MD Program
UNIVERSITY OF TORONTO

Anatomy

UNIT 2: Head and Neck

Lab 5

CLICK TO BEGIN

Lab 5 Exercise Selection

Pre-lab SLM

5A PRE-LAB SLM

Lab 5 Exercises

5.1 / 5.3 THE NECK

5.2 THE NOSE

5.4 THE ORAL CAVITY

If you finish any exercise early…

5.5 FIELD TRIP

Review Lab 5

QUIZLANDIA 5

5A An Introduction to the Oral and Nasal Cavities

Objectives:

When you have learned the material presented in this module, you will be able to describe the:

- boundaries of the oral cavity and nasal cavities.

Regarding the oral cavity, you will be able to describe the:

- features of the oral vestibule and oral cavity proper.
- muscles of the palate and the general sensory supply of the palatal mucosa.
- muscles of the floor of the mouth and tongue, including their actions and nerve supply, and the general sensory supply of the floor of the mouth and tongue.
- location of the palatine and lingual tonsils.

Regarding the nasal cavity, you will be able to describe the:

- bony skeleton of the nasal cavities.
- nasal conchae and meatuses.
- paranasal sinuses.
- blood and nerve supply of the nasal mucosa, including the route by which the parent vessels and nerves gain access to the nasal cavities.

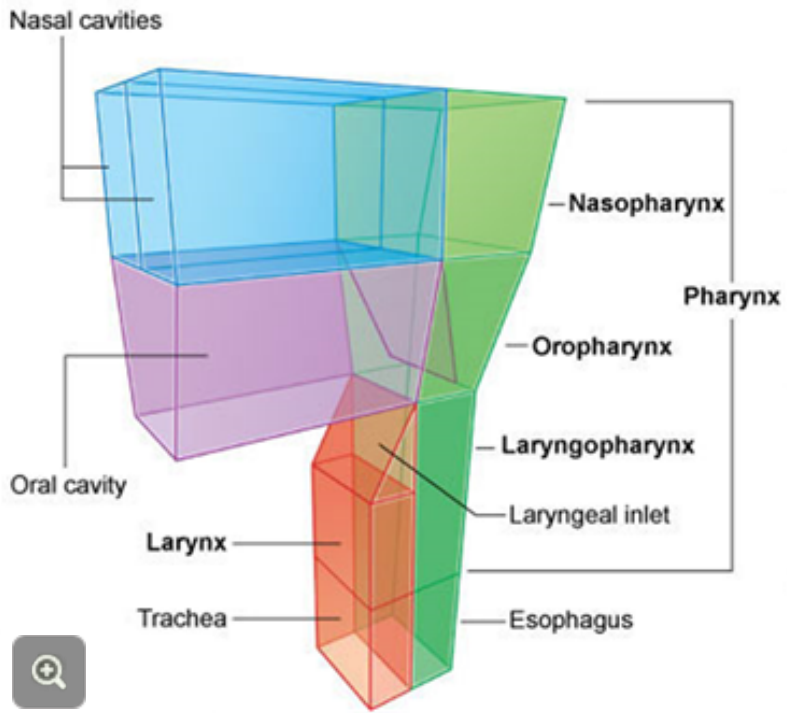
The schematic on the right is a useful starting point for understanding the relationships between these spaces.

Notice that the bilaterally-paired **nasal cavities**, depicted in blue, are superior to the **oral cavity**, depicted in purple.

The **pharynx**, depicted in green, is a single continuous space that is subdivided into the nasopharynx, oropharynx and laryngopharynx.

Notice that the **nasopharynx** is posterior to the nasal cavities and that the **oropharynx** is posterior to the oral cavity.

The **laryngopharynx** continues inferiorly as the **esophagus**, thus leading into the **digestive tract**, while it opens anteriorly into the **larynx** and trachea, thus leading into the **respiratory tract**.

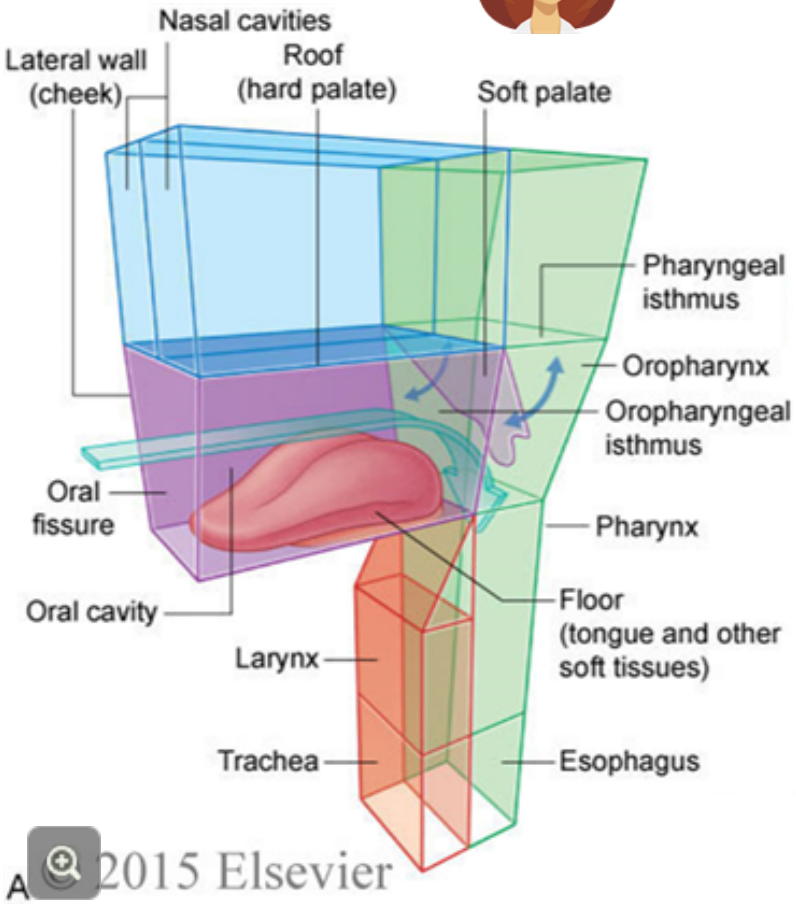


The Oral Cavity

The previous schematic is extended here, to focus more closely on the **oral cavity**.

Notice that the oral cavity opens anteriorly at the **oral fissure**. Its **roof** is formed by the **hard palate**, its **floor** is formed by the **tongue and associated mucosa**, and its **lateral walls** are formed by the **cheeks**.

The oral cavity ends posteriorly at the **oropharyngeal isthmus**, which is the narrowing that leads to the oropharynx. The oropharyngeal isthmus is **guarded by the soft palate**, which, as depicted by the blue arrows in the diagram, is raised in swallowing to isolate the oropharynx from the nasopharynx. This ensures that, in swallowing, food proceeds toward the digestive tract, and not upward into the nasal cavities.



The oral cavity consists of the **oral vestibule** and the **oral cavity proper**.

The **oral vestibule** is the space outside the teeth; it is therefore bounded by the lips and cheeks externally, and the teeth and gums (gingiva) internally.

The **oral cavity proper** is the space contained within the alveolar processes and teeth.

TASK

In a mirror, identify your oral vestibule and oral cavity, proper.

Lift your upper lip and, in your oral vestibule, identify your superior labial frenulum in the midline extending to your upper lip. Turn down your lower lip and identify your inferior labial frenulum in the midline extending to your lower lip. These are folds of mucous membrane that connect the lip to the gingiva.

TASK

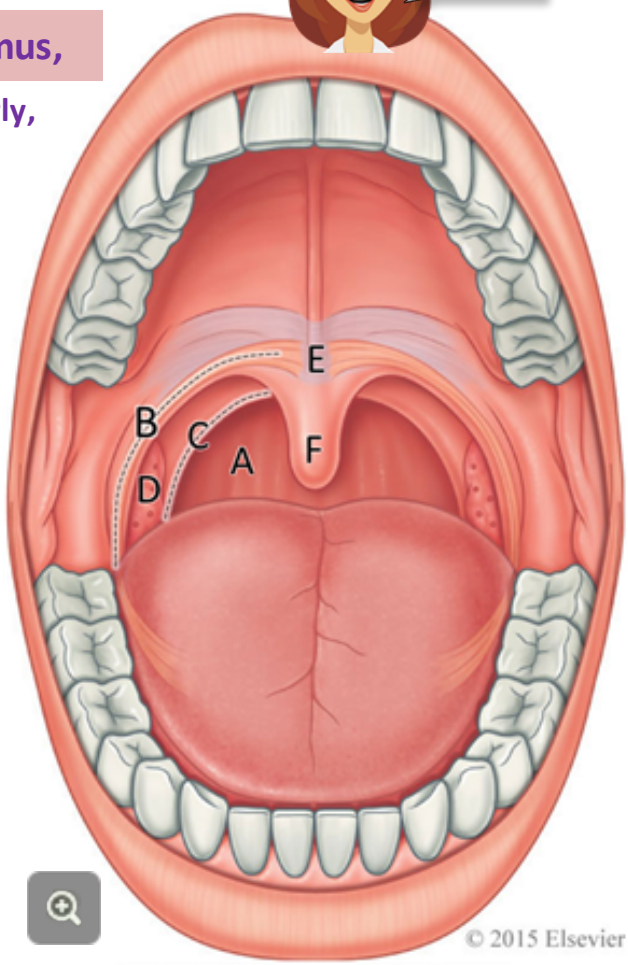
In the mirror, identify your oropharyngeal isthmus,

which is the opening between the oral cavity, anteriorly, and the oropharynx (A), posteriorly.

Identify the boundaries of your oropharyngeal isthmus, the soft palate (E) superiorly, two pairs of mucosal folds laterally (B & C), and the base of the tongue inferiorly. Identify your uvula (F), an extension of the soft palate, in the midline.

Identify the anterior member of each pair of mucosal folds, the palatoglossal fold (B) or anterior pillar, created by the underlying palatoglossus muscle. Identify the posterior member of each pair, the palatopharyngeal fold (C) or posterior pillar, created by the palatopharyngeus muscle.

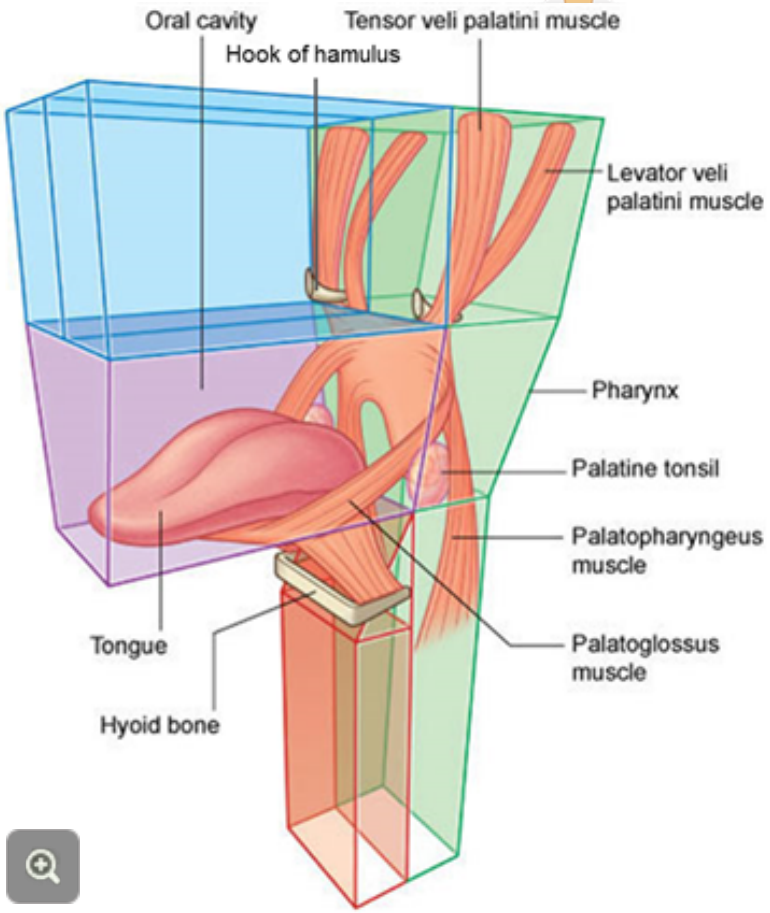
Between your palatoglossal and palatopharyngeal folds, identify your palatine tonsil (D). These tonsils are largest in children, atrophy with age, and may even have been removed during the lifetime of the cadaver you will study.



Exactly as their names suggest, the **palatoglossus muscles** extend from the soft palate to the tongue, and the **palatopharyngeus muscles** extend from the soft palate to the wall of the pharynx.

As shown in the diagram, the **palatine tonsil** is located in the angle between these two muscles.

These muscles both function to **close the oropharyngeal isthmus** by depressing the soft palate and pulling their respective folds toward the midline. In addition, the palatoglossus elevates the tongue and the palatopharyngeus elevates the pharynx. These actions occur during swallowing and are illustrated here:

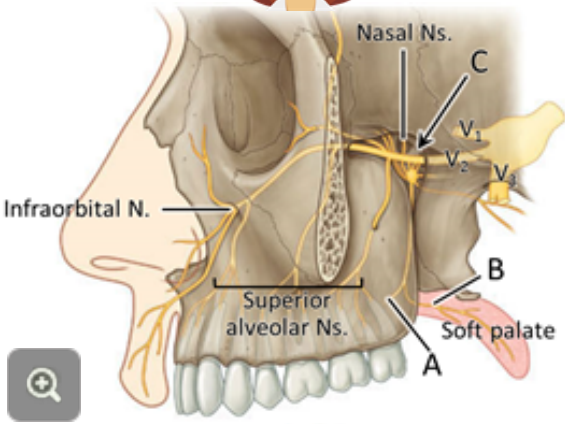


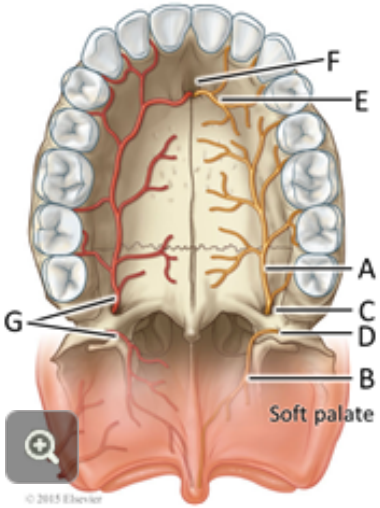
Like almost all structures **inferior to the eyes and superior to the oral fissure**, including the skin of the face, the general sensory innervation to the palate and maxillary teeth comes from **branches of the maxillary nerve, V_2**.

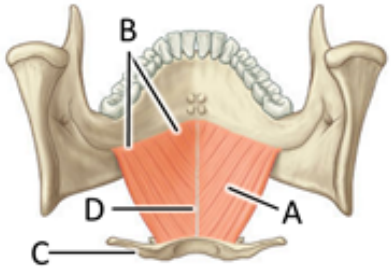
The **greater (A) and lesser (B) palatine branches of the maxillary nerve** reach the palate from the pterygopalatine fossa (C) by descending through the **palatine canal** to emerge through the **greater (C) and lesser (D) palatine foramina** in the palatine bone. The **greater palatine nerve** supplies the **hard palate**, and the **lesser palatine nerve** supplies the **soft palate**.

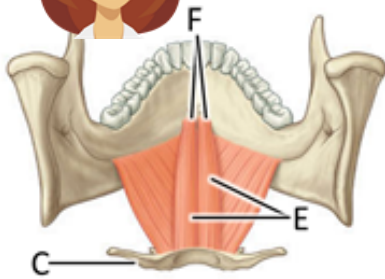
The **nasopalatine branch of the maxillary nerve (E)** reaches the anterior part of the palate from the nasal septum, by passing through the **incisive canal (F)**.

Blood supply to the palate is from the palatine branches of the maxillary artery (G) which travel with the palatine nerves.



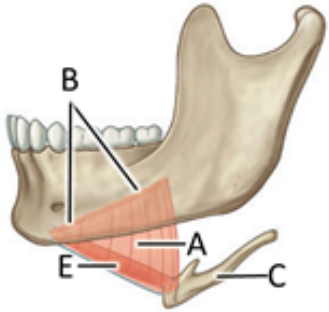




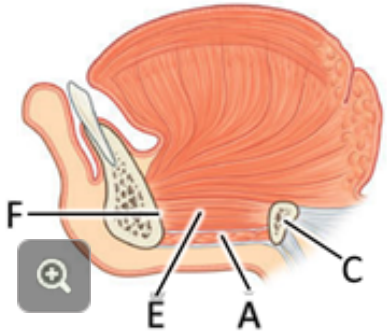


The muscles that form the floor of the oral cavity are named according to their attachments, **which makes it easier to identify them and to understand their actions**.

The **mylohyoid muscles (A)**, extend from the **mylohyoid line (B)** to the **hyoid bone (C)**. They largely insert into a **midline raphe** (D).

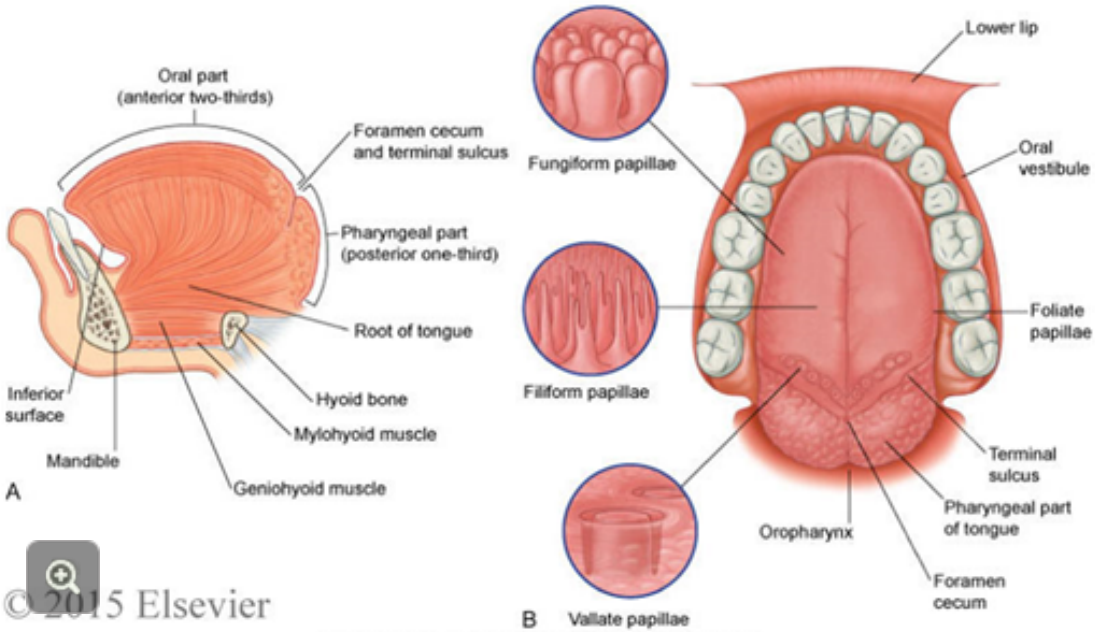


Superior to the mylohyoid muscles lie the paired **geniohyoid muscles** (E), which extend from the internal surface of the mandible, adjacent to the midline **(F)**, **to the hyoid bone (C)**.



The tongue is the largest structure in the oral cavity. Approximately the **anterior 2/3** lies horizontally within the oral cavity, and its surface is covered with projections called **papillae**. FYI, There are 3 different types of papillae; **filiform, fungiform and circumvallate**. The **taste buds** are located in the fungiform and circumvallate types.

The **posterior 1/3 of the tongue** is vertically oriented and faces into the oropharynx. It is separated from the anterior 2/3 by a v-shaped groove called the **terminal sulcus**. The posterior 1/3 of the tongue is covered with the lymphatic tissue that comprises the **lingual tonsil**.



5A The Lingual Frenulum

The tip of the tongue is connected to the floor of the mouth by a fold of mucosa, the **lingual frenulum**.

INFO

Ankyloglossia

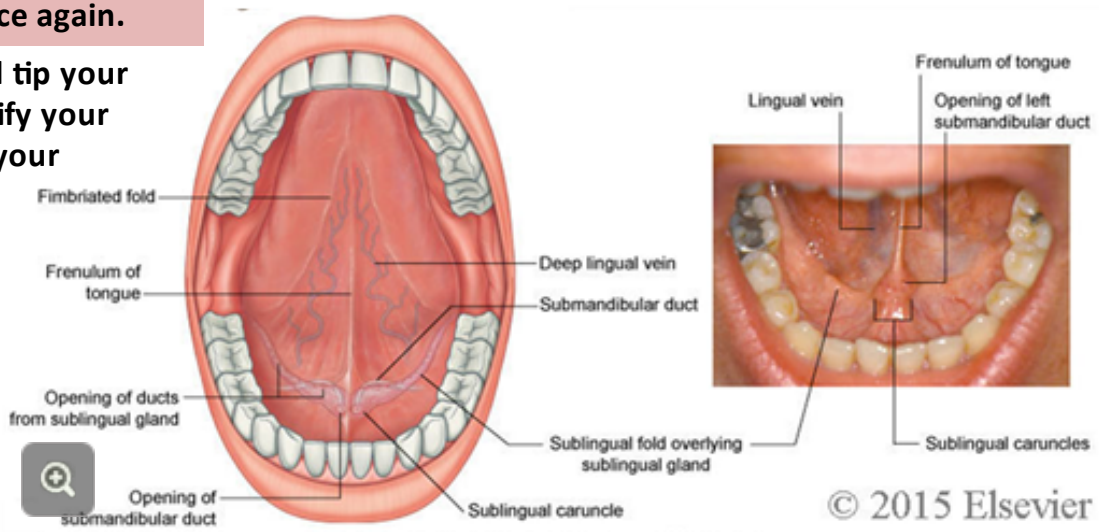
Children with the congenital malformation “tongue tie” (ankyloglossia) have an abnormally thick, short, lingual frenulum which can restrict tongue movements and interfere with the development of speech. Surgical intervention and correction is sometimes necessary.

On each side of the lingual frenulum lies a **sublingual caruncle** onto which a **duct of the submandibular salivary gland opens**.

TASK

Look in the mirror once again.

Open your mouth and tip your tongue upward. Identify your lingual frenulum and your sublingual caruncles.



