

* Respiratory system :- (في GIT لا يوجد)

Organs:

- 1- Nasal cavity / the nose
- 2- Pharynx
 - Nasopharynx
 - Oropharynx
 - Laryngopharynx

3- Larynx

4- Trachea → Dividing into :-

5- Branchi : composed of 3 portions → Primary , secondary & tertiary

↳ Have cartilage (cartilaginous wall)

The (2) primary bronchi → right main bronchus
↳ left main bronchus

6- Bronchioles → Don't have cartilage (unlike the bronchi)

↳ Instead: They are replaced by smooth muscles

↳ Bronchioles يسبب الاستhma (الربو)

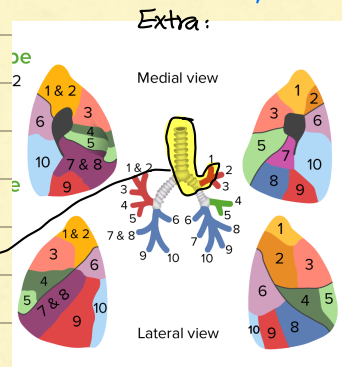
(Bronchi cartilage prevents any closure or narrowing of air passage ways as is the case in asthma)

* each lung contains many branchopulmonary segments :

↳ each one of them has the following:

bronchus (1°, 2° & 3°) → dividing into bronchioles → alveoli

1 Branchopulmonary segment



* each lung contains millions of alveoli (ملايين من الحويصلات)

* each alveolus has an almost circular wall → But when 2 alveoli meet, they form a septum separating them

* each alveolus has its own network of capillaries → For: Gas exchange
(the main function of the lungs)

* Functions of the RS :-

1- Gas exchange (main)

2- Regulation of blood pH → (The blood acidity depends on O₂ & CO₂ amounts)

* arterial blood * (الدم الشرياني) ← RS ← (ناتج من الدم الشرياني)

↳ pH / CO₂ / O₂ (وتنظيم نسبة الـ)

3- Filtration of inspired air

↳ First part after the opening of the anterior nares / nostrils is the: vestibule beneath the ala of the nose



(The ala forms the bulge of the nose seen from outside)

* The vestibule is characterised by having thick & short hairs
↳ (for filtration of air)

* The lining epithelium for the respiratory tract is (Pseudostratified ciliated columnar epithelium with goblet cells)

- From the nose to larynx to trachea to bronchi
- While the bronchides' lining is simple columnar or cuboidal ciliated
- & as long as we move distally through the respiratory tract, the thickness of the cells decreases

(simple columnar ciliated → simple cuboidal ciliated → non ciliated cells)

Simple squamous epithelium: آخر استرني مسطحة
at the respiratory part (for gas exchange)
↳ We call them:
* Clara cells *

so the filtration of air depends on the type of epithelium
↳ For e.g) ciliated: the cilia traps dust & foreign bodies propelling them outside (the cilia moves in one direction)

4- Has receptors for smell & phonation

By: bipolar cells present in the roof of the nose
↳ (olfactory epithelium)
↳ Function: convert the smell into nerve impulses
↳ Transmitted by the olfactory nerve (cranial nerve #1)
↳ Stored in the smell center in the brain

* Pharynx contains:
Vocal cords → True
→ False

* The true vocal cords are the ones responsible for the articulation/phonation

5- Moisturing / warming of air → By the different secretions

So: trapping bacteria & dusts

So: the cold air coming in is warmed

Why? To protect the brain cells if they get exposed to a cold wind, they could be damaged

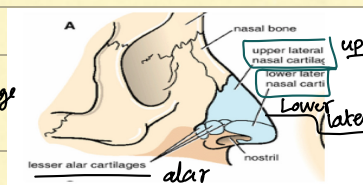
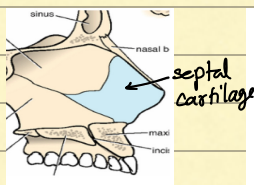
RS organs:-

