ANATOMY

بسم الله الرحمن الرحيم

MID | Lecture #1

The Digestive System in the Head & Neck

﴿ وَإِن تَتَوَلَّوْا يَسْتَبْدِلْ قَوْمًا غَيْرَكُمْ ثُمَّ لَا يَكُونُوا أَمْثَالَكُم ﴾

اللهم استعملنا ولا تستبدلنا

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Divisions of the GI System

- The **GI system is divided into three parts**:

1. The first part is the **head and neck**, which includes the **mouth, salivary glands, pharynx, palate,** and **tongue**.
2. The second part is the **abdominal region**, which contains the **alimentary tract (GI tube)**. This **tube extends from the oral cavity to the anal canal**, and includes the **oral cavity, pharynx, esophagus, stomach, small intestine, large intestine, rectum,** and **anal canal**.
3. The third part consists of **associated organs**, which include the **salivary glands, gallbladder, liver, spleen** and **pancreas**. These are **accessory organs that open into the alimentary tract (GI tube)**.

Functions of the GI System

- The functions of the GI system include:
  1. Digestion of food, which is the process of transforming complex substances into simpler absorbable forms, such as carbohydrates into glucose, fats into fatty acids, and proteins into amino acids.
  2. Absorption of these nutrients (glucose, fatty acids, amino acids, vitamins, and others) after digestion. These absorbed materials are transported to the liver via the portal circulation.
- The liver is considered one of the most important organs in the abdomen because it:
  1. Metabolizes absorbed nutrients.
  2. Synthesizes bile and bile salts, as well as certain enzymes and coagulation-related hormones.
  3. Detoxifies harmful substances from drugs or byproducts of digestion. The detoxified and waste products are drained into the hepatic vein, then into the inferior vena cava, and finally to the heart for reoxygenation.
  4. Stores glycogen, which can be converted into glucose when energy is needed.

The Digestive System in the Head & Neck

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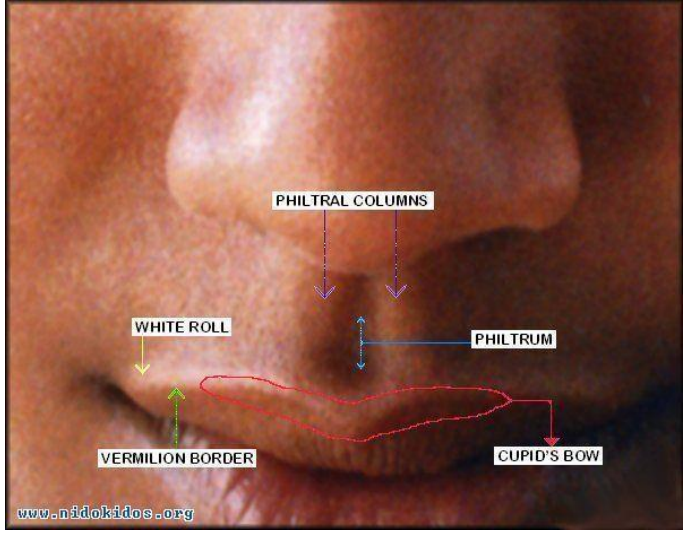
The Mouth (ORAL CAVITY)



- The mouth has two openings, anterior and posterior.
- The anterior opening lies between the upper and lower lip.
- The Lips:
  - The lips are two fleshy folds that surround the oral orifice
  - They are covered on the outside by skin and are lined on the inside by mucous membrane
  - the substance of the lips is made up by the Orbicularis Oris muscle, a circular striated muscle that acts as a sphincter. It is supplied by the facial nerve (cranial nerve VII). There are also muscles that radiate from the lips into the face.
  - The lips are essential for articulation, especially in the production of bilabial sounds, such as 'p' and 'm'.
  - The upper lip is formed during embryonic development by the fusion of the maxillary prominence and the medial nasal prominence. These structures meet at the junction between the lateral two-thirds and the medial one-third of the upper lip.
  - In cases of cleft lip, this fusion fails to occur properly, resulting in a gap at the junction between the lateral two-thirds and the medial one-third. This condition can be unilateral or bilateral.
  - Also included are the labial blood vessels and nerves, connective tissue, and many small salivary glands.

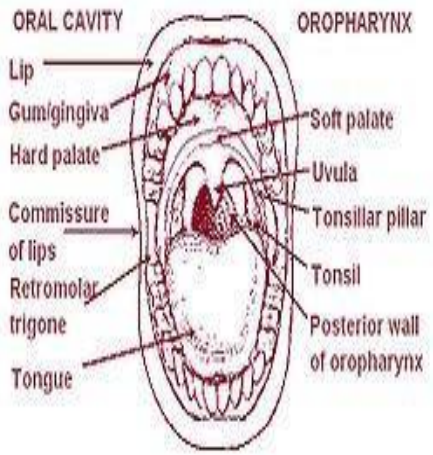
The Mouth (ORAL CAVITY)

- The philtrum is the shallow vertical groove in the midline of the outer surface of the upper lip, formed by the fusion of the right and left medial nasal prominences during embryonic development.
- Median folds of mucous membrane, known as the labial frenula, connect the inner surface of the lips to the gums.
- In histology, the lip consists of three main zones:
  1. Cutaneous (Outer) Zone:
     - This is composed of keratinized stratified squamous epithelium and resembles typical skin. It contains hair follicles, sebaceous glands, and sweat glands. Hair is more prominent in males.
  2. Mucosal (Inner) Zone:
     - This area is lined by non-keratinized stratified squamous epithelium. It contains the labial glands, which are embedded within the internal mucosa and covered by the mucosal lining.
  3. Red Zone (Vermilion Zone or Transitional Zone):
     - This is a modified form of skin, lined by modified keratinized stratified squamous epithelium, but lacks hair follicles, sebaceous glands, and sweat glands. It appears red due to its rich vascularity and is highly sensitive, containing a large number of nerve endings.

Injuries of the Facial Nerve

- When the **facial nerve is injured**, the patient may be **unable to whistle** due to **paralysis of the Orbicularis Oris muscle**, which prevents proper lip puckering. The **buccinator muscle** also becomes **nonfunctional and appears flattened**, making it **difficult to blow**. Additionally, during chewing, **saliva may dribble from the angle of the mouth**.

The Mouth Cavity

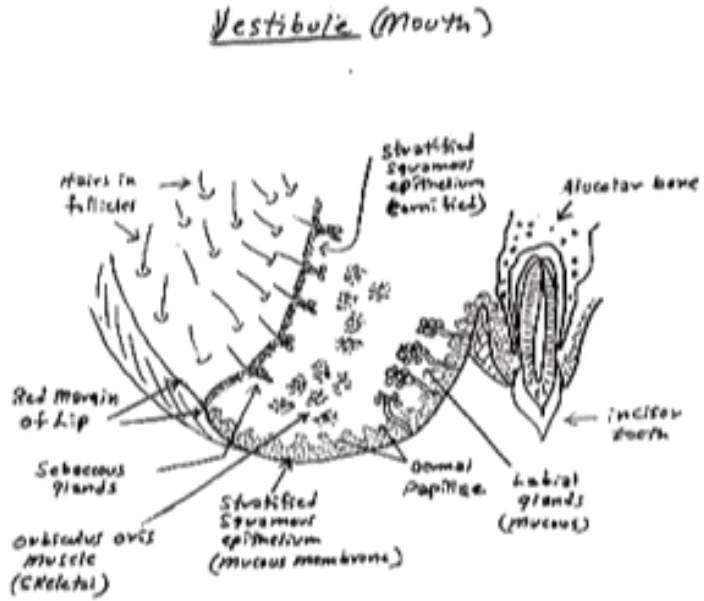


- The mouth extends from the lips to the pharynx
- The **entrance into the pharynx**, known as the **oropharyngeal isthmus** or **fauces** (the **posterior opening of the mouth**), is formed on each side by the palatoglossal fold
- The oropharyngeal isthmus has the following **boundaries**:
  - **Roof**: formed by the **soft palate and the uvula**.
  - **Floor**: formed by the **posterior third of the tongue**, which contains **lymphoid tissue known as the lingual tonsil**.
  - **Lateral sides**: each side contains the **palatine tonsil**, which is commonly inflamed in children due to frequent **tonsillitis**. This occurs because the palatine tonsils play a role in **filtering bacteria, viruses, and foreign particles.**
- The **palatine tonsil** is located **between two mucosal folds**:
  1. The **anterior fold** is the **palatoglossal fold**, which contains the **palatoglossus muscle**.
  2. The **posterior fold** is the **palatopharyngeal fold**, which contains the **palatopharyngeus muscle**.
- The mouth is divided into the vestibule and the mouth cavity proper.

