# Anatomy of the Oral Cavity, Pharynx and Larynx

ENT·Education·Gambia
"Education through Innovation"

## Introduction

This page is concerned with the anatomy relevant to your ENT course.

## The oral cavity

The main areas to discuss in this area are;

- The palate
- The tongue & salivary ducts
- The teeth – not covered here

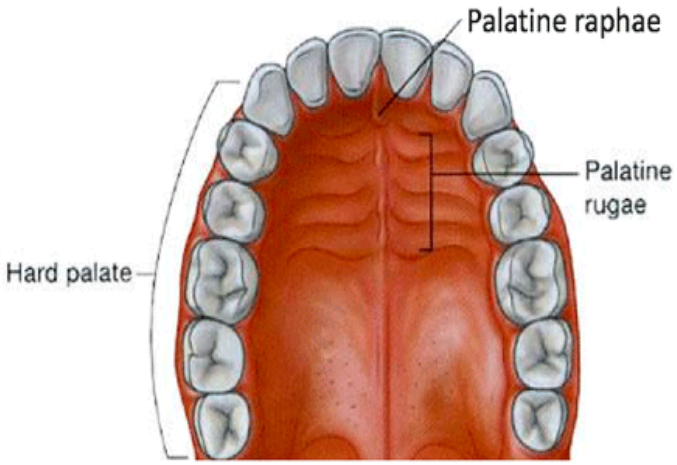
### The Palate

The palate is a colloquial term that described the partition between the nasal and oral cavity.

### The hard palate

The hard palate is named as such due to the presence of a bone. It is in fact made up of three bones: the palatine process of the maxilla and the paired palatine bones, which fuse during development. The bone is covered by a mucosal layer, respiratory superiorly and oral inferiorly, in continuation with the cavity in which the area lies.

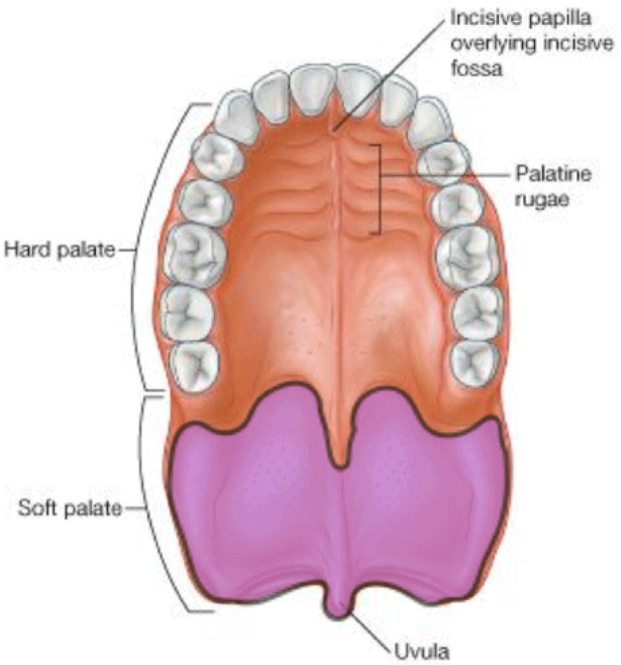
The image opposite shows two main structures to be aware of: the palatine raphe and rugae.




The sensory innervation of the palate is provided by the trigeminal nerve V3 via the nasopalatine, greater and lesser palatine nerves respectively.

## The soft palate

The soft palate is a completely muscular posterior extension of the hard palate via an aponeurotic line. Its borders are the same as the hard palate however its posterior border hangs freely as the uvula. Similar to the hard palate, the soft palate is important in aiding speech, for example in the pronunciation velar consonants such as [k], [g] and [ŋ]. During swallowing, the soft palate rises to prevent nasal regurgitation. This has a protective and a functional role.




The hard palate provides a structural barrier between the oral and nasal cavities, allowing a partial vacuum to be formed to facilitate feeding.

The formation of phonetic sounds in speech also heavily rely on the hard palate, which is best highlighted by the hyponasal speech in defects of the palate.

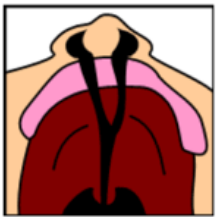
## Cleft lip and palate

- 1 in 700 births worldwide
- Spectrum of incomplete closure of tissues of lip &/or palate during development
- Velopharyngeal Inadequacy (VPI) - gap between nasal and oral cavity

The problem resulting are;

- Feeding
- Ear disease (distorted Eustachian tubes)
- Speech and socialisation (hyponasal voice)

All issues with the function of the hard & soft palate


Bilateral complete cleft lip & palate


Unilateral complete cleft lip & palate


Incomplete cleft palate

## Soft palate muscles

It is impossible to talk about the soft palate without discussing the musculature of the soft palate.

