

وَقُلْ رَبِّ زِدْنِي عِلْمًا



RESPIRATORY SYSTEM

HAYAT BATCH

SUBJECT : Nose,nasal cavity ,paranasal sinuses

LEC NO. : 1

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Tanineh.



Respiratory system

Nose, nasal cavity & paranasal sinuses

By

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Faculty of medicine

By the end of this lecture you must know:

- **Divisions and different parts of respiratory system.**
- **Anatomy of nose and Para nasal sinuses which includes:**
 - 1-External nose and its nerve supply**
 - 2-Nasal cavity boundaries and contents of its lateral wall.**
 - 3-Blood supply and lymphatic drainage of the nose.**
 - 4- Development of the nose and para nasal sinuses.**
 - 5- Anatomy of Para nasal sinuses, drainage and clinical importance**
 - 6-Histology of the nose and paranasal sinuses**

Respiratory system

تنقسم الى two parts :

1 conducting part

2. Respiratory part

* ال RS يبدأ من ايني آخذ هواء ادخله من برا

(من ال Atmospher) ادخله الى مجرى يوصل لل lungs يعل exchange

← ولكن بدى أعرضه وبين مكان ال exchange بالزبط

← ما قبل ال exchange هو

ال Conducting part

ببساطة جدا أنا اول ما اخذ النفس ال nose هو اول من يستقبل ال air وال
paranasal sinuses تدفئ الهواء وينزل غ ال nasopharynx يوصله لل larynx
وال trachea

وبعد كذا ال trachea تنقسم ل Bronchia

← بعدين تنقسم ل

Bronchioles

Preterminal

Terminal

من أول ما الهوا

خاتة على ال Nose

لحد ما وصل

ال terminal bronchioles

ها د ينقسم

Conducting
part
of RS

داي مكان بعد هيك

Respiratory part of RS

The Respiratory System is divided into 2 parts:

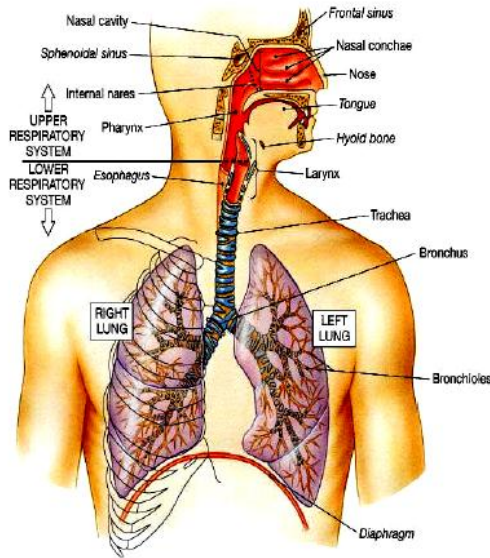


Figure 13.1: Conducting portion of the respiratory system

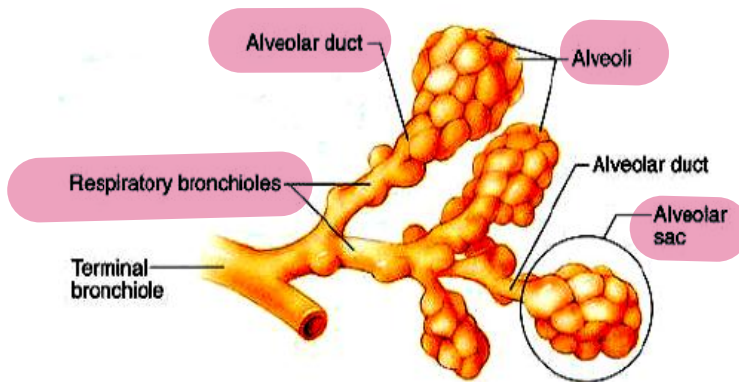


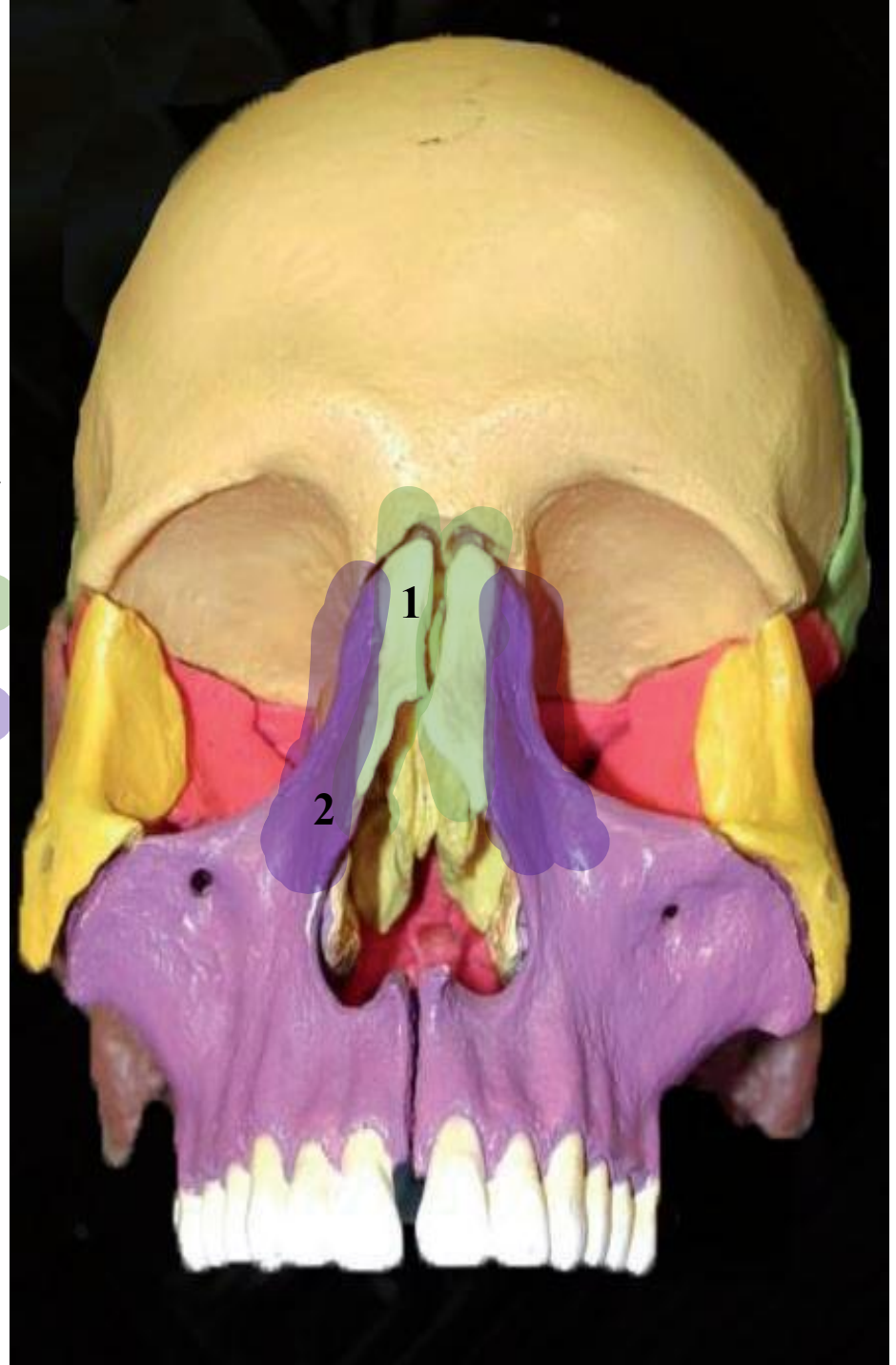
Figure 13.2: Respiratory portion of the respiratory system

المكان الى بيير فيه exchange وهو يتكون من

3 2 1 وهو يتكون من 5 4

Conducting part	Respiratory part
<p>-Nose (nasal cavity & Nasal sinuses.</p> <p>-Nasopharynx, larynx, trachea</p> <p>-Bronchial tree:</p> <p>Extra pulmonary bronchus</p> <p>- Intrapulmonary bronchus</p> <p>-Bronchioles:</p> <p>Preterminal bronchioles</p> <p>Terminal bronchioles</p>	<p>Gas exchange take place</p> <ol style="list-style-type: none"> 1 - Respiratory bronchioles 2 - Alveolar bronchioles 3 - Alveolar ducts 4 - Alveolar sacs 5 - Alveoli

- Its skeletal framework is formed by bones; **nasal bones** + **frontal processes of maxilla**



الكهف

Nasal Cavity

احنا ليا ليا
two nasal cavity
ونقسم في
Nasal septum

The nasal cavity: is the posterior wide part of the nose; divided into **2** halves by **nasal septum**, which making the two nasal cavities.

- Each half has a **roof**, **floor**, **lateral** and **medial wall**.

Sloping = *ساق* → Anterior & Posterior parts of Roof

Boundaries

1-The Roof (sloping):

*It is formed of 3 parts:

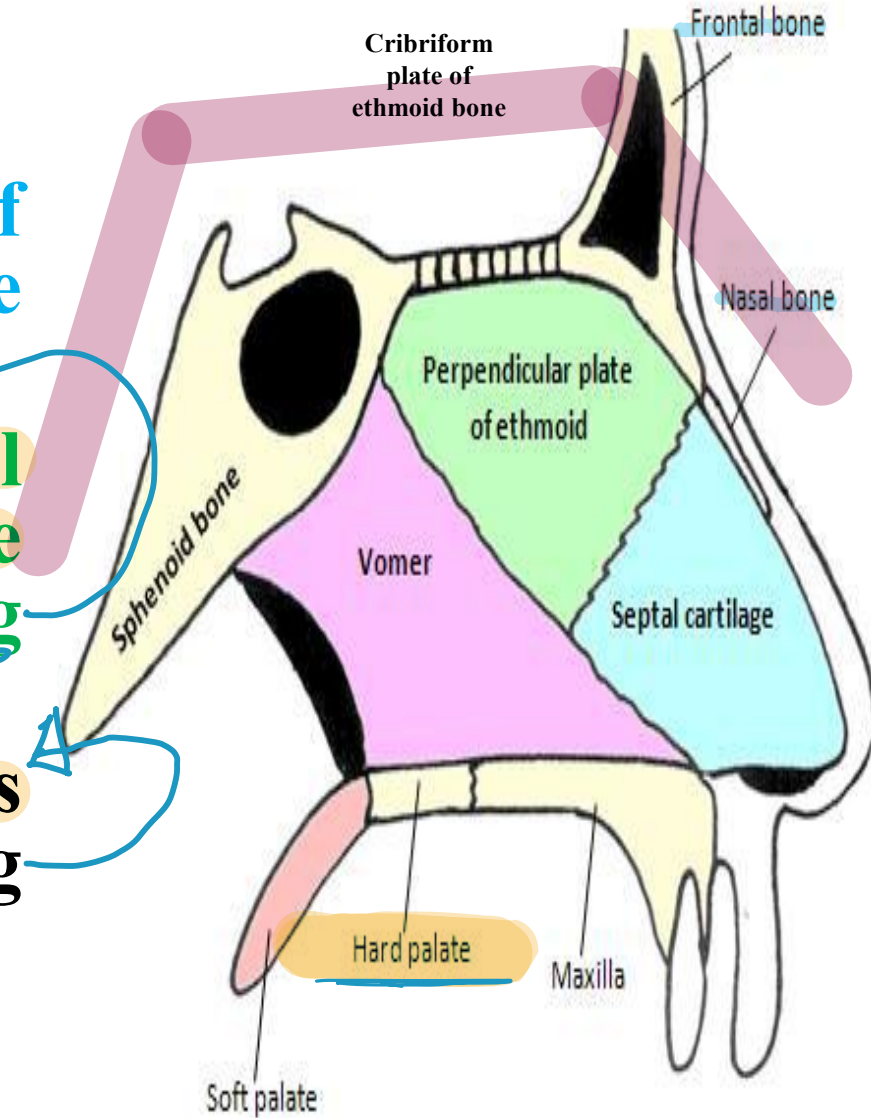
a. The cribriform plate of ethmoid form middle part.

b. Nasal bone & nasal process of frontal bone form anterior sloping part.

c. Body of sphenoid forms the posterior sloping part.

