

Nose and paranasal sinuses

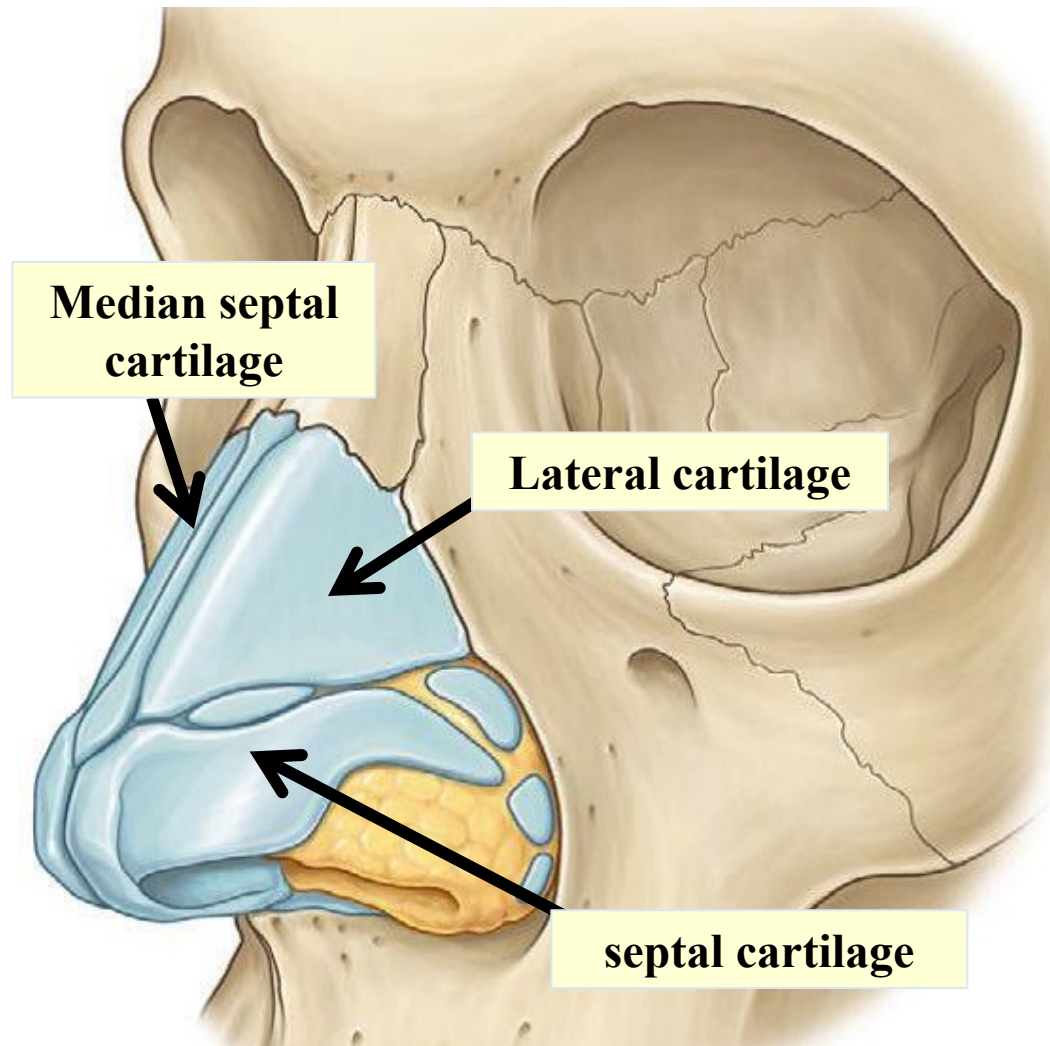
By

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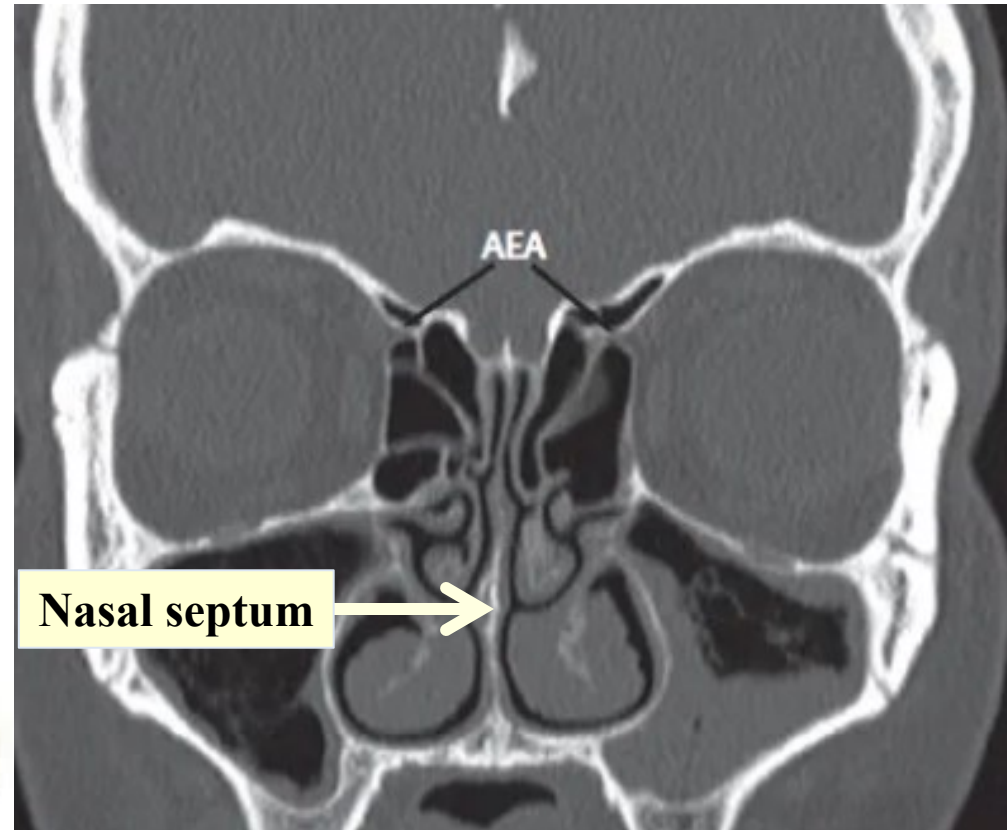
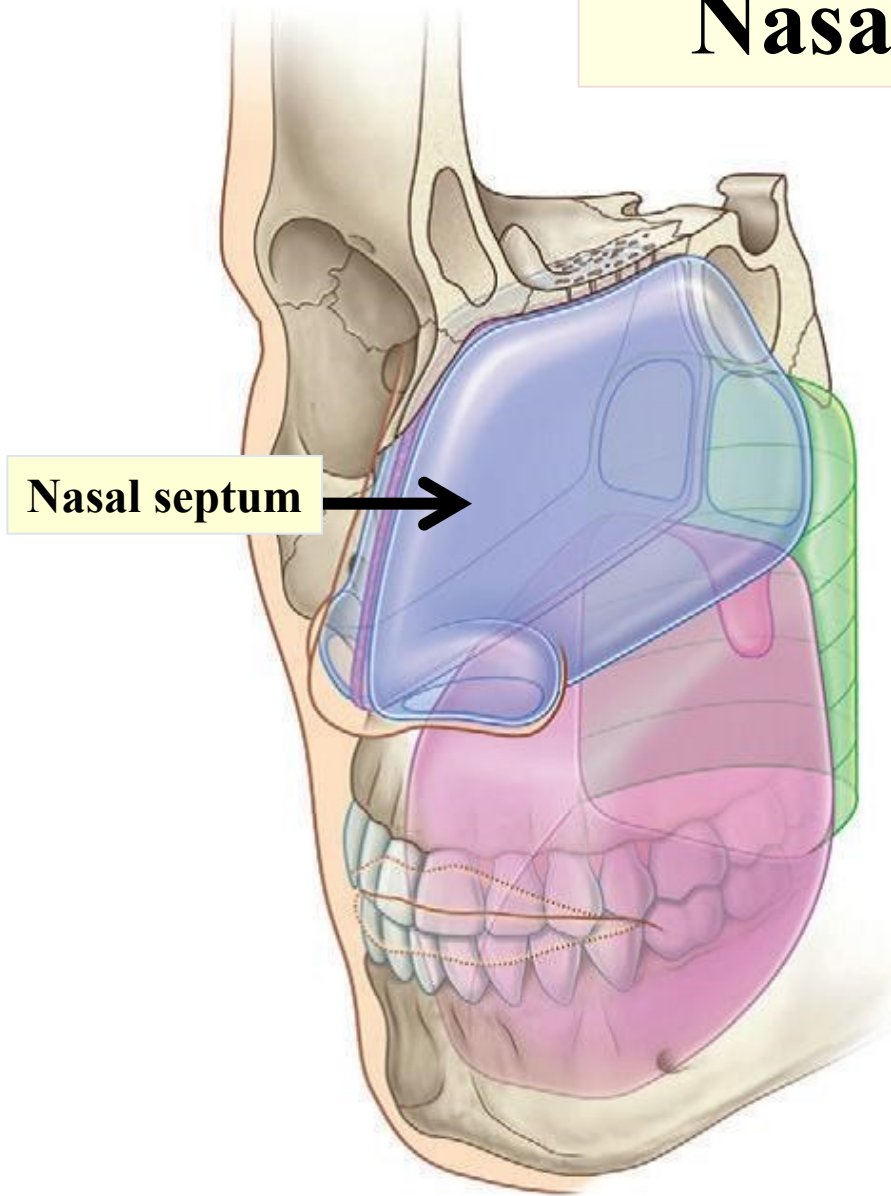
Faculty of Medicine, Cairo University

External nose



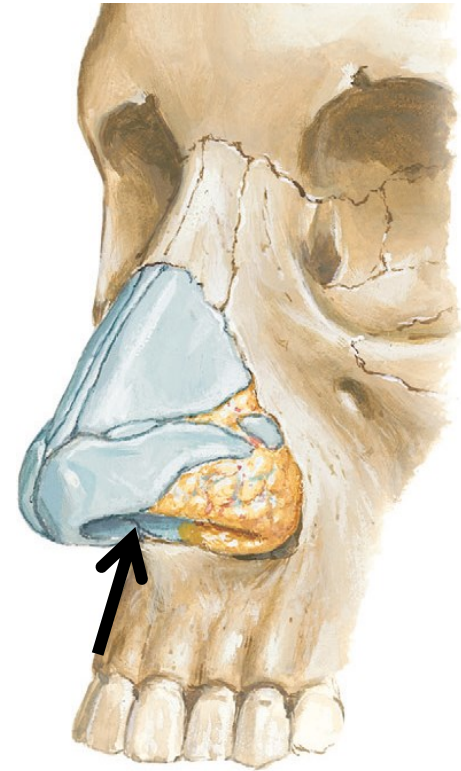
Shape: Pyramidal in shape having a root and free apex. Formed of bony & cartilaginous parts.
Bony part: nasal bones, frontal processes of maxilla and nasal process of frontal bone.
Cartilaginous part: median septal cartilage, lateral cartilages (above) and alar cartilages (below).

Nasal cavity



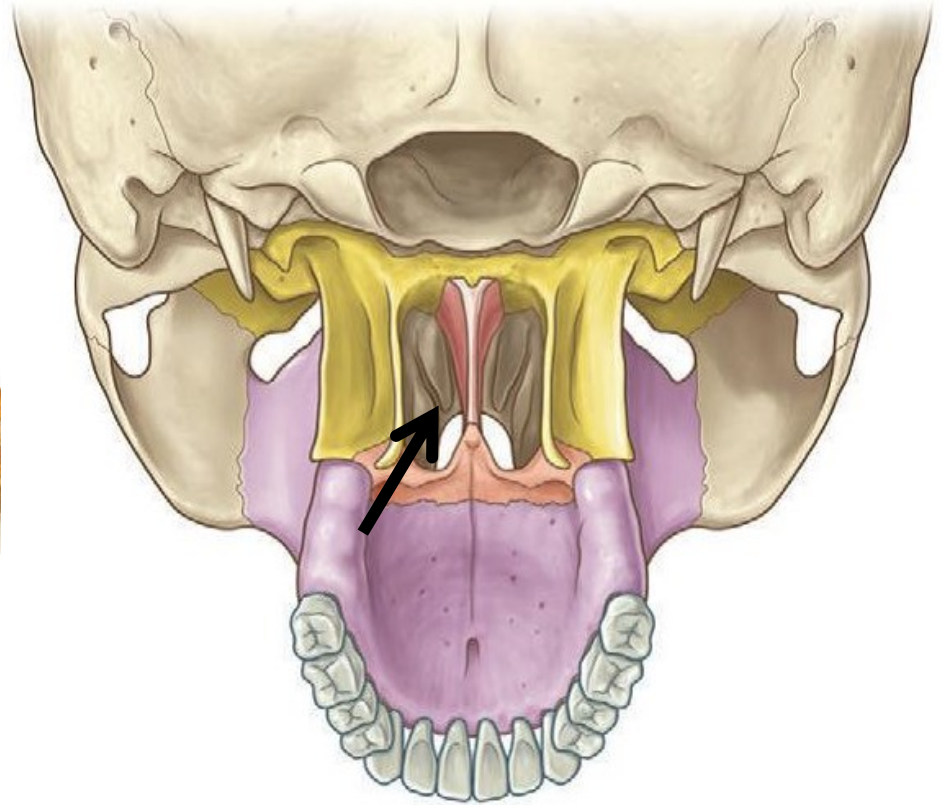
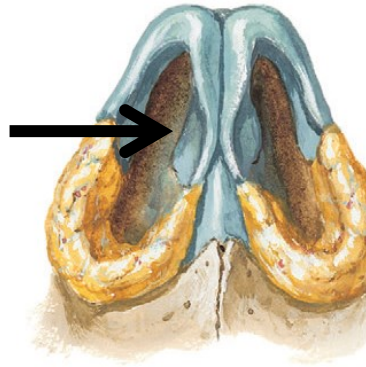
Two nasal cavities separated by a nasal septum.

Nasal cavity



Anterior nasal aperture

(Nostril)

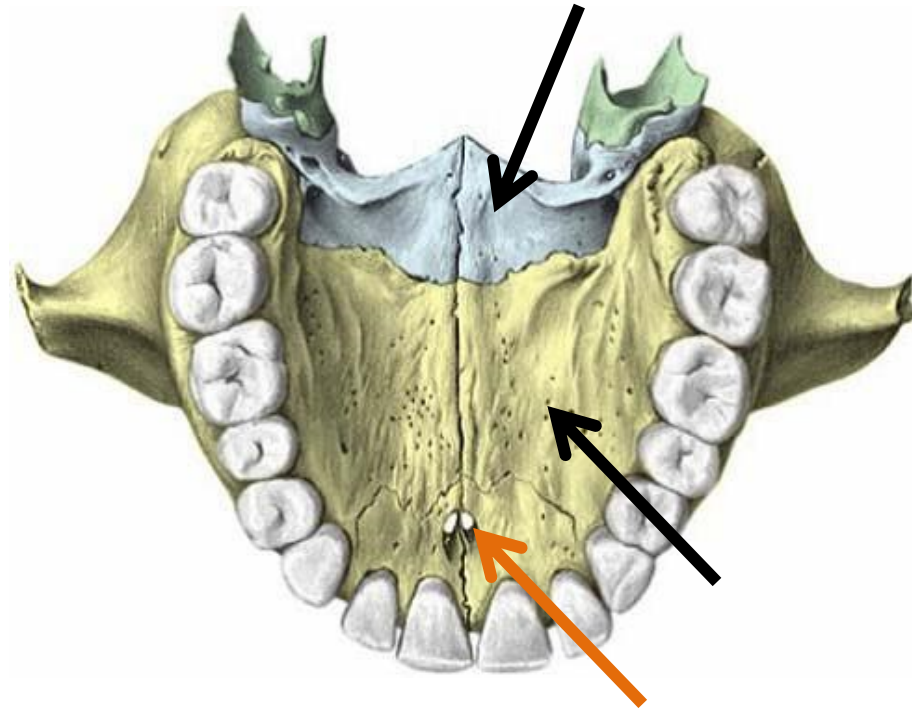
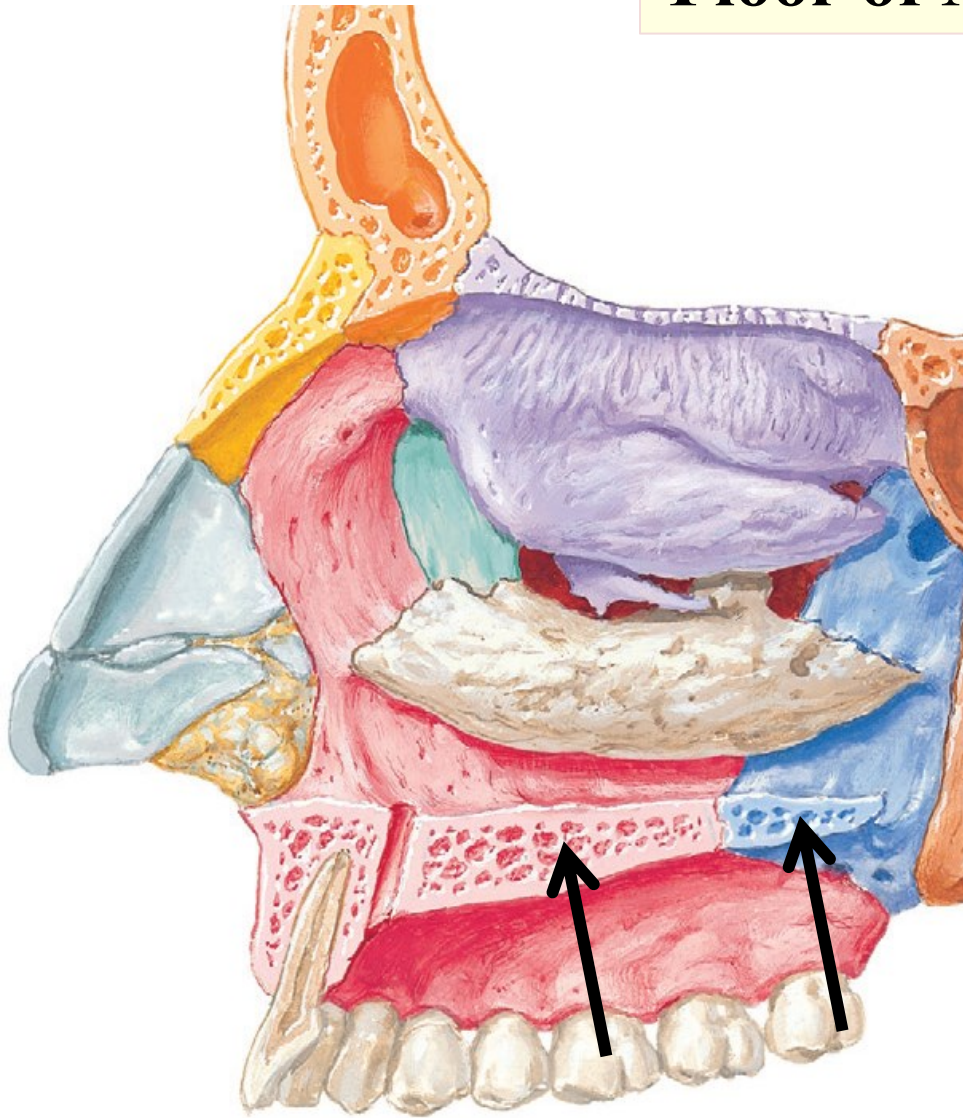


Posterior nasal aperture

(Choana)

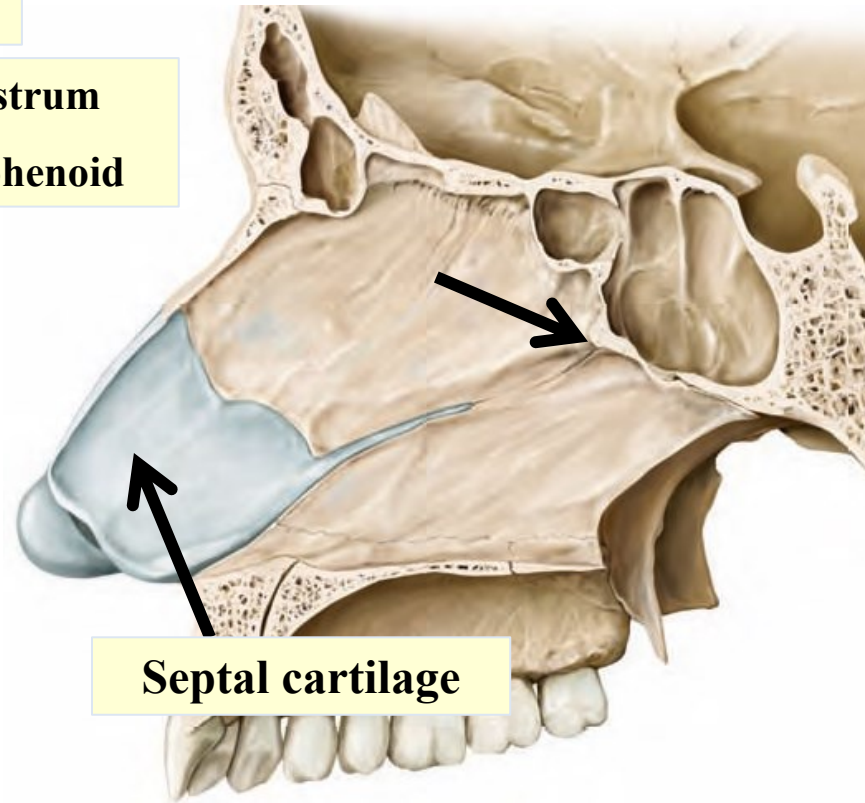
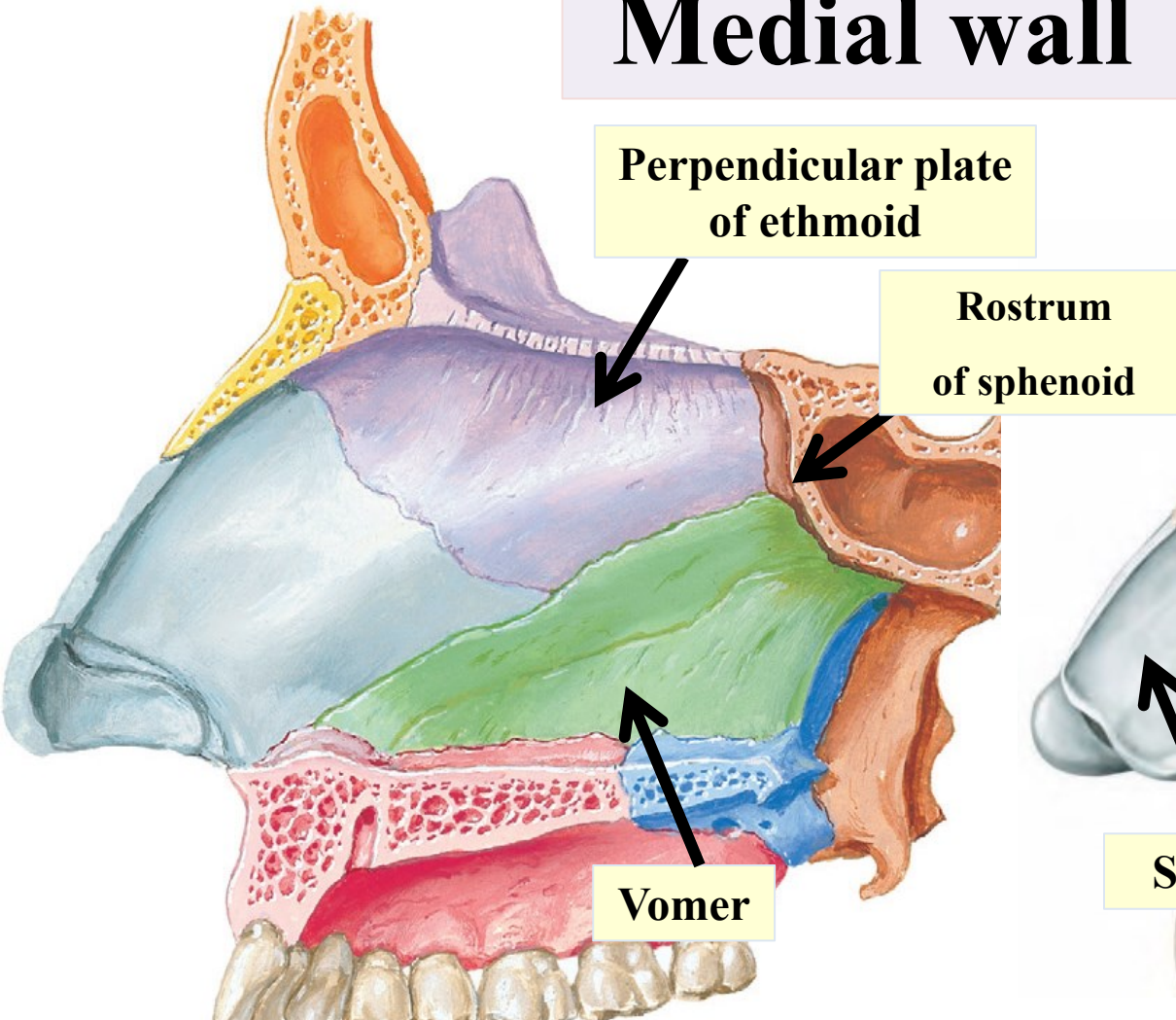
Two nasal cavities separated by a nasal septum.
Nasal cavity opens on face through anterior nasal opening or aperture (anterior nares or nostrils).
Nasal cavity opens posteriorly in nasopharynx through the posterior nasal apertures (the choana).

Floor of Nasal cavity



Floor: It is formed by the 2 parts of the hard palate; palatine process of maxilla anteriorly and horizontal plate of palatine bone posteriorly. It has the incisive fossa and canals which lie about 2 cm behind the anterior end.

