Section 5 – SALIVARY GLANDS

– OFFICE-BASED PROCEDURES

Chapter 57 – Transoral Removal of Salivary Duct Calculi

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Acute, painful enlargement of the major salivary gland is usually caused by a calculus within the excretory ducts. Occasionally, these calculi will pass spontaneously, but removal of impacted calculi, when necessary, is the optimal management strategy. If the calculus cannot be removed, alternative techniques, usually surgical removal of the gland itself, may be required. Recently developed instrumentation facilitates diagnostic endoscopy of the excretory ductal system, and removal of calculi by a variety of methods may be possible in selected cases in centers in which this expertise has been developed.[1]

Salivary calculi are composed of both organic and inorganic substances. Calcium apatite is the most common mineral substance encountered, although other calcium compounds can be found. Recent polymerase chain reaction–based studies suggests a bacterial cause, and there may be correlation with a history of tobacco use. The majority of calculi (60% to 90%) arise within the submandibular gland, although centers using newer diagnostic instrumentation have identified greater numbers of parotid calculi than in earlier reports.[1]

PATIENT SELECTION

Salivary calculi obstructing any of the four major salivary glands can lead to sudden and painful swelling of the gland (Fig. 57-1A). Typically, there is a history of recurrent swelling, particularly with meals. Occasionally, patients may have acute, rather severe bacterial infection with or without cellulitis that requires treatment with antibiotics. Severe infection in an obstructed submandibular duct with marked cellulitis can lead to airway obstruction requiring aggressive management, at times including tracheotomy.

Figure 57-1 **A,** Inflamed right parotid gland as a result of a stone impacted in Stenson's duct. **B,** Purulent exudate from the duct after stone manipulation.

Physical examination remains an important diagnostic tool, even today, and should not be replaced by imaging! Careful bimanual palpation of the affected gland and its excretory duct is required in all cases. Identification of a palpable calculus in an accessible location may dictate the choice of therapy. It is not necessary to wait for antibiotic therapy to be instituted before transoral removal of a calculus because release of the obstruction will often result in rapid resolution of the symptoms and infection.

Physical examination reveals an enlarged, tender gland. Associated soft tissue inflammation may preclude discrete palpation of the gland itself. In patients with severe inflammation of the submandibular gland, swelling may extend into the floor of the mouth. The finding of edema of the floor of the mouth suggests secondary cellulitis, and the surgeon must ensure that adequate monitoring and airway support are available.

Some patients will have marked swelling and abscess formation. In these cases calculus removal alone may be insufficient for management. Occasionally, a patient may have cellulitis of the entire neck and require emergency airway management, including tracheotomy and external surgical drainage. Patients with long-standing obstruction may form a fistulous tract to the skin and actually extrude the calculus (Fig. 57-2).

