

NAME: IDRIS ESTHER OLUFUNMILOLA

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ANATOMY ASSIGNMENT

1. DISCUSS THE CARVERNOUS SINUS

ANSWER

Carvenous Sinus

The carvenous 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 carvenous 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 of the Carvenous Sinus

The carvenous 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 carvenous 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 of 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 pass through the sinus itself or through its lateral wall:

- **Travels through the cavernous sinus**
 - i. Abducens nerve (CN VI)
 - ii. Internal carotid artery and its small branches
 - iii. Carotid plexus of sympathetic nerve
- **Travels through the lateral wall of cavernous sinus**
 - iv. Oculomotor nerve (CN III)
 - v. Trochlear nerve (CN IV)
 - vi. 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 exchange between the warm arterial blood and the cooler venous circulation.

Embryology

Most of the cavernous sinus is formed before birth. It first emerges as a collection of small venous canals consisting of only an endothelial layer. Throughout gestation, these canals gradually expand to form larger structures. In fact, after 13 weeks of gestation, the cavernous sinus appears as a faint cluster of small vessels, whereas after 27 weeks of gestation, the inferior venous pathways suddenly increase in size.

Arterial Blood Supply

The common carotid artery bifurcates in the cervical region and gives rise to external and internal carotid artery. The internal carotid artery travels superiorly and enters the skull via the carotid canal. After entering the carotid canal, the internal carotid makes a 90-degree turn and travels horizontally in the petrous part of the temporal bone- this is the petrous part of the internal carotid artery. The petrous part of the internal carotid enters the carvenous sinus via the foramen lacerum. In the carvenous sinus, the internal carotid artery is also referred to as the carvenous part. The carvenous part travels horizontally and anteriorly until it reaches the anterior limit of the sinus, where it curves vertically, exit the sinus superioly and become the cerebral part of the internal carotid artery. It is important to mention that the carvenous part of the internal carotid artery is the only artery in the body that is surrounded completely by venous blood.

Dura Venous Sinus System

The carvenous sinus works as a conduit. Cranial nerves leaving the brainstem travel through the carvenous sinus before entering iinto the orbit to innervate extraocular and intrinsic eye muscles. Also different venous tributaries drain into the carvenous sinus.

- The superior ophthalmic vein collects venous blood from the ethmoidal, vorticose, central retina and nasofrontal veins before draining into the anterior part of the carvenous sinus through the superior orbital fissure.
- Central vein of the retina drains into the superior ophthalmic vein, or directly into the carvenous sinus.
- The inferior ophthalmic vein, on the other hand, receives blood from the lacrimal sac, eyelids. the inferior rectus and inferior oblique muscles, the vorticose vein and from the anterior and medial wall of the orbit. It runs posteriorly toward the lower part of the orbit and divides into two branches. One of these branches joins the carvenous sinus, while the other one drains into the pterygoid plexus.

- Pterygoid plexus is located within the intertemporal fossa.
- The superficial middle cerebral vein originates on the lateral surface of the hemisphere, runs in the lateral sulcus, drains most of the temporal lobe into the cavernous sinus.
- The Sphenoparietal sinus receives blood from some branches of the middle meningeal vein before draining into the cavernous sinus. It is noteworthy to mention that efferent hypophyseal veins also drain into the cavernous sinus.

After collecting venous blood from these different veins, the cavernous sinus drains to the superior and inferior petrosal sinuses, which then join the sigmoid sinus to form the internal jugular vein. The internal jugular vein exits the brain through the jugular foramen and connects with the subclavian vein to become the right and left brachiocephalic vein.

Nerves

The nerves of the cavernous sinus are the oculomotor nerve (CN III), trochlear nerve (CN IV), ophthalmic nerve (V1), maxillary nerve (V2), abducens nerve (CN VI), and the sympathetic plexus around the internal carotid artery.