Vestibule

the space outside the closed teeth

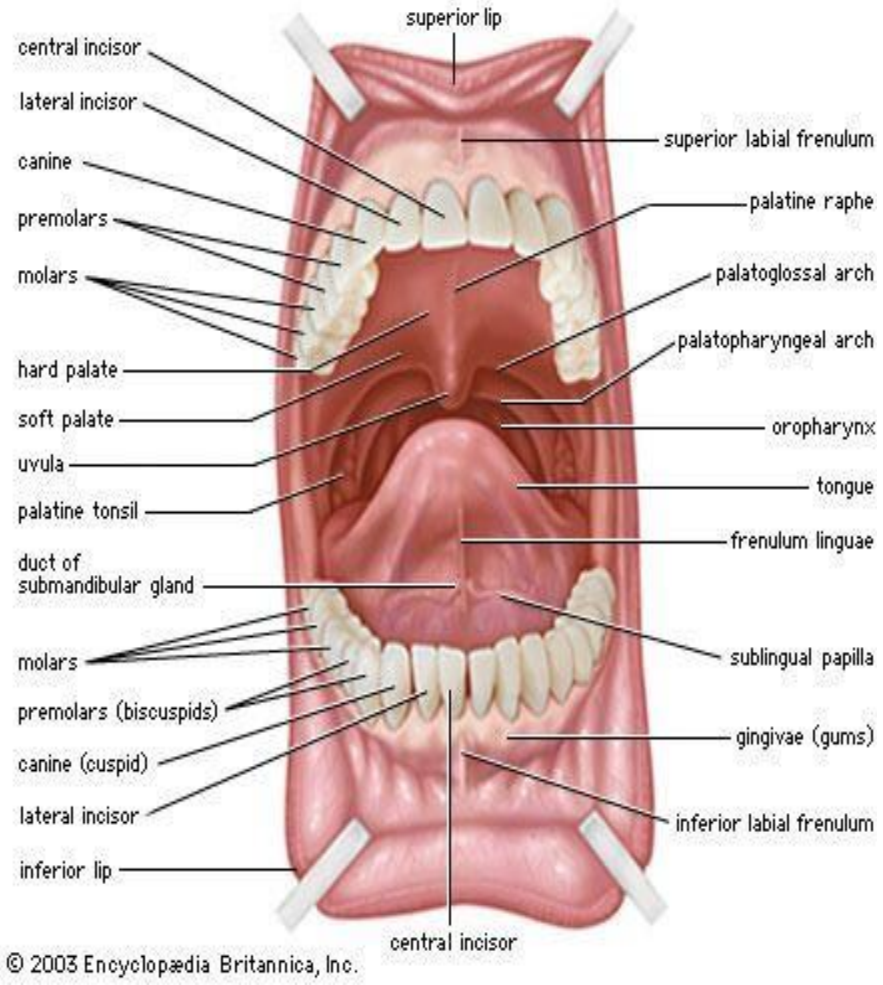
- The vestibule lies between the lips (anteriorly) and the cheeks externally (laterally) and the gums and the teeth internally (medially).
- Its function is to **receive the parotid duct**, which opens **at the level of the upper second molar tooth**. Here, **parotid saliva is secreted into the oral vestibule**, and then **passes into the mouth proper**, behind the last molar.
- This slit-like space communicates with the exterior through the oral fissure between the lips
- When the jaws are closed, it communicates with the mouth proper behind the third molar tooth on each side.
- The vestibule is limited above and below by the reflection of the mucous membrane from the lips and cheeks to the gums.
- The lateral wall of the vestibule is formed by the cheek, which is made up by the buccinator muscle and is lined with mucous membrane.
- The tone of the buccinator muscle and that of the muscles of the lips keeps the walls of the vestibule in contact with one another
- The duct of the parotid salivary gland opens on a small papilla into the vestibule opposite the upper second molar tooth



Mouth Proper

(cavity inside closed teeth)

- The mouth proper has a roof and a floor.
- The roof of the mouth is formed by the hard palate in front and the soft palate behind
- The floor is formed largely by the anterior two thirds of the tongue and by the reflection of the mucous membrane from the sides of the tongue to the gum of the mandible.
- The lateral side is formed by closed teeth.
- Fold of mucous membrane called the frenulum of the tongue connects the undersurface of the tongue in the midline to the floor of the mouth.
- Lateral to the frenulum, the mucous membrane forms a fringed fold, the plica fimbriata.
- The submandibular duct of the submandibular gland opens onto the floor of the mouth on the summit of a small papilla on either side of the frenulum of the tongue.
- The sublingual gland projects up into the mouth, producing a low fold of mucous membrane, the sublingual fold.
- Numerous ducts of the gland open on the summit of the fold.



Mucous Membranes of the Mouth

There are **two types of mucous membranes** in the oral cavity:

1. **Soft and elastic mucosa**: composed of **elastic connective tissue**, this type of mucosa is found **under the tongue and on the floor of the mouth**.
2. **Dense mucosa**: made of **dense connective tissue**, it **covers the hard palate, gums, and teeth**.

- In the vestibule the mucous membrane is tethered to the buccinator muscle by elastic fibers in the submucosa
- Prevent redundant folds of mucous membrane from being bitten between the teeth when the jaws are closed
- The mucous membrane of the gingiva, or gum, is strongly attached to the alveolar periosteum.

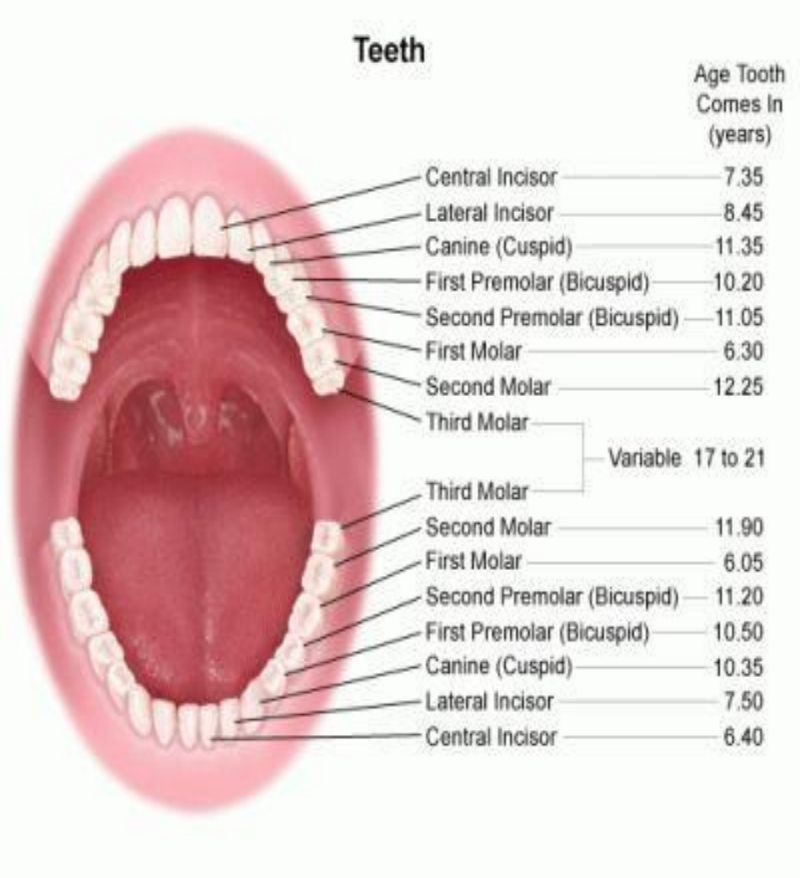
Sensory Innervation of the Mouth

- Roof (hard palate): The greater palatine and nasopalatine nerves from the maxillary division of the trigeminal nerve
- Floor: The lingual nerve (common (general) sensation [touch, temperature, pain]), a branch of the mandibular division of the trigeminal nerve.
- Taste (special sensory) fibers travel in the chorda tympani nerve, a branch of the facial nerve. The chorda tympani carries taste sensations from the dorsum of the tongue, where taste buds are located. These taste buds detect chemical (taste) stimuli, allowing us to perceive different flavors.
- Cheek: The **outer surface (skin),** and **mucosa inside** are innervated by the buccal nerve, a branch of the mandibular division of the trigeminal nerve (sensory), the buccinator muscle is innervated by the buccal branch of the facial nerve.
- It also receives **blood supply from branches of the facial artery and the lingual artery**.

The Teeth

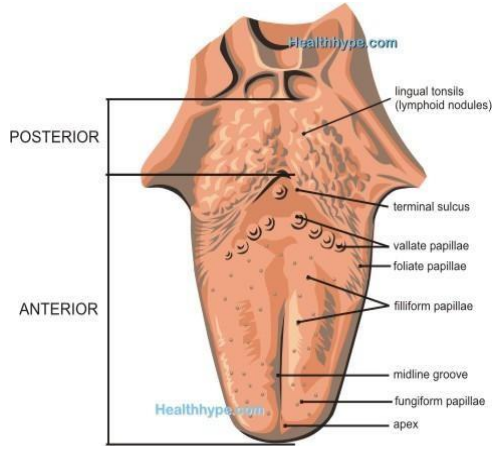
- The **gingivae** (**gums**) surrounded by dense connective tissue are specialized regions of the oral mucosa that surround the teeth and cover adjacent regions of the alveolar bone.
- Deciduous Teeth (milk teeth):
  - There are 20 (10 in the upper & 10 in the lower jaw) deciduous teeth: four incisors, two canines and four molars in each jaw.
  - The deciduous teeth begin to erupt around 6 months of age, starting with the lower central incisors, followed by the upper central incisors. By the end of 2 years, all deciduous teeth have usually erupted.
  - The teeth of the lower jaw usually appear before those of the upper jaw.

Permanent Teeth



- There are **32 permanent teeth**, arranged as **four incisors, two canines, four premolars,** and **six molars in each jaw**.
- **Eruption of the permanent teeth** typically begins at around **6 years of age** and is usually complete by **12 years of age**, **excluding the third molars**. The **teeth in the lower jaw generally erupt before those in the upper jaw**.
- The **third molars**, also known as **wisdom teeth**, are the **last to erupt**, usually between the ages of **17 and 30**. The term **"wisdom tooth"** comes from the idea that these teeth appear at a more mature age, when a person is thought to have gained **wisdom**.
- The **eruption of wisdom teeth** is often associated with **complications**, such as **impaction, infection**, or **complete failure to erupt**.

