ANATOMY

ANATOMY

HEAD

HEAD

AREAS	BONES	MUSCLES	NERVES	ORGANS	JOINTS	VESSELS	OTHER
• Scalp • Pterygopalatine Fossa • Infratemporal Fossa • Cranial Fossae	• Skull • Bony Orbit • Sphenoid Bone • Ethmoid Bone • Temporal Bone • Mandible • Nasal Skeleton • Cranial Foramina	• The Tongue • Facial Expression • Extraocular • Mastication	• Sympathetic Innervation • Parasympathetic Innervation • Ophthalmic Nerve • Mandibular Nerve • Maxillary Nerve	• The Ear • The Eye • Nose and Sinuses • Salivary Glands • Oral Cavity	• TMJ	• Arterial Supply • Venous Drainage • Lymphatics	• Lacrimal Gland • Eyelids • Teeth • Palate

HEAD

AREAS

- **SCALP**
- **PTERYGOPALATINE FOSSA**
- **INFRATEMPORAL FOSSA**
- **CRANIAL FOSSA**

CRANIAL FOSSA

Anterior Cranial Fossa

Middle Cranial Fossa

Posterior Cranial Fossa

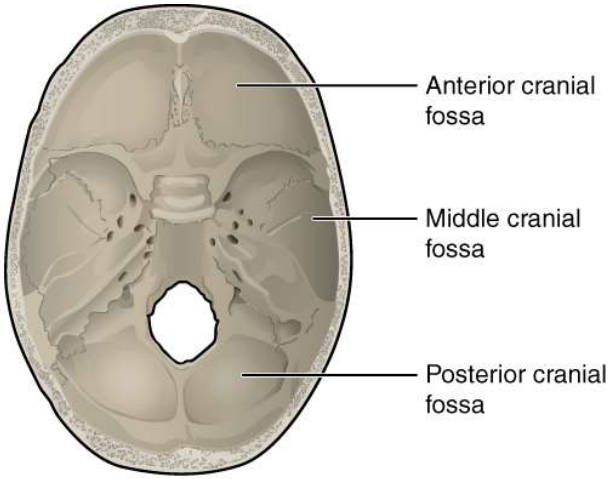
Anterior Cranial Fossa

Contents

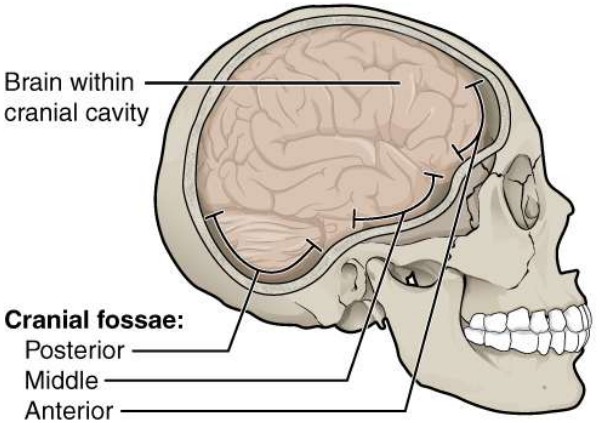
Anterior Cranial Fossa

- The floor of the **cranial cavity** is divided into three distinct depressions. They are known as the anterior cranial fossa, middle cranial fossa and posterior cranial fossa. Each fossa accommodates a different part of the brain.
- The anterior cranial fossa is the most shallow and superior of the three cranial fossae. It lies superiorly over the **nasal** and **orbital cavities**. The fossa accommodates the anteroinferior portions of the **frontal lobes** of the brain.
- In this article, we shall look at the borders, contents and clinical correlations of the anterior cranial fossa.

Cranial Fossa



Superior view



Lateral view

Anterior Cranial Fossa

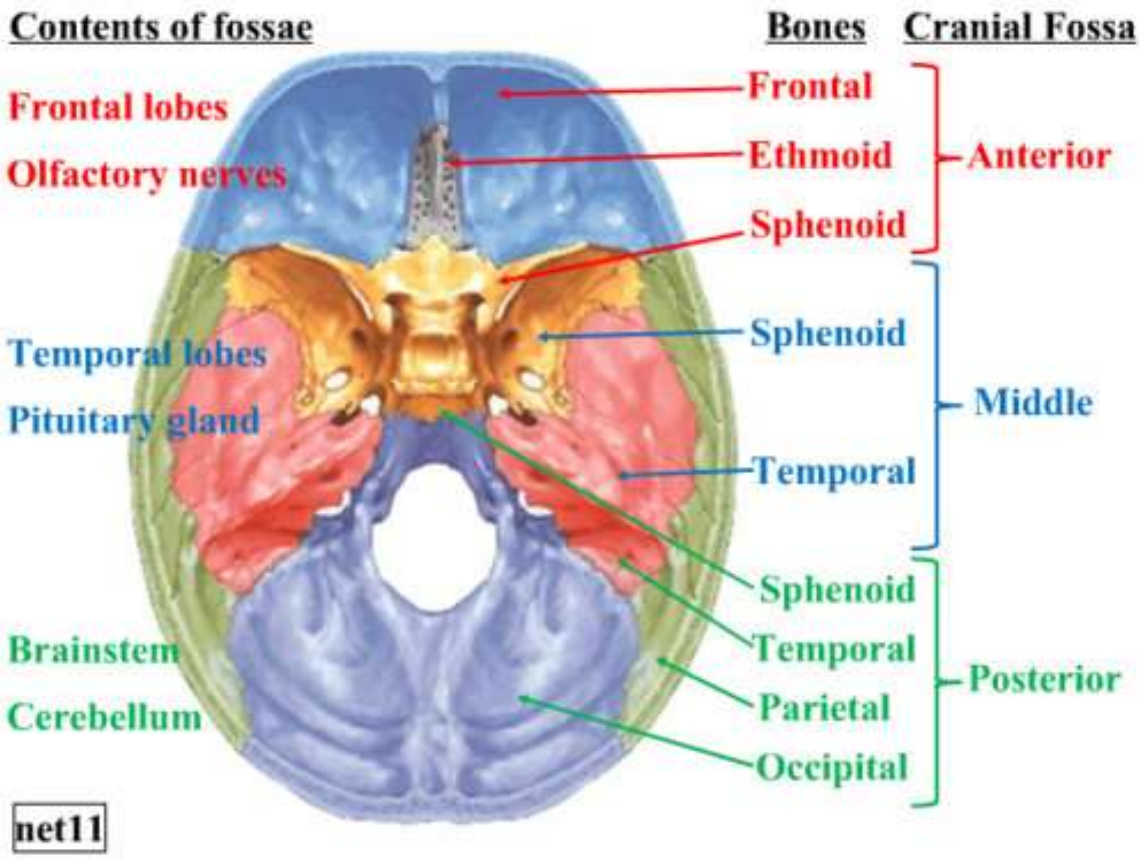
Borders

The anterior cranial fossa consists of three bones: the **frontal** bone, **ethmoid** bone and **sphenoid** bone.

It is bounded as follows:

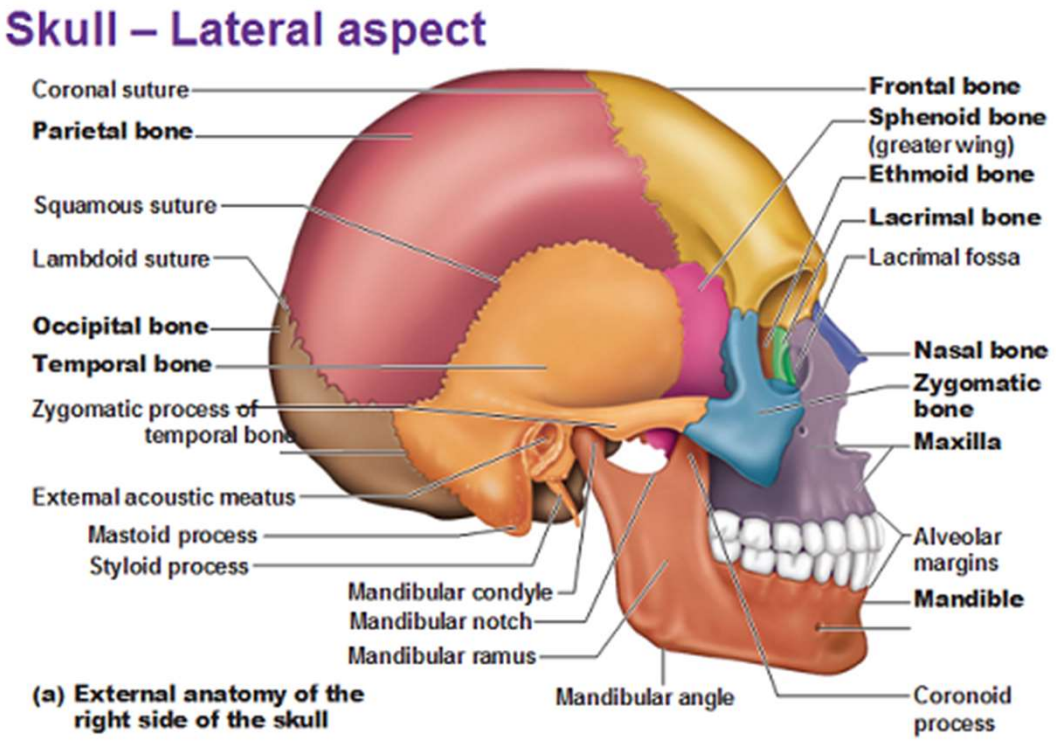
- **Anteriorly and laterally** it is bounded by the inner surface of the frontal bone.
- **Posteriorly and medially** it is bounded by the limbus of the sphenoid bone. The limbus is a bony ridge that forms the anterior border of the Prechiasmatic sulcus (a groove running between the right and left optic canals).
- **Posteriorly and laterally** it is bounded by the lesser wings of the sphenoid bone (these are two triangular projections of bone that arise from the central sphenoid body).
- **The floor** consists of the frontal bone, ethmoid bone and the anterior aspects of the body and lesser wings of the sphenoid bone

Cranial Fossa



Cranial Fossa

Anterior cranial Fossa



Anterior Cranial Fossa

Contents

There are several bony landmarks present in the anterior cranial fossa.

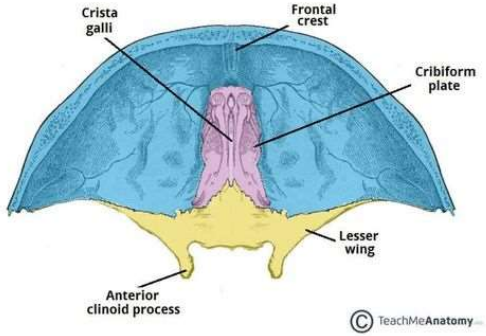
- The **frontal bone** is marked in the midline by a body ridge, known as the **frontal crest**. It projects upwards, and acts as a site of attachment for the falx cerebri (a sheet of dura mater that divides the two cerebral hemispheres).
- In the midline of the **ethmoid bone**, the **crista galli** (latin for cock's comb) is situated. This is an upwards projection of bone, which acts as another point of attachment for the falx cerebri.
- On either side of the crista galli is the **cribriform plate** which supports the **olfactory bulb** and has numerous foramina that transmit vessels and nerves.
- The anterior aspect of the **sphenoid bone** lies within the anterior cranial fossa. From the central body, the **lesser wings** arise. The rounded ends of the lesser wings are known as the anterior clinoid processes. They serve as a place of attachment for the tentorium cerebelli (a sheet of dura mater that divides the cerebrum from the cerebellum). The **lesser wings of the sphenoid bone** also separate the anterior and middle cranial fossae.

