Course Title: Human Anotomy II Rad 2nd semester section A

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Q no 1: What is the major features of intracranial fossae of the skull?

Ans: Cranial Fossae

Inside the skull, the floor of the cranial cavity is subdivided into three cranial fossae (spaces), which increase in depth from anterior to posterior, and Since the brain occupies these areas, the shape of each conforms to the shape of the brain regions that it contains. Each cranial fossa has anterior and posterior boundaries and is divided at the midline into right and left areas by a significant bony structure or opening.

Anterior Cranial Fossa

The anterior cranial fossa is the most anterior and the shallowest of the three cranial fossae. It overlies the orbits and contains the frontal lobes of the brain. Anteriorly, the anterior fossa is bounded by the frontal bone, which also forms the majority of the floor for this space. The lesser wings of the sphenoid bone form the prominent ledge that marks the boundary between the anterior and middle cranial fossae. Located in the floor of the anterior cranial fossa at the midline is a portion of the ethmoid bone, consisting of the upward projecting crista galli and to either side of this, the cribriform plates.

Middle Cranial Fossa

The middle cranial fossa is deeper and situated posterior to the anterior fossa. It extends from the lesser wings of the sphenoid bone anteriorly, to the petrous ridges (petrous portion of the temporal bones) posteriorly. The large, diagonally positioned petrous ridges give the middle cranial fossa a butterfly shape, making it narrow at the midline and broad laterally. The temporal lobes of the brain occupy this fossa. The middle cranial fossa is divided at the midline by the upward bony prominence of the sella turcica, a part of the sphenoid bone. The middle cranial fossa has several openings for the passage of blood vessels and cranial nerves.

Openings in the middle cranial fossa are as follows:

- *Optic canal—This opening is located at the anterior lateral corner of the sella turcica. It provides for passage of the optic nerve into the orbit.*
- *Superior orbital fissure—This large, irregular opening into the posterior orbit is located on the anterior wall of the middle cranial fossa, lateral to the optic canal and under the projecting margin of the lesser wing of the sphenoid bone. Nerves to the eyeball and associated muscles, and sensory nerves to the forehead pass through this opening.*
- *Foramen rotundum—This rounded opening (rotundum = "round") is located in the floor of the middle cranial fossa, just inferior to the superior orbital fissure. It is the exit point for a major sensory nerve that supplies the cheek, nose, and upper teeth.*
- *Foramen ovale of the middle cranial fossa—This large, oval-shaped opening in the floor of the middle cranial fossa provides passage for a major sensory nerve to the lateral head, cheek, chin, and lower teeth.*
- *Foramen spinosum—This small opening, located posterior-lateral to the foramen ovale, is the entry point for an important artery that supplies the covering layers surrounding the brain. The branching pattern of this artery forms readily visible grooves on the internal surface of the skull and these grooves can be traced back to their origin at the foramen spinosum.*
- *Carotid canal—This is the zig-zag passageway through which a major artery to the brain enters the skull. The entrance to the carotid canal is located on the inferior aspect of the skull, anteromedial to the styloid process. From here, the canal runs anteromedially within the bony base of the skull. Just above the foramen lacerum, the carotid canal opens into the middle cranial cavity, near the posterior-lateral base of the sella turcica.*
- *Foramen lacerum—This irregular opening is located in the base of the skull, immediately inferior to the exit of the carotid canal. This opening is an artifact of the dry skull, because in life it is completely filled with cartilage. All the openings of the skull that provide for passage of nerves or blood vessels have smooth margins; the word lacerum ("ragged" or "torn") tells us that this opening has ragged edges and thus nothing passes through it.*

Posterior Cranial Fossa

The posterior cranial fossa is the most posterior and deepest portion of the cranial cavity. It contains the cerebellum of the brain. The posterior fossa is bounded anteriorly by the petrous ridges, while the occipital bone forms the floor and posterior wall. It is divided at the midline by the large foramen magnum ("great aperture"), the opening that provides for passage of the spinal cord.

Located on the medial wall of the petrous ridge in the posterior cranial fossa is the internal acoustic meatus. This opening provides for passage of the nerve from the hearing and equilibrium organs of the inner ear, and the nerve that supplies the muscles of the face. Located at the anterior-lateral margin of the foramen magnum is the hypoglossal canal. These emerge on the inferior aspect of the skull at the base of the occipital condyle and provide passage for an important nerve to the tongue.

Immediately inferior to the internal acoustic meatus is the large, irregularly shaped jugular foramen. Several cranial nerves from the brain exit the skull via this opening. It is also the exit point through the base of the skull for all the venous return blood leaving the brain. The venous structures that carry blood inside the skull form large, curved grooves on the inner walls of the posterior cranial fossa, which terminate at each jugular foramen.

