

# Surgical Retrieval of Submandibular Stones



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## KEYWORDS

• Sialendoscopy • Submandibular gland • Sialolith • Sialolithiasis

## KEY POINTS

- Diagnostic sialendoscopy should be the initial approach to manage sialolithiasis of the submandibular gland whenever possible.
- The 2-step sialendoscopic approach (diagnostic and operative) is a very efficient method to manage sialolith obstructions in the submandibular duct.
- Sialendoscopic retrieval of submandibular gland stones reduces the potential postoperative complications of sialoadenotomies secondary to sialolithiasis.

## Introduction: nature of the problem

In the early 1990s sialendoscopy was presented as an innovative, minimally invasive, and effective technique to address salivary gland obstructions. Sialendoscopy has been proven to be a successful technique for the treatment of salivary gland obstruction caused by stones, mucous plugs, strictures, kinks, or foreign bodies.<sup>1,2</sup> In the past, the only treatment of obstructive conditions of the salivary glands was limited to open surgery.<sup>3</sup> Although not frequent, open surgery can lead to complications, such as nerve damage, xerostomia, hematomas, and gustatory anomalies.<sup>4</sup>

The authors' goal is to provide a standardized, logical, and effective technique to retrieve submandibular salivary gland sialoliths using sialendoscopy. Sialendoscopy provides the advantage of diagnosing and treating obstructive salivary gland diseases while avoiding the risks and complications that could emerge from more invasive procedures.<sup>3</sup>

Although obstructive conditions can occur in any of the 3 types of major salivary glands, this article focuses on sialolithiasis of the submandibular glands and how endoscopic or endoscopic-assisted techniques can be used as the initial management of this condition.

Sialoliths are associated with the submandibular gland roughly 90% of the time. It has been reported that the saliva from this gland as well as the particular gland anatomy contribute to this predilection. Submandibular gland saliva contains double the amount of calcium and has more alkaline pH along with a

mucinous component. The trajectory of the Wharton duct from the gland to its orifice, the well-known 2 sharp turns of the duct that cause turbulence, and the reduced diameter of the orifice compared with the duct provide ideal conditions that promote sialolithiasis formation. The formation of salivary gland stones ultimately comes from the accumulation of calcium salts in an intraductal space made of desquamated epithelial cells, foreign bodies, bacteria colonies, mucus, and so forth.<sup>5</sup>

## Surgical technique

### Preoperative planning

There are many tools reported in the literature to diagnose obstructive pathologies affecting salivary glands. These diagnostic tools range from plain films, such as panoramic and occlusal radiographs, to more advanced imaging, including ultrasound, MRI, medical computed tomography (CT), in-office cone-beam CT, and sialography.<sup>3</sup> Furthermore, approximately 20%, 60%, and 80% of the submandibular, parotid, and sublingual obstructions, respectively, are not typically observed with either simple or advanced imaging.<sup>6,7</sup>

## Surgical approach

### Diagnostic sialendoscopy

The purpose of the procedure is to identify any possible sialoliths that are not radiopaque or shown on imaging and also to investigate the possibility of strictures or any other obstructive condition within the ductal system itself. If a stone is found, a definitive sialolithotomy can be performed if possible.

### Sialendoscopy sialolithectomy

If the procedure is going to be performed in an office setting, patients are brought to the operating suite and placed in a

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**Fig. 1** Patient placed into a semi-Fowler position 35° to 45°.

semi-Fowler position (Fig. 1). If the procedure is going to be performed in the operating room, naso-endotracheal intubation should be performed to keep the endotracheal tube away from the surgical field.

The orifice of the duct should be identified. Duct dilation should be performed in a sequential dilatation with probes. An alternative for dilatation and catheterization includes dilating systems that include guidewires. If the procedure is being performed in an office setting, sialagogues, such as lemon juice or vitamin C powder, can be placed on the dorsal tongue (Fig. 2).

If performing in the office, topical anesthesia can be placed overlying the duct papilla. If injecting local anesthesia, care must be taken not to inject into the papilla, which can interfere with visibility of the orifice. The gland itself can be anesthetized with infiltration with local anesthesia through an angio-catheter placed into the duct or through the sialendoscope proper.

#### Sequential dilation of the duct orifice

1. Small pickups are used to lift the mucosa just slightly proximal to the orifice. The mucosa is tented up superiorly and slightly anteriorly (Fig. 3). A dilating probe is then inserted into the duct itself and passed posteriorly being aware that obstructions can be found along the duct (Fig. 4). Care should be taken not to push the stone proximally into the gland. The vector of insertion of the probes should be maintained at all times.
2. Once the smaller probe is removed, the next largest probe is inserted along the same vector, increasing sequentially (Fig. 5). This technique allows placement of the sialendoscope (Fig. 6). Overdilation can, in rare cases, create a discrepancy between the lumen of the duct and the scope resulting in the inability to maintain adequate distention or the optical cavity while irrigating. Circular movements at



**Fig. 3** Mucosa being pulled superiorly and anteriorly.

the orifice with the probe give some stretch to the muscle and aid in larger probe insertion. If the orifice is strictured or tight, a bougie dilator can be used, although care not to perforate the duct should be taken (Fig. 7).

3. Once the duct is dilated, insertion of the sialendoscope is then inserted into the duct.

#### Diagnostic sialendoscopy

1. Irrigation syringe tubing is attached to the irrigation port. Throughout the procedure, gentle irrigation is provided to maintain the optical cavity. Maintenance of the optical cavity during any endoscopy procedure is mandatory. Careful observation of the floor of the mouth should be done throughout the procedure to detect any possible signs of fluid extravasation, especially during office-based sialendoscopy procedures.
2. Endoscopic visualization allows for stones to be identified (Fig. 8). The appearance of the duct, level of vascularity, and corrugation of the wall can also be visualized (Fig. 9). The inflammatory component of the ductal epithelium and saliva may have some bearing on ductal fragility, fibrosis of the stone, and risk of postoperative adhesions, all of which could affect outcomes.
3. If no stone is present, the scope should be inserted through the hilum dual highways as far into the gland as possible to check for obstruction. If a stone is found at any particular



**Fig. 2** Sugar-free lemon drops and mepivacaine syringes used for localization and anesthesia of the submandibular duct.

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