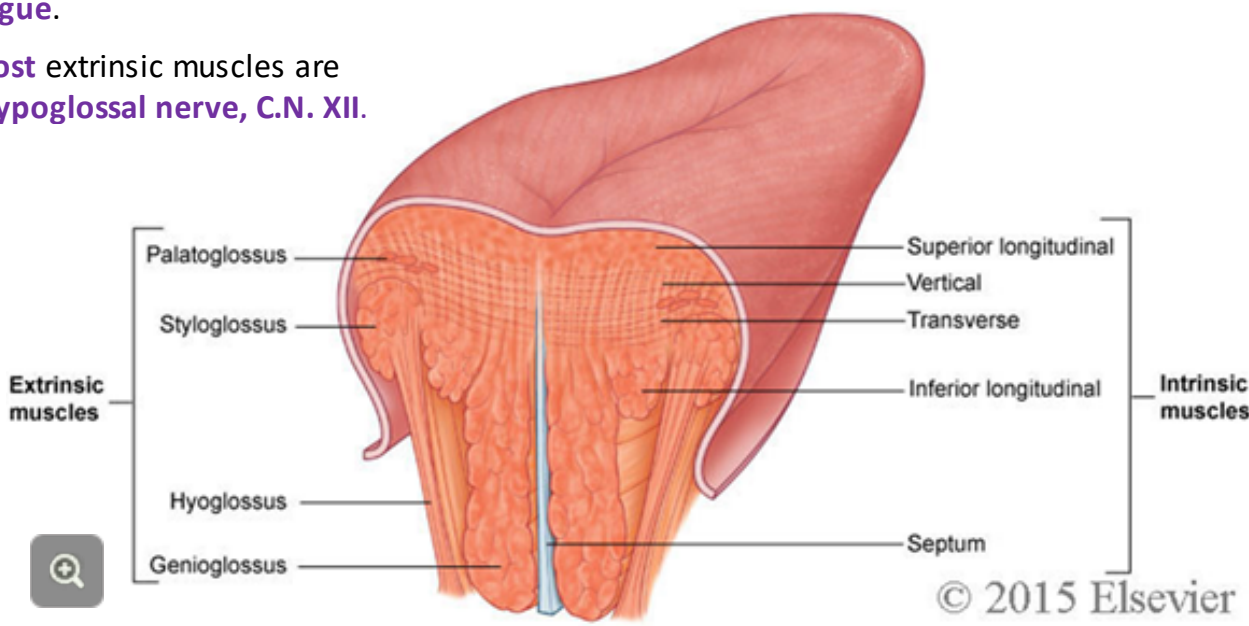
5A The Intrinsic and Extrinsic Muscles of the Tongue

The tongue can be described as a bag of bilaterally paired muscles covered by a mucous membrane. The muscles can be the divided into 2 groups.

The **intrinsic muscles** are entirely contained within the substance of the tongue and have no attachment to surrounding skeletal structures. The fibres of the intrinsic muscles are oriented in all 3 planes and are primarily used for **shaping the tongue**.

The **extrinsic muscles,** on the other hand, have one end attached to a skeletal structure, while the other end blends into the muscles of the tongue. Extrinsic muscles function primarily for controlling the **position of the tongue**.

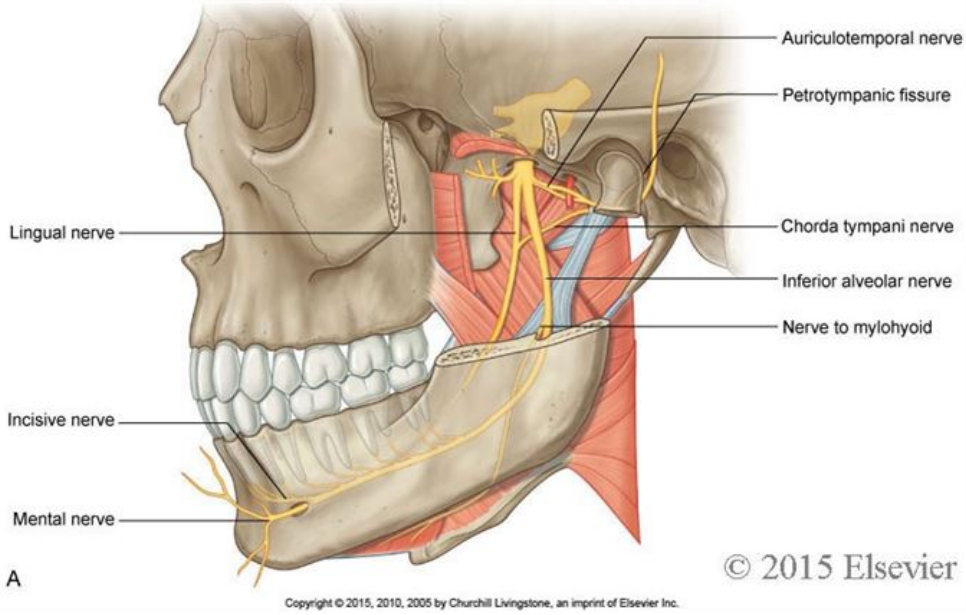
The intrinsic and **most** extrinsic muscles are innervated by the **hypoglossal nerve, C.N. XII**.



The floor of the oral cavity, including the teeth and tongue, receive **sensory innervation** from branches of the **mandibular division of the trigeminal nerve, V_3**. These include the **lingual nerve** and the **inferior alveolar nerve**.

The **chorda tympani**, a branch of the **facial nerve, VII**, carries **taste afferents** from the **anterior 2/3 of the tongue** and **parasympathetic efferents** to the floor of the mouth, including to the **submandibular** and **sublingual salivary glands**. These fibres, both taste and parasympathetic, are ultimately delivered to the floor of the mouth by the **lingual nerve**, a branch of the **mandibular division of the trigeminal nerve, V_3**.

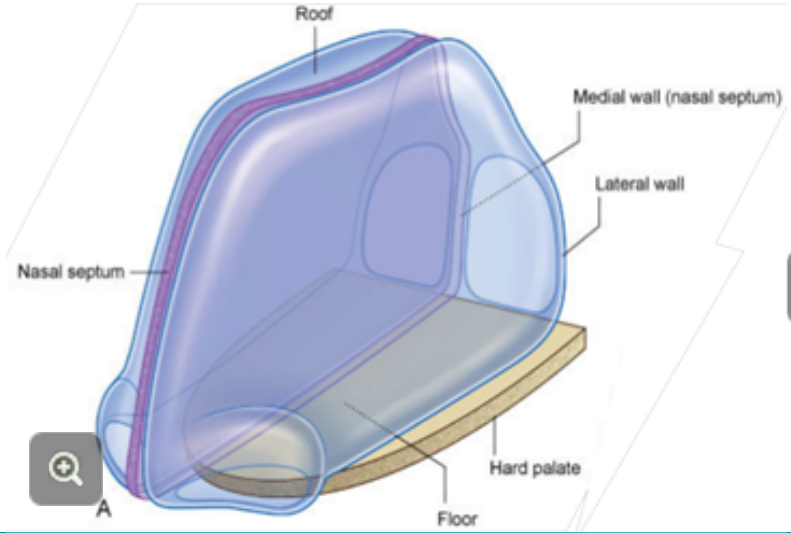
Sympathetic fibres to the oral cavity, both above and below the oral fissure (i.e. to both the floor and roof of the mouth), arise from **spinal level T_1**. These preganglionic sympathetic fibres ascend in the sympathetic chain to synapse on postganglionic neurons in the **superior cervical ganglion**. Postganglionic axons are distributed to their targets either in branches of the trigeminal nerve, V, or by traveling with blood vessels.

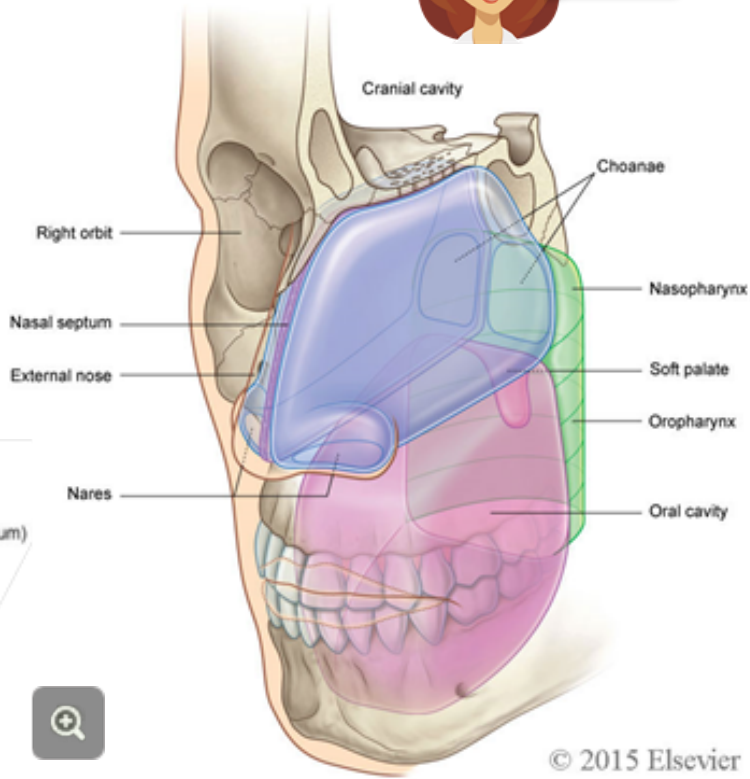


The Nasal Cavity

The nasal cavity extends from the **nostrils**, or **nares**, anteriorly, to the **choanae**, posteriorly. The choanae are bilaterally-paired openings on either side of the **nasal septum**, that are continuous with the **nasopharynx**.

Each nasal cavity is described as having a **floor, formed by the hard palate, a medial wall, formed by the nasal septum, a roof, and a lateral wall**.



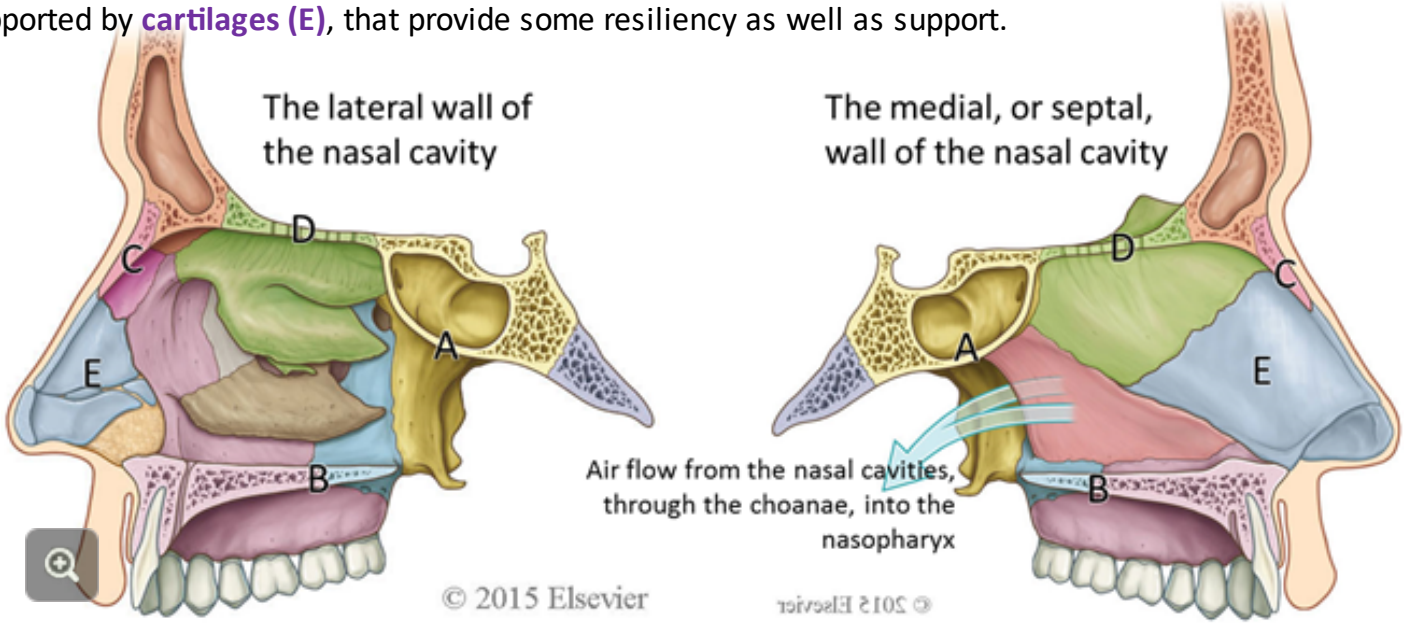


The choanae are bordered laterally by the **sphenoid bone (A)** and inferiorly by the **posterior edge of the hard palate (B)**.

The **roof** of the nasal cavity is mainly formed by the **nasal bones (C)**, the **cribriform plate of the ethmoid bone (D)** and the **body of the sphenoid bone**. Cranial nerve I, the **olfactory nerve**, passes through the cribriform plate of the ethmoid bone.

The **floor** is formed by the **hard palate**.

The medial and lateral walls are supported by several bones, but approximately the anterior 1/5 is supported by **cartilages (E)**, that provide some resiliency as well as support.



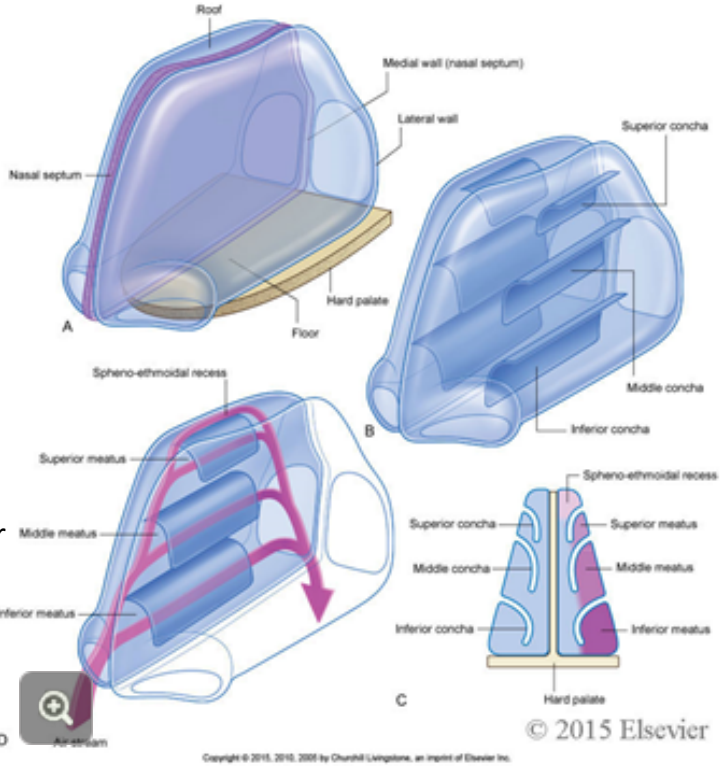
5A The Nasal Conchae and Meatuses

The nasal cavity is a passageway for air, but also serves to **sense odorant molecules** and to **warm, filter, and humidify the air during inspiration**. These latter functions are carried out by the histological properties of a well-vascularised, sticky, mucous membrane that lines the nasal cavity and over which the air passes to reach the pharynx posteriorly. To achieve these goals the nasal septum and the **conchae** (**turbinates**) serve to increase the surface area of mucous membrane over which the air must pass.

The **superior, middle and inferior conchae** are projections from the lateral wall that curve medially into the nasal cavity. The recesses that are created on the lateral sides of the conchae are the **superior, middle and inferior meatuses**. The recess above the superior concha is the **spheno-ethmoidal recess**.

The conchae not only increase the surface area over which air passes, but they also **create turbulence** which helps increase contact between the air and the mucosa.

The function of olfaction is restricted to the mucosa of the superior concha and above.

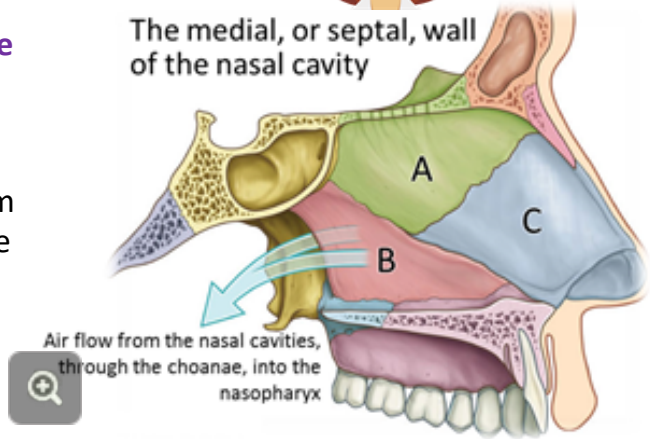


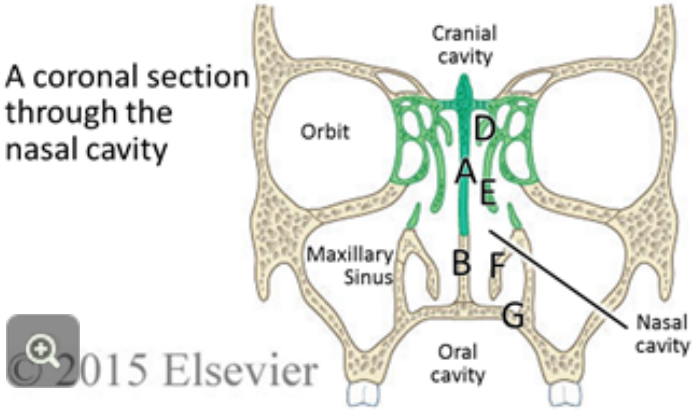
The Medial Wall of the Nasal Cavity

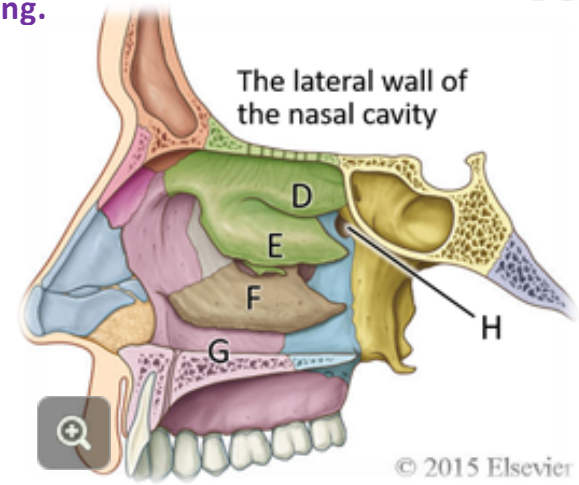
The nasal septum is formed by the **perpendicular plate of the ethmoid (A), the vomer (B), and the septal cartilage (C)**.

The Lateral Wall of the Nasal Cavity

The **superior (D) and middle (E) conchae** are projections from the **ethmoid bone**. The **inferior concha (F)** is a separate bone that articulates with the maxillary bone (G). The opening between the sphenoid and palatine bones is the **sphenopalatine foramen (H)**. It connects the pterygopalatine fossa to the nasal cavity. **Nerves and blood vessels gain access to the nasal cavity by passing through this opening.**



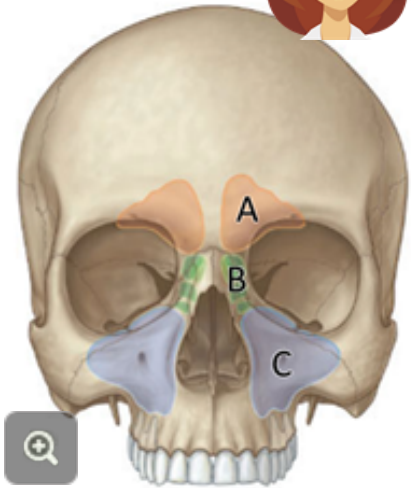


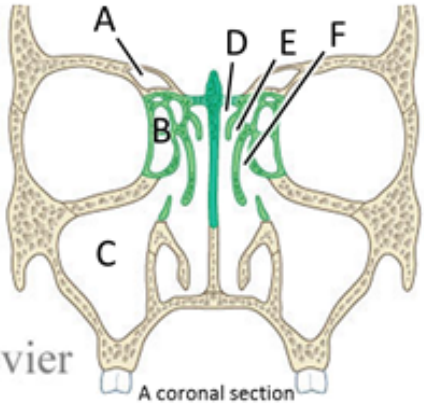


The **paranasal air sinuses** are cavities in the bones of the skull that open into the nasal cavity. They are lined by the same mucus membrane that lines the nasal cavity, and **the mucus produced in these sinuses drains through these openings into the nasal cavities**.

The paranasal air sinuses are named according to the bone in which they are located. Thus, they are the **frontal sinus** (A), **ethmoidal air cells** (B), the **maxillary sinus** (C) and **sphenoid sinus** (see next slide).

The sinuses of the ethmoid bone, the ethmoid air cells, consist of a group of small spaces, much like clusters of soap bubbles, within the **lateral masses of the ethmoid bone**. Note in the lower diagram that they are **located lateral to the sphenoethmoidal recess (D) and the superior (E) and middle (F) meatuses.** The posterior ethmoid air cells open into the superior meatus (not shown).





A coronal section through the nasal cavity

G

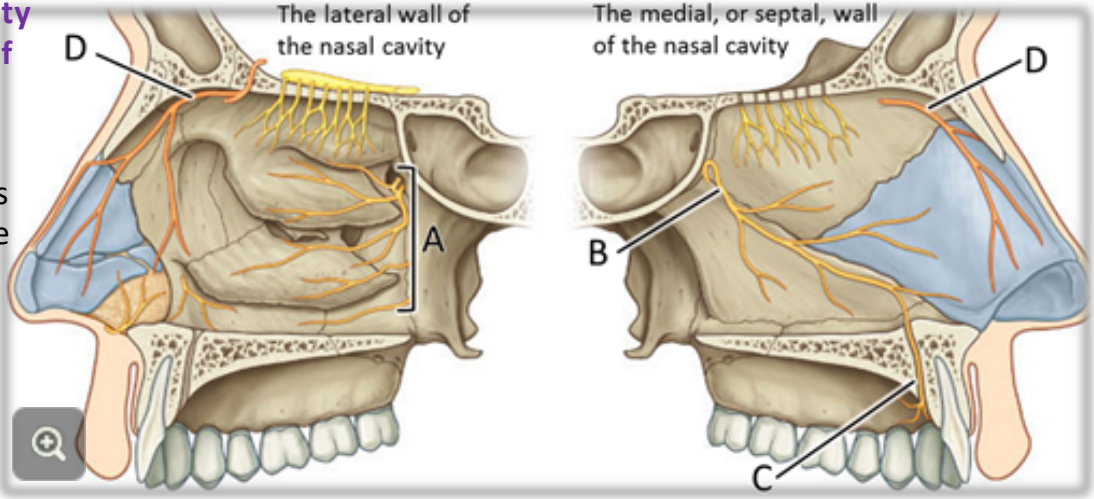
Like almost all structures **inferior to the eyes and superior to the oral fissure**, including the skin of the face, the general sensory innervation to the walls of the nasal cavity comes from **branches of the maxillary nerve, V_2**. They gain access to the nasal cavity by passing through the **sphenopalatine foramen** from the pterygopalatine fossa. **Their names describe their distribution.**

Lateral nasal branches (A) of the maxillary nerve (V_2) supply much of the **lateral wall** of the nasal cavity.

The **nasopalatine branch (B)** of the maxillary nerve (V_2) crosses the roof of the nose from lateral to medial, from the sphenopalatine foramen to the mucosa of the nasal septum. The distal part of the nasopalatine nerve leaves the anterior part of the septum to pass through the **incisive foramen (C)** to innervate the anterior portion of the oral surface of the hard palate.

Thus, most of the nasal cavity is innervated by branches of the maxillary nerve, V_2.

However, the anterior part of the lateral wall and septum is innervated by branches of the **ophthalmic division of the trigeminal nerve, V_1**. These are the **anterior ethmoidal nerves (D)**.



The **sphenopalatine artery** (A), a branch of the maxillary artery (B) enters the mucosa of the nasal cavity via the **sphenopalatine foramen**. Its **lateral nasal branches (C)** supply much of the lateral wall, and its **septal branches (D)** cross the roof of the nose to supply blood to the nasal septum.

