Imaging of Submandibular and Sublingual Salivary Glands

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KEYWORDS

• Submandibular • Sublingual • Imaging • Salivary

KEY POINTS

- Submandibular and sublingual spaces have complex anatomies and are best evaluated on cross-sectional imaging.
- Magnetic resonance (MR) imaging provides the highest sensitivity for most of the neoplastic and vascular conditions involving these glands and spaces.
- Computed tomography still serves as the most commonly used modality worldwide and is well complemented by ultrasound on many occasions.
- MR has witnessed exponential growth for evaluation of deep neck space abnormality and for salivary gland evaluation.
- A wide spectrum of diseases can be seen in these regions, including inflammatory, infectious, vascular, and neoplastic conditions.

ANATOMY OF THE SUBLINGUAL AND SUBMANDIBULAR GLAND AND SPACES

The mylohyoid muscle divides the lower part of the oral cavity into 2 spaces: the sublingual (SL) space, which is located superior to the muscle, and the submandibular (SM) space, inferior to the muscle but superior to the hyoid bone. Most of the SM gland lies posterolateral to the mylohyoid muscle.[1,2]

Sublingual space contains the SL glands, the deep smaller portion of the SM gland, Wharton duct, the lingual artery and vein, the lingual nerve, and the hyoglossus muscle. The SM space contains the larger superficial portion of the SM gland, the facial artery and vein, the hypoglossal nerve, the anterior belly of the digastric muscle, and its lymph nodes (**Fig. 1**). The SL gland lies between the muscles of the oral cavity floor: the geniohyoid muscle, intrinsic muscles of the tongue, the hyoglossus muscle, and the mylohyoid muscle. Its lateral margins are adjacent to the mandibular body (**Fig. 2**).[2,3]

The SM gland is the second largest major salivary gland. The SM gland is divided into a superficial and a deep lobe. The superficial lobe lies in the digastric triangle and is bounded anteriorly by the anterior belly of the digastric muscle, posteriorly by the posterior belly of the digastric and stylohyoid muscles, and laterally by the lower border of the mandible and medial pterygoid muscle. Posteriorly, the stylomandibular ligament separates it from the parotid gland. The floor of the SM triangle is formed by the mylohyoid muscle anteriorly and the hyoglossus muscle posteriorly.[2–4] The superficial portion of the SM gland is covered by the platysma muscle and is traversed by the anterior facial vein and marginal mandibular

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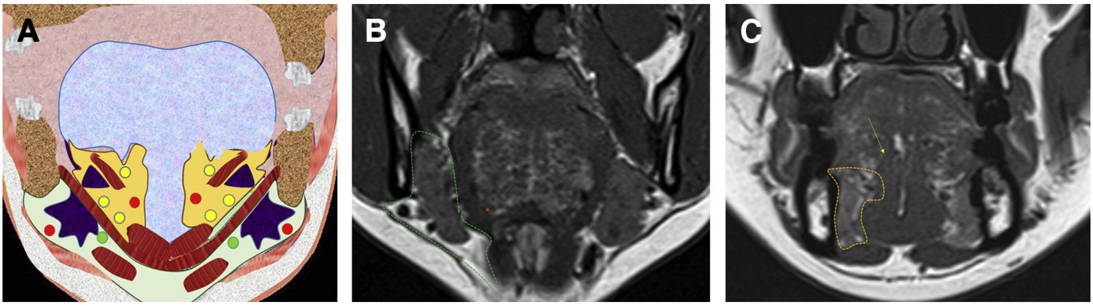

Fig. 1. Diagrammatic and MR imaging of the SM and SL space anatomy. (*A*) Diagram representing the SL and SM spaces with corresponding glanding. The SM space is seen as the green-shaded area (*B*) lying lateral to the mylohyoid sling (*brown arrow*) on coronal T1-weighted image. The SL space (*C*) is seen as the orange-shaded area lying lateral to the geniohyoid-genioglossus complex (*yellow arrow*) on T1-weighted coronal image.

nerve. The so-called deep portion of the SM gland lies deep to the posterior edge of the mylohyoid muscle (see **Fig. 2**). The lingual nerve lies above it and the hypoglossal nerve lies below. The middle layer of the deep cervical fascia encloses the SM gland. Wharton duct is around 5 cm long and exits anteriorly from the deep surface of the gland, coursing superiorly to the hypoglossal nerve while inferior to the lingual nerve and medial to the SL gland. It eventually lies between the mandible and the genioglossus muscle and empties lateral to the lingual frenulum through a papilla in the floor of the mouth behind the lower incisor tooth.[3,5]

Because there are no posterior fascial borders limiting the SL and SM spaces, communication is free between these spaces at the posterior margin of the mylohyoid (**Fig. 3**). In addition, no fascial border separates these spaces from the inferior parapharyngeal space. Thus, there is free communication among these 3 spaces, allowing lesions occurring in the SL or SM space to extend into the parapharyngeal space. There is no true fascial capsule surrounding the SL gland, which is covered by oral mucosa on its superior aspect. Several ducts (of Rivinus) from the superior portion of the SL gland either secrete directly into the floor of mouth or empty into Bartholin duct that then continues into Wharton duct. The SL space has low attenuation similar to that of fat on computed tomography (CT), because of its primarily fatty content.[2–6]

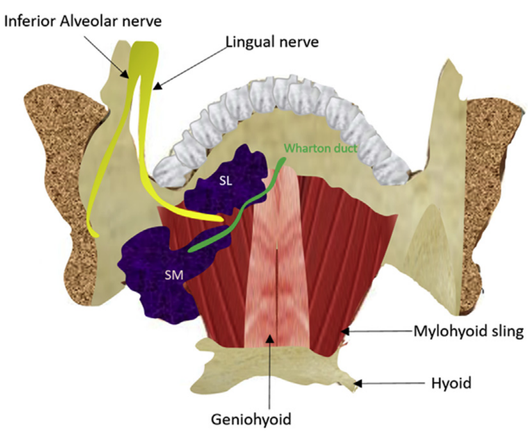

Fig. 2. Mylohyoid sling. Diagrammatic representation of the mylohyoid sling. The so-called deep portion of the SM gland lies deep to the posterior edge of the mylohyoid muscle and the lingual nerve lies above it.

A defect in the mylohyoid muscle is a common normal anatomic variant in the floor of the mouth that is seen in as many as 77% of CT examinations (**Fig. 4**).[7] Often in such cases, the SL salivary gland herniates through the defect into the adjacent SM space, sometimes producing a clinically palpable lump. Both the SM and the SL glands are supplied by the *submental* and *sublingual arteries*, branches of the lingual and facial arteries. The *facial artery*, the tortuous branch of the external carotid artery, is the main arterial blood supply of the SM gland.[3–8]

IMAGING TECHNIQUES FOR THE EVALUATION OF SUBMANDIBULAR AND THE SUBLINGUAL GLANDS

Plain films, sialography, ultrasound (US), nuclear medicine, CT, and magnetic resonance (MR) imaging are all commonly used in evaluation of salivary gland abnormality. CT is the most commonly used modality for salivary gland imaging with continuous improvement in the soft tissue differentiation, thinner sections, and excellent sagittal and coronal reconstructions along with the short examination time.[6,8,9] CT is very useful for evaluating infectious, inflammatory, and neoplastic processes and sialolithiasis. It is capable of depicting mandibular cortical bone erosion and destruction, cutaneous change, and