

Chapter 60 – Surgical Management of Ranula

Eugene N. Myers

Various intraoral masses may represent salivary gland abnormalities. Such masses may consist of common small retention cysts or the occasional rare benign or malignant tumor arising in the minor salivary glands. The most commonly encountered intraoral salivary gland mass is a ranula, which arises in the sublingual gland. The term *ranula* is derived from the Latin word *rana*, meaning “frog.” It refers to the appearance of a sublingual gland cyst in the floor of the mouth that when expanded with fluids, resembles a frog's belly (Fig. 60-1).

The sublingual gland lies directly beneath the mucosal surface of the anterior floor of the mouth. The major duct of Bartholin carries saliva directly into the submandibular duct, and the superior projection of the sublingual gland itself is just below the raised plica sublingualis, where 5 to 15 ducts of Rivini carry saliva into the oral cavity.^[1] The submandibular duct passes directly adjacent to the sublingual gland and for the distal 10 to 15 mm lies just deep to the mucosa of the floor of the mouth. It is easily injured during the resection of the sublingual gland. For this reason some surgeons routinely stent the duct during the procedure to avoid injury. Others routinely resect the duct in continuity with the sublingual gland and then marsupialize the orifice of the duct in the posterior aspect of the wound to prevent later obstruction to submandibular salivary gland outflow. The other structure to be concerned with during excision of the sublingual gland is the lingual nerve, which is closely related to the posterior part of the gland before crossing beneath the submandibular duct to enter the substance of the tongue.

The mechanism of formation of a ranula is believed to be that of a cyst-like lesion originating from an incompletely encapsulated sublingual gland, extravasation as a result of disruption, or obstruction of the sublingual duct or ruptured acini with subsequent spillage of mucus into the adjacent tissues, thereby resulting in a cavity lined with granulation tissue surrounded by condensed connective tissue.^[1] Aspiration and biochemical analysis performed on the ranula reveal a high protein and amylase concentration consistent with secretions from the mucous acini of the sublingual gland.^[2]

Excision can be performed with a variety of dissection tools. We favor the use of electrodissection. The CO₂ laser may be used because of a perceived decrease in bleeding and resultant improvement in intraoperative visualization. Techniques that involve the use of sharp dissection commonly result in significant bleeding, thus making dissection difficult.

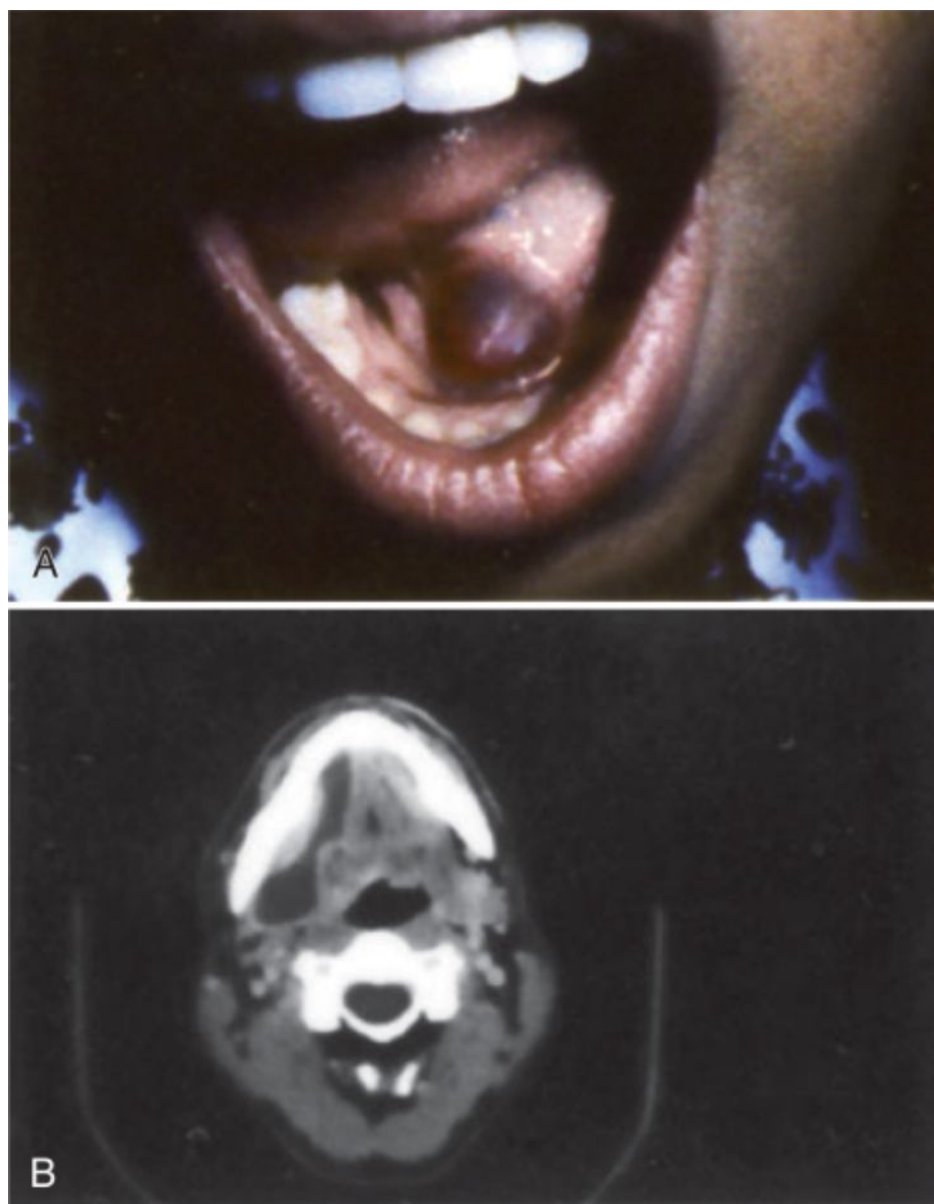


Figure 60-1 A, Ranula arising in the left sublingual gland. B, Computed tomography scan demonstrating a ranula in the right submandibular space.

