

**BSMS MODULE: 202, NEUROSCIENCE AND BEHAVIOUR**  
**THEME: BRAIN, SPINAL CORD AND NERVE CELLS**

**DR SESSION: 5. EXAMINATION OF THE PARANASAL SINUSES, FLOOR OF THE MOUTH AND NECK.**

**LEARNING OUTCOMES**

By the end of the module students should be able to

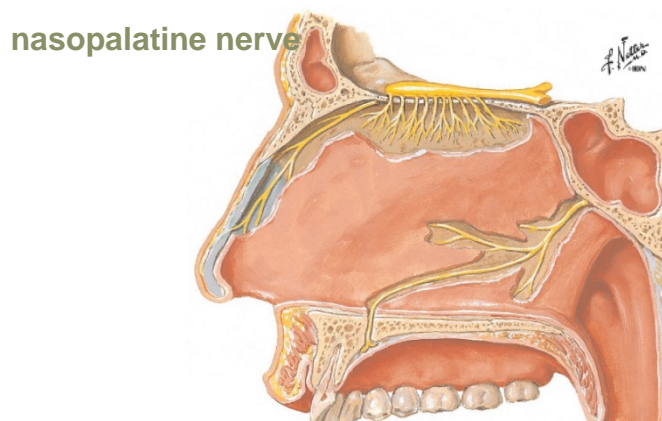
1. Distinguish the skeletal and nervous components of the nasal septum
2. Discriminate the structural and functional components of the lateral wall of the nose
3. Identify the location and structure of the paranasal sinuses
4. Understand the concept of the pterygopalatine ganglion
5. Identify the musculature of the floor of the mouth
6. Distinguish the components of the tongue and associated innervation and blood supply
7. Identify the strap muscles of the neck and understand their innervation
8. Locate the main neurovascular structures that traverse the neck
9. Locate the main structures of the larynx and pharynx.

In this practical session you will study the anatomy of the paranasal sinuses and the floor of the mouth. You will come across a number of different cranial nerves in this sessions, some of which we have not seen before. For this session you will be performing much of the dissection and will work on a cadaveric head that has already been bisected for you by the demonstrators and you used in the last session. In addition you will be able to examine a number of prosected specimens as well as the anatomical models available within the dissecting room. As with all your other practical sessions in the dissecting room make sure you work through this handout, answer the questions and complete the checklist.

