1) Anatomy of the Nose & Paranasal Sinuses – Dr. Muayyad

External nose

is a projecting triangular pyramid directed downwards. Its inferior base perforated by 2 nostrils separated by median septum & its superior root connects directly with the forehead at nasion. The external framework is composed of osseous & cartilaginous parts.

The osseous part formed by 2 wedge shaped nasal bones form the cephalic aspect of the dorsum, each is joined to the frontal bone above, nasal process of the maxilla laterally, to each other medially, inferiorly they join the cartilaginous part.

The cartilaginous part formed by 2 group of hyaline cartilage which may be ossified, they prevent collapse of the vestibule on inspiration.

The upper lateral cartilages (ULL) are triangular in shape lying inferior to the nasal bones & are overlapped by them & overlapped by the adjacent frontal process of the maxilla & by the lower lateral cartilages, the groove between the ULC & LLC is called limen nasi. The medial aspect of the ULC is continuous with the nasal septal cartilage which is bifid in this area. The dorsal aspect of the cartilaginous septum complete the external nose.

The lower lateral cartilages (LLC) completes the external framework which are form the lower 1/3 of the nose & each composed of medial & lateral crus which meet at the dome of the tip, the medial crura are loosely attached to each other in the midline & contribute to the columella (The columella is the part of the septum running between the tip of the nose & philtrum & anterior to the quadrilateral septal cartilage).

A number of small sesamoid cartilages make up the posterolateral aspects of the external framework.

The main muscles acting on the External nose are 3 compressor & 4 dilators of the nostrils (alae) were are all supplied by facial nerve.

Vestibule

The vestibule is the dilated passageway leading from the external nares into nasal fossae (nasal cavity proper), demarcated by the limen nasi at the superior margin of the lower lateral cartilage, the vestibule lined by skin bearing coarse hairs or vibrissae.

The nasal cavity

The nasal fossae are 2 irregular cavities extending from mucocutaneous junction with the nasal vestibule infront (the anterior nares) to the junction with nasopharynx (posterior nares).

The lining of the epithelium mainly respiratory type or olfactory, occasionally squamous epithelium were encroaches from the vestibule onto the anterior ends of the middle & inferior turbinates.

The nasal cavity is divided into 2 parts by a septum, each half has a floor, roof, medial & lateral wall.

Floor: anterior 3/4 is composed of the palatine process of the maxilla, posterior ¼ by the horizontal process of the palatine bone.

Roof: it’s the area of olfactory cleft which occupies the area between the superior turbinate, cribiform plate & corresponding area of the septum.

Lateral wall: the bony lateral wall of the cavity is convoluted by 3 turbinates, the superior & middle are the medial aspect of the lateral mass of the ethmoid bone & the inferior one is separate bone attached to the maxilla. Each turbinate overhangs a channel or meatus. The inferior turbinate covers the inferior meatus & so on. Superior to superior turbinate is the sphenoethmoidal recess. Superior meatus occupies the posterior 1/3 of the lateral wall, middle meatus the posterior 2/3, inferior meatus runs the length of the lateral wall.
Several ducts drains into the nose through the meatus. The inferior meatus in its anterior aspect receives the nasolacrimal duct, the anterior group of the sinuses (frontal, maxillary & anterior ethmoidal) drains into middle meatus through their ostia, the posterior ethmoidal sinuses drains into superior meatus & sphenoidal sinus into sphenethmoidal recess.

**Medial wall (nasal septum):**

Is composed of a small anterior membranous portion, cartilage, several bones (perpendicular plate of the ethmoid, vomer, 2 bony crests of the maxilla & palatine bones). The nasal septum separate the 2 nasal cavities, posteriorly its bony & anteriorly its cartilaginous (quadrilateral cartilage) were its attached inferiorly to maxillary crest, posteriorly to vomer, posterosuperiorly the perpendicular plate of the ethmoid.