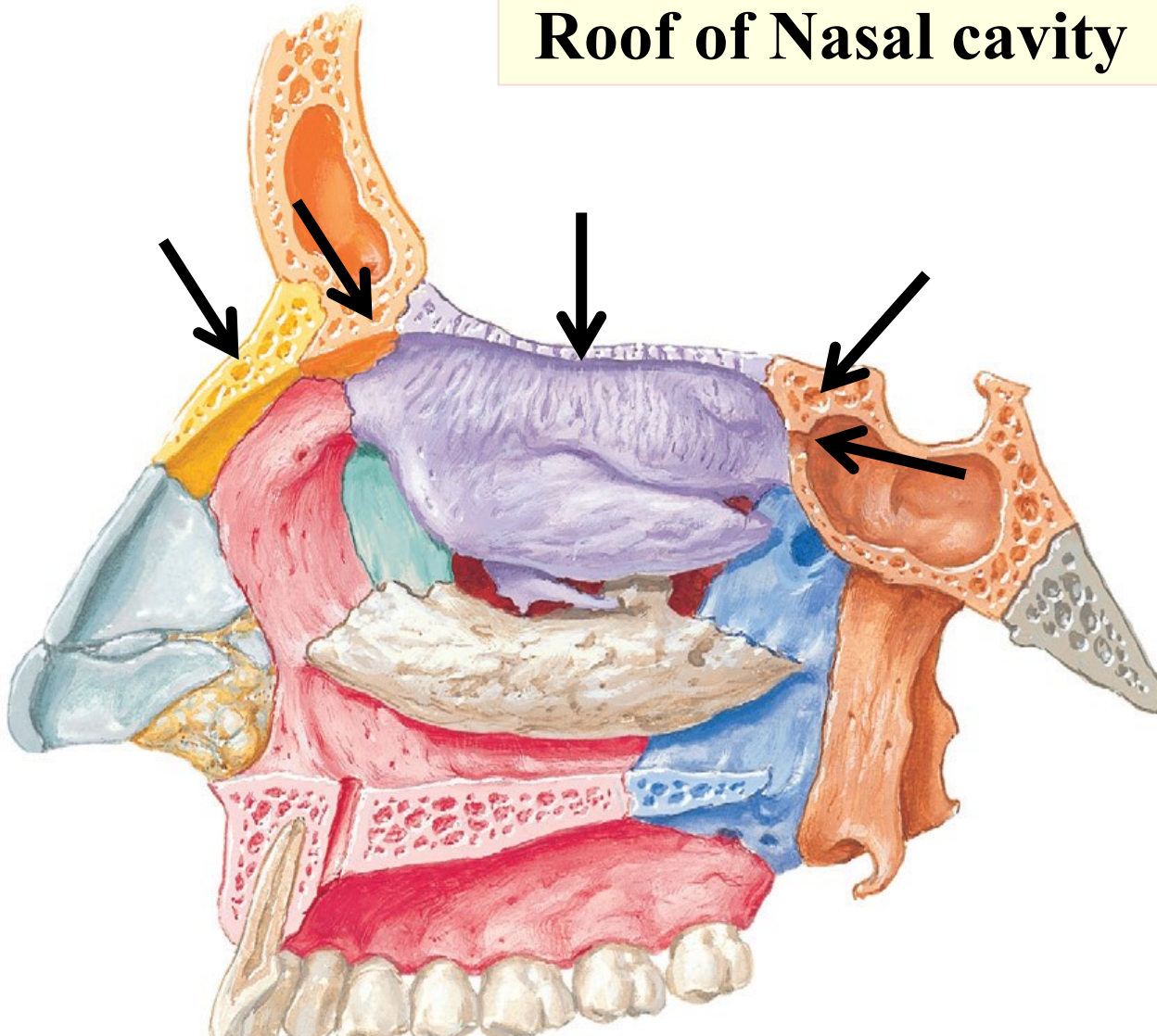
Medial wall



Medial wall (nasal septum): formed of

- 1- **Septal cartilage:** In front.
- 2- **Perpendicular plate of ethmoid:** Above and behind.
- 3- **Vomer:** Below and behind.
- 4- **Rostrum of sphenoid:** Small posterior part.

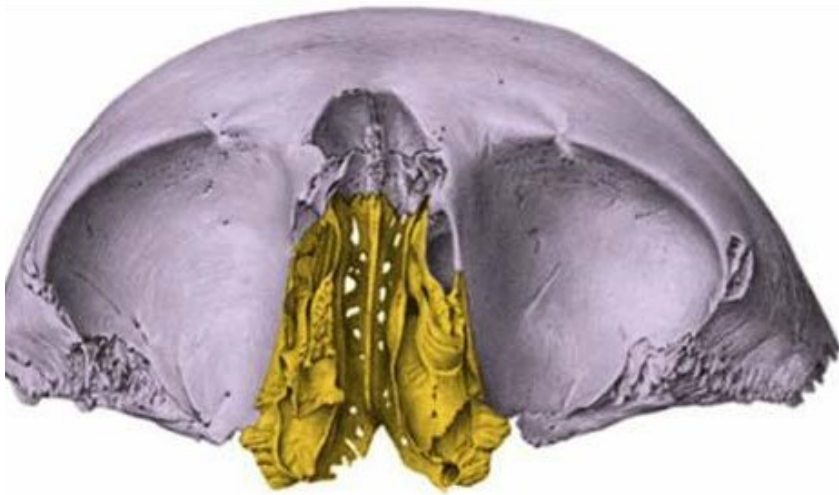
Roof of Nasal cavity

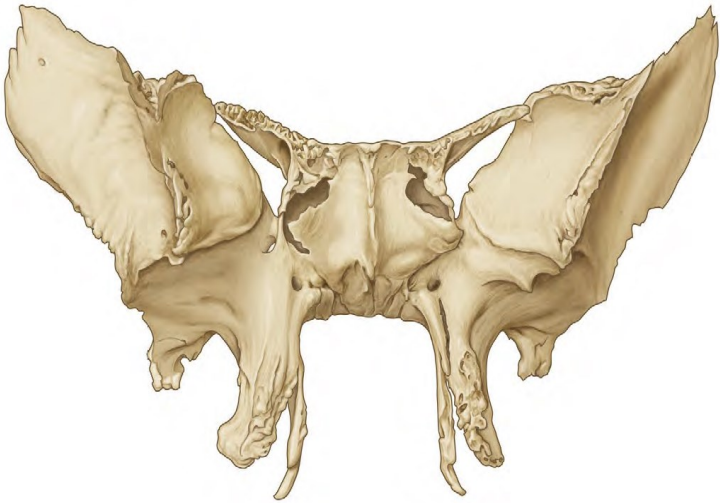
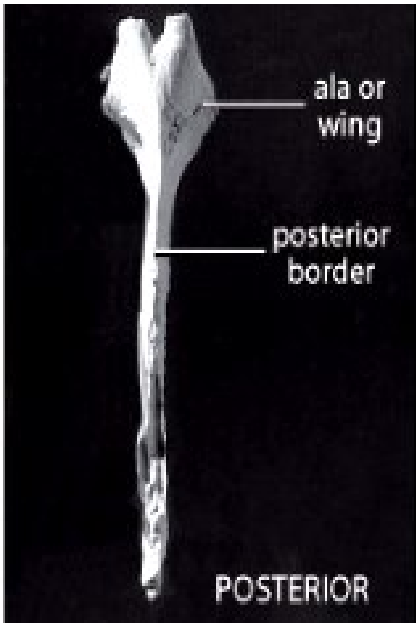
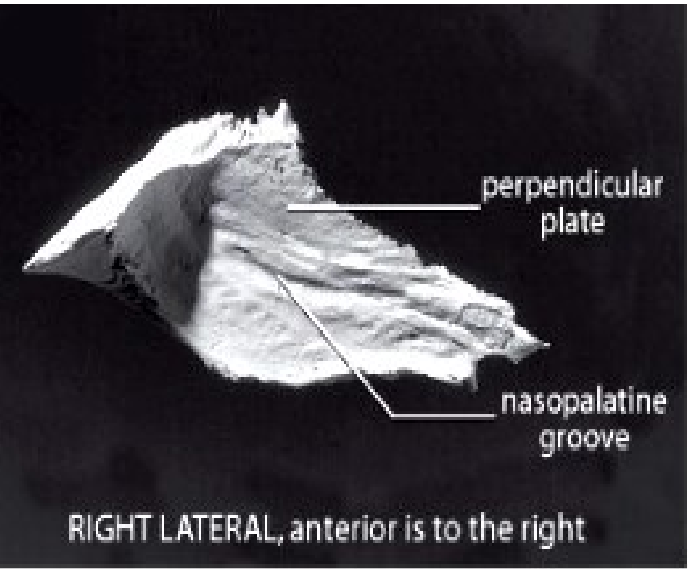


Roof: (Applied trans-nasal, trans-sphenoidal approach) formed of 3 parts:

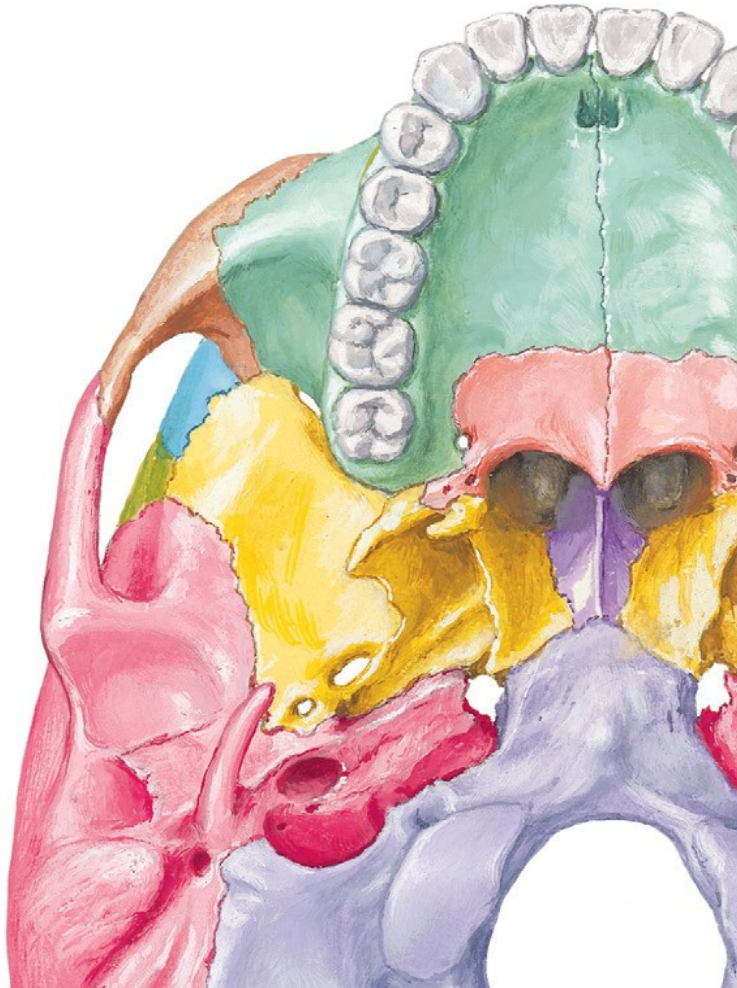
- 1- Anterior sloping part:** Formed of nasal and frontal bones.
- 2- Middle horizontal part:** The cribriform plate of ethmoid bone.
- 3- Posterior sloping part:** Formed of body of sphenoid with the opening of sphenoid sinus.

Ethmoid bone



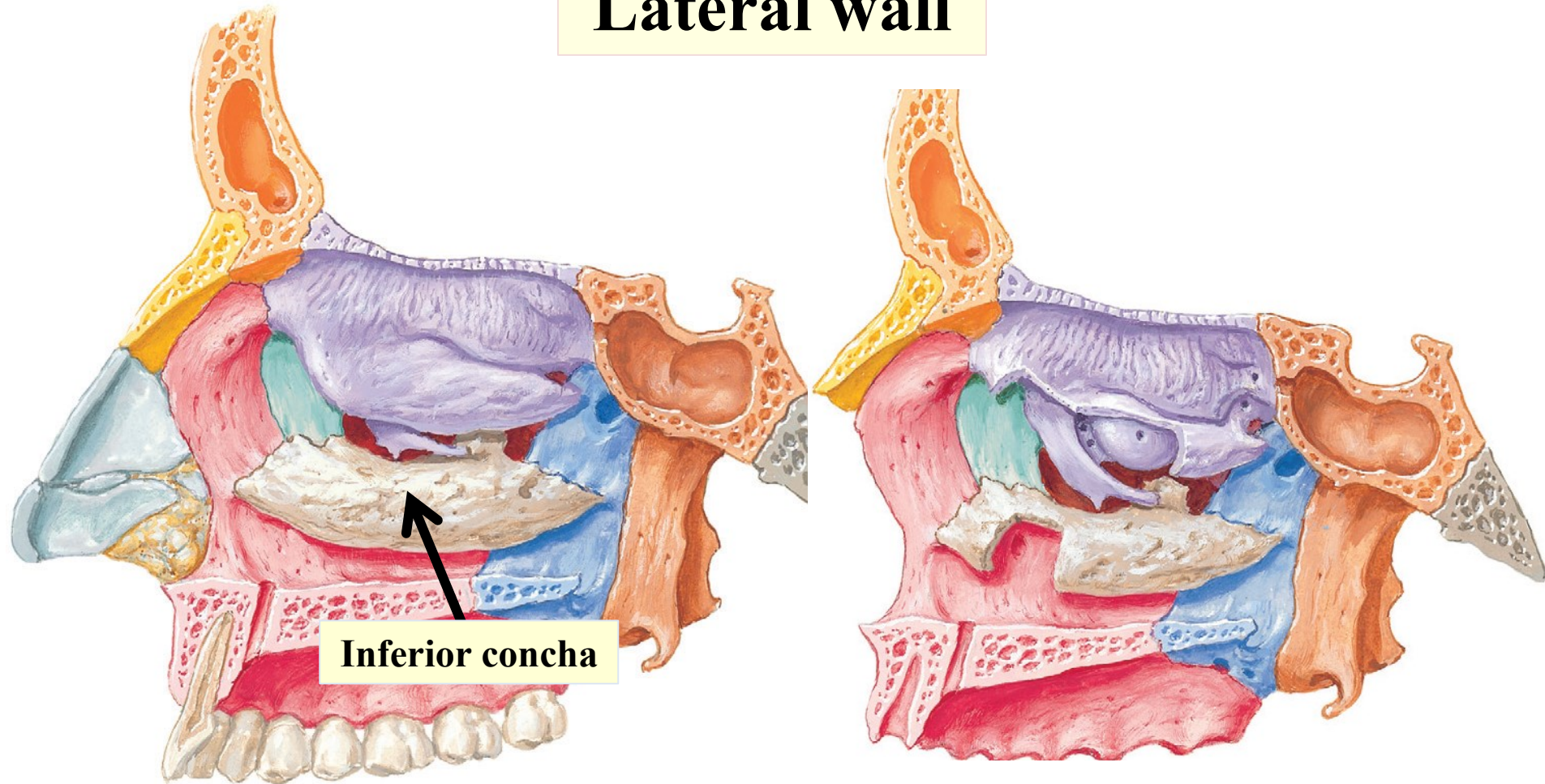


Lateral wall



- 1- **Medial surface of maxilla:** below and in front-contains opening of maxillary sinus in upperposterior part.
- 2- **Perpendicular plate of palatine bone:** Lies behind maxilla-contains sphenopalatine F. in upper part.
- 3- **Medial pterygoid plate:** The most posterior part.
- 4- **Medial surface of ethmoidal labyrinth:** The upper part.
- 5- **Nasal, frontal process of maxilla and lacrimal bones:** The upper anterior part.

Lateral wall

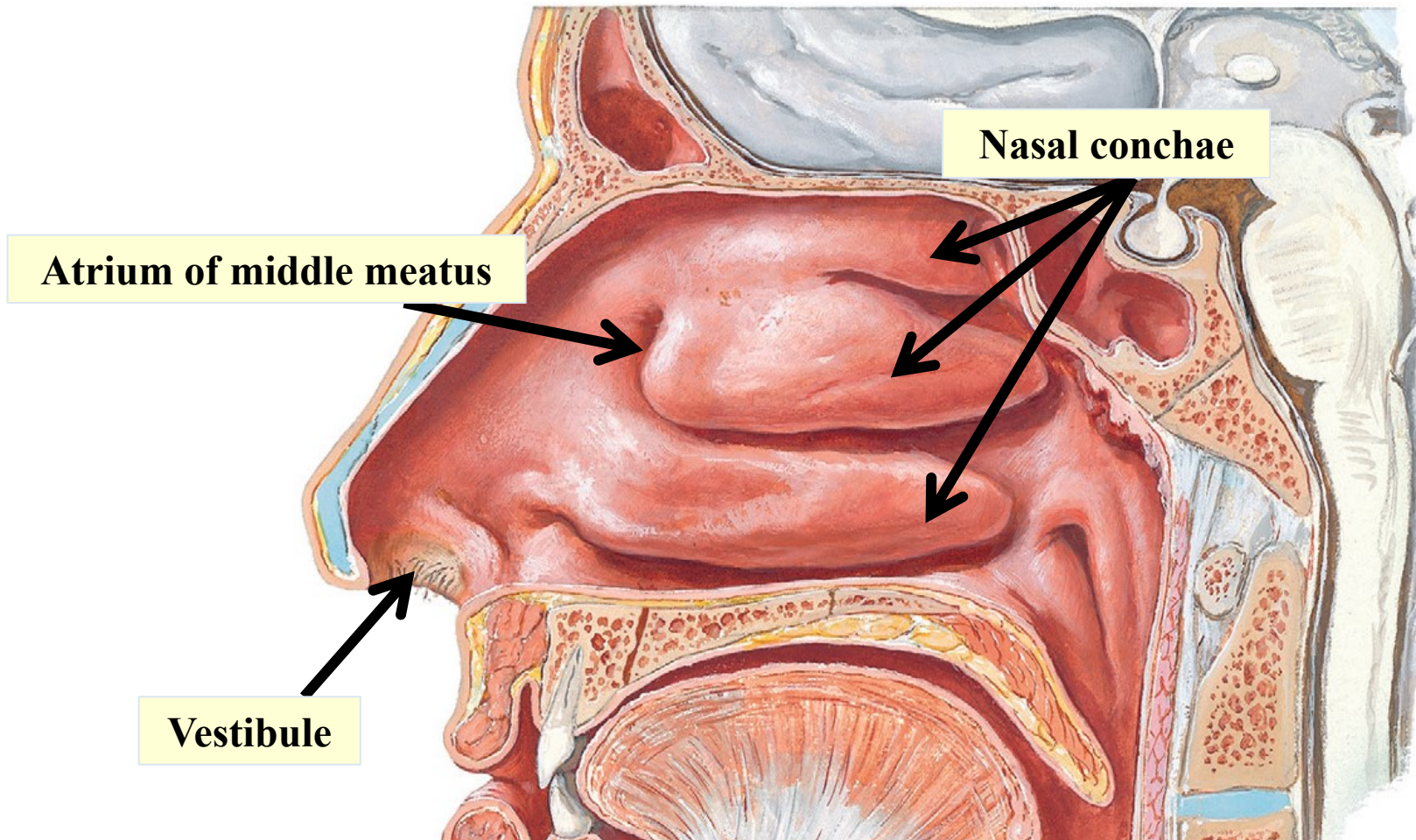


Inferior concha

Lateral wall: Nearly flat, showing openings which lead to paranasal sinuses. formed of :

- 1- **Medial surface of maxilla:** below and in front-contains opening of maxillary sinus in upperposterior part.
- 2- **Perpendicular plate of palatine bone:** Lies behind maxilla-contains sphenopalatine F. in upper part.
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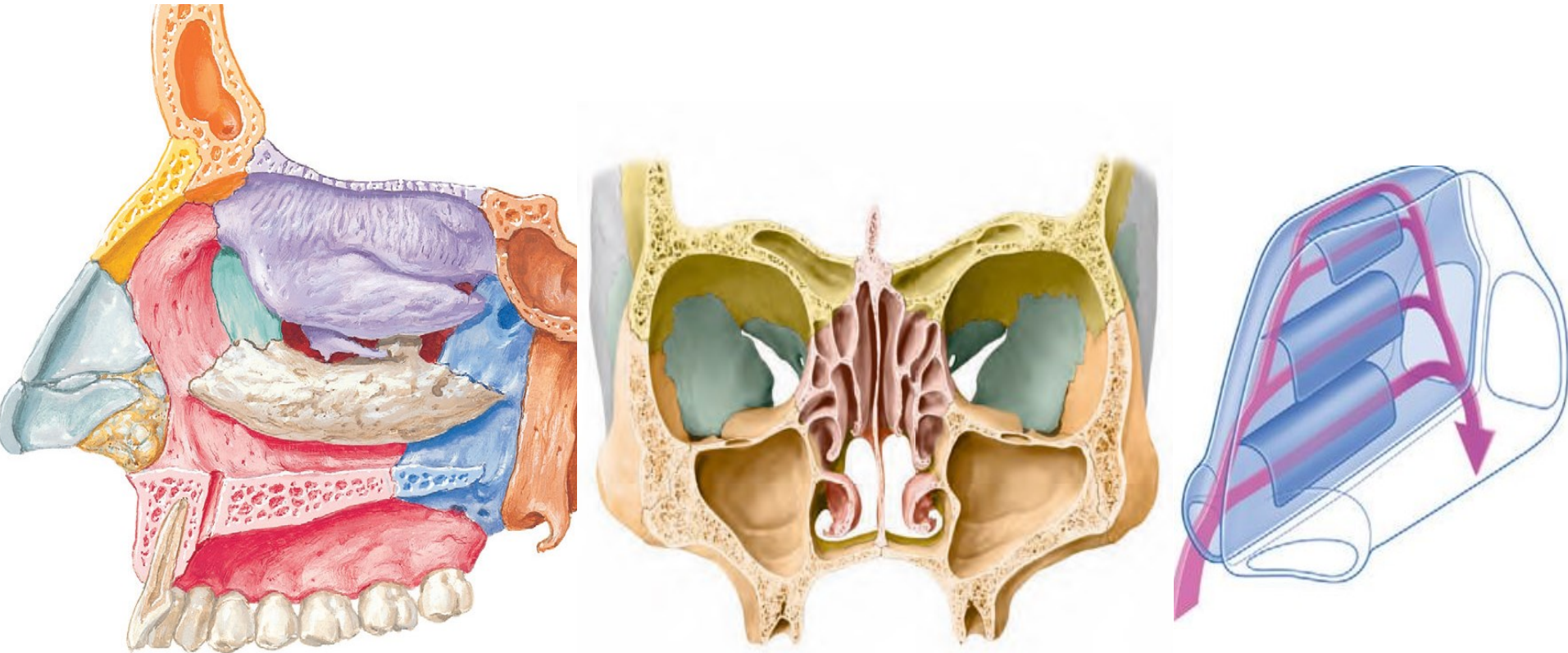
Parts of lateral wall of nose



- 1- Vestibule of nose:** Small dilated part above nostril--lined by skin containing sweat glands, sebaceous glands and coarse hairs for filtration of dust particles and insects (vestibule=dilatation).
- 2- Atrium of middle meatus:** Shallow depression above and behind vestibule -continuous posteriorly with middle meatus.
- 3- Nasal conchae and meatuses**

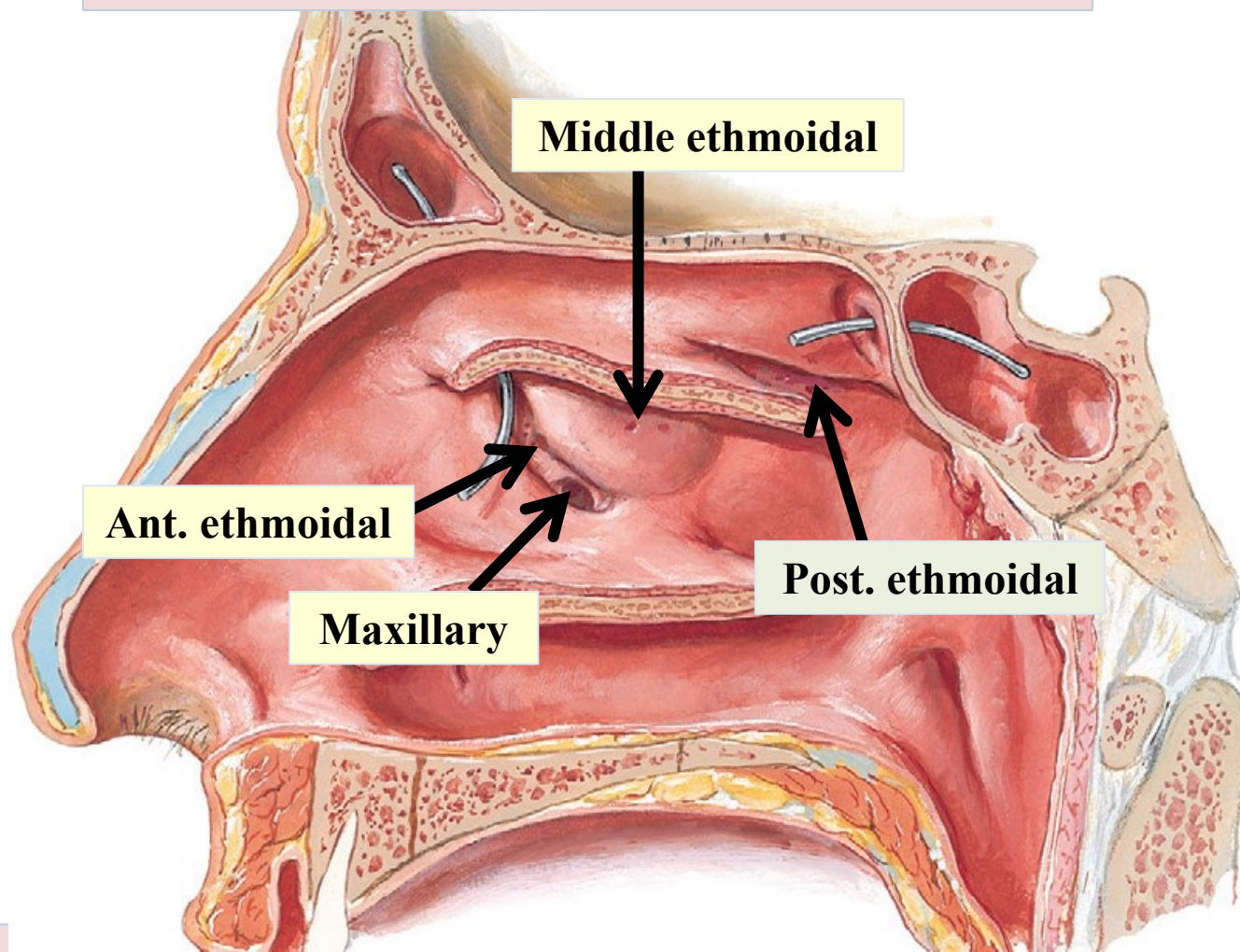


Nasal conchae



- Lateral wall shows 3 curved bony projections covered with highly vascular mucosa (conchae).
 - Superior concha (the smallest), middle concha, and the inferior concha (the largest).
 - Superior & middle conchae project from ethmoidal labyrinth-inferior concha is a separate skull bone.
- Functions:**
- Increase surface area of nasal cavity w magnifies turbulence of air and thus improves olfaction.
 - Excessive mucosal area, increases humidity and warming of inspired air.