2- Floor: hard palate.

البيضة بين ال
oral & nasal cavity.



3-The Medial wall (nasal septum):

a. Bony element:

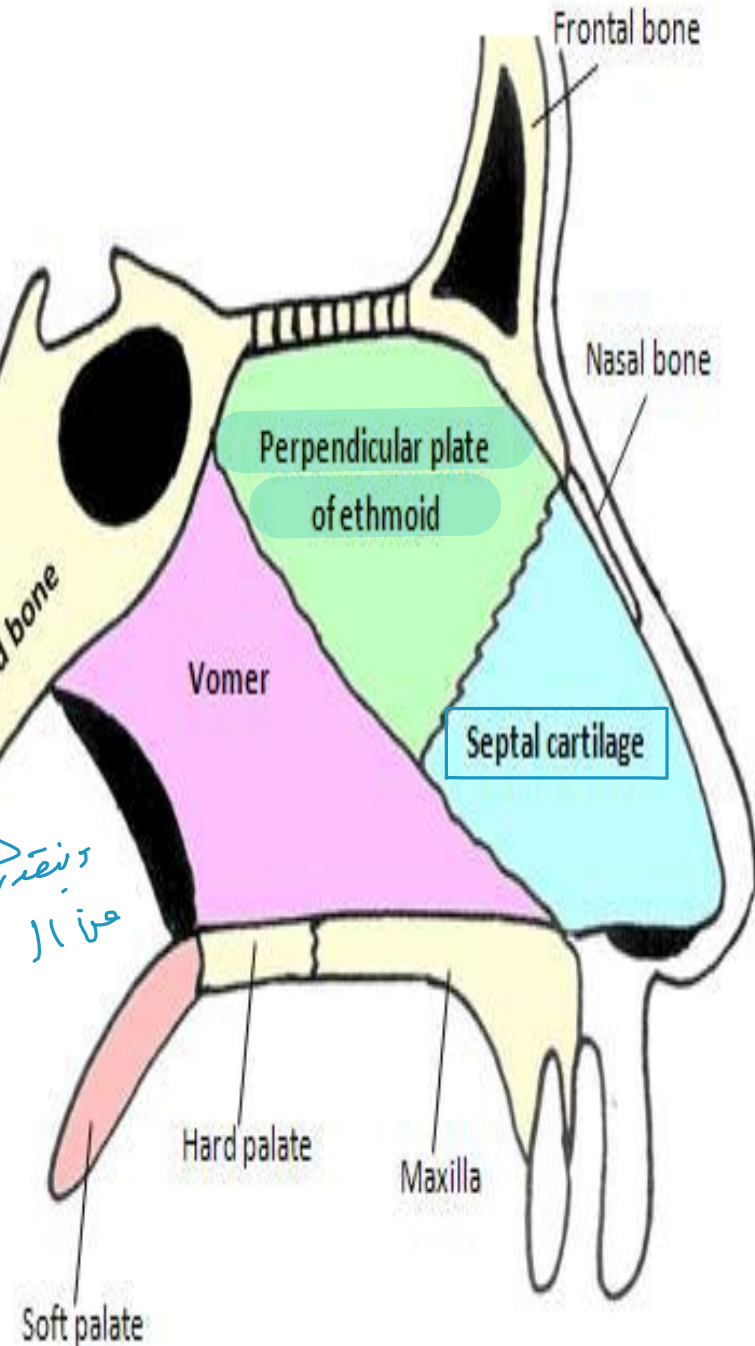
-Vomer bone
(posterior).

- Perpendicular plate of
ethmoid bone (above).

b. Cartilaginous
element: septal
cartilage (anterior).

وهي جزء من
Sphenoid Bone

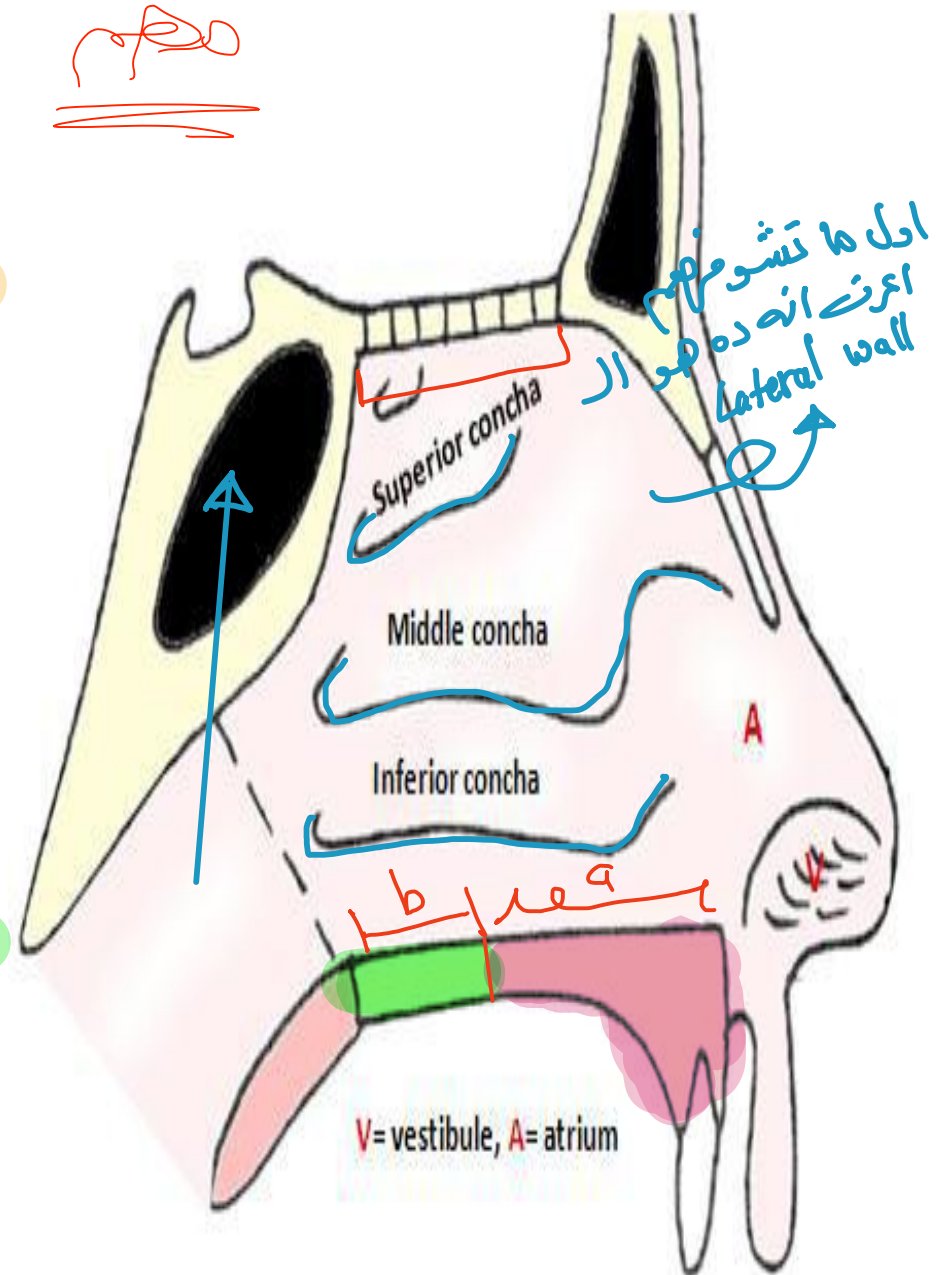
الجزء
الذي يقع
في الأمام



4-The Lateral wall:

Bones forming :

- **Superior:** Nasal aspect of ethmoid bone above.
- **inferior:**
- (a) Nasal aspect of maxilla
- (b) Perpendicular plate of palatine bone behind.

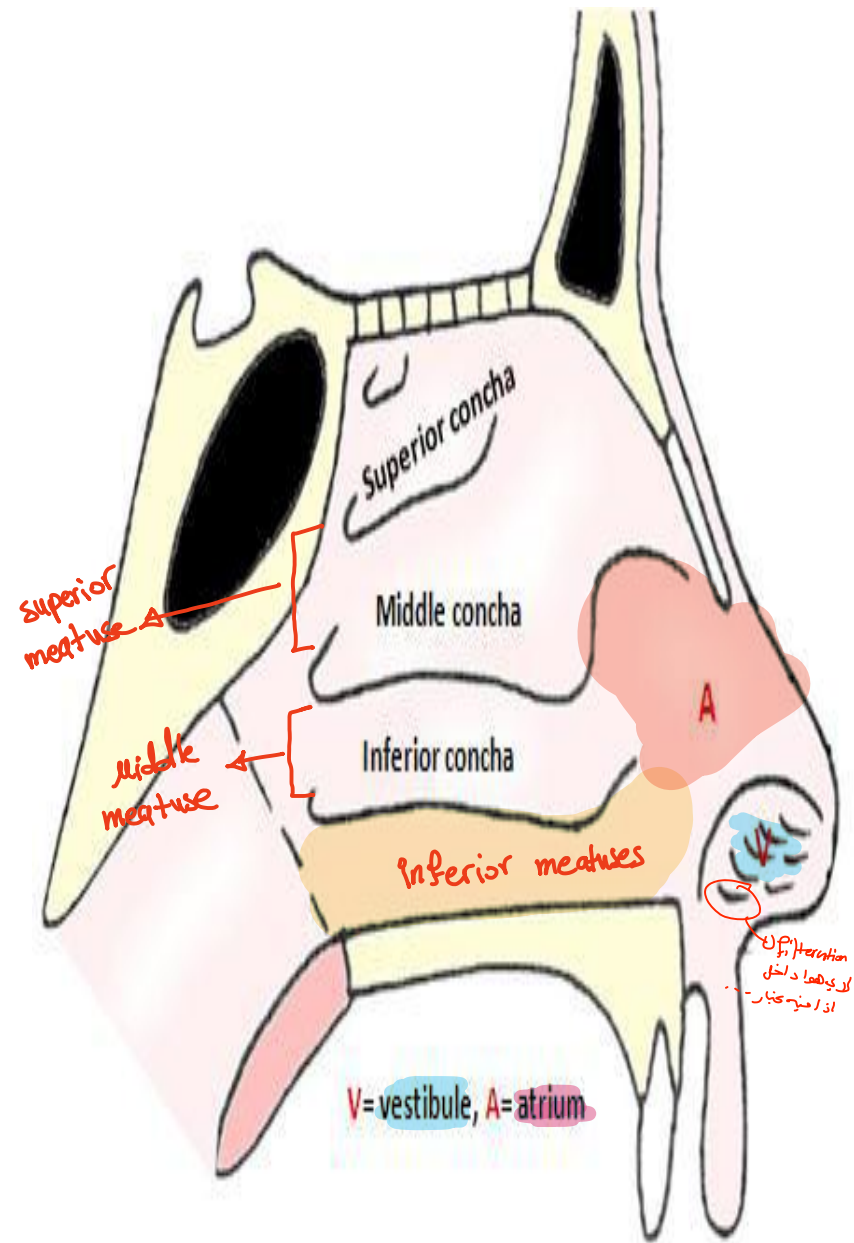


The lateral wall is divided into 3 parts:

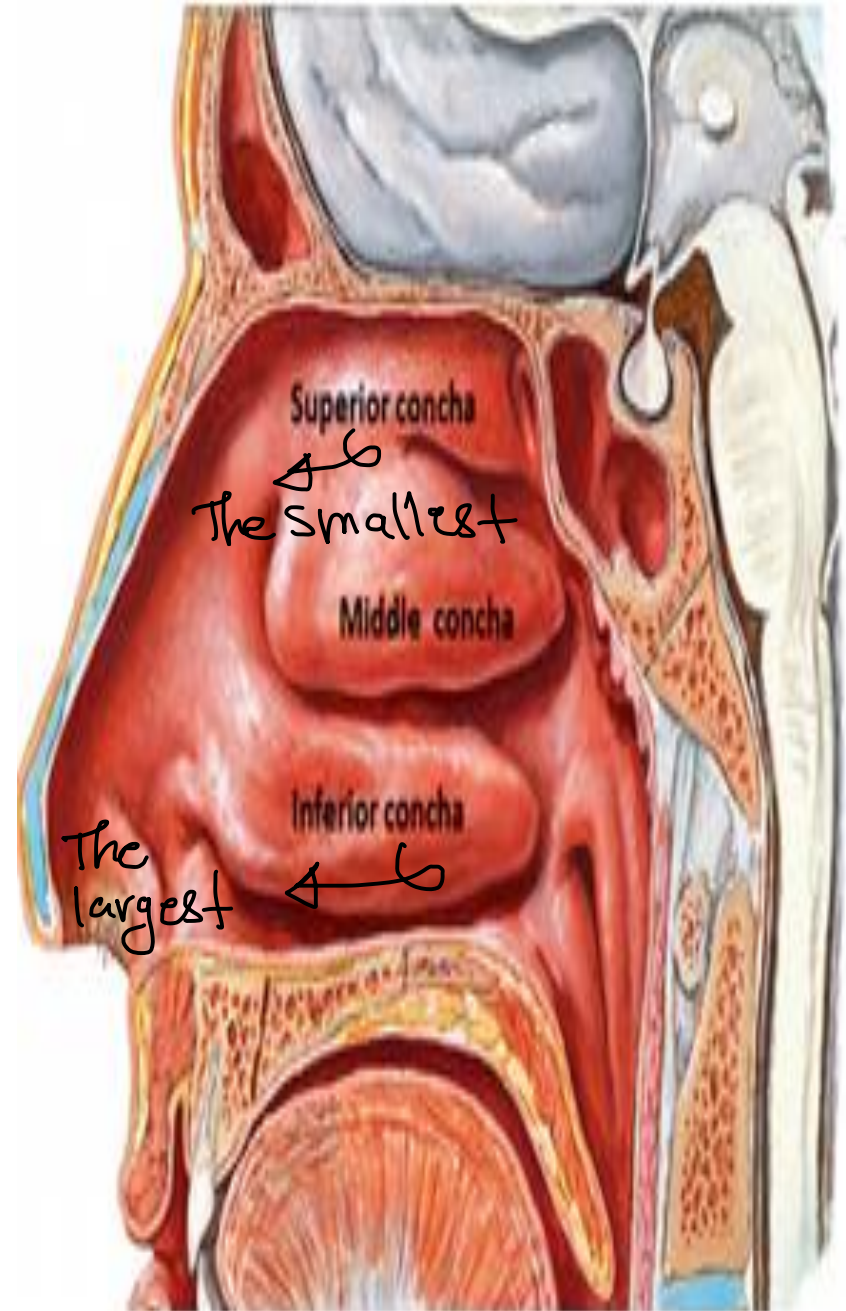
- a. Small anterior hollow part called “**vestibule**”, covered by skin and contains hair.
- b. Middle hollowed part called “**atrium of the middle meatus**”.
- c. Posterior part containing the conchae & meatuses.

3

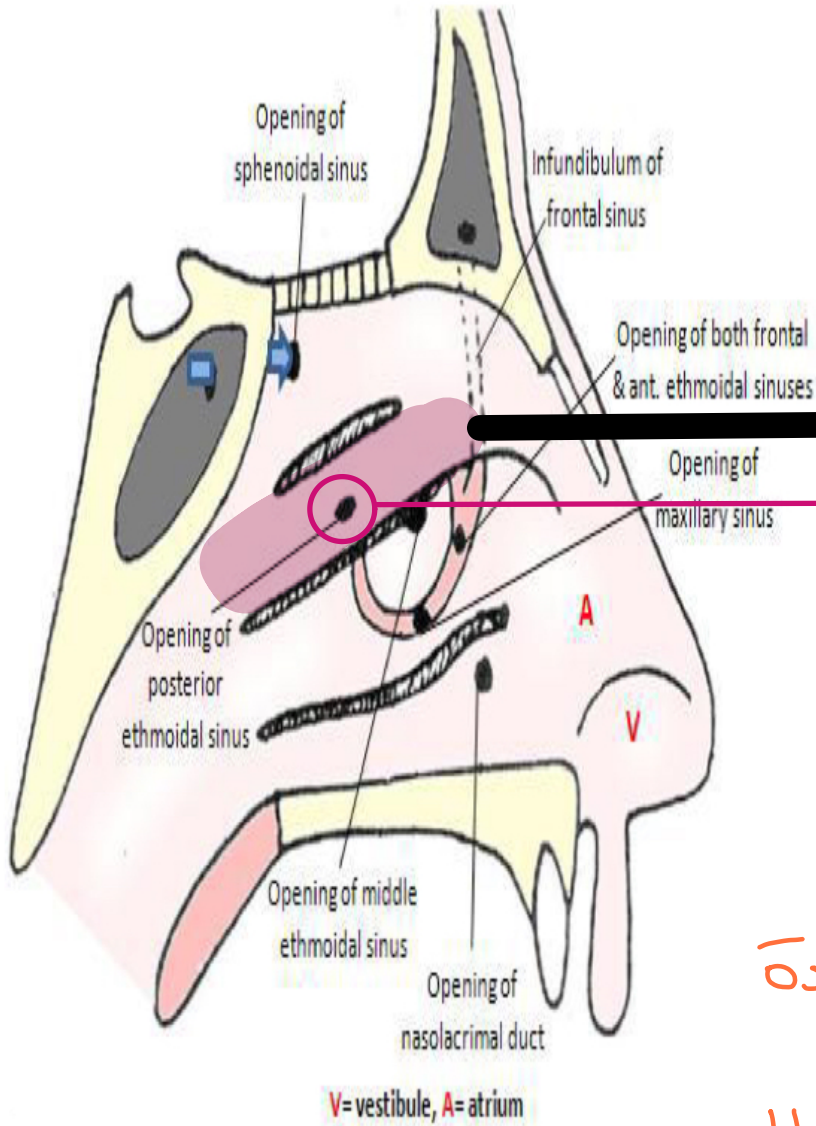
3



- **Nasal conchae:**
- (superior, middle & inferior):
- Shelf-like bony projections directed downward and medially.
- - The superior & middle conchae project from the ethmoidal bone while the inferior one is a separate bone
- Superior concha is **the smallest** while the inferior concha is the **largest**.