Paranasal Sinuses

The paranasal sinuses are hollow, air-filled spaces located within certain bones of the skull. All of the sinuses communicate with the nasal cavity (paranasal = "next to nasal cavity") and are lined with nasal mucosa. They serve to reduce bone mass and thus lighten the skull, and they also add resonance to the voice. This second feature is most obvious when you have a cold or sinus congestion. These produce swelling of the mucosa and excess mucus production, which can obstruct the narrow passageways between the sinuses and the nasal cavity, causing your voice to sound different to yourself and others. This blockage can also allow the sinuses to fill with fluid, with the resulting pressure producing pain and discomfort.

The paranasal sinuses are named for the skull bone that each occupies.
The frontal sinus is located just above the eyebrows, within the frontal bone. This irregular space may be divided at the midline into bilateral spaces, or these may be fused into a single sinus space. The frontal sinus is the most anterior of the paranasal sinuses. The largest sinus is the maxillary sinus. These are paired and located within the right and left maxillary bones, where they occupy the area just below the orbits. The maxillary sinuses are most commonly involved during sinus infections. Because their connection to the nasal cavity is located high on their medial wall, they are difficult to drain. The sphenoid sinus is a single, midline sinus. It is located within the body of the sphenoid bone, just anterior and inferior to the sella turcica, thus making it the most posterior of the paranasal sinuses. The lateral aspects of the ethmoid bone contain multiple small spaces separated by very thin bony walls. Each of these spaces is called an ethmoid air cell. These are located on both sides of the

ethmoid bone, between the upper nasal cavity and medial orbit, just behind the superior nasal conchae.

Qno 2: write a note on the cranial nerve?

Ans:

Cranial Nerve:

The cranial nerves are a set of 12 paired nerves that arise directly from the brain.

The first two nerves (olfactory and optic) arise from the cerebrum, whereas the remaining ten emerge from the brain stem.

The names of the cranial nerves relate to their function and they are also numerically identified in roman numerals (I-XII).

Origin of the Cranial Nerves
There are twelve cranial nerves in total.

The olfactory nerve (CN I) and optic nerve (CN II) originate from the cerebrum.

Cranial nerves III – XII arise from the brain stem (Figure 1). They can arise from a specific part of the brain stem (midbrain, pons or medulla), or from a junction between two parts:

- *Midbrain – the trochlear nerve (IV) comes from the posterior side of the midbrain. It has the longest intracranial length of all the cranial nerves.*
- *Midbrain-pontine junction – oculomotor (III).*
- *Pons – trigeminal (V).*
- *Pontine-medulla junction – abducens, facial, vestibulocochlear (VI-VIII).*
- *Medulla oblongata – posterior to the olive: glossopharyngeal, vagus, accessory (IX-XI). Anterior to the olive: hypoglossal (XII).*

The cranial nerves are numbered by their location on the brain stem (superior to inferior, then medial to lateral) and the order of their exit from the cranium (anterior to posterior) (Figures 1 & 2).

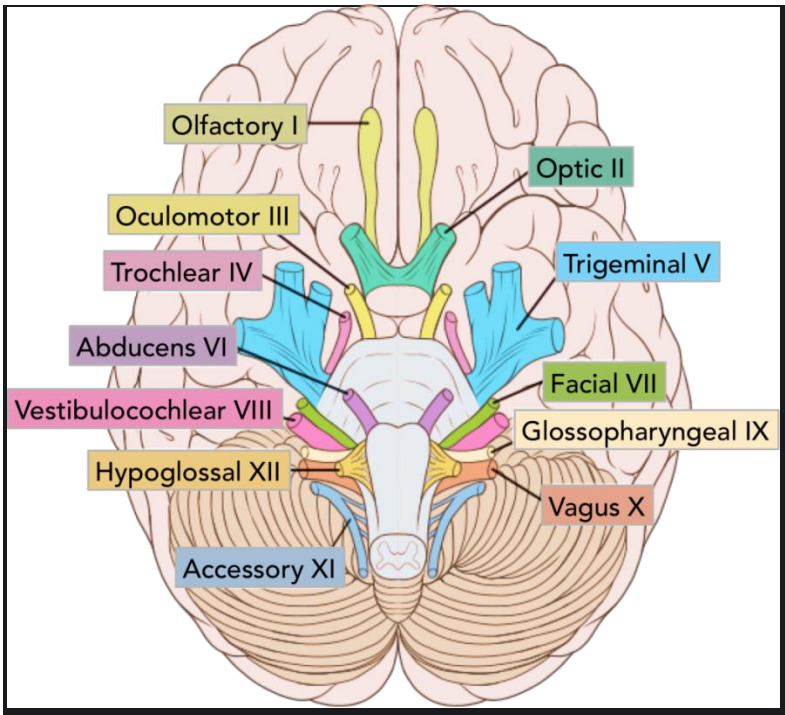


Figure 1 – The location of the cranial nerves on the cerebrum and brainstem.

