

The Nasal Cavity

I tried to put the related points together, which might mean that I didn't follow the recording's exact sequence.

The nose is divided into external nose and the nasal cavity.

The External nose

- There are two cavities in the nose, each with a floor and a roof. A **septum** lies between them and forms the **medial wall** for each.

- The septum is made of **hyaline cartilage** anteriorly, the **vertical plate of ethmoidal bone** (or the **perpendicular plate** of ethmoid) superiorly, and the **vomer** posteriorly.

- On the lateral side reside the **lower and upper lateral nasal cartilage** (also hyaline cartilage), with the lower nearer to the **ala** of the nose.

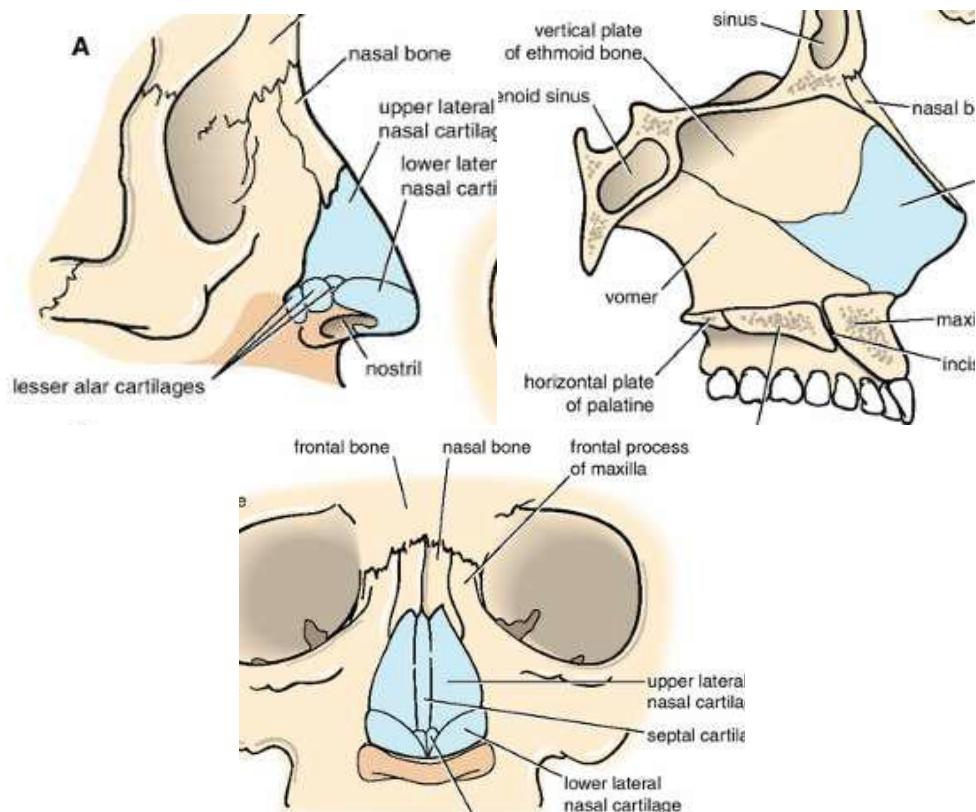
-The ala contains two muscles, one of which constricts it, and the other dilates it.

-The ala (alar cartilage) is also made up of hyaline cartilage.

- These 3 parts make up the **cartilaginous framework of the external nose**.
so the anterior part of the external nose is cartilaginous.

- The **bony part** of the nose is comprised of:

1. The two **nasal bones**, connected by a suture.
2. The **maxillary process of frontal bone**, which contributes to the lateral side of the nose.
3. The **frontal process of maxillary bone**, which also makes up the lateral side.



Blood supply of the external nose

- Comes from the **internal carotid artery**, and the **external carotid artery**.

A) The **ophthalmic** artery:

- Branch from the internal carotid.

-Enters the optic canal with the optic nerve.

-Gives off the **anterior ethmoidal** and the **posterior ethmoidal** arteries in the orbital cavity.

-The anterior ethmoidal reaches the nasal cavity then travels superficially to become the **external nasal artery**.

B) The **maxillary** artery:

-One of the terminal branches of the external carotid. It branches off along with the superficial temporal artery where the external carotid ends, which is in the substance of the parotid gland.