PATIENT SELECTION

Most patients with a ranula are asymptomatic. The ranula appears as a bluish mass and is discovered in the floor of the mouth immediately beneath the mucosa of the anterior floor of the mouth. An oral ranula is generally small to medium in size. The lesion may be large enough to interfere with articulation and displace the tongue superiorly and anteriorly. A very large oral ranula located in the area of the sublingual ducts may lead to partial obstruction of Wharton's duct with subsequent swelling of the submandibular gland.

Patients with a ranula may also have a mass in the neck, particularly in the submandibular area, which is usually associated with the typical appearance of a mass in the floor of the mouth. This so-called plunging ranula is generally limited to the submandibular space, but it may also involve the entire neck (Fig. 60-2). A recent report by Pang and colleagues described the unusual case of a 19-year-old man with a large (32 cm in diameter) mass on the chest wall.^[3] The mass was in continuity with a scar in the left submandibular region. The patient gave a history of removal of a mass in the left side of the neck 1 year previously. Treatment included removal of the submandibular gland, the sublingual gland, and the cyst in the neck and on the chest wall. Pathology was consistent with a ranula, and the patient had no recurrence detected over a 3-year follow-up period. It was postulated that the patient originally underwent incomplete removal of the ranula without excision of the sublingual gland.



Figure 60-2 A, Massive plunging ranula manifested as a neck mass. B, The ranula was exposed via a cervical incision. C, Complete excision required two incisions. The chin is to the left.

The diagnosis of ranula is based principally on clinical examination and, in the case of a plunging ranula, on computed tomography (CT) or magnetic resonance imaging (MRI). In cases of plunging ranula, imaging studies are helpful to determine the entire extent of the ranula so that it is staged and treated properly (Fig. 60-3). When a ranula manifests as a cervical swelling without an oral cavity component, the differential diagnosis may be more difficult. Other lesions that should be considered include a thyroglossal duct cyst, branchial cleft cyst, parathyroid cyst, cervical thymic cyst, dermoid cyst, cystic hygroma, and benign teratoma.^[4]

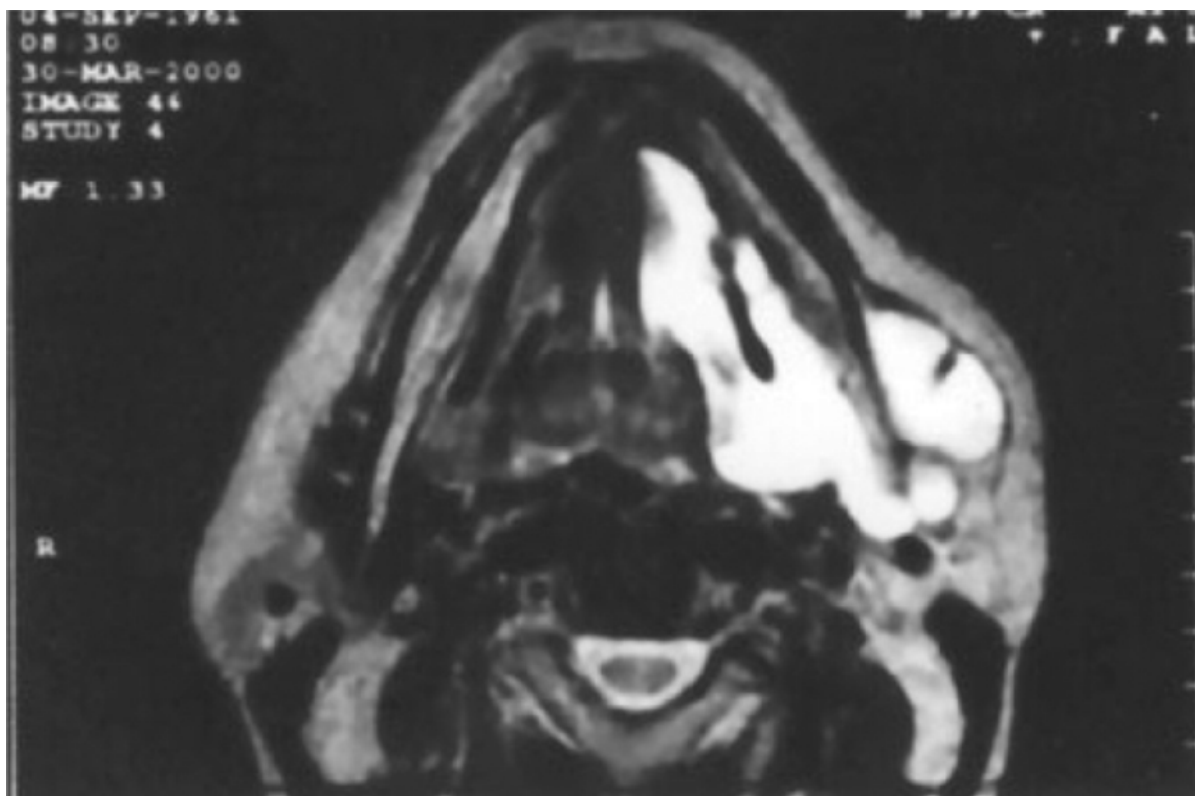


Figure 60-3 Axial T2-weighted magnetic resonance image (TR/TE 5000/96) showing a high-signal intensity collection of fluid in the floor of the mouth and extending behind the mandibular ramus and lateral to the mandibular angle.

