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COLLEGE: COLLEGE OF MEDICINE AND
HEALTH SCIENCES.

DEPARTMENT: MEDICINE AND SURGERY.

COURSE: GROSS ANATOMY OF THE HEAD AND
NECK.

COURSE CODE: ANA 301

LECTURER: DR OGEDENGBE

ASSIGNMENT

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

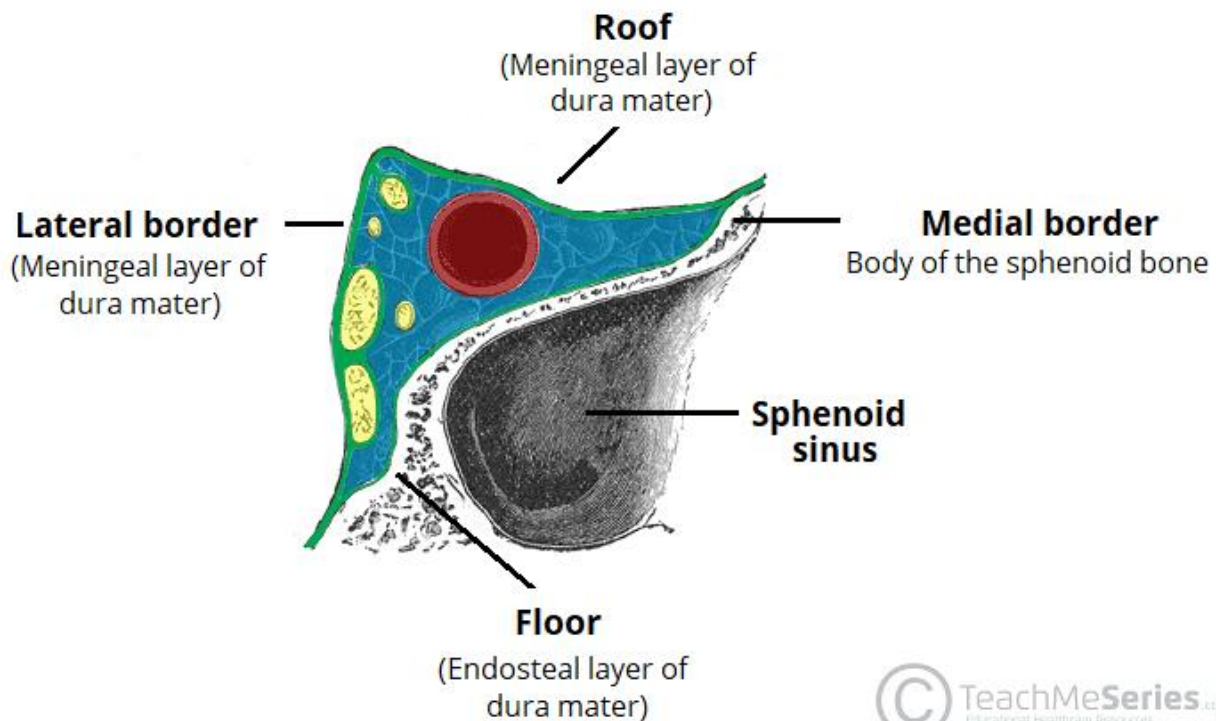
1. THE CAVERNOUS SINUS

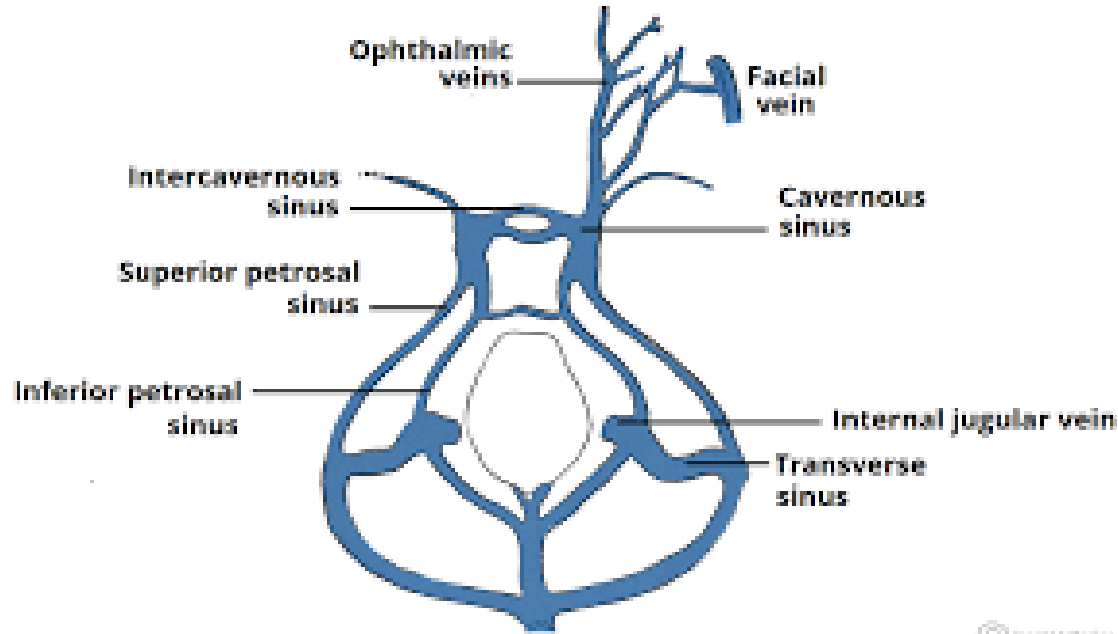
The cavernous sinus is a paired dural venous sinus located within the cranial cavity. It is divided by septa into small 'caves' – from which it gets its name. It is a network of veins that sit in a cavity, approximately 1 x 2 cm in size in an adult.

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 sinuses are as follows;

- **Anteriorly;** the superior orbital fissure and the apex of the orbit.