-Supplies the nose, the upper jaw, the face, and the skull.

-Passes through the infraorbital foramen, where it ends and gives off the **labial** to the upper lip, the **nasal** to the external nose, and the **infratrochlear** to the lower eyelid.

C) The **facial** artery:

-Branch from the external carotid.

-Gives off the **superior labial**, which supplies the nose internally and externally.

Nerve supply of the external nose

The trigeminal nerve (5th cranial) gives off three branches:

1) The **ophthalmic**: to the eye, but also gives off the **nasociliary**; which provides the **anterior ethmoidal**, the **posterior ethmoidal**, and the **infratrochlear**.

-The anterior ethmoidal gives off the **external nasal branch**.

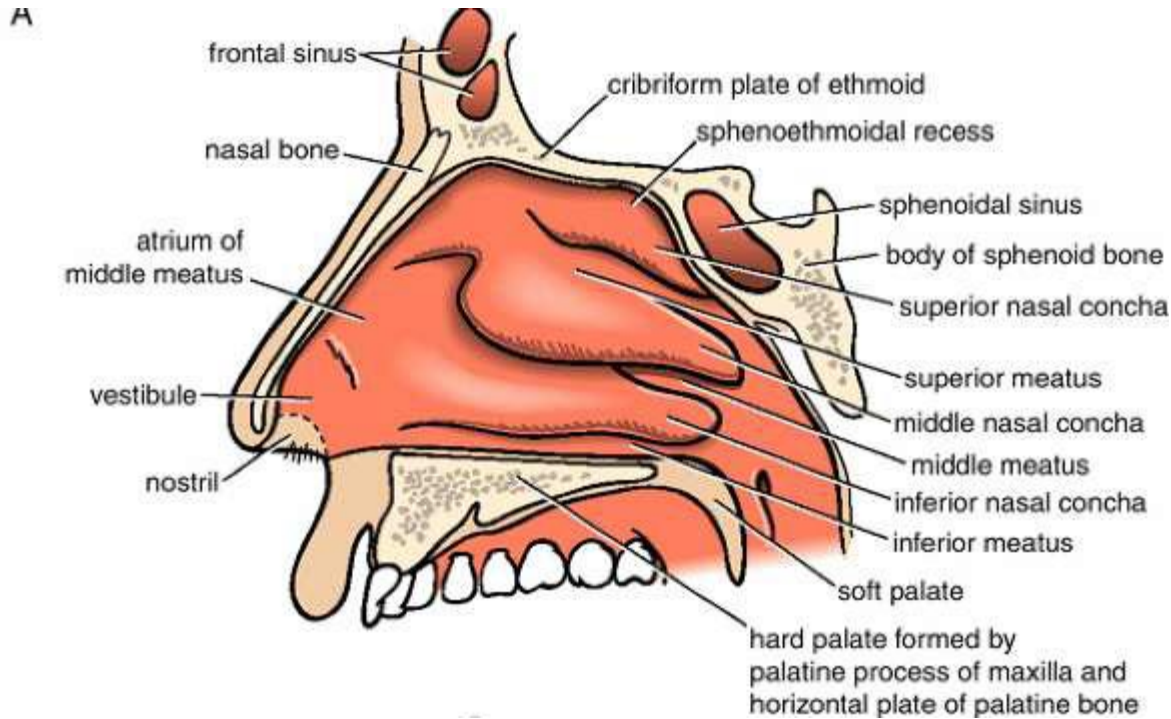
2) The **maxillary**: to the upper jaw.

-Leaves through the infraorbital foramen.

-Gives off the **labial**, **nasal**, and **infraorbital** branches.

3) The **mandibular**: to the lower jaw.

