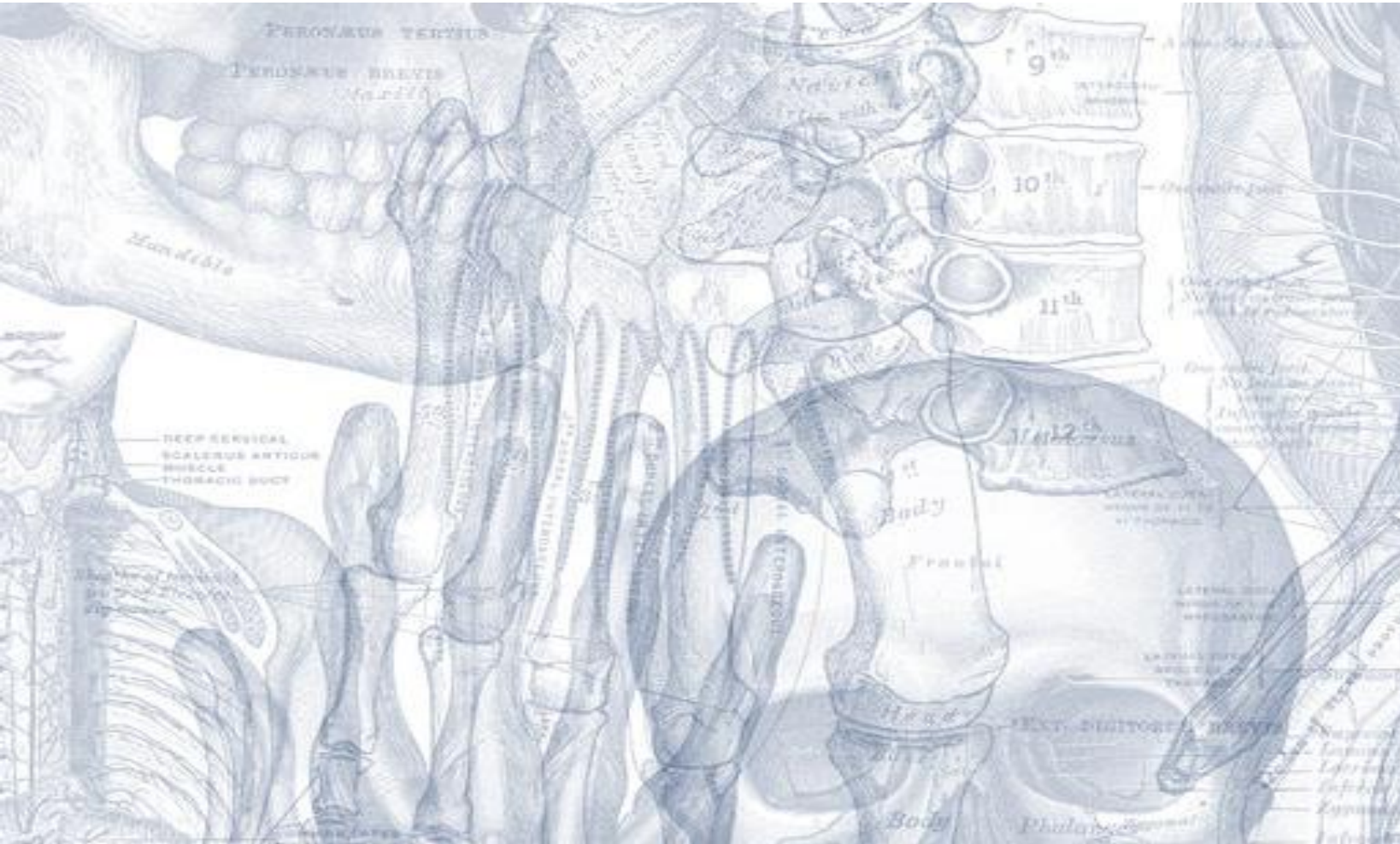


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Anatomy of the Nose and Olfactory Nerve

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Color Code

- Important
- Doctors Notes
- Notes/Extra explanation

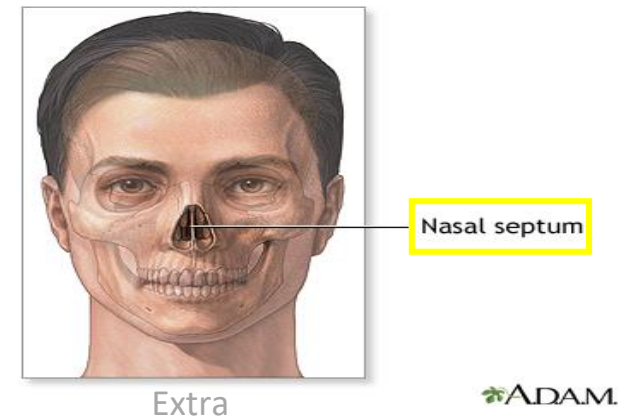
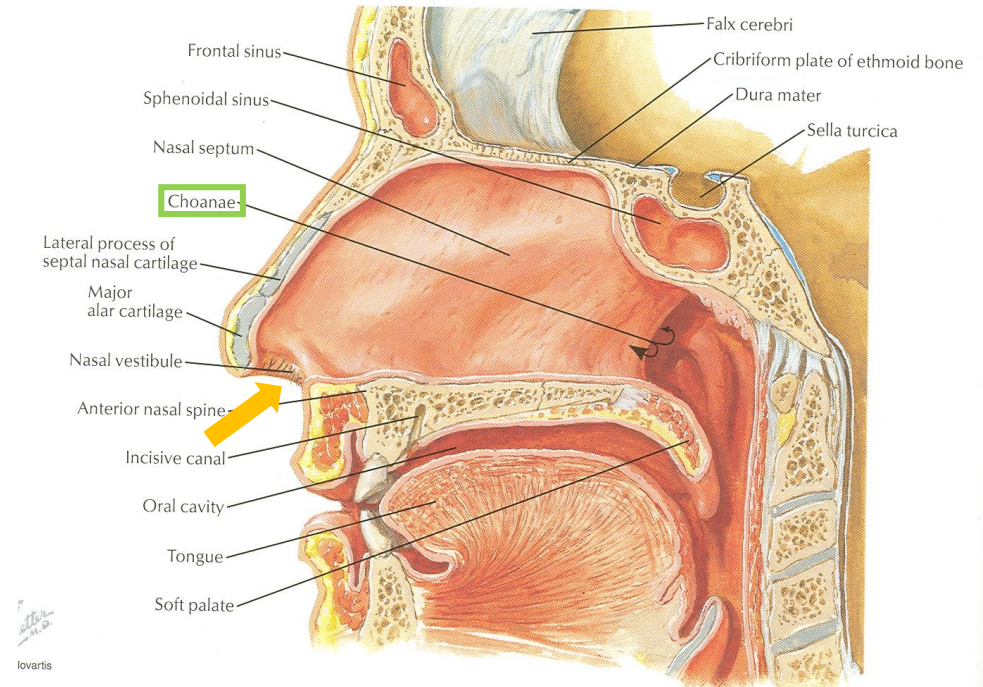
Objectives

By the end of this lecture the students should be able to:

- ✓ Describe the structures forming the walls of the nasal cavity.
- ✓ List the main structures draining into the lateral wall of the nasal cavity.
- ✓ Differentiate between the respiratory and olfactory regions of the nasal cavity.
- ✓ List the main sensory and blood supply of the nose.
- ✓ Describe the olfactory pathway.

Nasal Cavity

- It extends (begins) from nostrils *anteriorly* to the choanae *posteriorly*.
- Divided into right and left parts by the nasal septum (medial wall).
- Each part has:
 1. Roof
 2. Floor
 3. Lateral and
 4. Medial walls.