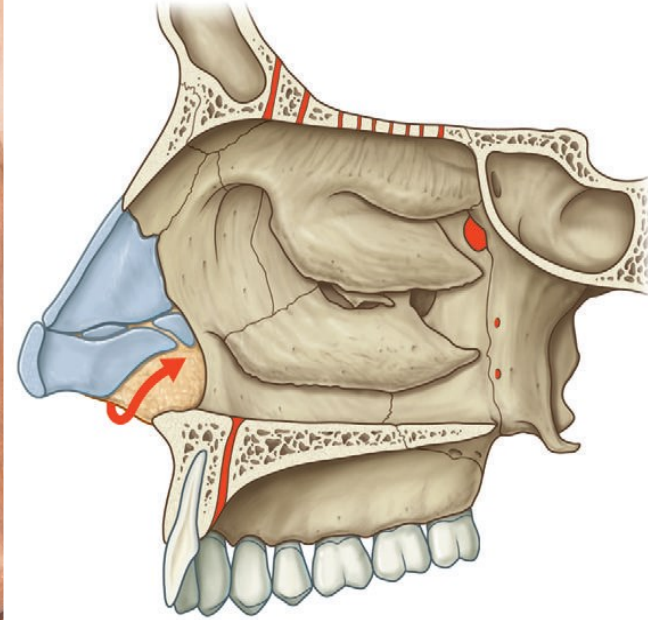
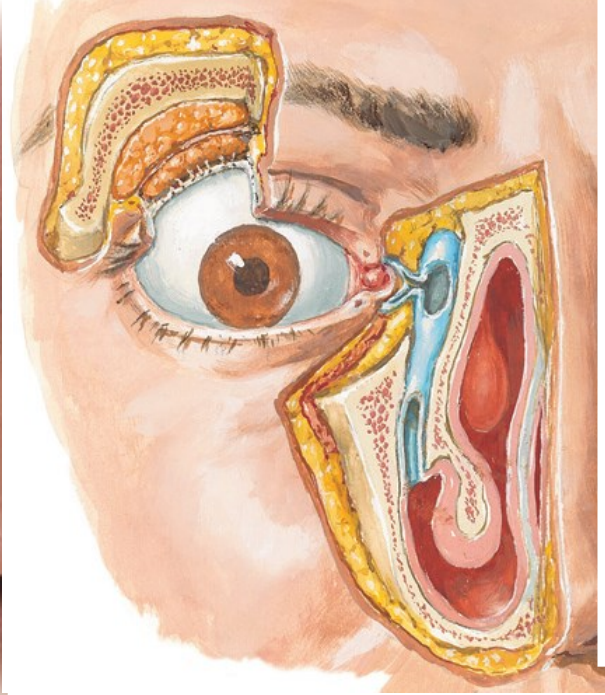
Four sinuses open into middle meatus



- 1- **Frontal sinus:** Opens in ethmoidal infundibulum which opens in anterior end of hiatus semilunaris.
- 2- **Maxillary sinus:** Opens in posterior end of hiatus semilunaris.
- 3- **Anterior ethmoidal sinus:** Opens in ethmoidal infundibulum or in anterior end of hiatus semilunaris.
- 4- **Middle ethmoidal sinus:** Opens in bulla ethmoidalis.

- ☐ **Posterior ethmoidal sinus opens into superior meatus.**
- ☐ **Sphenoidal sinus opens into spheno-ethmoidal recess.**

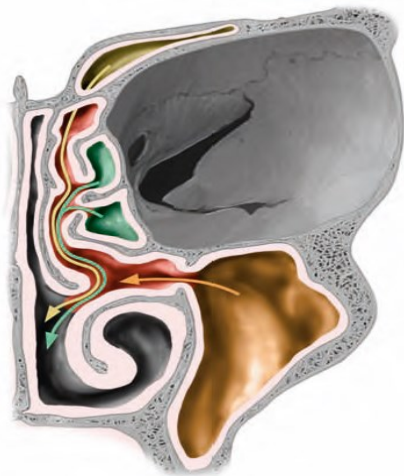
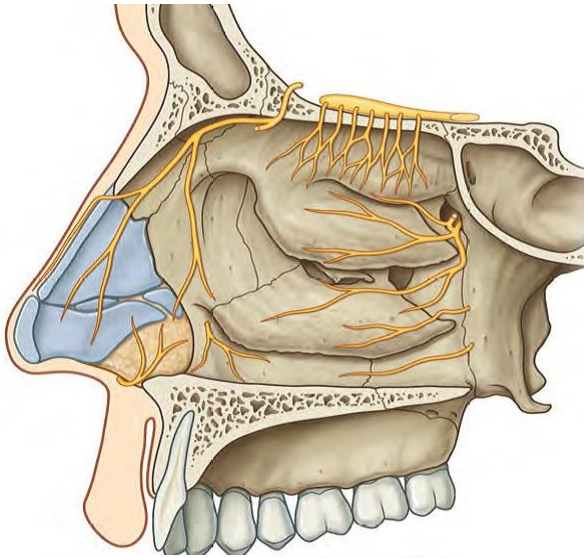
Nasolacrimal duct



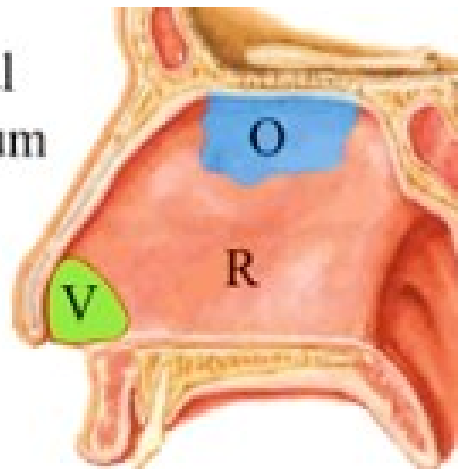
D- Other openings in the lateral wall of nose:

- ☐ Nasolacrimal duct opens in the anterior end of the inferior meatus of nose (IM).
- ☐ Sphenopalatine foramen lies behind the superior meatus and opens in pterygopalatine fossa.

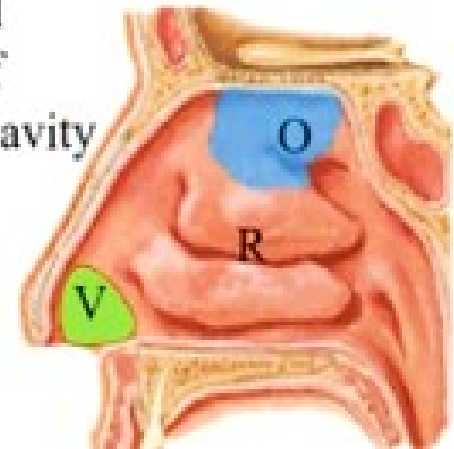
Nasal Mucosa



Nasal
septum



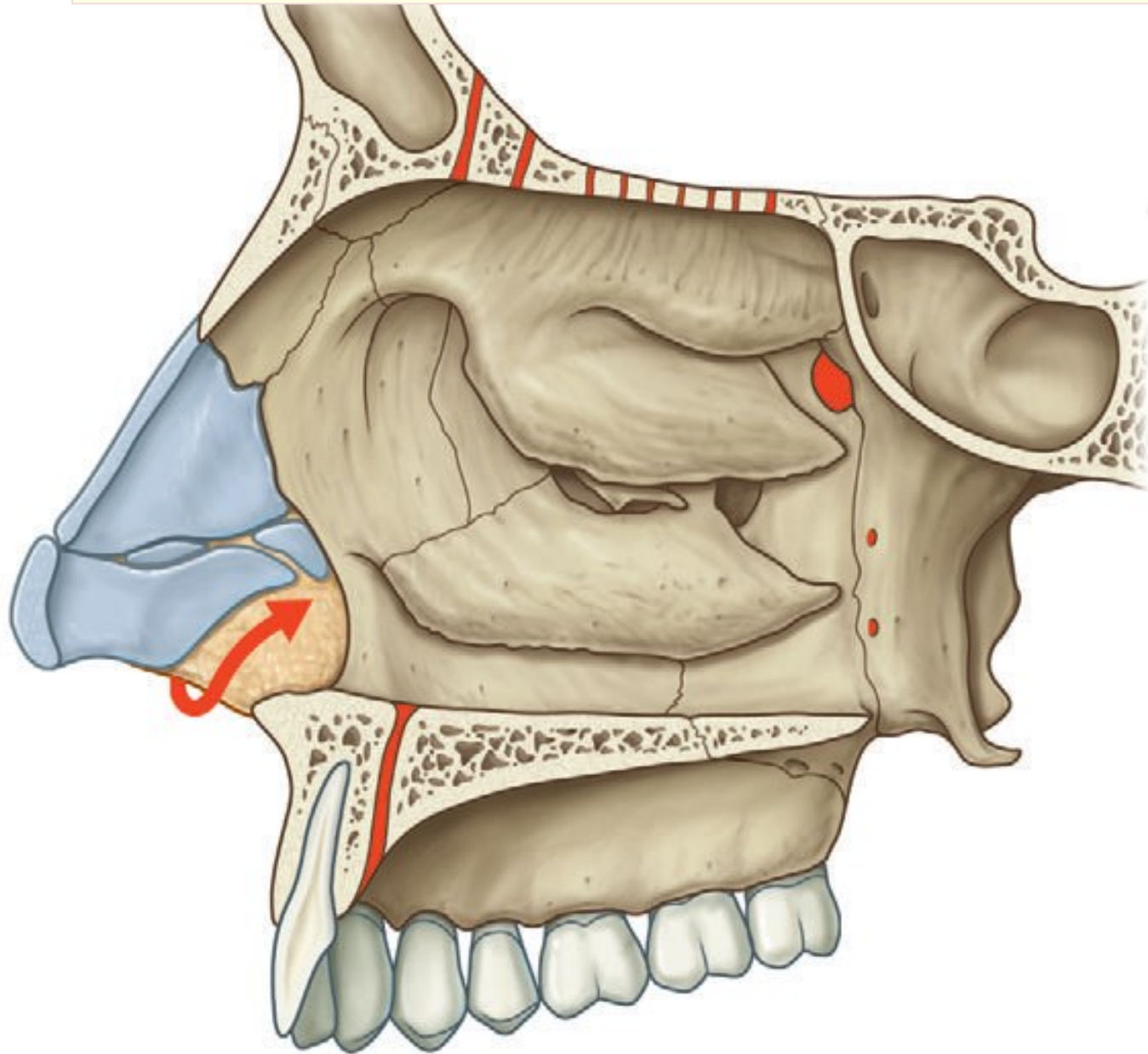
Lateral
wall of
nasal cavity



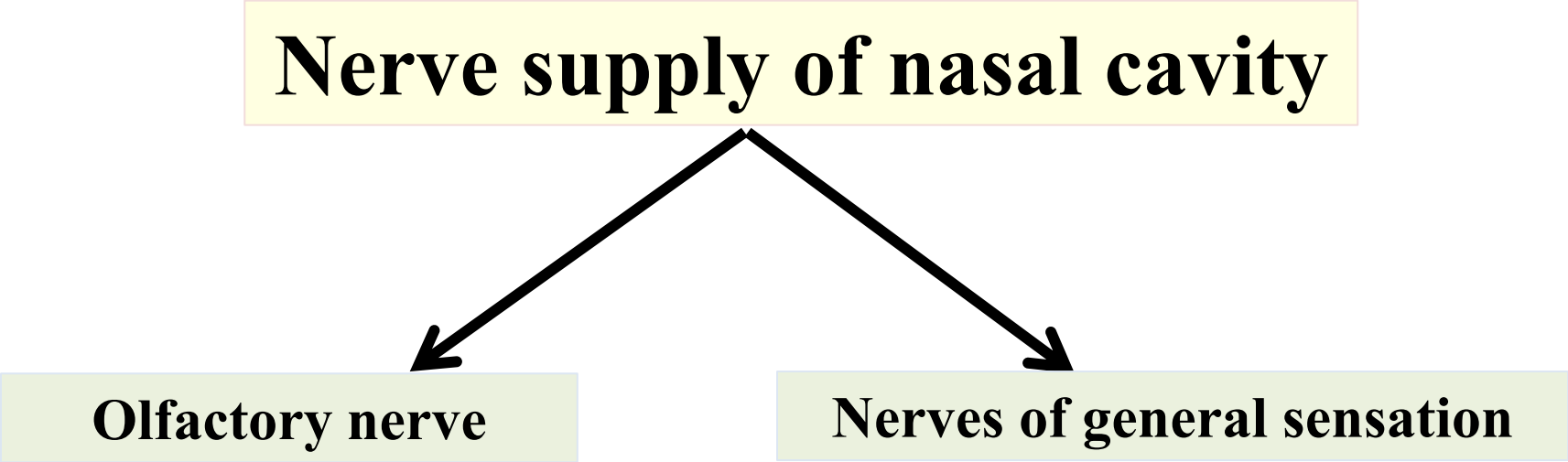
A- Olfactory mucosa: Lines roof, upper one cm of nasal septum, superior concha and area above it. Olfactory mucosa is yellowish, less vascular and gives origin to olfactory nerve filaments.

B- Respiratory mucosa: It covers all parts of nasal cavity except olfactory region and vestibule. It is pink or red in colour due to its high vasculature to allow rapid warming and moistening of inspired air. It is continuous with mucosa of paranasal sinuses, nasopharynx and conjunctiva.

Openings to the nasal cavity



Nerve supply of nasal cavity

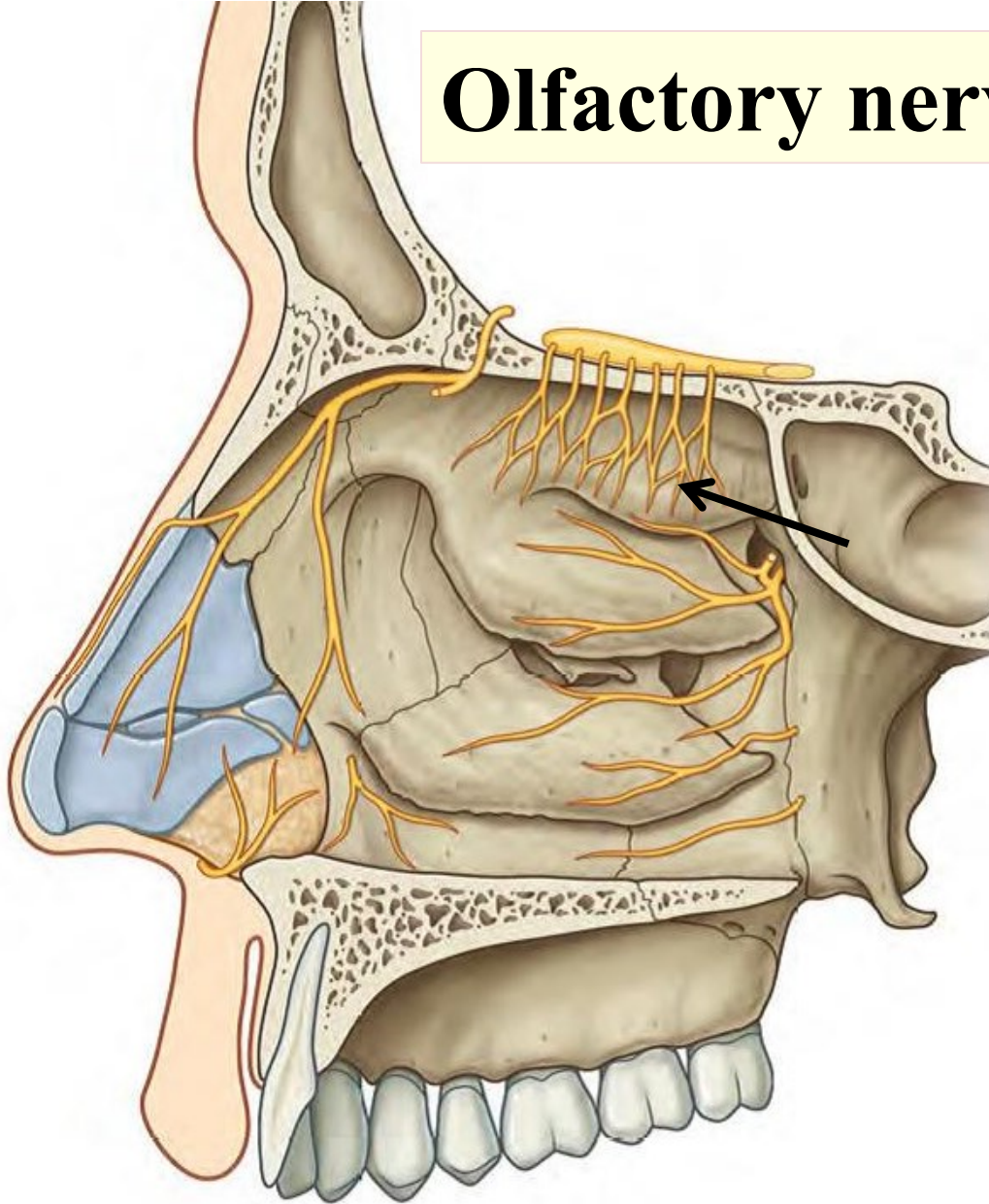


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graph TD; A[Nerve supply of nasal cavity] --> B[Olfactory nerve]; A --> C[Nerves of general sensation];
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Olfactory nerve

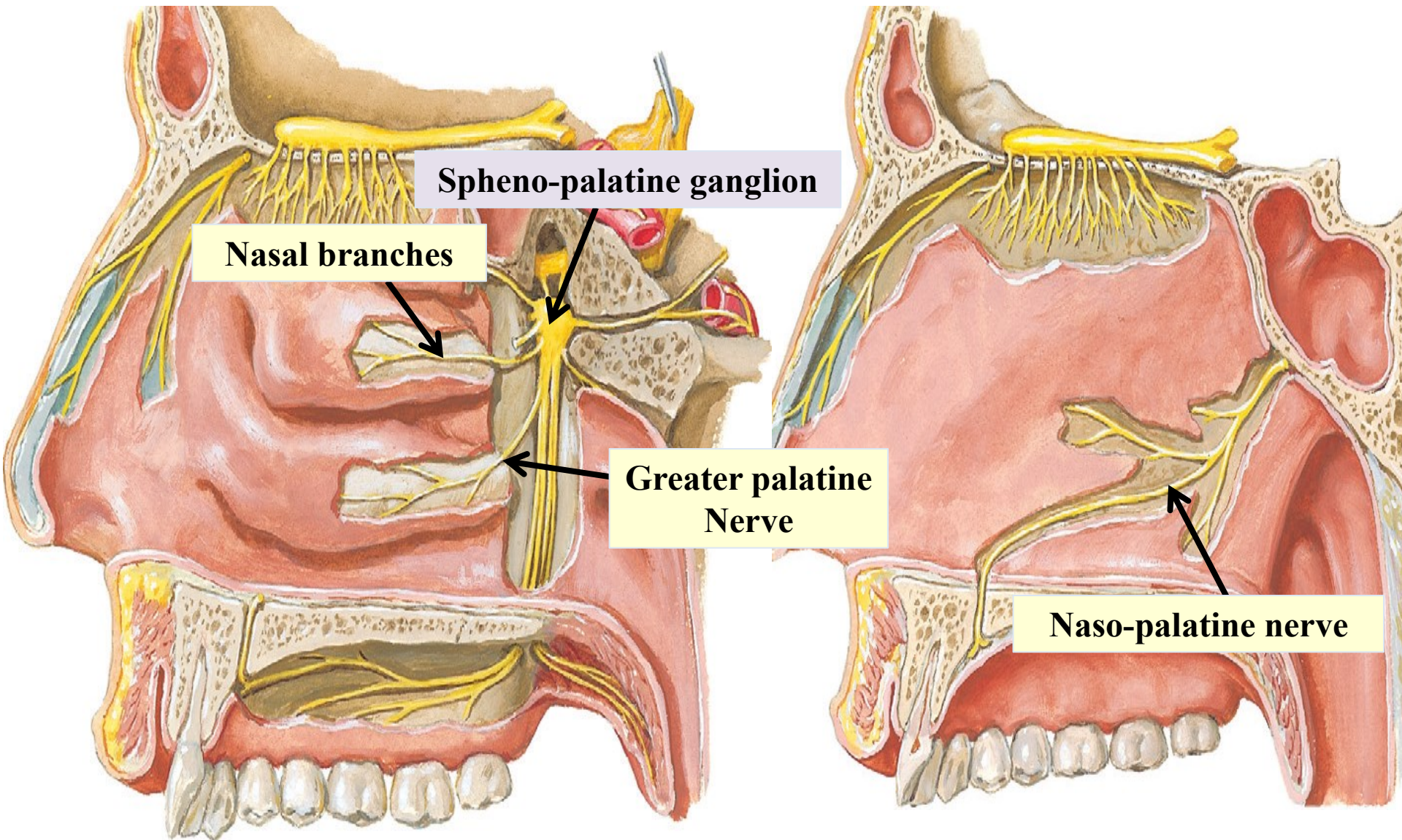
Nerves of general sensation

Olfactory nerve

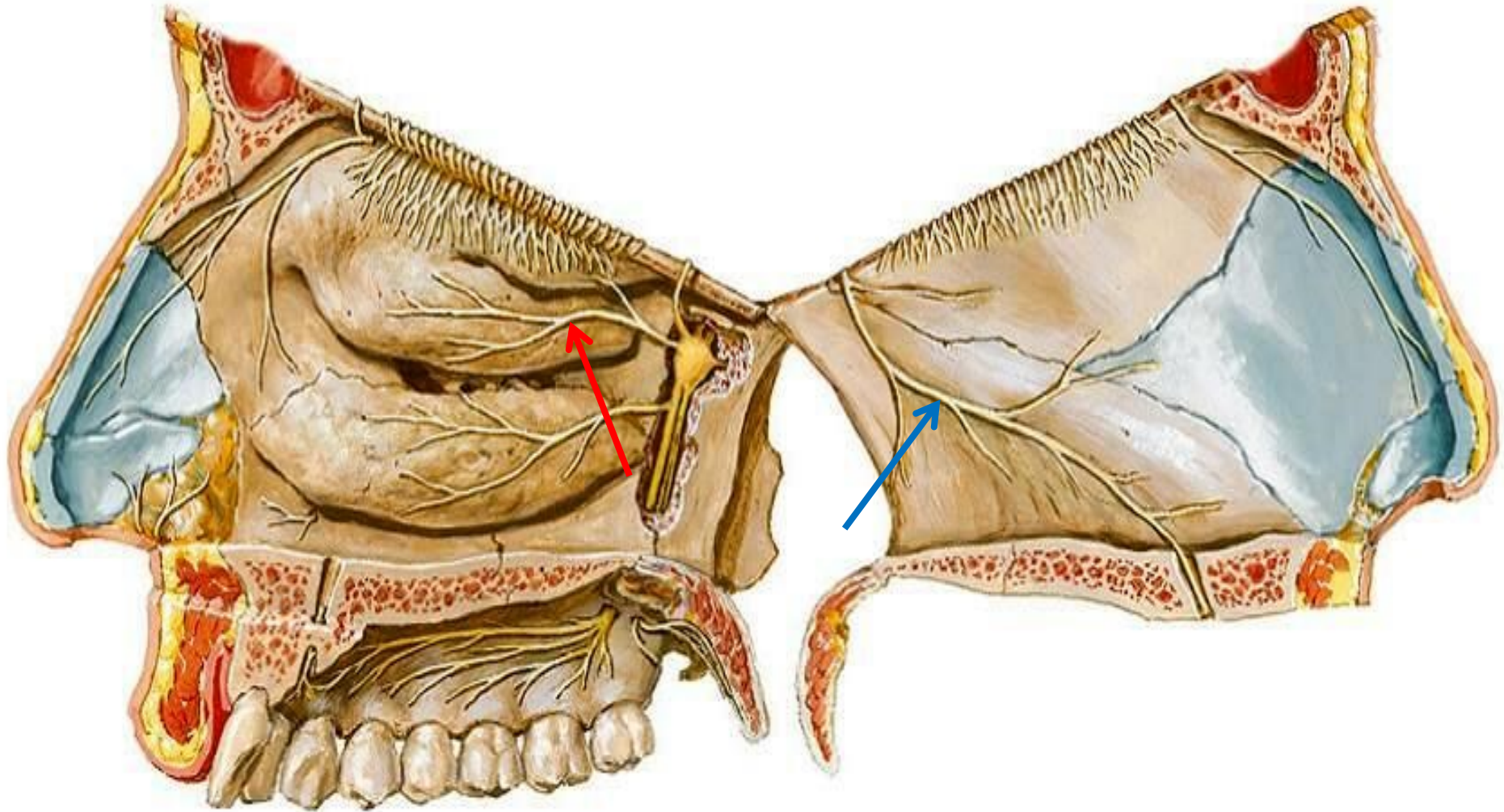


A- Olfactory nerve (1st cranial nerve): Arises from the olfactory mucosa, about 8-20 filaments passing through the cribriform plate of ethmoid to end in olfactory bulb.