Anterior Cranial Fossa

Contents

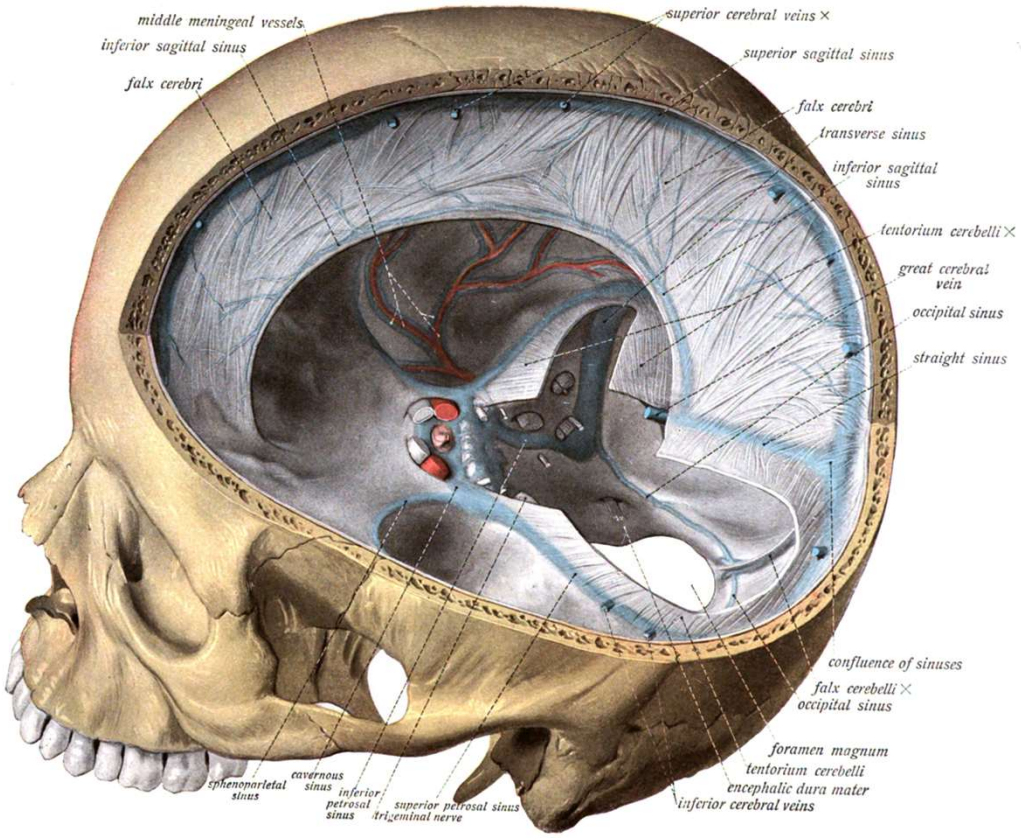
Anterior Cranial Fossa : Contents

- **Frontal crest**: acts as a site of attachment for the falx cerebri (a sheet of dura mater that divides the two cerebral hemispheres)
- **Crista galli**: midline of ethmoid bone, acts as another point of attachment for the falx cerebri
- **Cribriform plate**: on either site of the crista galli, supports the **olfactory bulb** and has numerous foramina that transmit vessels and nerves.
- **Anterior clinoid processes**: rounded ends of the lesser wings, serve as a place of attachment for the **tentorium cerebelli** (a sheet of dura mater that divides the cerebrum from the cerebellum)



Anterior Cranial Fossa

Falx Cerebri



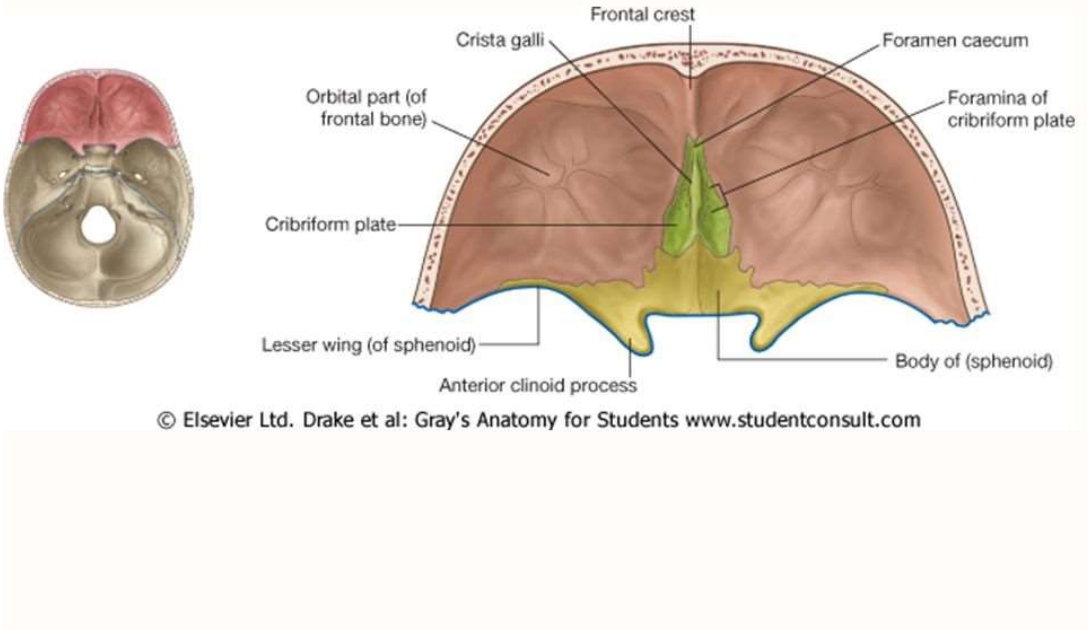
Anterior Cranial Fossa

Foramina

- The ethmoid bone in particular contains the main foramina (openings that transmit vessels and nerves) of the anterior cranial fossa. The **cribriform plate** is a sheet of bone seen either side of the **crista galli** which contains numerous small foramina – these transmit olfactory nerve fibres (CN I) into the nasal cavity. It also contains two larger foramen:
- **Anterior ethmoidal foramen** – transmits the anterior ethmoidal artery, nerve and vein.
- **Posterior ethmoidal foramen** – transmits the posterior ethmoidal artery, nerve and vein.

Anterior Cranial Fossa

Foramina



Anterior Cranial Fossa

Clinical Relevance: Fracture of the Cribriform Plate

- The **cribriform plate** of the ethmoid is the thinnest part of the anterior cranial fossa, and therefore most likely to fracture. There are two major consequences of cribriform plate fracture:
- **Anosmia** – the olfactory nerve fibres run through the cribriform plate, and can be 'sheared', resulting in loss of sense of smell.
- **CSF rhinorrhoea** – the fragments of bone can tear the meningeal coverings of the brain, causing the leakage of cerebrospinal fluid into the nasal cavity. This is visible as a clear fluid.

ANATOMY

HEAD

AREAS OF THE HEAD

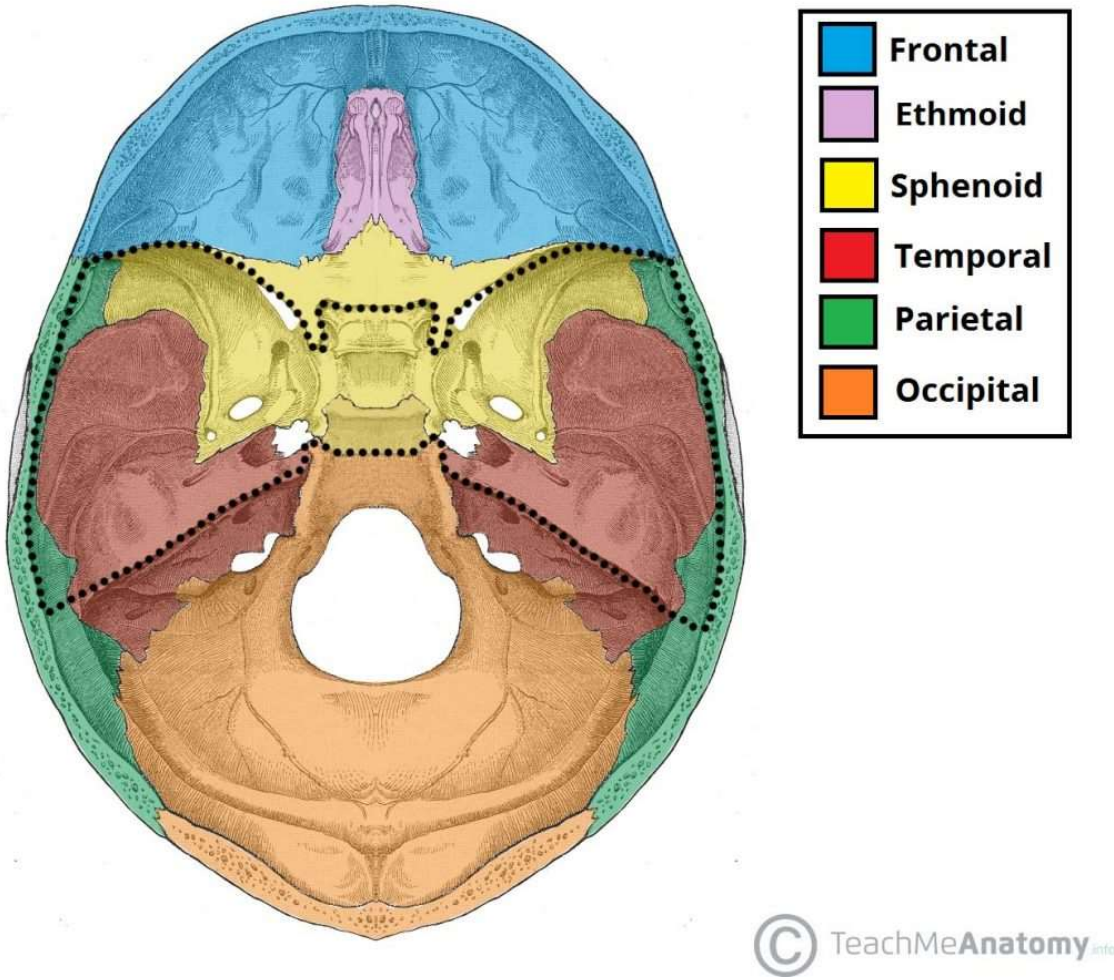
AREAS

- **SCALP**
- **PTERYGOPALATINE FOSSA**
- **INFRATEMPORAL FOSSA**
- **CRANIAL FOSSA**

MIDDLE CRANIAL FOSSA

Contents

Middle Cranial Fossa

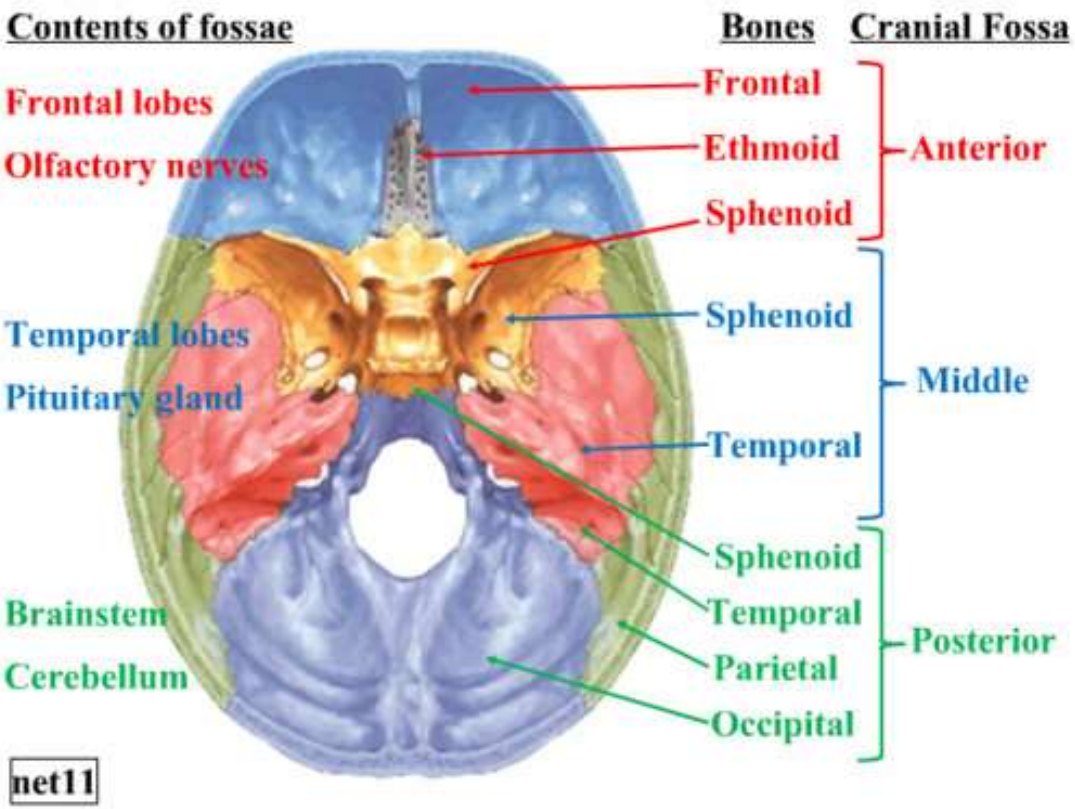


MIDDLE CRANIAL FOSSA

- The floor of the cranial cavity is divided into three distinct depressions. They are known as the Anterior cranial fossa, middle cranial fossa and posterior cranial fossa. Each fossa accommodates a different part of the brain.
- The middle cranial fossa is located, as its name suggests, centrally in the cranial floor. It is said to be “butterfly shaped”, with a middle part accommodating the **pituitary gland** and two lateral parts accommodating the **temporal lobes** of the brain
- In this article, we shall look at the borders, contents and clinical correlations of the middle cranial fossa.

