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MATRIC NUMBER: 17/MHS01/021

COURSE:ANA301 ASSIGNMENT 2

DEPARTMENT:MEDICINE AND SURGERY

GROSS ANATOMY OF THE HEAD AND NECK ASSIGNMENT

1.write an essay on the carvanous sinus.

The **cavernous sinus** is a paired dural venous sinus located within the cranial cavity. It is divided by septa into small ‘caves’ – from which it gets its name. The cavernous sinus is one of the dural venous sinuses of the head. It is a network of veins that sit in a cavity. The [carotid siphon](https://en.m.wikipedia.org/wiki/Internal_carotid_artery#C4:_Cavernous_segment) of the [internal carotid artery](https://en.m.wikipedia.org/wiki/Internal_carotid_artery), and cranial nerves III, IV, V (branches V1 and V2) and VI all pass through this blood filled space.

Each cavernous sinus has a close anatomical relationship with several**key structures** in the head, and is arguably the most clinically important venous sinus. The cavernous sinuses are located within the middle cranial fossa, on either side of the **sella turcica**of the sphenoid bone (which contains the pituitary gland). They are enclosed by the endosteal and meningeal layers of the dura mater.

**FUNCTION OF THE SINUS**: The cavernous sinus is the only site in the body where an artery (internal carotid) passes completely through a venous structure. This is thought to allow for **heat exchange** between the warm arterial blood and cooler venous circulation.

The borders of the cavernous sinus are as follows:

**Anterior** – superior orbital fissure.

**Posterior** – petrous part of the temporal bone.

**Medial** – body of the sphenoid bone.

**Lateral** – meningeal layer of the dura mater running from the roof to the floor of the middle cranial fossa.

**Roof** – meningeal layer of the dura mater that attaches to the anterior and middle clinoid processes of the sphenoid bone.

**Floor** – endosteal layer of dura mater that overlies the base of the greater wing of the sphenoid bone.

### Nearby structures

* Above: [optic tract](https://en.m.wikipedia.org/wiki/Optic_tract), [optic chiasma](https://en.m.wikipedia.org/wiki/Optic_chiasma), [internal carotid artery](https://en.m.wikipedia.org/wiki/Internal_carotid_artery).
* Inferiorly: [Foramen lacerum and the junction of the body and greater wing of sphenoid](https://en.m.wikipedia.org/w/index.php?title=Foramen_lacerum_and_the_junction_of_the_body_and_greater_wing_of_sphenoid&action=edit&redlink=1) bone.
* Medially: [Hypophysis cerebri](https://en.m.wikipedia.org/wiki/Hypophysis_cerebri%22%20%5Co%20%22Hypophysis%20cerebri) or (pituitary gland) and [sphenoidal air sinus](https://en.m.wikipedia.org/wiki/Sphenoidal_air_sinus).
* Laterally: [temporal lobe](https://en.m.wikipedia.org/wiki/Temporal_lobe) with [uncus](https://en.m.wikipedia.org/wiki/Uncus).
* Anteriorly: [superior orbital fissure and the apex of the orbit](https://en.m.wikipedia.org/w/index.php?title=Superior_orbital_fissure_and_the_apex_of_the_orbit&action=edit&redlink=1).
* Posteriorly: apex of [petrous temporal bone](https://en.m.wikipedia.org/wiki/Petrous_temporal_bone)

### Venous connections

The cavernous sinus receives blood from:

* [Superior](https://en.m.wikipedia.org/wiki/Superior_ophthalmic_vein) and [inferior ophthalmic veins](https://en.m.wikipedia.org/wiki/Inferior_ophthalmic_vein)
* [Sphenoparietal sinus](https://en.m.wikipedia.org/wiki/Sphenoparietal_sinus)
* [Superficial middle cerebral veins](https://en.m.wikipedia.org/wiki/Superficial_middle_cerebral_vein)
* [Inferior cerebral veins](https://en.m.wikipedia.org/wiki/Inferior_cerebral_veins)

Blood leaves the sinus via superior and [inferior petrosal sinuses](https://en.m.wikipedia.org/wiki/Inferior_petrosal_sinus) as well as via the [emissary veins](https://en.m.wikipedia.org/wiki/Emissary_veins) through the [foramina](https://en.m.wikipedia.org/wiki/Foramina_of_the_skull) of the skull (mostly through [foramen ovale](https://en.m.wikipedia.org/wiki/Foramen_ovale_%28skull%29)). There are also connections with the [pterygoid plexus](https://en.m.wikipedia.org/wiki/Pterygoid_plexus) of veins via [inferior ophthalmic vein](https://en.m.wikipedia.org/wiki/Inferior_ophthalmic_vein), [deep facial vein](https://en.m.wikipedia.org/wiki/Deep_facial_vein) and emissary veins.