There are 5 muscles of the soft palate, these can be broadly split into superior and inferior muscles.

### Superior group

**1. Tensor veli palatini**

- Tenses the soft palate
- Opens the eustachian tube

**2. Levator veli palatini**

- Elevates the soft palate above neutral position
- The muscle in action when you “Say Ah”

These muscles cannot be visualised clinically.

### Inferior group

**3. Muscularis uvulae - uvula** (Yellow)

- Function not fully understood

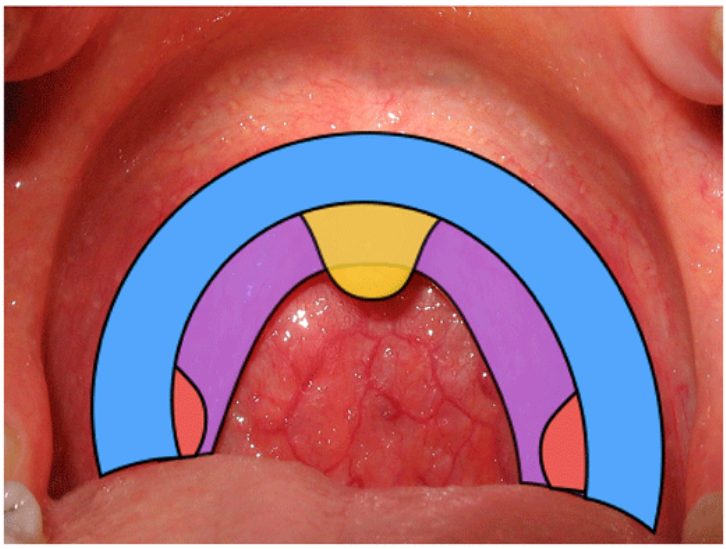
**4. Palatoglossus** (Blue)

- Depresses the soft palate
- Moves arch to midline

**5. Palatopharyngeus** (Purple)

- Depresses the soft palate
- Moves arch to midline

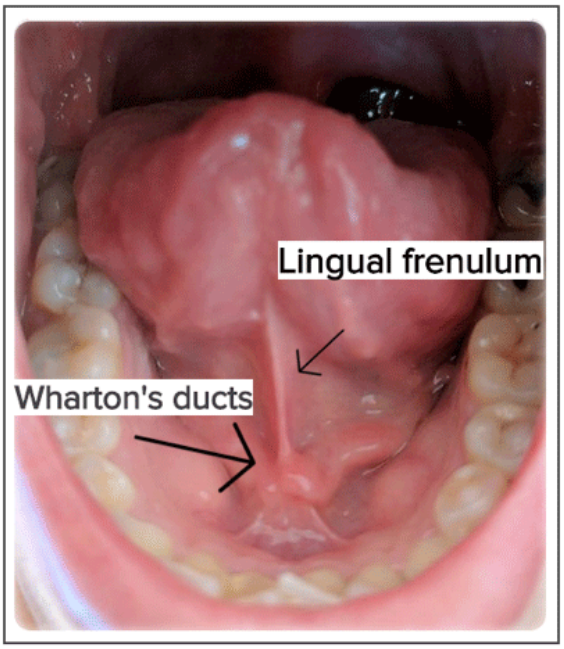
**Tonsils** (red)



These muscles make up the appearance of the oropharyngeal isthmus (more properly a part of the pharynx). The motor innervation of these muscles is supplied by the vagus nerve. The tensor veli palatini is the one exception which gains its innervation from the trigeminal nerve.

The clinical relevance behind the knowledge of these muscles is essential for tonsillectomy which dissects the tonsils from the inferior palatine muscles.

## The tongue and salivary ducts




Underneath the tongue lies two structures important submandibular or Wharton's ducts. These drain the submandibular glands. It is sometimes possible to palpate calculi in these ducts in Sialolithiasis.