- **Posteriorly;** petrous part of the temporal bone.
- **Medially;** body of the sphenoid bone.
- **Laterally;** 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 the dura mater that overlies the base of the greater wing of the sphenoid bone.





Venous connections

The cavernous sinus receives blood from:

- Superior and inferior ophthalmic veins
- Sphenoparietal sinus
- Superficial middle cerebral veins
- Inferior cerebral veins

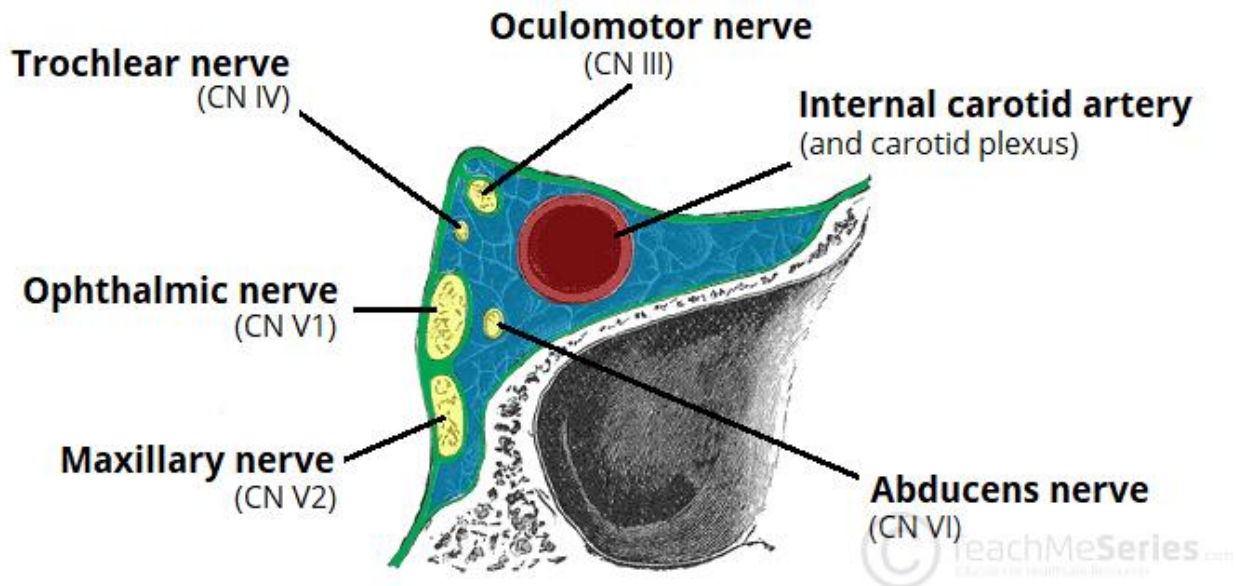
Blood leaves the sinus via superior and inferior petrosal sinuses as well as via the emissary veins through the foramina of the skull (mostly through foramen ovale). There are also connections with the pterygoid plexus of veins via inferior ophthalmic vein, deep facial vein and emissary veins.

