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COURSE: GROSS ANATOMY OF THE HEAD AND NECK

1) Write an essay on the cavernous sinus

The cavernous sinus is one of the dural venous sinuses within the human head. It creates a cavity called the **lateral sellar compartment** bordered by the temporal bone of the skull and the sphenoid bone, lateral to the sella turcica. The cavernous sinuses are large venous plexuses located on each side of the sella turcica on the upper surface of the body of the sphenoid which contains the sphenoidal (air) sinus.

It consists of a venous plexus of extremely thin-walled veins that extends from the superior orbital fissure anteriorly to the apex of the petrous part of the temporal bone posteriorly. The cavernous sinus receives blood from the following veins:

- i. Superior and inferior ophthalmic veins
- ii. Superficial middle cerebral vein
- iii. Sphenoparietal sinus.

The venous channels in these sinuses communicate with each other through venous channels anterior and posterior to it called the **intercavernous sinuses** and sometimes through veins inferior to the pituitary gland.

The cavernous sinuses drain postero-inferiorly through the **superior and inferior petrosal sinuses** and emissary veins to the basilar and pterygoid plexuses.

Structures within the lateral wall of the compartment

From superior to inferior:

- i. Oculomotor nerve (CN III)
- ii. Trochlear nerve (CN IV)
- iii. Ophthalmic (CN V₁) and maxillary divisions (CN V₂) of the trigeminal nerve

Structures passing through the midline (inside the cavernous sinus)

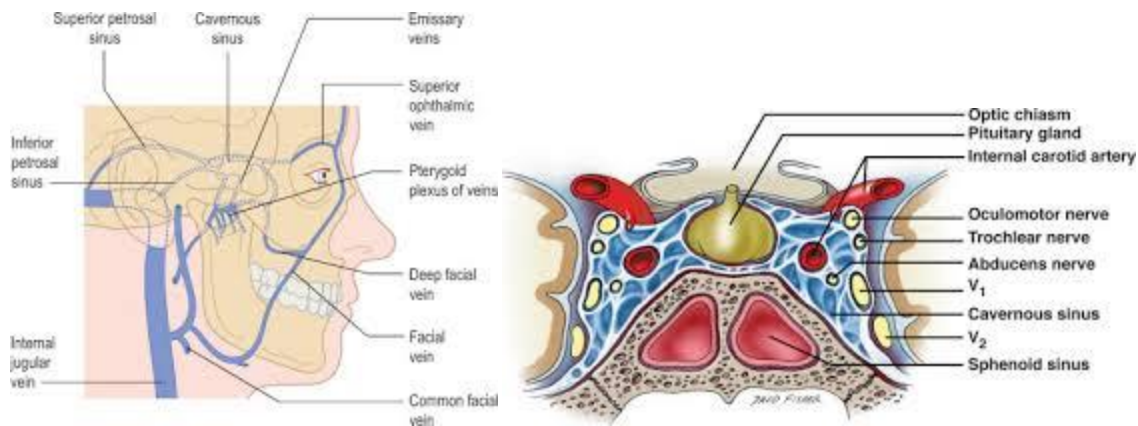
- i. Abducent nerve (CN VI)
- ii. Internal carotid artery and branches
- iii. Carotid plexus of sympathetic nerves

The nerves, with the exception of (CN V₂) pass through the cavernous sinus to enter the orbital apex through the superior orbital fissure. The maxillary branch (CN V₂) of

trigeminal nerve travels through the lower portion of the sinus and exits via the foramen rotundum.

Nearby structures of the cavernous sinus

- i. Above: optic tract, optic chiasma, internal carotid artery
- ii. Inferiorly: foramen lacerum and the junction of the body and greater wing of the sphenoid bone
- iii. Medially: pituitary gland and sphenoidal air sinus
- iv. Laterally: temporal lobe with uncus
- v. Anteriorly: superior orbital fissure and the apex of the orbit
- vi. Posteriorly: apex of petrous temporal bone



CLINICAL ANATOMY

- 1) **Fractures of cranial base:** in fractures of the cranial base, the internal carotid artery may be torn, producing an arterio-venous fistula within the cavernous sinus. Arterial blood rushes into the cavernous sinus, enlarging it, and forcing retrograde blood flow into its venous tributaries, especially the ophthalmic veins. Because CN III, CN IV, CN V1, CN V2 AND CN VI lie in or close to the lateral wall of the cavernous sinus, these nerves may be affected when the sinus is injured.
- 2) **Occlusion of cerebral veins and dural venous sinuses:** this results from thrombi (clots) thrombophlebitis (venous inflammation) or tumors. The dural venous sinuses most frequently thrombosed are the transverse, cavernous, and superior sagittal sinuses. Because of its connections with the facial vein via the superior ophthalmic vein, it is possible to get infections in the cavernous sinus. Cavernous sinus thrombosis usually results from infections in the orbit, nasal sinuses and superior part of the face. In persons with thrombophlebitis of the facial vein, pieces of an infected thrombus may extend into the cavernous sinus producing thrombophlebitis of the cavernous sinus. This may affect the nerves associated

with the cavernous sinus. Septic thrombosis of the cavernous sinus often results in the development of acute meningitis.

