

PREP XI RR

STUDY NOTES

ANATOMY

10

VIDEOS

129

PAGES

PREMIUM STUDY MATERIAL

PREP XI RR

Table of Contents follows on next page

#	Topic / Video Name	Pages
■ RR Reignite		
1	Embryology	3 – 21
2	General Histology	22 – 26
3	Types of Joints & Epiphysis	27 – 32
4	Neuroanatomy	33 – 54
5	Head and Neck	55 – 83
6	Thorax	84 – 92
7	Upper Limb.	93 – 109
8	Abdomen.	110 – 117
9	Pelvis and Perineum.	118 – 122
10	Lower Limb	123 – 131



1. EMBRYOLOGY

BIG QUESTION 1: What are the key steps and abnormalities of gametogenesis?

Broad Answer: Gametogenesis is the process by which germ cells develop into mature gametes—sperm in males and ova in females. It involves two main stages: mitotic proliferation of primordial germ cells, followed by meiosis to reduce the chromosome number by half, and cellular differentiation. This ensures the production of haploid gametes necessary for sexual reproduction.

DETAILED QUESTIONS

Q1.1: What is the Pre-embryonic period?

Answer: Up to the 2nd week.

Q1.2: What is the duration of the embryonic period?

Answer: From the 3rd to the 8th week.

Q1.3: What is the fetal period?

Answer: From the 9th week to birth.

Q1.4: How are Primordial Germ Cells (PGC) formed?

Answer: They are produced by the Epiblast by the 2nd week.

Q1.5: When does the primordial germ cell migrate to the yolk sac?

Answer: The PGC migrates to the yolk sac by the 4th week.

Q1.6: When does the primordial germ cell reach the gonads?

Answer: The primordial germ cells reach the gonads by the 5th week.

Q1.7: What does the abnormal migration of PGC to the neck lead to?

Answer: The development of **Craniopharyngeal Teratoma**.

Q1.8: What does the abnormal migration of PGC to the sacrum & coccyx lead to?

Answer: The development of **Sacroccoccygeal Teratoma**.

BIG QUESTION 2: What is Spermatogenesis?

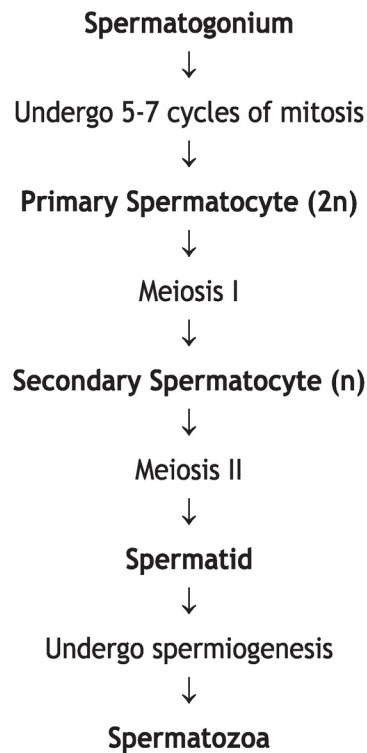
Broad Answer: Spermatogenesis begins in the seminiferous tubules with spermatogonia undergoing mitosis to form primary spermatocytes, which then undergo meiosis I to form secondary spermatocytes and meiosis II to produce haploid spermatids. These spermatids undergo a transformation process called spermiogenesis to become mature spermatozoa.

DETAILED QUESTIONS

Q2.1: What are the key steps of spermatogenesis?

PYQ: FMGE 2022, 2019

Answer:



Q2.2: Where does spermatogenesis begin?

Answer: It occurs in the seminiferous tubules.

Q2.3: How many days are required for the completion of spermatogenesis?

Answer: Spermatogenesis is completed in **74 days**.

Q2.4: What is spermiation?

Answer: The process of release of spermatozoa from Sertoli cells is called **spermiation**.

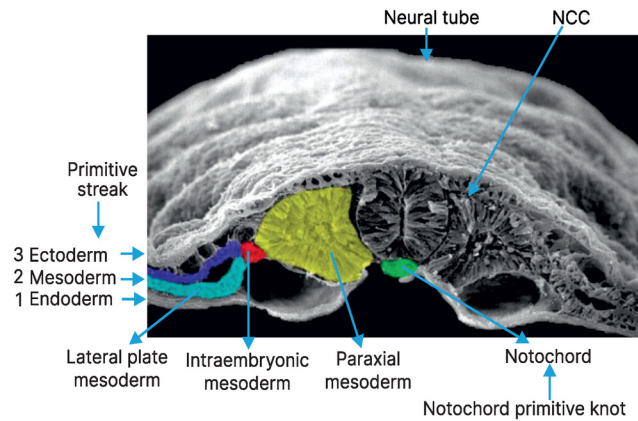
Q2.5: What is the function of the epididymis?

Answer: Function - Storage, maturation and motility of spermatozoa.

BIG QUESTION 3: What are the key events of gastrulation?

Broad Answer: Gastrulation begins with the formation of the primitive streak on the epiblast surface, through which epiblast cells migrate inward. These migrating cells displace the hypoblast to form the definitive endoderm and then spread between the epiblast and endoderm to form the mesoderm. The remaining epiblast cells become the ectoderm, thus establishing the three germ layers.

PYQ: INICET 2022



DETAILED QUESTIONS

Q3.1: What is gastrulation?

Answer: The formation of all three germ layers from the primitive streak is called gastrulation (3rd week).

Q3.2: What are the 3 germ layers?

Answer: In the order of formation:

1. Endoderm
2. Mesoderm
3. Ectoderm

Q3.3: From where is the notochord derived?

Answer:

Notochord is derived from **primitive knot/ Hensen's node**.

Q3.4: Write a short note on the neural tube.

Answer:

- The tube-like structure above the notochord.
- Neural crest cells are present adjacent to the neural tube.

Q3.5: What happens to the mesoderm in the 2nd and 3rd week?

Answer:

- The mesoderm in the 2nd week - Extraembryonic mesoderm.
- The mesoderm in the 3rd week - Intraembryonic mesoderm.
 - o Intraembryonic mesoderm is divided into:
 - o Paraxial mesoderm - along the central axis
 - o Intermediate mesoderm
 - o Lateral plate mesoderm

BIG QUESTION 4: What are the structures derived from the intraembryonic mesoderm?

Broad Answer: The intraembryonic mesoderm differentiates into three regions: paraxial, intermediate, and lateral plate mesoderm. The paraxial mesoderm forms somites, which give rise to the vertebrae, skeletal muscles, and dermis; the intermediate mesoderm forms the urogenital structures; and the lateral plate mesoderm forms the heart, blood vessels, and the linings of body cavities. These structures contribute to the development of the musculoskeletal, circulatory, and urogenital systems.

DETAILED QUESTIONS

Q4.1: What are the structures derived from the Intermediate mesoderm?

Answer:

- The intermediate mesoderm forms the urogenital system.
 - Nephrogenic cord → Kidney
 - Genital ridge → Gonads

Q4.2: What are somites?

Answer: They are spherical ball-like structures derived from the paraxial mesoderm.

Q4.3: What are the parts of somites?

Answer: Somites have 3 parts

- a. Dermatome - forms dermis of back
- b. Sclerotome - forms axial skeleton
- c. Myotome - is further divided into:
 - i. Epiaxial - forms true back muscles
 - ii. Hypoaxial - forms limb, abdominal and intercostal muscles.



Somites

Q4.4: What are the structures derived from lateral plate mesoderm?

Answer:

- Lateral plate mesoderm forms:
 - Dermis of the front
 - Appendicular skeleton
 - Smooth and cardiac muscle

Q4.5: What is the cavity inside the lateral plate mesoderm called?

Answer: Intra-embryonic coelom.

Q4.6: What does the Intra-embryonic coelom divide the Lateral plate mesoderm into?

Answer:

- Intra-embryonic coelom divides the lateral plate mesoderm into:
 - Somatopleuric Lateral plate mesoderm
 - Splanchnopleuric Lateral plate mesoderm

Q4.7: What does the Intra-embryonic coelom form?

Answer:

- Pericardial cavity
- Pleural cavity
- Peritoneal cavity

Q4.8: What are the structures derived from Somatopleuric Lateral plate mesoderm?

Answer:

- All parietal layers are derived from Somatopleuric Lateral plate mesoderm.

- o Dermis, appendicular skeleton
- All visceral layers are derived from the Splanchnopleuric lateral plate mesoderm.
 - o Smooth and cardiac muscle (Heart)

Q4.9: What is septum transversum?

Answer:

- Septum transversum is an undifferentiated lateral plate mesoderm
 - o The cranial most structure before folding

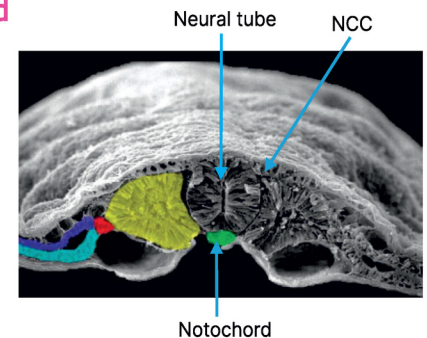
Q4.10: What are the derivatives of septum transversum?

Answer:

- Derivatives of septum transversum
 - o Central tendon of the diaphragm
 - o Fibrous pericardium
 - o Stroma of the liver
 - o Ventral Mesentery of the stomach (Ventral Mesogastrium)

BIG QUESTION 5: What is the origin, structure, and fate of the notochord during embryonic development ?

Broad Answer: The notochord is a rod-like structure derived from mesoderm that forms along the midline of the embryo during gastrulation. It serves as a primary axial support and plays a crucial role in inducing the overlying ectoderm to form the neural tube, the precursor of the central nervous system.



DETAILED QUESTIONS

Q5.1: What happens to the notochord after the formation of the neural tube?

Answer: After the formation of the neural tube, the notochord will degenerate.

Q5.2: What are the remnants of the notochord?

Answer:

1. Nucleus pulposus - in the intervertebral disc
2. Apical ligament of DENS
3. Tectorial membrane

Q5.3: What are the structures derived from the neural tube?

Answer:

1. Brain and spinal cord
2. Oligodendrocytes
3. Astrocytes
4. Ependymal cells
5. Retina - the extension of the diencephalon

Q5.4: What are the structures derived from neural crest cells?

Answer:

1. Ganglions
2. Schwann cells
3. Enteric Plexus
4. Adrenal medulla - modified ganglion
5. Parafollicular C cells in the thyroid gland
6. Melanocytes
7. Skull bones
8. Pharyngeal arch cartilages
9. Conotruncal septum - spiral and bulbar septum

BIG QUESTION 6: What are the embryological origins of the diaphragm, and what congenital defects can occur during its development?

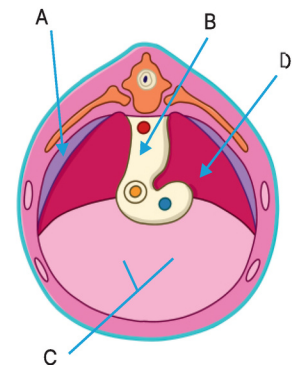
Broad Answer: The diaphragm develops from four main components: the septum transversum, pleuroperitoneal membranes, dorsal mesentery of the oesophagus, and muscular ingrowths from the lateral body walls. The septum transversum forms the central tendon, while the pleuroperitoneal membranes close the pericardioperitoneal canals. The diaphragm is innervated by the phrenic nerve, originating from cervical segments C3-C5.

DETAILED QUESTIONS

Q6.1: What are the 4 main components from where the diaphragm develops?

Answer: The diaphragm is formed from:

- a. Body wall mesoderm (cervical somites)
- b. Dorsal Meso-oesophagus
- c. Septum transversum
- d. Pleuroperitoneal membrane



Q6.2: What does the septum transversum form?

Answer: Central tendon of the diaphragm.

Q6.3: What is the nerve supply of the diaphragm, and from where does it originate?

Answer:

- Nerve supply to the muscles of the diaphragm - Phrenic nerve
- The phrenic nerve originates from C3, C4, and C5.

Q6.4: What is the dorsal mesoesophagus?

Answer:

- The oesophagus passes in the middle, surrounded by the peritoneum on the dorsal side.
- Double layer of peritoneum - mesentery
 - o Known as the dorsal mesoesophagus.

Q6.5: What is the significance of pleuroperitoneal membrane?

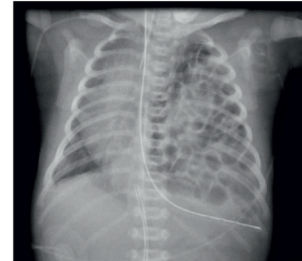
YOURWISH

Answer:

- The pleuroperitoneal membrane is present on either side of the diaphragm
 - o Pleura is present above the diaphragm
 - o The peritoneum is present below the diaphragm
- If the pleuroperitoneal membrane is not formed during the development
 - o Abdominal pressure is increased
 - o Abdominal organs herniate into the thorax and compress the lungs □ Lung hypoplasia

Q6.6: What is Congenital diaphragmatic hernia?**Answer:**

- Due to the absence of the pleuroperitoneal membrane.
- Most common CDH: Bochdalek hernia (left > right).

**BIG QUESTION 7: What are the key steps and the abnormalities of neurulation?**

Broad Answer: Neurulation is the process by which the neural tube, the precursor of the central nervous system, is formed from the ectoderm. It begins with the formation of the neural plate, which folds to form the neural groove and eventually fuses to form the neural tube. This tube later differentiates into the brain and spinal cord.

DETAILED QUESTIONS**Q7.1: What is neurulation?**

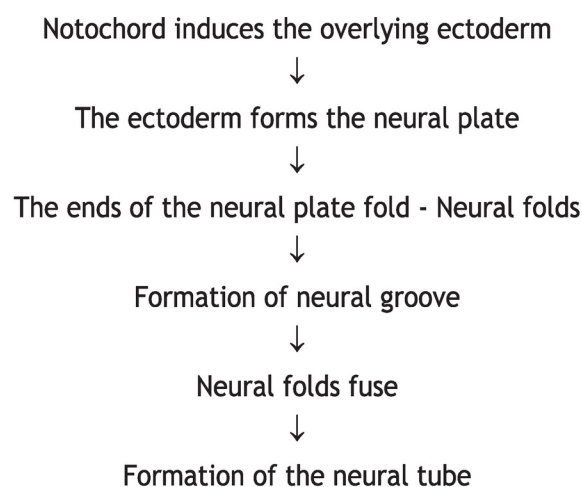
Answer: It is the process of formation of the neural tube.

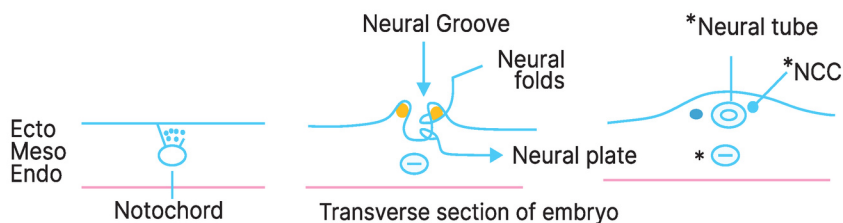
Q7.2: When does neurulation begin?

Answer: It begins in the 3rd week.

Q7.3: What are the steps of neurulation?

Answer:





- The neural folds multiply and differentiate on either side to form neural crest cells.

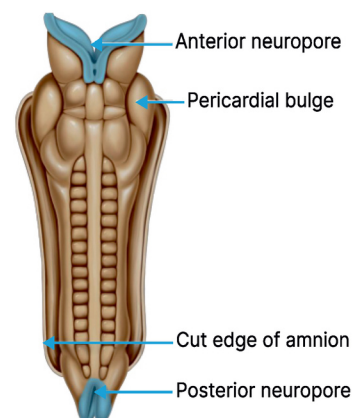
Q7.4: From where does neural tube formation begin?

Answer: The neural tube formation begins from the cervical region.

Q7.5: What are the 2 pores present in the neural tube?

Answer:

1. Anterior neuropore:
 - Also known as cranial neuropore/ rostral neuropore.
 - Closes on the 25th day.
2. Posterior neuropore:
 - Also known as the caudal neuropore.
 - Closes on the 27th or 28th day.



Q7.6: How does anencephaly occur?

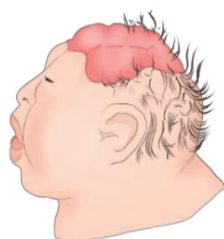
Answer: It occurs due to the failure of closure of the cranial neuropore.

Q7.7: How does spina bifida occur?

Answer: It occurs due to the failure of closure of the caudal neuropore.

Q7.8: How does cranial rachischisis occur?

Answer: It happens when Anencephaly, along with the failure of the spinous process to fuse.



Anencephaly



Spina bifida



Cranial rachischisis

PYQ: FMGE 2019, 2022

PYQ: NEET PG 2021

BIG QUESTION 8: Write briefly about head and neck embryology, and what are the derivatives of pharyngeal arches?

Broad Answer: The head and neck develop primarily from the pharyngeal (branchial) apparatus, which includes pharyngeal arches, pouches, grooves, and membranes. Each pharyngeal arch contains a cartilaginous rod, a nerve, an artery, and muscle tissue that give rise to specific craniofacial structures. Neural crest cells also play a key role in forming bones, connective tissue, and parts of the cranial nerves in this region.

DETAILED QUESTIONS

Q8.1: How is the ectodermal cleft formed?

Answer:

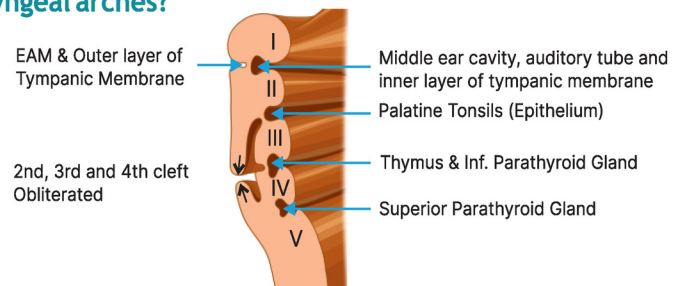
- Invagination of ectoderm → Ectodermal cleft
 - o Pharyngeal cleft
 - o 4 in number

Q8.2: How are endodermal pouches formed?**Answer:**

- Invagination of endoderm → Endodermal pouches
 - o 4 in number

Q8.3: What are the steps involved in the formation of pharyngeal arches?**Answer:**

- Mesoderm in the middle forms the pharyngeal arches
 - o Initially, 6 in number
 - o The 5th pharyngeal arch will degenerate
 - o Remnant → **Ultimobranchial body**

**Q8.4: What are the derivatives of ectodermal clefts?****Answer:**

- The 1st ectodermal cleft forms the:
 - o External acoustic meatus
 - o Outer layer of the tympanic membrane.
- The 2nd, 3rd and 4th cleft obliterate.
 - o The 2nd arch overlaps the clefts → formation of cervical sinus
 - o Persistence of cervical sinus leads to **branchial cyst/ fistula**

Q8.5: What are the structures derived from the endodermal pouch?**Answer:**

- The 1st pouch forms
 - o Middle ear cavity
 - o Auditory tube
 - o Inner layer of the tympanic membrane
- The 2nd pouch forms the epithelium of the palatine tonsils.
- The 3rd pouch forms the:
 - o Thymus
 - o Inferior parathyroid gland
- The 4th pouch forms the superior parathyroid gland
 - o After formation, the thymus migrates down.
 - o The thymus will carry the parathyroid along with it during migration

Q8.6: What are the features of Di-George syndrome?**Answer:**

- **22q11 deletion syndrome**
- 3rd pouch fails to develop

- Failure of development of thymus and inferior parathyroid gland → Leads to Hypocalcemia and thymic hypoplasia

Q8.7: From which layers is the tympanic membrane derived?

Answer:

- The tympanic membrane is derived from all 3 germ layers.
 - Ectoderm: Outer layer of the tympanic membrane.
 - Endoderm: Inner layer of the tympanic membrane.
 - Mesoderm: Middle layer of the tympanic membrane.

Q8.8: What are the derivatives of the pharyngeal arch?

🔍 PYQ: FMGE 2021, 2022

🔍 PYQ: NEET PG 2022

Answer:

Arch	Derivatives	Pharyngeal Arch	Nerve	Derivative
I	• Malleus • Incus • Anterior ligament of malleus • Sphenomandibular ligament • Mandible • Maxilla	1	Mandibular Nerve	Muscles of Mastication, Tensor Veli Palatini, Tensor Tympani, Ant Belly of Digastric, Mylohyoid
II Mnemonic: S for Second	• Stapes • Styloid process • Stylohyoid ligament • Lesser horn of hyoid bone • Upper part of the body of the hyoid bone.	2	Facial Nerve	Muscles of facial expression, Stapedius, Post. Belly of Digastric, Stylohyoid
III	• Greater horn of hyoid bone • Lower part of body of the hyoid bone	3	Glossopharyngeal Nerve	Stylopharyngeus
IV & VI	• All the cartilages of the larynx, except epiglottis ◦ Epiglottis is derived from hypobranchial eminence	4	SLN	Muscles of Larynx, Pharynx and Palate
		6	RLN	Muscles of Larynx, Pharynx and Palate

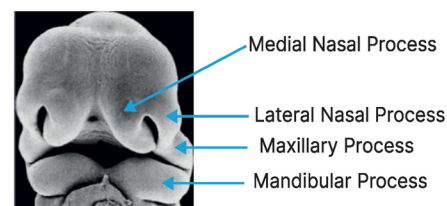
- SLN: Superior laryngeal nerve
- RLN: Recurrent laryngeal nerve

BIG QUESTION 9: How does the face develop during embryogenesis, and what are the developmental errors associated with it?

🔍 PYQ: FMGE 2022, 2019

Broad Answer:

- The entire face is derived from:
 - Mandibular process
 - Forms maxillary process
 - Frontonasal process
 - Medial and lateral nasal processes are present on either side of the nasal pit.



YOURWISH

DETAILED QUESTIONS

Q9.1: How is the lower lip formed?

Answer: The lower lip is formed by the fusion of the mandibular process.

Q9.2: How is the upper lip formed?

Answer: The upper lip is formed by the fusion of the maxillary process with the medial nasal process.

Q9.3: How is the philtrum of the upper lip formed?

Answer: The philtrum of the upper lip is formed by the fusion of the medial nasal process on both sides.

Q9.4: Describe the different types of cleft lip abnormalities.

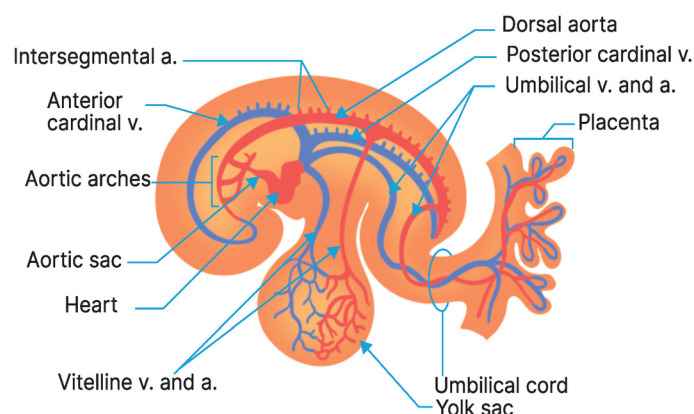
Answer:

Midline cleft lower lip	Due to the non-fusion of mandibular process	
Midline cleft upper lip	Due to non-fusion of the medial nasal process	
Unilateral cleft upper lip	Due to the non-fusion of the maxillary process with the medial nasal process on one side	
Bilateral cleft upper lip / Hares lip	Due to the non-fusion of the both maxillary process with the both medial nasal process on either side.	
Oblique facial cleft	Due to non-fusion of the lateral nasal process	

BIG QUESTION 10: Describe in detail the development of the arterial system, and what are the associated defects?

Broad Answer: Cardiovascular system (CVS) embryology begins with the formation of blood islands in the mesoderm,

leading to the development of blood vessels and the heart tube. The heart tube undergoes looping and septation to form the four chambers of the heart, while the aortic arch arteries give rise to major arteries. The venous system develops from vitelline, umbilical, and cardinal veins, which are remodelled to form the mature systemic and pulmonary venous systems.

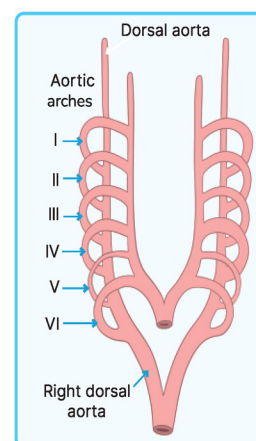


DETAILED QUESTIONS

Q10.1: What are the steps and structures involved in the development of the arterial system?

Answer:

- The dorsal aorta communicates with the aortic sac ventrally via **6 arch arteries** on either side.
- The arch of the aorta is derived from:
 - o Left horn of the aortic sac
 - o Left 4th arch artery
 - o Left dorsal aorta
- The arch of the aorta gives rise to:
 - o Brachiocephalic trunk of the right side
 - o Left common carotid artery
 - o Left subclavian artery
- The common carotid artery ascends, gives a branch (the external carotid artery) and continues as the internal carotid artery on both sides
- The dorsal aorta has cervical intersegmental arteries on either side.
- Left 7th cervical intersegmental artery, a branch from the arch of the aorta → Left subclavian artery
- The right subclavian artery is a branch of the brachiocephalic trunk.
- Ductus arteriosus is between the pulmonary artery and the arch of aorta (left side)
 - o Obliterated ductus arteriosus ligamentum arteriosum



Q10.2: List the arch arteries and their derivatives.

Answer:

Arch Artery	Derivative
Aortic Sac, Left Horn of Aortic Sac, Left 4 th Arch Artery	Arch of Aorta
Left Dorsal Aorta, Fused Dorsal Aorta	Descending Aorta
Right horn of Aortic Sac	Brachiocephalic Trunk
Left 7 th cervical intersegmental artery	Left subclavian artery
Right 4 th arch artery, right dorsal aorta, right 7 th cervical intersegmental artery	Right subclavian artery

Proximal part of 3 rd arch artery	CCA
Distal part of 3 rd arch artery and cervical part of dorsal aorta	ICA
Proximal part of 6 th arch artery	Pulmonary artery
Distal part of 6 th arch artery	Ductus arteriosus

Q10.3: What happens to the 5th arch artery?

Answer: Nothing is derived from the 5th arch artery as the 5th pharyngeal arch will completely degenerate.

Q10.4: What are the remnants of the 1st arch artery?

Answer:

- Remnant of 1st arch artery → Maxillary artery
 - o The largest branch of the external carotid artery
 - o Gives rise to 16 branches

Q10.5: What are the remnants of the 2nd arch artery?

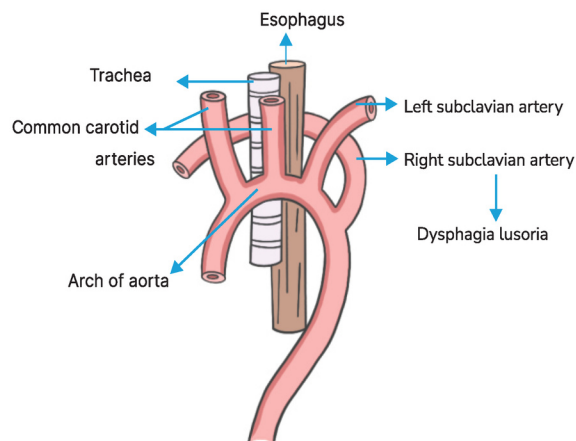
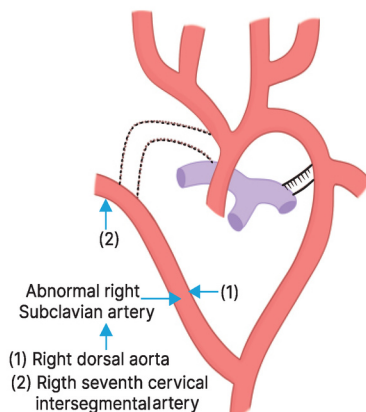
Answer:

- Stapedial artery
- Hyoid artery

Q10.6: What is dysphagia lusoria?

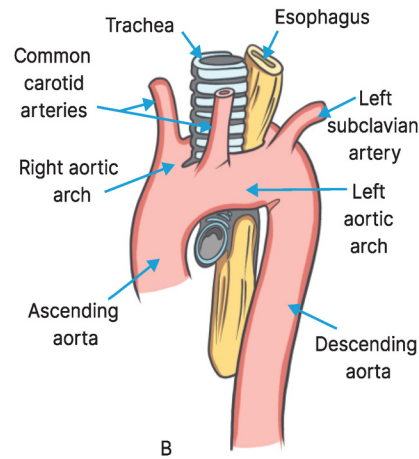
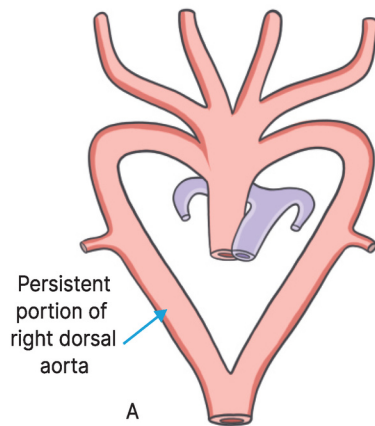
Answer:

- Abnormal right subclavian artery goes behind trachea and esophagus → Dysphagia lusoria
- Abnormal right subclavian artery
 - o Obliteration of right 4th arch artery
 - o Persistence of caudal part of the right dorsal aorta



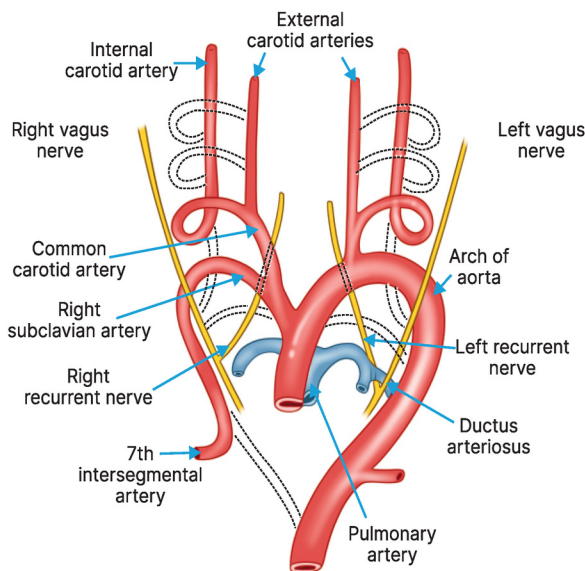
Q10.7: What causes double arch of aorta?

Answer: Persistent caudal portion of the right dorsal aorta.



Q10.8: What are the arteries derived from each pharyngeal arch?

Answer:



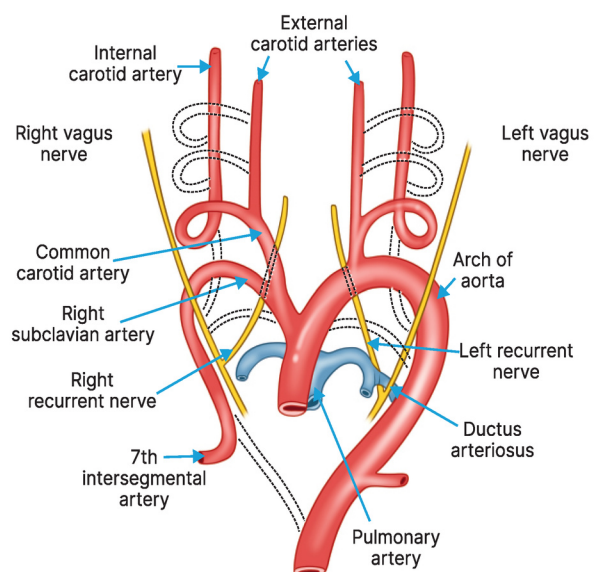
1st arch artery	• Maxillary artery
2nd arch artery	• Stapedial and hyoid artery
3rd arch artery	• Common carotid, external and internal carotid artery
4th arch artery	• Arch of aorta on left side • Right subclavian artery on the right side
5th arch artery	• Completely degenerate
6th arch artery	• Pulmonary artery - right and left • Distal part forms ductus arteriosus on left side.

Q10.9: What are the developmental features of recurrent laryngeal nerve?

PYQ: FMGE 2020, 2021

Answer:

- Left recurrent laryngeal nerve is a branch of the vagus nerve
- Left RLN has a longer course than the right RLN
 - This is because it turns under the left 6th arch artery, which persists in extra-uterine life as the ligamentum arteriosum, a fibrous remnant.
 - On the right side, neither the 6th nor the 5th arch arteries persist.
- Left RLN winds around arch of aorta
- Right RLN winds around the right subclavian artery



YOURWISH

BIG QUESTION 11: Describe the development of venous system in brief.

Broad Answer: The venous system develops from three main paired veins in the embryo: the vitelline, umbilical, and cardinal veins. The vitelline veins form the portal venous system, the umbilical veins contribute to the formation of the ductus venosus (later regressing), and the cardinal veins form the systemic venous system, including the superior and inferior vena cava. These veins undergo complex remodeling to establish the mature venous circulation.

DETAILED QUESTIONS**Q11.1: How is common cardinal vein formed?****Answer:**

- During development:
 - Vein that collects blood from the entire body of the embryo: Cardinal vein
 - Anterior and posterior cardinal veins combine to form a common cardinal vein.

Q11.2: Write a short note on vitelline vein.**Answer:**

- Vein that collects blood from yolk sac: Vitelline vein
- Yolk sac form future gut
- Portal vein is derived from the vitelline vein
- Vitelline vein forms:
 - Portal vein
 - Right and left branches of portal vein
 - Sinusoids in the liver
 - Central vein
 - Hepatic vein

Q11.3: Which vein that brings blood from mother to fetus?

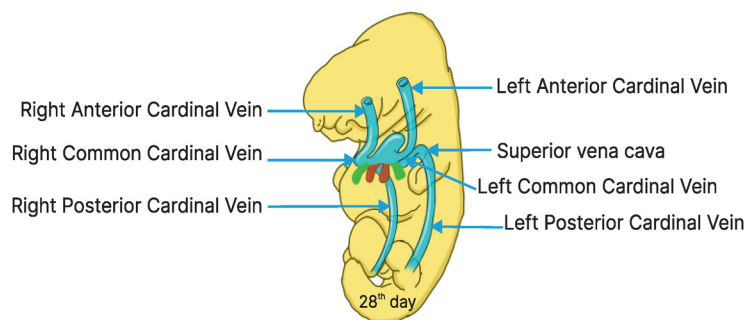
Answer: The vein that brings blood from mother to fetus is the umbilical vein

Q11.4: What happens to the right and left umbilical vein after birth?**Answer:**

- Right umbilical vein - completely regress
- Left umbilical vein - carries oxygenated blood from mother to fetus
 - Obliterate after birth
 - Remnant - ligamentum teres

BIG QUESTION 12: Write a short note on the development of superior vena cava (SVC).

Broad Answer: The superior vena cava (SVC) develops from the right anterior cardinal vein and the right common cardinal vein. During embryonic development, the left anterior cardinal vein regresses, and the right-sided veins enlarge to form the SVC. The SVC ultimately drains venous blood from the head, neck, upper limbs, and upper part of the thorax into the right atrium.



DETAILED QUESTIONS

Q12.1: How are the right and left common cardinal vein formed?

Answer:

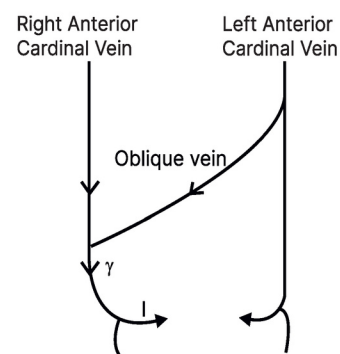
- Right anterior cardinal vein and Right posterior cardinal vein combine to form
 - o Right common cardinal vein
- Left anterior cardinal vein and Left posterior cardinal vein combine to form
 - o Left common cardinal vein

Q12.2: Where does the cardinal veins drain into?

Answer: The cardinal veins drain into the sinus venosus.

Q12.3: What is the role of the oblique vein?

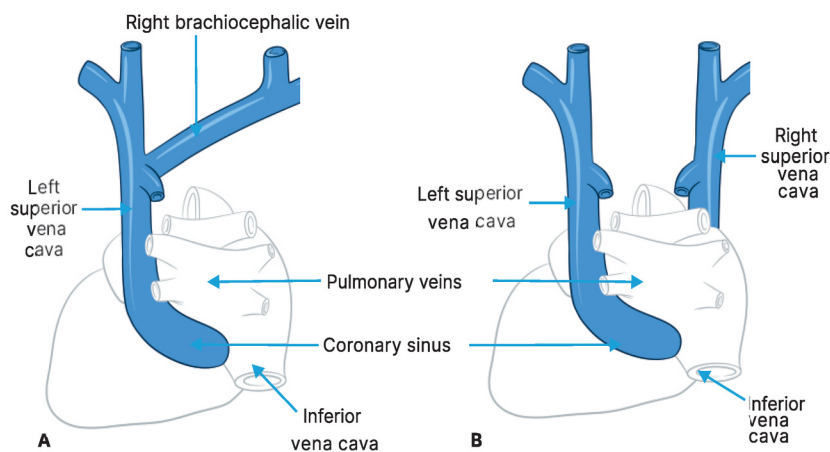
Answer: The left anterior cardinal vein connects to the right anterior cardinal vein through the oblique vein



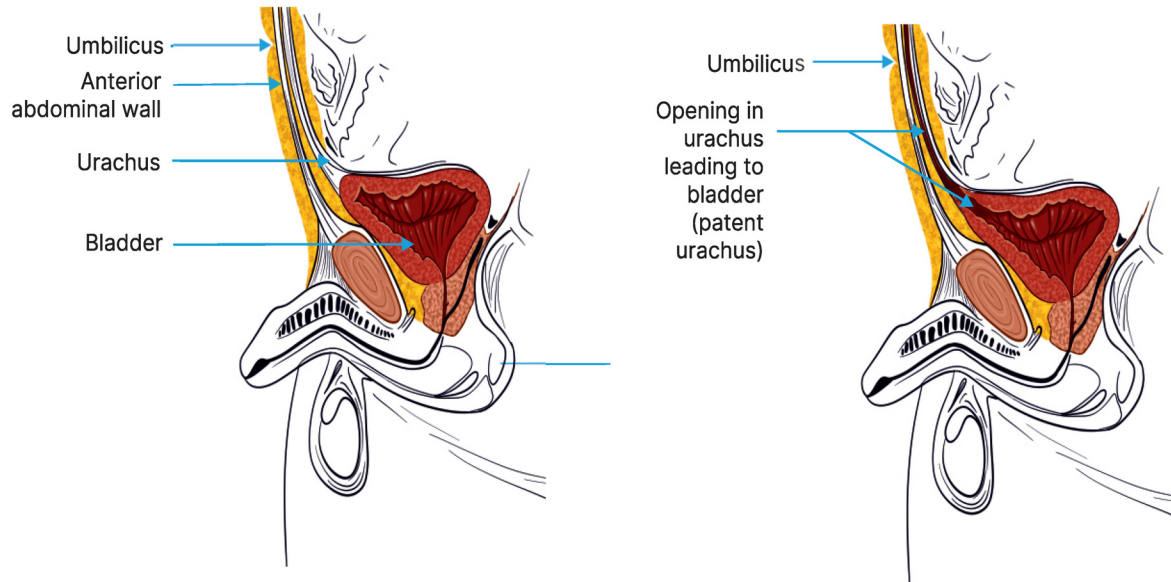
Q12.4: Where is SVC derived and formed from ?

Answer:

- Superior vena cava is derived from:
 - o Right common cardinal vein
 - o Right anterior cardinal vein
- Superior vena cava is formed by right and left brachiocephalic
 - o Right brachiocephalic from right anterior cardinal vein
 - o Left brachiocephalic from part of left anterior cardinal vein and oblique vein.



- o Hindgut forms the rectum, anal canal
- o Allantois forms the urogenital sinus
 - The cranial part of urogenital sinus: Urachus
 - Urogenital sinus develops into the urinary bladder except trigone
 - Trigone develops from absorbed part of mesonephric duct/Wolffian duct
 - Obliterated urachus forms the median umbilical ligament



- If urachus is not obliterated
 - o Urine from the urinary bladder comes out through the umbilicus
 - Weeping umbilicus - due to the persistence of urachus
 - o Meconium from umbilicus is due to the persistence of the Vitello intestinal duct.
 - o Urine from the umbilicus is due to the persistence of urachus.

Q13.5: What are the steps and structures derived from the foregut?

Answer:

- Foregut: Esophagus, stomach and upto 2nd part of duodenum
 - o Ventral mesentery: In front of foregut
 - o Dorsal mesentery: Behind foregut
- Mesentery: Double layer of peritoneum
 - o Connects parietal peritoneum to visceral peritoneum

Q13.6: What are the structures derived from ventral mesogastrium ?