CONTENTS OF THE CAVERNOUS SINUS

This is divided into:

1. Structures that pass through the cavernous sinus;
 - Abducens Nerve (CN VI)
 - Internal Carotid Artery (cavernous portion) this is also accompanied by the Carotid Plexus.
2. Structures that pass through the lateral wall of the carotid sinus
 - The Oculomotor Nerve [III]
 - The Trochlear Nerve [IV]
 - The Ophthalmic Nerve [V₁]

- The Maxillary Nerve [V₂]



These nerves, with the exception of CN V₂, pass through the cavernous sinus to enter the orbital apex through the superior orbital fissure. The maxillary nerve, division V₂ of the trigeminal nerve travels through the lower portion of the sinus and exits via the foramen rotundum. The maxillary branch passes external to, but immediately adjacent to, the lateral wall of the sinus).

Clinical significance

1. Arteriovenous Fistula

It is the only anatomic location in the body in which an artery travels completely through a venous structure. If the internal carotid artery ruptures within the cavernous sinus, an *arteriovenous fistula* is created (more specifically, a carotid-cavernous fistula). Lesions affecting the cavernous sinus may affect isolated nerves or all the nerves traversing through it.

An **arteriovenous fistula** is an abnormal connection or passageway between an artery and a vein.

2. Ophthalmoplegia

Ophthalmoparesis refers to weakness (-paresis) or paralysis (-plegia) of one or more extra ocular muscles which are responsible for eye movements. It is a physical finding in certain neurologic, ophthalmologic, and endocrine disease. This could be as a result of the Cavernous Sinus Syndrome which could be as a result of a pituitary adenoma which expands and eventually compresses the cavernous sinus.

3. Cavernous Sinus Thrombosis

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 the extracranial locations 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 edema, proptosis (bulging), photophobia and cranial nerves palsies. The abducens nerve (CNVI) is most commonly affected.

Treatment is typically with antibiotic therapy. Where the cause of the infection, thrombosis of the cavernous sinus can rapidly progress to meningitis

WALLS OF THE NOSE

The nose is the part of the respiratory tract superior to the hard palate. It contains the peripheral organ of smell. The shape of the nose is determined by the nasal bones and the nasal cartilages, including the nasal septum which separates the nostrils and divides the nasal cavity into two. On average the nose of a male is larger than that of a female.

The nose is divided into 2;

- The external nose
- The nasal cavity.

The major functions of the nose include:

- Respiration (breathing)
- Olfaction (smelling)
- Filtration of dust
- Humidification of inspired air
- Reception and elimination of secretions from the paranasal sinuses and nasolacrimal ducts