The Tongue

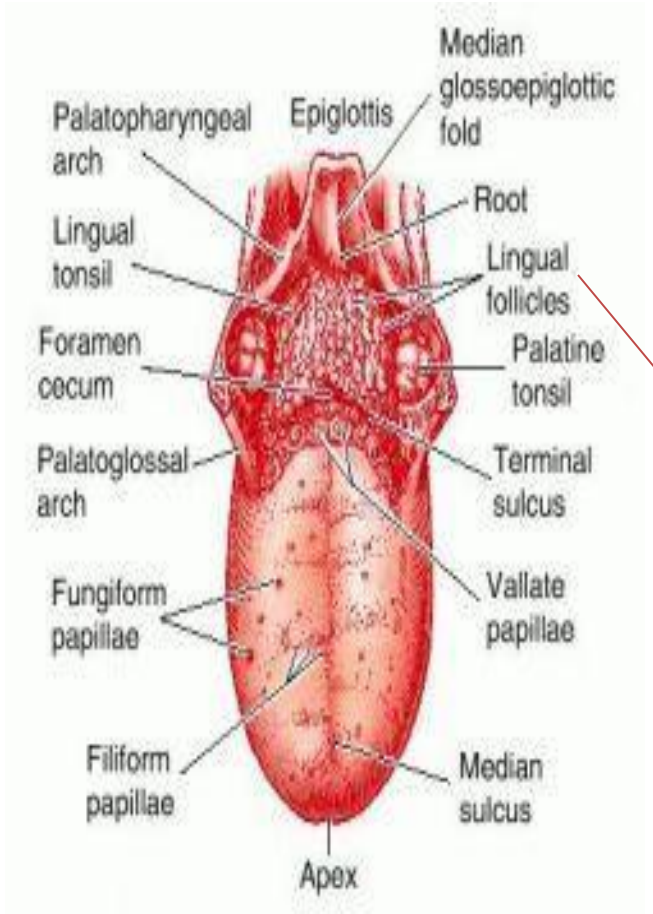


- The tongue is a mass of striated muscle (muscular organ) covered with mucous membrane
- The **muscles of the tongue** are divided into two main groups: **intrinsic** and **extrinsic**.
  - **Intrinsic muscles** are **bundles of muscle fibers** arranged in **longitudinal, transverse, and oblique** directions. These muscles are **responsible for changing the shape of the tongue** (e.g., curling, flattening, elongating).
  - **Extrinsic muscles** originate from structures outside the tongue and **insert into it**, allowing **movement of the tongue** (e.g., protrusion, retraction, elevation). These include:
    - **Styloglossus**: originates from the **styloid process** of the temporal bone.
    - **Genioglossus**: arises from the **superior mental (genial) tubercle** of the mandible.
    - **Palatoglossus**: originates from the **soft palate**.
    - **Hyoglossus**: arises from the **hyoid bone**.
- The muscles attach the tongue to the styloid process and the soft palate above and to the mandible and the hyoid bone below.
- The tongue is divided into right and left halves by a median fibrous septum. Which is why each muscle of the tongue is present in pairs—one on the right side and one on the left (symmetrical).
- The tongue is also divided into an anterior two-thirds and a posterior one-third by the sulcus terminalis and the foramen cecum.

- During **embryological development**, the **posterior third of the tongue** originates from the **third pharyngeal arch**, while the **anterior two-thirds** originates from the **first pharyngeal arch**. As a result, their **innervation differs**:
  - The **posterior third** is innervated by the **glossopharyngeal nerve (cranial nerve IX)**, which provides **both general sensation and taste**. This region also contains **lymphoid tissue** known as the **lingual tonsil**.
  - The **anterior two-thirds** receives:
    - **General sensation** via the **lingual nerve**, a branch of the **mandibular division of the trigeminal nerve (CN V3)**.
    - **Taste sensation** via the **chorda tympani**, a branch of the **facial nerve (CN VII)**.
  - **Taste buds** are mainly located on the **dorsal surface** of this region.
- **Types of Taste Buds (Papillae):**
  - **Fungiform**
  - **Circumvallate**
  - **Filiform**
- **Dorsum of the Tongue – Taste Areas:**
  - **Anterior part**: sweet
  - **Posterior circumvallate area**: bitter
  - **Lateral edges**: sour and salty

Mucous Membrane of the Tongue

- The mucous membrane of the upper surface of the tongue can be divided into anterior and posterior parts by a V-shaped sulcus, the sulcus terminalis
- The apex of the sulcus projects backward and is marked by a small pit, the foramen cecum
- The foramen cecum is an embryologic remnant and marks the site of the upper end of the thyroglossal duct



The **mucous membrane of the tongue** is divided into two surfaces:

1. The **dorsal (upper) surface**
2. The **ventral (lower) surface**

Type of Epithelium:

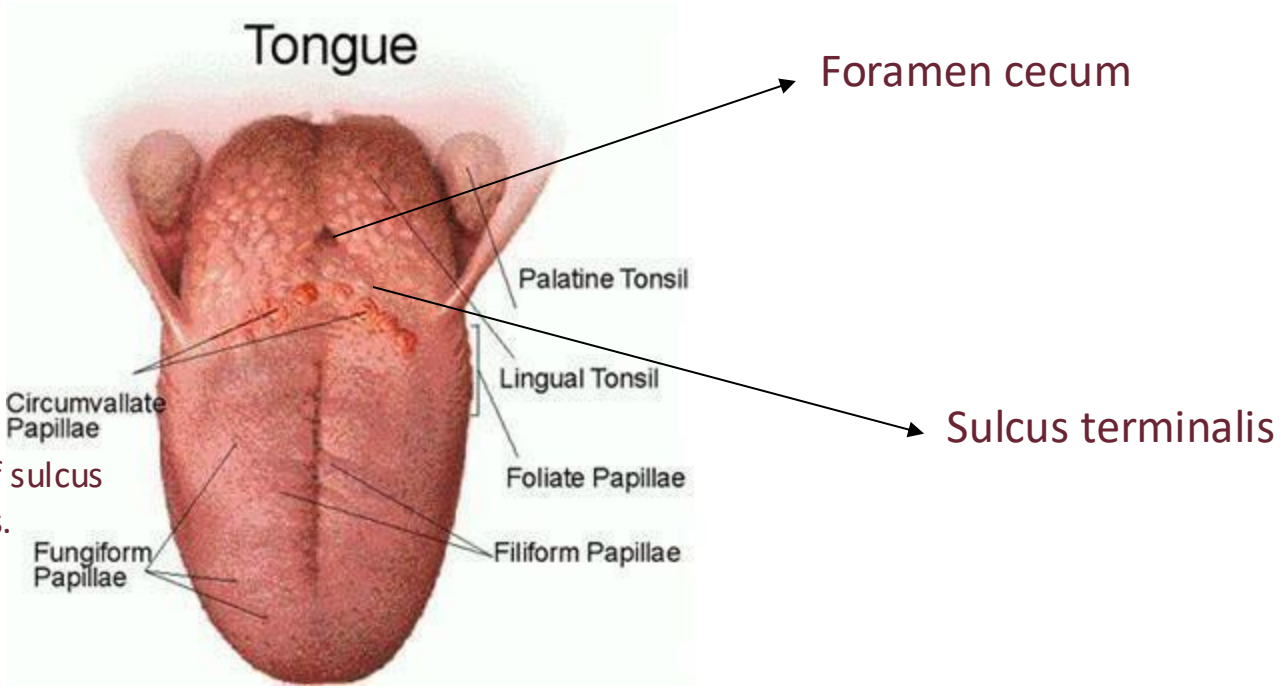
•Dorsal (Upper) Surface:

- Covered by **stratified squamous parakeratinized epithelium**. This surface is **initially keratinized**, but due to **exposure to digestion and secretions**, the keratin layer may become **damaged or reduced** over time.
- It is **rich in taste buds**, located on specialized structures known as **lingual papillae**.
- The **posterior third** of the dorsal surface contains **lymphoid tissue** known as the **lingual tonsil** (or **lingual follicle**), which **does not contain taste buds**.

•Ventral (Lower) Surface:

- Lined by **stratified squamous nonkeratinized epithelium**, which is smoother and more delicate.

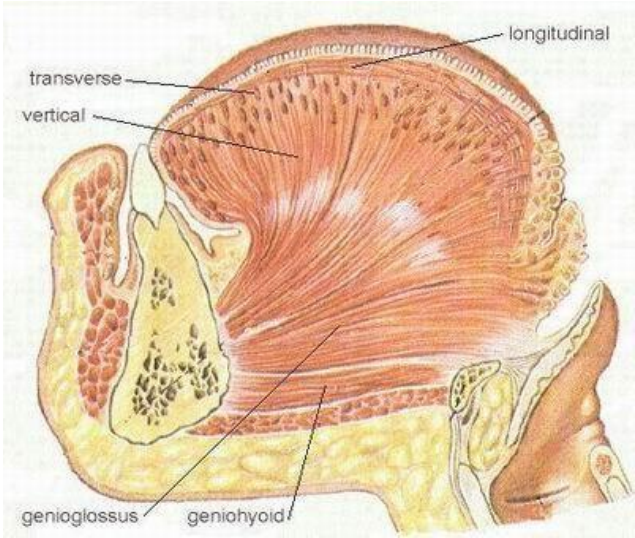
- Three types of papillae are present on the upper surface of the anterior two thirds of the tongue: the filiform papillae, the fungiform papillae, and the vallate papillae.
- The mucous membrane covering the posterior third of the tongue is devoid of papillae but has an irregular surface caused by the presence of underlying lymph nodules, the lingual tonsil.
- The mucous membrane on the inferior surface of the tongue is reflected from the tongue to the floor of the mouth
- In the midline anteriorly, the undersurface of the tongue is connected to the floor of the mouth by a fold of mucous membrane, the frenulum of the tongue
- On the lateral side of the frenulum, the deep lingual vein can be seen through the mucous membrane
- Lateral to the lingual vein, the mucous membrane forms a fringed fold called the plica fimbriata



- **Fungiform, filiform, and foliate papillae** are located on the **anterior two-thirds of the dorsal surface** of the tongue. Among these, the **filiform papillae are the most numerous**.
- The **circumvallate papillae**, which are involved in the detection of **bitter taste**, are located just **anterior to the sulcus terminalis**, near the **posterior third of the tongue**.
- Although they appear **anterior anatomically**, they are derived **embryologically from the posterior third** of the tongue. As a result, they are innervated by the **glossopharyngeal nerve (cranial nerve IX)**—not by the **chorda tympani (branch of CN VII)**, which innervates the **anterior two-thirds** of the tongue.