* The nose: 1- External nose

→ Anterior part (inferior) → Hyaline cartilage

(the cartilaginous parts:)

- Lateral nasal cartilage → upper lateral
→ lower lateral

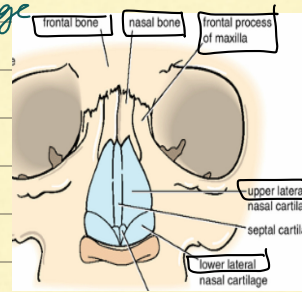


- Alar cartilage (has 2 muscles)
(the bulge) → constrictor → Dilator
- Septal cartilage

↳ Superior part → Nasal bone (2 bones separated by a septum)

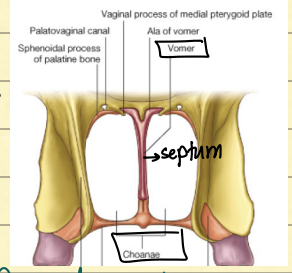
↳ Surrounded by many other bones like:

- Frontal process of maxilla
- Maxillary process of frontal bone



2- Nasal cavity (2 cavities separated by a septum)

- Boundaries:
- Lateral wall
 - Medial wall (the septum) 3 parts
 - Anterior: cartilage
 - Superior: vertical plate of ethmoidal bone
 - Posterior: vomer
 - Floor
 - Roof



- 2 openings:
- Anterior nares / nostrils
 - Posterior nares / nostrils (called: choana)
 - ↳ Open to the nasopharynx
 - ↳ 2 choanae separated by a septum formed by: the vomer

* Blood supply of the external nose.

- ↳ ophthalmic artery → Branch of the internal carotid
- ↳ maxillary artery
- ↳ Facial artery → Branches of the external carotid
 - ↳ When it reaches the face it gives 3 branches: one of them is the labial
 - superior
 - inferior
 - ↳ Gives the nasal artery

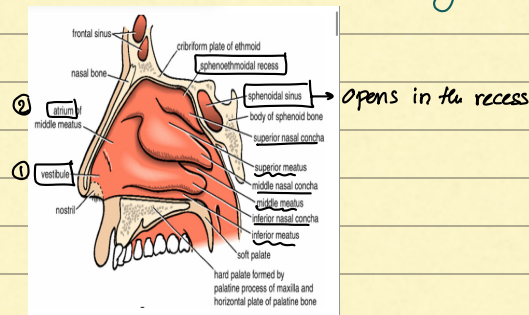
So: External carotid → Facial → superior labial → Nasal ★

* Nerve supply of the external nose:

- ↳ Infraorbital nerve → End branch of the maxillary nerve
- ↳ External nasal nerve
- ↳ Infraorbital nerve → Gives 3 branches: ① Palpebral ② Nasal ③ Labial
- ↳ (While the supraorbital is a branch of the ophthalmic nerve → but isn't related to the nose)
- ↳ Branches of the ophthalmic nerve → branches of the trigeminal nerve
- ↳ When it exits from the infraorbital foramen

* Lateral wall of the nasal cavity:

- ↳ Vestibule → begins with it. → air: ① Thick & short hairs for air filtration / ② Type of epithelium: skin (keratinised)
- ↳ Antrum (atrium) → the 2 anterior parts
- ↳ 3 conchae → They are extensions of the bones in the lateral wall → WHY? to ↑ surface area of the lateral wall
- ↳ 3 meatuses
- ↳ 1 recess: Sphenoethmoidal recess → function: Drainage of the sphenoid air sinuses



* Functions of the nasal cavity

- Respiration (passage of air)
- Smell sensations (olfactory)
- Resonance of the voice (رنين الصوت / رنين)

↳ Due to the paranasal sinuses ⇒ 12 in # → - 2 frontal (in the frontal bone)

- 2 maxillary (in the maxilla)
- 2 sphenoidal (in the sphenoid bone)
- 6 ethmoidal → (1-Middle, 2-Anterior, 3-Posterior) 3 on the right, 3 on the left
- These sinuses are filled with air
- They have ducts that open in the lateral wall of the nose