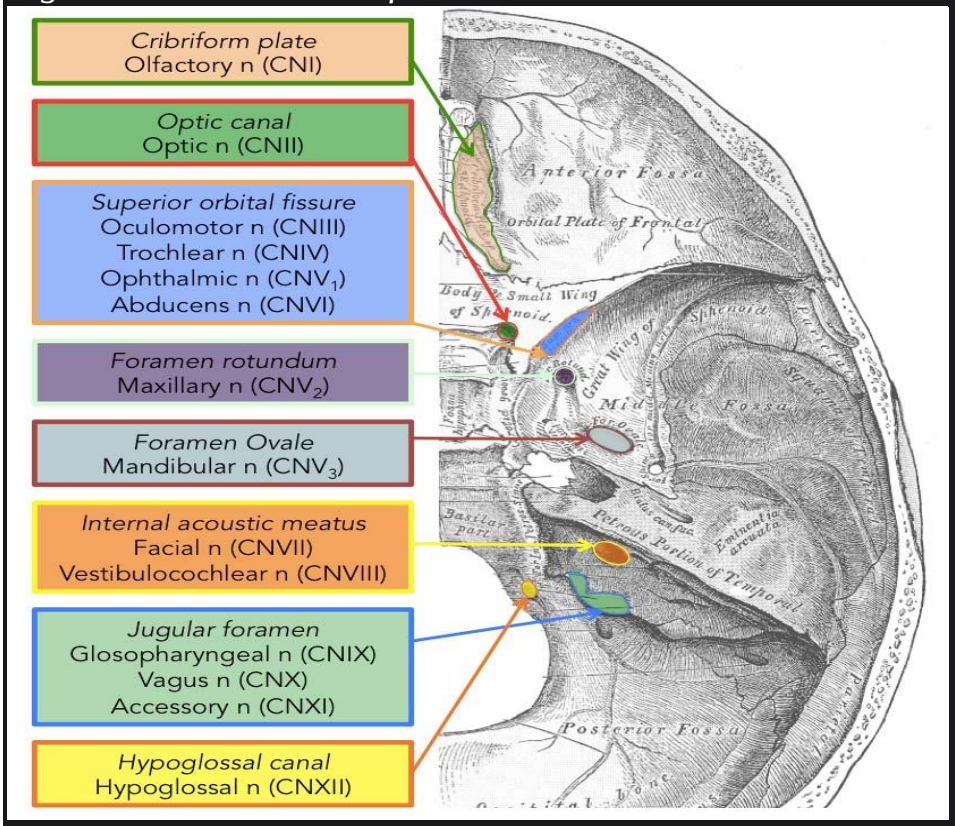


Figure 2 – Superior view of the skull base showing the foramina and which cranial nerves pass through them.

Tip: Cranial nerves with the number 2 in them (e.g. 2-optic and 12-hypoglossal) exit through a canal of the same name. They are the only cranial nerves to pass through canals.

Modalities

Simplistically, each cranial nerve can be described as being sensory, motor or both. They can more specifically transmit seven types of information; three are unique to cranial nerves (SSS, SVS and SVM). See table 1 for a summary of the cranial nerves, their modalities and functions.

Sensory (afferent) Modalities:

- *General somatic sensory (GSS) – general sensation from skin.*
- *General visceral sensory (GVS) – general sensation from viscera.*
- *Special somatic sensory (SSS) – senses derived from ectoderm (e.g. sight, sound, balance).*
- *Special visceral sensory (SVS) – senses derived from endoderm (e.g. taste, smell).*

Motor (efferent) Modalities:

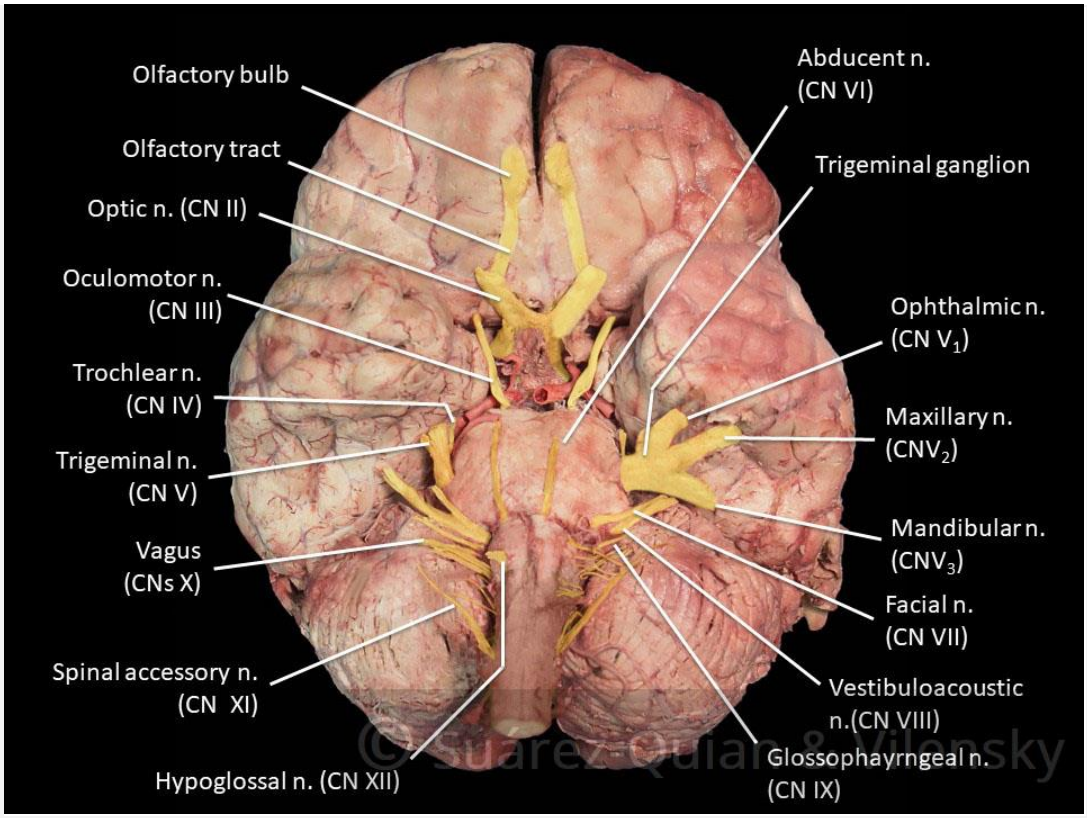
- *General somatic motor (GSM) – skeletal muscles.*
- *General visceral motor (GVM) – smooth muscles of gut and autonomic motor.*
- *Special visceral motor (SVM) – muscles derived from pharyngeal arches.*