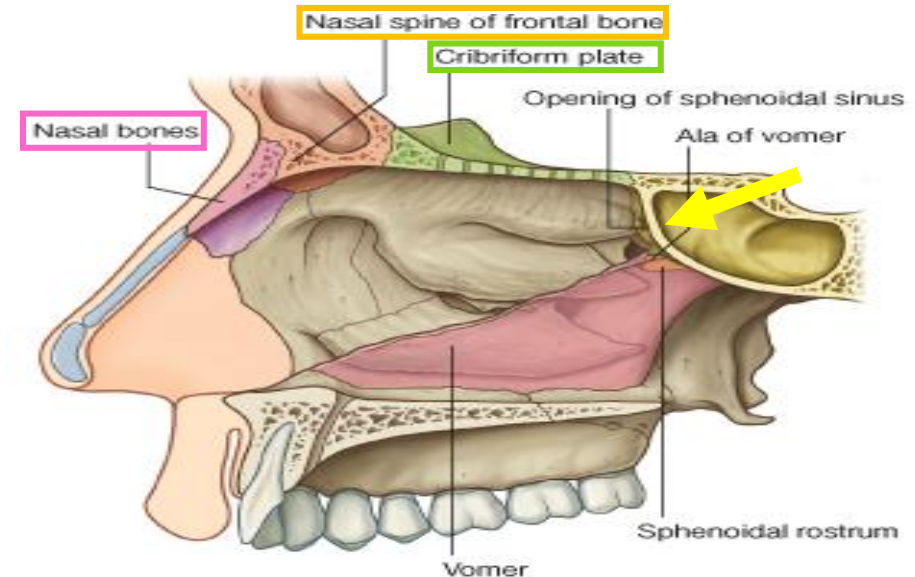
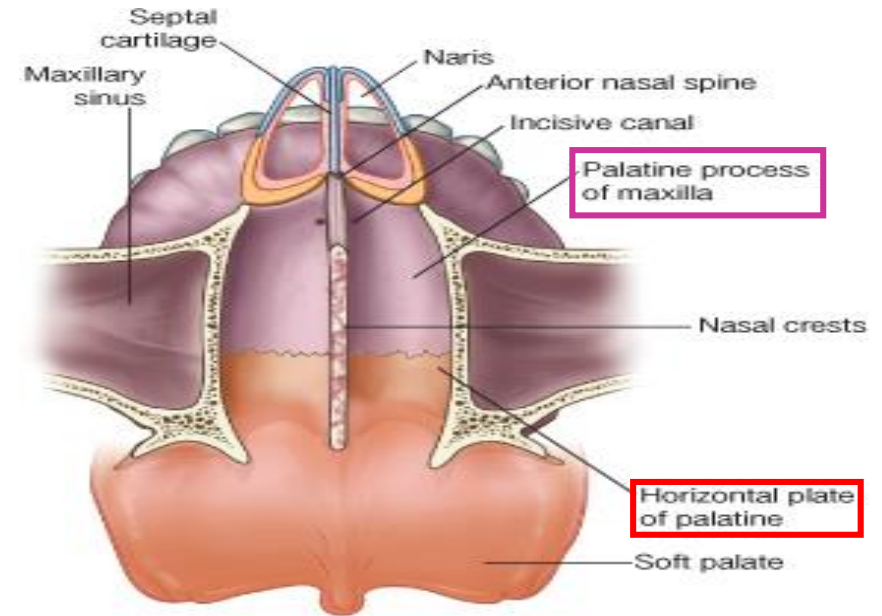
Nasal Cavity

1. Floor

- Formed by:
 - Nasal (upper) surface of the hard (bony) palate:
 - Palatine process of maxilla, anteriorly.
 - Horizontal plate of the palatine bone, posteriorly.

2. Roof

- Formed by:
 - Body of sphenoid, posteriorly.
 - Cribriform plate of ethmoid, in the middle.
 - Frontal, and nasal bones, Anteriorly.



Nasal Cavity

3. Medial Wall

- The nasal septum :
 - Vertical or perpendicular plate of ethmoid.
 - Septal cartilage.
 - Vomer.

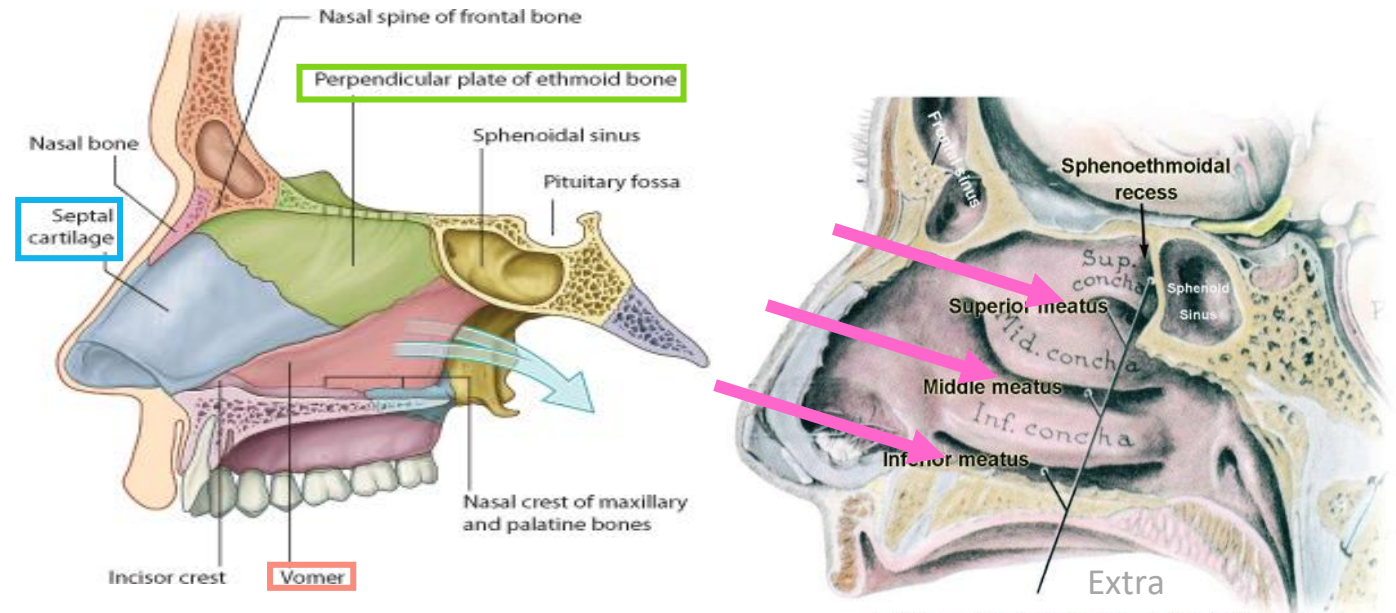
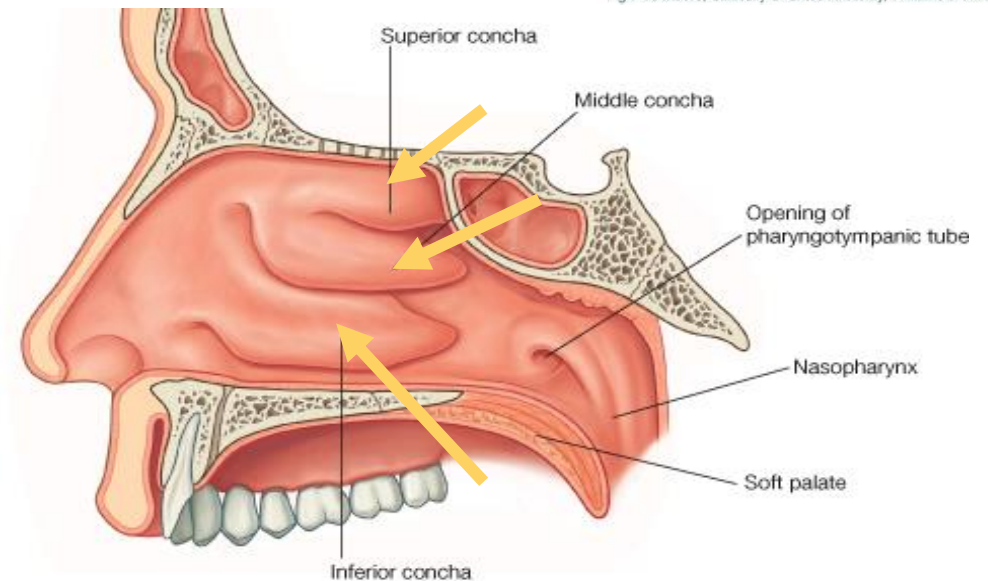