↳ Drainage of lacrimal fluid

* Lacrimal gland is in the lateral side of the roof of the orbit

↳ Function: secretion of tears ⇒ the tears clean the cornea (غسل القرنية بدموع)

* Then tears go to: either The skin under the eye

OR, Mostly to the lacrimal sac (in the medial angle of the eye)

Sometimes when babies cry,

the mother notices redness under

the eye followed by an infection

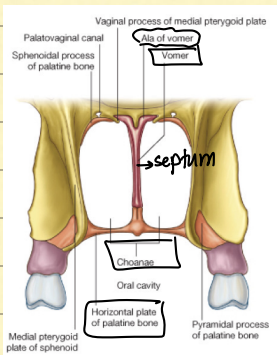
- Lacrimal sac has no drainage

- Nasolacrimal duct is blocked

↳ So: we open this duct (easy case!)

↳ Nasolacrimal duct opens in the inferior meatus

↳ Protection → By sneezing, filtration, proteolytic enzymes secreted by the glands, warming and moistening of air



* Remember the choanae: the 2 posterior openings in the nasal cavity that open in the nasopharynx

* Boundaries:

* the medial wall (the septum): formed by the vomer

* the base/the floor cavity: formed by the palatine bone (the horizontal plate)

* Lateral wall: medial pterygoid plate of the sphenoid bone

* the roof: medial pterygoid plate + palatine bone + foramen + ala of vomer

* Boundaries of the nasal cavity:

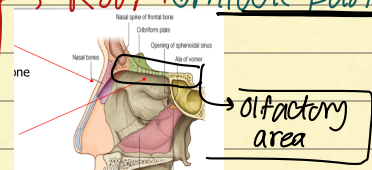
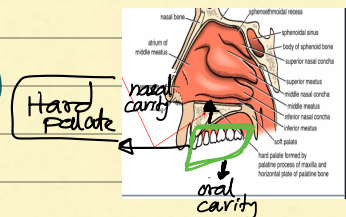
↳ Floor: Hard palate (separating the nasal cavity from the oral cavity)

↳ composed of: - Palatine process of maxilla

- Horizontal plate of palatine bone

↳ Roof: ① middle part (cribriform plate) / ② Anterior (nasal bone) / ③ Posterior

(Sphenoid bone + vomer + vaginal process of palatine bone)



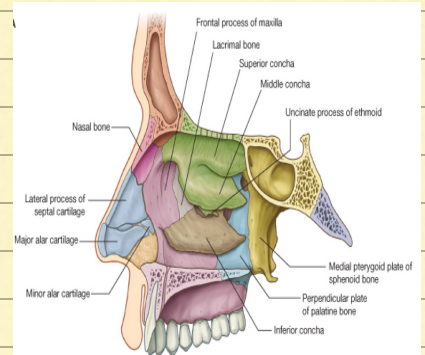
Olfactory area, below the cribriform plate of ethmoid

↳ Imp!! because this area contains the bipolar cells for smell sensation

- Medial wall (septum):
- 1- Vomer
 - 2- perpendicular plate of ethmoid
 - 3- The anterior part: Cartilage

→ Lateral wall → is completely supported by bones (like shelves) → The conchae

- * Conchae
- Superior
 - middle
 - Inferior → From the maxilla
- (in the form of a separate bone)
- ONLY the inferior could be seen from the anterior nostril



* Under the conchae → We have meatuses

- * Other bones for support → like :-
- lacrimal bone
 - frontal process of maxilla
 - perpendicular plate of palatine bone

* The lateral wall of the nose has all the layers of the respiratory tract

↓

Mucosa + Submucosa + supporting layer (cartilage) + CT

Submucosa is thick & contains venous plexus → if there's an infection of the nose

↓

Engorgement of blood in the nerves of the submucosa → block
(blood increases in the area of infections to bring more imm cells to fight the infection)