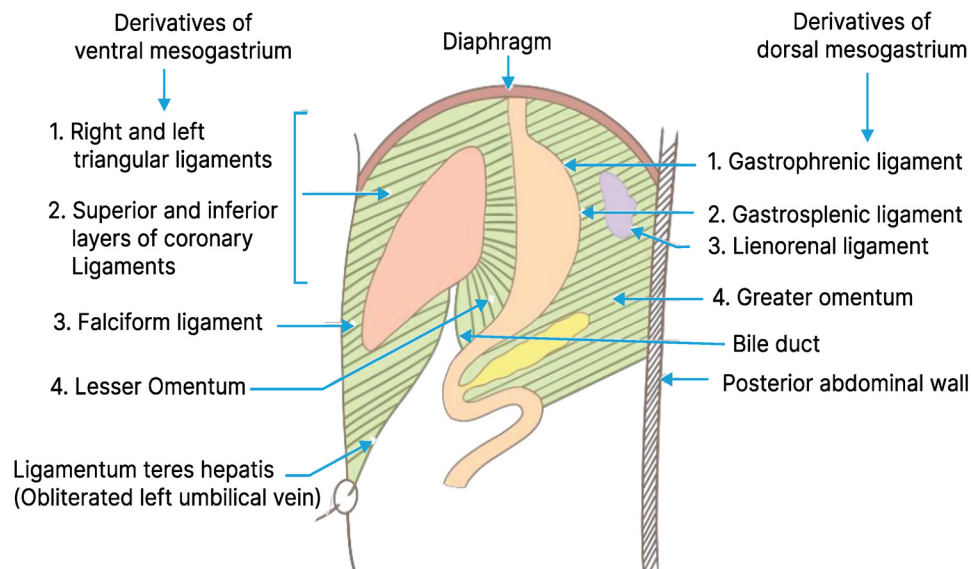
Answer:

- Liver develops in the ventral mesentery
 - o Liver develops from hepatic bud from the foregut
- Derivatives of ventral mesogastrium
 - o Falciform ligament- in front of liver
 - o Lesser omentum- between liver and stomach & 1st part of duodenum
 - o Right and left triangular ligaments
 - o Superior and inferior layer of coronary ligaments

Q13.7: What are the structures derived from dorsal mesogastrium ?**Answer:**

- Spleen is derived from dorsal mesentery
- Derivatives of dorsal mesentery
 - o Gastrophrenic ligament - between stomach and diaphragm
 - o Gastrosplenic ligament - between stomach and spleen
 - o Lienorenal ligament in the dorsal part of the spleen
 - o Greater omentum

 PYQ: FMGE 2022, 2023

**Q13.8: What are the steps involved in the rotation of the gut?****Answer:**

- In the 6 week of development:
 - o Foregut will rotate 90° in clockwise direction
 - o Midgut will rotate 270° in anti-clockwise direction
 - o Hindgut will not rotate
- The entire midgut comes out through the umbilical opening- physiological hernia
 - o Then rotates 270° in anti-clockwise direction around the superior mesenteric artery
 - Pre arterial segment forms small intestine
 - Post arterial segment forms large intestine
 - o First rotation: The pre-arterial segment rotates 90° anticlockwise
 - o Second rotation: 90° rotation and regress back into the abdomen
 - o Third rotation -90° rotation,
 - o The cecum enters the right iliac fossa from the subhepatic region

Q13.9: What is physiological hernia?**Answer:**

- Occurs in the 6th week.
- Reduces back by 10th week.

**Q13.10: What is omphalocele?****Answer:**

Failure of reduction of physiological hernia.

 PYQ: FMGE 2022, 2023



2. GENERAL HISTOLOGY

BIG QUESTION 1: Write about the histology of epithelium in brief.

Broad Answer: The epithelium is a tissue composed of closely packed cells that cover body surfaces, line cavities, and form glands. It is classified based on the number of layers (simple or stratified) and cell shape (squamous, cuboidal, or columnar). Epithelial tissue serves various functions such as protection, absorption, secretion, and sensation.

DETAILED QUESTIONS

Q1.1: What are the types of epithelium broadly?

Answer:

1. Simple epithelium: Single layer of cells
2. Stratified epithelium: Multiple layers of cells

Q1.2: What are the types of epithelium based on the shape of the cell?

Answer:

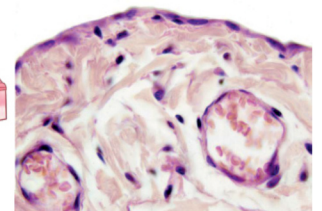
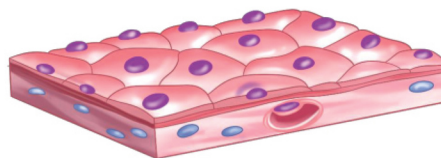
1. Squamous
2. Cuboidal
3. Columnar

Q1.3: What are the key characteristics and locations of simple squamous epithelium?

PYQ: NEET PG 2021

Answer:

- Flattened cells and nuclei
- Seen in:
 - o Alveoli
 - o Body cavities
 - o Bowman's capsule
 - o Blood vessels

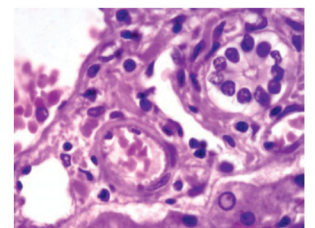
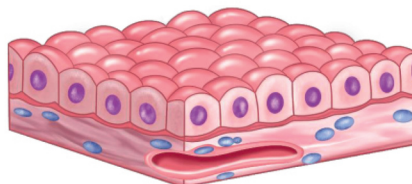


Simple squamous epithelium

Q1.4: What are the key characteristics and locations of simple cuboidal epithelium?

Answer:

- Length and breadth of the cell are equal
- Round and central nucleus
- Seen in:
 - o Thyroid follicles
 - o Kidney tubules
 - o Germinal epithelium of ovary



Simple cuboidal epithelium

Q1.5: What are the key characteristics and locations of simple columnar epithelium?

Answer:

- Length of the cell is longer than its width
- Oval shaped nucleus
- Seen in:
 - o Stomach
 - o Large intestine
 - o Uterus

Q1.6 What is the use of microvilli on simple columnar epithelium? Where are they seen?

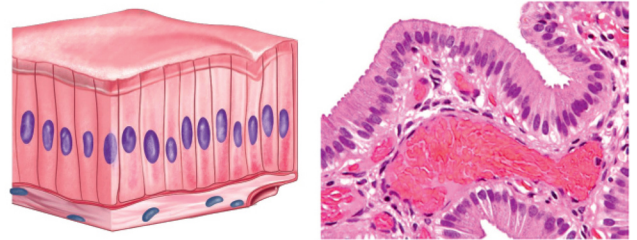
Answer:

- Simple columnar epithelium with **microvilli**: increases the surface area of absorption
- Seen in:
 - o Intestine
 - o Gallbladder

Q1.7 What is the use of cilia on simple columnar epithelium? Where are they seen?

Answer:

- Simple **ciliated** columnar epithelium - Helps in movement
- Seen in:
 - o Fallopian tube
 - o Eustachian tube
 - o Middle ear
 - o Ependyma of ventricles



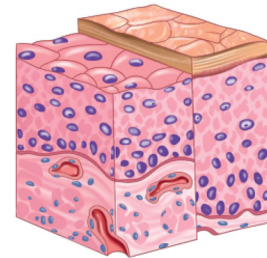
Simple columnar epithelium

BIG QUESTION 2: Write briefly about stratified squamous epithelium.

PYQ: NEET PG 2024

Broad Answer:

- Cells in the lower layer: Cuboidal/columnar
- Cells in the middle layer: Polygonal
- Cells in the topmost layer: Flattened



DETAILED QUESTIONS

Q2.1: What are the types of stratified squamous epithelium?

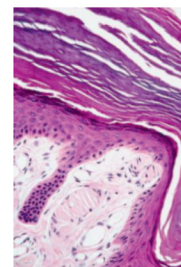
Answer:

1. Keratinized stratified squamous epithelium
2. Non keratinized stratified squamous epithelium

Q2.2: Where is keratinized stratified squamous epithelium seen?

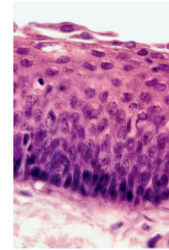
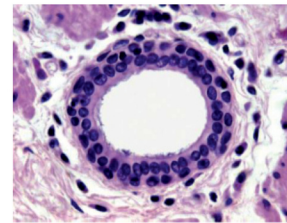
Answer:

1. Skin (thick skin)
2. Anal canal (lower part)
3. Filiform papillae of tongue

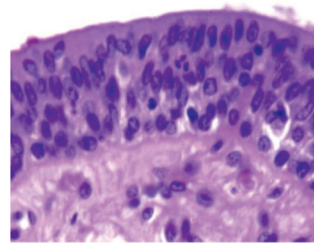
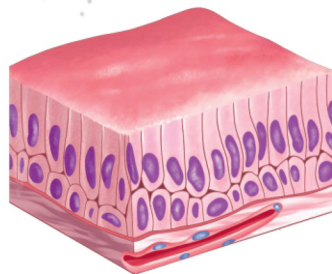


Q2.3: Where is non-keratinized stratified squamous epithelium seen?**Answer:**

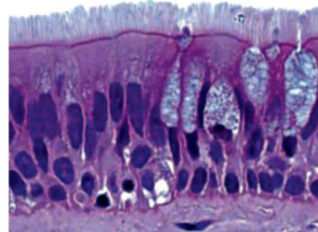
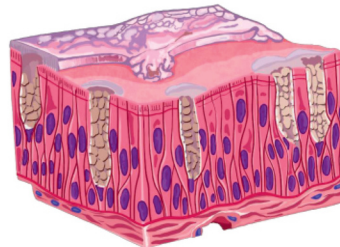
1. Skin (Thin Skin)
2. Oral cavity
3. Tongue
4. Tonsils
5. Esophagus
6. Vagina

**Q2.4: Where is stratified cuboidal epithelium seen?****Answer:** Ducts of exocrine and sweat glands**Q2.5: Where is stratified columnar epithelium seen?****Answer:**

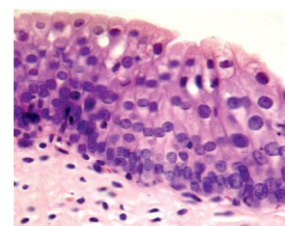
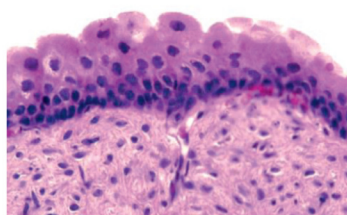
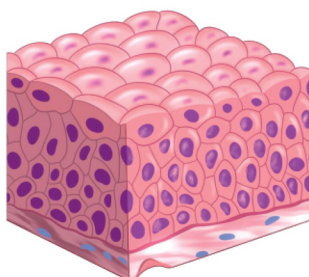
- Membranous urethra
- Penile urethra

**Q2.6: Where is pseudostratified epithelium seen?****Answer:** Falsely appearing as multilayered due to uneven arrangement of nuclei.

PYQ: FMGE 2020, 2021



- Seen in:
 - o Trachea and bronchi (pseudostratified ciliated epithelium)

Q2.7: Write a short note on transitional epithelium.**Answer:**

YOURWISH

- The topmost layer consists of **umbrella cells** that cover the cells beneath them
- Seen in:
 - o Bladder
 - o Ureter
 - o Prostatic urethra

BIG QUESTION 3: Describe briefly about the histology of different types of cartilage.

Broad Answer: Cartilage is a specialized connective tissue composed of chondrocytes embedded in an extracellular matrix and is classified into three types: hyaline, elastic, and fibrocartilage. Hyaline cartilage, found in the nose, trachea, and articular surfaces, has a glassy matrix rich in type II collagen. Elastic cartilage, present in the ear and epiglottis, contains abundant elastic fibers, while fibrocartilage, found in intervertebral discs and pubic symphysis, has dense bundles of type I collagen for tensile strength.

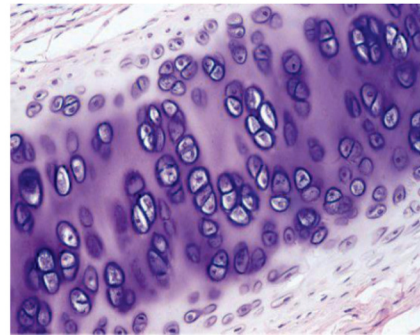
DETAILED QUESTIONS

Q3.1: What are the characteristics and locations of hyaline cartilage?

 PYQ: FMGE 2020, 2021

Answer:

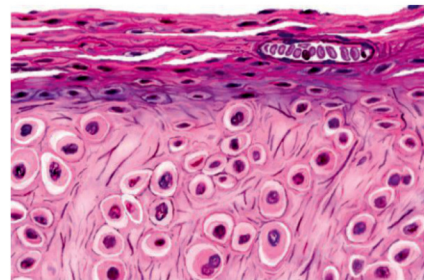
- Chondrocytes are arranged in groups
- Ground glass appearance
- Seen in:
 - o Embryonic cartilages
 - o Articular cartilages
 - o Costal cartilages
 - o Epiphyseal cartilage
 - o Respiratory cartilage
 - o Thyroid cartilage
 - o Cricoid cartilage
 - o Base of Arytenoid



Q3.2: What are the characteristics and locations of elastic cartilage?

Answer:

- Chondrocytes are arranged in groups
- Elastic fibers are seen in the matrix
- Seen in:
 - o Eustachian tube
 - o Ear lobe
 - o Corniculate cartilage
 - o Cuneiform cartilage
 - o Apex of arytenoid
 - o Epiglottis



Q3.3: What are the paired and unpaired cartilages in the larynx?

Answer: Cartilages of larynx:

I. Unpaired:

- Thyroid cartilage
- Cricoid cartilage
- Epiglottis

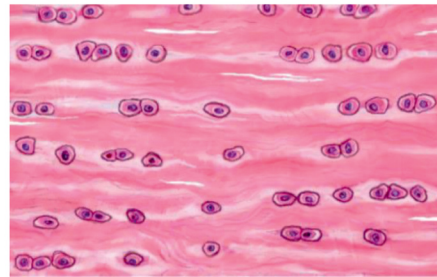
II. Paired:

- Arytenoid
- Corniculate
- Cuneiform

Q3.4: What are the characteristics and locations of fibrous cartilage?

Answer:

- Chondrocytes are arranged in rows
- Seen in:
 - o Meniscus
 - o Articular disc
 - o Glenoid labrum
 - o Intervertebral disc





3. TYPES OF JOINTS AND EPIPHYSIS

BIG QUESTION 1: What are the types of joints in the human body?

Broad Answer: Joints are classified structurally into fibrous, cartilaginous, and synovial types. Each category has specific subtypes based on the type of tissue and movement permitted.

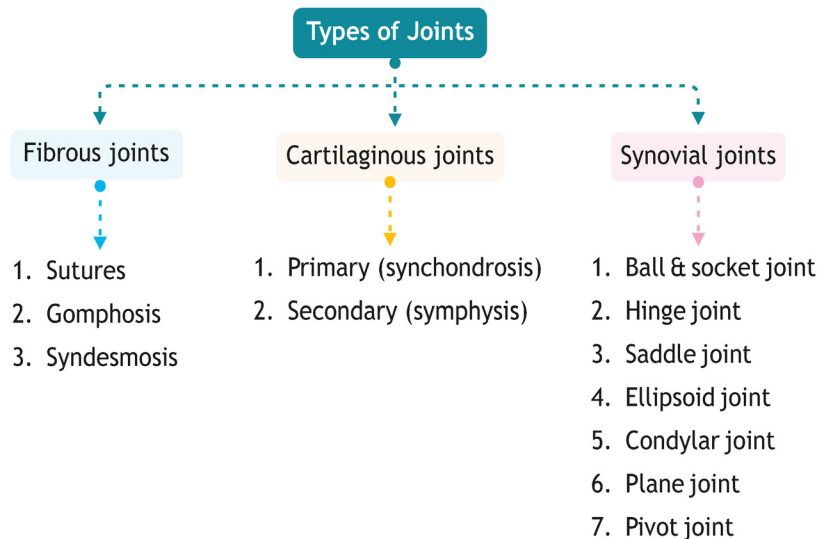
PYQ: FMGE 2020, 2021

DETAILED QUESTIONS

Q1.1: How are joints broadly classified?

Answer: Joints are classified based on the type of tissue uniting the articulating bones into:

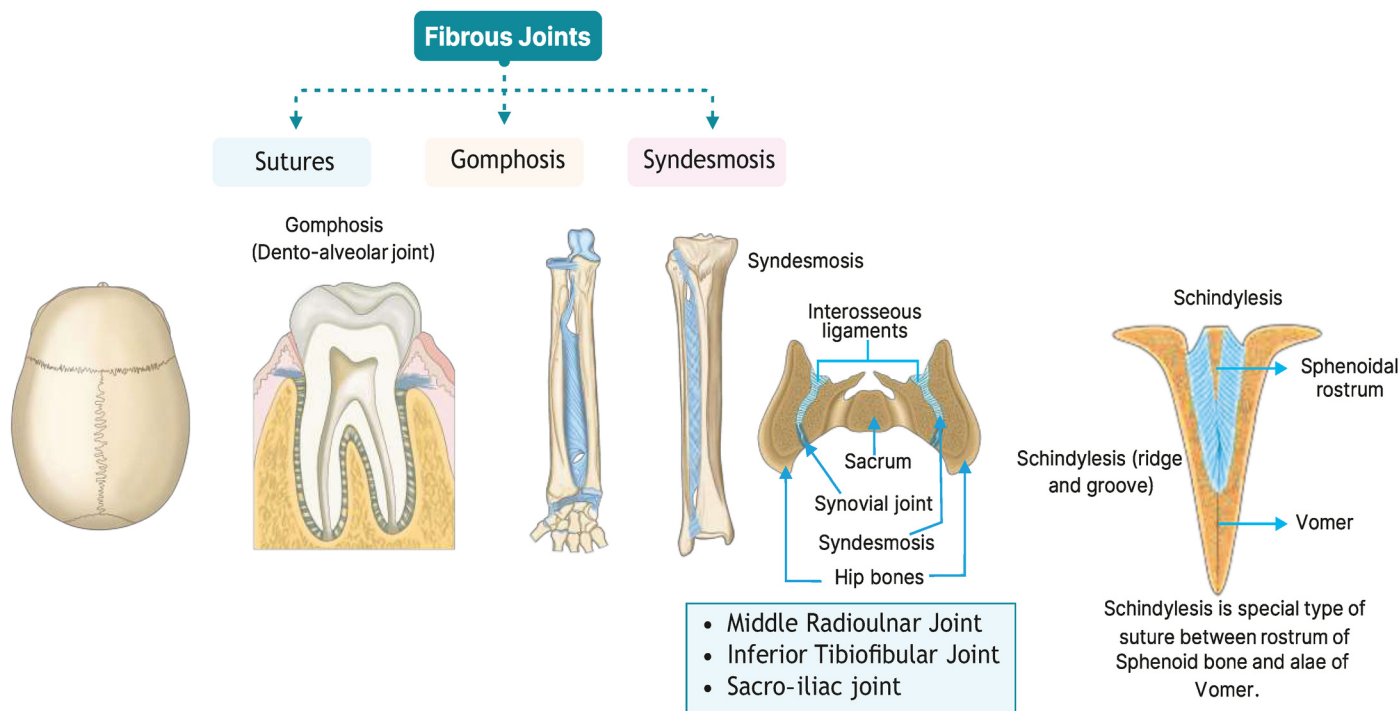
- Fibrous joints
- Cartilaginous joints
- Synovial joints



Q1.2: What are the types and subtypes of fibrous joints?

Answer:

Type of Fibrous Joint	Description	Examples
Sutures	Found only in the skull. Bones are united by short collagen fibres immovable joint	Coronal, sagittal, lambdoid
Syndesmosis	Bones connected by a sheet of fibrous tissue. Joint is with the help of interosseous membrane	Inferior tibiofibular joint, Schindylesis Middle radio-ulnar joint, Sacroiliac joint.
Gomphosis	Peg-in-socket joint.	Between tooth and alveolus



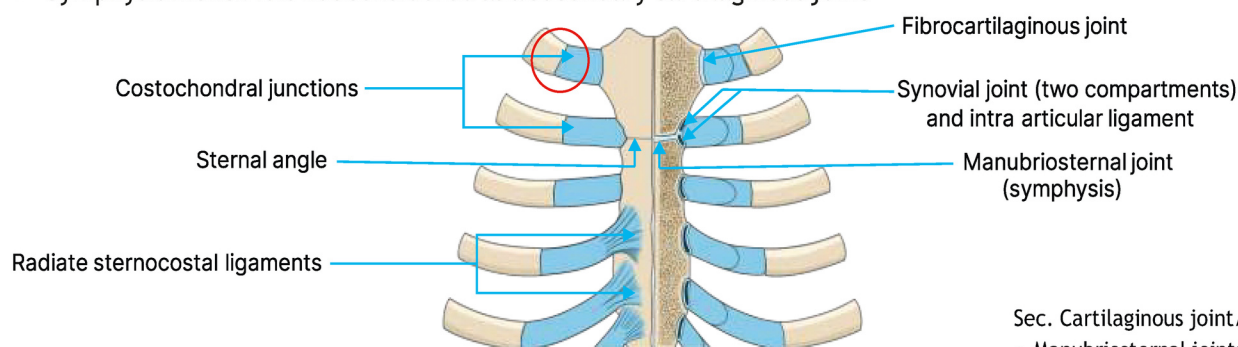
Q1.3: What are the types and subtypes of cartilaginous joints?

🔍 PYQ: NEET PG 2023

Answer:

Type of Cartilaginous Joint	Other Name	Characteristics	Examples
Primary cartilaginous joint	Synchondrosis	United by hyaline cartilage, temporary (fuses later)	• Between epiphysis and diaphysis of long bone • Costochondral joint: Between rib and costal cartilage • Spheno-occipital joint.
Secondary cartilaginous joint	Symphysis	United by fibrocartilage, permanent, slight movement	Intervertebral disc, pubic symphysis, manubriosternal joint, Xiphisternal joint, Xiphisternal joint

- Symphysis menti: It is not considered as a secondary cartilaginous joint



Pri. Cartilaginous joint/Synchondrosis

- Between epiphysis and diaphysis of long bone
- Costochondral joint
- Spheno- occipital joint

Sec. Cartilaginous joint/Symphysis

- Manubriosternal joints
- Xiphisternal joint
- Intervertebral disc
- Public symphysis
- Sacro-coccygeal joint

All symphyses occur in the midline (mandibular, manubriosternal, pubic and intervertebral) and all except the mandibular symphysis occur in the postcranial skeleton and resist synostosis. The mandibular symphysis (symphysis menti) is histologically different from the other symphyses; however, the widespread use of this descriptive term ensures that it remains, perhaps inappropriately, within this category.

YOURWISH

BIG QUESTION 2: What are synovial joints and what are their characteristics and classifications?

Broad Answer: Synovial joints are freely movable joints characterised by a joint cavity filled with synovial fluid, lined by a synovial membrane and enclosed in a fibrous capsule. They are classified based on shape and movement.

DETAILED QUESTIONS**Q2.1: What are the essential features of a synovial joint?****Answer:**

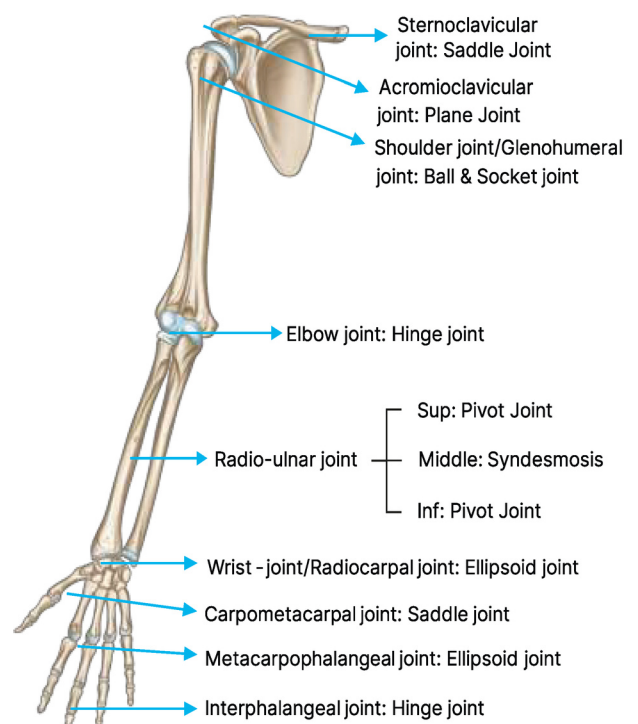
- **Articular cartilage** (usually hyaline): Covers the articulating bone surfaces.
- **Joint cavity:** Space between the bones filled with synovial fluid.
- **Synovial membrane:** Lines the inner surface of the capsule and secretes synovial fluid.
- **Fibrous capsule:** Outer tough layer providing strength.
- **Ligaments:** Reinforce and stabilise the joint.
- **Bursae (in some joints):** Fluid-filled sacs to reduce friction.
- **Menisci or articular discs (in some joints):** Pads of fibrocartilage improving fit and stability.

Q2.2: What is the blood and nerve supply to synovial joints?**Answer:**

- **Blood supply:** By articular arteries forming anastomoses around the joint.
- **Nerve supply: Hilton's Law:** The nerve supplying the muscles that act on a joint also supplies the joint and the skin overlying the insertion.

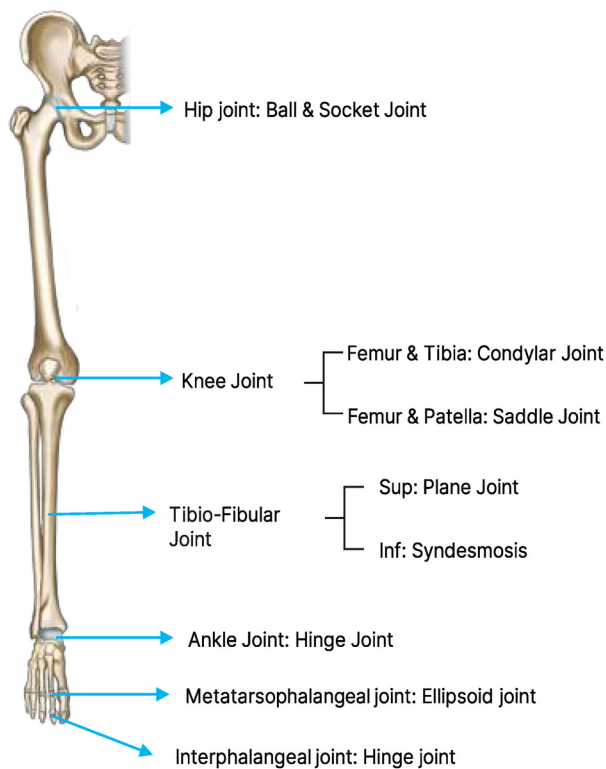
Q2.3: What are the types of synovial joints seen in upper limb?**Answer:**

- Sternoclavicular joint: Saddle joint
- Acromioclavicular joint: Plane joint
- Shoulder joint/ Glenohumeral joint: Ball and socket joint
- Elbow joint: Hinge joint
- Radio-ulnar joint:
 - o Superior: Pivot joint
 - o Middle: Syndesmosis
 - o Inferior: Pivot joint
- Wrist joint/ radiocarpal joint: Ellipsoid joint
- Carpometacarpal joint: Saddle joint
- Metacarpophalangeal joint: Ellipsoid joint
- Interphalangeal joint: Hinge joint

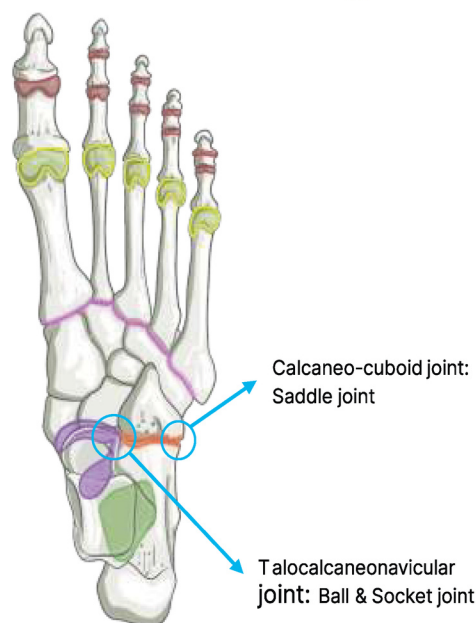
**Q2.4: What are the examples of synovial joints seen in lower limb?****Answer:** Lower limb

- Hip joint: Ball and socket joint
- Knee joint:
 - o Femur and tibia: Condylar joint
 - o Femur and patella: Saddle joint

- Tibio fibular joint:
 - o Superior: Plane joint
 - o Inferior: Syndesmosis
- Ankle joint: Hinge joint
- Metatarsophalangeal joint: Ellipsoid joint
- Interphalangeal joint: Hinge joint
- Talocalcaneonavicular joint: Ball and socket joint
- Calcaneo-navicular joint: Saddle joint



? PYQ: FMGE 2021, 2022

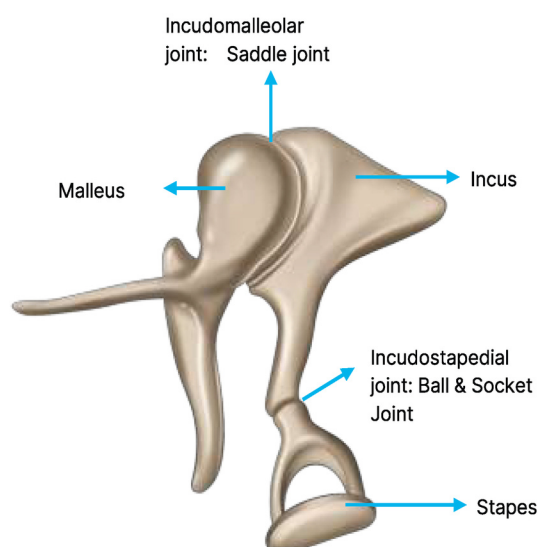


Q2.5: What are the joints seen in the ear?

Answer:

? PYQ: INICET 2023

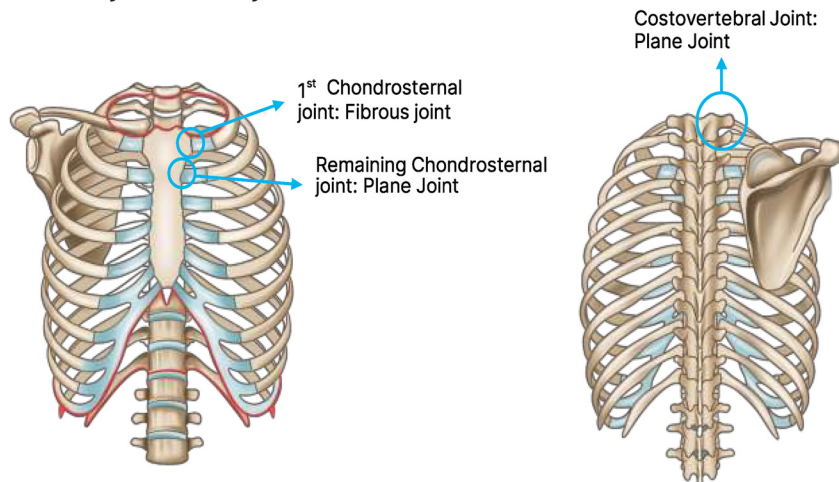
- Incudomalleolar joint: Saddle joint
- Incudostapedial joint: Ball and socket joint



Q2.6: What are the types of joints involved in formation of thoracic wall?

Answer:

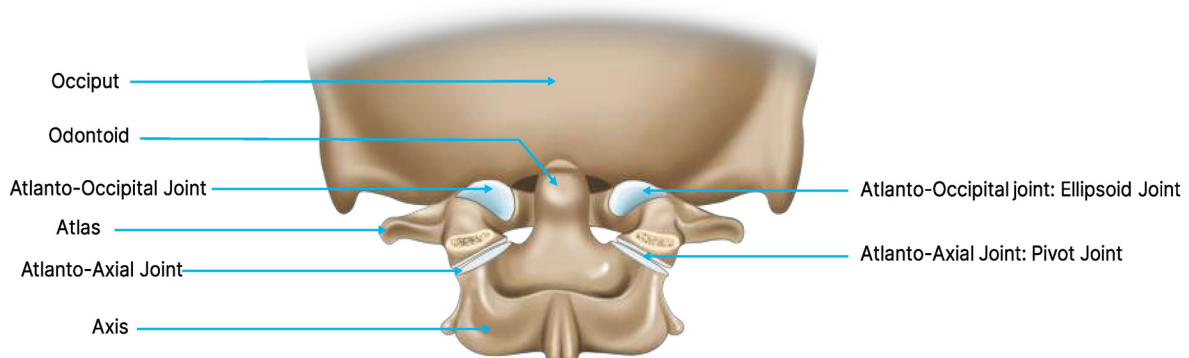
- Costovertebral joint: Plane joint
- 1st Chondrosternal joint: Fibrous joint
- Remaining chondrosternal joint: Plane joint



Q2.7: What synovial joints are present among the cervical vertebrae?

Answer:

- Atlanto-axial joint: Pivot joint
- Atlanto-occipital joint: Elliptical joint



BIG QUESTION 3: What is an epiphysis and what are its types?

Broad Answer: An epiphysis is the end part of a long bone, initially growing separately from the shaft and later fusing through a secondary ossification centre. It contributes to the articulation and growth of the bone.

DETAILED QUESTIONS

Q3.1: What is an epiphysis?

Answer:

- It is the end part of a long bone.
- It develops from a **secondary centre of ossification**.
- It is responsible for articulation and growth in bone length.

Q3.2: What are the types of epiphysis?

Answer:

PYQ: FMGE 2023

PYQ: NEET PG 2023

Type	Description	Example(s)
Pressure epiphysis	Takes part in joints and transmits weight	1. Head of humerus 2. Head of femur 3. Condyles
Traction epiphysis	Does not form part of joint; site of muscle attachment Formed due to the pull of the muscle	Trochanters of femur, tubercles of humerus, epicondyles
Atavistic epiphysis	Bone that was once separate in ancestors, now fused to main bone	Coracoid process of scapula Os trigonum
Aberrant epiphysis	Epiphysis that is not always present; often a variant	Head of first metacarpal, base of remaining metacarpals

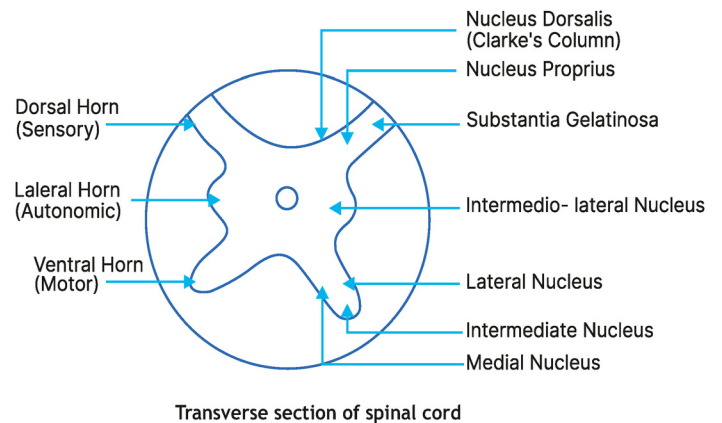


4. Neuroanatomy

BIG QUESTION 1: What are the anatomical features, extent, coverings, and modifications of the spinal cord and cerebrospinal fluid system?

Broad Answer:

- The spinal cord extends from the foramen magnum to the lower lumbar region and is surrounded by three meninges.
- It contains two enlargements and terminates at L1 in adults.
- The pia mater forms special extensions like the filum terminale and ligamentum denticulatum.
- CSF is present in the subarachnoid space, ideal for lumbar puncture, and flows through the ventricles and central canal of the spinal cord.



DETAILED QUESTIONS

Q1.1: What is the extent of the spinal cord in adults and infants?

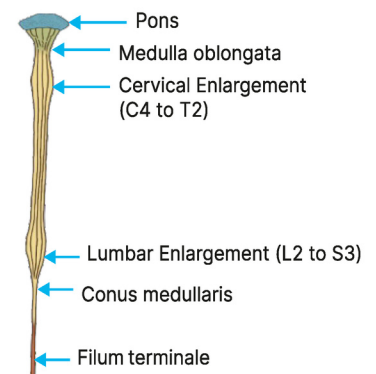
Answer:

- Adult: C1 to lower border of L1
- Infant: C1 to upper border of L3

Q1.2: What are the spinal cord enlargements and their levels?

Answer:

- Cervical enlargement: C4 to T2
- Lumbar enlargement: L2 to S3
- Note: Extents are in terms of spinal segments



Q1.3: What is the termination point of the spinal cord and subarachnoid space in adults?

Answer:

- Spinal cord: Middle third of the body of L1 vertebra
- Subarachnoid space: Ends at S2

Q1.4: What is the significance of the subarachnoid space?

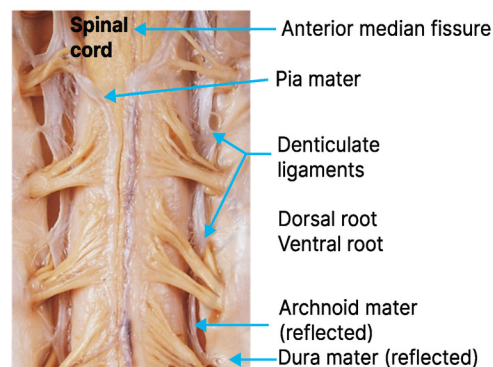
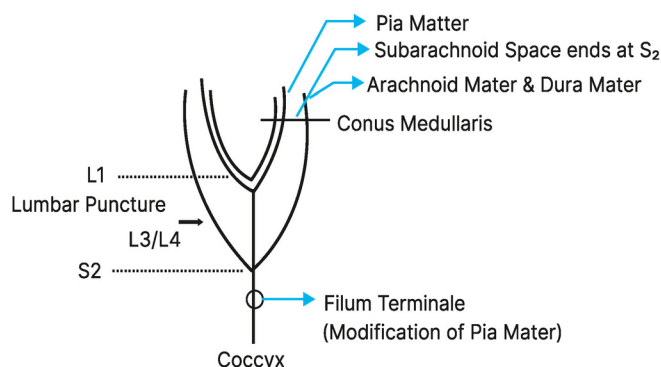
Answer:

- Located between arachnoid and pia mater
- Contains CSF
- Ideal site for lumbar puncture (done between L3 and L4)

Q1.5: What are the modifications of the pia mater in the spinal cord?

Answer:

Structure	Description
Filum Terminale	Fine thread-like extension from conus medullaris to coccyx
Linea Splendens	Pia mater extension into the anterior median fissure
Ligamentum Denticulatum	Tooth-like extensions of pia on either side (2 total), 21 projections each side



Q1.6: What is the terminal point of the spinal cord?

Answer:

- Spinal cord → Ends in Conus medullaris (cone-shaped structure) → At L1.
- Pia mater extends downward → Filum terminale (modification of the pia mater) → Divided into:
 - Filum Terminale internus → made up of pia mater.
 - Filum Terminale externus - merge of all 3 meninges.
- Arachnoid and dura mater descend → Merge with the pia mater at S2 (lower border)
- Dura mater continues down along with the pia mater → Upto the level of coccyx.

BIG QUESTION 2: What are the structural features of brain ventricles and cerebrospinal fluid flow, and what is their clinical relevance?

Broad Answer:

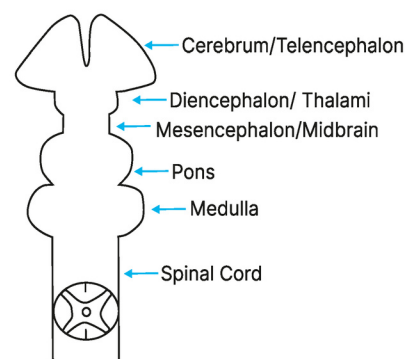
- The brain has four ventricles (two lateral, third, and fourth), which produce and circulate CSF.
- CSF flows from lateral ventricles → foramen of Monro → 3rd ventricle → aqueduct of Sylvius → 4th ventricle central canal and subarachnoid space.
- Any blockage (e.g., aqueductal stenosis, Dandy-Walker syndrome) leads to hydrocephalus.
- Each ventricle has specific horns and anatomical landmarks, including the choroid plexus, fornix, thalamus, and hippocampus.

DETAILED QUESTIONS

Q2.1: What are the ventricles of the brain and their embryological locations?

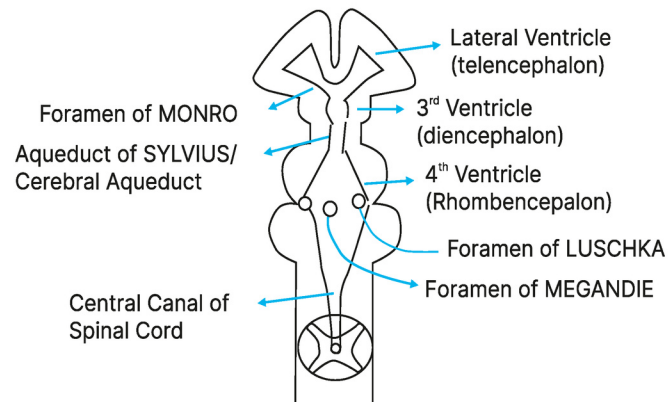
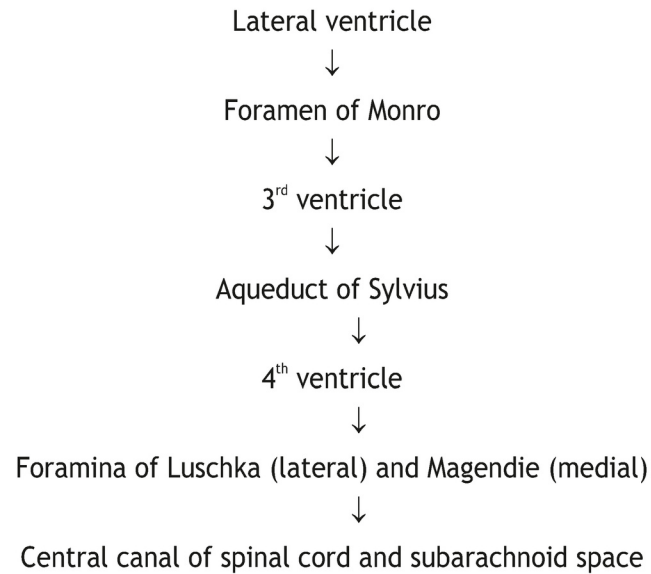
Answer:

- Lateral ventricles → in telencephalon
- 3rd ventricle → in diencephalon
- 4th ventricle → in rhombencephalon



Q2.2: How does CSF flow through the ventricles?

Answer:



Q2.3: Where is CSF formed and drained?