Muscles of the Tongue

- The muscles of the tongue are divided into two types: intrinsic and extrinsic
- Intrinsic Muscles
  - These muscles are confined to the tongue and are not attached to bone.
  - They consist of longitudinal, transverse, and vertical fibers (different muscular fibers).
  - Nerve supply: Hypoglossal nerve
  - Action: Alter the shape of the tongue



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Extrinsic Muscles

The **extrinsic muscles of the tongue** attach to bones or the soft palate and are responsible for the **position and gross movements of the tongue**. These muscles include:

1. Genioglossus

- **Origin**: Superior mental (genial) tubercle (spine) of the mandible
- **Insertion**: Base of the tongue, extending posteriorly
- **Action**: **Protrudes the apex of the tongue** through the mouth
- When the tongue is protruded in a **straight, midline position**, it indicates that **both genioglossus muscles are functioning symmetrically** on either side.
- The **genioglossus is clinically important** because it is innervated by the **hypoglossal nerve (cranial nerve XII)**. If the **right hypoglossal nerve is injured**, the **right genioglossus becomes paralyzed**, causing the tongue to **deviate toward the paralyzed side (right side)** when protruded.

2. Hyoglossus

- **Origin**: Body and greater cornu of the hyoid bone
- **Insertion**: Base of the tongue
- **Action**: **Depresses the tongue**

3. Styloglossus

- **Origin**: Styloid process of the temporal bone
- **Insertion**: Base of the tongue posteriorly
- **Action**: **Draws the tongue upward and backward**

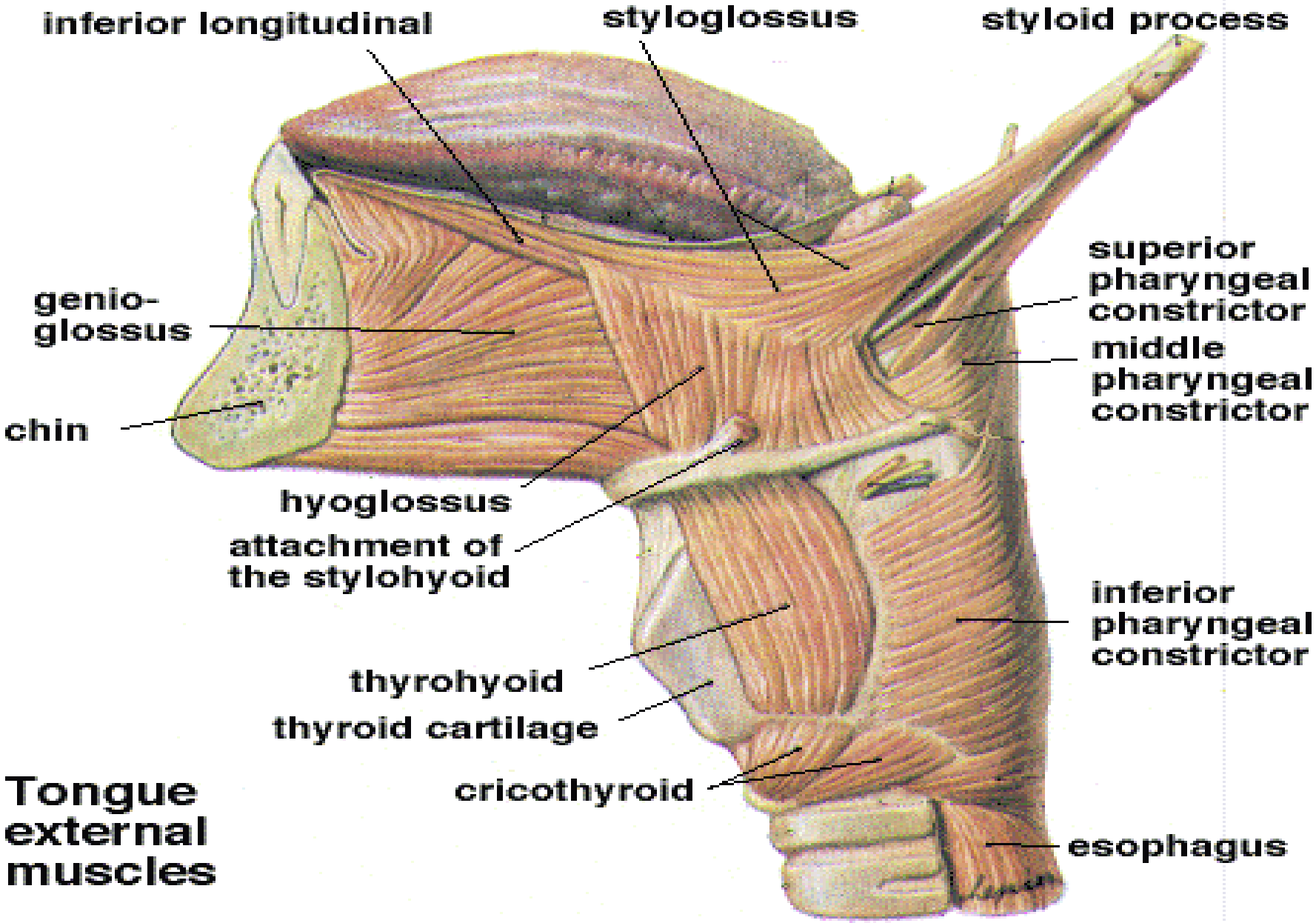
4. Palatoglossus

- **Origin**: Palatine aponeurosis
- **Insertion**: Side of the tongue
- **Action**: Pulls roots of tongue upward and backward and narrows oropharyngeal isthmus

Insertion Note:

- These muscles' insertions **blend with each other**

- **Nerve Supply:**
  - All extrinsic muscles of the tongue are innervated by the **hypoglossal nerve (cranial nerve XII)**,
  - **Except for the palatoglossus**, which is supplied by the **cranial accessory of vagus nerve**.



Tongue external muscles

Movements of the Tongue

- Protrusion: The genioglossus muscles on both sides acting together
- Retraction: Styloglossus and hyoglossus muscles on both sides acting together
- Depression: Hyoglossus muscles on both sides acting together
- Retraction and elevation of the posterior third: Styloglossus and palatoglossus muscles on both sides acting together
- Shape changes: Intrinsic muscles