Nerves of general sensation



Nasal branches of sphenopalatine ganglion



- a- **Lateral** nasal (**short** sphenopalatine) nerves: to lateral wall.
- b- **Medial** nasal (**long** sphenopalatine) nerves: to nasal septum.(Nasopalatine)

Anterior ethmoidal nerve

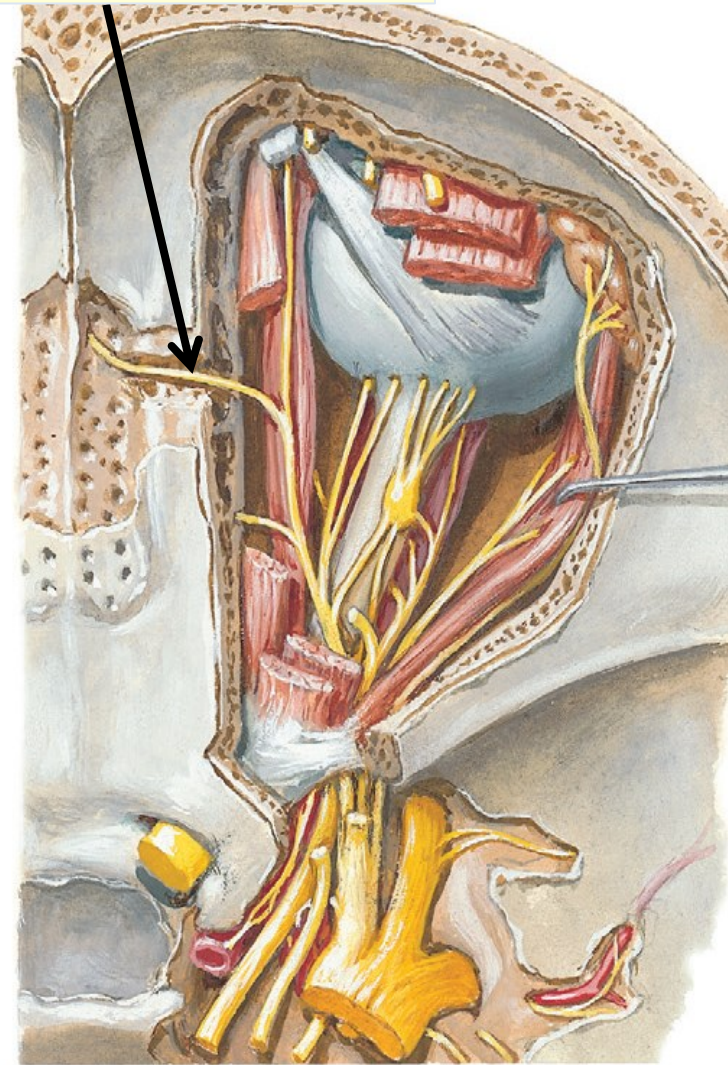
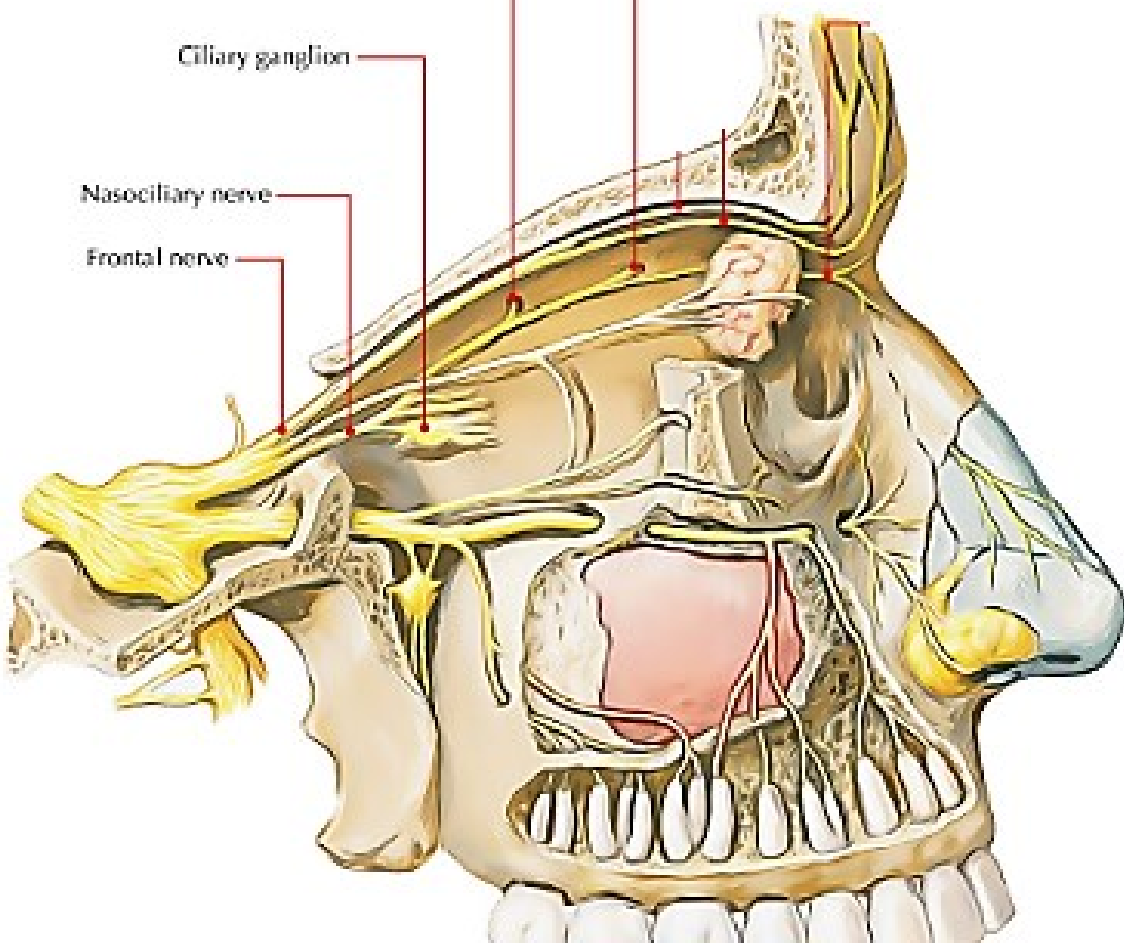
Posterior ethmoidal nerve

Ciliary ganglion

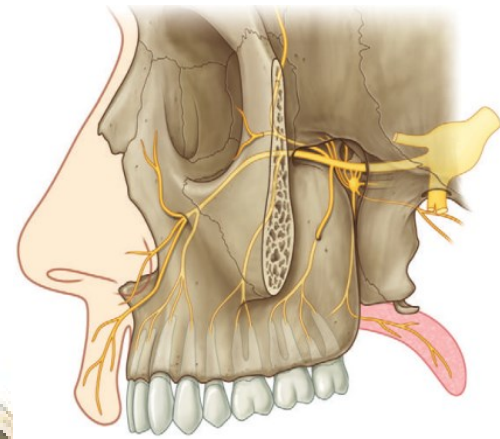
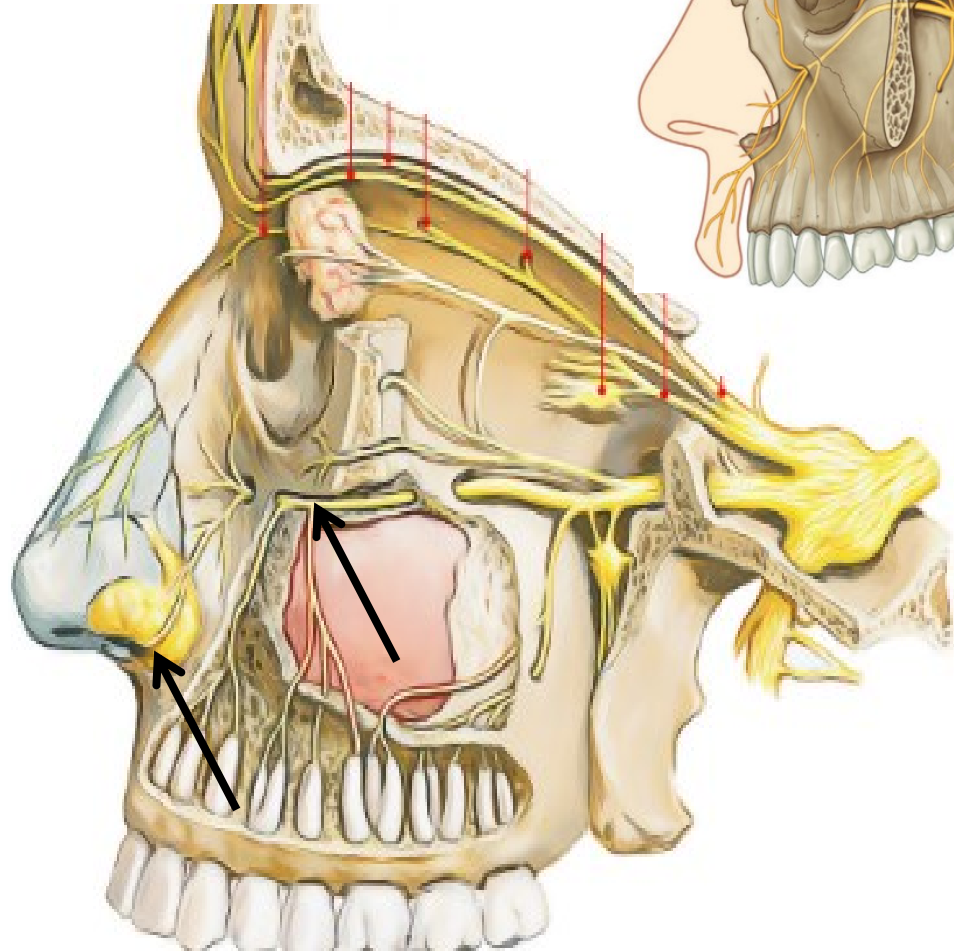
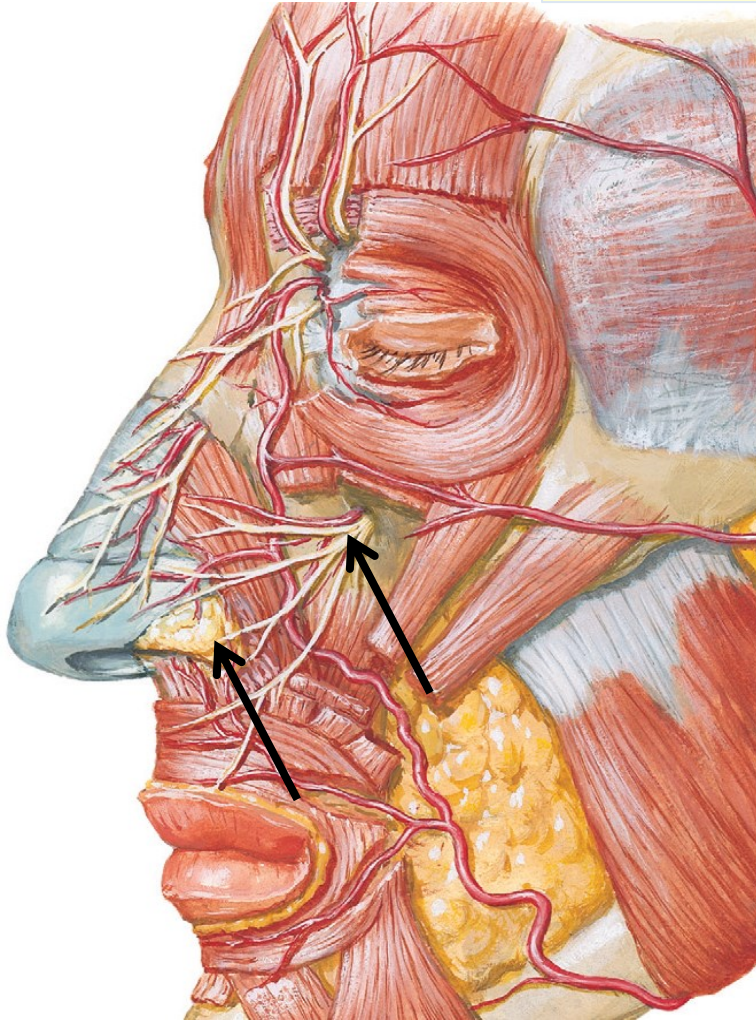
Nasociliary nerve

Frontal nerve

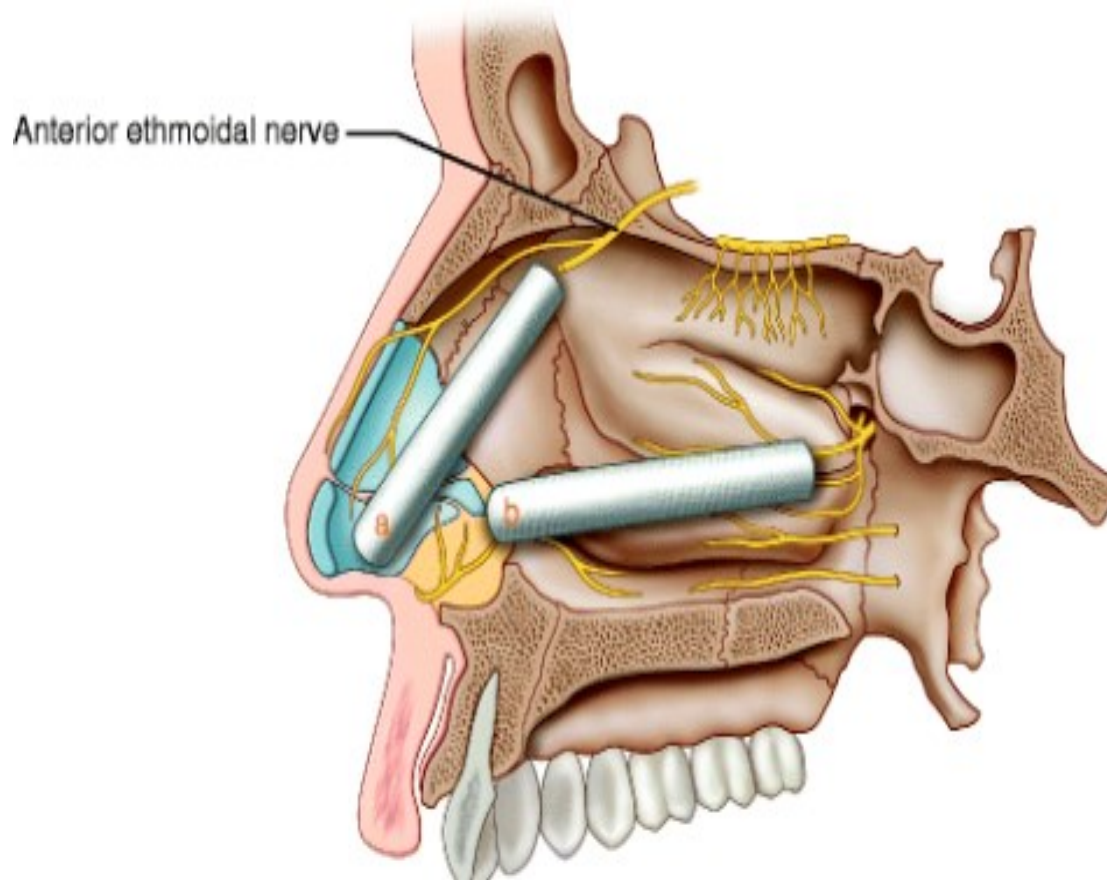
Anterior ethmoidal nerve



Infra-orbital nerve



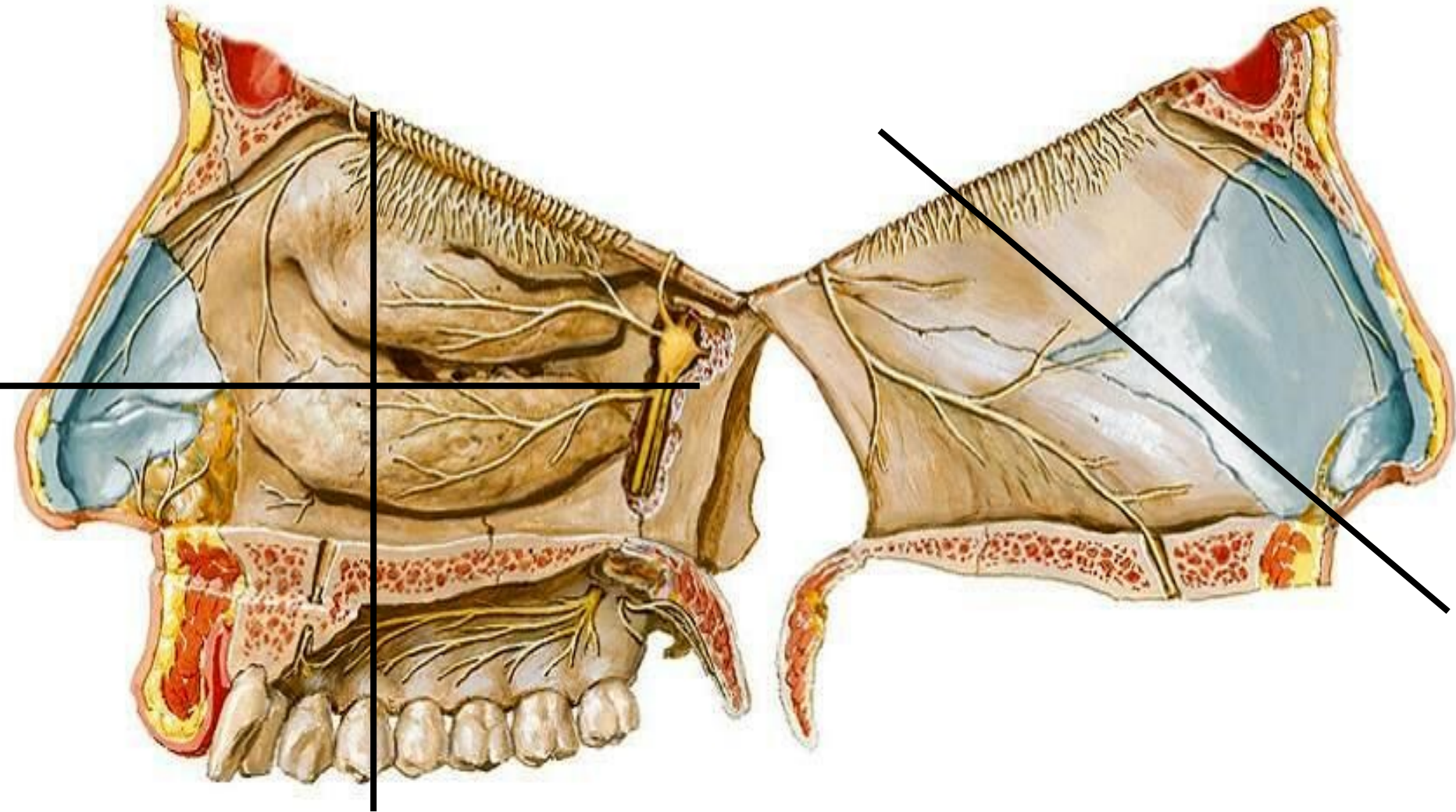
Anesthesia of the nose



By cotton pledgets soaked in 2–4% lidocaine.

The pledgets are positioned **anteriorly and superiorly** in order to block anterior ethmoidal nerve. After several minutes, a second applicator is positioned in a more **inferior and posterior** direction in order to block the pterygopalatine ganglion.

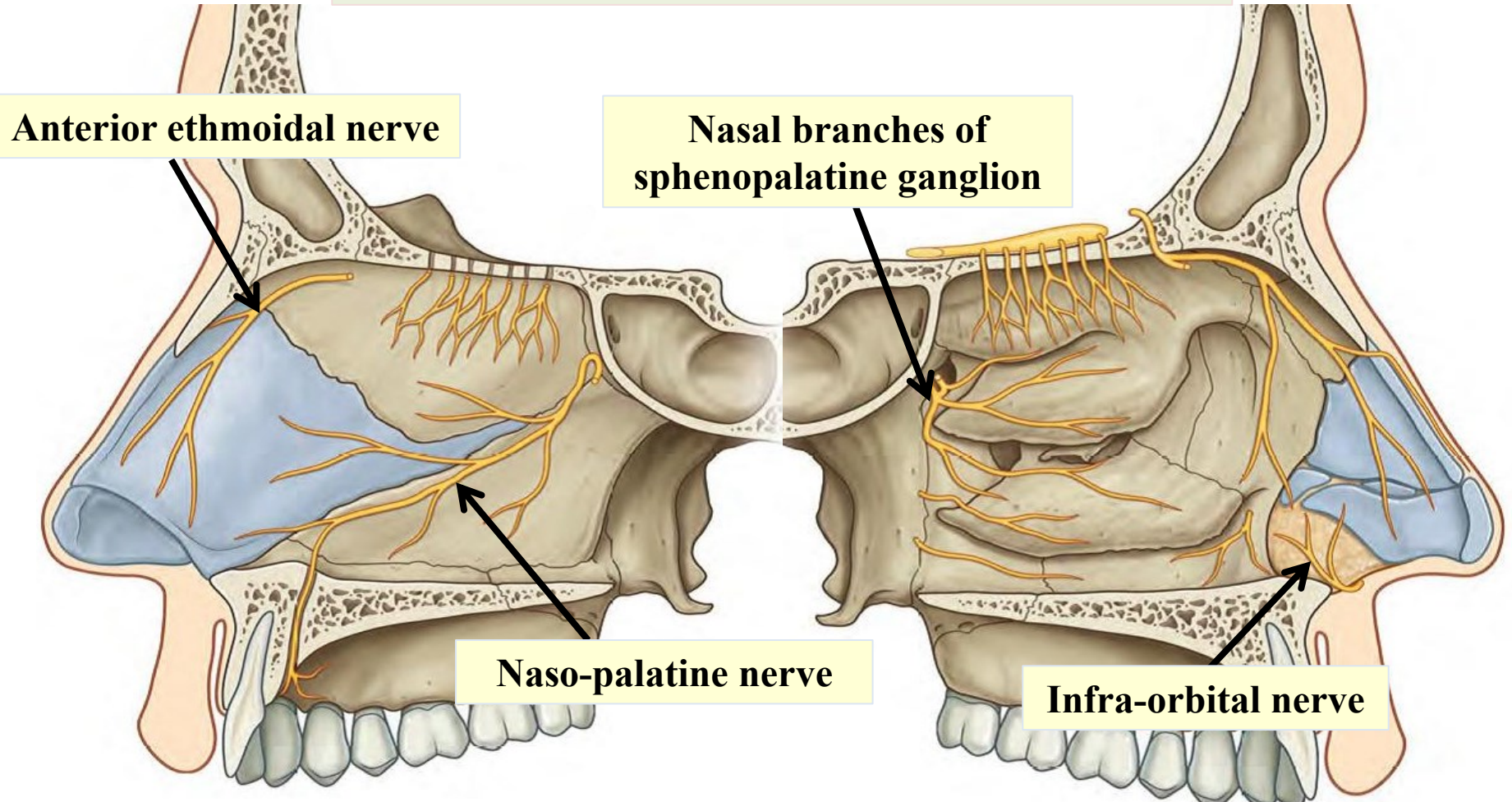
Nerve supply of nose



Lateral wall ----- 4 parts

Medial wall ----- 2 parts

Nerves of general sensation



- 1- **Anterior ethmoidal nerve:** Supplies upper anterior part of lateral wall and nasal septum. **(Both lateral and medial).**
- 2- **Nasal branches of sphenopalatine ganglion:**
 - a- **Lateral nasal (short sphenopalatine) nerves:** Supply postro-superior part of lateral wall.
 - b- **Medial nasal (long sphenopalatine) nerves:** Supply posterior part of nasal septum.
(Longest is nasopalatine nerve----inflammation in the palate--- irritation of nose in pediatrics)
- 3- **Infraorbital nerve:** Supplies vestibule, lower anterior part of lateral wall and nasal septum.
- 4- **Greater palatine nerve:** Supplies lower posterior part of lateral wall of nasal cavity.

Lateral wall

Anterior

- Above:
Anterior ethmoidal
- Below:
Infra-orbital

Posterior

- Above:
Short sphenopalatine
- Below:
Greater palatine

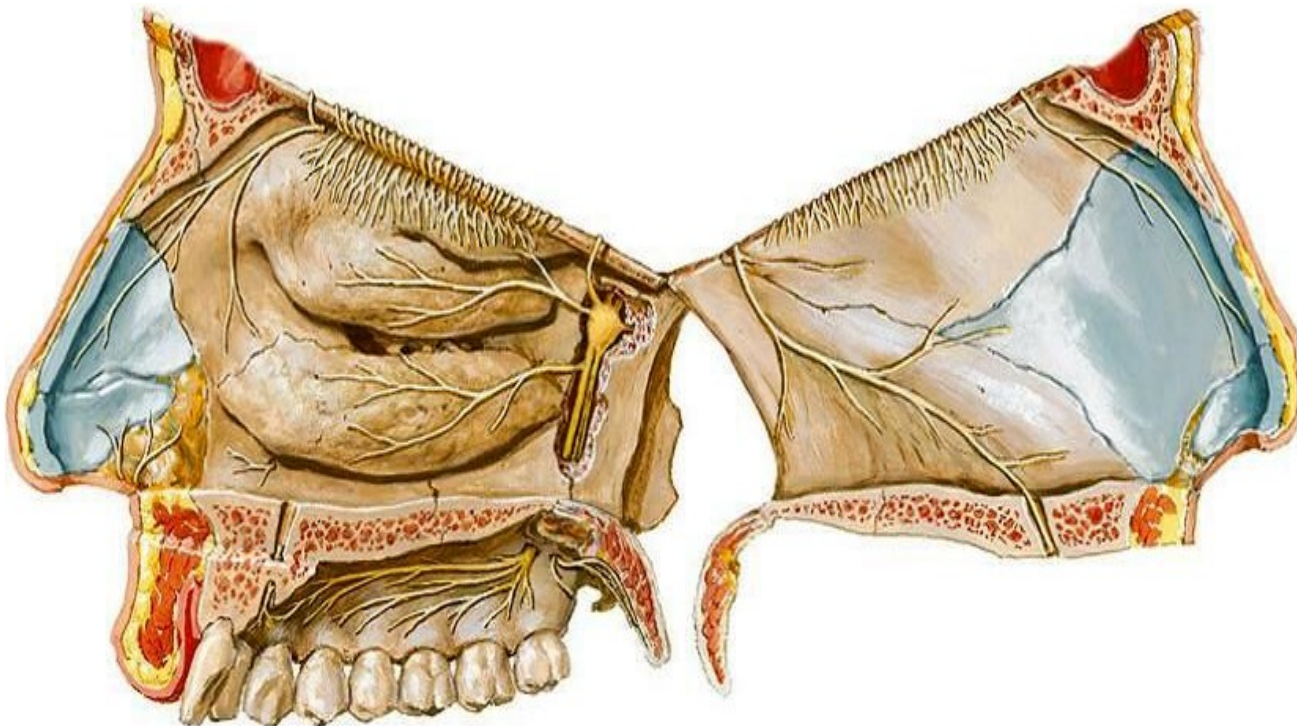
Medial wall

Anterior

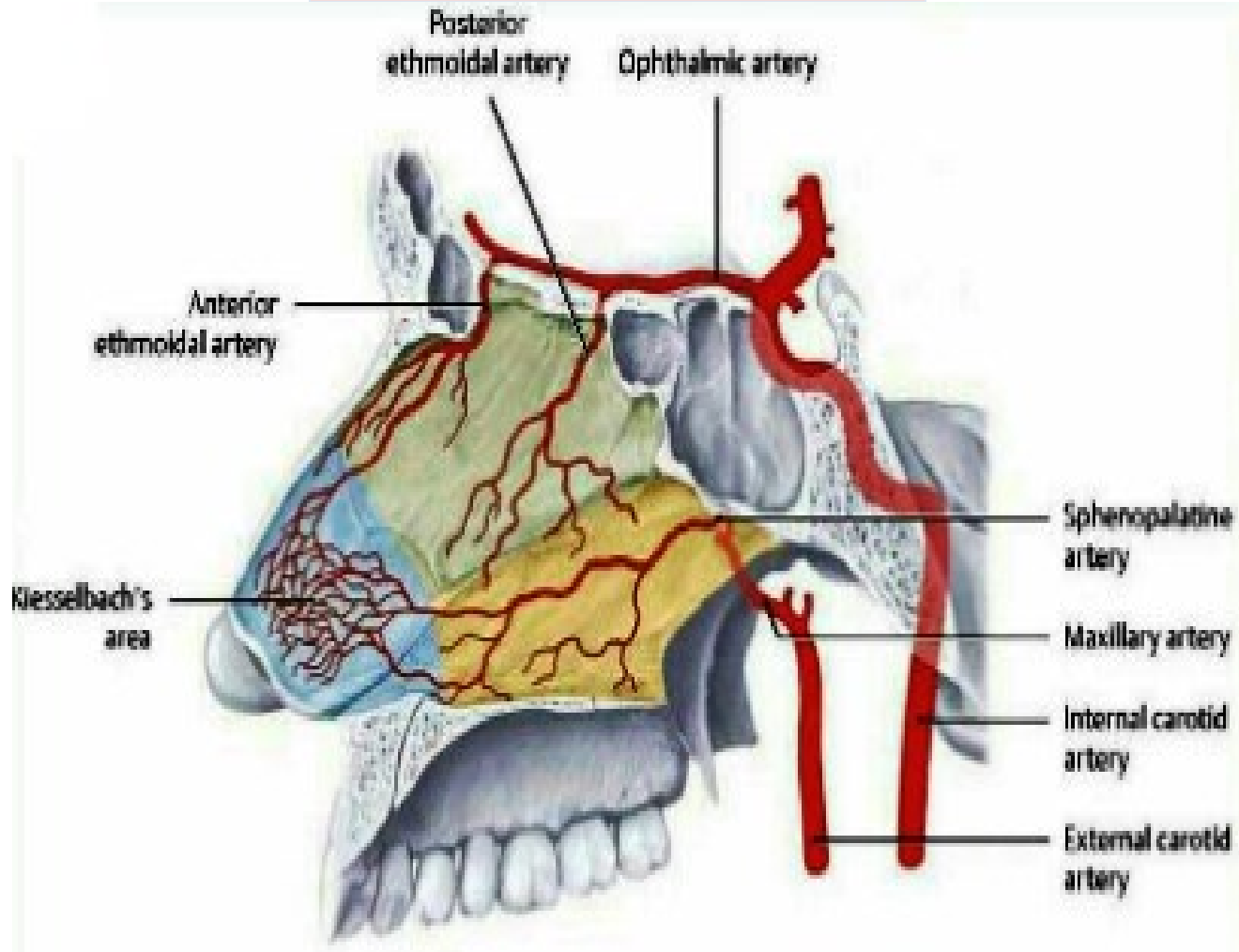
- Above:
Anterior ethmoidal
- Below:
Infra-orbital

