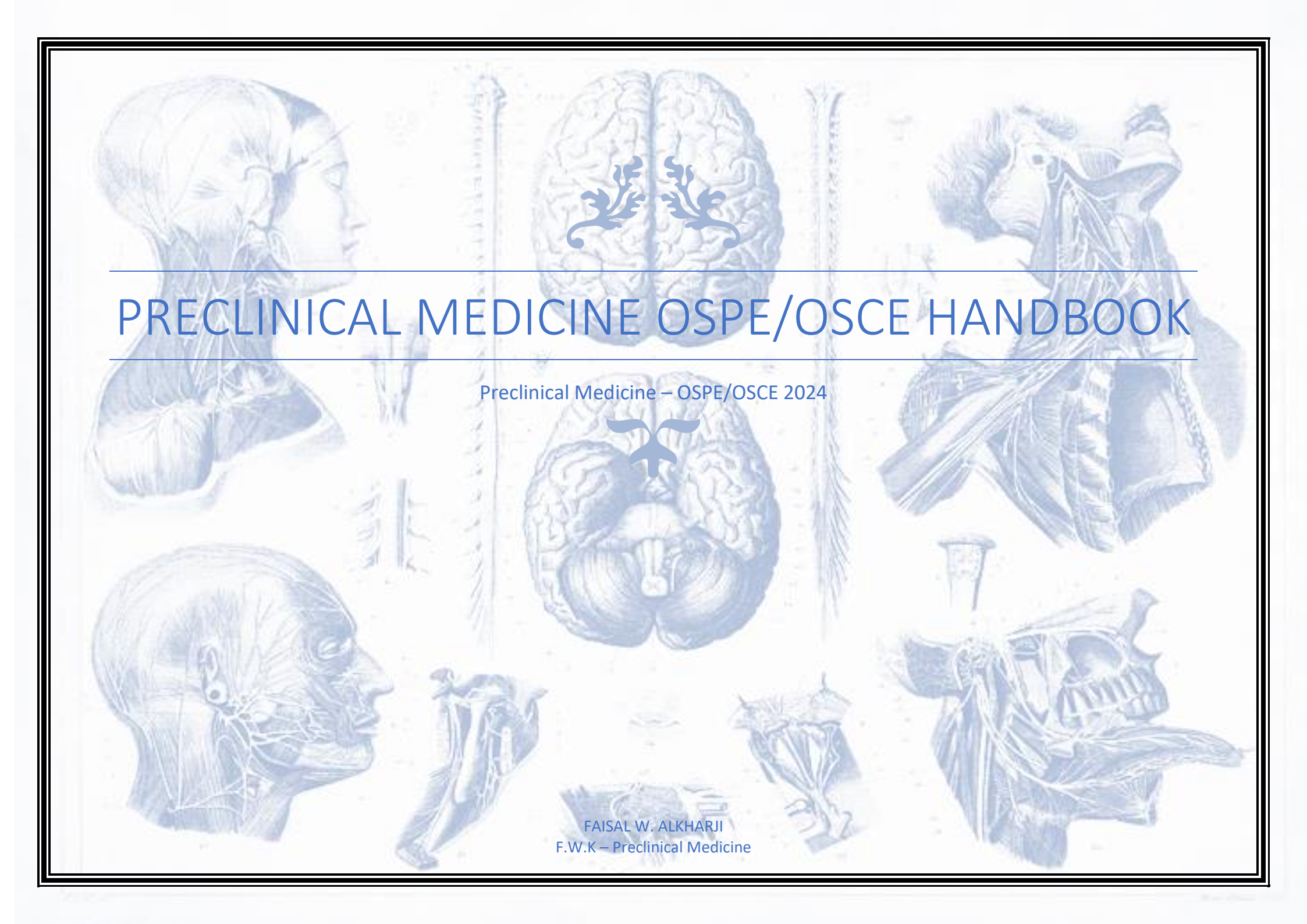

PRECLINICAL MEDICINE OSPE/OSCE HANDBOOK

Preclinical Medicine – OSPE/OSCE 2024

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F.W.K – Preclinical Medicine

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اللهم يا معلّم موسى علّمني، ويا مفهم سليمان فهّمني، ويا مؤتي لقمان الحكمة وفصل الخطاب آتني الحكمة وفصل الخطاب

. - اللهم اجعل ألسنتنا عامرة بذكرك، وقلوبنا بخشيتك، وأسرارنا بطاعتك، إنك على كل شيء قدير، حسبنا الله ونعم الوكيل

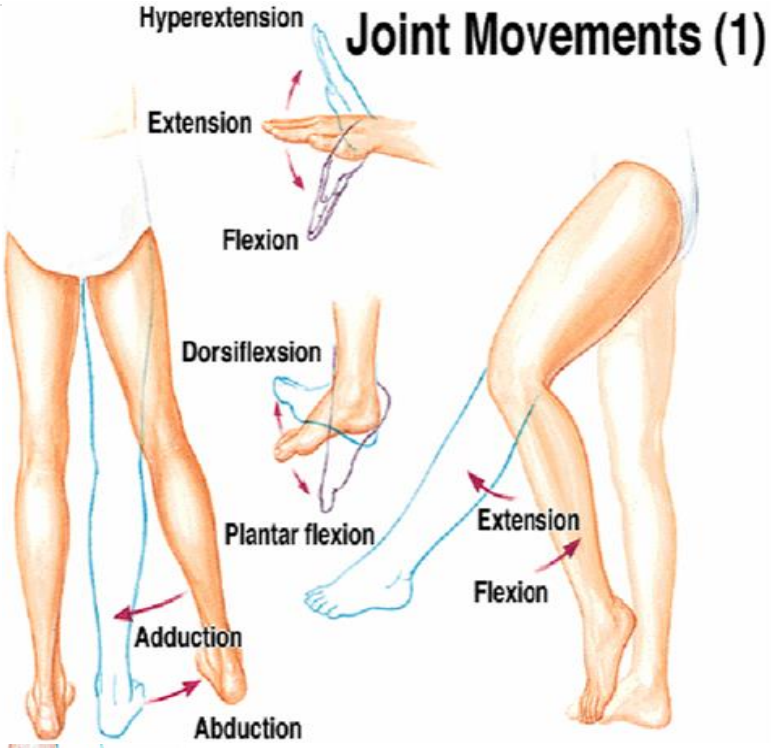
Good luck! :)

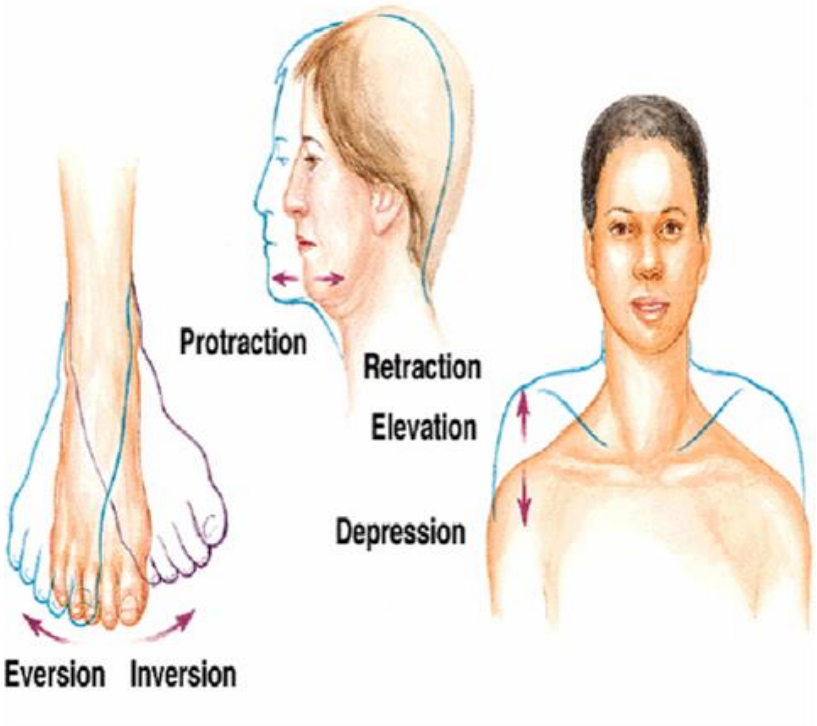
ANAT

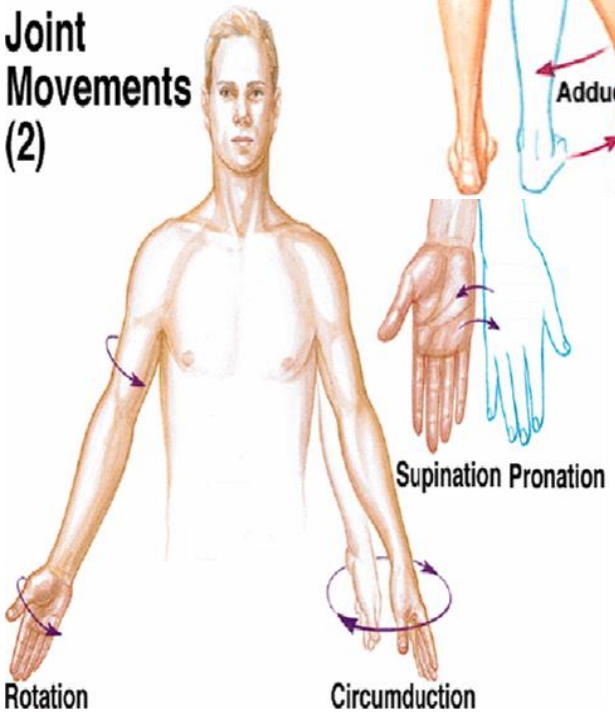
Anatomy

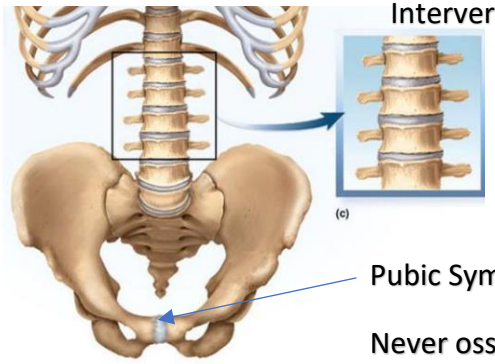
Terms related to the Movement:

Term	Meaning
Extension	**Increasement** in the angle between two articulating bones
Flexion	**Decreasement** in the angle between two articulating bones
Adduction	Movement **towards** median plane
Abduction	Movement **away** from median plane
Medial Rotation	Movement along the vertical axis **towards** median plane
Lateral Rotation	Movement along the vertical axis **away** median plane
Circumduction	**Successive** movement of **Flexion**, **Abduction**, **Extension**, and **abduction**









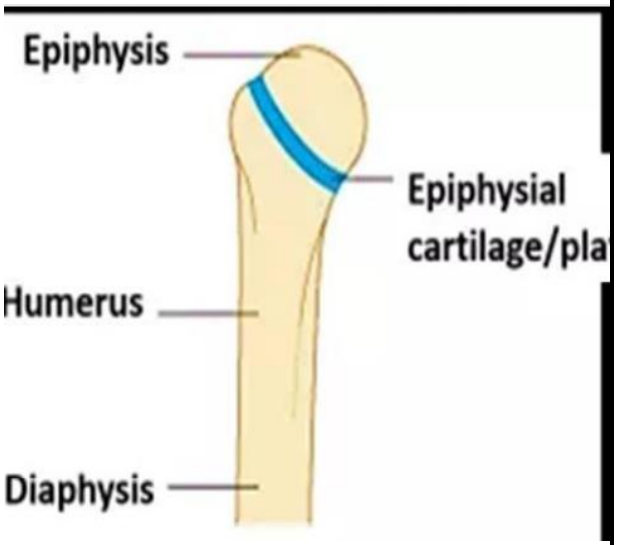
Never ossify by old age

Patella

Sesamoid bone

Knee joint is hinge joint

Contains Patella | Menisci | Knee Joint




Femur

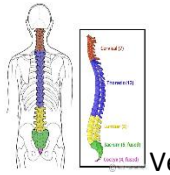
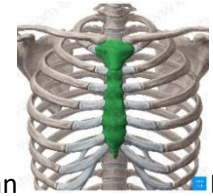

Fibula


Ulna


Upper Humerus – Lower Radius (left) & Ulna (right)

#1 According to position

Axial Skeleton

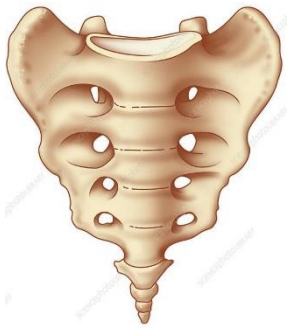
 Skull  Hyoid bone  Verterbral Column  Ribs & Sternum – ossify by old age

Appendicular skeleton – Upper limb bones

 Clavicle  Scapula  Humerus  Radius & Ulna 

Carpal – Metacarpal - Phalanges

Appendicular skeleton – lower limb bones

 Hips 

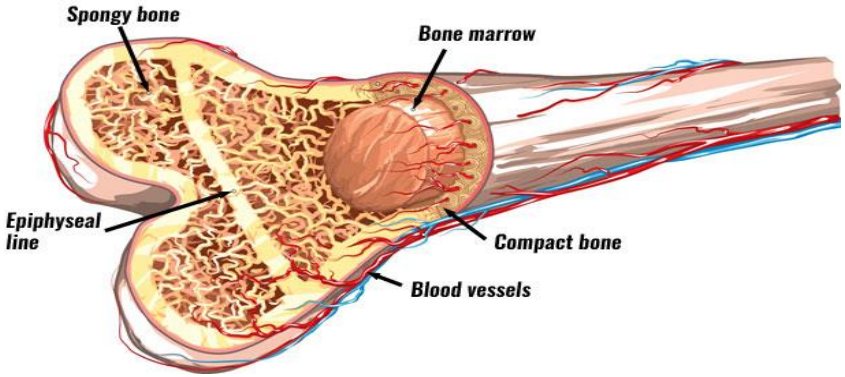
Sacrum & Coccyx in base

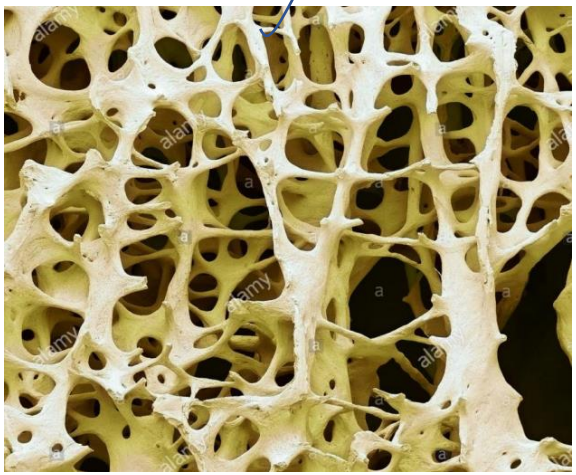
 Femur  Tibia & Fibula

Tarsal – Metatarsal - Phalanges

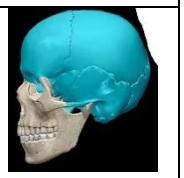
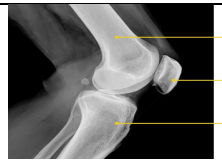
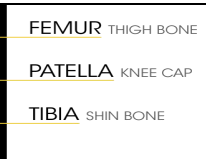
#2 According to Structure

1. Compact bone	2. Spongy bone
Dense, Ivory like	Bone trabeculae & spaces
In the cortex of the long bones	In the epiphysis of the long bones





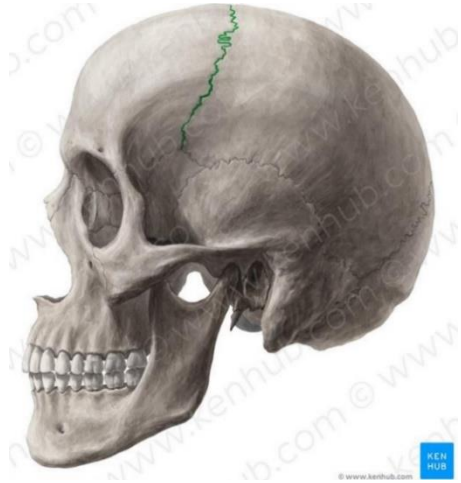
#3 According to Shape

#	Type of shape	Example
1	Long bone	Bones of arms, forearm & thigh, legs Radius & Ulna | Tibia & Fibula | Humerus | Femur
2	Short bone	Tarsal & carpal bones Feet & Hands bones  Carpal – Metacarpal - Phalanges Tarsal – Metatarsal - Phalanges 
3	Irregular bone	Vertebrae & base of skull & Coccyx - Sacral & Hips    
4	Flat bone	Scapula & skull cap bones  
5	Sesamoid bone	Patella & pisiform   
6	Pneumatic bone	Skull bones & bones which contains air spaces 

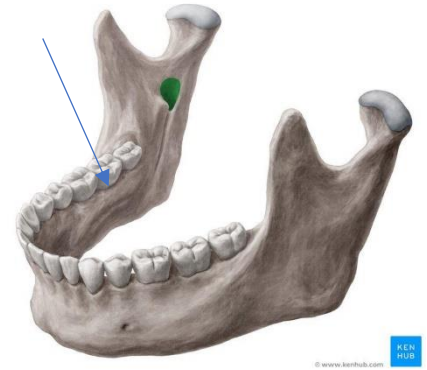
Types of fibrous joints

#	Type	Fact #1	Fact #2	Examples	Reference
1	***Sutures***	2 bones are connected together by **small amount** of fibrous tissue	**Ossified** in old age	Bones of the **skull Sutures**	
2	***Gomphoses***	Fixed to its boney socket by a fibrous membrane (Periodontal ligament)	**Some movement** while chewing	**Root** of the **tooth**	
3	***Syndesomosis***	2 bonest are connected together by **Excessive amount** of fibrous tissue	**Most movable** of fibrous joints	**Inferior tibiofibular joints** & **Interosseous membrane** ~between radius and **ulna & tibia**, and **fibula**	

Sutures



Gomphoses



Syndesomosis

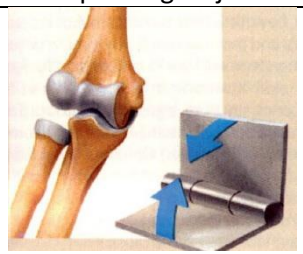
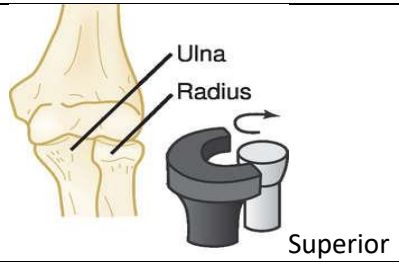
Found in between

Radius & Ulna

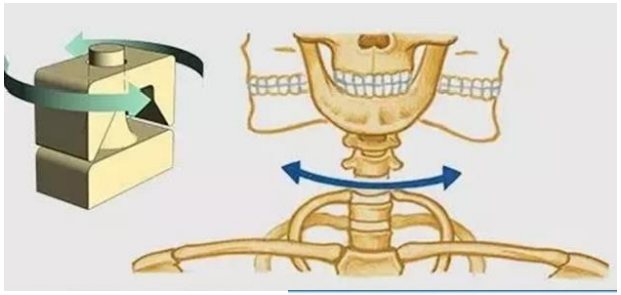
Tibia & Fibia

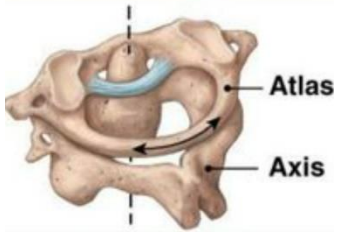
(Red Arrow)

Uni-Axial Joint

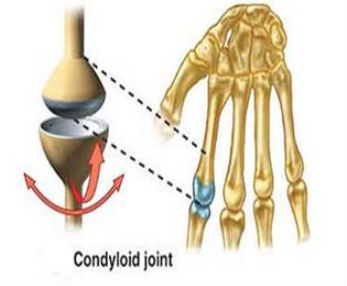
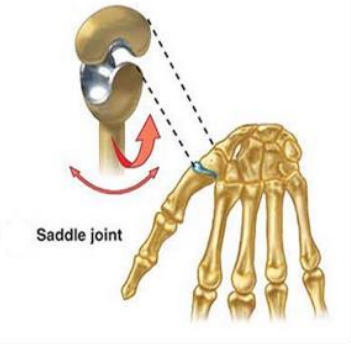
	Hinge Joints	Pivot Joints
Shape	Articulating surfaces – resemble hinge of door	Central bony pivot – surrounded by a ring
Example	Elbow & knee joint **|** Interphalangeal joints	Superior radio-ulnar joint **|** Atlanto-axial joint
Reference		

Atlanto-Axial Joint



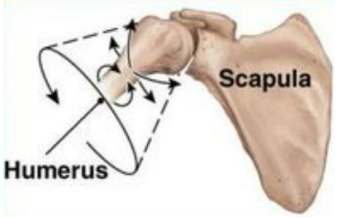


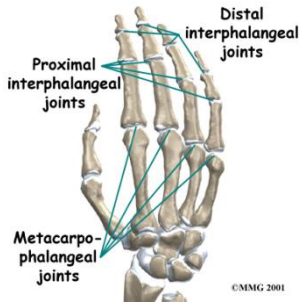
1. Bi-axial joint

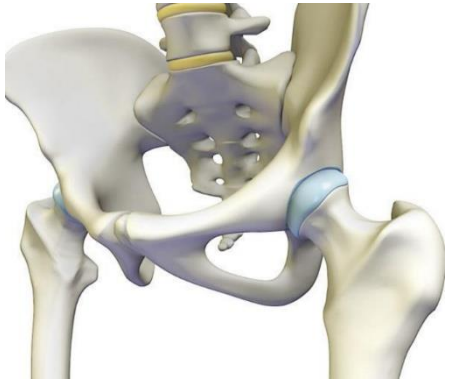
	Condyloid (Ellipsoid) Joints	Saddle Joints
Shape	Oval convexity – received in elliptical concavity	Of articulating surfaces one is **concavo-convex** & other is **Convexo-concave**
Example	Wrist joint **|** Metacarpophalangeal joints	Carpometacarpal joint of the thumb
Reference		

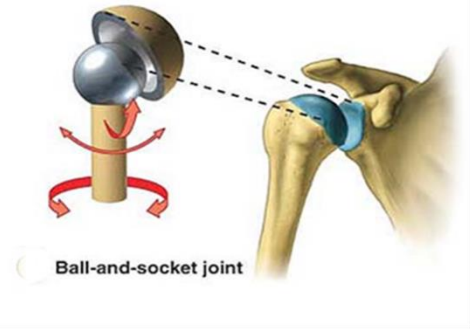
Poly-Axial Joint

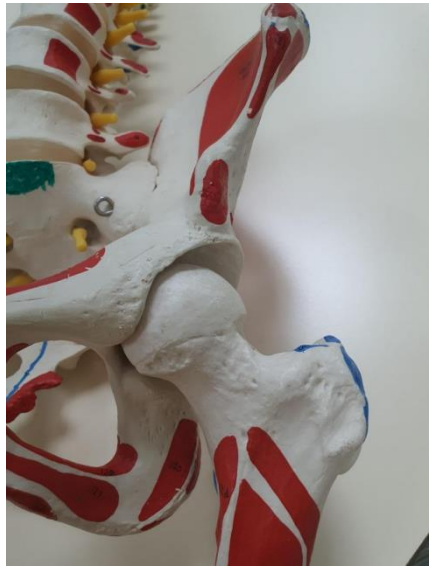
	Ball & socket Joints
Shape	Rounded head – received into cup-shaped concavity
Example	Hip & Shoulder joints



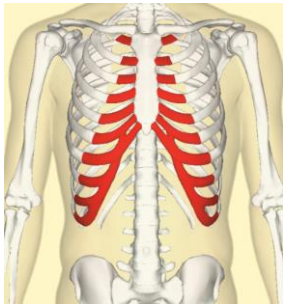
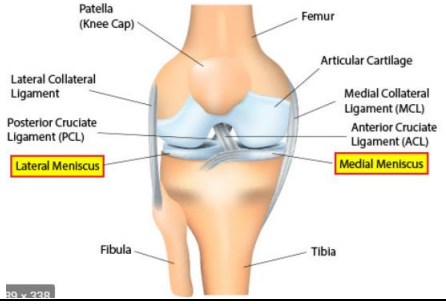
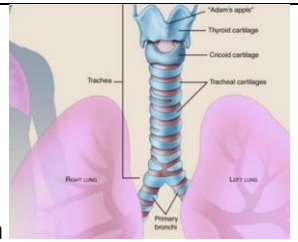








Cartilages sites

1. Hyaline – No nerve or blood vessels	2. Elastic is: elastic fiber with collagen	3. Fibro
Articular 	Ear pinna 	Intervertebral disc  In between the bones
Costal 	Epiglottis	Menisci 
Trachea 		

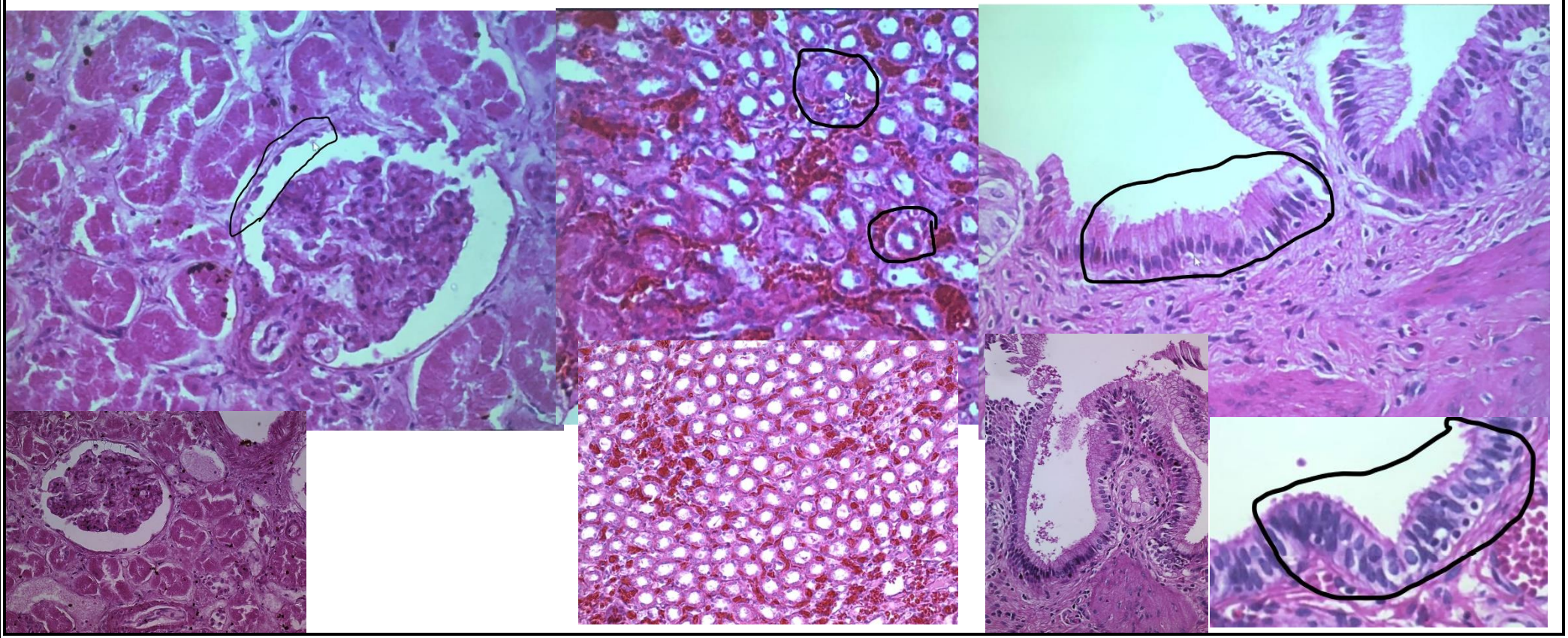
Upper Humerous – Lower Radius & Ulna

Histology

Histology Lab – 1

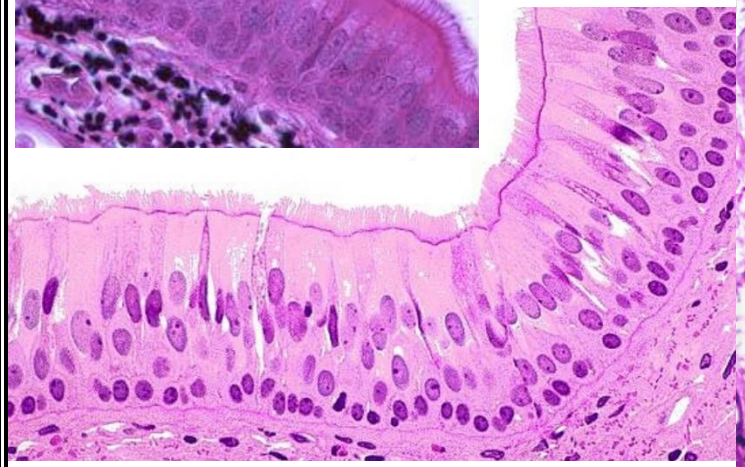
Types of Surface Epithelium – Simple Epithelium

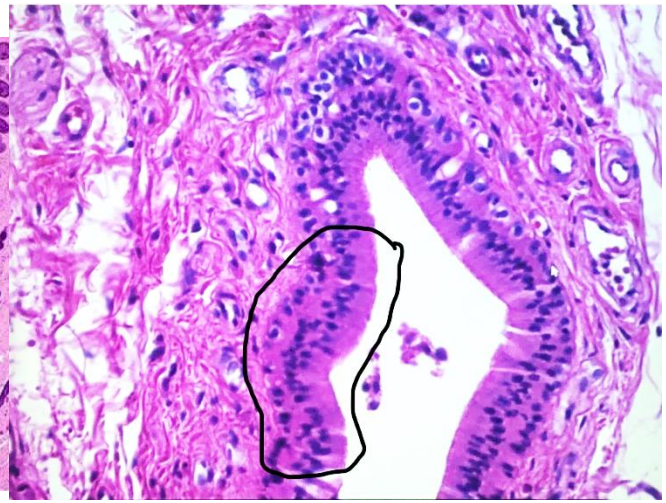
	Simple Squamous	Simple Cuboidal	Simple Columnar
Founded in	Bow's man Capsule	Kidney Tubules	1. Gallbladder 2. Fallopian Tube (Ovi-duct) cilia looks like lashes
Cell shape	Wider than tall	Tall As wide	Taller than Wide
Nucleus Shape	Disk Like (flat) Nucleus	Spherical Nucleus	Oval Nucleus
Layer Type	One Layer	One Layer	One Layer

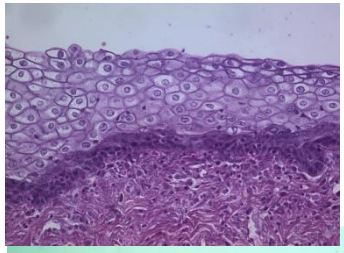


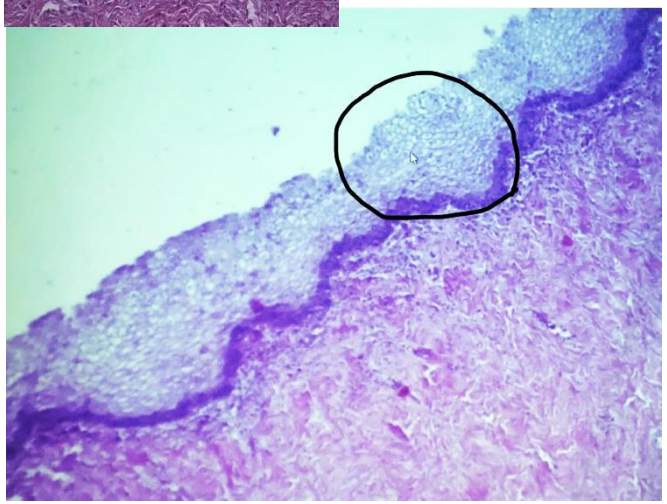
Types of Surface Epithelium – Stratified Epithelium

	Pseudostratified Columnar ciliated	Stratified Columnar	Stratified squamous non-keratinized
Founded in	Trachea	Large Ducts in Glands	
Cell shape	All cells touch basement membrane Single layer of cells with different heights	Superficial layer is columnar	Cells are not dead – Wider than taller
Nucleus Shape	Nuclei are on different levels		All cell have nuclei – Disc shaped nucleus
Layer Type	Cilia – single layer – appear stratified but arent	More than one layer	More than one layer



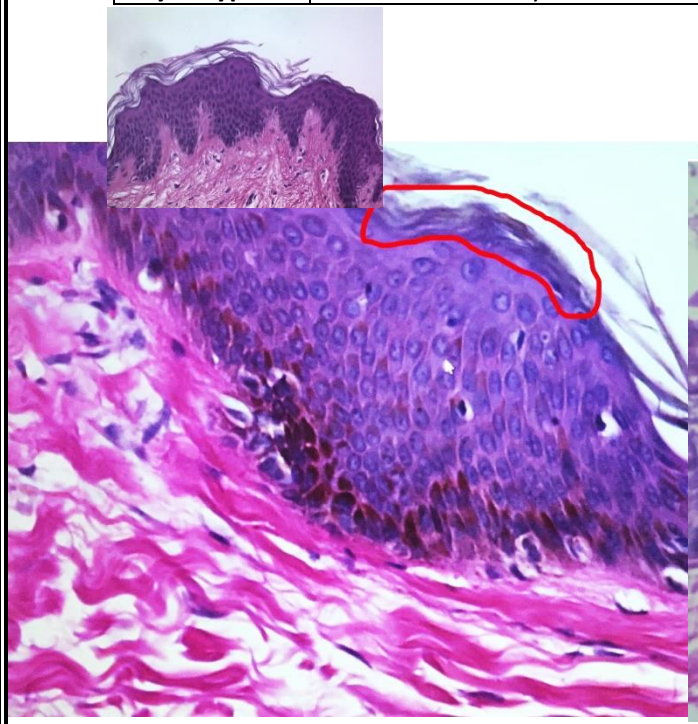


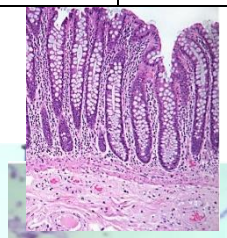


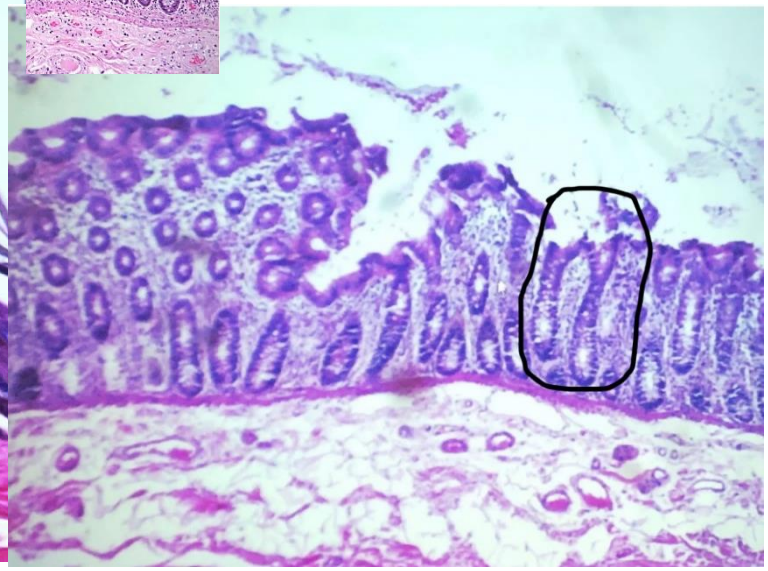


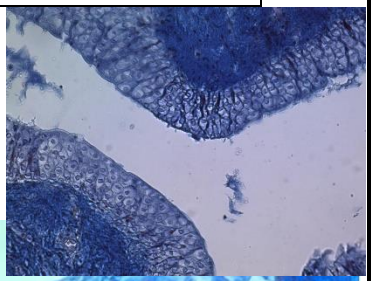
Types of Surface Epithelium - Transitional

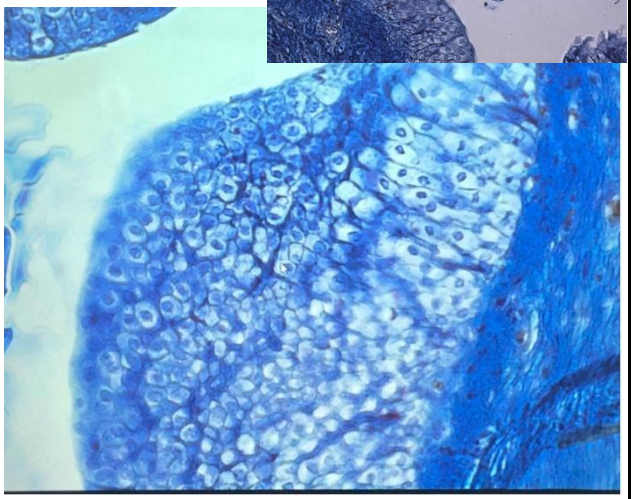
	stratified squamous keratinized	Glandular Epithelium	Transitional
Founded in		Simple epithelium	Urinary System
Cell shape	Cells are dead & Keratinized – Wider than tall	Goblet cells appear white	Dome shaped surface - Basal cells are cuboidal
Nucleus Shape	Keratinized cells have no nuclei Disc shaped nucleus (red) is superficial Keratinized layer	Tubular Unbranched Duct	
Layer Type	More than one layer		More than one layer







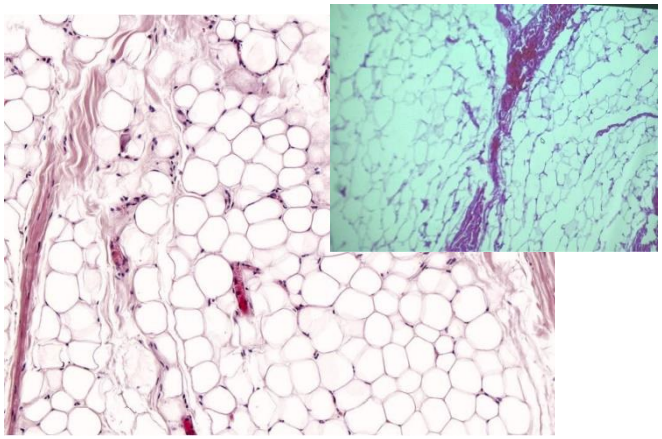


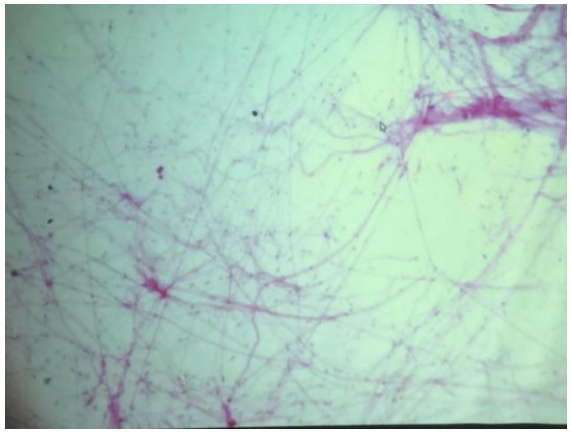


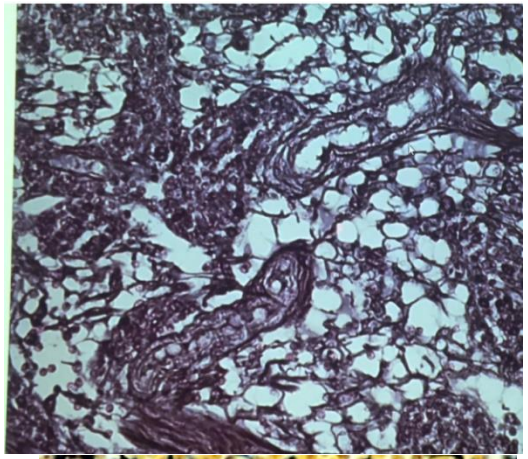
Histology Lab – 2

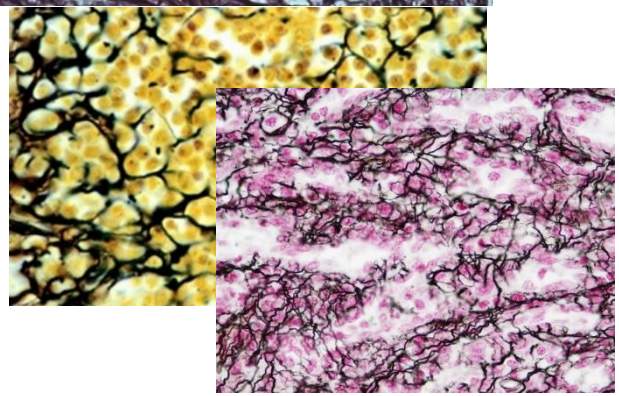
True (proper) C.T. – Loose Connective Tissues

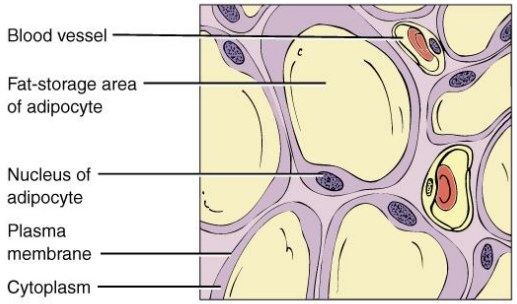
	Adipose Tissue	Areolar tissue	reticular tissue
Founded in	White Adipose Connective Tissues		
	"signet ring" appearing fat cells.	Loose fibers	black threads appearance (silver impregnation stain)
	Adipocytes (lipid filled cells or spaces)	less fibers & more cells	has reticular cells
	eccentric nuclei (pushed to the side)	has all three fiber types	has reticular fiber



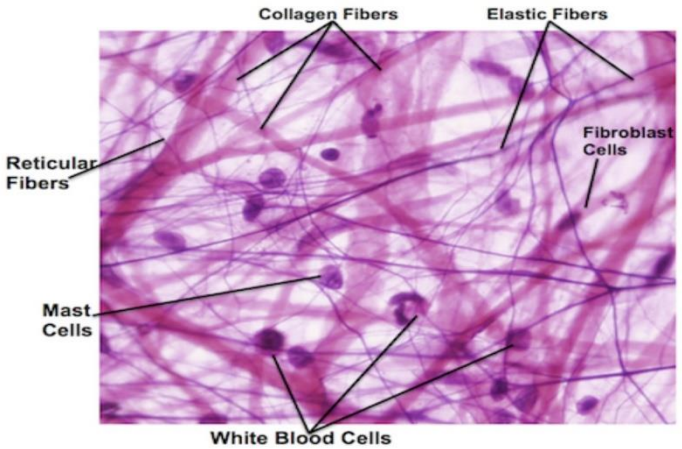






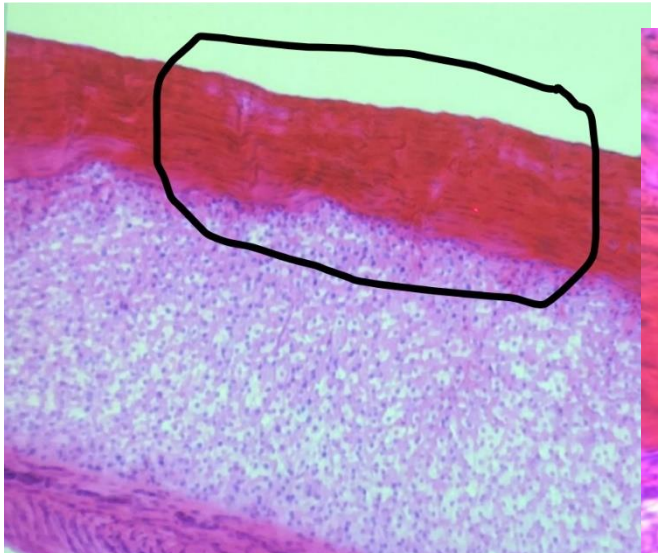


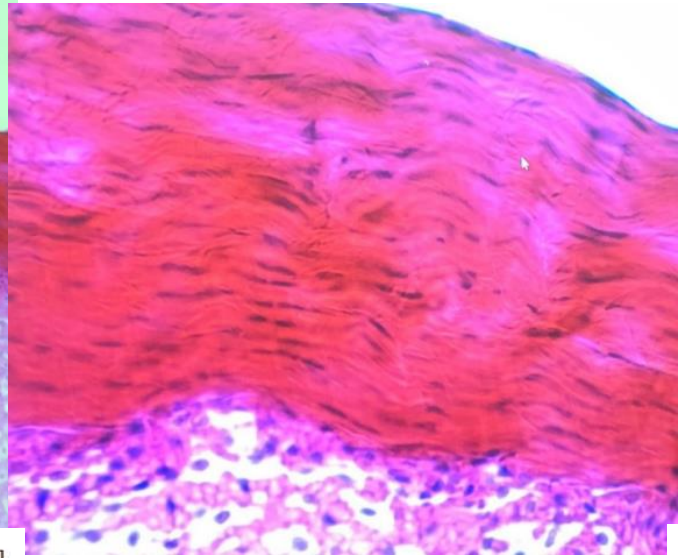
Adipose tissue

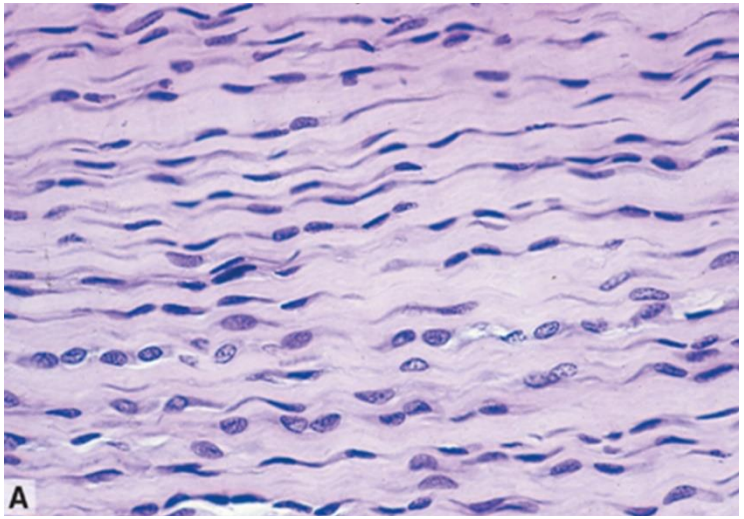


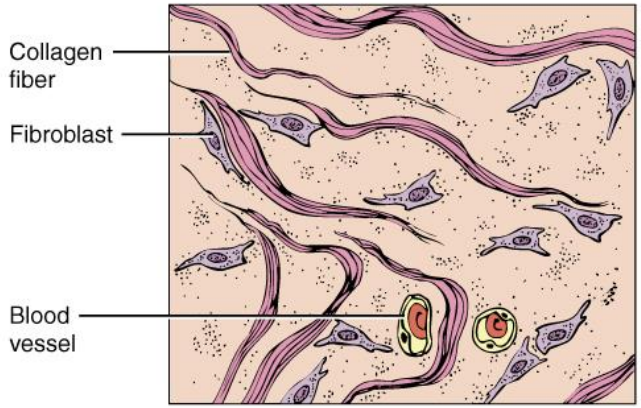
Dense Connective Tissue

	Tendons of Dense C.T
Type of fiber	Compact dense fibers
Arrangement	Regularly arranged & dense collagen fibers
Composition	More fibers & less cells
Fibroblast	Fibroblast is present

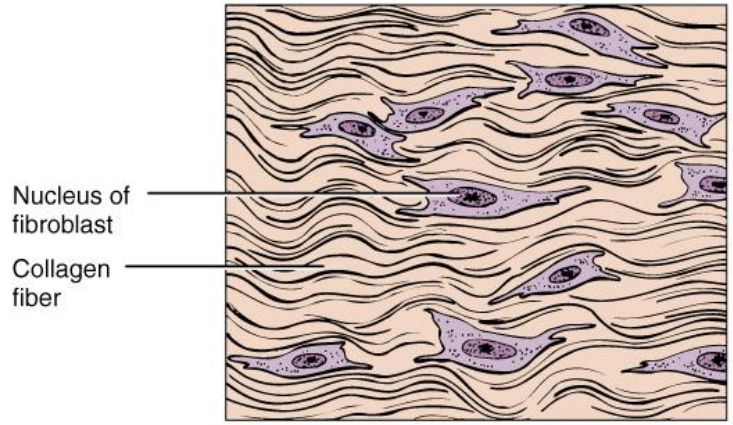








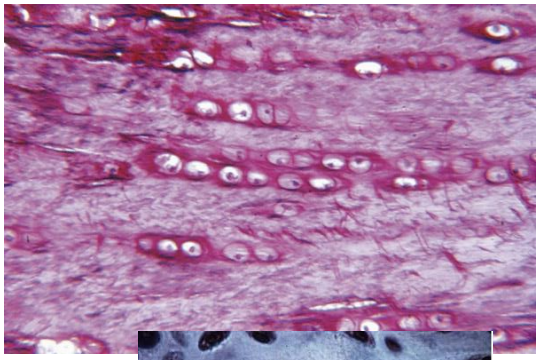
Dense irregular connective tissue

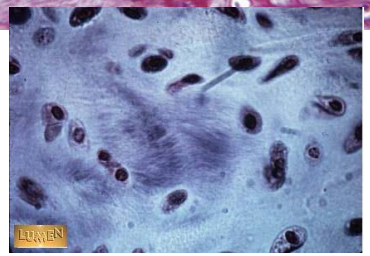


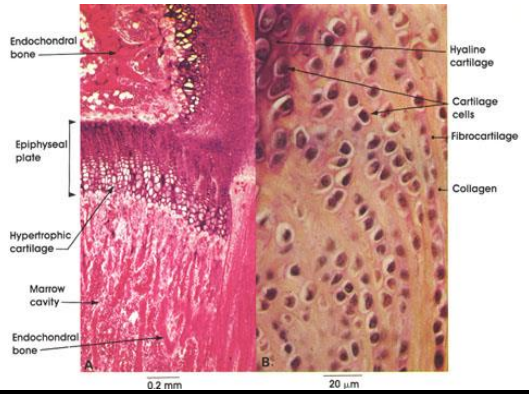
Dense regular connective tissue

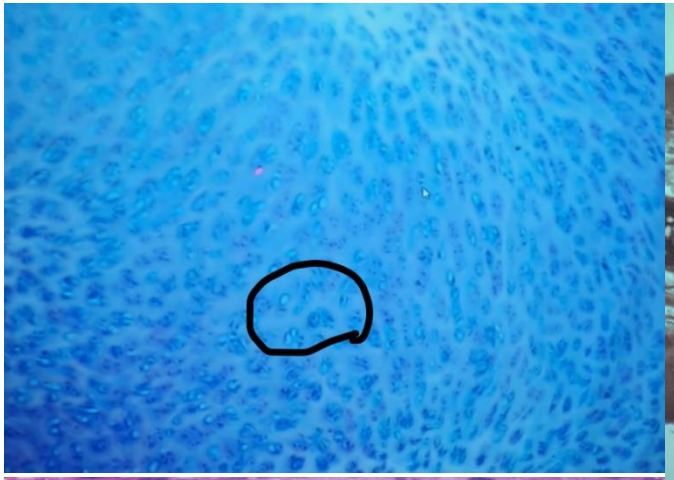
Supportive Connective Tissue

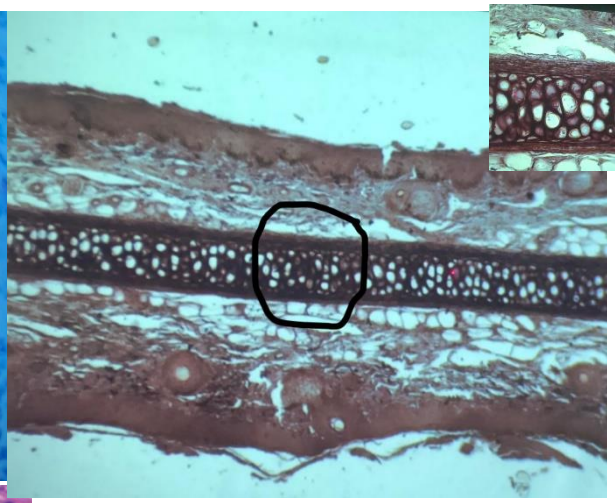
	Fibro Cartilage	Hyaline Cartilage	Elastic Cartilage
Founded in	Dense connective tissue in Tendons, mensei, intervertebral disc, and intraarticular disc	Supportive Connective Tissue in Articular, Costal, Trachea	Ear pinna Epiglottis
	Compact fibers	Chondrocytes inside lacunae	Chondrocytes inside lacunae
	Regularly arrange & dense collagen fibers	Invisible fibers (glassy appearance)	Elastic fibers are seen on circle reference
	More fibers & less cells	Contains Perichondrium on each ends	Contains Perichondrium on each ends
		Collagen Fibers	Collagen & Elastic fibers

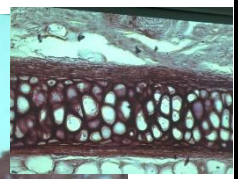


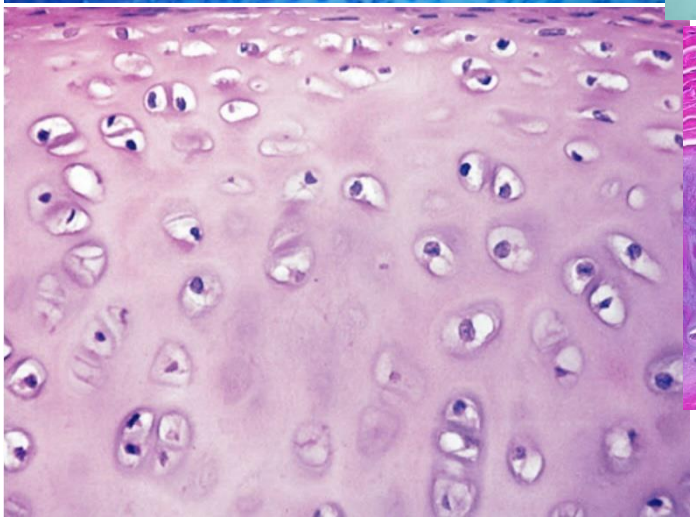


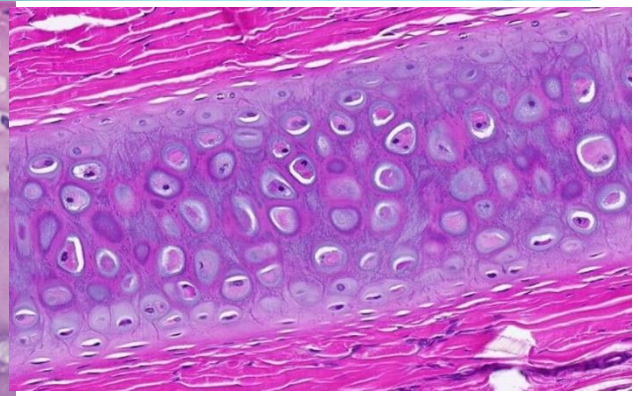






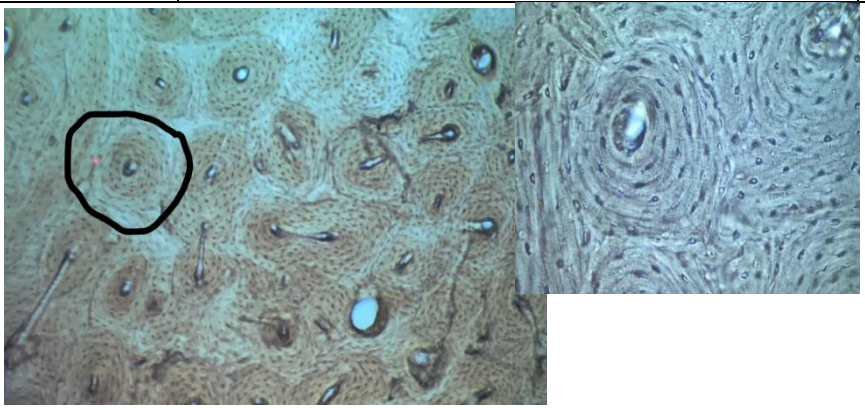






Bone Type

	Compact Bone	Spongy Bone
Founded in	In context of long bones	Rods of bone – is “Trabeculae”
	Haversian system – Contains Lamellae (Outer, interstitial & inner circumferential lamellae)	No Haversian System – Contains Lamellae
	No spaces	Spaces
	Osteocytes inside lacunae	Osteocytes inside lacunae



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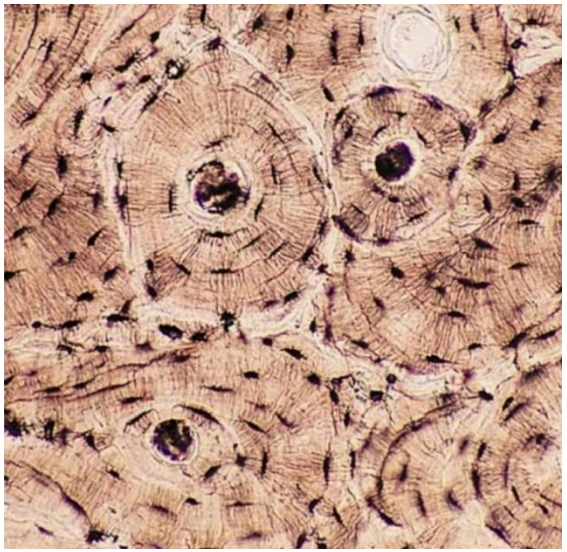
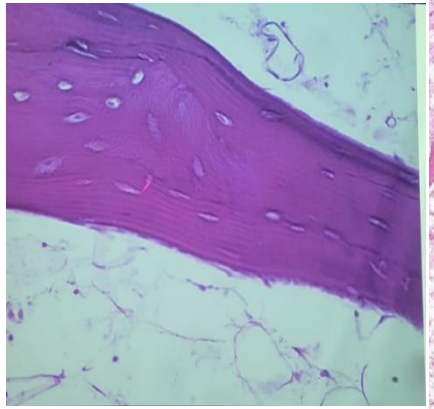
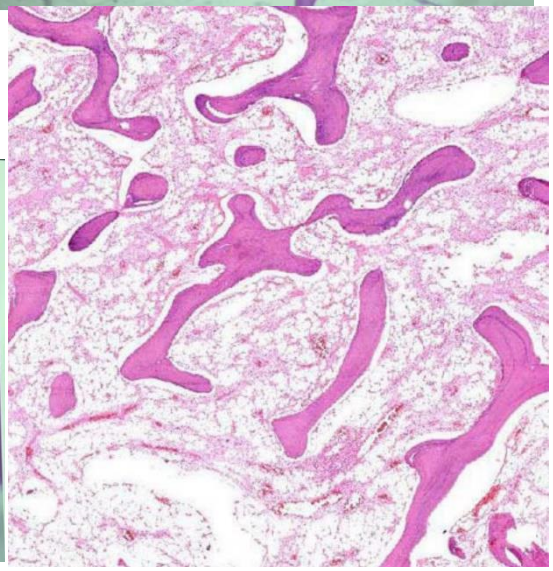


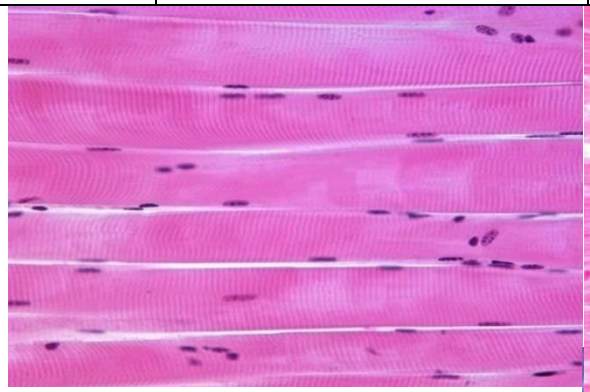


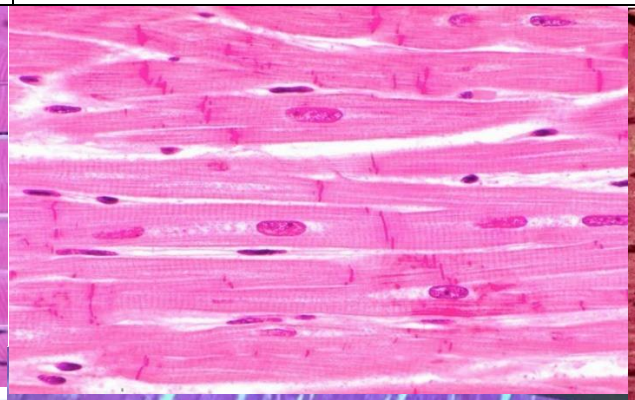


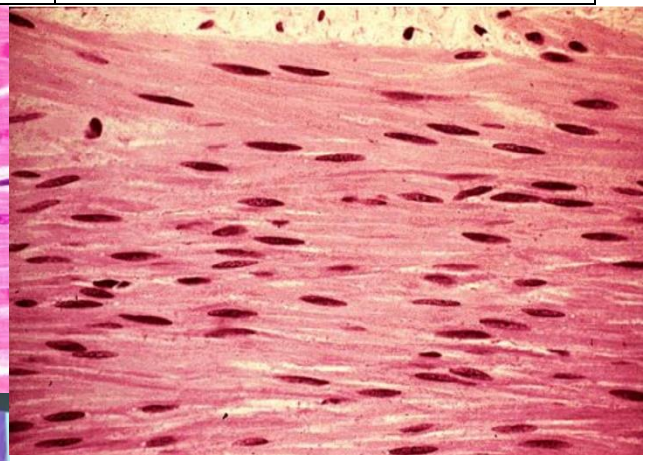
Histology Lab - 3

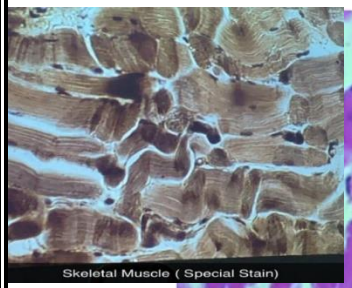
Muscular Tissues

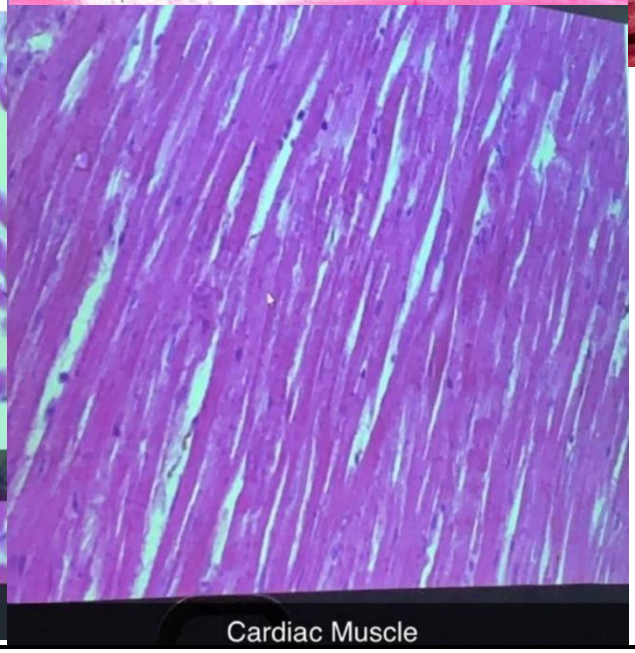
	Skeletal Muscle	Cardiac Muscle	Smooth Muscle
Founded in	Tongue Longitudinal Section	Heart	Intestine
Nucleus Type	Multiple Peripheral Nuclei	Central Nucleus	Flat Central Nucleus
Tissue/branch	Long - Unbranched	Intercalated Disc (Dark Line) – Branching fibers	Spindle Shape Cell
Striation	Transverse Striations	Transverse Striation	No Striation

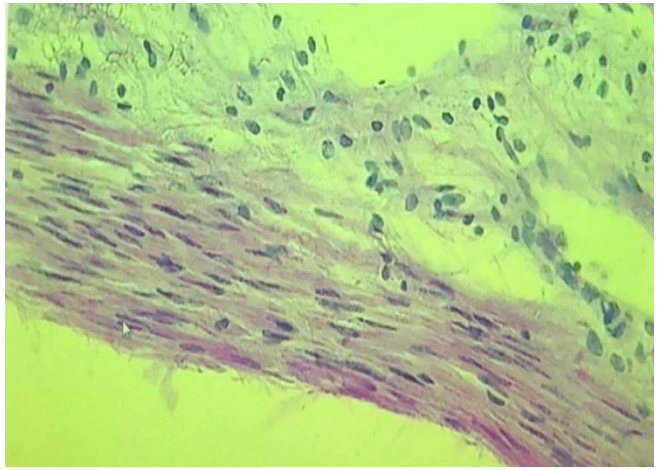








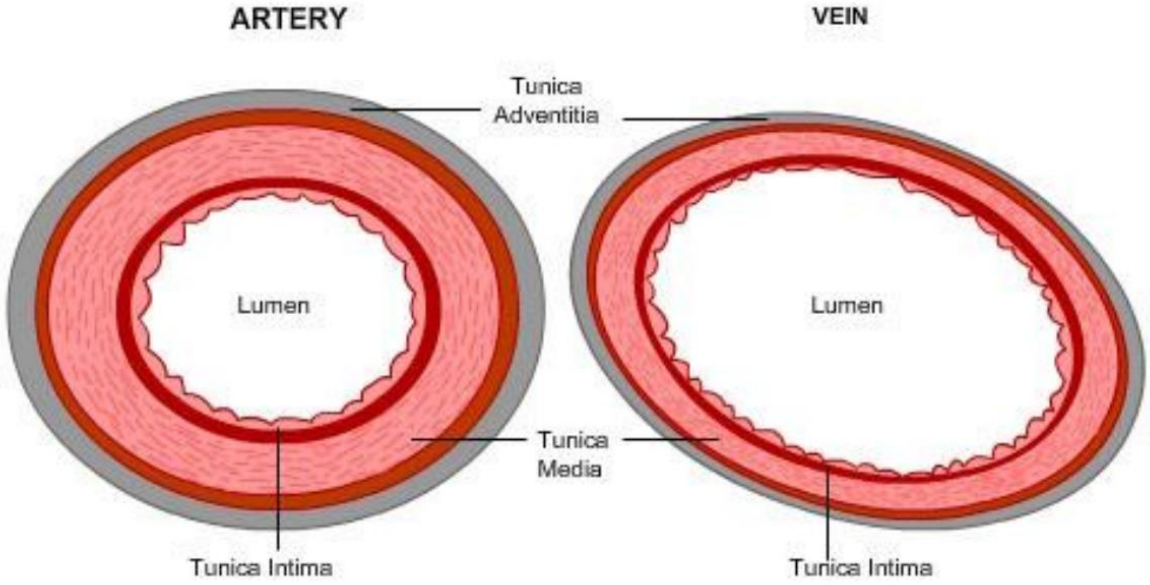


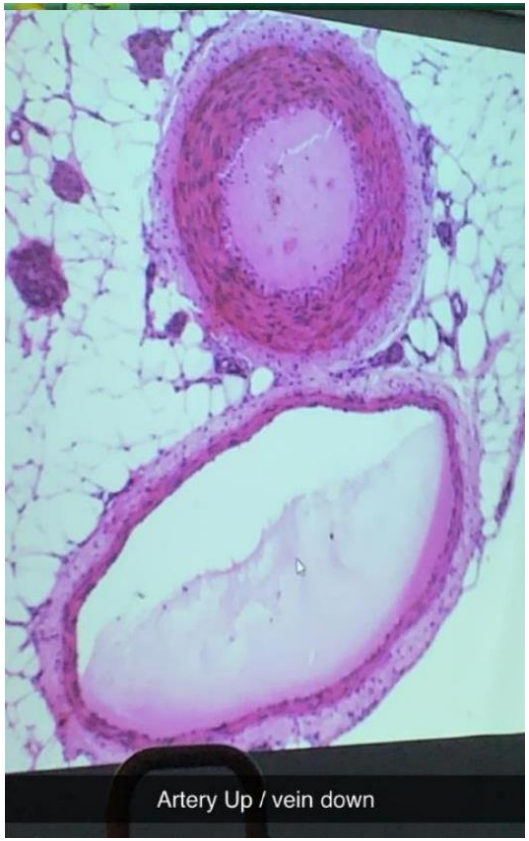


Artery & Vein

	Artery	Vein
Tunica	Tunica Media is **Thick – dark linings**	Tunica Media is **Thin**
Lumen	**Smaller** Lumen (cavity)	**Wider** Lumen (cavity)
Both	They have a middle layer made of smooth muscle called Tunica Media	

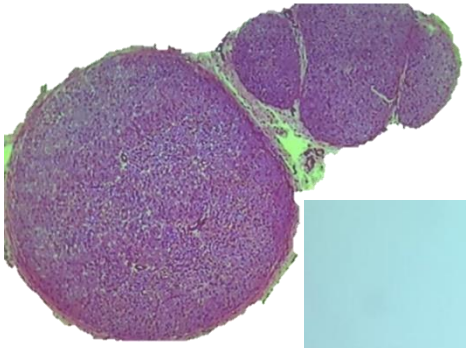
Tunica intima (endothelium).
Tunica media (spindle shape cells).
Tunica adventitia (connective tissue).

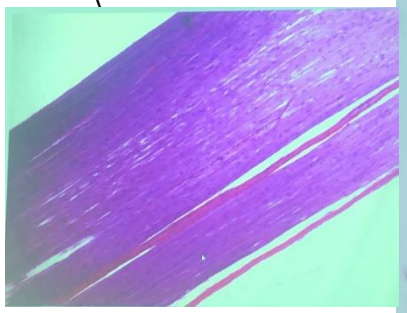




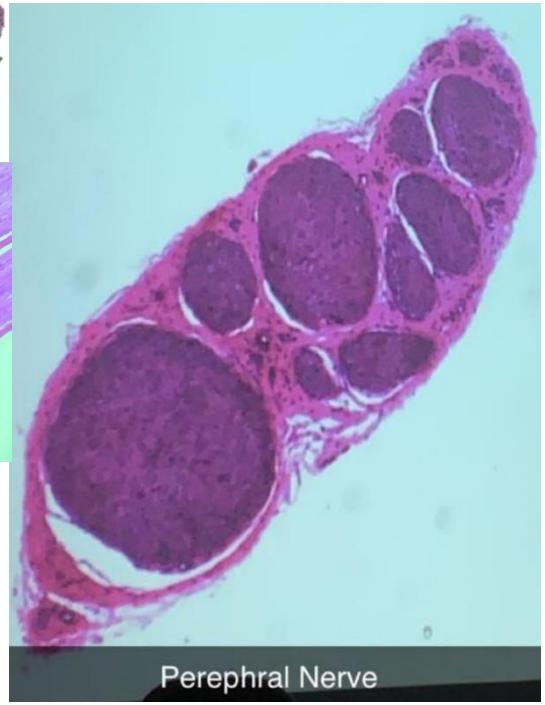
Nervous Tissues

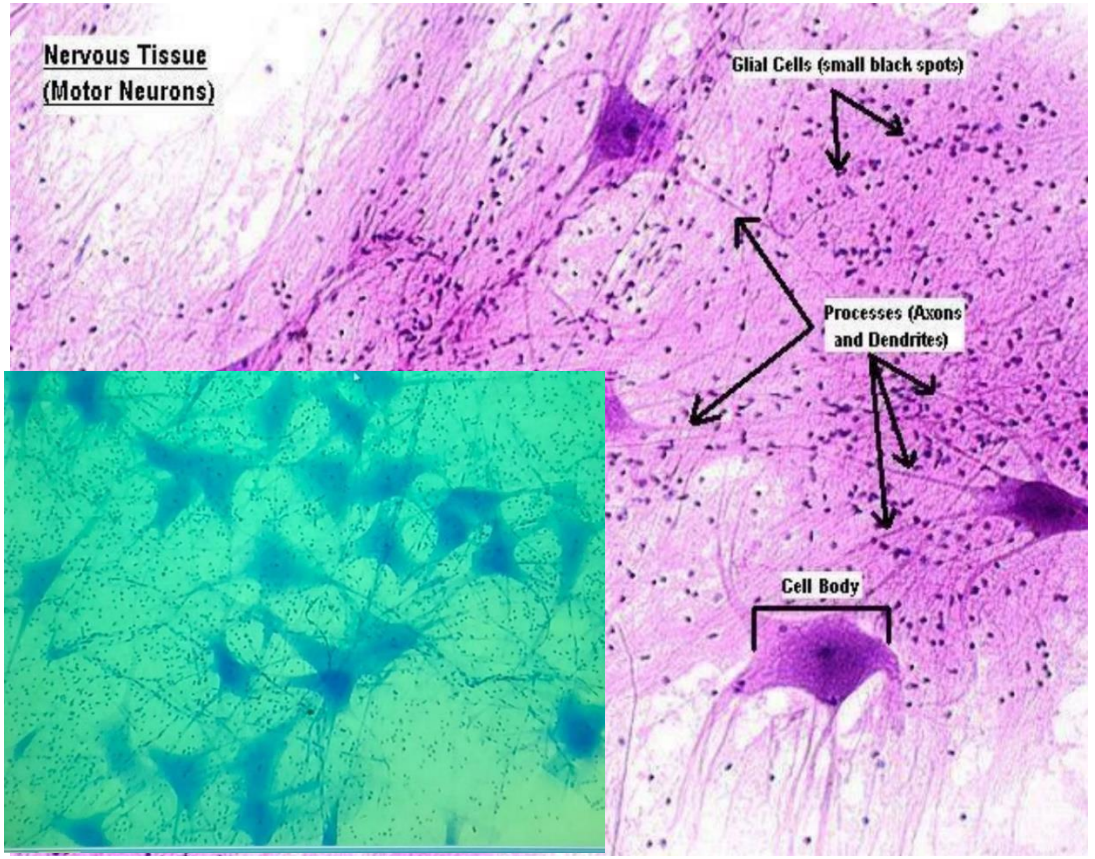
	Peripheral Nerve (Cross Section)	Motor Nervous Tissue
Contains	You can see nerve bundles surrounded by • Epineurium • Perineurium • Endoneurium • Axon is present (Seen as black dots surrounded by Schwann cells	• Cell body (Nucleus) • Dendrites • Multipolar • Neuroglial cells (Supporting Cells) • Axon

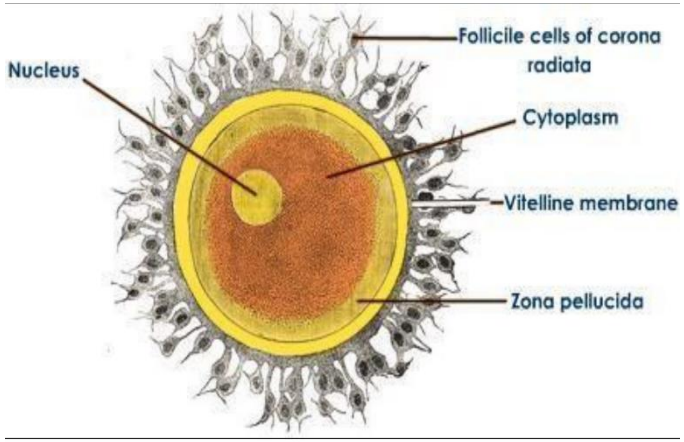




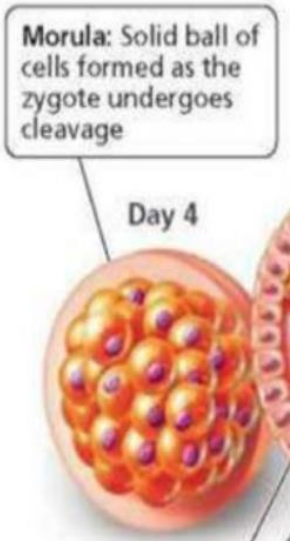
Long cross section

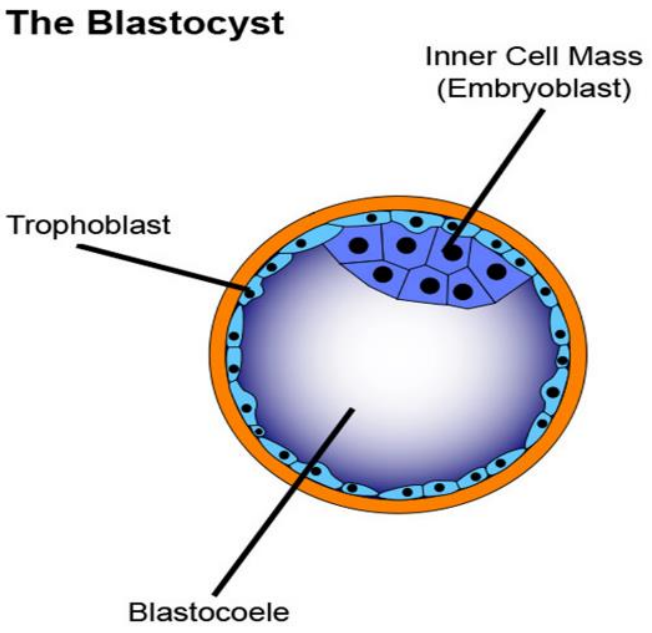


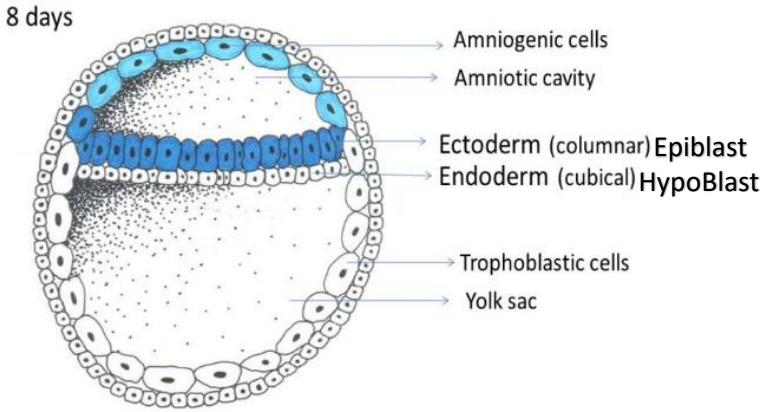




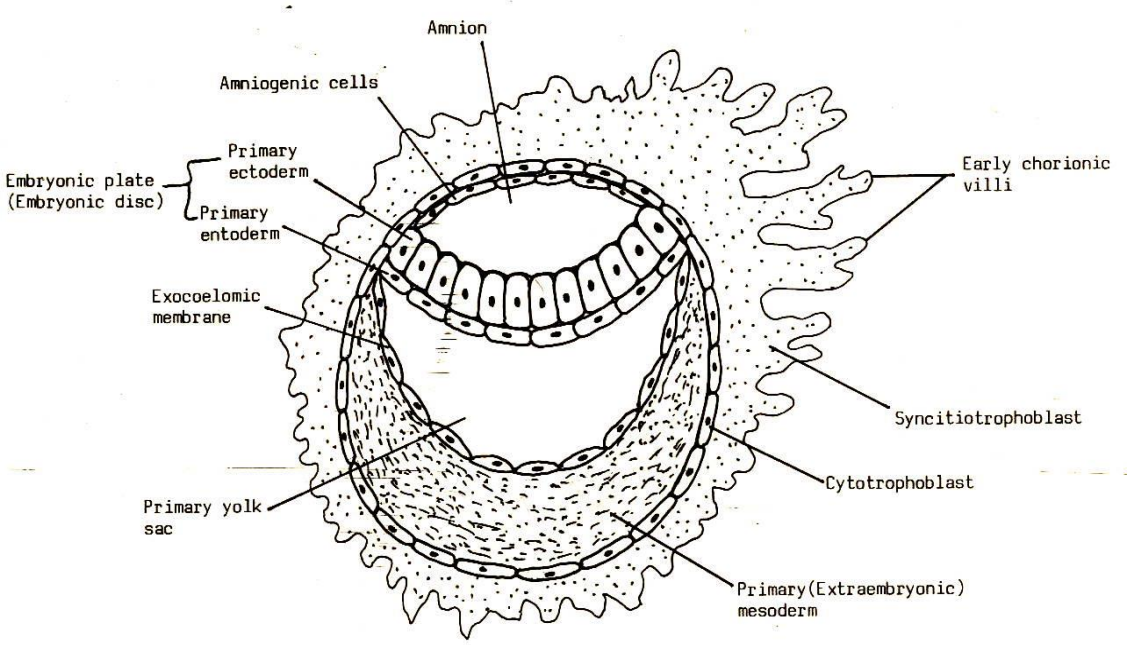
2ry oocyte

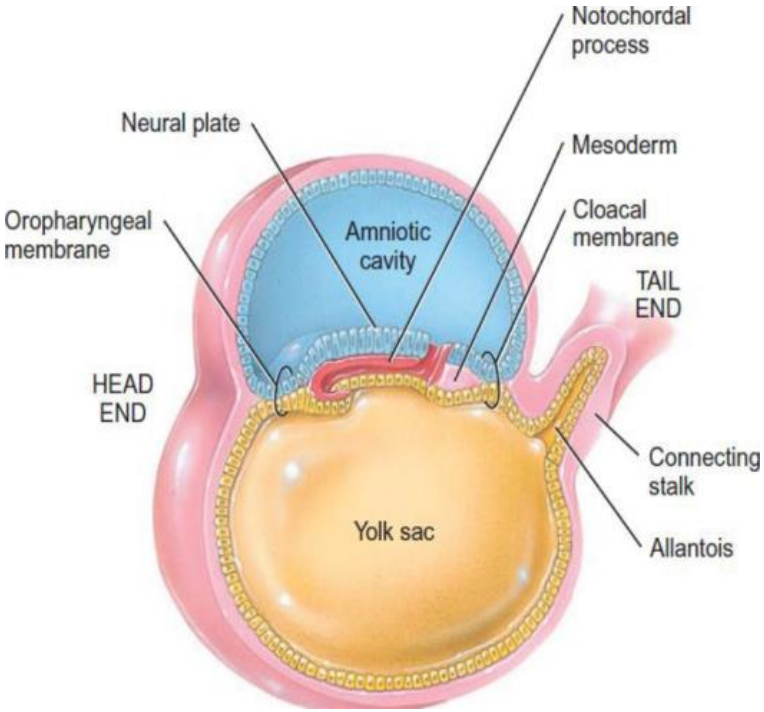


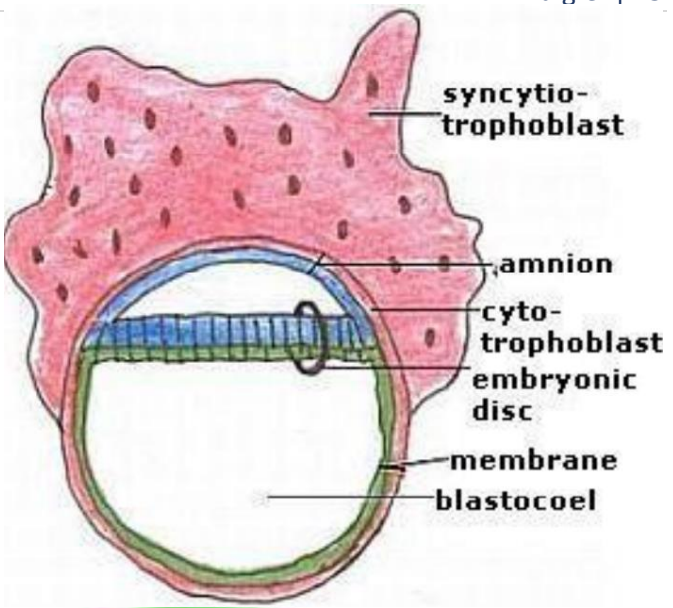


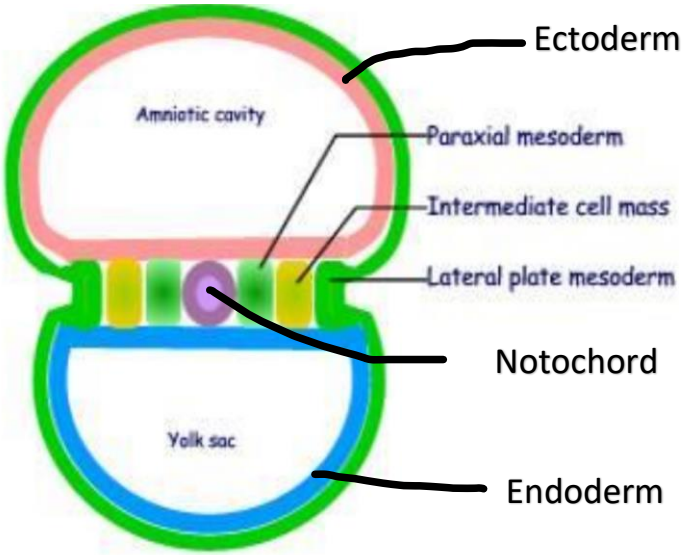


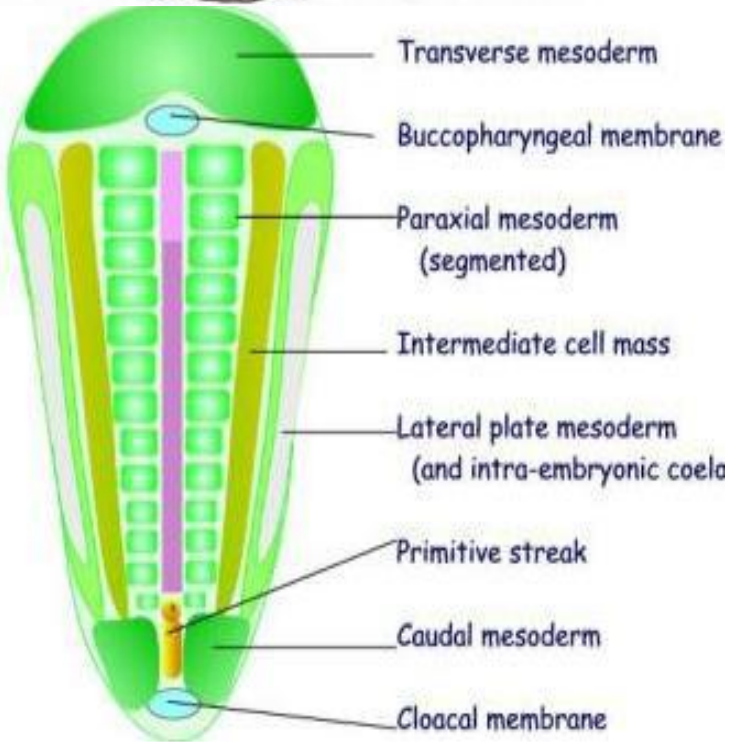
bilaminar disc

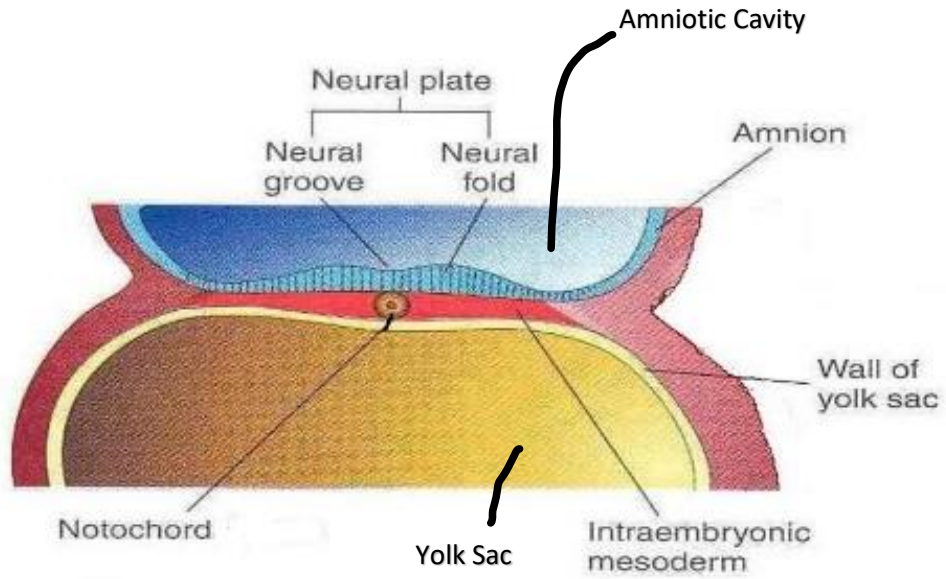


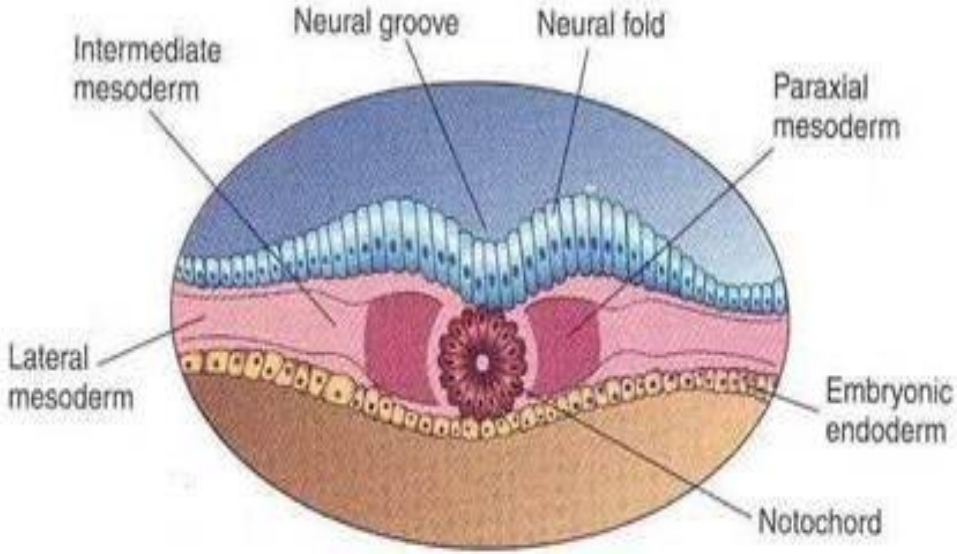

Notochordal process
Neural plate
Mesoderm
Oropharyngeal membrane
Amniotic cavity
Cloacal membrane
TAIL END
HEAD END
Connecting stalk
Yolk sac
Allantois

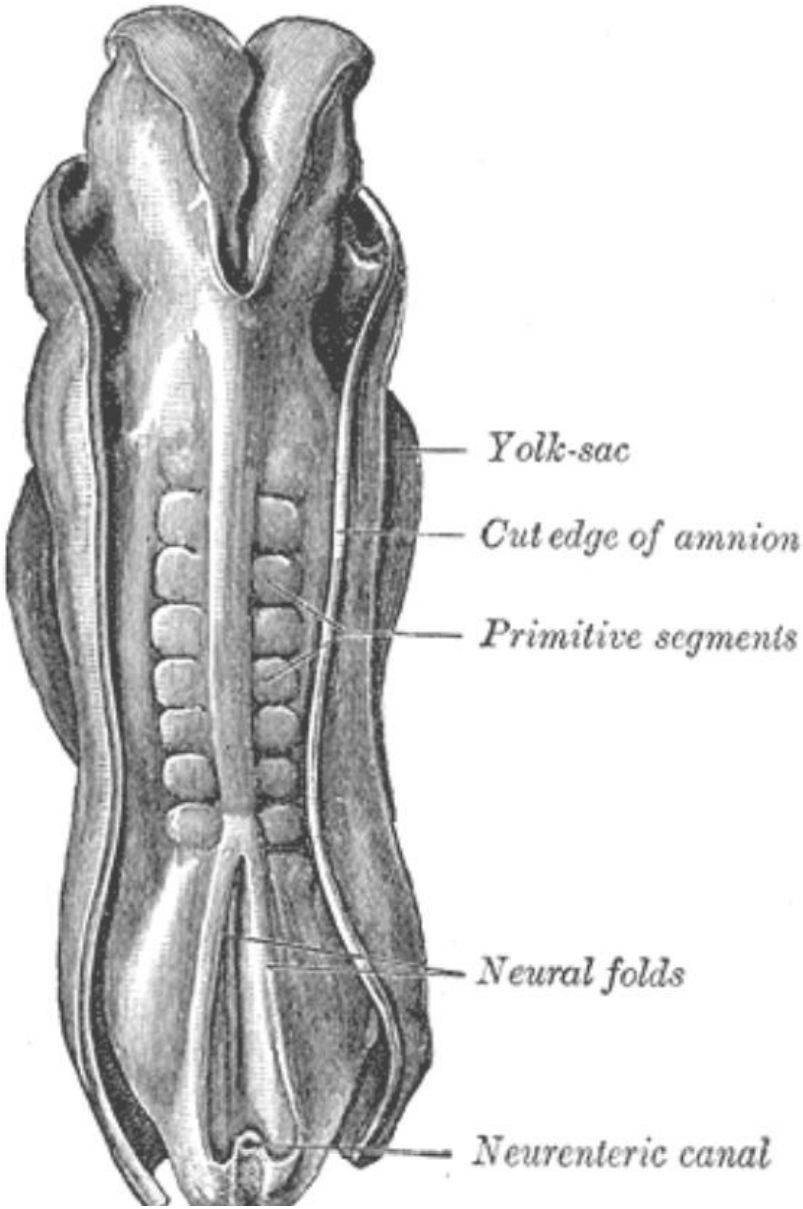

syncytio-trophoblast
amnion
cyto-trophoblast
embryonic disc
membrane
blastocoel

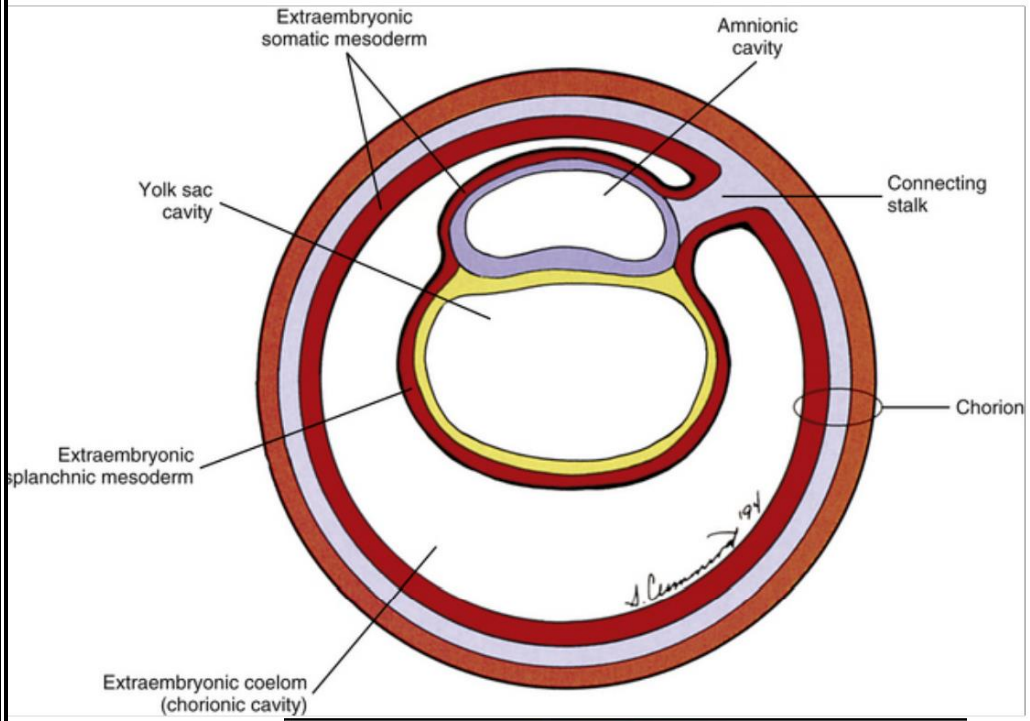

Ectoderm
Amniotic cavity
Paraxial mesoderm
Intermediate cell mass
Lateral plate mesoderm
Notochord
Yolk sac
Endoderm

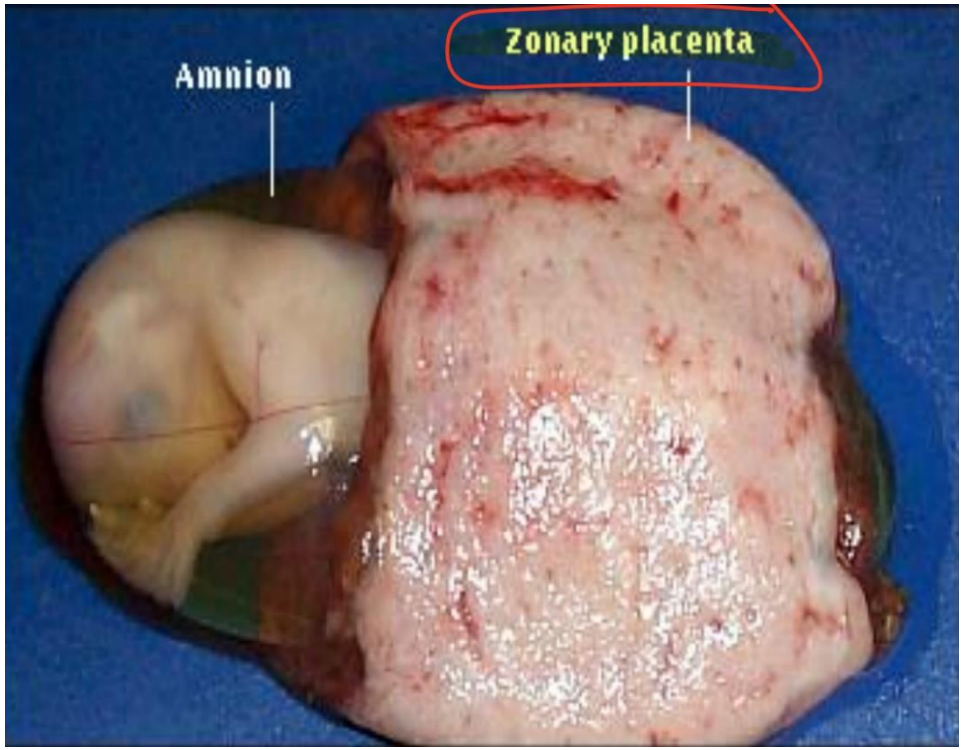

Transverse mesoderm
Buccopharyngeal membrane
Paraxial mesoderm (segmented)
Intermediate cell mass
Lateral plate mesoderm (and intra-embryonic coela
Primitive streak
Caudal mesoderm
Cloacal membrane

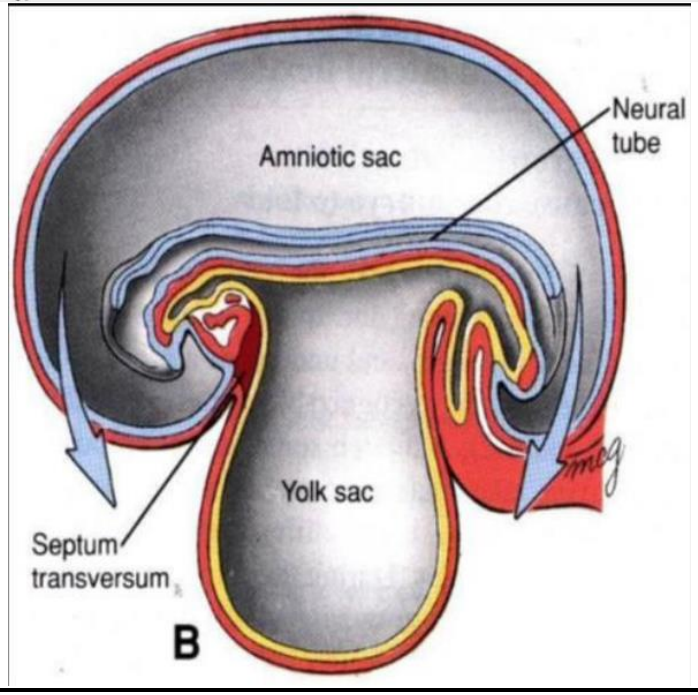

Amniotic Cavity
Neural plate
Neural groove
Neural fold
Amnion
Wall of yolk sac
Notochord
Yolk Sac
Intraembryonic mesoderm

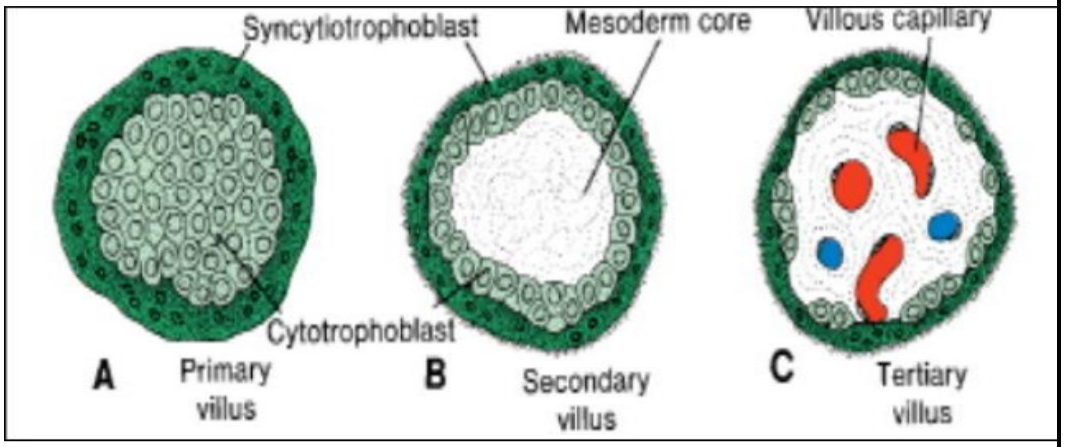

Neural groove
Neural fold
Intermediate mesoderm
Paraxial mesoderm
Lateral mesoderm
Embryonic endoderm
Notochord


Yolk-sac
Cut edge of amnion
Primitive segments
Neural folds
Neurenteric canal

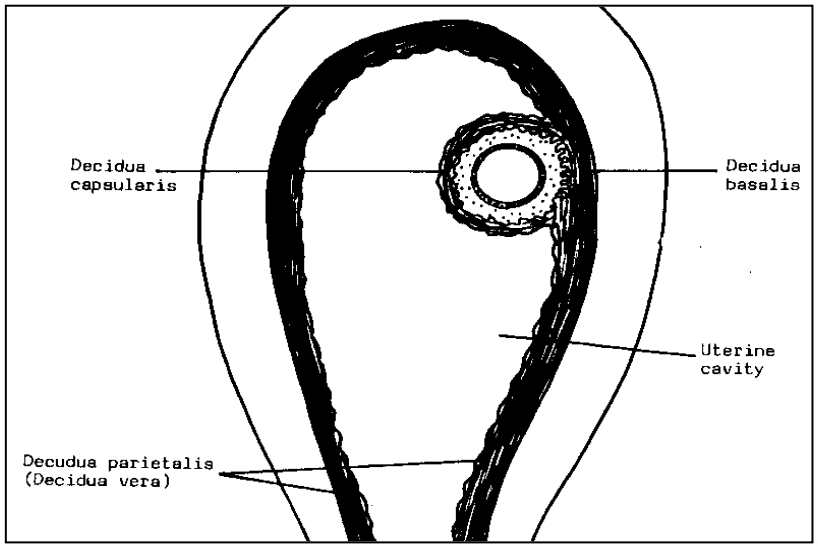

Extraembryonic somatic mesoderm
Amnionic cavity
Yolk sac cavity
Connecting stalk
Chorion
Extraembryonic splanchnic mesoderm
Extraembryonic coelom (chorionic cavity)

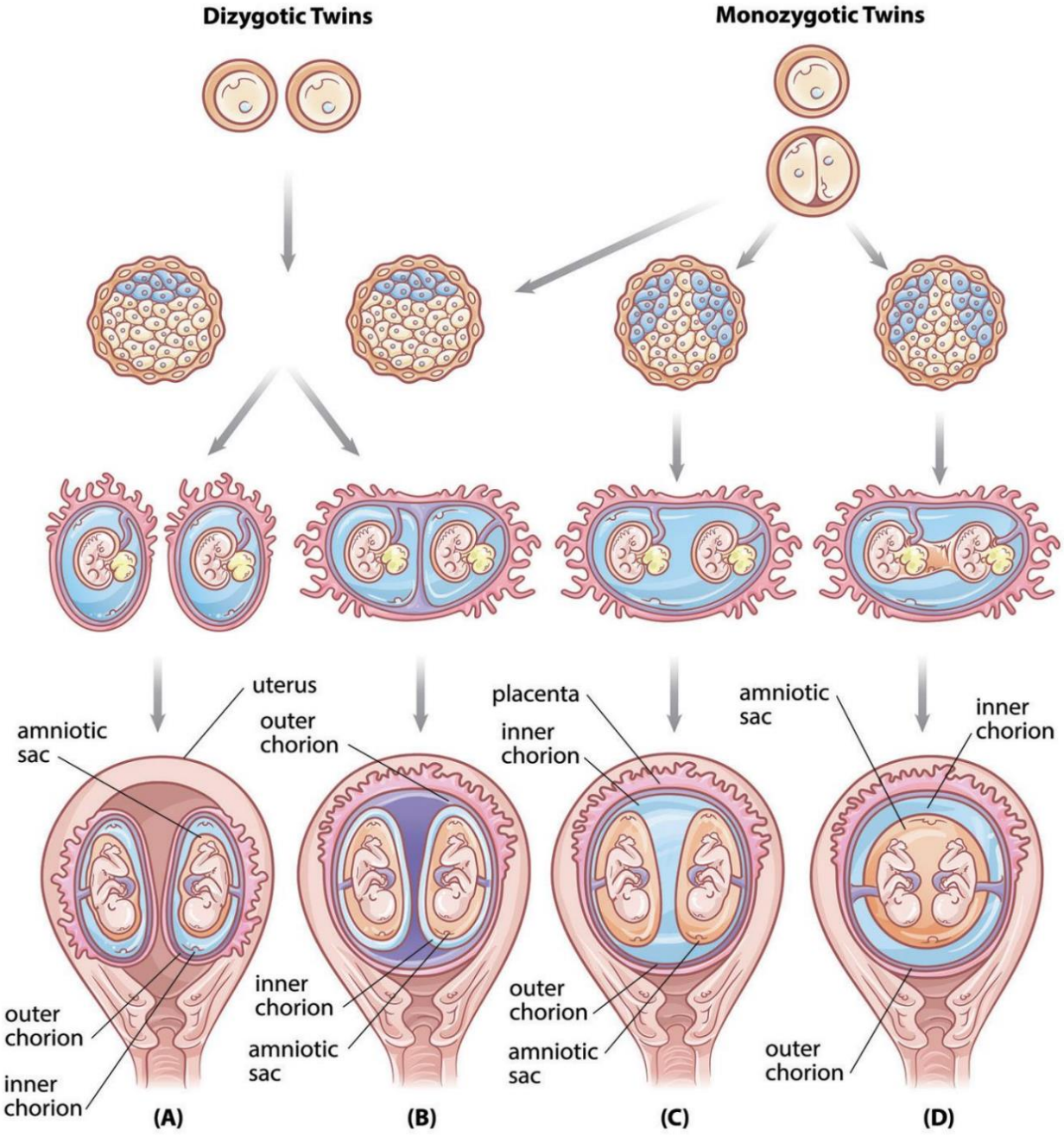

Amnion
Zonary placenta


Amniotic sac
Neural tube
Yolk sac
Septum transversum
B

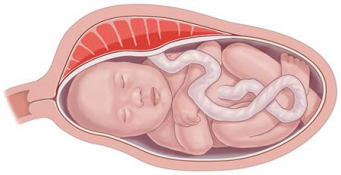

Syncytiotrophoblast
Mesoderm core
Villous capillary
Cytotrophoblast
A
Primary villus
B
Secondary villus
C
Tertiary villus

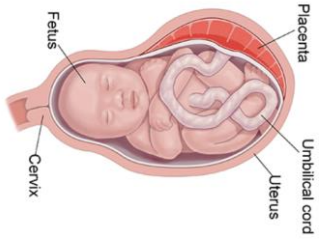
Mono Zygote Dizygotic

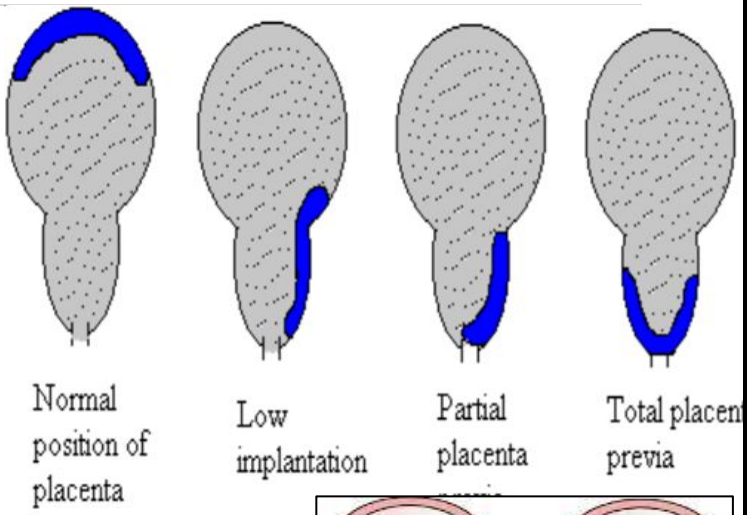


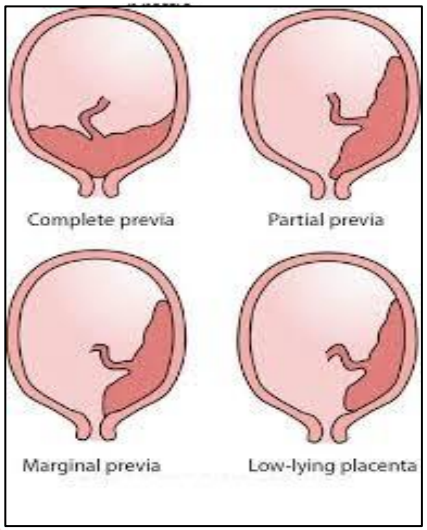


Inside the uterus (Placenta previa) anamoly

Types	Placenta previa	Reference
Lateralis	Placenta **Away** from internal os of cervix	
Centeralis	Placenta **Completely** covers the internal os of cervix	
Marginalis	Placenta **Partially** covers the internal os of cervix	
Lateralis	The placenta **away** from internal os of cervix.	

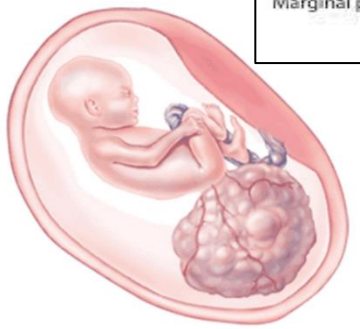
Normal	Far Away from the internal os of cervix	 (Normal Position of Placenta)





Anamoly of primitive streak

Anomaly	Description
Sacrococcygeal Teratomas	Remnants of the primitive streak, which causes **Large Tumor**
Causes	It doesn't degenerates by end of 4th week, continuing its production.

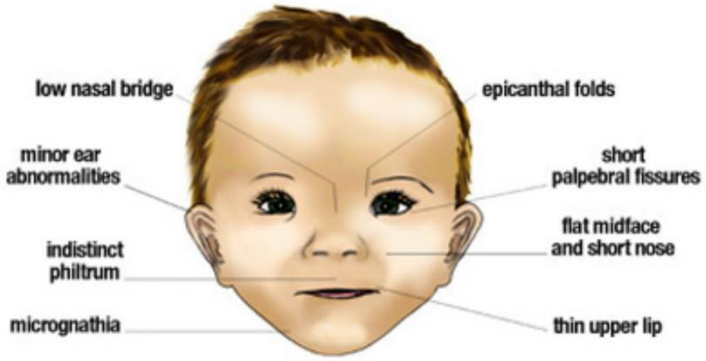


Sacrococcygeal teratomas

Anomaly of Gastrulation

Fetal Alcohol Syndrome	Sirenomeli (Mermaid Syndrome)

Abuse of Radiation, medication, alcoholism causes changes during gastrulation



Anomaly of Notochord

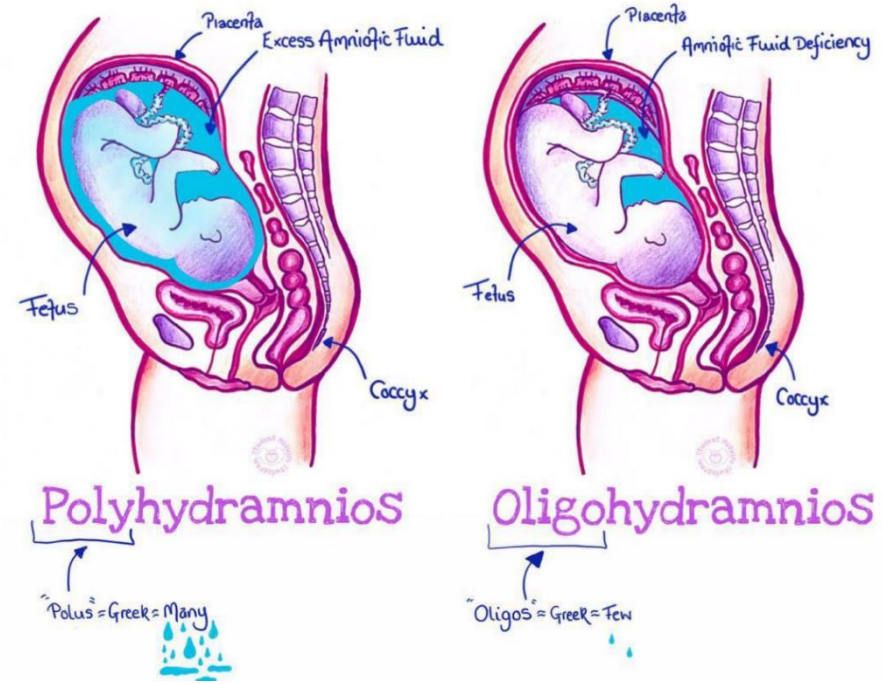
Remnants of Notochordal tissues
Gives rise to tumors called **Chordomas**

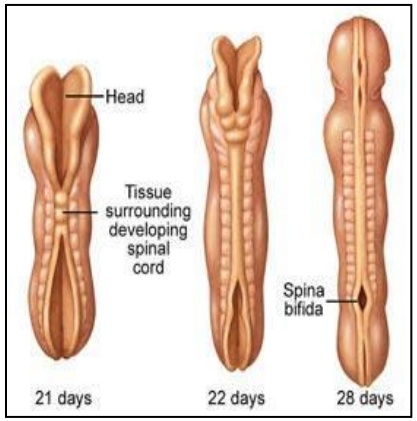
Umbilical vessels

Umbilical Vessels	• Two Umbilical Arteries: Carry **no Oxygenated** Blood • Left Umbilical vein: Carry **Oxygenated** Blood If **true knots** happened, passing of oxygen and removing waste is not possible

Anomaly of pregnancy

	Polyhydramnios	Oligohydramnios
Definition	**High** Volume of amniotic fluid – more than **2000 mL**	**Low** Volume of amniotic fluid – Less than **400 mL**
Causes	Idiopathic, Esophageal Atresia	Renal Agenesis (Failure of Kidney Formation)
Characteristic	• Premature Labor • Distress to mother & Fetus • Excess fetal movement cause true knots of umbilical cord	Adhesion between **Amnion** & **Embryo**



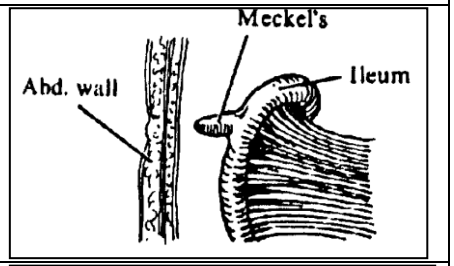
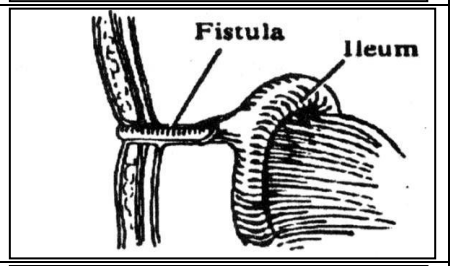
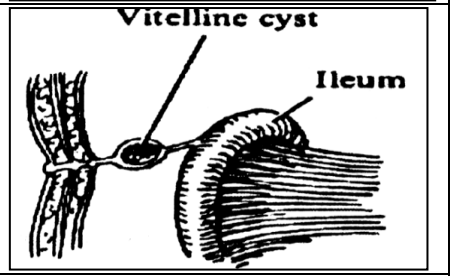
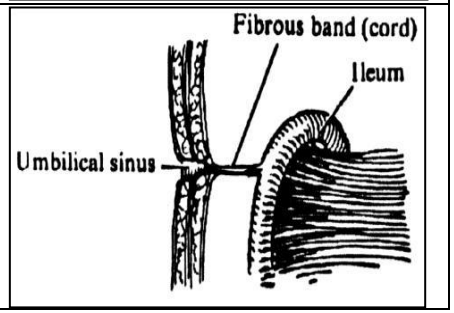


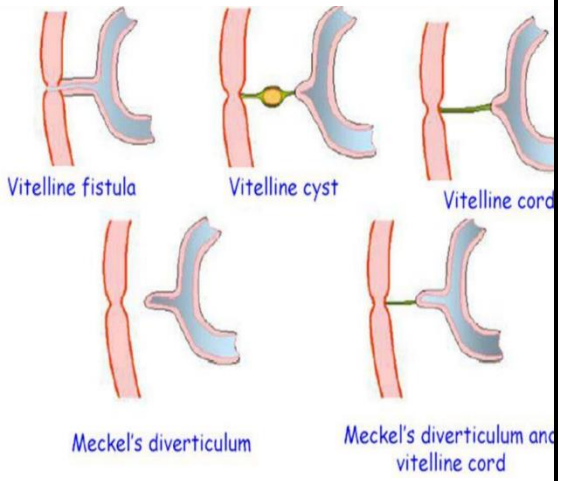
Neuropore

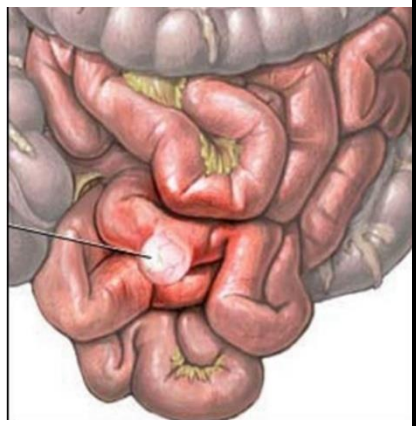
If Cranial pore didn't close- Anencephaly

If Caudal pore didn't close – Spina bifida occult

Anomalies of Vitelline ducts

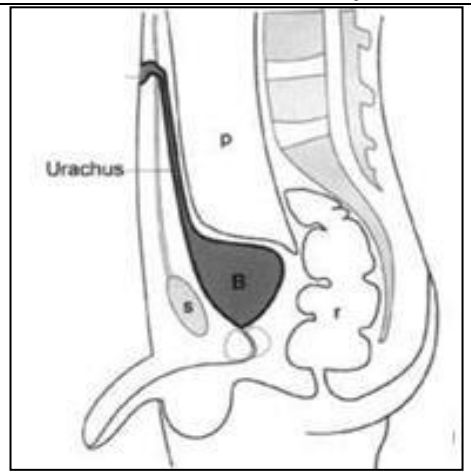
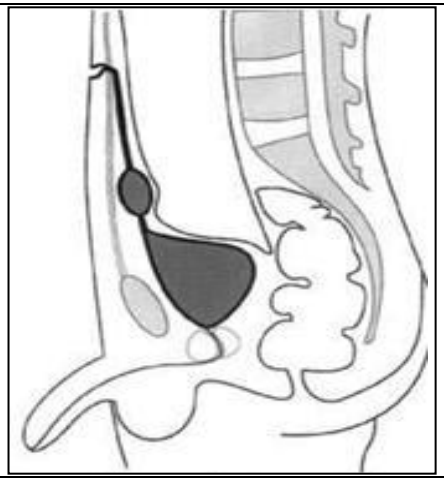
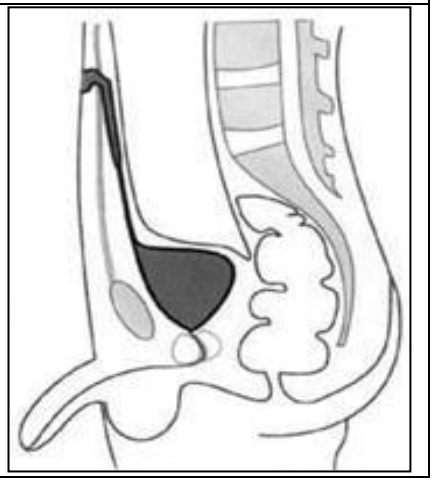
	Cause	Reference
Ileal (meckle's) diverticula	Failure of **Obliteration** of **Proximal** part of Vitello Intestinal Duct **Incidence:** 2% of people **Length:** 2 inch **Site:** 2 feets from ileocecal **Sex:** Male than female **Complication:** Inflamed & give **Symptoms** like **Appendicitis**	
Umblico-ileal fistula (vitelline fistula)	Failure of **Obliteration** of **whole** Vitello Intestinal Duct	
Vitelline Cyst	**Persistence** of **middle part** of Vitello Intestinal Duct	
Umbilical Sinus (Vitelline sinus)	**Persistence** of **Distal part** of Vitello Intestinal Duct near umbilicus	

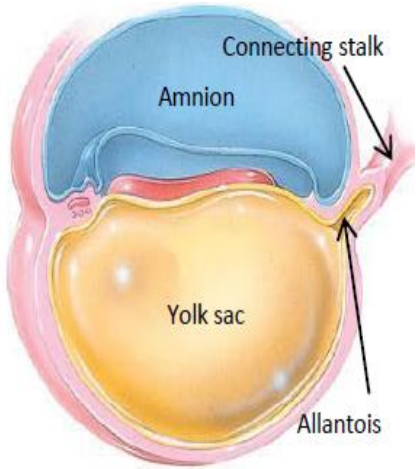


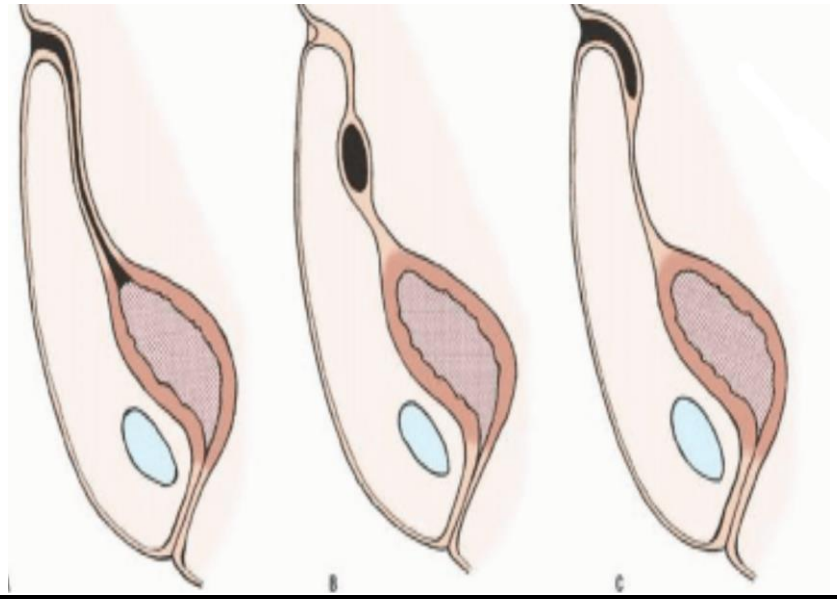


Meckel's Diverticulum

Anomalies of Allantois

	Urachal Fistula	Urachal Cyst	Urachal Sinus
Cause	**Failure** of **Obliteration** of **whole** Urachus **Feature:** There is a <u>communication</u> between **Umbilicus** & **Urinary Bladder**	**Persistent** of **middle** part of Urachus	**Persistent** of **Distal** part of Urachus
			





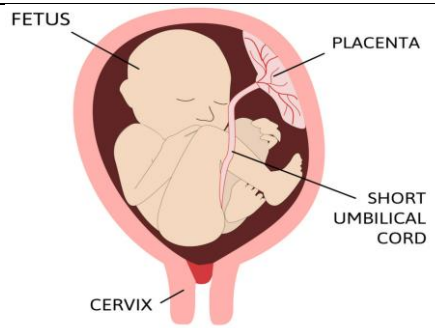
Knots of umbilical cord:

False Knots	No Significance – no knots on the cord
True Knots	Due to long umbilical cord – may be tighten & cause fetal death

Anomaly in structure of Umbilical cord

Cause	One artery is absent – due to agenesis or degeneration
Character	15-20% of Cardiovascular Abnormalities

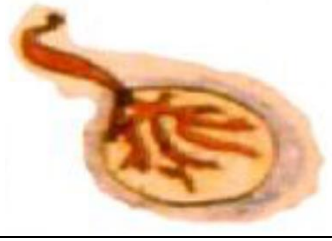
Abnormalities Related to Umbilical Cord

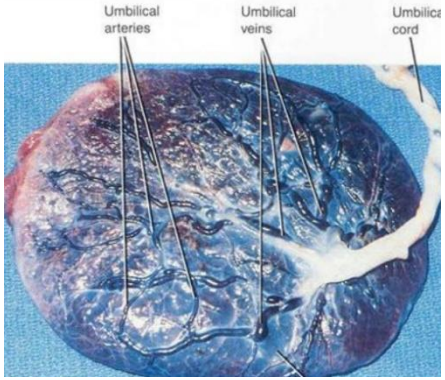
Long Umbilical Cord "Prolapse"	**Short umbilical cords**
Very long umbilical cord – May cause strangulation – or knots	Very short umbilical cord
	

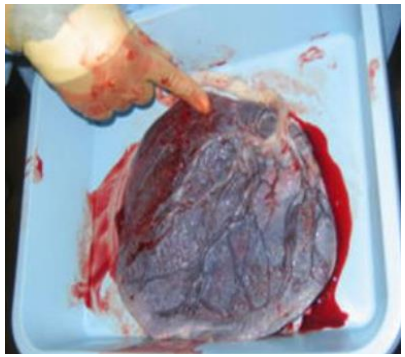
Persistence physiological umbilical hernia

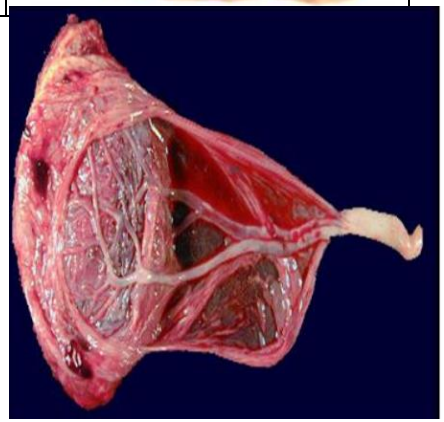
Exophathalomos	Not reduced after 10 week	

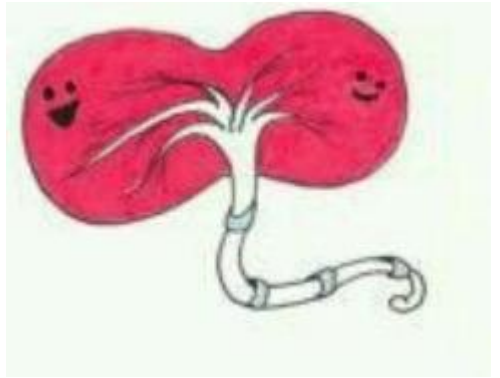
Attachment of umbilical Cord

Eccentric Attachment	Marginal Attachment	Velamentous Attachment
		

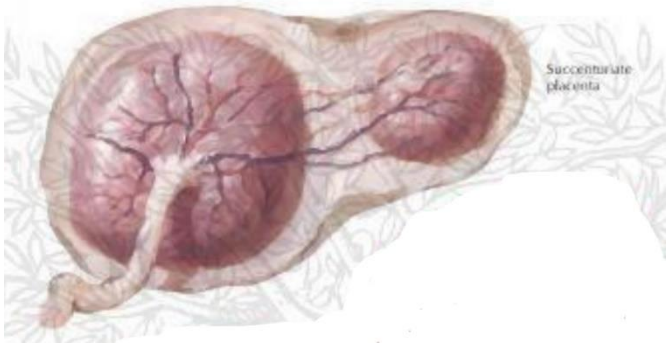








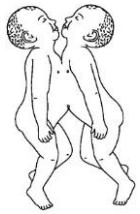
Bipartate



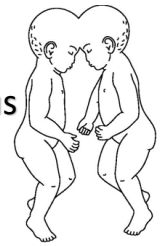
Succenturiate Placenta

Enclosed by Membranous Cord

z



Thoracopagus

Craniophagus 

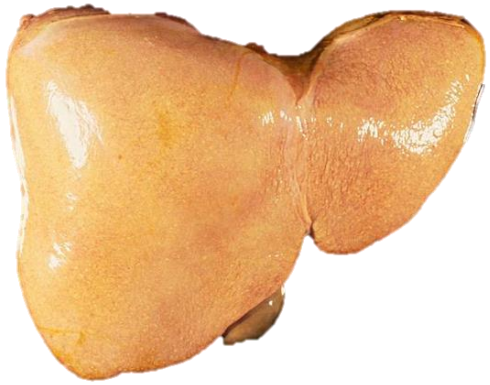
Anomaly of Monozygotic Twins (Identical Twins) – Conjoined Twins

	Conjoined (monozygotic twins, monsters or *Siamse*):		
Cause	Embryonic disc **not** divide completely		
United in	Thoracic region (Thoracopagus)	Head region (Craniophagus)	Dorsal or ventral body wall

PATH

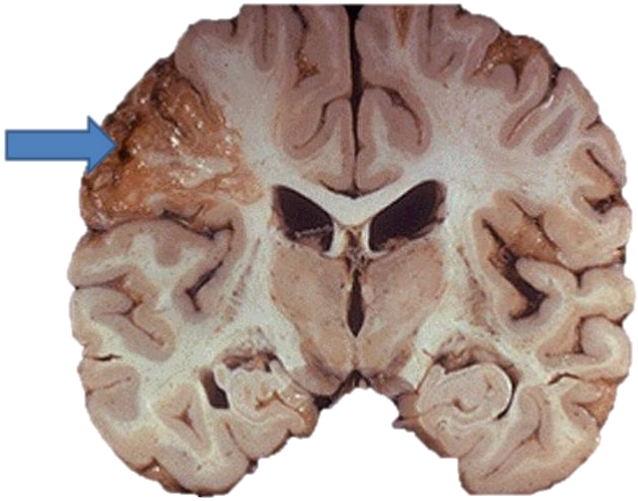
Gross Lesion

Fatty liver



Jaundice

Liquifactive necrosis of the brain



Chloasma of pregnancy

Acute appendicitis

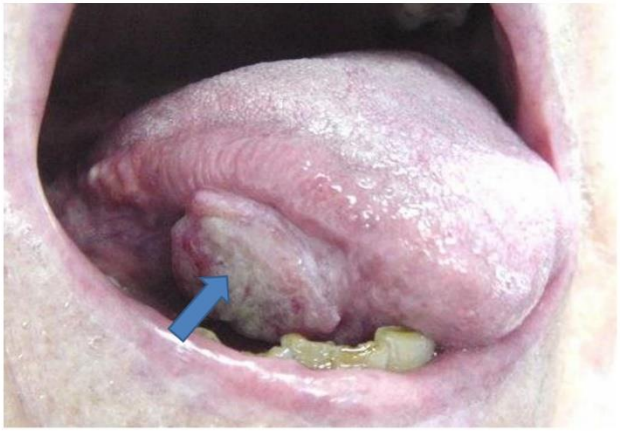
Subcutaneous abscess

Cellulitis

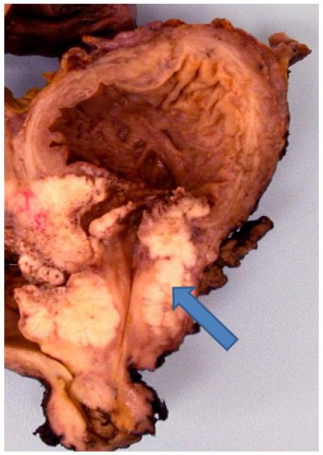
Keloid

Basal cell carcinoma of the face

Fungating carcinoma of the tongue

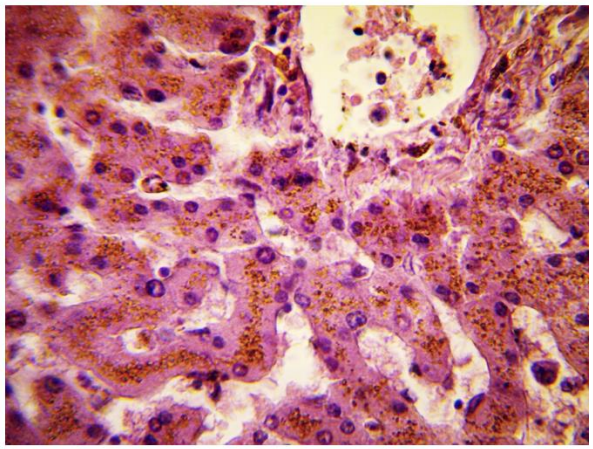


Infiltrative carcinoma of urinary bladder

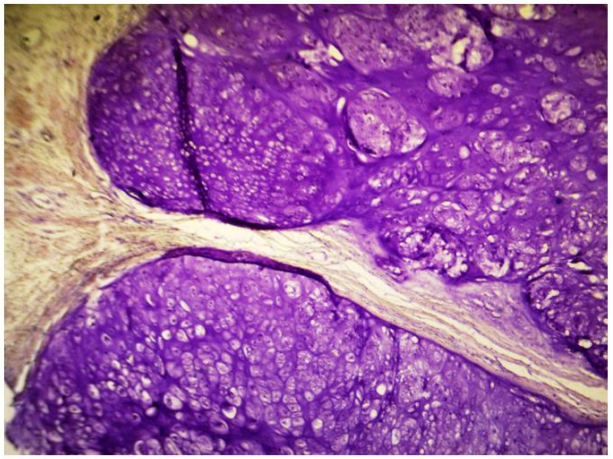


Microscopic Lesions

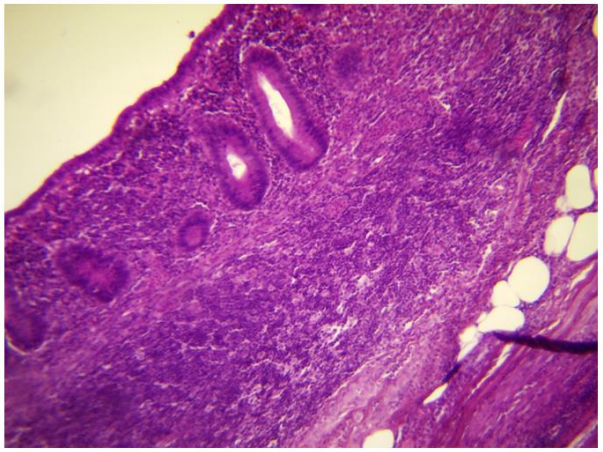
Hemosiderosis in liver



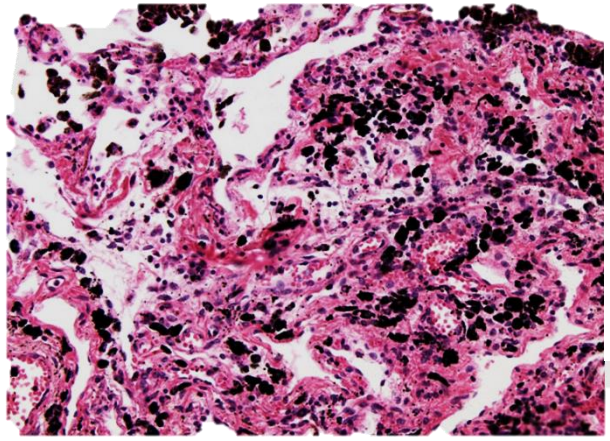
Chondroma



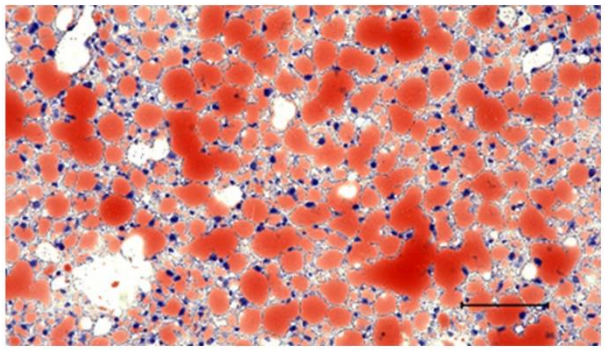
Acute appendicitis



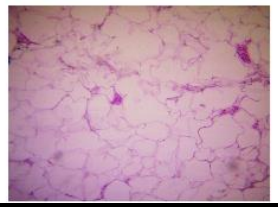
Anthracosis in lung



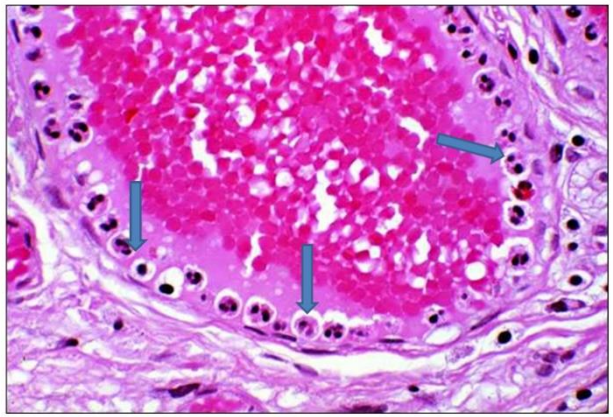
Fatty liver; Oil Red O stain

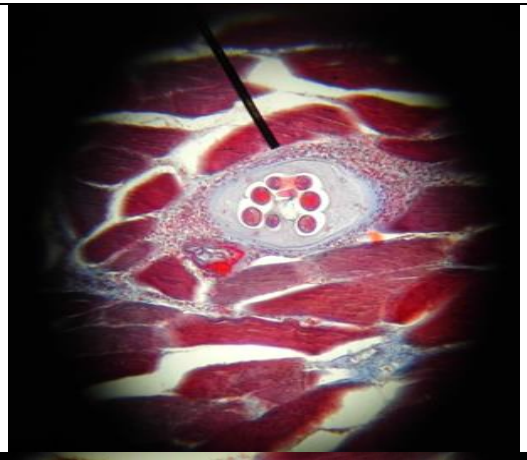
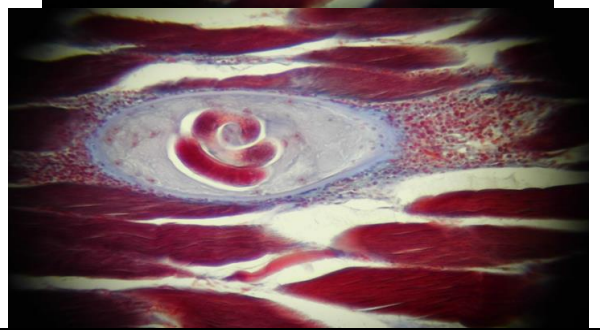


Lipoma



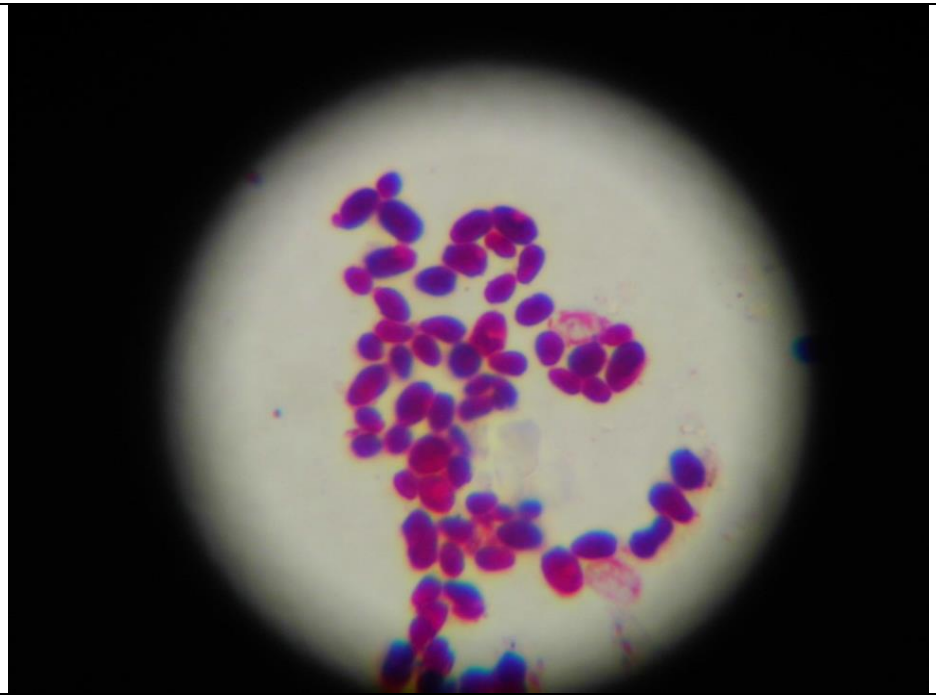
Margination sign in acute inflammation

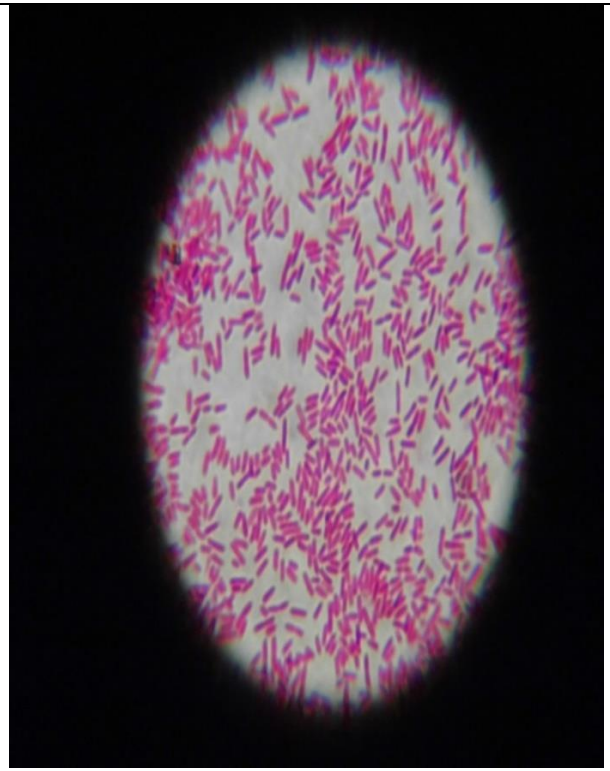


	Enterobius Vermicularis	**Trichinella Spiralis**
Named	[Pin Worm]	[Encysted Larva]
Disease	Perianal itching	Trichinosis; Muscle ache [Myalgia] W/ Eosinophilia
Habitat	Caecum | Ascending Colon | Terminal Ileum	In skeletal muscle biopsy
Classification	Nematodes	Nematodes
Definitive host	Man ~ *especially in children*	Encysted larva of trichinella spiralis in skeletal muscle biopsy
Reference	 	 

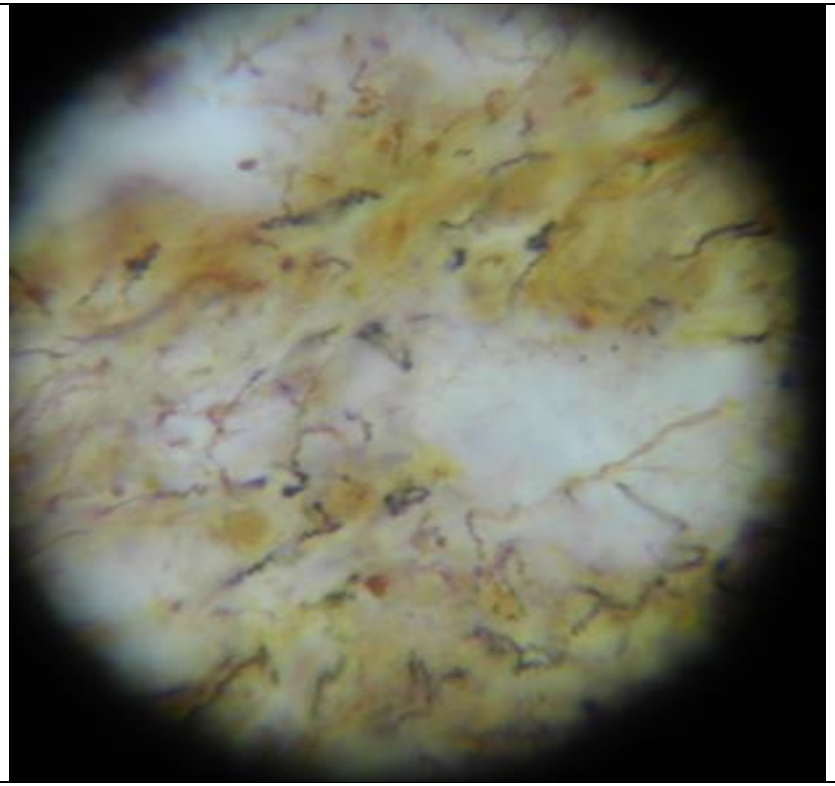
Mycology

Gram positive oval budding yeast cells

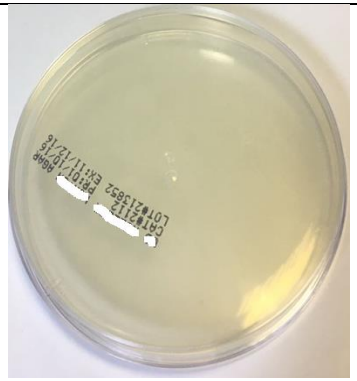
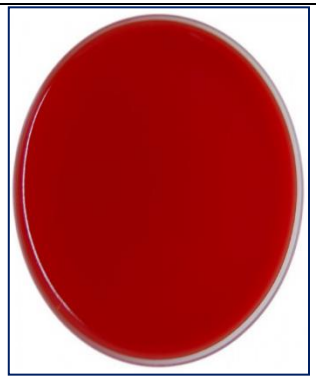
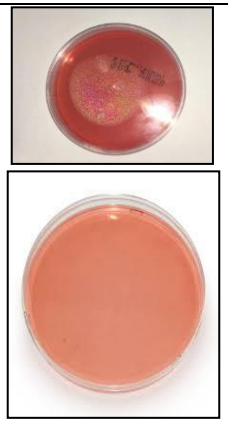
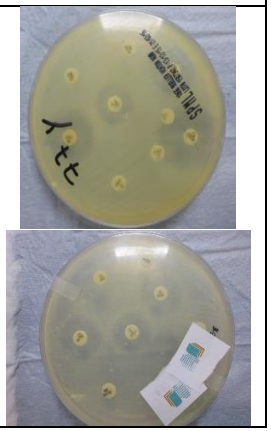
	Gram positive oval budding yeast cells
Microscopic Morphology	Gram's positive budding yeast cells
Example	Candida spp
Diseases	UTI | Oral Thrush | Vaginal Candidiasis
Reference	

	Gram positive Cocci in clusters	Gram negative bacilli
Morphology	Gram positive cocci in clusters	Gram negative Bacilli
Example	Staphylococci	E. Coli
Disease	Skin Abscess | Bacteremia | Septicemia | Food poisoning | Toxic shock syndrome	UTI | Gastroenteritis
Reference		

Treponema pallidum in skin biopsy stained by silver stain

	Treponema pallidum in skin biopsy stained by silver stain
Morphology	Spiral dark brown bacteria
Example	Treponema Palladium
Disease	Syphilis [Genital ulcer ; Chancre]
Reference	 

Agars

	Nutrient Agar	Blood Agar	Chocolate Agar	MacConkey Agar	Media & Agar: Muller-Hinton
Classification	Simple Media	Enriched Media	Enriched media	Differential – Selective Media	**Test name:** *Antibiotic Sensitivity Test*
Use		Cultivation of Gram's positive & Negative bacteria			Choose sensitive antibiotic for treatment
Principle					Disc-Diffusion
Reference					

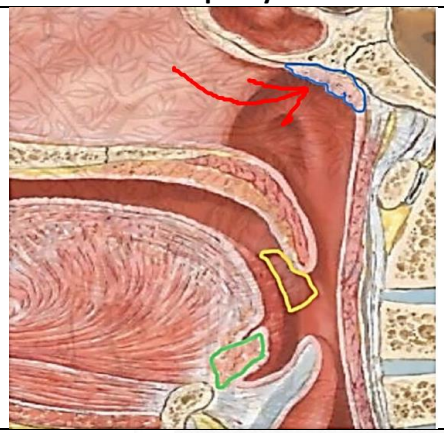
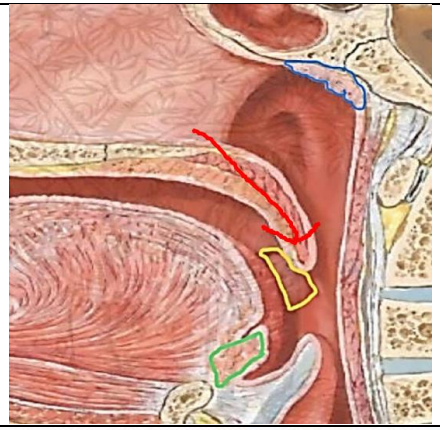
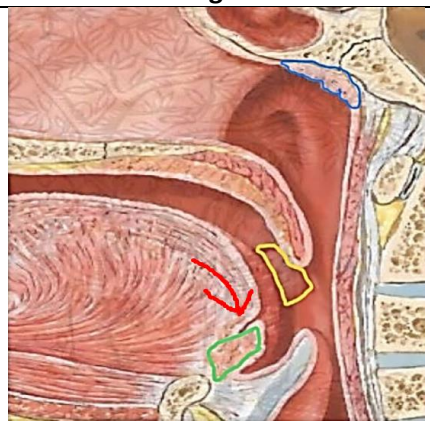
HMIM

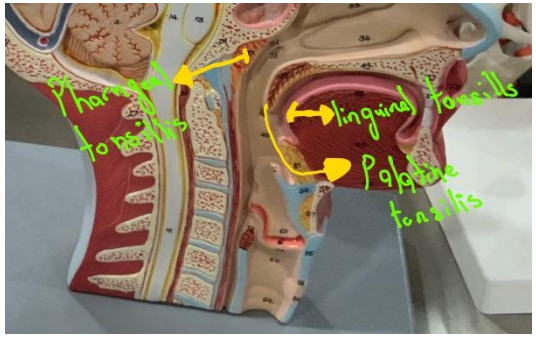
Sharcott lymph node → enlarged → Stomach tumor

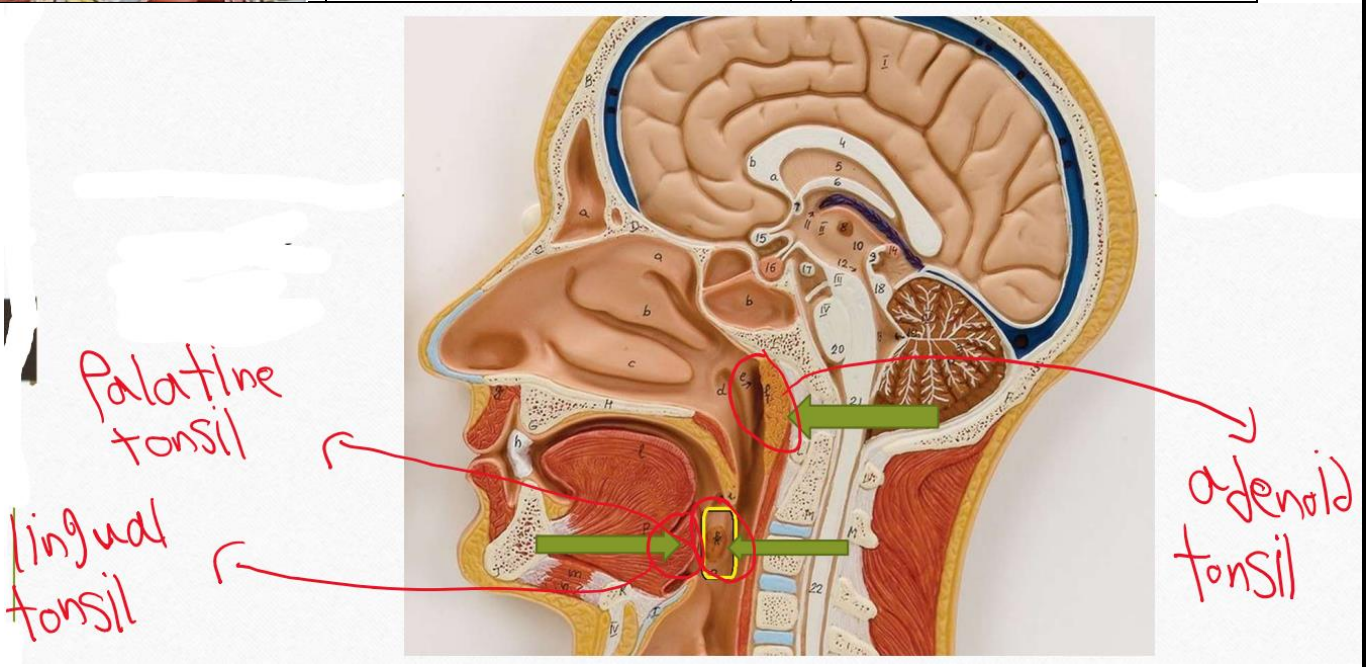
Tonsillites → Heart valves / Large Joints / Kidney (Affect)

Anatomy

Tonsils

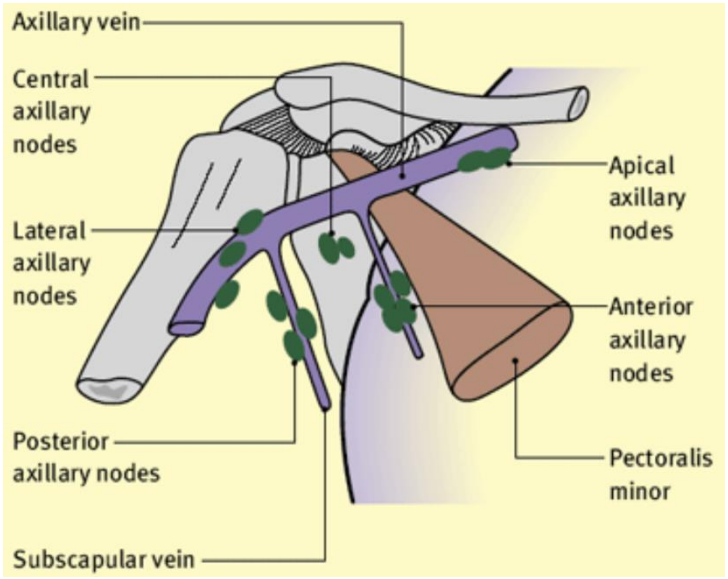
	Nasopharynx	Palatine	Lingual
Reference			

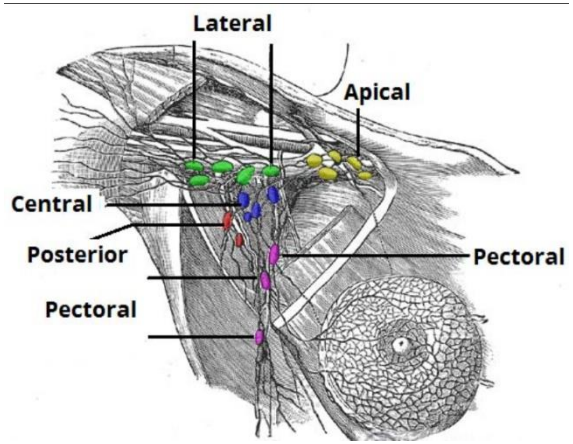


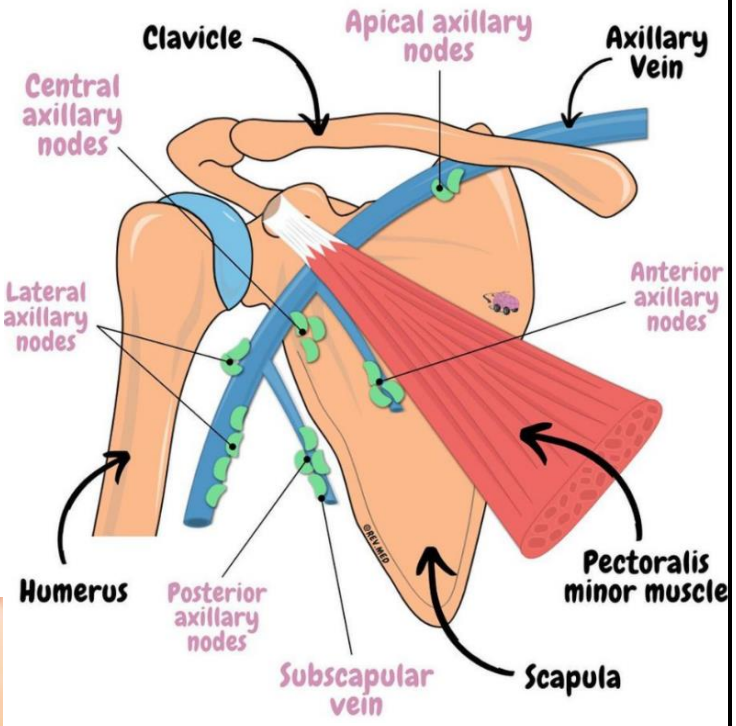


Axillary Lymph Nodes

	Infraclavicular	Apical	Lateral	Scapular [Posterior]	Pectoral [Anterior]
Located at	Below clavicle	At the apex of axilla	Along the axillary vessels	Along subscapular artery	Lower border of pectoralis minor

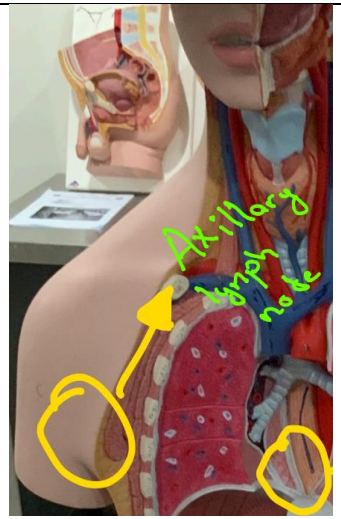
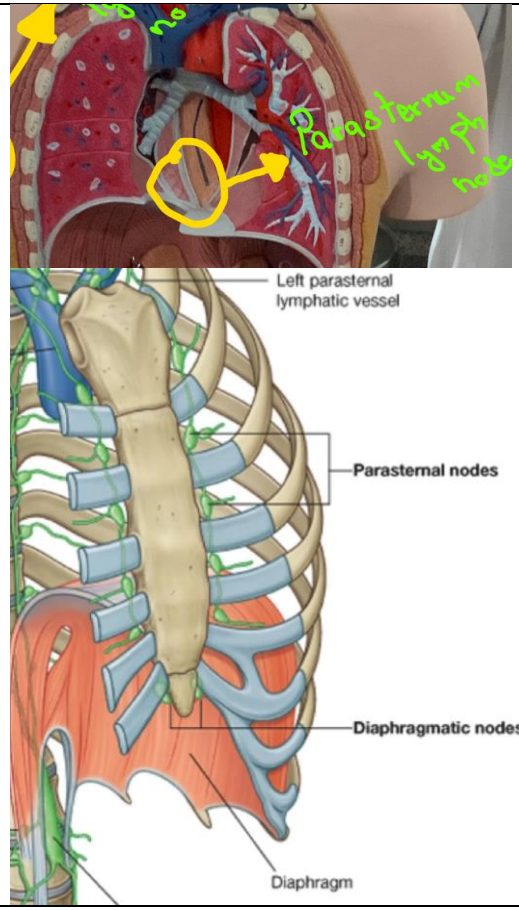
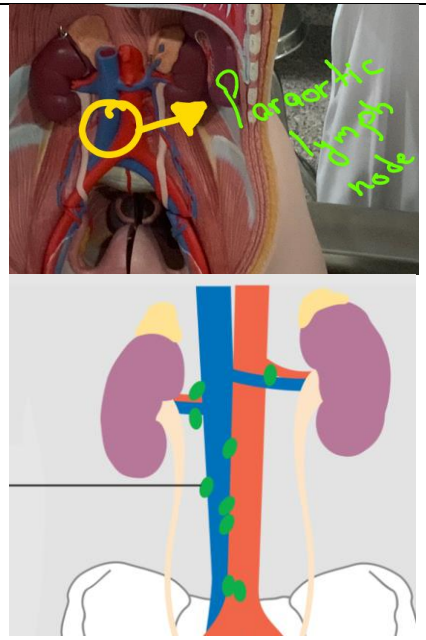
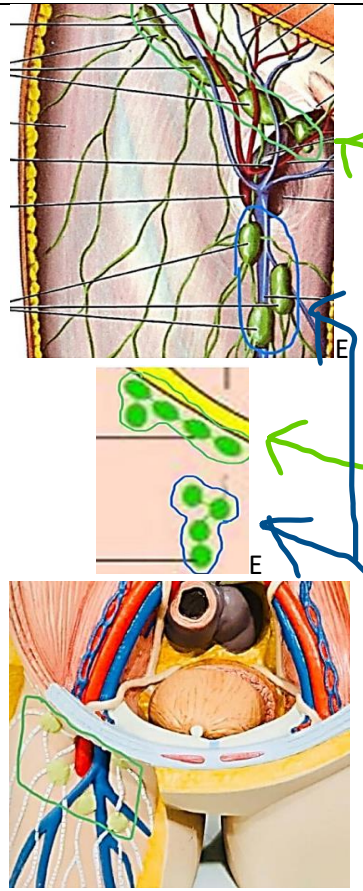






- Infraclavicular lymph node.
- Apical lymph node.
- Lateral lymph node.
- Scapular (posterior) lymph node.
- Pectoral (Anterior) lymph node.

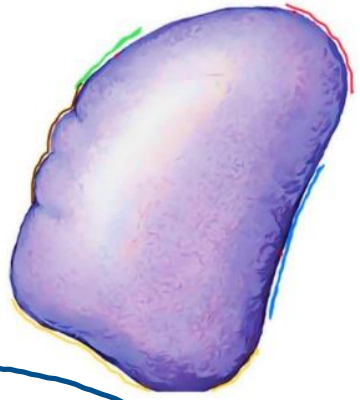
Major Lymph nodes

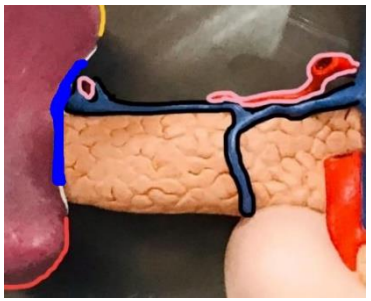
	Axillary	Parasternal	Para Aortic	Inguinal
Located at	Close to armpit & Breast	Lymph node found close to sternum	abdominal aorta and inferior vena cava	Thighs
Reference				

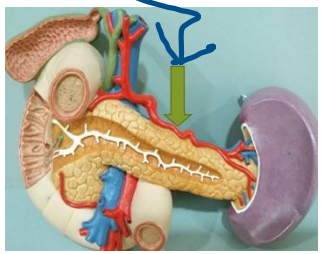
- Horizontal group of superficial inguinal lymph node.
- Vertical group of superficial inguinal lymph node.

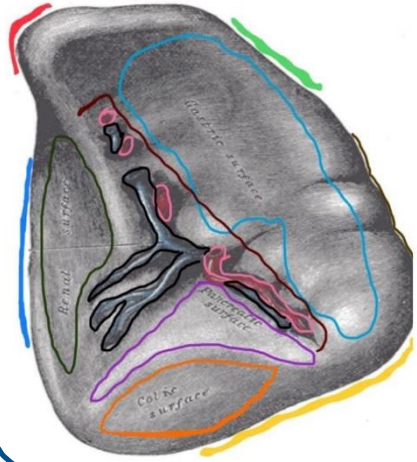
Spleen

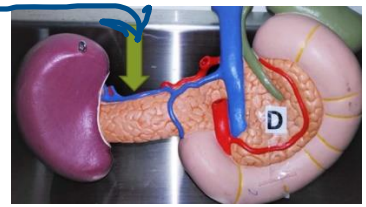
	Diaphragmatic surface	Visceral Surface
Points	Medial end Lateral end Upper border Lower border Splenic notch Splenic artery Splenic vein	Medial end Lateral end Upper border Lower border Splenic notch Splenic artery Splenic vein Hilum Gastric impression Pancreatic impression Colic Impression Renal Im pression

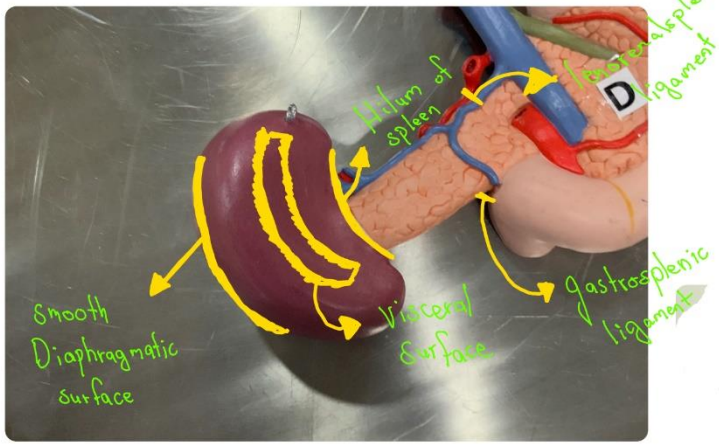


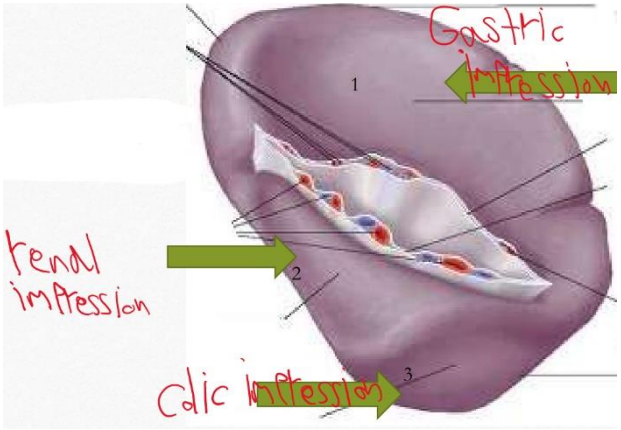


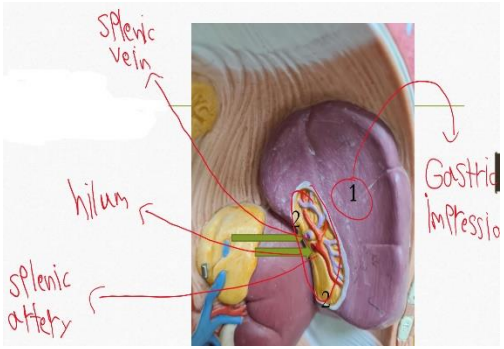




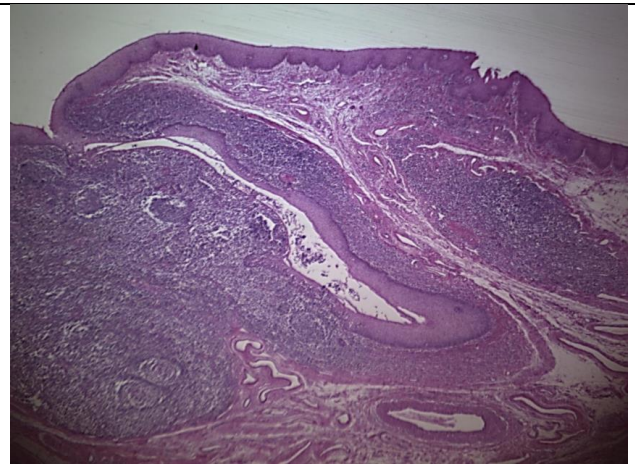
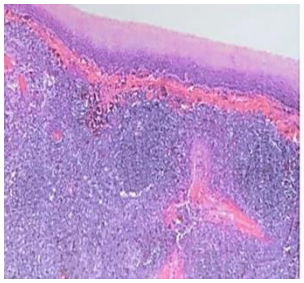
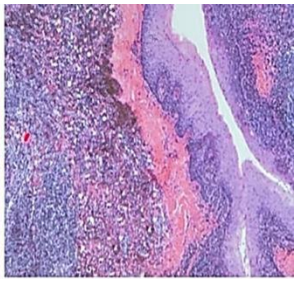
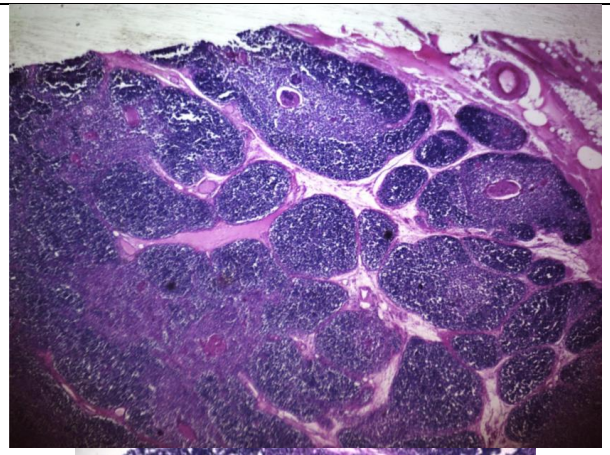
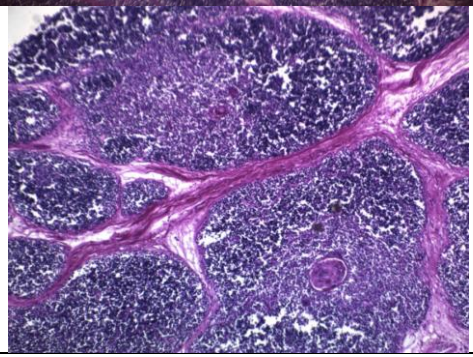


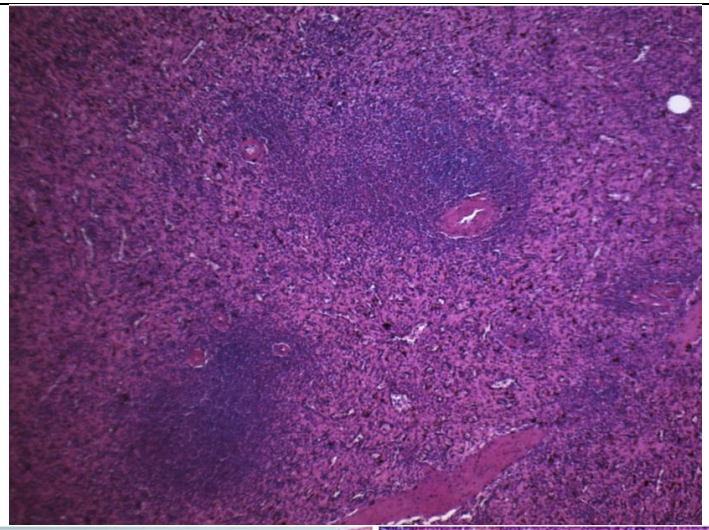
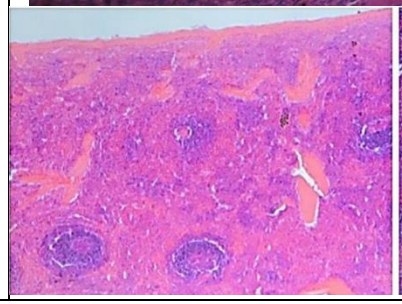
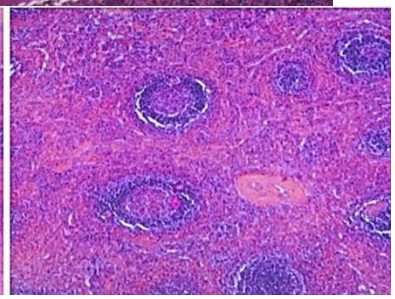
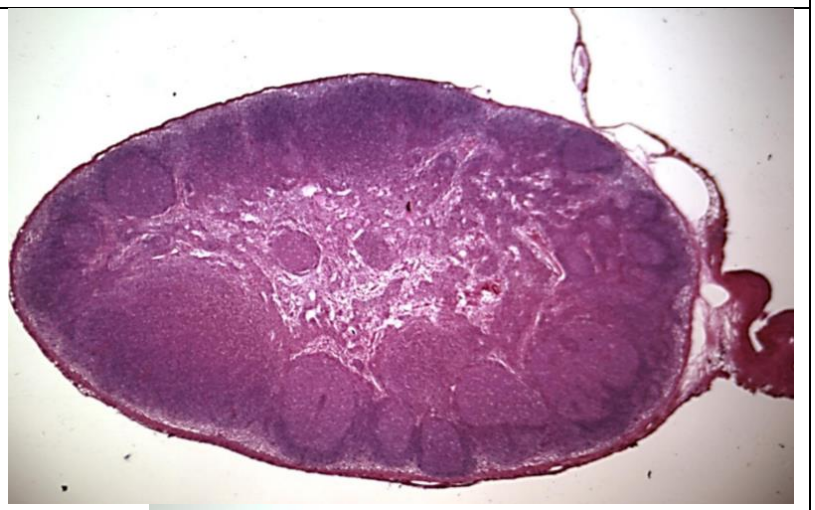
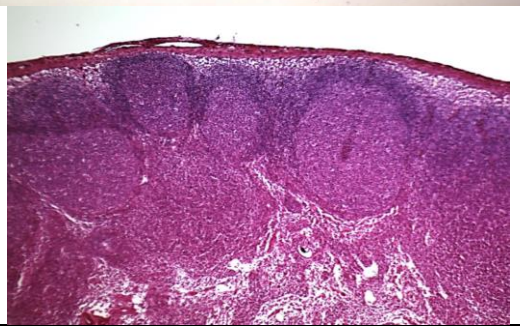






Histology

	Tonsil	Thymus [CHECK]
Point #1	Stratified squamous non-keratinized epithelium	Lobulated appearance / Multi-lobulated Each lobe has cortex [blue] & medulla [pink]
Point #2	Lymphatic Nodule [Blue] w/ germinal center	No lymphatic Nodules
Point #3	Tonsillar crypts [Deep grooves/ depression]	Hassan's corpuscles [like onion, pinkish, in the medulla]
Reference	  	 

	Spleen	Lymph node
Point #1	White Pulp w/ lymphatic nodules [Blue zone]	Sub scapular sinus [CHECK]
Point #2	Red pulp w/ splenic cord, venous sinuses [white space] & Pulp arteries [Pink]	Lymphatic nodules w/ germinal center in cortex
Point #3	Central Artery [Small red circle, w/ all lymphatic nodules or cols to it	Medulla w/ medullary cords [Pink zone] & medullary sinus [space in pink zone]
Reference	  	 

Biochemistry

- **Case 1**

A 5 years old child

Symptoms:

- ❖ Long history of: Shortness of breath (dyspnea)
- ❖ Sensation of tiredness even on trivial efforts

Lab Investigations:

- ✓ RBCs Count & Hemoglobin Concentration **LOW**
- ✓ Hemoglobin Electrophoresis: Hemoglobin H (Hb H) **HIGH**

What is your interpretation??

Severe alpha thalassemia disease [CHECK ASNWER]

- **Case 2**

56 years old lady On methotrexate medication
(for treatment of a cancer)

- ❖ Clinical manifestations of anaemia.

What is the type of anaemia in this case ?

Folic acid deficiency – Folate trap - Megaloblastic anemia

- **Case 3**

A 10 years old child lived in lead- based painted apartment

Symptoms

- ❖ Pallor, Dyspnea,
- ❖ Fatigue on minor efforts,
- ❖ Irritation,
- ❖ behavioral changes,
- ❖ Abdominal colic & nausea

Lab Investigations:

- ✓ HIGH Blood & urinary d-Aminolevulenic Acid (d-ALA) Concentration

Intrepret the case..

Acquired Porphyria by Chronic lead poisoning [CHECK ANSWER]

- **Case 4**

Lab Investigations:

- ✓ **Blood Picture:** Hypochromic microcytic anemia
- ✓ **Plasma Ferritin:** 35 mg/dl (N: 45 -150mg/dl) **LOW**
- ✓ **Plasma Transferrin**: 400 mg/dl (N: 200- 380 mg/dl) **HIGH**
- ✓ **Iron Percent Saturation:** expected to be **??? LOW**
  [Proportional to plasma ferritin]

Interpretation?

Iron Deficiency Anaemia

- **Case 5**

23 years man with history of chronic gastritis

Clinical Manifestations:

- ❖ Pallor, dyspnea & fatigue
- ❖ Insomnia, depression
- ❖ Diminished sensation in parts of the upper & lower limbs
- ❖ Impaired balance during walking

Hematological Lab Investigations:

- ✓ Macrocytic Anaemia

Interpretation?

Vitamin B12 deficiency

- **Case 6**

A 12 years old boy, History of chronic hemolytic anemia & prolonged intake of iron medication

Lab Investigations:

- ✓ Iron Percent Iron Saturation: 95%
- ✓ Serum Ferritin: expected to be??? HIGH

- Serum Transferrin: low or normal.
- Serum Iron: normal.

Interpretation?

Iron overdose = Iron Toxicity = Hemosiderosis

- **Case 7**

A 14-year-old girl

Clinical Manifestations:

- ❖ Jaundice
- ❖ Enlarged tender liver (Hepatomegaly)
- ❖ Behavior disturbances [Due to Lenticular Degeneration; Neurological symptoms like in parkinson's]
- ❖ Difficulty with movement
- ❖ Kayser flisher ring in his eyes

Lab Investigations:

- ✓ Serum Ceruloplasmin : 50 mmol/L (N: 200–450 mmol/L) LOW
- ✓ Urine Copper: 4.2 µmol/24 Hours Collection (N: 2–3.9 µmol/24 Hours Collection) HIGH
- ✓ Serum Copper : 8 mmol/L (N: 10–22 µmol/L) LOW
- ✓ Ferritin low , Serum Transferrin increase & Percent Saturation low

A liver biopsy was required to establish the diagnosis of……?

Wilson's Disease

- **Case 8**

Lab Investigations:

- ✓ Hemoglobin Concentration: normal 14gm%
- ✓ Blood Picture: No abnormal manifestations
- ✓ Serum Ferritin: **HIGH** [Iron Overdose or acute phase]
- ✓ Serum Transferrin: **LOW** [Iron Overdose or acute phase]
- ✓ Serum Iron: **LOW** [Confirmatory for absence of iron overdose & presence of acute phase]
- ✓ **Iron Percent Saturation: LOW/NORMAL**

Interpretation?

Chronic inflammation – Acute Phase Reaction

- **Case 9**

A 44-year-old woman – **Symptoms Swelling in lower limb**

:**Clinical Examination**: *Bilateral edema in lower limbs*

Lab Investigations: Plasma Albumin: 19 grams/L (Normal: 36–52) LOW

24 hours Urine Collection Protein : 10 grams (Normal: 0.15 grams). HIGH

HOW COULD YOU INTERPRET THE CASE ??

Nephrotic Syndrome – Hypoalbuminemia

- **Case 10**

A 20 years old male on antimalarial treatment , started to develop

Clinical manifestations

- ❖ Palpitation ,
- ❖ Dyspnea,
- ❖ Fatigue
- ❖ Yellowish coloration of eyes and skin
- ❖ Dark urine

Lab Investigations:

- ✓ **CBC:** decreased RBCs count, increased Reticulocyte count
- ✓ **Blood smear:** Heinz bodies
- ✓ **Fluorescent spot test :** negative

What is your interpretation?

G6PD Deficiency

How to confirm your diagnosis?

Heinz bodies are mark for G6PD deficiency hemolytic anemia, & negative screened of no NADPH in blo

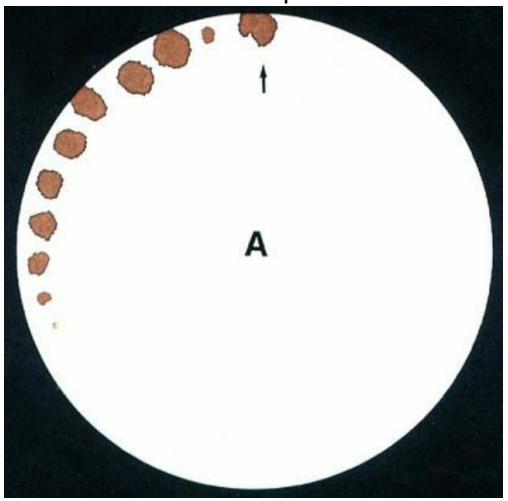
Physiology

PCV & ECR

	PCV	ESR
Name of the test	Packed cell volume test	Erythrocyte Sedimentation rate test
Name of the instruments	1. Microhematocrit centrifuge machine  2. Hematocrit / PCV reader **Low hematocrit** • Anemia • Internal or external hemorrhage – bleeding • Chronic renal failure – kidney disease • Pernicious anemia – vitamin-B12 deficiency • Hemolysis – associated with transfusion reactions **High hematocrit** • Polycythemia rubra vera [Primary Polycythemia] – abnormal increase of blood cells • Secondary Polycythemia – excessive red blood cell production secondary to hypoxia • Severe dehydration – e.g. in case of burns, diarrhea or excessive use of diuretics  3. Capillary Tube [w/ anti-coagulant 	1. Westergren tube 
Function	Determine • **Anemia, [Low Hematocrit]** • **Polycythemia, [High hematocrit]** • **Response to treatment to anemia or polycythemia**	[Check Answer] ESR value determines type of infection/disease **ESR Increase**: Bacterial infection, inflammation, Rheumatoid arthritis, tuberculosis, Malignancy **ESR Decrease:** Polycythemia, Congestive cardiac failure **Physiological**: Pregnancy & Females

- Hemostasis:
  - Is stoppage of bleeding, consisting of:
    1. Vasoconstriction
    2. Formation of platelet plug
    3. Formation of clot.

Bleeding time & Clotting time – Determined to test integrity of Hemostasis mechanism

	Bleeding time	**Clotting Time**
Name of the test	Bleeding time test	Clotting time test
Use to	Asses **platelet** function	Asses **clotting** factors [intrinsic pathway]
Test Process Name	Filter Paper 	Capillary Tube [Without anti-coagulant] 
Process	1- Finger prick 2- Wipe blood every 15 seconds w/ filter paper 3- Test ceases when bleeding ceases [2-5 min normal]	4- Finger prick 5- Soon blood appears start stopwatch, - then after every 30 seconds break off capillary tubing 1-2 cm from one end & look appearance of thread of fibrin 6- Stop timing when fibrin thread appears [3-8 min normal]
Prolonged test time conditions	• Vitamin C deficiency • Thrombocytopenia • Von Willebrand disease	• Vitamin K deficiency • Hemophilia A + B • Liver disease • Taking Warfarin or Heparin • Issue in $Ca^{+}2$

Blood Group Testing two main blood group systems

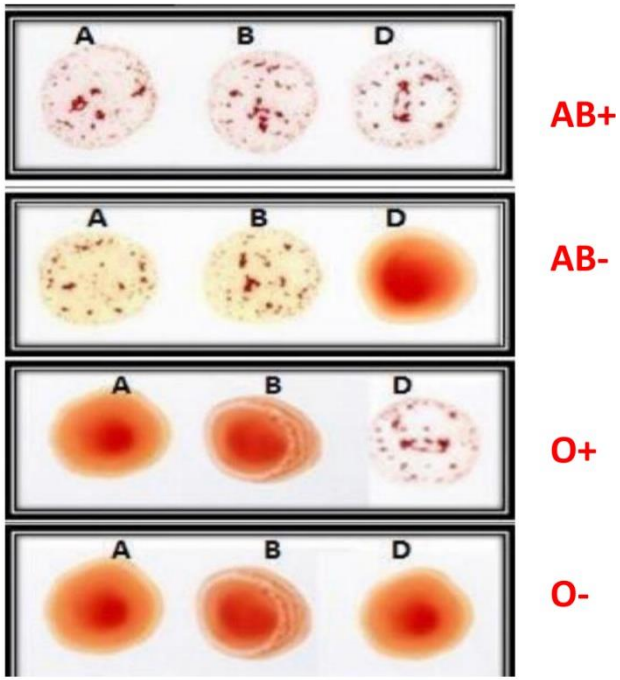
1- ABO System		
Blood Group	**Agglutination on RBC**	**Agglutinin in plasma**
A	A	Anti B
B	B	Anti A
AB	AB	--
O	--	Anti A & B

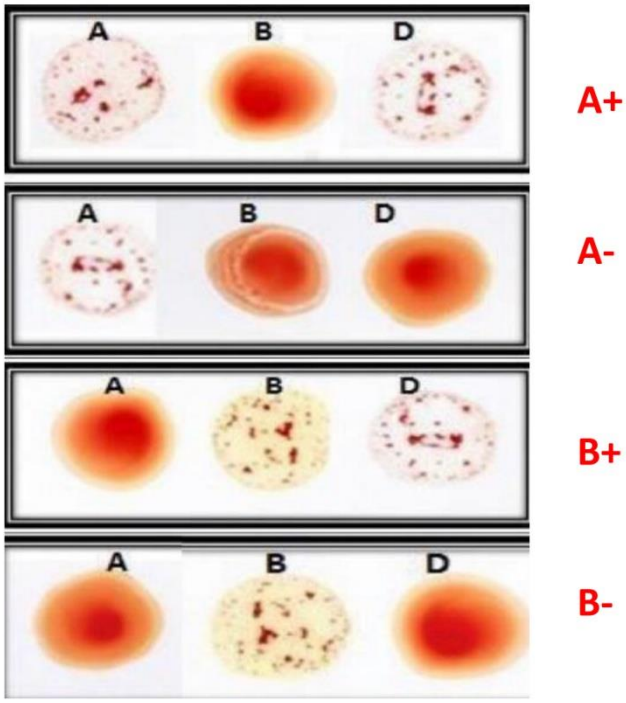
[6] Main types of Antigens: C, D, E, c,d,e. They are present on RBC membrane.

Most important is D antigen, if D antigen is present person is Rh positive. 80 – 90% of the people are Rh +

- Person may be Rh+ or Rh-, there is no antibody in the plasma
- **In Rh – persons, Rh agglutinins (antibody) are produced, when Rh- blood is sensitized with Rh + blood.**

2- Rh System		
Rh status	**Agglutination**	**Agglutinin in plasma**
Positive	Present	Anti D
Negative	None	Anti D

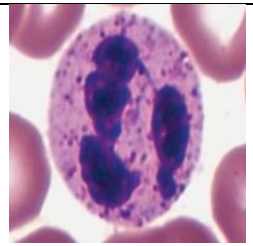
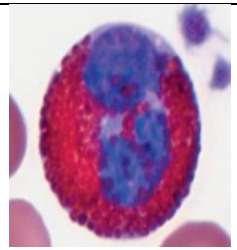
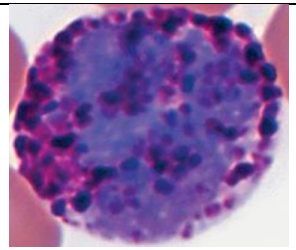
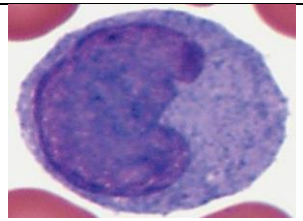
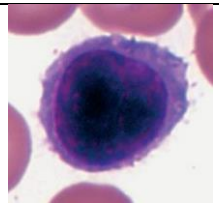
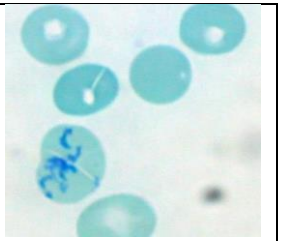




Blood Group A +

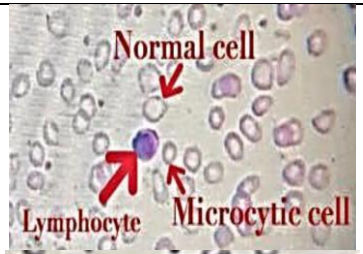
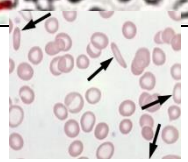
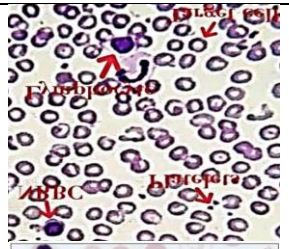
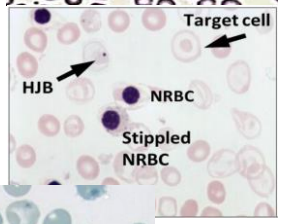
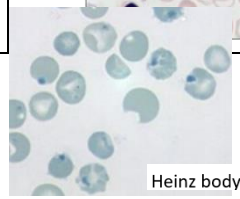
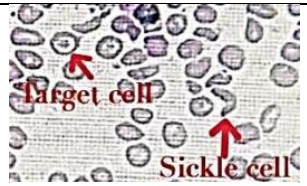
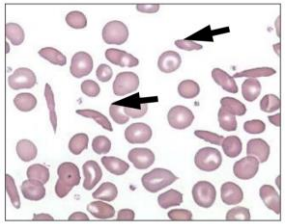
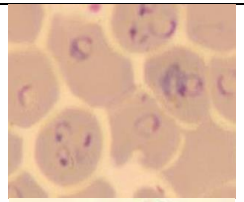
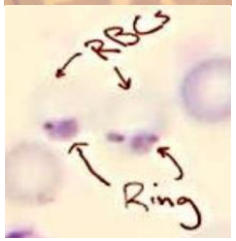
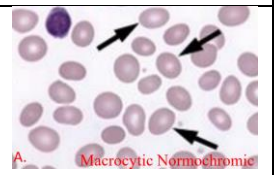
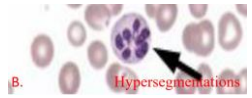
Increased count is seen in viral infections, chronic infections

Leucocytes & Reticulocyte

	Neutrophils	Eosinophils	Basophils	Monocytes	Lymphocytes	Reticulocyte
Function	Against Bacterial infection	Against Parasitic infection & Allergic reaction	Against Allergic reaction By releasing histamine & heparin	Phagocytosis of bacteria, dead cells, and other debris Increased count indicator in chronic infection e.g. Tu berculosis	**B-Cells:** Anti-body mediated or humoral immunity **T-Cells:** Cell-Mediated Immunity	Indicator of activity in Bone marrow
Granulocyte	Granulocyte [Light Purple]	Granulocytes [Coarse red]	Granulated [Deep blue]	Agranulocyte [not visible]	Agranulocyte [not visible]	
Nuclei	Multilobulated [Polymorphonuclear leukocyte]	Bilobed	Unclear lobed	Shapes of Spherical, Kidney, oval, or lobed	Large	
Size µm	10-14	10-15	10-15	12-20 [Largest of all]	7-9 or 10-15 [Slightly larger than RBCs]	
Normal range	50-70%	1-6%	<1%	1-10%	20 – 40%	
Reference				 Kidney Shape		

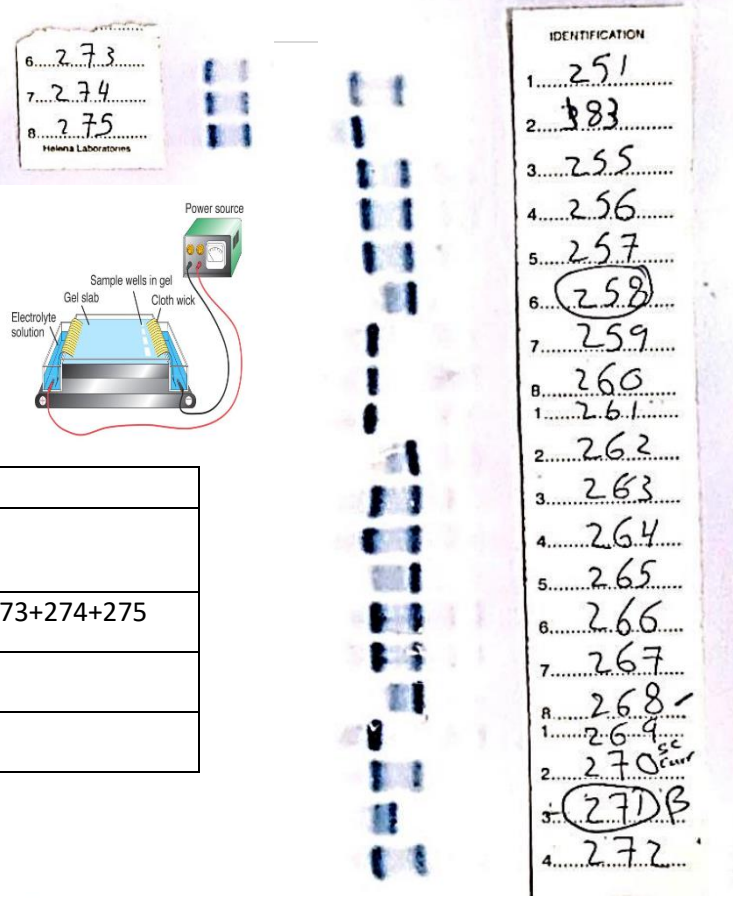
Hematology

Type of anemias

	Iron Deficiency	Thalassemia	Sickle Cell	Hemolytic Anemia	Megaloblastic anemia
Morphology	Microcytic, [smaller than lymphocyte] Hypochromic	Microcytic, Hypochromic	Normocytic, Normochromic	Normocytic, Normochromic	A. Macrocytic Normochromic . B.Hypersegmentaed neutrophil.
Indicators	Pencil Cell –	Target cell Anisocytosis Poikilocytosis NRBC; Nucleated RBCs HJB; RBCs Inclusions Heinz body = denatured beta globin chain	Sickle RBCs, Target cell	**Malaria** Agent/species-Plasmodium Classification – Sporozoa	Vitamin B12 deficiency or folate deficiency
Confirmation	Low MCV = 51 [78-98 normal]	MCV & MCH Low Inherited Hemolytic Anemia Hemoglobin electrophoresis test	Inherited mutation in **Beta globin gene** Hemolytic anemia	Diagnostic stage of ring stage	MCV Increased>110 [Normal:78-98fl]
Refrence	  	   Heinz body = denatured beta globin chain	  HGB S Disease (Hgb SS)	 	 

Hb Electrophoresis Test

	Hb Electrophoresis Test
Process	separation of hb fraction from each other by electrical current according to variation and molecular weight.
Name of the sheet	**Cellulose Acetate Media**
Clinical Significant	diagnosis of sickle cell anemia and thalassemia (disease and trait).



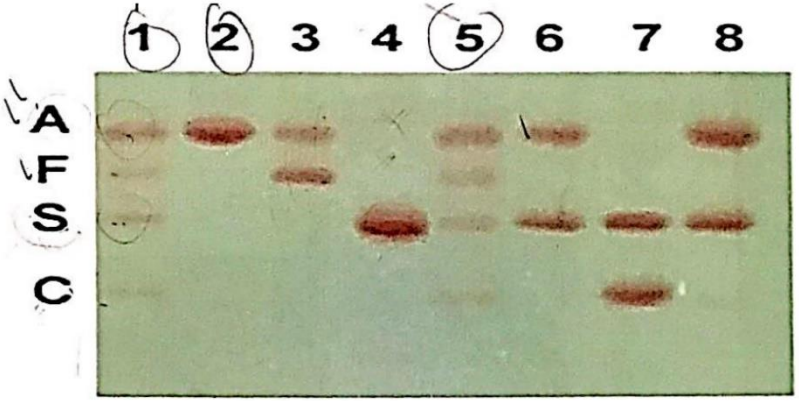
Test

	Hb Standard	N.
Normal	HbA	269+261+260+259+183
Sickle cell trait	HbA + HbS	**272**+270+267+266+264+263+257+ 256+255+251+273+274+275
Sickle cell disease	HbF + HbS little	268+262+ 258
Thallasemia Minor	HbA + HbF	271

Hb electrophoresis

Figure 1: causes of beta thalassemia and sickle anemia.

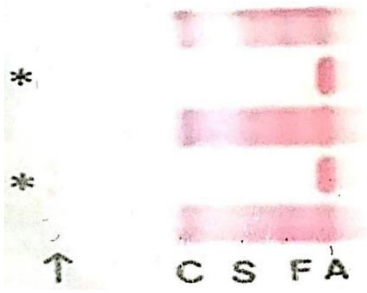
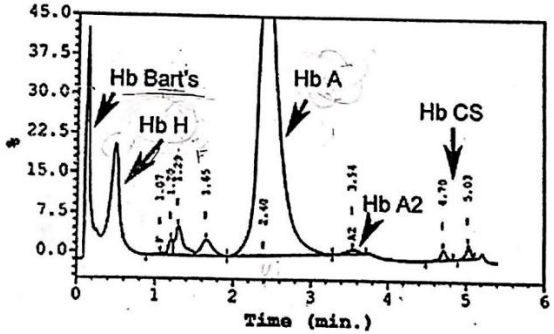
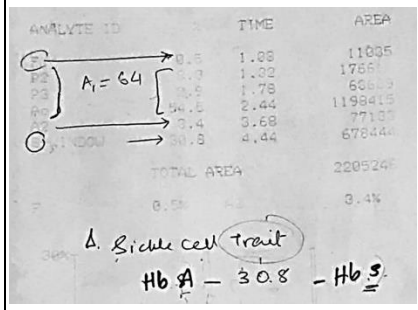
	Hb Standards	1-8
Normal	HbA	2
Sickle cell trait	HbS + HbA	6 + 8
Sickle cell disease	HbS + HbF [CHECK An.]	4
Sickle cell disease	HbS + HbC [CHECK An.]	7
Thalassemia Beta Minor	HbA + HbF	3

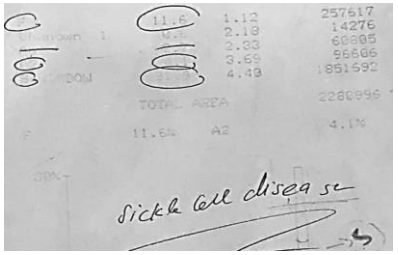


Hb Diseases Modes

<table>
<tr><th></th><th>Curve Starts w/</th><th>High Hb Amount</th></tr>
<tr><td>HbH

Alpha thalassemia intermedia disease</td><td>Hb Bart's → HbH → HbF → HbA1 → HbA2 → HbC → HbS
<table>
<tr><th>Peak Name</th><th>Calibrated Area %</th><th>Area %</th><th>Retention Time (min)</th><th>Peak Area</th></tr>
<tr><td>F</td><td>0.3</td><td>---</td><td>1.07</td><td>3909</td></tr>
<tr><td>Unknown</td><td>---</td><td>1.1</td><td>1.20</td><td>18127</td></tr>
<tr><td>P2</td><td>---</td><td>3.2</td><td>1.29</td><td>55793</td></tr>
<tr><td>P3</td><td>---</td><td>2.6</td><td>1.65</td><td>45007</td></tr>
<tr><td>Ao</td><td>---</td><td>90.3</td><td>2.40</td><td>1556492</td></tr>
<tr><td>A2</td><td>0.9*</td><td>---</td><td>3.54</td><td>14528</td></tr>
<tr><td>S-window</td><td>---</td><td>0.8</td><td>4.70</td><td>13238</td></tr>
<tr><td>C-window</td><td>---</td><td>0.9</td><td>5.03</td><td>15720</td></tr>
</table>
Total Area: 1,722,813

F Concentration = 0.3 %
A2 Concentration =0.9*%</td><td>Hb Bart's + HbH + HbA
 
</td><td rowspan="3"> 
</td></tr>
<tr><td>Sickle Cell Trait</td><td>Hb Bart's → HbH → HbF → HbA1 → HbA2 → HbC → HbS</td><td>HbA+HbS
 
</td></tr>
<tr><td>Sickle Cell Disease</td><td>Hb Bart's → HbH → HbF → HbA1 → HbA2 → HbC → HbS
<table>
<tr><th>Peak Name</th><th>Calibrated Area %</th><th>Area %</th><th>Retention Time (min)</th><th>Peak Area</th></tr>
<tr><td>F</td><td>13.1*</td><td>---</td><td>1.13</td><td>177810</td></tr>
<tr><td>~~Jun~~</td><td>---</td><td>~~3rd~~</td><td>2.36</td><td>44666</td></tr>
<tr><td>A2</td><td>6.4*</td><td>---</td><td>3.70</td><td>94380</td></tr>
<tr><td>S-window</td><td>---</td><td>77.4</td><td>4.47</td><td>1082702</td></tr>
</table>
Total Area: 1,399,557

F Concentration = 13.1*%
A2 Concentration =6.4*%</td><td>HbF + HbS
 
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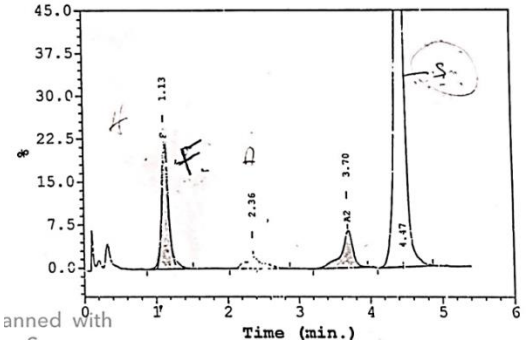
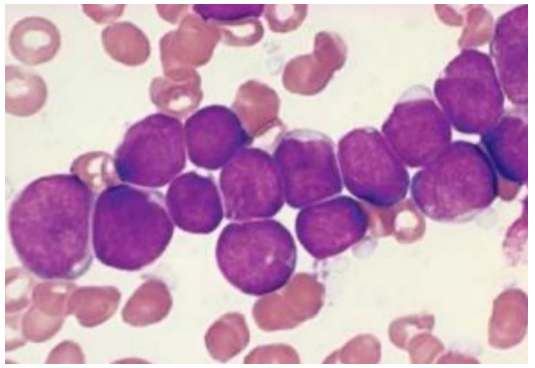


Pathology



Case No-1

A 5 year old boy presented with **cervical lymphadenopathy**, fever, repeated infections and **bleeding gums**. His CBC showed **anemia**, **leukocytosis** and **thrombocytopenia**.

He underwent bone marrow examination which revealed following histopathological image.

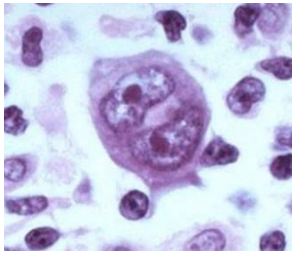
- identify the cells observed in the bone marrow aspiration image? Lymphoblast
- percentage of these cells should be there to arrive at a diagnosis? >20% Lymphoblast
- What is the diagnosis based on the clinical features, CBC and bone marrow examination? Acute Lymphoblastic Leukemia
- What is the prognosis in this case based on his age? Good prognosis

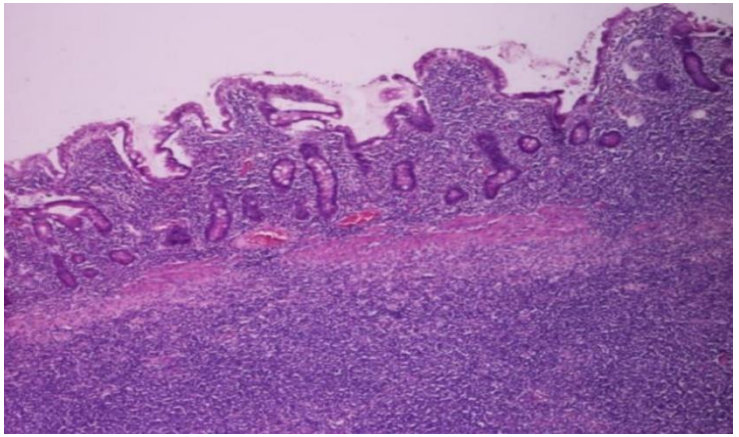
Case No-2

A **16 year old** boy presented with **massive cervical lymphadenopathy**. His CBC examination showed *leukocytosis, normal RBC and platelet count*. He underwent bone marrow examination which did **not reveal any abnormality**.

His cervical lymph node biopsy showed following histomorphological features.

- Identify the characteristic cell which is observed on biopsy? Reed-sternberg cells
- Describe the morphological features of the cell? Large cell, Owl's eye appearance
- Write the diagnosis based on clinical features, CBC, bone marrow examination and lymph node biopsy? Hodgkin Lymphoma
- Mention the name of other two variants of the characteristic cell? Lacunar & Popcorn cell
- Mention the immunophenotypic markers for confirmation of the characteristic cell? CD 15 & 30
- Mention the most common subtype? Nodular Sclerosis
- Mention the name of staging system used in this condition? Ann Arbor





Case No-3

A **50 year old** female presented with **pain** in **abdomen, nausea, vomiting and constipation**. USG showed a **mass in the small intestine**.

She was operated and a segment of small intestine along with mass was removed and sent for histopathological examination.

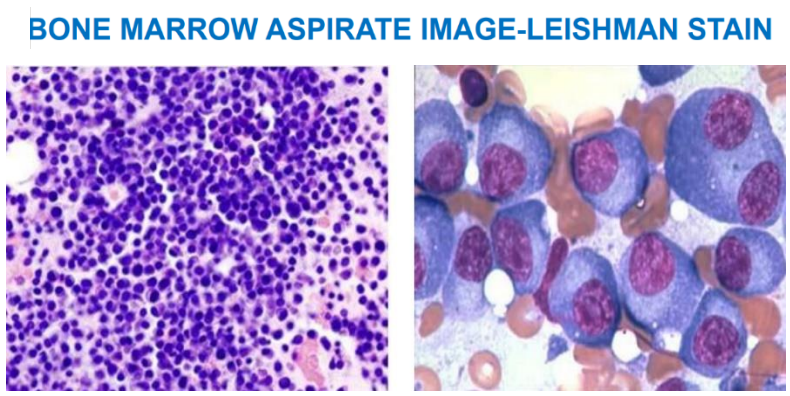
- What is the most likely diagnosis taking into consideration the clinical features, gross and microscopic features? Non-Hodgkin Lymphoma

- Which immunophenotypic markers will help to confirm the diagnosis?
  B-cell lymphoma +ve for CD20 | **T-cell Lymphoma** +ve for CD3, CD5

Case No-4

A **65-year-old** man presented with **pain in back** and fatigue. An X-ray examination revealed numerous **osteolytic lesions in the lumbar vertebral bodies**. Further evaluation revealed *normocytic normochromic anemia*, **hypercalcemia** and a **high globulin fraction**.

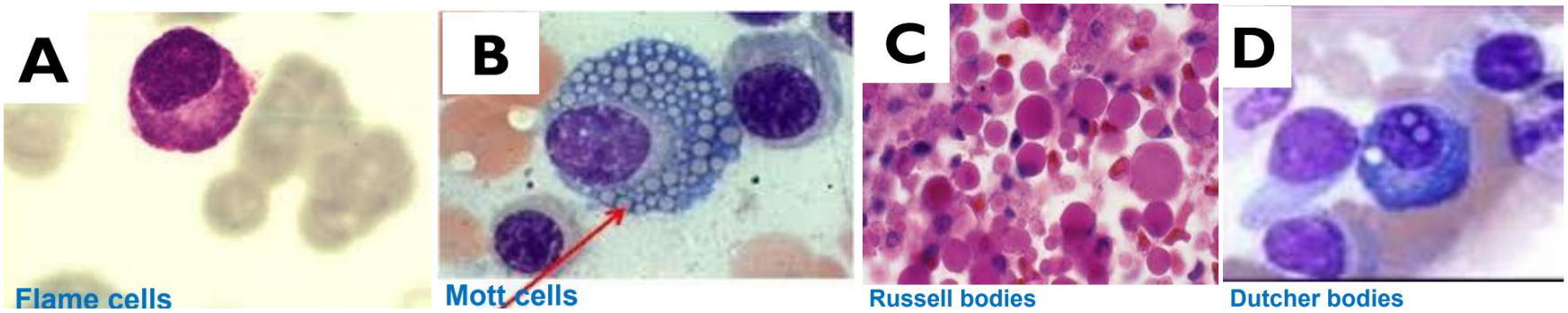
He underwent bone marrow examination which revealed following histopathological image



- Identify the cells observed in the bone marrow aspiration image? Plasma Cells

- What is the diagnosis based on the clinical features, CBC and bone marrow examination? Multiple Myeloma

Identify the following microscopic findings



Case No-5

A **21-year-old woman** presented with complaints of **fatigue, unintentional weight loss**, **red patches on her face** and a persistent oral ulcer. Physical examination revealed swelling and **tenderness** of **distal joints** of both the hands.

Laboratory studies showed *normocytic normochromic anemia* and **high antinuclear antibody (ANA) titers**.

