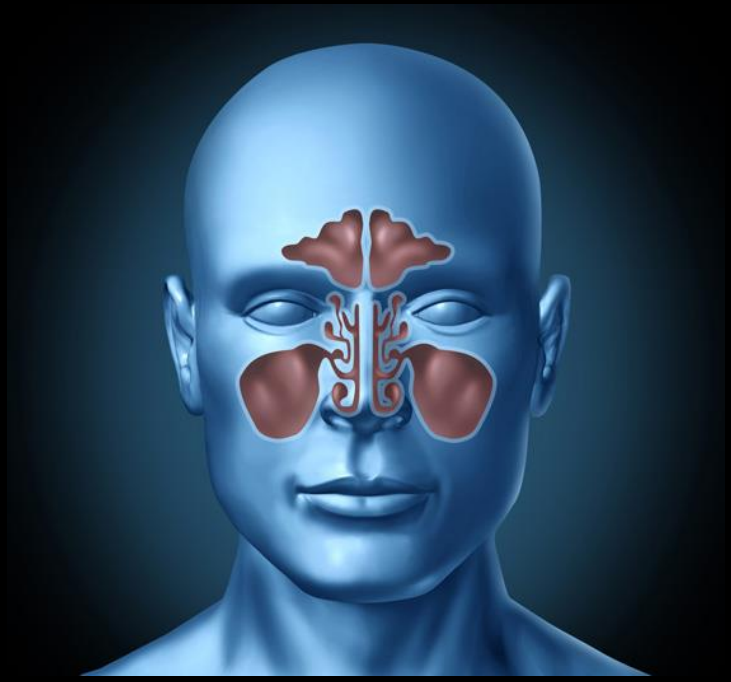
ANATOMY OF THE NOSE & OLFACTORY



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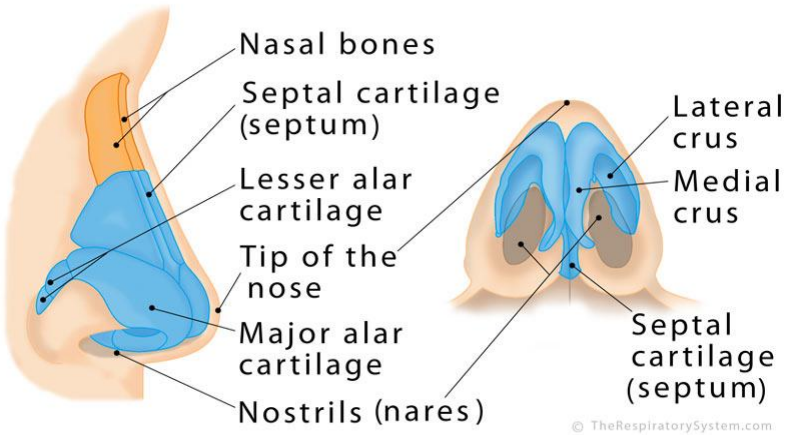
THE NOSE

- The external (anterior) nares or nostrils, lead to the nasal cavity.
- Formed above by bony skeleton.
- Formed below by plates of hyaline cartilage.

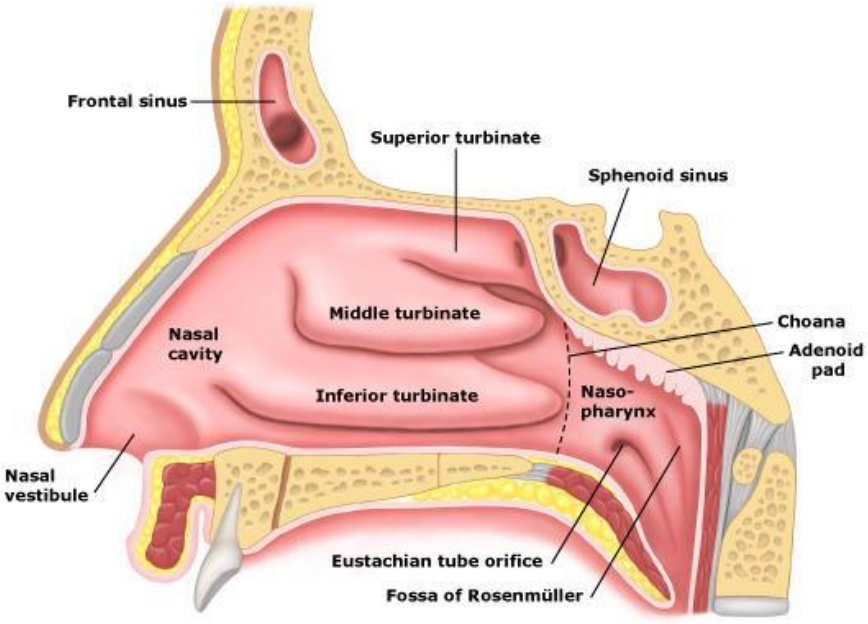


FUNCTIONS

- Olfaction
  - smell
- Respiration
  - breathing
- Warming the inspired air
  - submucous venous plexus
- Filtration of dust
- Humidification of the inspired air
  - Mucous
- Reception of secretions from the paranasal sinuses and nasolacrimal duct.

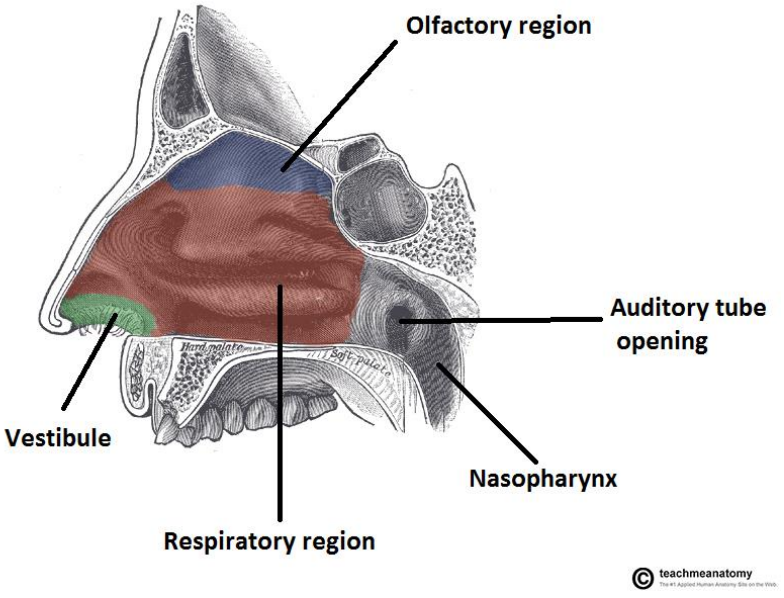
NASAL CAVITY

- It is a large air filled space above and behind the nose in the middle of the face.
- Each cavity is the continuation of one of the two nostrils.
- It extends from nostrils anteriorly to turbinate (Choanae) posteriorly.
- It is divided into right and left parts by the nasal septum.
- It communicates with the nasopharynx posteriorly.
- It consists of Vestibule, Respiratory and Olfactory regions.
- Each contains, roof, floor, lateral and medial walls.



