**17/MHS01/161**

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 **ANA 301**

 **1. WRITE AN ESSAY ON THE CARVENOUS 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. 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 cavernous sinuses are one of several drainage pathways for the brain that sits in the middle. In addition to receiving venous drainage from the brain, it also receives tributaries from parts of the face. The cavernous sinus works as a conduit. Cranial nerves leaving the brainstem travel through the cavernous sinus before entering the orbit to innervate extraocular and intrinsic eye muscles. The cavernous sinus is roofed by an inner layer of dura mater that continues with the diaphragma sellae that covers the superior part of the pituitary gland. The roof of the sinus also has several other attachments. Anteriorly, it attaches to the anterior and middle clinoid processes, posteriorly it attaches to the tentorium (at its attachment to the posterior clinoid process). Part of the periosteum of the greater wing of the sphenoid bone forms the floor of the sinus. The body of the sphenoid acts as the medial wall of the sinus while the lateral wall is formed from the visceral part 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. They can be sub-classified by whether they travel through the sinus itself, or through its lateral wall:

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| **TRAVELS THROUGH THE CARVENOUS SINUS** | **TRAVELS THROUGH THE LATERAL WALL OF THE CAVERNOUS SINUS** |
| Abducens nerve (CN VI) | Occulomotor nerve (CN III) |
| Carotid plexus | Trochlear nerve (CN IV) |
| Internal carotid artery | Opthalmic (V1) and maxillary branches of the trigeminal nerve |

 It is important to note that 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 cavernous sinus is an unconventional venous system in the sense that it does not have a unidirectional flow of blood. Owing to the fact that there are no valves in the sinus and its connected veins, the direction of blood flow is dependent on venous pressure. The veins that communicate with the cavernous sinus are:

i. Superior ophthalmic vein

ii. Inferior ophthalmic vein

iii. Superficial middle cerebral vein

iv. Middle meningeal vein

v. Hypophyseal veins

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 Syndrome

Cavernous sinus syndrome is a medical emergency and life-threatening disorder that presents with different symptoms depending on what structure is affected. A severe lesion involving the entire sinus will present with total ophthalmoplegia, due to CN III, IV, and VI injury, accompanied with fixed and dilated pupils due to compression of the superficial parasympathetic fibers of the CN III. Cavernous sinus syndrome can lead to Horner’s syndrome. Horner’s syndrome occurs when the sympathetic plexus around the internal carotid is damaged. When CN V1 and CN V2 are involved, sensory loss in the face, scalp, maxilla, nasal cavity, sinuses, and palate occurs. There are several causes of cavernous sinus syndrome, including metastatic tumor, meningioma, pituitary tumor, extension of nasopharyngeal tumors, granulomatous diseases, cavernous sinus thrombosis, and aneurysms of the cavernous part of the internal carotid artery. In case of rupture of a cavernous aneurysm, a carotid-cavernous fistula is created, leading to a pulsating exophthalmos on physical examination.

**2.** The nose is an olfactory and respiratory organ. It consists of nasal skeleton, which houses the nasal cavity. The nasal cavity extends from the external nares to the internal nares. It is divided into left and right halves by the nasal septum.

Each half has a: i) roof ii) floor iii) lateral wall iv) medial wall

Roof: Approximately 7cm long and 2mm wide

 It is narrow and formed (from behind forward) by the: body of sphenoid

 Cribriform plate of ethmoid bone

 Frontal bone

 Nasal bone and cartilage

Floor: approximately 5cm long and 1.5 cm wide

 It separates the oral cavity from the nasal cavity

 It is formed by the hard (bony) palate

Medial Wall: Otherwise known as the nasal septum is the median osseo-cartilagenous partition between the two halves of the nasal cavity.

Three cartilages contribute to the nasal septum:

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.

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.

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.

Arterial Supply

Antero-inferior part of the septum contains anastomoses between septal ramus of superior labial branch of facial artery, branch of sphenopalantine artery and anterior ethmoidal. These form a large capillary network called Kiesselbach’s plexus. This is a common site of nose bleed or epistaxis and is known as little’s area

Venous drainage

From little’s area plexus, drains anteriorly into facial vein

Posteriorly through sphenopalantine vein to pterygoid plexus

Nerve supply

General sensory nerves, arises from trigeminal nerve and distributed to the whole of the septum

Antero-superior part: internasal branch of the anterior ethmoidal nerve

Postero-inferior part: nasopalantine branch of the pterygopalantine ganglion

Postero- superior part- medial posterior superior nasal branches of the pterygopalantine ganglion

Lymphatic drainage

Anterior half drains to submandibular nodes.

Posterior half drains to retropharyngeal and deep cervical nodes.

Lateral Wall

The lateral wall of the nose is irregular owing to the presence of three shelf like bony projections called conchae.The conchae increase the surface area of the nose for effective air-conditioning of inspired air.

The lateral wall separates the nose:

From above, ethmoidal air sinuses

From the maxillary sinus, below

From the lacrimal groove and nasolacrimal canal, in front.

The lateral wall is sub divided into three parts:

1. The vestibule: a small depressed area in the anterior part lined by modified skin containing short, stiff, curved hairs called vibrissae.

2. Atrium of the middle meatus

3. The conchae, posteriorly.

The skeleton of the lateral wall is partly bony, partly cartilaginous and partly made up of soft tissues.

Bony part formed by: Nasal bone, frontal process of maxilla, lacrimal bone, labrininth of ethmoid with superior and middle conchae, inferior nasal conchae, perpendicular plate of palantine bone, and medial pterygoid plate.

Cartilaginous part formed by: superior nasal cartilage, inferior nasal cartilage and small cartilages of ala.

Arterial Supply

The antero-superior quadrant: anterior ethmoidal artery assisted by the posterior ethmoidal and facial arteries.

The antero-inferior quadrant: branches from the facial and greater palantine arteries.

The postero-superior quadrant: sphenopalantine artery.

The postero-inferior quadrant: branches from the greater palantine artery.

Venous Drainage

The veins form a plexus which drain anteriorly into the facial vein;

Posteriorly, into the pharyngeal plexus of veins;

From middle part to the pterygoid plexus of veins.

Nerve Supply

General sensory nerves derived from the branches of trigerminal nerve.

Anterior ethmoidal nerve branch of ophthalmic nerve

Anterior superior alveolar nerve, branch of maxillary nerve.

Lymphatic drainage

Anterior half of the lateral wall pass to the submandibular nodes

The posterior half to the retropharyngeal and upper deep cervical nodes.