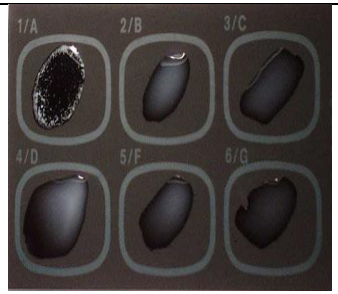
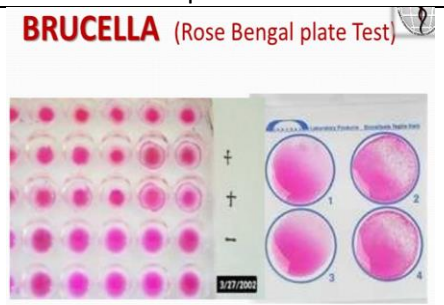
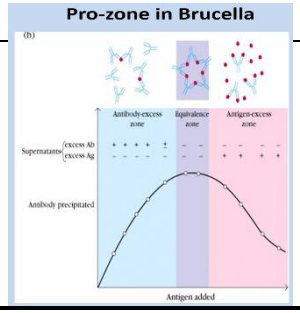
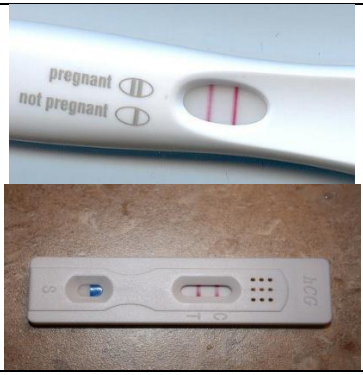
- Identify the clinical sign? Malar rash [Butterfly rash]
- Most likely diagnosis? Systemic Lupus Erythematosus

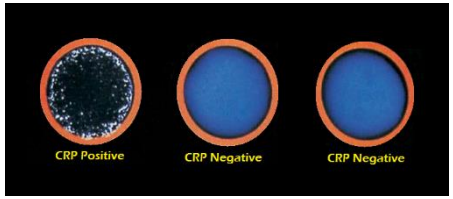
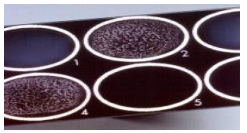
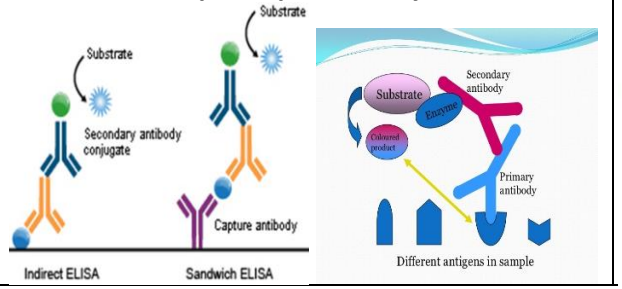
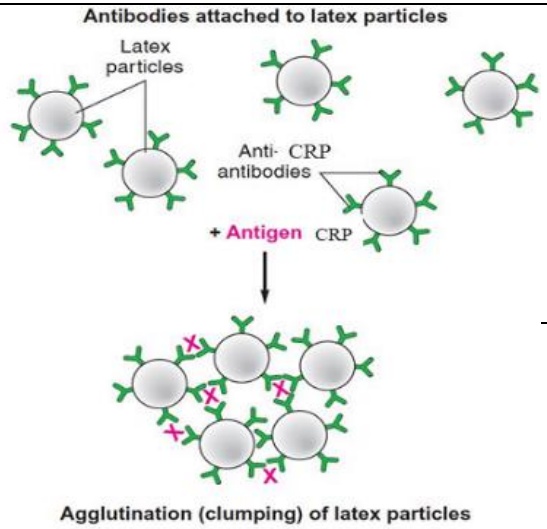
- Mention different types of ANA's?
  Antibodies to [DNA, Histones, Non-histone proteins boud to RNA [anti-smith], Nucleolar antigens]

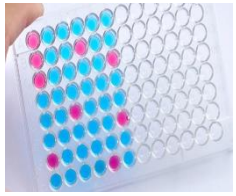
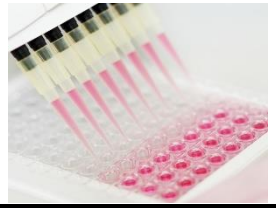
- Mention Name of method used to detect ANA's? Indirect Immunofluorescence

7.4 PH 36-37 C

Immunology

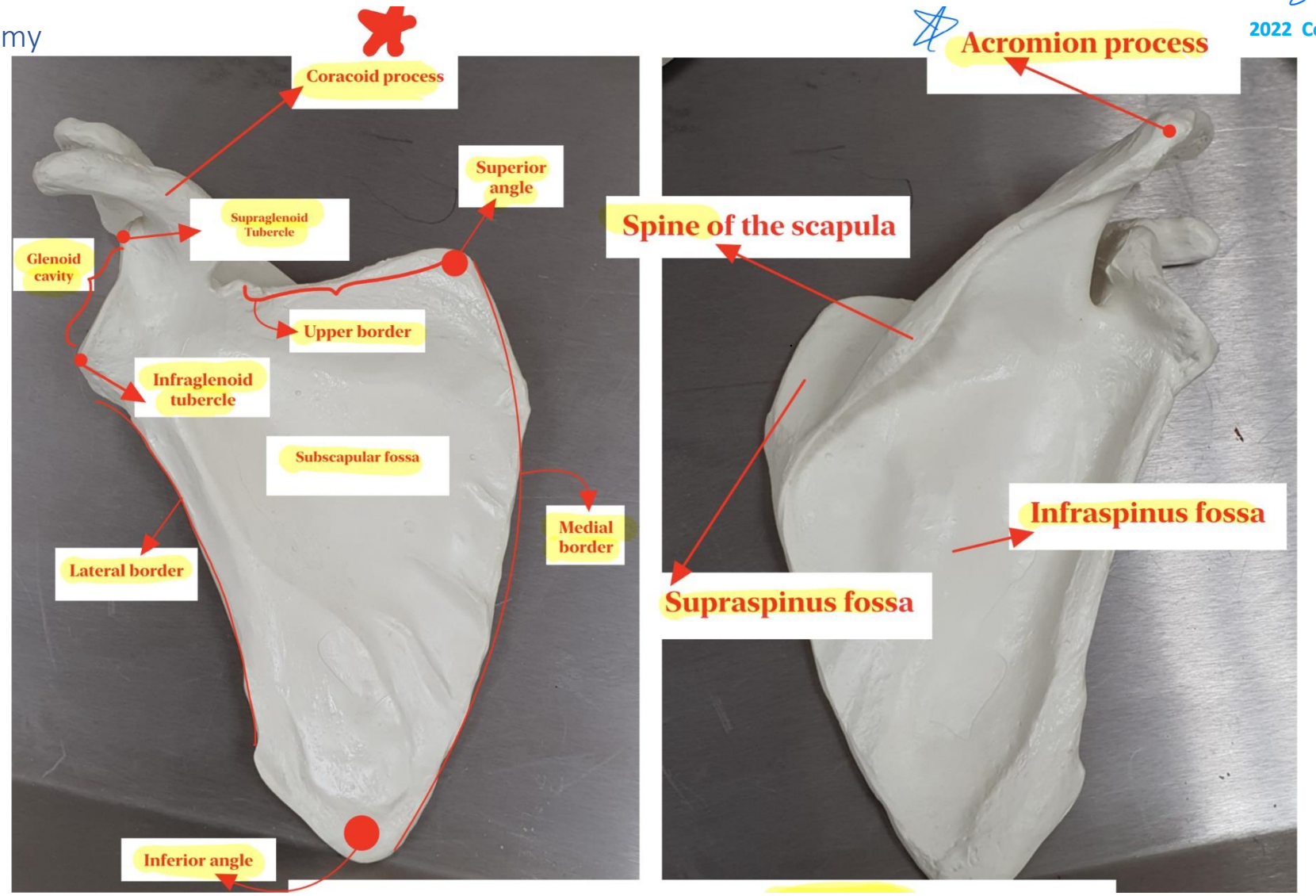
	Widal Test	Brucella Test	Pregnancy test
Principle of test	Direct Agglutination	Direct agglutination	Immunochromatography
Antigen/Antibodies in the test	~Killed colored bacteria (Salmonella)+ Patient Serum (Antibodies)= Positive or negative Reaction -Salmonella typhi-(O,H) -Salmonella paratyphi-A,B-(O,H)	*;(Killed-colored bacteria).* *-Brucella melitensis* *-Brucella abortus* 	In Serum or urine specimens is **HCG Hormone** Substance fixed on the strip of the test is **Anti-HCG antibodies**
Significant Titer	- 1/80 or more : Significant for children - 1/160 , 1/320, or more: Significant for adults	1/80, 1/160, or more	---
Clinical Significance	Diagnosis of typhoid fever	Diagnosis of Malta fever **Cause of false-negative reaction :** - The Pro-zone phenomenon	Determination of pregnancy
Reference	 	 	

	ELISA test	C-reactive protein [CRP] test	Rheumatoid Factor [RF] test
Principle of test	ELISA **method used to measure Antibodies or antigen concentration in vitro** Spectrophotometry	Indirect agglutination [Latex Agglutination] 	Indirect agglutination (Latex Agglutination)
Antigens/Antibodies in the test	**The substance coating the microtiter plate wells:** 1-Anti-Hepatitis B Antibodies. 2-Hepatitis C antigen. **The antigens detected in patient's serum:** 1-Hepatitis B virus-Antigens. 2-Anti-Hepatitis C Antibodies.	**Substance coating the Latex:** Anti-CRP Antibodies. **Antigen detected in serum:** CRP 	**Substance coating the Latex:** Human IgG Antibodies. **Antigen detected in serum:** Anti-Human IgG (IgM) Antibodies 
Diagnosis	**Substance conjug. w/ 2ry antibodies:** - Enzyme such as peroxidase - Alkaline Phosphatase	**Titer For positive results** 1/2, 1/4, 1/8,…. Or more	**Titer For positive results** 1/2, 1/4, 1/8,…. Or more
Reference	**Spectrophotometry** 		

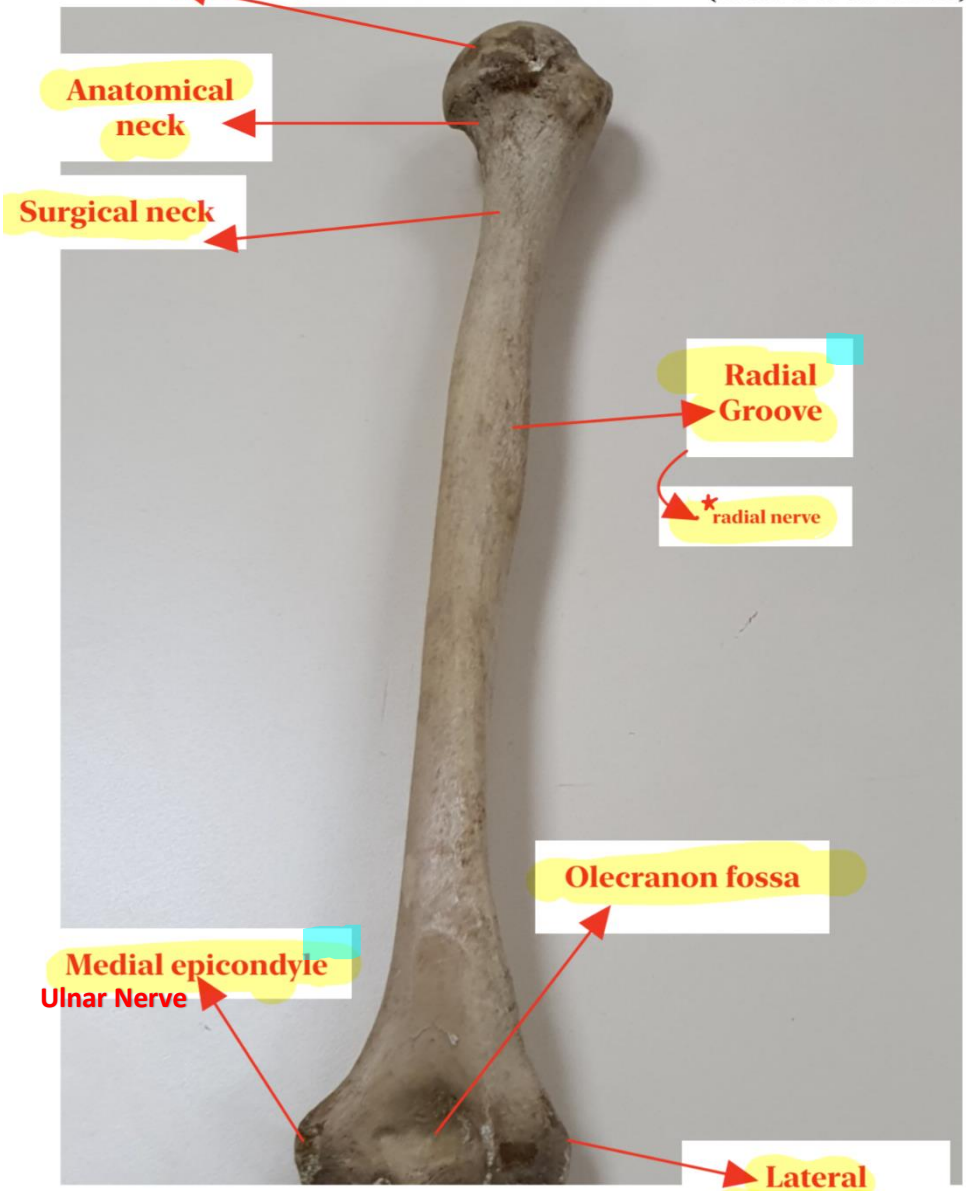
MSK

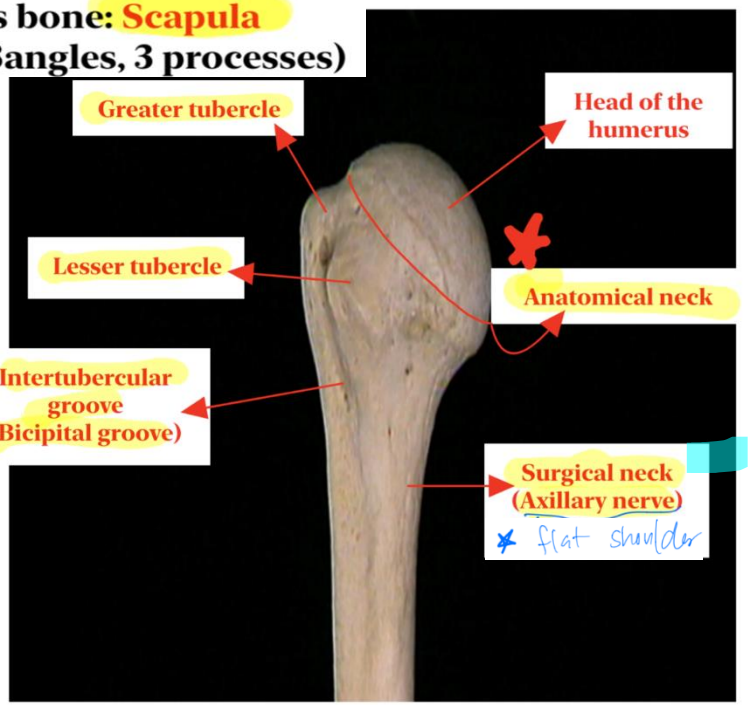
Anatomy

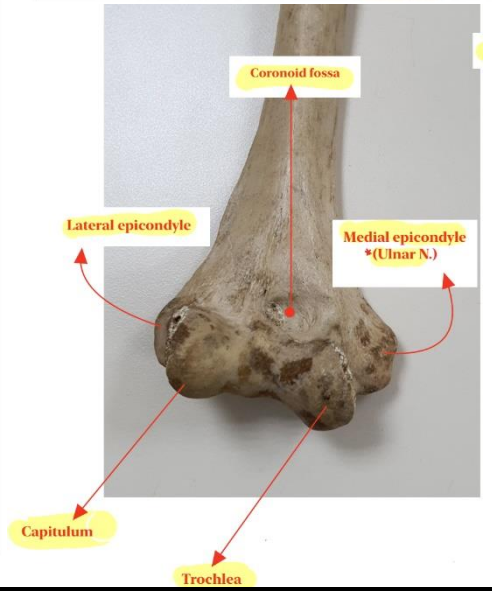


Back of the humer

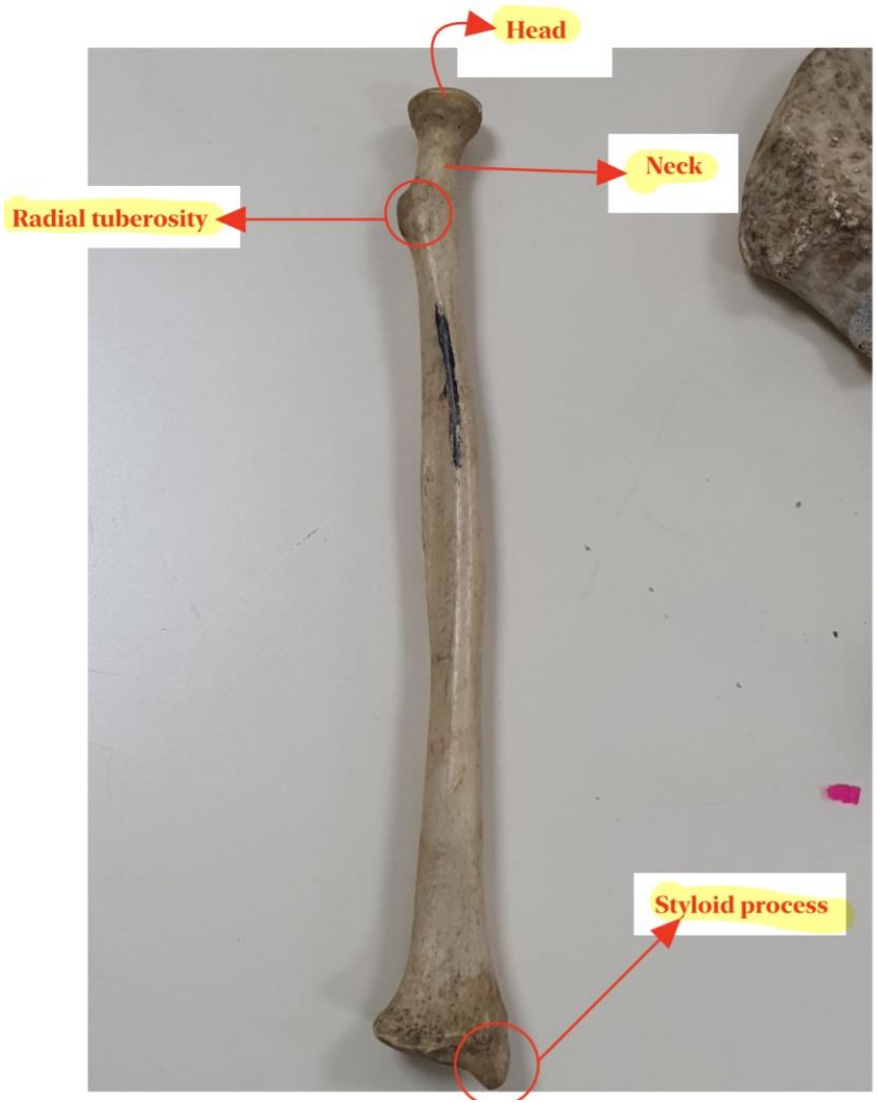
- Identify this bone: Scapula
- (Has 3 borders, 3angles, 3 processes)

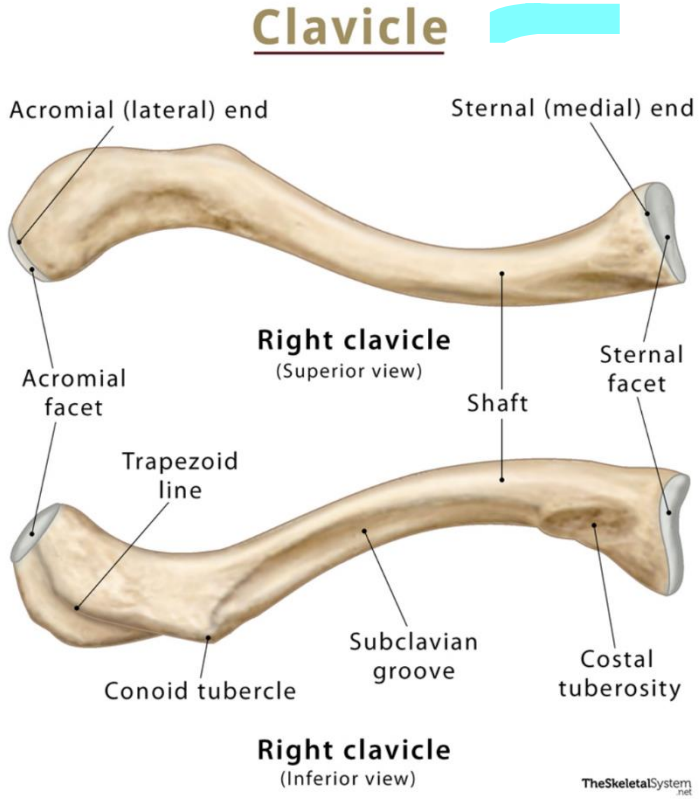






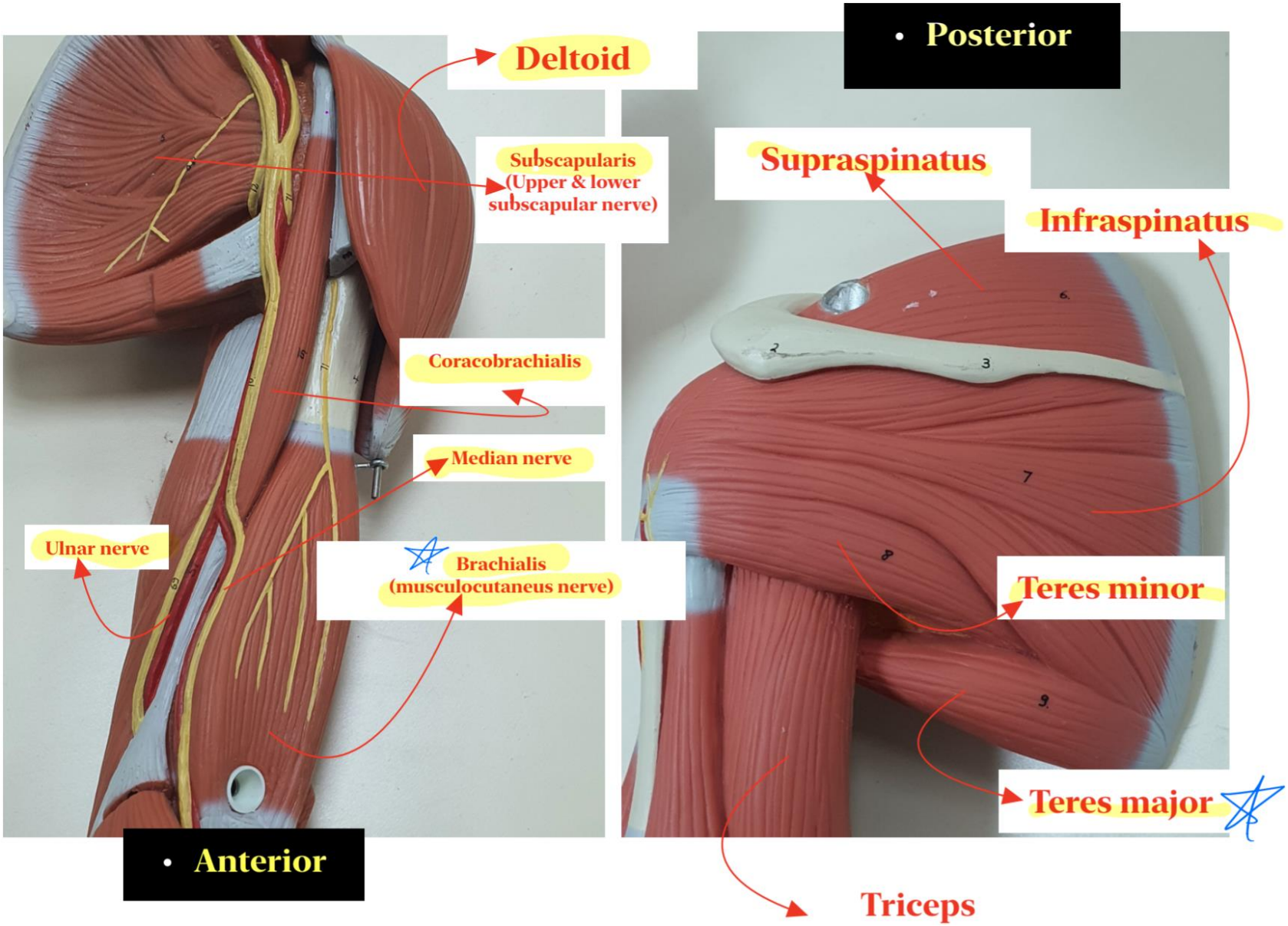
Identify this bone: Humerus

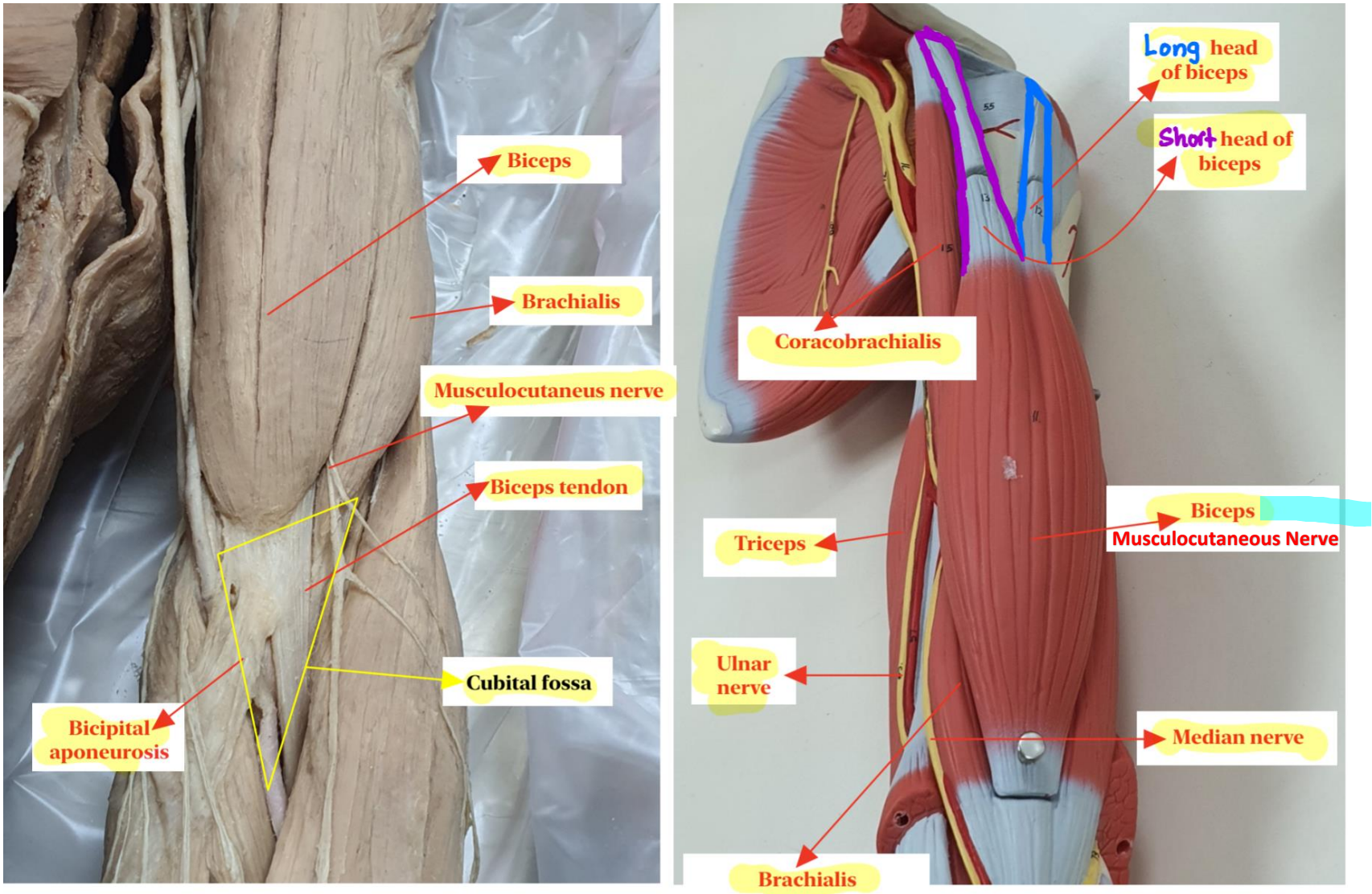




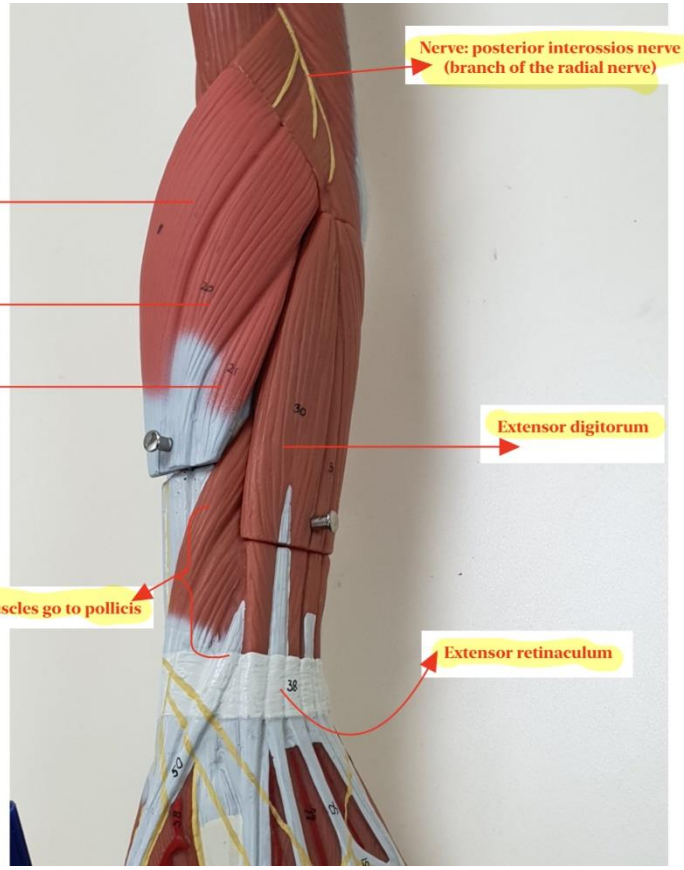
- **Identify this bone: Radius**

Lower end of the radius articulate with: Scaphoid & lunate

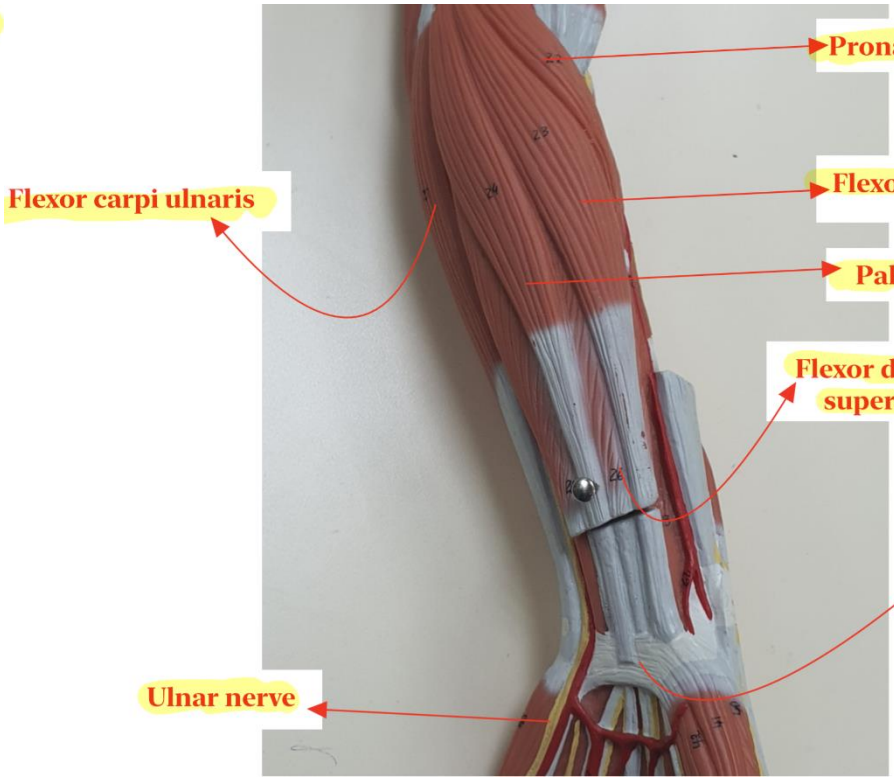

Deltoid
Subscapularis
(Upper & lower
subscapular nerve)
Coracobrachialis
Median nerve
Ulnar nerve
Brachialis
(musculocutaneus nerve)
• Anterior
• Posterior
Supraspinatus
Infraspinatus
Teres minor
Teres major
Triceps

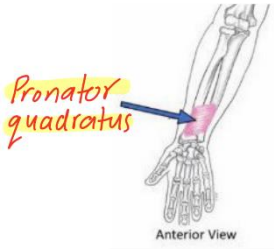

Biceps
Brachialis
Musculocutaneus nerve
Biceps tendon
Cubital fossa
Bicipital aponeurosis
Long head of biceps
Short head of biceps
Coracobrachialis
Triceps
Biceps
Musculocutaneous Nerve
Ulnar nerve
Median nerve
Brachialis

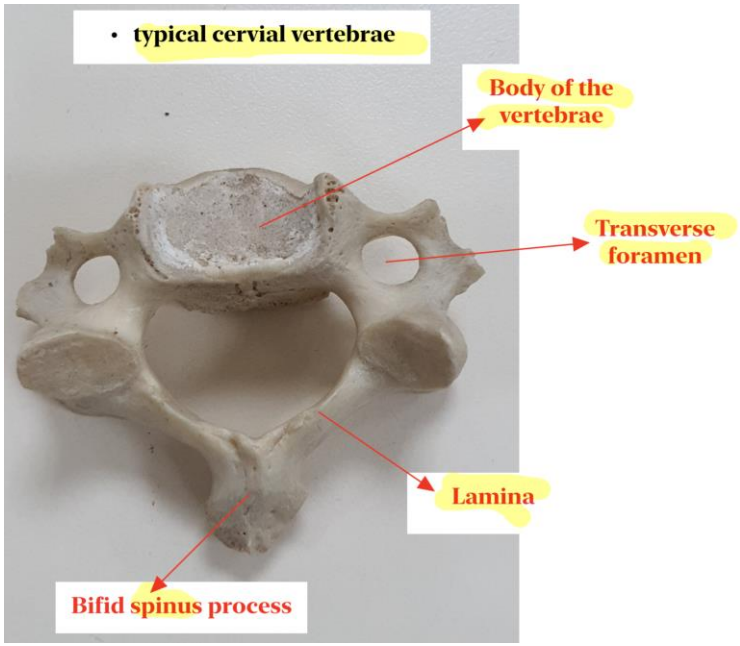
Back

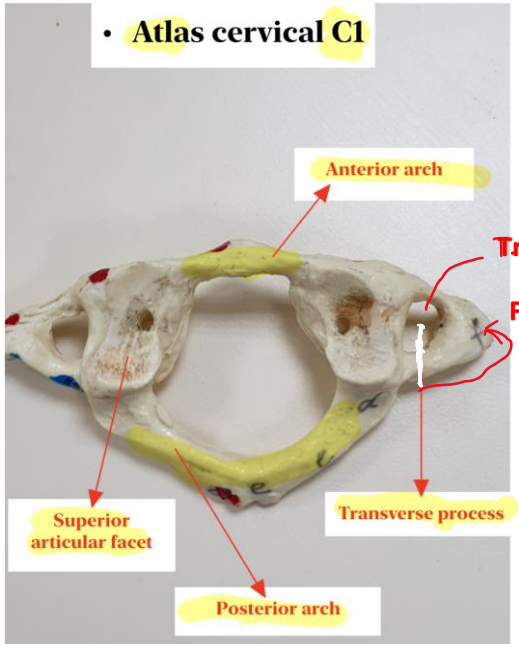

Nerve: posterior interossios nerve (branch of the radial nerve)
Brachioradialis
Extensor carpi radialis longus
Extensor carpi radialis brevis
Extensor digitorum
3 muscles go to pollicis
Extensor retinaculum

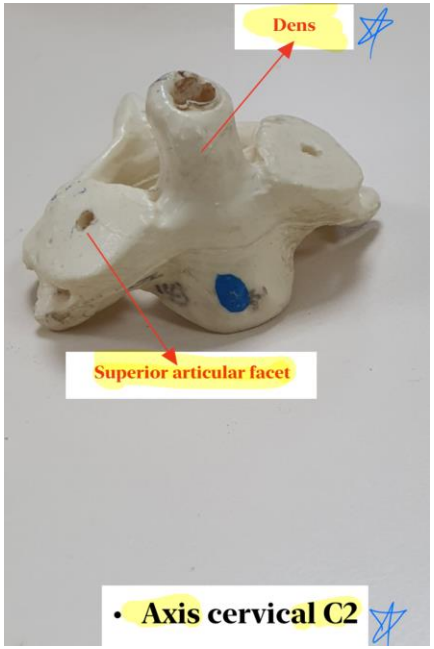
Front

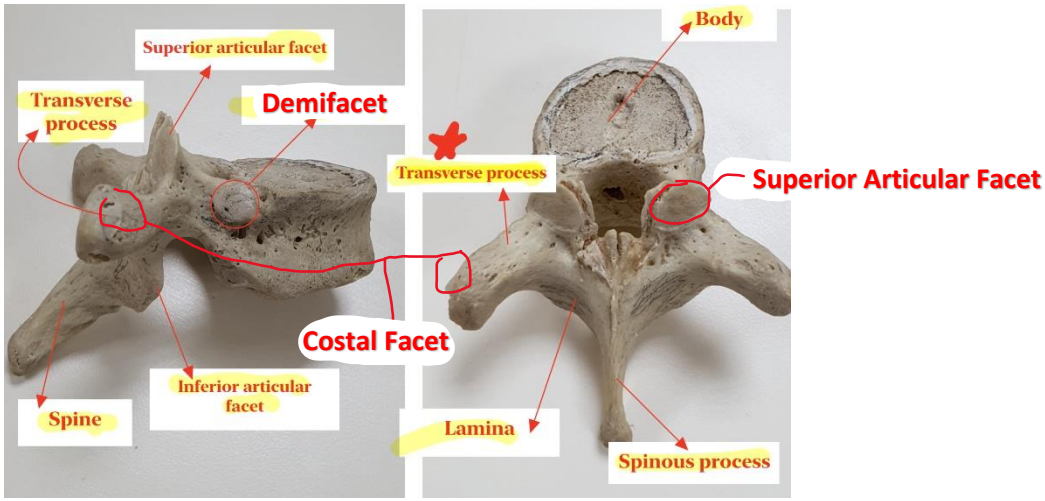

Pronator teres
Flexor carpi ulnaris
Flexor carpi radialis
Palmaris longus
Flexor digitorum superficialis
Flexor retinaculum
Ulnar nerve


Pronator quadratus
Anterior View

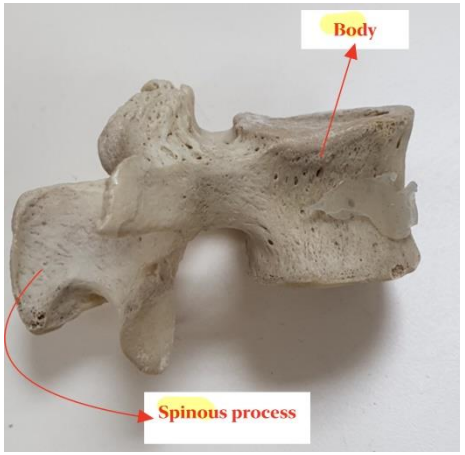




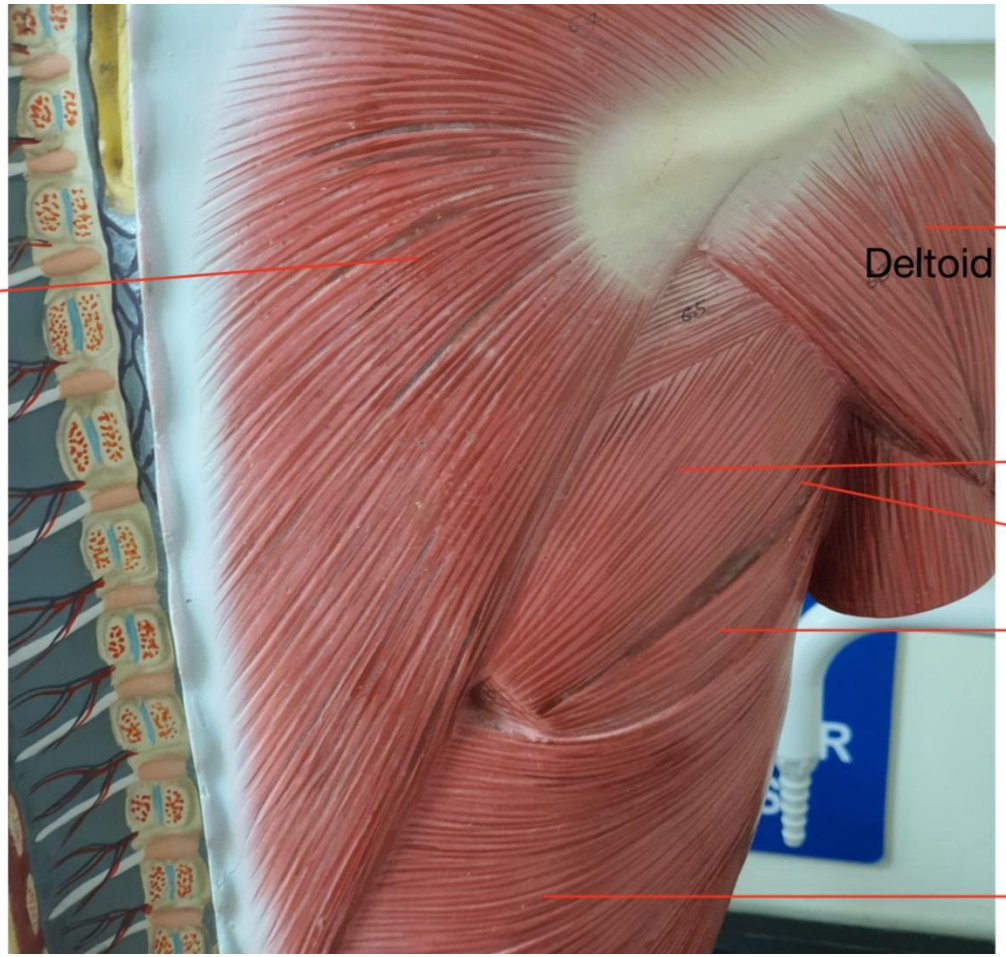


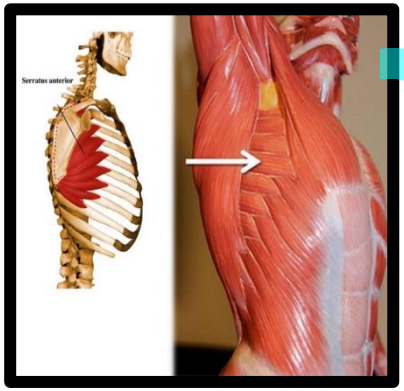


• identify the structure: Thoracic vertebrae



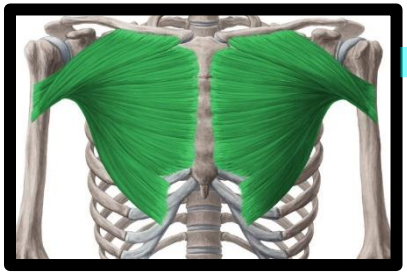
• Lumbar vertebrae
• (Has no costal facets & no transverse process foramina)





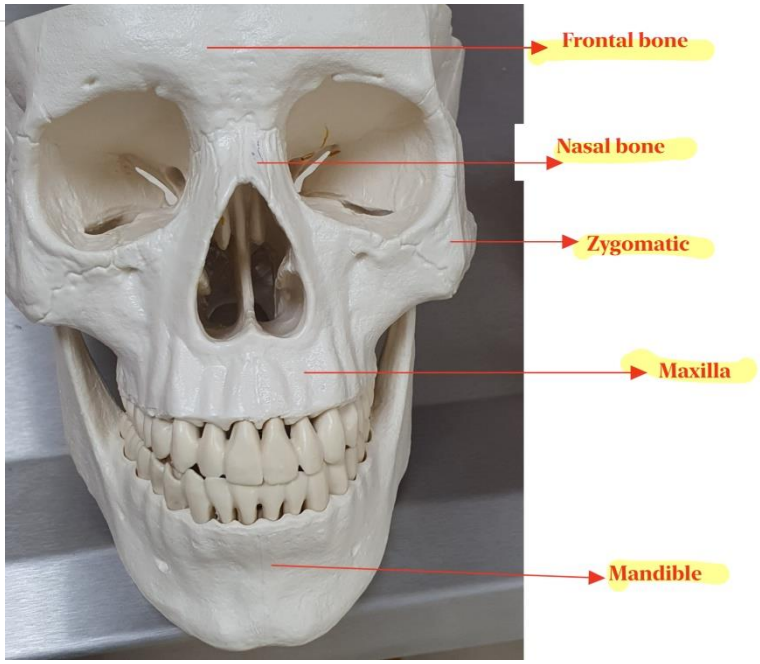
Muscle: Serratus Anterior

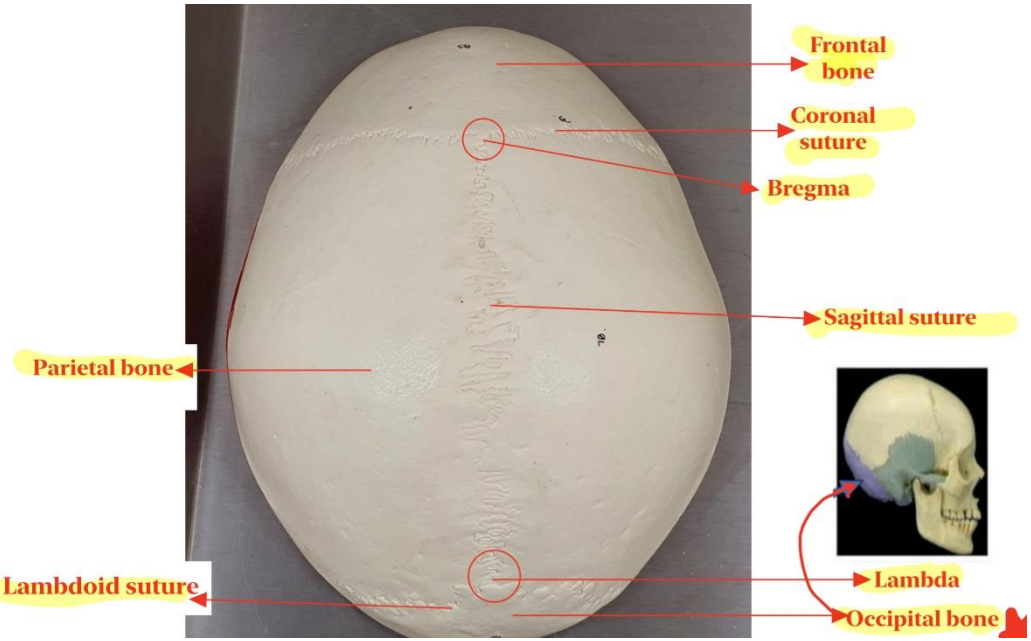
Nerve supply: Long thoracic nerve

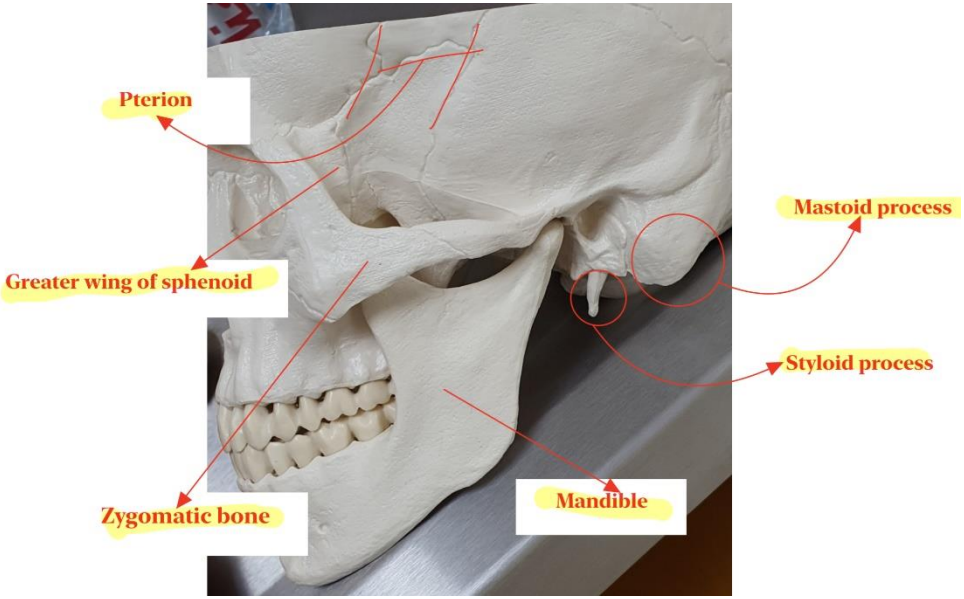


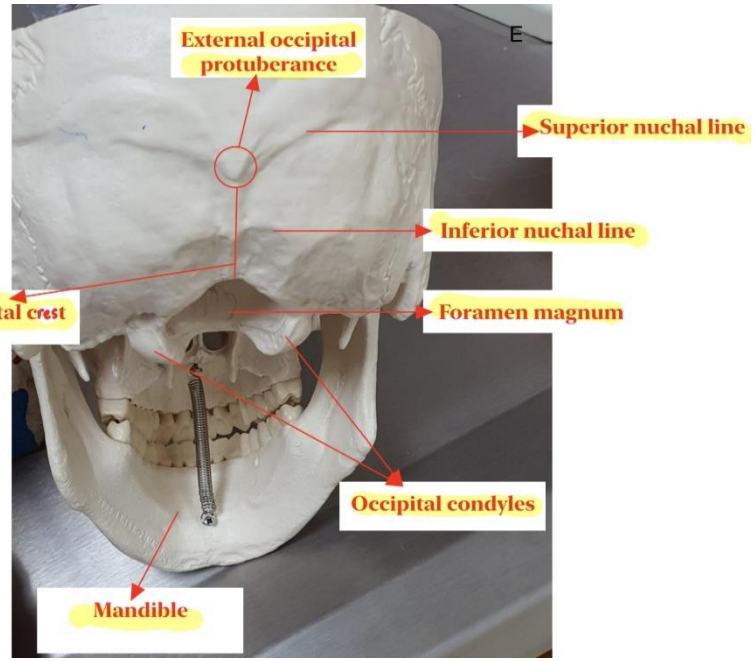
Muscle: Pectoralis Major

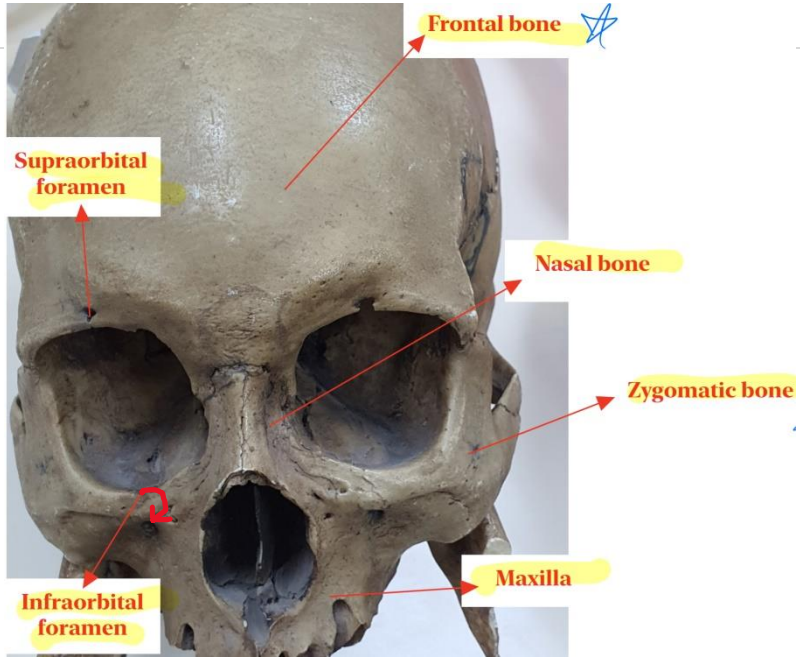
Nerve supply: Medial/Lateral Pectoral nerve

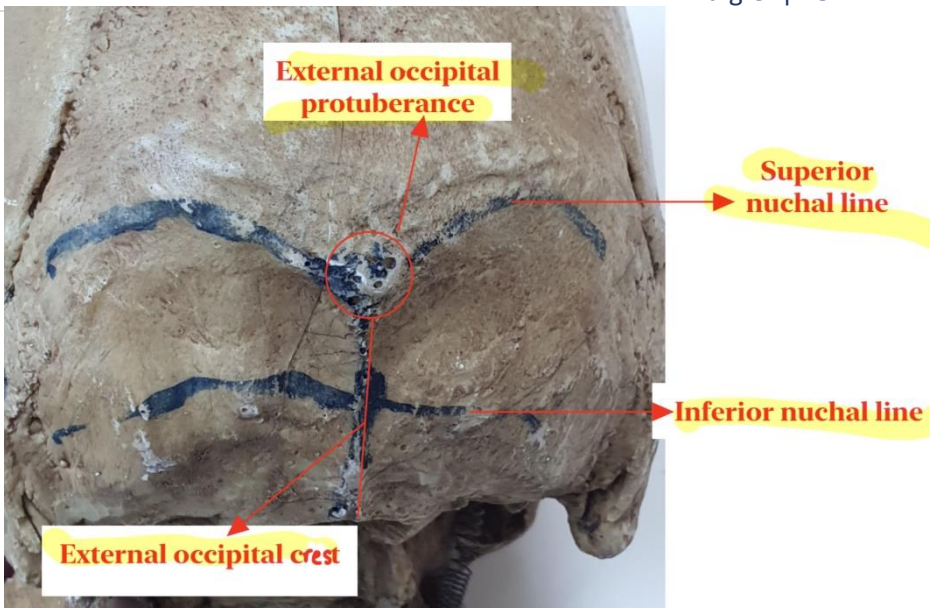

Frontal bone
Nasal bone
Zygomatic
Maxilla
Mandible

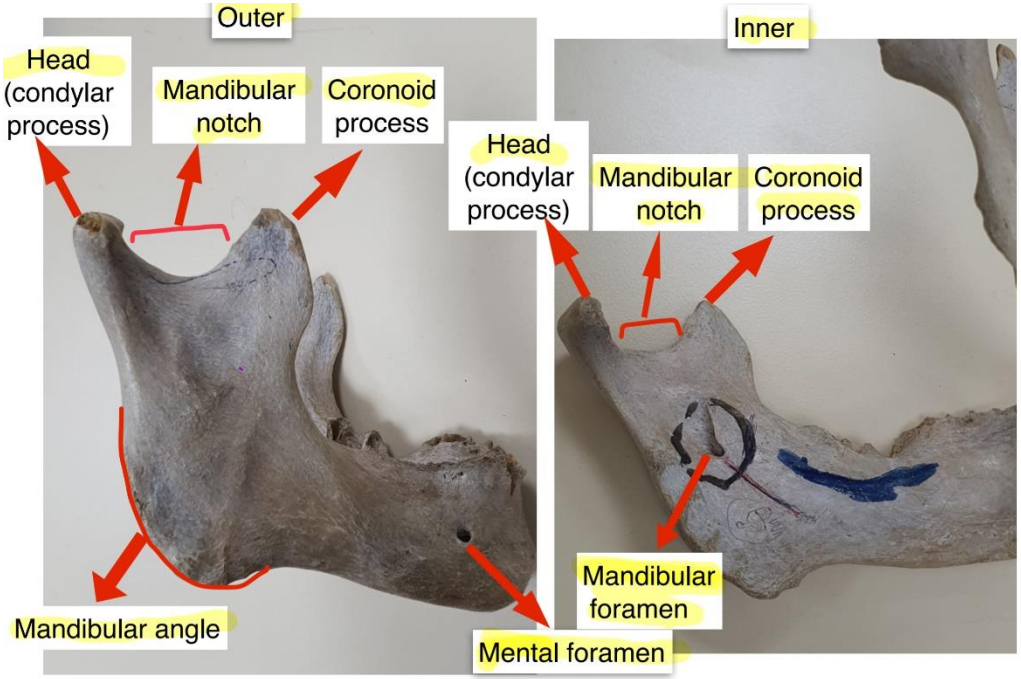

Frontal bone
Coronal suture
Bregma
Sagittal suture
Parietal bone
Lambda
Occipital bone
Lambdoid suture

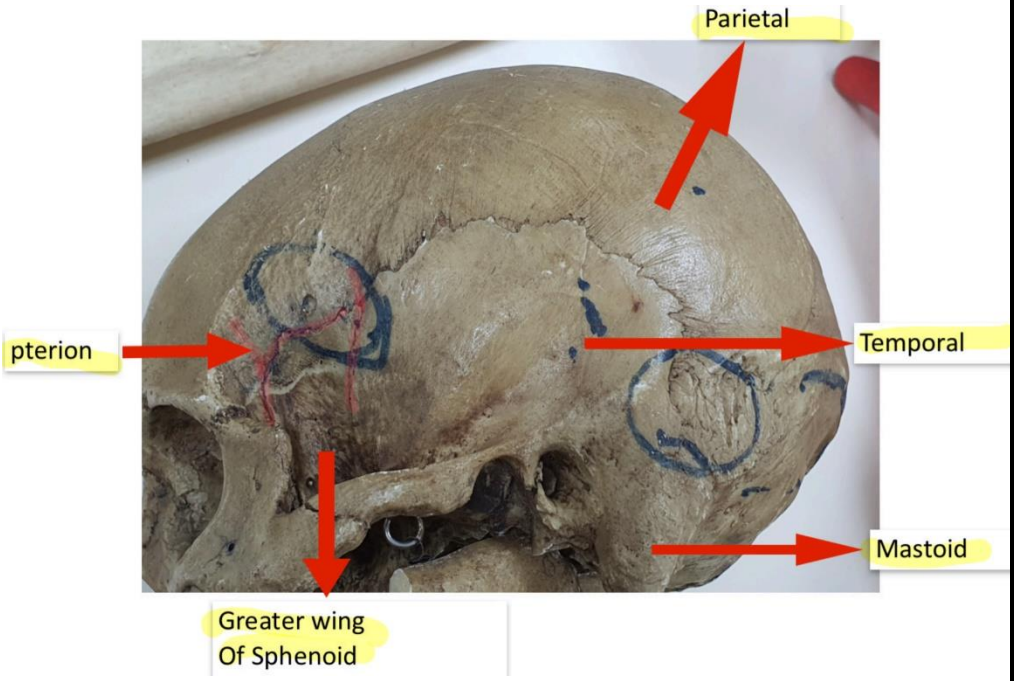

Pterion
Greater wing of sphenoid
Mastoid process
Styloid process
Zygomatic bone
Mandible


External occipital protuberance
Superior nuchal line
Inferior nuchal line
External occipital crest
Foramen magnum
Occipital condyles
Mandible









- Identify this bone: mandible

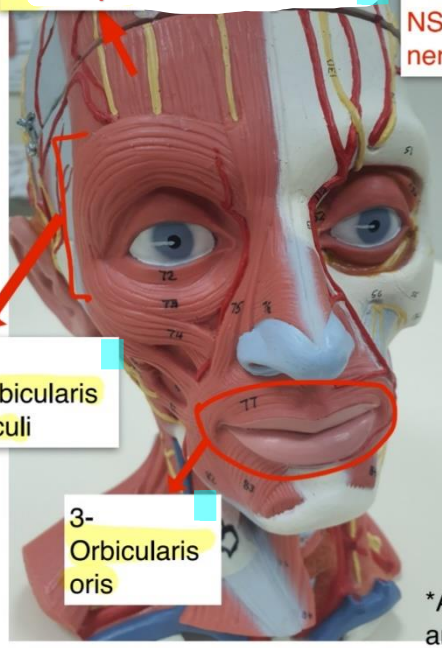
1- **Occipitofrontalis muscle**

4-Temporalis
NS:Mandiblular nerve

2- Orbicularis oculi

3- Orbicularis oris

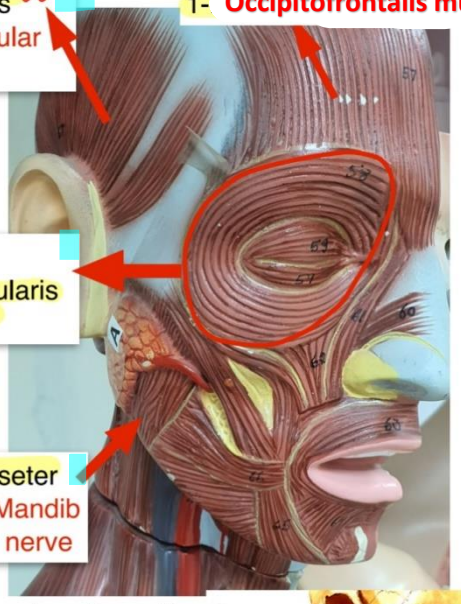
1-2-3: Are supplied by the facial nerve



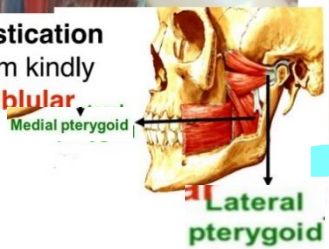
1- **Occipitofrontalis muscle**

2- Orbicularis oculi

Masseter
NS:Mandiblular nerve



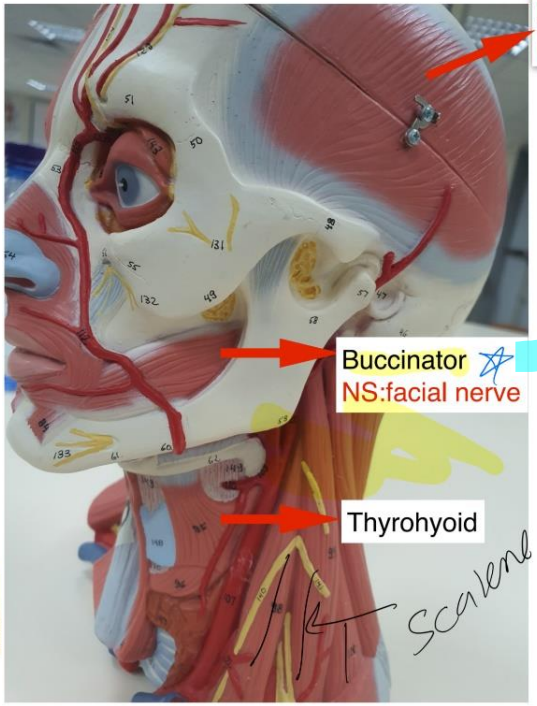
*All the muscles of **mastication** are included in the exam kindly check them, **NS:Mandiblular nerve**

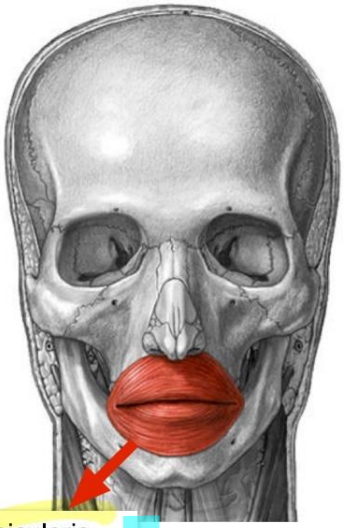


Temporalis
NS: Mandiblular nerve

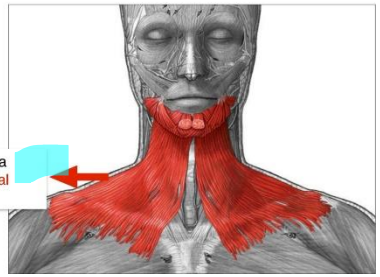
Buccinator
NS:facial nerve

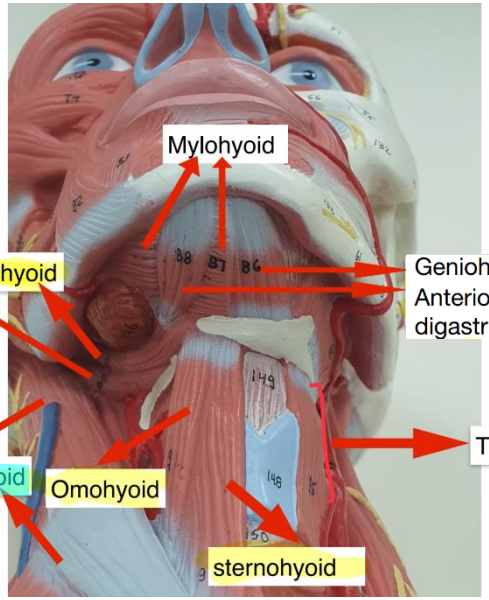
Thyrohyoid





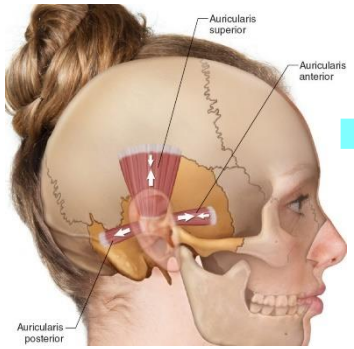
Orbicularis oris
NS:facial nerve



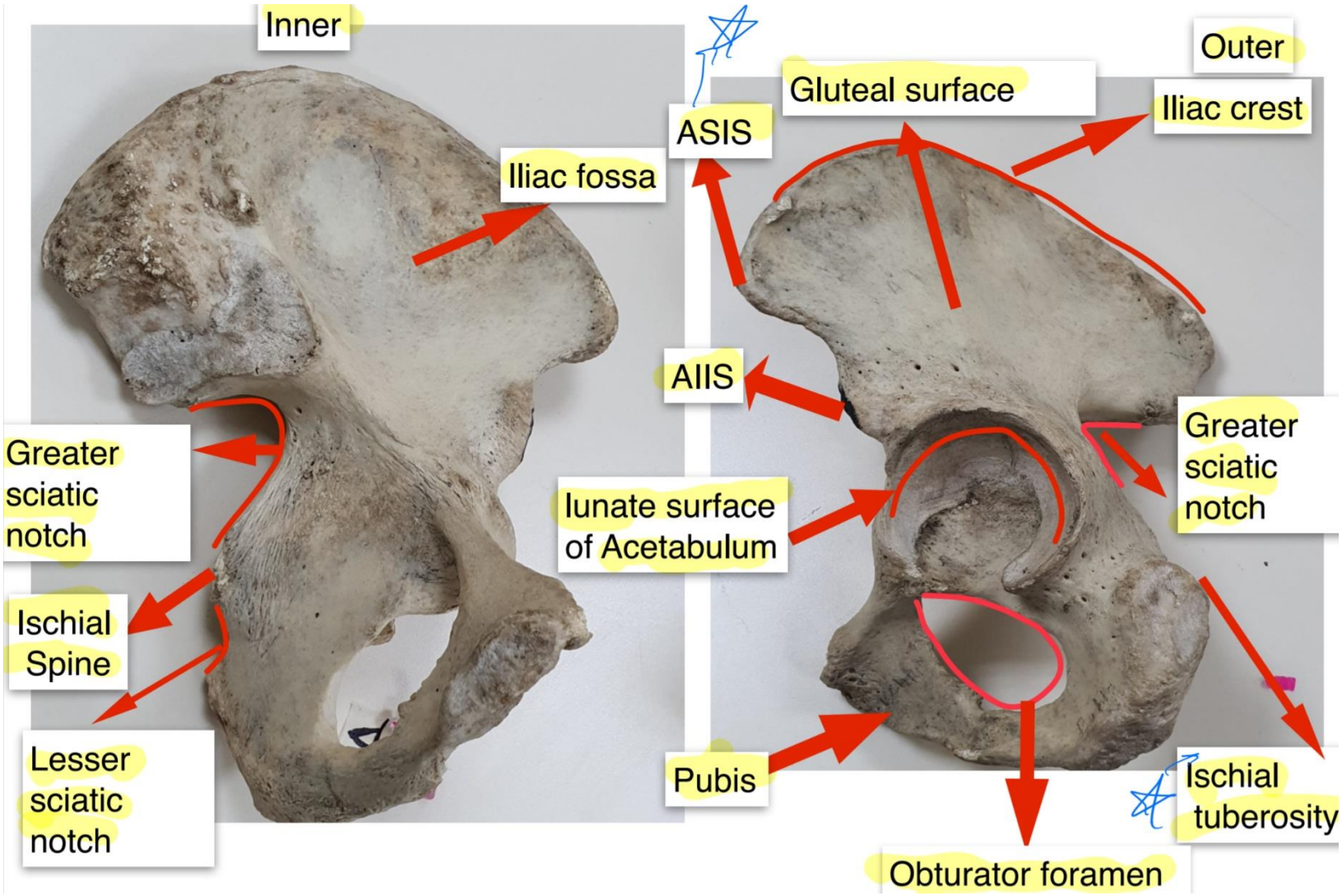


Accessory Nerve

Facial nerve

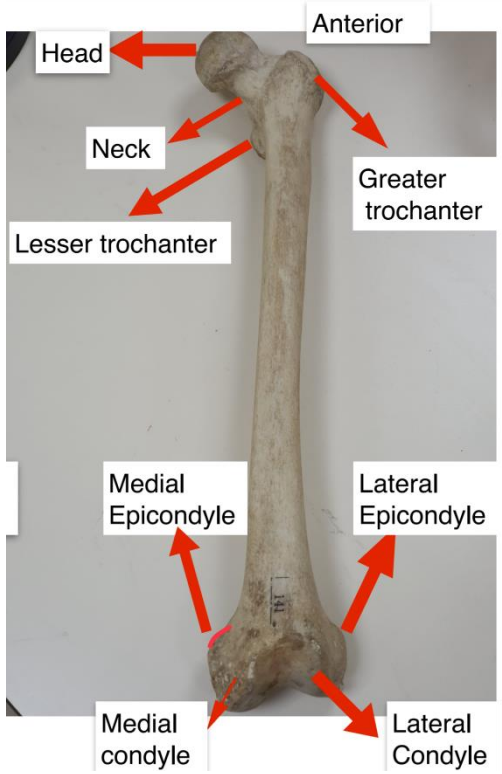


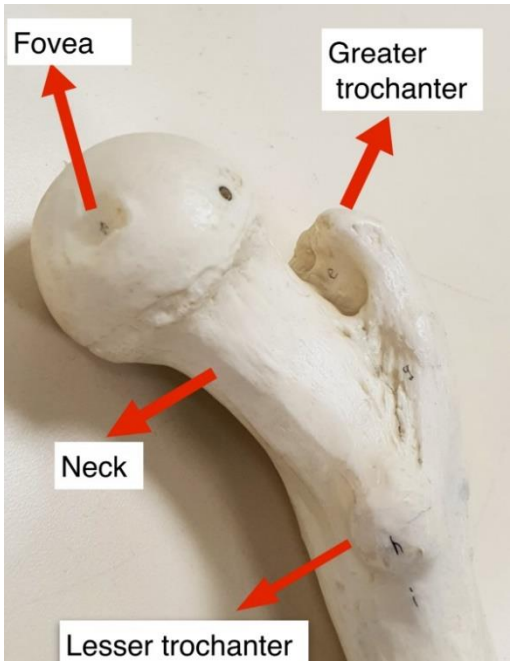
Facial nerve

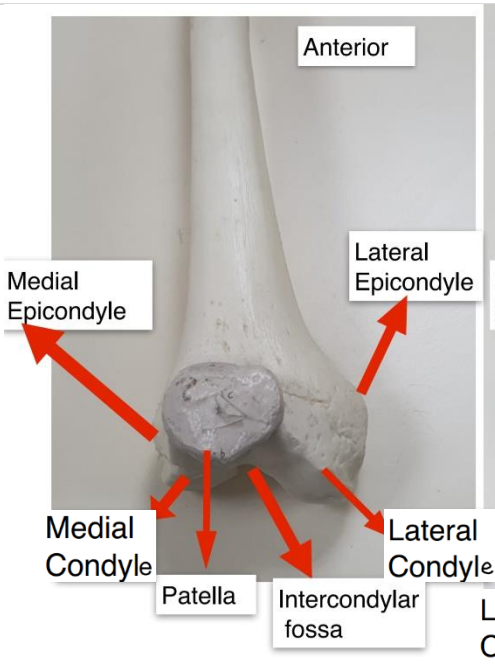


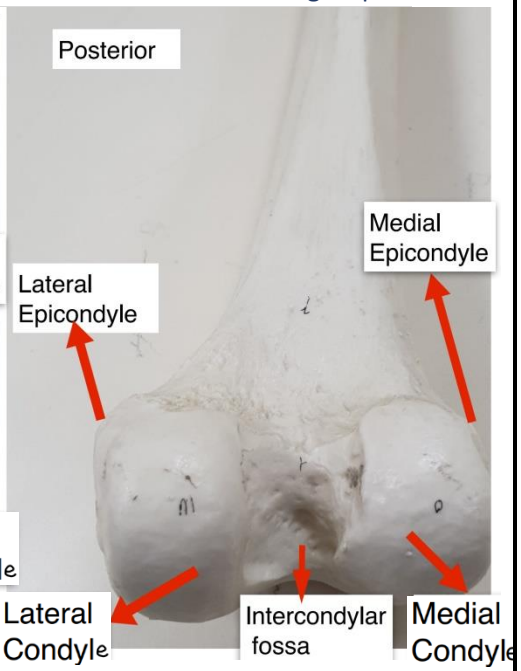
- Identify this bone: hip bone

ASIS= anterior superior iliac spine
AIIS= anterior inferior iliac spine

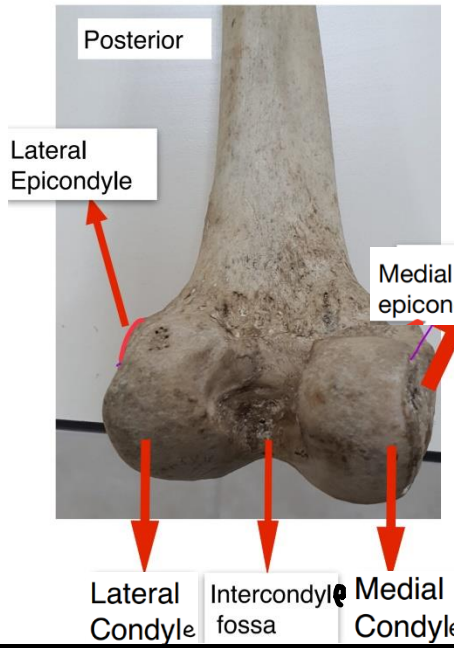


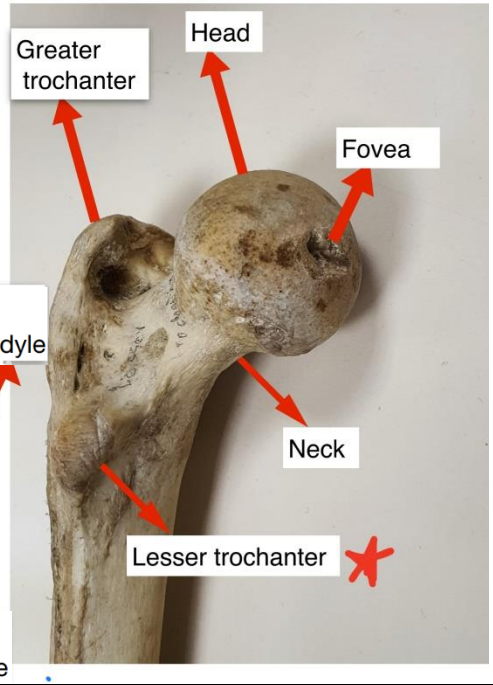


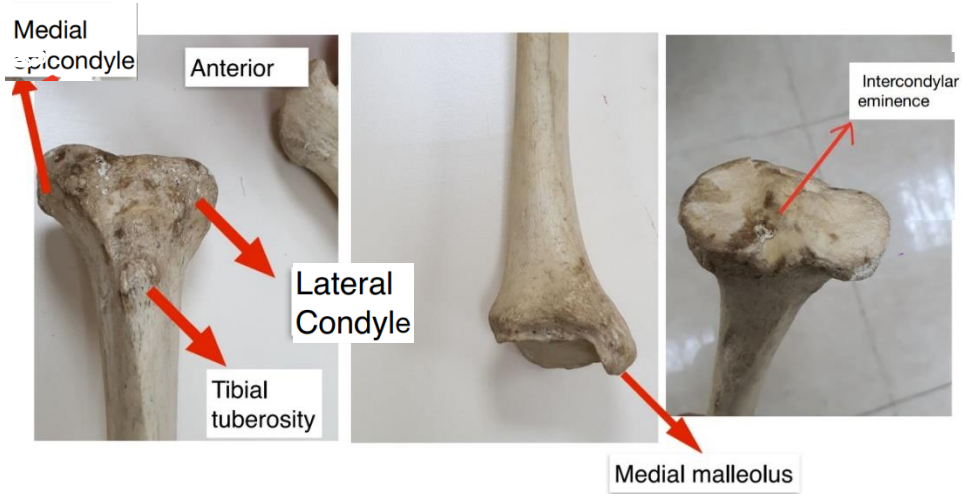




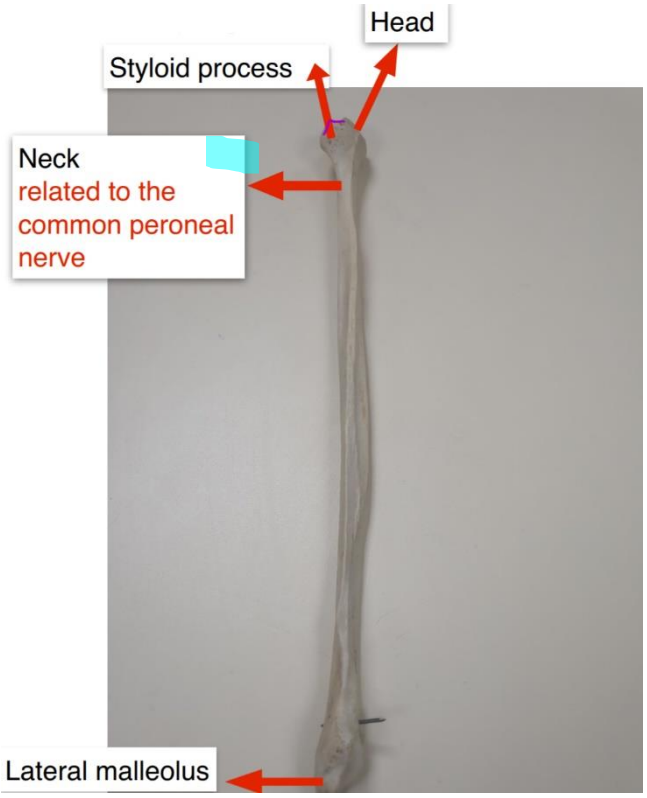
- Identify this bone: femur

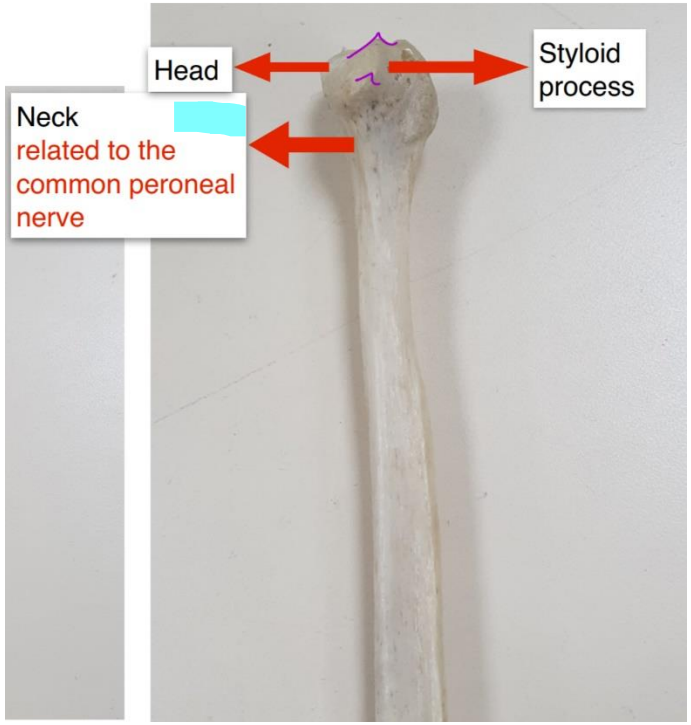




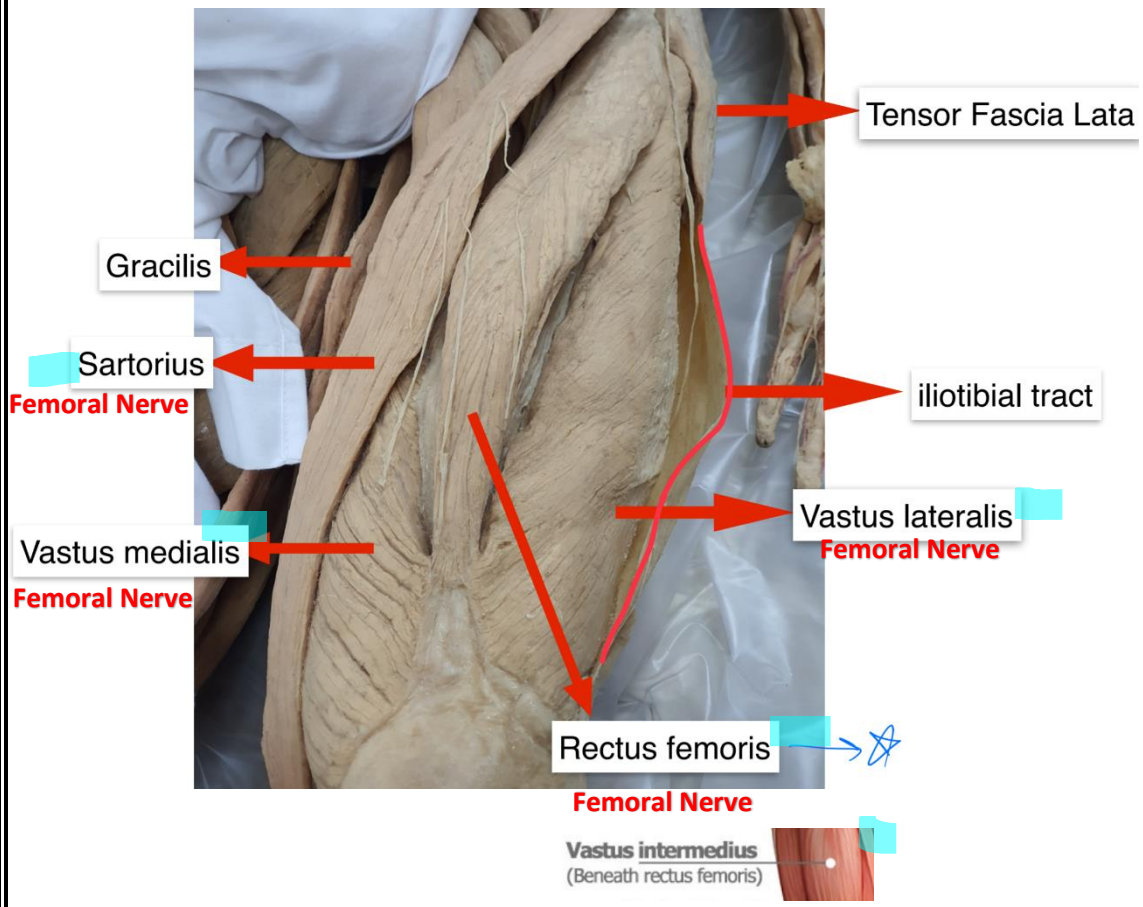


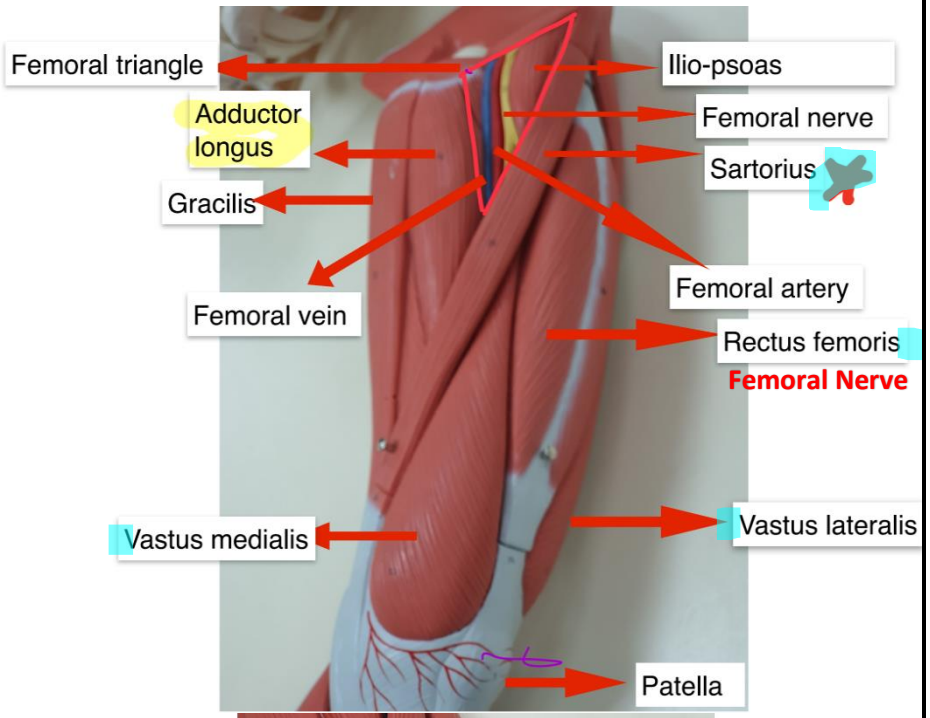
- Identify this bone: tibia

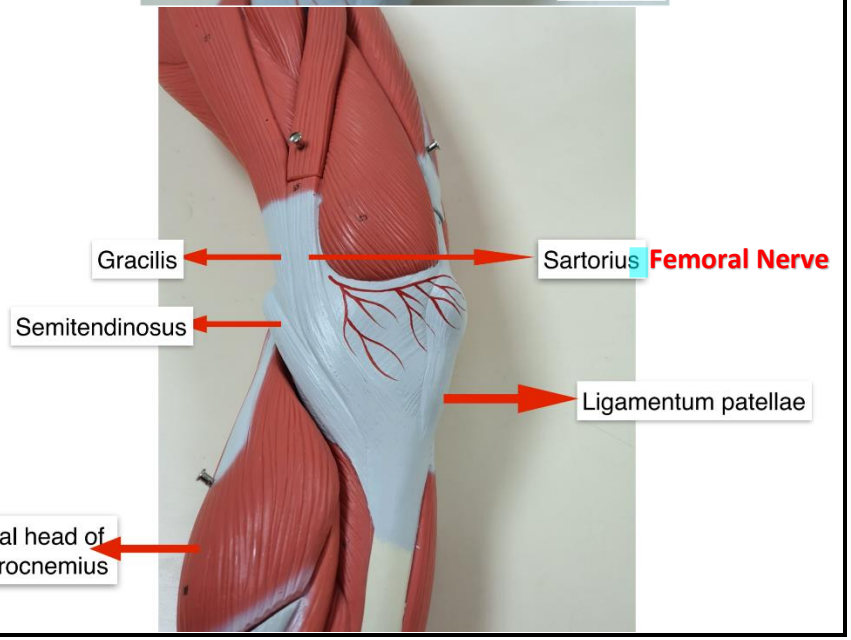




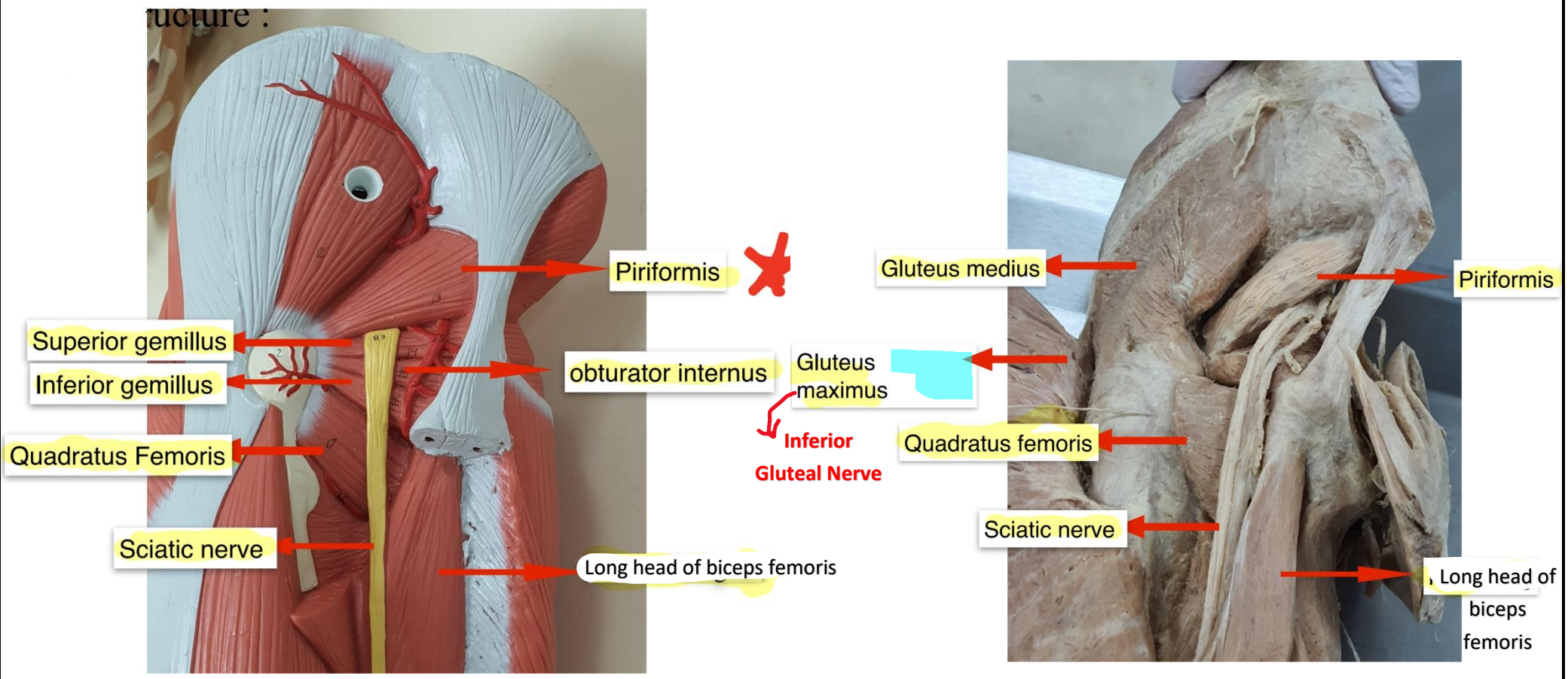
- Identify this bone: fibula





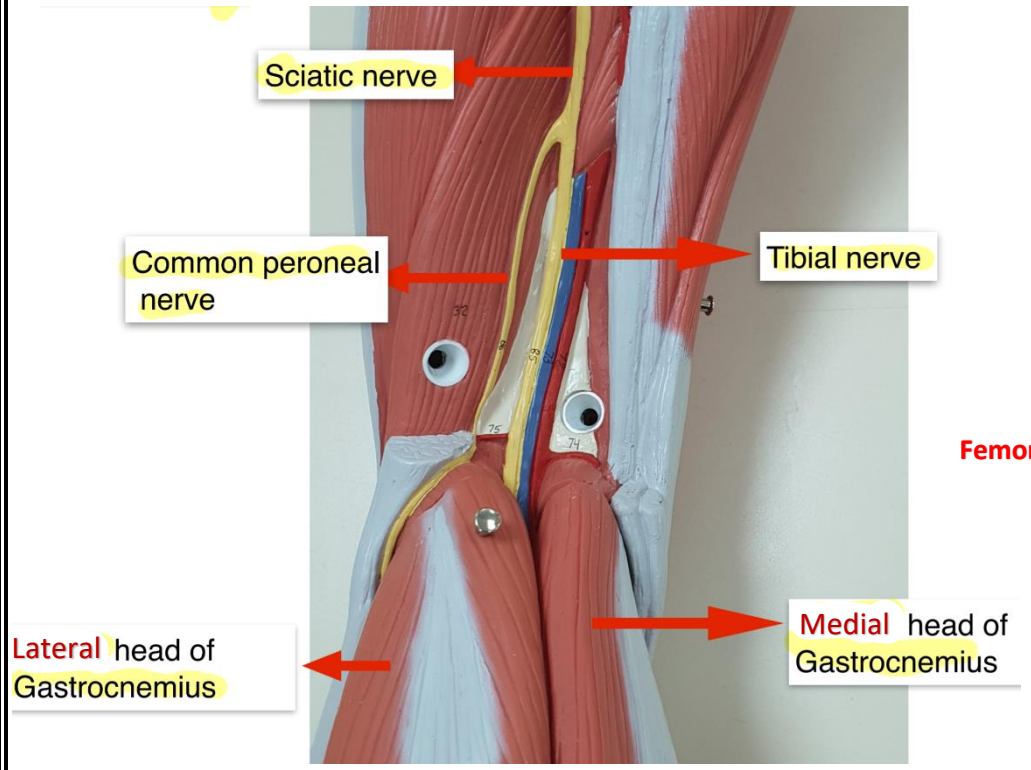


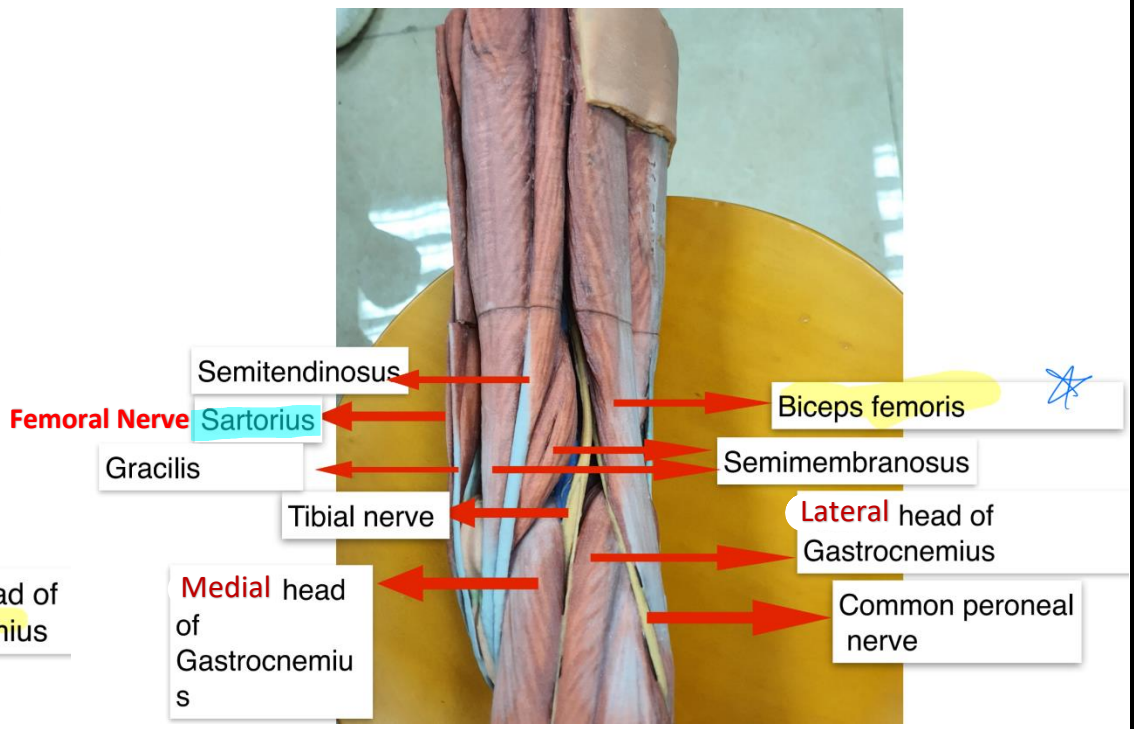
Identify this structure : thigh

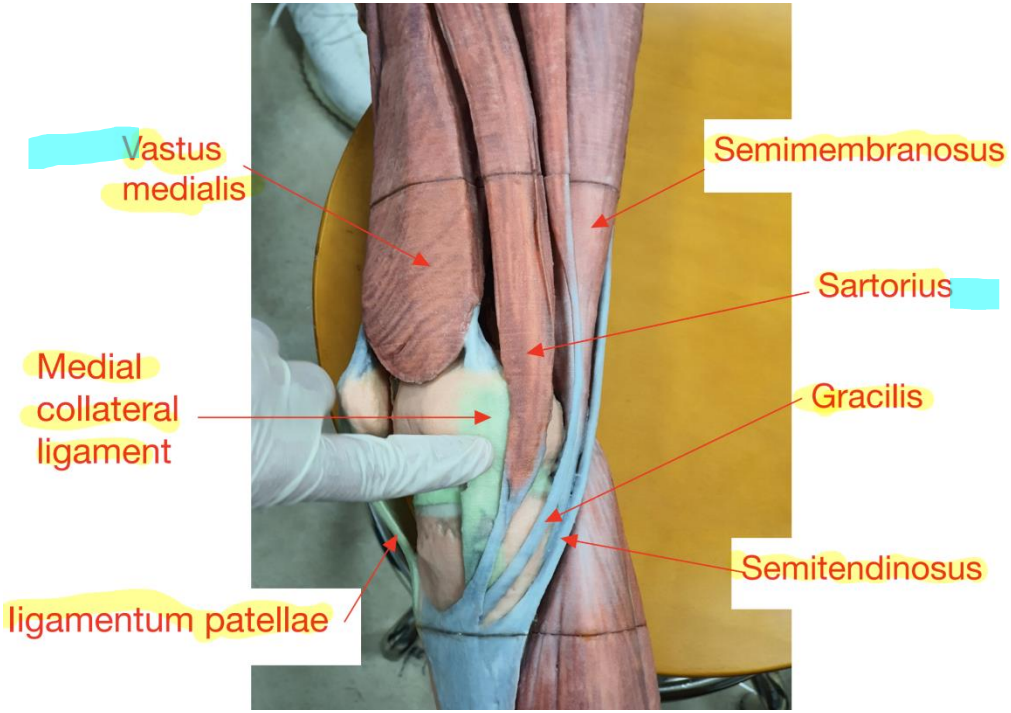


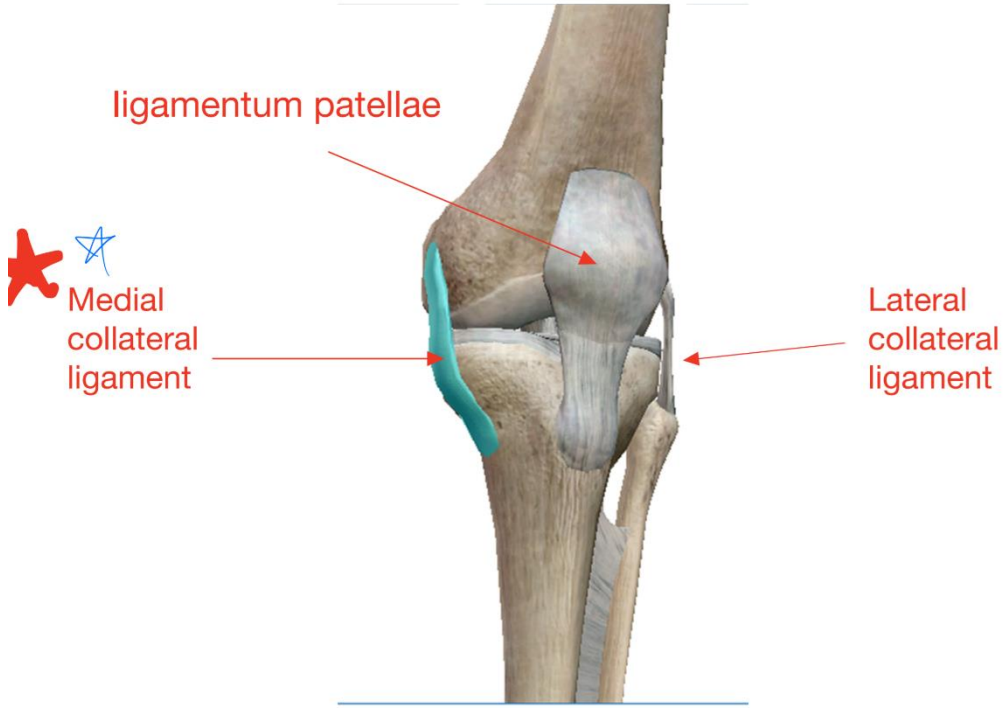
Identify this structure : Gluteal Region

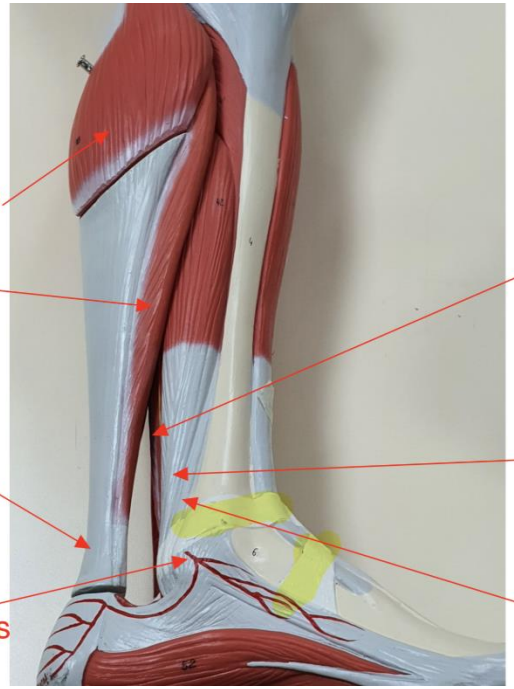
Popliteal fossa






Vastus medialis
Semimembranosus
Sartorius
Medial collateral ligament
Gracilis
Semitendinosus
ligamentum patellae


ligamentum patellae
Medial collateral ligament
Lateral collateral ligament



Gastrocnemius

Soleus

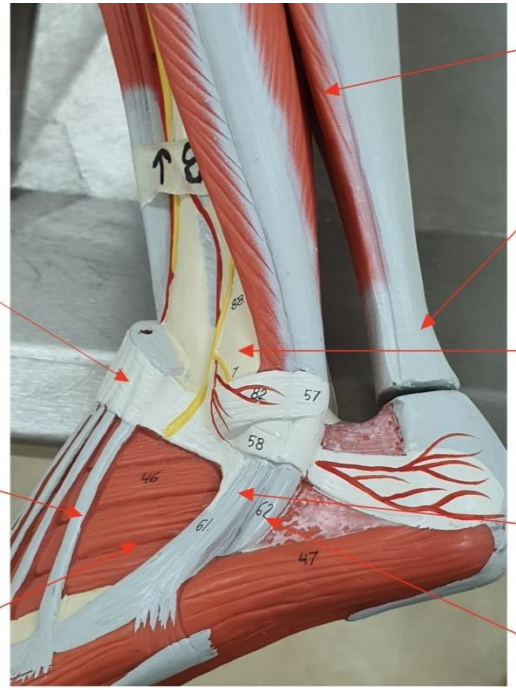
Calcaneal tendon

medial malleolus

Flexor hallucis longus

Flexor digitorum Longus

Tibialis posterior



Soleus

extensor retinaculum

peroneus tertius

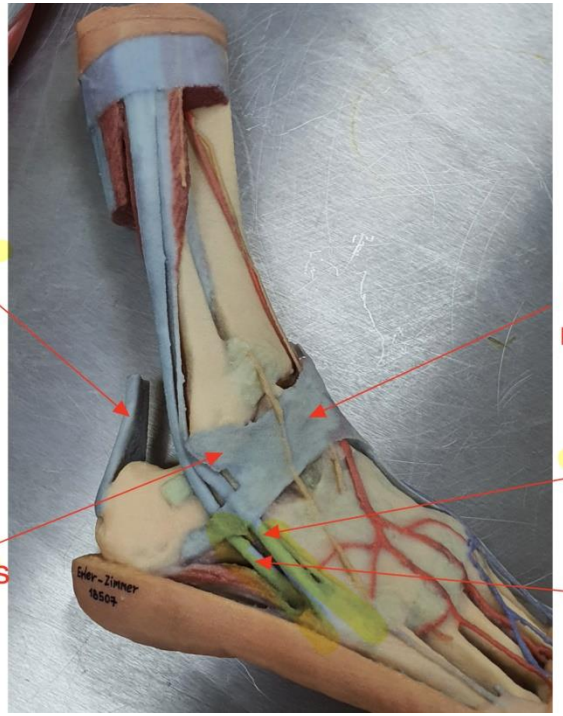
Extensor digitorum brevis

Calcaneal tendon

Lateral malleolus

Peroneal brevis

Peroneal longus



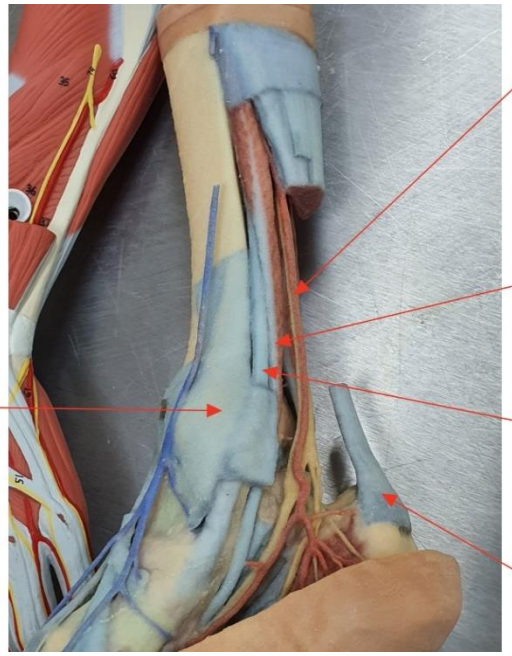
Calcaneal tendon

Lateral malleolus

extensor retinaculum

Peroneal brevis

Peroneal longus



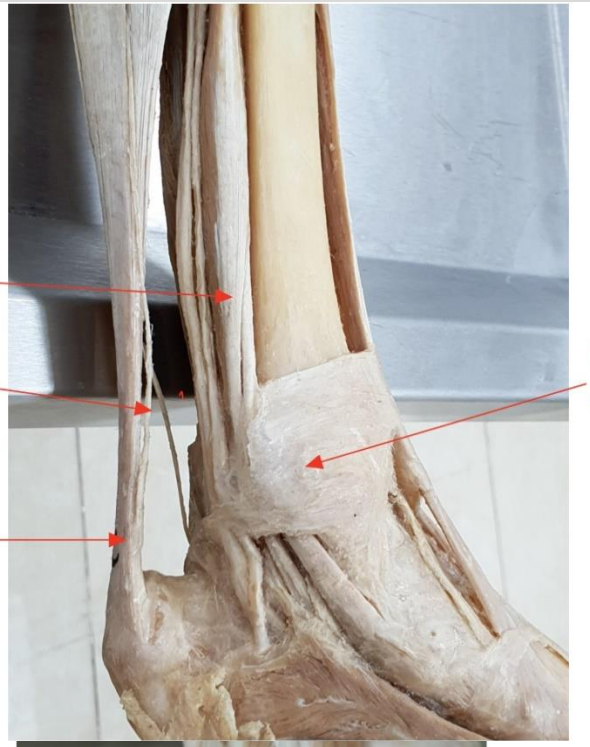
medial malleolus

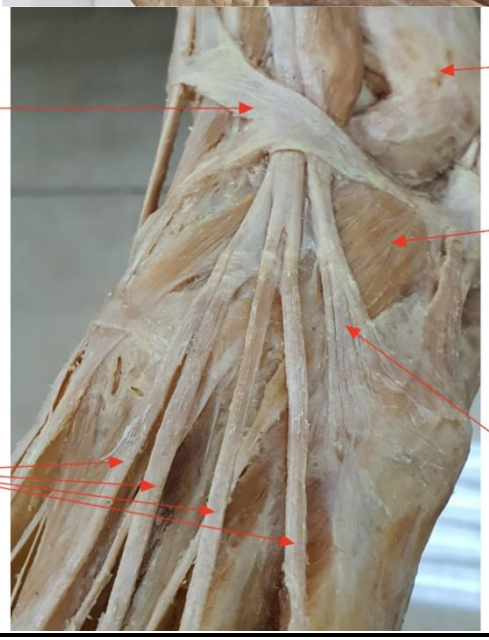
Flexor hallucis longus

Flexor digitorum Longus

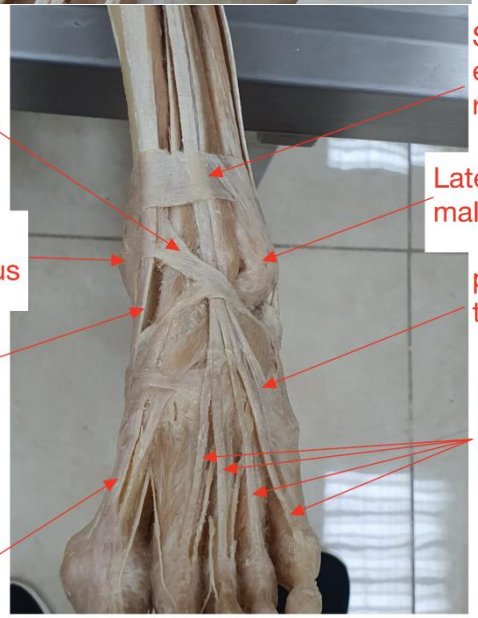
Tibialis posterior

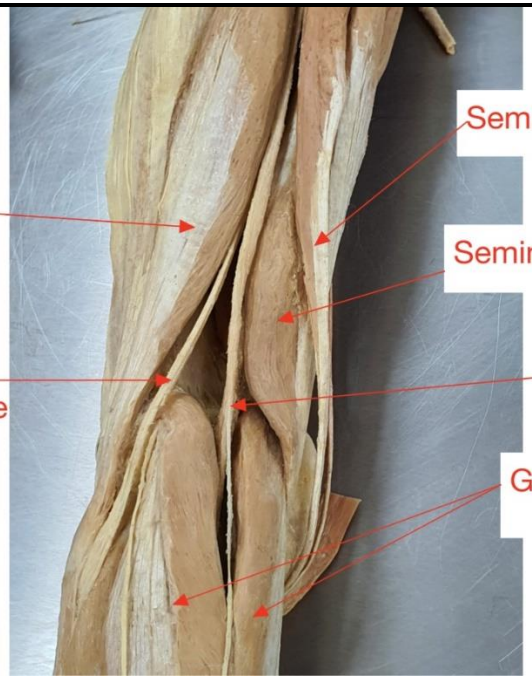
Calcaneal tendon

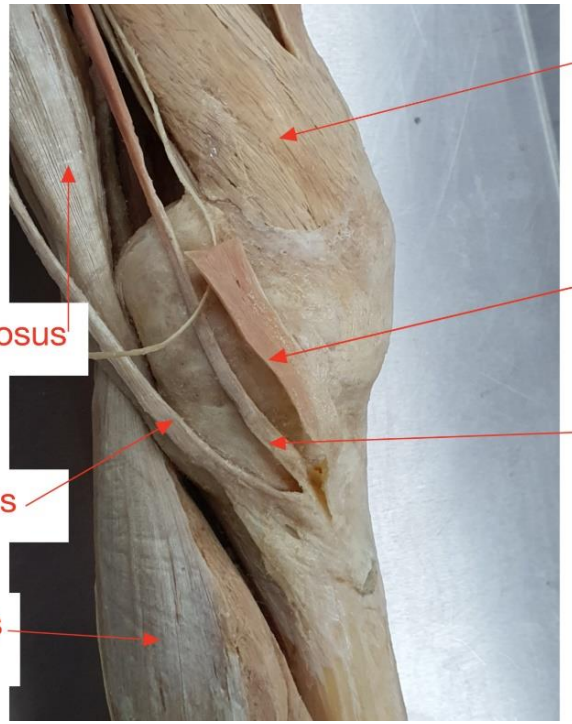

Flexor digitorum Longus
Plantaris
Calcaneal tendon
medial malleolus


Inferior extensor retinaculum
Lateral malleolus
Extensor digitorum brevis
peroneus tertius
Extensor digitorum longus

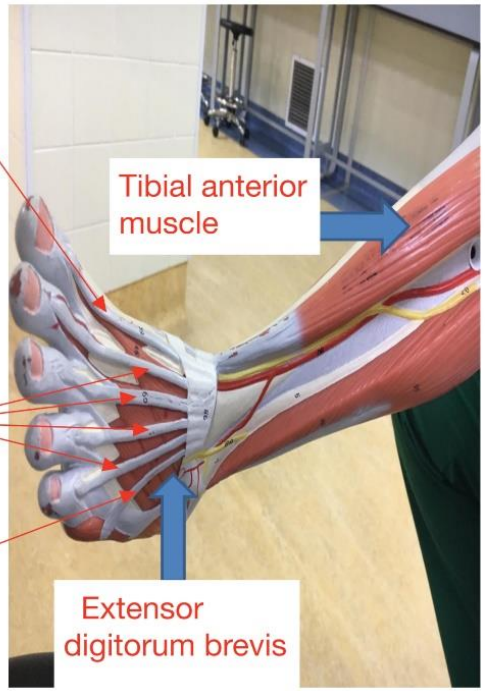

Superior extensor retinaculum
Inferior extensor retinaculum
peroneus tertius
Extensor digitorum longus
Lateral malleolus
Extensor digitorum brevis
Peroneal brevis
Peroneal longus

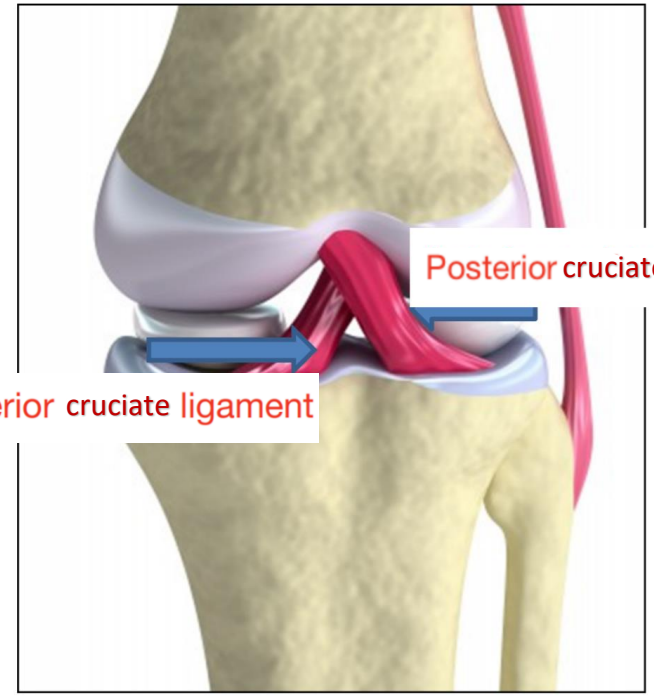

Inferior extensor retinaculum
medial malleolus
Tibialis anterior
Extensor hallucis longus
Superior extensor retinaculum
Lateral malleolus
peroneus tertius
Extensor digitorum longus

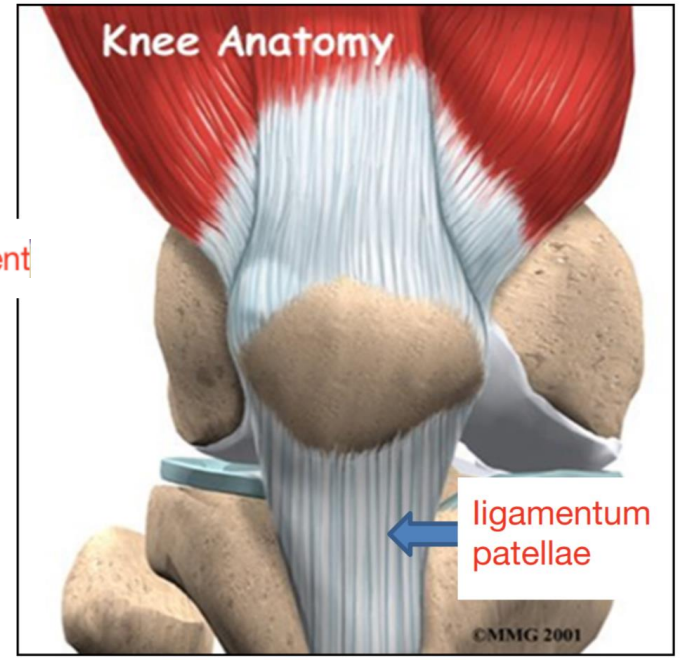




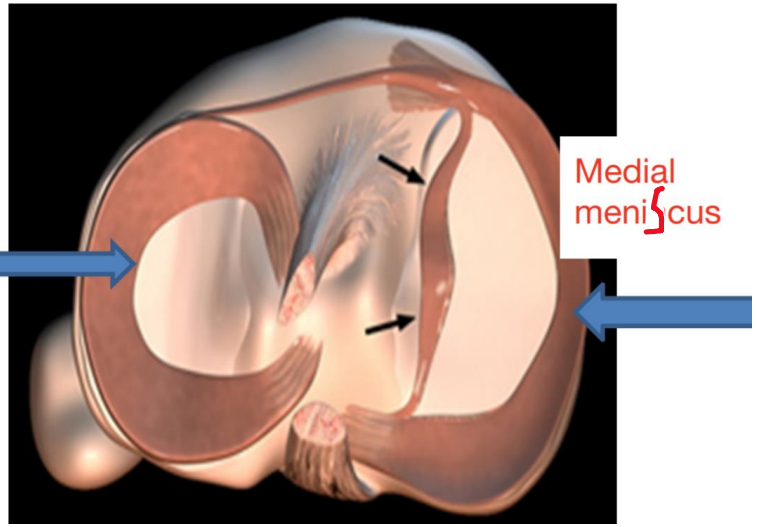
Identify labelled muscles.



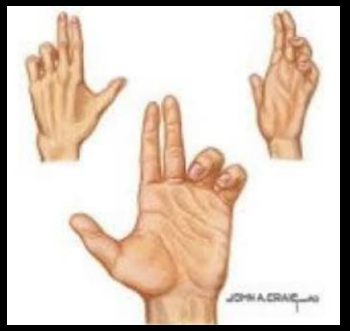


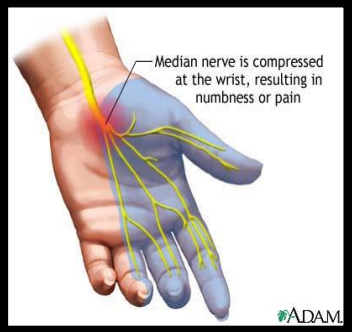


Identify labelled ligaments and cartilages?



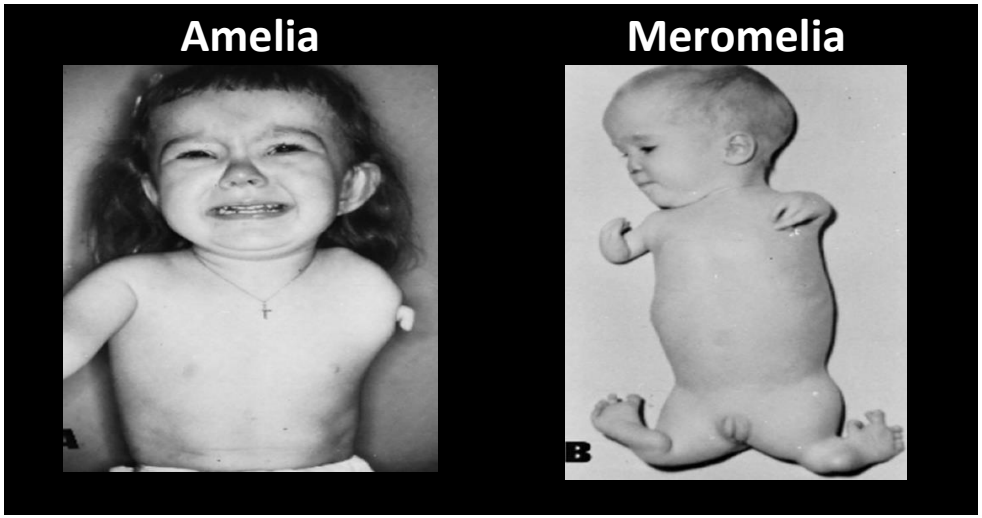
Nerve injuries

				
Anomaly	Foot drop	Hand/wrist drop	Claw hand	Winged Scapula
Nerve Injury	Common peroneal nerve	Radial nerve **[Posterior interosseous Nerve]**	Ulnar nerve	Long thoracic nerve

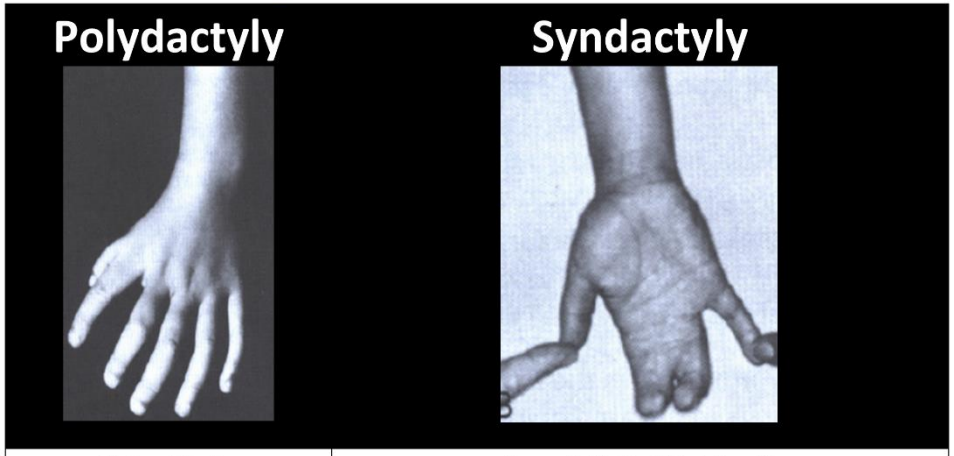
		
Anomaly	Ape hand	Flat shoulder
Nerve Injury	Median nerve **[Carpal tunnel syndrome]**	Axillary nerve

Embryology

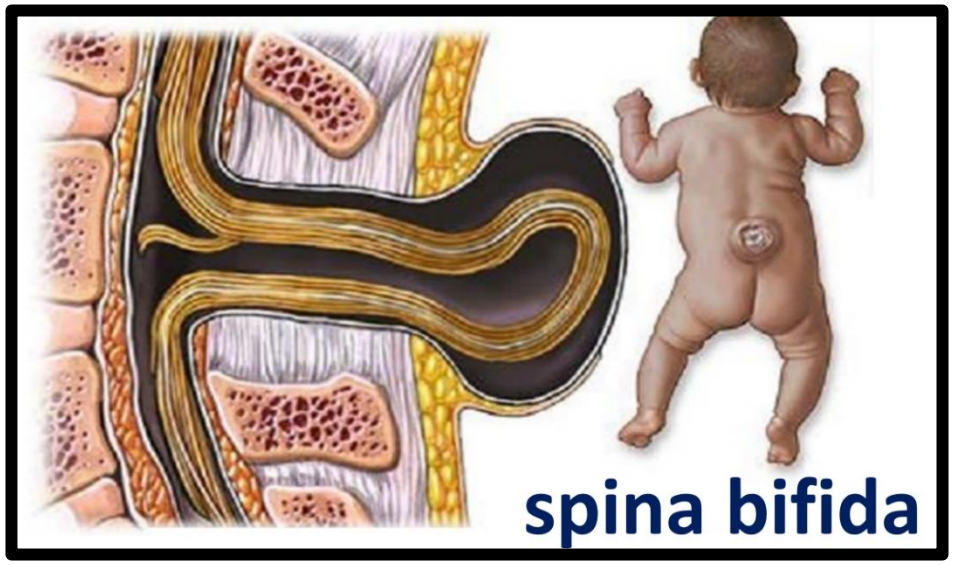
Anomalies of the limbs



Malformation of Digits



Extra Digits	Fused digits [Clubfoot]

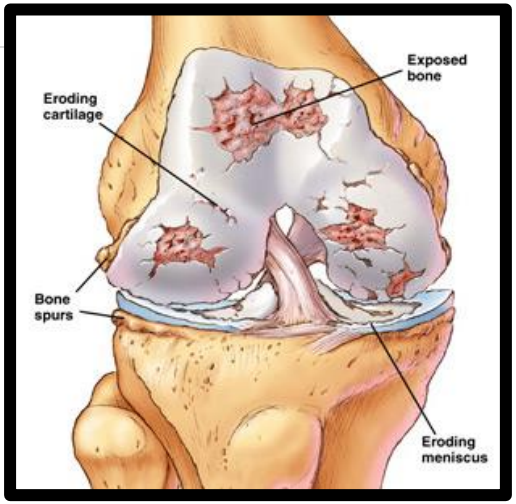


Craniosynostosis

Pathology

Case #1

A 60 year old male patient presented with severe pain in in the right hip region.
On examination there is swelling, crepitus, pain and limited range of motion at the hip joint.
There is no history of trauma, diabetes or any surgical procedure on joint.



- What is the most likely diagnosis based on clinical features? **Primary Osteoarthritis**
- Mention the investigations which are necessary in this case **X-ray & MRI**
- What is joint mice, bone eburnation and Heberden's nodes? **[Broken pieces of cartilage (osteophyte)]**

  A. **Joint Mice:** central part of articular cartilage – undergoes crackling w/ some pieces separate into joint cavity
  B. **Polished Ivor [Bone Eburnation]:** Underlying bone becomes exposed – Friction w/ opposing degenerated articular surface smooths & burnishes exposed bone
  C. **Osteophytes [Heberden Nodes]:** Bone projection along joint margins – Prominent osteophytes at distal interphalangeal joints – **Common in women**

- Describe following image – which shows characteristic features observed in this case? **Exposed bone & eroding cartilage osteophyte**
- Mention the common joints affected by this condition? **Hip joint & Knee, Lower lumbar & cervical vertebrae**
- Which joints are affected in baseball and basketball players? **Baseball: Shoulder & Elbow joint | Basketball: Knee joint**

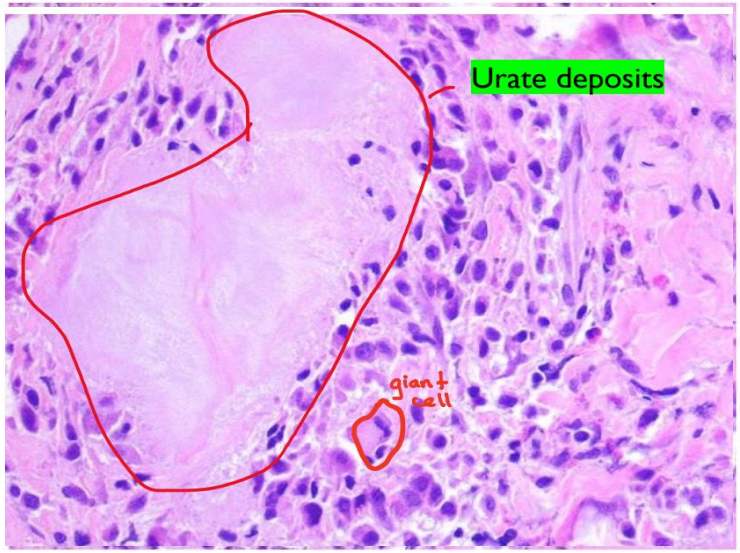
Case #2

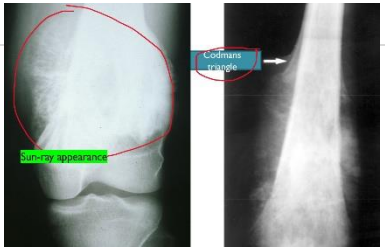
A 50 year old male patient presented with repeated attacks of severe pain in the great toe.
Physical examination showed swelling and skin ulceration with underneath white deposits.
Serological test revealed hyperuricemia. Biopsy of the deposits was sent for histopathological examination.

- What is the most likely diagnosis based on clinical and serological test? **Gouty Arthritis**
- Mention the pathognomonic hallmark observed in H and E stained section from the biopsy ? **Tophi Gout [Deposit of monosodium urate crystals]**
- Describe the microscopic findings in H and E stained section from the biopsy ?

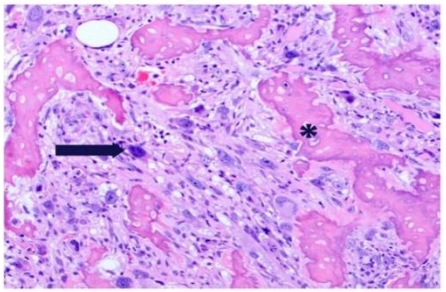
  Urate crystal deposit, Inflammatory cell [Giant cells & macrophages] & Zone of Fibrosis formation
- Mention the common sites for this condition? **Metatarsophalangeal Joint of big toe, Periarticular Ligament, Tendons, Soft tissues & Ear lops**
- Mention the complication observed when it affects the great toe? **Overlaying Skin Ulceration**

Biopsy image- H and E stain





Biopsy image-H and E stain



Case #3

A 16 year old boy presented with pain and large swelling around the right knee joint. Initially X-ray and then biopsy was carried out. Which showed following findings.

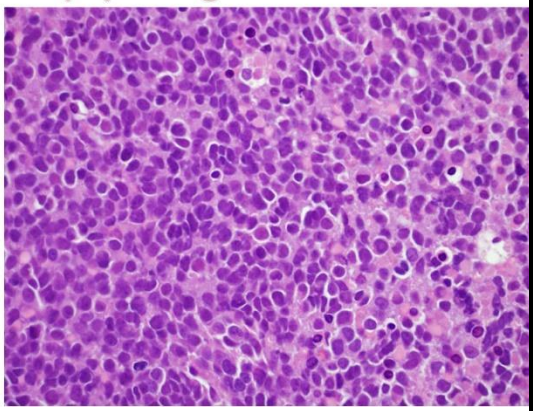
- Mention two characteristic X-ray features observed in X-ray image? **Sunray appearance & Codman's triangle**
- Mention two important histopathological features observed in biopsy image? **Malignant Osteoblast & Osteoid matrix**
- Write the diagnosis based on clinical, X-ray and histopathological features? **Osteosarcoma**
- Mention the two common sites for this condition? **[KNEE] Lower part of femur & Upper part of tibia**
- Mention the site of origin of this tumor in the long bone? **Metaphysis**
- Mention the two common sites involved by this tumor because of hematogenous spread? **Lung, Liver, Brain, & Bone**

Case #4

A 10 ear old boy presented with pain and swelling in the middle of the right leg. Biopsy was carried out.

- Mention two important microscopic features observed in the biopsy image? **Hypercellularity & Small round blue cells, scanty clear cytoplasm**
- Write the diagnosis based on clinical and histopathological features? **Ewing Sarcoma**
- Mention the genetic abnormality observed in this tumor? **Translocation [11,22] [Philadelphia]**
- Mention the common bones involved by this tumor? **Long bones: Femur & Flat bones: of pelvis & ribs**
- Mention the site of origin of this tumor in the long bone? **Diaphysis ~ [shaft of long bones]**

Biopsy image-H and E stain



Case #5

A 20 year old female presented with, low-grade fever, myalgia, weight loss, fatigue, swelling and pain in multiple joints of hands and feet.

- What further investigations will you advise in this patient?

  Citrullinated protein antibodies [APCA], Rheumatoid factor [RF] & Acute phase reactants [CRP, ESR]

- What is the diagnosis based on clinical features and serological tests in this case? **Rheumatoid Arthritis**

- Enlist all the clinical manifestations which can be observed in this case?

  Articular manifestation [Symmetric Peripheral Polyarthritis] & Non-articular manifestation [Forearms lesions & rheumatoid nodules]

Case #6

A 15 year old boy presented with complaints of progressive weakness of the leg muscles and inability to walk. There was a history of similar complaint in the older sibling leading to his early death at the age of 20 years.

- What investigations will be advised in this case? **Muscle biopsy & genetic analysis**

- What are the histopathological features observed in early and late muscle biopsy?

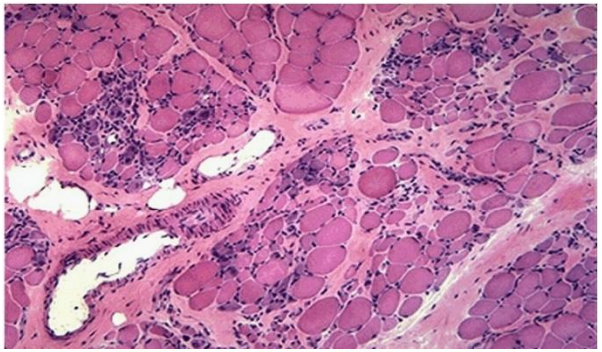
  Early- Focal loss of muscle fibers and inflammatory cells (macrophage and lymphocytes)

  Late- Major loss of muscle fibers to be replaced by adipocytes [No inflammatory cells]

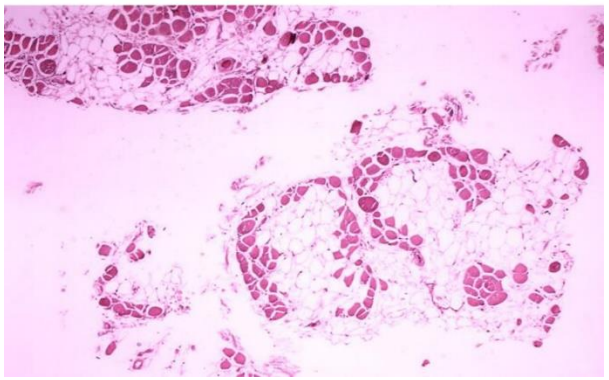
- What is the diagnosis in this case?

  Muscular Dystrophy [Duchenne Muscular Dystrophy]

Muscle biopsy (H and E stain) – few months of onset of disease



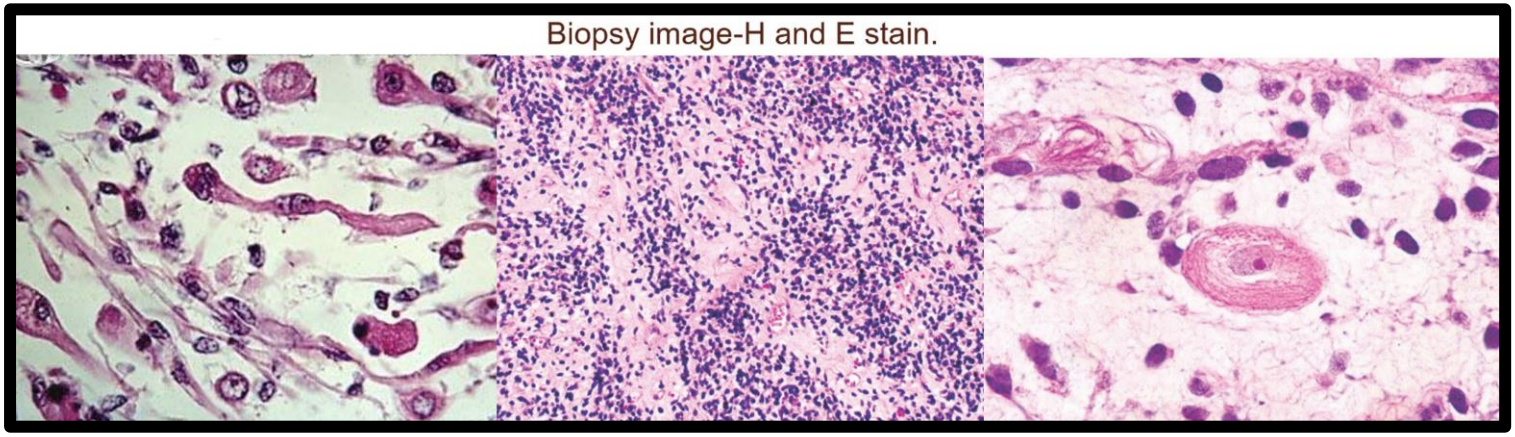
Muscle biopsy- few years after onset of disease (H and E stain)



Case #7

A 2 year old boy presented with a large mass in the left orbit.
Examination revealed large grayish white tumor totally destroying the eyeball. Biopsy was carried out.

- What is the diagnosis based on clinical and histopathological features? **Rhabdomyosarcoma**
- Mention the characteristic diagnostic cell in this condition? **Rhabdomyoblast / Tadpole cell**
- Mention the common sites for this tumor? **Orbit, Genitourinary tract, Extremities**
- What is the prognosis in this tumor? **Poor, aggressive neoplasm [5 yrs survival 27% adults & 61% children]**



Tadpole/strap Cell | Embryonal RMS | Rhabdomyoblast

- Hypercellularity
- Small round blue cells [Rhabdomyoblast]

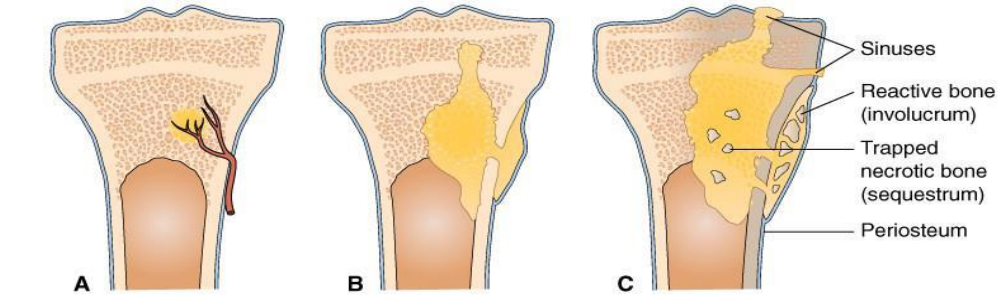
Case #8

A 10 year old boy presented with a discharging sinus below the knee joint.
There is no history of trauma. There is a history of lung infection 1 month back.
On examination the sinus discharge shows necrotic bone particles.

- What is the most likely diagnosis in this case? **Acute hematogenous osteomyelitis [Infection, Fracture]**

- Describe the following diagram which shows the pathogenesis of this condition **Acute Hematogenous Osteomyelitis**
  Blood borne infection of the metaphysis of long bones in children & young adults
  At first it would occlude local blood vessels, which causes bone necrosis and local spread of infection. Infection may expand through the bone cortex and spread under the periosteum, with formation of subcutaneous abscesses that may drain spontaneously through the skin.

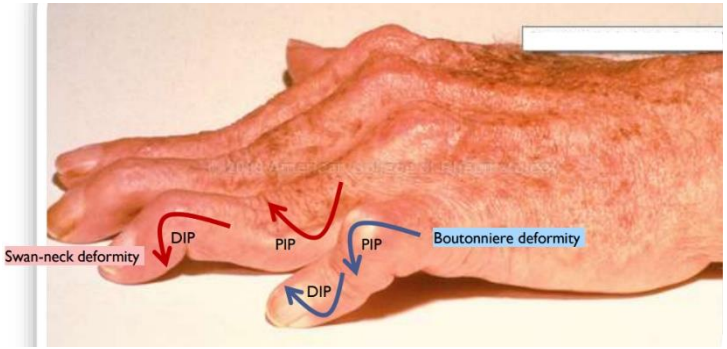
- Enlist the complications observed in this condition?
  Septicemia, Spread of infection, Pus formation, Pathological fractures, May lead to alteration of bone growth in children, & may become CHRONIC, Malignancy, 2ry amyloidosis



Identify the hand deformities observed in the following image? RA –

Boutonniere [Flexion at PIP joint along w/ hyperextension of DIP joint] &

Swan-neck deformity [Hyperextension at PIP joint along w/ Flexion of DIP joint]



Identify the following clinical abnormality observed in this condition?

- Identify the Abnormality **RA - Rheumatoid Nodules**
- **Mention the common sites for the above clinical abnormality? Ulnar of forearm, Around elbow , Occiput, Lumbosacral area**
- Mention the characteristic histopathological feature observed in biopsy in this condition **Pannus**

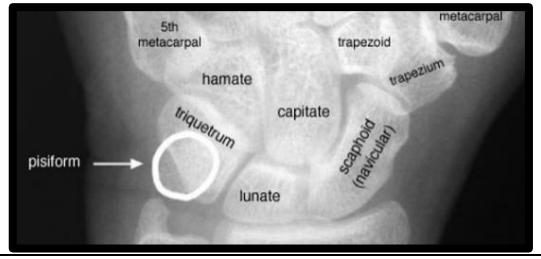
Hyperplasia & inflammation of synovium which creeps over articular cartilage

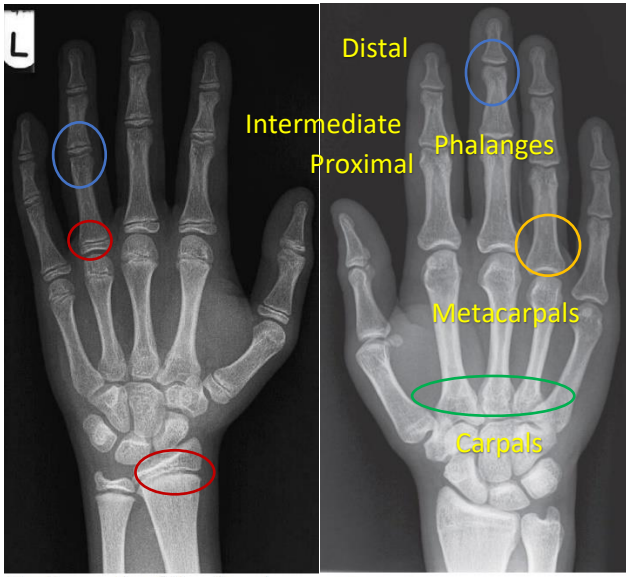
Radiology

Question #1

- Imaging modality ? **Plain X-ray**
- Age group of the patient Adult or Child ? Justify your answer ?
  Left image is the child's – due to the Present Epiphyseal growth plate
  Right image is the Adult's – due to the complete closure of Epiphyseal plate

- Radiographic anatomy ? (carpal – metacarpal – Phalanges + Joints) **Image Reference**
  Carpometacarpal joint & **Metacarpo phalangeal joint,**
  Proximal & Distal interphalangeal joints





Radiograph of the hand

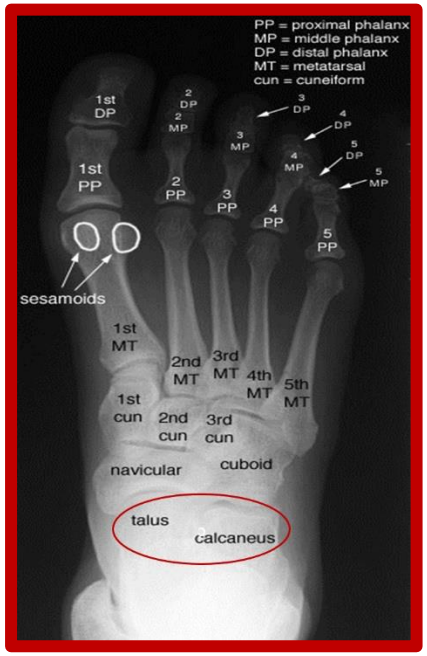
Hand plain x-ray

Question #2

- Imaging modality ? **Plain X-ray**

- Radiographic anatomy ? (Tarsal – metatarsal + Joints) **Image Reference**

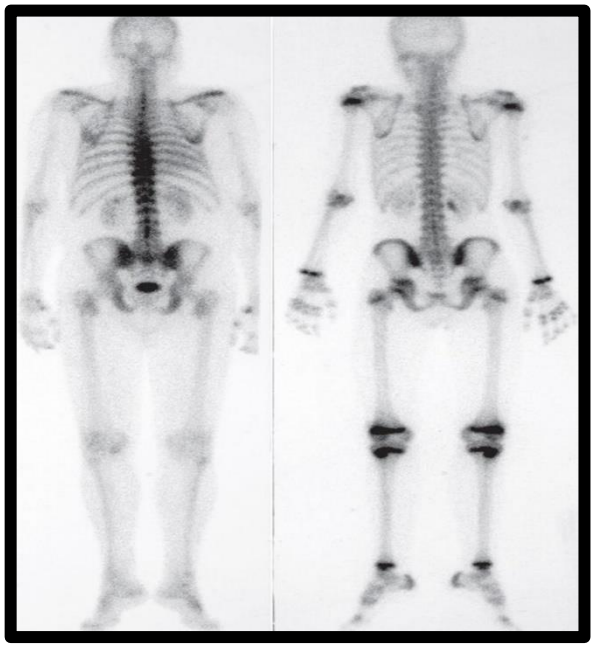
  Talocalcaneonavicular Joint, Calcaneocuboid Joint, Metatarsophalangeal Joint
  Proximal & Distal interphalangeal joints



Question #3

(Left) Adult. **Note the radionuclide in the bladder**.

(Right) Child.



- Imaging modality ? **Nuclear Scintigraphy - Radionuclide bone scan**
- Age group of the patient Adult or Child ? Justify your answer ?
  The Left image is the Adult – most increased uptake on irregular bones
  The Right image is the child – due to increased uptake in Epiphyseal growth plates

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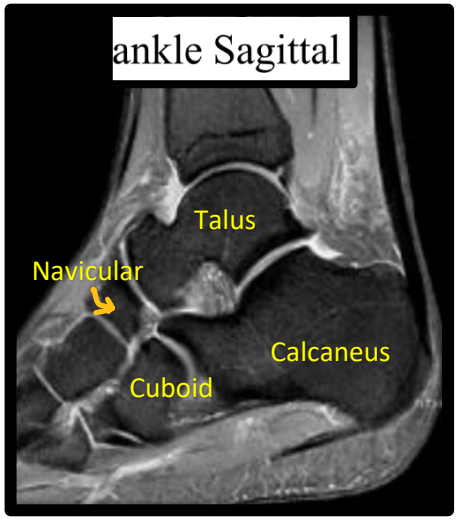
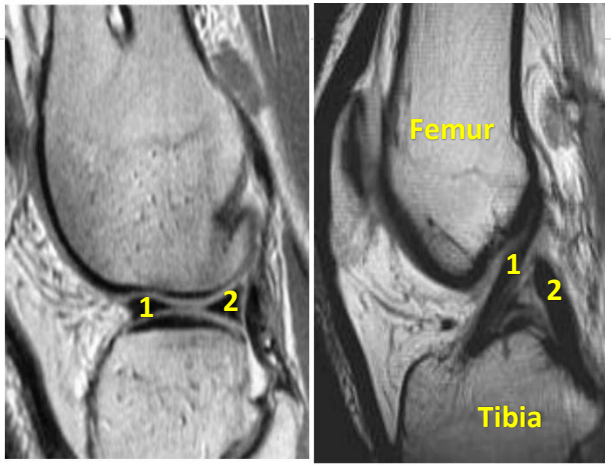
Question #4



- Imaging modality ? **MRI**
- Radiographic anatomy ? (Tarsal bones) **Shown in image**

Question #5

- Imaging modality ? **MRI**
- Anatomy ? Bone and ligament
  [First image] Lateral [1] & Medial [2] Meniscus
  [second image] Anterior [1] & Posterior [2] Cruciate Ligament
  Femur & Tibia



Sagittal, Meniscus NL Sagittal – Intact ACL

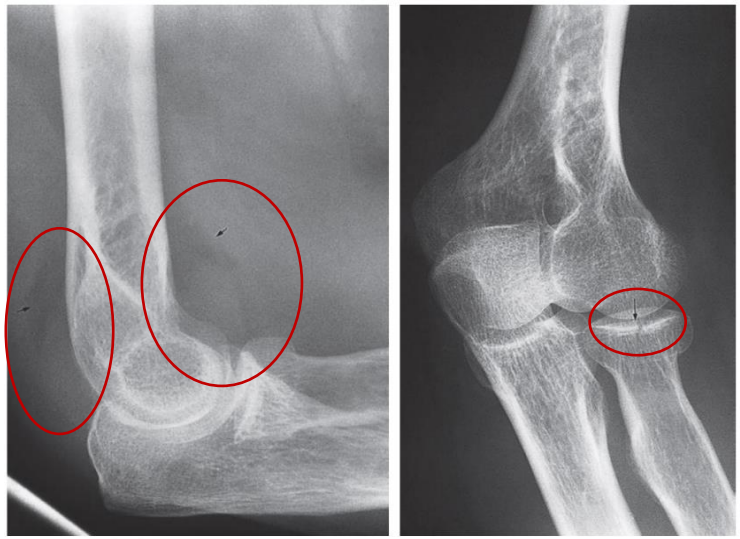
Question #6

Elbow effusion with fracture of the radial head.

(a) The anterior and posterior fat pads (arrows) are displaced away from the humerus, which almost invariably means a fracture is present.

(b) Oblique view in this patient showing the fracture of the radial head (arrow) which was only demonstrated on the oblique view

- Imaging modality? **Plain X-ray**
- Sign of the fracture ? [B] **In oblique view - lucent line fracture**
- Sign of joint effusion ? [A]
  visualization of the Anterior/Posterior fat pad displaced away from humerus
- Site of the fracture ? **Radial Head Fracture**



(a) (b)

Question #7 – Site & Sign of fracture

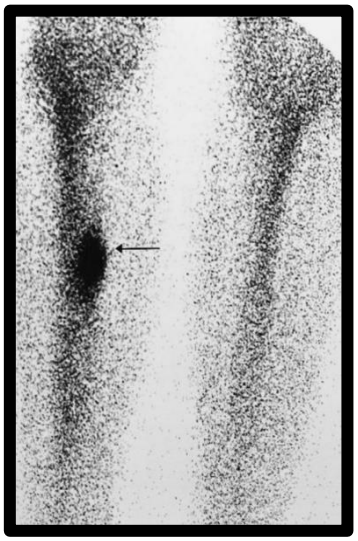
Fracture of the head of the radius appearing as a **lucent line.**	**Fracture of the lower ulnar metaphysis appearing as a** **sclerotic line**	**Step in cortex, lower end of radius and interruption of bony trabeculae in a** **Colles' fracture**

- Imaging modality? **Plain X-ray**

Question #8

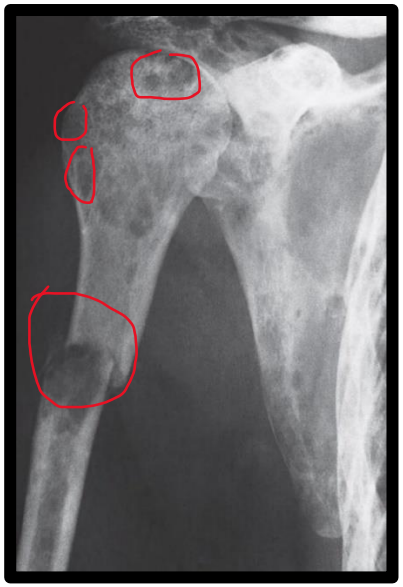
Patient (Marathoner - Soldier) presents with leg pain
No history of significant trauma Past history is not significant

Radionuclide bone scan showing increased uptake in the tibia (arrow) of this athlete with pain in the leg.



- Imaging modality? **Nuclear Scintigraphy - Radionuclide bone scan**
- Name of the fracture ? **Stress Fracture**
- Describe the abnormality. **March fracture due to Repeated, often minor trauma, causing increased uptake in radionuclide**

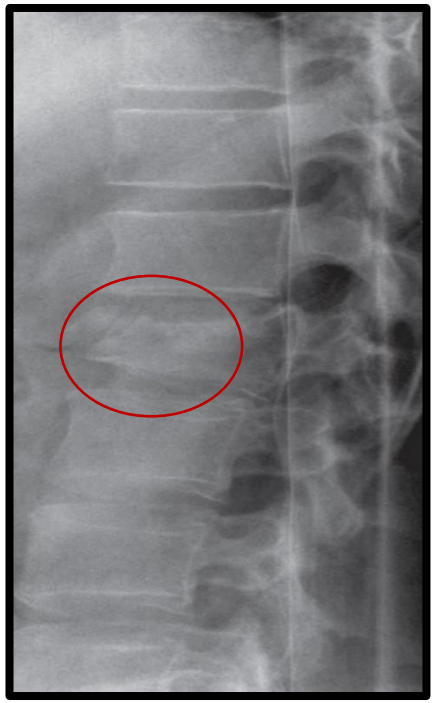
Question #9



- Imaging modality? **Plain X-ray**
- Name of the fracture ? **Pathological Fracture**
- Site of the fracture?
  humerus fracture has occurred through one of many lytic metastases from a carcinoma of the breast

Question #10

55 year-old woman Prolong history of steroids therapy
Plain film showing a compression fracture of the body of L1



- Imaging modality? **Plain X-ray**
- Name of the fracture ? **Compression Insufficiency Fracture – Vertebral Fracture**
- Site of the fracture? **Vertebral body of L1**
- Comment on bone density
  normal activity or minimal trauma in weakened bone,
  commonly from osteoporosis or osteomalacia –
  which compliments a decrease in bone density as the individual ages further

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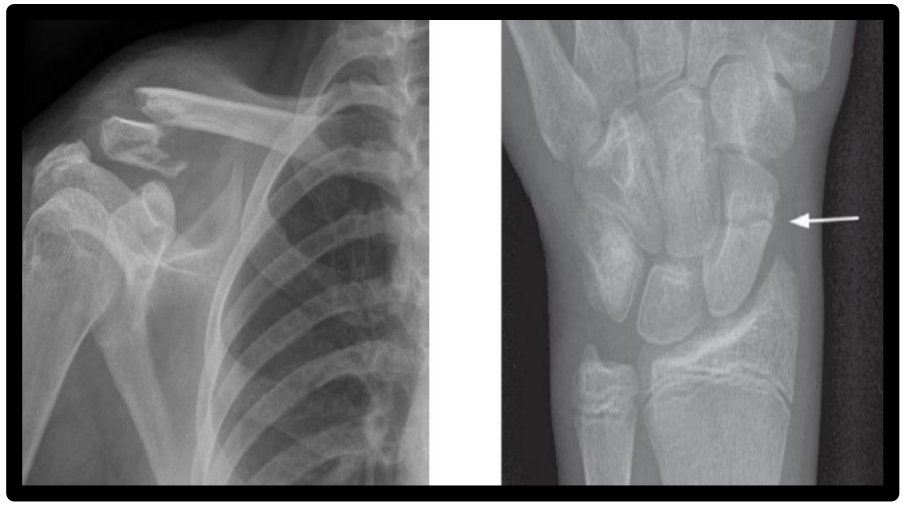
Question #11



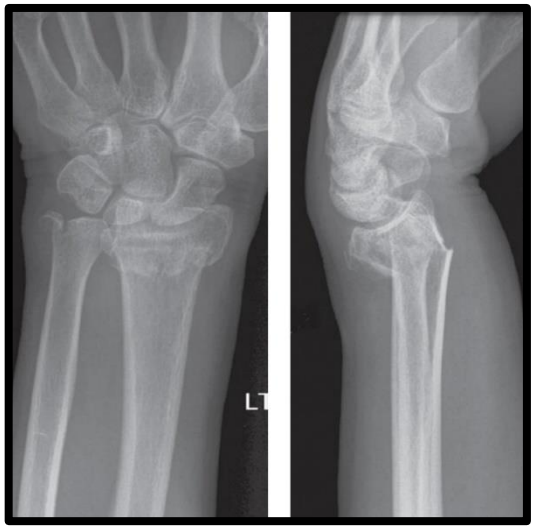
- Imaging modality? **Plain X-ray**
- Site of the fracture ? **Clavicle [Left] & Scaphoid Lucent Line [Right]**

Question #11

(a) Anteroposterior view.

(b) Lateral view showing **'dinner fork' deformity**.

- Imaging modality? **Plain X-ray**
- Name of the fracture ? **Colles' fracture**
- Site of the fracture and angulation? **Distal Radius | Posterior displacement & Angulation**



Question #12

fracture of the lower radius.

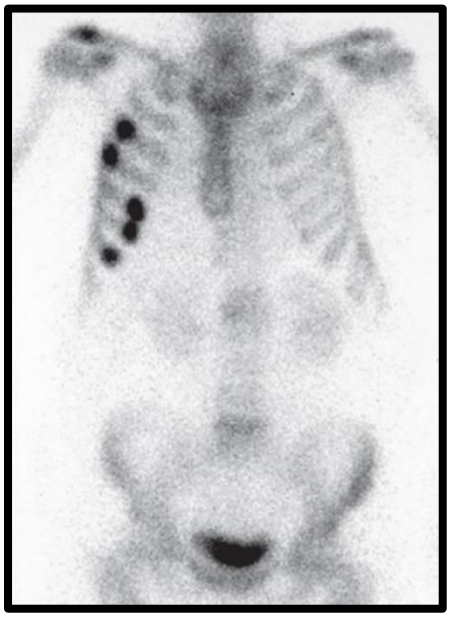
- Imaging modality? **Plain X-ray**
- Name of the fracture ? **Smith's fracture**
- Site of the fracture and angulation? **Distal Radius | anterior displacement and Angulation**

(a) Anteroposterior view. (b) Lateral view.

Question #13

- Imaging modality? **Plain X-ray**
- Name of the fracture ? **Green Stick Fracture**

Question #14

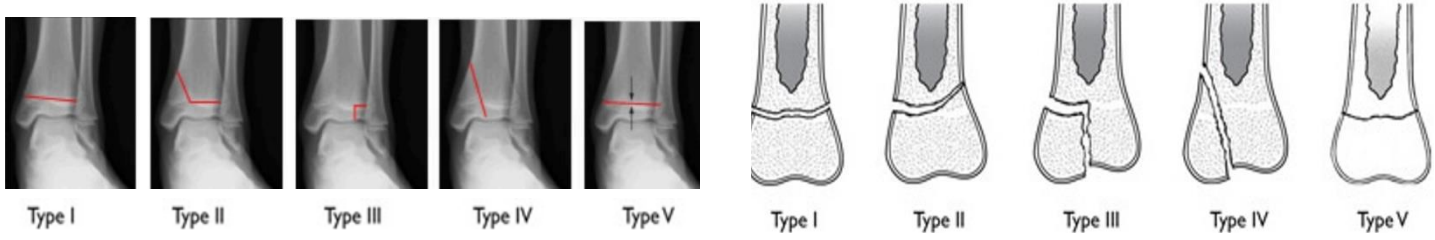


- Imaging examination ? **Nuclear Scintigraphy - Radionuclide bone scan**
- Diagnosis ? **[Fracture]**
- Site of the fractures ? **Fractures in five of the ribs on the right**
- Describe the abnormality. **Abnormal Increased uptake of Radionuclide**

Question #15 - Classify the fracture according the Salter-Harris classification ?

Salter-Harris Type 2	Salter-Harris Type 3	Salter-Harris Type 4
Growth plate / Metaphysis	Growth plate / Epiphysis	Growth plate / Metaphysis / Epiphysis

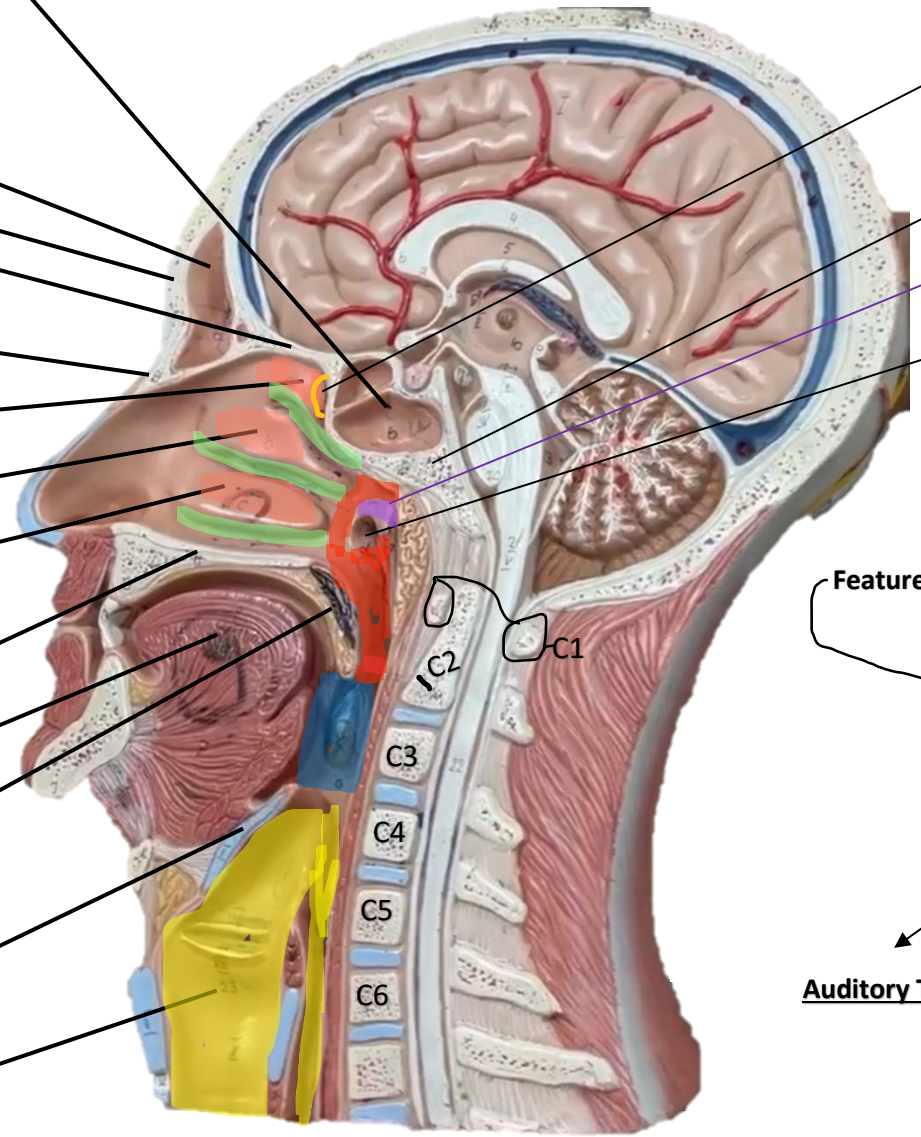
- Imaging modality? **Plain X-ray**



RESP

Hazem Al-khateeb, Sara, Raghad, Dana

Later Side of Nose, Due to rough side of Concha



Sphenoid Sinus

Frontal Sinus

Frontal Bone

Ethmoidal Bone

Nasal Bone

Superior Conchae & Meatus

Middle Conchae & Meatus

Inferior Conchae & Meatus

Hard Palate

Tongue

Soft Palate

Epiglottis Cartilage

Larynx

Spheno-Ethmoidal Recess

Sphenoid Bone

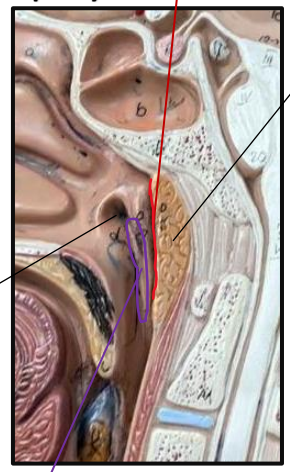
Tubular Elevation Finger like processes

Below it is round Auditory Tube

Adenoid – Pharyngeal Tonsil

Pharyngeal Recess

Features of Nasopharynx

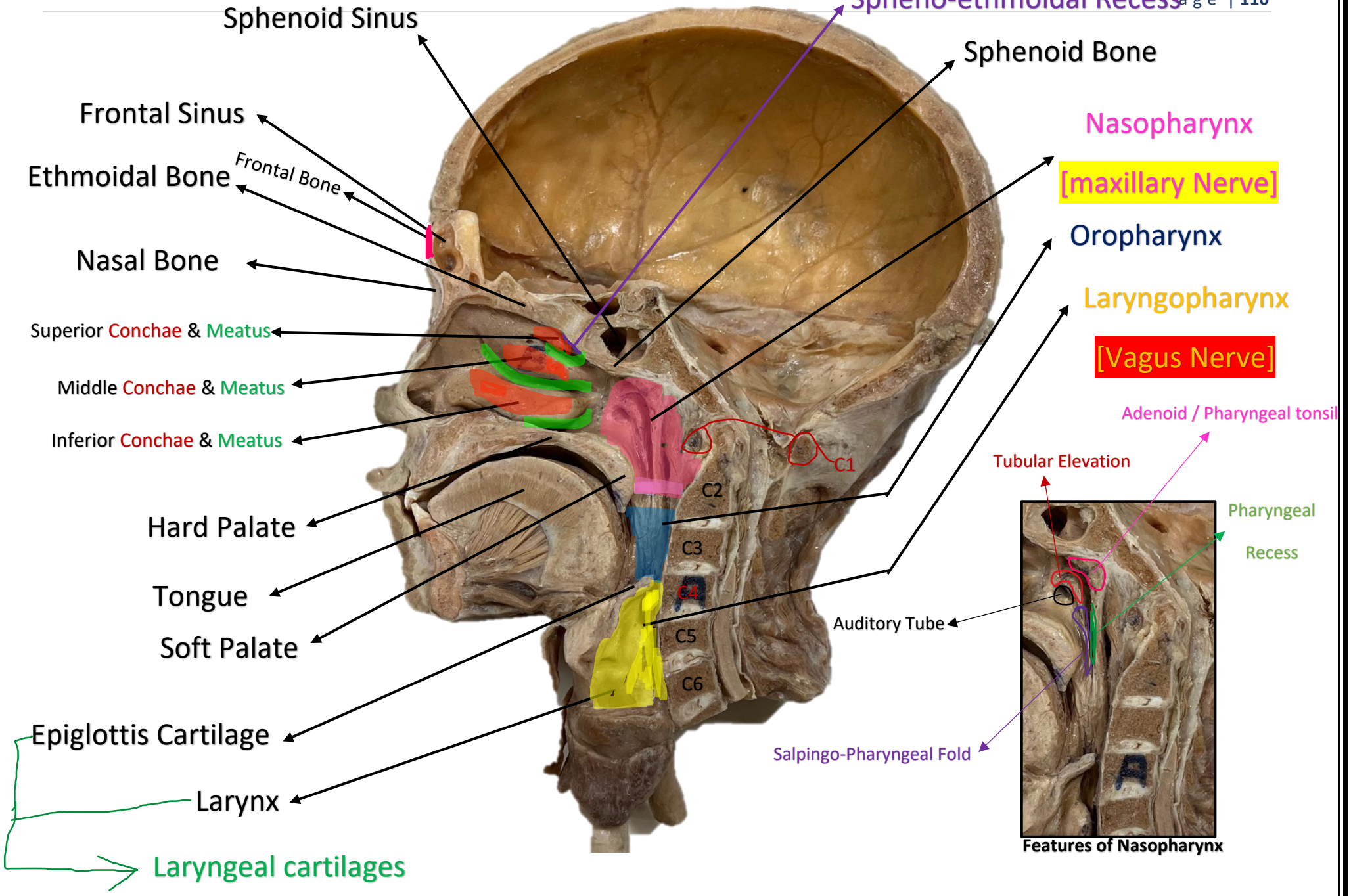


Auditory Tube

Salpingo-Pharyngeal Fold

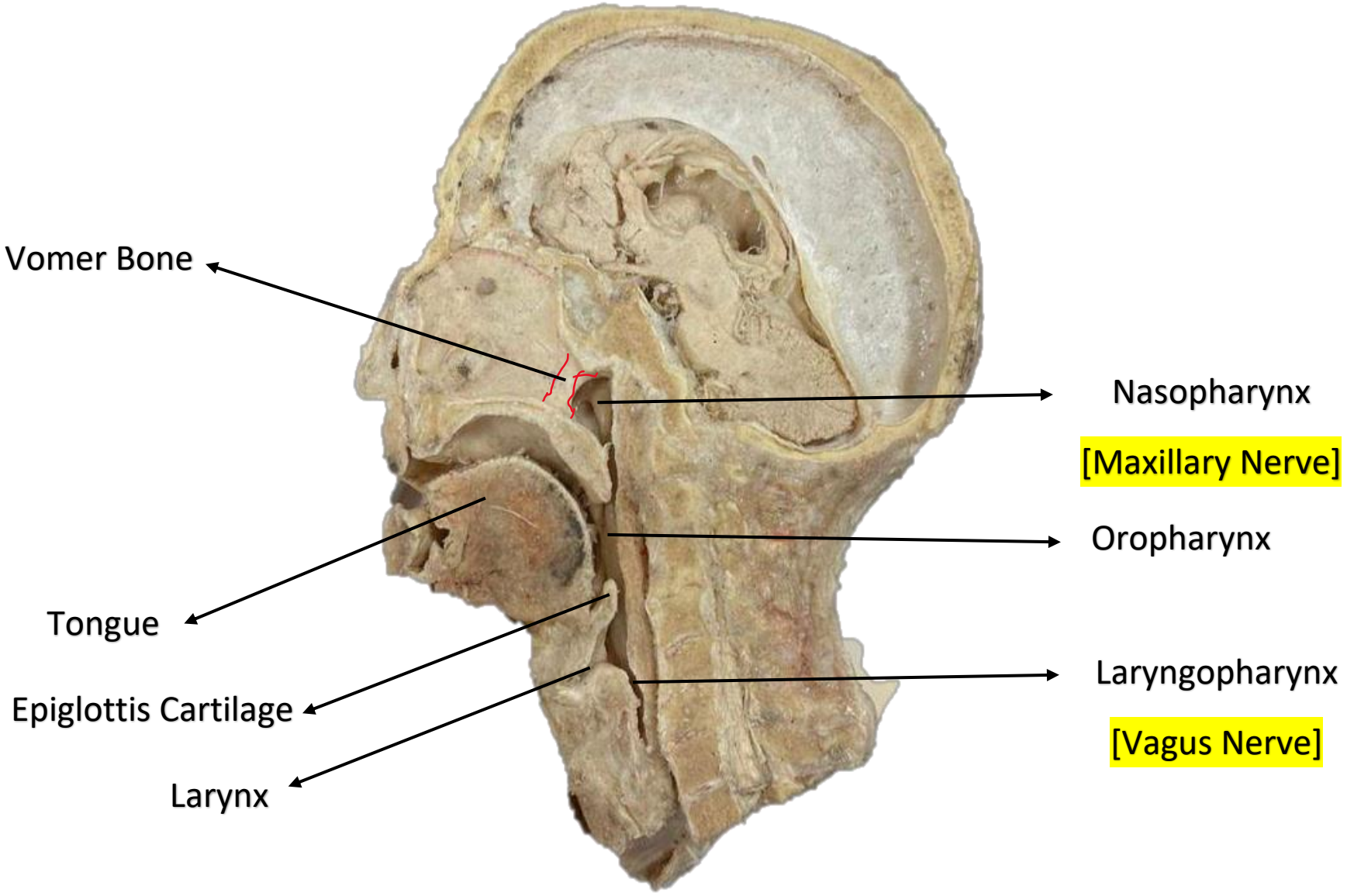
Parts of Pharynx: Nasopharynx [Maxillary N], Oropharynx, Laryngopharynx [vagus N]

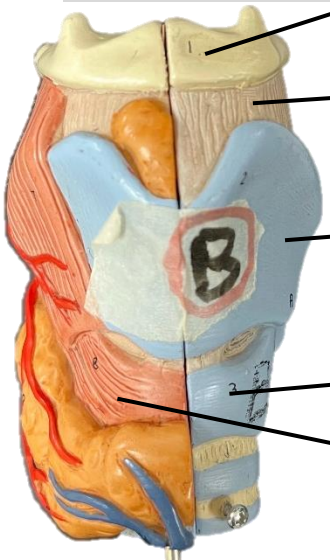
Includes: Boundaries of nose [Bones & Sinuses], Meatus, Conchae, Parts of Pharynx, Features of nasopharynx, & Cervical Vertebrae Levels



Features of Nasopharynx

Medial side, due to smooth surface of nose





Hyoid bone

Thyrohyoid Membrane

Thyroid Cartilage

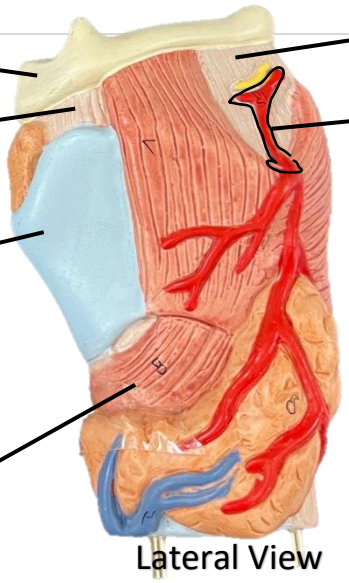
Cricoid Cartilage

Cricothyroid Muscle

Action: Tenses Vocal cord

[External Laryngeal Nerve]

Larynx Anterior View

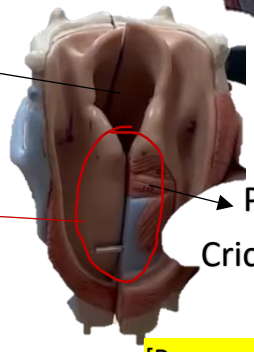


Thyrohyoid Membrane

Superior Laryngeal Artery & internal laryngeal nerve

Pierces Thyrohyoid membrane

Lateral View

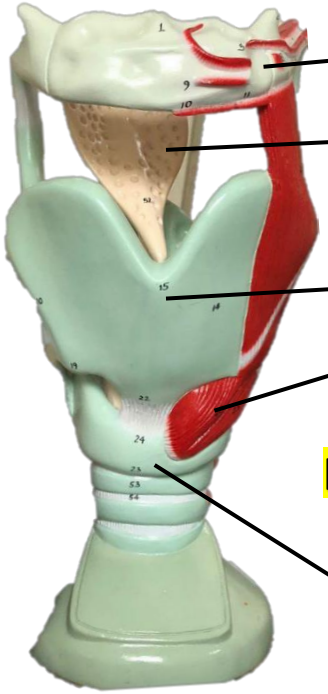


Inlet of Larynx

Pharynx

Posterior Cricoarytenoid Muscle

[Recurrent Laryngeal Nerve]



Hyoid bone

Epiglottis Cartilage

Thyroid Cartilage

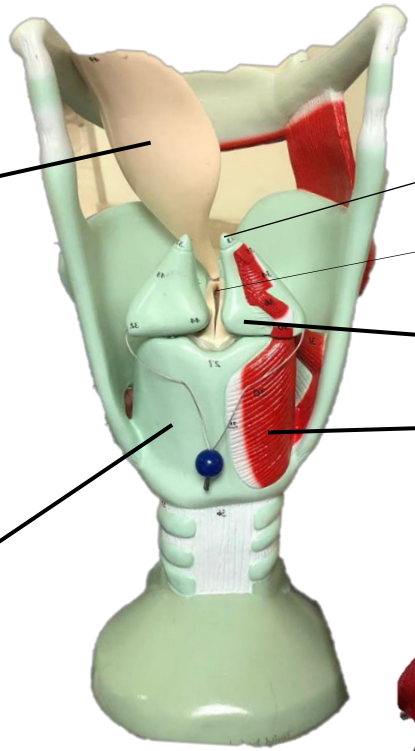
Cricothyroid muscle

Action: Tenses Vocal cord

[External Laryngeal Nerve]

Cricoid Cartilage

Anterior View



Corniculate Cartilage

Vocal cords – **In Between** [**Rima Glottidis**]

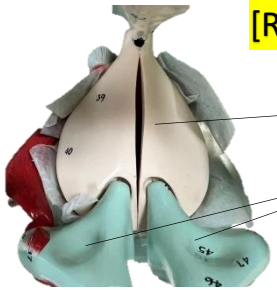
Arytenoid Cartilage

Posterior Cricoarytenoid Muscle

Action: Abducts Vocal cord

[Recurrent Laryngeal Nerve]

Posterior View

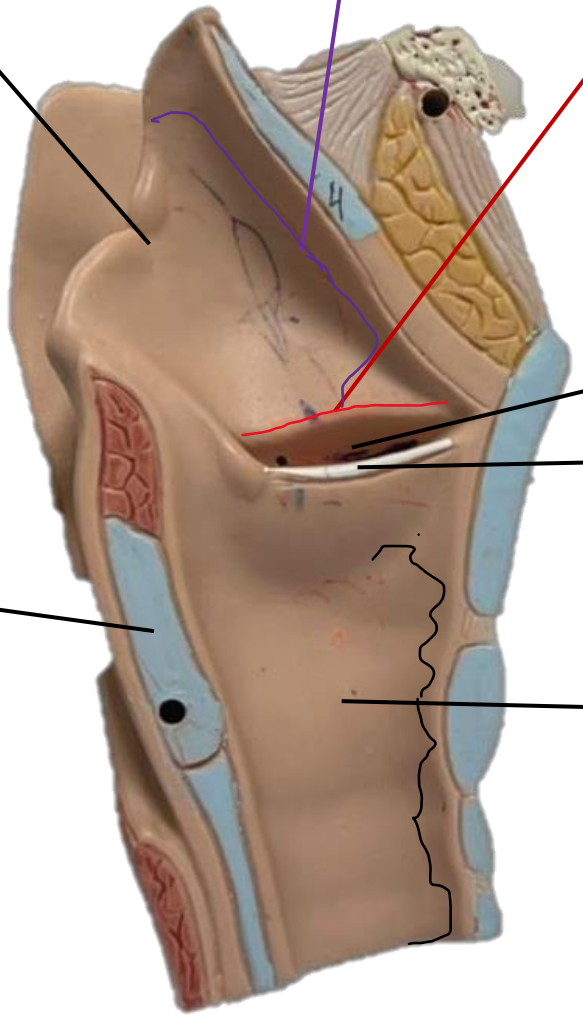


Vocal cords

Arytenoid cartilage

Vestibule – [Internal Laryngeal Nerve] Above Vocal Cord

Laryngeal Inlet



Vestibular Fold

Space between vestibular fold & vocal cord:

Sinus

True vocal cord

Cricoid Cartilage

Infraglottic

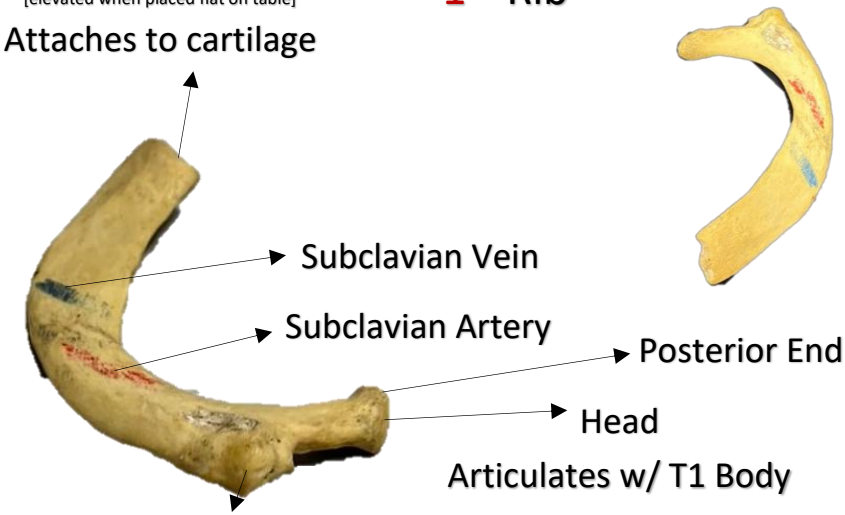
[Recurrent Laryngeal Nerve]

Below Vocal cord

Internal Larynx

1ST Rib

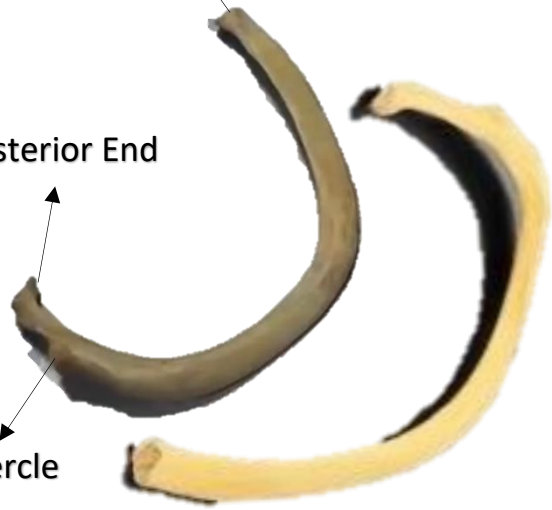
Anterior End
[elevated when placed flat on table]
Attaches to cartilage



Subclavian Vein
Subclavian Artery
Posterior End
Head
Articulates w/ T1 Body
Tubercle
Articulates w/: T1 Transverse Process

2nd Rib

Anterior End
[Both ends flat on flat table]
Posterior End
Tubercle

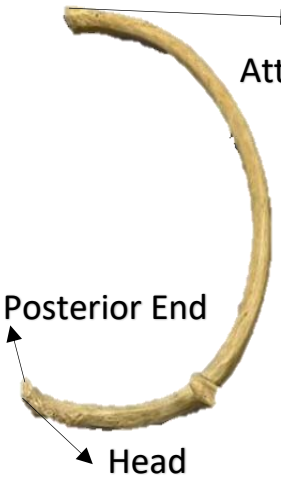


Last Ribs [Floating Ribs]

Posterior End

3rd Rib

Anterior End
Attaches to cartilages



Posterior End
Head
Articulates w/: T2 – T3

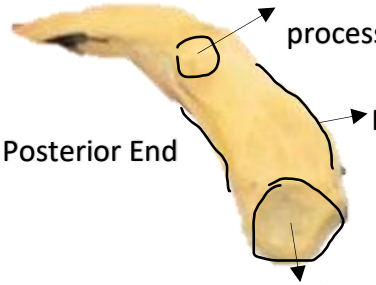
How to identify Typical Ribs:

1- Its head is elevated when placed flat on table

2- Its head articulates w/ its corresponding vertebra & the Vertebra above

3rd - 9th Typical Rib

Tubercle
Articulated w/ transverse process of its vertebra



Neck
Posterior End
Head
Articulated w/ body of vertebra

Anterior End

Head: Articulates w/ body of vertebra
Posterior End
Costal Groove

Vertebrate levels and Articulations of ribs & sternum

Suprasternal notch: Disc – T2-3

Manubrium – T3-4

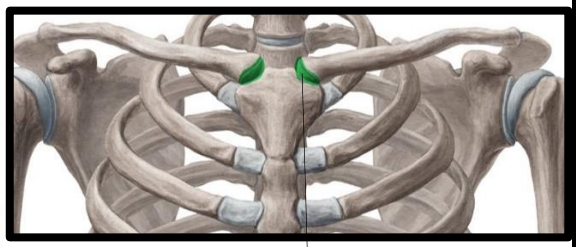
Sternal angle/
Manubriosternal Joint: Disc T4-5
[Secondary Cartilaginous]

Primary Cartilaginous
1st rib w/ manubrium

Synovial Plane
Sterno-costal 2-7

Body of Sternum – T5-8

Xiphisternal Joint: T9
[Secondary Cartilaginous]



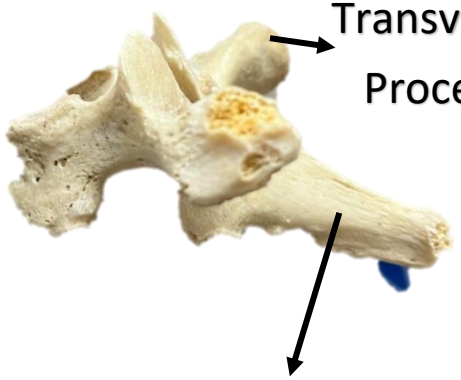
Synovial Saddle Joint, between clavicle & Manubrium

- True Ribs: 1-7
- False Ribs 8-12 [11, 12 floating ribs]

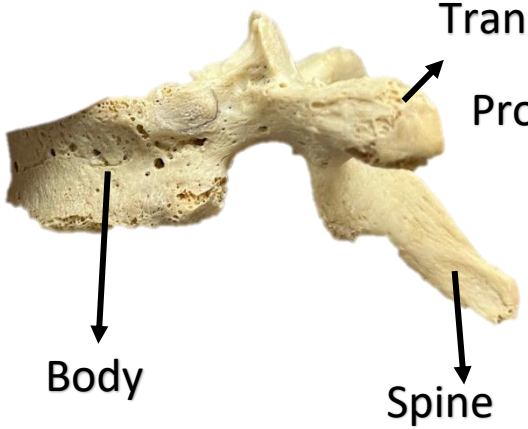
Xiphoid – T9

D

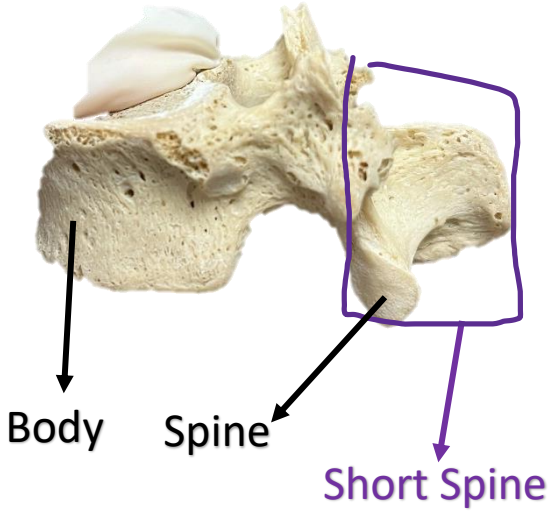
1ST Thoracic Vertebrae



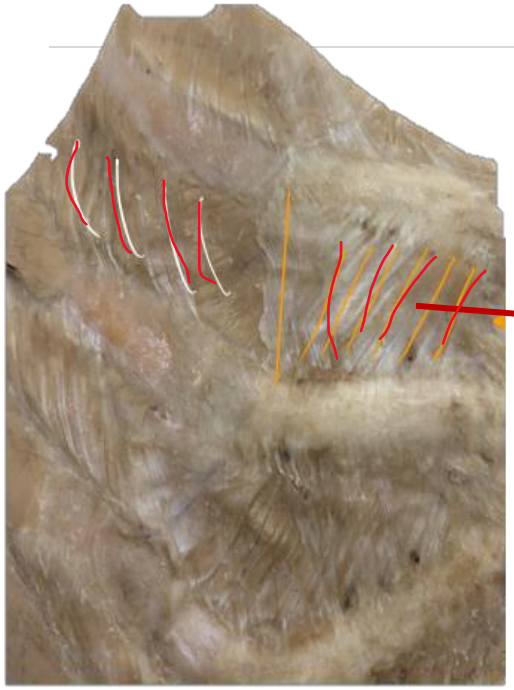
2-8th Typical Thoracic Vertebrae



11-12th Last Thoracic Vertebrae

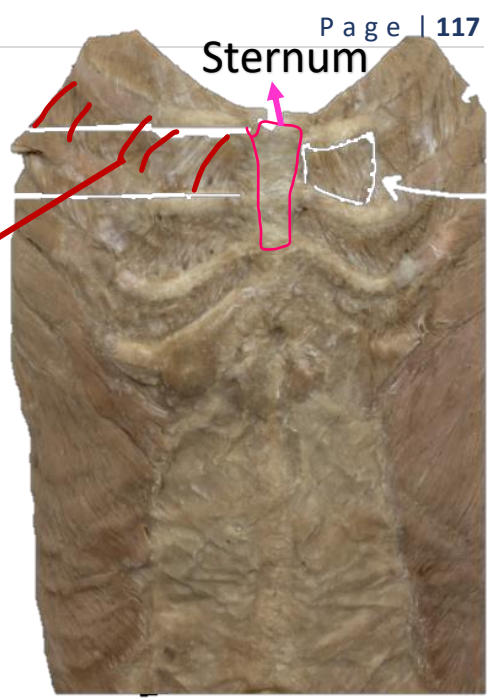


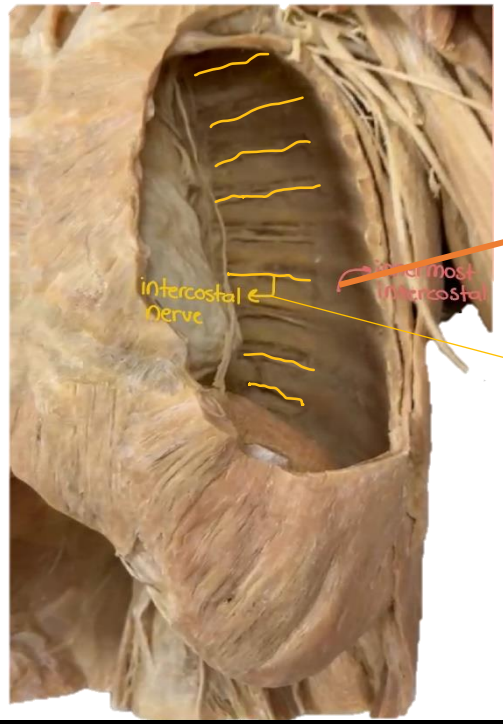
Intercostal muscles & Nerves



External Intercostal Muscle

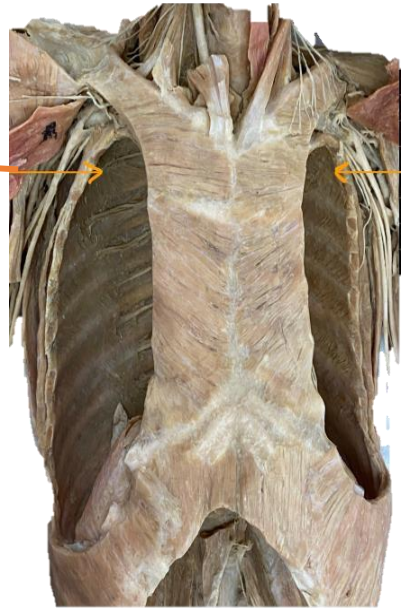
Action: Elevate Ribs





Innermost intercostal muscle

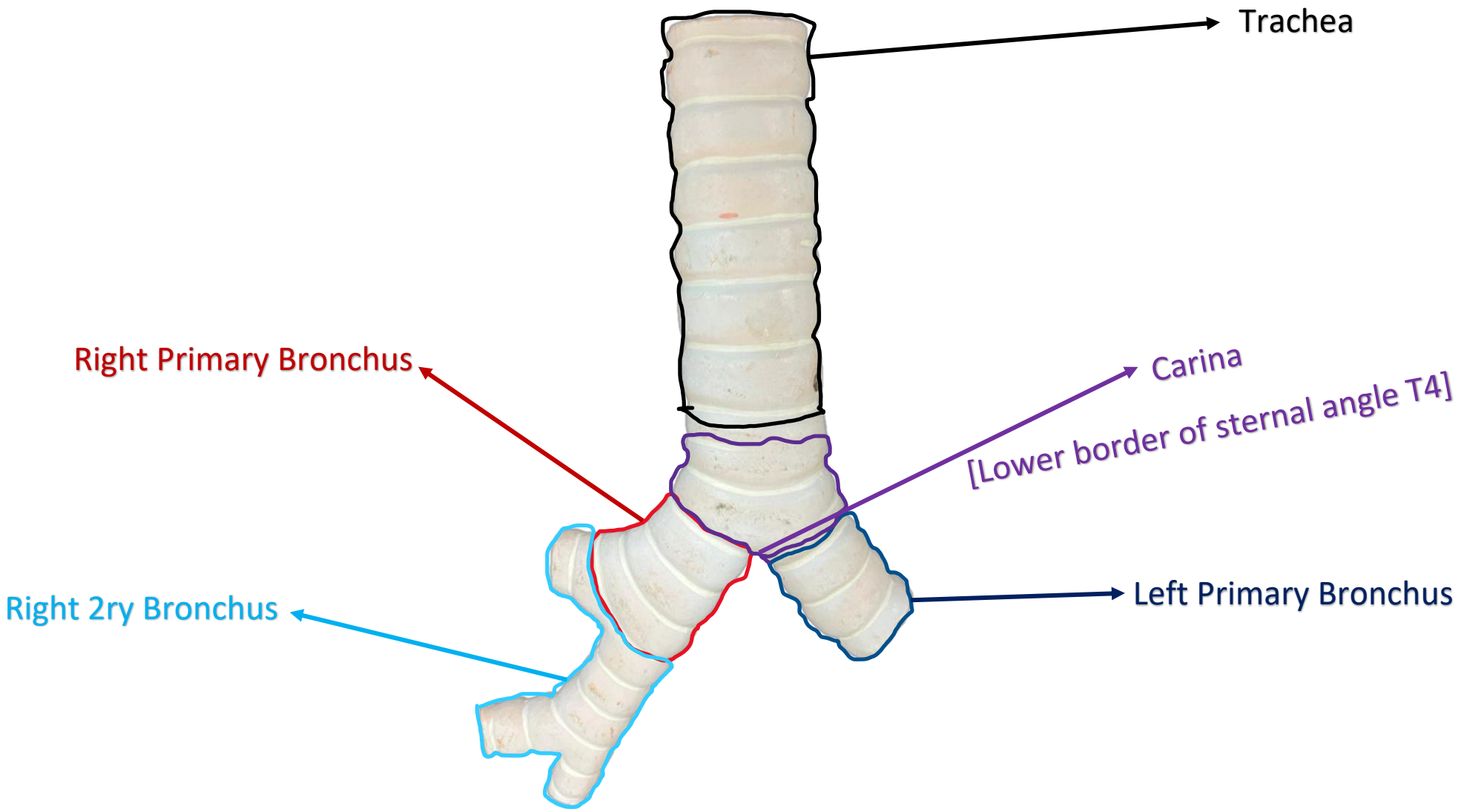
Action: Depresses ribs



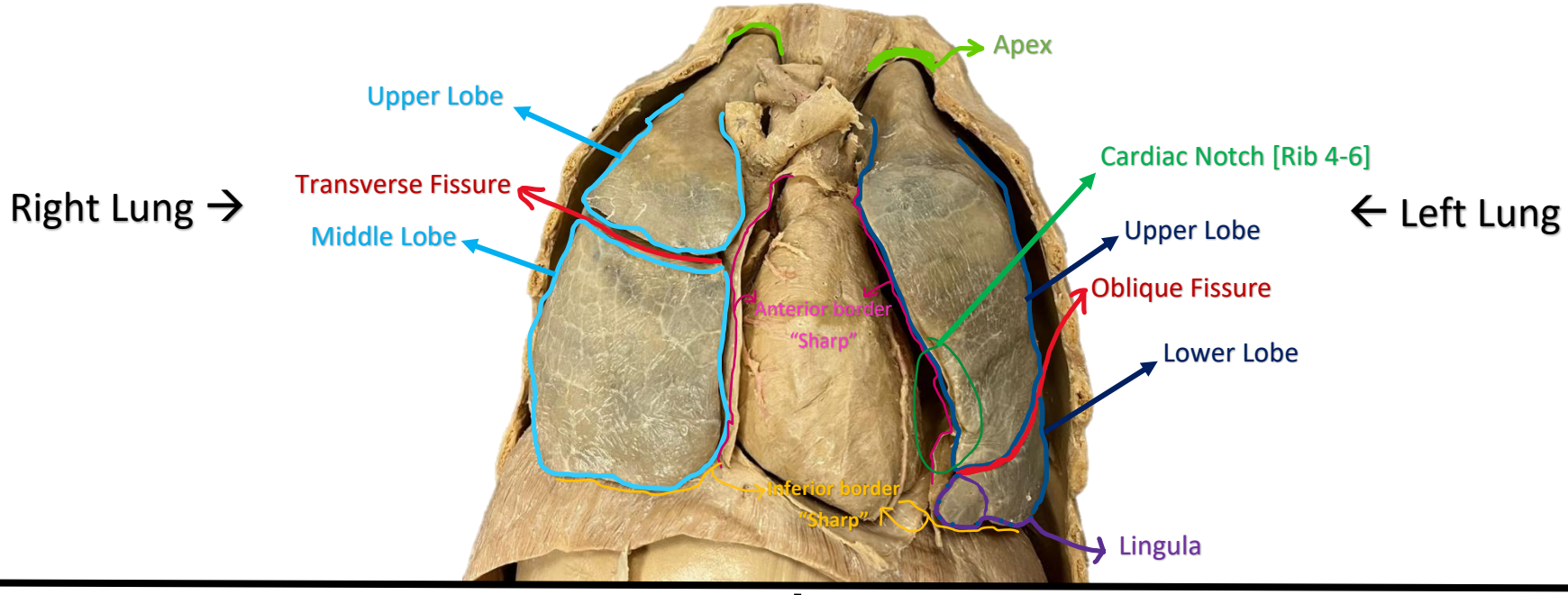
Intercostal Nerve

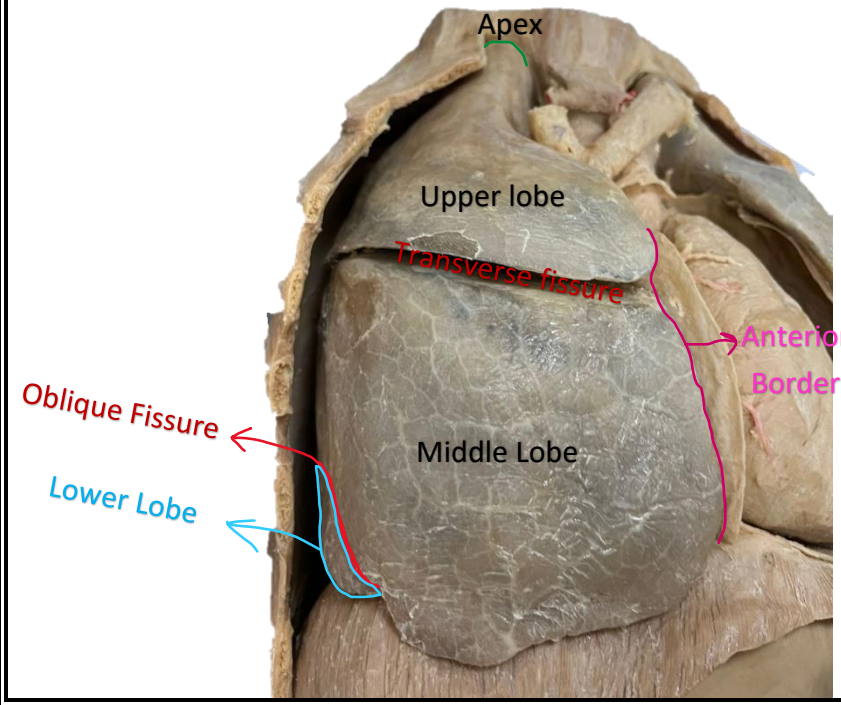
- **typical intercostal nerves : 3-6**

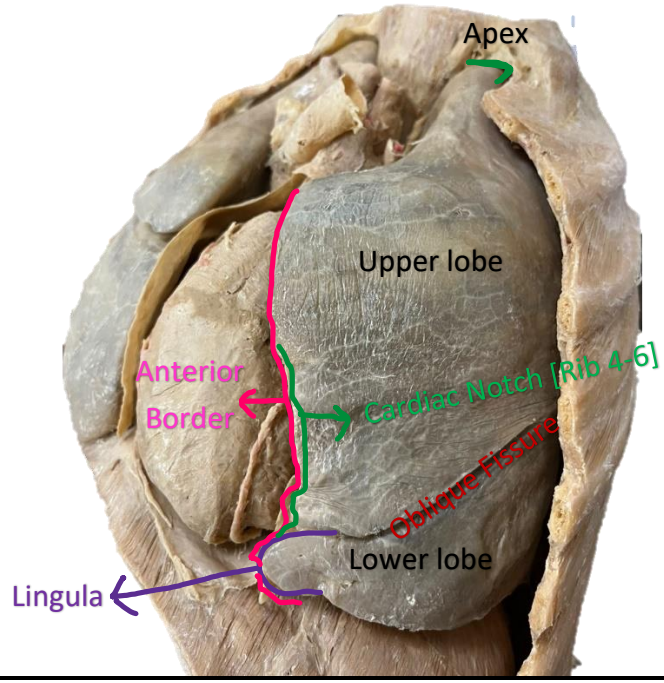
Trachea & Bronchi



Lungs

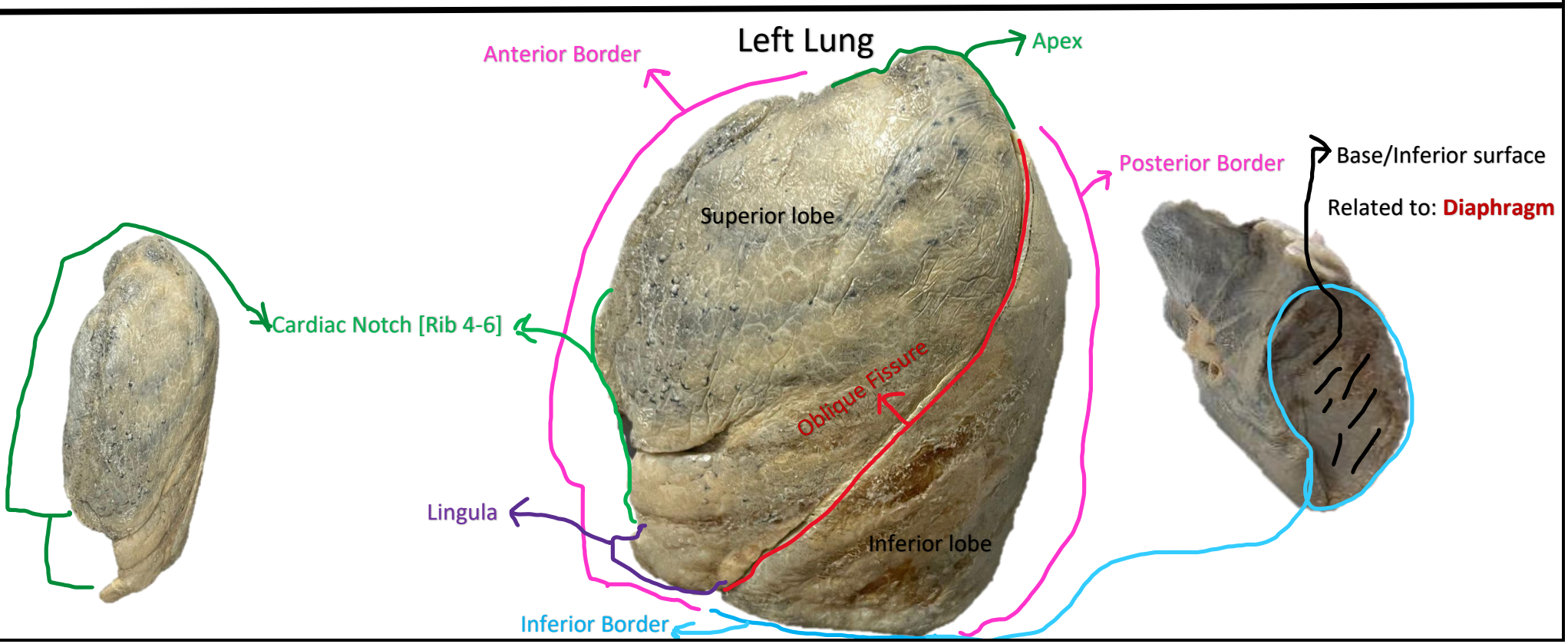

Right Lung →
← Left Lung
Apex
Upper Lobe
Transverse Fissure
Middle Lobe
Cardiac Notch [Rib 4-6]
Upper Lobe
Oblique Fissure
Lower Lobe
Anterior border
"Sharp"
Inferior border
"Sharp"
Lingula


Apex
Upper lobe
Transverse fissure
Anterior
Border
Oblique Fissure
Middle Lobe
Lower Lobe

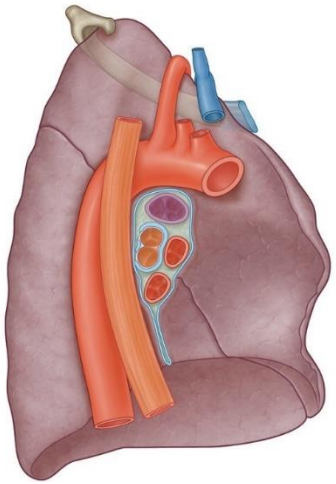

Apex
Upper lobe
Anterior
Border
Cardiac Notch [Rib 4-6]
Oblique Fissure
Lower lobe
Lingula

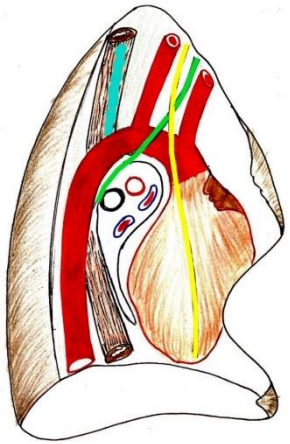
Right & Left Lung segments

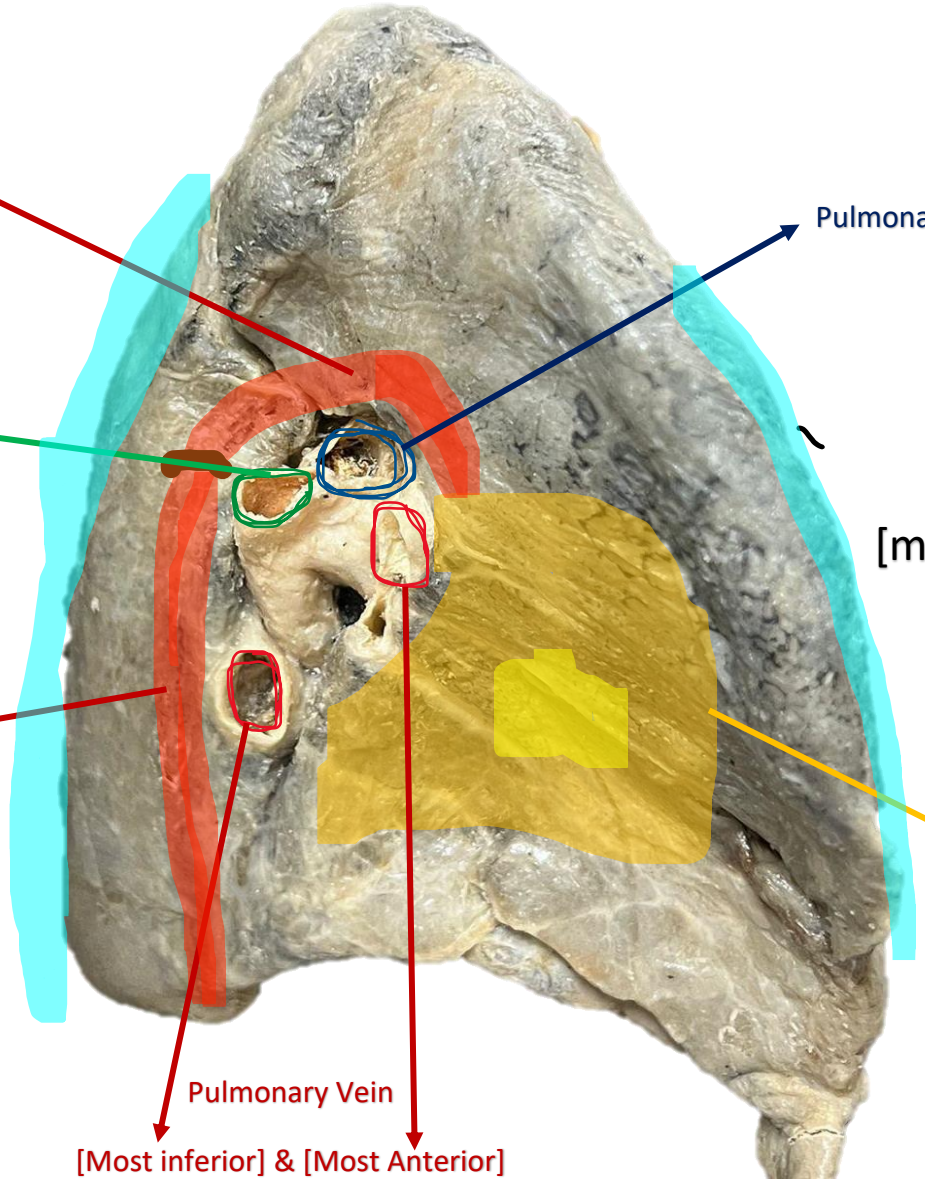
	Right Lung			Left Lung	
Fissures & Lobes	2 Fissures & 3 Lobes			1 Fissure & 2 Lobes	
Features	//			Cardiac Notch & Lingula	
Segments	**Upper Lobe**	**Middle Lobe**	**Lower Lobe**	**Upper Lobe**	**Lower Lobe**
	— Apical	— Medial	— Apical	— Apical	— Apical
	— Anterior	— Lateral	— Anterior Basal	— Anterior	— Anterior Basal
	— Posterior	— Posterior	— Posterior Basal	— Posterior	— Posterior Basal
	//////////////////	//////////////////	— Medial Basal	— Superior Lingula	— Medial Basal
	//////////////////	//////////////////	— Lateral Basal	— Inferior Lingula	— Lateral Basal



Left Lung Hilum/Structures/Impressions







[medial surface] of Left Lung:

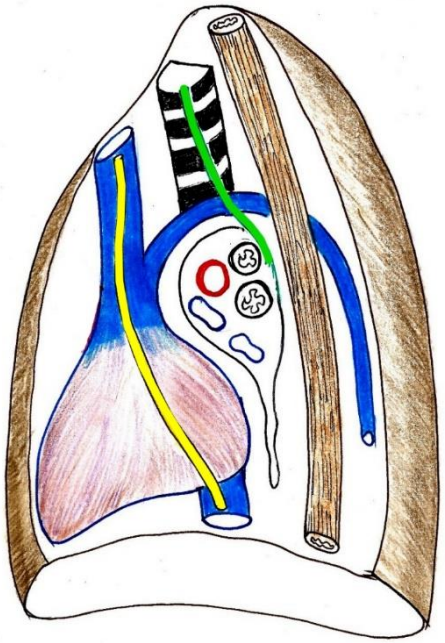
Has mediastinal Part &

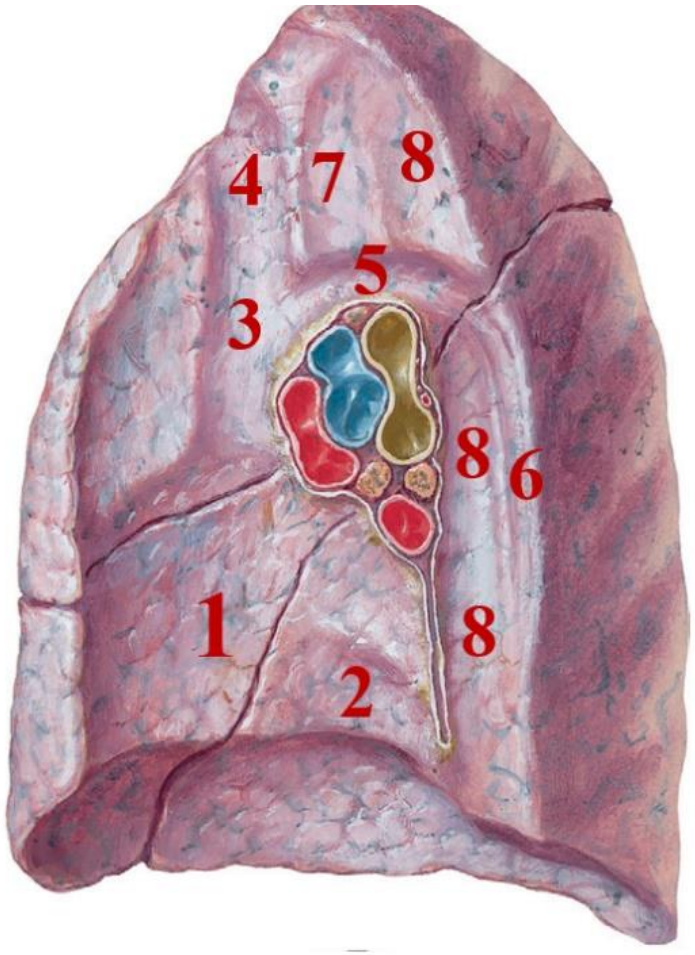
Vertebra Part

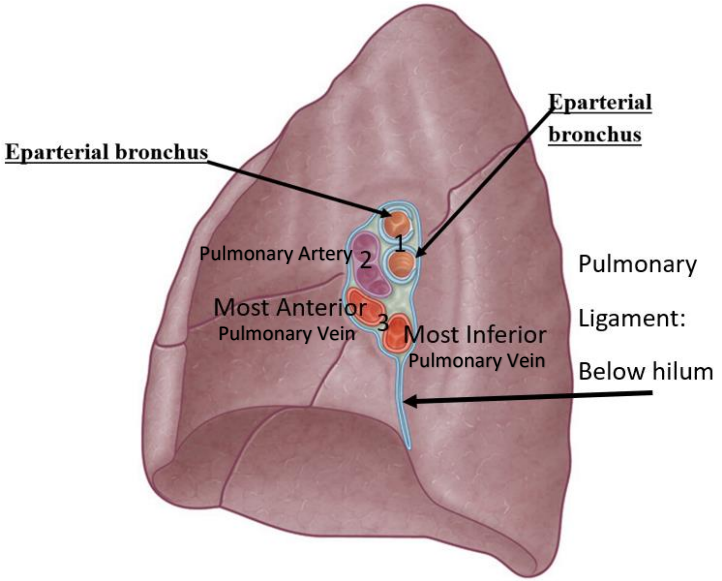
This page for your knowledge,
Not found in OSPE file

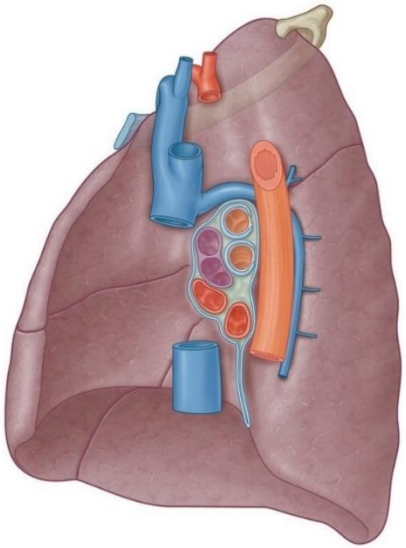
Right Lung Hilum/Structures/Impressions

1	Cardiac (Right atrium)
2	Inferior vena cava
3	Superior vena cava
4	Right brachiocephalic vein
5	Arch of azygos
6	Azygos vein
7	Trachea
8	Esophagus
9	Right vagus & Phrenic

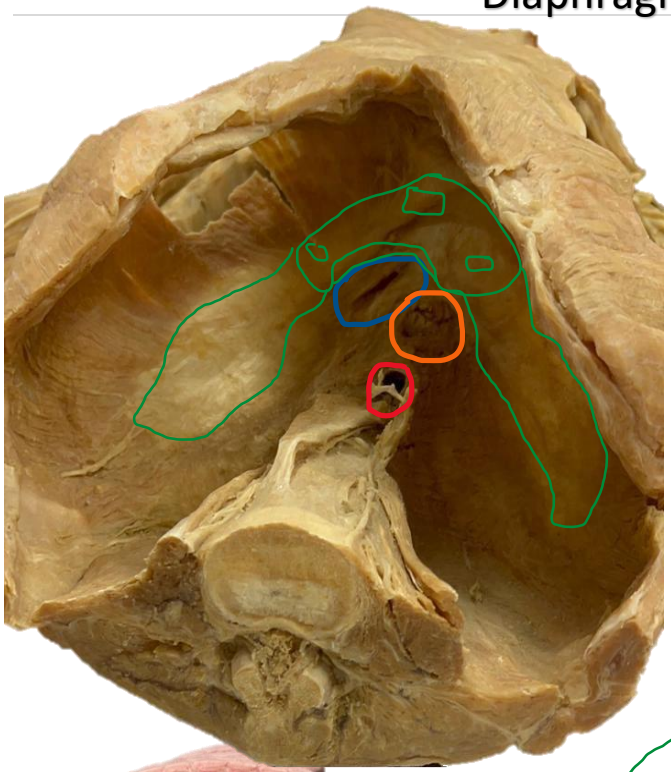








Diaphragm – Formia, Central Tendon, Nerve supply



Action of Diaphragm:

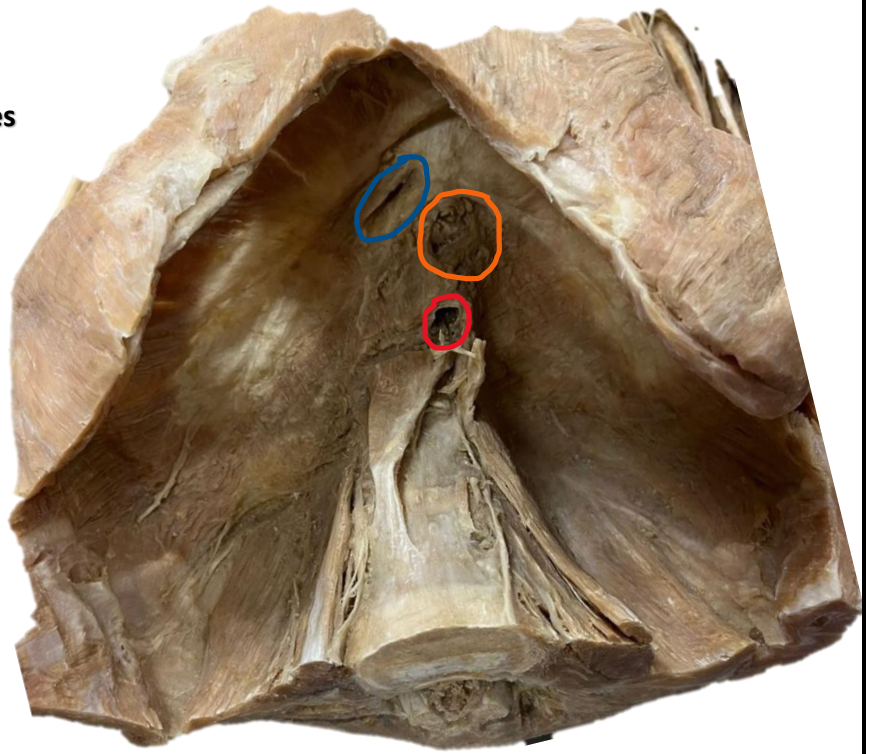
Descending down and increases vertical diameter of throax

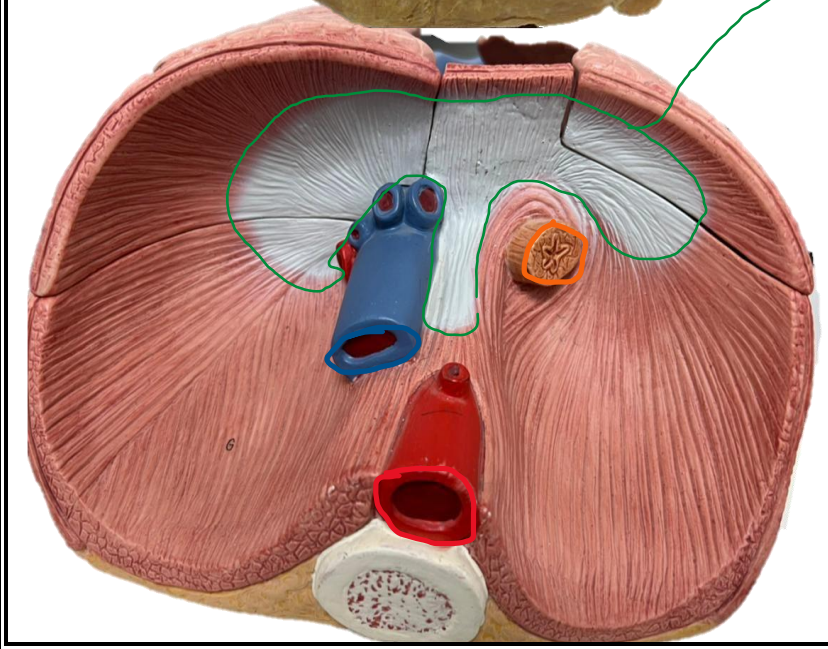
Venal Caval Opening [T8]

Esophageal Opening [T10]

Aortic Opening [T12]

Central Tendon





Major Openings of Diaphragm

	Aortic Opening	Esophageal Opening	Venal Caval Opening
Site	In Midline, posterior to median arcuate ligament	♦ To the left of midline ♦ Inside the right crus	♦ To the right of midline ♦ Inside central tendon
Level	**T12**	**T10**	**T8**
Structure Passing	Aorta, Thoracic duct, & Azygos vein	Esophagus & 2 Vagi	IVC & Right phrenic nerve

Nerve supply

	Supplied by
Motor Nerve Supply	**The right & left phrenic nerves (C3, 4, 5)**
Sensory Nerve Supply	❑ **The central parts supplied by phrenic nerves** ❑ **The periphery is supplied by lower six intercostal nerves.**

Physiology Spirometry

Pulmonary function test - Classification

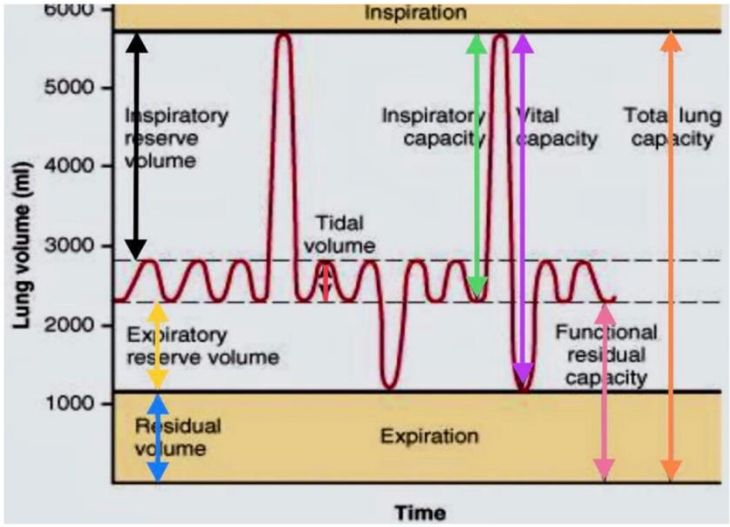
A- Ventilatory Function Tests	B- Respiratory Function Test
I. Lung volumes & capacities II. Test based on mechanical efficiency in breathing (PEFR)	measurement of arterial PO2, PCO2, pH

Lung volumes and capacities

Measurement of lung volumes provides a tool for understanding normal function of the lungs as well as disease states.

