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DEPT: MBBS

COURSE: Gross Anatomy of the Head and Neck

ASSIGNMENT:

1. Write an essay on the cavernous Sinus
2. Discuss the walls of the nose.

ANSWERS

1. The Cavernous Sinus

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 left and right cavernous sinuses communicate through the anterior and posterior intercavernous sinuses. The cavernous sinus drains to the superior and inferior petrosal sinuses, which then join the sigmoid sinus.

The cavernous sinuses are 1 cm wide cavities that extend a distance of 2 cm from the most posterior aspect of the orbit to the petrous part of the temporal bone. They are bilaterally paired collections of venous plexuses that sit on either side of the sphenoid bone. Although they are not truly trabeculated cavities, their numerous plexuses, however, give the cavities their characteristic sponge-like appearance.

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.

Contents of the Cavernous Sinus

The cavernous sinus contains the internal carotid artery and several cranial nerves. Abducens nerve (CN VI) traverses the sinus lateral to the internal carotid artery. The remainder of the cranial nerves pass through the lateral wall of the carotid sinus, and from superior to inferior they are:

Oculomotor nerve (CN III)

Trochlear nerve (CN IV)

Trigeminal nerve (CN V) - ophthalmic and maxillary divisions.

Relations

There are numerous structures surrounding the cavernous sinus:

- Medially, the sinus is adjacent to the lateral walls of the pituitary fossa with the pituitary gland, the sphenoid bone and its air sinus.
- The cerebral part of the internal carotid artery courses superiorly.
- Laterally, the medial aspect of the temporal lobe of each hemisphere lies adjacent to the sinus.

And,

- Posteriosuperiorly, the uncus of the temporal lobe has a relation to the sinus.

Communications

The cavernous sinus is an unconventional venous system in the sense that it does not have an 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:

Superior ophthalmic vein: the cavernous sinus generally has five venous tributaries. The superior ophthalmic vein receives blood from the ethmoidal, nasofrontal, vorticosae (drains the ocular choroid), and central retinal veins. It drains into the anterior part of the sinus via the superior orbital fissure.

Inferior ophthalmic vein: the inferior ophthalmic vein collects blood from the eyelids, lacrimal sac, and some vorticosae contributions, as well as the anterior floor and medial wall of the orbit. In addition to draining to the cavernous sinus, it also drains to the pterygoid plexus.

Superficial middle cerebral vein: at the point where the internal carotid artery emerges, the superficial middle cerebral vein pierces the roof of the sinus. Here, it drains blood from the cortices that are adjacent to it as it courses through the lateral sulcus.

Middle meningeal vein: finally, branches of the middle meningeal vein may join the sphenoparietal sinus on its way to the cavernous sinus. Before piercing the roof of the sinus, it travels along the edge of the lesser wing of the sphenoid between the layers of dura mater.

Hypophyseal veins: additionally, efferent hypophyseal veins of both the adenohypophysis and neurohypophysis drain to the cavernous sinus.

Intercavernous Sinuses and Drainage

The left and right cavernous sinuses communicate by way of the anterior and posterior intercavernous sinuses. These vessels travel anteriorly and posteriorly (respectively) around the infundibulum of the pituitary gland, deep to the diaphragma sellae, between the layers of dura mater.

The cavernous sinus in turn drains to the superior and inferior petrosal sinuses. Both sinuses join the sigmoid sinus, which then becomes the internal jugular vein. The internal jugular vein meets with the subclavian vein to become the left (or right) brachiocephalic vein.

Clinical significance

Carotid-cavernous fistula: head trauma resulting in rupture of the cavernous part of the internal carotid artery can produce what is known as a carotid-cavernous fistula. A pulsating exophthalmos can result as the venous pressure in the sinus would increase and reverse the flow of blood in the ophthalmic veins.

Cavernous sinus thrombosis: the sinus also has communicating branches from the sin of the face. Particularly in the 'danger area' at the nasolabial crease and at the crease between the ala of the nose and the cheek, an infection can spread to the cavernous sinus, which can result in a cavernous sinus thrombosis. This condition can result in internal strabismus (crossed eyes) if the Abducens

nerve (CN VI) is damaged, doubled vision while looking downward if Trochlear nerve (CN IV) was damaged, or ophthalmoplegia (paralysis or weakness in muscles of movement of the eye).

2. The walls of the Nose

The wall separating the two cavities of the nose, the nasal septum, is made up of bone inside and cartilage closer to the tip of the nose. The bony part is formed by the perpendicular plate of the ethmoid bone at the top, and the vomer bone below. The floor of the nose is made up of the incisive bone and the horizontal plates of the palatine bones, and this makes up the hard palate of the roof of the mouth. The two horizontal plates join together at the midline and form the posterior nasal spine that gives attachment to the musculus uvulae in the uvula.

The two maxilla bones join at the base of the nose at the lower nasal midline between the nostrils, and at the top of the philtrum to form the anterior nasal spine. This thin projection of bone holds the cartilaginous center of the nose. It is also an important cephalometric landmark.

Nasal Cavity

The nasal cavity is divided into two lateral compartments separated down the middle by the nasal septum. The nasal cavity communicates anteriorly through the nostrils and posteriorly with the nasopharynx through openings called choanae. The nasal cavities and septum are lined with a mucous membrane and are richly vascularized by branches of the maxillary, facial, and ophthalmic arteries. The nasal cavity receives innervation via branches of the olfactory [cranial nerve (CN) I], ophthalmic (CN V I), and maxillary nerves (CN VII).

Boundaries of the Nasal Cavity

The nasal cavity is bordered by the following structures:

- Roof. Formed by the nasal, frontal, sphenoid, and ethmoid bones (cribriform foramina, which transmits CN I for smell).
- Floor. Formed by the maxilla and the palatine bones. The incisive foramen transmits branches of the sphenopalatine artery and the nasopalatine nerve for general sensation from the nasal cavity and palate.
- Medial wall (nasal septum). Formed by the perpendicular plate of the ethmoid bone, the vomer bone, and the septal cartilage.
- Lateral wall. Formed by the superior, middle and inferior nasal conchae. In addition, the maxillary, sphenoid, and palatine bones contribute to the lateral wall. The lateral wall contains the following openings:

- Sphenoethmoidal recess. The space between the superior nasal concha and the sphenoid bone, with openings from the sphenoid sinus.
- Superior meatus. The space inferior to the superior nasal concha, with openings from the posterior ethmoidal air cells.
- Middle meatus. The space inferior to the middle nasal concha, with openings for the frontal sinus via the nasofrontal duct, the middle ethmoidal air cells on the ethmoidal bulla, and the anterior ethmoidal air cells and maxillary sinus in the hiatus semilunaris
- Inferior meatus. The space inferior to the inferior nasal concha, with an opening for the nasolacrimal duct, which drains tears from the eye into the nasal cavity.
- Sphenopalatine foramen. An opening posterior to the middle nasal concha receives the nasopalatine nerve and the sphenopalatine artery from the pterygopalatine fossa into the nasal cavity.