

**ANATOMY OF NOSE  
AND  
PARANASAL SINUSES.  
PHYSIOLOGY.**

# NOSE - ANATOMY

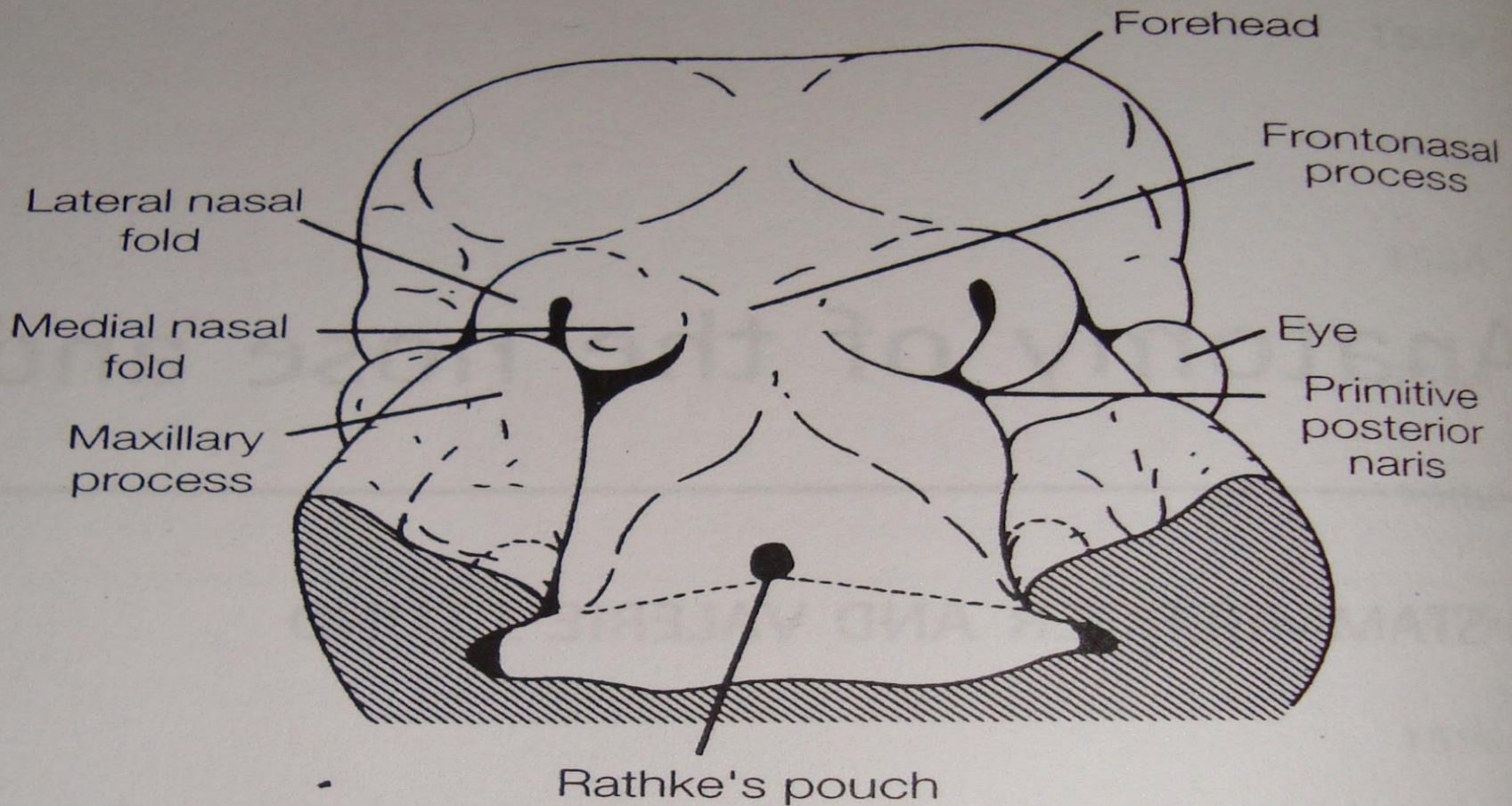
## DEVELOPMENT

- Nose develops from frontonasal process which grows between primitive forebrain and the stomodaeum.
- Frontonasal process gets divided into median nasal process and two lateral process.
- Primitive nasal cavities are closed at their posterior ends by bucconasal membrane which ruptures and forms choanae.

Clinical significance: choanal atresia

# DEVELOPMENT

- Olfactory placodes on the frontonasal process become depressed to form olfactory pits which later form nasal cavity.



**Figure 104.2** The roof of the stomatodaeum of a 12 mm human embryo illustrating the development of the primitive palate and posterior nares by approximation of the maxillary processes to the lateral and medial nasal folds. The previous site of attachment of the buccopharyngeal membrane is represented by a dotted line and part of the left maxillary process has been removed. After Hamilton and Mossman<sup>1</sup>.

# ANATOMY OF NOSE

## *EXTERNAL NOSE*

- External nose is shaped like a pyramid with its root up and base directed downwards.
- Consists of osteocartilagenous framework covered by muscle and skin.