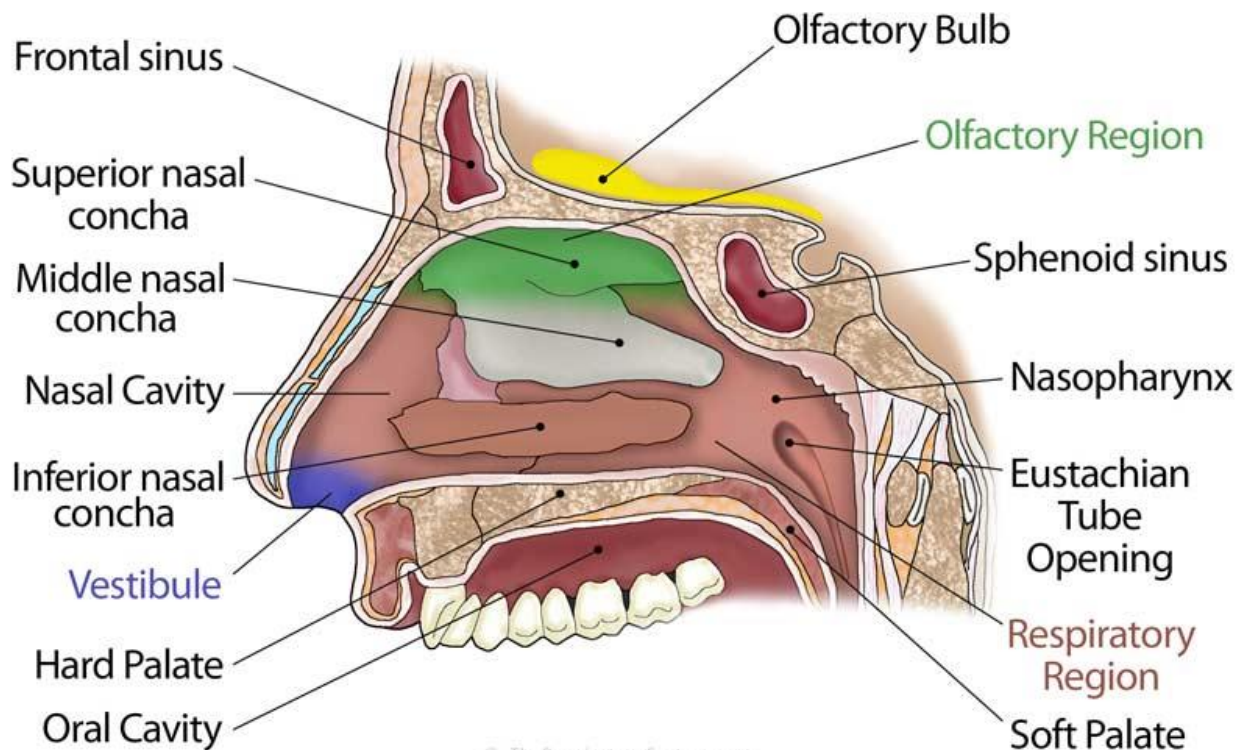
EXTERNAL NOSE

This is the visible portion that projects from the face. Its skeleton is mainly cartilaginous (small bony contributions are present). The part of the external nose that extends from the root of the nose to the apex (tip) of the nose is called the dorsum. The inferior surface of the nose is pierced by two piriform openings called nares (nostrils, anterior nasal apertures). The nares are bounded laterally by the alae (wings) of the nose

THE NASAL CAVITY

It is divided into right and left halves by the nasal septum. The nasal cavity is entered anteriorly through the nares. It opens posteriorly into the nasopharynx through the choanae. Mucosa lines the nasal cavity, except for the nasal vestibule, which is lined with skin.

Nasal Cavity



Boundaries of the Nasal Cavity

- The nasal cavity has a:
1. Roof
 2. Floor
 3. Medial wall
 4. Lateral wall

The roof

This is curved and narrow, except at its posterior end. It is divided into 3 parts. They are named from the bones forming each part.