3) Discuss the walls of the nose

The nose is the part of the respiratory tract that is superior to the hard palate and contains the peripheral organ of smell. It includes the external nose and the nasal cavity which is divided into left and right cavities by the nasal septum. The function of the nose includes olfaction, respiration, and humidification of air amongst others.

The walls of the nose are contained within the nasal cavity. The walls are divided into the:

- Nasal septum (medial wall of the nasal cavity)
- Nasal conchae (lateral wall of the nasal cavity)

THE NASAL SEPTUM

The nasal septum divides the chamber of the nose into two nasal cavities. The septum has a bony part and a soft mobile cartilaginous part. The main components of the nasal septum the perpendicular plate of ethmoid, the vomer and the septal cartilage and are grouped into 2 parts:

- **Bony part of the nasal septum:** this consists of
 - i. Perpendicular plate of ethmoid: this forms the superior part of the nasal septum, descends from the cribriform plate, and continues superior to this plate as the crista galli.
 - ii. The vomer: this is the thin flat bone that forms the postero-inferior part of the nasal septum with some contribution from the nasal crests of the maxillary and palatine bones.
- **Cartilaginous part of the nasal septum:**
 - i. Septal cartilage: has a tongue and groove articulation with the edges of the bony septum.

Three cartilages contribute to the nasal septum:

- i. Lesser alar cartilage: paired cartilages that suspend in the fibro-fatty tissue that forms the lateral aspect of the nostril.
- ii. Greater alar cartilage: paired cartilages that form part of the antero-superior nostril as well as nasal tip.

- iii. Paired lateral nasal cartilage: forms the cartilaginous part of the bridge of the nose in conjunction with the greater alar cartilages.

THE NASAL CONCHAE

The nasal conchae are any of several thin, scroll like (turbinate) bones in the lateral sides of the nasal cavity that offer a vast surface area for heat exchange. They curve inferomedially hanging like louvers or curtains from the lateral walls of the nasal cavity.

In humans a nasal meatus underlies each of the nasal conchae bony formations. The nasal meatus is the nasal passage of the nasal cavity, especially one which is open to the exterior. Thus, there are five **passages** in which the nasal cavity is divided:

- i. Postero-superiorly placed **spheno-ethmoidal recess**: lie supero-posteriorly to the superior concha. It receives the opening of the sphenoidal sinus.
- ii. Three **laterally located nasal meatus** (superior, middle and inferior):
 - **Superior nasal meatus**: lies between the superior and middle nasal conchae into which the posterior ethmoidal sinuses open.
 - **Middle nasal meatus**: longer and deeper than the superior meatus. The antero-superior part of this passage leads into a funnel-shaped opening known as **ethmoidal infundibulum**. The ethmoidal infundibulum aids the communication between the middle nasal meatus and the frontal sinus. The passage that leads inferiorly from each frontal sinus to the ethmoidal infundibulum is the *frontonasal duct*. The frontal sinus opens into the semicircular groove – *the semilunar hiatus*. The ethmoidal bulla is an elevation superior to the semilunar hiatus formed by ethmoidal cells that form the ethmoidal sinuses.
 - **Inferior nasal meatus**: this is a horizontal passage inferolateral to the inferior nasal concha. The nasolacrimal duct which drains tears from the lacrimal sac opens into the anterior part of the meatus.
- iii. Medially placed **common nasal meatus** (into which the four passages open): this is the medial part of the nasal cavity between the conchae and the nasal septum, into which the lateral recesses and the meatus open.

There are three **nasal conchae**:

- i. **The inferior concha**: this is the longest and broadest of the conchae formed by an independent bone (of the same name, inferior concha)

covered by a mucous membrane that contains large vascular spaces that can enlarge affecting the caliber of the nasal cavity.

- ii. **The middle concha:** is a medial process of the ethmoid bone. It is found between the superior and inferior nasal conchae. It plays a role in humidifying and clearing inspired air of micro-particles such as dirt.
- iii. **The superior concha:** is a medial process of the ethmoid bone. It is a bony shelf above the middle nasal concha and below the sphenoidal recess.

When infected or irritated, the mucosa covering the conchae may swell rapidly, blocking the nasal passages on that side.

CLINICAL ANATOMY

- 1) **SINUSITIS:** due to the continuation between the paranasal sinuses and the nasal cavities through apertures, infection may spread from the nasal cavities producing inflammation and swelling of the mucosa (sinusitis) and local pain.