# ANATOMY OF NOSE

## *EXTERNAL NOSE*

- **Osteocartilagenous framework:**

Upper 1/3<sup>rd</sup> - bony

Lower 2/3<sup>rd</sup> – cartilagenous

- **Bony framework**

- a) Nasal bones

- b) Nasal processes of frontal bone

- c) Frontal processes of maxilla

# ANATOMY OF NOSE

## *EXTERNAL NOSE*

- Cartilagenous framework
  - a) Upper lateral cartilages
  - b) Lower lateral cartilages (alar cartilages)
  - c) Lesser cartilages (sesamoid cartilages)
  - d) Septal cartilage

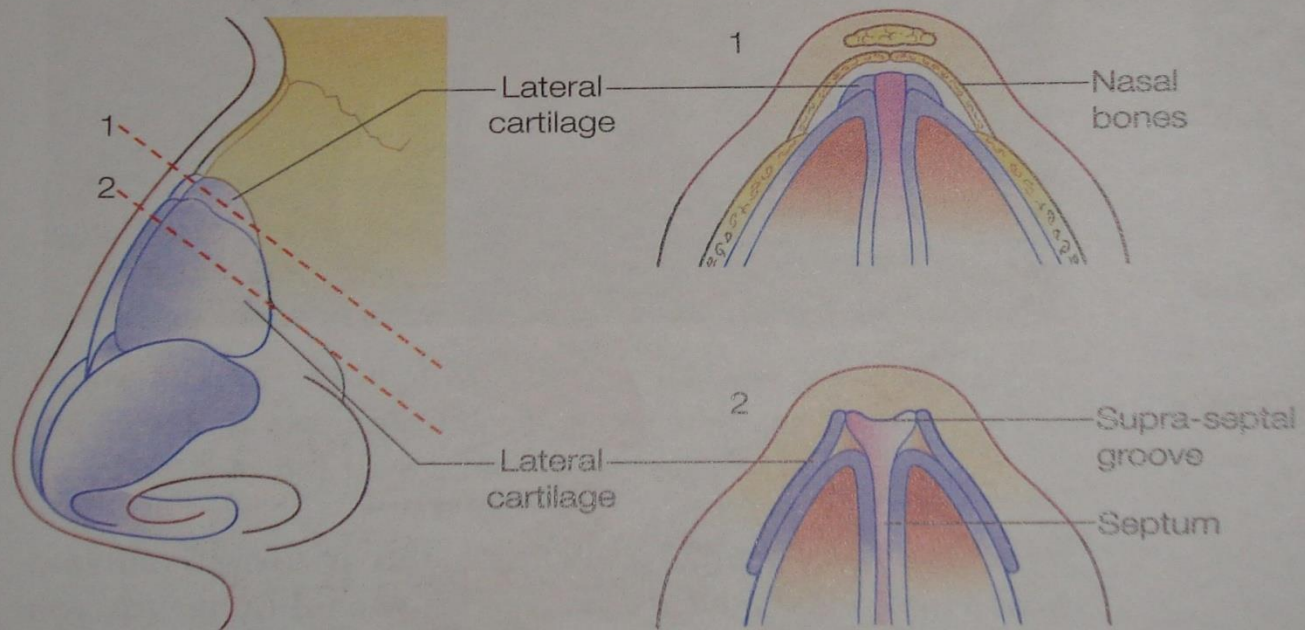
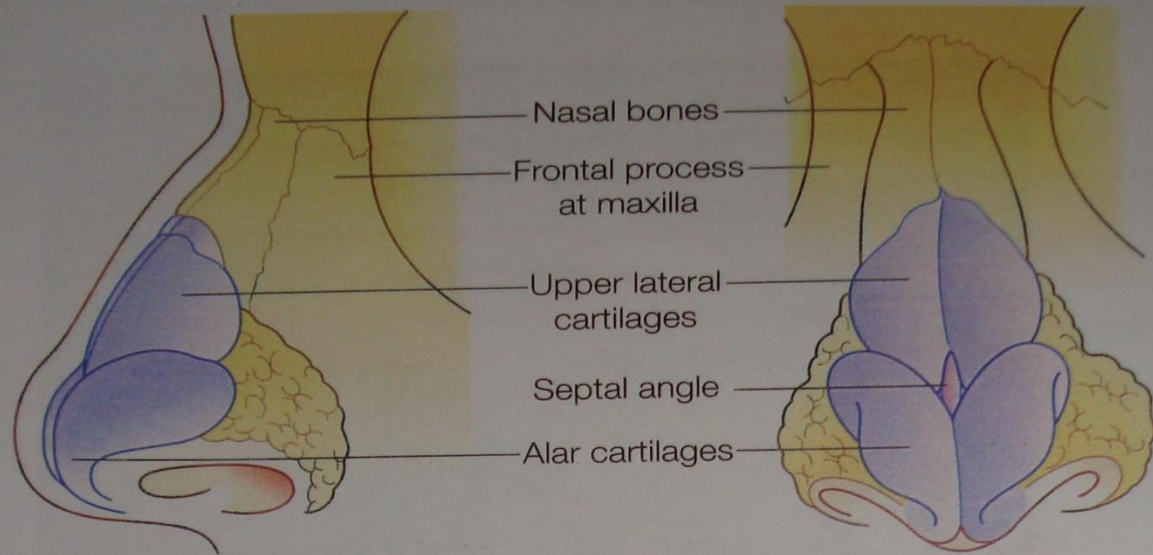
Clinical significance: *limen nasi* (nasal valve) is the narrowest area in the upper airway

# ANATOMY OF NOSE

## *EXTERNAL NOSE*

- *Nasal valve*: Formed by lower edge of upper lateral cartilages, the anterior end of inferior turbinate and adjacent nasal septum.