- The CN III exits the midbrain ventrally at the interpeduncular fossa, pierces the dura, and enters the cavernous sinus, where it runs on the roof and lateral wall. After exiting the cavernous sinus, it goes through the superior orbital fossa. Within the superior orbital fossa it splits into the superior and inferior division.
- The CN IV is the only nerve exiting the midbrain dorsally. It originates from the trochlear nerve nucleus; it crosses the midline and emerges inferior to the inferior colliculus, situated in the posterior part of the midbrain. It then travels anteriorly around the midbrain, pierces and enters the dura mater near the tentorium cerebelli, and continues its course in the lateral wall of the cavernous sinus. After exiting the cavernous sinus, it enters the orbit through the superior oblique muscle.

- The ophthalmic nerve (V1) and maxillary nerve are divisions of the trigeminal nerve (CN V). The CN V exits the brainstem from the ventrolateral pons and enters the Meckel's cave where the trigeminal ganglion lies. The V1 branches of the trigeminal ganglion pass through the inferior part of the carvenous sinus and after exiting the carvenous sinus, they enter the orbit via the superior orbital fissure. Also, the V2 branches of the trigeminal ganglion enter the carvenous sinus and exit the skull via the foramen rotundum.
- The CN VI exits in the brainstem ventrally at the pontomedullary junction, pierces the dura, and travels the longest intracranial distance of all cranial nerves. After long intracranial course, it enters the carvenous sinus, where it is surrounded by venous blood, like the internal carotid artery.
- The sympathetic plexus around the internal carotid artery originates from the superior cervical ganglion, travels with the internal carotid artery, enters the skull through the carotid canal, and enters the carvenous sinus through the jugular foramen. Within the carvenous sinus, it gives sympathetic fibers to the CN III and V1.

Clinical Significance

Carvenous Sinus Thrombosis (CST)

This refers to the formation of clot within the carvenous sinus.

The most common cause of CST is infection; typically spreads extracranial location such as 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 superiorophthalmic veins.

Common clinical features include headache, unilateral periorbital oedema, proptosis (eye bulging), photophobia and cranial nerve palsies. The abducens nerve is most commonly affected.

2. DISCUSS THE WALLS OF THE NOSE

ANSWER

the nose comprises of two walls namely;

- Medial wall/nasal septum
- Lateral wall

MEDIAL WALL

The medial wall is formed by the nasal septum. The wall separating the left and right airways of the nasal cavity dividing the two nostrils is known as the nasal septum. The nasal septum is depressed by the depressor septi nasi muscle.

Structure

The fleshy external end of the nasal septum is called the columella or columella nasi, and made up of cartilage and soft tissue. The nasal septum contains bone and hyaline cartilage. It is normally about 2mm thick.

The nasal septum is composed of four structures:

- perpendicular plate of ethmoid bone
- vomer bone
- septal nasal cartilage
- maxillary crest

The lowest part of the septum is narrow strip of bone that projects from the maxilla and the palatine bones and is the length of the septum. The strip of bone is called the maxillary crest, and it articulates in front with the quadrangular cartilage, and at the back with the vomer. The maxillary crest is described in the anatomy of the nasal septum as having a maxillary component and a palatine component.

LATERAL WALL

The lateral wall of the nose is the region of the nasopharynx essential for

humidifying and filtering the air we breathe in nasally.

Parts

It mainly consists of

- Cartilages: greater alar cartilages, lesser alar cartilages, lateral nasal cartilages
- Bones: anterior nasal aperture (piriform aperture) formed by maxilla and nasal bones
- Nasal conchae: Superior nasal conchae, middle nasal conchae and inferior nasal conchae

In the lateral wall lies a structure called agger nasi. The agger nasi is also referred to as the nasoturbinal concha or nasal ridge. It can be described as a small mound or ridge found in the lateral side of the nasal cavity. The structure is located midway along the anterior aspect of the middle nasal concha. An abnormally enlarged form may restrict the drainage of the frontal sinus obstructing the frontal recess area.