The Nasal Cavity



- The nasal cavity has two **anterior nares**, which are the two front openings visible when looking directly at the nose.
- It begins with the **vestibule**, which is a dilated part lined with **stratified squamous non-keratinized epithelium**. It is divided by the nasal septum. Sweat glands, sebaceous glands and hair follicles are all present in the vestibule.
**Remember that there is no gas exchange in the nose, it only provide a passage for air.
- The hair follicles are short, and thick. They are named **vibrissae**, and they filter inspired air.
- Right above the vestibule is the **antrum**(or atrium). It is part of the respiratory part; therefore its epithelium is of the **pseudostratified ciliated columnar** type.
- Then comes the lateral wall of the nose. It is made up of:
 - **Three conchae**: superior, middle, and inferior.
 - The superior and middle conchae originate from the ethmoidal bone, while the inferior from the maxilla as a separate bone.
 - **Three meatuses**: superior, middle, and inferior.
 - One recess**: positioned above the superior conchae. It receives the **sphenoid air sinus**(cavity of air in body of sphenoid).
 - All air sinuses must open into the lateral wall of the nose by way of a duct. They are:

- The **frontal** sinus: in the frontal bone.
 - The **maxillary** sinus: in the maxillary bone.
 - The **sphenoid** sinus: in the sphenoid bone.
 - The **six ethmoidal** sinuses: three on the right, three on the left in the ethmoidal bone.
- They are responsible for the **resonance of voice**.

Functions of the nasal cavity:

1. Provides passage for air.
2. Filters inspired air using the vibrissae.
3. Protection through sneezing, filtration, proteolytic enzymes, and warming and moistening the inspired air.
4. Contains the olfactory region (receptors of smell) positioned on the **roof, most superior part of the lateral wall**, and the **septum**. This region contains **bipolar cells** which transform smell from mechanical signals to chemical signals to electrical signals, which pass through the olfactory nerve.
5. Resonance of voice, by way of the paranasal sinuses.
6. Phonation of speech (produce vocal sound, by the vocal cords).
7. Drains lacrimal fluid.
 - The **lacrimal gland** is positioned in the roof of the orbital cavity. It produces tears that clean the cornea. The tears that are produced mostly go to the **lacrimal sac**, positioned on the medial angle of the eye, in the **lacrimal fossa** of the **lacrimal bone**.
 - The lacrimal sac continues as the **nasolacrimal duct**, which opens into the **inferior meatus**.
 - Some babies are born with a blocked nasolacrimal duct. This causes a skin infection(dermatitis) on the cheeks as a result of the tears always draining onto them. This is treated by opening the duct, and the results are immediate.

Openings into the lateral wall of the nose:

The sphenopalatine foramen:

- Creates a communication line between the **pterygopalatine fossa** and the **nasal cavity**.
 - The pterygopalatine fossa provides the sphenopalatine vessels and nerves to the nasal cavity through the **nasopalatine foramen**.

The foramen caecum:

- Positioned in the anterior part of the **cribriform plate of the ethmoid**, beside the crista galli, in the anterior cranial fossa.
 - The cribriform plate of ethmoid has small foramina that allow the passage of **filaments of the olfactory nerve**.
 - The olfactory nerve originates from the bipolar cells, passes through the cribriform plate of ethmoid, and then forms the **olfactory bulb**. The bulb continues as the olfactory tract, which ends in the olfactory center(responsible for smell impulse meanings).

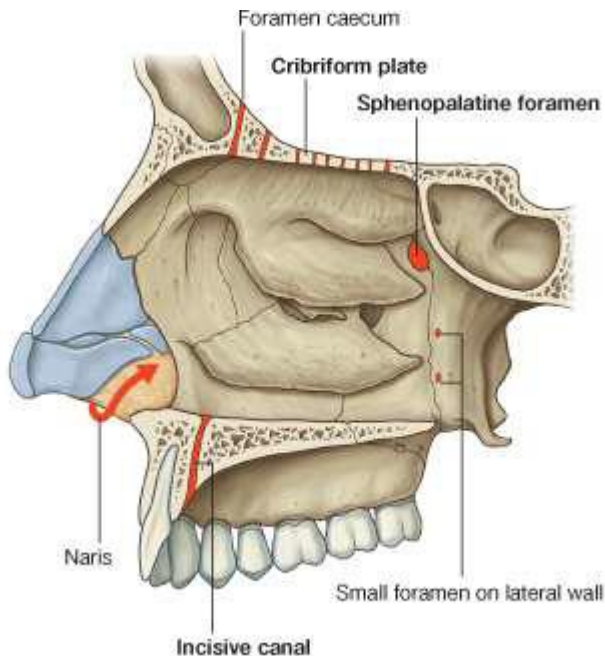
-The anterior ethmoidal nerve and vessels pass through it, to reach the external nose as the **external nasal nerve and artery**.

The incisive canal:

-Originally the incisive foramen and canal.