# ANATOMY OF NOSE

## *EXTERNAL NOSE*

### ■ Nasal musculature:

- a) Procerus
- b) Nasalis (transverse and alar part)
- c) Levator labii superioris alaeque nasi
- d) Anterior and posterior dilator naris
- e) Depressor septi

Nasal skin: skin over nasal bone and upper lateral cartilage is thin and freely mobile while that on alar cartilages is thick and adherent and contains sebaceous glands

# ANATOMY OF NOSE

## *EXTERNAL NOSE*

- Blood supply: facial and ophthalmic arteries and veins
- Lymphatic drainage: preauricular and submandibular lymph nodes

# ANATOMY OF NOSE

## *INTERNAL NOSE*

- It is divided into right and left nasal cavities by nasal septum.
- Each nasal cavity consists of
  - a) Skin lined portion - vestibule (contains sebaceous glands, hair follicles, vibrissae)
  - b) Mucosa lined portion - nasal cavity proper

# ANATOMY OF NOSE

## *INTERNAL NOSE*

- Nasal cavity proper: bounded by lateral wall, medial wall, roof and a floor.
- Floor: Formed by
  - a) Palatine process of maxilla (anterior  $3/4^{\text{th}}$  )
  - b) Horizontal process of palatine bone (posterior  $1/4^{\text{th}}$  )

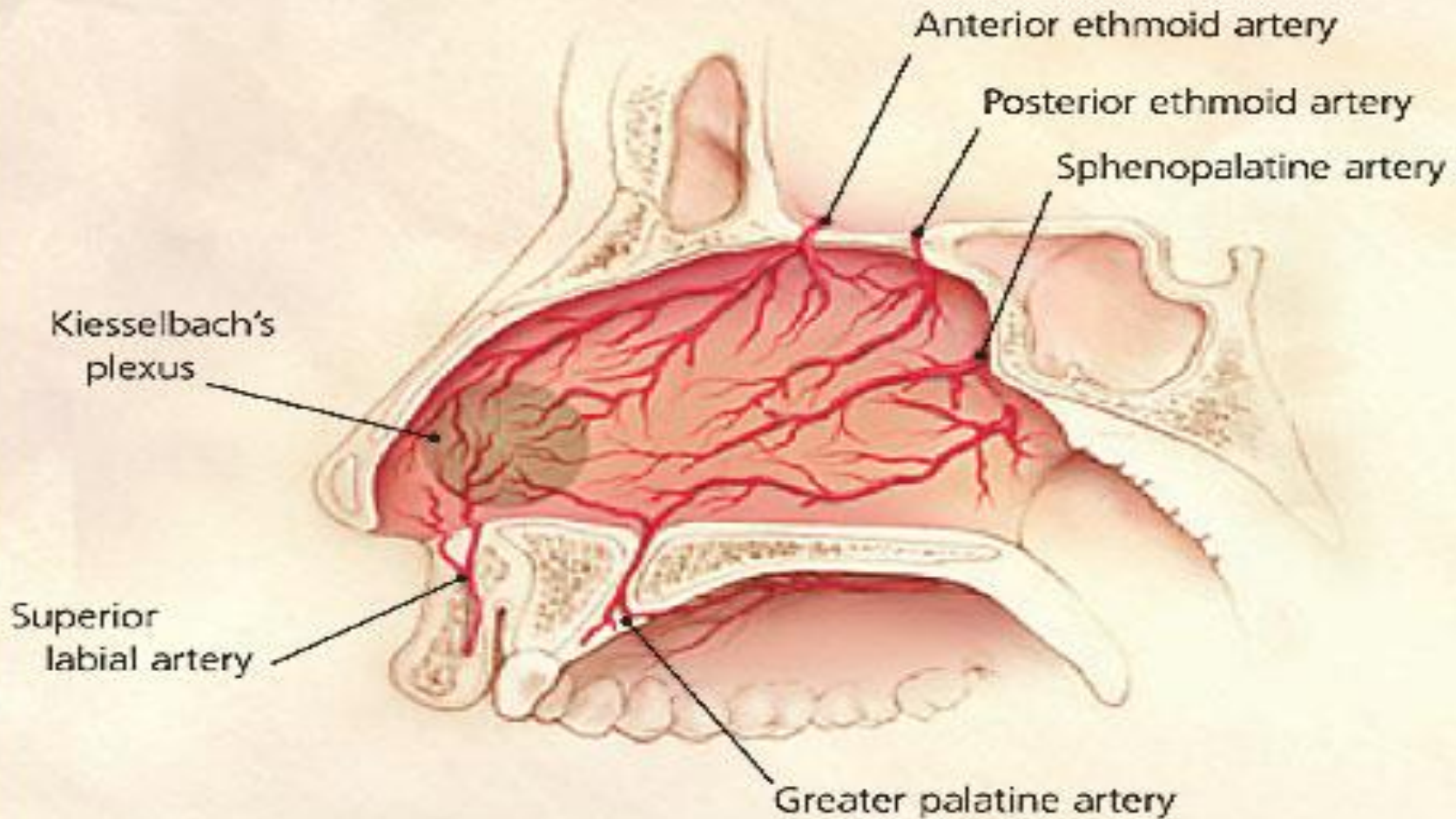
# ANATOMY OF NOSE

## *INTERNAL NOSE*

- Roof: formed by
  - a) Anterior sloping part by nasal bones
  - b) Posterior sloping part by body of sphenoid
  - c) Middle horizontal part by cribriform plate of ethmoid through which olfactory nerves enter the nasal cavity