Fig 7-55 Moore, Clinically Oriented Anatomy, Williams & Wilkins, 1992

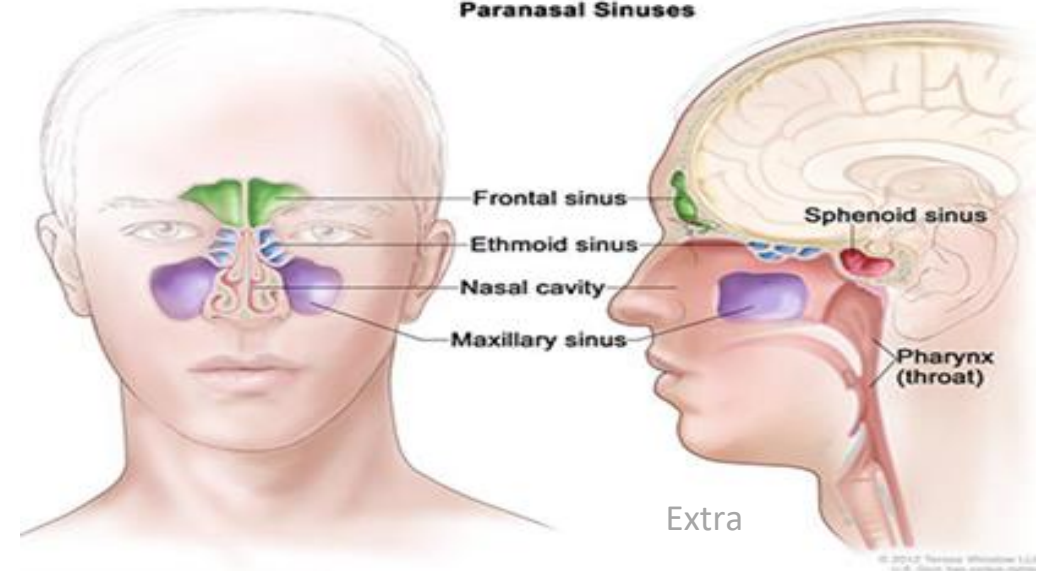
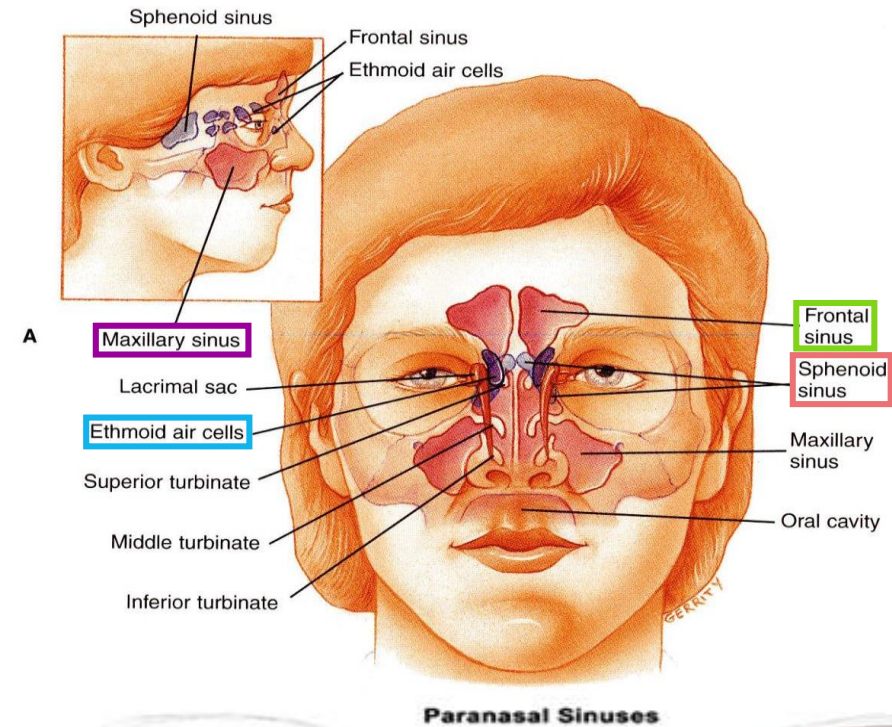
4. Lateral Wall

- Marked by Three projections (Nasal **Conchae**):
 - Superior, middle, and inferior
- The space below each concha is called **Meatus**.
 - Superior, middle, and inferior meatus.
- The space (fossa) above the superior concha is the **Sphenoethmoidal recess**.



Nasal Cavity Paranasal Sinuses

- They are **cavities** inside the:
 - Maxilla
 - Frontal bone
 - Sphenoid bone
 - Ethmoid bone divided into anterior, middle, and posterior
- They are:
 1. Lined with **mucoperiosteum**;
 2. Filled with **air**; &
 3. Communicate with the nasal cavity.
 4. Open in the lateral wall of the nasal cavity
- Function:
 - Lighten the skull weight
 - Amplify the sound as we speak.
 - **Resonance of voice.**



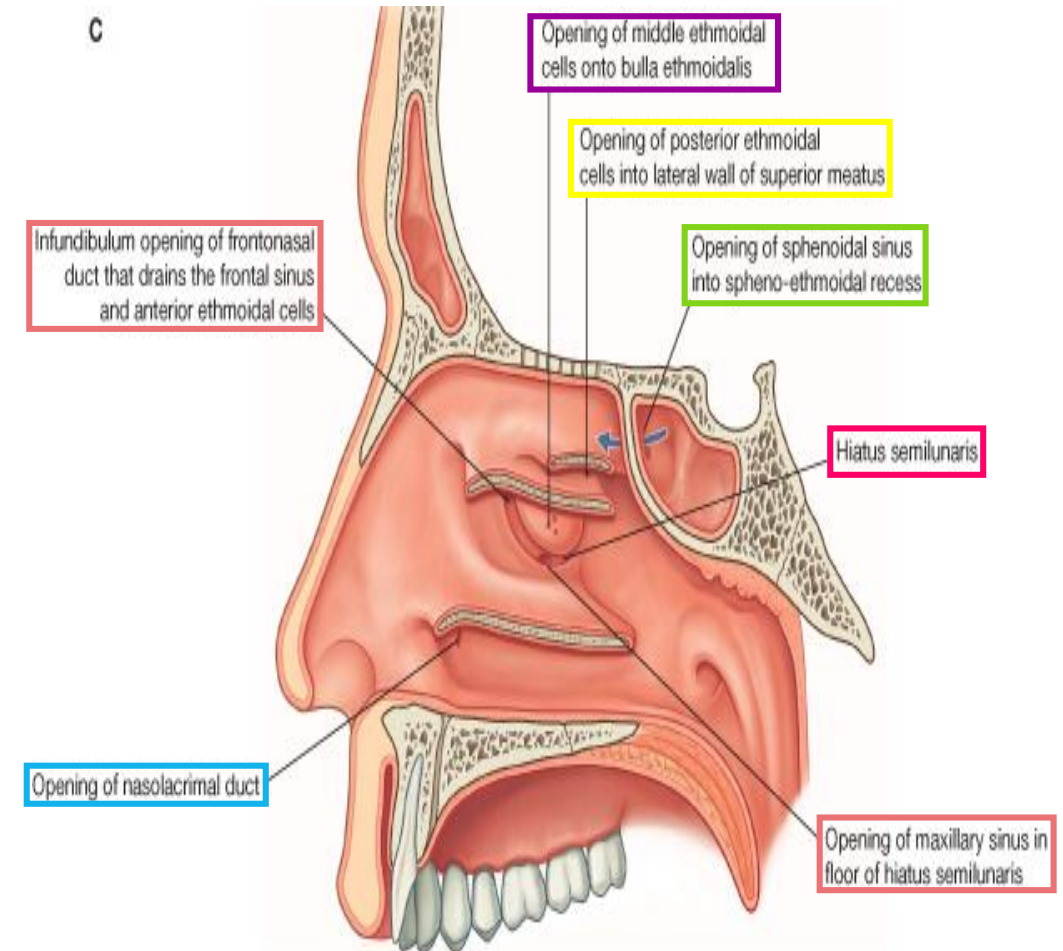
Nasal Cavity

Sinuses Opening in Lateral Wall

Spheno-ethmoidal recess	receives the opening of sphenoidal air sinus
Superior meatus	receives the opening of posterior ethmoidal sinus.
Middle meatus	receives the openings of (1) maxillary , (2) frontal , & (3) anterior , (4) middle ethmoidal sinuses. contains <u><i>bullae ethmoidalis</i></u> and <u><i>hiatus semilunaris</i></u> ,
Inferior meatus	receives the opening of nasolacrimal duct.

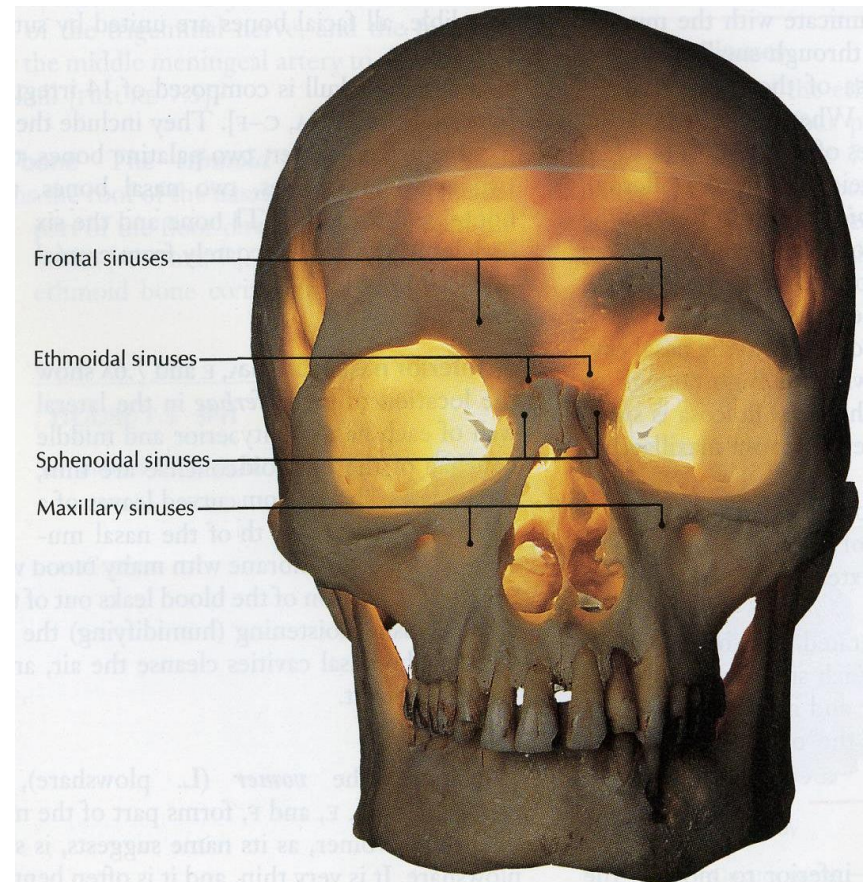
Note : all sinuses open into the *middle* meatus EXCEPT:

1. **Sphenoidal sinus** : in *sphenoethmoidal* recess.
2. **Posterior ethmoidal sinus** : in *superior* meatus.