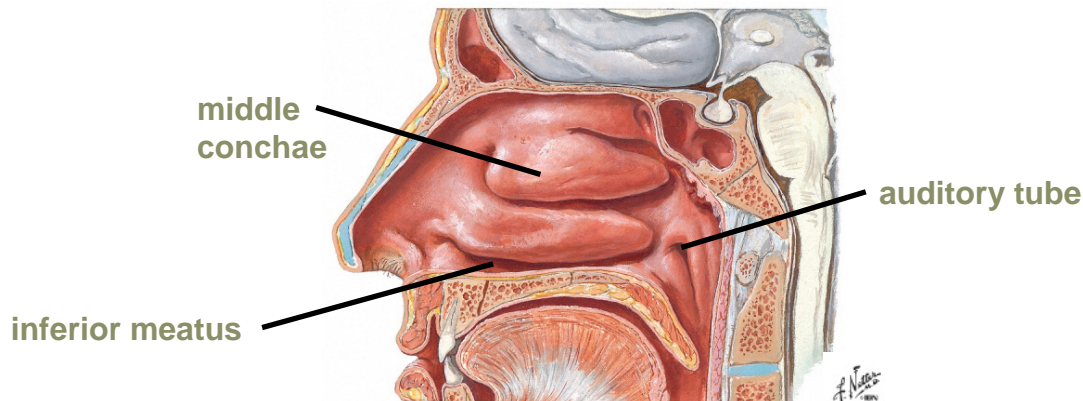
**Task 1. Nose**



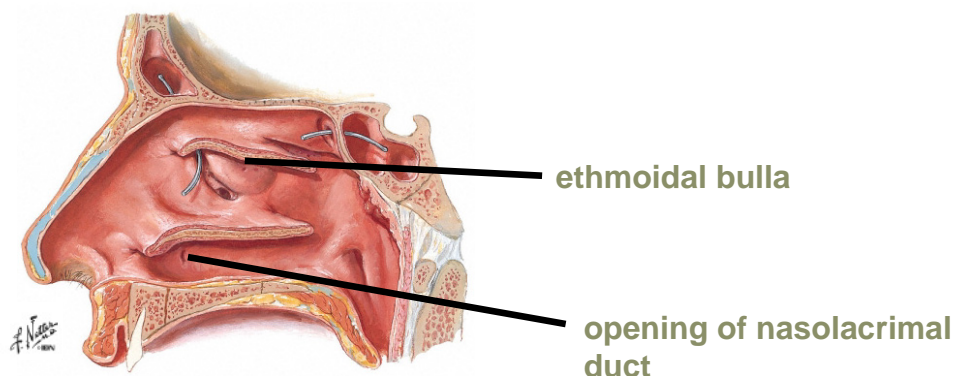
Bissection of the cadaveric heads allows for an examination of the nasal septum and the lateral wall of the nose to be made. The sawcut has been made approximately 2-3 mm off the midline so that one side should have the **nasal septum** intact. If your head does not have the nasal septum in place, work with a neighbouring group or examine the prosections. Remove the mucous membrane covering the nasal septum and search for the **nasopalatine nerve**, which runs anteriorly and inferiorly. The septum itself consists of cartilage anteriorly and mainly the **vomer and ethmoid** bones posteriorly, although the **maxilla, nasal and palatine** bones also make small contributions.



Next remove the nasal septum by making cuts along the superior and inferior attachments using a sharp scalpel blade and examine the lateral wall of the nose. Start by identifying the **vestibule** of the nose immediately above the nostril. The vestibule leads posteriorly into the larger **atrium** of the nose. Posterior to the atrium are three longitudinally running bony shelves – the **conchae or turbinate** bones. Identify the superior, middle and inferior conchae and the spaces that lie inferior to each one. These spaces or grooves are known as the **meatus**.



Underlying the anterior lip of the inferior conchae is the opening to the nasolacrimal duct, which drains lacrimal fluid from the conjunctival sac of the eye into the nasal cavity (you met this in an earlier session). Carefully cut off the inferior concha to expose the opening and insert a probe into the opening (see diagram below) so that you can note the direction that the duct takes as it passes towards the orbit. Next remove the middle concha, under which is the opening to a number of the **paranasal sinuses**, which we will examine shortly. Immediately inferior to the attachment of the middle conchae the lateral wall elevates to form the dome-like **ethmoidal bulla** (see diagram). The 'bulging' of the underlying middle ethmoidal air cells creates the bulla. Inferior to the bulla is a curved groove known as the **hiatus semilunaris**, which forms a channel towards the frontal sinus and aids in mucus drainage. By removing the overlying mucous membrane from the posterior parts of the inferior and middle meatus you may be able to see the palatine nerves running within the **greater palatine canal**.



