pyogenic affects lower level).
- DISH also causes ossification of iliolumbar & sacroiliac ligaments with whiskering of ischial tuberosities.
- Spinal dermoids occur usually in conus or cauda equina & are associated with spinal dysraphism. They are variable on T1 & hyperintense on T2.
- Spine lesions without brain involvement can be seen in MS.

<i>Split notochord syndrome</i>	<i>→ Type I → Diastematomyelia (separate dural sheaths)</i>
	<i>Type II → Diplomyelia (single dural sheath)</i>

- Hemangioblastoma is seen in dorsal cord of cervical cord with few flow voids.
- Spinal gangliogliomas involves the cord for more than 4 levels with bony erosion or scalloping with tumoral cysts.
- Paragangliomas are rare intradural extra-medullary tumours; appear as ovoid lesion eccentrically placed at conus medullaris with flow voids & hemorrhage & avid enhancement.

<i>Spinal astrocytomas</i>	<i>Spinal ependymomas</i>
<i>Children</i>	<i>Adults</i>
<i>C > T > L</i>	<i>C > T = L</i>
<i>Eccentric</i>	<i>Central</i>
<i>Infiltrating margins</i>	<i>sharp margins</i>

<i>Long segment involved</i>	<i>Peripheral low T2 sign</i>
<i>NF 1</i>	<i>NF 2</i>

- Rupture of left MCA aneurysm is seen as hemorrhage in ipsilateral sylvian fissure. Early hydrocephalus may be associated.
- Carotid body paragangliomas causes splaying of ICA & ECA. They cause intense persistent vascular blush on imaging with flow voids giving “Salt & Pepper” appearance on MRI.
- Carotid cavernous fistula affects young adults & causes proptosis, chemosis, enhancement & enlarged extraocular muscle, dilated ipsilateral cavernous sinus & superior ophthalmic vein.
- Head of caudate nucleus & anterior limb of internal capsule are supplied by medial lenticulostriate branch of ACA but lentiform nucleus, other parts of caudate nucleus & internal capsule are supplied by lateral lenticulostriate (MCA branch).
- Echogenic peripheral parietal lobe on USG is due to MCA territory infarct.
- Venous sinus thrombosis causes lethargy, unable to tolerate oral fluids, confusion, agitation and tonic clonic seizure. There is high signal on FLAIR in parasagittal cortex bilaterally.
- Dural AV fistula is mostly diagnosed by intra-arterial angiography (gold standard) or dynamic MR subtraction angiography.
- Overall risk of unruptured AVM is about 2-3% per year.
- Pregnancy does not increase the risk of cerebral AVM hemorrhage.

<i>Doppler values of ICA.</i>	
<i>PSV (m/sec)</i>	<i>Stenosis</i>
<i>< 1.5</i>	<i>0 - 49</i>
<i>1.5 - 2.3</i>	<i>50 - 69</i>
<i>> 2.3</i>	<i>> 70</i>
<i>None</i>	<i>occluded.</i>

- Ratio of PSV of ICA/CCA > 4 suggests 70% stenosis.
- Loss of flow or reversal of flow in CCA suggests an occlusion or very high grade stenosis.
- Reversal (Retrograde) of flow in dilated superior ophthalmic vein is seen in carotid – cavernous fistula.
- Carotid body tumours are painless & show flow voids. Malignant transformation is 6%.
- In Moya Moya → Multiple flow voids are seen due to hypertrophied lenticulostriate arteries. There is ischemia & infarct in cortical/subcortical areas in children. In adults, infarcts occur in deep white matter along with hemorrhage. Supraclinoid MCA is first to be involved. Anterior > Posterior circulation is affected.
- Shower of microscopic fat emboli in multiple arteries is fat embolism syndrome.
- *In carotid – cavernous fistula, drainage from the affected cavernous sinus is via the superior ophthalmic vein, contralateral cavernous sinus & petrous sinus. There can be sellar erosion & enlarged superior orbital fissure.*
- Most of the berry aneurysms causing SAH are seen at the junction of ACA & ACom & at the junction of ICA & PCA.
- Giant aneurysm is > 25mm in diameter.
- Complications of cerebral angiography are embolism of plaque & thrombus. Catheter induced spasm & dissection can also occur.
- Angular artery is a cortical branch of MCA.
- Minor trauma may stretch the vertebral artery over lateral mass of C2 leading to dissection. Symptoms are occipital headache, neck pain, vertigo, diplopia & stroke. Enlarged vertebral artery with narrowed lumen & peripheral high density crescent (rim sign) is seen.

In fat embolism syndrome, there is triad of acute respiratory distress with hypoxia, petechial skin hemorrhage & neurological dysfunction. On imaging, microinfarcts with edema are seen (T2W↑↑ & DW ↑↑) in cerebral deep grey & deep white matter. CT can be normal even on repeat scan.

- CT angiography is as accurate for aneurysm detection as DSA. CTA should be used as primary imaging & DSA is reserved for difficult cases.
- Moya Moya disease is progressive arteries typically affecting both supraclinoid ICA, ACA & MCA.
- Moya Moya syndrome is nomenclature when disease associated with NF, bacterial meningitis, head trauma, TB, oral contraceptives, atherosclerosis or sickle cell disease.
- *FNAC & biopsy are contraindicated in case of carotid body tumour (paraganglioma). They are laterally mobile but vertically fixed lesions present below the angle of jaw.*
- Phelobololiths are circular calcifications & are unique to vascular malformation. Arterial malformations are high flow but venous, capillary & mixed malformations are low flow.
- Paired basal veins of Rosenthal are formed in sylvian fissure & travels in the ambient cistern around the midbrain to enter the vein of Galen along with internal cerebral vein.
- Veins of Trolard & Labbe are anastamotic veins that connect the superficial MCV to the superior sagittal & transverse sinuses respectively.
- Paired internal cerebral veins run along the roof of 3rd ventricle & enter vein of Galen.

<i>Branches of ECA in order:</i>	<i>(1) Superior Thyroid</i>
	<i>(2) Ascending pharyngeal</i>
	<i>(3) Lingual</i>
	<i>(4) Facial</i>
	<i>(5) Occipital</i>
	<i>(6) Posterior Auricular</i>
	<i>(7) Superficial temporal</i>
	<i>(8) maxillary.</i>

- Facial artery crosses the inferior border of mandible before traversing the cheek & forms a connection between ICA & ECA by anastomosing with ophthalmic artery.

<i>Venous sinus thrombosis:</i>
<i>Acute (< 5days) → T1 – iso, T2 – low</i>
<i>Subacute → T1 ↑↑, T2 ↑↑</i>
<i>Chronic → T1 – iso to high, T2 – iso/high</i>

- Vertebral artery dissection is common at C1-C2 level.
- Dissection of ICA is more common than VA.
- In dissection, periarterial rim of high signal can be seen on T1W.
- Carotid body tumour rapidly enhances, splays the ICA & ECA & shows flow voids on MRI.
- *Cavernous malformation (cavernoma) is a benign vascular hematoma is a lobulated mass containing blood products at different ages. They have popcorn appearance of mixed signal intensity with a hypointense hemosiderin rim with central calcifications.*
- Capillary telangiectasia are poorly demarcated lesions, usually < 1cm, demonstrating “brush like enhancement on T1W post contrast.
- Caput medusa of dilated medullary veins is a feature of developmental venous anomaly (a variant).
- Dilated cortical veins are seen in dural AV fistula.
- Brain AVMs cause early venous drainage.

