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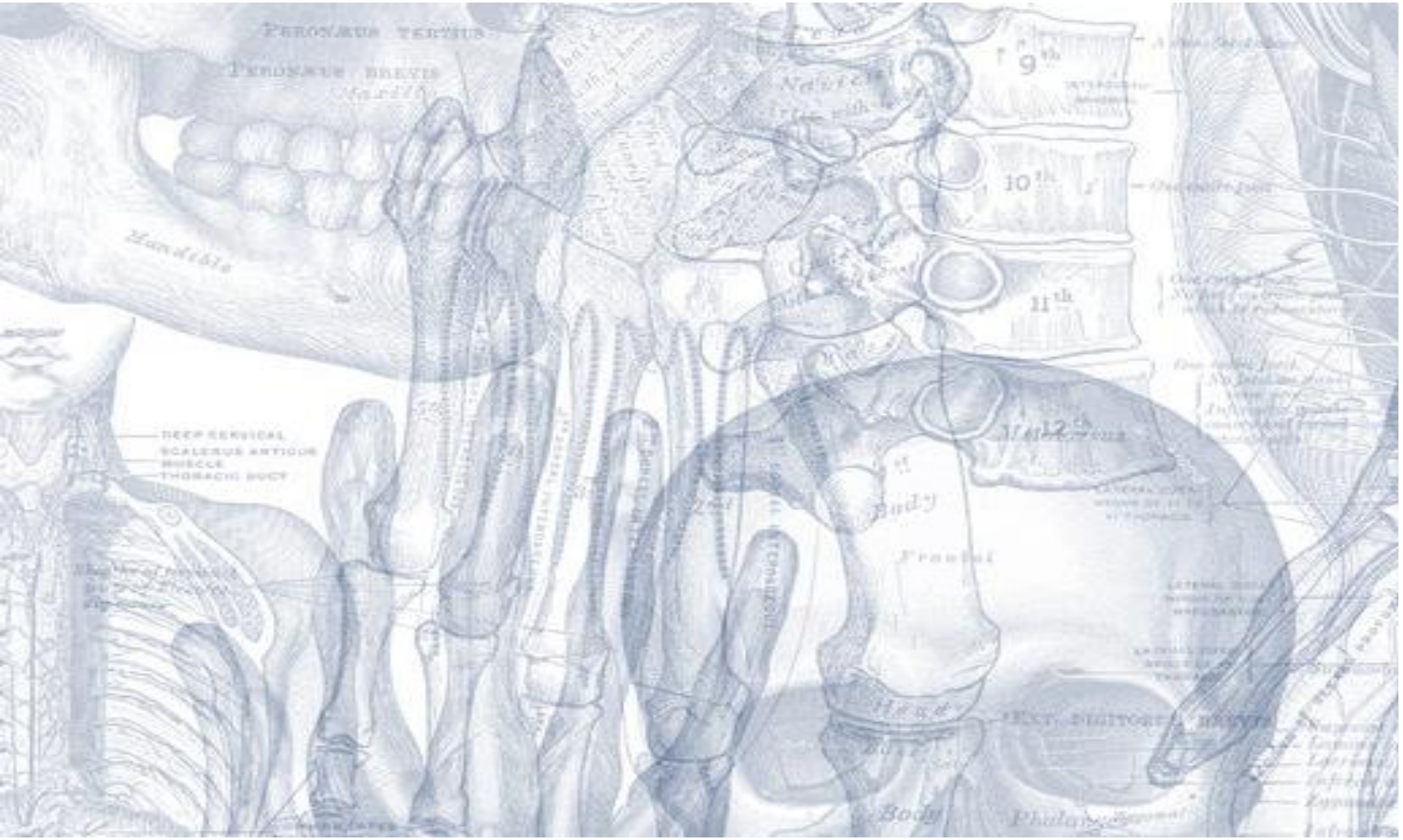


ANATOMY
TEAM 436

436
MEDICINE
KING SAUD UNIVERSITY

Revised by
شوق الأحمري & طراد الوكيل

Nose, Nasal Cavity, Paranasal Sinuses, and Pharynx

Please view our Editing File before studying this lecture to check for any changes.

Color Code

- **Important**
- **Doctors Notes**
- **Notes/Extra explanation**

Objectives

At the end of the lecture, the students should be able to:

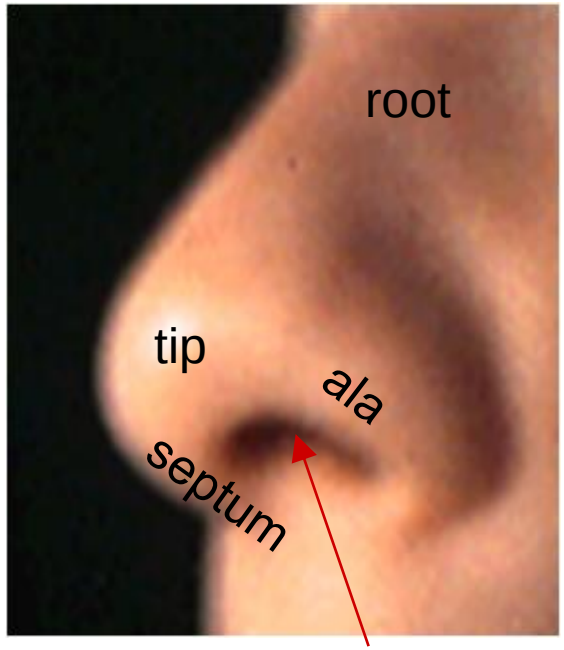
- ✓Describe the boundaries of the nasal cavity.
- ✓Describe the nasal conchae and meati.
- ✓Demonstrate the openings in each meatus.
- ✓Describe the paranasal sinuses and their functions
- ✓Describe the pharynx and its parts, and the related structures.

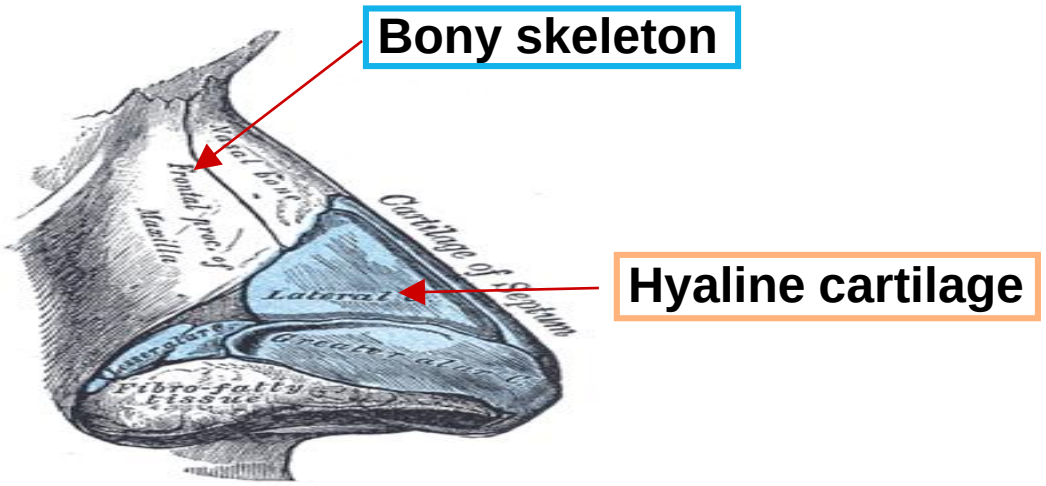
Nose

The external (anterior) nares or nostrils, lead to the **nasal cavity.**

Formed above by: **Bony skeleton**

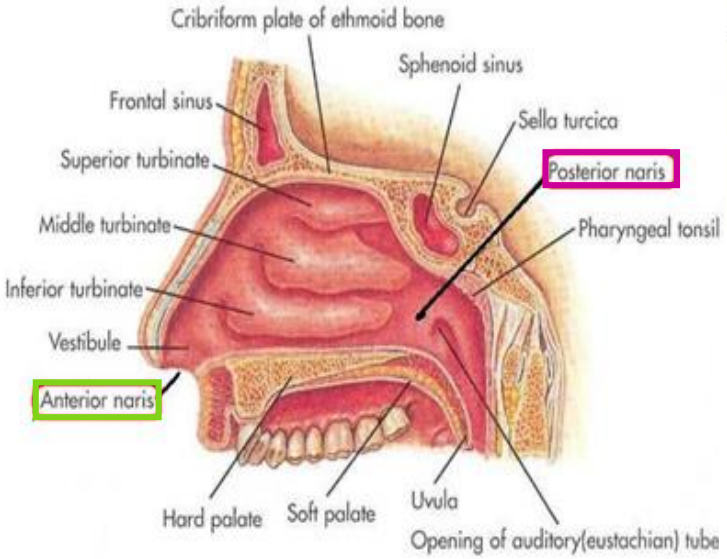
Formed below by plates of **hyaline cartilage.**

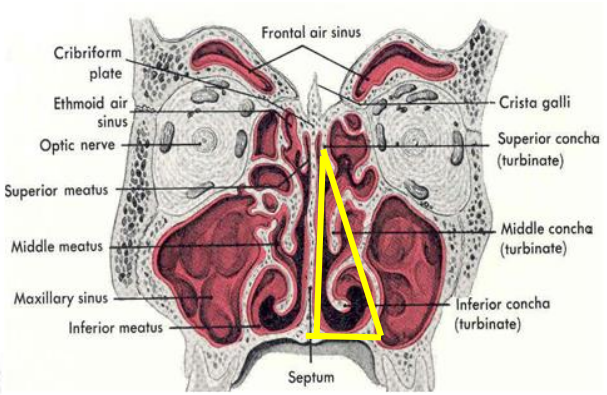


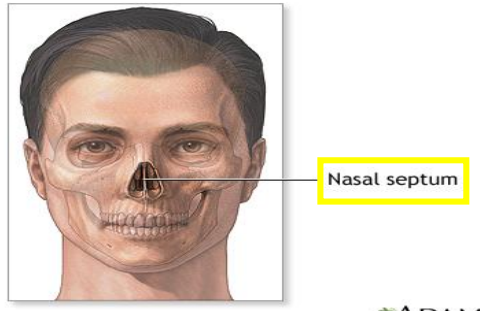


Nasal Cavity

- Extends from the external (anterior) nares to the posterior nares (choanae).
- Divided into right & left halves by the nasal septum.
- Each half has a:
  1. Roof
  2. Floor
  3. Medial wall (septum)
  4. Lateral wall







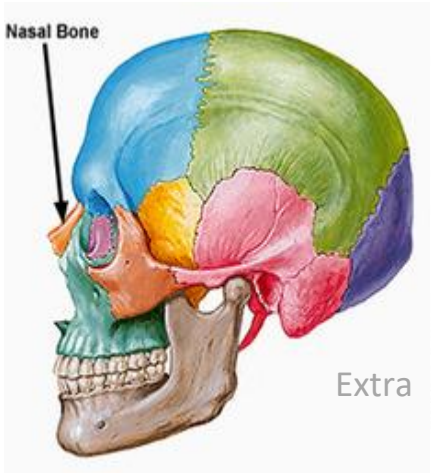
Extra

Nasal Cavity

1. Roof

Narrow & formed (from behind to forward) by:

1. Body of sphenoid.
2. Cribriform plate of ethmoid bone.
3. Frontal bone.
4. Nasal bone & cartilage



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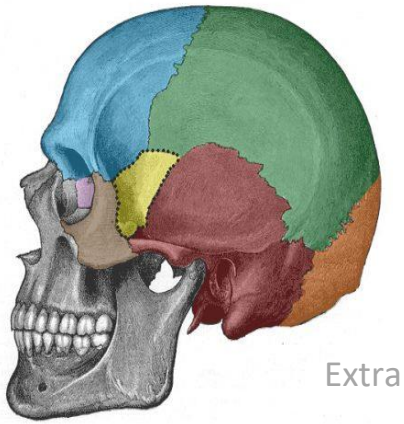

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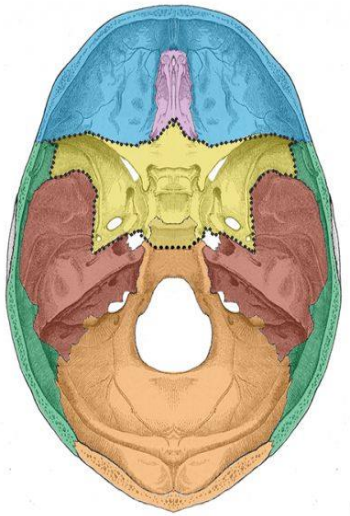
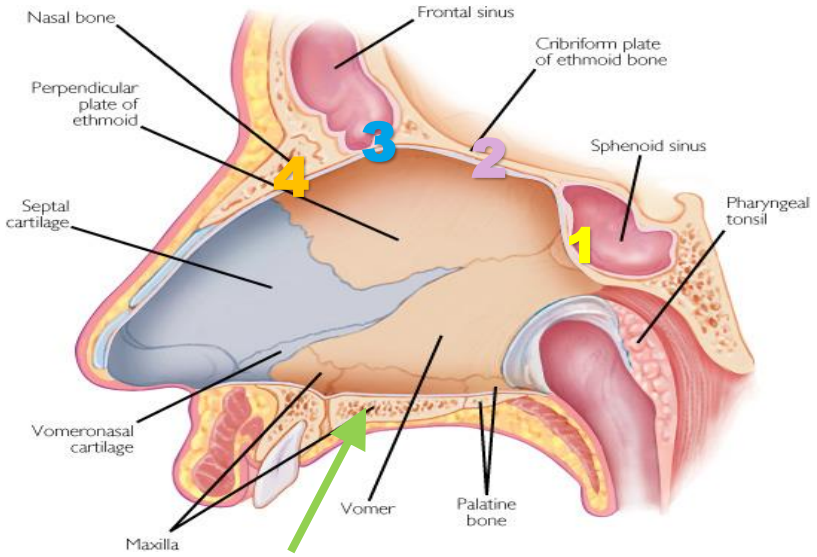


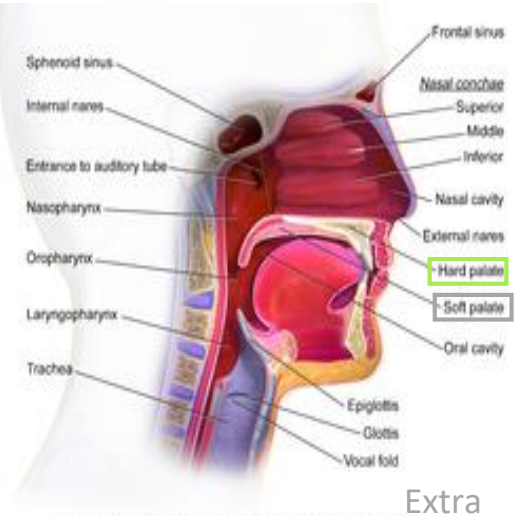
2. Floor

- Separates it (nasal cavity) from the oral cavity.
- Formed by the hard (bony) palate.

Note:

There are 2 palates: a soft palate and a hard palate.





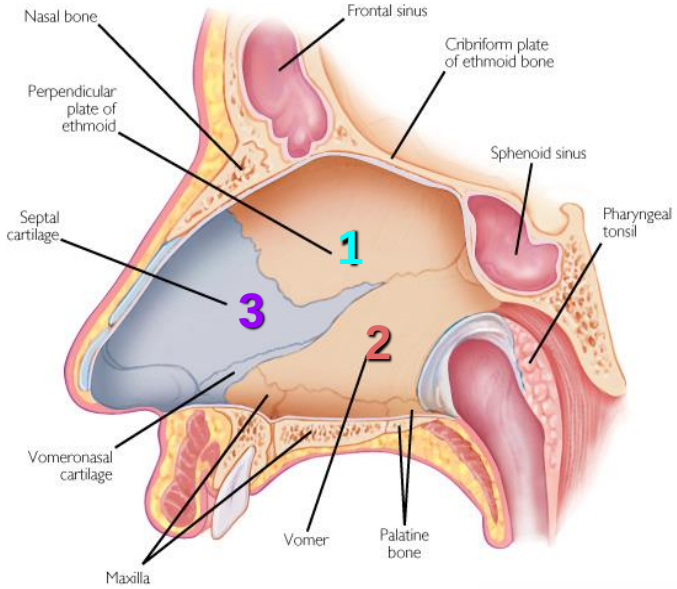
Extra

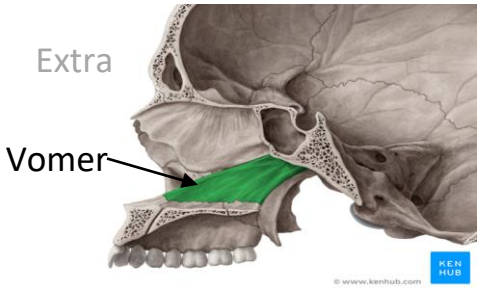
The Upper Respiratory System

Nasal Cavity

3. Medial Wall (Nasal Septum)

- Osteocartilaginous partition.
- Formed by:
  1. Perpendicular plate of ethmoid bone.
  2. Vomer.
  3. Septal cartilage.

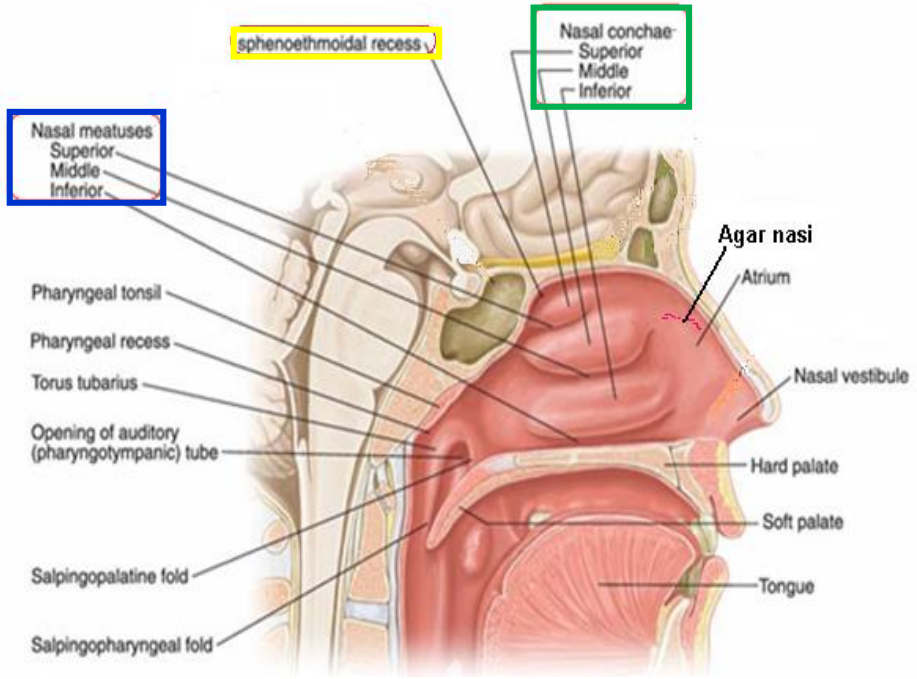




*Don't get confused between the choanae (posterior nares) and the conchae!

4. Lateral Wall

- Shows three horizontal bony projections, the superior, middle & inferior conchae*
- The cavity below each concha is called a meatus and are named as superior, middle & inferior meatus corresponding to the conchae.
- The small space above the superior concha and below the roof is the sphenoethmoidal recess.
- The conchae increase the surface area of the nasal cavity.
- The recess & meati receive the openings of the: Paranasal sinuses and Nasolacrimal duct. (will be discussed later)



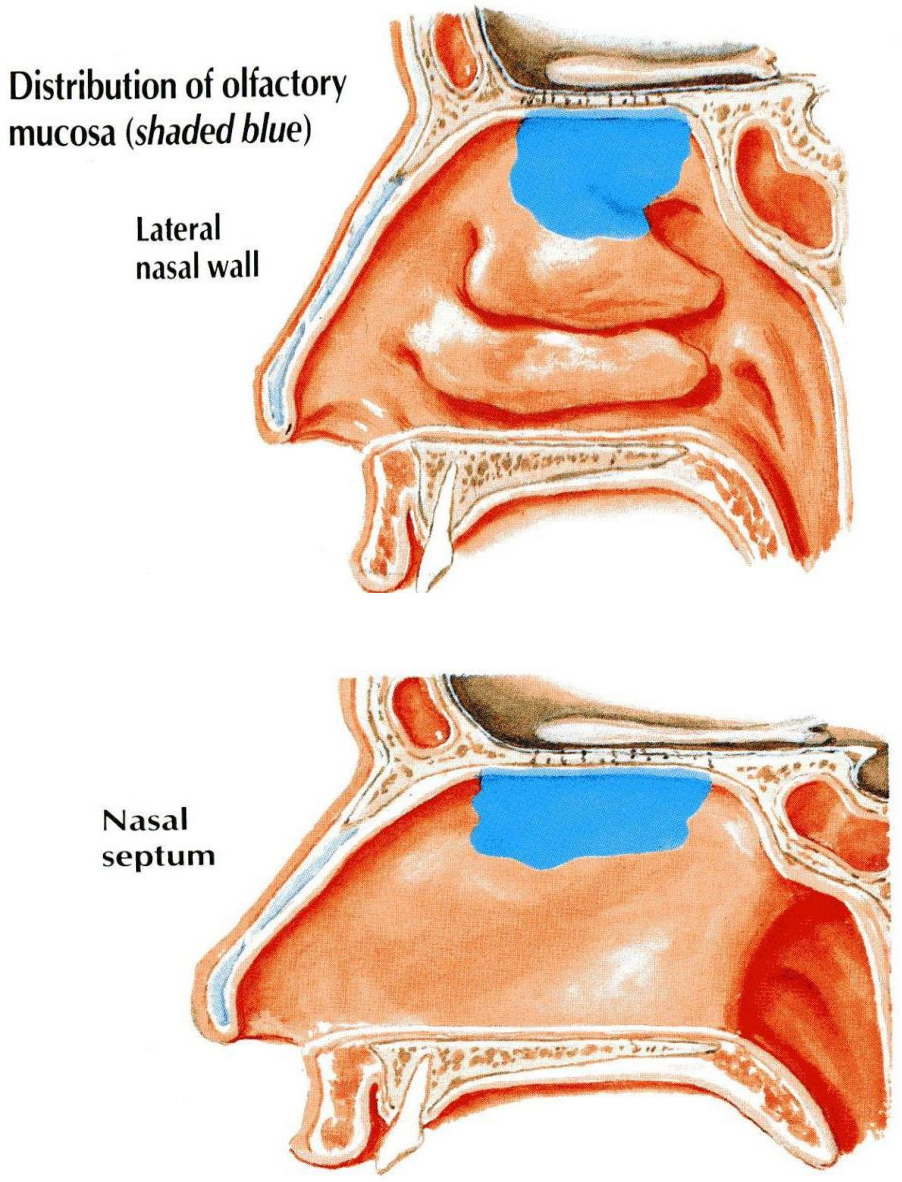
Nasal Cavity

Nasal Mucosa

We have 2 type of nasal mucosa: olfactory and respiratory.