### Contents

Apart from the blood which passes through a venous sinus, several anatomical structures, including some [cranial nerves](https://en.m.wikipedia.org/wiki/Cranial_nerves) and their branches, also pass through the sinus.

Structures within the outer (lateral) wall of the compartment from [superior to inferior](https://en.m.wikipedia.org/wiki/Anatomical_terms_of_location):

* [Oculomotor nerve](https://en.m.wikipedia.org/wiki/Oculomotor_nerve)
* [Trochlear nerve](https://en.m.wikipedia.org/wiki/Trochlear_nerve)
* [Ophthalmic](https://en.m.wikipedia.org/wiki/Ophthalmic_nerve) and [maxillary branches](https://en.m.wikipedia.org/wiki/Maxillary_nerve) of the [trigeminal nerve](https://en.m.wikipedia.org/wiki/Trigeminal_nerve)

Structures passing through the midline (medial) wall:

* [Abducens nerve](https://en.m.wikipedia.org/wiki/Abducens_nerve)
* [Internal carotid artery](https://en.m.wikipedia.org/wiki/Internal_carotid_artery) accompanied by the [Internal carotid plexus](https://en.m.wikipedia.org/wiki/Internal_carotid_plexus)

These nerves, with the exception of CN V2, pass through the cavernous sinus to enter the orbital apex through the [superior orbital fissure](https://en.m.wikipedia.org/wiki/Superior_orbital_fissure). The maxillary nerve, division V2 of the trigeminal nerve travels through the lower portion of the sinus and exits via the [foramen rotundum](https://en.m.wikipedia.org/wiki/Foramen_rotundum). The maxillary branch passes external to, but immediately adjacent to, the lateral wall of the sinus). The [optic nerve](https://en.m.wikipedia.org/wiki/Optic_nerve) lies just above and outside the cavernous sinus, superior and lateral to the [pituitary gland](https://en.m.wikipedia.org/wiki/Pituitary_gland) on each side, and enters the orbital apex via the [optic canal](https://en.m.wikipedia.org/wiki/Optic_canal).

### Venous drainage

As a venous sinus, the cavernous sinus receives blood from the [superior](https://en.m.wikipedia.org/wiki/Superior_ophthalmic_vein) and [inferior ophthalmic veins](https://en.m.wikipedia.org/wiki/Inferior_ophthalmic_vein) and from superficial cortical veins, and is connected to the basilar plexus of veins posteriorly. The cavernous sinus drains by two larger channels, the superior and [inferior petrosal sinuses](https://en.m.wikipedia.org/wiki/Inferior_petrosal_sinus), ultimately into the internal jugular vein via the sigmoid sinus, also draining with emissary vein to [pterygoid plexus](https://en.m.wikipedia.org/wiki/Pterygoid_plexus%22%20%5Co%20%22Pterygoid%20plexus).

Several important structures pass through the cavernous sinus to enter the **orbit**. The can be sub-classified by whether they travel through the sinus itself, or through its lateral wall:

Each cavernous sinus receives venous drainage from:

* **Ophthalmic veins** (superior and inferior) – these enter the cavernous sinus via the superior orbital fissure.
* **Central vein of the retina**– drains into the superior ophthalmic vein, or directly into the cavernous sinus.
* **Sphenoparietal sinus**– empties into the anterior aspect of the cavernous sinus.
* **Superficial middle cerebral vein**– contributes to the venous drainage of the cerebrum.
* **Pterygoid plexus** – located within the infratemporal fossa.

It is important to note that the superior ophthalmic vein forms an anastomosis with the**facial vein**. Therefore, the ophthalmic veins represent a potential route by which infection can spread from an extracranial to an intracranial site. The cavernous sinuses empty into the **superior**and**inferior petrosal sinuses**, and ultimately, into the internal jugular vein. The left and right cavernous sinuses are connected in the midline by the anterior and posterior **intercavernous sinuses**. They travel through the sella turcica of the sphenoid bone.