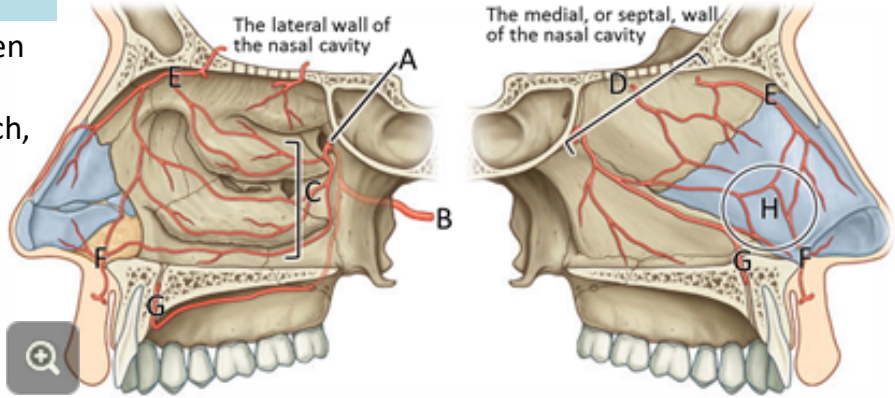
While most of the nasal mucosa receive blood from branches of the maxillary artery,

- the ethmoidal branches of the **ophthalmic artery** (E) supply the olfactory part of the nasal mucosa, and
- branches of the **facial artery** (F) supply of the mucosa in the anterior part of the nose, and
- branches of the **greater palatine artery** (G) ascends via the incisive foramen to contribute to the supply of the anterior nasal septum

These vessels anastomose freely within the nasal mucosa.

INFO

The anastomoses in the anterior, inferior nasal septum between branches of the maxillary, facial and ophthalmic arteries are particularly rich, and create a complex called **Keisselbach's plexus (H)**, making this area particularly prone to nosebleeds (epistaxis). This area is commonly referred to as Keisselbach's area or Little's area. The majority of nosebleeds occur in this location.

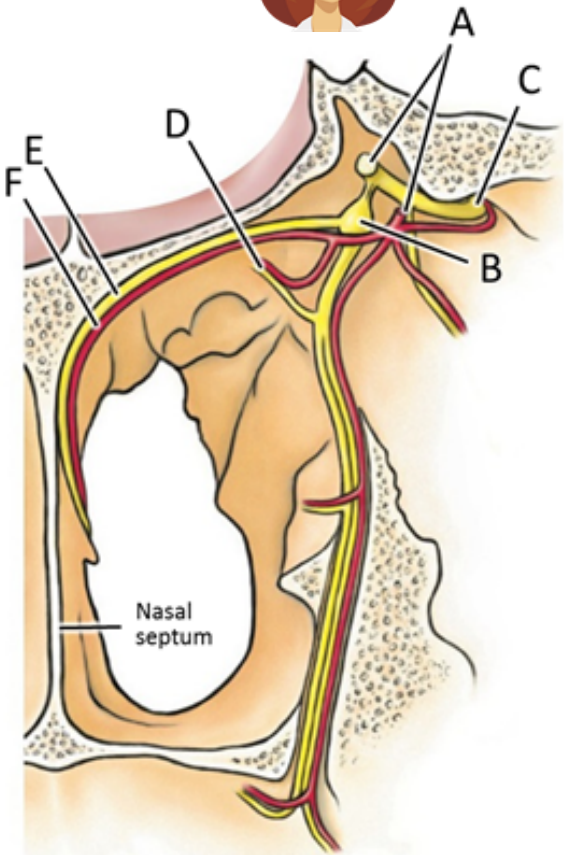


The figure on the right is a posterior view of a coronally-sectioned skull, looking through the right nasal cavity and piriform aperture.

The maxillary nerve, V_2, and artery (A) are shown in the pterygopalatine fossa, along with the pterygopalatine ganglion (B). The infraorbital nerve and artery pass anteriorly through the inferior orbital fissure to the orbit (C).

The sphenopalatine artery and maxillary nerve, V_2, give rise to **lateral nasal branches (D).**

The **nasopalatine branch (E)** of the maxillary nerve (V_2) and the **septal branches (F)** of the sphenopalatine artery cross the roof of the nasal cavity from lateral to medial, from the sphenopalatine foramen to the mucosa of the nasal septum.

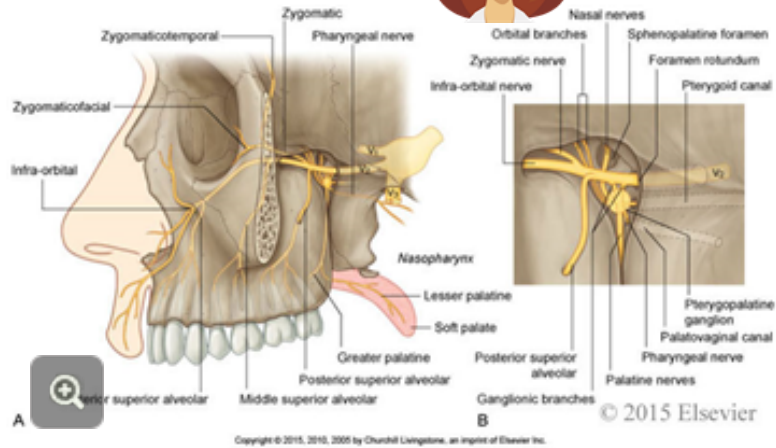


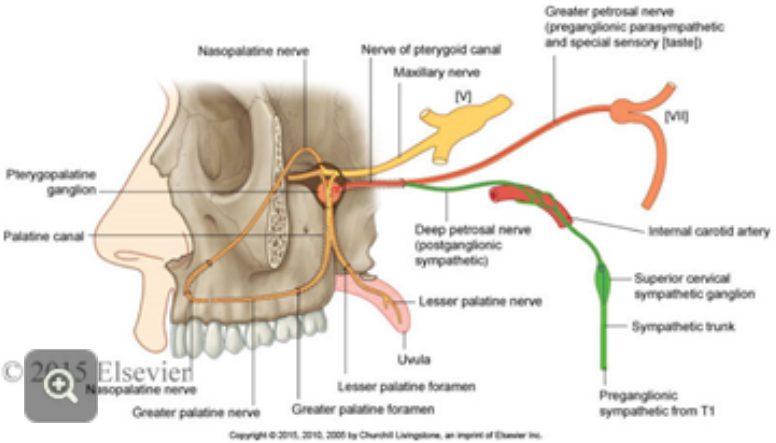
From Grant's Atlas of Anatomy, 13e, LWW

5A Parasympathetic (PSy) Distribution in V_2 Territory

You are well familiar with the distribution of PSy fibres to targets in V_3 territory, i.e. **BELOW the oral fissure**. It involves the **chorda tympani** branch of **C.N. VII** for the submandibular and sublingual glands and the mucosa of the floor of the mouth and it involves the **lesser petrosal nerve** from **C.N. IX** for the parotid gland. In both cases, the PSy postganglionic fibres are **distributed** to their targets with general sensory **branches of V_3**.

A similar pattern applies for the distribution of PSy fibres to targets in the V_2 territory. PSy preganglionic fibres arising from **C.N. VII** are carried in its branch, the **greater petrosal nerve**. These fibres synapse onto postganglionic neurons in the **pterygopalatine ganglion**. The postganglionic axons arising from the pterygopalatine ganglion join, and are distributed with general sensory **branches of V_2**. Thus, they reach the mucosa of the nasal cavities with the **lateral nasal** and **nasopalatine nerves**, the hard palate and soft palate with the **greater and lesser palatine nerves**, and the nasopharynx with the **pharyngeal branch of V_2**.





5.1 / 5.3 The Neck

What you'll need:

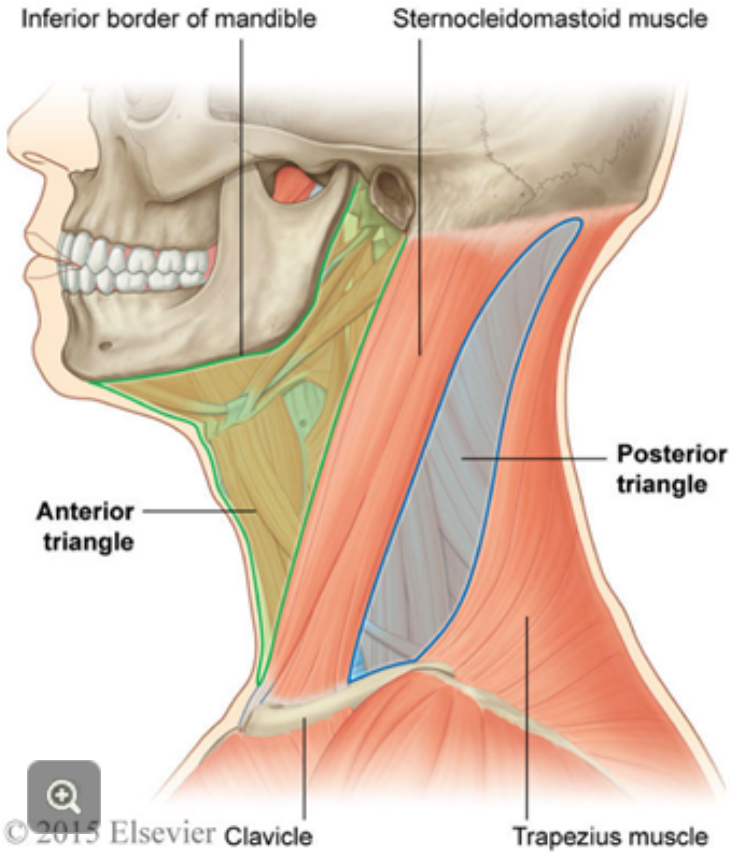
SPECIMENS

- cadaver 1
- a hyoid bone

	Session 1		Session 2	
	First 90 mins	**Second 90 mins**	**First 90 mins**	**Second 90 mins**
right side neck	pairs 1	pairs 2	pairs 3	pairs 4
left side neck	pairs 3	pairs 4	pairs 1	pairs 2

When you have completed the exercises described here, you will be able to identify and describe the:

- external jugular vein and its relationship to the sternocleidomastoid muscle.
- attachments, actions and nerve supply of the sternocleidomastoid muscle.
- larynx within the context of the neck.
- suprahyoid muscles, including their actions and nerve supply.
- the submandibular gland in the context of the neck.
- the infrahyoid muscles, including their actions and nerve supply.
- accessory nerve, and its relationship to the sternocleidomastoid and trapezius muscles.
- muscles in the floor of the posterior triangle and their relationship to the roots of the brachial plexus, subclavian artery and vein.



TASK

ENLIST the help of your colleagues and

block up the shoulders of the cadaver. this will extend the neck and also give you better access to its lateral aspect as you work.

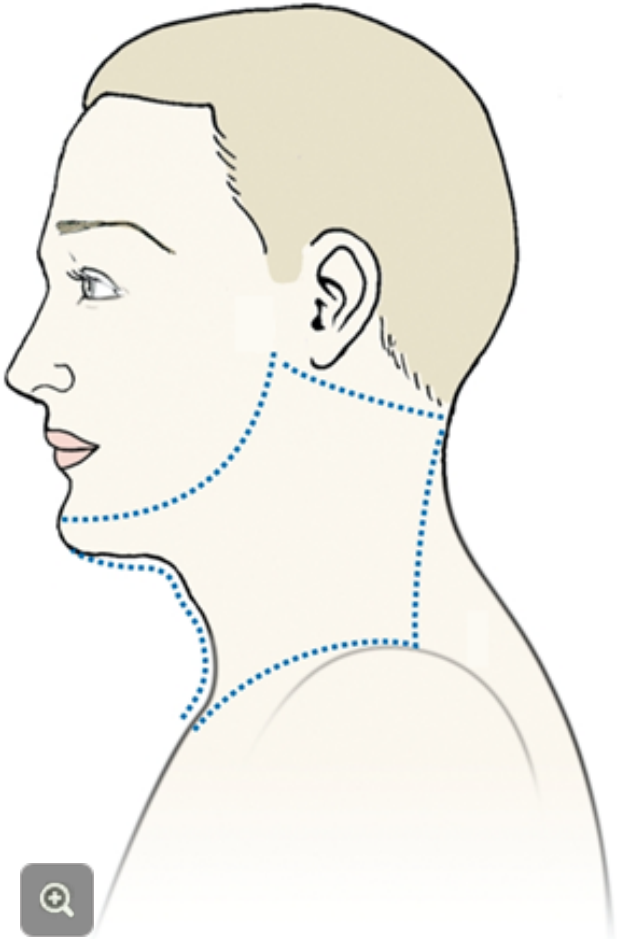
Remember to remove this block when you're done dissecting. If the block is left under the cadaver between labs, the cadaver will dry out.

TASK

USING the incision lines suggested

by the diagram, remove the skin from both sides of the neck posteriorly as far as the superior border of the trapezius muscles on each side.

The skin of the neck is relatively thin, so take care not to cut too deeply. Both sides of the neck should be dissected.



TASK

As you remove the skin,

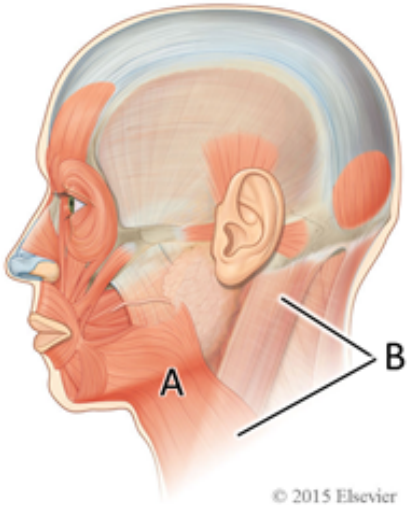
you might notice fibres of the platysma muscle (A) in the superficial fascia. The platysma extends from the superficial fascia in the upper thorax, superiorly to attach to the mandible.

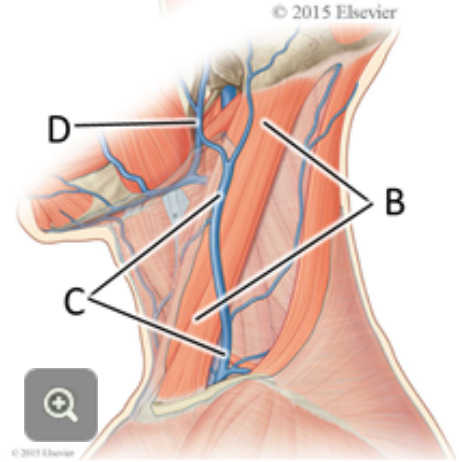
TASK

Carefully LIFT the skin, including the

platysma over the clavicle, and raise the muscle superiorly as far as the mandible. Free the muscle from the underlying sternocleidomastoid muscle (B), taking care to protect the external jugular vein (C) which crosses the sternocleidomastoid.

The external jugular vein begins approximately at the angle of the mandible where it receives blood from the retromandibular vein (D). It descends to empty into the subclavian vein.





TASK

IDENTIFY the sternocleidomastoid muscle (A)

and trace it from the mastoid process (B) of the temporal bone to its attachments to the manubrium (C) and medial clavicle (D). Note that the attachment to the manubrium is tendinous but the attachment to the clavicle is fleshy.

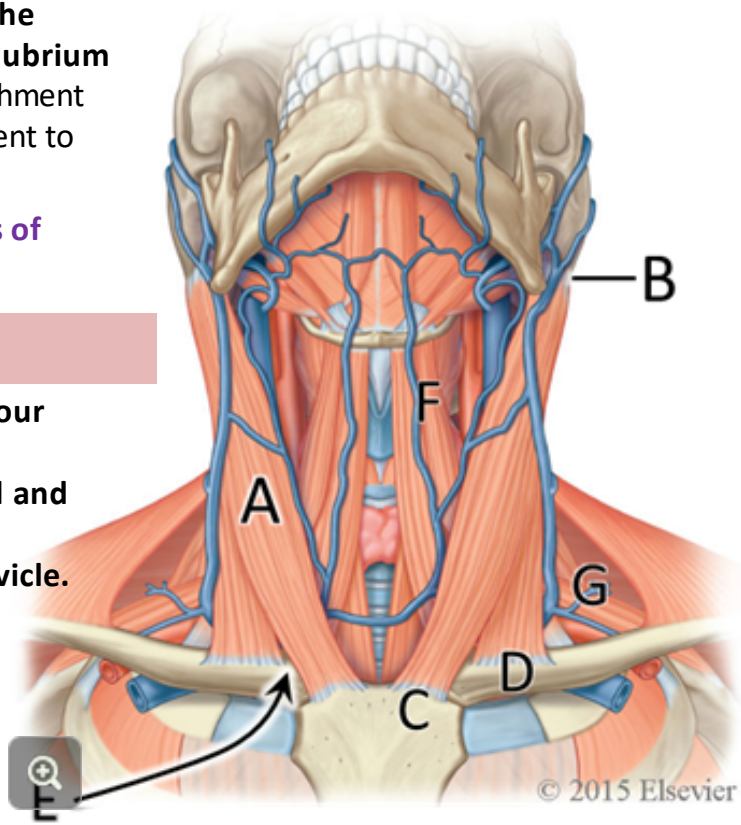
Thoroughly cleaning the SCM is key to the success of the entire dissection.

TASK

The SCM functions

to turn the head to the opposite side. Turn your head to the left and palpate the inferior attachments of the right sternocleidomastoid and confirm the tendinous attachment to the manubrium and fleshy attachment to the clavicle.

There is a gap between these two attachments, immediately deep to which lies the internal jugular vein (E). The sternocleidomastoid muscle divides the neck into the anterior (F) and posterior (G) triangles (next slide…).



TASK

IDENTIFY the borders

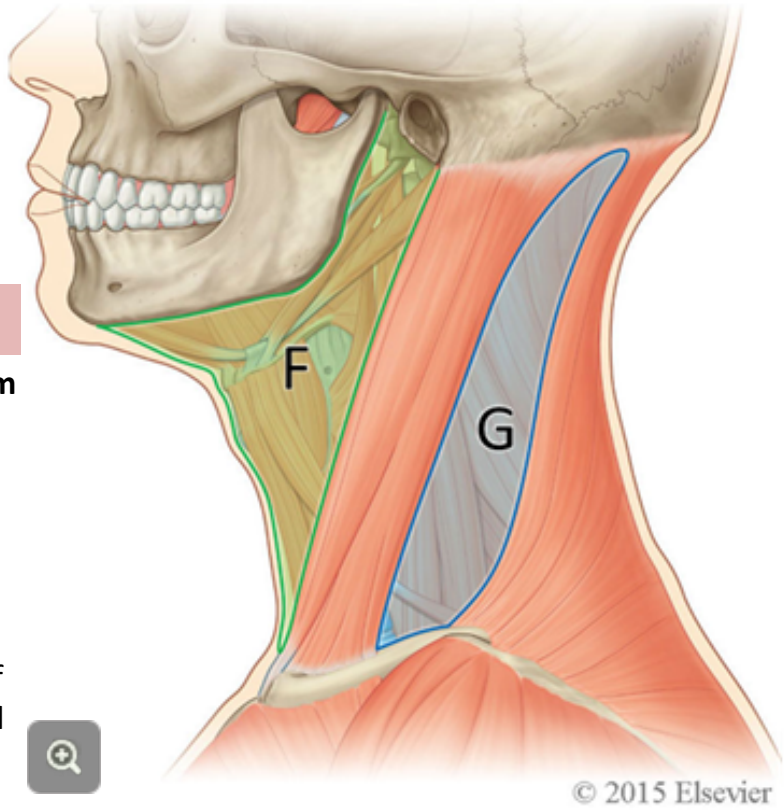
of the anterior triangle (F) on the diagram and on the cadaver: these are the midline of the neck medially, the anterior border of the sternocleidomastoid muscle laterally, and the inferior border of the mandible superiorly.

TASK

IDENTIFY the borders

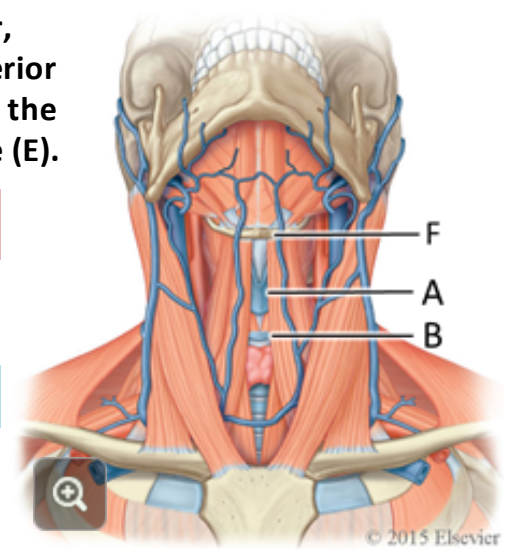
of the posterior triangle (G) on the diagram and on the cadaver: these are the posterior border of the sternocleidomastoid anteriorly, the superior border of the trapezius muscle posteriorly and the middle one third of the clavicle inferiorly.

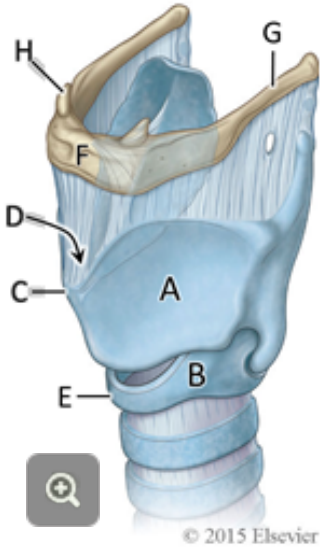
You will start by dissecting the anterior triangle of the neck, as described in the following slides, and then carry on to disset the posterior triangle.



The larynx guards the entrance to the respiratory tract and permits phonation. Its skeleton is largely cartilaginous. Two of the larger cartilages of the larynx are the thyroid (A) and cricoid (B) cartilages. The detailed structure of the thyroid and cricoid cartilages will be the subject of a later lab on the structure of the larynx.

What is readily palpated at this time, however, are the laryngeal prominence (C) and the superior thyroid notch (D) of the thyroid cartilage, and the narrow anterior lamina of the cricoid cartilage (E).





TASK

PALPATE the thyroid and cricoid cartilages on yourself and a lab partner.

INFO

The gap between these two structures is a landmark for cricothyrotomy, a method for creating an airway in emergency.

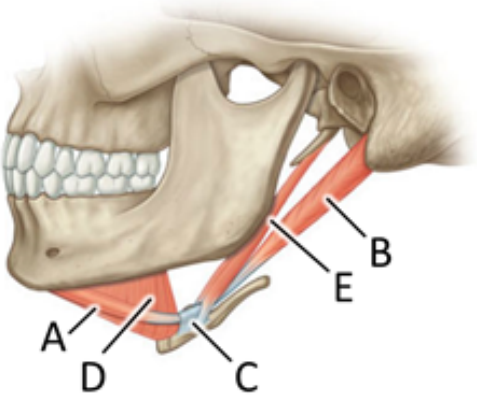
TASK

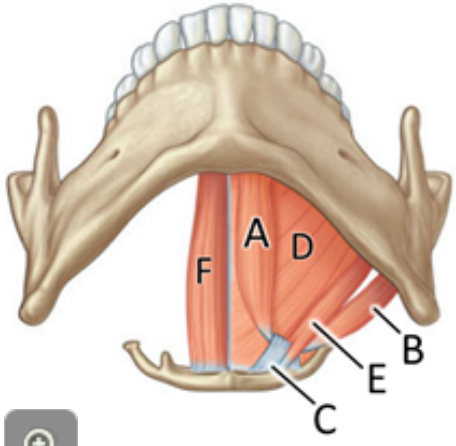
You have been provided with a hyoid bone. On it, identify the body (F), and the greater (G) and lesser horns (H). Palpate the hyoid bone on the cadaver.