Volume of	Description	Normal ml ≈	Abv.
Tidal	Volume of air **inspired or expired during single normal breath**	**500 ml**	**TV**
Inspiratory Reserve	volume of air that can be **inspired forcefully**, over and above normal tidal volume	**3000 ml**	**IRV**
Expiratory Reserve	maximum volume of air that can be **expired forcefully** after normal tidal expiration	**1000 ml**	**ERV**
Residual	volume of **air remaining** in the lungs **after maximal expiration**	**1200 ml**	**RV**

Capacity of	Description	Includes X = Abv.	Normal ml ≈	Abv.
Inspiratory	maximum volume of air that can be inspired after normal tidal expiration.	**TV + IRV**	**3500 ml**	**IC**
Functional Residual	volume of air that remains in the lungs after normal tidal expiration	**ERV + RV**	**2200 ml**	**FRC**
Vital	maximum volume of air that can be expired forcefully after taking maximum inspiration	**TV + IRV + ERV**	**4500 ml**	**VC**
Total Lung	maximum volume of air that lungs can hold	**TV + IRV + ERV + RV & VC + RV**	**5700 ml**	**TLC**



What is Spirometry?

Spirometry: Is the most common of the Pulmonary Function Tests (PFTs)

Why Perform Spirometry?

- Measure airflow obstruction to help make a **definitive diagnosis** .
- Distinguish between **Obstructive** and **Restrictive** diseases of the lungs.

Types of Spirometers

• Bellows Spirometers	• Electronic Desk Top Spirometers	• Small hand-held spirometers
Measure volume; mainly in lung function units	Measure flow and volume with real time display	Inexpensive and quick to use but no print out

Spirogram Patterns:

- Normal
- Obstructive
- Restrictive
- Mixed Obstructive & Restrictive

Spirometers

Standard Spirometric Indices

- The Spirometer calculates different ventilation parameters:

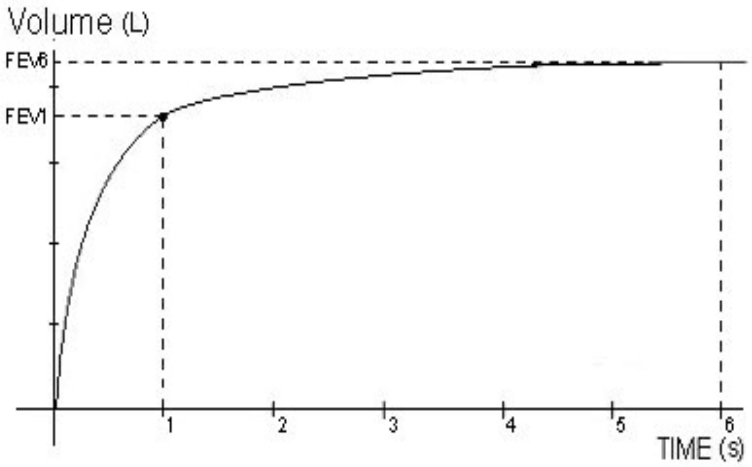
• FVC – Forced Vital Capacity	• FEV_1 – Forced Expiratory volume in 1st second	• FEV_1 / FVC ratio
The total volume of air that can be forcibly exhaled in one breath	The volume of air expired in the first second of the blow	The fraction of air exhaled in the first second relative to the total volume exhaled

Predicted Normal Values depends on the following: Age, Height, Weight, Sex, Ethnic Origin

Volume-time loop

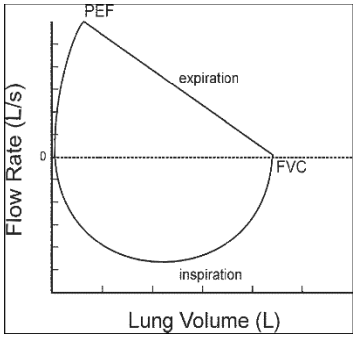
The volume versus time curve is a an alternative way of plotting spirometric results and is another *useful illustration of patient* performance.

	Ranges and their implication
FEV_1	**75-80%** of the FVC can be expelled in first second is **normal**
FEV_1/FVC	**75-80%.** Anything below this is considered **abnormal** (obstructive or restrictive disease).



Flow- volume loop

- Spirometry is a valuable tool for analyzing the flow rate of air passing into and out of the lungs.
- Flow volume loops provide a graphical illustration of a patient's spirometric efforts .



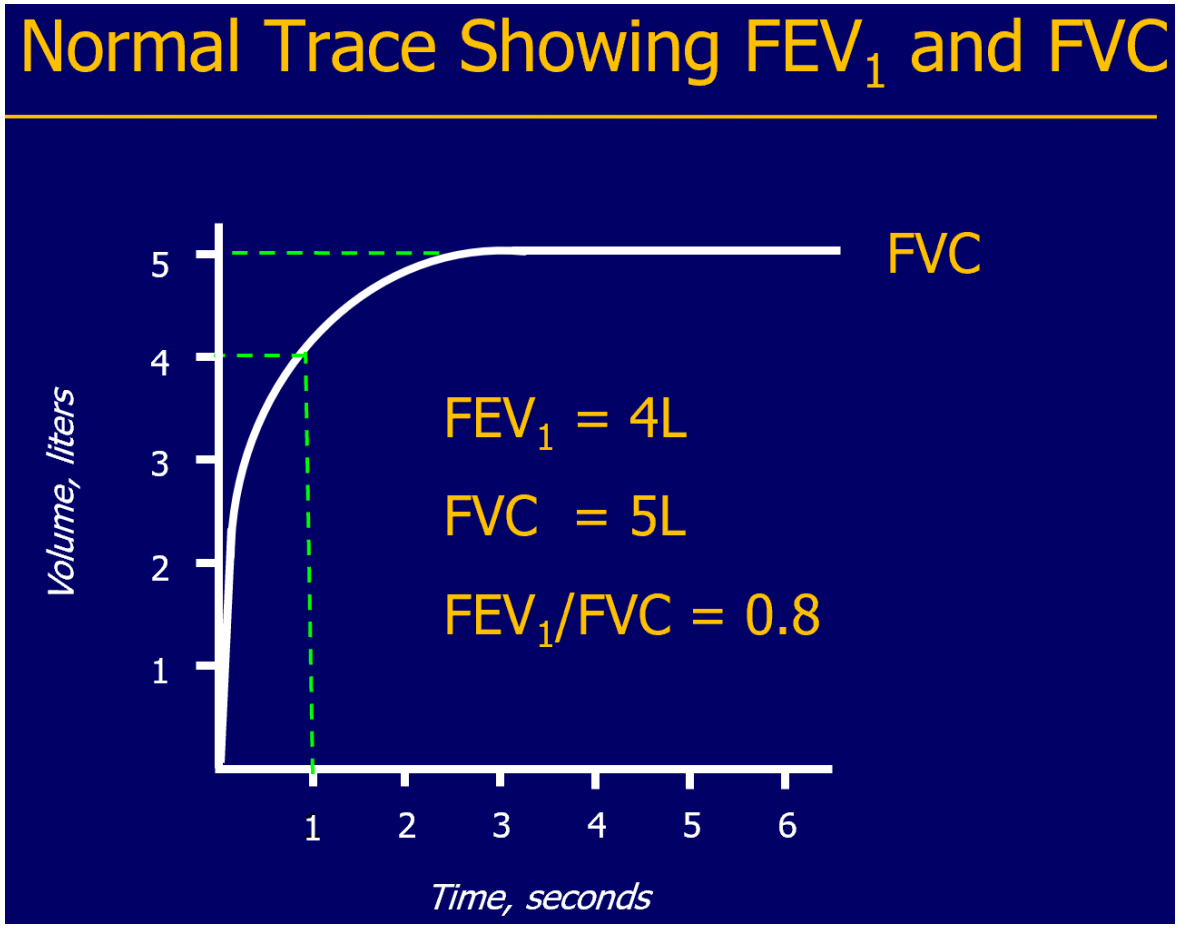
obstructive and restrictive diseases

- **Lung disease is often divided into two broad categories**: obstructive disease and restrictive disease.

Examples of Obstructive Disease	Examples of Restrictive Disease
Emphysema, Chronic Bronchitis, and bronchial Asthma.	disease are abnormalities of the spine and chest and diseases within the lungs that make them less elastic (“stiffer”), such as pulmonary fibrosis.

Criteria for Normal

	Predicted Normal Range
FEV_1	**≥ 80%**
FVC	**≥ 80%**
FEV_1 / FVC	**> 0.7**

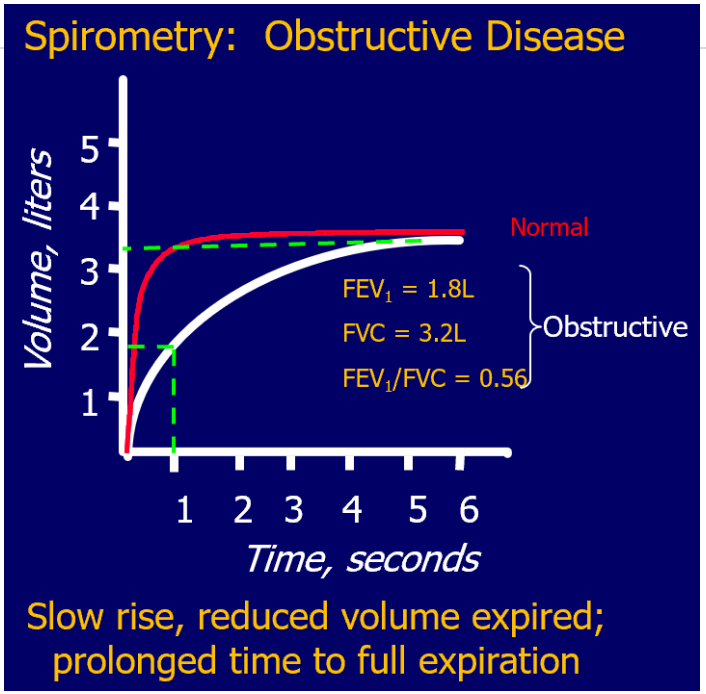


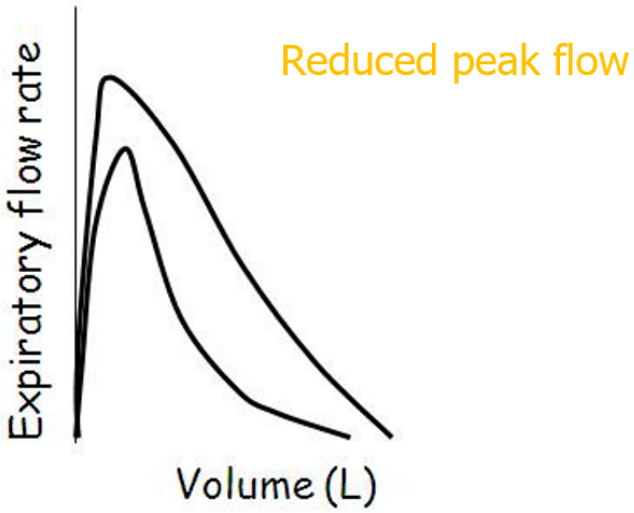
Criteria for Obstructive Disease

	Predicted Range
FEV_1	< 80% ↓ ↓
FVC	< 80% ↓
FEV_1 / FVC	< 0.7

Diagnosis of

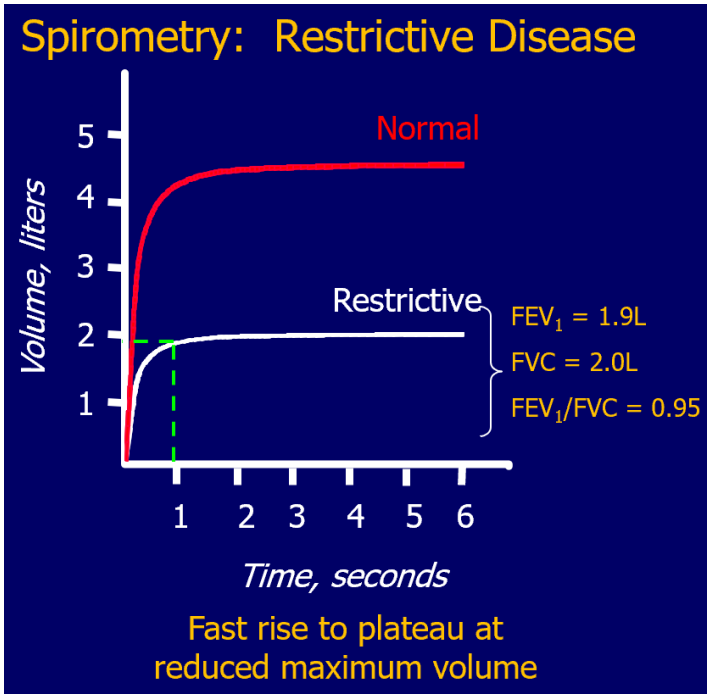
COPD is confirmed by $FEV_1/FVC < 0.7$

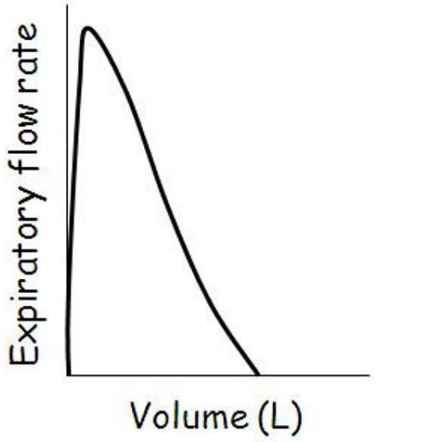




Criteria for Restrictive Disease

	Predicted Range
FEV_1	< 80% ↓
FVC	< 80% ↓ ↓
FEV_1 / FVC	> 0.7



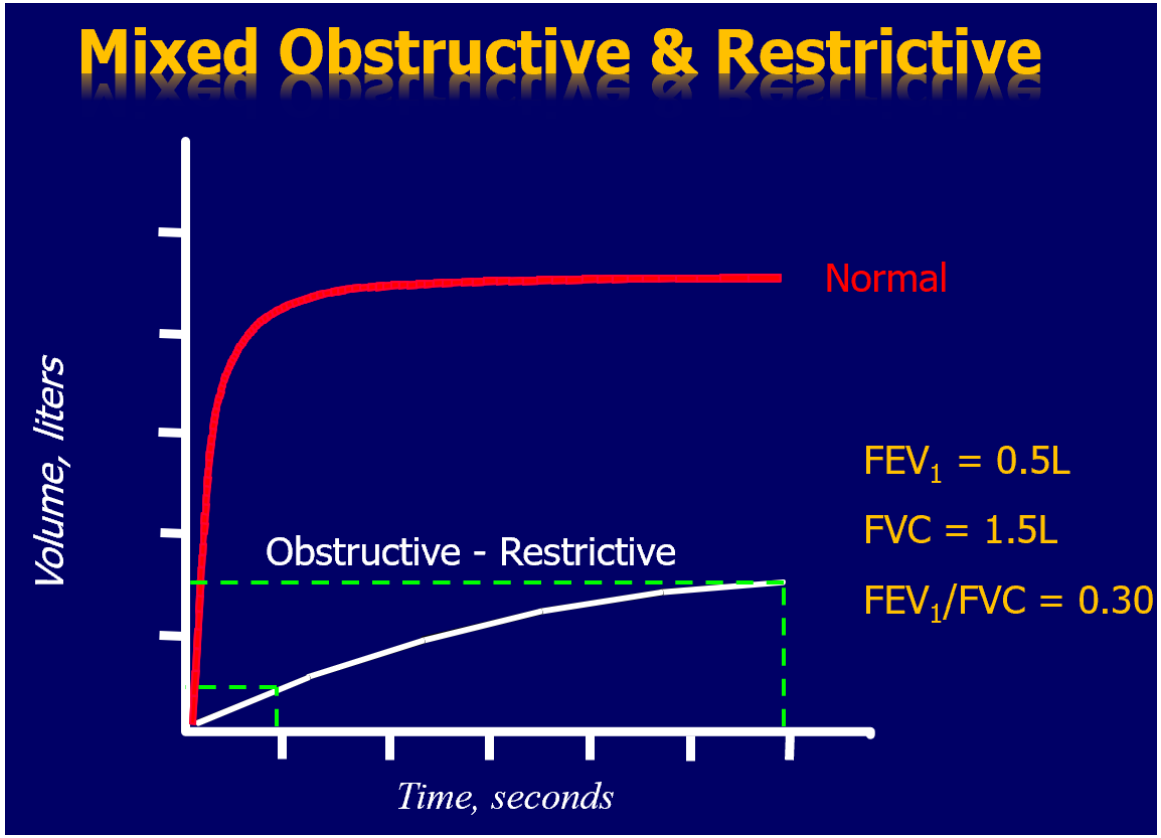


Criteria for Mixed obstructive/Restrictive Disease

	Predicted Range
FEV_1	< 80%
FVC	< 80%
FEV_1 / FVC	< 0.7

Restrictive and mixed obstructive-restrictive are difficult to diagnose by spirometry alone; full respiratory function tests are usually required

(e.g., body plethysmography, etc)



Biochemistry – Clinical Based Questions

Assessment of Acid-Base Balance Disturbances

	1- Acidosis	2- Alkalosis
Metabolic	↓↓ HCO_3^-	↑↑ HCO_3
Respiratory	↑↑ CO2	↓↓ CO2

R Respiratory — PH ↑ PCo2 ↓ Alkalosis

O Opposite — PH ↓ PCo2 ↑ Acidosis

M Metabolic — PH ↑ HCo3 ↑ Alkalosis

E Equal — PH ↓ HCo3 ↓ Acidosis

$$pH \propto \frac{[HCO_3^-]}{PCO_2}$$

Arterial Blood Gas (ABG) Report

•Acid-Base Information

- **pH**
- **pCO_2**
- **HCO_3** [Calculated OR Measured]

•Oxygenation Information

- **pO_2** [Oxygen Tension]
- **sO_2** [Oxygen Saturation]

Normal Values	
pH	7.35-7.45
CO_2	35-45
pO_2	80-100
HCO_3	22-26
O_2 Sat.	95-100%

```
At 37C
pH_______7.490
PCO2_____42.3 mmHg
PO2______88 mmHg
HCO3_____32 mmol/L
BEecf____9 mmol/L
sO2*_____97 %
   *calculated

FIO2_____: 100
Sample Type_: ART

  24MAY01     11:25
```

Case #1

A 54- yea-r old man with a history of chronic obstructive pulmonary disease & was rushed to the Emergency Department with increasing shortness of breath, pyrexia & cough with yellow-green sputum. Upon examination, crackles & wheezes can be heard in the lower lobes. He has a tachycardia & a bounding pulse.

Measurement of arterial blood gas (ABG) report
pH = 7.3 ~ Low
pCO2 = 68 mm Hg ~ High
HCO3 = 24 mmol/L ~ N
pO2 = 60 mm Hg ~ Low

The case has:

1. **Chronic obstructive pulmonary disease with CO2 retention.**
2. **Respiratory Acidosis (Low pH, High CO2)**
3. **No Renal Compensation yet, (normal HCO3)**

What is the diagnosis?: Respiratory Acidosis (Uncompensated)

Case #2

A 10 –years- old child was brought to the hospital due to vomiting & a decreased level of consciousness. The patient displays slow & deep breathing & he was lethargic & irritable in response to stimulation. He appeared to be dehydrated—his eyes were sunken & mucous membranes were dry—and he had a two week history of polydepsia, polyuria, and weight loss.

Measurement of arterial blood gas (ABG) report
pH= 7.25 ~ Low
pCO2 =40 mm Hg ~ N
HCO3= 12 mmol/L ~ Low
pO2 = 90 mm Hg ~ N

Other Investigations: Glucose 400 mg/dl, K+ 5.4 mmol/L

The case has:

1. **Type 1 Diabetes Mellitus (Increased Blood Glucose Level) complicated by Diabetic Coma, hyperkalemia**
2. **Metabolic Acidosis (Low pH, Low HCO3 -)**
3. **No Respiratory Compensation (normal CO2)**

What is the diagnosis?: Diabetic Ketoacidosis (DKA). Metabolic Acidosis (Uncompensated)

Case #3

A lady was brought to the emergency department of a hospital after she fell into the ground & hurt her left leg.
She is noted to be tachycardic and tachypneic.
Painkillers were carried out to lessen her pain. Suddenly, she started complaining that she is still in pain & now experiencing muscle cramps, tingling, and paraesthesia.

Measurement of arterial blood gas (ABG) report
pH= 7.6 - High
pCO2= 31 mm Hg - Low
HCO3 = 25 mmol/L - N
pO2 = 100 mm Hg - N

The case has:

1- Hyperventilation (due to anxiety & pain) causing CO2 reduction

2- Respiratory Alkalosis (High pH, Low CO2)

3- No renal Compensation (Normal HCO3-)

What is the diagnosis?: Respiratory Alkalosis (Uncompensated)

Case #4

A 65 - years- old lady was suffering from persistent vomiting for two days.
Now, she appears to be lethargic & weak & has myalgia.
She is diagnosed as having gastroenteritis & dehydration.

Measurement of arterial blood gas (ABG) report
pH= 7.5 ~ High
pCO2= 40 mm Hg ~N
HCO3= 34 mmol/L ~ High
PO2= 90 mmHg ~ N

The case has:

1- Severe Vomiting due to the gastroenteritis (loss of H+ ions)

2- Metabolic Alkalosis (High pH, High bicarbonate)

3- No Respiratory Compensation(normal CO2, so CO2 did not increase to compensate the case)

What is the diagnosis?: Metabolic Alkalosis (Uncompensated)

Case #5

A 34-years-old lady showed difficulty to be aroused from anesthesia two hours following surgery. She was administered morphine sulfate intravenously to the for complaints of post-surgical pain. Her respiratory rate was 7 per minute & showed shallow breathing. The patient does not respond to any stimuli.

Measurement of arterial blood gas (ABG) report
pH= 7.35 ~ N
pCO2 = 70 mm Hg ~ High
HCO3= 29 mmol/L ~ High
PO2= 70mmHg ~ Low

The case has:

1- **Respiratory distress with retention of CO2**
2- **Respiratory Acidosis (Low pH, High pCO2)**
3- **Renal Compensation (high HCO3)**

What is the diagnosis?: Respiratory Acidosis (Compensated)

Case #6

A 1.5 years- old infant was brought to the Emergency Room by his mother who admitted that her infant had diarrhea for the past 3 days. The infant's respiratory rate is elevated & the fontanels are sunken.

The Emergency Room physician orders ABGs.

Measurement of arterial blood gas (ABG) report
pH= 7.35 ~ N
pCO2= 27 mmHg ~ Low
HCO3 = 19 mmol/L ~ Low
PO2= 85mmhg ~ N

The case has:

1- **Diarrhea (loss of intestinal bicarbonate)**
2- **Metabolic Acidosis (pH low normal, Low HCO3)**
3- **Respiratory Compensation (Low pCO2)**

What is the diagnosis?: Metabolic Acidosis (Compensated)

Case #7

A 56 – years- old man who underwent post-abdominal surgery, has a nasogastric tube. The nurse on duty noted that the nasogastric tube was draining a large amount (900 ml in 2 hours) of coffee ground secretions. The patient is not oriented to person, place, or time.

Measurement of arterial blood gas (ABG) report
pH= 7.57 ~ High
pCO2= 37 mmHg ~ N
HCO3= 35 mmol/l ~ High
PO2= 90mmHg ~ N

The case has:

1- **excessive gastric wash (loss of H+ ions)**
2- **Metabolic Alkalosis (pH high, high HCO3)**
3- **No Respiratory Compensation (Normal pCO2)**

What is the diagnosis?: Metabolic Alkalosis (Uncompensated)

Case #8

A man was admitted to the hospital for brain surgery. He was very anxious & scared of the upcoming surgery. He began to hyperventilate & became very dizzy and finally lost consciousness.

Measurement of arterial blood gas (ABG) report
pH= 7.45 ~ N
pCO2 = 22 mmHg ~ Low
HCO3= = 19 mmol/l ~ Low
PO2= 90 mmHg ~ N

The case has:

1- **Hyperventilation which led to reduction of CO2**
2- **Respiratory Alkalosis (High pH, Low CO2)**
3- **Renal Compensation (low HCO3)**

What is the diagnosis?: Respiratory Alkalosis (Compensated)

Case #9

A 3- years- old child was brought to the ER & was diagnosed as bronchial asthma and respiratory distress syndrome. The mother admitted that she has noticed slight tremors & behavioral changes in her child over the past four days.

Measurement of arterial blood gas (ABG) report
pH= 7.25 ~ Low
pCO2= 72 mmHg ~ High
HCO3= 25mmol/L ~ N
PO2= 75 mmHg ~ Low

The case has:

1- **Respiratory distress (due to asthma) which led to CO2 retention.**
2- **Respiratory Acidosis (Low normal pH, High CO2)**
3- **No Renal Compensation (normal HCO3)**

What is the diagnosis?: Respiratory Acidosis (Uncompensated)

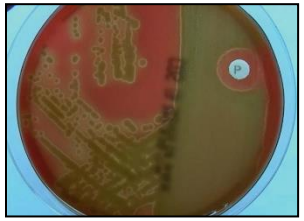
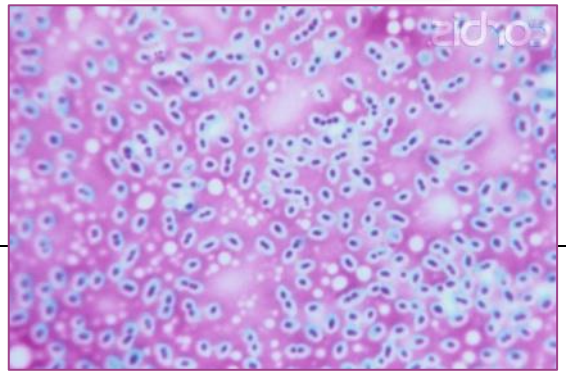
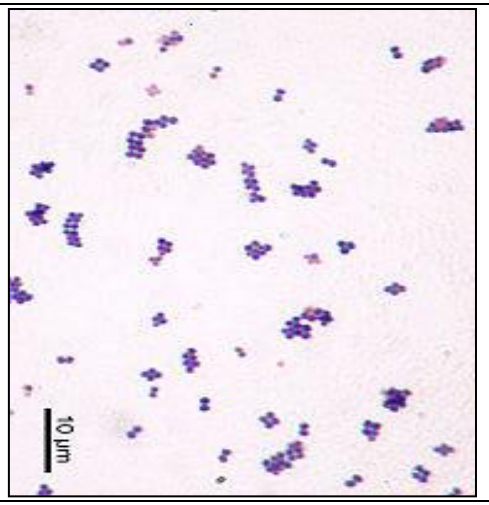
Case #10

A man felled and hits his head on the ground. His friend brought him to the Emergency Room as he was unconscious. In the ER he showed depressed ventilation (shallow & slow respirations), rapid heart rate & bleeding from both ears.

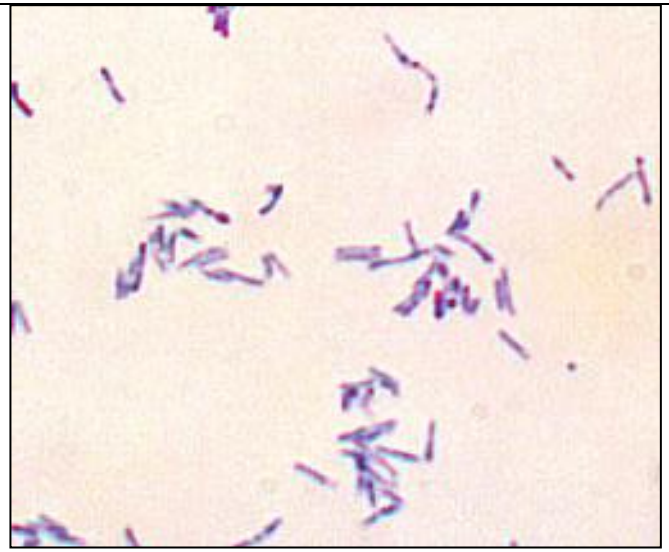
Which primary acid-base imbalance may be complicated in this man according to his case??

Respiratory Acidosis

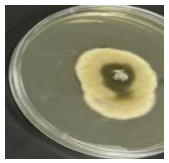
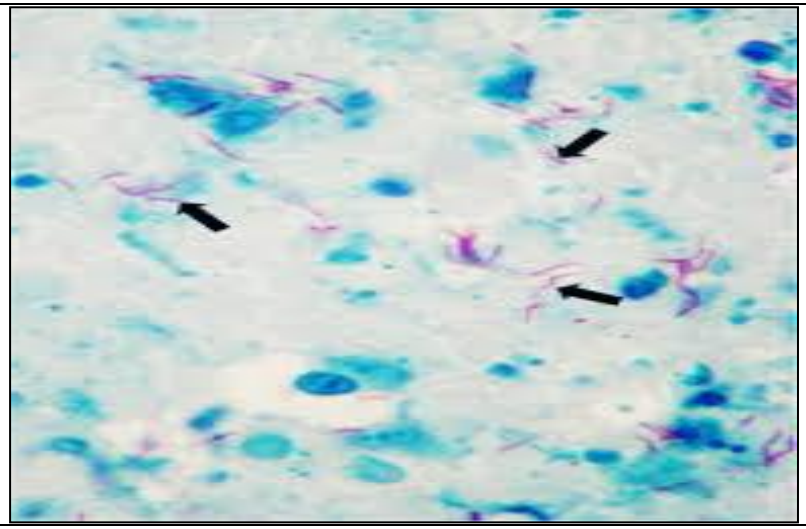
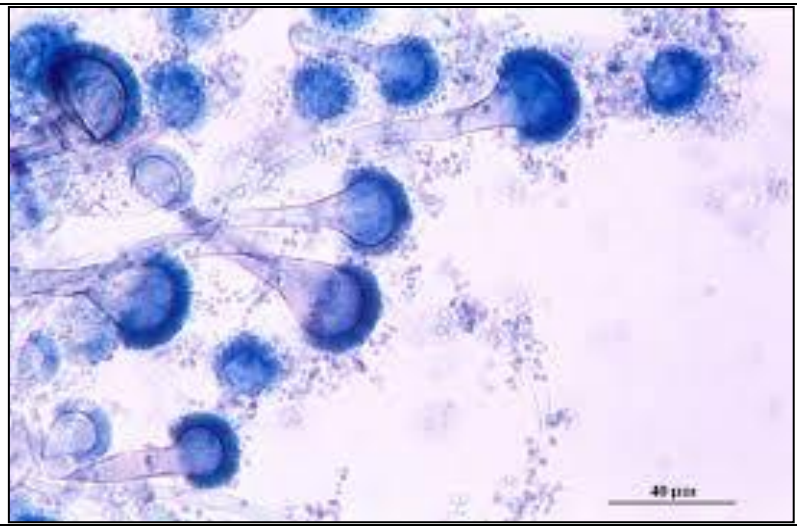
Microbiology

	Streptococcus pyrogens: Group A-Streptococci	Streptococcus Pneumoniae	Staphylococcus Aureus
Microscopic Morphology	**Gram-positive cocci in Chains**	capsulated Gram's positive lancet-shaped diplococci.	**Gram-positive cocci in cluster**
Cultural Characteristics	**Beta hemolysis** on blood agar, and **bacitracin sensitive**	**Both S.p, S.v** are **Alpha-hemolytic** on blood **Differentiation by:** **Optochin disc:** **1-*S. pneumoniae* :** Optochin sensitive. **2-*S.* viridans:** Optochin resistant. 	**Golden colonies with beta hemolysis** **Identification test:** **catalase test (positive), and coagulase test (positive)**
Diseases	Acute Follicular Tonsillitis, Pharyngitis, Scarlet fever, sinusitis, otitis media, and rheumatic fever	sinusitis, otitis media, pneumonia, meningitis, peritonitis,….	nosocomial pneumonia, lung abscess
Reference	 	 	

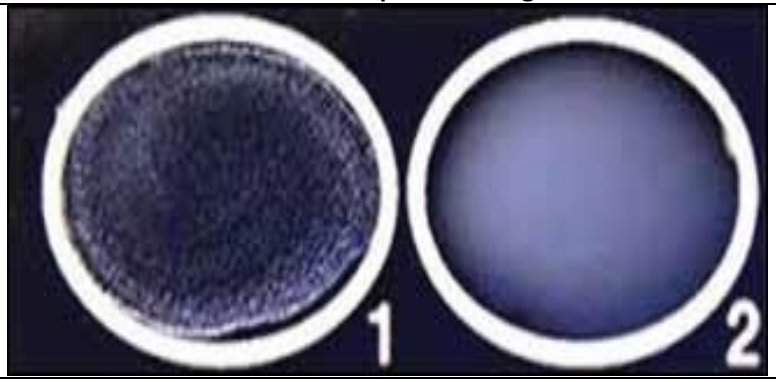
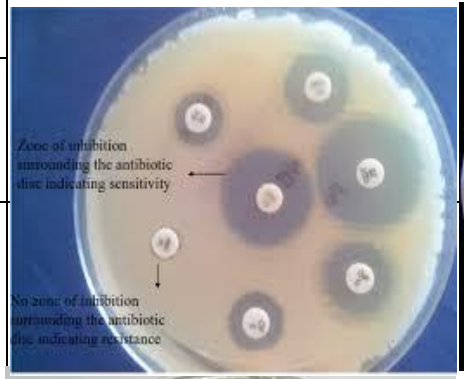
Corynebacterium Diphtheria & Bacillus Anthracis

	Corynebacterium Diphtheria	Bacillus Anthracis
Microscopic Morphology	**Gram-positive bacilli, Chinese letters appearance**	**Gram-positive bacilli with spores**
Cultural Characteristics	**-Culture: Grow on:** **1-Enriched media:** **Lofflers serum** **2-Selective media:** **Tellurite agar.**	
Diseases		• **inhalation anthrax**, • **cutaneous anthrax**, • **GIT anthrax**, • **meningitis**.
Reference		

Mycobacterium Tuberculosis & Aspergillus Fumigatus

	Mycobacterium Tuberculosis	Aspergillus Fumigatus
Microscopic Morphology	**Acid fast bacilli**	**Branching Hyphae with conidiospores**
Cultural Characteristics	• Stain Name: **Ziehl Nelsen stain** (Sputum sample) **Selective media:** **Lowenstein Jensen media.**	**Enriched selective media:** **Sabouraud dextrose agar.**  
Diseases	• Chronic granulomatous pneumonia	• chronic pulmonary aspergillosis • invasive aspergillosis.
Reference		

ASOT & Antibiotics Sensitivity Test

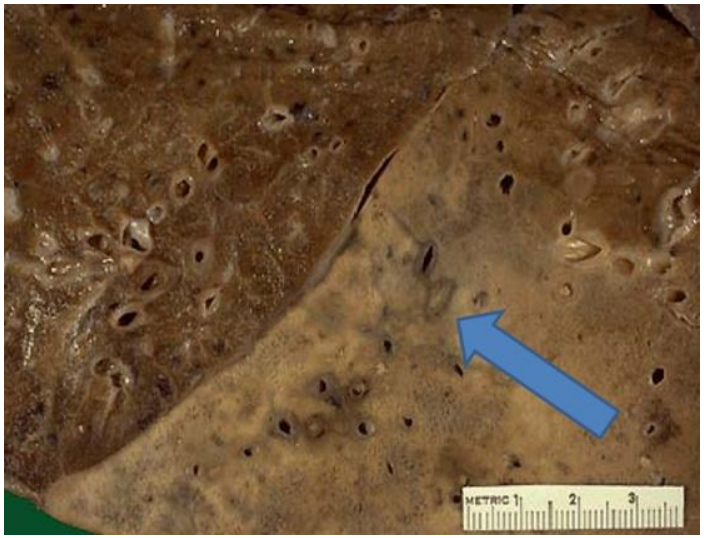
	ASOT	Antibiotics Sensitivity Test
Test/media Name	**Anti-Streptolysin O test [ASO test]**	**Antibiotics Sensitivity Test / media: Mueller Hinton agar**
Principle of test	Latex Agglutination Test	**Disc-Diffusion**
Significant titer	=≥ 200 IU/ml	
C.L. Significant	Diagnosis of **Streptococcus,** and diagnosis of **Scarlet fever** and **Rheumatic fever**	
Reference	**N.O. 1: Positive | N.O. 2: Negative** 	   

Pathology

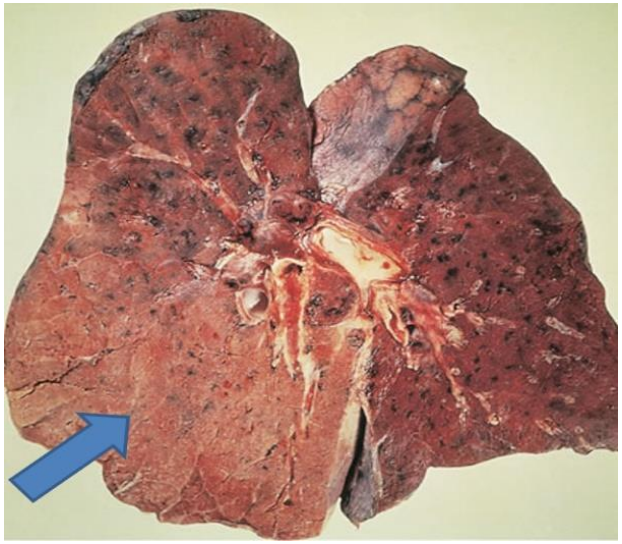
Case #1

Male patient aged **40 years old** complaining of high grade fever, cough, dyspnea and chest pain.

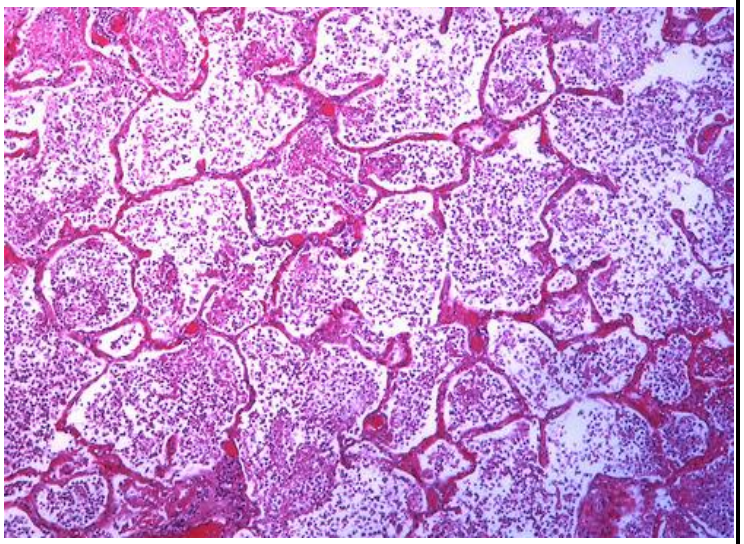
Identify diagnosis Per image / stage



Lobar pneumonia – Grey hepatization



Lobar pneumonia – Red hepatization



Lobar pneumonia

Case #2

10 years immunocompromised child complaining of high grade fever, cough, dyspnea and chest pain.

What is your diagnosis?

Bronchopneumonia

Case #3

Male patient aged 50 years old complaining of **chronic productive cough** with expectoration of **pus**, fever, dyspnea and chest pain.

What is your diagnosis?

Bronchiectasis

Case #4

Male patient aged **60 years old** complaining of cough, marked weight loss, **hemoptysis**, chest pain.

What is your diagnosis?

Bronchogenic carcinoma

Case #5

Male patient aged 55 years complaining of fever, cough, expectoration of **yellowish sputum**.

Chest X. ray showed a cavitary lesion at the apex of the right lung. Sputum culture showed **staphylococcus aureus**.

What is your diagnosis?.

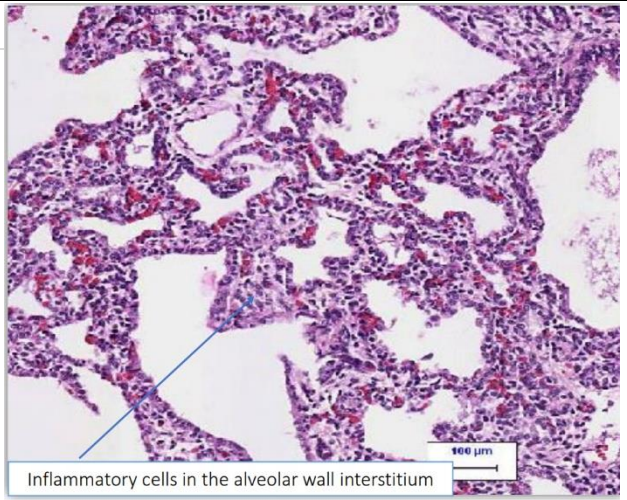
Lung abscess

Case #6

A 23-year-old woman presented with fever, cough and malaise. She was treated with erythromycin for 10 days and reported improvement. An image of the lung typical for this illness is shown below.

What is your diagnosis?

Atypical pneumonia [interstitial pneumonia]

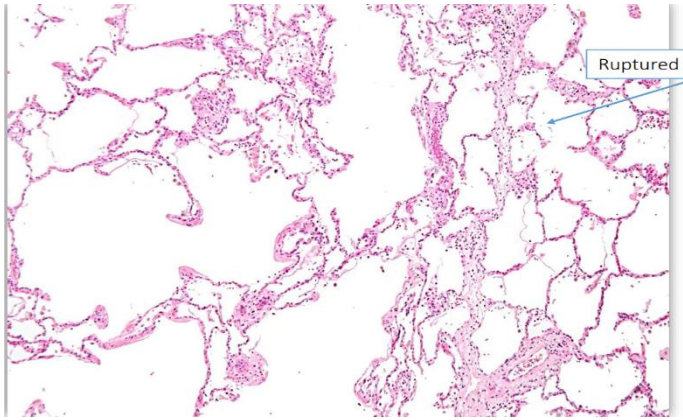


Case #7

Heavy cigarette smoker male patient died of respiratory failure.

What is your diagnosis?

Emphysema

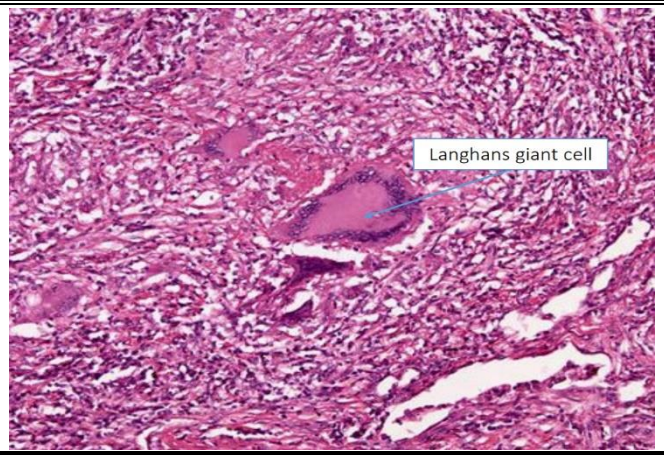


Case #8

Female patient aged 45 years old complaining of cough weight loss, anorexia, fever, **night sweats**, hemoptysis, chest pain and fatigue.

What is your diagnosis?

Pulmonary tuberculosis

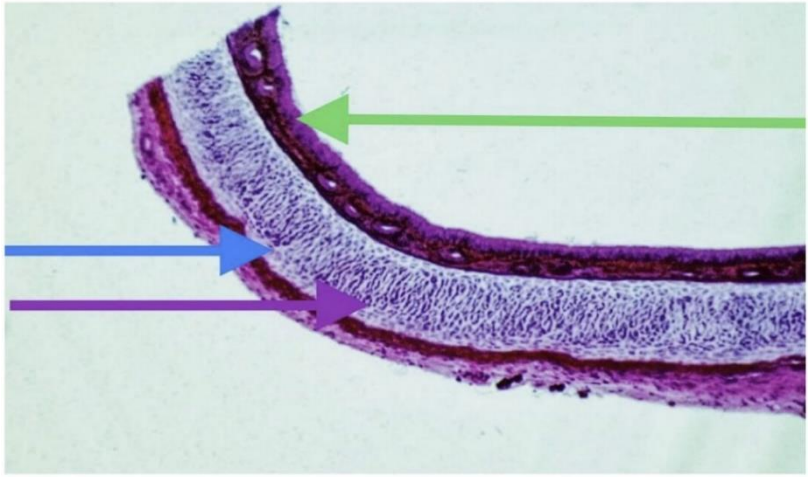


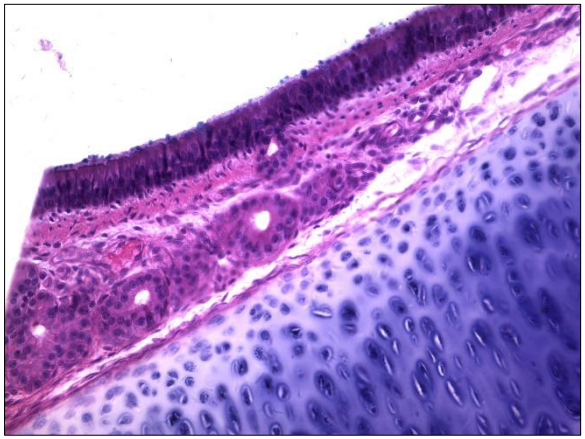
Histology

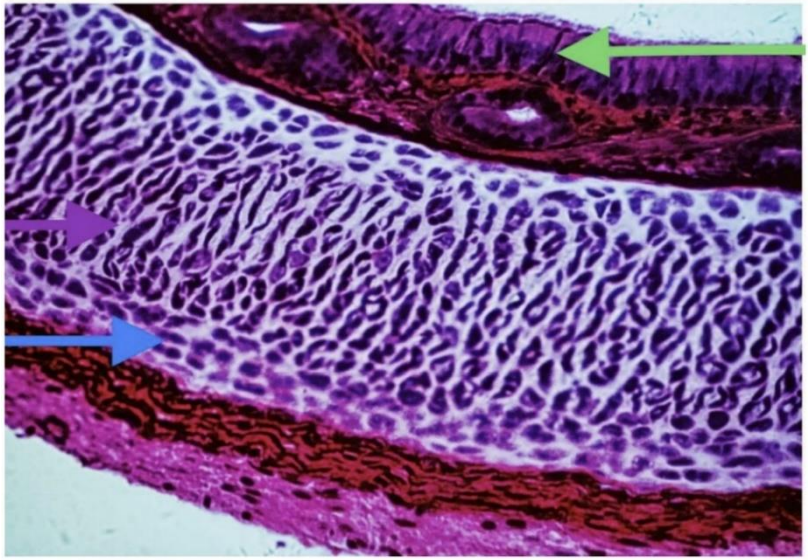
[Highlighted are found in RESP Histology LAB file] ~ [Identify Structure/Gland, then give 2 points of identification]

Structure of Trachea

#	Findings	Contains
1	**Mucosa**	• **Pseudostratified ciliated columnar epithelium**. • Lamina propia (elastic fibers).
2	**Sub Mucosa**	• Connective Tissue. • Seromucous tracheal Glands
3	**Adventitia**	
4	**C-Shaped Hyaline Cartilage**	
5	**Chondrocytes**	
6	**Trachealis Muscle**	

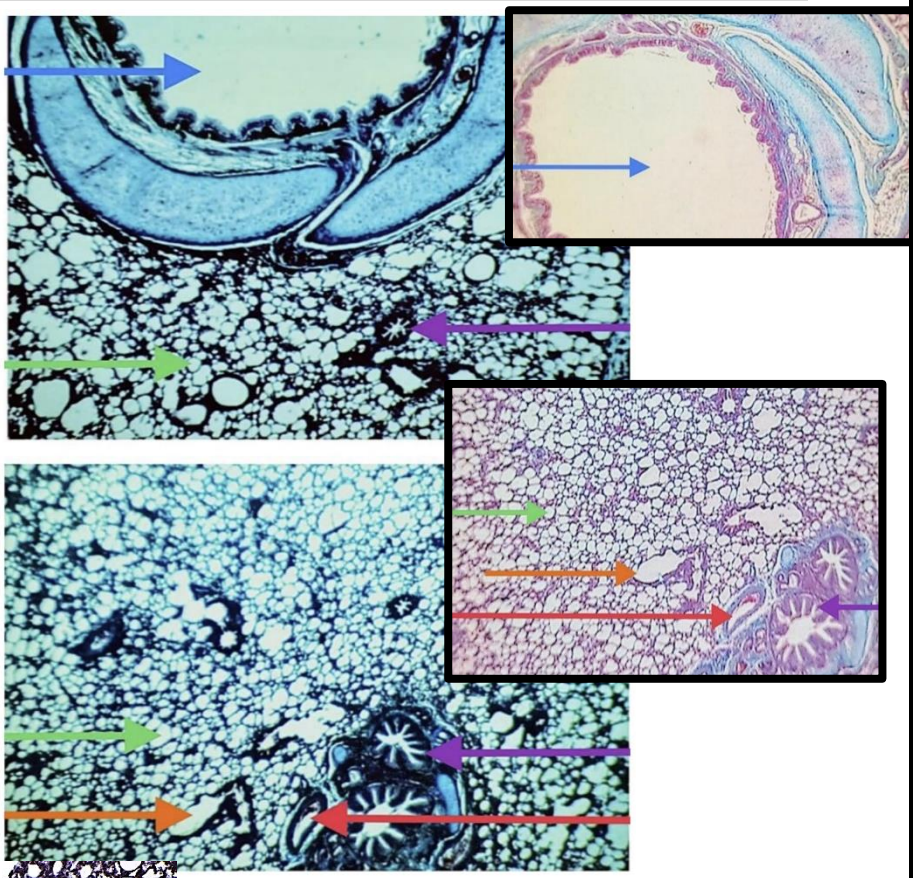


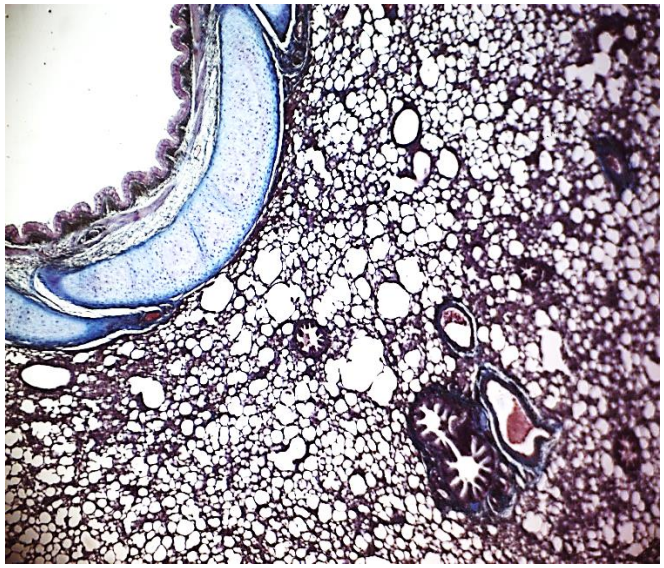


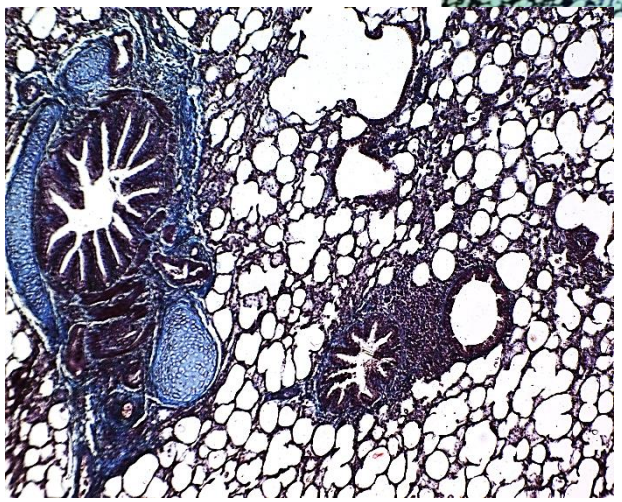


Gland of the Lung

#	Findings	Contains
1	Bronchus	• **Pseudostratified ciliated columnar epithelium**. • Seromucous Glands. • Cartilaginous layer.
2	Terminal Bronchiole	• **Ciliated simple columnar** or **cuboidal epithelium**. • Clara cells .
3	Respiratory Bronchiole	• **Simple cuboidal epithelium**.
4	Alveoli	• Simple squamous epithelium. • Alveolar cells type 1&2.
5	**Alveolar duct**	
6	**Alveolar Sac**	
7	**Blood Vessels**	

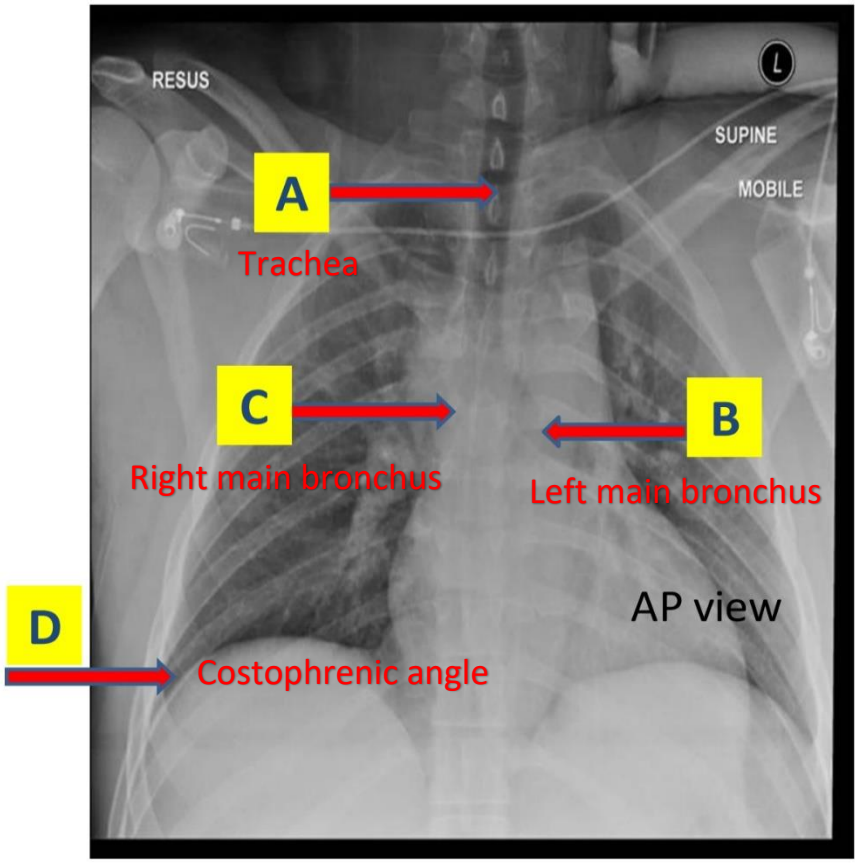






Radiology

AP View



1. Imaging modality Plain Radiograph

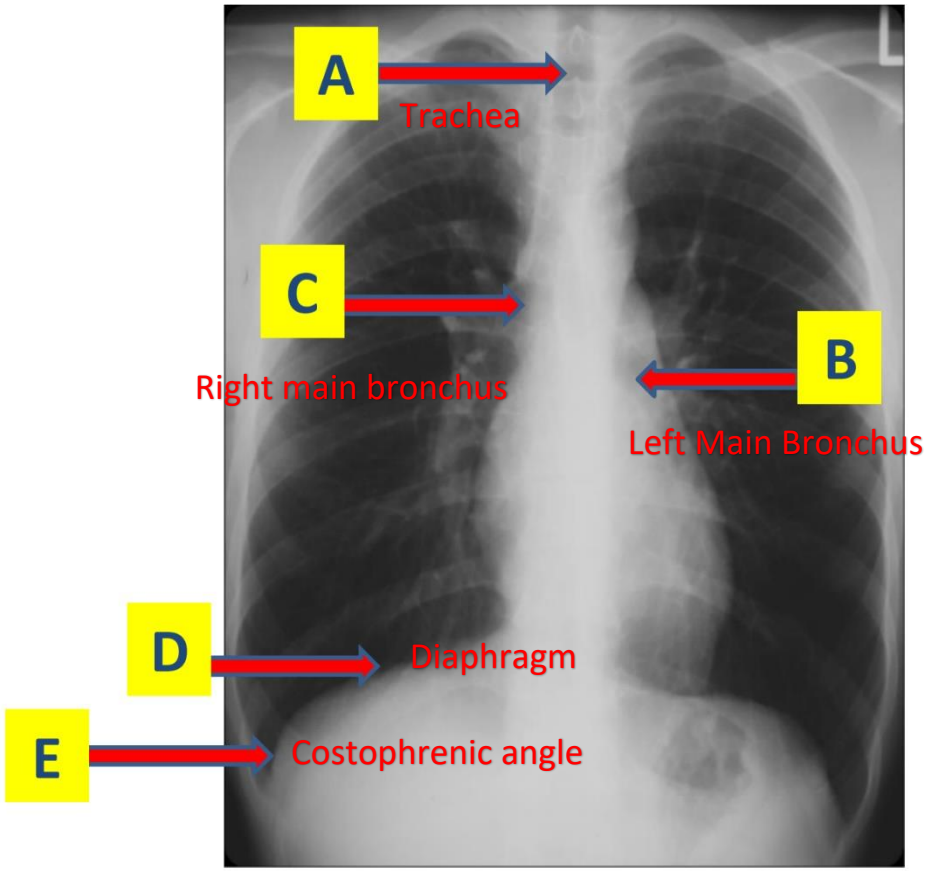
2. Anatomy [Shown in image]

3. Criteria of this AP View

Scapula is present in lung field, Larger mediastinum

Done in emergency / Cant stand up, or is Comatose

PA View



1. Imaging modality Plain Radiograph

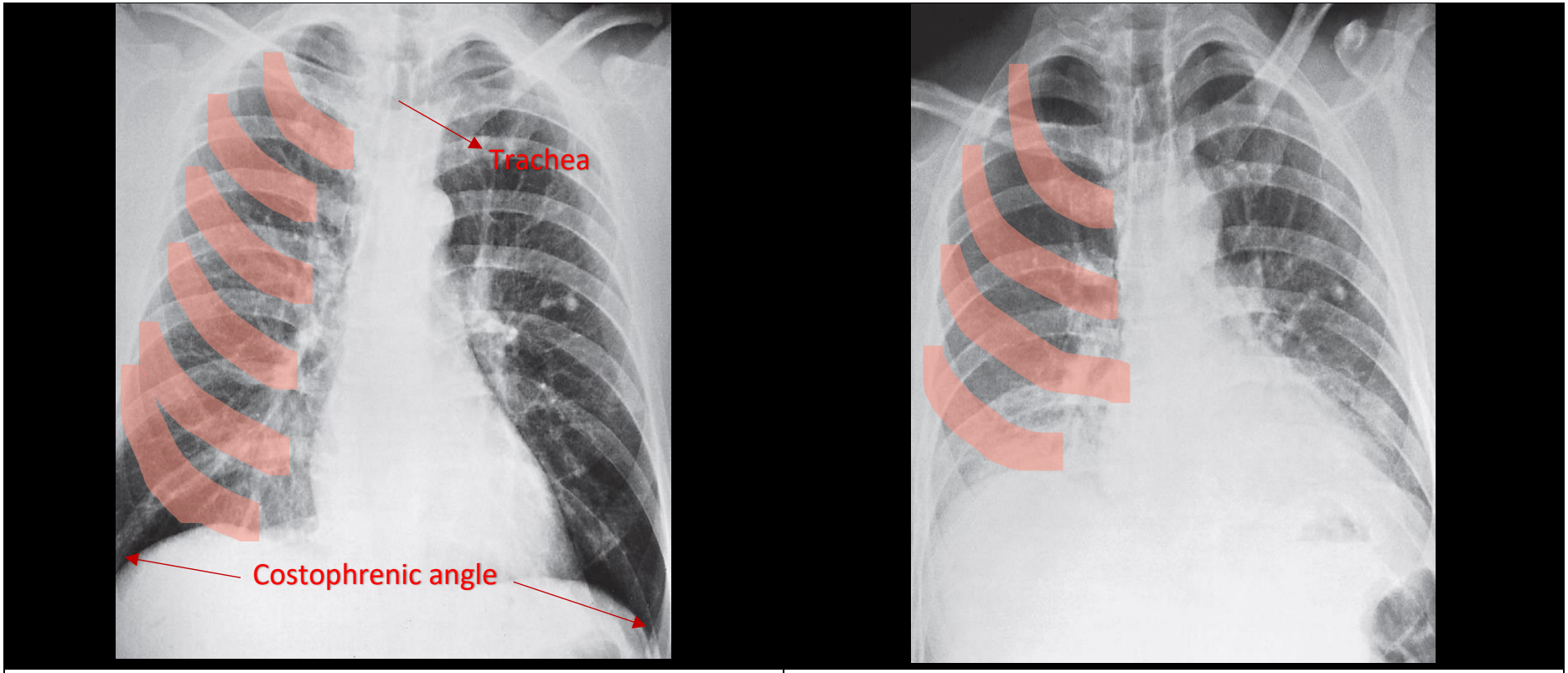
2. Anatomy [Shown in image]

All PA view Plain Radiograph

Pain X-ray Levels of Exposure

Adequate	Over Exposed	Under Exposed
Why? Lung **parenchyma is seen**. **Spine** is **barely visible** through the heart shadow.	**Why?** Lung **parenchyma is not visible** and **spine & disc** spaces are **visible**	**Why?** **Spine** is **not visible** through the heart shadow

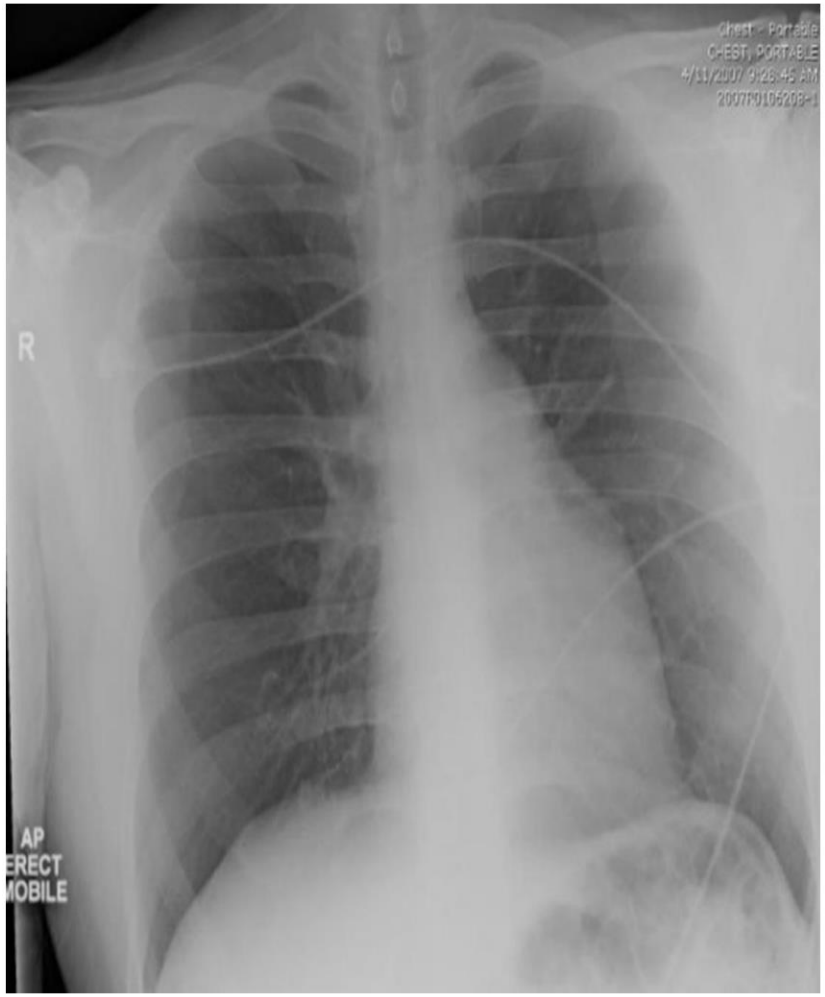
Inspiration vs Expiration Imaging differentiation



Good inspiratory CXR, the dome of the **right hemidiaphragm** is at the level of the anterior end of the **sixth rib**.	**Expiratory CXR**, the dome of the **right hemidiaphragm** is at the level of the anterior end of the **fourth rib**.
Adequate clear imaging due to good inspiration, where everything is clear	**Inadequate Expiration makes imaging less clearer** **Causing heart appears larger and the lung bases are hazy**

Imaging modality/Study: Plain Chest Radiograph

Rotation



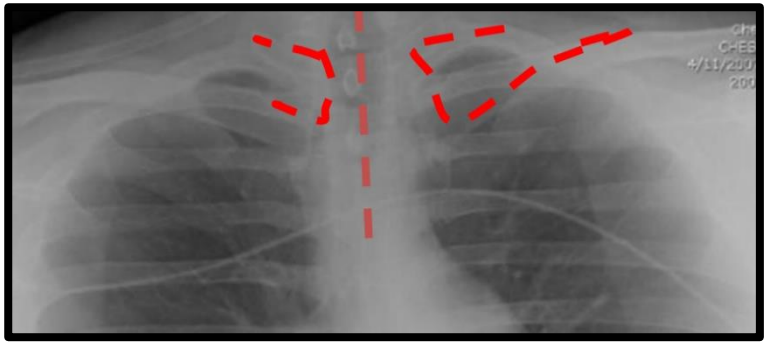
1. Imaging modality / study Plain Chest Radiograph

2. Anatomy ~ Clavicle

3. Well centered patient or rotated and why?

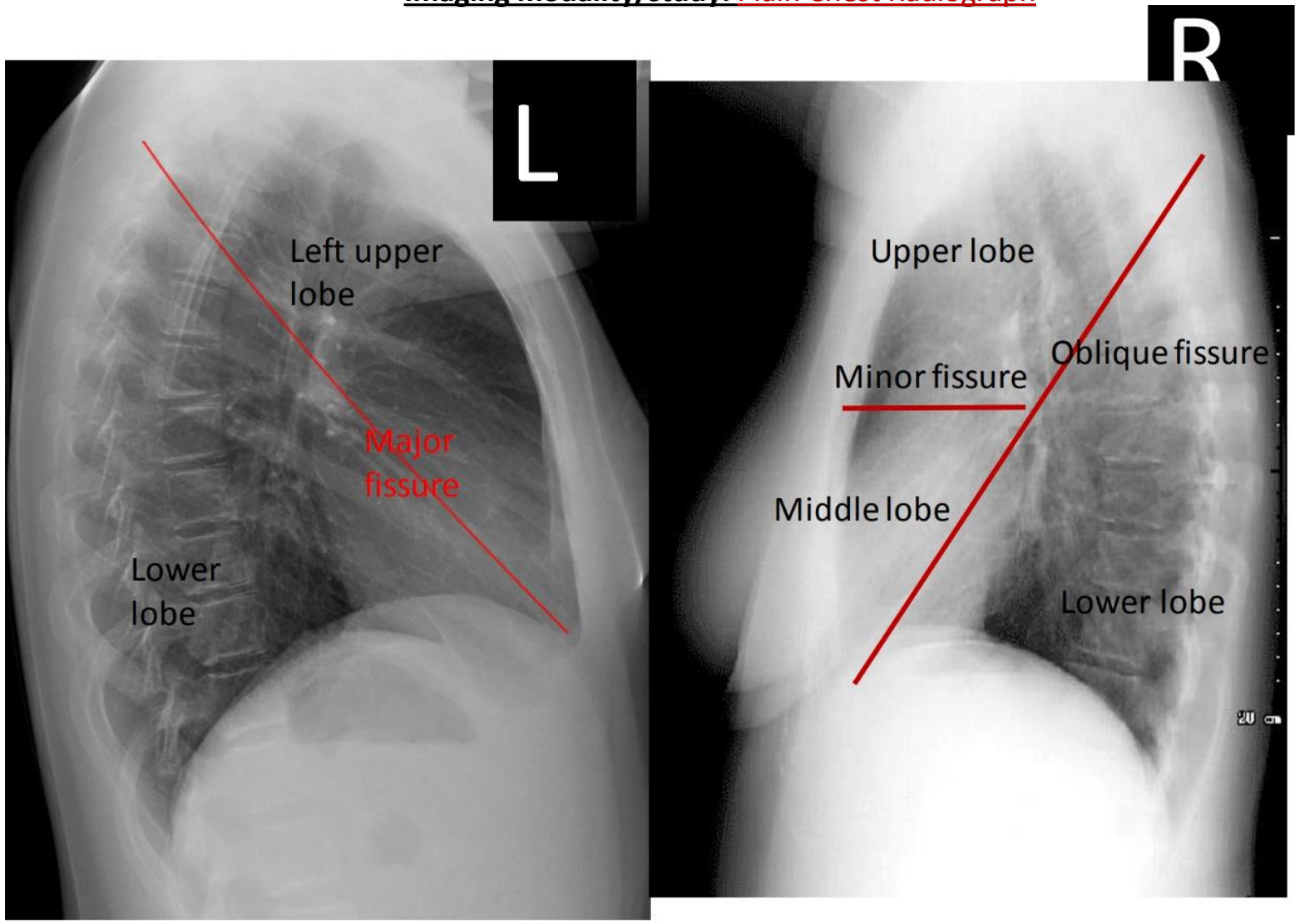
Medial ends of clavicle are not at equal distance from the midline

Due to misalignment of patient to the x-ray film



Fissures & Divisions of Lungs

Imaging modality/study: Plain Chest Radiograph

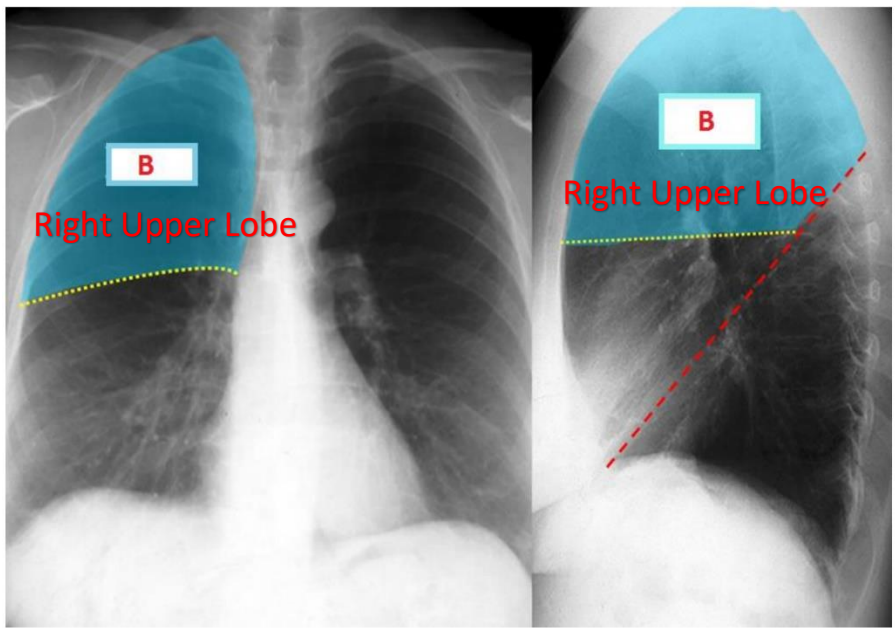


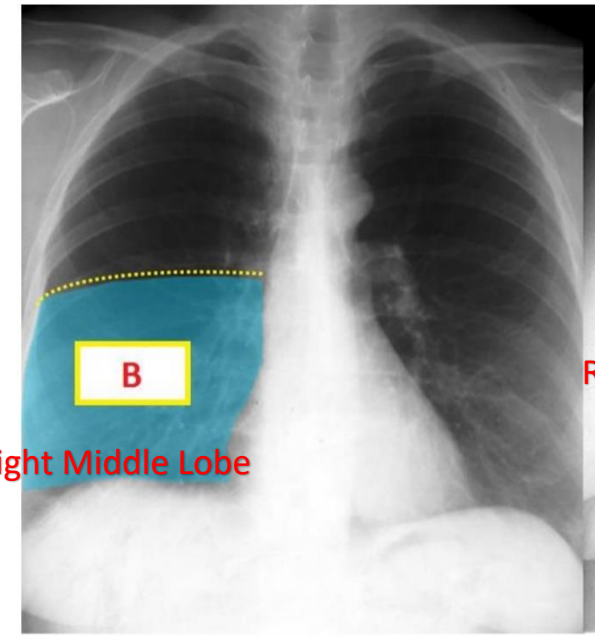
Left Lung

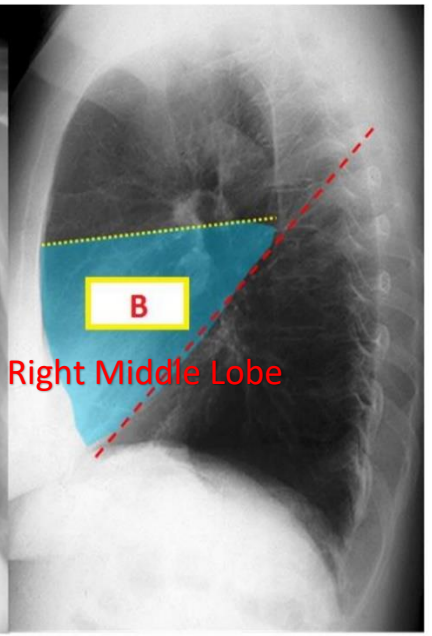
Right Lung

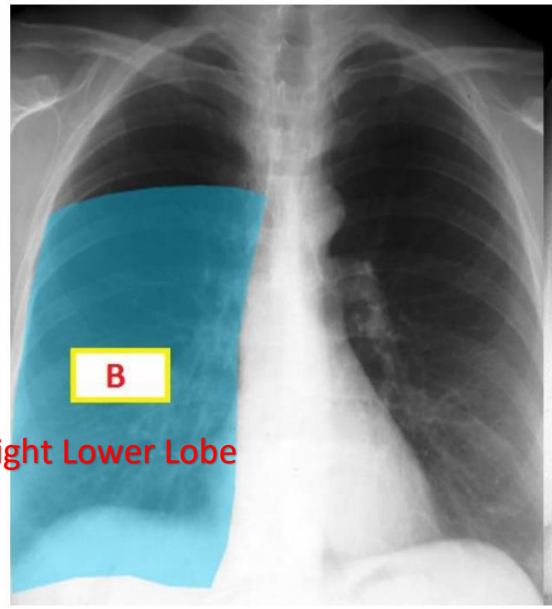
Imaging modality/study: Plain Chest Radiograph

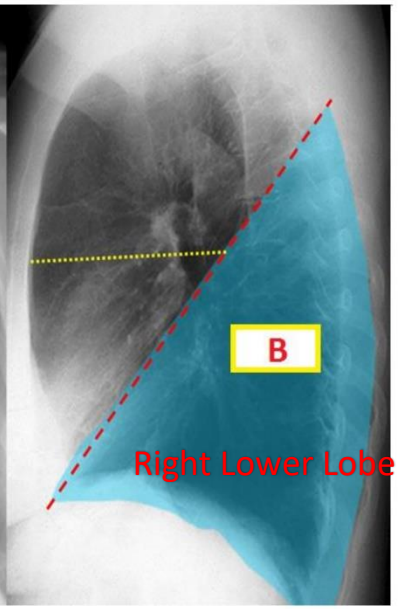
Right Lung Divisions





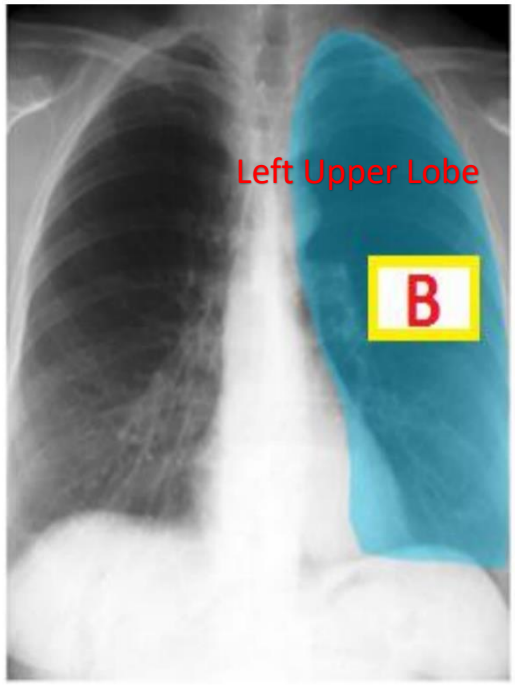


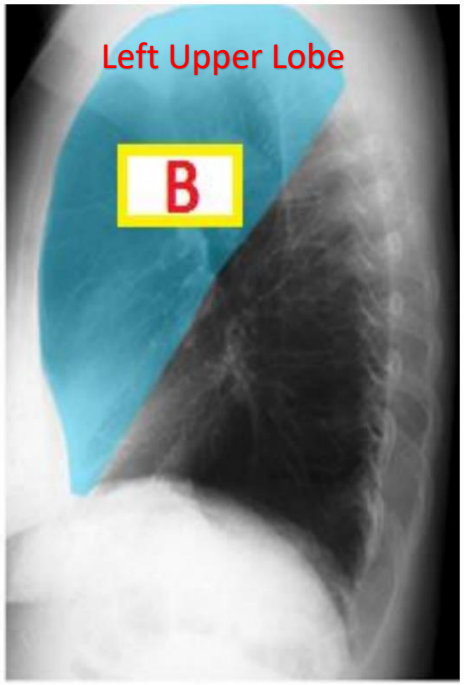


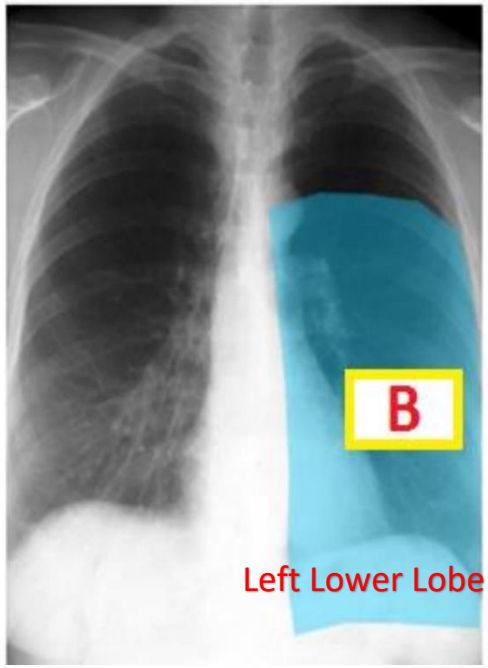


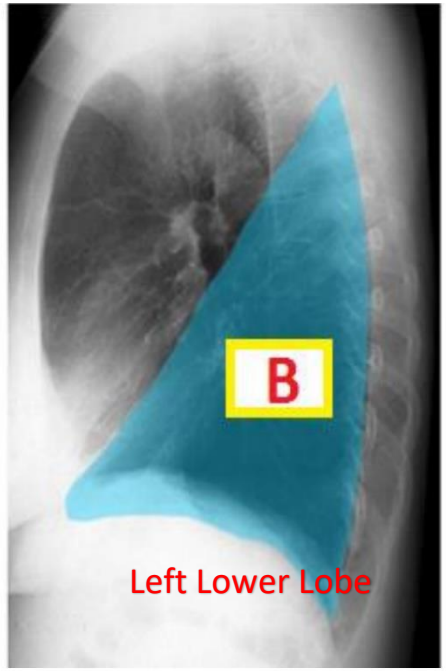
Left Lung Divisions

Imaging modality/study: Plain Chest Radiograph

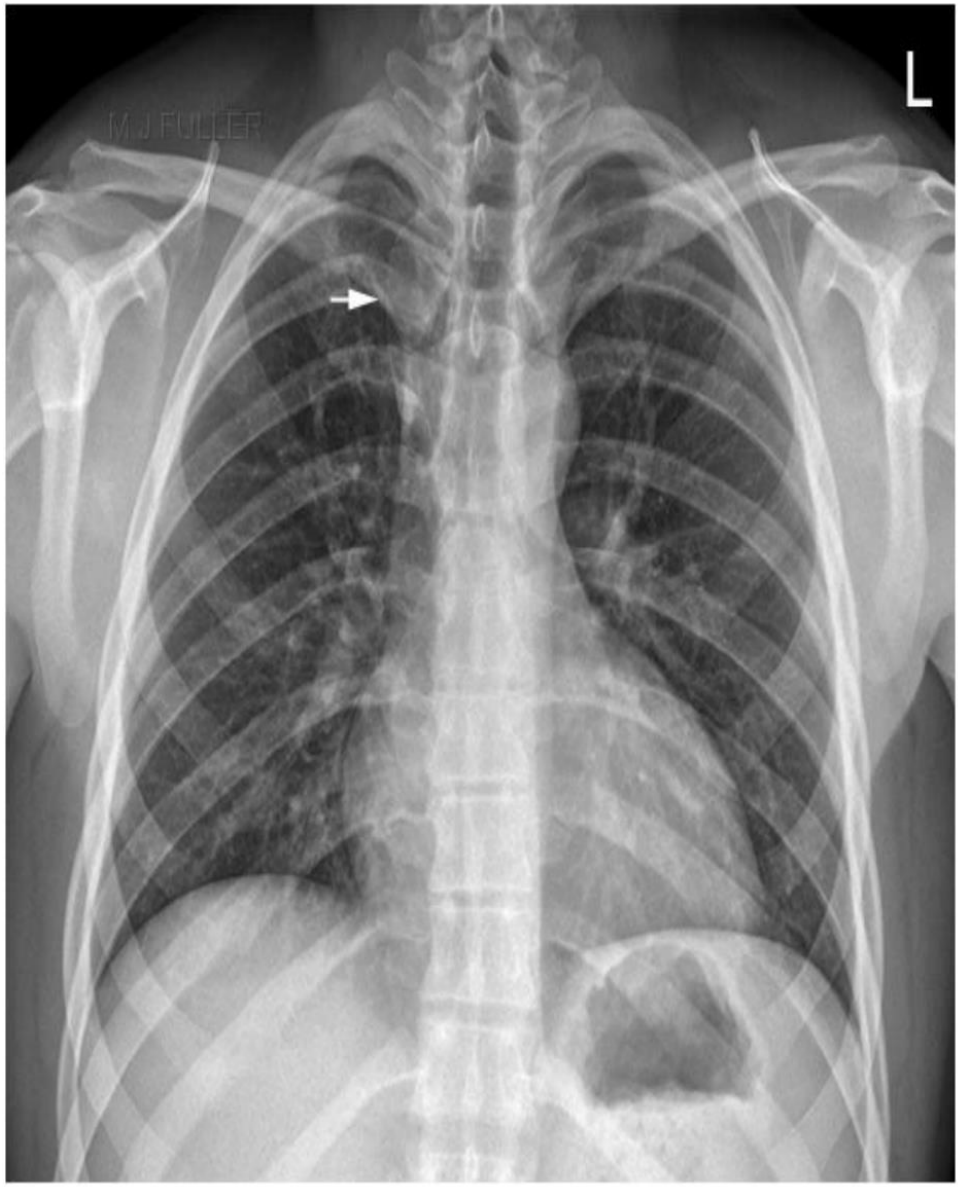








Accessory azygos lobe and fissure



1. Imaging modality Plain Radiograph

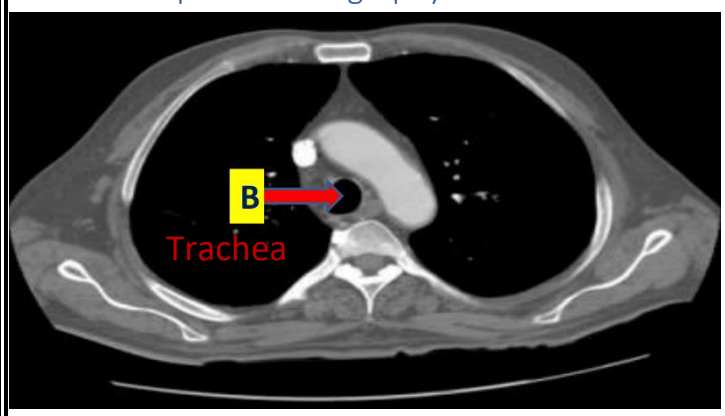
2. Anatomy

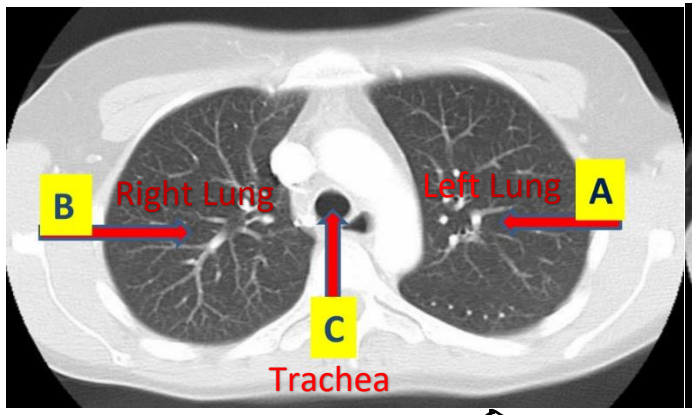
(Anatomic variant) white arrow in image is:

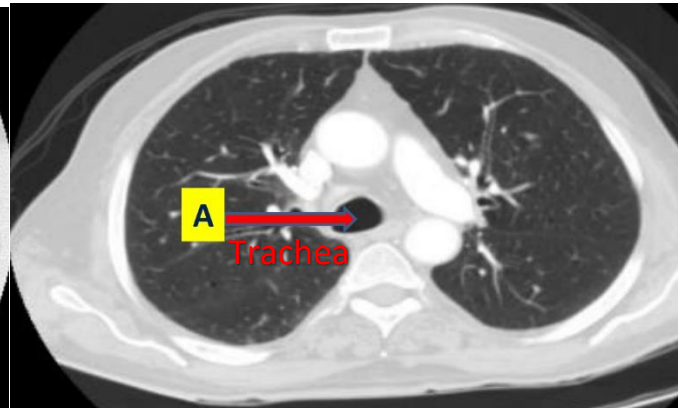
Accessory Azygos Lobe Fissure

Imaging modality: Computerized tomography

Computed Tomography





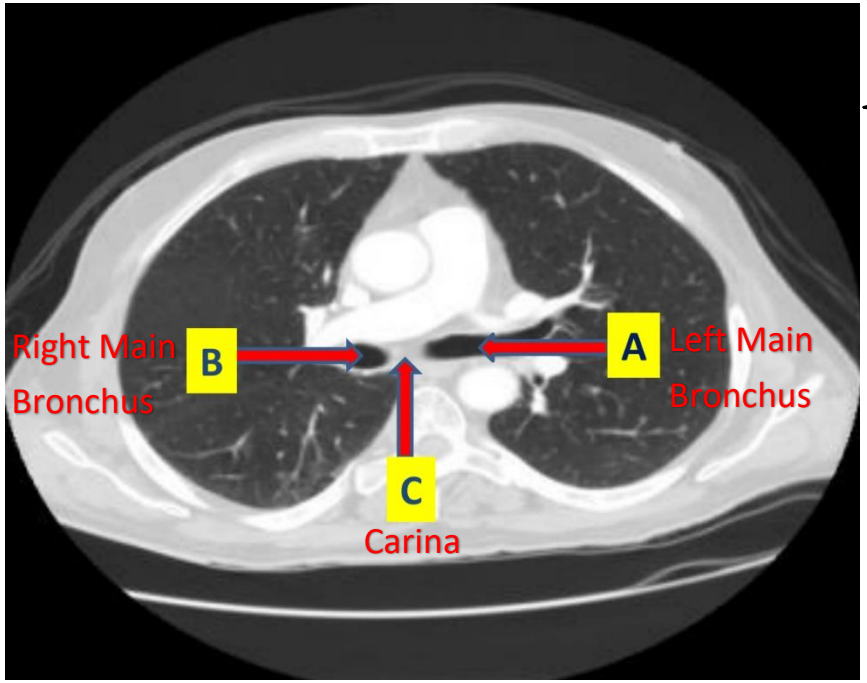


Window settings

Mediastinal Window

Study:

Axial CTs through Thorax



Window settings

Parenchymal Window

Study:

Axial CTs through Thorax

Anatomy [Shown in image]

MRI Vs. CT

Imaging modality:

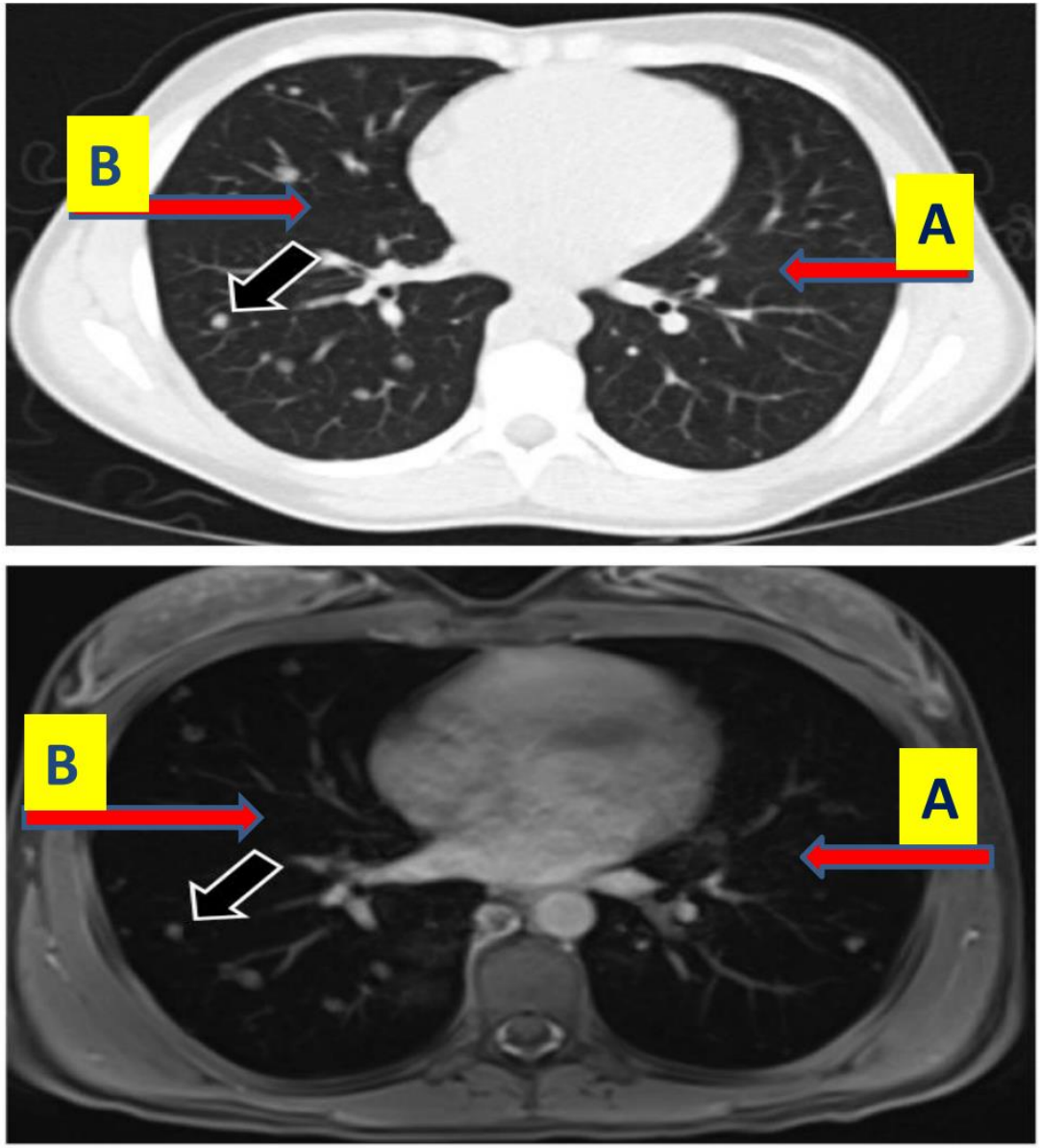
Computerized tomography

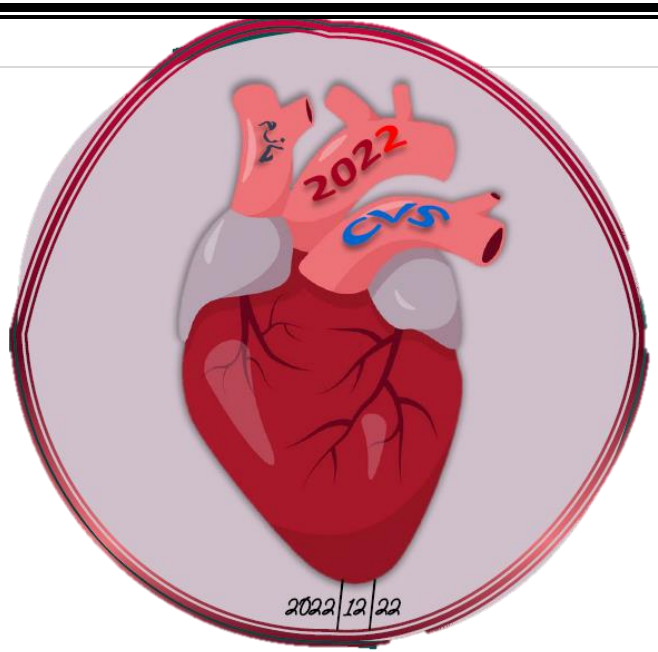
Imaging Study:

Axial CTs through Thorax

Window settings:

Parenchymal Window





CVS

Hazem Al-khateeb, Loay abutair, Abdullah Albohairi

Name:	Origin:	Termination:	Branch:
Axillary A	Subclavian A	Brachial A	Lateral thoracic
Brachial A	Axillary A	Radial, Ulnar	Profunda brachii
Ulnar A	Brachial A	Terminal branches	Muscular branch
Radial A	Brachial A	Deep palmar arch	Radial recurrent
Axillary V	basilic & vena com	Subclavian vein	
External iliac A	Common iliac A	Femoral A	Femoral A
Femoral A	External iliac A	Popliteal A	Superficial epigastric
Popliteal A	Femoral A	Tibial arteries	Middle
Ant Tibial A	Popliteal A	Dorsalis Pedis	Ant tibial recurent
Dorsalis pedis A	Ant Tibial A	Plantar arch	Arcuate A
Post Tibial A	Popliteal A	Plantar A	Peroneal A
Femoral V	Popliteal V	External iliac vein	
Left CCA	Aortic arch	Internal, external	External, internal
Right CCA	Brachiocephalic	Internal, external	External, internal
External carotid A	CCA	Maxillary, sup temp	Facial A
Internal Carotid A	CCA		
Right subclavian A	Brachiocephalic A	Axillary A	Internal thoracic A
Left subclavian A	Aortic arch	Axillary A	Internal thoracic A
Brachiocephalic A	Aortic Arch	Rt (subclavian, CCA)	Rt (subclavian, CCA)
Facial A, Superficial Temp, Posterior Auricular A.		**Origin:** External carotid A	
External jugular V	(Retro mandible+ post auricular) V	Subclavian V	
Internal jugular V	Sigmoid sinus	Join subclavian V	
Subclavian V	Axillary V	Join internal jugular V	
Brachiocephalic V	(Subclavian+ Internal jugular) V	SVC	

Mediastinum

Boundaries of middle mediastinum

Anterior: anterior mediastinum

Posterior: posterior mediastinum

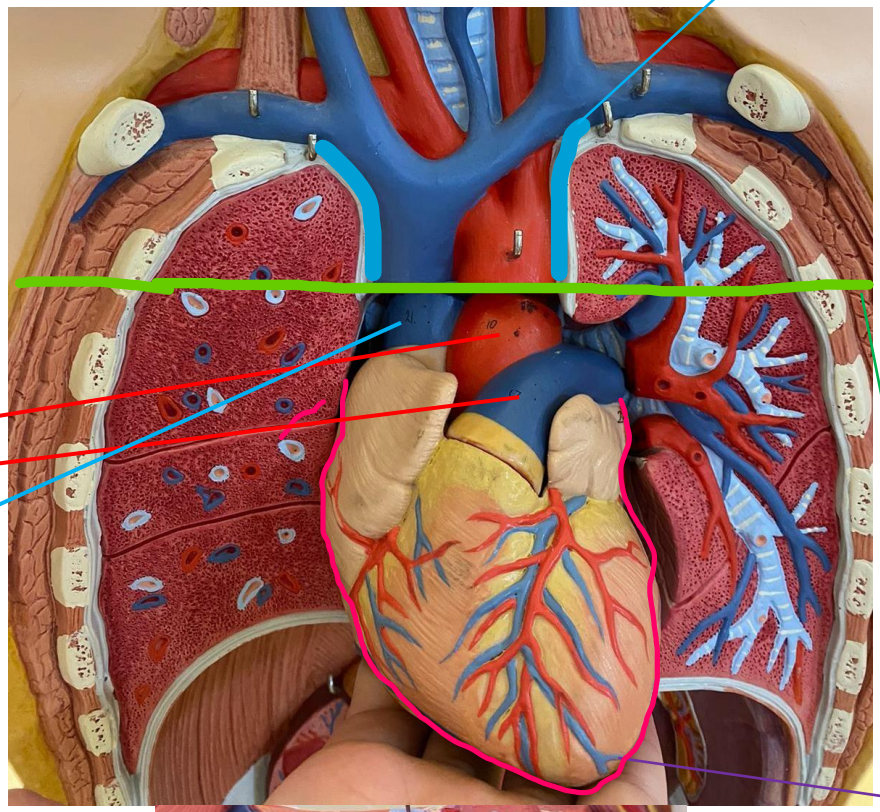
Above: imaginary line

Below: diaphragm

On each side: 2 pleural cavities

Contents:

A. Ascending Aorta
B. Pulmonary Trunk
C. Superior Vena Cava [Lower Part]



Superior Mediastinum

Boundaries:

Anterior: manubrium sterni

Posterior: upper 4 thoracic vertebrae
Above: thoracic inlet

Below: imaginary line

On each side: 2 pleura cavities

Contents:

A. Trachea
B. Esophagus
C. Thoracic Duct

Imaginary Line

[sternal angle to lower border of T4]
Or Disc between T4 & T5

Inferior Mediastinum

A. Anterior mediastinum
B. Middle mediastinum
C. Posterior mediastinum

Boundaries of Posterior Mediastinum

Anterior: Middle mediastinum

Posterior: Lower 8 thoracic V.

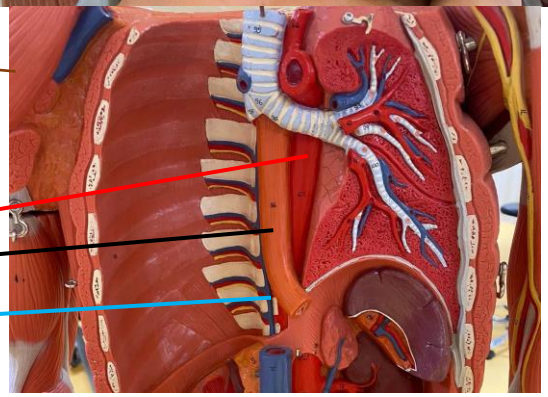
Above: imaginary line

Below: diaphragm

On each side: 2 pleural cavities

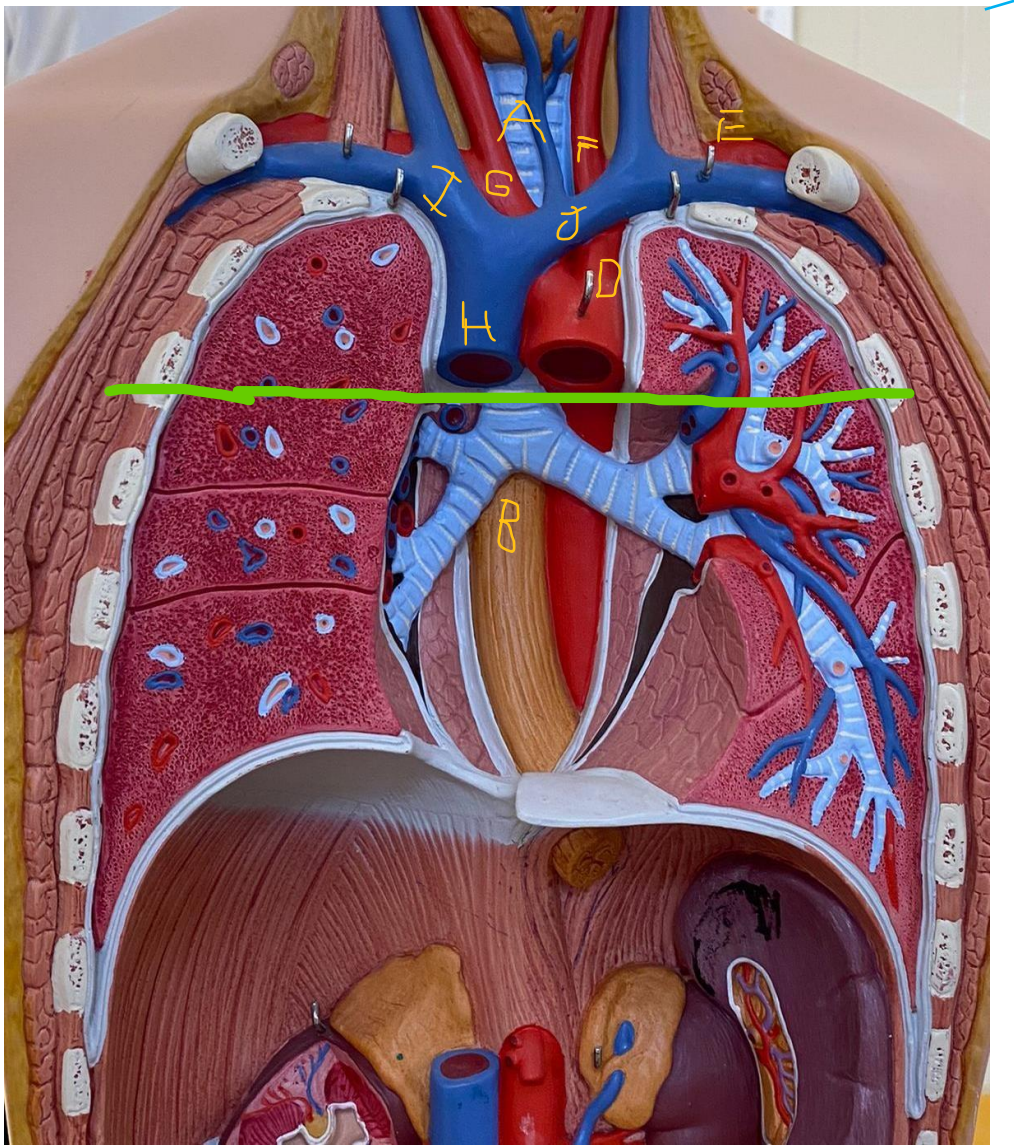
Contents:

A. Descending Thoracic Aorta
B. Esophagus
C. Azygous Vein



Boundaries of Superior & Middle mediastinum

A. Trachea



Superior Mediastinum

Boundaries:

Anterior: manubrium sterni

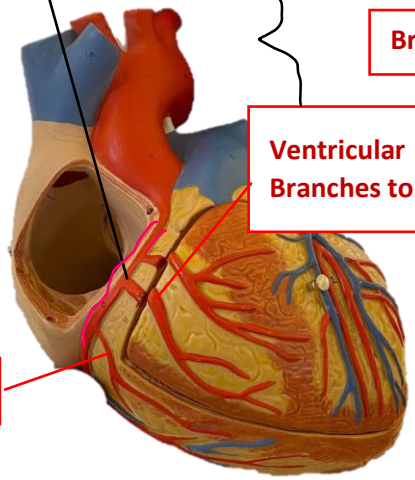
Posterior: upper 4 thoracic vertebrae
Above: thoracic inlet

Below: imaginary line

On each side: 2 pleura cavities

Contents:

A. Trachea
B. Esophagus
C. Thoracic Duct
D. Arch of Aorta
E. LT. Subclavian A.
F. LT. Common A.
G. Brachiocephalic A.
H. SVC [Upper Part]
I. RT. Brachiocephalic V.
J. LT. Brachiocephalic V.



RT. Coronary A. Give two Branches

Ventricular Branches to RT. V.

Rt. [Acute] Marginal to Rt. V.

Brachiocephalic A.

LT. Common Carotid A.

LT. Subclavian A.

Arch of Aorta

Ascending Aorta

Pulmonary A.

Pulmonary Trunk

Atrial Part: Left Auricle

Atrial Part: Right Atrium [Mainly]

Divided by coronary Groove

RT. Coronary A. – Divided by Coronary groove
Origin: RT. Aortic Sinus
Runs in: Coronary Groove
Anteriorly: Between RT atrium & Ventricle

LT. Circumflex Branch [LCx]

LT. Ventricle 1/3

RT. Ventricle 2/3

Ventricles Divided by: Anterior Interventricular Groove:
Great Cardiac V. & LT. Anterior Descending [LAD]

Borders of the Heart

Upper: 2 Atria
Right: Right Atrium
Left: LT. V. [Mainly] & LT. Auricle
Lower: Right V. [Mainly] & LT. V.

Anterior Surface [Sternocostal Surface]

Site: behind sternum & costal cartilage

Divided by coronary groove into :
Atrial part: RT atrium mainly
divided by Anterior interventricular groove into :
Ventricular part: RT 2/3 & LT 1/3 Ventricle

LT. Coronary Artery

Origin:
Left Aortic Sinus

Course:
Between PT & LT Auricle

Termination: Divides into LCx & LAD

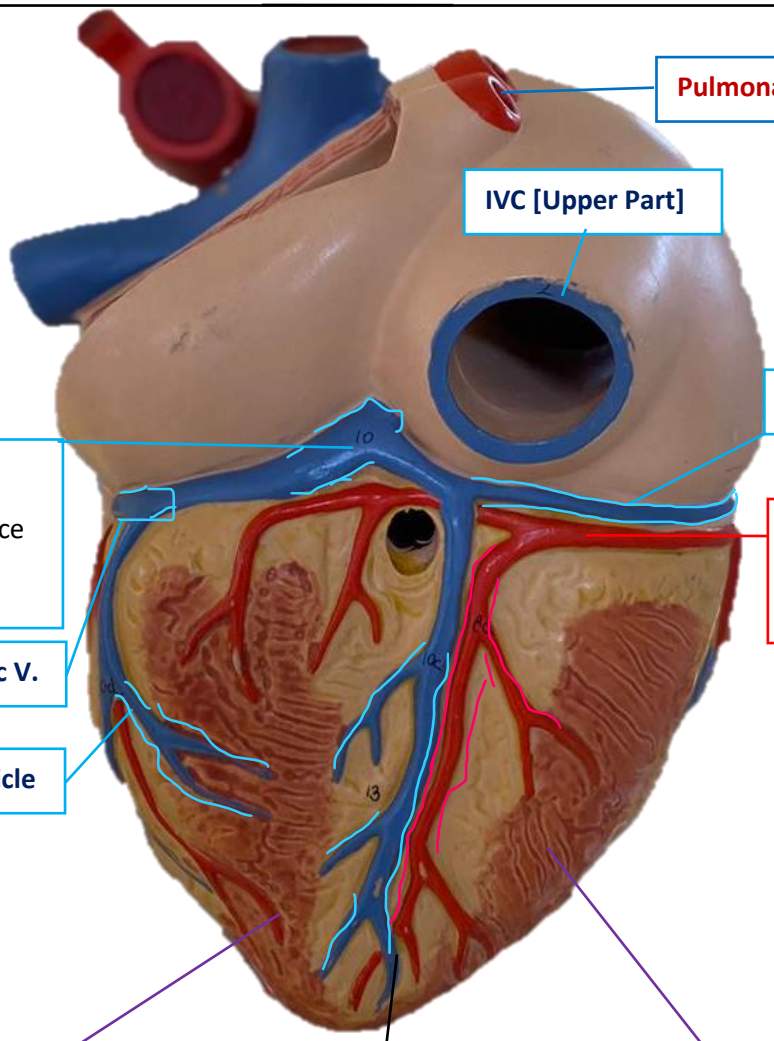
Apex of the Heart

Direction: Downward, to the left
Site: 5th Intercostal Space 3.5 inches
Formed by: Left Ventricle Only

Diaphragmatic surface (inferior)

Directed: Downward / Rests: on Diaphragm

Divided by: Posterior Interventricular Groove: LT V. 2/3 & RT V. 1/3



Pulmonary V.

IVC [Upper Part]

Small Cardiac V.

Coronary Sinus

Site: Between LT. Atrium & Diaphragmatic Surface

Terminates: Posterior wall of RT. Atrium

RT. Coronary A.
Between Diaphragmatic Surface & Base of Heart

Great Cardiac V.

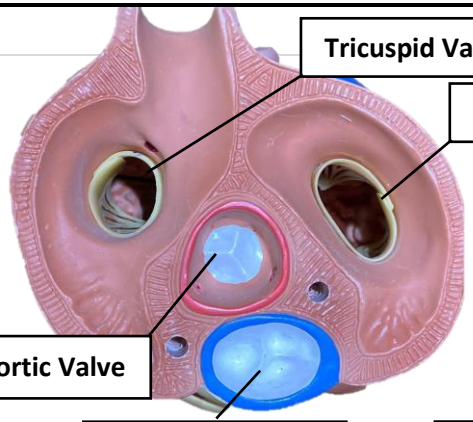
Posterior Vein of LT Ventricle

LT. Ventricle 2/3

RT. Ventricle 1/3

Ventricles Divided by: Posterior Interventricular Groove:
Middle Cardiac V. & Posterior Interventricular Descending A. [PDA]

PDA Supplies:
1- diaphragmatic surface of both ventricle
2- Posterior 1/3 of interventricular septum



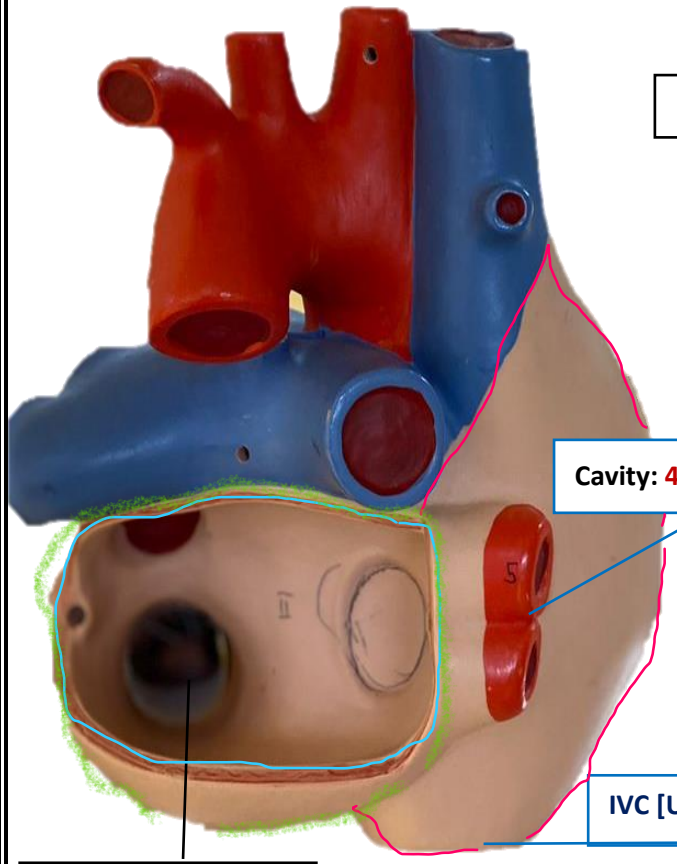
Tricuspid Valve

Mitral Valve

Aortic Valve

Pulmonary Valve [Semi-Lunar]

Cavity of LT. Atrium



Cavity: 4 Pulmonary V.

IVC [Upper Part]

Cavity: Mitral Valve

Cavity of RT. Atrium

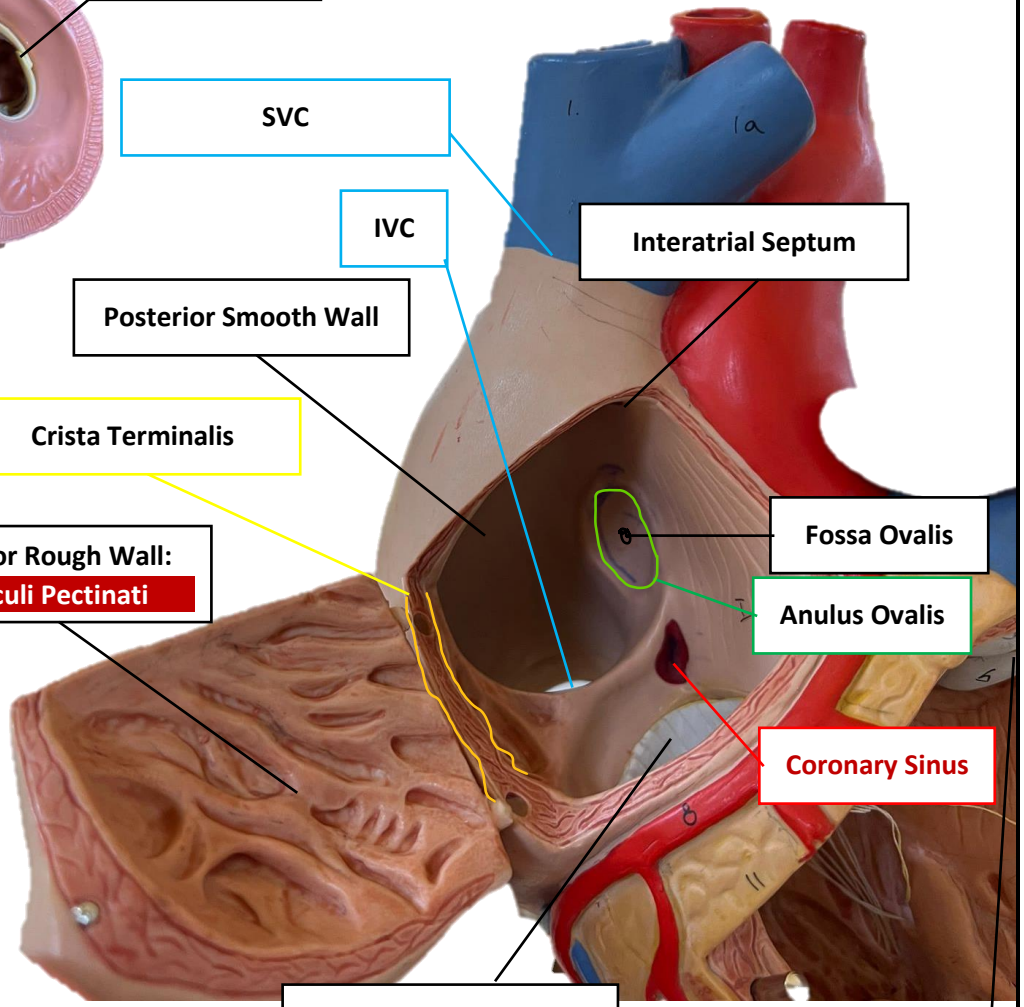
SVC

IVC

Interatrial Septum

Posterior Smooth Wall

Crista Terminalis



Fossa Ovalis

Anulus Ovalis

Anterior Rough Wall:
Musculi Pectinati

Coronary Sinus

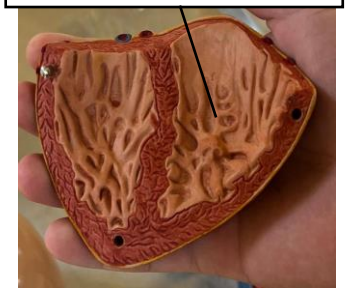
Tricuspid Valve

Pulmonary Valve

Base of the heart surface
Direction: Backwards
Formed by: LT. atrium (mainly) & RT. Atrium

Related posteriorly to posterior mediastinum which separates it from T5-8 vertebrae

Trabeculae Carneae



Trabeculae Carneae

Pulmonary Valve | Ant. | RT. Post. | LT. Post.

Infundibulum

Outflowing Smooth Part

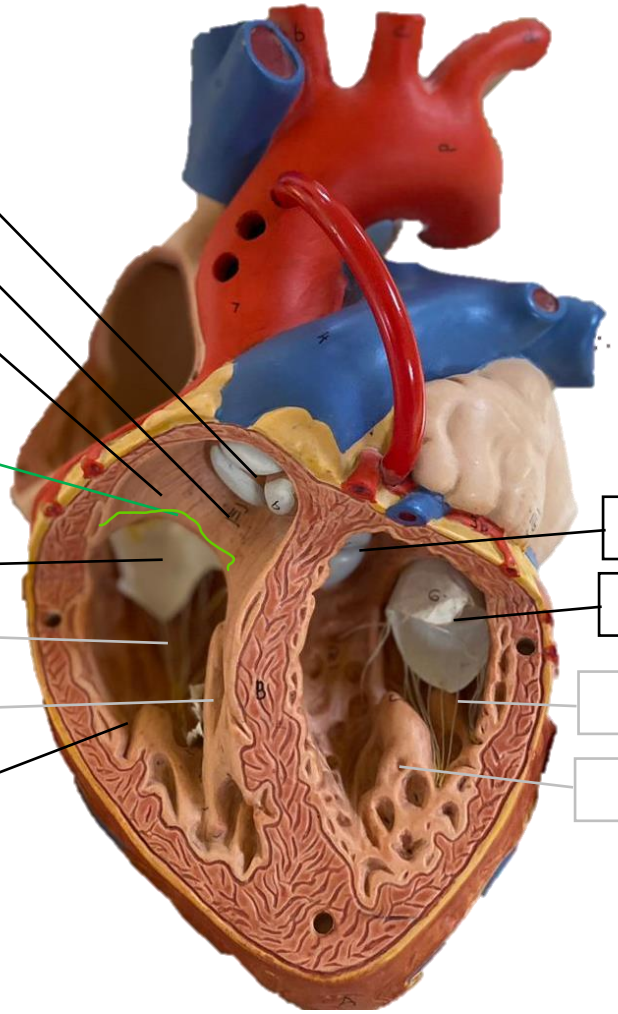
Divided by Supraventricular Crest

Tricuspid Valve | Ant. | Septal | Post.

Chordae Tendineae

Three Papillary Muscles

Inflowing Rough Part

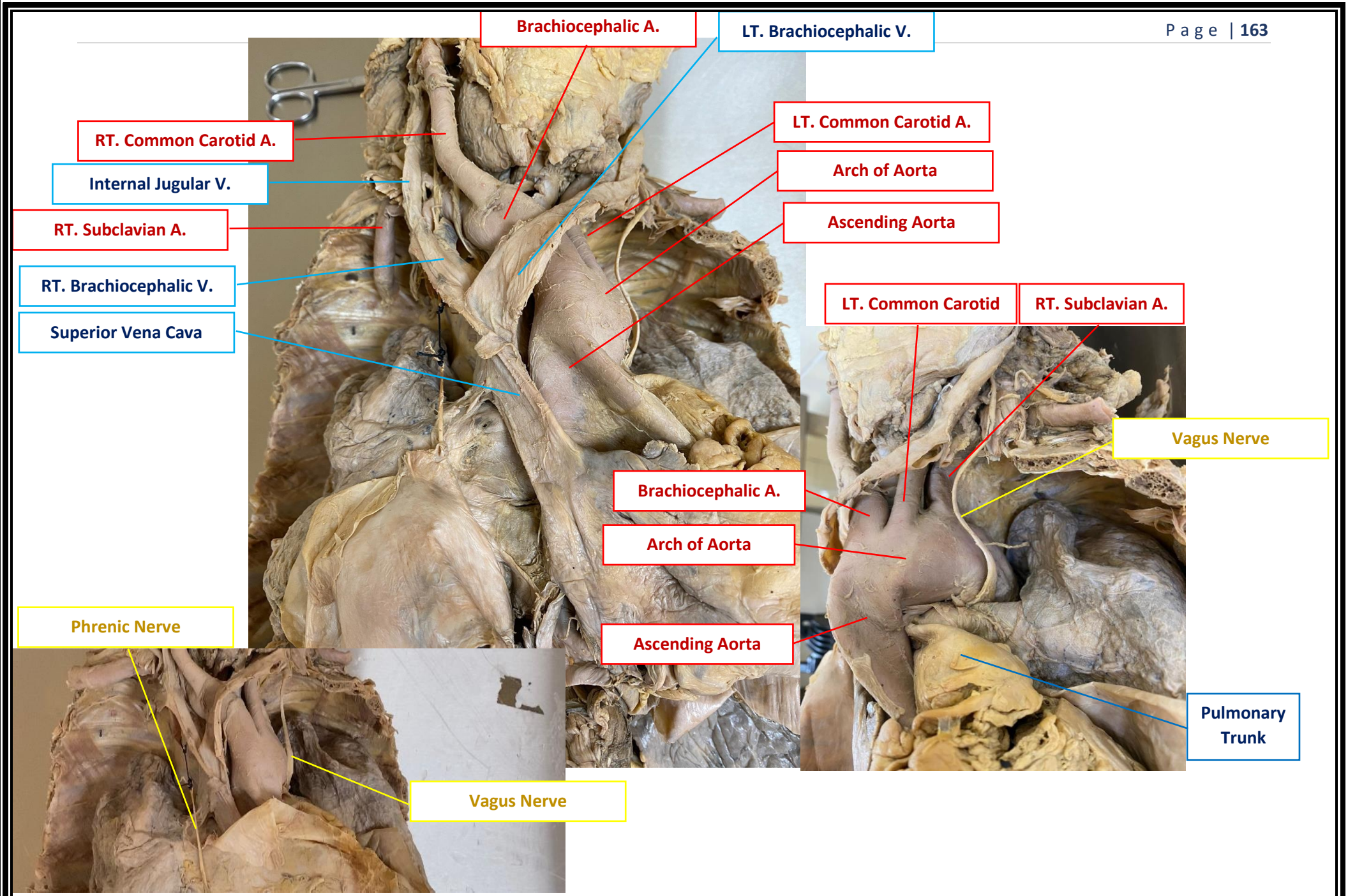


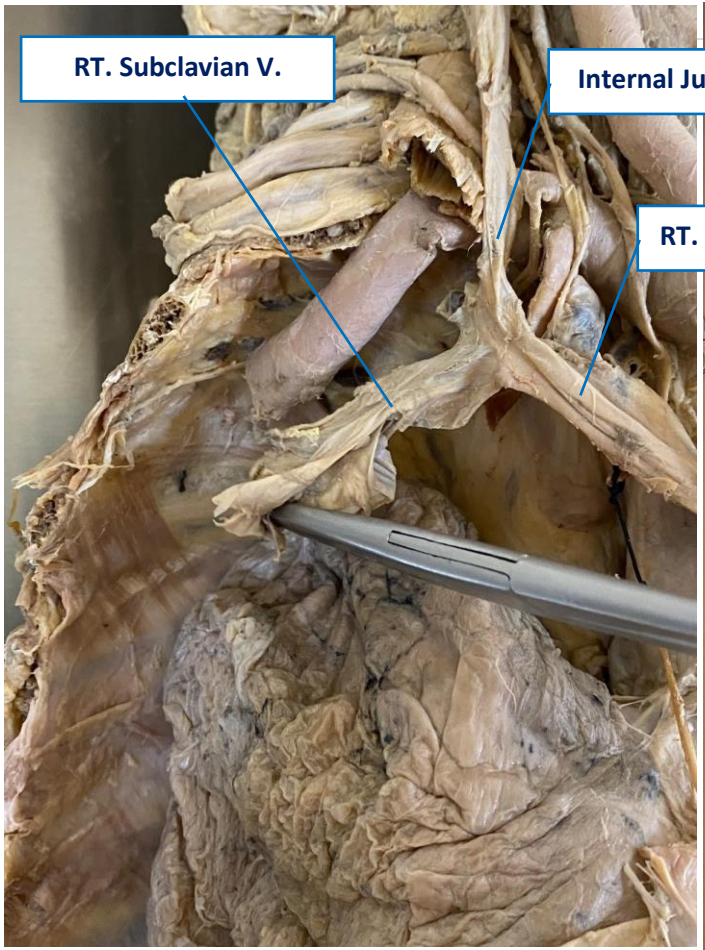
Aortic Valve | RT. Ant. | LT. Ant.

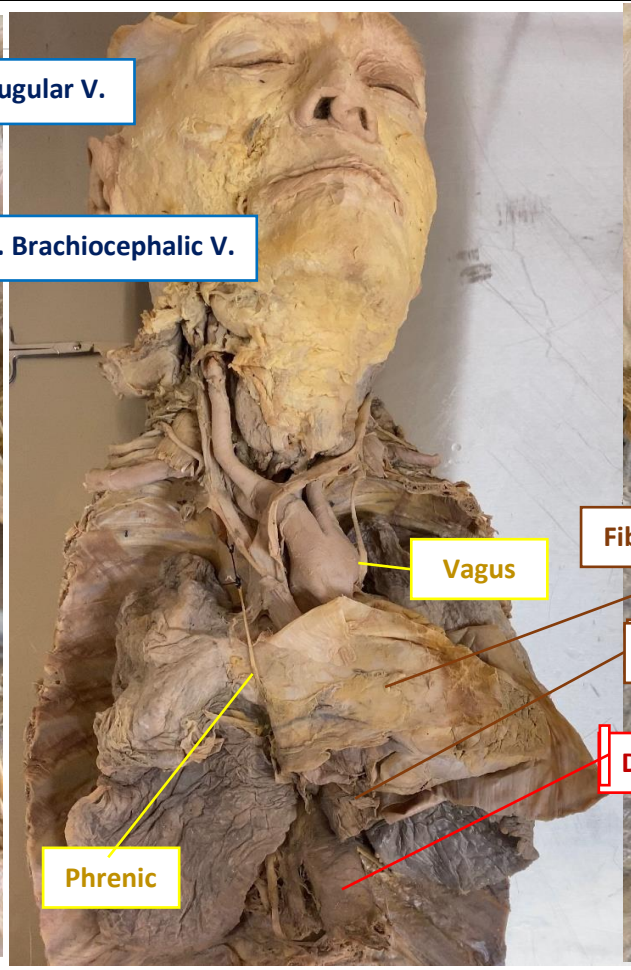
Mitral Valve | Ant. | Post.

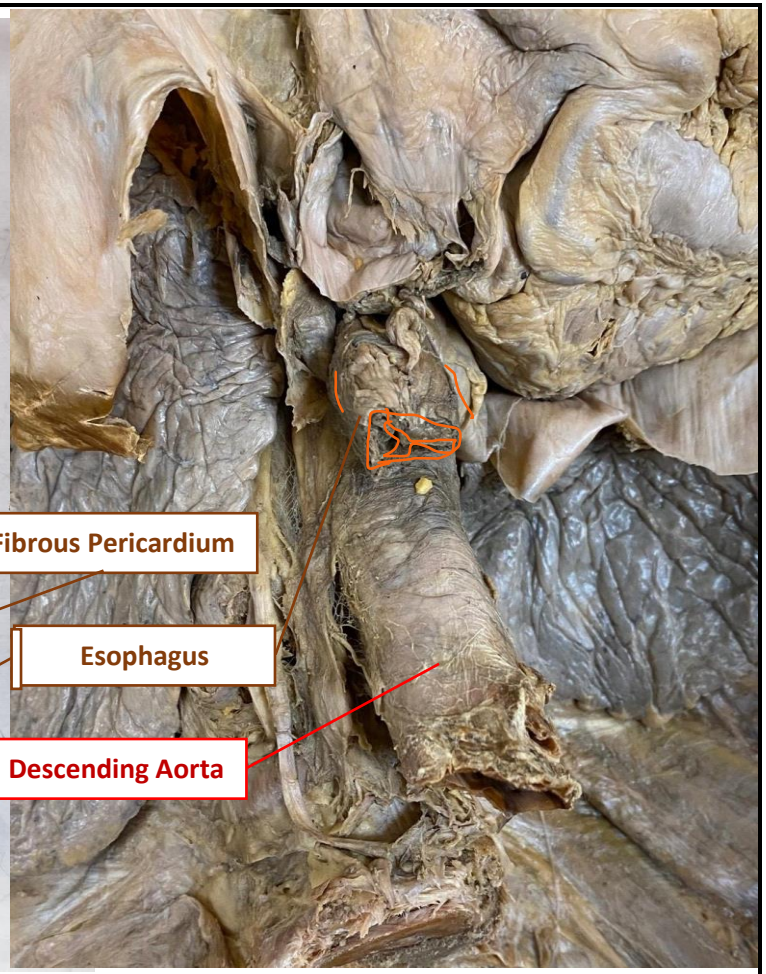
Chordae Tendineae

Two Papillary Muscles


Brachiocephalic A.
LT. Brachiocephalic V.
RT. Common Carotid A.
LT. Common Carotid A.
Internal Jugular V.
Arch of Aorta
RT. Subclavian A.
Ascending Aorta
RT. Brachiocephalic V.
LT. Common Carotid
RT. Subclavian A.
Superior Vena Cava
Vagus Nerve
Brachiocephalic A.
Arch of Aorta
Phrenic Nerve
Ascending Aorta
Pulmonary Trunk
Vagus Nerve



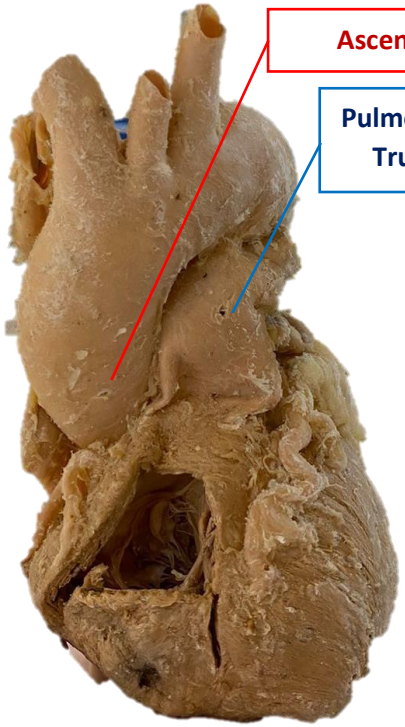


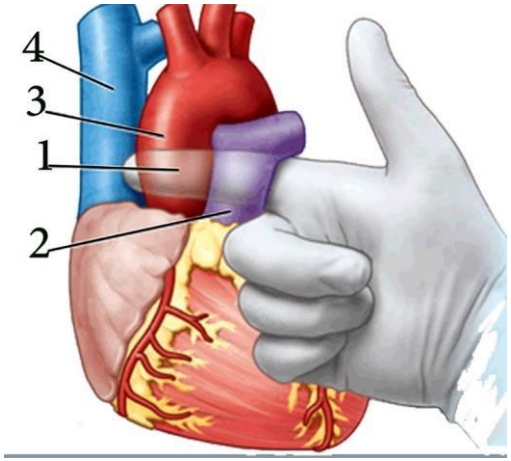


Structures present in more than one mediastinum

Sup & ant mediastinum	Sup & middle mediastinum	Sup & post mediastinum
Thymus	Svc Phrenic N Trachea & its bifurcation	Esophagus Vagus N Thoracic duct

Transverse Pericardial Sinus





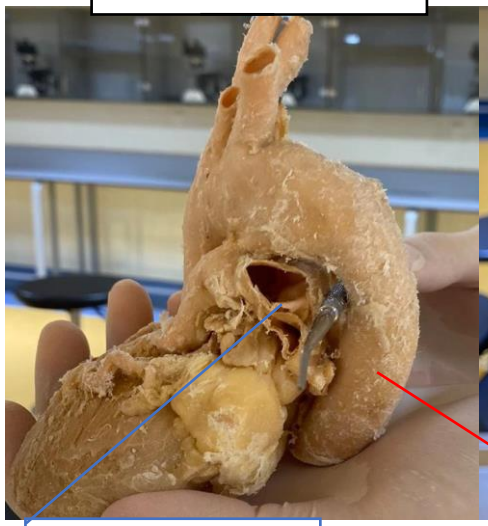
Boundaries:

Anterior: Ascending aorta & pulmonary trunk

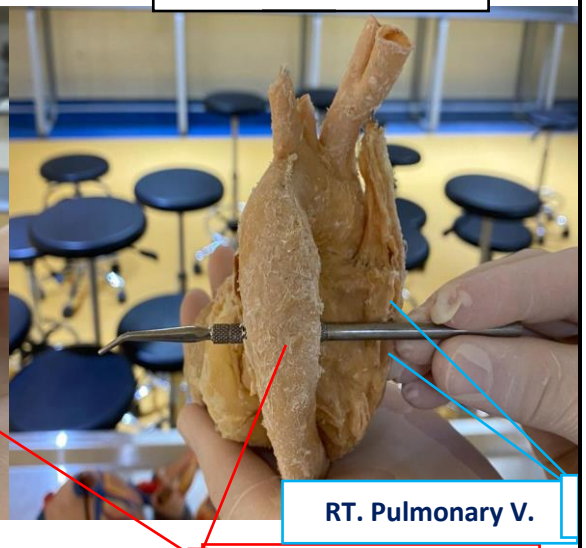
Posterior: 2 atria

Oblique Sinus Of Pericardium

Lateral View



Posterior View



Boundaries:

Anterior: Left Atrium

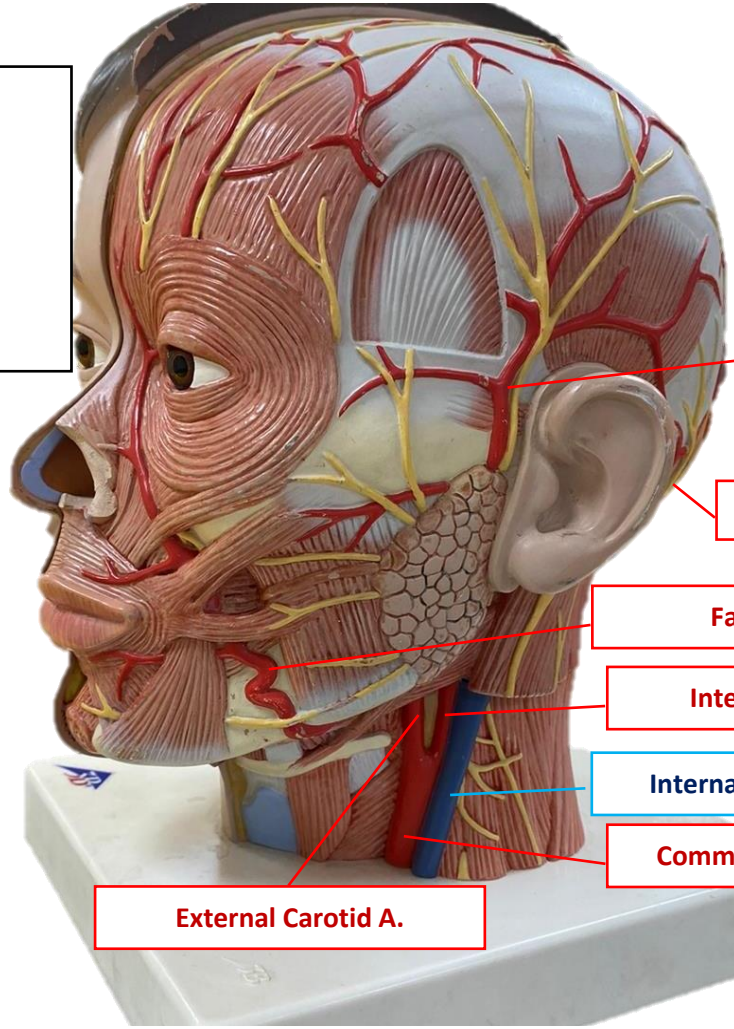
Posterior: contents of posterior mediastinum

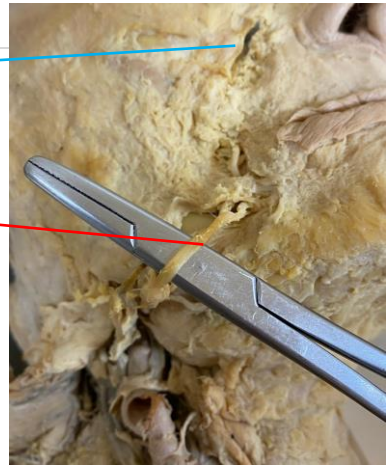
Left: 2 left pulmonary veins

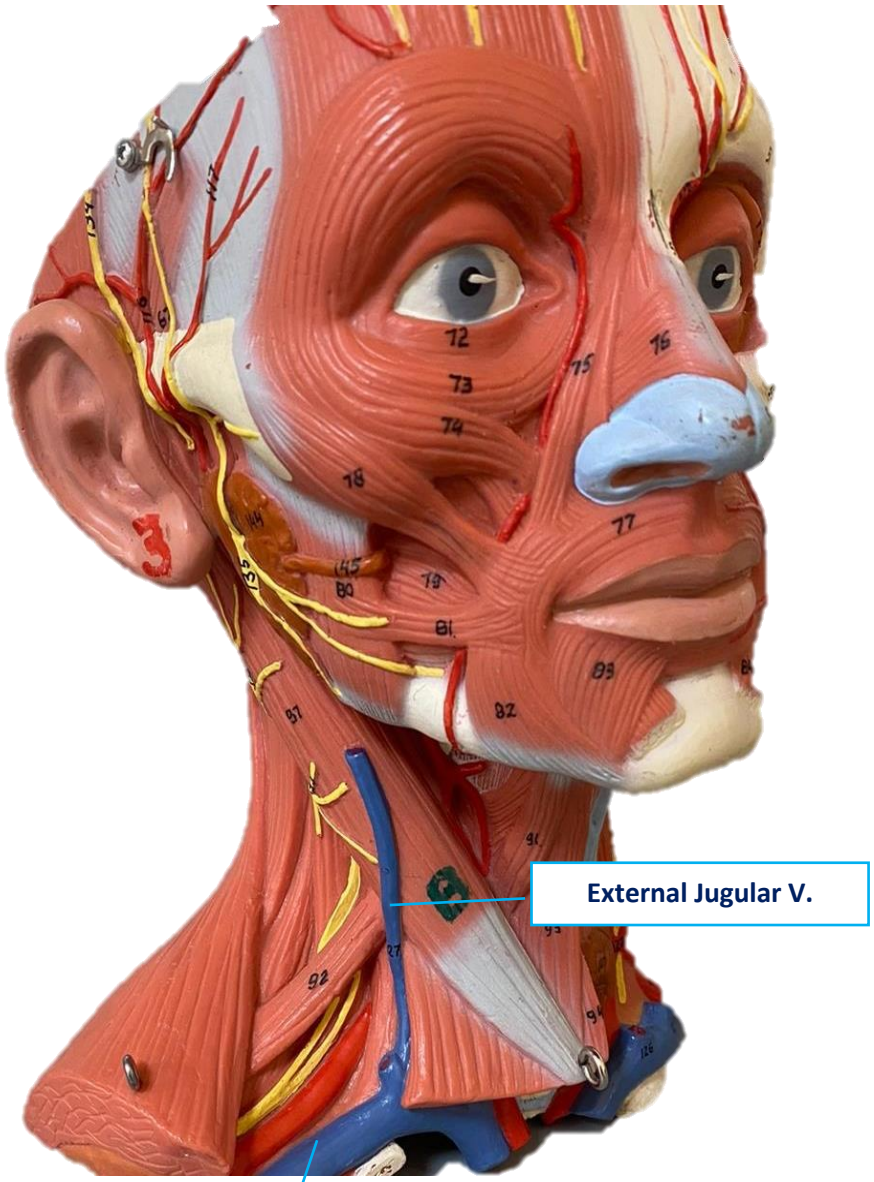
Right: 2 right pulmonary veins and IVC

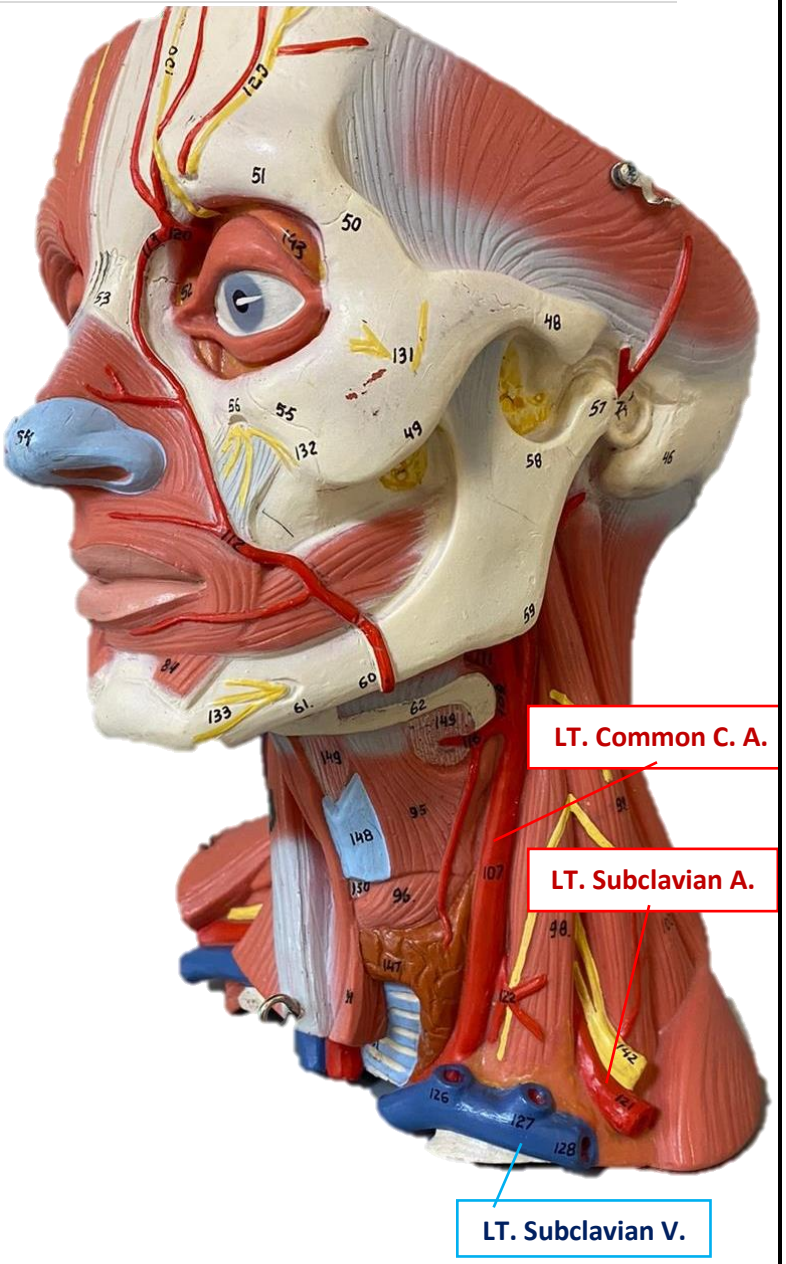
Q|GIVE 2 BRANCHES of left common carotid artery

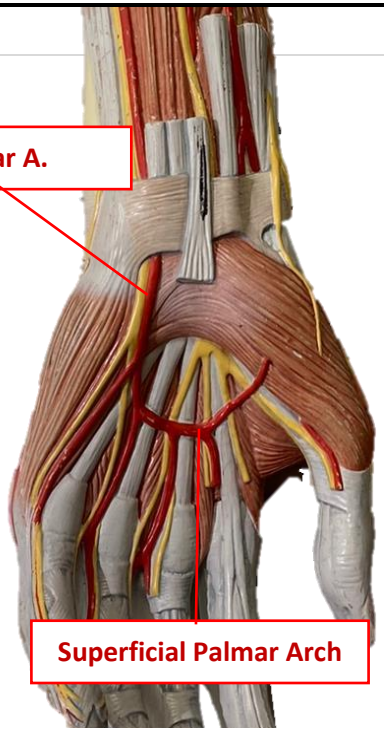
1- External carotid artery
2- internal carotid artery

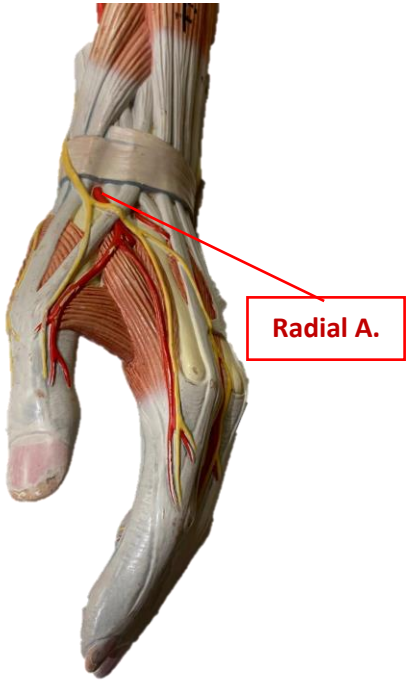


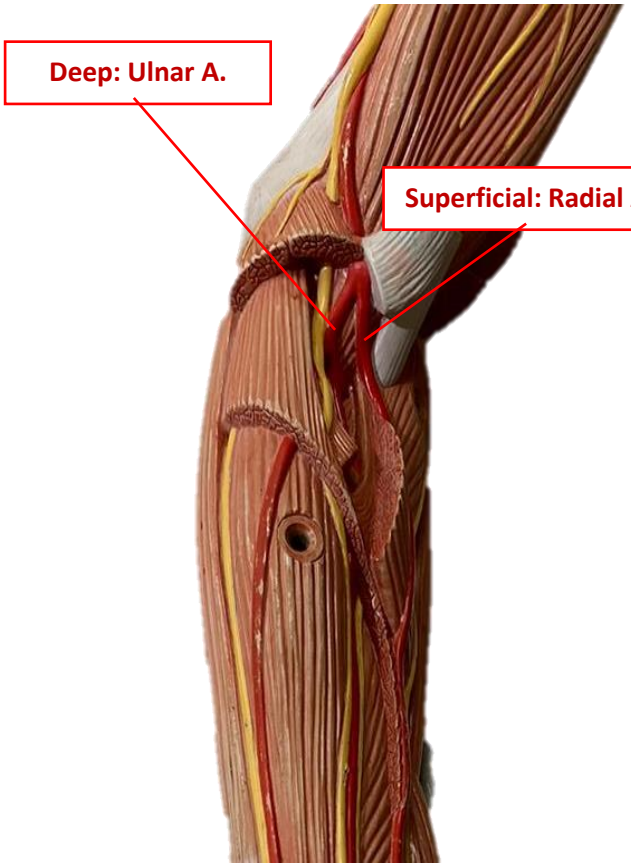


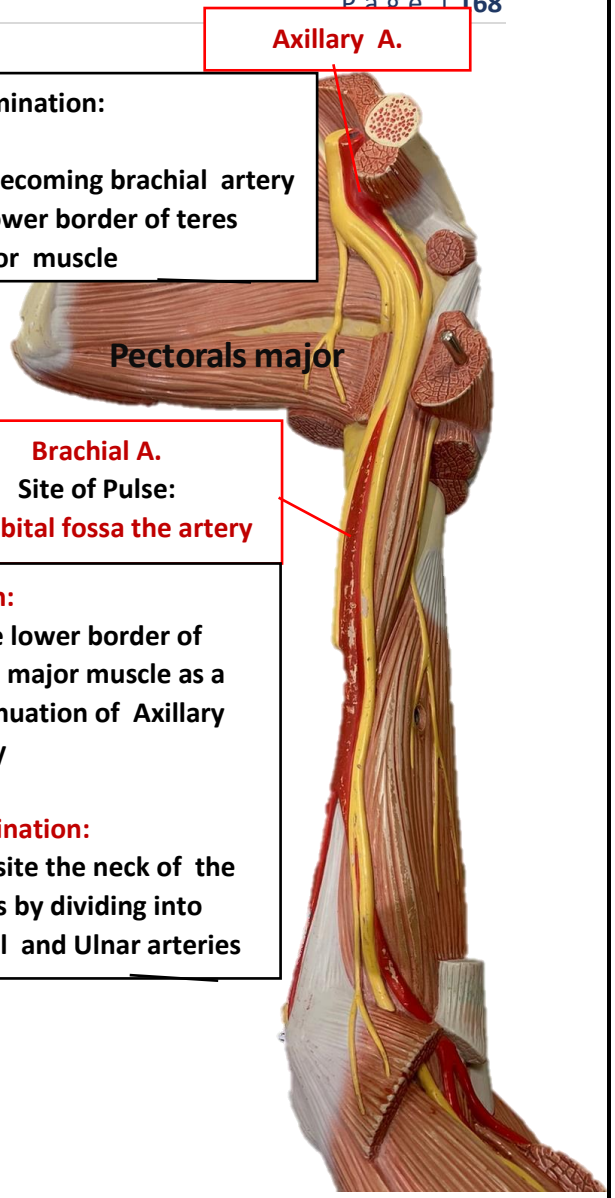

External Jugular V.
RT. Subclavian V.


LT. Common C. A.
LT. Subclavian A.
LT. Subclavian V.









Termination:

By becoming brachial artery at lower border of teres major muscle

Brachial A.

Site of Pulse:

at cubital fossa the artery

Origin:

at the lower border of teres major muscle as a continuation of Axillary artery

Termination:

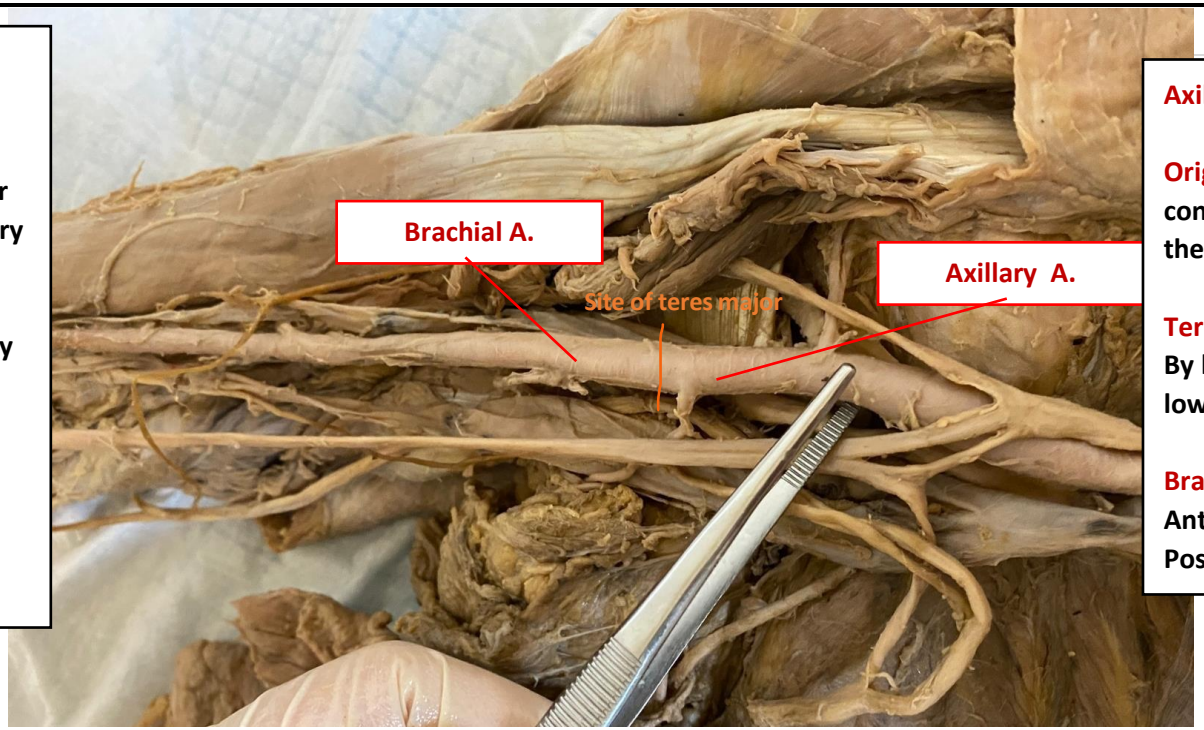
opposite the neck of the radius by dividing into Radial and Ulnar arteries

Brachial A.

Origin:
at the lower border of teres major muscle as a continuation of Axillary

Termination:
opposite the neck of the radius by dividing into Radial & Ulnar arteries

Branches of Brachial artery:
1- Muscular branches
2- Profunda Brachii artery



Axillary A.

Origin:
continuation of subclavian artery at the outer border of 1st rib

Termination:
By becoming brachial artery at lower border of teres major muscle

Branches of axillary artery:
Ant. circumflex humeral arteries
Post. circumflex humeral arteries

Axillary V.

Beginning:
union of the vena comitantes of brachial artery and basilic vein at lower border of teres major

Termination:
Subclavian Vein at outer border of 1st rib

Ulnar A.

Origin:
Larger terminal branch of Brachial A.

Termination:
in hand divide into 2 terminal branches

1- **Deep branch:**
join radial artery to
complete the deep palmer arch

2- **Superficial branch:**
unites with superficial palmer
branch of radial artery to form
superficial palmer arch

Branches of ulnar artery:

1. **Muscular branches**
2. **Anterior and posterior ulnar Recurrent branches**

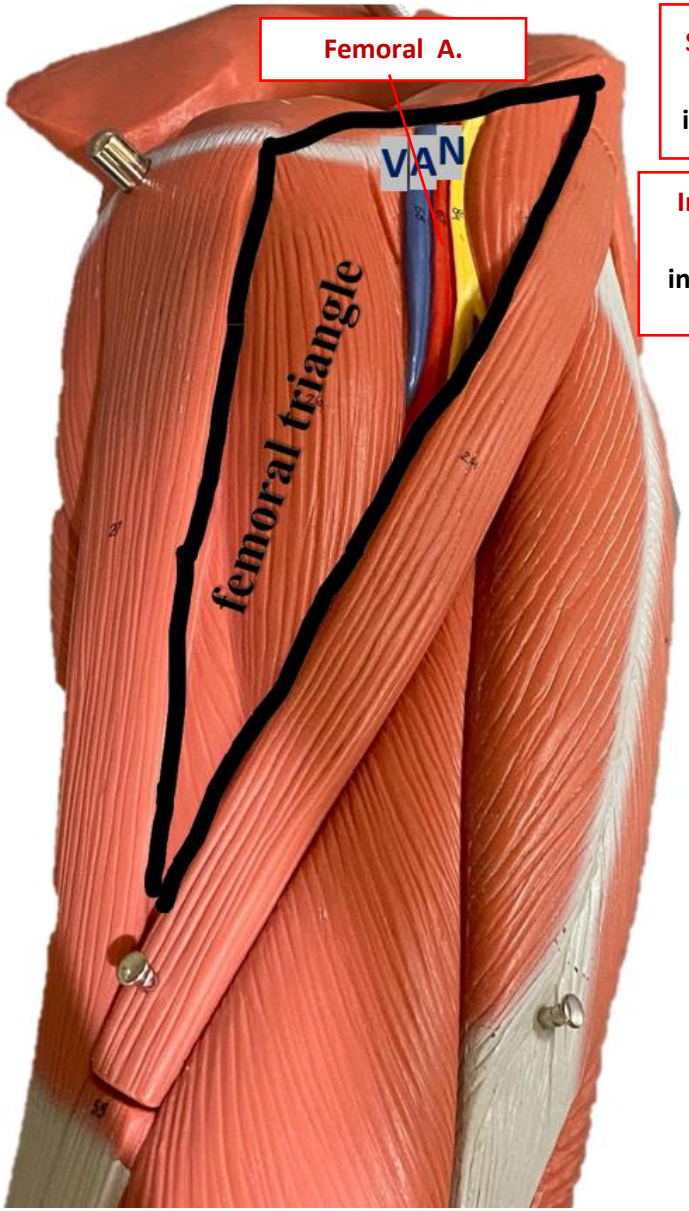
Radial A.

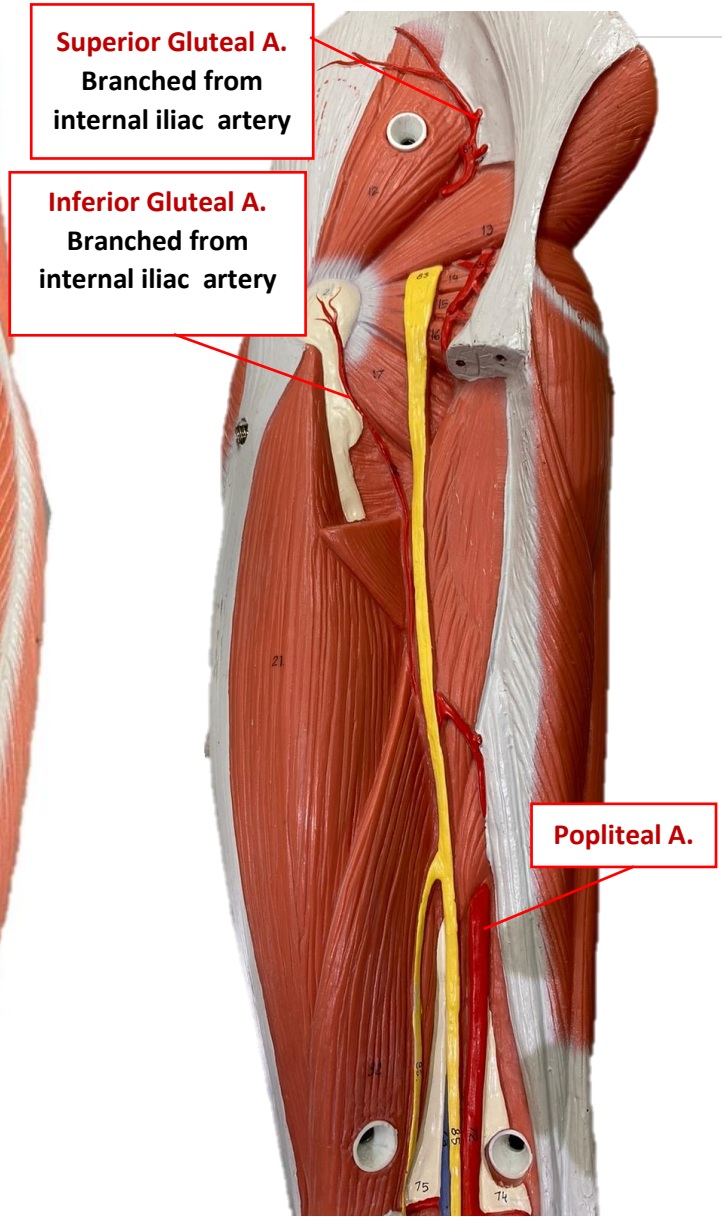
Origin:
one of two terminal branches of brachial artery opposite the neck of the radius

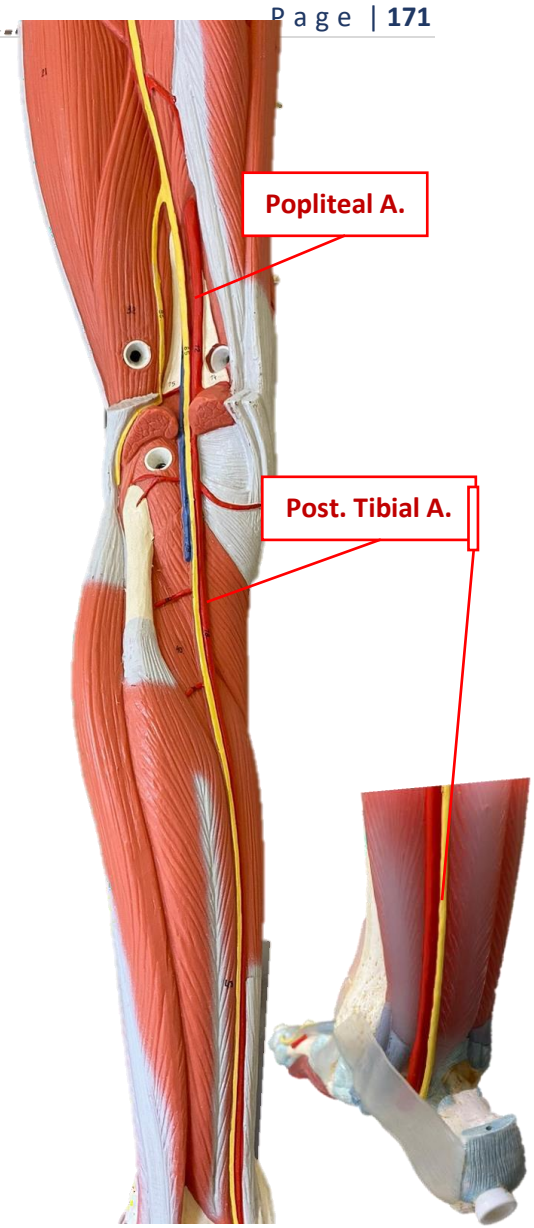
Termination:
joins deep branch of ulnar artery to form Deep Palmar Arch.

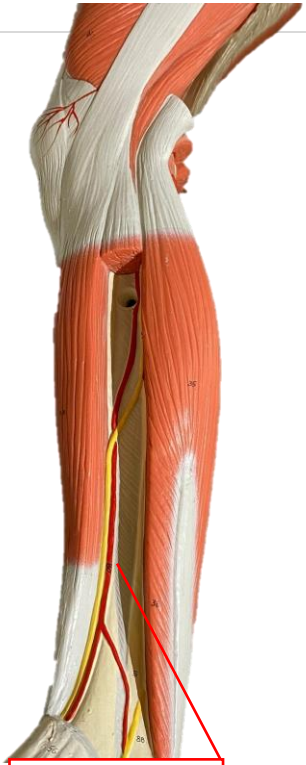
Branches of Radial artery:

1. **Radial Recurrent branch**
2. **Superficial Palmar branch**

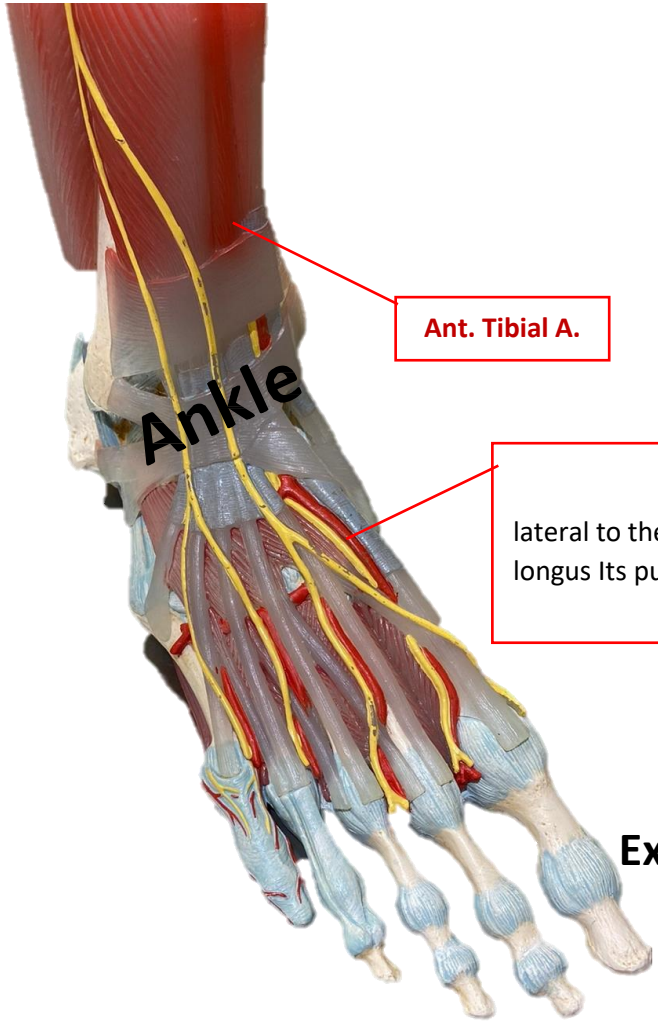

Femoral A.
femoral triangle


Superior Gluteal A.
Branched from
internal iliac artery
Inferior Gluteal A.
Branched from
internal iliac artery
Popliteal A.


Popliteal A.
Post. Tibial A.



Ant. Tibial A.



Ant. Tibial A.

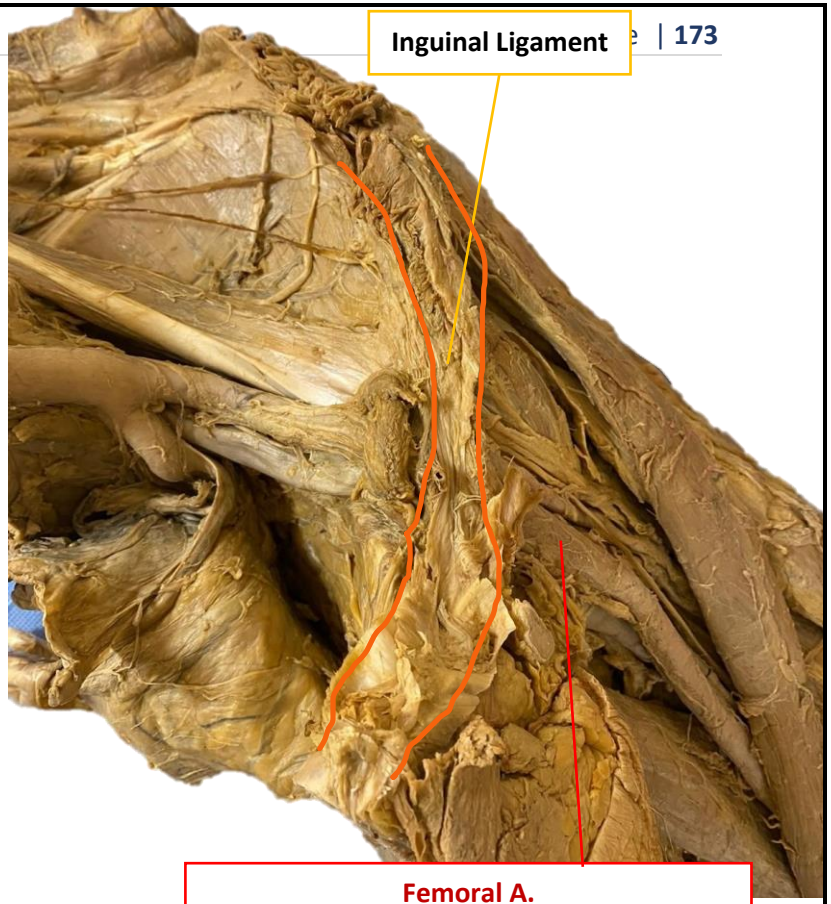
Dorsalis Pedis A.
lateral to the tendon of extensor hallucis longus Its pulsation can be felt here

Extensor hallucis longus

External iliac V.

Beginning:
continuation of popliteal V. at adductor hiatus.

Termination:
continuous as external iliac V. at mid-inguinal point.



Inguinal Ligament

Descending Aorta

Common iliac A.

Branches of common iliac A.
1. :internal iliac artery
2. :External iliac artery

Internal iliac A.

Branches of internal iliac A.
1. Superior gluteal artery
2. Inferior gluteal artery

External iliac A.

External iliac V.

Femoral A.

Origin:
Continuation of External iliac artery at the mid-inguinal point.

Termination:
Pass through at the adductor hiatus By becoming Popliteal A.

Branches of femoral artery
1. Superficial circumflex iliac artery
2. Superficial epigastric artery

Popliteal A.

Origin: Continuation of Femoral artery at the adductor hiatus

Termination: at the lower border of the Popliteus muscle

Branches of popliteal artery: 1; Anterior tibial A. | 2: Posterior tibial

Popliteal V.

Beginning:
union of venae comitantes of the anterior & posterior tibial arteries.

Termination:
becomes femoral vein at the adductor hiatus.

Posterior Tibial A.

Origin:

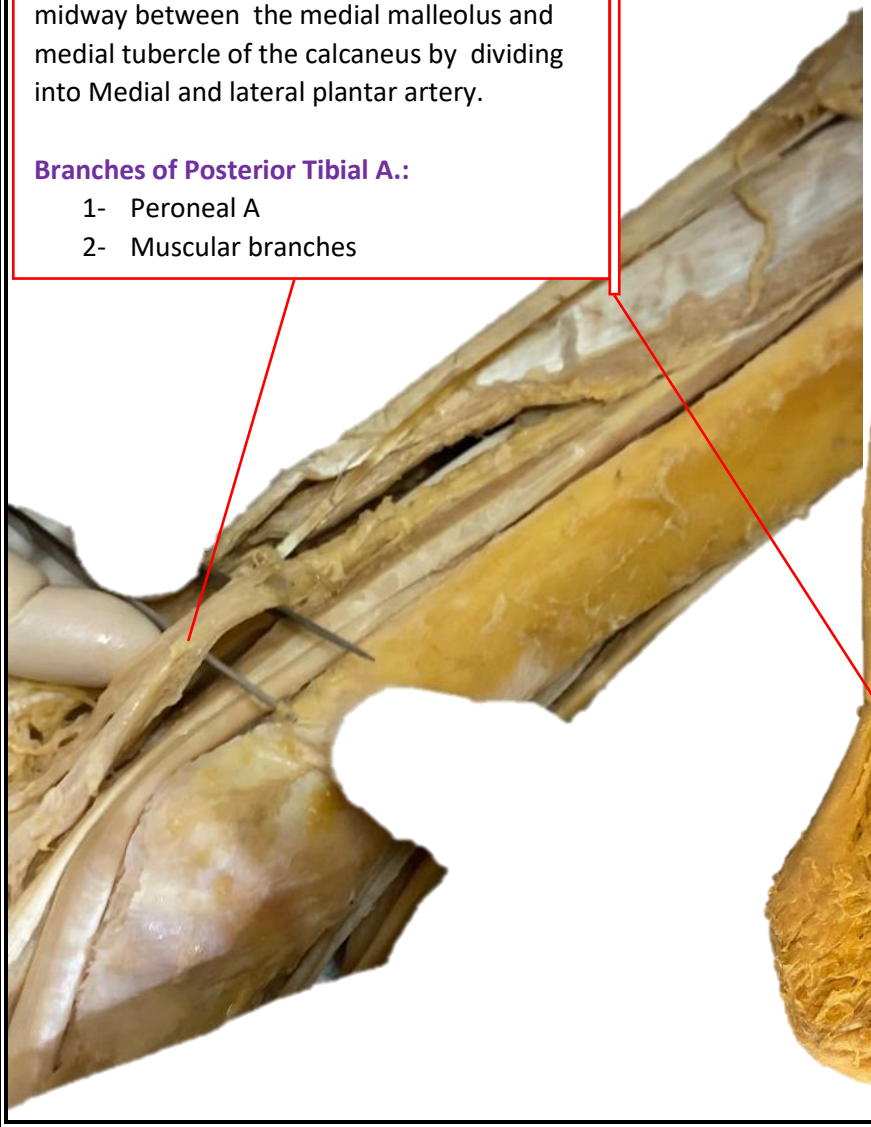
one of the two terminal branches of popliteal artery at lower border of popliteus

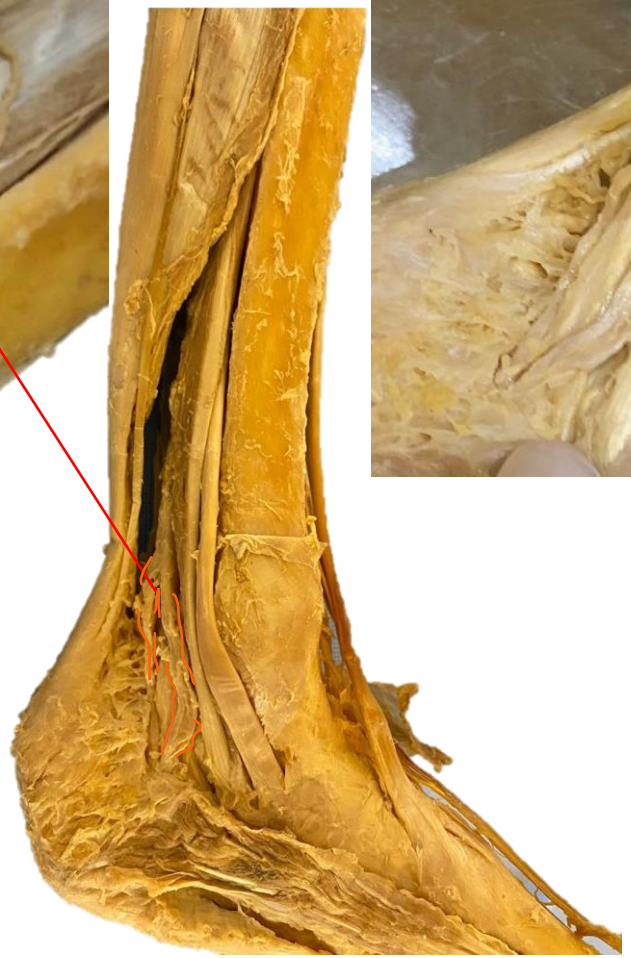
Termination:

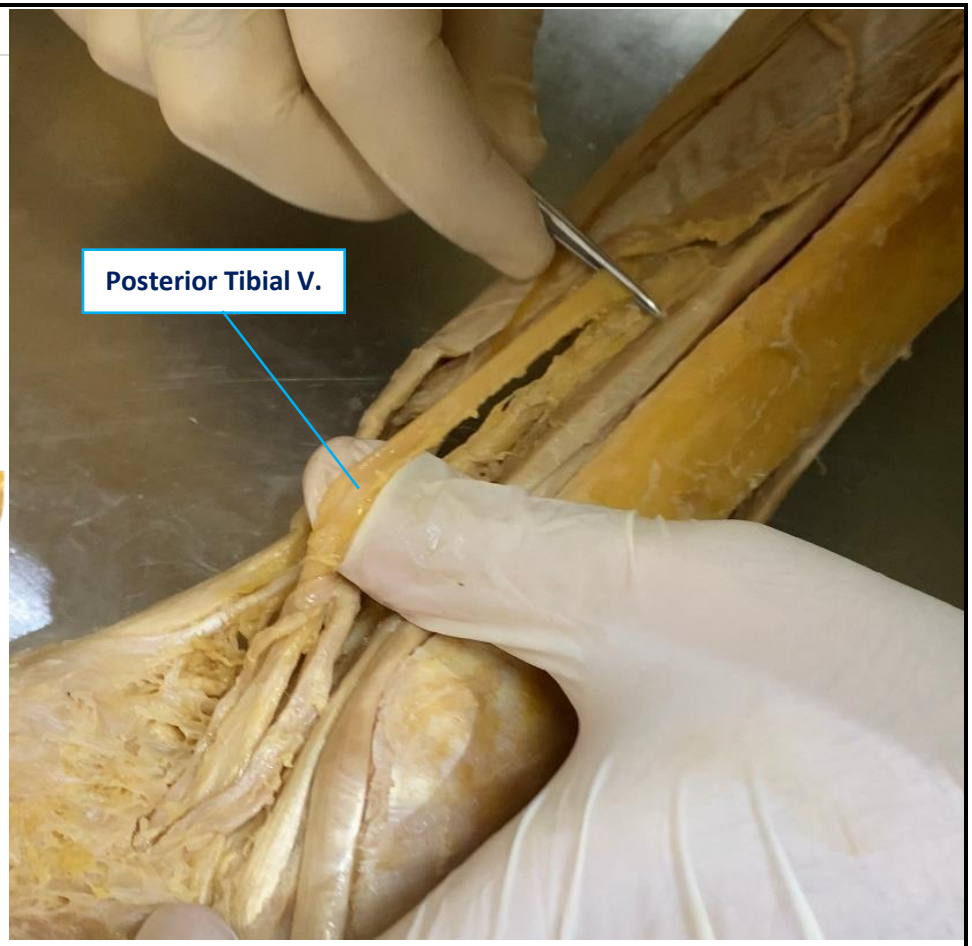
It ends under cover of the flexor retinaculum, midway between the medial malleolus and medial tubercle of the calcaneus by dividing into Medial and lateral plantar artery.

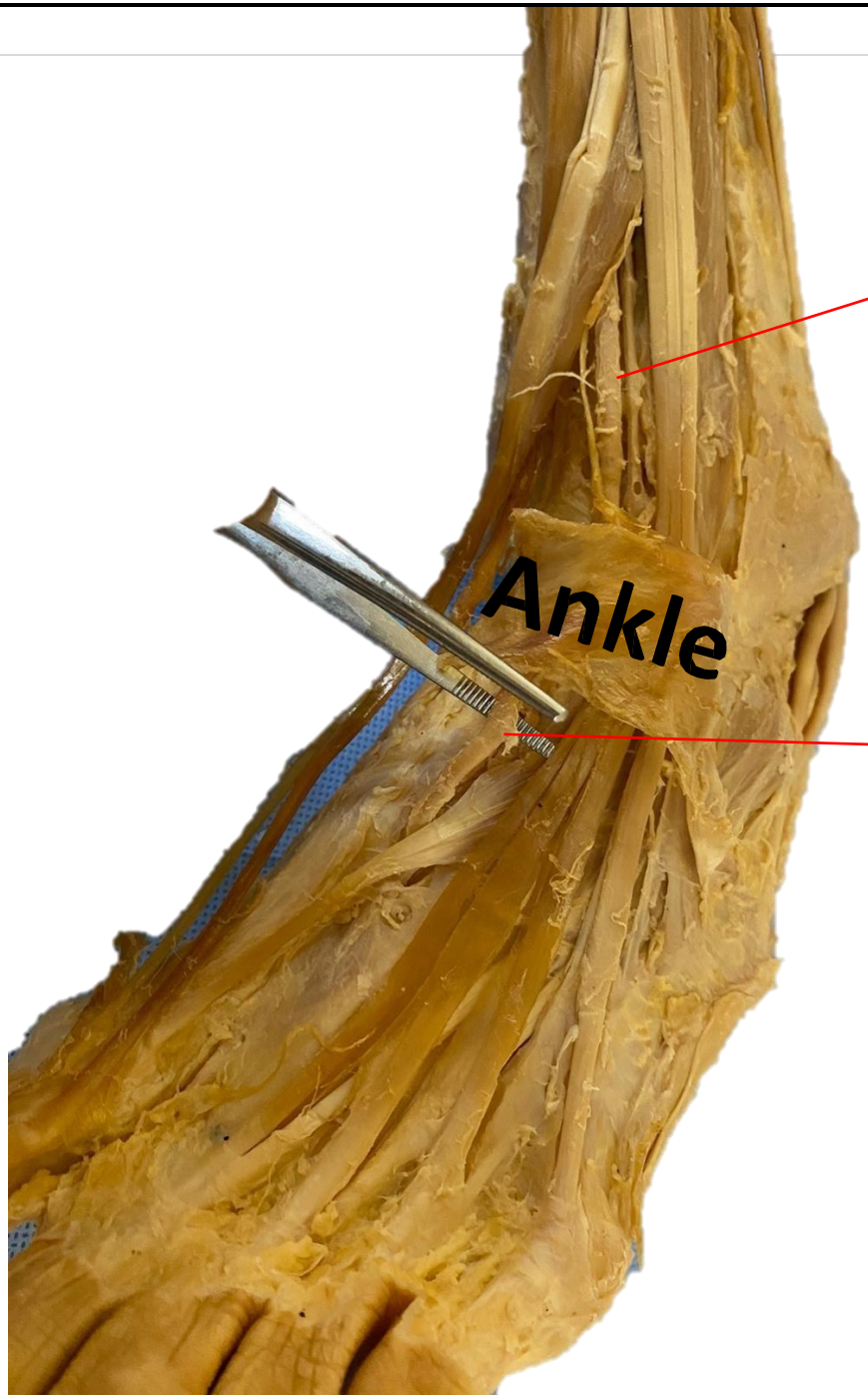
Branches of Posterior Tibial A.:

1- Peroneal A
2- Muscular branches









Anterior Tibial A.

Origin:
one of the two terminal branches of popliteal artery at lower border of popliteus

Termination:
in front ankle joint between the 2 malleoli, becomes dorsalis pedis artery.

Branches of Anterior Tibial A.:
1- **Posterior tibial recurrent**
2- **Anterior tibial recurrent**

Dorsalis Pedis A.
lateral to the tendon of extensor hallucis longus Its pulsation can be felt here

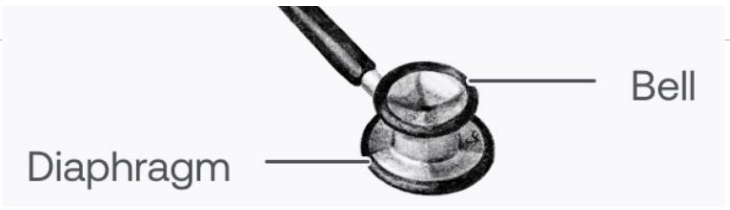
Origin:
continuation of anterior tibial artery in front ankle joint midway between two malleoli

Termination:
by joining the lateral plantar artery and completes the plantar arch.

Branches of Dorsalis Pedis A.:
1- **Medial tarsal artery**
2- **Lateral tarsal artery**

Physiology OSPE

Examination of CVS Auscultation (Heart Sounds)



A stethoscope w/ bell + diaphragm, earpieces should fit comfortably & firmly, tubing should be about 25 cm long & thick enough to reduce external sounds

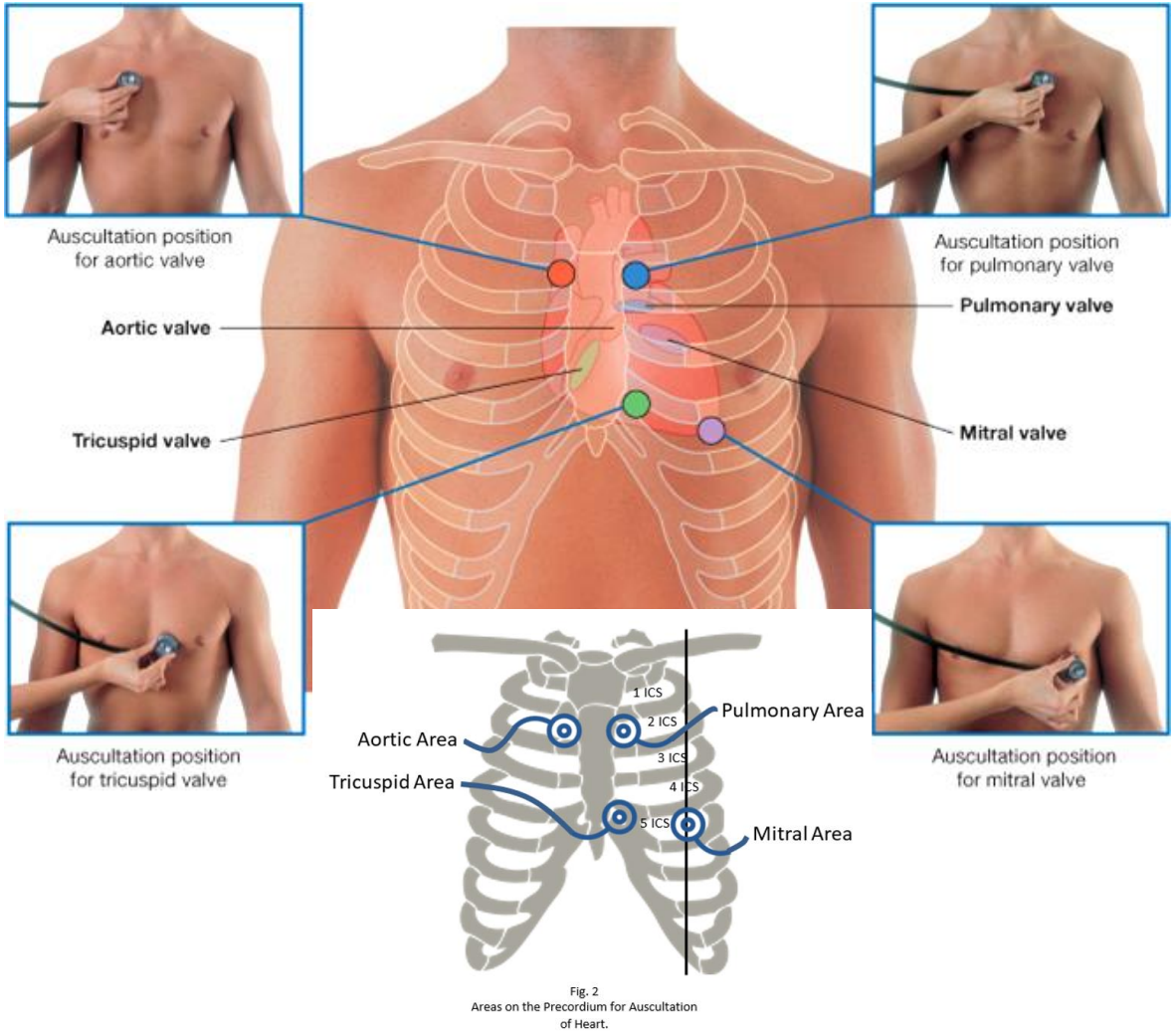


Fig. 2
Areas on the Precordium for Auscultation of Heart.

Auscultation Areas

- Aortic Area – Right second intercostal space
- Pulmonary area - Left second intercostal space
- Tricuspid area – Left Lower Sternal border
- Mitral area – 5th Intercostal space in midclavicular line.

Abnormalities of the Heart Sounds

1. Alteration in Intensity.

	S1	S2
Increased	* **Mitral** + **Tricuspid stenosis [MS, TS]** * Reduced diastolic filling (HTN)	* Systemic Hypertension [A_2] * **Cong. AS**. (A2) * Pulmonary Hypertension [P_2]
Decreased	* Prolonged dias. filling (1st degree block). * Delayed onset of sys. (LBBB). * **Mitral Regurgitation [MR]**	* **Aortic Regurgitation [AR]**

2. Splitting

Inc. N.

- d.t. delay in Rt vent. emptying.
- RBBB, PS, VSD, MR.

Reversed

- P ⟶ A + in expiration.
- LBBB, AS.

What to hear ?

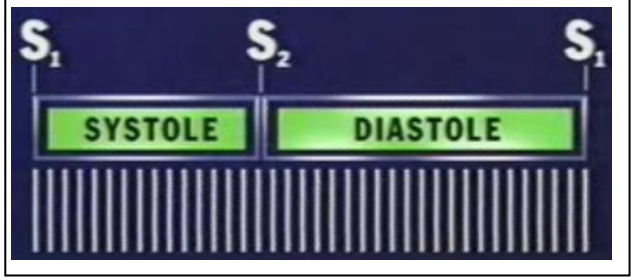
First Heart Sound (S1)

- **Closure of M + T valves.**
- **Beginning of ventricular systole.**

Second Heart Sound (S2)

- **Closure of A + P valves. (A → P)**
- **End of ventricular systole.**
- **Splitting of the S2.**

Timing



3. Extra Heart Sounds

#		
1	3RD Heart Sound (S3) Lubb-dupp-da	lushing in aused by turbulent blood flow into ventricles & detected near end of first one-third of diastole (Rapid ventricular filling). luid backing up , as in cardiac failure
2	4TH Heart Sound (S4) Da-lubb-dupp	• A stiff wall • With the atria systole • Non compliant ventricles

Third Heart Sound (S3)

- Low pitched. @ apex + left lateral sternal border [LLSB.]
- Mid-diastolic.
- Triple rhythm (lub-dub-dum) (= gallop rhythm)
- N: children + young people + pregnancy + athletes + fever.

- **Abnormality:** Ventricular septal defect, atrial septal defect, aortic regurgitation, mitral regurgitation, tricuspid regurgitation, patent ductus arteriosus

Fourth Heart Sound (S4)

- High pressure atrial wave reflected back from a poorly compliant ventricle.
- Late diastolic, high-pitched sound.
- **NEVER physiological**.

- **Abnormal:** Hypertension (systemic or pulmonary), hypertrophic cardiomyopathy, acute myocardial infarction, coronary artery disease, congestive heart failure, aortic stenosis, pulmonary stenosis

4. Additional Sounds

Due to

A. Opening Snap
B. Systolic Ejection Click
C. Prosthetic Heart Valves
D. Pericardial Friction Rub

D. Pericardial friction rub

- A superficial scratching sound.
- Occurs at any time during the cardiac cycle.
- Sign of PERICARDITIS.
- Louder with sitting up and breathing out.

5. Murmurs

A- Timing

Systolic	Diastolic	Others
Innocent. (fever, athletes, pregnancy)	**Early.** (AR, PR)	**Presys.** (MS, TS)
Pansys. (MR, TR, VSD)	**Mid.** (MS, TS)	**Continuous.** (PDA + fistulae)
Ejection (mid) sys. (AS, PS, ASD, severe anemia)		
Late sys. (M Prolapse)		

B- Intensity

1/6	2/6	3/6	4/6	5/6	6/6
Soft/not heard at first	Soft – detectable	Moderate, No thrill	Loud + Thrill	Very loud	Loud without stethoscope

C- Area of greatest intensity

D- Propagation

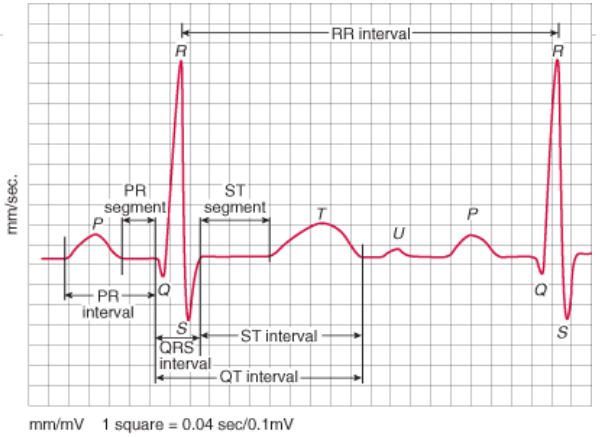
- **PSM [MR] → Lt Axilla**
- **PSM [VSD] → Rt sternal edge**
- **ESM [AS] → Carotid Arteries**

E- Effect of certain maneuvers

- Respiration.
- Valsalva maneuver.
- Squatting.
- Isometric exercise.

Manoeuvre	Lesion		
	MVP	AS	MR
Valsalva (dec. preload)	Longer	Softer	Softer
Squatting or leg raise (inc. preload)	Shorter	Louder	Louder
Hand grip (inc. afterload)	Shorter	Shorter	Louder

Electrocardiogram Interpretations



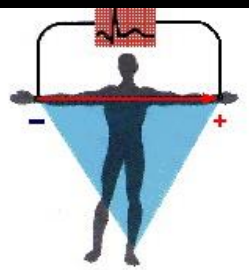
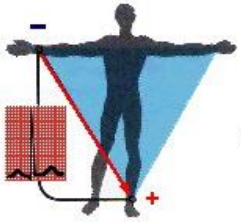
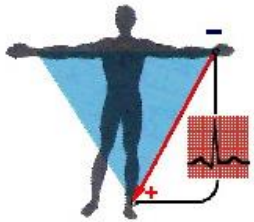
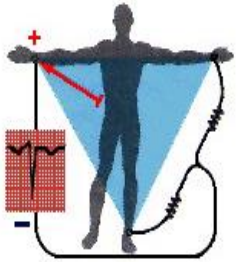
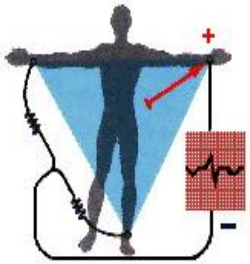
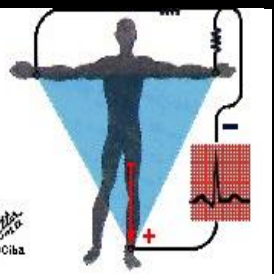
Analyzing individual waves & segments

#		Normal Range	Interpretations
1	P-Wave	0.08 – 0.11 s	• upright except in avR • do you see p waves ? • are all p waves same ? • does all QRS complexes have p waves ?
2	P-R Interval	0.12 – 0.20 s	• Is the PR interval constant ? If prolong indicates various blocks
3	QRS Complex	0.08 – 0.1	• Are the p waves & QRS complexes are associates with each other • Are the QRS complexes narrow or wide
4	ST Segment	0.32	• **Normal:** Isoelectric • **Elevation:** in acute MI • **Depression:** in ischemia
5	T-Wave	0.10 to 0.25 s [or greater]	• **Tall T wave :** ischemia, hyperkalemia • **Inverted :** young children ,deep inspiration, bundle branch block, ischemia,hypokalemia
6	Q-T Interval	0.4 – 0.43 [Depending on HR]	• At high heart rates, ventricular action potentials shorten in duration, which decreases the Q-T interval • prolonged in acute MI ,hypocalcaemia

Ideal Values

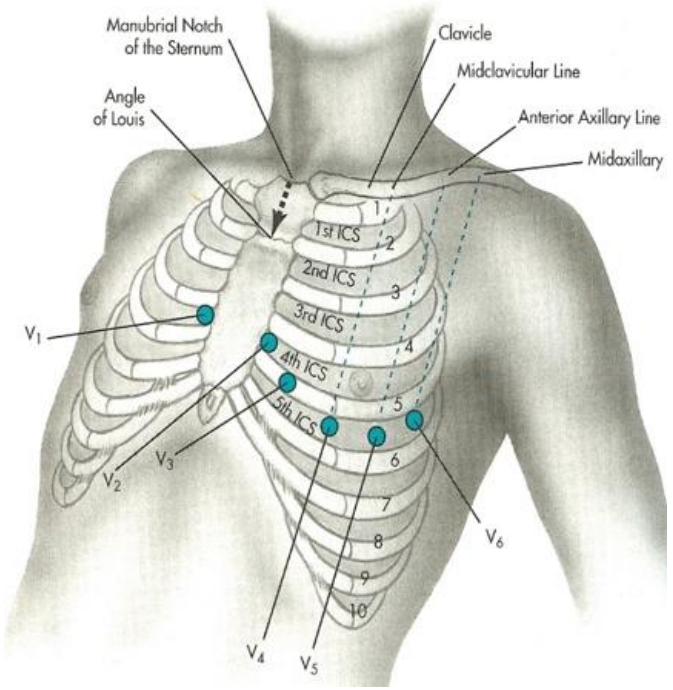
Regularity	Rate	P waves	PR interval	QRS Duration
Regular	60-100 bpm	Normal	0.12 – 0.20 s	0.04 – 0.12 s

Limb Leads

Bipolar			Unipolar		
 Lead I *	 Lead II *	 Lead III *	 Lead aVR *	 Lead aVL *	 Lead aVF *
Right & Left Arm	**Right Arm & Left Leg**	**Left arm & Left Leg**	**Right Arm**	**Left Arm**	**Left Leg**

Precordial Chest Leads

Chest Lead	Found at	Type of View
V1	Right 4th ICS	Septal
V2	Left 4th ICS	Septal
V3	Between V2-4	Anterior
V4	5TH Midclavicular Line of ICS	Anterior
V5	5TH Axillary Line of ICS	Lateral
V6	5th Mid-Axillary line of ICS	Lateral



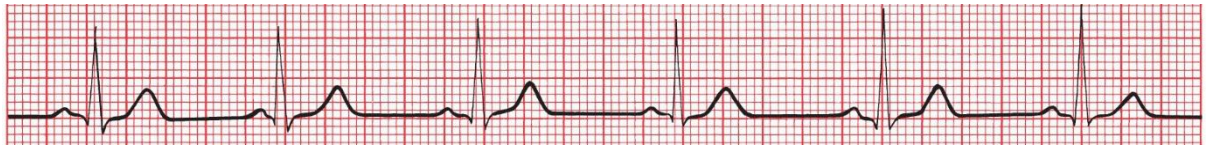
The 12-Leads

3 Limb Leads	3 Augmented Leads	6 Precordial Leads
I, II, III	aVR, aVL, aVF	V_1-V_6

1- Determine Regularity

- Look at the R-R distances (using a caliper or markings with a pen on paper).
- Regular (are they equidistant apart)? Occasionally irregular? Regularly irregular? Irregularly irregular?
- **Interpretation:** Regular

2- Calculating heart rate



- Find the R wave that falls on, or nearly on, one of the heavy lines.
- Count the number of large square or small square until the next R wave
- Determine the heart rate by applying following formula

Calculating Heart rate =

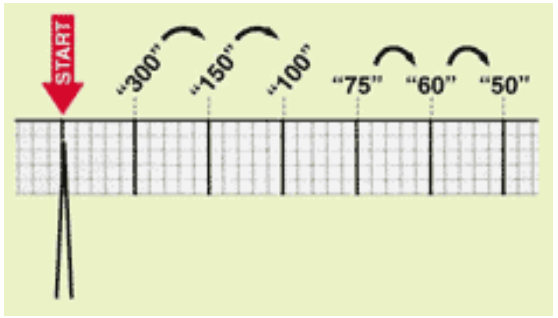
First Method:

$$Big\ Square\ [B.S.] = \frac{300}{\text{No of B. S. Between RR Interval}}$$

OR

$$Small\ Square\ [S.S.]: = \frac{1500}{\text{No of S. S. Between RR Interval}}$$

Second Method:

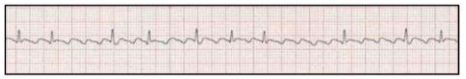


3- Assess the P waves

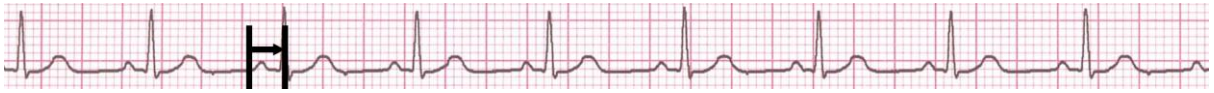
- Are they present?, All look alike?, Regular?, Is there P wave before each QRS?
- **Interpretation:** **Normal P waves w/ 1 P wave for every QRS**

Regularly irregular

Irregularly Irregular

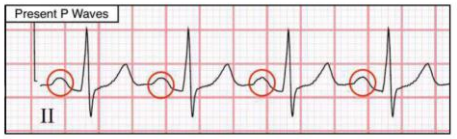


4- Determine PR Interval

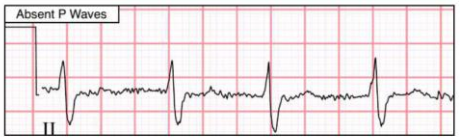


- **Normal:** 0.12 – 0.20 Seconds [3-5 boxes]
- **Interpretation:** **0.12 Seconds**

Present P Wave (Sinus):



Absent P Wave (Non-Sinus):



5- QRS Duration

- **Normal:** 0.04 – 0.12 Seconds [1-3 boxes], **Interpretation:** **0.08 Seconds**

A- Rhythm Analysis

#	Steps of Rhythm Analysis
1	Determine Regularity
2	Calculate Rate
3	Assess the P waves
4	Determine PR interval
5	Determine QRS duration

The ECG Paper

Horizontally	Vertically
One Small box = 0.04 s One Large Box = 0.2s	One Large box = 0.5 mV

Regularity	Rate	P waves	PR interval	QRS Duration
Regular	90-95 bpm	Normal	0.12 s	0.08 s

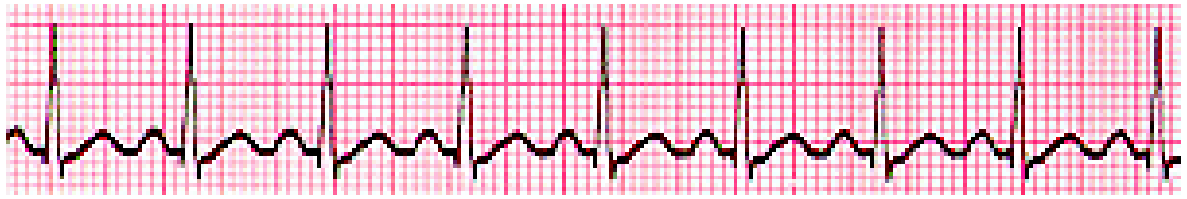
Interpretation?