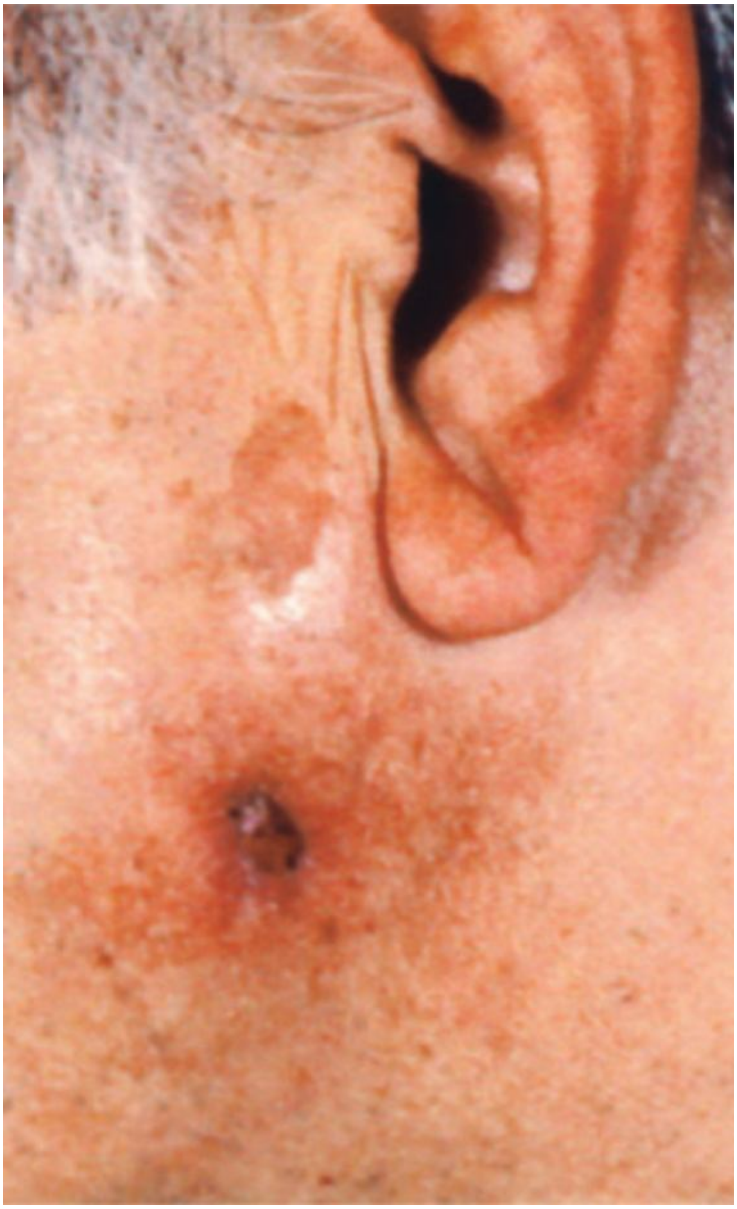

Figure 57-2 Fistulous tract that developed after prolonged obstruction of the left parotid duct by a large calculus.

Intraoral examination may reveal the calculus palpable at or just proximal to the orifice of the duct (see Fig. 57.1B). In these instances, transoral removal of the calculus and release of the obstruction should result in complete resolution of the patient's symptoms almost immediately. In other patients, however, the calculus may be in a more proximal position. Radiologic imaging is often helpful and may be supplemented (or potentially replaced) by sialoendoscopy (Fig. 57-3).[1] Calculi within the submandibular duct or hilum of the gland can often be visualized on plain radiography of the lateral mandible or an occlusal plain radiograph. An occasional calculus is not sufficiently radiopaque to be visualized on radiographs, so a negative plane film should not rule out the presumptive diagnosis.