- Frontonasal
- Ethmoidal
- Sphenoidal

The floor

This is wider than the roof. It is formed by the;

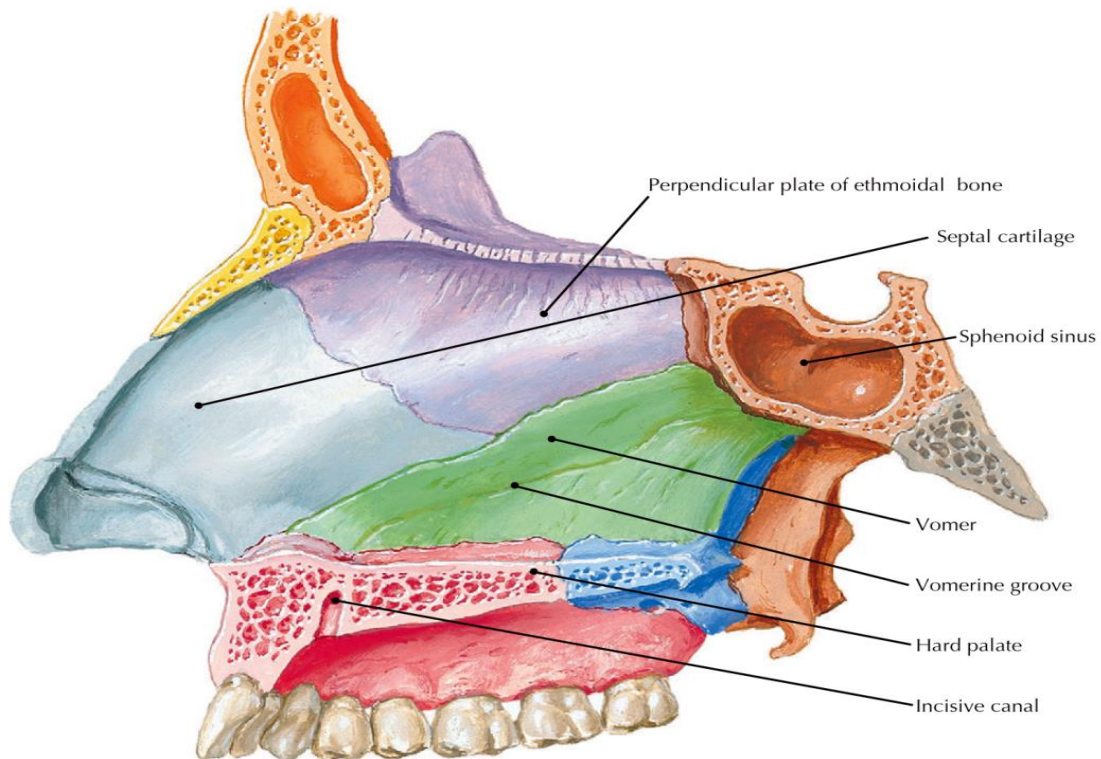
- palatine processes of the maxilla
- horizontal plates of the palatine bone

The medial wall

The medial wall of the nasal cavity comprises the nasal septum, the septal cartilage and various bones of the skull.

- A. **The Nasal Septum:** The nasal septum is a structure consisting of both bony and cartilaginous components. The bony components are the:
- perpendicular plate of the ethmoid superoinferiorly
 - the vomer posteroinferiorly
 - the crests of the maxillary bone anteroinferiorly
 - the crest of the palatine bone inferior to the vomer.
- B. **The Septal Cartilage:** 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.



MEDIAL WALL OF NASAL CAVITY (NASAL SEPTUM)

The Lateral Walls

The lateral wall of the nasal cavity is a region of the nasopharynx essential for humidifying and filtering the air we breathe in nasally. They are formed by three irregularly shaped structures which project inferiorly, they are referred to as the nasal conchae.