**CLINICAL ANATOMY**

* Cavernous sinus thrombosis (CST): refers to the formation of a **clot** within the cavernous sinus.This most common cause of CST is **infection**; which typically spreads from an extracranial location such as the orbit, paranasal sinuses, or the ‘danger zone’ of the face. Infection is able to spread in this manner due to the anastomosis between the facial vein and superior ophthalmic veins. Common clinical symptoms include headache, unilateral periorbital oedema, proptosis (eye bulging), photophobia and cranial nerve palsies. The **abducens nerve** (CN VI) is most commonly affected. Treatment is typically with antibiotic therapy. Where the cause is infection, thrombosis of the cavernous sinus can rapidly progress to **meningitis**.
* It is the only anatomic location in the body in which an [artery](https://en.m.wikipedia.org/wiki/Artery) travels completely through a venous structure. If the internal carotid artery ruptures within the cavernous sinus, an [arteriovenous fistula](https://en.m.wikipedia.org/wiki/Arteriovenous_fistula) is created (more specifically, a [carotid-cavernous fistula](https://en.m.wikipedia.org/wiki/Carotid-cavernous_fistula)). Lesions affecting the cavernous sinus may affect isolated nerves or all the nerves traversing through it.
* The [pituitary gland](https://en.m.wikipedia.org/wiki/Pituitary_gland) lies between the two paired cavernous sinuses. An abnormally growing [pituitary adenoma](https://en.m.wikipedia.org/wiki/Pituitary_adenoma), sitting on the bony [sella turcica](https://en.m.wikipedia.org/wiki/Sella_turcica), will expand in the direction of least resistance and eventually compress the cavernous sinus. **Cavernous sinus syndrome** may result from mass effect of these tumors and cause [ophthalmoplegia](https://en.m.wikipedia.org/wiki/Ophthalmoparesis) (from compression of the oculomotor nerve, trochlear nerve, and abducens nerve), ophthalmic sensory loss (from compression of the ophthalmic nerve), and maxillary sensory loss (from compression of the maxillary nerve). A complete lesion of the cavernous sinus disrupts CN III, IV, and VI, causing total ophthalmoplegia, usually accompanied by a fixed, dilated pupil. Involvement of CN V (V1 and variable involvement of V2) causes sensory loss in these divisions of the trigeminal nerve.
* Because of its connections with the [facial vein](https://en.m.wikipedia.org/wiki/Facial_vein) via the [superior ophthalmic vein](https://en.m.wikipedia.org/wiki/Superior_ophthalmic_vein), it is possible to get infections in the cavernous sinus from an external facial injury within the [danger area of the face](https://en.m.wikipedia.org/wiki/Danger_area_of_the_face). In patients with [thrombophlebitis](https://en.m.wikipedia.org/wiki/Thrombophlebitis) of the facial vein, pieces of the clot may break off and enter the cavernous sinus, forming a [**cavernous sinus thrombosis**](https://en.m.wikipedia.org/wiki/Cavernous_sinus_thrombosis).

2.Discuss the walls of the nose.

 The **human nose** is the most protruding part of the [face](https://en.m.wikipedia.org/wiki/Face). It bears the [nostrils](https://en.m.wikipedia.org/wiki/Nostril) and is the first organ of the [respiratory system](https://en.m.wikipedia.org/wiki/Respiratory_system). It is also the principal organ in the [olfactory system](https://en.m.wikipedia.org/wiki/Olfactory_system). The shape of the [nose](https://en.m.wikipedia.org/wiki/Nose) is determined by the [nasal bones](https://en.m.wikipedia.org/wiki/Nasal_bone) and the [nasal cartilages](https://en.m.wikipedia.org/wiki/Nasal_cartilages), including the [nasal septum](https://en.m.wikipedia.org/wiki/Nasal_septum) which separates the nostrils and divides the [nasal cavity](https://en.m.wikipedia.org/wiki/Nasal_cavity) into two. On average the nose of a [male](https://en.m.wikipedia.org/wiki/Male) is larger than that of a [female](https://en.m.wikipedia.org/wiki/Female).