Olfactory: (relating to the sense of smell)

- It is delicate and contains olfactory nerve cells (carries smell to the brain)
- It is present in the upper part of nasal cavity in the roof, lateral wall and medial wall.
  - On the Lateral wall : It lines the upper surface of the superior concha and the sphenoethmoidal recess.
  - On the Medial wall: It lines the superior part of the nasal septum



Nasal Cavity

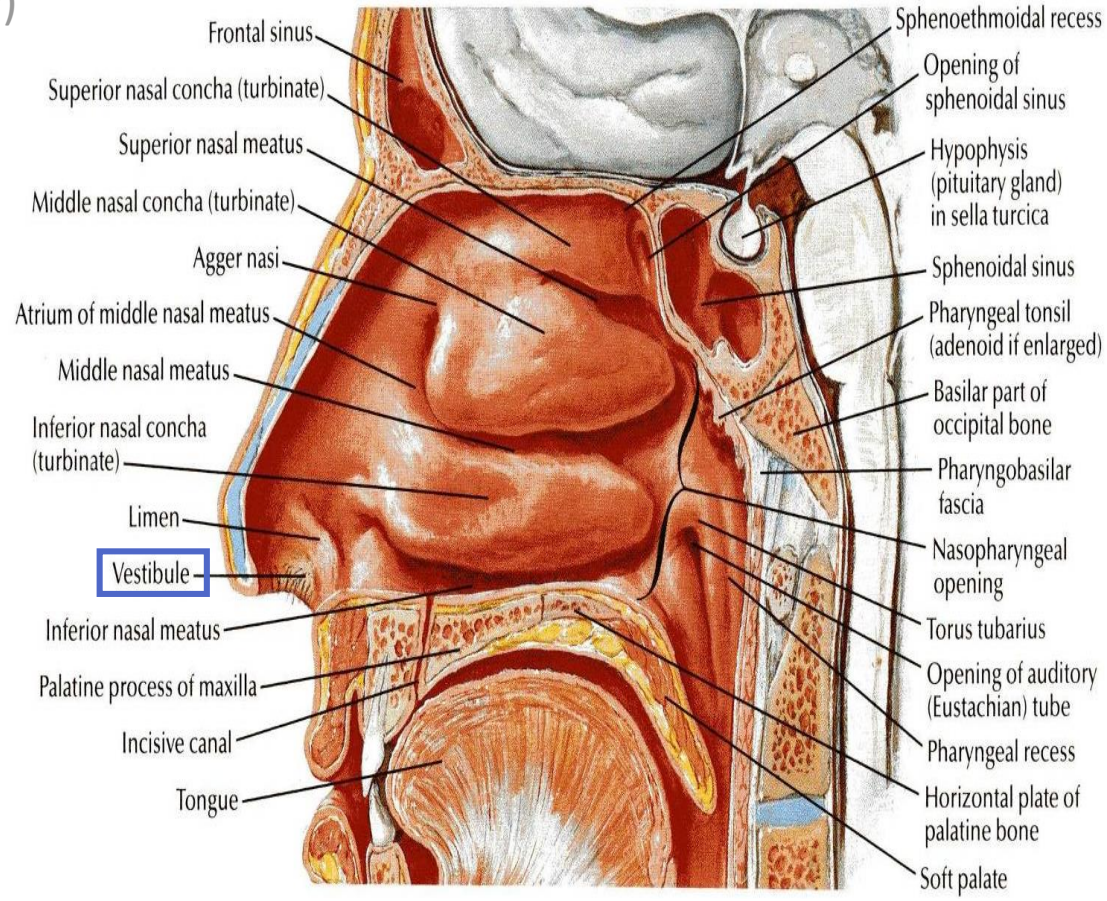
Nasal Mucosa

We have 2 type of nasal mucosa: olfactory and respiratory.

The inspired air is dirty , dry and cold. So, the respiratory mucosa will clean, moisten and warm the inspired air.

Respiratory mucosa (lining the rest of the nasal cavity)

- It is thick, ciliated ,highly vascular and contains mucous glands & goblet cells.
- It lines the **Lower part** of the nasal cavity.
- It functions to moisten, clean and warm the inspired air.
- The air is **moistened** by the secretion of numerous serous glands.
- It is **cleaned** by the removal of the dust particles by the ciliary action of the columnar ciliated epithelium that covers the mucosa.
- The air is **warmed** by a **submucous venous plexus**.
- Vestibule is lined by Skin.(the only part of the nasal cavity lined by skin not mucosa)



Nasal Cavity

Nerve supply:

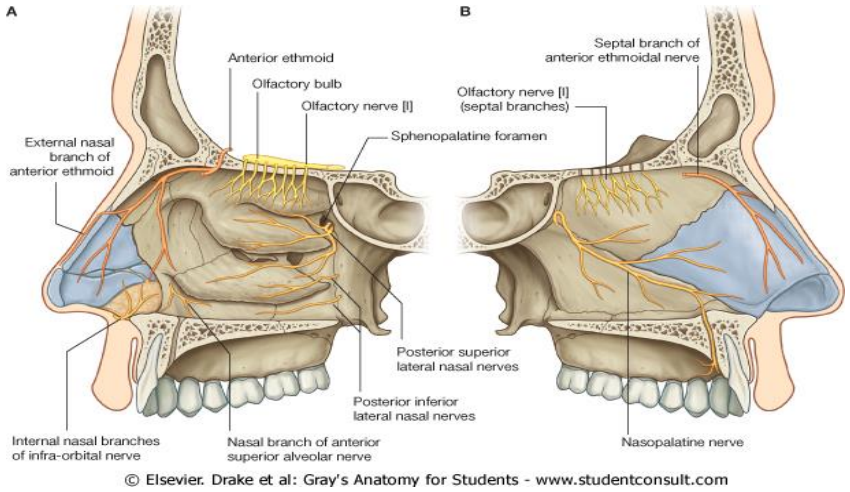
-Olfactory mucosa supplied by olfactory nerves (speacial sensation).

-Nerves of general sensation are derived from:

- Ophthalmic nerve
- Maxillary nerve.

} Branches from the trigeminal nerve

- Anterior ethemoidal nerve.
- Autonomic fibers:
  Nasal, nasopalatine and palatine branches of the ptergopalatine ganglion.



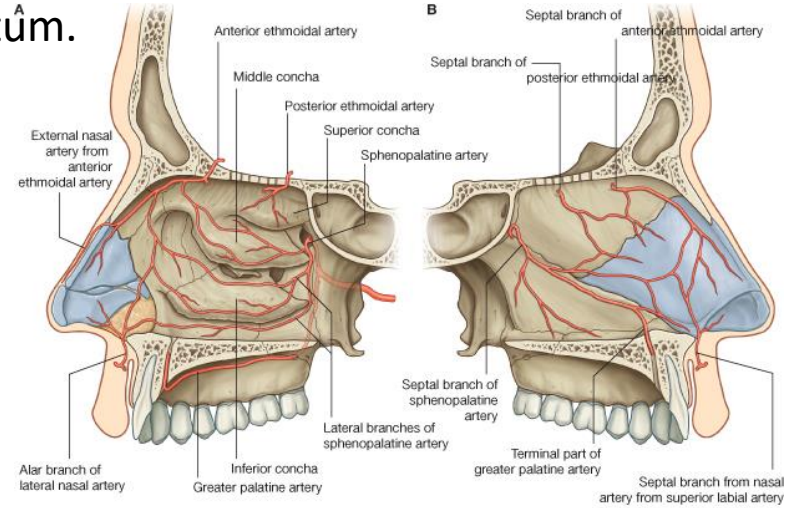
Arterial Supply:

-Branches of the:

- Maxillary: sphenopalatine artery
- Facial: superior labial artery
- Ophthalmic: ethmoidal arteries.

-The arteries make a rich anastomosis in the region of the vestibule, and anterior portion of the septum.

Maxillary and facial arteries are branch of external carotid artery
Opthalmic artery is branch of internal carotid artery.



Venous Drainage:

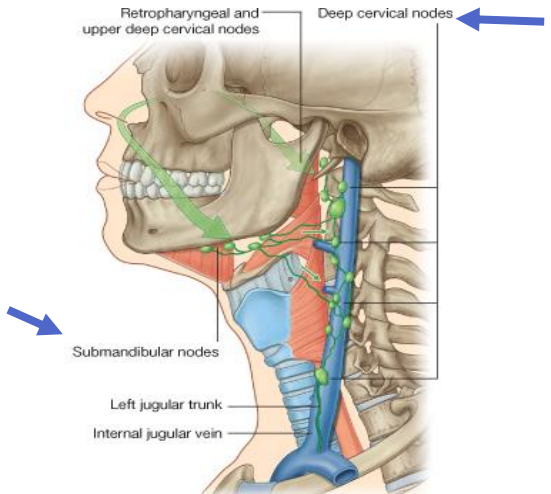
Submucosal plexus by veins accompany the arteries which drain into the:

- Facial vein
- Ophthalmic vein
- Spheno-palatine vein

Lymphatic Drainage:

The lymphatics from the:

- Vestibule drains into the submandibular lymph nodes.
- Rest of the cavity drains into the upper deep cervical lymph nodes.



Paranasal Sinuses (الجيوب الأنفيه)

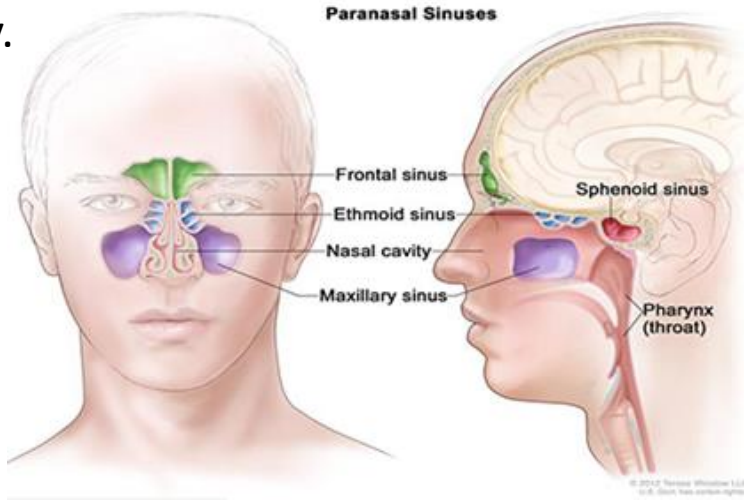
- **Air filled cavities** located in the bones around the nasal cavity: (Ethmoid, Sphenoid, Frontal and Maxilla bones)*
- Lined by respiratory mucosa which is continuous with the mucosa of the nasal cavity.
- Drain into the nasal cavity (Sinuses drain into recess and meati of the nasal cavity).
- Functions :

1- Lighten the weight of the skull.