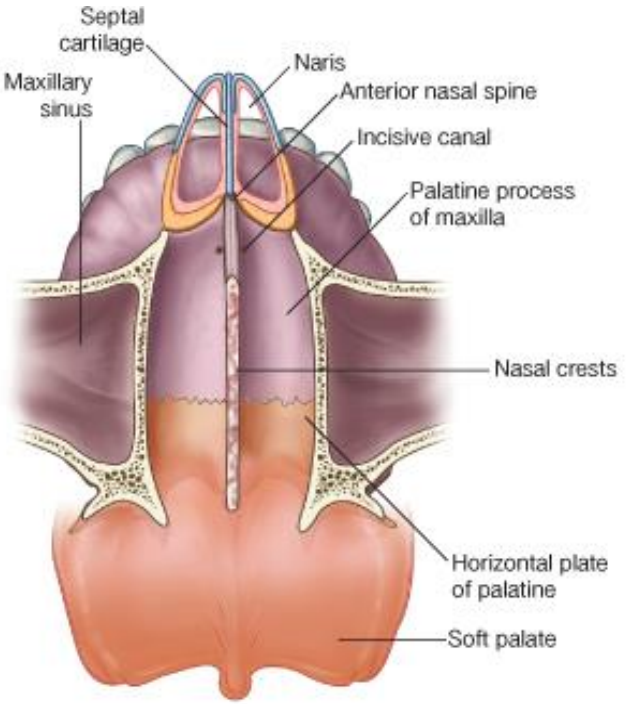
NASAL CAVITY

- **Vestibule Region**
  - The area surrounding the external opening to the nasal cavity
  - Lined by modified skin, provided with hairs, and sebaceous glands, to filter the incoming air.
- **Respiratory Region**
  - The largest and lined with mucous that is continuous with that of Nasal Sinuses, Lacrimal sac, Conjunctiva, and Nasopharynx.
- **Olfactory Region**
  - Located at the apex of the nasal cavity.
  - It is lined by olfactory cells with olfactory receptors.



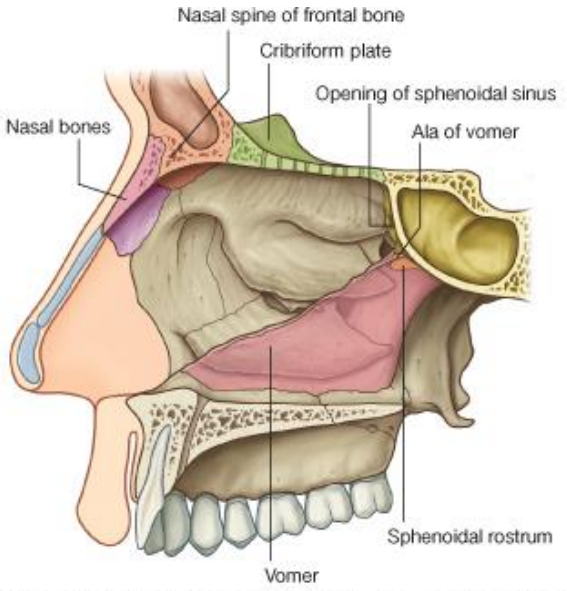
FLOOR

- **It is formed by:**
  - The nasal surface of the hard palate;
    - Palatine process of maxilla.
    - Horizontal plate of palatine bone.



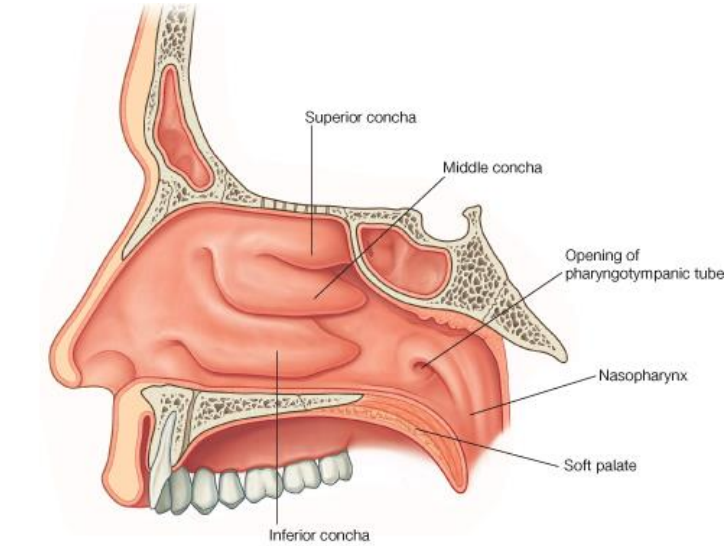
ROOF

- **It is formed by:**
  - Body of sphenoid.
  - Cribriform plate of ethmoid.
  - Frontal bone.
  - Nasal bones.



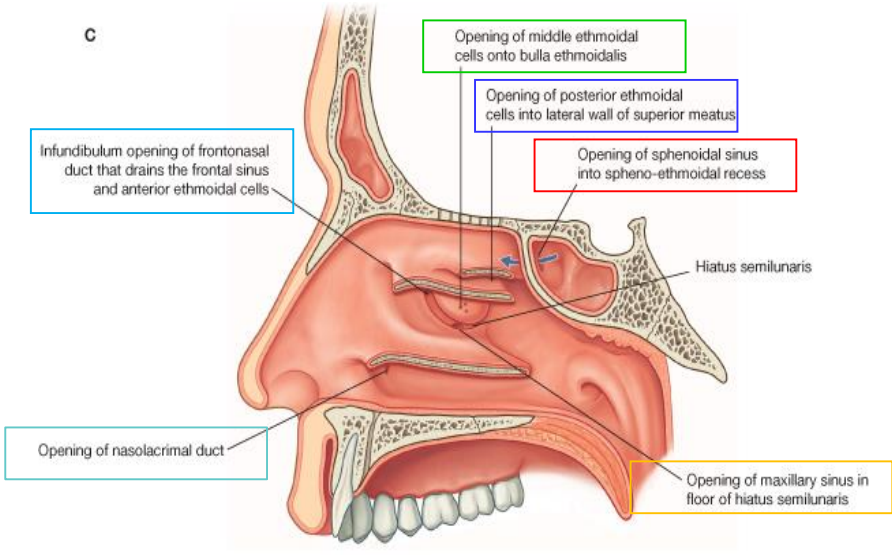
LATERAL WALL

- It is marked by three projections; (nasal conchae)
  - Superior, middle, and inferior nasal conchae
- The space below each concha is called (meatus);
  - Superior, middle, and inferior meatuses.