# BLOOD SUPPLY-NASAL SEPTUM

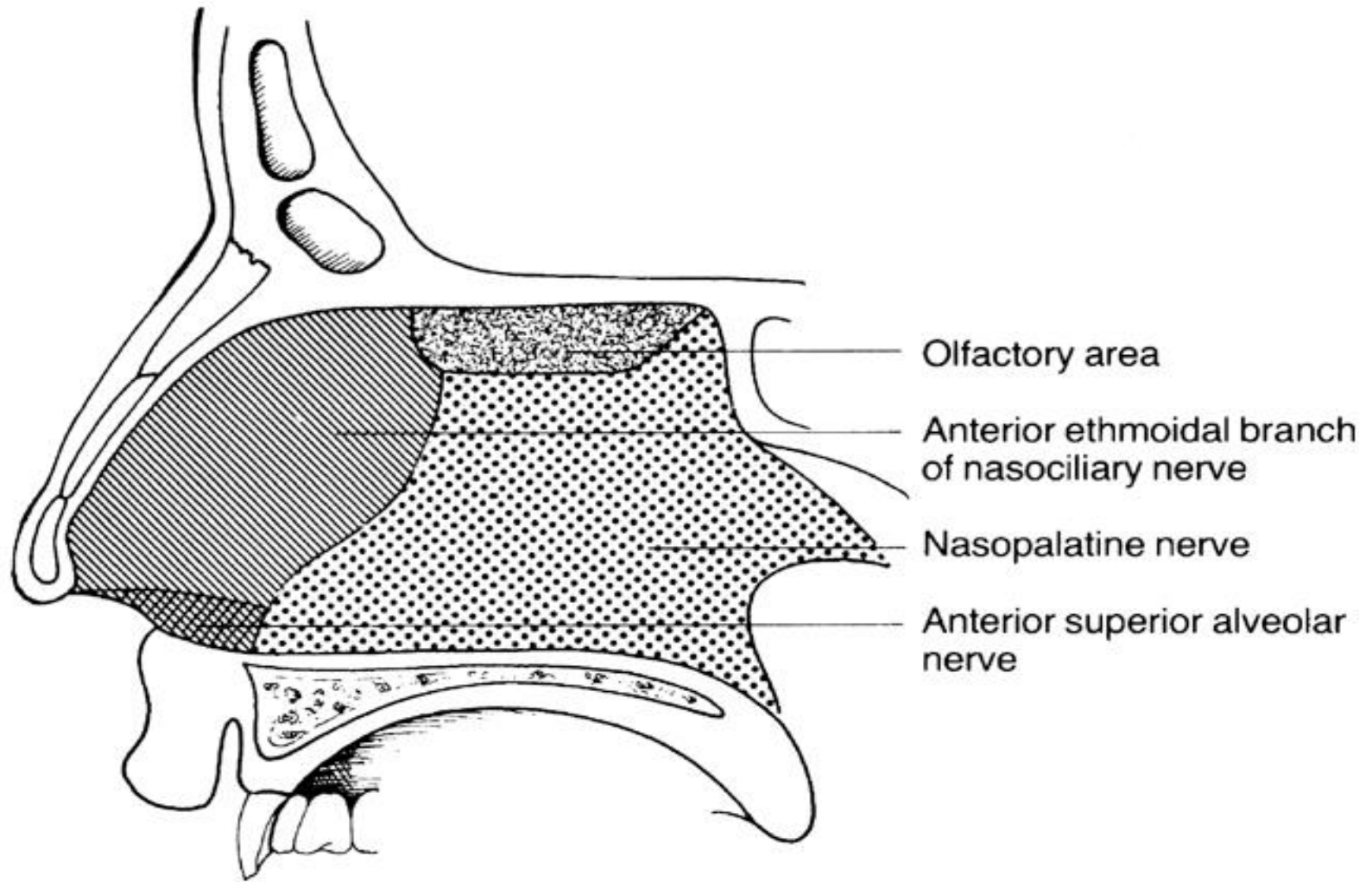




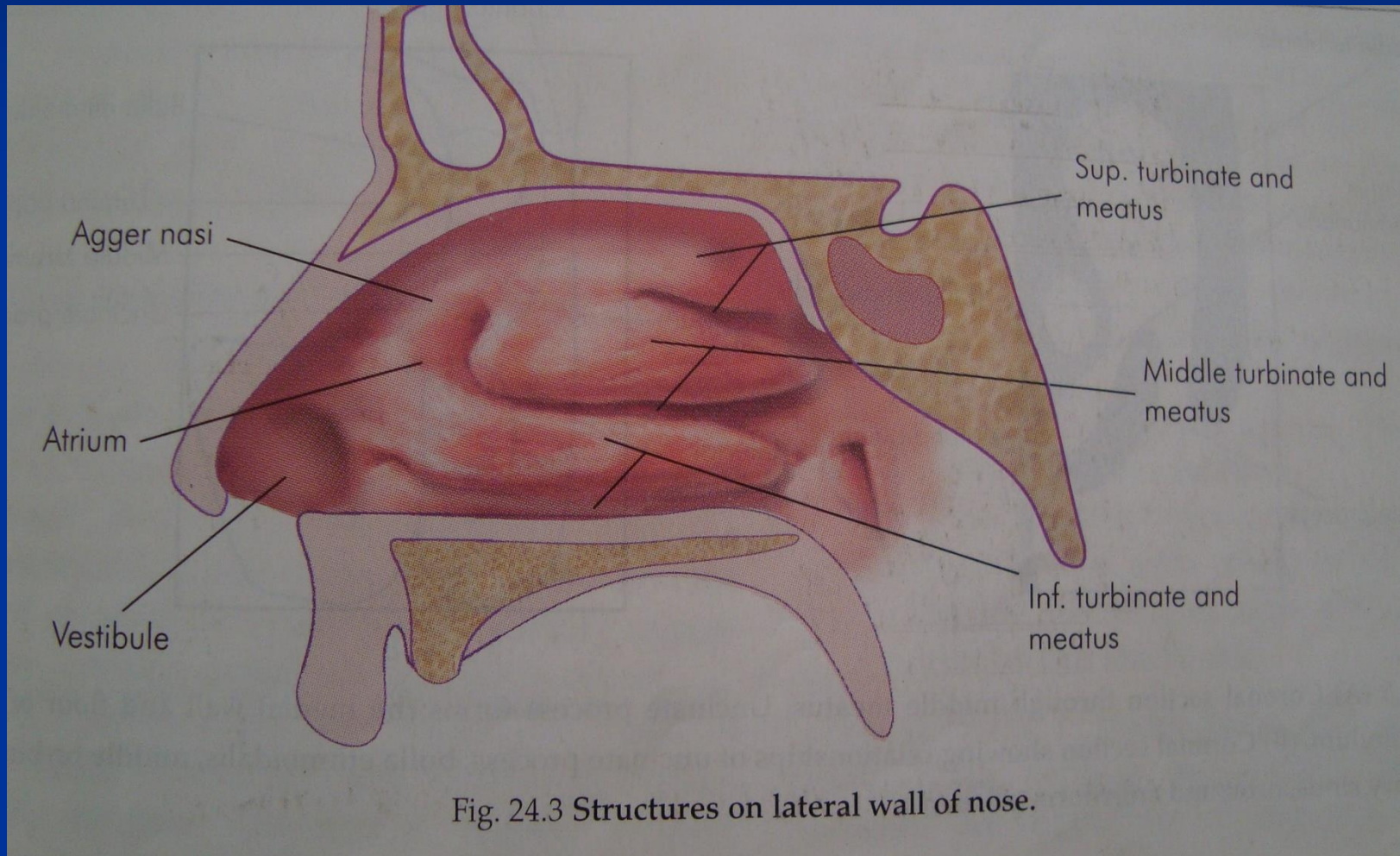
# BLOOD SUPPLY-NASAL SEPTUM

- Little's area: Situated in the antero-inferior part of nasal septum just above the vestibule. Four arteries-anterior ethmoidal, septal branch of superior labial, septal branch of sphenopalatine and greater palatine anastomose here to form Kiesselbach's plexus.

# NERVE SUPPLY-NASAL SEPTUM



# ANATOMY-LATERAL WALL OF NASAL CAVITY



# ANATOMY-LATERAL WALL OF NASAL CAVITY

- Lateral wall is formed by
  - a) Ascending process of maxilla
  - b) Nasal bone
  - c) Ethmoid
  - d) Medial part of maxilla
  - e) Inferior turbinate
  - f) Perpendicular plate of palatine bone
  - g) Medial pterygoid plate

# ANATOMY-LATERAL WALL OF NASAL CAVITY

- *Inferior meatus* - nasolacrimal duct opens in its anterior part.
- *Middle meatus* - frontal, maxillary and anterior ethmoidal sinuses open into middle meatus.
- *Superior meatus* - posterior ethmoidal sinuses open into it.
- *Sphenoethmoidal recess* - Sphenoidal sinus opens into it.