The hyoid bone, with the thyroid and cricoid cartilages, contribute to the skeleton of the larynx. The hyoid is an unusual bone because it does not form a joint with any other bone. Instead, it is suspended between the mandible and the thyroid cartilage by muscles, ligaments, and membranes.

The suprahyoid muscles are a group of muscles that connect the hyoid bone with the skull. This group includes the digastric, which as its name implies, consists of two muscle bellies, the anterior (A) and posterior (B) bellies of the digastric. The 2 parts of the muscle are connected by a tendon which passes through a loop of fascia attached to the hyoid bone near the lesser horn (C).

In addition, the suprahyoid muscles include the mylohyoid (D), stylohyoid (E) and geniohyoid (F) muscles. Geniohyoid is deep to the mylohyoid, and will be seen in a later lab. By virtue of their attachments to the hyoid bone, **the suprahyoid muscles can raise the larynx during speech and swallowing**.

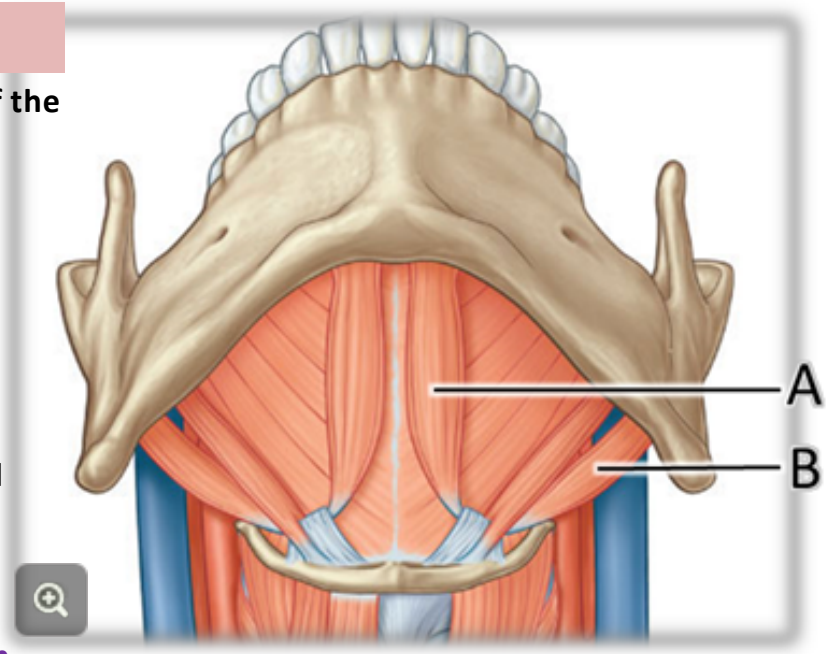




TASK

IDENTIFY and outline the

anterior (A) and posterior (B) bellies of the digastric muscle.



The anterior belly attaches to the deep surface of the anterior part of the mandible and is innervated by the mandibular division of the trigeminal nerve (V_3). The posterior belly attaches to the base of the skull medial to the mastoid process and is innervated by the facial nerve (VII).

When the mandible is fixed, digastric will raise the larynx when it contracts. If the hyoid bone is fixed in position by contraction of other muscles attached to it, the digastric will open the mouth.

TASK

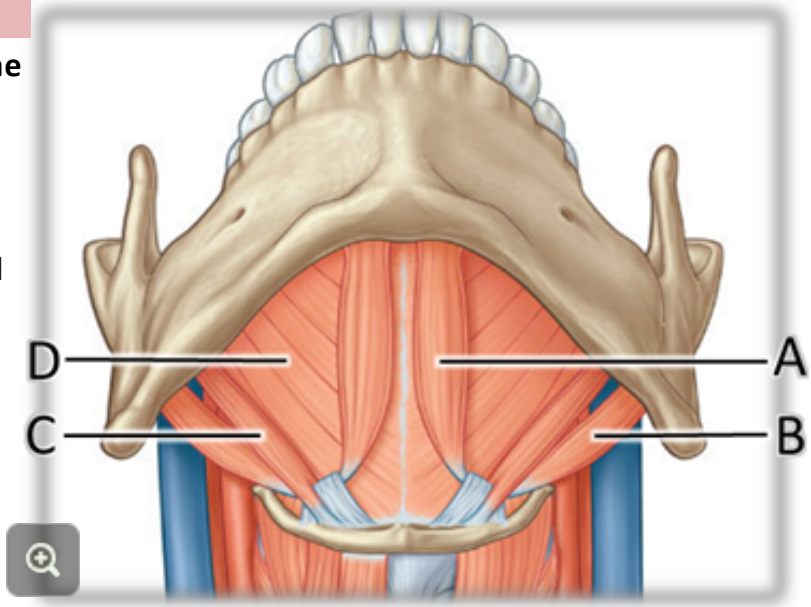
IDENTIFY the fibres of the

stylohyoid muscle lying just superior to the posterior belly of the digastric (C). The stylohyoid muscle splits over the digastric tendon to reach its attachment to the hyoid. Like the posterior belly of the digastric, the stylohyoid muscle is innervated by the facial nerve (VII).

TASK

Deep to the anterior belly

of the digastric, identify and clean the fibers of the mylohyoid muscle (D) .



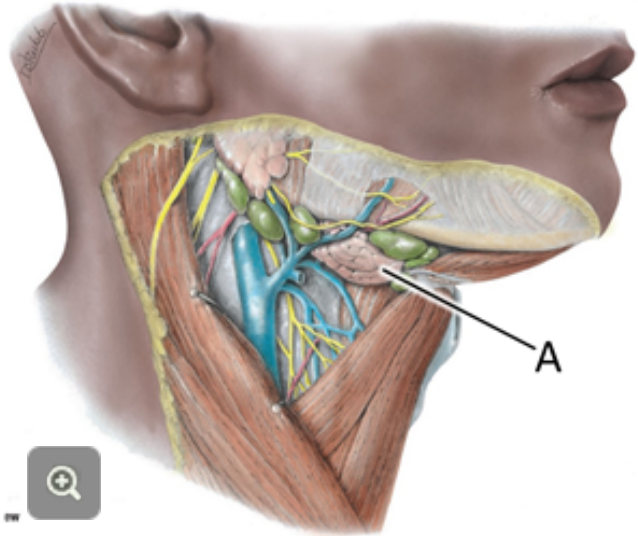
Note that the fibres of the mylohyoid run perpendicular to those of the anterior belly of the digastric muscle. Each mylohyoid arises from the medial surface of the body of the mandible. Its posterior fibers attach to the hyoid bone and its more anterior fibers blend with those of the mylohyoid on the opposite side in a midline band of connective tissue called a **raphe**. The mylohyoid muscles form the floor of the mouth, and they are innervated by the mandibular division of the trigeminal nerve (V_3).

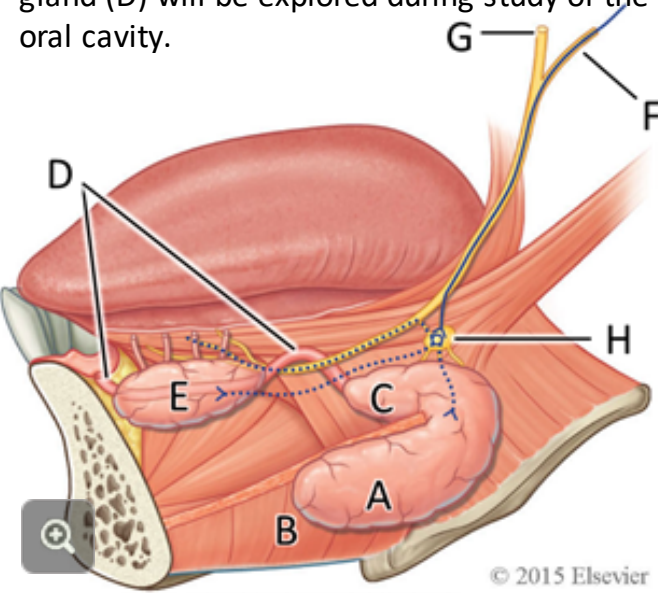
TASK

CLEAN and identify the superficial part

of the submandibular salivary gland (A) between the posterior fibres of mylohyoid and the body of the mandible.

The submandibular salivary gland wraps around the posterior border of the mylohyoid muscle (B), so that **its deep part (C) comes to lie within the floor of the mouth**. The duct of the gland (D) will be explored during study of the anatomy of the oral cavity.





For the submandibular gland, like the sublingual gland (E), preganglionic parasympathetic fibers that are secretomotor for salivation are carried in the chorda tympani branch (F) of the facial nerve (VII).

The chorda tympani joins the lingual branch (G) of the mandibular nerve (V_3), which carries the parasympathetic preganglionic fibres into the floor of the mouth. The preganglionic fibers synapse in the submandibular ganglion (H) on the lingual nerve, and the postganglionic fibers enter the gland and supply the mucosa in the floor of the mouth.

The infrahyoid muscles pass inferiorly from the hyoid bone and include the sternohyoid, omohyoid, sternothyroid and thyrohyoid.

TASK

Without detaching the SCM,

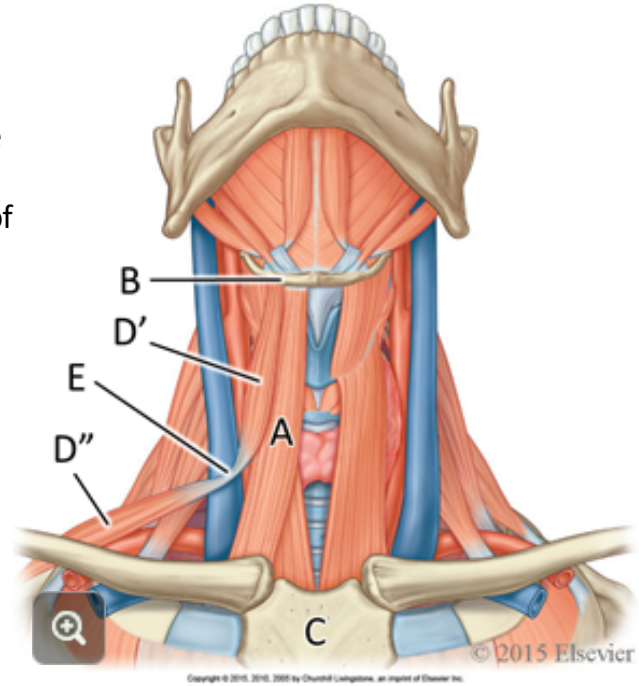
identify and clean the 2 sternohyoid muscles (A) passing from the body of the hyoid bone (B) to the manubrium of the sternum (C).
Lateral to the sternohyoid, identify the omohyoid muscles (D).

Similar to the digastric, the omohyoid muscle has 2 bellies. The superior belly (D') passes from the hyoid bone to a tendon (E) that lies deep to the sternocleidomastoid muscle. The tendon of the omohyoid passes through a sling of fascia attached to the internal jugular vein, and joins the inferior belly (D"), which passes laterally to attach to the scapula.

TASK

CLEAN the superior belly of the omohyoid,

lying lateral to the sternothyroid and outline it down to where is passes deep to the sternocleidomastoid. It is <u>not</u> necessary to identify the inferior belly of the omohyoid at this time.



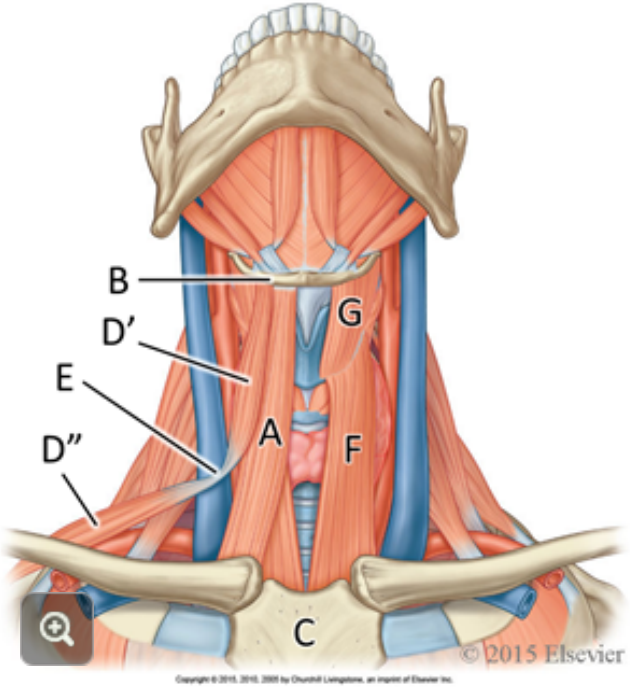
TASK

On one side ONLY of the cadaver,

DETACH the sternohyoid muscle (A) and the superior belly of the omohyoid (D') from the hyoid bone (B). Using blunt dissection, turn both muscles inferiorly as far as possible. Deep to these muscles, identify and outline the sternothyroid (F) and thyrohyoid (G) muscles. Like sternohyoid and omohyoid, the names of these muscles simply describe their attachments.

The sternohyoid, omohyoid, sternothyroid and thyrohyoid muscles are the infrahyoid (or strap) muscles. The **infrahyoid muscles act to lower the larynx during speech and swallowing.**

The infrahyoid muscles are innervated by branches of the 1st, 2nd and 3rd cervical spinal nerves which form a looping structure called the **ansa cervicalis** from which branches extend to innervate these muscles. The ansa cervicalis lies deep to the sternocleidomastoid muscle. It is not necessary to identify it at this time.



TASK

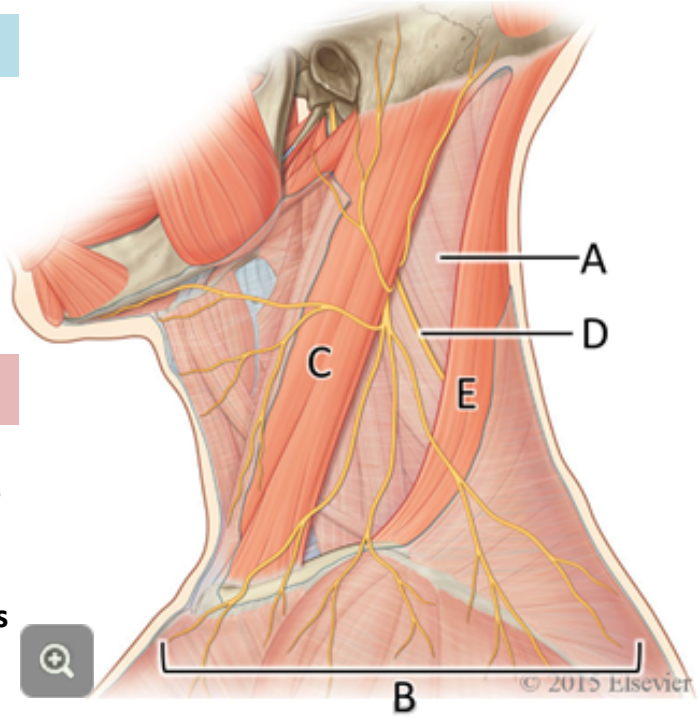
The fascia filling the posterior triangle

is quite thick and dense (A). **Using the closed-open scissors technique and forceps, break up the fascia and remove it piecemeal. As you remove the fascia from the posterior triangle you will encounter cutaneous branches of the cervical plexus crossing the posterior triangle.**

INFO

The supraclavicular branches

to the skin of shoulder (B) and the phrenic nerve to the diaphragm share a common origin from cervical spinal nerves C3, C4 and C5. **This is why irritation of the parietal pleura or the parietal peritoneum over the central part of the diaphragm is commonly referred to the shoulder.**



TASK

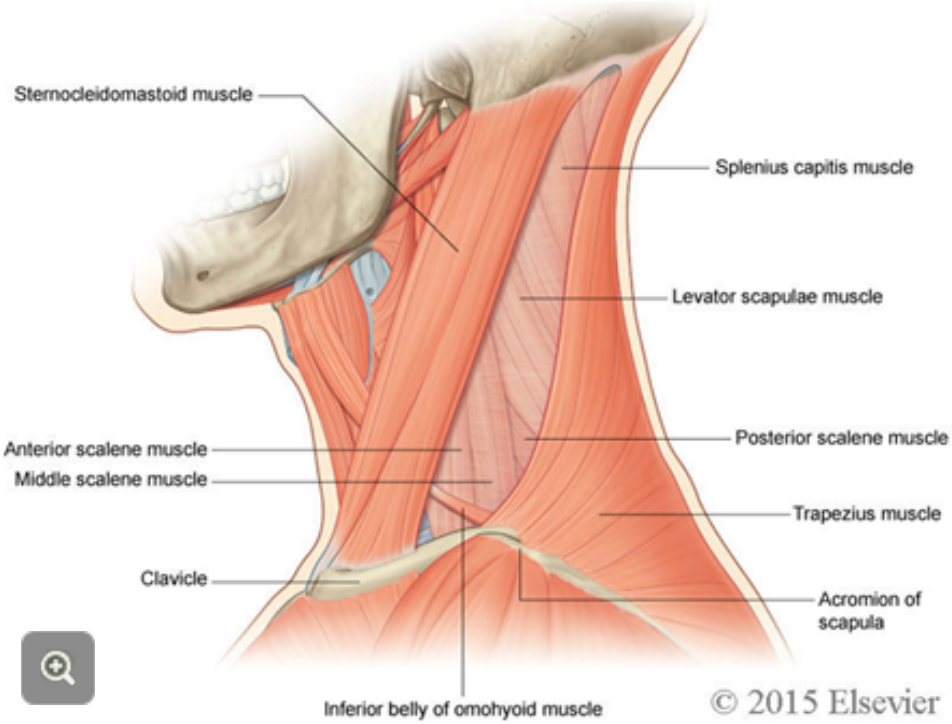
As you remove the fascia from the area

at a level corresponding approximately with the midpoint of sternocleidomastoid (C), look for the accessory nerve, CN XI (D) emerging from under cover of the muscle and trace it across the posterior triangle until it passes deep to trapezius (E). The accessory nerve innervates both the sternocleidomastoid and the trapezius muscles.

TASK

IDENTIFY and outline

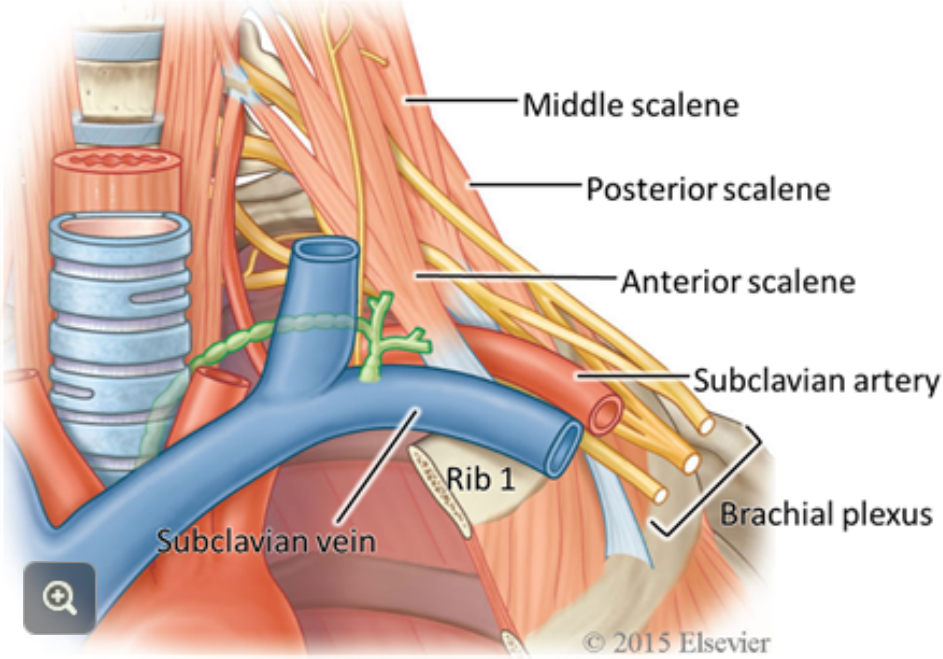
the inferior belly of the omohyoid muscle near the base of the posterior triangle, just above the clavicle. Clean the muscles in the floor of the posterior triangle to identify the splenius capitis, levator scapulae, the middle scalene muscle and the anterior scalene muscle.



TASK

Posterior to the inferior belly

of the omohyoid, and by dividing it if necessary, LOOK for the upper roots of the brachial plexus passing between the anterior and middle scalene muscles. The subclavian artery leaves the thorax by passing between the anterior and middle scalene in front of the lower fibers of the brachial plexus. The subclavian vein passes through the lower part of the posterior triangle in front of the anterior scalene to enter the thorax.



Since embarking on this exercise, you have **identified** the following structures and learned the **answers to the following questions**:

- sternocleidomastoid muscle (actions? innervation?), external jugular vein (how does it begin and end?), internal jugular vein
- the laryngeal prominence and superior thyroid notch of the thyroid cartilage, the anterior laminal of the cricoid cartilage
- the body, greater and lesser horns of the hyoid bone
- 3 of the 4 suprahyoid muscles, the digastric, mylohyoid and stylohyoid muscles (actions as a group? innervation?)
- the submandibular gland (how does it receive parasympathetic innervation?)
- the infrahyoid muscles, sternohyoid, superior belly of omohyoid, sternothyroid and thyrohyoid muscles (actions as a group? innervation?)
- explain the relationship between the roots of the supraclavicular and phrenic nerves and referred pain from the pleura / peritoneum covering the diaphragm
- the accessory nerve (target muscles? actions controlled?), inferior belly of omohyoid, splenius capitis, levator scapulae, middle and anterior scalene, roots of the brachial plexus, subclavian artery and vein

If you are satisfied with your **ability to identify these structures** and **answer these questions**, call your TA over for confirmation and for **permission to move on** to the next stage of the exercise.