Summary Table

Number	*Name*	*Exit*	*Modality*
1 (CNI)	*Olfactory*	*Cribriform plate*	*Sensory (SVS)*
2 (CNII)	*Optic*	*Optic canal*	*Sensory (SSS)*
3 (CNIII)	*Oculomotor*	*Superior orbital fissure*	*Motor (GSM & GVM)*
4 (CNIV)	*Trochlear*	*Superior orbital fissure*	*Motor (GSM)*
5 (CNV)	*Trigeminal:*		

Number	*Name*	*Exit*	*Modality*
	Ophthalmic	*Superior orbital fissure*	*GSS*
	Maxillary	*F. rotundum*	*GSS*
	Mandibular	*F. ovale*	*GSS* *SVM*
6 (CNVI)	*Abducens*	*Superior orbital fissure*	*Motor* *(GSM)*
7 (CNVII)	*Facial*	*Internal acoustic meatus > stylomastoid f.*	*Both:* *GSS* *SVS* *SVM* *GVM*
8 (CNVIII)	*Vestibulocochlear*	*Internal acoustic meatus*	*Sensory* *(SSS)*
9 (CNIX)	*Glossopharyngeal*	*Jugular f.*	*Both:* *GSS* *GVS* *SVS* *GVM* *SVM*
10(CNX)	*Vagus*	*Jugular f.*	*Both:* *GSS* *GVS*

Number	*Name*	*Exit*	*Modality*
			SVS *GVM* *SVM*
11 (CNXI)	*Spinal accessory*	*Jugular f.*	*Motor* *(GSM & SVM)*
12 (CNXII)	*Hypoglossal*	*Hypoglossal canal*	*Motor* *(GSM)*



Prosection 1 – The base of the cerebrum, demonstrating the origin of the cranial nerves.

Qno3: write a note on the silent features of norma frontalis and norma occipitals of the skull?

Ans:

Norma Frontalis

When viewed from the front the skull exhibits a somewhat oval outline, limited above by the frontal bone, below by the body of the mandible, and laterally by the zygomatic bones and the mandibular rami. The upper part, formed by the frontal squama, is smooth and convex.

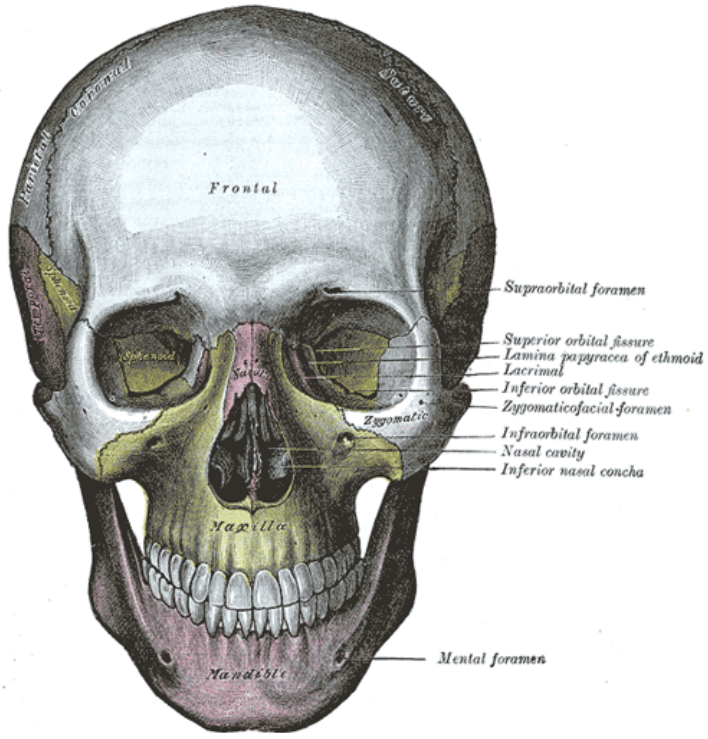
The lower part, made up of the bones of the face, is irregular; it is excavated laterally by the orbital cavities, and presents in the middle line the anterior nasal aperture leading to the nasal cavities, and below this the transverse slit between the upper and lower dental arcades.