Middle Cranial Fossa

Formation



MIDDLE CRANIAL FOSSA

Borders

The middle cranial fossa consists of three bones – the **sphenoid** bone and the two **temporal** bones.

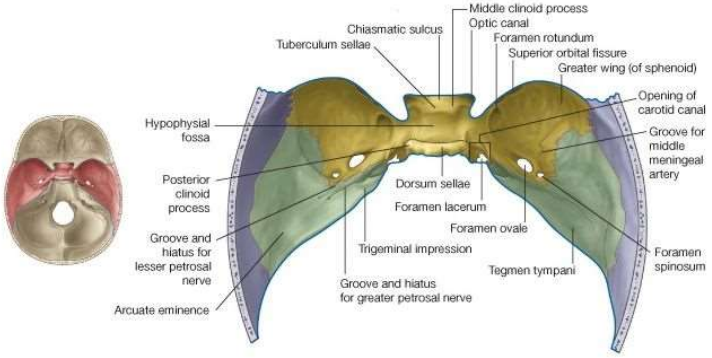
Its boundaries are as follows:

- **Anteriorly and laterally** it is bounded by the lesser wings of the sphenoid bone. These are two triangular projections of bone that arise from the central sphenoid body.
- **Anteriorly and medially** it is bounded by the limbus of the sphenoid bone. The limbus is a bony ridge that forms the anterior border of the chiasmatic sulcus (a groove running between the right and left optic canals).
- **Posteriorly and laterally** it is bounded by the superior border of the petrous part of the temporal bone.
- **Posteriorly and medially** it is bounded by the dorsum sellae of the sphenoid bone. This is a large superior projection of bone that arises from the sphenoidal body.
- The **floor** is formed by the body and greater wing of the sphenoid, and the squamous and petrous parts of the temporal bone.

Middle Cranial Fossa

Boundaries

Middle Cranial Fossa



- **Formed by**: **median part-** body of sphenoid bone

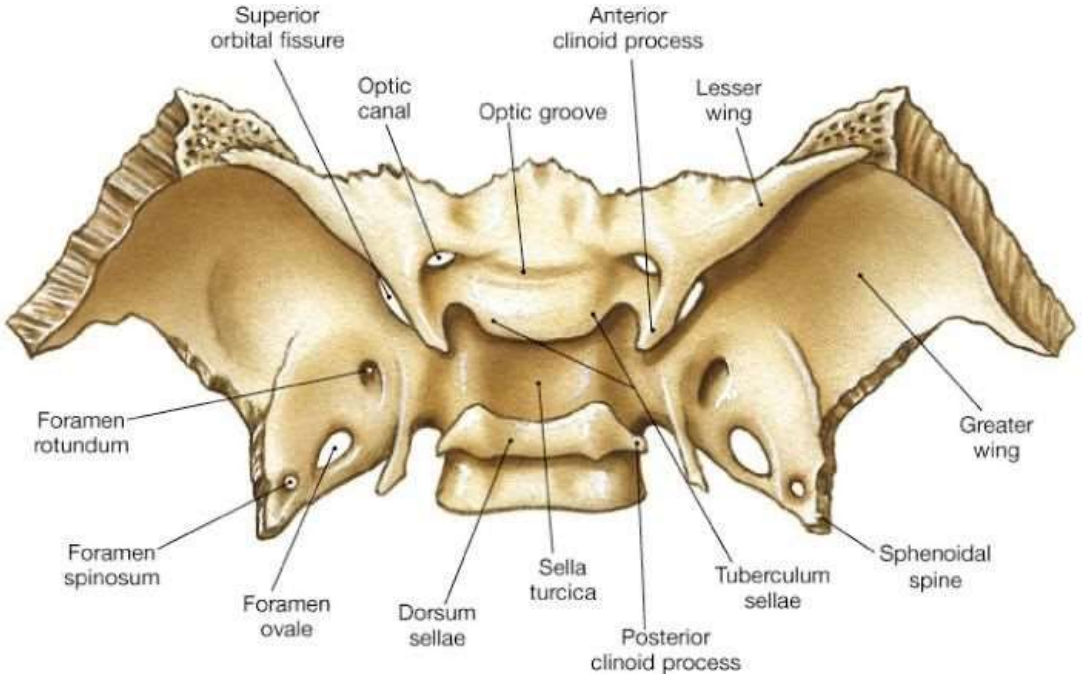
  Lateral concavities - greater wing of sphenoid, squamous and petrous parts of temporal bone.
- **Boundaries**: Ant. lesser wing of sphenoid

  Post. upper border of petrous part of temporal bone

  Lat. greater wing of sphenoid, parietal bone and squamous part of temporal bone.
- **Contains**: the temporal lobes of the brain.

Middle cranial Fossa

Sphenoid Bone



MIDDLE CRANIAL FOSSA

Contents

- The middle cranial fossa consists of a central portion, which contains the **pituitary gland**, and two lateral portions, which accommodate the **temporal lobes** of the brain.
- Both parts of the fossa are marked by numerous bony landmarks, which will be discussed below.

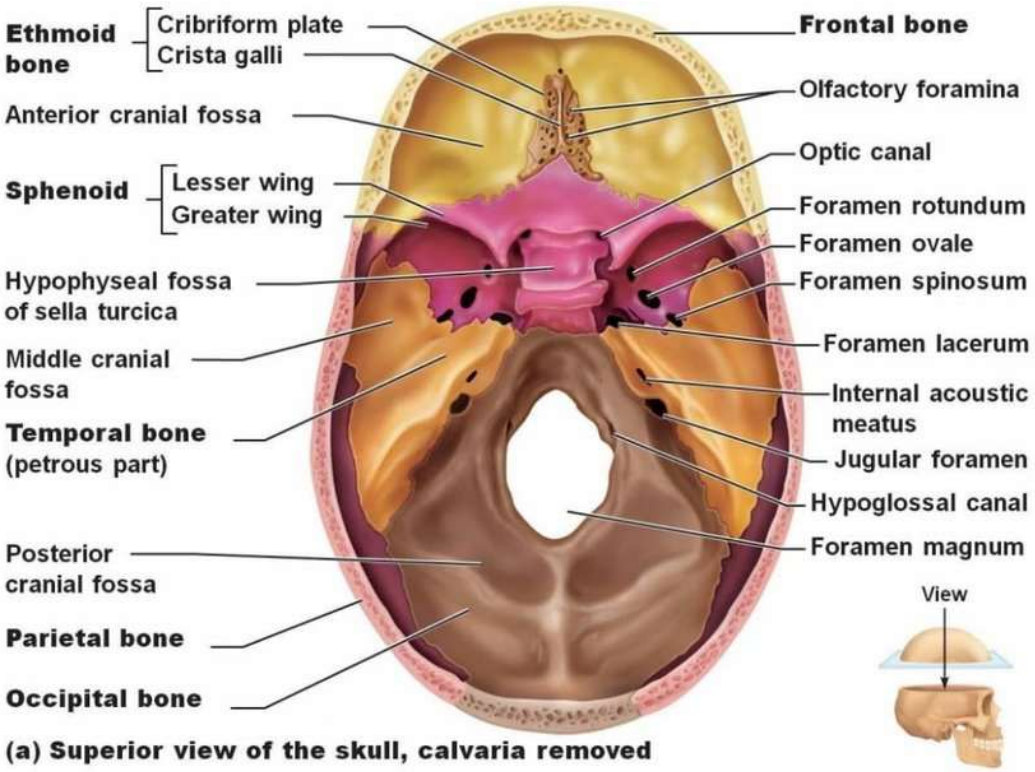
MIDDLE CRANIAL FOSSA

Central Part

- The central part of the middle cranial fossa is formed by the body of the sphenoid bone. It contains the **sella turcica** (latin for Turkish saddle), which is a saddle-shaped bony prominence . It acts to hold and support the pituitary gland, and consists of three parts:
- The **tuberculum sellae** (horn of the saddle) is a vertical elevation of bone. It forms the anterior wall of the sella turcica, and the posterior aspect of the chiasmatic sulcus (a groove running between the right and left optic canals).
- The **hypophysial fossa** or **pituitary fossa** (seat of the saddle) sits in the middle of the sella turcica. It is a depression in the body of the sphenoid, which holds the pituitary gland.
- The **dorsum sellae** (back of the saddle) forms the posterior wall of the sella turcica. It is a large square of bone, pointing upwards and forwards. It separates the middle cranial fossa from the posterior cranial fossa.
- The sella turcica is surrounded by the anterior and posterior **clinoid processes**. The anterior clinoid processes arise from the sphenoidal lesser wings, while the posterior clinoid processes are the superolateral projections of the dorsum sellae. They serve as attachment points for the **tentorium cerebelli**, a membranous sheet that divides the brain.

Middle Cranial Fossa

Central Part



(a) Superior view of the skull, calvaria removed

MIDDLE CRANIAL FOSSA

Lateral Parts

- The depressed lateral parts of the middle cranial fossa are formed by the **greater wings** of the sphenoid bone, and the **squamous** and **petrous** parts of the temporal bones. They support the temporal lobes of the brain. It is the site of many foramina – small holes by which vessels and nerves enter and leave the cranial cavity.

MIDDLE CRANIAL FOSSA

Foramina

- There are many foramina that transmit vessels and nerves into and out of the middle cranial fossa. These foramina will be discussed in relation to the bones they are situated in.