-The **greater palatine nerves and vessels** pass through it.

-Branches of the maxillary artery and nerve. They reach the oral cavity then pass through the incisive foramen and canal in the hard palate to the nasal cavity.



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The Choana

-The **choana** are the **posterior nares** that communicate with the **nasopharynx**.

-This means that air breathed in first passes through the anterior nares then through the nasal cavity then through the choana to the nasopharynx, and finally reaches the larynx.

-They are surrounded by bone which immobilizes them, and causes them to be open at all times.

So we can say that they are Rigid openings completely surrounded by bone

-Boundaries of choana:

-Medial boundary or septum: The **vomer**, which gives off processes to the roof, called ala of the vomer.

-Floor: The **horizontal plate of palatine bone**.

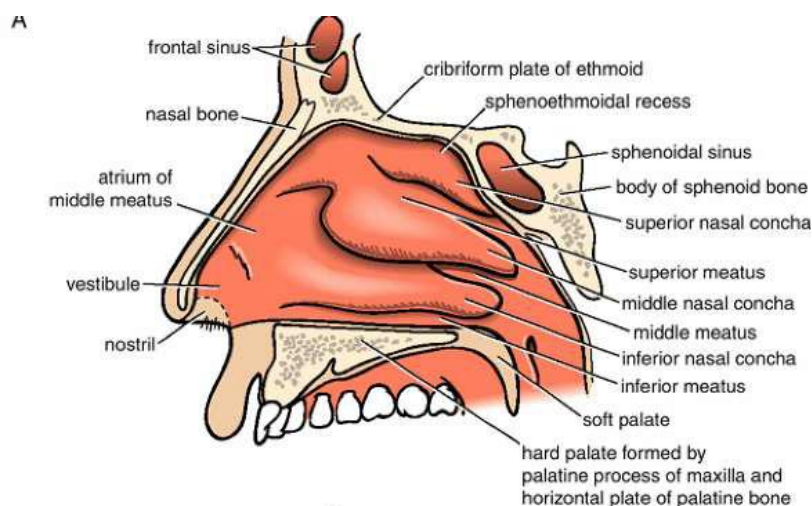
-Lateral boundary: The **medial pterygoid plate of sphenoid**.

-Roof: The **sphenoidal process of palatine bone**, and the **ala of vomer**.

Boundaries of the nasal cavity

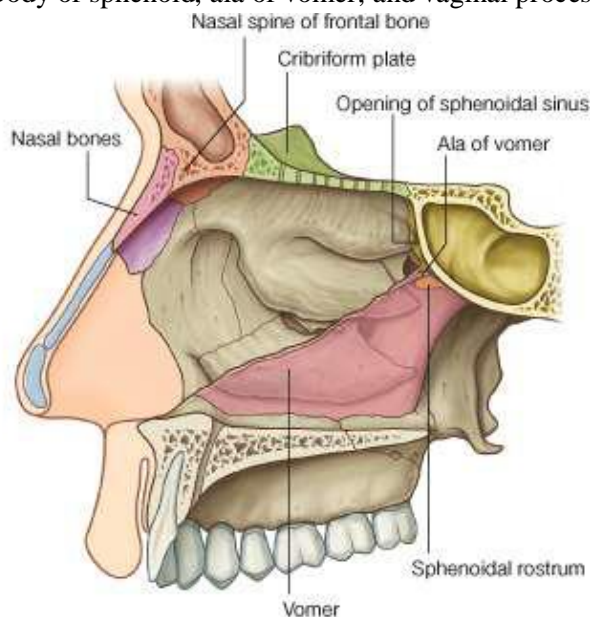
-**Floor**: made of the **hard palate**.

-The hard palate is made of the palatine process of the maxilla and the horizontal plate of the palatine bone.