Normal Sinus Rhythm

Regularity	Rate	P waves	PR interval	QRS Duration
Regular	**35 bpm**	Normal	0.12 s	0.10 s

Interpretation?

Sinus Bradycardia



Regularity	Rate	P waves	PR interval	QRS Duration
Regular	**130 bpm**	Normal	0.16 s	0.08 s

Interpretation?

Sinus Tachycardia

Atrial Fibrillation

Deviation from NSR

- **No organized atrial depolarization, so no normal P waves (impulses are not originating from the sinus node)**
- **The atrial rate is usually above 350 beats per minute**
- **Atrial activity is chaotic (resulting in an irregularly irregular rate).**
- **Common, affects 2-4%, up to 5-10% if > 80 years old**

Regularity	Rate	P waves	PR interval	QRS Duration
Regular	70 bpm	**Flutter Waves**	**None**	0.06 s
Interpretation?				
Atrial Flutter				

Regularity	Rate	P waves	PR interval	QRS Duration
Regular	60 bpm	Normal	**0.36 s**	0.08 s
Interpretation?				
1ST Degree AV Block				

Etiology: Prolonged conduction delay in the AV node or Bundle of His.

Regularity	Rate	P waves	PR interval	QRS Duration
Regularly Irregular	50 bpm	Normal, but 4th no QRS	Lengthens	0.08 s
Interpretation?				
2nd Degree AV Block, Type I				

- PR progressively lengthens, then impulse is completely blocked (P wave not followed by QRS).
- **Etiology:** Each successive atrial impulse encounters a longer and longer delay in the AV node until one impulse (usually the 3rd or 4th) fails to make it through the AV node.

Regularity	Rate	P waves	PR interval	QRS Duration
Regular	40 bpm	Normal, 2 & 3 no QRS	0.14 s	0.08s
Interpretation?				
2nd Degree AV Block, Type II				

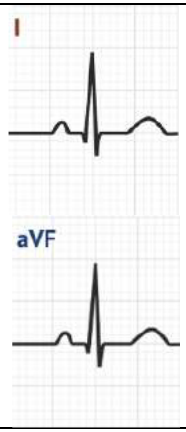
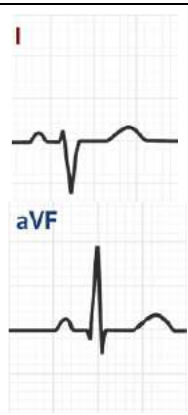
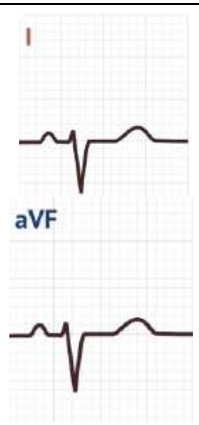
- Occasional P waves are completely blocked (P wave not followed by QRS).

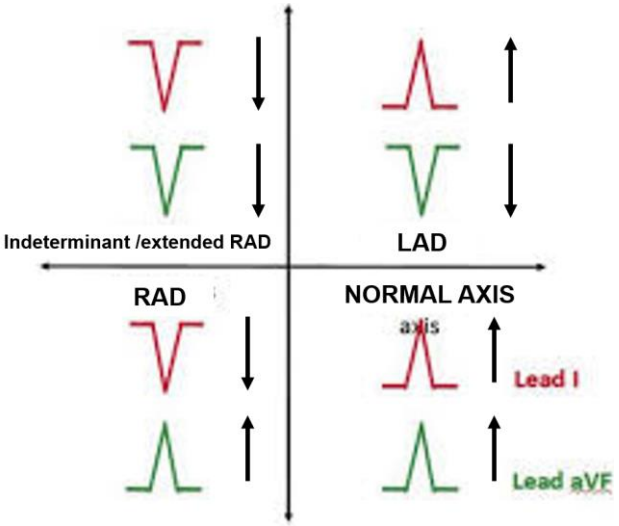
Etiology: **Conduction is all or nothing (no prolongation of PR interval); typically block occurs in Bundle of His**

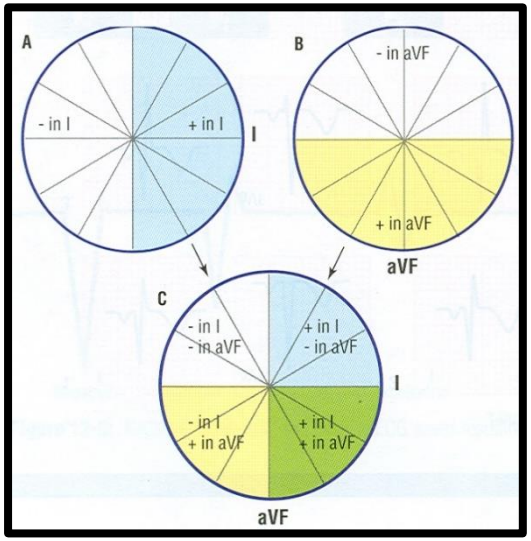
Regularity	Rate	P waves	PR interval	QRS Duration
Regular	40 bpm	No relation to QRS	None	Wide [0.12 s]
Interpretation?				
3rd Degree AV Block				

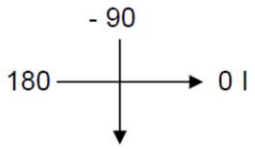
- **Etiology:** There is complete block of conduction in the AV junction, so the atria and ventricles form impulses independently of each other. Without impulses from the atria, the ventricles own intrinsic pacemaker kicks in at around 30 - 45 beats/minute

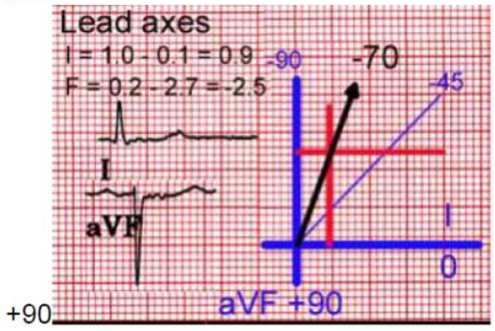
Electrical Axis

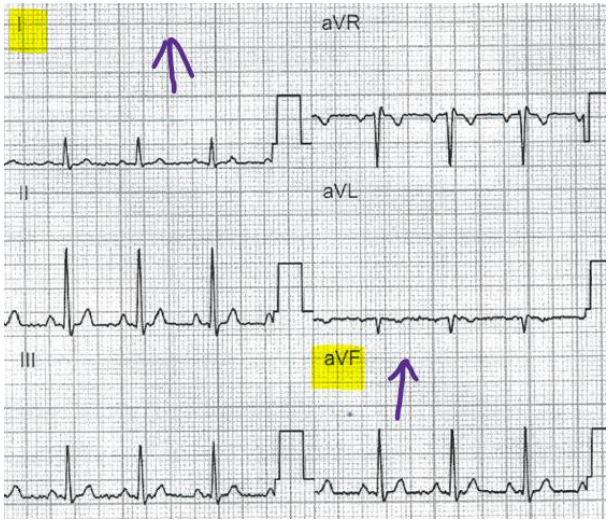
	Normal	Left Axis Deviation LAD	Right Axis Deviation RAD	Right Sup. Axis Dev. / Indeterminant
I	+	+	–	–
aVF	+	–	+	–
° Value	-30° and +110°	-30° and -110°	+110° and +180°	+180° and -90°
Reference				



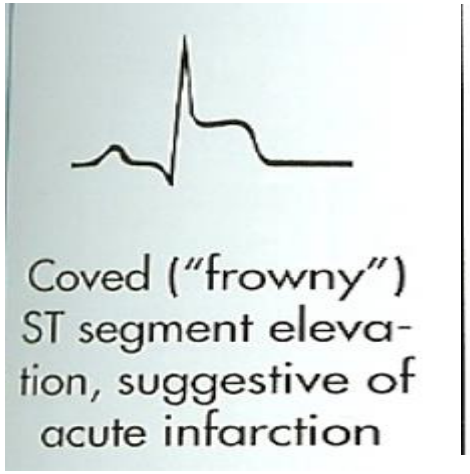


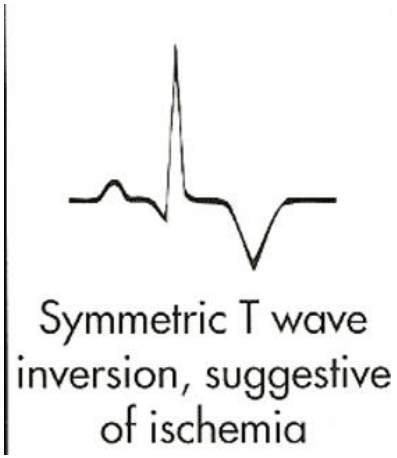


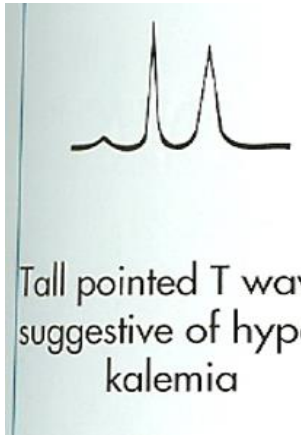


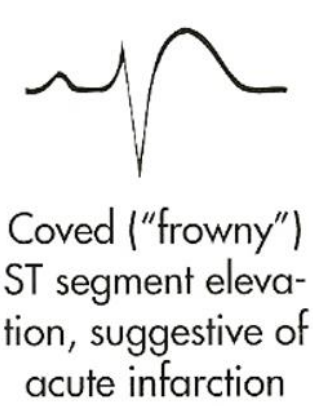


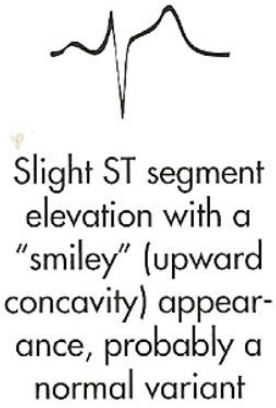
Variation in ST segment







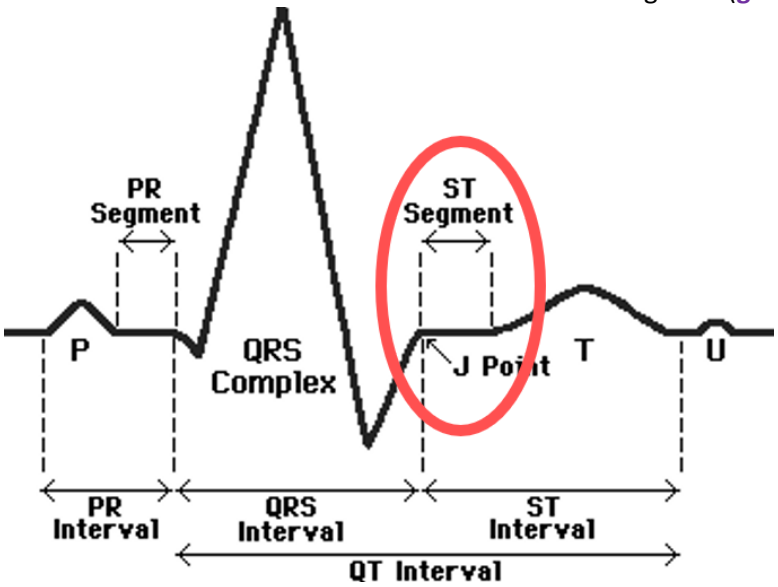


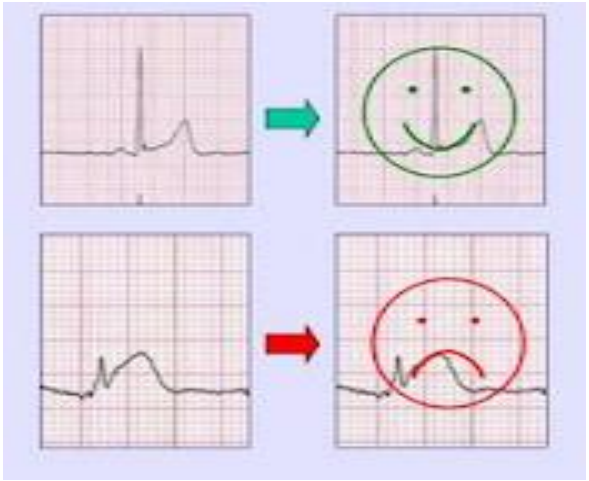


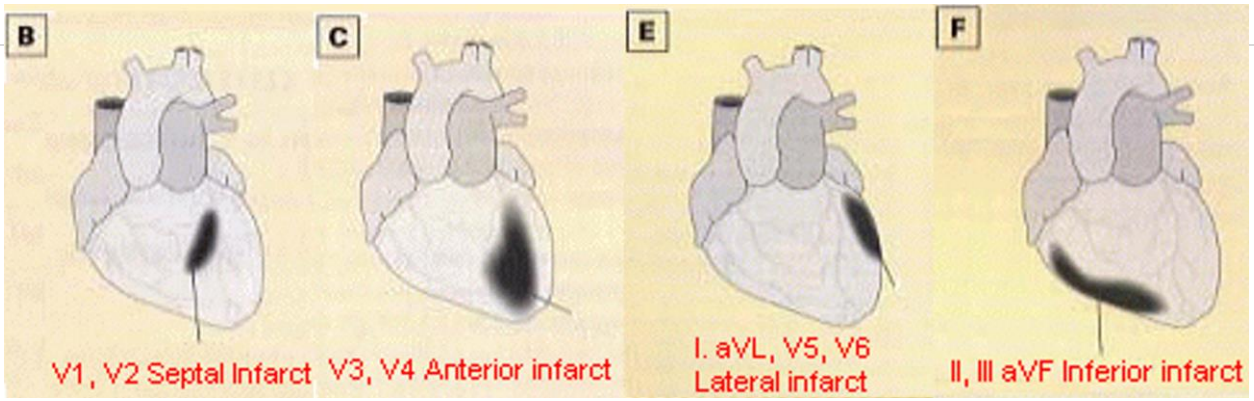
ST Elevation Suggestive of MI

One way to diagnose an **acute MI** is to look for elevation of the ST segment.

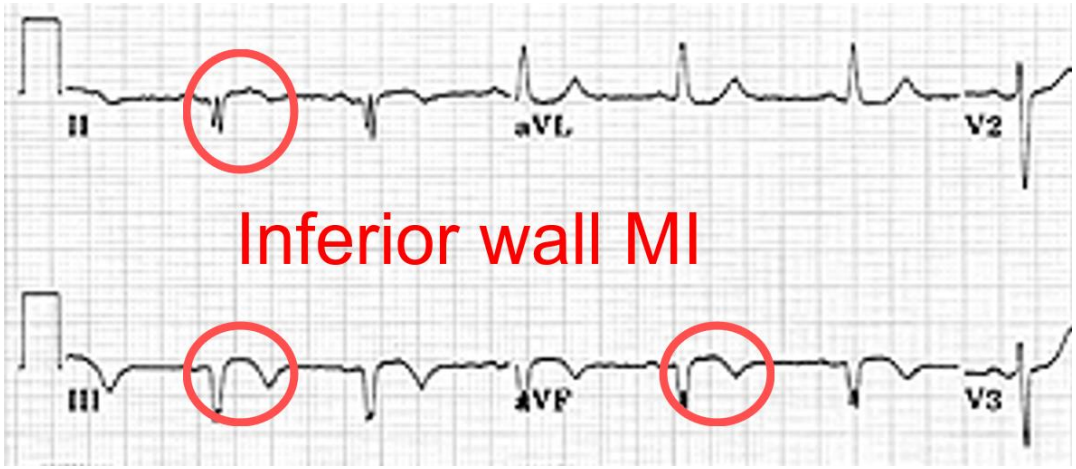
Elevation of the ST segment (**greater than 1 small box**) **in 2 leads** is consistent with a myocardial infarction.

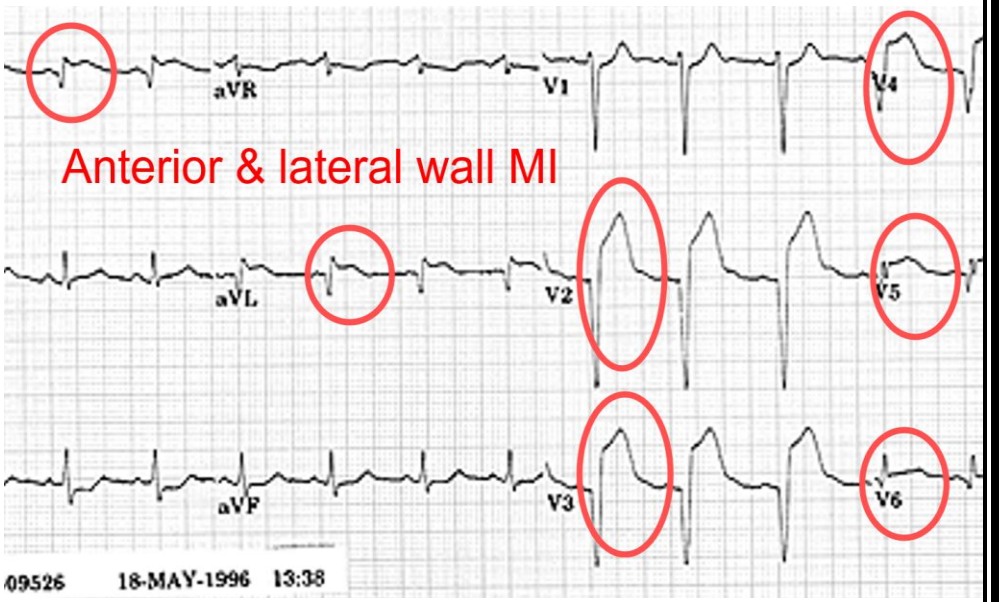


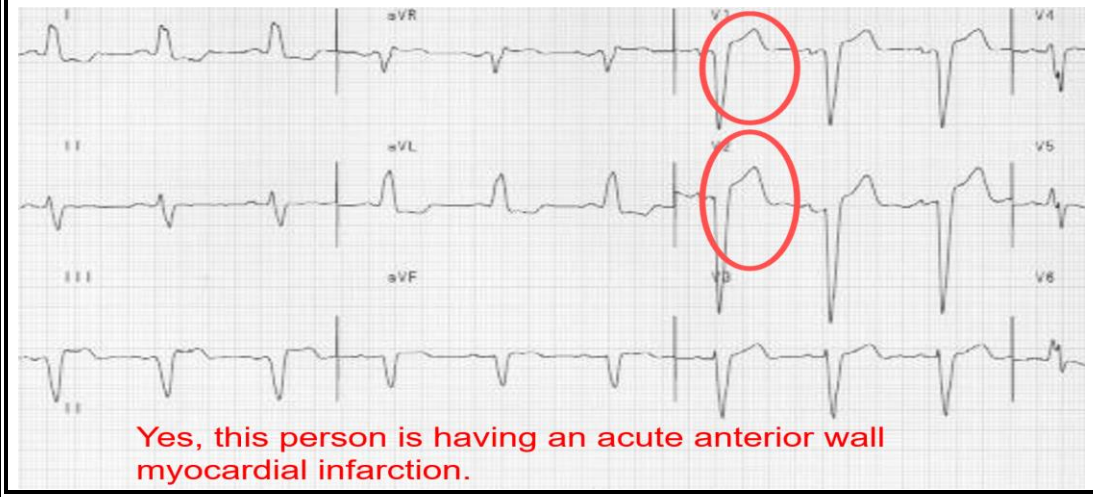




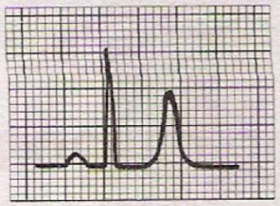
Interpretate where the myocardial infarction is



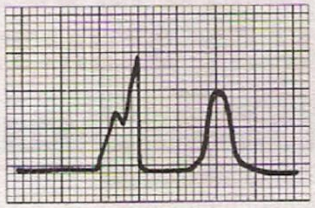




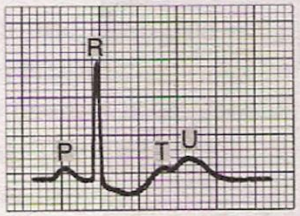
Normal tracing (plasma K^+ 4–5.5 meq/L). PR interval = 0.16 s; QRS interval = 0.06 s; QT interval = 0.4 s (normal for an assumed heart rate of 60).



Hyperkalemia (plasma K^+ ±7.0 meq/L). The PR and QRS intervals are within normal limits. Very tall, slender peaked T waves are now present.



Hyperkalemia (plasma K^+ ±8.5 meq/L). There is no evidence of atrial activity; the QRS complex is broad and slurred and the QRS interval has widened to 0.2 s. The T waves remain tall and slender. Further elevation of the plasma K^+ level may result in ventricular tachycardia and ventricular fibrillation.



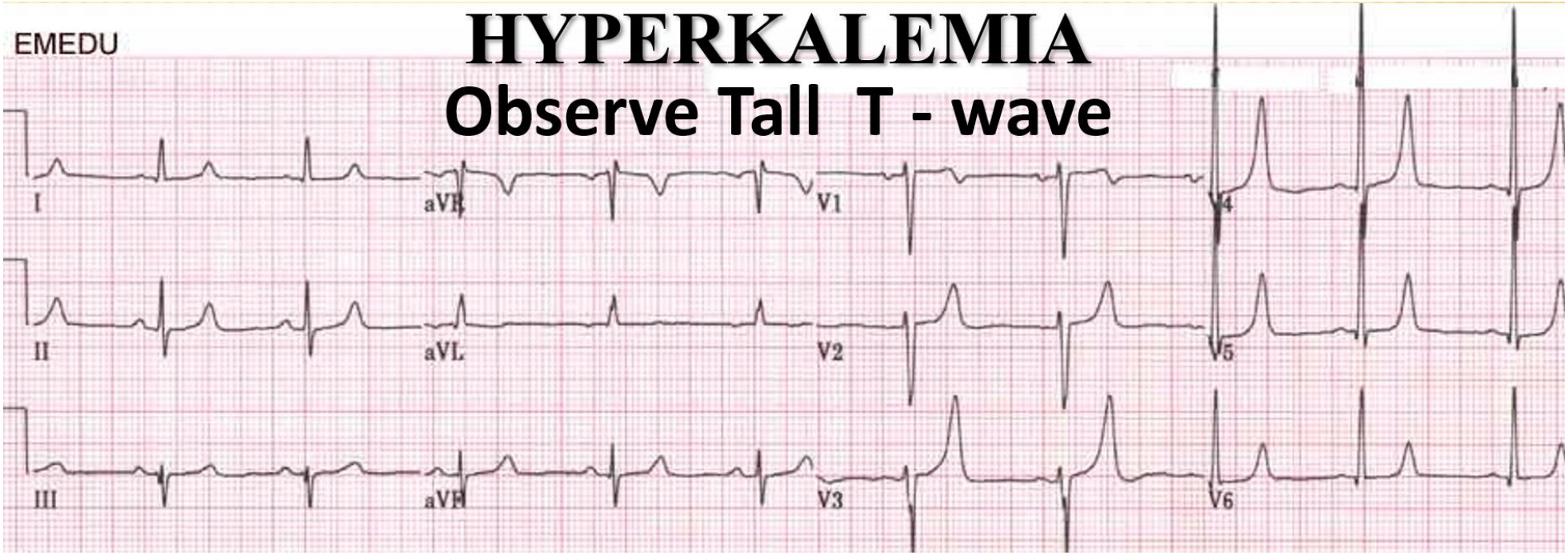
Hypokalemia (plasma K^+ ±3.5 meq/L). PR interval = 0.2 s; QRS interval = 0.06 s; ST segment depression. A prominent U wave is now present immediately following the T. The actual QT interval remains 0.4 s. If the U wave is erroneously considered a part of the T, a falsely prolonged QT interval of 0.6 s will be measured.

Hypokalemia (plasma K^+ ±2.5 meq/L). The PR interval is lengthened to 0.32 s; the ST segment is depressed; the T wave is inverted; a prominent U wave is seen. The true QT interval remains normal.

NORMAL

HYPERKALEMIA

HYPOKALEMIA


EMEDU
HYPERKALEMIA
Observe Tall T - wave
I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6

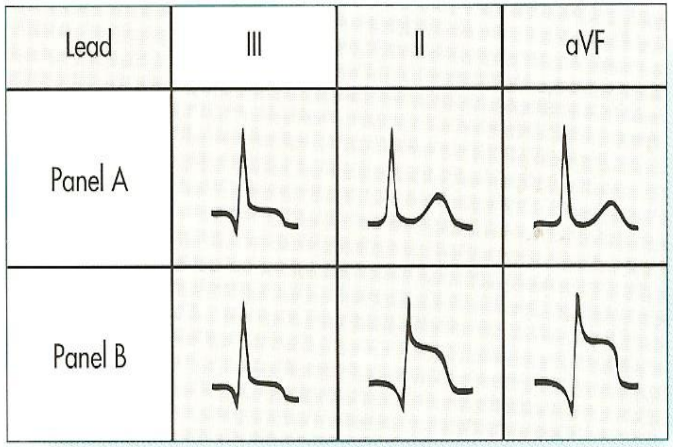


FIGURE 10-1: Illustration of the concept of ***"patterns of leads."*** Note how the ECG complex in **lead III** is virtually *identical* in appearance in both **Panel A** and **Panel B.** Should you consider the small q wave and subtle ST segment elevation that is seen in lead III of Panel A to be clinically significant? *Or is it more likely that these changes in lead III are significant in Panel B?*

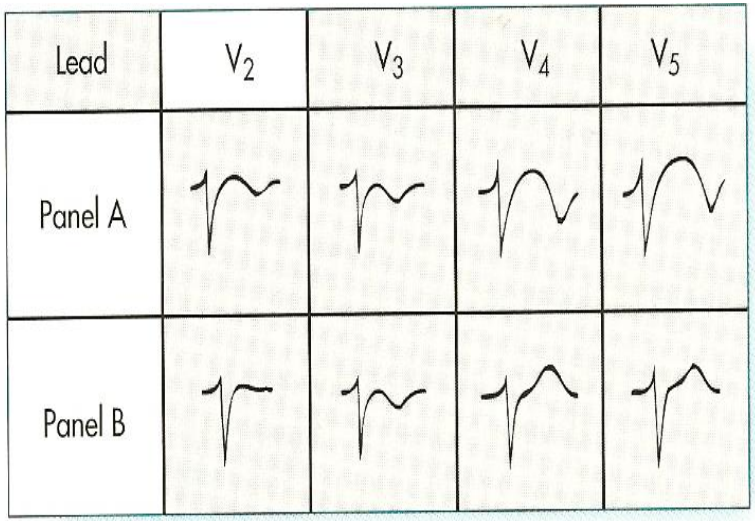
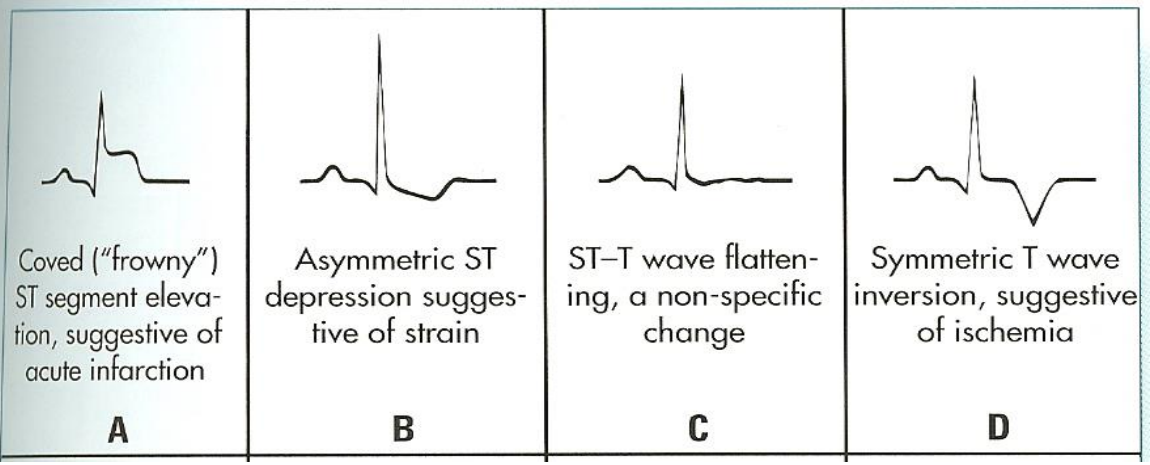


FIGURE 10-2: Additional illustration of the concept of *"patterns of leads."* Note that the ECG complex in **lead V_3** is virtually *identical* in appearance in both **Panel A** and **Panel B.** *Is the T wave inversion in lead V_3 of Panel B likely to be clinically significant?*

Answer to Figure 10-17:



What is the most likely cause of changes in ST seg. & T wave of each diagram?

Acute Myocardial Infarction

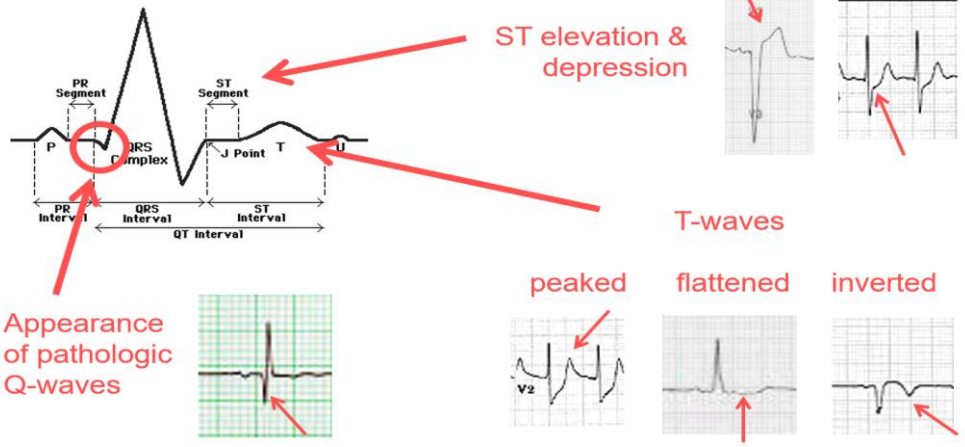
Summary

Reporting of ECG

A- Sinus rhythm
B- Heart rate of 75/ min
C- Normal QRS axis
D- Normal PR interval 0.12 sec
E- Normal QRS duration 0.8 sec
F- ST segment isoelectric in all leads
G- T wave normal & upright in all wave **except in aVR**

ECG Changes

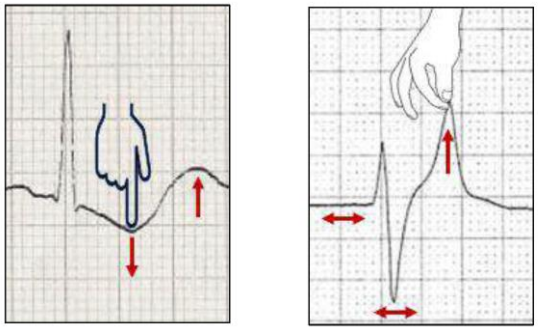
Ways the ECG can change include:



T Wave

Inverted T wave:
- Hypokalemia
- Bundle Block

Tall T Wave:
- Hyperkalemia

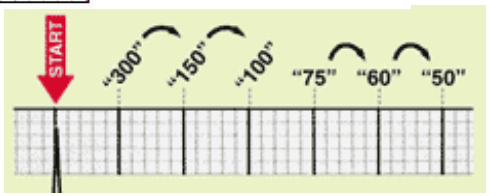


ST Segment

Normal:

Elevated:
- Myocardial Infraction

Depressed:
- Ischemia



Regularity	Rate	P waves	PR interval	QRS Duration	ST Segment	T Wave
Regular	90-95 bpm	Normal	0.12 s	0.08 s	isoelectric	Normal/Upright [except aVR]
Interpretation?						
Normal Sinus Rhythm						

Blood Pressure Measurement

Normal BP	Range	Equipment
120/80 mmHg (In Adults)	Systolic = 100-140 mmHg & Diastolic = 60-90 mmHg	Stethoscope | Sphygmomanometer | Bicycle ergometer /Treadmill

Objectives

- **Measure Blood Pressure using Sphygmomanometer**
- **Recognize the effect of**:
  - gravity [take blood pressure during supine, sitting and standing position].
  - exercise [take blood pressure before & after exercise].

Palpatory method

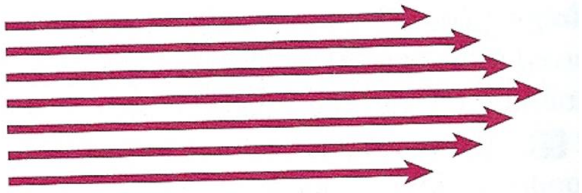
Auscultatory Method

Methods of measurement BP

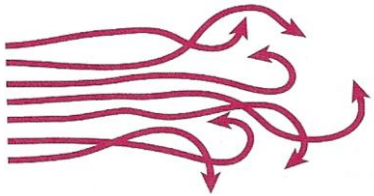
- **Palpatory method**: gives estimate of **Systolic BP only**
- **Auscultatory method**: allows Both **Systolic & Diastolic** to be measured.
- KOROTKOFF Sounds
- Laminar Flow, Turbulent Flow

DIFFERENCE BETWEEN LAMINAR & TURBULANT BLOOD FLOW

	Laminar	Turbulent
Flow	Normal Flow	Abnormal Flow
Movement	Blood moves in layers, with maximum velocity at the center	Blood moves in different directions and strikes the vessel wall.
Sound	No sound is produced	Sound is produced
Vessel	Fully open	Partially open

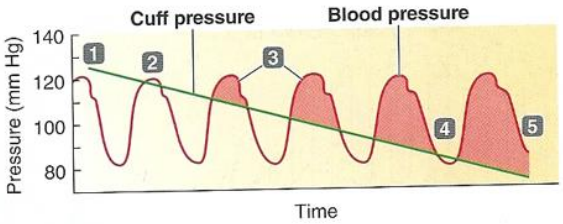


(a) Laminar flow (does not create any sound)



(b) Turbulent flow (can be heard)

Measurement of blood pressure



When blood pressure is 120/80:

When cuff pressure is greater than 120 mm Hg and exceeds blood pressure throughout the cardiac cycle:

No blood flows through the vessel.

1 No sound is heard because no blood is flowing.

When cuff pressure is between 120 and 80 mm Hg:

Blood flow through the vessel is turbulent whenever blood pressure exceeds cuff pressure.

2 The first sound is heard at peak systolic pressure.

3 Intermittent sounds are produced by turbulent spurts of flow as blood pressure cyclically exceeds cuff pressure.

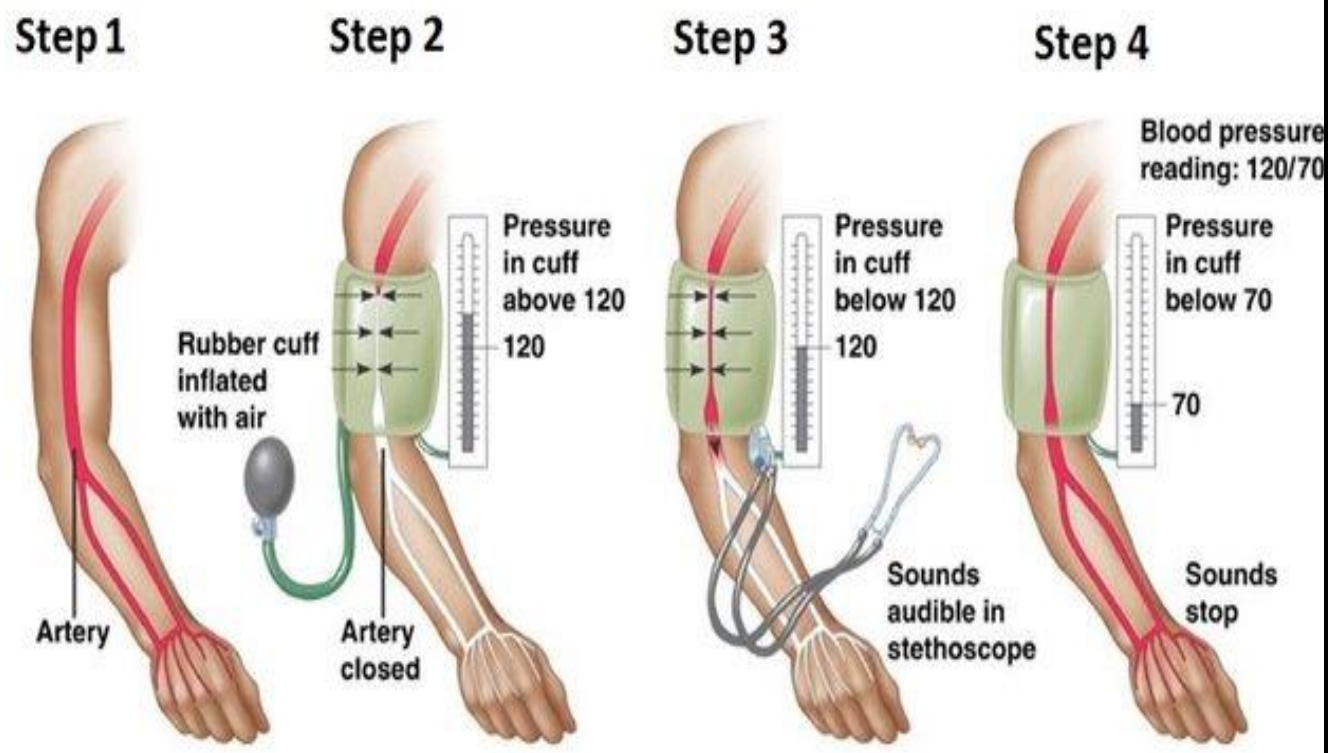
When cuff pressure is less than 80 mm Hg and is below blood pressure throughout the cardiac cycle:

Blood flows through the vessel in smooth, laminar fashion.

4 The last sound is heard at minimum diastolic pressure.

5 No sound is heard thereafter because of uninterrupted, smooth, laminar flow.

(b) Blood flow through the brachial artery in relation to cuff pressure and sounds



PRECAUTIONS WHILE TAKING BLOOD PRESSURE

- Cuff size – 12 × 24cms for adults [Cuff size is big for obese person and small for children].
- Apply cuff 4cms above elbow joint.
- Keep manometer at the level of heart.
- Subject should be comfortable.
- If subject coming after walking, should take rest for 5 – 10mins, then take BP to avoid effect of sympathetic stimulation.

Six tips for an accurate BP reading:

1. Place cuff over bare arm
2. Ask patient to uncross legs.
3. Ensure cuff fits properly.
4. Ask patient to keep still and be silent.
5. Position patient with arm supported, cuff at heart level.
6. Seat patient in a chair with back supported and feet flat on the floor or a footstool.

FACTORS AFFECTING BLOOD PRESSURE

BLOOD PRESSURE is affected by the following factors:

- Age – BP increases with age
- Sex
- Height, Weight
- Posture—Supine, Standing
- Emotions
- Exercise – there is increased cardiac output and

decrease in peripheral resistance, {due to vasodilation in skeletal muscle}, therefore systolic BP increases and diastolic BP decreases. Pulse pressure is increased.

Blood pressure measurement:
Measure accurately

Screening for high blood pressure

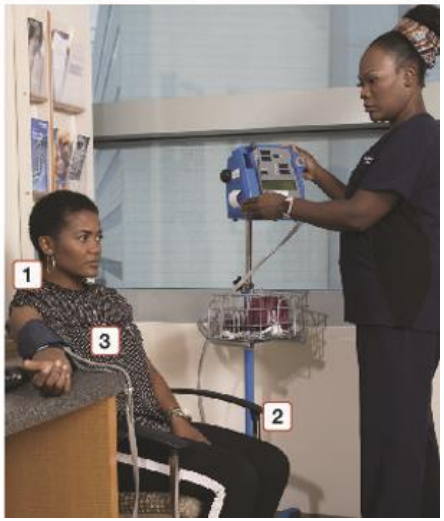
- Use a validated, automated device to measure BP
- Use the correct cuff size on a bare arm
- Ensure the patient is positioned correctly

If initial blood pressure is elevated, obtain a confirmatory measurement

- Repeat above steps
- Ensure the patient has an empty bladder
- Ensure the patient has rested quietly for at least five minutes
- Obtain the average of at least three BP measurements

Evidenced-based tips for correct positioning

- Ensure the patient is seated comfortably with:
  - [1] Back supported
  - [2] Legs uncrossed with feet flat on the floor/ supported with a stool
  - [3] Arm supported with the BP cuff at heart level
- Remain quiet: No one should be talking during the measurement



Formulas:

Pulse Pressure [PP] =

Systole BP – Diastole BP

Mean Arterial Pressure [MAP] =

Diastolic Pressure + 1/3 (PP)

ANSWER THE FOLLOWING QUESTIONS

BP is 120/80 mmHg

Q1. If you raise the mercury level in manometer to 130mmHg, will you listen any sound by stethoscope over brachial artery? No, Occlusion

Q2. If the mercury level is at 120mmHg, will you listen any sound? Yes, Turbulent flow sound starts at systolic 120 mmhg

Q3. If the mercury level is at 78mmHg, will you listen any sound? Why?

No, indicates end sound for Diastolic pressure at 80 mmhg, and sound can't be heard any lower since its becoming laminar flow.

Q4 Calculate the pulse Pressure [PP]:

= 120-80 = 40 mmhg

Q5 Calculate the Mean Arterial Pressure [MAP]

= 80 + (0.33 * 40) = 93.3 mmhg

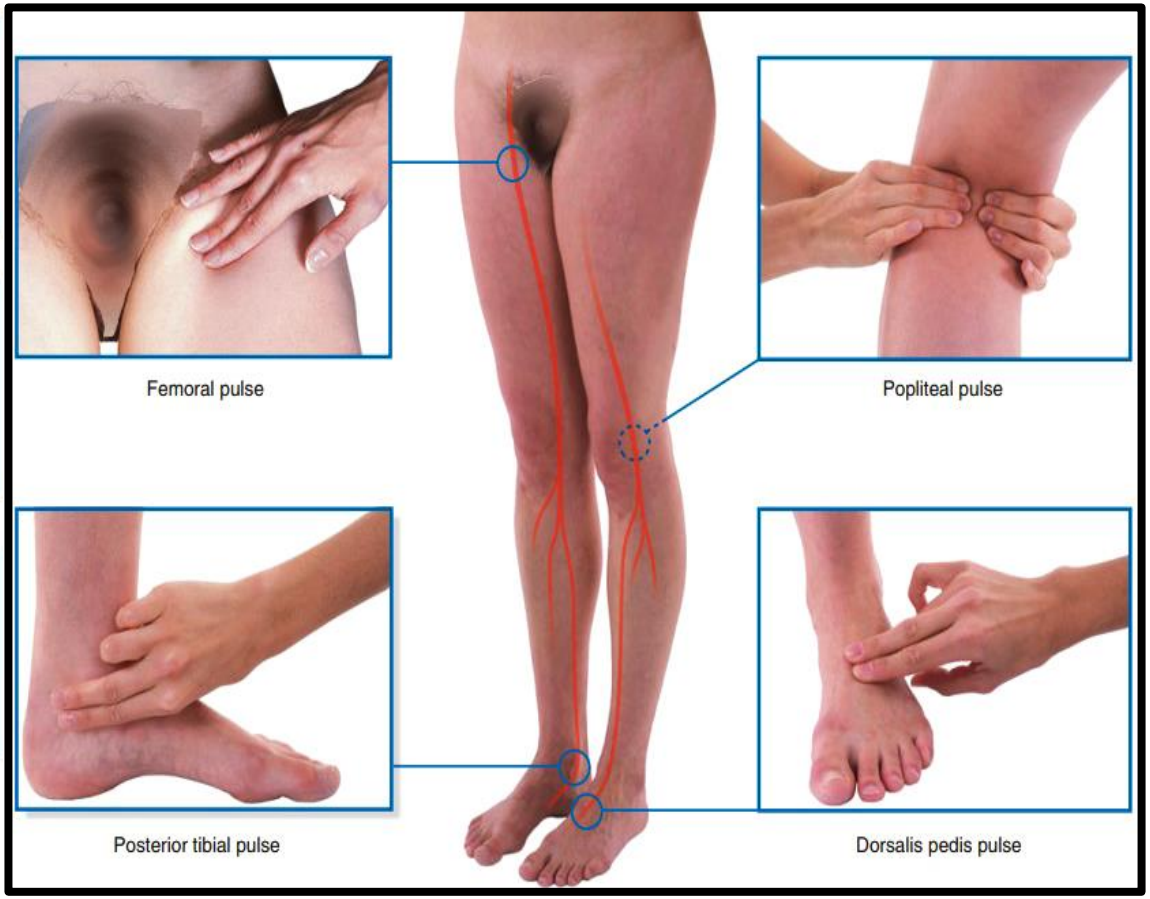
Physiology OSCE

#	Blood Pressure Performance Checklist		
1	Introduce yourself, Identify your patient		
2	Explain procedure, take permission & wash your hand		
3	Check Equipment		
4	**Position patient:** Sitting, his arm & back are supported, feet should be resting firmly on the floor, arm at the level of the heart		
5	Choose Appropriate size of the cuff & place it around the patient's arm [Line up the cuff marker with the brachial artery]		
6	Measure blood pressure accurately [Auscultatory Method]		
	A	Palpate the brachial artery [Just medial to the biceps tendon	
	B	Place the stethoscope's diaphragm over it	
	C	Inflate cuff to 20-30 mmHg above your approximate systolic BP measured earlier	
	D	Deflate the cuff slowly [Around 2-3 mmHg per second] & listen for Korotkoff's Sound	
	E	I	Record the **systolic BP** [1st Korotkoff's sound]
		II	Continue to deflate the cuff until the sounds completely disappears [5th Korotkoff's sound, then this is the **diastolic BP**] Record it
7	Tell the patient his readings & thank him		
8	Document in patient's files		
9	Communicate well with the patient, and address his concerns		

Full Guide Measuring blood pressure

https://www.youtube.com/watch?v=pP_6917sJW0&ab_channel=PhysiologypracticalsDr.ShitalGDr.Dipti

Pulse



1. Mention Heart rate
   Method 30 seconds [Pulse Rate * 2]

2. Is it synchronized? [Use two opposite pulse method]

3. Is pressure normal? [Detectable, strong, weak, undetectable Obstruction of artery]

History & Clinical Examination OSCE

Simplified History Examination

Most important tip in History & Clinical examination is to ask & explore more about the details in the abnormal things to make a great assessment then move to the next question after compiling comprehensive answer for the condition to be charted

#	Process	Includes
1	Introduction	Introduce yourself, Identify the patient, and mention the procedure
2	Patient Information	Full name, Role, Age, Personal Quality, Observations
3	Agenda	Needs patient for visit, Make full list of patient's concerns, summarize.
4	History of patient	Quality/Severity, Location/Radiation, Onset/Duration, Symptoms, Relieving Factors
5	Past medical history	Allergies/Drug reactions, Family History, Medical History, Surgical History, Immunization.
6	Warn about and Assess the Preventative/Risk Factors	Tobacco/Alcohol/Occupational/Sexual/Diseases/diabetes/overweight
7	Review of systems	1- General [Fever, weight change, overall weakness, depression] 2- Specific System [General change in normal characteristic of the body]

Simplified Clinical Examination

#	Process	Includes
1	Clinical Courtesy	Wash hands, make sure the patient understands your language & verbally say what examination you will take, and what you will do to the patient, respect comfort of the patient, Summarize the findings
2	Vital Sign	Determine Heart Rate, Blood Pressure, Respiratory Rate [Heart rate & Blood pressure mentioned in previous pages]
3	Other body systems	Assess physiological function of all body system, to exclude abnormality like [Inflamed Lymph, Enlarged Thyroid, slow pupil response to light, hearing problems, Inflamed tonsils, Rash etc…] - one body system could be enough if concern of patient and diagnosis is clear.

You can find the full assessment on this file/Link to gain the comprehensive idea of History & Clinical Examination

http://ksumsc.com/download_center/Archive/3rd/433/433%20Teams%20work/History%20taking%20%26%20examination/HISTORY%20TAKING%20AND%20PHYSICAL%20EXAM.pdf

History Taking (**CHEST PAIN)**	
Introduction	Introduced self – Keep privacy
	Demographic data including name, age, sex, nationality, occupation and marital status.
	Date and time of interview.
Chief Complaint	Symptom in patient words
	Duration of symptom
History of Present Illness	Must elicit all of the following: 1-Location 2 -Quality 3- Severity 4- Onset of symptom 5- Radiation. 6- Modifying factor. 7-Associated Symptom. 8- Review the involved system.
Past History	Medical.
	Surgical.
	Trauma.
Family History	Similar disease, Common disease
Drug History	Medications
Allergies	Drugs, Food
Social History	Smoking, Drugs abuse, Alcohol intake, Occupation

Clinical Examination – wash hands before starting procedure

Pulse Rate is —— Regular Normal volume Synced?

Heart & Blood Vessels

Jugular venous pulse inspection and measurement

PULSES: includes radial, dorsalis pedis, posterior tibial and carotids.

Precordial Examination

A) INSPECTION

Pulsations, Scars, Prominent blood vessels ,bulging

B) PALPATION:

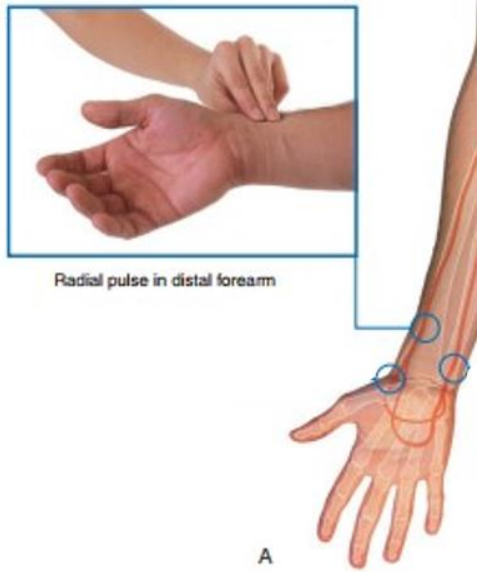
heart apex, trachea, left sternal heave and palpable second heart sound

C) PERCUSSION (LIMITED)

D) AUSCULTATION

of four areas including:

Aortic, pulmonary, tricuspid and mitral



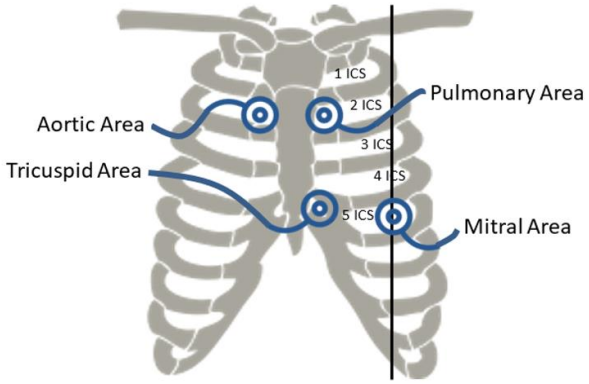


Fig. 2
Areas on the Precordium for Auscultation of Heart.

Biochemistry

Markers and their initial time findings for after initial Myocardial infarction

	Detected within	Returns to normal	Confidence
Myoglobin	1 – 4 H	1 D	**Nonspecific** [Skeletal muscle, Renal Tissue] — **Re-infraction after 1 day**
Troponin I [cTn I.]	4-6 H	>14 D	**100% Specific** [**Golden standard test**]
CK-MB	4-6 H	**3 days** of onset (**can be used for reinfarction after 3-14 days**)	**Nonspecific** – Less specific than Troponin I **~ 2nd Choice** [Skeletal Muscles] ***Best for initial Reinfarction***
AST	12H	6 D	**Non-specific** [Liver, & other organs]
LDH 1 & 2	12 H	14 D	**Nonspecific** [Liver, RBCs] [Ratio LDH1/LDH2] **> 0.75 flipped pattern Diagnostic**

Ranking of specific/Sensitive to less Specific/Sensitive

#	
1	cTn I
2	CK-MB
3	Myoglobin
4	AST / LDH

1- Myoglobin is the most specific bio markers for Myocardial Infarction **[False]**
2- CK-MBis the first ***enzyme*** to increase in myocardial infarction **[True]**
3- Cardiac troponin disappear from the blood after 3 days **[False]**

Mention TWO **non-enzyme** markers used for diagnosis of myocardial infarction **Myoglobin & Troponin I**

Case #1

Patient come with myocardial infraction **after 1 day** which biomarker can be used for diagnosis?

- **cTn I**
- **CK MB.**
- **AST**
- **LDH**

Case #2

A 47 year old diabetic woman come to the outpatient clinic suffered atypical chest pain of **myocardial infraction 10 days ago** . In order to confirm that the cause of chest pain is due to the occurrence of myocardial infarction in this lady, what are the **TWO biomarkers** can be used for diagnosis

1. **Cardiac Troponin I (cTn I).**
2. **LDH**

Case #3

A 45 year old woman come to the clinic suffered from substernal pain of myocardial **infraction 14 days ago** . In order to confirm that the cause of chest pain is due to the occurrence of myocardial infarction in this lady, what are the **TWO biomarker** can be used for diagnosis?

- **cTn I**
- **LDH**

Case #4

Patient come with **delayed admission** of myocardial infraction **after 10 h** which biomarkers can be used for diagnosis?

- **cTn I**
- **CK MB.**
- **Myoglobin.**

Case #5

Patient come with **delayed admission** of myocardial infraction **after 7 days** which biomarkers can be used for diagnosis?

- **cTn I**
- **LDH**

Case #6

Patient come with **re-infarction** **after 2 days** which biomarkers can be used for diagnosis?

- **Myoglobin**

Case #7

Patient come with **re-infarction** **after 3-4 days** which biomarkers can be used for diagnosis?

- **CK-MB**

Case #8

Patient come with **re-infarction** **after 11 days** which biomarkers can be used for diagnosis?

- **cTn I**

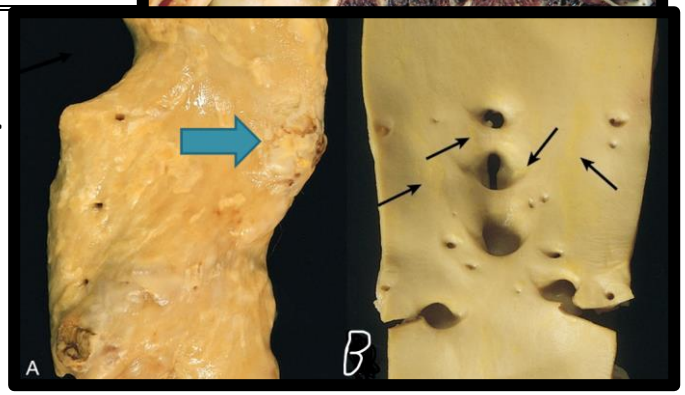
Pathology

I. Case Q1

A 55 year old male, suffering from DVT of lower limb has suddenly died. Autopsy examination was carried out. Following is the gross image of lung tissue.

Write the name of the Arrowed Lesion: Pulmonary Embolism

II. Case Q2

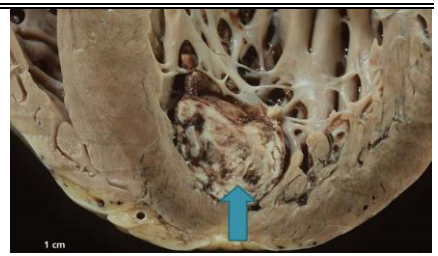


Write the name of the pathology (marked by arrows) observed in a segment of lower abdominal aorta.

A- Fatty Streaks

B- Atheroma

III. Case Q3

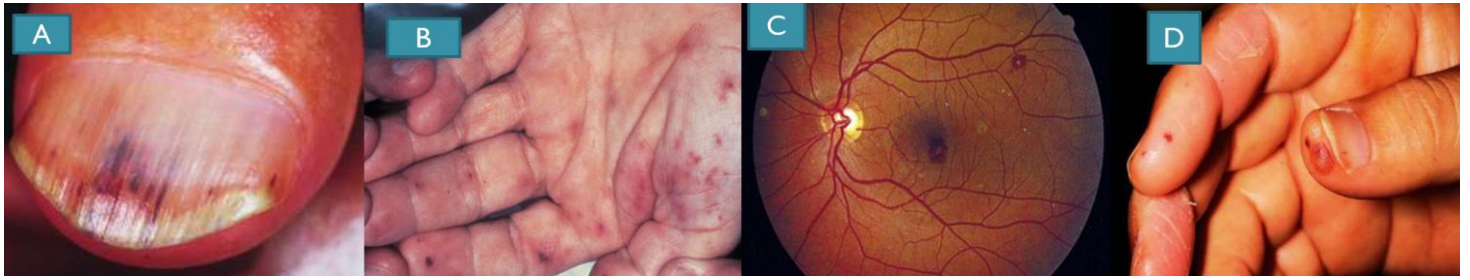


Write the name of pathology(marked by an arrow)
observed during autopsy examination in a known case of ischemic heart disease.

Mural Thrombus

IV. Case Q4

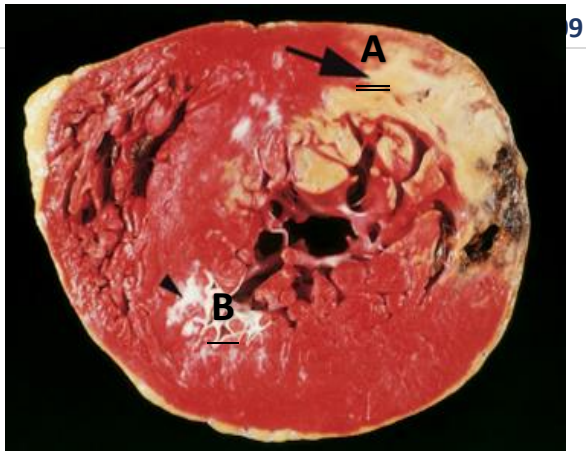
Write the name of the clinical features observed in a case of infective endocarditis.



Splinter Hemorrhage **Janeway Lesions** **Roth Spots** **Osler Nodes**

V. Case Q5

Write the name of lesion marked by an arrow and arrow head in the given gross image.

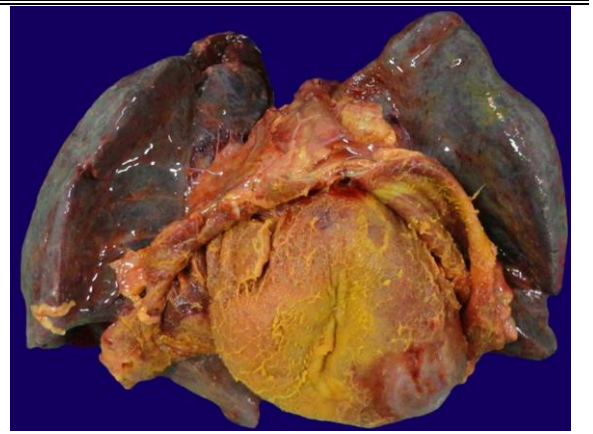


A- Recent/Acute myocardial Infarction

B- Old/Healed Myocardial Infarction

VI. Case Q6

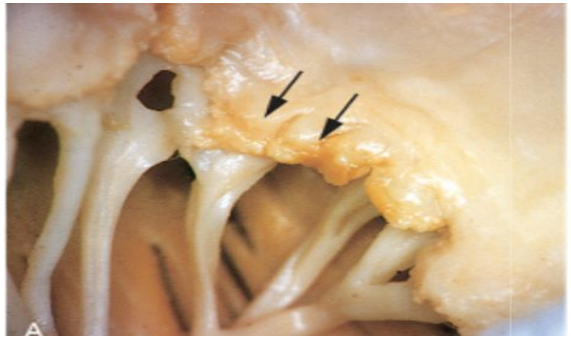
Write the name of the characteristic gross finding observed in heart in a case of acute rheumatic fever.



Bread & Butter / Pericarditis

VII. Case Q7

Following is the gross image of heart lesions in acute rheumatic fever.
Write the name of the characteristic lesions (marked by arrow).



Rheumatic Vegetations

VIII. Case Q8

Write the name of the clinical feature in a case of acute rheumatic fever given below.

Erythema Marginatum

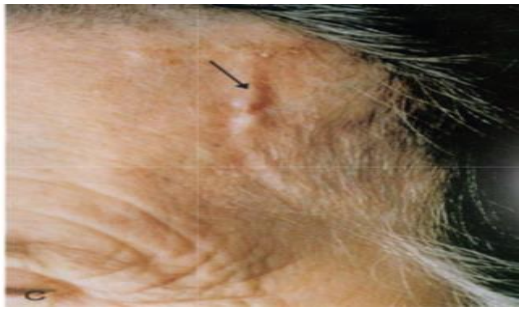
IX. Case Q9

Write the gross findings observed in mitral valve in a case of chronic rheumatic heart disease

Fish mouth / Mitral Stenosis

X. Case Q10

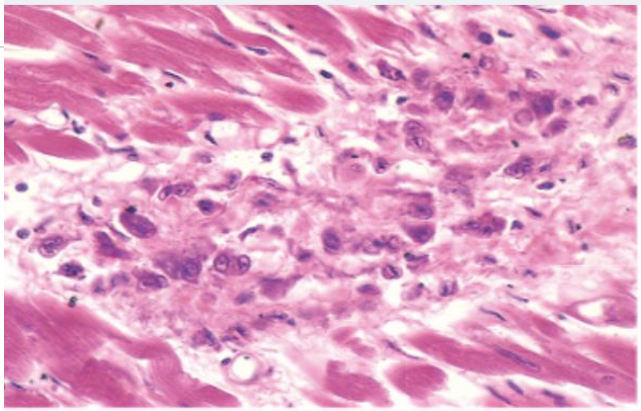
Write the diagnosis in a 55 year old male patient presenting with headache and facial pain along the course of the artery marked by an arrow.



Temporal Arteritis / Giant cell Arteritis

Case Q11

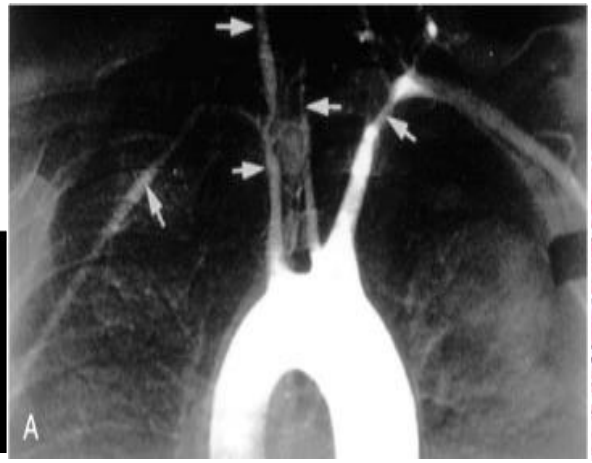
Write the name of the lesion observed in myocardium in a case of acute rheumatic fever.

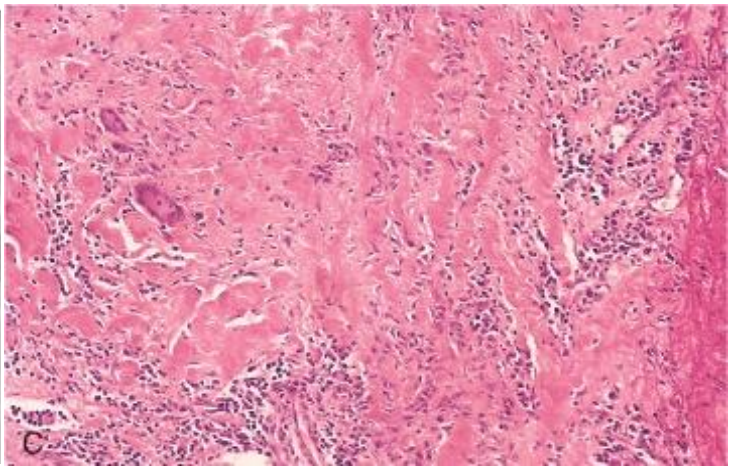


Aschoff Body

Case Q12

Write the probable diagnosis after analyzing the aortic arch angiogram, gross and microscopy of the carotid artery.



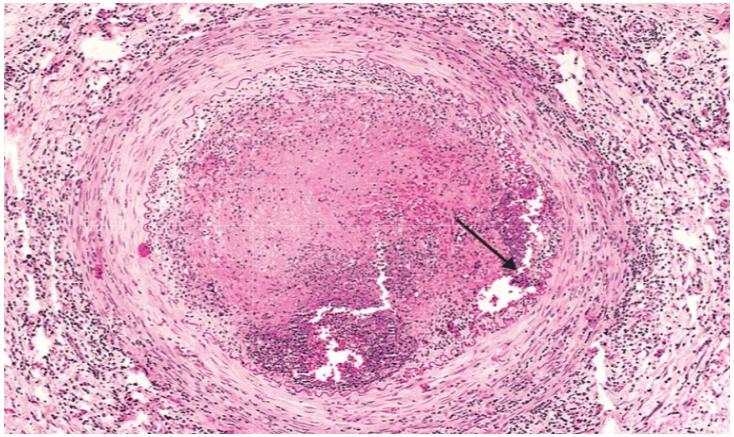


Pulseless Disease /

Takayasu Arteritis

Case Q13

Following is the H&E stained section of an artery showing lumen occluded by a thrombus containing abscesses (arrow), and the vessel wall infiltrated with leukocytes.



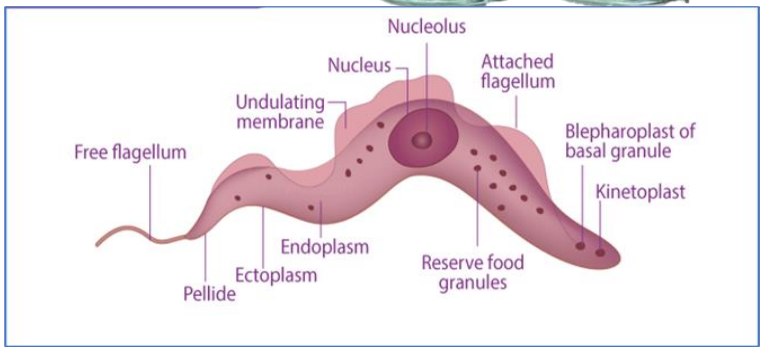
Buerger's disease

Microbiology

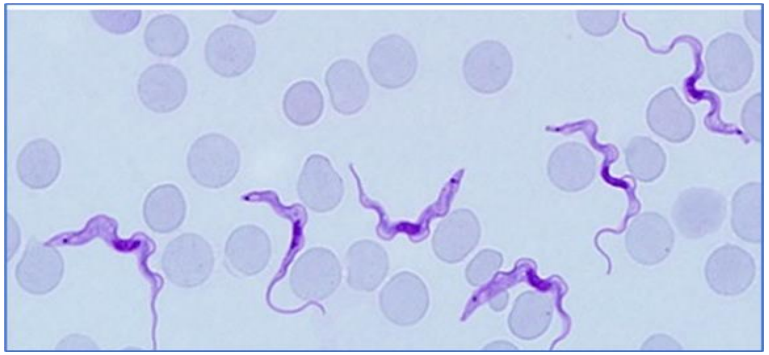
1- Blood Culture

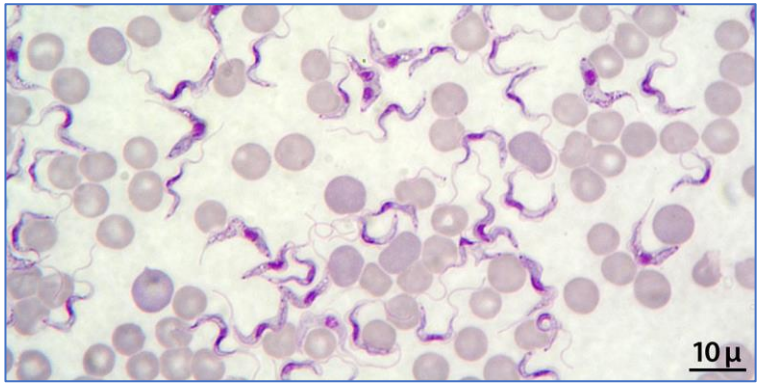
#	Blood Culture Significances		
1	**Blood volume extracted for Culture:**	10-20 ml for adults and 1–3 cc for a child	
2	**Incubation conditions:**	at 37 °C, aerobic and anaerobic for up to 7 days	
3	**Growth Indicators:**	**1.** Turbidity of Culture Media	**2.** Formation of Air bubbles
		3. Blood hemolysis	**4.** Surface Pellicle or colonies
4	**Clinical significance of the test:**	Diagnosis of Bacteremia and sepsis, & Infective Endocarditis	

2- Trypanosoma



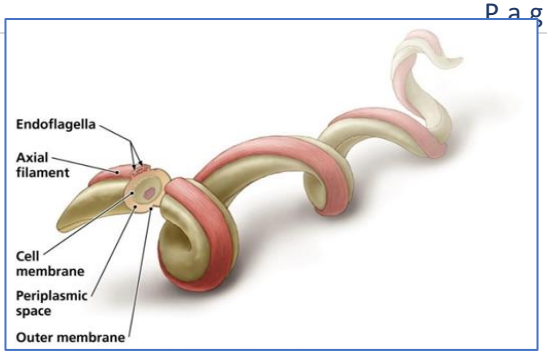
	Trypanosoma
Specimen & Stain Name	Blood smear stained by **Giemsa**
Classification of Microbe	**Blood and tissue Mastigophora:** Flagellated unicellular protozoa w/ an undulating membrane
Mode of transmission	Arthropod-bite
Disease caused by this microbe	**Chagas disease:** **Acute stage:** Chagoma | **Chronic stage:** Dilated Cardio Myopathy [DCM & Arrhythmia

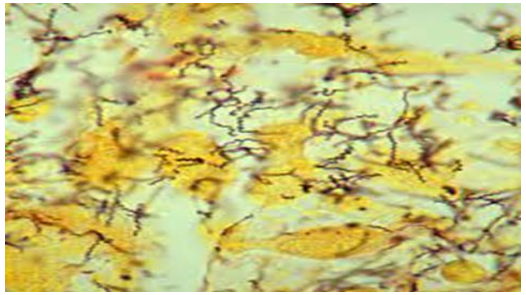




3- Treponema

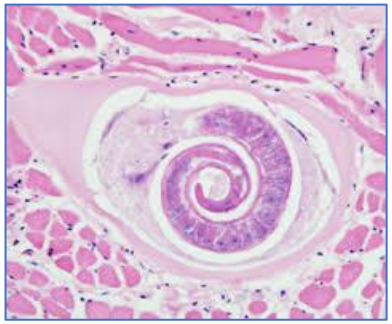
	Treponema
Specimen & Stain Name	Skin tissue stained by **Steiner Silver Stain**
Classification of Microbe	**Spirochete**
Complications	Cardiovascular syphilis & Aortitis, and Aortic Aneurysm
Serological Screening Test	**To detect anti-cardiolipin antibodies: VDRL** and **RPR**
Serological Confirmatory Test	**To detect anti-treponema antibodies: TPHA** and **FT-A**.





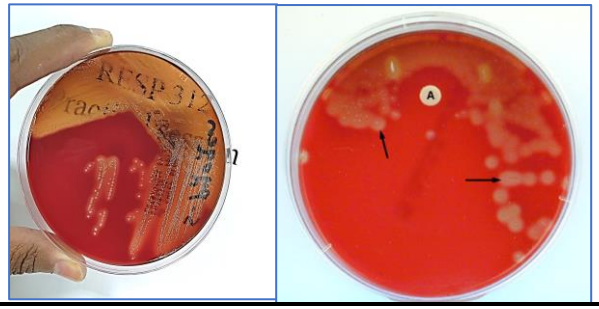
4- Trichinella Spiralis

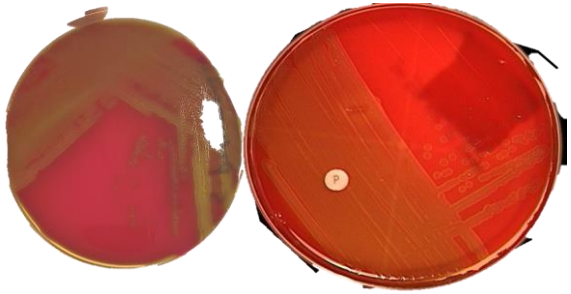
	Trichinella Spiralis
Specimen & Stain Name	**Muscle** biopsy stained by **H&E Stain**
Infective & Diagnostic Stage	**encysted larvae**
Classification	**Helminth (Nematoda)**
Mode of transmission	Ingestion of **contaminated pork meat**
Diseases caused by this parasite	**Trichinellosis** or **Trichinosis**



Bacterium

	5- Streptococcus Pyogenes [Group A]	6- Streptococcus Viridans	7- Staphylococcus Aureus + [Coagulase]
Cultural Characteristics Of Cultivation	**Beta-hemolytic** and **bacitracin sensitive**	**Alpha-hemolytic** bacteria & **optochin resistant**	**Beta-hemolytic**; **digestion of agar components, Golden Colonies on blood agar.**
Name of Biotyping test	**Bacitracin** test	**Optochin** test	**Coagulase test** (tube method)
C.L. Significance	Differentiate Streptococcus pyogenes (Group A) from non-Group A Streptococci	Differentiate Streptococcus pneumoniae from the viridans Streptococcus	Differentiate Staphylococcus aureus (coagulase positive) from other Staphylococci
Microbial I.D.	S. pyogenes - **Base of identification:** The microbe is Beta-hemolytic and Bacitracin sensitive.	viridans Streptococci – **Base of identification:** The microbe is Alpha-hemolytic and optochin resistant	
Diseases Associated by this pathogen	**1** Pyogenic tonsillitis **2** Acute rheumatic fever **3** Rheumatic heart disease	**1** Dental Caries and plaque gingivitis (poor personal hygiene). **2** **Sub-acute infective endocarditis**.	**1** Bacteremia and sepsis. **2** Toxemia and sepsis. **3** Acute infective endocarditis.

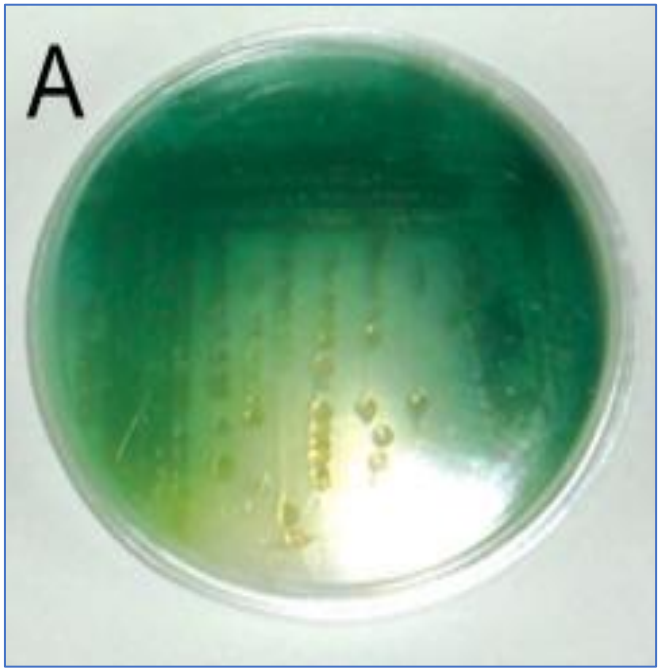


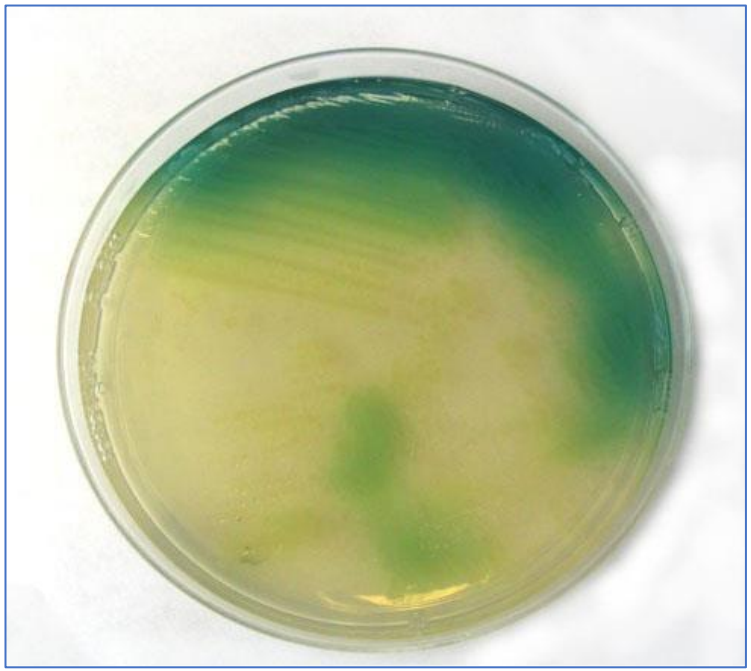


8- Pseudomonas Aeruginosa

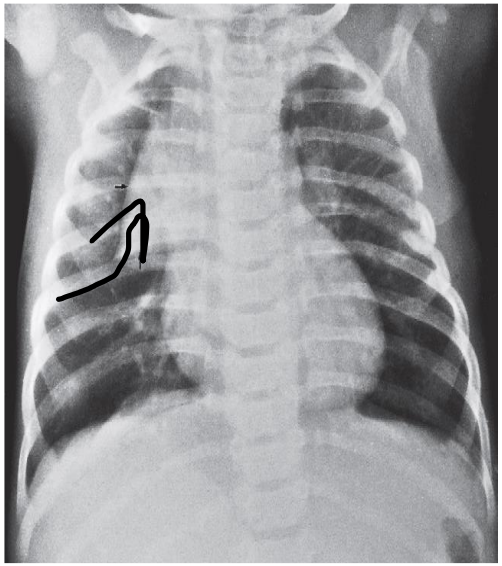
A blood culture taken from a patient with septic shock revealed the following microbe:

Microbial I.D.: Pseudomonas Aeruginosa	
Base of Identification: Cultural Characteristic	**Greenish exo-pigment production on nutrient agar**
Mechanism of Septic Shock Induction	**Activation of immune cells by lipopolysaccharide:** 1- Monocytes and macrophages activation 2- Complement System Activation





Radiology

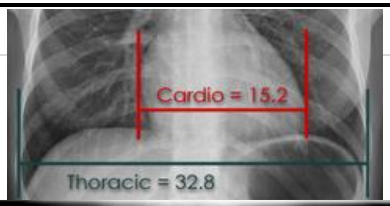


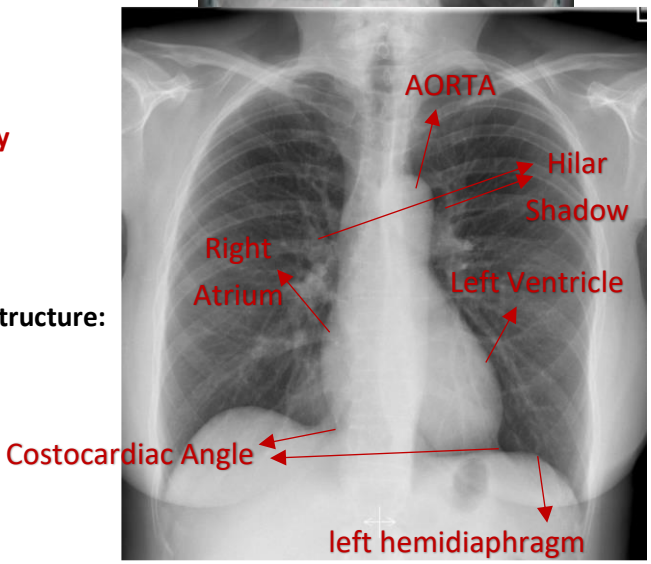
Child aged 3 months

Imaging modality ? Plain X-ray

Name of arrowed Opacified Structure:

Thymus Gland





Imaging modality ? Plain X-ray

Radiographic anatomy?

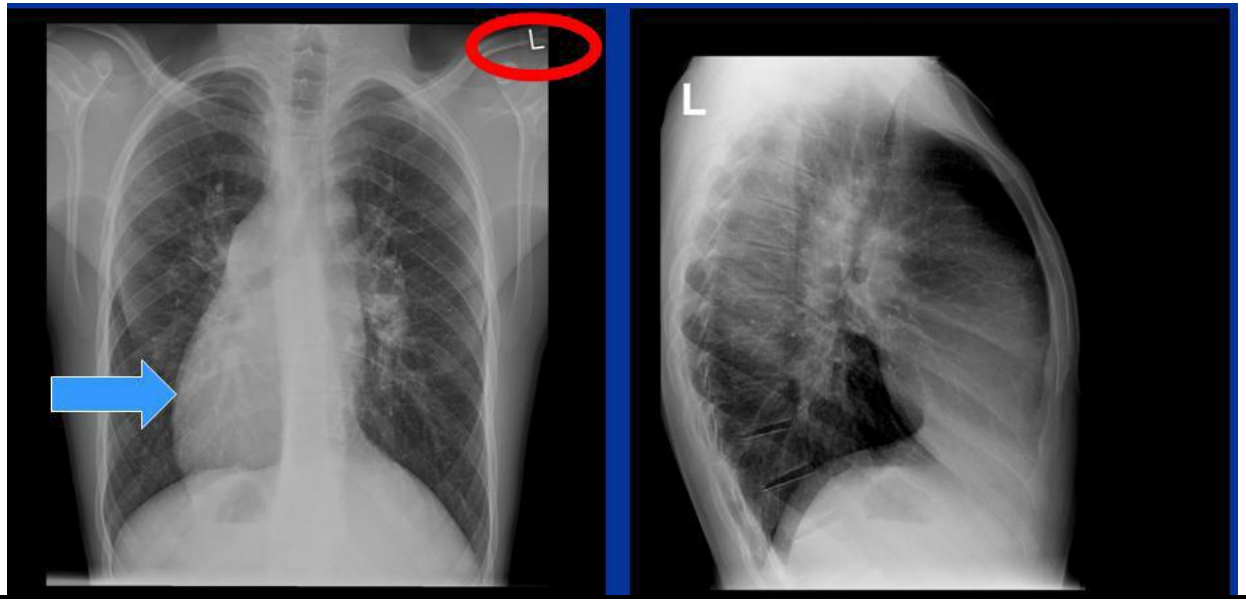
1. Cardiac and mediastinal boarders
2. Diaphragm

Cardio-thoracic ratio:

Should be less than 50% in adults otherwise its abnormal

Example:

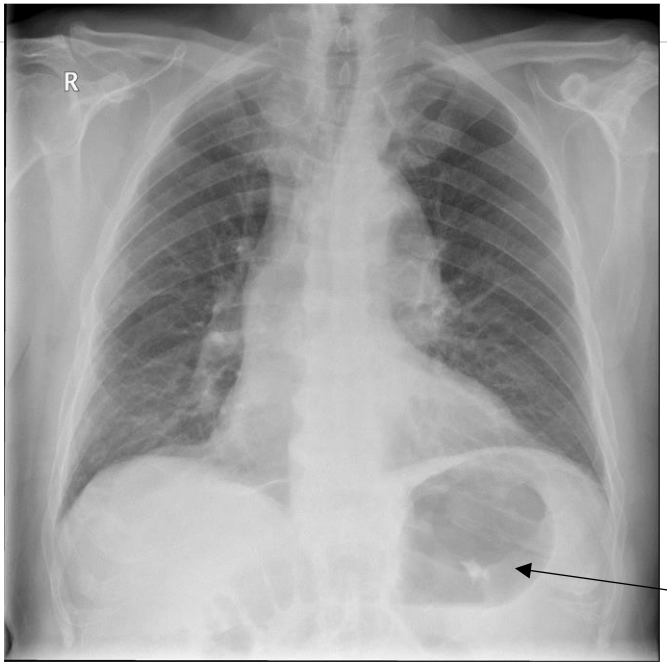
Cardio: 15.2 ÷ Thoracic: 32.8 x 100% = 46%



Imaging modality ? Plain X-ray

Name of abnormality?

Dextrocardia



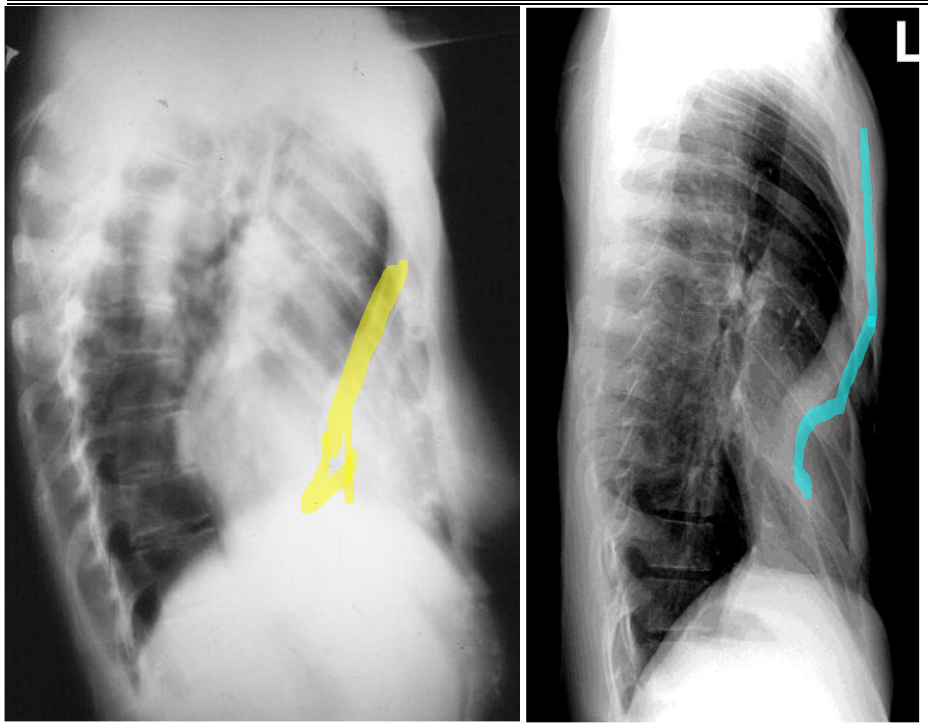
88 Year-old man

Imaging modality ? Plain X-ray

Most Likely cause of widen mediastinum?

Unfolded Aorta

GAS

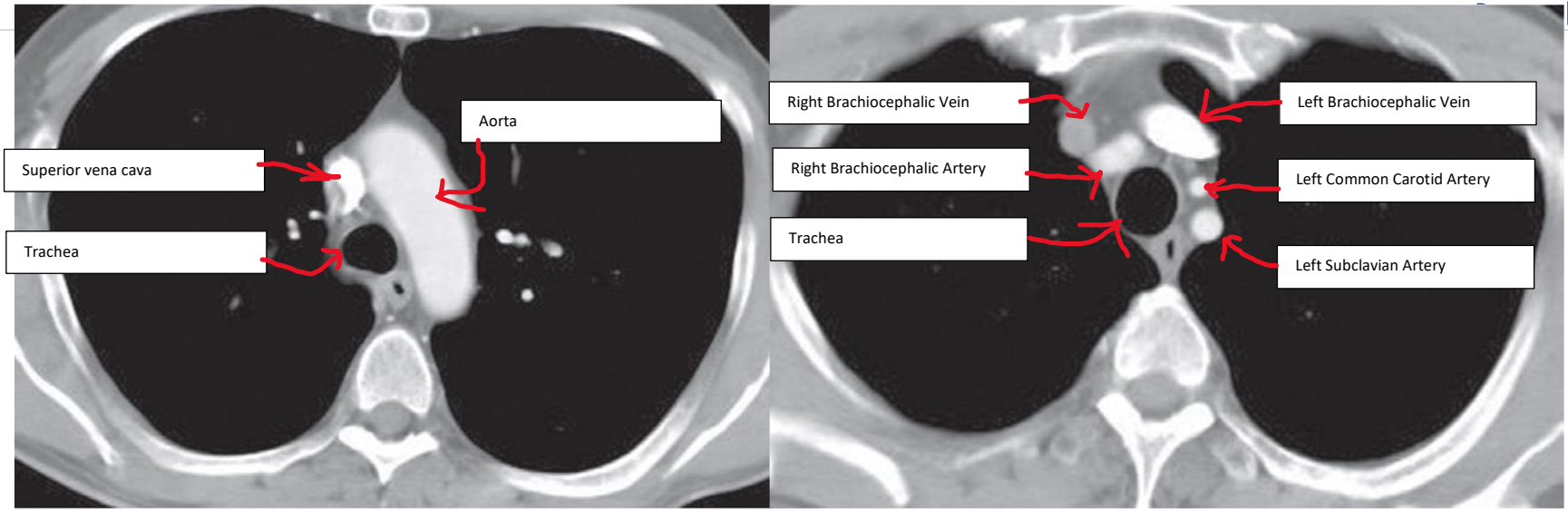


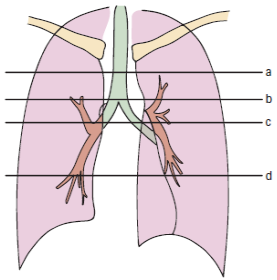
Imaging modality / View? Plain X-ray Lateral view

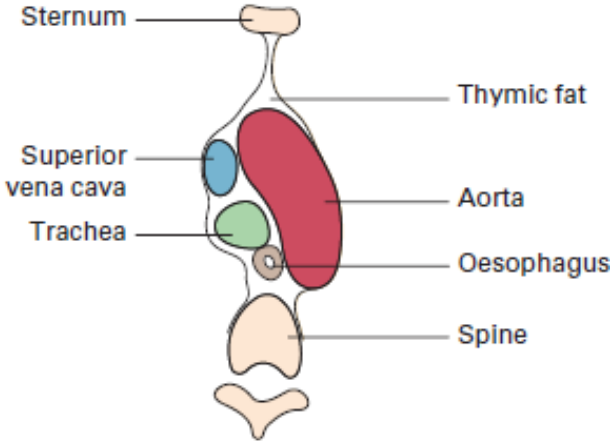
Name of Abnormality?

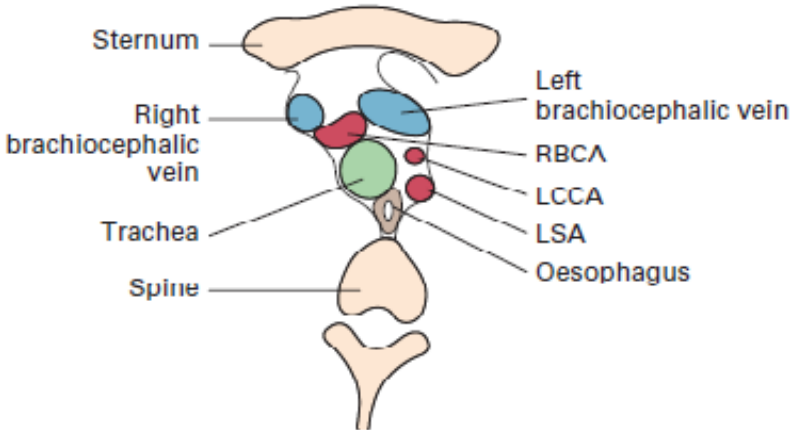
Congenital Deformity: Pectus Excavatum

~Backward Depression of Sternum



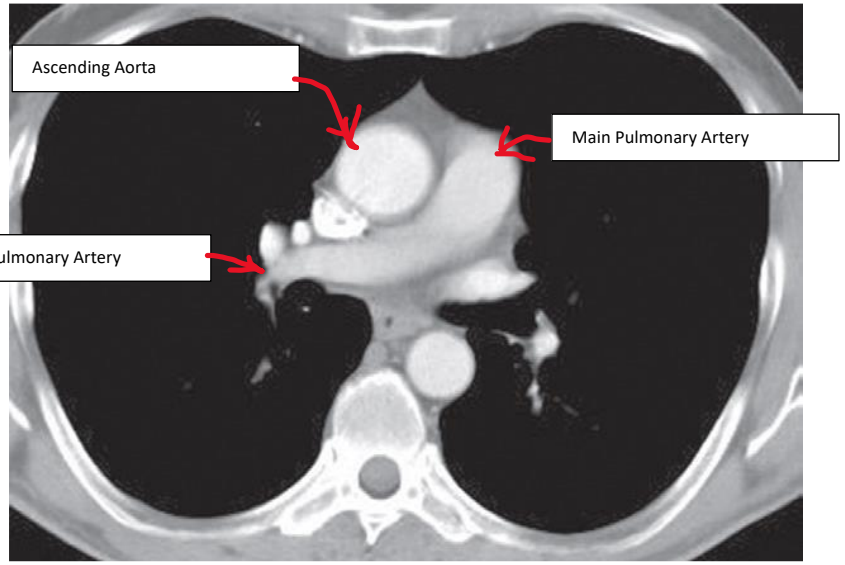


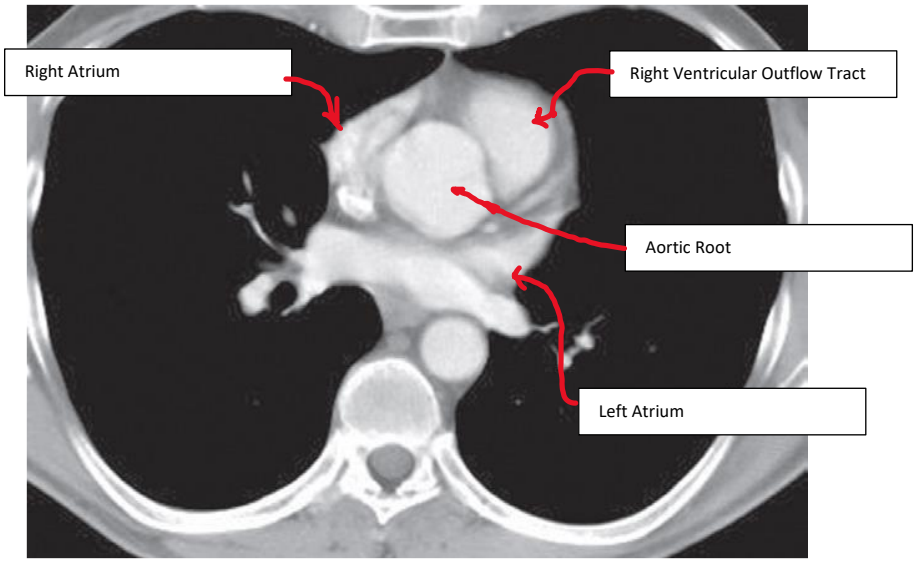


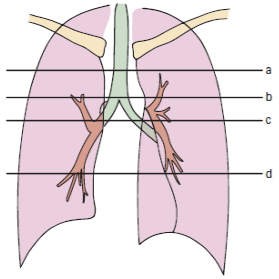


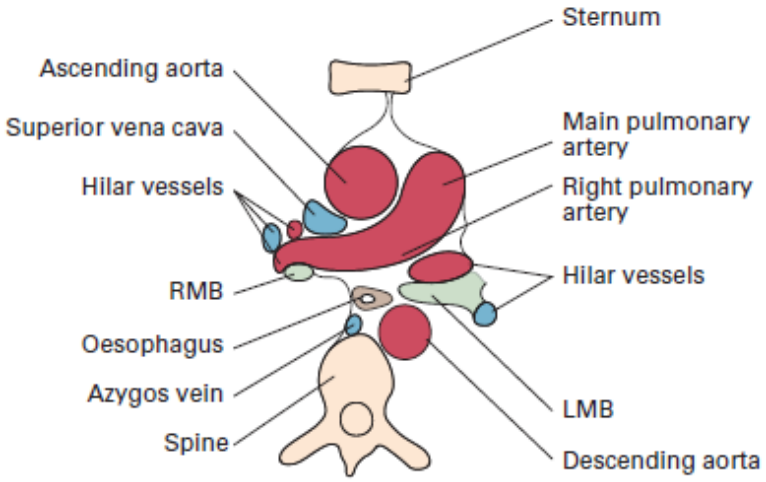
CECT of the normal mediastinum

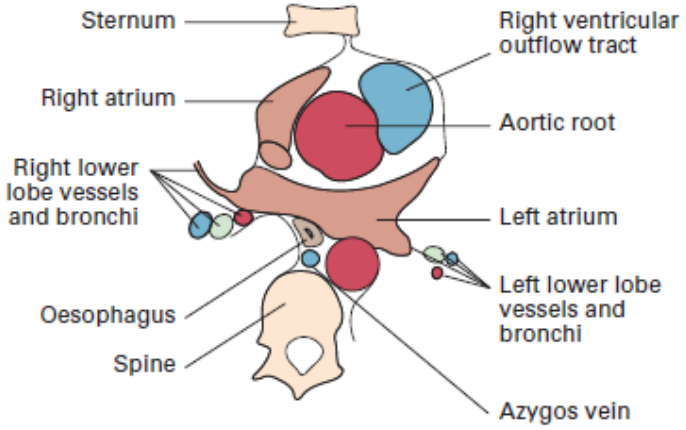
Imaging modality computerized tomography with contrast / examination/Study? Angiogram of mediastinum / Anatomy (Vessels)?





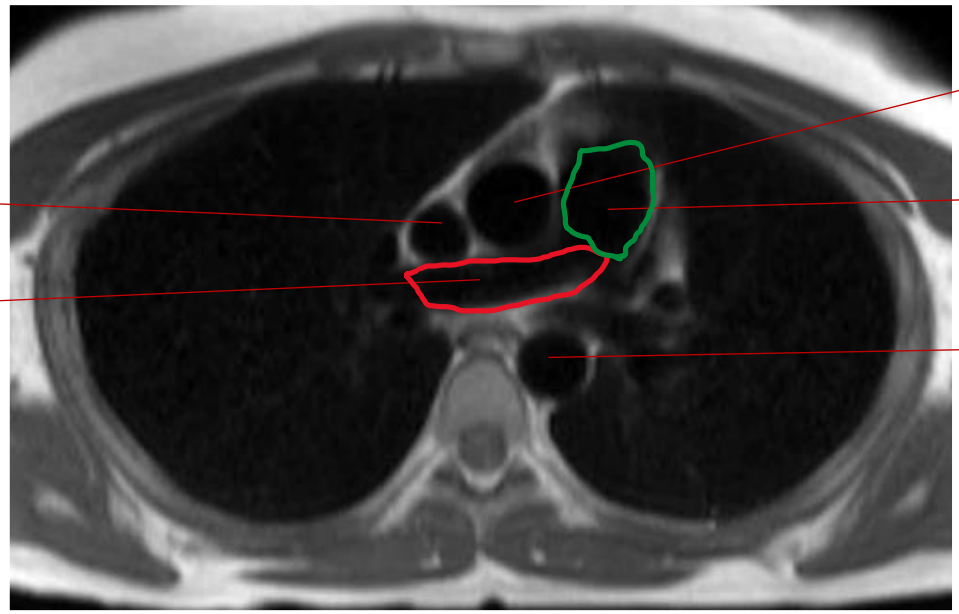




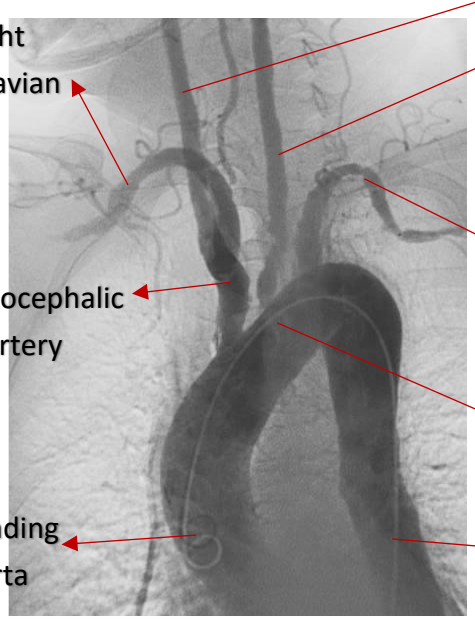


CECT of the normal mediastinum

Imaging modality computerized tomography with contrast / examination / Study? Angiogram / Anatomy ? (vessel)?



Catheter Angiography

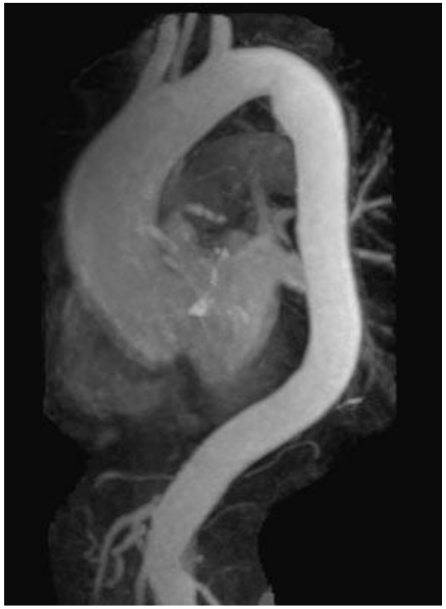


Imaging modality / examination/ Study?

Catheter Arteriography/Angiography

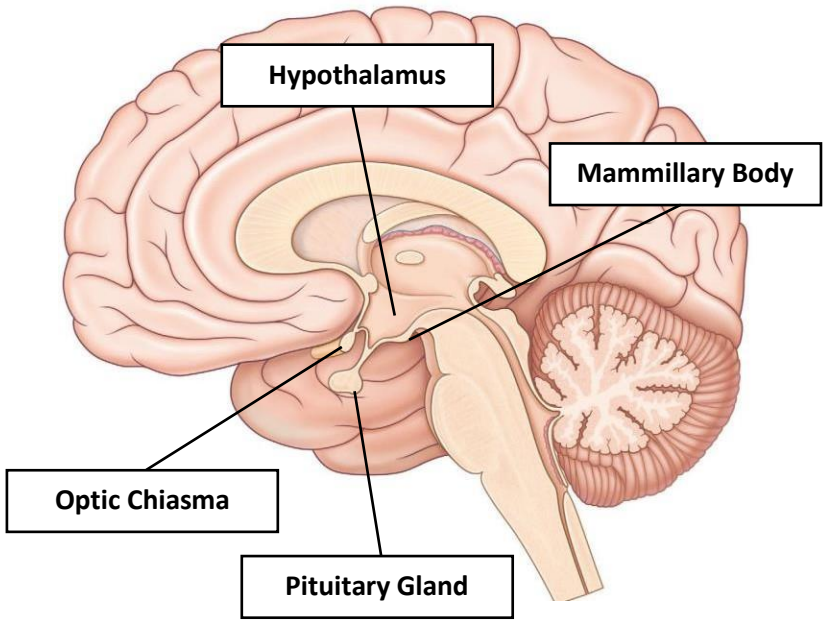
Anatomy (Vessels)?

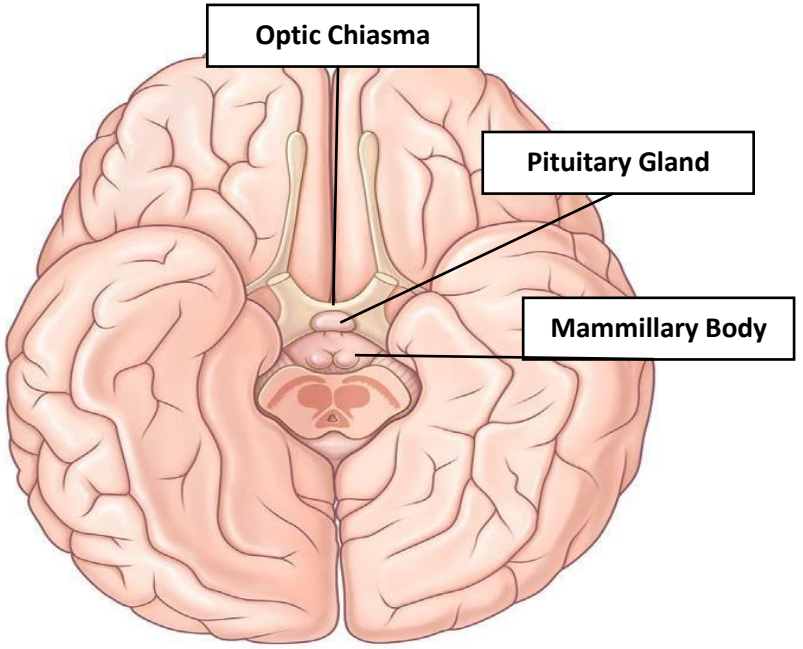
Magnetic resonance angiography (MRA)

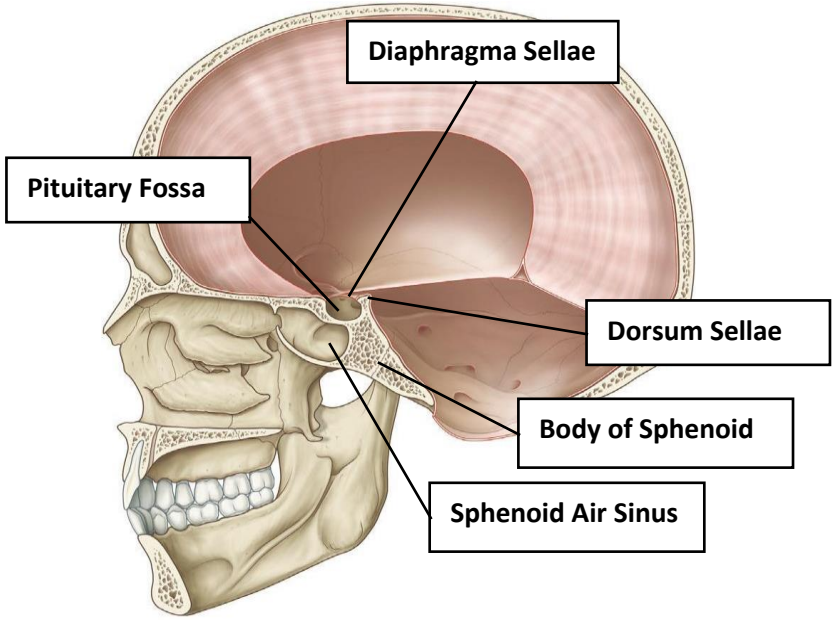


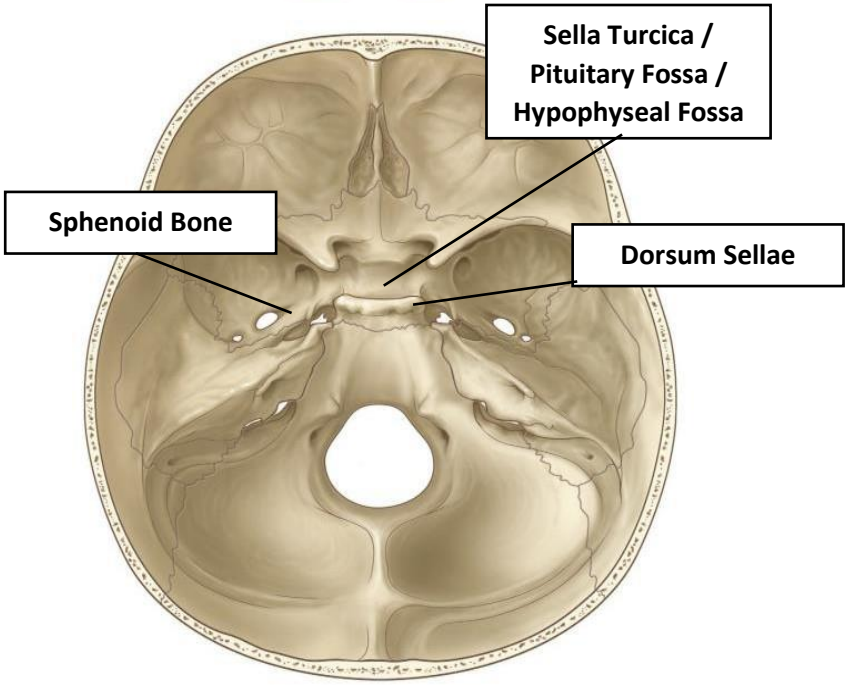
ENDO

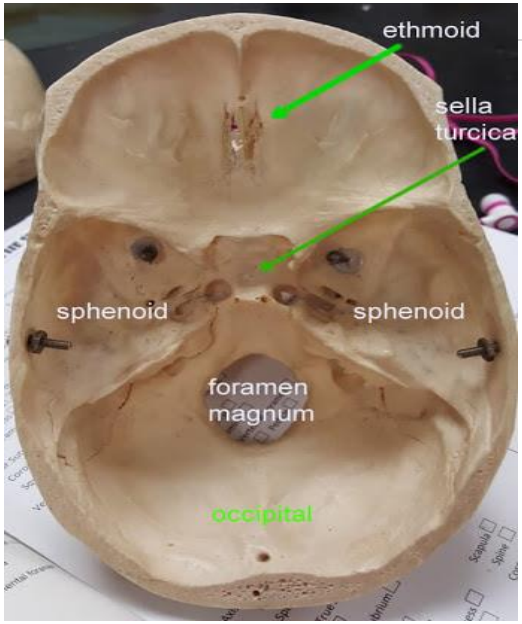
Anatomy

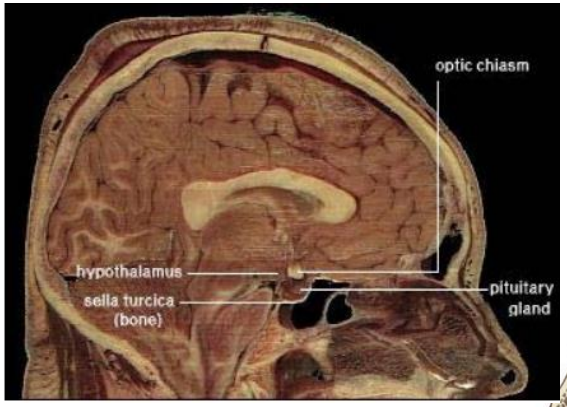

Hypothalamus
Mammillary Body
Optic Chiasma
Pituitary Gland

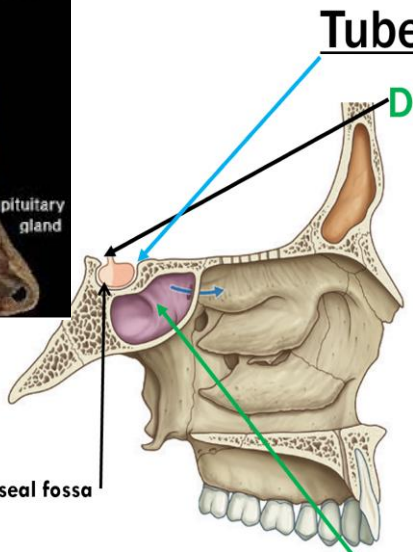

Optic Chiasma
Pituitary Gland
Mammillary Body

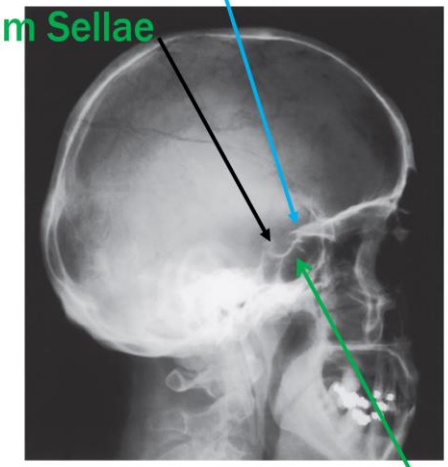

Diaphragma Sellae
Pituitary Fossa
Dorsum Sellae
Body of Sphenoid
Sphenoid Air Sinus

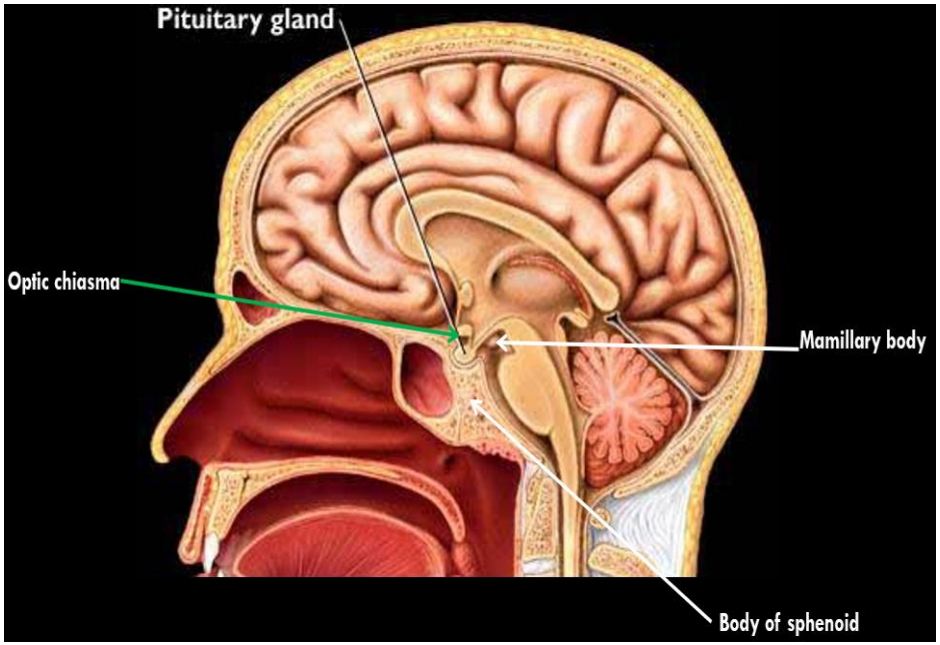

Sella Turcica /
Pituitary Fossa /
Hypophyseal Fossa
Sphenoid Bone
Dorsum Sellae

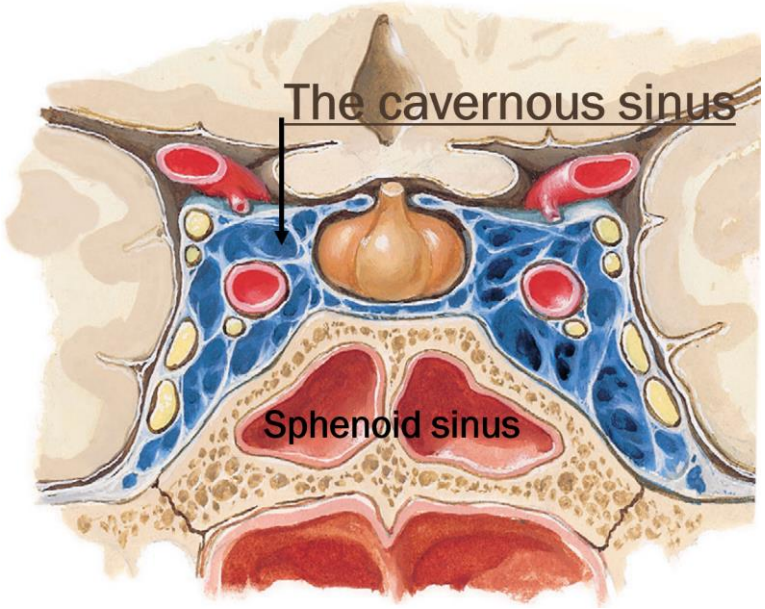

ethmoid
sella turcica
sphenoid
sphenoid
foramen magnum
occipital


optic chiasm
hypothalamus
sella turcica (bone)
pituitary gland

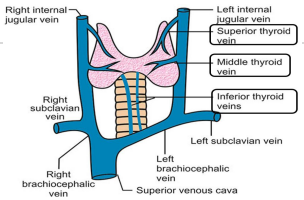

Tuberculum sellae
Dorsum Sellae
Hypophyseal fossa


Body of sphenoid & Sphenoidal air sinus

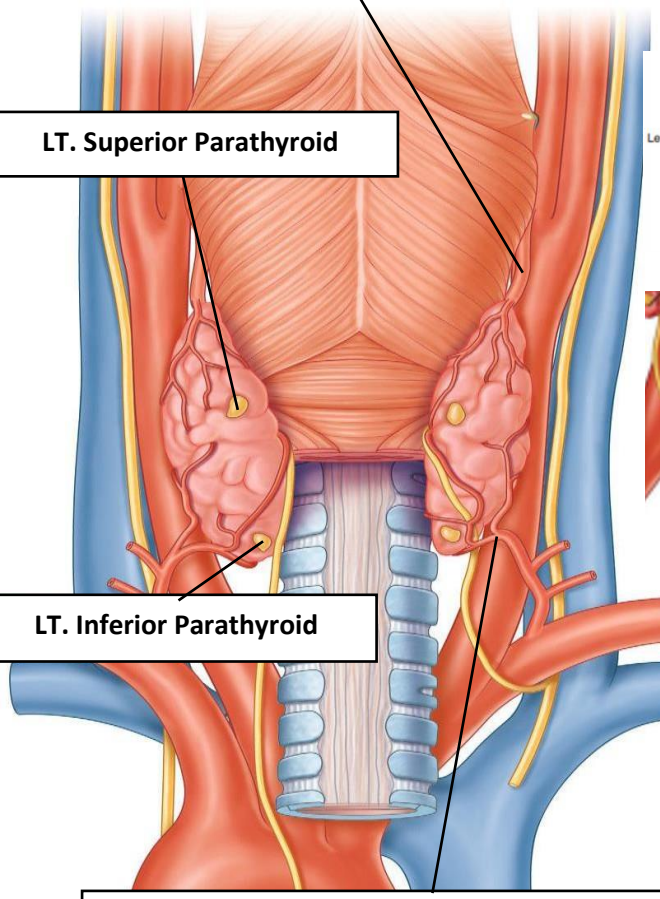

Pituitary gland
Optic chiasma
Mamillary body
Body of sphenoid


The cavernous sinus
Sphenoid sinus

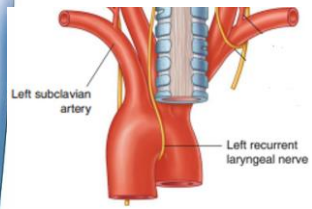
Superior Thyroid A.
Origin: External Carotid A.
Accompanied by: External Laryngeal N.



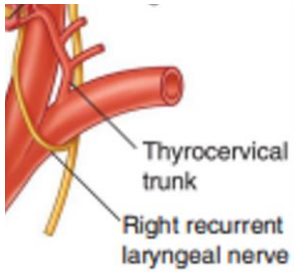
Isthmus
Relations Anteriorly: Sternothyroid, Sternohyoids, ANT. Jugular V., Fascia, Skin
Relations Posteriorly: 2nd-4th Rings of trachea



LT. Superior Parathyroid



RT. Superior Thyroid V.
Drains: Internal Jugular V.



RT. Superior Thyroid

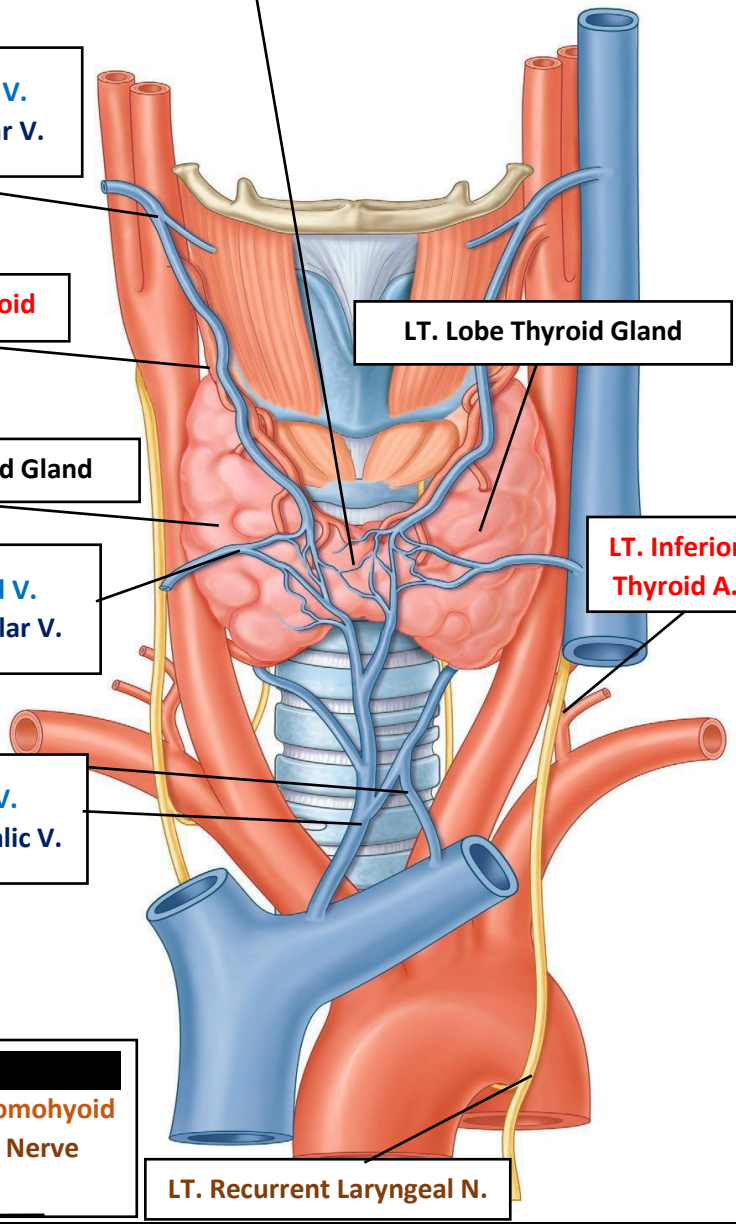
LT. Lobe Thyroid Gland

RT. Lobe Thyroid Gland

LT. Inferior Parathyroid

RT. Middle Thyroid V.
Drains: Internal Jugular V.

LT. Inferior Thyroid A.



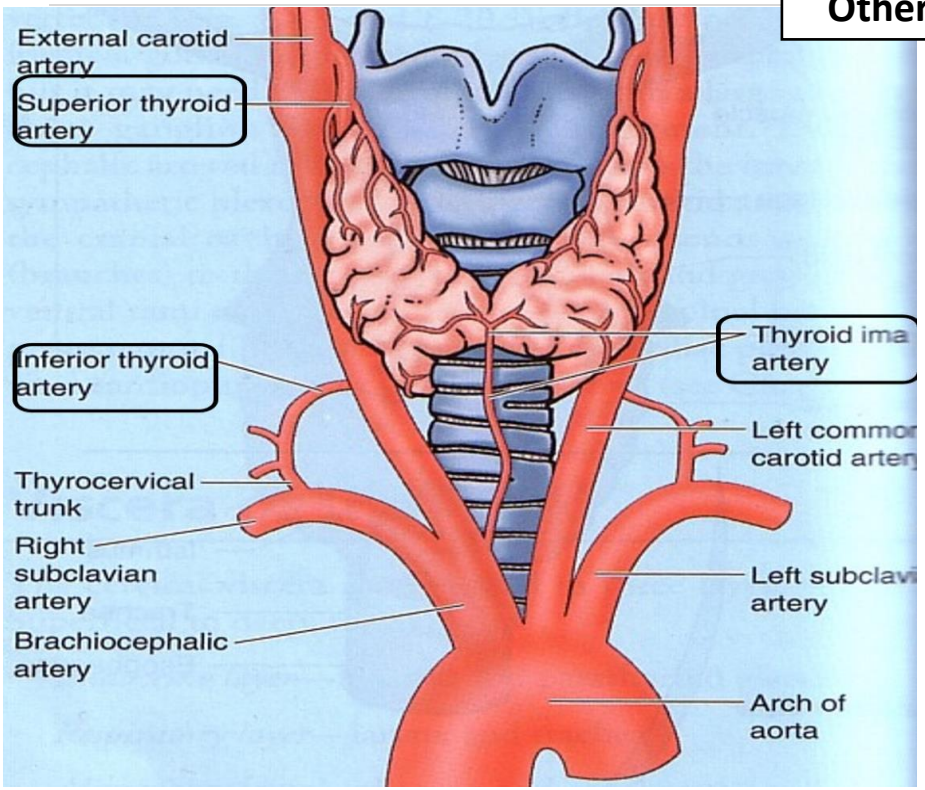
RT. Inferior Thyroid V.
Drains: LT. Brachiocephalic V.

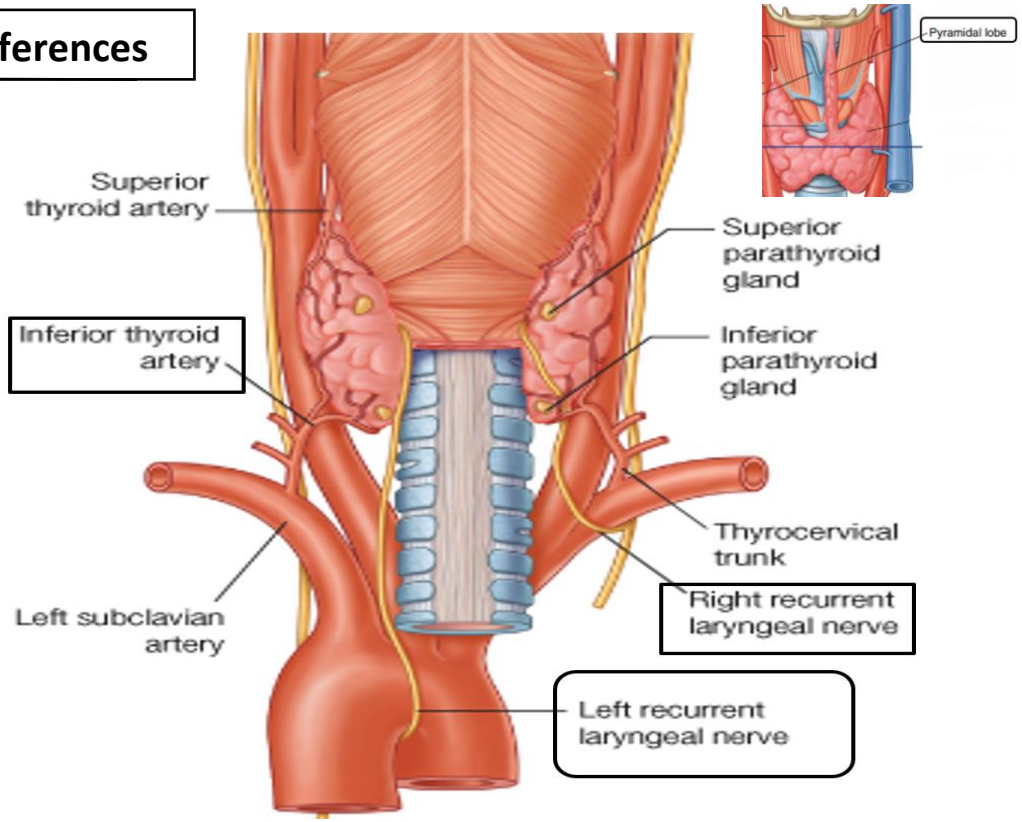
RT. Inferior Thyroid A.
Origin: Thyrocervical trunk branch of Subclavian
Accompanied by: RT. Recurrent Laryngeal N.

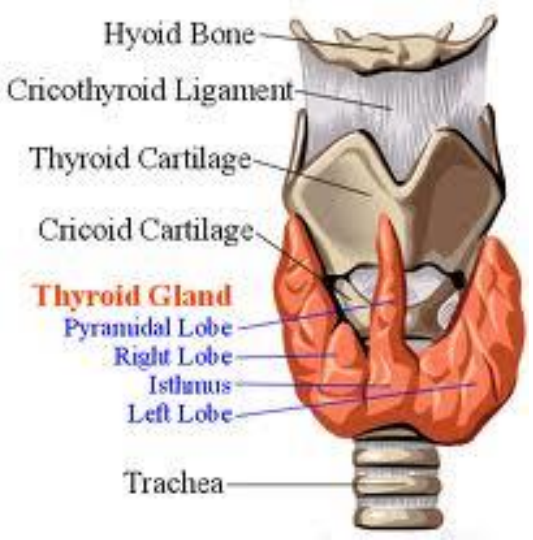
Relations of The Lobes
Anterolateral: Sternothyroid, Sternohyoid, Superior belly of omohyoid
Posterolateral: Parathyroid glands, Internal Jugular V., Vagus Nerve
Medially: Larynx, Pharynx, Trachea, Esophagus

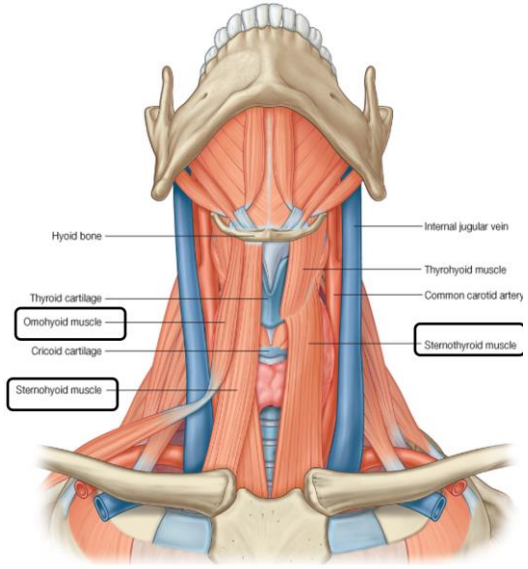
LT. Recurrent Laryngeal N.

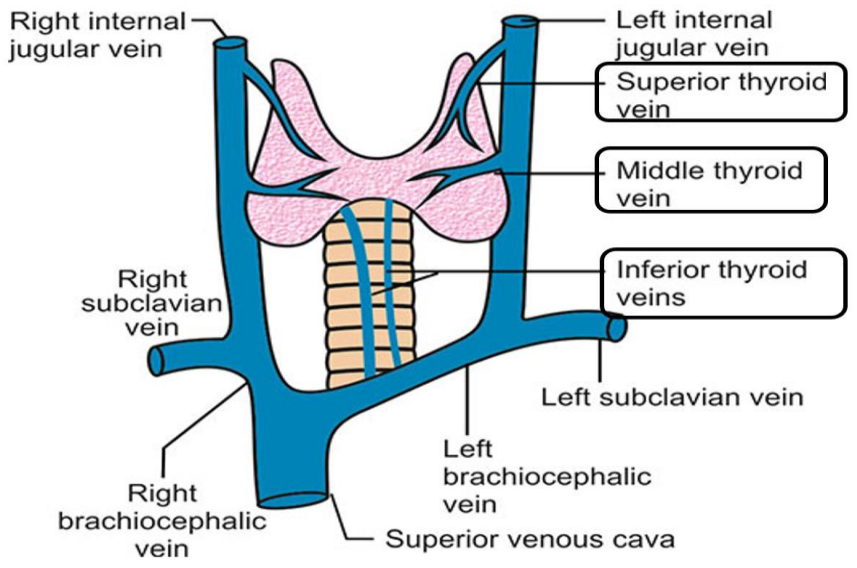
Other References











RT. Suprarenal Gland (Pyramid)
Anteriorly: RT lobe of liver, IVC
Posteriorly: Diaphragm

Inferior Phrenic A.

LT. Suprarenal Gland (crescentic)
Anteriorly: Pancreas, Stomach, Spleen, Lesser Sac
Posteriorly: Diaphragm

RT. Kidney

LT. kidney

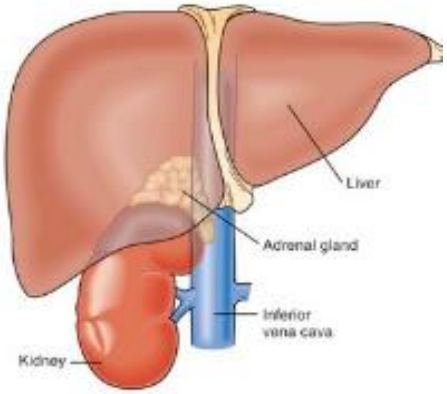
RT. Adrenal V.
Drains: IVC

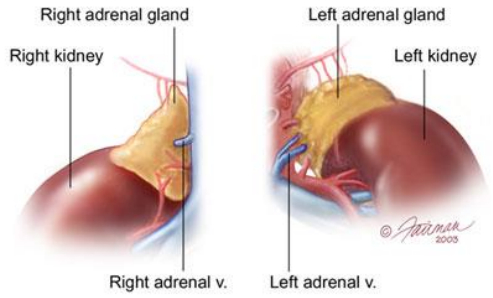
LT. Adrenal V.
Drains: Renal V.

LT. Superior Suprarenal A.
Origin: Inferior Phrenic A.

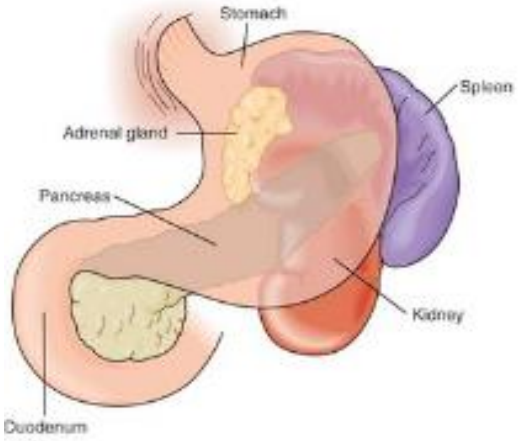
LT. Middle Suprarenal A.
Origin: Aorta

LT. Inferior Suprarenal A.
Origin: Renal A.

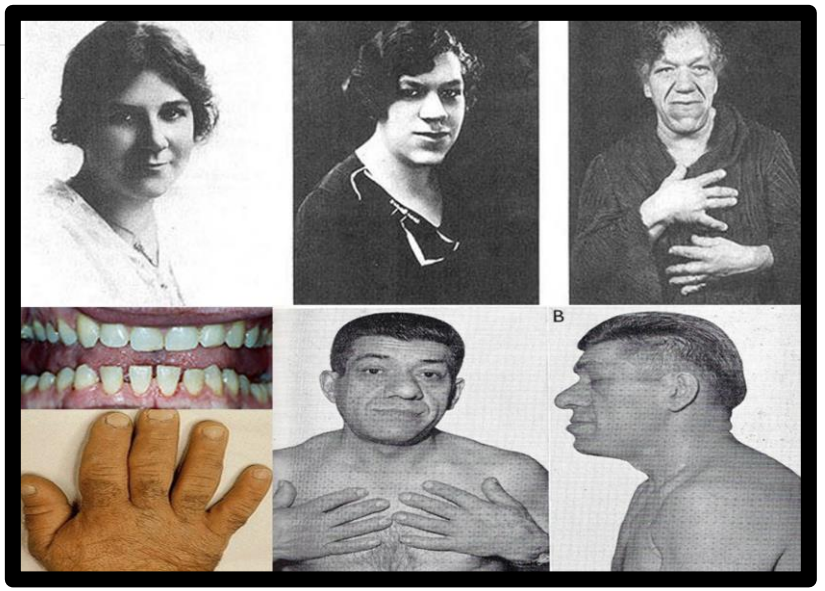




IVC [RT] & Aorta [LT]



Physiology



Acromegaly

Acro = extremity as hands and feet. Megaly = large.

Happens due to: ↑↑ GH by Acidophil After union of epiphysis (in Adult).

Bone thickening:

•Protruding lower jaw (= prognathism) & upper jaw, supraorbital ridge, separation of teeth, coarsening of facial features (bone deformities).

•Hands and feet (=acral parts) are enlarged (thick, broad fingers).

•Bowing of spine (kyphosis).

Soft tissue enlargement:

- Deeper voice because larynx enlarges

- Bigger tongue and lips that affects breathing

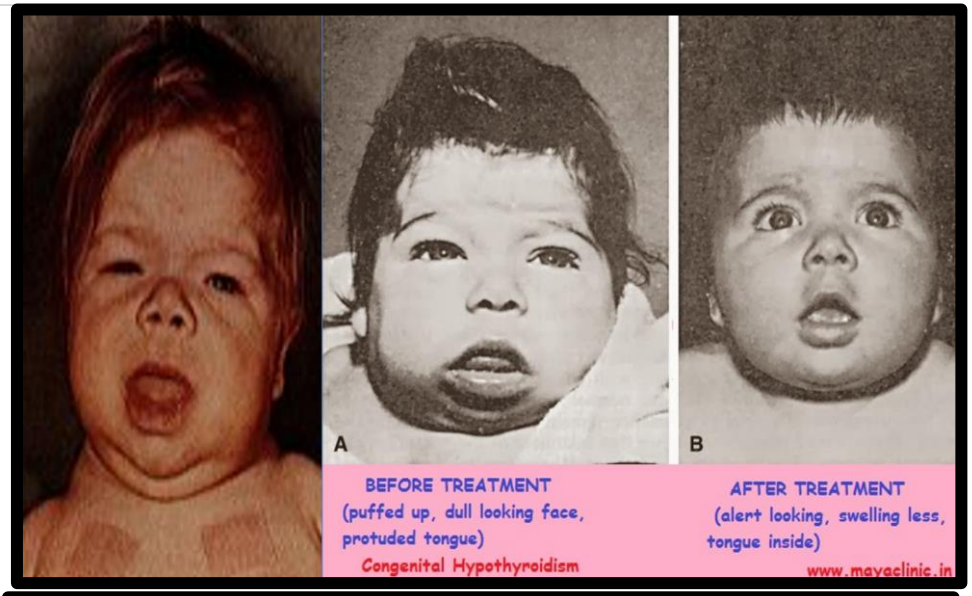
- Cartilages in nose and ears enlarge making nose and ears broader.

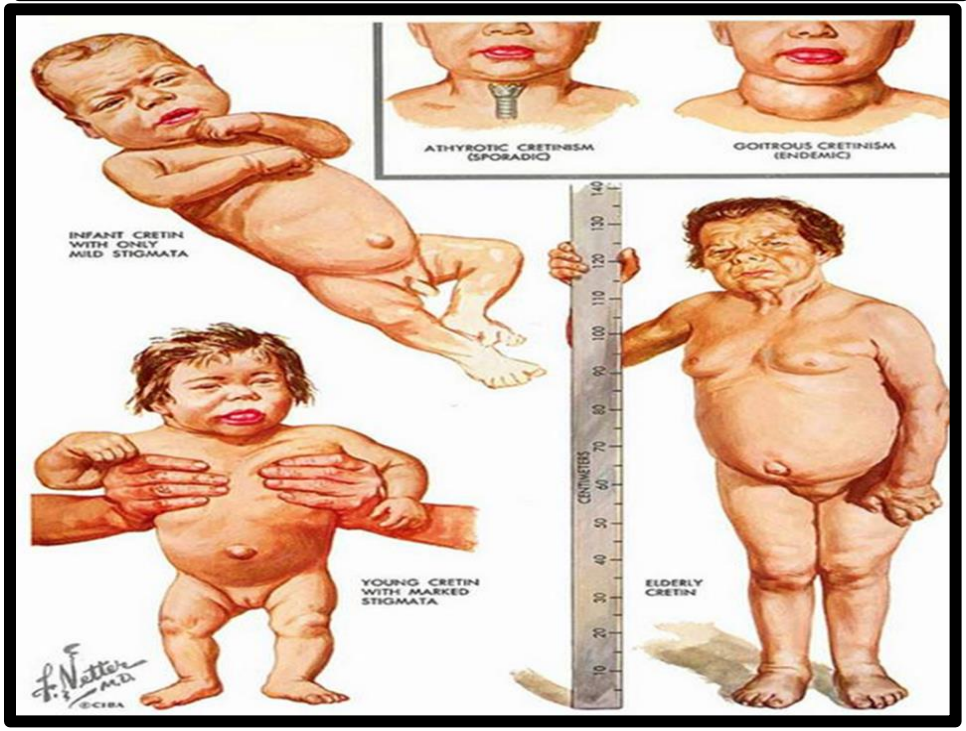
CRETINISM

Hypothyroidism in utero or early life

Clinical picture: The defect is usually detected at 6 months of age.

- The infant is mentally retarded with coarse facies.
- Short child with short limbs.
- Dry skin, scanty hair & large protruding tongue & open mouth.
- Depressed nose due to delayed bone growth.
- Delayed teeth eruption, defective speech & hoarsy cry.
- Weak abdominal wall, bulging abdomen and umbilical hernia.





Grave's Disease

- Exophthalmos
- Effects of excess thyroxine:
- ↑ BMR & O2 consumption, ↑ sensitivity to heat.
- Loss of weight in spite of ↑ appetite & ↑ GIT motility , diarrhea.
- ↑ Protein catabolism ,muscle weakness.
- ↓ blood cholesterol level.
- ↑ Blood glucose with mild glycosuria.
- Demineralization of bones :↑ Ca++ and P04 excretion in urine.
- ↑ Nervous excitability (fine tremors of outstretched hands & insomnia).
- ↑ Heart rate, COP, ABP & water hammer pulse → heart failure.

Goiter

Goiter is an enlargement of thyroid gland. – Could be due to

1) **Simple Goiter:** due to deficiency of iodine supply
   ↓ thyroid hormones formation, ↑ TSH, ↑thyroid growth.

2) **Exophthalmic Goiter:** Occurs when TSI excessively stimulates the thyroid gland

Tetany

1) **Manifest Tetany:** **↓ Plasma Ca++ level is below 7 mg%, Hypocalcaemia manifest itself by cramps of the limbs in form of:**
   - **Carpal Spasm:** flexion at elbow, wrist, metacarpophalangeal joints & extension at interphalangeal joints and adduction of thumb.
   - **Pedal Spasm:** Dorsiflexion of foot and planter flexion of toes.

2) **Latent Tetany:** **↓ Plasma CALCIUM level below 9 mg and above 7 mg/dl – Diagnosis of latent tetany by:**
   1. **Plasma Ca++ level** 2. **Trousseau's sign** 3. **Chvostek's sign**

Cushing's syndrome

- **Causes:**

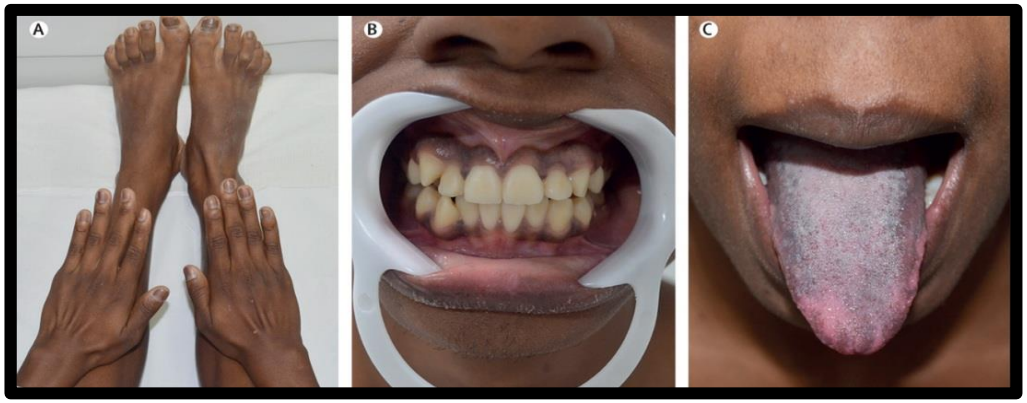
1- Adrenal tumor.
2- Pituitary adenoma (Cushing's disease).

- **CLINICAL PICTURE**

- **•C** central obesity, cervical fat pads, collagen fiber weakness
- **•U** urinary free cortisol & glucose increase
- **•S** striae & suppressed immunity
- **•H** hyperglycemia, hypertension & hirsutism
- **•I** increased plasma cortisol & glucose level.
- **•N** neoplasms (adrenal or pituitary tumor)
- **•G** gonadal affection (amenorrhea) & growth retardation

Endocrinal Causes

Endocrinal Obesity	Endocrinal Hyperglycemia	Endocrinal Osteoporosis	Endocrinal Short Stature
Cushing's | Myxedema	**Diabetes Mellitus | Acromegaly | Cushing's**	**Cushing's | Hyperparathyroidism**	**Pituitary Dwarfism | Cretinism**



Addison's Disease

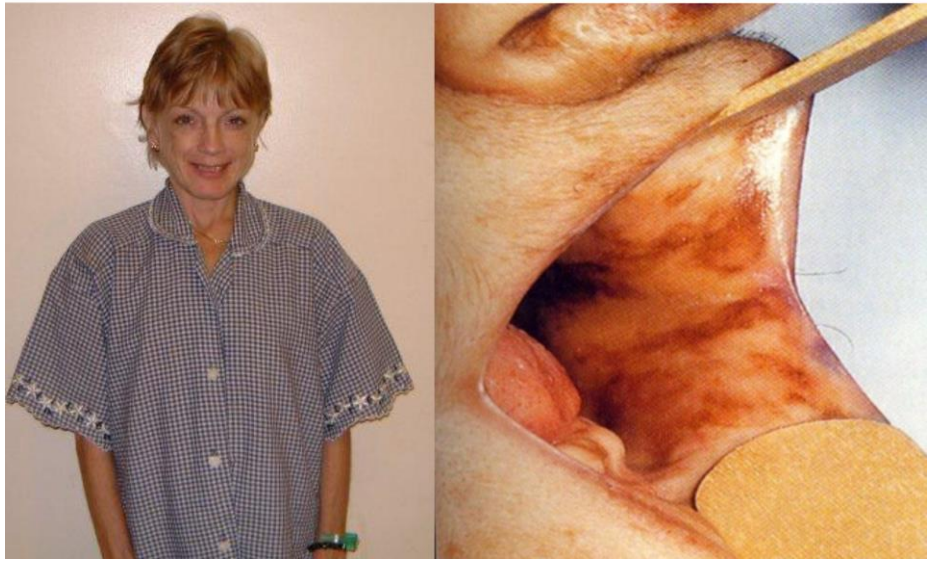
Primary Adrenal Failure

Clinical Features:

- **W**eight loss (>90%).
- **W**eakness, tiredness—generalized
- **A**norexia, nausea, vomiting and diarrhea
- **A**bdominal pain.
- **S**kin Pigmentation: **generalized but most common in skin areas exposed to friction or pressure (elbows and knees, and under bras and belts), mucosae, and scars acquired after onset of adrenal insufficiency. Look at palmar creases in Caucasians.**
- **H**ypotension, postural hypotension.
- **H**ypoglycemia—rare in adults

Skin Pigmentation of Addison's Disease

Skin and Buccal pigmentation in Addison's disease



Basic Thyroid Examination

This examination can be split into two parts:

A- The peripheral examination (examination of the thyroid status).
B- The basic examination of the thyroid gland itself.

A- THE PERIPHERAL EXAMINATION (Examination of thyroid status)

1. **Introduction**
2. **General Inspection of the patient**
3. **Face Examination**
4. **Hands Examination**

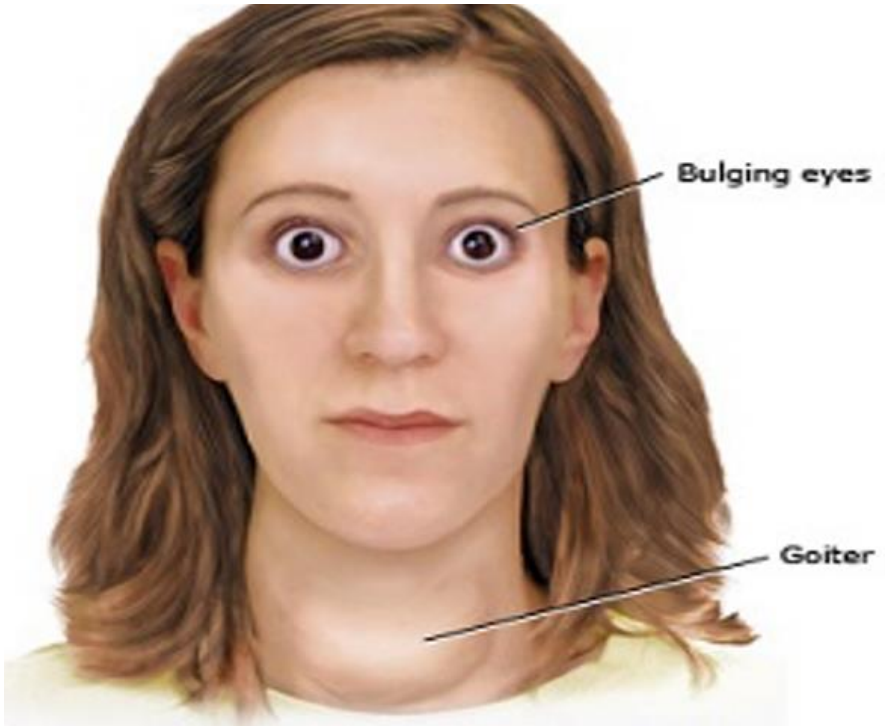
1- Introduction

- **W**ash hands
- **I**ntroduce yourself to the patient including your name and role
- Ask the **P**atient's name
- **E**xplain the examination and obtain consent using patient-friendly language
- **E**xpose the patient's neck

2- General inspection

Inspect the patient whilst at rest, looking for clinical signs suggestive of underlying pathology ~ Look for signs of:

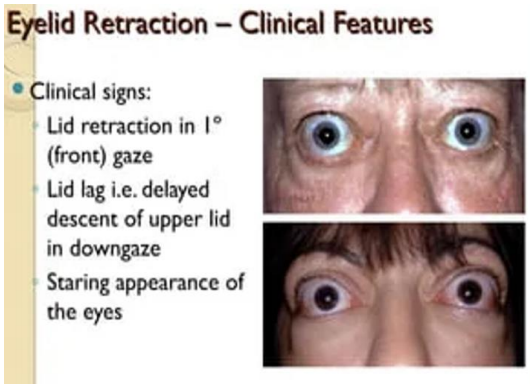
Hyperthyroidism	Hypothyroidism
Weight loss, Anxiety, Flushed face of thyrotoxicosis, Sweaty	Overdressed, Obese, Facial myxedema, Look for signs of mental & Physical sluggishness

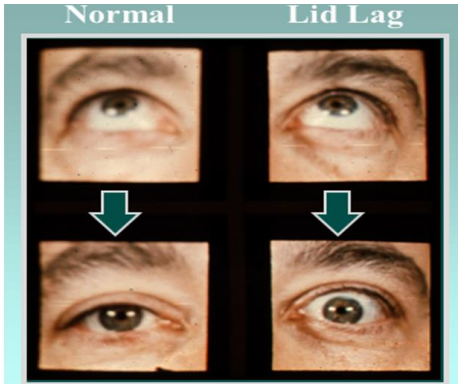


3- Face [Tests]

➢ Eyes

- **Lid retraction of the upper eyelid & lid lag:** ask the patient to follow your finger as it descends at a moderate rate from the upper to the lower part of the visual field.
- **Exophthalmos** (**sclera visible above and below iris**)

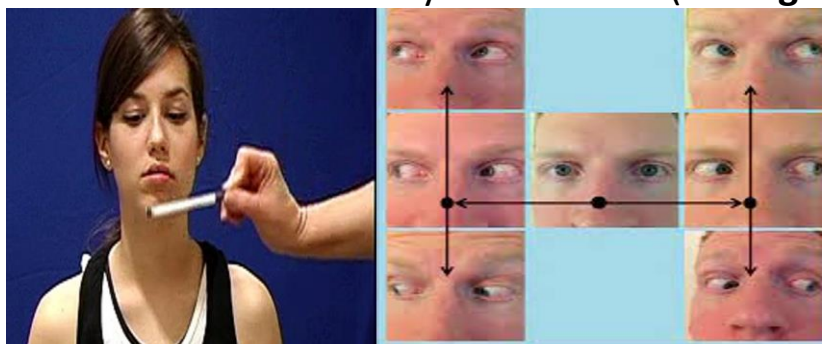




➢ Extra-Ocular Muscles

Double vision

- Perform H-test and ask about diplopia to test for ophthalmoplegia
- Test central vertical eye movement (**'lid lag'** on downward vertical gaze = thyrotoxicosis)



Examine the hands

4- Hands [Inspection & Pulse]

- feel the hands for any sweating
- Look for any tremor
- palmar erythema
- Check the nails for any thyroid Acropachy :
  - digital clubbing
  - swelling of digits and toes
  - & periosteal reaction of extremity bones
- feel the pulse

❑ Fine tremors of outstretched hands (paper test)

❑ Nails: (Graves' disease)

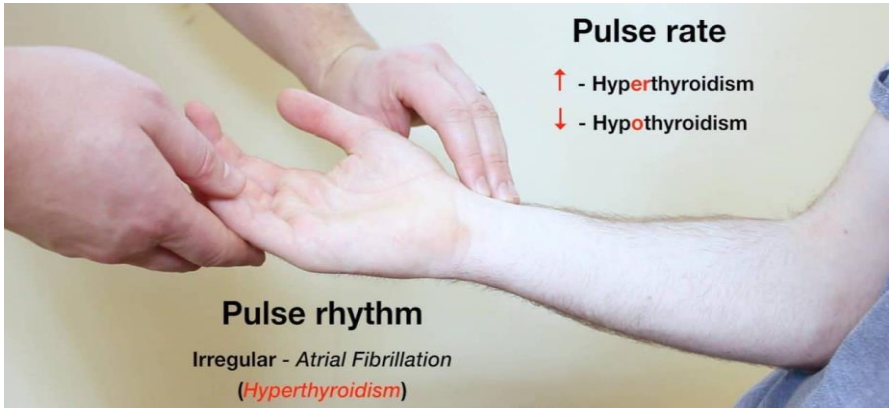
— **Thyroid acropachy** (clubbing of the fingers)
— **Onycholysis** (separation of the nail from its bed)

❑ Palms:

— Cold and dry (hypothyroidism)
— Moist and sweaty (thyrotoxicosis)
— Palmar erythema (thyrotoxicosis)

❑ Pulse rate, rhythm, volume

— Tachycardia (thyrotoxicosis)
— Water hammer pulse (thyrotoxicosis)
— AF (thyrotoxicosis)

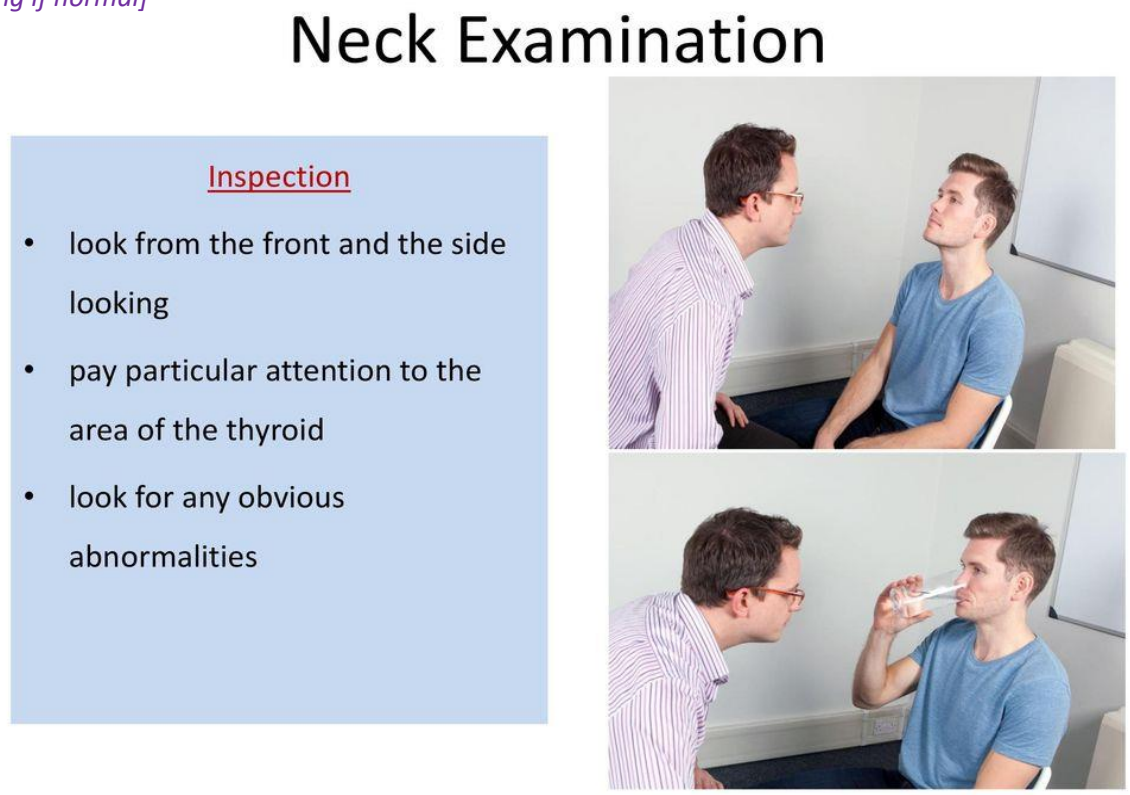


B- THE BASIC EXAMINATION OF THE THYROID IT SELF

1- Inspection 2- Palpation 3- Percussion 4- Auscultation

1-Neck Inspection

- **Inspect from the front and side of the patient**.
- Ask the patient to **Swallow** a sip of water and watch the neck movement (goiter or thyroglossal cyst will rise during swallowing).
- Ask the patient to **protrude** the **tongue**. if the mass moves, it is most likely a thyroglossal cyst, but if it does not, it may be a thyroid swelling.
- Describe the **Swelling**
- Previous surgical **Scars** (thyroidectomy)
- **Skin**: red (suppurative thyroiditis)
- *[No neck swelling if normal]*



2-Palpation – (From posteriorly)

- **Palpate thyroid.** Flex the neck slightly, and put your thumbs behind the neck and the rest of your fingers in front.
- Feel one side at a time, use one hand to steady the gland and the other to palpate.
- If you excessively press, you will miss.
- Ask the patient to **swallow** during palpation (Normal thyroid gland is not palpable).
- **Comment** on the thyroid swelling if it is present (Size, Shape, Surface, Consistency, Color, Temperature, Tenderness) (SSSCCTT)
- Slight flexion of neck

Neck Palpation Mention the following.

Nodular? Single/multiple? Or Diffuse smooth goiter?

Consistency:

- **Soft:** Normal
- **Firm:** in simple goiter
- **rubbery hard:** in Hashimoto's thyroiditis.
- **stony hard node:** in carcinoma.
- **Tenderness:** this may be a feature of thyroiditis

https://www.youtube.com/watch?v=Ed2WE7heOdU

Lymph Node Examination:

- **Palpate cervical lymph nodes for any enlargement.**

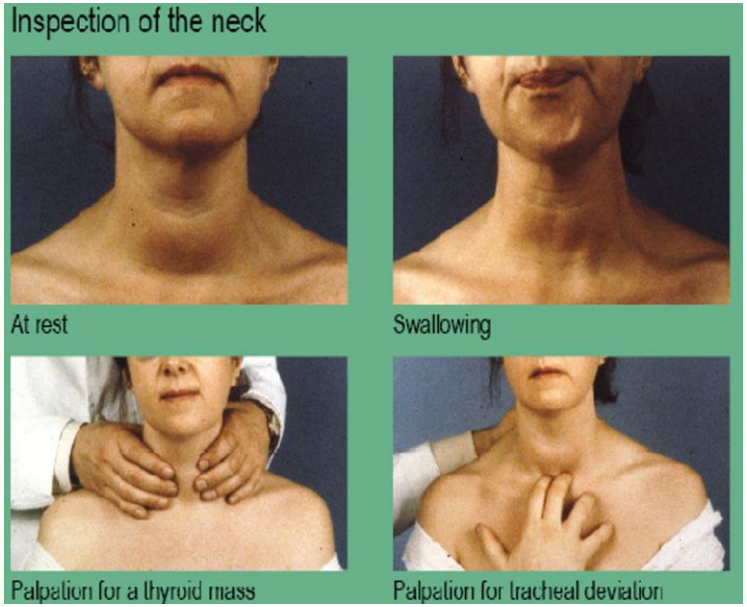
https://www.youtube.com/watch?v=SZkIq6P-0UQ

https://www.youtube.com/watch?v=4U3aFuMdJCw

Palpation

- feel the gland
- The approach is from behind
- Palpate both lobes & the isthmus
- Note any swellings or lumps
- note the shape and consistency of any lumps as well as whether they are tender or mobile
- examine while the patient drinks to assess whether the lump moves with swallowing.
- examine the cervical lymph nodes

Neck Examination



3-Percussion

Percussion over sternum: for retrosternal goiter

4-Auscultation

Lastly Auscultation: thyroid bruit (systolic bruit) over each lobe. This is a sign of increased blood supply, which may occur in hyperthyroidism

To complete

- Thank patient.
- Summarize and suggest further investigations you would consider after a full history (e.g. TFTs, thyroid US).

Full Thyroid Status Examination:

https://www.youtube.com/watch?v=ziaYBkgEZNU

Basic Summarization of Thyroid Examination

#	examination			Includes the following
A	Peripheral examination	#	Chronological Step	Points to mention
		1	Introduction	• Wash your hands then introduce yourself to patient w/ your name & Role • Ask the Patient's Name & Explain examination • Expose the Patient's Neck
		2	General Inspection	**Look out clinical signs & Rule out symptoms whilst patient at rest on the chair** **Hyperthyroidism** [Weight loss, anxiety, flushed face of thyrotoxicosis, Sweaty] **Hypothyroidism** [Overdressed, obese, facial myxedema, Mental/Physical Sluggishness]
		3	Face [Tests]	**Eyes:** • Ask patient to follow your finger, to rule out Lid Retraction of upper eyelid & lig lag • Rule out Exophthalmos when sclera is not visible above & below iris **Extra-ocular muscles:** • Rule out double vision by performing H-test & ask about diplopia to test for Ophthalmoplegia • Test central vertical eye movement ('Lid Lag' on downward vertical gaze = thyrotoxicosis)
		4	Hands [Inspection & Pulse]	Perform Paper test, Exclude Clubbing or Onycholysis from nails which indicates grave's disease Inspect status of palm whether its cold/dry [hypo] or moist/sweaty/ and/or erythematous [hyper] Check the pulse rate, rhythm, volume; Tachycardia/Water hammer pulse/AF = thyrotoxicosis
B	basic examination of thyroid itself	#	Chronological Step	Points to mention
		1	Neck Inspection [Ant.]	• Ask patient to swallow to check Goiter or thyroglossal cyst when rising during swallowing • Ask patient to protrude tongue – mass will move indicating thyroglossal cyst. If no movement, may be only thyroid swelling • Describe swelling, look for scars for thyroidectomy, and if there are Redness in skin.
		2	Palpitations [Post.]	Palpate the thyroid posteriorly, feel one side at time, ask patient to swallow while examining. Comment on swelling (Size, shape, surface, consistency, color, temperature, tenderness) , examine the cervical lymph node, and Slight flexion of neck.
		3	Percussion [Ant.]	Percussion over sternum: for retrosternal goiter
		4	Auscultation [Ant.]	Lastly Auscultation: thyroid bruit (systolic bruit) over each lobe. This is a sign of increased blood supply, which may occur in hyperthyroidism
		5	To Complete	Thank the patient, then Summarize & Suggest further investigation you would consider after a full history – which includes for example TFTs, Thyroid US

The basic interpretation of BMI & Diabetes/Prediabetes

BMI	Weight Status
<18.5	Underweight
18.5 - 24.9	Normal
25 - 29.9	Overweight
30 - 34.9	Obese [Class I]
35 - 39.9	Obese [Class II]
>40	Extreme Obesity [Class III]

$$\text{Body Mass Index} = \frac{\text{Weight (in kg)}}{\text{Height}^2 \text{ (in m)}}$$

Notes in Interpretation of BMI & Diabetes:

- BMI isn't best indication for Diabetes/insulin resistance but could be risk factor
- Patient could be muscular and that falsify the definitions given.
- Best accurately A1C is measured & then Plasma Glucose
- Plasma glucose could be normal due to insulin medications, but A1C is better indication to know severity of diabetes.
- Examiner will give BMI, Fasting Glucose level, Postprandial, and A1C% level.
- Mention BMI Class, Type of Diabetes, Management & Treatment, and medications if so.
- If DM 1 there is different management and medication, don't confuse between DM 2.
- **Lastly do Follow up w/ patient**

Blood Test Levels for Diagnosis of Diabetes and Prediabetes

	A1C (percent)	Fasting Plasma Glucose (mg/dL)	Postprandial~ Oral Glucose Tolerance Test (mg/dL)
Diabetes	6.5 or above	126 or above	200 or above
Prediabetes	5.7 to 6.4	100 to 125	140 to 199
Normal	About 5	99 or below	139 or below

Definitions: mg = milligram, dL = deciliter
For all three tests, within the prediabetes range, the higher the test result, the greater the risk of diabetes.

Lifestyle managements In Obesity

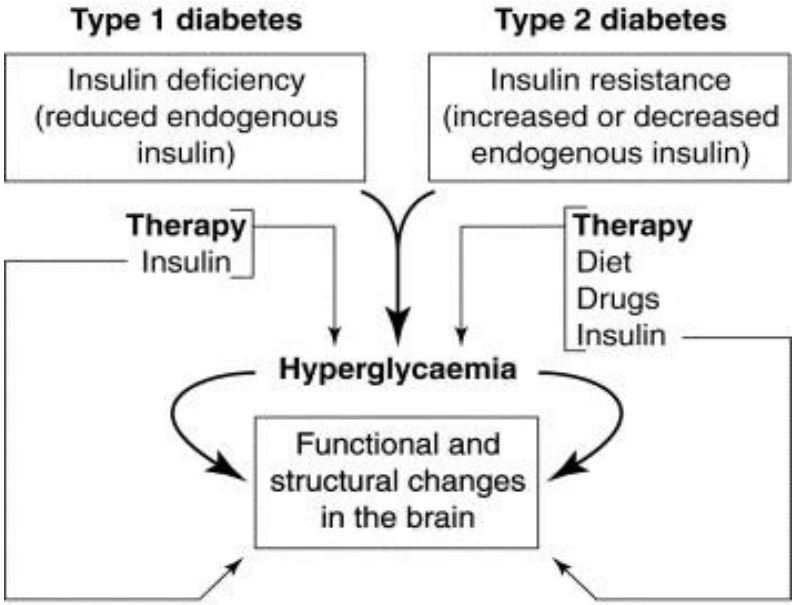
- ***If BMI 25-29.9 with no comorbid condition only* lifestyle changes *[still advised to all types] such as diet & exercise, and with no medications***

Medication & Management plans in Obesity:

Are useful adjuncts to life-style modification for some patients.

Orlistat (**pancreatic lipase inhibitor**) is approved by the FDA for long-term use in treating obesity.

- **Patient Selection:**
  BMI of **30 kg/m² or more** or a ***BMI of 27 kg/m² or more with comorbid condition***



Weight Loss Surgery

It should be considered for those patients who have failed in other attempts to lose weight.

- **Patient selection:**
  ***BMI > 40 kg/m²* and have failed medical therapy**.
  BMI's between ***35 and 39.9 kg/m²* if they are at *high risk because of comorbidities*.**

DM Management

- **Insulin is recommended in DM2 when A1C/ Glucose is high Indicated to Highly resistant Diabetes / failed medications or Hyperglycemia.**
- ***If Type 1 DM Insulin therapy***

Example #1:

Patient presented with BMI of 27,
with Fasting glucose at 89, postprandial 120, and A1C 5.5 %; give your interpretation & management plans.

Patient is Overweight, w/ normal A1C & Glucose level,
treatment plans include lifestyle changes and follow up.

Example #2:

Patient presented with BMI of 33.3,
with Fasting glucose at 112, postprandial 166, and A1C 6.2%; give your interpretation & management plans.

Patient is Obese Class I, with indication of Prediabetes,
treatment plans include lifestyle changes, medication, and follow up.

Example #3:

Patient presented with BMI of 45,
with Fasting glucose at 160, postprandial 250, and A1C 8 %; give your interpretation & management plans.

Patient is Obese Class III, w/ indication of Diabetes,
treatment plans include lifestyle changes, Medication, Sleeve Gastrectomy, and Follow up.

Biochemistry

Diabetic Ketoacidosis [Commonly Type I DM] [Guide For Reference]

Diagnosis	#	Diagnosis of DKA
	1	**History** [For cause of DKA]
	2	**Clinical Examination**
	3	**Lab Investigations**: to confirm the diagnosis & follow up of treatment — **Urine by dipstick**: **HIGH** Glucose & Ketones +++ (**RAPID TEST**) — **Blood Chemistry Analysis:** ▪ **High Blood**: Glucose & Urea (Dehydration) ▪ **Electrolytes:** High (or normal) Potassium & Low (or normal) Sodium ▪ **Assessment of Acid-Base status:** (Metabolic Acidosis) - **Blood Bicarbonate:** Low (usually below 5 mmol/L) - **pCO2:** Low (compensatory)
Biochemical Basis of Treatment	#	**Emergency Treatment of DKA**
	1	Correction of **DEHYDRATION** : by **IV fluids & Sodium (isotonic saline)**
	2	Correction of **ACIDOSIS**: by **IV bicarbonate**
	3	Correction of **METABOLIC ABNORMALITY** : by **insulin IV infusion**
	4	**POTASSIUM** is given with insulin treatment as insulin induces K+ entry into cells
	5	**IV GLUCOSE** should be started in case glucose in blood falls below 10 mmol/l (avoid hypoglycemia induced by insulin)
	6	**FOLLOW UP is QUITE IMPORTANT** to monitor ❖ Blood **glucose** level ❖ Electrolytes (**Na+ & K+**) ❖ Acid-base status (blood **bicarbonate** level)

Case 1

15 years old boy was reported by his school that he was found drowsy & they have got to take him to hospital according to the advice of his school doctor.
In the hospital, his mother told the doctor that her son seemed unusually thirsty for the last 3 months & she thought that he had lost weight. She admitted also that on the morning before leaving for school, he was complaining of abdominal pain & discomfort.

Examination:

- Semiconscious
- Deep & rapid respiration
- Pulse rate 120 beats/minute
- BP: 90/50
- Cold extremities

Clinical Chemistry Lab Investigation #9:	Results	Reference	Interpretation
Random Blood Glucose	550 mg/dl	//////////////	↑
Urea	160 mg/dl	20 -40	↑
K+	6.9 mmol/L	3.5 – 4.5	↑
Na+	127 mmol/L	135 – 145	↓
pCO2	2.9 kPa	4.4 – 6.1	↓
HCO3-	7 mmol/L	21 – 27.5	↓
pO2	14 kPa	12 – 17	~

Urine Analysis:

Urine Dipstick Test:

- Glucose +++
- Ketone +++
- Albumin ++

What investigations were recommended for him?

- **Glucose, ketone bodies, Potassium, urea and albumin (due neuropathy) is high, Low PH, Bicarb, sodium (maybe) low, Fasting/Postprandial glucose.**

What is the diagnosis of this case? Diabetic Ketoacidosis

treatment? IV Insulin, [Glucose given w/ insulin to prevent Hypoglycemia, then monitor**], [POTASSIUM** is given w/ insulin treatment as insulin induces K+ entry into cells**], Isotonic Saline, IV Bicarbonate [Correct Acidosis], then follow up.**

Nonketogenic Hyperglycemic Coma [Commonly Type II DM] [Guide]

In cases with severe hyperglycaemia especially in older age diabetics type 2 **Hyperglycaemia** induces **osmotic diuresis with loss of ECF**

The osmotic diuresis causes loss of water in excess of sodium (more water loss) leading to very high plasma osmolality (with **hypernatremia**) & marked **dehydration** (esp. in elderly who commonly have some renal impairment & infrequent water drinking)

No ketgenesis due to presence of sufficient insulin to prevent DKA

(or sometimes there is minimal ketogenesis with minimal metabolic acidosis i.e. Bicarbonate is not much lowered as in DKA)

Lab Findings:

- **Hyperglycaemia ↑**
- **Hypernatremia ↑**
- **No Ketogenesis ~**
- **Bicarbonate is not much lowered ~**

Treatment: Emergency Case!!

Fluid replacement (**hypotonic saline**) + **Insulin IV infusion** + **follow up**

https://next.amboss.com/us/search?q=diabetes+mellitus&v=article

Case 2

45 year old came to Emergency Room with, confusion, problems communicating, light-headedness, Hunger, dizziness, and complained of excessive urine output. Her brother told to the physician that she is on vacation and she forgot about the medication at home. Physician ordered Lab investigation with the findings →

Examination:

- Slurred Speech
- Dry mouth
- Pulse rate 135 beats/minute
- BP: 135/100
- Cold extremities

Clinical Chemistry Lab Investigation #9:	Results	Reference	Interpretation
Random Blood Glucose	600 mg/dl	//////////////	↑
Urea	55 mg/dl	20 -40	Mildly High
K+	3.7 mmol/L	3.5 – 4.5	~
Na+	175 mmol/L	135 – 145	↑
pCO2	6.0 kPa	4.4 – 6.1	~
HCO3-	25 mmol/L	21 – 27.5	~
pO2	14 kPa	12 – 17	~

What is the diagnosis of this case? **Nonketogenic Hyperglycemic Coma**

What is the treatment for emergency: Fluid replacement (**hypotonic saline**) + **Insulin IV infusion** + **follow up**

Adrenal Abnormalities [Guide]

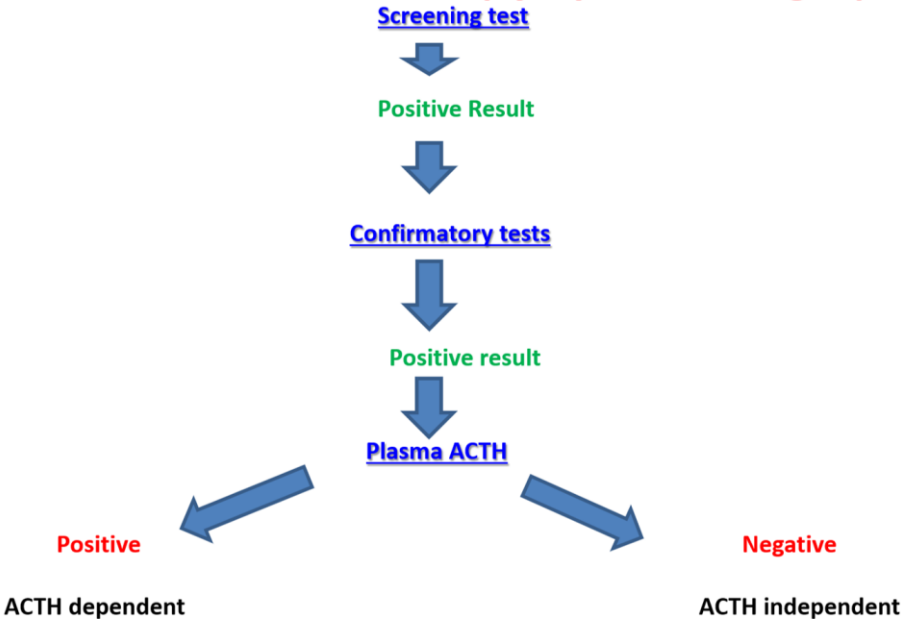
A- Adrenal hyperfunction

- **Hypercortisolism:** ***(in all these cases, blood cortisol is elevated)***

A- ***Endogenous*** i.e. *over secretion* of CRH, ACTH or glucocorticoids (cortisol) – OR:
B- ***Exogenous*** intake of cortisol (or ACTH)

- **Cushing's Syndrome:**
  describes a group of signs & symptoms resulting from
  excess glucocorticoids (cortisol) production or **prolonged exogenous steroid use**

Clinical manifestations (symptoms & signs)



Causes of adrenal hyper function (Cushing`s syndrome)

1- ACTH dependent (2ry)
- **A-** ACTH secreting pituitary adenoma ++++, 68%
- **B-** Ectopic ACTH or ectopic CRH, 15% (usually malignant lung tumor)
- **C-** ACTH therapy (Iatrogenic Cushing`s Syndrome)

2- ***ACTH independent (1ry)***
- **A-** Adrenal adenoma, 17% (ACTH is suppressed)
- **B-** Glucocorticoids therapy

Interpretation of Screening Tests

If Positive results for **screening test** 1, 2 & 3

- **Cushing`s Syndrome**
- **Pseudo-Cushing`s syndrome**
  Depression, Extremely Anxious, Severe Illness, Alcoholism

So, **confirmatory tests** should be performed to rule out pseudo-Cushing`s syndrome by confirmatory test (**insulin hypoglycemic test**)

Stage I – Screening Tests

Screening test – 1

Cortisol excess By: Urine free cortisol (and/or metaboites) Measurement

Free cortisol (& metabolites) is excreted in urine if blood cortisol exceeds capacity of its carrier protein. **Urine free cortisol (or metabolites) is a sensitive indicator of endogenous cortisolism**.

Advantage of urine free cortisol: It reflects free cortisol level.

17-hydroxycorticosteroid (metabolite of cortisol), is preferred as it is **not affected by urine volume**. (Other metabolites are secreted in higher amounts with increase urine volume).

Urine collection period: 24 hours (or from **10 PM till 8 AM**)

NB: Random plasma cortisol measurement is of **little value in diagnosis of Cushing`s syndrome** as levels of normal people vary widely during the day & may overlap with levels found in patients of Cushing`s syndrome.

Screening test – 2

By: Loss of diurnal rhythm determination

Principle of the test:

Normally, blood cortisol is at its highest 6 - 8 AM & at its lowest 10 PM – 12 AM (midnight).

This variation is lost in Cushing`s syndrome (i.e. increased all over the day)

Loss can be determined by measuring plasma cortisol 11 PM – 12 AM (midnight).

This test is **more sensitive** than urine cortisol in diagnosing Cushing` syndrome

Or by: Saliva cortisol (instead of plasma cortisol)

Cortisol is stable at room temperature in saliva (easy storing of samples), Non-invasive (no sampling by puncture etc…), Patient can collect the samples by himself, Many samples can be collected over a defined period…. **BUT: less sensitive than urine cortisol**

Screening test – 3

Loss of normal cortisol suppression by dexamethazone

By: Overnight Dexamethazone suppression test

Principle of the test:

Dexamethasone act as an exogenous cortisol substitute that suppresses endogenous cortisol secretion if adrenal cortex is normal (through suppressing ACTH if ant. pit. is normal)

Procedure:

Dexamethazone 1 mg is given at **11 PM** (should suppress early morning cortisol high secretion). Then, **8-9 AM**: **serum free cortisol is measured**.

Results:

- **In normal individuals:** cortisol is **less than 3.6 mg/dl** (cortisol is **suppressed** by **dexameth**.)
- **Positive test In Cushing`s syndrome:** cortisol level in blood is **higher than 3.6 mg/dl**.
  (cortisol secretion is **not suppressed** by **dexamethazone** in these cases).

Confirmatory Test: Insulin hypoglycemic test

Principle: Hypoglycemia induces CRH that induces ACTH that induces cortisol secretion. i.e. normal HPA axis).

In Cushing`s syndrome (for any cause),
no response to hypoglycemia & accordingly no effect on CRH, ACTH or cortisol

Procedure (IN HOSPITAL UNDER RECAUSIONS)

Insulin IV (0.15 U/kg) will reduce blood glucose to 2.2 mmol/l or less.

Normally, serum cortisol reaches its maximum 60-90 minutes after injection.

Blood samples for cortisol is withdrawn before injection & then 60 and 90 minutes after injection (together with blood glucose measurement)

Results:

Increase in blood cortisol after-injection samples:

Negative for **Cushing`s syndrome** so the case is **pseudo-Cushing`s syndrome**

No difference between before & after samples:

Positive for **Cushing`s syndrome** (defect in HPA axis due inflammation of adrenals due stressors aggravating disease]

Stage II – Determining Cause of Cushing's Syndrome

Once Cushing`s syndrome is confirmed, cause is to be decided.
(i.e. ACTH dependent or ACTH independent) By:

Plasma ACTH [At 8 AM & 10PM]

Undetectable ↓

ACTH independent= 1ry

Adrenal Cause
[e.g. Adrenal Tumor]

Increased ↑

ACTH Dependent = 2ry

Pituitary Cause

Ectopic ACTH

To differentiate:

CRH stimulated BIPSS & peripheral vein sampling

BIPSS ACTH / peripheral ACTH > 3 in pituitary causes

BIPSS ACTH / peripheral ACTH < 2.5 in ectopic causes

(BIPSS = bilateral inferior petrosal sinus sampling)

Case 3

A 37 years old housewife

Complaining of:

- Headache, Weakness on trivial efforts, Wasting in proximal limb muscles
- Polyuria
- Polydipsia (drink water more than before)

On Examination:

- BP: 165/105
- BMI: 33

Interpret the table →

Diagnosis:

Cushing Syndrome / Primary Adrenal Insufficiency / ACTH Independent / Adrenal Adenoma

	Fasting & Urine glucose
Fasting Blood Glucose	160 mg/dl (N: 70 – 110) ↑
Urine glucose	nil
Serum Cortisol	**Adrenal Function Test**
At 8:00 AM	410 nmol/L (N: 150 - 550)
At 10:00 PM	**390 nmol/L (N: up to 200) ↑**
Serum Cortisol	**Dexamethasone Suppression Test**
Basal (Before dexamethasone)	420 nmol/L
After dexamethazone	418 nmol/L ~ (Minimal suppression) indication for adrenal abnormality
Serum Cortisol	**Insulin Hypoglycemic Test**
Basal at blood Glucose	4.5 mmol/L 435 nmol/L
After Blood Glucose	1.5 mmol/L 445 nmol/L (Minimal) **(If major difference = Pseudo-Cushing's Syndrome)**
ACTH	**ACTH Levels**
At 8:00 AM	**less than 2 ng/L (N: 7-51) ↓** **(If Higher = 2ry = ACTH Dependent, Pituitary or Ectopic ACTH Cause)**

Adrenal Insufficiency [Addison's Disease] Low cortisol result from: [Guide]

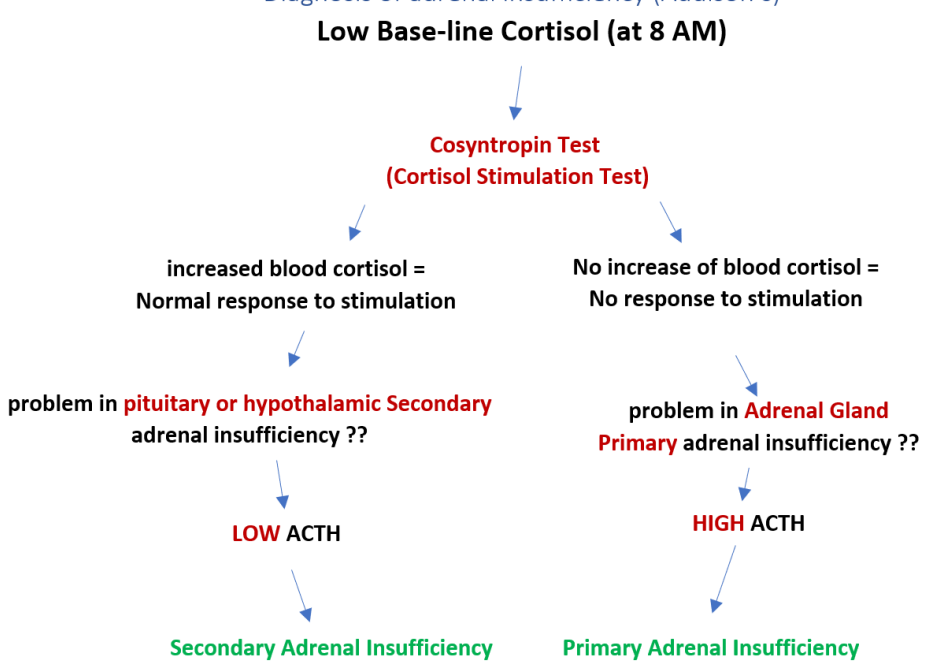
1- Primary Adrenal Problem

(destruction of 90% of adrenal cortex) mainly caused by **autoimmune destruction** of **adrenal cortex** (more than ***70% of cases of adrenal insufficiency***)

2- Secondary to ACTH deficiency [Abnormal of HPA Axis]

(abnormal of HPA axis) Main clinical manifestation:

A- Weakness, fatigue, anorexia, weight loss (failure to thrive)
B- Hyponatremia, hyperkalemia & mild metabolic acidosis



Cosyntropin test:

Principle:

Cosyntropin is a synthetic stimulator of cortisol secretion by adrenal cortex.
the test checks the capacity of adrenal gland to increase cortisol production in response to stimulation by cosyntropin.

Procedure: 1- Base-line cortisol is measured 2- Then, Cosyntropin is IV or IM Administered
3- Cortisol then is measured 30 & 60 minutes after Administration of cosyntropin

Results:

Normally*, cortisol secretion is increased after stimulation of the adrenal gland by cosyntropin.*
In primary adrenal insufficiency*, cosyntropin fails to increase cortisol secretion by the adrenal cortex.*
https://next.amboss.com/us/article/fg0ku2?q=adrenal%20glands%20disorders

Case 4

24 years old Female

Complaints: Weakness, fatigue, nausea & vomiting

Examination: Deep tanning of both exposed and unexposed parts of the body and dark pigmentation inside the mouth.

Lab Investigations: **Low blood cortisol** | **High ACTH** | **Low blood Na+ and Cl– & high K+**

Diagnosis: Addison's disease – Primary Adrenal Insufficiency

Confirmatory Test: Cosyntropin

↓ plasma cortisol because of adrenal insufficiency releases feedback ↑ of ACTH secretion by the pituitary, resulting in elevation of ACTH Biosynthesis

Hyperpigmentation is a feature of Addison disease, the diagnosis in this case

The ACTH precursor peptide is cleaved to yield melanocyte-stimulating hormone [MSH] the factor responsible for hyperpigmentation –
Even in areas not exposed to sunlight.

Below #cases not included in OSPE, reference for EB:

Interpretation

T3	T4	TSH	State
↔	↔	↔	Euthyroid
↑	↑	↓	Primary hyperthyroidism
↓	↓	↑	Primary hypothyroidism
↓	↓	↓	Secondary hypothyroidism
↑	↑	↑	Secondary hyperthyroidism
↔	↔	↑	Subclinical hypothyroidism
↔	↔	↓	Subclinical hyperthyroidism

Hypocholesterolemia in Hypothyroidism

Causes of poor calcification of bones:

I- Vitamin D deficiency:

A- Deficiency of sources of Vitamin D3

Due to Nutritional Vitamin D deficiency (vitamin D3) & Lack exposure to sun light

B- Impaired Vitamin D Metabolism

- **Renal Rickets: deficiency of 1 hydroxylase of the kidney**
- **Deficiency of parathyroid hormone : decrease activity of 1 α hydroxylase**
- **Genetic** defects in vitamin D metabolism (**defect in its activation**)
- **Genetic** defects of vitamin D **receptors or abnormal ligand binding**

II- Calcium deficiency:

[nutritional or defect in intestinal absorption]

Laboratory Investigations for the Diagnosis of Rickets & Osteomalacia

#	Investigations to confirm the diagnosis
1	↓ Blood levels of 25-hydroxycholecalciferol (25 HCC)
2	↓Blood calcium, (hypocalcemia)
3	↑ Blood Alkaline phosphatase (ALP)
	Investigations to diagnose the Cause
1	Kidney function tests (KFT)
2	Blood 1, 25 dihydroxycholecalciferol (1, 25 DHCC)
3	Blood PTH
4	Others i.e. molecular genetics (if indicated)

MAIN CAUSES of HYPERCALCEMIA

#	Hypercalcemia Due to	
1	Primary Hyperparathyroidism	due to **adenomas** (single or multiple) of the parathyroid gland ❖ Blood PTH is high (or upper normal range *) ❖ Blood calcium is high & Blood phosphorus is low
2	Tumors	— Humoral hypercalcemia of malignancy due to **PTHrP** (***PTH related protein***) released by some kinds of tumor cells — PTHrP is not responsive to negative feedback by calcium
3	Hypervitaminosis D	— **Excessive intake** of vitamin D — Extrarenal hydroxylation of 25HCC as in granulmotaous diseases as **sarcoidosis**

MAIN CAUSES of HYPOCALCEMIA

#	Hypocalcemia Due to
1	Hypoparathyroidism (↓ **PTH**)
2	**Vitamin D** deficiencies
3	**Renal** disease :low 1 a hydroxylase activity & by hyperphosphaturia
4	Hypoalbuminemia: low blood **albumin**
5	**Nutritional** calcium deficiency
6	Intestinal disorders causing inadequate calcium or vit.D **absorption**

Case 5

Female , 30 Yeas, Married +2 , Housewife On estrogen-containing contraceptive pills [Increases TBG]

Complaints: Loss of weight, Irritable, Uncomfortable with summer weather

Examination: Pulse 130 BP 155/95, Palm sweaty, Fine tremors of fingers when her arms are stretched, no eye signs, thyroid gland enlarged – no nodules

Diagnosis: **Primary Hyperthyroidism**

Thyroid Function Test #1:			
Analysis	**Results**	**Reference**	**Interpretation**
TSH	**0.1 mIU/L**	0.3 – 5	↓
Free T4	**30 pmol/L**	10 – 27	↑
Total T4	**160 nmol/L**	70 – 150	↑
Free T3	**20 pmol/L**	3 – 9	↑
Total T3	**6 nmol/L**	1.2 – 2.8	↑

Case 6

Male , 38 Years, Married + 3, Engineer
Already diagnosed as Graves disease & began treatment 3 months ago
He came to the outpatient clinic for follow up of his treatment as now, he is clinically normal

Diagnosis: **sub clinical hypothyroidism**

Thyroid Function Test #2:			
Analysis	**Results**	**Reference**	**Interpretation**
TSH	**<0.1 mIU/L**	0.3 – 5	↓
Free T4	**10 pmol/L**	10 – 27	~
Total T4	**100 nmol/L**	70 – 150	~
Free T3	**2.9 pmol/L**	3 – 9	↓
Total T3	**0.9 nmol/L**	1.2 – 2.8	↓

Case 7

26 Years, Female, Single, Student, living in Al-Wahat Al-Kharja- West Desert, EGYPT

Complaints: Tired & feeling low [Depressed] all time, Gaining weight, discomfort in neck

Examination: Pulse 55 | BP 108/6, Dry palm, Goiter [Diffusely Enlarged]

Diagnosis: **Primary Hypothyroidism**

Thyroid Function Test #3:			
Analysis	**Results**	**Reference**	**Interpretation**
TSH	**48 mIU/L**	0.3 – 5	↑
Free T4	**8 pmol/L**	10 – 27	↓
Total T4	**56 nmol/L**	70 – 150	↓
Free T3	**2.7 pmol/L**	3 – 9	↓
Total T3	**1.9 nmol/L**	1.2 – 2.8	↓

Case 8

A 27 years old man presents to his physician 3 weeks after his thyroid surgically removed for a thyroid cancer. However, since he went home from the hospital, he noticed painful, involuntary muscular cramping. He also felt numbness and tingling around his mouth & in his hands and feet.

- *His parents said that he was irritable for the last 2 weeks. He is on levothyroxine medication.*

Clinical Chemistry Lab Investigation #4:			
	Results	Reference	Interpretation
Calcium	5.6 mg/dl	8.5 – 10.2	↓
Albumin	4.1 g/dl	3.5 – 4.8	~
PTH	<1 pg/ml	11 – 54	↓

Examination:

- *Well-healing thyroidectomy scar*
- *No palpable masses in the thyroid bed*
- *Blood pressure cuff inflated above systolic pressure induces involuntary muscular contracture in the ipsilateral hand after 60 seconds (Trousseau`s sign)*
- *Tapping on the face interior to the ears cause twitching in the ipsilateral corner of the*
- *mouth (Chevostek`s sign)*

Diagnosis: Hypoparathyroidism ~ The parathyroid glands were removed during thyroidectomy → PTH Undetectable → Hypocalcemia → Clinical Manifestations of hypocalcemia (↑ reflexes & muscular cramping)

Case 9

A 4 years old child was brought to Outpatient Clinic by his parents who complained that he has a delay in proper walking & bowing of his extremities

- **Diagnosis: Renal Rickets**
- **Further Investigation: Alkaline phosphatase , 25-hydroxycholecalciferol (25 HCC)**
- **Treatment: 1,25 DHCC**

Clinical Chemistry Lab Investigation #5:			
	Results	Reference	Interpretation
Calcium	2 mmol/l	2.2 – 2.6 mmol/l	↓
Albumin	4 gm/dl	3.5 – 5.5 gm/dl	~
Creatine	5 mg/dl	0.5 – 1.5 mg/dl	↑

Case 10

A case with clinical manifestations of osteomalacia
X-ray showed generalized poor calcification of his skeleton

Lab Investigations:

- ↓ blood ionized Calcium
- Normal Calcitriol

What is the expected cause of this case is: Vitamin D receptors defect.

Case 11

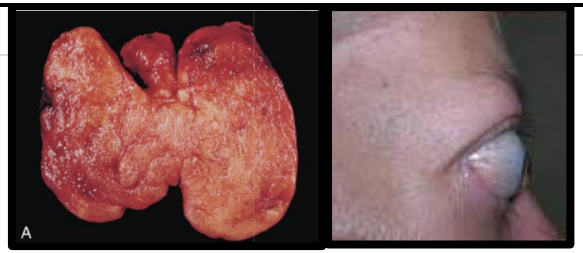
A case with clinical manifestations of rickets with bone deformities
X-ray showed generalized poor calcification of his skeleton.

Lab Investigations:

- ↓ blood ionized Calcium
- ↓ level of 25 OH vitamin D3

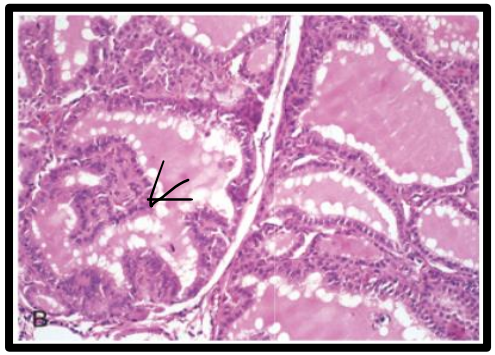
What is the expected cause of this case is: Nutritional Vitamin D Deficiency.

Pathology



Case-1

20-year-old female presented with gradually enlarging swelling in the middle of the neck, palpitation, weight loss and heat intolerance. Physical examination revealed tachycardia, exophthalmos and diffuse, symmetrical enlargement of the thyroid gland.

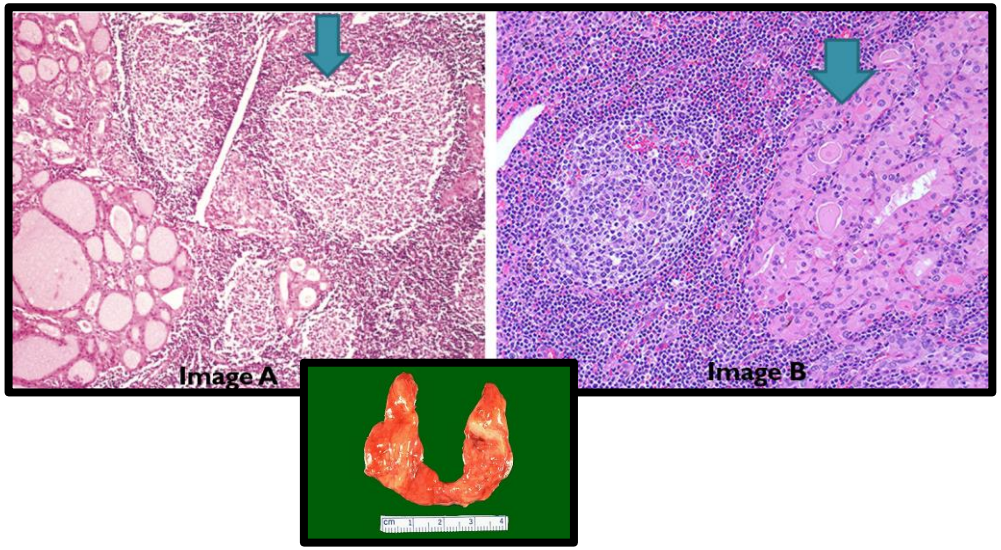


Thyroid function tests revealed low TSH level with high T3 and T4 and positive anti-TSH receptor antibodies.

- **Diagnosis: Primary Toxic Goiter / Graves' Disease / Exophthalmic Goiter**
- **Autoantibody which is responsible:** Thyroid stimulating Immunoglobulin [**TSI**]
- **Important gross features:** Symmetrical/Diffused enlargement – Firm in consistency & Dark red "Vascular"
- **Microscopic features & feature the marker:** Hyperplasia, Scalloping of colloid w/ peripheral Vacuolization
- **Mention name of C.L. Feature observed in Graves Disease: Exophthalmos**

Case-2

40-year-old female presented with a large, painless swelling in her neck. She also complained of fatigue, weight gain and increased sensitivity to cold. On examination, thyroid was diffusively enlarged and had a rubbery consistency. Thyroid function tests revealed high TSH level with low T3 and T4, positive anti-thyroglobulin antibodies and anti-thyroid peroxidase antibodies. Subtotal thyroidectomy was performed.

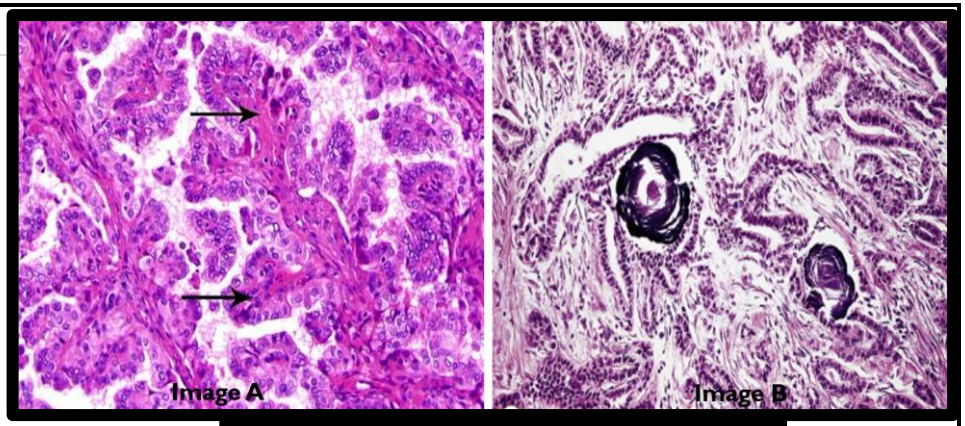


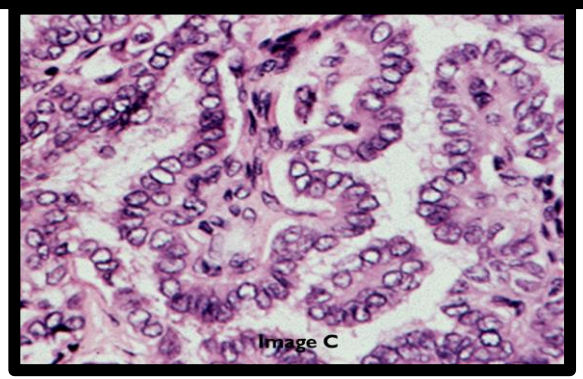
- **What is the most likely diagnosis? Hashimoto's thyroiditis**
- **Mention the name of microscopic features observed in image A and B marked by an arrow.**
  A: Lymphoid Follicle, B: Hurtle Cell Metaplasia
- **Enumerate other types of thyroiditis?**
  1- DeQuervain Thyroiditis / **Subacute Granulomatous** thyroiditis
  2- Riedel's Thyroiditis / **Fibrous** Thyroiditis

Case-3

A 44-year-old woman presented with lump on the left side of neck.
Physical examination showed a non-tender nodule in the left lobe of thyroid gland.
Ultrasound revealed an ill-demarcated nodule suggestive of neoplastic origin.
Serological tests for T4 and TSH levels were normal.

Partial thyroidectomy was performed and sent for histopathological examination.





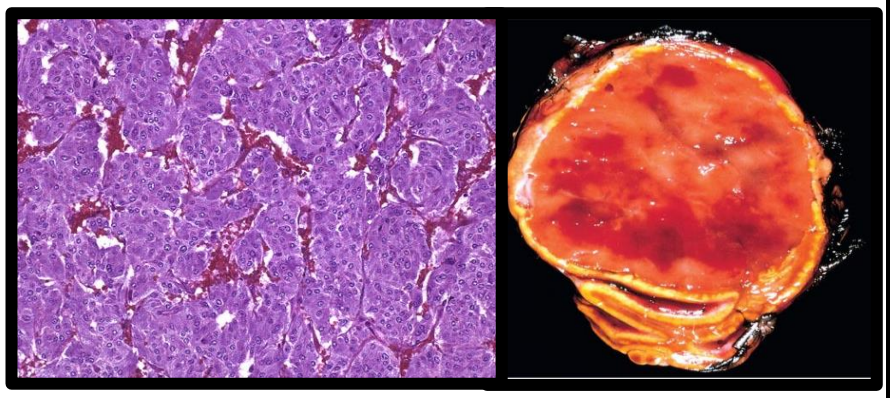
- **What is the most likely diagnosis?** **Papillary Carcinoma of thyroid**

- **Mention the characteristic microscopic findings in image A, B and C of this tumor?**
  - **A-** **Papillary structure**
  - **B-** **Psammoma bodies**
  - **C-** **Orphan Annie Eye Nuclei**

- **Mention one risk factor that contributes to the development of this tumor**
  Exposure to Ionizing Radiation, Old standing multinodular goiter, Hashimoto thyroiditis

Case-4

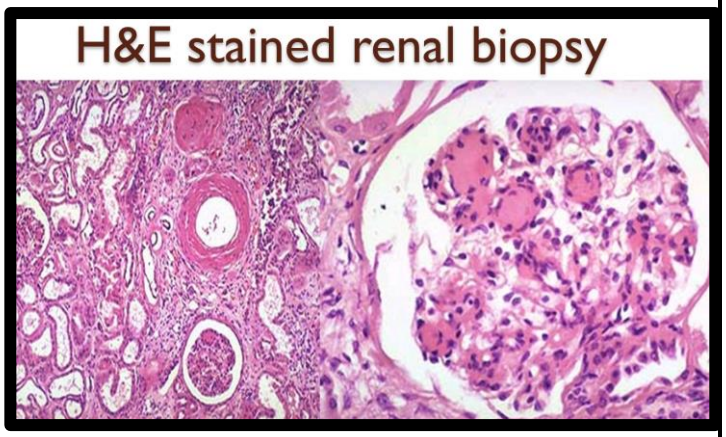
A 35-year-old male presented with severe headache in the emergency department.
On examination his blood pressure was 200/120 mm Hg. He mentioned frequent episodes of anxiety, palpitations and sweating in the past. Further evaluation revealed a left suprarenal mass which was surgically removed. Grossly,
it appeared well circumscribed, dark red brown with areas of hemorrhage.



- **What is the most likely diagnosis?** Pheochromocytoma of Adrenal Medulla
- **Describe characteristic microscopic findings of tumor?** Zellballen Appearance, Nest cells separated by fibrovascular/ connective tissue or trabecular
- **What is the cause of hypertension in this case?** Due to increased Catecholamine
- **Mention the types of MEN syndrome with which this tumor is associated?** MEN-Type II 2A & 2B

Case-5

A 55-year-old female is a known case of long-standing uncontrolled diabetes mellitus, presented with generalized edema. On physical examination, there was no clinical evidence of cardiac or liver failure. Laboratory tests revealed elevated blood urea nitrogen and serum creatinine (both indicating renal failure). Urine examination revealed glucose 2+ and massive proteinuria. A renal biopsy was performed, and microscopic appearance is shown in the figure.

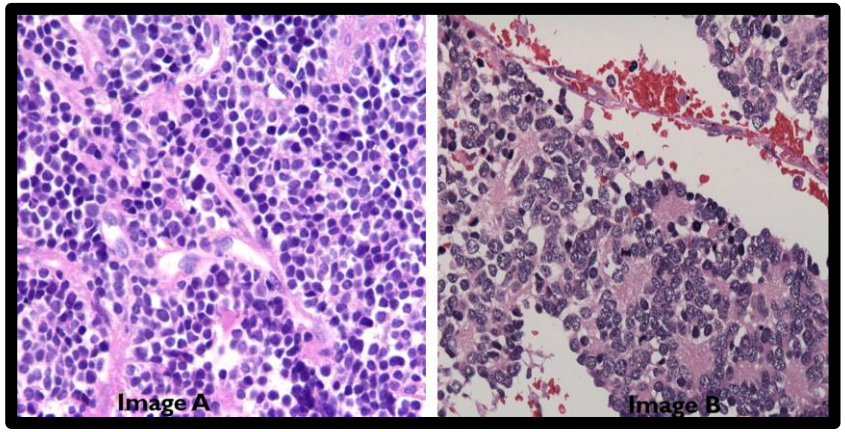


- **Describe the microscopic picture of renal biopsy?**
  Hyaline Arteriolosclerosis
  Nodular Glomerulosclerosis

- **Mention the name of characteristic glomerular lesion?** **Kimmelstiel-Wilson Lesion**

Case-6

A 2 year old boy was brought to the pediatric department by his mother after noticing a lump in the lower abdomen. She also mentioned recent loss of weight and irritable behavior. Ultrasound revealed a mass over the upper pole of left kidney, probably neoplastic. Biopsy of the mass was carried out.



- **Describe the microscopy of the tumor?**
  1- **Small round blue cells,**
  2- **arranged in nests separated by connective tissue or trabecula**
  3- **homer-wright Pseudorosettes**
- **Mention the name of characteristic rosette observed in the image.**
  Image A: Neuroblasts, Eosinophilic Neurofibrillary matrix, Palisading Peripheral nuclei
- **Write the diagnosis?** **Neuroblastoma**
- **Mention the cells of origin of this tumor.** Primitive Neural Crest Cells
- **Mention the site of origin of this tumor.** Sympathetic Ganglia of Posterior Mediastinum

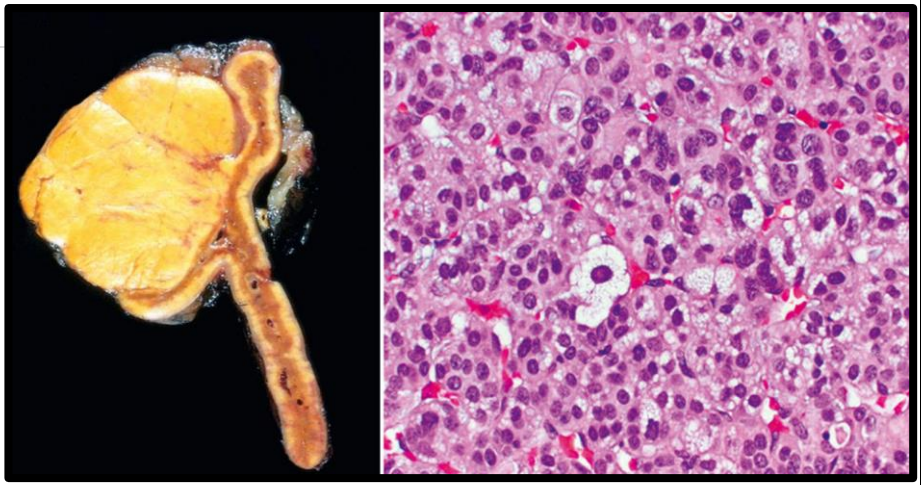
Case-7

A 40 year old male patient presented with clinical manifestations of Cushing syndrome. MRI showed a mass in the adrenal gland.

The mass was resected and sent for histopathological examination.

Write the diagnosis: **Adrenocortical Adenoma**

[Capsulated, bright-yellow or Golden-Yellow color, Arranged in nests or trabecula]



Case-8

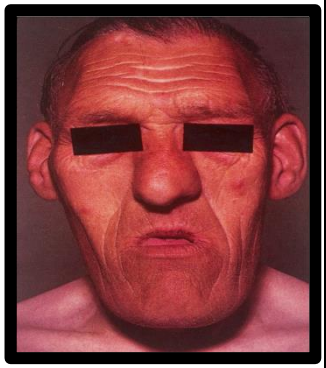
A 40 year old female presented with a large anterior neck swelling.