<u>Foramina of the Sphenoid Bone</u>

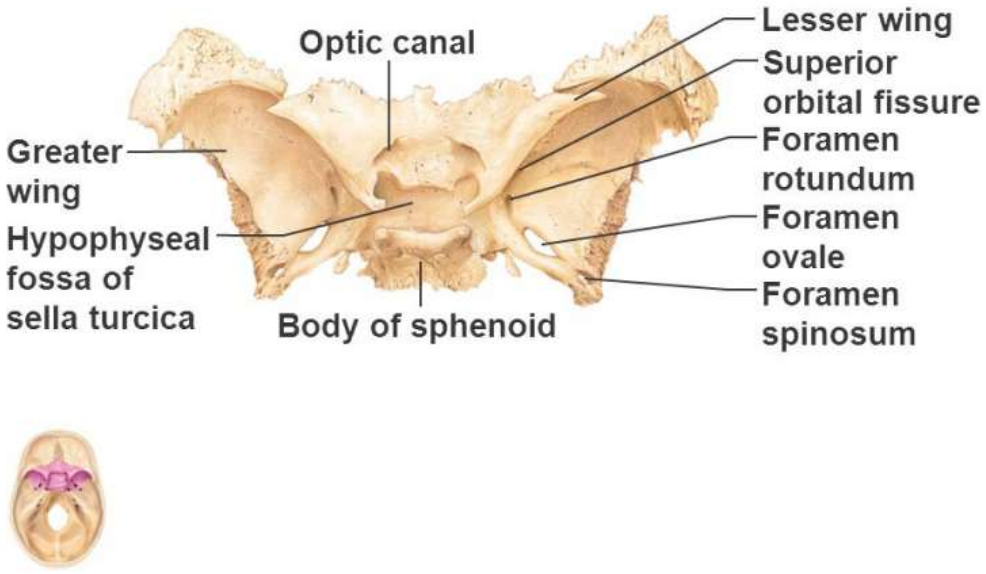
- The **optic canals** are situated anteriorly in the middle cranial fossa. They transmit the optic nerves (CN II) and ophthalmic arteries into the orbital cavities. The optic canals are connected by the **chiasmatic sulcus**, a depressed groove running transversely between the two.
- Immediately lateral to the central part of the middle cranial fossa are four foramina:

MIDDLE CRANIAL FOSSA

- The **superior orbital fissure** opens anteriorly into the orbit. It transmits the oculomotor nerve (CN III), trochlear nerve (CN IV), ophthalmic branch of the trigeminal nerve (CN V1), abducens nerve (CN VI), opthalmic veins and sympathetic fibres.
- The **foramen rotundum** opens into the pterygopalatine fossa and transmits the maxillary branch of the trigeminal nerve (CN V2).
- The **foramen ovale** opens into the infratemporal fossa, transmitting the mandibular branch of the trigeminal nerve (CN V3) and accessory meningeal artery.
- The **foramen spinosum** also opens into the infratemporal fossa. It transmits the middle meningeal artery, middle meningeal vein and a meningeal branch of CN V3.

Middle Cranial Fossa

Foramina



(a) Superior view of Sphenoid bone

Figure 7.9a

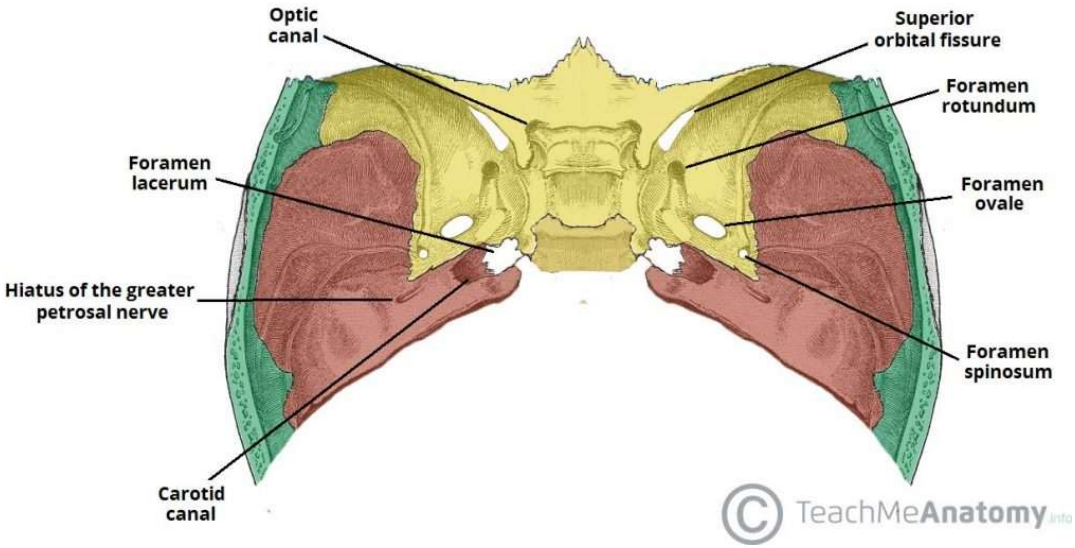
MIDDLE CRANIAL FOSSA

Foramina of the Temporal Bone

- The temporal bone is marked by three major foramina:
- **Hiatus of the greater petrosal nerve** – transmits the greater petrosal nerve (a branch of the facial nerve), and the petrosal branch of the middle meningeal artery.
- **Hiatus of the lesser petrosal nerve** – transmits the lesser petrosal nerve (a branch of the glossopharyngeal nerve).
- **Carotid canal** – located posteriorly and medially to the foramen ovale. This is traversed by the internal carotid artery, which ascends into the cranium to supply the brain with blood. The deep petrosal nerve also passes through this canal.
- At the junction of the sphenoid, temporal and occipital bones is the **foramen lacerum.** In life, this foramen is filled with cartilage, which is pierced only by small blood vessels.

Middle cranial Fossa

Foramina in Temporal Bone



MIDDLE CRANIAL FOSSA

Clinical Relevance: Pituitary Surgery

- The pituitary gland lies in the **Sella turcica** of the sphenoid bone, within the middle cranial fossa. In cases of a pituitary tumour, it may need to be removed surgically.
- Surgery to remove pituitary tumours is usually by a **endoscopic transsphenoidal approach**. An endoscope is inserted through the nostrils, or more rarely through an incision into either the upper lip or nasal septum. It is then advanced through the nasal cavity. The **sphenoid sinus** is opened and the endoscope passes through to the pituitary gland where it lies on the sella turcica. The tumour can then be removed in sections.
- Complications of pituitary surgery include CSF rhinorrhoea, meningitis, diabetes insipidus, haemorrhage and visual disturbances.

Posterior Cranial Fossa

Contents

Posterior Cranial Fossa

- The floor of the cranial cavity is divided into three distinct depressions. They are known as the anterior cranial fossa, middle cranial fossa and posterior cranial fossa. Each fossa accommodates a different part of the brain.
- The posterior cranial fossa is the most posterior and deep of the three cranial fossae. It accommodates the brainstem and cerebellum.
- In this article, we shall look at the borders, contents and clinical correlations of the posterior cranial fossa.

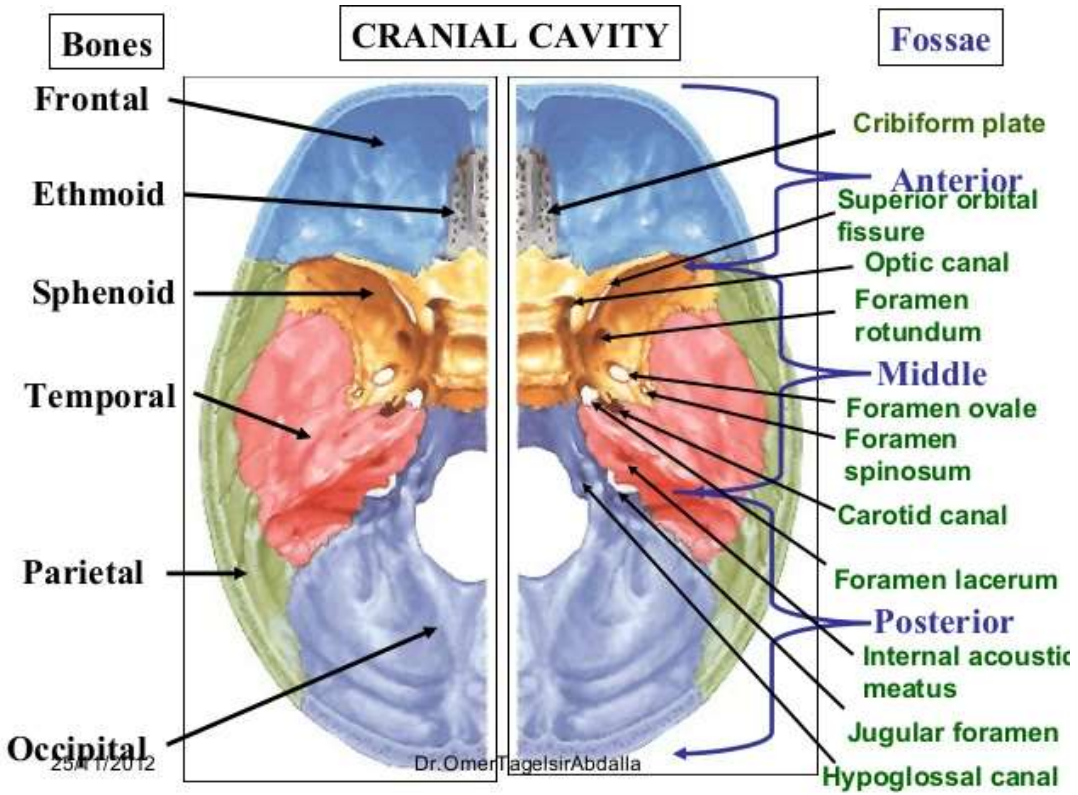
Posterior Cranial Fossa

Borders

- The posterior cranial fossa is comprised of three bones: the occipital bone and the two temporal bones.
- It is bounded as follows:
- **Anteriorly and medially** it is bounded by the dorsum sellae of the sphenoid bone. This is a large superior projection of bone that arises from the body of the sphenoid.
- **Anteriorly and laterally** it is bounded by the superior border of the petrous part of the temporal bone.
- **Posteriorly** it is bounded by the internal surface of the squamous part of the occipital bone.
- **The floor** consists of the mastoid part of the temporal bone and the squamous, condylar and basilar parts of the occipital bone.

Posterior Cranial Fossa

Borders



Posterior Cranial Fossa

Contents

- The posterior cranial fossa houses the brainstem and cerebellum.
- The brainstem is comprised of the medulla oblogata, pons and midbrain and continues down through the **foramen magnum** to become the spinal cord. The cerebellum has an important role in co-ordination and fine motor control.
- Alongside the gross anatomical structures of the brainstem and cerebellum, the posterior cranial fossa also accommodates associated arteries and nerves. Some key structures will be discussed with regards to their foramina below.

Posterior Cranial Fossa

Foramina

- There are several bony landmarks and foramina present in the posterior cranial fossa (a foramen is simply a hole that allows the passage of a structure – usually a blood vessel or nerve).

Posterior Cranial Fossa

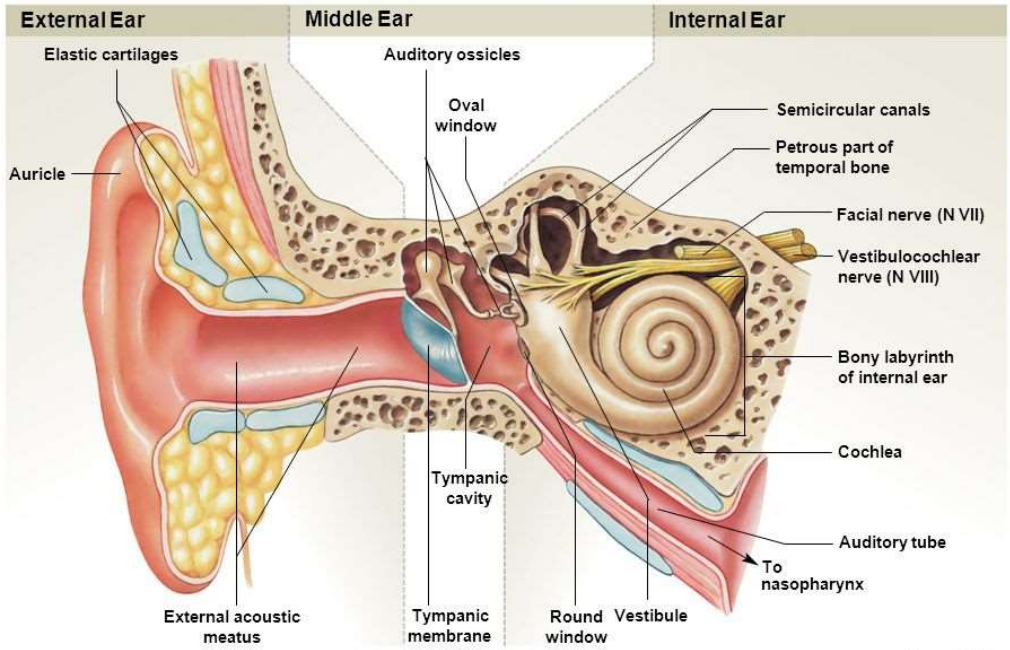
Temporal Bone

- The **internal acoustic meatus** is an oval opening in the posterior aspect of the petrous part of the temporal bone. It transmits the facial nerve (CN VII), vestibulocochlear nerve (CN VIII) and labyrinthine artery.