* Superior + middle + inferior meatuses & the recess are very important !! → since they receive the openings of the paranasal sinuses

• Middle meatus ^(وَجِيءُ) → has 2 imp anatomical structures

① Bulla ethmoidalis (bulge from the ethmoidal bone)

↳ Contains the middle ethmoidal sinus
the drainage of the middle ethmoidal sinus (the opening)

② Hiatus similunaris (below the bulla)

↳ is a semicircular groove

↳ receives the openings of

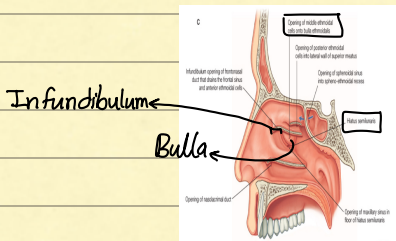
- * Maxillary air sinus
 - * Anterior ethmoidal air sinus
- (in the ant part of the hiatus)

* All are in the middle meatus

(in the middle meatus)

* The small area anterior to the hiatus similunaris → is called: The infundibulum (anterior to the opening of the anterior ethmoidal air sinus)

↳ receives the opening of the frontal air sinus



- * Paranasal sinuses → where do they open :-
 - Frontal sinus → infundibulum (middle meatus)
 - Anterior ethmoidal sinus → Ant part of hiatus semilunaris (middle meatus)
 - Middle ethmoidal sinus → the bulla ethmoidalis (middle meatus)
 - Posterior ethmoidal sinus → superior meatus
 - Maxillary sinus → hiatus semilunaris (middle meatus)

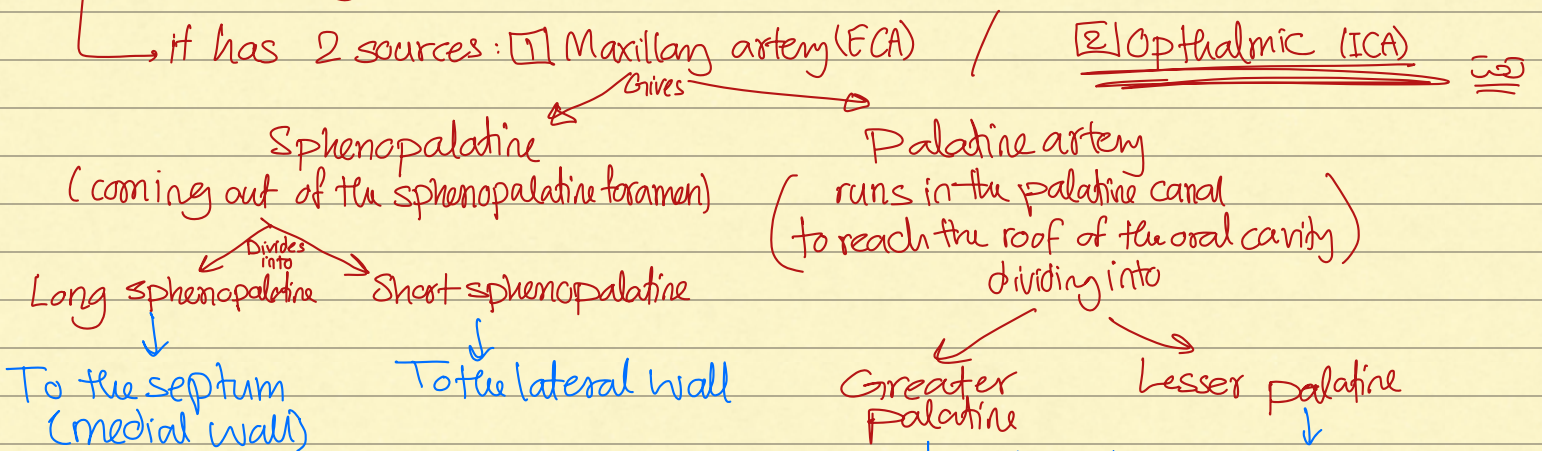
Attention: Frontal & Anterior ethmoidal
 فيسوسا فيسوسا لسان