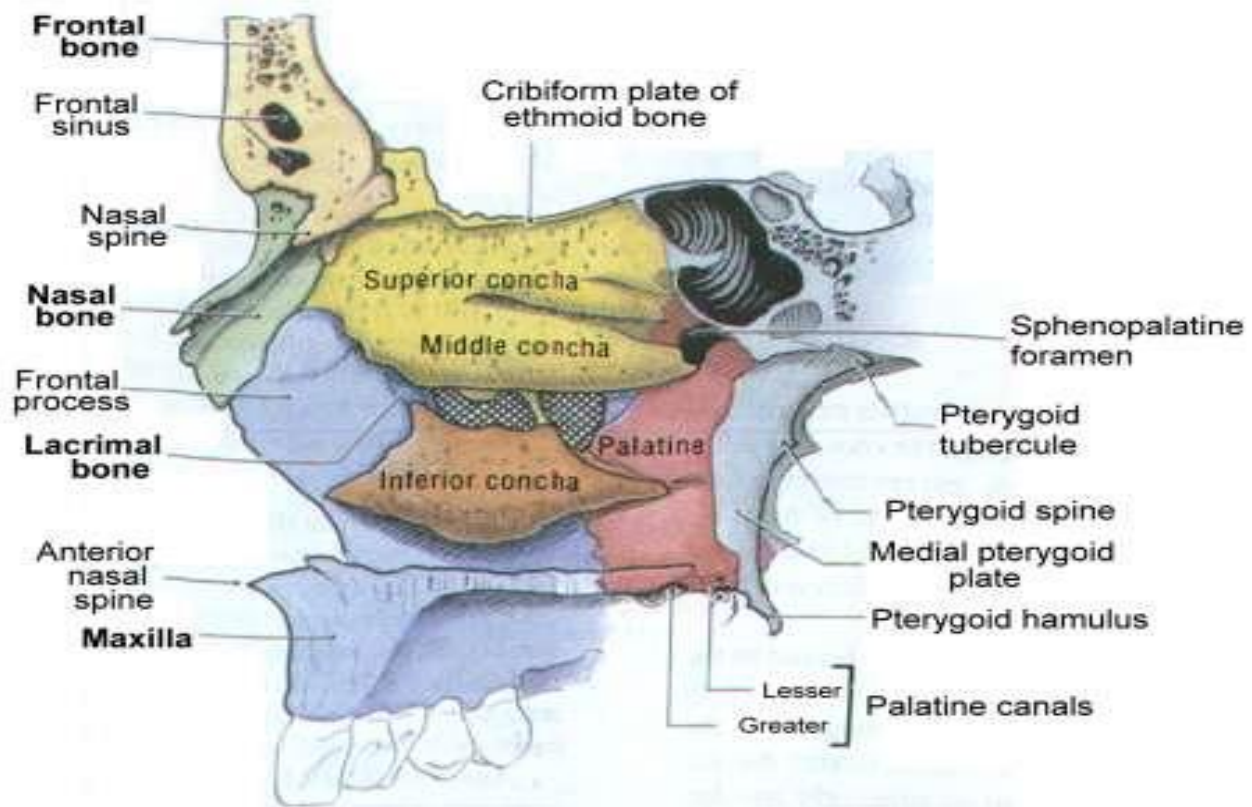
The nasal conchae include;

- Superior nasal concha
- middle nasal concha
- inferior nasal concha

The bony structure of the lateral walls of the nasal cavity include:

- Maxillary bone
- Sphenoid bone
- Palatine bones

The conchae or turbinates of many mammals (especially running mammals and those existing in extreme environments) are highly convoluted, scroll-like structures that offer a vast surface area for heat exchange. Underneath each concha in both humans with simple nasal conchae and animals with complex turbinates is a recess or meatus {passage(s) in the nasal cavity}.