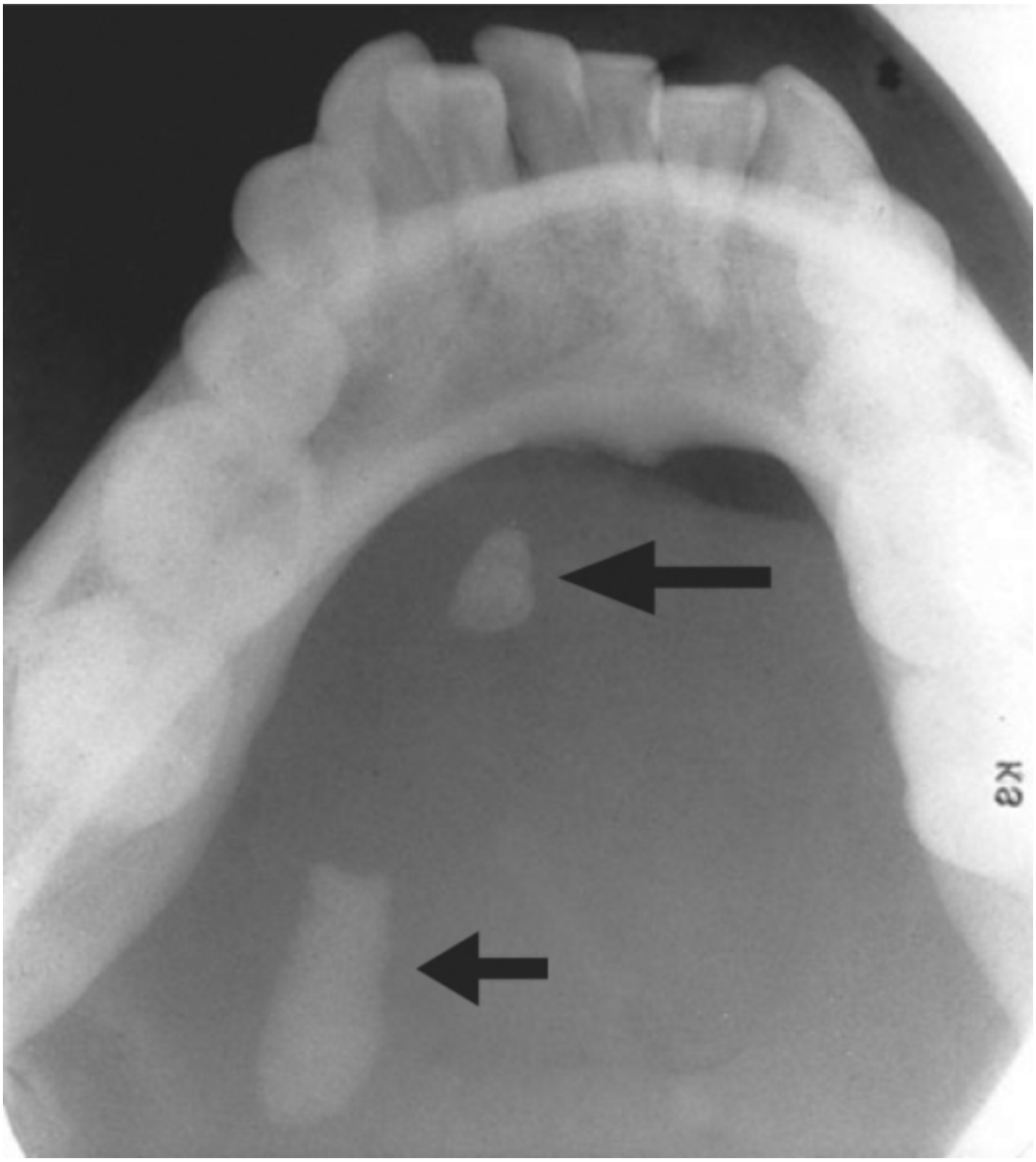

Figure 57-3 Occlusal plane radiograph demonstrating a calculus impacted at the orifice of Wharton's duct *(small arrow)*. Unfortunately, a second calculus was noted more posteriorly in the proximal duct *(large arrow)*. Although removal of the anterior calculus may be performed easily via the transoral route, unless the more proximal calculus passes spontaneously, excision of the entire submandibular gland may be necessary.

Computed tomography (CT) scanning is often of considerable benefit when the diagnosis is unclear, especially for identification of calculi within the parotid duct. CT imaging must be performed both with and without contrast enhancement because a calculus can be confused with a contrast-enhanced vascular structure. Sialography performed with injection of contrast medium into the duct has been a standard tool for evaluation for some years; however, it is technically difficult and sometimes impossible to perform, may be associated with considerable discomfort, and is contraindicated in the face of acute inflammation. Recently introduced signal acquisition techniques using new magnetic resonance imaging equipment and protocols may replace sialography.[1,2]

Sialoendoscopy using 1-mm rigid optical endoscopes with a variety of working sheaths and channels for irrigation and with instrumentation for retrieval has been introduced by Marchal and Dilguerov and has demonstrated excellent utility in experienced hands.[1] This technology may become routine as both the instrumentation and surgeons trained in its use become more available.

Large calculi impacted in the hilum of the submandibular or parotid glands have historically not been considered removable via the transoral route, but recent reports of transoral removal of stones from the hilum of the submandibular gland have been published.[3] Newer techniques using sialoendoscopy with stone fragmentation and retrieval may further alter the treatment paradigms in the near future. At this time, however, surgical excision of the affected gland is necessary in most such instances.

The submandibular gland is most commonly excised for chronic sialoadenitis secondary to calculus. The procedure

has low risk and is relatively straightforward (see Chapter 61). In contrast, parotidectomy for chronic infection is technically difficult because of perineural scarring and carries a high rate of temporary facial paralysis. These procedures are best performed by one of the small number of individuals who are experienced in these difficult dissections.

Transoral extraction of calculi impacted at the orifice of the duct can be removed in the outpatient setting with common office instrumentation. Topical anesthesia supplemented by minimal local injection is usually adequate, and sedation is not required.

SURGICAL TECHNIQUE

Magnification is essential for this procedure and may consist of either loupes or the operating microscope. If the latter is used, it is easiest to have the patient recline on a table and for the surgeon to hold the mouth open with the nondominant hand and to cradle the head of the patient in the crook of the arm. Loupes or “naked vision” can be used with the patient sitting or reclining. In a sitting position, patients must lean forward and open their mouth. Oral suction is necessary because patients will be unable to swallow during the course of the procedure. An assistant should be available to assist in suctioning the oral cavity.