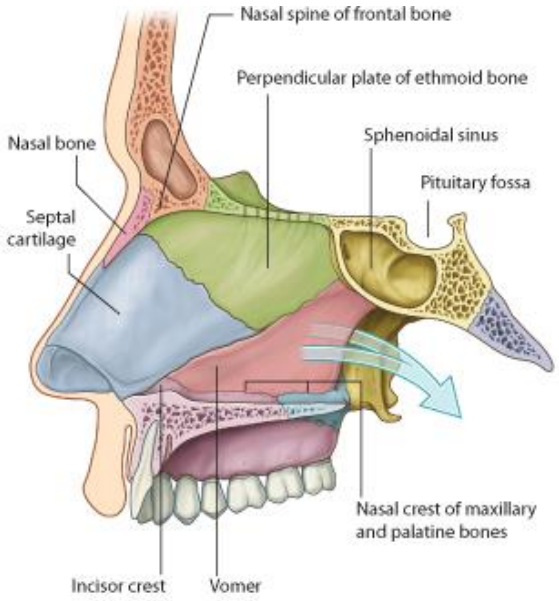
LATERAL WALL

- Sphenoethmoidal recess
  - opening of sphenoid air sinus
- Superior meatus
  - receives openings of posterior ethmoidal sinuses.
- Middle meatus
  - for opening of middle ethmoidal sinus.
- Hiatus semilunaris
  - for openings of maxillary sinus.
- Infundibulum
  - for frontal and anterior ethmoidal sinus.
- Inferior meatus
  - receives opening of nasolacrimal duct.



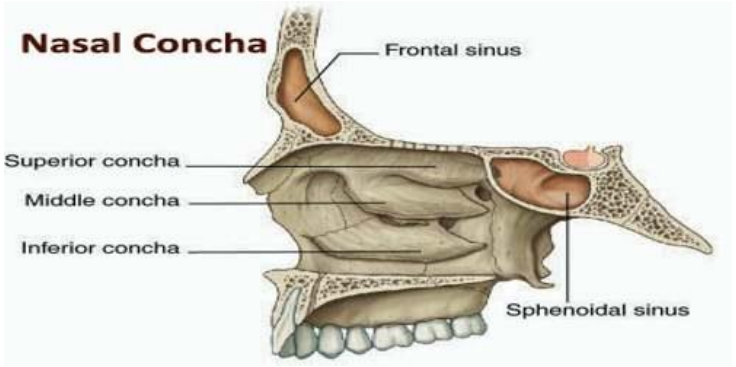
MEDIAL WALL

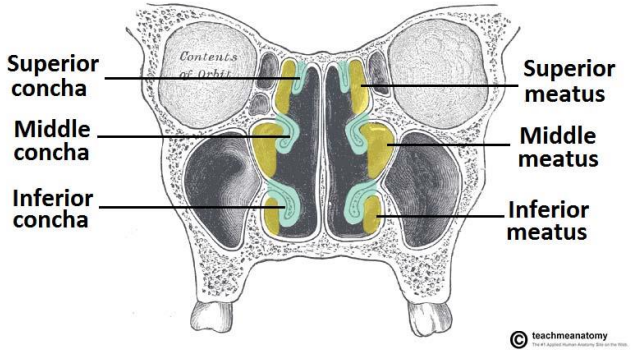
- The nasal septum.
- Vertical plate of ethmoid.
- Vomer.
- Septal cartilage.



NASAL CONCHAE

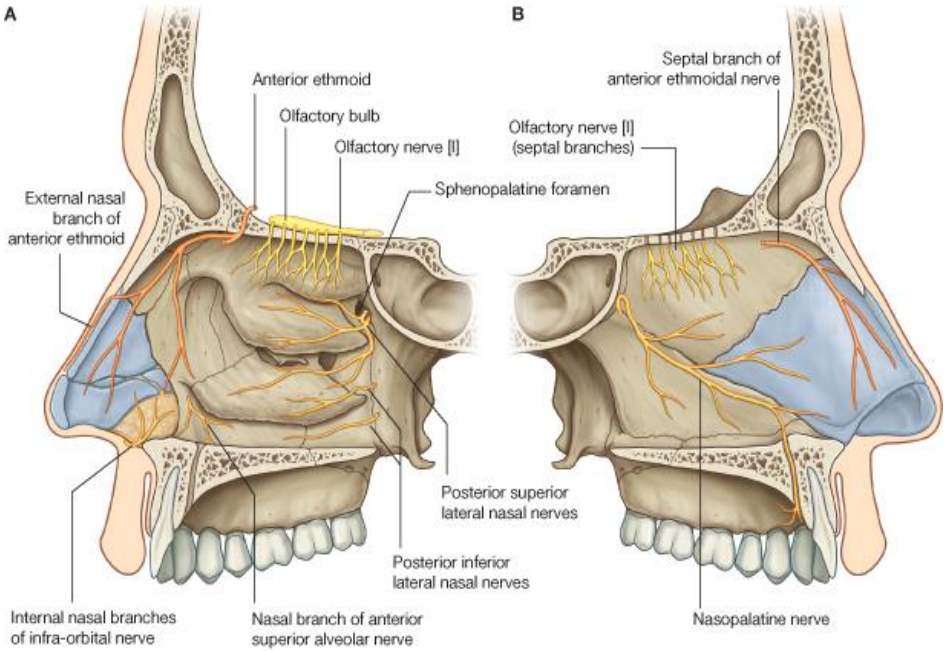
- Projecting out of the lateral walls of the nasal cavity are curved shelves of bone.
- They project into the nasal cavity, creating four pathways for the air to flow. These pathways are called meatuses:
  - Inferior meatus: Lies between the inferior concha and floor of the nasal cavity.
  - Middle meatus: Lies between the inferior and middle concha.
  - Superior meatus: Lies between the middle and superior concha.
  - Spheno-ethmoidal recess: Lies superiorly and posteriorly to the superior concha.
- The function of the conchae is to increase the surface area of the nasal cavity to increases the amount of inspired air that can come into contact with the cavity walls.
- They also disrupt the fast, laminar flow of the air, making it slow and turbulent. The air spends longer in the nasal cavity, so that it can be humidified.