Posterior

Long
sphenopalatine

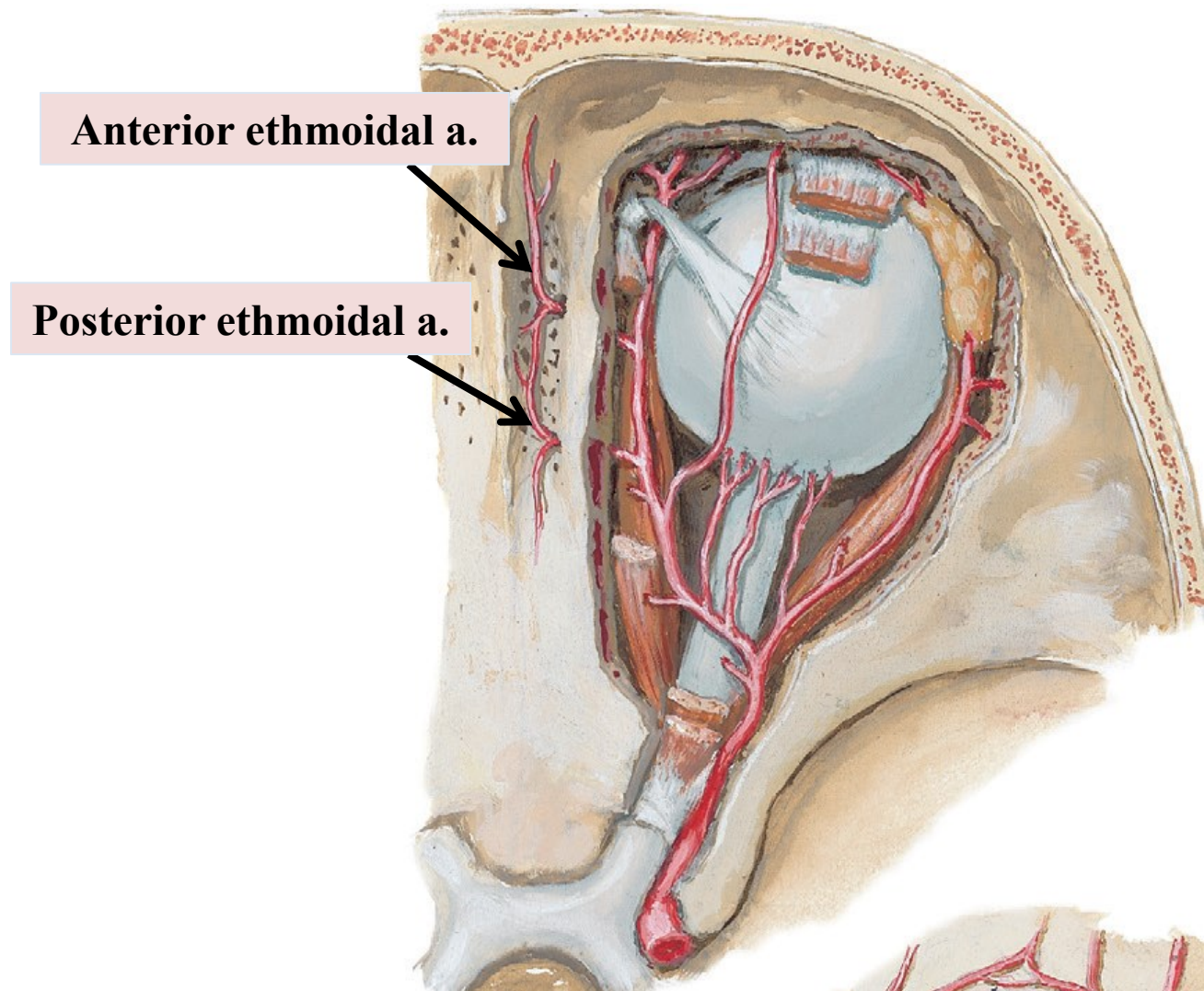


Arterial supply



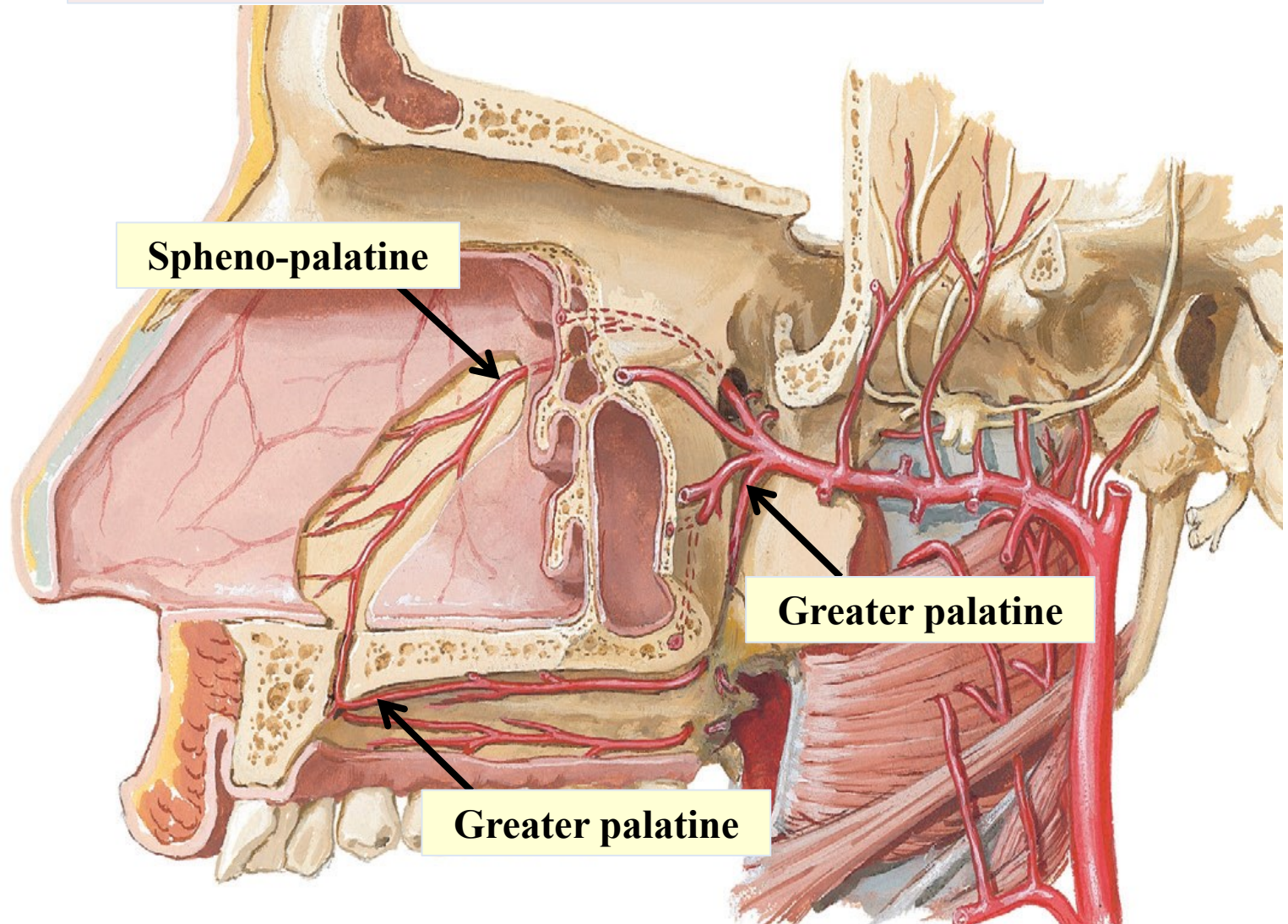
- 1- Anterior and posterior ethmoidal a.:** arise from ophthalmic a.- supplies upper anterior and posterior parts of nasal cavity.
- 2- Sphenopalatine artery:** The main artery of the nose, it arises from 3rd part of maxillary artery supplies most of nasal septum and lateral wall.
- 3- Terminal part of greater palatine artery:** Arises from 3rd part of maxillary artery Ascends through the incisive canal to reach and supply the lower anterior part of nasal septum.
- 4- Septal branch of the superior labial artery (branch of facial):** Supplies nasal septum in region of vestibule.

Anterior and posterior ethmoidal arteries



- **Anterior and posterior ethmoidal arteries:** arise from ophthalmic artery supplies upper anterior and posterior parts of nasal cavity.

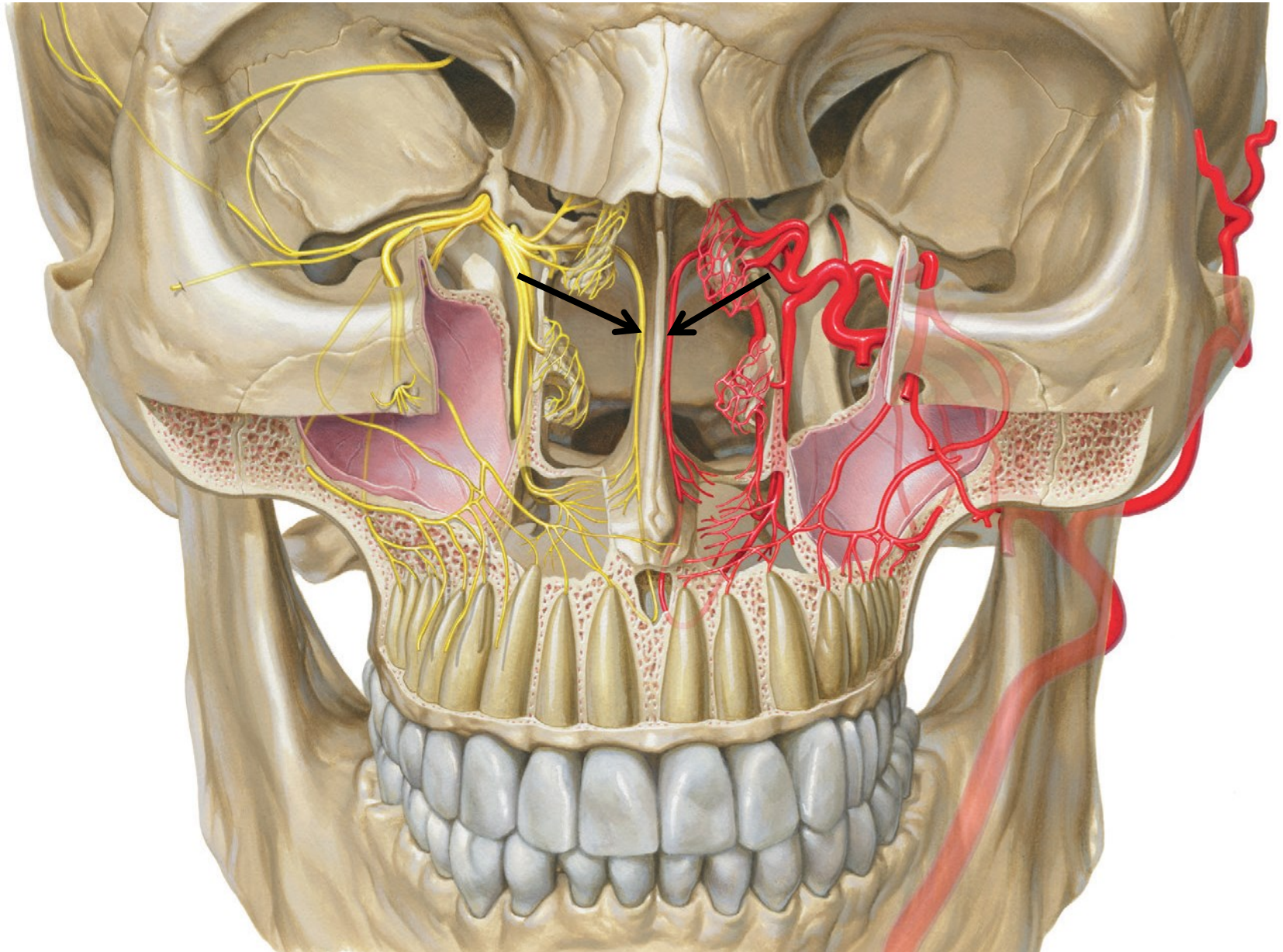
Sphenopalatine and Greater palatine



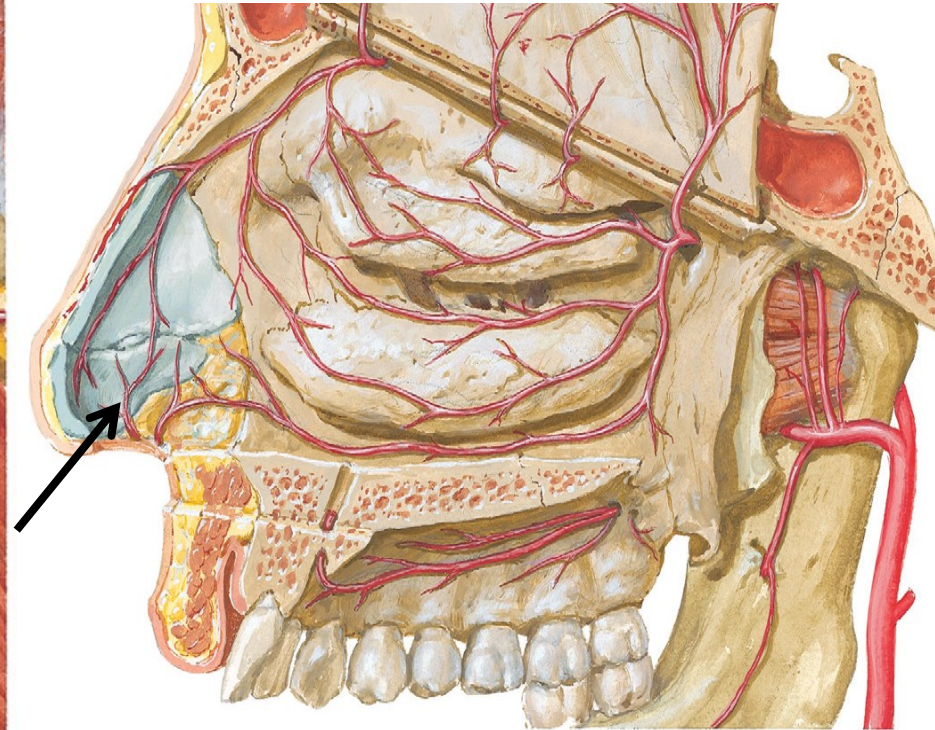
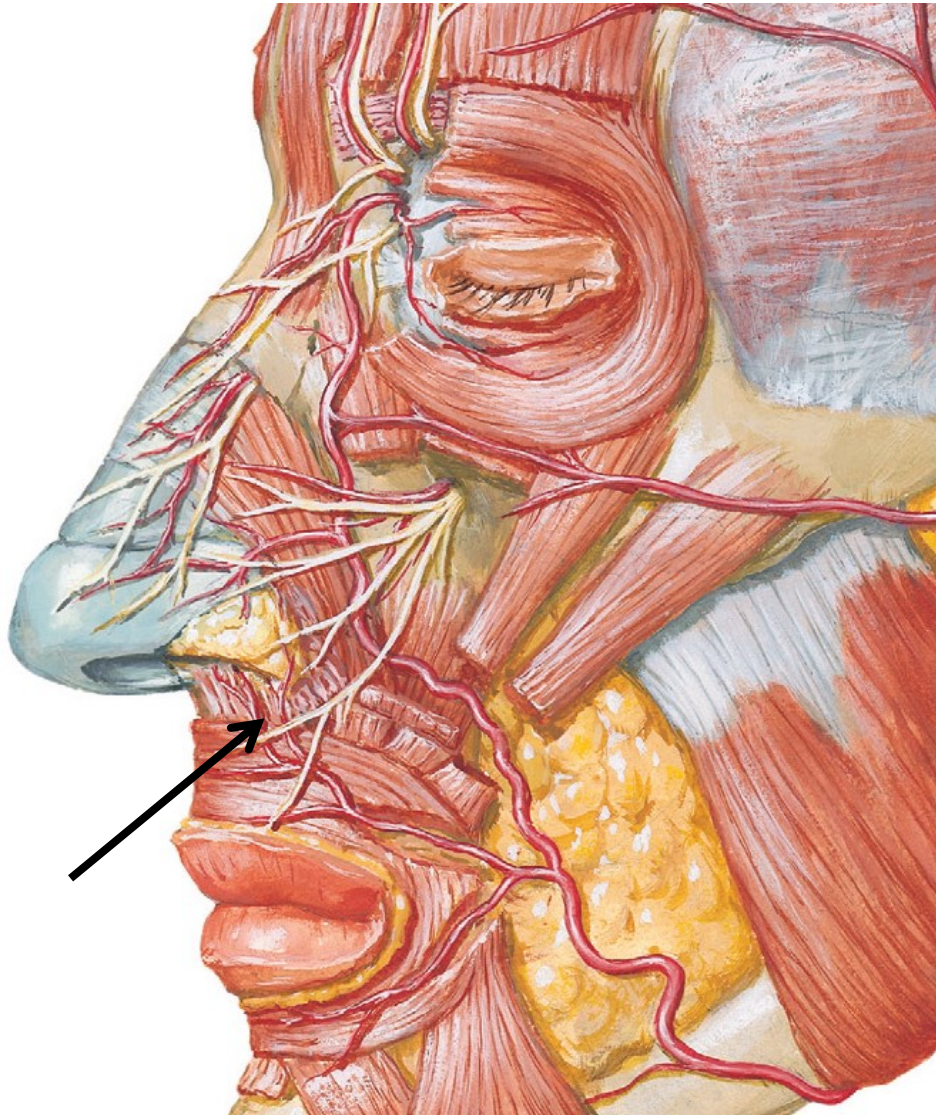
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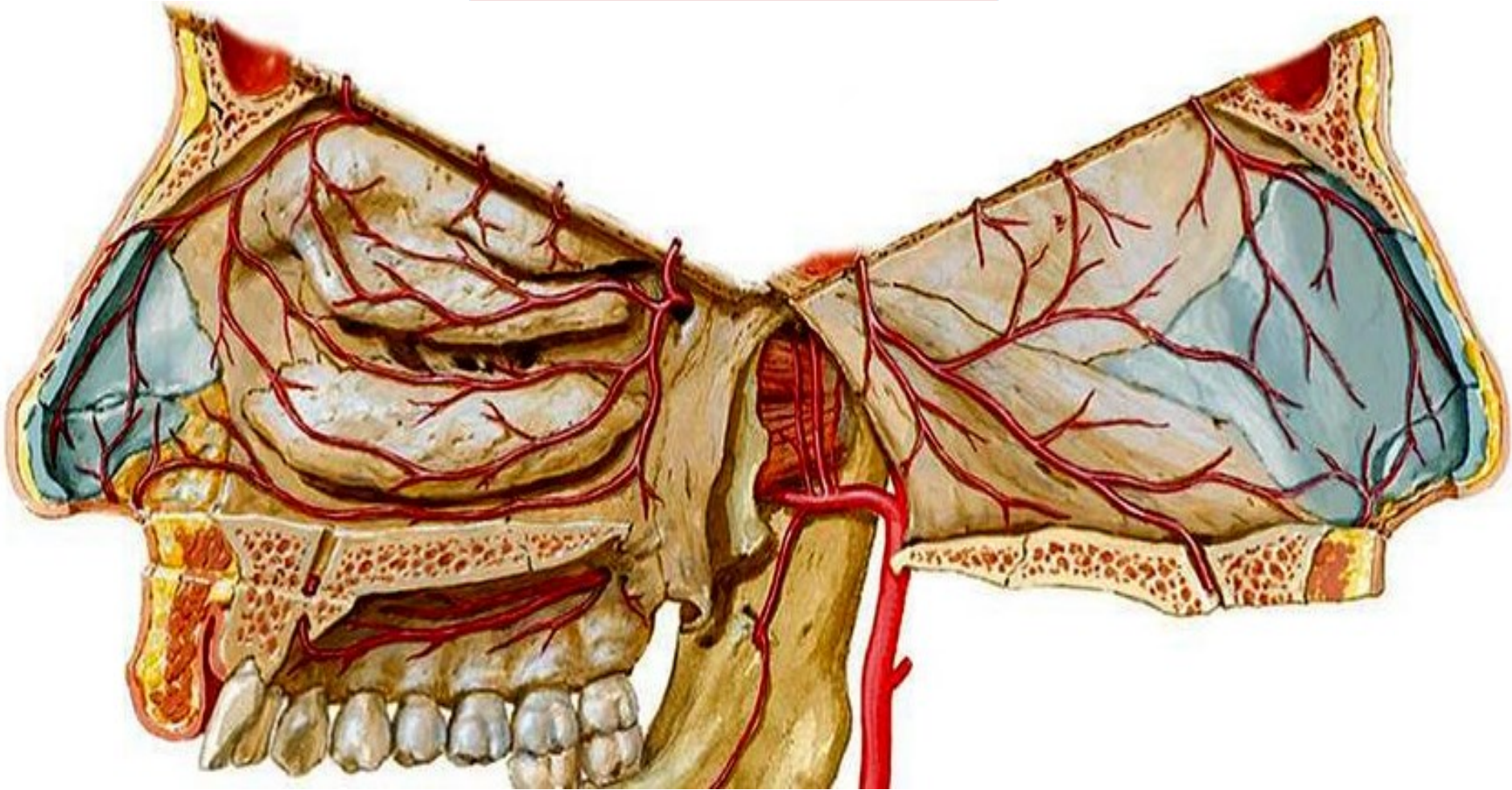
Spheno-palatine nerve and artery