After palpation has revealed the presence of a calculus in the distal duct, the overlying mucosa is anesthetized by the topical application of 10% lidocaine (Xylocaine), 4% lidocaine, or 2% tetracaine (Pontocaine). The effectiveness of topical anesthesia can be enhanced by drying the mucosa with a sponge before application of the anesthetic. Additional anesthesia and hemostasis are achieved by injection of a small amount of lidocaine with 1:100,000 epinephrine. Waiting for 5 to 10 minutes before proceeding will improve the hemostatic effect of the epinephrine and reduce bleeding in the site. Some surgeons place a probe within the duct before injection of local anesthetic because of the deformity caused by the injection.

If the calculus is readily palpated and is bulging through the duct orifice, simply excising the mucosa adjacent to the calculus may release it sufficiently to allow removal. More commonly, however, the calculus may be palpated but is not directly at the orifice. The orifice must first be probed with a lacrimal probe in these cases (Fig. 57-4A). Identification of the punctum can be challenging, especially in the presence of an inflamed papilla. Magnification is helpful and patience is required to identify and cannulate it. Trauma caused by indelicate probing will lead to bleeding and loss of visualization, so it is critical to use gentle technique.

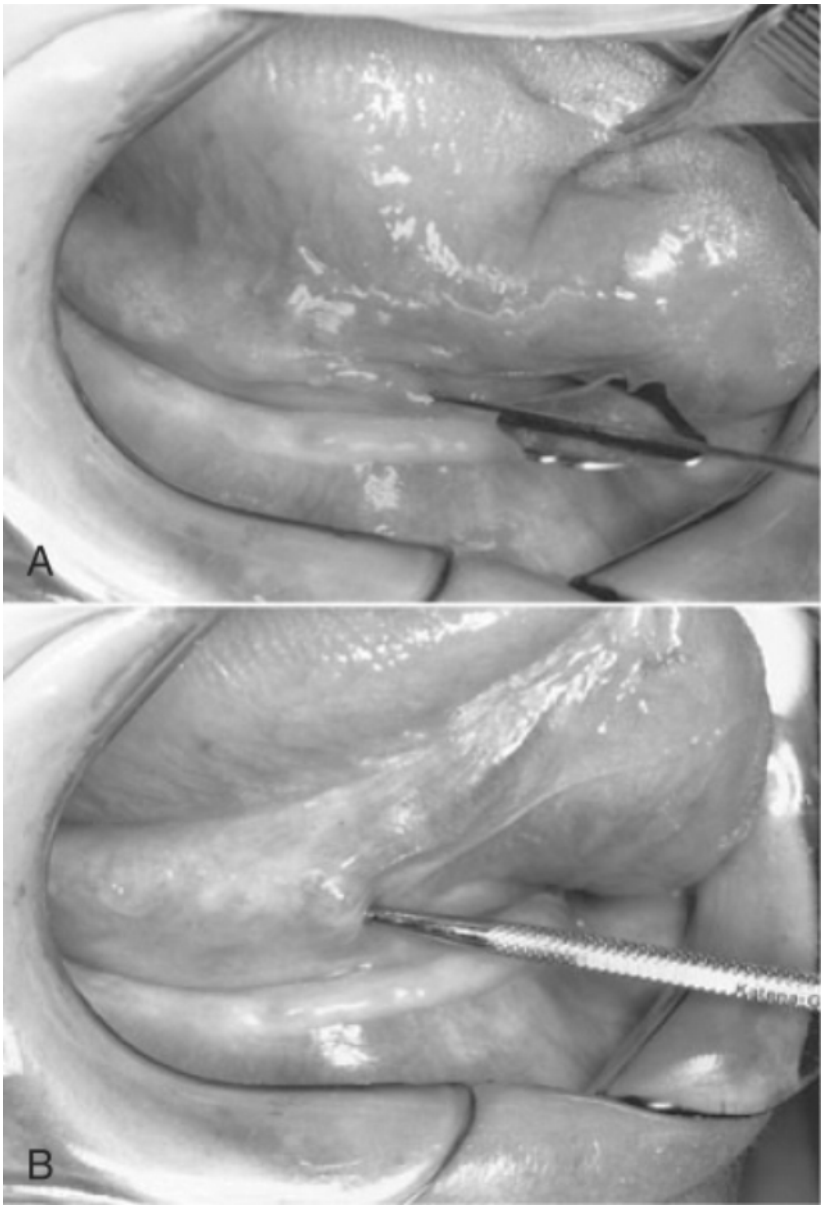

Figure 57-4 **A,** A lacrimal probe is inserted into the orifice of Wharton's duct. **B,** The duct is then dilated with a lacrimal dilator.

