

كلية المستقبل الجامعة قسم هندسة الطب الحياتي

المرحلة الثانية



HEAD & NECK

ANATOMY

(L6)

Head and Neck Areas

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HEAD and NECK AREAS : THE CRANIAL FOSSAE

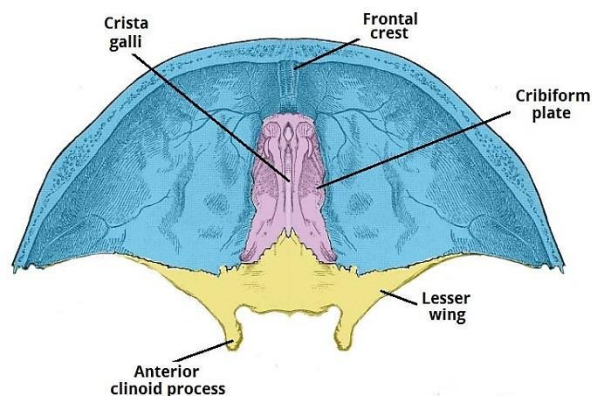
The floor of the **cranial cavity** is divided into three distinct depressions. They are known as the anterior cranial fossa, [middle cranial fossa](#) and [posterior cranial fossa](#). Each fossa accommodates a different part of the brain.

The Anterior Cranial Fossa

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.

It consists of three bones: the **frontal** bone, [ethmoid](#) bone and [sphenoid](#) bone. There are several bony landmarks present in the anterior cranial fossa.

In the midline of the [ethmoid](#) bone, the **crista galli** (latin for cock's comb) is situated. This is an upwards projection of bone, 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. The **lesser wings of the sphenoid bone** also separate the [anterior](#) and [middle cranial fossae](#).



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](#).

The floor consists of the frontal bone, [ethmoid](#) bone and the anterior aspects of the body and lesser wings of the [sphenoid](#) bone.

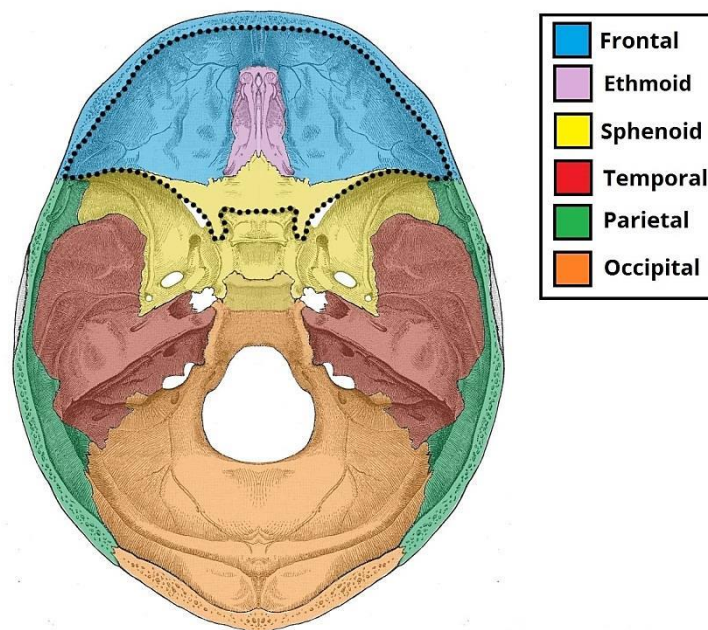


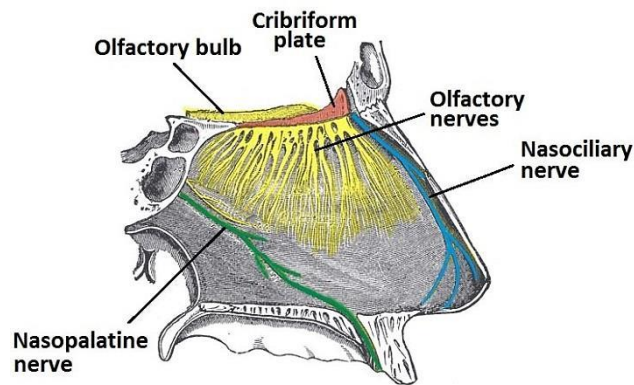
Fig The bones of the base of the skull. The anterior cranial fossa has been outlined.

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.