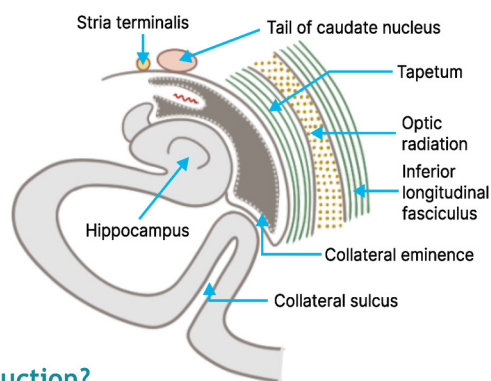
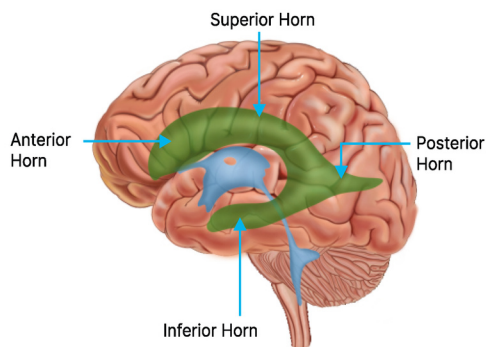
Answer:

- Formation: Choroid plexus in lateral ventricles
- Drainage:
 - o Via arachnoid granulations
 - o Into dural venous sinuses
 - o Mainly into superior sagittal sinus

Q2.4: What are the horns and important anatomical relations of the lateral ventricle?

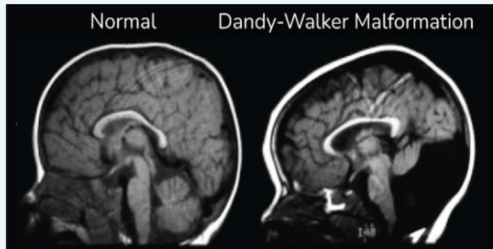
Answer:

Horn	Anatomical Features
Anterior	In frontal lobe
Superior	In parietal lobe
Posterior	Roof & lateral wall: Tapetum fibres • Bulb of posterior horn : Forceps major • Calcar avis: Calcarine sulcus).
Inferior	Roof: Tail of caudate nucleus; Floor: Hippocampus



Q2.5: What are the clinical conditions related to CSF obstruction?

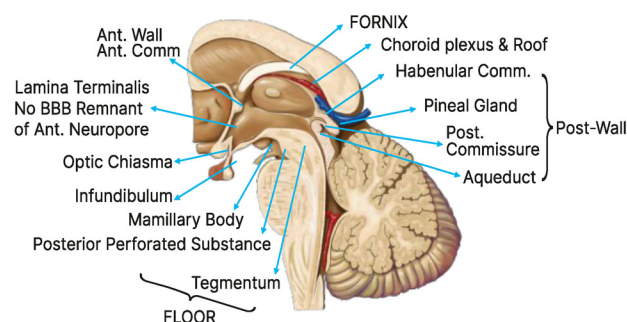
Answer:

Condition	Cause
Aqueductal stenosis 	Blockage of aqueduct of Sylvius (cerebral aqueduct) → dilated 3 rd ventricle Most common cause of congenital hydrocephalus: Congenital Aqueductal stenosis
Dandy-Walker syndrome 	Atresia of foramina of Luschka and Magendie → dilated 4 th ventricle 
Hydrocephalus	Increased CSF pressure due to obstruction or impaired drainage

Q2.6: What are the anatomical boundaries and walls of the 3rd ventricle?

Answer:

Wall	Structures
Anterior wall	- Anterior commissure - Lamina terminalis
Posterior wall	- Pineal gland (below splenium) - Posterior commissure (below pineal gland) - Habenular commissure (above pineal gland) - Aqueduct of Sylvius
Floor	- Optic chiasma - Infundibulum (between optic tracts) - Tuber cinereum - Mammillary body - Posterior perforated substance - Tegmentum
Lateral wall	- Thalamus - Hypothalamus



YOURWISH

BIG QUESTION 3: What are the internal structures of the brain seen in coronal, sagittal, and transverse sections?

Broad Answer:

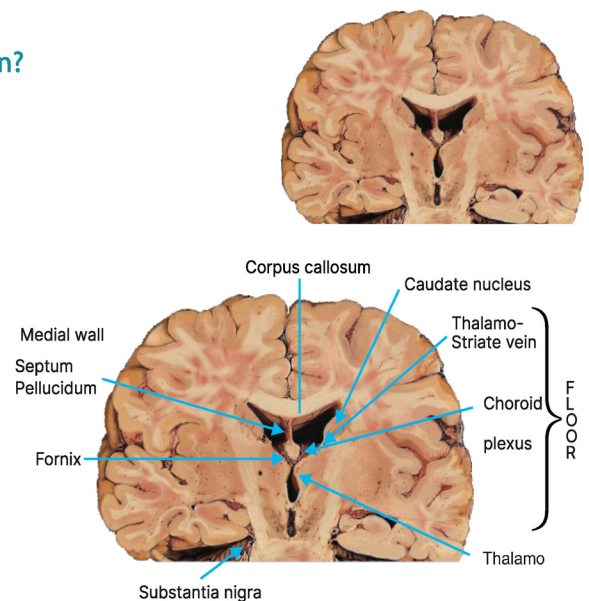
- Brain sections (coronal, sagittal, and transverse) reveal key anatomical structures such as ventricles, commissures, nuclei, tracts, and fiber pathways.
- These include the corpus callosum, fornix, thalamus, internal capsule, geniculate bodies, and midbrain/medulla components like red nucleus and substantia nigra.
- The sections also show connectivity between hemispheres, sensory and motor integration, and ventricular boundaries.

DETAILED QUESTIONS

Q3.1: What structures are visible in the coronal section of the brain?

Answer:

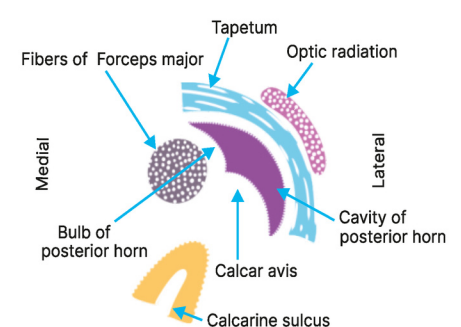
- Lateral ventricles (in telencephalon)
 - Open into the 3rd ventricle via foramen of Monro
- Commissural fibers (connect both hemispheres):
 - Corpus callosum (roof of lateral ventricle)
- Septum pellucidum (between lateral ventricles)
- Fornix (below septum pellucidum)
- Floor of lateral ventricle:
 - Caudate nucleus
 - Thalamo-striate vein
 - Choroid plexus
 - Thalamus



Q3.2: What are the parts and functions of the corpus callosum?

Answer:

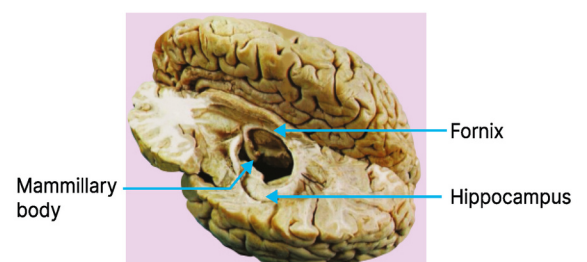
Part	Connections
Rostrum	Anterior-most
Genu	Connected to frontal lobe via forceps minor
Body	Sends lateral fibers: Tapetum
Splenium	Connected to occipital lobe via forceps major



Q3.3: What is the structure and role of the fornix?

Answer:

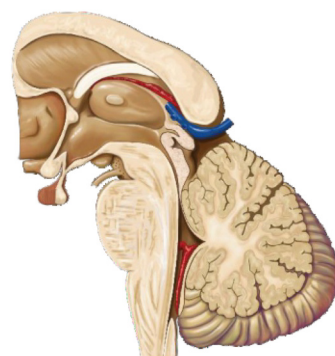
- Begins from the hippocampus
- Ends at the mamillary body
- Right and left fornices connected via hippocampal commissure
- Forms roof of 3rd ventricle (with choroid plexus)
- Forms medial wall of lateral ventricle (with septum pellucidum)



Q3.4: What is the anatomical layout seen in sagittal sections?

Answer:

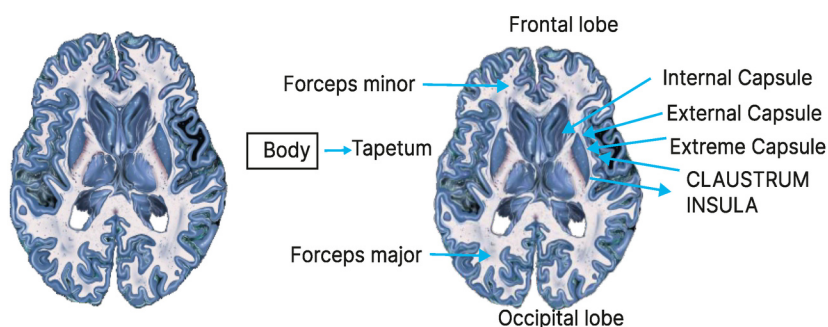
- 3rd ventricle connects to 4th ventricle via aqueduct of Sylvius
- Thalamus & hypothalamus form lateral wall of 3rd ventricle
- Fornix & choroid plexus form roof of 3rd ventricle
- Corpus callosum (rostrum, genu, body, splenium)
- Septum pellucidum below corpus callosum
- Anterior commissure below rostrum
- Lamina terminalis below anterior commissure
 - o Forms anterior wall of 3rd ventricle
 - o Is a circumventricular organ (no BBB)
 - o Remnant of anterior neuropore



Q3.5: What are the main features seen in transverse sections of brain regions?

Answer:

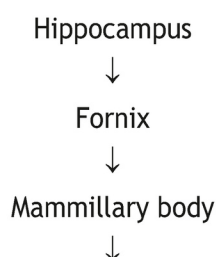
Region	Key Structures
Midbrain (superior colliculus)	Red nucleus, CN III (ventral origin), tectum, tegmentum, cerebral peduncle, substantia nigra
Midbrain (inferior colliculus)	CN IV (dorsal origin, internal decussation)
Pons	Forceps minor & major, tapetum fibers from corpus callosum
Medulla	Pyramid (corticospinal tract), Olive (inferior olivary nucleus), 4th ventricle behind



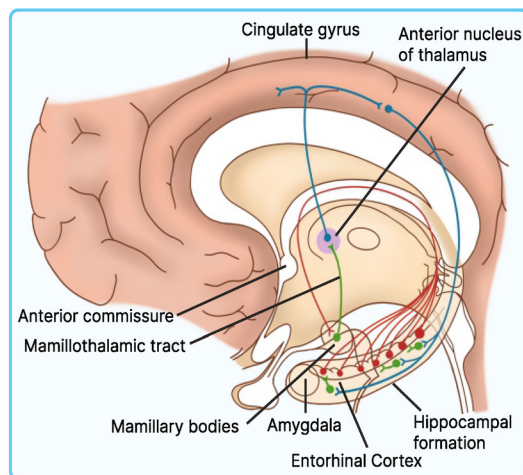
Q3.6: What is the role of the limbic system and how is the Papez circuit organized?

Answer:

- The limbic system plays a role in emotion, behavior, memory, and learning.
- It is involved in forming the Papez circuit, a major memory-emotion pathway.
- **Pathway:**



Mammillothalamic tract
↓
Anterior nucleus of thalamus

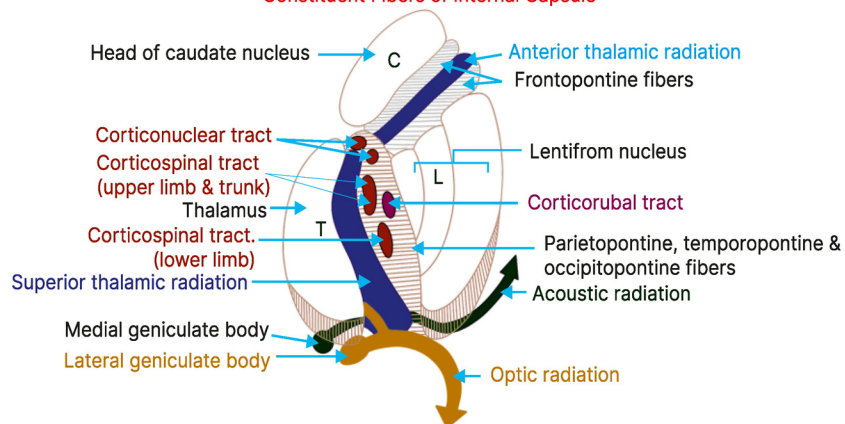


Q3.7: What are the parts of the internal capsule and their anatomical relations?

Answer:

Part	Medial Relation	Lateral Relation
Anterior limb	Caudate nucleus	Lentiform nucleus
Genu	-	-
Posterior limb	Thalamus	Lentiform nucleus
Retrolentiform part	Lateral geniculate body	Posterior to lentiform
Sublentiform part	Medial geniculate body	Below lentiform nucleus

Constituent Fibers of Internal Capsule



Q3.8: What tracts pass through different parts of the internal capsule?

Answer:

Tract	Part of Internal Capsule	Function
Corticonuclear tract	Genu	Supplies motor fibers to cranial nerves
Corticospinal tract	Anterior 2/3 rd of posterior limb	Supplies upper and lower limb muscles
Auditory radiation	Sublentiform part	Hearing (from medial geniculate body)
Optic radiation	Retrolentiform part	Vision (from lateral geniculate body)

Q3.9: What are the geniculate bodies and their related fiber pathways?

Answer:

Geniculate Body	Function	Pathway
Medial geniculate body	Auditory pathway	Sublenticular fibers → auditory cortex
Lateral geniculate body	Visual pathway	Retrolenticular fibers → visual cortex

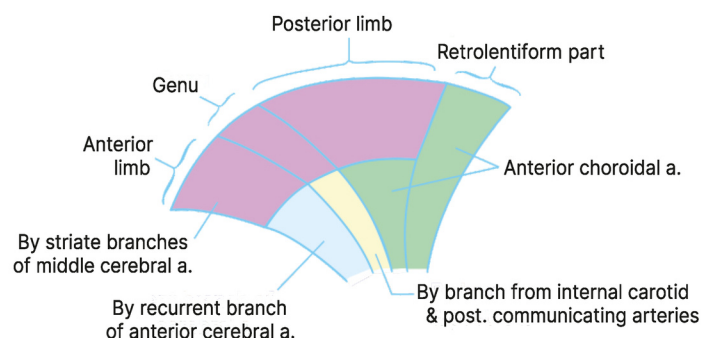
- Mnemonic:
 - o M for Music = Medial = Auditory
 - o L for Light = Lateral = Visual

Q3.10: What is the blood supply of the internal capsule?

Answer:

Part	Superior Part	Inferior Part
Anterior limb	Striate branches of MCA	Recurrent artery of ACA (Heubner/Medial striate)
Genu	Striate branches of MCA	ICA + Posterior communicating artery
Posterior limb	Striate branches of MCA	Anterior choroidal artery (from ICA)
Retrolenticular	Anterior choroidal artery	

- Striate branches of MCA = Lateral striate artery / Charcot's artery
- Recurrent artery of ACA = Medial striate artery / Recurrent artery of Heubner



Q3.11: What is the clinical significance of the internal capsule?

Answer:

Tract Affected	Effect of Lesion
Corticospinal (Post. limb)	Contralateral hemiplegia (upper & lower limbs)
Corticonuclear (Genu)	Weakness of face and cranial nerve function

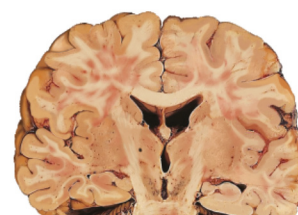
Q3.12: The structure indicated in the image originates from:

- Mamillary body
- Hippocampus
- Thalamus
- Amygdala

PYQ: NEET PG 2022

Answer: B. Hippocampus

- The fornix arises from the hippocampus and terminates at the mamillary body.



YOURWISH

Q3.13: Which pathway provides afferents to the mamillary body?

- A. Fornix
- B. Thalamus
- C. Pituitary gland
- D. Corpus callosum

Answer: A. Fornix

- The fornix connects the hippocampus to the mamillary body as part of the Papez circuit.

BIG QUESTION 4: What are the fiber types in brain white matter and their anatomical examples?

Broad Answer:

- Brain white matter consists of axonal bundles classified into **association**, **commissural**, and **projection** fibers, depending on their direction and connectivity.
- Each type of fiber connects different parts of the brain – either within the same hemisphere, between the hemispheres, or between the brain and spinal cord.
- Certain tracts like the **fornix** and **internal capsule** contain combinations of these fibers.

DETAILED QUESTIONS

Q4.1: What are the types of white matter fibers in the brain?

Answer:

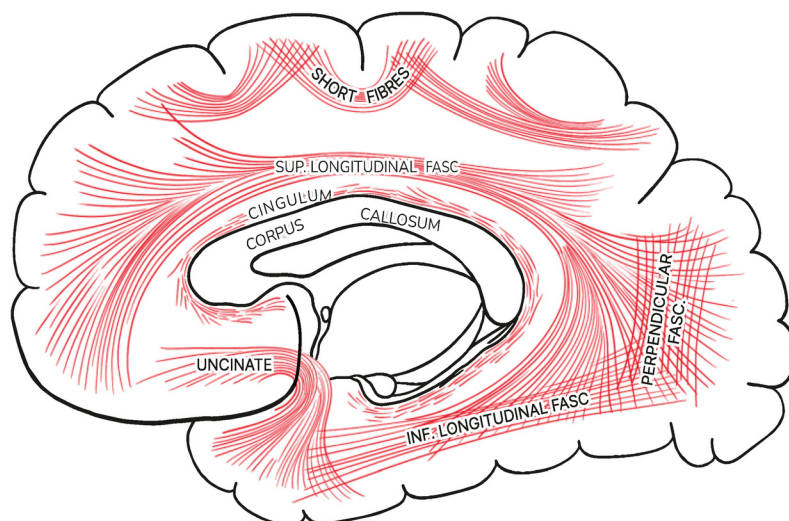
Fiber Type	Function
Association fibers	Connect different parts within the same hemisphere (anteroposteriorly)
Commissural fibers	Connect the right and left hemispheres
Projection fibers	Connect the brain with spinal cord (vertical fibers)

Q4.2: What are the examples of association fibers?

 PYQ: NEET PG 2021

Answer:

Fiber	Connection
Short association fibers	Connect adjacent gyri (e.g., arcuate fasciculus)
Superior longitudinal fasciculus	Frontal → Occipital lobe
Inferior longitudinal fasciculus	Temporal → Occipital lobe
Uncinate fasciculus	Connects Broca's area (44, 45) ↔ Auditory area (41, 42)
Cingulum	Surrounds corpus callosum
Arcuate fasciculus	Connects Broca's area and Wernicke's area



Q4.3: What are examples of commissural fibers and their function?

Answer:

- **Corpus callosum:** Largest commissural fiber; connects both hemispheres
- **Anterior commissure:** Connects temporal lobes
- **Hippocampal commissure:** Connects both fornices
- **Posterior commissure & habenular commissure:** Involved in pupillary reflexes

Q4.4: What are projection fibers and their pathways?

Answer:

- Connect brain → spinal cord, pass through:
 - o Corona radiata
 - o Internal capsule
 - o Tracts
- Examples:
 - o Corticospinal tract
 - o Corticonuclear tract

Q4.5: What is the fiber composition of the fornix?

Answer:

- Fornix contains:
 - o Association fibers > Commissural fibers > Projection fibers

Q4.6: Fornix consists of which type of fibers?

- A. Association and commissural fibers
- B. Association and projection fibers
- C. Commissural and projection fibers
- D. Association fibers

Answer: A. Association and commissural fibers

- Fornix mainly consists of association fibers, with some commissural and projection components.

BIG QUESTION 5: What are the major ascending and descending spinal cord tracts and their clinical significance?

Broad Answer:

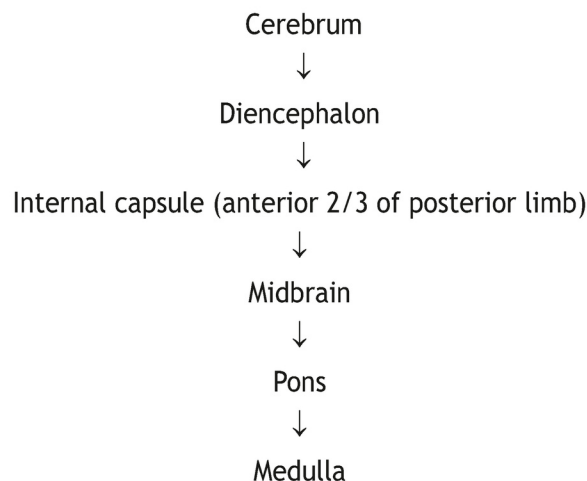
- The spinal cord contains both ascending (sensory) and descending (motor) tracts.
- Major ascending tracts include the **spinothalamic, dorsal column, and spinocerebellar tracts**, while descending tracts include the **corticospinal (pyramidal) tract**.
- Each tract carries specific modalities such as pain, touch, proprioception, and motor control.
- Clinical syndromes like **Brown-Séquard syndrome** help localize lesions based on tract functions.

DETAILED QUESTIONS

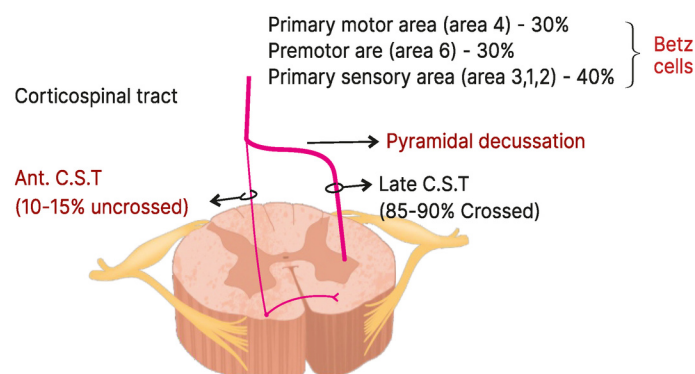
Q5.1: What are the components and functions of the pyramidal (corticospinal) tract?

Answer:

- Origin: Motor cortex
 - Area 4 (Primary motor): 30%
 - Area 6 (Premotor): 30%
 - Area 3,1,2 (Sensory): 40%
- From Betz cells
- Pathway:



- Decussation (crossing):
 - 90-95% fibers → cross in medulla → lateral column → lateral corticospinal tract
 - 5-10% fibers → remain uncrossed → anterior column → anterior corticospinal tract.
- Hence, 100% of pyramidal tract fibers decussate



Q5.2: What are the clinical signs of corticospinal tract injury?

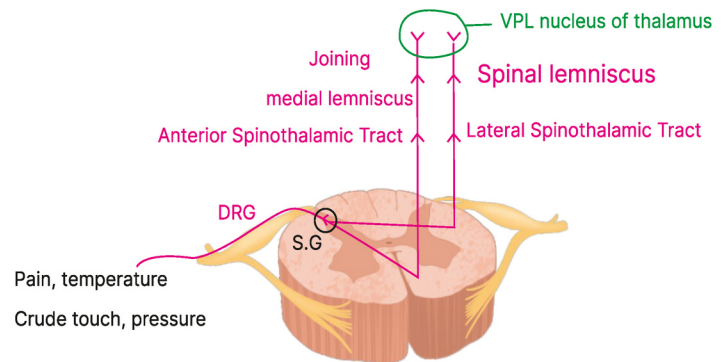
Answer:

Site of Injury	Effect
Before decussation	Contralateral hemiplegia
After decussation	Ipsilateral hemiplegia
Hemisecion (Brown-Séquard)	Ipsilateral hemiplegia

Q5.3: What sensations are carried by the spinothalamic tract and how is it organized?

Answer:

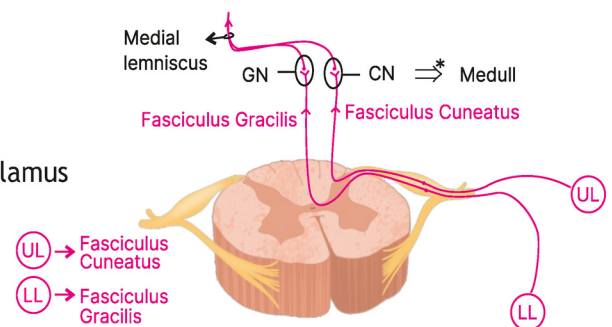
- Enters via dorsal root ganglion
- Relays in substantia gelatinosa
- Crosses and ascends via:
 - o Lateral spinothalamic: Pain, temperature
 - o Anterior spinothalamic: Crude touch, pressure
- Brainstem:
 - o Lateral → Spinal lemniscus
 - o Anterior → Joins medial lemniscus
- Ends in VPL nucleus of thalamus



Q5.4: What are the features and pathway of the dorsal column tract?

Answer:

- Enters via dorsal root ganglion
- Divides into:
 - o Fasciculus gracilis (lower limb)
 - o Fasciculus cuneatus (upper limb)
- Ends in nucleus gracilis and nucleus cuneatus (medulla)
- Second-order neurons cross → medial lemniscus → VPL of thalamus
- Modalities:
 - o Fine touch
 - o Vibration
 - o Proprioception
 - o Stereognosis

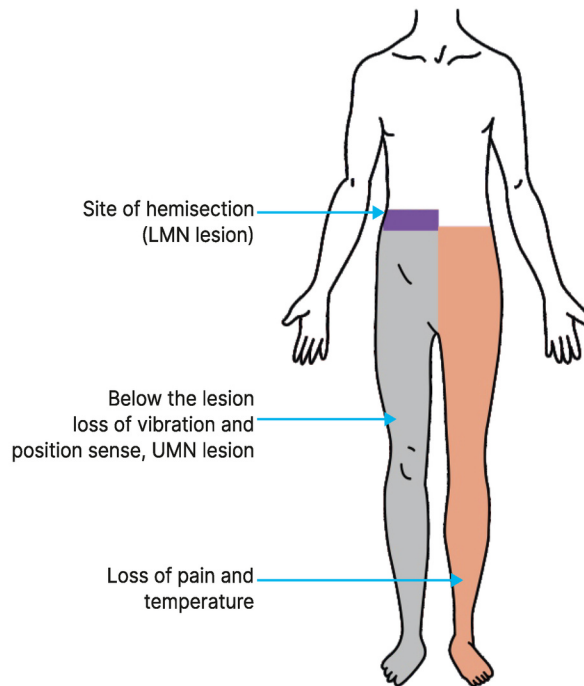


Q5.5: What is Brown-Séquard syndrome and how are spinal tracts affected?

Answer:

PYQ: INICET 2022

Tract Affected	Side of Deficit	Sensation/Function Lost
Dorsal column	Ipsilateral	Fine touch, vibration, stereognosis, proprioception
Spinothalamic tract	Contralateral	Pain, temperature, crude touch, pressure
Corticospinal tract	Ipsilateral	Motor weakness/hemiplegia



BIG QUESTION 6: What are the Brodmann areas of the cerebral cortex and their clinical correlations?

Broad Answer:

- Brodmann areas are regions of the cerebral cortex defined by cytoarchitecture and associated functions.
- Specific areas govern motor control, sensory processing, vision, speech, and auditory functions.
- Lesions in these areas result in distinct neurological deficits like aphasia. These areas are located on the superolateral, medial, and inferior brain surfaces.

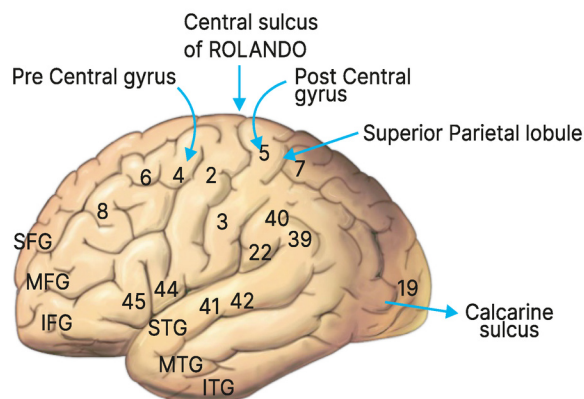
DETAILED QUESTIONS

Q6.1: What are the key Brodmann areas on the superolateral surface and their functions?

Answer:

🔍 PYQ: INICET 2021 🔍 PYQ: NEET PG 2022 🔍 PYQ: FMGE 2020, 2021

Area	Location	Function
41, 42	Superior temporal gyrus (Heschl's gyrus)	Primary auditory area
22	Superior temporal gyrus (posterior)	Auditory association area (Wernicke)
8	Middle frontal gyrus	Frontal eye field (horizontal gaze)
4	Pre-central gyrus	Primary motor area
6	In front of area 4, all 3 frontal gyri	Pre-motor area
44, 45	Inferior frontal gyrus	Broca's speech area (motor speech)
40	Supramarginal gyrus	Part of Wernicke's area (sensory)
39	Angular gyrus	Visual language, reading
3, 1, 2	Post-central gyrus	Primary somatosensory area
5, 7	Superior parietal lobule	Somatosensory association area
17	Around calcarine sulcus	Primary visual area
18, 19	Around area 17	Visual association areas



Q6.2: What are the features of Broca's and Wernicke's speech areas and related aphasias?

Answer:

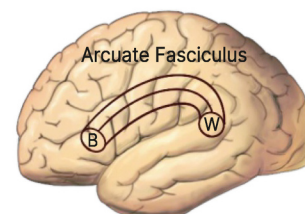
Area	Location	Location	Lesion → Aphasia Type
Broca's (44, 45)	Inferior frontal gyrus	Motor speech	Broca's/Expressive/Agrammatic
Wernicke's (22)	Superior temporal gyrus (post.)	Sensory speech	Wernicke's/Fluent/Receptive

Q6.3: What are the associated tracts between speech and auditory areas?

PYQ: FMGE 2021, 2022

Answer:

- Arcuate fasciculus: Connects Broca's → Wernicke's area
- Uncinate fasciculus: Connects Broca's → Auditory area
- Cingulum: Around corpus callosum



Q6.4: What are the clinical types of aphasia and their anatomical basis?

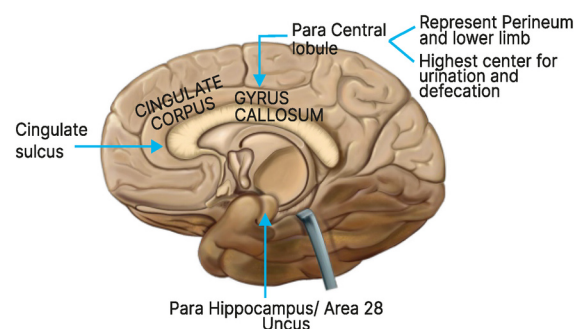
Answer:

Type	Affected Area	Clinical Features
Broca's aphasia	Area 44/45	Non-fluent, expressive, understanding intact
Wernicke's aphasia	Area 22	Fluent, meaningless speech, comprehension poor
Conduction aphasia	Arcuate fasciculus lesion	Poor repetition, intact comprehension & fluency
Global aphasia	Broca's + Wernicke's + Arcuate fasciculus	Severe communication impairment

Q6.5: What are the important Brodmann areas on the medial surface of the brain?

Answer:

- Cingulate sulcus: In front of corpus callosum → forms cingulate gyrus
- Paracentral lobule: Surrounded by branches of cingulate sulcus
 - o Represents lower limb & perineum
 - o Highest center for urination & defecation
- Area 28 (Uncus/Parahippocampus): Smell-mediated sexual behavior



BIG QUESTION 7: What is the anatomy and function of basal ganglia, and what are the effects of its lesions?

Broad Answer:

- The basal ganglia are subcortical grey matter structures that regulate voluntary motor control, procedural learning, and emotion.
- They include nuclei from the telencephalon, diencephalon, and midbrain.
- Lesions in specific components of the basal ganglia cause characteristic movement disorders like Parkinsonism, chorea, athetosis, and hemiballismus.

DETAILED QUESTIONS

Q7.1: What are the components of the basal ganglia and their embryological origin?

Answer:

Component	Location
Corpus striatum • Caudate nucleus • Lentiform nucleus - o Putamen - o Globus pallidus internus & externus	Telencephalon
Subthalamic nucleus	Diencephalon
Substantia nigra	Mesencephalon

Q7.2: What is the neostriatum composed of?

Answer: Neostriatum = Caudate nucleus + Putamen

Q7.3: What is the function of basal ganglia in motor control?

Answer:

- Initiates, modulates, and fine-tunes voluntary motor activity
- Inhibits unwanted movements
- Works via indirect and direct pathways in motor circuit loops

Q7.4: What are the clinical effects of basal ganglia lesions?

Answer:

Structure Affected	
Globus pallidus	Athetosis
Putamen	Chorea
Substantia nigra	Parkinson's disease
Subthalamus	Hemiballismus

Q7.5: What is the neurotransmitter involvement in Parkinsonism?

Answer:

- Substantia nigra contains dopaminergic neurons
- Degeneration → ↓ Dopamine → Parkinsonism

Q7.6: Neostriatum consists of:

- A. Caudate nucleus and globus pallidus
- B. Globus pallidus and putamen
- C. Globus pallidus and lentiform nucleus
- D. Caudate nucleus and putamen

Answer: D. Caudate nucleus and putamen

BIG QUESTION 8: What are the external and internal features of the brainstem and cranial nerve origins?

Broad Answer:

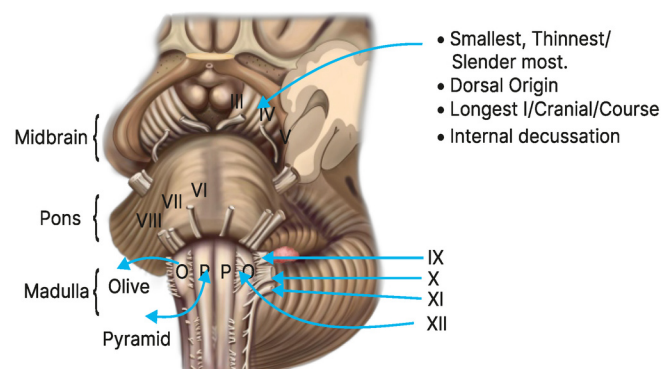
- The brainstem comprises the midbrain, pons, and medulla oblongata, and is the origin of most cranial nerves.
- Key external landmarks include the interpeduncular fossa, pyramids, and olives.
- Internally, transverse sections reveal grey and white matter structures such as the red nucleus, substantia nigra, tectum, and tegmentum.
- Cranial nerves arise at distinct levels, and lesions at these sites lead to characteristic deficits.

DETAILED QUESTIONS

Q8.1: What are the brainstem components and their cranial nerve origins?

Answer:

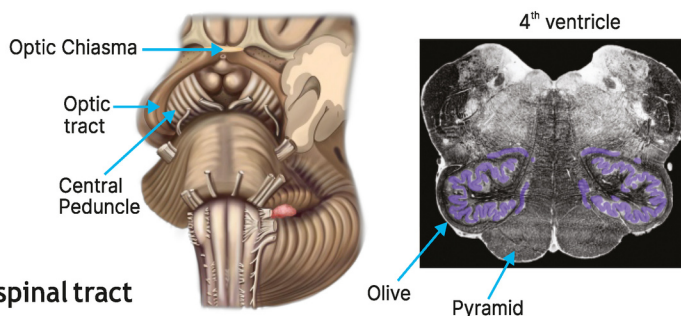
Part	Cranial Nerves Originating
Midbrain	CN III (Oculomotor), CN IV (Trochlear)
Pons	CN V (Trigeminal)
Pontomedullary Junction	CN VI (Abducens), CN VII (Facial), CN VIII (Vestibulocochlear)
Medulla	CN IX, X, XI (lateral to olive), CN XII (between pyramid & olive)



Q8.2: What are the surface landmarks of the brainstem and their features?

Answer:

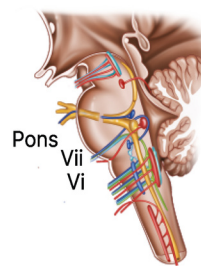
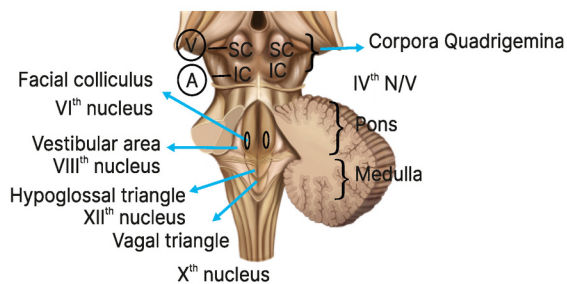
- Interpeduncular fossa: Between optic chiasma, optic tract, and cerebral peduncle
 - o Contains:
 - Infundibulum
 - Tuber cinereum
 - Mammillary bodies
 - Posterior perforated substance
 - CN III (Oculomotor)
- Pyramid: Anterior elevation in medulla due to corticospinal tract
- Olive: Lateral to pyramid, due to inferior olivary nucleus



Q8.3: What are the elevations in the floor of the 4th ventricle (rhomboid fossa)?

Answer:

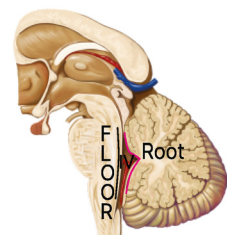
Elevation	Nucleus
Facial colliculus	VI nucleus (abducens) + CN VII fibers looping
Vestibular area	CN VIII nucleus
Hypoglossal triangle	CN XII nucleus
Vagal triangle	CN X nucleus
Superior fovea	Locus ceruleus (bluish-grey) → Secretes dopamine



Q8.4: What are the roof structures of the 4th ventricle?

Answer:

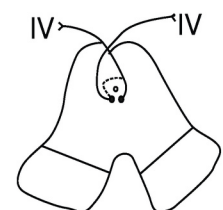
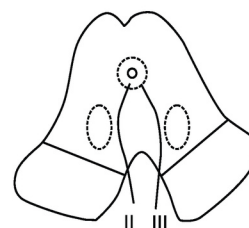
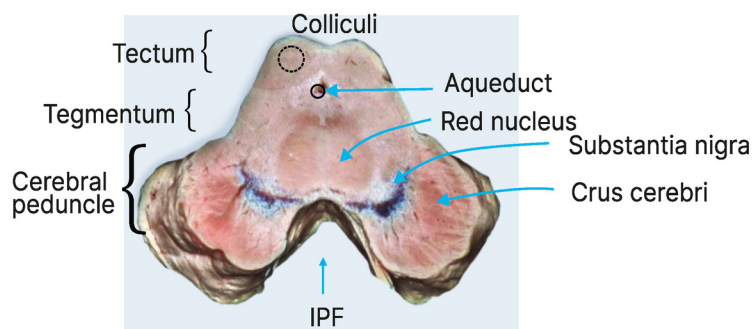
Part	Structure
Superior medullary velum	Nervous tissue
Inferior medullary velum	Non-nervous tissue



Q8.5: What are the internal structures seen in transverse sections of the midbrain?

Answer:

Level	Key Structures
Superior colliculus	CN III (ventral origin), red nucleus, substantia nigra
Inferior colliculus	CN IV (dorsal origin, decussates internally)
Midbrain general	Tectum (behind aqueduct), tegmentum (middle), cerebral peduncle (anterior), aqueduct of Sylvius (central)



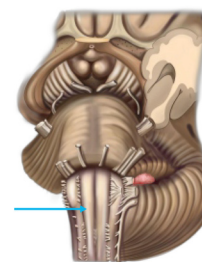
Q8.6: Injury at the arrow-marked structure (pyramid) leads to:

- A. Contralateral hemiplegia
- B. Ipsilateral hemiplegia

Answer: A. Contralateral hemiplegia

The marked structure is Pyramid, injury to which causes:

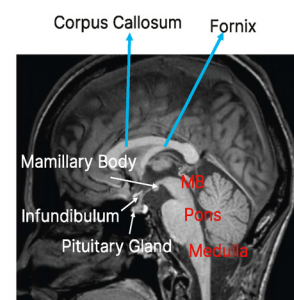
- Before decussation → Contralateral hemiplegia
- After decussation → Ipsilateral hemiplegia

**Q8.7: The marked structure sends efferents to which thalamic nucleus?**

- A. Pulvinar
- B. Posterior lateral nucleus
- C. Anterior nucleus
- D. Lateral nucleus

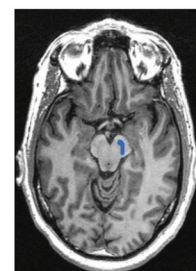
Answer: C. Anterior nucleus

- The mammillary body, via mammillothalamic tract, sends fibers to the anterior thalamic nucleus (part of the Papez circuit).

**Q8.8: The neurotransmitter secreted by the marked structure is:**

- A. Dopamine
- B. Acetylcholine
- C. Glutamine
- D. Noradrenaline

Answer: A. Dopamine

**BIG QUESTION 9: What is the anatomical structure, circuitry, and functional output of the cerebellum?****Broad Answer:**

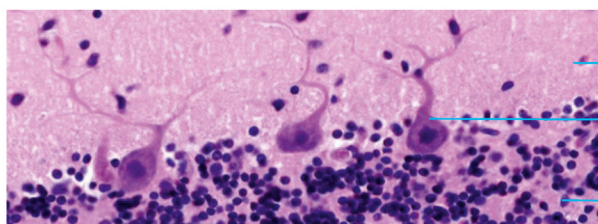
- The cerebellum coordinates movement and balance.
- It is composed of three layers of cortex, receives inputs via climbing and mossy fibers, and sends outputs through Purkinje cells to deep cerebellar nuclei.
- These nuclei connect the cerebellum to the rest of the brain via three peduncles.
- Lesions affect coordination, leading to ataxia and imbalance.

DETAILED QUESTIONS**Q9.1: What is the histological structure of the cerebellar cortex?**

Answer:

Layer	Cells
Molecular layer	Stellate cells, Basket cells
Purkinje layer	Purkinje cells (flask-shaped, largest inhibitory cell)
Granular layer	Granule cells (excitatory), Golgi cells

- Cerebellar cortex has largest collection of inhibitory neurons
- Excitatory: Granule and Golgi cells
- Inhibitory: Stellate, basket, Purkinje



- M Stellate cells - Basket cells
- Purkinje cells
 - flask shaped
 - largest
- Granular cells - Golgi cells

Q9.2: What are the afferent and efferent pathways of the cerebellum?

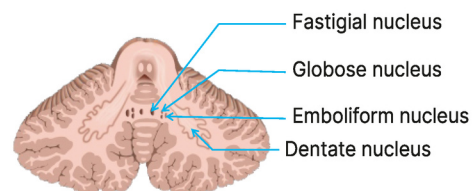
Answer:

Pathway	Type	Termination
Climbing fibers • Source: Olivocerebellar and para-olivary tract	Afferent	Reach molecular layer
Mossy fibers • Source: All other tracts • Mossy fibers + granule cells = Cerebelloglomeruli	Afferent	End in granular layer
Purkinje cells	Efferent	Inhibit deep cerebellar nuclei via GABA

Q9.3: What are the deep nuclei of the cerebellum?