Nasal Cavity Mucosa

- The mucosal lining of these (paranasal) sinuses is continuous with that in the nose and the throat.
- So infection in this area tends to migrate into the sinuses causing sinusitis.
- **When the sinuses are obstructed they cause headaches.**
- The nose has 2 functions: respiration and smell, so accordingly there are two types of mucosa in the nasal cavity:
 1. Respiratory mucosa
 2. Olfactory mucosa



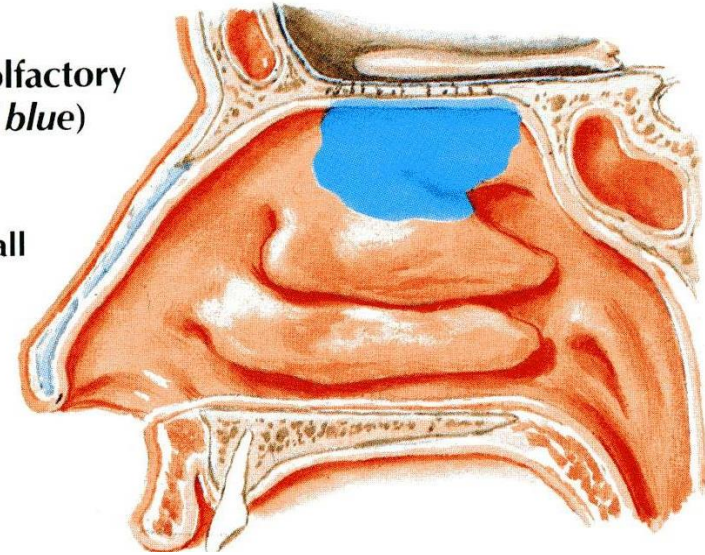
Nasal Cavity

Olfactory Mucosa

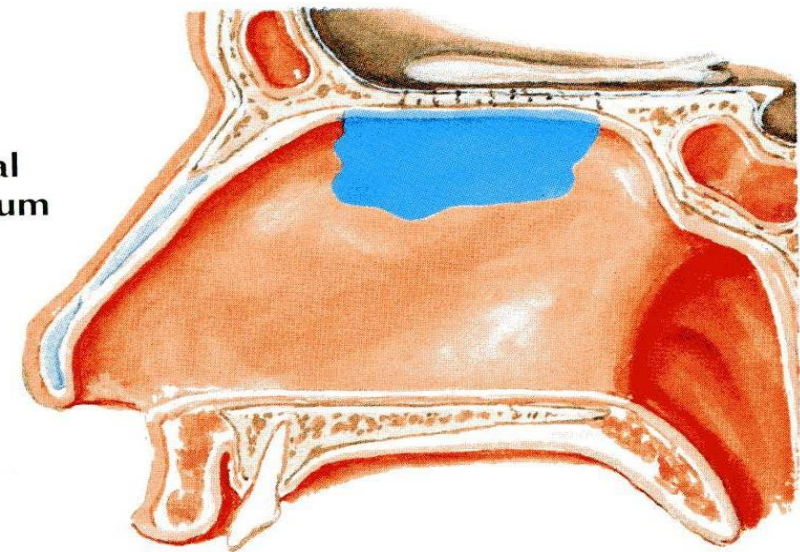
- It is delicate and contains *olfactory nerve cells*.
- It is present in the **upper part** of nasal cavity:
 - **Roof**
 - On the **lateral wall**, it lines the upper surface of the *superior concha* and the *sphenoethmoidal recess*.
 - On the **medial wall**, it lines the superior part of the *nasal septum*.

Distribution of olfactory mucosa (shaded blue)