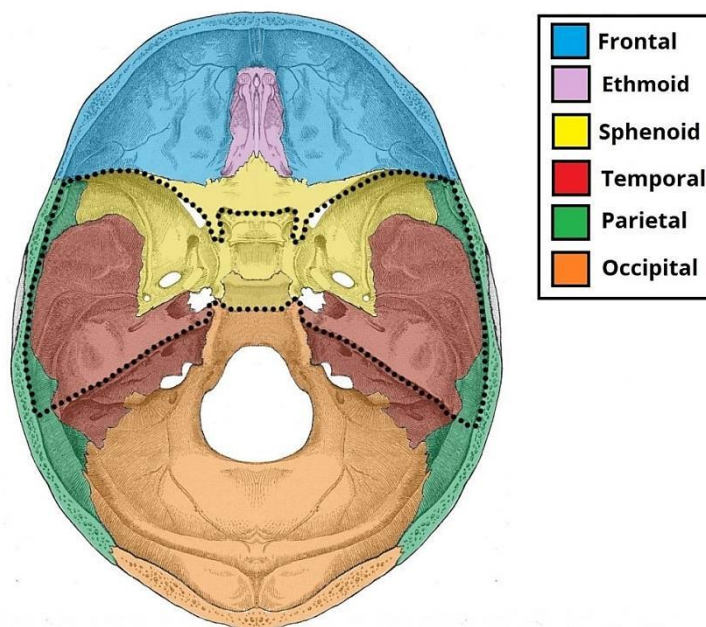
CSF rhinorrhoea – the fragments of bone can tear the meningeal coverings of the brain, causing the leakage of cerebrospinal fluid into the nasal cavity. This is visible as a clear fluid.



Lateral view of the nasal septum. Note the close relationship of the olfactory bulb and cribriform plate

The Middle Cranial Fossa

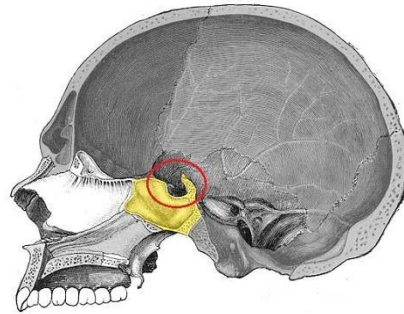
The middle cranial fossa is located, as its name suggests, centrally in the cranial floor. It is said to be “butterfly shaped”, with a middle part accommodating the **pituitary gland** and two lateral parts accommodating the **temporal lobes** of the brain. The middle cranial fossa consists of three bones – the [sphenoid](#) bone and the two [temporal](#) bones. The **floor** is formed by the body and greater wing of the sphenoid, and the squamous and petrous parts of the temporal bone.



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 (see Fig). It acts to hold and support the pituitary gland.

Sagittal section of the skull, showing the saddle-like sella turcica.



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.

Foramina

There are many foramina that transmit vessels and nerves into and out of the middle cranial fossa.

Foramina of the Sphenoid Bone

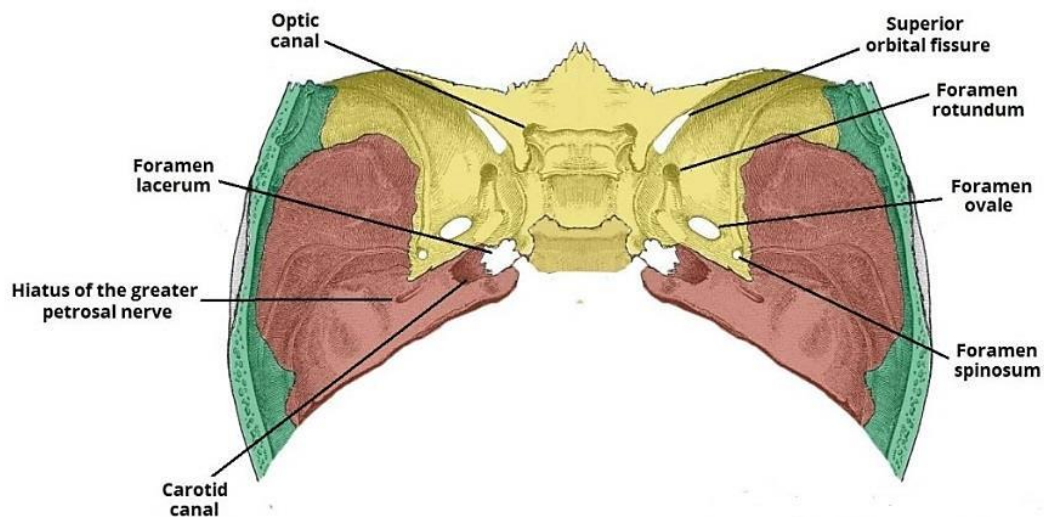
The optic canals are situated anteriorly in the middle cranial fossa. They transmit the [optic nerves](#) (CN II) and ophthalmic arteries into the orbital cavities. Immediately lateral to the central part of the middle cranial fossa are four foramina :

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), ophthalmic veins and sympathetic fibres.