2- Act as **resonant chambers** for speech.

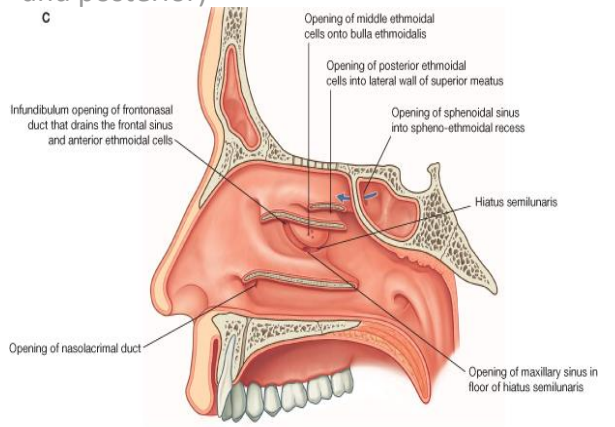
عشان كذا الاشخاص اللي عندهم التهاب او انسداد في الجيوب الأنفية يتغير صوتهم (sinusitis)

3- **Air conditioning**: The respiratory mucosal lining helps in warming, cleaning and moistening the incoming air.

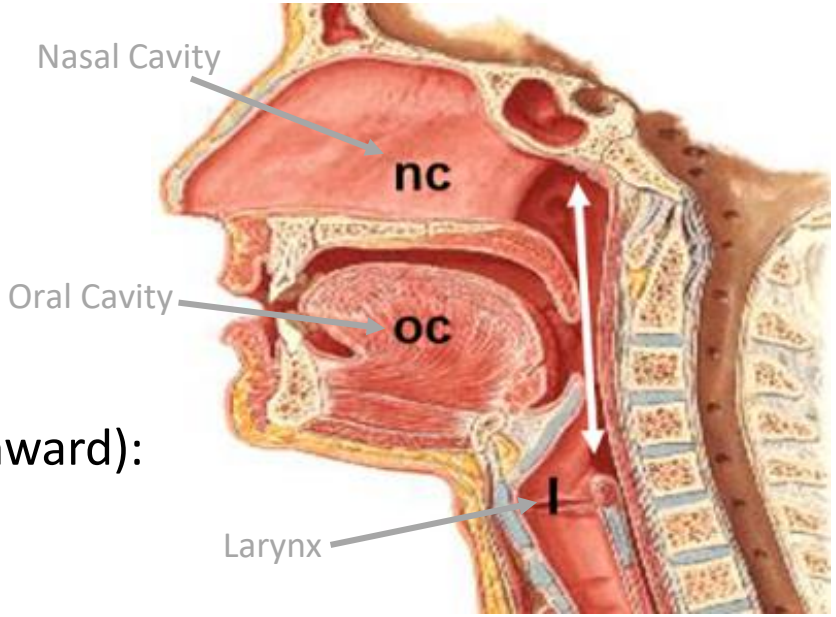


* The paranasal sinuses are:
1. Frontal sinus
2. Maxillary sinus
3. Spenoid sinus
4. Ethmoid sinus (divided into anterior, middle, and posterior)

Opening	Sinus
Spheno-ethmoidal recess	sphenoidal sinus
Superior meatus	posterior ethmoidal sinus
Middle meatus	middle ethmoidal, anterior ethmoidal , maxillary, and frontal sinuses
Inferior meatus	nasolacrimal duct. (carries tears from the lacrimal sac of the eye into the nasal cavity)

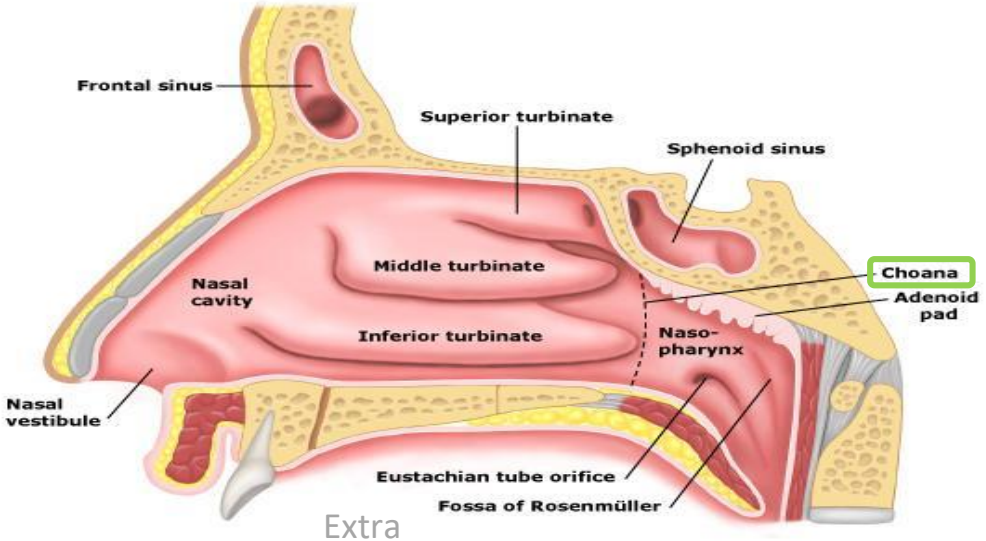


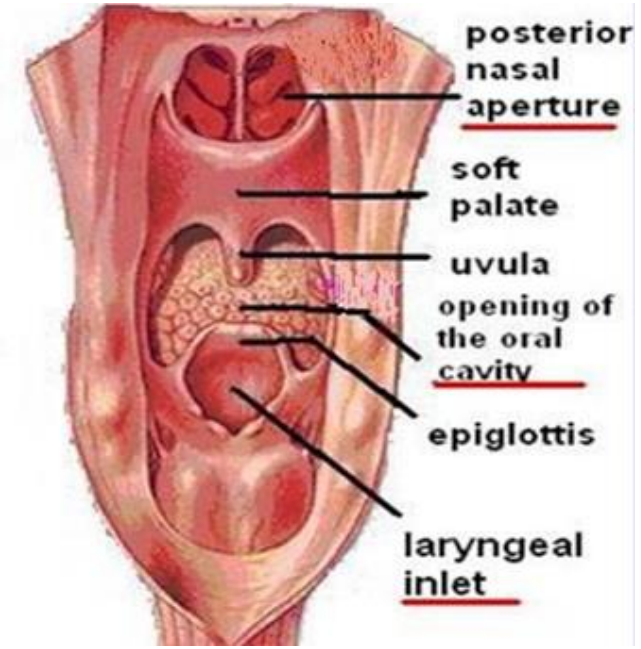
Pharynx



- Muscular tube lying behind the nose, oral cavity & larynx.
- Extends from the base of the skull to level of the C6 vertebra, where it continuous with the esophagus .
- The anterior wall is **deficient** and shows (from above to downward):
  1- Posterior nasal apertures. (choaena)
  2- Opening of the oral cavity.
  3- Laryngeal inlet.
- The muscles are arranged in circular and longitudinal layers.

Explanation:
The pharynx is made up of muscles that cover/make up the posterior and lateral walls. But they do not cover the anterior wall that's why it is deficient. Instead the anterior wall is open and connects with the structures listed above.





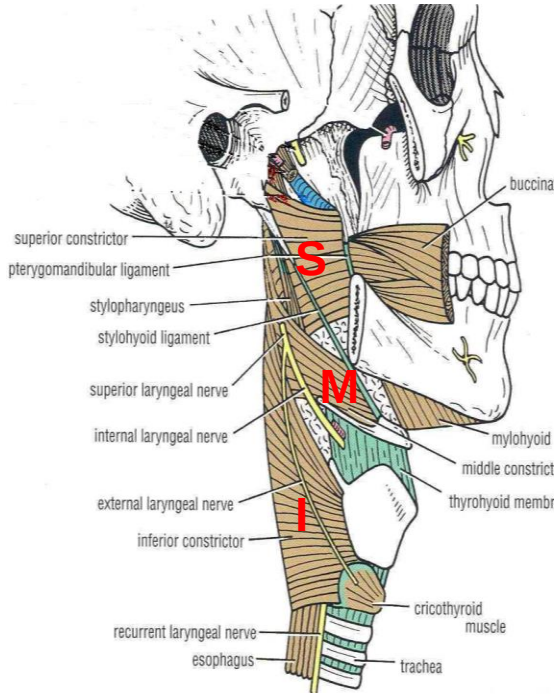
Extra

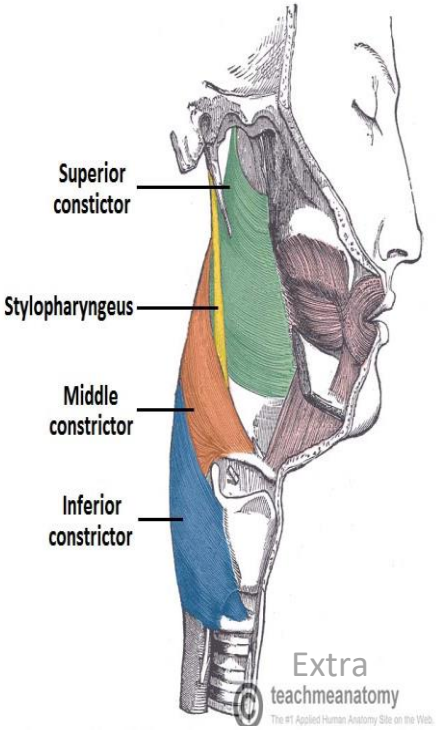
Muscles that form the walls of the Pharynx :

1- Circular (Constrictor) Muscles :

Three in number:
(1) Superior constrictor (2) Middle constrictor (3) Inferior constrictor
The three muscles overlap each other.

Functions:
- Propel the bolus of food down into the esophagus.
(by contracting **sequentially** from superior to inferior to constrict the lumen)
- lower fibers of the inferior constrictor (**Cricopharyngeus**) act as a sphincter, preventing the entry of air into the esophagus between the acts of swallowing.