5.2 The Nose

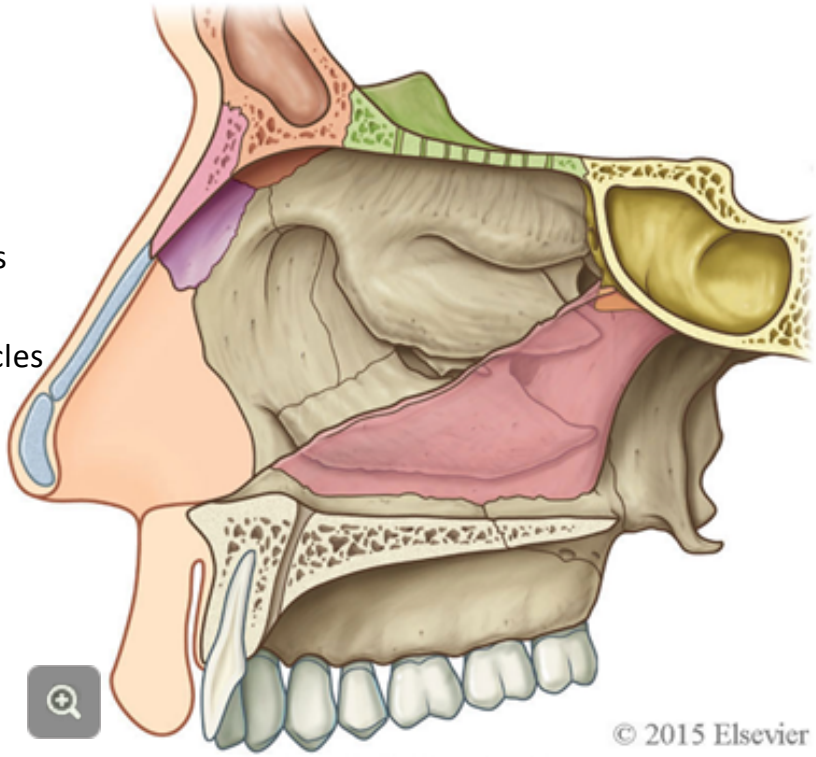
What you'll need:

SPECIMENS

- skulls
- a model of a bisected skull
- 4 bisected cadaver heads

When you have completed the exercises described here, you will be able to identify and describe the:

- bony skeleton of the nasal cavities.
- nasal conchae and meatuses.
- paranasal sinuses.
- openings into the nasal cavities from the paranasal sinuses and the nasolacrimal duct.
- blood and nerve supply of the nasal mucosa, including the route by which the parent vessels and nerves gain access to the nasal cavities.
- structure of the soft palate, including the muscles that control it and their nerve supply.



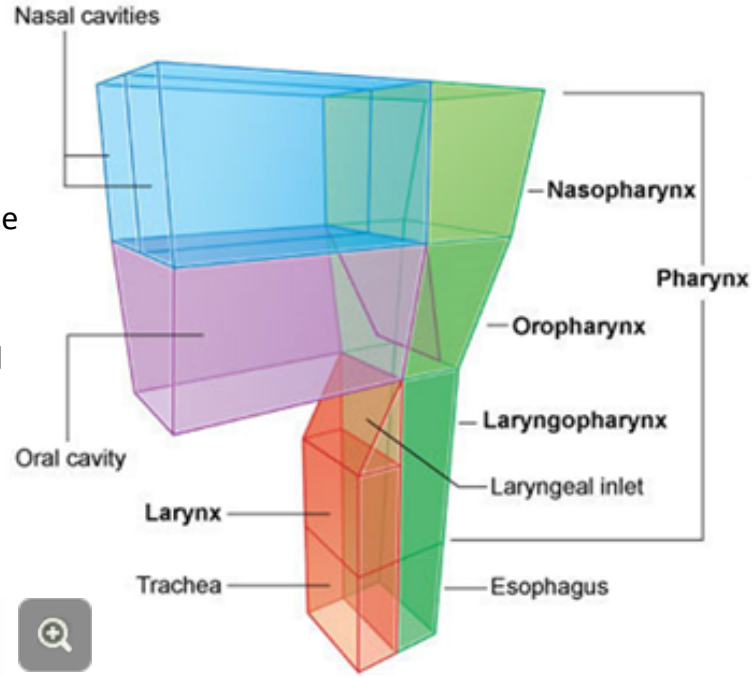
Recall the schematic on the right as a useful starting point for understanding the relationships between these spaces.

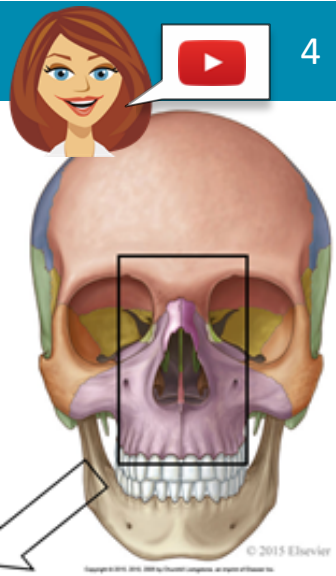
Notice that the bilaterally-paired nasal cavities, depicted in blue, are superior to the oral cavity, depicted in purple.

The pharynx, depicted in green, is a continuous space that is subdivided into three parts: the nasopharynx, oropharynx and laryngopharynx.

Notice that the nasopharynx is posterior to the nasal cavities and that the oropharynx is posterior to the oral cavity.

The laryngopharynx continues inferiorly as the esophagus, thus leading into the digestive tract, while it opens anteriorly into the larynx and trachea, thus leading into the respiratory tract.

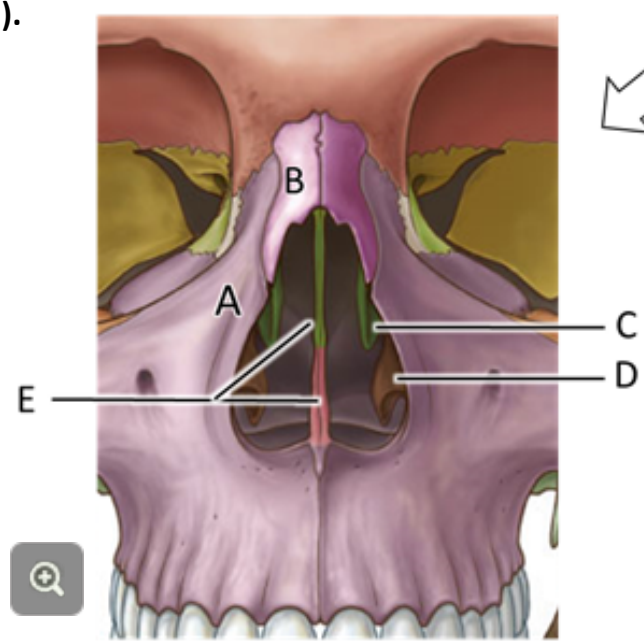




TASK

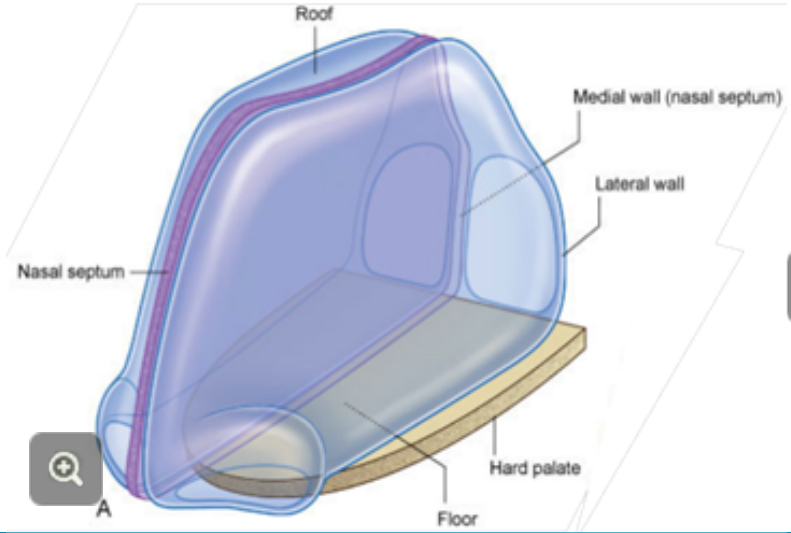
On the skull,

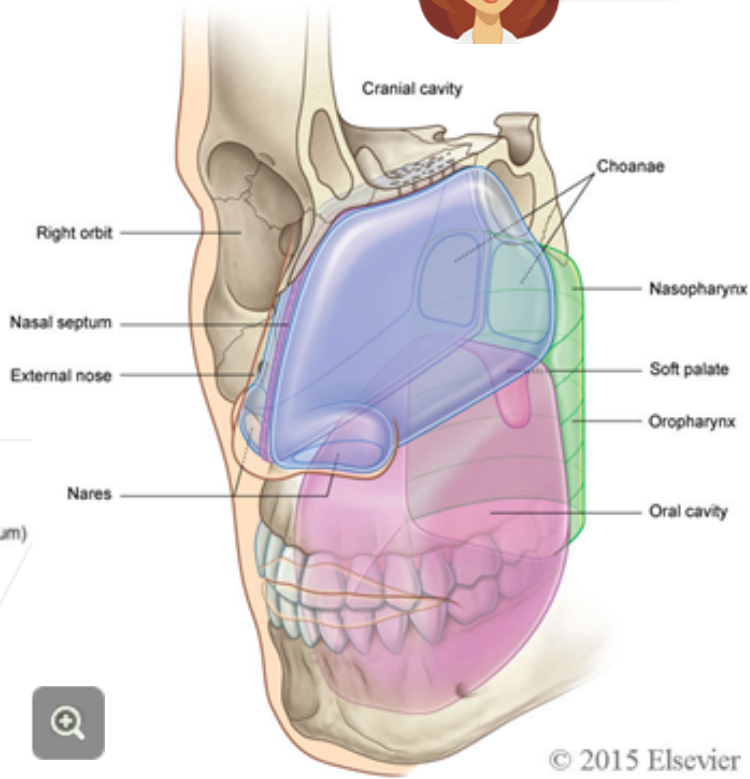
identify the skeletal opening to the nasal cavity, the piriform aperture, bordered by the frontal processes of the maxillary bones (A) and the nasal bones (B). Looking through the piriform aperture identify the middle (C) and inferior (D) conchae and the bony nasal septum (E).



Recall the limits of the nasal cavity. It extends from the **nostrils**, or **nares**, anteriorly, to the **choanae**, posteriorly. The choanae are bilaterally-paired openings on either side of the **nasal septum**, that are continuous with the **nasopharynx**.

Each nasal cavity is described as having a **floor, formed by the hard palate, a medial wall, formed by the nasal septum, a roof, and a lateral wall**.



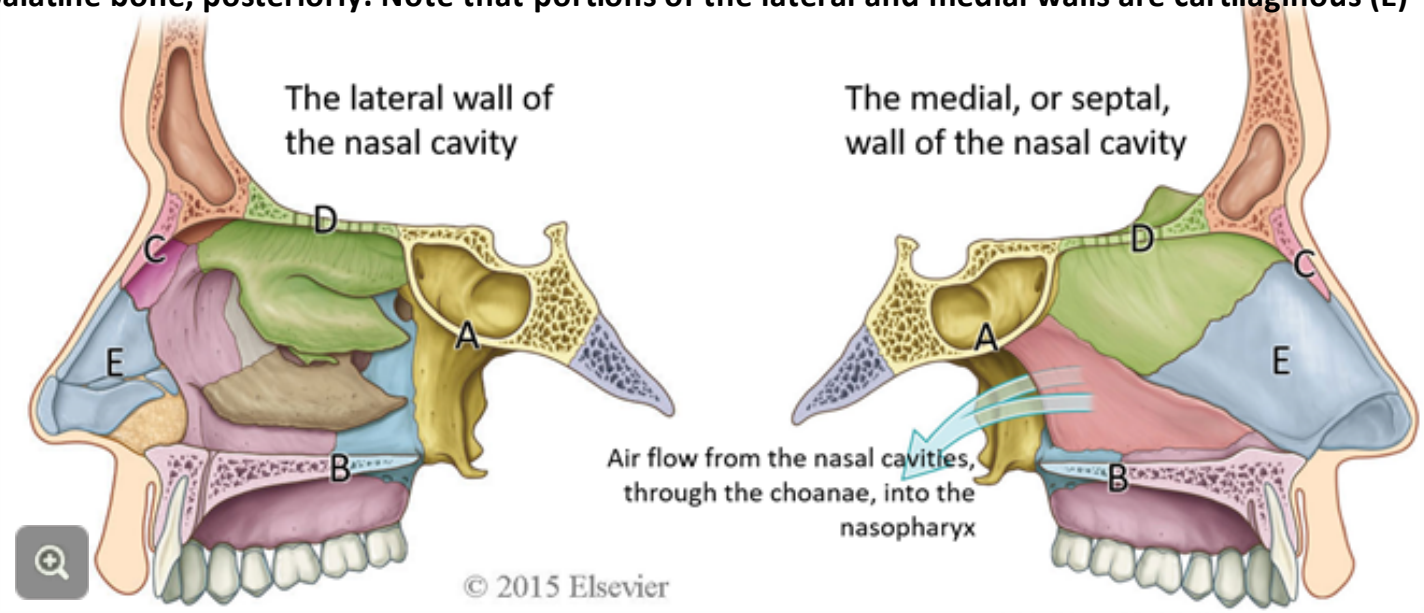


TASK

On the split half skull, identify the borders of the choanae

formed i) superiorly by the body of the sphenoid bone (A), ii) laterally by its medial pterygoid plate, iii) inferiorly by the posterior border of the hard palate (B) and iv) medially by the posterior border of the nasal septum.

Identify the roof of the nasal cavity, formed by the nasal bones (C), the cribriform plate of the ethmoid bone (D) and the body of the sphenoid bone (A). Identify the floor, formed by the hard palate (B), consisting of the palatine process of the maxillary bone, anteriorly, and the horizontal process of the palatine bone, posteriorly. Note that portions of the lateral and medial walls are cartilaginous (E)



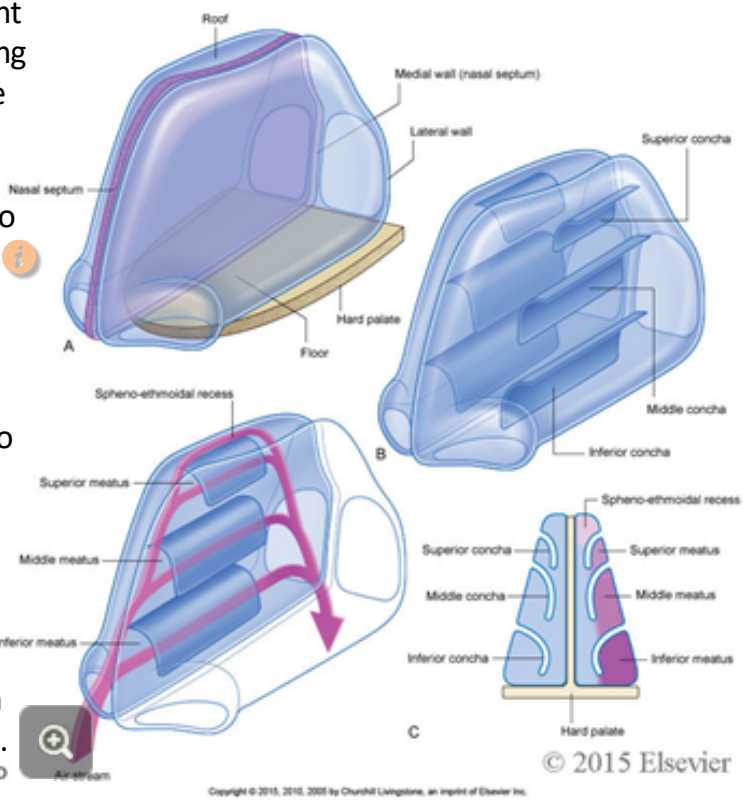
5.2 The Nasal Conchae and Meatuses

Review the features of the nasal cavity. The nasal cavity is a passageway for air, but also serves to sense odorant molecules and to warm, filter, and humidify the air during inspiration. These latter functions are carried out by the histological properties of a well-vascularised, sticky, mucous membrane that lines the nasal cavity and over which the air passes to reach the pharynx posteriorly. To achieve these goals the nasal septum and the **conchae (turbinates)** serve to increase the surface area of mucous membrane over which the air must pass.

The **superior, middle and inferior conchae** are projections from the lateral wall that curve medially into the nasal cavity. The recesses that are created on the lateral sides of the conchae are the **superior, middle and inferior meatuses**. The recess above the superior concha is the **spheno-ethmoidal recess**.

The conchae not only increase the surface area over which air passes, but they also create turbulence which helps increase contact between the air and the mucosa.

The function of olfaction is restricted to the mucosa of the superior concha and above.

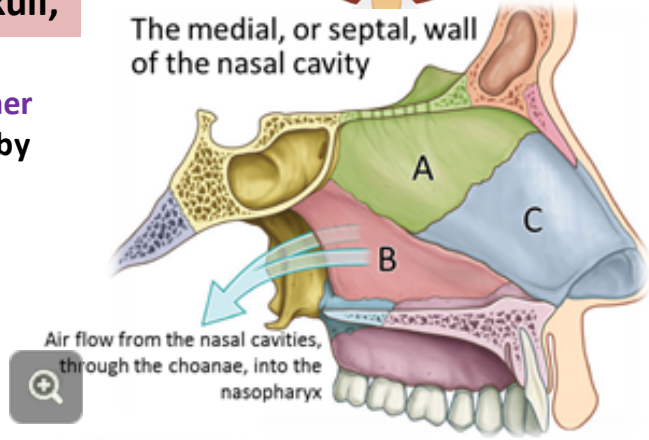


TASK

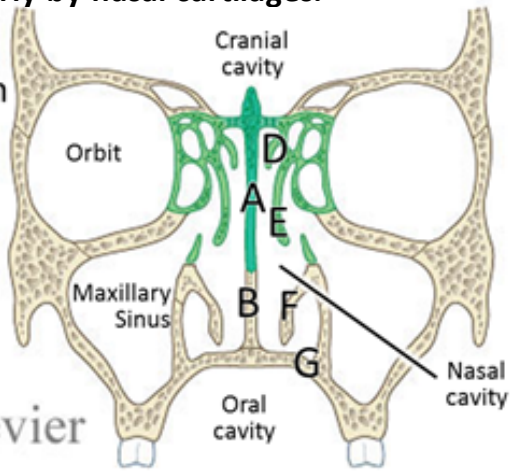
On the split half skull and / or the exploded skull,

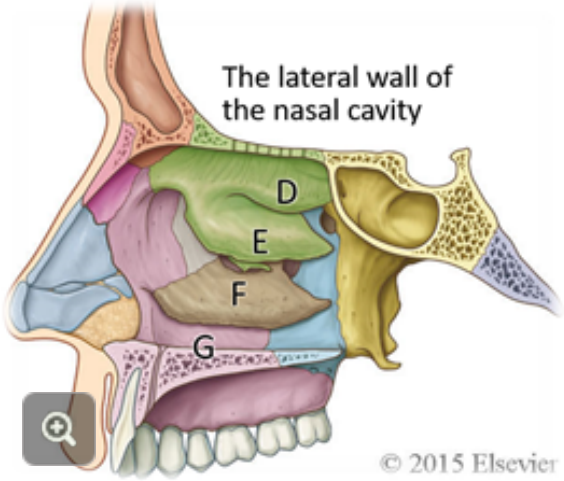
identify the bones that form the nasal septum, the perpendicular plate of the ethmoid (A), and the vomer (B). Recall that the septum is completed, anteriorly, by the septal cartilage (C).

Identify the bones that form the lateral wall of the nasal cavity, the superior (D) and middle (E) conchae are projections from the ethmoid bone. Realize that the inferior concha (F) is a separate bone that articulates with the maxillary bone (G). The lateral wall is also completed anteriorly by nasal cartilages.



A coronal section through the nasal cavity





After the heads are bisected, the nasal septum will generally be found on one half, while the conchae can be readily seen on the other.

TASK

IDENTIFY the nasal septum

on a half head where it is intact. Leave it intact for later groups to study.

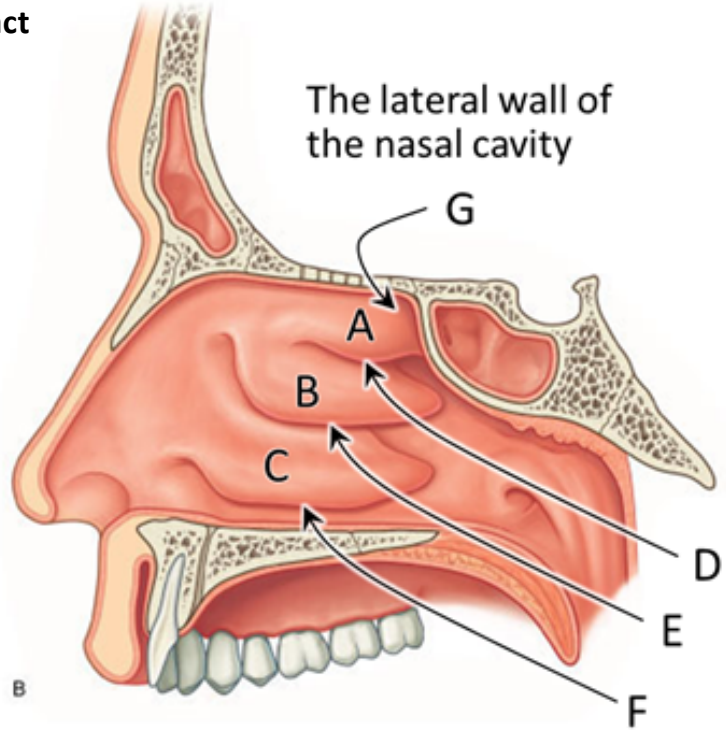
TASK

On the half heads without

the nasal septum, IDENTIFY the superior (A), middle (B) and inferior (C) conchae.

IDENTIFY the spaces lateral to the conchae, the superior (D), middle (E) and inferior (F) meatuses.

Also IDENTIFY the sphenoethmoidal recess (G), which is the name given to the region of the nasal cavity between the superior surface of the superior concha and the body of the sphenoid bone.

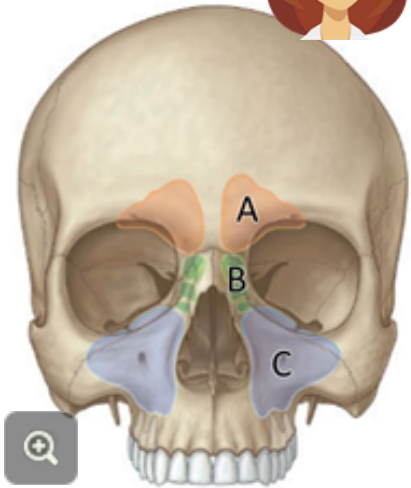


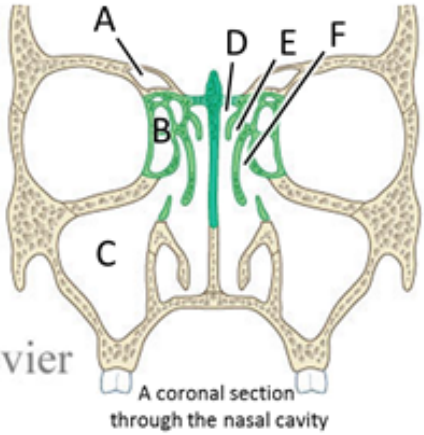
Review:

The **paranasal air sinuses** are cavities in the bones of the skull that open into the nasal cavity. They are lined by the same mucus membrane that lines the nasal cavity, and **the mucus produced in these sinuses drains through these openings into the nasal cavities**.

The paranasal air sinuses are named according to the bone in which they are located. Thus, they are the **frontal sinus** (A), **ethmoidal air cells** (B), the **maxillary sinus** (C) and **sphenoid sinus** (see next slide).