(Reprinted with permission from Shelley MJ, Yeung KH, Bowley NB, Sneddon KJ: A rare case of an extensive plunging ranula: Discussion of imaging, diagnosis, and management. *Oral Surg Oral Med Oral Pathol Oral Radiol Endol* 93:743-746, 2002.)

Treatment of ranula has varied, and simple drainage of the cyst, marsupialization, excision, and sublingual gland excision have all been described. Simple drainage or incision is commonly associated with recurrence of the ranula and is not suggested. Marsupialization may be effective, but it is usually technically difficult to perform and often results in recurrence. A ranula that recurs after an initial attempt at excision makes subsequent attempts at excision significantly more difficult. Therefore, the initial complete surgical excision of the ranula and the sublingual gland is the procedure most likely to result in control.

Treatment of a ranula remains controversial. Zhao and coauthors reported a series of 571 patients with the diagnosis of ranula.^[5] The ranulas were classified into three clinical types according to the site of primary swelling: oral ranula (intraoral swelling only), plunging ranula (submandibular or submental swelling, or both, without intraoral swelling), and mixed ranula (intraoral and extraoral swelling). A total of 571 patients underwent 606 procedures; 580 were for primary lesions and 26 for recurrent ranula. Of 606 procedures, 9 consisted of marsupialization, 28 involved excision of the ranula, 356 involved excision of the sublingual gland, and 213 consisted of excision of the sublingual gland in conjunction with the ranula. When the lesion was operated on through a submandibular excision, it was often found that on elevation of the platysma muscle there was a thin wall cyst immediately associated with the anterior portion of the submandibular gland. However, further dissection revealed that the lesion involved the sublingual gland. Recurrence rates were 66% for marsupialization, 57% for excision of the ranula, and 1.2% for excision of the sublingual gland and the ranula. The marsupialization procedure itself gives rise to the largest number of recurrences, and the authors suggest that marsupialization is still performed because of fear on the part of the surgeon about the potential for injury to surrounding structures, especially the lingual nerve.

Kobayashi and coworkers reported a series of six cases of plunging ranula treated by excision of the cyst wall and the sublingual gland.^[6] After removal of the sublingual gland, careful examination with a telescope confirmed the absence of a sublingual gland and an intact lingual nerve. Simple drainage of mucus within the ranula was performed by dividing the mylohyoid muscle. Any potential residual cyst contents are expected to disappear spontaneously after complete resection of the source of secretions from widening of the sublingual gland.

Kolker and coauthors reported a Jehovah's Witness who while 32 weeks pregnant underwent ultrasound as part of a high-risk obstetric-gynecologic protocol.^[7] The developing fetus was noted to have a cystic mass encompassing the entire oral cavity. The tongue was displaced anterosuperiorly, compressed against the palate, and protruding from the mouth. Expecting airway obstruction at the time of delivery, an ex utero intrapartum treatment (EXIT)

team was created, and at 38 weeks' gestation, a cesarean section and the EXIT procedure were performed, leaving the umbilical cord attached to the baby for constant oxygenation. A large sublingual mass was excised intraorally. The mass was consistent with a congenital ranula. There was no recurrence or complication noted at 6 months.

Onderoglu and colleagues reported a 34-year-old woman who was seen at 21 weeks' gestation for scheduled prenatal care.^[8] Routine ultrasound revealed a fetus with an intraoral cystic lesion measuring 2 × 2 cm. At 34 weeks, the cyst had enlarged to 3 × 4.2 cm and appeared to force the tongue to protrude out of the mouth. At 38 weeks' gestation an EXIT procedure was performed by cesarean section, and 40 mL of fluid was aspirated from the lesion before the cord was clamped (Fig. 60-4). Ultrasound and MRI revealed a cystic, necrotic mass in the sublingual area of the neck. At the time the paper was written, the infant was 6 months old without recurrence.