<i>Drainage:</i>
<i>Superior cerebrum → Superior sagittal sinus</i>
<i>Temporal, parietal, occipital lobes → Transverse sinus</i>
<i>Vein of Galen (straight sinus) → CC, BG, thalami, upper brainstem.</i>

- Intraparotid LN may cause a lump in the cheek.
- Sjogren syndrome causes salivary & lacrimal glands destruction. It leads to RA, dry eyes, mouth, skin & parotid swellings showing punctuate calcification.
- If there is bone erosion of either of the ossicles or tympanic cavity wall, it is mostly cholesteatoma or malignancy.
- Fungal sinusitis shows hyperdense lesion with calcification & bony erosion. Ethmoid sinus is commonly involved.
- Intranasal glioma is present at birth as a soft mass centred at nasal dorsum.
- Pars flaccida cholesteatoma causes erosion of scutum.

Cholesterol granuloma in ear is due to recurrent hemorrhage into the middle ear cavity forming an inflammatory mass. It causes expansion & appears hyperintense on T1 & T2WI.

- Rhabdomyosarcoma affects young children & causes bone destruction. It may affect the orbit & one of the paranasal sinuses.
- Nasopharyngeal carcinoma commonly affects basisphenoid, basiocciput or petrous tip. There may be cranial nerve involvement.
- Expansion & erosion of sinus is due to mucocoele due to recurrent sinusitis. Mucocoele shows peripheral enhancement.
- Ameloblastoma (adamantinoma of jaw) are associated with impacted/unerupted tooth. They occur commonly at angle of mandible.
- Laryngeal adenoid cystic carcinoma does not involve LNs but there is a propensity for nerve invasion & usually there is no history of smoking.
- Laryngeal adenoid cystic Ca is mostly subglottic.
- Sialography is contraindicated in acute infection or inflammation.
- **In sialography → 2ml of contrast is used. Pain, duct rupture & infection are recognized usual complications.**
- Enhancing nasal mass causing widening of pterygopalatine fissure is juvenile angiofibroma.
- Keratocysts (not dentigerous) are multiloculated lucencies (seen in Gorlin Goltz syndrome).
- Anteromedial displacement of biconcave disc of TM joint on mouth opening is seen when patient complains of teeth grinding, jaw stiffness & headache.
- *Multiloculated hypoechoic lesion in parotid with slow growth and no invasion into adjacent structures is pleomorphic adenoma (shows calcification as well).*
- Nasal polyposis causes widening of maxillary ostia & multiple polyps in maxillary sinus & nasal cavity.
- Cholesteatoma causes destruction of ossicles, tegmen tympani, lateral semicircular canal erosion, cerebral abscess, meningitis, labyrinthine fistula & facial nerve palsy.
- Warthin's tumour is a well defined heterogeneous mass with solid & cystic components with vessels in hilar distribution with branches in the septa.
- Ameloblastoma grows in buccolingual direction & are expansile.
- Stage T3 laryngeal Ca causes cord fixation, extension to posterior cricoid area & medial wall of pyriform sinus/pre-epiglottic space.
- Longitudinal fracture of temporal bone can cause dislocation of ossicles resulting in conductive deafness.
- Vertigo, sensoryneural hearing loss & facial nerve palsy occur in horizontal fracture of temporal bone (transverse fracture).
- Radicular cyst develops at the apex of carious tooth.
- Ameloblastoma (soap bubble appearance) are frequently associated with crown of an impacted or unerupted tooth.
- Cholesteatoma is hyperintense on T1 & T2WI.
- Maxillary nerve passes through foramen rotundum.
- Cholesterol granuloma of petrous bone appears bright on T1 & T2.
- Cystic degeneration of tooth enamel before eruption occurs in dentigerous cyst. They are unilocular & related to crown.
- B/L parotid masses in the tail region with solid & cystic components is s/o warthin's tumour.

- Cholesteatoma shows increased signal on DWI but mucocele shows decreased signal.
- Transverse temporal bone fractures result in fracture of labyrinthine part of facial nerve canal.

Juvenile angiofibromas are centred within the sphenopalatine foramen & involve & widen the pterygopalatine fossa with bowing of posterior wall of maxillary sinus with widening of inferior orbital & pterygo-maxillary fissures with osseous erosions. Multiple flow voids are seen.

- Inverted papillomas arise from lateral nasal wall of maxillary sinus (entering nasal cavity) with associated bony remodelling with stippled calcification. A convoluted cerebriform pattern on T2WI or enhanced T1WI is seen.
- Postoperative frontal sinus recess stenosis occurs due to lateralization of middle turbinate, inadequate removal of Agger nasi & frontal recess cells, retained superior portion of uncinate process, osteoneogenesis, scarring or inflammatory mucosal thickening.

Cervical LNs

I – Below mylohyoid

II – Jugulodigastric

III – Deep cervical

IV – Virchow

V – Posterior triangle or accessory spinal

VI – Prelaryngeal/Pretracheal/Delphian nodes

VII – Superior Mediastinal (between CCAs, below top of manubrium).

- Fibromatosis colli (pseudotumour of SCM muscle) occurs in first 2 – 4 wks of life, associated with breech or forceps delivery. Firm, non tender mass is seen in lower 2/3 of SCM. Resolves by 1st year of life.
- Lesion arising from parotid space displaces the fat in parapharyngeal space anteromedially.
- Lesion in masticator space displaces the fat in the parapharyngeal space posteromedially & retropharyngeal space lesion will displace anterolaterally.
- Warthin tumour or adenolymphoma is second most common benign tumour of parotid. Multiple or B/L parotid masses with increased uptake on Tc99 are s/o Warthin tumour. They do not enhance.
- Pleomorphic adenomas are solitary & unilateral. They demonstrate homogenous enhancement.
- Keratocystic odontogenic tumours are benign locally aggressive tumours of mandibular ramus & body & associated with impacted tooth. It can be unilocular or multilocular with cortical expansion & erosion. Associated with Gorlin syndrome.

Separation of all or a part of maxilla from skull base is a Le-Fort fracture. They involve the posterior maxillary buttress at the junction of posterior maxillary sinus & pterygoid plates of sphenoid.

Type I → Maxillary arch moves relative to rest of face & skull.

Type II → Entire maxilla moves.

Type III → Complete craniofacial separation.

- Posterior extension of Le Fort fracture into hard palate results in widening of maxillary arch & dental mal-occlusion.
- First branchial cyst is seen in the region of parotid gland, external auditory canal & angle or mandible.
- Neck lymphangiomas are seen in posterior triangle of neck. They show multiloculation with thin septa.
- A retropharyngeal LN is unilateral but an abscess fills the entire retropharyngeal space from side to side.