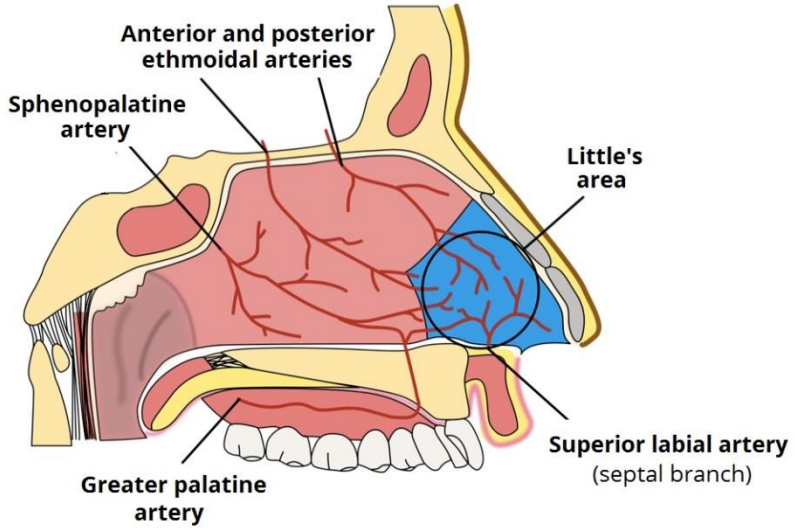
NERVE SUPPLY

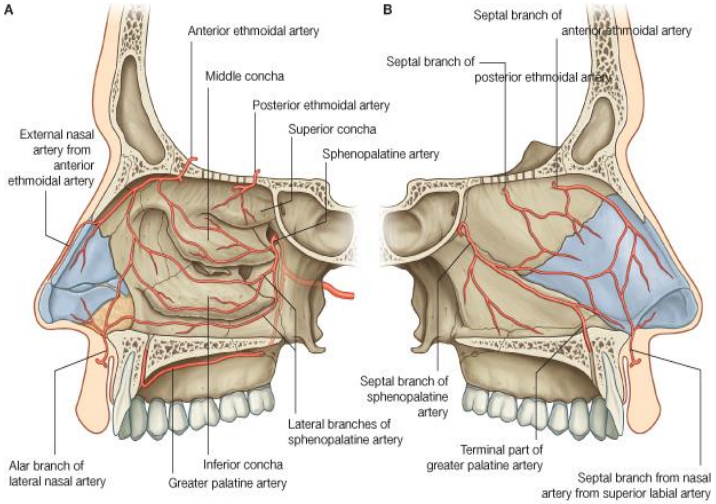
- Nerves of smell:
  - Olfactory Nerves (Cr 1).
- Nerves of general sensation:
  - Ophthalmic and Maxillary divisions of Trigeminal nerve (Cr 5).



BLOOD SUPPLY

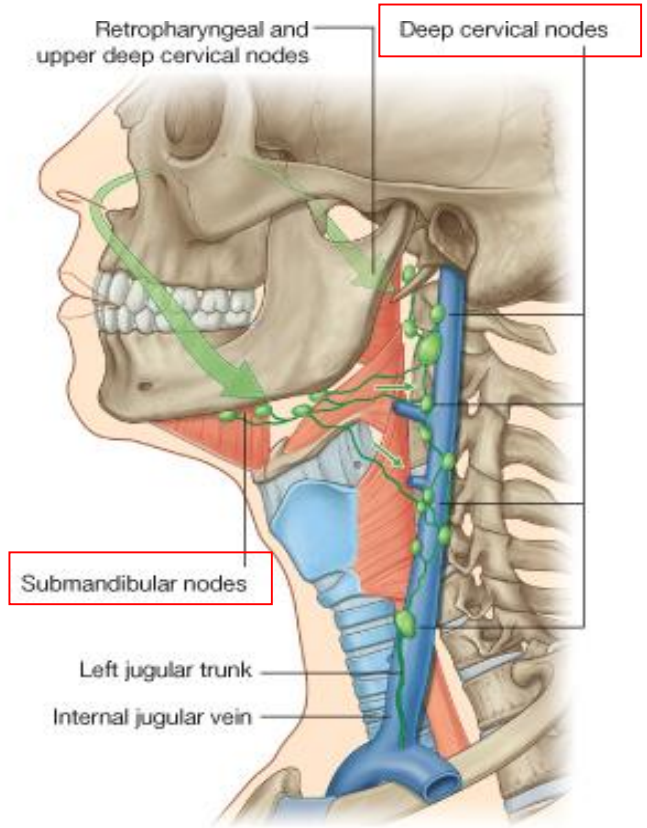
- Arterial supply
  - Internal carotid branches:
    - Anterior ethmoidal artery
    - Posterior ethmoidal artery
    - The ethmoidal arteries are branch of the ophthalmic artery.
  - External carotid branches:
    - Sphenopalatine artery
    - Greater palatine artery
    - Superior labial artery
    - Lateral nasal arteries
- Venous drainage
  - Plexus in submucosa by veins accompany the arteries





LYMPH DRAINAGE

- Submandibular nodes.
- Upper deep cervical nodes.



CLINICAL SIGNIFICANCES

❑ NOSEBLEED

- It is common case due to rich blood supply of the node.
- Most likely occur in anterior third of nasal cavity.
- Cause could be local due to trauma or systemic due to hypertension.

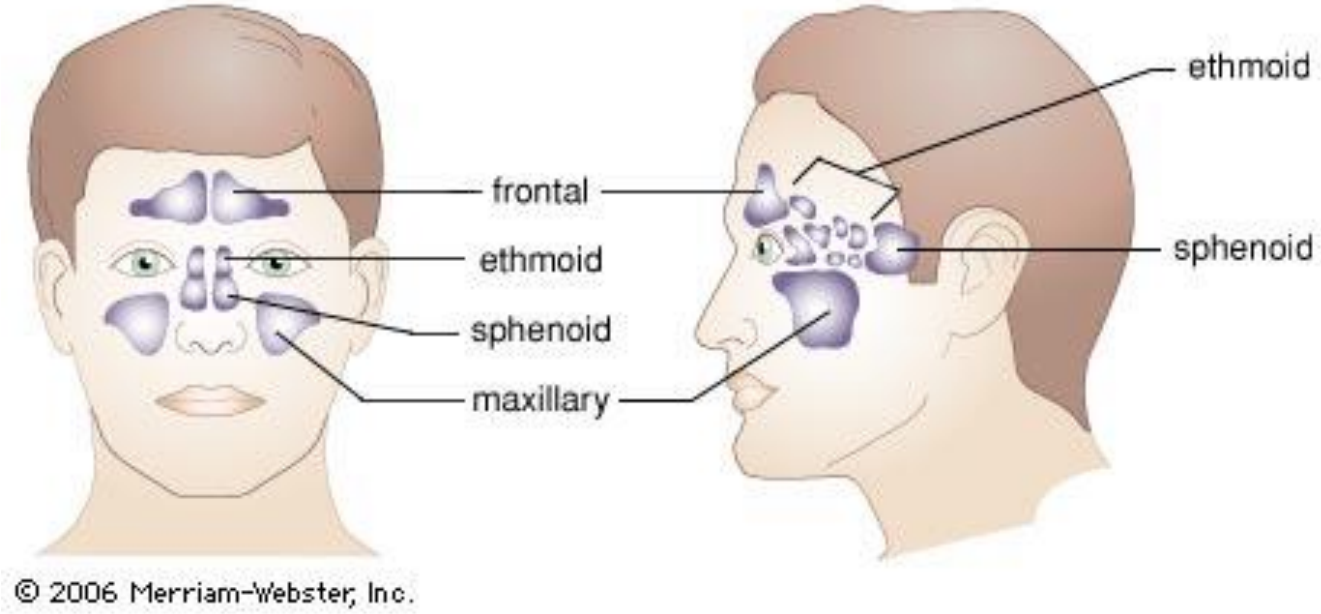
❑ DISEASES OF THE NASAL CAVITY INCLUDE:

- Viral
- Bacterial
- Fungal infections
- Nasal cavity tumors
- Inflammations of the nasal mucosa

PARANASAL SINUSES

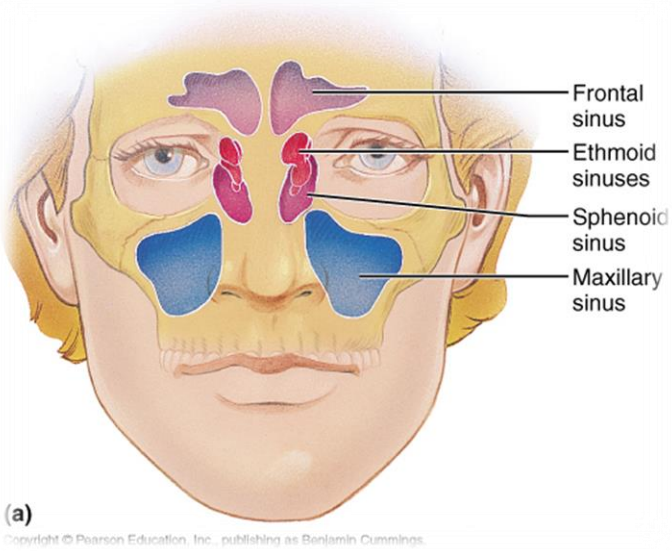
INTRODUCTION

- Paranasal sinuses are a group of four paired air-filled spaces that surround the nasal cavity.