Write the clinical diagnosis: **Multinodular Goiter**

Case-9

Following is a 20 year old male diagnosed with somatotroph adenoma.

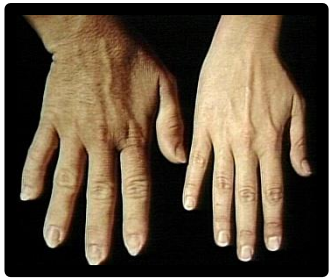
- **Write the most likely clinical diagnosis. Gigantism**
- **Mention any two complications observed in this condition. HF, DM, Arthritis, Hypertension**



Case-10

Following is a 45 year old male diagnosed with somatotroph adenoma.

- **Write the most likely clinical diagnosis.** Acromegaly
- **Mention 2 identification criteria?** Bone thickening, prognathism, Soft tissue enlargement, Bigger Heart, Sausage shape fingers

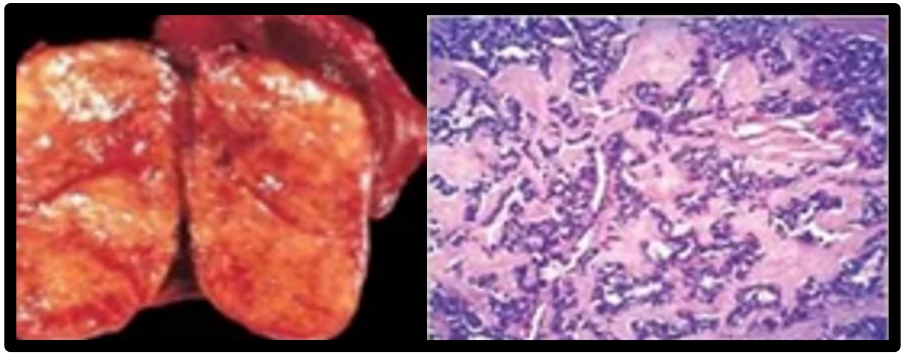


- **Identify the clinical abnormality of fingers observed in this case.** Sausage Shape finger

Case-11

45-years-old female presented with enlargement at the middle of the neck.

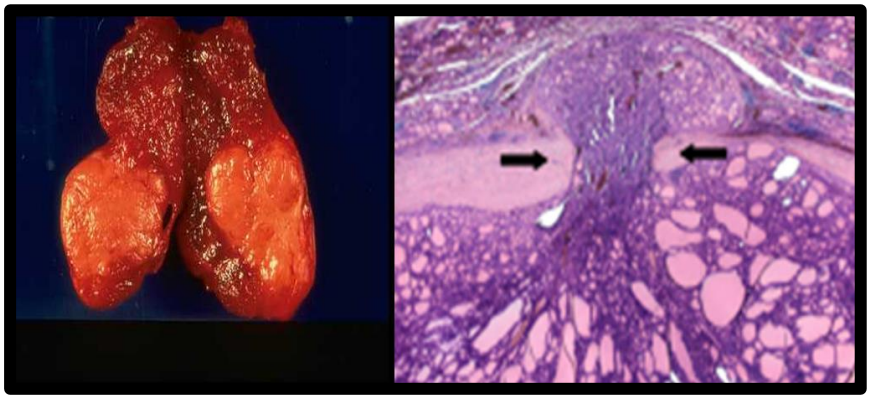
- **What is the possible diagnosis?** Colloid Goiter
- **Describe the gross & microscopic picture of the thyroid?** Gelatinous grossly, Scanty stroma, abundant colloid
- **Mention the pathogenesis of this lesion?** After Correction of Iodine



Case-12

A 50-year-old woman presented with lump on front of neck.
Physical examination showed a non-tender mass in the thyroid gland.
Ultrasound revealed an ill-demarcated lesion suggestive of neoplastic origin.
Serological tests for T4 and TSH levels were normal.
Subtotal thyroidectomy was performed and sent for histopathological examination.

- **What is the most likely diagnosis and how you can confirm it? Medullary Carcinoma of Thyroid**
- **Mention the characteristic microscopic findings of this tumor? Pink Amyloid deposition in stroma**
- **Mention types of this leison according to incidence? Men-II 2a & 2b**



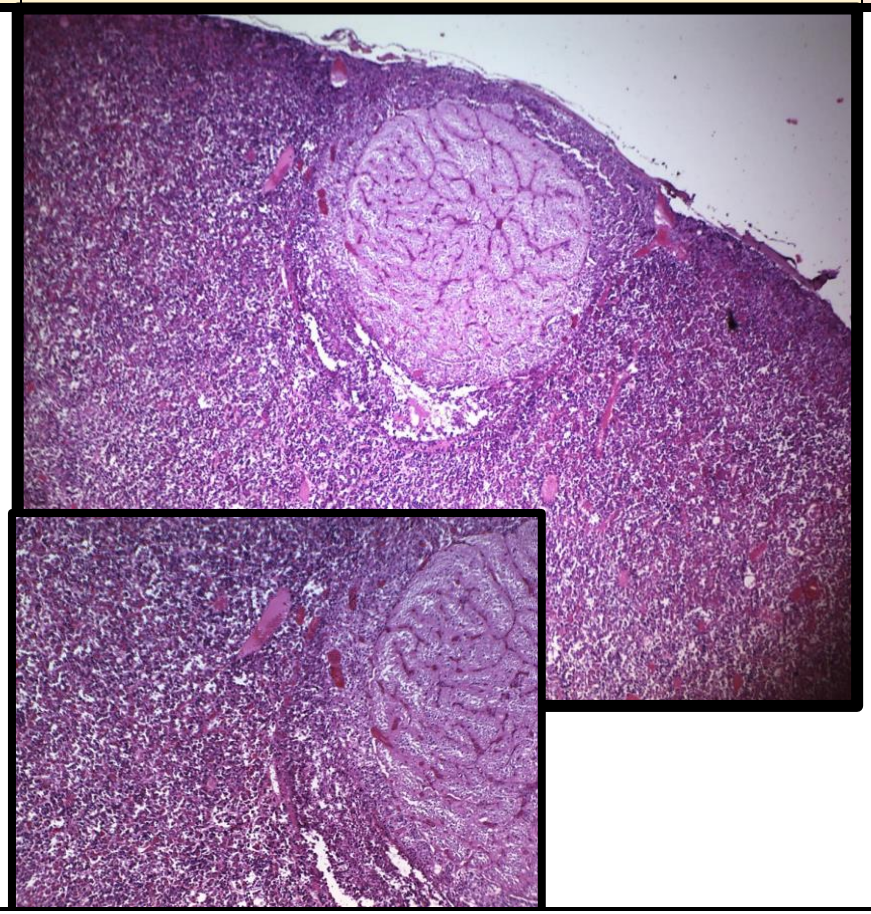
Case-13

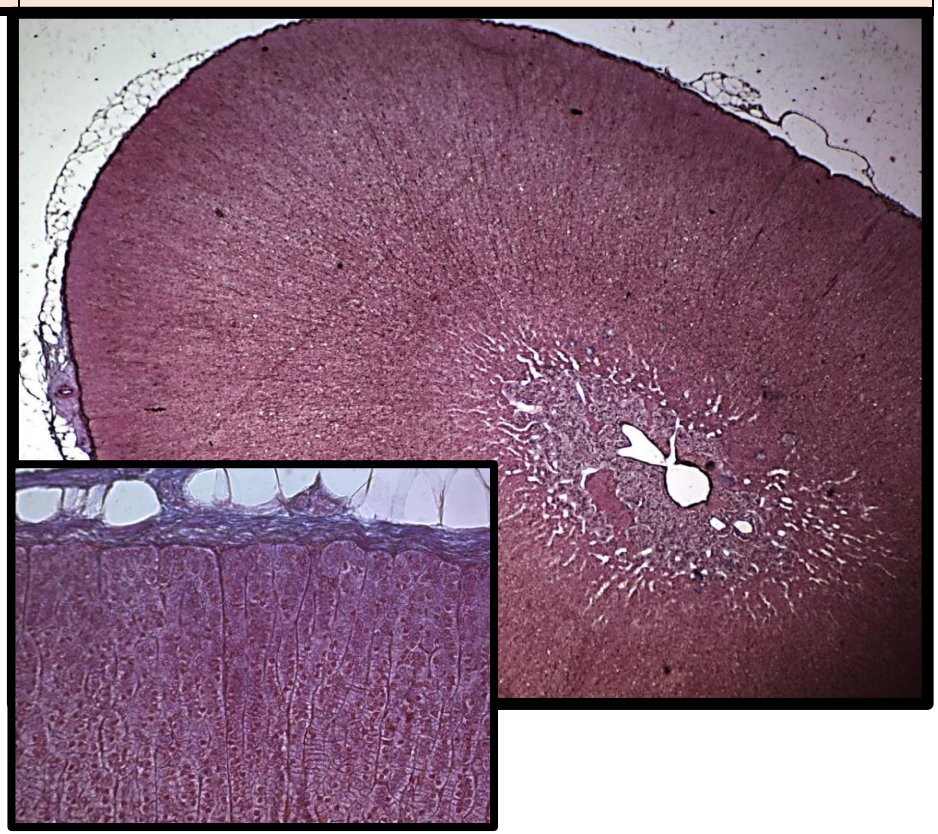
A 40-year-old woman presented with lump on front of neck.
Physical examination showed a non-tender mass in the thyroid gland.
Ultrasound revealed an infiltrative lesion suggestive of neoplastic origin.
Serological tests for T4 and TSH levels were normal.
Subtotal thyroidectomy was performed and sent for histopathological examination.

- **What is the most likely diagnosis?**
  Follicular Carcinoma of Thyroid
- **Mention the characteristic microscopic findings of this tumor?**
  Vascular infiltration, Capsular Infiltration

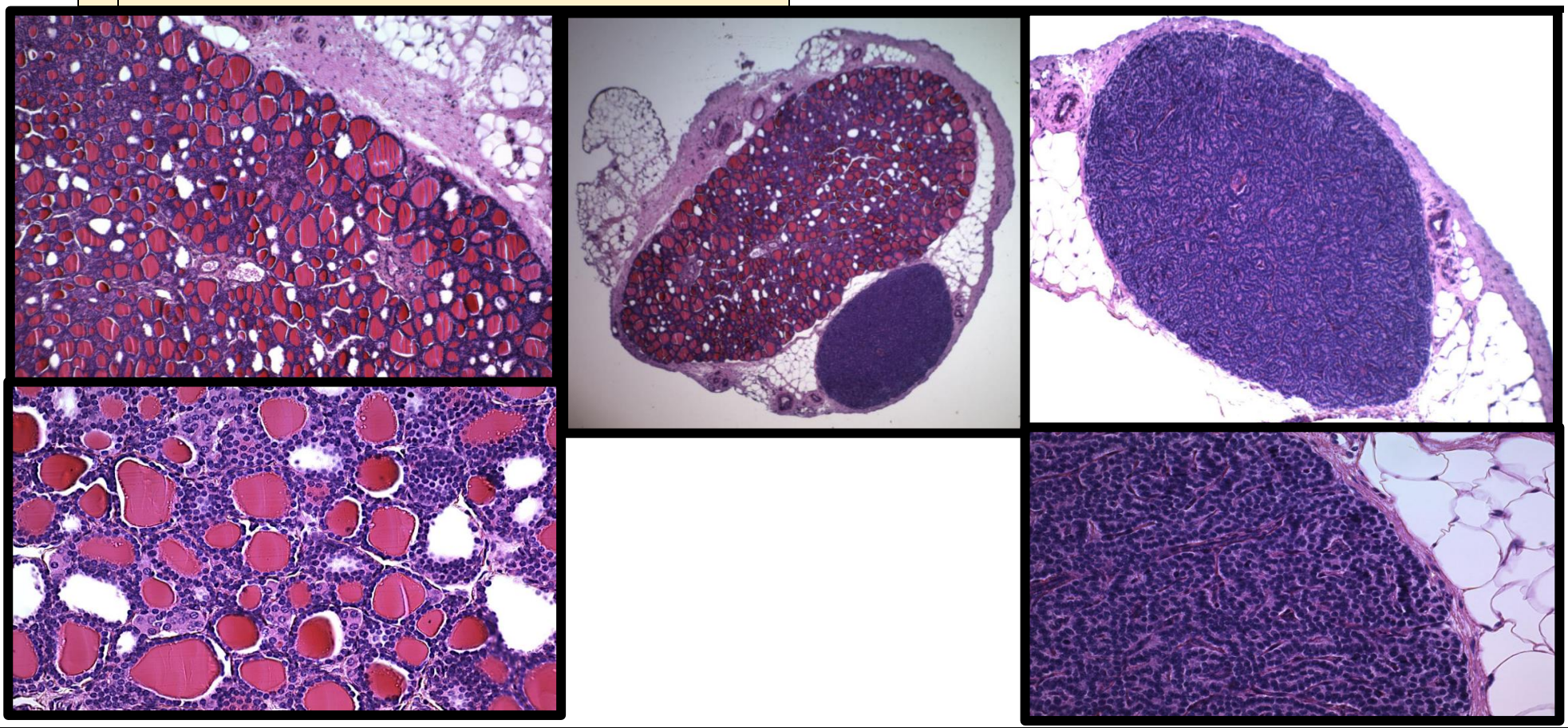
Histology

Pituitary Gland		Adrenal Gland	
#	**Identification Points**	#	**Identification Points**
1	Adenohypophysis	1	Capsule is present / Chromaffin cells
2	**Adenohypophysis:** Acidophils	2	Zona glomerulosa
3	**Adenohypophysis:** Basophils	3	Zona fasiculata
4	Neurohypophysis	4	Zona reticularis

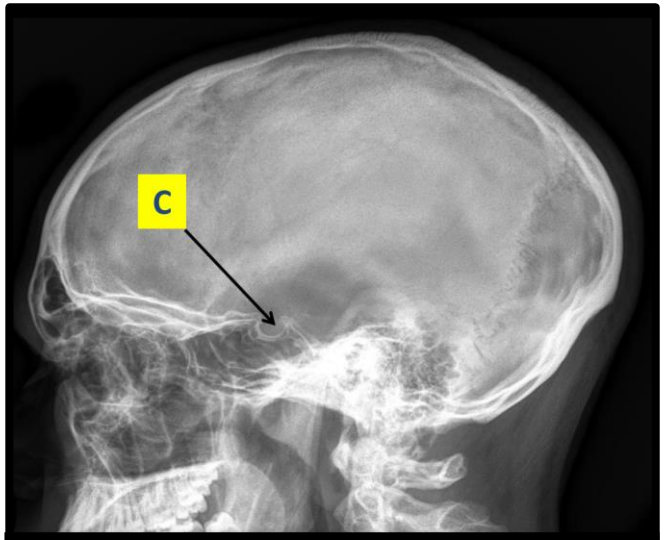




Thyroid Gland		Parathyroid Gland	
#	Identification Points	#	Identification Points
1	Follicles are present	1	Chief Cells
2	Follicular cells are present	2	Oxyphils Cells
3	Parafollicular cells are present		
4	Colloid		

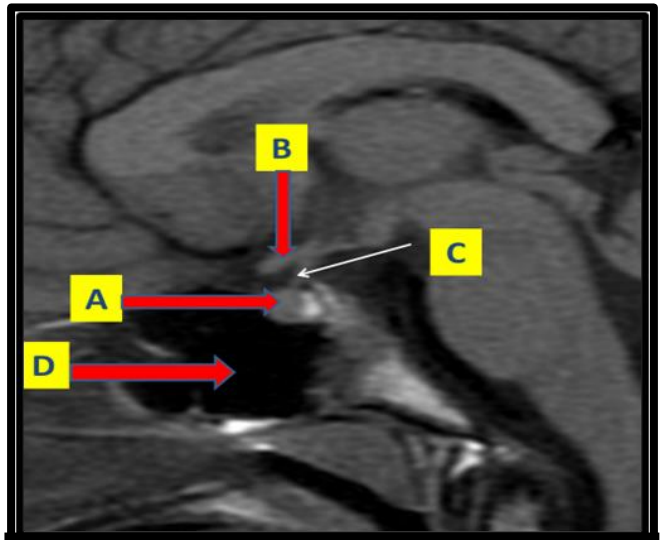


Radiology



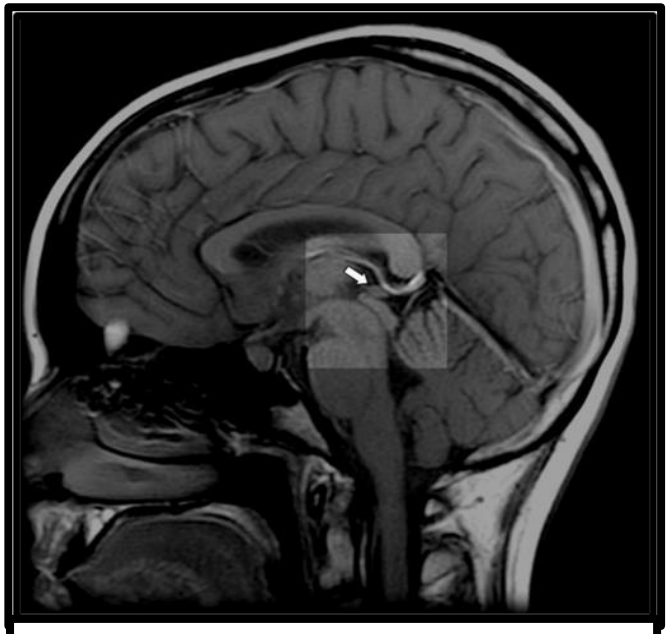
Name imaging modality used in the given image
X-ray LA view - Skull

Identify gland located in the fossa marked as C.
Hypophyseal Fossa (Pituitary fossa) –
Contains Pituitary Gland



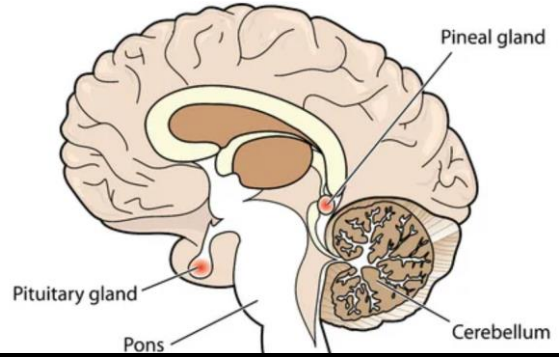
Name imaging modality used in the given image
MRI of Pituitary Gland

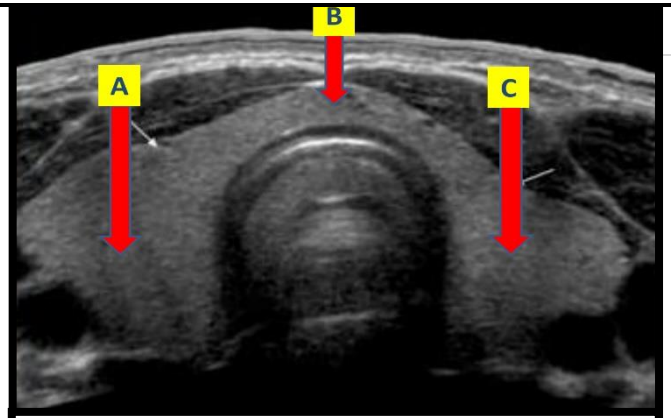
Identify Marked Structures
- A- Pituitary Gland
- B- Optic Chiasm
- C- Pituitary Stalk
- D- Sphenoid Sinus



Name imaging modality used in the given image
MRI

Identify Marked Structures
Pineal Gland





Name imaging modality used in the given image

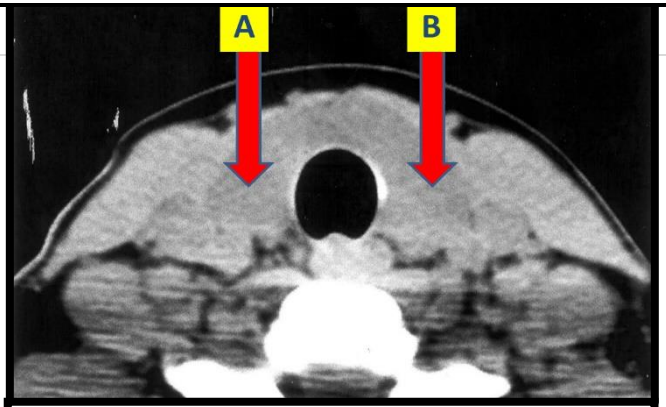
Ultrasound of thyroid

Identify Marked Structures

A- Right Lobe of Thyroid

B- Isthmus

C- Left Lobe of Thyroid



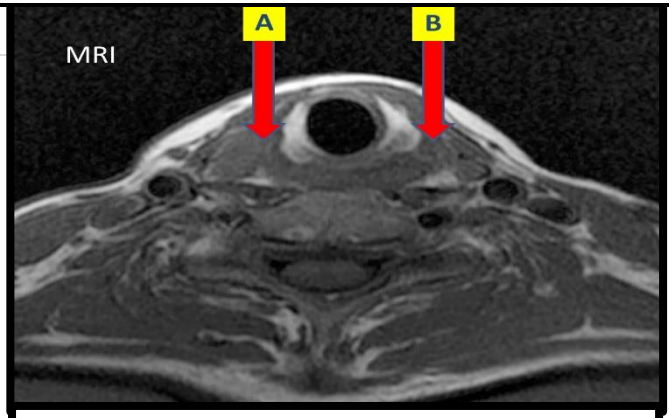
Name imaging modality used in the given image

CT image of thyroid

Identify Marked Structures

A- Right Lobe of Thyroid

B- Left Lobe of Thyroid



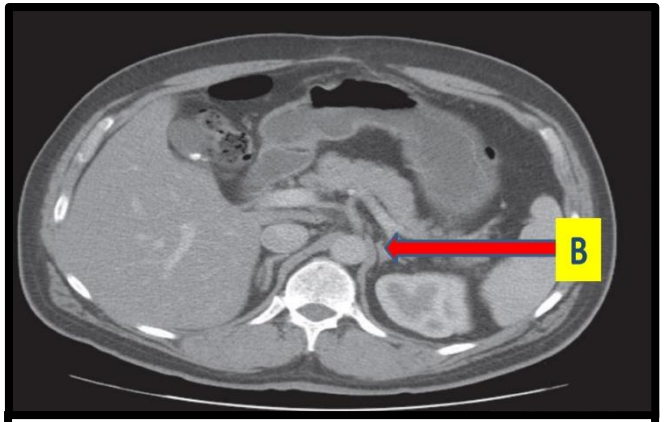
Name imaging modality used in the given image

MRI

Identify Marked Structures

A- Right Lobe of Thyroid

B- Left Lobe of Thyroid

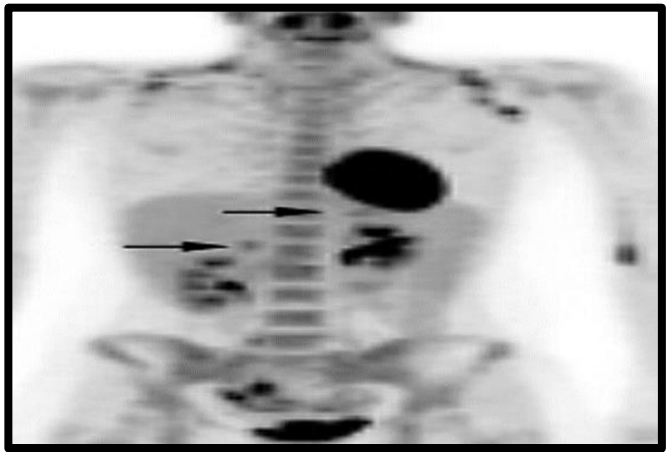


Name imaging modality used in the given image

CT Scan of Adrenal

Identify the structures

B- Left Adrenal



Name imaging modality used in the given image

Radionuclide Scan

Identify Marked Structures

Adrenal Glands

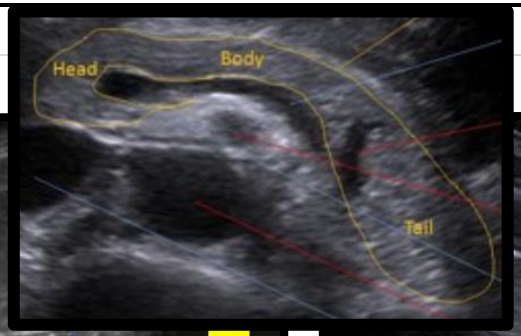
Name imaging modality used in the given image

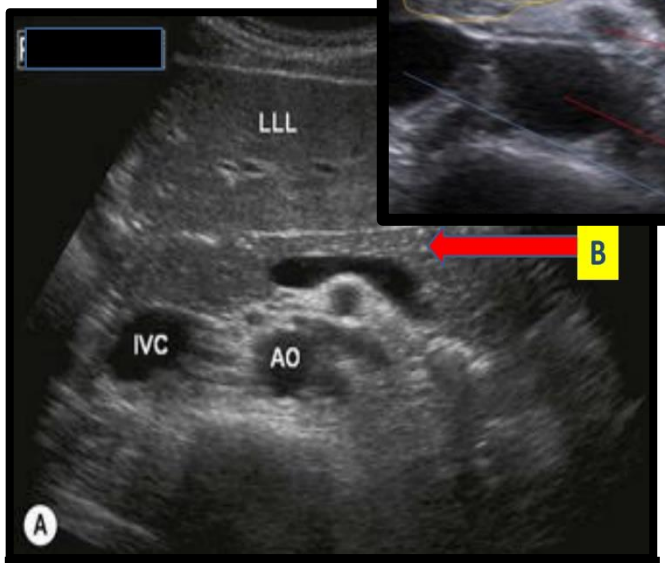
MRI of Adrenals

Identify Glands marked

A- Right Adrenal Gland

B- Left Adrenal Gland



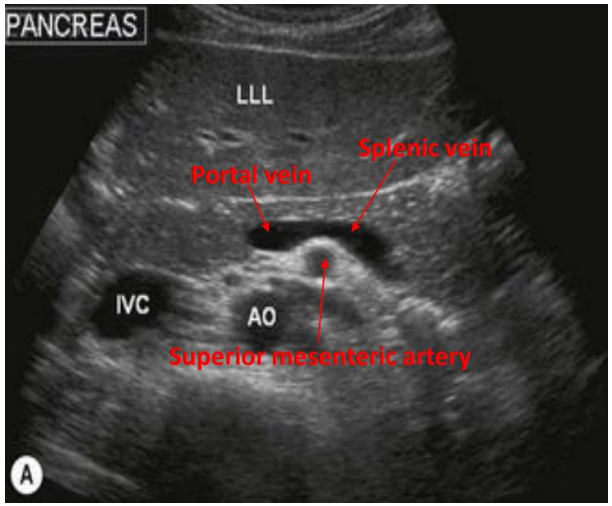


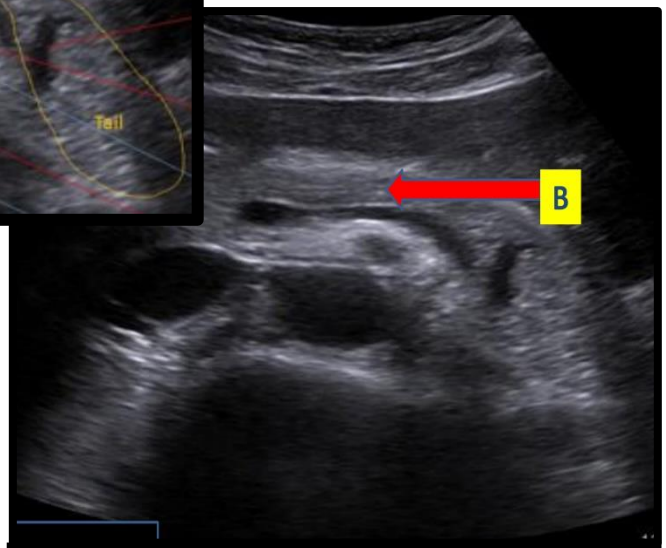
Name imaging modality used in the given image

Ultrasound images of pancreas

Identify Marked Structures

B- Pancreas



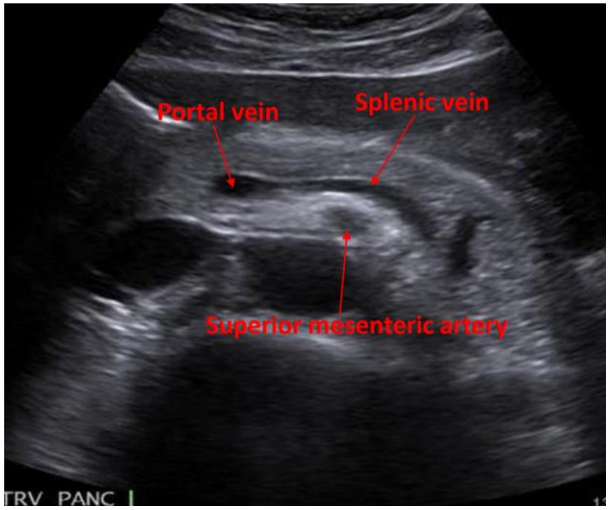


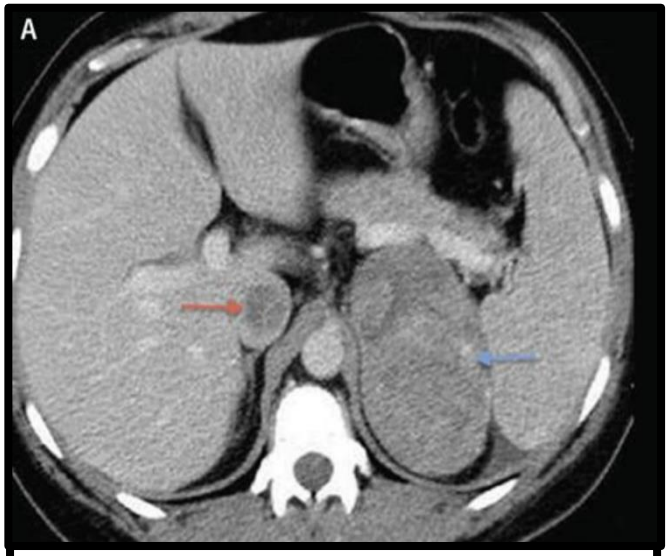
Name imaging modality used in the given image

Ultrasound images of pancreas

Identify Marked Structures

B- Pancreas



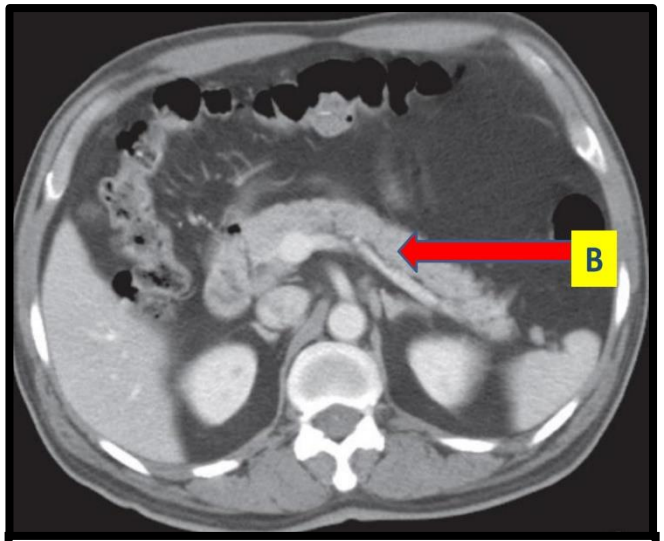


Name imaging modality used in the given image

CT Scan

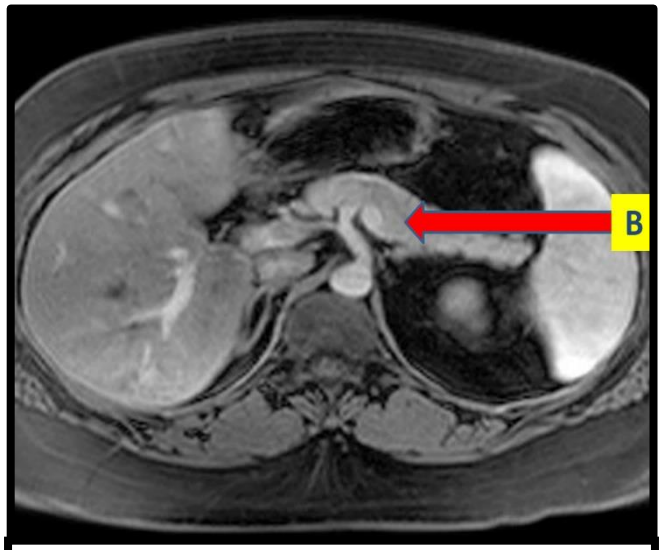
Identify the abnormal gland in the given image.

Bilateral = from lung cancer – Adrenal Metastasis



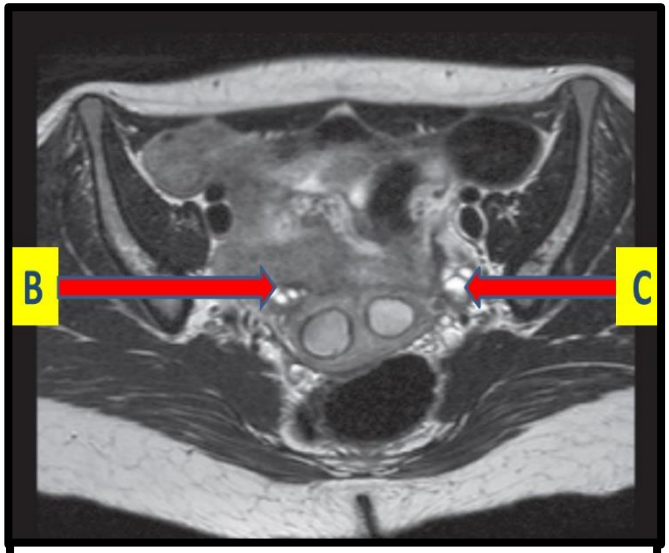
Name imaging modality used in the given image.
CT images

Identify gland located.
B- Pancreas



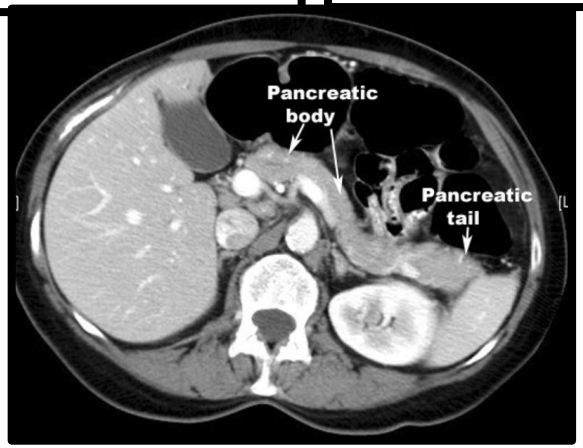
Name imaging modality used in the given image.
MRI images

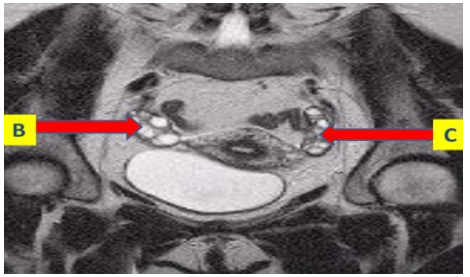
Identify gland located.
B- Pancreas



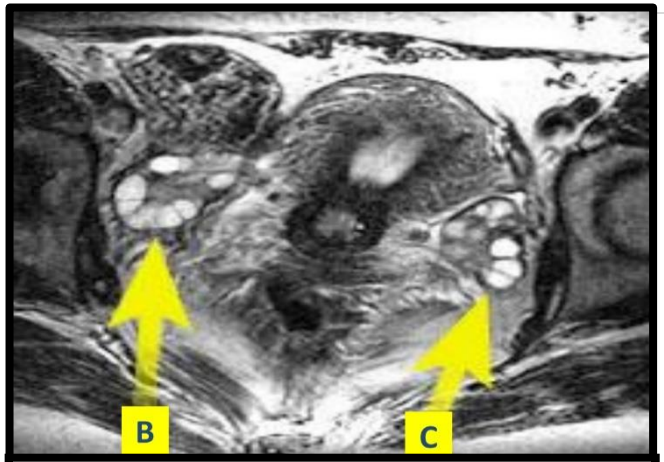
Name imaging modality used in the given image.
Axial MRI of a Septate Uterus - an anatomical variant. Note the normal ovaries bilaterally.

Identify gland Structures.
B- Right Ovary
C- Left Ovary





Identify gland Structures.
B-Right Ovary
C- Left Ovary

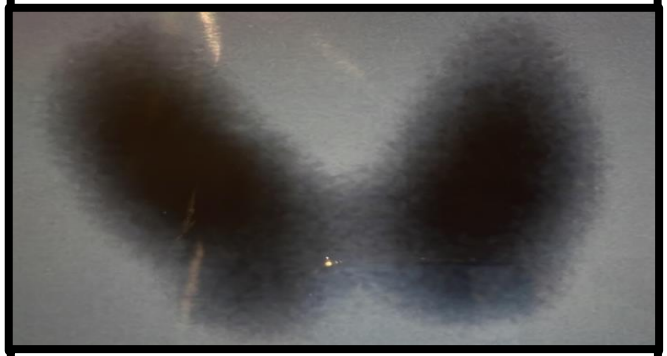


Name imaging modality used in the given image.
MRI of Ovaries

Identify gland located.
B- Right Ovary
C- Left Ovary

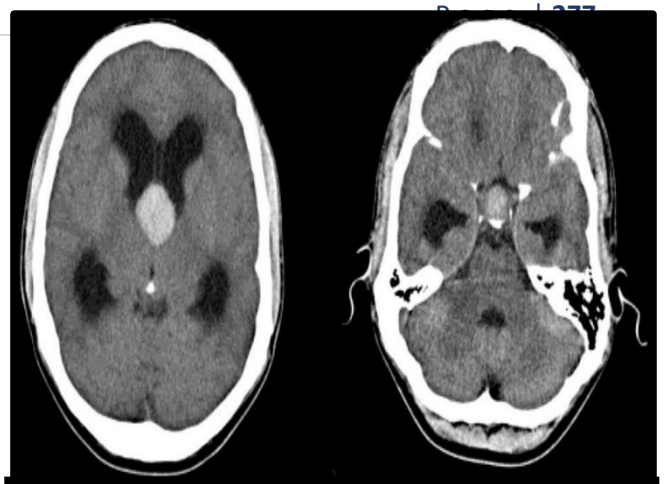
Name imaging modality used in the given image.
MRI head (T1-weighted; without contrast)

Mention Abnormality in gland
Macroadenoma (prolactinoma) of the pituitary gland is the most likely diagnosis.



Name imaging modality used in the given image.
Radionuclide Scan

Diagnosis?
Hyperthyroidism

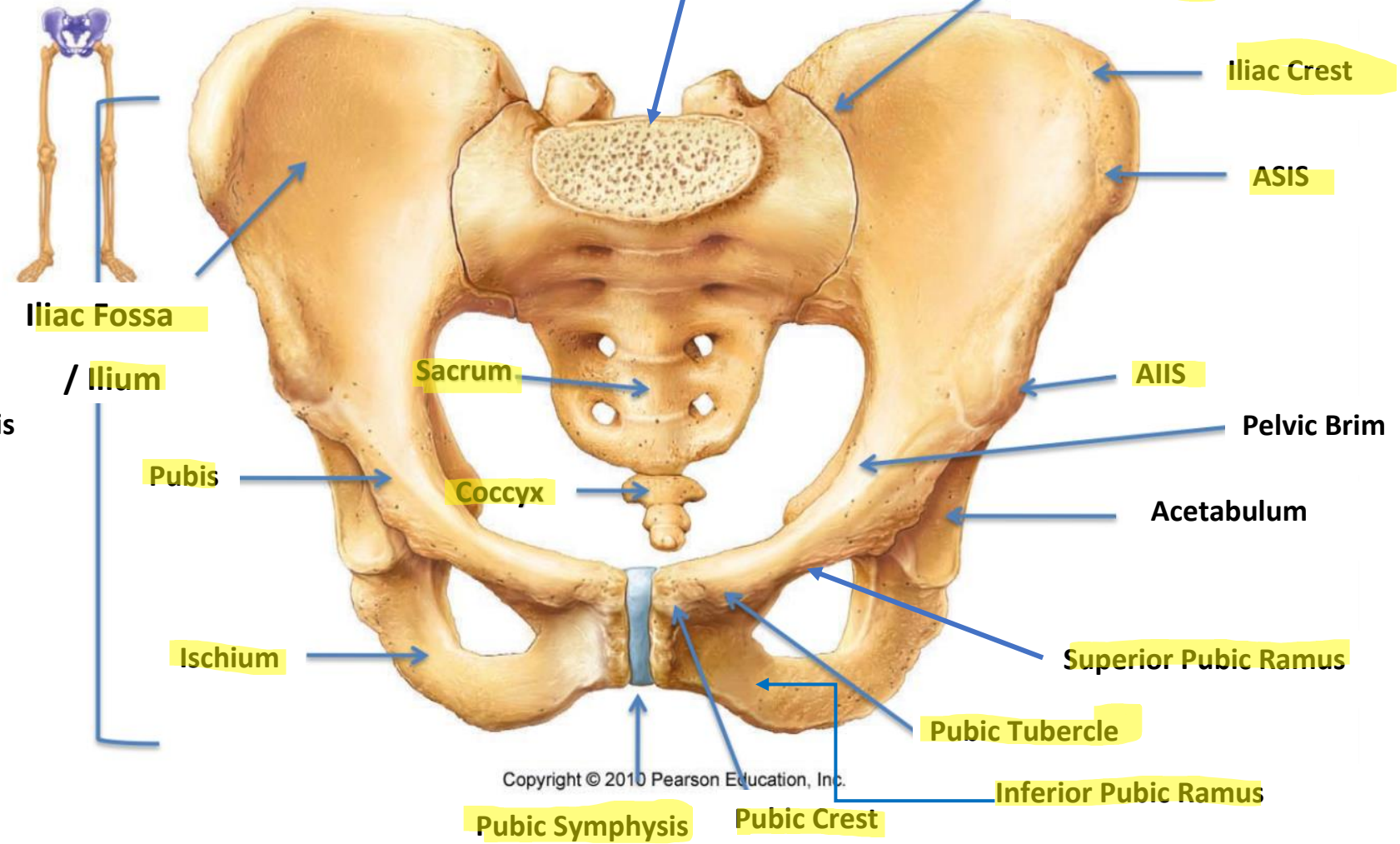


Name imaging modality used in the given image.
CT head (with contrast; axialplane)

Mention Abnormality in gland
Pituitary Mass
A midline high-attenuation mass extends superiorly from the

REPR

Anatomy


Lumbosacral Joint
Sacroiliac Joint
Iliac Crest
ASIS
Iliac Fossa
/ Ilium
Pelvis
Sacrum
AIIS
Pelvic Brim
Pubis
Coccyx
Acetabulum
Ischium
Superior Pubic Ramus
Pubic Tubercle
Inferior Pubic Ramus
Pubic Symphysis
Pubic Crest
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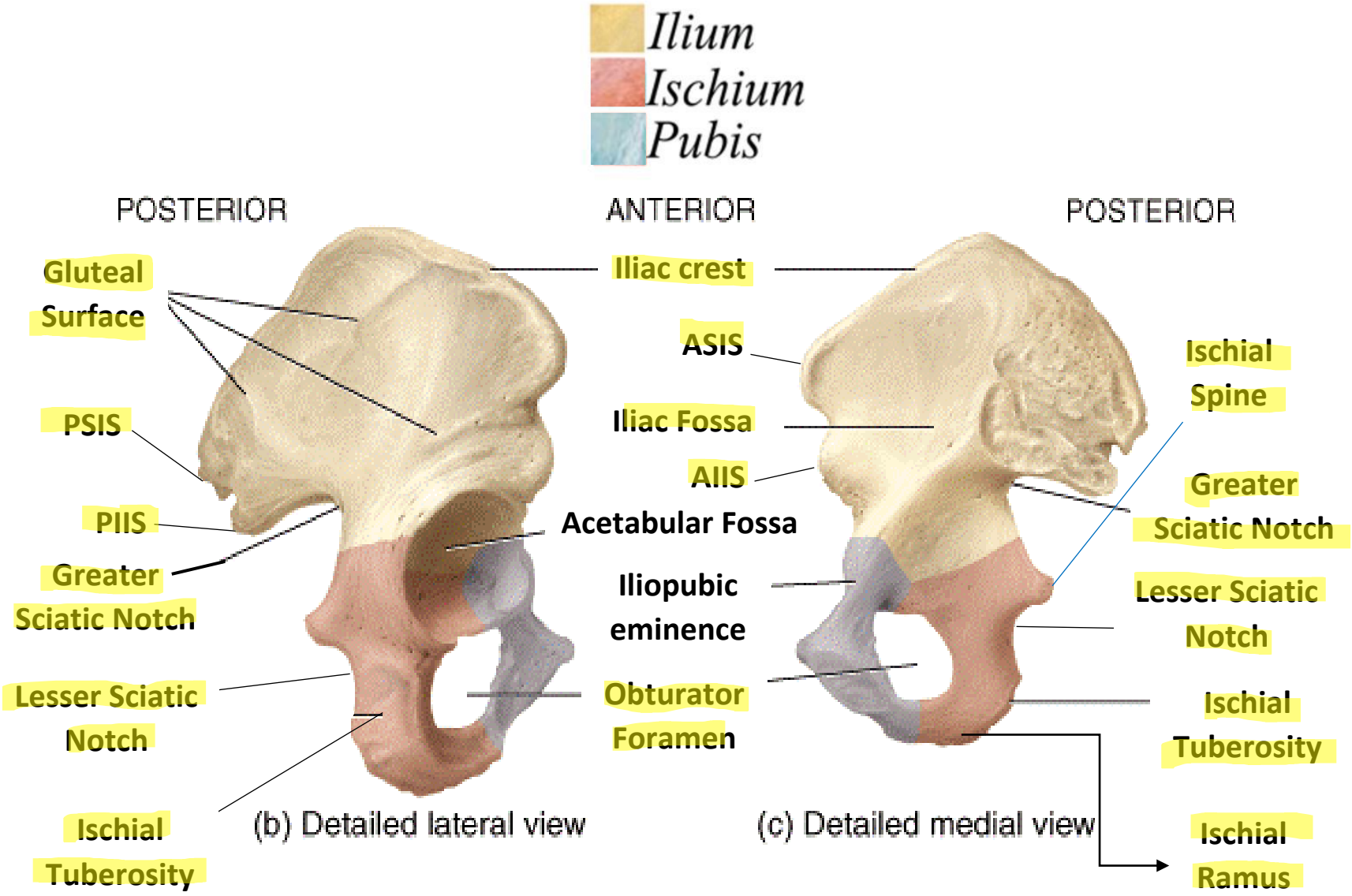
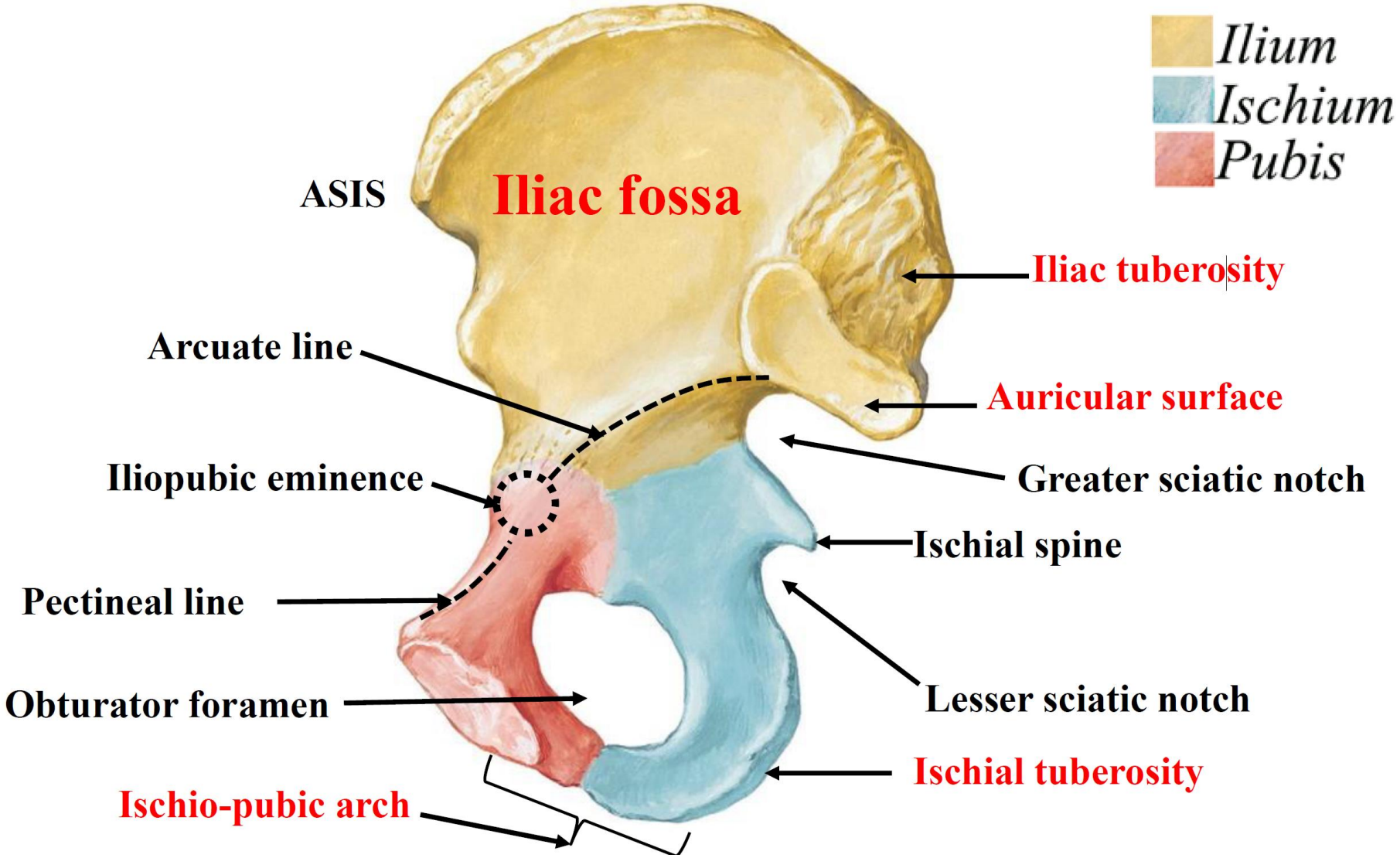
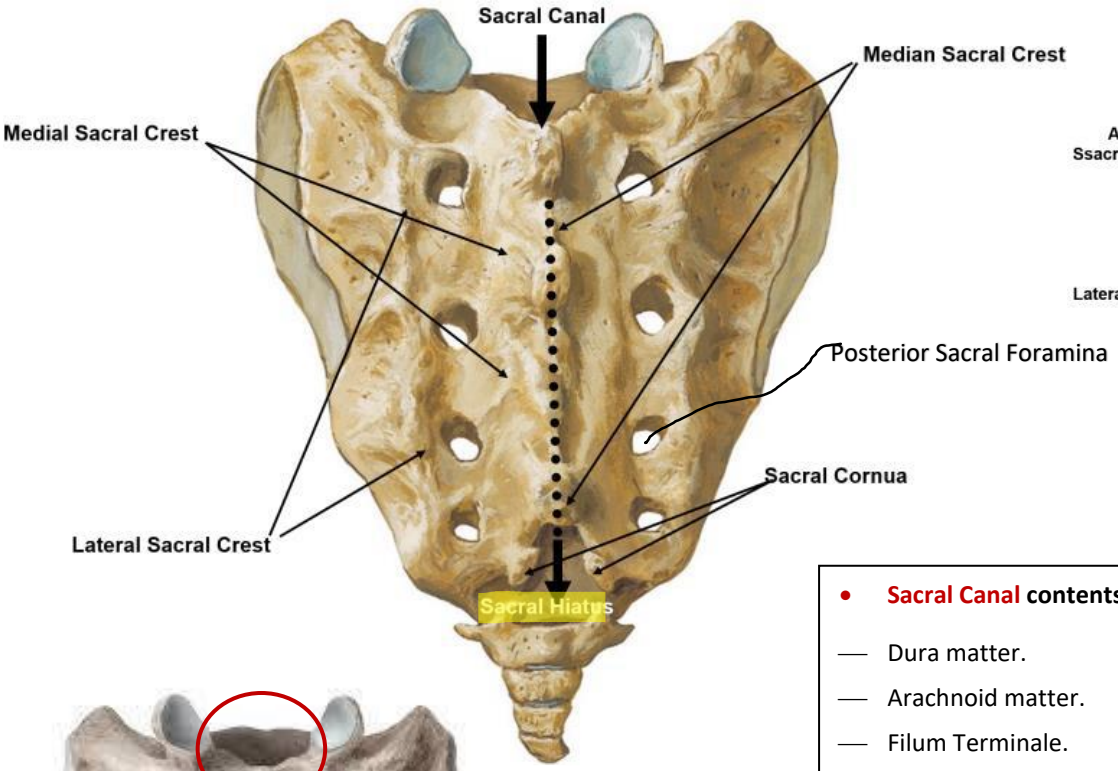
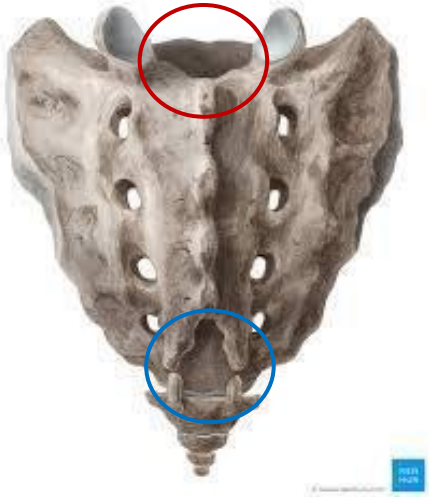

Ilium
Ischium
Pubis
POSTERIOR
ANTERIOR
POSTERIOR
Gluteal Surface
PSIS
PIIS
Greater Sciatic Notch
Lesser Sciatic Notch
Ischial Tuberosity
Iliac crest
ASIS
Iliac Fossa
AIIS
Acetabular Fossa
Iliopubic eminence
Obturator Foramen
Ischial Spine
Greater Sciatic Notch
Lesser Sciatic Notch
Ischial Tuberosity
Ischial Ramus
(b) Detailed lateral view
(c) Detailed medial view


Ilium
Ischium
Pubis
ASIS
Iliac fossa
Iliac tuberosity
Arcuate line
Auricular surface
Iliopubic eminence
Greater sciatic notch
Ischial spine
Pectineal line
Obturator foramen
Lesser sciatic notch
Ischial tuberosity
Ischio-pubic arch

Sacrum

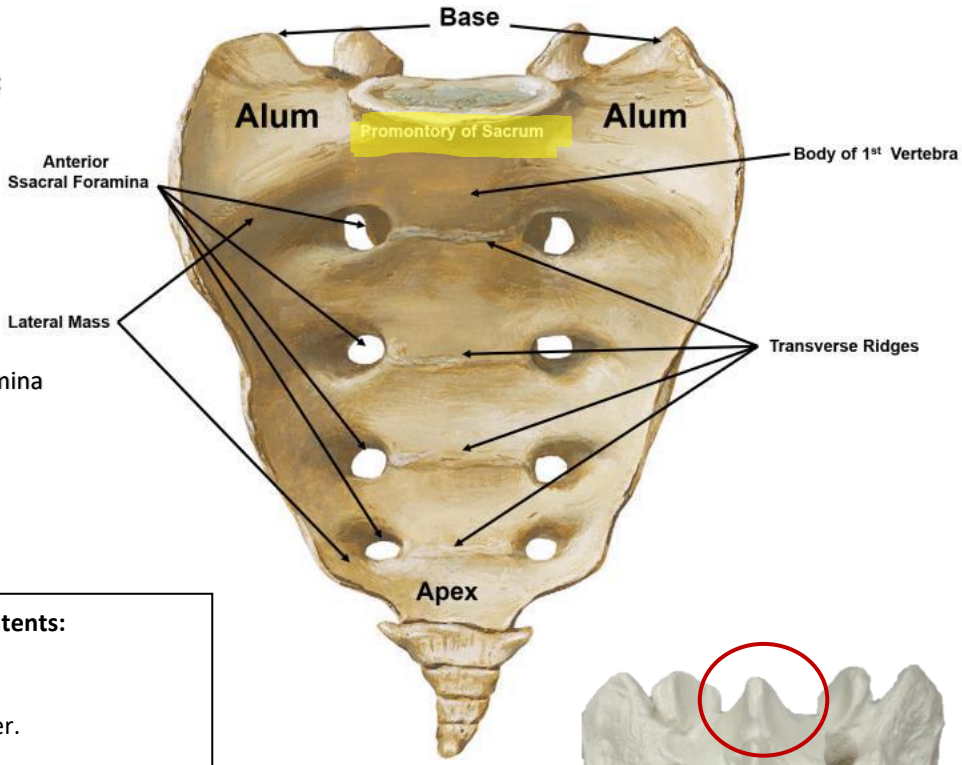
Posterior Surface of Sacrum

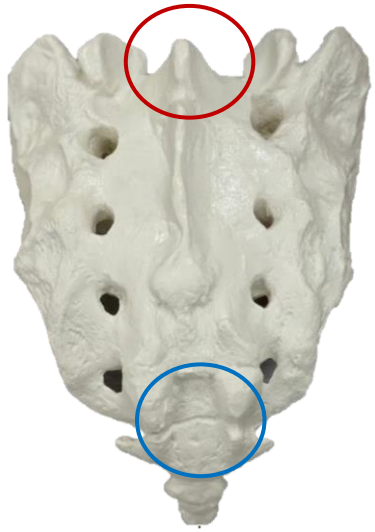


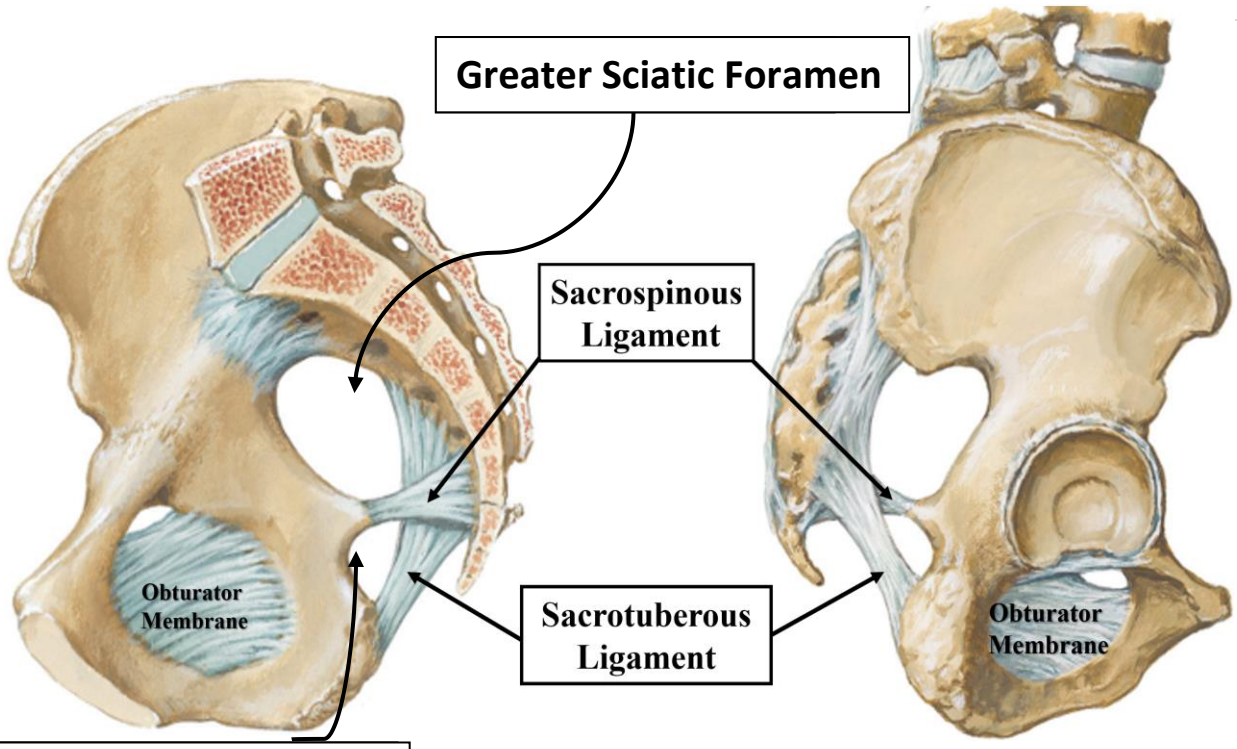


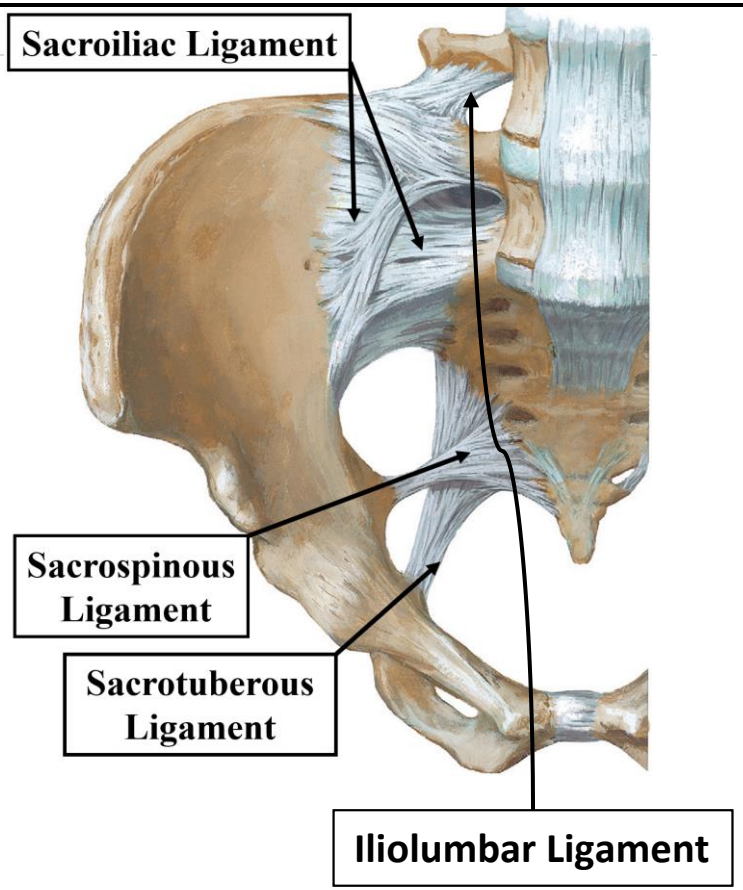
- **Sacral Canal contents:**
  - Dura matter.
  - Arachnoid matter.
  - Filum Terminale.
  - Roots & Trunks of Sacral
  - Coccygeal Nerves (**Cauda Equina**)
  - Branches of Lateral Sacral A.
  - Median Sacral A.
- **Sacral Hiatus contents:**
  - Filum Terminale.
  - Coccygeal Nerve.
  - 5th sacral nerve.

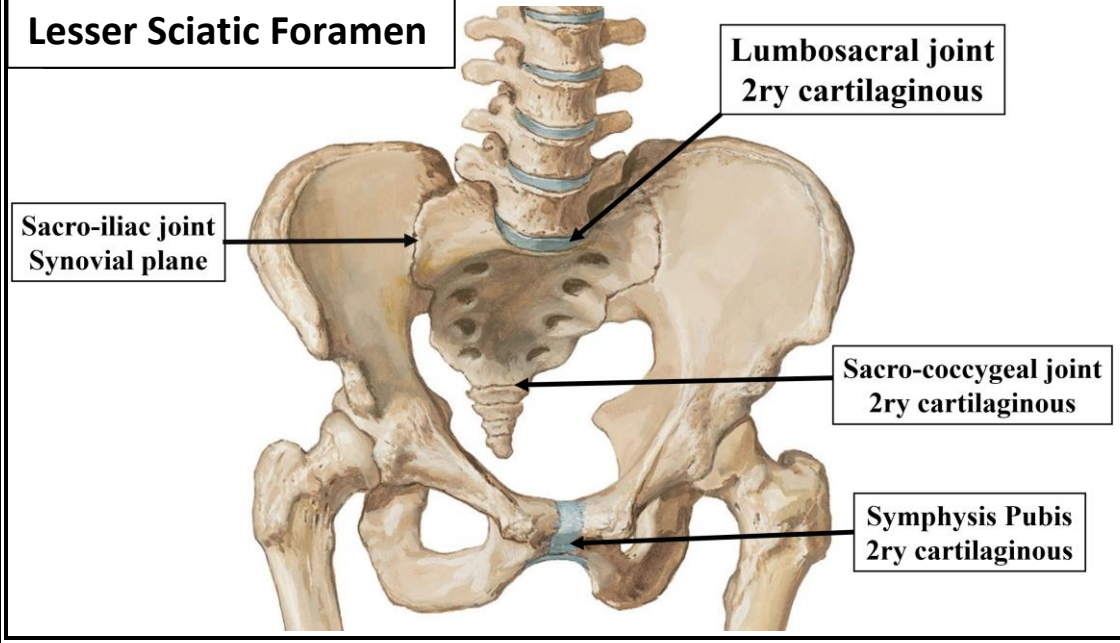
Base, Apex and Anterior Surface of Sacrum





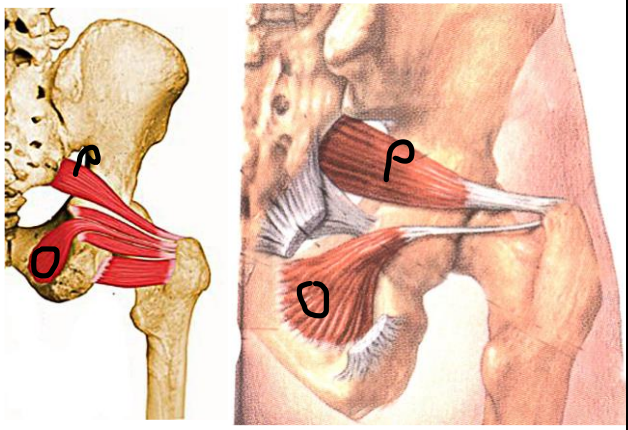


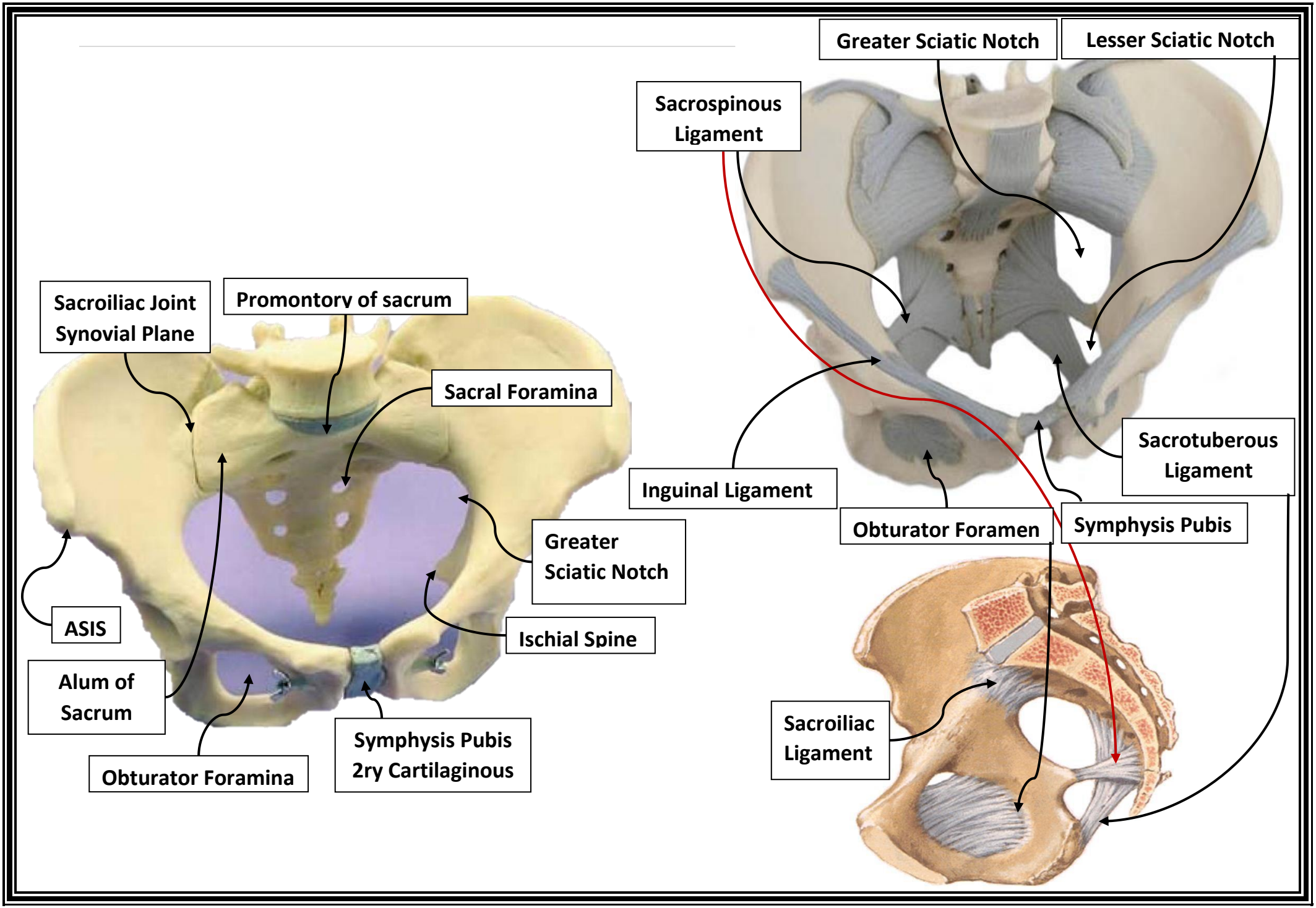




Obturator Internus:
Nerve to Obturator Internus
Lesser Sciatic Foramen

Piriformis:
S1 & S2
Greater Sciatic Foramen

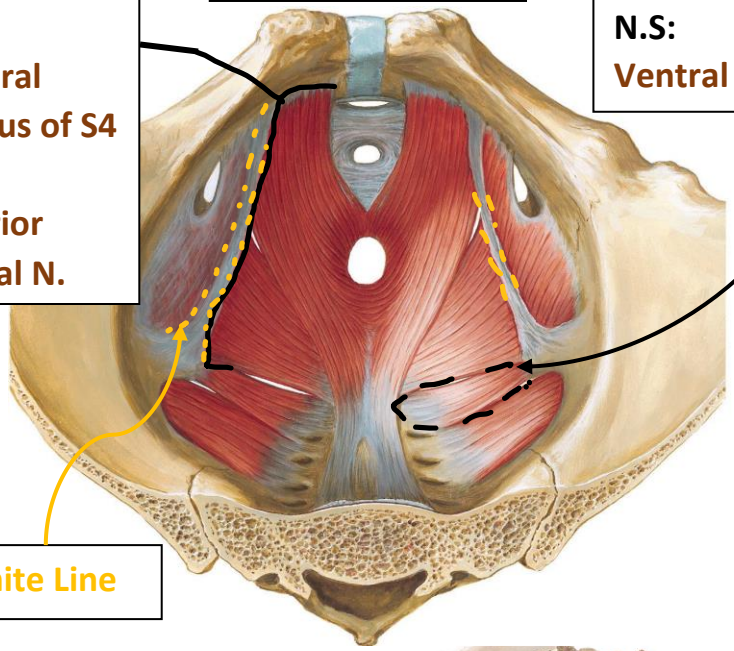



Greater Sciatic Notch
Lesser Sciatic Notch
Sacrospinous Ligament
Sacroiliac Joint Synovial Plane
Promontory of sacrum
Sacral Foramina
Inguinal Ligament
Obturator Foramen
Sacrotuberous Ligament
Symphysis Pubis
Greater Sciatic Notch
ASIS
Ischial Spine
Alum of Sacrum
Sacroiliac Ligament
Obturator Foramina
Symphysis Pubis 2ry Cartilaginous

Levator ani
N.S:
Ventral Ramus of S4 & Inferior Rectal N.

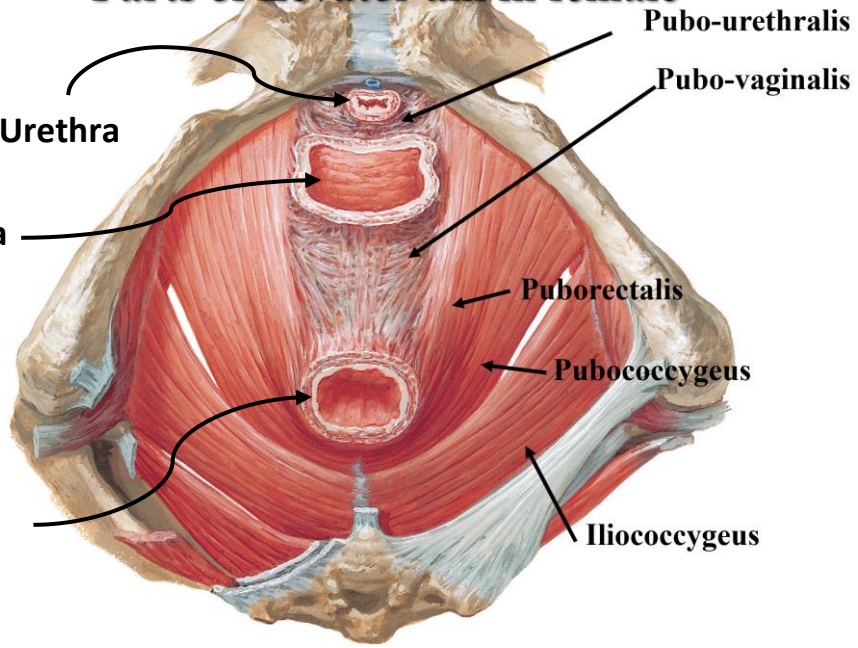
Pelvic Diaphragm

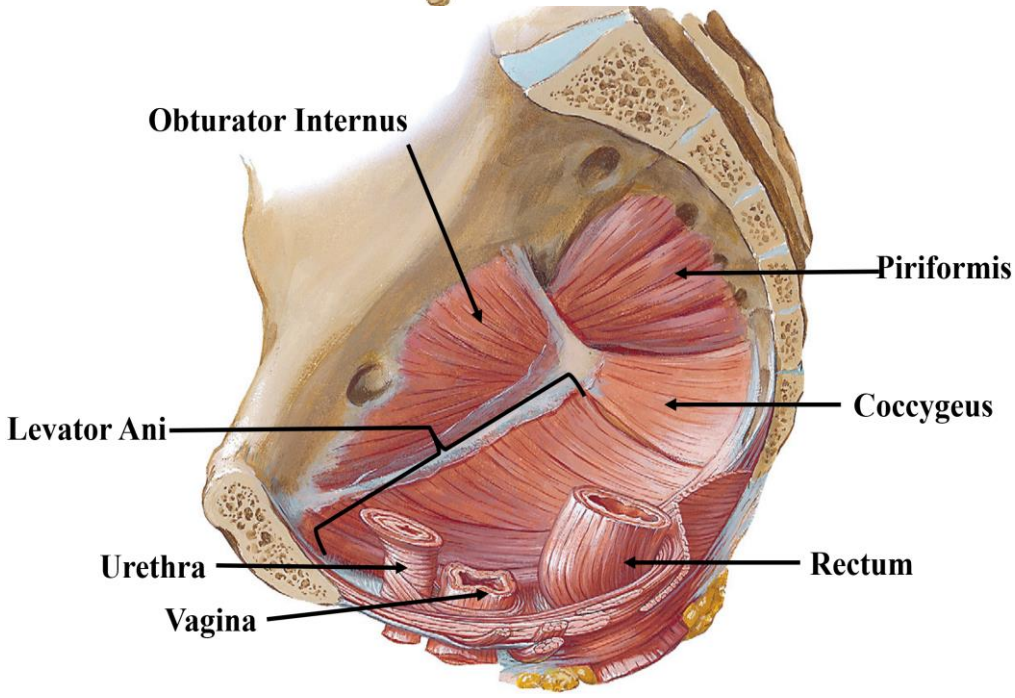
Coccygeus
N.S:
Ventral Ramus of S3 & S4



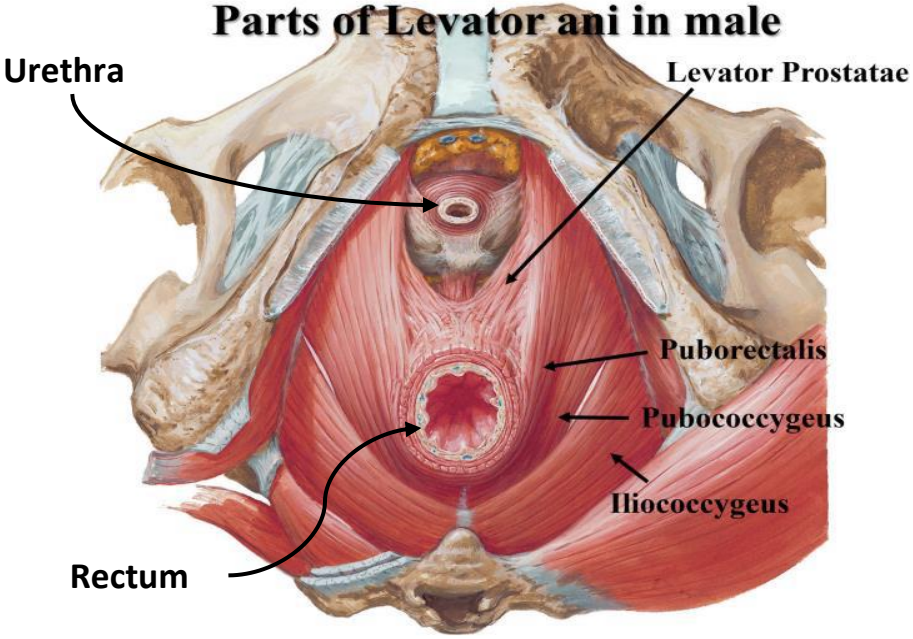
White Line

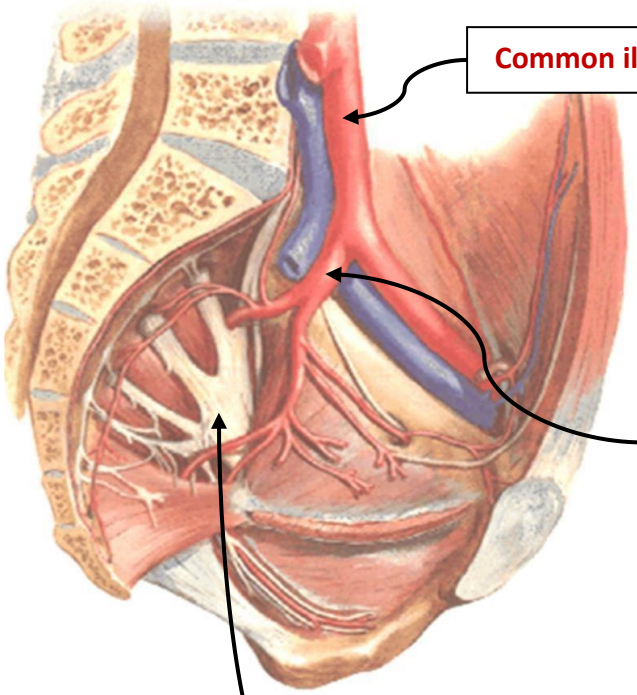
Parts of Levator ani in female





Parts of Levator ani in male





Common iliac A.

Sacral Plexus

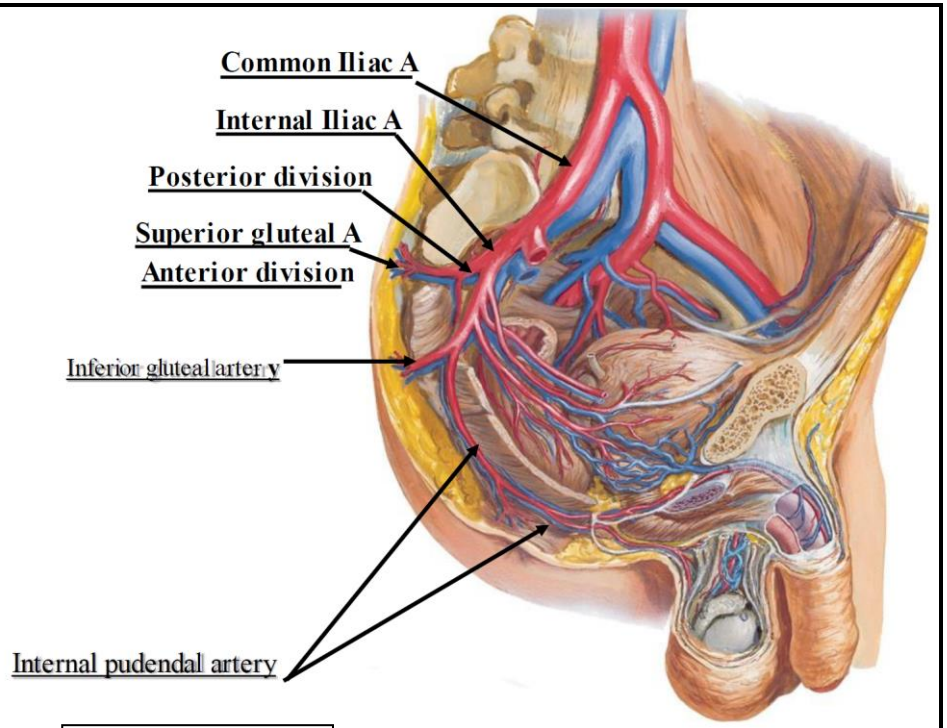
Internal iliac A.

Anterior Division:

- Obturator A.
- Umbilical A.
- Inferior vesical A. (M) BUT Vaginal A. (F)
- Uterine artery (females only).
- Middle rectal artery.
- Inferior gluteal artery.
- Internal pudendal artery.

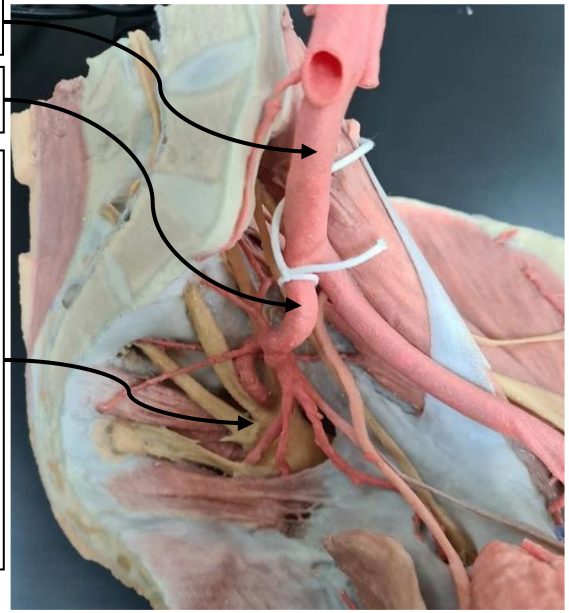
Posterior Division:

- Lateral Sacral A.
- Superior Gluteal A.
- illiolumbar A.



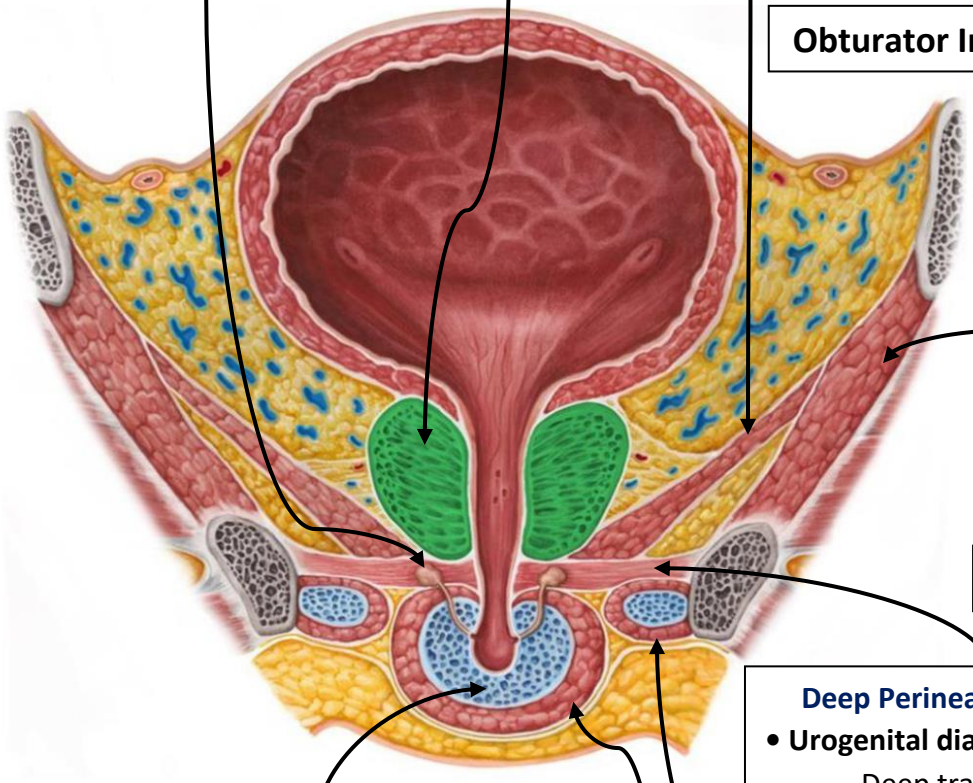
Common iliac A.

Internal iliac A.



Sacral Plexus

- Inferior gluteal N.
- Superior gluteal N.
- Posterior cutaneous nerve of the thigh.
- Sciatic N.
- Pudendal N.



Bulbouretheral gland

Prostate

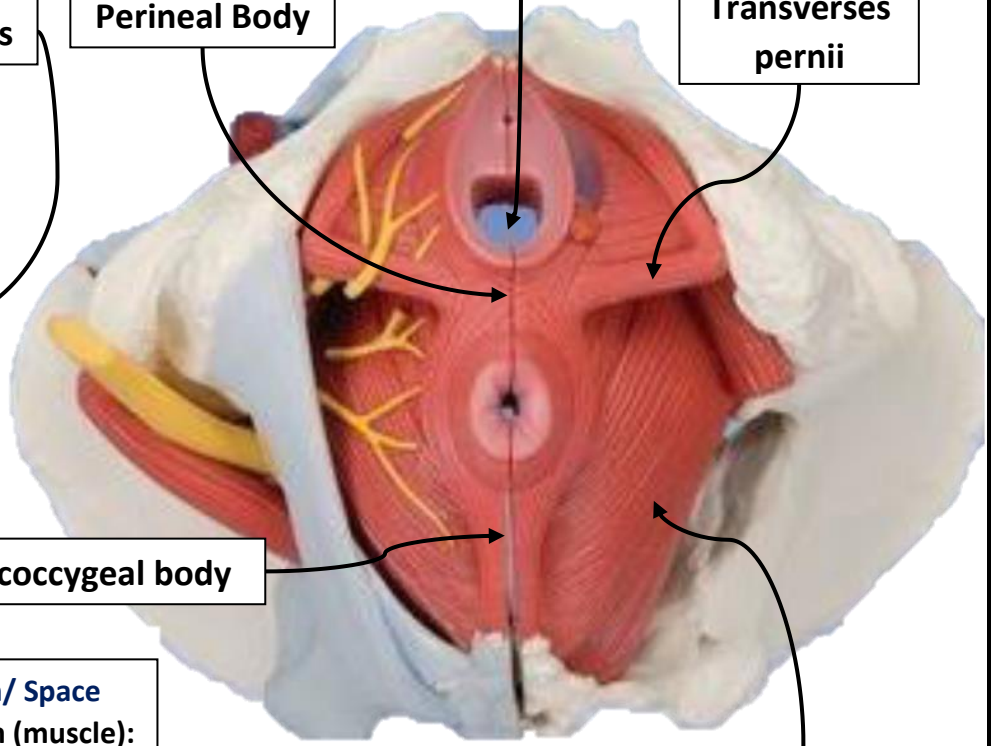
Levator Ani Muscles

Obturator Internus

Perineal Body

Vagina

Superficial Transverses pernii



Anococcygeal body

Deep Perineal Pouch/ Space

- **Urogenital diaphragm (muscle):**
  - Deep transverses pernii.
  - Sphincter urethrae.

Levator Ani muscle

Nerve supply:

- Inferior rectal N.
- Coccygeal N.
- Lower sacral N.

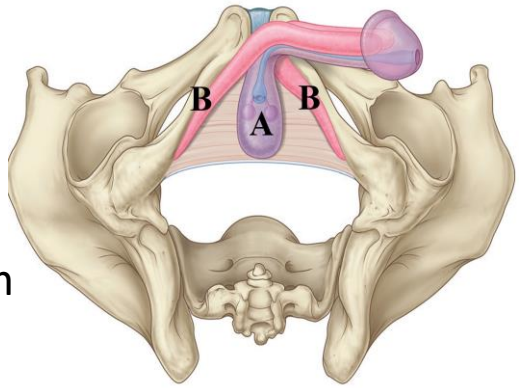
Superficial Perineal Pouch/ Space or Bulb of penis

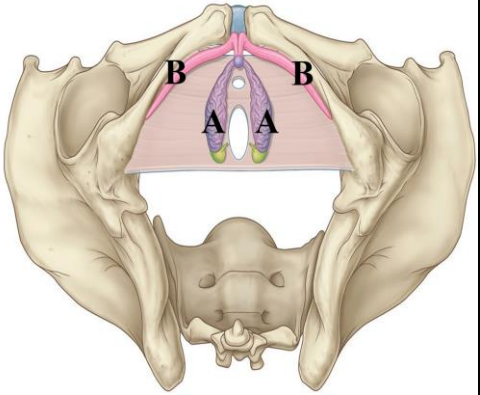
- Urethra.
- Duct of Bulbourethral Gland.
- Artery of The Bulb of penis or artery of Superficial Perineal Pouch/ Space.

Ischiocavernosus muscle

Bulbospongiosus Muscle

Contents of Superficial Perineal Pouch

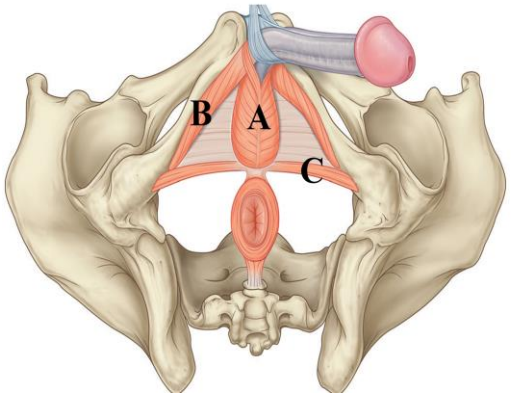


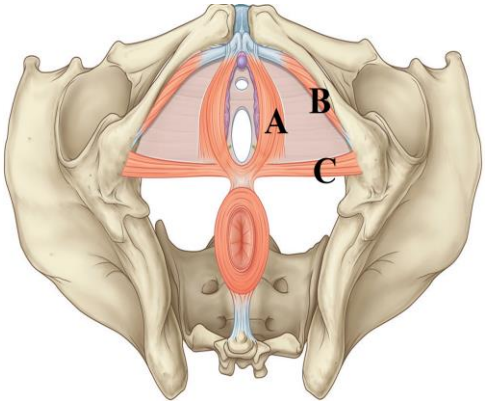


1- The root of penis (clitoris)

A. **Bulb:** continue as corpus spongiosum

B. **2 crura:** each continue as corpus cavernosum





2- muscles

A. **Bulbospongiosus** muscle covers the **bulb**

B. **Ischiocavernosus** muscle covers the **crus**

C. **Superficial transverse perineal** muscles

Sympathetic Chain

- Enter the pelvis in front of ala of sacrum
- The 2 sympathetic chains unite at the ganglion impar in front of coccyx

Sacral Plexus

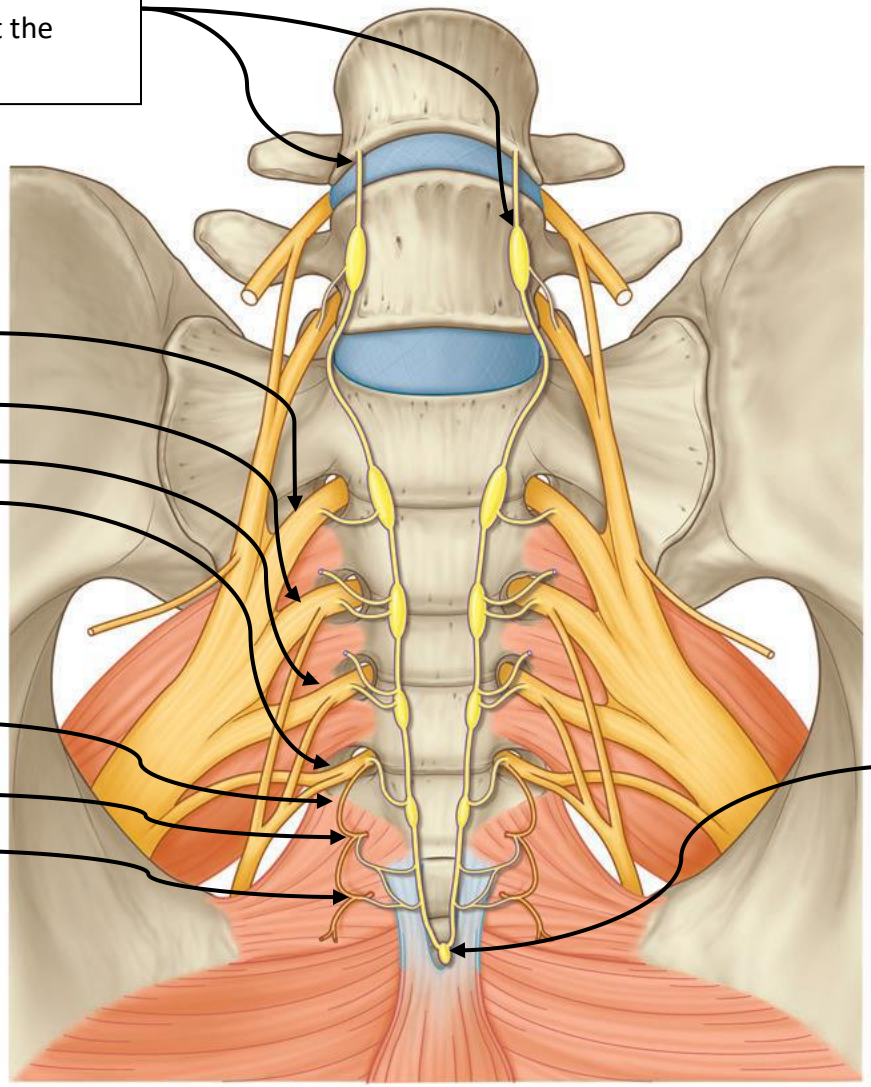
Site: Infront of piriformis

Formation: L4-5 & S1-4

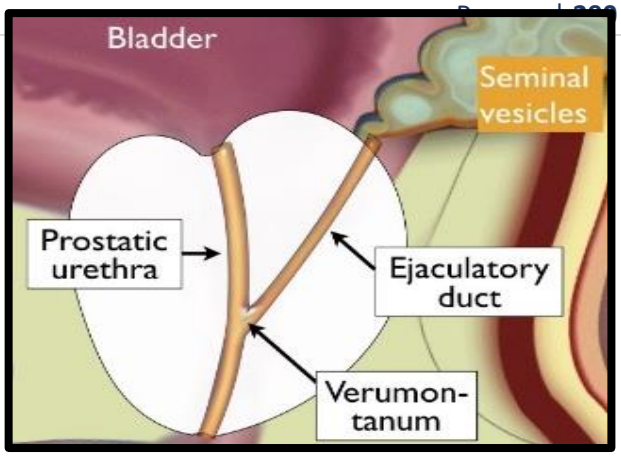
Coccygeal Plexus

Origin:
S4-5 & coccygeal nerve.

Branches:
Anococcygeal nerve supply external anal sphincter



Ganglion Impar
Termination of sympathetic chain



Seminal Vesicle
Middle Rectal A.

Ampulla of Vas

Prostate
A. Supply:
Origin Internal iliac A.
Inferior Vesical A.
Middle Rectal A.

Venous Drainage:
Internal iliac V.

Vas Deferens
A. To Vas

Epididymis

Bulbourethral Gland

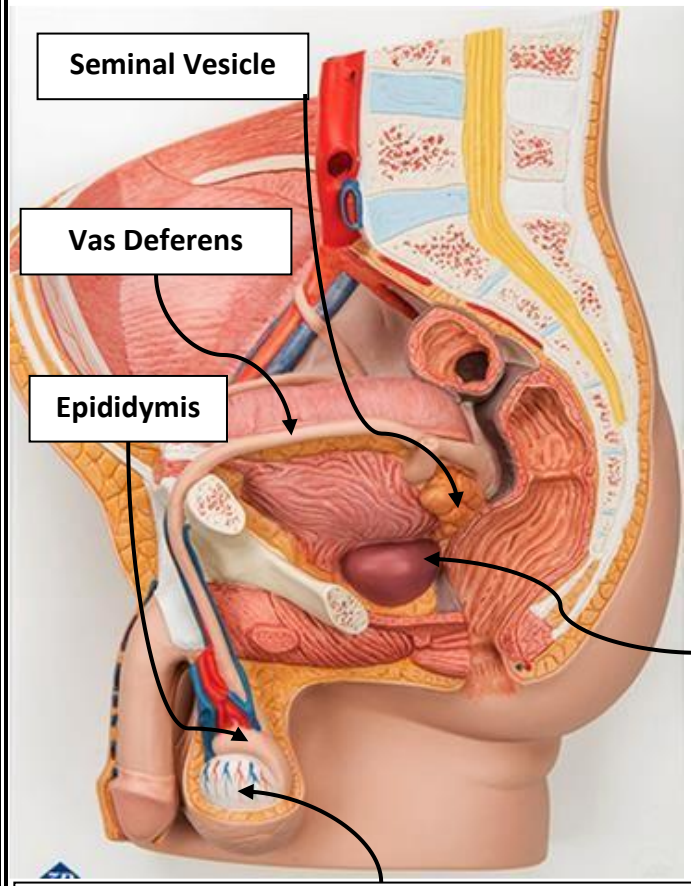
Ejaculator Duct
Formed by:
vas +seminal vesicle

Termination in:
prostatic urethra

Prostatic Urethra

Penile Urethra

Testis
Testicular A. LT & RT – Origin: **Abdominal Aorta L2**
RT testicular V. Drains into **IVC**
LT Testicular V. Drains into **LT Renal V.**
Lymphatic drainage into
pre-aortic and **para-aortic** groups of lymph nodes.



Prostate

A. Supply:
Origin Internal iliac A.
Inferior Vesical A.
Middle Rectal A.

Venous Drainage:
Internal iliac V.

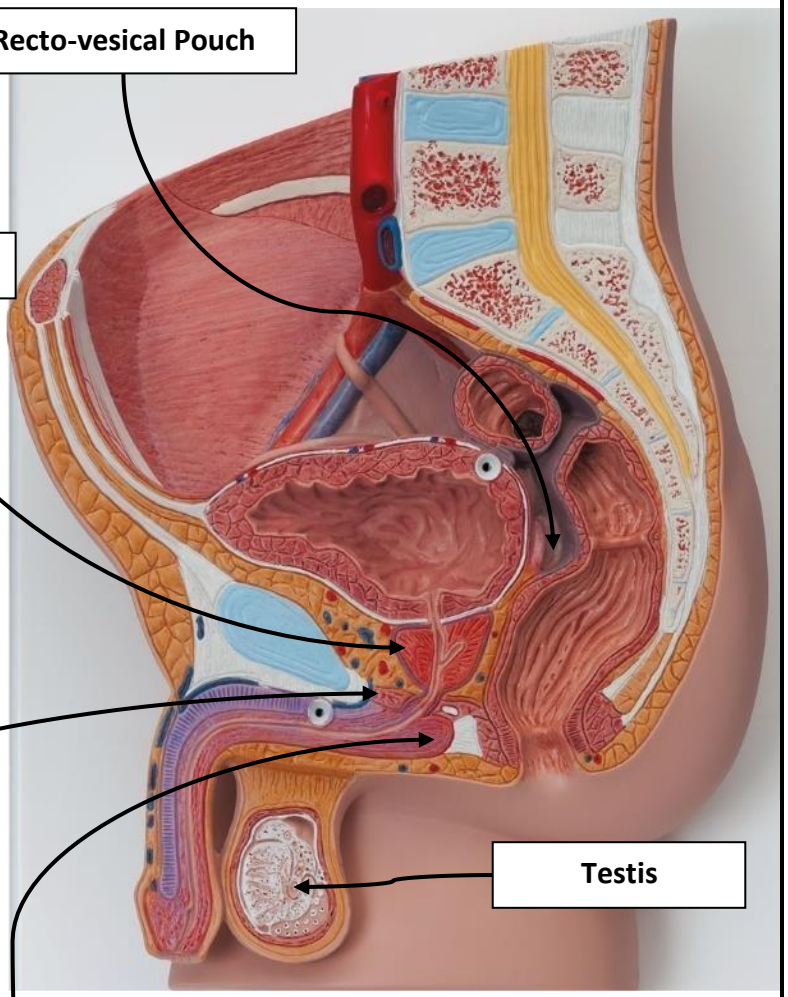
Testis

Testicular A. LT & RT – Origin: **Abdominal Aorta L2**
RT testicular V. Drains into **IVC**
LT Testicular V. Drains into **LT Renal V.**
Lymphatic drainage into
pre-aortic and **para-aortic** groups of lymph nodes.

Urogenital Diaphragm

Deep Perineal Pouch/ Space
- Internal pudendal artery.
- Urogenital diaphragm (muscle):
- Deep transverses pernii.
- Sphincter urethrae.

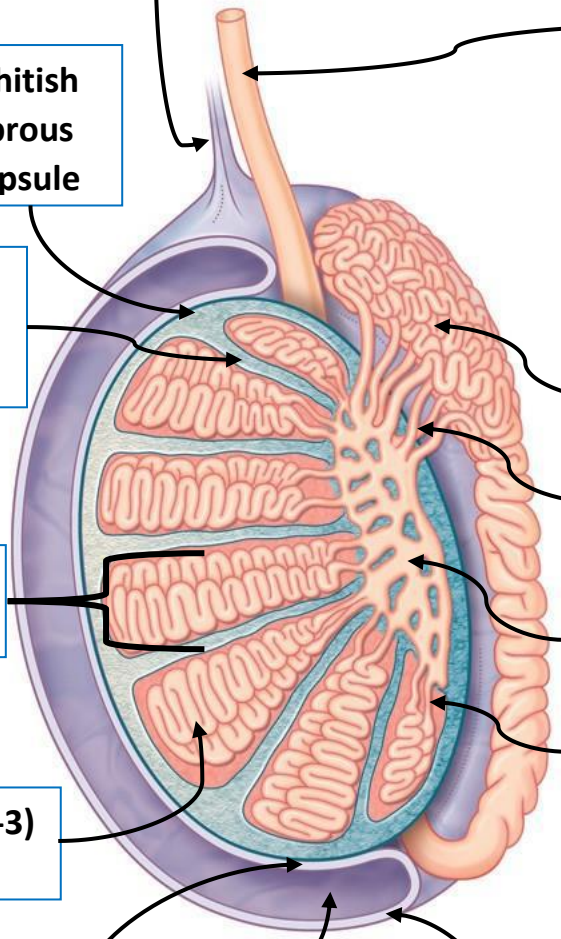
In male only:
- Membranous urethra.
- Bulbouretheral gland.
- Dorsal nerve of penis.



Superficial Perineal Pouch/ Space or Bulb of penis
- Urethra.
- Duct of Bulbourethral Gland.
- Artery of The Bulb of penis or artery of Superficial Perineal Pouch/ Space.

Tunica Albuginea (Genital Ridge):

Serous sac, has Four parts



Covering the testis:
Vestige of Processus Vaginalis

Vas deferens

Whitish Fibrous Capsule

Send Fibrous Septa

Epididymis

Efferent Ductules

Septa divides testis into (200-300) Lobules

Rete Testis

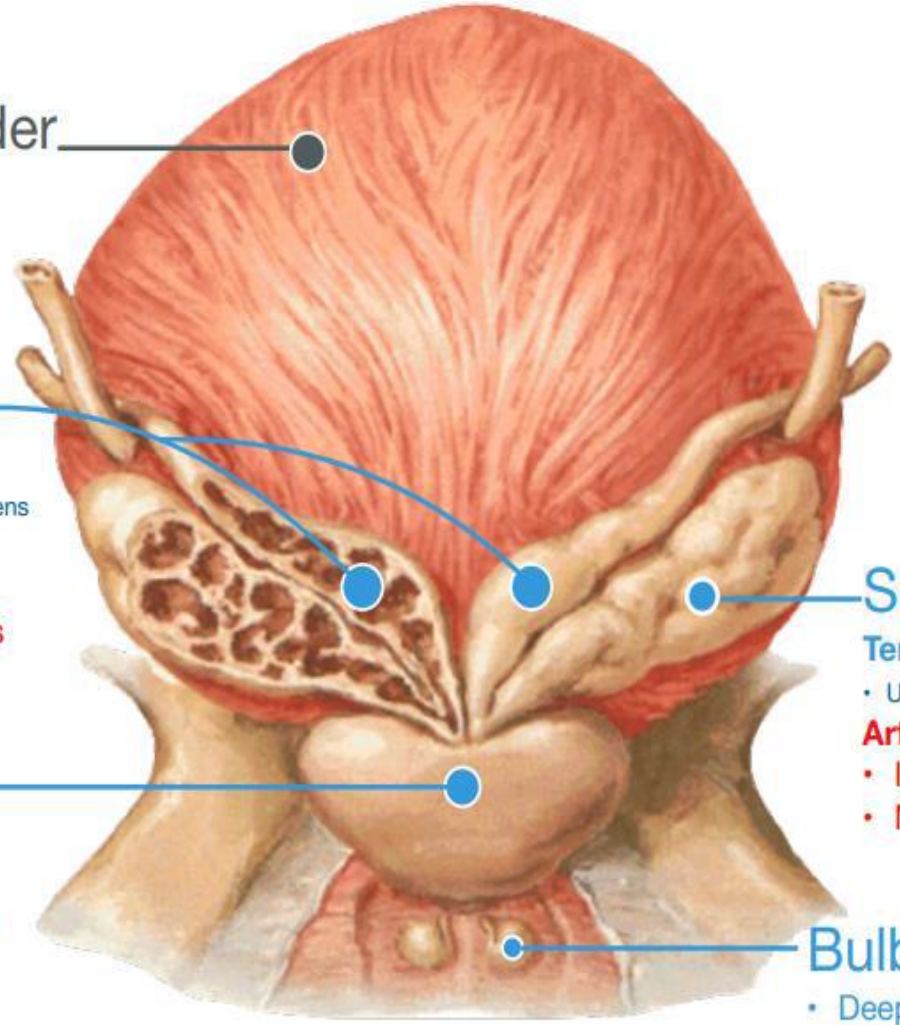
Straight Tubules

Each Lobule contains (1-3) seminiferous tubules

Visceral Layer | Cavity | Parietal Layer

Tunica Vaginalis (processus vaginalis):

Serous sac, has three parts



Urinary Bladder

Ampulla of Vas

Termination: Ejaculatory Duct

- Unite of Seminal Vesicle and Vas Deferens

Arterial supply:

- Superior vesicle Artery
- Artery to the ductus Deferens

Seminal Vesicle

Termination: Ejaculatory Duct

- Unite of Seminal Vesicle and Vas Deferens

Arterial supply:

- Inferior vesicle Artery
- Middle Rectal Artery

Prostate

Opening of:

- Ejaculatory Duct
- Prostate gland (prostate sinus)

Arterial Supply:

- Inferior Vesicle Artery
- Medial Rectal Artery

Bulbourethral Gland

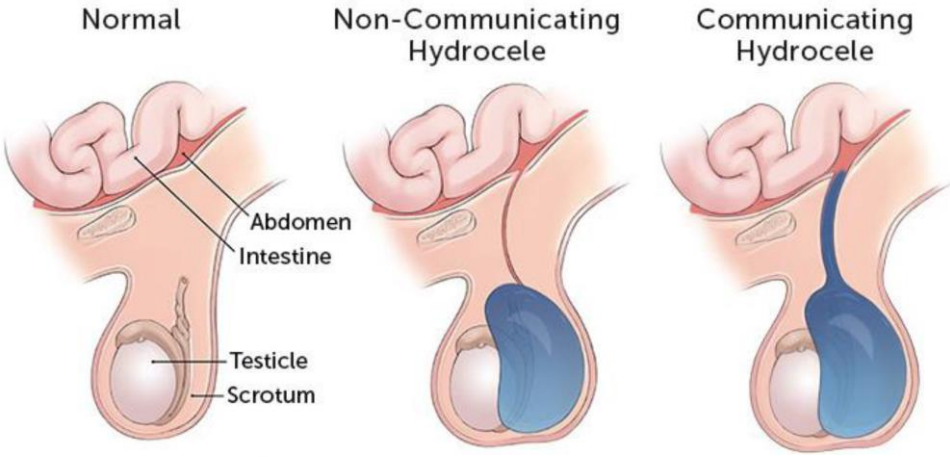
- Deep perineal Pouch
- **Termination**: Spongy Urethra
- **Homologues** (Equivalent) **In female**: Vagina

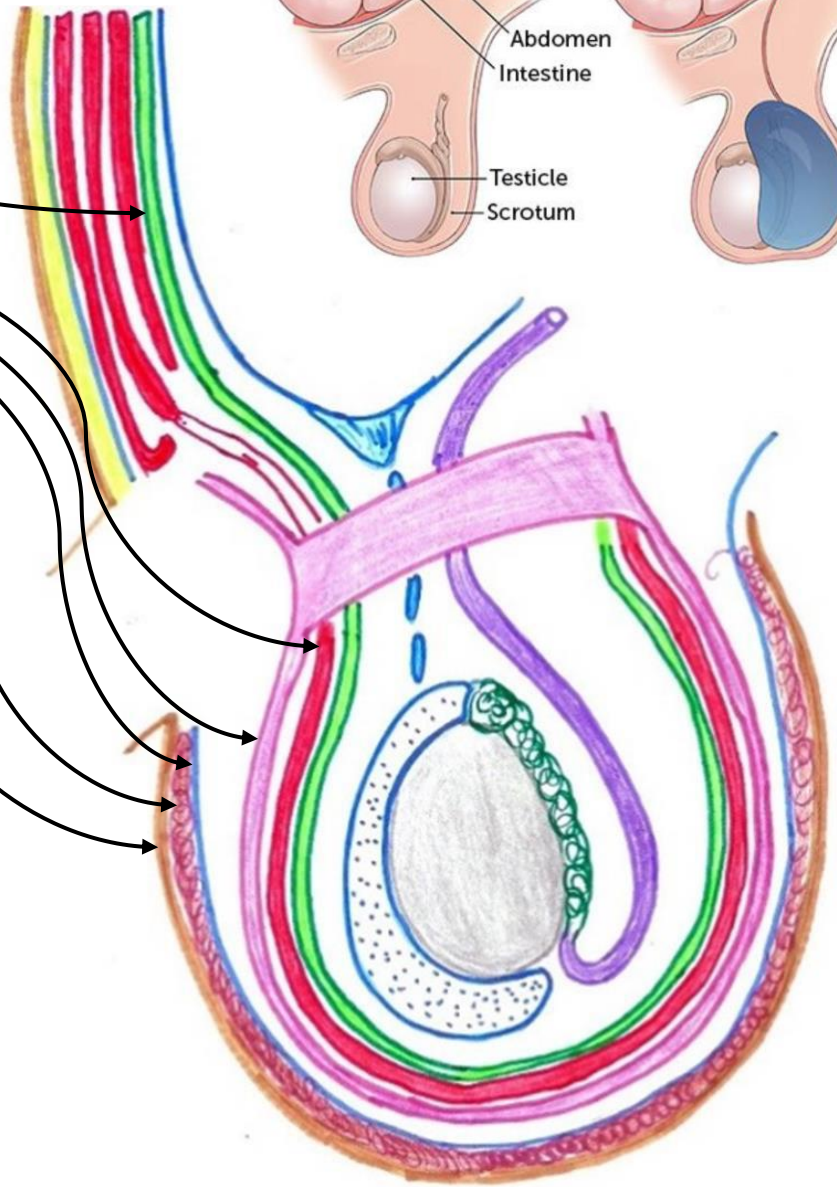
Contents of Spermatic Fascia

- **A- Internal Spermatic Fascia**
- **B- Cremastric muscle**
- **C- External spermatic fascia**
- **D- Membranous layer of fascia:**
- **E- Dartos muscle**
- **F- Skin**

Contents of spermatic cord

- ❑ Vas deferens
- ❑ Vestige of processes vaginalis
- ❑ Pampiniform plexus of veins
- ❑ Cremasteric artery
- ❑ Artery of the vas
- ❑ Testicular artery
- ❑ Lymphatic vessels
- ❑ Genital branch of genitofemoral nerve
- ❑ Sympathetic plexus

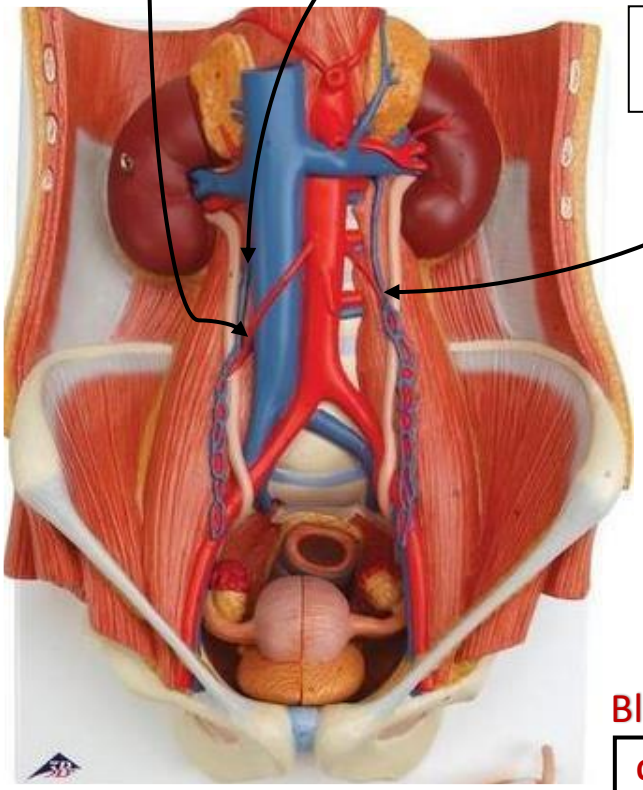




Ovarian A. – Abdominal Aorta L2

RT Ovarian V. – IVC

LT Ovarian V. – LT Renal V.



Internal iliac A.

Common iliac A.

Abdominal Aorta

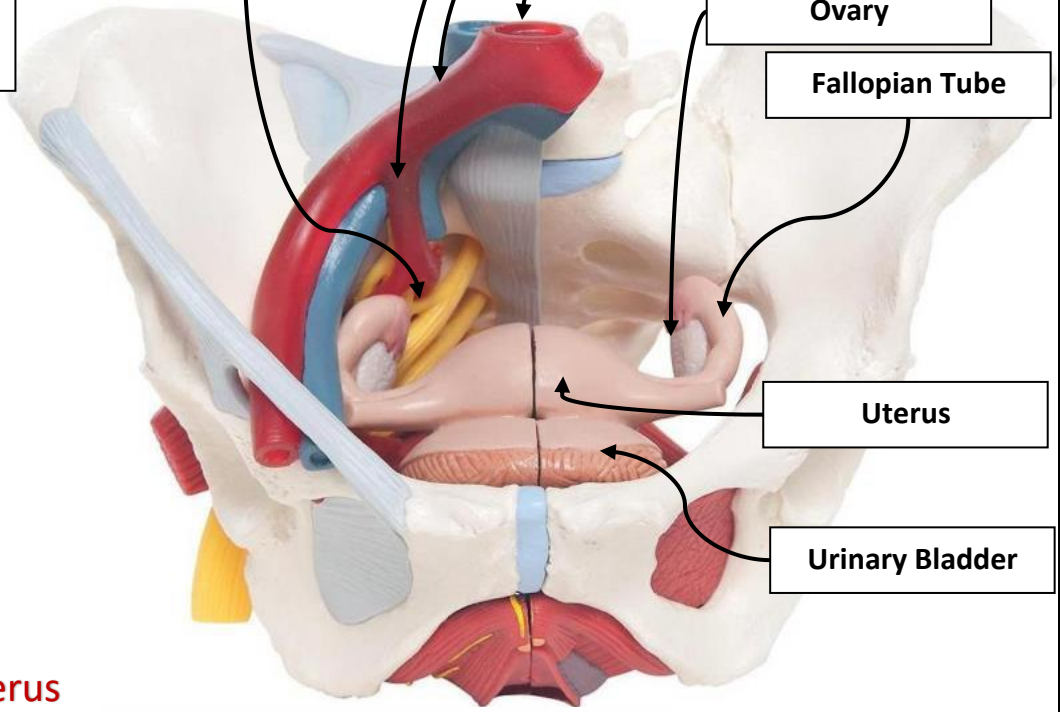
Sacral Plexus

Ovary

Fallopian Tube

Uterus

Urinary Bladder

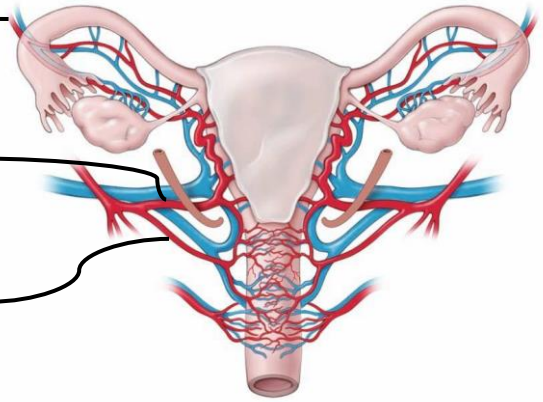


Blood Supply of Uterus

Ovarian A.
From Abdominal Aorta

Uterine A.
From Internal Iliac A.

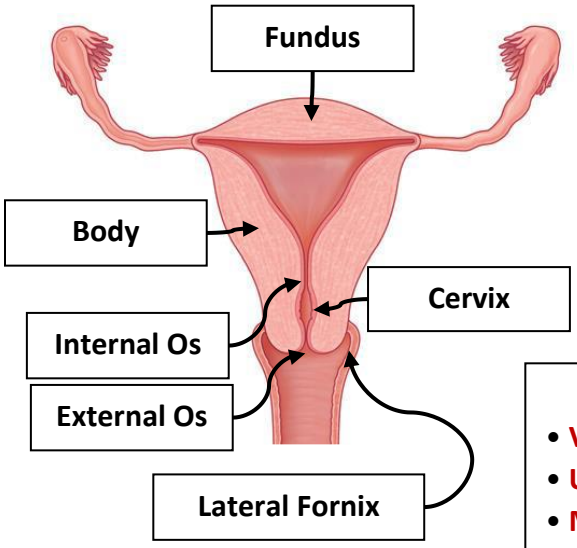
Vaginal A.
From Internal Iliac A.

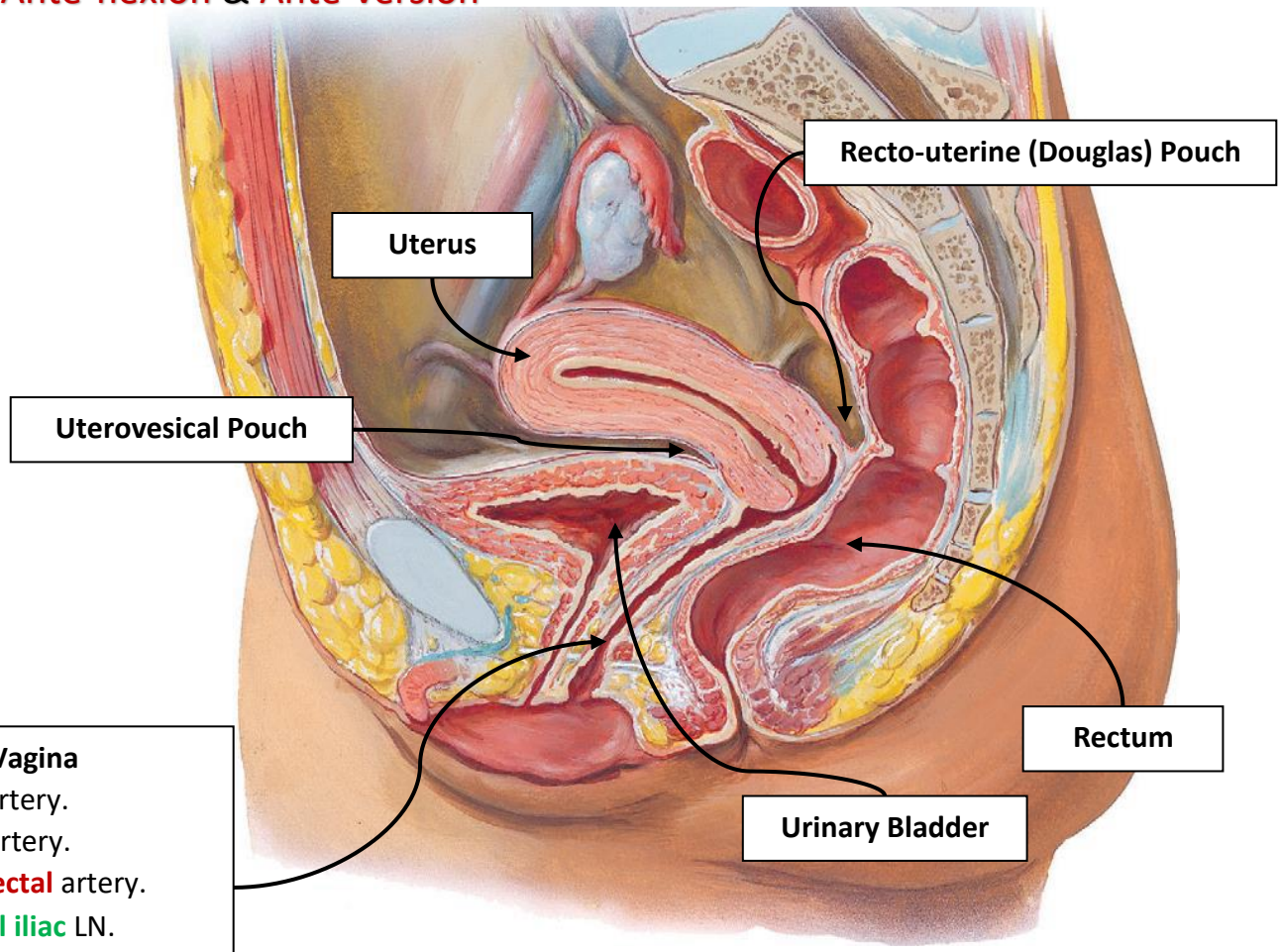


Site: Between urinary bladder and rectum

Size: 1 inch anteroposterior | 2 inch transverse | 3 inch length.

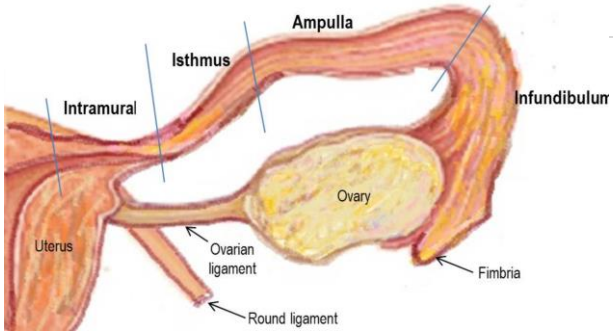
Normal Position: Ante-flexion & Ante-version





Vagina

- **Vaginal** artery.
- **Uterine** artery.
- **Middle rectal** artery.
- **Internal iliac** LN.
- **External iliac** LN.
- **superficial inguinal** LN.



Suspensory Ligament of Ovary

Fundus

Vaginal part of the cervix;

Penetrate upper end of vagina

Surrounded by: 4 vaginal forensics (anterior, posterior 2 lateral)

Ligament of Ovary

Ovary

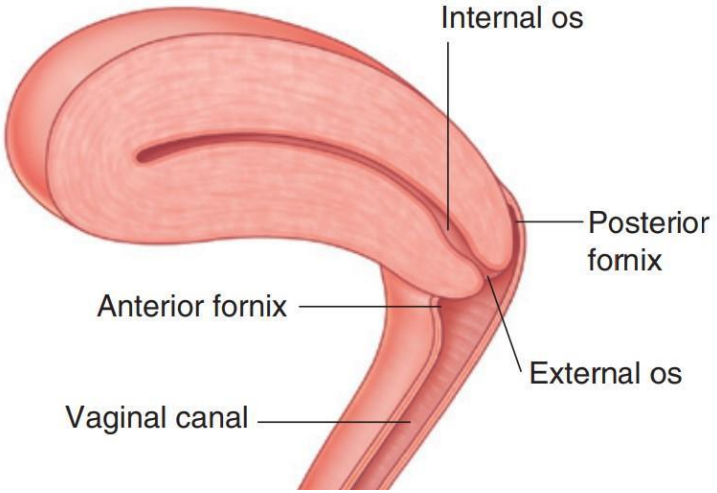
Body

Internal Os

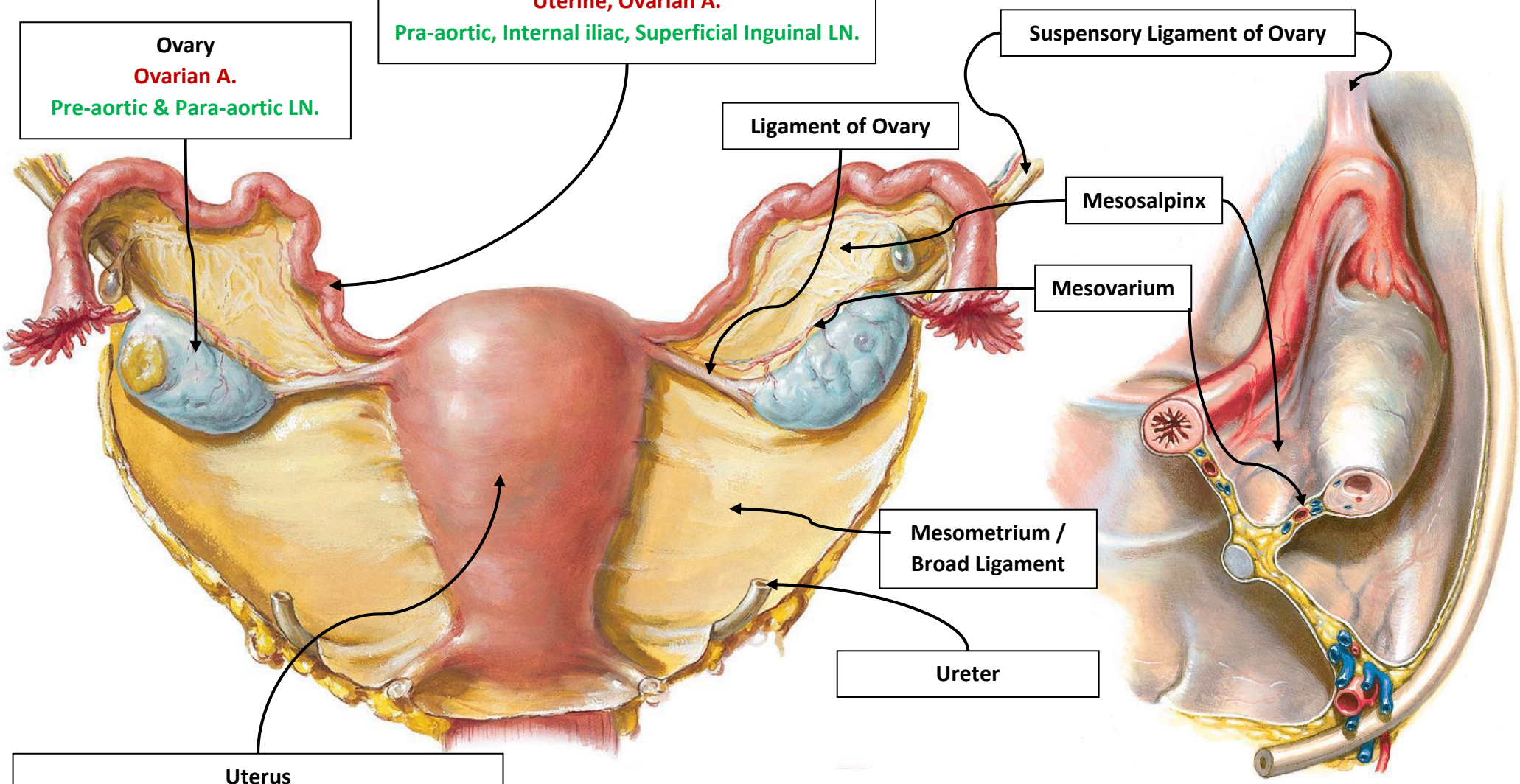
Lateral Fornix of vagina

External Os

Cervix



Parts of the Broad Ligament of the uterus



At the base of broad ligament, the uterine

A cross above ureter (water under bridge)

Ovary Peritoneal Covering:

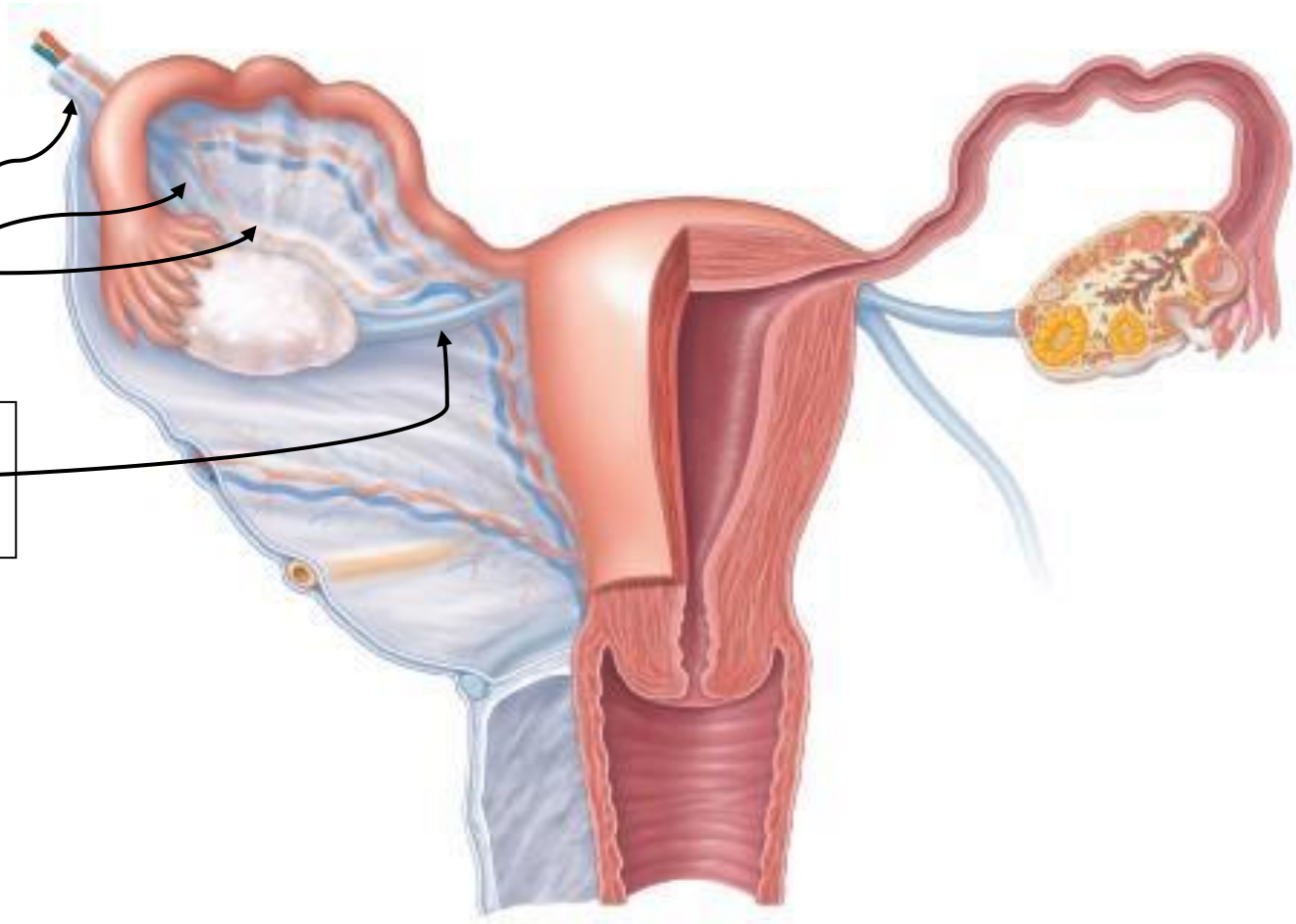
Covered completely w/ peritoneum suspended to broad ligament by mesovarium

Peritoneal Ligaments:

- **A- Suspensory Ligament of Ovary**
- **B- Mesovarium**

Non-peritoneal Ligaments:

Ligament of Ovary



Ovary

- **Para-aortic** LN (mainly).
- **Pre-aortic** LN.

Fallopian Tube

Lateral part:
Paraortic LN.

Middle part:
internal iliac LN.

Medial part:
Follow Round ligament to
Superficial Inguinal LN.

Uterus

Fundus & upper part of body:
Paraortic LN.

Lower part of body:
internal & external iliac LN.

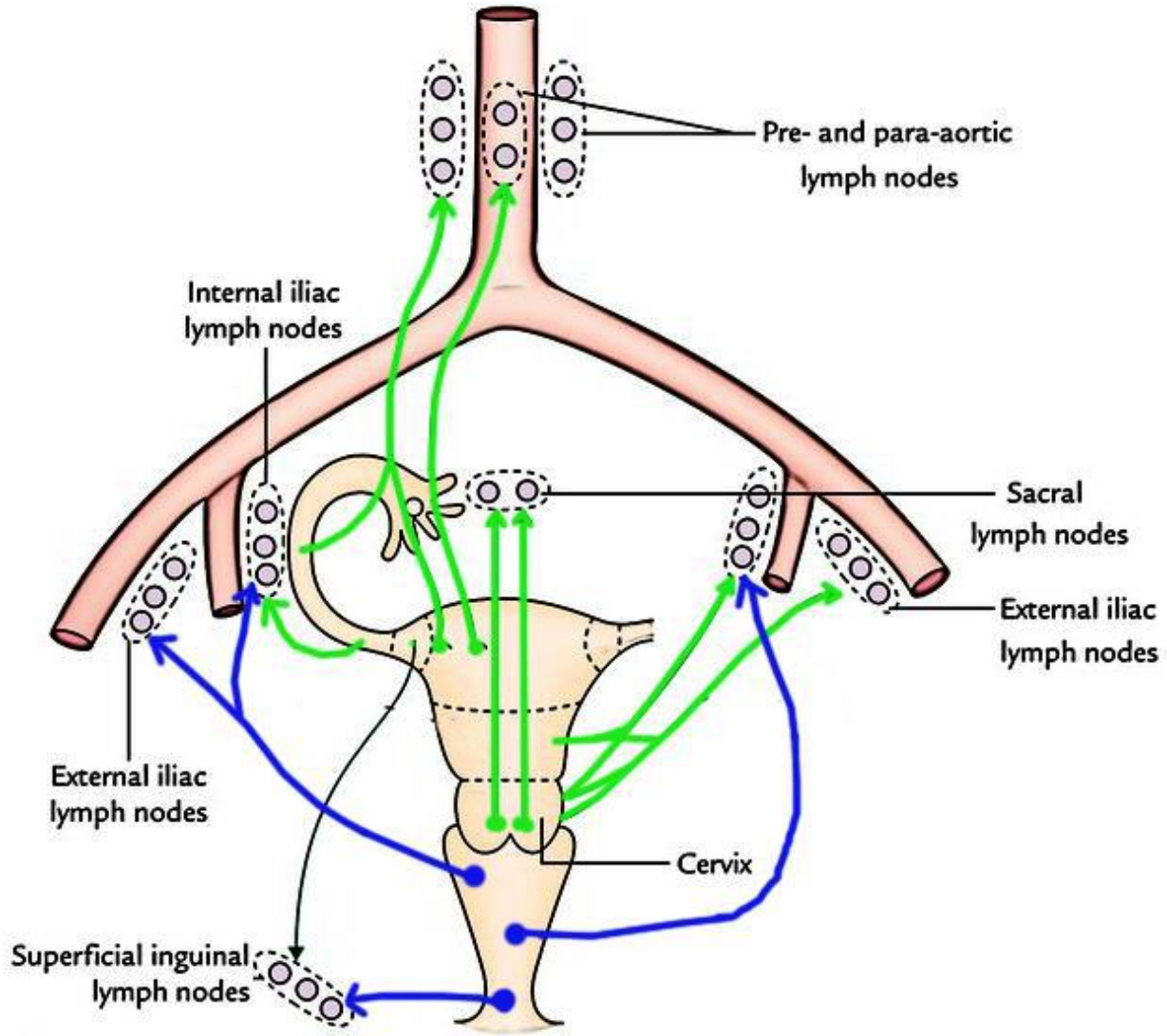
Cervix:
sacral LN.

Vagina

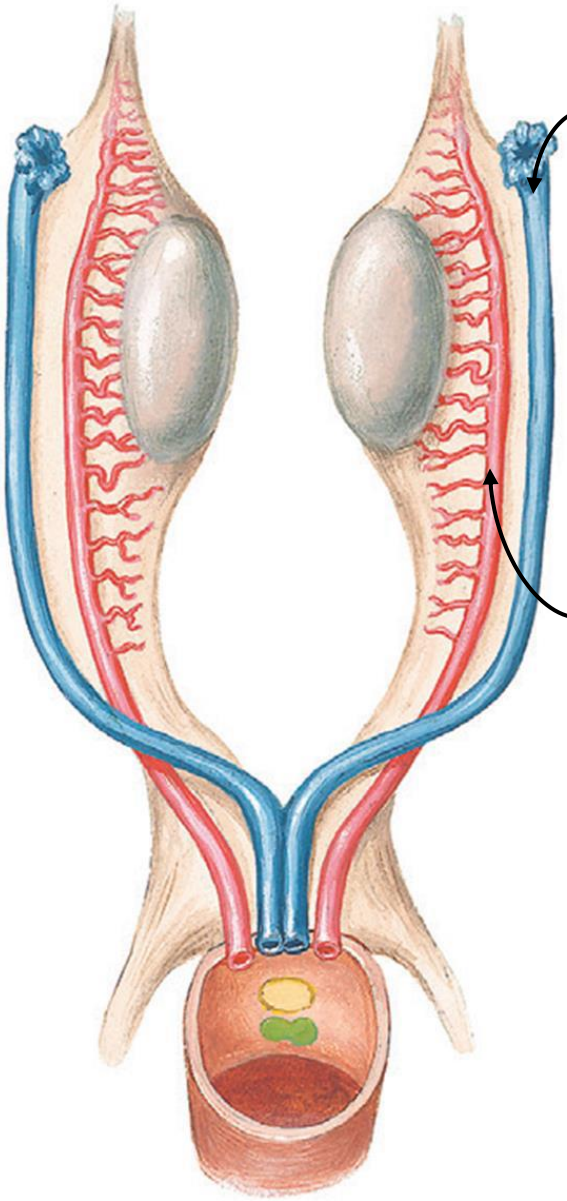
Upper part:
internal & external iliac LN.

Middle part:
internal iliac LN.

Lower part:
superficial inguinal LN.



Embryology



PARAMESONEPHRIC DUCTS:

In female:
A. Fallopian Tube
B. Uterus
C. Upper part of vagina

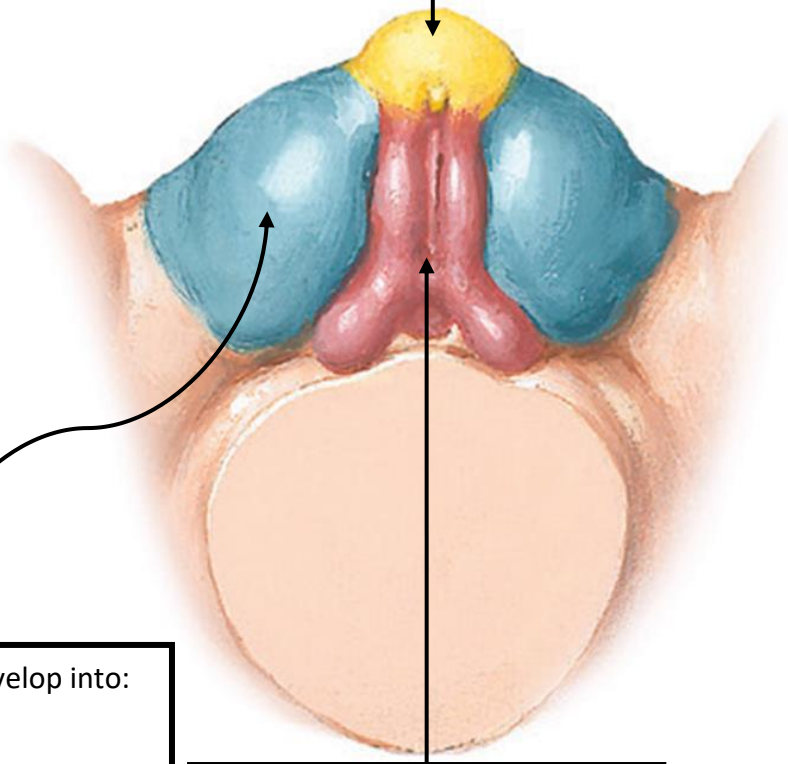
In males:
A. prostatic utricle
B. appendix of testis

MESONEPHRIC DUCTS:

In female:
A. Epoophoron
B. Paroophoron
C. Gartner duct

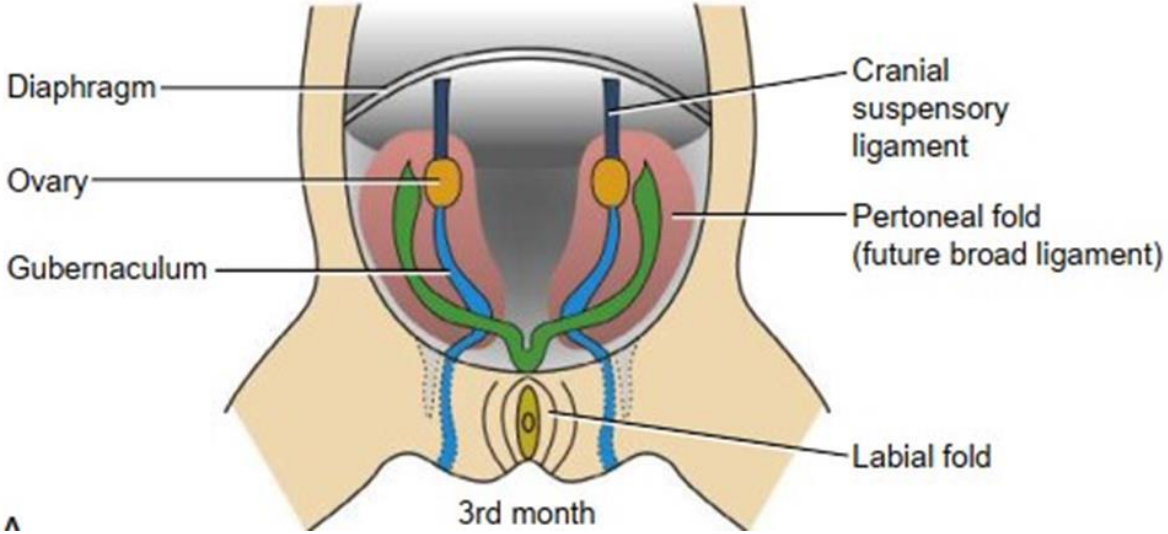
In males:
A. Epididymis
B. Vas deferens
C. Seminal vesicle
D. Ejaculatory Duct

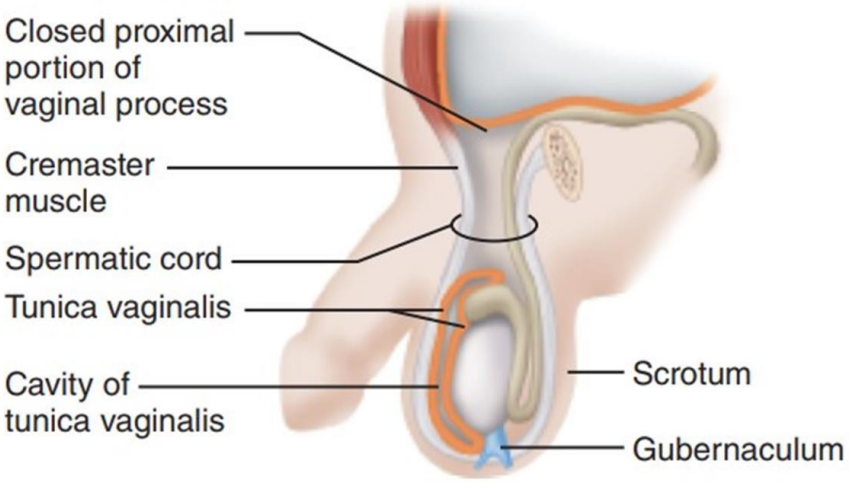
Genital tubercle, develop into:
- **Glans Clitoris**
- **Glans Penis**



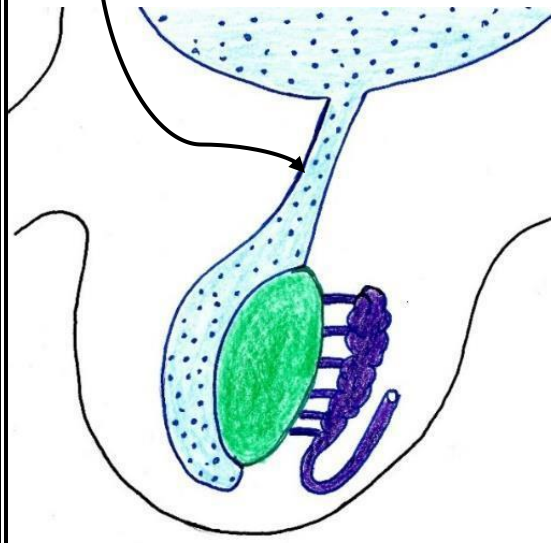
Labioscrotal swelling, develop into:
- **Labia Majora**
- **Scrotum**

Urethral Folds, develop into:
- **Labia Minora**
- **Spongy Urethra**

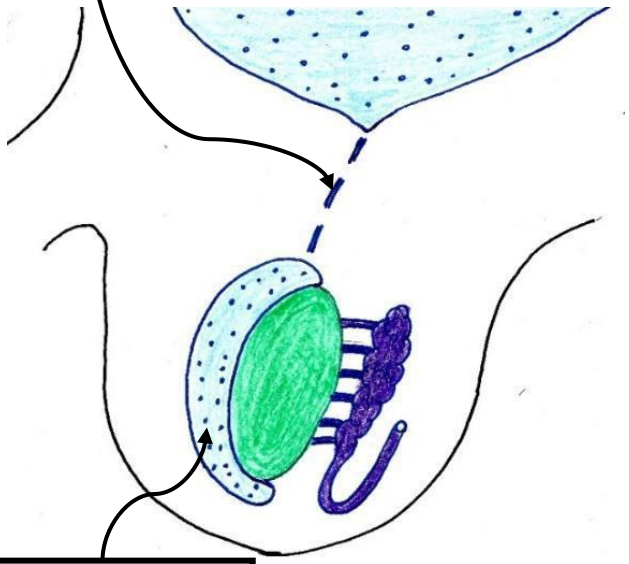




PROCESSUS VAGINALIS



VESTIGEAL OF PROCESSUS VAGINALIS



TUNICA VAGINALIS

Gubernaculum Fate:

In female :

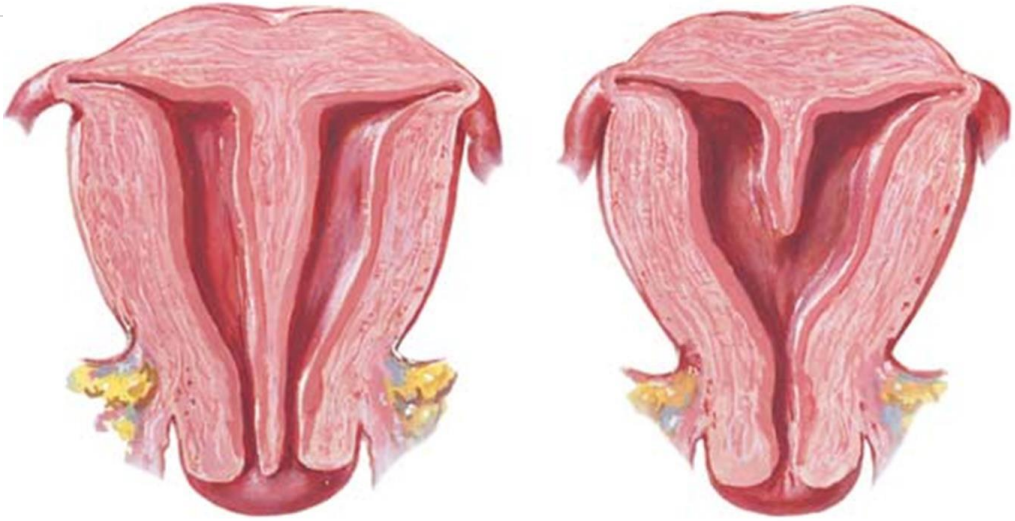
1- Ovarian ligaments

2- 2- round ligaments of uterus

In males :

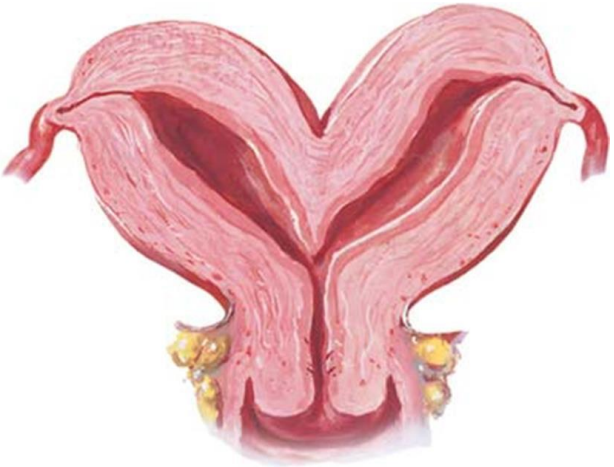
Become vestigue of gubernaculum ligaments

Uterus didelphys

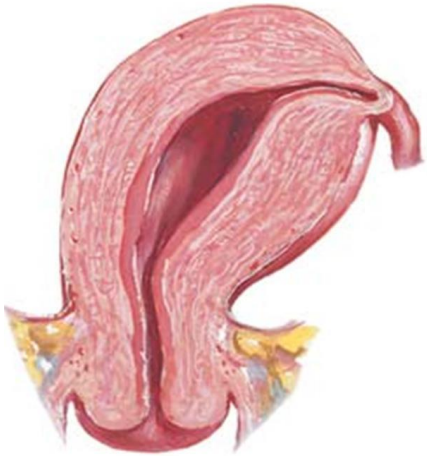


Septate Uterus

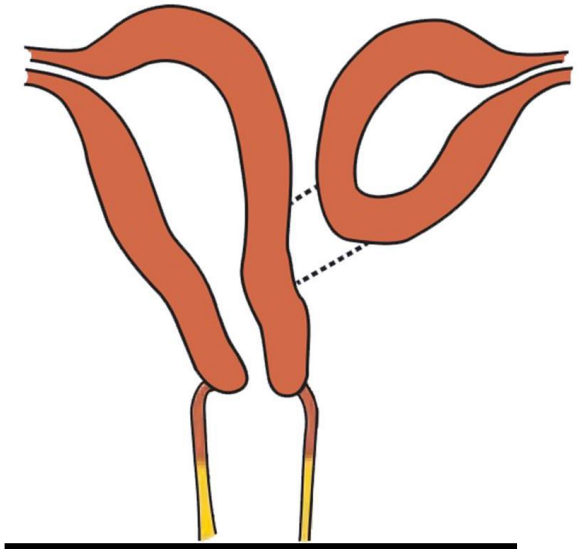
Uterus bicornis bicoilis



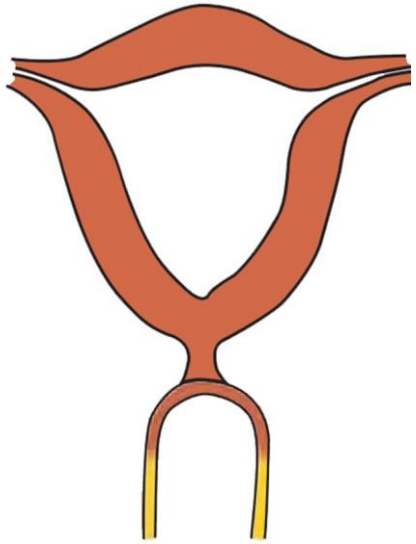
Uterus bicornis unicoilis



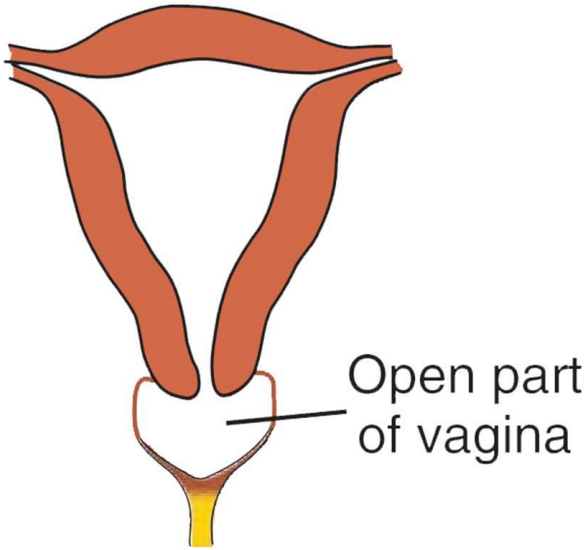
Unicornuate uterus



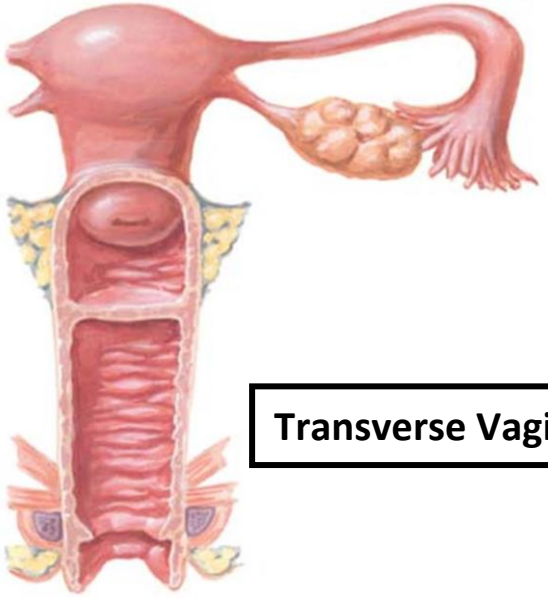
Bicornuate uterus with a rudimentary horn



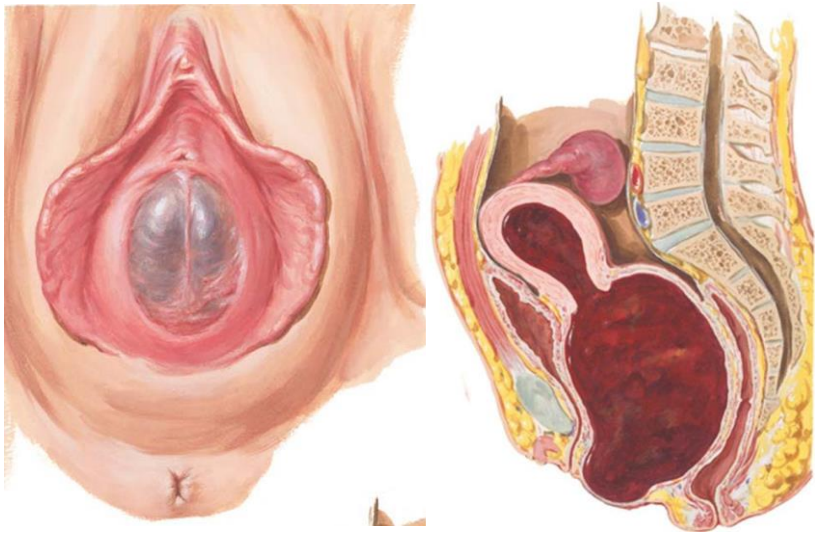
Cervical atresia



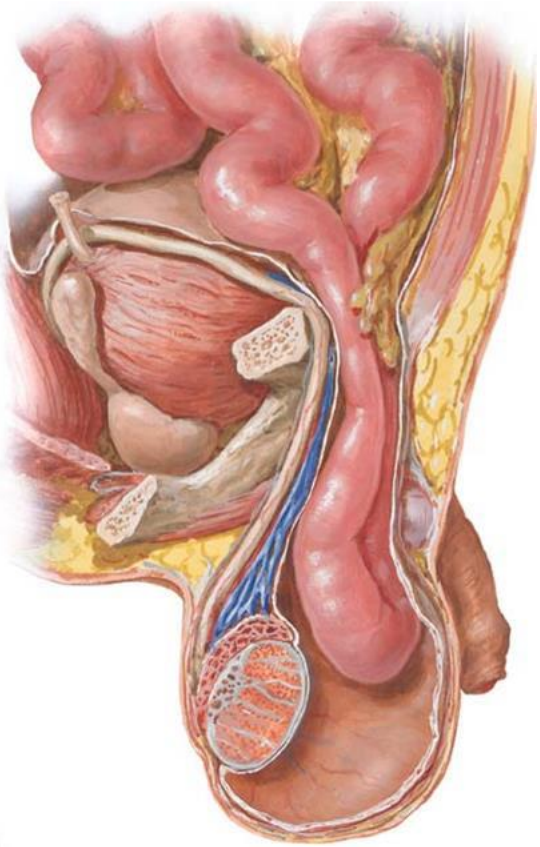
Vaginal atresia



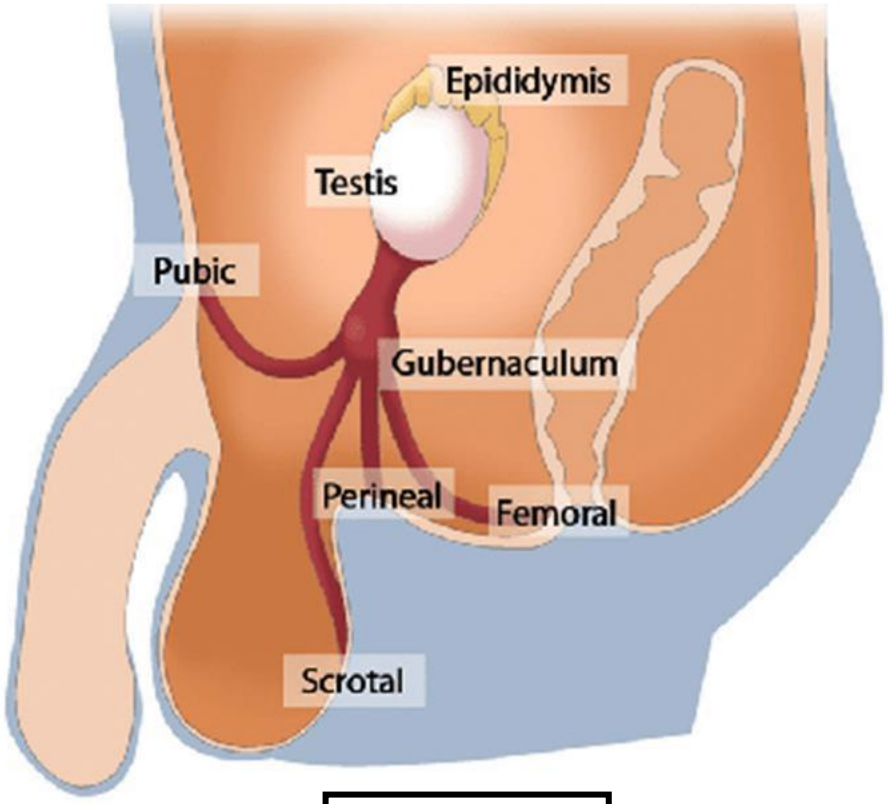
Transverse Vaginal Septum



Imperforate hymen

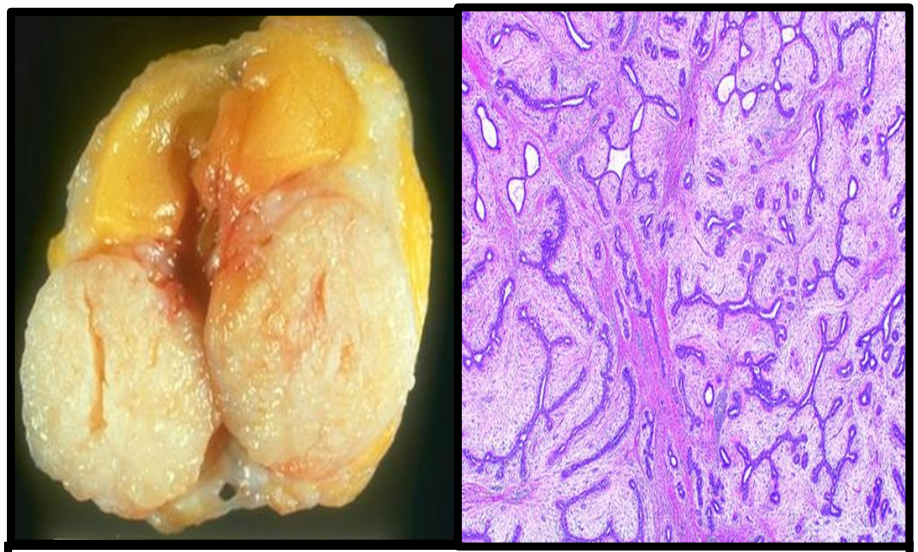


Hernia-hydrocele



Ectopic testis

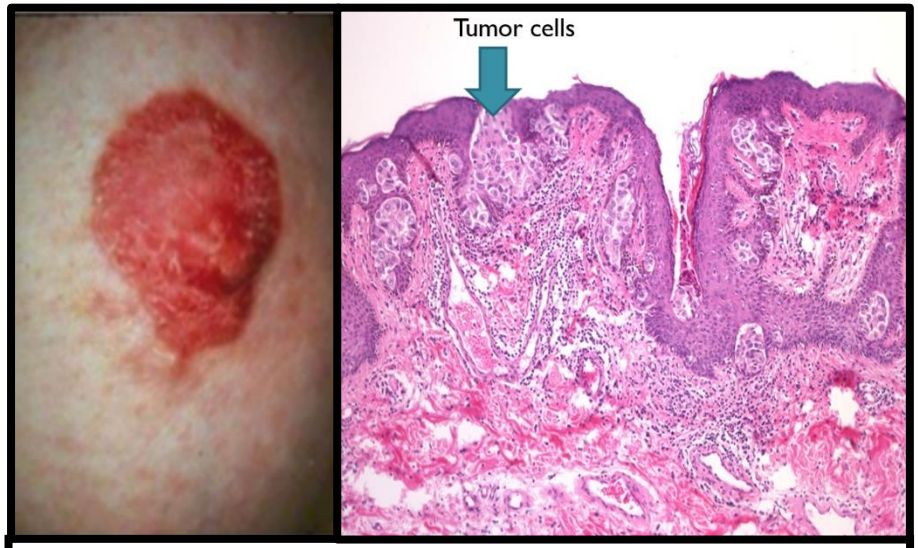
Pathology



A **22 year old female** presented with a lump **in right breast** since 2 months. On examination the lump was 3 x2 cm, **painless**, **freely mobile** and **rubbery** in consistency. After thorough investigations, the lump was excised & showed following histomorphological features?

Write the diagnosis?:

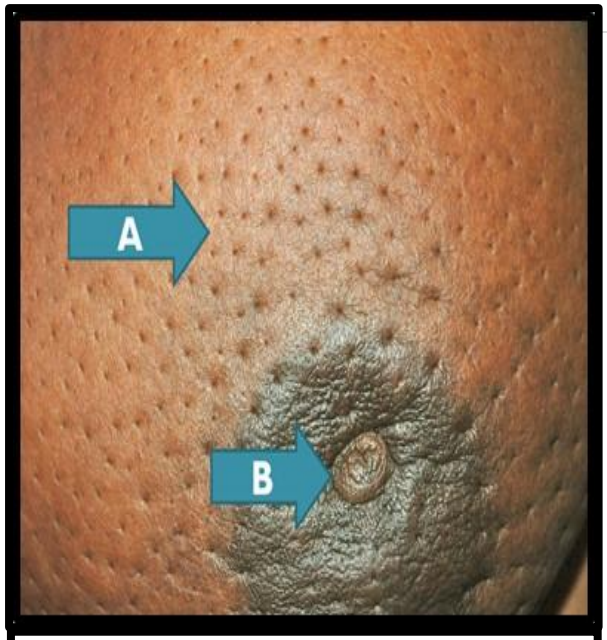
Fibroadenoma



A 50 year old female presented with **erythematous**, **pruritic nipple** of the right breast since 4 months. Biopsy was carried out

Write diagnosis based on histopathological feature:

Paget Disease of nipple



A **55 year old female** presented with a gradually **enlarging hard** lump in the left **breast** since 1 year. Also noticed a **hard nodule** in the **left axilla** since 6 months. Physical examination revealed following features?

Identify clinical feature marked by arrow A & arrow B?

A- Peau d'orange
B- Nipple retraction

Write the diagnosis?:

Breast Cancer

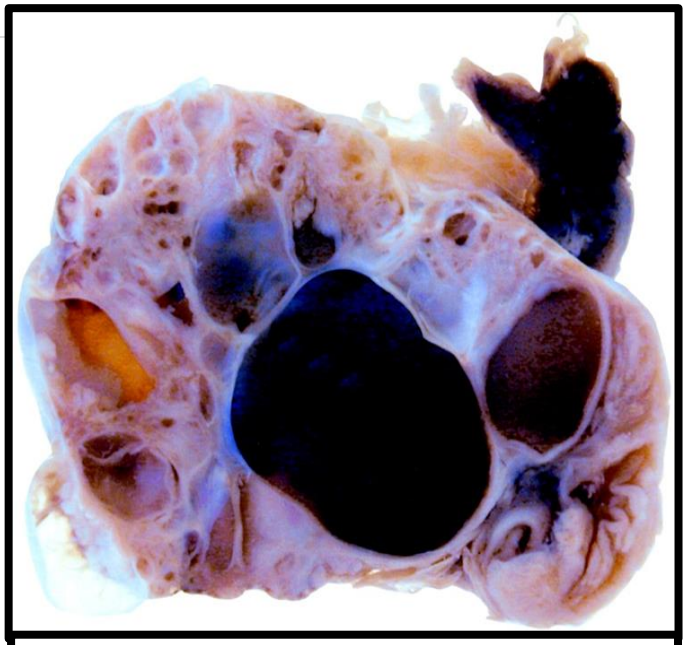
A 40 year old female underwent hysterectomy for **pelvic pain** and **abnormal menstrual bleeding**.

Write the gross diagnosis.

Multiple Leiomyomas of uterus

Mention any 2 complications because of condition.

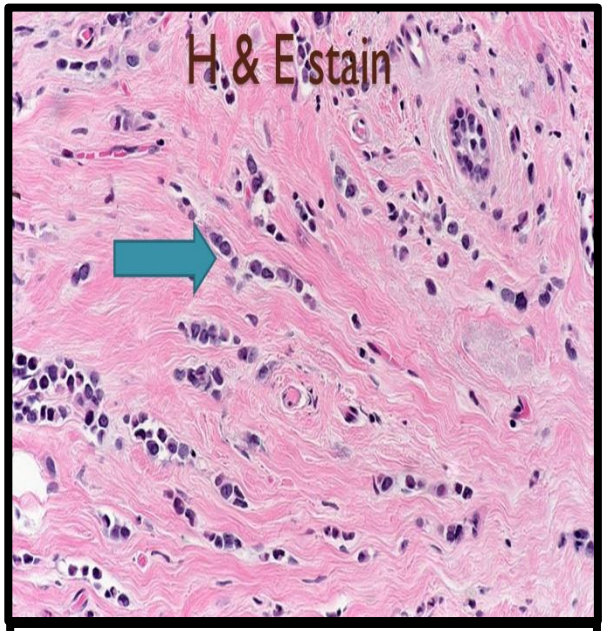
1- Infertility
2- Malignancy to Leiomyosarcoma



A 25 year old married **female** presented with **hirsutism**, **oligomenorhoea** and **infertility**. USG showed **both the ovaries** replaced by **multiple variable sized cysts**. Biopsy of the ovarian tissue revealed following gross features.

Write the diagnosis in this case:

Polycystic Ovarian Disease



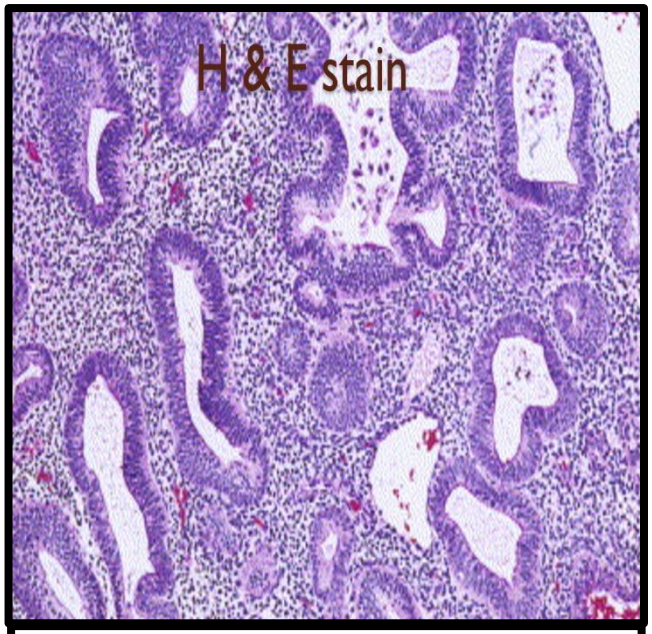
A 60 year old female presented with an ill-defined **hard lump** in **both the breast** since 2 months. The biopsy of both the lumps revealed similar histopathological features.

Write the microscopic feature marked by arrow:

Indian file pattern

Write diagnosis based on histopathological feature:

Invasive Lobular Carcinoma



45 year old **obese** female presented W/ **abnormal uterine bleeding**. Endometrial curettage revealed following features.

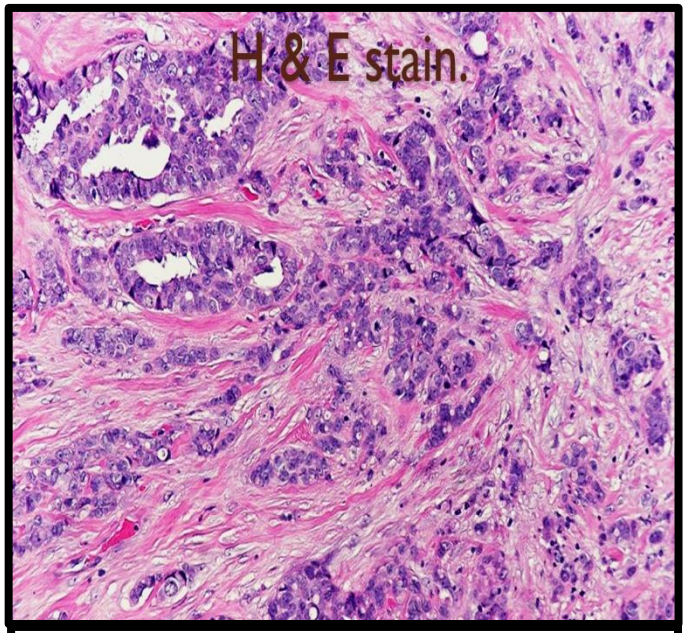
Write diagnosis based on histopathological feature:

Simple Hyperplasia without Atypia

Write the probable cause of this condition in this case:

Repeated Anovulatory Cycles & or

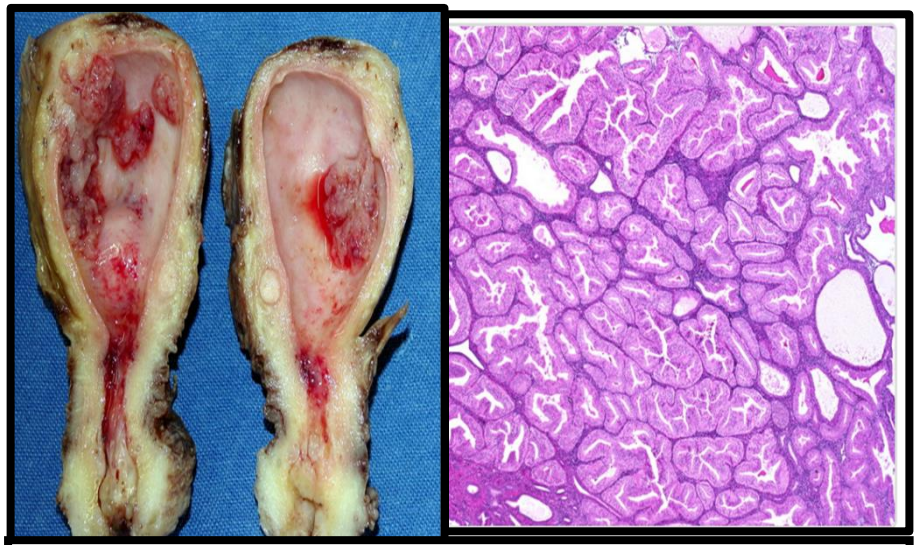
↑ endogenous & Exogenous estrogen



A **70 year old female** presented with an ill defined 4x3x3 cm **hard lump** in the right breast. The lump was **fixed** to surrounding tissues.

Write diagnosis based on histopathological feature:

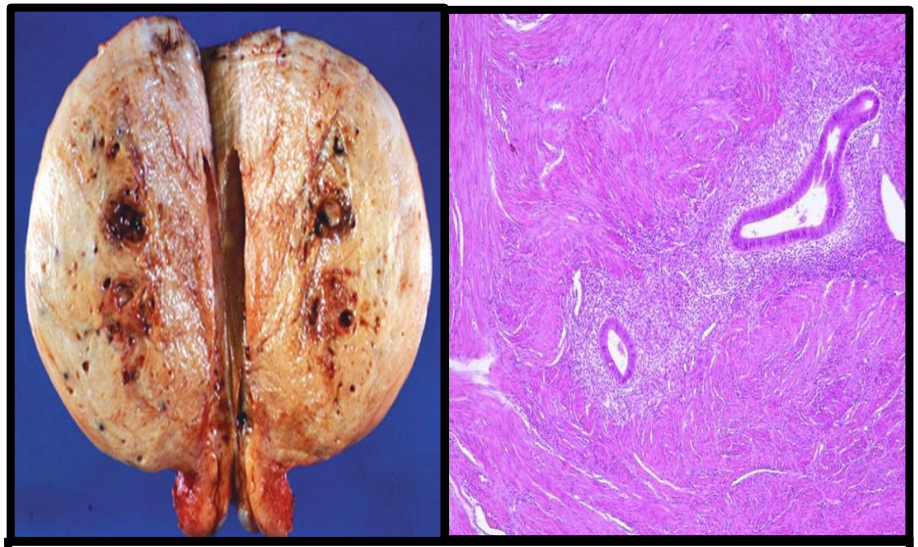
Invasive Ductal Carcinoma



A 55 year old female underwent hysterectomy for a **mass in the uterine cavity**.

Write diagnosis based on Gross & Histological feature:

Endometroid Carcinoma



A 38 year old female with abnormal vaginal bleeding underwent hysterectomy.

Write diagnosis based on Gross & Histological feature:

Adenomyosis

A 55 year old female presented with an **exophytic mass** on the **cervix**. Surgical excision was carried out.

Write the diagnosis in this case:

Cervical Carcinoma / Squamous cell Carcinoma

Mention the most important etiologic agent associated with this condition:

HPV-16

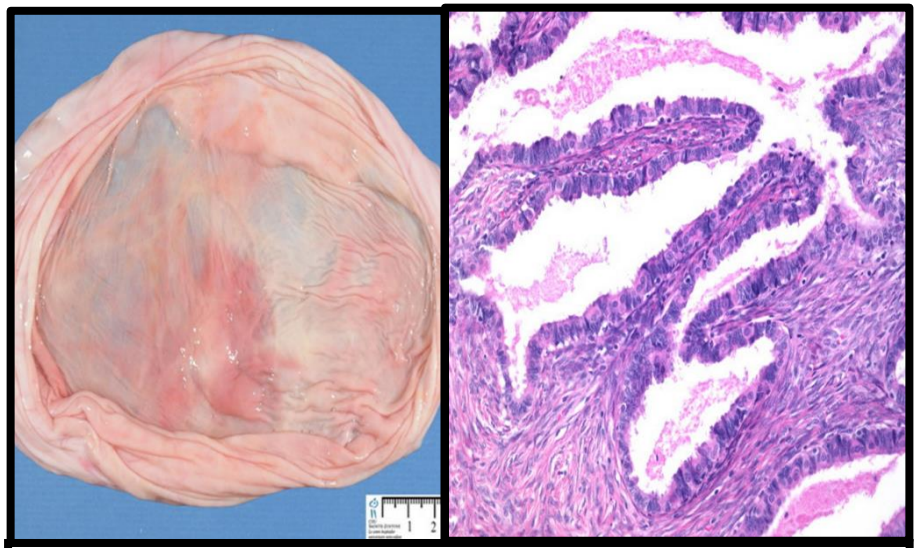
Mention any two risk factors for this condition:

1- **Multiple sexual partners** &
2- **Early-onset of sexual activity**

A 15 year old female presented with left sided **pelvic pain**. USG revealed a **large cystic mass** in the **left ovary**. Cystectomy was carried out.

Write diagnosis based on Gross & Histological feature:

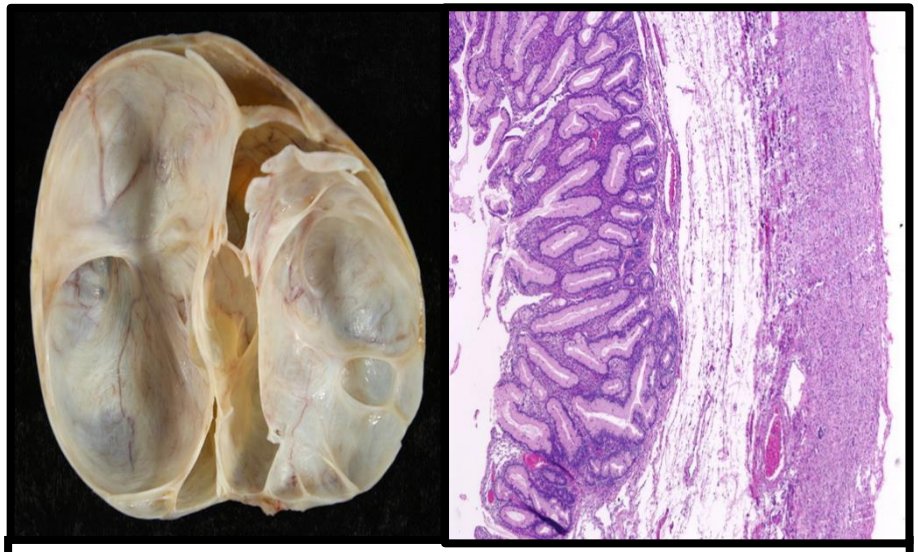
Dermoid cyst / Mature Teratomas



A 35 year old female presented with right sided **pelvic pain**. USG revealed a **large cystic mass** in the **right ovary**. Cystectomy was carried out.

Write diagnosis based on Gross & Histological feature:

Serous Cystadenoma



A 35 year old female presented with right sided **pelvic pain**. USG revealed a **large cystic mass** in **right ovary**. Cystectomy was carried out.

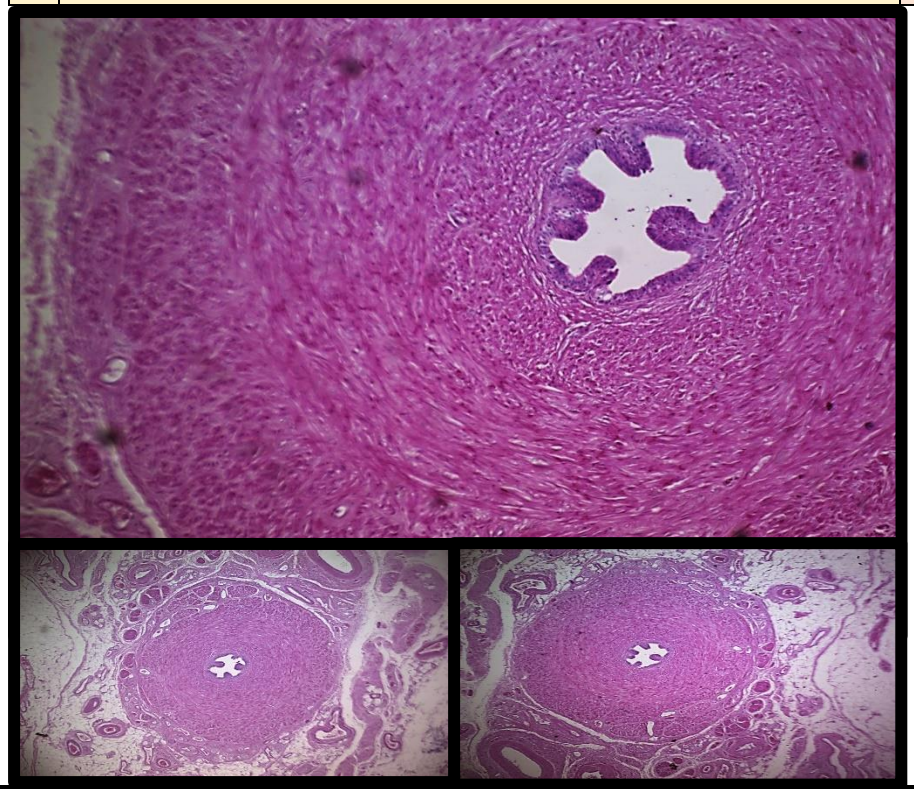
Write diagnosis based on Gross & Histological feature:

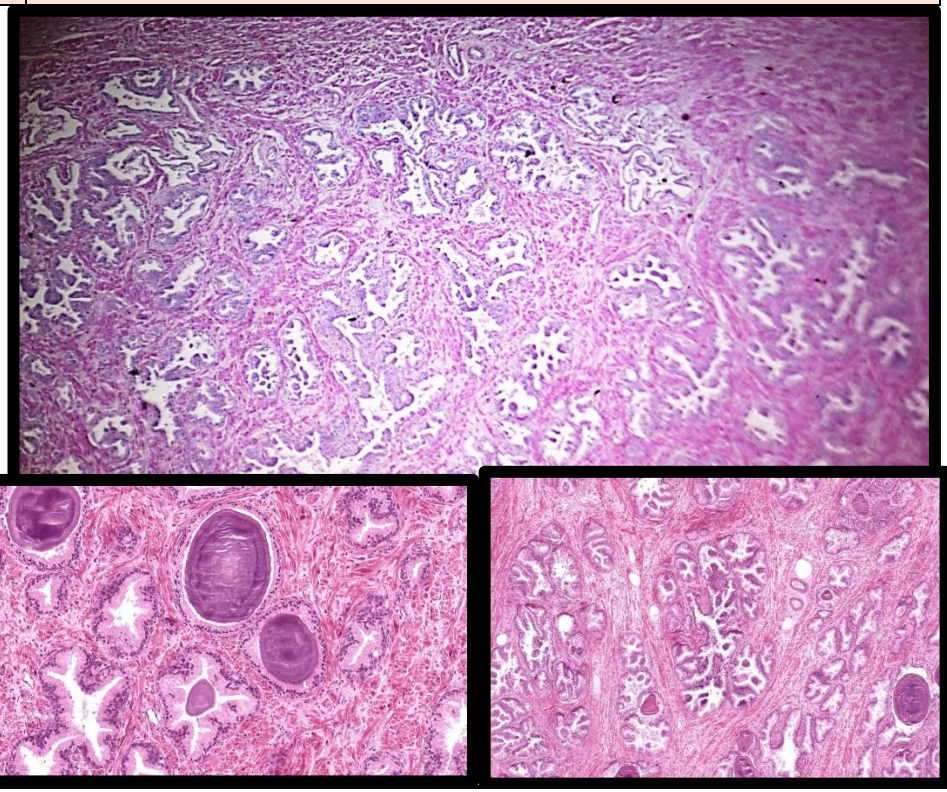
Mucinous Cystadenoma

Histology

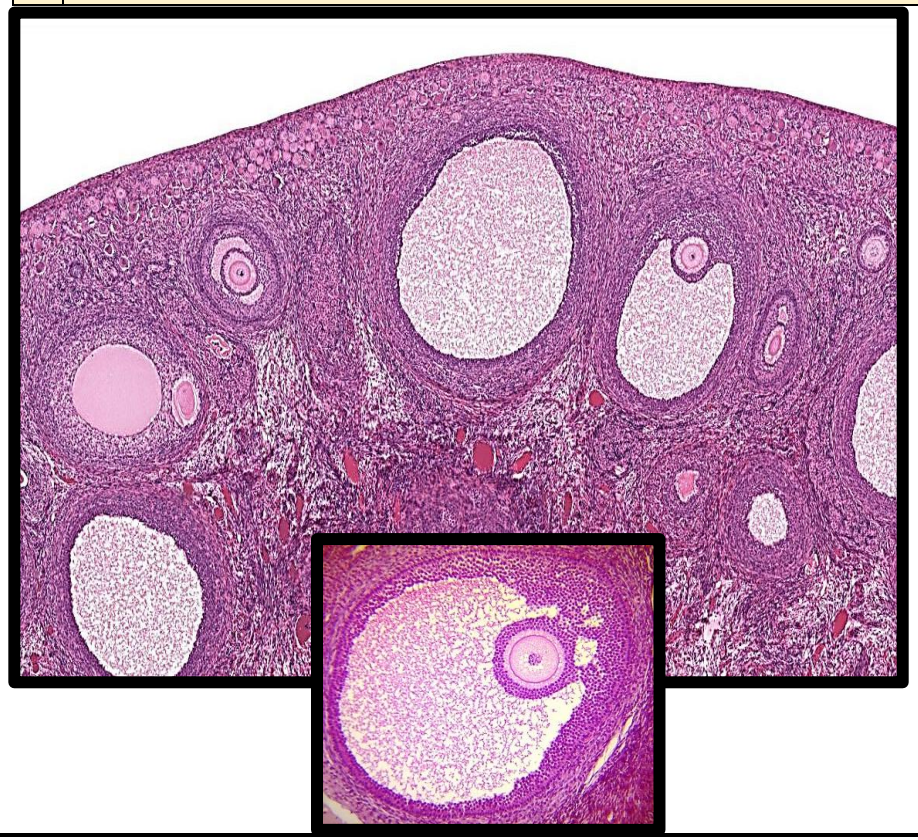
Testis		Epididymis	
#	Identification Points	#	Identification Points
1	**Tunica** albuginea & Vasculosa	1	Pseudostratified columnar epithelium.
2	Seminiferous Tubules	2	Spermatozoa in lumen of the duct.
3	Interstitial [**Leydig**] & **Sertoli** cells	3	Muscular layer
4	Germinal epithelium & Spermatids	4	Stroma (C.T between coils of the duct).