- Medullary Ca of thyroid does not show uptake of radioiodine or pertechnetate but frequently concentrates thallium. Papillary tumours concentrate radioiodine, follicular tumours concentrate pertechnetate but not radioiodine & anaplastic tumours show no radioiodine uptake.
- Lymph node calcification is seen in medullary carcinoma of thyroid & in papillary Ca.
- T2 fat suppressed axial images are used for parathyroid adenoma.
- Parathyroid adenoma is well-defined oval hypoechoic / anechoic lesion posterior to the thyroid gland.
- Thyroid cancers are cold on scintigraphy.
- Enlarged thyroid with heterogeneous echotexture and patchy uptake is seen in Hashimoto's thyroiditis.
- Parathyroid adenomas are hyperdense on CT, hypoechoic on USG & T1 ↓ with T2 ↑ on MRI.
- Increased radiotracer uptake is seen in lithium therapy, early thyroiditis, hyperthyroidism & rebound after withdrawal of anti-thyroid medications.
- Hot thyroid nodule is seen in adenomatous hyperplasia & autonomous adenoma. Any hot nodule on TC⁹⁹ should be imaged with I¹²³ to differentiate autonomous & cancerous lesions.
- Parathyroid adenomas do not uptake pertechnetate which is accumulated by thyroid but sestamibi is taken up by both thyroid & parathyroid tissue. Subtraction of these is used to look for adenoma. Delayed images show retention of sestamibi in adenoma (delayed washout).

Staging of thyroid Ca

T1 → Less than 2 cm

T2 → 2 - 4 cm

T3 → > 4cm with no extension or any tumour with limited extension.

T4a → Extension into subcutaneous, larynx, trachea esophagus or recurrent laryngeal nerve

T4b → Extension into prevertebral fascia or encasement of carotid artery / mediastinal vessels

- In pseudohypoparathyroidism, there is low serum calcium with high PTH (due to PTH resistance).

- **Cavernous hemangioma of orbit is most common orbital mass in adults & most common vascular malformation. There are microcalcification & septae within. Remodelling of the bone with painless progressive proptosis is seen.**
- *Grave's ophthalmopathy may also cause superior ophthalmic vein dilatation (B/L).*
- Malignant melanoma in Orbit is always unilateral & may cause retinal detachment, vitreous hemorrhage & glaucoma.
- **Periopic meningiomas are tubular in appearance with tumour enhancement around the non enhancing optic nerve (tram – track sign) & calcification.**
- Orbital pseudotumor is hypointense on T2WI.
- Grave's disease is bilateral & affects old age group.
- "Coke bottle" sign of involvement of extraocular muscles is seen in Grave's disease.
- Enophthalmia due to retrobulbar lesion is breast Ca mets.
- Capillary hemangiomas are most common vascular orbital masses in children. They are usually poorly margined, with diffuse contrast enhancement and curvilinear flow voids.
- **Pseudotumor also causes increased attenuation within the retrobulbar fat with enlarged lacrimal gland.**
- Rhabdomyosarcoma of orbit causes muscle & bone destruction with deviation of eyeball with progressive proptosis.
- *Calcification in an ocular mass in a child less than 3yrs. of age is retinoblastoma. (CT is best).*
- Optic gliomas cause enlargement of optic foramina.
- Retinoblastoma is a poorly enhancing mass with clumped calcification.
- Orbital lymphoma presents as painless orbital swelling. It can mould the bony contour but does not cause bony destruction.
- Cavernous hemangioma is the most common intra orbital tumour in adults, appearing as hyperdense lesion with moulding of the orbital walls. (Similar to orbital lymphoma).
- *Hyperdense extra & intraconal mass with calcified phleboliths and heterogenous enhancement is orbital varix & it causes intermittent proptosis on valsalva or postural change.*
- Orbital meningioma causes straightening of optic nerve.
- Lesion in left optic radiation results in loss of vision of the right half of visual field in both eyes (right homonymous hemianopia). There are two tracts of optic radiation, one goes directly posteriorly & other goes via temporal lobe (Meyer's loop) & is more prone to disruption. Meyer's loop carries upper field (right superior homonymous quadrantonopia).
- Lesion at optic chiasm causes bitemporal hemianopia.
- Triad of carotid cavernous fistula is chemosis, pulsatile exophthalmos & auscultatory bruit.
- **Orbital/ophthalmic varix causes intermittent exophthalmos with dilated superior &/or inferior ophthalmic veins.**
- Oculomotor nerve palsy results in double vision, ptosis & dilated pupil on (affected) one side & constricted on other side. Down & out position of affected eye is also seen. Nucleus of III nerve is in midbrain at superior colliculus & IV at inferior colliculus.
- In Grave's disease → order of involvement of muscles: Inferior rectus, medial rectus, superior rectus, lateral rectus & oblique muscles.
- Optic canal & IAC is not widened by respective meningiomas.
- Extraconal compartment → fat, lacrimal gland & bony orbit. (Pathologies → infections, NF, Adenocarcinoma, lymphoma, adenoid cystic Ca, bone neoplasia & rhabdomyosarcoma)
- Conal compartment → Muscles (Grave's, pseudotumour, Rhabdomyosarcoma, can extend intraconal & intracranial.)
- Intraconal → fat, LNs, Vessels, nerves, optic nerve sheath complex. (Hemangioma, AVM, Meningioma, glioma, lymphoma, venolymphatic malformation)
- Globe → Retinoblastoma, mets, Melanoma.
- **Choroidal melanoma breaks through the basal lamina of choroid & gives a "Cottage Loaf" appearance.**

- Capillary hemangioma of orbit presents in early months of life. They show flow voids.
- Orbital varices show dilated tortuous vessels.
- **Cavernous hemangiomas of orbit occur in adults in retrobulbar intraconal space. They contain phleboliths & show progressive enhancement.**
- *Enhancement is rapid & persistent in capillary hemangioma than lymphangioma.*
- Lymphoma of orbit mostly involves lacrimal glands.
- **Venous lymphatic malformation (lymphangioma) of orbit occurs in childhood, show fluid levels, hemorrhages of varying ages with no feeding vessel or flow void seen. Lesion is extraconal mainly but extends intraconally.**
- **Tolosa Hunt syndrome is an inflammatory process involving cavernous sinus causing ophthalmoplegia and Horner's syndrome.**
- Superior orbital fissure → Nerves III, IV, VI & V1