Lateral nasal wall



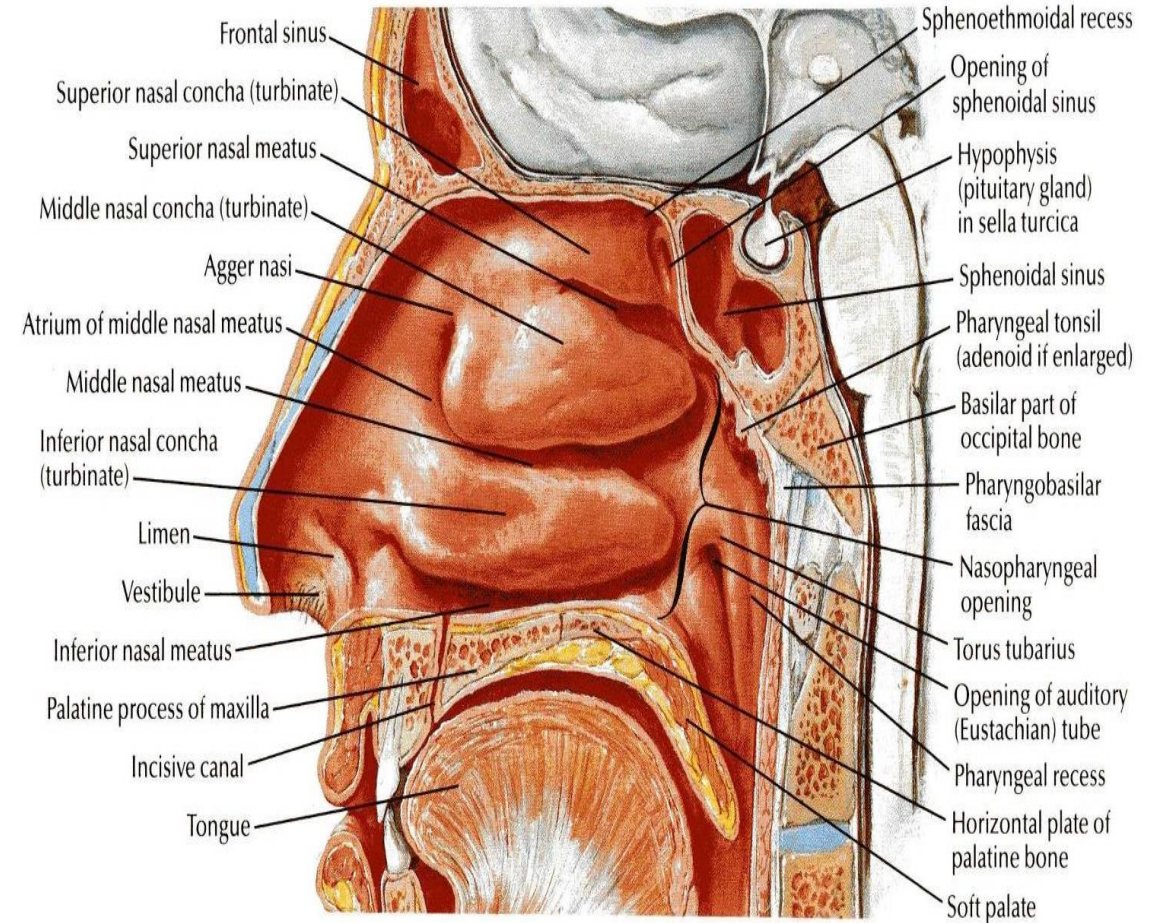
Nasal septum



Nasal Cavity

Respiratory Mucosa

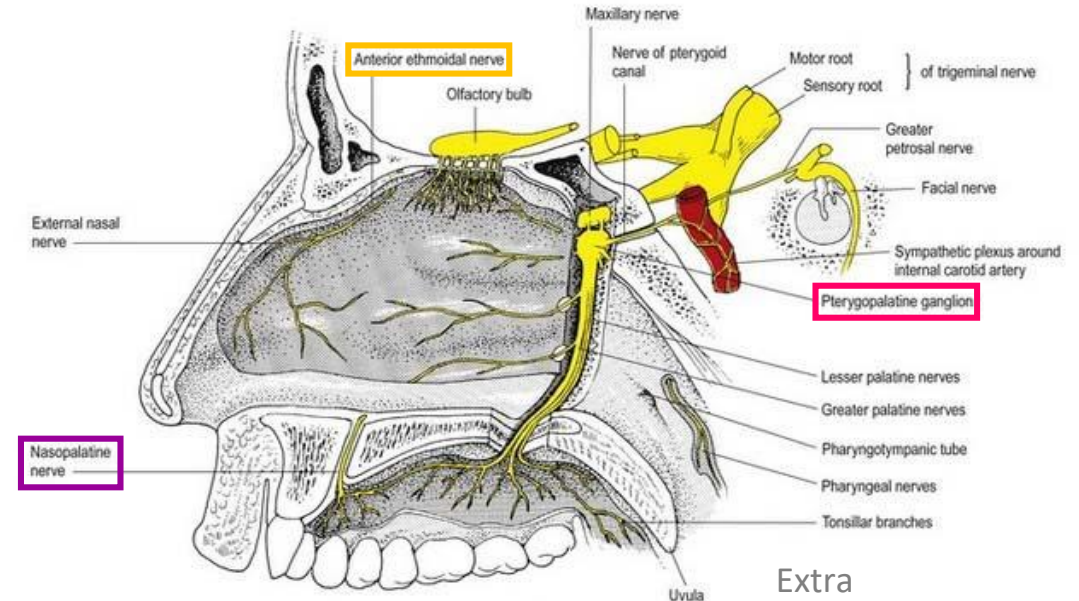
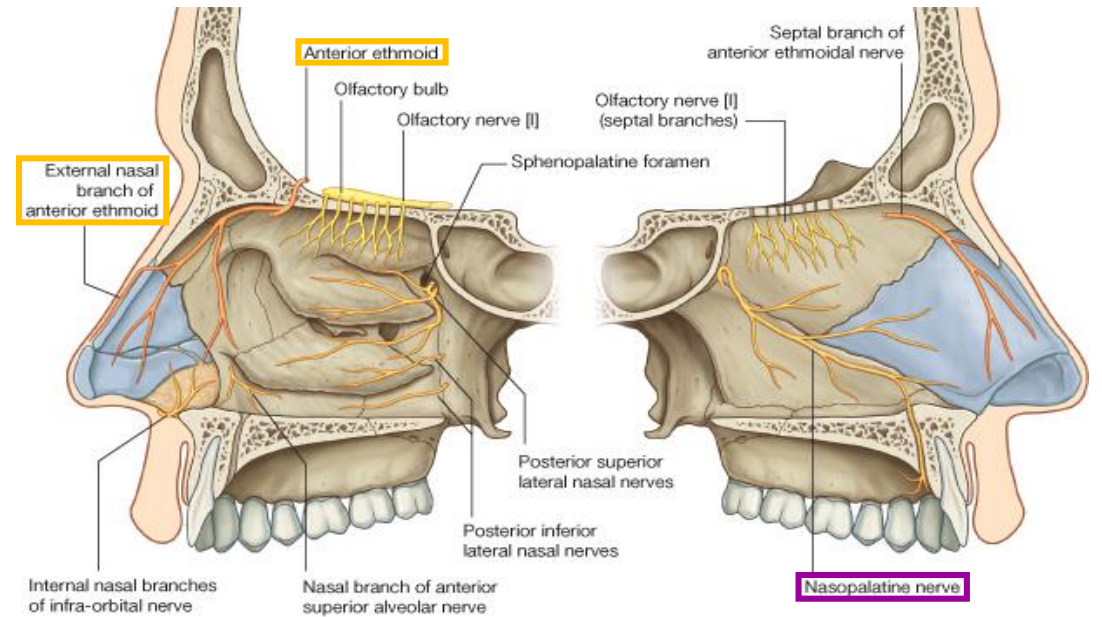
- It is thick, ciliated, highly vascular and contains **mucous glands & goblet cells**
- It lines the **lower part** of the nasal cavity (from skin of *vestibule* to the *superior concha*).
- It functions to moisten, clean and warm the inspired air.
 - The air is moistened by the secretion of numerous *serous glands*.
 - It is cleaned by the removal of the dust particles by the ciliary action of the *columnar ciliated epithelium* that covers the mucosa.
 - The air is warmed by a *submucous venous plexus*.



Nasal Cavity Nerve Supply

- The nerves of General Sensation are derived from the **Ophthalmic & Maxillary** divisions of *trigeminal nerve*.
- The *anterior part* is supplied by: **Anterior Ethmoidal** nerve.
- The *posterior part* is supplied by *branches* of the **pterygopalatine ganglion***:
 - 1- **Nasopalatine**,
 - 2- **Nasal**, and
 - 3- **Palatine**

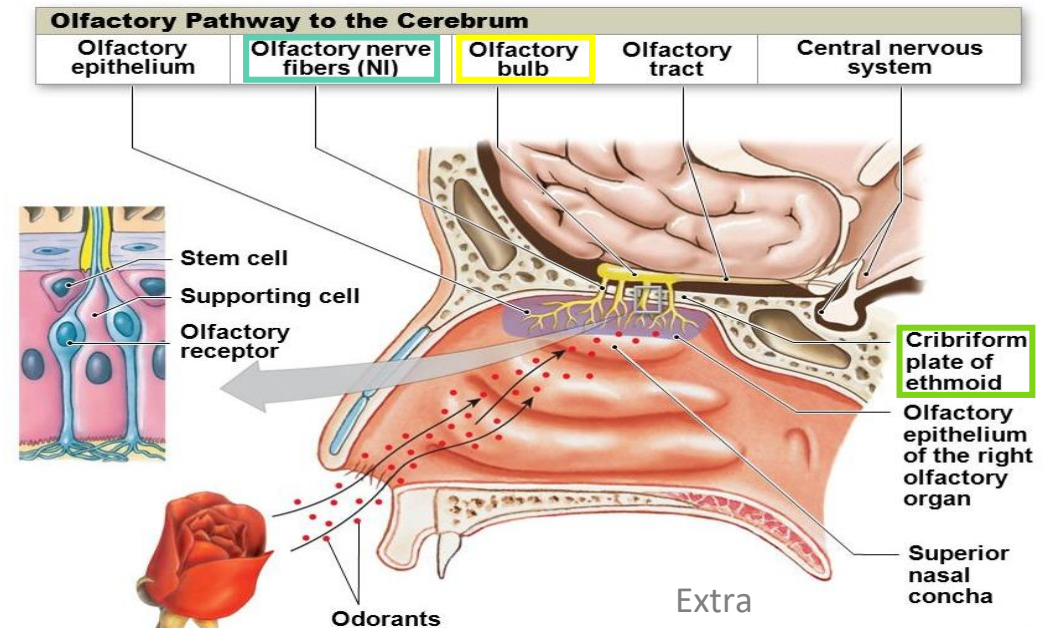
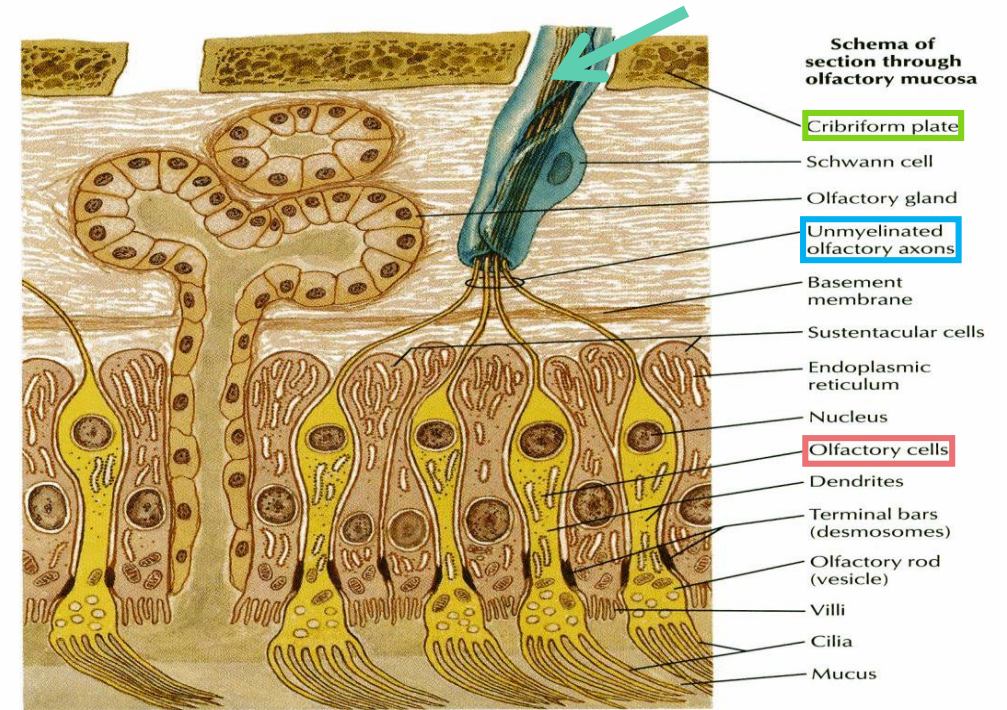
* The sensory root of the pterygopalatine ganglion is from the maxillary nerve.