The foramen rotundum transmits the maxillary branch of the [trigeminal](#) nerve (CN V2).

The foramen ovale transmitting the mandibular branch of the [trigeminal](#) nerve (CN V3)

The foramen spinosum transmits the middle meningeal artery, middle meningeal vein and a meningeal branch of CN V3.



Foramina of the Temporal Bone

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.

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.

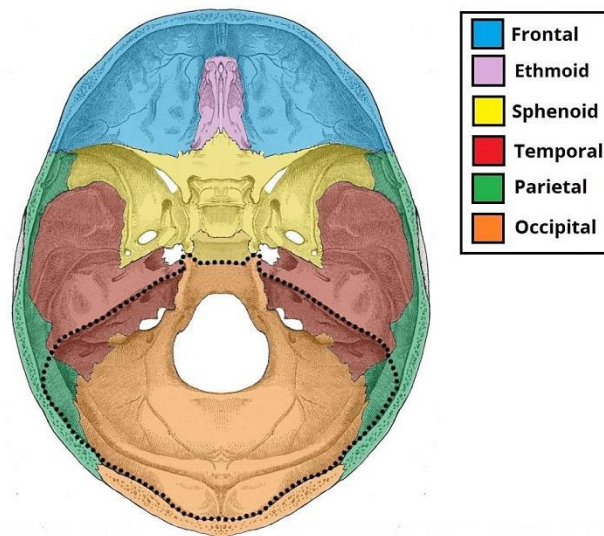
Clinical Relevance: Pituitary Surgery

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. 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.

The Posterior Cranial Fossa

The posterior cranial fossa is the most posterior and deep of the three cranial fossae, is comprised of three bones: the occipital bone and the



two [temporal](#) bones. The posterior cranial fossa houses the brainstem and [cerebellum](#).

The brainstem is comprised of the [medulla oblongata](#), 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.

Foramina

There are several bony landmarks and foramina present in the posterior cranial fossa

Temporal Bone

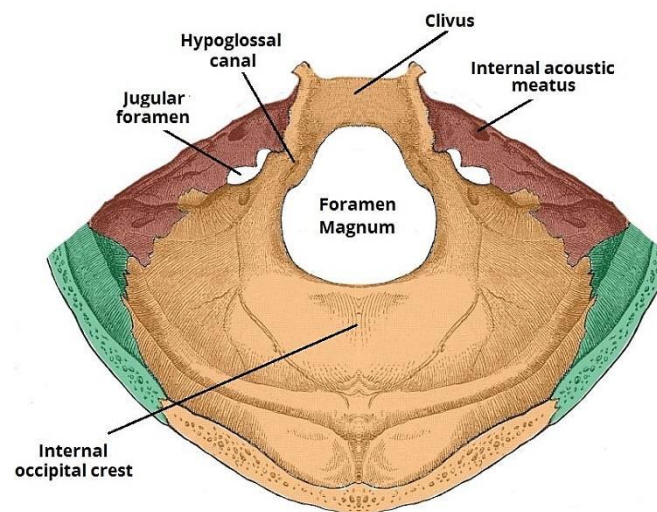
The **internal acoustic meatus** is an oval opening in the posterior aspect of the petrous part of the temporal bone. It transmits the [facial nerve](#) (CN VII), [vestibulocochlear nerve](#) (CN VIII) and labyrinthine artery.

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.

The **jugular foramina** are situated either side of the foramen magnum. Each transmits the [glossopharyngeal nerve](#), [vagus nerve](#), internal jugular vein.

Immediately superior to the anterolateral margin of the foramen magnum is the **hypoglossal canal**. It transmits the [hypoglossal nerve](#) through the occipital bone.



The Anterior Triangle of the Neck

The **anterior triangle** is a region located at the front of the neck.

Borders

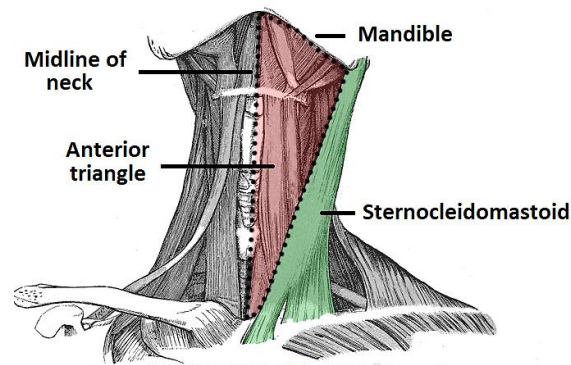
The anterior triangle is situated at the front of the neck. It is bounded:

Superiorly – inferior border of the mandible (jawbone).