The probe is inserted into the duct and the calculus is palpated, after which the orifice of the duct is dilated with lacrimal dilators of increasing size (see Fig. 57-4B). One point of the iris scissors is then placed within the duct, and with a single snip, the duct mucosa and overlying oral mucosa are incised to open the duct widely (Fig. 57-5). The calculus can usually be easily retrieved at this stage, and the procedure is completed (Fig. 57-6). Some surgeons use small absorbable suture to marsupialize the now-open duct. Because continued flow of saliva will maintain an adequate duct orifice in most patients, marsupialization is rarely necessary. Additional calculi are often found posterior to the excised calculus, so examination via repeat probing of the duct should be performed.

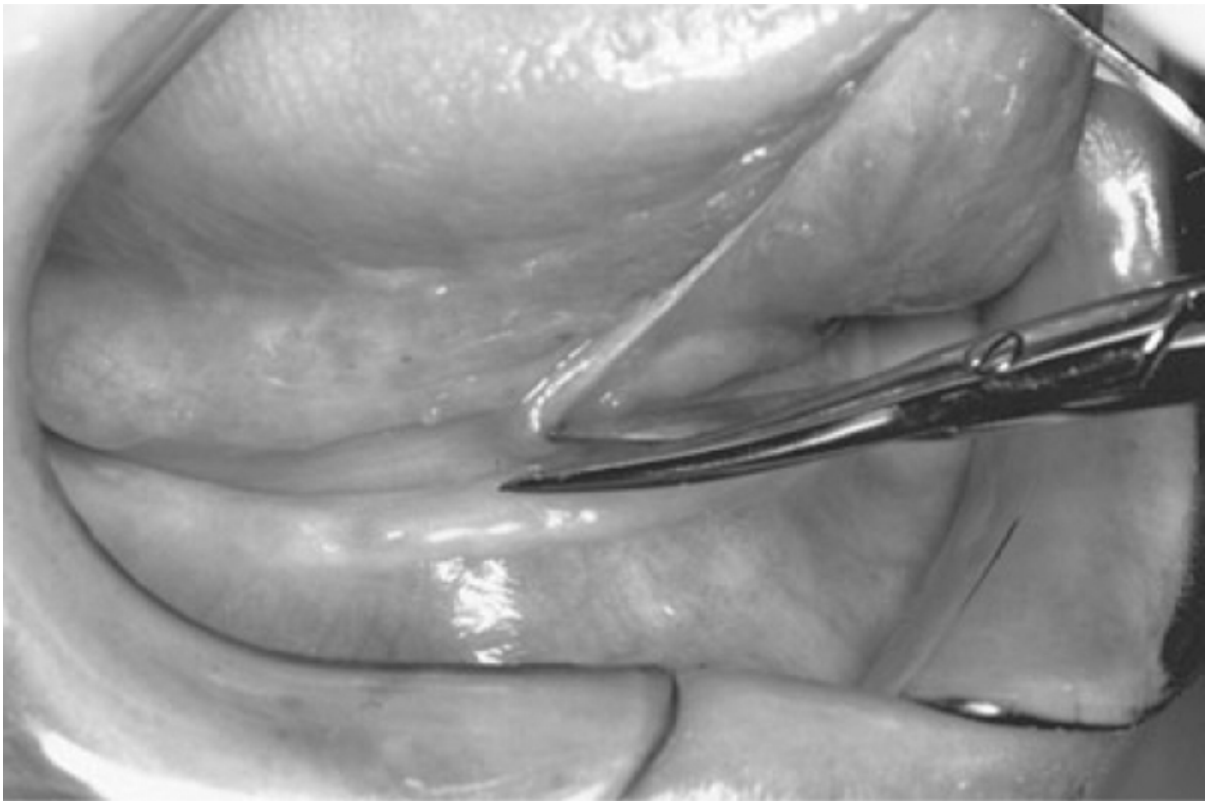

Figure 57-5 Scissors are placed within the orifice of the duct to incise the puncta of the duct.