# ANATOMY-LATERAL WALL OF NASAL CAVITY

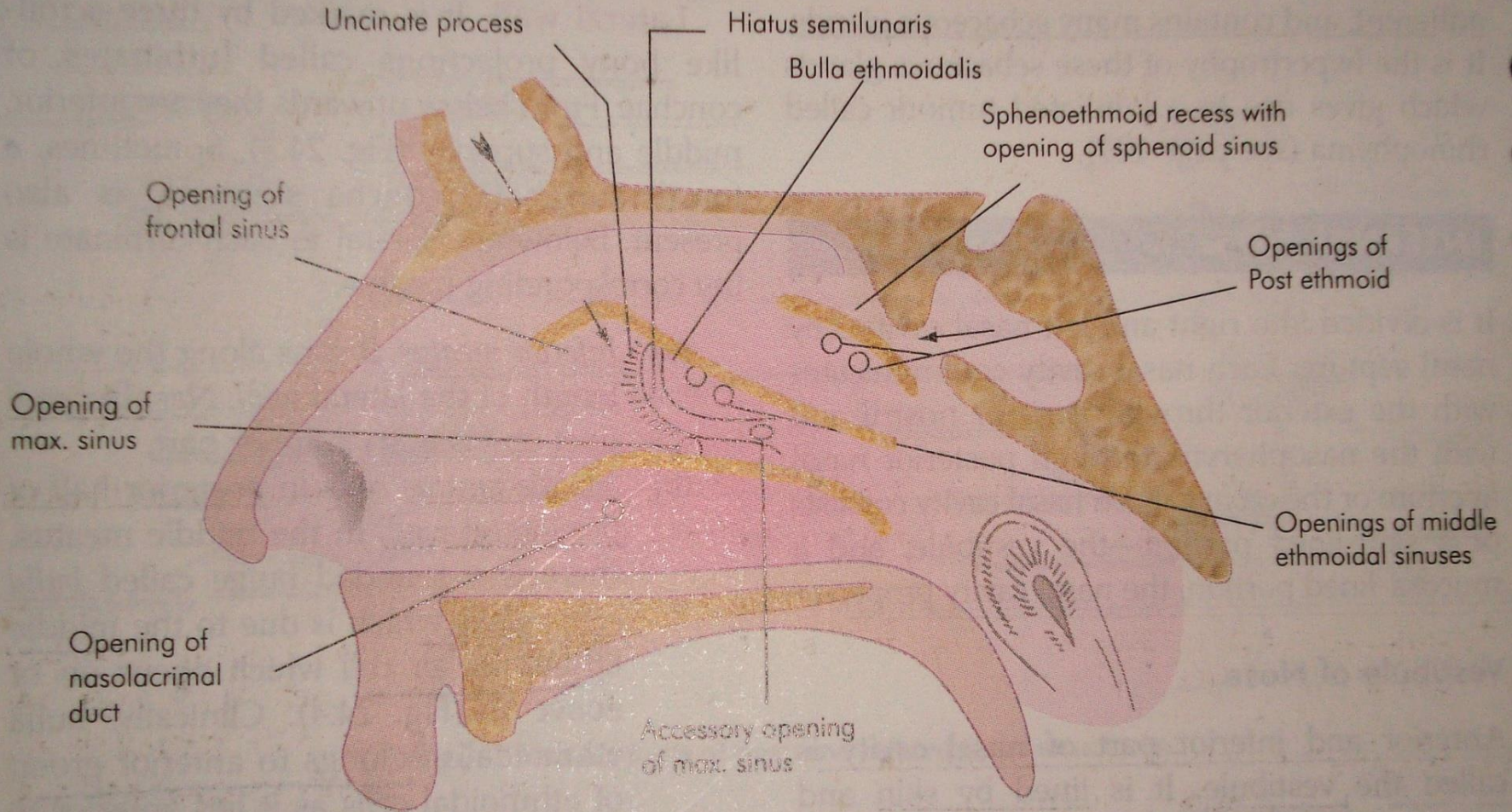


Fig. 24.4 Lateral wall of nose with turbinates removed showing openings of various sinuses.

# SENSORY NERVE SUPPLY-NASAL CAVITY

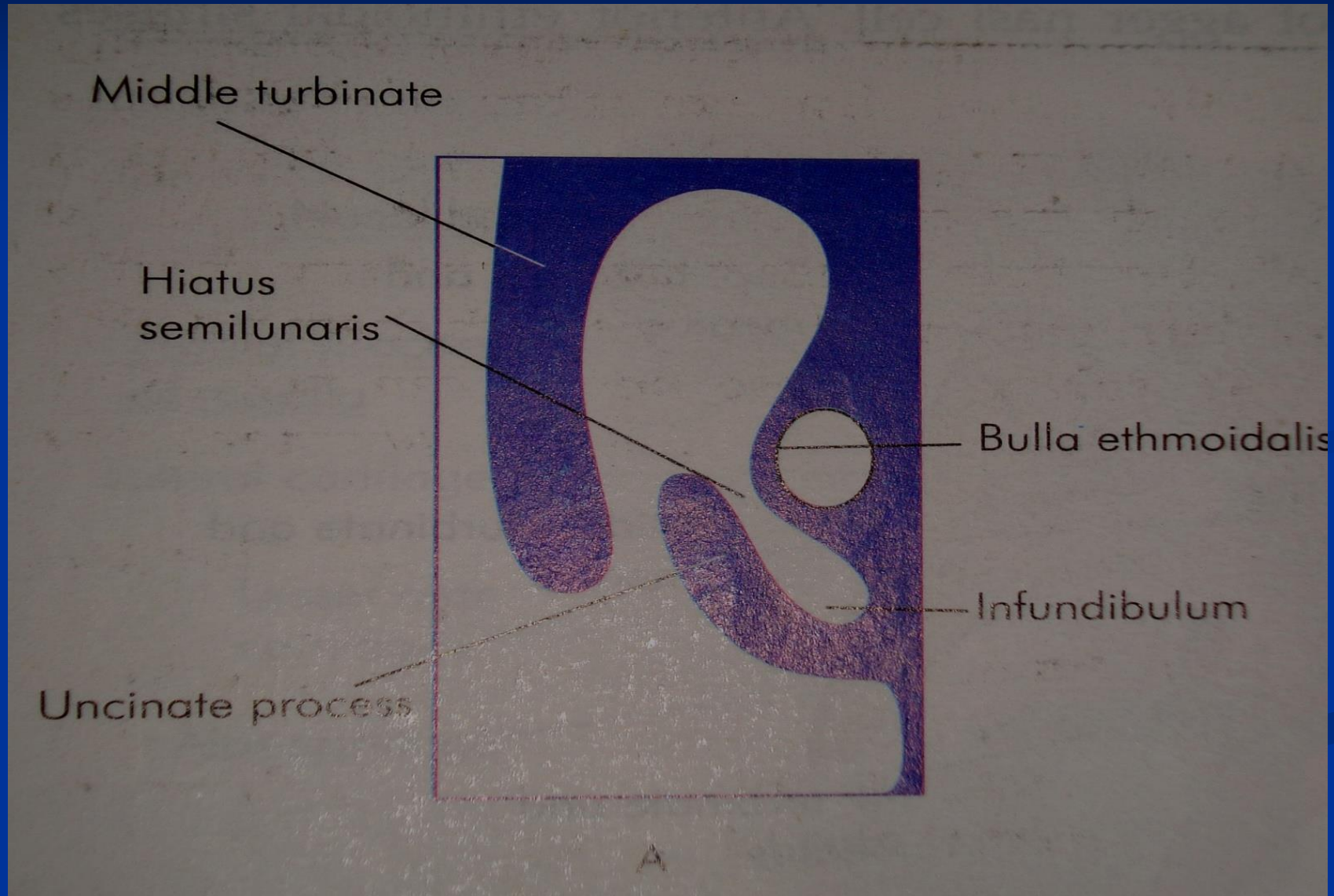
- Trigeminal nerve carries the common sensation via ophthalmic and maxillary divisions.
- Special sensory (smell) carried via olfactory nerves.