Answer:

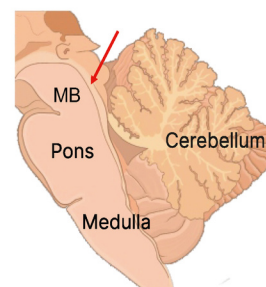
Mnemonic	Nucleus	Location
D	Dentate nucleus	Lateral (largest, crumpled bag)
E	Emboliform nucleus	Intermediate
G	Globose nucleus	Intermediate
F	Fastigial nucleus	Medial



- Interpositus nucleus = Emboliform + Globose
- Mnemonic: Doctors Eat Good Food

Q9.4: Fibers from the marked structure (cerebellum) terminate at:

- Fastigial nucleus
- Inferior olivary nucleus
- Red nucleus
- Subthalamus



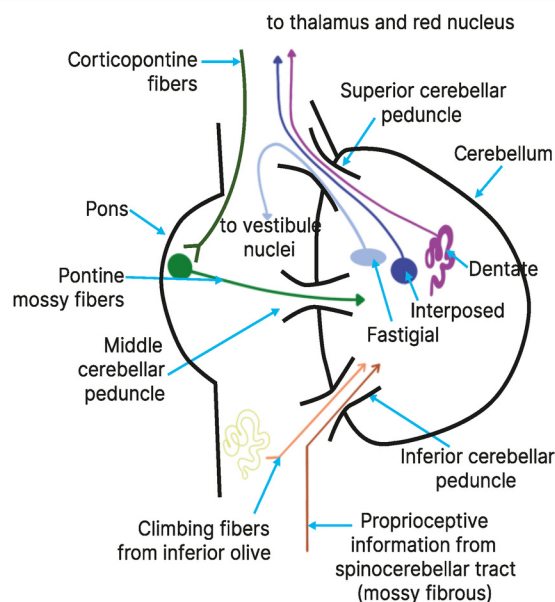
Answer: C. Red nucleus

- Efferents from deep nuclei pass through superior cerebellar peduncle to red nucleus and thalamus

Q9.5: What are the cerebellar peduncles and their connections?

Answer:

Peduncle	Connects Cerebellum To	Fiber Direction
Superior cerebellar	Midbrain	Mostly efferent
Middle cerebellar	Pons	Afferent (from cortex via pons)
Inferior cerebellar	Medulla	Afferent (proprioceptive)



Q9.6: Decussation of the superior cerebellar peduncle occurs at:

- A. Midbrain
- B. Medulla
- C. Pons
- D. Diencephalon

Answer: A. Midbrain

BIG QUESTION 10: What is the arterial supply of the brain and Circle of Willis, and what are the vascular syndromes and aneurysm complications?

Broad Answer:

- The brain is supplied by internal carotid and vertebral arteries, which form the **Circle of Willis**.
- Key cerebral arteries (anterior, middle, posterior) supply specific brain regions. Blockage or rupture of these vessels causes strokes, hemorrhages, and syndromes like ataxia or visual loss.
- Aneurysms at major junctions can compress cranial nerves or cause subarachnoid hemorrhage.

DETAILED QUESTIONS

Q10.1: What arteries form the Circle of Willis?

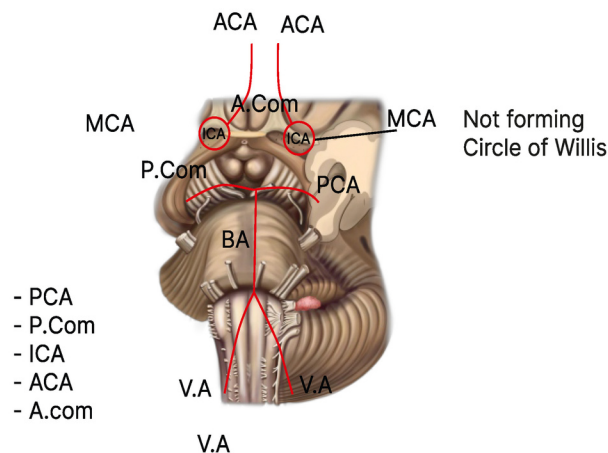
Answer:

PYQ: FMGE 2021, 2022

- Constituent Arteries
 - o Posterior cerebral artery (PCA)
 - o Posterior communicating artery

YOURWISH

- o Internal carotid artery (ICA)
- o Anterior cerebral artery (ACA)
- o Anterior communicating artery
- **Middle cerebral artery (MCA) is not part of the Circle of Willis**



Q10.2: What are the branches of internal carotid and vertebrobasilar systems?

Answer:

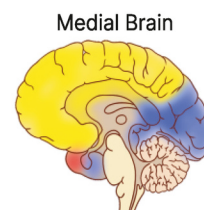
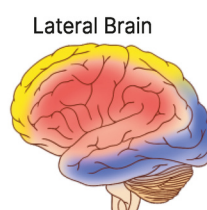
- **Internal Carotid Artery (ICA) Branches:**
 - o Anterior cerebral artery (ACA)
 - o Middle cerebral artery (MCA)
 - o Posterior communicating artery
 - o Ophthalmic artery (1st branch)
 - o Anterior choroidal artery
- **Vertebral Artery Branches:**
 - o Anterior spinal artery
 - o Posterior spinal arteries (2)
 - o Posterior inferior cerebellar artery (PICA)
 - o Medullary branches
 - o Meningeal branches
- **Basilar Artery Branches:**
 - o Anterior inferior cerebellar artery (AICA)
 - o Labyrinthine artery (from AICA)
 - o Pontine branches
 - o Superior cerebellar artery
 - o Posterior cerebral artery (PCA)

Q10.3: What are the dominant arteries of different brain surfaces?

Answer:

PYQ: NEET PG 2022

Brain Surface	Dominant Artery
Lateral surface	Middle cerebral artery
Medial surface	Anterior cerebral artery
Inferior surface	Posterior cerebral artery



- Anterior Cerebral Artery
- Middle Cerebral Artery
- Posterior Cerebral Artery

Q10.4: A patient presents with ataxia and incoordination. Likely artery involved:

- A. Posterior cerebral artery
- B. Middle cerebral artery
- C. Internal carotid artery
- D. Superior cerebellar artery

Answer: D. Superior cerebellar artery

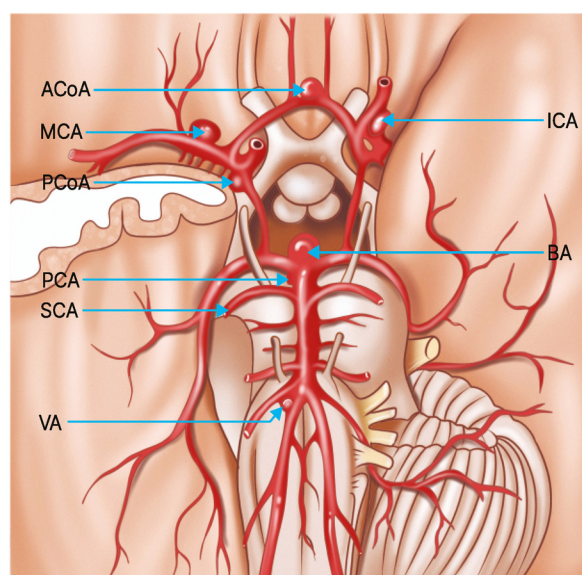
- It supplies cerebellum → Lesions cause cerebellar dysfunction

Q10.5: What are the complications of aneurysms at Circle of Willis?

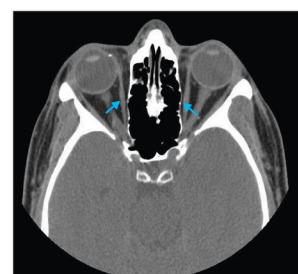
PYQ: FMGE 2020

Answer:

Aneurysm Site	Complication
Anterior communicating artery	Compresses optic chiasma → visual defects
Posterior communicating artery	Compresses CN III → oculomotor palsy
Saccular (Berry) aneurysm rupture	Subarachnoid hemorrhage

**Q10.6: At which level does the nerve supply for the marked structure arise?**

- A. Red nucleus
- B. Subthalamic nuclei
- C. Decussation of pyramid tract
- D. Olivary nucleus



Answer: A. Red nucleus

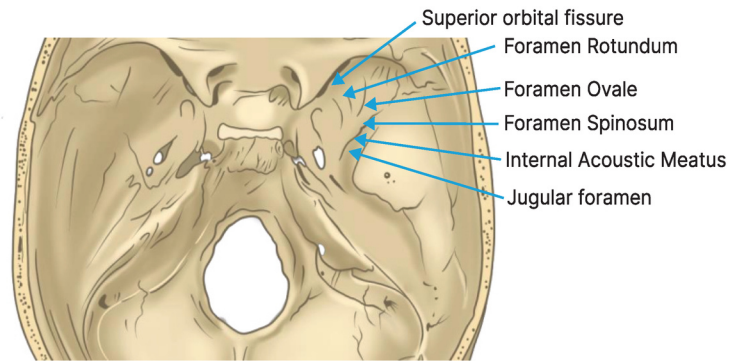
- The arrow shows the medial rectus → Supplied by 3rd cranial nerve (originating from the midbrain at the level of superior colliculi)
 - o Red nucleus is present at this level.



5. HEAD AND NECK

BIG QUESTION 1: What are the important cranial foramina and the structures passing through them?

Broad Answer: Cranial foramina are openings in the base of the skull through which various cranial nerves, arteries, and veins pass. Understanding the location, boundaries, and contents of each foramen is crucial for clinical diagnosis and surgical approaches.

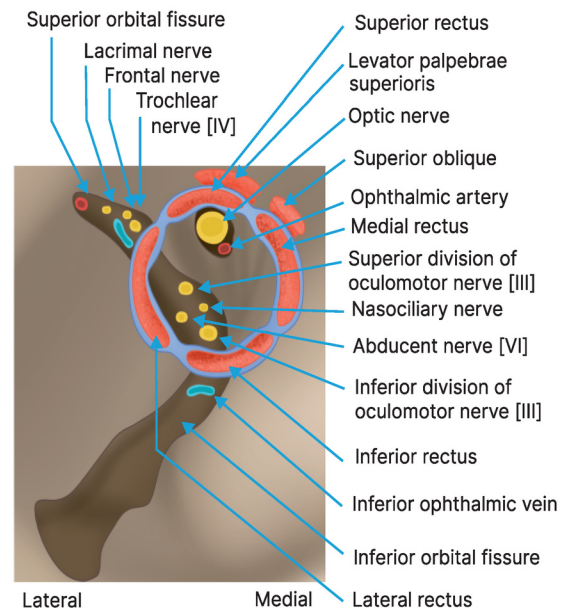


DETAILED QUESTIONS

Q1.1: What passes through the superior orbital fissure, and how is it divided?

Answer: The superior orbital fissure lies between the greater and lesser wings of the sphenoid and is divided by the Ring of Zinn into three parts:

- **Superolateral (Mnemonic: LFT):**
 - o Lacrimal nerve
 - o Frontal nerve (branch of CN V1)
 - o Trochlear nerve (CN IV)
 - o Superior ophthalmic vein
- **Intermediate:**
 - o Nasociliary nerve (branch of CN V1)
 - o Superior and inferior division of oculomotor nerve (CN III)
 - o Abducent nerve (CN VI)
- **Inferomedial:**
 - o Inferior ophthalmic vein



Q1.2: What are the key structures passing through foramen rotundum?

Answer: Maxillary division of trigeminal nerve (CN V2)

Q1.3: What structures pass through foramen ovale (Mnemonic: MALE)?

Answer:

- Mandibular nerve (CN V3)
- Accessory meningeal artery
- Lesser petrosal nerve
- Emissary vein

Q1.4: What passes through the foramen spinosum?

Answer:

- Nervus spinosus
- Middle meningeal artery (rupture can lead to epidural hemorrhage)
 - o Classically associated with a **lucid interval**
 - Biconvex shaped hemorrhage

Q1.5: What are the contents of the internal acoustic meatus?

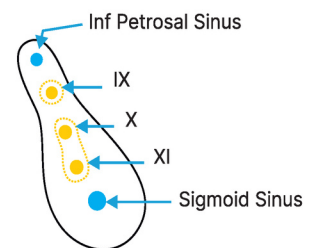
Answer:

- Facial nerve (CN VII)
- Vestibulocochlear nerve (CN VIII)
- Labyrinthine vessels

Q1.6: What are the structures passing through the jugular foramen?

Answer: Jugular foramen is the space between temporal and occipital bone

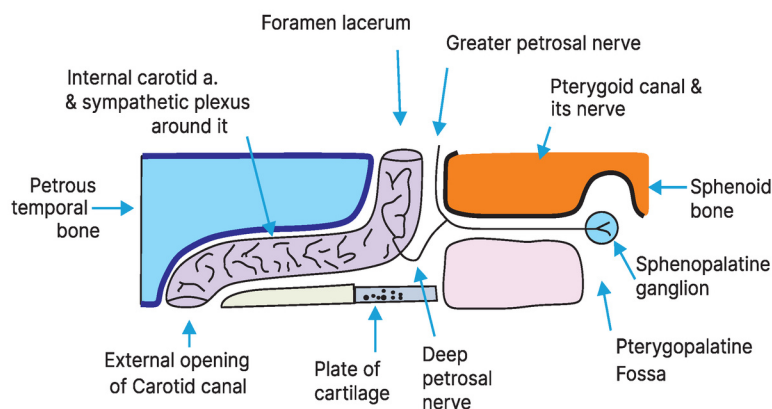
- CN IX (Glossopharyngeal) in a separate sheath
- CN X and XI (Vagus and Accessory) in a common sheath (vagoaccessory complex)
- Sigmoid sinus and inferior petrosal sinus join to form the internal jugular vein



Q1.7: What passes through the foramen lacerum?

Answer:

- Foramen lacerum:
 - o Sphenoid bone
 - o Apex of the petrous part of the temporal bone
 - o Basilar part of the occipital bone → Margins are lacerated
- The internal carotid artery (ICA) passes through the upper part of the foramen via the carotid canal
- ICA is surrounded by sympathetic plexus
 - o Gives rise to deep petrosal nerve
 - o Deep petrosal + Greater petrosal nerve (branch of CN VII) = Nerve of the pterygoid canal (Vidian nerve)
 - o Vidian nerve ends in sphenopalatine ganglion → Lacrimal nerve



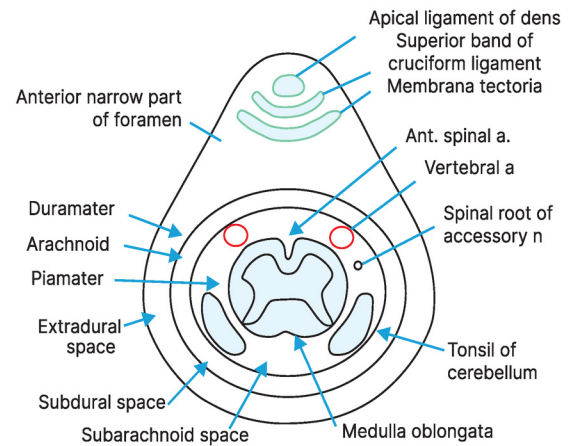
Q1.8: What are the contents of the foramen magnum?

Answer:

- Medulla oblongata
- Vertebral arteries (2 trunks unite to form anterior spinal artery)
- Spinal accessory nerve

YOURWISH

- Apical ligament of dens
- Cruciform ligament
- Membrana tectoria

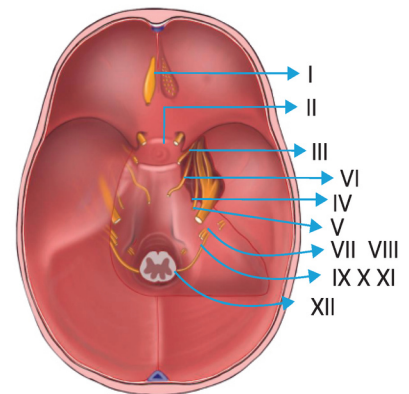


Q1.9: Which cranial nerves pass through which foramina?

Answer:

Cranial Nerve	Foramen / Pathway	Additional Notes
CN I (Olfactory)	Cribriform plate	Intracranial spread of COVID via this route
CN II (Optic)	Optic canal	
CN III (Oculomotor)	Midbrain (ventral origin) → Superior orbital fissure	Supplies extraocular muscles
CN IV (Trochlear)	Midbrain (dorsal origin) → Superior orbital fissure	
CN V (Trigeminal)	V1: SOF, V2: Foramen rotundum, V3: Foramen ovale	Largest CN
CN VI (Abducent)	Pontomedullary Junction → Ascends up through the slope - Clivus → Superior orbital fissure	Supplies lateral rectus
CN VII, VIII	Internal acoustic meatus	
CN IX, X, XI	Jugular foramen	CN IX separate sheath, CN X + XI = common sheath
CN XII (Hypoglossal)	Hypoglossal canal	

PYQ: FMGE 2020, 2021



NOTE: CN VI, VII, VIII exits from Pontomedullary Junction

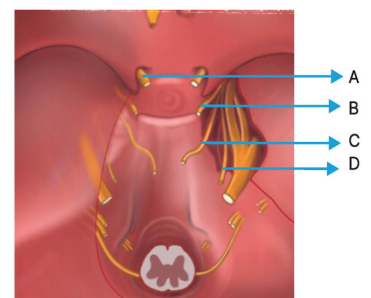
Q1.10: All of the following nerves are involved in the movement of the eyeball except:

- A. a. A
- B. b. B
- C. c. C
- D. d. D

Answer: A. a. A

Explanation:

- A - Optic nerve (Not involved in movement)
- B - Oculomotor nerve
- C - Abducens nerve
- D - Trochlear nerve



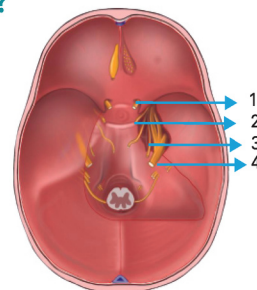
Q1.11: What is the nerve supply of the extraocular muscles

Answer: SO4 LR6

- Superior oblique - CN IV (Trochlear)
- Lateral rectus - CN VI (Abducens)
- All others - CN III (Oculomotor)

Q1.12: A patient presents with unilateral throbbing headache, photophobia, excessive lacrimation, and hemifacial clenching teeth. Pupillary reactions are normal. Which marked nerve is involved?

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



Answer: C. 3

Diagnosis: Trigeminal Neuralgia

- The Trigeminal nerve is involved.
- Clinical features: unilateral throbbing headache, photophobia, lacrimation, hemifacial pain
- Reflexes (light, accommodation) are normal → rules out optic/oculomotor pathology

BIG QUESTION 2: What are the important bones and surface landmarks of the sphenoid and the temporal regions, and what are their clinical correlations?

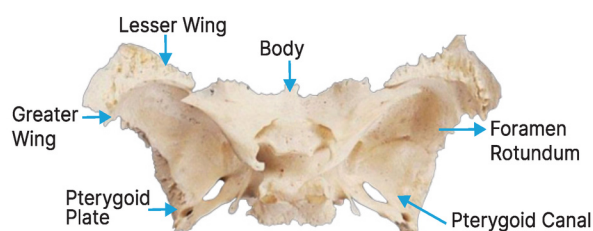
Broad Answer: Understanding the parts and relations of the sphenoid bone and pterion region is essential for surgical anatomy and recognizing clinical conditions such as epidural hemorrhage.

DETAILED QUESTIONS

Q2.1: What are the parts of the sphenoid bone (anterior view)?

Answer:

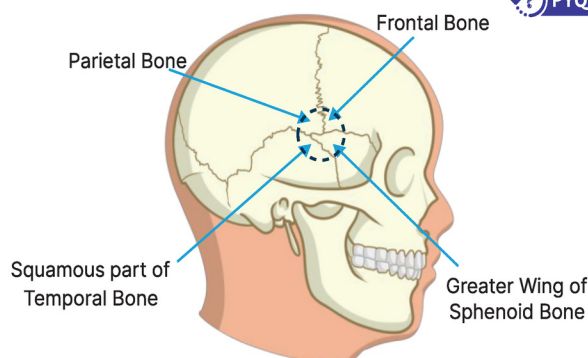
- Body
- Lesser wing
- Greater wing
- Pterygoid plates
- The superior orbital fissure is located between the greater and lesser wing of the sphenoid.



Q2.2: What is the pterion, and what bones form it?

Answer:

- Pterion is an H-shaped suture.
- It corresponds to the site of the anterolateral fontanelle of the fetal skull.
- It is formed by:
 - o Frontal bone
 - o Parietal bone



PYQ: FMGE 2020, 2021

- o Squamous part of the temporal bone
- o Greater wing of sphenoid bone

Q2.3: What are the anatomical relations of the pterion?

Answer:

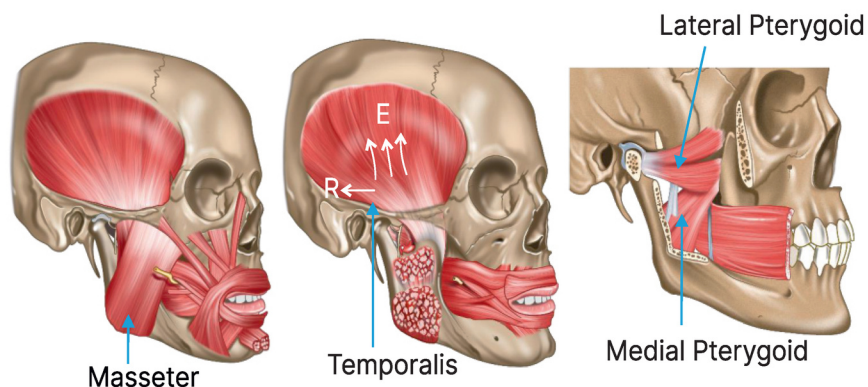
- Anterior/frontal division of the middle meningeal vessels
- Middle cerebral vessels
- Sylvian fissure/lateral sulcus (between frontal and temporal lobe)
- Lesser wing of sphenoid

Q2.4: What is the clinical significance of a pterion fracture?

Answer: Fracture of pterion → Rupture of middle meningeal artery → Epidural hemorrhage

BIG QUESTION 3: What are the muscles of mastication, their functions, and their innervation?

Broad Answer: The muscles of mastication are innervated by the mandibular nerve (branch of CN V). They are responsible for the movements of the jaw including elevation, depression, protraction, and retraction.



DETAILED QUESTIONS

Q3.1: What nerve supplies the muscles of mastication?

Answer: Mandibular nerve (branch of Cranial Nerve V3)

Q3.2: What are the actions of the muscles of mastication?

Answer:

- **Lateral pterygoid:** Depresses the mandible (opens the jaw)
- **Temporalis:** Retracts the mandible
- **Other 3 muscles (temporalis, medial pterygoid, masseter):** Elevation of the mandible
- **Remaining 3 muscles (excluding temporalis):** Protraction of mandible

Q3.3: What muscle is most commonly involved in trismus during mastication?

Answer: Medial pterygoid

Q3.4: What muscle is most commonly involved in trismus (lockjaw) while yawning?

Answer: Lateral pterygoid

Q3.5: What is the accessory muscle of mastication?**Answer:** Buccinator muscle**Q3.6: A student had his jaw locked while yawning. Which of the following muscles attached to the articular disc of TMJ is under spasmodic contraction?**

- A. Lateral pterygoid
- B. Temporalis
- C. Medial pterygoid
- D. Masseter

Answer: A. Lateral pterygoid**Q3.7: What is the insertion of the lateral pterygoid muscle?****Answer:**

- Inserts into the capsule of the temporomandibular joint (TMJ)
- Tendon is present inside the capsule - articular disc (Remnant of lateral pterygoid muscle)

Q3.8: What is the insertion of the medial pterygoid muscle?**Answer:** Inner surface of the ramus of the mandible**Q3.9: What is the origin and insertion of the masseter muscle?****Answer:**

- Origin: Zygomatic arch
- Insertion: Outer surface of the ramus of the mandible

Q3.10: What is the origin and insertion of the temporalis muscle?**Answer:**

- Origin: Temporal fossa
- Insertion: Converges and inserts over the coronoid process of the mandible
 - o Posterior fibers: Horizontal → Retraction of mandible
 - o Vertical fibers: Elevation of mandible
 - o Elevation > Retraction

BIG QUESTION 4: What are the extrinsic muscles of the tongue and their nerve supply?

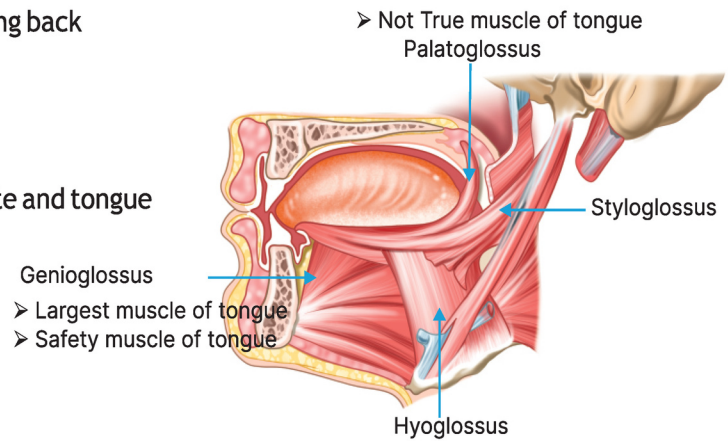
Broad Answer: The extrinsic muscles of the tongue are responsible for its movement and are supplied mainly by the hypoglossal nerve, with one exception. Knowledge of their origin, action, and clinical tests is important for neurological examination.

DETAILED QUESTIONS**Q4.1: What are the extrinsic muscles of the tongue and their origins?****Answer:**

- **Genioglossus:** Originates from genoid tubercle of the mandible (inner aspect)
 - o Largest muscle of tongue

YOURWISH

- o "Safety muscle" - prevents the tongue from falling back
- o Action: Protrusion of tongue
- **Styloglossus:** Originates from styloid process
- **Palatoglossus:** Origin: Palate
 - o Not a true tongue muscle – muscle of both palate and tongue
- **Hyoglossus:** Origin: Hyoid bone



Q4.2: What is the nerve supply to the tongue muscles?

Answer: All tongue muscles are supplied by the **hypoglossal nerve (CN XII)** except **palatoglossus**, which is supplied by the **pharyngeal plexus**.

Q4.3: How is CN XII tested clinically?

Answer:

- When the patient is asked to protrude the tongue, it deviates toward the paralyzed side.
- o Indicates side of hypoglossal nerve lesion



BIG QUESTION 5: What is the sensory supply of the tongue and what are the different types of papillae?

Broad Answer: The tongue receives both general and special sensory innervation from multiple cranial nerves depending on its region. Understanding these supplies and types of papillae is essential for interpreting taste and sensory disorders.

DETAILED QUESTIONS

Q5.1: What are the types of sensation in the tongue?

Answer:

- **Special sensation:** Taste
- **General sensation:** Touch, temperature, pain

Q5.2: How is the tongue divided for sensory supply?

Answer:

- **Anterior 2/3:**
 - o Special sensation (taste): CN VII (Facial nerve)
 - o General sensation: CN V (Trigeminal nerve)
- **Posterior 1/3:**
 - o Both general and special sensation: CN IX (Glossopharyngeal)
- **Posterior-most part:**
 - o Both general and special sensation: CN X (Vagus)

Q5.3: Which papillae are located in the anterior 2/3rd of the tongue and what is special about circumvallate papillae?

Answer: Circumvallate papillae are located in the anterior 2/3rd of the tongue but are supplied by CN IX (Glossopharyngeal)

Q5.4: Which papillae have taste buds and what is the lining epithelium?

Answer:

- All papillae **except filiform** have taste buds
- All papillae are lined by **non-keratinized stratified squamous epithelium**
 - o Exception: Filiform papillae (keratinized)

Q5.5: Which nerve supplies most papillae?

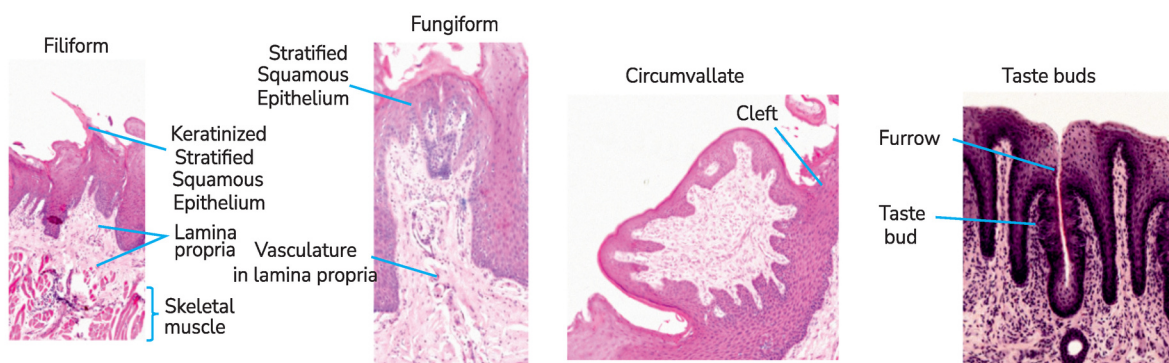
Answer:

- **Chorda tympani** (branch of CN VII) supplies most papillae
 - o Exception: **Circumvallate papillae** - supplied by CN IX

Q5.6: How can different types of papillae be identified histologically?

Answer:

- Papillae can be identified by their location, structure, and the presence or absence of taste buds.
 - o **Fungiform:** Mushroom-shaped, scattered across the tongue, contain taste buds
 - o **Circumvallate:** Large, circular with surrounding furrow, located in V-shape posteriorly, contain taste buds
 - o **Filiform:** Slender and thread-like, cover dorsal tongue, **no taste buds**, keratinized
 - o **Foliate:** Lateral folds on posterior tongue, well-developed in children, contain taste buds



PYQ: FMGE 2021, 2022

Papilla Type	Location	Features
Fungiform	Scattered on tongue surface	Mushroom-shaped, contain taste buds
Circumvallate	Posterior, in V-shape	Large, circular, surrounded by furrow, taste buds present
Filiform	Entire dorsal surface	Slender, thread-like, no taste buds , keratinized epithelium
Foliate	Lateral posterior part	Vertical folds, well-developed in childhood

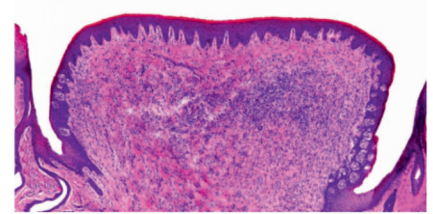
Q5.7: Identify the papillae from the given histological section?

- A. Fungiform
B. Circumvallate

- C. Filiform
- D. Foliate

Answer: B. Circumvallate

Explanation: The histology image shows Large, circular papillae with a circular groove or trench suggestive of circumvallate papilla.



Q5.8: Histological layers of tongue section:

Answer:

- Keratinized/stratified squamous epithelium (except in filiform)
- Lamina propria
- Skeletal muscle
- Vasculature in lamina propria

Q5.9: What is the Rule of 17 and how is it applied?

Answer:

- Deviation of uvula – CN X (Vagus)
- Deviation of angle of mouth – CN VII (Facial)
- Deviation of tongue – CN XII (Hypoglossal)
- Deviation of jaw – CN V (Trigeminal)
- Mnemonic:
 - o $12 + 5 = 17$ (Hypoglossal + Trigeminal nerve - Ipsilateral deviation)
 - o $10 + 7 = 17$ (Vagus + Facial nerve - Contralateral deviation)



BIG QUESTION 6: What is the structure and functional anatomy of the trigeminal nerve and its branches?

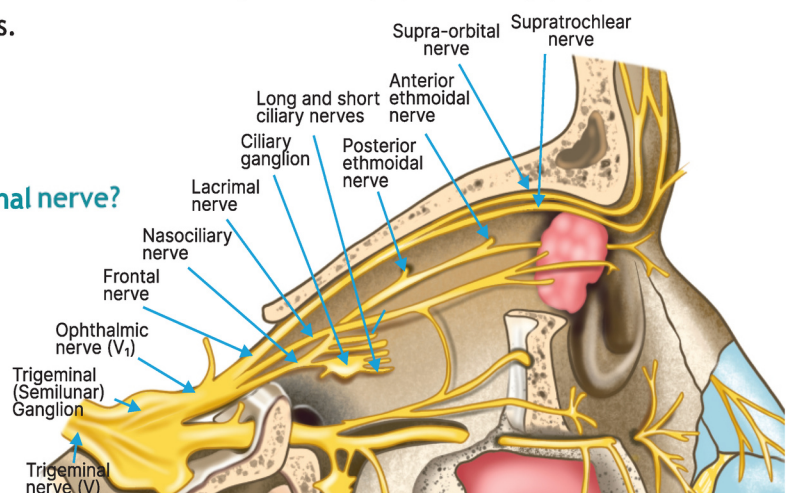
Broad Answer: The trigeminal nerve (CN V) is the largest cranial nerve, responsible for facial sensation and motor supply to muscles of mastication. It divides into three main branches: ophthalmic (V1), maxillary (V2), and mandibular (V3), each with distinct sensory and motor functions.

DETAILED QUESTIONS

Q6.1: What are the three branches of the trigeminal nerve?

Answer:

- Ophthalmic (V1)
- Maxillary (V2)
- Mandibular (V3)



Q6.2: What are the components and pathways of the ophthalmic nerve (V1)?

Answer:

- Divides into:
 - o **Frontal nerve** → supplies skin over the forehead
 - Supratrochlear nerve
 - Supraorbital nerve
 - o **Nasociliary nerve**
 - Anterior ethmoidal nerve
 - Posterior ethmoidal nerve
 - o **Lacrimal nerve** → supplies the lacrimal gland
- Anterior & posterior ethmoidal nerves:
 - o Supply dura mater of anterior cranial fossa
 - o Then descend into the nasal cavity → supplies ethmoidal & sphenoidal air sinuses & nasal mucosa
 - o Anterior ethmoidal nerve exits → external nasal branch → supplies skin over tip of nose

Q6.3: What is the functional nature of the mandibular nerve (V3)?

Answer:

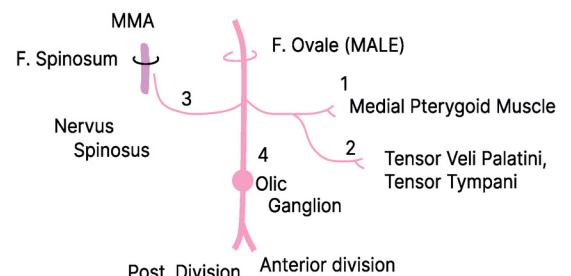
- Mixed nerve with:
 - o Sensory component
 - o Motor component
- Both components pass through the foramen ovale

Q6.4: What are the branches from the trunk of the mandibular nerve?

Answer:

- **Nerve to medial pterygoid** → supplies:
 - o Medial pterygoid
 - o Tensor veli palatini
 - o Tensor tympani
- **Nervous spinosus** → passes through foramen spinosum with middle meningeal artery
 - o Main artery and nerve of the dura mater
- Trunk passes through the otic ganglion (topographic nerve)

 PYQ: FMGE 2021, 2022



Q6.5: How does the mandibular nerve divide and what are its branches?

Answer:

- **Anterior division:**
 - o Supplies:
 - Masseter muscle
 - Lateral pterygoid muscle
 - Temporalis muscle
 - o Continues as the **buccal branch** (sensory)
 - Supplies skin and mucosa of the cheek by piercing buccinator muscle
 - Buccinator is supplied (motor) by buccal branch of facial nerve (motor).

YOURWISH

- **Posterior division:**

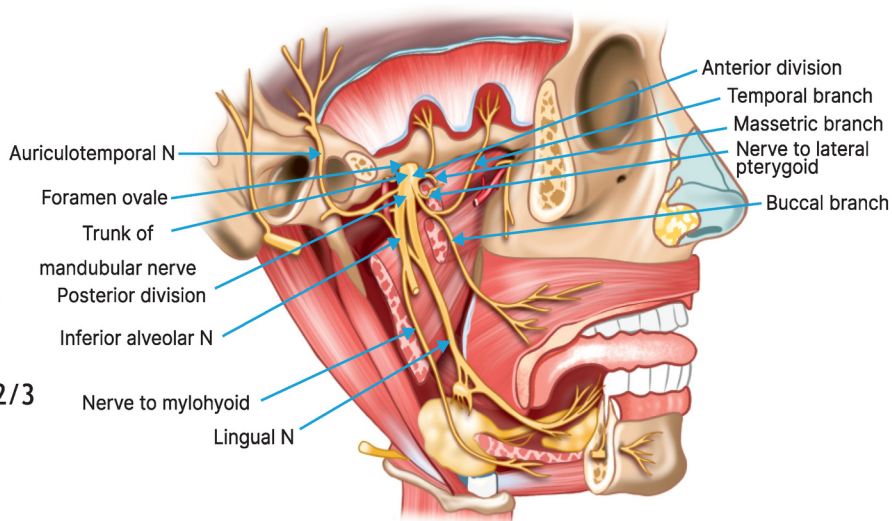
- o **Auriculotemporal nerve**

- Upper 2/3 of auricle skin
 - Temporal region
 - TMJ
 - Parotid gland

- o **Lingual nerve**

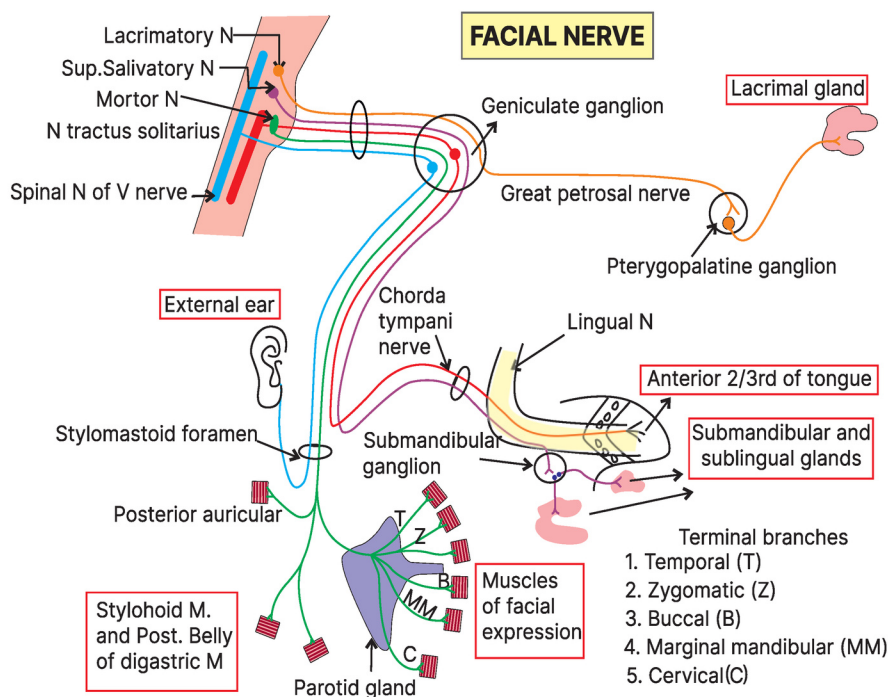
- Passes through submandibular ganglion (topographic)
 - General sensation to anterior 2/3 of tongue

- o **Inferior alveolar nerve**



BIG QUESTION 7: What is the functional anatomy and clinical relevance of the facial nerve (cranial nerve VII)?

Broad Answer: The facial nerve (CN VII) is a mixed cranial nerve responsible for facial expression, taste, and parasympathetic secretomotor function. It has several important branches and ganglionic connections relevant for both sensory and motor innervation.



DETAILED QUESTIONS

Q7.1: What are some key clinical associations involving the facial nerve?

Answer:

- **Frey's syndrome:**

- o Injury to auriculotemporal nerve → Regenerates and joins with great auricular nerve → Gustatory sweating (redness and sweating while eating)

- **Lingual nerve injury:**
 - o Most commonly damaged during submandibular duct removal
- **Mandibular foramen:**
 - o Transmits inferior alveolar nerve and vessels

Q7.2: Where does the facial nerve emerge from and what are its early branches?

Answer:

- Exits from pontomedullary junction
- Gives rise to:
 - o **Greater petrosal nerve** → joins deep petrosal nerve to form **Vidian nerve** → leads to lacrimal gland via: → Pterygopalatine ganglion → Maxillary nerve → Zygomaticotemporal nerve → Lacrimal nerve
 - o **Chorda tympani nerve** → Ends in submandibular ganglion

Q7.3: Through which foramen does the facial nerve exit the skull?

Answer: Exits via stylomastoid foramen

Q7.4: What is the course of the facial nerve after exiting the skull?

Answer:

- Pierces the **parotid gland** (does NOT supply it)
- Divides in Patey's plane (between superficial and deep parts of parotid) into five terminal branches
 - o Temporal
 - o Zygomatic
 - o Buccal
 - o Marginal mandibular
 - o Cervical
- These branches supply muscles of facial expression
 - o Exception: **Levator palpebrae superioris** is supplied by oculomotor nerve (CN III)

Q7.5: What other muscles are supplied by the facial nerve?

Answer:

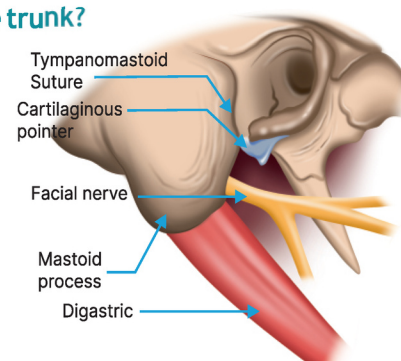
- Posterior belly of digastric
- Stylohyoid muscle
- Auricular muscles
- Occipitalis muscle
- Platysma muscle
- Buccinator (motor)

Q7.6: Which of the following is not used for the identification of the facial nerve trunk?

- Retrograde dissection from distal branch
- Tragal pointer
- Inferior belly of omohyoid muscle
- Posterior belly of digastric

Answer: C. Inferior belly of omohyoid muscle

Explanation:



- Facial nerve trunk is identified by
 - o Cartilaginous pointer
 - o Posterior belly of digastric
 - o Retrograde dissection from the distal branch

BIG QUESTION 8: What is the anatomy and clinical significance of the ansa cervicalis and its related nerve contributions?