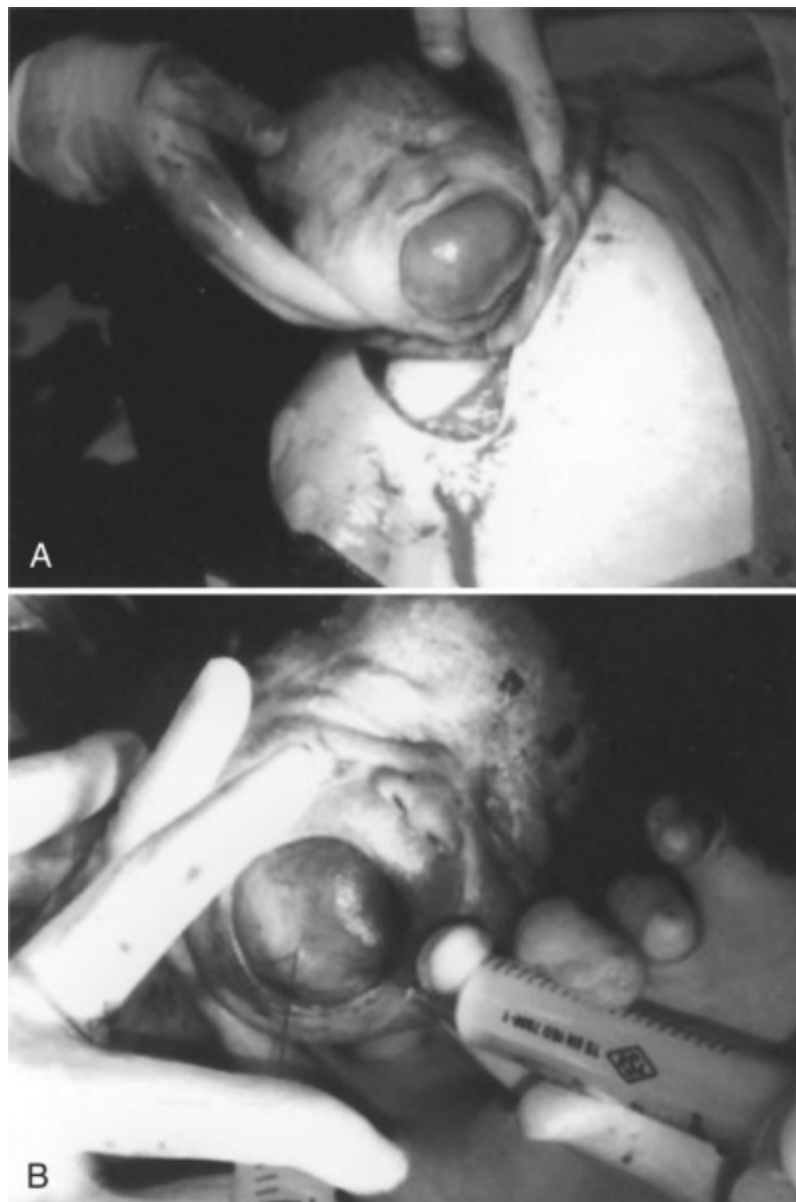


Figure 60-4 A, The cyst filled the mouth completely at birth. B, Clear fluid was aspirated to open the airway before the cord was clamped. (Reprinted with permission from Onderoglu L, Saygan-Karamursel B, Deren O, et al: *Prenatal diagnosis of ranula at 21 weeks of gestation. Ultrasound Obstet Gynecol* 22:399-401, 2003.)

SURGICAL TECHNIQUE

General anesthesia is required because of difficulty holding the oral cavity open and controlling bleeding in an awake patient. Bimanual palpation of the ranula will often reveal its depth, as well as its relation to the adjacent submandibular gland. The submandibular duct is probed and stented to maintain identification of the course of the submandibular duct during dissection.

An elliptical excision is made in the floor of the mouth such that it includes the entire sublingual gland (Fig. 60-5).

Dissection is carried along the lateral aspect of the sublingual gland down to the level of the underlying mylohyoid muscle. In the medial aspect of the gland, dissection is carried between the sublingual gland and the submandibular duct (Fig. 60-6). The dissection is extended more posteriorly, and the lingual nerve is identified and preserved (Fig. 60-7). Care should be taken to avoid rupturing the ranula if possible. The use of peanut dissectors, careful hemostasis, and judicious application of electrocautery or laser will help maintain a dry field and ensure complete excision. If excessive bleeding results, hemostasis should be obtained before proceeding with dissection. Injury to the lingual nerve or submandibular duct or inadequate removal is more likely if visualization has been impaired by a bloody field.