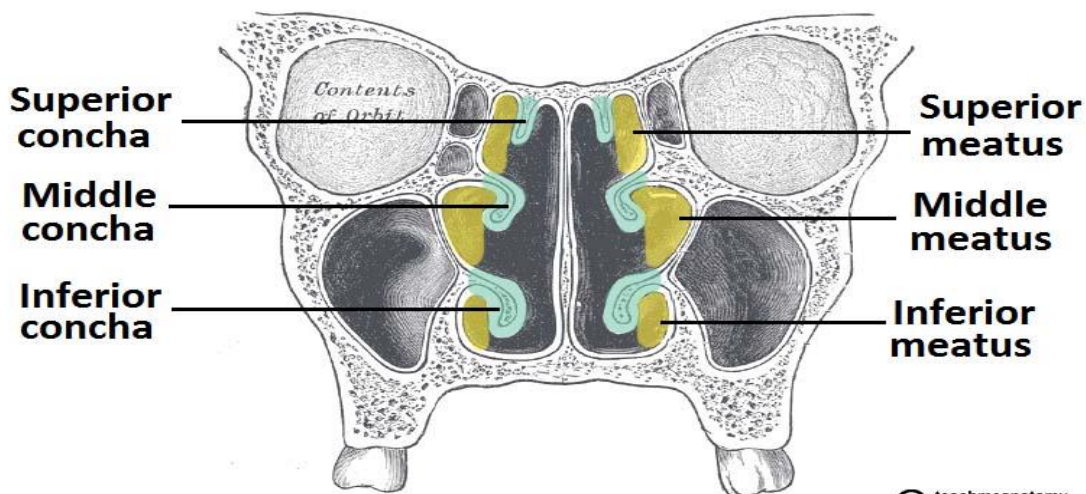
LATERAL WALL OF THE NOSE

- **Inferior nasal concha**: It 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**: They arise from the perpendicular plate of the ethmoid bone. The middle nasal concha is found in between the superior and inferior

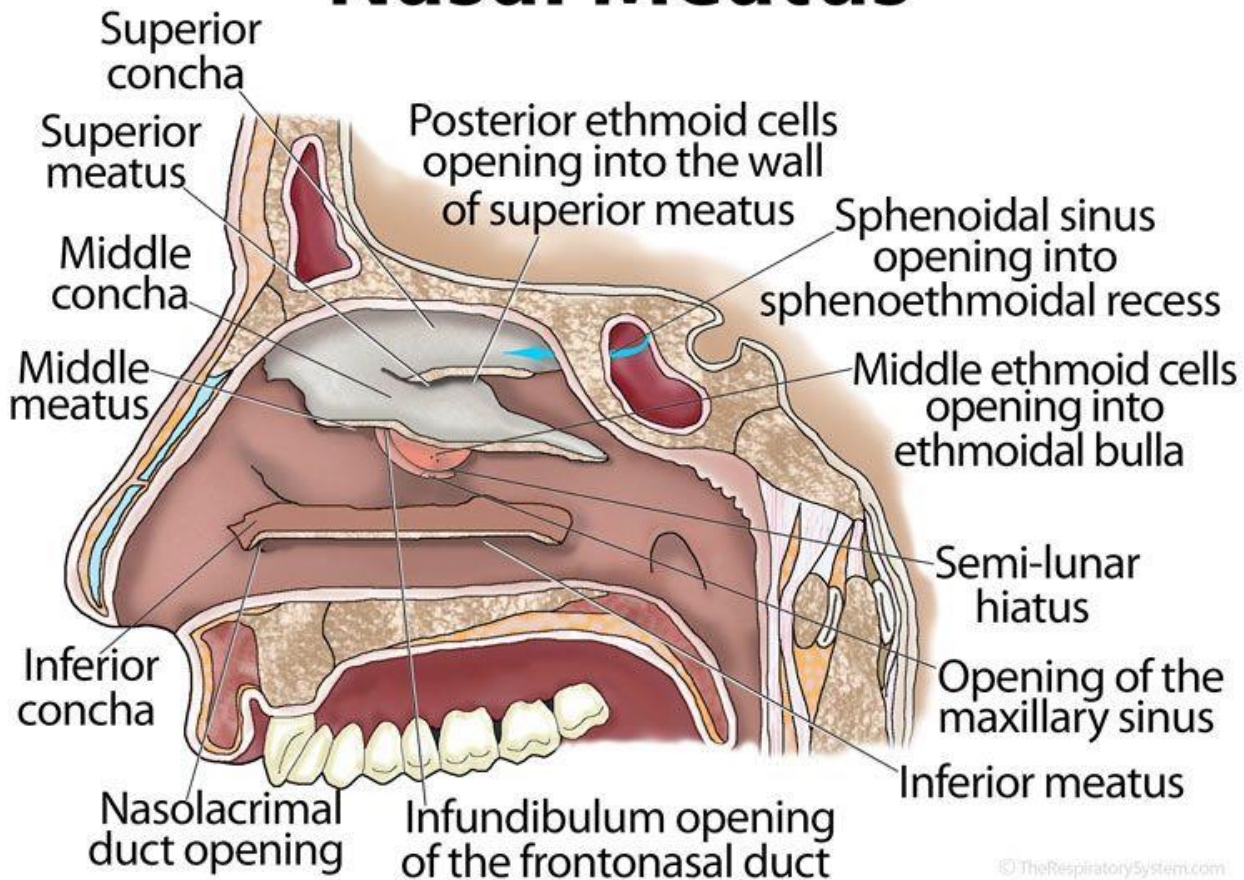
nasal concha and plays a role in humidifying and clearing inspired air of micro-particles such as dirt. The superior nasal concha is a bony shelf located above the middle nasal concha and below the sphenothmoidal recess. Similar to the middle nasal concha the superior concha is itself part of the ethmoid bone.