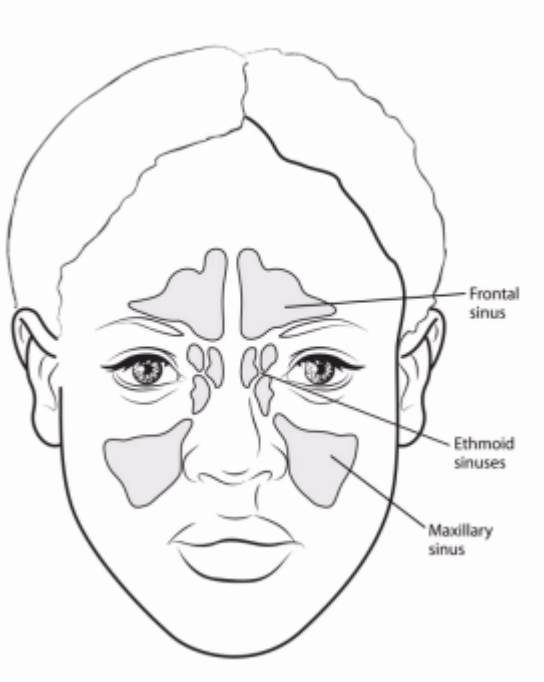
STRUCTURS

- There are four paired of paranasal sinuses, divided into subgroups that are named according to the bones within which the sinuses located:
- The Maxillary Sinuses
  - the largest of the paranasal sinuses, located under the eyes, in the maxillary bones.
- The Frontal Sinuses
  - superior to the eyes, in the frontal bone, which forms the hard part of the forehead.
- The Ethmoidal Sinuses
  - formed from several discrete air cells within the ethmoid bone between the nose and the eyes.
- The Sphenoidal Sinuses
  - in the sphenoid bone.
- The paranasal air sinuses are lined with respiratory epithelium (ciliated pseudostratified columnar epithelium).



FUNCTIONS

- Decreasing the relative weight of the front of the skull, and especially the bones of the face.
- Increasing resonance of the voice.
- Providing a buffer against facial trauma.
- Insulating sensitive structures like dental roots and eyes from rapid temperature fluctuations in the nasal cavity.
- Humidifying and heating of inhaled air because of slow air turnover in this region.



CLINICAL SIGNIFICANCES

Inflammation

- The paranasal sinuses are joined to the nasal cavity via small orifices called ostia. These become blocked easily by allergic inflammation, or by swelling in the nasal lining that occurs with a cold. If this happens, normal drainage of mucus within the sinuses is disrupted, and sinusitis may occur.
- Because the maxillary posterior teeth are close to the maxillary sinus, this can also cause clinical problems if any disease processes are present, such as an infection in any of these teeth.

Cancer

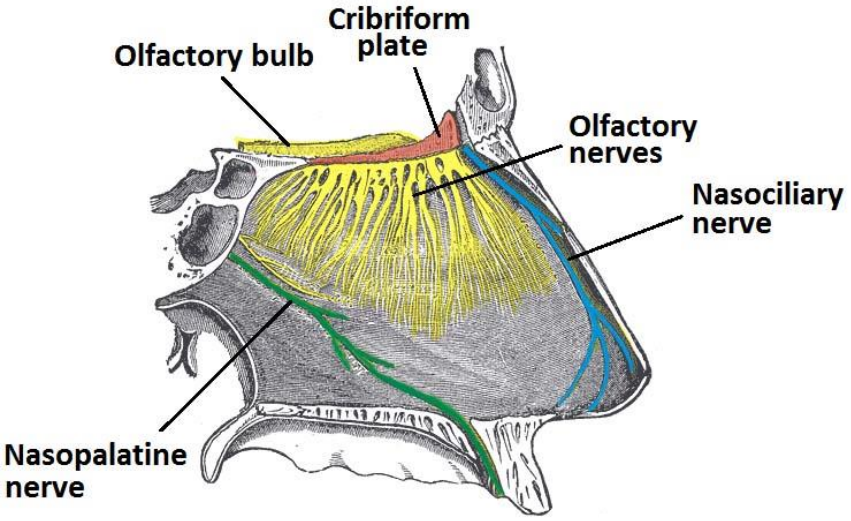
- Malignancies of the paranasal sinuses comprise approximately 0.2% of all malignancies.
- About 80% of these malignancies arise in the maxillary sinus.
- They most often occur in the age group between 40 and 70 years.
- Carcinomas are more frequent than sarcomas.
- Tumours of the sphenoid and frontal sinuses are extremely rare.

OLFACTORY I

SENSORY

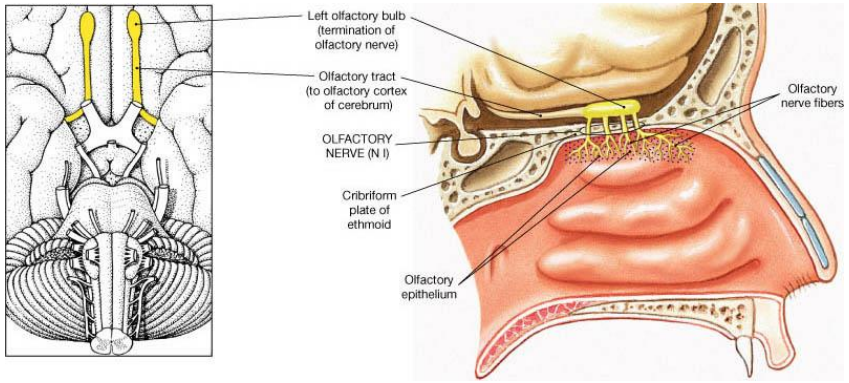
INTRODUCTION

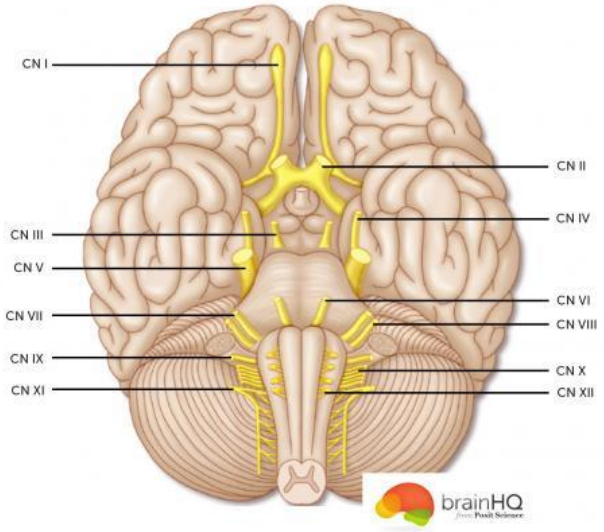
- The first and shortest cranial nerve.
- It is the nerve to transmits special sensory information to have a sense of smell.
- It is one of two nerves that DO NOT emerge from brainstem.
- Elderly people usually have less sensation of smell probably because of progressive reduction in number of olfactory cells.