Posterior Cranial Fossa

Foramina

Figure 17-21 The Anatomy of the Ear



p. 590

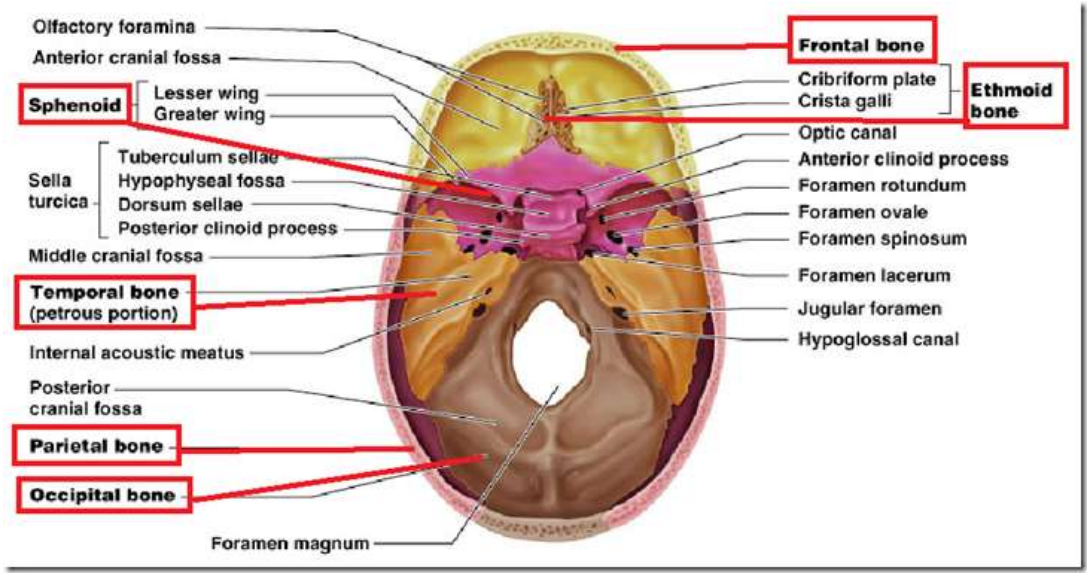
Posterior Cranial Fossa

Occipital Bone

- A large opening, the **foramen magnum,** lies centrally in the floor of the posterior cranial fossa. It is the largest foramen in the skull. It transmits the medulla of the brain, meninges, vertebral arteries, spinal accessory nerve (ascending), dural veins and anterior and posterior spinal arteries. Anteriorly an incline, known as the **clivus**, connects the foramen magnum with the dorsum sellae.
- The **jugular foramina** are situated either side of the foramen magnum. Each transmits the glossopharyngeal nerve, vagus nerve, spinal accessory nerve (descending), internal jugular vein, inferior petrosal sinus, sigmoid sinus and meningeal branches of the ascending pharyngeal and occipital arteries.
- Immediately superior to the anterolateral margin of the foramen magnum is the **hypoglossal canal**. It transmits the hypoglossal nerve through the occipital bone.
- Posterolaterally to the foramen magnum lies the **cerebellar fossae**. These are bilateral depressions that house the cerebellum. They are divided medially by a ridge of bone, the**internal occipital crest**.

Posterior cranial fossa

Foramina



Posterior Cranial Fossa

Clinical Relevance: Cerebellar Tonsillar Herniation

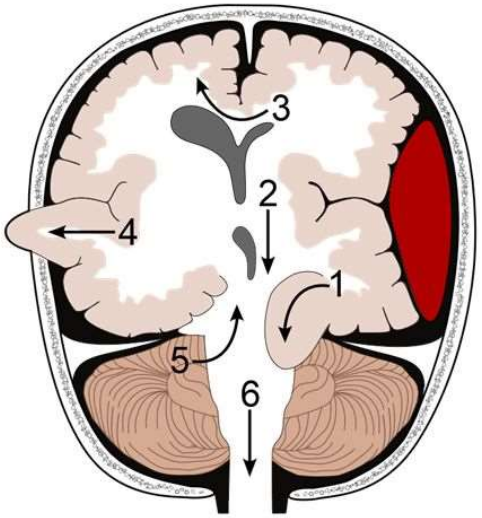
- Cerebellar tonsillar herniation is the downward displacement of the **cerebellar tonsils** through the **foramen magnum**. It is also known as 'coning'.
- It is produced by a raised **intracranial pressure**, which has a varied aetiology. Causes include hydrocephalus, space occupying lesions, and a malformed posterior cranial fossa.
- Cerebellar tonsillar herniation results in the compression of the **pons** and **medulla**, which contain the cardiac and respiratory centres. Thus, a herniation of this type ultimately results in death from cardiorespiratory arrest.

Posterior cranial fossa

Clinical Relevence

Tonsillar/Cerebellar Herniation (6)

- Cerebellar tonsils herniate through foramen magnum
- Usually from posterior fossa mass lesion
- Compresses aqueduct of Sylvius and causes hydrocephalus
- Neck pain, vomiting, decreased mental status, bradycardia, hypertension



ANATOMY

HEAD

HEAD

AREAS OF THE HEAD

SCALP

PTERIGOPALATINE FOSSA

CRANIAL FOSSA

INFRATEMPORAL FOSSA

The Scalp

Contents

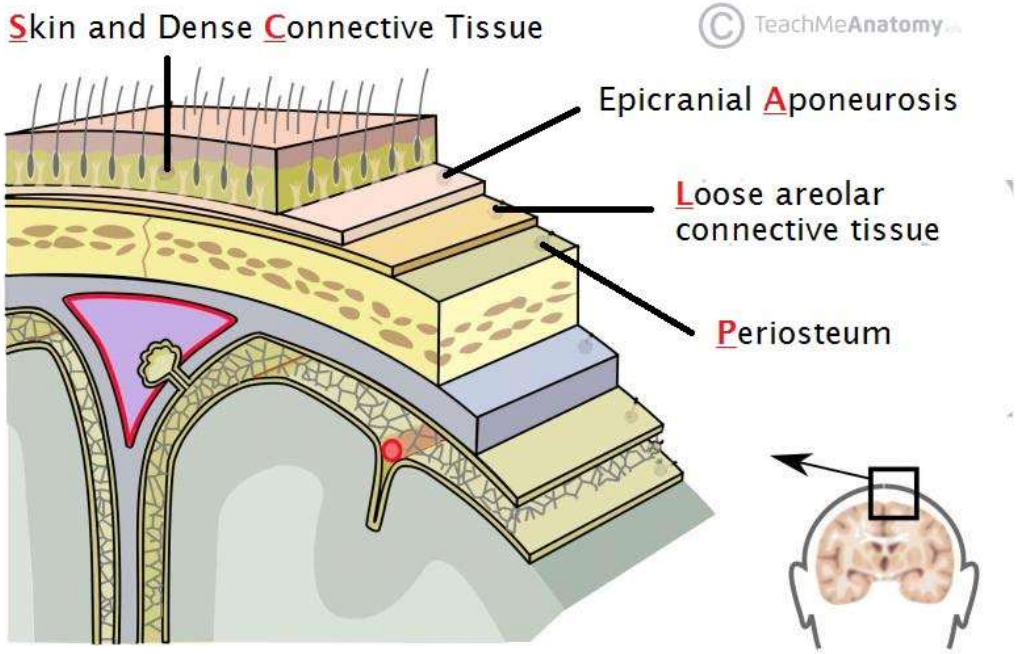
SCALP

Layers of the Scalp

- The scalp consists of five layers. The first three layers are tightly bound together, and move as a unit.
- *The mnemonic '**SCALP**' can be a useful way to remember the layers of the scalp: **S**kin, Dense **C**onnective Tissue, Epicranial **A**poneurosis, **L**oose Areolar Connective Tissue and **P**eriosteum.*
- **Skin** – contains numerous hair follicles and sebaceous glands (thus a common site for sebaceous cysts).
- **Dense Connective tissue** – connects the skin to the epicranial aponeurosis. It is richly vascularised and innervated.
    - The blood vessels within the layer are highly adherent to the connective tissue. This renders them unable to constrict fully if lacerated – and so the scalp can be a site of profuse bleeding.
- **Epicranial Aponeurosis** – a thin, tendon-like structure that connects the occipitalis and frontalis muscles.
- **Loose Areolar Connective Tissue** – a thin connective tissue layer that separates the periosteum of the skull from the epicranial aponeurosis.
    - It contains numerous blood vessels, including emissary veins which connect the veins of the scalp to the diploic veins and intracranial venous sinuses.
- **Periosteum** – the outer layer of the skull bones. It becomes continuous with the endosteum at the suture lines.

SCALP

Layers



SCALP

Clinical Relevance – Scalp infections

- The ‘danger area of the scalp’ is the area of loose connective tissue. This is because pus and blood spread easily within it, and can pass into the cranial cavity along the emissary veins. Therefore infection can spread from the scalp to the meninges, which could lead to meningitis.

SCALP

Arterial Supply

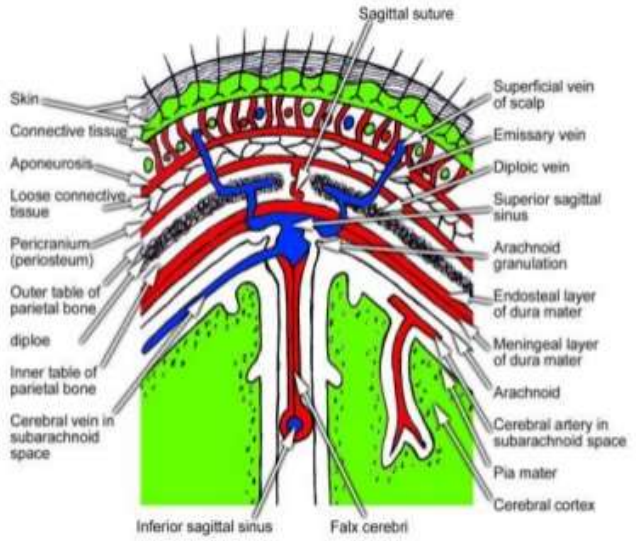
- The scalp receives a rich arterial supply via the **external carotid artery** and the ophthalmic artery (a branch of the internal carotid). There are three branches of the external carotid artery involved:
- **Superficial temporal** – supplies the frontal and temporal regions
- **Posterior auricular** – supplies the area superiorly and posteriorly to the auricle.
- **Occipital** – supplies the back of the scalp
- Anteriorly and superiorly, the scalp receives additional supply from two branches of the **ophthalmic artery** – the supraorbital and supratrochlear arteries. These vessels accompany the supraorbital and supratrochlear nerves respectively.