Superior labial artery

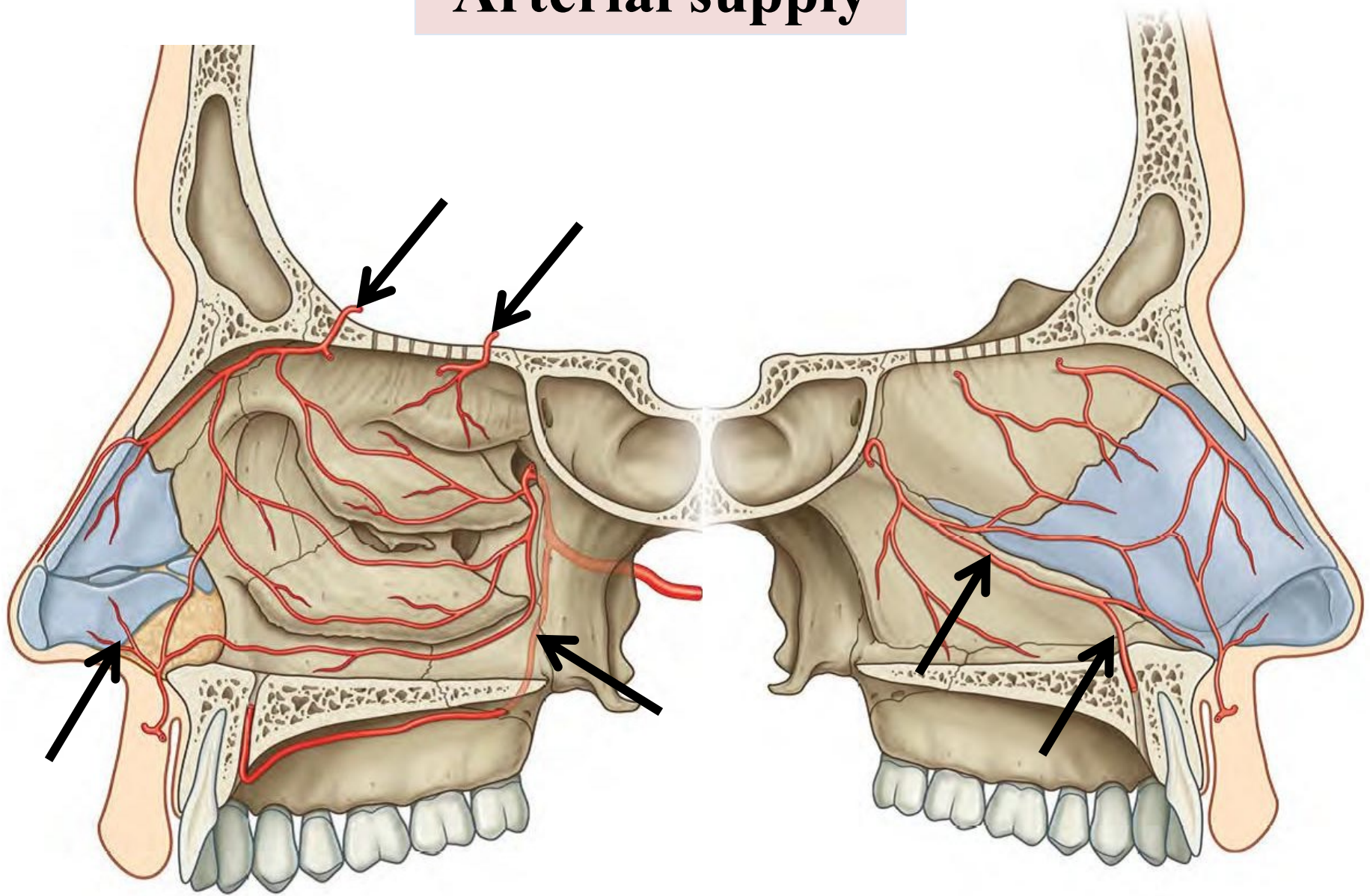


Arterial supply

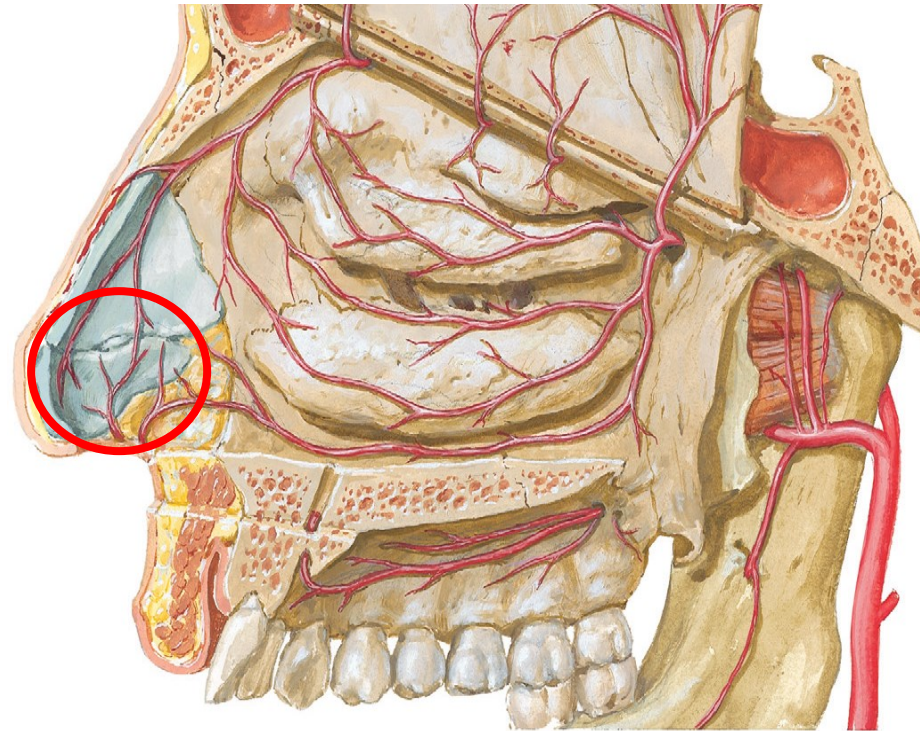
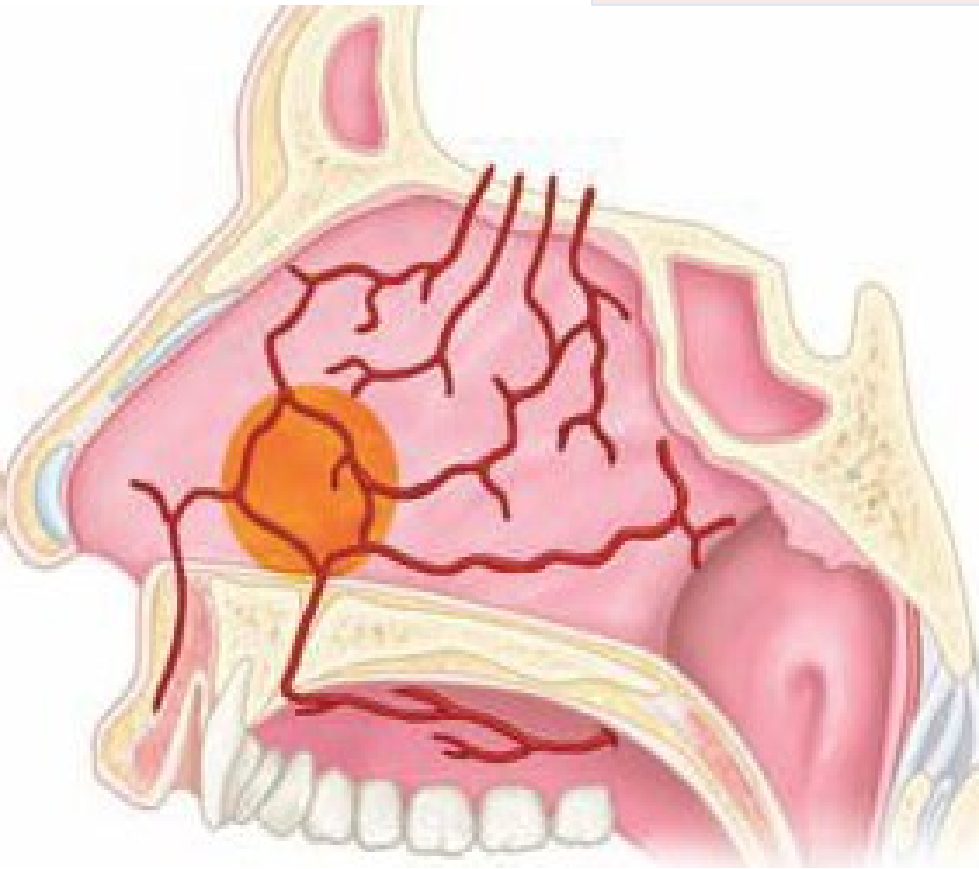


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- 2- **Sphenopalatine artery: The main artery of the nose**, it arises from 3rd part of maxillary artery supplies most of nasal septum and lateral wall.(arteries no short and long)
- 3- **Terminal part of greater palatine artery:** Arises from 3rd part of maxillary artery Ascends through the incisive canal to reach and supply the lower anterior part of nasal septum.
- 4- **Septal branch of the superior labial artery (branch of facial):** Supplies nasal septum in region of vestibule.

Arterial supply

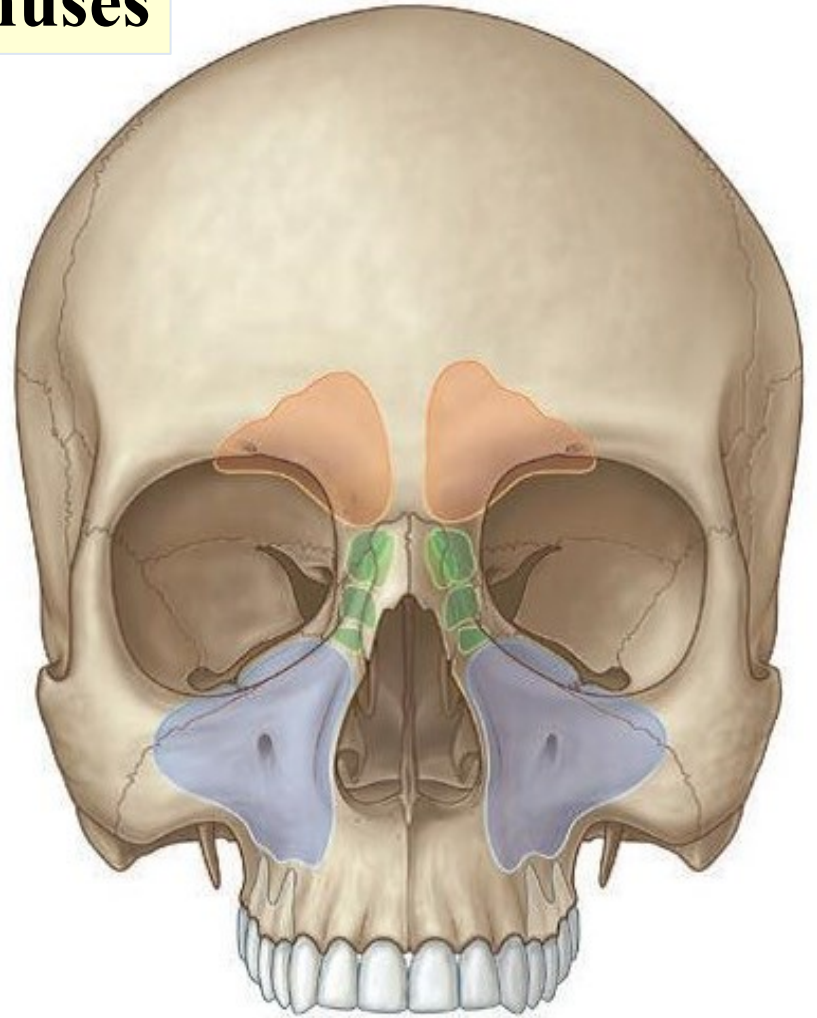
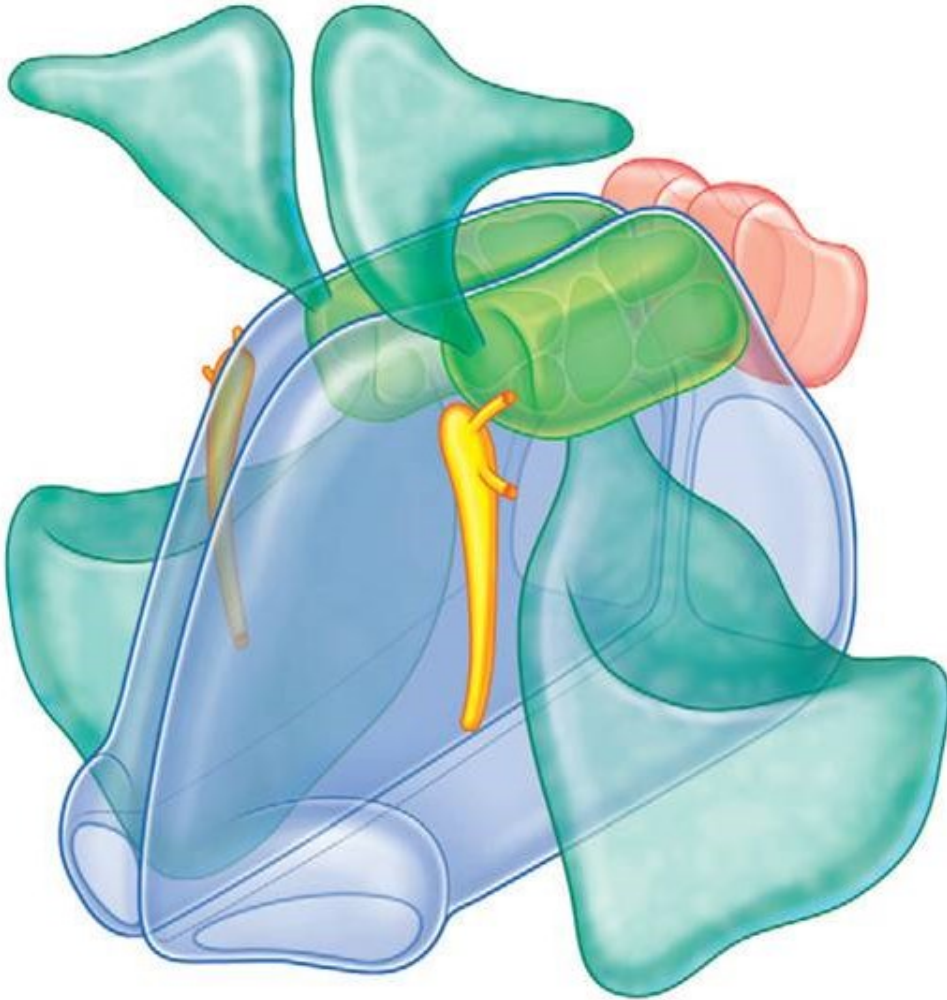


The area of epistaxis (Little's area)



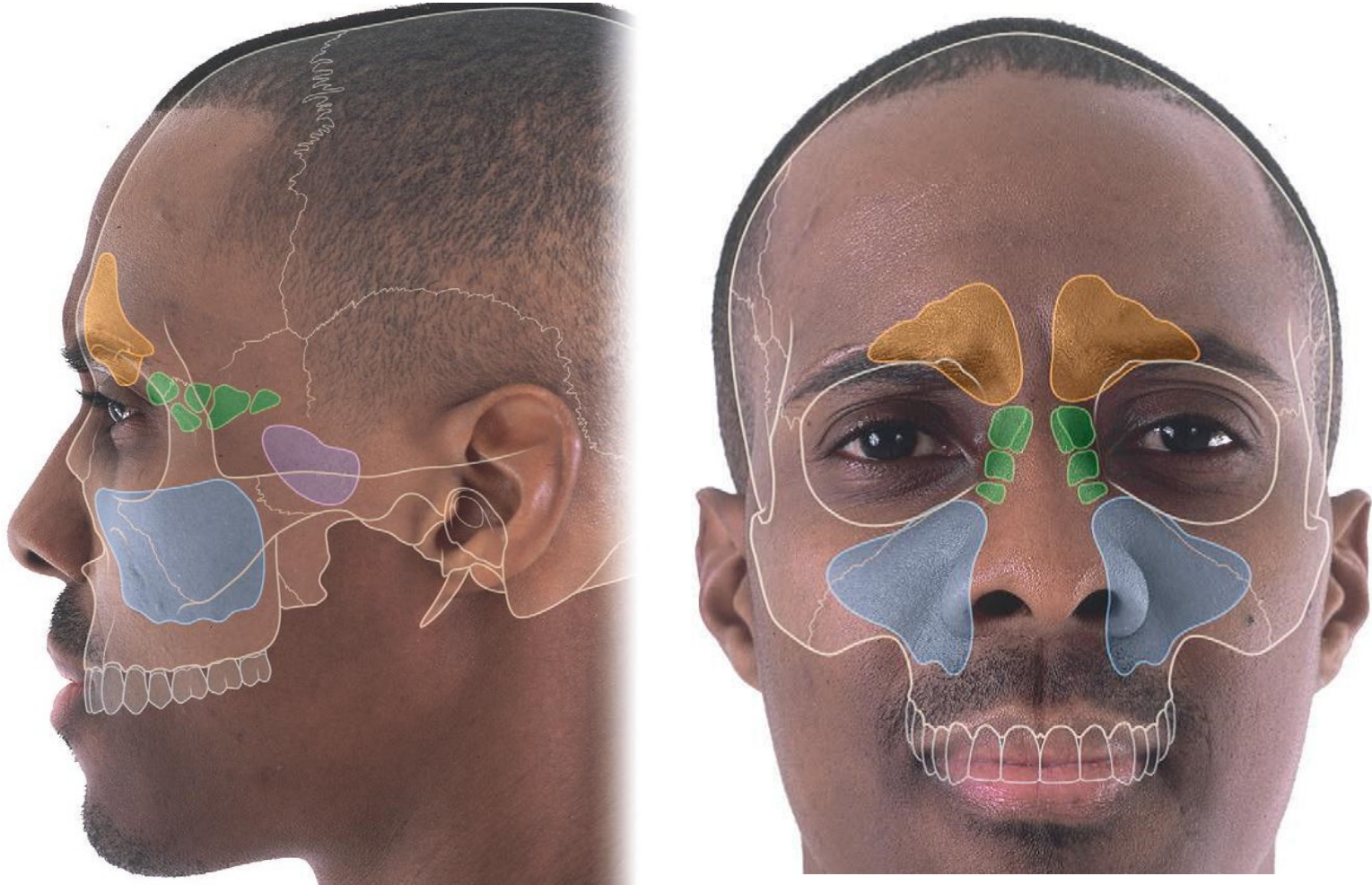
- A small area in the anteroinferior part of nasal septum in region of **vestibule**.
- An area of anastomosis between (4 arteries) **sphenopalatine**, **greater palatine** and septal branch of **superior labial artery** of facial. (and **anterior ethmoidal artery**).
- In **90% of cases**, epistaxis (bleeding from nose) occurs from Little's area.

Paranasal sinuses



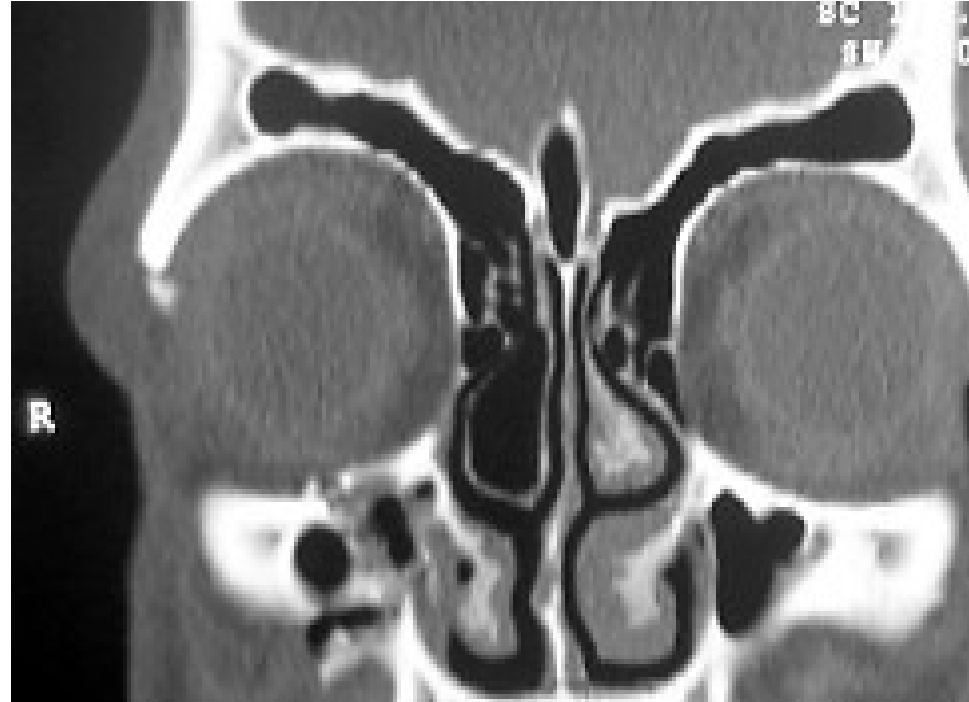
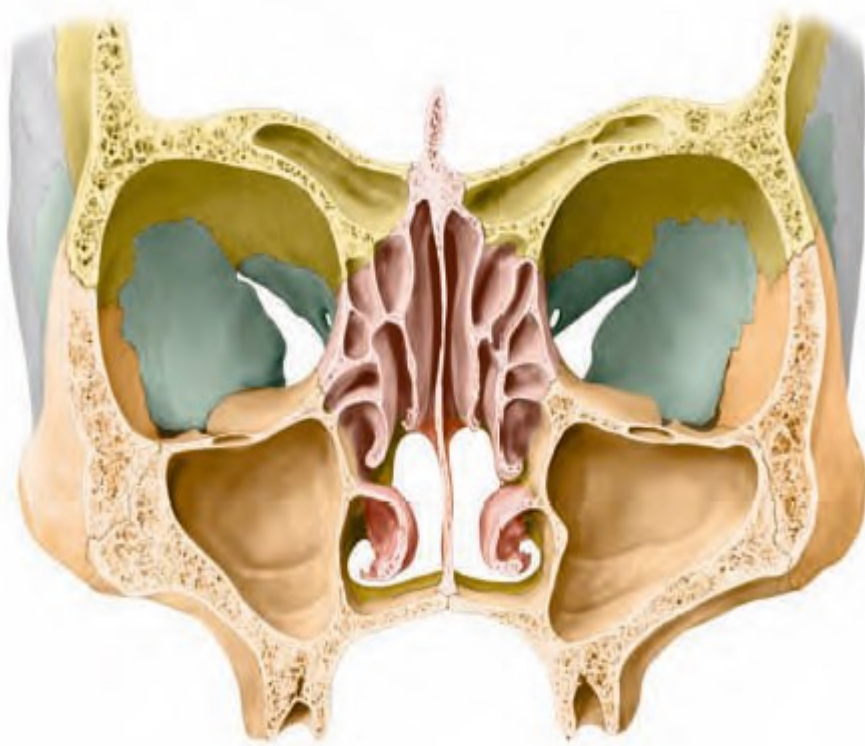
They are air-filled spaces in the skull bones surrounding the nose.
Formed by absorption of spongy bone present between inner and outer tables of skull bones.
They are lined with mucous membrane which is continuous with that of the nose.
Open in the lateral wall of nasal cavity by special foramina.

Functions of Paranasal sinuses



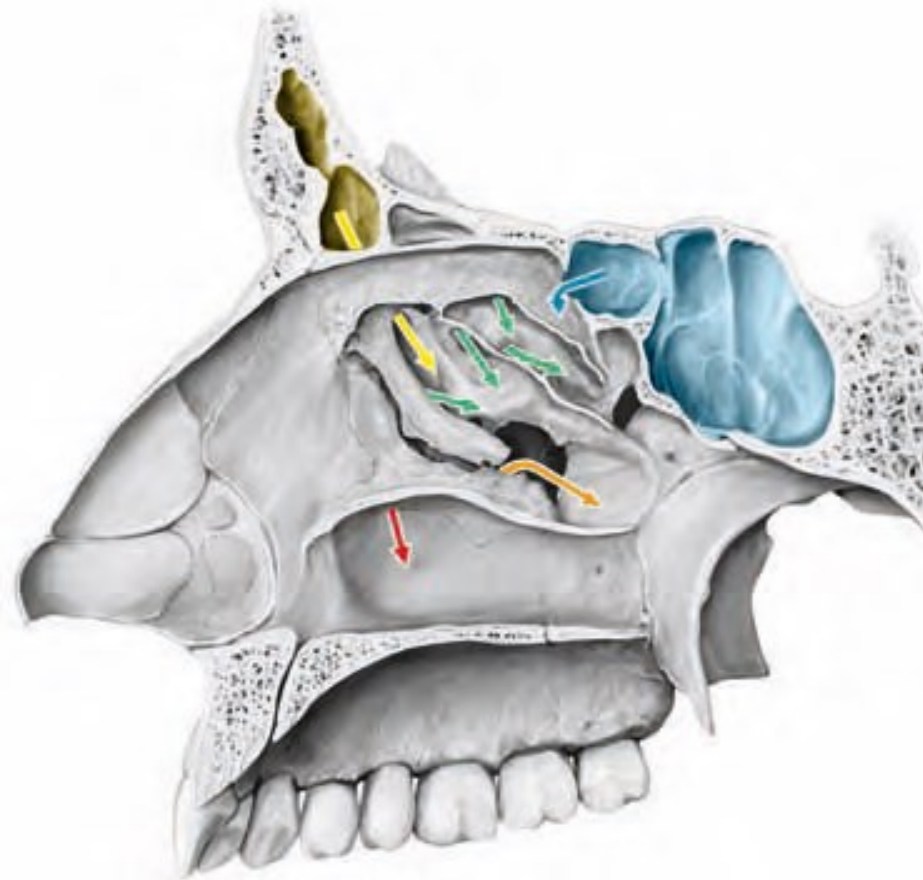
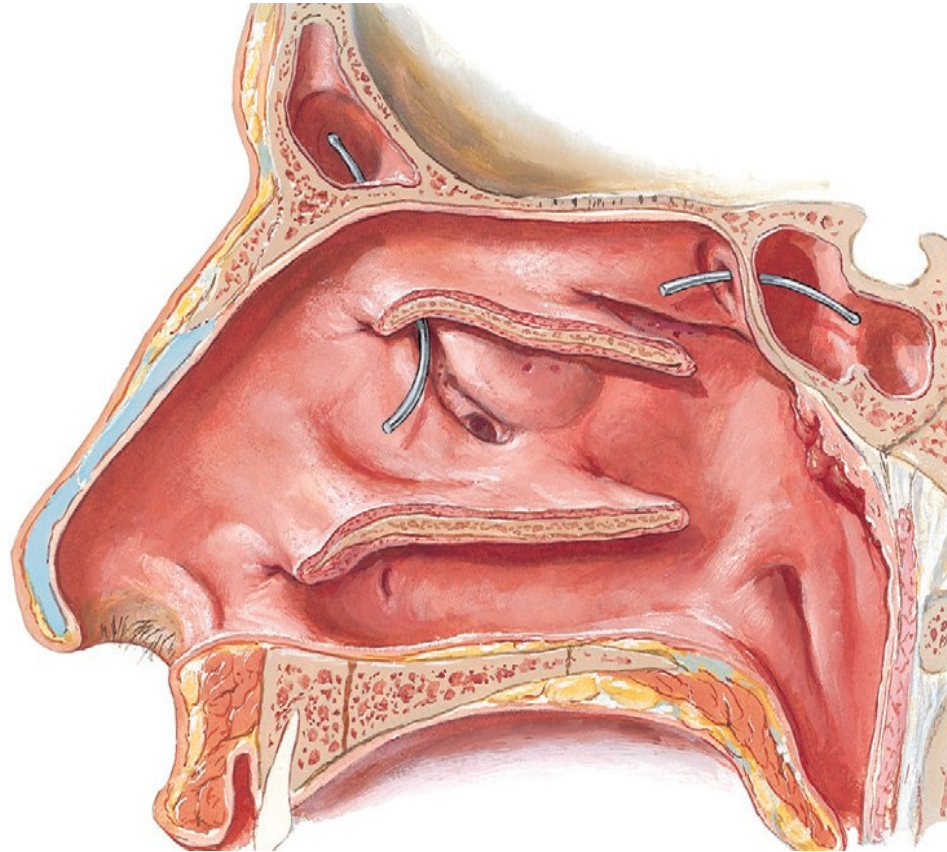
- 1- Decrease the weight of the skull due to filling of the sinuses by air.
 - 2- Resonance of voice.
 - 3- Increase surface area of nasal mucosa, warm and moist inspired air.
 - 4- They act as air insulator cushions for the brain, eye and pituitary gland.
- The paranasal sinuses are absent at birth (except the maxillary sinus).
They show marked growth at the time of eruption of permanent teeth.

