

Anatomy and physiology of the nose and paranasal sinuses

The external nose:-

It is pyramidal in shape base cranially and tip caudally ,its shape is maintained by skeletal framework which is composed of:-

1-bony constituent 2-cartilagenous constituents.

The bony constituents supports the upper $\frac{1}{3}$ of the nose and mainly formed by the nasal bones. the cartilaginous constituents support the lower $\frac{2}{3}$ of the external nose and formed by:-1-upper lateral cartilage 2-lower lateral cartilage 3-quadrilatewral cartilage of the nasal septum.

The vestibule (part of the external nose) is the entrance to the nasal cavity ,it is lined with skin and contain sebaceous glands and hairs(vibrissae).

The nasal cavities:-

The right and left nasal cavities are separated by nasal septum .they open anteriorly with anterior nares (nostrils) each cavity communicate with :-

1-the paranasal cavities through their ostia .

2- the nasopharynx through the posterior choanae(posterior nares).

Each nasal cavity is bounded by:-

Floor: which is formed by :a-palatine process of the maxilla. b-horizontal plate of the palatine bone.

Roof :it is very narrow and formed by: a-cribriform plate of ethmoid . b-body of sphenoid.

Medial wall: this is the nasal septum, it lies in or near the midline .

Its main constituents are :a-the vomer .b-perpendicular plate of the ethmoid. c-quadrilateral cartilage.

Lateral wall:- it is forme4d mainly by :a-medial wall of the maxilla .b-lateral mass of the ethmoid and lacrimal bone.

The main features of the lateral wall are:-

a-three turbinates (conchae) superior,middle and inferior. The inferior is the largest.

b-Three meati: named after the turbinates,each meatus lies below and lateral to the corresponding turbinate.

c- sphenoid-ethmoidal recess: lies above the superior turbinate and receives the ostium of the sphenoid sinus.

Superior meatus: contain the ostia of the posterior ethmoidal air cells.

Middle meatus: it is the most complex and by far the most important.

The ostia of the maxillary , anterior ethmoid, and frontal sinuses open in to it.

The bulla ethmoidalis :is the smooth , rounded mass formed by the anterior ethmoidal air cells ,the ostia of these air cells open into the bulla or above it.

The hiatus semilunares : lies below and in front of the bulla and leads forward into the infundibulum.it is bounded below by the uncinat process of the ethmoid.

Inferior meatus: receive the nasal opening of the naso-lacrimal duct.

Paranasal sinuses:-

These are air filled spaces within certain bones of the skull.

There are four on each side :maxillary ,ethmoid, frontal, and sphenoidal sinuses .they are lined with a mucous membrane continuous with that of corresponding nasal cavity through there ostia.

Mucous membrane of the nose and paranasal sinuses:-

It is of two types:

1-respiratory epithelium: this lines the lower 2/3 of the nasal septum ,the lateral wall of the nose below the superior turbinates ,and the floor of the nasal cavities. It is pink in color and covered by ciliated pseudo stratified columnar epithelium.

2-olfactory epithelium:- lines the upper 1/3 of the nasal septum ,the roof of the nose ,and the lateral wall above and including the superior turbinates. It is yellow in color , non ciliated columnar epithelium.

Blood supply of the nose and paranasal sinuses:-

a- arterial supply:-the nasal cavities and paranasal sinuses are supplied by branches of the external and internal carotid arteries (upper half of the nose by the anterior and posterior ethmoidal arteries ,branches of the ophthalmic artery which is branch from the internal carotid artery, lower half of the nose supplied by the sphenopalatine artery ,greater palatine artery, superior labial artery which are branches from the maxillary artery which is a branch from the external carotid artery).

There is a highly vascularized area at the antero-inferior aspect of the nasal septum called little's area where four arteries make an anastomosis in the mucous membrane. these are spheno-palatine artery, greater palatine artery ,superior labial artery(branches of the external carotid artery)and the anterior ethmoidal artery(branch of the internal carotid artery) .

b-venous drainage:-forms a cavernous plexus beneath the mucous membrane and drains through the sphenopalatine and facial veins.

c-lymphatic drainage:-from the anterior part of the nose to the submandibular lymph nodes and the superior deep cervical chain. the posterior is drained to the middle deep cervical chain.

Nerve supply:-it is extremely rich .

The sensory supply comes from the ophthalmic and maxillary divisions of the trigeminal cranial nerve.

The secretory (sympathetic and parasympathetic) supply is mainly contained in the vidian nerve .parasympathetic cause vasodilatation and secretion(rhinorrhea), sympathetic cause vasoconstriction.

The sense of smell is supplied by the olfactory cranial nerve which pass through the cribriform plate.

Applied physiology of the nose and the paranasal sinuses:-

a-functions of the nose:-

1-respiration.2-purification (filtration)of inspired air.3-warming of inspired air. 4-moisturing of inspired air.5-smell.

b-functions of the paranasal sinuses:-

1-resonance of the voice.

2-sound protection from transmission of the sound of one's own speech to the ears.

3-air conditioning of the inspired air.

4-influence olfaction.

5-reduce weight of the skull.

6-protect the eye from trauma.

7-insulate the skull base and the orbit thermally.