* ركزوي ستوي هون قبل السلايد الجديد



هاي عبارة عن Superior meatus

شايين هاي النقطة السوداء

هاي عبارة عن opening of the ethmoidal sinuses

* احنا لازم تكون عارضين انه

ال opening of the ethmoidal sinuses موجودة

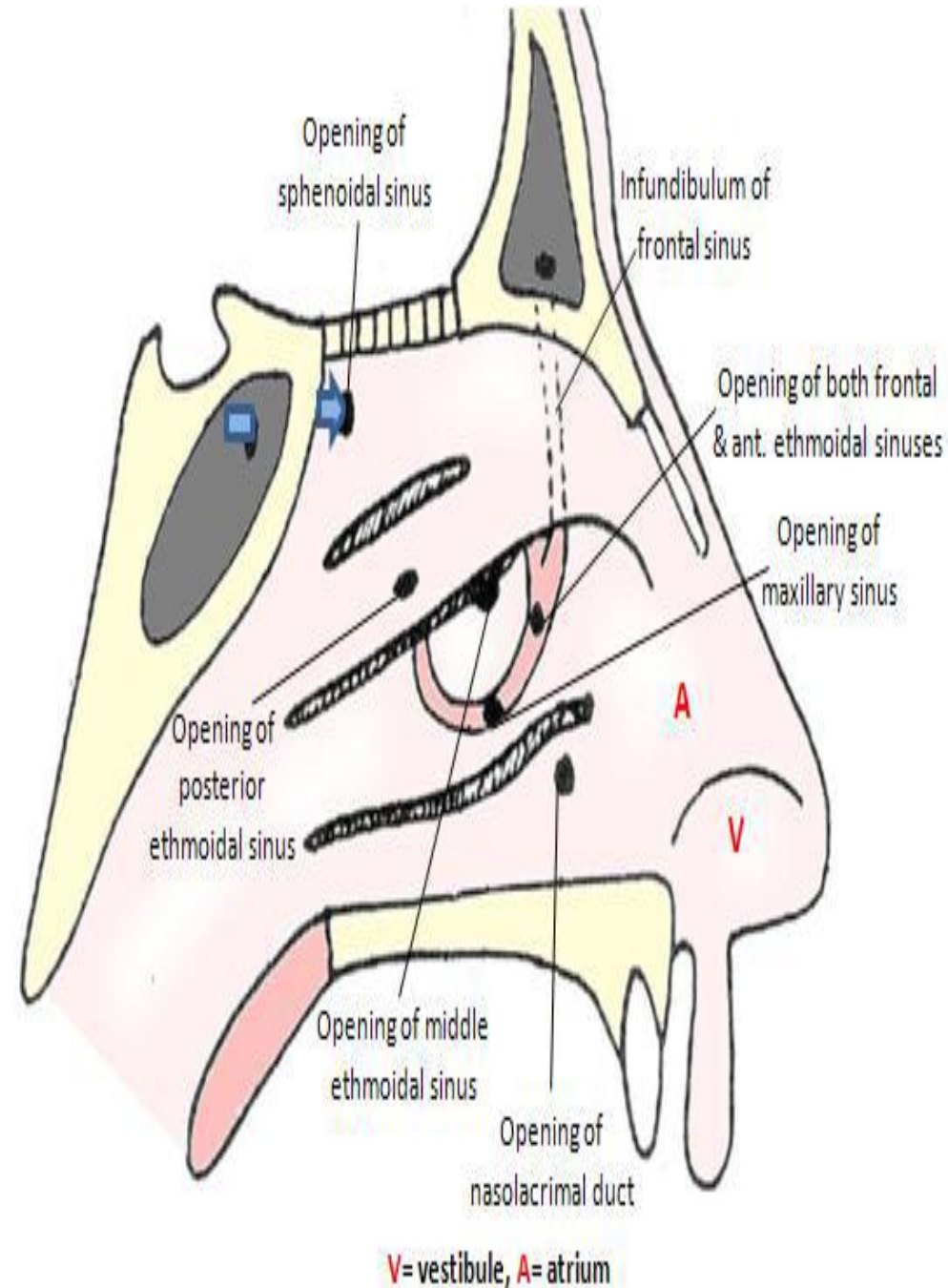
بال Superior meatus ونفس الاشي انه ال

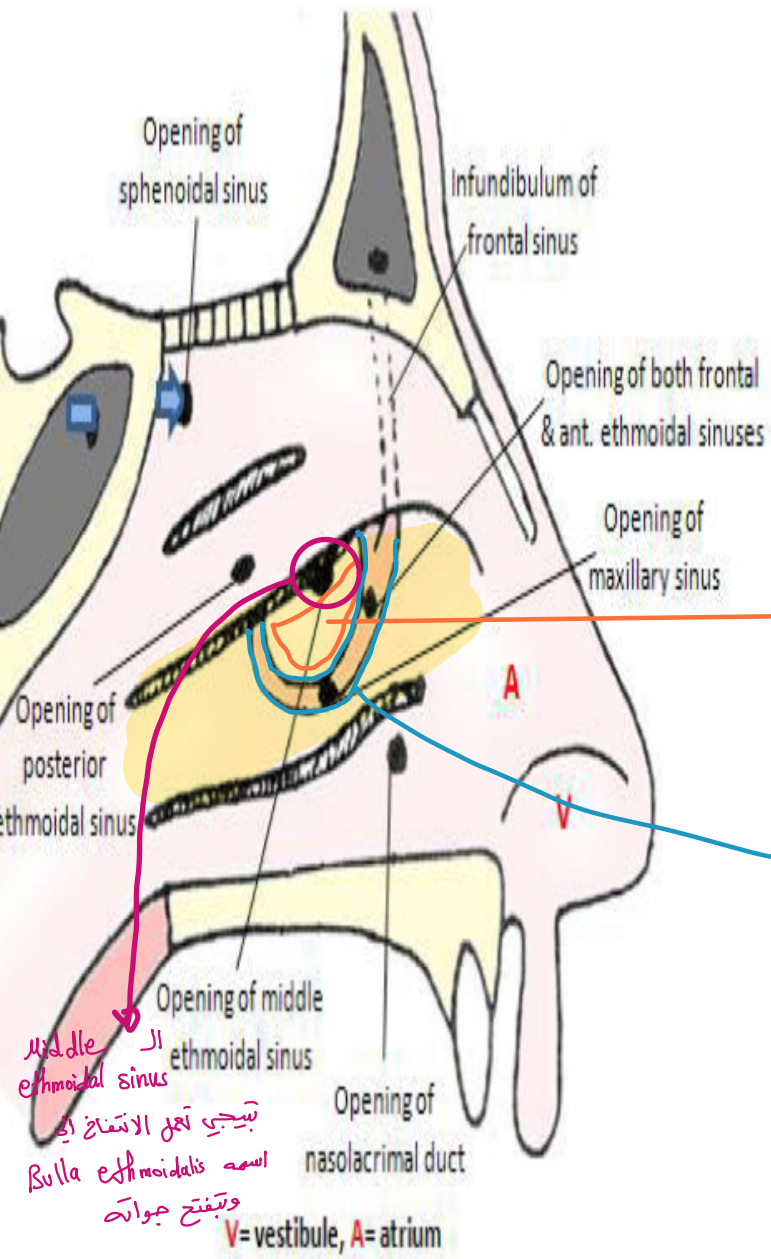
بستقل ال opening of the ethmoidal sinuses

V=vestibule, A=atrium
Superior meatus

Nasal meatuses:

- Are passages beneath the conchae.
- **The superior meatus** : the shortest and shallowest one, receiving the opening of the **posterior ethmoidal sinuses**.





نفتح فيها ال Middle ethmoidal sinus

الارتفاع هاد اسمه Bulla ethmoidalis

المرفوا انها موجودة بال Middle meatus

حولين ال Bulla ethmoidalis في Groove هاد ال groove

Hiatus semi-lunaris اسمه

Anterior end

Posterior end

Anterior ethmoidal sinuses

تفتح ال Anterior ethmoidal sinuses

وجيها كان ال infundibulum of frontal sinus

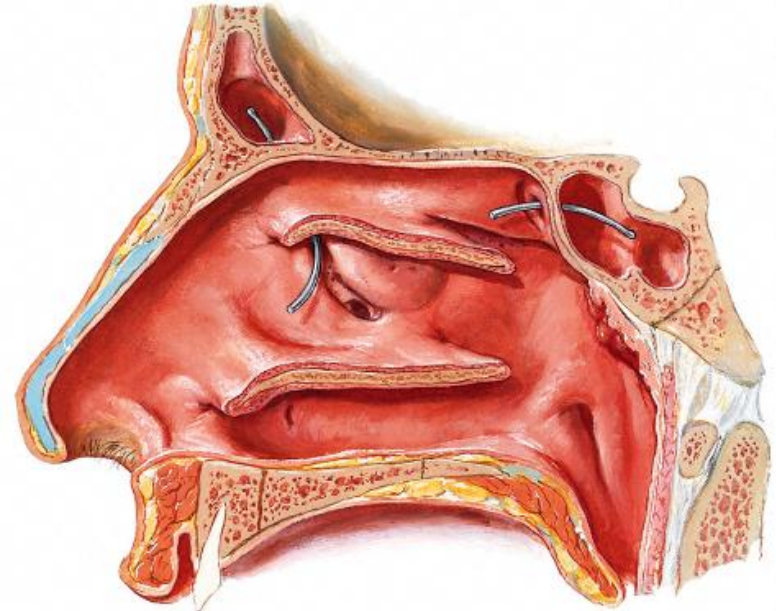
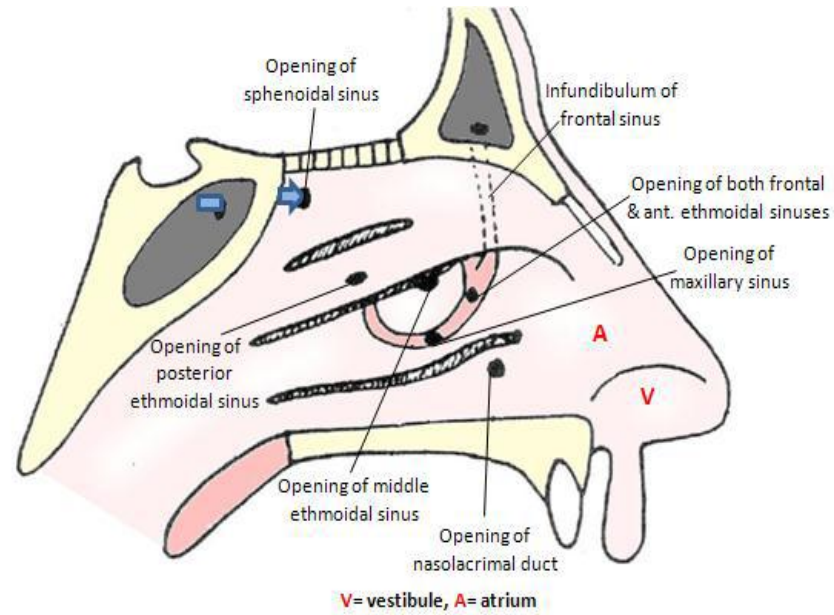
Maxillary sinus تفتح فيه ال

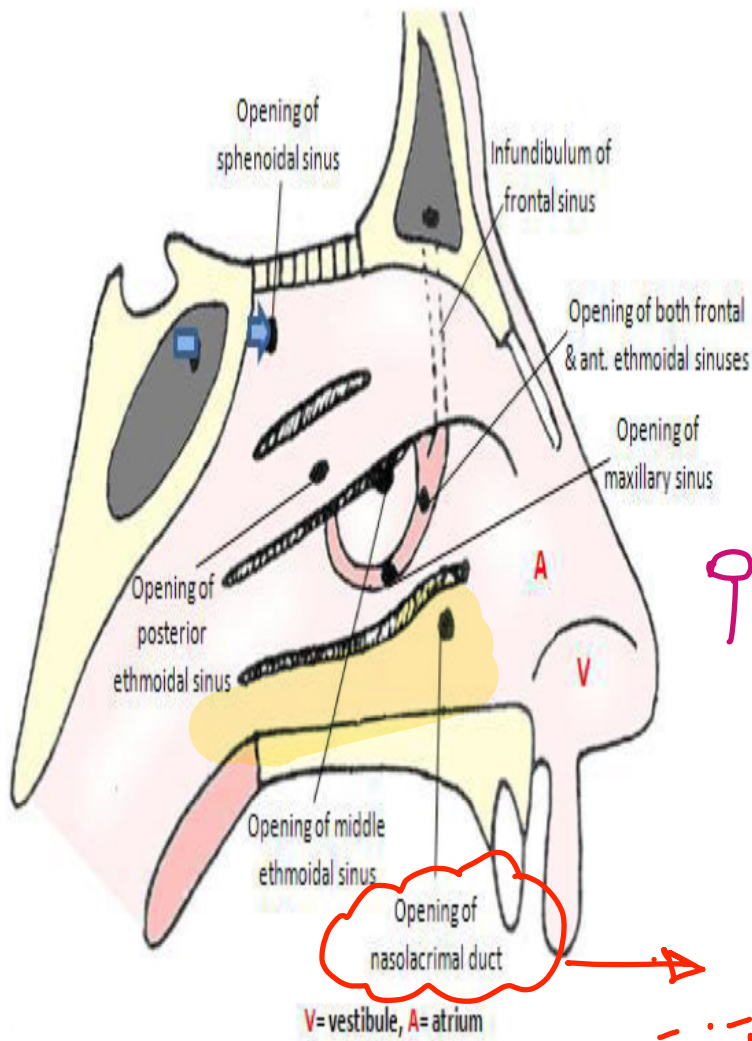
المiddle ethmoidal sinus

تسمى عمل الارتفاع الي

اسمه Bulla ethmoidalis وتفتح جواره

- **II- The middle meatus:**
has 3 features:
- **1. *Bulla ethmoidalis:*** rounded elevation produced by the **middle ethmoidal sinus (open on it).**
- **2. *Hiatus semi-lunaris:*** deep semicircular groove below the bulla, has: - **Anterior end**, receives the opening of the **frontal air sinus & anterior ethmoidal air sinus.** - **Posterior end**, receives the opening the **maxillary air sinus.**
- **3. *Infundibulum:*** short passage at the anterior end of the hiatus.