Above, the frontal eminences stand out more or less prominently, and beneath these are the superciliary arches, joined to one another in the middle by the glabella.

On and above the glabella a trace of the frontal suture sometimes persists; beneath it is the frontonasal suture, the mid-point of which is termed the nasion.

Behind and below the frontonasal suture the frontal articulates with the frontal process of the maxilla and with the lacrimal. Arching transversely below the superciliary arches is the upper part of the margin of the orbit, thin and prominent in its lateral two-thirds, rounded in its medial third, and presenting, at the junction of these two portions, the supraorbital notch or foramen for the supraorbital nerve and vessels. The supraorbital margin ends laterally in the zygomatic process which articulates with the zygomatic bone, and from it the temporal line extends upward and backward. Below the frontonasal suture is the bridge of the nose, convex from side to side, concavo-convex from above downward, and formed by the two nasal bones supported in the middle line by the perpendicular plate of the ethmoid, and laterally by the frontal processes of the maxillæ which are prolonged upward between the nasal and lacrimal bones and form the lower and medial part of the circumference of each orbit. Below the nasal bones and between the maxillæ is the anterior aperture of the nose, pyriform in shape, with the narrow end directed upward. Laterally this opening is bounded by sharp margins, to which the lateral and alar cartilages of the nose are attached; below, the margins are thicker and curve medialward and forward to end in the anterior nasal spine. On looking into the nasal cavity, the bony septum which separates the nasal cavities presents, in front, a large triangular deficiency; this, in the fresh state, is filled up by the cartilage of the nasal septum; on the lateral wall of each nasal

cavity the anterior part of the inferior nasal concha is visible. Below and lateral to the anterior nasal aperture are the anterior surfaces of the maxillæ, each perforated, near the lower margin of the orbit, by the infraorbital foramen for the passage of the infraorbital nerve and vessels. Below and medial to this foramen is the canine eminence separating the incisive from the canine fossa. Beneath these fossæ are the alveolar processes of the maxillæ containing the upper teeth, which overlap the teeth of the mandible in front. The zygomatic bone on either side forms the prominence of the cheek, the lower and lateral portion of the orbital cavity, and the anterior part of the zygomatic arch. It articulates medially with the maxilla, behind with the zygomatic process of the temporal, and above with the great wing of the sphenoid and the zygomatic process of the frontal; it is perforated by the zygomaticofacial foramen for the passage of the zygomaticofacial nerve. On the body of the mandible is a median ridge, indicating the position of the symphysis; this ridge divides below to enclose the mental protuberance, the lateral angles of which constitute the mental tubercles. Below the incisor teeth is the incisive fossa, and beneath the second premolar tooth the mental foramen which transmits the mental nerve and vessels. The oblique line runs upward from the mental tubercle and is continuous behind with the anterior border of the ramus. The posterior border of the ramus runs downward and forward from the condyle to the angle, which is frequently more or less everted.



The skull from the front.

Norma Occipitalis.

When viewed from behind the cranium presents a more or less circular outline. In the middle line is the posterior part of the sagittal suture connecting the parietal bones; extending downward and lateralward from the hinder end of the sagittal suture is the deeply serrated lambdoidal suture joining the parietals to the occipital and continuous below with the parietomastoid and occipitomastoid sutures; it frequently contains one or more sutural bones. Near the middle of the occipital squama is the external occipital protuberance or inion, and extending lateralward from it on either side is the superior nuchal line, and above this the faintly marked highest nuchal line. The part of the squama above the inion and highest lines is named the planum occipitale, and is covered by the Occipitalis muscle; the part below is termed the planum nuchale, and is divided by the median nuchal line which runs downward and forward from the inion to the foramen magnum; this ridge gives attachment to the ligamentum nuchæ. The muscles attached to the planum nuchale are enumerated on p. 130. Below and in front are the mastoid processes, convex laterally and grooved medially by the mastoid notches. In or near the occipitomastoid suture is the mastoid foramen for the passage of the mastoid emissary vein.

Q no 4: What do you know the about the muscles of hip and knee?