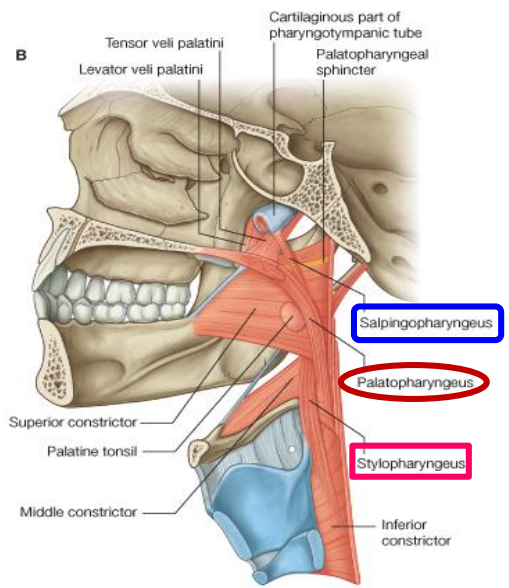


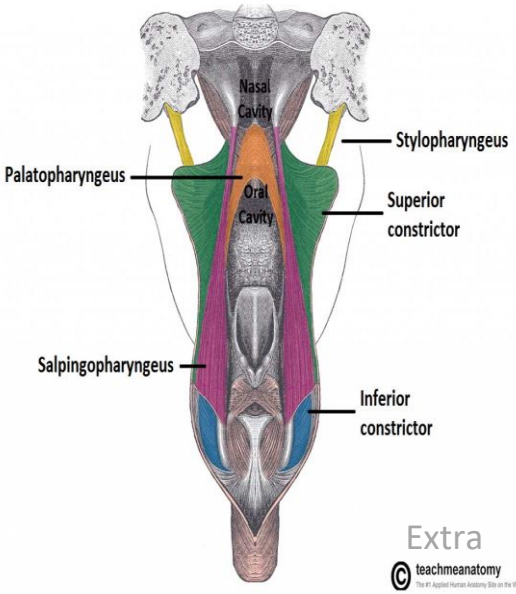


2- Longitudinal Muscles :

Three in number:
(1) Stylopharyngeus (2) Salpingopharyngeus (3) Palatopharyngeus.

Function:
- Elevate the larynx & pharynx during swallowing





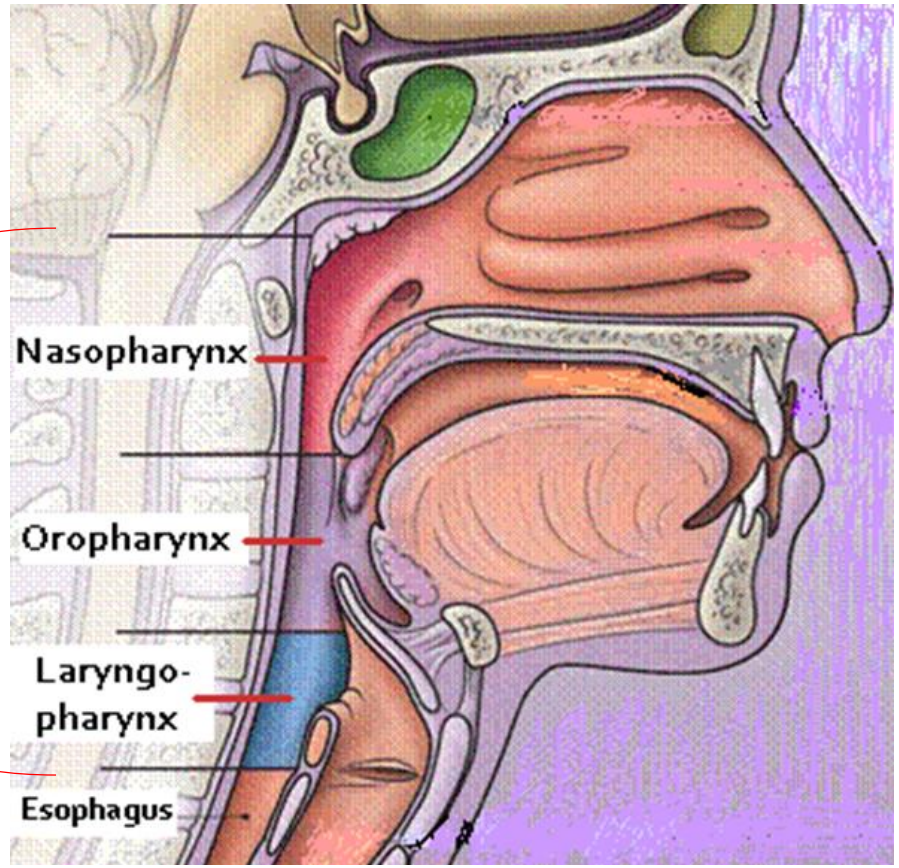
Pharynx

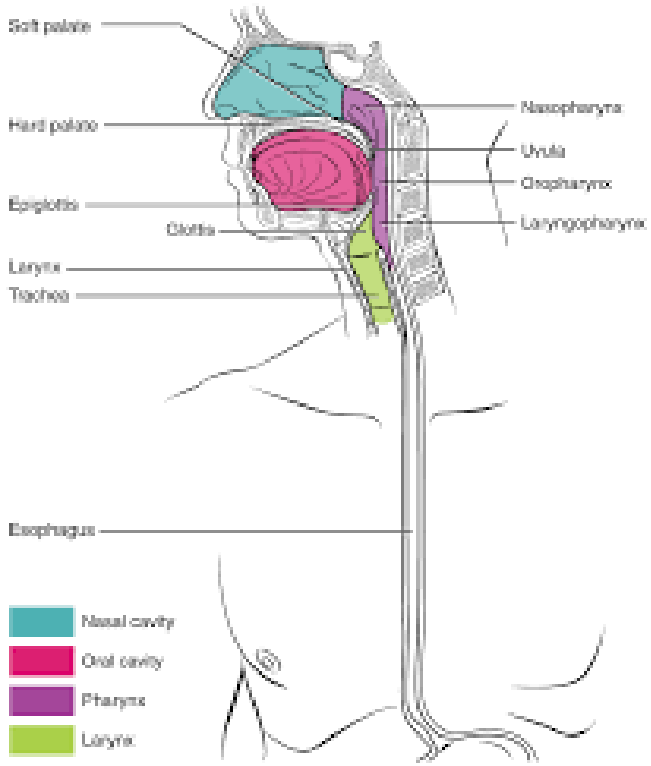
The pharynx is divided into three parts:

- Nasopharynx.
- Oropharynx.
- Laryngopharynx.

داخل البلعوم ، البلع و التنفس ما يمكن أنهم يحصلون بنفس الوقت لهذا:
Nasopharynx & laryngopharynx are concerned with respiration
Oropharynx & laryngopharynx are concerned with swallowing

Divisions of pharynx
(البلعوم)



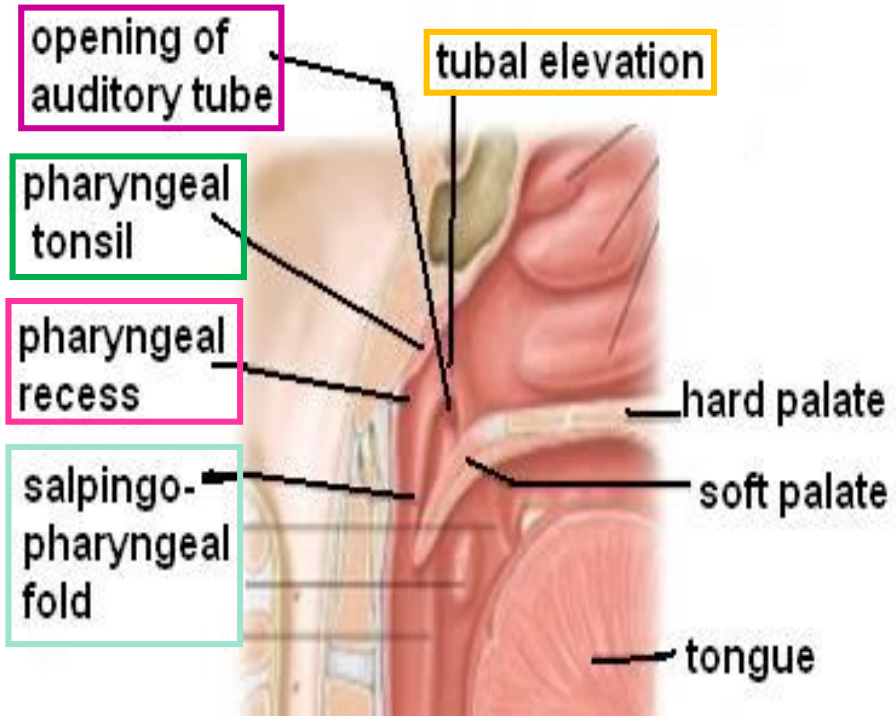


Extra

Pharynx

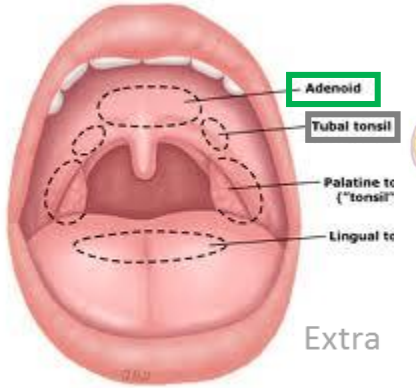
Nasopharynx

- Extends from the base of skull to the soft palate.
- Communicates with the nasal cavity through posterior nasal apertures (choanae)
- **Pharyngeal tonsils** (Adenoides *اللحمية) present in the submucosa covering the roof.
- **Lateral wall shows:**
  1. **Opening of auditory tube****.
  2. **Tubal elevation** (produced by posterior margin of the auditory tube).
  3. Tubal tonsil.
  4. Pharyngeal recess (الجزء الغائر)
  5. **Salpingopharyngeal fold** (raised by salpingo-pharyngeus muscle).