Broad Answer: Ansa cervicalis is a loop of nerves formed by contributions from cervical spinal nerves, particularly C1-C3, and is closely associated with the hypoglossal nerve (CN XII). It innervates most infrahyoid muscles and plays a role in swallowing and stabilizing the hyoid bone.

DETAILED QUESTIONS

Q8.1: Where is the hypoglossal nucleus located, and what muscles does CN XII supply?

Answer:

- The hypoglossal nucleus is located in the **medulla oblongata**.
- CN XII supplies **all muscles of the tongue**, except **palatoglossus**, which is supplied by the **pharyngeal plexus**.

Q8.2: What cervical spinal nerve joins CN XII and what muscles does it supply?

Answer:

- A branch from **C1** joins CN XII and later separates to supply:
 - o Geniohyoid muscle
 - o Thyrohyoid muscle
 - o These are supplied by **C1 via CN XII**

Q8.3: What is the ansa cervicalis and what muscles does it innervate?

Answer:

- Ansa cervicalis is formed by:
 - o A descending branch from **C1**
 - o A descending branch from **C2 and C3**
 - o Together they form a loop-like structure
- It innervates:
 - o Sternothyroid muscle
 - o Sternohyoid muscle
 - o Omohyoid muscle
- It supplies all infrahyoid muscles **except thyrohyoid** (which is supplied by C1 via CN XII)

Q8.4: What are the topographic and functional nerves of the submandibular ganglion?

Answer:

- **Topographic nerve:** Lingual nerve
 - o Carries general sensation from anterior 2/3 of tongue
- **Functional nerve:** Chorda tympani (branch of CN VII)
 - o Carries taste sensation from anterior 2/3 of tongue
 - o Also supplies submandibular and sublingual glands

BIG QUESTION 9: What are the dural venous sinuses and their connections in the cranial cavity?

Broad Answer: Dural venous sinuses are channels formed between layers of dura mater that drain venous blood from the brain into the internal jugular vein. They play a key role in intracranial circulation and pathologies like venous thrombosis.

DETAILED QUESTIONS

Q9.1: What are the layers of the dura mater involved in sinus formation?

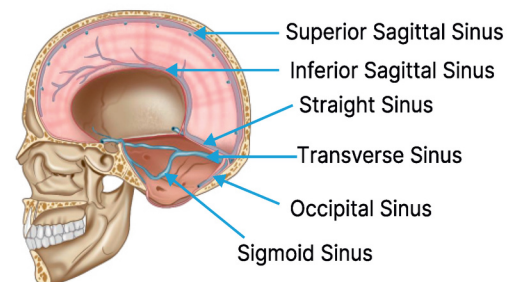
Answer:

- The dura mater has two layers:
 - o Endosteal layer
 - o Meningeal layer
- Spaces between these layers form dural venous sinuses

Q9.2: What are the key sinuses and their connections?

Answer:

- Superior sagittal sinus and inferior sagittal sinus are connected by the straight sinus
- Straight sinus also connects with the occipital sinus
- These join at the confluence of sinuses, a point where multiple sinuses meet



Q9.3: How does blood exit the cranial cavity through sinuses?

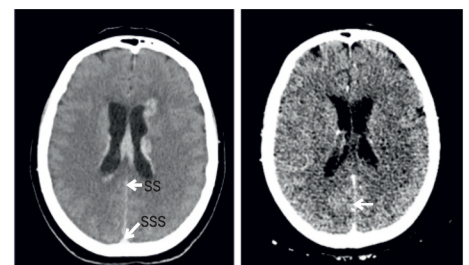
Answer:

- From the confluence, blood flows into the transverse sinus
- Transverse sinus curves into the sigmoid sinus
- Sigmoid sinus joins with the inferior petrosal sinus to form the internal jugular vein

Q9.4: What are important facts about these venous sinuses?

Answer:

- Internal jugular vein is formed from:
 - o Sigmoid sinus + Inferior petrosal sinus
- Great cerebral vein (vein of Galen) continues as the straight sinus
- Inferior sagittal sinus and straight sinus are present only in the meningeal layer of dura



The arrow marked is Straight sinus

BIG QUESTION 10: What is the anatomy, contents, and clinical significance of the cavernous sinus?

Broad Answer: The cavernous sinus is a paired venous structure located on either side of the sphenoid body. It is clinically important because of its anatomical relationships with cranial nerves and vessels, and its connection to facial veins which makes it a route for spread of infection.

DETAILED QUESTIONS

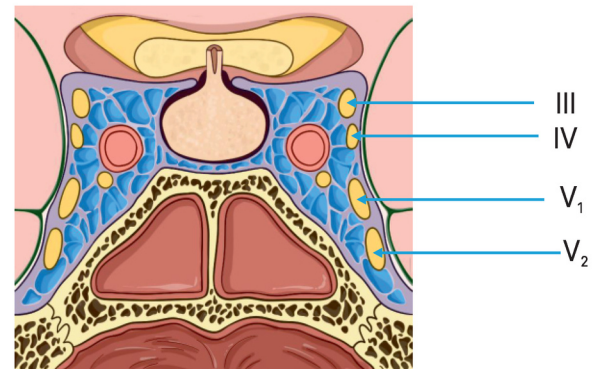
Q10.1: Where is the cavernous sinus located?

Answer: On either side of the body of the sphenoid bone

YOURWISH

Q10.2: Which cranial nerves pass through the lateral wall of the cavernous sinus?**Answer:**

- Cranial nerve III (Oculomotor)
- Cranial nerve IV (Trochlear)
- Cranial nerve V1 (Ophthalmic branch of Trigeminal)
- Note: Maxillary nerve (V2) does not pass through the lateral wall

**Q10.3: What structures are present inside the cavernous sinus?****Answer:**

- Internal carotid artery
- Cranial nerve VI (Abducent)

Q10.4: How does infection spread to the cavernous sinus from the face?**Answer:**

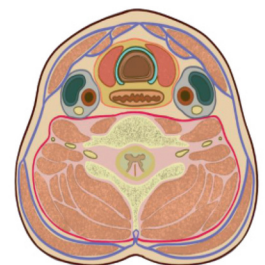
- Via venous connections:
 - Facial vein → Deep facial vein → Pterygoid venous plexus → Emissary vein → Cavernous sinus
 - Facial vein → Angular vein → Superior ophthalmic vein → Cavernous sinus
- Dangerous area of the face:
 - Lower part of nose
 - Alae of nose
 - Upper lip

BIG QUESTION 11: What are the deep cervical fascia and their anatomical subdivisions and relationships?

Broad Answer: The deep cervical fascia has several subdivisions that compartmentalize structures in the neck. Understanding their relations is critical in surgery and diagnosis of deep neck infections and spread of malignancy.

DETAILED QUESTIONS**Q11.1: What are the three major layers of deep cervical fascia?****Answer:**

- Investing layer
- Prevertebral fascia
- Pretracheal fascia

**Q11.2: What does the investing layer enclose and form?****Answer:**

- Encloses:
 - 2 muscles: Sternocleidomastoid, Trapezius
 - 2 glands: Parotid, Submandibular gland

- o 2 ligaments: Stylomandibular, Sphenomandibular ligament
- o 2 spaces: Suprasternal, Supraclavicular space
- o 2 pulleys: For digastric and omohyoid muscle
- Forms the roof of the posterior triangle of the neck
- Clinical note: Parotid swellings are painful due to the unyielding investing fascia

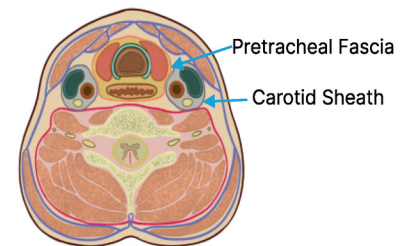
Q11.3: What is the function of the prevertebral fascia?

Answer:

- Forms the floor of the posterior triangle
- Extends as the axillary sheath

Q11.4: What does the pretracheal fascia surround?

Answer: Encloses the **thyroid gland** and forms its **false capsule**



Pretracheal fascia and carotid sheath

Q11.5: What are the anatomical components and relations of the carotid sheath?

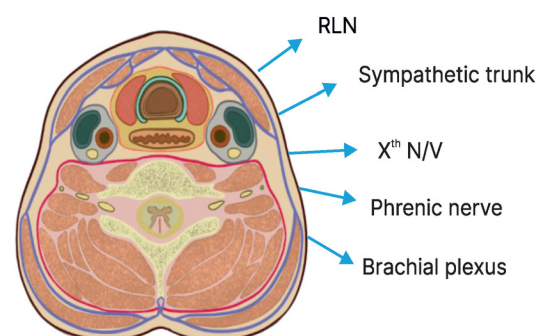
Answer:

- Walls:
 - o Posterior wall: Prevertebral fascia
 - o Anterior wall: Investing and pretracheal layers
- Contents:
 - o Common carotid artery
 - o Internal carotid artery
 - o Vagus nerve
 - o Internal jugular vein
- False contents (present only in the upper part):
 - o CN IX (Glossopharyngeal)
 - o CN XI (Accessory)
 - o CN XII (Hypoglossal)
- Relations:
 - o Anterior: Ansa cervicalis
 - o Posterior: Sympathetic trunk

Q11.6: What are the important nerves seen in a transverse section of the neck?

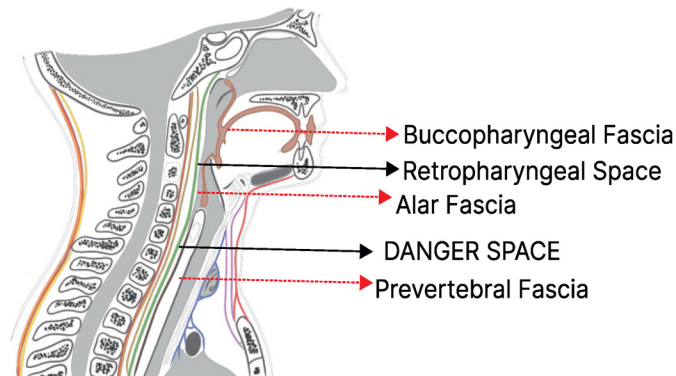
Answer:

- **Recurrent laryngeal nerve** - in tracheoesophageal groove
- **Sympathetic trunk** - behind carotid sheath
- **Vagus nerve** - inside carotid sheath (between artery and vein)
- **Phrenic nerve** - in front of scalenus anterior muscle
- **Brachial plexus** - between scalenus anterior and medius muscles



BIG QUESTION 12: What are the fascial spaces of the neck and their clinical importance?

Broad Answer: Fascial spaces in the neck provide potential routes for spread of infections from oropharyngeal regions to the mediastinum. Identifying them is crucial for assessing complications in deep neck infections.



DETAILED QUESTIONS

Q12.1: What fascia surrounds the cervical vertebrae and muscles?

Answer: Prevertebral fascia

Q12.2: What fascia is located behind the pharynx?

Answer: Buccopharyngeal fascia

Q12.3: What lies between the buccopharyngeal fascia and prevertebral fascia?

Answer: Alar fascia, which fuses with buccopharyngeal fascia at the level of C7

Q12.4: What are the named fascial spaces and their locations?

Answer:

- **Retropharyngeal space:** Between buccopharyngeal and alar fascia
- **Danger space:** Between alar fascia and prevertebral fascia
 - o Clinical relevance: Infection in danger space can spread to **mediastinum**

Q12.5: What is Berry's ligament and its significance?

Answer:

- A thickening of **pretracheal fascia** behind the **thyroid gland**
- Connects thyroid to **cricoid cartilage**
- Facilitates movement of thyroid with **deglutition**

Q12.6: What clinical sign is seen with a thyroglossal cyst?

Answer: Moves with protrusion of the tongue

BIG QUESTION 13: What are the anatomical boundaries and contents of the posterior triangle of the neck?

Broad Answer: The neck is divided into anatomical triangles that help locate structures like nerves, vessels, and lymph nodes. Understanding these subdivisions aids clinical assessments and surgical planning.

DETAILED QUESTIONS

Q13.1: What are the boundaries of the posterior triangle of the neck?

Answer:

- Sternocleidomastoid (anterior border)
- Trapezius (posterior border)
- Clavicle (base)

Q13.2: What forms the roof and floor of the posterior triangle?

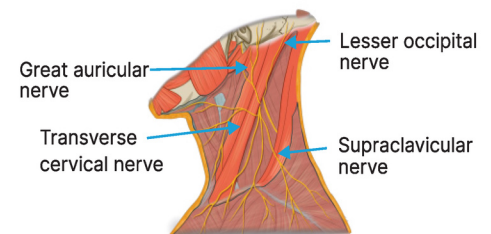
Answer:

- **Roof:** Investing layer of deep cervical fascia
- **Floor:** Prevertebral fascia

Q13.3: What are the important structures related to the posterior triangle?

Answer:

- **Cutaneous nerves exiting Erb's point:**
 - o Lesser occipital nerve
 - o Great auricular nerve
 - o Transverse cervical nerve
 - o Supraclavicular nerve
- **External jugular vein:** in front of the sternocleidomastoid



Q13.4: What is the course and function of the great auricular nerve?

Answer:

- Root value: C2, C3
- Runs with external jugular vein
- Supplies skin over:
 - o Angle of mandible
 - o Parotid region
 - o Lobule of ear
- Clinical: Injury during parotid surgery → sensory loss in shaving area
- In Frey's syndrome: Regenerating auriculotemporal nerve joins great auricular → Gustatory sweating

Q13.5: What is the course and role of the spinal accessory nerve in the neck?

Answer:

- Travels between:
 - o Prevertebral layer (roof)
 - o Investing layer (floor)
- Supplies:
 - o Sternocleidomastoid
 - o Trapezius
- Is a content of the posterior triangle
- Injury in this region → **only trapezius** is paralyzed

Q13.6: What are the functions and clinical signs related to the trapezius muscle?

Answer:

- Shape: Triangular
- Together with contralateral trapezius forms a **rhomboid**
- Actions:
 - Retraction of scapula
 - Shoulder shrug
 - **Overhead abduction above 90°** with serratus anterior
- Injury to spinal accessory nerve → **shoulder drop**

BIG QUESTION 14: What are the subdivisions and contents of the anterior triangle of the neck?

Broad Answer: The anterior triangle of the neck includes important neurovascular structures and glands. It is subdivided into smaller triangles based on anatomical landmarks for clinical and surgical orientation.

DETAILED QUESTIONS

Q14.1: What are the boundaries of the anterior triangle?

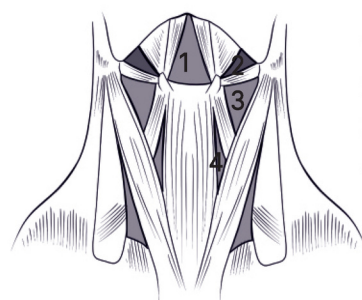
Answer:

- Midline of the neck
- Anterior border of sternocleidomastoid
- Lower border of mandible

Q14.2: What are the subdivisions of the anterior triangle and their contents?

Answer:

- **Submental triangle** (between anterior belly of digastric and hyoid bone):
 - Contains submental lymph nodes
- **Digastric/Submandibular triangle** (between anterior & posterior belly of digastric and mandible):
 - Muscles: Mylohyoid, Hyoglossus
- **Carotid triangle** (bounded by posterior belly of digastric, superior belly of omohyoid, and sternocleidomastoid):
 - Contents:
 - Common carotid artery
 - Carotid sheath
 - Internal and external carotid arteries
 - Internal jugular vein
 - Vagus nerve
 - Ansa cervicalis
- **Muscular triangle** (between superior belly of omohyoid, sternocleidomastoid, and midline):
 - Contains infrahyoid muscles and viscera of neck



- 1 Submental triangle
- 2 Digastric triangle
- 3 Carotid triangle
- 4 Muscular triangle

BIG QUESTION 15: What are the superficial and deep relations of the hyoglossus and scalenus anterior muscles?

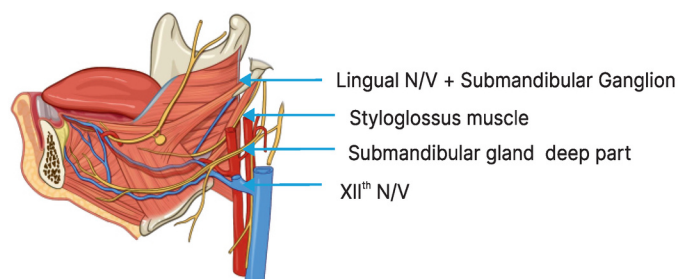
Broad Answer: The anatomical relationships of the hyoglossus and scalenus anterior muscles are crucial for understanding surgical approaches in the submandibular and root-of-neck regions. These muscles are closely related to important nerves, vessels, and glands.

DETAILED QUESTIONS

Q15.1: What are the superficial relations of the hyoglossus muscle?

Answer:

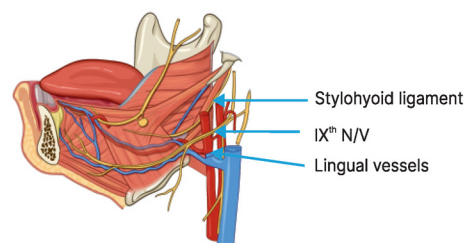
- Lingual nerve along with submandibular ganglion
- Styloglossus muscle
- Deep part of the submandibular gland
- Hypoglossal nerve
- Clinical relevance: Submandibular duct winds along the lingual nerve → commonly injured in submandibular resection



Q15.2: What are the deep relations of the hyoglossus muscle?

Answer:

- Stylohyoid ligament
- Glossopharyngeal nerve
- Lingual vessels



Q15.3: What are the posterior relations of the scalenus anterior muscle?

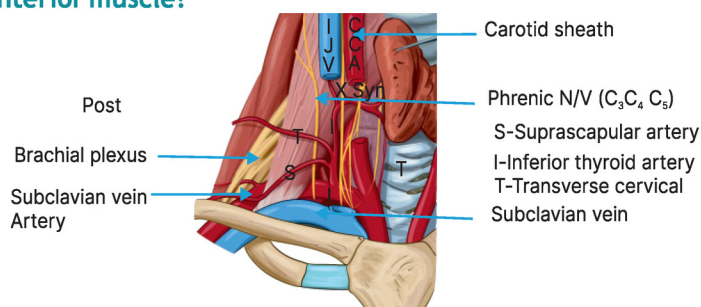
Answer:

- Subclavian artery
- Brachial plexus → Pass between scalenus anterior and scalenus medius

Q15.4: What are the anterior relations of the scalenus anterior muscle?

Answer:

- Subclavian vein
- Branches of subclavian artery
- Carotid sheath



Q15.5: What are the branches of the 1st part of the subclavian artery and their relation to the scalenus anterior muscle?

Answer:

- Gives rise to 3 branches:
 - o Vertebral artery
 - o Internal thoracic artery
 - o Thyrocervical trunk, which gives off:

- Suprascapular artery
- Transverse cervical artery
- Inferior thyroid artery

- These three branches are located in front of the **scalenus anterior muscle**

Q15.6: What is the course and function of the phrenic nerve in relation to the scalenus anterior muscle?

Answer:

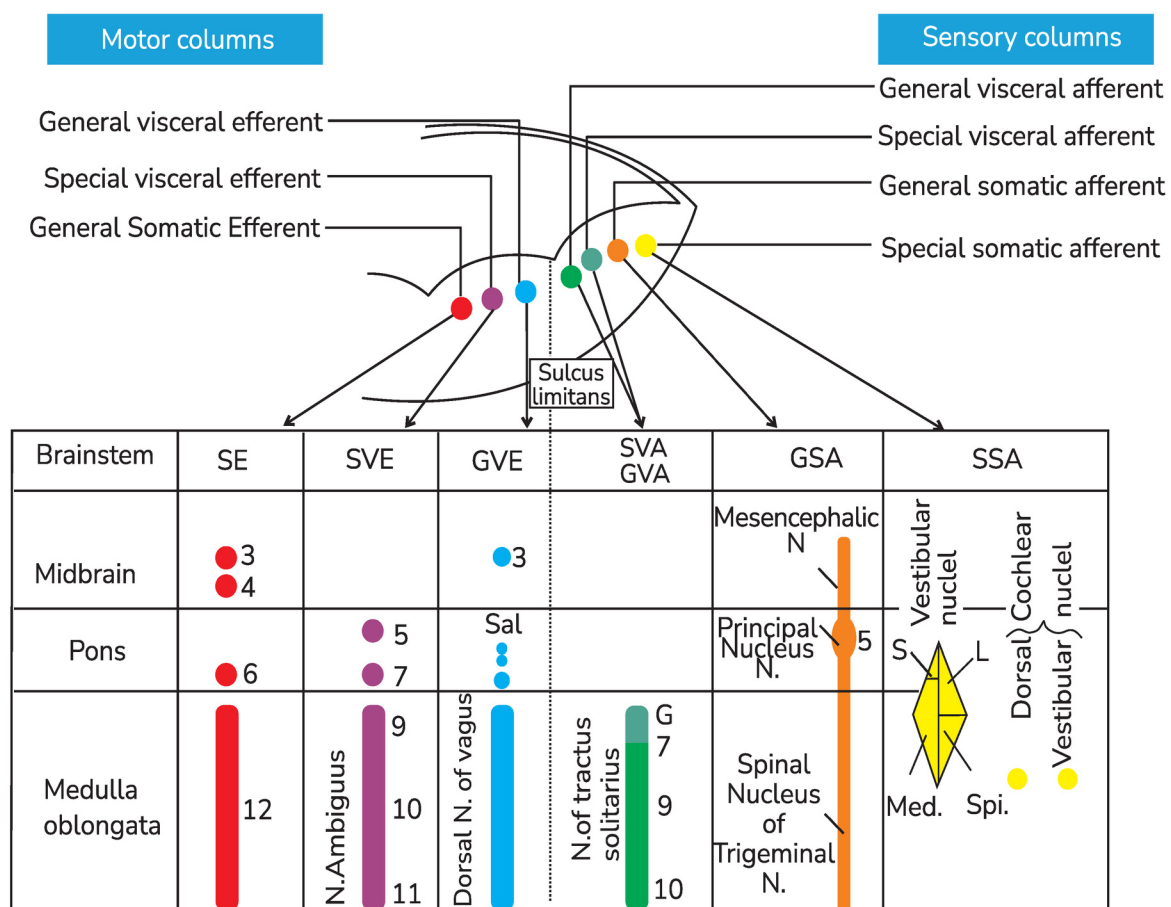
- Originates from C3, C4, C5
- Passes in front of the scalenus anterior muscle
- Travels between subclavian artery and vein
- Passes through mediastinum in front of the hilum of lung
 - o Vagus nerve passes behind the hilum
- Function: Supplies diaphragm

Q15.7: Where is the recurrent laryngeal nerve located?

Answer: Lies in the tracheoesophageal groove

BIG QUESTION 16: What are the motor and sensory columns of cranial nerves and their associated nuclei?

Broad Answer: Cranial nerve nuclei are arranged in longitudinal columns in the brainstem and are responsible for motor and sensory innervation of the head and neck. These nuclei are classified based on embryological origin and function.



DETAILED QUESTIONS

Q16.1: What are the motor columns and what do they supply?

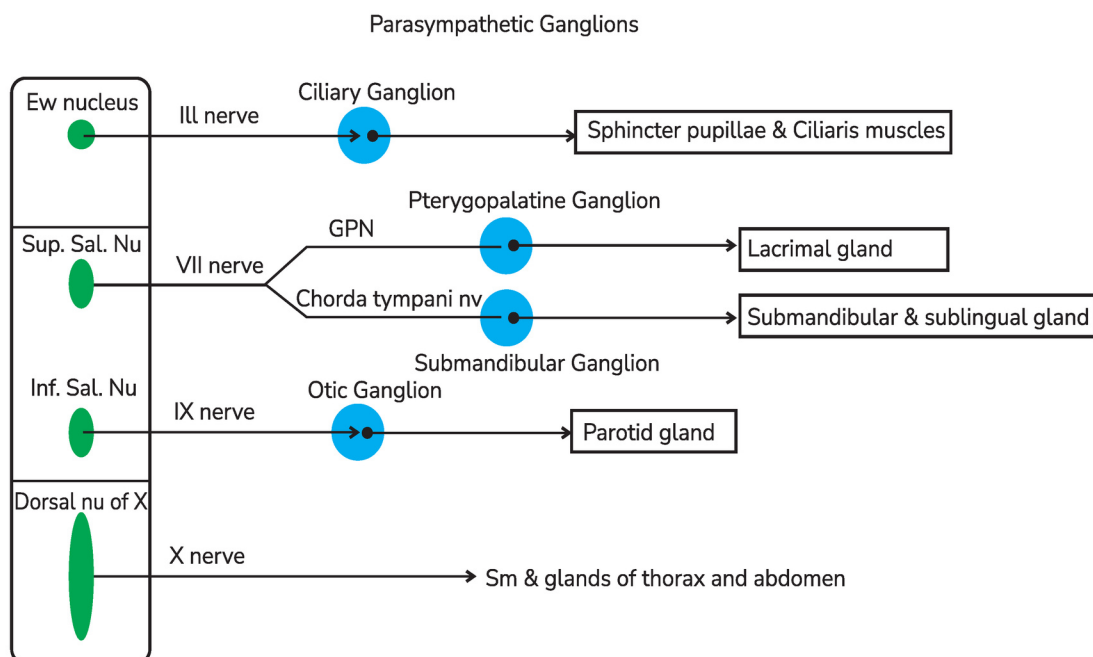
Answer:

- **General visceral efferent (GVE):** Autonomic supply to glands and smooth muscles
- **Special visceral efferent (SVE):** Supply to pharyngeal arch muscles
 - o Cranial nerves involved: CN V, VII, IX, X
 - CN V & VII: nuclei in pons
 - CN IX, X, XI: nucleus ambiguus in medulla oblongata
- **General somatic efferent (GSE):**
 - o Supply to extraocular muscles and tongue muscles (from occipital somites)
 - o Cranial nerves: III, IV, VI, XII
 - CN III, IV: nuclei in midbrain
 - CN VI: nucleus in pons
 - CN XII: nucleus in medulla oblongata

Q16.2: What parasympathetic nuclei correspond to general visceral efferent column?

Answer:

- **Edinger-Westphal nucleus** (midbrain) → CN III → Ciliary ganglion → Short ciliary nerve - supplies:
 - o Targets:
 - Sphincter pupillae (pupil constriction)
 - Ciliaris muscle (accommodation reflex)
- **Superior salivatory nucleus** (pons) → CN VII
 - o Glands below orbit:
 - Lacrimal gland via greater petrosal nerve → Pterygopalatine ganglion
 - Submandibular & sublingual glands via chorda tympani → Submandibular ganglion
- **Inferior salivatory nucleus** (medulla) → CN IX → Otic ganglion → Parotid gland
- **Dorsal nucleus of vagus** (medulla) → CN X → Thoracic and abdominal viscera



YOURWISH

Q16.3: What are the sensory columns and their key nuclei?**Answer:**

- **General visceral afferent (GVA) & Special visceral afferent (SVA):**
 - Nucleus of tractus solitarius
- **General somatic afferent (GSA):**
 - Trigeminal sensory nucleus - Largest, spans midbrain, pons, medulla
 - CN V has 4 nuclei: 3 sensory + 1 motor
- **Special somatic afferent (SSA):**
 - Vestibulocochlear nucleus (at pontomedullary junction)

Q16.4: What are the parts of the sensory nucleus of the trigeminal nerve and their functions?**Answer:**

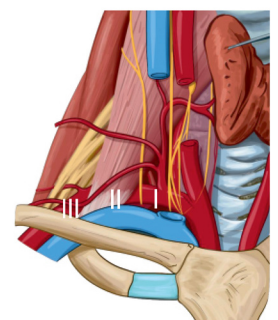
- **Mesencephalic nucleus (midbrain):**
 - Proprioception from face
 - Center for jaw reflex
 - Contains pseudounipolar neurons
- **Chief/principal sensory nucleus (pons):**
 - Touch and pressure from the face
- **Spinal nucleus (medulla):**
 - Pain and temperature from the face

BIG QUESTION 17: What are the branches of the subclavian and external carotid arteries, and what is their clinical relevance?

Broad Answer: The subclavian and external carotid arteries are major sources of head and neck blood supply. Their branches serve critical regions, and knowledge of these branches aids in understanding collateral circulation and surgical interventions.

DETAILED QUESTIONS**Q17.1: How is the subclavian artery divided and what are its branches?****Answer:**

- Divided into three parts by the scalenus anterior muscle
- **First part:**
 - Vertebral artery
 - Internal thoracic artery
 - Thyrocervical trunk, which gives rise to:
 - Suprascapular artery
 - Inferior thyroid artery
 - Transverse cervical artery
- **Second part:**
 - Costocervical trunk
- **Third part:**
 - Dorsal scapular artery



Q17.2: Which structures are supplied by the inferior thyroid artery?**Options:**

- A. Thyroid gland
- B. Parathyroid glands
- C. Cervical part of oesophagus
- D. Thymus
- E. All of the above

Answer: E. All of the above

Q17.3: Where does the external carotid artery arise and at what level does the bifurcation occur?**Answer:**

- It is a branch of the common carotid artery
- Bifurcation occurs at C3/C4, most commonly at the upper border of the lamina of thyroid cartilage

Q17.4: What are the branches of the external carotid artery?**Answer:**

- **Ventral branches:**
 - o Superior thyroid artery
 - o Lingual artery
 - o Facial artery
- **Medial branch:**
 - o Ascending pharyngeal artery (first and smallest branch)
- **Dorsal branches:**
 - o Occipital artery
 - o Posterior auricular artery
- **Terminal branches:**
 - o Maxillary artery (largest)
 - o Superficial temporal artery

BIG QUESTION 18: What is the location and anatomical attachment of the thyroid gland?

Broad Answer: The thyroid gland spans several cervical vertebrae and is anchored to the trachea and laryngeal cartilages by ligaments and fascia, which restrict its movement during pathological enlargement.

DETAILED QUESTIONS**Q18.1: Where is the thyroid gland located?****Answer:**

- Lies deep to the sternothyroid and sternohyoid muscles
- Anteriorly in the neck at the level of C5 to T1 vertebrae

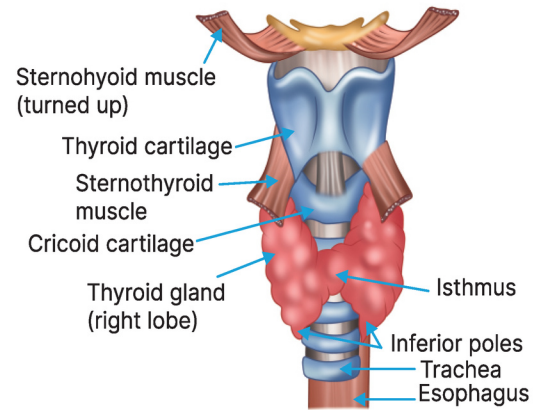
Q18.2: Which of the following structures prevents the upward extension of thyroid swelling through its attachment to the thyroid cartilage?

- A. Pretracheal fascia

- B. Sternothyroid
- C. Thyrohyoid membrane
- D. Ligament of berry

Answer: B. Sternothyroid

Explanation: Sternothyroid muscles is attached to the oblique line of thyroid cartilage, and this attachment prevents the upward extension of thyroid swellings beyond this level.



Q18.3: Infer the extent of the thyroid gland from the given image.

- A. B to D
- B. A to D
- C. A to C
- D. C to D

Answer: B. A to D



BIG QUESTION 19: What is the muscular structure of the pharynx and its anatomical relations?

Broad Answer: The pharynx consists of circular and longitudinal muscles. It is a vital structure in swallowing and speech, with anatomical weak points that can lead to pathologies like diverticula.

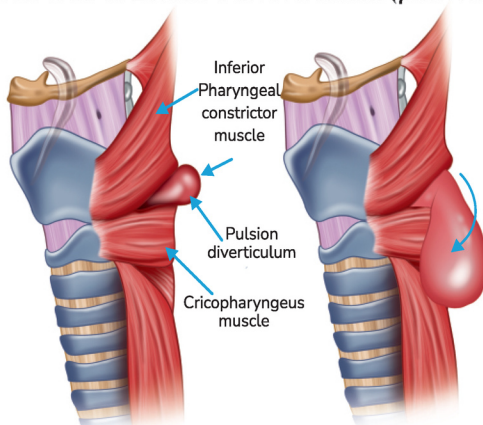
DETAILED QUESTIONS

Q19.1: What are the types of muscles in the pharynx?

PYQ: FMGE 2021, 2022

Answer:

- **Circular muscles:**
 - o Superior constrictor
 - o Middle constrictor
 - o Inferior constrictor
- **Subdivided into:**
 - Thyropharyngeus - from oblique line of thyroid cartilage to pharyngeal raphe
 - Cricopharyngeus - from cricoid cartilage to pharyngeal raphe
- **Weak area between the two = Killian's dehiscence**
 - Clinical: Can lead to Zenker's diverticulum (pulsion diverticulum)



Q19.2: What structures pass above the superior constrictor muscle?

Answer:

- Levator veli palatini
- Auditory tube
- Ascending palatine artery
- Palatine branch of ascending pharyngeal artery

Q19.3: What passes between the superior and middle constrictor muscles?

Answer:

- Stylopharyngeus muscle
- Glossopharyngeal nerve

Q19.4: What passes between the middle and inferior constrictor muscles?

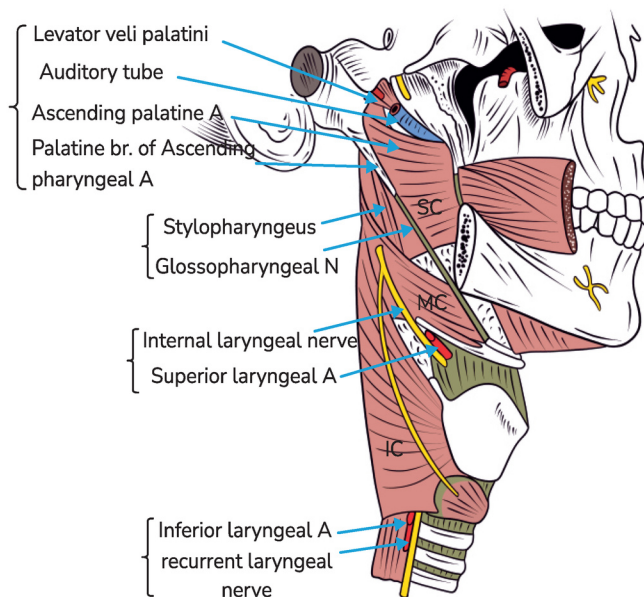
Answer:

- Internal laryngeal nerve (pierces thyrohyoid membrane)
- Superior laryngeal artery

Q19.5: What structures pass below the inferior constrictor?

Answer:

- Inferior laryngeal artery
- Recurrent laryngeal nerve (in tracheoesophageal groove)



BIG QUESTION 20: What is the anatomy and function of the larynx, including cartilages and intrinsic muscles?

Broad Answer: The larynx is composed of several cartilages and muscles that regulate airflow, phonation, and protection of the airway. Understanding the ossification patterns, muscle functions, and innervation is key to managing airway disorders.

DETAILED QUESTIONS

Q20.1: Which laryngeal cartilages are paired and unpaired?

Answer:

PYQ: FMGE 2021

PYQ: NEET PG 2022, 2023

- **Unpaired:**
 - Thyroid (hyaline)
 - Cricoid (hyaline)
 - Epiglottis (elastic)
- **Paired:**
 - Arytenoid:
 - Base: hyaline
 - Apex: elastic
 - Corniculate (elastic)
 - Cuneiform (elastic)

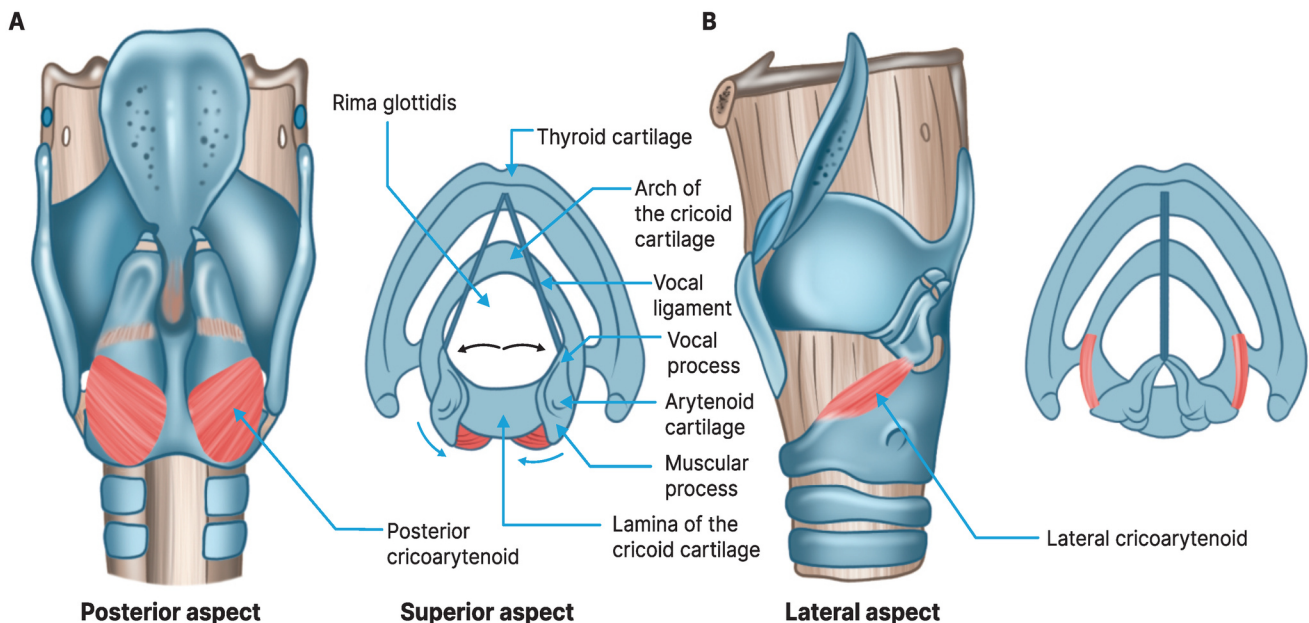


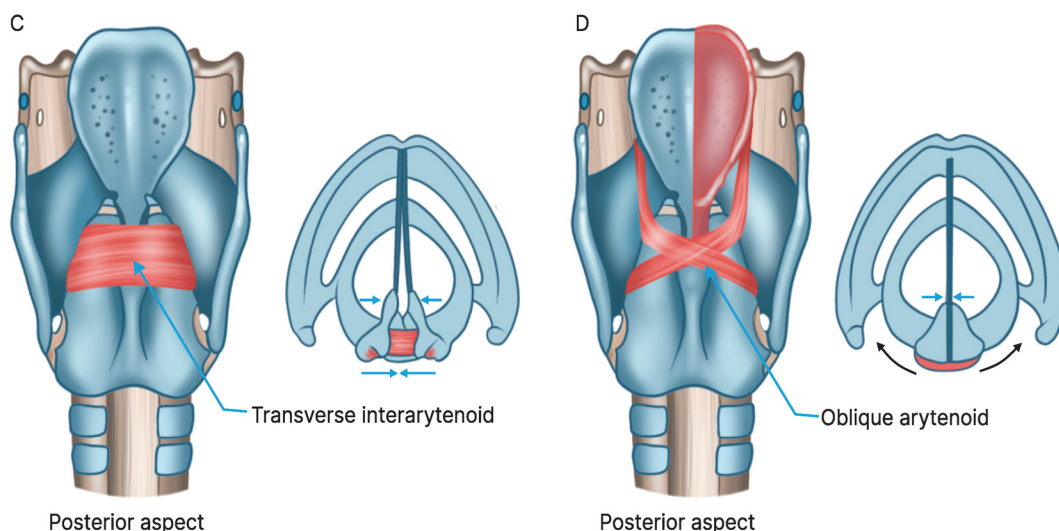
NOTE: All the hyaline cartilages will ossify.

Q20.2: What are the intrinsic muscles of the larynx and their functions?

Answer:

- **Posterior cricoarytenoid:** Abducts vocal cords ("safety muscle of larynx")
- **Lateral cricoarytenoid:** Adducts vocal cords
- **Transverse arytenoid:** Brings arytenoid cartilages together
- **Oblique arytenoid → Aryepiglottic muscle:** Closes the laryngeal inlet
- **Thyroepiglottic muscle:** Opens the laryngeal inlet
- **Thyroarytenoid:** Decreases vocal cord tension (brings thyroid and arytenoid closer)
- **Cricothyroid:** Increases tension of vocal cords (located outside larynx)

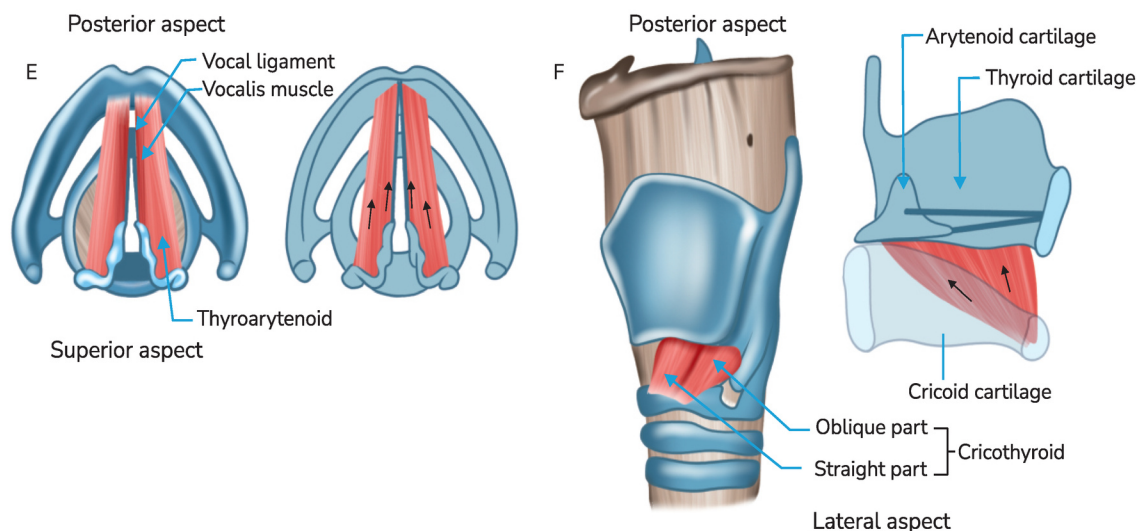




Q20.3: What are the vocal fold components?