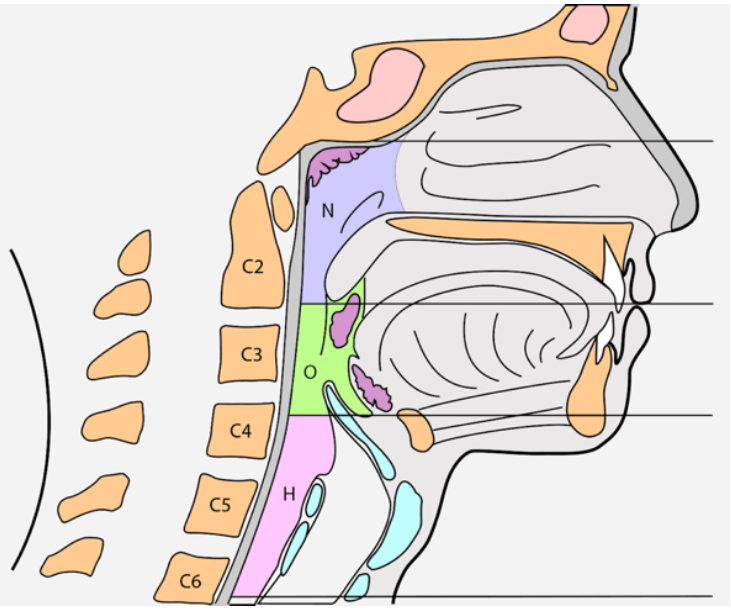
The floor of the tongue can be an area where infection can track via salivary gland infections or a dental abscess. This presents clinically with a raised floor of mouth which is a clinical sign of a potential airway at risk!

Another important salivary duct is seen in Stensen's duct (the parotid duct), this opens opposite the upper second molar tooth.

## The Pharynx

The pharynx is a fibro-muscular tube extending from the skull base to the oesophagus. It has three distinct regions: the nasopharynx, the oropharynx and the laryngopharynx. Each of these has the cervical spine as its posterior relation and each has a defect in its anterior face.

The nasopharynx opens into the nasal cavity, the oropharynx into the oral cavity, and the laryngopharynx into the larynx.




N - nasopharynx: from skull base to soft palate, nasal cavity opens into it anteriorly at the choana

O - oropharynx: from soft palate to hyoid bone, oral cavity opens into it anteriorly at the faucial pillars

H - hypopharynx: from hyoid down to cricopharyngeus (around C5-6), the larynx opens into it anteriorly

A schematic of the regions of the pharynx.

The pharynx is made of three tubular muscles and a number of longitudinal muscles. These are listed in the table together with their innervating motor cranial nerve.

| Tubular | Longitudinal |
|---|---|
| • Superior constrictor (X)<br>• Middle constrictor (X)<br>• Inferior constrictor (X) [thyropharyngeus and cricopharyngeus] | • Stylopharyngeus (IX)<br>• Palatopharyngeus (X)<br>• Salpingopharyngeus (X) |

Sensation in the pharynx is mediated by the IX and X cranial nerves. Note that the superior constrictor is the muscle of the nasopharynx and oropharynx.

### The nasopharynx

This opens anteriorly into the nasal cavity. Posteriorly lies the upper cervical spine (C1 and C2). Superiorly is the sphenoid bone. Laterally lies the upper reaches of the parapharyngeal space.

The nasopharynx houses the adenoid, a part of Waldeyer's ring of lymphoid tissue. It is a midline structure that regresses in adolescence. The Eustachian tubes open where the lateral nasal wall meats the nasopharynx.

### The oropharynx

The oropharynx lies between the nasopharynx and hypopharynx. In vertical extent the oropharynx lies between the soft palate and the hyoid bone. Anteriorly it communicates with the oral cavity via the palatal arches (fauces) between which lie the palatine tonsils. The tonsils themselves are a part of the oropharynx as is the tongue base. The cervical spine lies posteriorly and laterally lie the parapharyngeal spaces.

### The laryngopharynx

The lowest part of the pharynx this is joined below to the oesophagus. Posteriorly is the cervical spine, laterally the parapharyngeal spaces (carotid sheath and thyroid lobe below) and anteriorly it opens into the larynx. The hypopharynx is described in three parts: the post cricoid area, the piriform sinus, and the posterior pharyngeal wall.

## The Larynx

The larynx is the valve that separates the airway from the pharynx. Its purpose is to protect the airway from fluids and solids that are being swallowed.

A secondary function is in the production of sound (phonation) that can be articulated into speech by the lips, tongue, teeth and palate.