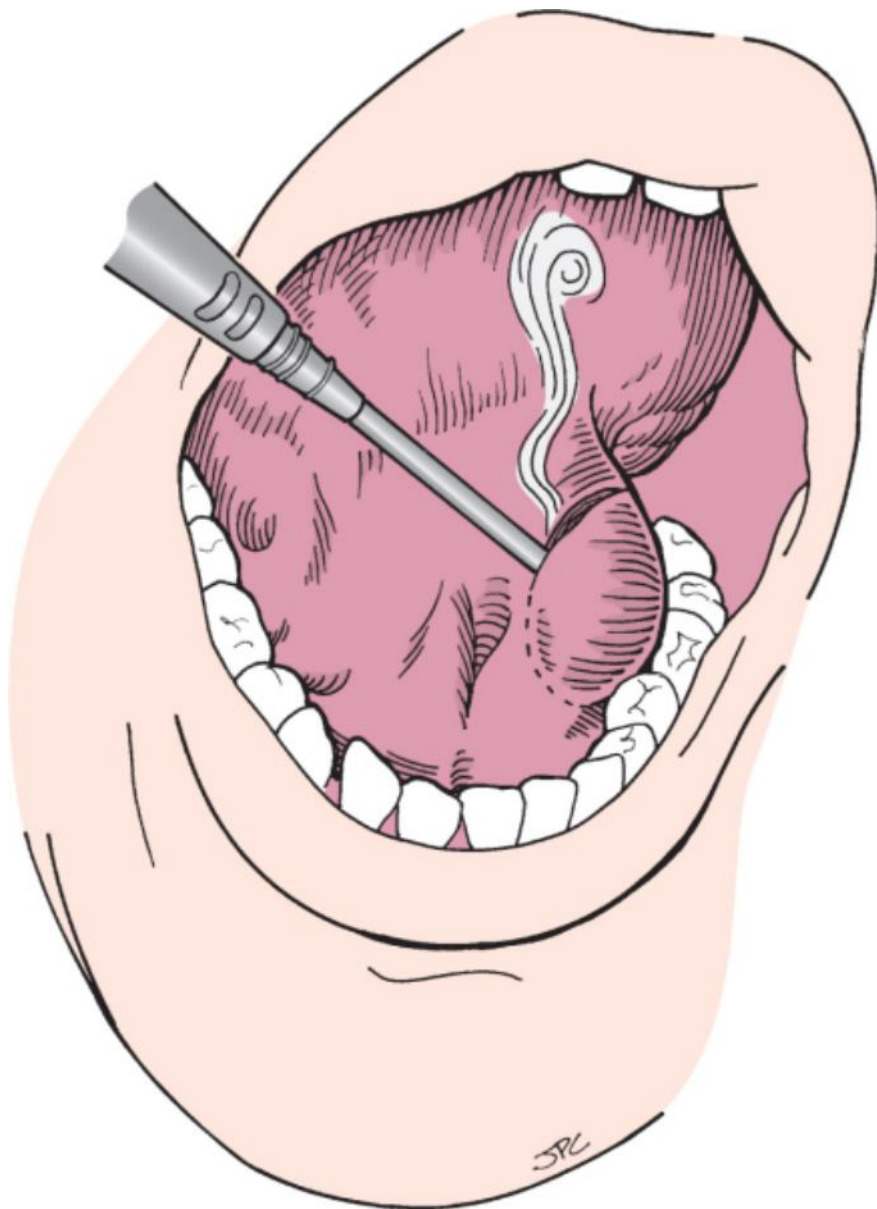


Figure 60-5 The incision is outlined on the floor of the mouth. The entire sublingual gland must be resected along with the ranula.