Laterally – anterior border of the sternocleidomastoid.

Medially – sagittal line down the midline of the neck.

Investing fascia covers the roof of the triangle, while visceral fascia covers the floor. It can be subdivided further into four triangles.



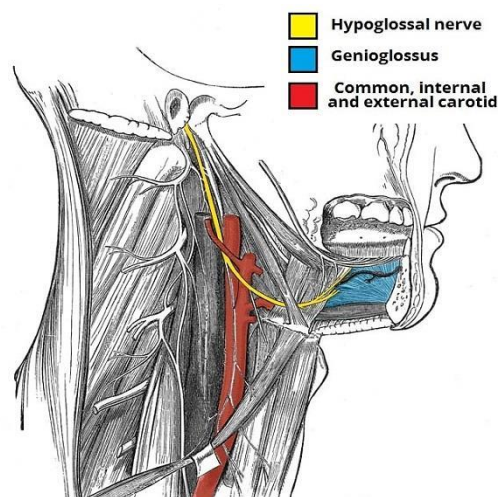
Contents

The contents of the **anterior triangle** include muscles, nerves, arteries, veins and lymph nodes.

The muscles in this part of the neck are divided as to where they lie in relation to the [hyoid bone](#). The **suprahyoid muscles** are located superiorly to the hyoid bone, and infrahyoids inferiorly.

There are several important vascular structures within the anterior triangle. The **common carotid artery** bifurcates within the triangle into the external and internal carotid branches. The internal jugular vein can also be found within this area – it is responsible for venous drainage of the head and neck.

Numerous **cranial nerves** are located in the anterior triangle. Some pass straight through, and others give rise to branches which innervate some of the other structures within the triangle. The cranial nerves in the anterior triangle are the [facial \[VII\]](#), [glossopharyngeal \[IX\]](#), [vagus \[X\]](#), [accessory \[XI\]](#), and [hypoglossal \[XII\]](#) nerves.



The Posterior Triangle of the Neck

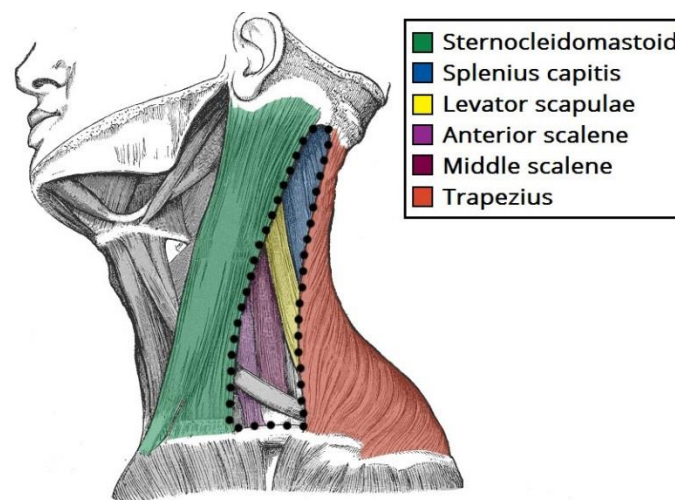
The **posterior triangle** of the neck is an anatomical area located in the lateral aspect of the neck. **Borders** : Its boundaries are as follows:

Anterior – posterior border of the sternocleidomastoid.

Posterior – anterior border of the trapezius muscle.

Inferior – middle 1/3 of the clavicle.

The posterior triangle of the neck is covered by the **investing** layer of fascia, and the floor is formed by the **prevertebral** fascia (see [fascial layers of the neck](#)).



Nerves

The **accessory nerve (CN XI)** exits the cranial cavity, descends down the neck, innervates sternocleidomastoid and enters the posterior triangle. It crosses the posterior triangle in an oblique, inferoposterior direction, within the **investing** layer of fascia. It lies relatively **superficial** in the posterior triangle, leaving it vulnerable to injury.

The **cervical plexus** forms within the muscles of the **floor** of the posterior triangle. A major branch of this plexus is the **phrenic nerve**, which arises from the anterior divisions of spinal nerves C3-C5. It descends down the neck, within the **prevertebral** fascia, to innervate the diaphragm. The trunks of the **brachial plexus** also cross the floor of the posterior triangle.