

gland stones and are intimately associated with the mandible. Phleboliths are commonly multiple in number and also exist within the neck outside of the submandibular triangle. They are scattered and have a classic lamellated appearance with a lucent core. Finally, phleboliths are smaller than sialoliths and demonstrate an oval shape, compared to the sialolith, whose elliptical shape has been created by a salivary duct (Mandel and Surattanont 2004). One further entity worthy of mention is calcified atheromas of the carotid artery, which is sufficiently distant from the submandibular triangle so as to not be confused with a submandibular sialolith. These are most commonly located inferior and posterior to the mandibular angle adjacent to the intervertebral space between cervical vertebrae 3 and 4 (Friedlander and Freymiller 2003).

While the diagnosis of sialolithiasis is frequently confirmed radiographically, it is important for the clinician to not obtain radiographs prior to performing a physical examination. Bimanual palpation of the floor of the mouth may reveal evidence of a stone in a large number of patients. Similar palpation of the gland may also permit detection of a stone as well as the degree of fibrosis present within the gland. Examining the opening of Wharton's duct for the flow of saliva or pus is an important aspect of the evaluation. It has been estimated that approximately one-quarter of symptomatic submandibular glands that harbor stones are non-functional or hypofunctional. Radiographs should be obtained and may reveal the presence of a stone. It has been reported that 80% of submandibular stones are radio-opaque, 40% of parotid stones are radio-opaque, and 20% of sublingual gland stones are radio-opaque (Miloro 1998).

## Treatment of Sialolithiasis

General principles of management of patients with sialolithiasis include conservative measures such as effective hydration, the use of heat, gland massage, and sialogogues that might result in flushing a small stone out of the duct. A course of oral antibiotics may also be beneficial. These measures may be particularly appropriate since some patients may carry a clinical diagnosis of sialadenitis in case of a radiolucent sialolith. As such, the treatment is the same in the initial management of both diagnoses.

## SUBMANDIBULAR SIALOLITHIASIS

The treatment of salivary calculi of the submandibular gland is a function of the location and size of the sialolith (Figure 5.10). For example, sialoliths present within the duct may often be retrieved with a transoral sialolithotomy procedure and sialodochoplasty. In general terms, if the stone can be palpated transorally, it can probably be removed transorally. A review of 172 patients who underwent intraoral sialolithotomy of a submandibular stone assessed results as to complete removal, partial removal, and failure (Park, Sohn, and Kim 2006). The effect of location, size, presence of infection, and palpability of the calculi on the results was assessed. Univariate analysis showed that palpability and the presence of infection were statistically significant factors affecting transoral sialolithotomy. Palpability was the only significant factor after multivariate analysis. This study provides scientific evidence supporting intraoral removal of extraglandular submandibular gland stones regardless of location, size, presence of infection, or recurrence of calculi as long as the calculi are palpable. This procedure involves excising Wharton's duct overlying the stone, thereby permitting its retrieval (Figure 5.11). Reconstruction of the duct in the form of a sialodochoplasty permits shortening of the duct and enlargement of salivary outflow, thereby preventing recurrence and allowing for healing of the gland (Rontal and Rontal 1987). A properly performed sialodochoplasty ensures effective flow of saliva from the gland in hopes of maintaining the health of the salivary gland. This procedure involves suturing the edges of the duct's mucosa to the surrounding oral mucosa (Figure 5.11). The number of sutures placed is arbitrary; however, a sufficient number of sutures is required so as to stabilize the reconstructed duct to the floor of the mouth. Proper postoperative hydration of the patient with free flowing saliva maintains patency of the sialodochoplasty, thereby enhancing the potential for reversal or stabilization of the underlying sialadenitis. Chronic submandibular obstructive sialolithiasis clearly leads to chronic sialadenitis with presumed parenchymal destruction. After removal of the sialolith, however, the apparent resiliency of the submandibular gland usually results in no adverse symptoms (Baurmash 2004). As such, the ability to effectively retrieve a sialolith usually refutes the need to also remove the affected salivary gland.