**Question 1. What purpose do the conchae serve?**

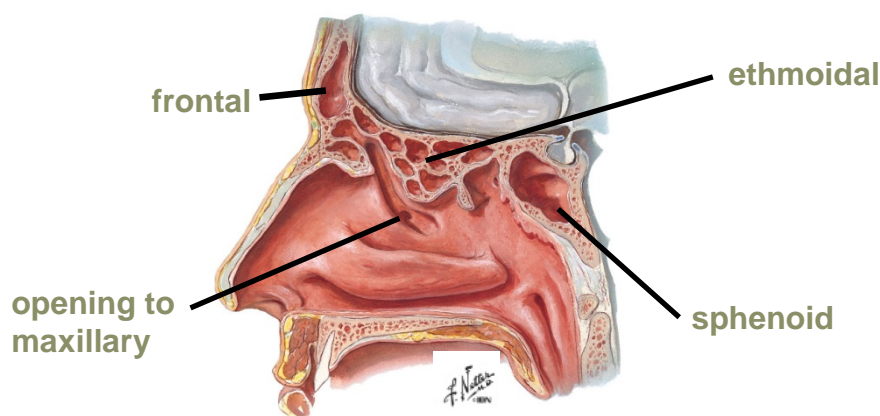
## Task 2. Paranasal sinuses



The **paranasal sinuses** are made up of the **frontal**, **sphenoidal** and **maxillary** sinuses and the **ethmoidal air cells**. Each sinus is lined by mucus secreting mucosa, has an opening into the nasal cavities and is innervated by branches of trigeminal. Firstly identify the frontal sinus, which lies within the frontal bone and drains onto the lateral wall of the middle meatus via the **frontonasal duct**.

Next examine the ethmoidal air cells, which are a cluster of small sinuses separated from each other and the orbit and nasal cavity by thin plates of bone. The individual chambers are divided into anterior, middle and posterior based on the aperture location. The sphenoid sinus lies within the body of the sphenoid bone with apertures on the anterior walls.

At the posterior end of the hiatus semilunaris you should identify the opening of the maxillary sinus. Insert a probe through this opening and you should be able to determine whether the opening lies in the superior or inferior part of the medial wall of the sinus.



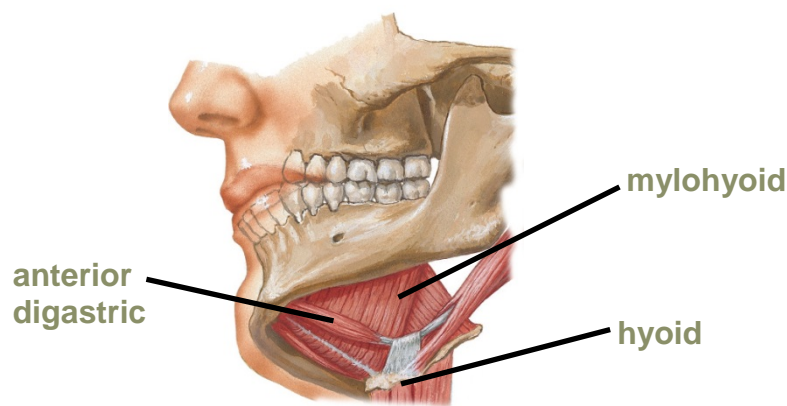
By breaking away the lateral wall of the nasal cavity from just in front of the **palatine canal** to the opening of the nasolacrimal duct you can expose the extent of the maxillary sinus, which fills the body of the maxilla. Despite the cavity being rather dark, you may be able to make out the infra-orbital nerve running within the **infraorbital groove** of the lateral wall of the sinus. The nerve also communicates with the pterygopalatine ganglion, one of the four main parasympathetic ganglia in the head.

**Question 2. Based on their location, which branch(es) of trigeminal do you think innervates the various paranasal sinuses?**

## Task 3. Floor of the mouth



If you haven't already removed the skin inferior to the mandible, do so now in order to expose the anterior belly of the **digastric muscle** (innervated by CN V3), which is attached to the mandible in the **digastric fossa** and has a fascial sling attachment to the **hyoid bone** (identify the hyoid bone on a skeleton). Cut the anterior digastric muscle at its mandibular attachment and reflect to examine the **mylohyoid muscle**. Two mylohyoid muscles form a muscular diaphragm that defines the inferior limit of the floor of the oral cavity. The mylohyoid muscles are attached to medial side of the mandible body, and run inferiorly to the midline where fibres join with those of the contralateral side in a **raphe**. The raphe extends posteriorly to the body of the hyoid.