ANATOMY & FUNCTION

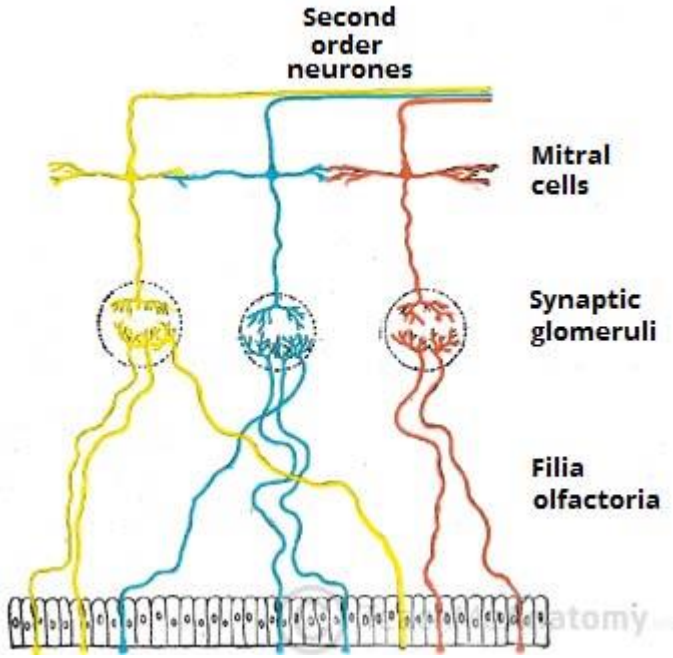
- It passes through the cribriform plate of the ethmoid bone and attached to olfactory bulb.
- The fibres enter the olfactory bulb, which lies in the olfactory groove, within the anterior cranial fossa.
- The olfactory tract runs inferiorly to the frontal lobe.
- Function is to carry afferent impulses for the sense of smell.

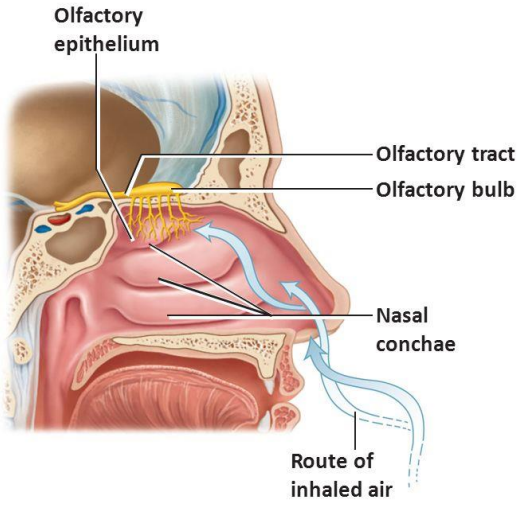




ANATOMICAL COURSE

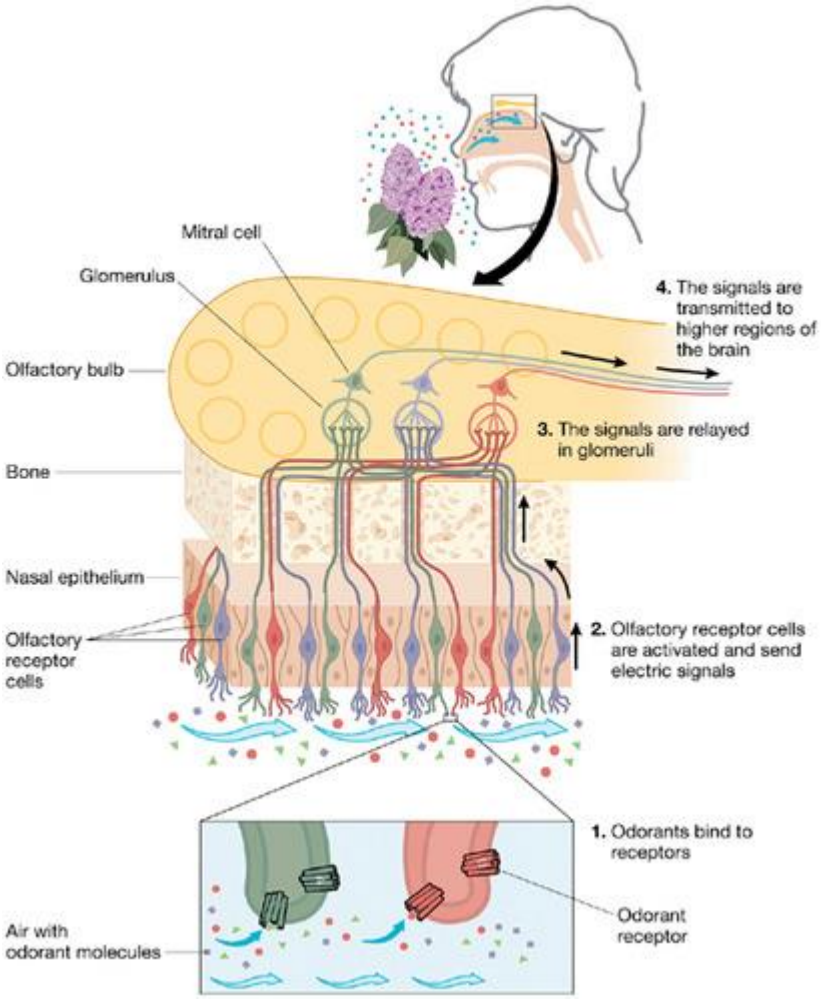
- Once the axon penetrates through the basement membrane, it joins other non-myelinated processes to form the fila olfactoria
  - bundles of olfactory axons.
- They enter the cranial cavity through the cribriform plate of the ethmoid bone.
  - the roof of the nasal cavity.





OLFACTORY BULB

- In the cranial cavity, the fibres enter the olfactory bulb, which lies in the olfactory groove, within the anterior cranial fossa.
- The olfactory bulb is an ovoid structure which contains specialized neurons, called mitral cells.
- The olfactory nerve fibres synapse with the mitral cells, forming collections known as synaptic glomeruli.
- From the glomeruli, second order nerves then pass posteriorly into the olfactory tract.



OLFACTORY TRACT

- The olfactory tract runs inferiorly to the frontal lobe to reaches the anterior perforated substance to divides into medial and lateral stria:
- The lateral stria sends carries the axons to the olfactory area of the cerebral cortex (also known as the primary olfactory cortex).
- The medial stria carry the axons across the medial plane of the anterior commissure where they meet the olfactory bulb of the opposite side.
- The primary olfactory cortex sends nerve fibres to many other areas of the brain, like piriform cortex, amygdala, olfactory tubercle and the secondary olfactory cortex.
- These areas are involved in the memory and appreciation of olfactory sensations.