Answer:

- Vocal ligament
- Vocalis muscle



Q20.4: What are the clinical safety muscles and their functions?

Answer:

- **Genioglossus muscle:** Prevents tongue from falling back (safety muscle of tongue)
- **Posterior cricoarytenoid:** Only abductor of vocal cords (safety muscle of larynx)

BIG QUESTION 21: What is the summary of major cranial parasympathetic pathways and their ganglia?

Broad Answer: Parasympathetic pathways in the head and neck involve specific cranial nerves and ganglia. These control secretion from glands and are essential in autonomic regulation of oral, nasal, and ocular structures.

DETAILED QUESTIONS

Q21.1: Which cranial nerves have parasympathetic functions?

Answer:

- CN III (Oculomotor)

- CN VII (Facial)
- CN IX (Glossopharyngeal)
- CN X (Vagus)

Q21.2: What are the associated parasympathetic ganglia and their pathways?

Answer:

Cranial Nerve	Parasympathetic Nucleus	Ganglion	Target Structures
CN III	Edinger-Westphal	Ciliary ganglion	Sphincter pupillae, Ciliaris muscle
CN VII	Superior salivatory	Pterygopalatine ganglion	Lacrimal gland
CN VII	Superior salivatory	Submandibular ganglion	Submandibular & Sublingual glands
CN IX	Inferior salivatory	Otic ganglion	Parotid gland
CN X	Dorsal motor nucleus	Terminal ganglia	Thoracic and abdominal viscera



6. THORAX

BIG QUESTION 1: Describe the constrictions of the esophagus, their blood supply, and clinical significance.

Broad Answer: The esophagus has physiological constrictions at specific levels where it is narrowed by surrounding structures. These sites are important for the passage of instruments and are common areas for foreign body impaction or stricture formation. Blood supply varies along its length and is clinically relevant in conditions like esophageal varices.

DETAILED QUESTIONS

Q1.1: What are the constrictions of the esophagus?

Answer: Divided into 3 parts:

1. Cervical
2. Thoracic
3. Abdominal

Q1.2: What is the reference point used to measure the constrictions of the esophagus?

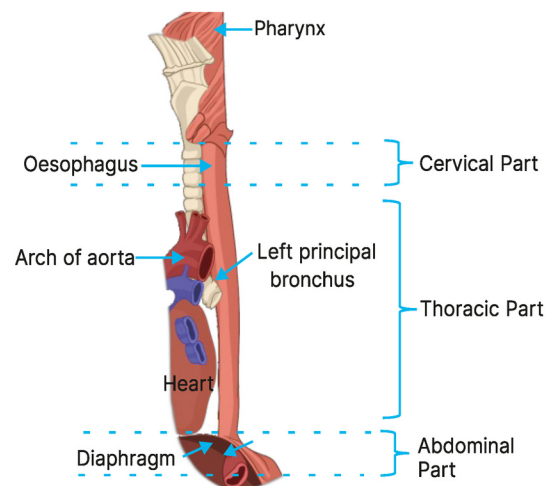
Answer: Constrictions are measured from the upper incisors

PYQ: NEET PG 2020

Q1.3: What structures cross the esophageal constrictions, and what are their lengths from incisors?

Answer:

- At the origin of the esophagus, surrounded by the cricopharyngeus muscle, 15 cm from the incisors
- Crossed anteriorly by the aortic arch: 23 cm from the incisors
- Crossed by the left main bronchus: 28 cm from the incisors
- Passes through the respiratory diaphragm: 40 cm from the incisors



Q1.4: What is the blood supply of the esophageal constrictions?

Answer:

Cervical part	Inferior thyroid artery	Inferior thyroid vein
Thoracic part	Bronchial artery and descending thoracic aorta	Azygos vein
Abdominal part	Left gastric artery	Azygos vein, portal vein and left gastric vein (site of portocaval anastomosis)

YOURWISH

Q1.5: What is the clinical significance of esophageal constrictions?

Answer:

- These are common sites for
 - Foreign body impaction
 - Caustic injury
 - Stricture formation
- May pose difficulty during endoscopy or NG tube insertion

BIG QUESTION 2: What is the anatomy of the intercostal space, and its clinical significance?

Broad Answer: The intercostal space is the anatomical region between two adjacent ribs, filled with layers of intercostal muscles that assist in respiration. It contains the intercostal neurovascular bundle- vein, artery, and nerve- typically located along the inferior border of the upper rib. Blood supply is via the intercostal arteries and veins, both anterior and posterior. This space is clinically important for procedures like thoracocentesis, where careful positioning avoids injury to underlying structures.

DETAILED QUESTIONS

Q2.1: What are the intercostal muscles?

Answer: Intercostal muscles:

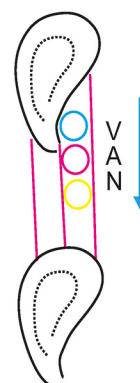
- External
- Internal
- Innermost:
 - Sternocostalis
 - Subcostalis
 - Intercostalis intimi

Q2.2: Where is the neurovascular bundle located?

Answer: The neurovascular bundle is between the internal and the innermost intercostal bundle.

Arrangement:

- Intercostal vein → intercostal artery → intercostal nerve from above downwards
- In the 1st intercostal space: Intercostal nerve → intercostal artery → intercostal vein from above downwards



Q2.3: What is the order of structures pierced during thoracocentesis?

Answer:

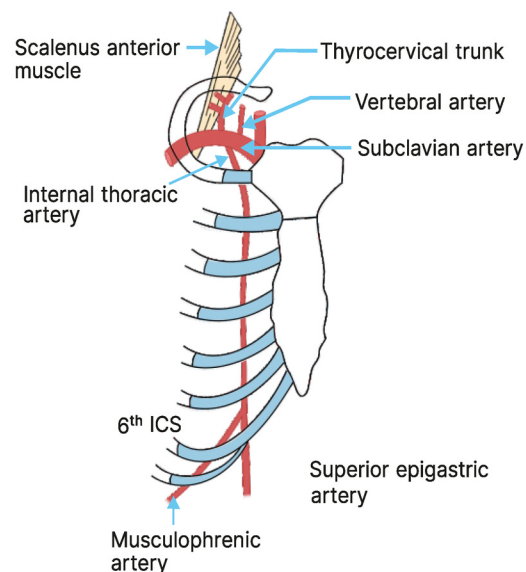
- In pleural effusion, thoracocentesis is done
- The needle is inserted along the mid-axillary line
- The structures pierced by the needle:
 - Skin
 - Superficial fascia
 - Deep fascia
 - Serratus anterior muscle
 - External intercostal muscle

- o Internal intercostal muscle
- o Innermost intercostal muscle (intercostalis intimi muscle)
- o Endothoracic fascia
- o Parietal pleura
- The needle has to be inserted just above the lower rib to prevent injury to the neurovascular bundle.

Q2.4: What is the arterial supply of the intercostal space?

Answer:

- The intercostal space is supplied by the Intercostal arteries
- Intercostal arteries are of two types:
 - o Anterior intercostal arteries
 - o Total: 9 pairs
 - o The upper 6th is given by the internal thoracic artery (a branch of the subclavian artery)
 - o Terminates in the 6th intercostal space by dividing into:
 - o Superior epigastric artery: Continues as part of the rectus sheath
 - o Musculophrenic artery: Gives rise to 7th, 8th and 9th anterior intercostal arteries
 - o Posterior intercostal arteries
 - o The superior intercostal artery gives rise to the upper 2 posterior intercostal arteries.
 - o The lower 9 originate from the aorta



Q2.5: What are the branches of the internal thoracic artery?

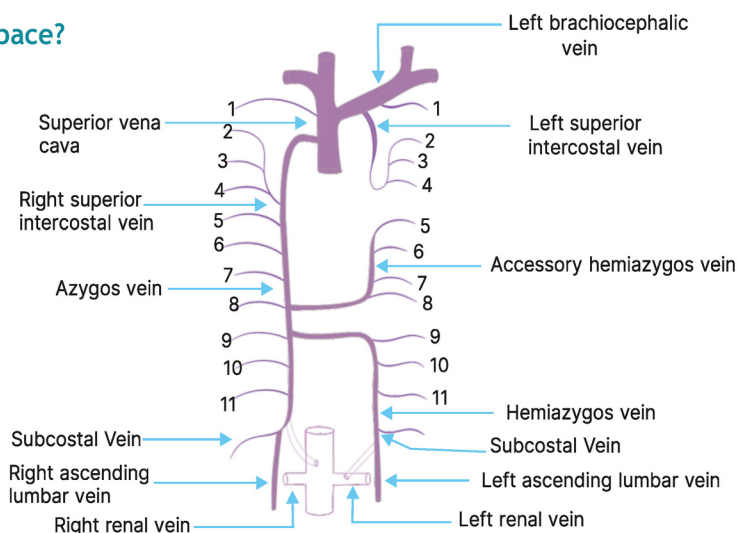
Answer: Branches of the internal thoracic artery

- First 6 anterior intercostal arteries
- Mediastinal branch (principal artery of the thymus)
- Perforating arteries (supply the mammary gland)
- Pericardiophrenic artery
- Superior epigastric artery
- Musculophrenic artery

Q2.6: What is the venous drainage of the intercostal space?

Answer: Intercostal veins:

- Anterior intercostal veins: Similar to anterior intercostal arteries
- Posterior intercostal veins:
 - o The right brachiocephalic vein and the left brachiocephalic vein form the SVC
 - o Azygos vein: Unpaired, towards the right side
 - o Drains the blood into the SVC



Q2.7: Describe the venous drainage of the posterior intercostal veins.

Answer:

- On the right side
 - o 1st vein drains into the right brachiocephalic vein
 - o 2nd, 3rd, and 4th veins form the right superior intercostal vein, which drains into the azygos vein
 - o All remaining veins drain into the Azygos vein directly
- On the left side
 - o 1st vein drains into the left brachiocephalic vein
 - o 2nd, 3rd, and 4th veins form the left superior intercostal vein, which drains into the left brachiocephalic vein
 - o 5th, 6th, 7th, and 8th drain into the accessory hemiazygos vein, which in turn drains into the azygos vein (at T7)
 - o 9th, 10th, and 11th veins drain into the hemiazygos vein, which in turn drains into the azygos vein (at T8)

BIG QUESTION 3: What are the anatomical features and relations of the root of the lung and the mediastinal surfaces of the right and left lungs?

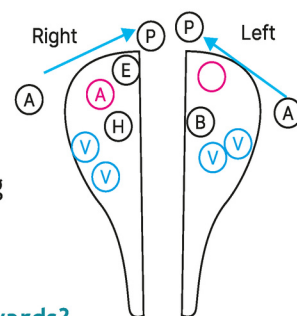
Broad Answer: The lungs are connected to mediastinal structures through the root, which enters the hilum and contains vital vessels and airways. The mediastinal surfaces of the right and left lungs show characteristic impressions and relations reflecting adjacent thoracic anatomy.

DETAILED QUESTIONS

Q3.1: What is the root of the lung?

Answer:

- Openings in the mediastinal surface of the lungs: Hilum
- All structures entering and leaving the lung through the hilum form the root of the lung



Q3.2: What is the arrangement of structures in the root of the left lung from above downwards?

Answer: From above downwards

- Pulmonary artery
- Bronchus
- Pulmonary veins

Q3.3: What is the arrangement of structures in the root of the right lung from above downwards?

Answer: From above downwards

- Eparterial bronchus
- Pulmonary artery
- Hyparterial bronchus
- Pulmonary veins

Q3.4: What is the arrangement of structures in the root of the lung anteroposteriorly?

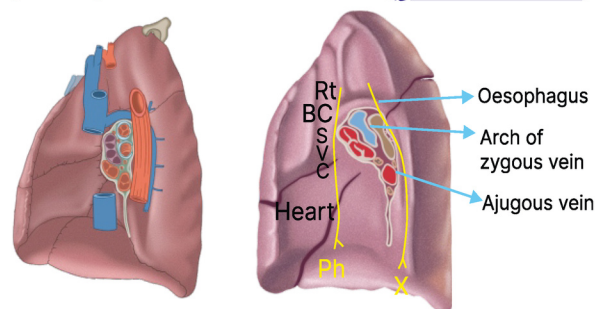
Answer: Veins → Artery → Bronchus → Bronchial vessels (in both lungs)

Q3.5: What structures are seen on the mediastinal surface of the right lung?

PYQ: FMGE 2019

Answer:

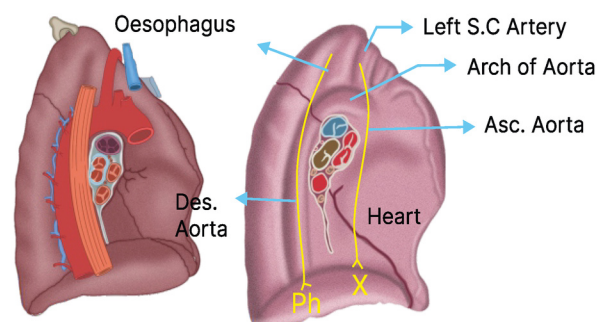
- The nerve in front of the root of the lung: Phrenic nerve
- Nerve behind the hilum: Vagus nerve



Q3.6: What structures are seen on the mediastinal surface of the left lung?

Answer:

- The nerve in front of the hilum: Phrenic nerve
- Nerve behind the hilum: Vagus nerve



BIG QUESTION 4: What are bronchopulmonary segments, and how are they arranged in the right and left lungs?

Broad Answer: Bronchopulmonary segments are functionally and anatomically distinct subdivisions of each lung, each supplied by its segmental bronchus and artery. They are the smallest surgically resectable units of the lung. Their arrangement differs between the right and left lungs and is clinically important in procedures like segmental resection and the spread of infections. Understanding their anatomy aids in diagnostic imaging and surgical planning.

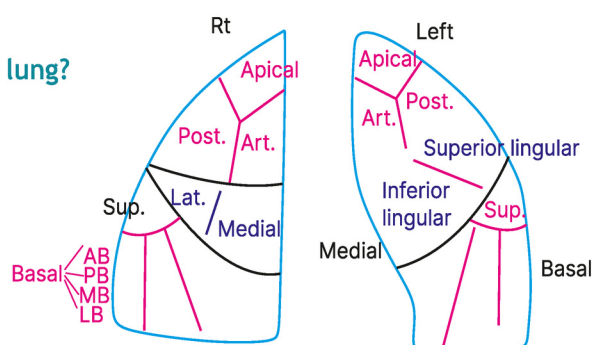
DETAILED QUESTIONS

Q4.1: What structure aerates each bronchopulmonary segment?

Answer: Tertiary/ segmental bronchus

Q4.2: How many bronchopulmonary segments are present in each lung?

Answer: Each lung has 10 bronchopulmonary segments



Q4.3: What are the bronchopulmonary segments seen in both lungs?

Answer: In the right lung and the left lung

- Upper lobe:
 - o Apical
 - o Anterior
 - o Posterior
- Lower lobe:
 - o Superior

YOURWISH

- o Basal:
 - Anterior Basal
 - Posterior Basal
 - Medial Basal
 - Lateral Basal

Q4.4: What are the bronchopulmonary segments seen in the right lung?

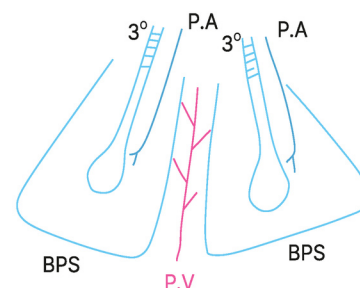
Answer: In the right lung

- Middle lobe:
 - o Medial
 - o Lateral

Q4.5: What are the bronchopulmonary segments seen in the left lung?

Answer: In the left lung

- Lingula:
 - o Superior lingular
 - o Inferior lingular



Q4.6: What are the exceptions seen in bronchopulmonary segments in the left lung?

Answer:

- Medial basal segment (to accommodate the heart) is sometimes absent in the left lung → L: R = 10: 9 (most common)
- Apical and posterior segments are sometimes fused (apicoposterior segment) in the left lung → L: R = 10: 8
- Bronchopulmonary segments cannot be called broncho-vascular segments
 - o Pulmonary veins are present between bronchopulmonary segments (intersegmental)

Q4.7: How does the dependent bronchopulmonary segment change with body position?

Answer:

- In standing position: The Posterobasal segment of the lower lobe of the right lung is dependent.
- In the supine position: The Superior segment of the lower lobe of the right lung is dependent.

BIG QUESTION 5: What is the coronary circulation of the heart, including the origin and branches of the right and left coronary arteries, the aortic sinus, and the venous drainage of the heart?

Broad Answer: The coronary circulation refers to the network of vessels that supply blood to and drain blood from the myocardium. It arises from the aortic sinuses and consists of the right and left coronary arteries with their respective branches. Venous drainage is through a set of cardiac veins that empty mainly into the coronary sinus. This system is essential for maintaining myocardial function and has key clinical relevance in cardiac disorders.

DETAILED QUESTIONS

Q5.1: Where do the coronary arteries arise from?

Answer:

- Coronary arteries originate from aortic sinuses
- Aortic sinus:

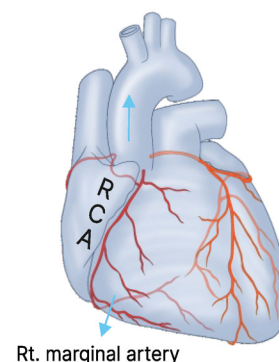
- o Anterior: Gives rise to the right coronary artery
- o Posterior:
 - Right: Non-coronary sinus
 - Left: Gives rise to the left coronary artery

 PYQ: NEET PG 2022

Q5.2: What are the branches of RCA?

Answer: Branches of RCA

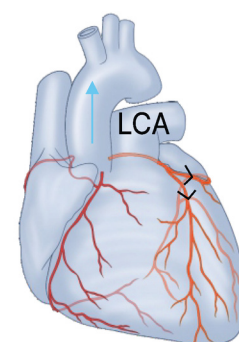
- SA nodal artery (65%)
- Right conus artery (3rd coronary artery)
- Right anterior ventricular rami (right/ acute marginal artery)
- Posterior interventricular artery
 - o Supplies the posterior part of the interventricular septum
 - o Supplies the AV node



Q5.3: What are the branches of RCA?

Answer: Branches of LCA

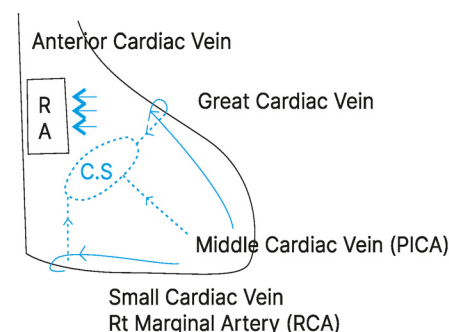
- Shorter in length
- Anterior interventricular artery
 - o Also known as LAD (Left Anterior Descending)
 - o Diagonal artery: Supplies the left ventricle
- Left circumflex artery (SA nodal artery in 35% and left/ obtuse marginal artery)



Q5.4: What is the venous drainage of the heart?

Answer:

- All cardiac veins drain into the coronary sinus
- It is a remnant of the left horn of the sinus venosus
- Anterior cardiac veins directly drain into the right atrium
- The small cardiac vein is accompanied by the right marginal artery and the right coronary artery
- The great cardiac vein is accompanied by the anterior interventricular artery and the circumflex artery
- The middle cardiac vein is accompanied by the posterior interventricular artery



BIG QUESTION 6: What are the anatomical features, internal structures, and clinical significance of the right atrium of the heart?

Broad Answer: The right atrium is one of the four chambers of the heart. Its internal architecture shows important landmarks such as the crista terminalis, fossa ovalis, and openings of major veins. These anatomical features play critical roles in cardiac physiology and serve as landmarks for conduction system components, making them clinically significant.

DETAILED QUESTIONS

Q6.1: Which vessels drain blood into the right atrium?

Answer: SVC and IVC drain blood into the right atrium

Q6.2: What is the crista terminalis?

Answer: Crista terminalis is a vertical muscular ridge inside the right atrium that separates:

- The smooth part of the atrial wall
- From the rough part of the anterior atrial wall

Q6.3: What is Musculi pectinati?

Answer: Musculi pectinati is the teeth of a comb arrangement of muscles in the anterior wall.

Q6.4: What is the fossa ovalis? Where is it derived from?

Answer:

- A depression in the interatrial septum
- It is derived from septum primum

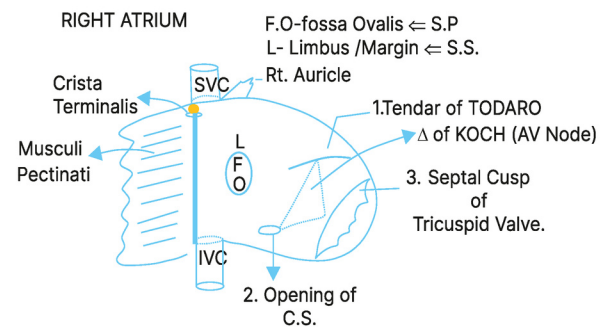
Q6.5: What is the margin above the fossa ovalis?

Answer: Limbus fossa ovalis (derived from septum secundum)

Q6.6: What are the cusps of the tricuspid valve?

Answer:

- Anterior cusp
- Posterior cusp
- Septal cusp

**Q6.7: What is the triangle of Koch and its importance?**

Answer:

- The triangle formed between the tendon of Todaro, the septal cusp of the tricuspid valve, and the opening of the coronary sinus
- The AV node is present

Q6.8: Where is the SA node located?

Answer: The SA node is present in the uppermost part of the crista terminalis

Q6.9: What is the auricle of the right atrium?

Answer: The ear-like projection of the right atrium is known as the auricle.

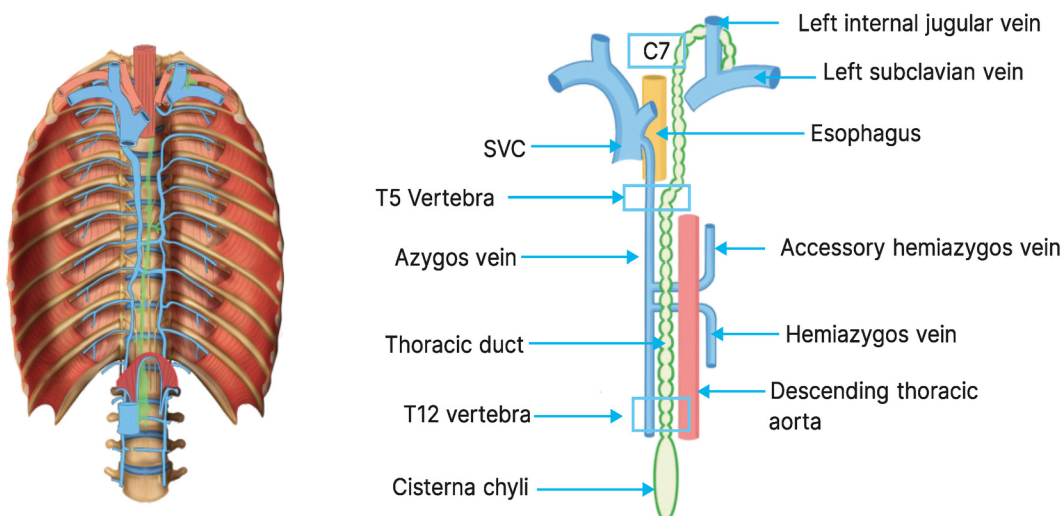
BIG QUESTION 7: Discuss the thoracic duct in detail: its course, anatomical relations, termination, and the areas not drained by it.

Broad Answer: The thoracic duct is an important lymphatic channel that plays a crucial role in draining lymph from large parts of the body back into the bloodstream. It begins deep in the abdomen, travels upward through the thorax, and ends by emptying into major veins near the neck. While it drains most regions, there are a few parts of the body that it does not drain.

DETAILED QUESTIONS

Q7.1: What is the course of the thoracic duct?

Answer: Largest lymphatic vessel



Begins from the cisterna chyli located at L2



Crosses the diaphragm through the aortic opening at the level of T12



Deviates towards the left at the level of T5



Drains lymph at the junction of the left subclavian vein and the left internal jugular vein at the level of C7

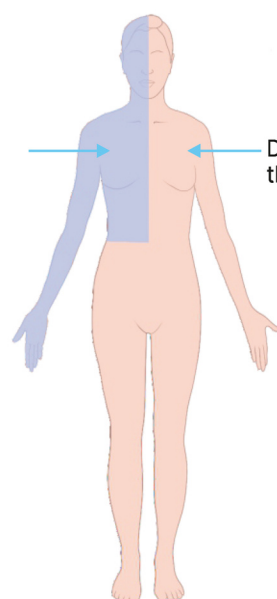
Q7.2: What are the areas not drained by the thoracic duct?

PYQ: NEET PG 2021

Answer:

- The right head and neck
- Right thoracic wall
- Right upper limb
- Right lung
- The right surface of the heart
- Convex part of the liver

Drained by the lymphatic duct



Drained by the thoracic duct



7. UPPER LIMB

BIG QUESTION 1: What are the muscles of the hand, and what are their nerve supply and attachments?

Broad Answer: The muscles of the hand are a group of small, intricate muscles that enable fine movements and grip control. They are divided into functional groups and are primarily innervated by the median and ulnar nerves. These muscles originate from the bones and ligaments of the wrist and hand and attach to various parts of the fingers. Their coordinated action is essential for precision, strength, and dexterity.

DETAILED QUESTIONS

Q1.1: What are the various muscles of the hand and their numbers?

Answer: 20 in number

- 4 thenar
- 4 hypothenar
- 4 lumbricals
- 4 palmar interossei
- 4 dorsal interossei

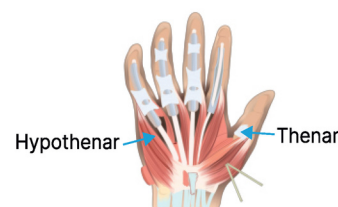
Q1.2: What are the thenar and hypothenar muscles?

Answer:

🔍 PYQ: FMGE 2021, 2022, 2020

🔍 PYQ: NEET PG 2022

Thenar Muscles	Hypothenar Muscles
• Flexor pollicis brevis • Abductor pollicis brevis • Opponens pollicis • Adductor pollicis	• Abductor digiti minimi • Flexor digiti minimi • Opponens digiti minimi • Palmaris brevis



Q1.3: What is the nerve supply of the muscles of the hands?

Answer:

- The ulnar nerve supplies the hypothenar muscles and adductor pollicis
- The 3 thenar muscles supplied by the median nerve are:
 - o Flexor pollicis brevis
 - o Abductor pollicis brevis
 - o Opponens pollicis

Q1.4: What is Froment's sign?

Answer:

Adductor pollicis is tested by the book test
If the ulnar nerve is injured



The action of the Adductor pollicis is lost.



Flexion of the thumb using the flexor pollicis while doing the book test



Froment's sign is positive.

Q1.5: How are carpal bones arranged in the wrist?

Answer: 8 carpal bones are arranged in two rows:

- Scaphoid, Lunate, Triquetrum, Pisiform
- Trapezium, Trapezoid, Capitate, Hamate

Q1.6: What is the sequence of bones in the hand?

Answer: Carpal bones → 5 metacarpals → Phalanges

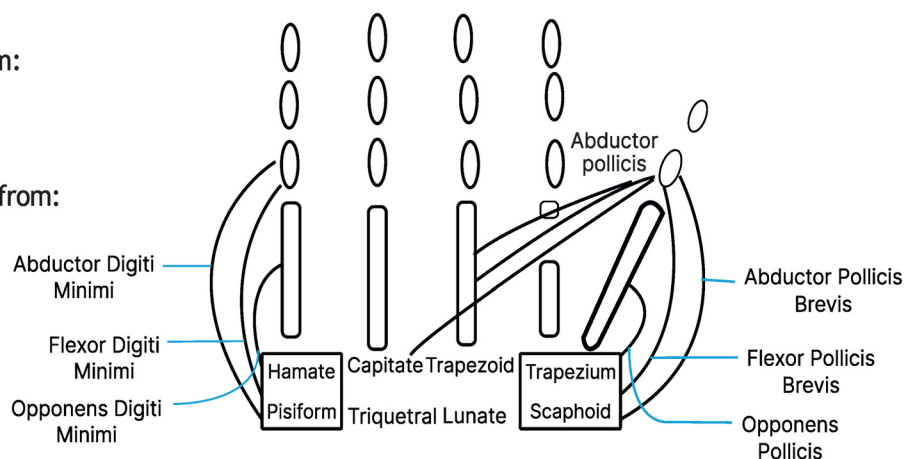
- 3 phalanges each for metacarpal II to V → Proximal, intermediate, distal
- 2 phalanges for metacarpal I

Q1.7: Where do the muscles of the hand originate from?

PYQ: FMGE 2021, 2022

Answer:

- All the thenar muscles originate from:
 - o Scaphoid
 - o Trapezium
- All the hypothenar muscles originate from:
 - o Pisiform
 - o Hamate



Q1.8: Where are the thenar muscles inserted?

Answer: Thenar muscles

- Abductor pollicis brevis inserts into the proximal phalanx of the thumb - the outermost muscle.
- Flexor pollicis brevis also inserts into the proximal phalanx of the thumb
- Opponens pollicis inserts into the shaft of the 1st metacarpal - inside
- Adductor pollicis
 - o Fibers originate from the 3rd metacarpal and the capitate
 - o Inserts into the proximal phalanx of the thumb

Q1.9: Where are the hypothenar muscles inserted?

Answer: Hypothenar muscle

- Abductor digiti minimi inserts into the proximal phalanx of the 5th digit - outer.
- Flexor digiti minimi inserts into the proximal phalanx of the 5th digit
- Opponens digiti minimi inserts into the shaft of the 5 metacarpal - inside
- Palmaris brevis is a subcutaneous muscle

Q1.10: Where is the abductor pollicis longus muscle inserted?**Answer:**

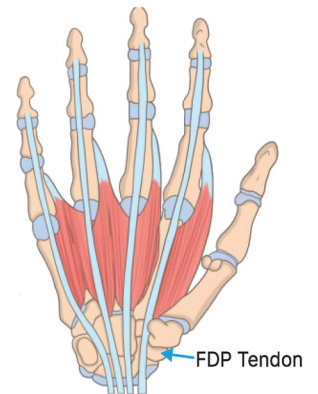
- The abductor pollicis longus muscle is inserted into the base of the 1 metacarpal.

Q1.11: What are the anatomical features of Lumbricals?

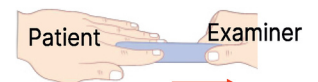
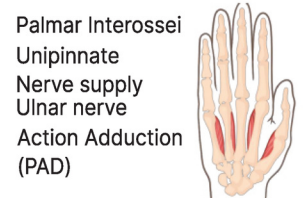
PYQ: NEET PG 2022

Answer:

- Origin: Flexor Digitorum Profundus (FDP) Tendon
 - o 1st and 2nd lumbricals originate from one tendon - Unipinnate
 - o 3rd and 4th lumbricals originate from two adjacent tendons - Bipinnate
- Insertion: Common extensor tendon
- Nerve supply:
 - o 1st and 2nd lumbricals: Median nerve
 - o 3rd and 4th lumbricals: Ulnar nerve
- Action:
 - o Flexion at the metacarpophalangeal joint
 - o Extension at interphalangeal joints

**Q1.12: What are the features of the palmar interossei?****Answer:**

- Palmar interossei - Unipennate
- Nerve supply: Ulnar nerve
- Action: Palmar interossei - Adduction of fingers (PAD)
- The middle finger does not have any palmar interossei
- The middle finger has two dorsal interossei attached to both sides.
- Test: Card test



Testing Palmar Interossei (Ulnar Nerve): Card Test

Q1.13: What are the features of the dorsal interossei?**Answer:**

- Dorsal interossei - Bipinnate
- Nerve supply: Ulnar nerve
- Action: Abduction of fingers (DAB)
- The little finger and thumb do not have any dorsal interossei inserted.
- Test: Egawa test



Testing Dorsal Interossei (Ulnar Nerve): Egawa Test

Q1.14: What is the sensory supply of the hand?**Answer:**

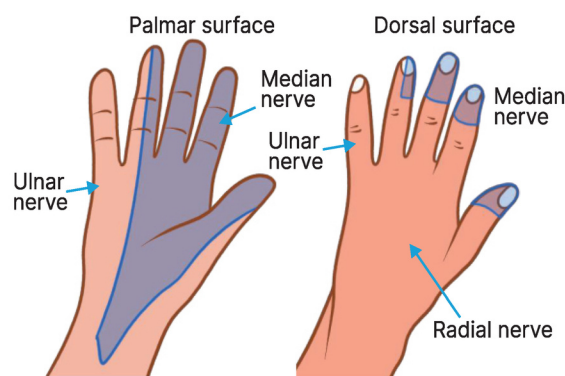
PYQ: FMGE 2022, 2021

PYQ: NEET PG 2021, 2022, 2023

Sensory Supply of Hand

- **Palmar surface**
 - o Medial 1½ digits - Ulnar nerve
 - o Lateral 3½ digits - Median nerve

- **Dorsal surface**
 - o Medial 1½ digits - Ulnar nerve
 - o Distal phalanges of lateral 3 and ½ digit - Median nerve
 - o The remaining portion - Radial nerve



Q1.15: Summarise the nerve supply of the upper limb.

Answer:

Muscles	Nerve
All the muscles in the anterior compartment of the arm	Musculocutaneous nerve
All the muscles in the posterior compartment of the arm and forearm	Radial nerve
All the muscles in the anterior compartment of the forearm	Ulnar and median nerve
Muscles of hand	Ulnar and median nerve

BIG QUESTION 2: What are the course, muscle supply, and clinical effects of injury to the ulnar nerve?

Broad Answer: The ulnar nerve is a major peripheral nerve of the upper limb that supplies several muscles in the forearm and hand. It can be injured at various levels, leading to characteristic motor and sensory deficits. The pattern of muscle involvement and clinical findings depends on the site of injury. Understanding its course helps in identifying the functional loss and associated deformities.

DETAILED QUESTIONS

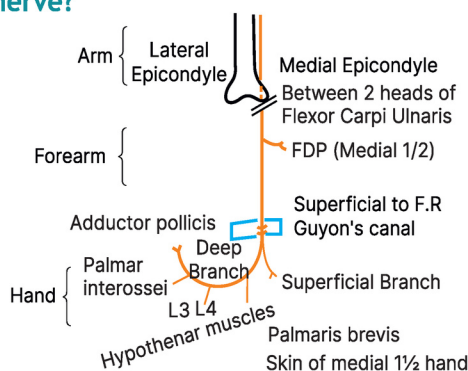
Q2.1: What is the origin of the ulnar nerve?

Answer:

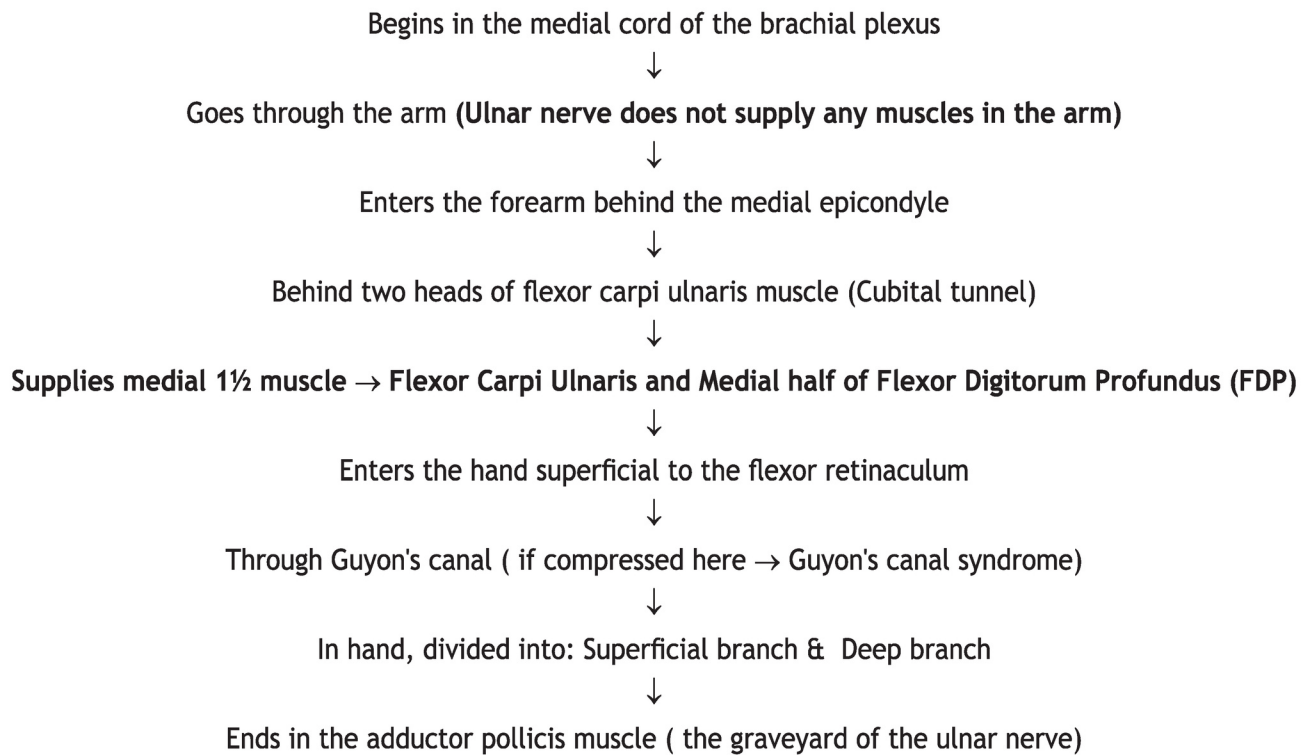
- Branch of the medial cord of the brachial plexus (Mnemonic: M4U)
- Root value: C7 C8 T1
 - o All other branches of the medial cord have root value C8 T1

Q2.2: What is the course of the ulnar nerve?

Answer:



YOURWISH

**Q2.3: Compression of the ulnar nerve at which site results in cubital tunnel syndrome?**

Answer: Behind the two heads of the flexor carpi ulnaris muscle (Cubital tunnel)

Q2.4: Which nerves supply the anterior compartment of the forearm?

Answer: The anterior compartment of the forearm is supplied by the ulnar and median nerves.

Q2.5: Why is the flexor digitorum profundus (FDP) called a hybrid muscle?

Answer: Flexor digitorum profundus is a composite/hybrid muscle

- Medial ½ is supplied by the ulnar nerve
- Lateral ½ is supplied by the median nerve

Q2.6: Which muscles are supplied by the superficial and deep branches of the ulnar nerve in the hand?

Answer: In the hand, the ulnar nerve gets divided into:

- **Superficial branch - supplies**
 - o Palmaris brevis muscle
 - o The skin of the medial 1½ hand.
- **Deep branch - supplies**
 - o All remaining hypothenar muscles
 - o 3rd and 4th lumbricals
 - o Palmar and dorsal interossei
 - o Adductor pollicis muscle

Q2.7: What are the common sites of ulnar nerve injury and their clinical features?

Answer:

- Ulnar nerve injury → **Partial claw hand**
- **Higher injuries** - Near medial epicondyle

- o In medial epicondyle fracture, cubital tunnel syndrome
- o Clawing will be less
- **Lower injuries** - Near the wrist
 - o In Guyon's canal syndrome
 - o Clawing will be more
 - Because the muscles proximal to the injury are normal (Flexor Carpi Ulnaris and Flexor Digitorum Profundus)

Q2.8: What is ulnar paradox?

Answer:

 PYQ: FMGE 2019, 2020

- In the lower lesion of the ulnar nerve, clawing is more
- In higher lesions of the ulnar nerve, clawing is less

BIG QUESTION 3: What are the course, muscle supply, and clinical effects of injury to the median nerve?

Broad Answer: The median nerve is a key nerve of the upper limb that supplies muscles in the forearm and hand, especially those involved in fine movements. Injury to this nerve can occur at different sites and leads to distinct patterns of motor and sensory impairment. The extent of muscle weakness and functional loss depends on the level of involvement. Clinical signs often reflect its anatomical pathway and areas of innervation.

DETAILED QUESTIONS

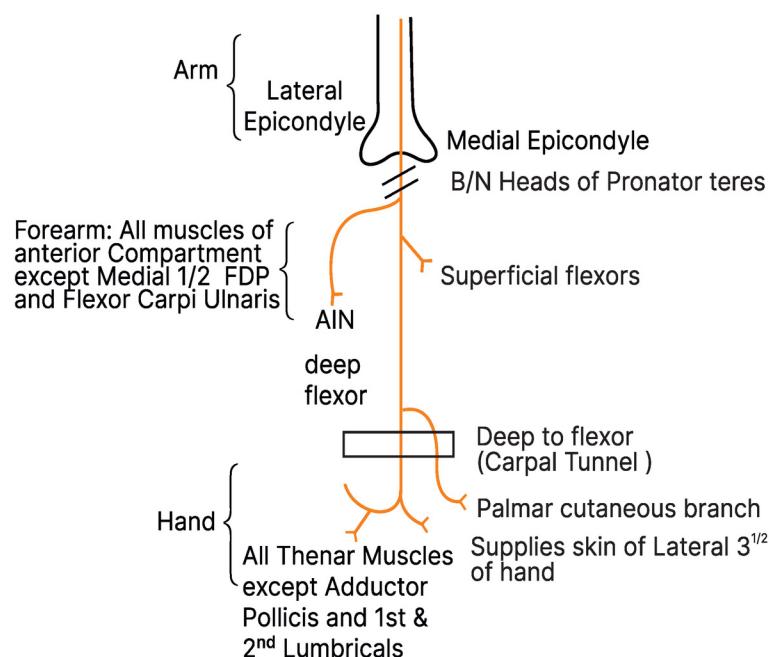
Q3.1: What is the origin of the median nerve?