Figure 57-6 Calculus removed from the anterior duct superimposed on the radiograph that demonstrated its presence. This calculus was easily removed by widening the orifice with iris scissors.

Calculi located in the midportion of the submandibular duct can be removed by incising the lateral floor of the mouth and dissecting the soft tissue down to the duct. Care must be taken to avoid injury to the lingual nerve. Access to the duct is enhanced by having the assistant apply pressure on the submandibular space. When the duct and calculus have been identified, the duct is incised just over the calculus. Before the calculus is removed, 4-0 silk suture is passed through the mucosa of the floor of the mouth and the wall of the duct on either side of the calculus. The calculus is then extracted, and several more sutures are placed to marsupialize the duct (Fig. 57-7).

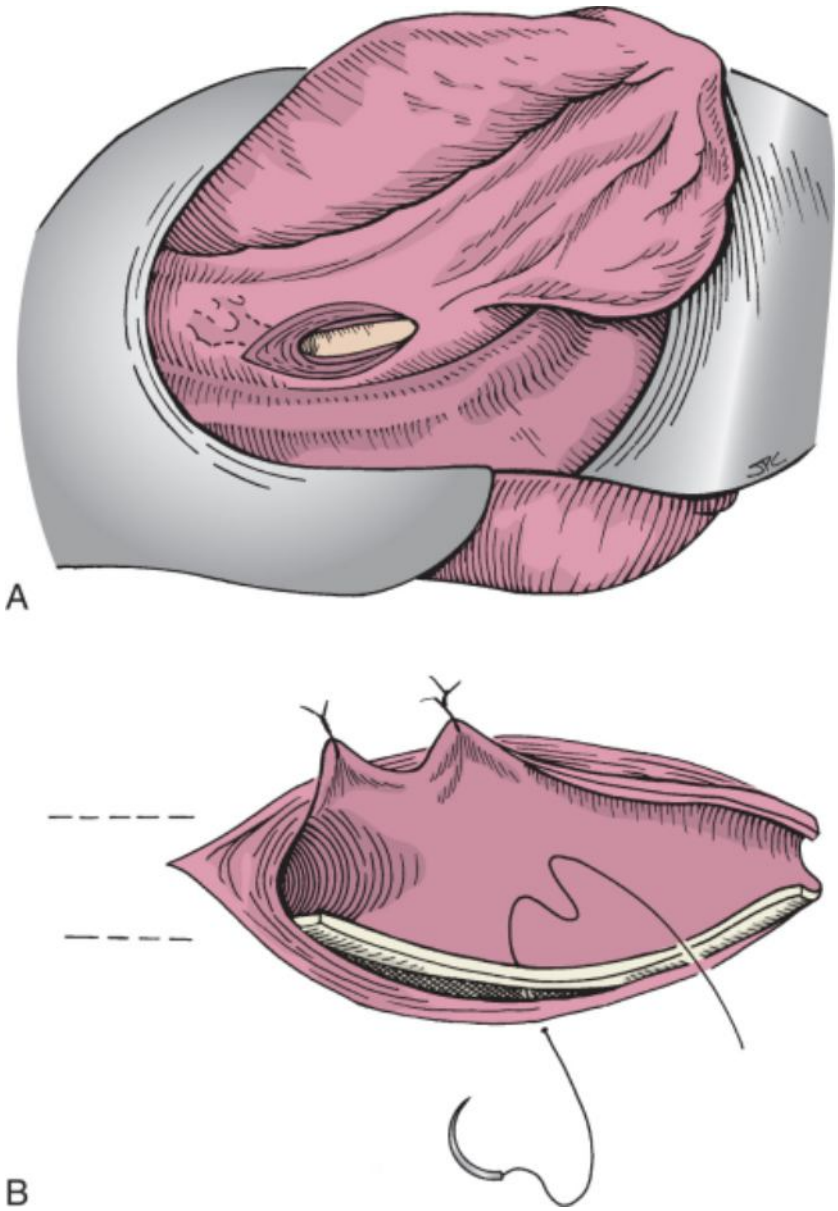

Figure 57-7 **A,** The duct is marsupialized to prevent strictures by sewing the mucosa of the duct to the mucosa of the floor of the mouth. **B,** Detail of the marsupialization sutures.