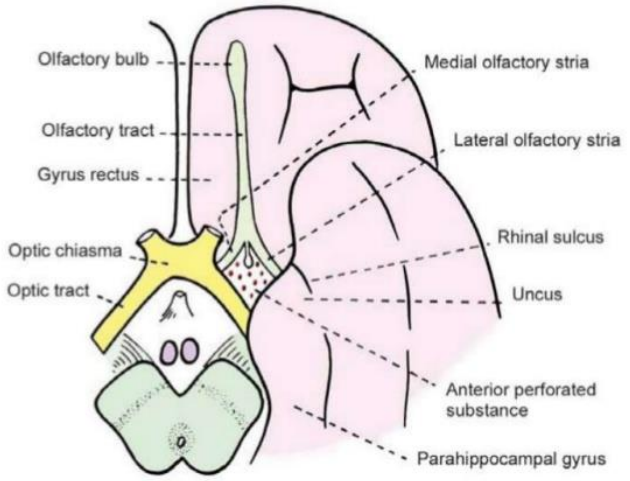
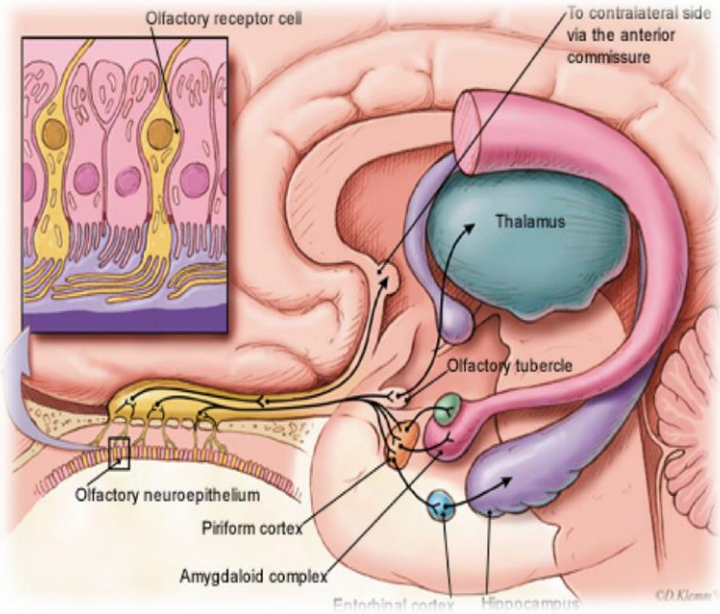
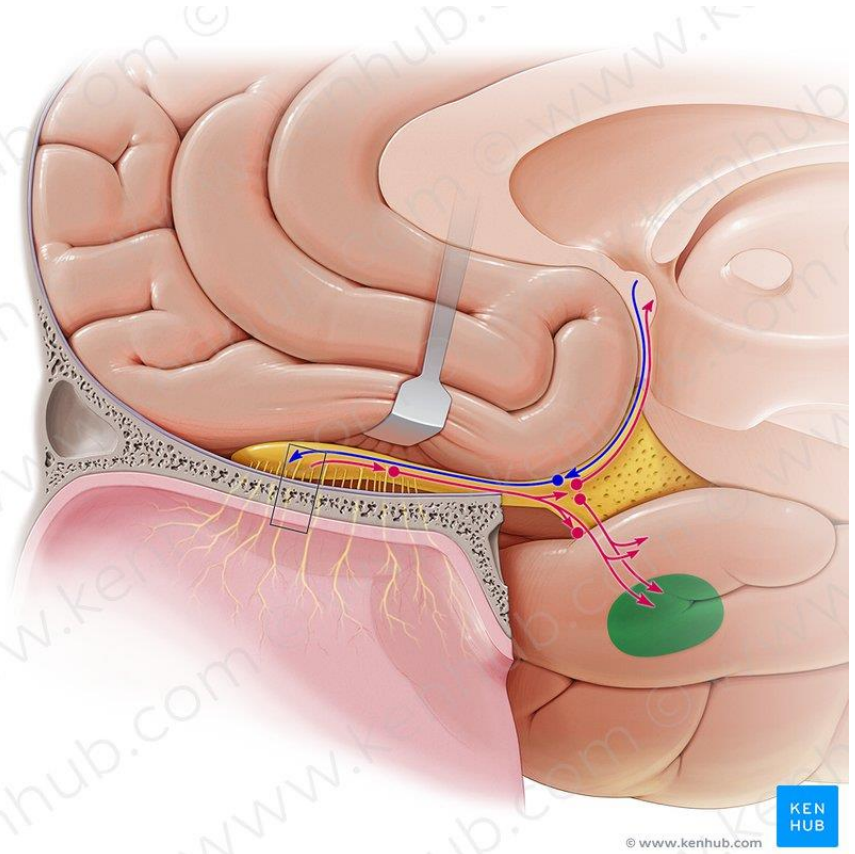


Fig. 16.1. Some structures related to the anterior part of the base of the brain.



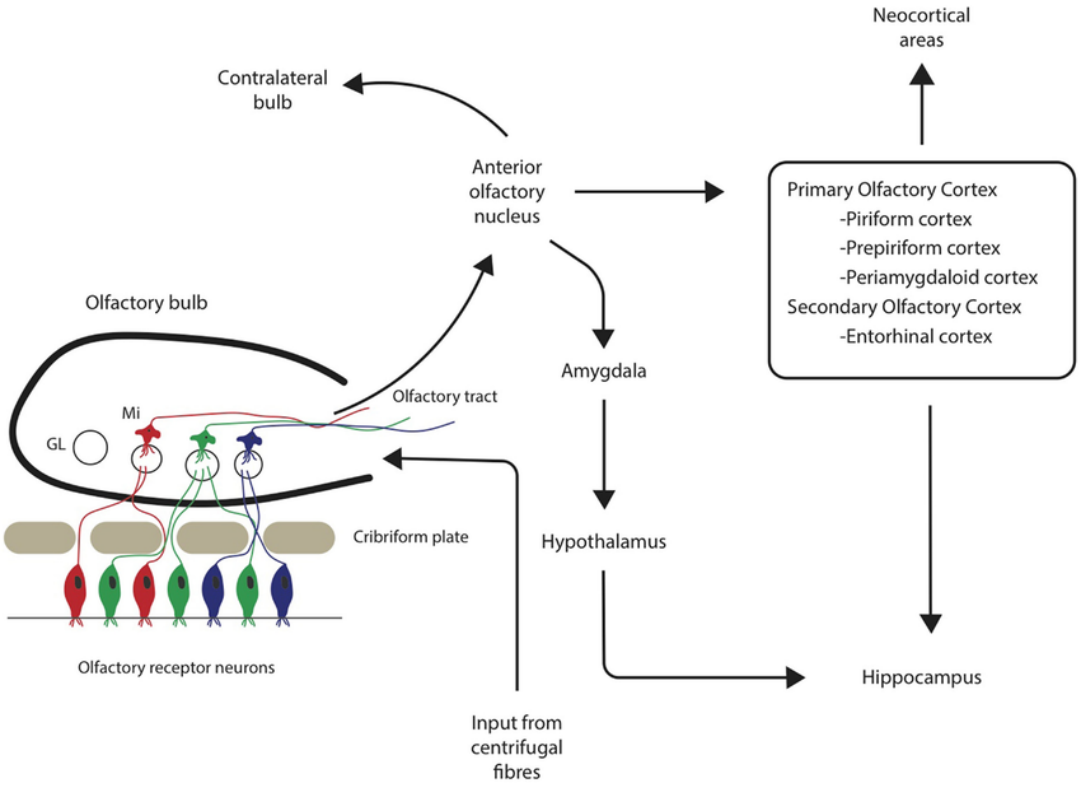
OLFACTORY STRIAE

- Posterior and anterior to the optic chiasm, the olfactory tract on both sides divides into medial and lateral olfactory striae.
- The medial stria projects to the anterior commissure, and then to contralateral olfactory structures.
- The lateral stria continues on to structures associated with the olfactory cortex.