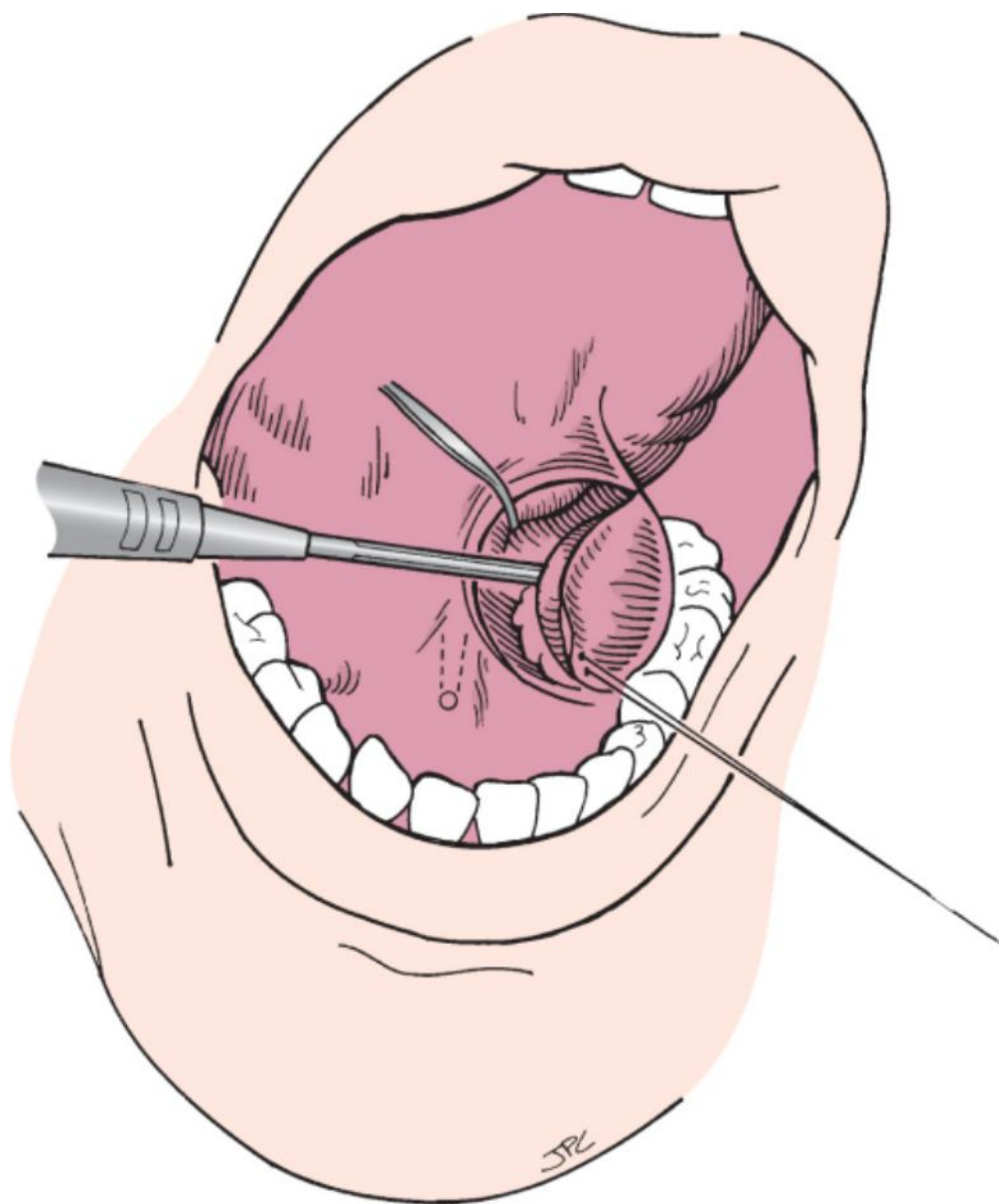


Figure 60-6 The dissection is carried between the submandibular duct and the sublingual gland. Stenting the duct is often helpful to preserve the integrity of the duct. Alternatively, the duct can be transected, opened, and marsupialized into the floor of the mouth.

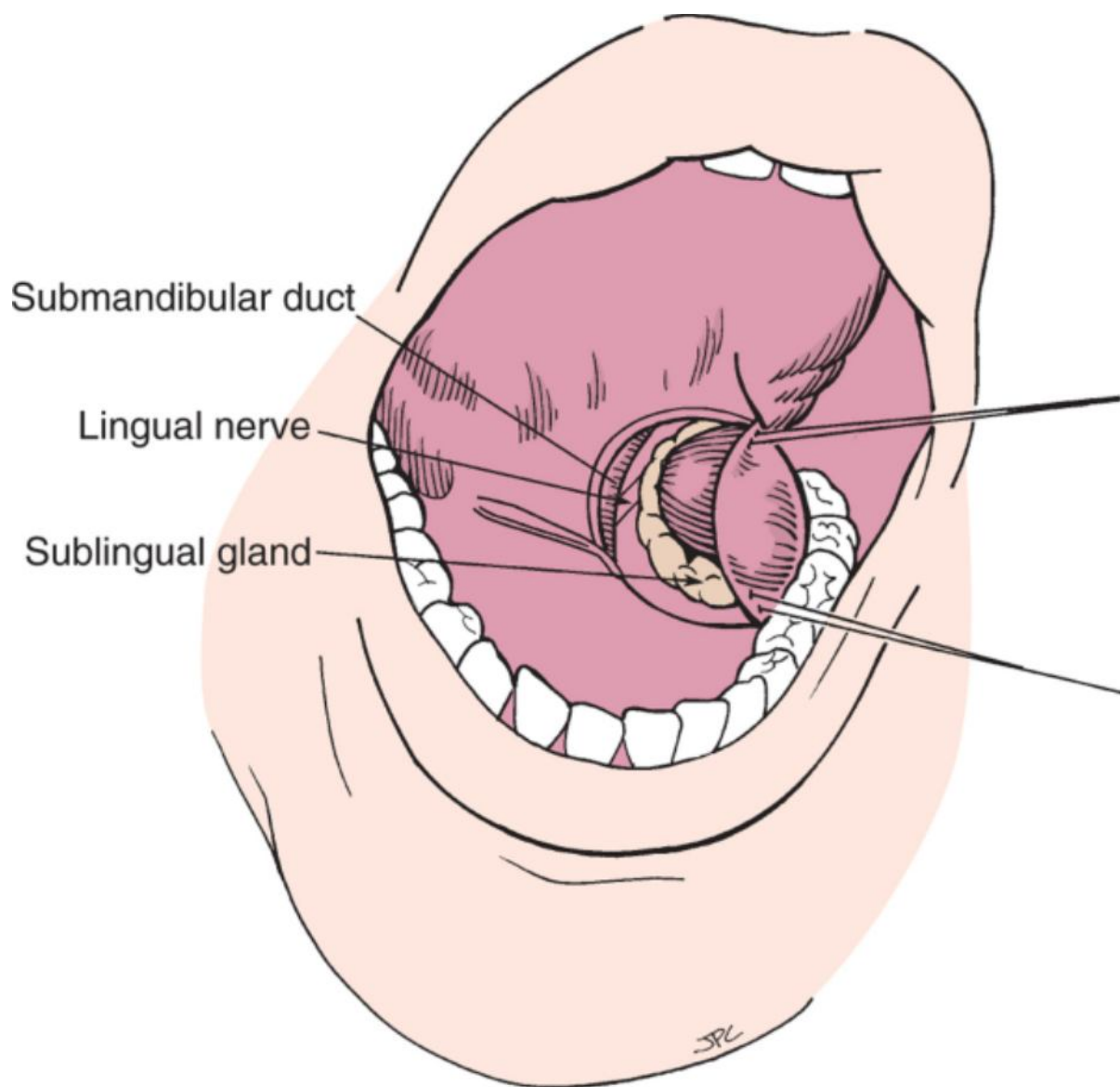


Figure 60-7 Dissection of the sublingual gland exposes the lingual nerve. Injury to this nerve must be prevented.

When the sublingual gland has been excised and hemostasis ensured, the submandibular duct should be carefully identified. If interrupted, the posterior remnant of the duct should be opened and marsupialized into the wound using several small absorbable sutures (Fig. 60-8). The wound in the floor of the mouth can be closed with absorbable suture, although some surgeons leave the wound open to preclude the development of hematoma.