Calculi can frequently be identified in the more proximal portion of the duct by palpating them with a probe. Removal may require milking the gland after incision of the duct. Occasionally, calculi can be freed by oral rinses and secretagogues more easily than by surgical manipulation. Most calculi impacted in the hilum of the gland or the proximal portion of the duct cannot be removed, and excision of the submandibular gland will be required. Nonetheless, transoral removal of hilar stones has been reported[3] and is performed in a manner similar to that for transoral excision of the submandibular gland (see Chapter 61).

Because the parotid duct passes lateral to the masseter muscle, calculi impacted proximal to the orifice of the duct require alternative techniques for removal. Marchal has developed an approach to removing calculi from the proximal end of Stensen's duct.[4] He uses the sialoscope to identify the calculus in Stensen's duct and then exposes the duct through an external approach. The light from the endoscope helps the surgeon identify the calculus. He then opens the duct, extracts the calculus, and repairs the damage that has been done to the duct from the calculus.

Endoscopic Removal

Full discussion of endoscopic removal is beyond the scope of this chapter. In addition to appropriate in-strumentation, extensive training and experience are required for successful completion of examination and removal of calculi. A 1.3-mm operating sheath containing the endoscope, a 0.25-mm irrigation channel, and a 0.65-mm working channel (Fig. 57-8) are inserted into the dilated duct. A small Domia basket or laser fiber can be passed through the working channel of the sheath. Small calculi are visualized and retrieved from within the ducts,

whereas larger ones are fragmented by laser before retrieval. Because the parotid duct is smaller, calculi impacted in the parotid duct are a significantly greater challenge than those within the submandibular duct (Fig. 57-9).

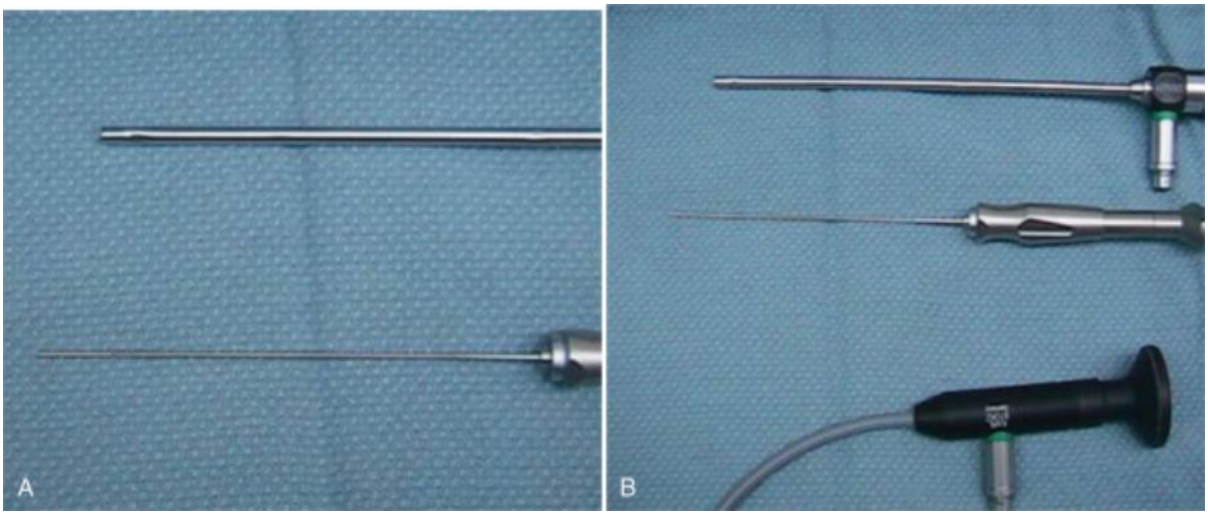

Figure 57-8 **A** and **B,** Photographs of an optical telescope for sialoendoscopy. The largest working sheath is 1.3 × 1.1 mm in size, with an irrigation channel of 0.25 mm and a working channel of 0.65 mm.