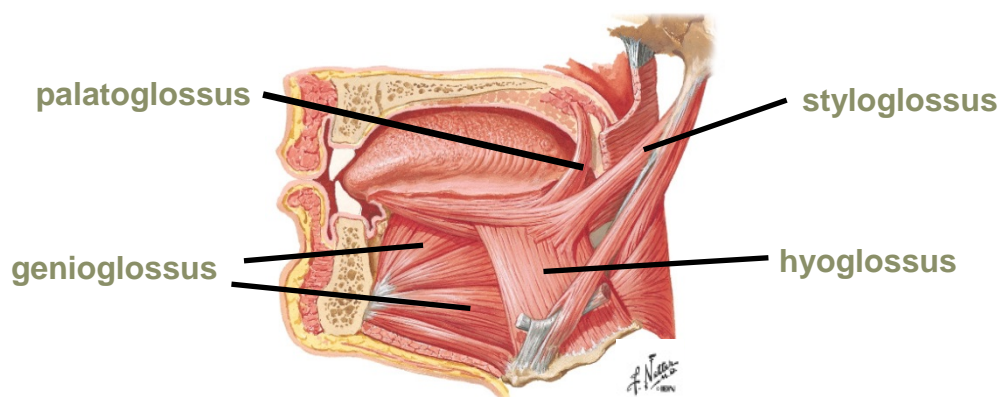


Reflect the mylohyoid towards the mandible and examine one of the paired **geniohyoid muscles** that lie on either side of the midline and run from the **mandibular symphysis** to the body of the hyoid (try using a skull to see these attachment sites). The geniohyoid muscles main role is to pull the hyoid and larynx superiorly and anteriorly during swallowing.

**Question 3. What is the innervation of the geniohyoid muscles?**

#### Task 4. Tongue

The tongue is a muscular structure that sits in the floor of the mouth. The tongue is divided in the midline by a septum, which means all the muscles of the tongue are paired. The extrinsic muscles have origins outside the tongue and insert into it. The four extrinsic muscles are the **genioglossus**, **hyoglossus**, **styloglossus** and **palatoglossus**. You will easily be able to identify genioglossus on the medial surface of your bisected head as it is the large fan shaped muscle that makes up a great deal of the bulk of the muscle. Genioglossus muscle fibres originate immediately superior to the origin of geniohyoid and run into the tongue where they blend with the intrinsic muscles. Genioglossus is innervated by the hypoglossal nerve.



It may be rather difficult to find hyoglossus, a thin quadrangular muscle, but try and locate it by reflecting the mylohyoid muscle and submandibular gland. This hypoglossal innervated muscle originates from the hyoid bone, blends into the tongue and is involved with depression of the tongue. Hyoglossus is a key landmark in the floor of the mouth as the lingual artery enters the tongue deep to hyoglossus and the hypoglossal and lingual nerves enter the tongue on the external surface of the hyoglossus. Styloglossus may be difficult to see clearly in your dissection. It takes its origin on the styloid process (use a skull to identify this structure and examine the projections) and runs inferiorly and medially between the constrictor muscles of the pharynx to enter the lateral surface of the tongue.