The sinuses of the ethmoid bone, the ethmoid air cells, consist of a group of small spaces, much like clusters of soap bubbles, within the **lateral masses of the ethmoid bone**. Note in the lower diagram that they are **located lateral to the sphenoethmoidal recess (D) and the superior (E) and middle (F) meatuses.** The posterior ethmoid air cells open into the superior meatus (next slide).





A coronal section through the nasal cavity

G

NOTE: Perform the following on ONE HALF HEAD ONLY, so that subsequent groups can study the intact conchae and meatuses.

TASK

IDENTIFY

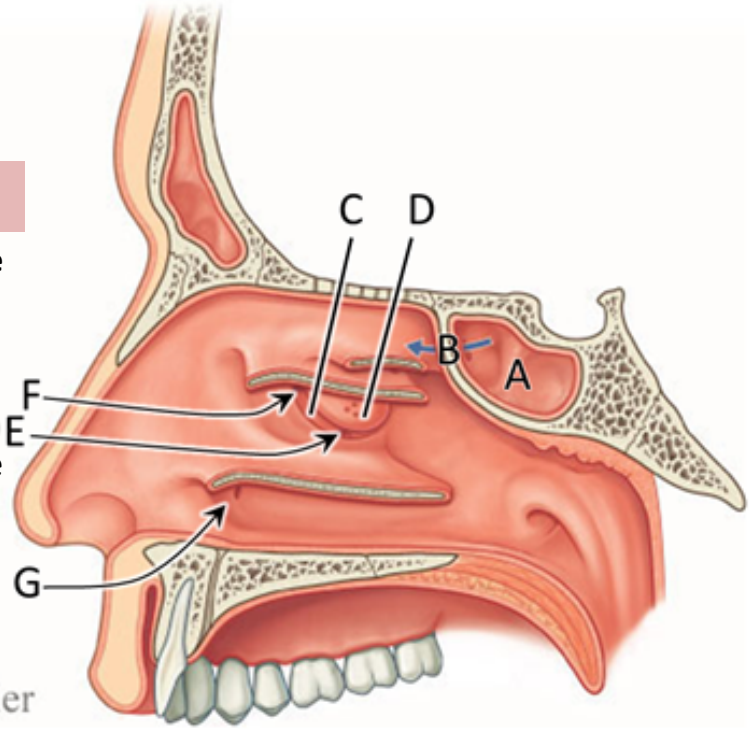
the sphenoid air sinus (A) which opens into the sphenoethmoidal recess (arrow, B).

TASK

Using Scissors, CUT away

the middle and inferior conchae to observe the structures in these meatuses. In the middle meatus, identify the semilunar hiatus (C).

The raised area of the middle meatus superior to the semilunar hiatus is called the ethmoidal bulla (D). The middle ethmoid air cells are located within the bulla and open onto its surface. The anterior ethmoid air cells open into the posterior part of the semilunar hiatus.



TASK

Using the tip of a blunt dissecting probe,

locate the opening to the maxillary sinus approximately midway along the semilunar hiatus (E). The maxillary sinuses are the largest of the paranasal air sinuses. **Next locate the opening of the frontal sinus (F) at the anterior end of the semilunar hiatus.**

TASK

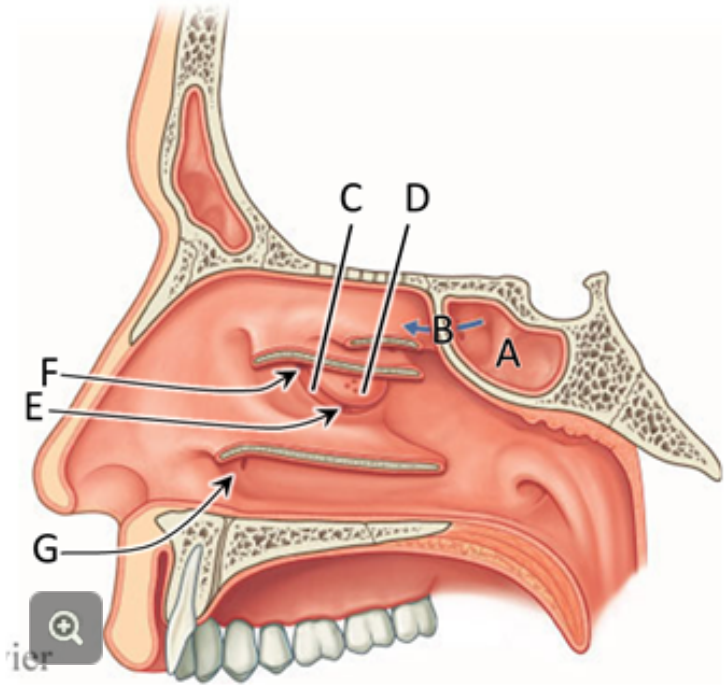
PROBE the anterior, superior,

part of the inferior meatus and identify the opening of the nasolacrimal duct (G). This passage allows tears from the orbit to drain into the nasal cavity.

TASK

On a skull,

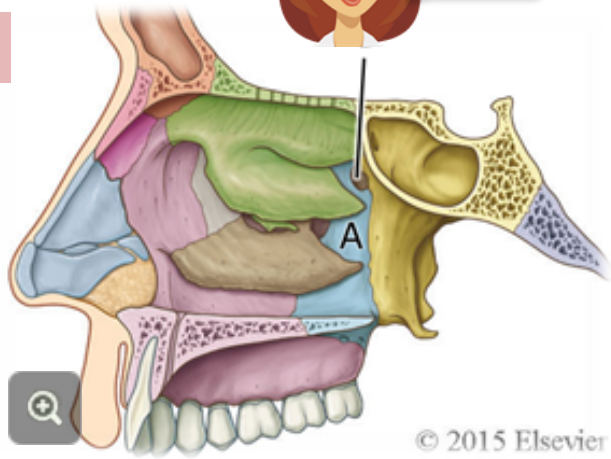
LOCATE the entrance of the nasolacrimal duct in the anterior, inferior, medial part of the orbit. Use a pipe cleaner to probe in, and confirm the connection to the inferior meatus.



TASK

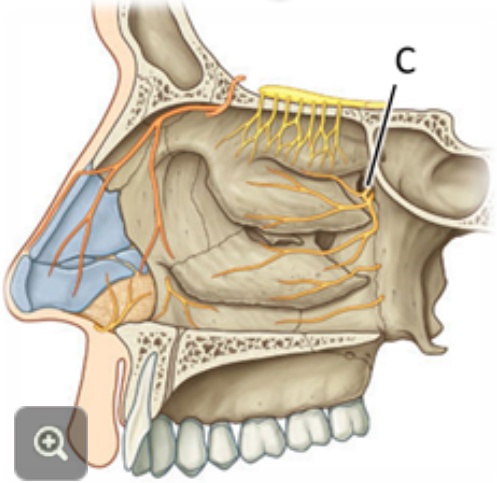
Using the tip of a scalpel,

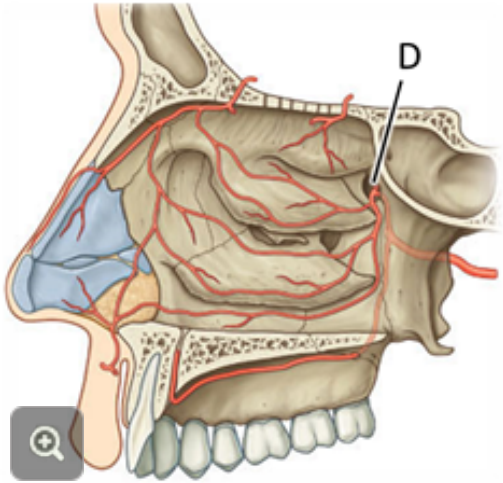
scrape away the mucosa from the perpendicular plate of the palatine bone (A), posterior to the cut edge of the middle concha. Deep to the mucosa in this location you will find the sphenopalatine foramen (B).



This is an opening into the nasal cavity from the pterygopalatine fossa through which branches of **the maxillary nerve (C) and artery (D)** gain access to the mucosa lining the nasal cavity.

How do they get there????



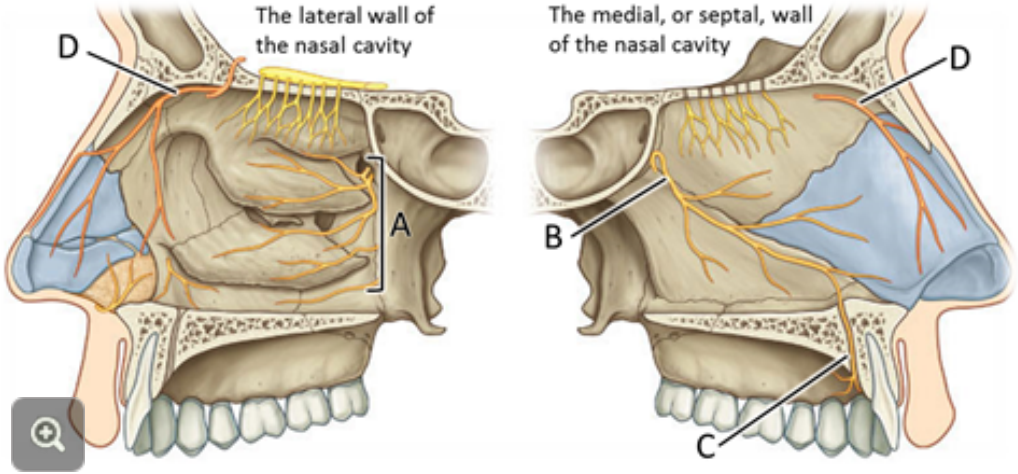


5.2 The Nerve Supply to the Nasal Cavity

The **lateral nasal branches (A) of the maxillary nerve (V_2)** supply much of the lateral wall of the nasal cavity.

The **nasopalatine branch (B) of the maxillary nerve (V_2)** crosses the roof of the nose from lateral to medial, from the sphenopalatine foramen to the mucosa of the nasal septum. The distal part of the nasopalatine nerve leaves the anterior part of the septum to pass through the **incisive foramen (C)** to innervate the anterior portion of the oral surface of the hard palate. **Thus, most of the nasal cavity is innervated by branches of the maxillary nerve, V_2.**

However, the anterior part of the lateral wall and septum is innervated by branches of the **ophthalmic division of the trigeminal nerve, V_1**. These are the **anterior ethmoidal nerves (D)**, which branch from the nasociliary branch of the ophthalmic division of the trigeminal nerve.



5.2 The Blood Supply to the Nasal Cavity

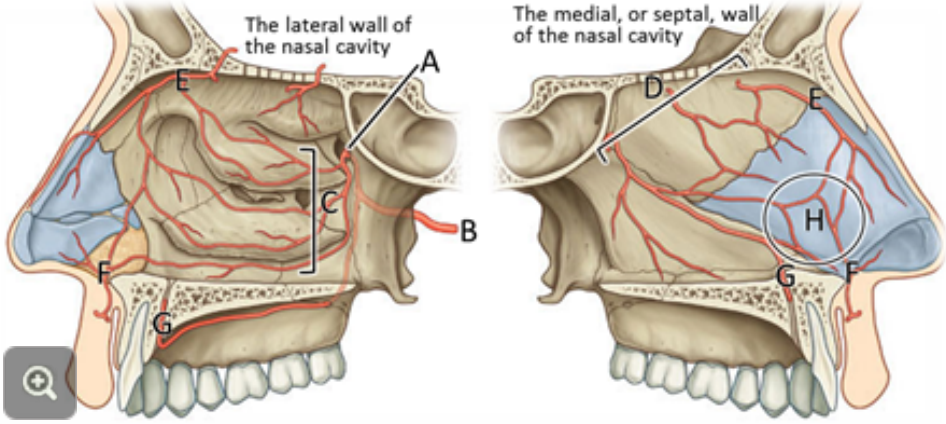
The **sphenopalatine artery** (A), a branch of the maxillary artery (B) enters the mucosa of the nasal cavity via the sphenopalatine foramen. Its **lateral nasal branches (C)** supply much of the lateral wall, and its **septal branches (D)** cross the roof of the nose to supply blood to the nasal septum. While most of the nasal mucosa receive blood from branches of the maxillary artery,

- the ethmoidal branches of the **ophthalmic artery** (E) supply the olfactory part of the nasal mucosa, and
- branches of the **facial artery** (F) supply of the mucosa in the anterior part of the nose, and
- branches of the **greater palatine artery** (G) ascends via the incisive foramen to contribute to the supply of the anterior nasal septum

These vessels anastomose freely within the nasal mucosa.

INFO

The anastomoses in the anterior, inferior, nasal septum between branches of the maxillary, facial and ophthalmic arteries are particularly rich, and create a complex called Keisselbach's plexus (H), making this area particularly prone to nosebleeds (epistaxis). This area is commonly referred to as Keisselbach's area or Little's area. The majority of nosebleeds occur in this location.



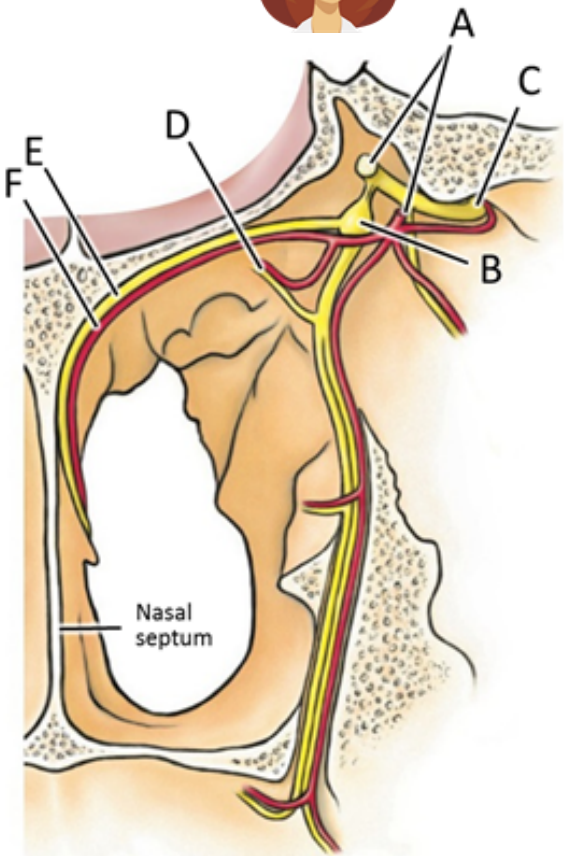
5.2 Summary: The Blood and Nerve Supply to the Nasal Cavity

The figure on the right is a posterior view of a coronally-sectioned skull, looking through the right nasal cavity and piriform aperture.

The maxillary nerve, V_2, and artery (A) are shown in the pterygopalatine fossa, along with the pterygopalatine ganglion (B). The infraorbital nerve and artery pass anteriorly through the inferior orbital fissure to the orbit (C).

The sphenopalatine artery and maxillary nerve, V_2, give rise to **lateral nasal branches (D).**

The **nasopalatine branch (E)** of the maxillary nerve (V_2) and the **septal branches (F)** of the sphenopalatine artery cross the roof of the nasal cavity from lateral to medial, from the sphenopalatine foramen to the mucosa of the nasal septum.

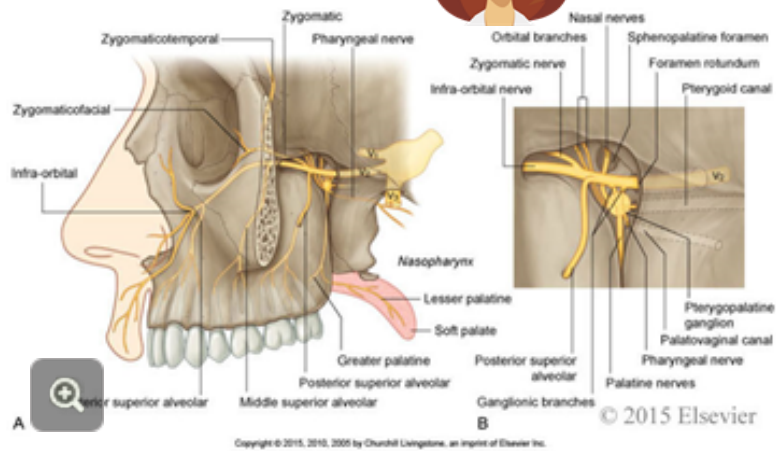


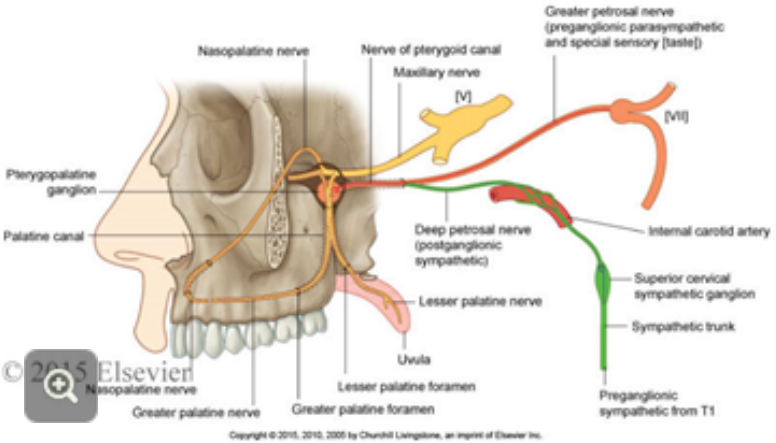
From Grant's Atlas of Anatomy, 13e, LWW

5.2 Parasympathetic (PSy) Distribution in V_2 Territory

You are well familiar with the distribution of PSy fibres to targets in V_3 territory, i.e. **BELOW the oral fissure**. It involves the **chorda tympani** branch of **C.N. VII** for the submandibular and sublingual glands and the mucosa of the floor of the mouth and it involves the **lesser petrosal nerve** from **C.N. IX** for the parotid gland. In both cases, the PSy postganglionic fibres are **distributed** to their targets with general sensory **branches of V_3**.

A similar pattern applies for the distribution of PSy fibres to targets in the V_2 territory. PSy preganglionic fibres arising from **C.N. VII** are carried in its branch, the **greater petrosal nerve**. These fibres synapse onto postganglionic neurons in the **pterygopalatine ganglion**. The postganglionic axons arising from the pterygopalatine ganglion join, and are distributed with general sensory **branches of V_2**. Thus, they reach the mucosa of the nasal cavities with the **lateral nasal** and **nasopalatine nerves**, the hard palate and soft palate with the **greater and lesser palatine nerves**, and the nasopharynx with the **pharyngeal branch of V_2**.

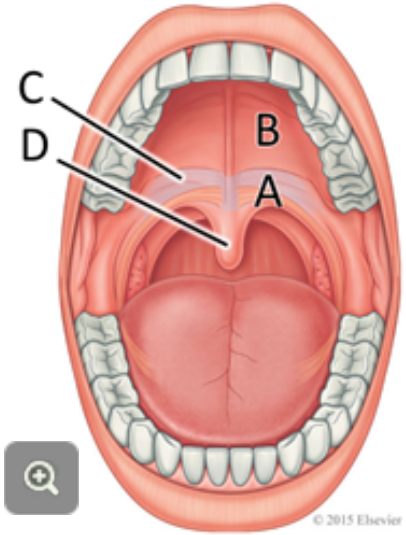




TASK

TURN to your partner

and tell them to open their mouth and say "ahhh". Identify their soft palate (A), posterior to the hard palate (B). The soft palate consists of striated muscle and a core of dense connective tissue called the **palatal aponeurosis (C)**. **Identify your partner's uvula (D), which should be dangling in the midline from their soft palate.**



TASK

TELL your partner to close their mouth.

INFO

Some people have a bifid uvula.

The palate is formed, embryologically, by the union of tissues in the midline. Failure of the completion of this process results in a cleft lip, cleft palate, and in the most mild cases, a bifid uvula.
Does your partner have a bifid uvula? Statistically speaking, there should be 2-3 people in your class with a bifid uvula.

5.2 Muscles of the Soft Palate: Attachments and Actions

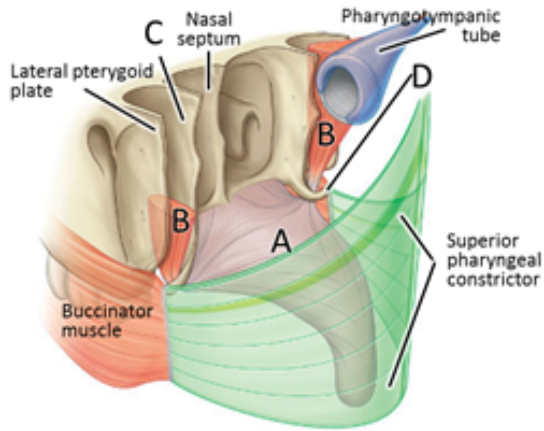
Several muscles act on the soft palate during speech and swallowing, including the **palatoglossus and palatopharyngeus muscles** (see activity 5.4) from the oral side and the **tensor and levator veli palatini muscles** on the nasal side, described here.

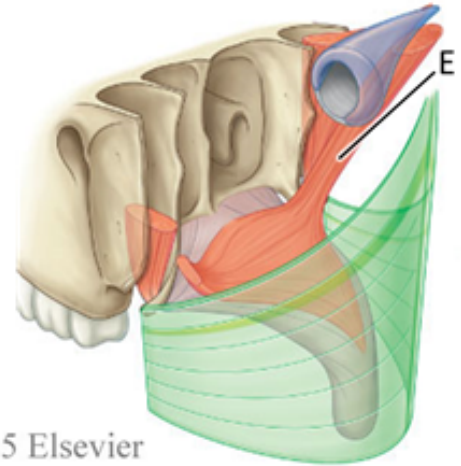
On the diagram, identify the palatal aponeurosis (A). Much of the **tensor veli palatini** (B) attaches to the lateral surface of the medial pterygoid plate (C) and only a small portion of the muscle will be seen in today's dissection. The tendon of the muscle loops under a projection of the medial pterygoid plate called the **pterygoid hamulus (D)** to fan out into the soft palate and blend with the tendon of the muscle on the opposite side. The tensor veli palatini, as the name implies, functions to **stiffen the soft palate, and opens the pharyngotympanic tube during swallowing**. It is innervated by a branch of the **mandibular division of the trigeminal nerve V_3**.

The **levator veli palatini (E)** muscle descends from the petrous temporal bone to insert into the superior surface of the palatine aponeurosis. The LVP is the only muscle capable of raising the soft palate, which isolates the nasal cavity from the oral cavity during swallowing. LVP is innervated by the vagus nerve, CN X.

Notice in the accompanying diagram that the TVP is anterior to the pharyngotympanic tube and to the LVP.

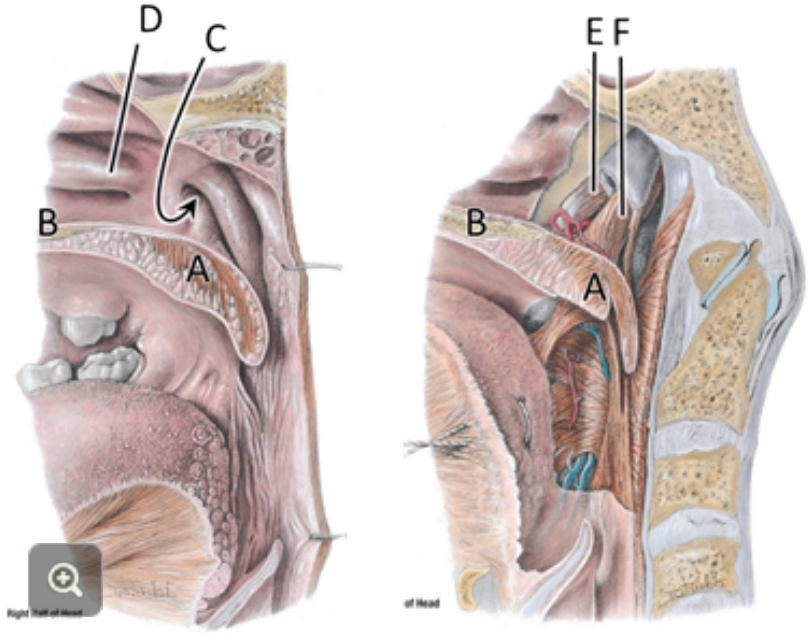
You will now demonstrate this relationship in dissection.