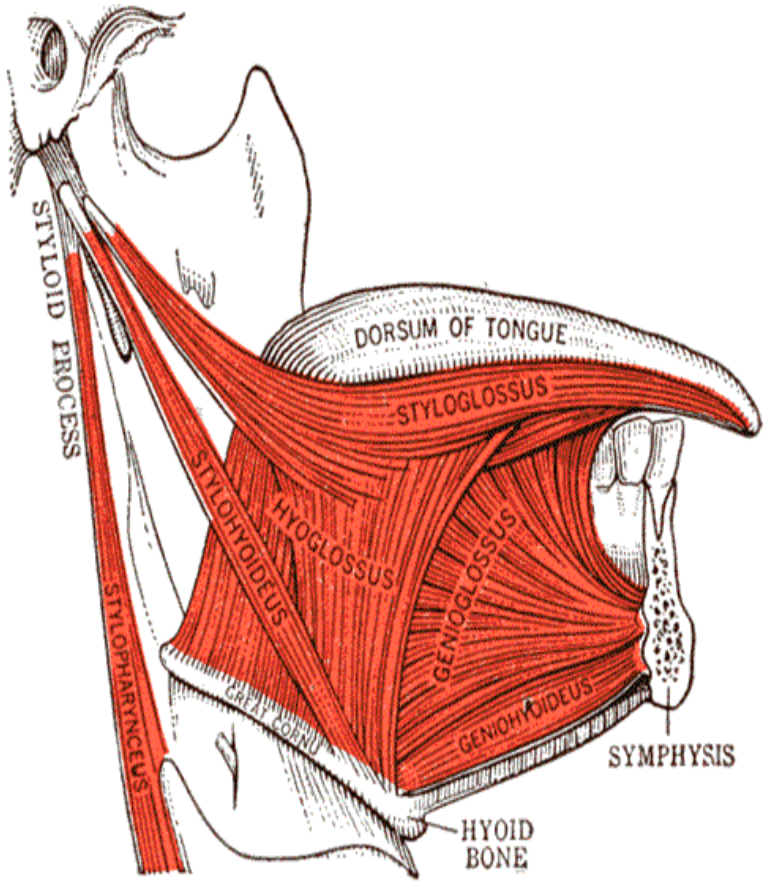


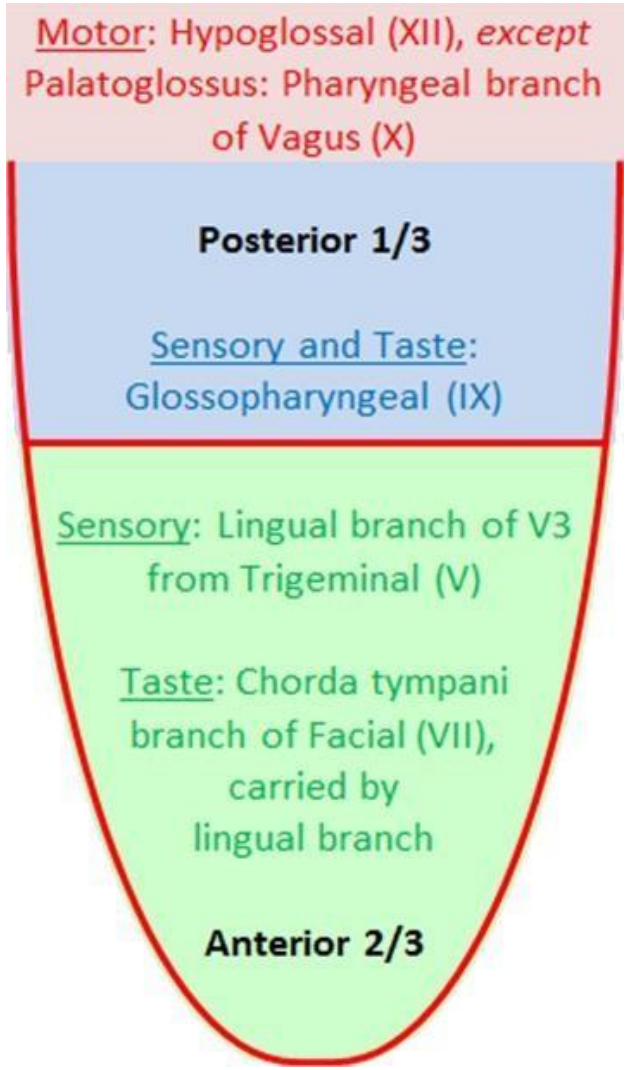
FIG. 89. SOME OF THE MUSCLES OF THE TONGUE. Viewed from the right side.

- Sensory Innervation
  - Anterior two thirds: Lingual nerve branch of mandibular division of trigeminal nerve (general sensation) and chorda tympani branch of the facial nerve (taste)
  - Posterior third: Glossopharyngeal nerve (general sensation and taste)

- Blood Supply
  - The lingual artery, the tonsillar branch of the facial artery, and the ascending pharyngeal artery supply the tongue, and all of those are branches from the external carotid artery.

- The veins drain into the internal jugular vein. Tributaries veins (opposite of arteries) drain into internal jugular vein.

- Lymph Drainage
- Tip: Submental lymph nodes
- Sides of the anterior two thirds: Submandibular and deep cervical lymph nodes
- Posterior third: Deep cervical lymph nodes



Note: Although the **posterior one-third of the tongue** is largely composed of **lymphoid tissue** (forming the **lingual tonsil**), **taste sensation** in this region is provided by the **circumvallate papillae**.

- Salivary glands are classified into **two main types**:

1. **Minor Salivary Glands**
   - These are **numerous** and are **mostly mucous-secreting glands**.
   - They are **scattered throughout the oral cavity** and include:
     1. **Labial glands** (within the lips)
     2. **Lingual glands** (on the tongue)
     3. **Palatal glands** (in the hard and soft palate)
2. **Major Salivary Glands**
   - There are **three pairs of large salivary glands**:
     1. **Parotid glands**
     2. **Submandibular glands**
     3. **Sublingual glands**
   - For each of the **major salivary glands**, it is essential to know the following details:
     - **Location (site)**
     - **Presence and type of capsule**
     - **Duct and gland contents**
     - **Type of secretion** (serous, mucous, or mixed)
     - **Anatomical relations**
     - **Innervation** (both sympathetic and parasympathetic)

- All major salivary glands are **surrounded by a capsule**, but the **parotid gland** is unique in that it has **two capsules.**
- **Type of Secretion:**
  1. **Parotid gland**: Produces **serous secretion**
  2. **Submandibular gland**: Produces **mixed secretion** (mostly **serous**, some **mucous**)
  3. **Sublingual gland**: Produces **mostly mucous secretion**
- **Innervation of Salivary Glands:**
  - Each major salivary gland receives **three types of innervation**:
    1. **Sensory innervation**: for general sensation
    2. **Sympathetic innervation**: causes **vasoconstriction** of blood vessels
    3. **Parasympathetic innervation**: **stimulates glandular secretion** (secretomotor fibers)

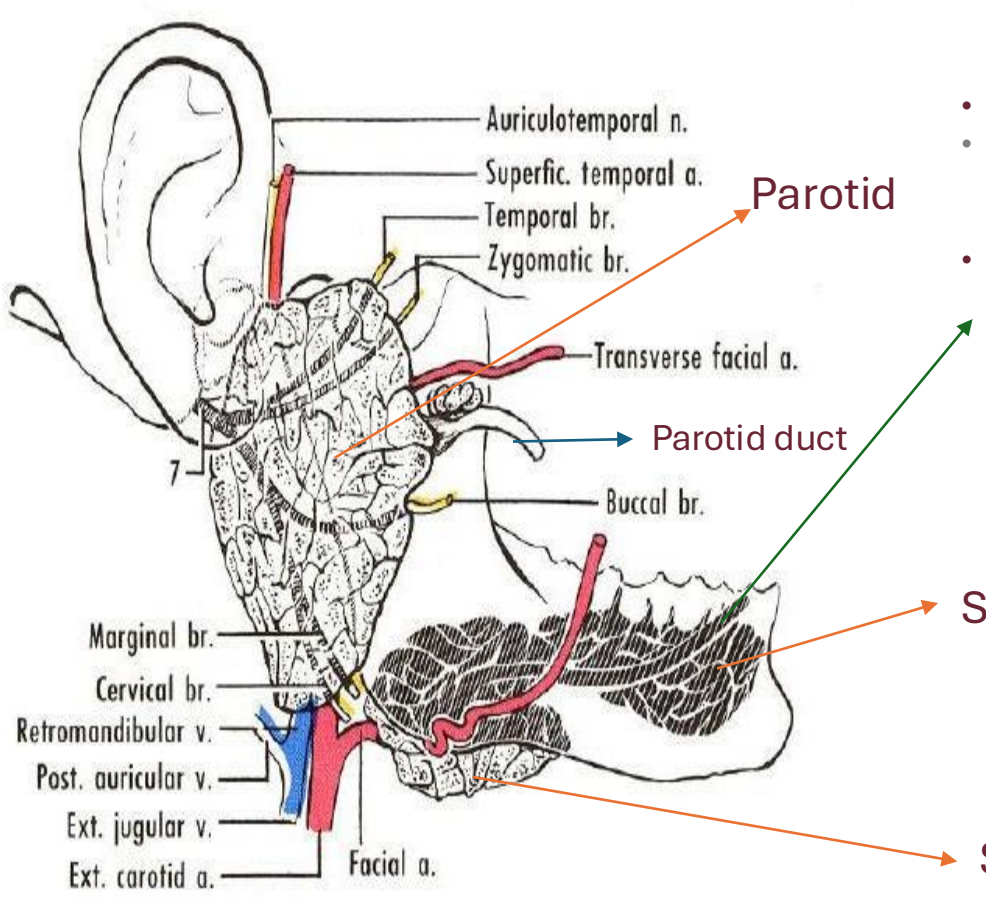
❖ While **sympathetic** and **parasympathetic** systems often have opposite effects, their roles in salivary glands differ:

- **Parasympathetic** innervation has a **direct effect** by stimulating saliva production.
- **Sympathetic** innervation does **not directly inhibit secretion**, but it causes **vasoconstriction**, which may **indirectly reduce salivary output** by limiting blood flow to the gland.

The Salivary Glands

- Parotid Gland
- The parotid gland is the largest salivary gland and is composed mostly of serous acini
- lies in a deep hollow below the external auditory meatus, behind the ramus of the mandible and in front of the sternocleidomastoid muscle
- <u>The facial nerve divides the gland into superficial and deep lobes</u>
- The parotid duct emerges from the anterior border of the gland and passes forward over the lateral surface of the masseter.
- It enters the vestibule of the mouth upon a small papilla opposite the upper second molar tooth
- Parasympathetic secretomotor supply arises from the glossopharyngeal nerve
- The nerves reach the gland via the tympanic branch, the lesser petrosal nerve, the otic ganglion, and the auriculotemporal nerve.