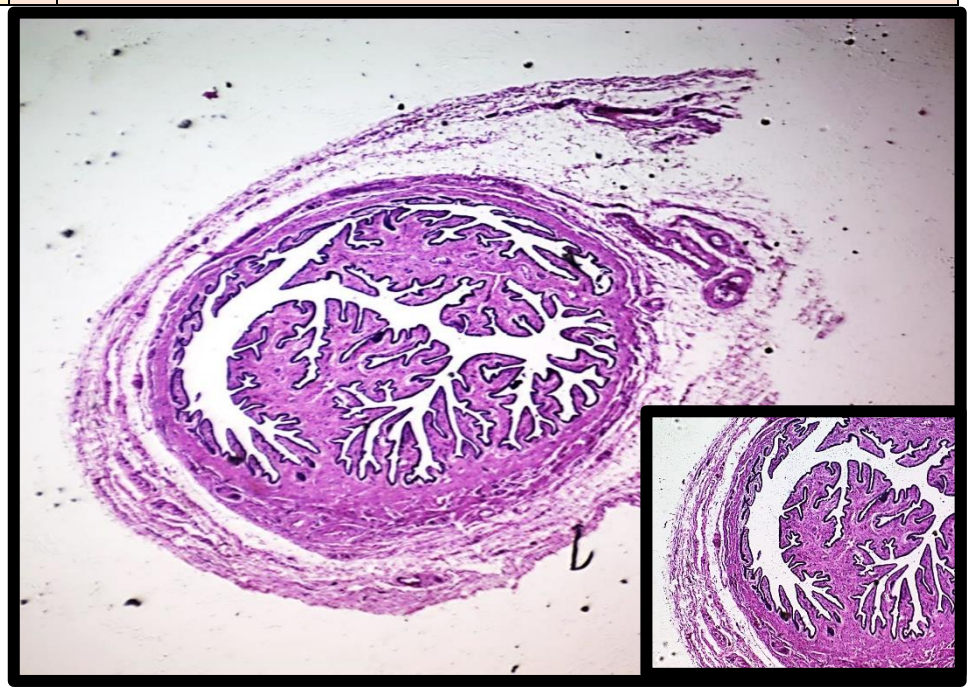
Vas Deference		Prostate	
#	Identification Points	#	Identification Points
1	Irregular Convoluted lumen	1	Lobes & Lobules
2	Pseudostratified columnar epithelium with stereocilia.	2	Fibromuscular stroma
3	Thick (3 layered) muscularis.	3	Prostatic glands
4	Adventitia	4	Corpora Amyleca



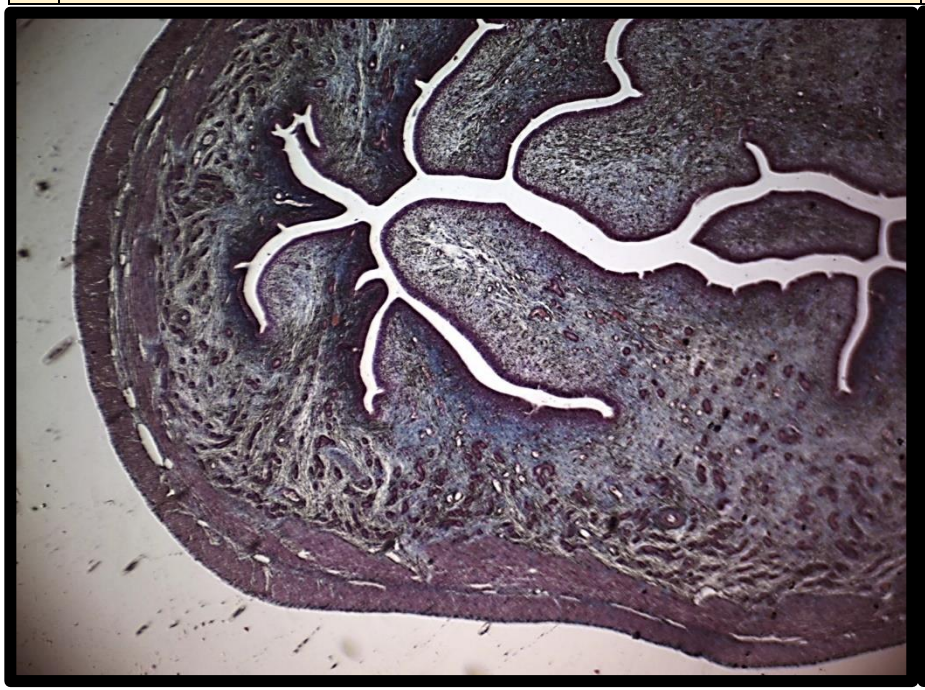


Ovary		Oviduct	
#	Identification Points	#	Identification Points
1	Germinal epithelium	1	Irregular mucosal folds.
2	Tunica Albuginea	2	Simple columnar epithelium.
3	Cortical Stroma & Medulla	3	Muscularis (inner circular outer longitudinal)
4	**Primary**, **Secondary**, **Graffian** Follicles	4	Serosa

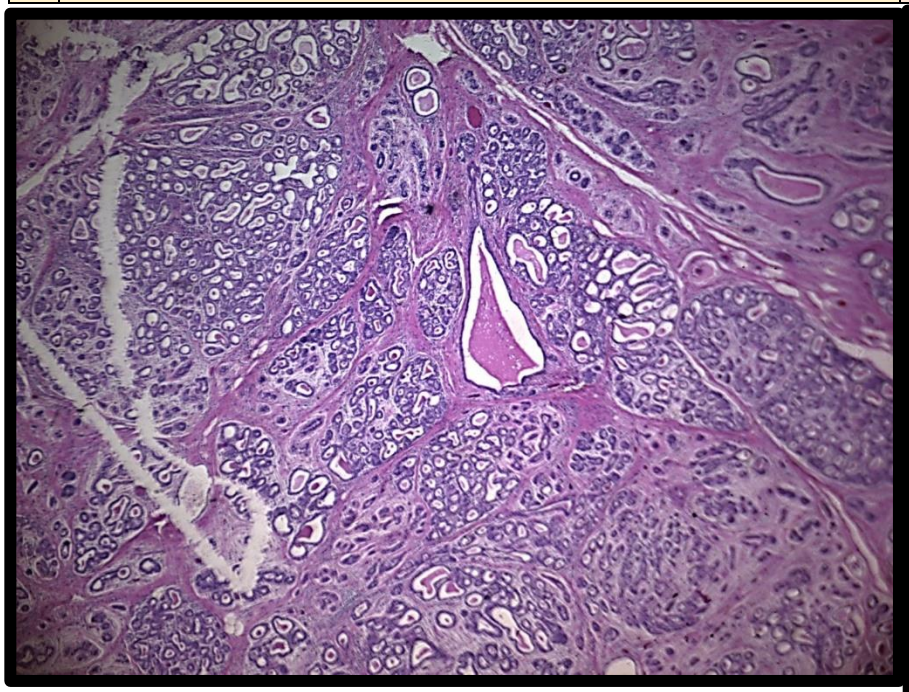


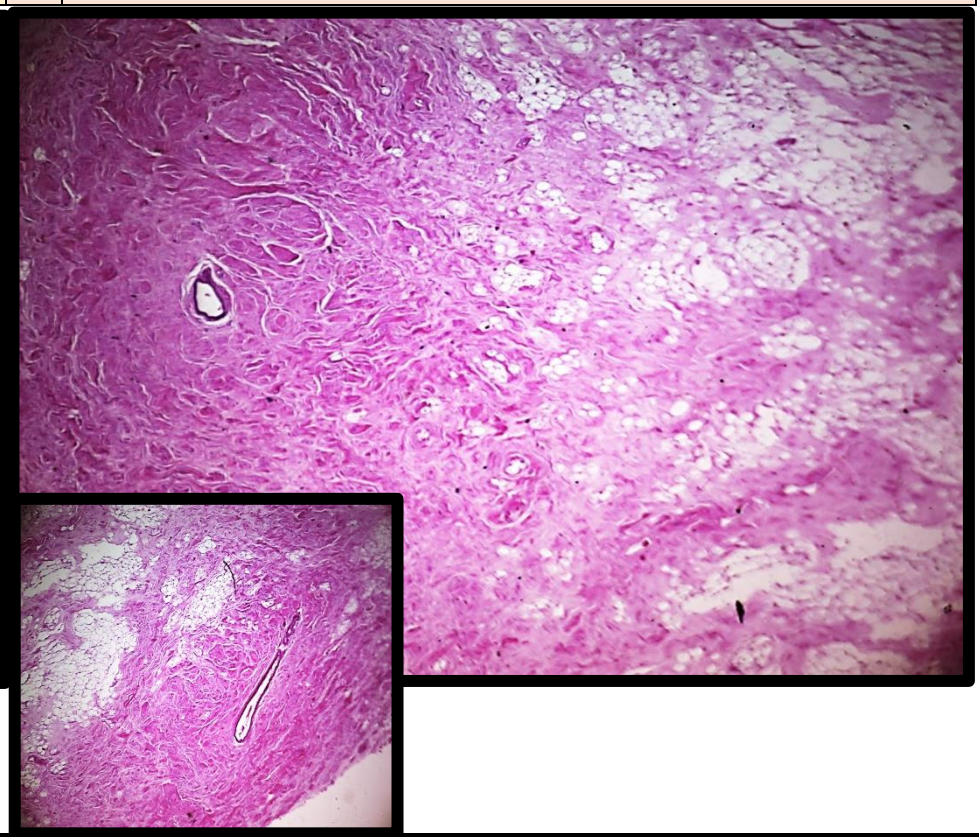


Uterus		Vagina	
#	Identification Points	#	Identification Points
1	**Endometrium** (simple columnar epithelium & lamina propria).	1	**Epithelium:** St. Sq. Nonkeratinized epithelium
2	**Myometrium**.	2	Lamina propria lacks glands.
3	**Perimetrium** (serosa).	3	Bundles of smooth muscles

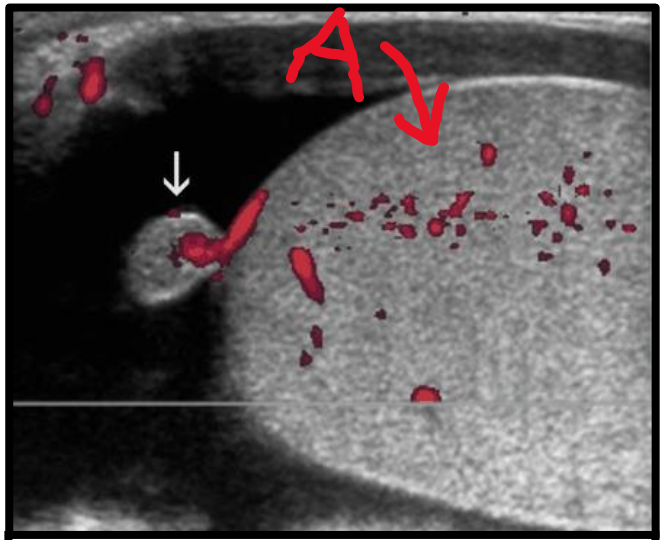


Mammary Gland [Lactating]		Mammary Gland [Non-Lactating]	
#	Identification Points	#	Identification Points
1	Lobes & Lobules	1	Lobes & Lobules
2	Little interlobular connective tissue.	2	Abundant interlobular connective tissue.
3	Lactiferous ducts	3	Small & Large interlobular ducts
4	Alevoli with milk	4	Little glandular tissue



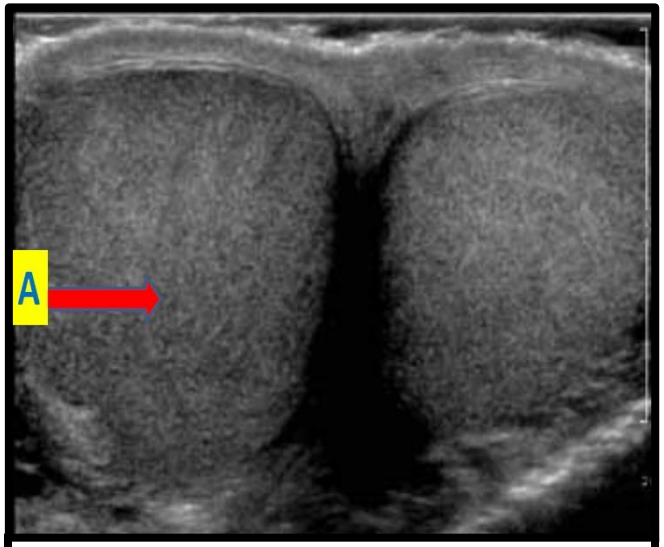


Radiology



Imaging Modality/Study:
Color Doppler Ultrasound

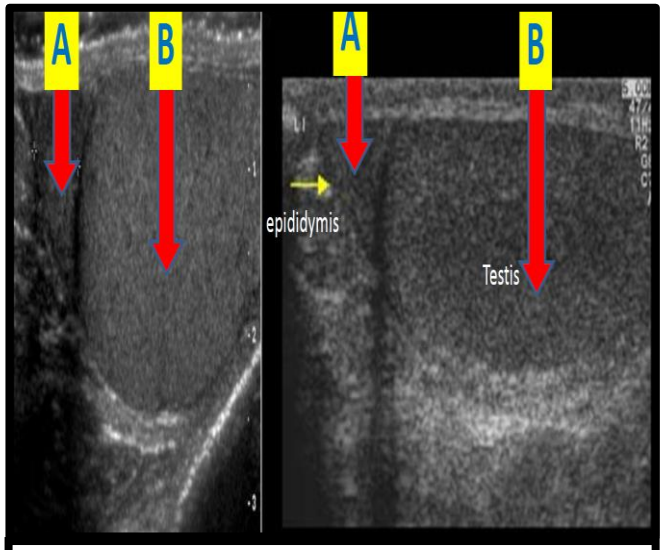
A- Anatomy: Testes



Imaging Modality/Study:
Ultrasound

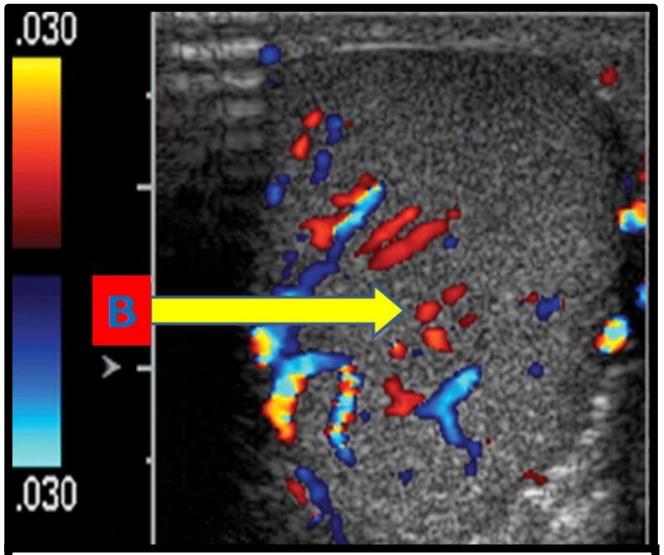
One indication for imaging examination: Scrotal Pain or Swelling

Anatomy: A- Testes



Imaging Modality/Study:
Ultrasound

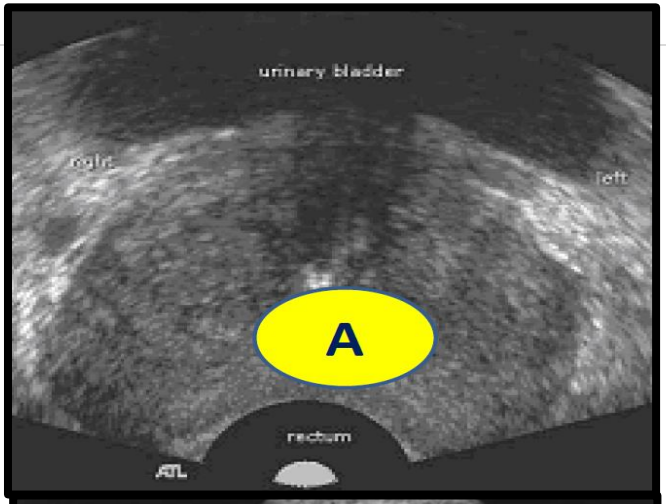
Anatomy:
A- Epididymis
B- Testes

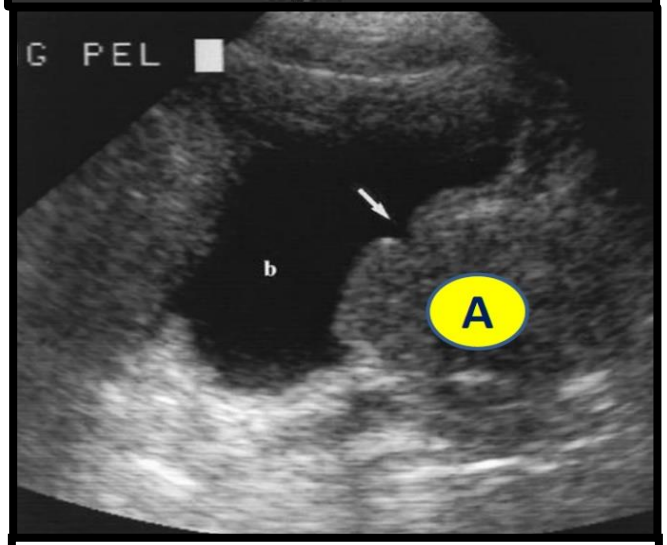


Patient presented with
scrotal pain / swelling

Imaging Modality/Study:
Color doppler Ultrasound

B- Anatomy: Testes





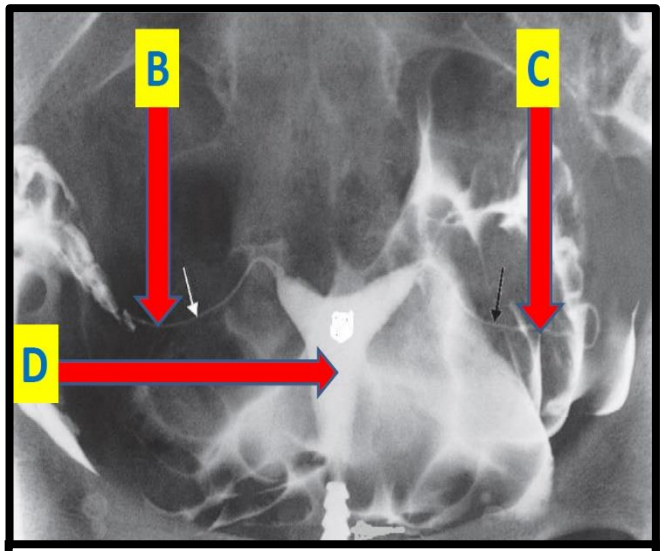
TRANSRECTAL US IMAGE [TOP]
TRANSABDOMINAL US IMAGE

Imaging Modality/Study:
Ultrasound

Anatomy: A- Prostate

Imaging Modality/Study:
Pelvic CT

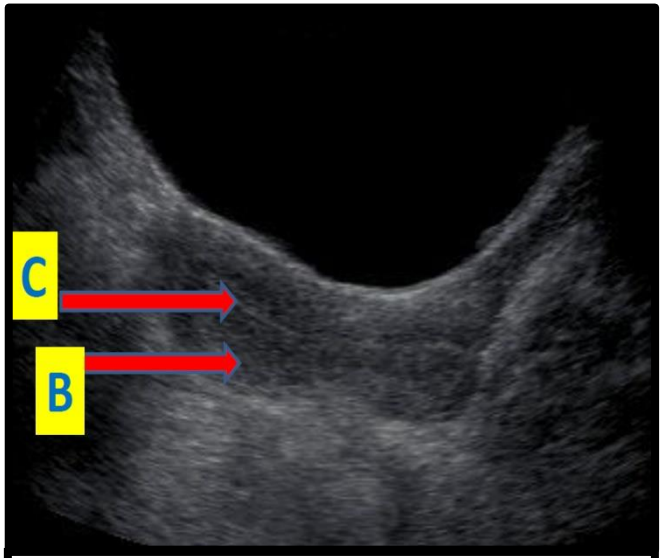
Anatomy:
(A) Right femoral head
(B) Right obturator internus muscle
(C) Urinary bladder
(D) Prostate
(E) Rectum



Imaging Modality/Study:
Hysterosalpingogram (HSG)
Markings:
(B) Right uterine (Fallopian) tube
(C) Left uterine (Fallopian) tube
(D) uterus

HSG one Indications
- Infertility and recurrent miscarriages
- Congenital uterine anomalies
- Uterine tube pathologies

HSG one Contraindications
- Recent surgery on the tubes or the uterus
- Acute and sub acute PID
- Contrast allergy
- Pregnancy (UPT /Beta hCG mandatory)



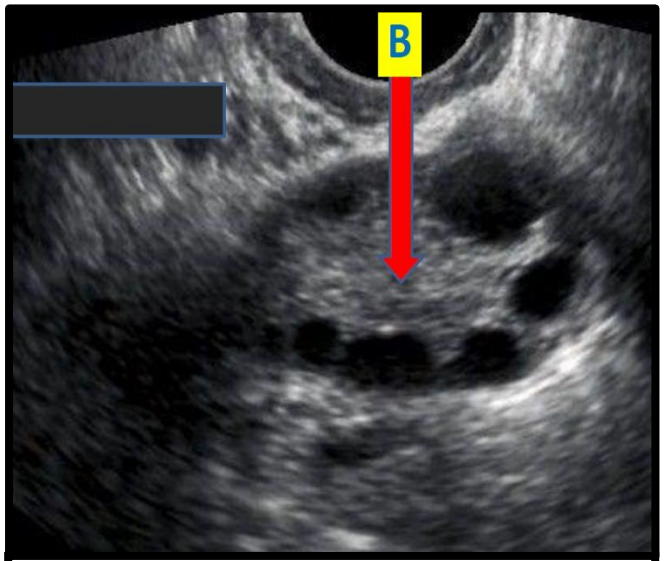
Patient presented w/ vaginal bleeding

Imaging Modality/Study:
Transabdominal ultrasound

Give the name of the labeled organ/ uterine layer marked as B/C:

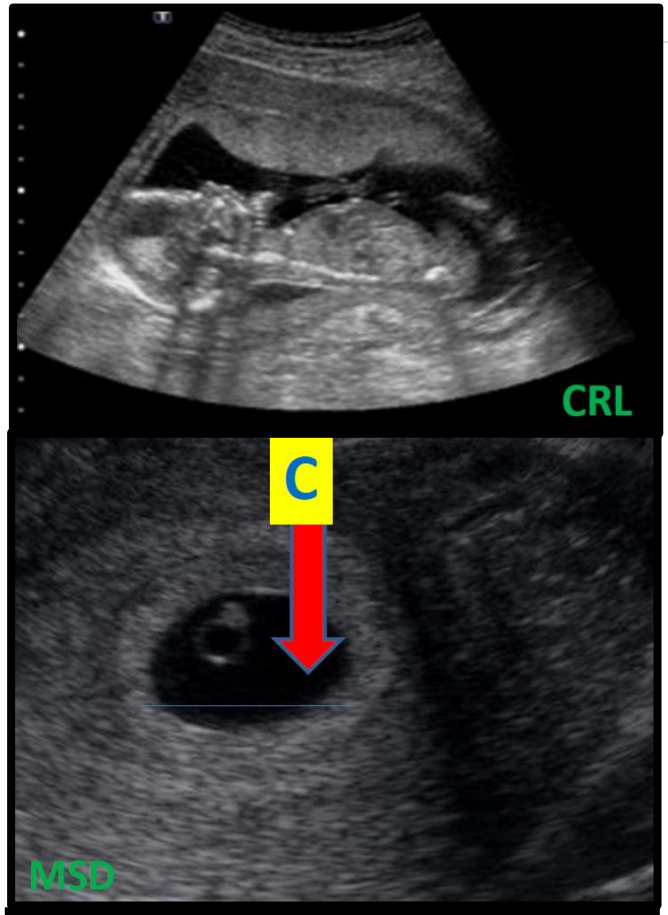
B. Uterus / Uterine myometrium

C. Uterus /Uterine endometrium



Female patient w/ history of infertility
Imaging Modality/Study:
Ultrasound

Anatomy:
B- Ovary

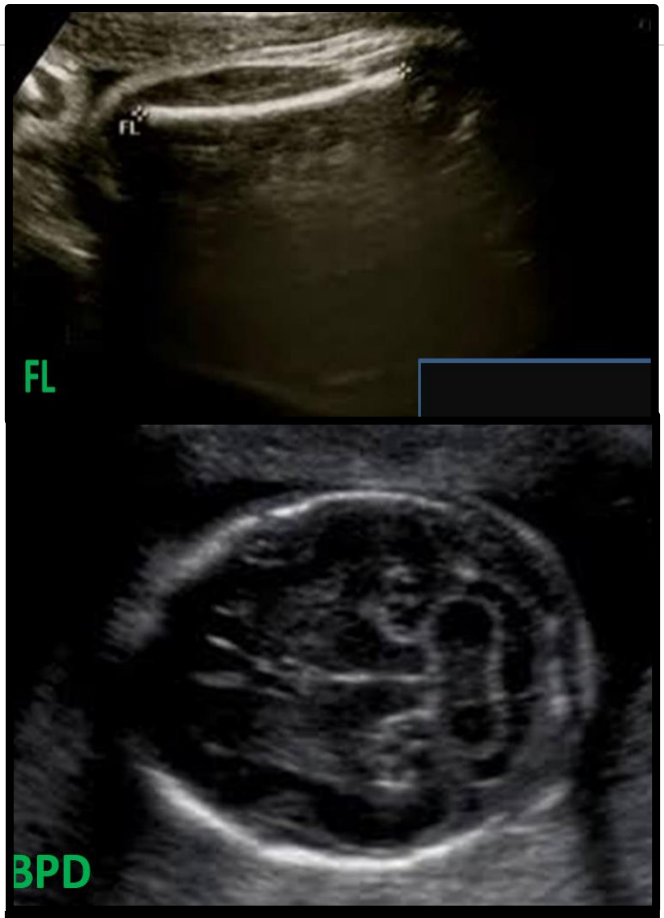


Amenorrhea/ Serum beta hCG is +

Imaging Modality/Study:
Ultrasound

Method of estimation GA:
MSD – CRL

Labeled Structure Gestational sac



Pregnant lady

Imaging Modality/Study:
Ultrasound

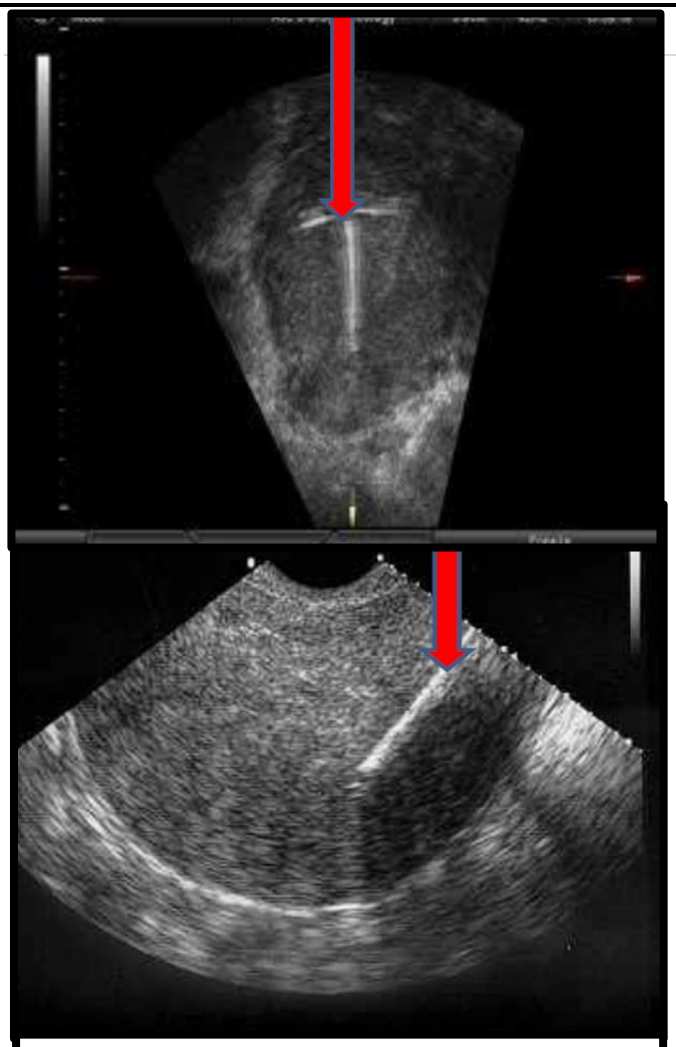
Method of estimation GA:
1.Transabdominal ultrasound

2. BPD – FL

Ultrasound of a twin pregnancy : (fetal heads) The twins are separated by individual amniotic sacs,

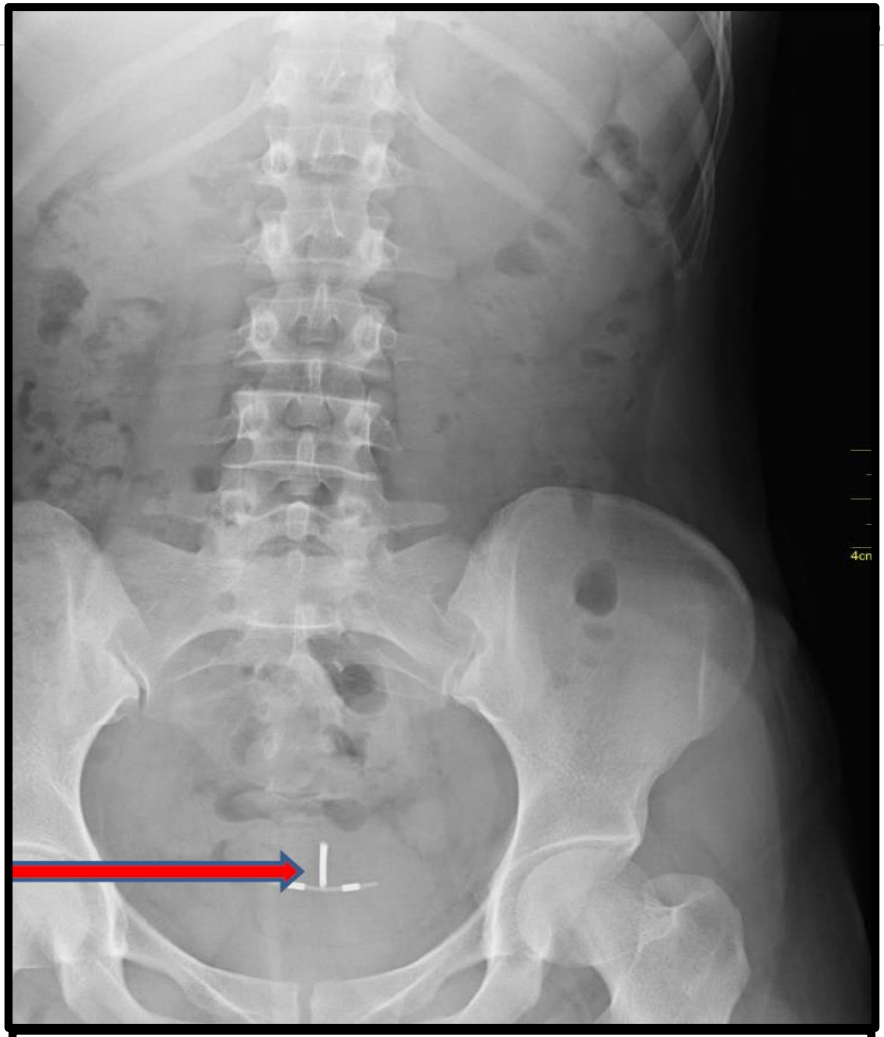
Imaging Modality/Study:
Ultrasound

What is the diagnosis:
Multiple pregnancy / Twin pregnancy



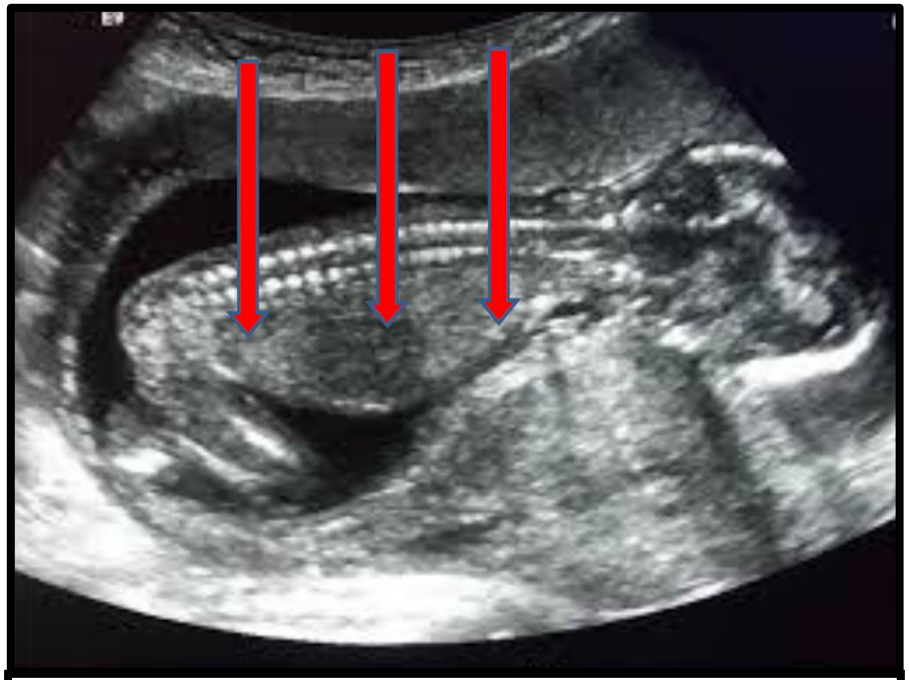
Imaging Modality/Study:
Ultrasound

Labeled Device:
IUCD



Imaging Modality/Study:
Plain X-ray of Abdomen

Labeled Device:
IUCD



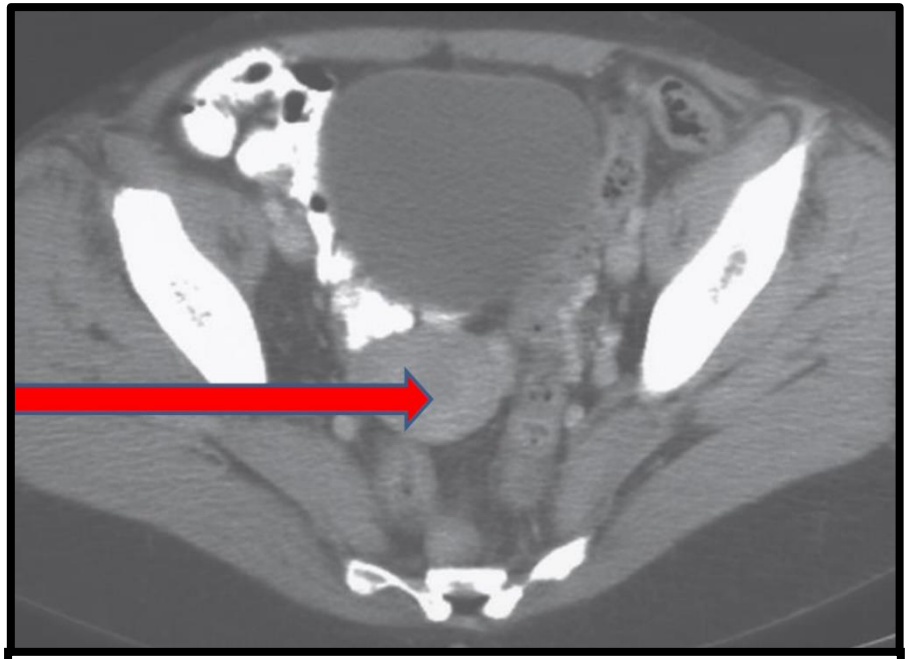
Imaging Modality/Study:
Ultrasound

What do you see marked by arrows:
Intrauterine pregnancy Fetus

Imaging Modality/Study:
Ultrasound

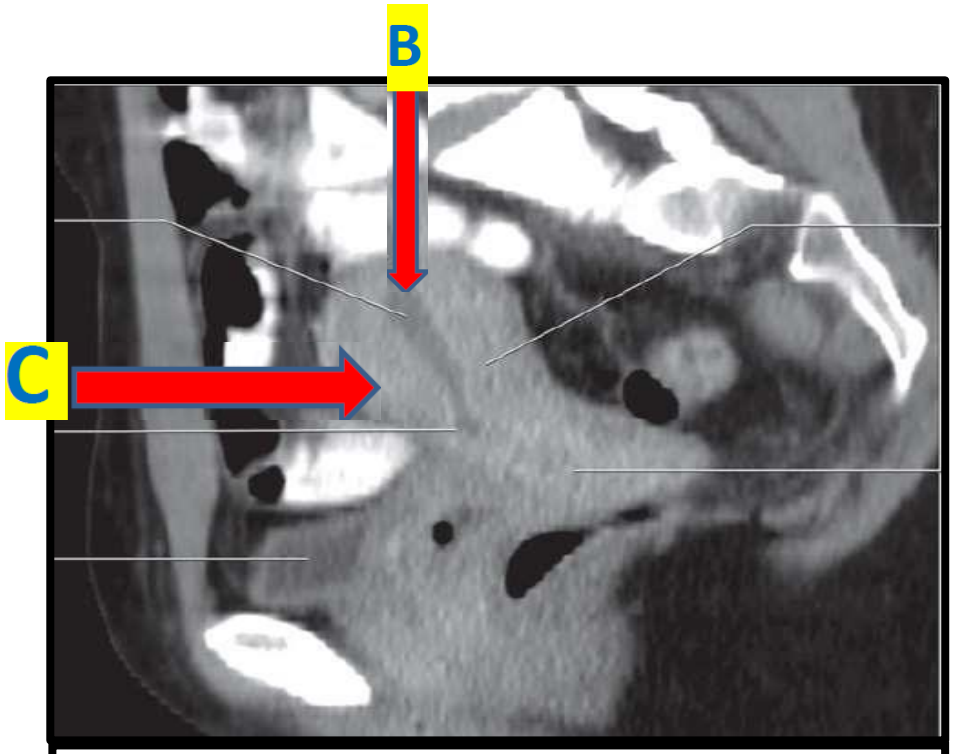
What do you see: **Intrauterine pregnancy Fetus**

The name of used method for estimation of gestational age: **CRL**



Imaging Modality/Study:
Computed Tomography

Labeled: Uterus

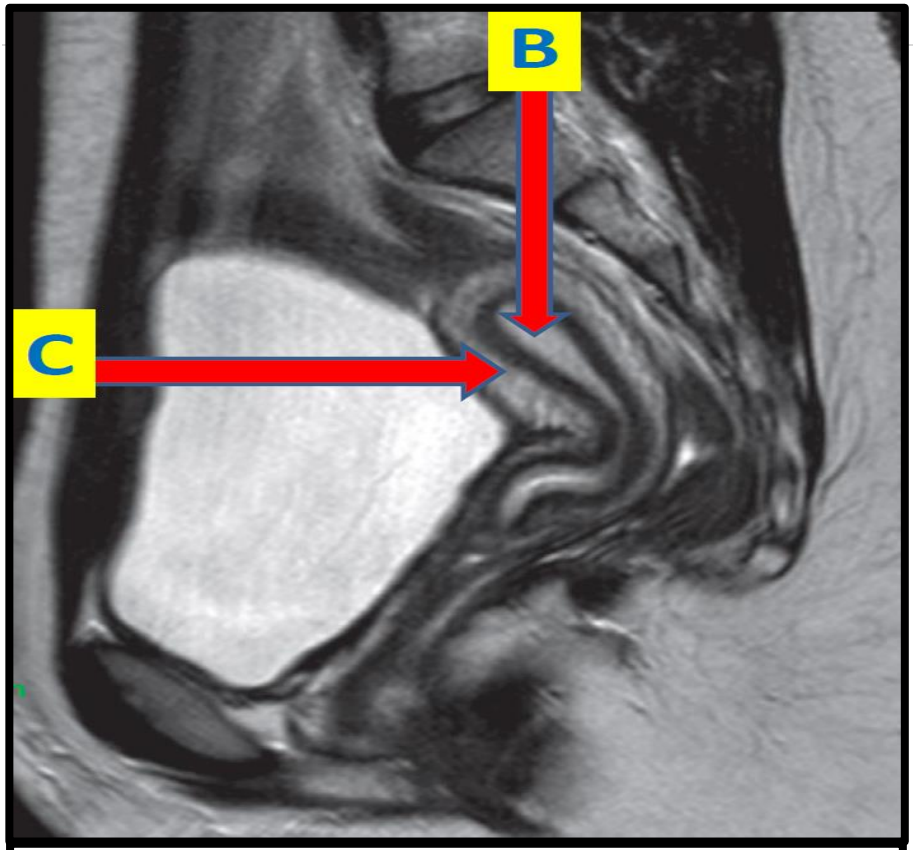


Imaging Modality/Study:
Computed Tomography

Labeled:

B- Uterus / Uterine Endometrium

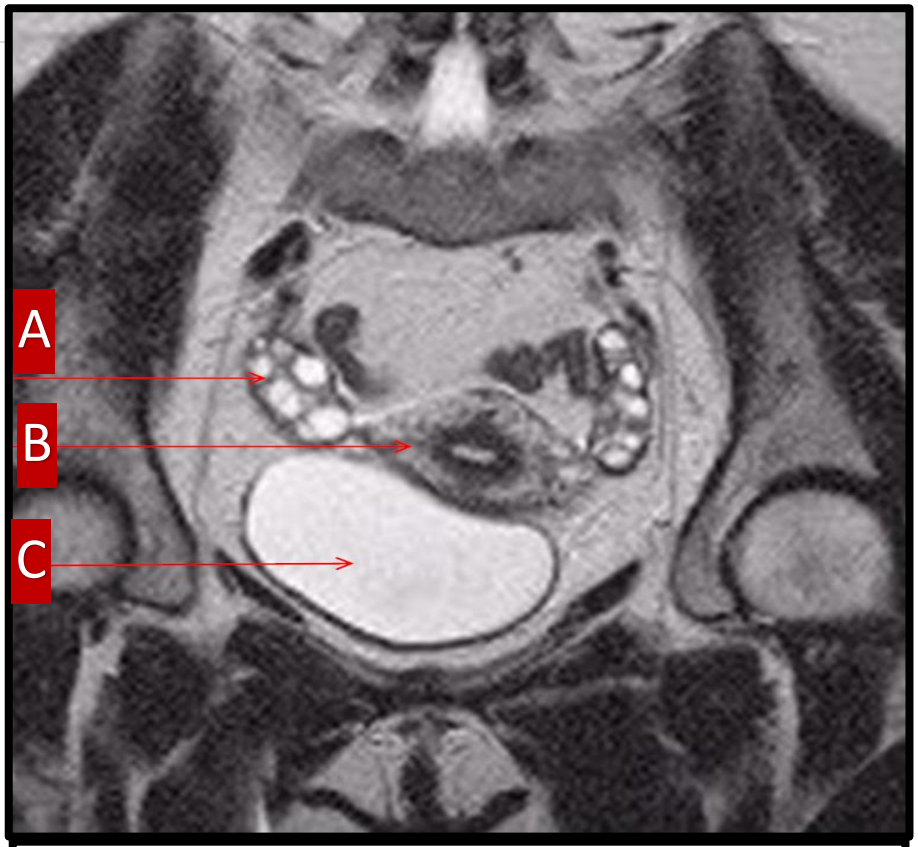
C- Uterine Myometrium



Normal uterus on sagittal T 2 weighted MRI The endometrium returns a high signal intensity

Imaging Modality/Study:
MRI

Labeled:
D- Uterus / Uterine Endometrium
E- Uterine Myometrium



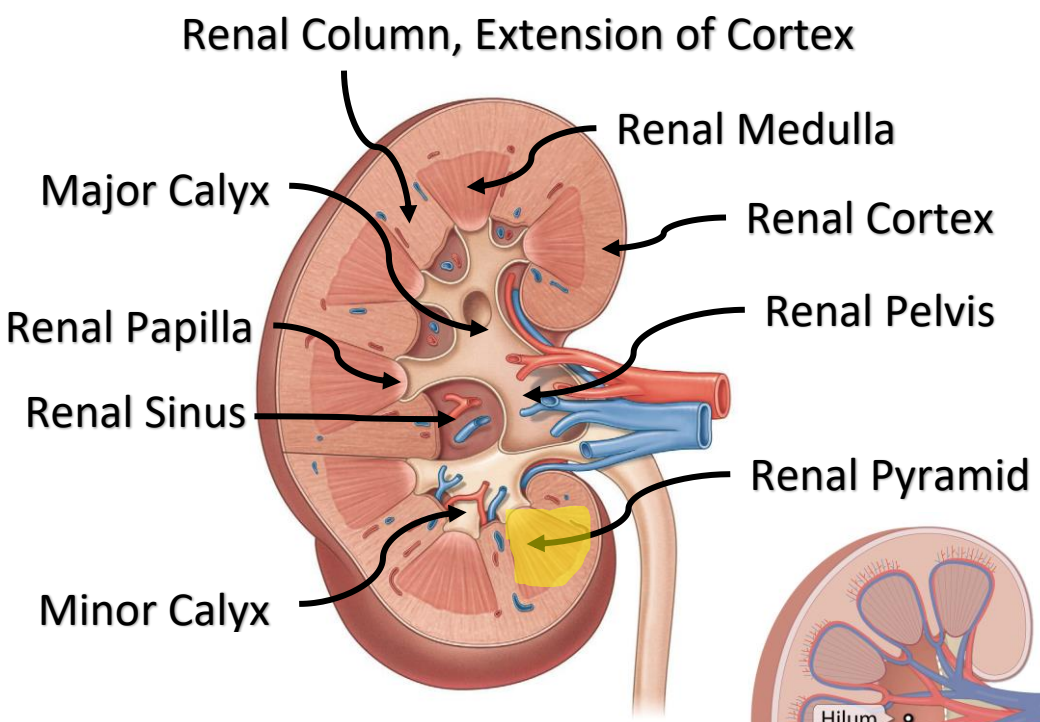
Imaging Modality/Study:
CORONAL T2WI MRI

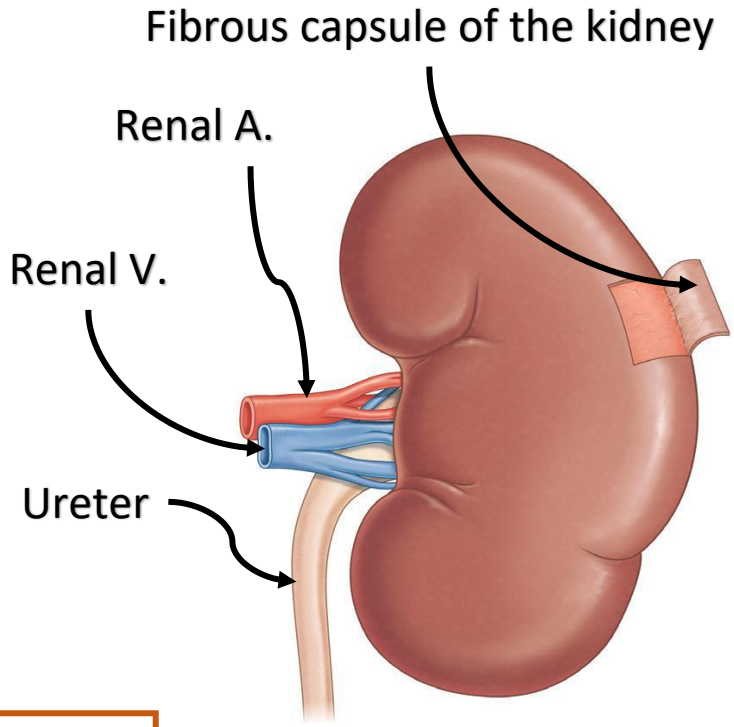
Labeled:
A- Ovary
B- Uterus
C- Bladder

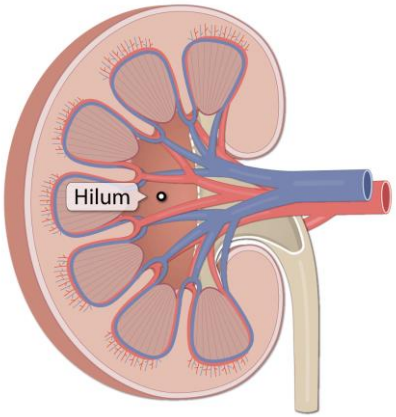
URIN

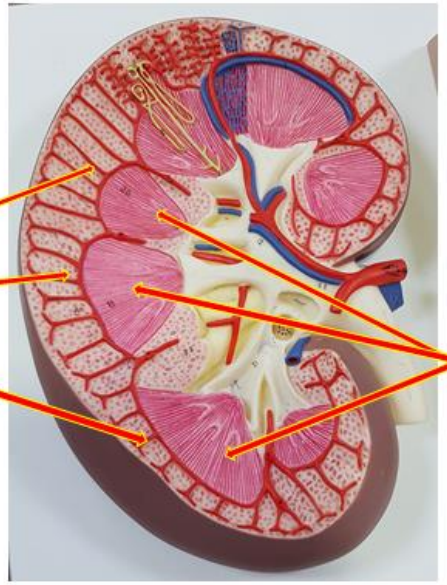
Anatomy

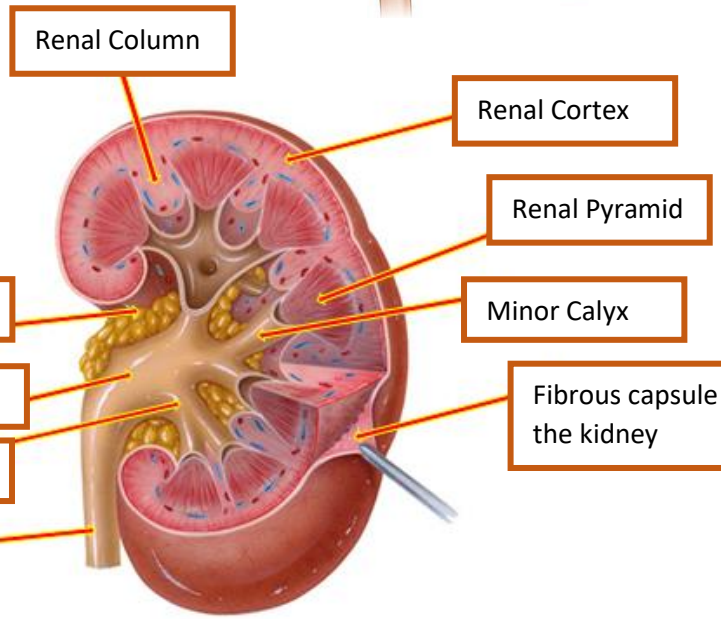
Identification: Kidney

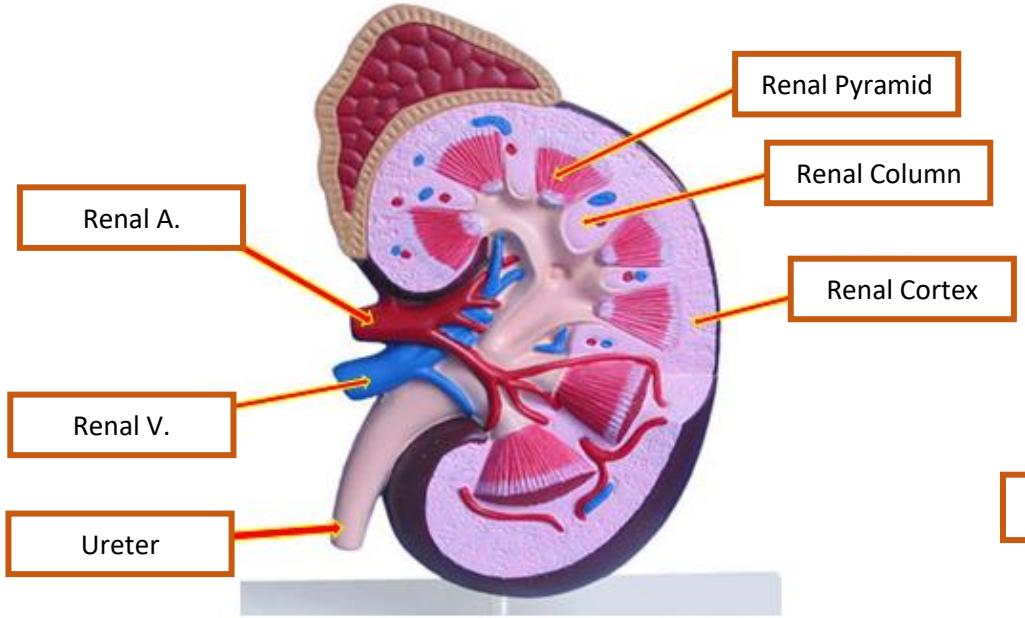


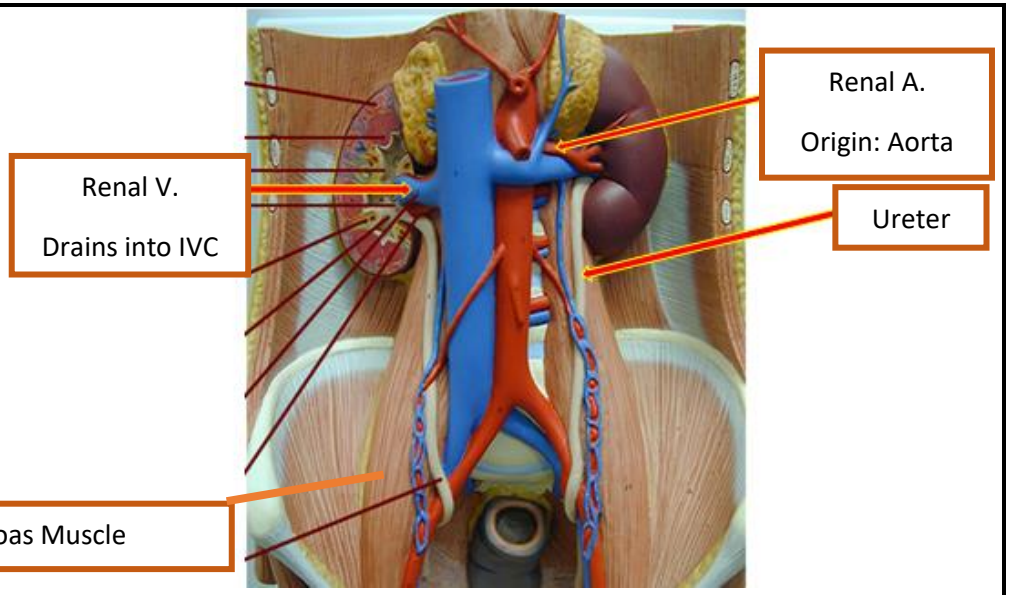


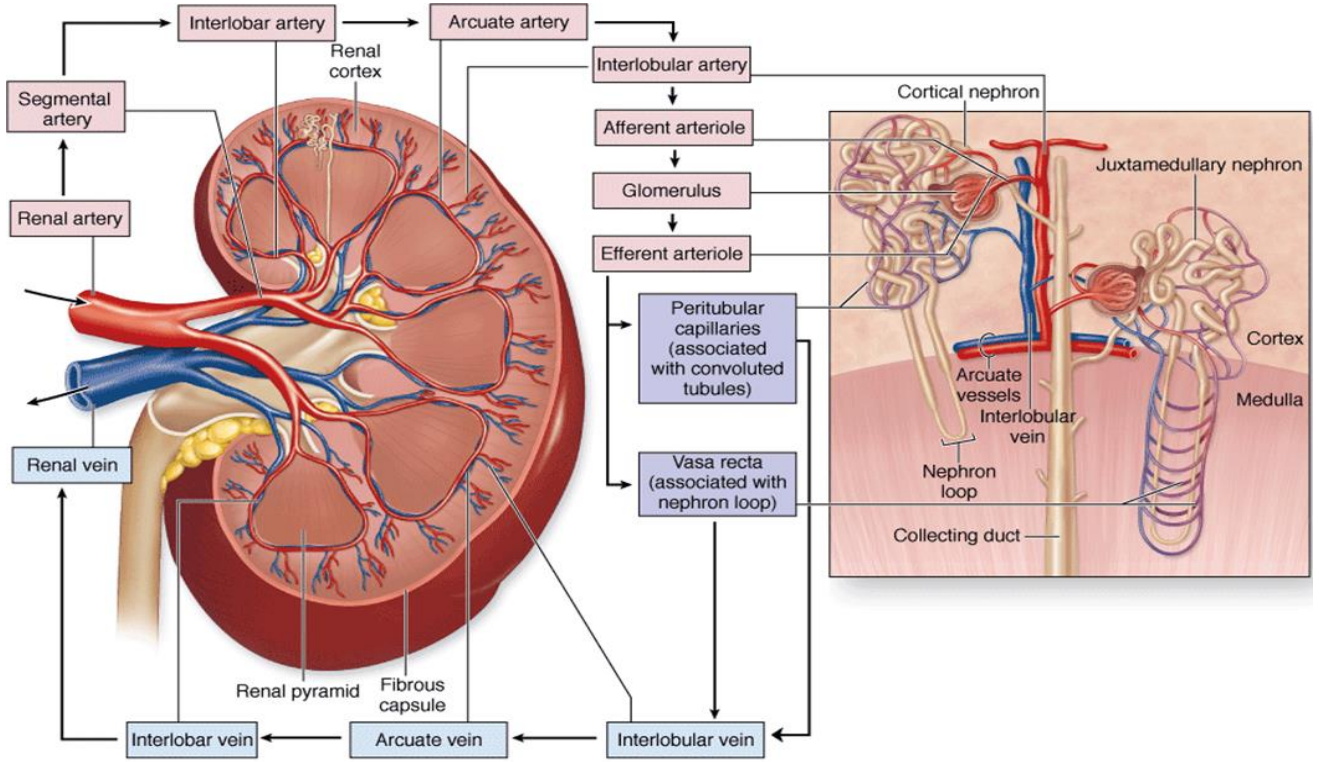


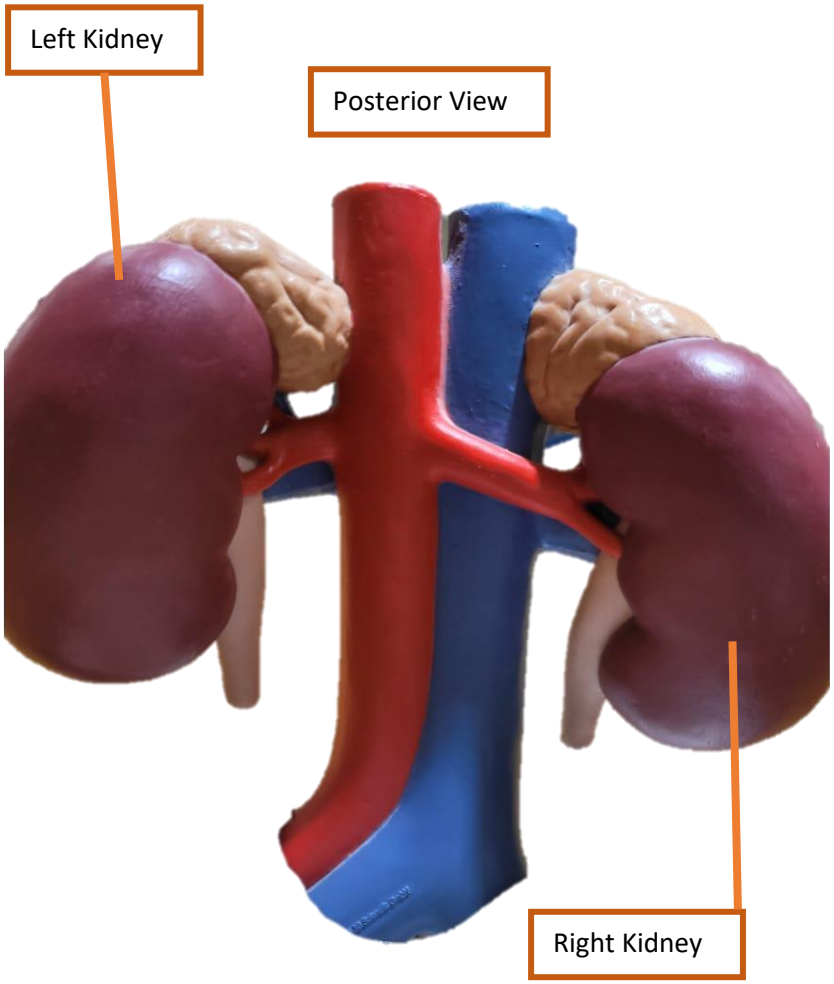





Renal Pyramid
Renal Column
Renal A.
Renal Cortex
Renal V.
Ureter


Renal A.
Origin: Aorta
Renal V.
Drains into IVC
Ureter
Psoas Muscle


Interlobar artery
Arcuate artery
Interlobular artery
Renal cortex
Segmental artery
Afferent arteriole
Glomerulus
Efferent arteriole
Renal artery
Peritubular capillaries (associated with convoluted tubules)
Vasa recta (associated with nephron loop)
Renal vein
Renal pyramid
Fibrous capsule
Interlobar vein
Arcuate vein
Interlobular vein
Cortical nephron
Juxtamedullary nephron
Cortex
Medulla
Arcuate vessels
Interlobular vein
Nephron loop
Collecting duct



In Anterior view, vessels are in order as

Renal V. → Renal A. → Ureter

From the posterior view it is opposite

IVC is closest to the right kidney with shortest renal V.

Where Aorta on the Left kidney, with shortest Renal A.

Anterior relations to Right Kidney:

Suprarenal gland, Liver, Duodenum, Right Colic Flexure, Illeum

Anterior relations to Left Kidney:

Suprarenal gland, Stomach, Spleen, Splenic artery, Pancreas, Jejunum, Left colic flexure

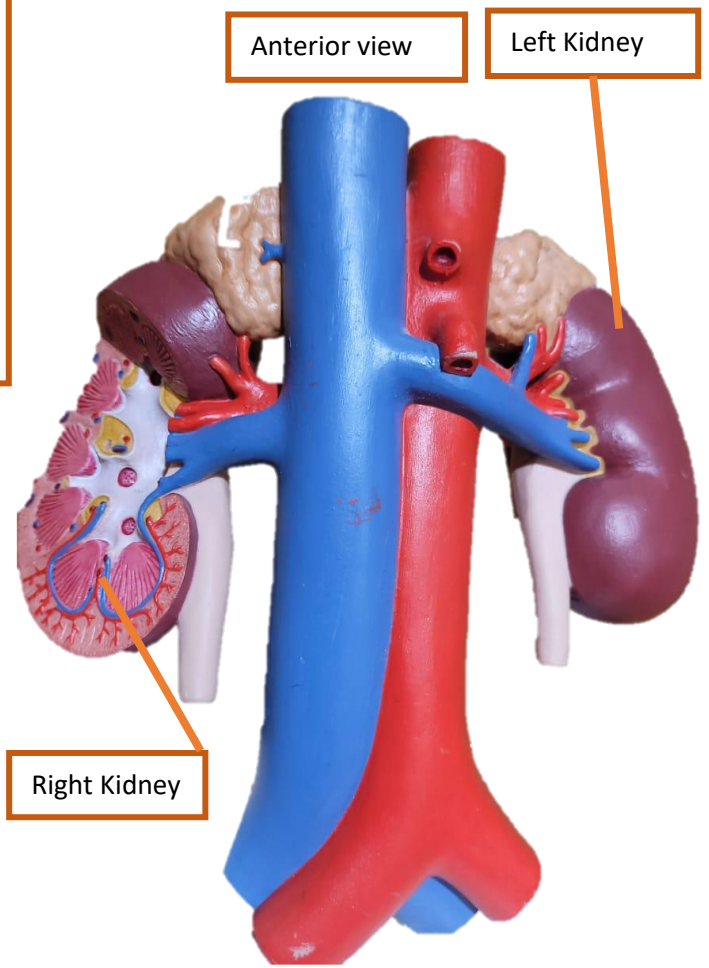
Posterior Relations to Both Kidneys:

12^{th} rib on right kidney,

11^{th},12^{th} rib on left kidney,

Diaphragm, Psoas major, Quadratus lumborum, Transversus abdominis muscles

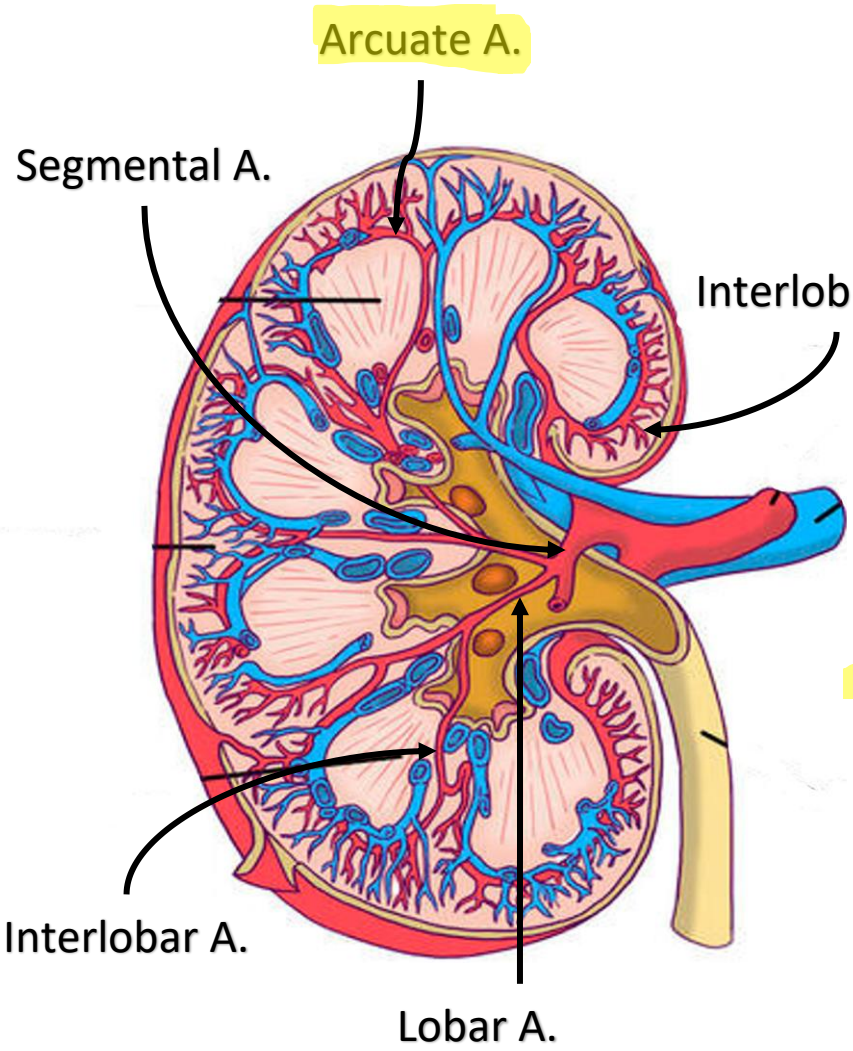
Subcostal, Illiohypogastric, ilioinguinal nerves

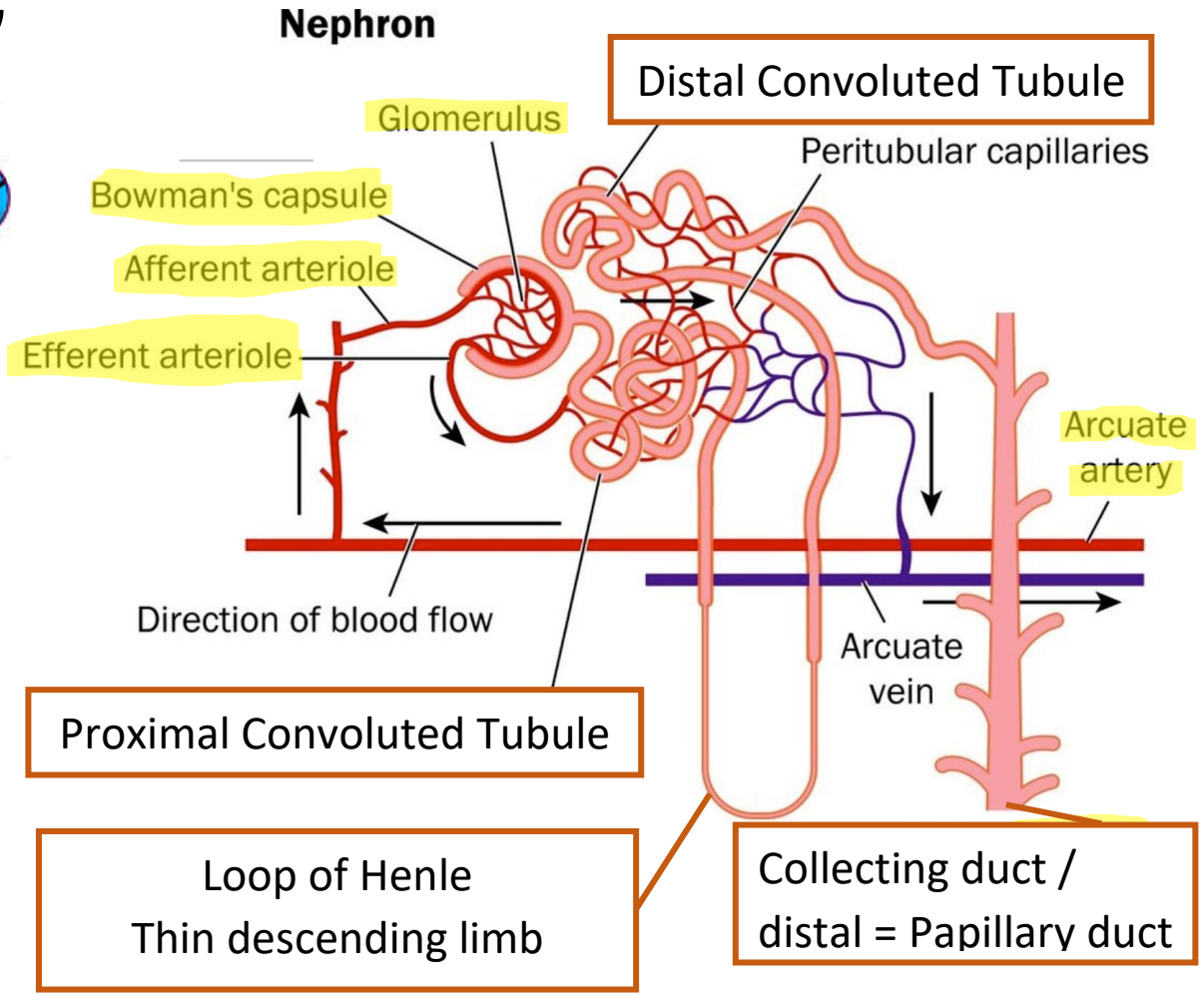


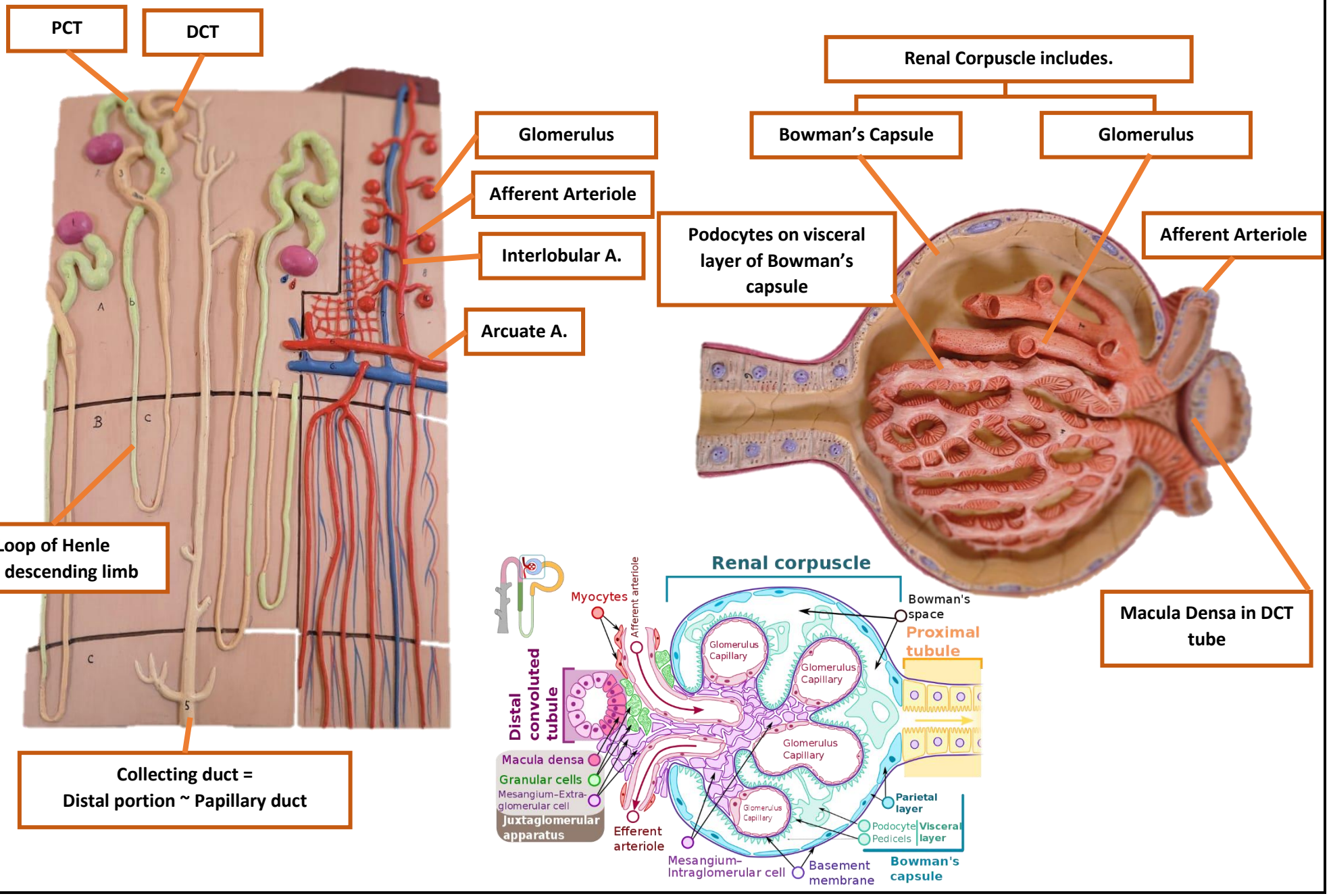
Renal Corpuscle includes Glomerulus & Bowman's Capsule

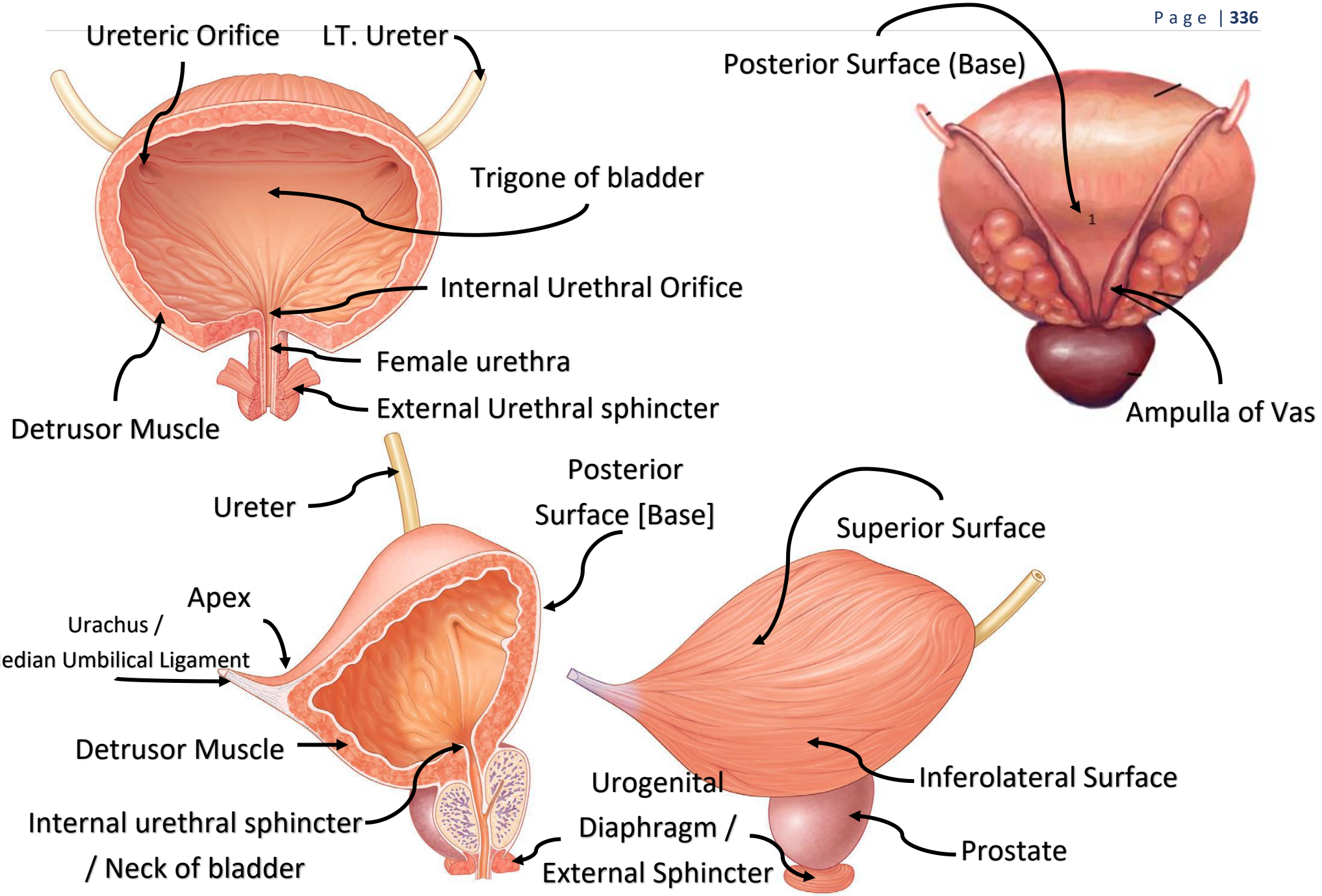
Podocytes found in visceral layer of Bowman's Capsule

Macula Densa present in DCT

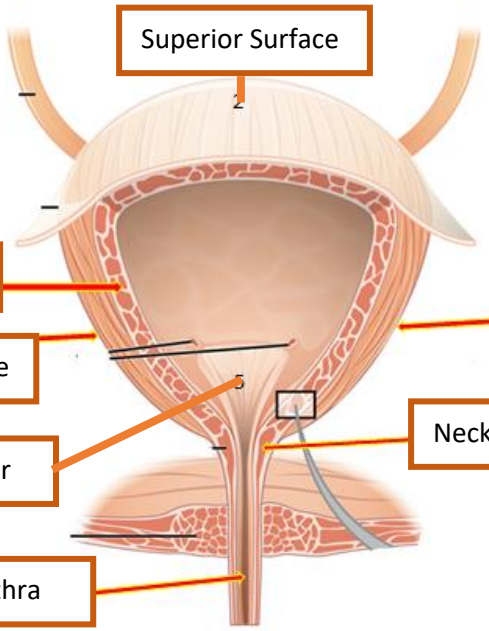




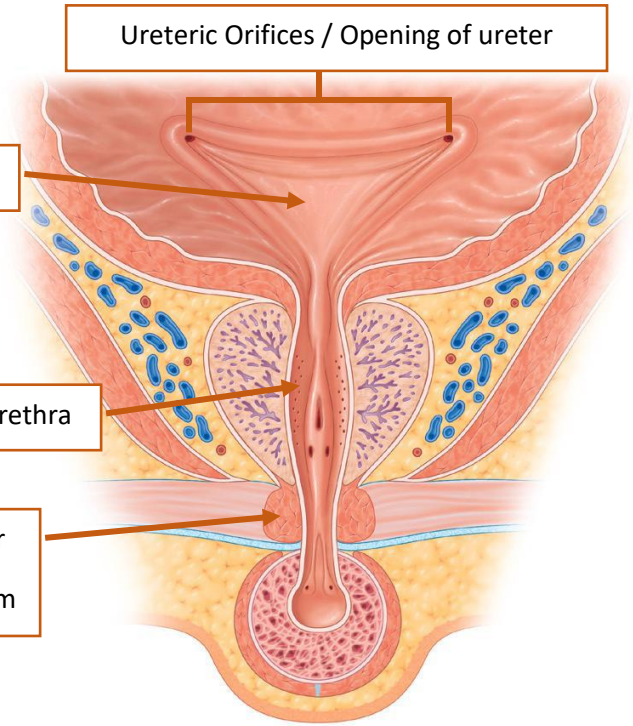

PCT
DCT
Glomerulus
Afferent Arteriole
Interlobular A.
Arcuate A.
Loop of Henle
thin descending limb
Collecting duct =
Distal portion ~ Papillary duct
Renal Corpuscle includes.
Bowman's Capsule
Glomerulus
Podocytes on visceral layer of Bowman's capsule
Afferent Arteriole
Macula Densa in DCT tube
Renal corpuscle
Myocytes
Afferent arteriole
Bowman's space
Proximal tubule
Distal convoluted tubule
Glomerulus Capillary
Macula densa
Granular cells
Mesangium-Extra-glomerular cell
Juxtaglomerular apparatus
Efferent arteriole
Parietal layer
Podocyte Pedicels
Visceral layer
Mesangium-Intraglomerular cell
Basement membrane
Bowman's capsule

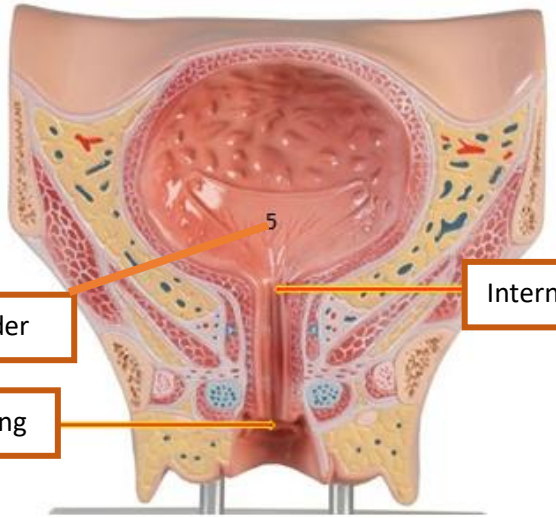

Ureteric Orifice
LT. Ureter
Trigone of bladder
Internal Urethral Orifice
Female urethra
External Urethral sphincter
Detrusor Muscle
Posterior Surface (Base)
Ampulla of Vas
Ureter
Posterior
Surface [Base]
Apex
Urachus /
Median Umbilical Ligament
Detrusor Muscle
Internal urethral sphincter
/ Neck of bladder
Superior Surface
Inferolateral Surface
Urogenital
Diaphragm /
External Sphincter
Prostate

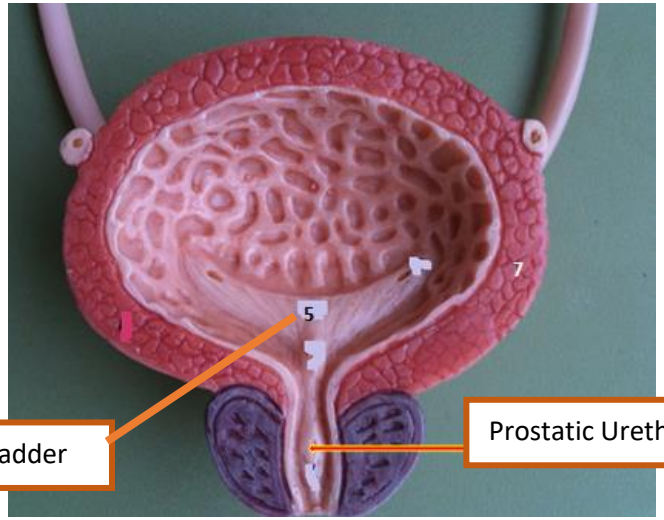
Female

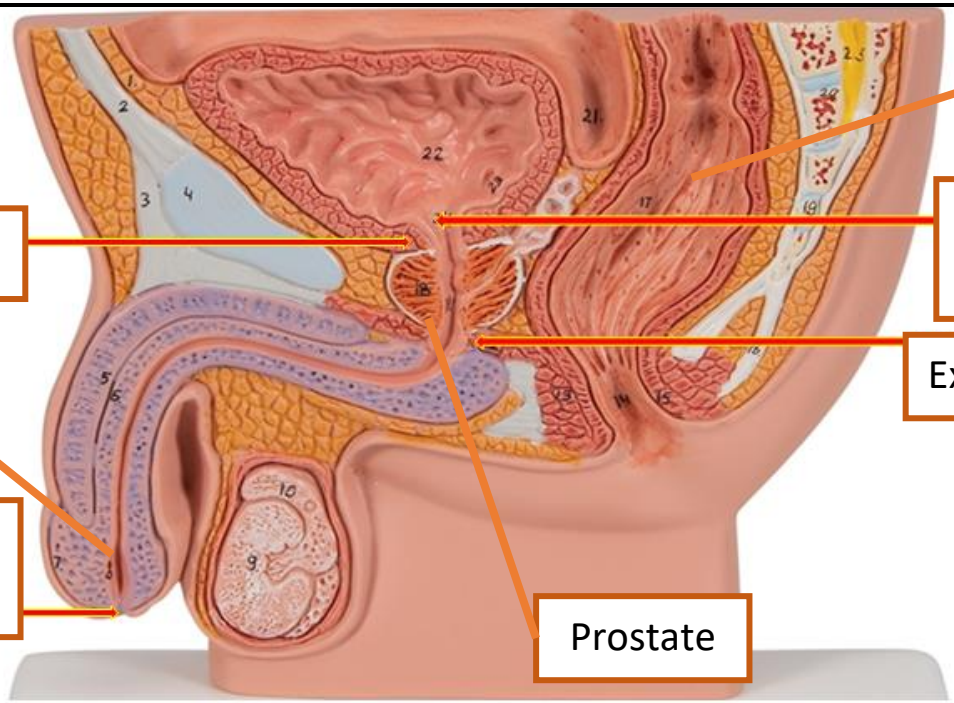

Superior Surface
Detrusor Muscle
Inferolateral Surface
Inferolateral Surface
Neck of bladder
Trigone of Bladder
Female Urethra

Male


Ureteric Orifices / Opening of ureter
Trigone of Bladder
Prostatic Urethra
External Urethral Sphincter
Within urogenital Diaphragm


Trigone of Bladder
Internal Urethral Opening
External Urethral Opening


Trigone of Bladder
Prostatic Urethra



Rectum

Internal Urethral Sphincter

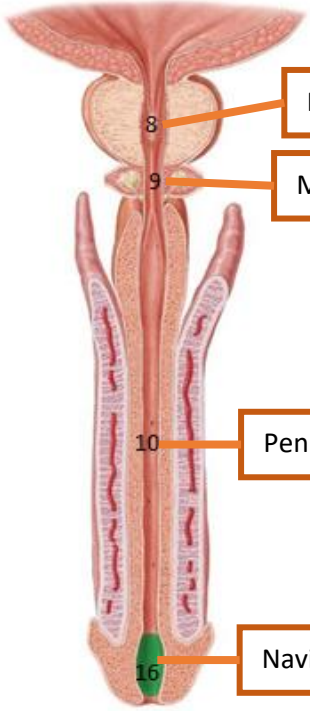
Internal Urethral Opening / (Meatus)

External Urethral Sphincter

Navicular Fossa

External Urethral Opening / (Meatus)

Prostate

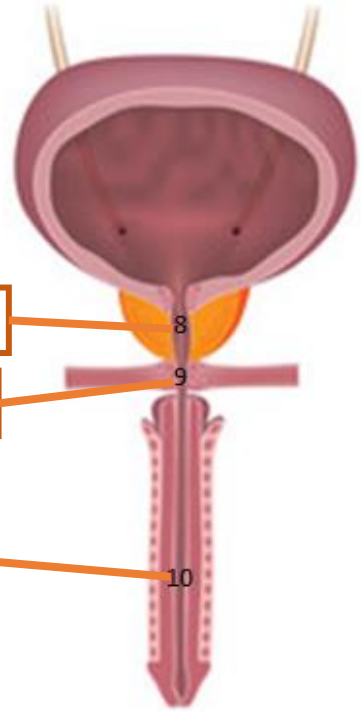


Prostatic Urethra

Membranous Urethra

Penile/Spongy Urethra

Navicular Fossa



Prostatic Urethra

Membranous Urethra

Penile/Spongy Urethra

Superior surface:

- Covered with peritoneum
- coils of ileum & sigmoid colon in males
- In females body of uterus & uterovesical pouch

Inferior surface:

Prostate gland in males

Urogenital diaphragm in females

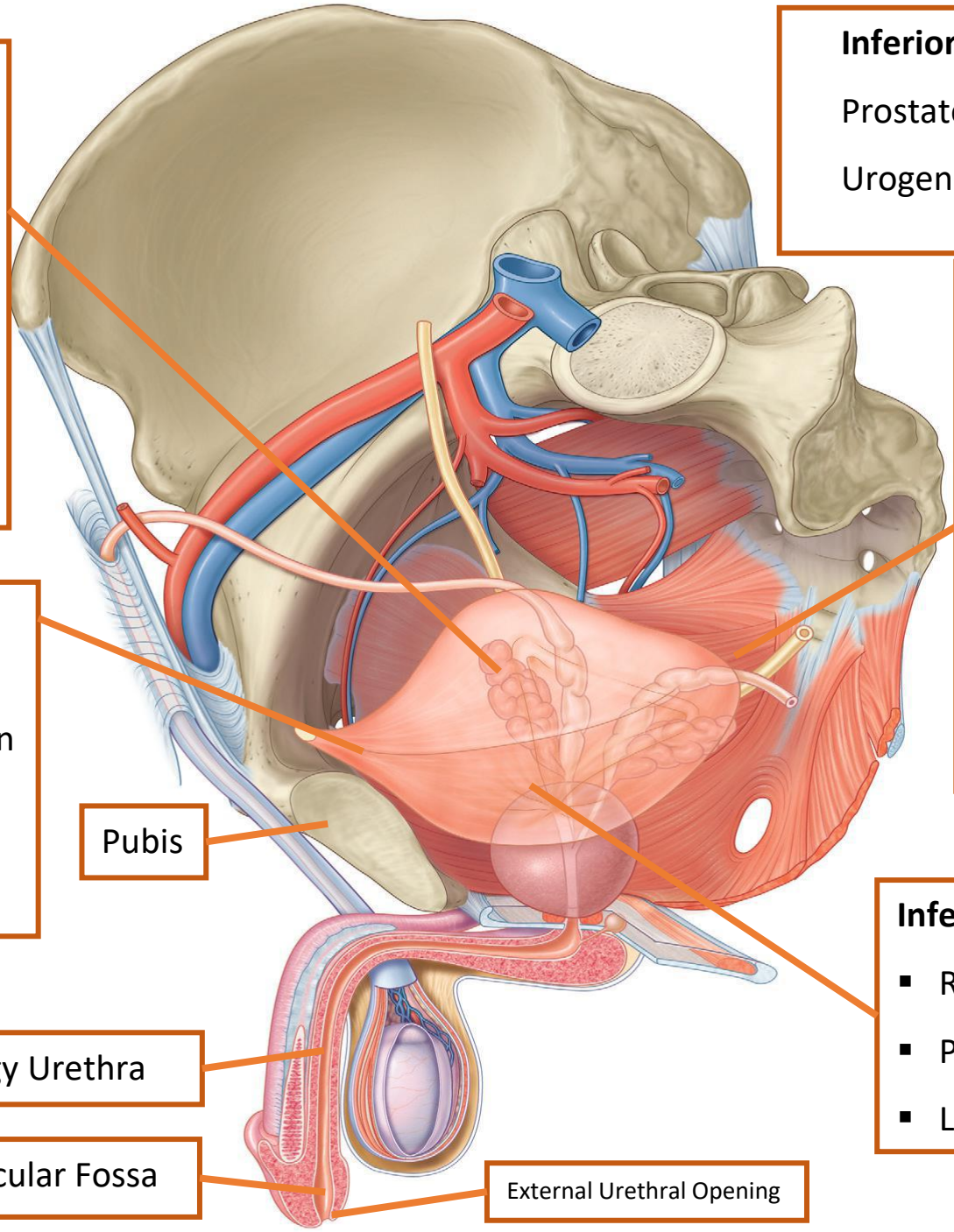
Posterior Surface (Base):

- Males: Rectovesical Pouch, Vas deferens, Seminal Vesicle, Rectum
- **Females:**

  Vagina

Apex of bladder:

- pubic Symphysis
- umbilicus by Median umbilical ligament (Remnant of urachus)



Pubis

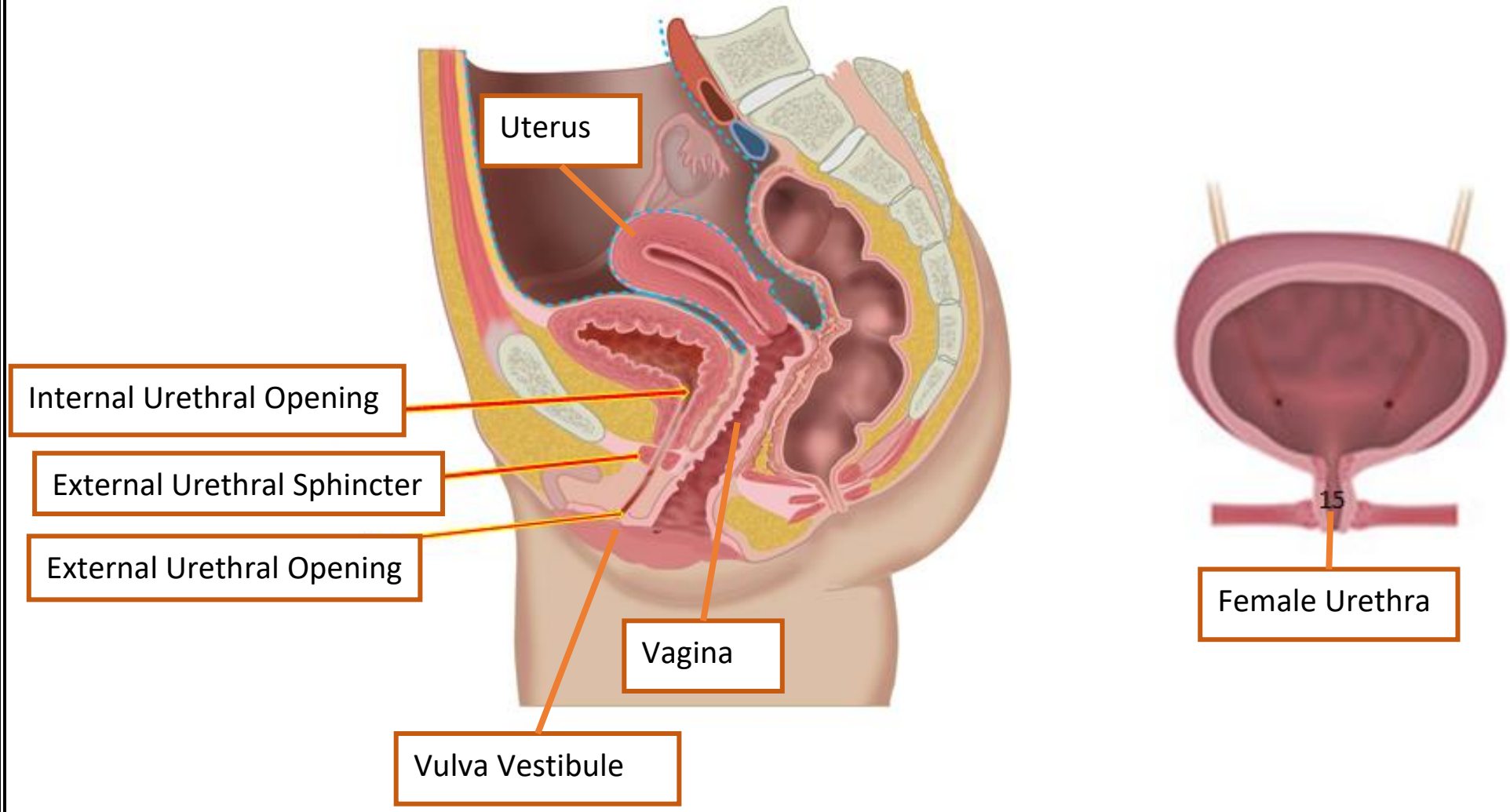
Inferolateral surface:

- Retropubic pad of fat
- Pubic bones
- Levator ani muscle

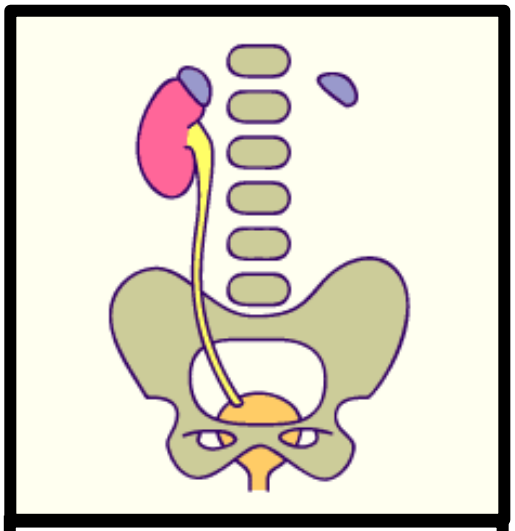
Penile/Spongy Urethra

Navicular Fossa

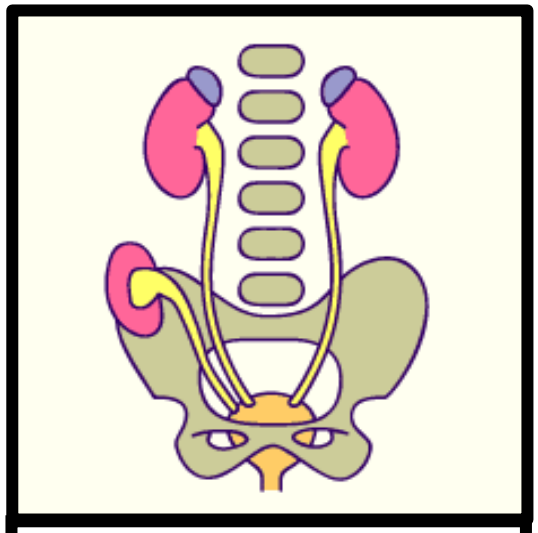
External Urethral Opening


Uterus
Internal Urethral Opening
External Urethral Sphincter
External Urethral Opening
Vagina
Vulva Vestibule
15
Female Urethra

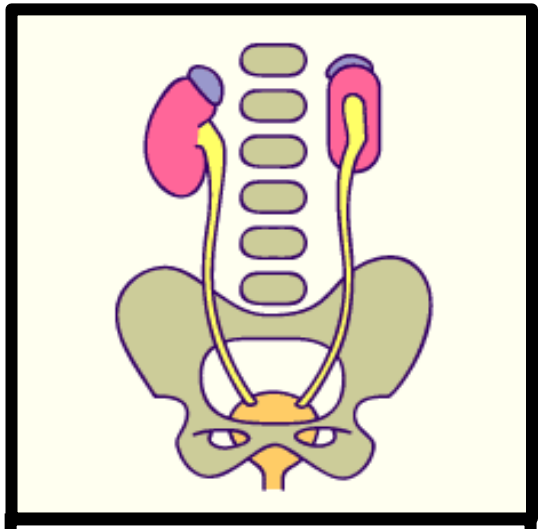
Embryology



Renal agenesis

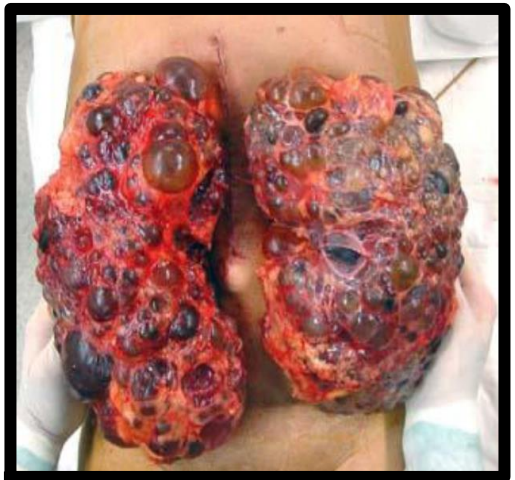


Too many kidneys (doubling)

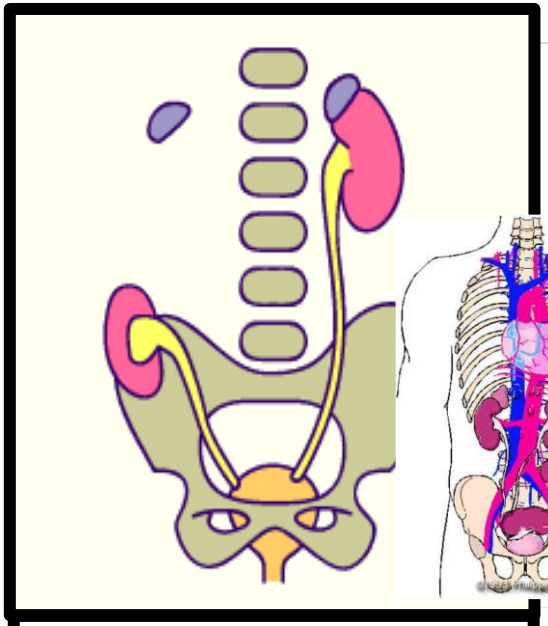


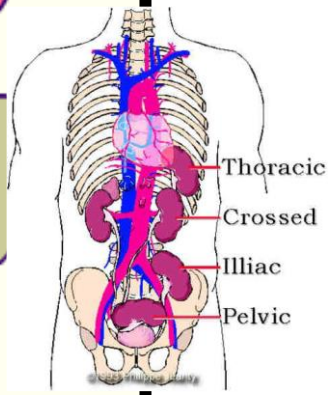
Rotational anomalis:
This anomaly is relatively frequent.

If the pyelo-ureteral connection is oriented:
Ventrally (missing rotation)



Polycystic Kidneys



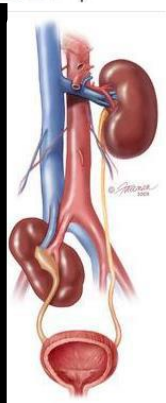


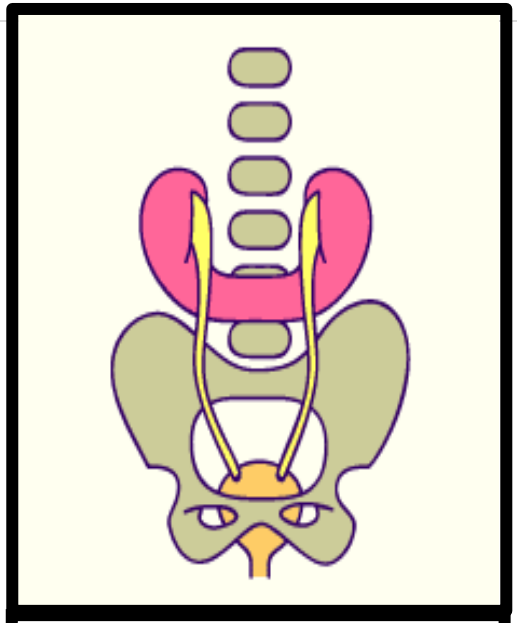
Disorder of the ascent of the kidneys or ectopic kidneys:

•A kidney is ectopic when, **without ptosis**, it **does not lie in the lumbar fossa.**

•The ectopia is the result of an **incomplete** or **missing ascent**.

•It can occur in the upper or lower region (pelvic kidney) or even crossed.

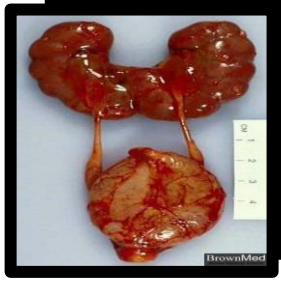


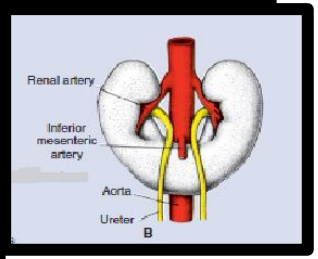


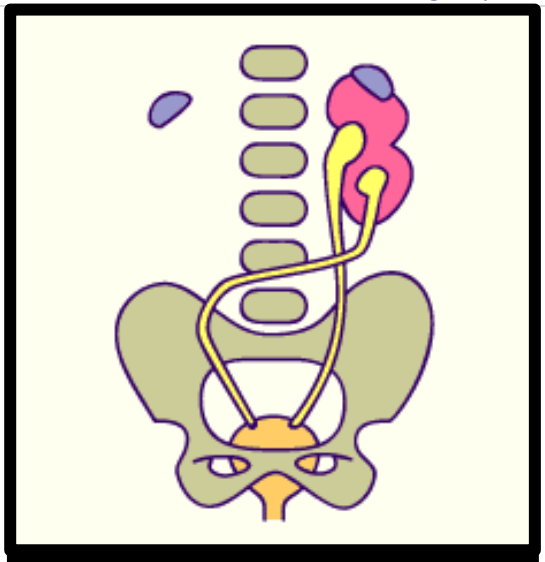
Horseshoe kidney

The two kidneys are most often bound together at the **lower pole**.

It is usually at the lumbar level since its ascent is usually arrested by the **inferior mesenteric artery**





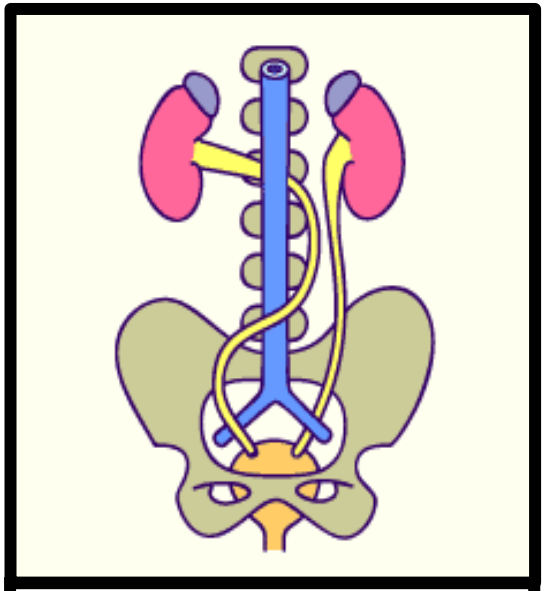


In a **crossed ectopia** a kidney migrates to the other side.

•Its ureter crosses the midline and inserts normally into the bladder.

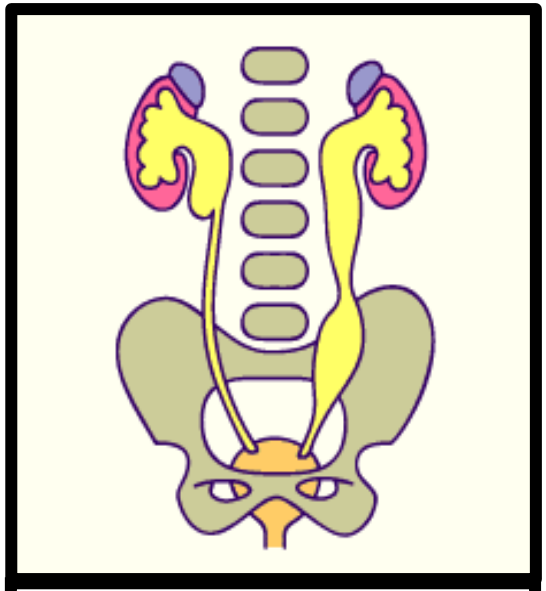
•In the case of a unilateral crossed ectopia a fusion of the two kidneys often occurs**.**

Congenital ureteral abnormalities



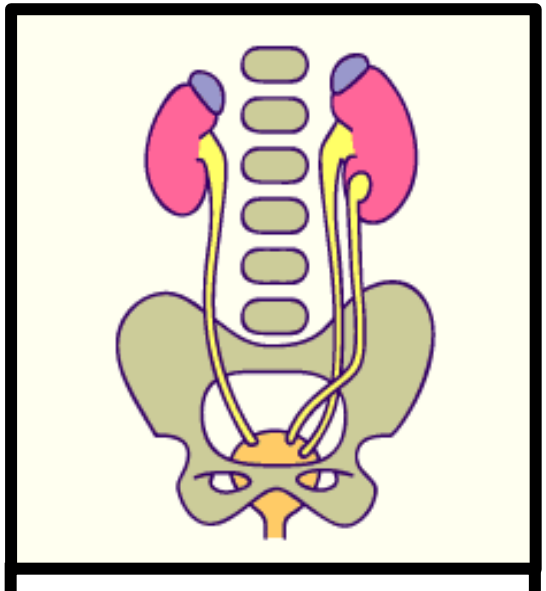
Course anomalies of the ureter Retrocaval ureter:

In this abnormality the right ureter traces out an "S" at the L4 level behind the vena cava (retrocaval ureter).



Anomalies of the ureteral diameter Primary megaloureter

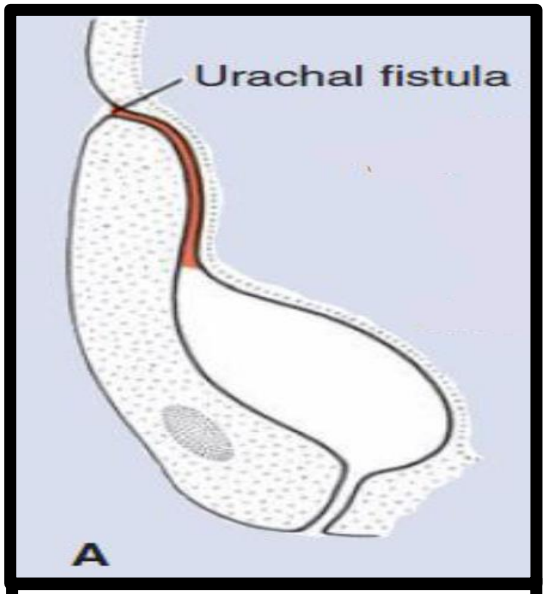
due to an obstruction: The cause of this abnormality is a constriction in the terminal part of the ureter, leading to a dilatation.



Complete doubling of ureter:

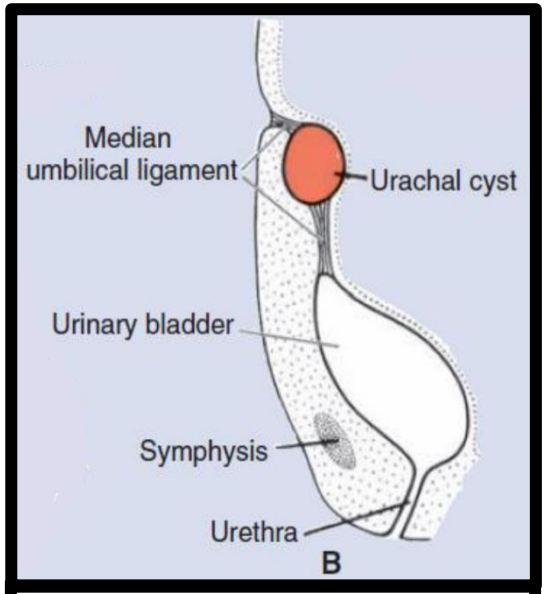
Here a complete doubling of the ureters with a second renal pelvis is involved. The ureters empty into the bladder.

Bladder Defects



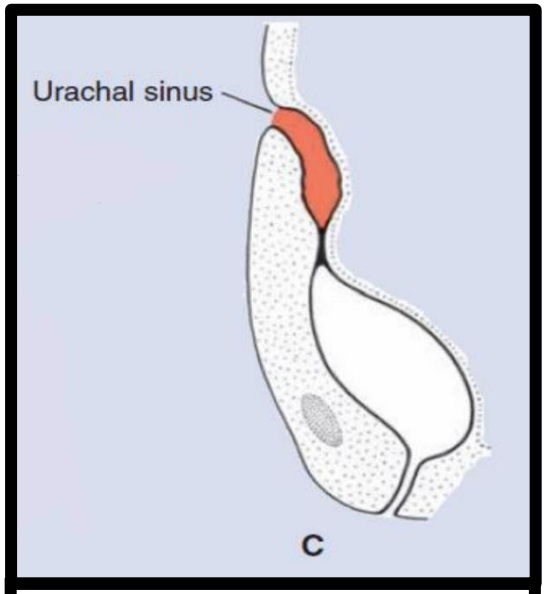
Urachal fistula=

Persistance of intraembryonic portion of the allantois (urine drains through umblicus).



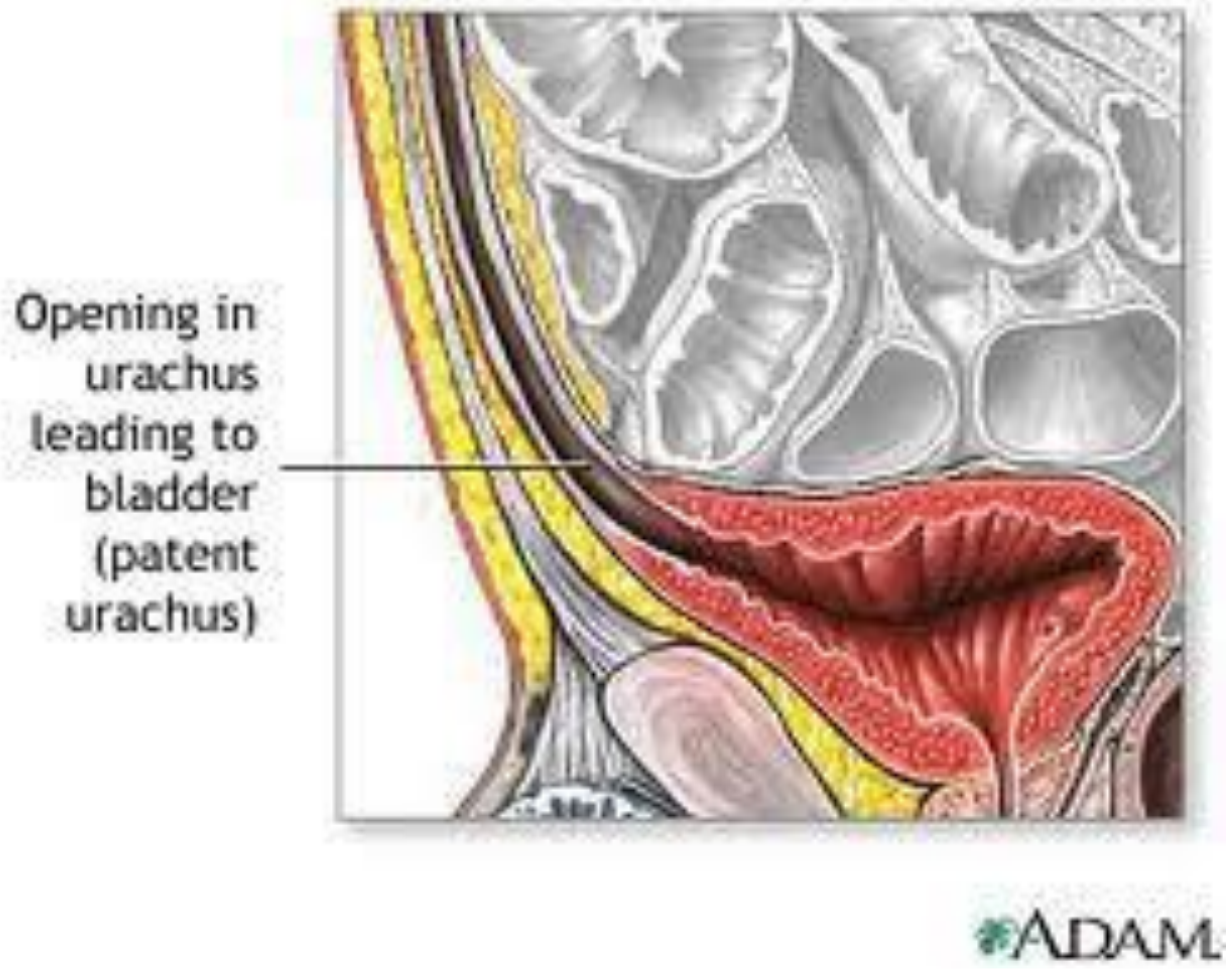
Urachal cyst=

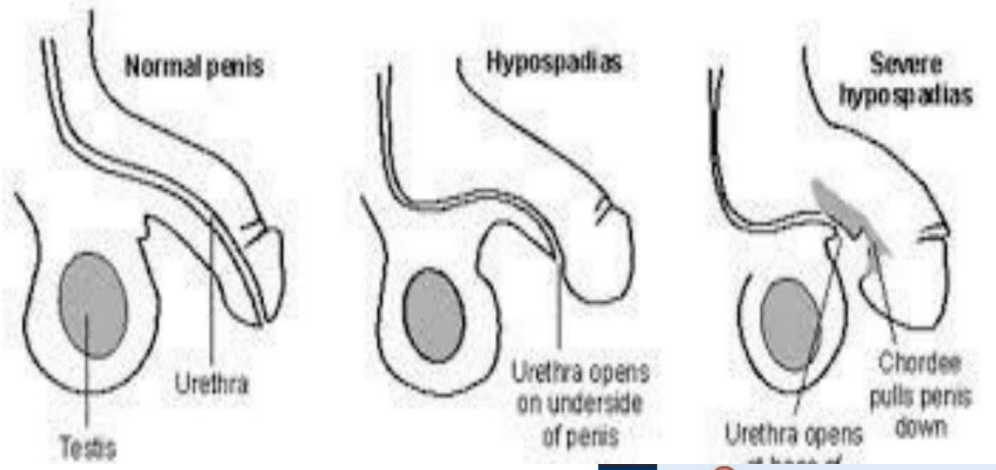
Persistance of local area of allantois

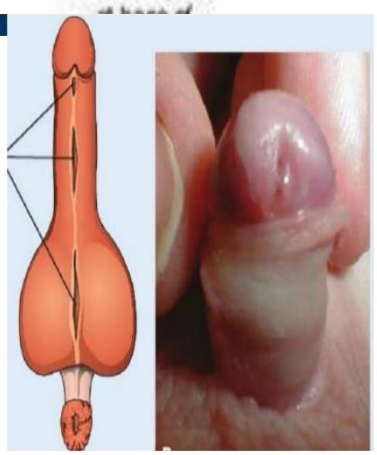


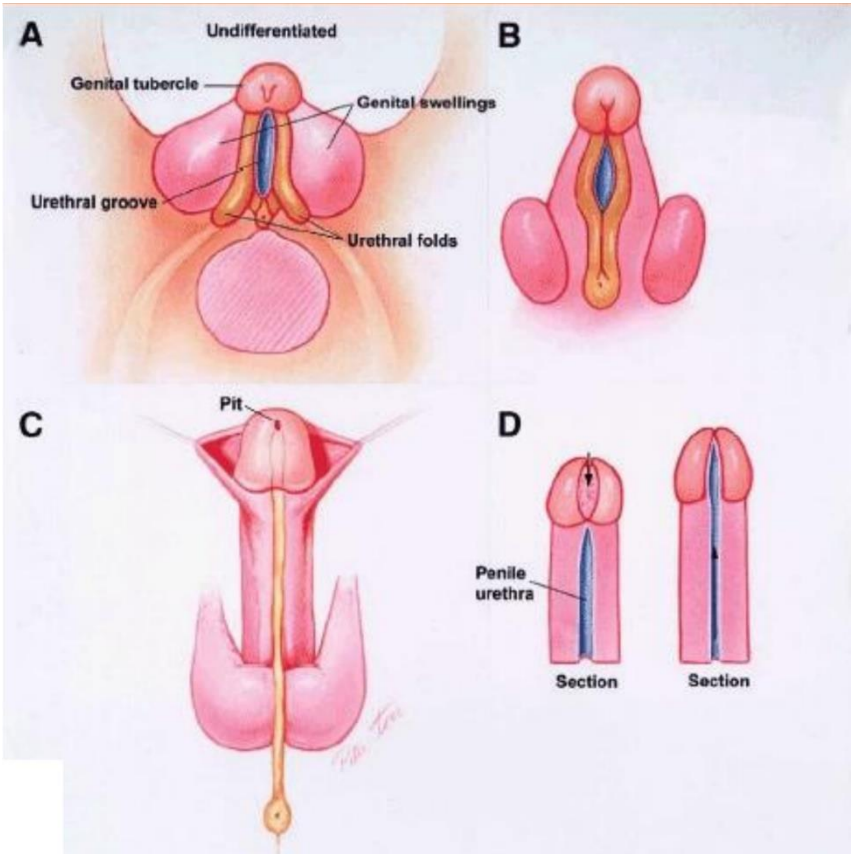
Urachal sinus=

Persistance of the upper part of allantois

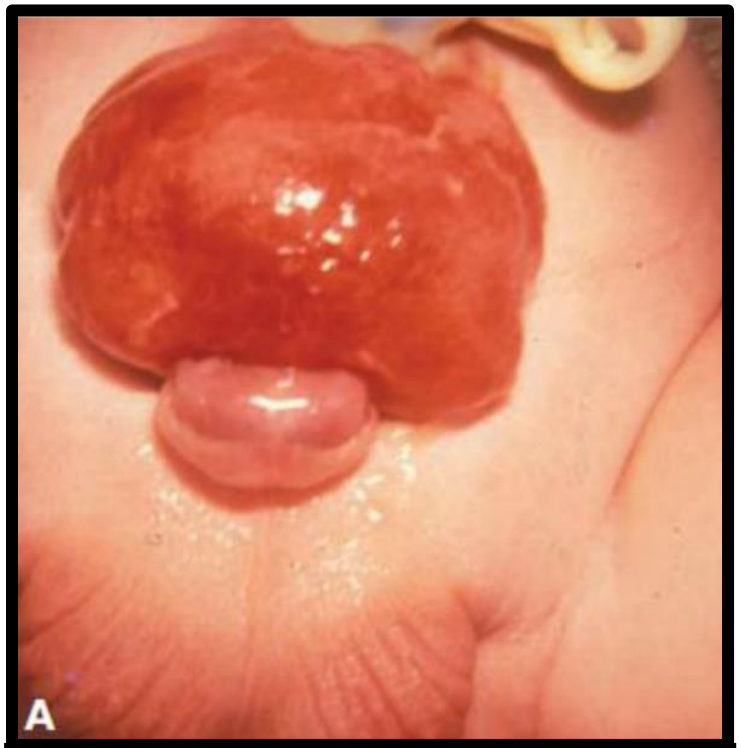

Opening in urachus leading to bladder (patent urachus)
A.D.A.M.







Hypospadias

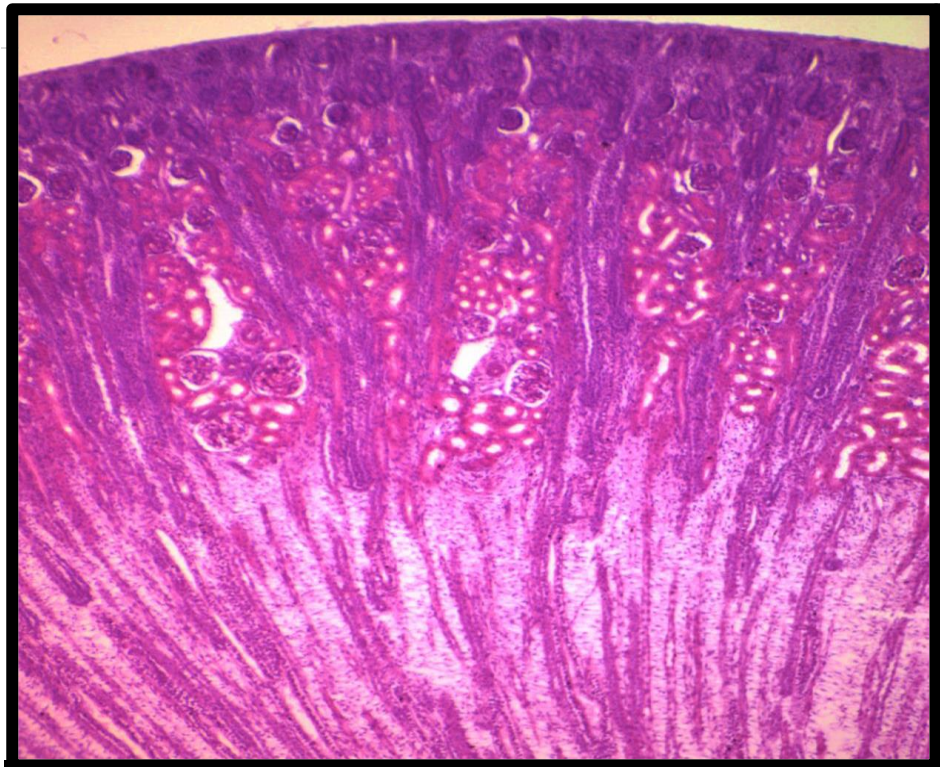


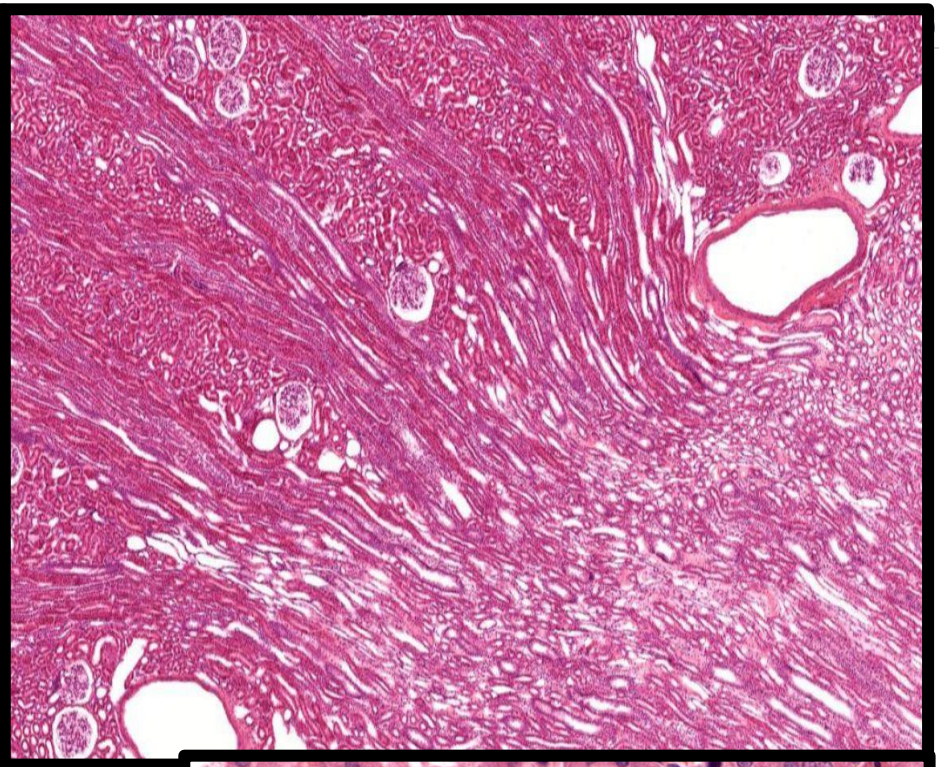
Exstrophy of the bladder:
is a ventral body wall defect

Exstrophy of the cloaca:
is a severe ventral body wall defect

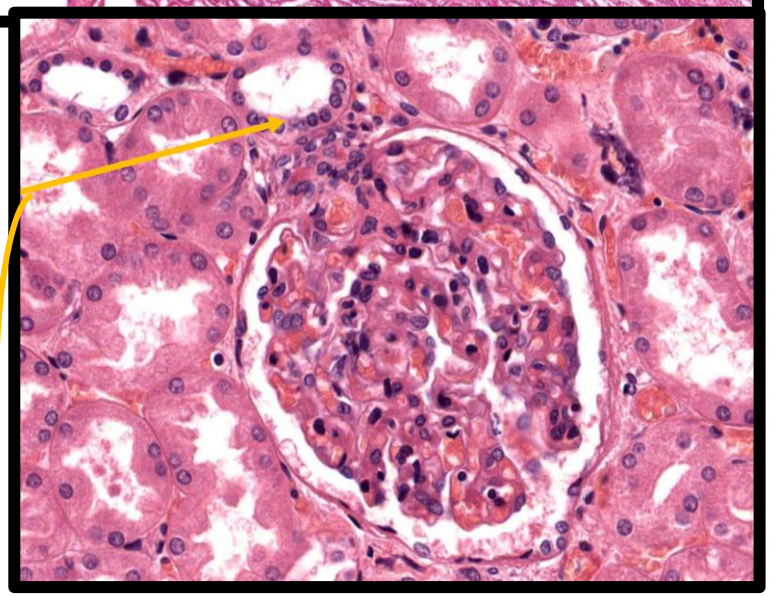
The defect includes exstrophy of the bladder, spinal defects ,imperforate anus, and usually omphalocele.

Histology

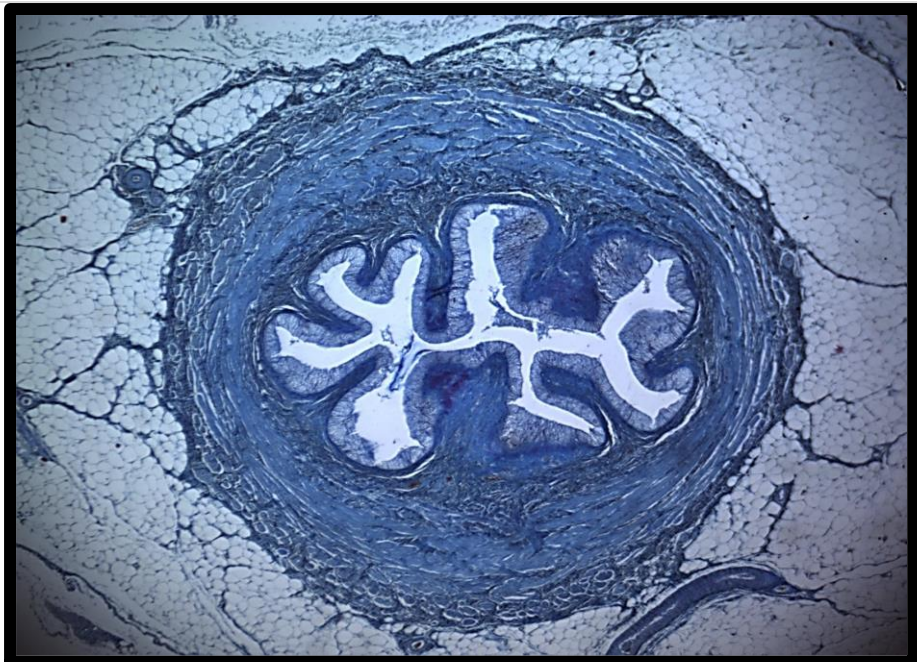


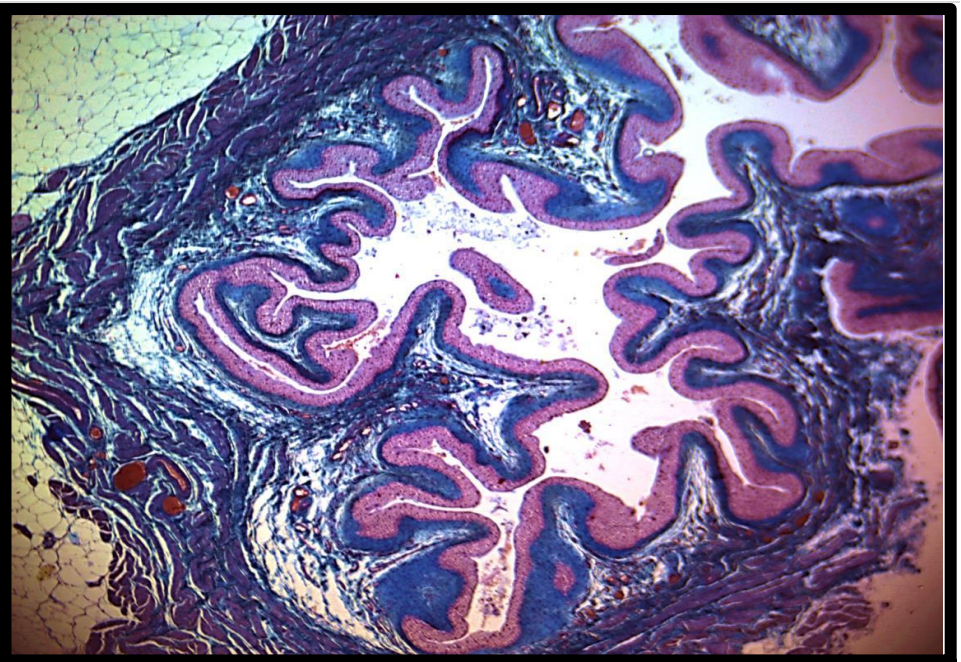


Kidney	
#	**Identification Points**
1	Cortex & Medulla
2	Renal corpuscles
3	Tubules (Proximal , Henle & Distal)
4	Collecting ducts.

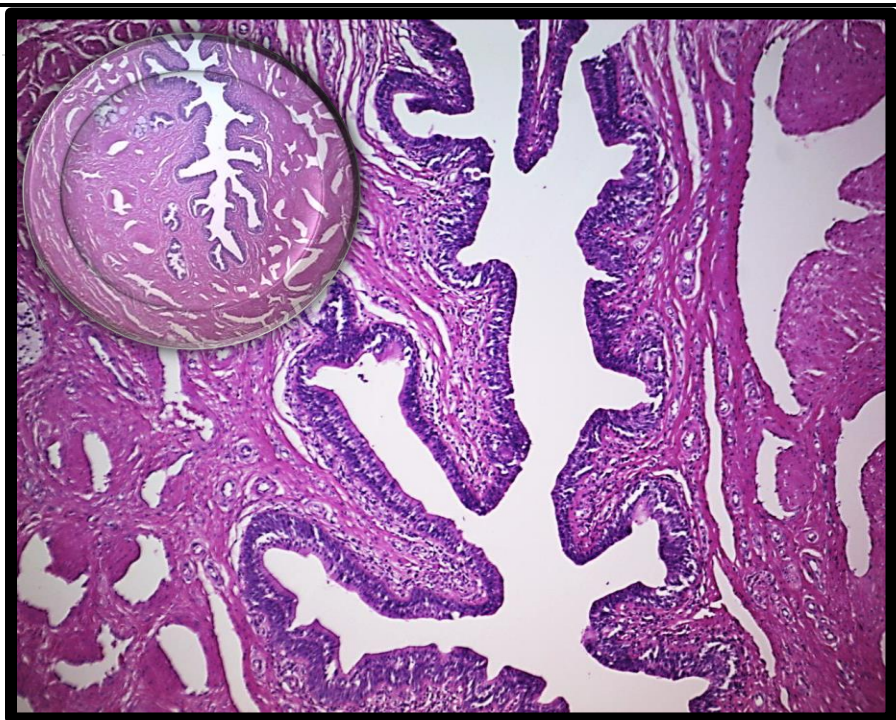


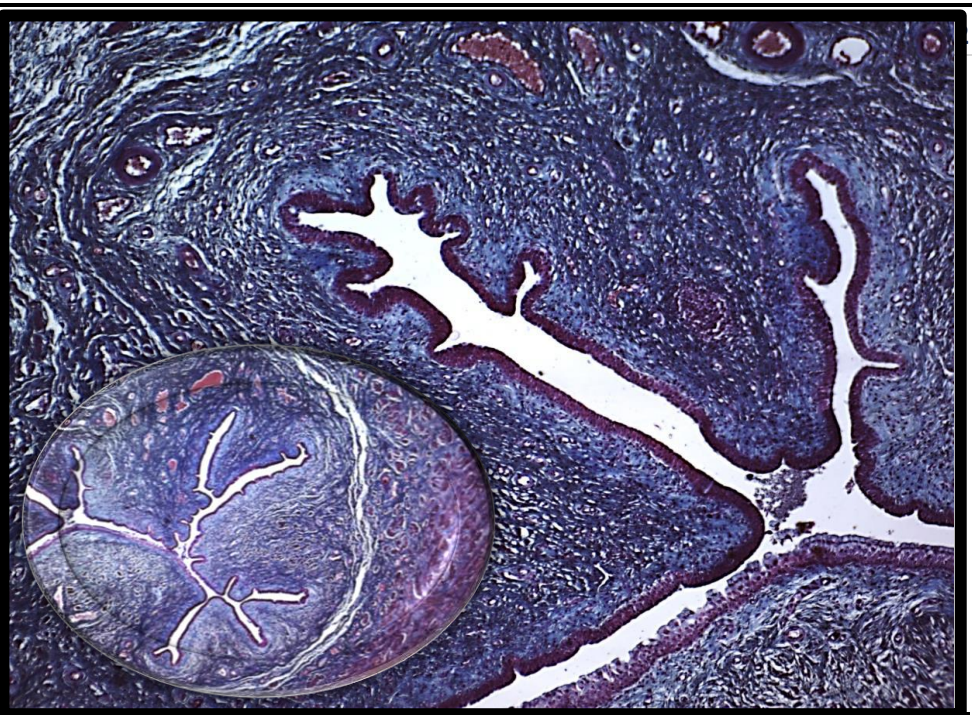
Macula Densa





Ureter		Urinary Bladder	
#	Identification Points	#	Identification Points
1	Stellate Lumen	1	//
2	Transitional epithelium & Submucosa	2	Transitional epithelium
3	**Muscle layers:** (**inner longitudinal**, **middle circular**, **Outer longitudinal**)	3	**Muscle layers:** (**inner longitudinal**, **middle circular**, **Outer longitudinal**)
4	Adventitia	4	Adventitia





Penile Urethra		Female Urethra	
#	**Identification Points**	**#**	**Identification Points**
1	Pseudostratified columnar epithelium & stratified columnar	**1**	Transitional epithelium
2	Corpus spongiosum	**2**	Adventitia
3	Urethral Glands of Littre (Mucus glands)	**3**	**Muscle layers:** (**inner longitudinal**, **middle circular**, **Outer longitudinal**)

Pathology

Case-1

A 5-year-old boy is noted to have generalized edema.

Urine analysis reveals, pH 6.5, no glucose, 4+ protein, no blood, no ketones.

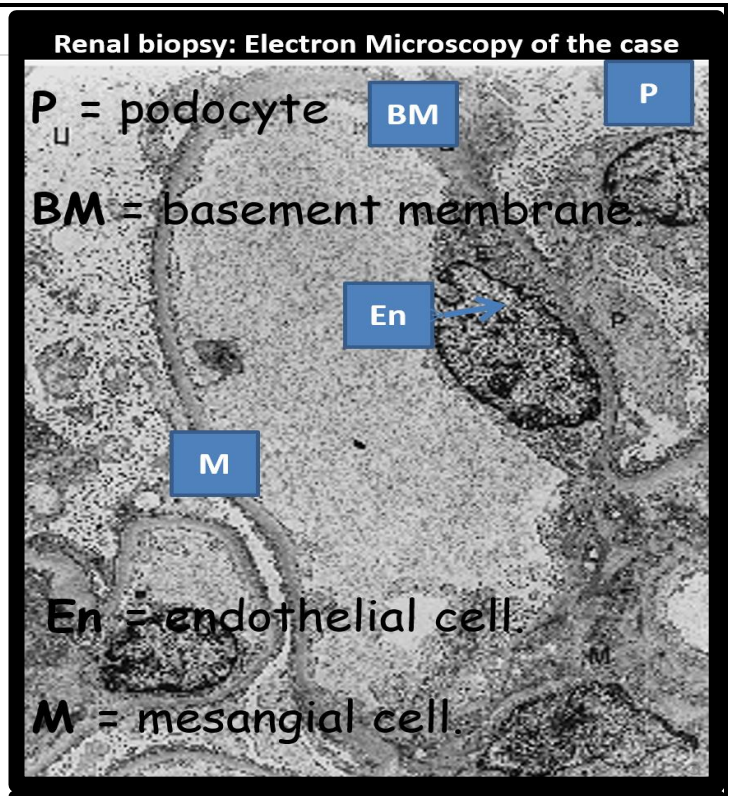
A renal biopsy was taken and the child improved following a course of corticosteroid therapy.

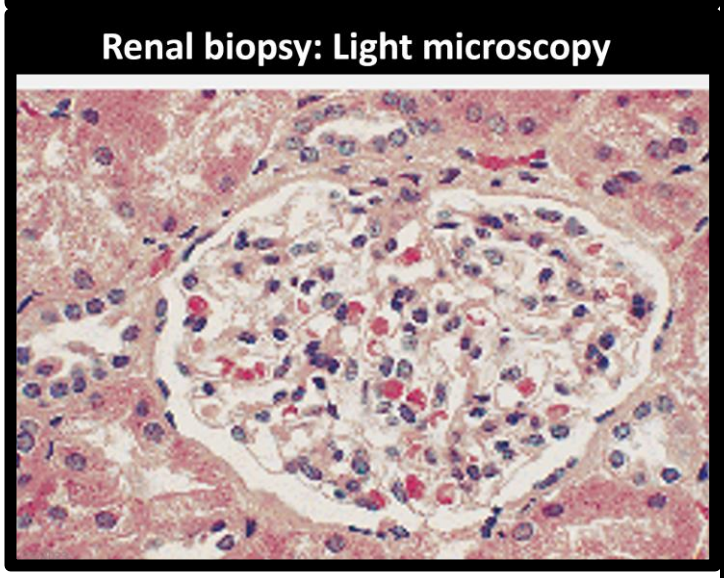
What is the most probable diagnosis of the case?

Minimal change glomerular disease.

What is the most common cause of the same syndrome in adults?

Membraneous glomerulonephritis.





Case-2

An 8-year-old boy presents with headaches and malaise. He was seen for a severe sore throat 2 weeks ago .

Physical examination reveals periorbital edema. The blood pressure is 180/110 mm Hg.

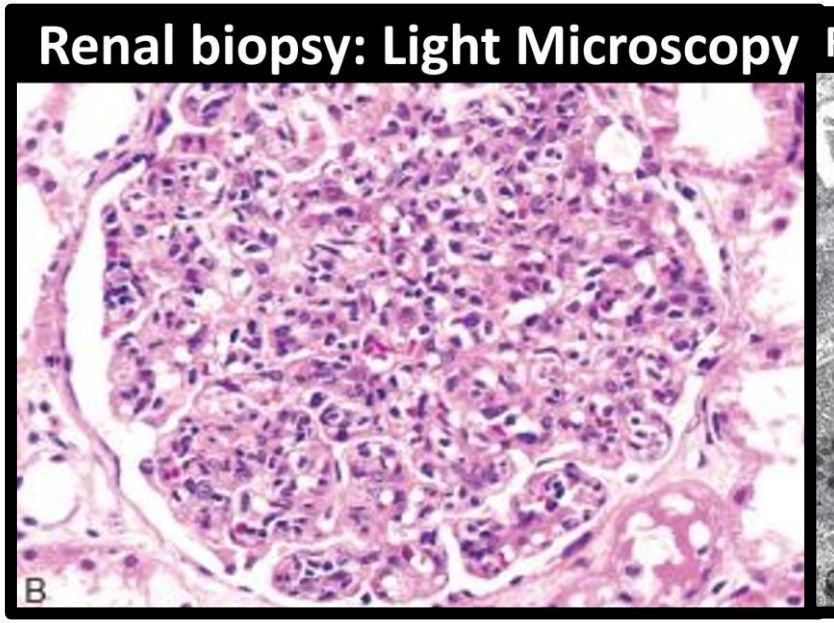
A 24-hour urine collection demonstrates oliguria, and urinalysis shows hematuria. A renal biopsy was taken.

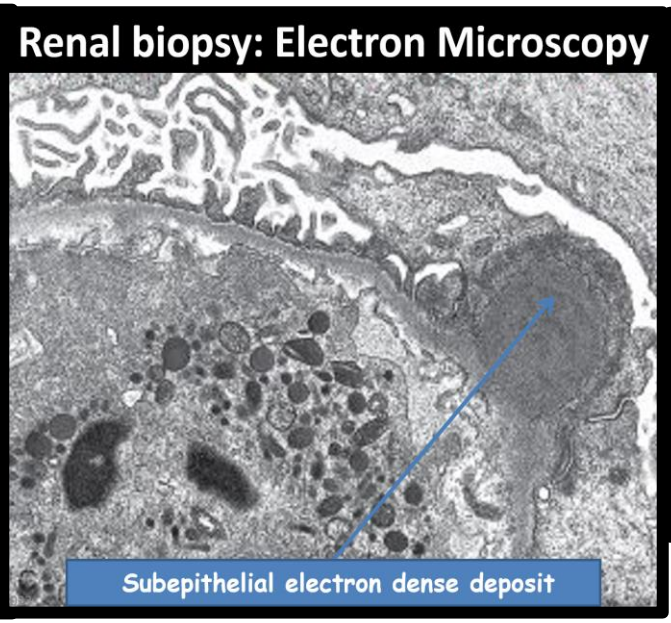
What is the diagnosis of the case?

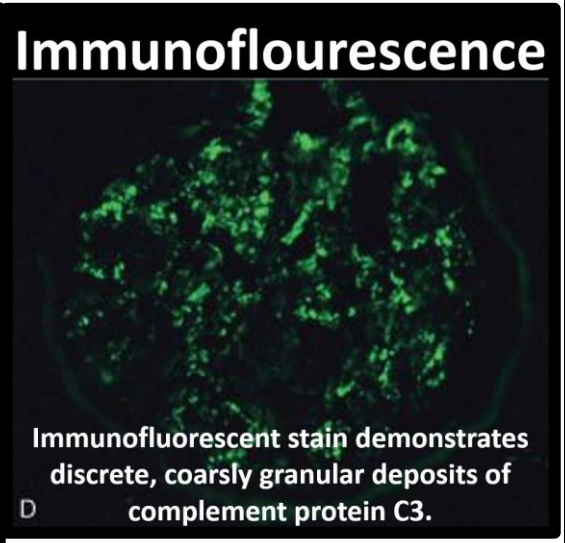
Post streptococcal glomerulonephritis .

What is the expected outcome ?

Good prognosis.







Case-3

A 70-year-old obese woman presents with a 3-month history of progressive renal insufficiency. She has a longstanding history of hypertension. Ultrasonography shows that both kidneys are small. The patient subsequently suffers a massive stroke and died.

Examination of the kidneys at autopsy reveals symmetrically shrunken small kidneys, with coarsely granular surface. The pelvicalyceal system was distorted and covered by yellowish exudate.

What is your diagnosis of the case?.

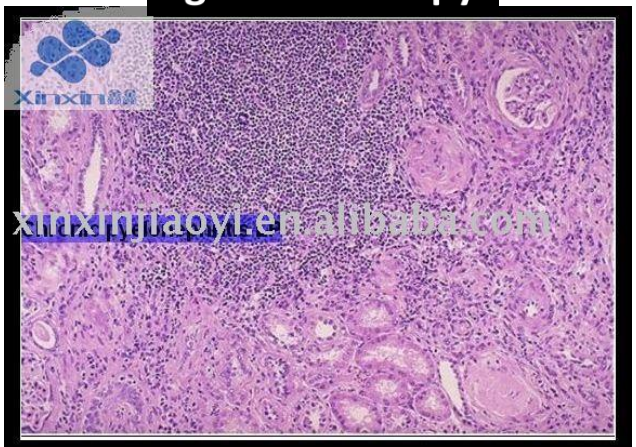
Chronic pyelonephritis.

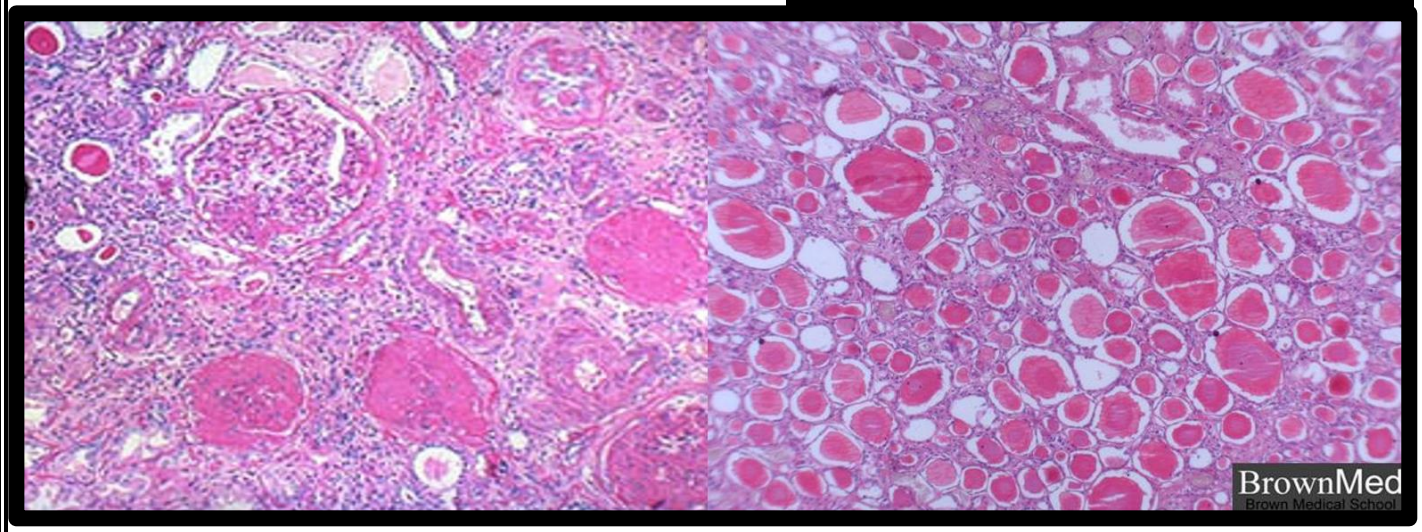
Mention two possible complications.

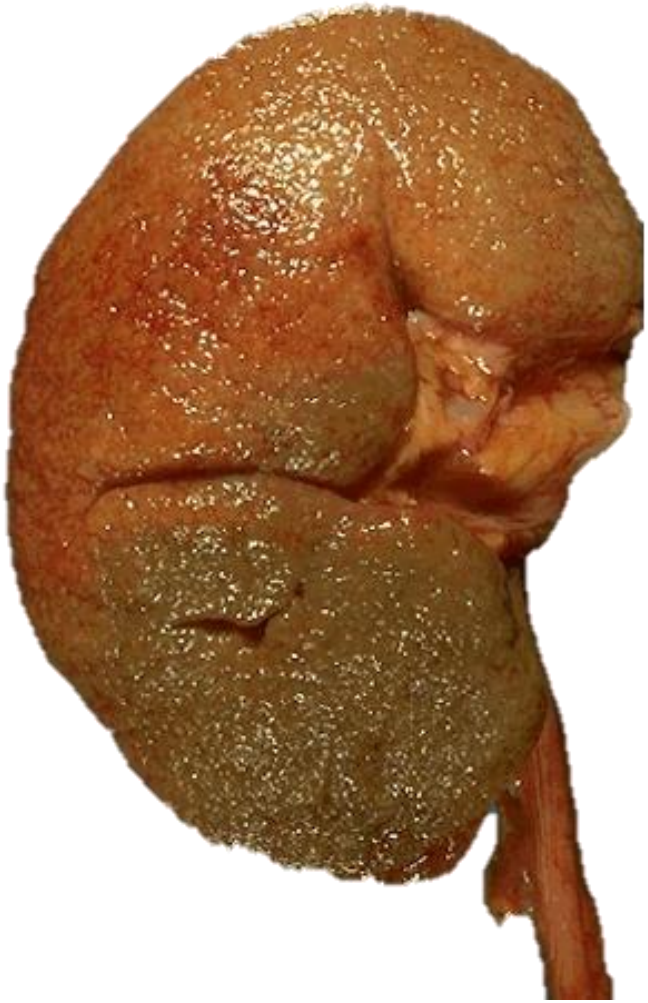
Bilateral/ chronic renal failure.

Hypertension.

Light Microscopy:





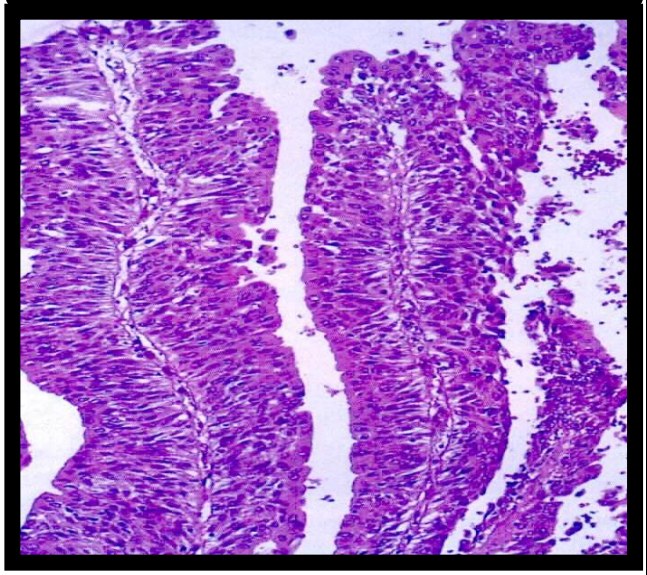


Case-4

A 59-year-old man notes blood in his urine for the past week. Urine analysis confirms presence of blood, but no proteinuria or glucosuria.

A urine culture is negative. A cystoscopy is performed, and a 9 cm exophytic mass is seen in the dome of the bladder. A biopsy of this mass is performed and microscopic examination reveals fibrovascular cores covered by a thick layer of transitional cells.

The musculosa propria is free.



What is your diagnosis of the case?

Papillary transitional cell carcinoma.

What are the risk factors that most likely lead to development of this lesion?

Cigarette smoking, **Bladder stones**, **Schistosoma Haematobium**

exposure/Usage of Naphthylamine, Analgesics, Cyclophosphamide, Radiation to bladder

What is the stage of this lesion?

pT 1

Case-5

A 60-year-old woman died of a renal tumor. At autopsy, the kidney was enlarged and shows a well circumscribed golden yellow mass measures about 9 X7 cms. Infiltrated kidney capsule and renal vein. – Microscopic examination of the lesions revealed nests of epithelial cells with clear cytoplasm surrounded by vascular stroma.

What is your Diagnosis?

Clear cell renal cell carcinoma.

What are the risk factors that most likely lead to development of this lesion?

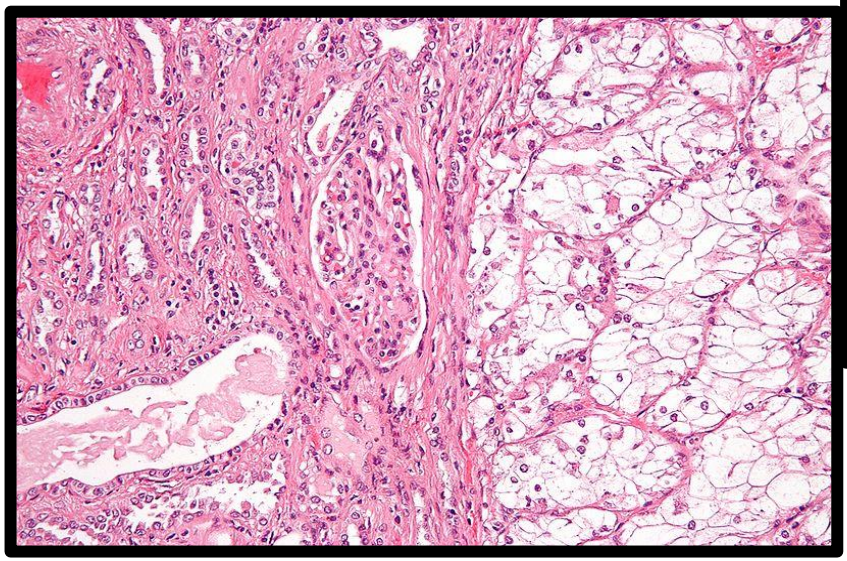
Cigarette smoking, **Obesity**, **Hypertension**

Unopposed estrogen therapy, Exposure to asbestos, petroleum products, & heavy metals.

Acquired polycystic kidney disease secondary to dialysis.

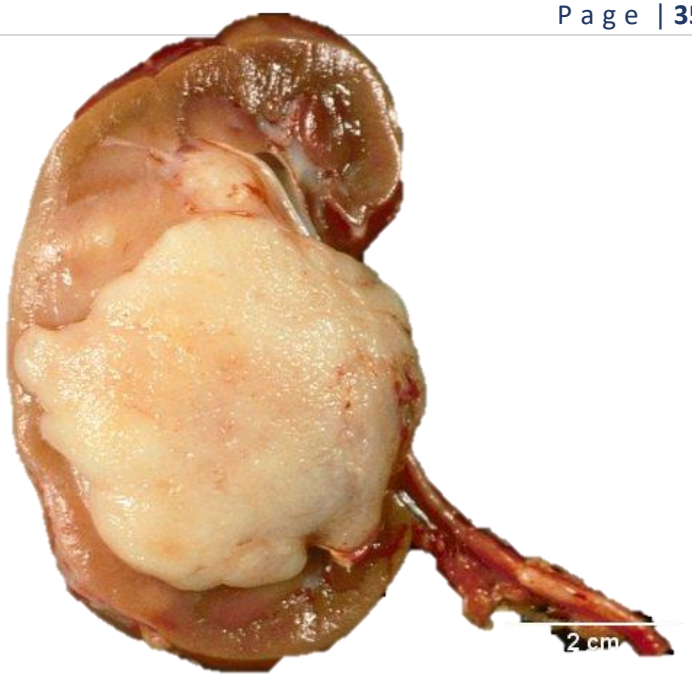
Mention the stage of this tumor.

3rd Stage



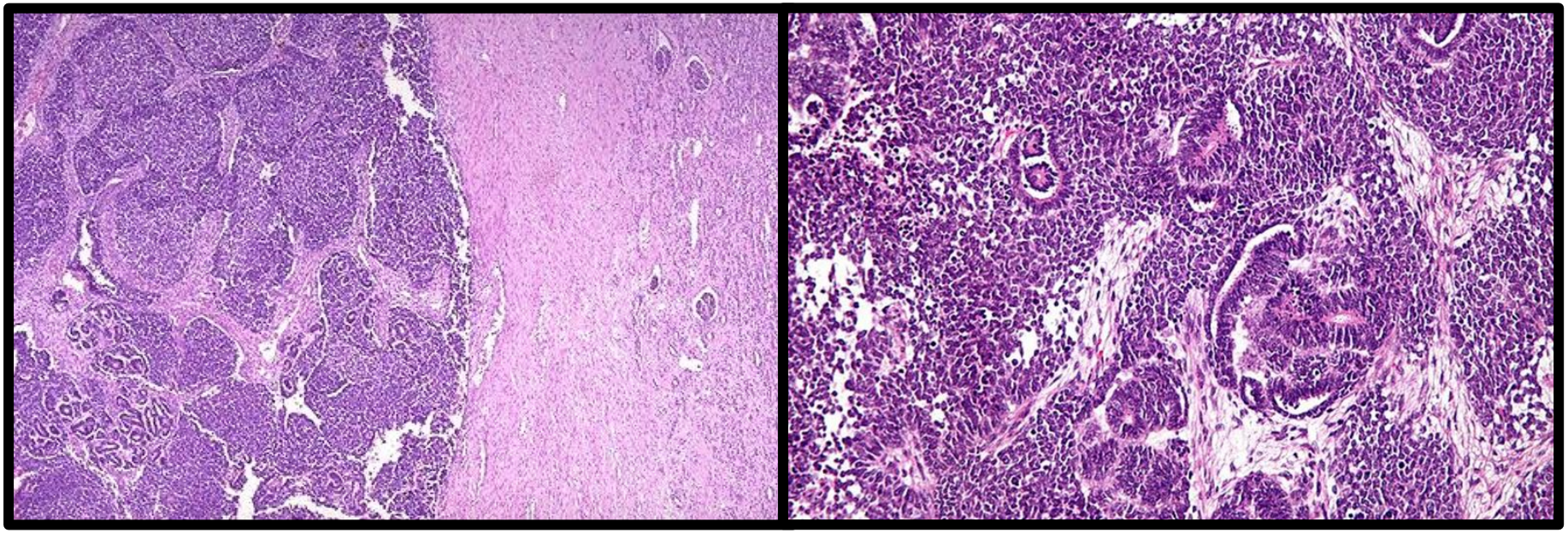
Case-6

A child aged 4 years admitted to the hospital due to a left renal mass. He underwent left nephrectomy and the kidney was examined microscopically.



- What is your diagnosis?

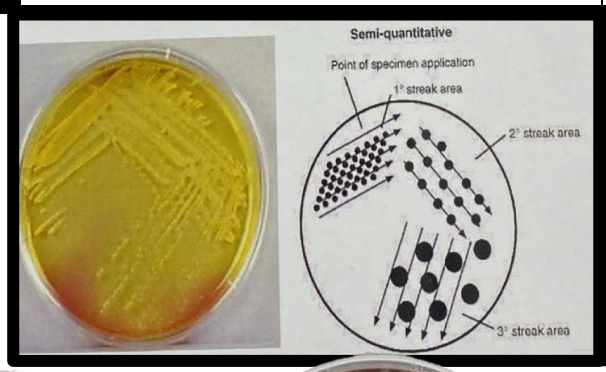
Wilms tumor nephroblastoma.

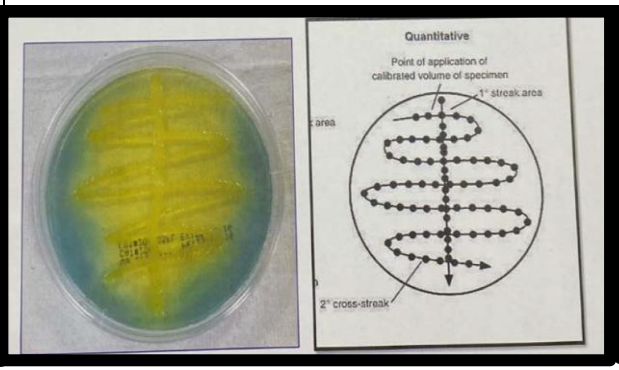


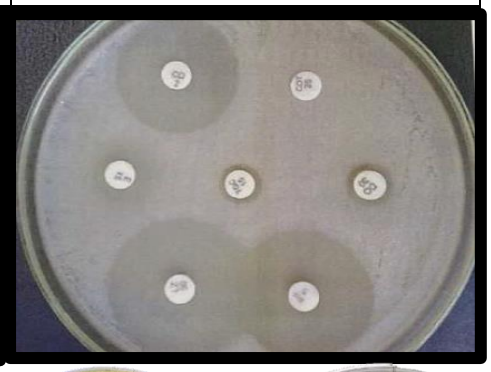
Microbiology

1,2- fMethods of urine cultivation & 3- determination of antibiotic sensitivity

	1- Four Quadrant streaking method	2- Network streaking method	3- Antibiotic Sensitivity Test
Method Name	Four quadrant streaking	Network streaking	Plate spreading method
C.L. Significance / Principle of test	**Isolation of different bacterial species in case of urinary tract Co-infection** [**e.g. E.coli & Staphylococcus co-infection**]	— **Calculation of CFU/ml in urine or** — **Detection of significant bacterinuria** [**e.g.: for midstream catch urine X ≥ 10^5 CFU/ml**]	Disc-diffusion; (Antibiotic diffusion in agar)

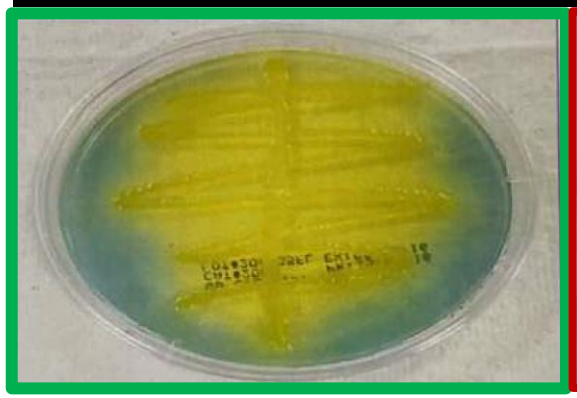






Isolation of Lactose Fermenter Bacilli

Isolation of Lactose Fermenter Bacilli	
Species	**Gram's negative bacilli**
Sample	On **CLED agar**: (Urine Sample) & **MacConkey's Agar**
Suspected Microbe	E.coli | Klebsiella | Others
Tests required for further identification	**1-** IMVC Test **2-** API-20-E Test



CLED agar

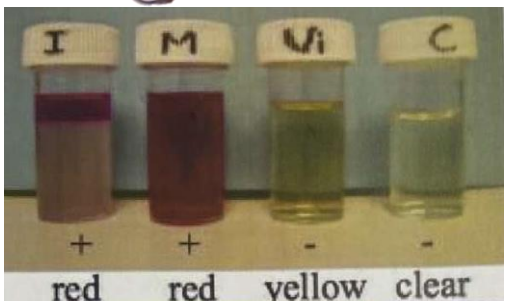
MacConkey's Agar

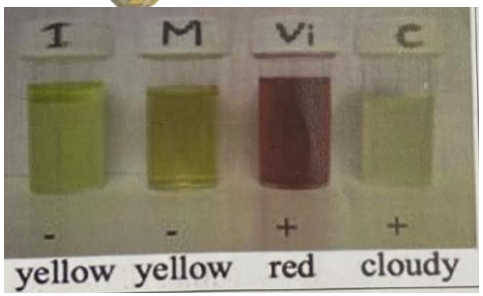
E.coli

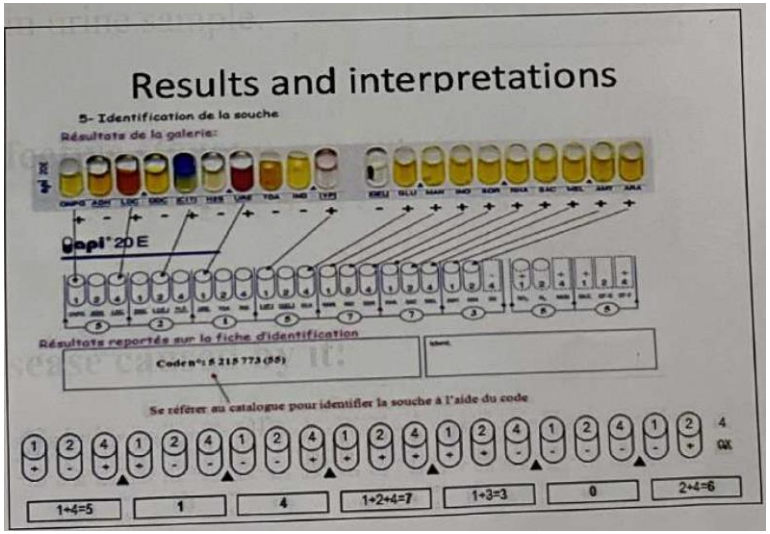
Klebsiella

Tests required for further identification of Lactose fermenter bacilli

Test name	1- IMVC Test					2- API-20-E Test
	IMVC Test [For lactose fermenter Gram's negative bacilli]					API-20 E System [Biochemical identification of Gram's negative bacilli isolated from urine]
Base I.D		Indole	Methyl-red	Vogus-Prosk	Citrate	Define the microbe number after substrate color changes induced by microbial enzymes
	Suspected E.coli	+	+	-	-	
	Suspected Klebsiella	-	-	+	+	





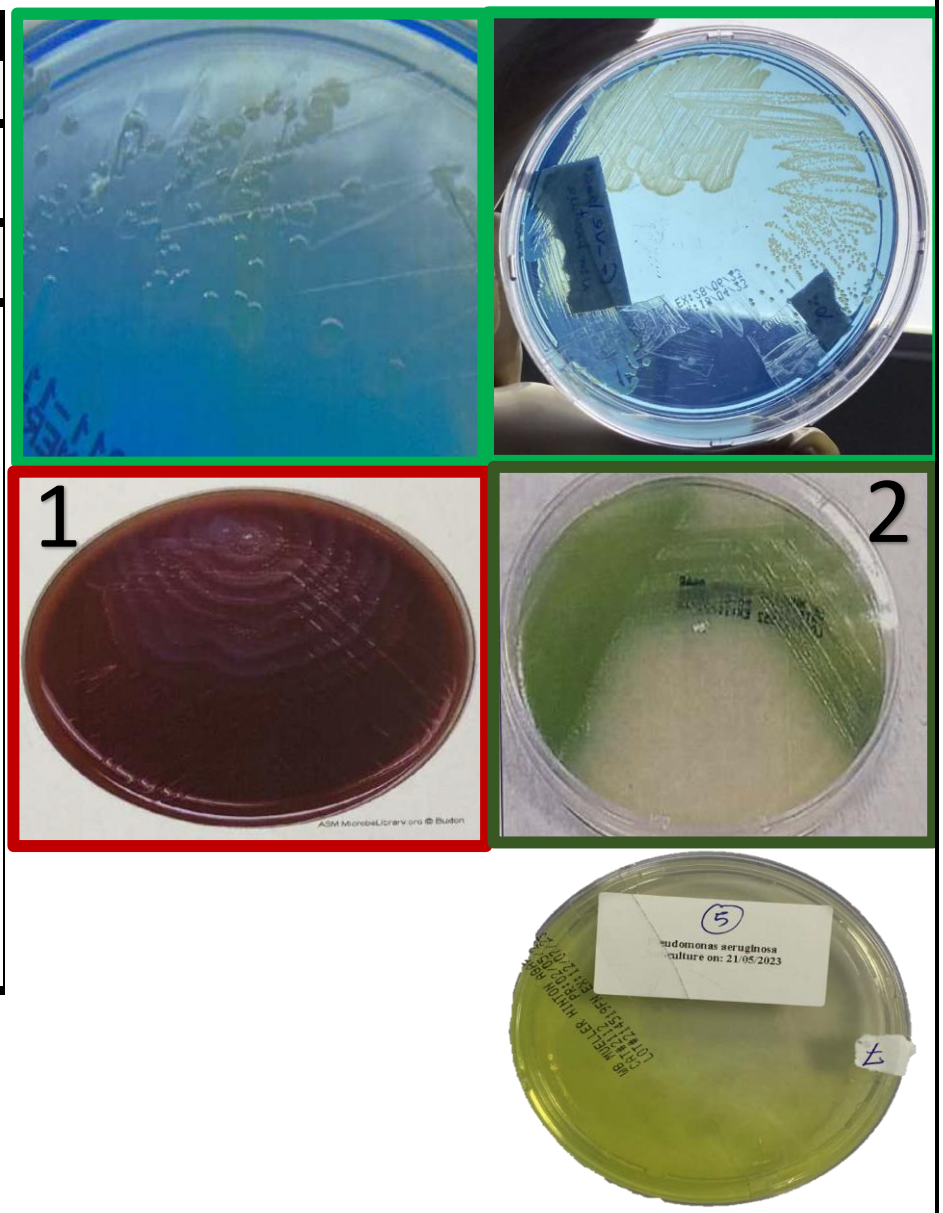


E.coli

Klebsiella

Isolation of Non-lactose fermenter bacilli

Isolation of Non-lactose Fermenter Bacilli	
Species	**Gram's negative bacilli**
Sample	On **CLED** agar: (Urine Sample)
Suspected Microbe	Proteus | Pseudomonas Aeruginosa
Tests required for further identification	**1- Swarming growth** on **blood agar** & **I.D:** Proteus **Confirmatory Test: Urease positive** **Caused by: Cystitis | Pyelonephritis | Sepsis** **2- Exopigment production** on **nutrient agar** & **I.D:** Pseudomonas Aeruginosa **Confirmatory Test: oxidase positive** **Caused by: Cystitis | Pyelonephritis | Sepsis**



Gram's Positive Cocci

Isolation of Gram's Positive Cocci from urine sample

Selective media required for I.D:

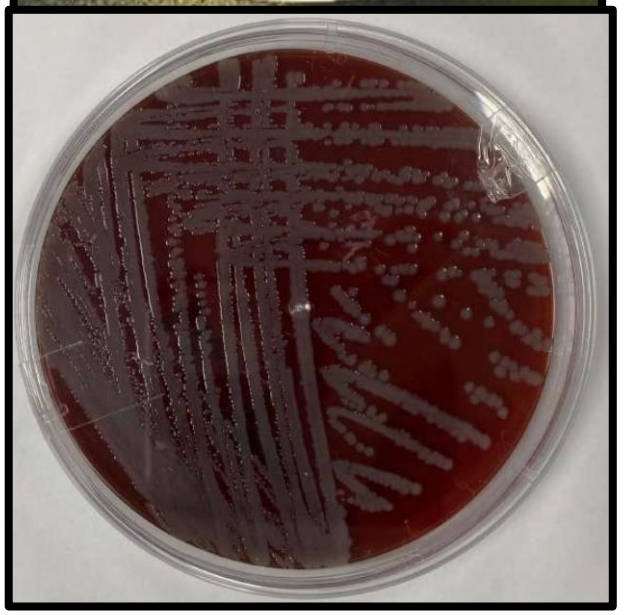
Mannitol Salt Agar:

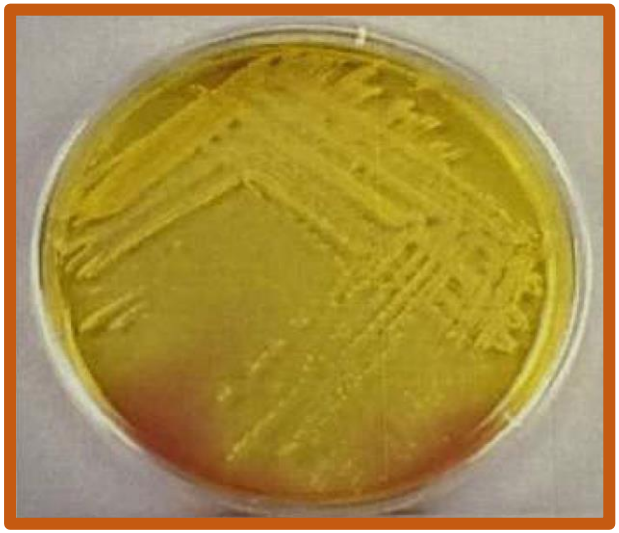
- **Suspecting organisms**: Staph. Aureus | Staph. Saprophyticus

— **Confirmatory Test for Differentiation – Coagulase Test:**

1- **Positive** Coagulase: **Staph. Aureus**

2- **Negative** Coagulase: **Staph. Saprophyticus**





Candida Albicans from Urine Sample on Sabouraud's Dextrose agar:

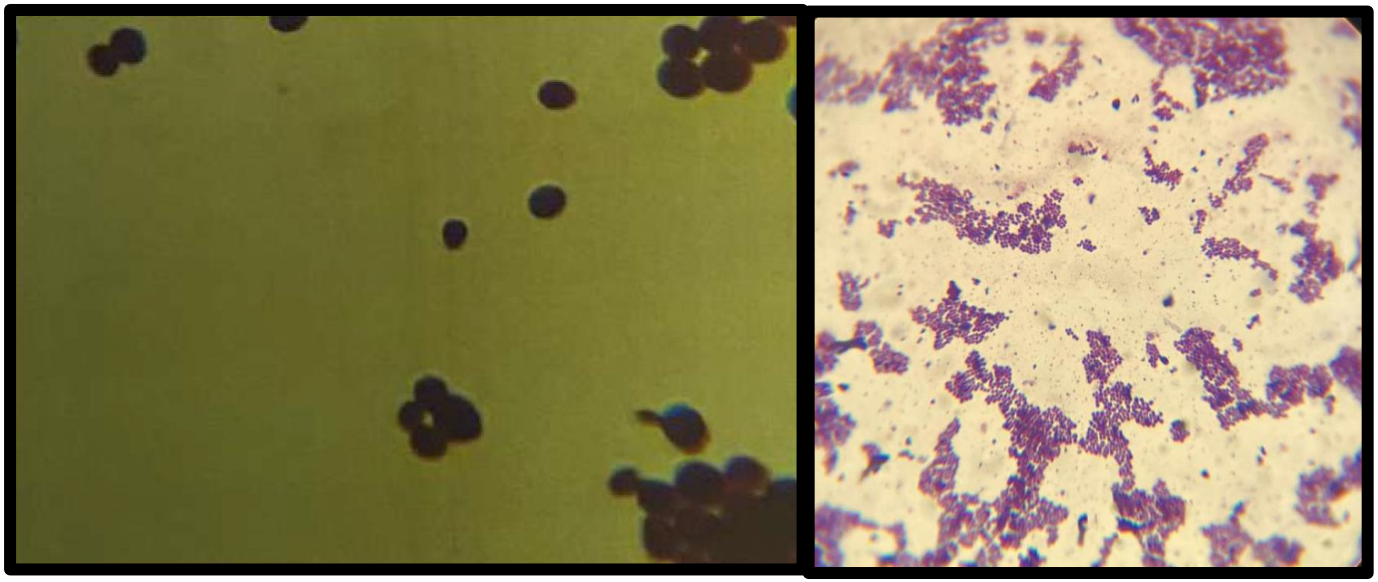
Selective Media: **Sabouraud's Dextrose Agar**

Rapid Confirmation test: **Positive Germ Tube Test**

Infection Cause by: C. Albicans [**Urethritis**, **Cystitis**, and **vaginitis**]

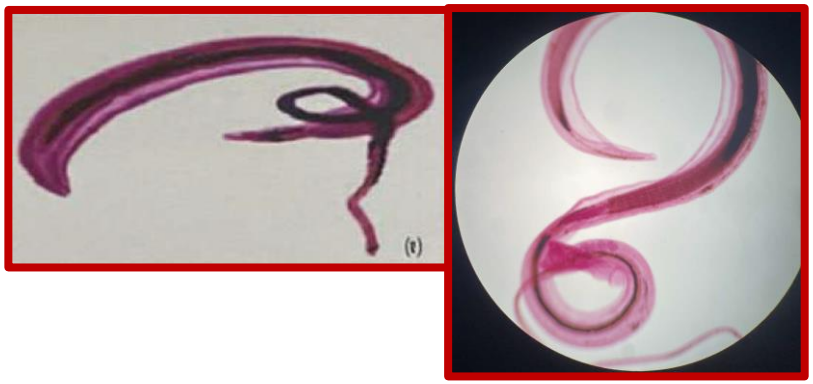
Microscopy of:

Gram's positive budding yeast cells – **Suspected microbe** **Candida Species**



Microscope:

Couples of **Schistosomiasis Hematobium**



Classification: Trematodes

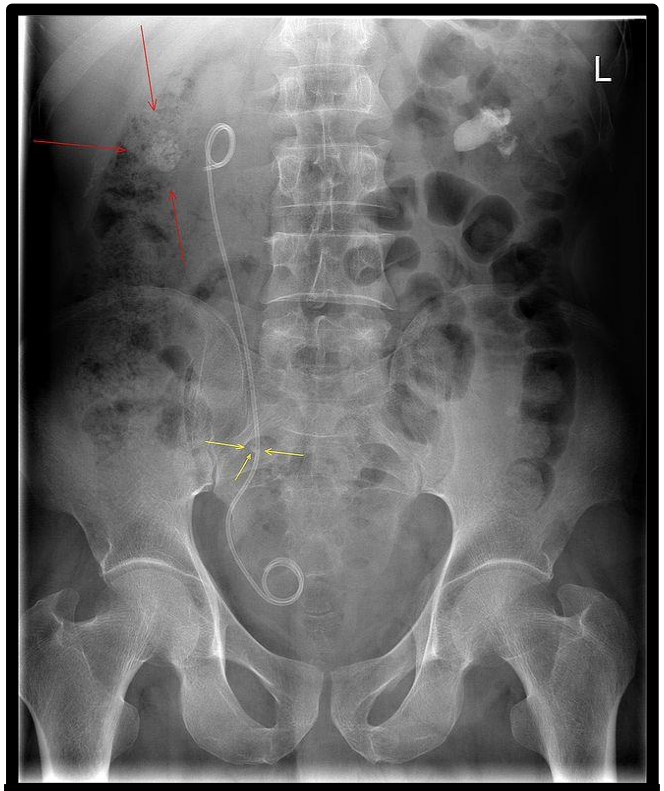
Diagnostic Stage: Ova w/ Terminal Spine

Infective Stage: Cercaria

Disease cause by it:

Parasitic Cystitis or Kidney-liver fibrosis

Radiology

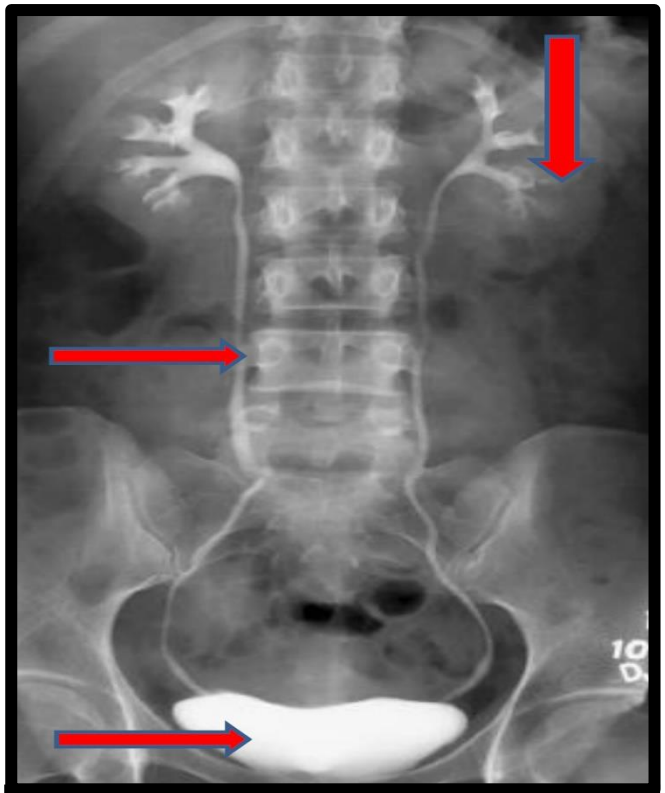


Imaging modality:

Abdominal X-ray

Name of the instrument [Yellow arrows] :

— Double J stent.

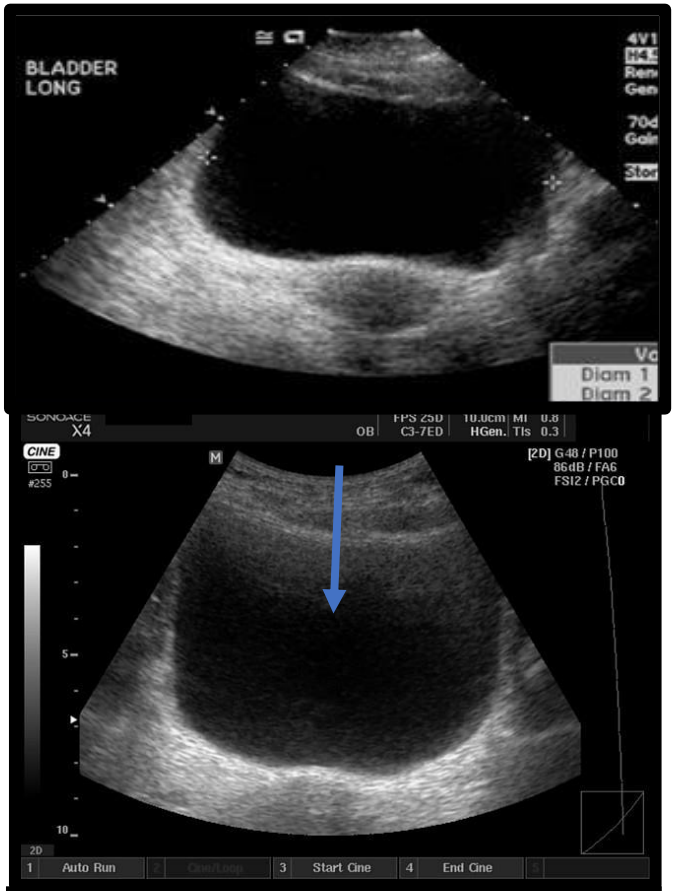


Imaging examination:

X-ray – contrast Intravenous Urography

Anatomy in descending order:

Left Kidney, Right Ureter , Urinary bladder

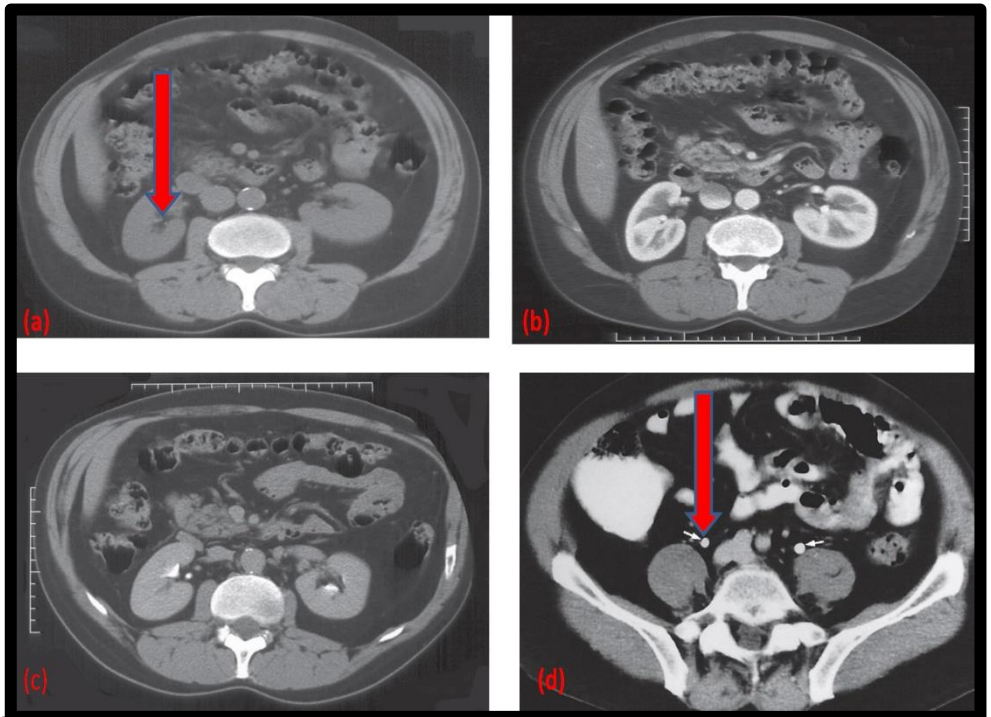


Imaging examination:

Ultrasound of bladder

Anatomy:

Urinary bladder



Normal CT of kidneys

(a) Before the intravenous contrast

(b) CT after intravenous contrast (Early)

(c) CT following the contrast infusion (Late)

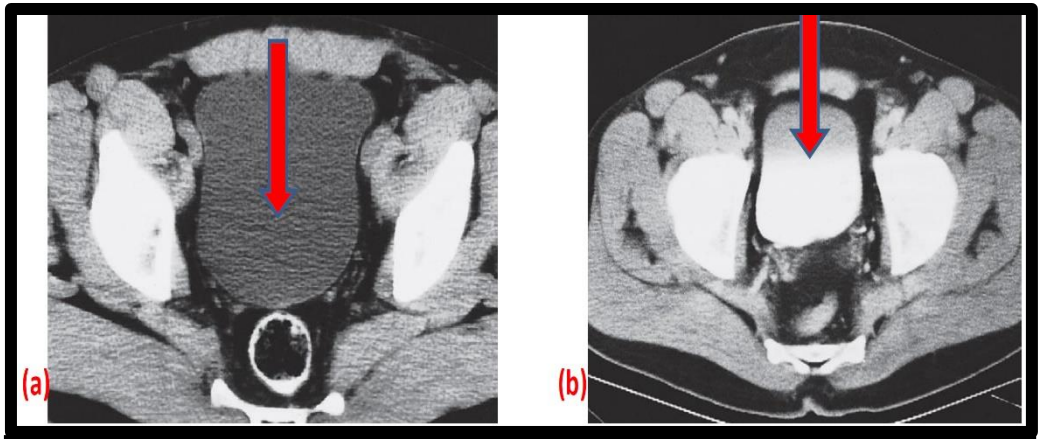
(d) CT after contrast - Section through pelvis showing ureters (arrows).

Imaging examination: CT scan of abdomen

Anatomy:

A- Left Kidney

D- Left Ureter



(a)CT Section through a bladder without contrast opacification.

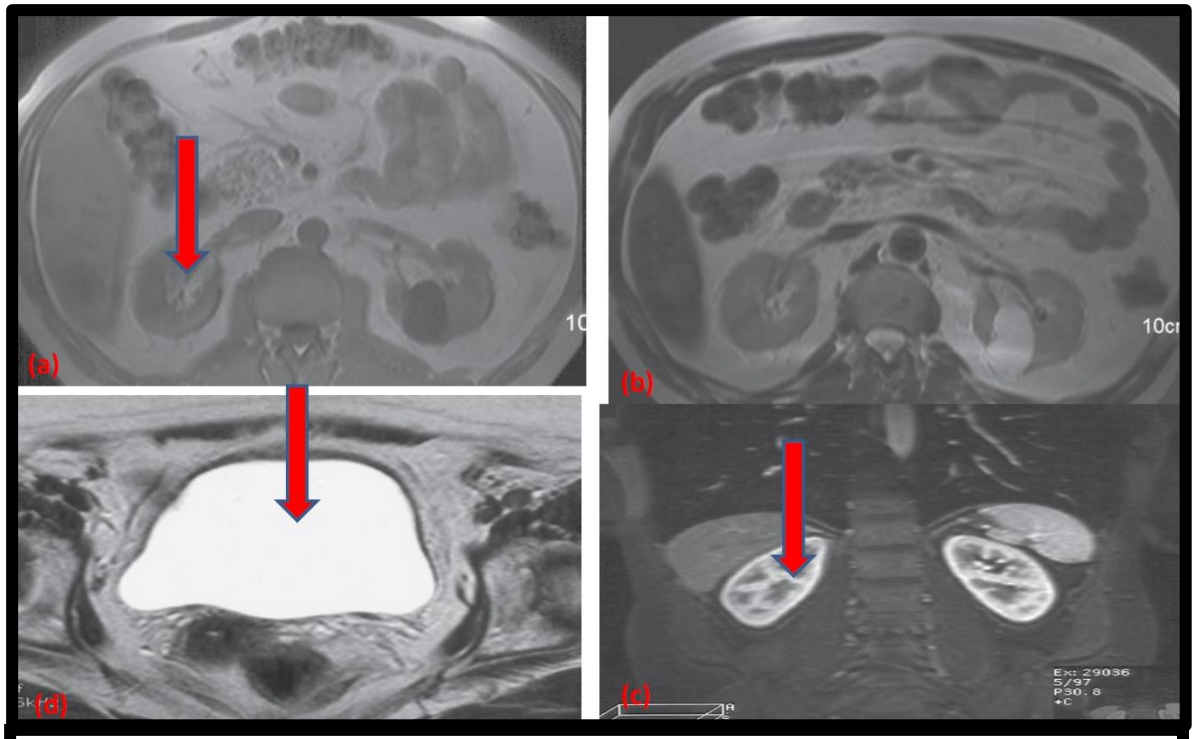
(b) CT after contrast - an opacified bladder showing.

Imaging examination:

Pelvic CT reformat – The ureter has been reformatted in the coronal plane

Anatomy in Descending order:

Kidney, Ureter, Bladder



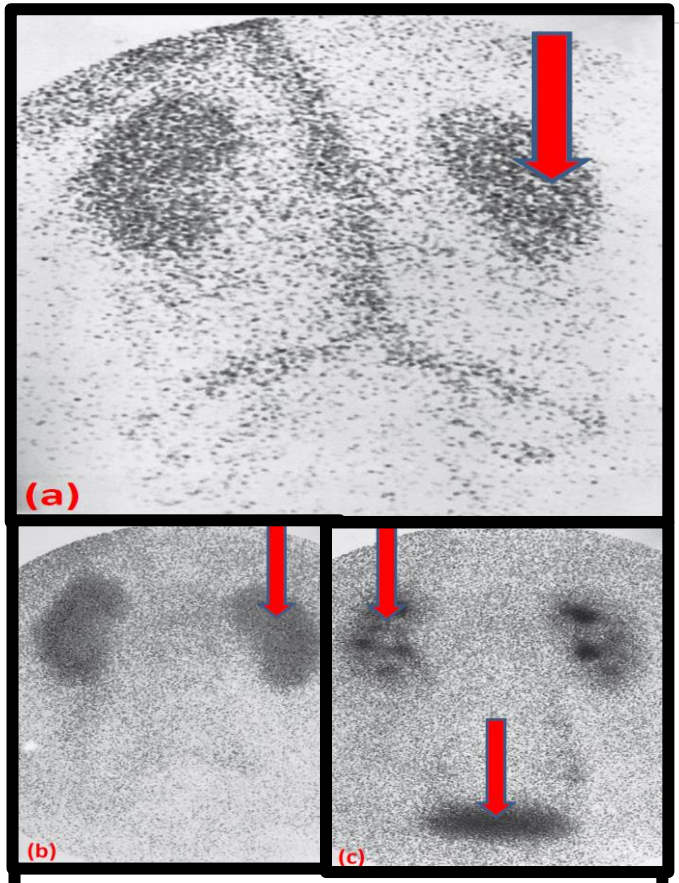
Imaging examination: MRI of kidney & bladder

[B. Transverse | C. Coronal]

Anatomy

A, C Right Kidney

D. Urinary Bladder



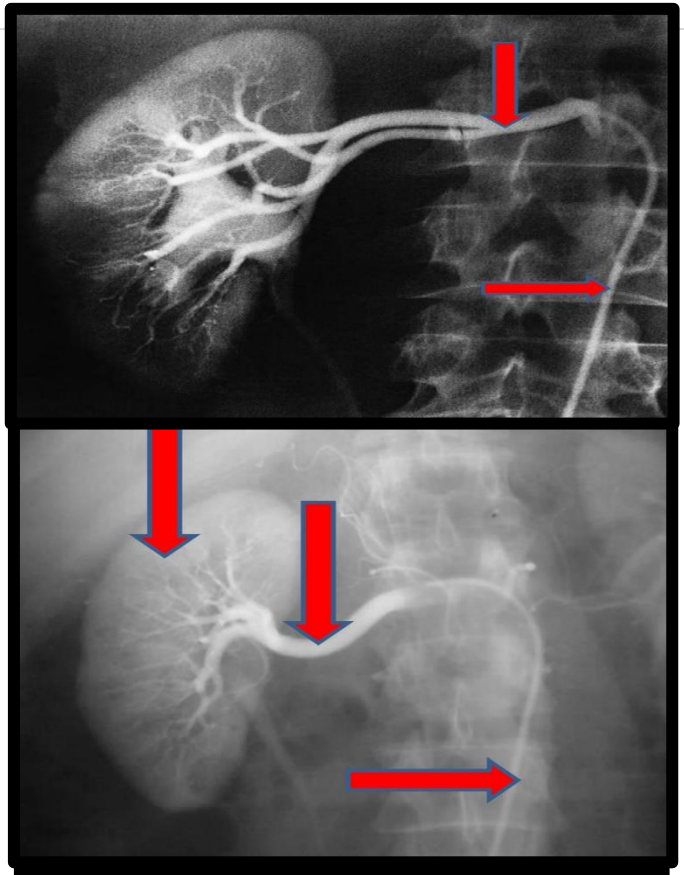
Imaging modality / examination:

Renal radionuclide scan –

99mTc DTPA renogram, serial images.

Anatomy Descending order:

LT [A,B] RT [C] Kidney & Urinary bladder

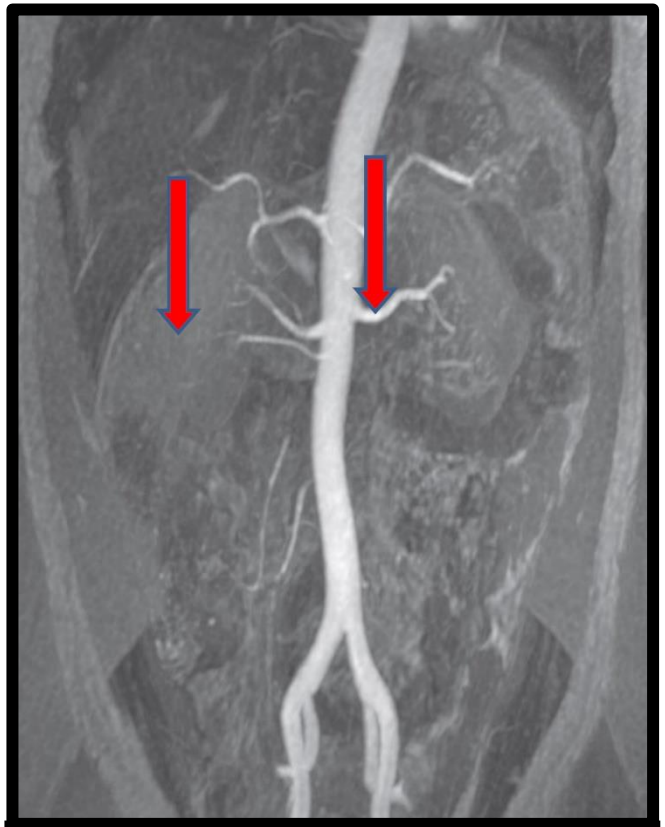


Imaging modality / examination:

Renal catheter arteriography

Anatomy:

RT Kidney & Renal Artery, Catheter

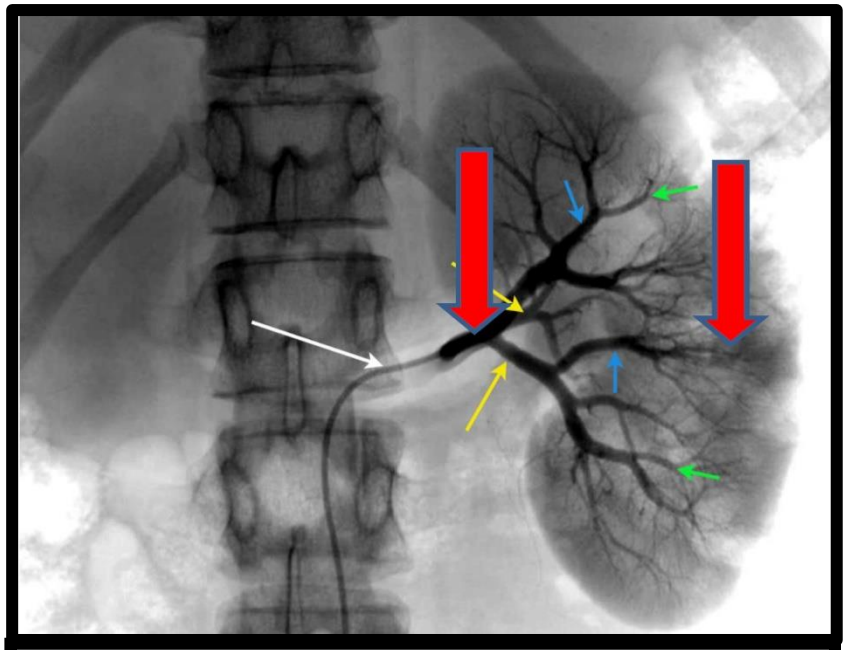


Imaging modality / examination

Magnetic resonance angiogram of kidney

- Coronal

Anatomy: LT Renal artery & RT Kidney



Imaging modality / examination:

Conventional (Catheter) Angiography of kidney

Anatomy:

LT. Renal Artery & kidney

Imaging modality / examination:

Magnetic Resonance Angiography of kidneys

Anatomy:

LT Kidney, RT/LT Renal Artery

Imaging modality: Ultrasound

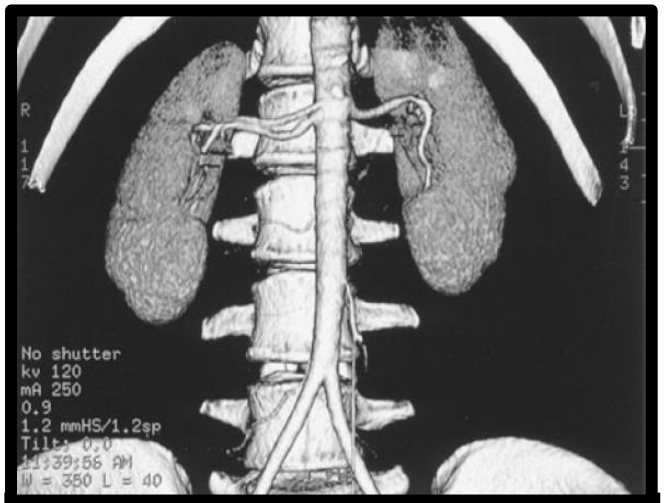
Structures [Descending order from white line of renal capsule]:

Renal capsule

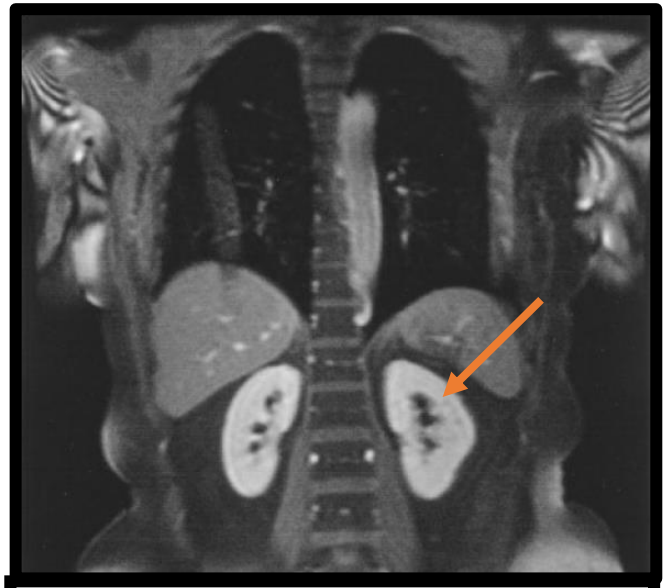
Renal cortex

Renal medulla (Pyramids)

Renal sinuses



Imaging modality: CT 3D of kidneys



Imaging modality:

Coronal MRI of kidneys

Anatomy:

Left Kidney

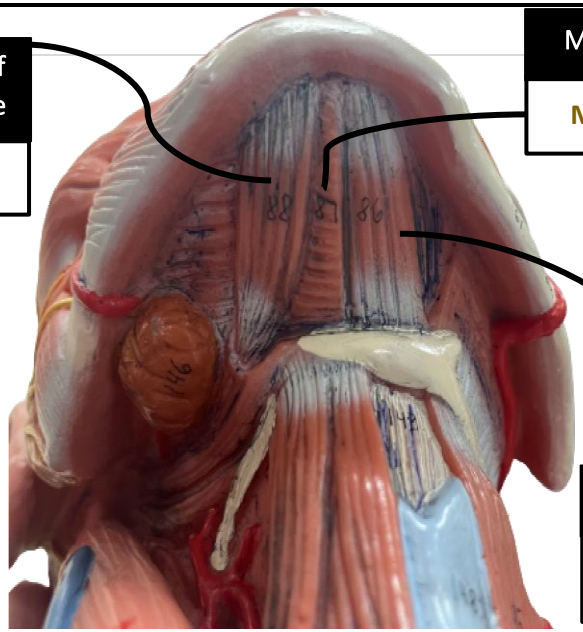
"Man should strive to have his intestine relaxed all the days of his life"
-Moses Maimonides

2023/10/3

GIT

Hazem Alkhateeb, Loay abu-tair, Deema Alsarrawi, Raghad Ayesh

Anatomy



Anterior Belly of Digastric Muscle

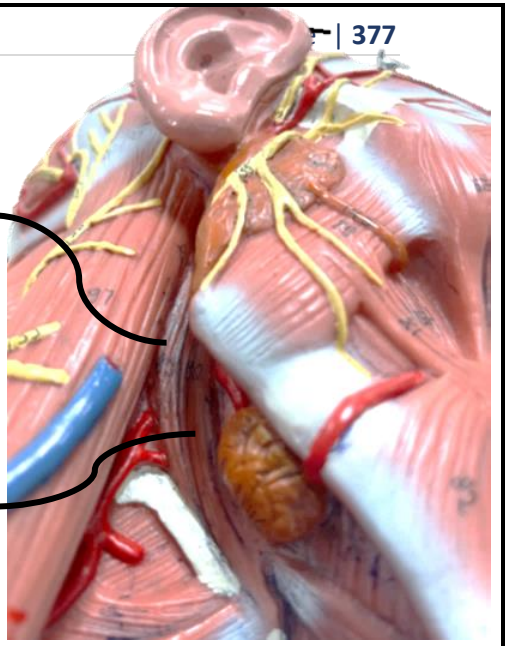
Mandibular

Mylohyoid Muscle

Mylohyoid Nerve

Geniohyoid Muscle

C1 & Hypoglossal [12]

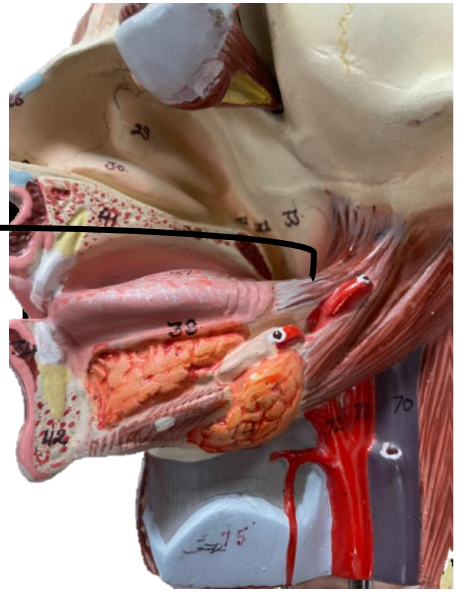


Post. Belly of Digastric Muscle

Facial Nerve [7]

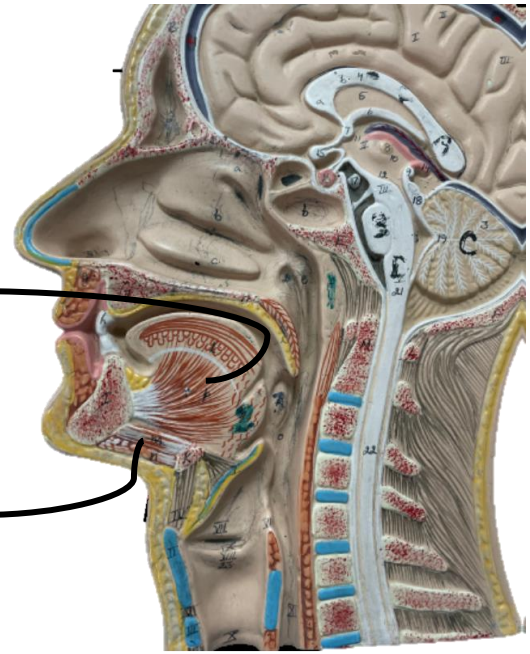
Stylohyoid Muscle

Facial Nerve [7]



Styloglossus M.

Hypoglossal [12]



Genioglossus M.

Hypoglossal Nerve [12]

Geniohyoid Muscle

C1 & Hypoglossal [12]

Styloglossus M.

Hypoglossal [12]

Post. Belly of Digastric Muscle

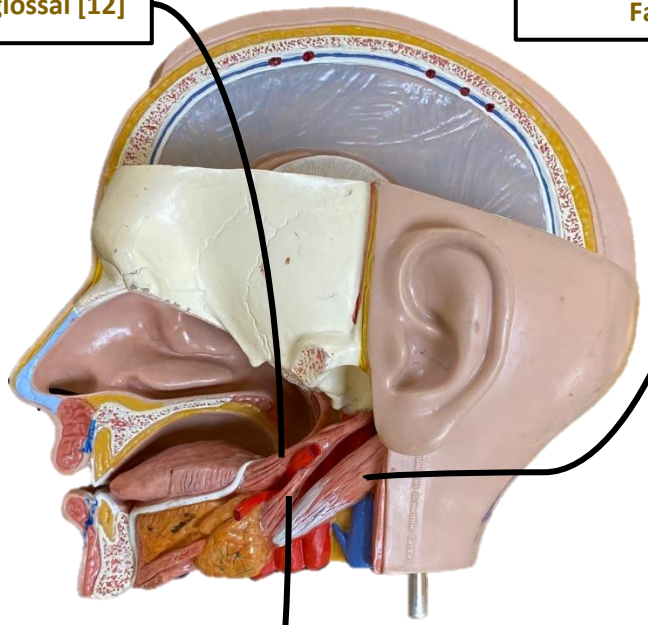
Facial Nerve [7]

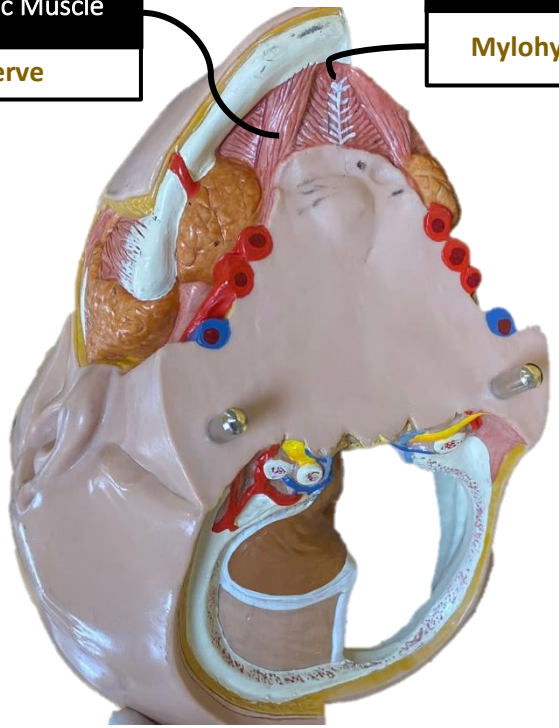
Ant. Belly of Digastric Muscle

Mandibular Nerve

Mylohyoid Muscle

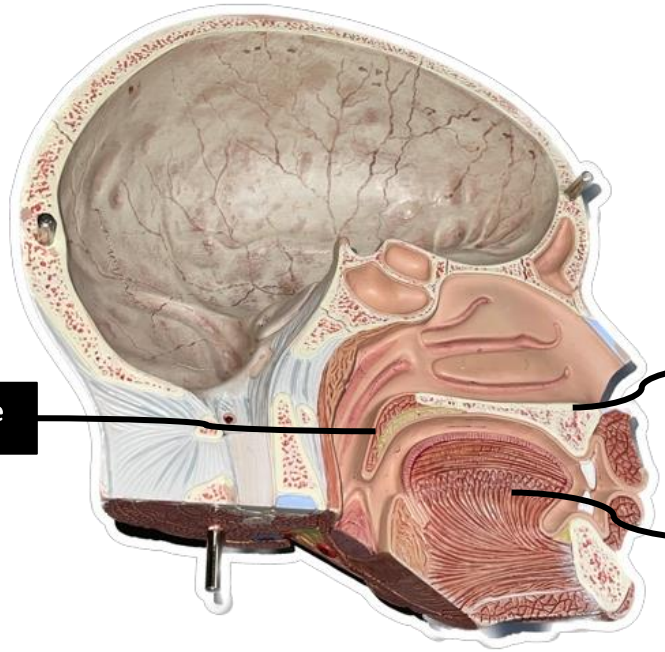
Mylohyoid Nerve





Stylohyoid Muscle

Facial Nerve [7]



Soft Palate

Hard Palate

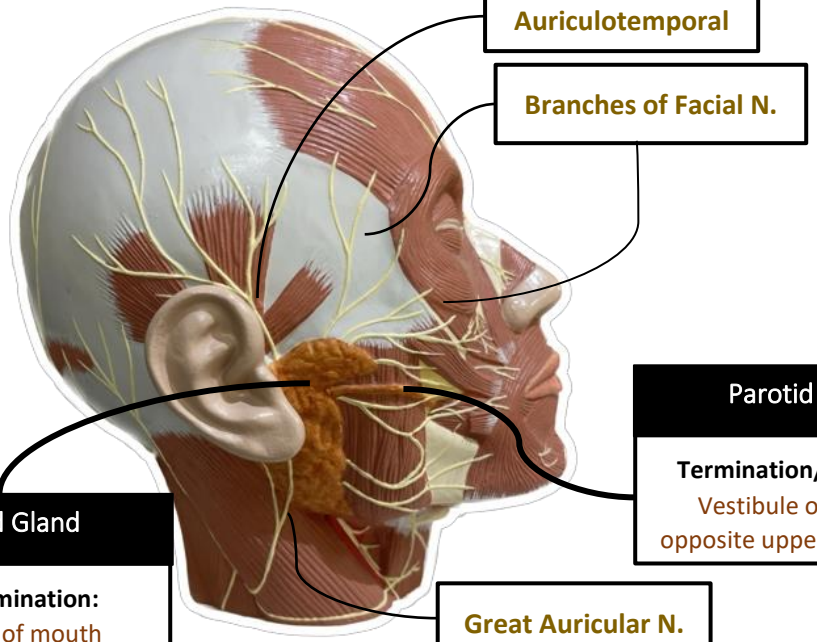
Tongue

Motor nerve supply :

All muscles supplied by vagus nerve except tensor palati by mandibular nerve

Motor nerve supply :

Hypoglossal nerve



Auriculotemporal

Branches of Facial N.

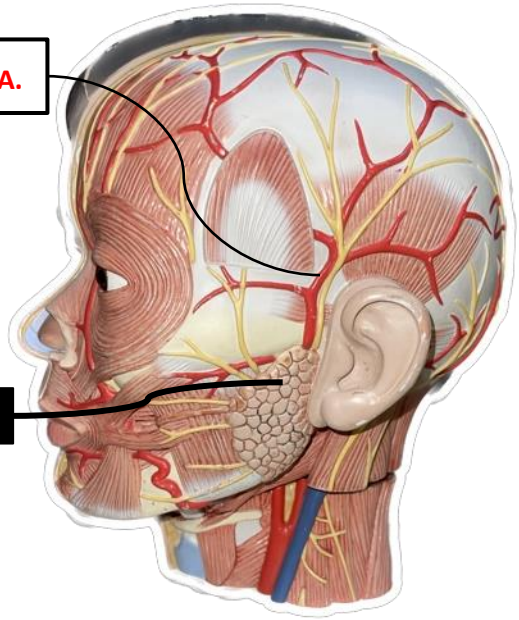
Parotid Duct

Termination/Opening:
Vestibule of mouth
opposite upper 2nd molar

Parotid Gland

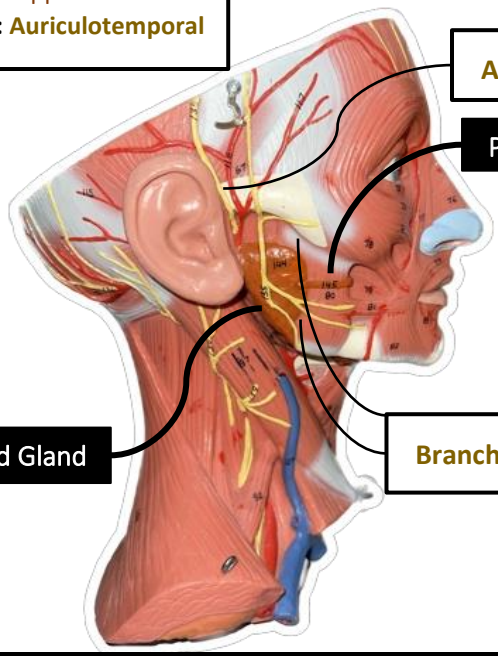
Duct Termination:
Vestibule of mouth
opposite upper 2nd molar
Sensory: Auriculotemporal

Great Auricular N.



Superficial Temporal A.

Parotid Gland



Auriculotemporal

Parotid Duct

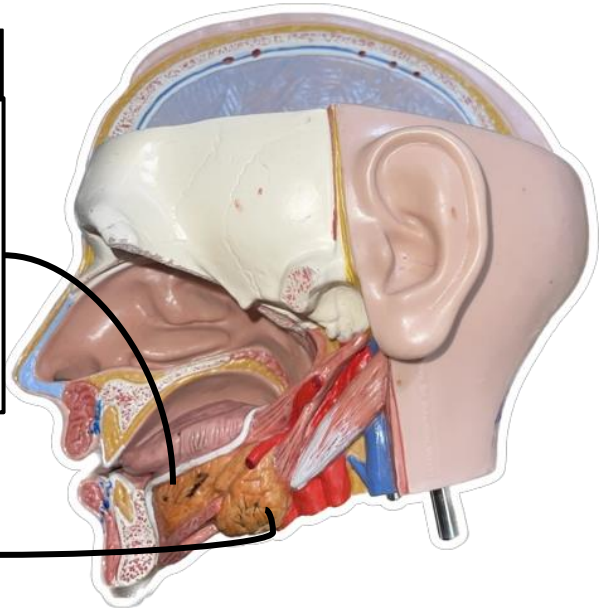
Parotid Gland

Branches of Facial N.

Sublingual Gland

Termination / Opening:
sublingual Fold

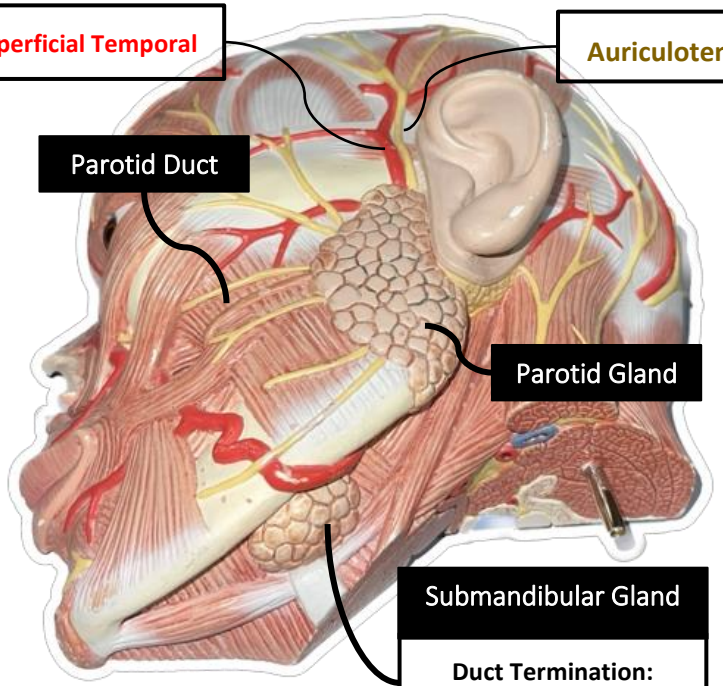
Sensory: Lingual N.
Parasympathetic Nucleus: Superior Salivary Nucleus
Arterial: Sublingual & Submental A.
Venous: Facial & Lingual V.
LN: Submandibular & Submental LNs



Submandibular Gland

Sensory: Lingual N.

Sympathetic: plexus around facial a.

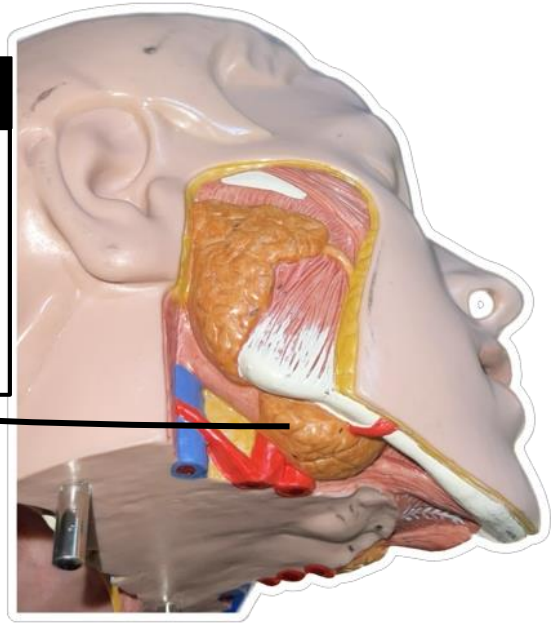


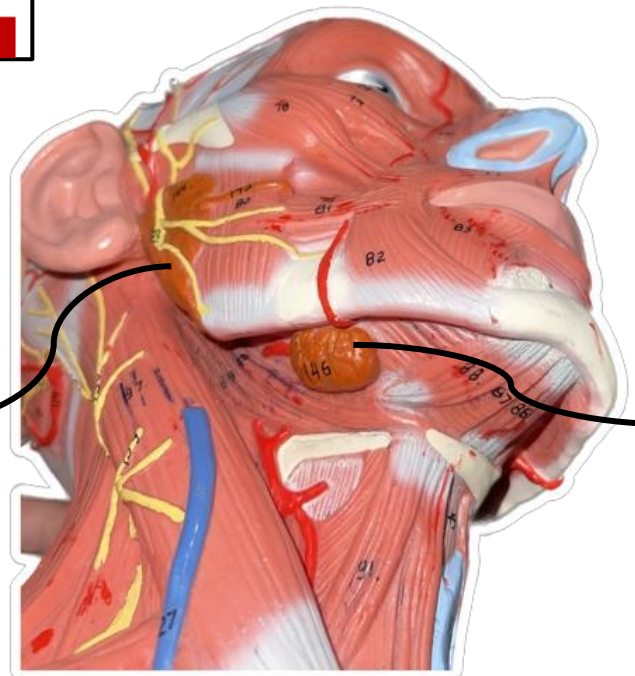
Submandibular Gland

Sensory: Lingual N.

Sympathetic: plexus around facial artery

Parasympathetic Nucleus: Superior Salivary Nucleus





Parotid Gland

Sensory: Auriculotemporal nerve

Structures passing through: ECA & Facial Nerve

Arterial: Maxillary & Superficial Temporal A.
Originated from ECA

Venous: Retromandibular V.

LN: Deep & Superficial Cervical LNs

Submandibular Gland

Arterial: Facial A.
Originated from ECA

Venous: Facial V.

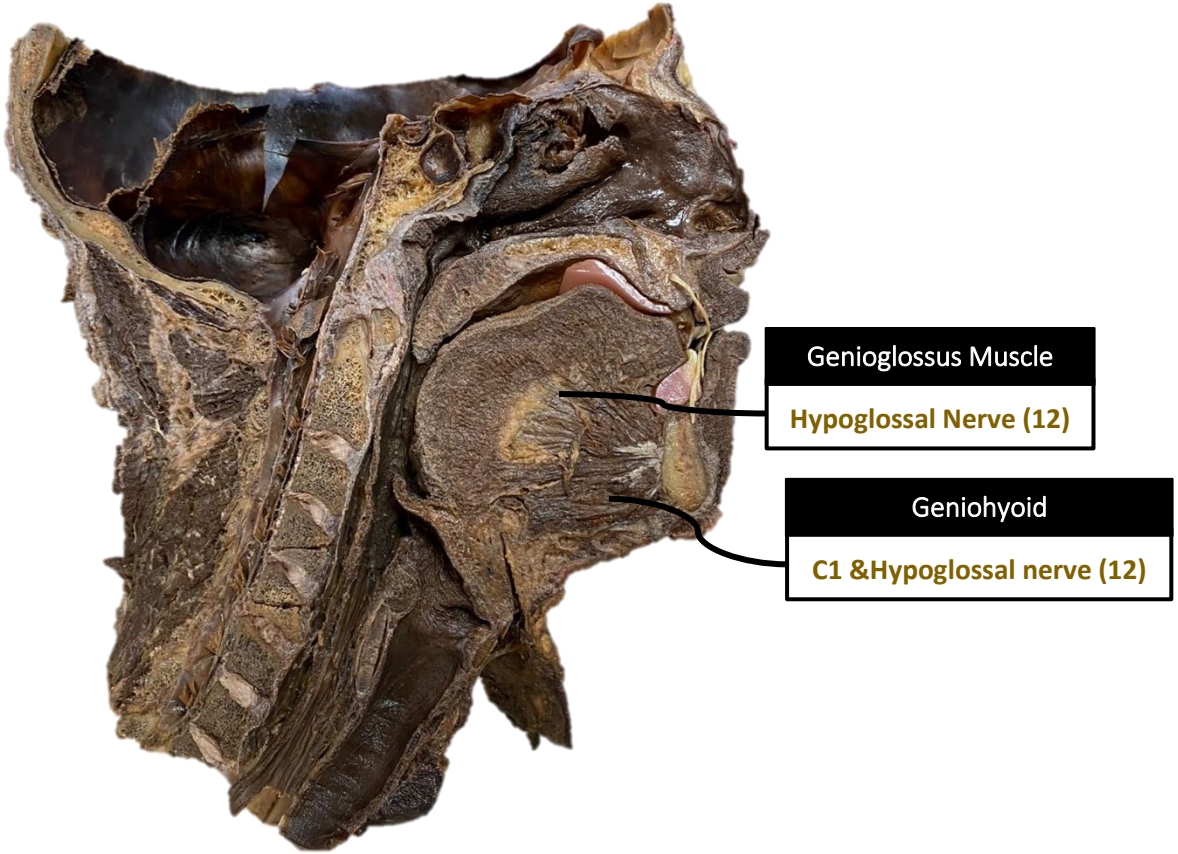
LN: Submandibular LNs

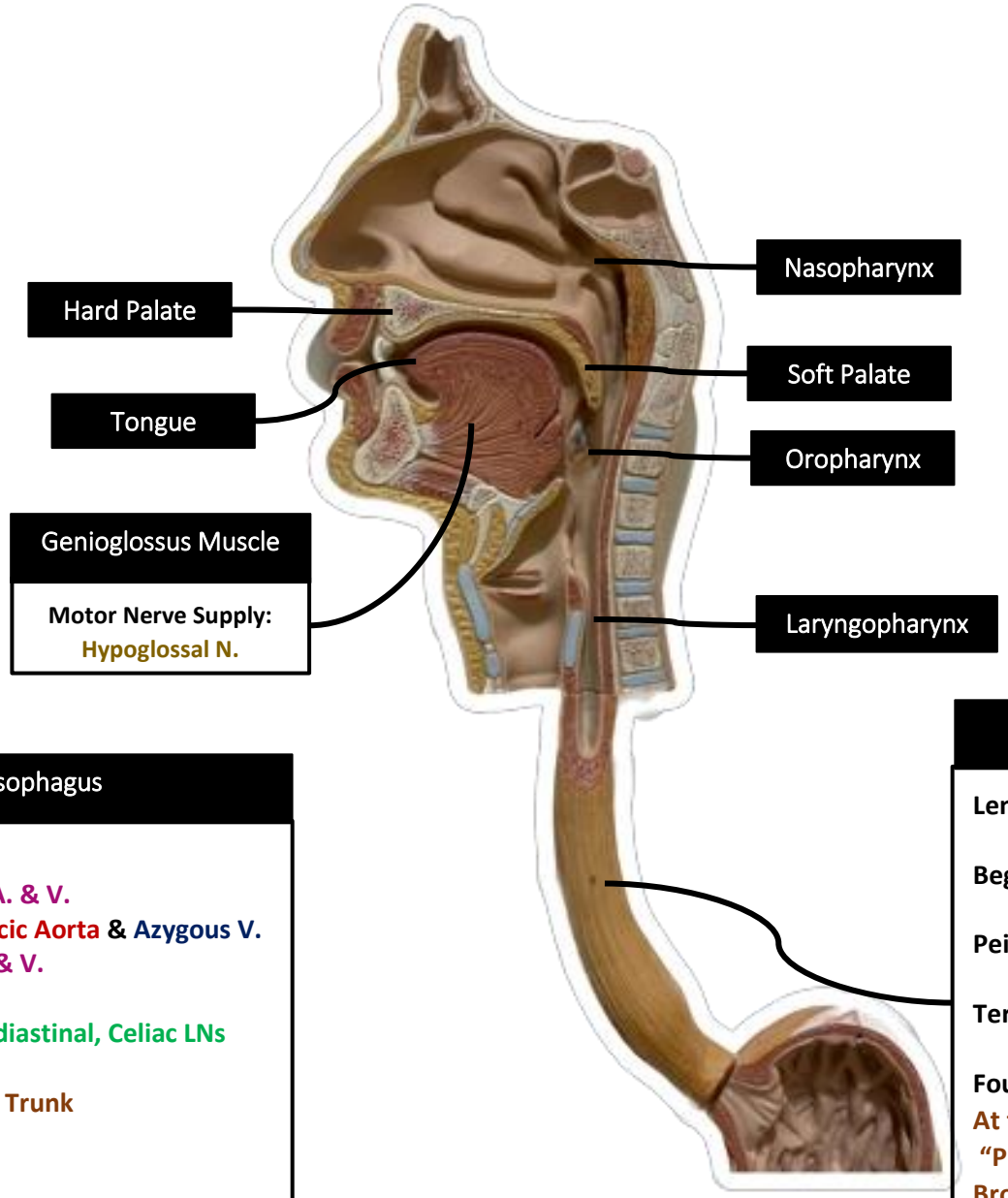
Sensory: Lingual Nerve

Glands nerves :

-	Parotid	Submandibular	Sublingual
Sensory	great auricular nerve	Lingual nerve	Lingual nerve
Sympathetic	Plexus Around (External carotid artery)	Plexus Around (Facial artery)	Plexus Around (Facial artery)
Parasympathetic	Otic ganglia / glossopharyngeal nerve (cr 9)	Submandibular ganglia / facial nerve (cr 7)	Submandibular ganglia / facial nerve (cr 7)

Important one:





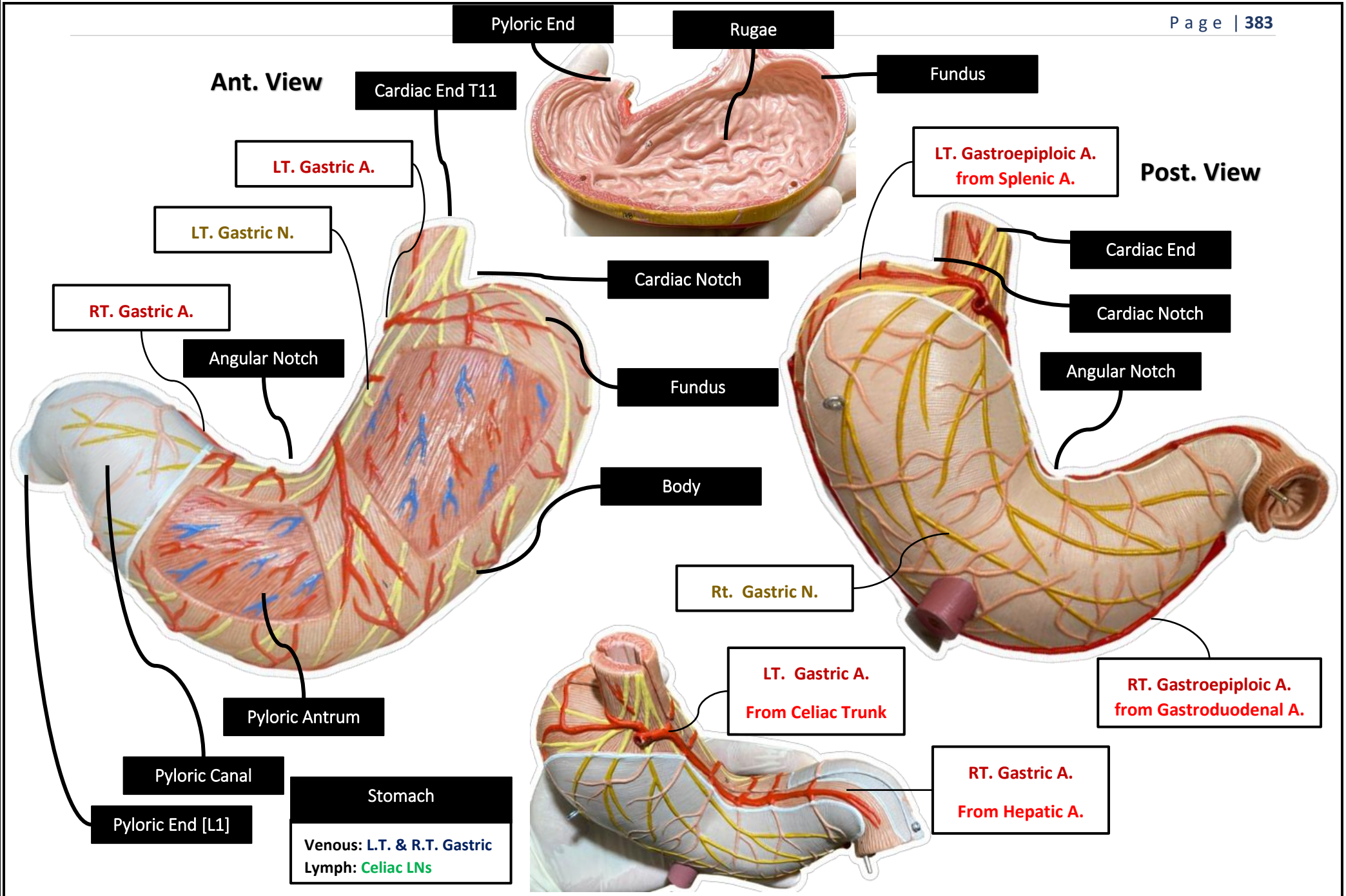
All muscles supplied by vagus nerve except tensor palati by mandibular nerve

Pharynx termination:

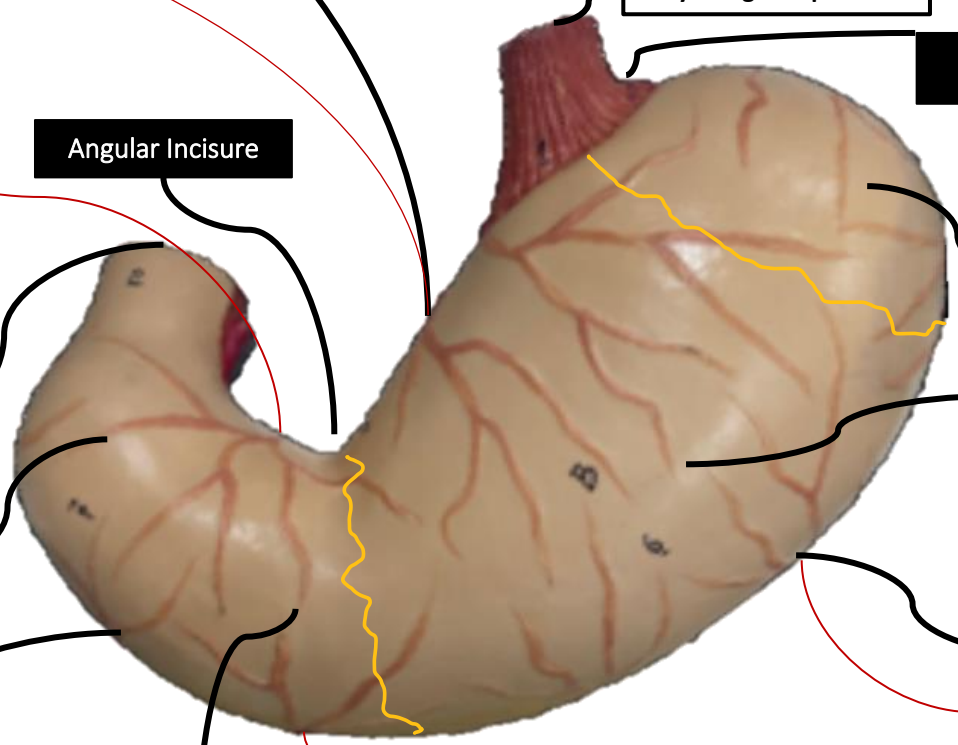
Lower border of C6

Vessels of Esophagus
Arterial & Venous **Cervical:** Inferior Thyroid A. & V. **Thorax:** Descending Thoracic Aorta & Azygous V. **Abdominal:** LT. Gastric A. & V. **Lymph:** Deep cervical, Mediastinal, Celiac LNs **Sympathetic:** Sympathetic Trunk **Parasympathetic:** Vagi

Features of Esophagus
Length: 25 cm / 10 Inches **Beginning:** C6 **Peirce Diaphragm:** T10 **Termination:** T11 **Four Constrictors:** At the Beginning "Pharyngoesophageal junction", Aorta, Left Bronchus, Esophageal opening w/ diaphragm


Ant. View
Pyloric End
Rugae
Fundus
Cardiac End T11
LT. Gastric A.
LT. Gastric N.
Cardiac Notch
RT. Gastric A.
Angular Notch
Fundus
Body
Pyloric Antrum
Pyloric Canal
Pyloric End [L1]
Stomach
Venous: L.T. & R.T. Gastric
Lymph: Celiac LNs
Post. View
LT. Gastroepiploic A.
from Splenic A.
Cardiac End
Cardiac Notch
Angular Notch
Rt. Gastric N.
RT. Gastroepiploic A.
from Gastroduodenal A.
LT. Gastric A.
From Celiac Trunk
RT. Gastric A.
From Hepatic A.