*خطورة اللحمية لما تكون كبيرة عند بعض الأطفال أنها تسد choanae فما يقدر الطفل يتنفس

**Auditory tube (comes from audio) عبارة عن قناة تفتح على الأذن الوسطى ، وهي المسؤولة عن معادلة الضغط الجوي . تكون مقفلة دائما و تفتح لما يختلف الضغط (عشان كذا لما يختلف الضغط يبلع الواحد ريقه)



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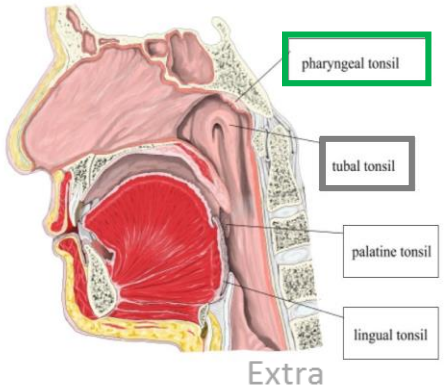


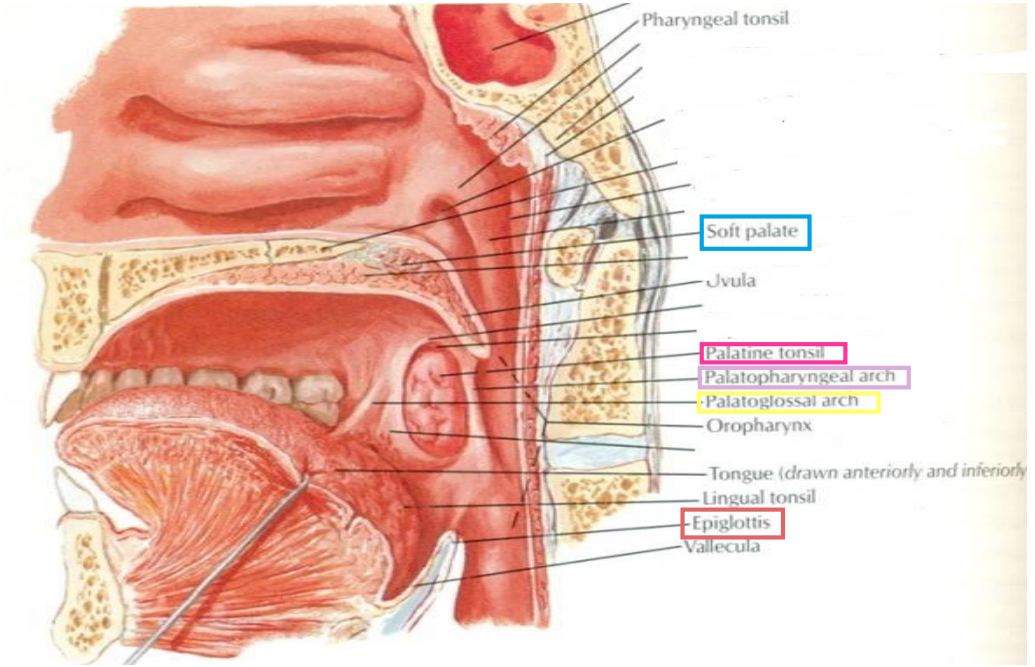
Extra

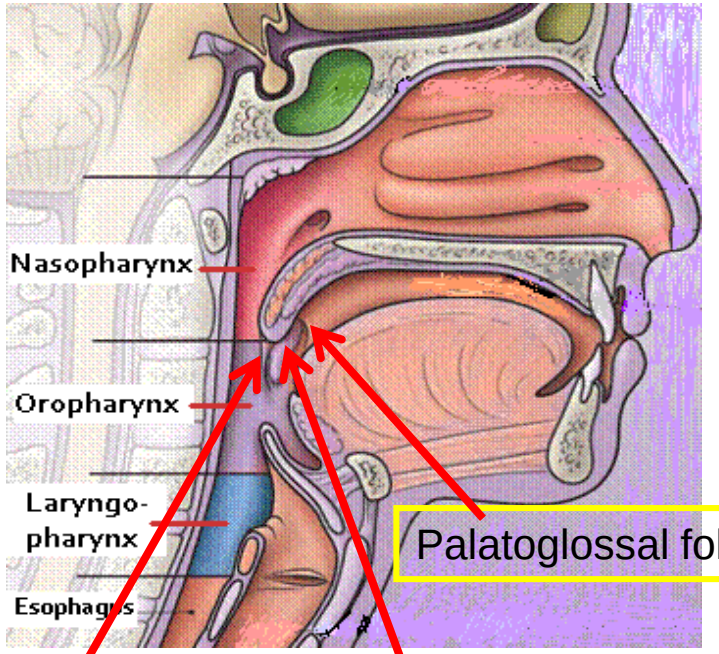
Pharynx

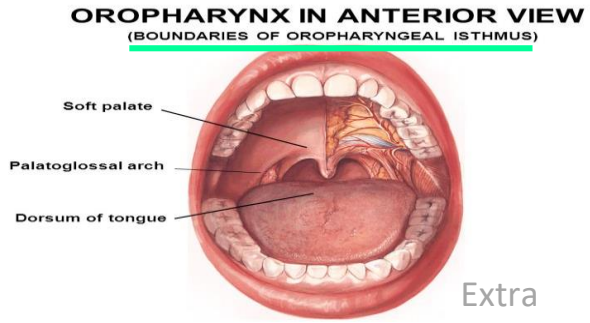
Oropharynx

- Lies behind the mouth cavity, communicates with the oral cavity through the **oropharyngeal isthmus***
- Extends from soft palate to upper border of epiglottis.
- **Lateral wall shows:**
  - Palatopharyngeal fold or arch.
  - Palatoglossal fold (glossal=related to tongue)
  - Palatine tonsil اللوز located between them in a depression called the 'tonsillar fossa'.

*isthmus: a narrow anatomical part or passage connecting two larger structures or cavities (in this case the oral cavity and the pharynx)







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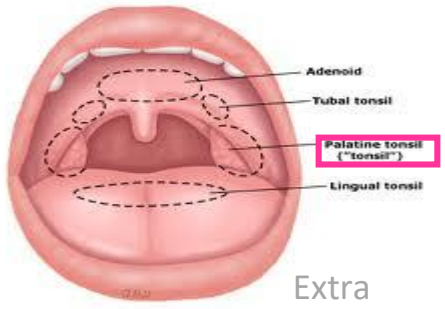


Extra

Pharynx

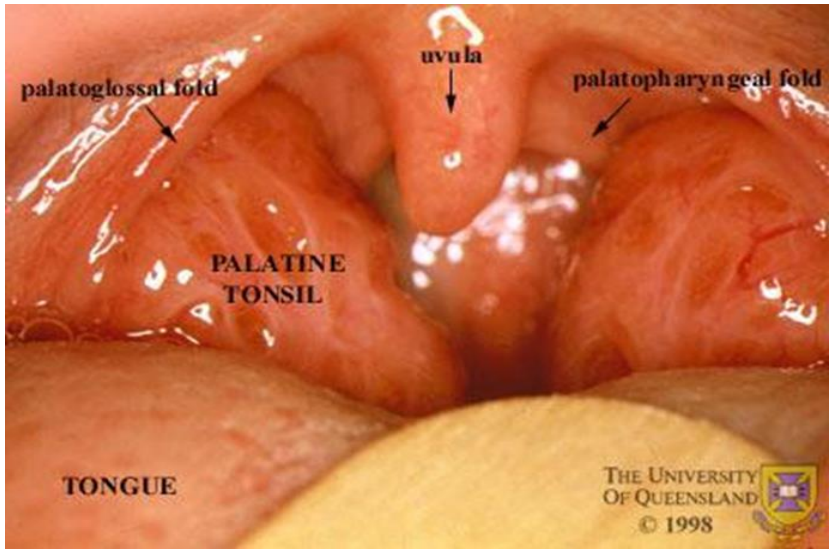
Palatine Tonsil

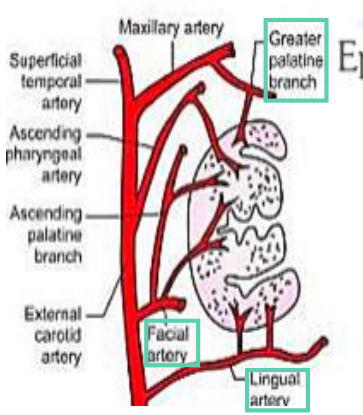
- Two masses
- Formed of lymphoid tissue
- located in the lateral wall of the <u>oropharynx</u> in the tonsillar fossa,

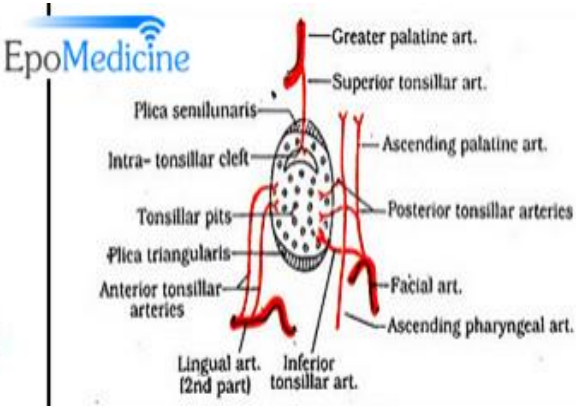
Each one is covered by:

- mucous membrane
- laterally by fibrous tissue (capsule).

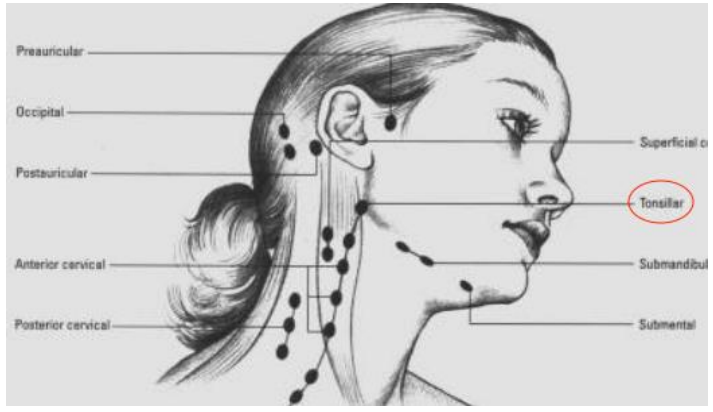
It reaches the maximum size during childhood, after puberty it diminishes in size . لأن الانسان اذا كبر تقل مناعته







Arterial supply	tonsillar artery from the fascial, lingual, ascending pharyngeal and greater palatine.
Venous drainage	join external palatine, pharyngeal, and fascial veins
Lymphatic drainage	to the upper deep cervical **(jugulodigastric node)**

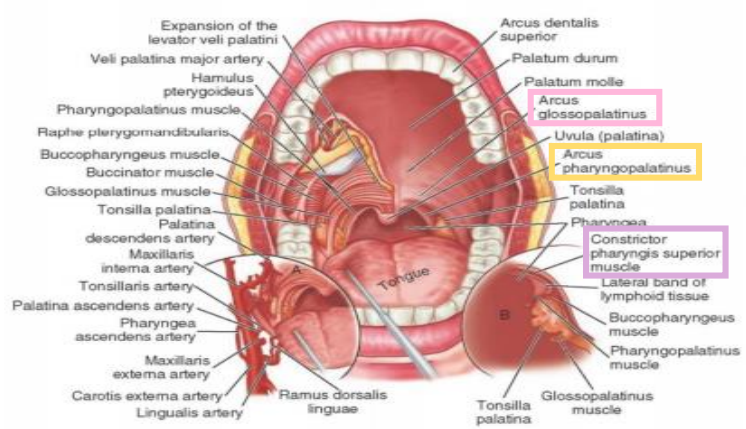


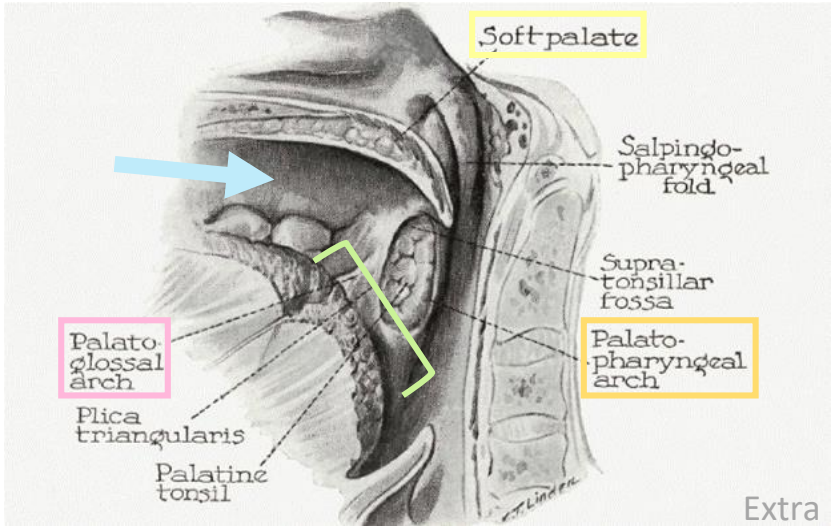
Pharynx

Palatine Tonsil

Relations

Anteriorly	palatoglossal arch
Posteriorly	palatopharyngeal arch
Superiorly	soft palate
Inferiorly	posterior 1\3 of the tongue
Medially	cavity of the oropharynx
Laterally	(1) superior constrictor of the pharynx separated from it by loose connective tissue through which descends the (2) external palatine vein, (3) loop of the facial artery and , (4) the internal carotid artery which lies behind and lateral to the tonsils.





