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MATRIC NUMBER: 17/MHS01/290

ANA 301 ASSIGNMENT

Question: 1. Write an essay on the carvanous sinus

2. Discuss the walls of the nose

1.

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 it is the most clinically important venous sinus.

**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 OF THE CARVENOUS SINUS**

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:

Travels through cavernous sinus:

1. Abducens nerve (CN VI)
2. Carotid plexus (post-ganglionic sympathetic nerve fibres)
3. Internal carotid artery (cavernous portion)

Travels through lateral wall of cavernous sinus:

1. Oculomotor nerve (CN III)
2. Trochlear nerve (CN IV)
3. 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:

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

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 (CST): refers to the formation of a clot within the cavernous sinus.The most common cause of CST is infection; which typically spreads from an extracranial location such as the orbit, paranasal sinuses. 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 nose is made of four walls:

1. The lateral wall

2. The medial wall

3. The floor

4. The roof

1. **THE LATERAL WALL**: The lateral wall of the nasal cavity is a region of the nasopharynx essential for humidifying and filtering the air we breathe in nasally. The lateral wall is made of nasal septum, nasal conchea and some bones

**NASAL SEPTUM**

Anterior nasal aperture

The anterior nasal aperture is the area where the anterior bony aspects of both the maxilla and the nasal bone terminate and form an opening into the cartilaginous nasal vestibule. The structure is also referred to as the piriform aperture. Three cartilages contribute to the nasal septum:

1. Lesser alar cartilages: are paired cartilages suspended in the fibro-fatty tissue that forms the lateral aspect of the nostril. The structures lie free from the other cartilages and provide the nostril with stability and form.

2. Greater alar cartilages: are paired cartilages that form part of the antero-superior nostril as well as the nasal tip. The structures give the tip of the nose stability and flexibility and are a crucial element of the cartilaginous apparatus of the nose.

3. Lateral nasal cartilages: are structures that articulate inferiorly with the greater alar cartilages and superiorly with the anterior nasal aperture formed by both the nasal bone superiorly and for a short part of its border with the perpendicular plate of the ethmoid bone. These structures form the cartilaginous part of the bridge of the nose and form in conjunction with the greater alar cartilages, the major structural appearance of the nose.

**NASAL CONCHEA**

We can find 3 types of nasal conchae in the nasal cavity. They are: Superior, inferior and middle nasal conchea

* Inferior nasal concha is the longest and broadest of the conchae and is formed by an independent bone (of the same name, inferior concha). The concha is covered by a mucous membrane that contains large vascular spaces and is one of the three that work to both humidify and clear the air that passes into the nasopharynx.
* Superior and middle nasal conchae arise from the perpendicular plate of the ethmoid bone. The middle nasal concha is found in between the superior and inferior nasal concha and plays a role in humidifying and clearing inspired air of micro-particles such as dirt. The superior nasal concha is a bony shelf located above the middle nasal concha and below the sphenoethmoidal recess. Similar to the middle nasal concha the superior concha is itself part of the ethmoid bone.

The bones that contribute to the lateral wall include: The frontal bone, the ethmoid bone, the lacrimal bone, the nasal bones, the pallentine bone and the sphenoid bone.

2. **THE MEDIAL WALL**: The medial wall of the nasal cavity comprises the nasal septum, the septal catilage and various bones of the skull.

**The nasal septum** is a structure consisting of both bony and cartilaginous components. The bony components are the:

1. Perpendicular plate of the ethmoid superoinferiorly
2. The vomer posteroinferiorly
3. The crests of the maxillary bone anteroinferiorly
4. The crest of the palatine bone inferior to the vomer
5. Ethmoid bone

The medial wall of the nasal cavity is formed by both bony elements and cartilage. Posteriorly the perpendicular plate of the ethmoid bone forms the superoposterior part of the bony nasal septum and articulates superiorly with the cribriform plate. The posterior border articulates superiorly with the sphenoidal crest and with the vomer by its inferior border.The cribriform plate is found in the midline on the anterior floor of the anterior cranial fossa. It can be descried as a thin bony plate of perforated bone through which the fibres of the olfactory nerve ascend and reach the entorhinal cortex. The plate is divided by the crista galae in the midline.

**The other components:**

* Maxillary bone: Further posteriorly than the ethmoid bone, the crest of both the maxilla and palatine bone complete the posterior septum. The anterior septum is formed entirely of the quadrangular cartilage which divides the cavity in the midline. The nasal septum can be deviated in some and is a sign of nasal trauma or abnormal growth.
* Vomer: The vomer is an unpaired bone of the skull forms the inferior part of the septum. It is located in the mid sagittal plane and articulates with the ethmoid, both palatine bones and both maxillary bones.
* Palatine bone: The horizontal plate of the palatine bone is a rectangular shaped bone that projects medially and forms a right angle with the perpendicular plate of the ethmoid. The nasal surface of the bone forms part of the inferior meatus of the nose, while the serrated anterior maxillary surface articulates with the maxilla. Laterally the bone articulates with the perpendicular plate, and superior portion of the plate forms the posterior part of the nasal cavity. The inferior surface of the plate is rough and provides attachment to the oral mucosa of the hard palate.

The septal cartilage is approximately 3-4mm thick. It divides the nasal cavity into two halves. The anteroinferior part of the cartilage has an expansion known as the ‘footplate’ which is 4-8mm wide. This foot plate lies in free contact with the membranous septum. The cartilage is expanded in other regions, namely the junction with the lateral nasal cartilage termed the posterior process. The cartilage is firmly adhered to the nasal bone by taut collagen fibres.

The cartilage of the septum is also termed the ‘quadrangular cartilage’ due to its shape.

3. **THE FLOOR:** The floor of the nasal cavity is formed by the hard palate and the soft palate.

1. The hard palate: The hard palate is a horizontal plate of bone formed by both the palatine process of the maxilla, which forms 75% of the hard palate, and the horizontal plate of the palatine bone, which forms the remaining 25%. This bony structure has numerous perforations to allow for the passage of nutrient vessels. Its function is to form a separation between the nasopharynx and oropharynx. Insufficiency in this structure can cause difficulty with swallowing.

2. The soft palate: The soft palate is also referred to as the ‘velum’. This is a continuation of the hard palate posteriorly but has no bony structure. This structure is constituted of five muscles crucial for swallowing. These are the:

* Tensor veli palatini (innervated by the mandibular branch of the trigeminal nerve)
* Palatoglossus
* The palatopharyngeus which has a crucial role in breathing
* The levator veli palatini which elevates the soft palate to encompass the bolus of food
* The musculus uvulae which move the uvula
* The uvula has an essential role in human speech and works with the posterior part of the tongue to create ‘guttural’ sounds.

4. **THE ROOF:** The roof of the nasal cavity is formed by nasal cartilages and several bones, chiefly the nasal and frontal bones, the cribiform plate of the ethmoid and the body of the sphenoid.

Clinical Anatomy

Sinusitis: Sinusitis is an inflammation of the different sinuses found in the head. That type of inflammation may result in different symptons including: plugged nose, nasal mucus, and pain in the facial region. The frontal bone overlies the frontal lobe of the brain and lies anteriorly forming the brow, forehead and one third of the anterior scalp. The bone contains the frontal sinus, which in sinusitis and nasal infections can become filled with fluid.