TASK

IDENTIFY the soft palate (A), posterior to the hard palate (B). Identify the opening of the pharyngotympanic tube (C) into the nasopharynx, above the soft palate, at the level of the posterior margin of the inferior concha (D). Use small forceps and small scissors with the closed-open technique to lift the mucosa inferior and anterior to the opening of the pharyngotympanic tube. This will expose the fibers of the tensor veli palatini (E) and levator veli palatini (F) muscles.



From Grant's Atlas of Anatomy, 13e, LWW

Since embarking on this exercise, you have **identified** the following structures and learned the **answers to the following questions**:

- the relationships between the nasal cavities, nasopharynx, oral cavity, oral pharynx, laryngopharynx, larynx, esophagus and trachea
- the piriform aperture and associated bones
- the nasal cavity, nares, choanae, and the structures that form its floor, roof, medial and lateral walls
- the nasal septum, conchae, meatuses and the spheno-ethmoidal recess (function?)
- locations of the paranasal air sinuses and their openings into the nasal cavity
- semilunar hiatus, ethmoidal bulla, opening of the nasolacrimal duct, sphenopalatine foramen (significance)
- blood and nerve supply to the medial and lateral walls of the nasal cavity
- describe the path by which parasympathetics and sympathetics are distributed to the mucosa and glands superior to the oral fissure; include the roles of branches of CN VII and V2 and the deep petrosal nerve
- soft palate and uvula; what is a bifid uvula?
- what is the palatal aponeurosis? Identify the tensor veli palatini muscle and levator veli palatini (actions? innervation?), opening of the pharyngotympanic tube,

If you are satisfied with your **ability to identify these structures** and **answer these questions**, call your TA over for confirmation and for **permission to move on** to the next stage of the exercise.

5.4 The Oral Cavity

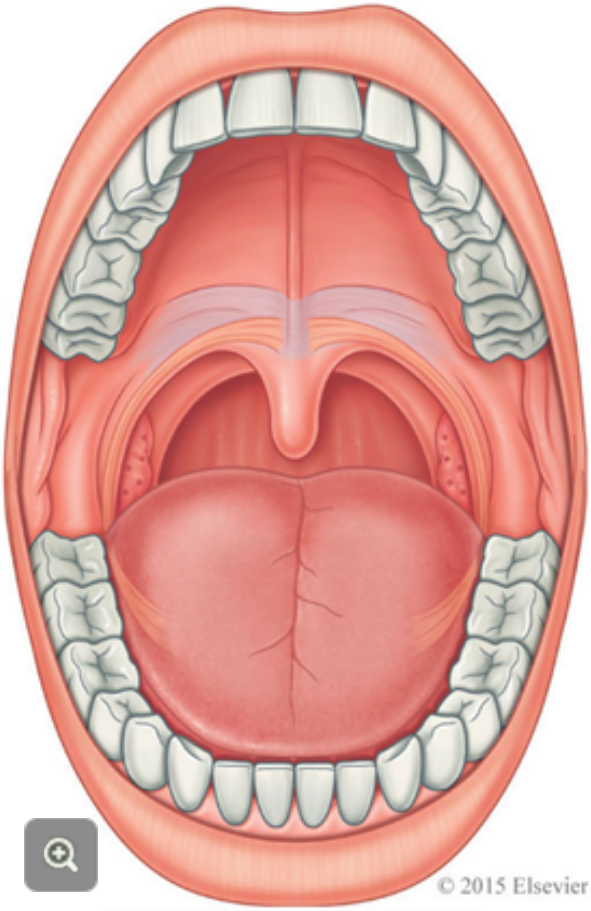
What you'll need:

SPECIMENS

- 4 bisected cadaver heads

When you have completed the exercises described here, you will be able to identify and describe the:

- boundaries of the oral cavity.
- the features of the oral vestibule and oral cavity proper.
- muscles of the palate, including their actions and nerve supply, and the general sensory supply of the palatal mucosa.
- muscles of the floor of the mouth and tongue, including their actions and nerve supply, and the general sensory supply of the floor of the mouth and tongue.
- location of the palatine and lingual tonsils.
- the nerves glands, ducts and blood vessels of the floor of the mouth



Review:

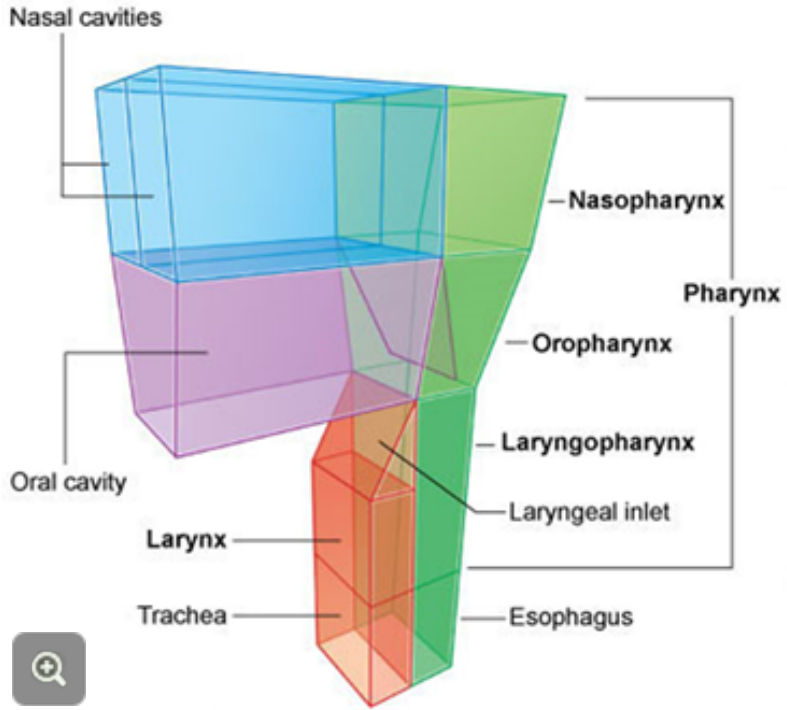
The schematic on the right is a useful starting point for understanding the relationships between these spaces.

Notice that the bilaterally-paired **nasal cavities**, depicted in blue, are superior to the **oral cavity**, depicted in purple.

The **pharynx**, depicted in green, is a single continuous space that is subdivided into the nasopharynx, oropharynx and laryngopharynx.

Notice that the **nasopharynx** is posterior to the nasal cavities and that the **oropharynx** is posterior to the oral cavity.

The **laryngopharynx** continues inferiorly as the **esophagus**, thus leading into the **digestive tract**, while it opens anteriorly into the **larynx** and trachea, thus leading into the **respiratory tract**.

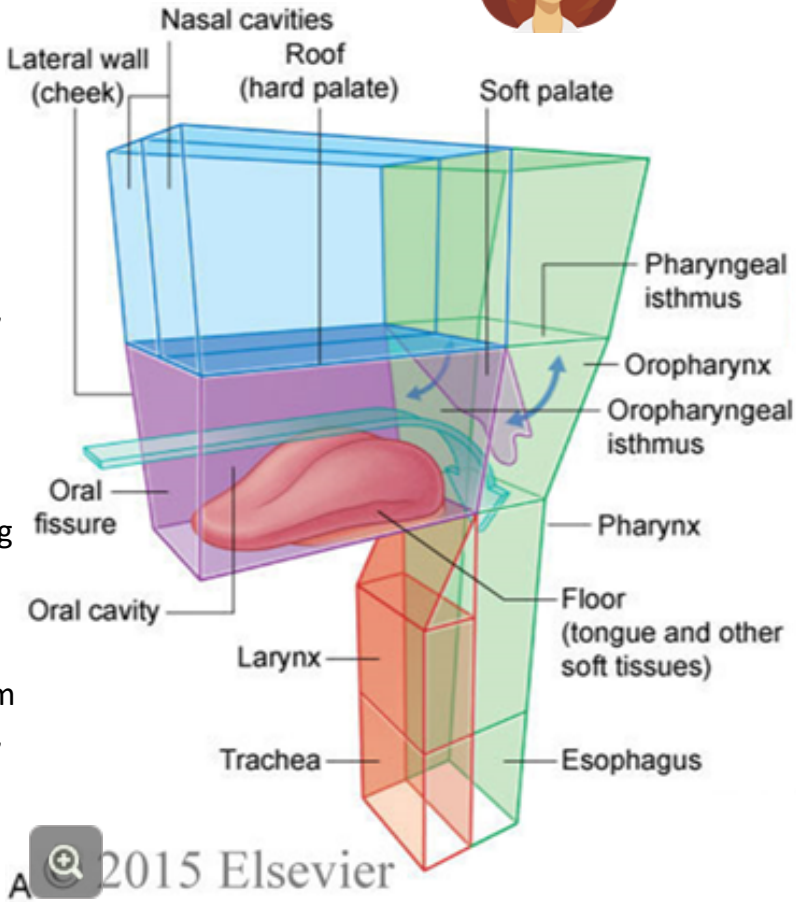


Review:

The previous schematic is extended here, to focus more closely on the **oral cavity**.

Notice that the oral cavity opens anteriorly at the **oral fissure**. Its **roof** is formed by the **hard palate**, its **floor** is formed by the **tongue and associated mucosa**, and its **lateral walls** are formed by the **cheeks**.

The oral cavity ends posteriorly at the **oropharyngeal isthmus**, which is the narrowing that leads to the oropharynx. The oropharyngeal isthmus is **guarded by the soft palate**, which, as depicted by the blue arrows in the diagram, is raised in swallowing to isolate the oropharynx from the nasopharynx. This ensures that, in swallowing, food proceeds toward the digestive tract, and not upward into the nasal cavities.



TASK

Ask your lab partner to lift their upper lip

and turn down their lower lip and identify the superior and inferior labial frenulum in the midline of each . These are folds of mucous membrane that connect the lip to the gingiva.

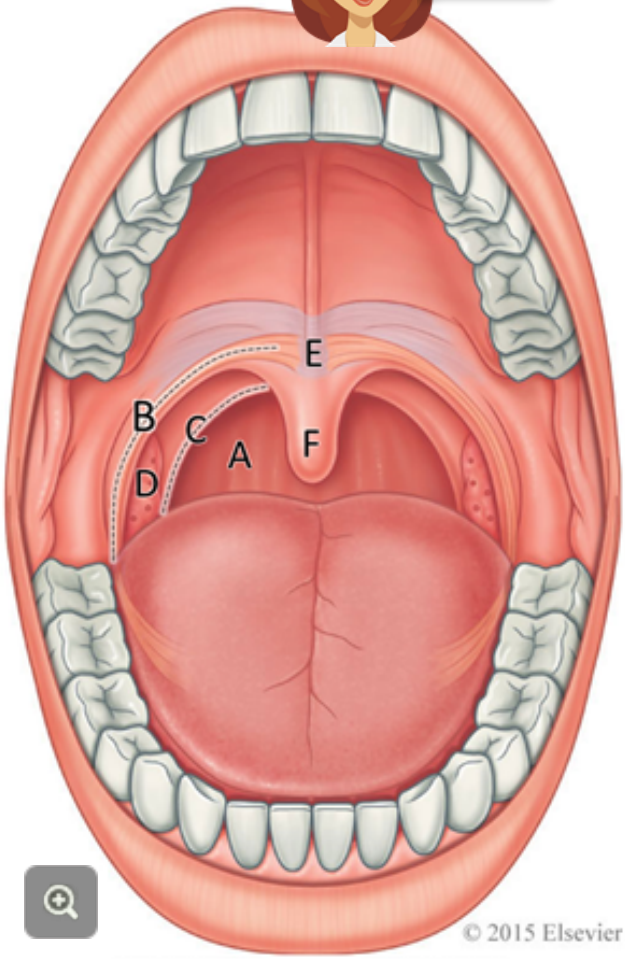
TASK

Ask your lab partner to stop doing that.

TASK

Have your lab partner open their mouth

and identify their soft palate (E), uvula (F), palatoglossal and palatopharyngeal folds, and if possible, the palatine tonsils in the open mouth of your lab partner.

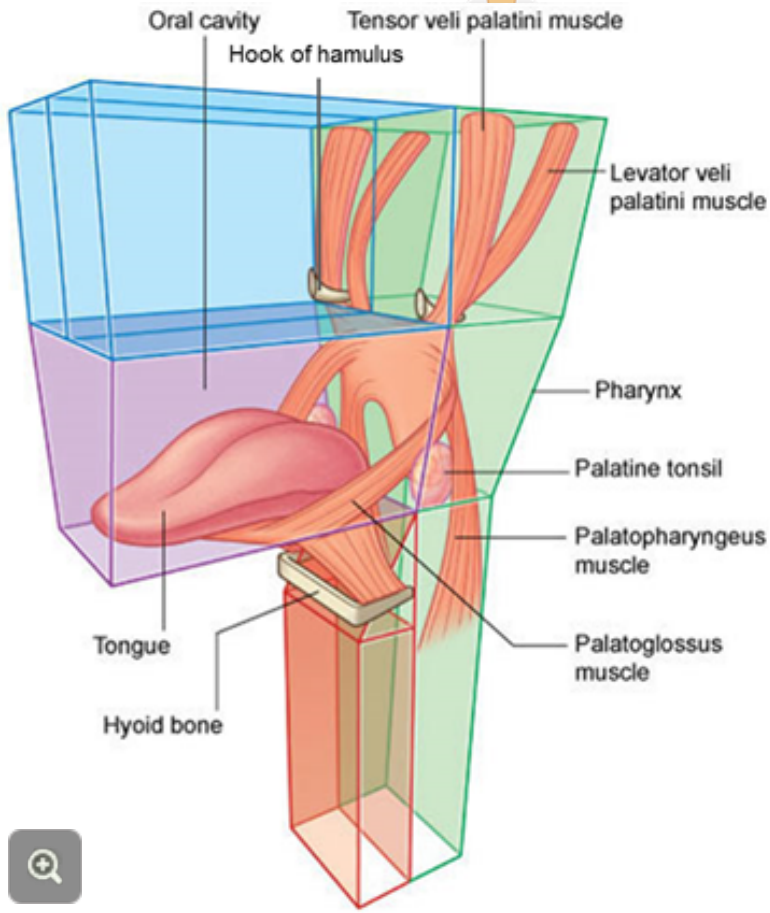


Review:

Exactly as their names suggest, the **palatoglossus muscles** extend from the soft palate to the tongue, and the **palatopharyngeus muscles** extend from the soft palate to the wall of the pharynx.

As shown in the diagram, the **palatine tonsil** is located in the angle between these two muscles.

These muscles both function to **close the oropharyngeal isthmus** by depressing the soft palate and pulling their respective folds toward the midline. In addition, the palatoglossus elevates the tongue and the palatopharyngeus elevates the pharynx. These actions occur during swallowing and are illustrated here:



TASK

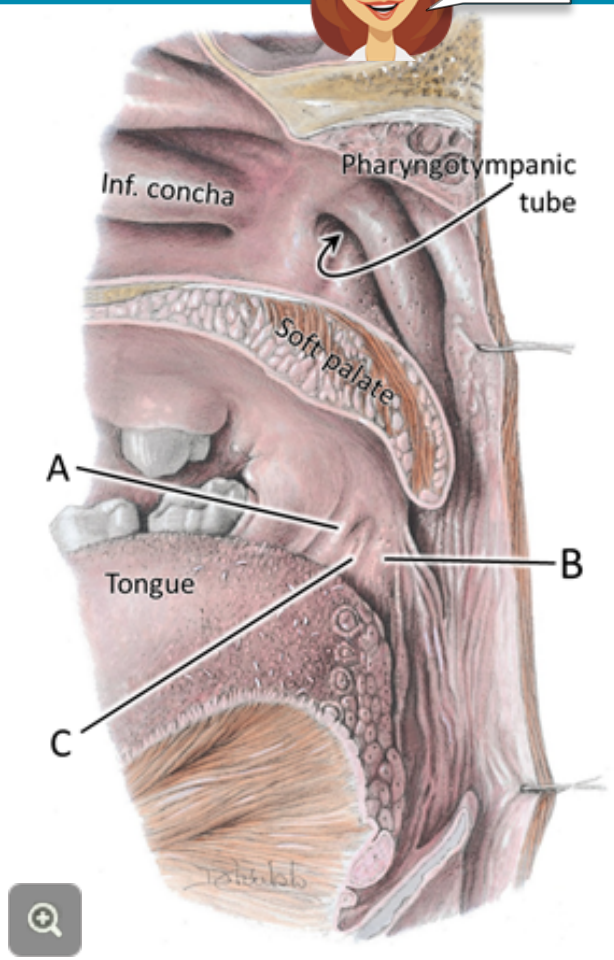
Now identify the palatoglossal (A) and palatopharyngeal (B) folds and the tonsillar bed (C) in the bisected cadaver head.

If you are pair 4, and thus the first pairs at station 5.4, you will choose one half head to leave intact and undissected, so that subsequent groups can identify these folds. On the other three half heads, you will now CAREFULLY remove the mucosa overlying the palatoglossus and palatopharyngeus muscles in order to expose the muscles below.

TASK

Use fine forceps and fine scissors.

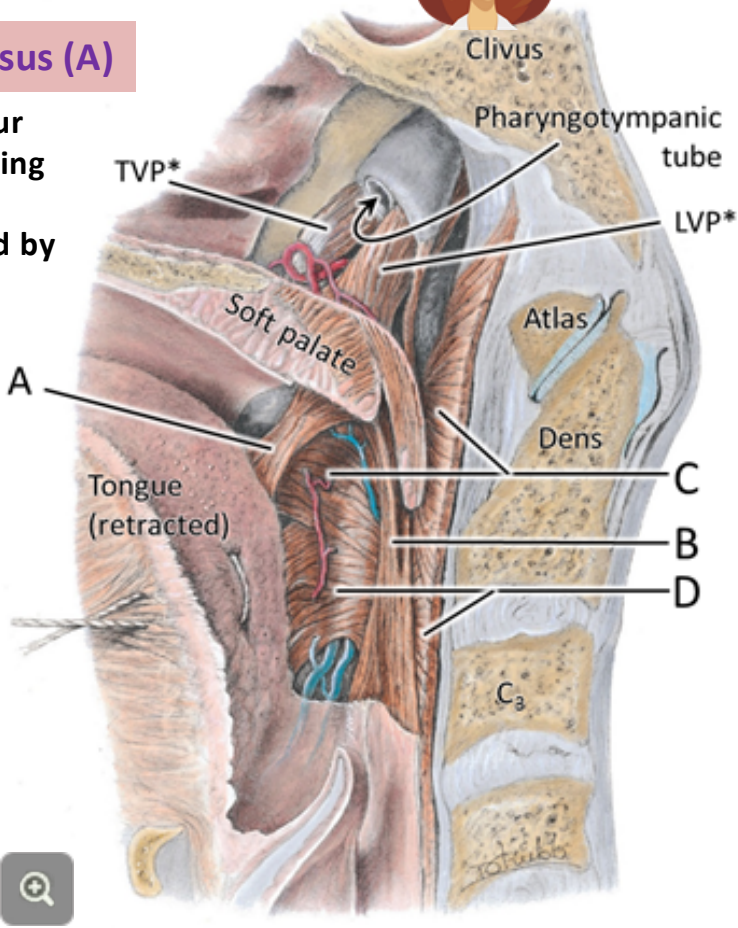
Grasp the mucosa covering each fold and gently lift it away from the underlying muscle. Pierce the mucosa with the closed tips of your scissors and find the plane between the mucosa and the underlying muscle. Open your scissors so as to separate the mucosa from the muscle. Continuing in this fashion, remove the mucosa and expose both the palatoglossus muscle, palatopharyngeus muscle and between them, the tonsillar bed.



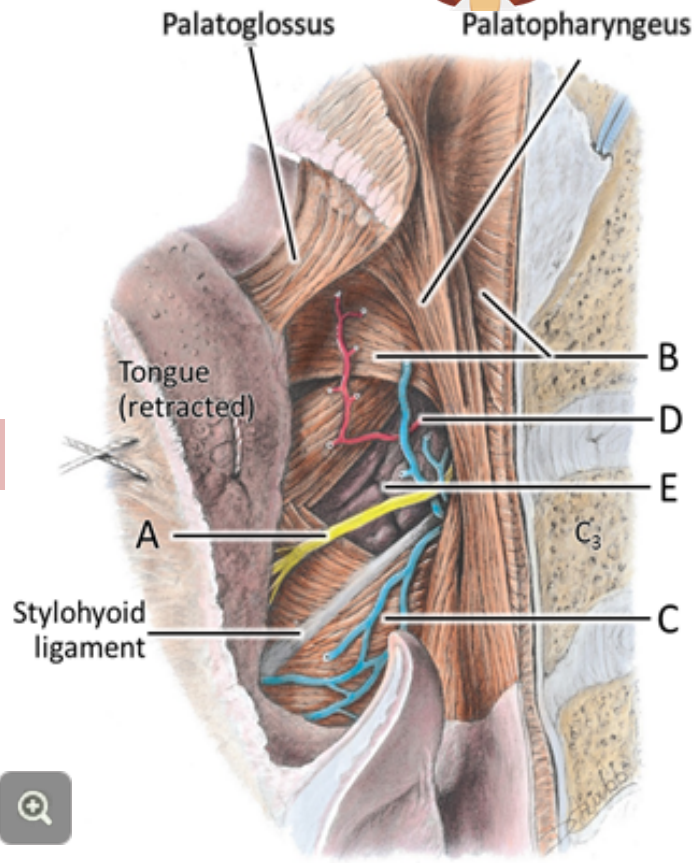
TASK

Once you have exposed the palatoglossus (A) and palatopharyngeus (B) muscles, focus your efforts on removing any mucosa and remaining tonsillar tissue in between these muscles to expose the bed of the tonsil, which is formed by fibres of the superior (C) and middle (D) constrictor muscles of the pharynx.

There are three **constrictor muscles of the pharynx**, superior middle and inferior. The fibres of these muscles are arranged circularly, and the muscles are organized like three cups stacked one inside the other. You will study the pharynx in more detail in lab 6.



Nerves, blood vessels and lymphatics can enter and exit the pharynx by passing between the adjacent constrictor muscles, as in the photograph to the left, where a twist tie is passing between the green and yellow cups.



