



Anatomy of Submandibular Gland

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The submandibular glands are the second largest of the major salivary glands and are vital for saliva production. Located within the submandibular triangle (also known as digastric triangle), these glands are bordered by the anterior and posterior bellies of the digastric muscle and the inferior margin of the mandible. Each gland weighs between 7 and 16 grams, approximately the size of a walnut, and is irregularly J-shaped. It is a mixed gland, producing both serous (predominantly) and mucus secretions.

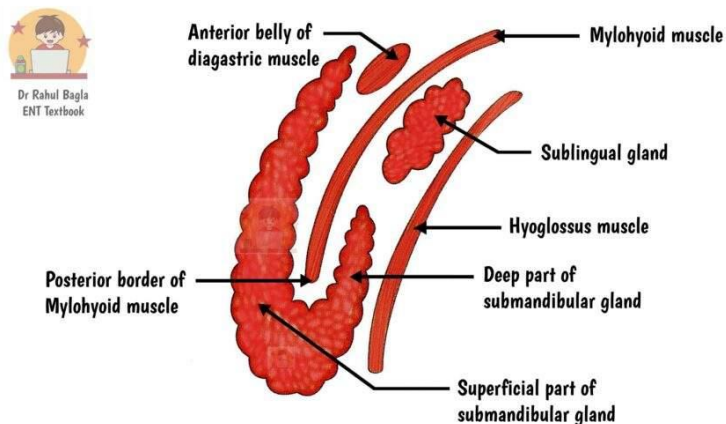


Diagram: Horizontal section through the submandibular region showing the location of the submandibular and sublingual glands

The mylohyoid muscle divides the gland into two parts:

1. Superficial part of submandibular gland
2. Deep part of submandibular gland

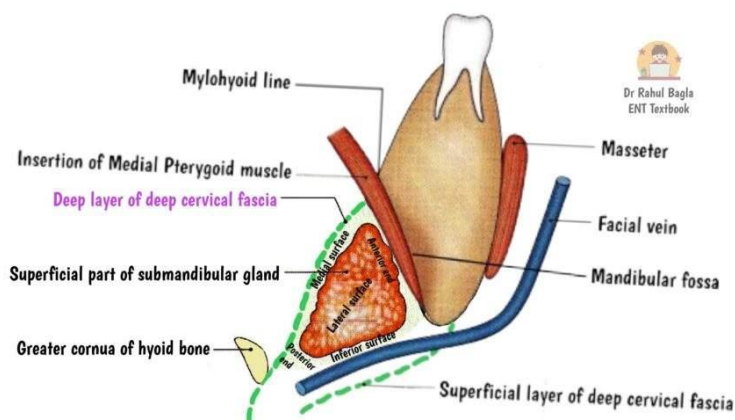


Diagram: Showing relations of submandibular gland

Superficial Part of the Submandibular Gland

The superficial part is the larger part of the gland and is located adjacent to the mandible. It extends upwards to the mylohyoid line, opposite the molar and premolar teeth, and downwards up to the stylohyoid muscle and posterior belly of digastric muscle. It has two ends – anterior end and posterior end and three surfaces—inferior surface, lateral surface, and medial surface.

Ends.

1. **Anterior end.** It extends up to the anterior belly of the digastric muscle.
2. **Posterior end.** It extends up to the stylomandibular ligament and separates the submandibular gland from the parotid gland.

Surfaces. The investing layer of deep cervical fascia splits into two layers (superficial and deep lamina) and covers the inferior surface and medial surface of the submandibular gland. Superficial lamina after covering the inferior surface of the submandibular gland it gets attached to the lower border of the mandible. Deep lamina after covering the medial surface of the submandibular gland it gets attached to the mylohyoid line of the mandible.

1. **Inferior surface:** It is covered by several structures (from outside to inside) – Skin, superficial fascia, platysma muscle, the cervical branch of the facial nerve, common facial vein, deep fascia and lastly submandibular group of lymph nodes.
2. **Lateral surface:** On its lateral surface, the gland is positioned in relation to the submandibular fossa of the mandible, near where the medial pterygoid muscle inserts. A key anatomical relationship here is the facial artery. The loop of the facial artery runs between the lateral surface of the submandibular gland and the ramus of the mandible and winds around the lower border of the mandible (Initially, the facial artery enters from the posterior part of the gland and emerges from deep within the superior margin of the posterior belly of the digastric muscle. It moves anterolaterally and then emerges between the gland and the lower border of the mandible).
3. **Medial surface:** The medial aspect of the gland is closely related to the mylohyoid, hyoglossus, and styloglossus muscles, moving from front to back. It can be divided into anterior part, middle part and posterior part.

- Anterior part. It lies on the surface of the mylohyoid muscle separated by the nerve to the mylohyoid, vessels of the mylohyoid and the submental branch of the facial artery.
- Posterior part. It is related to the styloglossus muscle, stylopharyngeus muscle, the middle constrictor muscle and the posterior belly of the digastric muscle. It is also related to the glossopharyngeal nerve, lingual artery and hypoglossal nerve. The anatomical knowledge of the medial surface is essential during surgeries to avoid damage to nerves and vessels.
- Middle part. It rest on the hyoglossus muscle and is related to the lingual nerve (which carries the submandibular ganglion).
- Inferiorly, the gland overlaps key muscles, including the stylohyoid and the posterior belly of the digastric muscle.