-**Roof**: divided into

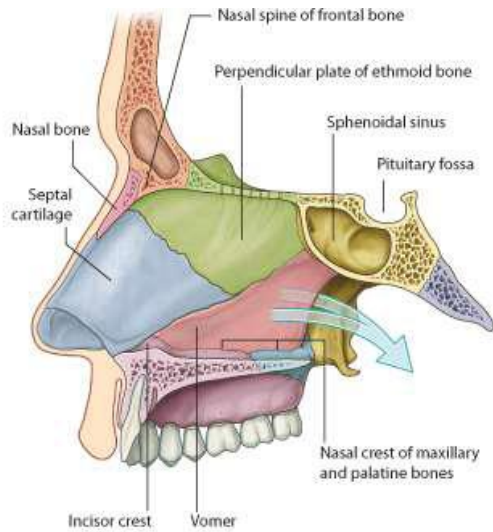
- An **anterior sloping** part.
 - Nasal bone, and nasal spine of frontal bone.
- A **middle horizontal** part.
 - Cribriform plate of ethmoid.
- A **posterior sloping** part.
 - Body of sphenoid, ala of vomer, and vaginal process of palatine bone.



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-**Medial wall**: The septum

-made of perpendicular plate of ethmoid, cartilage, and vomer.

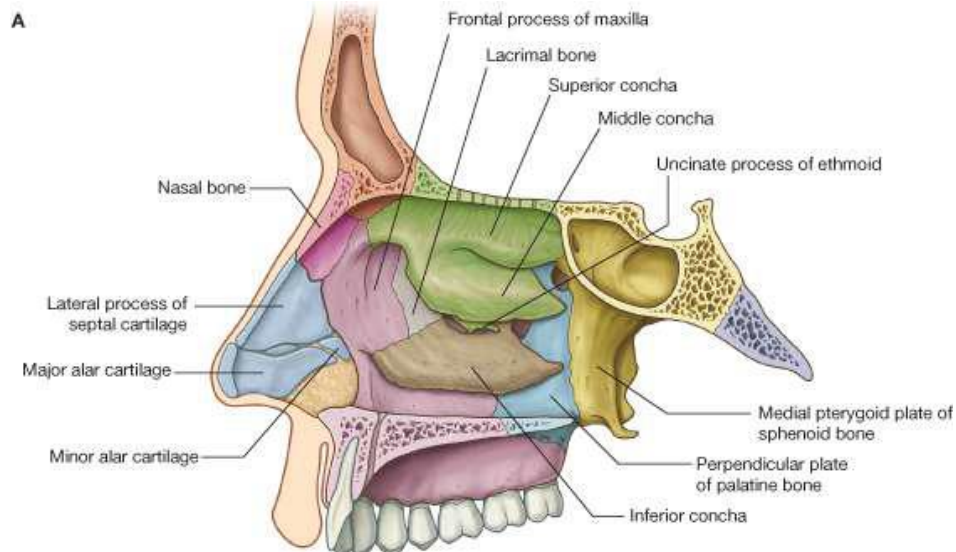


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-Lateral wall: Vestibule, antrum, three conchae, three meatuses, and one recess.

-There are bones that support the lateral wall:

- The ethmoidal: especially to the superior and middle conchae.
- The maxilla: especially to the inferior.
- The perpendicular plate of palatine.
- The medial pterygoid plate(pterygoid process).
- The lacrimal.



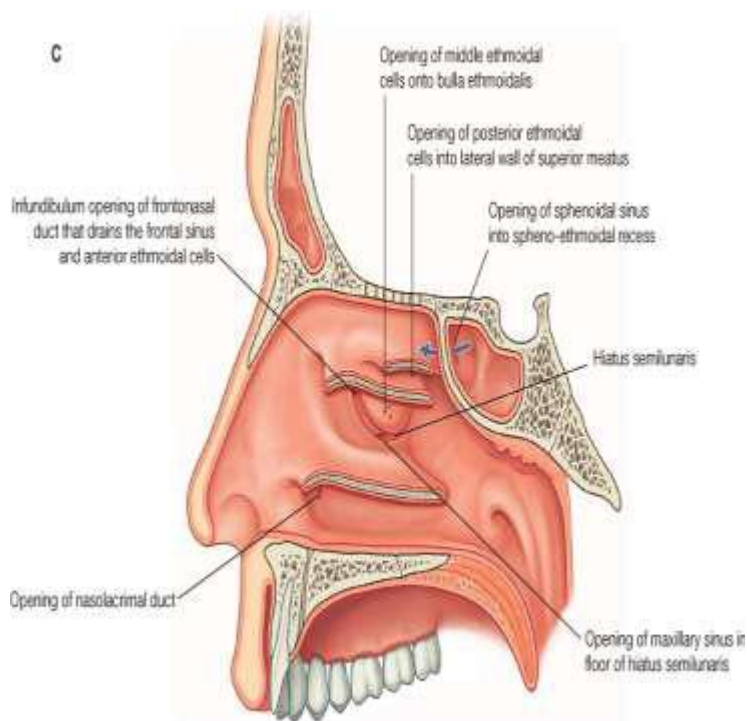
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Mucosa of the nasal cavity