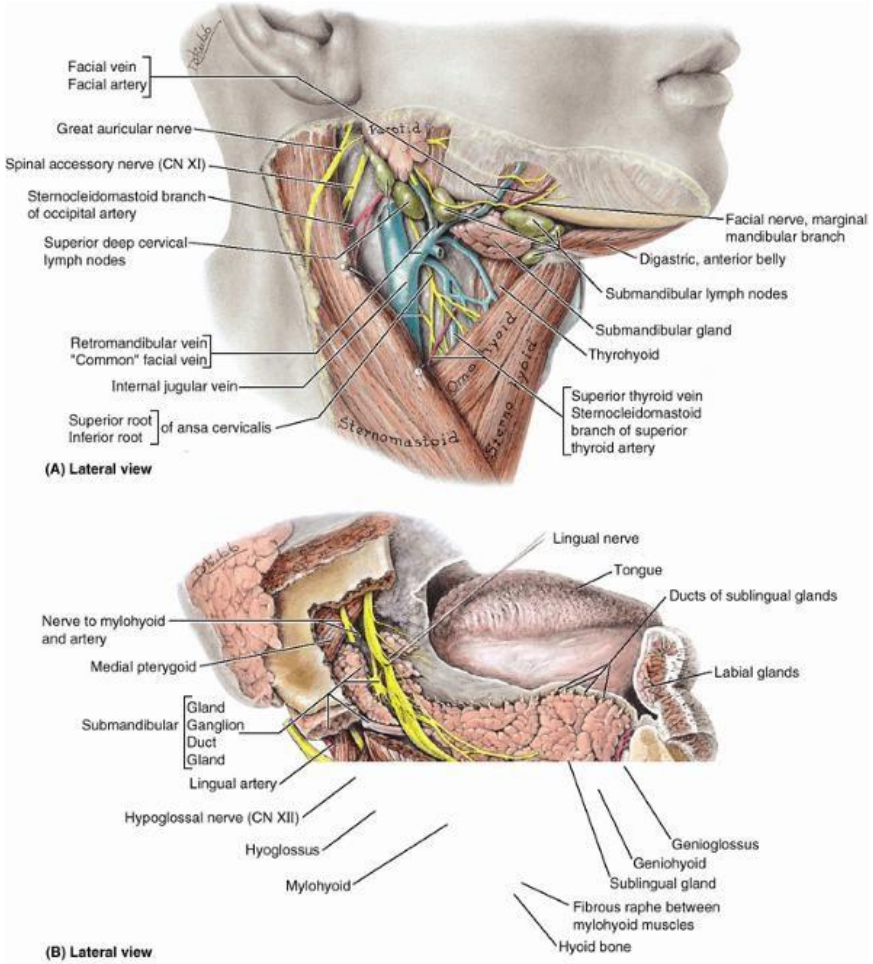
Look closely at the image below and know the relation of the arteries, veins, nerves with the parotid gland.



- Origin of Mylohyoid muscle.
- It separates the **superficial part of the submandibular gland** from its **deep part**.
- It also separates the **submandibular gland** from the **sublingual gland**

Anatomical relations

- The **parotid gland** lies within the **parotid bed**, which is anatomically bounded by:
  1. **Posteriorly**: the **sternocleidomastoid muscle**
  2. **Anteriorly**: the **ramus of the mandible**
  3. **Superiorly**: the base of the trench is formed by the **external acoustic meatus** and the **posterior part of the zygomatic arch**
- The **parotid duct** runs **anteriorly** over the external surface of the **masseter muscle**, then turns **medially**, **pierces the buccinator muscle**, and opens into the **oral cavity adjacent to the crown of the second upper molar tooth**.
- The **parotid gland** encloses three important structures:
  1. The **external carotid artery**
  2. The **retromandibular vein**
  3. The **extracranial part of the facial nerve (cranial nerve VII)**



Site of the Parotid Gland

- The **parotid gland** is located **anterior to the ear**, and it **overlies both the masseter muscle and the sternocleidomastoid muscle**.
- The **base** of the gland lies **just beneath the skin**, while the **apex** points **toward the pharynx**.
- **Parotid Bed**

  The **parotid bed** refers to the **structures upon which the gland rests**, including:

  - The **styloid process of the temporal bone**
  - **Muscles attached to the styloid process**: stylohyoid, etc.
  - The **posterior belly of the digastric muscle**
  - The **deep cervical fascia**
  - The **last four cranial nerves** (CN IX–XII)
- **Vascular Relations**

  The **parotid gland also overlies major blood vessels**, including:

  - The **internal jugular vein**
  - The **common carotid artery**, which bifurcates into the **external** and **internal carotid arteries** deep to or near the gland

Facial Nerve and the Parotid Gland

- The **most superficial structure within the parotid gland** is the **facial nerve (cranial nerve VII)** and its **five terminal branches**, which pass through the gland but **do not supply it functionally**.
- **Facial Nerve Branches in the Parotid:**

  These branches arise **within the parotid gland** and fan out to innervate the **muscles of facial expression**:

  1. **Temporal branch** → innervates the **orbicularis oculi**
  2. **Zygomatic branch**
  3. **Buccal branch**
  4. **Marginal mandibular branch** → innervates muscles near the **mandible**
  5. **Cervical branch** → innervates the **platysma**

- The **main trunk (stem) of the facial nerve** enters the parotid gland and **divides it into superficial and deep lobes**.
- **Clinical Relevance in Parotid Surgery:**
  - During **parotid gland surgery** (e.g. tumor removal), the **facial nerve is at risk of injury**. This is a **primary surgical concern**.
  - On the **first day after surgery**, the doctor typically assesses facial nerve function by asking the patient to perform actions involving facial muscles:
    - **Close the eyes** → tests the **temporal branch (orbicularis oculi)**
    - **Blow out the cheeks**
    - **Check for drooling of saliva**

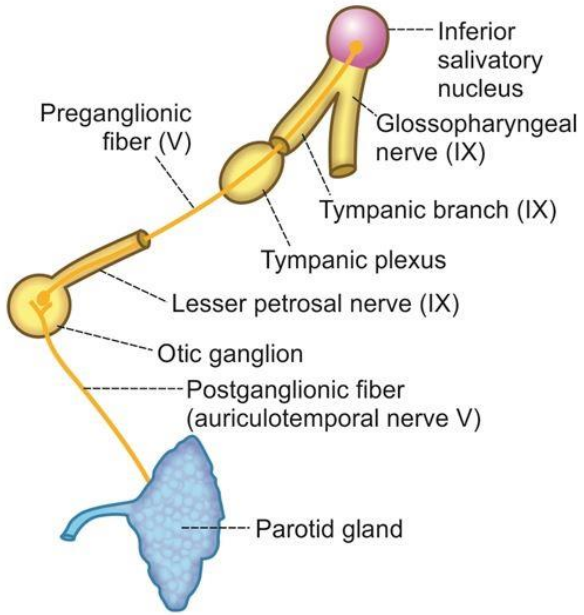
Doctor said a lot of questions ask about the relations of the parotid gland:

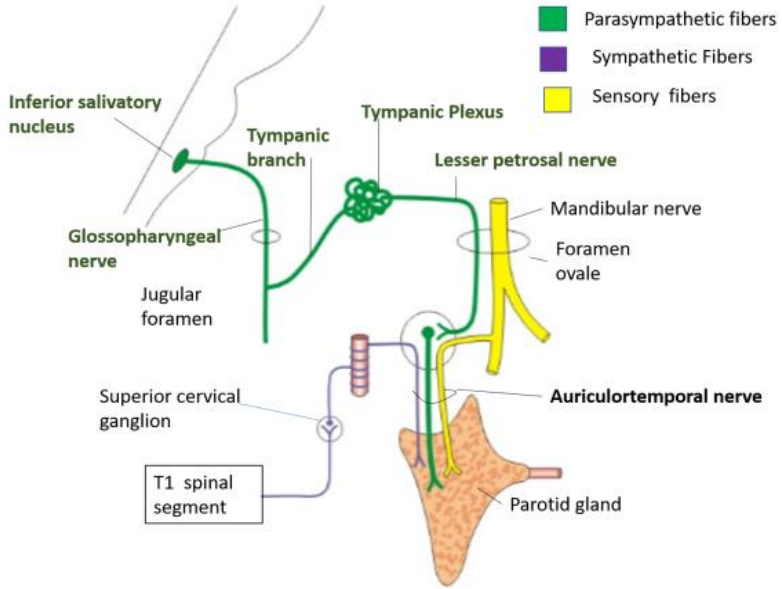
- Most superficial → Facial nerve.
- Middle → Retromandibular vein.
- Deep → External carotid artery.
- The **retromandibular vein**, which lies **deep to the facial nerve**, is formed by the union of the **superficial temporal vein and the maxillary vein** within the **parotid gland**.
- The **deepest structure within the parotid gland** is the **external carotid artery**, along with its terminal branches—the **superficial temporal and maxillary arteries**. These vessels **run alongside their corresponding veins**.
- **Mumps**, a **viral infection**, leads to **inflammation and swelling** of the parotid gland. However, the gland's **tight fibrous capsule** limits expansion, causing **severe pain** due to **pressure buildup**.
- The **parotid gland contains intraglandular lymph nodes**, commonly referred to as the **parotid lymph nodes**.
- The gland is divided into **lobes and lobules by connective tissue septa**, which extend **inward from the inner capsule**.
- Each **lobule contains secretory acini**, which drain into "small" **interlobular ducts**. These eventually converge to form the **main parotid duct,** which opens into the **oral vestibule opposite the upper second molar tooth**.
- The **parotid duct** arises from the **anterior border** of the parotid gland, is approximately **4 cm long**, and has a surface anatomical landmark of **one fingerbreadth below the zygomatic arch**.
- The gland's **outer capsule is formed by the parotid fascia**, which is derived from the **deep cervical fascia**.

Extra images

- The parasympathetic innervation of the parotid gland originates from the **inferior salivatory nucleus** in the medulla oblongata. The **glossopharyngeal nerve (cranial nerve IX)** emerges from this nucleus and gives rise to the **tympanic nerve**, which branches into the lesser petrosal nerve at the tympanic membrane. The lesser petrosal nerve carries **preganglionic parasympathetic fibers** to the **otic ganglion**, located just below the **foramen ovale**. The **postganglionic parasympathetic fibers** then travel via the **auriculotemporal nerve** to reach and innervate the **parotid gland**. This nerve also provides **sensory innervation** to the gland.

- **Preganglionic parasympathetic:** lesser petrosal nerve
- **Postganglionic parasympathetic and sensory:** auriculotemporal nerve
- **Postganglionic sympathetic:** fibers originate from the **superior cervical ganglion in the neck** and reach the gland via a **plexus around the external carotid artery**.