Extra

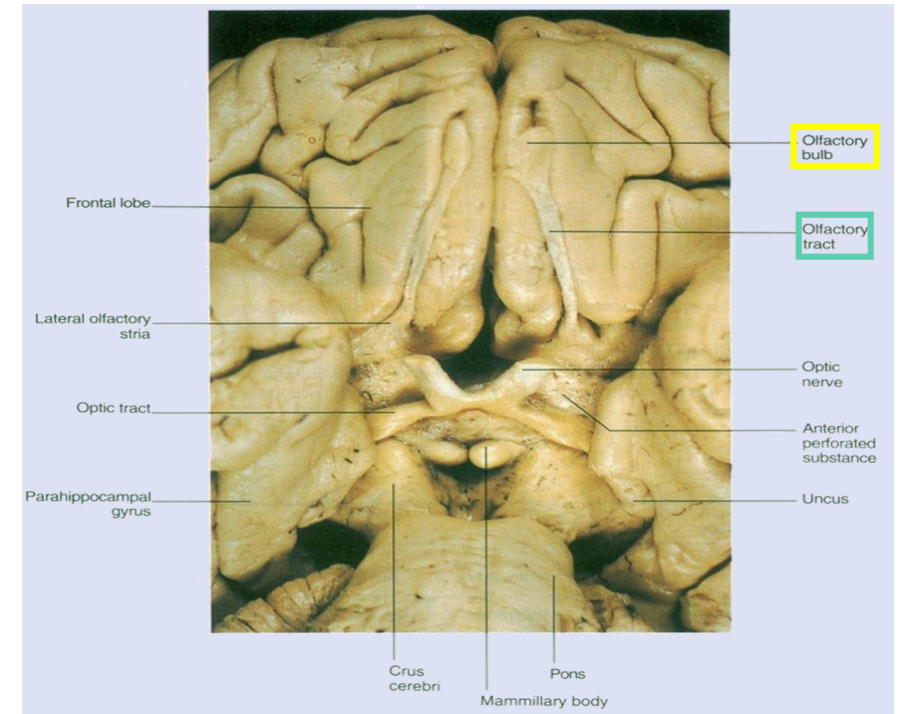
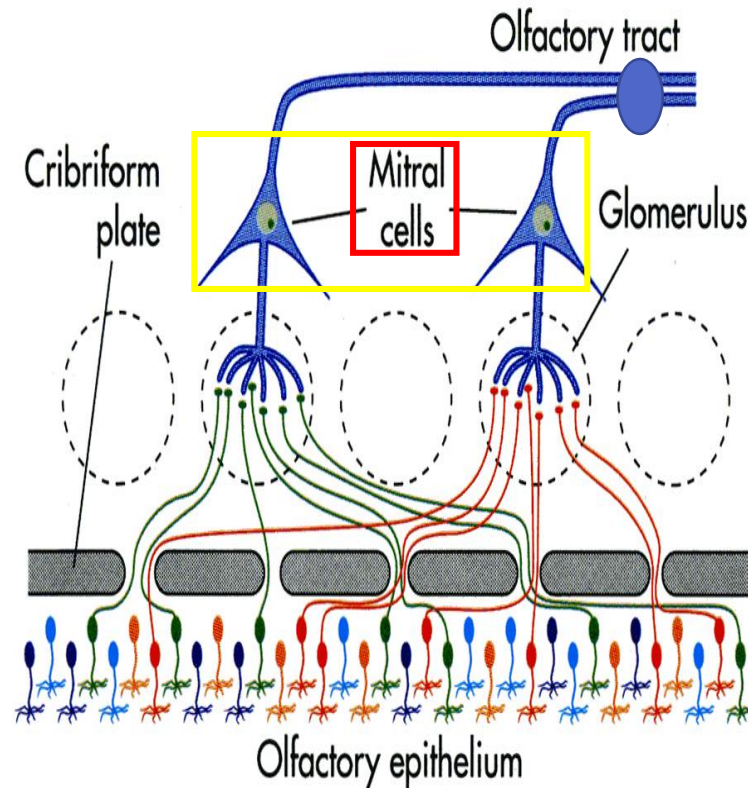
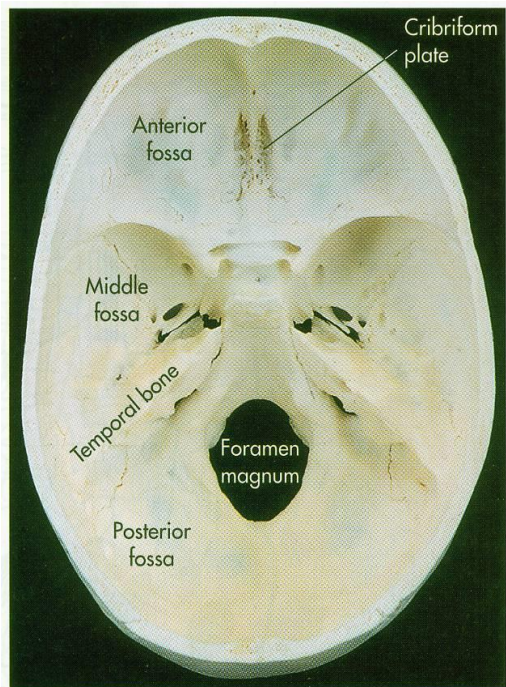
Nasal Cavity Nerve Supply

- The nerve of special sensation is the **olfactory nerve**.
- Olfactory pathway:
1st neurone:
 - Olfactory receptors are specialized, **ciliated nerve cells** that lie in the **olfactory epithelium**.
 - The axons of these bipolar cells 12-20 fibers form the true olfactory nerve fibers.
 - Which passes through the cribriform plate of ethmoid.
 - They join the olfactory bulb



Nasal Cavity Nerve Supply

Preliminary processing of olfactory information is within the **olfactory bulb**, which contains interneurons and large **Mitral cells**; axons from the latter leave the bulb to form the **olfactory tract**. (smell is the only sense that does not go to the thalamus)



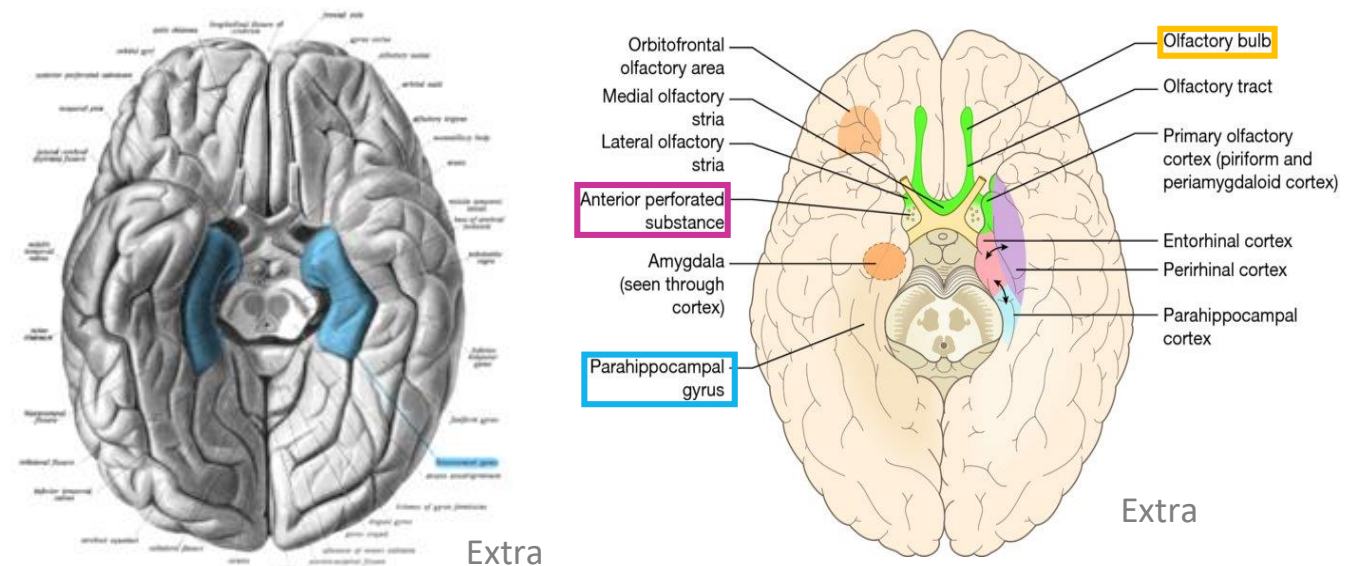
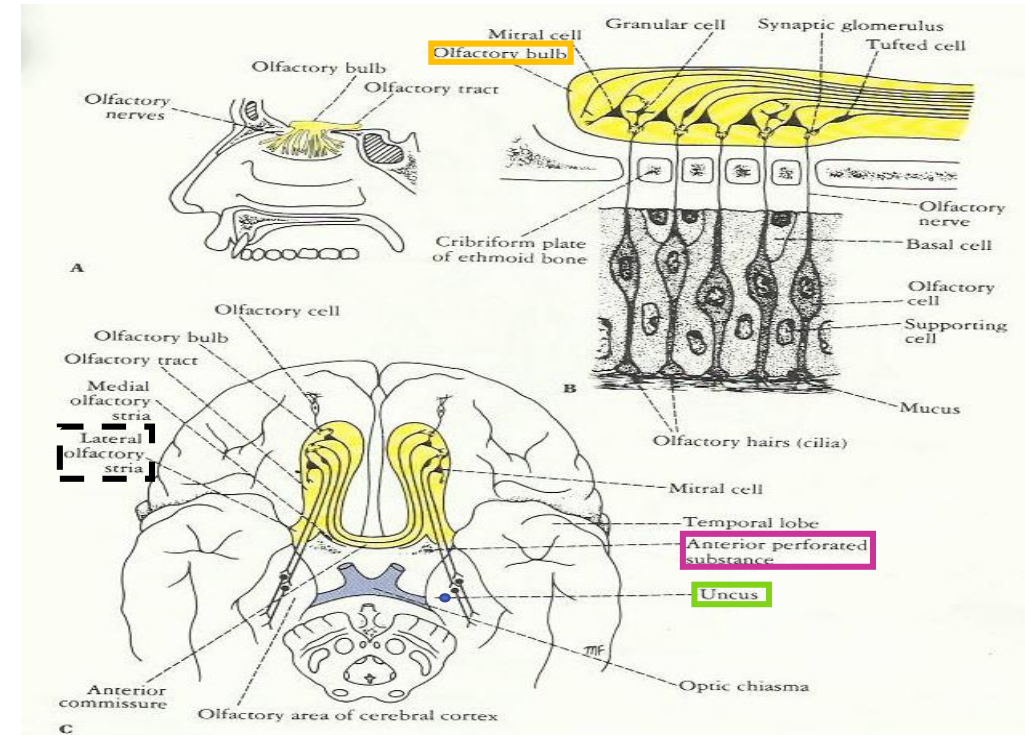
Nasal Cavity Nerve Supply