* All sinuses are imp in the resonance of voice (12 sinuses)
 ↳ & all of them have ducts that descend downward ^{80°} → easy drainage
 - except: the maxillary, its duct ascends superiorly (its opening is high up) *Bad drainage*
 ↳ so: if there's an infection it will stay inside
 ↳ May lead to: fistula formation - opening on the oral cavity
 (since the maxillary sinus is behind the upper last molars)
 ↳ the mouth becomes filled with pus with a very bad smell
 عوزا لسان اذا خلج طبب الانسان
 ال last molars
 فوالا لسان
 فوالا لسان

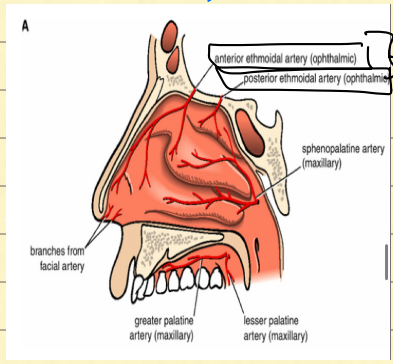
* Type of epithelium in the nose :-
 Pseudostratified columnar epithelium

Except : the vestibule + the olfactory region (in the roof)
 ↳ Due to the presence of the bipolar cells

* Blood supply of the nose :- (it's divided into lateral & medial wall - septum)



Note: it's not considered a blood supply of the nose

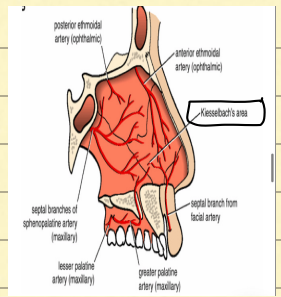


[2] Ophthalmic artery
 ↳ Anterior ethmoidal → Supplies the lateral wall anteriorly & the septum anteriorly → then ends as external nasal
 ↳ Posterior ethmoidal → to the air sinuses + post part of the lateral wall

* Other arteries :-

• Superior labial → branch of the facial (facial → sup labial → nasal)

↳ Gives the nasal artery → Supplies the septum



* Epistaxis: Bleeding through the nose after trauma

↳ This blood is coming from the septum (not the lateral wall)

WHY? BC the septum has the (Kiesselbach area) → anastomosis 1 جاذ ← 3-4 arteries ← سِتْرَكْ هِجْ

* This area is located between the upper 2/3rds & the lower 1/3rd of the septum

* Main arteries responsible for the bleeding/epistaxis:

[1] Nasopalatine (long sphenopalatine) → Branch of the sphenopalatine of maxillary artery (septum) الجاذ : سِتْرَكْ

[2] Superior labial (from the facial) → through a septal branch

How to deal with it? Avoid lying down → كَيْ يَبْعُ الْوَلْيُ

↳ So: - Sit down

- Pinch a napkin in the vestibule

→ the bleeding continues? → cauterization (كَيْ)

- Silver nitrate

(a chemical substance that stops the bleeding)

* Venous drainage of the nose :-

↳ anterior part → to the facial vein → to the internal jugular vein

↳ Upper & post parts → to the pterygoid plexus of veins (around the lateral pterygoid muscle)

↳ Forming the maxillary vein (Goes to the parotid gland & meets the superficial temporal) → Forming the retromandibular vein

(pterygoid plexus → maxillary → retromandibular) (+superficial temporal) →

* Lymphatic drainage of the nose :

1- Anything on the midline of the nose ⇒ Submental lymph nodes

2- All other structures ⇒ submandibular LNs

* Innervation of the nose :- (3 types)

1- Special sensation (for smell) → in the olfactory region

تخزين جميع المعلومات الروائح

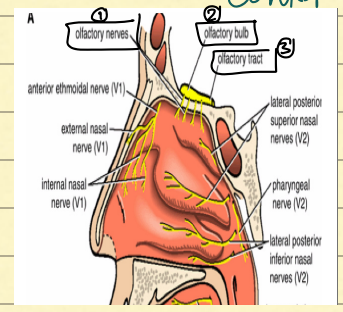
(Bipolar cell ^{قطب}) Filaments of **olfactory nerve** ^{ألياف} → Olfactory bulb → Olfactory tract → Olfactory center

2- General sensations (pain...)

