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**MEDICINE AND SURGERY**

**GROSS ANATOMY OF THE HEAD AND NECK**

1. The Cavernous 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. 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 dural venous sinuses are channels between the two layers of dura mater which are responsible for the venous drainage of the brain, skull, orbit and internal ear. .

Anatomical Location and Borders

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.

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.

Contents

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

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| Travels through the cavernous sinus: | Travels through the lateral wall of the cavernous sinus: |
| Abducens nerve (CN VI) | Oculomotor nerve (CN III) |
| Carotid plexus (post-ganglionic sympathetic nerve fibres) | Trochlear nerve (CN IV) |
| Internal carotid artery (cavernous portion) | Ophthalmic (V1) and maxillary (V2) branches of the trigeminal nerve |

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.

Dural Venous Sinus System

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 Significance - Cavernous Sinus Thrombosis

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 features 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.

2. THE WALLS OF THE NOSE

The lateral wall of each nasal cavity mainly consists of the maxilla . However, there is a deficiency that is compensated for by the perpendicular plate of the palatine bone , the medial pterygoid plate, the labyrinth of ethmoid and the inferior concha . The paranasal sinuses are connected to the nasal cavity through small orifices called ostia . Most of these ostia communicate with the nose through the lateral nasal wall, via a semi-lunar depression in it known as the semilunar hiatus . The hiatus is bound laterally by a projection known as the uncinate process . This region is called the ostiomeatal complex

The roof of each nasal cavity is formed in its upper third to one half by the nasal bone and more inferiorly by the junctions of the upper lateral cartilage and nasal septum. Connective tissue and skin cover the bony and cartilaginous components of the nasal dorsum.

The floor of the nasal cavities, which also form the roof of the mouth, is made up by the bones of the hard palate: the horizontal plate of the palatine bone posteriorly and the palatine process of the maxilla anteriorly. The most anterior part of the nasal cavity is the nasal vestibule . The vestibule is enclosed by the cartilages of the nose and lined by the same epithelium of the skin (stratified squamous, keratinized). Within the vestibule this changes into the typical respiratory epithelium that lines the rest of the nasal cavity and respiratory tract. Inside the nostrils of the vestibule are the nasal hair , which filter dust and other matter that are breathed in. The back of the cavity blends, via the choanae , into the nasopharynx.

The nasal cavity is divided in two by the vertical nasal septum . On the side of each nasal cavity are three horizontal outgrowths called nasal conchae (singular "concha") or turbinates. These turbinates disrupt the airflow, directing air toward the olfactory epithelium on the surface of the turbinates and the septum. The vomeronasal organ is located at the back of the septum and has a role in pheromone detection.

Nasal Conchae

Projecting out of the lateral walls of the nasal cavity are curved shelves of bone. They are called conchae (or turbinates). The are three conchae – inferior, middle and superior.

They project into the nasal cavity, creating four pathways for the air to flow. These pathways are called meatuses:

Inferior meatus – between the inferior concha and floor of the nasal cavity.

Middle meatus – between the inferior and middle concha.

Superior meatus – between the middle and superior concha.

Spheno-ethmoidal recess – superiorly and posteriorly to the superior concha.

The function of the conchae is to increase the surface area of the nasal cavity – this increases the amount of inspired air that can come into contact with the cavity walls. They also disrupt the fast, laminar flow of the air, making it slow and turbulent. The air spends longer in the nasal cavity, so that it can be humidified.