2nd neurone:

- It is formed by the **Mitral cells of olfactory bulb**.
- The axons of these cells form the *olfactory tract*.
- Each tract divides into 2 roots (lateral and medial) at the **anterior perforated substance**:

1. *Lateral root:*

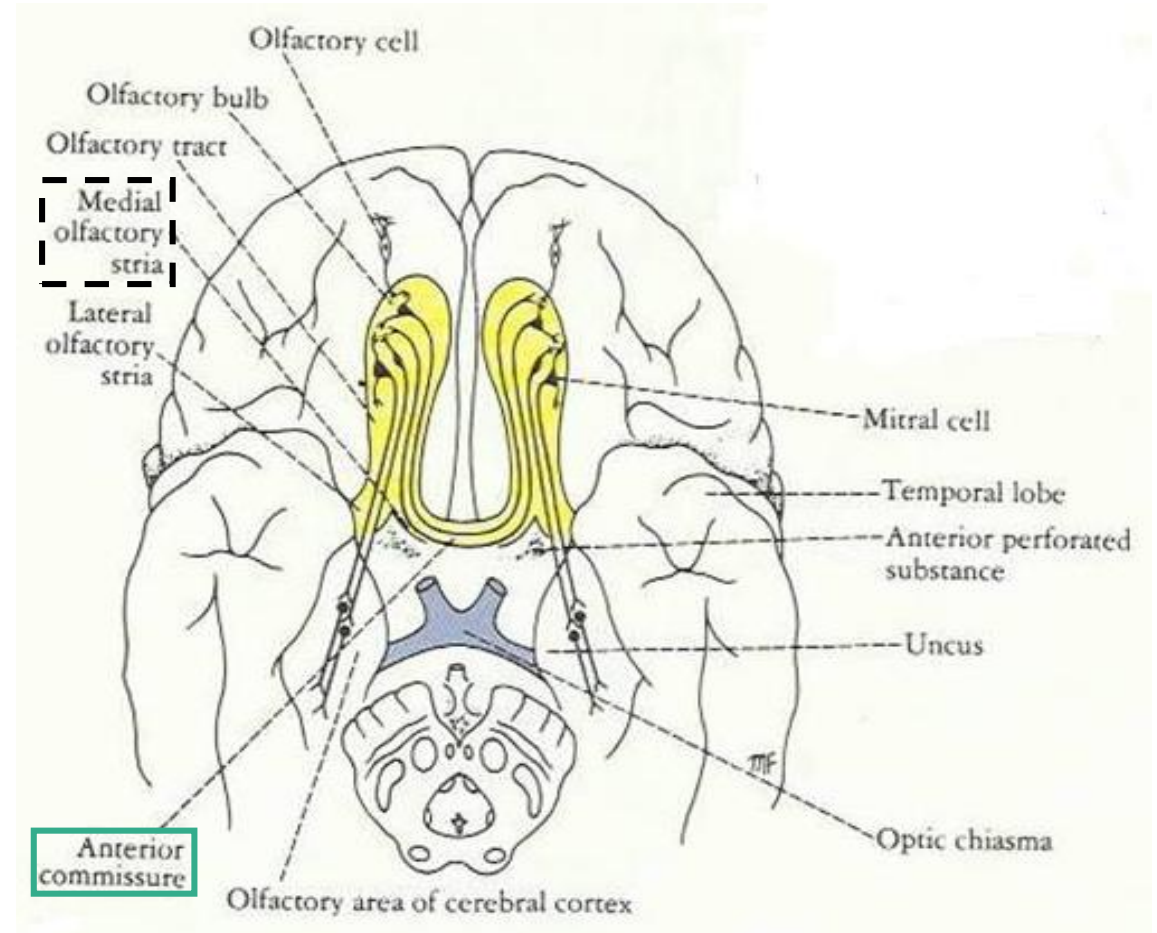
Carries olfactory fibers to end in cortex of the **Uncus** & adjacent part of **Hippocampal gyrus** (center of smell).



Nasal Cavity Nerve Supply

2. *Medial root* :

- crosses midline through anterior commissure and joins the uncrossed lateral root of opposite side.
- It connects olfactory centers of 2 cerebral hemispheres.
- So each olfactory centre receives smell sensation from both halves of nasal cavity.
- **NB. Olfactory pathway is the only sensory pathway which reaches the cerebral cortex without passing through the Thalamus.**

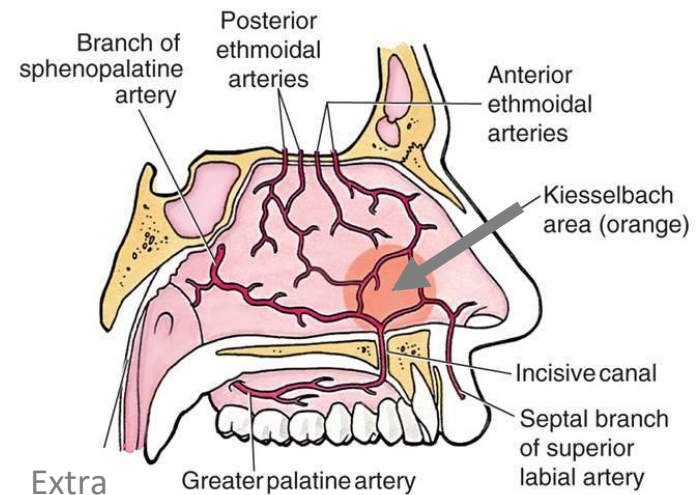
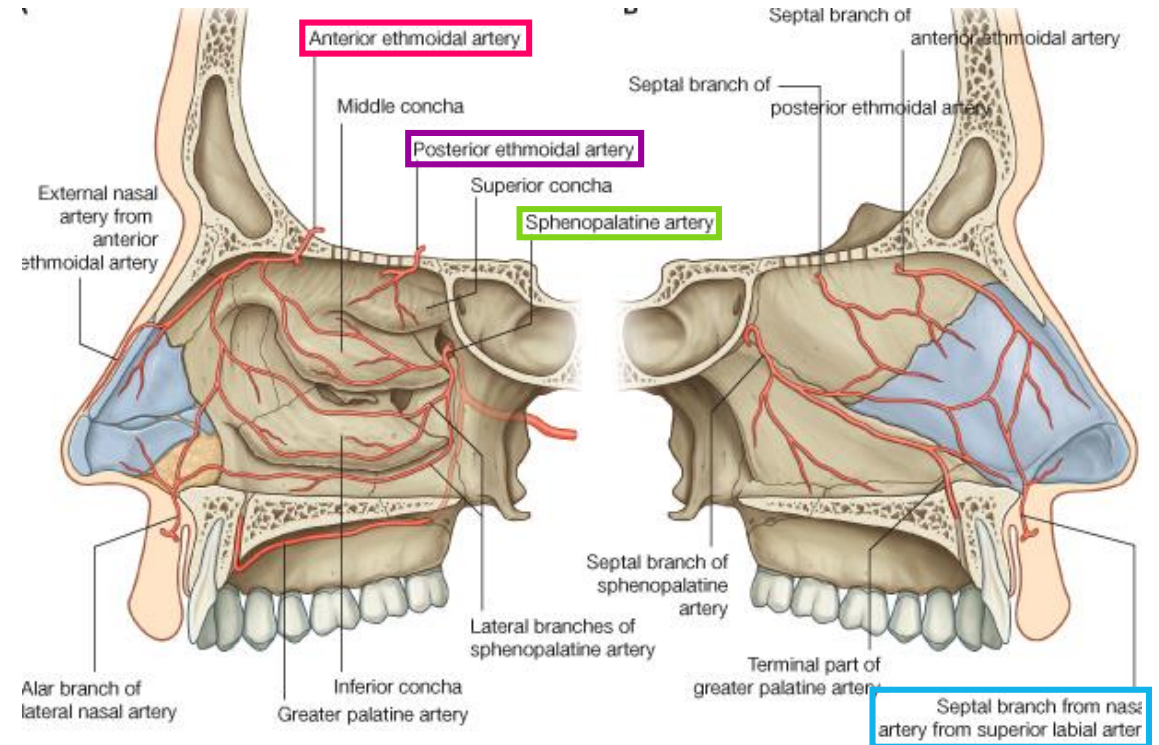


Note: The lateral root goes to the same side while the medial root crosses to the opposite side.