Ans:

The Hip Muscles

The hip muscles encompass many muscles of the hip and thigh whose main function is to act on the thigh at the hip joint and stabilize the pelvis. Without them, walking would be impossible. They can be divided into three main groups:

- *Iliopsoas group*
- *Gluteal muscles*
- *Hip adductors*

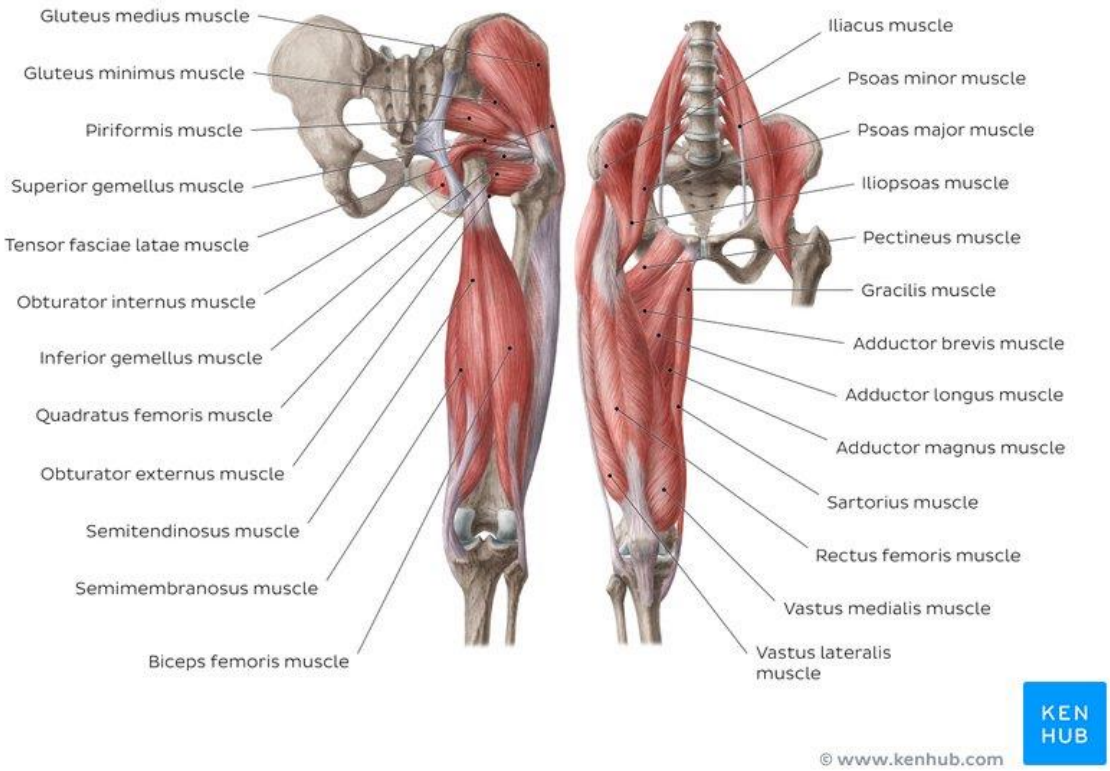
This article will introduce the muscles in each group and touch on their origin, insertion, function, and innervation.

Key facts about hip muscles

Iliopsoas group	*Muscles: iliacus, psoas major, and psoas minor* *Main function: flexion of the trunk and thigh, lateral flexion of the trunk (excluding psoas major and minor only)* *Innervation: anterior rami of spinal nerves L1-L3 and femoral nerve (L2-L4) (iliacus only)*
Gluteal muscles (superficial)	*Muscles: gluteus maximus, gluteus medius, gluteus minimus, and tensor fasciae latae* *Main function: varied – extension, external and internal rotation, abduction and adduction of the thigh* *Innervation: superior (L4, S1) and inferior (L5-S2) gluteal nerves*
Gluteal muscles (deep)	*Muscles: piriformis, gemellus superior, obturator internus, gemellus inferior, obturator externus, and quadratus femoris* *Main function: external rotation and abduction of the thigh; stabilizes head of femur* *Innervation: varied – nerve to piriformis (S1-S2), nerve to obturator internus (L5-S2), nerve to quadratus femoris (L4-S1), obturator nerve (L3-L4)*
Hip adductors	*Muscles: Gracilis, pectineus, adductor longus, adductor brevis, adductor magnus, and adductor minimus* *Main function: Adduction of the thigh at the hip joint* *Innervation: Obturator nerve (L2-L4) and femoral nerve (L2-L3) (pectineus only)*
Clinical points	*Femoral triangle*