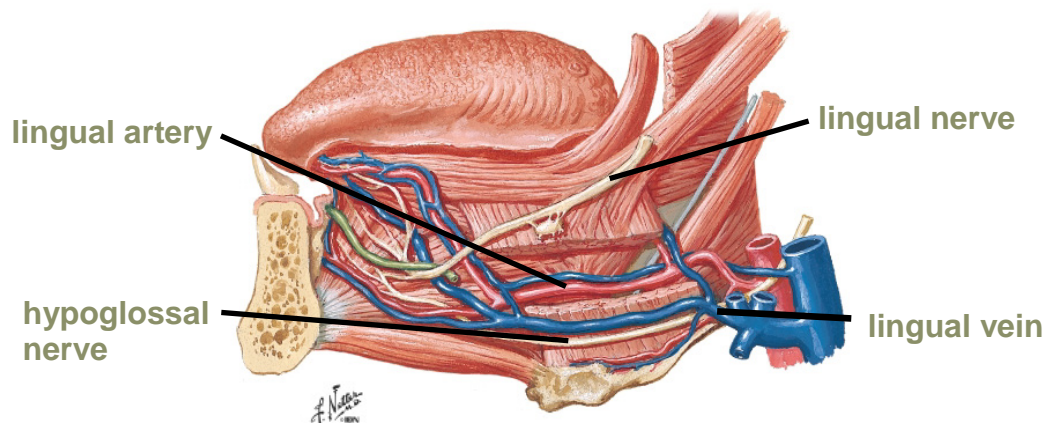


The palatoglossus originates from the aponeurosis of the soft palate and passes anteriorly and inferiorly to the tongue. It is innervated by cranial accessory nerve (CN XI) fibres carried on the vagus nerve (CN X). It is really a muscle of the soft palate!

Unlike the extrinsic muscles of the tongue, the intrinsic muscles are less visible mainly because they originate and insert in the substance of the tongue. The muscles are the **superior** and **inferior longitudinal** muscles and the **transverse** and **vertical** muscles. These muscles act together to alter the shape of the tongue by changing the length, curling the edges and rounding and flattening the surface.

In addition to the musculature of the tongue you should examine some of the major vessels and nerves that are present within this region. Some of these structures are situated deep within the tongue and may not be readily visible and may require further dissection. The major artery of the tongue is the **lingual artery**, which originates from the external carotid artery. It travels anteriorly from an inferior position between the hyoglossus and genioglossus muscles to the apex of the tongue. Drainage of blood from the tongue is achieved via the **lingual vein** and its tributaries.

The innervation of the tongue is quite complex and involves five cranial nerves. Apart from the hypoglossal and accessory (using the vagus nerve) nerves there is the **lingual nerve** (CV V3). If you are able to reflect the mandible away from the lateral surface of the oral region you will notice how the lingual nerve loops under the submandibular duct and ascends into the tongue. The lingual nerve is responsible for general sensation in the oral part of the tongue. Other innervation of the tongue is provided by the **glossopharyngeal** and **facial** nerves, with general and special (taste) sensation of the pharyngeal tongue provided by the glossopharyngeal nerve and taste in the oral tongue carried by the facial nerve (via the **chorda tympani**).



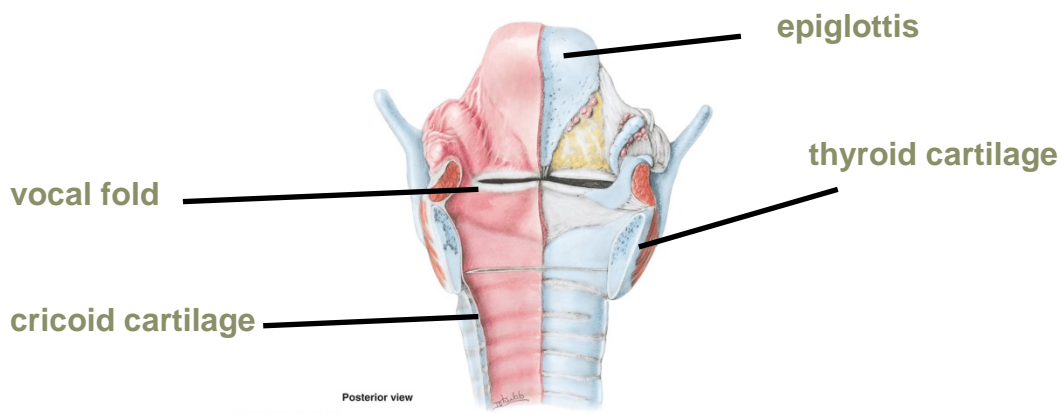
**Question 4. Apart from eating and swallowing, why are precision movements of the tongue required?**