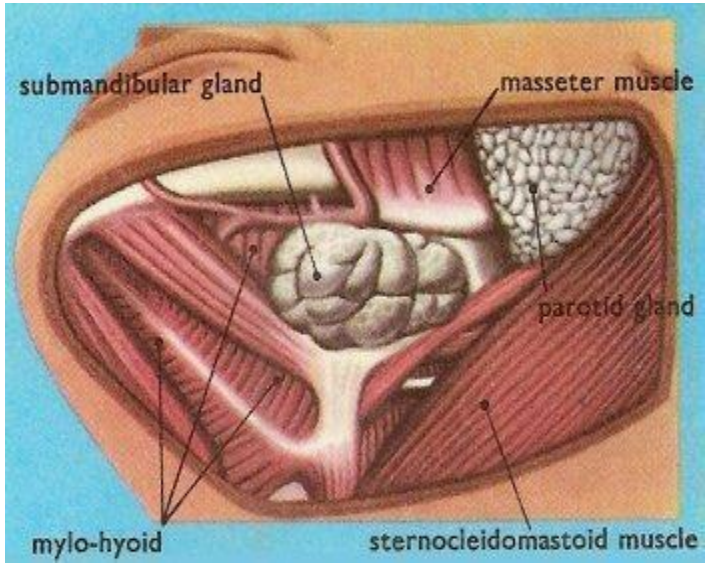




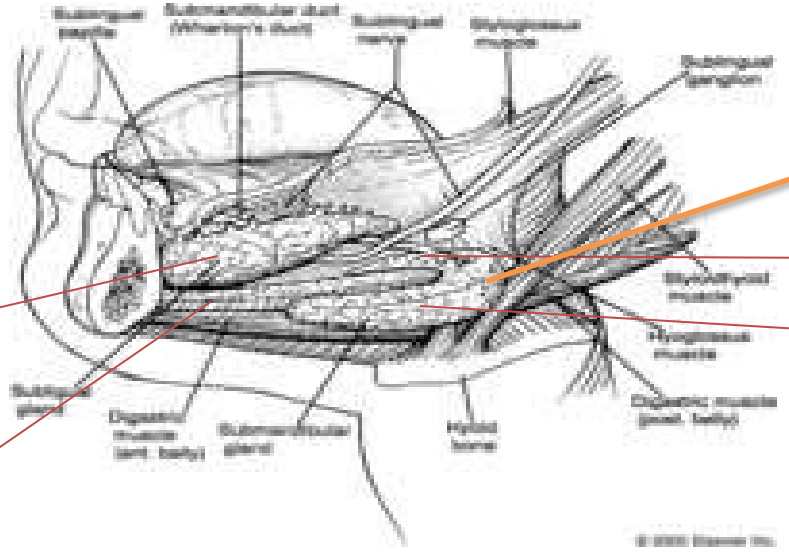
Submandibular Gland

- The submandibular gland consists of a mixture of serous and mucous acini
- It lies beneath the lower border of the body of the mandible
- divided into superficial and deep parts by the mylohyoid muscle
- The deep part of the gland lies beneath the mucous membrane of the mouth on the side of the tongue.
- The submandibular duct emerges from the anterior end of the deep part of the gland and runs forward beneath the mucous membrane of the mouth.
- It opens into the mouth on a small papilla, which is situated at the side of the frenulum of the tongue
- Parasympathetic secretomotor supply is from the facial nerve via the chorda tympani, and the submandibular ganglion
- The postganglionic fibers pass directly to the gland.

The **submandibular gland** lies within the **submandibular (digastric) triangle**, located **between the anterior and posterior bellies of the digastric muscle**.



The **submandibular duct** opens at the base of the tongue, in the **floor of the mouth**. This opening is marked by a **small submandibular papilla beneath the tongue**.



The parts meet behind the mylohyoid muscle.

Deep part

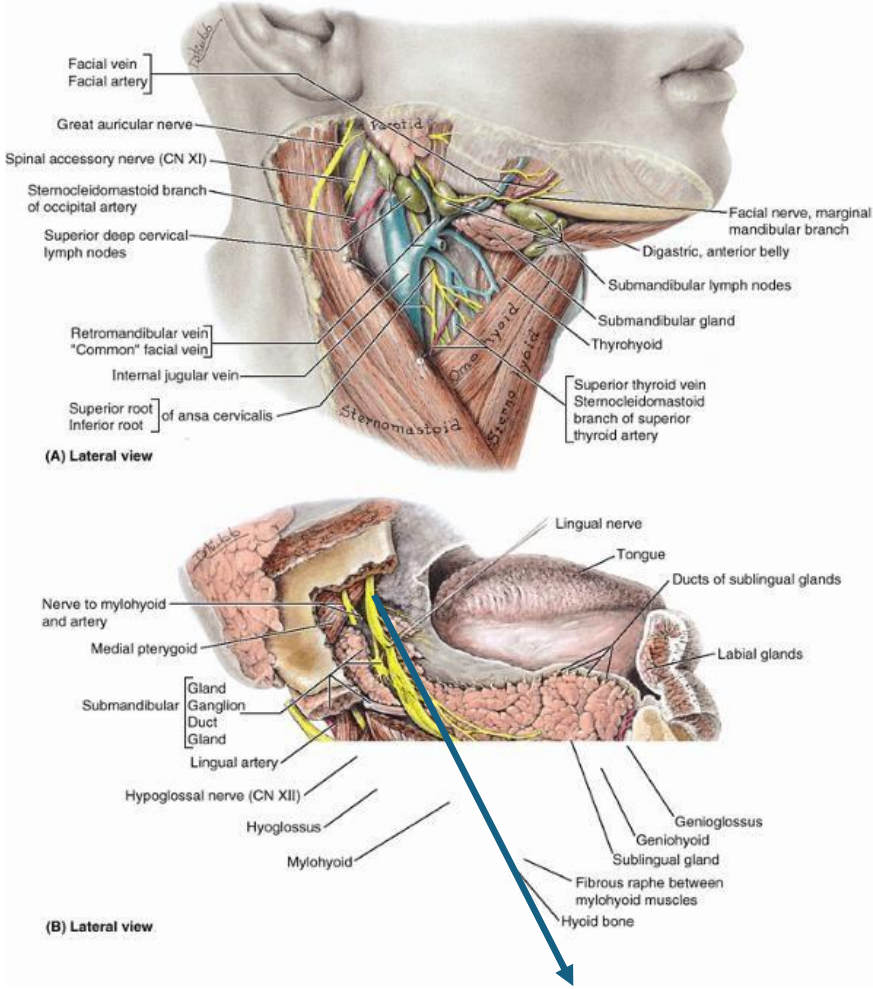
Superficial part

Sublingual under the tongue

Mylohyoid muscle

Submandibular Gland

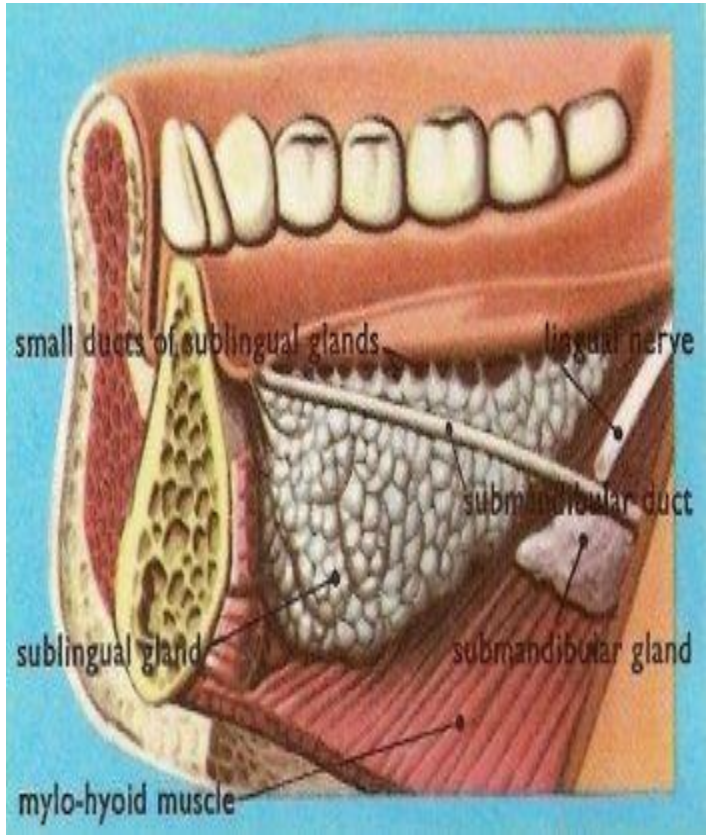
- The larger arm of the hook is directed forward in the horizontal plane below the mylohyoid muscle and is therefore outside the boundaries of the oral cavity-this larger superficial part of the gland is directly against a shallow impression on the medial side of the mandible (submandibular fossa) inferior to the mylohyoid line;
- The smaller arm of the hook (or deep part) of the gland loops around the posterior margin of the mylohyoid muscle to enter and lie within the floor of the oral cavity where it is lateral to the root of the tongue on the lateral surface of the hyoglossus muscle.
- The lingual nerve loops under the submandibular duct, crossing first the lateral side and then the medial side of the duct, as the nerve descends anteromedially through the floor of the oral cavity and then ascends into the tongue.
- **Relations:**
  - There are **five key structures** located **between the mylohyoid and hyoglossus muscles**:
    1. **Three submandibular structures**:
    2. **Deep part of the submandibular gland**
    3. **Submandibular ganglion**
    4. **Submandibular duct (Wharton's duct)**
  - **Two nerves**:
    1. **Lingual nerve**
    2. **Hypoglossal nerve (cranial nerve XII)**



Notice how the chorda tympani, joins the lingual nerve and carries preganglionic parasympathetic fibers.