Superior & Middle
meatus

Inferior meatus

Inferior
meatus

بينا غرفه ال

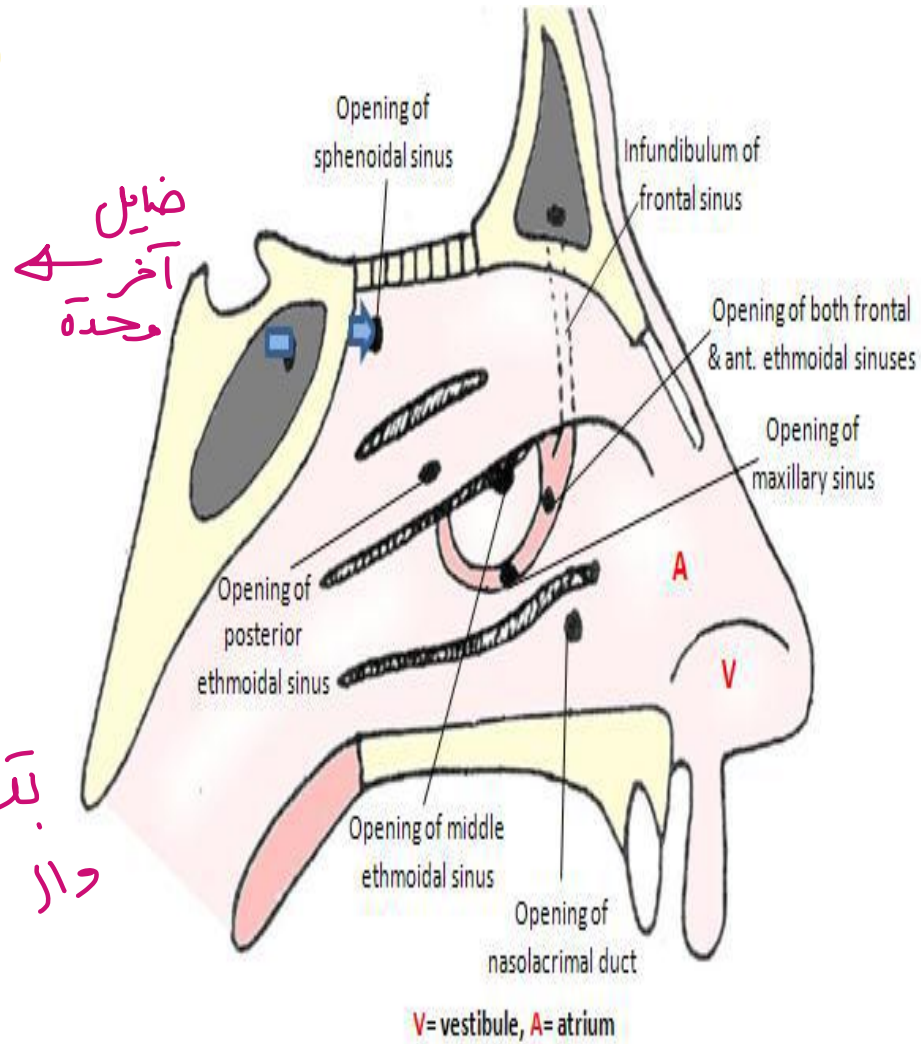
فتحة ال
nasolacrimal duct

Inferior
meatus

فتحة
الموع تفتح بال

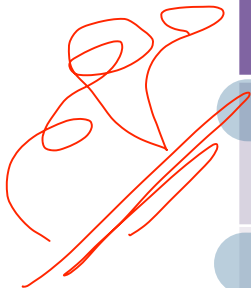
- **III- Inferior meatus:**
the largest one,
receives opening of
naso-lacrimal duct

- **IV- Spheno-ethmoidal recess:** triangular fossa above superior concha, receiving the opening of **sphenoidal air sinus.**

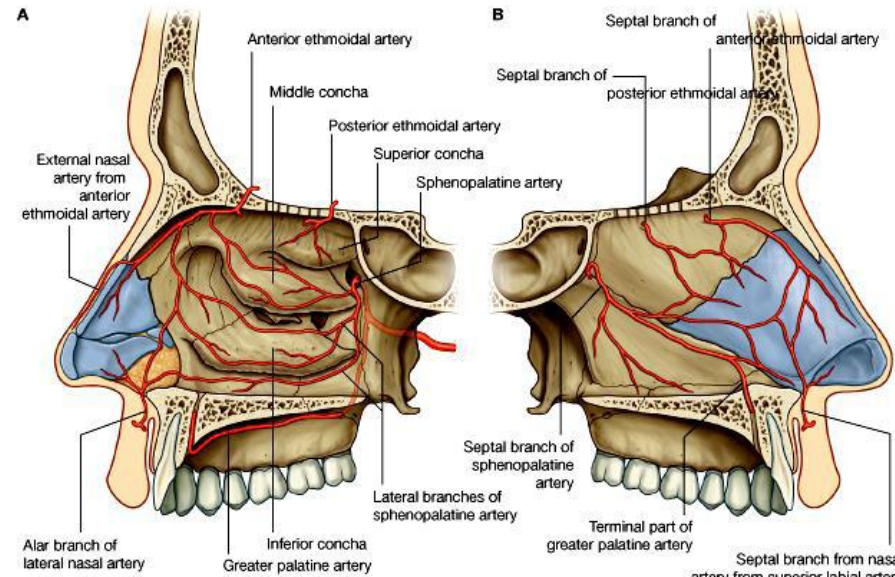


Blood supply of the nose

superior → Anterior
 ↓ posterior
 inferior → Anterior
 ↓ posterior



part	Arterial supply
1-Antero-superior	→ Ant. & post. ethmoidal as
2-postero-superior	→ Sphenopalatine a
3-Antero-inferior	→ Facial a, Gr. palatine a, Ant. sup.alv.a
4- postero-inferior	→ Greater palatine a



***Venous drainage of the nose:**

a. Anterior part into the **facial vein**.

b. Posterior part into the **pharyngeal plexus**.

c. Middle part into the **pterygoid venous plexus**.

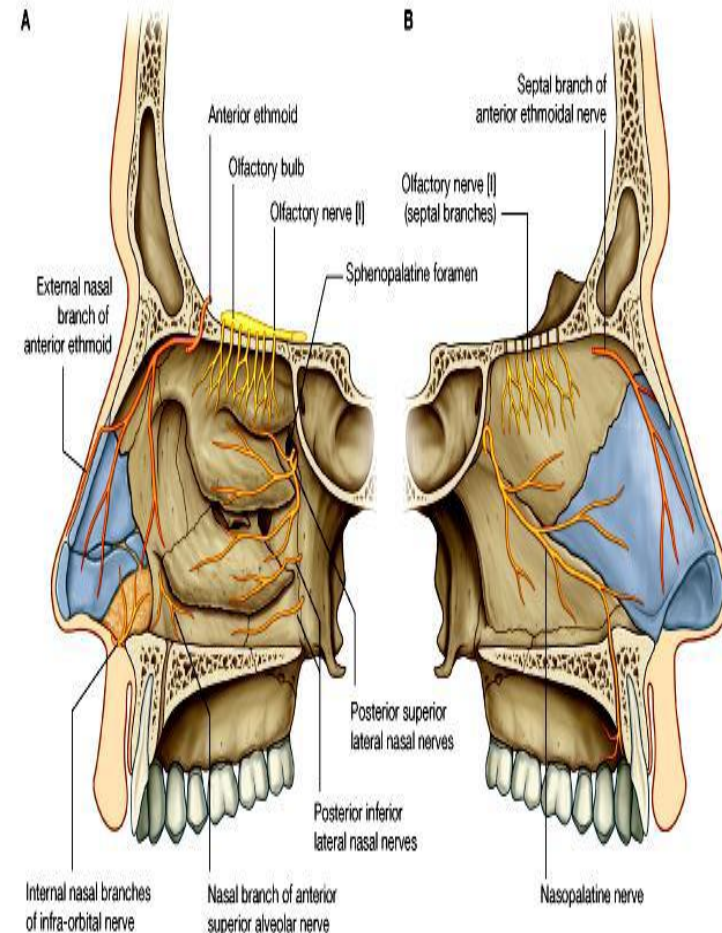
*Nerve supply of the nose

According to Function

A)- General sensation: (from trigeminal n 5th cranial n)

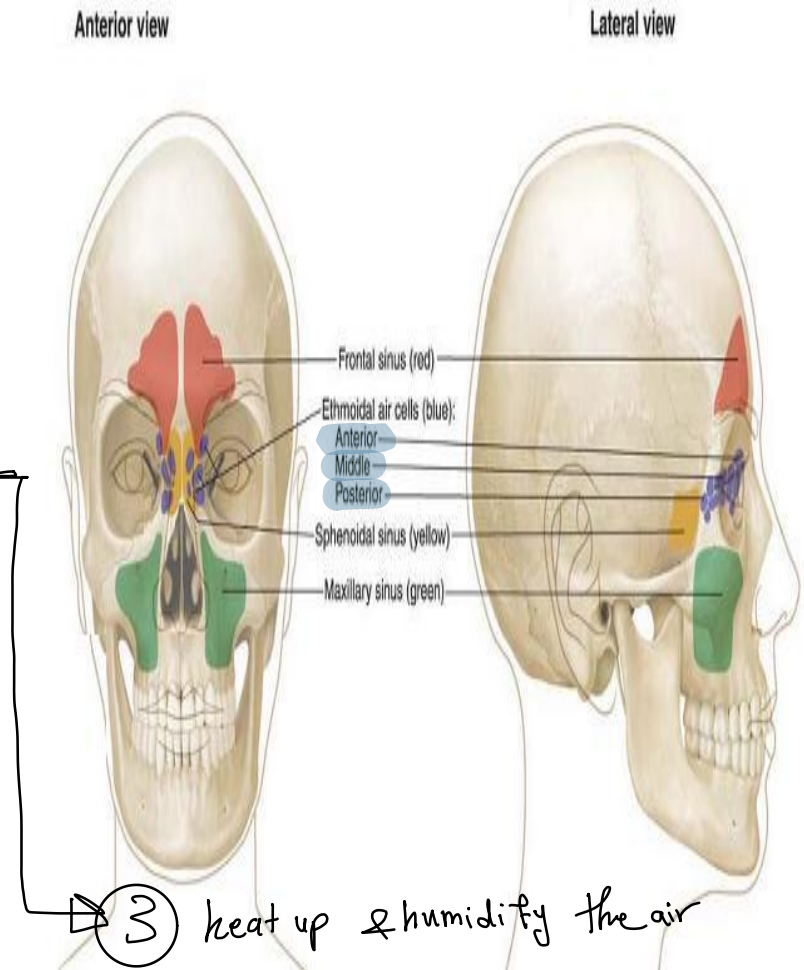
B)-Special sensation : (olfactory n. 1st cranial n).

• *نور الحاسة* *



Parnasal Air Sinuses

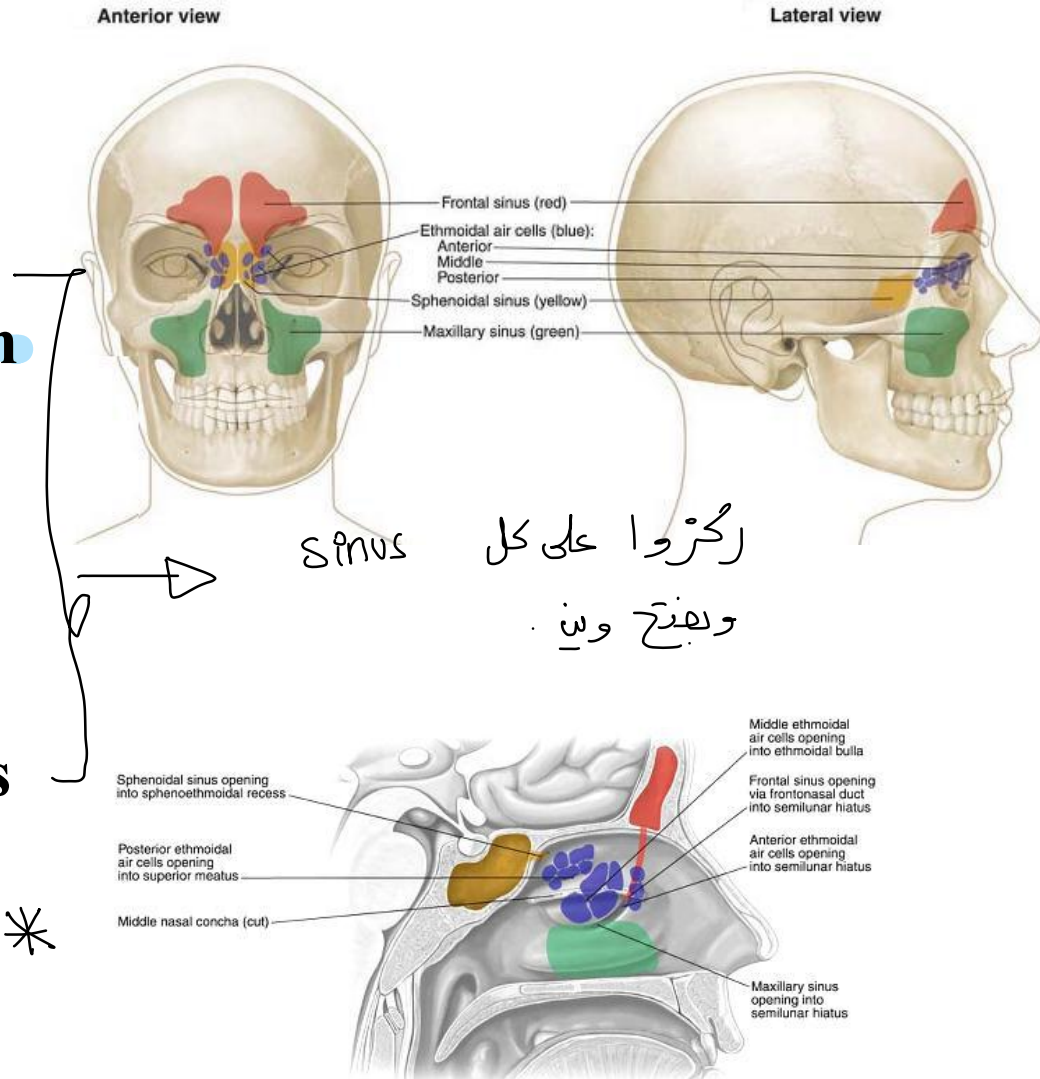
- **Definition:** spaces inside the skull filled by air. *not fluid.*
- **4 sinuses** on each side (**frontal**, **maxillary**, **sphenoidal** & **ethmoidal**), they open into the lateral wall of nose. ①
- **Function:** lighten the skull weight & add resonance to the voice. ②
- They are either absent or rudimentary at birth but increase in size until adolescence they become fully developed after eruption of permanent teeth.