## Task 5. Neck

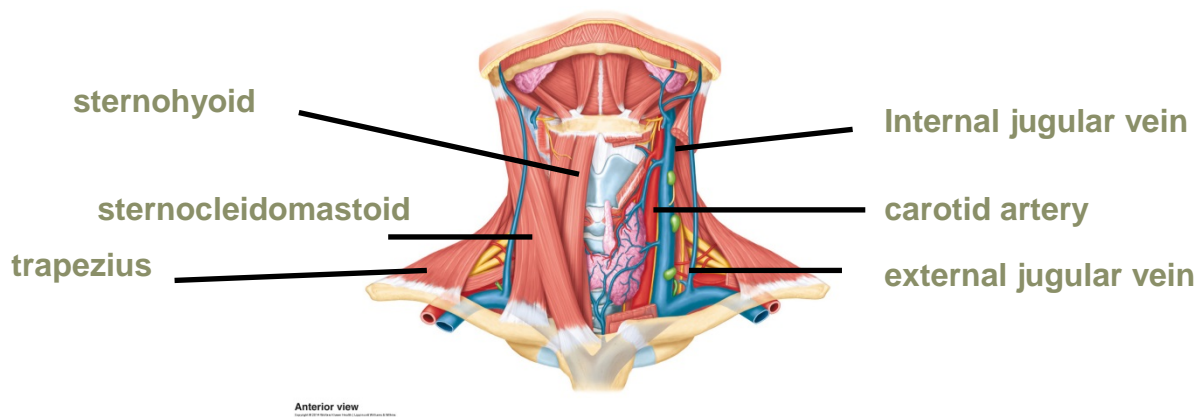


The larynx is the organ responsible for voice production. It is located in the neck inferior to the hyoid bone and superior to the trachea. The larynx is located at the vertebral level C3-C6. Using the bisected head locate the larynx and trace its boundaries back to the vertebrae. The larynx is responsible for producing phonation and acts to guard the air passages. The larynx is comprised of a series of cartilages including a single **thyroid cartilage**, **epiglottis**, and **cricoid cartilage** and paired arytenoid, corniculate and cuneiform cartilages. Identify these on the prosection and the models. The interior of the larynx is comprised of a cavity and the **vocal folds**. You will be able to see the vocal fold on the bisected head. You will also note there is another fold this is the vestibular fold or false vocal fold. The vocal fold attaches to the arytenoid cartilages and muscles surround the larynx create change in the tone and the pitch of the sound emitted. These muscles are controlled by the inferior and superior laryngeal nerves which are branches of the **vagus** nerve.

Examine the pot ED30 and locate the epiglottis and vocal folds



Using the prosected specimens. When peeling back the skin on the neck the first muscle that one encounters is **platysma**, a thin broad sheet. Underneath the platysma on the anterior aspect is a series of 'strap' muscles of the neck. The muscles are described as being suprahyoid (above the hyoid bone) and include: mylohyoid, geniohyoid, stylohyoid and digastric, which you have already studied in the previous sections. Muscles which are 'infrahyoid' (below the hyoid) are the: **sternohyoid**, **omohyoid**, **sternothyroid** and **thyrohyoid**. **Using the prosections** of the neck examine the infrahyoid muscles. Moving laterally some of the larger muscles involved in movement of the neck can be examined. Locate each of the following: **sternocleidomastoid**, **omohyoid**, **trapezius** and the **scalene muscle group**. Ensure you can locate the following vessels: internal jugular vein, external jugular vein, common carotid artery, internal and external carotid arteries.



**Question 5. What happens to the vocal fold during a Valsalva manoeuvre?**

### Checklist



Review all the structures you have examined today and ensure that your demonstrator is satisfied that you have completed the check list below before you leave the dissecting room:

**Distinguished the skeletal and nervous components of the nasal septum**

**Discriminated the structural and functional components of the lateral wall of the nose**

**Identified the location and structure of the paranasal sinuses**

**Understood the concept of the pterygopalatine ganglion**

**Identified the musculature of the floor of the mouth**

**Identified the main components of the larynx**

**Identified the main musculature and vasculature of the neck**

**Distinguished the components of the tongue and associated innervation**