SCALP

Blood Supply

Anatomy

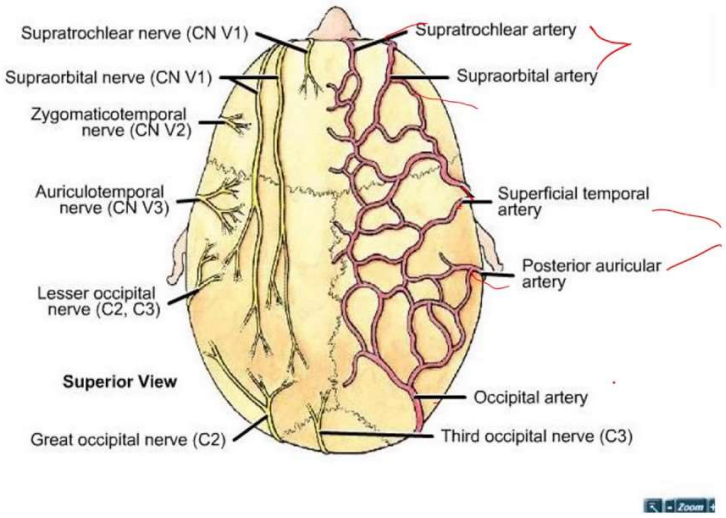
SCALP
S - **S**kin
C - **C**lose connective tissue & cutaneous vessels & nerves.
A - **A**poneurosis (epicranial aponeurosis)
L - **L**oose connective tissue
P - **P**ericranium (periosteum of skull bones)



Laceration wound of scalp –
STO day 7-10
Non-absorbable suture

SCALP

Blood Supply



SCALP

Venous Drainage

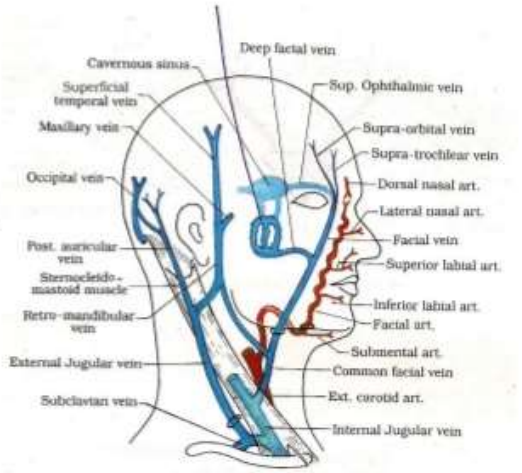
- The venous drainage of the scalp can be divided into superficial and deep components.
- The superficial drainage follows the arteries above; the **superficial temporal**, **occipital**, **posterior auricular**, **supraorbital** and **supratrochlear** veins. The deep (temporal) region of the skull is drained by the pterygoid venous plexus. This is a large plexus of veins situated between the temporalis and lateral pterygoid muscles, and drains into the maxillary vein.
- Importantly, the veins of the scalp connect to the diploic veins of the skull via valveless emissary veins. This establishes a connection between the scalp and the dural venous sinuses.

SCALP

Venous Drainage

VENOUS DRAINAGE

1. **Supra-trochlear vein**
2. **Supra-orbital vein**
3. **Superficial temporal vein**
4. **Posterior auricular vein**
5. **Occipital vein**



SCALP

Innervation

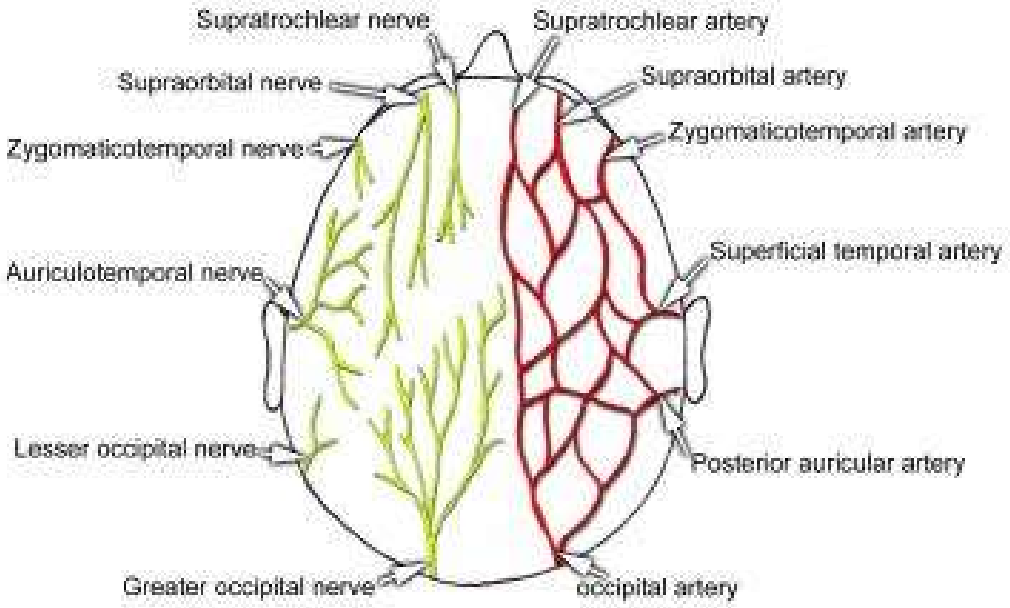
The scalp receives cutaneous innervation from six main nerves, which arise from the trigeminal nerve or the cervical nerves.

Trigeminal Nerve

- **Supratrochlear nerve** – branch of the ophthalmic nerve which supplies the anteromedial forehead.
- **Supraorbital nerve** – branch of the ophthalmic nerve which supplies a large portion of the scalp between the anterolateral forehead and the vertex.
- **Zygomaticotemporal nerve** – branch of the maxillary nerve, this supplies the temple.
- **Auriculotemporal nerve** – branch of the mandibular nerve which supplies skin anterosuperior to the auricle.

SCALP

Innervation



SCALP

Cervical Nerves

- **Lesser occipital nerve** – derived from the anterior ramus (division) of C2, and supplies the skin posterior to the ear
- **Greater occipital nerve** – derived from the posterior ramus (division) of C2, and supplies the skin of the occipital region.
- **Great auricular nerve** – derived from the anterior rami of C2 and C3, and supplies the skin posterior to the ear and over the angle of the mandible.
- **Third occipital nerve** – derived from the posterior ramus of C3, and supplies the skin of the inferior occipital region

SCALP

Clinical Relevance – Scalp Lacerations

- Deep lacerations to the scalp tend to bleed profusely for several reasons. These are:
- The pull of the occipitofrontalis muscle prevents the closure of the bleeding vessel and surrounding skin.
- The blood vessels to the scalp are adhered to dense connective tissue, preventing the vasoconstriction that normally occurs in response to damage.
- The blood supply to the scalp is made up of many anastomoses, which contribute to profuse bleeding.
- It is important to note that loss of blood supply to the scalp doesn't lead to bone necrosis as most of the blood supply to the skull comes from the middle meningeal artery

SCALP

Lacerations

SCALP

Clinical Relevance

Applied Anatomy

- Black eye
  - Spread thro subaponeurotic space
- Scalp lacerations
- Sebaceous cysts
- Gaping wounds
  - Due to incisional wound of galea in coronal plane
- Cephalhaematoma
- Bone flaps
- Dangerous area of scalp
  - Loose areolar tissue – infection spread to intracranial venous sinus thro emissary vein
- Caput succedaneum
- Safety valve mechanism
- Scalp avulsion

SCALP

Black Eye

BLACK EYE

- ✓ Blow on the skull
- ✓ Collection of blood in the subaponeurotic space produce generalised swelling affecting the whole dome of skull
- ✓ Blood slowly gravitates into the eye lids because the frontalis has no bony attachments

ANATOMY

HEAD

HEAD

AREAS OF THE HEAD

THE PTERYGOPALATINE FOSSA

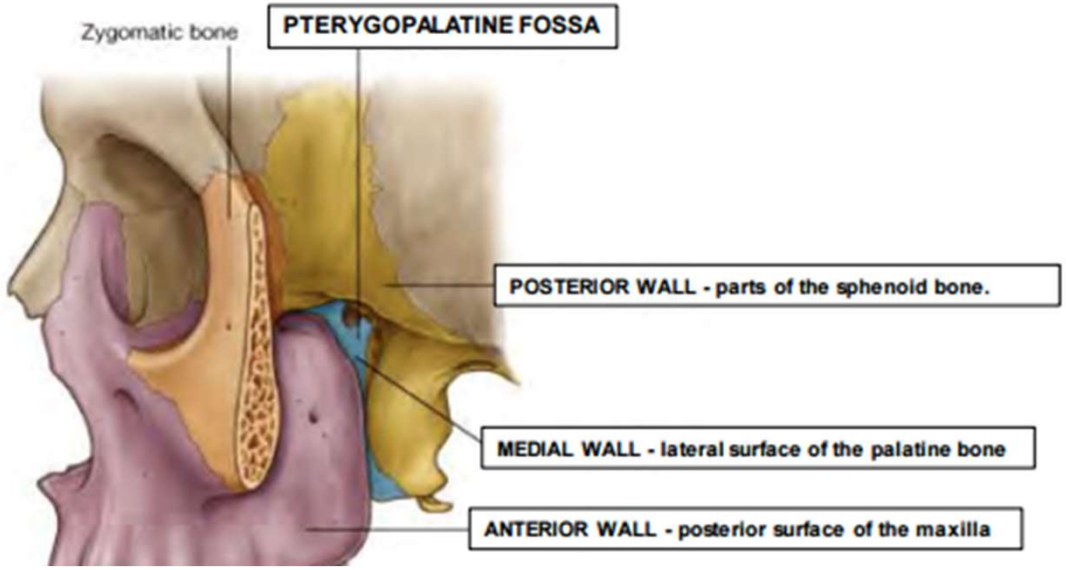
Contents

THE PTERYGOPALATINE FOSSA

- The **pterygopalatine fossa** is a bilateral, cone-shaped depression extending deep from the infratemporal fossa all the way to the nasal cavity via the sphenopalatine foramen.
- It is located between the maxilla, sphenoid and **palatine** bones, and communicates with other regions of the skull and facial skeleton via several canals and foramina. Its small volume combined with the numerous structures that pass through makes this a complex region for anatomy students.
- This article will discuss the **pterygopalatine fossa**, and consider the structures involved according to their respective foramina.

THE PTERYGOPALATINE FOSSA

Boundaries



THE PTERYGOPALATINE FOSSA

Borders

- The borders of the pterygopalatine fossa are formed by the palatine, maxilla and sphenoid bones:
- **Anterior**: Posterior wall of the maxillary sinus.
- **Posterior**: Pterygoid process of the sphenoid bone.
- **Inferior**: Palatine bone and palatine canals.
- **Superior**: Inferior orbital fissure of the eye.
- **Medial**: Perpendicular plate of the palatine bone
- **Lateral**: Pterygomaxillary fissure