- They are divided into 2 groups:
- **Anterior group:** frontal, maxillary, anterior & middle ethmoidal (all open in the middle meatus).

- **Posterior group:**
 - *Sphenoidal opens in sphenoidal recess.
 - *Posterior ethmoidal opens in superior meatus.

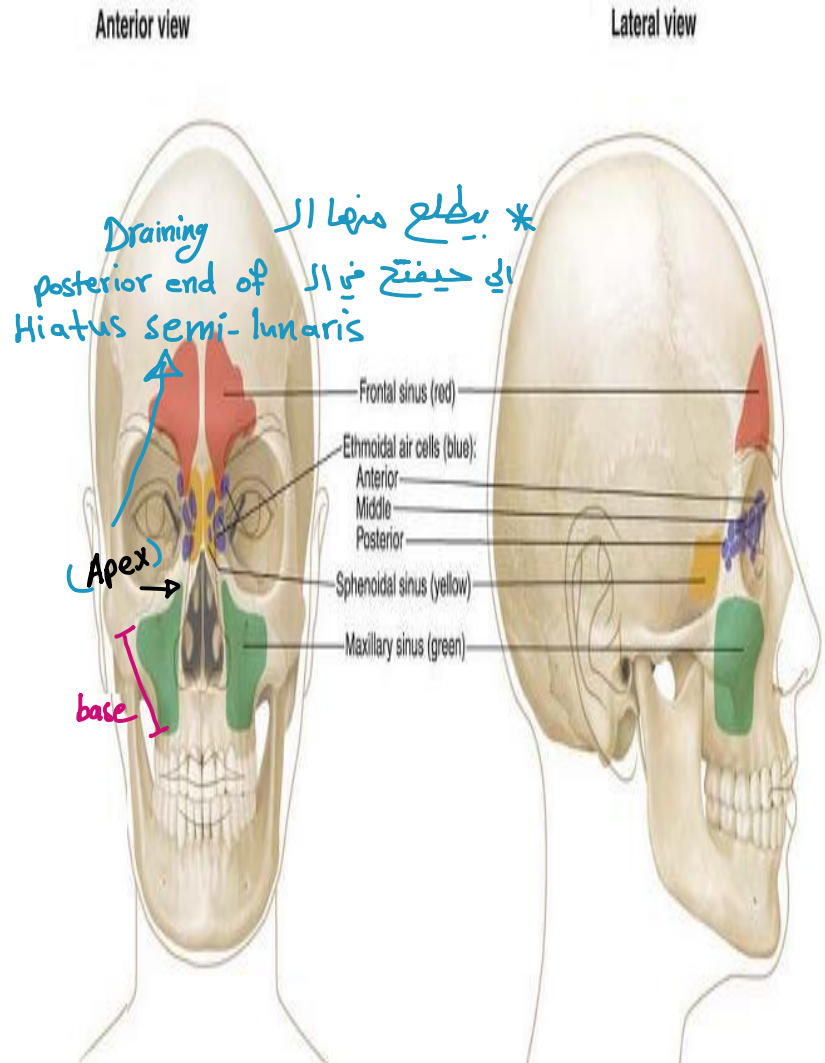
Anterior والباقي يكون Posterior * احفظ ال



1-Maxillary Air Sinus

- **Site:** body of the maxilla.
- **Shape:** pyramidal in shape:
- The base is the lateral wall of the nose
- The apex extends to zygomatic process of maxilla or even the zygomatic bone.
- The roof is the floor of the orbit.
- The floor is the maxilla's alveolar process
- The sinus opens into the hiatus semilunaris by one or two openings.

***Nerve supply:** infraorbital and superior alveolar nerves. Pain from an infected sinus can be referred to the teeth (upper jaw).



Sinvs * أكثر
infection بحبرها
Maxillary sinvs هيا ال
لمب ليه؟

Clinical importance

- The maxillary air sinus is commonly infected (maxillary sinusitis) because:

1-Its drainage is difficult (its drainage orifice lies near the roof) *Anti-gravity.*

2-Discharge from an infected frontal or anterior ethmoidal air sinus can pass to the sinus.

*يعني أي infection بال Frontal أو ال Anterior ethmoidal
ينتقل لل Maxillary sinus*

3-It is closely related to teeth so spread of infection from tooth to the sinus can occur.

* آفة infection بجي على ال Frontal sinus دمري بزل على ال Maxillary sinus كهاي من رجمة ربا فينا
 Frontal sinus لاندلو قعدت في ال

2-Frontal Air Sinuses

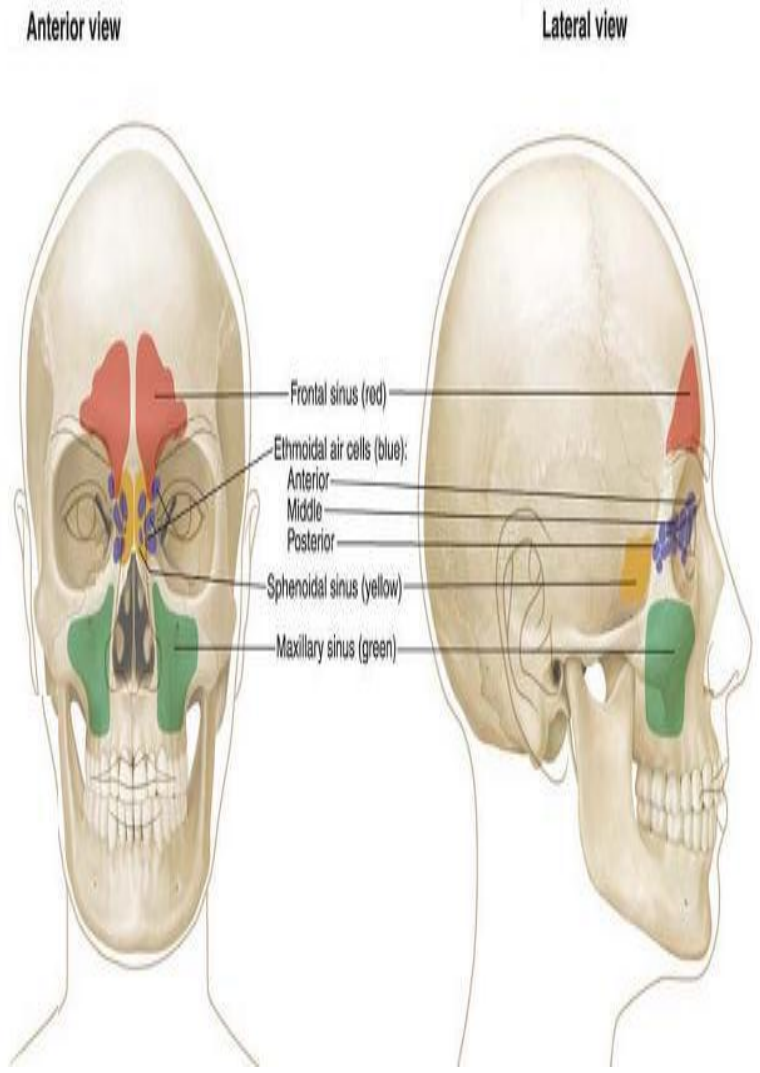
مكن توكل الدظم وتدخن
 Frontal lobe ال

encephalitis دتعل
 infection in Brain اد آفة

- The two sinuses in frontal bone are usually unequal in size. -Each drains into the **middle meatus of the nose by the infundibulum**, in the anterior part of the hiatus semilunaris.

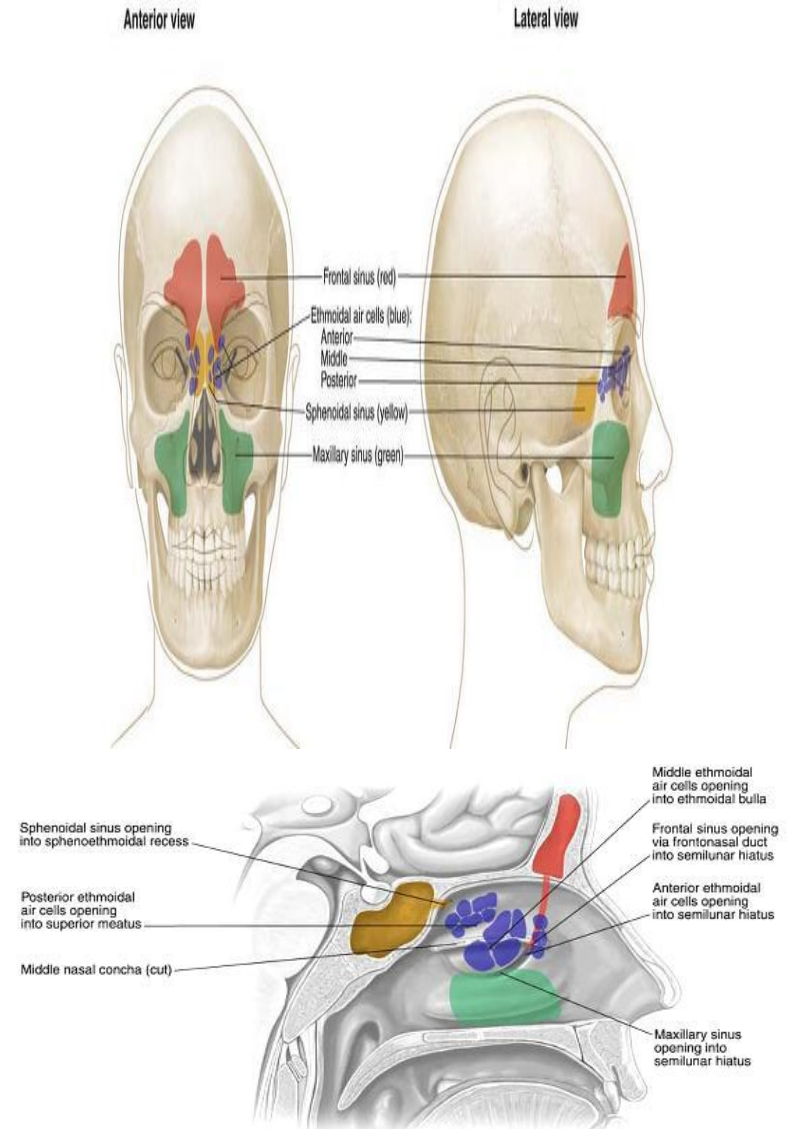
- ***Nerve supply:** **Supraorbital nerve.**
 trigeminal واحد من أوتلاد ال

- Clinical importance:** pain from an infected sinus can be referred to the forehead Infection of frontal air sinus can spread to frontal lobe of brain.