**-Nasal cavity** :The nasal cavity extends in an antero-posterior direction from the nostrils, or nares, to the choanae. The choanae are the posterior apertures of the nose. Each choana is bounded medially by the vomer, inferiorly by the horizontal plate of the palatine bone, laterally by the medial pterygoid plate, and superiorly by the body of the sphenoid bone (see figs. Posteriorly, the nasal cavity communicates with the nasopharynx, which in many respects may be regarded as the posterior portion of the cavity. The nasal cavity is related to the anterior and middle cranial fossae, orbit, and paranasal sinuses and is separated from the oral cavity by the hard palate. In addition to the nostrils and choanae, the nasal cavity presents openings for the paranasal sinuses and the nasolacrimal duct. Further openings, covered by mucosa in vivo, are found in a dried skull, e.g., the sphenopalatine foramen. The nasal cavity is divided into right and left halves (each of which may be termed a nasal cavity) by the nasal septum. Each half has a roof, floor, and medial and lateral walls.

-**The roof**:The roof of the nasal cavity is formed by nasal cartilages and several bones, chiefly the nasal and frontal bones, the cribriform plate of the ethmoid, and the body of the sphenoid. The floor, wider than the roof, is formed by the palatine process of the maxilla and the horizontal plate of the palatine bone, i.e., by the palate. The medial wall, or nasal septum, is formed (from anteiror to posterior) by (1) the septal cartilage (destroyed in a dried skull), (2) the perpendicular plate of the ethmoid bone, and (3) the vomer. It is usually deviated to one side. The lowest part of the septum (the columella) is membranous and mobile.

-**The lateral wall:** The lateral wall is uneven and complicated and is formed by several bones: nasal, maxilla, lacrimal and ethmoid, inferior nasal concha, perpendicular plate of palatine, and medial pterygoid plate of sphenoid. The lateral wall presents three or four medial projections termed nasal conchae, which overlie passages (meatuses). The inferior concha is a separate bone; the others are portions of the ethmoid bone. The conchae were formerly known as turbinates.

-**The spheno-ethmoidal recess**: The spheno-ethmoidal recess, above and posterior to the superior concha, receives the opening of the sphenoidal sinus. The superior meatus, under cover of the superior concha, receives the openings of the posterior ethmoidal cells and (in a dried skull) the sphenopalatine foramen. The middle meatus, under cover of the middle concha, receives the openings of the maxillary and frontal sinuses. Most anterior ethmoidal cells open on an elevation. A curved slit (hiatus semilunaris) inferior to the bulla receives the opening of the maxillary sinus. The frontal sinus and some anterior ethmoidal cells open either into an extension (ethmoidal infundibulum) of the hiatus or directly into the anterior part (frontal recess) of the middle meatus. The inferior meatus, which lies between the inferior concha and the palate, receives the termination of the nasolacrimal duct.

-**INNERVATION**

 The nerves of ordinary sensation are derived from the first two divisions of the trigeminal nerve. These are responsible for sensations of touch, pressure and temperature in the nose. The nerves for the posterior and larger portion of the nasal cavity come from branches of the pterygopalatine ganglion that are derived from the maxillary nerve. The chief sympathetic (vasoconstrictor) and parasympathetic (vasodilator and secretory) innervation of the nasal cavity follow nerve branches arising in the region of the pterygopalatine ganglion, but some sympathetic fibers are carried along the walls of arteries. Parasympathetic preganglionic nerve fibers to the nose leave the brain with the facial nerve and pass through the greater petrosal nerve and the nerve of the pterygoid canal to reach the pterygopalatine ganglion, where they synapse. Sympathetic preganglionic nerve fibers leave the upper thoracic spinal cord and traverse white rami communicans in that region, ascend the cervical sympathetic chain and synapse in the superior cervical sympathetic ganglion. The postganglionic nerve fibers follow the internal carotid artery and then the nerve of the pterygoid canal to reach the pterygopalatine fossa. These nerve fibers pass through the ganglion to join branches of the maxiallary nerve and artery to reach the nasal mucosa.

**-Blood supply and lymphatic drainage:** The most important arteries to the nasal cavity are the sphenopalatine (from the maxillary) artery and the anterior ethmoidal (from the ophthalmic) artery. Bleeding from the nose (epistaxis) occurs usually from the junction between septal branches of the superior labial and sphenopalatine arteries. The lymph vessels drain into deep cervical nodes. Communications probably occur between the nasal lymphatics and the subarachnoid space, probably through the sheath of the olfactory nerve.