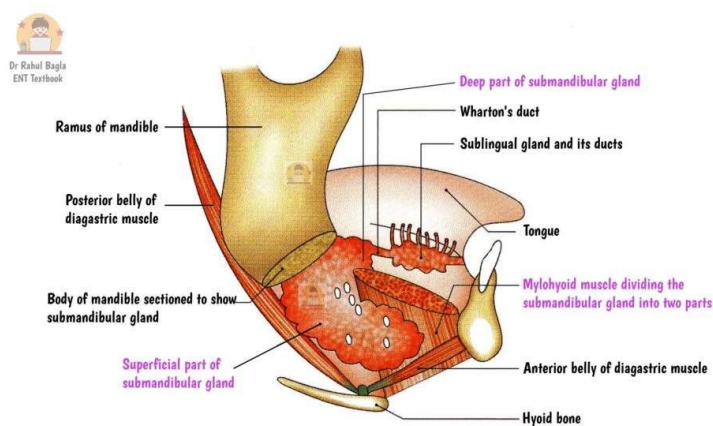


Diagram: Showing Mylohyoid muscle dividing the submandibular gland into two parts
(i) Superficial part (ii) Deep part

Deep Part of the Submandibular Gland

The deep part of the gland is much smaller and resides within the floor of the mouth. The deep part extends between the mylohyoid muscle and the hyoglossus muscle. Posteriorly, it is continuous with the superficial part of the submandibular gland and looping around the posterior border of the mylohyoid it again moves anteriorly to the posterior end of the sublingual gland.

Relations:

1. Laterally: The mylohyoid muscle.
2. Medially: The hyoglossus muscle.
3. Above: The lingual nerve, which also contains the submandibular ganglion.
4. Below: The hypoglossal nerve.

Submandibular Duct (Wharton's Duct)

The submandibular duct, also known as Wharton's duct, is approximately 5 cm long and is responsible for the drainage of saliva produced by the gland. It emerges from the medial side of the deep part of the gland and runs forward along the hyoglossus muscle,

lying between the lingual and hypoglossal nerves. As the gland approaches the anterior edge of the hyoglossus muscle, the submandibular duct is crossed laterally by the lingual nerve. After crossing, branches of the lingual nerve emerge on the medial surface of the duct, continuing the anatomical relationship. This close anatomical relationship is especially significant during surgery, where detailed knowledge of the duct's proximity to the lingual nerve is required to avoid nerve damage. The duct opens into the floor of the mouth at the sublingual papilla, next to the frenulum of the tongue.

Blood Supply and Lymphatic Drainage

- The submandibular gland is primarily supplied by the submental branch of the facial artery and the sublingual artery which are the branches of the external carotid artery. The artery runs through the gland after emerging from deep within the superior margin of the posterior belly of the digastric muscle.
- The venous drainage of the gland occurs through the common facial or lingual veins. A critical anatomical feature is the relationship between the marginal mandibular nerve and the vein, as the nerve passes laterally to the vein. This makes the nerve susceptible to injury during surgical dissection, emphasizing the need for careful anatomical consideration.
- Lymphatic drainage from the gland passes into the submandibular lymph nodes and subsequently into the deeper cervical lymph nodes, particularly the jugulo-omohyoid nodes.

Nerve Supply

The gland is innervated by both sympathetic and parasympathetic nerve fibers, which regulate its function and control saliva production.

- **Sympathetic innervation:** It originates from the superior cervical ganglion and reaches the gland via the lingual nerve. Sympathetic stimulation primarily controls vasoconstriction within the gland, regulating blood flow.
- **Parasympathetic innervation:** Parasympathetic control arises from the superior salivatory nucleus in the pons. The nerve fibers travel through the nervus intermedius and chorda tympani (a branch of the facial nerve), before joining the lingual nerve, which is a branch of the mandibular division of the trigeminal nerve (cranial nerve V). These fibres synapse at the submandibular ganglion and then provide secretomotor stimulation to the gland, promoting saliva production.

Comparison of the Three Major Salivary Glands

	Parotid Gland	Submandibular Gland	Sublingual Gland
Location	Situated near the external ear, adjacent to the angle of the mandible and the mastoid process	Located in the submandibular fossa, near the angle of the mandible	Positioned in the sublingual fossa, at the base of the mandible
Size	Largest of the major salivary glands	Intermediate in size	Smallest among the major salivary glands
Relation to Fascia	Encased within the investing layer of the cervical fascia	Enclosed by the investing layer of the cervical fascia	Not enclosed by fascia
Type of Gland	Exclusively serous secreting	Mixed gland, producing both serous and mucus secretions	Primarily mucus-secreting
Gross Features	Comprises three surfaces, three borders, an apex, and a base. Contains one artery, one vein, and one nerve, along with lymph nodes located within the gland	Consists of three surfaces: inferior, lateral, and medial. The posterior part is indented by an artery. Only lymph nodes are present within the gland	Closely related to the lingual nerve and the submandibular duct
Secretomotor Innervation	Supplied by the glossopharyngeal nerve (Cranial Nerve IX)	Innervated by the facial nerve (Cranial Nerve VII)	Also innervated by the facial nerve (Cranial Nerve VII)
Sympathetic Innervation	Receives sympathetic fibres from the plexus surrounding the middle meningeal artery	Supplied by fibres from the plexus around the facial artery	Shares the same sympathetic supply as the submandibular gland
Sensory Innervation	Sensory fibres provided by the auriculotemporal nerve	Sensory input from the lingual nerve	Also receives sensory input from the lingual nerve
Embryological Development	Derived from ectoderm	Originates from endoderm	Also originates from endoderm
Duct Opening	Opens into the vestibule of the mouth opposite the second upper molar tooth	Drains through a papilla in the sublingual fold, located in the floor of the mouth	10–12 ducts open along the sublingual fold in the floor of the mouth

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