# LYMPHATIC DRAINAGE-NASAL CAVITY

- Upper deep cervical nodes drain the nasal cavity directly or via the retropharyngeal nodes.



# OSTEOMEATAL COMPLEX



# OSTEOMEATAL COMPLEX

- The middle meatus is the space below and lateral to the middle turbinate, and is often functionally referred to as the osteomeatal complex. It contains the drainage pathways for the anterior ethmoids, the maxillary and the frontal sinuses.
- The middle meatus is the area that is most commonly involved in the pathophysiology of chronic rhinosinusitis.

# APPLIED ANATOMY

- *Dangerous area of face* - The lower part of external nose and the upper lip. Infection may spread to cavernous sinus through inferior ophthalmic vein via anterior facial vein which have no valves
- *Dangerous area of nose - olfactory area*  
Infection may spread into meninges along the pia and arachnoid sheath of olfactory nerves. This area is also connected to superior sagittal sinus and cavernous sinus by venous channels

# PARANASAL SINUSES-ANATOMY

- These are air filled spaces in certain bones of skull and are in direct communication with nasal cavity through their ostia. They are four on each side divided as
  - a) Anterior group - maxillary, frontal, anterior ethmoidal
  - b) Posterior group - posterior ethmoid, sphenoid

# Maxillary sinus (Antrum of Highmore)

- Largest of the paranasal sinuses
- Pyramidal in shape with base towards lateral wall of nose and apex directed into zygomatic process
- Capacity - 10-20 ML

# FRONTAL SINUS

- Situated in between inner and outer table of frontal bone
- Pyramidal in shape with apex upwards and base is formed by the floor
- Capacity - 5-10 ML

# ETHMOIDAL SINUSES

- Thin walled air cavities in the lateral masses of ethmoid bone.
- Clinically divided into anterior and posterior group

# SPHENOID SINUS

- There are two sphenoidal sinuses in the sphenoid bone divided unequally by a thin bony septum
- Relations-
  - a) Laterally - cavernous sinus containing 3,4,5,6<sup>th</sup> cranial nerves, internal carotid artery, optic nerve
  - b) Superiorly - pituitary gland, optic chiasma, olfactory bulb, frontal lobe
  - c) Inferiorly - nasopharynx and vidian nerve
  - d) Posteriorly - brainstem, Basilar artery



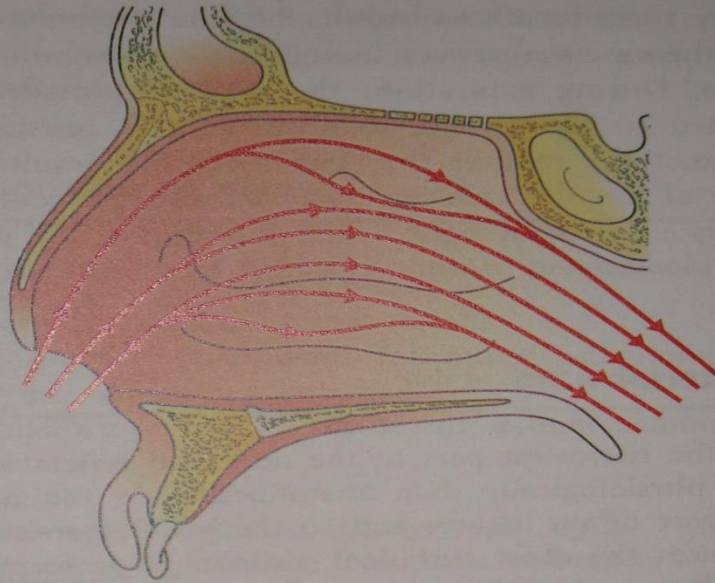
# PHYSIOLOGY OF NOSE

## ■ *FUNCTIONS OF NOSE*

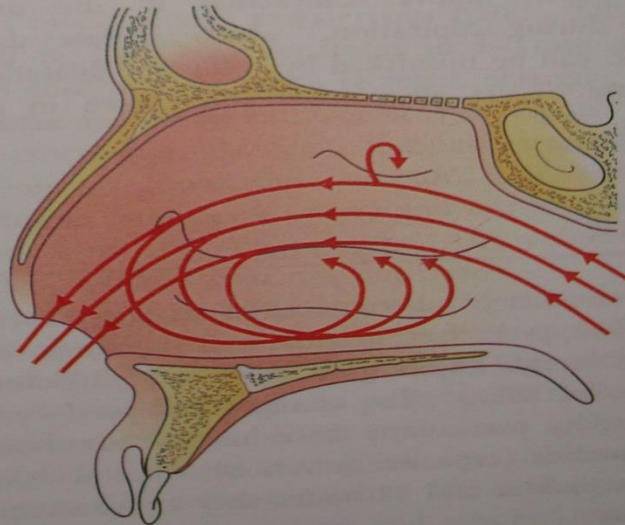
- a) Respiration
- b) Air conditioning
- c) Protection of lower airway
- d) Vocal resonance
- e) Nasal reflex functions
- f) Olfaction