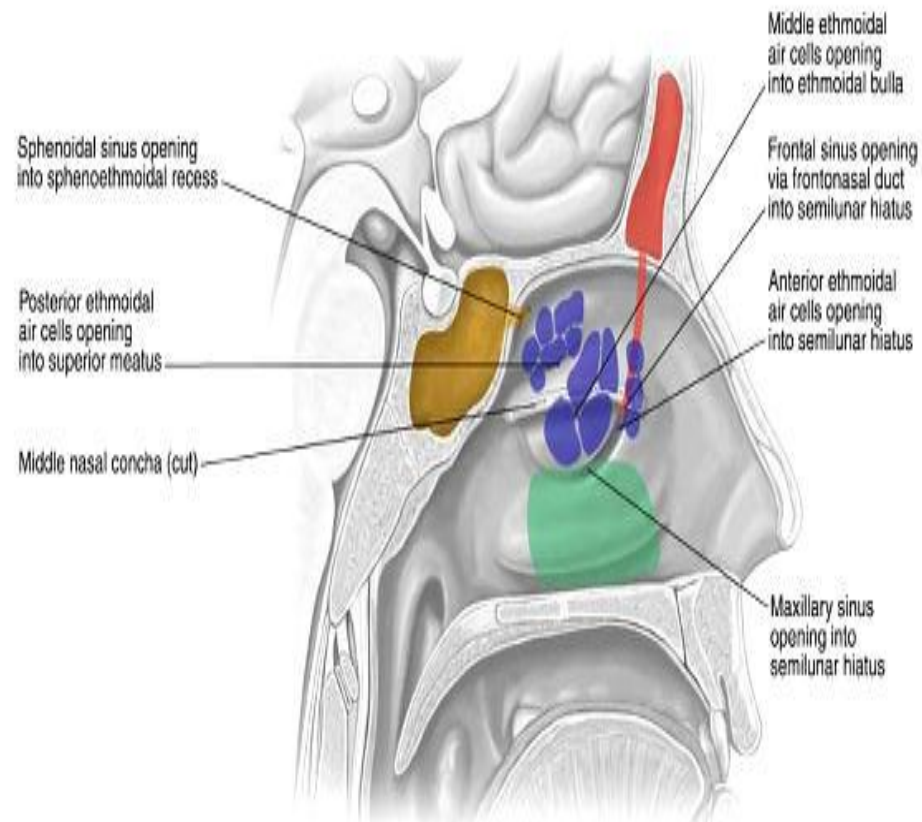


3-Ethmoidal Air Sinuses

- -They are present in the ethmoid bone arranged into: **anterior, middle and posterior ethmoidal air sinuses.** They lie between the nasal cavity and orbit. Infection in these sinuses can spread to the orbit.



- **a) Anterior ethmoidal sinuses:** drain into infundibulum at anterior end of hiatus semilunaris of middle meatus.
- **b) Middle ethmoidal sinuses:** drain by an opening on top of bulla ethmoidalis.
- **c) Posterior ethmoidal sinuses:** drain into superior meatus.
- **Nerve supply:* They are supplied by anterior and posterior ethmoidal nerves.



ترتيب ال sinuses من
أكثر sinus بصير infection

1. Maxillary sinus
2. Frontal
3. Sphenoidal

4-Sphenoidal Air Sinuses

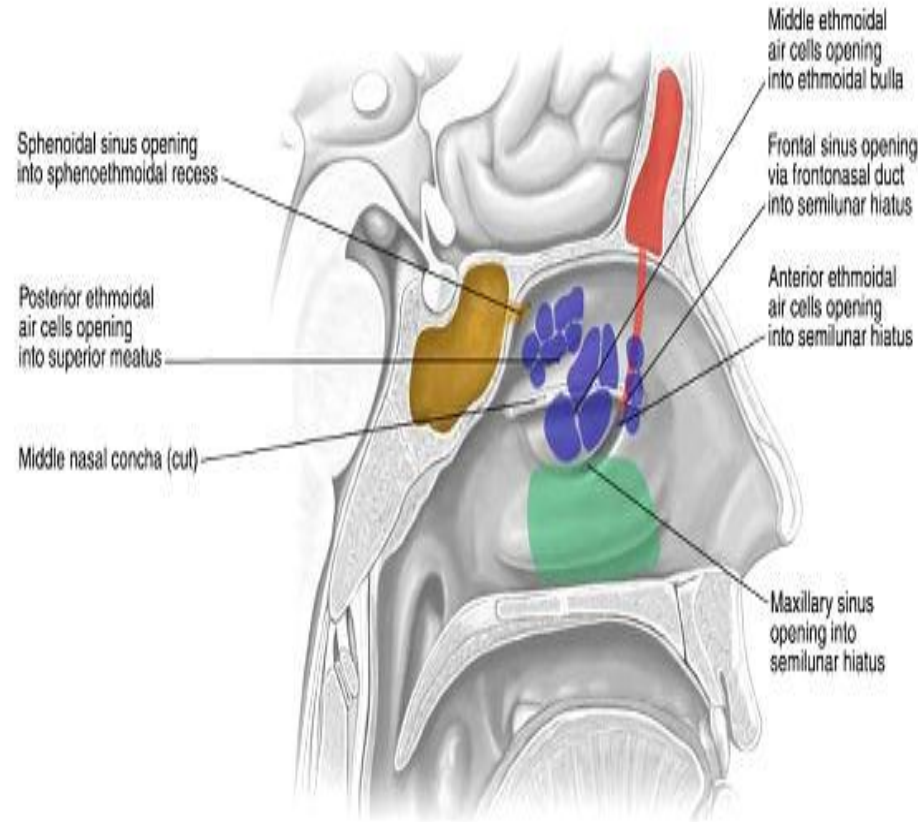
نادر انه بصير لها infection →

- They are two right and left separated by a septum inside body of sphenoid. They drain into **spheno-ethmoidal recess**.

***Nerve supply:** Posterior ethmoidal nerve.

- **Clinical importance:** The sphenoidal air sinuses are related superiorly to pituitary gland & optic chiasma and laterally to cavernous venous sinus & its contents.

بعضو راحة من رتبنا
لمكانها خطير ترتيبه من
أما عن مهمة مثل ال hypothalamus



كهنه #

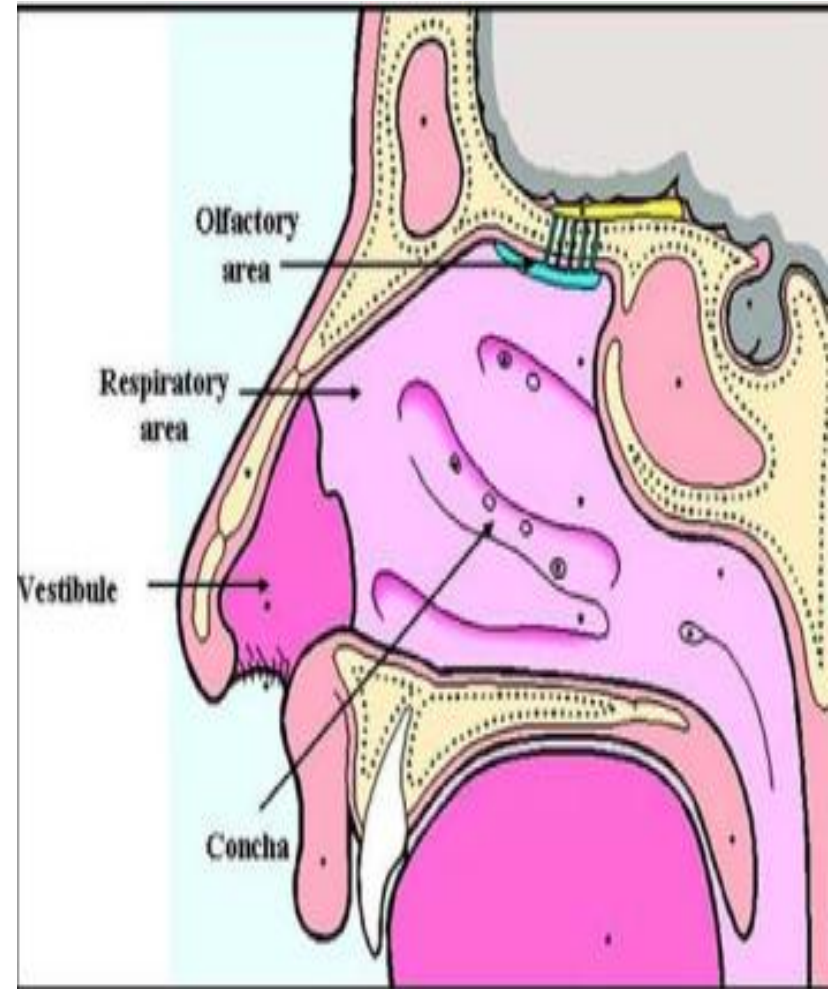
Histology of the nasal cavity

It is divided into 2 parts:

[1] Anterior part of nasal cavity (vestibule): It is the dilated anterior part of the nasal cavity. It is lined with modified skin formed of:

1. Epidermis: lined by Stratified squamous keratinized epithelium with short stiff hairs (vibrissae) for filtration of the inspired air.

2. Dermis: contains sweat and sebaceous glands.



[2] Posterior part of nasal cavity : Its lateral wall contains 3 projections called conchae (superior, middle and inferior). It is divided into 2 areas, respiratory and olfactory areas.

I. Respiratory area: It is lined by mucous membrane; which is formed of:

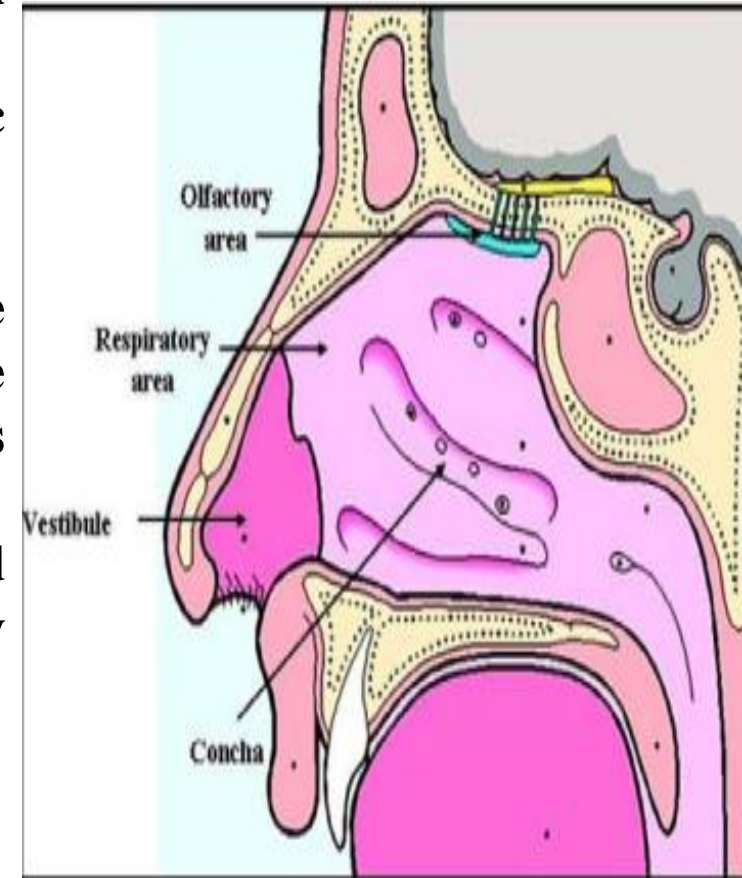
(a) Respiratory epithelium; Pseudo-stratified columnar ciliated with goblet cells.