- Lipoma, epidermoid & low-grade gliomas do not enhance.
- CNS siderosis causes recurrent subarachnoid bleeds due to haemosiderin deposition (hypo on T2 & T2*) on surface of brain, brainstem & leptomeninges. There can be previous history of AVM.
- Melanoma is hyper on T1 & hypo on T2.
- Ground glass appearance of bones is due to FD.
- Tornwaldt's cyst is located in midline between the longus coli muscles in posterior nasopharynx. They may cause halitosis, focal taste & persistent nasopharyngeal drainage.
- *Stages of hematoma* → *Oxyhemoglobin* → *Deoxyhemoglobin* → *Intracellular Methaemoglobin* → *Extra cellular methaemoglobin* → *Hemosiderin*.
- Granulocytic sarcoma (chloromas) is a complication of CML. They present as a solitary lucent lesion in skull, face, orbit & sinuses & they have infiltrative margins with contrast enhancement.
- “Beak” sign refers to curved rim of tissue pointing medially between the ICA & ECA (for second branchial cleft cyst).
- Subdural hygroma is traumatic subdural effusion devoid of blood products (CSF density collection) with no mass effect.
- Basal ganglia calcification is seen in Down's, NF, birth hypoxia, rubella, TORCH, aging, Cockayne's disease, Fahr's disease, TS, Leigh's disease (not Wilson's ds).
- Majority of thyroglossal cysts are infrahyoid & occur within the strap muscles.
- Craniosynostosis is a feature of Arnold Chiari I malformation.
- Increased uptake may be seen in pyramidal lobe in normal individuals.
- Widened sutures, enlarged sella, wormian bones, brachycephaly, delayed dentition, hypertelorism & decreased pneumatization of paranasal sinuses is s/o hypothyroidism.
- Tubercular nodes show matting.
- EDH crosses dural attachments but do not cross sutures.
- Increased peripheral vessels is a feature of malignant lymphnodes.
- RA causes erosion of odontoid peg.
- Basal ganglia is commonest location of toxoplasma.
- PML has a predilection for parieto – occipital region.

Supraglottic Ca → *Level II nodes*.

Subglottic Ca → *III & IV* → *larynx mainly*

Thyroid, hypopharynx & upper esophagus → *IV*

Oral cavity, tongue, nasopharynx → *II*

Salivary glands → *I & II*

Stages of bleed:

Early subacute → *3 – 7 days*

Late subacute → *1 week to months*

- Bronchial Ca (not squamous cell) > Breast Ca > GIT > RCC > Melanoma > Choriocarcinoma causes brain mets.

Peripherally enhancing LNs in neck are seen in TB, mets (usually squamous cell), lymphoma & infection, but features of calcification suggests TB. Medullary & papillary thyroid cancers can also cause calcified LNs with peripheral enhancement.

- For acute stroke, CT window width of 8HU with centre at 32 HU is used. This setting increases the difference between normal & edematous tissue.

- Nasal & paranasal involvement with migratory lung nodules, which can be cavitary are features of Wegener's granulomatosis. Features of vasculitis, T2W hyperintensities, aneurysms, infarcts, hemorrhage, vascular occlusion & stenosis can be seen in brain.
- Axial FLAIR is used for supratentorial lesions of MS. T2WI is used for posterior fossa & spinal cord.
- *Bony structures on CT are seen with window width of 2000 & level of 500.*
- *DWI appear bright for a long time due to "T2 shine through" but ADC returns to normal in 1 – 4wks in case of infarct.*
- Vasospasm & infarction occur following SAH after 72 hours with a peak in 5 – 17 days.
- Malignant LNs are round, hypoechoic, no hilum & show peripheral vascularity.
- Dural venous sinuses lie between two layers of dura.
- Tc^{99m} HMPAO (first choice) & Tc^{99m} ECD are used as regional blood flow imaging tracer for localization of epileptic foci.
- For CNS mets, meningioma & gliomas → Tc pertechnetate, TcDTPA & Tc glucohepatonate are used.
- Facial nerve lies in antero - superior aspect of IAC.
- Breast Ca mets causes nodular pachymeningeal thickening.
- Stroke causes gyriiform enhancement.
- *Tip of odontoid process should be less than 5mm above McGregor line.*
- *Basal angle (between clivus & anterior cranial fossa floor) is less than 140°.*
- Wormian bones should be less than 10 in number & less than 6 x 4mm size.
- Cranial sutures should be less than 10mm at birth, < 3mm at 2yrs. & < 2mm at 3yrs.
- Surface blood vessels appear bright relative to brain parenchyma in hypoxia / drowning on USG.
- Focal neurological signs are seen with SAH.
- CSF on DWI is hypointense.
- PML is associated with AIDS, Cancer, Whipple disease, Sarcoid, TB, autoimmune disease, immunosuppressive therapies & transplant.
- Three Dolan lines are described → orbital, zygomatic & maxillary → All are disrupted by tripod fracture.
- Spinal astrocytomas are most common spinal tumours in children.
- Acute hematoma (3-48 hrs) shows HU value of 60-80 with fluid – fluid levels.
- Hyperacute hematoma (0-2 hrs) shows HU value 40 – 60.
- Subacute hematoma shows high density core with low density periphery (vasogenic edema).

NICE guidelines

- *GCS less than 13 within 2 hrs.*
- *After 2hrs, GCS < 15*
- *Suspected open or depressed fracture within 1hr.*
- *Sign of skull base fracture within 1hr.*
- *Seizure, Amnesia within 1hrs.*
- *Focal deficit, LOC within 1hrs.*
- *Amnesia > 30min. within 8 hrs.*
- *Amnesia or LOC in > 65 year of age*

- T2 fast SE sequence is not used for vertebral mets.
- High risk variables for non traumatic SAH are age > 40 yrs, neck pain, LOC, arrival by ambulance, vomiting & BP > 160/100mm Hg.
- Cerebral lesions that cross midline → GBM, lymphoma, mets, MS, lipoma & stroke.
- In Fahr's disease, serum calcium & phosphorous are normal.

1. Which of the following statements are correct about Thyroglossal duct cyst:

- (a) Is usually located the level of or immediately below the hyoid bone.
- (b) Accounts for 70 % of all congenital neck anomalies.
- (c) Is usually located in the midline.
- (d) Typically presents as a painful neck lump.
- (e) During embryological development, the thyroid gland migrates down behind the hyoid bone.

Answers:

- (a) Correct
- (b) Correct
- (c) Correct
- (d) Not correct
- (e) Not correct

Explanation:

The thyroid gland begins to develop in the third week of gestation as a median outgrowth from the floor of the primitive pharynx at the level of foramen Caecum which lies at the junction of the anterior two thirds and posterior third of the tongue.

It descends down on the floor of the mouth, anterior to the hyoid bone, to reach its final position in the inferior part of the neck by 7th week of gestation.

It typically presents as a painless lump. A painful lump can occur if there is imposed infection.

2. The following skull foramina transmit the named cranial nerves:

- (a) Superior orbital fissure – VIth cranial nerve.
- (b) Foramen ovale – orbital division of Vth cranial nerve
- (c) Inferior orbital fissure – IIIrd cranial nerve.
- (d) Internal auditory meatus – VIIth cranial nerve.
- (e) Foramen rotundum – maxillary division of Vth cranial nerve.