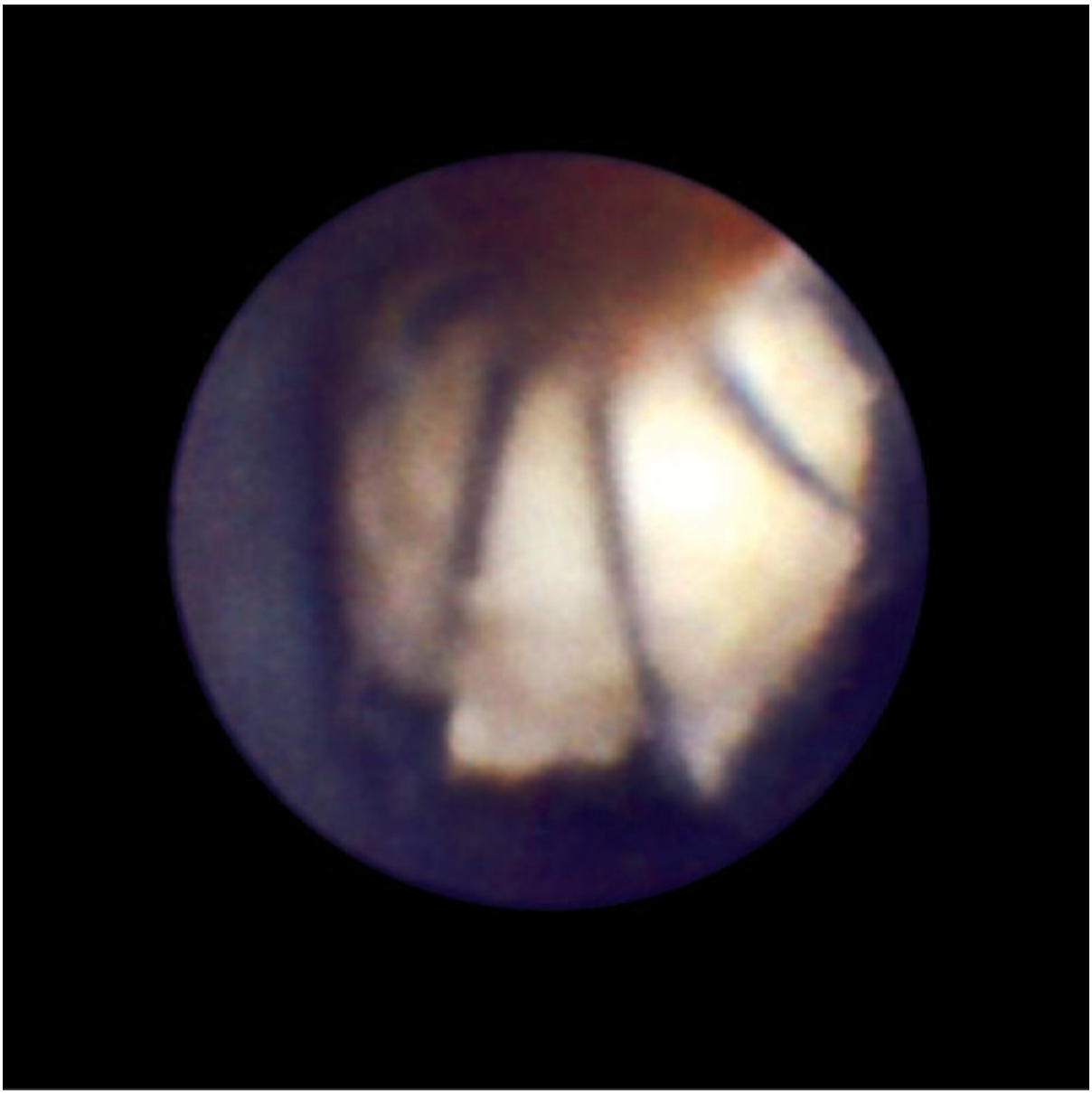

Figure 57-9 Endoscopic view of a salivary calculus captured in a basket before removal.

PEARLS

- A history of recurrent swelling of the submandibular or parotid gland suggests obstruction of the excretory duct, usually by calculus.
- Calculus impacted at the orifice of the duct can easily be palpated and removed.
- The submandibular gland must usually be removed in the case of calculi impacted in the hilum of the duct.
- Parotid duct stones impacted proximal to the duct orifice will require parotidectomy for removal.
- New technology consisting of miniature endoscopes to illuminate Stensen's duct, together with external exposure of the duct, can lead to extraction of calculi and reconstruction of the duct.[4]

PITFALLS

- Failure to identify and remove a stone impacted at the duct orifice can result in prolonged swelling, infection, and potentially avoidable morbidity.
- Excessive trauma to the duct orifice will lead to edema and bleeding.
- Recurrent calculus may be an indication of hypercalcemia.
- Failure to extract the calculus may result in cellulitis of the gland and surrounding tissue.