Frontal sinuses



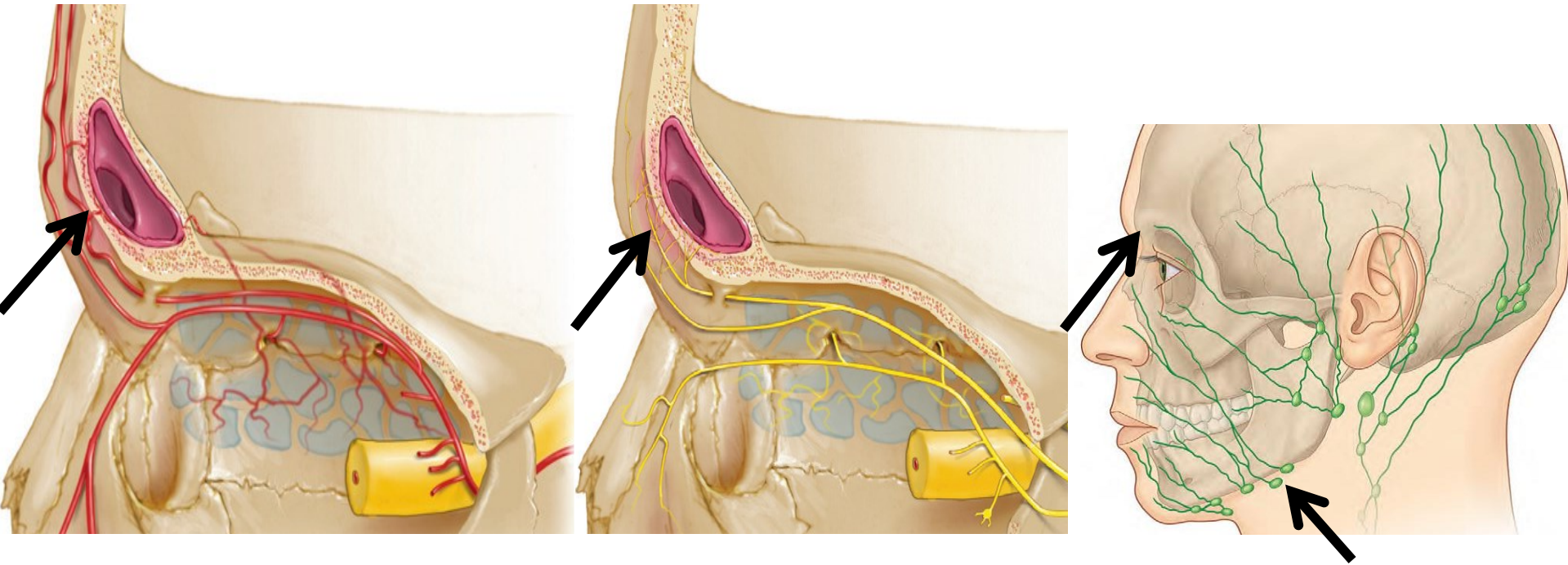
They are two asymmetrical sinuses present in squamous part of frontal bone above and behind superciliary arches. They are separated by a bony septum which is usually deviated to one side.

Frontal sinuses



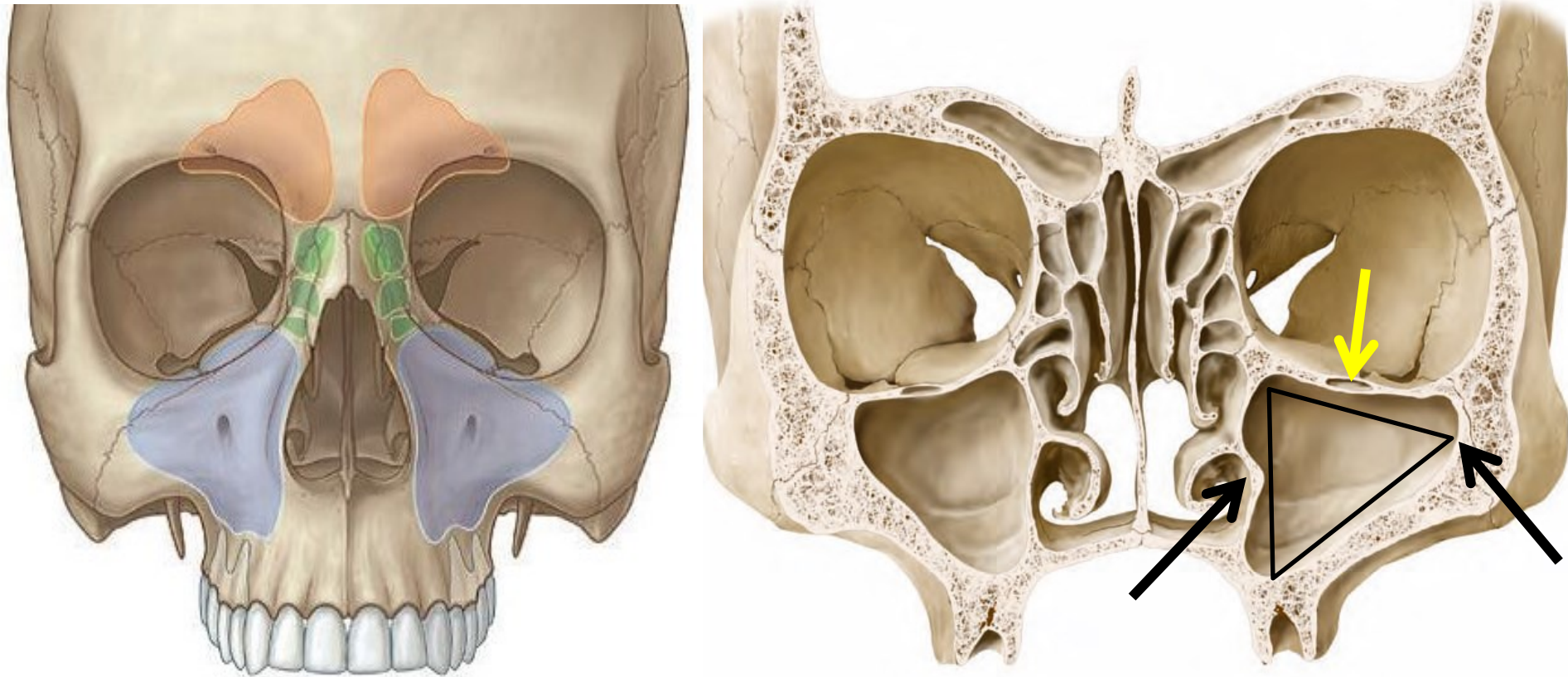
Each sinus opens into fronto-nasal duct (ethmoidal infundibulum) which opens in anterior end of hiatus semilunaris in middle meatus of nose.

Frontal sinuses



Nerve supply: Supraorbital and anterior ethmoidal nerves.
Arterial supply: Supraorbital artery.
Lymph drainage: Into the submandibular lymph nodes.

Maxillary sinuses



The largest air sinus and the only one present at birth.

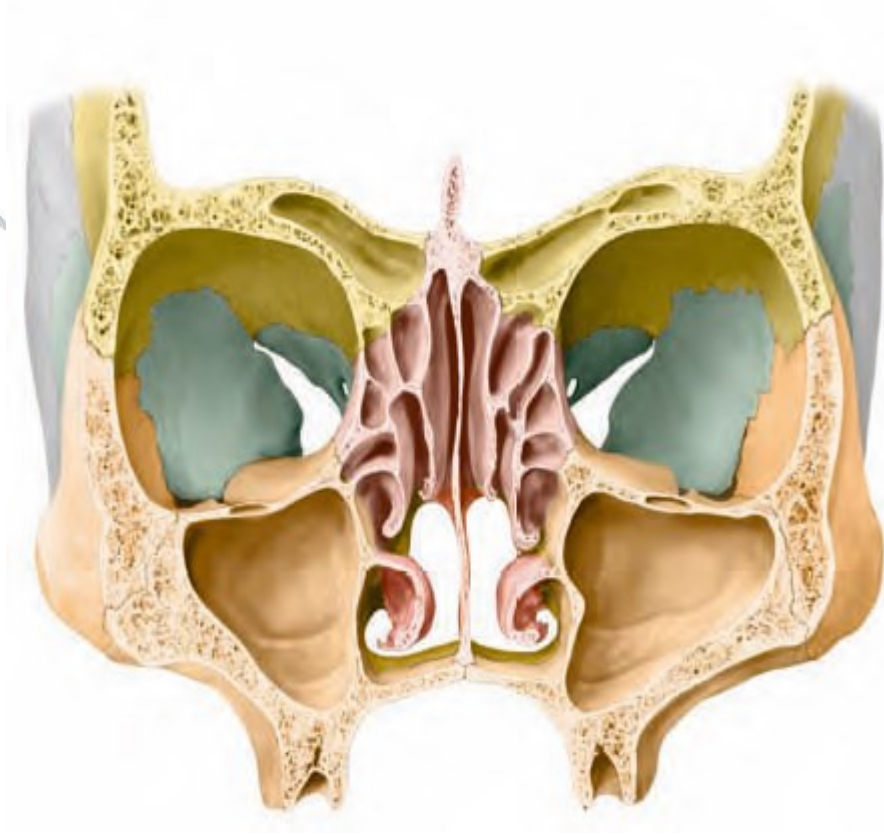
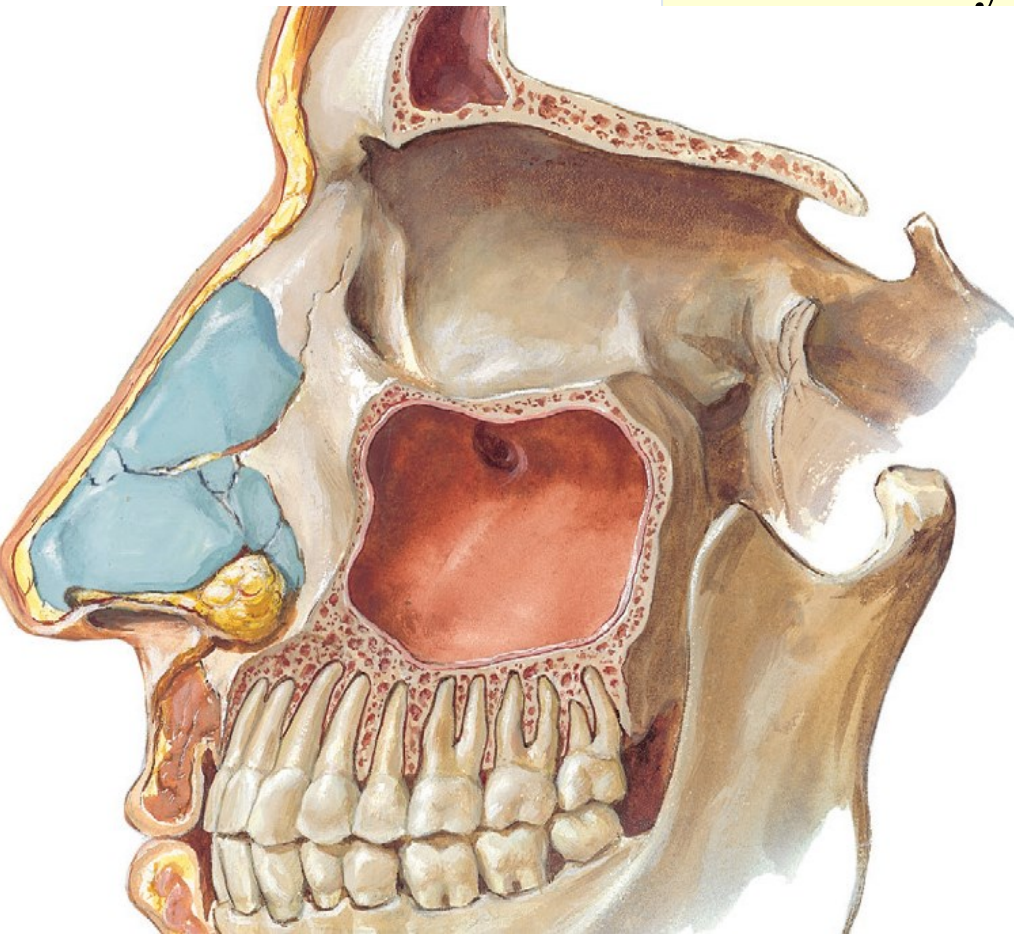
It is pyramidal in shape and occupies whole of body of maxilla.

Relations: **Apex:** laterally towards zygomatic bone. **Base:** medially towards nasal cavity.

Roof: floor of the orbit, containing infraorbital groove and canal and infraorbital nerve and vessels.

It separates the sinus from the contents of the orbit.

Maxillary sinuses

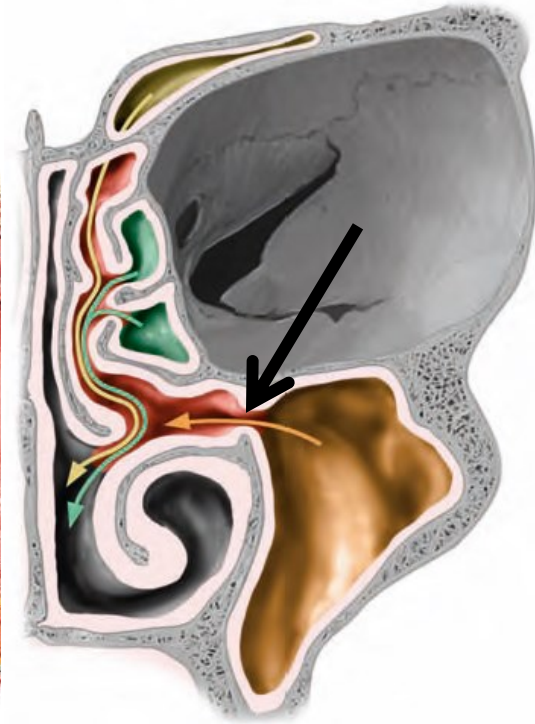
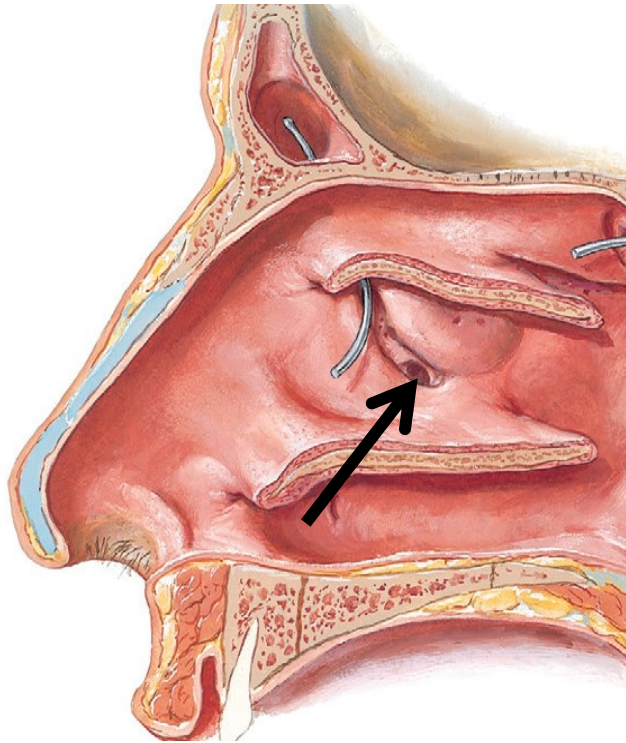
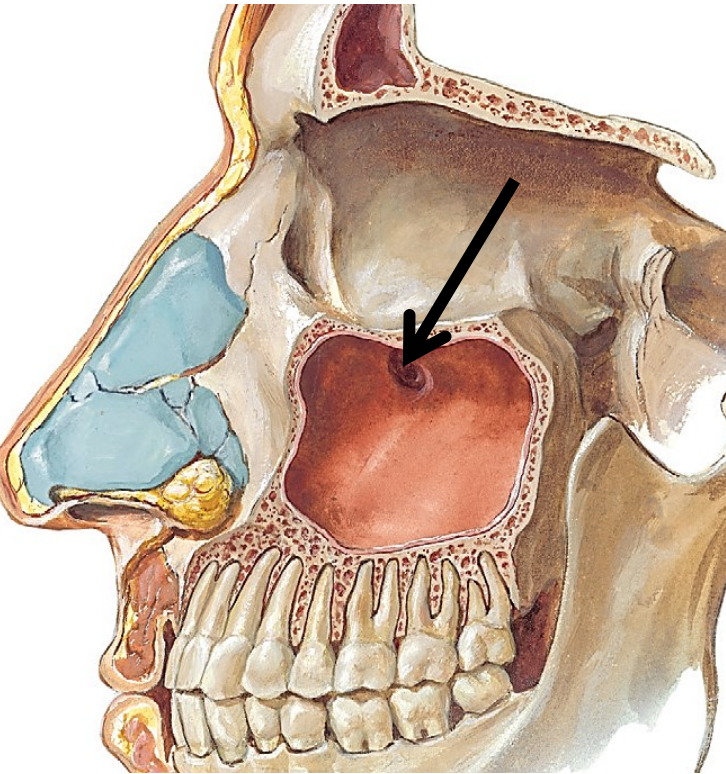


Floor: Formed by alveolar process of maxilla. It lies 1 cm below the floor of nose. Its lower part lies opposite the 2nd premolar and 1st molar teeth, so the extraction of these teeth may damage and perforate the floor leading to oroantral fistula.

Anterior wall: Subcutaneous, containing anterior superior alveolar nerve and vessels.

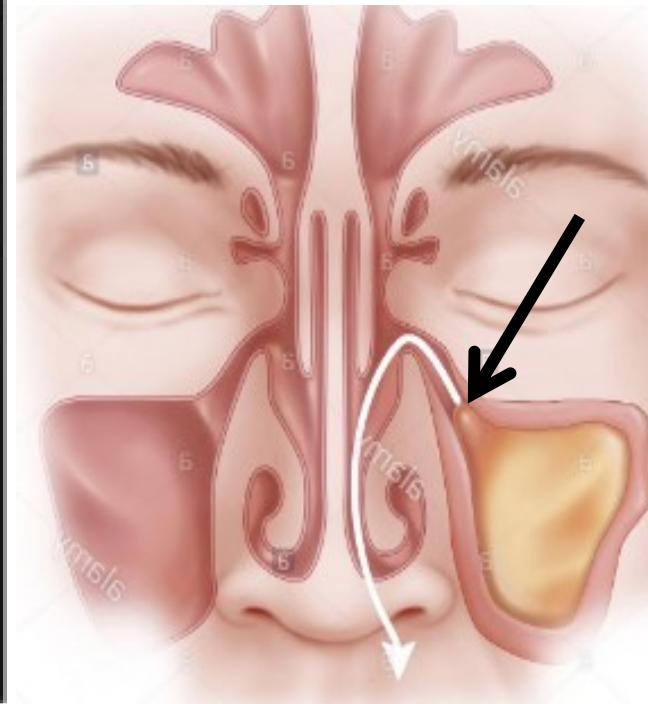
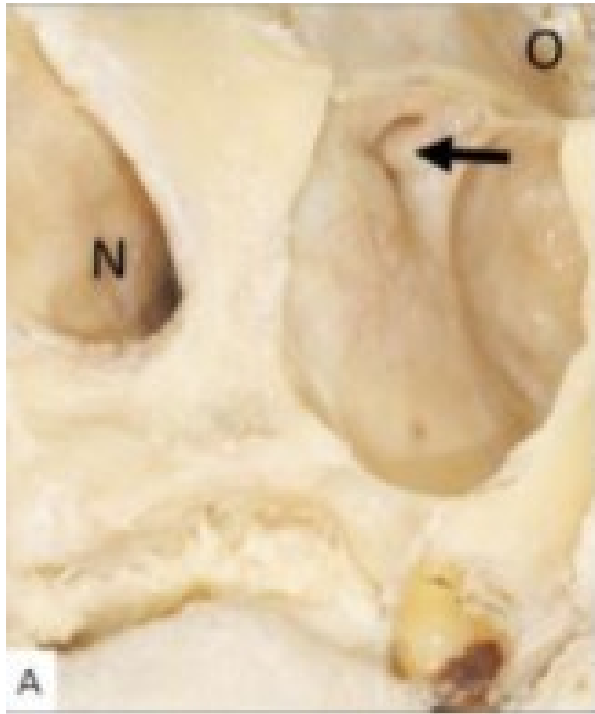
Posterior wall: Separates the sinus from infratemporal and pterygopalatine fossae. It is pierced by posterior superior alveolar nerve and vessels.

Opening of Maxillary sinuses



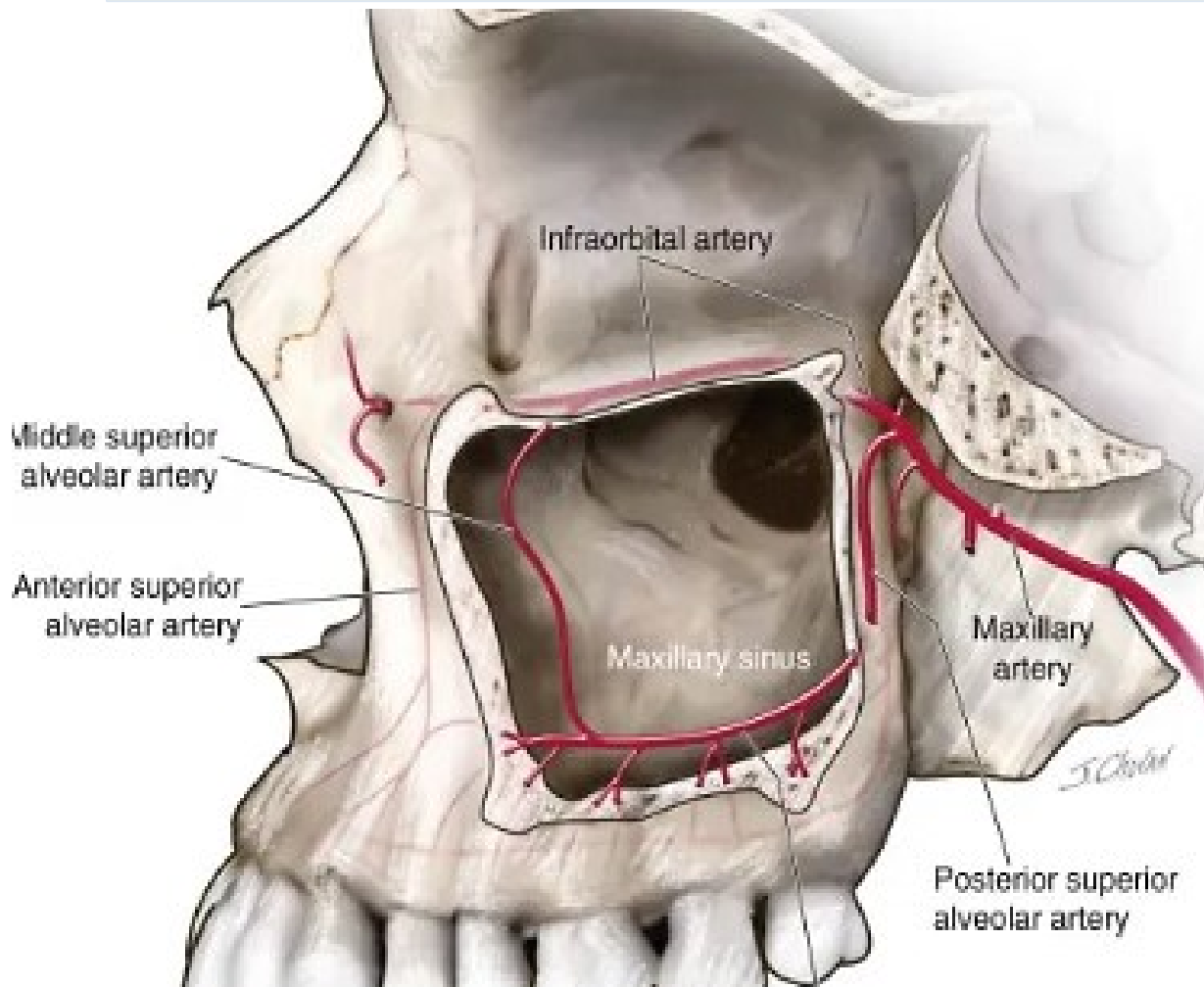
- Large rounded opening, 2 cm in diameter, present in the upper part of the base of sinus.
- It opens in middle meatus at posterior end of hiatus semilunaris below the bulla ethmoidalis.
- Accessory small openings are usually present behind the main opening.
- The higher position of sinus opening makes drainage of pus or blood collection very hard.