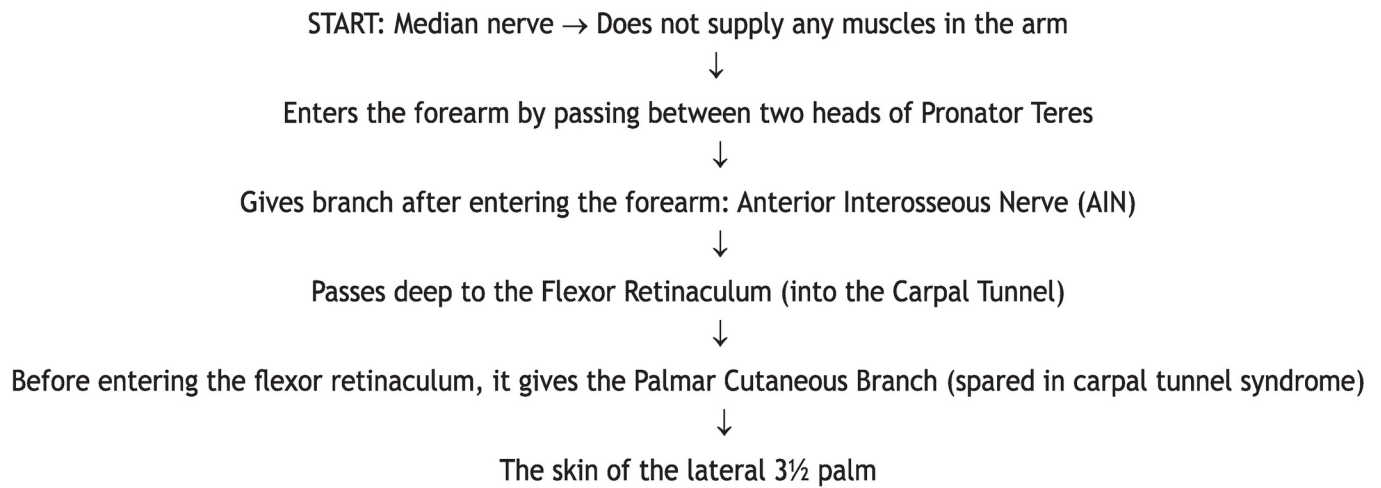
Answer:

- Originates from the lateral and medial cords of the brachial plexus
- Root value: C5 C6 C7 C8 T1

Q3.2: What is the course of the median nerve?

Answer:





Q3.3: What are the forearm innervations of the median nerve?

Answer: In the forearm, the median nerve supplies all anterior compartment muscles except the medial ½ of the FDP.

- The median nerve supplies the superficial flexors
- AIN supplies the deep flexors

Q3.4: What are the hand innervations of the median nerve?

Answer: In the hand, the median nerve supplies the:

- Thenar muscles, except the Adductor pollicis
- 1st and 2nd Lumbricals
- Digital branch - supplies the skin of the lateral 3½ digits

Q3.5: What are the sites of injury of the median nerve?

Answer:

- **Higher lesion**
 - o Pronator teres syndrome: If compressed while passing between the two heads of the Pronator teres muscle
 - o Supracondylar fracture: AIN is more injured
- **Lower lesion**
 - o Carpal tunnel syndrome: If compressed when passing deep to the flexor retinaculum

 PYQ: NEET PG 2021

Q3.6: What are the clinical signs of median nerve injury?

Answer:

If the median nerve is injured:

- Atrophy of the thenar eminence
- All thenar muscles will be affected except the adductor pollicis
 - o The adductor pollicis is supplied by the ulnar nerve
- The thumb will be in an adduction position along the plane of the fingers → Ape thumb

If the median nerve is injured in a higher lesion:

- All forearm muscles are affected
 - o While making a fist → Pointing index
- Ape thumb is also observed in higher lesion injury
- Sensory loss in the lateral 3 ½ fingers (palm and digits)

If the median nerve is injured in the lower lesion:

- Ape thumb deformity is seen
- No pointing index
- The Palmar cutaneous branch is spared in carpal tunnel syndrome
 - o No sensory loss in the palm
 - o Sensory loss in the later 3 ½ digits

BIG QUESTION 4: What are the course, muscle supply, and clinical effects of injury to the radial nerve?

Broad Answer: The radial nerve is primarily responsible for extension at the elbow, wrist, and fingers, and also supplies the skin over the posterior limb. Injury to it can result in varying degrees of motor and sensory loss depending on the site. Clinical effects are closely linked to its anatomical course.

DETAILED QUESTIONS

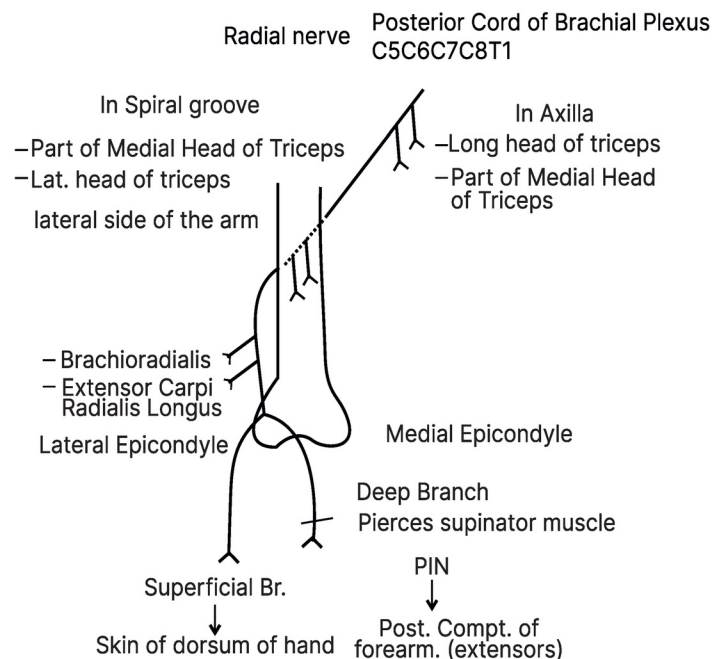
Q4.1: What is the origin of the radial nerve?

Answer:

- Origin: Posterior cord of brachial plexus (Mnemonic: LUNAR)
- Root value: C5 C6 C7 C8 T1

Q4.2: What is the course of the radial nerve?

Answer:



START: From the posterior cord (Brachial Plexus)



Passes behind the shaft of the humerus (in the axilla)

Supplies: Long head + part of the medial head of triceps



Turns in the Spiral/Radial Groove

Supplies: Remaining medial head + lateral head of triceps



Enters the lateral side of the arm

Supplies: Brachioradialis + Extensor Carpi Radialis Longus (ECRL)
(ECRL helps in wrist extension)



In front of the lateral epicondyle, it divides into:

- Superficial branch: Supplies skin of dorsum of hand + distal phalanges
- Deep branch → Pierces supinator → becomes Posterior Interosseous Nerve (PIN): supplies posterior compartment of the forearm (extensors)

Q4.3: What are the different injuries of the radial nerve?

Answer:

- In the axilla: Clutch palsy
- In the spiral groove: Saturday night palsy
- In the lateral aspect of the arm
- Injury to PIN

Q4.4: What are the landmarks of radial nerve injury?

Answer:

- Contraction of the triceps → extension of the elbow joint
 - If the triceps is involved → **loss of extension or a flexed elbow**
 - Anterior compartment muscles dominate
- If ECRL is involved, → no extension of wrist → **wrist drop**
- If PIN is involved, → extensor digitorum is affected → **Finger drop**
- If the superficial branch is involved → **loss of sensation**

Q4.5: What are the features of radial nerve injury in the axilla?

Answer:

- All triceps are affected → flexed elbow
- ECRL is affected → Wrist drop
- PIN is involved → Finger drop
- Superficial branch is involved → loss of sensation

Q4.6: What are the features of radial nerve injury in the spiral groove?

Answer:

- Long head and medial head of triceps are spared → Weakness of extension at the elbow.
- ECRL is affected → Wrist drop
- PIN is involved → Finger drop
- Superficial branch is involved → loss of sensation

Q4.7: What are the features of radial nerve injury in the lateral aspect of the arm?

Answer:

- Extension at the elbow is normal
- No wrist drop

- Finger drop is present
- Loss of sensation is present.

Q4.8: What are the features of PIN palsy?

Answer: Only finger drop is present

BIG QUESTION 5: What are the anatomical features of the brachial plexus, and what are its common injuries?

Broad Answer: The brachial plexus is a network of nerve fibers formed by the anterior rami of C5 to T1 spinal nerves, organized into roots, trunks, divisions, cords, and branches. It supplies the upper limb, with terminal branches including the musculocutaneous, axillary, radial, median, and ulnar nerves. The plexus lies in the neck and axilla, closely related to important vascular structures. Common injuries include upper trunk lesions (Erb's palsy) and lower trunk lesions (Klumpke's palsy), each producing characteristic motor and sensory deficits. Knowledge of its structure is essential for understanding limb function and localizing nerve injuries.

DETAILED QUESTIONS

Q5.1: What is the origin of the brachial plexus?

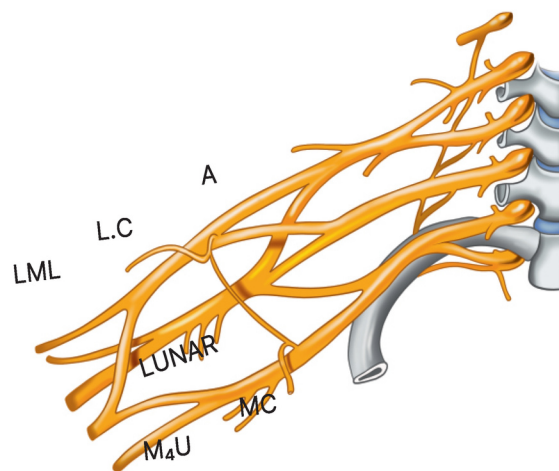
Answer: Origin: Ventral rami of C5, C6, C7, C8, T1

Q5.2: What are the parts of the Brachial plexus?

Answer: Roots → Trunks → Divisions → Cords → branches

🔍 PYQ: FMGE 2019, 2020

🔍 PYQ: NEET PG 2022, 2023



Q5.3: How is the brachial plexus formed?

Answer:

- C5 and C6 will combine to form → the upper trunk
- C7 will continue as the middle trunk
- C8 and T1 will combine to form → the lower trunk
- All the trunks give rise to:
 - o Anterior division
 - o Posterior division
- The posterior division of the upper trunk, middle trunk, and lower trunk combines to form → Posterior cord.

- The anterior division of the upper and middle trunk will combine to form → lateral cord.
- The anterior division of the lower trunk will continue as the medial cord.
- There are no branches from the division

Q5.4: What are the branches of the brachial plexus?

Answer:

Cord	
Lateral cord	• Lateral pectoral nerve • Musculocutaneous nerve • Lateral root of median nerve
Medial cord (Mnemonic: M4U)	• Medial pectoral nerve • Medial root of median nerve • Medial cutaneous nerve of arm • Medial cutaneous nerve of forearm • Ulnar nerve
Posterior cord (Mnemonic: LUNAR)	• Lower subscapular nerve • Upper subscapular nerve • Nerve to latissimus dorsi - thoracodorsal nerve • Axillary nerve • Radial nerve
Trunk	
Upper trunk	• Suprascapular nerve • Nerve to subclavius
Root	
C5	• Dorsal scapular nerve
C5 C6 C7	• Long thoracic nerve- supply serratus anterior muscle (boxer's muscle) ◦ Also known as the nerve of bell

Q5.5: What are the different injuries of the brachial plexus?

Answer:

 PYQ: NEET PG 2021, 2022  PYQ: FMGE 2019, 2020, 2021, 2022

- Injury to the upper trunk: Erb's paralysis
- Injury to lower trunk: Klumpke's paralysis
- Injury to the long thoracic nerve: Winging of the scapula

Q5.6: What are the features of Erb's paralysis?

Answer:

- Injury to the upper trunk of the brachial plexus
- The nerve root involved is C5 and C6
- **Nerves involved:** (Mnemonic: **SAM**)
 - Suprascapular nerve
 - Axillary nerve
 - Musculocutaneous nerve
- **Causes:**
 - Birth injury

- Shoulder dystocia → injury while overstretching
- o Fall on the shoulder
- **Sign: Policeman's tip hand/ Waiter's tip hand/ Porter's tip hand.**
 - o Arm: Adducted and medially rotated
 - o Elbow: Extended
 - o Forearm: Pronated
 - o Fingers: Flexed



Q5.7: What are the features of Klumpke's paralysis?

Answer:

- Injury to the lower trunk of the brachial plexus
- The nerve root involved is C8 T1
- **Nerve involved:** The intrinsic muscles of the hand are affected
 - o Ulnar nerve
 - o Median nerve
- **Cause:** Hyperabduction of the arm
- **Sign: Claw hand**
 - o Hyperextension of the metacarpophalangeal joint
 - o Flexion at the interphalangeal joint
- **Horner's syndrome**- due to the involvement of T1
 - o Ptosis
 - o Miosis
 - o Anhidrosis



Q5.8: What is the winging of the scapula?

Answer:

- Injury to the long thoracic nerve
- Nerve roots involved are C5, C6 C7
- The Serratus anterior muscle is involved
- The medial border of the scapula becomes more prominent



BIG QUESTION 6: What are the anatomical features of the Clavicle, and what is its clinical significance?

Broad Answer: The clavicle is an S-shaped bone that connects the upper limb to the trunk, acting as a strut between the sternum and scapula. It serves as an attachment site for multiple muscles and protects underlying neurovascular structures. Clinically, it is the most commonly fractured bone in the body due to its subcutaneous position and curved shape.

YOURWISH

DETAILED QUESTIONS

Q6.1: What are the special features of the clavicle?

Answer:

- It is the only bone that lies horizontally
- There is no medullary cavity
- It is the first bone to start ossification by the 5th week of intrauterine life.
- It is the last bone to complete ossification by 22-25 years of life
- It is the only long bone that undergoes membranous ossification (except the medial end)
- It is the only long bone that has 2 primary centers and 1 secondary center of ossification.



Q6.2: What is the common site of clavicle fracture?

Answer:

- The clavicle is most commonly fractured between the lateral 1/3rd and the medial 2/3rd
 - Lateral 2/5 and medial 3/5

BIG QUESTION 7: What are the features of the Anatomical snuff box, and its clinical significance?

Broad Answer: The anatomical snuff box is a triangular depression on the lateral aspect of the wrist, bordered by tendons of the thumb. It contains the radial artery, scaphoid bone, and superficial branch of the radial nerve. Clinically, tenderness in this area suggests a scaphoid fracture, which carries a risk of avascular necrosis due to poor blood supply.

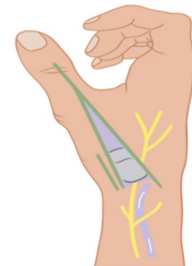
DETAILED QUESTIONS

Q7.1: What are the boundaries of the anatomical snuff box?

PYQ: FMGE 2020

Answer:

- **Laterally**
 - Extensor pollicis brevis
 - Abductor pollicis longus
- **Medially**
 - Extensor pollicis longus
- **Roof**
 - Cephalic vein
 - Superficial branch of the radial nerve
- **Floor**
 - The lower end of the radius
 - Scaphoid
 - Trapezium
 - Base of the 1st metacarpal



Q7.2: What is the content of the anatomical snuff box?

Answer: Radial artery

Q7.3: What is the clinical significance of the anatomical snuff box?

Answer:

- The scaphoid bone is most commonly fractured here.
- Tenderness in the anatomical snuff box

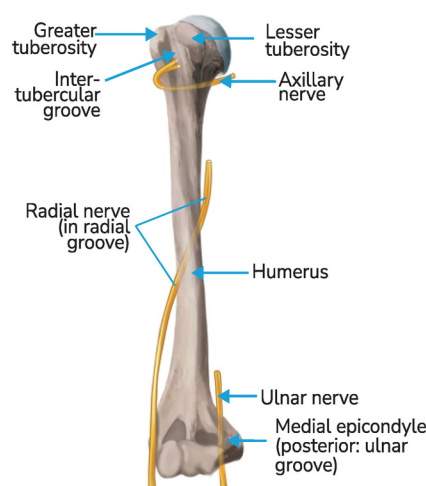
BIG QUESTION 8: Which nerves are closely related to the humerus, and why are they clinically important?

Broad Answer: Several nerves are closely related to the humerus, making them vulnerable to injury in fractures. These relationships are clinically important because fractures at specific sites can lead to corresponding nerve injuries, resulting in characteristic motor and sensory deficits.

DETAILED QUESTIONS

Q8.1: What are the nerves related to the humerus?

Answer:



Nerves closely related to the humerus are:

- Axillary nerve
- Radial nerve
- Ulnar nerve

Q8.2: Where is the axillary nerve located in relation to the humerus, and its clinical importance?

Answer:

- Axillary nerve - passes behind the surgical neck of the humerus
- Fracture of the surgical neck of the humerus → The axillary nerve is damaged

PYQ: FMGE 2021

PYQ: NEET PG 2022



Q8.3: What is the relation of the radial nerve to the humerus, and what fracture leads to radial nerve injury?

Answer:

- Radial nerve - passes through the spiral / radial groove behind the shaft of the humerus.
- Fracture of the shaft of the humerus → The radial nerve is damaged.



Q8.4: How does the ulnar nerve course around the humerus?

Answer:

- Ulnar nerve: Passes behind the medial epicondyle
- Fracture of the medial epicondyle of the humerus → The ulnar nerve is damaged



Q8.5: What is the nerve injury seen in the supracondylar fracture of the humerus?

Answer: In supracondylar fracture, the Anterior interosseous nerve is more damaged than the median nerve.

BIG QUESTION 9: What are the anatomical features of the carpal tunnel and the flexor retinaculum?

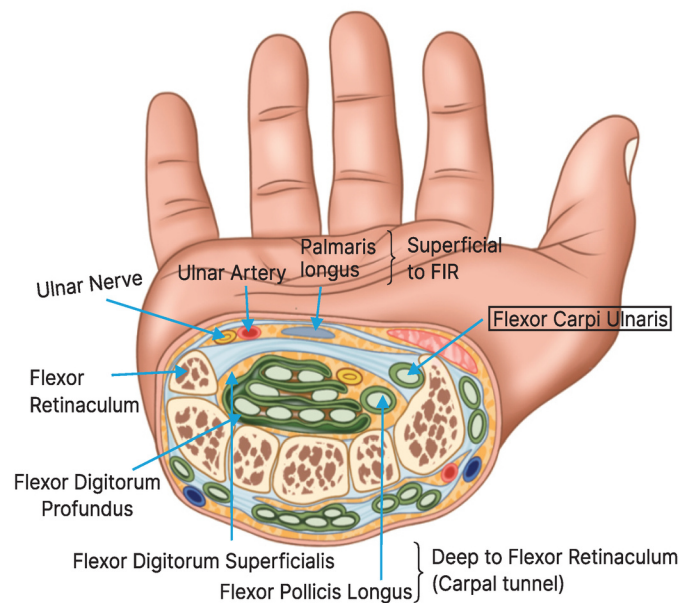
Broad Answer: The carpal tunnel is a confined space at the wrist formed by carpal bones and covered by the flexor retinaculum. It contains the median nerve and flexor tendons of the forearm. Compression within the tunnel has clinical relevance in conditions like carpal tunnel syndrome.

DETAILED QUESTIONS

Q9.1: What is the flexor retinaculum?

PYQ: NEET PG 2020

Answer: The flexor retinaculum is a fibrous band-like structure covering the carpal bones.



Q9.2: What are the structures passing superficial to the flexor retinaculum?

Answer: Structures passing superficial to the flexor retinaculum

- Ulnar nerve

- Ulnar artery
- Palmaris longus tendon
- The palmar cutaneous branch of the median nerve

Q9.3: What structure passes through the flexor retinaculum?

Answer:

- The flexor carpi radialis tendon is neither superficial nor deep to the flexor retinaculum.
- It passes through the flexor retinaculum

Q9.4: What are the structures passing deep to the flexor retinaculum?

Answer:

- The space deep to the flexor retinaculum is known as the carpal tunnel
- Structures passing through the carpal tunnel are:
 - o 4 tendons of the flexor digitorum superficialis
 - o 4 tendons of flexor digitorum profundus
 - o Tendon of the flexor pollicis longus
 - o Median nerve

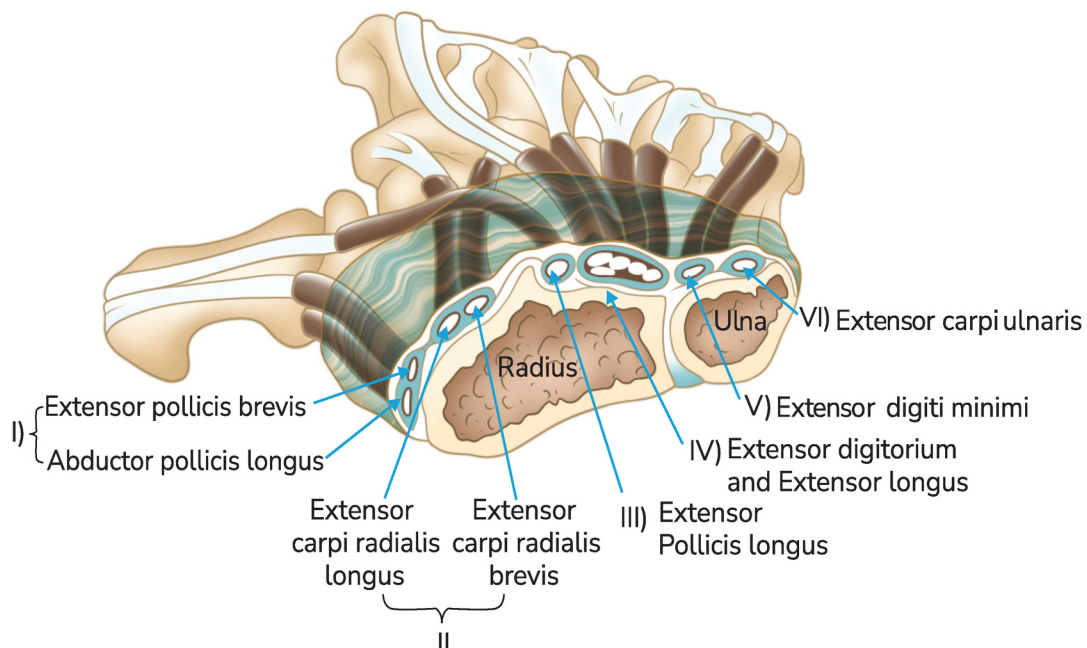
BIG QUESTION 10: Describe the anatomy of the extensor compartment of the wrist and extensor retinaculum.

Broad Answer: The extensor compartment of the wrist contains six fibro-osseous tunnels formed by the extensor retinaculum, which stretches from the lateral to medial aspect of the distal radius and ulna. These compartments transmit various extensor tendons of the forearm, each enclosed in a synovial sheath. The retinaculum holds the tendons in place and prevents bowstringing during extension movements.

DETAILED QUESTIONS

Q10.1: How many extensor compartments are present at the wrist?

Answer: There are 6 extensor compartments in the wrist



YOURWISH

Q10.2: What are the contents of the extensor compartment of the wrist**Answer:**

From lateral to medial side,

Compartment	Contents
I	• Lateral boundary of the anatomical snuff box - o Extensor pollicis brevis - o Abductor pollicis longus
II	• Extensor carpi radialis longus • Extensor carpi radialis brevis
III	• Medial boundary of the anatomical snuff box - o Extensor pollicis longus
IV	• 4 tendons of Extensor digitorum • Extensor longus
V	• Extensor digiti minimi
VI	• Extensor carpi ulnaris

Q10.3: What is the extensor retinaculum?**Answer:**

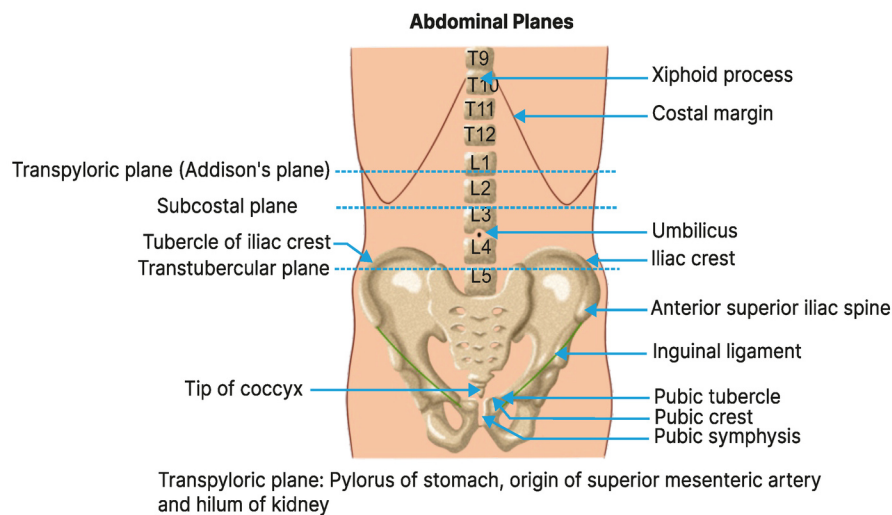
- The extensor retinaculum is a strong fibrous band on the back of the wrist that holds the extensor tendons in place.
- Forms the roof of six extensor compartments through which these tendons pass.



8. ABDOMEN

BIG QUESTION 1: What are the important anatomical abdominal planes?

Broad Answer: Abdominal planes are horizontal reference lines used to divide the abdomen into regions for clinical and anatomical purposes. They pass through key anatomical landmarks and help in locating viscera and vascular structures.



DETAILED QUESTIONS

Q1.1: What is the transpyloric plane (Addison's plane)?

PYQ: INICET 2023

Answer:

- At the level of L1
- Passes through the pylorus of the stomach
- Origin of superior mesenteric artery (midgut artery)
- Colic trunk arises at the level of T12 (foregut artery)
- Hilum of kidney is present at this level

Q1.2: What is the subcostal plane?

Answer:

- Passes the lowermost part of costal margin
- Level of L3

Q1.3: What is the supracristal plane?

Answer:

- Passes at the level of the highest point of iliac crest
- Level of L4

Q1.4: What is the transtubercular intertubercular plane?

Answer: At the level of L5

Q1.5: What is the umbilicus level and dermatome?

Answer:

- Between L3 and L4
- Dermatome: T10

BIG QUESTION 2: What is the structure and anatomy of the inguinal ligament and inguinal canal?

Broad answer: The inguinal region includes the inguinal ligament and canal. The ligament originates from the external oblique muscle and plays a key role in forming the inguinal canal, which transmits structures such as the spermatic cord or round ligament. Understanding its walls, rings, and contents is important in inguinal hernia classification.

DETAILED QUESTIONS

Q2.1: What is the inguinal ligament/ Poupart's ligament?

Answer:

- Thickening of aponeurosis of external oblique muscle
- Midpoint of inguinal ligament: Midpoint between ASIS and pubic tubercle
- Mid-inguinal point: Midpoint between ASIS and pubic symphysis
- Caput medusae is 1.25 cm above mid-inguinal point

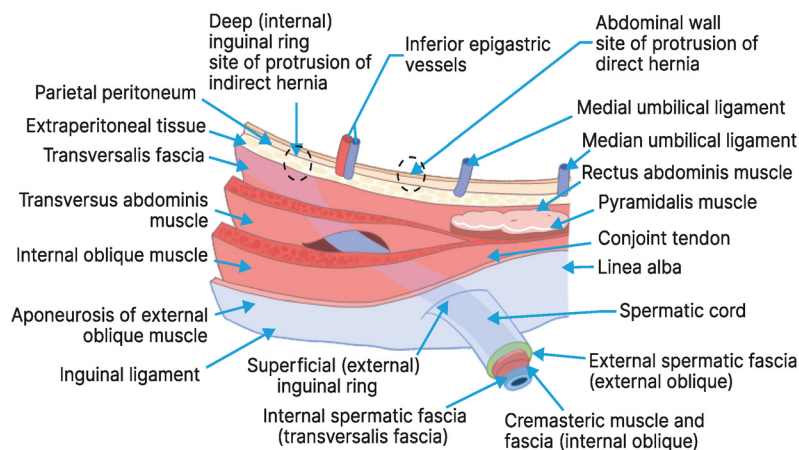
Q2.2: What are the layers of the anterior abdominal wall that form the inguinal canal?

Answer:

- Skin
- Superficial fascia:
 - o Outer fatty layer (Camper's fascia)
 - o Inner fibrous layer (Scarpa's fascia)
- External oblique muscle and aponeurosis
- Internal oblique muscle and aponeurosis
- Transversus abdominis muscle and aponeurosis
- Transversalis fascia
- Extraperitoneal tissue
- Parietal peritoneum

Q2.3: What is the anatomy of the deep and superficial inguinal rings?

Answer:

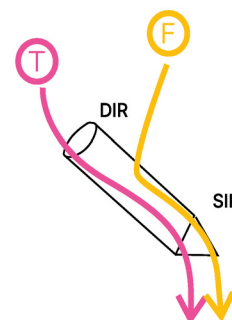


- Deep ring: Transversalis fascia has a oval-shaped defect
- Superficial ring: External oblique aponeurosis has a triangular-shaped defect
- Internal oblique and transversus abdominis arch over the canal and form the conjoint tendon on opposite side

Q2.4: What are the boundaries and contents of the inguinal canal?

Answer:

- Length: 4 cm (3.8-7.5 cm)
- Boundaries:
 - o Anterior: External oblique and internal oblique
 - o Posterior: Transversalis fascia and conjoint tendon
 - o Roof: Internal oblique and transversus abdominis
 - o Floor: Inguinal ligament
- Contents:
 - o Male: Spermatic cord and ilioinguinal nerve
 - o Female: Round ligament and ilioinguinal nerve
- True content: Enters through DIR and exits through SIR
- False content: Enters through posterior wall and exits through SIR → Ilioinguinal nerve



Q2.5: What are the components of the spermatic cord?

Answer:

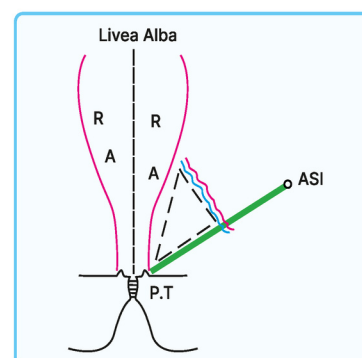
- Testicular artery
- Pampiniform plexus of vein
- Genital branch of genitofemoral nerve
- Vas deferens/Ductus deferens
- Artery to vas deferens
- Internal spermatic fascia
- Cremasteric muscle and fascia
- External spermatic fascia

Q2.6: What is the classification of inguinal hernias?

Answer:

- Indirect inguinal hernia: Through DIR
- Direct inguinal hernia: Through **Hesselbach's triangle**
 - o Base: Inguinal ligament
 - o Medial: Rectus abdominis
 - o Lateral: Inferior epigastric vessels

🔍 PYQ: FMGE 2022



BIG QUESTION 3. What are the anatomical relations of the spleen?

Broad Answer: The spleen lies in the left hypochondrium and has diaphragmatic and visceral surfaces. It is closely related to several organs and is supported by ligaments that maintain its position.

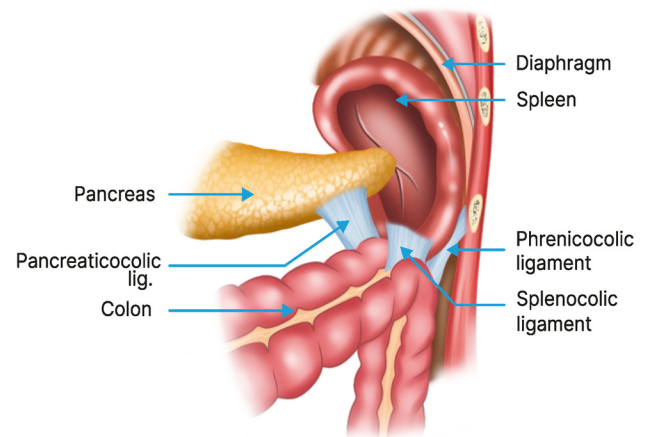
YOURWISH

DETAILED QUESTIONS

Q3.1: What are the relations of the spleen?

Answer:

- Convex surface: Diaphragm
- Visceral surface:
 - o Stomach
 - o Left kidney
 - o Left colic flexure
 - o Tail of pancreas

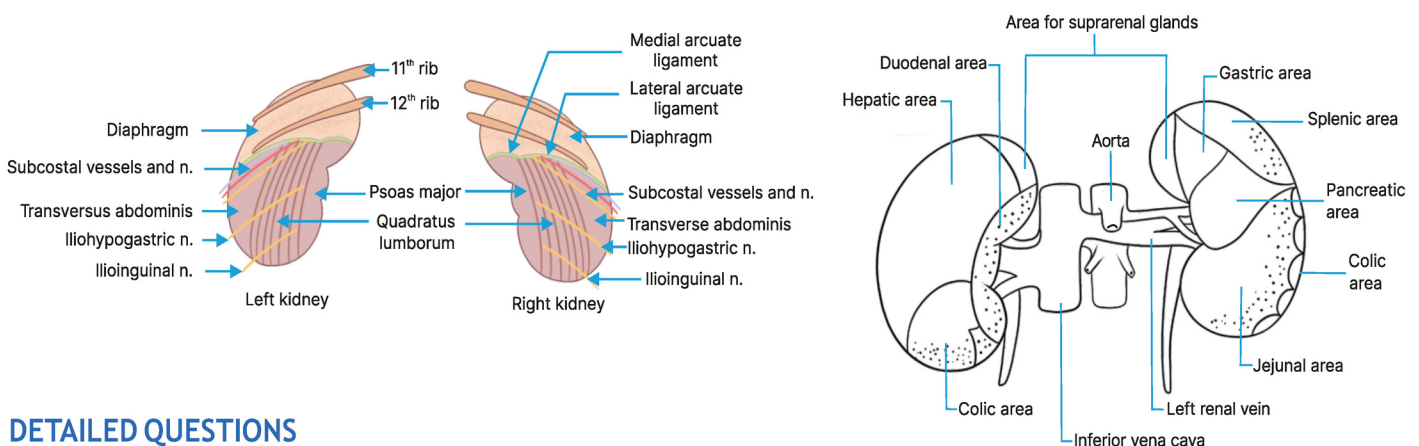


Q3.2: What ligament prevents downward displacement of spleen?

Answer: Phrenicocolic ligament

BIG QUESTION 4. What are the anatomical features and relations of the kidney?

Broad Answer: Kidneys extend from T12 to L3, with the right kidney lying lower. They have similar posterior relations and are associated with important muscles, nerves, and ribs.



DETAILED QUESTIONS

Q4.1: What is the anatomical extent of the kidney?

Answer:

- T12 to L3
- Right kidney is lower than the left

PYQ: FMGE 2020, 2021

Q4.2: What are the posterior relations of both kidneys?

Answer:

- Same for both kidneys:
 - o Upper half: Diaphragm
 - o Lower half:
 - Medial: Psoas major
 - Middle: Quadratus lumborum
 - Lateral: Transversus abdominis
- Nerves: Iliohypogastric and ilioinguinal nerves
 - o Comes out between psoas major and quadratus lumborum

- Below T12: Subcostal nerve, artery and vein
- Costal relations:
 - o Right kidney: 12th rib
 - o Left kidney: 11th and 12th ribs

Q4.3: What are the anterior relations?

Answer:

- Right kidney: Liver, duodenum
- Left kidney: Spleen, pancreas, stomach

BIG QUESTION 5. What structures pass through the diaphragm openings?

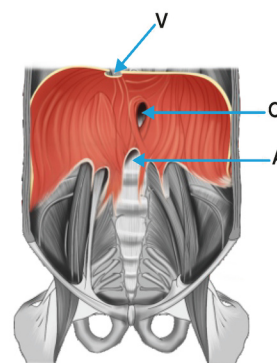
Broad Answer: There are three main openings in the diaphragm—venae caval, esophageal, and aortic—with specific vertebral levels and structures passing through.

DETAILED QUESTIONS

Q5.1: What are the diaphragmatic openings and their contents?

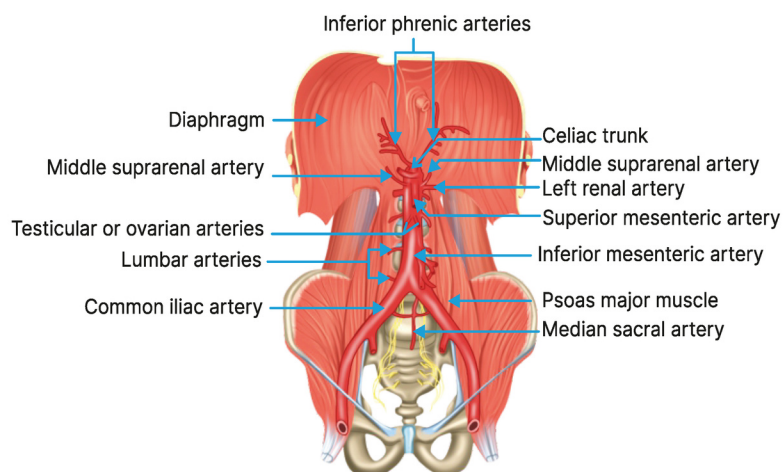
Answer:

- Vena caval opening: T8
 - o IVC
 - o Right phrenic nerve
- Esophageal opening: T10
 - o Esophagus
 - o Vagus nerve
- Aortic opening: T12
 - o Aorta
 - o Thoracic duct
 - o Azygos vein



BIG QUESTION 6. What is the anatomy of the abdominal aorta?

Broad Answer: The abdominal aorta begins at T12 and ends at L4. It gives off ventral, lateral, and dorsal branches to supply abdominal and pelvic organs.



DETAILED QUESTION

Q6.1: What is the extent of the abdominal aorta?

Answer:

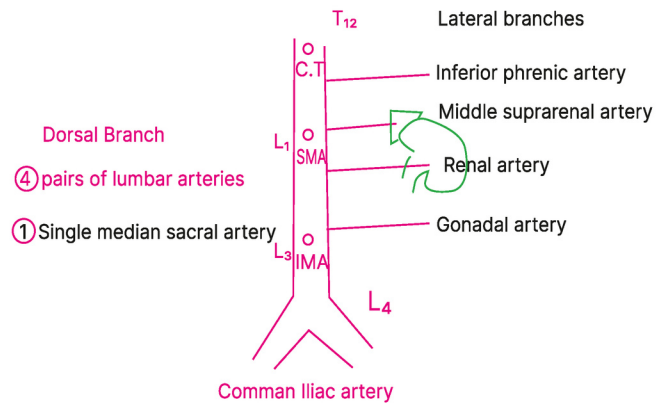
- Begins at T12
- Extends upto L4

Q6.2: What are the branches of the abdominal aorta?

Answer:

- Ventral branches:
 - o T12: Celiac trunk (foregut)
 - o L1: Superior mesenteric artery (midgut)
 - o L3: Inferior mesenteric artery (hindgut)
- Lateral branches:
 - o Inferior phrenic artery
 - o Middle suprarenal artery
 - o Renal artery
 - o Gonadal artery
- Dorsal branches:
 - o 4 pairs of lumbar arteries
 - o Single median sacral artery

PYQ: NEET PG 2020

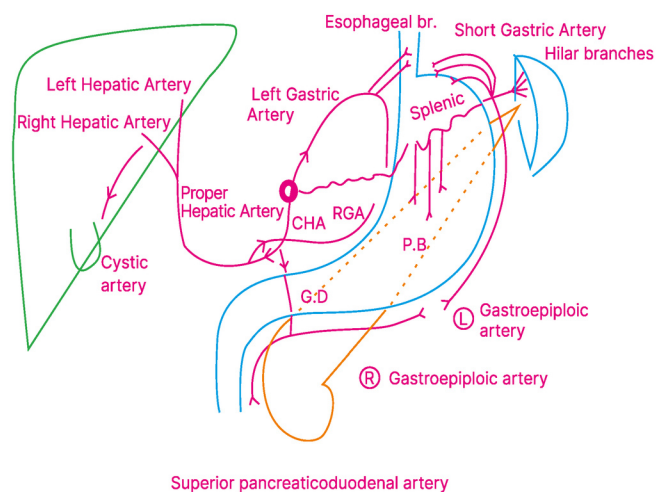
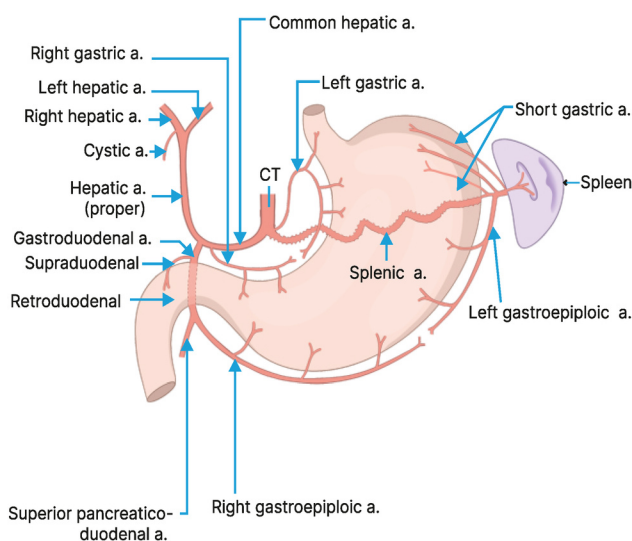


BIG QUESTION 7. What is the celiac trunk and its branches?

Broad Answer: The celiac trunk arises from T12 and supplies foregut structures. It divides into the left gastric, splenic, and common hepatic arteries with multiple branches.

DETAILED QUESTION

Q7.1: What are the branches of the celiac trunk?



- Left gastric artery
- Splenic artery
- Common hepatic artery

Q7.2. What are the branches of Left gastric artery?

Answer:

- Left gastric artery:
 - o Along lesser curvature of stomach
 - o Esophageal branches

Q7.3. What are the branches of splenic artery?

Answer:

- Splenic artery:
 - o Runs behind stomach
 - o Tortuous
 - o Branches:
 - Pancreatic
 - Left gastroepiploic
 - Short gastric
 - Hilar

Q7.4. What are the branches of the common hepatic artery?