Answers:

- (a) Correct
- (b) Not correct
- (c) Not correct
- (d) Correct
- (e) Correct

Explanation:

The inferior orbital fissure transmits the infraorbital nerve (i.e. continuation of the second division of the fifth cranial nerve) and emissary veins that drain the inferior ophthalmic vein to the pterygoid plexus.

The foramen ovale transmits the mandibular division of fifth cranial nerve and the accessory meningeal artery.

The internal auditory meatus contains the seventh and eighth cranial nerves as well as the internal auditory artery.

3. Which of the following statements are correct about Haemangioblastoma (HB):

- (a) The most common site is the spinal cord.
- (b) Is the most common primary cerebellar tumor in adults.
- (c) Most patients with multiple HBs have von Hippel-Lindau disease
- (d) Most HBs have homogeneously solid appearance on MRI.
- (e) Most HBs do not enhance after intravenous gadolinium.

Answers:

- (a) Not correct
- (b) Correct
- (c) Correct
- (d) Not correct
- (e) Not correct

Explanation:

HB is a vascular tumour of the CNS. It occurs most often in the cerebellum, where it is the most common primary neoplasm in adults. HBs are less commonly seen in the spinal cord and rarely occur elsewhere in the CNS .

Cerebellar hemangioblastomas are traditionally classified into 4 types. Type one is a simple cyst without macroscopic nodule. Type II (most common) is a cyst with a mural nodule. Type III are solid tumours and type IV are solid tumours with small internal cysts.

4. Which of the following statements are correct about Neurofibromatosis type 1 (NF-1):

- (a) Plexiform neurofibromas are pathognomonic for NF-1
- (b) Has an incidence of around 1 in 3000
- (c) 1-10 % of neurofibromas undergo malignant transformation.
- (d) Anterior vertebral scalloping is characteristic.
- (e) Pulmonary parenchymal abnormalities are seen in up to 20 % of cases.

Answers:

- (a) Correct
- (b) Correct
- (c) Correct
- (d) Not correct
- (e) Correct

Explanation:

Neurofibromatosis shows posterior scalloping and enlargement of intervertebral foramen due to dural ectasia and neurofibroma of nerve roots.

Other features are ribbon ribs, bowing of long bones, pseudoarthrosis and cystic osteolytic lesions.

5. Which of the following statements are correct about MRI features of multiple sclerosis:

- (a) Corpus callosum lesions are best visualized on axial view.
- (b) T2W spin echo is superior to FLAIR for posterior fossa lesions.
- (c) Whiter matter lesions are more conspicuous than grey matter lesions.
- (d) Ring enhancement on post gadolinium T1W MRI suggests an alternative diagnosis.
- (e) 10-15 % of patients have lesions limited to the spinal cord.'

Answers:

- (a) Not correct
- (b) Correct
- (c) Correct
- (d) Not correct
- (e) Correct

Explanation:

MS plaques are classically seen in periventricular and juxtacortical white matter. Involvement of corpus callosum is characteristic and is best seen on Sagittal images.

Both solid and ring enhancement may occur. Incomplete ring enhancement is seen in larger MS plaques.

6. Which of the following statements are correct about Chiari malformation:

- (a) In normal physiology, cerebellar tonsils descend with increasing age.
- (b) Cerebellar tonsils laying 3 mm below the foramen magnum is a normal finding in the second decade.
- (c) Is usually associated with other congenital brain anomalies.
- (d) Is rarely associated with spinal cord lesions.
- (e) Is associated with Klippel-Feil anomaly (fused cervical vertebrae).

Answers:

- (a) Not correct
- (b) Correct
- (c) Not correct
- (d) Not correct
- (e) Correct

Explanation:

In normal physiology, cerebellar tonsils ascend with increasing age. In Chiari 1, there is downward displacement of tonsils below the foramen magnum by more than 5 mm.

It is usually associated with spinal cord and skull base abnormalities rather than other brain anomalies.

7. Which of the following statements are correct about Tuberous sclerosis:

- (a) Cortical tubers enhance following intravenous contrast in the majority of cases on CT.
- (b) Subependymal nodule enhancement indicates malignant transformation.
- (c) Subependymal giant cell astrocytoma is seen in the 10-20 % of cases.
- (d) Renal angiomyolipomas are seen in 5-10% of cases.
- (e) Cardiac rhabdomyoma is a recognized manifestation.

Answers:

- (a) Not correct
- (b) Not correct
- (c) Correct
- (d) Not correct
- (e) Correct

Explanation:

In tuberous sclerosis, the cortical tubers are seen in 95% of patients although enhancement is seen in less than 5% of

tubers.

30-80% of all subependymal nodules enhance after intravenous contrast but it does not indicate malignant transformation.

Renal Angiomyolipomas are seen in 40-80% of cases of tuberous sclerosis.

8. Which of the following statements are correct about Subarachnoid hemorrhage (SAH):

- (a) A normal CT within 24 h of onset of symptoms excludes SAH.
- (b) The most common etiology is trauma.
- (c) Focal interhemispheric blood suggests an anterior communicating artery aneurysm rupture.
- (d) Blood in the 4th ventricles is a typical feature of posterior communicating artery aneurysm rupture.
- (e) SAH detected on CT more than 1 week after the initial hemorrhage suggests recurrent bleeding.

Answers:

- (a) Not correct
- (b) Not correct
- (c) Correct
- (d) Not correct
- (e) Correct

Explanation:

A ruptured intracranial aneurysm is the most common aetiology and accounts for 72% of cases of SAH.

A normal CT within 24 hours can exclude SAH in 90% of cases but not always.

4th ventricle blood is common with posterior inferior cerebellar artery aneurysms.

9. Which of the following statements are correct about Congenital cholesteatoma of the middle ear:

- (a) 80 % of middle ear cholesteatoma are congenital in origin
- (b) Facial nerve palsy is a recognized complication.
- (c) The anterosuperior aspect of the middle ear is a typical location.
- (d) MRI is the imaging modality of choice.
- (e) Is associated with poorly pneumatized mastoid air cells:

Answers:

- (a) Not correct
- (b) Correct
- (c) Correct
- (d) Not correct
- (e) Not correct

Explanation:

Congenital cholesteatoma accounts for 2% of all cholesteatomas and are clinically differentiated from acquired as they occur behind an intact tympanic membrane in patients without a history of tympanic perforation or otorrhoea.

CT provides more accurate information regarding the mass and bony structures than MRI.

Well pneumatized mastoid air cells are seen in congenital cholesteatomas than in acquired.

10. Characteristic features of Herpes simplex encephalitis (HSE) in adults include:

- (a) Unilateral cerebral involvement
- (b) Infection by HSV type II
- (c) Untreated infection has a mortality rate of 50-70 %
- (d) Gyriform enhancement on contrast enhanced CT
- (e) High signal in the cingulate gyrus on T2W MRI.

Answers:

- (a) Not correct
- (b) Not correct
- (c) Correct
- (d) Correct
- (e) Correct

Explanation:

Neonatal herpes is caused by HSV II and herpes in adults is caused by HSV I.