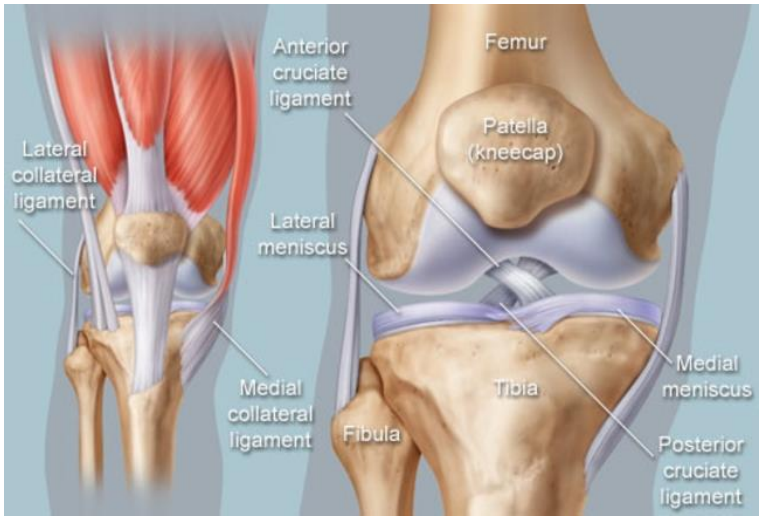
1. *Iliopsoas group*
2. *Iliacus*
3. *Psoas major*
4. *Psoas minor*
5. *Gluteal muscles*
6. *Superficial layer*
7. *Deep layer*
8. *Hip adductors*

9. *Gracilis*
10. *Pectineus*
11. *Adductor longus*
12. *Adductor brevis*
13. *Adductor magnus*
14. *Adductor minimus*



As you can see, there are many hip muscles. Start by learning to identify the muscles of the hip and thigh with this study unit.

Picture of the Knee



The knee is one of the largest and most complex joints in the body. The knee joins the thigh bone (femur) to the shin bone (tibia). The smaller bone that runs alongside the tibia (fibula) and the kneecap (patella) are the other bones that make the knee joint.

Tendons connect the knee bones to the leg muscles that move the knee joint. Ligaments join the knee bones and provide stability to the knee:

- *The anterior cruciate ligament prevents the femur from sliding backward on the tibia (or the tibia sliding forward on the femur).*
- *The posterior cruciate ligament prevents the femur from sliding forward on the tibia (or the tibia from sliding backward on the femur).*
- *The medial and lateral collateral ligaments prevent the femur from sliding side to side.*

Two C-shaped pieces of cartilage called the medial and lateral menisci act as shock absorbers between the femur and tibia.

Numerous bursae, or fluid-filled sacs, help the knee move smoothly.

Q no 5: Write a comprehensive note on the femoral triangle?

Ans:

Femoral triangle

The femoral triangle is a hollow area in the anterior thigh. Many large neurovascular structures pass through this area, and can be accessed relatively easily. Thus, it is an area of both anatomical and clinical importance.

we shall look at the borders, contents and clinical correlations of the femoral triangle.

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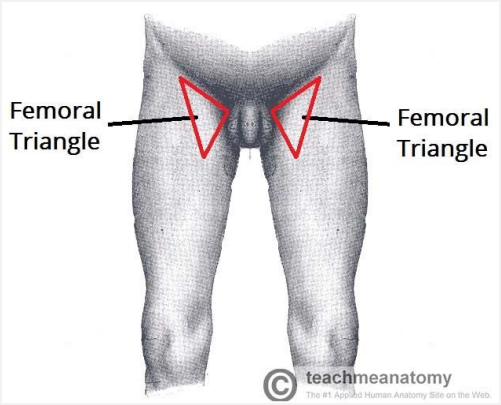

Fig Surface anatomy of the femoral triangle.

Borders

- *Superior border*

Formed by the inguinal ligament, a ligament that runs from the anterior superior iliac spine to the pubic tubercle.

- *Lateral border*

Formed by the medial border of the sartorius muscle.

- *Medial border*

Formed by the medial border of the adductor longus muscle. The rest of this muscle forms part of the floor of the triangle.

- *Note: Some sources consider the lateral border of the adductor longus to be the medial border of the femoral triangle. However, the majority state that it is the medial border of the adductor longus – and this is definition we have gone with.*

It also has a floor and a roof:

- *Anteriorly, the roof of the femoral triangle is formed by the fascia lata.*
- *Posteriorly, the base of the femoral triangle is formed by the pectineus, iliopsoas and adductor longus muscles.*

The inguinal ligament acts as a flexor retinaculum, supporting the contents of the femoral triangle during flexion at the hip