**Blood supply:**

The arterial supply to the septum is derived from 2 sources

1. External carotid system (main source) through maxillary art. & sphenopalatine art. Which is divided into 3 branches (inferior turbinate, middle turbinate, nasopalatine art.). The nasopalatine art. Leaves the sphenopalatine foramen & passes along the anteroinferior border of the sphenoid to the septum, where it divides into 2, the superior branch lies in the perpendicular plate, the lower just above the maxillary crest, the latter divides again & one of these branches passes through incisive foramina.

2. Internal carotid system (minor source) through anterior & posterior ethmoidal art.

Both of them are branches of ophthalmic art. Were are entered the nose through anterior ethmoidal foramen to supply variable parts of the septum & also give branches to littels area anteriorly.

There is a highly vascular area at the anteroinferior aspect of the septum called littels area or kiesselbach s plexus formed by the following arteries

- greater palatine, infraorbital, superior dental, pharyngeal branches) all are branches of the maxillary artery.
- superior labial artery from facial artery.
- posreior ethmoidal art. from ophthalmic art.

The lateral wall has similar corresponding blood supply

**Paranasal sinuses**

These are air filled cavities lined by an evagination of the mucous membrane of the nose from the nasal cavity into adjacent skull bones. They are arranged in pairs & divided into anterior & posterior groups.

**The maxillary sinus:** the maxillary sinus (antrum) is hollowed out of the maxilla, pyramidal in shape, its apex is formed by malar process. Its base is the lower part of the lateral wall of the nose, the roof is the floor of the orbit & its narrow floor lies over the alveolar process of the maxilla & the root of the molar & premolar teeth with its deepest part overlying the 2nd premolar & 1st molar teeth.

The medial wall is the lateral wall of the nasal cavity. The ostium is sited high on the medial wall of the sinus hence drainage is dependent on ciliary action not on gravity, one or more accessory ostia may lie posteriorly on the main one.

The posterior wall is the anterior wall of the pterygopalatine & infratemporal fossae.

At birth the sinus is rudimentary & growth is slow until the secondary dentition, then quickly expand to its adult size of 35 mm height, 30 mm anteroposteriorly & 25 mm wide with eruption of the 3rd molar tooth.
The frontal sinuses: situated in the frontal bone above supraorbital margin & root of the nose. They are unevenly divided by a vertical bony septum, they probably arise from the anterior ethmoidal cells & are closely related. The frontonasal duct passes through ethmoidal labyrinth to middle meatus, anteriorly is anterior table of the skull, posteriorly related to temporal lobe of the brain.

The ethmoidal sinuses: These labyrinths of thin walled cavities are variables in number & size. They are relatively large at birth. laterally bordered by the medial wall of the orbit which is very thin paper like bone called lamina papyraceae & medially bordered by the nasal cavity. They lie inferior to the anterior cranial fossa near the midline at each side of the cribriform plate (called fovea ethmoidalis). They are arranged in 2 groups, the anterior group small & numerous & posterior group large & scanty.

The sphenoid sinuses: they occupy the body of the sphenoid bone, unevenly divided by a vertical septum, true growth occur at puberty, 1% show minimal pneumatization, 40% pneumatized back to the anterior bony wall of the pituitary fossa called ( presellar) & 60% extent to & under the pituitary fossa called( sellar) type. The ostium is situated anteriorly & drained into sphenethmoidal recess.

laterally the wall is contagious with internal carotid artery, optic nerve, cavernous sinus & its contents. superiorly lies the frontal lobe & olfactory apparatus. Posteriorly lies the pituitary fossa. Sphenopalatine nerve & vessels lies in front of sphenoid sinus & vidian nerve lies inferiorly.

Physiology of the nose

The nose has several functions as follow:

1. Provide airway for respiration
2. Air conditions the inspired air
3. Collects the moisture from expired air to prevent excessive loss.
4. Provide the voice with a pleasing resonant quality
6. Transports mucous posteriorly to lubricate the pharynx
7. Filters suspended particulate matter from inspired air
8. Integral part of olfactory system

Function of the sinus: mostly they are vestigial, having no function, but there is several unproven hypotheses have been suggested as follow:

1. Give resonance to the voice
2. Sound protection from transmission of the ones own speech to the ears.
3. Air conditioning
4. Have some influence on olfaction
5. Reducing the weight of the skull
6. Protect the eyes in trauma