OLFACTORY NERVE PATHWAY

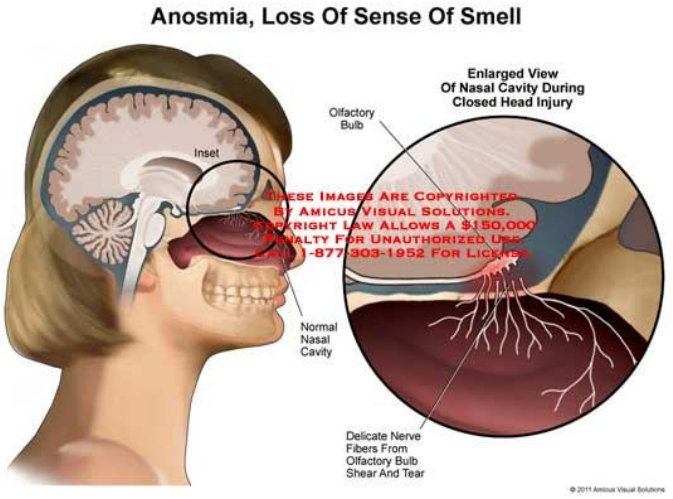
- It is important to note that the olfactory nerve is made up of multiple nerve fibers/rootlets coming from the receptors cells.
- The pathway can be summarized as follows:
  - olfactory receptor cells
  - olfactory nerves
  - olfactory bulb
  - olfactory tract
  - olfactory striae
  - olfactory cortex



CLINICAL SIGNIFICANCE

Anosmia

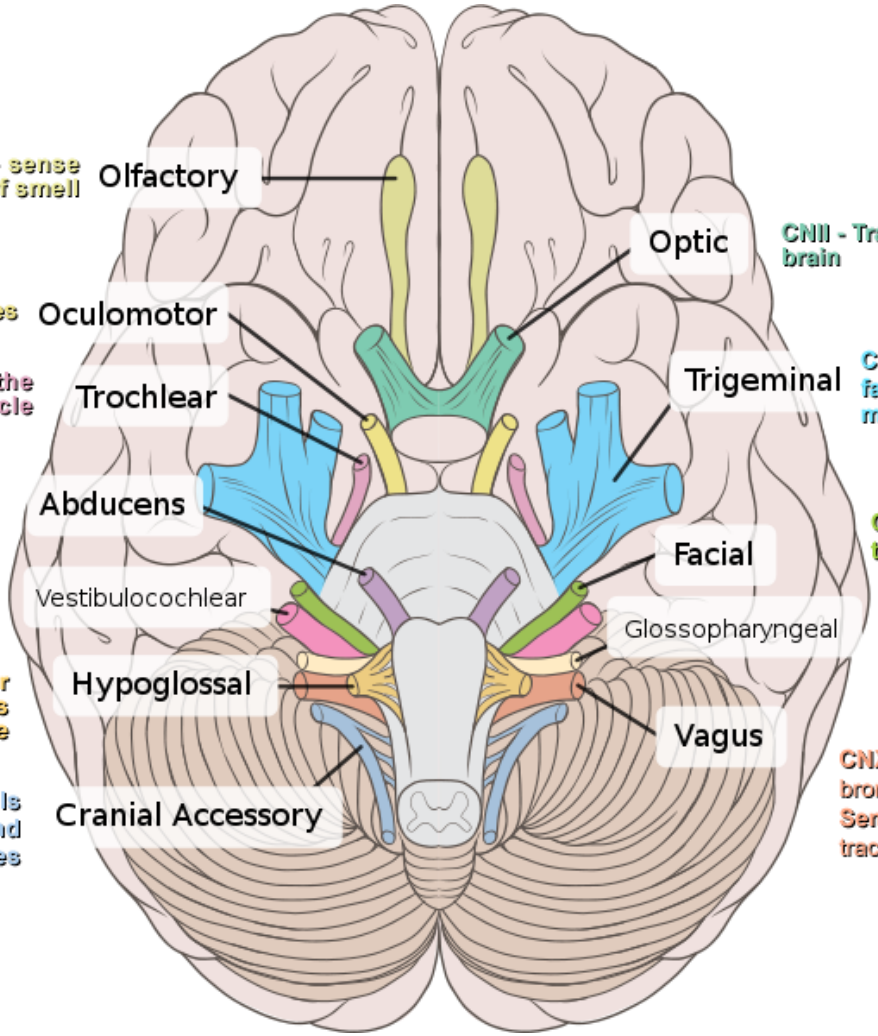
- The absence of the sense of smell.
- It can be temporary or permanent.
- Temporary anosmia can be caused by infection or by local disorders of the nose.
- Permanent anosmia can be caused by head injury, or tumours which occur in the olfactory groove (e.g. meningioma).
- Anosmia can also occur as a result of neurodegenerative conditions, such as Parkinson's or Alzheimer's disease.



CLINICAL SIGNIFICANCE

Dysosmia

- A distortion in the quality of the perception of an odor.
- Sometimes, the perception of an odor when no odor is actually present.
- Damage to olfactory nerve fibers can occur as a complication of upper respiratory tract infections.
- A decrease in the number of nerve fibers from these infections mean that there are not enough different fibers to accurately differentiate odors resulting in parosmia.


CNI - Transmits the sense of smell
Olfactory
Optic
CNII - Transmits visual information to the brain
CNIII - Innervates eye muscles
Oculomotor
CNIV - Innervates the superior oblique muscle
Trochlear
Trigeminal
CNV - Receives sensation from the face and innervates the muscles of mastication
CNVI - Innervates the lateral rectus
Abducens
CNVII - Provides motor innervation to the muscles of facial expression
Facial
CNVIII - Senses sound, rotation and gravity
Vestibulocochlear
Glossopharyngeal
CNIX - Motor: Pharyngeal Musculature
Sensory: posterior part of tongue, tonsil, pharynx
CNXII - Provides motor innervation to the muscles of the tongue
Hypoglossal
Vagus
CNX - Motor: heart, lungs, bronchi, GIT
Sensory: heart, lungs, bronchi, trachea, GIT, external ear
CNXI - Controls sternocleidomastoid and trapezius muscles
Cranial Accessory

QUESTIONS!