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1. Write an essay on the Cavernous Sinus

The **cavernous sinus** within the human head is one of the [dural venous sinuses](https://en.wikipedia.org/wiki/Dural_venous_sinuses) creating a cavity called the **lateral sellar compartment** bordered by the [temporal bone](https://en.wikipedia.org/wiki/Temporal_bone) of the [skull](https://en.wikipedia.org/wiki/Human_skull) and the [sphenoid bone](https://en.wikipedia.org/wiki/Sphenoid_bone), lateral to the [sella turcica](https://en.wikipedia.org/wiki/Sella_turcica).

Structure

The cavernous sinus is one of the dural venous sinuses of the head. It is a network of veins that sit in a [cavity](https://en.wikipedia.org/wiki/Sinus_%28anatomy%29), approximately 1 x 2 cm in size in an adult. The [carotid siphon](https://en.wikipedia.org/wiki/Internal_carotid_artery#C4:_Cavernous_segment) of the [internal carotid artery](https://en.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.

Nearby structures

* Above: [optic tract](https://en.wikipedia.org/wiki/Optic_tract), [optic chiasma](https://en.wikipedia.org/wiki/Optic_chiasma), [internal carotid artery](https://en.wikipedia.org/wiki/Internal_carotid_artery).
* Inferiorly: [Foramen lacerum and the junction of the body and greater wing of sphenoid](https://en.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.wikipedia.org/wiki/Hypophysis_cerebri) or (pituitary gland) and [sphenoidal air sinus](https://en.wikipedia.org/wiki/Sphenoidal_air_sinus).
* Laterally: [temporal lobe](https://en.wikipedia.org/wiki/Temporal_lobe) with [uncus](https://en.wikipedia.org/wiki/Uncus).
* Anteriorly: [superior orbital fissure and the apex of the orbit](https://en.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.wikipedia.org/wiki/Petrous_temporal_bone).

Venous connections

The cavernous sinus receives blood from:

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

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

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

Structures passing through the midline (medial) wall:

* [Abducens nerve](https://en.wikipedia.org/wiki/Abducens_nerve)
* [Internal carotid artery](https://en.wikipedia.org/wiki/Internal_carotid_artery) accompanied by the [Internal carotid plexus](https://en.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.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.wikipedia.org/wiki/Foramen_rotundum). The maxillary branch passes external to, but immediately adjacent to, the lateral wall of the sinus)

A mnemonic exists to remember the orientation of the vertical and horizontal content of the sinus: O TOM CAT. (OTOM are the lateral wall contents from superior to inferior; CAT are the horizontal contents from medial to lateral). The [optic nerve](https://en.wikipedia.org/wiki/Optic_nerve) lies just above and outside the cavernous sinus, superior and lateral to the [pituitary gland](https://en.wikipedia.org/wiki/Pituitary_gland) on each side, and enters the orbital apex via the [optic canal](https://en.wikipedia.org/wiki/Optic_canal).

Function

**Venous drainage:** As a venous sinus, the cavernous sinus receives blood from the [superior](https://en.wikipedia.org/wiki/Superior_ophthalmic_vein) and [inferior ophthalmic veins](https://en.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.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.wikipedia.org/wiki/Pterygoid_plexus).

Clinical significance

It is the only anatomic location in the body in which an [artery](https://en.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.wikipedia.org/wiki/Arteriovenous_fistula)is created (more specifically, a [carotid-cavernous fistula](https://en.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.wikipedia.org/wiki/Pituitary_gland) lies between the two paired cavernous sinuses. An abnormally growing [pituitary adenoma](https://en.wikipedia.org/wiki/Pituitary_adenoma), sitting on the bony [sella turcica](https://en.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.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. [Horner's syndrome](https://en.wikipedia.org/wiki/Horner%27s_syndrome) can also occur due to involvement of the carotid ocular sympathetics, but may be difficult to appreciate in the setting of a complete third nerve injury.

Because of its connections with the [facial vein](https://en.wikipedia.org/wiki/Facial_vein) via the [superior ophthalmic vein](https://en.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.wikipedia.org/wiki/Danger_area_of_the_face). In patients with [thrombophlebitis](https://en.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.wikipedia.org/wiki/Cavernous_sinus_thrombosis). From there the infection may spread to the [dural venous sinuses](https://en.wikipedia.org/wiki/Dural_venous_sinuses). Infections may also be introduced by facial lacerations and by bursting pimples in the areas drained by the facial vein.