Opening of Maxillary sinuses



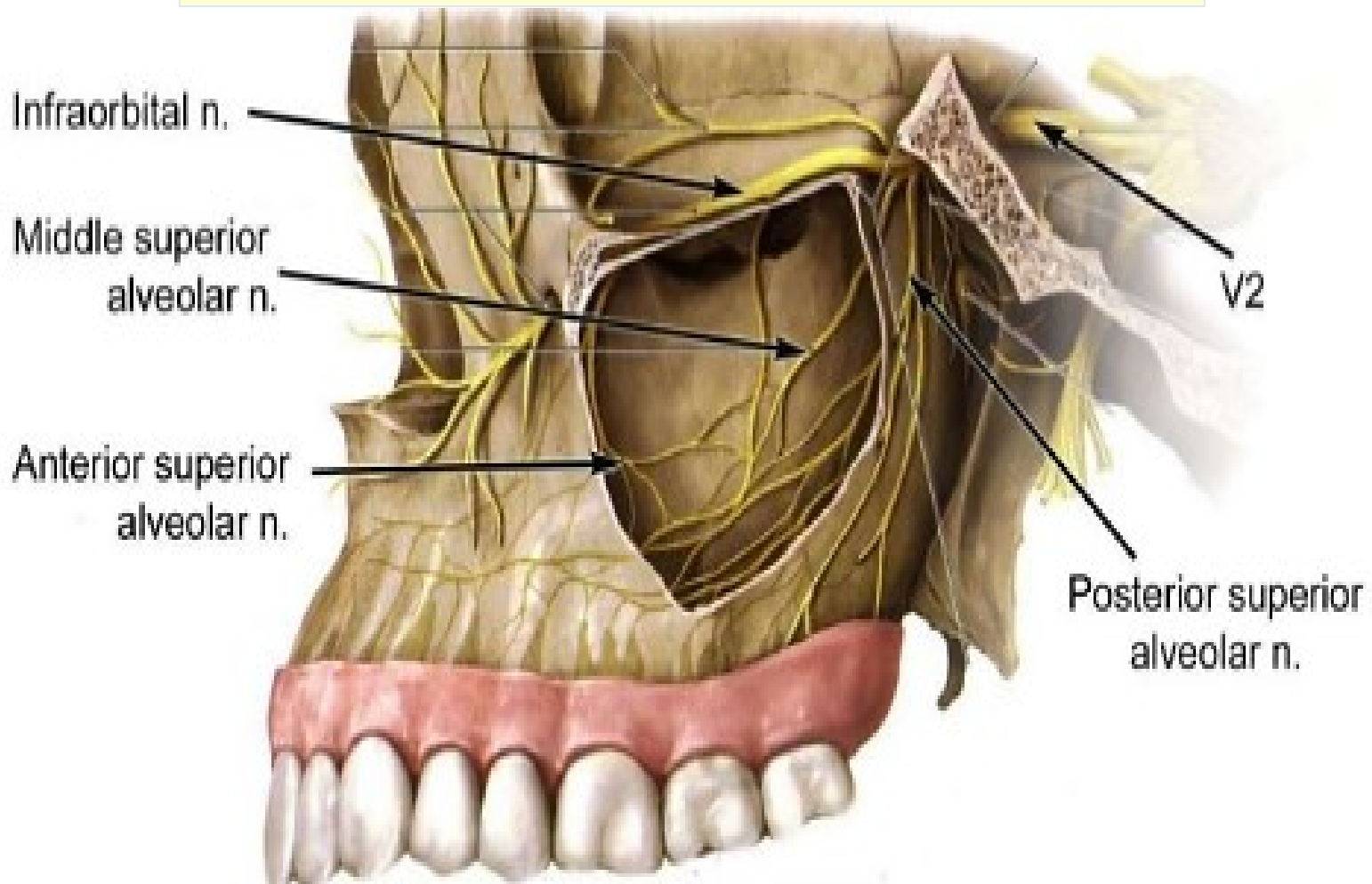
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Vessels related to maxillary sinus



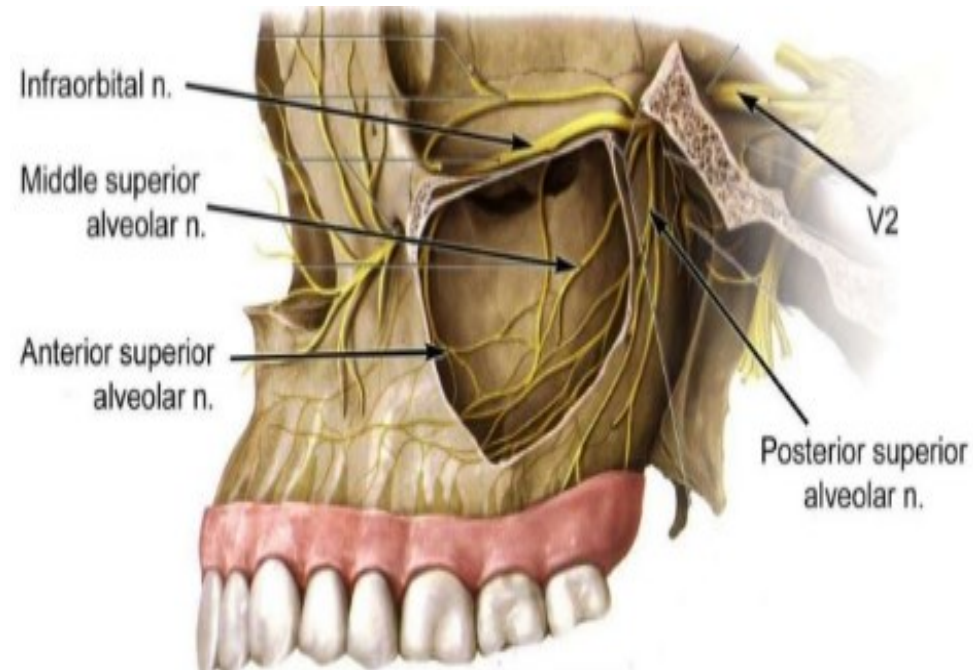
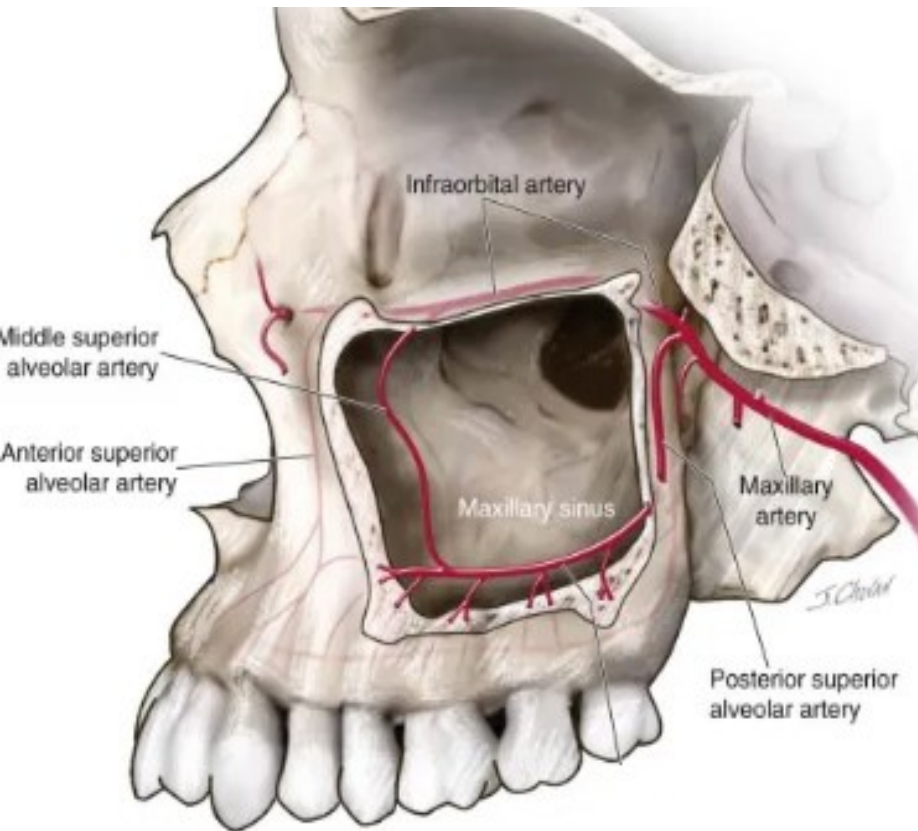
- 1- Anterior superior alveolar:** From infraorbital nerve and vessels. In the anterior wall.
- 2- Middle superior alveolar:** From infraorbital nerve and vessels. In the lateral wall.
- 3- Posterior superior alveolar:** From maxillary nerve and vessels. In the posterior wall.
- 4- Infraorbital nerve and vessels:** Pass in infraorbital groove and canal through the roof.
- 5- Greater palatine nerve and vessels:** They descend behind the sinus supplying posterior wall.

Nerves related to maxillary sinus

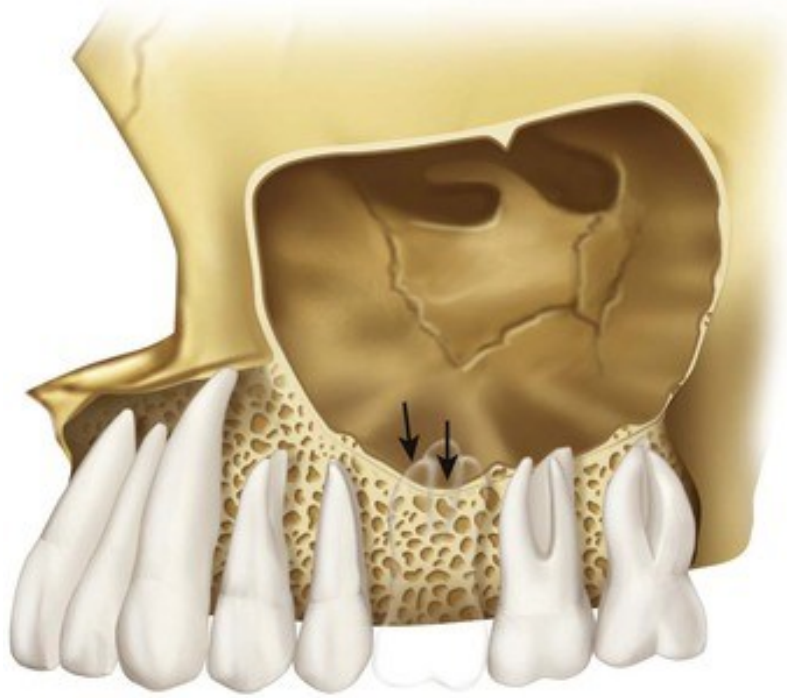


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Nerves and vessels related to maxillary sinus



Pain of maxillary sinusitis is referred to the teeth



Ethmoid sinus



They are intercommunicating spaces lying inside ethmoidal labyrinth between orbit and upper part of nasal cavity. They vary in number from 3-18 air cells arranged into 3 groups

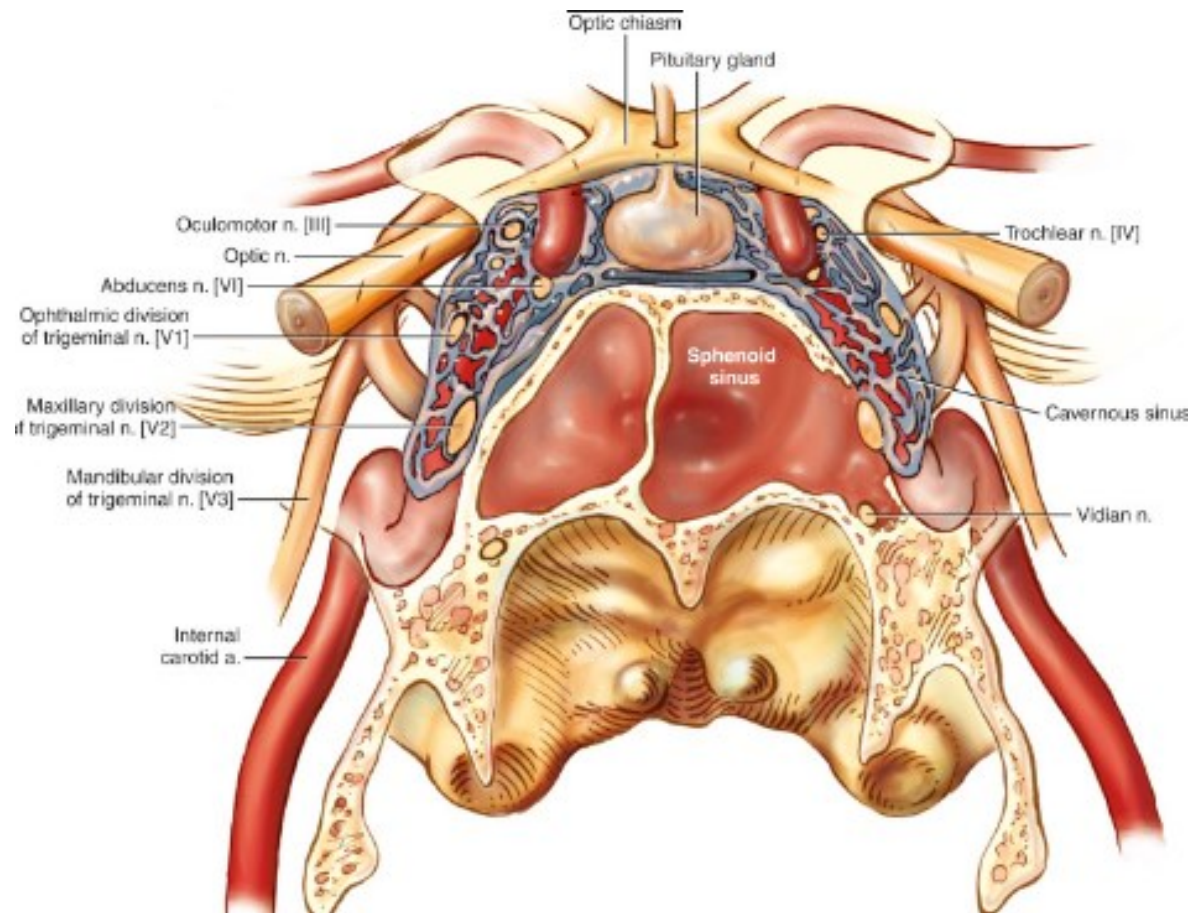
1- Anterior ethmoidal sinus (or cells) opens in ethmoidal infundibulum or in anterior end of hiatus semilunaris in the middle meatus of nose.

2- Middle ethmoidal sinus (or cells) produces the bulla ethmoidalis on which it opens.

3- Posterior ethmoidal sinus (or cells) opens in the superior meatus.

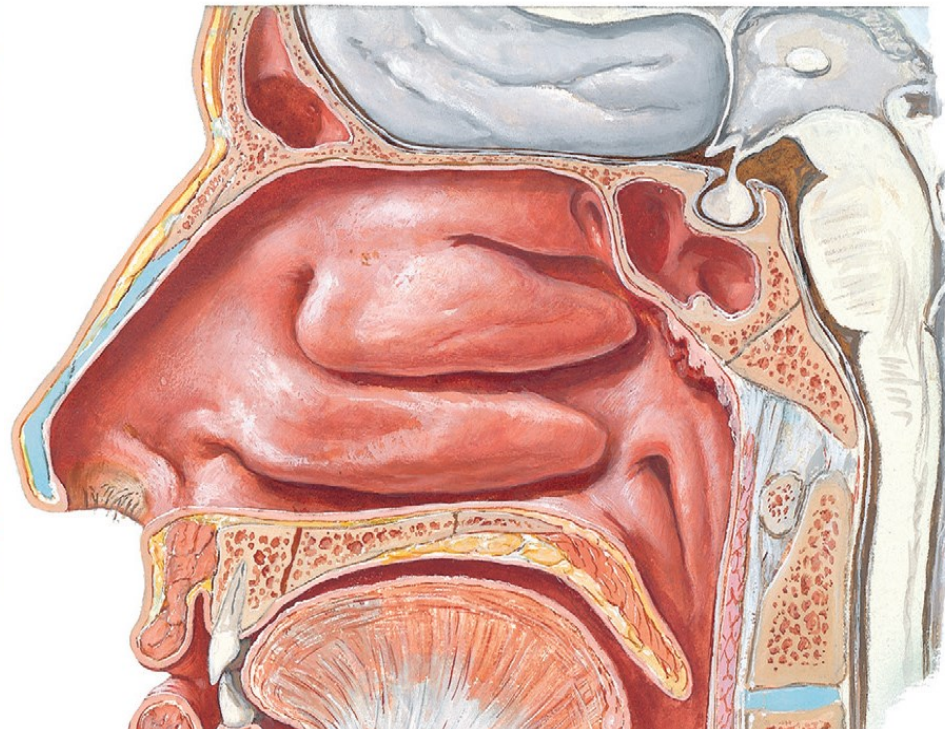
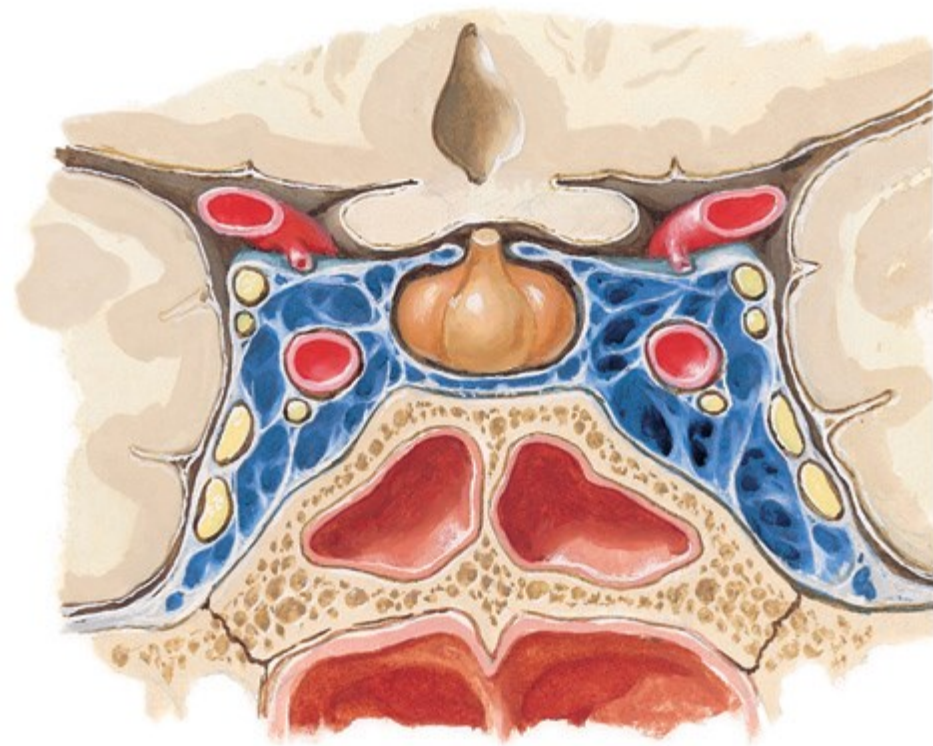
Nerve and arterial supply: Anterior and posterior ethmoidal nerves and arteries.

Sphenoid sinus



It occupies body of sphenoid and lies behind the upper part of nasal cavity. The two sphenoid sinuses are separated by a bony septum which lies in the midline or may be deviated to one side in most of cases.

Relations of Sphenoid sinus



Superiorly: Pituitary gland and optic chiasma.

Posteriorly: Pons and basilar artery.

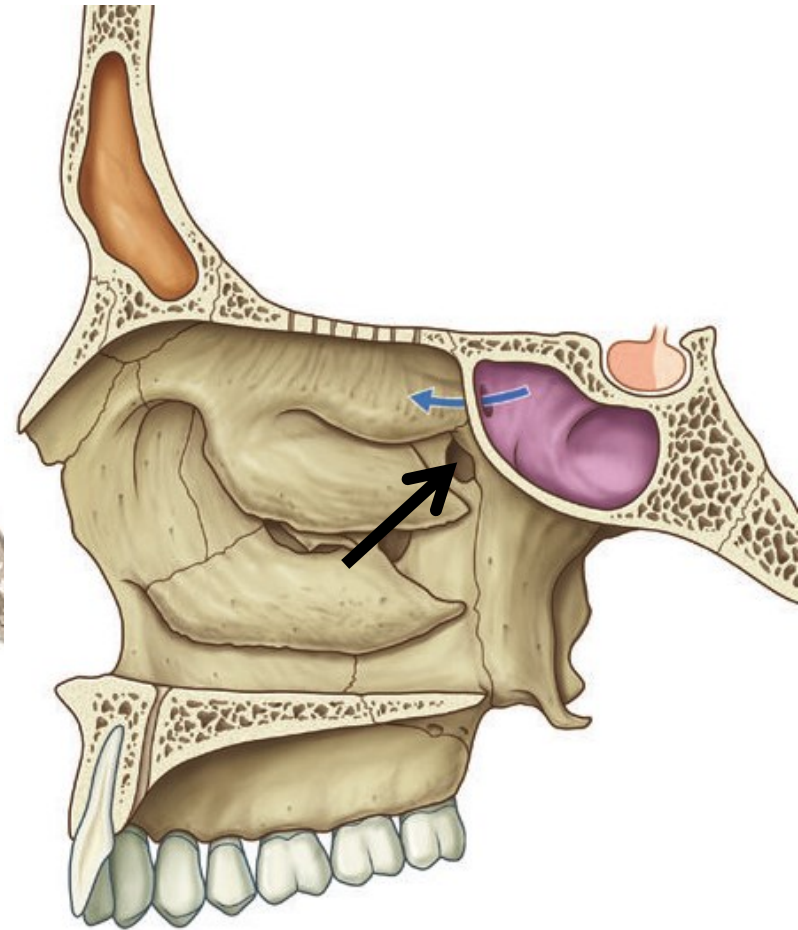
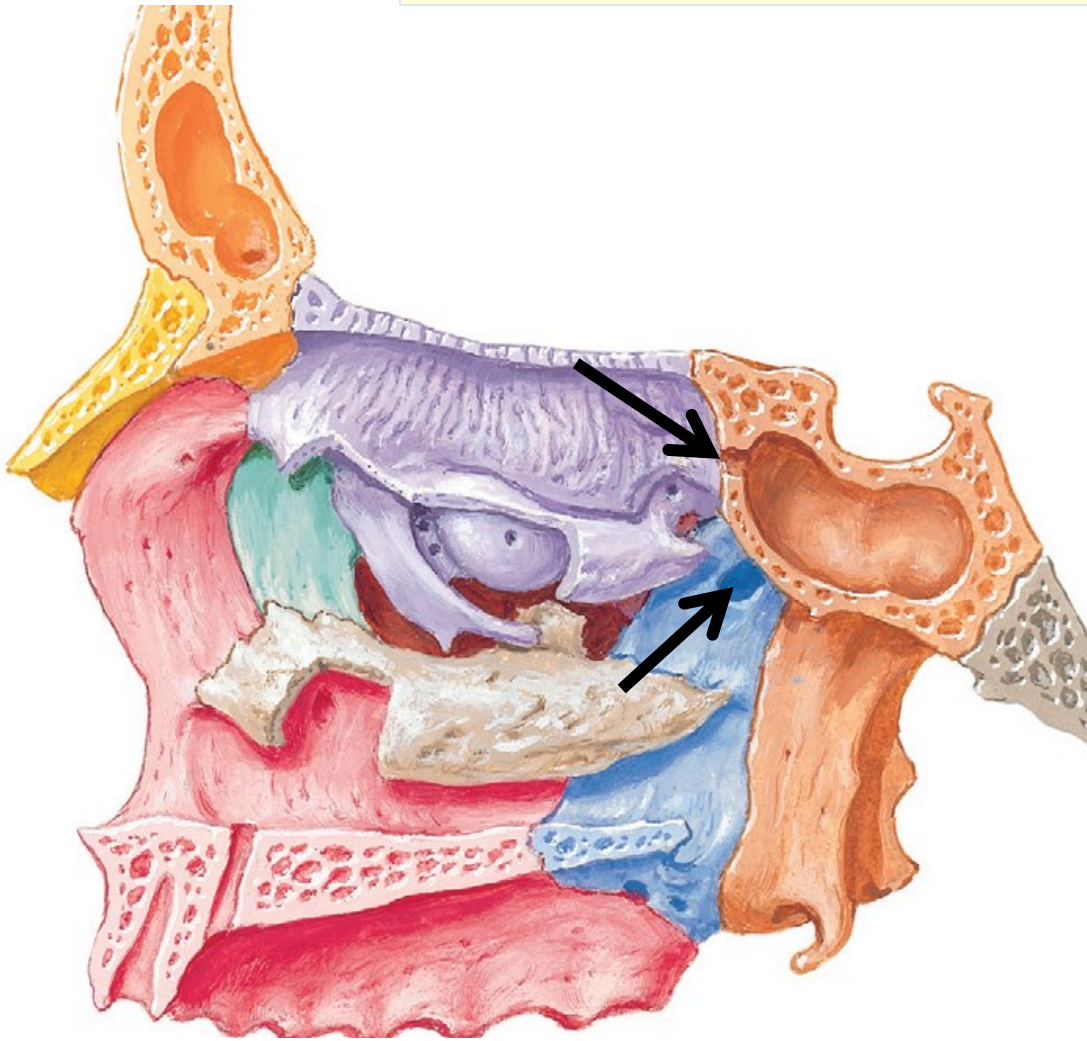
Anteriorly: Sinus opening lies in upper part of its anterior wall and it opens in sphenoid ethmoidal recess. The sphenopalatine foramen (with structures passing through it) lies anterior to lower part of sinus.

Laterally: On both sides there are cavernous sinuses with the internal carotid arteries and abducent nerves.

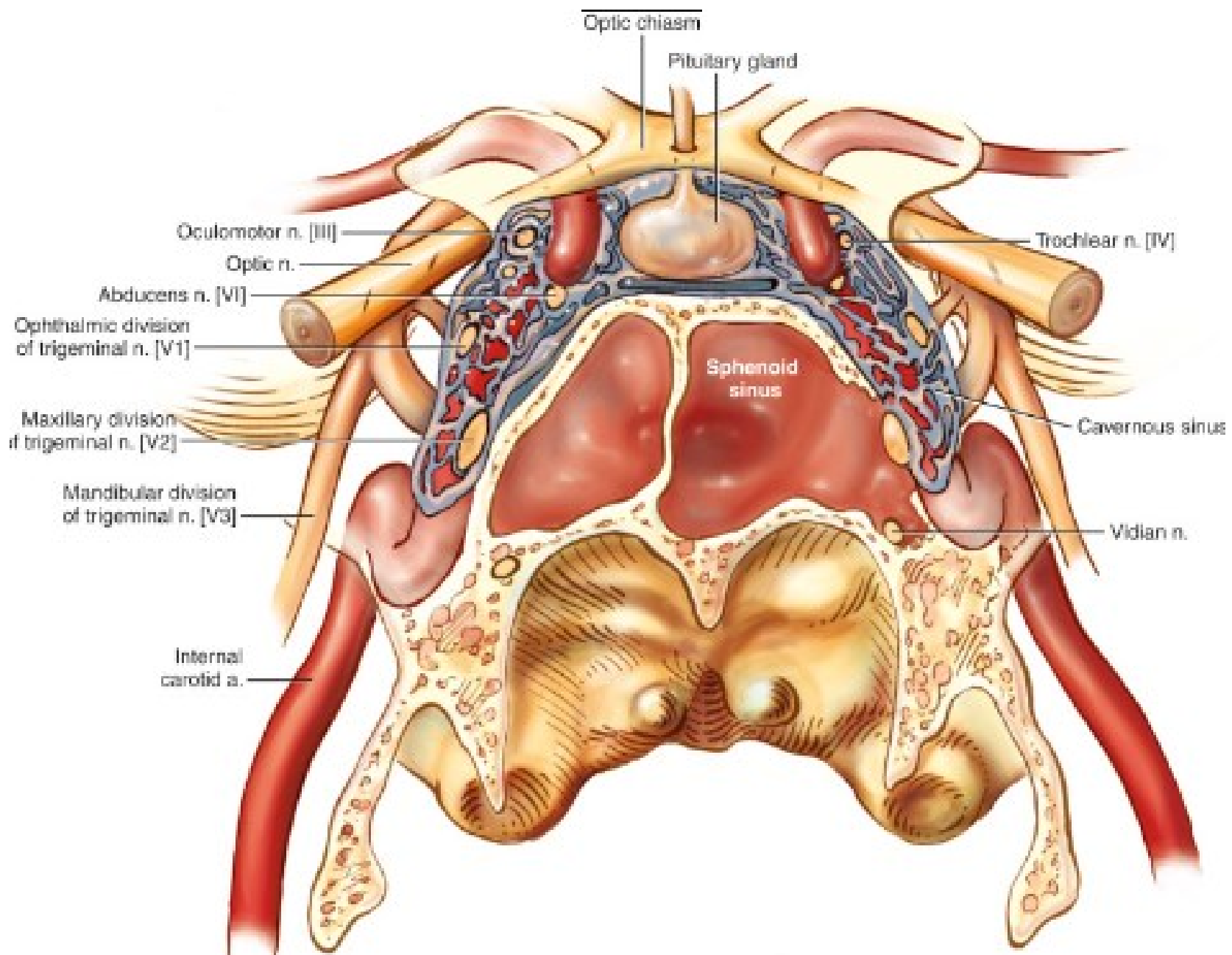
Nerve supply: Posterior ethmoidal and orbital branches of the sphenopalatine ganglion.

Arterial supply: Posterior ethmoidal artery.

Relations of Sphenoid sinus



Anteriorly: Sinus opening lies in upper part of its anterior wall and it opens in sphenoidal recess. The sphenopalatine foramen (with structures passing through it) lies anterior to lower part of sinus.



Laterally: On both sides there are cavernous sinuses with ICA and abducent nerves.

وَقُلِ الْحَمْدُ لِلَّهِ