- **Ophthalmic nerve**
 - anterior ethmoidal
 - posterior ethmoidal
- **Maxillary nerve**

↳ similar naming to the blood supply

↳ except for the long sphenopalatine artery
↳ the corresponding nerve is called: Nasopalatine



Sensation to the septum

(recheck the slides → innervation)

examples of some nerve names

- * Palatine nerves → Greater & lesser
- * Nasopalatine → Long & short (runs with the sphenopalatine arteries)

3- Parasympathetic nerves → Secretomotor to the glands in the nose

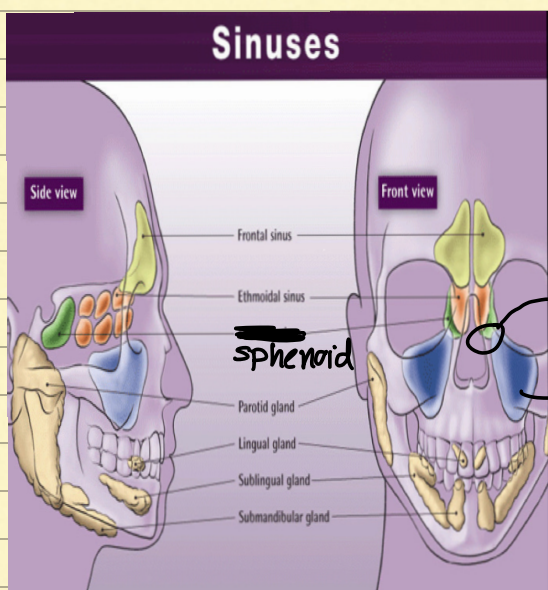
↳ From the facial nerve (through the **greater petrosal nerve**)
↳ (branch of the facial)

- The glands are located in the submucosa region (submucosa)

* Paranasal sinuses : cavities inside the skull bones (frontal, maxillary, ethmoidal, sphenoid)

- Functions:
 - 1- Resonance of the voice
 - 2- Decrease the skull weight
 - 3- Protection

→ All air sinuses at birth are rudimentary (بسيط)
↳ with growth of the face bones as we age → they enlarge



→ its opening (high up) → Bad drainage
↑
→ maxillary

* Frontal air sinus: Pyramidal in shape (above & medial to the orbit)
 ↳ innervation: Branches of the supra-orbital nerve (branch of ophthalmic nerve)
 ↳ Good drainage (comes from above & descends to open downward)
 ↳ Opens at the infundibulum (middle meatus)

* Ethmoidal sinuses (6) → in the form of air cells
 (ant, middle & post) }
 Ant part of hiatus semilunaris } → all are innervated by: 1-Anterior ethmoidal nerve
 ↳ Bulla ethmoidalis } 2-Posterior ethmoidal nerve

* Maxillary → pyramidal in shape → base & apex (in the lateral wall) → Bad drainage may form fistula (in last 3 molars)
 ↳ nerve supply: Maxillary (⊙ infraorbital ⊙ alveolar branches)
 ↳ Relations: to the last upper 3 molars

* Sphenoidal → in the body of sphenoid bone
 ↳ above it: sella turcica (containing the pituitary gland)
 ↳ If there's an invasive tumor → invading the bones → Seen in x-rays → this sinus is affected
 ↳ innervation: posterior ethmoidal / maxillary nerve (via orbital branches)
 ↳ Related to the cavernous sinus (in both sides of sella turcica)
 ↳ Contents: 1- internal carotid artery
 2- Abducent nerve
 3- Oculomotor nerve
 4- Ophthalmic nerve
 5- Trochlear nerve } → On the lateral wall of cavernous sinus