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:** It is a narrow passage between the superior and the middle nasal conchae. 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**. The ethmoidal bulla is only visible when the middle concha is removed. The bulla is a swelling formed by **middle ethmoidal cells** that form the ethmoidal sinuses. Anterior and inferior to the semilunar hiatus is a hooklike process called the uncinat process of the ethmoid bone. This process articulates with the inferior nasal concha.
- **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.



Nasal Meatus



The arterial supply

The arterial supply of the **medial** and **lateral walls** of the nasal cavity is from five sources:

- Anterior ethmoidal artery (from the ophthalmic artery)
- Posterior ethmoidal artery (from the ophthalmic artery)
- Sphenopalatine artery (from the maxillary artery)
- Greater palatine artery (from the maxillary artery)
- Septal branch of the superior labial artery (from the facial artery)

The anterior part of the nasal septum is the site (**Kiesselbach area**) of an anastomotic arterial plexus involving all five arteries supplying the septum

The **external nose** also receives blood from the 1st and 5th arteries listed above plus nasal branches of the infraorbital artery, lateral nasal branches of the facial artery.

Venous drainage

A rich submucosal venous plexus deep to the nasal mucosa drains into the sphenopalatine, facial, and ophthalmic veins

Innervation

1. Olfactory nerve
2. Branches of the ophthalmic [v₁] which include the anterior and posterior ethmoidal nerves
3. Maxillary [v₂] nerves which include;
 - Posterior superior lateral nasal nerves
 - Posterior superior medial nasal nerves
 - Nasopalatine nerve
 - Posterior inferior nasal nerves

CLINICAL ANATOMY

1. Epistaxis

Epistaxis (nosebleed) is relatively common because of the rich blood supply to the nasal mucosa. In most cases, the cause is trauma and the bleeding is from an area in the anterior third of the nose (Kiesselbach area). Epistaxis is also associated with infections and hypertension, spurting of blood from the nose results from rupture of arteries. Mild epistaxis may also result from nose picking, which tears veins in the vestibule of the nose

2. Rhinitis

The nasal mucosa becomes swollen and inflamed (rhinitis) during severe upper respiratory infections and allergic reactions (e.g., hayfever). Swelling of the mucosa occurs readily because of its vascularity.

- Infections of the nasal cavities may spread to the:
 - Anterior cranial fossa through the cribriform plate
 - Nasopharynx and retropharyngeal soft tissues
 - Middle ear through the pharyngotympanic tube (auditory tube), which connects the tympanic cavity and nasopharynx
- Paranasal sinuses
- Lacrimal apparatus and conjunctiva

3. Nasal Polyps

Nasal polyps are associated with sinusitis and occur when the lining of the sinuses swell. Polyps may block the nasal airway, creating difficulty in breathing. Polyps may also block the natural drainage of the sinus cavities leading to infections. Polyps are generally thought to occur as a result of an ongoing inflammatory process within the nose and sinuses.