TASK

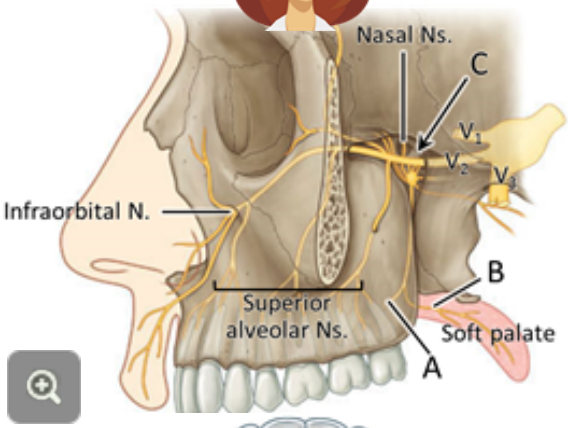
Identify the glossopharyngeal nerve (A)

passing between the superior (B) and middle (C) constrictors and through the tonsillar bed to reach the base of the tongue. The glossopharyngeal nerve is sensory for both general senses and taste over the posterior 1/3 of the tongue.

You may also encounter in the tonsillar bed the tonsillar branch of the facial artery (D) passing deep to the submandibular gland (E).

TASK

Identify the hard and soft palates which form the roof of the mouth.

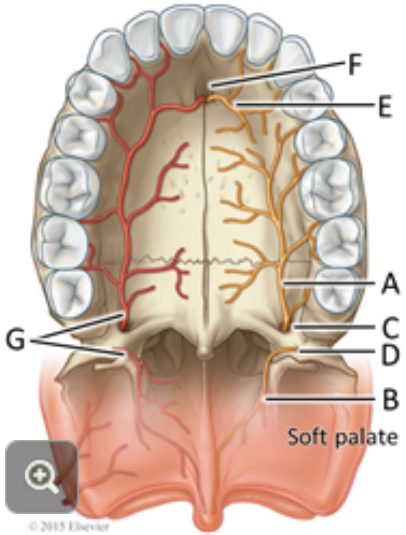


Review its innervation on the specimen:

Like almost all structures inferior to the eyes and superior to the oral fissure, the general sensory innervation to the palate comes from branches of the maxillary nerve, V_2.

The **greater (A) and lesser (B) palatine branches of the maxillary nerve** reach the palate from the pterygopalatine fossa (C) by descending through the palatine canal to emerge through the greater **(C)** and lesser **(D)** palatine foramina in the palatine bone. The **nasopalatine branch of the maxillary nerve (E)** reaches the anterior part of the palate from the nasal septum, by passing through the incisive canal **(F)**.

Blood supply to the palate is from the palatine branches of the maxillary artery (G) which travel with the palatine nerves.



5.4 Muscles Forming the Floor of the Mouth

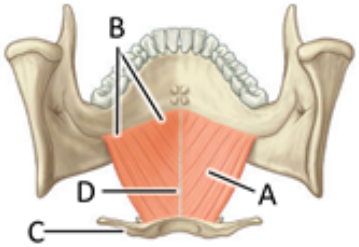
Recall the muscles of the floor of the mouth:

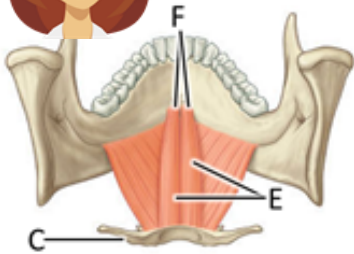
The muscles that form the floor of the oral cavity are named according to their attachments, which makes it easier to identify them and to understand their actions.

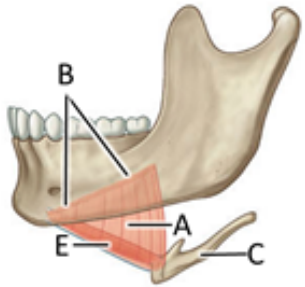
The **mylohyoid muscles** (A), extend from the mylohyoid line (B) to the hyoid bone (C). They largely insert into a midline raphe (D).

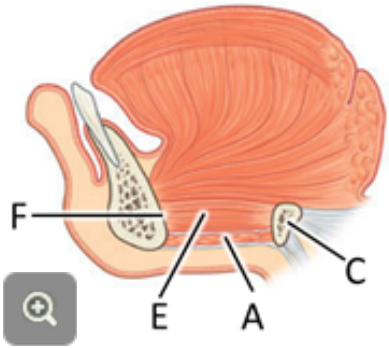
Superior to the mylohyoid muscles lie the paired **geniohyoid muscles** (E), which extend from the internal surface of the mandible, adjacent to the midline (F), to the hyoid bone (C).

"Genio" is a common prefix referring to the "chin".









TASK

On the bisected cadaver head,

locate the mylohyoid and geniohyoid muscles.

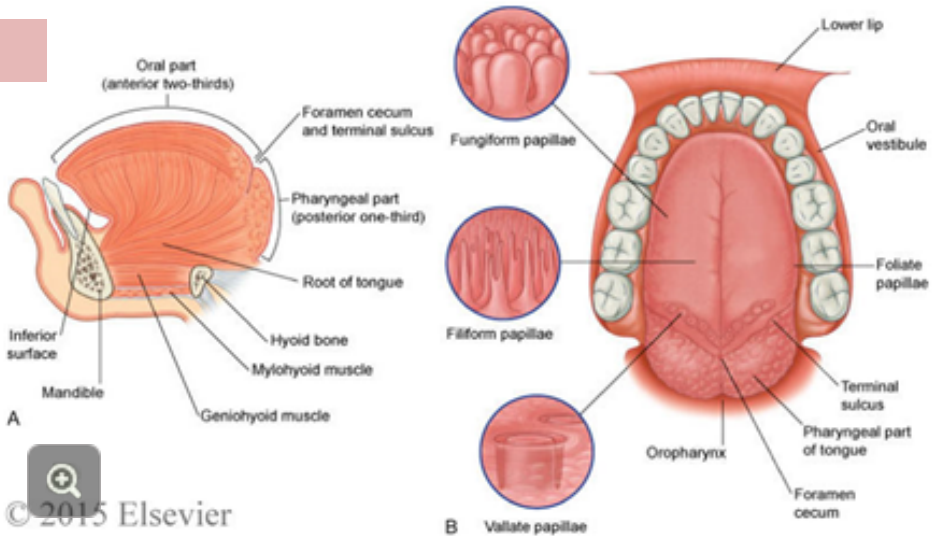
5.4 The Tongue

Recall the description of the tongue: it is the largest structure in the oral cavity. Appro[illegible]y the anterior 2/3 lies horizontally within the oral cavity, and its surface is covered with projections called **papillae**. There are 3 different types of papillae; **filiform, fungiform and circumvallate**. The **taste buds** are located in the fungiform and circumvallate types. The posterior 1/3 of the tongue is vertically oriented and faces into the oropharynx. It is separated from the anterior 2/3 by a v-shaped groove called the **terminal sulcus**. The posterior 1/3 of the tongue is covered with the lymphatic tissue that comprises the **lingual tonsil**.

TASK

On the bisected cadaver head,

identify the anterior 2/3 and the posterior 1/3 of the tongue, circumvallate papillae, the terminal sulcus, and the lingual tonsil. At the midline of the terminal sulcus, it is sometimes possible to identify a depression called the **foramen cecum**, the site where the development of the thyroid gland began during embryonic life as in invagination into the floor of the mouth.



5.4 The Lingual Frenulum

Recall that the tip of the tongue is connected to the floor of the mouth by a fold of mucosa, the **lingual frenulum**.

INFO

Ankyloglossia

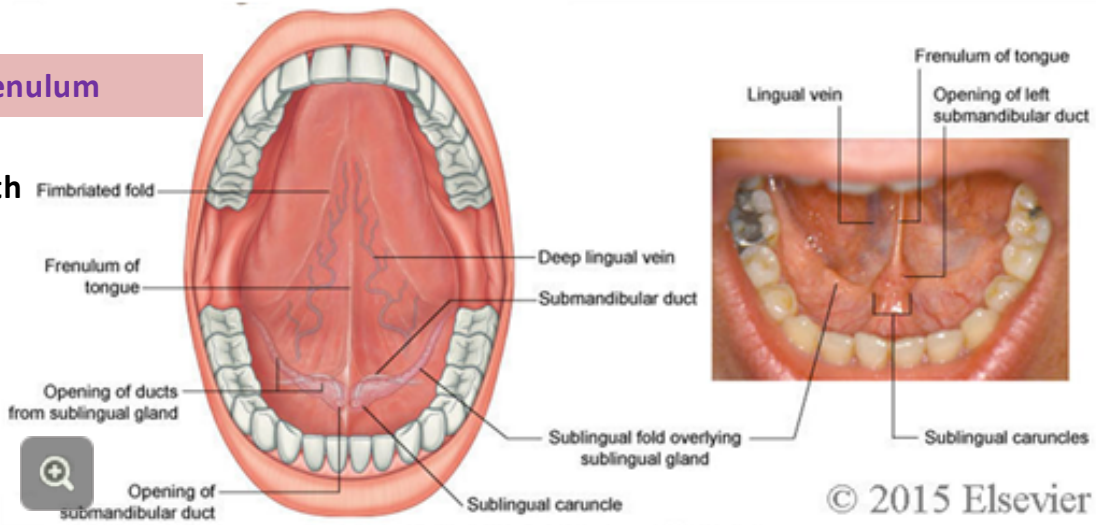
Children with the congenital malformation “tongue tie” (ankyloglossia) have an abnormally thick, short, lingual frenulum which can restrict tongue movements and interfere with the development of speech. Surgical intervention and correction is sometimes necessary.

On each side of the lingual frenulum lies a **sublingual caruncle** onto which a **duct of the submandibular salivary gland opens**.

TASK

Identify the lingual frenulum

and the sublingual caruncles in the mouth of your lab partner.



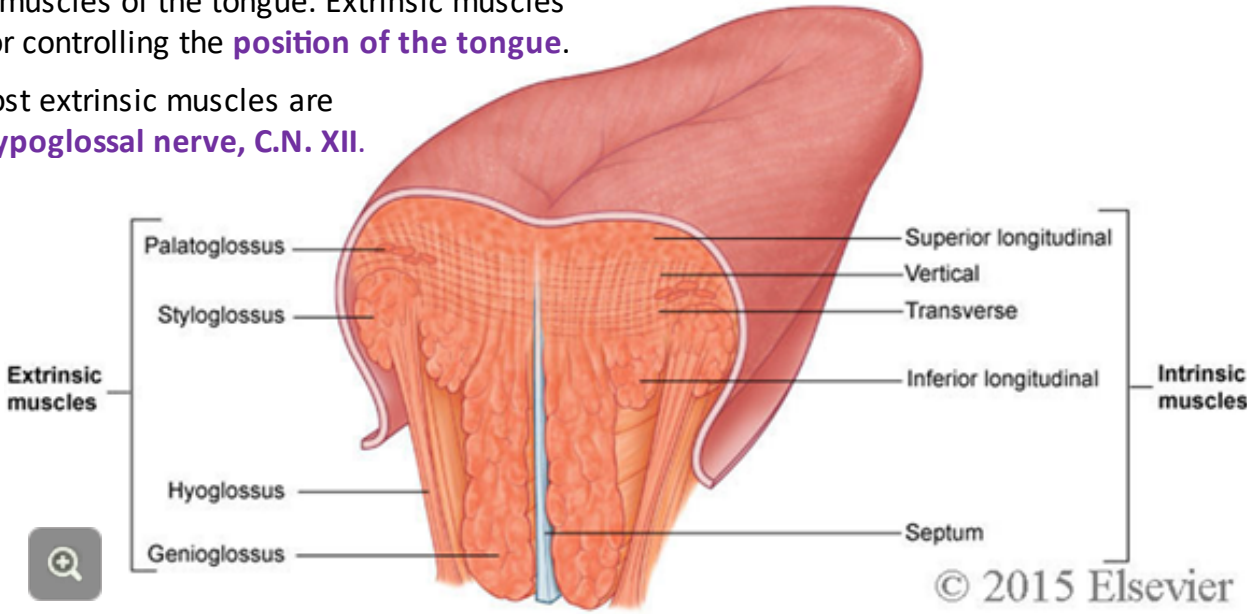
5.4 The Intrinsic and Extrinsic Muscles of the Tongue

Before you study the tongue in the specimen, recall its the muscles.

The tongue can be described as a bag of bilaterally paired muscles covered by a mucous membrane. The muscles can be the divided into 2 groups. The **intrinsic muscles** are entirely contained within the substance of the tongue and have no attachment to surrounding skeletal structures. The fibres of the intrinsic muscles are oriented in all 3 planes and are primarily used for **shaping the tongue**.

The **extrinsic muscles,** on the other hand, have one end attached to a skeletal structure, while the other end blends into the muscles of the tongue. Extrinsic muscles function primarily for controlling the **position of the tongue**.

The intrinsic and most extrinsic muscles are innervated by the **hypoglossal nerve, C.N. XII**.



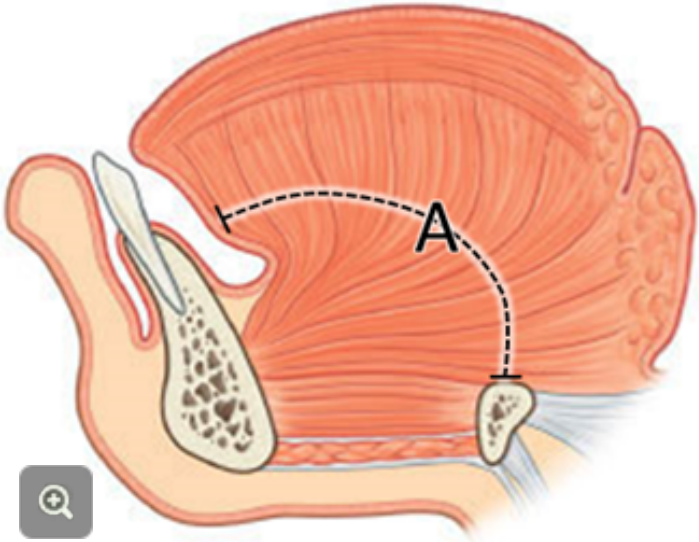
TASK

On the bisected cadaver head,

identify the genioglossus muscle (A).

This is a fan-shaped muscle arising from the deep surface of the mandible at the chin. Its lower fibres attach to the hyoid bone, but the upper fibres fan superiorly and anteriorly into the substance of the tongue.

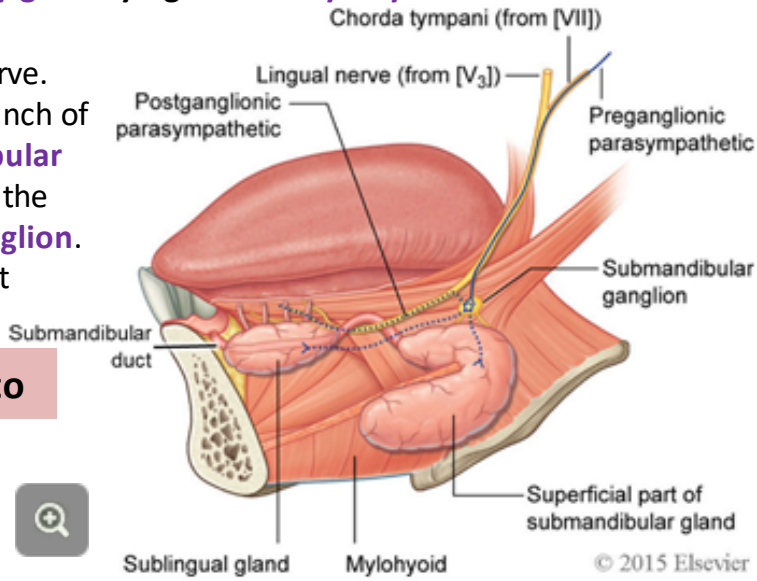
The genioglossus muscles protrude the tongue.



TASK

Pull the tongue away from the mandible and, with fine scissors, carefully incise the mucous membrane along the medial surface of the mandible, from the frenulum to the last molar tooth. Using probe and forceps, lift the mucosa away from the floor of the mouth to identify the sublingual salivary gland lying on the mylohyoid muscle.

The sublingual gland is innervated by postganglionic parasympathetic fibres that originate with the facial nerve. Preganglionic fibres, carried in the **chorda tympani** branch of the facial nerve, join the **lingual branch of the mandibular nerve, V_3.** The lingual nerve carries them to the floor of the mouth, where they synapse on the **submandibular ganglion**. The sublingual salivary glands have about a dozen short ducts that open directly into the floor of the mouth.



TASK

Use a probe to clear away tissue medial to the sublingual gland. Locate the submandibular duct and trace it posteriorly to where it joins the deep part of the submandibular gland. Identify and trace the lingual nerve crossing under the submandibular duct, from the lateral to medial side, as illustrated.

The **lingual nerve** is a branch of the **mandibular division of the trigeminal nerve, V_3**, that is responsible for **general sensation from that anterior 2/3 of the tongue**. It also delivers **taste** fibres to this region, which it receives from the **chorda tympani** branch of the **facial nerve, CN VII**.

TASK

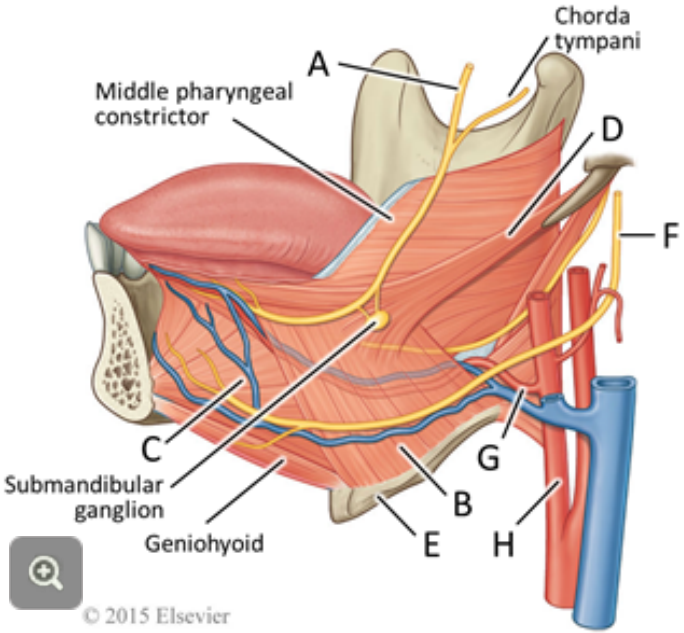
Medial to the lingual nerve (A), identify the vertically-oriented fibres of the hyoglossus muscle (B). The hyoglossus muscle, like the genioglossus muscle (C) and styloglossus muscle (D), is an extrinsic muscle of the tongue. The fibres of the hyoglossus pass superiorly from the hyoid bone (E) to blend with the muscles of the tongue. Inferior to the lingual nerve, identify the hypoglossal nerve (F), running lateral to the hyoglossus.

The lingual artery (G), a branch of the external carotid artery (H), passes medial to the hyoglossus.

The sublingual gland is innervated by postganglionic parasympathetic fibres under control of the facial nerve. Preganglionic fibres are carried in the **chorda tympani** branch of the facial nerve. These fibres join the **lingual branch of the mandibular nerve, V_3**, which carries them into the floor of the mouth, where they synapse on the submandibular ganglion.

The sublingual salivary glands have about a dozen short ducts that open directly into the floor of the mouth.

Paralysis of the tongue



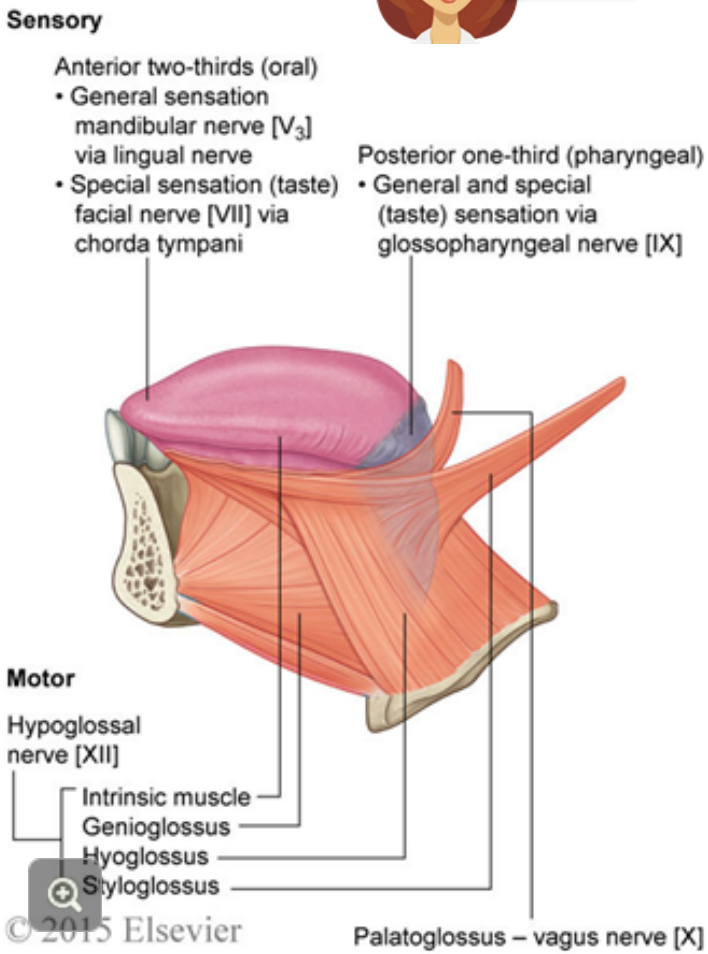
5.4 Summary of the Nerve Supply to the Tongue

To summarize, 4 of the cranial nerves play a major role in the innervation of the tongue.

With the exception of the palatoglossus muscle which is innervated by the vagus nerve, CN X, both the intrinsic and extrinsic muscles of the tongue are innervated by the **hypoglossal nerve, CN XII**.

For the anterior 2/3 of the tongue, **general sensation** (pain, temperature, touch, and pressure) is carried by the **lingual branch of the mandibular division of the trigeminal nerve, V_3. Taste** is carried by the **chorda tympani branch of the facial nerve, CN VII**.

For the posterior 1/3 of the tongue, the **glossopharyngeal nerve, CN IX,** is sensory for both general sensation and taste.



Since embarking on this exercise, you have **identified** the following structures and learned the **answers to the following questions**:

- describe the relationships between the nasal cavities, nasopharynx, oral cavity, oral pharynx, laryngopharynx, larynx, esophagus and trachea
- the oral fissure, oral cavity and structures forming its roof, floor and lateral walls
- oral vestibule, superior and inferior labial frenulum
- identify the oral cavity proper, oropharyngeal isthmus, soft palate, uvula, palatoglossal and palatopharyngeal folds, palatine tonsils
- identify the palatoglossus and palatopharyngeus muscles (actions? innervation?)
- identify the glossopharyngeal nerve; describe its relationship to the pharyngeal constrictors and its distribution
- describe the nerve and blood supply to the hard and soft palate
- identify the mylohyoid and geniohyoid muscles, the lingual frenulum, sublingual caruncle (significance?), intrinsic muscles of the tongue (actions? innervation?), genioglossus, hyoglossus, styloglossus muscles (actions? innervation?), sublingual gland, submandibular duct, lingual nerve, hypoglossal nerve
- describe the distribution of parasympathetics to the mucosa and glands in the floor of the mouth

If you are satisfied with your **ability to identify these structures** and **answer these questions**, call your TA over for confirmation and for **permission to move on** to the next stage of the exercise.