Answer:

- Common hepatic artery:
 - o Proper hepatic artery
 - Branches:
 - Right hepatic artery → Gives off cystic artery
 - Left hepatic artery
 - Right gastric artery
 - o Gastroduodenal artery
 - Right gastroepiploic artery
 - Superior pancreaticoduodenal artery

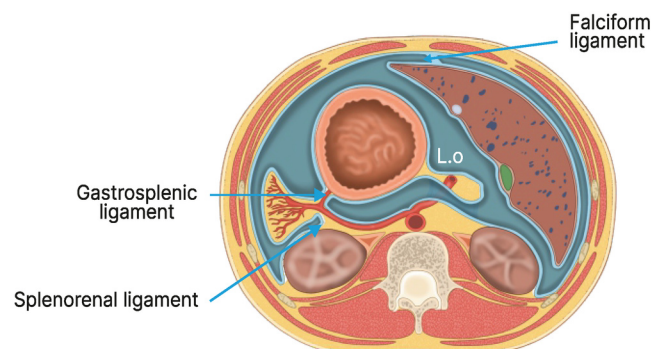
BIG QUESTION 8. What is the structure and boundary of the peritoneum and epiploic foramen?

Broad Answer: The peritoneum lines the abdominal cavity and forms sacs. The epiploic foramen (of Winslow) is a passage connecting greater and lesser sacs with defined anatomical boundaries.

DETAILED QUESTION

Q8.1. What are the peritoneal ligaments and sac details?

Answer:



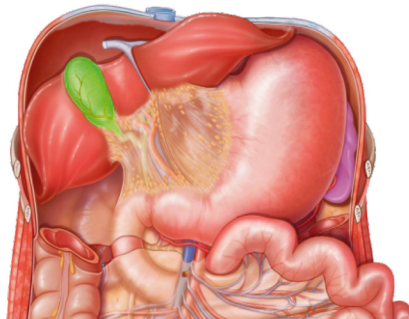
YOURWISH

- Lesser sac: Enclosed behind stomach
- Greater and lesser sac: Communicate via epiploic foramen/ foramen of Winslow
- Ligaments:
 - o Falciform (derived from ventral mesentery):
 - Connects liver to anterior abdominal wall
 - o Lesser omentum: Between liver and stomach
 - o Gastrosplenic (derived from dorsal mesentery): Between stomach and spleen
 - Short gastric artery
 - Left gastroepiploic artery
 - o Splenorenal/ Lienorenal (derived from dorsal mesentery):
 - Splenic artery
 - Tail of the pancreas

Q8.2. What are the boundaries of the epiploic foramen?

 PYQ: FMGE 2020, 2022

Answer:



- Anterior: Free margin of lesser omentum with hepatic artery, bile duct, and portal vein
- Posterior: IVC
- Superior: Caudate lobe of liver
- Inferior: First part of duodenum

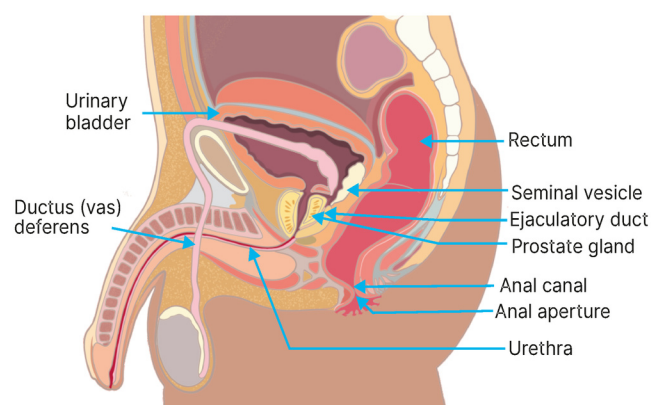
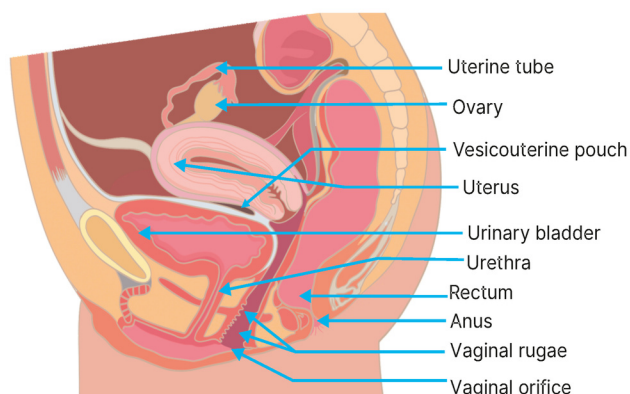


9. PELVIS AND PERINEUM

BIG QUESTION 1: What are the fascial layers, pouches, and urethral parts in the sagittal anatomy of the pelvis and perineum?

Broad Answer:

- In sagittal sections of the male and female pelvis, the perineum is organized into fascial layers and pouches.
- The deep perineal pouch lies between the superior and inferior fascia of the urogenital diaphragm, while the superficial perineal pouch lies between the perineal membrane and Colle's fascia.
- These pouches contain muscles, glands, and portions of the urethra, differing by sex.



DETAILED QUESTIONS

Q1.1: What are the fascial layers of the urogenital diaphragm and how do they relate to perineal pouches?

Answer:

- Superior fascia - forms the roof of the urogenital diaphragm
- Inferior fascia - also called the perineal membrane, forms the floor
- Superficial fascia - known as Colle's fascia

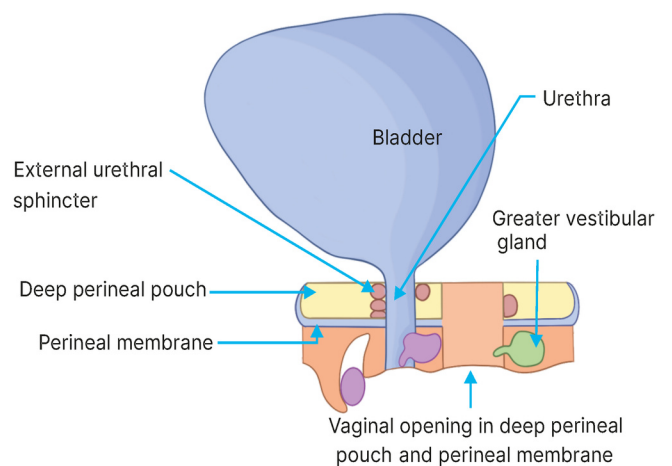
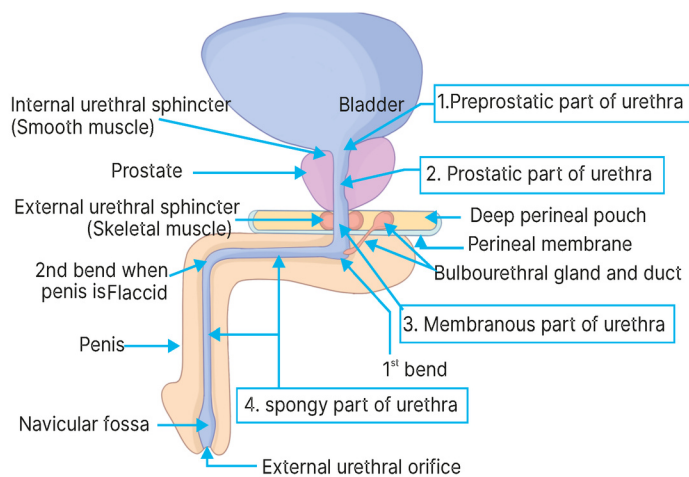
Perineal Pouch	Boundaries
Deep perineal pouch	Between superior and inferior fascia
Superficial perineal pouch	Between perineal membrane and Colle's fascia

Q1.2: What are the parts of the male urethra and what lies within the deep perineal pouch?

Answer:

- Parts of male urethra:
 - o Prostatic urethra - passes through prostate
 - o Membranous urethra - lies in deep perineal pouch
 - o Bulbar urethra - in bulb of penis
 - o Penile urethra - continues distally in penis
- Contents of deep perineal pouch:
 - o Membranous urethra (males)

- o External urethral sphincter
- o Deep transverse perineal muscle
- o Bulbourethral gland (Cowper's gland) in males



Q1.3: What are the contents of the superficial perineal pouch?

Answer:

- In males:
 - o Bulb of penis (surrounded by bulbospongiosus muscle)
 - o Crus of penis (surrounded by ischiocavernosus muscle)
 - o Superficial transverse perineal muscle
- In females:
 - o Greater vestibular gland (Bartholin's gland)

BIG QUESTION 2: What are the causes, types, and spread of urine extravasation in urethral injury?

Broad Answer:

- Urine extravasation occurs due to urethral rupture, commonly from straddle injuries or pelvic fractures.
- The site of urethral rupture determines the path of urine leakage – into the deep perineal pouch, superficial perineal pouch, scrotum, penile shaft, space of Retzius, or anterior abdominal wall.

DETAILED QUESTIONS

Q2.1: What are the common causes of urethral rupture, and which parts of the urethra are typically injured?

Answer:

🔍 PYQ: FMGE 2020,21,22

🔍 PYQ: NEET PG 2022, 2023

Cause	Urethral Part Affected
Pelvic fracture • Fall into a manhole causing pelvic fracture	Membranous urethra
Straddle injury • Straddle injury while riding a bicycle on a bumpy road	Bulbar urethra



Q2.2: What are the possible anatomical spaces where urine can extravasate after urethral rupture?

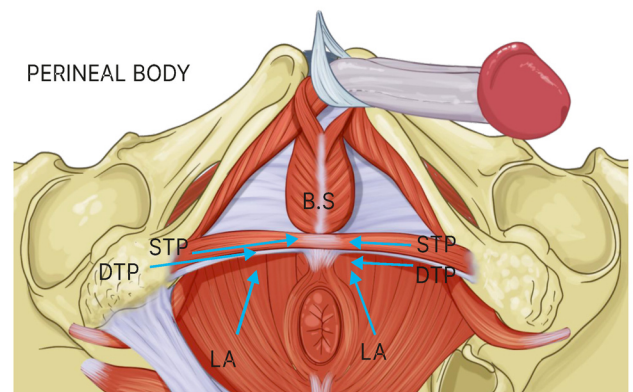
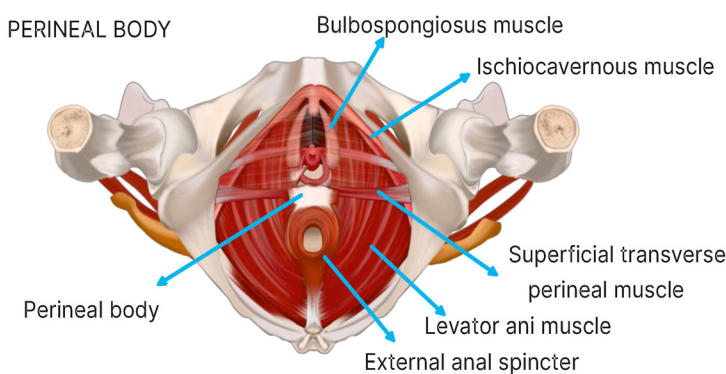
Answer:

- Membranous urethra:
 - o Deep perineal pouch
 - o Space of Retzius (Around bladder and prostate)
- Bulbar urethra:
 - o Superficial perineal pouch
 - o Scrotum
 - o Penile shaft
 - o Anterior abdominal wall

BIG QUESTION 3: What is the perineal body and which muscles are attached to it?

Broad Answer:

- The perineal body is a dense fibromuscular structure located in the perineum – between the vagina and anal canal in females, and a corresponding midline point in males.
- It acts as a central point for 10 muscles that support the integrity of the pelvic floor and maintain continence.



DETAILED QUESTIONS

Q3.1: Where is the perineal body located and what is its structural nature?

Answer:

- In females: Between the vaginal and anal canal openings
- In males: At the perineal midline
- Structure: Dense, tough fibrous body that serves as a muscle attachment point

Q3.2: What are the muscles that attach to the perineal body?

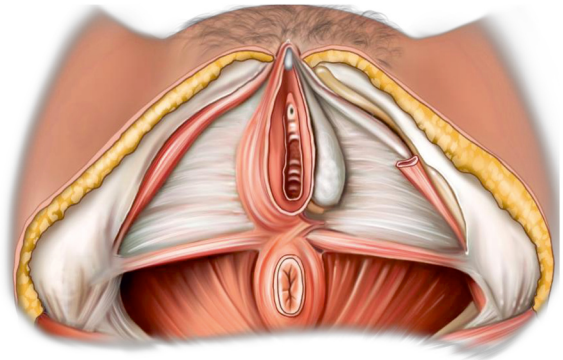
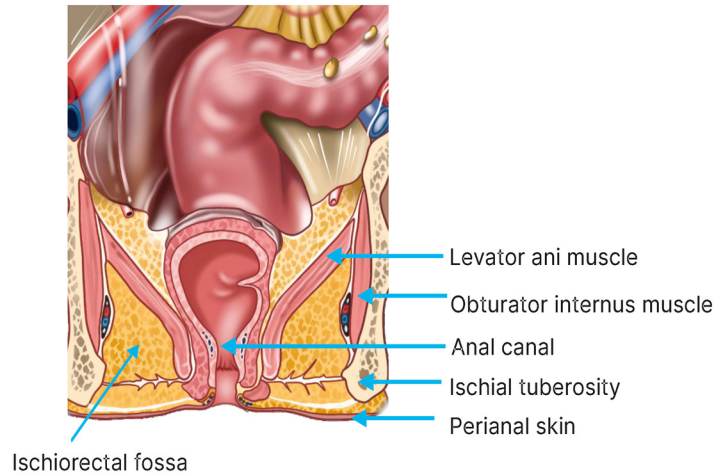
Answer: Total 10 muscles

Paired Muscles (4 pairs = 8 muscles)	Unpaired Muscles (2 total)
• Superficial transverse perineal muscle • Deep transverse perineal muscle • Bulbospongiosus • Levator ani	• External anal sphincter • Longitudinal muscle of the anal canal

YOURWISH

BIG QUESTION 4: What are the boundaries and contents of the ischiorectal (ischioanal) fossa?**Broad Answer:**

- The ischiorectal fossa (also called ischioanal fossa) is a wedge-shaped fat-filled space located on either side of the anal canal.
- It allows expansion of the anal canal during defecation and contains critical neurovascular structures such as the pudendal canal with its contents.

**DETAILED QUESTIONS****Q4.1: What are the anatomical boundaries of the ischioanal fossa?****Answer:**

Boundary	Structure
Lateral	Obturator internus muscle
Medial	Levator ani and external anal sphincter
Anterior	Perineal membrane
Posterior	Sacrotuberous ligament and gluteus maximus

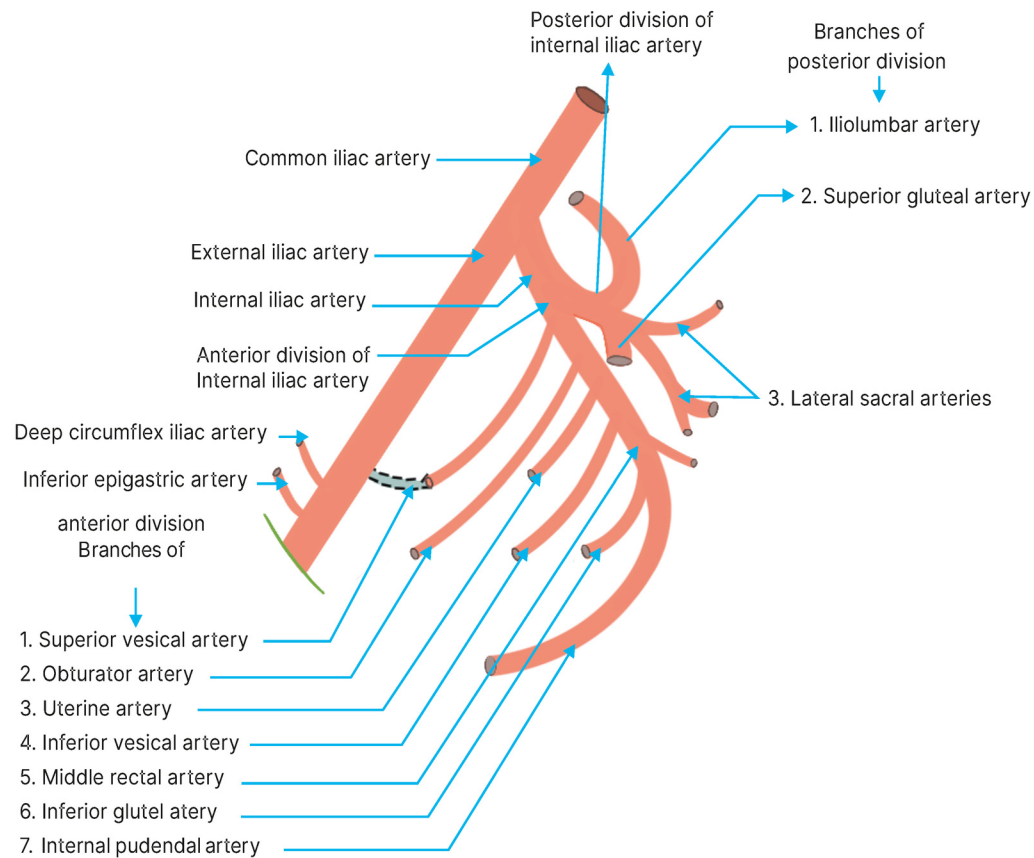
Q4.2: What structures are contained in the ischioanal fossa?**Answer:**

- Fat (main content)
- Pudendal canal (Alcock's canal) containing:
 - o Pudendal nerve
 - o Internal pudendal artery
 - o Internal pudendal vein

BIG QUESTION 5: What are the divisions and branches of the internal iliac artery, particularly its posterior division?**Broad Answer:**

PYQ: FMGE 2020

- The common iliac artery divides into the external and internal iliac arteries.
- The internal iliac artery further divides into anterior and posterior divisions.
- The posterior division gives rise to three main branches remembered by the mnemonic SIL: Superior gluteal, Iliolumbar, and Lateral sacral arteries.



DETAILED QUESTIONS

Q5.1: How is the internal iliac artery formed and how does it divide?

Answer:

- The common iliac artery divides into:
 - o External iliac artery
 - o Internal iliac artery
- The internal iliac artery divides into:
 - o Anterior division
 - o Posterior division

Q5.2: What are the branches of the posterior division of the internal iliac artery?

Answer:

- S → Superior gluteal artery
- I → Iliolumbar artery
- L → Lateral sacral arteries



10. LOWER LIMB

BIG QUESTION 1: What is the compartmental organization of the lower limb, including nerve supply, major nerves, muscles, injuries, and their clinical effects?

Broad Answer:

- The lower limb is organized into compartments—anterior, posterior, medial (thigh), lateral (leg), and plantar (foot)—each supplied by specific nerves.
- The femoral, sciatic (tibial + common peroneal), and obturator nerves supply these compartments.
- Injuries to these nerves result in characteristic gait patterns and muscle paralysis.

DETAILED QUESTIONS

Q1.1: How are the thigh and leg compartments innervated?

Answer:

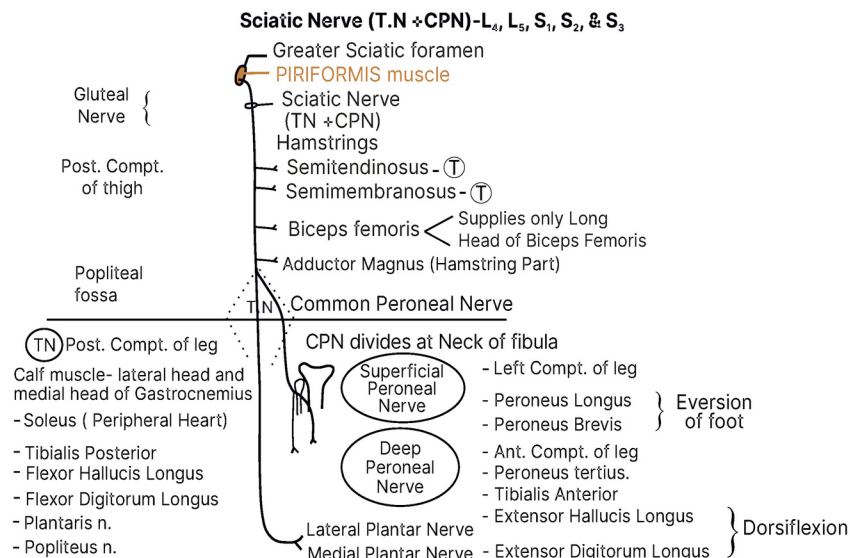
Region	Compartment	Nerve Supply
Thigh	Anterior	Femoral nerve
	Medial	Obturator nerve
	Posterior	Tibial nerve (from sciatic)
Leg	Anterior	Deep peroneal nerve
	Lateral	Superficial peroneal nerve
	Posterior	Tibial nerve
Foot	Medial plantar side	Medial plantar nerve
	Lateral plantar side	Lateral plantar nerve

Q1.2: What is the sciatic nerve's course, branches, and supply?

Answer:

- Formed from L4-S3
- Enters gluteal region via greater sciatic foramen below piriformis → Moves down to the posterior compartment of thigh
- Supplies posterior thigh (hamstrings):
 - o Semitendinosus - tibial nerve
 - o Semimembranosus - tibial nerve
 - o Biceps femoris long head - tibial nerve
 - o Biceps femoris short head - common peroneal nerve
 - o Adductor magnus (hamstring part) - tibial nerve
- Divides in popliteal fossa into:
 - o Tibial nerve
 - o Common peroneal nerve

PYQ: FMGE 2022



Q1.3: What does the common peroneal nerve supply, and what happens if it's injured?

Answer:

PYQ: FMGE 2022, 2023

- Enters the leg → Divides near neck of fibula as:
 - Superficial peroneal nerve:** Lateral compartment (Peroneus longus, brevis) - foot eversion
 - Deep peroneal nerve:** Anterior compartment (Tibialis anterior, EDL, EHL, Peroneus tertius) - foot dorsiflexion
- Injury effects:
 - Dorsiflexors and evertors paralyzed
 - Foot drop, inversion, high-stepping gait

Q1.4: What does the tibial nerve supply, and what happens if it's injured?

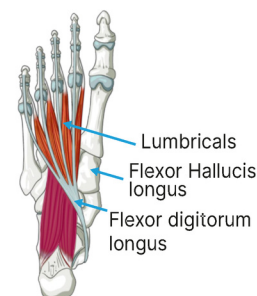
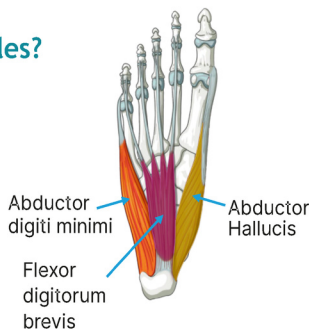
Answer:

- Posterior leg:
 - Gastrocnemius (medial + lateral heads), Soleus → Triceps surae (all three heads together)
 - Calcaneal/Achilles tendon = common tendon of the above
 - Other muscles: Tibialis posterior, FHL, FDL, Popliteus, Plantaris (longest tendon)
- Foot:
 - Medial and lateral plantar nerves
- Injury effects:
 - Plantarflexors paralyzed → Dorsiflexors dominate
 - Foot dorsiflexed → Calcaneal gait

Q1.5: What are the layers and innervation of sole muscles?

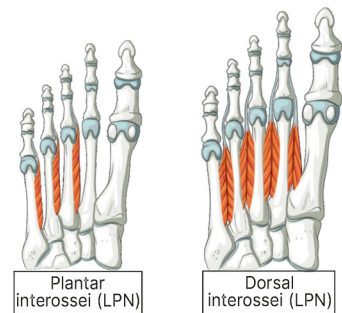
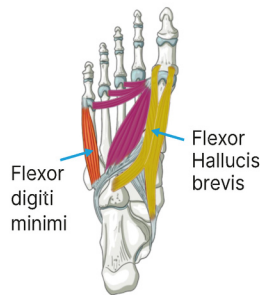
Answer:

- First layer:**
 - Abductor hallucis (MPN)
 - Abductor digiti minimi (LPN)
 - Flexor digitorum brevis (MPN)
- Second layer:**
 - Tendons: FDL, FHL
 - Muscles: Quadratus plantae (LPN), Lumbricals (1st - MPN, others - LPN)



YOURWISH

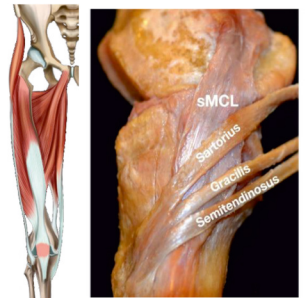
- **Third layer:**
 - o Flexor hallucis brevis (MPN)
 - o Flexor digiti minimi (LPN)
 - o Adductor hallucis (LPN)
- **Fourth layer:**
 - o 3 Plantar interossei (unipennate, LPN)
 - o 4 Dorsal interossei (bipennate, LPN)



Q1.6: What is Pes Anserinus?

Answer:

- Broad conjoint tendon of insertion on medial tibia:
 - o Sartorius
 - o Gracilis
 - o Semitendinosus
- Nicknamed "Goose foot" or "Guy ropes"



Q1.7: What is the significance of popliteus muscle?

Answer:

- Unlocks the knee joint
- Supplied by tibial nerve
 - o Locking of the knee → Quadriceps

Q1.8: What are common gait abnormalities caused by nerve injuries?

Answer:

- Tibial nerve injury → Calcaneal gait
- Common peroneal nerve injury → High stepping gait

BIG QUESTION 2: What is the anatomy, innervation, and clinical relevance of the femoral nerve and lumbar plexus?

Broad Answer:

- The **femoral nerve** arises from L2-L4 (posterior division), innervates the **anterior thigh**, and gives off **cutaneous branches** including the **saphenous nerve**.
- Minor branches of the **lumbar plexus** include iliohypogastric, ilioinguinal, genitofemoral, and lateral cutaneous nerve of thigh.
- These play roles in sensation, motor control, and clinical reflexes.

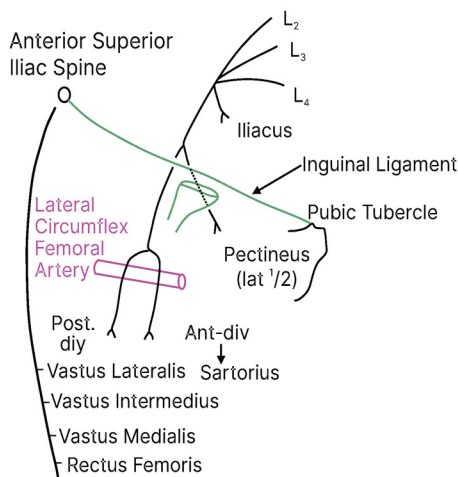
DETAILED QUESTIONS

Q2.1: What is the course and distribution of the femoral nerve?

Answer:

- Passes behind inguinal ligament
- Supplies iliacus
- Sends branch to lateral pectineus (medial half by obturator)

- Divided by lateral circumflex femoral artery:
 - o Anterior division → Sartorius/Tailor's muscle/ Honeymoon muscle (hip flexion/abduction/ext rotation; knee flexion & med rotation)
 - o Posterior division → Quadriceps femoris (VL, VI, VM, RF)



Q2.2: What are the cutaneous branches of the femoral nerve?

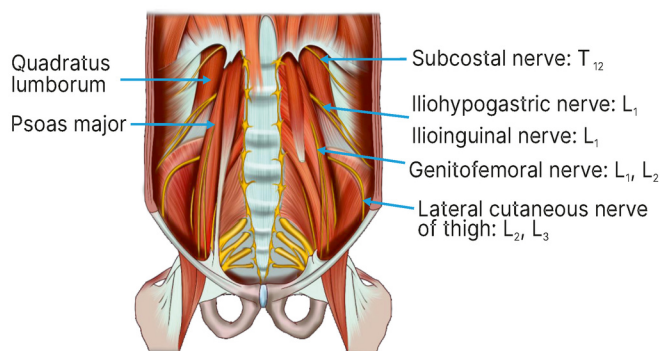
Answer:

- Medial cutaneous nerve of thigh
- Intermediate cutaneous nerve of thigh
- Saphenous nerve (longest cutaneous nerve; travels with saphenous vein)

Q2.3: What are the minor branches of lumbar plexus and their course?

Answer:

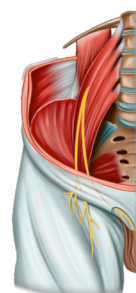
Nerve	Root	Course/Function
Subcostal	T12	Below 12th rib
Iliohypogastric	L1	Between quadratus lumborum & psoas major
Ilioinguinal	L1	Same
Genitofemoral	L1, L2	Pierces psoas major
Lateral cutaneous nerve thigh	L2, L3	Inner aspect of ilium



Q2.4: What is the nerve basis of the cremasteric reflex?

Answer:

- Afferent:
 - o Femoral branch of genitofemoral nerve → Anesthetized in femoral nerve cannulation



- o Supplies the skin of upper and medial aspect of thigh
- Efferent:
 - o Genital branch of genitofemoral nerve
 - o Supplies the cremasteric muscle

Q2.5: What is Meralgia Paresthetica?

Answer:

- Compression of lateral cutaneous nerve of thigh
- Occurs under inguinal ligament
- Causes: Obesity, tight clothing, pregnancy
- Symptoms: Numbness, tingling, stabbing/burning on lateral thigh



BIG QUESTION 3: What are the muscles, nerves, foramina, and bony landmarks of the gluteal region, including their clinical relevance?

Broad Answer:

- The gluteal region consists of powerful muscles involved in hip movements and stabilization, including the glutei and lateral rotators.
- Important nerves and vessels pass through the greater and lesser sciatic foramina, with clinical applications like the Trendelenburg sign and pudendal nerve block.
- The femur has key muscular attachment points essential for motion and diagnosis.

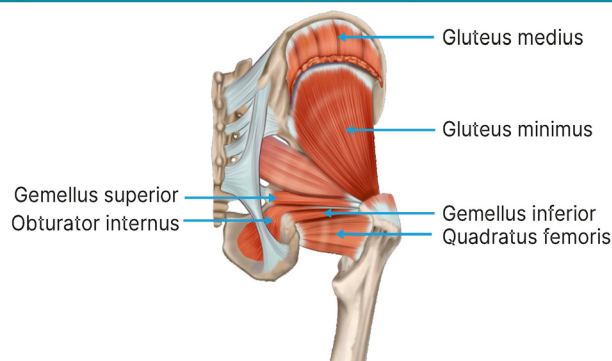
DETAILED QUESTIONS

Q3.1: What are the gluteal muscles, their nerve supply, and actions?

PYQ: FMGE 2019 PYQ: NEET PG 2022

Answer:

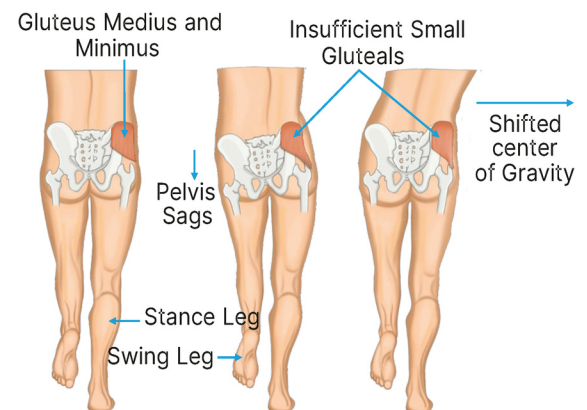
Muscle	Nerve Supply	Action
Gluteus maximus	Inferior gluteal nerve (L5-S2)	Hip extension, external rotation
Gluteus medius	Superior gluteal nerve (L4-S1)	Hip abduction, pelvic stabilization (while walking)
Gluteus minimus		
Piriformis	Nerve to piriformis	Lateral rotation at hip
Gemellus superior	Nerve to obturator internus	
Obturator internus		
Gemellus inferior	Nerve to quadratus femoris	
Quadratus femoris		



Q3.2: What is the Trendelenburg sign and its gait implications?

Answer:

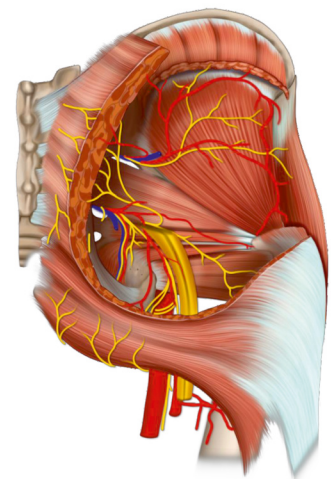
- Normal function: When standing on one foot, the gluteus medius & minimus on the weight-bearing side elevate the contralateral pelvis
- Positive Trendelenburg: Weak/paralyzed muscles → pelvic drop on unsupported side
 - Right gluteus medius paralysis → Left pelvis drop
- Gait types:
 - Lurching gait: unilateral sag
 - Waddling gait: bilateral sag



Q3.3: What structures pass through the greater and lesser sciatic foramina?

Answer:

Foramen	Structures Passing Through
Greater (above piriformis)	• Superior gluteal nerve, artery, vein
Greater (below piriformis)	• Inferior gluteal nerve, artery, vein • Sciatic nerve • Pudendal nerve • Internal pudendal artery & vein • Nerve to obturator internus • Nerve to quadratus femoris
Lesser	• Pudendal nerve • Internal pudendal artery & vein • Obturator internus tendon



Q3.4: What is the clinical importance of the pudendal nerve and ischial spine?

Answer:

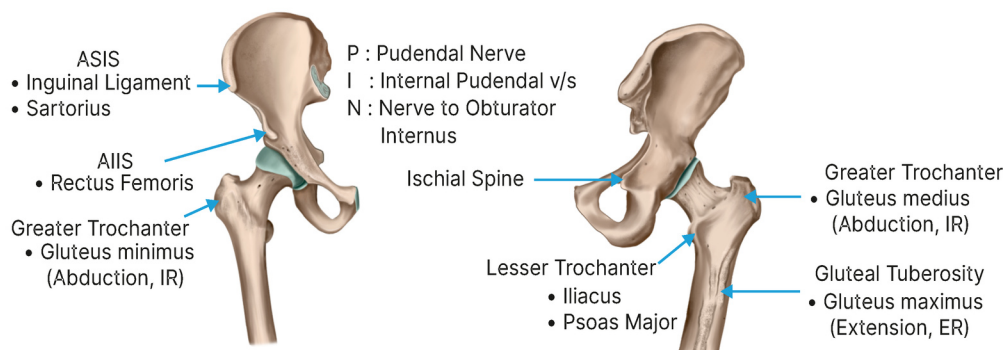
- Pudendal nerve winds around ischial spine
- Site of pudendal block: At ischial spine

Q3.5: What muscles and ligaments attach to the femoral landmarks?

Answer:

Landmark	Attachments
ASIS	Sartorius, Inguinal ligament
AIIS	Rectus femoris
Gluteal tuberosity	Gluteus maximus

Iliotibial tract	Gluteus maximus, Tensor fascia lata
Greater trochanter	Gluteus medius (posterior), Gluteus minimus (anterior)
Lesser trochanter	Iliacus, Psoas major
Ischial spine	Pudendal nerve, Internal pudendal vessels, Nerve to obturator internus



BIG QUESTION 4: What is the structure and clinical significance of the tarsal tunnel and ankle joint?

Broad Answer:

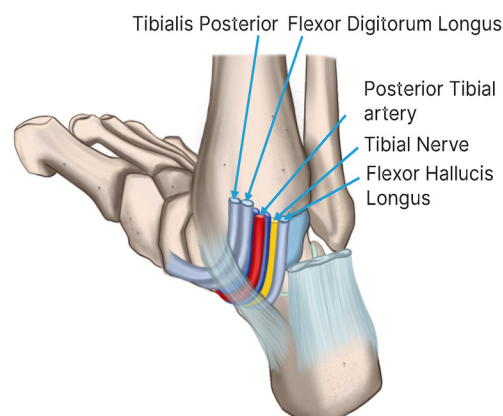
- Between medial malleolus and calcaneus: Flexor retinaculum (fibrous band)
- The tarsal tunnel transmits tendons, vessels, and the tibial nerve. Compression causes tarsal tunnel syndrome.
- The ankle joint is a hinge-type joint, stabilized by medial (deltoid) and lateral (collateral) ligaments that are often injured during inversion or eversion injuries.

DETAILED QUESTIONS

Q4.1: What are the boundaries and contents of the tarsal tunnel?

Answer:

- Location: Between medial malleolus and calcaneus
- Roof: Flexor retinaculum
- Content - **Mnemonic: Tom, Dick And Nervous Harry**
 - o T: Tendon of Tibialis posterior
 - o D: Tendon of Flexor digitorum longus
 - o A: Posterior tibial artery
 - o N: Tibial nerve
 - o H: Tendon of Flexor hallucis longus



Q4.2: What is tarsal tunnel syndrome?

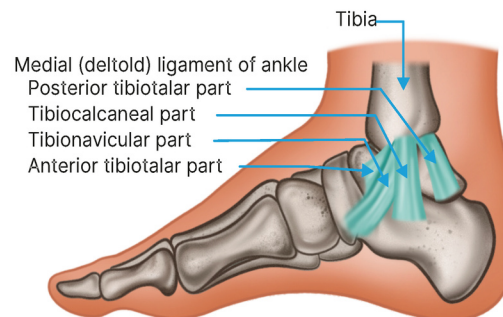
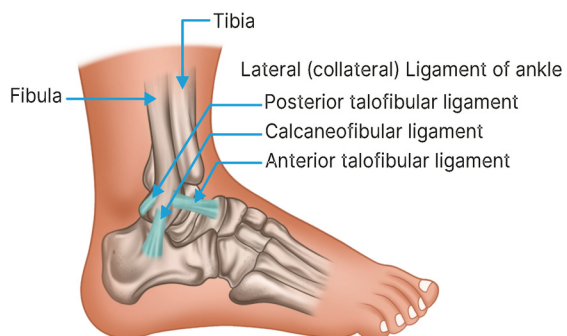
Answer:

- Tibial nerve compression in tarsal tunnel
- Symptoms: Pain, tingling, burning in sole of foot
- Peripheral pulse: Between medial malleolus and calcaneus → Posterior tibial artery

Q4.3: What are the structural features of the ankle joint?

Answer:

- Joint type: Hinge joint
- Articulations: Tibia, fibula, talus



Q4.4: What are the medial (deltoid) ligament components?

Answer:

- Anterior tibio-talar ligament
- Posterior tibio-talar ligament
- Tibio-calcaneal ligament
- Tibio-navicular ligament

Q4.5: What are the lateral (collateral) ligament components?

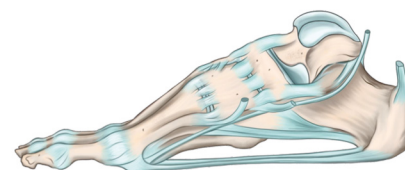
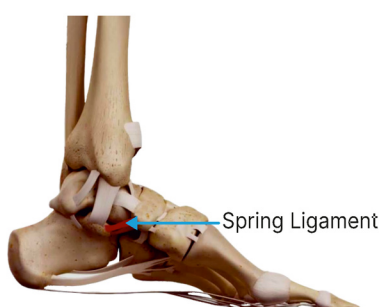
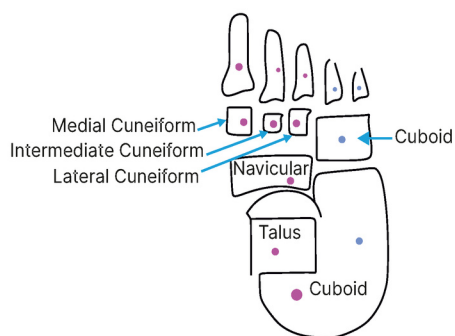
Answer:

- Anterior talo-fibular ligament
- Posterior talo-fibular ligament
- Calcaneo-fibular ligament

BIG QUESTION 5: What are the arches of the foot, their anatomical supports, and how are dermatomes distributed in the lower limb?

Broad Answer:

- The foot has medial and lateral longitudinal arches that distribute body weight and provide elasticity during walking.
- These are supported by bones, ligaments, muscles, and tendons.
- Dermatomes of the lower limb follow a predictable pattern, important in assessing nerve root integrity.



DETAILED QUESTIONS

Q5.1: What are the components of the medial longitudinal arch?

Answer:

Feature	Details
Bones	Calcaneum, talus, navicular, 3rd cuneiform, 1st-3rd metatarsals
Summit	Talus

Joint	Talocalcaneonavicular (ball & socket joint)
Ligament	Spring ligament (plantar calcaneonavicular ligament)
Tie Beams	Plantar aponeurosis, tendon of FHL, medial half of FDB
Slings	Tibialis anterior, Tibialis posterior, FHL, FDL

Q5.2: What are the components of the lateral longitudinal arch?

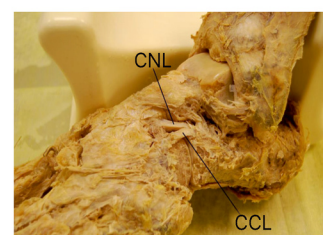
Answer:

Feature	Details
Bones	Calcaneum, cuboid, 4th & 5th metatarsals
Summit	Calcaneum
Joint	Calcaneocuboid (saddle joint)
Ligament	Short and long plantar ligaments
Tie Beams	Plantar aponeurosis, lateral half of FDB
Slings	Peroneus longus, Peroneus brevis

Q5.3: What is the bifurcate ligament and its components?

Answer:

- Bifurcate ligament has two parts:
 - o Calcaneonavicular ligament
 - o Calcaneocuboid ligament



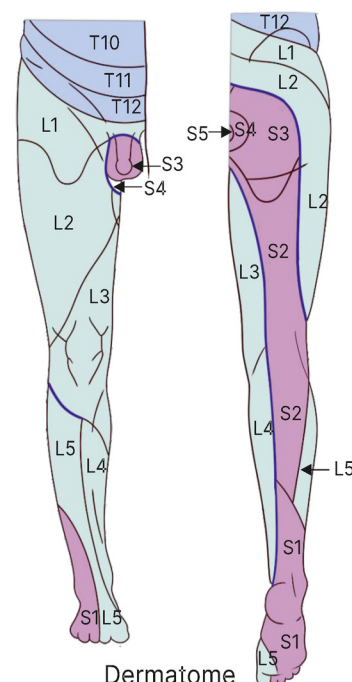
Bifurcate ligament

Q5.4: What is the dermatome distribution in the lower limb?

Answer:

Dermatome	Region Supplied
L1-L3	Upto knee joint
L4	Medial side of leg and foot
L5	Lateral leg and dorsum of foot
S1	Lateral margin of foot
S2	Medial posterior thigh/leg

PYQ: FMGE 2020



Dermatome