THE PTERYGOPALATINE FOSSA

Contents

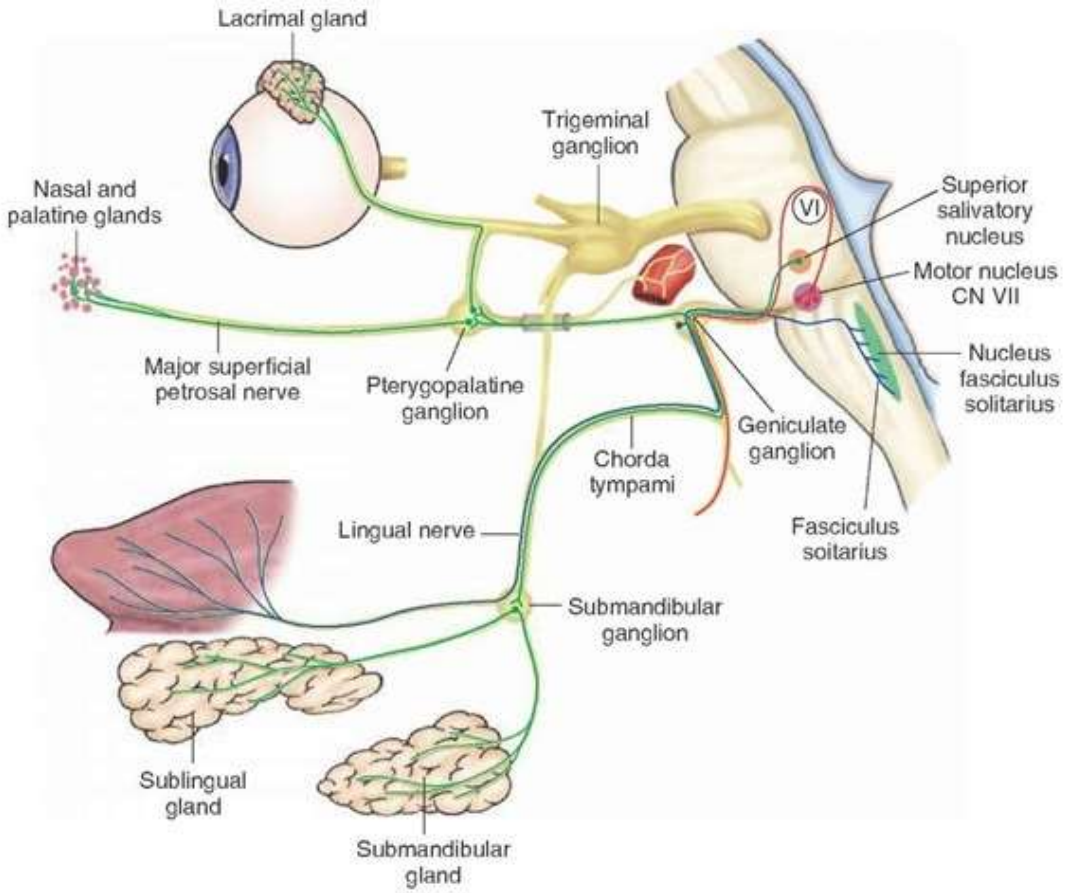
The Pterygopalatine Fossa contains many important neurovascular structures. Here we will discuss the maxillary nerve and its branches, the pterygopalatine ganglion and the maxillary artery and its branches.

Maxillary Nerve

- The maxillary nerve is the second branch of the trigeminal nerve (CNV_2). It passes from the middle cranial fossa into the pterygopalatine fossa through the **foramen rotundum**.
- The main trunk of the maxillary nerve leaves the pterygopalatine fossa via the **infraorbital fissure**. Here, it enters the infraorbital canal of the maxilla and exits below the orbit in the infraorbital foramen to contribute to the sensory innervation of the face .
- While in the pterygopalatine fossa, the maxillary nerve gives of numerous branches including the infraorbital, zygomatic, nasopalatine, superior alveolar, pharyngeal and the greater and lesser palatine nerves. The maxillary nerve also communicates with the **pterygopalatine ganglion** via two small trunks, the **pterygopalatine nerves** . These nerves suspend the ganglion within the pterygopalatine fossa.

THE PTERYGOPALATINE FOSSA

Neuronal Connections



Pterygopalatine Fossa

Pterygopalatine Fossa

THE PTERYGOPALATINE FOSSA

Pterygopalatine Ganglion

- The pterygopalatine ganglion sits deep within the pterygopalatine fossa near the sphenopalatine foramen. It is the largest parasympathetic ganglion related to branches of the maxillary nerve (via pterygopalatine branches) and is predominantly innervated by the **greater petrosal branch of the facial nerve (CNVII).**
- Postsynaptic parasympathetic fibres leave the ganglion and distribute with branches of the maxillary nerve (CNV_2). These fibres are **secretomotor** in function, and provide **parasympathetic innervation** to the lacrimal gland, and muscosal glands of the oral cavity, nose and pharynx.

THE PTERYGOPALATINE FOSSA

Maxillary Artery

The maxillary artery is a terminal branch of the **external carotid artery**. The terminal portion of the maxillary artery lies within the pterygopalatine fossa. Here, it separates into several branches which travel through other openings within the fossa to reach the regions they supply.

These branches include, but are not limited to:

- **Sphenopalatine artery** (to the nasal cavity).
- **Descending palatine artery** – branches into greater and lesser palatine arteries (hard and soft palates).
- **Infraorbital artery** (lacrimal gland, and some muscles of the eye).
- **Posterior superior alveolar artery** (to the teeth and gingiva).
- At their terminal ends, the sphenopalatine and greater palatine arteries anastomose at the nasal septum.

Pterygopalatine Fossa

Maxillary Artery

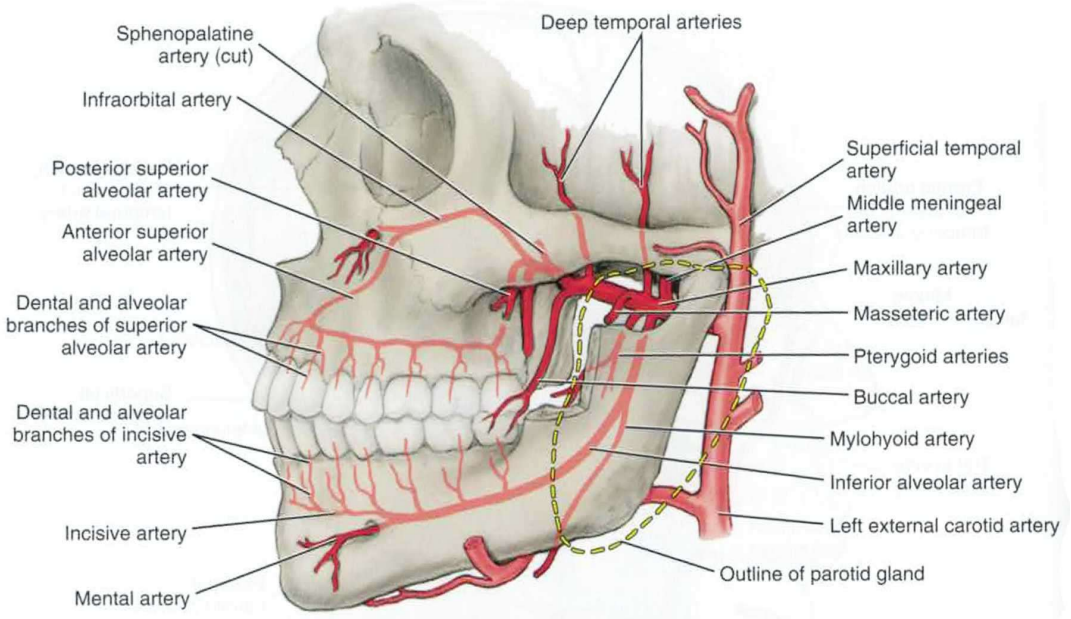


FIGURE 6-9 Pathway of the maxillary artery (except those branches to nasal cavity and palate).

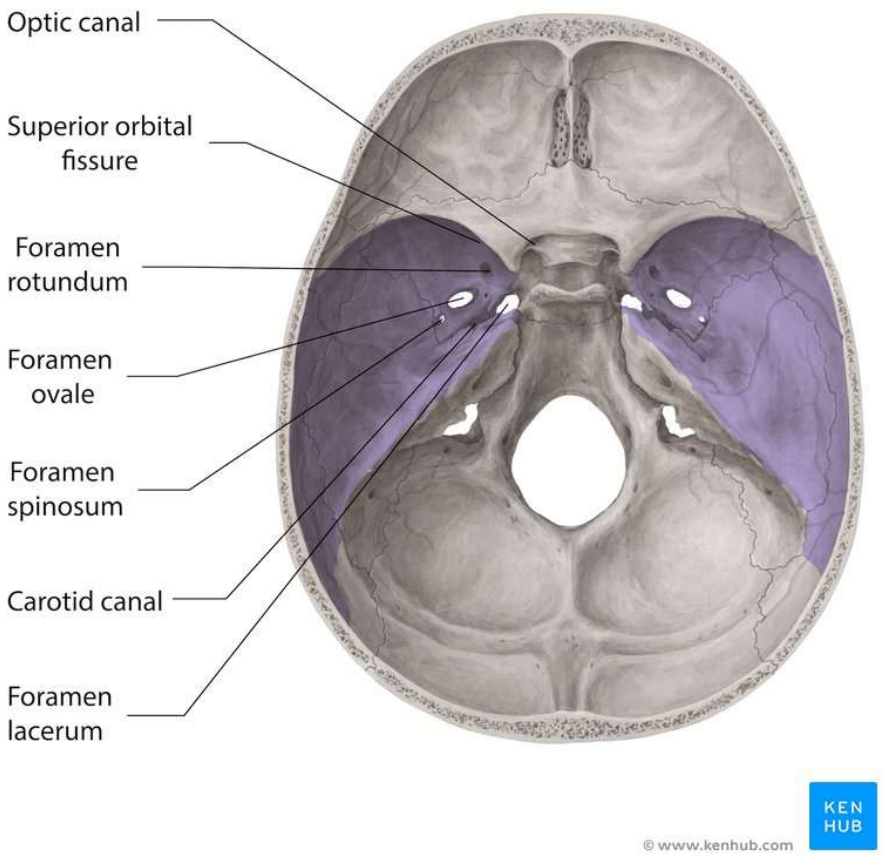
THE PTERYGOPALATINE FOSSA

Foramen Rotundum

- The foramen rotundum connects the pterygopalatine fossa to the **middle cranial fossa**. It is one of three openings in the posterior boundary of the pterygopalatine fossa. It conducts a single structure, the **maxillary nerve.**

Pterygopalatine Fossa

Foramen Rotandum



THE PTERYGOPALATINE FOSSA

Pterygoid and Pharyngeal Canals

- These two canals, along with the foramen rotundum, are the three openings in the posterior wall of the pterygopalatine fossa:
- **Pterygoid canal** – runs from the middle cranial fossa and through the medial pterygoid plate. It carries the nerve, artery and vein of the pterygoid canal.
- **Pharyngeal canal** – communicates with the nasopharynx. It carries the pharyngeal branches of the maxillary nerve and artery.

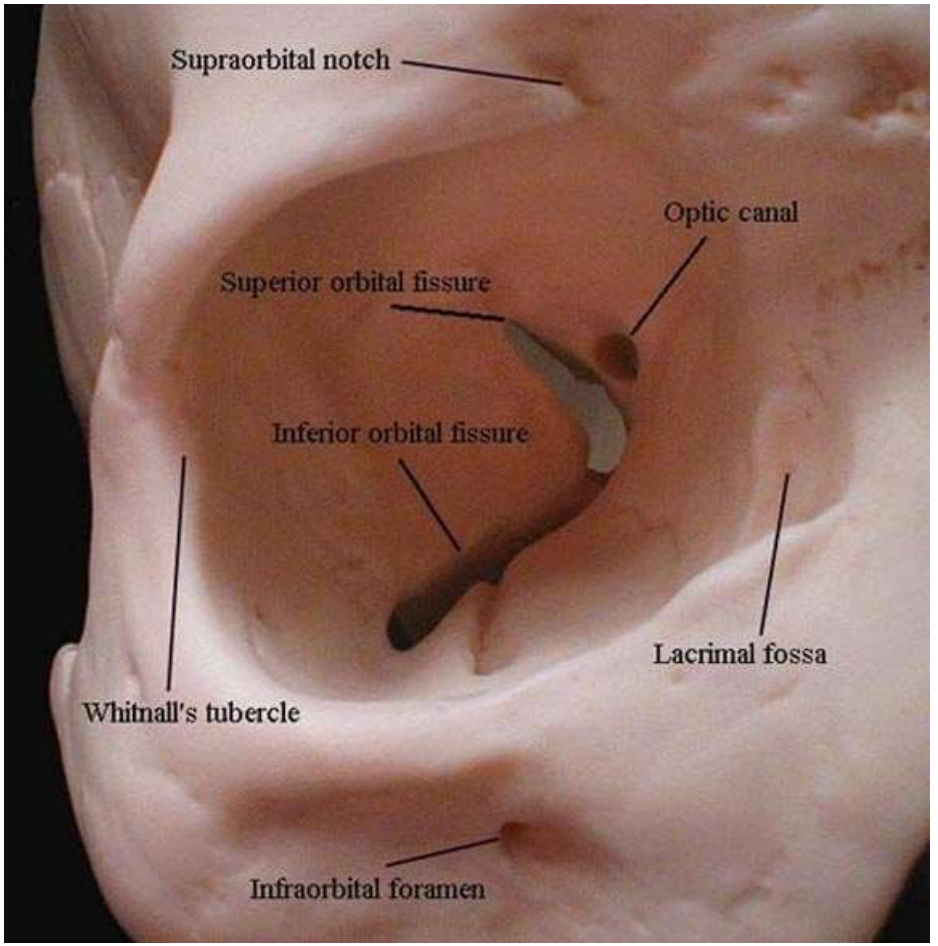
THE PTERYGOPALATINE FOSSA

Inferior Orbital Fissure

- The inferior orbital fissure forms the superior boundary of the pterygopalatine fossa and communicates with the **orbit**. It is a space between the sphenoid and maxilla bones.
- The **zygomatic branch** of the maxillary nerve and the **infraorbital artery and vein** pass through the inferior orbital fissure.