Ant. View



Lesser Curvature

Peritoneal: Lesser Omentum
Arterial Upper Part:
LT. Gastric A.
from Celiac A.

Arterial Lower Part:
RT. gastric A.
Hepatic A.

Venous:
LT. & RT. Gastric V.

Cardiac Inlet [T11]

Physiological Sphincter

Cardiac Notch

Angular Incisure

Fundus of Stomach

Short Gastric A. from Splenic A.
Short Gastric V.

Pyloric Inlet [Lower L1]

True Sphincter

Body

Pyloric Canal

Antrum of Stomach

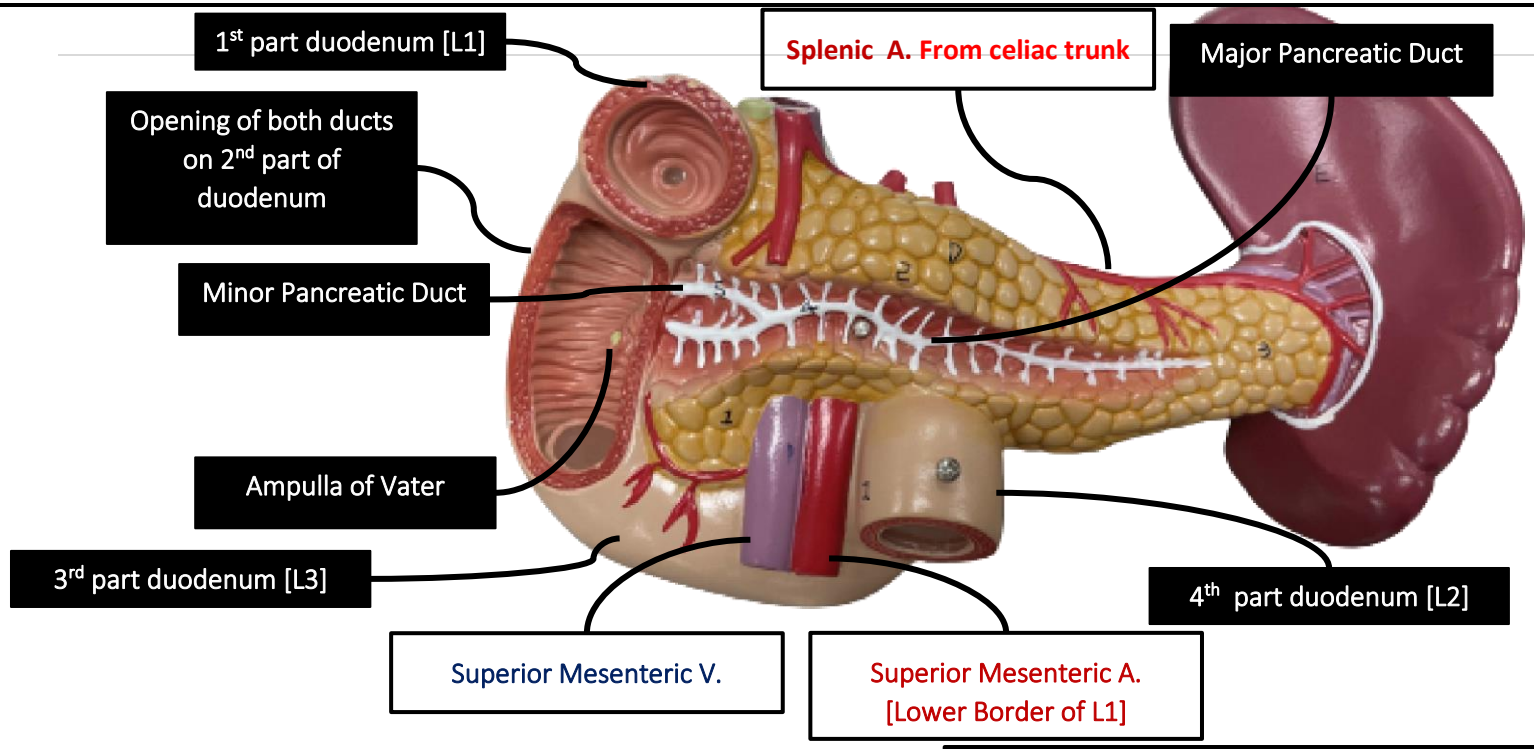
Pyloric Antrum

Greater Curvature

Peritoneal: Greater Omentum [stores fat]
Arterial Upper Part:
LT. Gastroepiploic A.
from splenic A.

Arterial Lower Part:
RT. Gastroepiploic A. from
Gastroduodenal A. [Hepatic]

Venous:
LT. Gastroepiploic V.



Supply of Pancreas

To the head
Superior pancreatico-duodenal A: from coeliac trunk

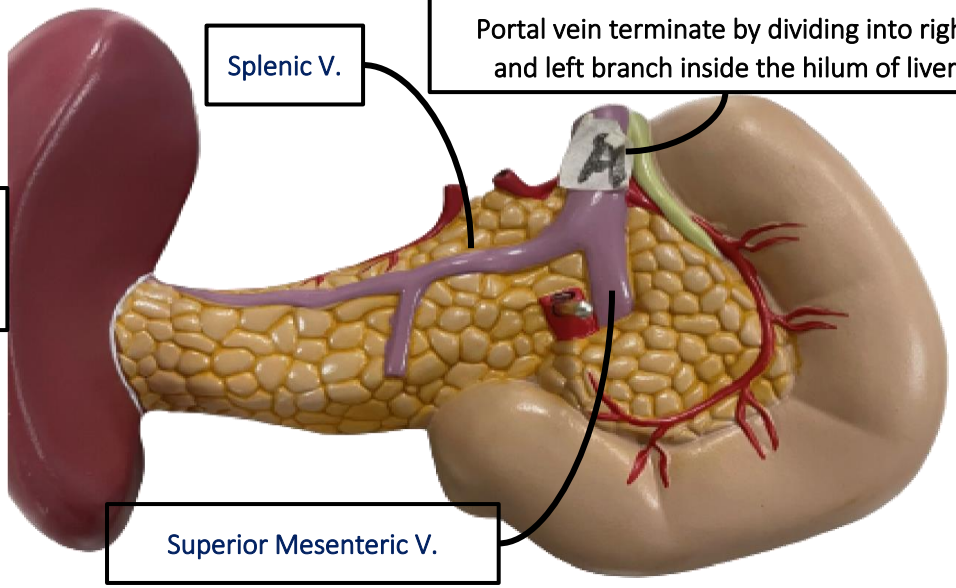
-inferior pancreatico-duodenal A: from SMA

To rest of pancreas:
Pancreatic branches of splenic A: from coeliac trunk.

Venous drainage:
Portal V.

Portal V.

Portal vein terminate by dividing into right and left branch inside the hilum of liver



SPLENIC V. UNITES W/ SMV TO FORM PORTAL V.

Relations of Pancreas

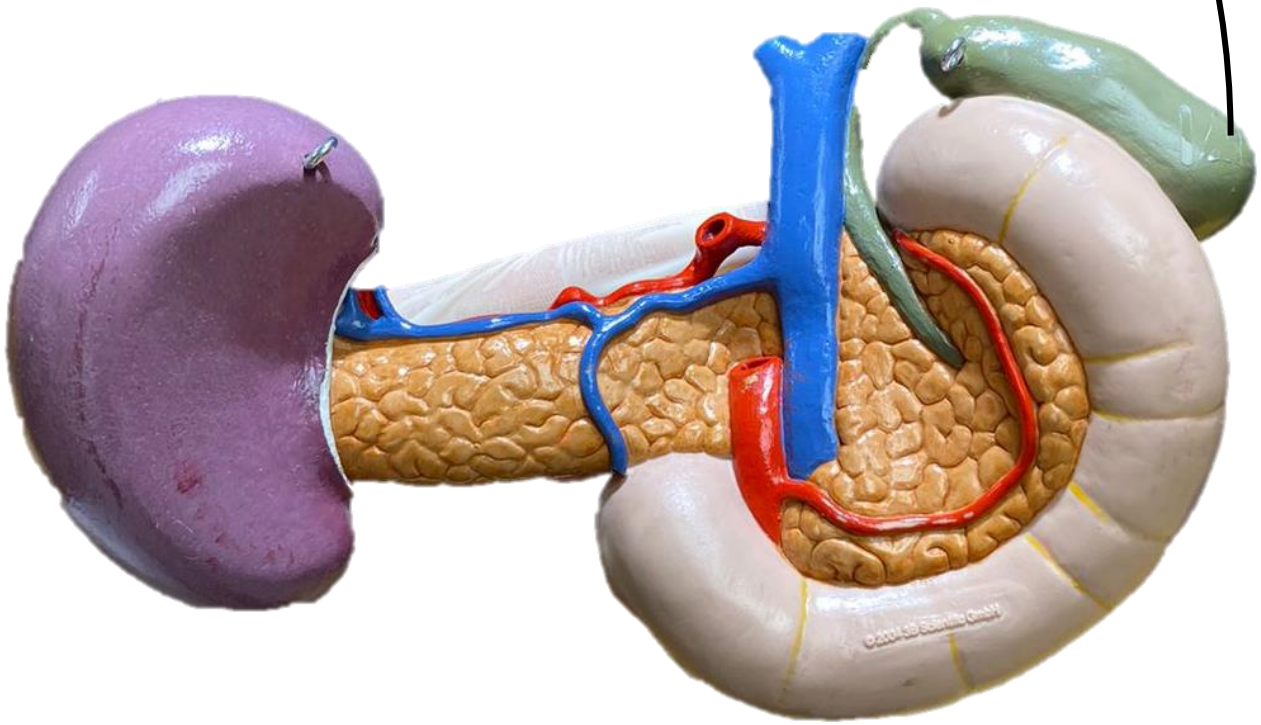
Superior Border: Splenic A.

Posterior Border: Splenic V.

Gallbladder

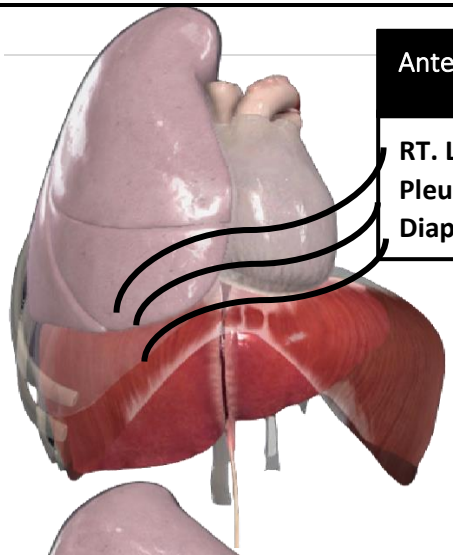
Supplied by: cystic artery from Celiac trunk

Nerve Supply: Right Phrenic Nerve(C3,4,5)



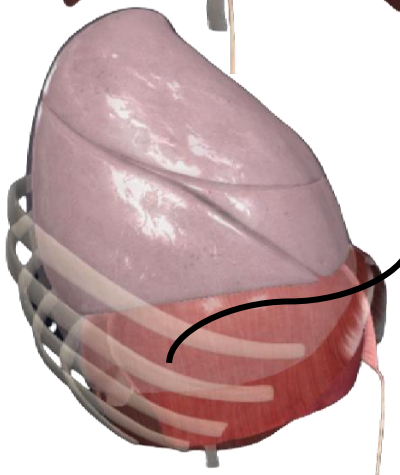
Arteries

	Celiac trunk	SMA	IMA
Origin	Abdominal Aorta **upper** border of **L1**	Abdominal Aorta **lower** border of **L1**	Level of **L3**
Supplies	• 1st part of duodenum • 1/2 2nd part of duodenum • Stomach • Liver • Gall Bladder • Pancreas	• Right 2/3 of transverse colon • Right colic flexure • 1/2 of 2nd part of duodenum • 3rd part of duodenum • 4th part of duodenum • Jejunum • Ileum • Appendix • Caecum • Ascending Colon	• 1/3 transverse colon • Left colic flexure • Descending Colon • Sigmoid Colon • Rectum • Upper 1/2 of anal rectum
Branches	1. **Left Gastric Artery** **Esophageal and Gastric Branches** 2. **Hepatic Artery** **Right and Left hepatic** 3. **Splenic Artery** **-Short gastric Arteries** **- Pancreatic Branches**	1. **Middle colic Artery** 2. **Right Colic Artery** 3. **Inferior Pancreaticoduodenal Artery** 4. **Intestinal Arteries** 5. **ileocolic Artery**	1. **Left Colic Artery** 2. **Sigmoid Arteries** 3. **Superior Rectal Artery**



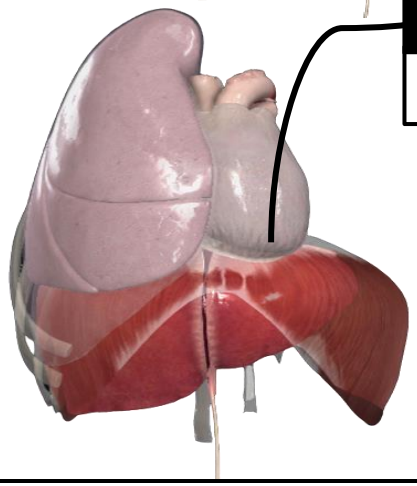
Anterior Relation of Liver

- RT. Lung
- Pleura
- Diaphragm



Right Relation of Liver

- Right 7-11 Ribs



Superior relation of liver

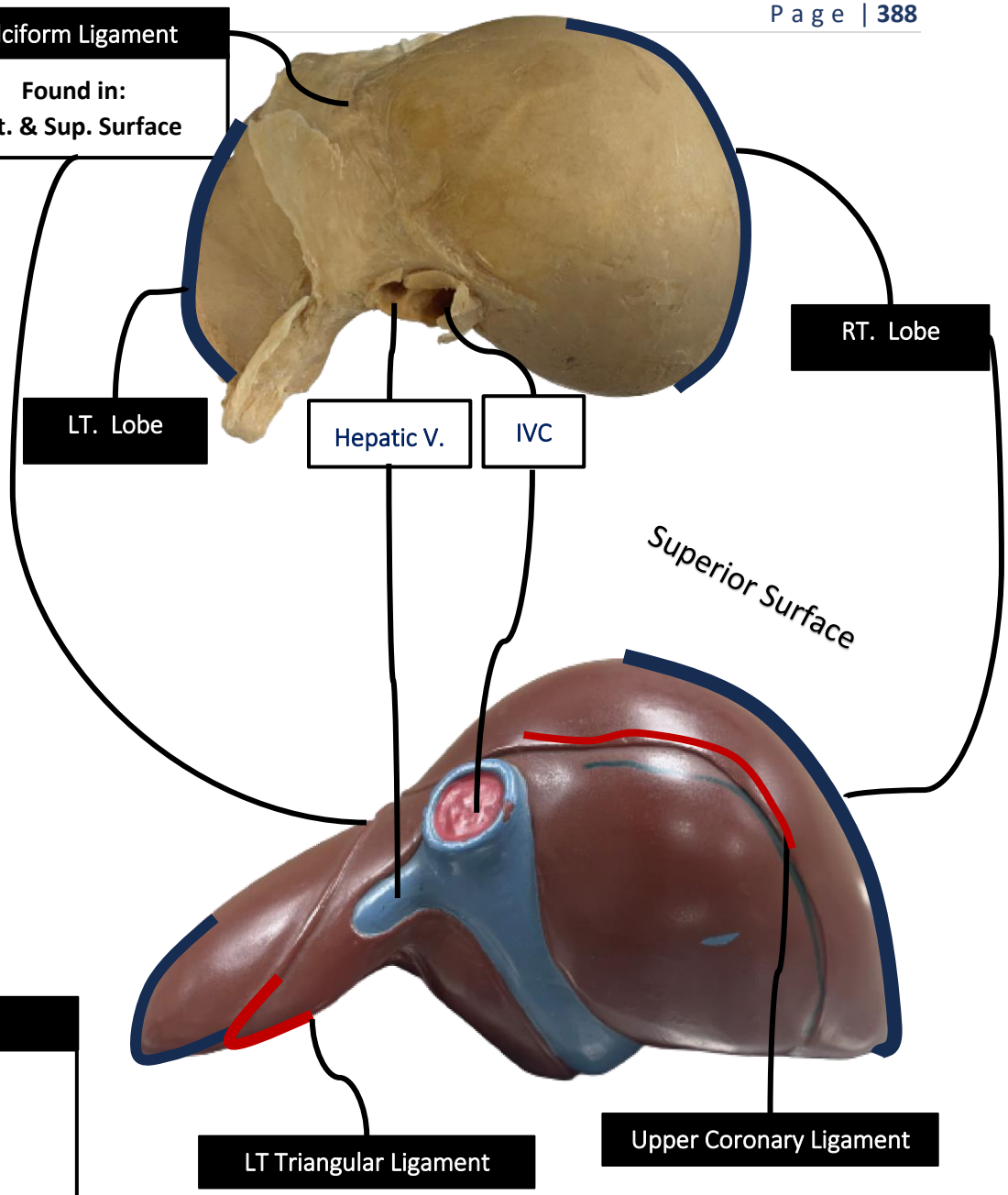
- Heart / Pericardium

Ligaments of Liver

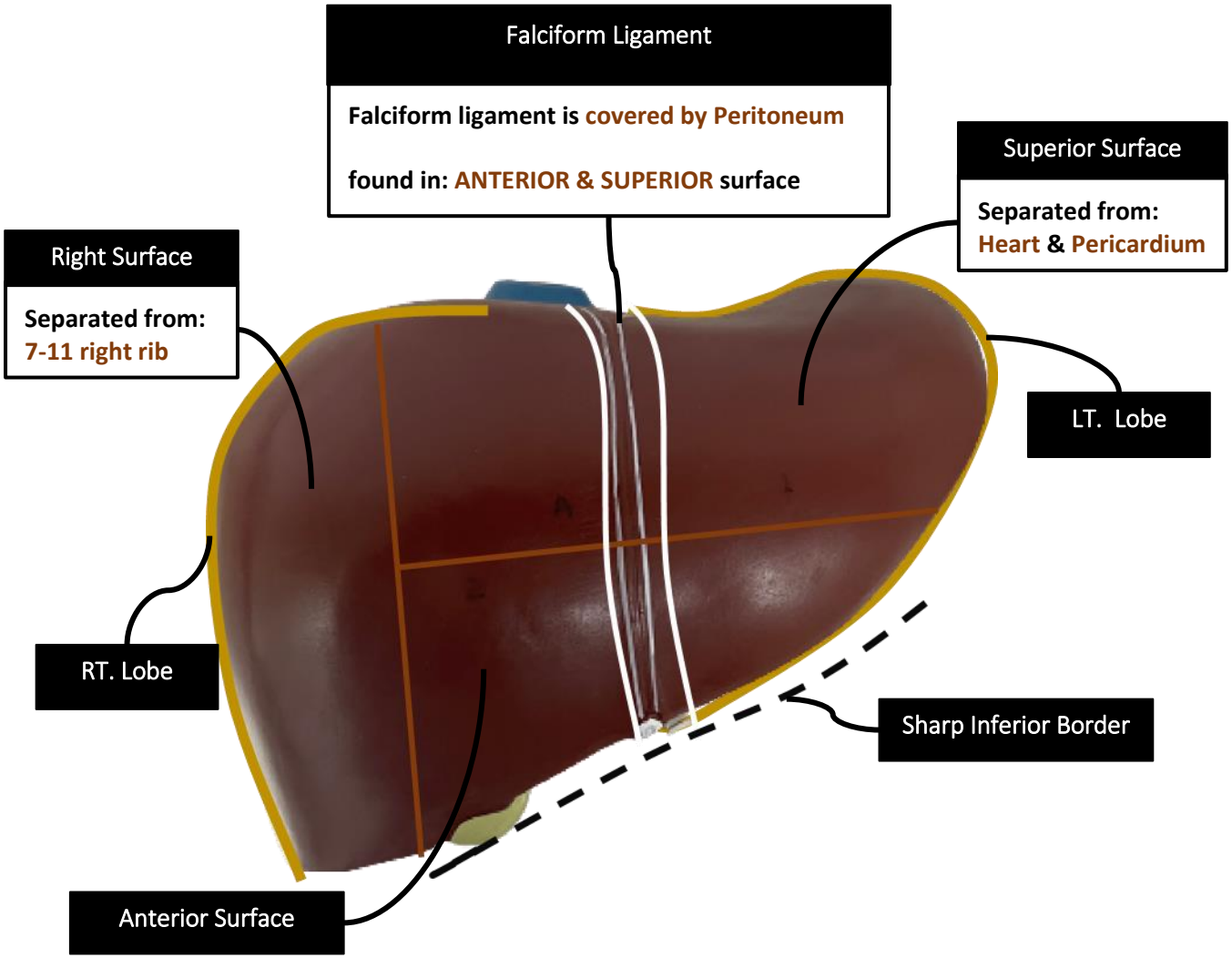
- Falciform ligament
- Left triangular ligaments
- Right triangular ligaments
- Upper Coronary ligament
- |all are covered by Peritoneum

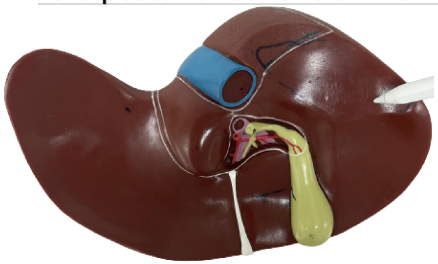
Falciform Ligament

Found in:
Ant. & Sup. Surface



Anterior View of Liver





Fissure for Ligamentum Venosum

Non-peritoneal –
Embryological Origin:
Ductus Venosus

Porta Hepatics [Hilum]

RT. & LT. Hepatic Ducts
RT. & LT. Hepatic A.
RT. & LT. Portal V.
Lymphatics

Bare Area

Non-peritoneal –
Relations:
Base/IVC, Diaphragm,
RT suprarenal gland

Caudate Lobe

Lesser Sac

Esophageal Impression

RT. Kidney & Suprarenal Impression

Gastric Impression

Supply of Liver

Right & left hepatic A.
Origin: Celiac Trunk

RT. & LT. Portal V.
Origin: SMV & splenic V.

RT Colic Flexure Impression

2nd Duodenal Impression

Supply of Gallbladder

Cystic Artery
Origin: celiac trunk

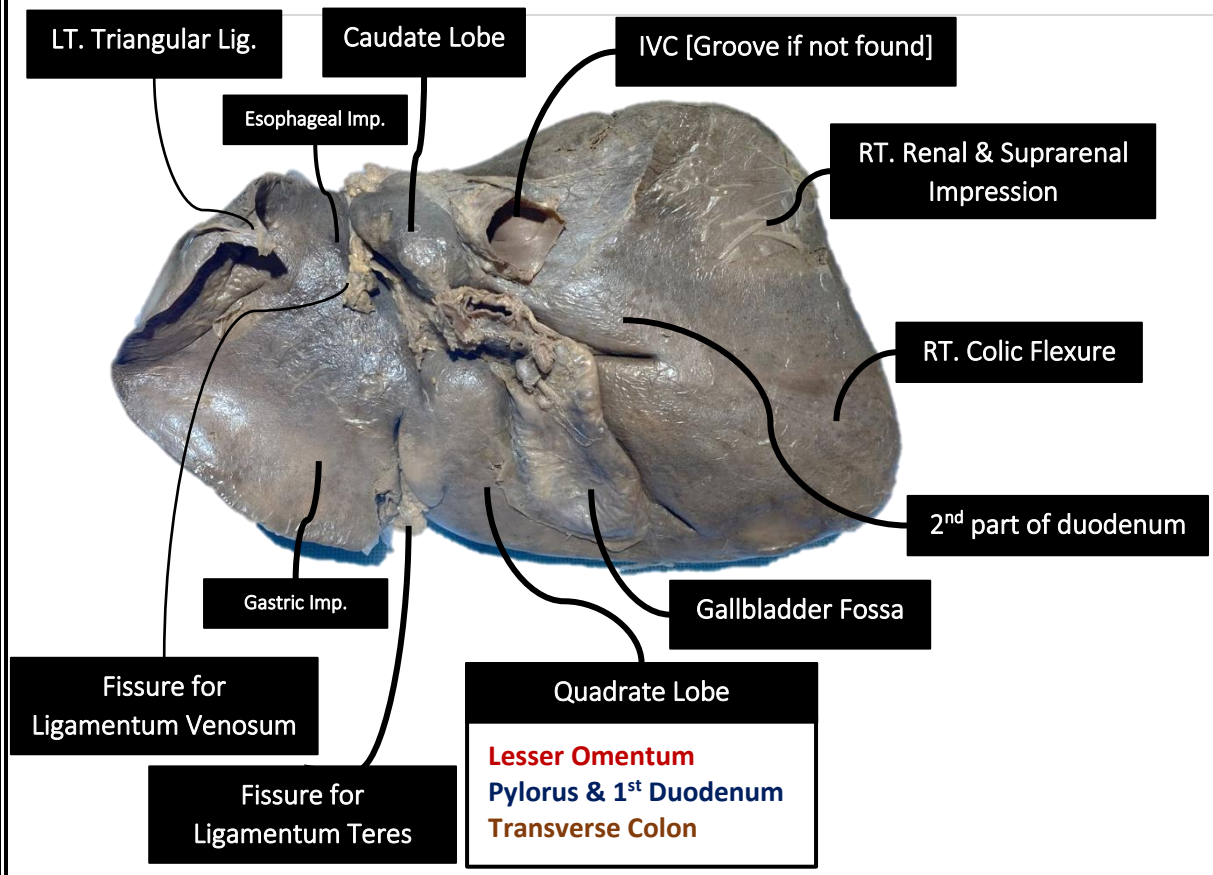
Fissure for Ligamentum Teres

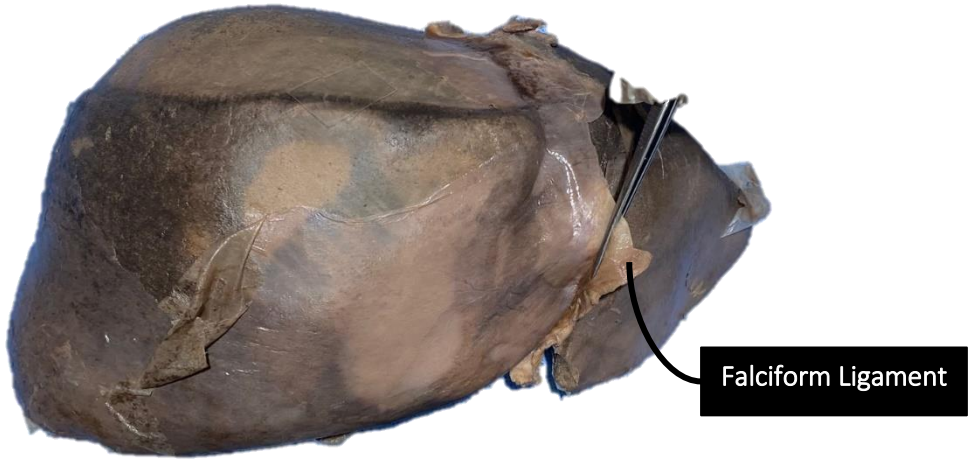
Non-peritoneal –
Embryological Origin:
Umbilical Vein

Quadrate Lobe

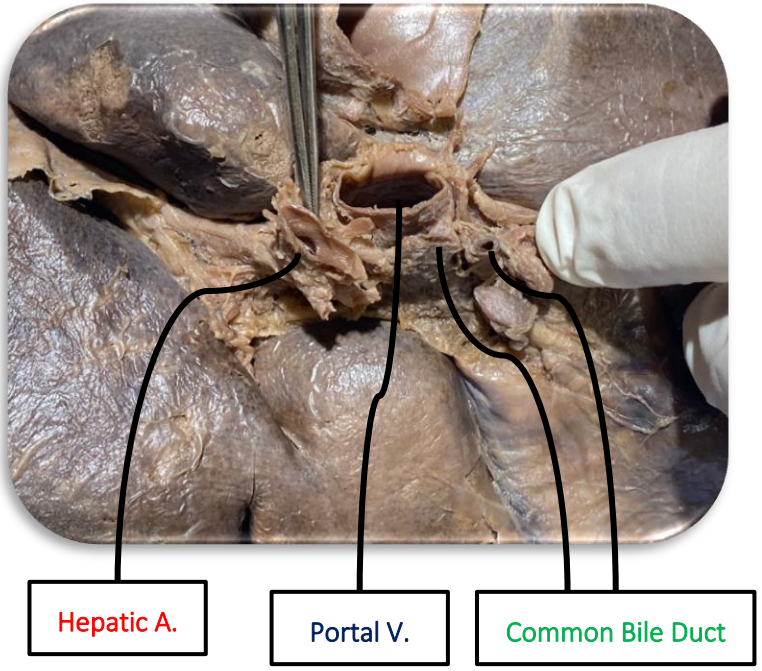
Lesser Omentum
Pylorus & 1st Duodenum
Transverse Colon

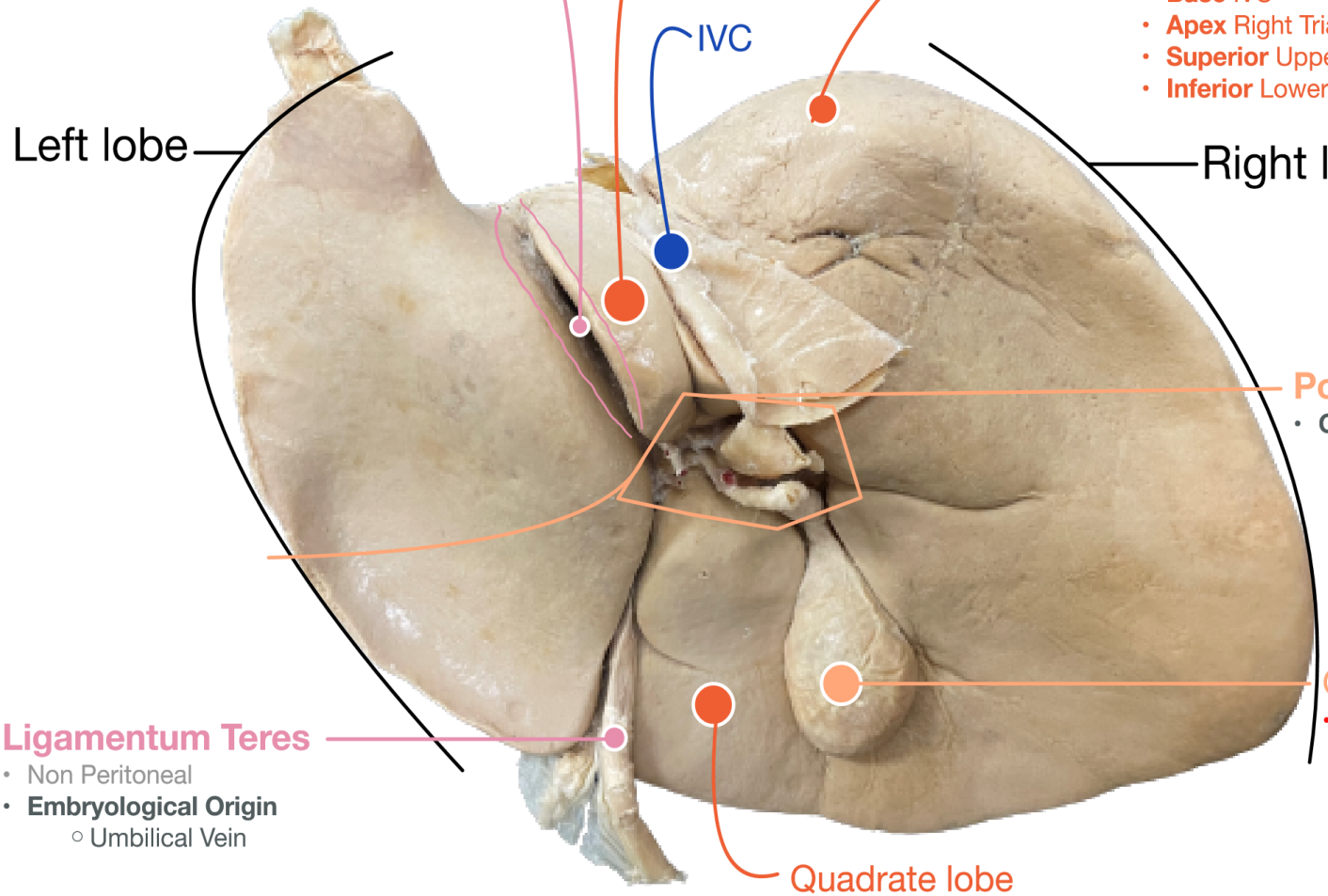
Gallbladder





Porta Hepatis





Fissure of Ligamentum Venosum

- Non peritoneal
- Embryological origin:
  - Ductus Venosus

Caudate lobe

IVC

Bare Area

- No peritoneum
- **Base** IVC
- **Apex** Right Triangular Lig.
- **Superior** Upper Coronary Lig.
- **Inferior** Lower Coronary Lig.

Left lobe

Right lobe

Porta hepatics (hilum)

- **Content**
  - Right and left hepatic duct
  - Right and left hepatic artery
    - **Origin:** Celiac Trunk
  - Right and left portal vein
    - **Origin:**
      - superior Mesenteric
      - splenic vein

Gall Bladder

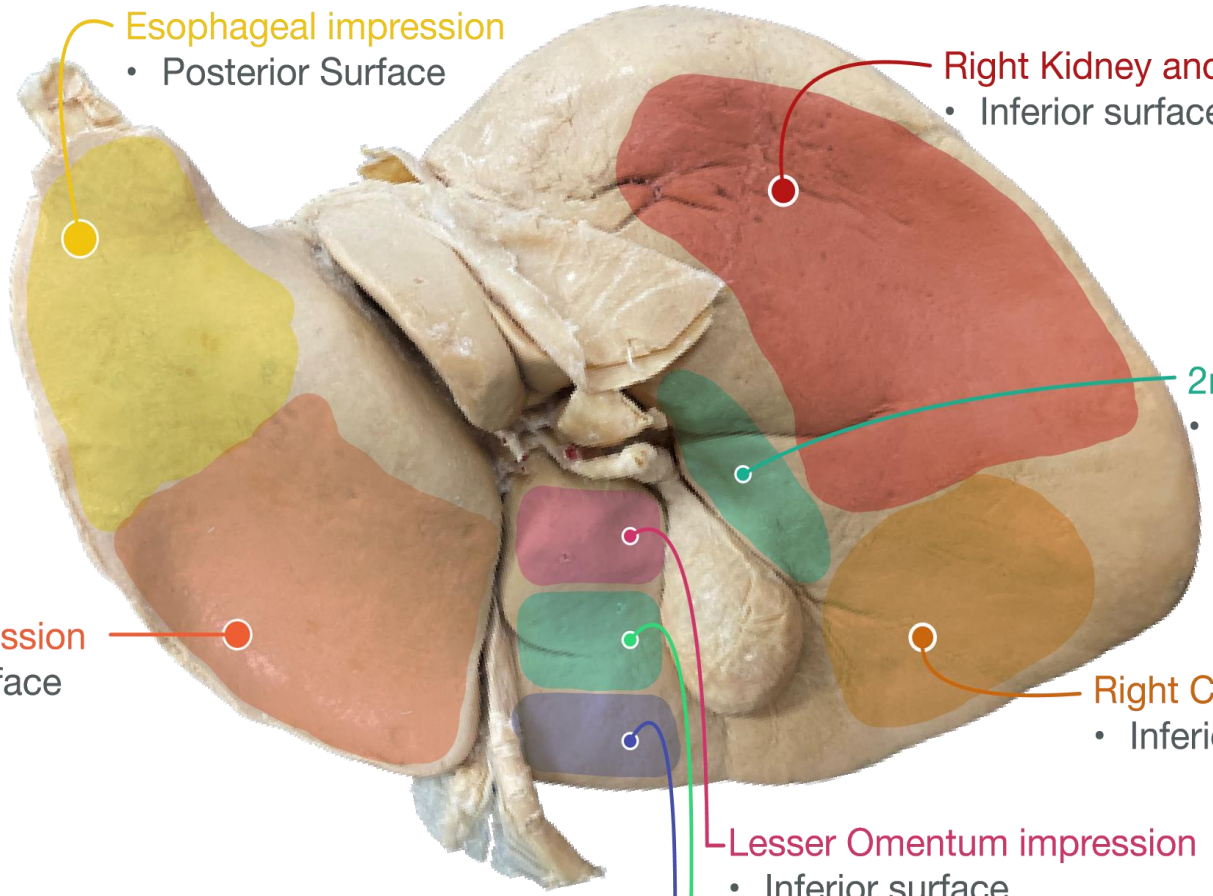
- **Arterial Supply:**
  - Cystic Artery
  - **Origin:** celiac trunk

Ligamentum Teres

- Non Peritoneal
- **Embryological Origin**
  - Umbilical Vein

Quadrate lobe

Related Structures of infero-posterior Surface of liver



Esophageal impression
- Posterior Surface

Right Kidney and Suprarenal Impression
- Inferior surface

2nd Duodenal Impression
- Inferior surface

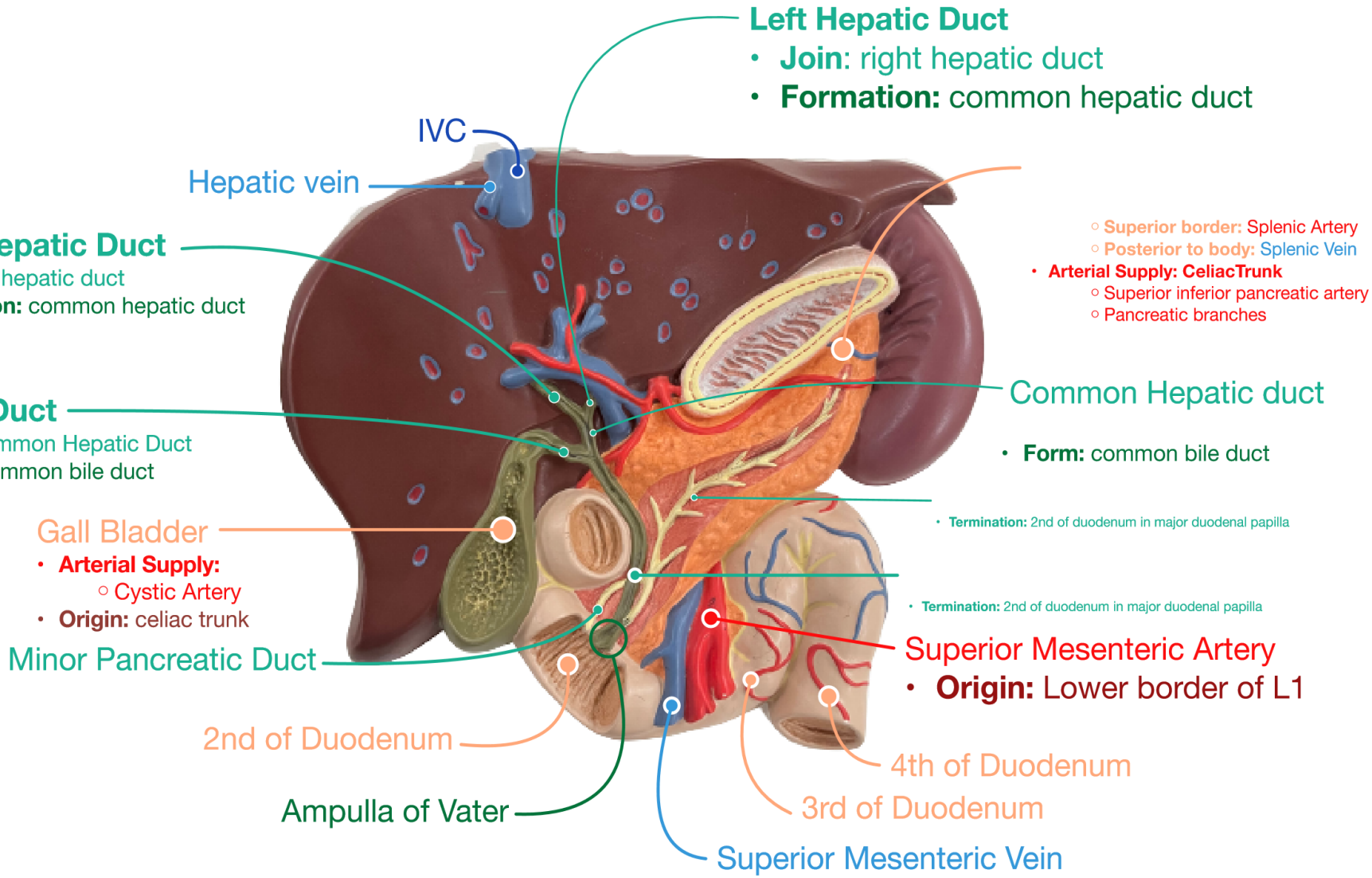
Gastric impression
- Inferior surface

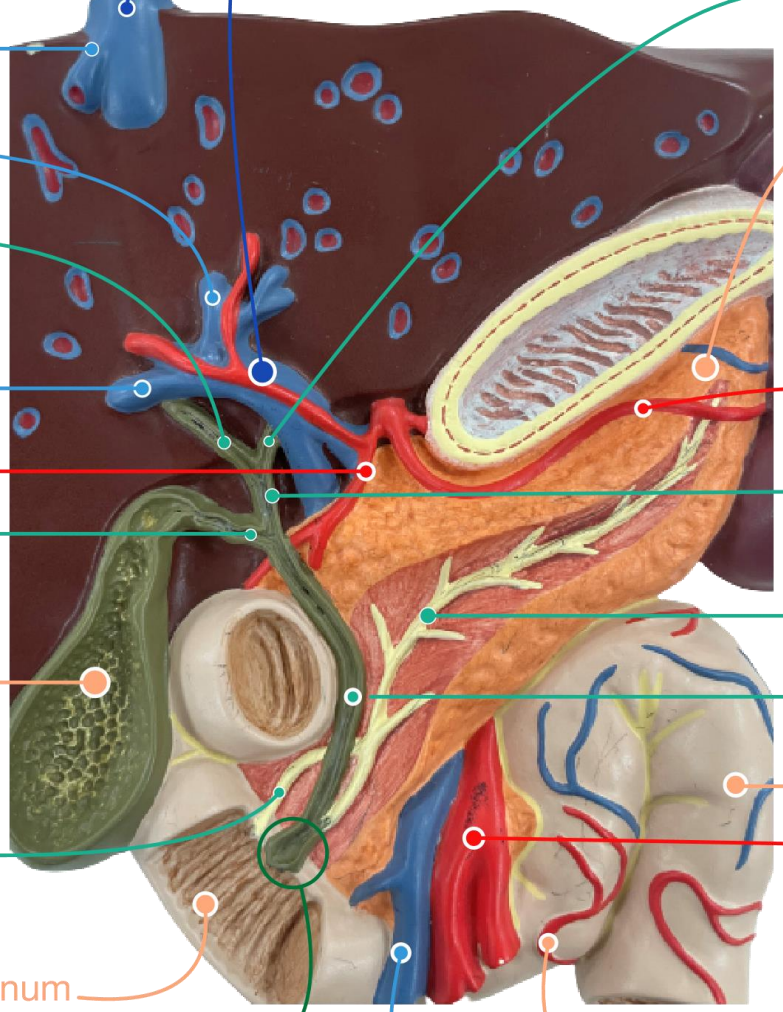
Right Colic Flexure Impression
- Inferior surface

Lesser Omentum impression
- Inferior surface

Pyloric & 1st duodenum impression
- Inferior surface

Transverse Colon Impression
- Inferior surface


Left Hepatic Duct
• Join: right hepatic duct
• Formation: common hepatic duct
IVC
Hepatic vein
Right Hepatic Duct
• Join: left hepatic duct
• Formation: common hepatic duct
Cystic Duct
• Join: Common Hepatic Duct
• Form: common bile duct
Gall Bladder
• Arterial Supply:
○ Cystic Artery
• Origin: celiac trunk
Minor Pancreatic Duct
2nd of Duodenum
Ampulla of Vater
○ Superior border: Splenic Artery
○ Posterior to body: Splenic Vein
• Arterial Supply: CeliacTrunk
○ Superior inferior pancreatic artery
○ Pancreatic branches
Common Hepatic duct
• Form: common bile duct
• Termination: 2nd of duodenum in major duodenal papilla
• Termination: 2nd of duodenum in major duodenal papilla
Superior Mesenteric Artery
• Origin: Lower border of L1
4th of Duodenum
3rd of Duodenum
Superior Mesenteric Vein



IVC

Portal Vein
- **Formed by joining of:**
  - Splenic vein
  - Superior Mesenteric Vein

Hepatic vein

Left Portal Vein

Right Hepatic Duct
- **Join**: left hepatic duct
- **Formation:** common hepatic duct

Right Portal vein

Gastroduodenal Artery

Cystic Duct
- **Join**: Common Hepatic Duct
- **Form:** common bile duct

Gall Bladder
- **Arterial Supply:**
  - Cystic Artery
- **Origin:** celiac trunk

Minor Pancreatic Duct

2nd of Duodenum

Ampulla of Vater

Superior Mesenteric Vein

Left Hepatic Duct
- **Join**: right hepatic duct
- **Formation:** common hepatic duct

Pancreas
- **Relations:**
  - **Superior border:** Splenic Artery
  - **Posterior to body:** Splenic Vein
- **Arterial Supply: CeliacTrunk**
  - Superior inferior pancreatic artery
  - Pancreatic branches

Splenic Artery
- **Origin:** Celiac Trunk

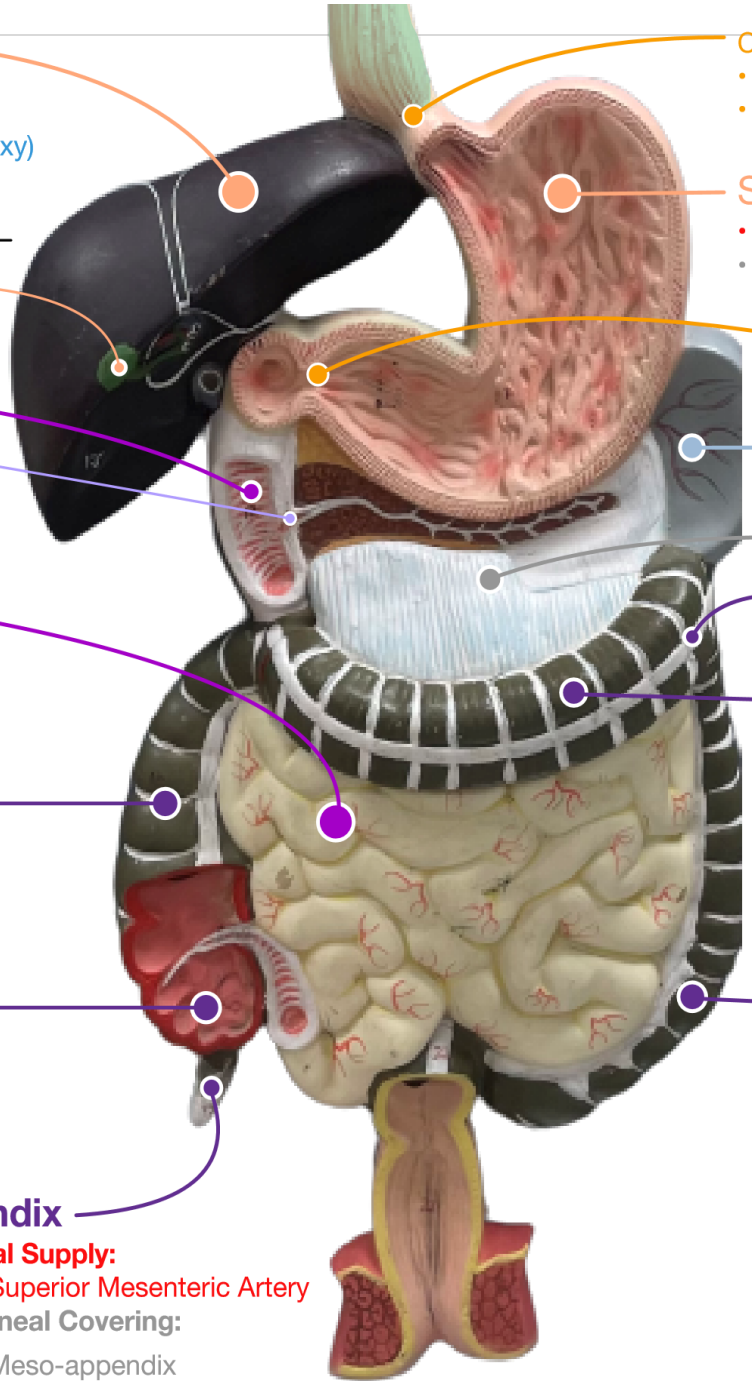
Common Hepatic duct
- **Join**: Cystic Duct
- **Form:** common bile duct

Major Pancreatic Duct
- **Termination:** 2nd of duodenum in major duodenal papilla

Common Bile Duct
- **Termination:** 2nd of duodenum in major duodenal papilla

4th of Duodenum

Superior Mesenteric Artery
- **Origin:** Lower border of L1



Liver
- **Arterial Supply:**
  - Hepatic Artery
  - portal Vein (de oxy)
- **Peritoneal covering:**
  - Ligaments

Gallbladder
- **Arterial Supply:**
  - Cystic Artery

2nd Duodenum
- **Ampulla of Vater,**
  - **opening of:**
    - Major pancreatic duct
    - Common bile duct

Small Intestine
- **Arterial Supply:**
  - Superior Mesenteric Artery
- **Peritoneal Covering:**
  - Mesentery

Ascending Colon
- **Arterial Supply:**
  - Superior Mesenteric Artery
- **Peritoneum Covering**
  - Cover Front and sides

Caecum
- **Arterial Supply:**
  - Superior Mesenteric Artery
- **Peritoneum Covering**
  - Covered completely

Appendix
- **Arterial Supply:**
  - Superior Mesenteric Artery
- **Peritoneal Covering:**
  - Meso-appendix

Cardiac Inlet
- Physiological Sphincter
- At level T11

Stomach
- **Arterial Supply:** Celiac Trunk
- **Peritoneal Covering:** Omentum

Pyloric Inlet
- True Sphincter
- At lower border of L1

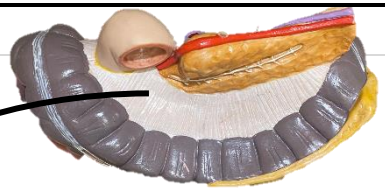
Spleen

Transverse Meso-Colon

Taenia Coli

Transverse Colon
- **Arterial Supply**
  - **Right 2/3:** Superior Mesenteric
  - **Left 1/3:** Inferior Mesenteric
- **Peritoneal Covering** All covered
  - Transverse Meso-colon

Descending Colon
- **Arterial supply:**
  - Inferior Mesenteric Artery
- **Venous Drainage:**
  - Inferior Mesenteric Vein
- **Peritoneal Covering:**
  - Cover Front and Sides



Transverse Colon

Peritoneal Covering:
All covered by transverse Meso-colon

Arterial: SMA [RT 2/3] & IMA [LT 1/3]

Pancreas

Splenic A. from Celiac Trunk

Greater Omentum

Function: Store Fat

Ascending Colon

Peritoneal Covering:
Cover Front and sides

Arterial: SMA

Caecum

Peritoneal Covering:
Covered completely

Arterial: SMA

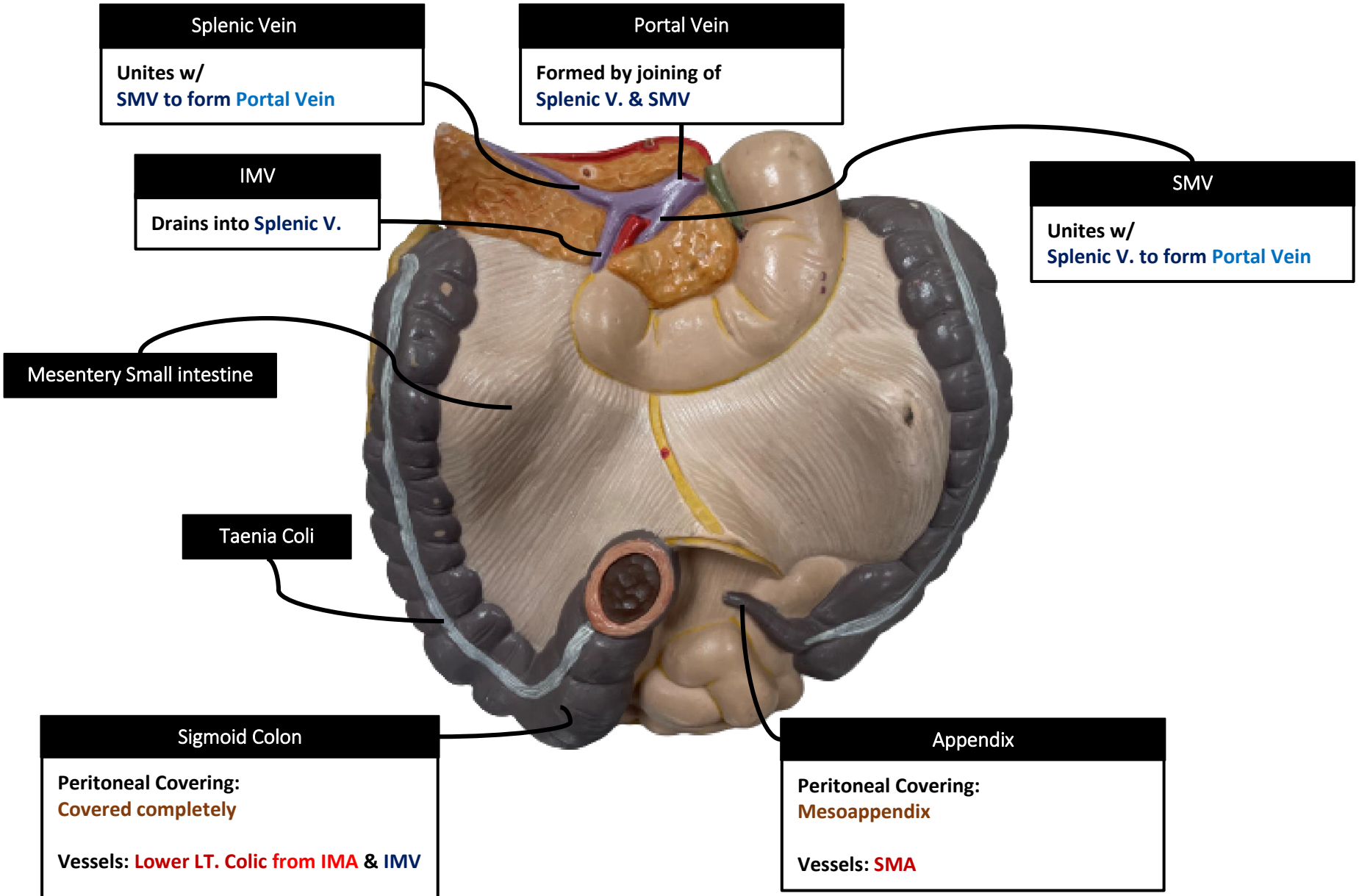
Descending Colon

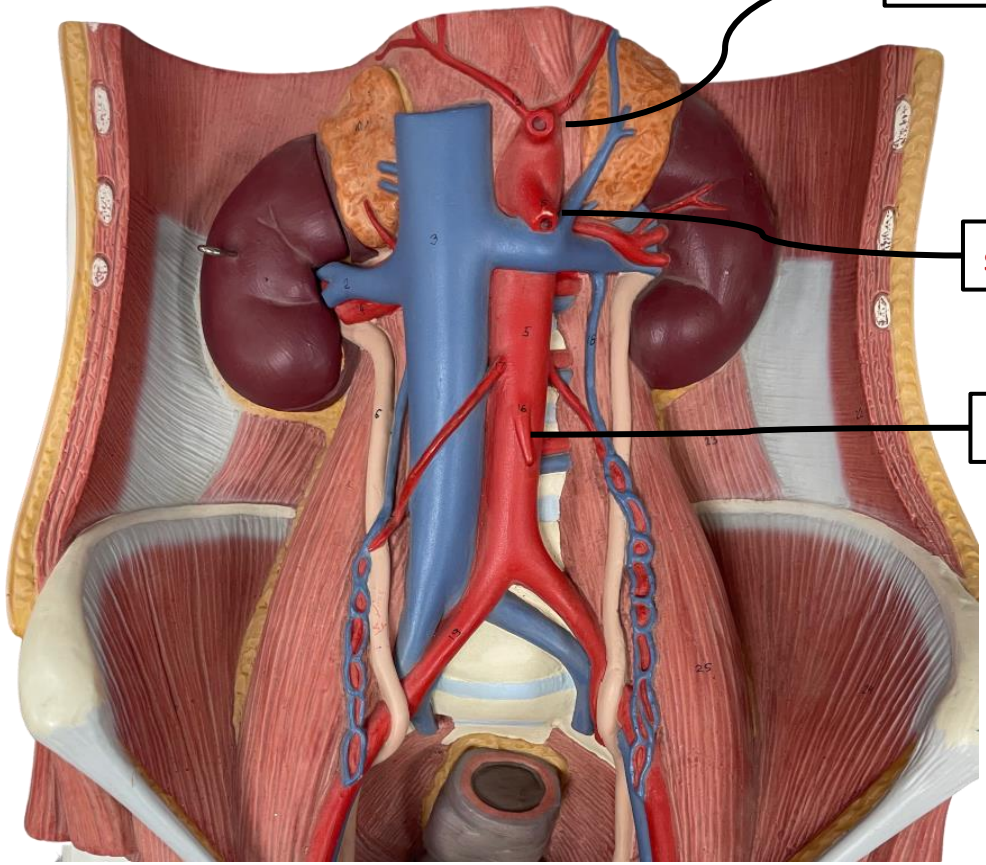
Peritoneal Covering:
Cover Front and sides

Vessels: IMA & IMV

Small Intestine

Peritoneal Covering: Mesentery
Arterial: SMA


Splenic Vein
Unites w/
SMV to form Portal Vein
Portal Vein
Formed by joining of
Splenic V. & SMV
IMV
Drains into Splenic V.
SMV
Unites w/
Splenic V. to form Portal Vein
Mesentery Small intestine
Taenia Coli
Sigmoid Colon
Peritoneal Covering:
Covered completely
Vessels: Lower LT. Colic from IMA & IMV
Appendix
Peritoneal Covering:
Mesoappendix
Vessels: SMA



Celiac Trunk from Abdominal Aorta (Upper L1)

SMA from Abdominal Aorta (Lower L1)

IMA from Abdominal Aorta (L3)

Inguinal Canal

Content:
Male:
Spermatic cord &
ilioinguinal Nerve

Female:
Round Ligament &
ilioinguinal Nerve

Rectum

Peritoneal covering:

Upper 1/3: front and sides
Middle 1/3: front only
Lower 1/3:no peritoneal covering

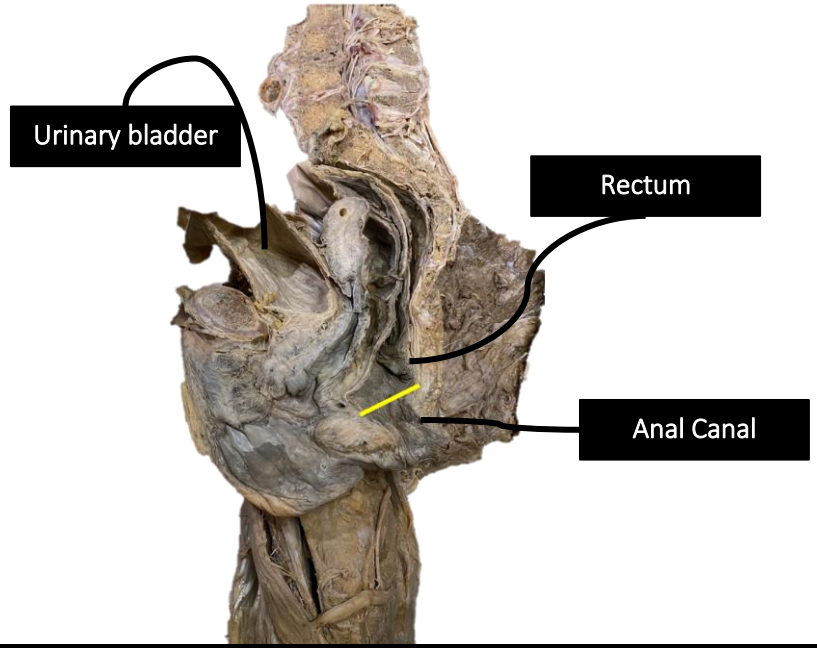
Beginning: S3 continuation of sigmoid
Termination: 1 inch below Coccyx

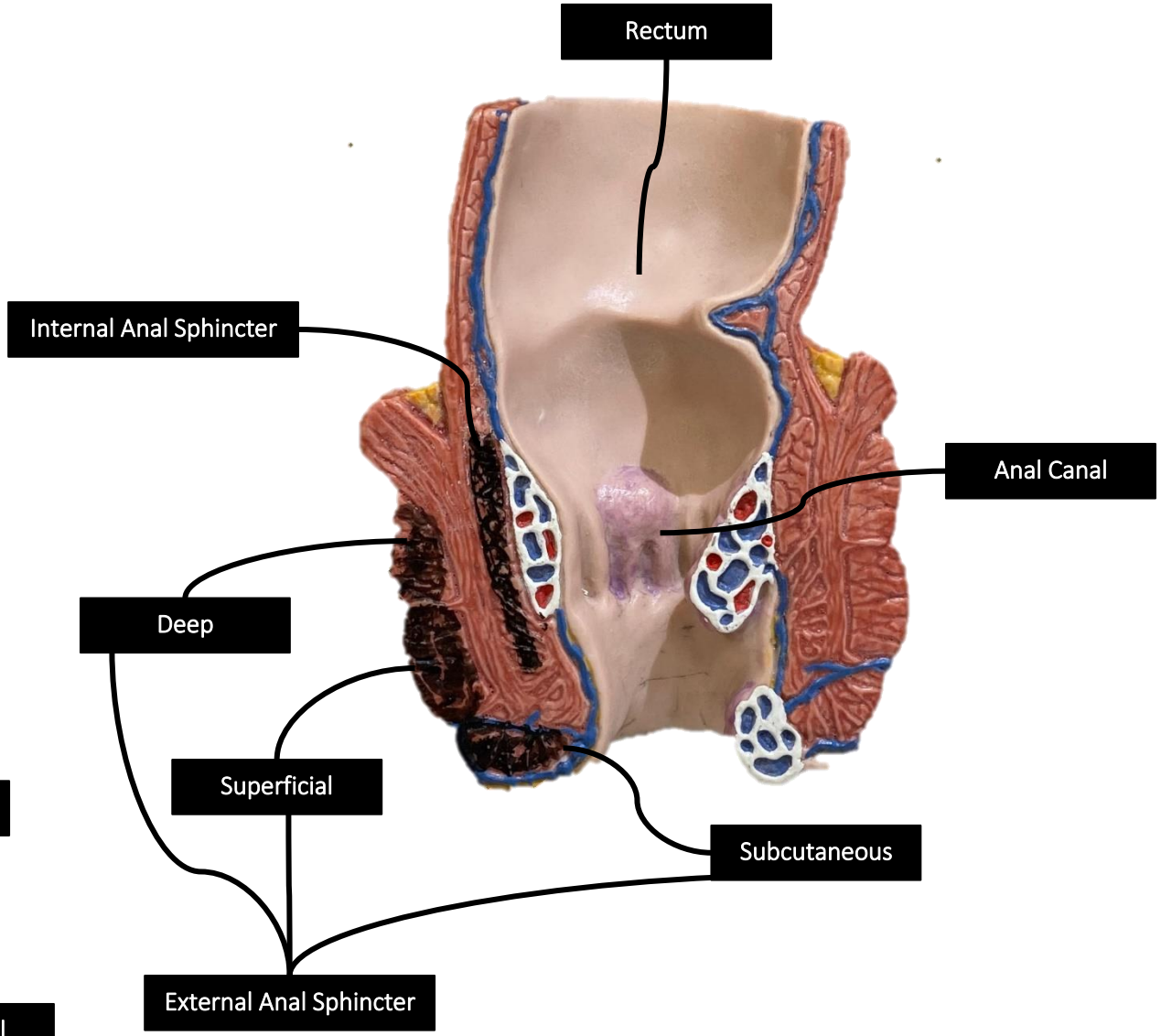
Arterial supply:

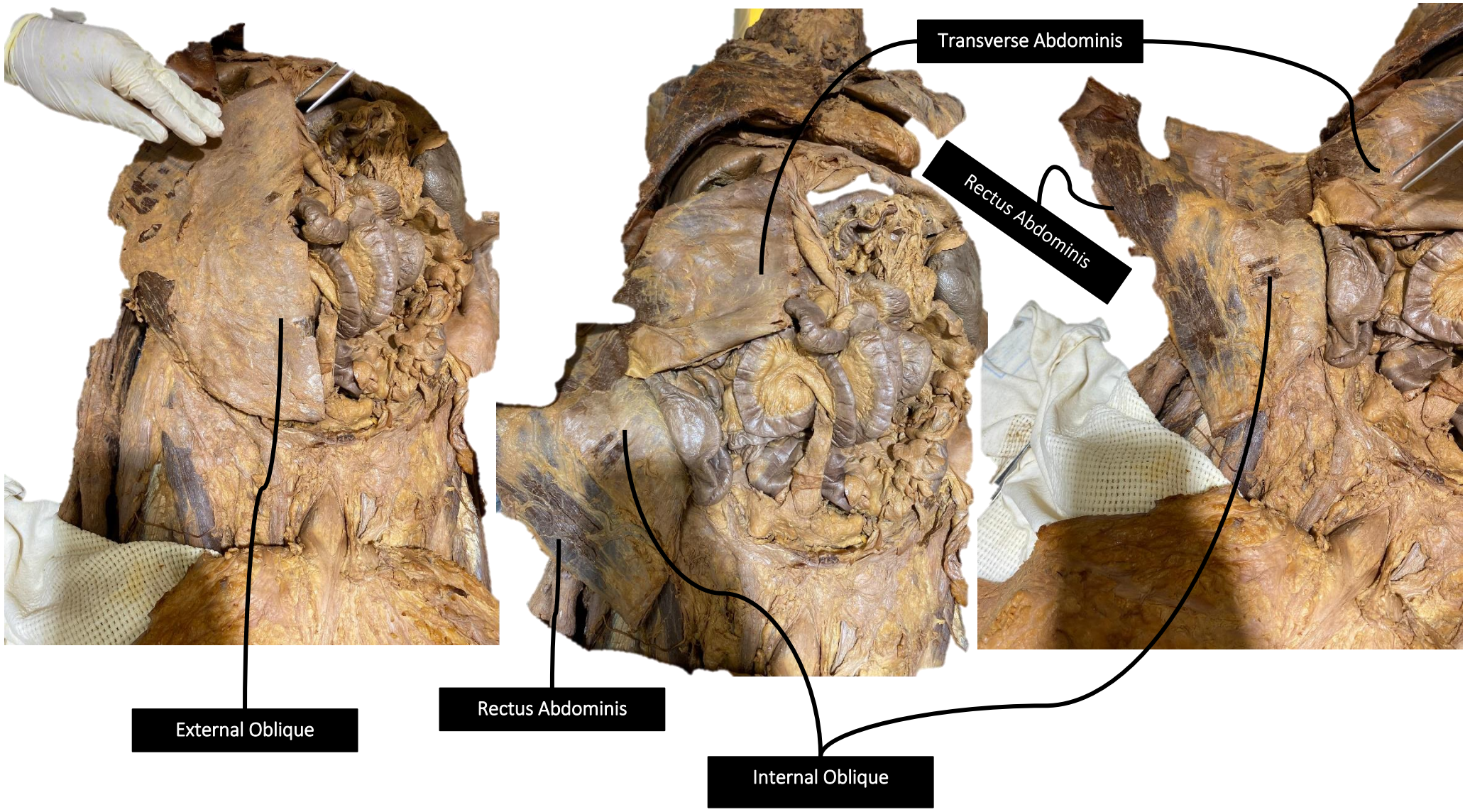
1- **Superior** Rectal A. From **IMA**

2- **Middle** Rectal A. from **Internal iliac A.**

3- **Inferior** Rectal A. from **Internal pudendal A.**

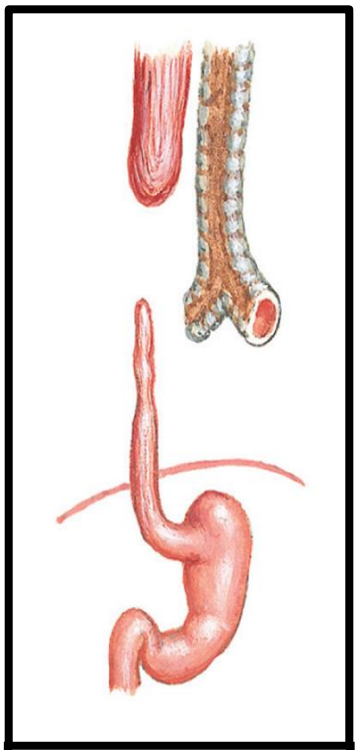




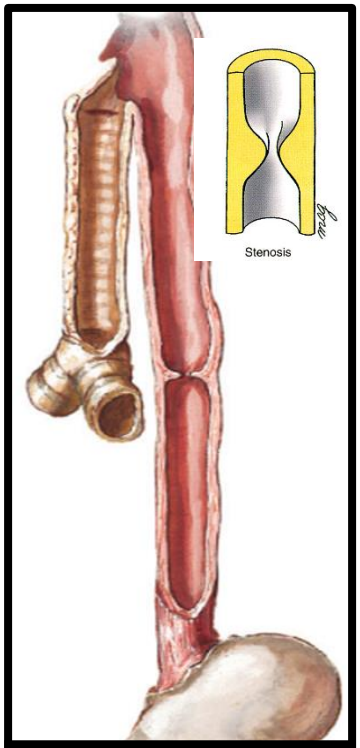

Transverse Abdominis
Rectus Abdominis
External Oblique
Rectus Abdominis
Internal Oblique

Embryology

Congenital Anomalies of Esophagus

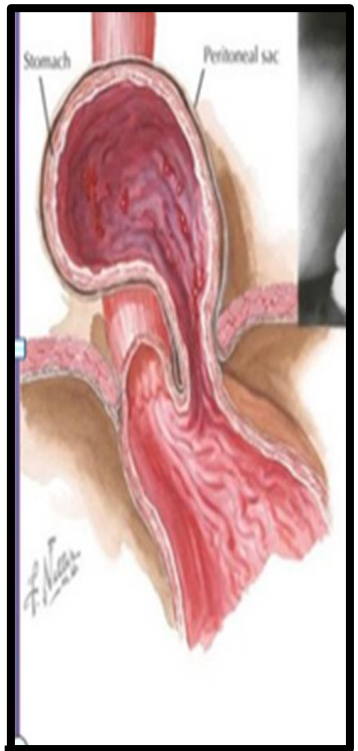


Esophageal Atresia

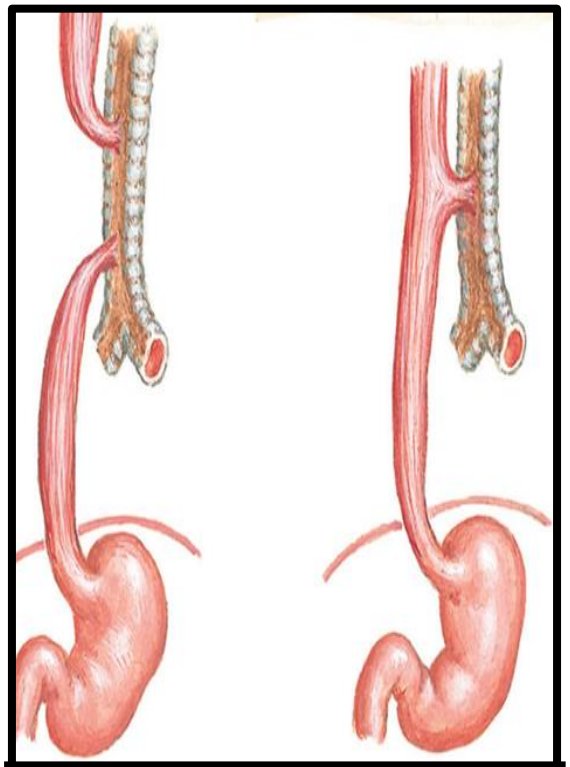


Esophageal Stenosis

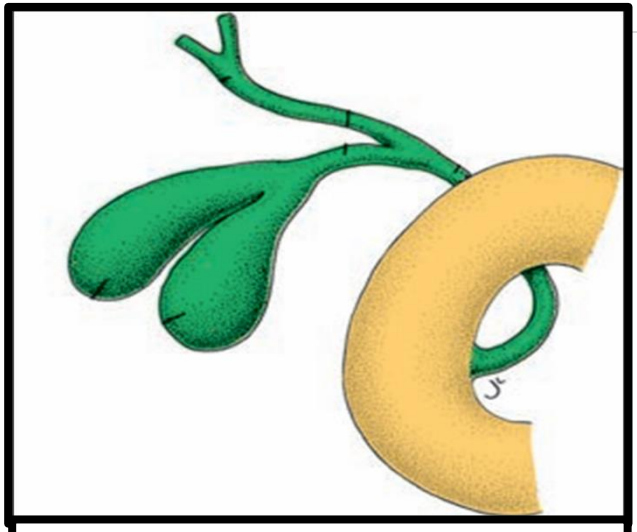
Short Esophagus



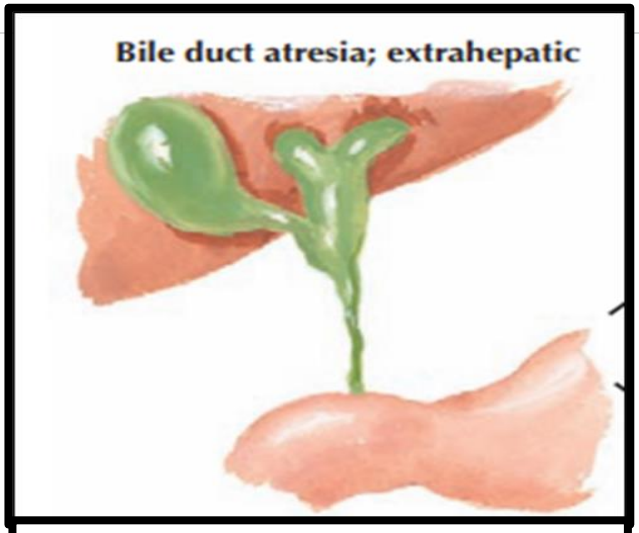
Congenital Hiatal Hernia



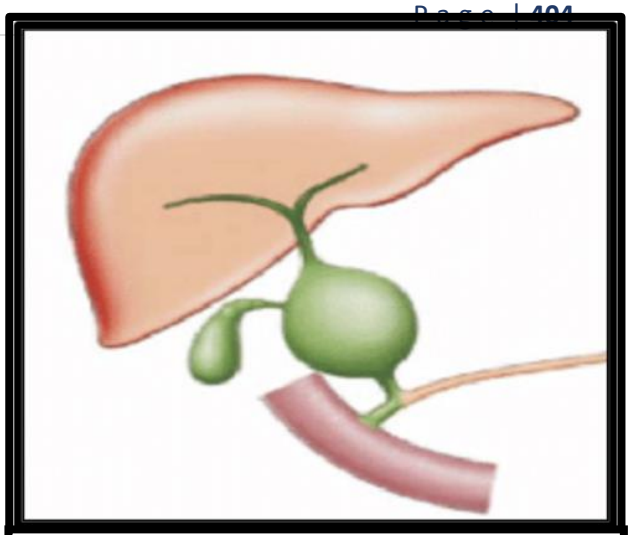
Tracheo-oesophageal fistula



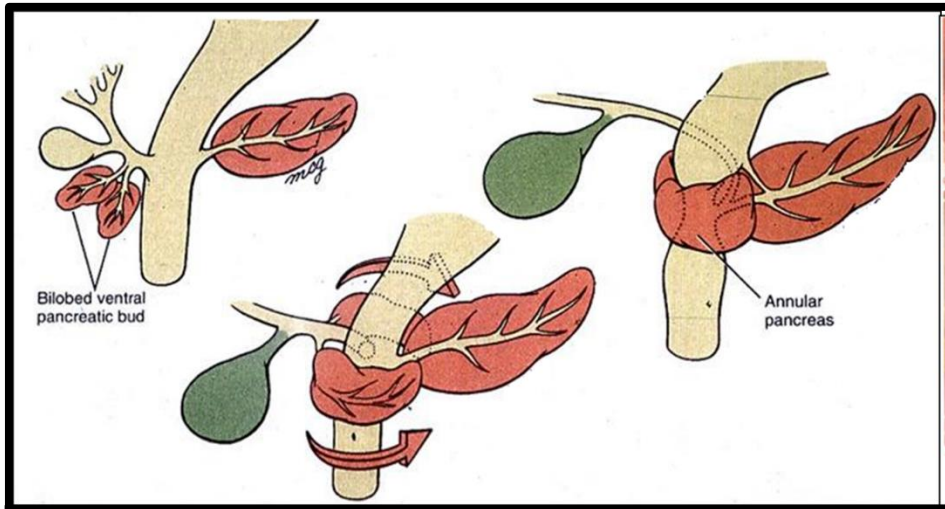
Double gall bladder & one cystic Duct

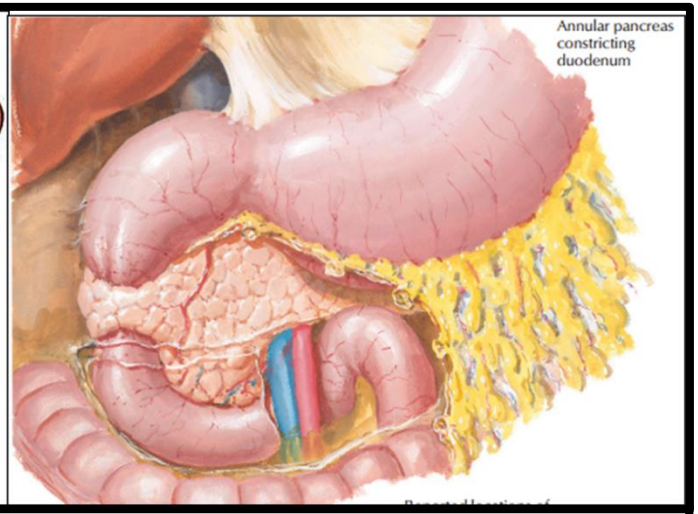


Atresia of the common bile duct



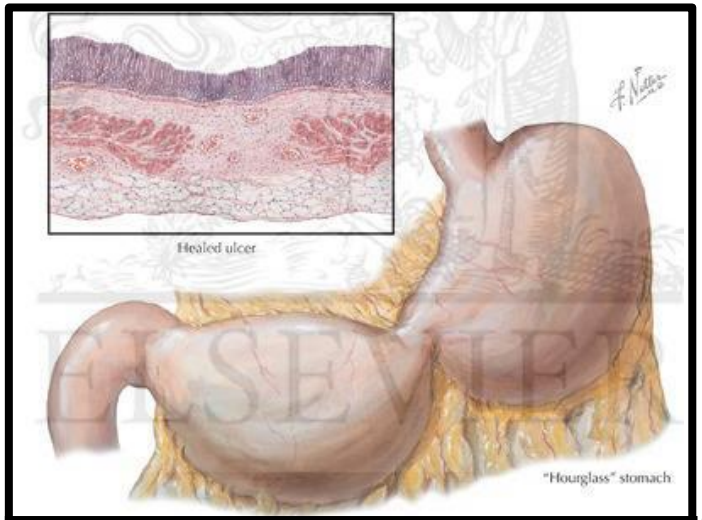
Congenital Choledochal Cyst



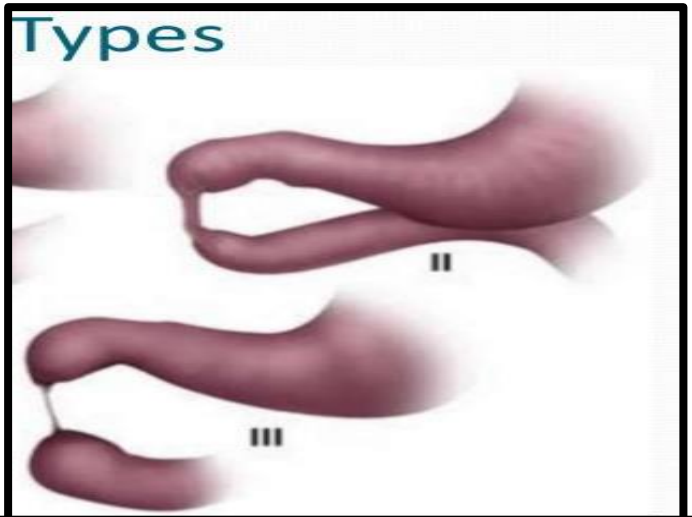


Annular Pancreas

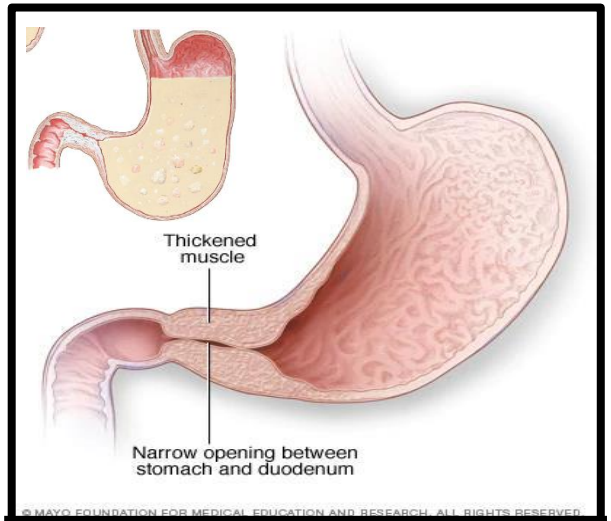
Foregut Development



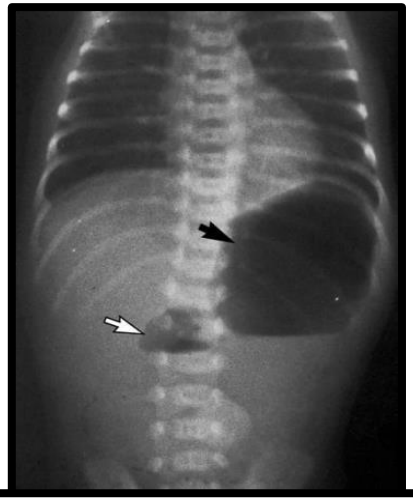
Hourglass Stomach



Duodenal Atresia



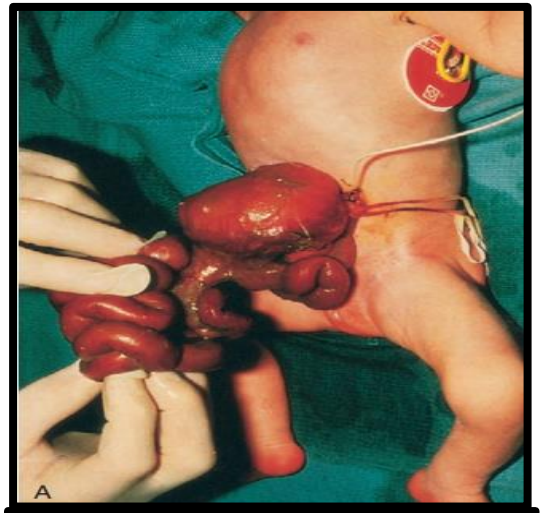
Congenital hypertrophic pyloric stenosis

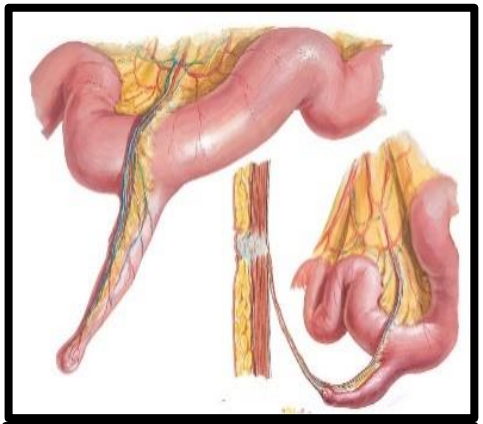


Duodenal obstruction

Lobulated Liver

Midgut Development

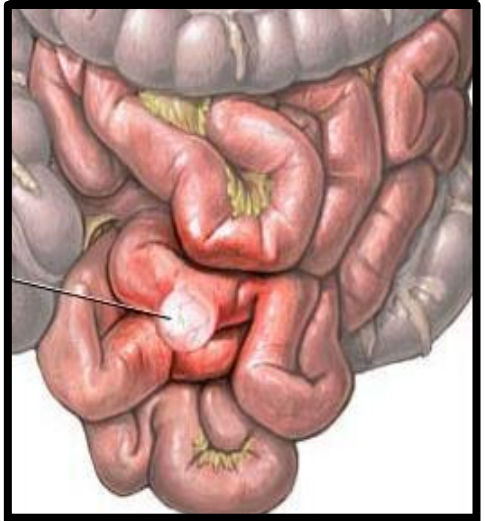




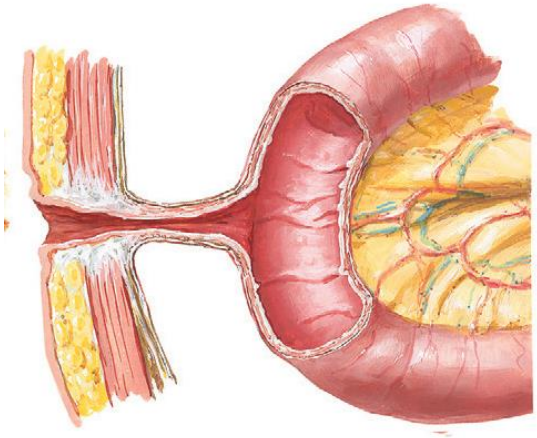
Congenital umbilical hernia

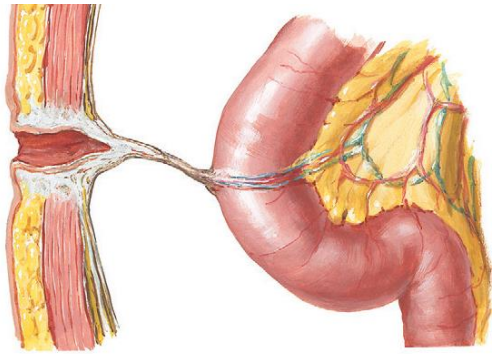
Gastroschisis

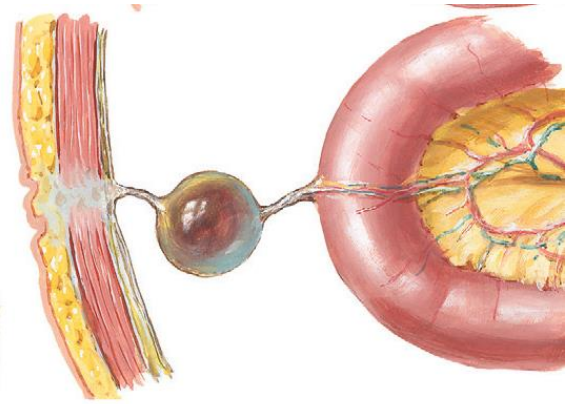
Exomphalos (omphalocele)

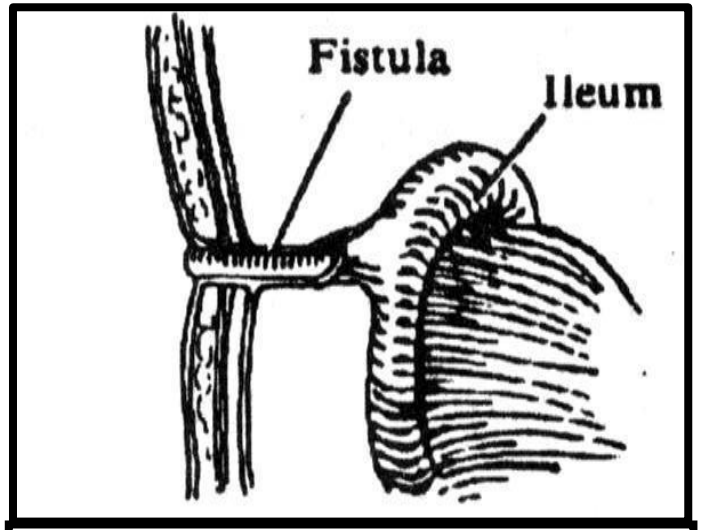


Ileal (meckle's) diverticula

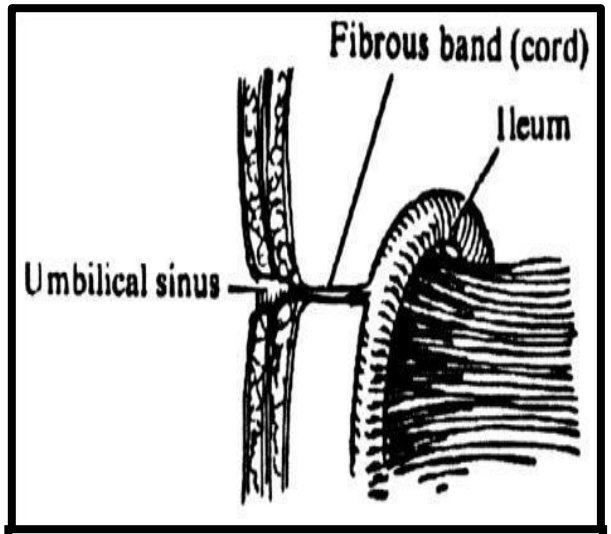




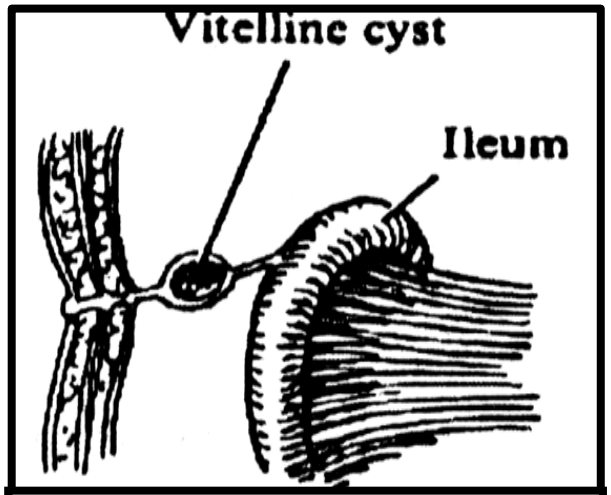




Umblico-ileal fistula (vitelline fistula)

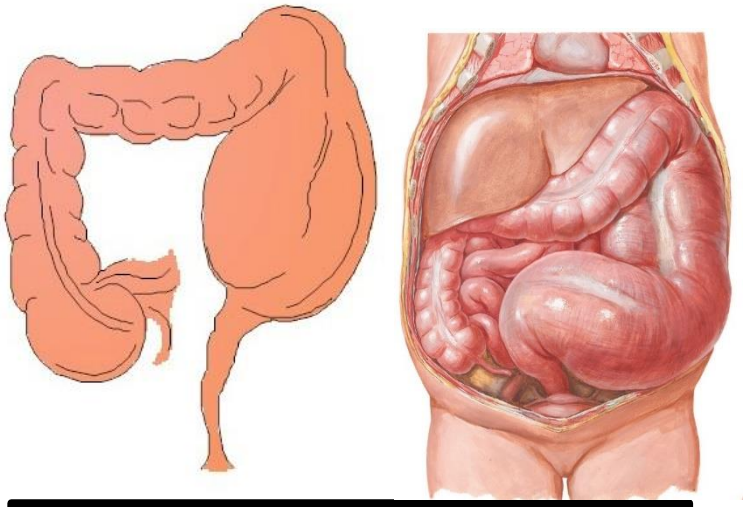


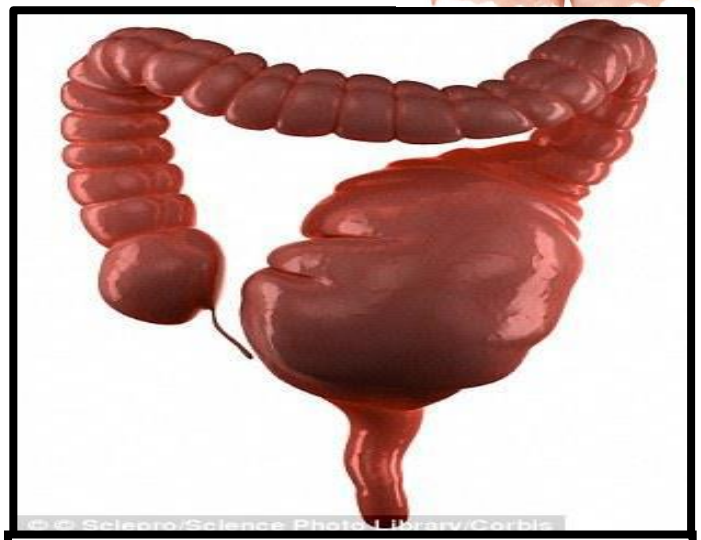
Umbilical sinus (vitelline sinus)



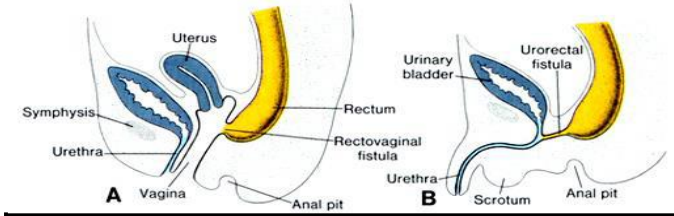
Vitelline cysts

Hindgut Development

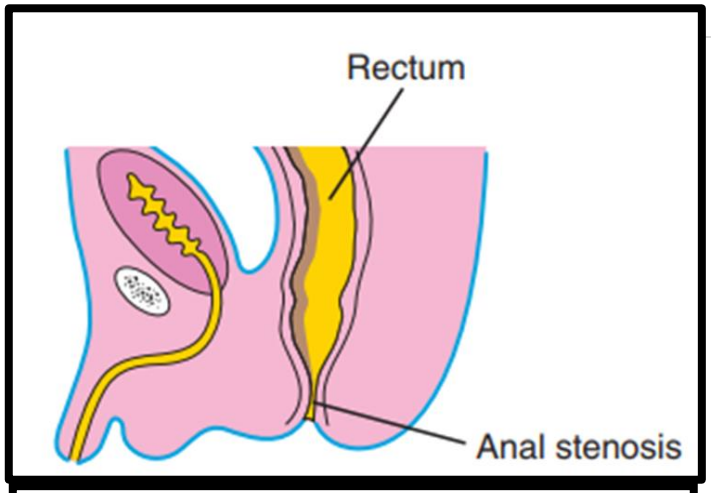




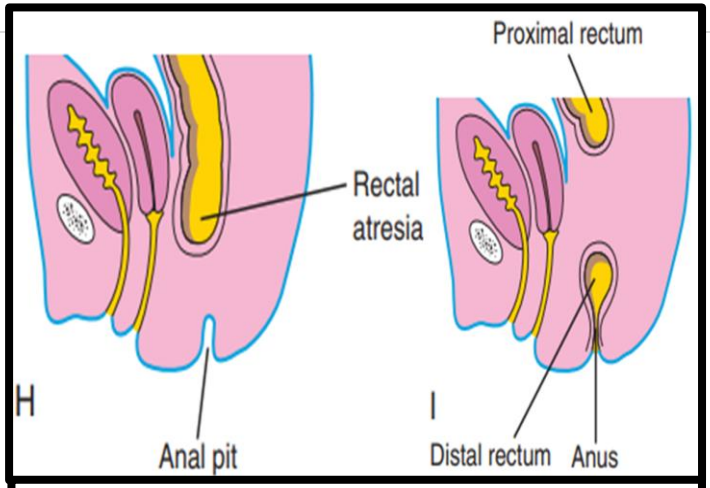
Congenital megacolon (Hirschsprung disease)



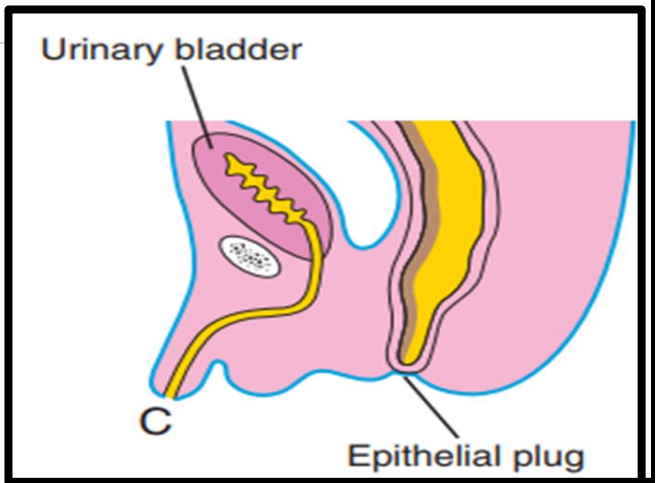
Imperforate anus



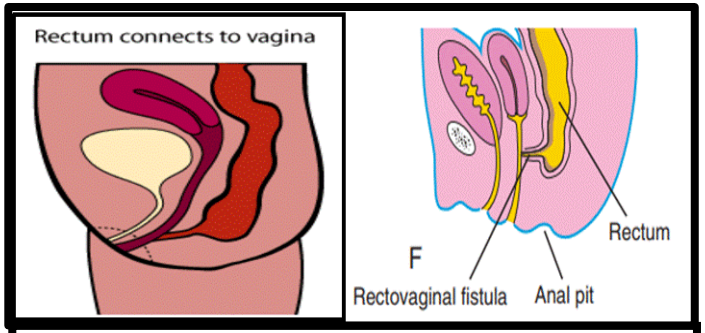
Anal Stenosis



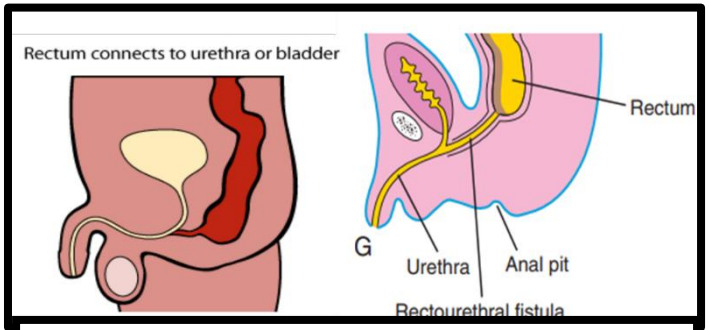
Rectal atresia



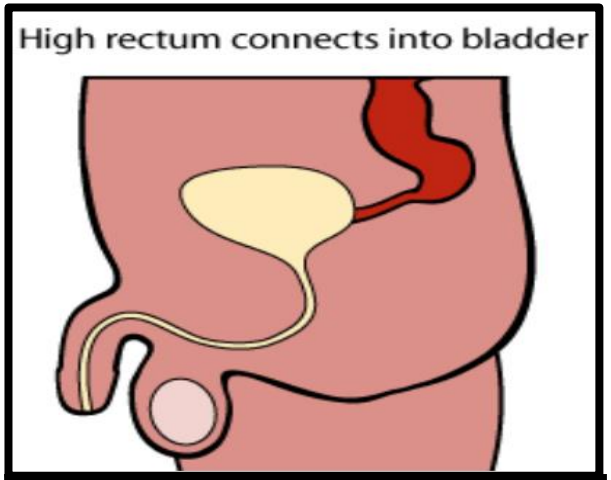
Membranous atresia of the anus:



Recto-**vaginal** fistula



Recto-**urethral** fistula

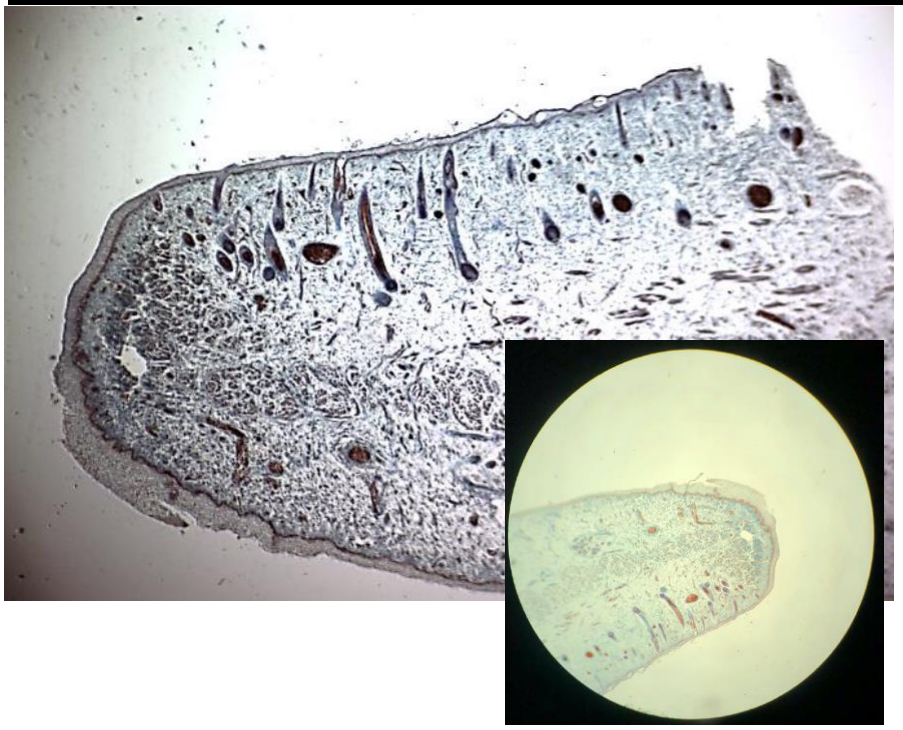


Recto-**vesical** fistula

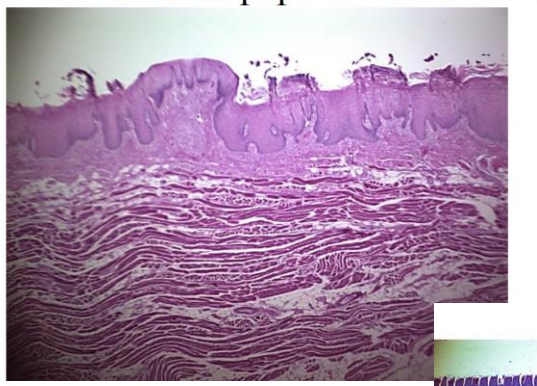
Histology

Lip & Tongue

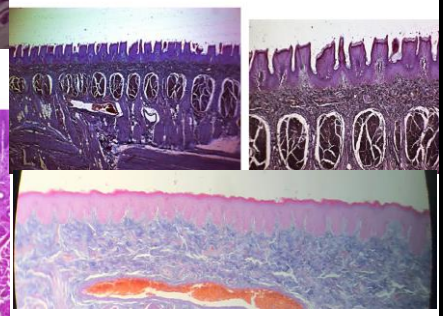
#	Lip	Tongue
1	Stratified sqamous keratinised epithelium & Stratified sqamous non keratinised epithelium	Stratified sqamous non keratinised epithelium
2	Muco-cutaneous junction	Papillae present (can mention names of papillae)
3	Hair follicles & Orbicularis oris muscle	Taste buds present or absent according to location
4	Labial glands	Striated or skeletal muscle present



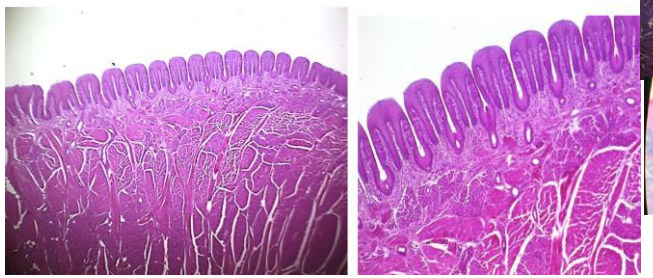
TONGUE-Filliform papillae without taste buds



TONGUE-CAT

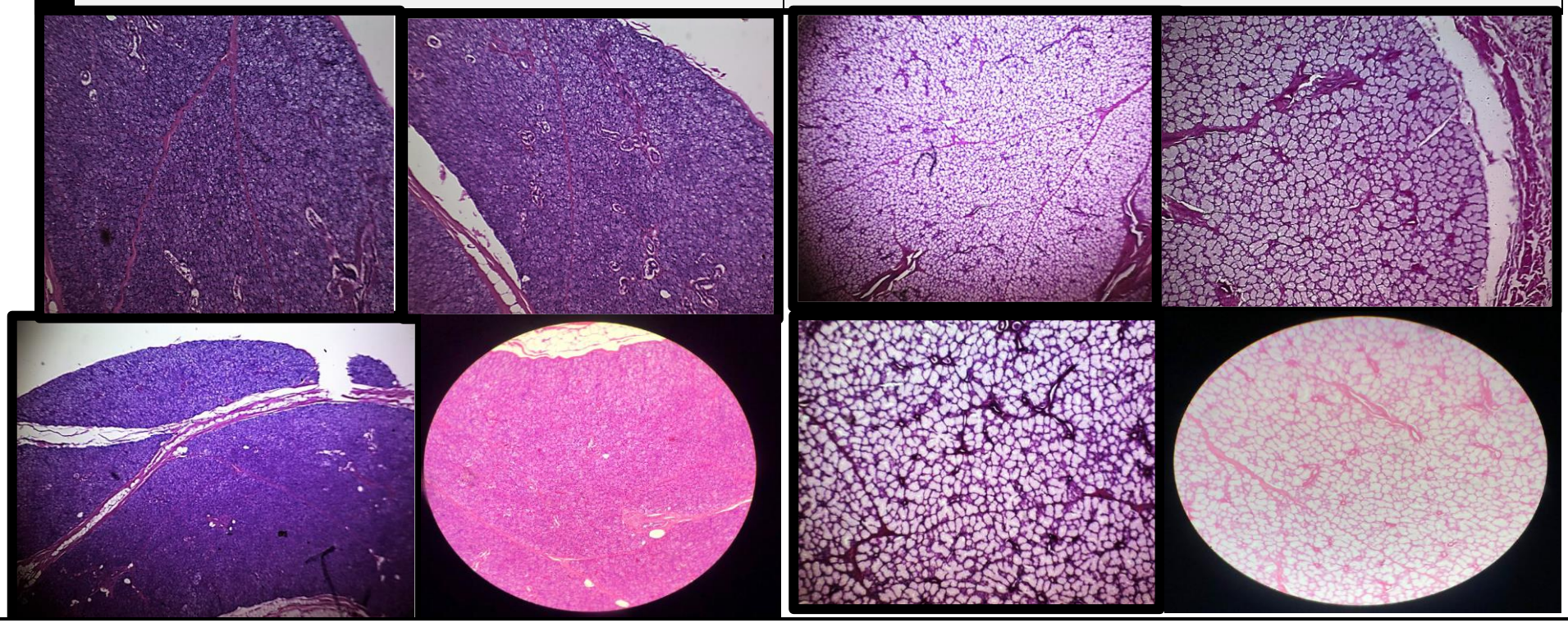


TONGUE-Foliate Papillae with taste buds



Parotid & Sublingual Gland

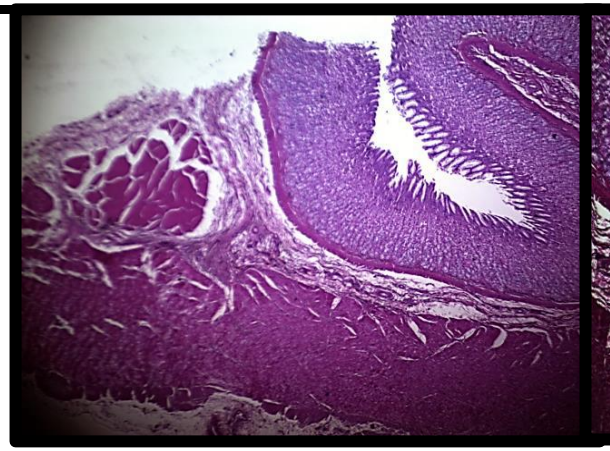
#	PAROTID GLAND	SUBLINGUAL GLAND
1	Capsule.	Capsule.
2	Lobes and Lobules	Lobes and Lobules
3	Interlobular septa	Interlobular septa
4	Serous acinii	Mucous acini & Serous demilunes
5	Ducts intercalated ,striated,interlobular	Ducts intercalated ,striated,interlobular



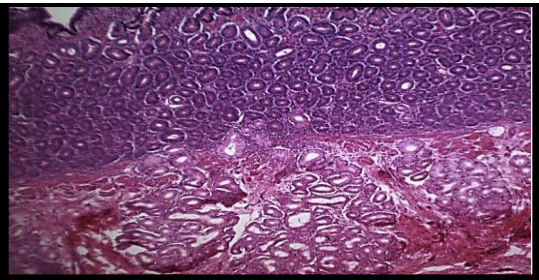
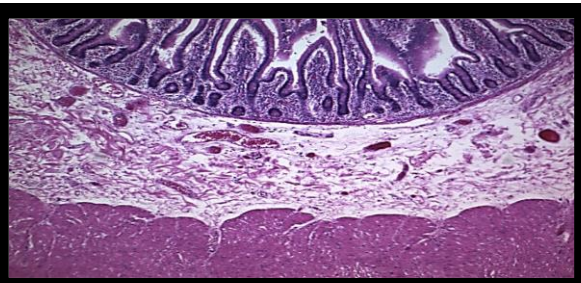
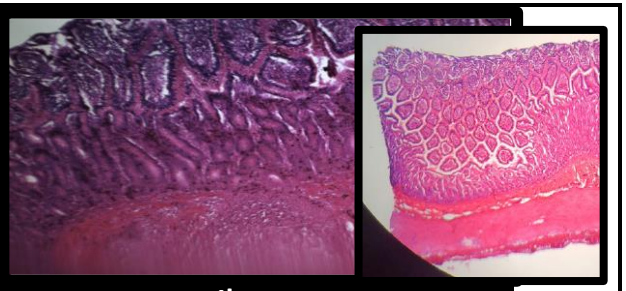
OESOPHAGUS & FUNDIC STOMACH

	Esophagus	Stomach Fundus
Mucosa	▪ Non-keratinized stratified squamous epithelium	▪ Rugae or longitudinal folds, Gastric pits ▪ Simple columnar epithelium ▪ Lamina propria -Fundic or gastric glands ▪ Chief, parietal, G-cells, Mucous cells. ▪ Muscularis mucosa
Submucosa	▪ Mucous acini of the esophageal glands ▪ Excretory ducts of esophageal glands ▪ Numerous blood vessels ▪ Meissner's plexus or submucosal plexus	▪ Numerous blood vessels ▪ Meissner's plexus or submucosal plexus
Muscularis Externa	▪ Inner circular muscular layer ▪ Connective tissue [myenteric plexus] ▪ Outer longitudinal muscular layer	▪ Internal layer is oblique ▪ Middle layer is circular ▪ External layer is longitudinal
A & S	Adventitia & Serosa	Serosa

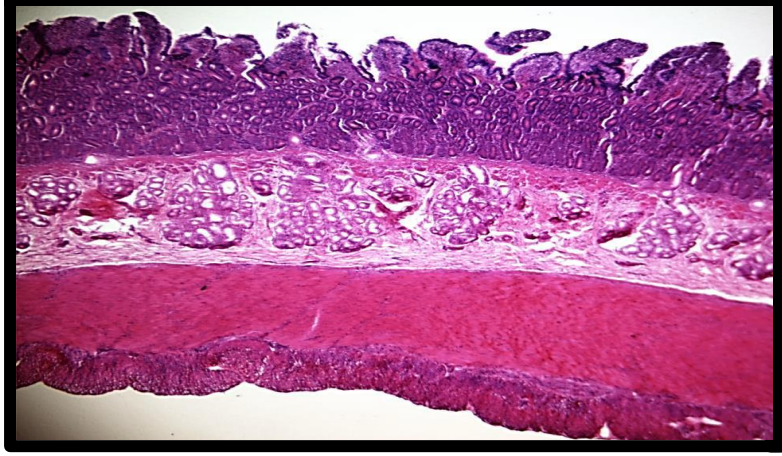
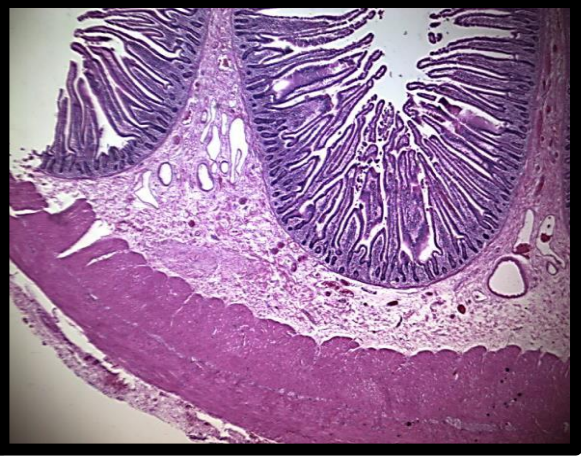





Small Intestine

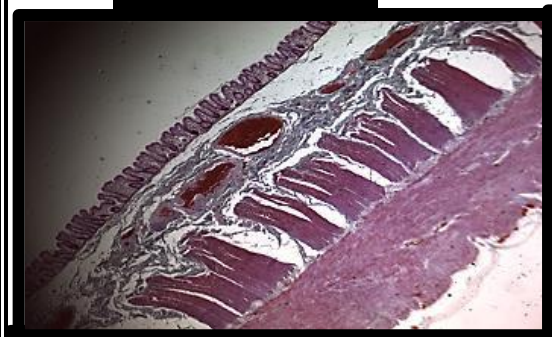




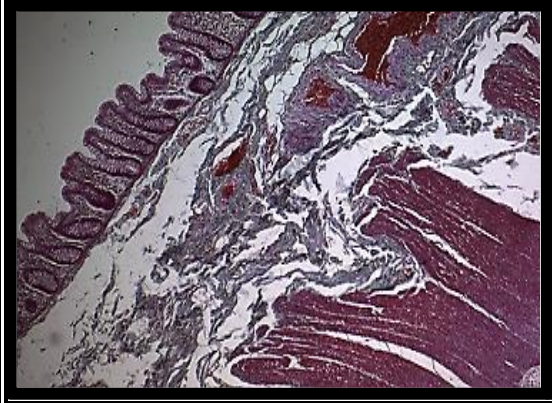
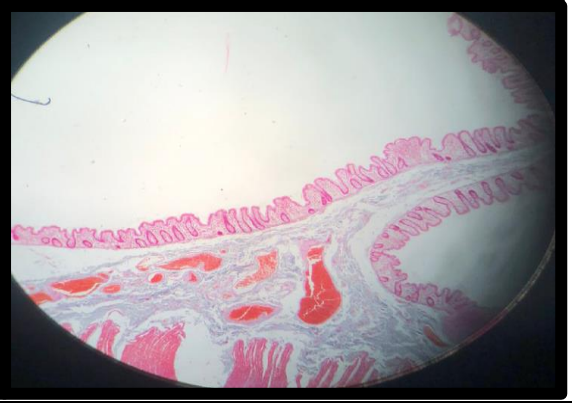
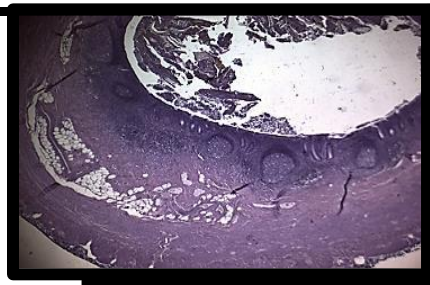
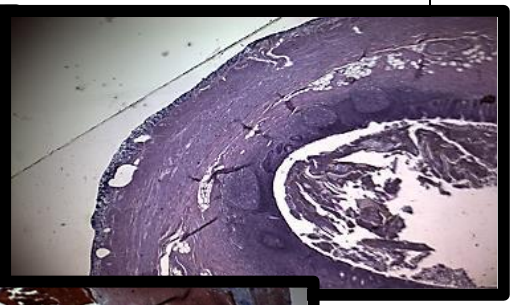
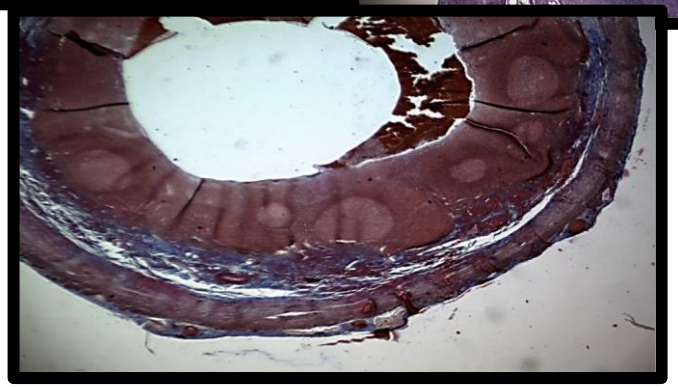
	Duodenum	Jejunum	Ileum
Mucosa	Simple columnar epithelium Villi –**leaf** shaped – Lamina Propria (Intestinal glands or Crypts of Lieberkuhun) Muscularis mucosa-continous	Simple columnar epithelium Plica circularis Villi –**finger** shaped Lamina Propria (Lymphatic nodule) Muscularis mucosa (Paneth cells)-continous	Simple columnar epithelium Villi –club shaped Lamina Propria (Lymphatic nodule-**Peyer's patches**) Muscularis mucosa-interrupted
Submucosa	Duodenal (Brunner's)Gland	Forms core of Plica circularis	Peyer's patches
Muscularis Externa	Muscularis externa	▪ Inner circular muscular layer ▪ Connective tissue containing myenteric plexus ▪ Outer longitudinal muscular layer	▪ Inner circular muscular layer ▪ Connective tissue containing myenteric plexus ▪ Outer longitudinal muscular layer
A & S	**Serosa**-Retroperitoneal part has adventitia rest is covered by serosa	**Serosa**	**Serosa**


Colon & Appendix

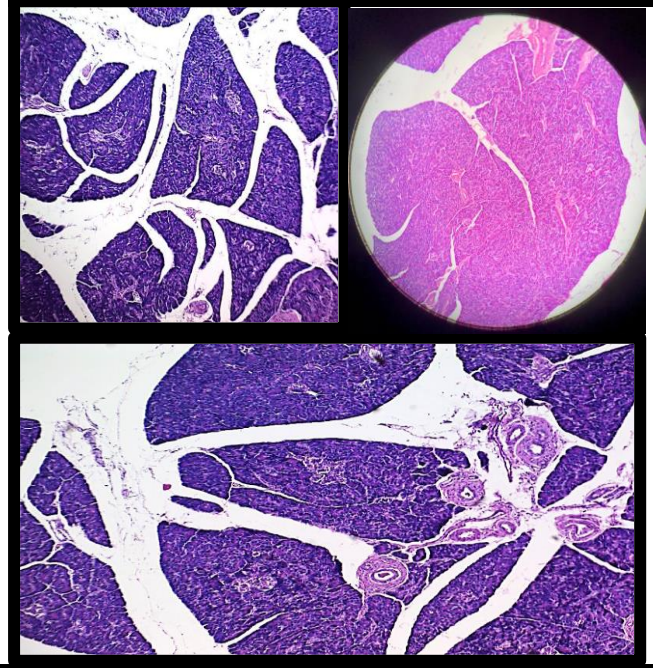
	Colon	Appendix
Mucosa	• Simple columnar epithelium • Lamina Propria • Muscularis mucosa • Absence of villi and Plicae circularis	▪ Simple columnar epithelium (numerous goblet cells) ▪ Lamina Propria (Diffuse lymphatic tissue) ▪ Muscularis mucosa
Submucosa	Submucosa	Submucosa
Muscularis Externa	Muscularis externa (Outer longitudinal layer forms Tenia coli)	Muscularis externa (No Tenia coli)
A & S	Serosa	Serosa

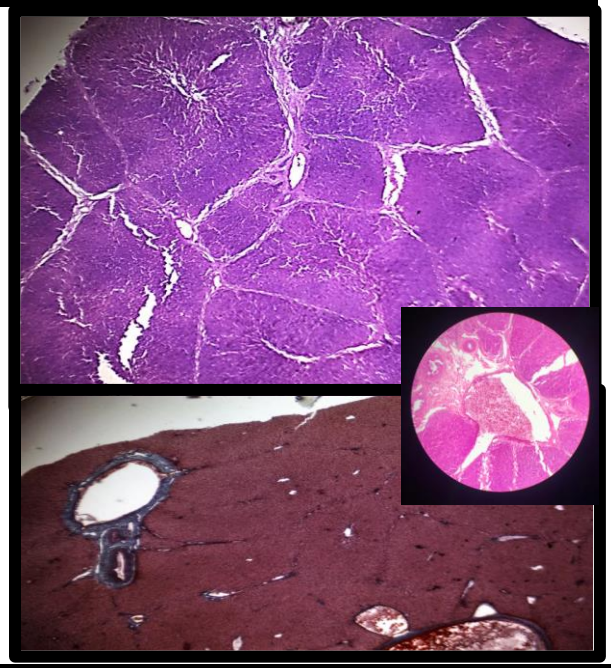


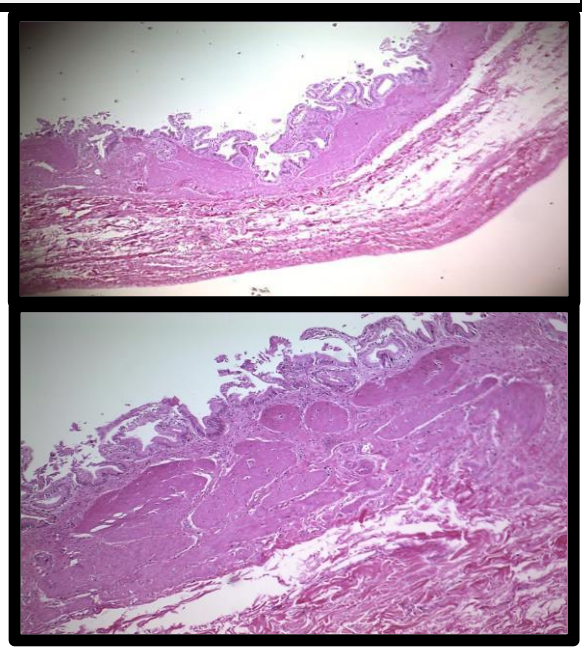






Pancreas, Liver & Gallbladder

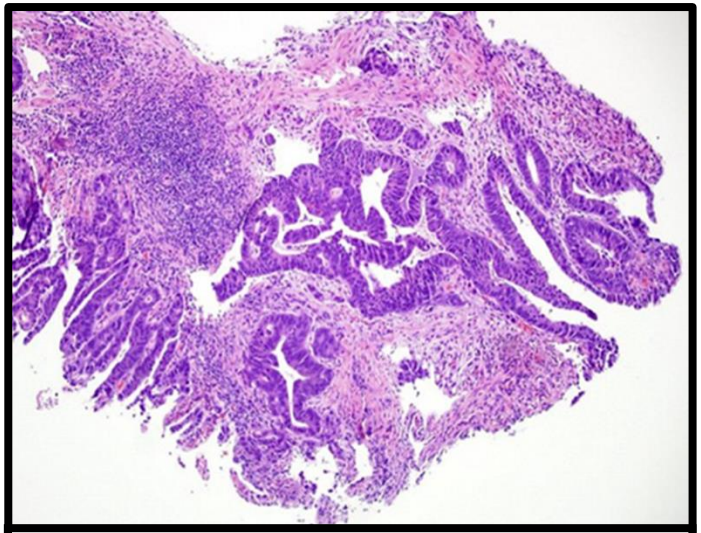
#	Pancreas	Liver	Gallbladder
1	Capsule & Lobes and Lobules	Capsule & Liver Lobules	**Mucosa:** The mucosa has abundant folds (diverticuli) Simple columnar epithelium Lamina Propria
2	Interlobular septa	**Hepatocytes-forming hepatic plates** **&** Sinusoids-between hepatic plates	**Muscularis(Externa)** Randomly arranged smooth muscle fibers
3	Serous acini Ducts intercalated ,striated,interlobular	Central Vein & Portal Triad	**Adventitia or Serosa** The wall of the gall bladder does not contain muscularis mucosae or submucosa
4	islets of Langerhans & Centroacinar cells	Kupffer Cells	





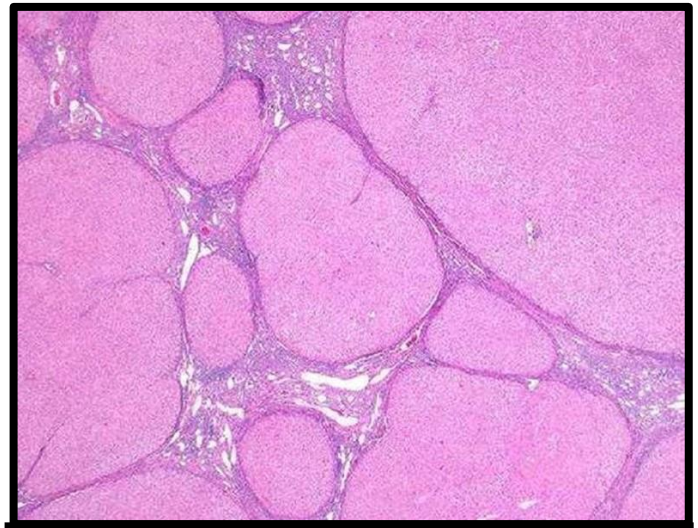


Pathology



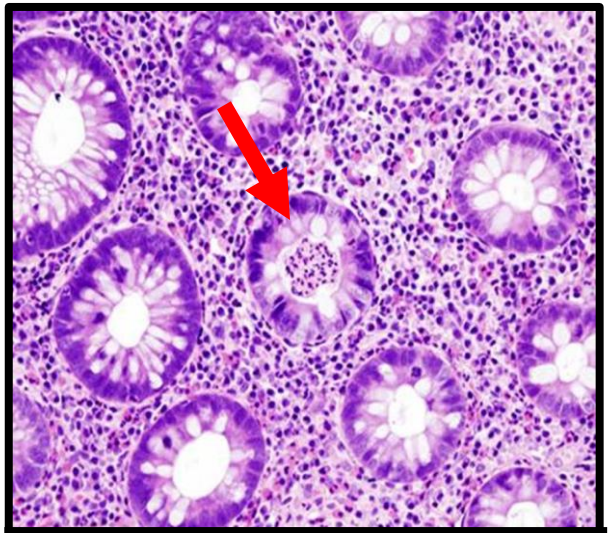
A 60-year-old man presented with melena and weight loss. Upper GI endoscopic biopsy was taken from a gastric lesion.
Write the diagnosis

Gastric Adenocarcinoma Intestinal Type



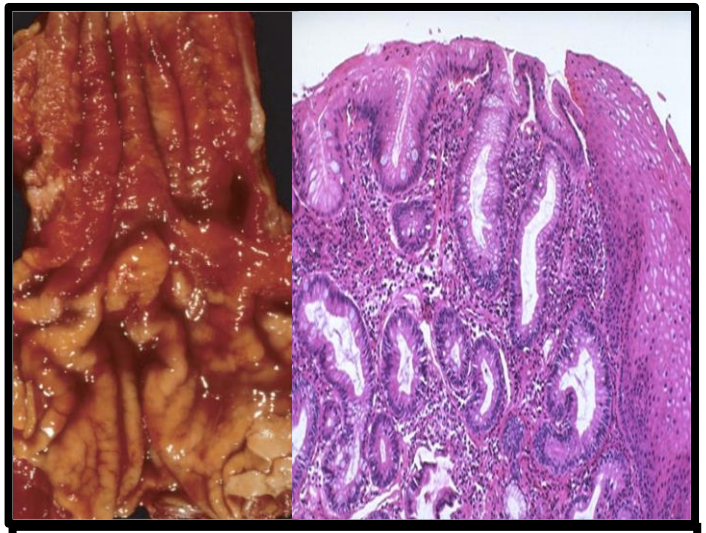
Mention the diagnosis of the liver biopsy in a case of liver cell failure.

Cirrhosis



Name the microscopic feature marked by an arrow in a colonic biopsy from a case of ulcerative colitis.

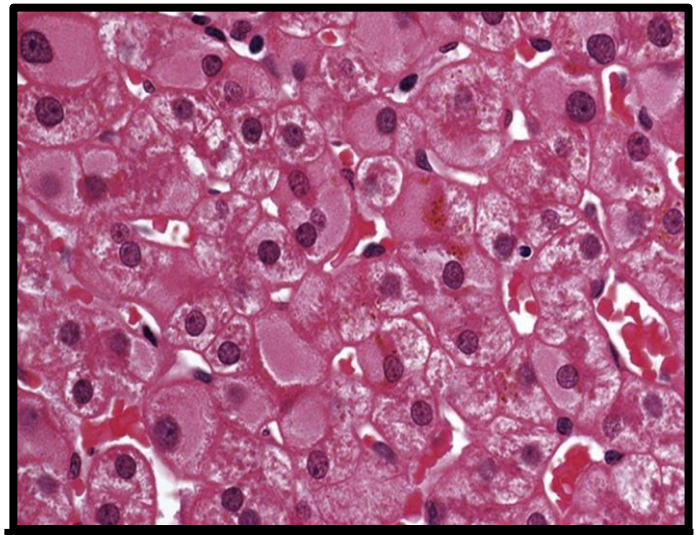
Crypt Abscess



A 60-year-old man with history of GERD underwent upper GI endoscopy. Following are the Gross and histomorphological features of lower esophagus.

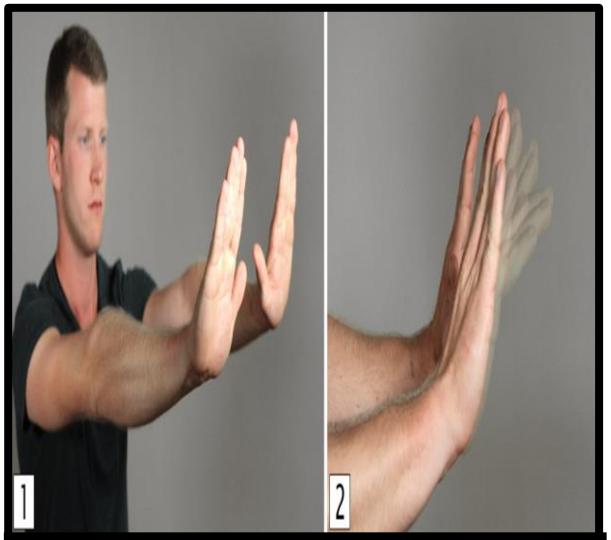
Write the diagnosis.

Barret's Esophagus



A case of chronic hepatitis B viral infection . Write the characteristic microscopic feature observed in the cytoplasm of hepatocytes.

Ground Glass Appearance



1- Write the name of this clinical sign in a patient with decompensated cirrhosis

Asterixis

2- what is the underlying etiology of sign

Hepatic Encephalopathy due to Hyperammonemia in liver cell failure

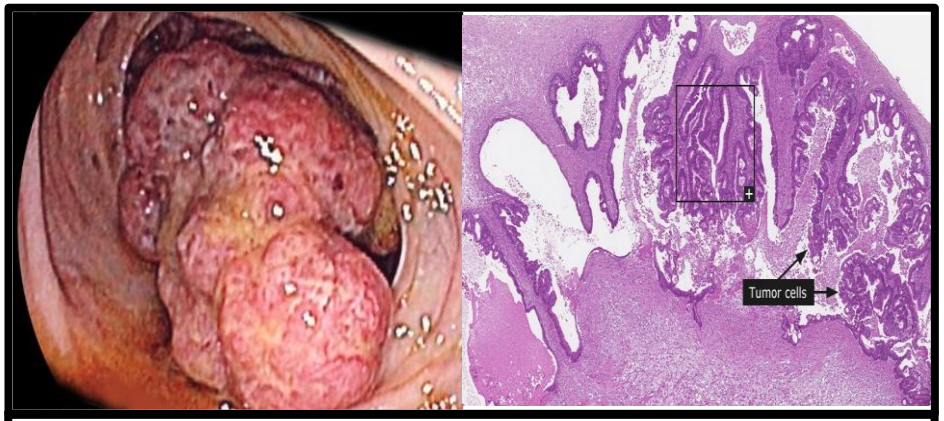
1- Write the name of this clinical sign in a patient with decompensated cirrhosis

Spider Angioma

2- what is the underlying etiology of this sign

Hormone disturbance ~ Increase Estrogen

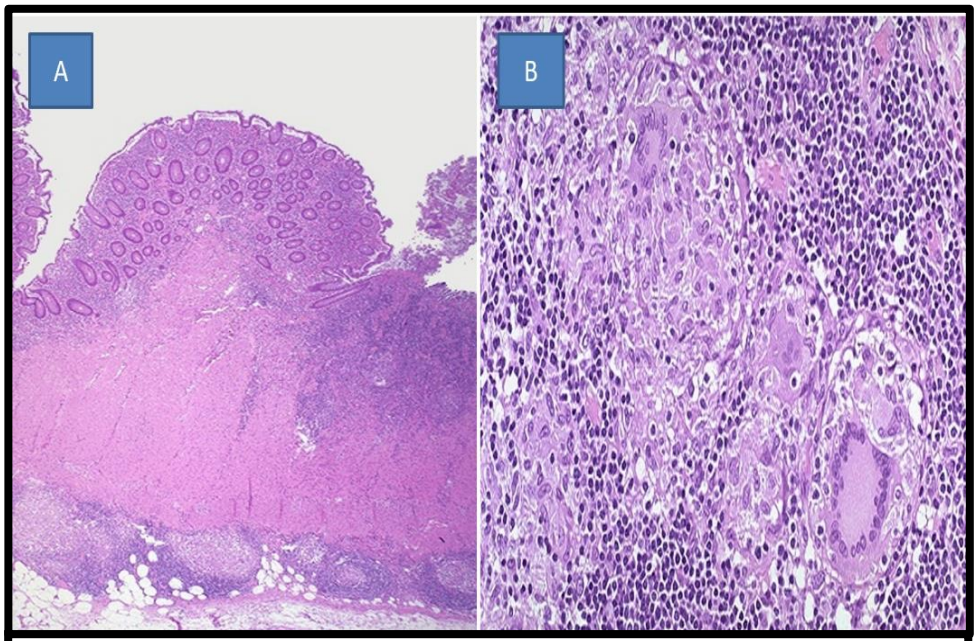
due to Liver Failure



60-year-old man presented with intermittent bleeding per rectum. Following are the histomorphological features.

Write the diagnosis.

Adenocarcinoma of Colon

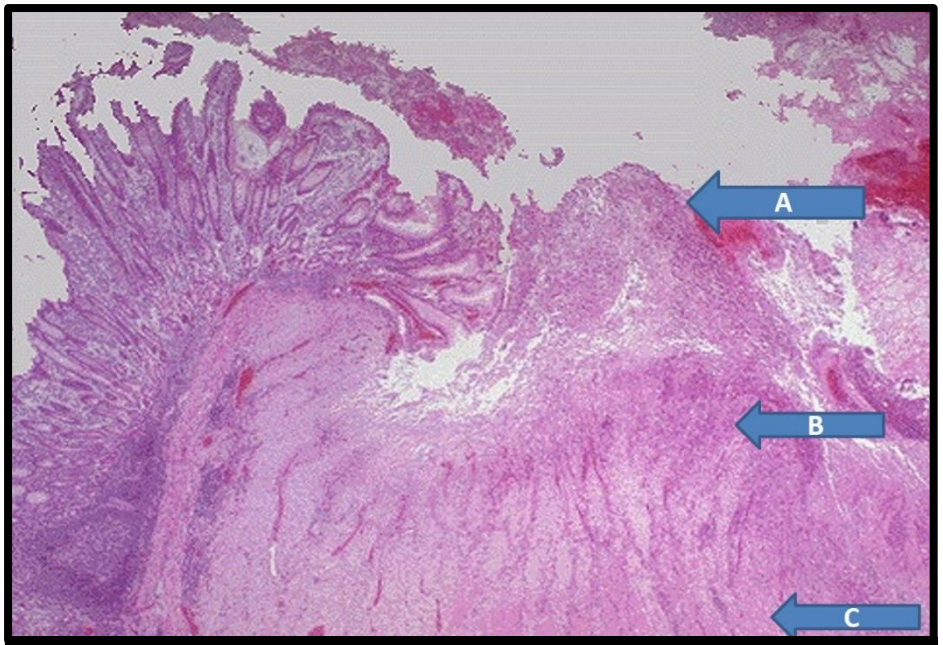


A 30-year-old man, presented with repeated attacks of watery diarrhea and pain in the abdomen. Biopsy of the intestine revealed following features.

1. Write the microscopic features observed in image A and B.

A- Transmural Inflammation | B- Non Caseating Granuloma

2. Write the diagnosis? Crohn Disease



Identify the microscopic layers marked A, B and C in the image of a peptic ulcer.

A: Necrotic Debris

B: Inflammatory Cells

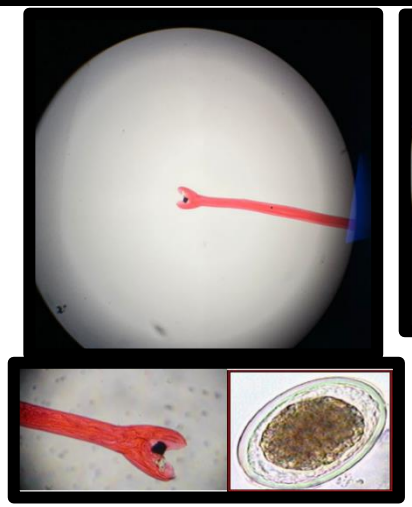
C: Granulation Tissue

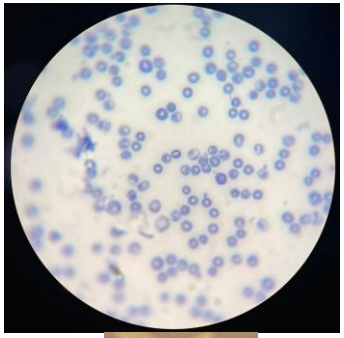
Microbiology

Parasites

Micro I.D.	Ancylostoma Duodenale	Enterobius Vermicularis [Pin Worm]	Ascaris Lumbricoides	Taenia Saginata [Beef tapeworm]	Plasmodium Species P. Falciparum
Class	**Nematode**	**Nematode**	**Nematode**	**Cestodes**	**Sporozoa**
Stage	**Infective Stage:** 2-8 cell stage ova	**Infective Stage:** Egg **Diagnostic Stage:** D-shaped Egg	**Infective Stage:** Embryonated Ova **Diagnostic Stage:** Double Membrane Ova	**Diagnostic Stage:** Ova or Gravid Segment	**Diagnostic Stage:** Ring stage inside RBC[s]
Disease	Invasive enteritis w/ Anemia	Anal itching in children	Invasive enteritis w/ Intestinal & Biliary obstruction	Diarrheal illness w/ Obstruction	Hepatitis w/ Hemolytic Anemia
Habitat	//////////////////////////	Caecum / Large Intestine	Small intestine & Bile ducts	Transmitted w/ Ingestion of pork meat	//////////////////////
Treatment	//////////////////////////	**Mebendazole**	**Mebendazole**	//////////////////////////	//////////////////////

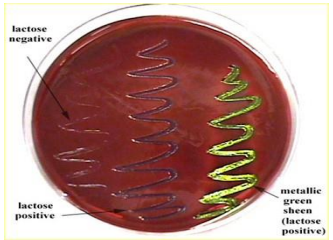


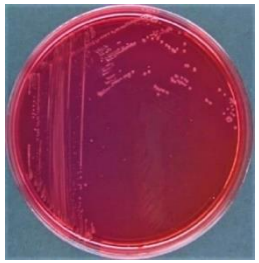


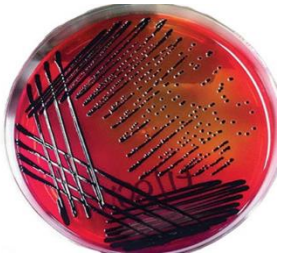


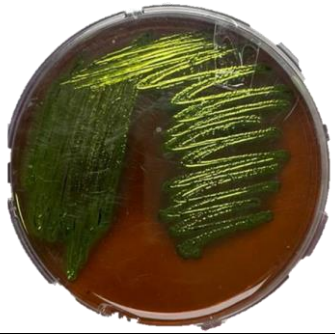

XLD Media Indications

	Lactose Fermenter colonies on XLD	Non-Lactose Fermenter colonies on XLD	Non-lactose fermenter colonies on XLD w/ Black Colonies
Suspected Microbe	**E.coli** Also indicated on **Metalic Green Sheen on EMB Agar**	**Shigella**	**Salmonella**
Confirmatory Tests	1. **Serotyping by:** **Anti-O157:H7 Positive RXN** 2. **API20 E System**	// // // //	1. **Serotyping by:** **Salmonella Polyvalent reagent Positive RXN** 2. **API20 E System**
Disease	A. **Bloody Diarrhea**: **EHEC** (**O157:57**) B. **Water Diarrhea**: **ETEC**	A. Bloody-mucoid Diarrhea or B. Bacillary Dysentery	1. **Invasive Enteritis**: Watery-Bloody Diarrhea 2. **Typhoid Fever**: Salmonella Typhi









Aspergillus spp on sabouraud's dextrose agar [SDA]:

Disease:

Intoxication

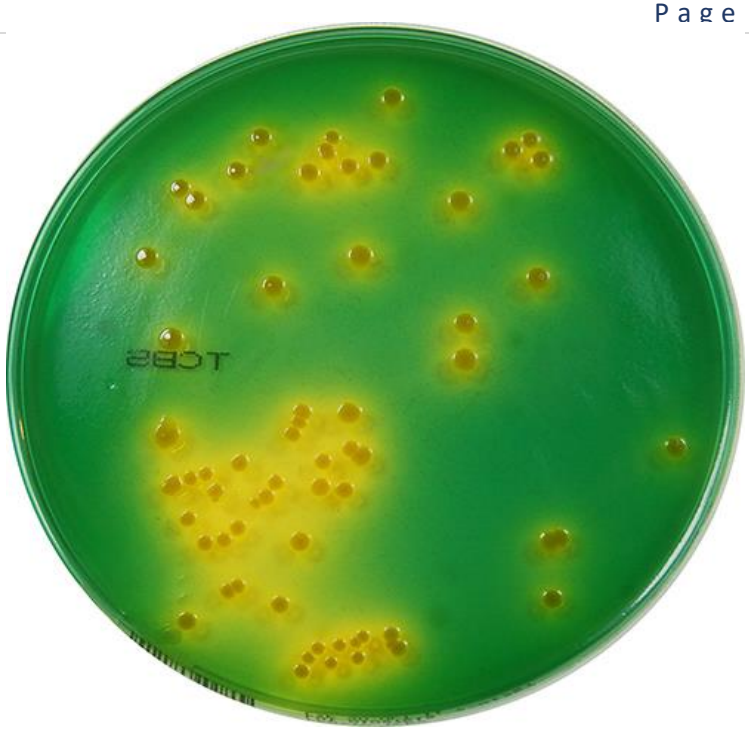
Types of toxin produced by aspergillus:

Alfatoxin & Ochratoxin

Pathological effects of the toxin

1- Nephrotoxic activity
2- Carcinogenic effect on liver
3- Immunosuppressive; toxic for WBCs

Growth of Yellow colonies on TCBS:



Suspected bacteria grown:

: ***Vibrio cholera***

Confirmatory tests:

1-Serotyping:

O1 or O139 El-Tor.

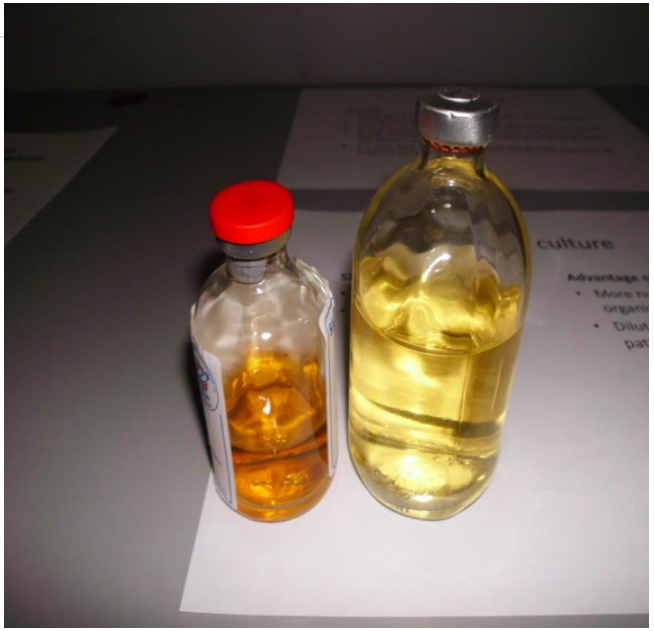
2-Biochemical reaction:

Presence of Nitrose-Indole compound (+ve cholera red reaction)

Disease caused by the organism: Cholera (Non-Invasive Enteritis).

Type of the media: TCBS; selective media.

Blood culture:



Clinical significance of Blood culture: Diagnosis of:

1. Enteric fever in the first week
2. Brucellosis or Malta fever
3. Bacteremia and septicemia
4. Infective endocarditis

Specimen: 5-10 cc venous blood under aseptic technique.

Growth indicators:

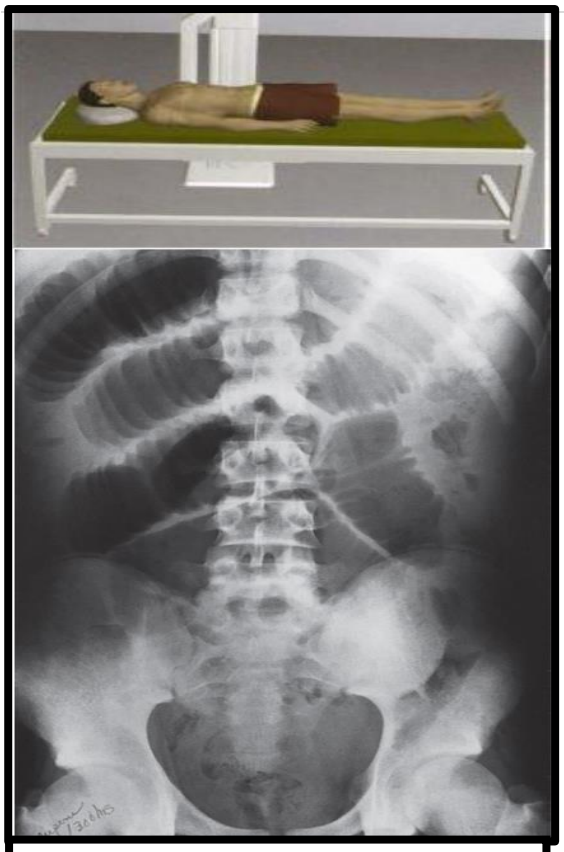
1-Haemolysis

2-Turbidity

3-Air bubbles formation.

4-Surface micro-colonies formation.

Radiology

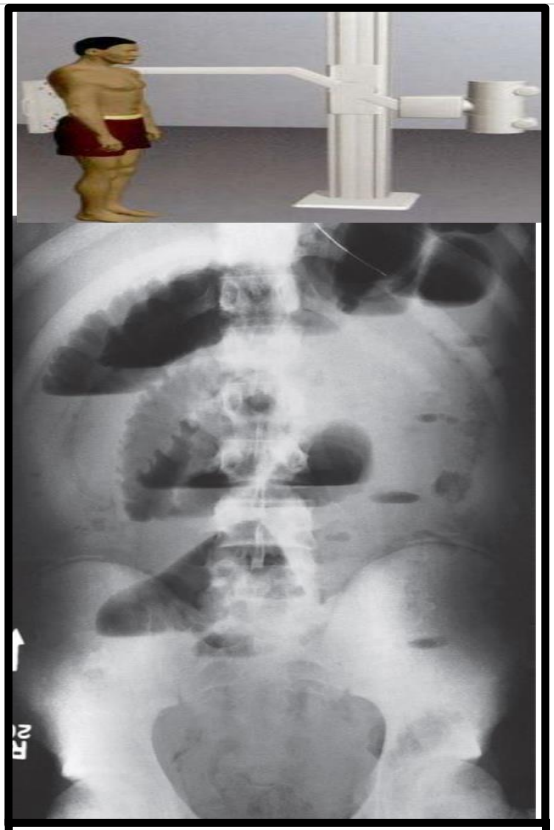


Imaging modality/Study ?

Plain X-ray of abdomen

Patient's position ?

Supine

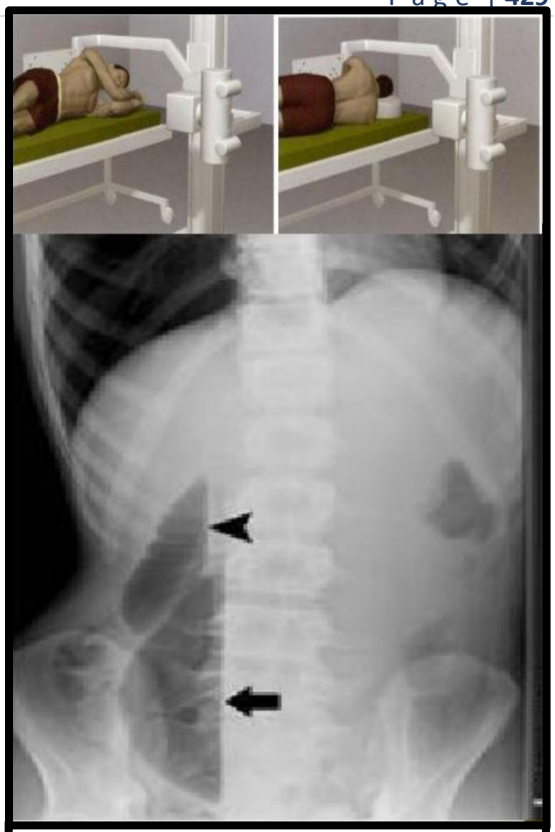


Imaging modality/Study ?

Plain X-ray of abdomen

Patient's position ?

Erect (Fluid level)



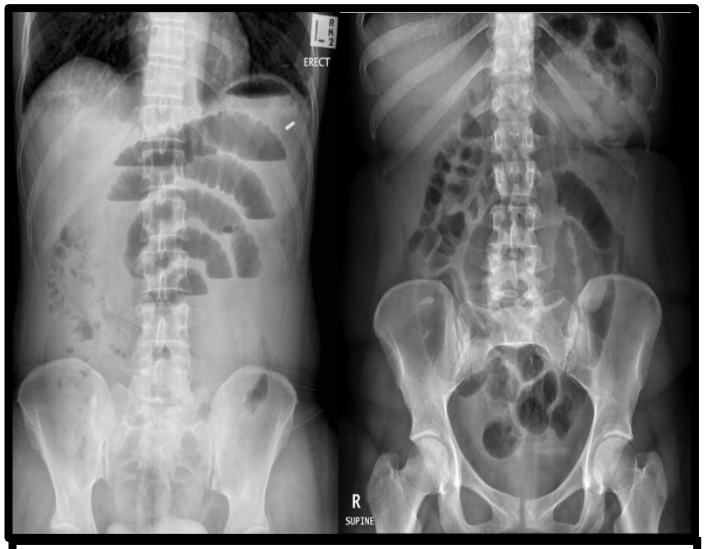
Imaging modality/Study ?

Plain X-ray of abdomen

Patient's position ?

Lateral decubitus

Erect Supine



Imaging modality / Study?

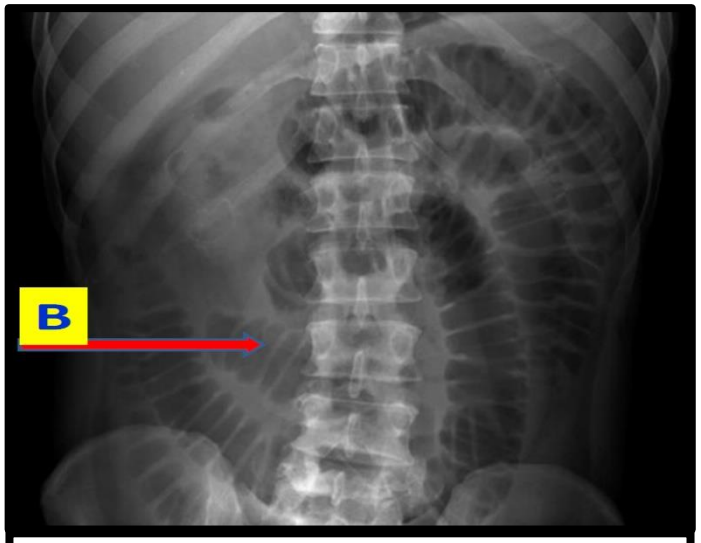
Plain X-ray of abdomen

Patient's position?

Erect position shows fluid levels

& Supine Film on second picture

Small Intestine	Large Intestine
Small bowel is central in distribution.	Large bowel is peripheral.
Valvulae conniventes are present	Haustra are present



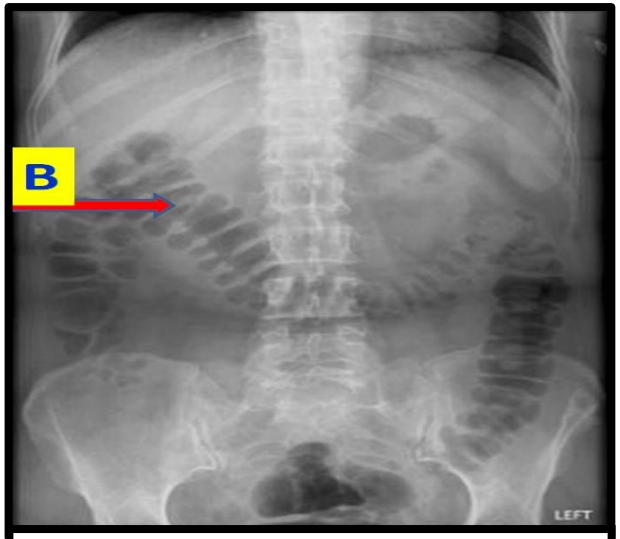
Xray abdomen supine Normal gas pattern Small intestine

Give the name of the used imaging modality /study

Plain X-ray

Is the marked bowel as B in the given image large or small and give one justification for your answer

Small Intestine on central distribution–
Valvulae conniventes – 'stack of coins' close together & cross width of the bowel



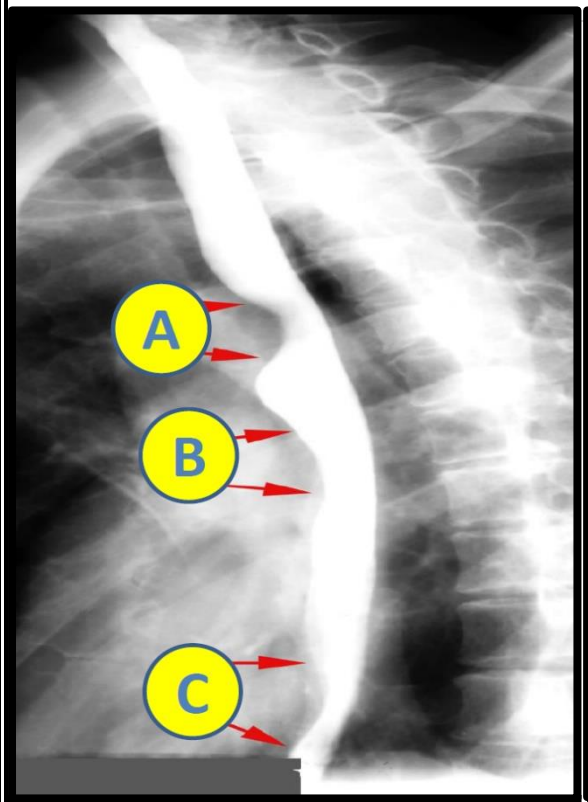
Xray abdomen supine Normal gas pattern Large intestine

Give the name of the used imaging modality/study

Plain X-ray

Is the marked bowel as " in the given image large or small and give one justification for your answer

Large Bowel on peripheral –
Haustra –
Incomplete bands across colonic gas shadows

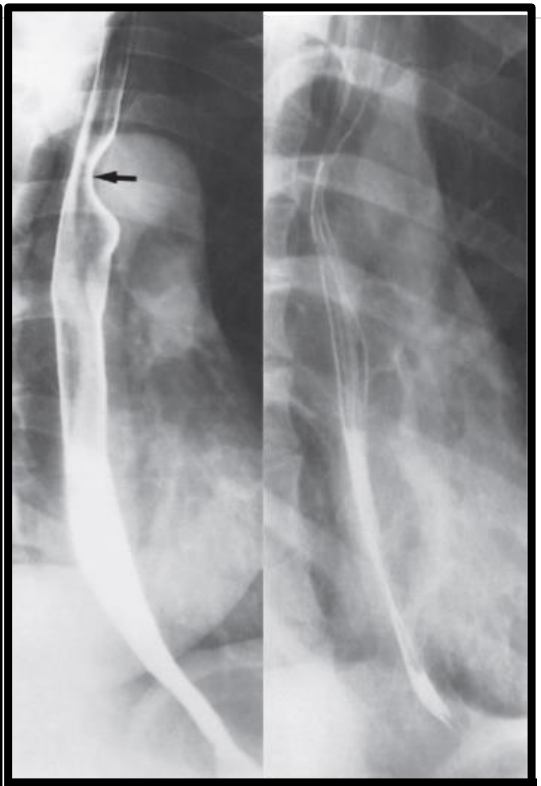


Give the name imaging examination

BARIUM SWOLLOW: Normal anatomic narrowing of esophagus

Identify the structure causing the narrowing (A)/B/LA

- A- Aortic Arch
- B- Left Main Bronchus
- C- Left Atrium



Give name imaging examination

BARIUM SWOLLOW of Esophagus

Identify the structure causing the narrowing Aortic Arch

Give one indication

Dysphagia,

Esophageal diverticulum

Hiatal Hernia

Imaging modality / Study?

Barium follow through

of Small Intestine

Give one indication

IBD,

Malabsorption,

Suspected Stricture

Imaging modality / Study ?

Small bowel enema

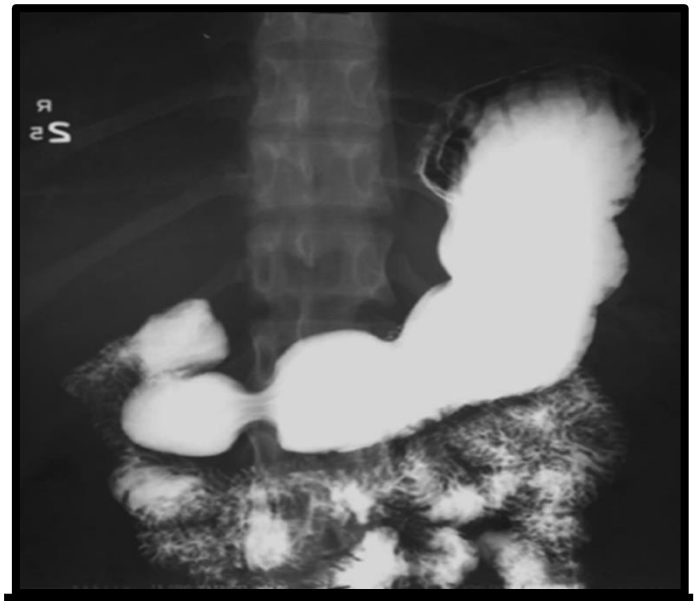
of Small Intestine

Give one indication

IBD,

Malabsorption,

Suspected Stricture



Imaging modality / Study ?

Single contrast Ba meal of

Stomach & Duodenum

Give one indication

Failed gastroscopy,

anastomotic leak following gastric surgery

the name imaging examination/study

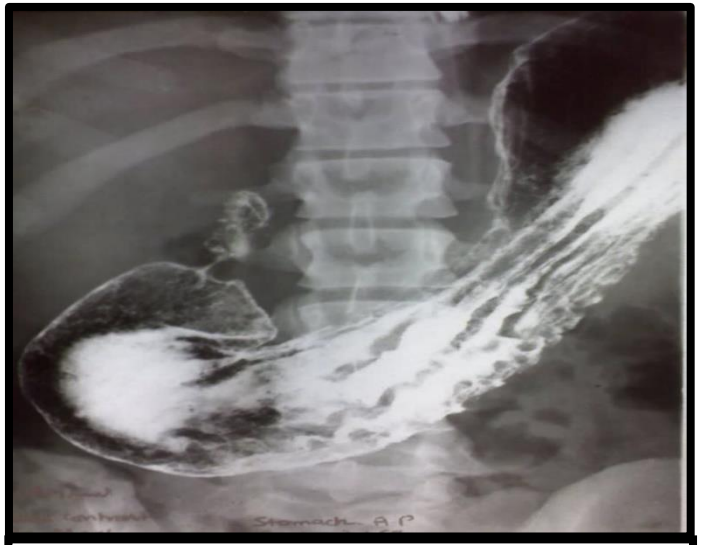
DOUBLE CONTRAST BARIUM MEAL of

Stomach & Duodenum

Give one indication

Failed gastroscopy,

anastomotic leak following gastric surgery



Imaging modality / Study ?

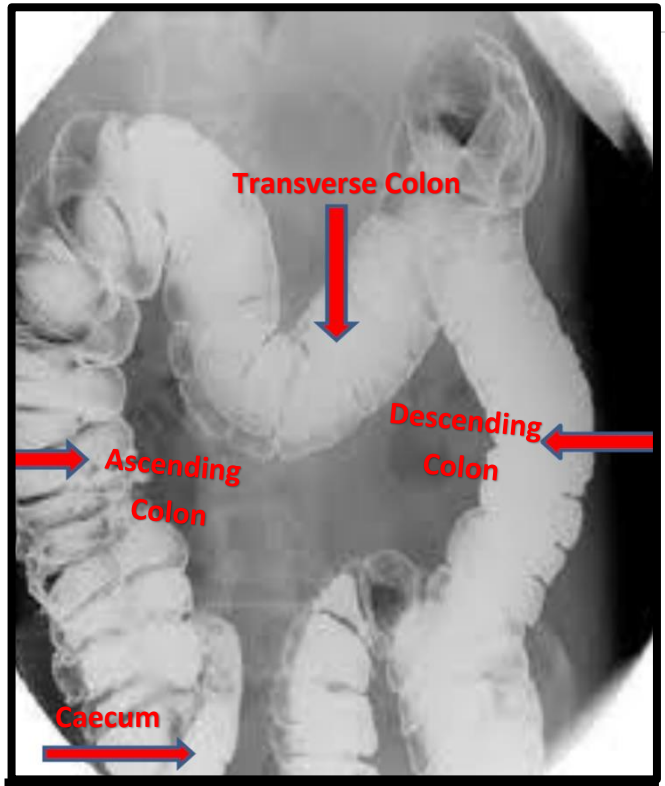
Double contrast Ba meal of

Stomach & Duodenum

Give one indication

Failed gastroscopy,

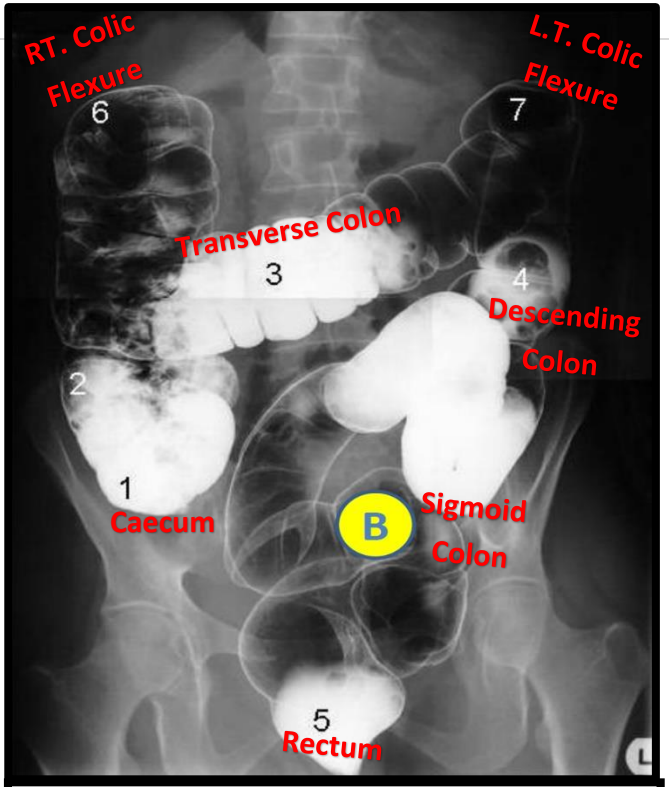
anastomotic leak following gastric surgery



Imaging modality / Study ?
Single contrast barium enema

Give one indication
Bleeding / Melena,
Change in bowel habits,
Chronic inflammatory diseases

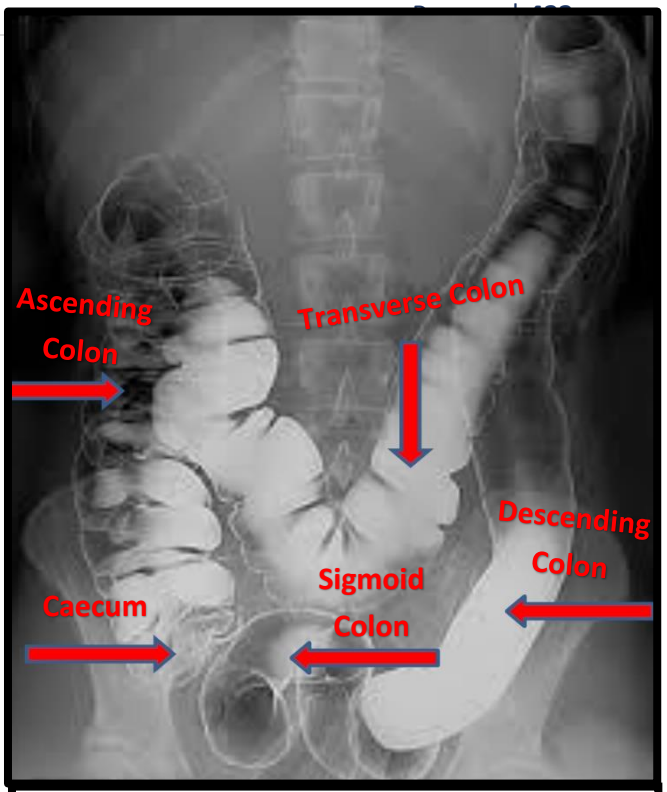
One Contraindication
Toxic mega colon, Acute Colitis



Imaging modality / Study ?
Double Contrast Barium Enema

Give one indication
Bleeding / Melena,
Change in bowel habits,
Chronic inflammatory diseases

Identify the structure 1 2 3 4 5 or B
Shown in image

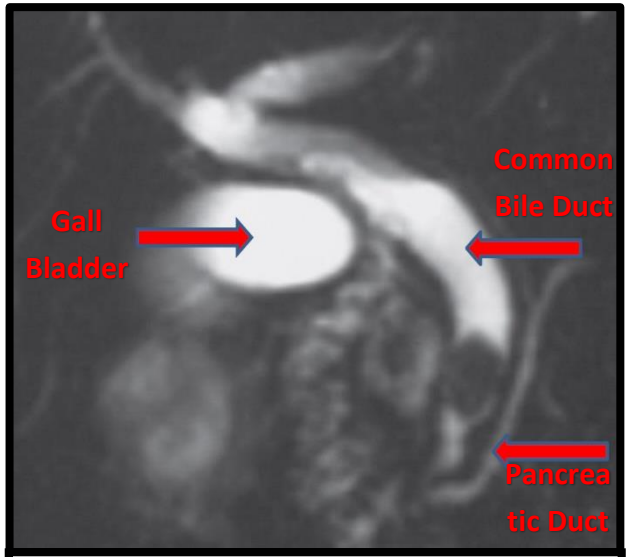


Give the name imaging examination
Double contrast Barium enema

Give one indication
Bleeding / Melena,
Change in bowel habits,
Chronic inflammatory diseases

One Contraindication
Toxic mega colon, Acute Colitis

Identify the structure (Arrow) Shown in image

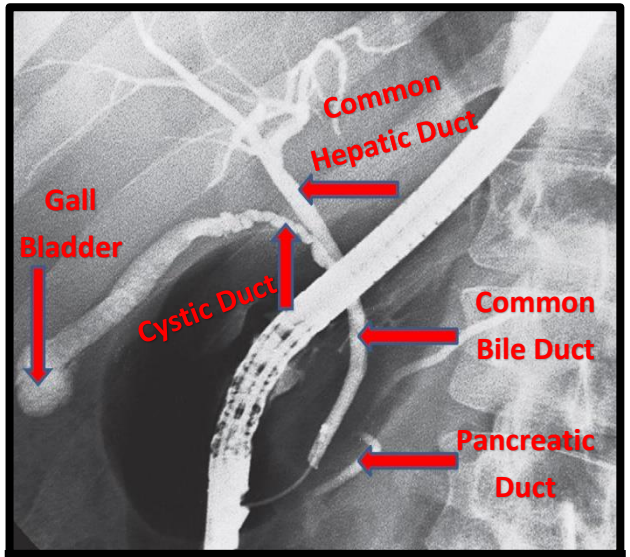


Give the name imaging examination

Magnetic Resonance Cholangiopancreatography (MRCP)

Identify the structures

Shown in image



Give the name imaging examination

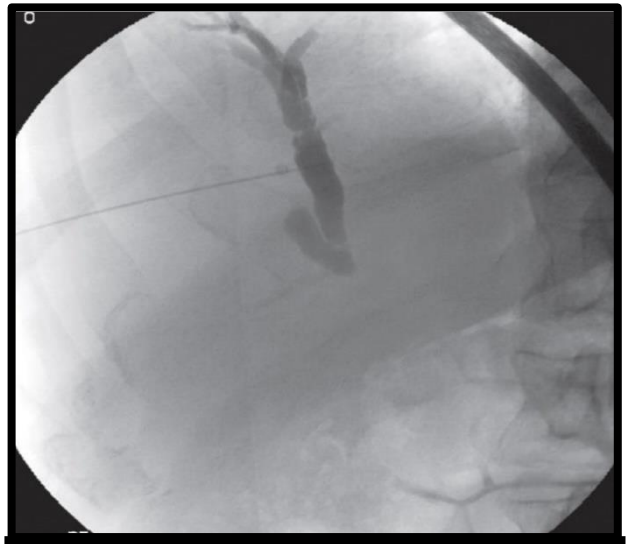
Endoscopic Retrograde Cholangiopancreatography (ERCP)

Give one indication

Stone in common bile duct,
Biliary obstruction due to pancreatitis

Identify the structures

Shown in image



Give the name imaging examination

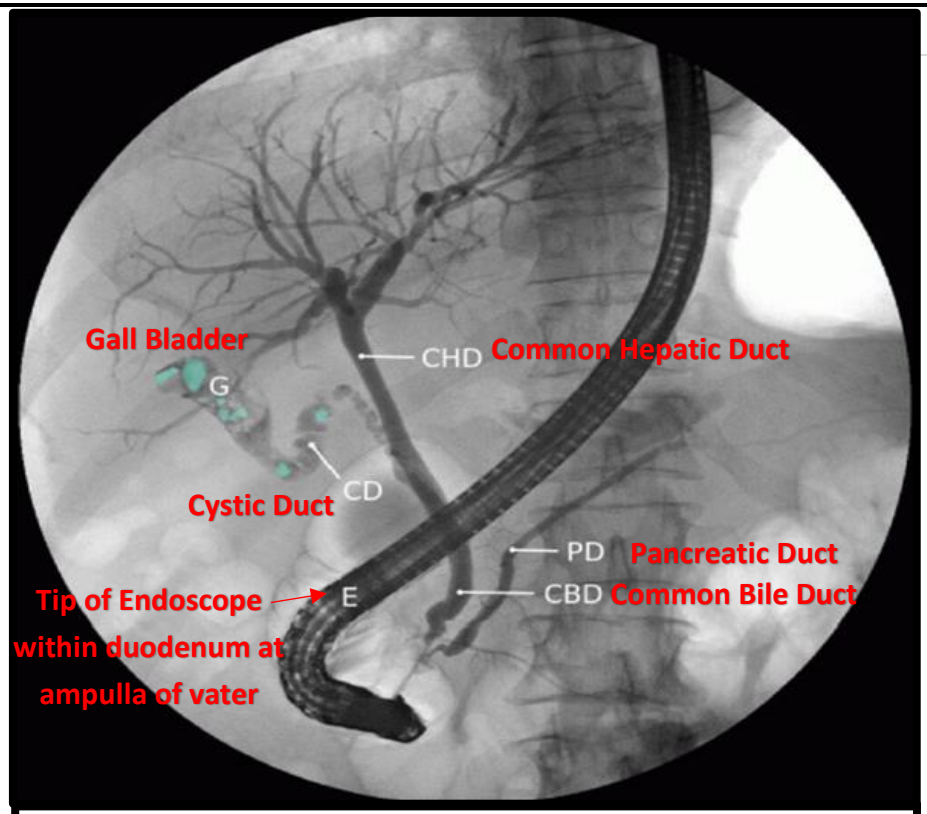
Percutaneous Transhepatic Cholangiogram (PTC)

one indication

Obstructive Jaundice,
Failed ERCP

One Contraindication

Bleeding Diathesis, Gross Ascites



Give the name of the used imaging study in the given

Endoscopic retrograde cholangiopancreatography (ERCP)

Identify the abnormality.

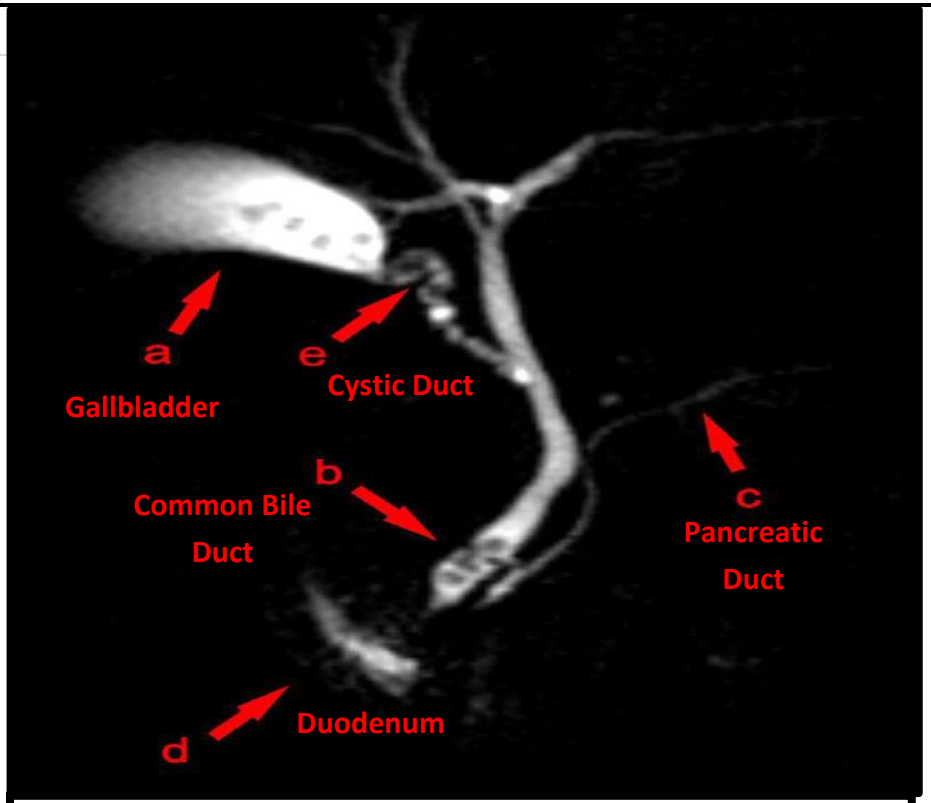
cholelithiasis

Description

Multiple filling defects (examples indicated by green overlay) can be seen within the gall bladder and cystic duct

Anatomy

Shown in image



Give the name of the used imaging study in the given

Magnetic resonance cholangiopancreatography (MRCP)

Identify the abnormality

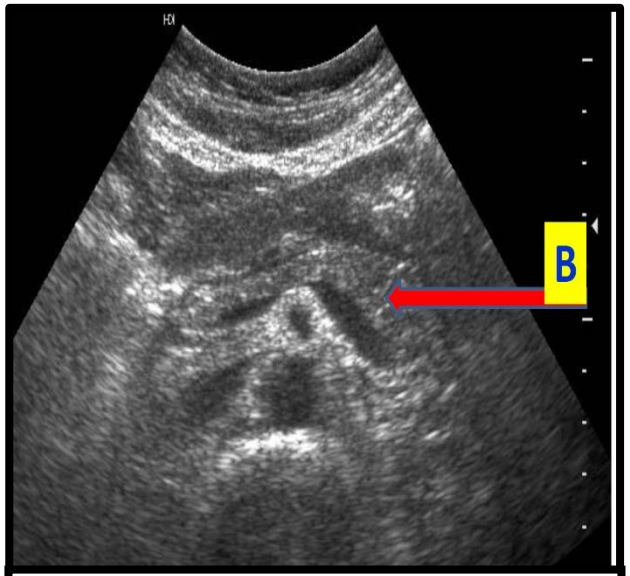
cholelithiasis & Choledocholithiasis

Description

Filling defects (i e the dark spots or areas that have not taken up the contrast) are visible within the gallbladder , the cystic duct and the common bile duct

Anatomy

Shown in image

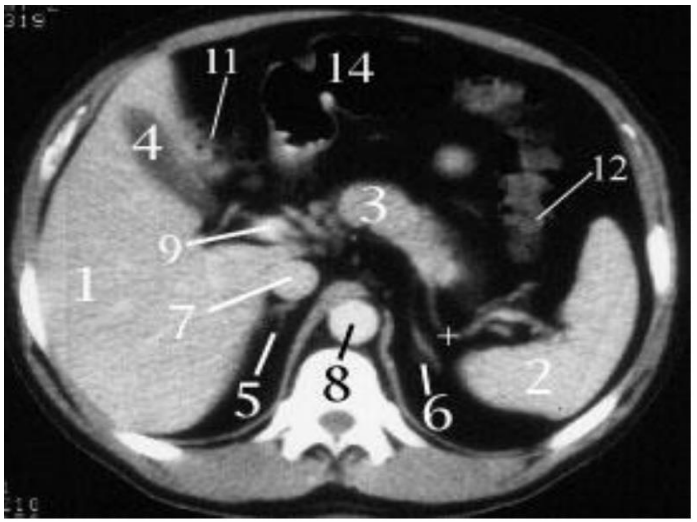


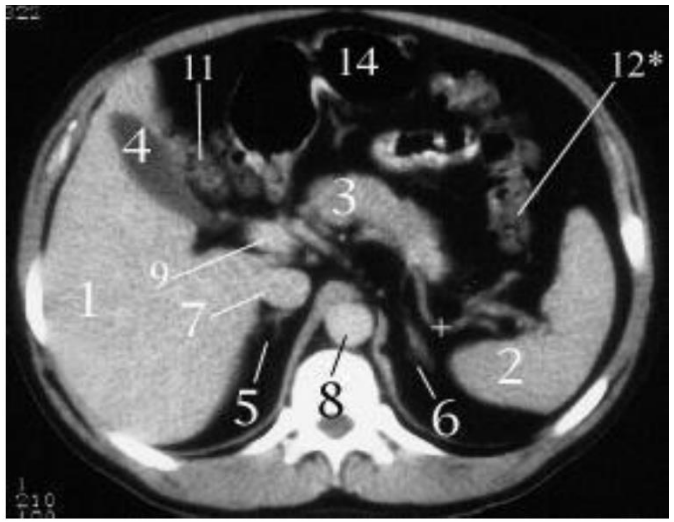
Give the name of the used imaging modality in the given

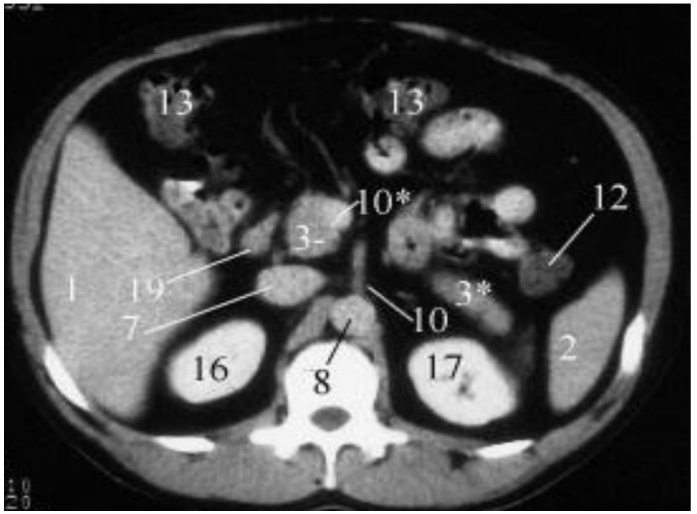
Ultra Sound

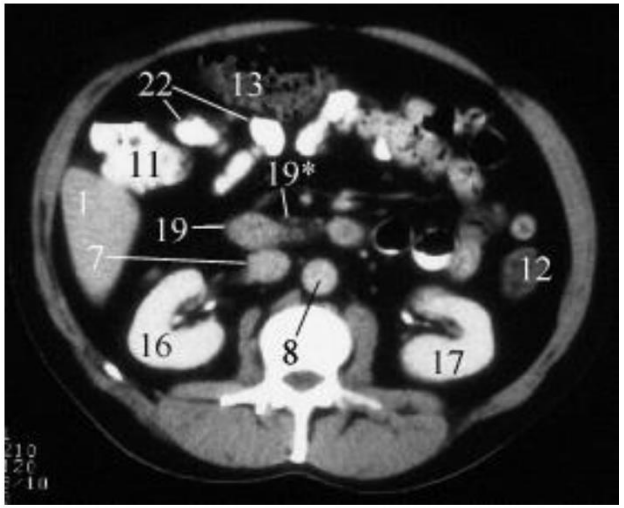
Identify the organ marked as B ” in the given image.

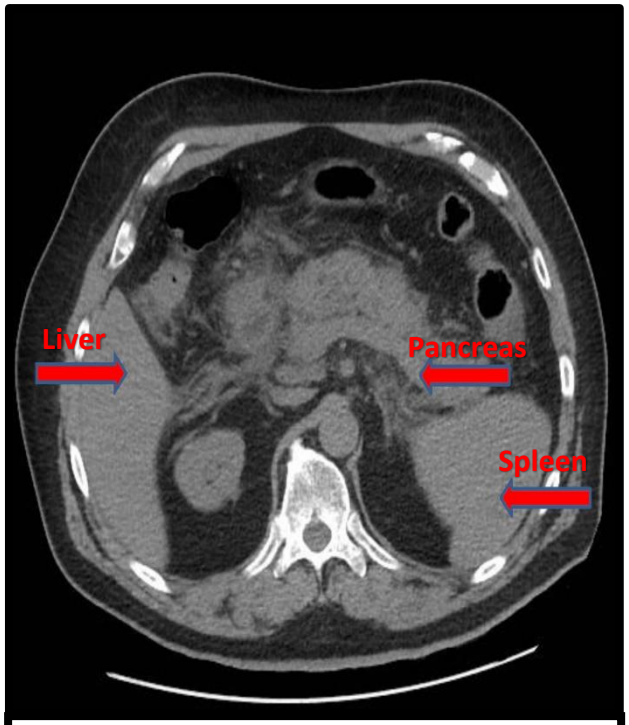
Pancreas









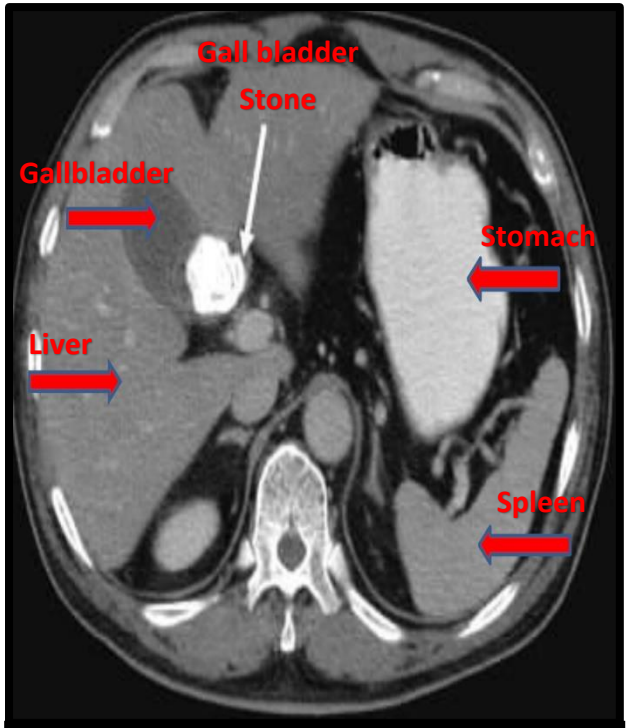


Imaging modality

CT abdomen without contrast

Identify the organ marked as A/B/C " in the given image.

Shown in image

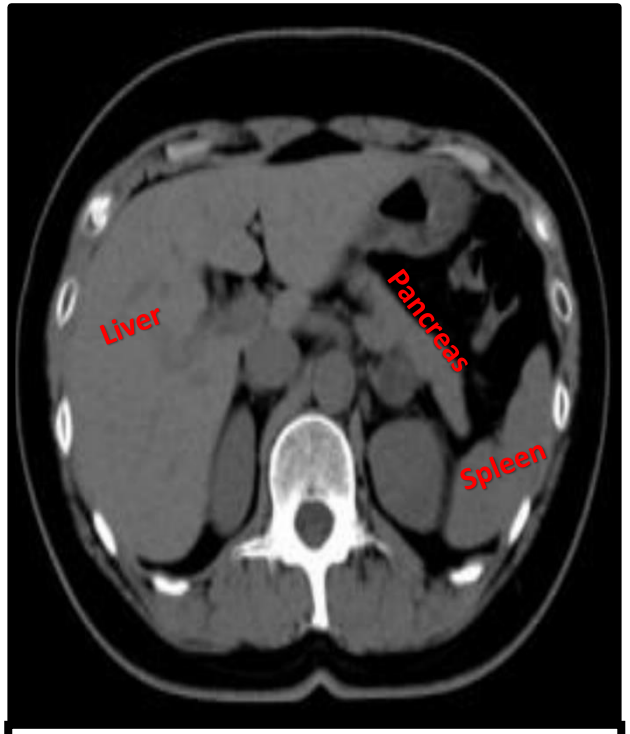


Imaging modality

CT with contrast abdomen

Identify the organ marked as A/B/C " in the given image.

Shown in image



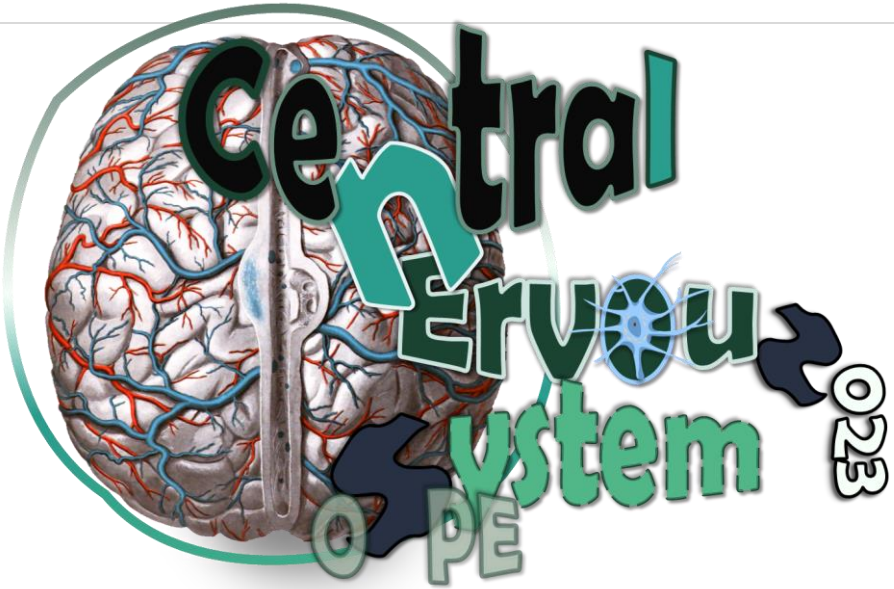
Exam?

Computerized Tomography (CT)

without Contrast

Anatomy?

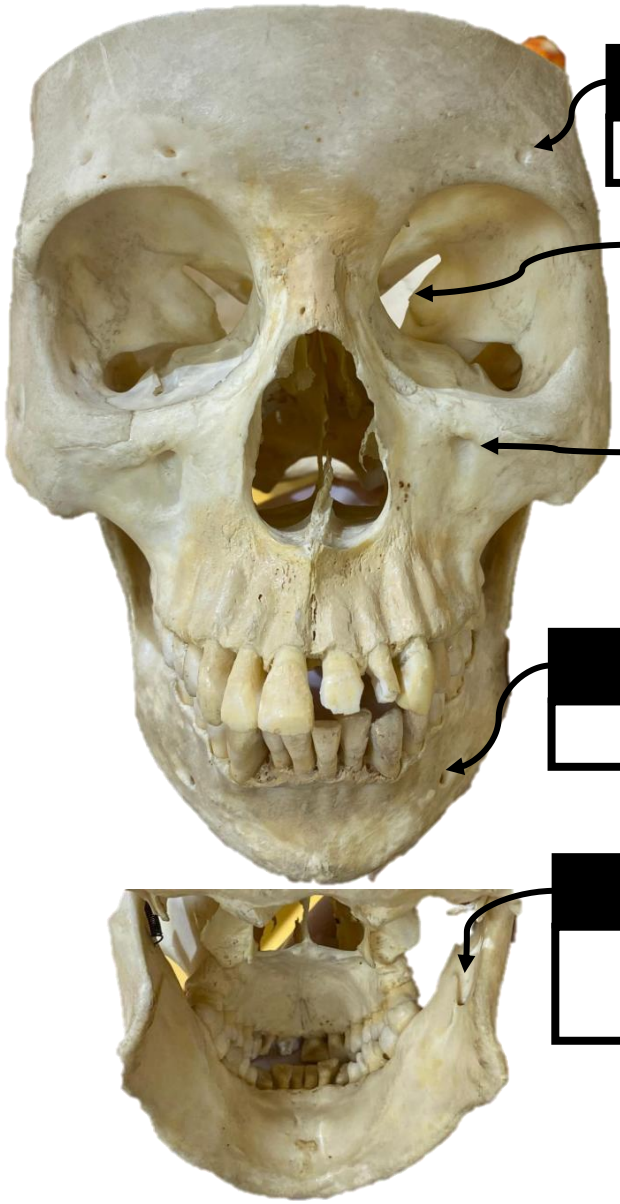
Shown in image



CNS

Hazem Alkhateeb

Anatomy



Supraorbital foramen (notch)

Supraorbital Nerve & Vessels

Superior Orbital Fissure

CN III (OC), CN IV (TR), CN VI (Abd)
Superior & Inferior ophthalmic V.

Infraorbital Foramen

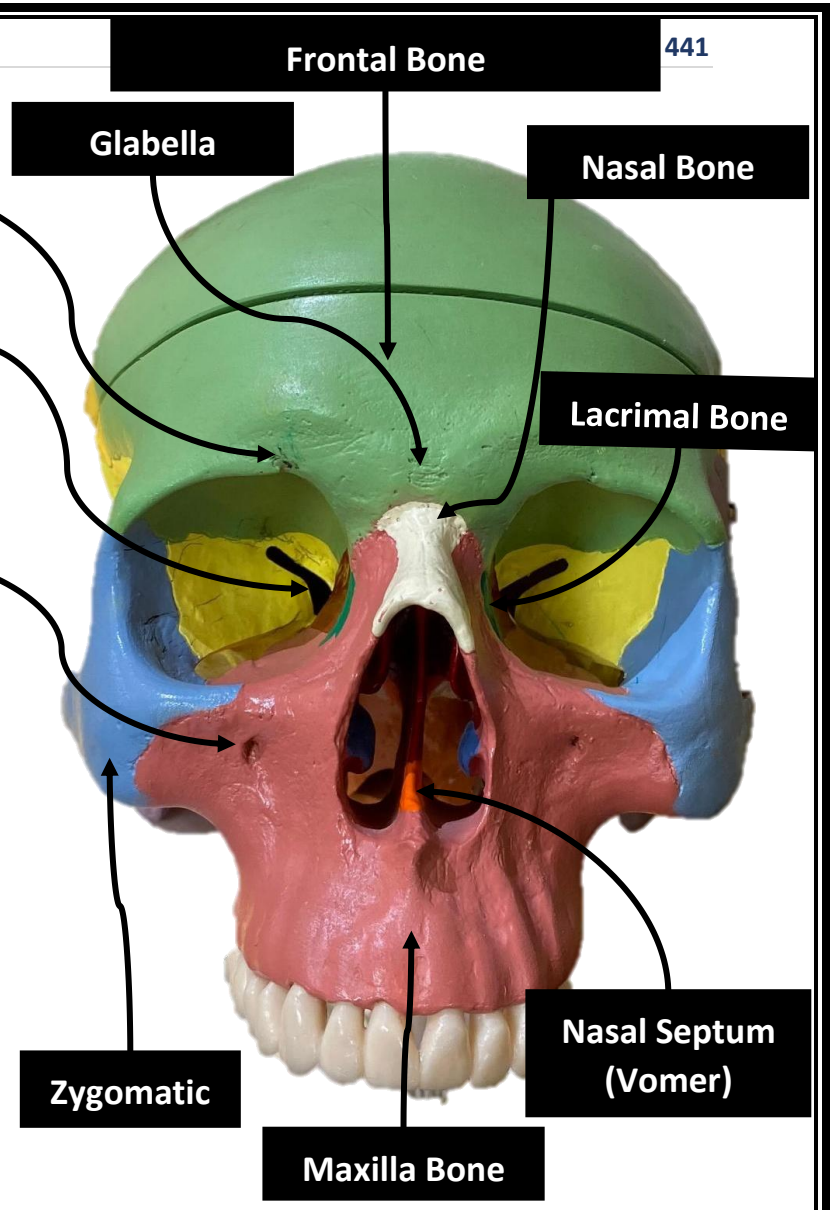
Maxillary Nerve
Infraorbital Nerve & Vessels

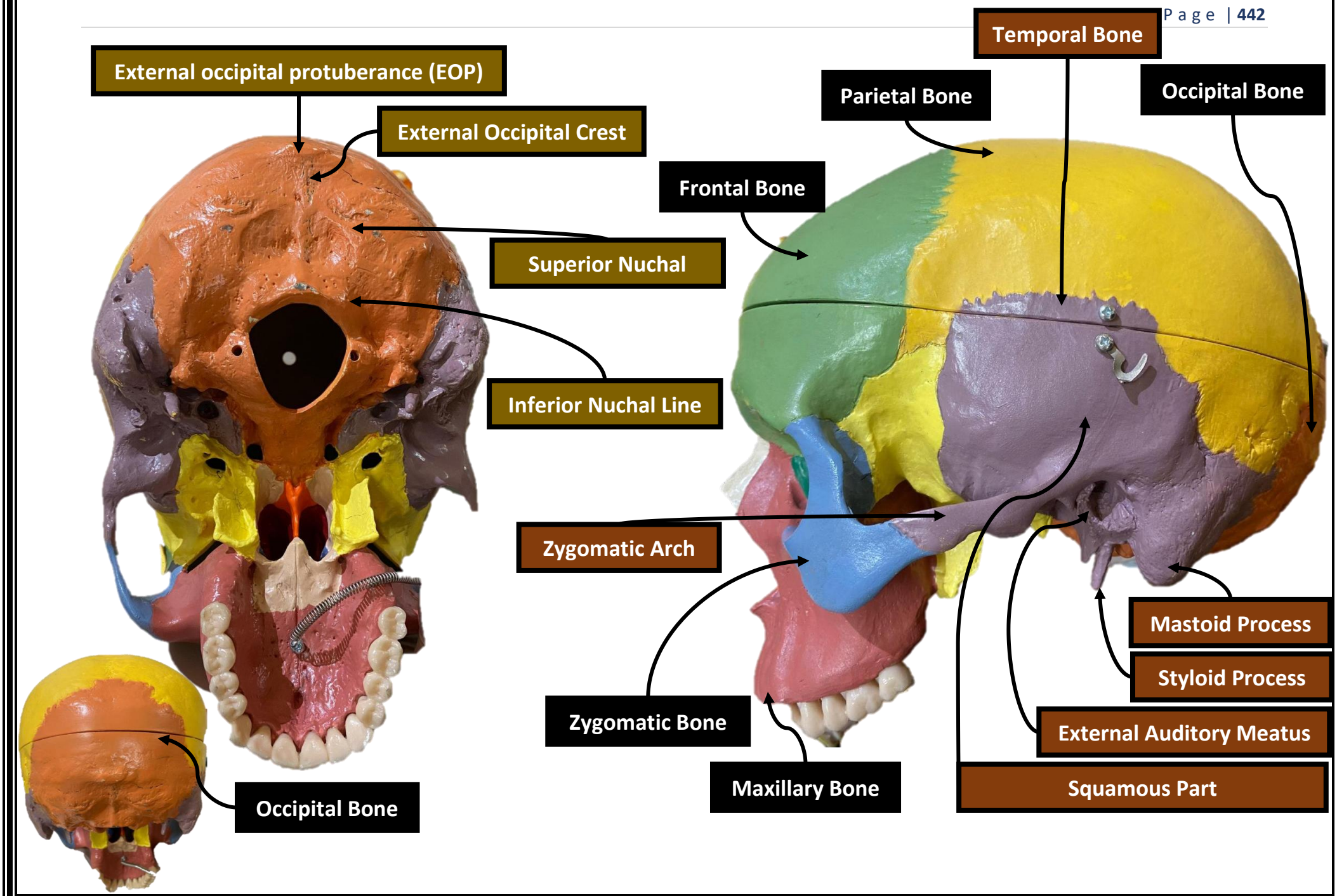
Mental Foramen

Mental Nerve & Vessels

Mandibular Foramen

Mandibular &
Inferior Alveolar Nerve




External occipital protuberance (EOP)
External Occipital Crest
Superior Nuchal
Inferior Nuchal Line
Occipital Bone
Temporal Bone
Parietal Bone
Occipital Bone
Frontal Bone
Zygomatic Arch
Mastoid Process
Styloid Process
Zygomatic Bone
External Auditory Meatus
Maxillary Bone
Squamous Part

Skull Fontanelles

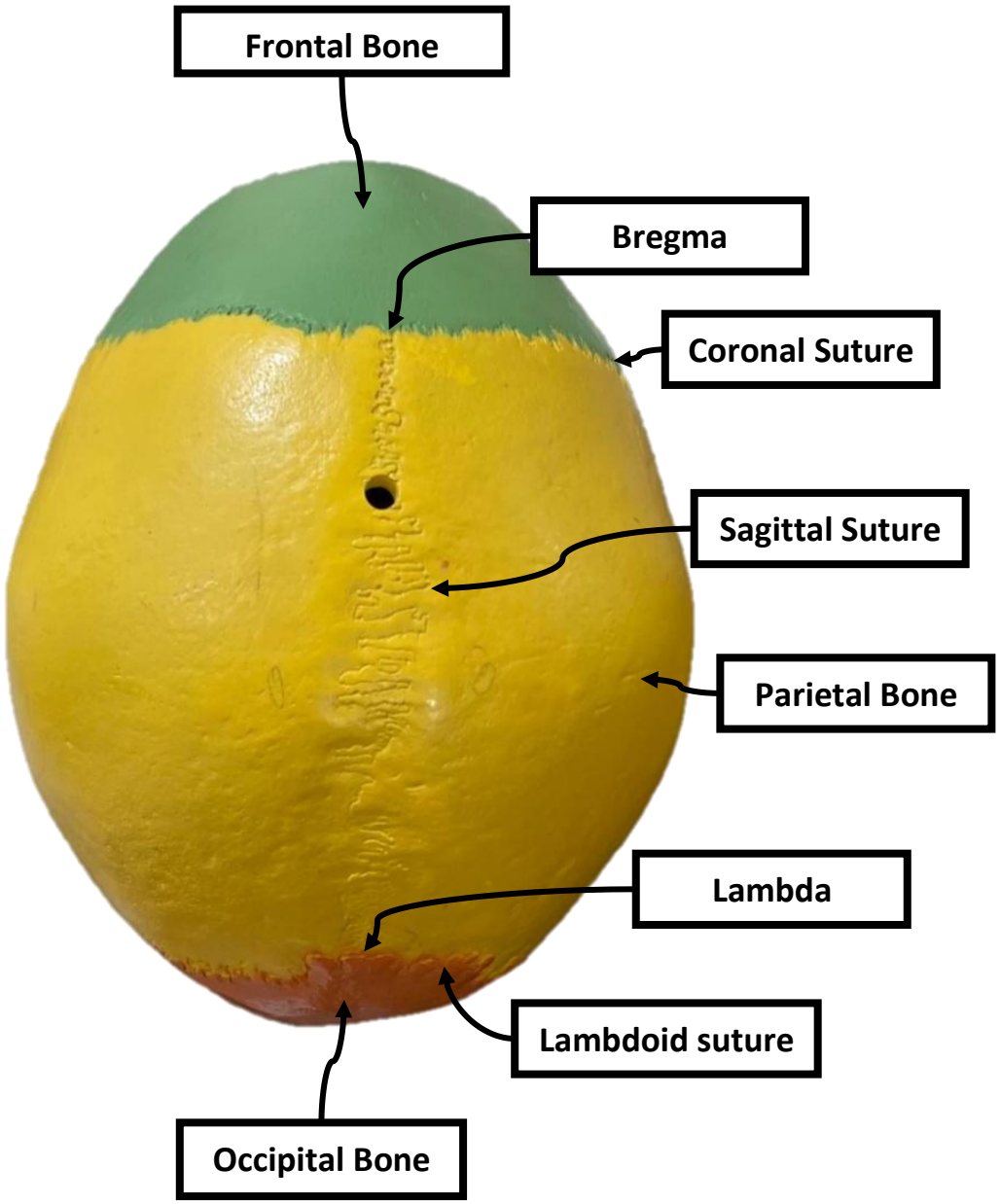
Types:

1- **Anterior Fontanelle**
Closed by 18-24 months,
and becomes **BREGMA**

2- **Posterior Fontanelle**
Closed by 3-6 months,
and becomes **LAMBA**

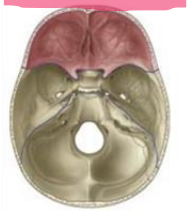
Importance:

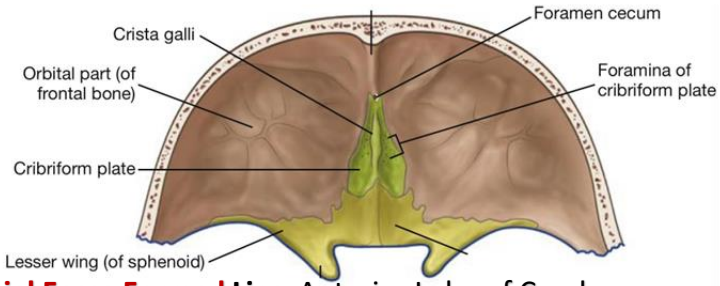
1. They permit easy growth of the brain.
2. They permit overlapping of skull bones



Cranial Fossa

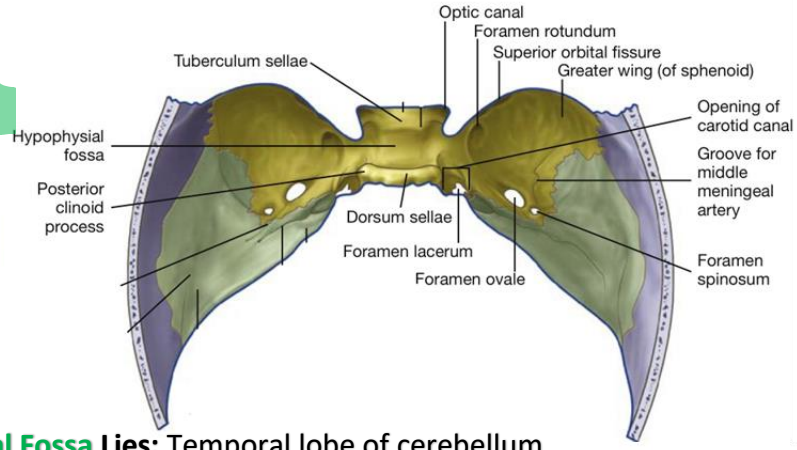
Anterior





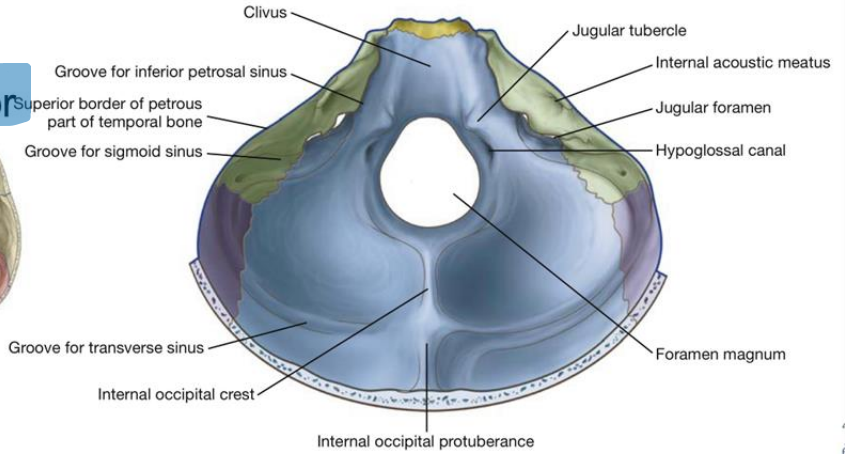
Anterior Cranial Fossa Formed Lies: Anterior Lobe of Cerebrum

Middle



Middle Cranial Fossa Lies: Temporal lobe of cerebellum

Posterior



Posterior Cranial Fossa Lies: cerebellum and Brain Stem

Cribriform Plate of Ethmoid

Content: Olfactory N. (I)
Fracture: Epistaxis, Cerebrospinal Rhinorrhea

Crista Gali

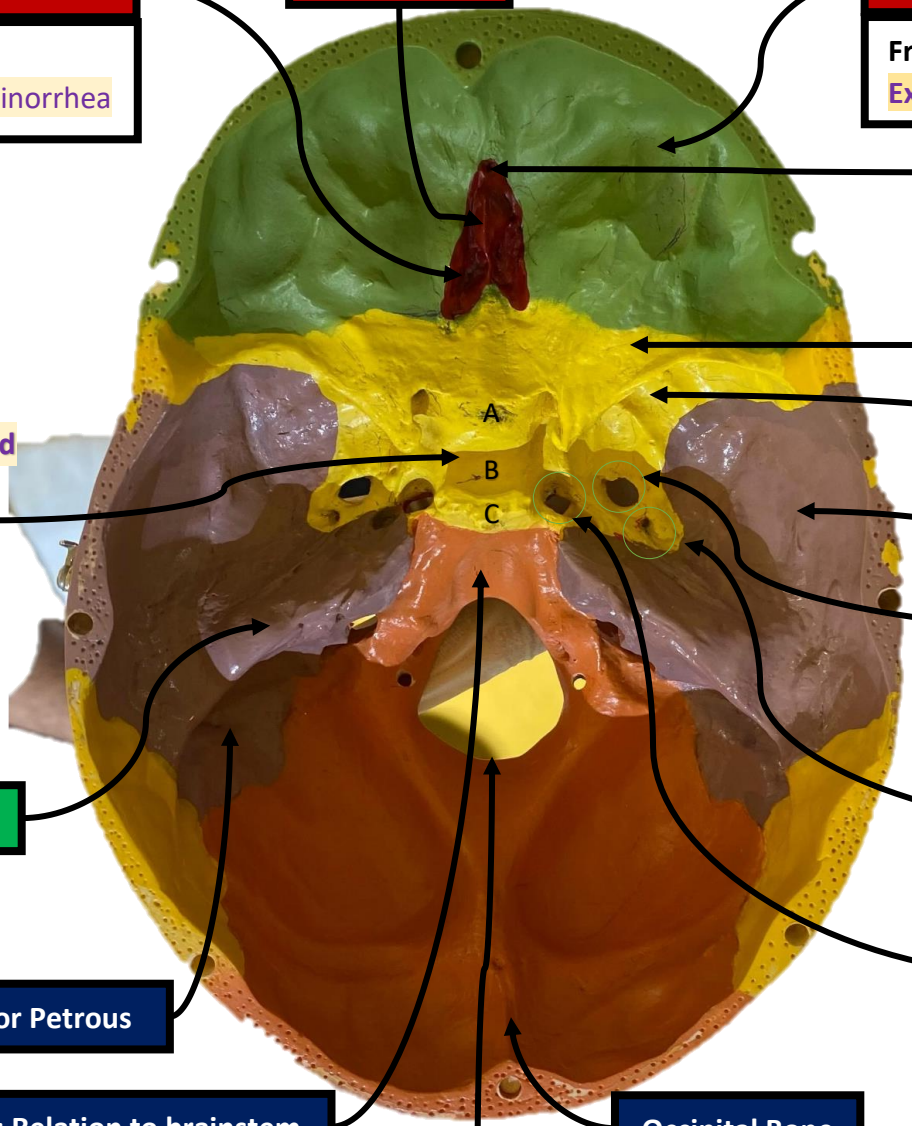
Orbital Plate of Frontal Bone

Fracture of Orbital:
Exophthalmos & Subconjunctival Hemorrhage

Foramen Caecum

Relations: Superior Sagittal Sinus
Terminates: Right transverse sinus

Clinical: Sphenoid Bone Fracture:
CSF & Blood leakage from ear,
Battle's Sign,
III, IV, VI Cranial nerve may be damaged



Lesser Wing of Sphenoid

Greater Wing of Sphenoid

Squamous of Temporal

Sella Turcica

A- Tuberculum Sellae
B- Hypophyseal fossa
C- Dorsum Sellae

Foramen Ovale

Mandibular Nerve &
Accessory Meningeal A.