In adults, herpes initiates as unilateral involvement of limbic system (temporal lobes, insular cortex, subfrontal area and cingulate gyri) but eventually follows bilaterally.

CT performed early in the course of illness may be normal or only subtly normal.

11. Concerning the submandibular space:

- (a) Anteriorly there is free communication between the submandibular space and the sublingual space.
- (b) The superficial lobe of the submandibular gland lies inferolateral to mylohyoid.
- (c) Intraglandular ducts are seen as linear hypoechoic structures on ultrasound.
- (d) Stenson's duct exits in the floor of the mouth at the base of the frenulum.
- (e) As with the parotid gland, normal lymph nodes are found within the submandibular gland.

Answers:

- (a) Not correct
- (b) Correct
- (c) Not correct
- (d) Not correct
- (e) Not correct

Explanation:

Submandibular and sublingual space communicates posteriorly.

Intraglandular ducts are seen as linear hyperechoic structures on USG.

Wharton's duct exits in the floor of mouth at the base of frenulum.

Normal lymph nodes are not found in the submandibular gland.

12. Which of the following statements are correct about Pyogenic brain abscesses:

- (a) Most commonly occur secondary to a generalised septicaemia.
- (b) Typically occur at the corticomedullary junction.
- (c) On CT have a smooth regular wall with relative thinning of the lateral wall.
- (d) Are more common in the occipital lobes than the frontal lobes.
- (e) The most common causative organism is Staphylococcus.

Answers:

- (a) Not correct
- (b) Correct
- (c) Not correct
- (d) Not correct
- (e) Not correct

Explanation:

32% of the pyogenic brain abscesses could be due to generalised septicaemia for example, from a lung abscess or pneumonia. However 41% occur secondary to extension from paranasal sinus infection.

The occur most commonly in the frontal lobes than in the occipital lobes.

On CT there is a relative thinning of the medial wall due to would blood supply of white matter which leads to the rupture of the abscess into the ventricular system.

Most common causative organism is streptococcus.

13. Regarding subarachnoid haemorrhage:

- (a) It occurs secondary to arteriovenous malformation in 10% of cases.
- (b) It is associated with subdural haemorrhage in 20% of cases.
- (c) 15-20% of patients will have multiple aneurysms.
- (d) MRI is the best modality for detecting early subarachnoid haemorrhage.
- (e) Cerebral vasospasm is maximal from 48 to 72 hours after the event.

Answers:

- (a) Correct
- (b) Not correct
- (c) Correct
- (d) Not correct
- (e) Not correct

Explanation:

Subarachnoid haemorrhage is associated with subdural haemorrhage in 5% of the cases.

Initially subarachnoid haemorrhage may not be seen on MRI, hence CT is used for earlier detection of subarachnoid haemorrhage.

Cerebral vasospasm occurs at 5-17 days after the event of subarachnoid haemorrhage.

14. Concerning orbital mass lesions:

- (a) 50% of patients with optic nerve glioma have neurofibromatosis Type 1.
- (b) On MRI, retinoblastoma usually enhances following intravenous gadolinium.
- (c) Rhabdomyosarcoma of the orbit presents with rapid onset proptosis and visual loss.
- (d) Inflammatory orbital pseudotumour involves the muscle tendons.
- (e) 60-80% of children with retinoblastoma have bilateral tumours.

Answers:

- (a) Not correct
- (b) Correct
- (c) Not correct

- (d) Correct
- (e) Not correct

Explanation:

25% of the patients with optic nerve glioma have neurofibromatosis type I however only 15% of the patients with neurofibromatosis type I have optic nerve glioma.

In the rhabdomyosarcoma of the orbit, there is rapid onset of proptosis however vision is spared.

Only 20-40% of retinoblastomas occur bilaterally in children.

15. Which of the following statements are correct about pineal region masses:

- (a) Pineoblastomas are categorised as part of the primitive neuroectodermal tumour group.
- (b) Pineoblastomas usually show poor enhancement.
- (c) Germinomas are 10 times more common in males than females.
- (d) Pineal germinomas are associated with Parinaud's syndrome.
- (e) Germinomas are hypodense on unenhanced CT.

Answers:

- (a) Correct
- (b) Not correct
- (c) Correct
- (d) Correct
- (e) Not correct

Explanation:

Pineoblastomas show avid enhancement on post contrast images.

The isodense to hyperdense on CT.

They are similar to medulloblastoma as the both are part of neuroectodermal tumour group.

16. Regarding differentiation between epidermoids and dermoids of the brain:

- (a) Epidermoids more closely resemble cerebrospinal fluid on MRI.
- (b) Both are formed due to enclosure of ectodermal elements when the neural tube closes.
- (c) Epidermoids are more common.
- (d) Epidermoids may become malignant.
- (e) Fat-fluid level on imaging is highly suggestive of dermoids.

Answers:

- (a) Correct
- (b) Correct
- (c) Correct
- (d) Not correct
- (e) Correct

Explanation:

Dermoids and epidermoids are benign lesions and slow-growing and never become malignant.

17. Concerning cerebellopontine angle masses:

- (a) Meningiomas are the second commonest cerebellopontine angle mass.
- (b) Meningiomas commonly cause expansion of the internal auditory canal.
- (c) Meningiomas are typically brighter on T2 weighted MRI than T1.
- (d) Epidermoids have the same signal as cerebrospinal fluid on MRI.
- (e) Acoustic neuromas usually enhance poorly on post-contrast scans.

Answers:

- (a) Correct
- (b) Not correct
- (c) Not correct
- (d) Correct
- (e) Not correct

Explanation:

Meningiomas do not cause expansion of internal auditory canal.

They are usually less bright on T2-weighted MRI.

Acoustic neuromas usually enhance avidly on postcontrast images.

18. Concerning the differences between cortical contusions and diffuse axonal injury (DAI):

- (a) Patients with cortical contusions are much less likely to have had loss of consciousness.
- (b) Patients with cortical contusions usually have a better prognosis.
- (c) Cortical contusions are more commonly haemorrhagic than DAI.
- (d) CT is the best modality to diagnose acute DAI.
- (e) Most patients with DAI suffer immediate loss of consciousness.

Answers:

- (a) Correct
- (b) Correct
- (c) Correct
- (d) Not correct
- (e) Correct

Explanation:

Diffuse axonal injury are seen much better on MRI than CT.

On MRI diffusion weighted images and susceptibility weighted images are most.

19. Concerning differences between primary CNS lymphoma and toxoplasmosis:

- (a) Subependymal extension across the corpus callosum is more likely to occur in toxoplasmosis.
- (b) High signal on T2 weighted MRI favours lymphoma.
- (c) Toxoplasmosis is more frequently multiple.
- (d) Ring enhancement following contrast administration favours lymphoma.
- (e) The lesions are usually smaller in lymphoma.

Answers:

- (a) Not correct
- (b) Not correct
- (c) Correct
- (d) Not correct
- (e) Not correct

Explanation:

CNS lymphoma shows subependymal extension across the corpus callosum. CNS lymphoma and toxoplasmosis lesions can be smaller as well as large and should not be differentiated on basis of size.