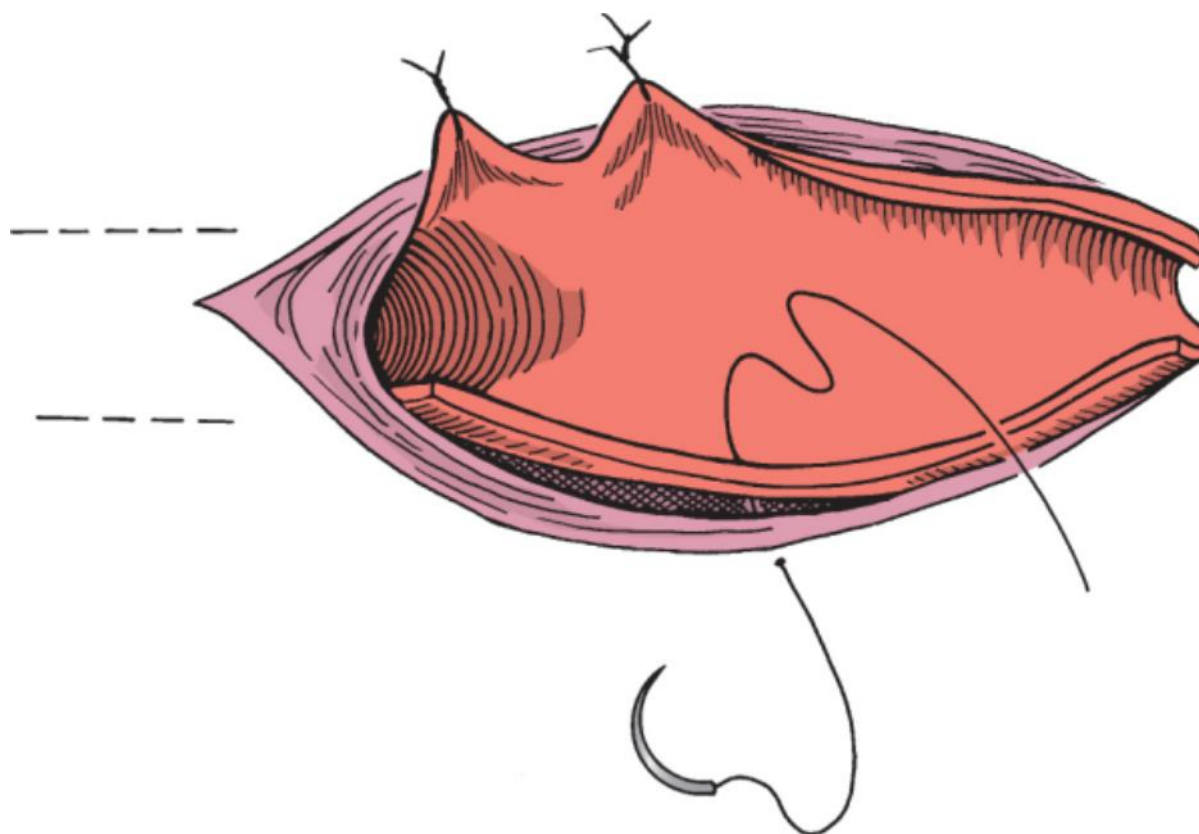


Figure 60-8 If the duct has been interrupted, it should be marsupialized by suturing the edges of the duct to the edges of the excision site.

Plunging ranulas occasionally require neck incisions for exposure (see Fig. 60-2B and C). Most, however, can be delivered transorally by bimanual palpation and judicious retraction during excision of the gland.

Several different methods of treatment have been used for removal of ranulas, including cold knife excision, cryosurgery, marsupialization, laser excision, and intralesional injection of OK-432. Choi and Oh recommended the hydrodissection technique for complete removal of the ranula.^[9] This procedure involves injection of saline and lidocaine between the ranula and the surrounding soft tissue. The fluid dissects along the ranula and creates a safe plane of dissection. Niccoli-Filho and Morosolli reported complete excision with a laser without evidence of recurrence or damage to surrounding structures and advocated that technique.^[10] Guerrissi and Taborda described an endoscopic approach for excision of the sublingual gland.^[11]

These procedures are anatomically safe and can be performed with minimal morbidity. The essential surgical steps include (1) careful identification of Wharton's duct and the lingual nerve, (2) retraction of the mylohyoid muscle, and (3) protection of the sublingual gland. External pressure on the submandibular gland allows intraoral protrusion of the cyst. Careful dissection of the posterior one third of the submandibular gland while avoiding the facial artery and vein is then carried out.

Takagi and colleagues describe treatment of a plunging ranula by fenestration and continuous pressure.^[12] The technique consists of making an incision in the ranula, inserting a Penrose drain, and leaving it in place for 3 weeks. Continuous pressure is applied to the submandibular triangle to prevent pooling of saliva. This technique resulted in complete resolution of plunging ranulas in four patients. They were free of recurrence 17 months later.