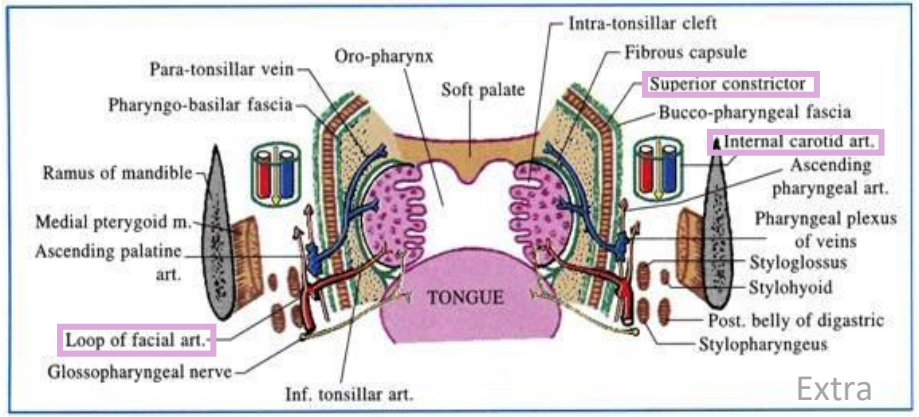


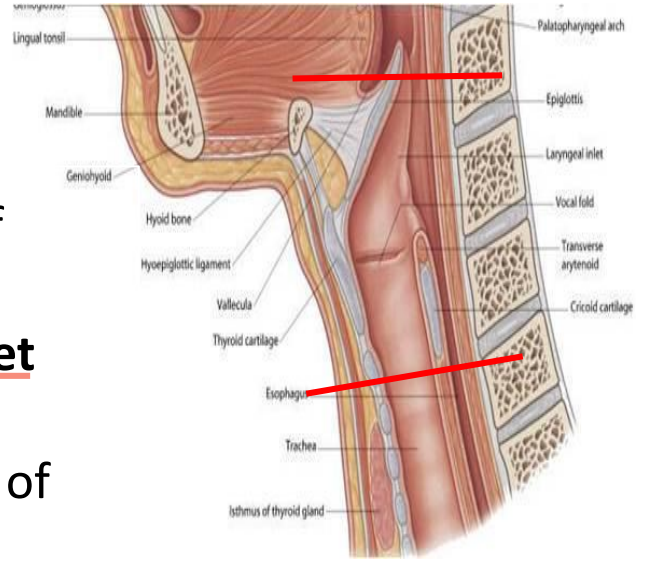
Fig. 12.9. *Coronal section through palatine tonsils showing their lateral relations.*

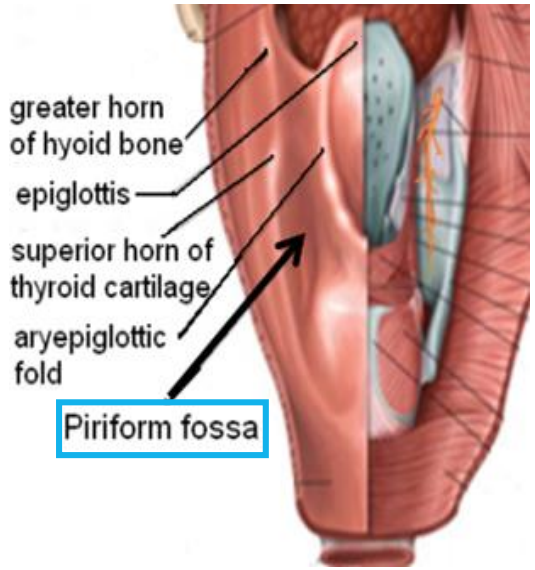
Pharynx

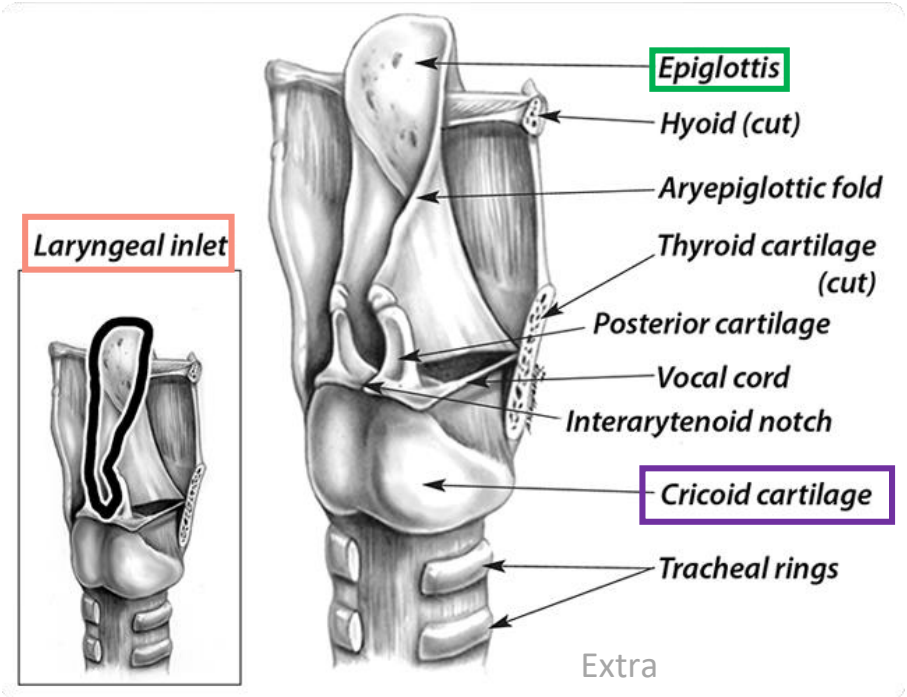
Laryngopharynx

- Lies behind the laryngeal inlet & the posterior surface of larynx
- communicates with the larynx through the **laryngeal inlet** (الفتحة الي تودي للللارنكس)
- Extends from upper border of epiglottis to lower border of cricoid cartilage.
- A small depression تجويفsituated on either side of the laryngeal inlet is called '**Piriform Fossa**' it is a common site for the lodging of foreign bodies*.
- Branches of **internal laryngeal** & **recurrent laryngeal nerves** lie deep to the mucous membrane of the fossa'Piriform Fossa' and are vulnerable to injury during removal of a foreign body.

*When you swallow fish bones this is were they usually get stuck. You should be careful when trying to remove them because they could injur the internal laryngeal & recurrent laryngeal nerves.







Extra

Pharynx

Nerve Supply	*Sensory*	Nasopharynx: Maxillary nerve Oropharynx: Glossopharyngeal nerve (cranial nerve number 9) Laryngopharynx: Vagus nerve (cranial nerve number 10)
	Motor	All the muscles of pharynx are supplied by the pharyngeal plexus. Except the **Stylopharyngeus** is supplied by the glossopharyngeal nerve
Arterial supply		from branches of the following arteries: 1- Ascending pharyngeal 2- Ascending palatine 3- Facial 4- Maxillary 5- Lingual
Veins		drain into pharyngeal venous plexus, which drains into the internal jugular vein
Lymphatics		drain into the deep cervical lymph nodes either directly, or indirectly via the retropharyngeal or paratracheal lymph nodes

Summary

Upper Respiratory

Nasal cavity

parts

left — right

Boundaries of each half

Roof

1- Nasal bone & cartilage
2- frontal bone
3- cribriform plate of ethmoid
4-body of spenoid

Floor

Hard bony plate (forms the roof of oral cavity)

Medial wall "nasal septum"

1- septal cartilage
2-perpendicular plate of ethmoid
3-vomer

lateral wall

Conchae
1- superior concha
2-middle concha
3-inferior concha

Meati
1- sphenoethmoidal recess
2- superior meatus
3- middle meatus
4- inferior meatus

Blood supply

Arterial
Branches of:
-maxillary
-facial
-ophthalmic
arteries.

Venous
-facial,
-ophthalmic
-spheno-palatine
veins.

Nerve supply

1-Olfactory mucosa by olfactory nerve

2-General sensation: ophthalmic , maxillary, Anterior ethemoidal nerves, and Autonomic fibers.