Toxoplasmosis shows high signal on T2-weighted MRI and shows ring enhancement on post contrast images.

20. Which of the following statements are correct about cerebellar medulloblastoma:

- (a) Is more common in females.
- (b) Is the commonest paediatric brain tumour.
- (c) 75% of patients are less than 15 years of age.
- (d) Calcification occurs in 40-50%.
- (e) Is associated with basal cell carcinomas.

Answers:

- (a) Not correct
- (b) Not correct
- (c) Correct
- (d) Not correct
- (e) Correct

Explanation:

Medulloblastoma is the second commonest paediatric tumour, second only to astrocytoma however it is the commonest paediatric posterior fossa tumour.

It occurs more commonly in males.

Calcifications are seen in up to 20% of patients. Cystic changes or necrosis are seen in up to 50%. They are usually hyperdense on CT. On MRI, they are usually hypointense to grey matter on T1 weighted images and variable appearance on T2-weighted images. Oedema is almost always seen.

21. Concerning the differentiation between optic nerve glioma and optic nerve sheath meningioma:

- (a) A widened optic canal is seen more commonly in optic nerve glioma.
- (b) Optic nerve sheath meningioma affects an older age group.
- (c) Optic nerve glioma typically shows the 'tram-track' sign on enhancement.
- (d) Calcification is more commonly seen with optic nerve glioma.
- (e) Optic nerve glioma may cause orbital hyperostosis.

Answers:

- (a) Correct
- (b) Correct
- (c) Not correct
- (d) Not correct
- (e) Not correct

Explanation:

Optic nerve sheath meningioma affects older age usually middle aged woman.

Calcification can be seen with optic nerve meningioma but is rarely seen with optic nerve glioma.

Optic nerve sheath meningioma typically shows the tram track sign on enhancement.

Optic nerve sheath meningioma causes orbital hyperostosis.

22. Concerning intracranial lymphoma:

- (a) It is usually a Hodgkin's lymphoma.
- (b) Secondary lymphoma more commonly involves the leptomeninges than the brain parenchyma.
- (c) It is usually hypodense on unenhanced CT.
- (d) It is normally high signal on T2 weighted images.
- (e) Toxoplasmosis may mimic lymphoma in the brain.

Answers:

- (a) Not correct
- (b) Correct
- (c) Not correct
- (d) Not correct
- (e) Correct

Explanation:

CNS lymphoma are usually B-cell non-Hodgkin's lymphoma. They are usually hyperdense on unenhanced CT.

They show intermediate to low signal on T2-weighted MR images.

23. Concerning posterior fossa tumours in children:

- (a) 80% of medulloblastomas arise from the vermis.
- (b) Juvenile pilocytic astrocytomas are the second commonest posterior fossa tumour.
- (c) Juvenile pilocytic astrocytomas usually calcify.
- (d) Brainstem gliomas mostly affect the midbrain.
- (e) Ependymoma seeds to the CSF in 30% of cases.

Answers:

- (a) Correct
- (b) Correct
- (c) Not correct
- (d) Not correct
- (e) Correct

Explanation:

Juvenile pilocytic astrocytomas are the second commonest posterior fossa tumours after medulloblastoma. Only 20% of these calcify.

Brainstem gliomas mostly affect the pons.

24. Concerning intraorbital pathology:

- (a) The lacrimal gland is the most frequently involved orbital structure in idiopathic inflammatory pseudotumour.

- (b) Idiopathic inflammatory pseudotumour is unilateral in 40-50% of cases in adults.
- (c) Optic nerve glioma is the commonest tumour arising from the optic nerve sheath complex.
- (d) Use of steroids differentiates idiopathic inflammatory pseudotumour from lymphoma.
- (e) Thyroid eye disease is the most common disorder affecting the orbit.

Answers:

- (a) Correct
- (b) Not correct
- (c) Correct
- (d) Not correct
- (e) Correct

Explanation:

Pseudotumour is unilateral in 80% of the cases in adults.

Use steroids in differentiating pseudotumour from lymphoma is not useful.

25. Which of the following statements are correct about Juvenile angiofibromas:

- (a) Biopsy is contraindicated.
- (b) Almost exclusively affects females.
- (c) Widening of the pterygopalatine fossa is only seen in advanced cases.
- (d) Is the commonest benign nasopharyngeal tumour.
- (e) Invasion of the sphenoid sinus occurs in up to two thirds of cases.

Answers:

- (a) Correct
- (b) Not correct
- (c) Not correct
- (d) Correct
- (e) Correct

Explanation:

Juvenile angiofibromas affects only males.

Widening of pterygopalatine fossa is seen in 90% of the cases.

Due to significant vascularity and the risk of haemorrhage, biopsy is always contraindicated.

26. Regarding sonography of abnormal neck lymph nodes:

- (a) Malignant nodes have sharp borders, whereas benign nodes usually have unsharp borders.
- (b) Regardless of the primary tumour, the presence of a metastatic node reduces the 5-year survival rate by 50%.
- (c) Metastatic nodes are usually hyperechoic when compared to the adjacent muscles.
- (d) Nodal calcification is common in metastatic nodes from follicular carcinoma of the thyroid.
- (e) The presence of peripheral vascularity is highly suggestive of malignancy.

Answers:

- (a) Correct
- (b) Correct
- (c) Not correct

- (d) Not correct
- (e) Correct

Explanation:

Metastatic nodes are usually hyperechoic compared to the adjacent muscles. However metastatic nodes from papillary carcinoma of thyroid tend to be hyperechoic.

Nodal calcification is seen in metastatic nodes from papillary and medullary carcinoma thyroid.

27. Concerning sellar masses:

- (a) Craniopharyngioma usually contains bright areas on T1 weighted images.
- (b) Craniopharyngioma is more commonly calcified in adults than children.
- (c) Craniopharyngioma is the commonest childhood sellar mass.
- (d) Craniopharyngioma normally has a regular outline on imaging.
- (e) Rathke's cleft cyst develops from squamous epithelium in the sphenoid sinus.

Answers:

- (a) Correct
- (b) Not correct
- (c) Correct
- (d) Not correct
- (e) Not correct

Explanation:

Craniopharyngiomas are 80% calcified in children and 40% calcified in adults.

They usually have lobulated and irregular margins.

Rathke's cleft cyst develops from the anterior lobe of the pituitary gland.

28. Regarding Tornwaldt's cysts, which of the following are correct?

- (a) They do not enhance after contrast on computed tomography (CT).
- (b) They are midline in location.
- (c) They are usually low signal on T1 weighted MRI sequence.
- (d) They erode bone.
- (e) They typically arise caudal to Rathke's pouch cyst.

Answers:

- (a) Correct
- (b) Correct
- (c) Not correct
- (d) Not correct
- (e) Correct

Explanation:

Tornwaldt cyst usually show high signal on T1-weighted MR images due to high protein content in the cyst.