Sublingual Gland

- The sublingual gland lies beneath the mucous membrane (sublingual fold) of the floor of the mouth, close to the frenulum of the tongue
- It has both serous and mucous acini, with the latter predominating.
- The sublingual ducts (8 to 20 in number) open into the mouth on the summit of the sublingual fold
- Parasympathetic secretomotor supply is from the facial nerve via the chorda tympani, and the submandibular ganglion. Postganglionic fibers pass directly to the gland.



- The **sublingual gland** is located **beneath the tongue**, in the **floor of the mouth**. It is **enclosed in a thin mucosal capsule**. The gland has **8–20 minor ducts**, which **open directly into the oral cavity**. In some cases, these ducts **join the submandibular duct.**
- **Relations:**
  - Medially, the sublingual gland is related to the **lingual nerve**, the **submandibular duct**, and the **genioglossus muscle**.

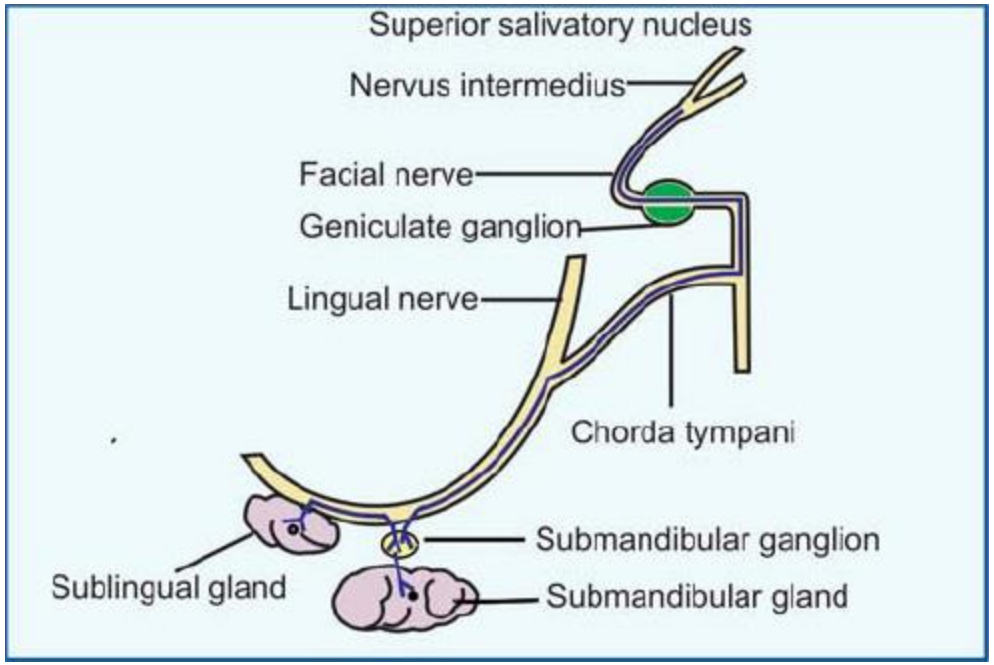
➢ Innervation of the Submandibular and Sublingual Glands:

- The **parasympathetic innervation** of the **submandibular and sublingual glands** originates from the **superior salivatory nucleus** in the **medulla oblongata and** is carried by the **facial nerve (cranial nerve VII)**. The **facial nerve** gives rise to the **chorda tympani nerve**, which carries **preganglionic parasympathetic fibers** as well as **taste fibers from the anterior two-thirds of the tongue**.
- The **chorda tympani** joins the **lingual nerve** (a branch of the mandibular division of the trigeminal nerve) in the **infratemporal fossa**. The parasympathetic fibers then synapse in the **submandibular ganglion,** which is located within the submandibular triangle, between the mylohyoid and the hyoglossus muscles.
- The **postganglionic parasympathetic fibers** either directly innervate the submandibular and sublingual glands or **re-enter the lingual nerve** to reach their target glands.

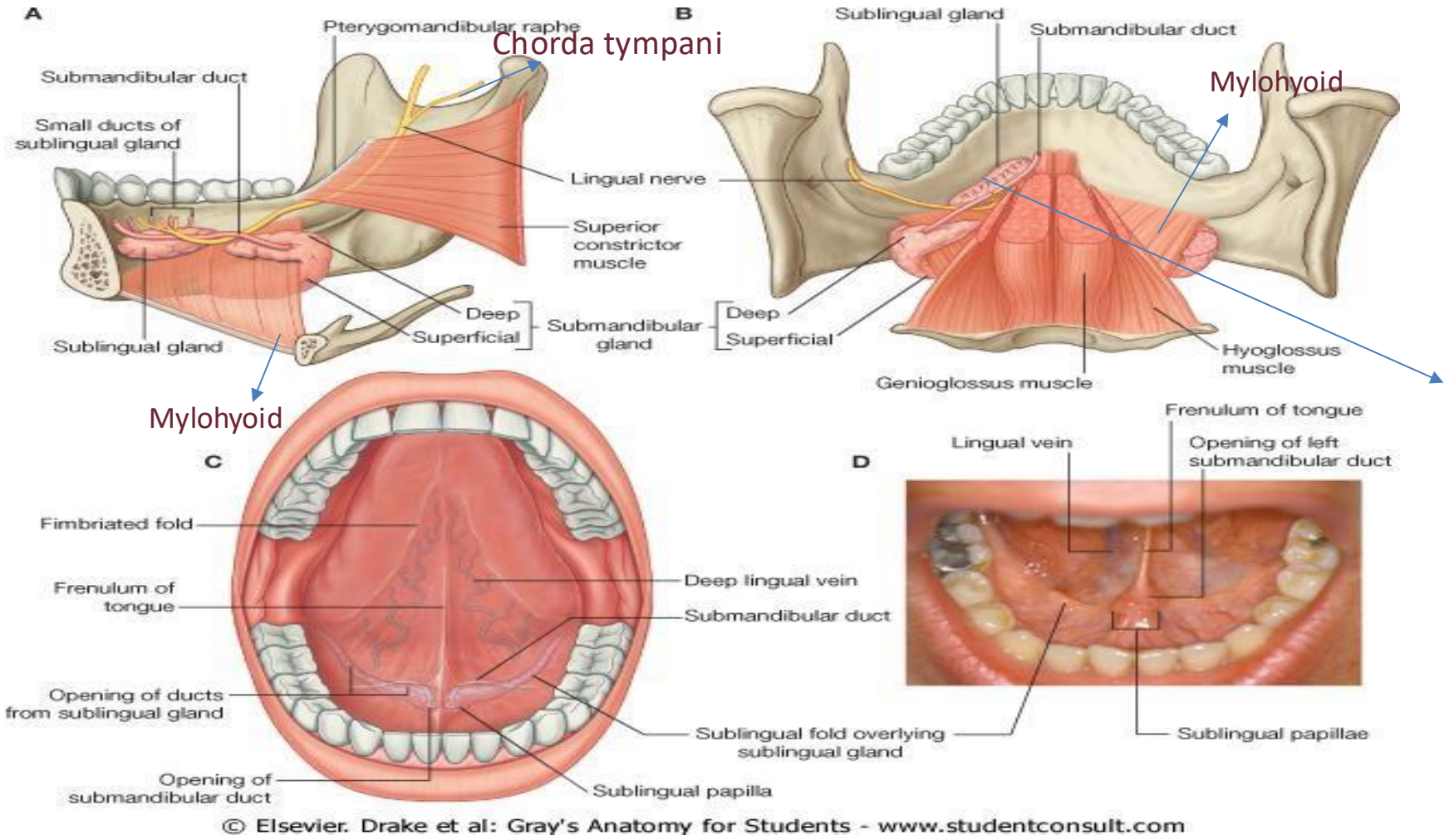
❖ *Note:* The **chorda tympani fibers travel with the lingual nerve** to reach the ganglion; they do not run independently.

- **Summary:**
  - **Preganglionic parasympathetic:** chorda tympani
  - **Sensory and taste fibers:** lingual nerve
  - **Postganglionic sympathetic fibers:** arise from the **superior cervical ganglion** and reach the glands via a **plexus around the lingual artery**

Extra image



Sublingual & Submandibular Glands



Sublingual & Submandibular Glands Notes

- The **lingual nerve** has a triple relation to the **submandibular duct**: it passes **lateral**, then **inferior**, and finally **medial** to it.
- Although the **chorda tympani** joins the lingual nerve in the **infratemporal fossa**, their fibers remain distinct — the lingual nerve merely **carries parasympathetic and taste fibers** to the **submandibular ganglion and gland**, while still providing **general sensation**.
- In the **oral cavity**, there are **mucosal folds** known as **frenula**:
  - The **superior and inferior labial frenula** connect the **upper and lower lips** to the **gingiva**.
  - On the **underside of the tongue**, the **lingual frenulum** connects the **tongue to the floor of the mouth**.
- If you look in the mirror and lift your tongue, you'll notice **bluish veins** beneath the tongue — these are the **deep lingual veins**, visible through the thin mucosa of the **floor of the mouth**.
- The **lingual artery** and **lingual nerve** lie **deeper and more medially**, and are **not typically visible**, but they run in close relation to the vein beneath the mucosa.

For any feedback, scan the code or click on it.

Corrections from previous versions:

Versions	Slide # and Place of Error	Before Correction	After Correction
V0 → V1			General Modifications
V1 → V2			

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