Shelley and coworkers described a cyst in a 38-year-old man who had a history of a mucous retention cyst in the left floor of the mouth discovered 13 years previously.^[13] A large fluctuant cyst was present in the submental and submaxillary space. However, the floor of the mouth looked normal. MRI confirmed a large cyst occupying the aforementioned spaces. In addition, the mass extended to the anterior floor of the mouth and along the entire length of the medial pterygoid muscle, almost to the pterygoid plates. It was diagnosed as an extensive plunging ranula. The left sublingual gland was removed and a Penrose drain was inserted into the cavity and sutured into the wound after draining the fluid out of the cyst. Over the next several weeks the neck returned to its normal contour. There was no sign of recurrence 6 months postoperatively. MRI demonstrated a large plunging ranula (Fig. 60-9). The authors believe this case well illustrates and supports the theory that a plunging ranula should be managed by simple intraoral excision of the sublingual salivary gland and drainage of the contents of the ranula.

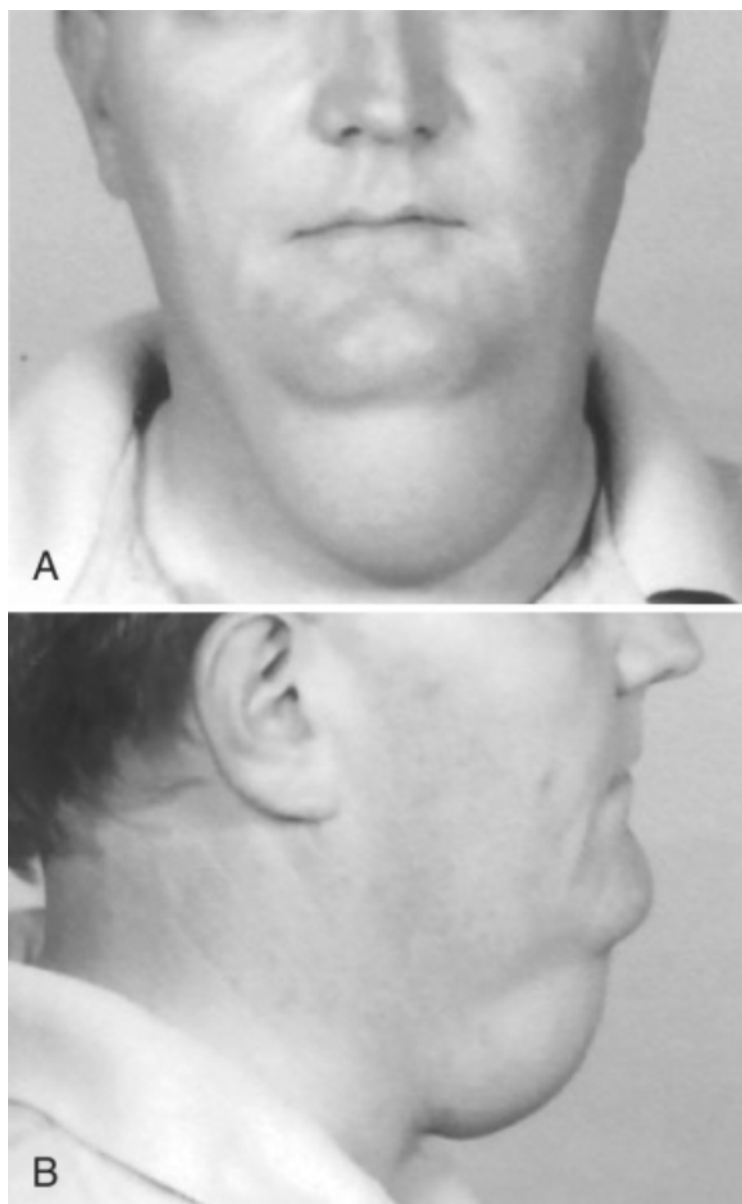


Figure 60-9 A and B, Clinical photographs of a patient with submandibular swelling.

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POSTOPERATIVE MANAGEMENT

The patient is maintained on a liquid diet for several days because of discomfort and then gradually advanced to a regular diet. No specific postoperative care is required, and overnight observation is not generally necessary. If drains are used in the neck wound, they can be removed on the first postoperative day.

COMPLICATIONS

The most common complication of surgery for ranula is recurrence. The risk of recurrence can be minimized by preoperative imaging that can provide an assessment of the lesion and dictate the extent of surgery. Excision of the sublingual gland together with the ranula is the most important means of preventing recurrence. Excision of the sublingual gland rarely allows preservation of the anterior aspect of the Wharton's duct. The posterior portion of the duct should be more marsupialized (see Fig. 60-8) to prevent stenosis of the duct with subsequent submandibular sialadenitis. If the sublingual gland is injured, numbness of the tongue results. The complication can be avoided by maintaining a dry field and identifying and preserving the lingual nerve.

PEARLS

- Imaging with CT or MRI is helpful in defining the projections of a plunging ranula.
- The best chance to cure a ranula limited to the floor of the mouth is excision of the ranula and the sublingual gland.
- Dissection must be carried out transorally with particular attention to preservation of the lingual nerve and Wharton's duct.
- A plunging ranula is best treated by transoral excision of the cyst and sublingual gland in conjunction with a cervical approach to excise the plunging ranula.

PITFALLS

- Failure to use imaging studies may result in understaging of a plunging ranula.
- Failure to remove the sublingual gland in the treatment of a ranula results in a high risk of recurrence.
- Failure to properly identify Wharton's duct and the lingual nerve will result in injury to these structures.
- Recurrent ranula after inadequate excision or marsupialization is very difficult to excise because of scarring of the floor of the mouth and related structures.
- Lack of ultrasound imaging with a high-risk fetus may result in the birth of a child with an unexpected large ranula that may produce airway obstruction at birth.

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