Anterior Petrous

Foramen Spinosum

MMA

Foramen Lacerum

Internal Carotid A. & Emissary V.

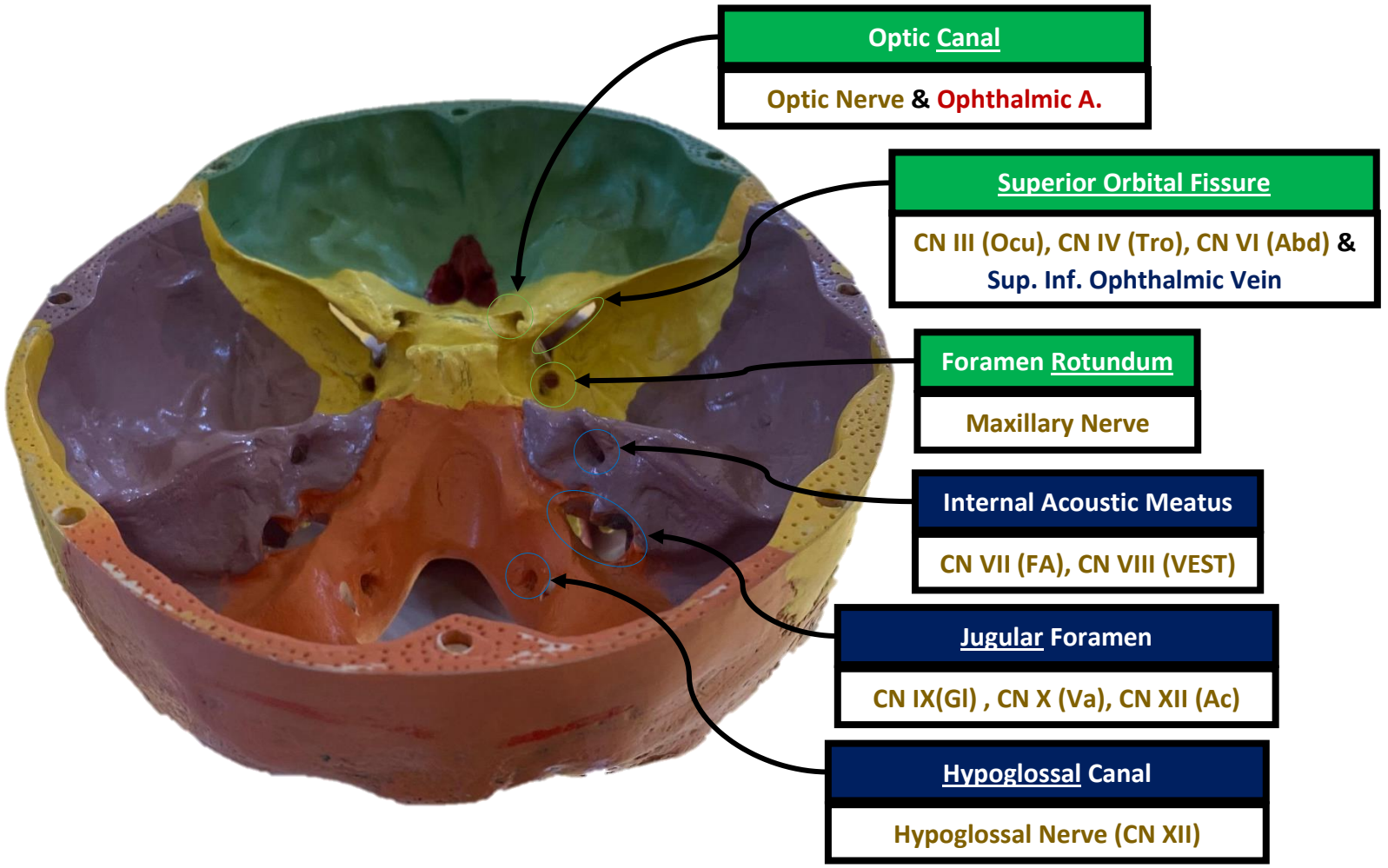
Posterior Petrous

Clivus of Sphenoid: Relation to brainstem

Occipital Bone

Foramen Magnum

Spinal Cord, ASA, Vertebral Artery


Optic Canal
Optic Nerve & Ophthalmic A.
Superior Orbital Fissure
CN III (Ocu), CN IV (Tro), CN VI (Abd) & Sup. Inf. Ophthalmic Vein
Foramen Rotundum
Maxillary Nerve
Internal Acoustic Meatus
CN VII (FA), CN VIII (VEST)
Jugular Foramen
CN IX(Gl) , CN X (Va), CN XII (Ac)
Hypoglossal Canal
Hypoglossal Nerve (CN XII)

Sup. Sagittal Sinus (Single)

Beginning: Foramen Caecum
Termination: RT. Transverse

Midbrain

CN III (Ocu), CN IV (Troc)
SCA & PCA

Pons

CN V (Tri), CN VI (Abd), CN VII (Fai), CN VIII (Vest)
Basilar A.

Medulla

CN IX (Glo), CN X (Vag), CN XI (Acc), CN XII (Hypoglossal)
ASA, PSA, PICA

Paracentral gyrus

Lesion: Contralateral loss of sensation& Paralysis of leg

Precuneus Gyri

Primary Visual BA 17
Association Visual BA 18,19

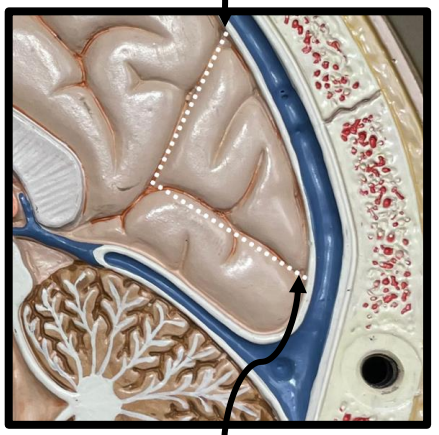
Cuneus Gyri

Primary Visual BA 17
Association Visual BA 18,19

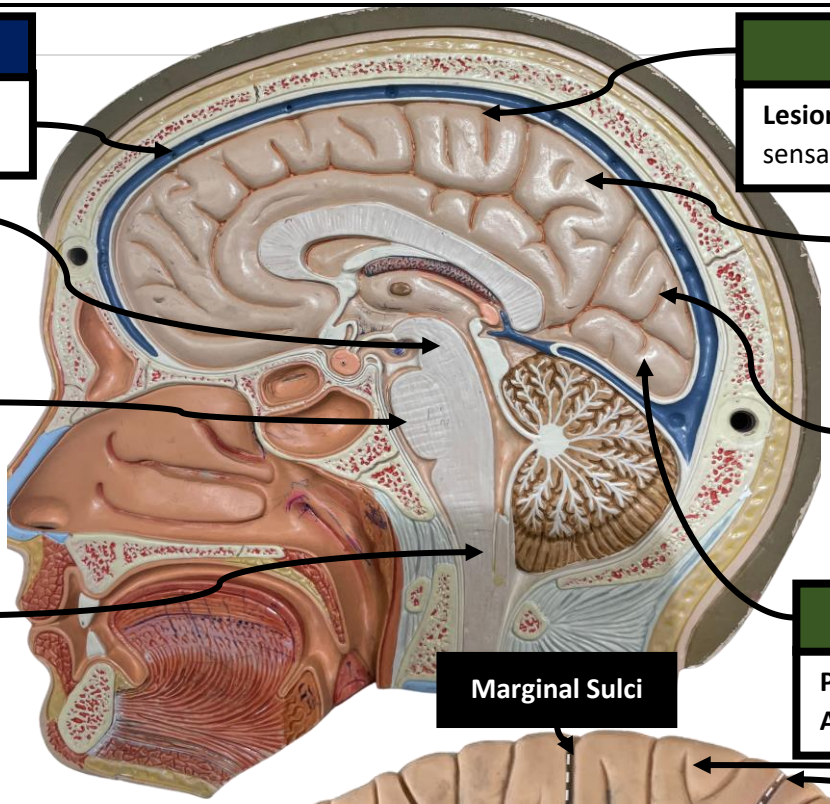
Lingual Gyri

Primary Visual BA 17
Association Visual BA 18,19

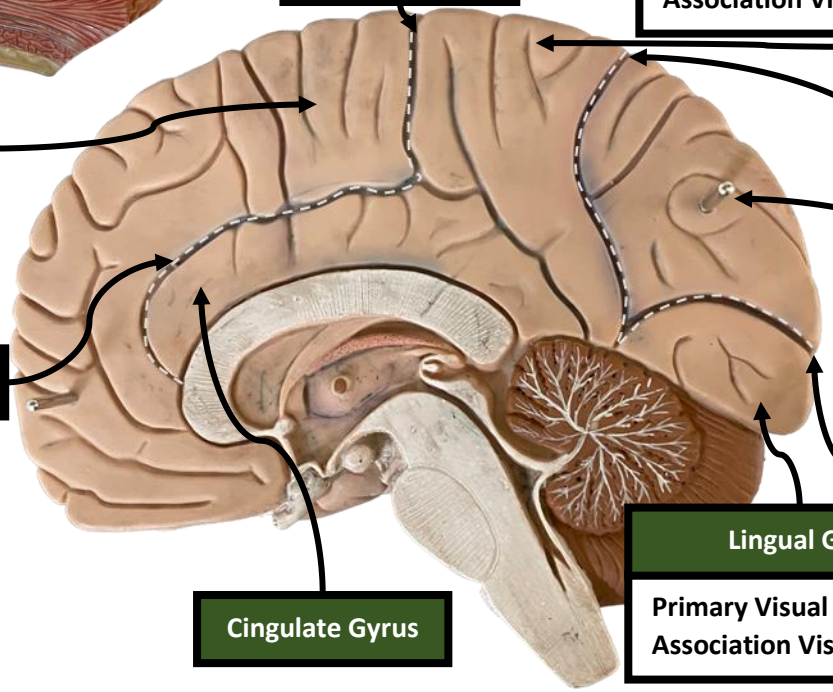
Parieto-ocipital Sulcus



Calcarine Sulcus



Marginal Sulci



Paracentral gyrus

Lesion: Contralateral loss of sensation& Paralysis of leg

Cingulate Sulci

Cingulate Gyrus

Precuneus Gyri

Primary Visual BA 17
Association Visual BA 18,19

Parieto-ocipital Sulcus

Cuneus Gyri

Primary Visual BA 17
Association Visual BA 18,19

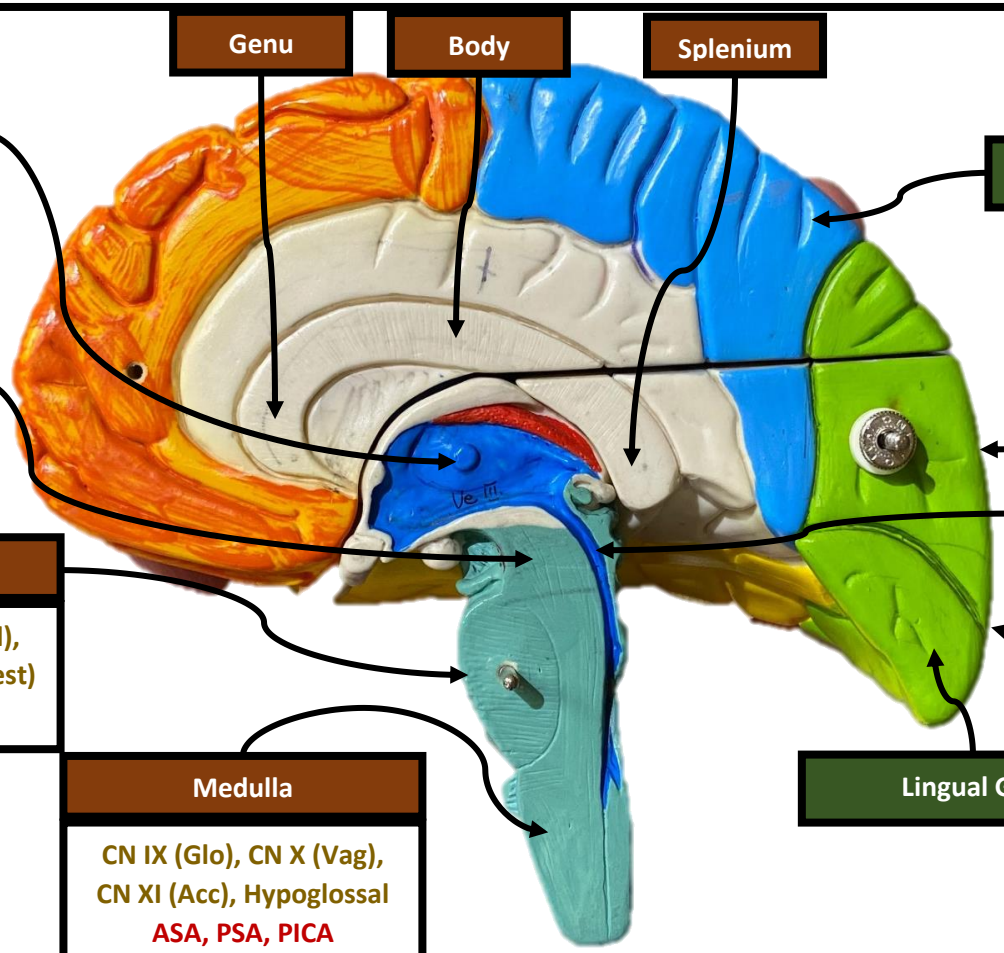
Calcarine Sulcus

Lingual Gyri

Primary Visual BA 17
Association Visual BA 18,19

Corpus Callosum

Genu & Body: ACA & **Splenium:** PCA
Lesion: Callously Apraxia (Split Brain)
Fiber: Commissural fiber
Function: transfer memory and language from dominant to non-dominant hemisphere



Gyrus | sulcus

Arterial supply :

PCA (Posterior cerebral artery)

Area:	lesion:
Primary visual area (17)	contralateral homonymous hemianopia with macular sparing
Association visual area (19,18)	

Post-central gyri

General sensation BA 1,2,3
Lesion: Contralateral **Loss of sensation**

Central sulci

Pre-central gyri (pre on frontal)

Primary Motor BA 4
Lesion: **Contralateral Paralysis**

Post-central Sulcus

Pre-central Sulcus

Arterial supply :

MCA

ACA

MUST WRITE THEM BOTH

Inferior Frontal Gyri

Motor Speech BA 44,45
Lesion: **Motor Aphasia**
Arterial Supply: **MCA**

Lateral Sulcus

Superior Temporal Gyri

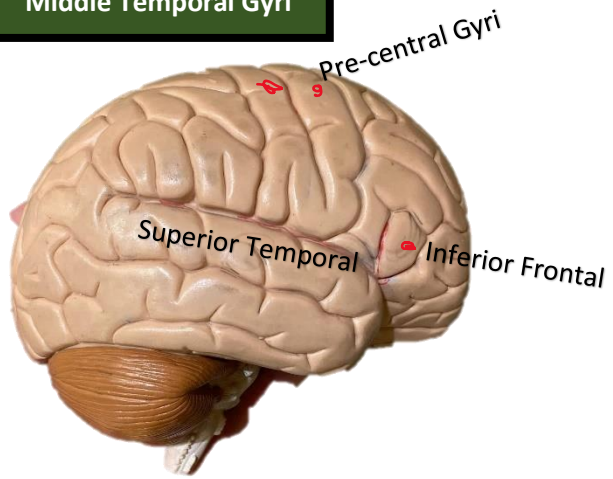
Primary Auditory BA 41,42 **& Association Auditory** BA 22
Lesion: **Bi-lateral Diminution of hearing**
Arterial Supply: **MCA**

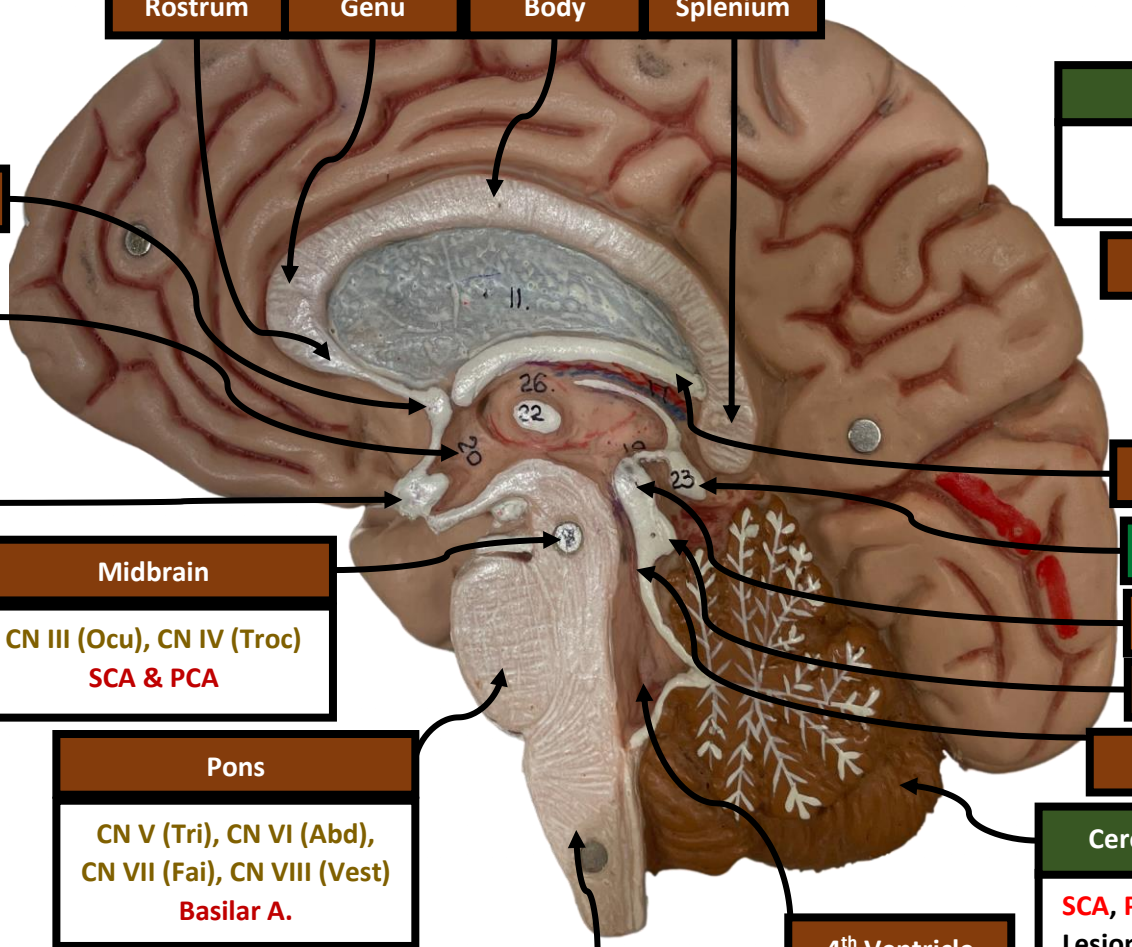
Superior Temporal Sulci

Middle Temporal Gyri

Inferior Temporal Gyri

Inferior Temporal Sulci





Corpus Callosum

ACA & PCA
Lesion: Callously Apraxia (Split Brain)
Fiber: Commissural fiber

Rostrum | Genu | Body | Splenium

Anterior Commissure

Hypothalamus

ACA, MCA, PCA,
Ant. & Post. Communicating A.

Optic Chiasm

Midbrain

CN III (Ocu), CN IV (Troc)
SCA & PCA

Pons

CN V (Tri), CN VI (Abd),
CN VII (Fai), CN VIII (Vest)
Basilar A.

Medulla

CN IX (Glo), CN X (Vag),
CN XI (Acc), Hypoglossal
ASA, PSA, PICA

4th Ventricle (Cavity)

Thalamus (26)

PCA & Ant. Chrodial A.
Post. Communicating A.

Intrathalamic Adhesion (22)

Body of fornix

Pineal Gland

Posterior Commissure

Tectum of Midbrain

Cerebral Aqueduct of Sylvius

Cerebellum

SCA, PICA, AICA
Lesion: Ataxia

Corpus Callosum

Genu & Body: ACA & **Splenium:** PCA
Lesion: Callously Apraxia (Split Brain)
Fiber: Commissural fiber
Function: transfer memory and language from dominant to non-dominant hemisphere

Anterior Cerebral Artery (ACA)

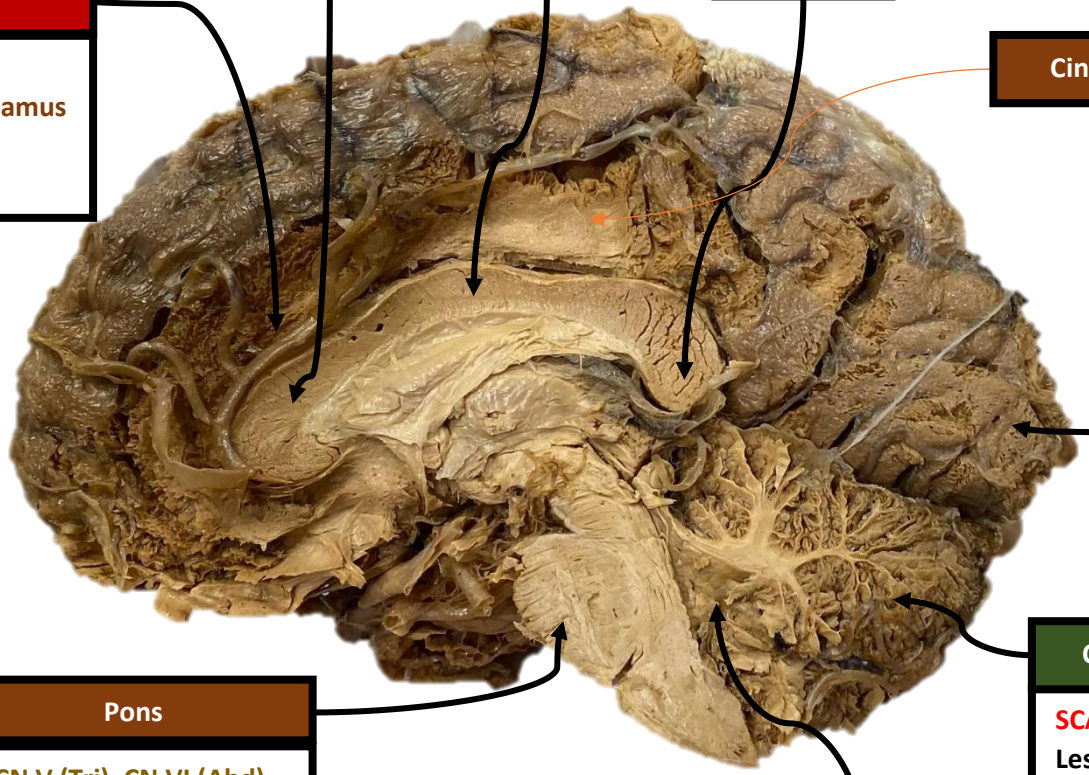
Origin: Internal Carotid Artery
Supplies: Corpus Callosum & Hypothalamus
Lesion: Callosal Apraxia (Split Brain) & Paralysis of one leg

Genu

Body

Splenium

Cingulate Gyrus



Lingual Gyri

Pons

CN V (Tri), CN VI (Abd), CN VII (Fai), CN VIII (Vest)
Basilar A.

Cerebellum

SCA, PICA, AICA
Lesion: Ataxia

4th Ventricle (Cavity)

Genu of Corpus Callosum

Continue as Forceps Minor

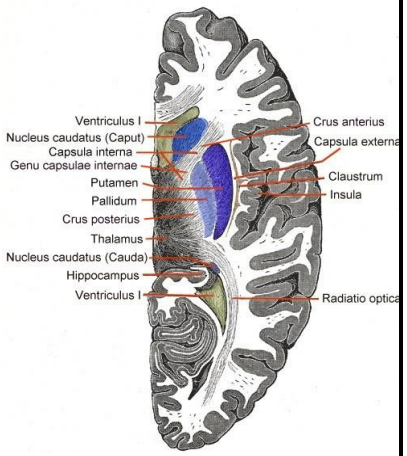
Forceps Minor

Anterior Horn of Lateral Ventricle
Attach to head of caudate

Insula

Lentiform: Putamen (Lateral)

Lentiform: Globus Pallidus (Medial)



Internal Capsule

Ant. Limb, **Genu**, **Post. Limb**

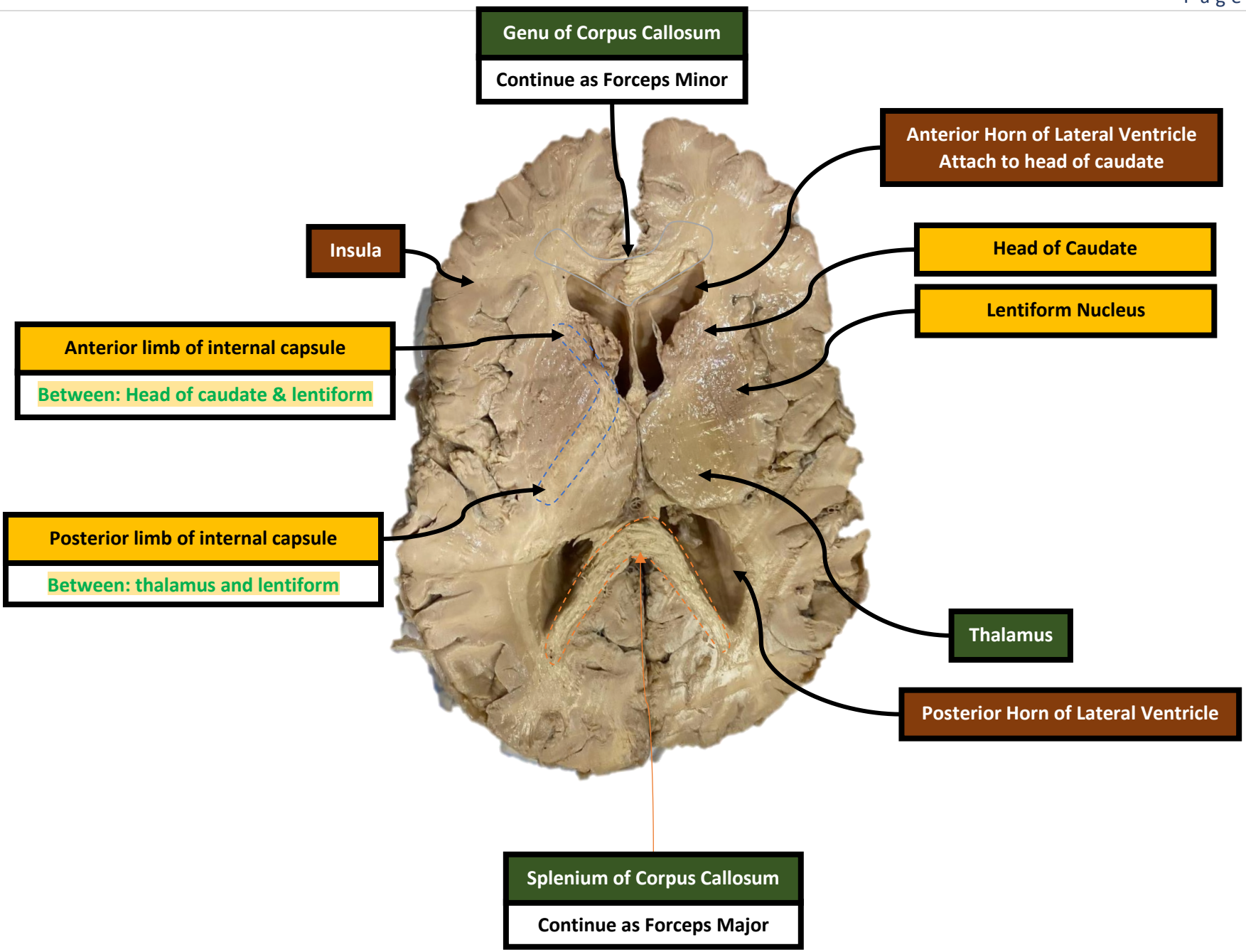
Thalamus

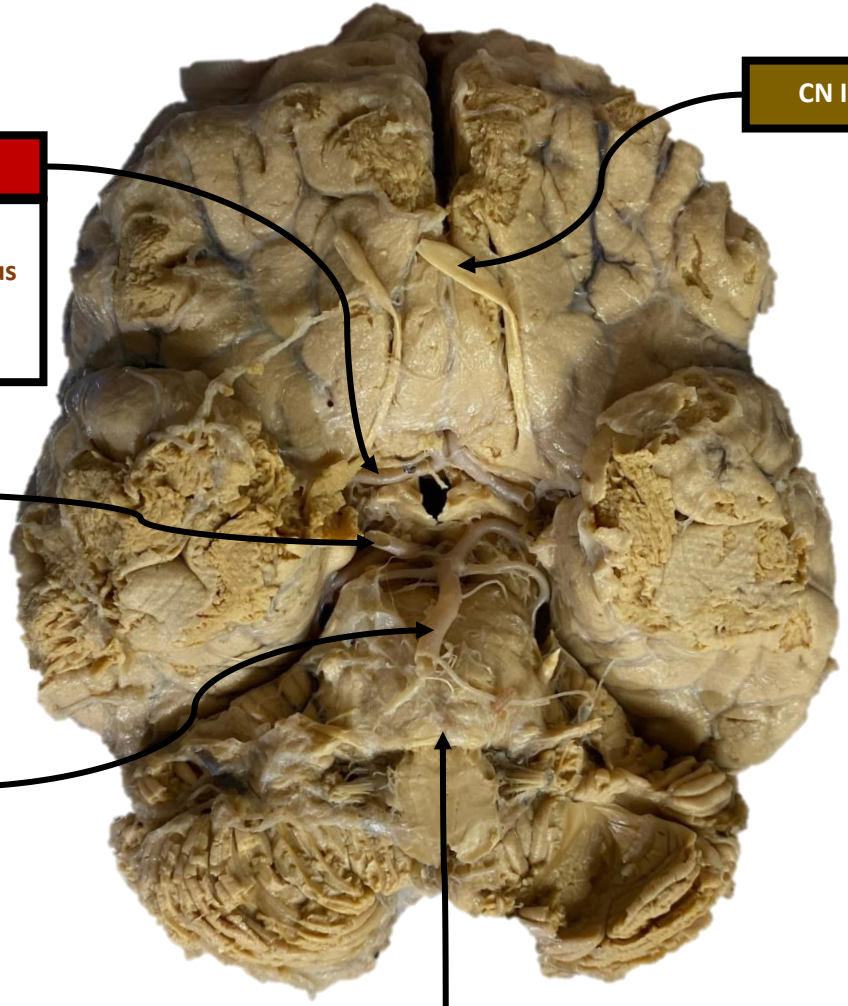
Forceps Major

Posterior Horn of Lateral Ventricle

Splenium of Corpus Callosum

Continue as Forceps Major


Genu of Corpus Callosum
Continue as Forceps Minor
Anterior Horn of Lateral Ventricle
Attach to head of caudate
Insula
Head of Caudate
Lentiform Nucleus
Anterior limb of internal capsule
Between: Head of caudate & lentiform
Posterior limb of internal capsule
Between: thalamus and lentiform
Thalamus
Posterior Horn of Lateral Ventricle
Splenium of Corpus Callosum
Continue as Forceps Major



Anterior Cerebral Artery (ACA)

Origin: Internal Carotid Artery
Supplies: Corpus Callosum & Hypothalamus
Lesion: Callosal Apraxia (Split Brain) & Paralysis of one leg

CN I (Olf)

PCA

Origin: Basilar Artery
Location: calcarine sulcus

Basilar Artery

Origin: Vertebral Artery
Termination: PCA

Pons

CN V (Tri), CN VI (Abd), CN VII (Fai), CN VIII (Vest)
Basilar A.

Anterior Cerebral Artery (ACA)

Origin: Internal Carotid Artery
Location: Above corpus callosum

Anterior Communicating A.

Middle Cerebral Artery (MCA)

Origin: Internal Carotid Artery

Posterior Communicating A.

Basilar Artery

Origin: Vertebral Artery
Termination: PCA

PCA

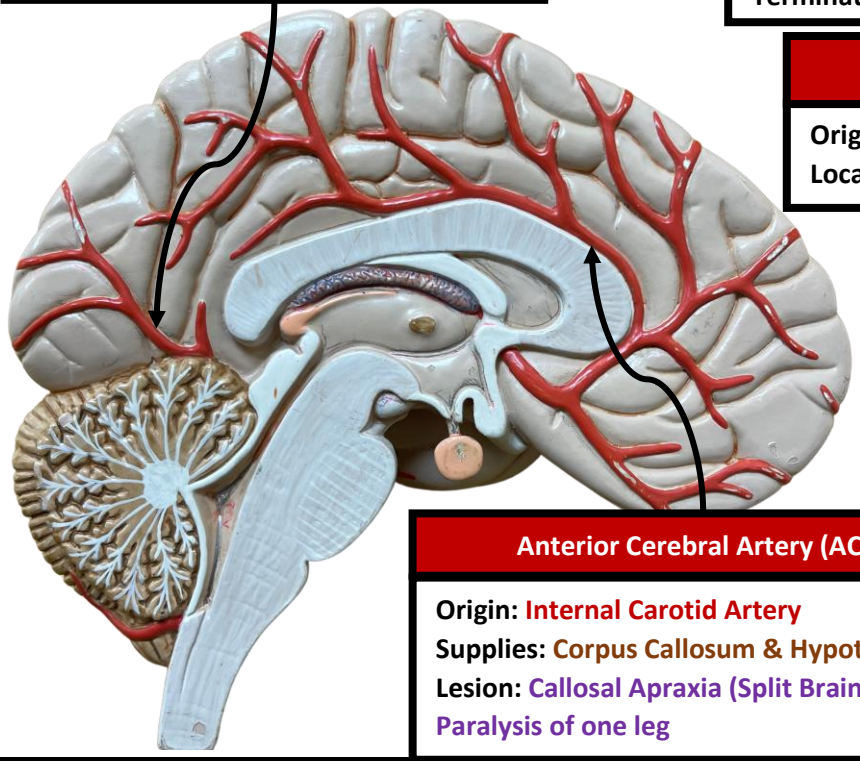
Origin: Basilar Artery
Location: calcarine sulcus

Vertebral Artery

Origin: Subclavian Artery
Termination: Basilar Artery

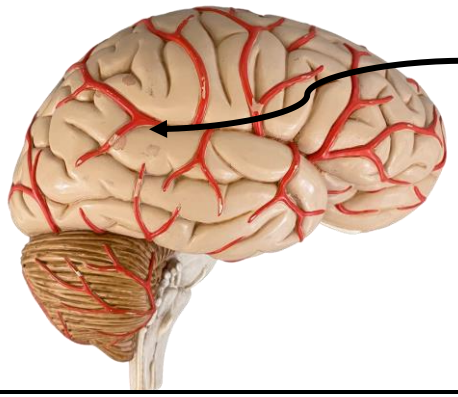
PCA

Origin: Basilar Artery
Supplies: Thalamus, Hypothalamus, Corpus Callosum
Lesion: Contralateral homonymous hemianopia with macular sparing



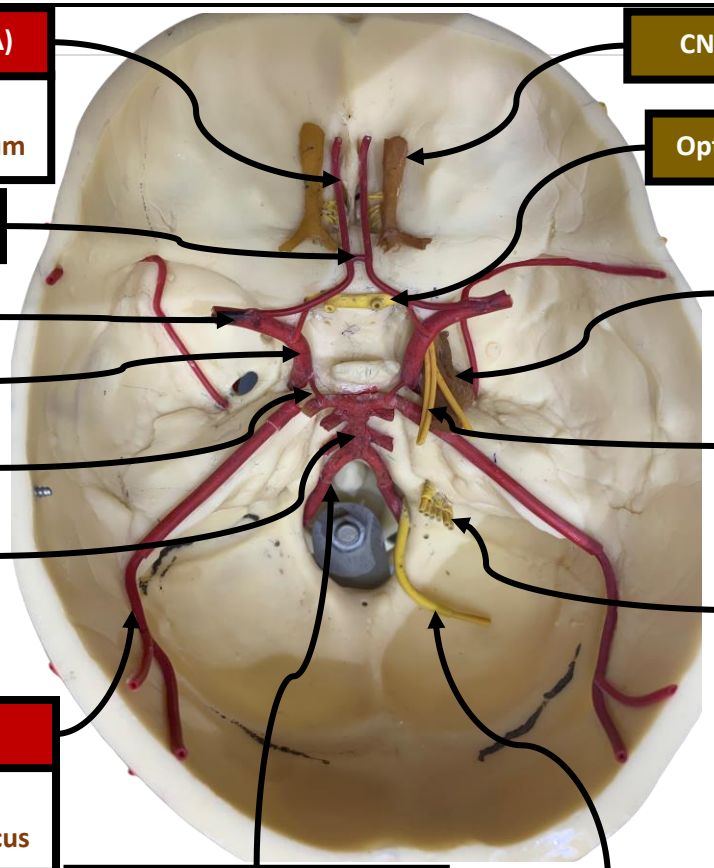
Anterior Cerebral Artery (ACA)

Origin: Internal Carotid Artery
Supplies: Corpus Callosum & Hypothalamus
Lesion: Callosal Apraxia (Split Brain) & Paralysis of one leg



Middle Cerebral Artery (MCA)

Origin: Internal Carotid Artery
Supply: Internal capsule, Hypothalamus, Basal Ganglia
Lesion: Bi-lateral Diminution of hearing & Motor Aphasia



CN I (Olf)

Optic Chiasm

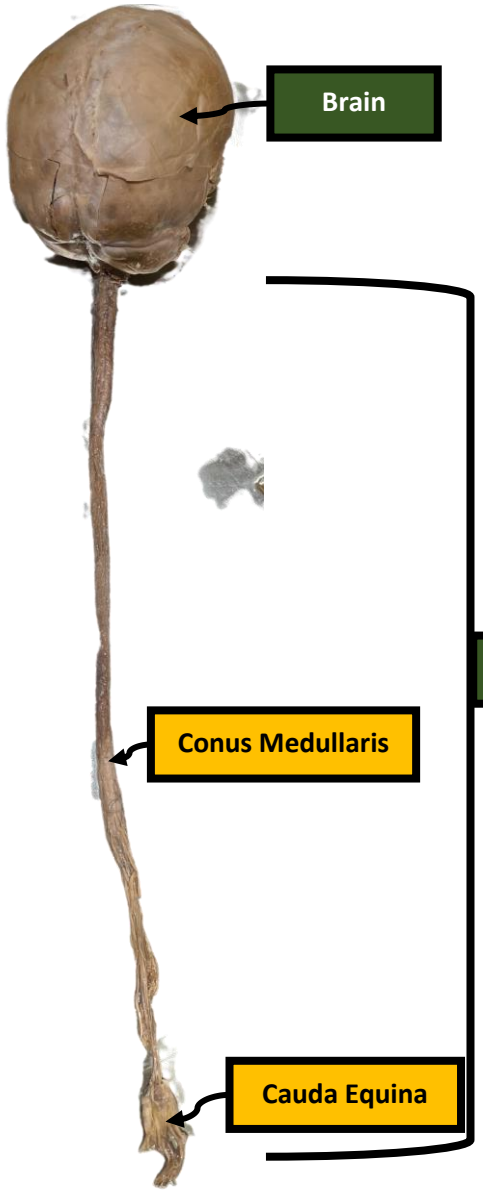
CN V (Trig) (Ophthalmic, Maxillary, Mandibular)

CN III (Ocul)
CN IV (Troch)
CN VI (Abd)

CN IX (Gloss)
CN X (Vagu)
CN XI (Acces)

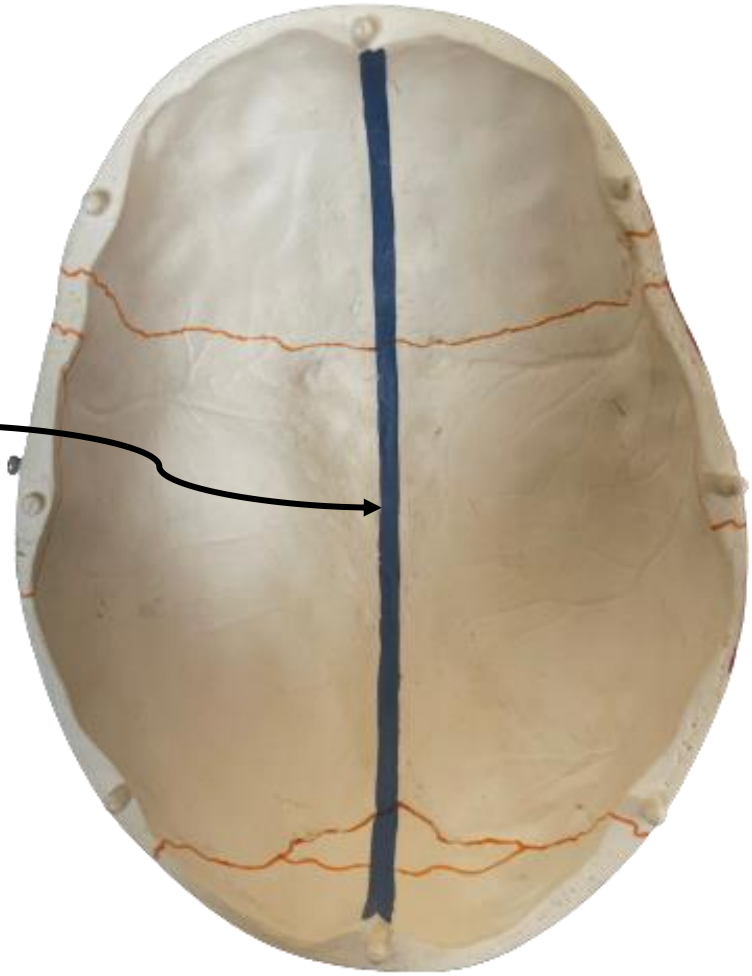
CN XII (Hyp)

Central Nervous System



Superior Sagittal Sinus (Single)

Beginning: Foramen Caecum
Termination: Right Transverse Sinus



Spheno-parietal Sinus (Paired)

Cavernous Sinus (Paired)

Superior Petrosal Sinus (Paired)

Beginning: Cavernous Sinus
Termination: Transverse Sinus

Inf. Petrosal Sinus (Paired)

Beginning: Cavernous Sinus
Termination: Internal Jugular

Sigmoid Sinus (Paired)

Beginning: Transverse Sinus
Termination: Internal Jugular

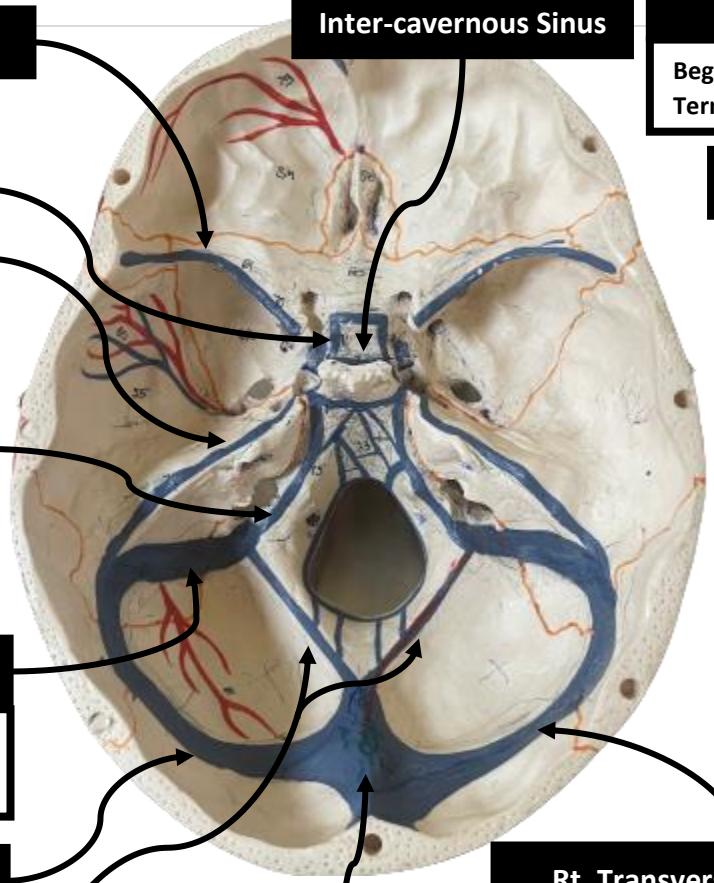
Lt. Transverse Sinus (Paired)

Beginning: Straight Sinus
Termination: Sigmoid Sinus

Occipital Sinus

Termination: Sigmoid Sinus

Inter-cavernous Sinus



Confluence Sinus

Rt. Transverse Sinus (Paired)

Beginning: Superior Sagittal Sinus
Termination: Sigmoid Sinus

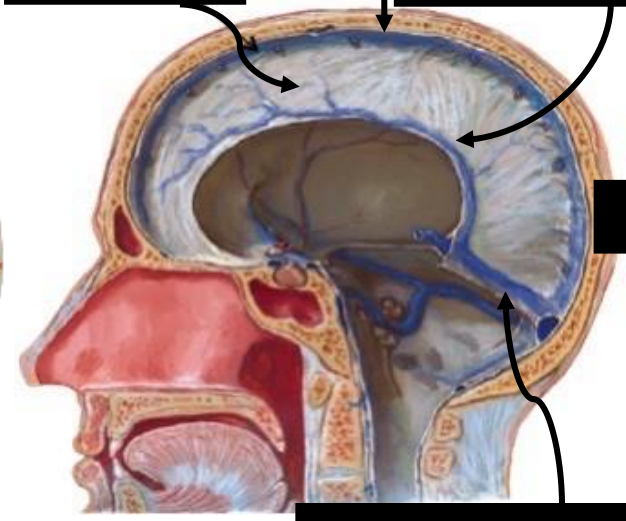
Sup. Sagittal Sinus (Single)

Beginning: Foramen Caecum
Termination: RT. Transverse Sinus

Falx Cerberi

Inf. Sagittal Sinus (Single)

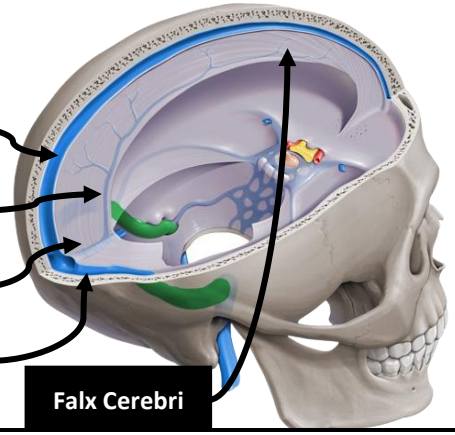
Termination: Straight Sinus



Dural Sinuses

Straight Sinus (Single)

Beginning: Inferior Sagittal & Great Cereberal vein of gallen
Termination: Left Transverse sinus



Sup. Sagittal Sinus (Single)

Inf. Sagittal Sinus (Single)

Straight Sinus

LT. Transverse Sinus (Paired)

Falx Cerebri

Cerebellum

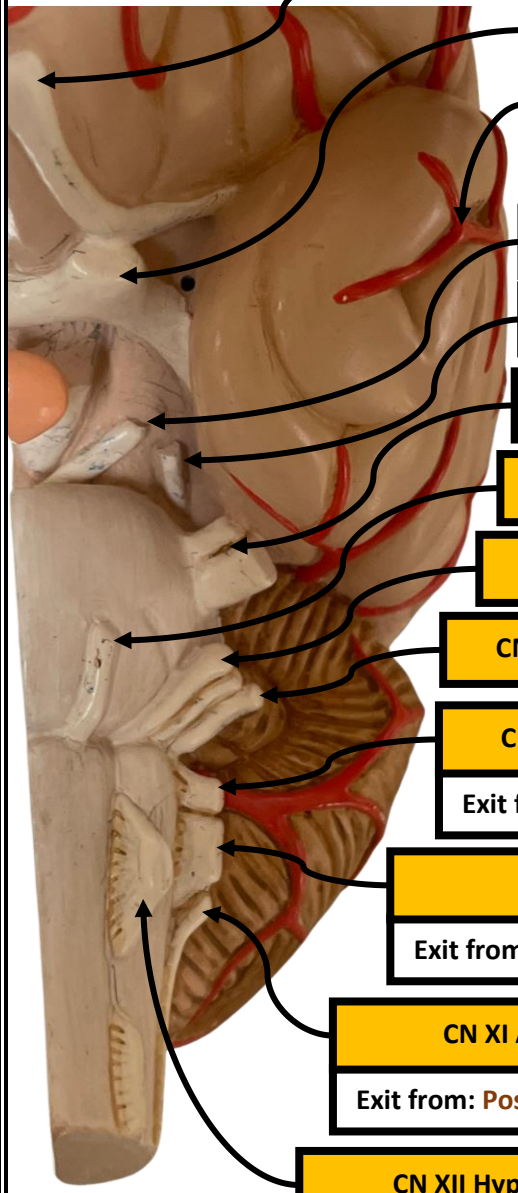
SCA, **PICA**, **AICA**
Lesion: Ataxia

4th Ventricle (Cavity)

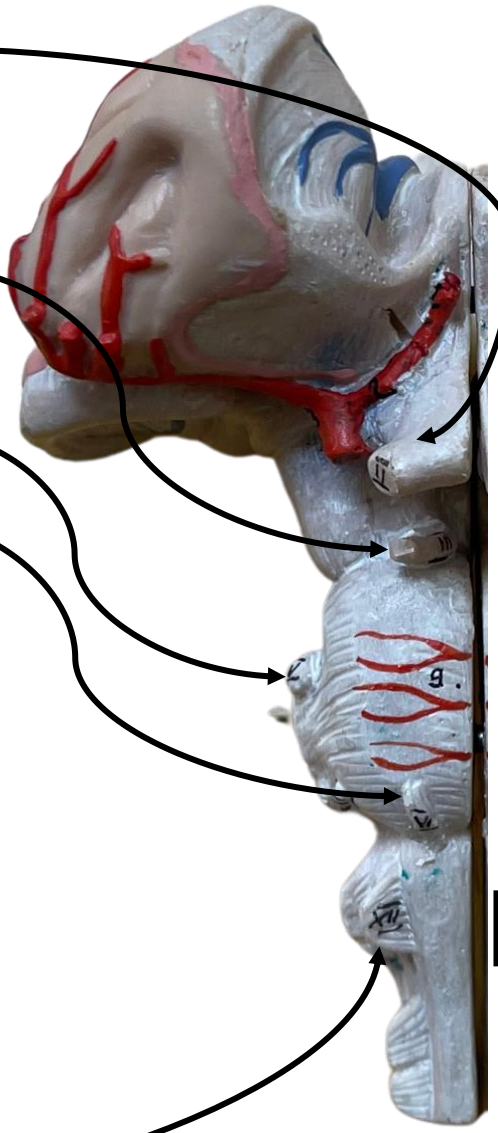
Brainstem

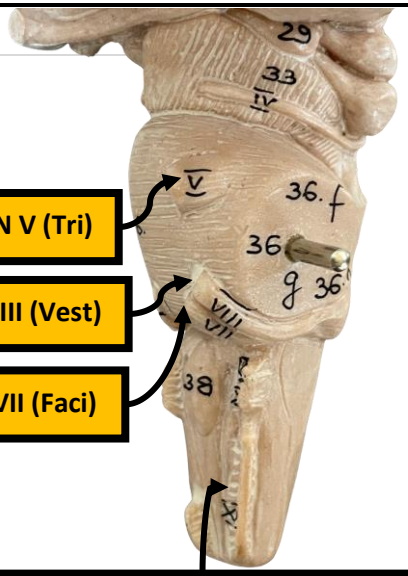
Pons (Basilar Groove)

Brain Stem

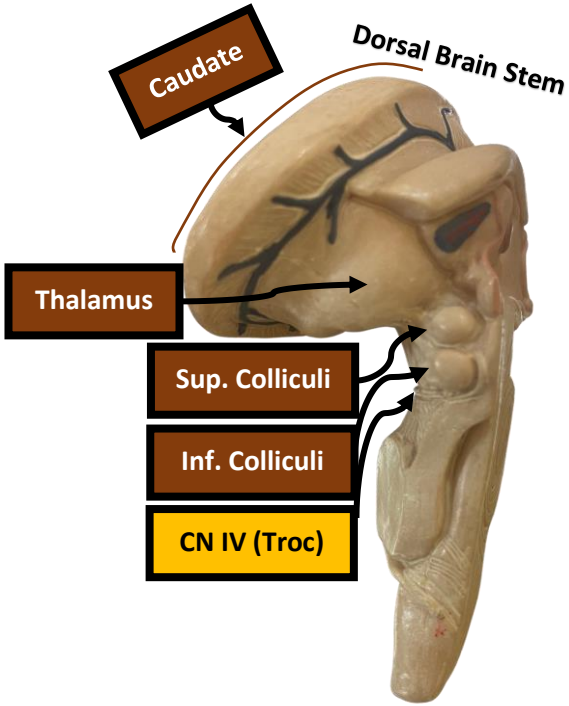


- CN I Olfactory
- Optic Chiasm
- MCA (Middle Cerebral A.)
  - Origin: Internal Carotid Artery
- CN III Oculomotor
- CN IV Trochlear
- CN V Trigeminal
- CN VI Abducens
- CN VII Facial
- CN VIII Vestibulocochlear
- CN IX Glossopharyngeal
  - Exit from: Post-olivary Fissure
- CN X Vagus
  - Exit from: Post-olivary Fissure
- CN XI Accessory
  - Exit from: Post-olivary Fissure
- CN XII Hypoglossal
  - Exit from: Pre-olivary Fissure





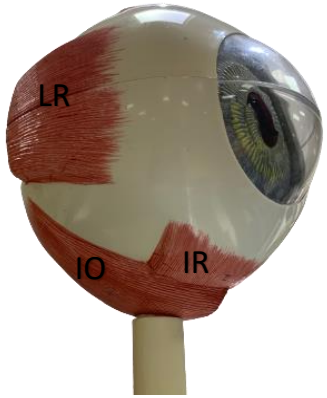
- CN V (Tri)
- CN VIII (Vest)
- CN VII (Faci)
- CN X (Vag)
  - Exit from: Post-olivary Fissure

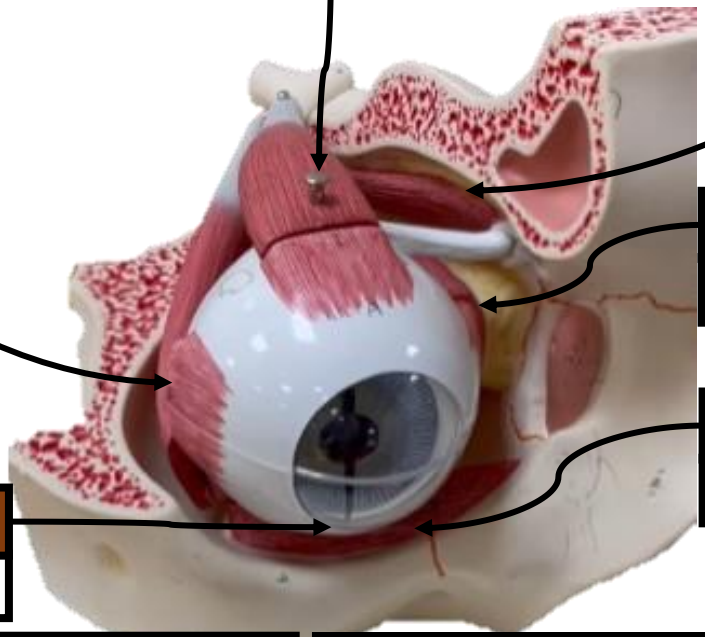


- Caudate
- Dorsal Brain Stem
- Thalamus
- Sup. Colliculi
- Inf. Colliculi
- CN IV (Troc)

Eye

Lateral Rectus	Superior Rectus	Superior Oblique
Nerve: CN VI Abducens Lesion: Diplopia (Looking laterally , Medial Strabismus	Nerve: CN III Oculomotor Lesion: Ptosis, Mydriasis, Loss light reflex	Nerve: CN IV Trochlear Lesion: Diplopia (looking downward)





Medial Rectus

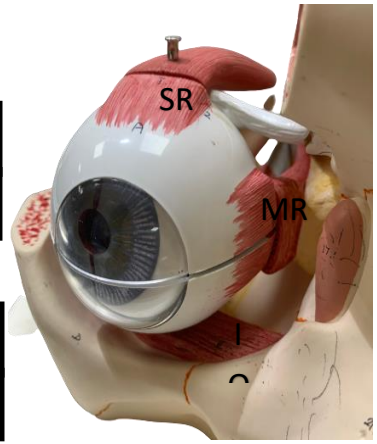
Nerve: CN III (Ocul)

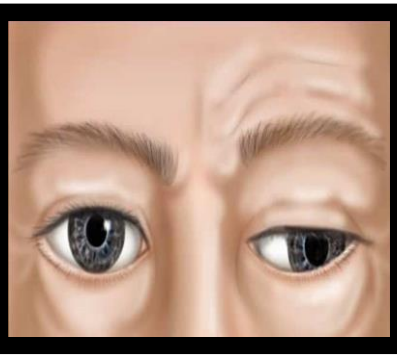
Inferior Oblique

Nerve: CN III (Ocul)

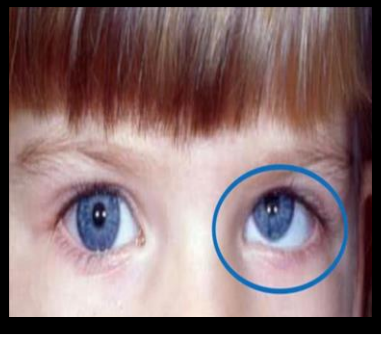
Inferior Rectus

Nerve: CN III (Ocul)



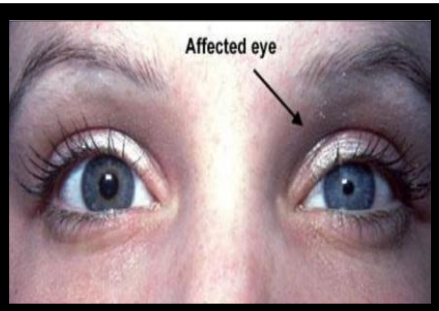


Nerve lesion: Oculomotor N. (CN III)
Muscle Affected: Paralysis of levator palpebrae superioris

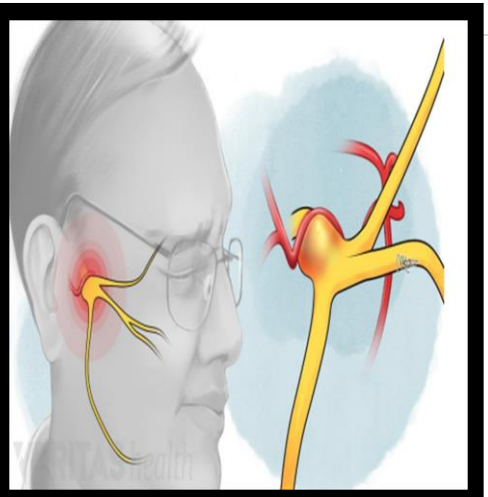


Nerve lesion: Trochlear N. (CN IV)
Muscle Affected: Paralysis of Sup. oblique muscle

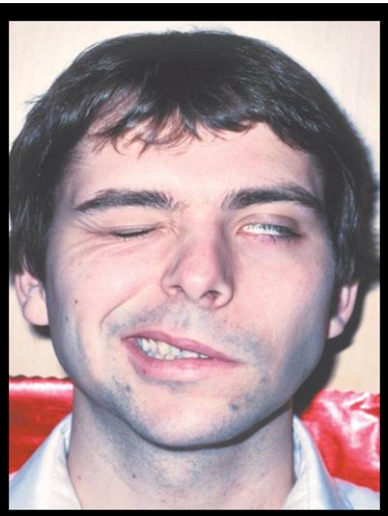
Nerve lesion: Abducens N. (CN VI)
Muscle Affected: Paralysis of lateral rectus muscle



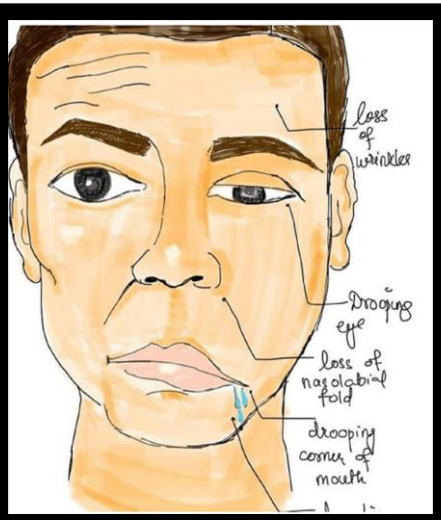
Horner's syndrome
Lesion: above T1



Trigeminal Neuralgia
Nerve Affected: Trigeminal N. (V)

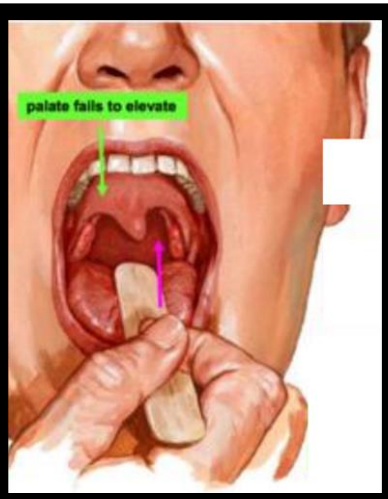


Nerve lesion: Facial Nerve(CN VII)
Side Effected: left side

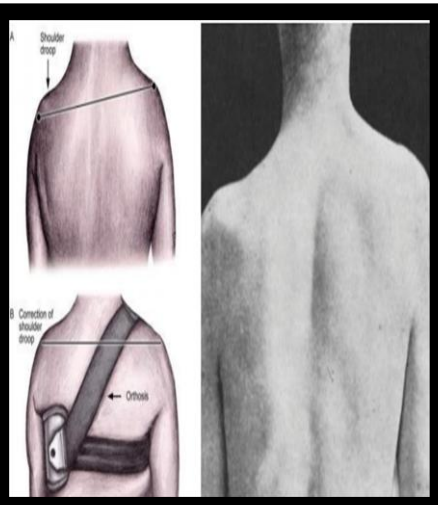


Bell's Palsy
Nerve Affected: Facial Nerve (VII)
Ipsilateral paralysis of muscles of facial expressions (LMNL)

Nerve lesion: Hypoglossal N. (CN XII)
Side Effected: Left side



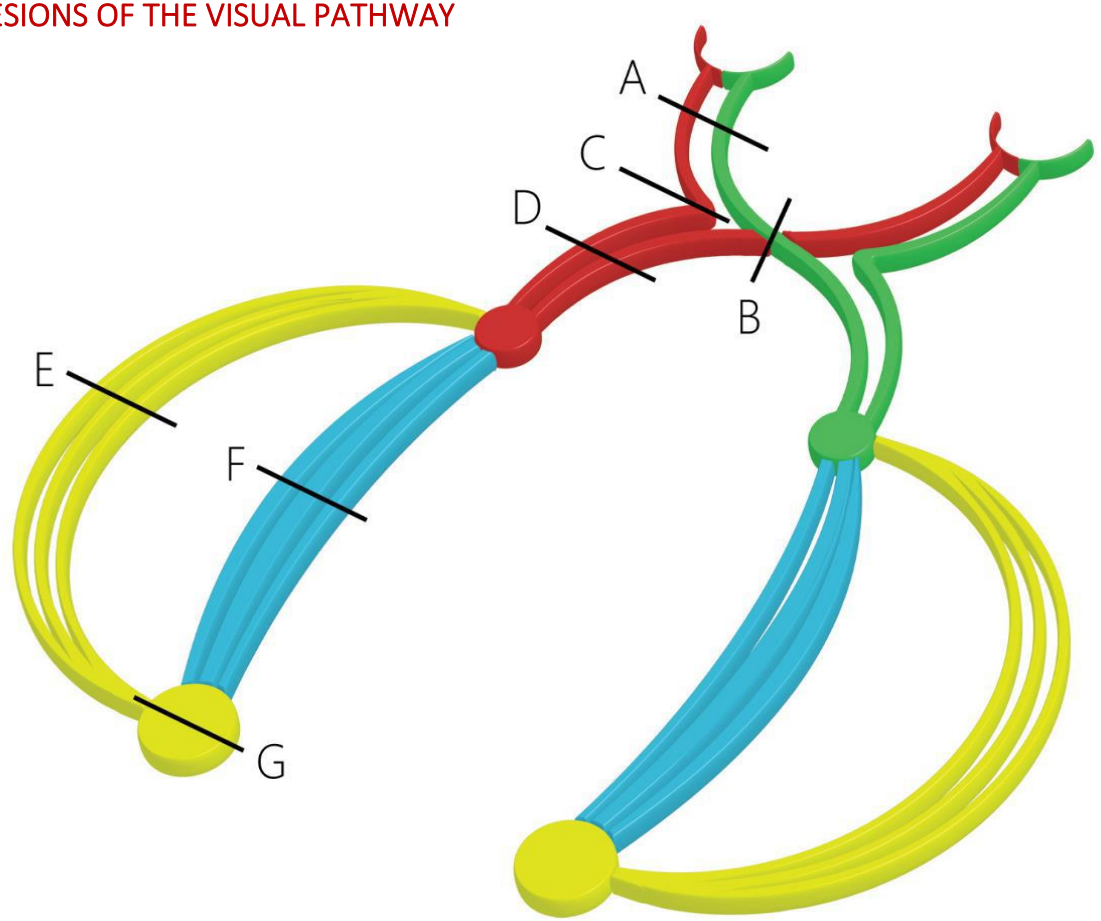
Nerve lesion: Right Vagus (x)
Deviation to: Left side



Accessory nerve injury
Nerve lesion: Accessory nerve (XI)

Physiology of Eye

LESIONS OF THE VISUAL PATHWAY



A. Left Hemianopia
Left optic nerve lesion

B. Bitemporal Hemianopia
Optic chiasm lesion
Pituitary tumor

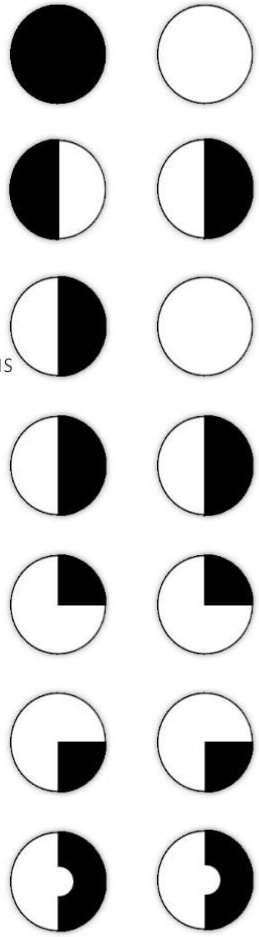
C. Right Nasal Hemianopia
Outer optic tract lesion
Internal carotid artery thrombus

D. Right Homonymous Hemianopia
Optic tract lesion

E. Right Superior Quadrantanopia
Meyer's Loop lesion
Left temporal lesion

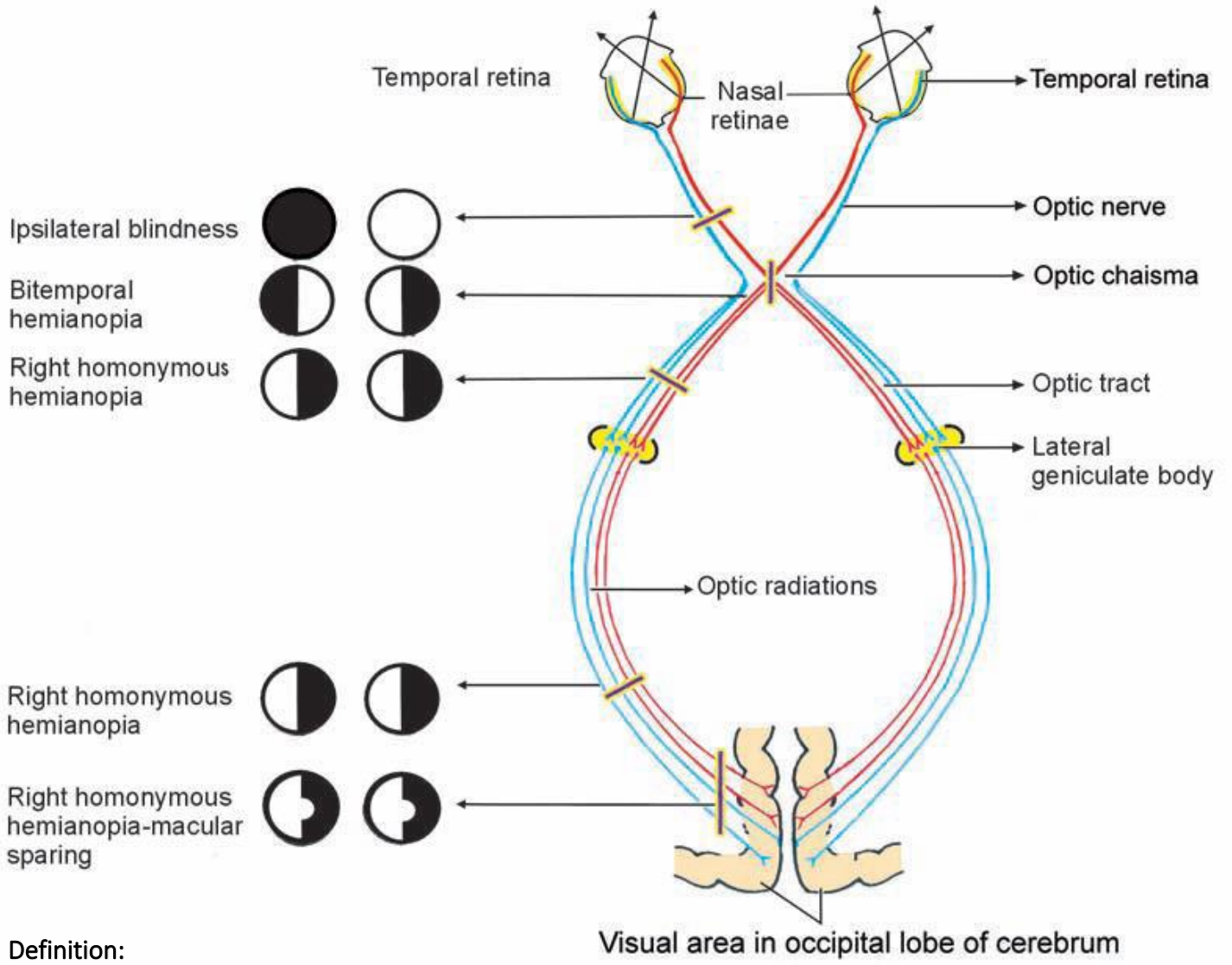
F. Right Inferior Quadrantanopia
Dorsal optic radiation lesion
Left parietal lesion

G. Right Hemianopia with Macular Sparing
PCA infarct



Definition:

1. **Hemianopia** loss of half the field of vision of both eyes
2. **Amblyopia** partial loss of sight, fixation reflexes not developed.
3. **Amaurosis**complete loss of sight in one or both eyes



Hand Held Acuity Card

Ask patient to wear glasses
Hand held card at 14 inches or 40 cm
Assess both eye separately
Direct the patient to read smallest letter that he can see

Definition:

1. **Hemianopia** loss of half the field of vision of both eyes
2. **Amblyopia** partial loss of sight, fixation reflexes not developed.
3. **Amaurosis**complete loss of sight in one or both eyes

What is Visual acuity?

•Visual acuity is describes as "sharpness" of vision and ability to perceive small details of varying letter sizes.

•Visual acuity is a measurement of central vision only.

•Visual acuity can be tested for both distanceand near vision.

•Distance visual acuity (DVA)
•20ft or 6M is equivalent to optical infinity
•Near visual acuity (NVA)
•at about 40 cm

Near Visual Acuity

•Testing the VA at close range (usually 30cm)

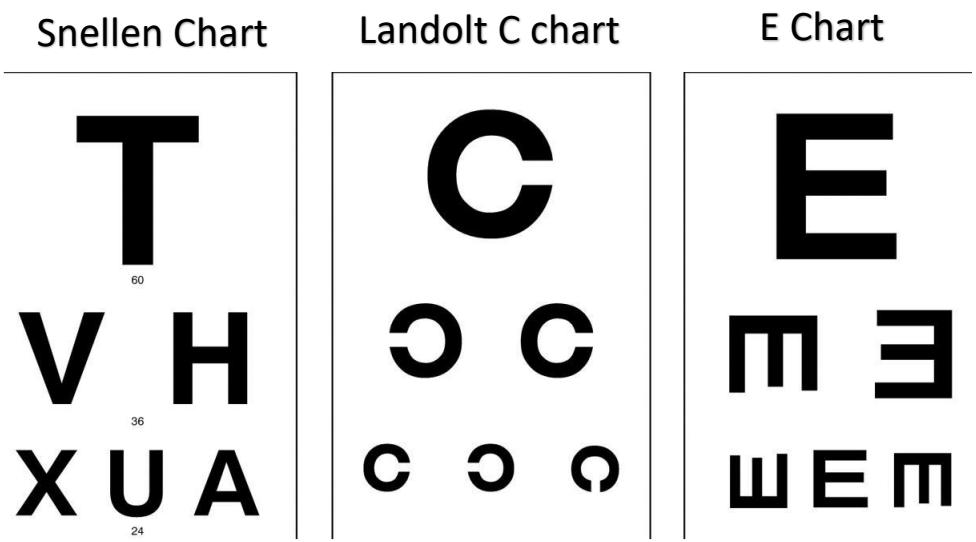
•The purpose is to detect people with **near vision difficulties** (e.g., uncorrected high hyperopia, accommodative dysfunction)

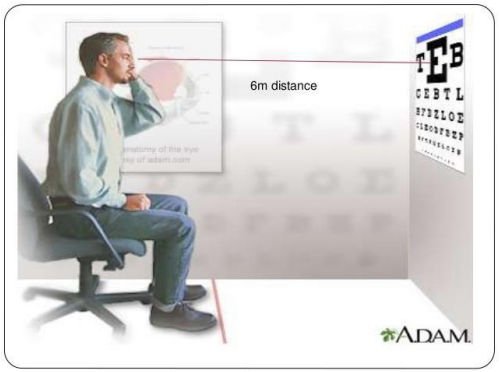
•In patients over 40 years old, the reduced near visual acuity is one of the symptoms of **presbyopia**

NEAR POINT

•Near point is nearest possible distance at which the near object can be clearly seen.
•It changes with age.
•It is about 8 cm at age 10 and
•25 cm in adult
•100 cm at age 70 yrs
•50 cm at the age of 50 yrs

Examples of Distant Visual Acuity Charts (For far & Distance vision)

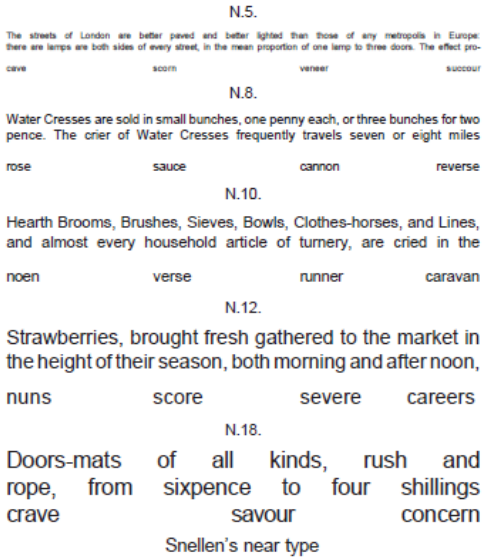




Formula

Testing distance
VA= distance at which letter subtends 5min of arc

Near Visual Acuity chart (for measurement of near vision)



Visual Acuity Grading (10th Revision of the WHO International Statistical Classification of Diseases).
1 Good vision = 6/6 to 6/18
2 Low vision = 6/24 to 3/60 (CF3m).
3 Blind = 3/60 (CF3m) to PL (perception of light).
4Blind to light -NPL (no perception of light).

Legal blindnessis defined as visual acuity(vision) of 20/200 (6/60)or less in the better eye with best correction possible.

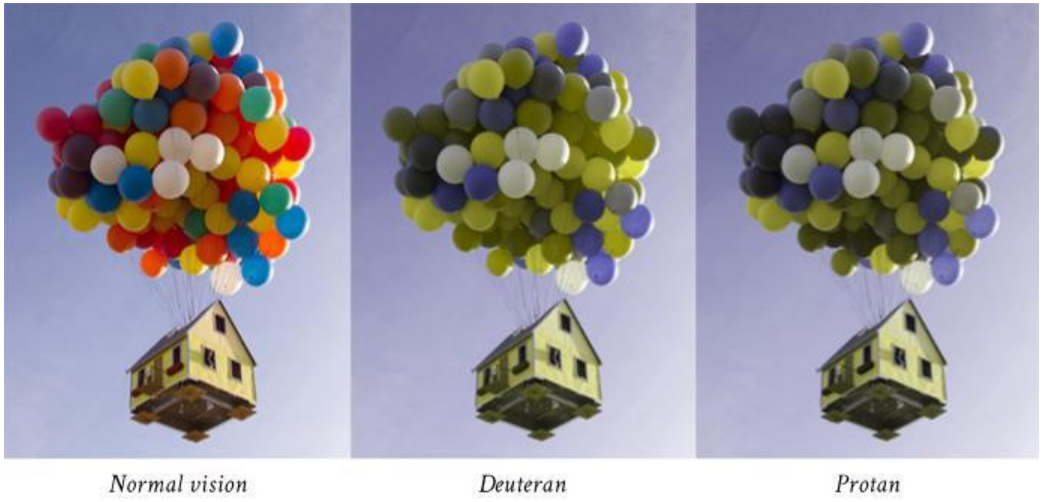
In many areas, people with average acuity who nonetheless have a visual fieldof less than 10 degrees(the normal being 180 degrees) are also classified as being legally blind.

CF 50 ~ Count 2 fingers
HM ~ Hand Movement
NPL ~ Light Sense

Color Sense

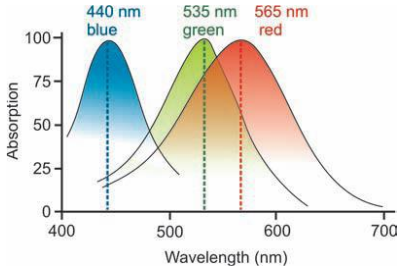
The normal colour vision is called “trichromatic” (red,green, blue)

- **Color blindness [achromatopsia]**
- An inability to recognise colour.
- *Congenital*—an inherited condition
- *Acquired*—diseases of the macula

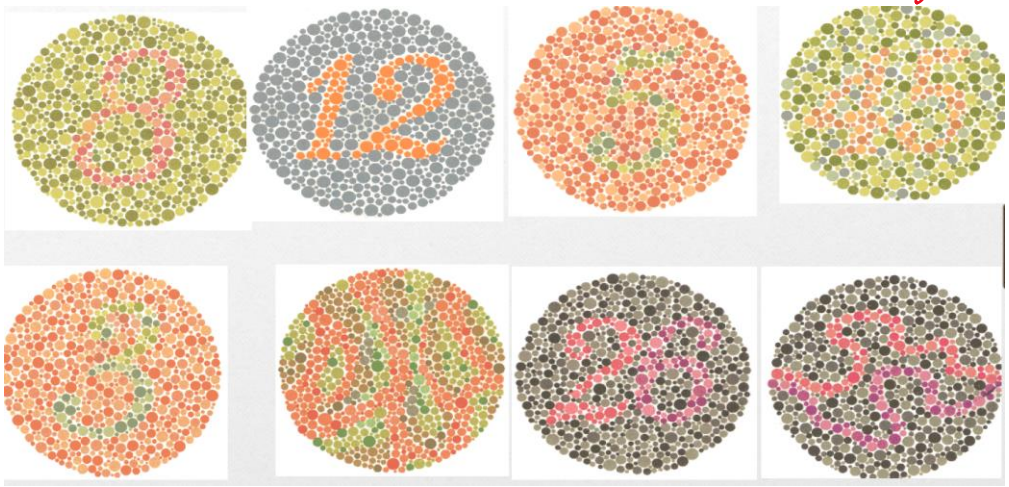


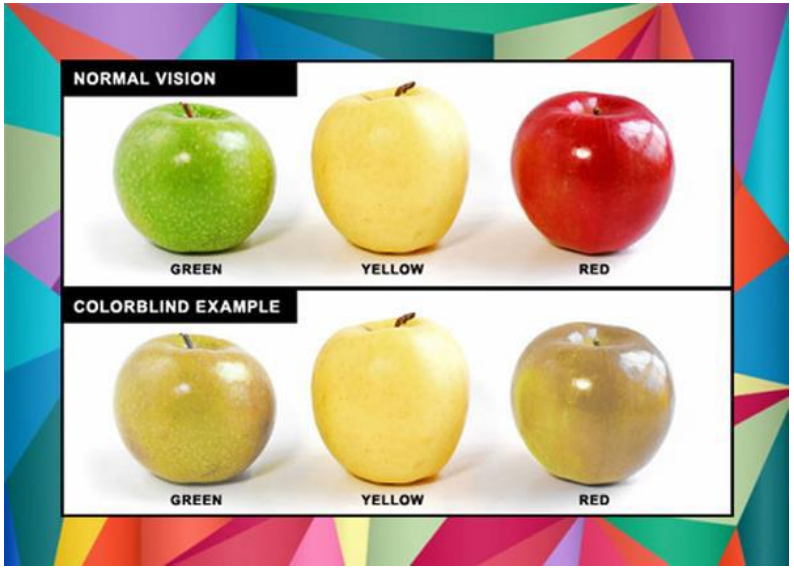
Types of color blindness

-**Red color blindness (protanopia)**
-**Greencolor blindness (deyteranopia)**
-**Blue-yellowcolor blindness (tritanopia)**

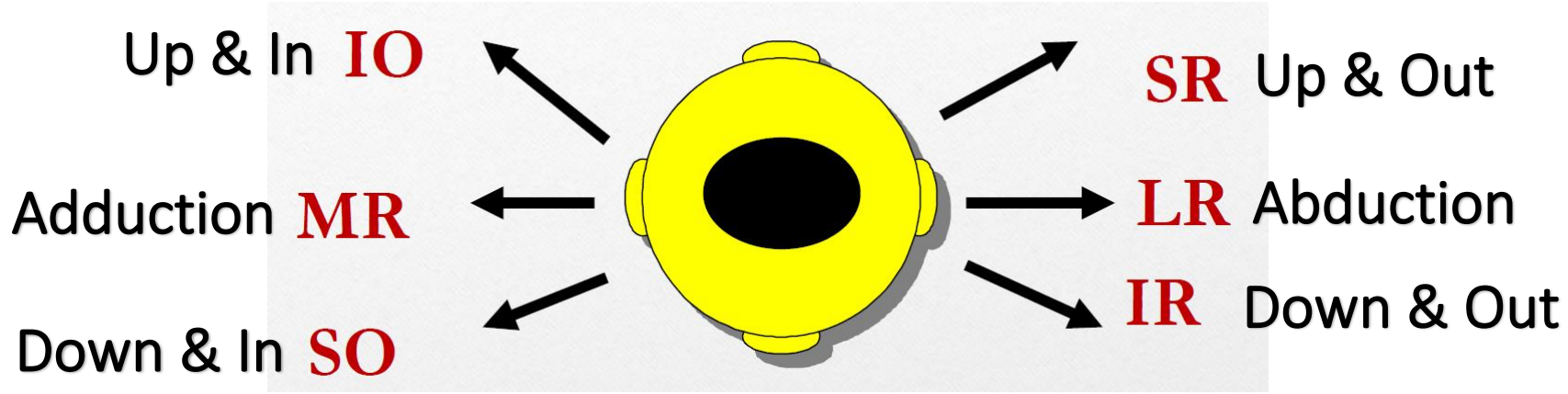


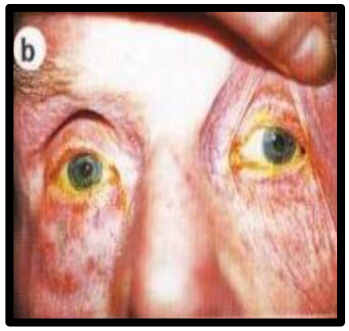
Ishihara Color Blindness Test Plate (Evaluation of color vision)





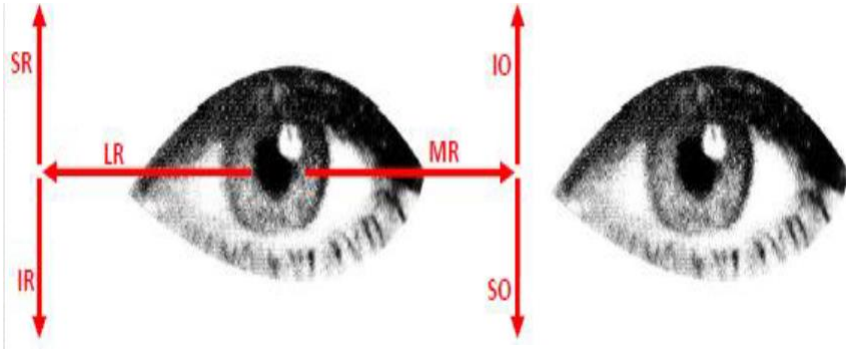
Ocular Movements

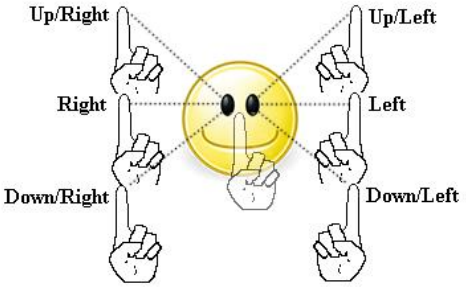




3rd Nerve Palsy

Testing Extra-ocular muscle movements – H TEST





6th Nerve Palsy

Pupillary light reflex test (Center: Edinger Westphal Nucleus)

A black circular opening in the center of the iris, It is surrounded by the pupillary margin of the iris,

To control the amount of light entering the eye

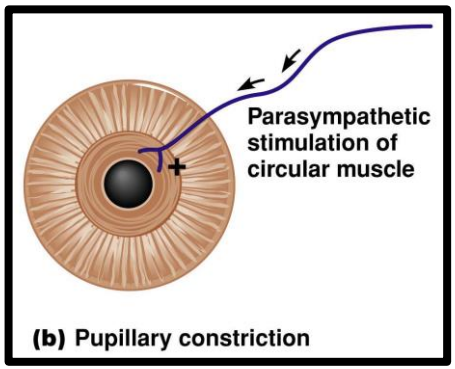
Normal Pupils

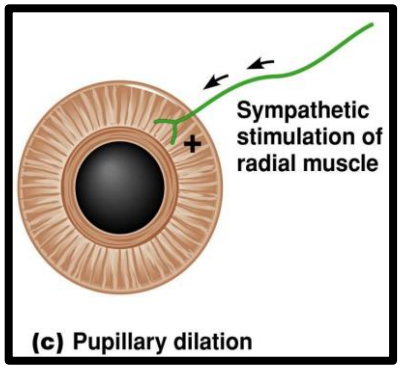
They are round in shape and relatively equal in size. Normal pupils range from 3 to 5mm in ambient light conditions.

— Miotic pupils are less than 3mm

— Mydriatic pupils are greater than 7mm

Pupils are Controlled by two muscles of the iris:





Sphincter muscle (pupil constriction):
Innervated by the parasympathetic nervous system (short ciliary N.)

Dilator muscle (pupil dilation):
Innervated by the sympathetic nervous system (long ciliary nerve)

Afferent Pathway of the Pupil Light Reflex

Sensory pathway for pupil constriction Axons from retinal ganglion cells (input) → Optic nerve → Optic chiasm → Optic tract →

Edinger Westphal ← Pretectal nucleus

Efferent Pathway of the Pupil Light Reflex

Parasympathetic pathway for pupil constriction EW nucleus (output) → Cranial nerve III Accommodation fibers → Ciliary ganglion →

Short ciliary nerve → Ciliary body & Iris sphincter muscle

Sympathetic pathway for pupil dilation Hypothalamus → Spinal cord → Superior cervical ganglion → Cranial nerve V → Eyelid muscles →

Long ciliary nerve → Dilator muscle

Response: Direct and Consensual Response

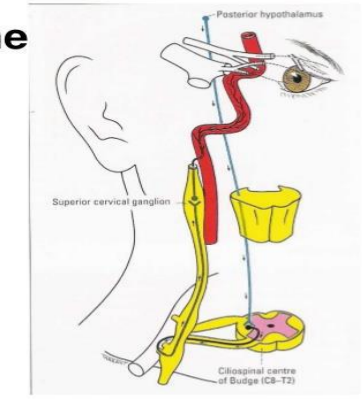
The signal is passed **to both sides** of the midbrain so that light information given to one eye is passed on to both pupils equally.

- **Direct light reflex:** The constriction of the **ipsilateral** pupil to the light stimulus
- **Consensual light reflex:** The constriction of the **contralateral** pupil to the light stimulus

Sympathetic Pathway

Sympathetic ne

- Hypothalamus → ciliospinal center of Budge in C8 → sympathetic chain → superior cervical (stellate) ganglion → sympathetic plexus of ICA → ophthalmic artery → ciliary ganglion → ciliary nerves → dilator pupillae.



Horner's Syndrome

Pupillodilator dysfunction – **Damage to the sympathetic pathway,** Pupil reacts normally to light and near

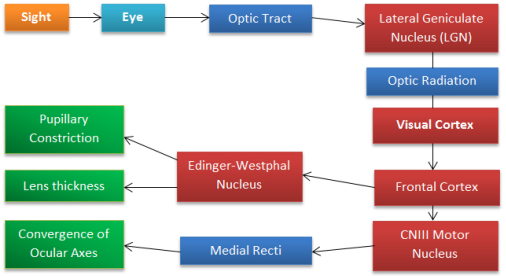
Common cause: lung cancer

Signs: ptosis (droopy eyelid), **miosis,facial anhydrosis (sweat gland denervation), iris heterochromia (congenital Horner's)**

Pupil Testing

To examine the afferent and efferent neurological pathways responsible for pupillary function

Recent onset of the following may be life or sight threatening: Asymmetry in pupil size & Abnormal response to light or accommodation



Accommodation (or "Near") Reflex

1.Shift in gaze from far to near. (contraction of pupil)

2.Three components: Ocular convergence, Pupillary constriction, Lens thickening

3. Accommodation, convergence, and pupil constriction (miosis) occur at the same time

- **Marcus-Gunn pupil:** There is ill-sustained contraction of the pupil in swinging flashlight test, e.g. as in retrobulbar neuritis.
- **Argyll Robertson pupil:** Pupillary constriction occurs as part of the accommodation reflex, but not in response to light.

Corneal reflex – Blinking reflex (Assessment of corneal sensation)

This reflex is a protective mechanism to the eye. – To do this test you should twist the end of piece of cotton to be a thread.

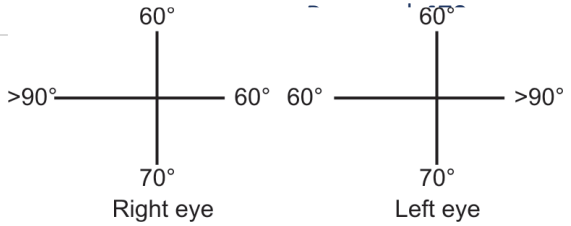
- Ask the patient to look medially and with the cotton thread touch the cornea without touching the lashes.
- You should disturb the patient's attention first.
- Do not make him see your hand or feel its movement.

Pathway for corneal/blinking reflex:

- **Receptors** => touch receptors of cornea.
- **Stimulus** => thread of cotton.
- **Afferent** => along nasociiiarybranches of ophth. Of V nerve.
- **Center** => **area 18-occipital cortex**.
- **Efferent** => facia! nerve VII.
- **Effector** => orbicnians oculi.
- **Action** => reflex closure of eye lids.

Visual Fields

The area that can be “seen” by the patient without movement of the head and with the eyes fixed on a single spot.

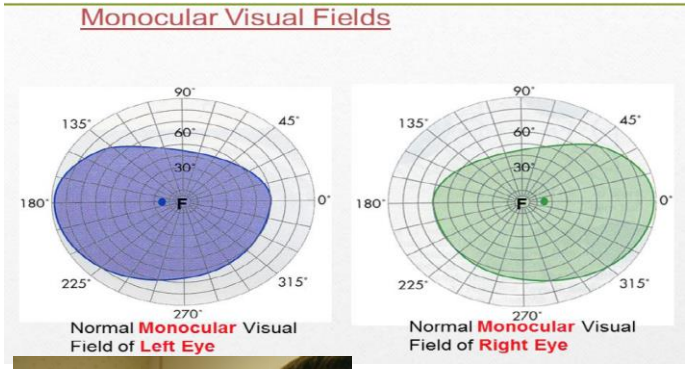


Testing of Visual Fields: Confrontational method & Perimetery (Manual or Automated)

Blind Spot

15°to the temporal side of the visual field of each eye

- On the horizontal meridian
- Corresponds to the location of the optic nerve head15°to the nasal side of the retinaof each eye.



Assessment of visual fields defect by confrontation test

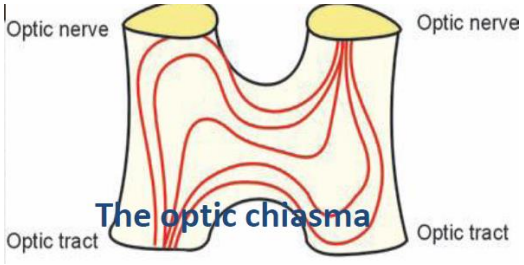
1. Face patient roughly 1-2 ft apart, nose at the same level
2. Close your R eye, while pt closes their L. keep other eye open and look directly @ one another,
3. Move your left arm out and away, keeping it equidistant from 2 of you.
4. A raised index finger should be just outside your field of vision.
5. Wiggle finger & bring it in towards your nose. You should be able to detect it same time.
6. Repeat moving finger in from each direction. Use other hand finger to check medial field (i.e. starting in front of closed eye)
7. Then repeat for other eye.

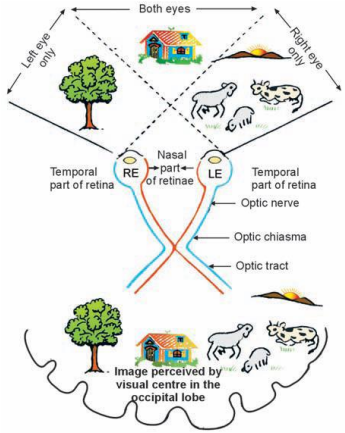
Visual field monocular or binocular

•Binocular vision provides detection of distance and three-dimensional appearance of object in front of eyes.

•This is due to central analysis of fields of vision from both eyes.

•Final visual image is formed in visual cortex.



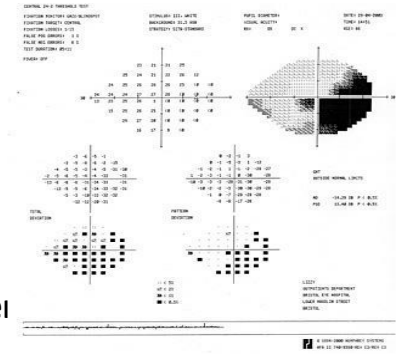


Perimetry

Term 'perimetry' is used to describe various techniques employed to evaluate both central & peripheral visual fields using targets of various sizes & colours.

Two techniques:

- Kinetic perimetry—A target is moved across the field to map out of the two-dimensional extent of field.
- Static perimetry—Non-moving stimuli presented to obtain a vertical boundary / height of the visual field.



Uses: Charting of the visual fields is very useful in the diagnosis of many disease conditions

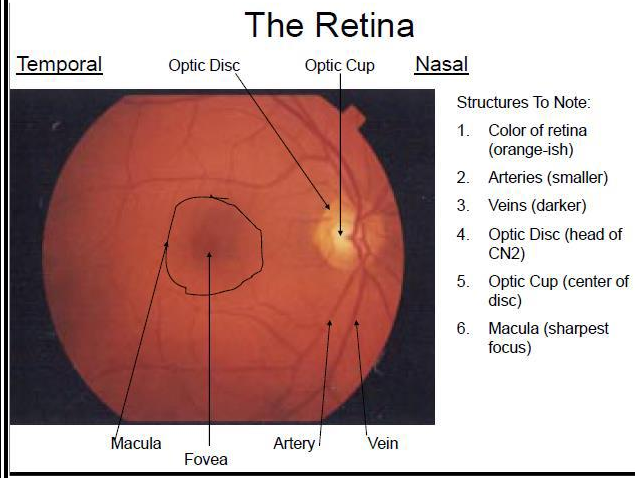
- **Glaucoma**
- **Retinal diseases** e.g. retinitis pigmentosa
- Follow up of laser treatment for **diabetic retinopathy**
- **Neurological disorders**, e.g. brain tumors, head injury, multiple sclerosis.

Automated perimeters utilize computers to program visual field seque

Fundus/Retina Examination

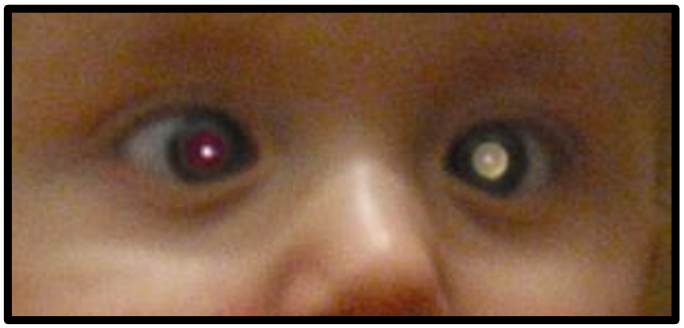
Pupil is **dilated** with a suitable mydriatic, e.g. phenylephrine, or cyclopentolate and the examination of the fundus is done in a dark room.

Atropine ointmentis preferred in children as it results in paralysis of ciliary muscle.



Structures To Note:

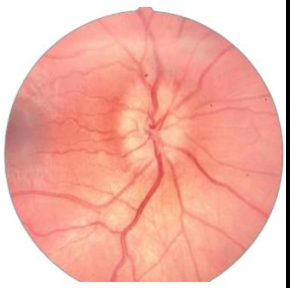
1. Color of retina (orange-ish)
2. Arteries (smaller)
3. Veins (darker)
4. Optic Disc (head of CN2)
5. Optic Cup (center of disc)
6. Macula (sharpest focus)



Red Reflex & White Reflex

Red reflex is reduced in cataract, corneal opacity, Retinoblastoma

- **Name the Pathology:**
  - Papilledema
- **What is the cause of Increase Intracranial Pressure:**
  - Hydrocephalus
  - Brain Tumor
  - Brain Abscess
  - Brain Hemorrhage
  - Meningitis
  - Encephalitis

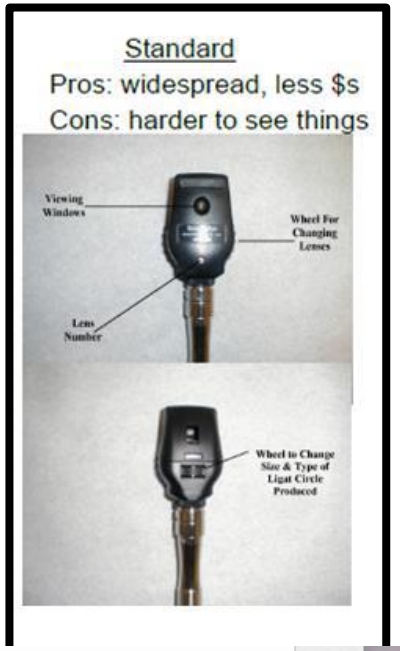


Using your direct Ophthalmoscope (Examination of Retina & Optic Disc)

- Medium circle light, Medium intensity
- Instruct pt to look towards a distant point (avoid roving)
- R eye------R eye
- L eye-------L eye
- Place one hand on fore head
- Grasp handle near top
- Start 15 degree temporal
- Move in slowly-rotate focus wheel until a retinal structure comes into sharp focus
- Remove the glasses or contact lenses to cut down reflections

The image is virtual, erect and magnified 15 times in emmetrope eye)

Adjust
light (left) and power (right)



Examiner right eye, hand, right patient eye

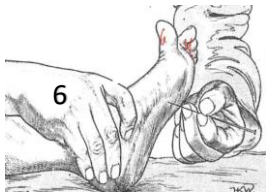
Direct Ophthalmoscope

Indirect ophthalmoscopy (Examination of Retina & Optic Disc)

Observer Method—It is done in a dark room with a convex condensing lens (+ 30 D, + 20 D, +14 D) and a concave mirror. The lens is held in between the thumb and forefinger of the left hand. The curved surface of the lens is towards the examiner. The periphery of the retina can be seen by scleral depression with the patient in lying down position.

A real, inverted enlarged (5 times with +13D and 3 times with + 20D lens) image of the fundus is formed

Neurological Examination

#	Neurological Examination Steps			
1	**Motor Examination:**	#	**Motor Examination Process**	
		A	**Observe:** Twitches, Tremors, **Abnormal movements such as;** Tremor rest, with arms outstretches, intention, chorea, athetosis	
		B	**Palpate Muscles: Myopathy:** Muscle Tenderness	
		C	**Check Muscle Tone by Passively Move each limb to Tone:** **Normal**, **Hypertonia (UMTL): cogwheel**, **clasp knife**, **Hypotonia (LMNL)**	
		#	**Motor Examination in Lower Motor Neuron Lesion**	
		A	**What is the first step to examine:**	Ask Patient to relax
		B	**What To examine in Inspection:**	Atrophy (Muscle Wasting), **Abnormal Movement**, Deformity, Fasciculation
			examination of tone in	
		1	**Examination of Brachioradialis**	**First. Check for Suitable weakness by:** Pronator Drift, pronation and Supination. **Second. Check individual muscle for strength by:** MRC scale
		2	**Examination of hip tone**	**How:** By rolling
2	**Reflexes:** 	**Muscles Stretch Reflex (Deep Tendon Reflex): Grading (0-5)**		
		0. Absent | 1. Present with reinforcement | 2. Normal | 3. Enhanced | 4. Unsustained clonus | 5. Sustained clonus		
		#	**Reflexes examination of**	**Roots**
		1	**Biceps Reflex**	C4, C5
		2	**Brachioradialis Reflex**	C4, C5
		3	**Triceps Reflex**	C6, C7, C8.
		4	**Knee Reflex**	L2, L3, L4
		5	**Ankle Reflex**	L5-S1
		6	**Plantar Reflex**	S1, S2 – **Response:** Positive for Babinski's Ding
3	**Strength:**	**Strength Grade (0-5)**		
		0. No movement | 1. Flicker | 2. Movement without gravity | 3. Movement Against Gravity 4. Movement Against Resistance | 5. Normal Strength		
		Examination	Upper and lower extremities, Distal and proximal muscles and Grip strength is a poor screening tool for strength	
		First step to examine Strength	Ask patient to raise Hand	

4- Sensory Examination

	Sensory Examination Process	
Primary Sensations	**Superficial:** - Light Touch - Pinprick - Temperature	**Deep:** - Vibration - Joint Position
Examination	**start distally and move proximally:** ○ Pin Prick ○ Temperature ○ Vibration ○ Joint Position Sense	
Higher Cortical Examination:	○ Graphesthesia ○ Stereognosis ○ Double Simultaneous Stimulation ○ Texture	
What to Test	○ Joint Position Sense	
Testing what part of brain	○ Cuneate Tract	

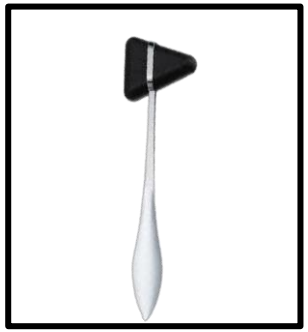
5- Cerebellum Examination

Cerebellum Examination			
Function of Cerebellum	**#**	**Cerebellum function in**	
	A	**Upper Limb:**	▪ **Rapid Alternating Movement** ▪ **Finger to Finger to Nose Testing**
	B	**Lower Limb:**	▪ **Heel to Shin** ▪ **Gain (tandem)**
Lesion Result in	**Ataxia: imbalance**		
Tests Includes	**#**	**Name of Test**	**Testing on**
	1	Finger Nose Finger	Cerebellum
	2	Rapid Alterating Movement	Cerebellum
	3	Heel to shin	Cerebellum
	4	Gait (Tandem)	Cerebellum
	5	Romberg Test	Cerebellum

Name the Device and used for which test

Tuning Fork

Vibration Test Examination



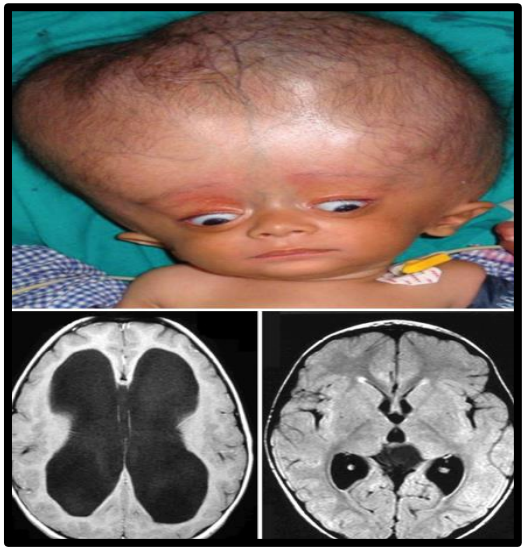
Tendon Hammer

For Reflex Examination

Embryology

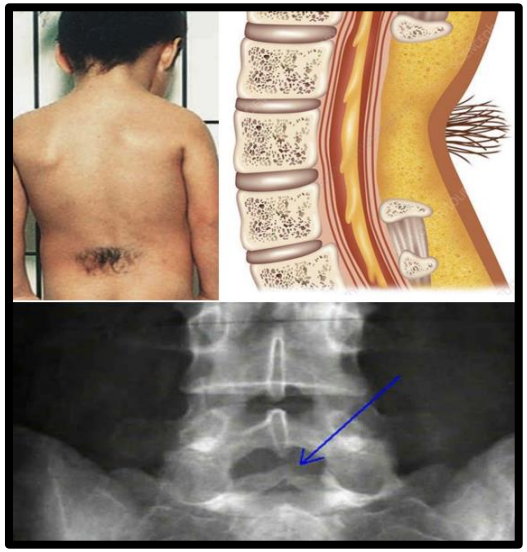
Microcephaly

Anencephaly

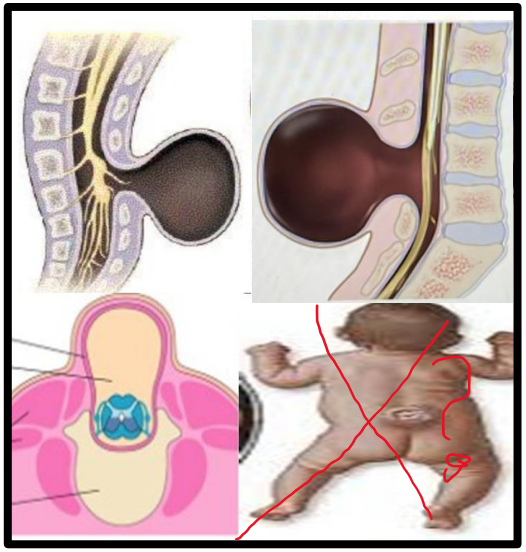


Congenital Hydrocephalus

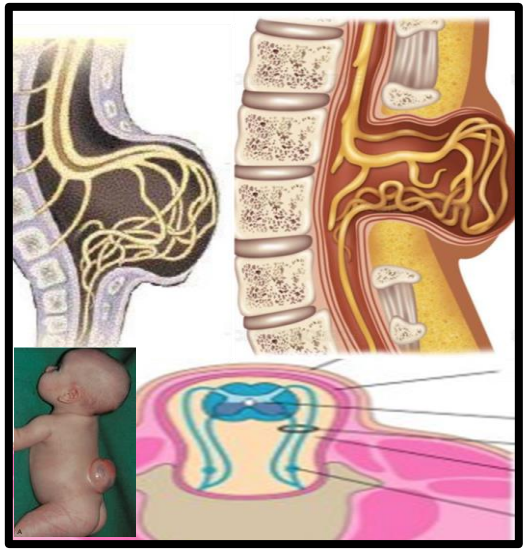
Spinal Dermal Sinus



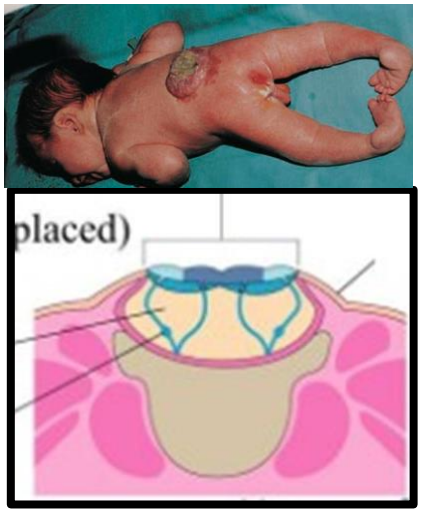
Spina Bifida Occulta



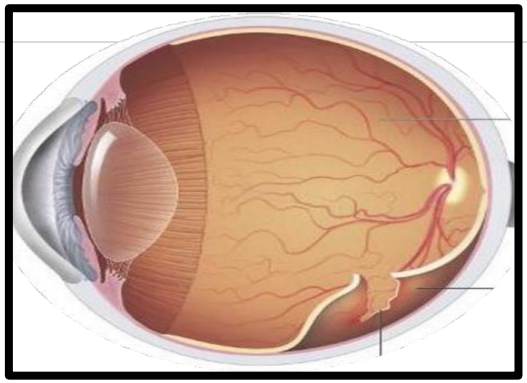
Spina Bifida Meningocele



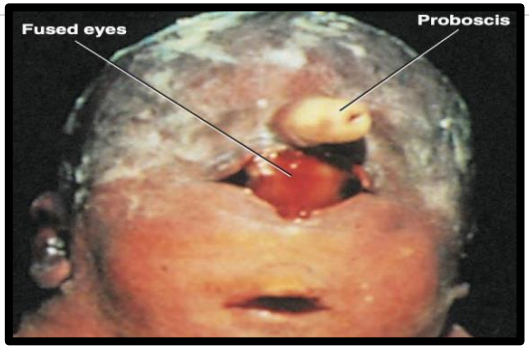
Spina Bifida Meningomyelocele



Spina Bifida Myelocele



Congenital Retinal Detachment

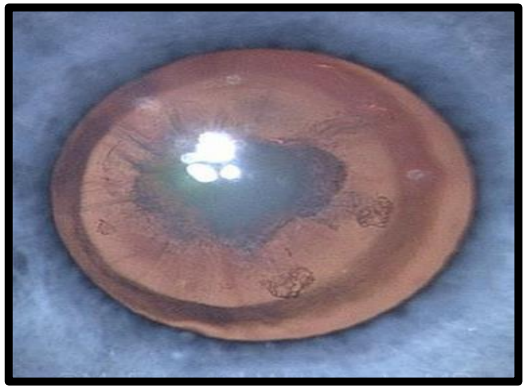


Cyclopia

Microphthalmos

Anophthalmia

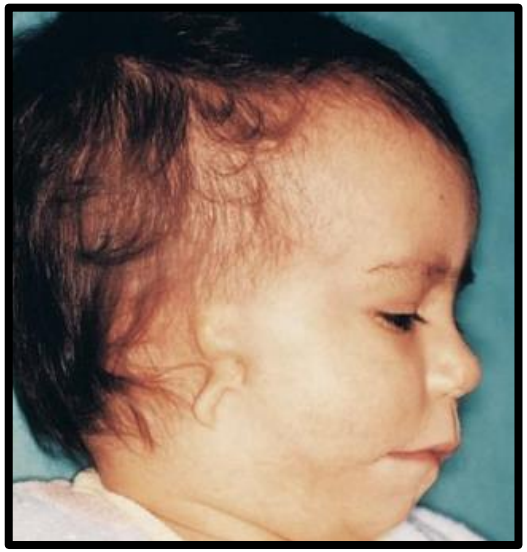
Congenital Cataract



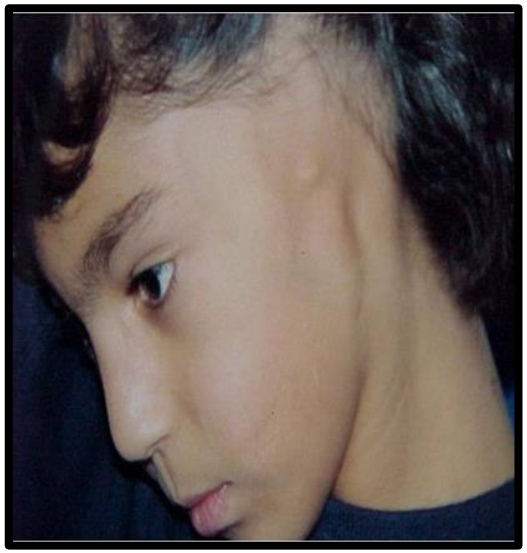
Congenital Aphakia

Coloboma of Iris

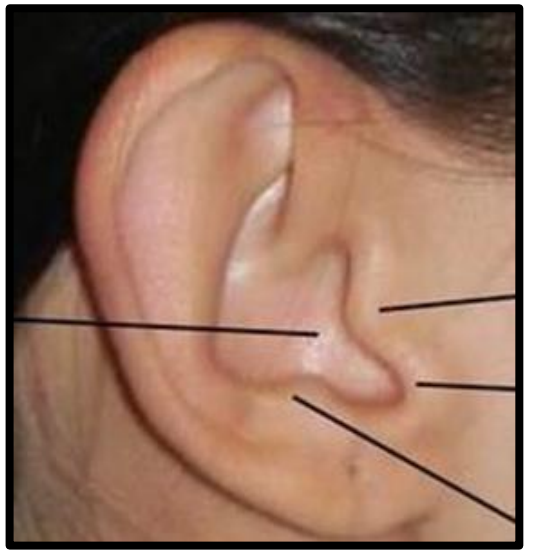
Congenital Aniridia



Microtia

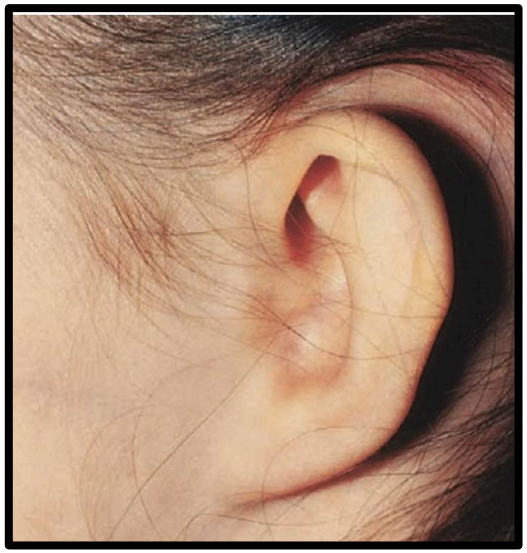


Anotia (Absence of auricle)



Atresia of the external acoustic meatus

Preauricular Sinus



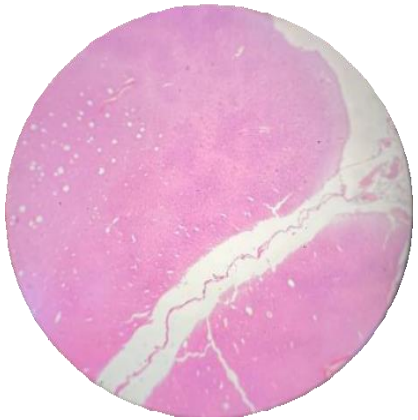
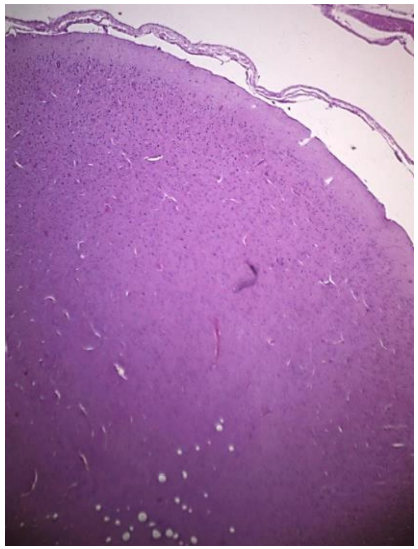
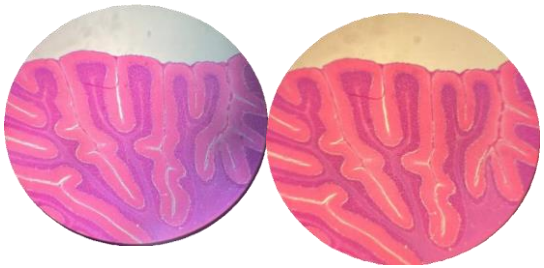
Absence of the external acoustic

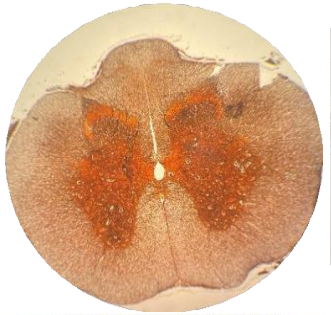
Congenital Deafness

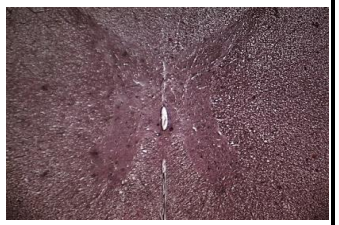
Histology

CNS Histology

	Cerebrum	Cerebellum	Spinal Cord
Identifications	➢ **Grey Matter; Layers** — Molecular layer (Plexiform layer) — External granular layer — External pyramidal layer — Internal granular layer — Internal pyramidal layer (Ganglionic Layer) — Multiform Layer (Layer of Polymorphic Cells) ➢ **White Matter** ➢ **Pia Matter** ➢ **Arachnoid Matter**	➢ **White Matter** ➢ **Molecular Layer** ➢ **Purkinje Cell Layer** ➢ **Granular Layer**	➢ **White Matter** ➢ **Anterior Horn** ➢ **Posterior Horn** ➢ **Central Canal** ➢ **Motor Neuron** ➢ **Axon** ➢ **Meninges**



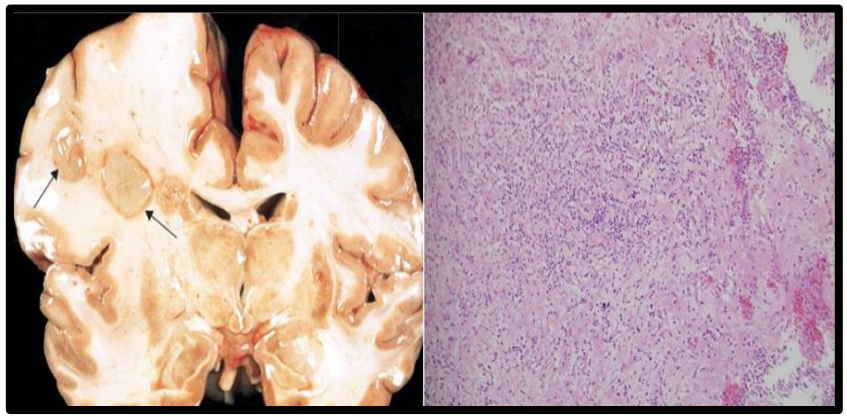



Pathology

Case #1

A 43-year-old, previously healthy woman presented with headache and fever for the past two weeks. She had a history of severe respiratory tract infection two weeks back. On physical examination, her temperature is 38.5 C. There is right hemiparesis. CT scan of the head shows a sharply demarcated, 3 cm, ring-enhancing lesion in the right frontal region. While undergoing treatment the patient went into respiratory failure because of unknown cause and died. Autopsy was carried out as per hospital protocol.

The slice of brain and microscopic image is provided for interpretation.



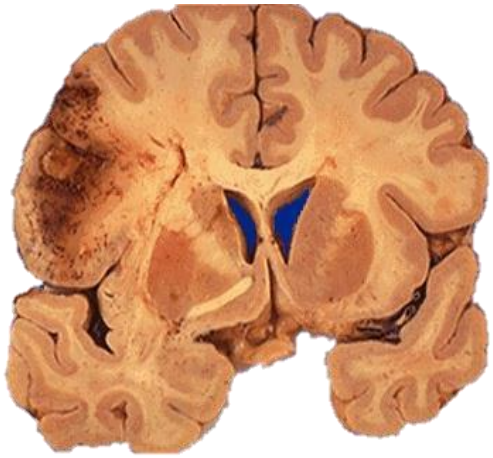
- **What is the most likely Diagnosis:**
  Multiple Brain Abscess

- **Write three important microscopic features**:
  Liquefactive Necrosis, **Dead and viable neutrophils**, **Neovascularization and Gliosis**

Case #2

50-year-old man was brought dead in the casualty department of a hospital. Autopsy was carried out to know the cause of death. His medical records showed a history of atrial fibrillation followed by sudden right-sided body weakness.

The slice of brain is provided for interpretation.

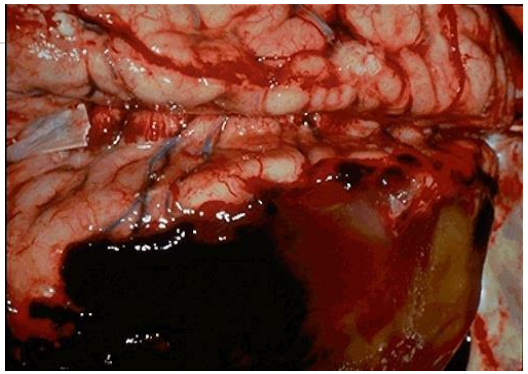


- **What is the most likely Diagnosis: Hemorrhagic Infraction (Red Infraction)**

- **What is the most likely cause for this condition: Embolism**

- **Mention the most common artery affected in this condition: Middle Cerebral Artery.**

Case #3

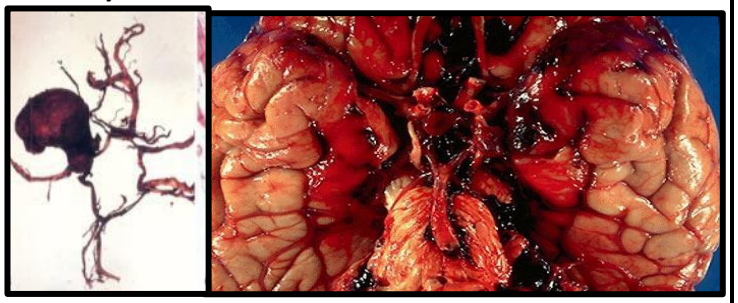


An 80 year old woman fell down the stairs. About 36 hours later, she developed headache and confusion and is taken to the emergency department. On physical examination, she is drowsy and has a scalp contusion on occiput. CT scan of the head shows a collection of blood in the subdural space.

- **What is the most likely Diagnosis: Rupture of Bridging Veins**

Case #4

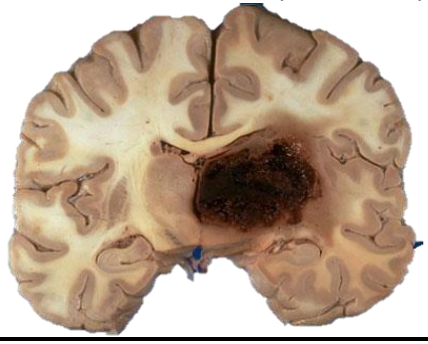
A 42 year old drowsy woman presents to the emergency department with complaint of the "worst headache of her life"
Few hours later she developed nausea, vomiting and weakness of the right side of the body. There is no history of head trauma.
Interpret the gross images and answer the questions



- **What is the most likely Diagnosis: Subarachnoid Hemorrhage**
- **What is the common cause of this condition: Rupture of Saccular Aneurysm** (Berry Aneurysm)
- **Write name of cerebral aneurysm: Saccular Aneurysm** (Berry Aneurysm).
- **Mention most common site of this type of aneurysm: Anterior Cerebral Artery** & **Anterior Communicating Artery Junction**

Case #5

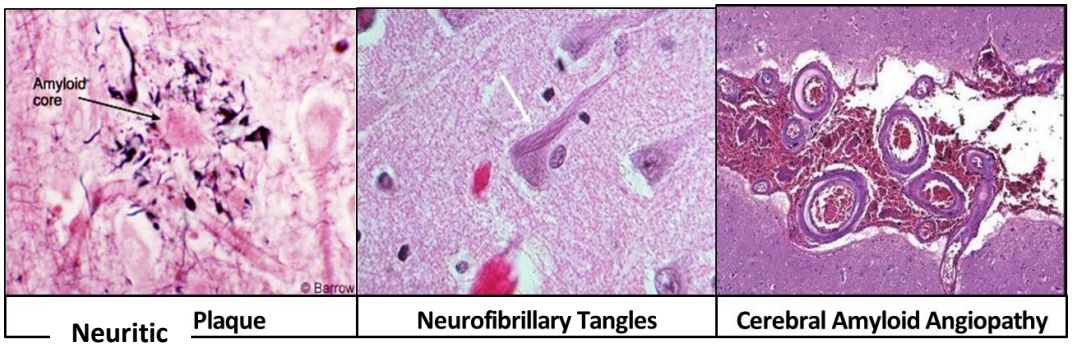
A 58-year-old chain smoker with long standing uncontrolled hypertension and diabetes mellitus experienced acute onset of weakness and numbness on the left side of his body and an inability to walk. He mentions the history of intermittent bouts of severe headaches. His blood pressure upon arrival at the emergency center was 192/105 mm Hg. Suddenly he went into cardiac arrest and expired. Autopsy was carried out. – slice of brain is provided for interpretation



- **What is the most likely Diagnosis: Intracerebral Hemorrhage (Intraparenchymal Hemorrhage)**
- **What is the most likely cause for this condition: Rupture of small Intraparenchymal blood vessels**

Case #6

An 86 year old man resident of a nursing home is found wandering the streets, looking for his way "home." The patient's family describes deteriorating cognitive function that has been worsening progressively over the last several years. He does not have a history of head trauma or cardiovascular disease. In addition to the disorientation, the patient has demonstrated significant language and emotional impairment.

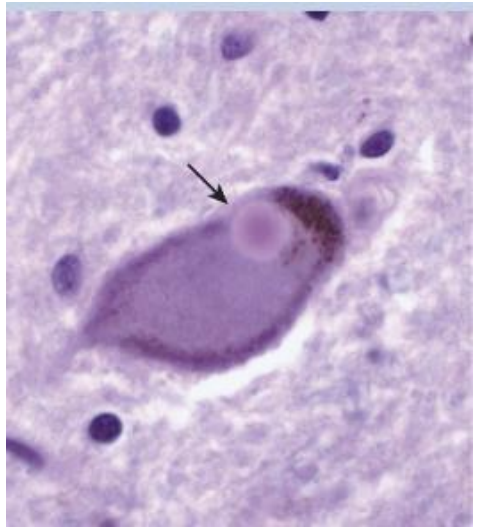


- **What is the most likely Diagnosis: Alzheimer Disease**
- **Identify the distinctive pathologic findings observed in brain section: Neuritic Plaque, Neurofibrillary Tangles, Cerebral Amyloid Angiopathy**

Case #7

Physical examination of 62-yr revealed festinating gait, stooped posture, bradykinesia, muscle rigidity, pill-rolling tremor, "mask-like" facial expression.

- **What is the most likely Diagnosis: Parkinson Disease**
- **Identify the pathological finding: Lewy Body**
- **Mention the name of the abnormal protein which is responsible for this pathological finding: α-synuclein**
- **Mention two the most common sites which are affected in this condition:**
  - **Substantia Nigra**
  - **Locus Cerulus**
  - **Basal Nucleus of Meynert**
  - **Dorsal Motor Nucleus of Vagus**

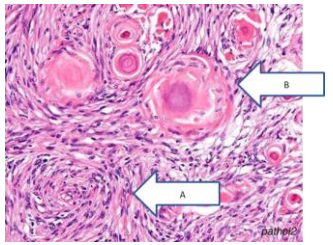


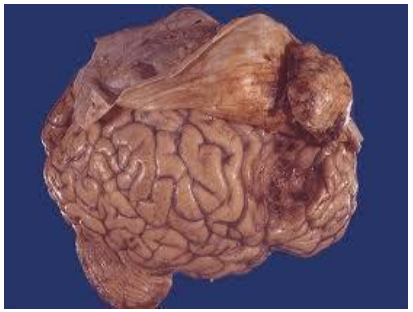
Case #8

40-yrs has been in good health until recently, when she developed recurrent headaches. A CT scan reveals a 2-cm extra axial dura based frontal mass

- **What is the most likely Diagnosis: Meningioma**
- **Identify two important microscopic features marked as A and B in the image:**

  A- Whorls of Meningothelial Cells & **B- Psammoma Bodies**

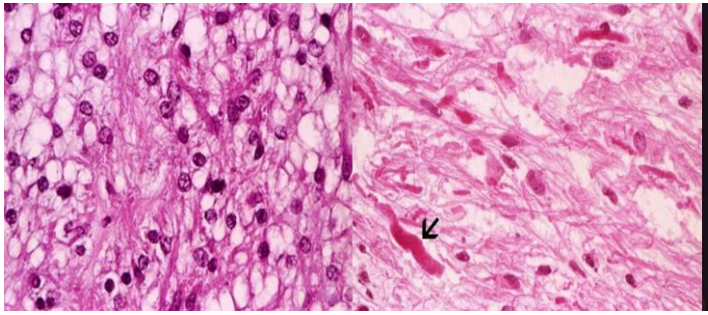


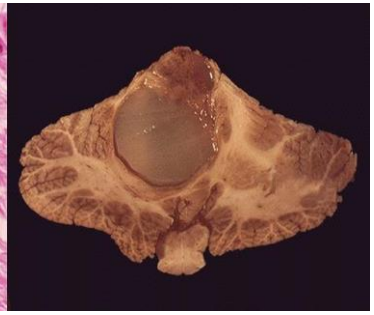


Case #9

A 9-year-old girl is evaluated for headaches and ataxia over the last month. A CT scan reveals a midline, partially cystic cerebellar mass. The tumor is removed surgically, and microscopic examination shows elongated bipolar astrocytes with fibrillary processes and Rosenthal fibers.

- **What is the most likely Diagnosis: Pilocytic Astrocytoma**
- **Mention the pathological grade of this tumor: Grade I**





Case #10

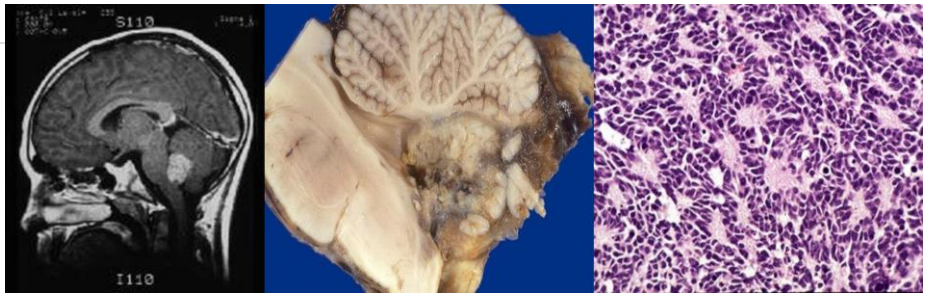
A 20 year old male presented with the following clinical manifestations. – There is a family history of similar clinical manifestations.

Interpret the images and write the diagnosis: Neurofibromatosis Type I

Case #11

A 5 year old boy presented with headache and ataxia.

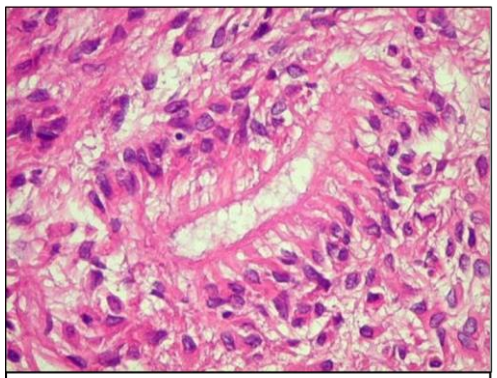
- **Interpret the following images and write the diagnosis: Medulloblastoma**



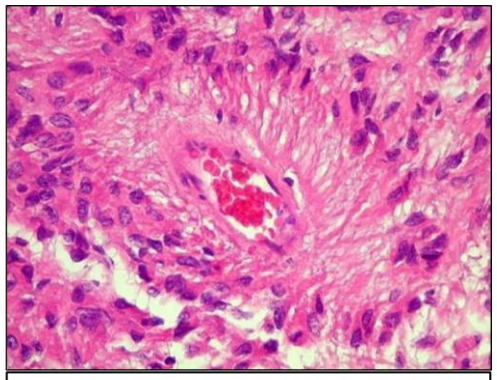
Case #12

A 15 year boy is diagnosed as a case of ependymoma.

- **Write the name of the characteristic rosettes seen in in this condition:**
  - **A. True Rosette.**
  - **B. Pseudo-rosette (Perivascular Rosette)**



True Rosette

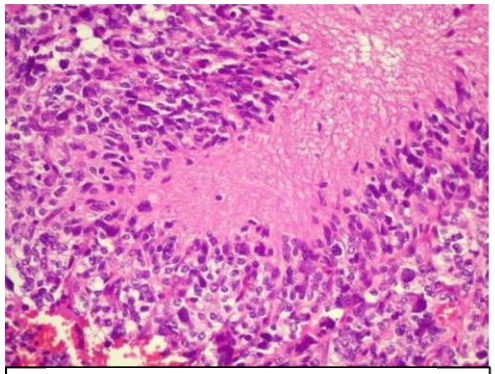


Pseudo-rosette

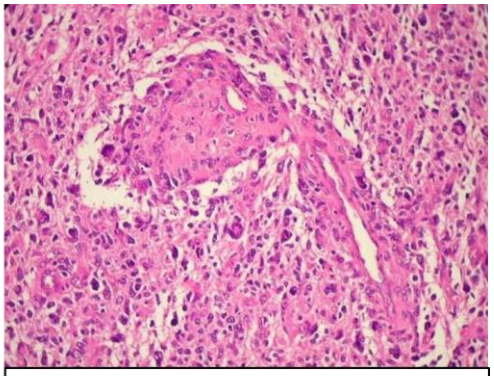
Case #13 [cc]

A 65 year old male is diagnosed as case of glioblastoma.

- **Write the name of the microscopic features observed in this tumor.**
  - **A. Pseudo-palisading Necrosis**
  - **B. Vascular Proliferation**



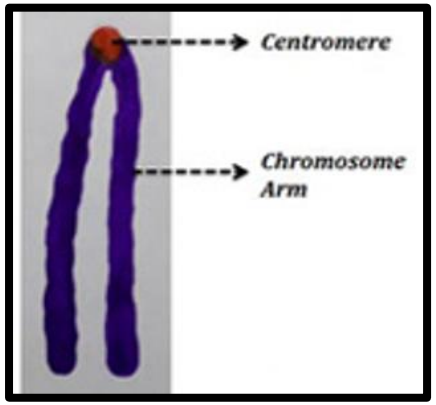
Pseudo-palisading necrosis



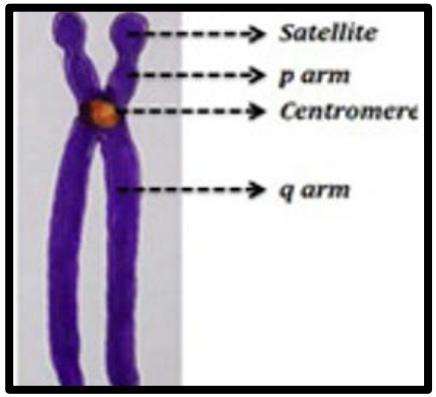
Vascular Proliferation

MGEN

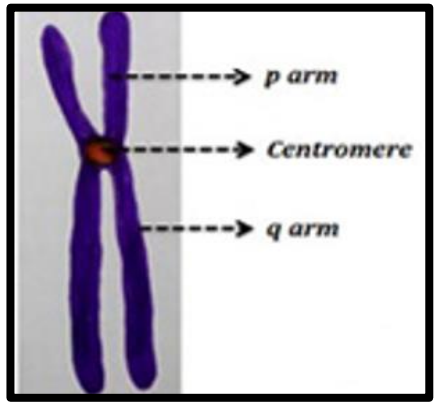
Chromosomal study



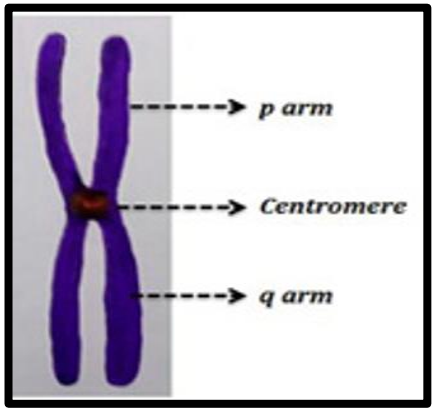
Classification of chromosome on position of centromere:
Telo-centric Chromosome



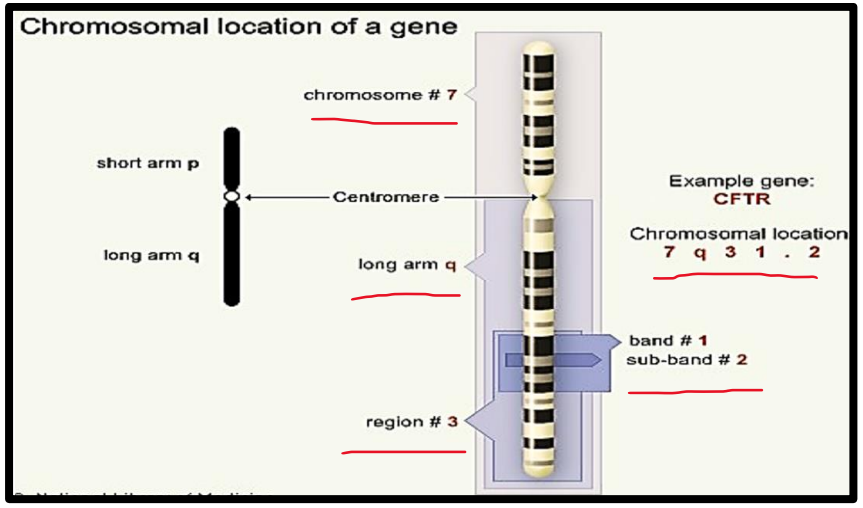
Classification of chromosome on position of centromere:
Acro-centric Chromosome



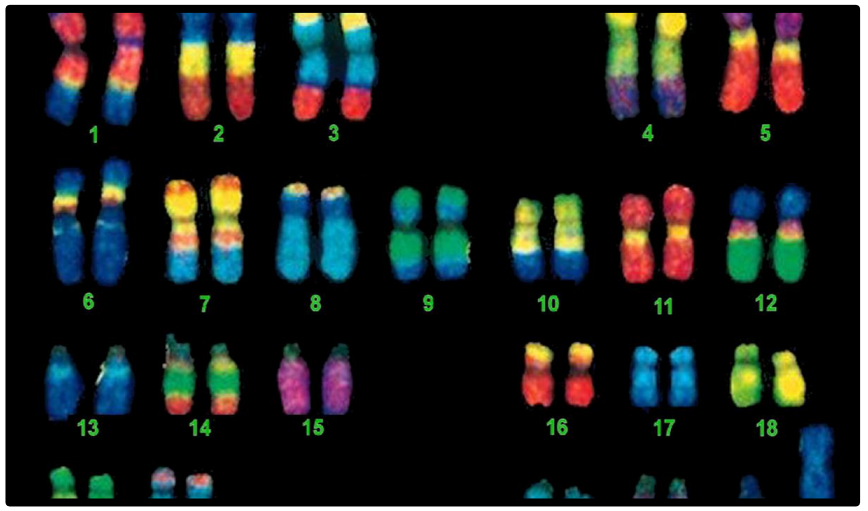
Classification of chromosome on n position of centromere:
Sub-metacentric Chromosome



Classification of chromosome on position of centromere:
Metacentric Chromosome

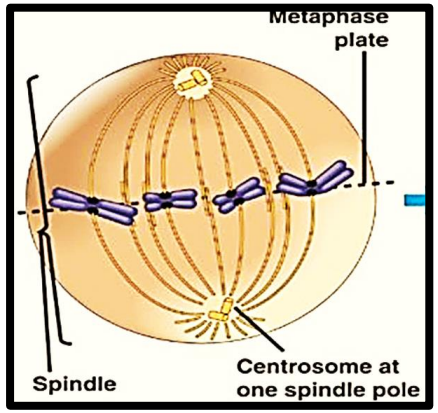


Chromosomal location of gene classification:
chromosom N 7 , q means long arm, region 3 , band 1, sub- band 2

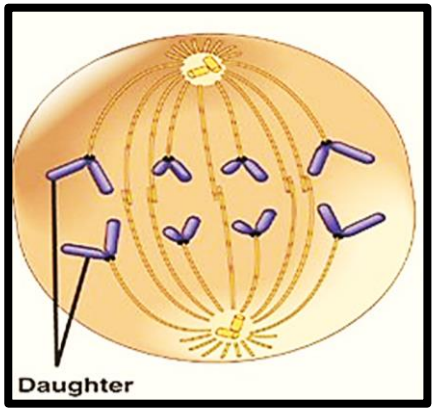


Name Technique:
Chromosomal Painting

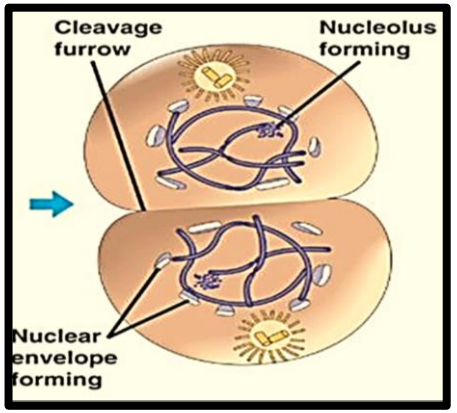
Cell cycle Modes of inheritance



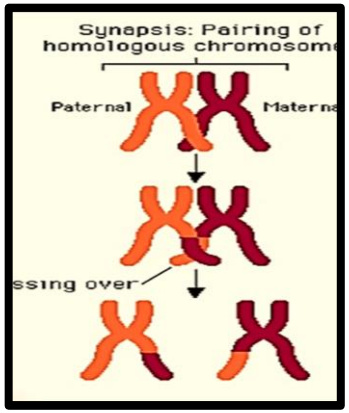
Phase of cell division:
Metaphase



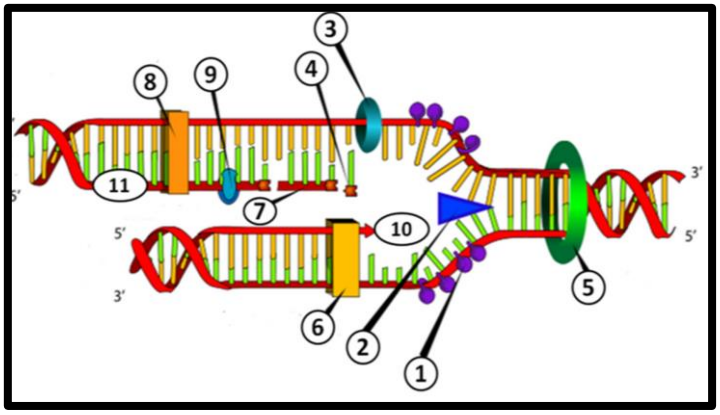
Phase of cell division:
Anaphase



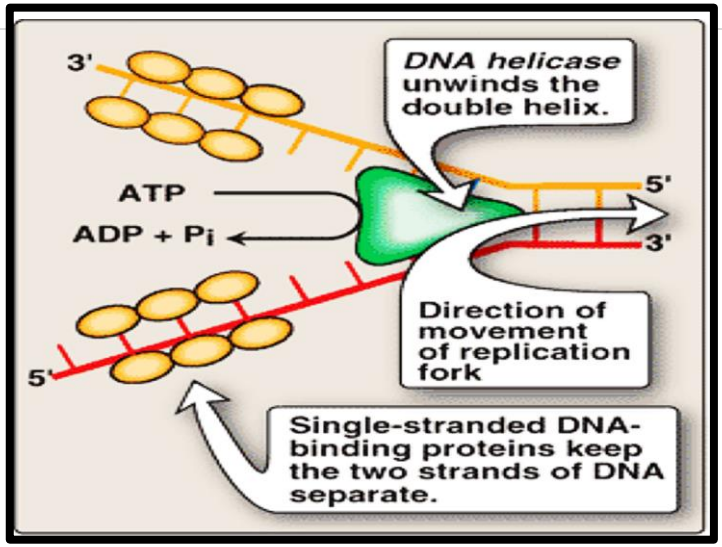
Phase of cell division:
Telophase & Cytokines



Cross over,
During: miosis division

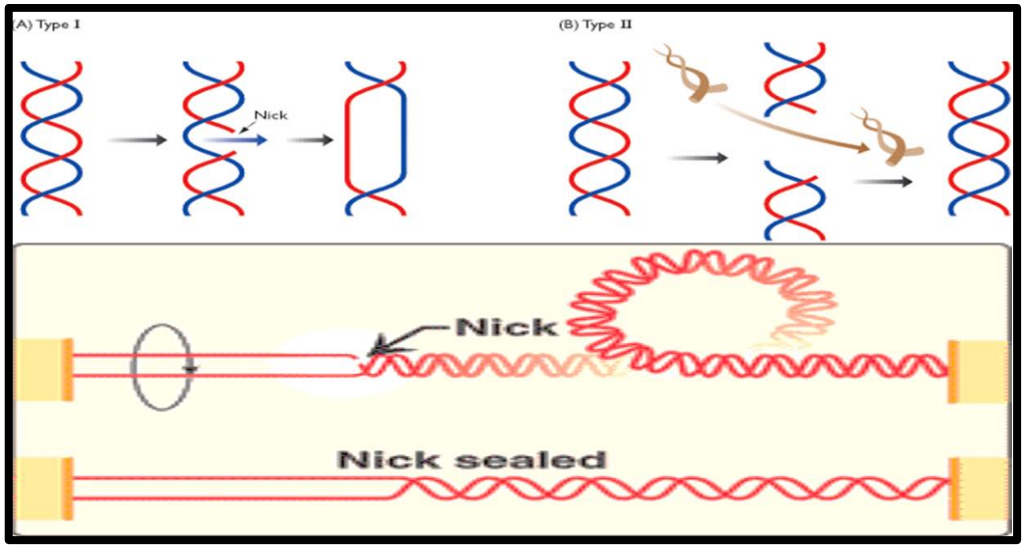


DNA Replication



Enzyme for unwinding double helix: DNA Helicase

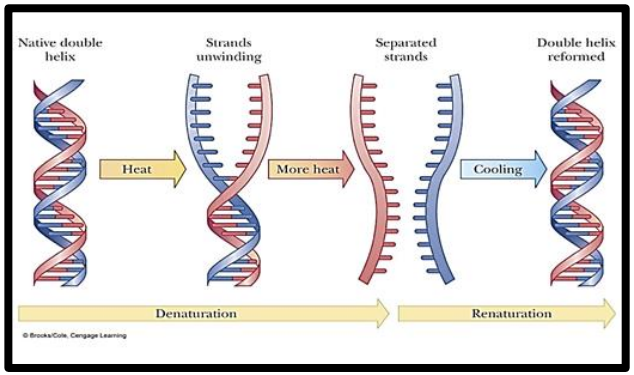
Keeps 2 strands of DNA separate: Single-stranded DNA binding proteins



Name of enzyme topoisomerases:

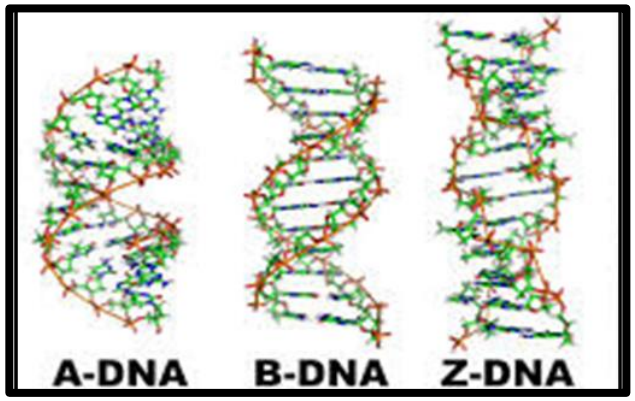
Type I DNA topoisomerases & Type II DNA topoisomerases

Genetic Materials

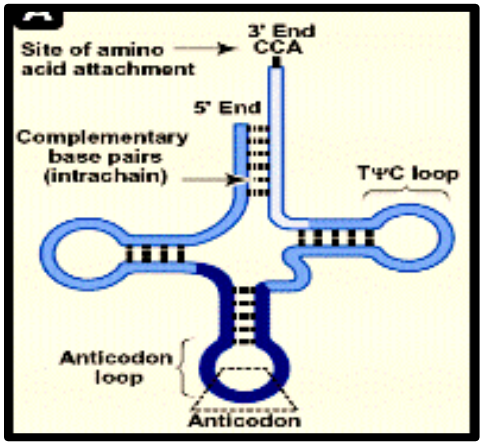


types bonds broken during this process of Denaturation?

Hydrogen Bonds

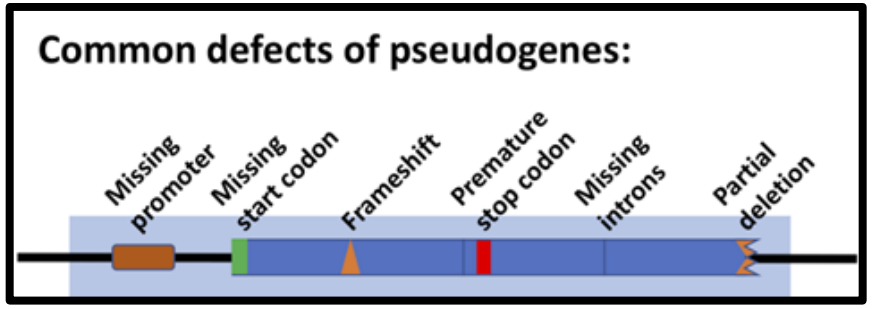


Which is left handed? Z form



Mention 2 modified nucleotides in this tRNA?

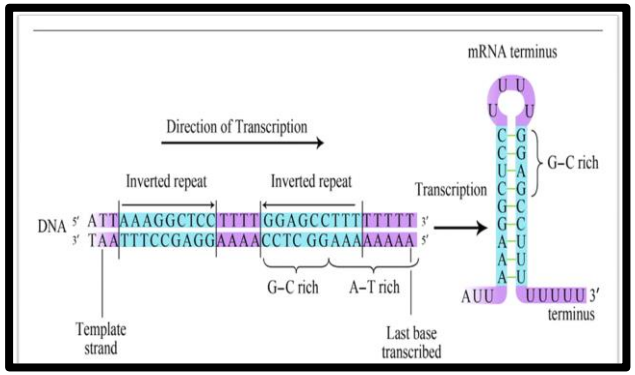
pseudouridine (Y), dihydrouridine (DHU), & ribothymidine (T)



Name example for this type of pseudogene?

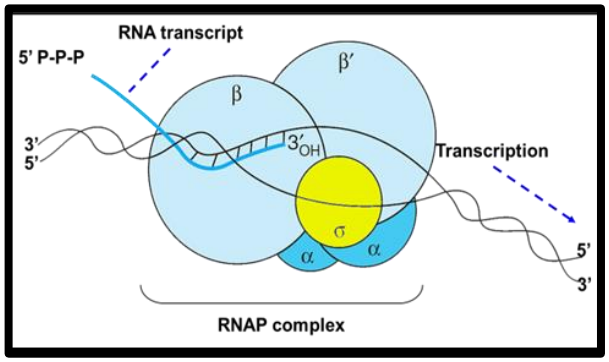
gulonolactone (L-) oxidase. – responsible for Vitamin C synthesis

Transcription of mRNA



Name this molecular process?

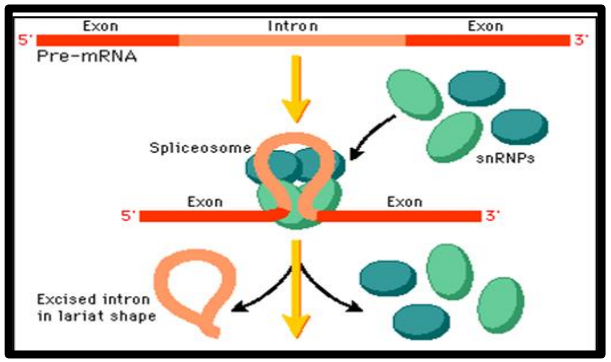
Termination of Transcription



Name types of this enzyme in human?

3 types OF RNA Polymerase:

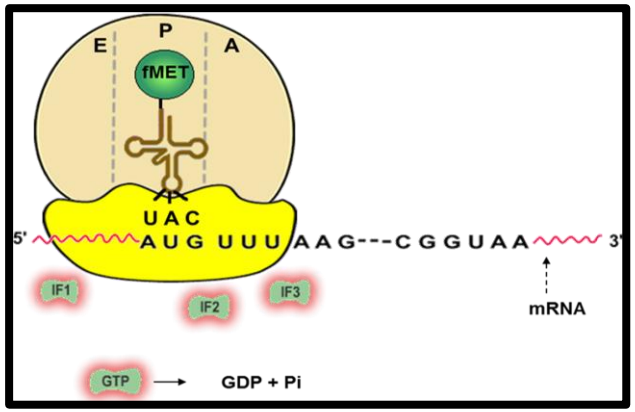
RNAP-I , RNAP-II, RNAP-III



Name this molecular process?

M.RNA Splicing

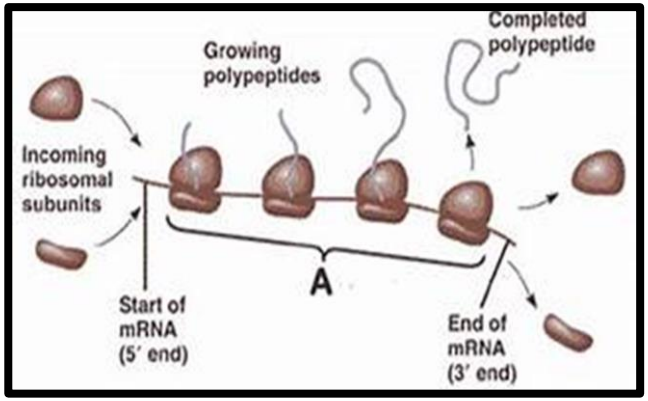
Protein synthesis mRNA Translation



Name this stage during protein synthesis?

Initiation

Translation process during (Initiation codon- Formyl methionine)

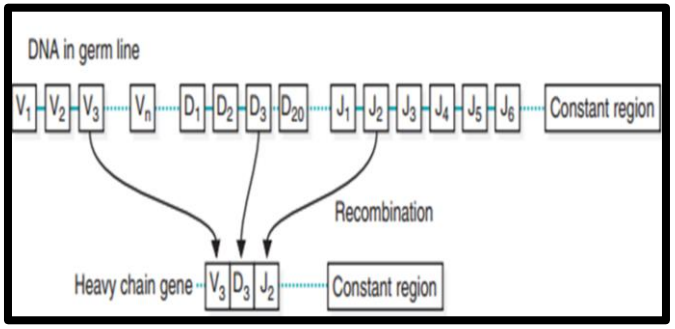


Name this molecular process ?

(polyribosomes/ polysomes)

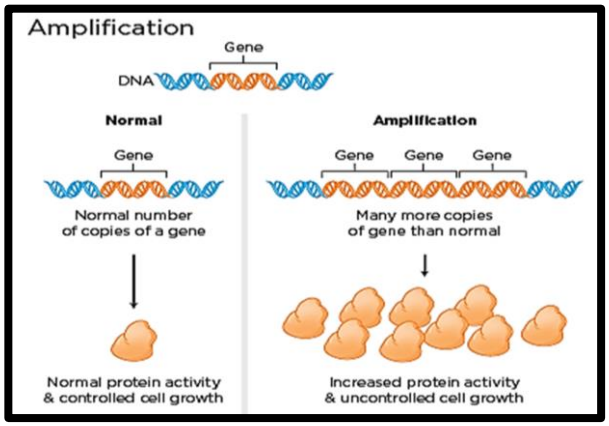
Translation of mRNA by many ribosomes

Regulation of gene expression



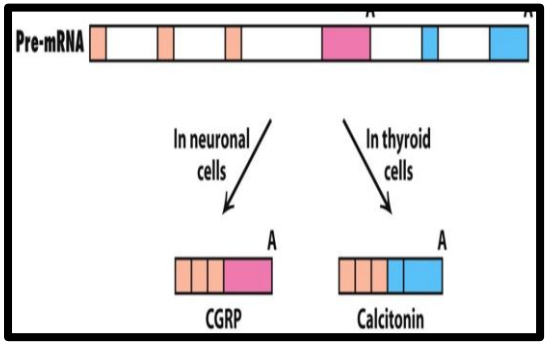
Name method for control gene expression?

Gene re-arrangement



Name an example of gene undergo Gene amplification?

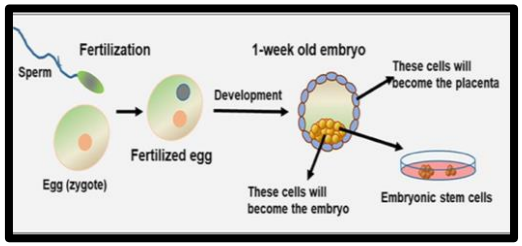
di-hydrofolate reductase (DHFA Reductase gene)



Name this molecular process?

Alternative Splicing

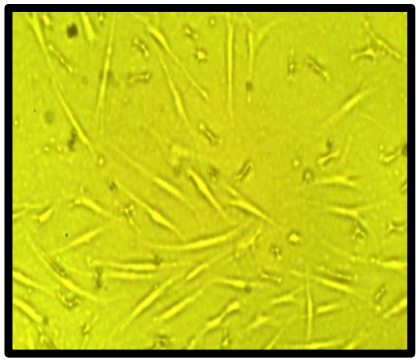
Stem Cells



Name 1 disadvantage for use of this type of Embryonic stem cells (ESCs)?

Disadvantage:

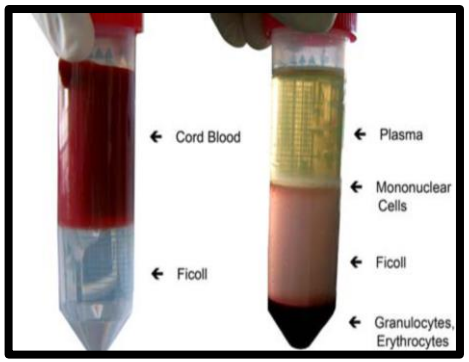
Immune Rejection, Ethic Controversies



Identify the type of stem cells in this figure?

MSCs –

Mesenchymal stem cells



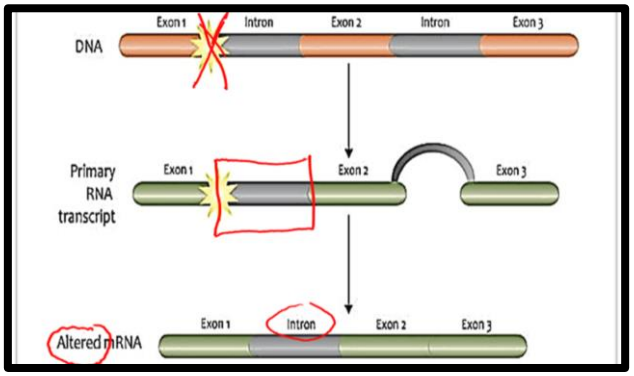
Name the name of this step during UCMSCs isolation ?

Mono-nuclear cells isolation (MNCs Isolation)

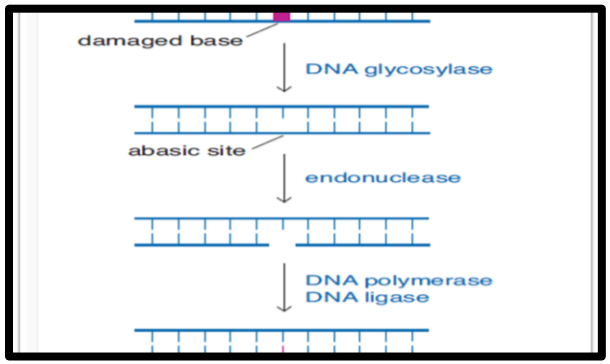
Identify this tool used in stem cell culture?

Tissue Culture Flask

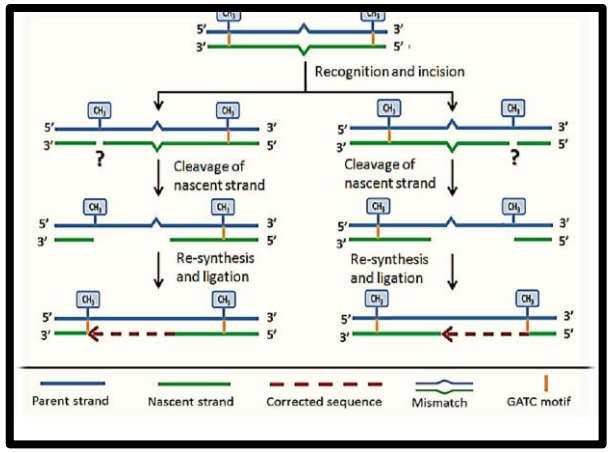
Mutation & DNA Repair



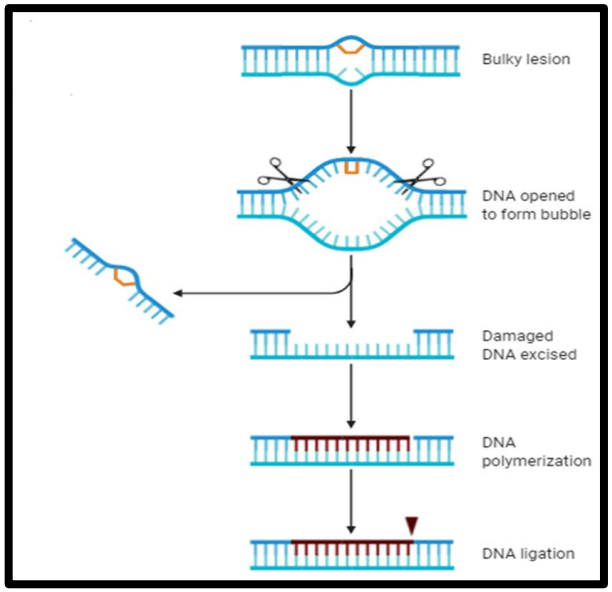
Thalassemia – (splice site mutation)



Base excision repair

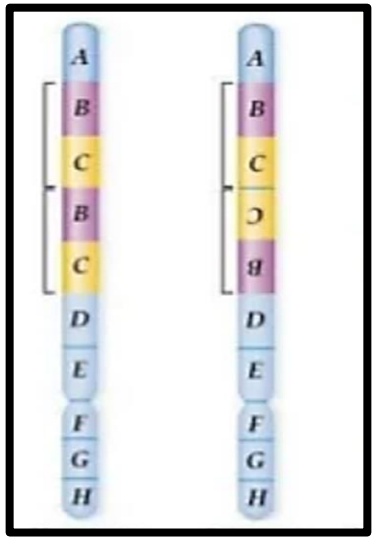


Mismatch repair (Lynch syndrome)

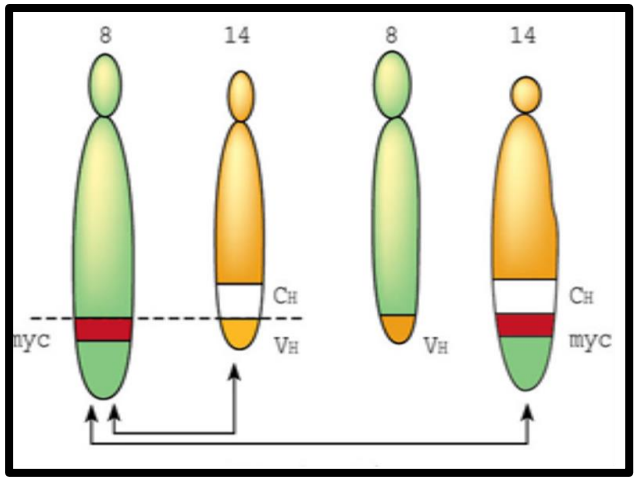


Nucleotide excision repair
(Xeroderma pigmentosum)

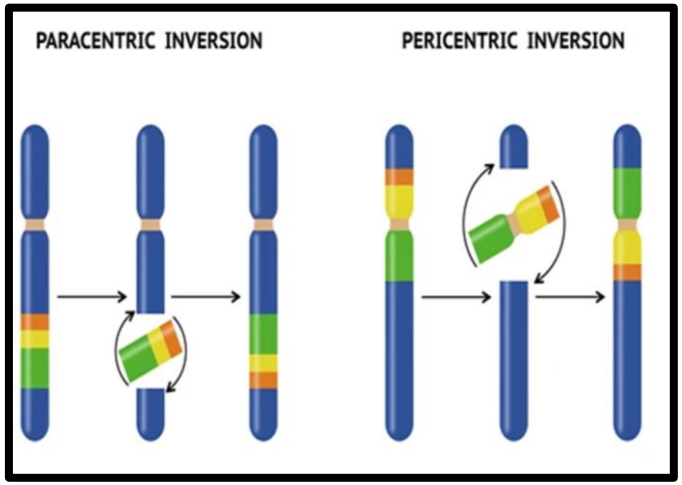
Genetic Disorders Chromosomal structural anomaly



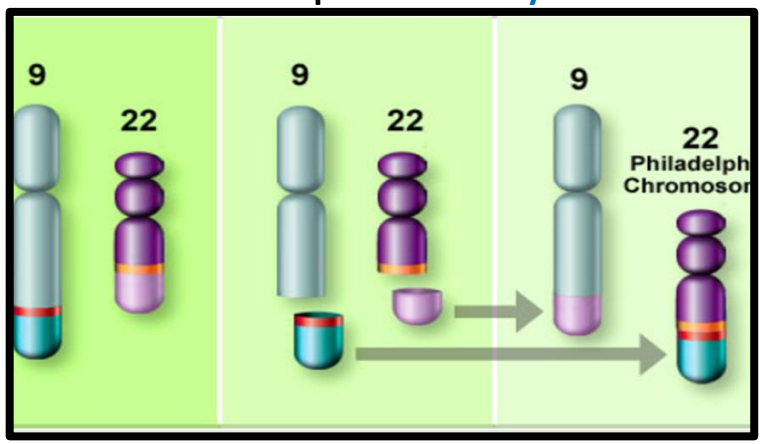
Tandem Duplication [LT] & ,
Reverse tandem duplication [RT]



Reciprocal translocation
implicated in Burkitt's lympoma
Translocation between: Chromosome 8 & 14
Overexpression: C-myc

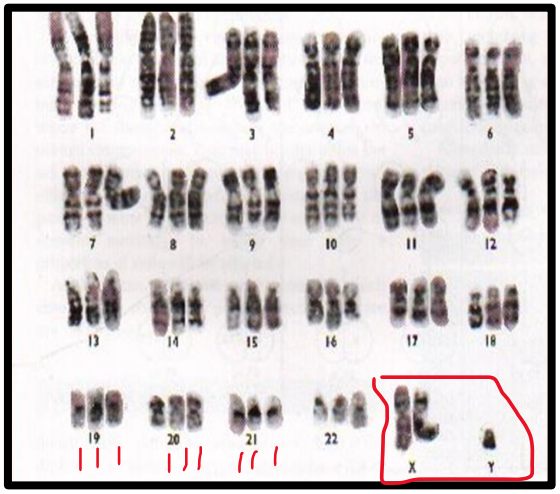


Inversion (Paracentric or pericentric)



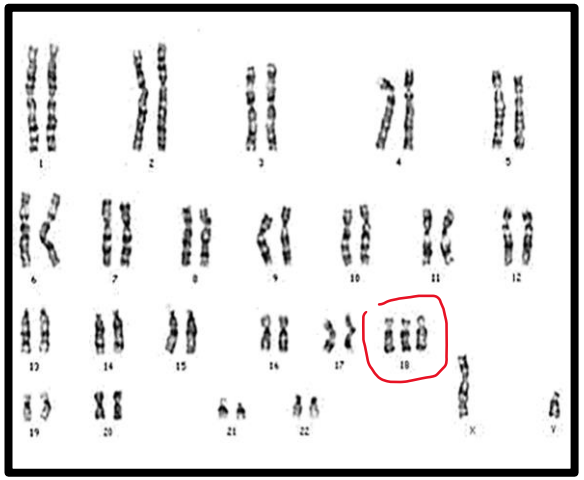
Reciprocal translocation
implicated in Chronic Myeloid leukemia
Translocation between: Chromosome 9 and 22
Overexpression: Chimeric protein (Abl-Bcr protein)

Chromosomal numerical anomaly



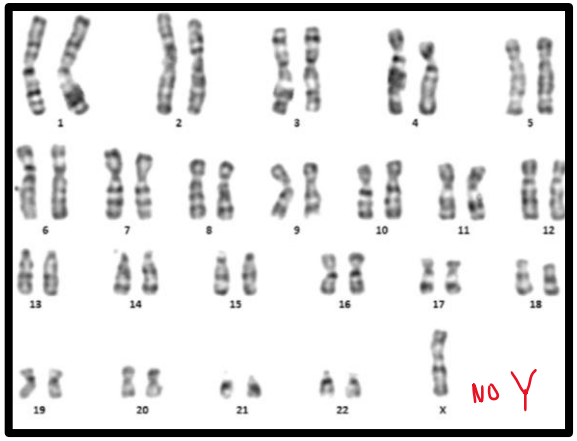
Triploidy (69, XXY)

Down syndrome (47, +21, XX)

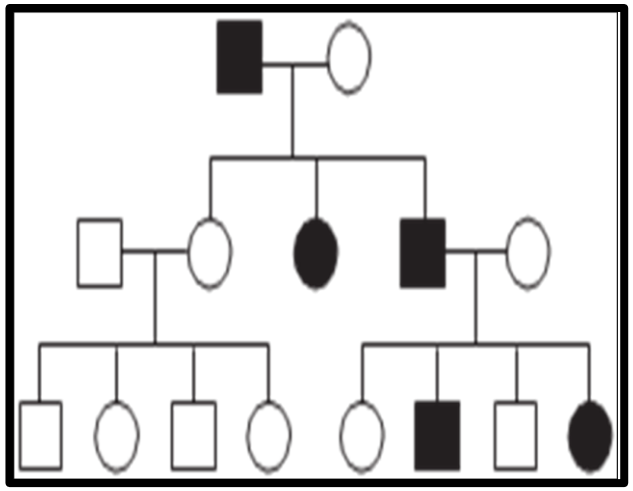


Edward syndrome (47, +18, XY)

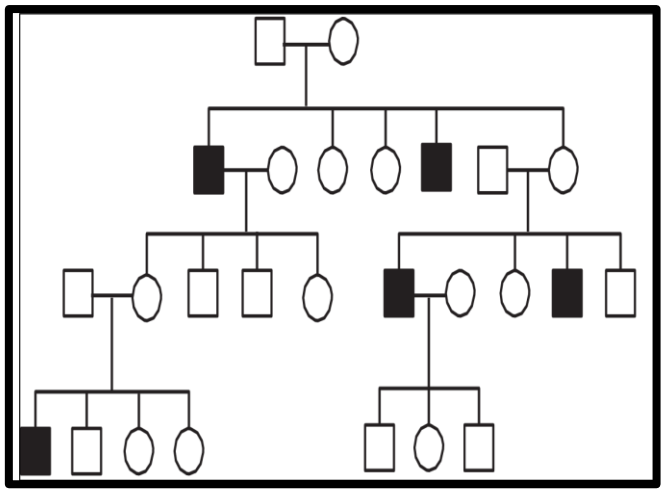
Kleinfilter syndrome (47, XXY)



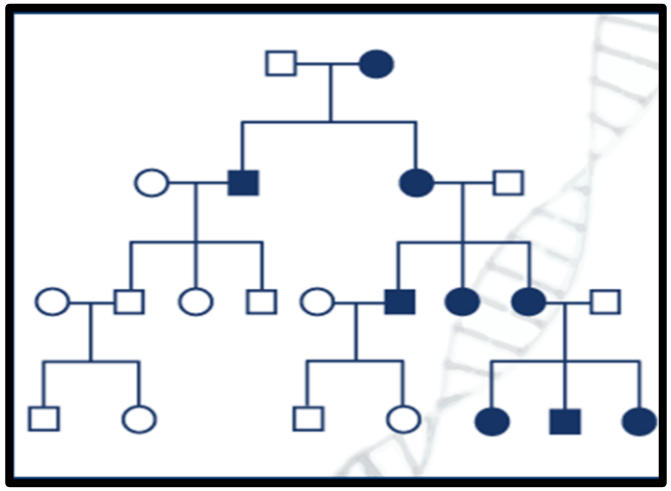
Turner syndrome (45, X)



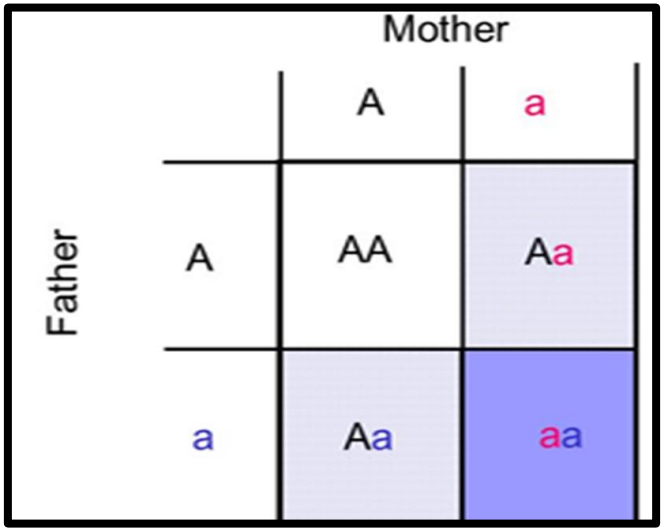
Autosomal dominant inheritance



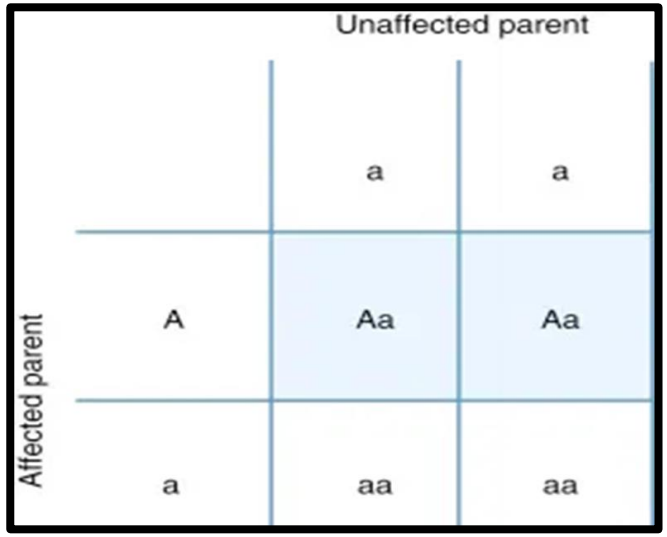
X-linked recessive inheritance



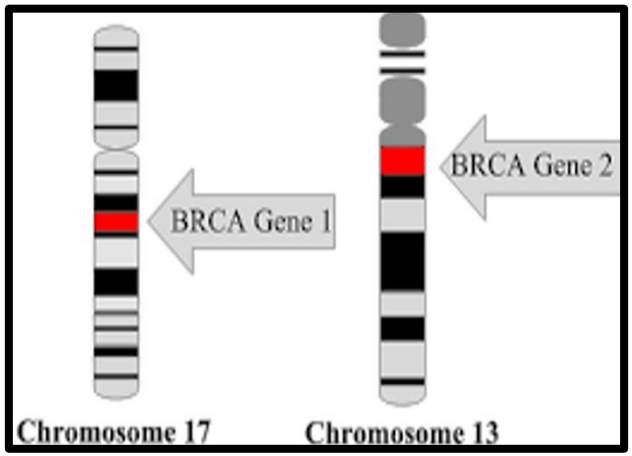
Mitochondrial inheritance



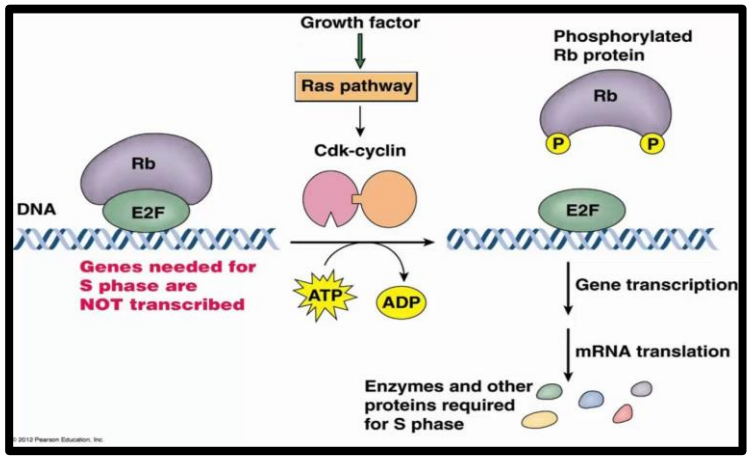
Punnet Square for Autosomal Recessive Inheritance.
(both parents are carriers (heterozygous)
Offspring: 25% Affected | 50% Carriers | 25% normal



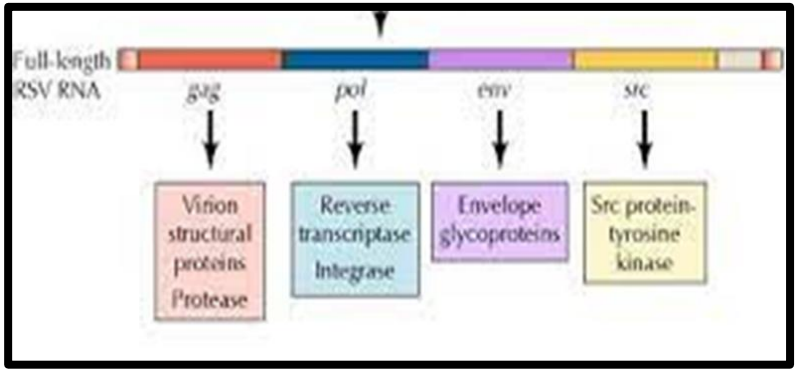
Punnet Square for Autosomal Dominant Inheritance.
(One affected parents is (heterozygous)
Offspring: 50% Affected | 50% normal



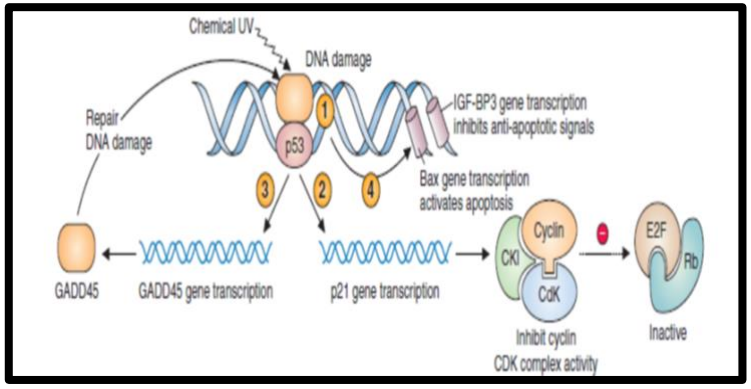
Mutations in **tumor suppressor genes BRCA1** & **BRCA2** have been implicated in **Breast & Ovarian cancers**



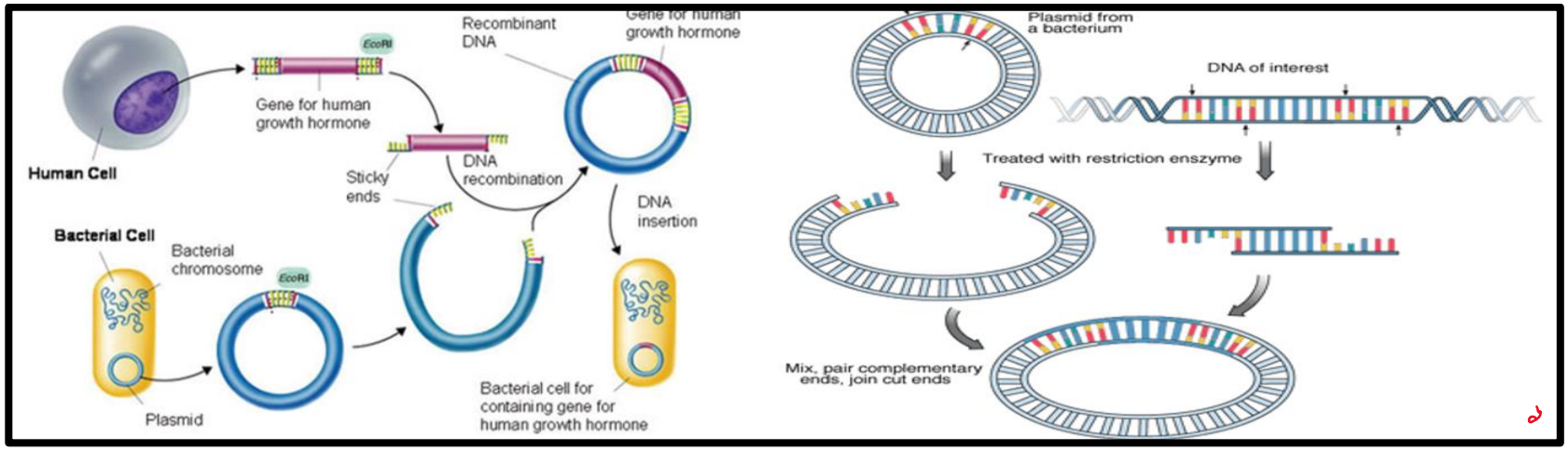
Inherited Mutation in **tumor suppressor gene** (**RB1**) has been implicated in **Familial Retinoblastoma**



Rous Sarcoma Virus (RSV)
It contains oncogene **src (sarcoma causing) gene**

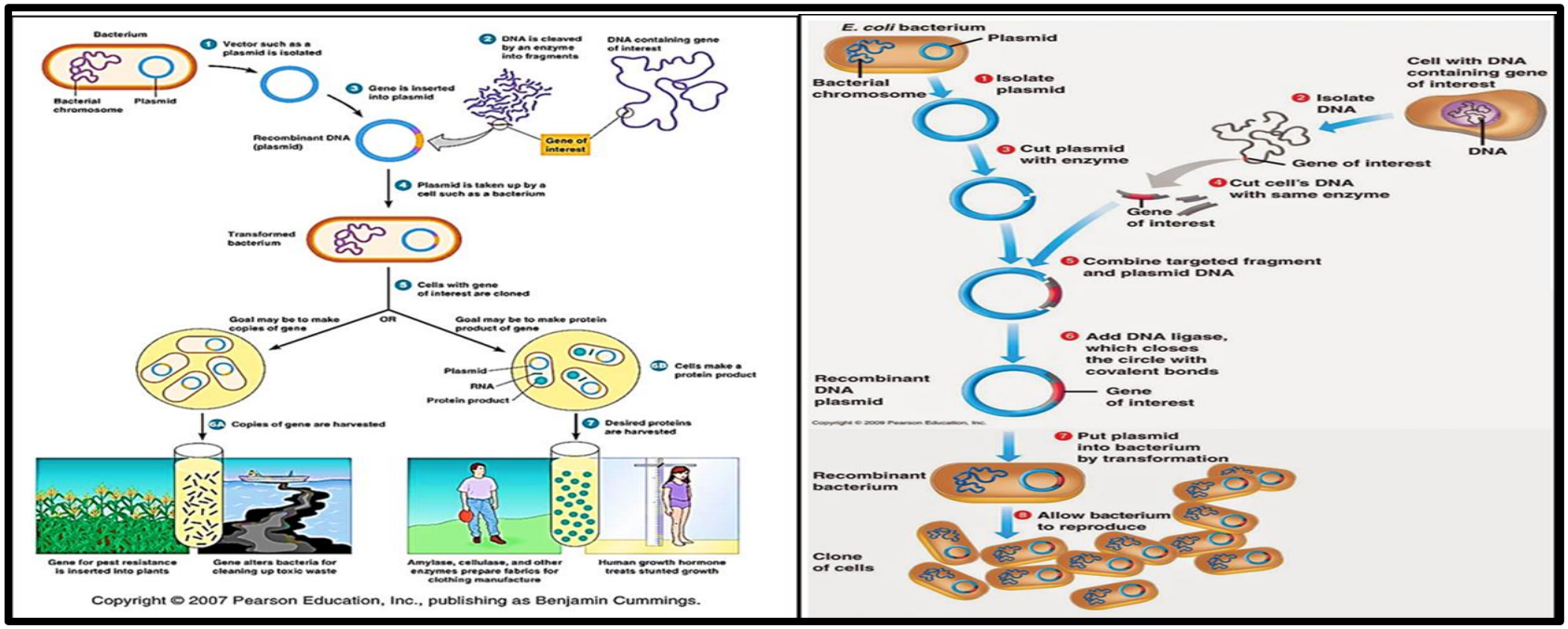


Inherited Mutation in **tumor suppressor gene** (**P53**) has been implicated in **Li-Fraumeni syndrome**

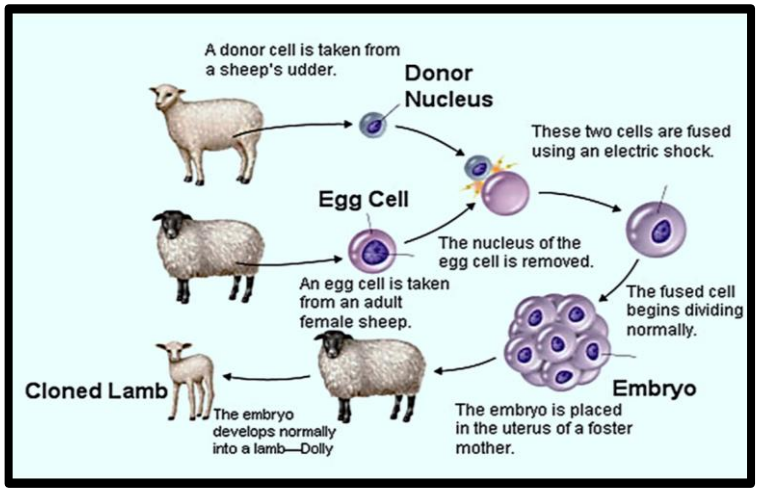


Technique: Recombinant DNA Technology

Cutting Enzyme: Restriction endonuclease, Sealed by: DNA ligase, Vector: Plasmid

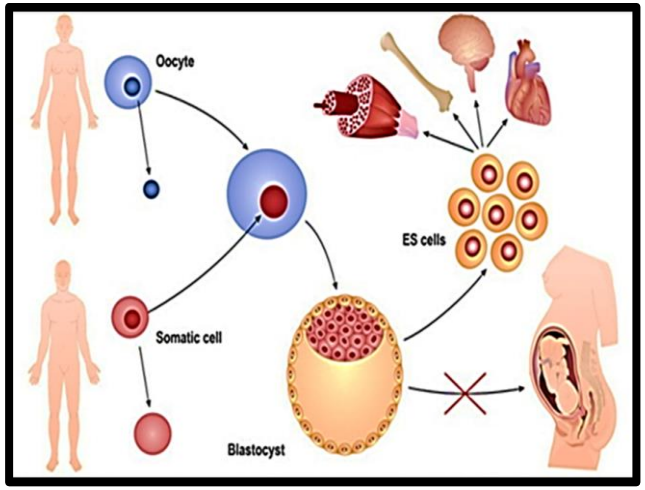


Technique: Molecular (DNA) Cloning – what is basis: (Recombinant DNA technology)



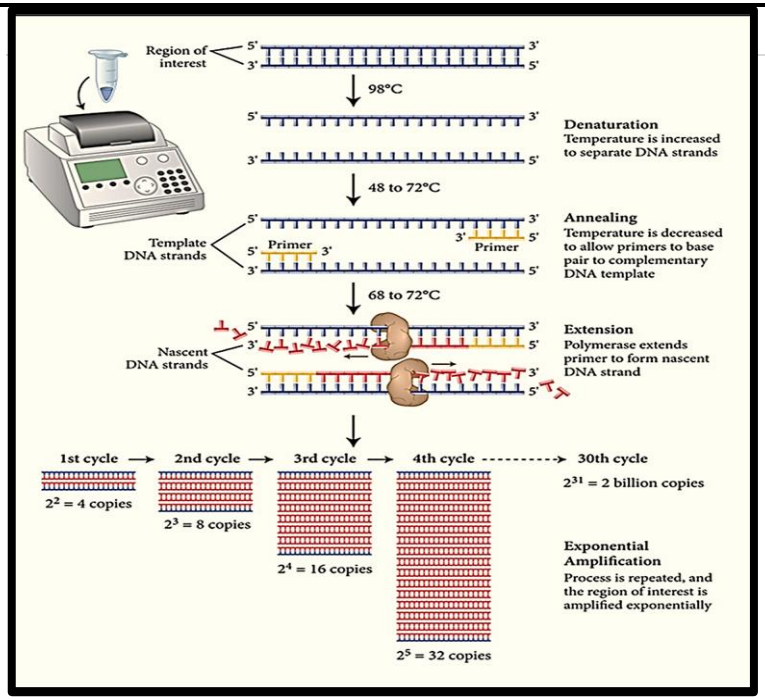
Technique: Reproductive cloning

Basis: (Somatic cell nucleus transfer - SCNT)



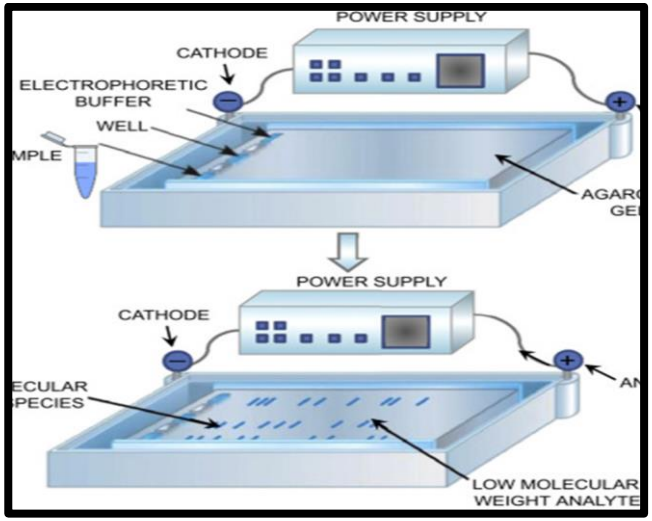
Technique: Therapeutic cloning

Basis: (Somatic cell nucleus transfer - SCNT)

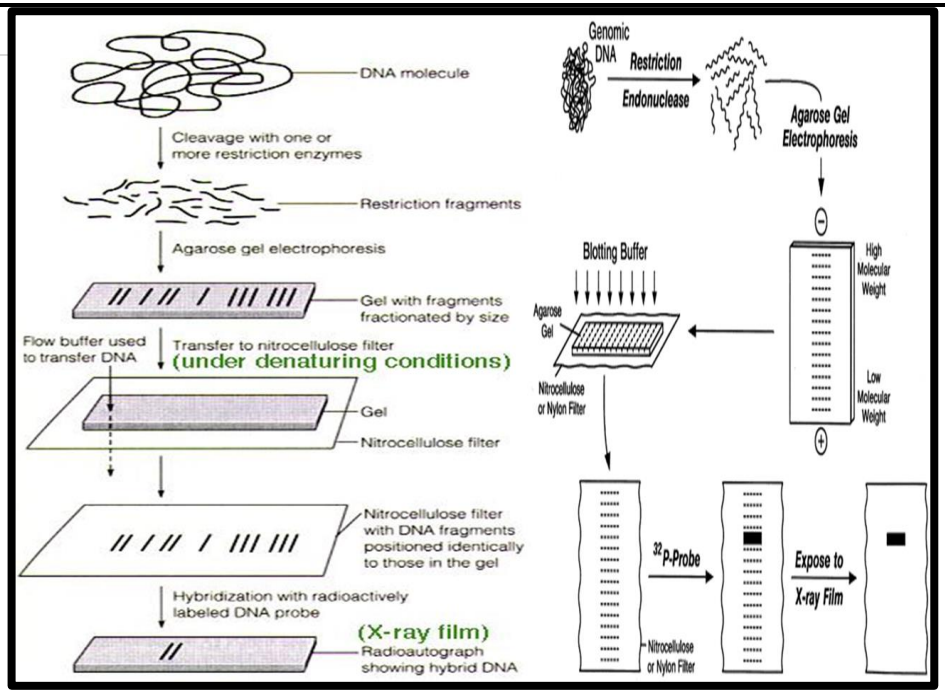


Technique: POLYMERASE CHAIN REACTION (PCR)

Using: Thermal cycler – Enzyme: Taq polymerase

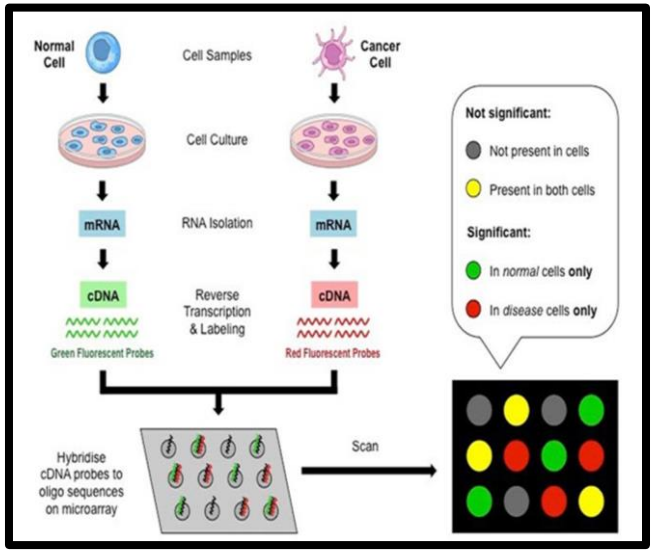


Detection of traditional (conventional) PCR Products by Agarose Gel Electrophoresis

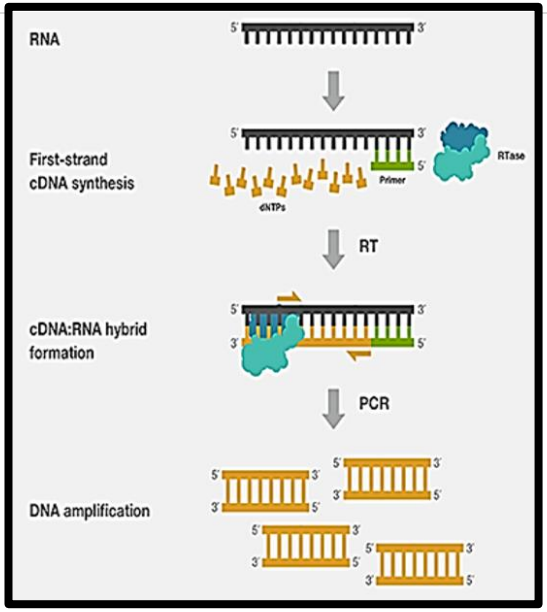


Technique: Southern Blotting Technique

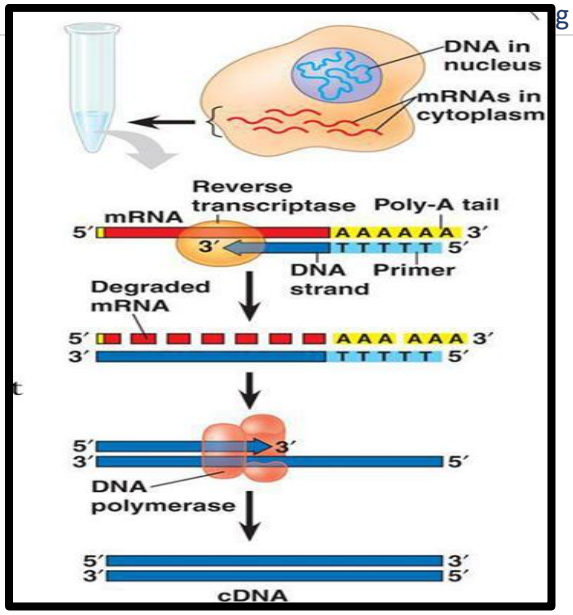
Probe used is ssDNA



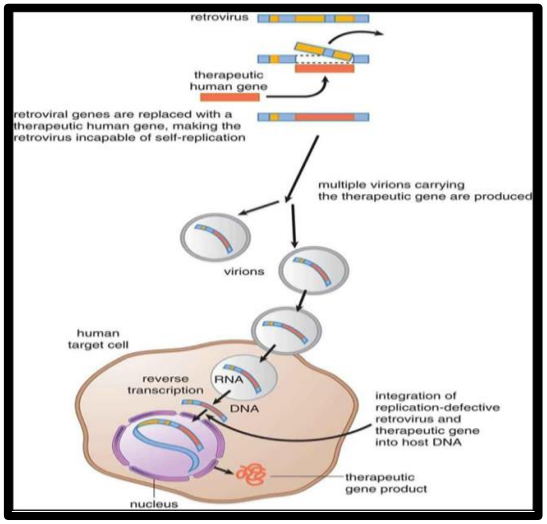
DNA Micro-arrays (DNA chips)



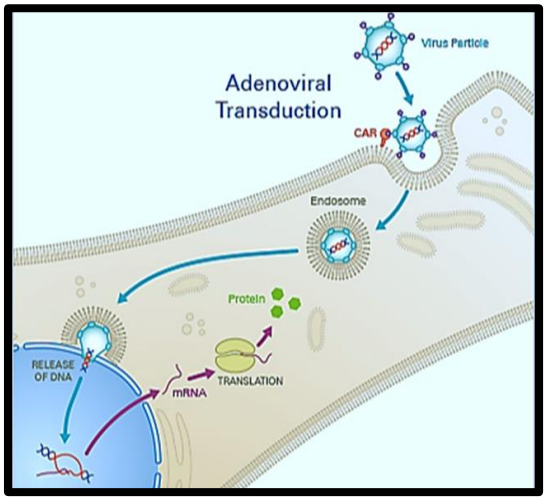
Technique: Reverse transcriptase (RT) PCR
(Assessment of gene expression at mRNA level)



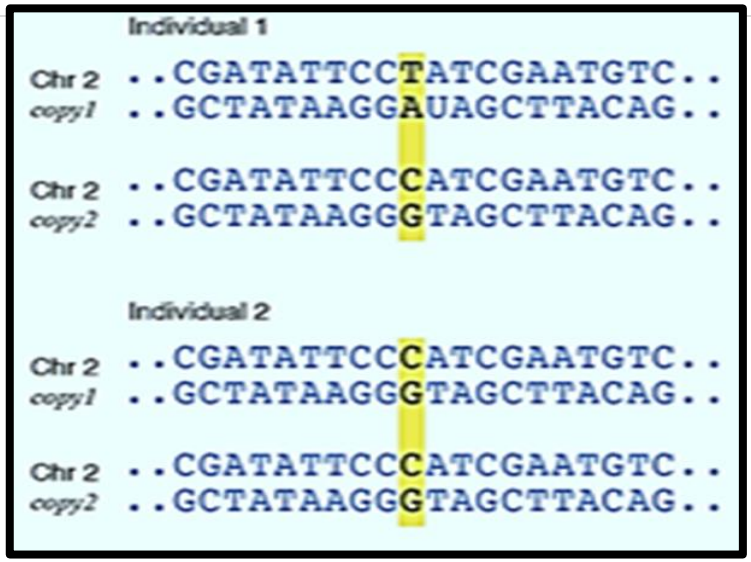
Technique: Complementary DNA (cDNA)
Enzyme: Reverse transcriptase – Primer: Oligo (dT) primer



Viral Vectors in Gene Therapy: Retrovirus



Viral Vectors in Gene Therapy: Adenovirus

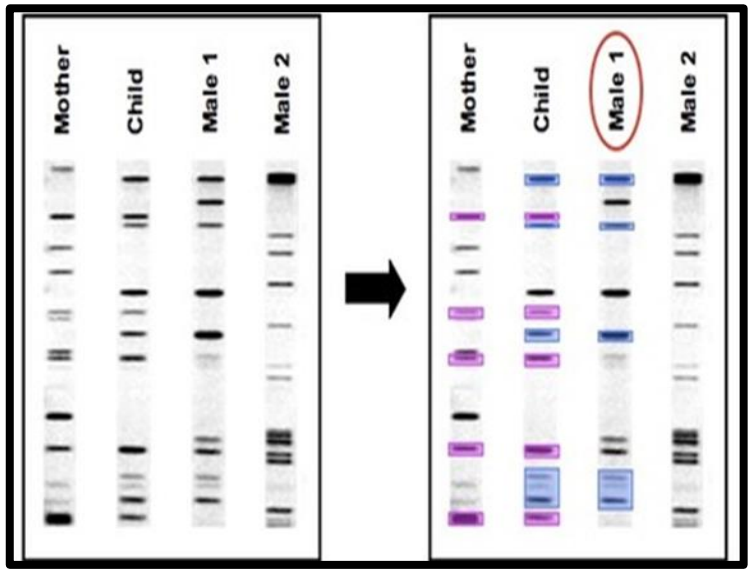


Type of Polymorphism:

Single Nucleotide Polymorphism (SNP)

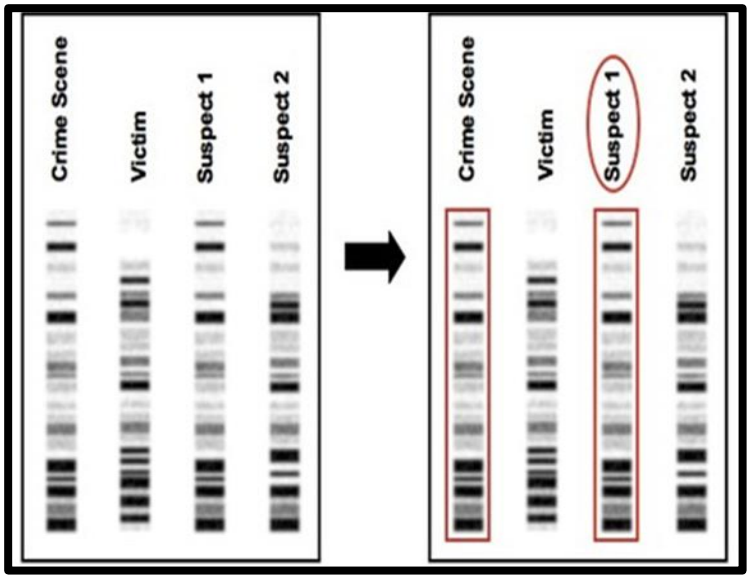
Type of Polymorphism:

Variable Number Tandem Repeats (VNTR)



In Paternity Testing

Technique: DNA Fingerprinting



In Forensic Testing

Technique: DNA Fingerprinting