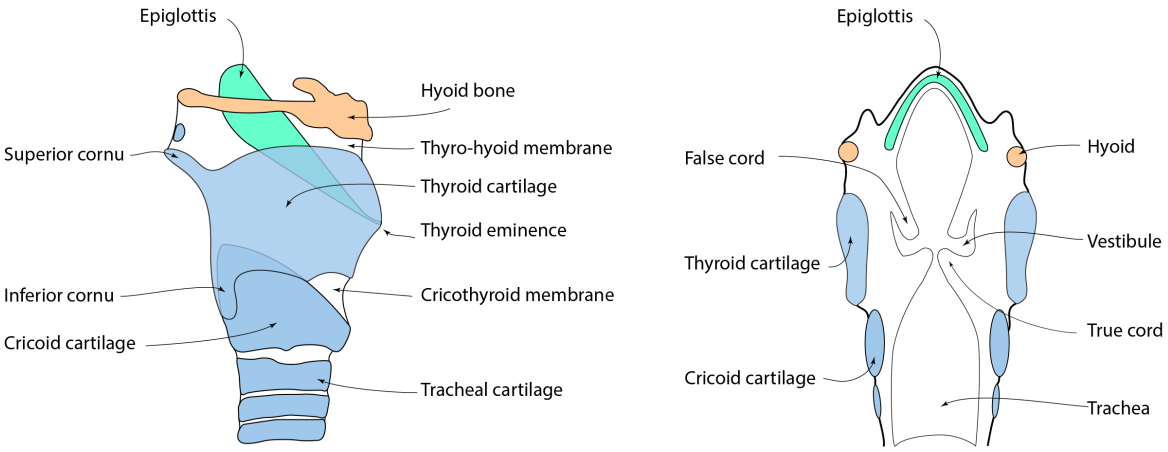



Diagram of the lateral view of the laryngeal cartilages and a coronal view through the larynx.

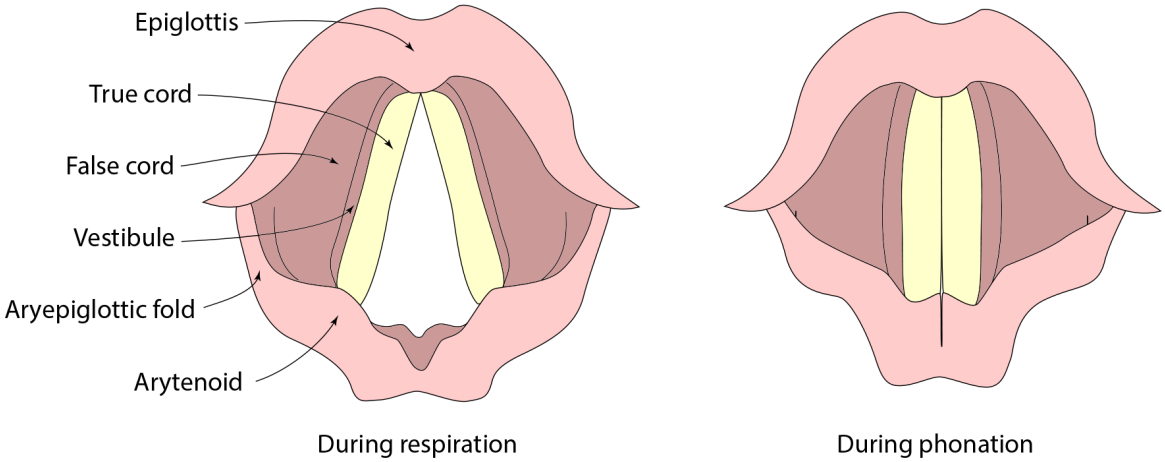



Diagram of larynx as seen during examination with an endoscope

## The Cartilages

There are six cartilages, three paired and three single. The single cartilages are midline:

- Epiglottis (elastic cartilage)
- Thyroid (hyaline)
- Cricoid (hyaline)

The three paired cartilages are:

- Arytenoids (hyaline)
- Cuneiform (elastic cartilage)
- Corniculate (elastic cartilage)

Of these the arytenoids are the most important as these are responsible for abducting and adducting the vocal cords during breathing, coughing, swallowing and phonation.

## The Muscles

The muscles are divided into two groups: intrinsic and extrinsic. The intrinsic muscles are responsible for sound production and lie within the laryngeal framework. They also have a role in airway protection. The extrinsic muscles are involved with elevation and depression of the larynx during swallowing and hence in the protection of the airway.

Important intrinsic muscles:

- Posterior cricoarytenoid - this is the only abductor muscle (arguably the most important muscle in the body as it allows you to breathe
- Cricothyroid - lengthens and tenses the vocal folds and thus adjusts pitch of sound
- Lateral cricoarytenoid - adductor of the cords
- Transverse and oblique arytenoids
- Thyroarytenoid - relaxes and shortens the vocal cord, narrows the glottis

Extrinsic muscles:

There is a long list of these. Elevators include: Digastric, stylohyoid, geniohyoid, and hyoglossus. Depressors include: Sternothyroid, omohyoid, and sternohyoid.

## The Nerves

Motor and sensory nerves to the larynx are derived from the Vagus (CN X). This parent nerve gives off two branches: the superior laryngeal and the recurrent laryngeal.

Superior laryngeal nerve - this is predominantly sensory supplying the cords and vestibule (i.e. the cords and upwards). Its muscular branch supplies the cricothyroid muscle).

Recurrent laryngeal nerve - This supplies all of the other intrinsic muscles and is sensory to the subglottis.