(b) Lamina propria: which is a dense fibroelastic connective tissue characterized by:

1- It is highly vascularized

2- It contains muco-serous glands to moisten the air and make a film of mucoid fluid on the surface to trap any minute foreign particles that is removed by the action of cilia.

3- It is rich with lymphocytes, macrophages and plasma cells (have immune function against any FBs)



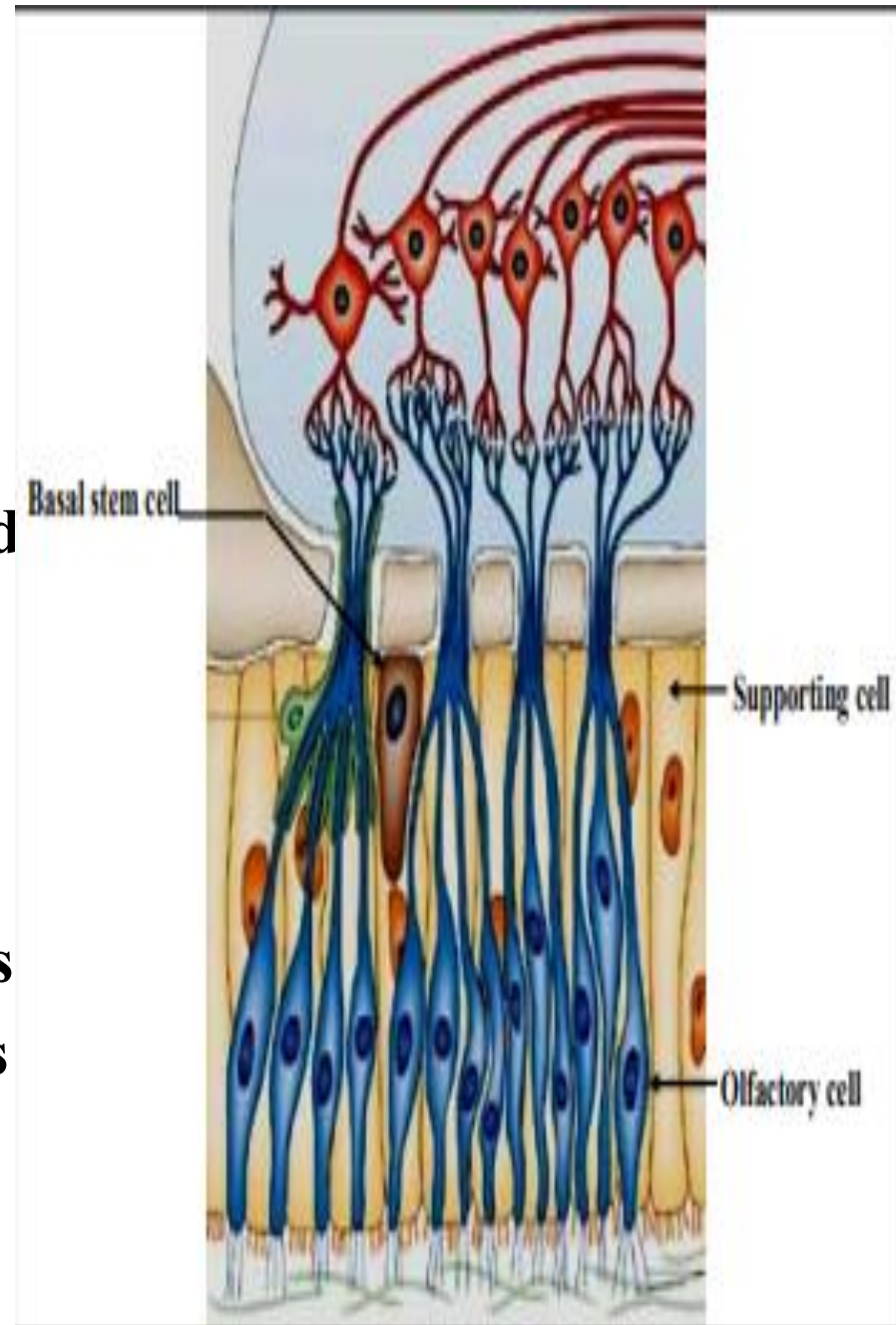
II. Olfactory area : present at the roof of the nasal cavity and extends on upper parts of its medial and lateral walls.

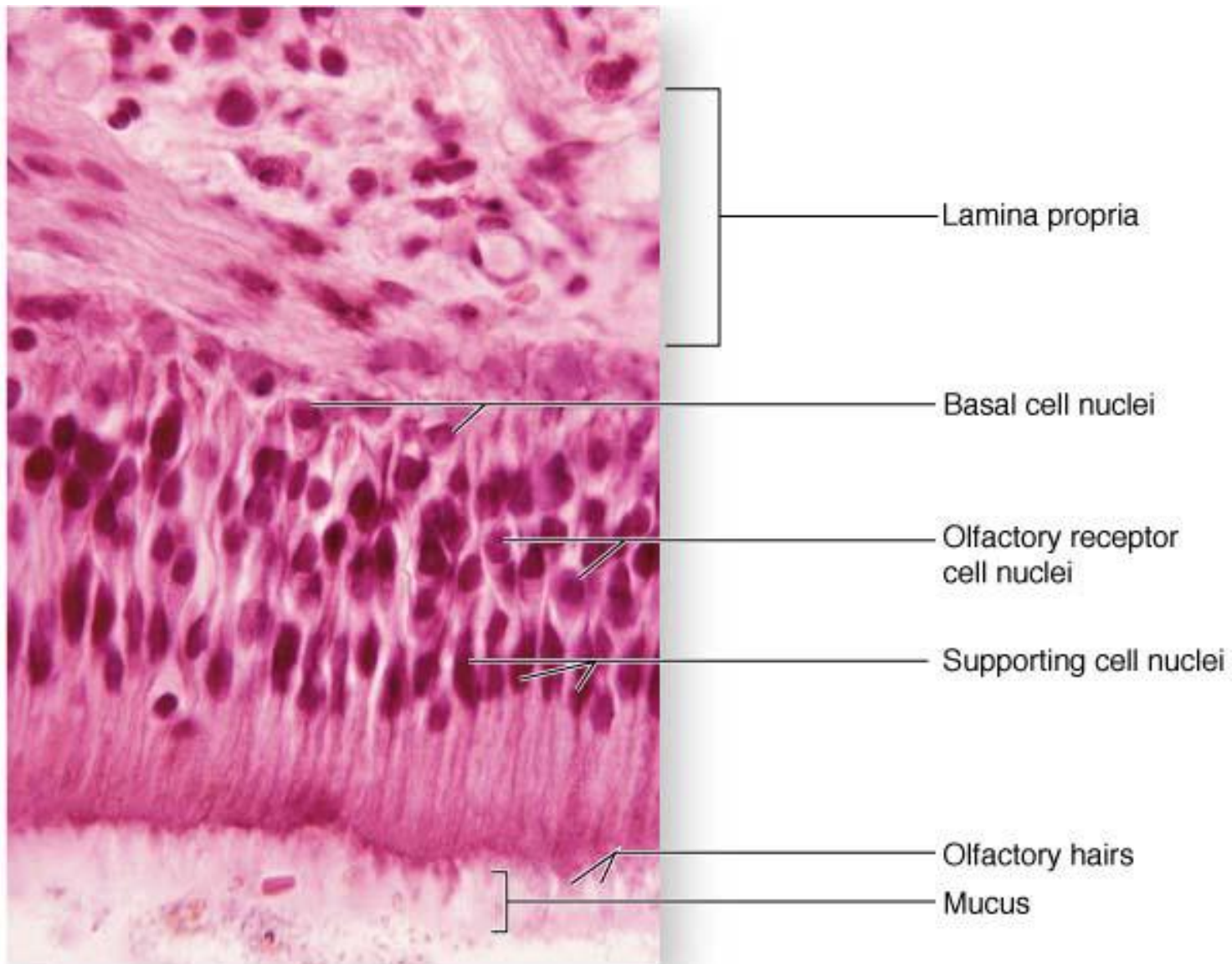
- **Lining:** lined by olfactory mucosa (organ of smell) which includes olfactory epithelium and thick lamina propria

- **Olfactory epithelium:**

Thick pseudo stratified epithelium formed of three types of cells:

- Sustentacular (supporting) cells**
- Olfactory (chemoreceptor) cells**
- Basal (stem) cells**





b

Source: Mescher AL: *Junqueira's Basic Histology: Text and Atlas, 12th Edition*: <http://www.accessmedicine.com>

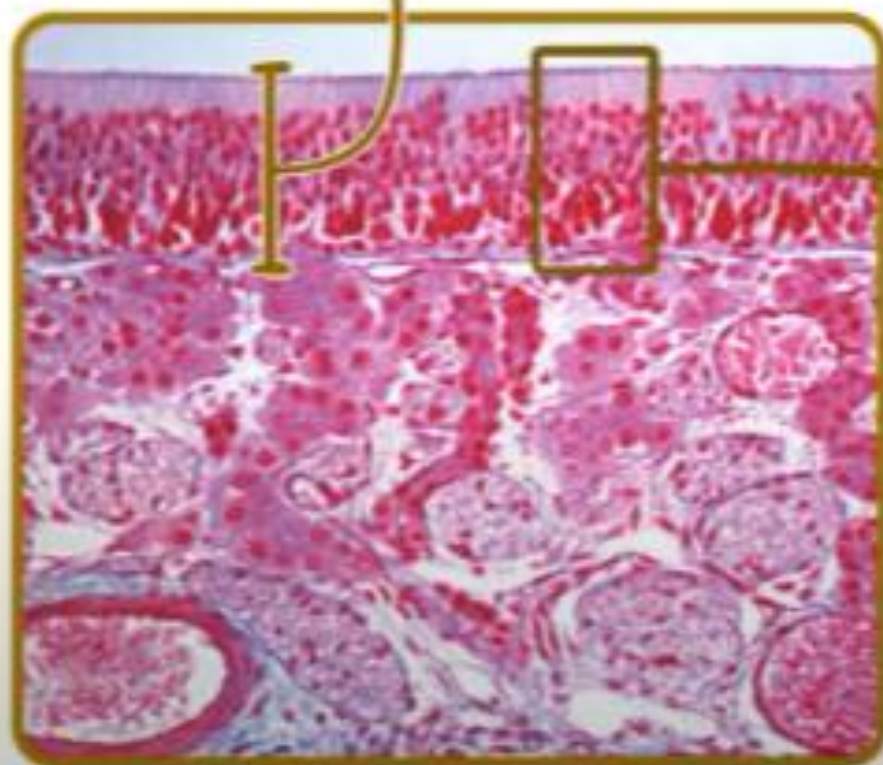
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OLFACTORY EPITHELIUM

↳ PSEUDOSTRATIFIED CILIATED
COLUMNAR CELLS

↳ olfactory, sustentacular, & basal cells

↳ lined with **OLFACTORY RECEPTORS**





Thank You
Thank You
Thank You!!!!