# PHYSIOLOGY OF NOSE

- *Respiration* - during quiet inspiration air passes through middle part of nose between turbinate and nasal septum very little air passes through inferior meatus or olfactory area
- During expiration friction offered at limen nasi converts it into eddies under middle and inferior turbinate and this ventilates the sinuses



**Figure 106.1** The direction of inspiratory airflow.



**Figure 106.2** The direction of expiratory airflow.

# PHYSIOLOGY OF NOSE

- *Air conditioning* - it filters and purifies the inspired air and adjusts its temperature and humidity before it passes on to lungs

# PHYSIOLOGY OF NOSE

## ■ Protection of lower airway

- a) Mucociliary mechanism - secretions form a mucous blanket floating on top of cilia which a constantly beating to carry it like a 'conveyer belt'

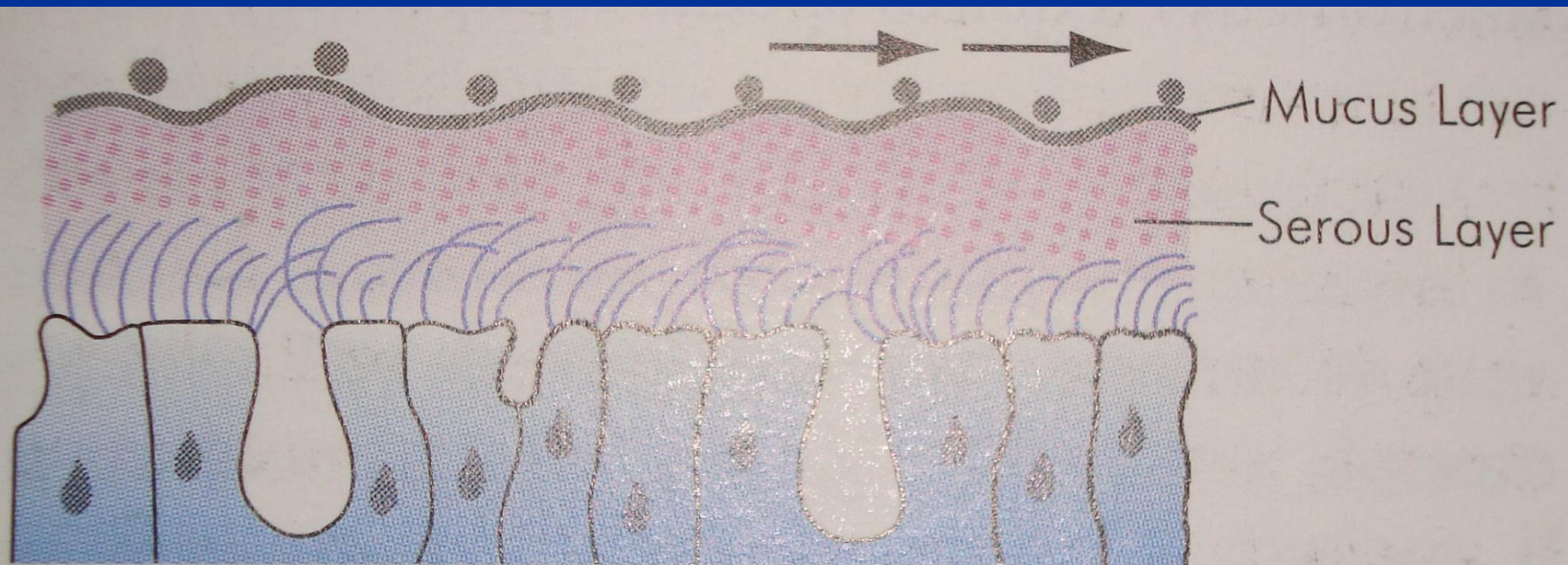


Fig. 25.2 "Conveyor belt" mechanism of mucus blanket to entrap and carry organisms and dust particles.

# PHYSIOLOGY OF NOSE

## *Protection of lower airway*

- b) Enzymes and immunoglobulins  
nasal secretions contain immunoglobulins Ig A and Ig E, interferons and enzyme muramidase (lysozyme)
- c) Sneezing - it is a protective reflex induced by foreign particles which irritate nasal mucosa

# PHYSIOLOGY OF NOSE

- *Vocal resonance*

Nose forms a resonating chamber for certain consonants. In phonating nasal consonants (m/n/ng) sound passes through the nasopharyngeal isthmus and is emitted through the nose

# PHYSIOLOGY OF NOSE

## ■ *Nasal reflexes*

1. Smell of palatable food causes reflex secretion of saliva and gastric juice
2. Irritation of nasal mucosa causes sneezing
3. Nasal function is closely related to pulmonary function through naso-bronchial and naso-pulmonary reflexes



# PHYSIOLOGY OF NOSE

## ■ Olfaction

Plays a critical role in enjoying the taste of food.

## Olfactory pathway

Olfactory area of nose -> olfactory nerves -> mitral cells of olfactory bulb -> olfactory tract -> prepiriform cortex and amygdaloid nucleus

# PHYSIOLOGY OF PARANASAL SINUSES

1. *Air conditioning* of inspired air by providing large surface area over which air is humidified and warmed
2. *To provide resonance to voice*
3. *To protect delicate structures in orbit and cranium*
4. *To lighten the skull bones*