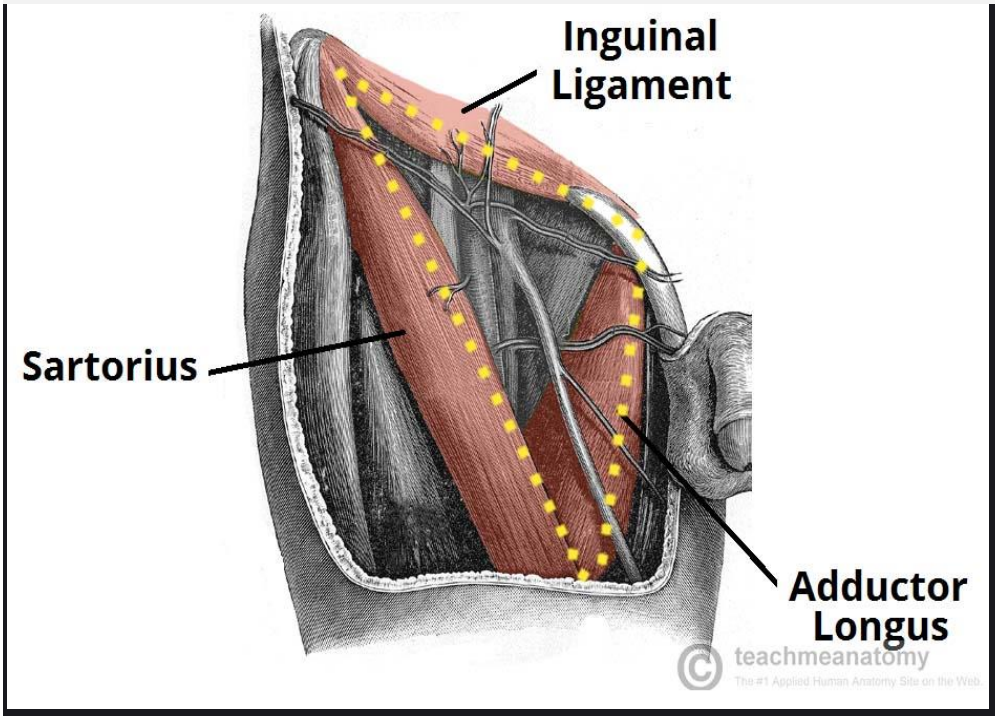

Fig The borders of the right femoral triangle.

The femoral triangle contains some of the major neurovascular structures of the lower limb. Its contents (lateral to medial) are:

- *Femoral nerve – Innervates the anterior compartment of the thigh, and provides sensory branches for the leg and foot.*
- *Femoral artery – Responsible for the majority of the arterial supply to the lower limb.*
- *Femoral vein – The great saphenous vein drains into the femoral vein within the triangle.*
- *Femoral canal – A structure which contains deep lymph nodes and vessels.*

The femoral artery, vein and canal are contained within a fascial compartment – known as the femoral sheath.

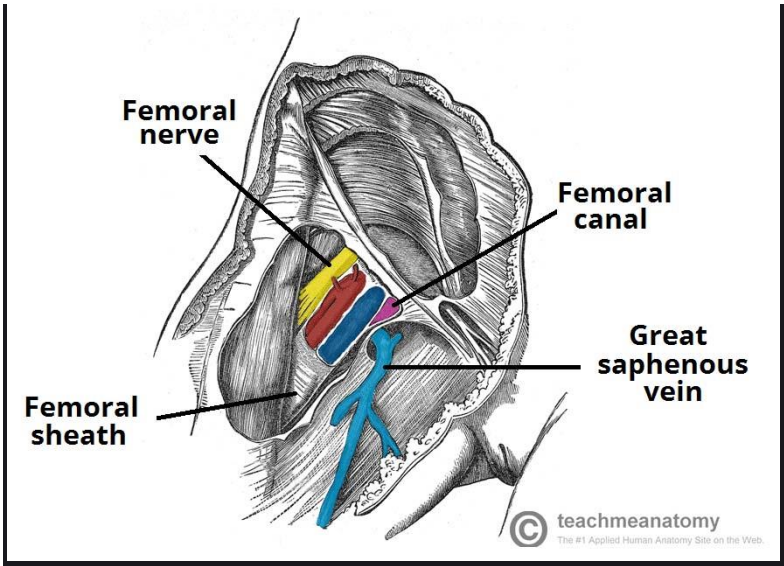

Fig The contents of the femoral triangle.

A good way of remembering the contents is using the acronym NAVEL:

N: Nerve.
A: Artery.
V: Vein.
E: Empty space
L: Lymph canal.

Clinical Relevance: The Femoral Triangle

Femoral Pulse

Just inferior to where the femoral artery crosses the inguinal ligament, it can be palpated to measure the femoral pulse. The femoral artery crosses exactly midway between the pubic symphysis and anterior superior iliac spine (known as the mid-inguinal point).

Access to the Femoral Artery

The femoral artery is located superficially within the femoral triangle, and is thus easy to access. This makes it suitable for a range of clinical procedures.

One such procedure is coronary angiography. Here, the femoral artery is catheterised with a long, thin tube. This tube is navigated up the external iliac artery, common iliac artery, aorta, and into the coronary vessels. A radio-opaque dye is then injected into the coronary vessels, and any wall thickening or blockages can be visualised via x-ray.

Femoral Hernia

A hernia is defined as "a condition in which part of an organ is displaced and protrudes through the wall of the cavity containing it".

In the case of femoral hernia, part of the bowel pushes into the femoral canal, underneath the inguinal ligament.

This manifests clinically as a lump or bulge in the area of the femoral triangle. It usually requires surgical intervention to treat.

The End……..