THE PTERYGOPALATINE FOSSA

- Inferior Orbital Fissure



THE PTERYGOPALATINE FOSSA

Greater Palatine Canal

- The greater palatine canal lies in the inferior boundary of the pterygopalatine fossa, and communicates with the **oral cavity**. The canal is formed by a vertical groove in the palatine bone which is closed off by an articulation with the maxilla. Branching from the greater palatine canal are the accessory **lesser palatine canals**.
- The greater palatine canal transmits the descending palatine artery and vein, the **greater palatine nerve** and the **lesser palatine nerve**.

THE PTERYGOPALATINE FOSSA

Sphenopalatine Foramen

- This foramen is the only opening in the medial boundary. It connects the pterygopalatine fossa to the **nasal cavity** – specifically the superior meatus.
- It is formed by the sphenopalatine notch at the superior aspect of the perpendicular plate of the palatine bone and the body of the sphenoid.
- The sphenopalatine foramen transmits the **sphenopalatine artery and vein**, as well as the **nasopalatine nerve** (a large branch of the pterygopalatine ganglion – CNV_2).

THE PTERYGOPALATINE FOSSA

Clinical Relevance

Maxillary Nerve Block

- Extensive dental surgery may require total nerve block of the maxillary branch of the trigeminal nerve (CNV_2). The maxillary nerve in the pterygopalatine fossa is most often approached intraorally via the **greater palatine canal**.

Chronic Epistaxis

- The Sphenopalatine artery is often referred to as the artery of **epistaxis** (nosebleed). In cases of chronic epistaxis, the pterygopalatine fossa can be surgically approached via the maxillary sinus, and the artery ligated to control bleeding.

Infratemporal Fossa

Contents

Infratemporal Fossa

- The **infratemporal fossa** is a complex area located at the base of the skull, deep to the masseter muscle.
- It is closely associated with both the temporal and pterygopalatine fossae and acts as a **conduit** for neurovascular structures entering and leaving the cranial cavity.
- This article will outline the borders and content of the fossa before examining its clinical relevance.

Infratemporal Fossa

Boundaries

Infratemporal fossa

- **Boundaries:**

Anteriorly: post. Surface of maxilla

Posteriorly : styloid & mastoid process

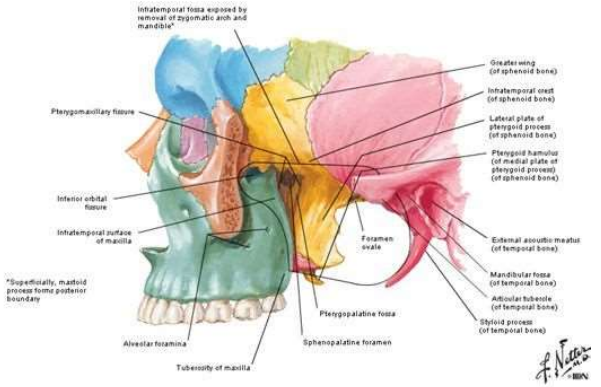
Medially: lateral pterygoid plate

Laterally : coronoid process & ramus of Md.

- **Contents:**
- **Muscles :** 2 deep Ms of Mastications

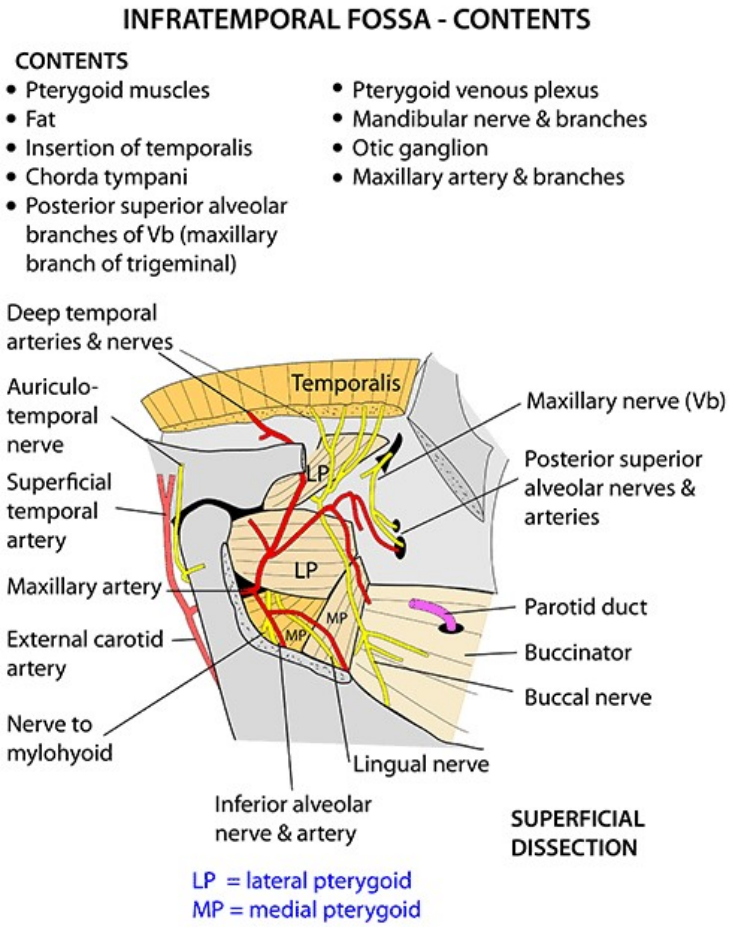
a) medial pterygoid Ms. b) lateral pterygoid m.

- **Nerves:** a) Md. N. b) chorda tympani c) Mx. N.
- **Vesseles :** a) Mx. A. b) pterygoid plexus of viens



Infratemporal Fossa

Content



Infratemporal Fossa

Content

Muscles

- The infratemporal fossa is associated with the muscles of mastication.
  The **medial** and **lateral pterygoids** are located within the fossa itself, whilst the masseter and temporalis muscles insert and originate into the borders of the fossa.

Nerves

- The infratemporal fossa forms an important passage for a number of nerves originating in the cranial cavity (figure 1.2):
- **Mandibular nerve** – a branch of the trigeminal nerve (CN V). It enters the fossa via the foramen ovale, giving rise to motor and sensory branches. The sensory branches continue inferiorly to provide innervation to some of the cutaneous structures of the face.
- **Auriculotemporal, buccal, lingual and inferior alveolar nerves** – sensory branches of the trigeminal nerve.
- **Chorda tympani** – a branch of the facial nerve (CN VII). It follows the anatomical course of the lingual nerve and provides taste innervation to the anterior 2/3 of the tongue.
- **Otic ganglion** – a parasympathetic collection of neurone cell bodies. Nerve fibres leaving this ganglion 'hitchhike' along the auriculotemporal nerve to reach the parotid gland.

Infratemporal Fossa

Vasculature

The infratemporal fossa contains several vascular structures:

- **Maxillary artery** – the terminal branch of the external carotid artery. It travels through the infratemporal fossa.
  - Within the fossa, it gives rise to the middle meningeal artery, which passes through the superior border via the foramen spinosum.
- **Pterygoid venous plexus** – drains the eye and is directly connected to the cavernous sinus.
  - It provides a potential route by which infections of the face can spread intracranially.
- **Maxillary vein**
- **Middle meningeal vein**

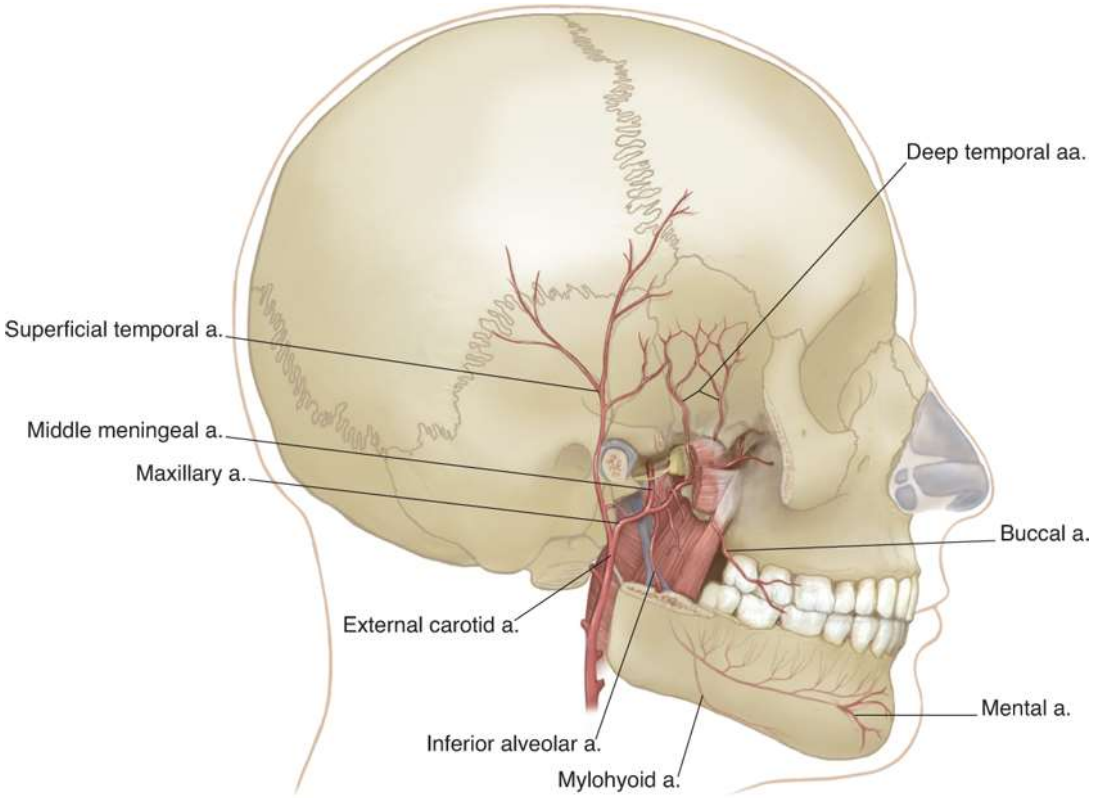
Infratemporal Fossa

Clinical Relevance – Fractures of the Pterion

- The pterion is an important structure in cranial anatomy. It is the point where the temporal, parietal, frontal and sphenoid bones meet and the skull is at its weakest. Trauma in this region can lead to an extradural haematoma as the middle meningeal artery (MMA) lies deep to it.
- An extradural haematoma causes a dangerous increase in intra-cranial pressure, which can lead to herniation of brain tissue and ischaemia.
- The increase in **intra-cranial** pressure causes a variety of symptoms; nausea, vomiting, seizures, bradycardia and limb weakness. It is treated by **diuretics** in minor cases, and drilling **burr holes** into the skull in the more extreme haemorrhages.

Infratemporal Fossa

Middle Mennigeal artery



Infratemporal Fossa

Pterion