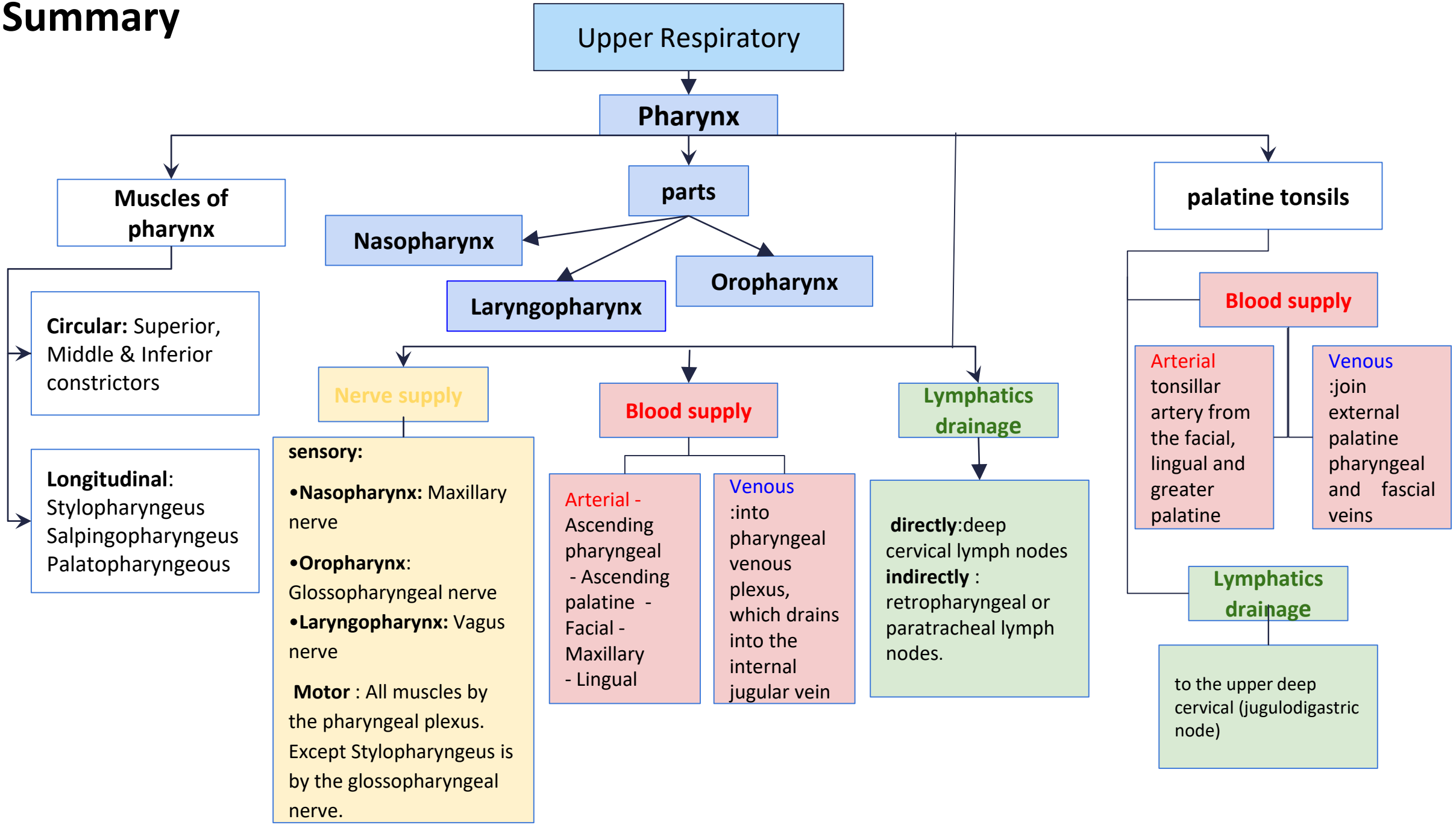
Lymphatics drainage

1-submandibular lymph nodes
2- upper deep cervical lymph nodes

Paranasal Sinuses

Spheno ethmoidal recess	sphenoidal sinus
Superior meatus	posterior ethmoidal sinus
Middle meatus	Middle ethmoidal,maxillary, frontal & the anterior ethmoidal sinuses
Inferior meatus	nasolacrimal duct.

Summary


Upper Respiratory
Pharynx
Muscles of pharynx
Circular: Superior, Middle & Inferior constrictors
Longitudinal: Stylopharyngeus Salpingopharyngeus Palatopharyngeous
parts
Nasopharynx
Laryngopharynx
Oropharynx
palatine tonsils
Nerve supply
sensory:
•Nasopharynx: Maxillary nerve
•Oropharynx: Glossopharyngeal nerve
•Laryngopharynx: Vagus nerve
Motor : All muscles by the pharyngeal plexus. Except Stylopharyngeus is by the glossopharyngeal nerve.
Blood supply
Arterial - Ascending pharyngeal - Ascending palatine - Facial - Maxillary - Lingual
Venous :into pharyngeal venous plexus, which drains into the internal jugular vein
Lymphatics drainage
directly:deep cervical lymph nodes
indirectly : retropharyngeal or paratracheal lymph nodes.
Blood supply
Arterial tonsillar artery from the facial, lingual and greater palatine
Venous :join external palatine pharyngeal and fascial veins
Lymphatics drainage
to the upper deep cervical (jugulodigastric node)

Summary

	Begins	Ends	Communicates with	Tonsil	Structures
Nasopharynx	Base of skull	Soft palate	Nasal cavity *Through* posterior nasal apertures	Pharyngeal Tubal	Opening of auditory tube Tubal elevation Pharyngeal recess Salpingopharyngeal fold
Oropharynx	Soft palate	Upper border of epiglottis	Oral cavity *Through* oropharyngeal isthmus	Palatine	Palatopharyngeal fold Palatoglossal fold
Laryngopharynx	Upper border of epiglottis	Lower border of cricoid cartilage	Larynx *Through* laryngeal inlet	-	Piriform Fossa

Questions

1. Which one of the following is a component of the roof of the nasal cavity :
   A) Epiglottis. B) nasal septum.
   C) body of sphenoid. D)choanae.

Answer: C

2. The cavity below the conchae known as :
   A) choanae. B) piriform fossa.
   C) notch. D) meatus.

Answer: D

3. Which one of the following is the feature of respiratory mucosa :
   A) thick. B) highly vascularized.
   C) has goblet cells and mucous glands.
   D) all of the above

Answer: D

4. What is the nerve supply of the olfactory mucosa :
   A) maxillary nerve. B) olfactory nerve.
   C) facial nerve. D) vagus nerve.

Answer: B

5. Blood supply of nasal cavity includes branches of:
   A) ophthalmic artery. B) maxillary artery.
   C) facial artery. D) all of the above

Answer: D

6. Which one of the following is <u>not</u> a function of paranasal sinuses :
   A) elevate the larynx and pharynx.
   B) lighten the skull. C) air conditioning
   D) resonant chambers for speech.

Answer: A

7. The lymphatic drainage from vestibule into :
   A) upper deep cervical lymph nodes.
   B) submandibular lymph nodes

Answer: B

Questions

8. Which one of the following drains into the sphenoethmoidal recess?
    A. Maxillary sinus
    B. Anterior ethmoidal sinus
    C. Posterior ethmoidal sinus
    D. Sphenoidal sinus

Answer: D

9. Medial to the palatine tonsil is:
    A. Palatopharyngeal arch
    B. Cavity of the oropharynx
    C. Palatoglossal arch
    D. Soft palate

Answer: B

10. Which muscle prevents the entry of air into the esophagus while swallowing?
    A. Superior constrictor muscle
    B. Stylopharyngeus
    C. Cricopharyngeus
    D. Palatopharyngeus

Answer: C

11. The uppermost portion of the pharynx is:
    A. Oropharynx
    B. Laryngopharynx
    C. Nasopharynx

Answer: C

12. Which structure is present in the lateral wall of the oropharynx?
    A. Pharyngeal recess
    B. Auditory tube
    C. Palatine tonsil
    D. Tubal tonsil

Answer: C

13. Which of the following does NOT drain into the middle meatus?
    A. Anterior ethmoidal sinus
    B. Posterior ethmoidal sinus
    C. Frontal sinus
    D. Maxillary sinus

Answer: B

Questions

14. The Palatoglossal fold acts as an anterior margin for which third of the pharynx?
    A. Nasopharynx
    B. Oropharynx
    C. Laryngopharynx

Answer: B

15. Inferior portion of the pharynx; extends from the epiglottis to lower border of the cricoid cartilage:
    A. Nasopharynx
    B. Oropharynx
    C. Laryngopharynx
    D. Larynx

Answer: C

16. All muscles of the pharynx are supplied by pharyngeal plexus except:
    A. Stylopharyngeus
    B. Salpingopharyngeus
    C. Palatopharyngeus
    D. Superior constrictor muscle

Answer: A

17. In continuation of the previous question: which nerve is it supplied by?

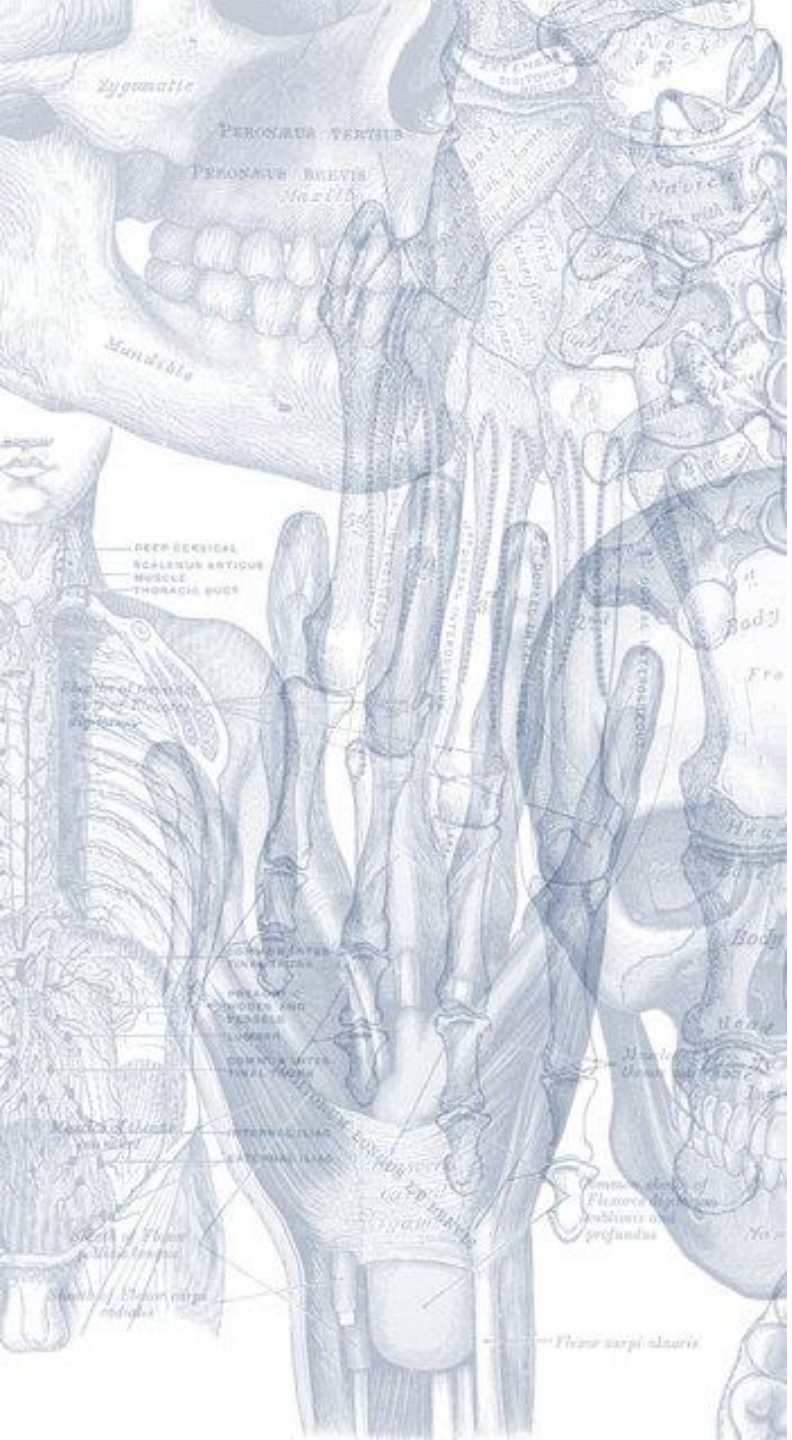
Answer: glossopharyngeal nerve

18. A patient presented to the ER and was diagnosed with tonsilitis after examination of the palatine tonsil. Which lymph nodes would be enlarged in this case?

Answer: upper deep cervical lymph nodes

19. A little boy presented to the ER with a foreign body stuck in the piriform fossa. Which nerve(s) is/are vulnerable for injury?

Answer: internal laryngeal and recurrent laryngeal nerves



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