Potential causes of cavernous sinus syndrome include [metastatic tumors](https://en.wikipedia.org/wiki/Metastatic_tumor), direct extension of [nasopharyngeal tumours](https://en.wikipedia.org/wiki/Nasopharynx_cancer), [meningioma](https://en.wikipedia.org/wiki/Meningioma), [pituitary tumors](https://en.wikipedia.org/wiki/Pituitary_tumor) or [pituitary apoplexy](https://en.wikipedia.org/wiki/Pituitary_apoplexy), [aneurysms](https://en.wikipedia.org/wiki/Aneurysm) of the intracavernous [carotid artery](https://en.wikipedia.org/wiki/Carotid_artery), [carotid-cavernous fistula](https://en.wikipedia.org/wiki/Carotid-cavernous_fistula), bacterial infection causing cavernous sinus thrombosis, [aseptic cavernous sinus thrombosis](https://en.wikipedia.org/wiki/Cavernous_sinus_thrombosis), idiopathic [granulomatous disease](https://en.wikipedia.org/wiki/Granulomatous_disease) ([Tolosa–Hunt syndrome](https://en.wikipedia.org/wiki/Tolosa%E2%80%93Hunt_syndrome%22%20%5Co%20%22Tolosa%E2%80%93Hunt%20syndrome)), and fungal infections. Cavernous sinus syndrome is a medical emergency, requiring prompt medical attention, diagnosis, and treatment.

2. Discuss the walls of the nose

The walls of the nose (nasal cavity) are the medial wall and the lateral wall.

**The medial wall**: formed by the nasal septum

**The lateral walls**: are irregular owing to three bony plates, the nasal conchae, which project inferiorly, somewhat like louvers

Features on the lateral wall of the nasal cavity

* There is the presence of nasal conchae and they curve inferomedially
* The nasal conchae include;
* Superior nasal concha
* middle nasal concha
* inferior nasal concha
* The conchae or turbinates of many mammals (especially running mammals and those existing in extreme environments) are highly convoluted, scroll-like structures that offer a vast surface area for heat exchange
* Underneath each choncha in both humans with simple nasal conchae and animals with complex turbinates is a recess or meatus {passage(s) in the nasal cavity}
* The nasal cavity is thus divided into 5 passages:

I) a posterosuperiorly placed **sphenoethmoidal recess**

 3 laterally located nasal meatus:

II) Superior

III) Middle

IV) Inferior

V) and a medially placed common nasal meatus into which the four lateral passages open

Arterial supply

The arterial supply of the **medial** and **lateral walls** of the nasal cavity is from five sources:

* Anterior ethmoidal artery (from the ophthalmic artery)
* Posterior ethmoidal artery (from the ophthalmic artery)
* Sphenopalatine artery (from the maxillary artery)
* Greater palatine artery (from the maxillary artery)
* Septal branch of the superior labial artery (from the facial artery)

Venous drainage

A rich submucosal venous plexus deep to the nasal mucosa drains into the sphenopalatine, facial, and ophthalmic veins

Innervation

* olfactory nerve
* branches of the ophthalmic [V1] which include the anterior and posterior ethmoidal nerves
* maxillary [V2] nerves which include;
* posterior superior lateral nasal nerves
* posterior superior medial nasal nerves
* nasopalatine nerve
* posterior inferior nasal nerves

CLINICAL ANATOMY

**Epistaxis:** Epistaxis (nosebleed) is relatively common because of the rich blood supply to the nasal mucosa. In most cases, the cause is trauma and the bleeding is from an area in the anterior third of the nose (Kiesselbach area). Epistaxis is also associated with infections and hypertension. Spurting of blood from the nose results from the rupture of arteries. Mild epistaxis may also result from nose picking, which tears veins in the vestibule of the nose.

**Rhinitis**: The nasal mucosa becomes swollen and inflamed (rhinitis) during severe upper respiratory infections and allergic reactions (e.g., hayfever). Swelling of the mucosa occurs readily because of its vascularity.

Infections of the nasal cavities may spread to the:

* Anterior cranial fossa through the cribriform plate
* Nasopharynx and retropharyngeal soft tissues
* Middle ear through the pharyngotympanic tube (auditory tube), which connects the tympanic cavity and nasopharynx
* Paranasal sinuses
* Lacrimal apparatus and conjunctiva