- The vestibule's mucosa is modified skin that contains vibrissae.
 - The antrum's mucosa is pseudostratified ciliated columnar epithelium.
 - The submucosa is thick because of the presence of blood vessels, and venous plexuses.
 - The venous plexuses contain warm blood that heat up and moisture the inspired air.
in congestion: there might be excess thickening and block of one side, so we give the patient decongestant.
 - The olfactory mucosa is part of the respiratory mucosa, and contains bipolar cells for smell sensation.
- **refer to slide 19

The meatuses and sinuses

- The meatuses are grooves below the conchae that increase the surface area of the nose, and **time of contact** between the inspired air and the nose.
- All air sinuses open into the lateral wall of the nose by way of **ducts**.
 - Sphenoid** air sinus:
 - Drains into the **sphenoethmoidal recess** above the superior concha.
 - Posterior ethmoidal** air sinus:
 - Drains into the **superior meatus**.
 - Middle ethmoidal** air sinus:
 - Drains into a bulge of mucosa in the **middle meatus**, named **bullae ethmoidalis**.
 - Maxillary** air sinus:
 - Drains into the **hiatus semilunaris**, which is a gutter positioned below the bullae ethmoidalis.
 - Anterior ethmoidal** air sinus:
 - Drains into the **infundibulum** of the **middle meatus**.
 - Frontal** air sinus:
 - Drains into the **infundibulum** of the **middle meatus** through the **frontonasal duct**.
- The **nasolacrimal duct** opens and drains into the **inferior meatus**.



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Blood supply of the nose

-Divided into: blood supply to the lateral wall, and blood supply to the septum.

-The lateral wall: divided into four quadrants:

1. Upper anterior.
-Supplied by the **anterior ethmoidal**; which ends as the **external nasal branch** supplying the **external nose**, and **septal branch** supplying the **septum**.
2. Upper posterior.
-Supplied by the **posterior ethmoidal**, and **short sphenopalatine**.
3. Lower anterior.
4. Lower posterior.

-The sphenopalatine artery:

-Branch from the maxillary, found in the pterygopalatine fossa, passing through the sphenopalatine foramen.

-Divides into:

-Long sphenopalatine.

-Mainly to the **septum**. It is sometimes called the **nasopalatine** artery.

-Short sphenopalatine.

-Provides the **posterior lateral nasal branches**.

-The palatine arteries:

-Branches from the maxillary artery, found in the pterygopalatine fossa, passing through the sphenopalatine foramen.

- They travel through the palatine canal to the oral cavity.

-Divide into the greater and lesser palatine.

-The **greater palatine** artery travels through the greater palatine foramen to the **hard palate**, and then ascends through the **incisive foramen** to reach the nasal cavity.

-Supplies the **lateral wall mainly**, and the septum secondarily.

It is written in the slides that it Supplies the anterior regions of the medial wall and adjacent floor (**posterior and anterior-inferior quadrant**)

-The **lesser palatine** artery travels to the **soft palate**.

-The facial artery:

-Provides the **superior labial** which gives off the lateral nasal arteries, the alar artery, and a septal branch.

-This **septal** branch is the **most important cause of epistaxis** (nosebleeds).

-Bleeding occurs mainly in a region called “**Kiesselbach’s area**” which is found between the anterior one third, and the other two thirds.

-A lot of anastomosis is observed in this area, mostly between the **septal branch of the facial artery**, and the nasopalatine artery (also called long sphenopalatine artery).

If asked in the exam about one artery that causes epistaxis, always name the septal branch of the facial artery. It is the main cause of bleeding, even if there is anastomosis with the nasopalatine.

-The correct way of treating epistaxis is by blocking the cavity by hand. If the bleeding persists for more than a minute or two, it is preferable to block with a piece of cloth. If there is recurrent bleeding, **cauterization** (burning) by chemical (silver nitrate) or electrical means is performed to stop the bleeding.