Nasal Cavity Arterial Supply

1. Sphenopalatine artery (branch of maxillary).
2. Anterior and Posterior Ethmoidal (branch of ophthalmic).
3. Superior labial (branch of facial).

- *Applied anatomy* :
The most common site for **epistaxis** (nosebleed) is at the anterior & inferior part of nasal septum (Little's area) because of the rich arterial anastomosis

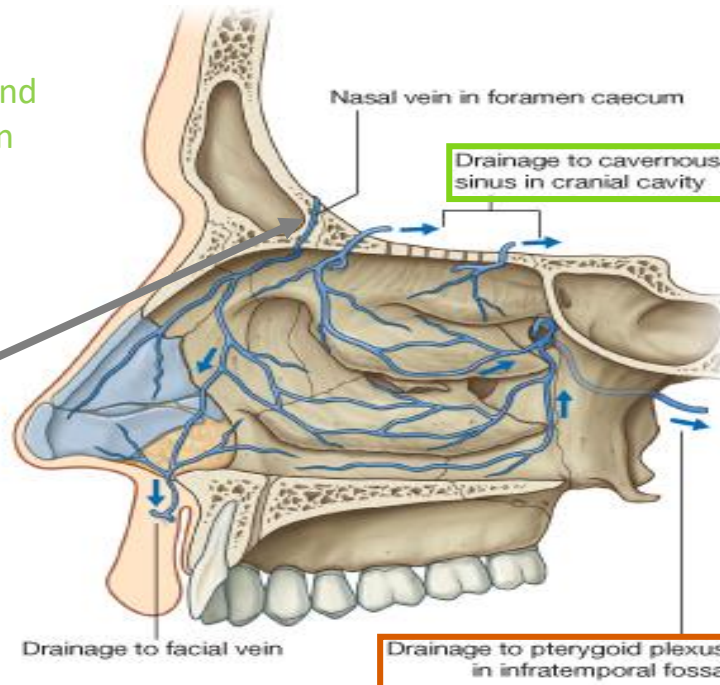


Nasal Cavity

Venous Drainage

- **Venous plexus** in the sub mucosa formed by *veins accompanying the arteries*
- They drain into cavernous sinus* & pterygoid venous plexus.

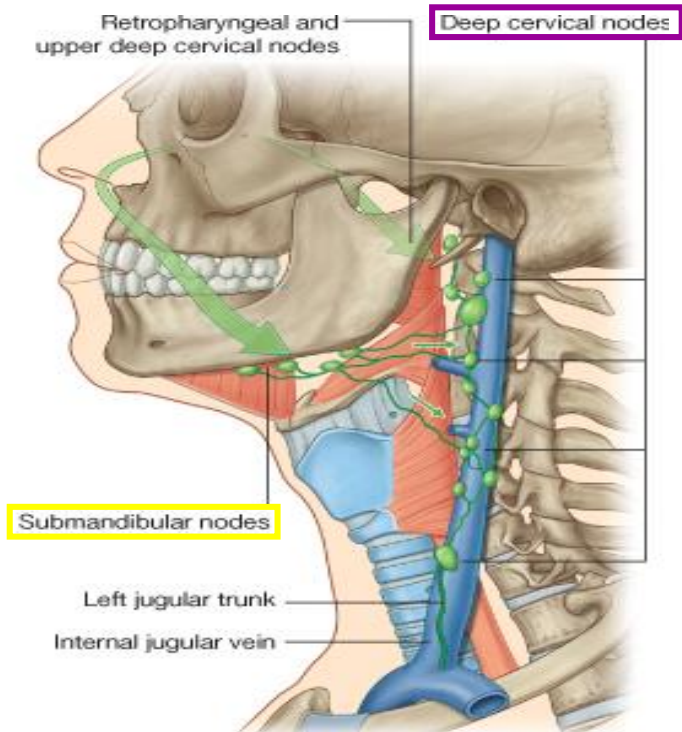
*The internal carotid artery and abducens nerve are present in the cavernous sinus



The emissary vein directly opens into the cavernous sinus. The vein is special because it is valve-less, so blood can pass in 2 directions

Lymphatic Drainage

- To Submandibular &
- Upper deep cervical nodes.



Summary

Anatomy of the Nose and Olfactory Nerve

Arterial Supply

- Sphenopalatine artery
- Anterior and Posterior Ethmoidal (branch of ophthalmic).
- Superior labial (branch of facial).
- arterial anastomosis

Nerve Supply

General Sensation

from the anterior part Ophthalmic & posterior part Maxillary divisions of trigeminal nerve.
anterior it's supplied by: Anterior Ethmoidal nerve.
posterior is supplied by branches of the pterygopalatine ganglion
1- Nasopalatine, 2- Nasal 3- Palatine

special sensation

olfactory nerve

Olfactory pathway:
1st neurone:
The axons form the true olfactory nerve fibers, Which passes through the cribriform plate of ethmoid and join the olfactory bulb

2nd neurone: is formed by the Mitral cells of olfactory bulb.
-The axons of these cells form the olfactory tract.
-Each tract divides into 2 roots (lateral and medial) at the anterior perforated substance:

lateral :end in cortex of the Uncus & adjacent part of Hippocampal gyrus (center of smell. To the same side

medial : crosses midline through anterior commissure and joins the uncrossed lateral root of opposite side.
It connects olfactory centers of 2 cerebral hemispheres

Mucosa

Olfactory Mucosa

. delicate and contains olfactory nerve cells.
It is present in the upper part of nasal cavity:
-Roof
- lateral wall, --
medial wall,

Respiratory Mucosa

-thick, ciliated and highly vascular. -contains mucous glands & goblet cells
- lines the lower part of the nasal cavity (from vestibule to the superior concha).
- functions; to moisten, clean and warm the inspired air.

Nasal Cavity

floor

formed by: nasal surface of the hard palate:-
-Palatine process of maxilla, anteriorly.
-Horizontal plate of the palatine bone, posteriorly

Roof

Formed by:
-Body of sphenoid, posteriorly.
-Cribriform plate of ethmoid, in the middle.
- Frontal, and nasal bones, Anteriorly

Lateral wall

Marked by:
- Superior, middle, and inferior between them is the Meatus.
-Superior, middle, and inferior meatus.
- Sphenoethmoidal recess.

medial wall

The nasal septum :
-Vertical plate of ethmoid.
-Septal cartilage.
-Vomer.

Paranasal Sinuses

Spheno-ethmoidal recess > sphenoidal air sinus

Superior meatus > posterior ethmoidal sinus

Middle meatus > (1) maxillary, (2) frontal, & (3) anterior, (4) middle ethmoidal sinuses

Inferior meatus > nasolacrimal duct.

Lymphatic Drainage

To Submandibular & Upper deep cervical nodes

Venous Drainage

Venous plexus > drain into cavernous sinus (in it is the carotid artery and the nerve 6) & pterygoid venous plexus.

MCQs

1. Anterior nasal floor is composed of:

- A- Horizontal plate of the palatine bone
- B- Palatine process of maxilla
- C- Vomer
- D- Inferior meatus

Answer: B

2. Paranasal Sinuses are lined with:

- A- serous membrane
- B- cutaneous membrane
- C- mucoperiosteum

Answer: C

3. Which sinus doesn't open into the middle meatus:

- A- Maxillary
- B- Sphenoidal sinus
- C- Frontal
- D- Middle ethmoidal

Answer: B

4. Olfactory Mucosa in nasal cavity is present in:

- A- Upper part
- B- Lower part

Answer: A

5. Posterior part of nasal cavity is innervated by all of the following **except**:

- A- Anterior Ethmoidal.
- B- Nasopalatine.
- C- Palatine.
- D- Pterygopalatine ganglion.

Answer: A

6. Which root of 2nd neuron (mitral cells) joins the opposite side:

- A- Medial root
- B- Lateral root

Answer: A

7. First order neurons are present in:

- A- Olfactory epithelium
- B- Olfactory bulb
- C- Olfactory tract

8. What is the most common site for **epistaxis** (nosebleed):

- A- Anterior & inferior part of nasal septum
- B- Posterior part of nasal septum
- C- Floor of nasal cavity
- D- Lateral wall of nasal cavity

Answer: A

SAQs

1. What are the functions of the paranasal sinuses?

- Lighten the skull weight
- Amplify the sound as we speak.

2. Describe how respiratory mucosa moisten, clean, and warm?

The air is moistened by the secretion of numerous serous glands.

It is cleaned by the removal of the dust particles by the ciliary action of the columnar ciliated epithelium that covers the mucosa. The air is warmed by a submucous venous plexus.

3. Mention the innervation of nasal cavity?

The anterior part is supplied by **Anterior Ethmoidal** nerve (a branch of the ophthalmic nerve).

The posterior part is supplied by branches of **pterygopalatine** ganglion (a branch of maxillary nerve): Nasopalatine, Nasal, and Palatine.

Both ophthalmic and maxillary are branches of trigeminal nerve.