They do not cause bony erosion. They are rarely calcified and usually appear hypodense on CT.

29. Which of the following are correct regarding dermoid and epidermoid cysts?

- (a) Epidermoid cysts are usually unilocular.
- (b) High signal on T1 weighted MRI is diagnostic of a dermoid cyst.
- (c) Dermoid cysts may be distinguished from lipoma on T1 weighted MRI.
- (d) The most common location of dermoid cyst in the head and neck is the orbit.
- (e) Epidermoid cysts have high signal on T2 weighted MRI scans.

Answers:

- (a) Correct
- (b) Not correct
- (c) Not correct
- (d) Correct
- (e) Correct

Explanation:

Dermoid cysts are usually hyperintense on T1-weighted MR images but this signal characteristic can be seen in other lesions example lipoma. Hence their differentiation is not recommended on T1-weighted MR images.

Dermoid cysts are usually seen in orbit, oral and nasal cavities however orbit is the most common site.

30. Concerning imaging of the larynx, which of the following are correct?

- (a) Cricoid cartilage typically fractures in at least two places following trauma.
- (b) More than 90% of laryngeal cancers are squamous cell tumours.
- (c) The arytenoids usually dislocate rather than fracture during trauma.
- (d) Glottic cancers typically arise from the anterior half of the vocal cord.
- (e) AT presentation, subglottic tumours are frequently non-operative.

Answers:

- (a) Correct
- (b) Correct
- (c) Correct
- (d) Correct
- (e) Correct

Explanation:

Following trauma, the arytenoids dislocate anteriorly and superiorly .

Squamous carcinoma of larynx occurs most commonly at glottic location.

Subglottic tumours are rare and involves trachea, oesophagus and thyroid and hence have a poor prognosis.

31. Regarding thyroid carcinoma, which of the following are correct?

- (a) Lymph node spread occurs in 90% of patients with papillary cell carcinoma.
- (b) Follicular carcinoma accounts for 60% of all thyroid carcinomas.
- (c) Early haematogenous spread occurs in follicular carcinoma.
- (d) Anaplastic carcinoma demonstrates no radioiodine uptake.
- (e) Multiple endocrine neoplasia (MEN) type IIb may be associated with medullary cell carcinoma.

Answers:

- (a) Not correct
- (b) Not correct
- (c) Correct
- (d) Correct
- (e) Correct

Explanation:

Papillary carcinoma of thyroid accounts for 60%, follicular 20%, anaplastic 10% and medullary 5% .

Metastasis to nodes from papillary carcinoma occurs in 40% of adult cases and 90% of child cases.

32. Which of the following are correct about fibrous dysplasia?

- (a) Facial bones are rarely involved.
- (b) Exophthalmos is a recognised feature.
- (c) There is an association with Cushing's syndrome.
- (d) In the calvaria, the frontal bone is most commonly involved.
- (e) It effects the maxilla more frequently than the mandible.

Answers:

- (a) Not correct
- (b) Correct
- (c) Correct
- (d) Correct
- (e) Correct

Explanation:

Fibrous dysplasia typically presents before the age of 30 years. The most common sites of involvement of the ribs, cranial, facial bones and femur and tibia.

33. Which of the following are correct regarding lesions of the jaw?

- (a) Simple bone cysts are more common in the maxilla than the mandible
- (b) A dentigerous cyst develops around an unerupted tooth.
- (c) Dentigerous cysts are associated with basal cell naevi.
- (d) Radicular cysts arise in relation to the tooth apex.
- (e) Ameloblastoma occurs more frequently in the maxilla.

Answers:

- (a) Not correct
- (b) Correct
- (c) Correct
- (d) Correct
- (e) Not correct

Explanation:

Bone cysts are unilocular and well-defined. They may be trauma-related and typically arise in the body of mandible.

About 75% of neuroblastomas arise in the mandible, usually at the angle. They may be multilocular and are cystic expansile lesions, which often recur after excision.

34. Which of the following are correct regarding trauma of the neck?

- (a) The most common site of vertebral artery injury in blunt trauma to the neck is at the C5/C6 level.
- (b) Multiple levels are involved in 20% of fractures of the cervical spine.
- (c) In blunt neck trauma, dissection of the extracranial carotid artery is asymptomatic in 10% of cases.
- (d) Fracture of the odontoid peg most commonly involves the tip.
- (e) Barium swallow has poor sensitivity for pharyngoesophageal injury in blunt neck trauma.

Answers:

- (a) Not correct
- (b) Correct
- (c) Not correct
- (d) Not correct
- (e) Not correct

Explanation:

Vertebral artery injury is usually due to stretching and occurs most frequently at the C1-C2 level. Vertebral artery injuries are more common than carotid artery injuries in blunt neck trauma.

Dissection of the extracranial carotid artery is asymptomatic at presentation in 50% of the cases. Diagnosis may be delayed.

35. Which of the following are correct regarding Klippel-Feil syndrome?

- (a) Vertebral fusion involves the bodies and neural arches.
- (b) Coarctation is a feature.
- (c) It is associated with Sprengel's shoulder deformity.
- (d) Conductive hearing loss is a feature.
- (e) Lymphoedema is a feature.

Answers:

- (a) Correct
- (b) Correct
- (c) Correct
- (d) Correct
- (e) Correct

Explanation:

Klippel Feil syndrome is also associated with syringomyelia, platybasia, clubfoot, hemivertebrae and congenitally heart diseases.

Vertebral fusion may involve the craniovertebral junction and cervicothoracic junctions.

36. Which of the following are correct regarding fractures of the cervical spine?

- (a) Flexion teardrop fractures involve the superior endplate of the vertebral body.
- (b) Hangman's fracture is a bilateral fracture of the neural arches of C2.
- (c) Unilateral interfacet joint dislocation is a stable injury.
- (d) Clay shoveler's fracture is stable.
- (e) In bilateral interfacetal dislocation, there is anterior translocation of the involved vertebra by at least 50% of the diameter of the subjacent vertebrae.

Answers:

- (a) Not correct
- (b) Correct
- (c) Correct
- (d) Correct
- (e) Correct

Explanation:

Flexion teardrop fractures involve avulsion of the anterior inferior corner, usually of the C2 vertebral body with displacement of the involved vertebral body into the spinal column. There is destruction of all soft tissue structures with an associated acute anterior cervical cord syndrome.

37. Which of the following are correct regarding salivary gland calculi?

- (a) Most submandibular stones are radio-opaque.
- (b) Submandibular stones typically occur within Wharton's duct.
- (c) Asymptomatic Intraductal parotid stones can be an incidental finding on CT.
- (d) More than 80% of salivary gland stones occur in the submandibular gland.
- (e) About 25% of patients have multiple stones.

Answers:

- (a) Correct
- (b) Correct
- (c) Correct
- (d) Correct
- (e) Correct

Explanation:

About 10% to 20% of salivary gland calculi occur in parotid gland.

About 80% of submandibular stones and 60% of parotid stones are radiopaque.

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