Sialendoscopy

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Overview

Background

Whereas traditional methods of treating nonneoplastic disorders of the salivary gland include watchful observation, medical treatment, and surgical excision of the involved salivary gland, sialendoscopy (sialoendoscopy) is a relatively new procedure that allows endoscopic transluminal visualization of major salivary glands and offers a mechanism for diagnosing and treating both inflammatory and obstructive pathology related to the ductal system.\[1\]

Sialendoscopy can be both diagnostic and therapeutic. It is complementary to diagnostic techniques such as plain radiography, ultrasonography, computed tomography (CT), magnetic resonance sialography, and conventional sialography, all of which are traditional, time-tested methods for evaluating the salivary ductal system.\[2, 3\]

Despite its apparent simplicity, sialendoscopy is a technically challenging procedure that requires organized and sequential learning.\[1\] Once the procedure has been mastered, success rates can exceed 85% for both diagnostic and interventional applications.\[1, 4, 10\]

Indications

Current evidence validates sialendoscopy for the treatment of nonneoplastic disorders of the salivary glands, including sialolithiasis.\[21, 22\] Sialolithiasis is one of the most common of these disorders and is a major cause of sialadenitis and unilateral diffuse swelling of the major salivary glands.\[1, 4\] Other common indications for sialendoscopy include diagnostic evaluation of recurrent unexplained swelling of the major salivary glands associated with meals, ductal stenosis, and intraductal masses.\[4, 5\]

A few series have also suggested benefit in patients with radiiodine-induced sialadenitis.\[6, 7\] Patients with refractory symptoms from any salivary gland pathology that does not respond to conservative management may benefit from interventional sialendoscopy, which yields success rates of 50-67%.\[5, 7\] Several studies, as well as the authors’ experience, suggest benefit in children with recurrent parotitis and also in patients who have recurrent sialadenitis from autoimmune processes such as Sjögren syndrome.

Marchal et al have proposed an algorithm for stone management that is based on stone size (see the image below).\[1\] In general, smaller stones (< 4 mm in the submandibular gland, < 3 mm in the parotid gland) are amenable to endoscopic removal. Intermediate-size stones (5-7 mm) may have to be fragmented further with
either a holmium laser or lithotripsy before endoscopic extraction. Large stones (> 8 mm) usually necessitate the use of a combined technique for stone removal.[8, 9, 10, 11, 12, 13]

Algorithm depicting management of recurrent glandular swelling caused by salivary stones. Management is based on stone size: small, intermediate, or large.

Contraindications

The only contraindication for sialendoscopy is acute sialadenitis.[4] Although this condition is not an absolute contraindication, it makes sialendoscopy problematic because an inflamed ductal system is more difficult to dilate. In addition, use of the rigid dilator system, a semirigid endoscope, or both during an acute episode of sialadenitis increases the chance of ductal trauma and potentially fosters the spread of infection in the soft tissues of the head and neck.

Technical Considerations

Successful outcomes depend on correct technique, which can be acquired through training and appropriate patient selection. This is especially true for sialolithiasis. Endoscopic stone removal is recommended for stones smaller than 4 mm in submandibular cases and smaller than 3 mm in parotid cases. Removal of larger stones requires previous fragmentation by modalities such as external lithotripsy or laser.[1]

When the stones are very large or when preoperative assessment suggests that endoscopic removal will be difficult, the authors have successfully employed the combined approach described by Marchal.[10] This technique involves localization of the stone in the ductal system by means of sialendoscopy. Exploration of the duct is guided by the illumination of the sialendoscope.

In submandibular cases, the exploration requires an intraoral incision. In parotid cases, a partial or complete parotidectomy incision and elevation of a superficial musculoaponeurotic system (SMAS) flap may be necessary to deliver the stone. This is followed by surgical repair of the duct and placement of a stent under endoscopic visualization.

Expected Outcomes

In more than 900 sialendoscopy procedures performed in both parotid and submandibular cases, Marchal reported no instances of facial nerve paralysis or hemorrhage.[17] However, many of these studies were not conducted in the United States.

In a retrospective analysis of 56 sialendoscopy cases, no instances of facial nerve paralysis or hemorrhage were reported.[5] Additionally, the authors found that major complications (defined as iatrogenic insults directly responsible for additional procedures) occurred in only 2% of cases and that minor complications (defined as any adverse event leading to either failure of the procedure, a second surgical procedure, a change in the surgical plan, or deviation from the planned course of events as a result of the procedure itself) occurred in 23%.

With respect to diagnostic sialendoscopy, Marchal and Dulguerov reported a 98% success rate,[1] whereas Nahlieli and Baruchin reported a success rate of 96% in their case series.[19]

In the interventional setting, Nahlieli et al reported success rates of 86% and 89% for endoscopic parotid and submandibular sialolithotomy, respectively, in 736 cases of sialolithiasis.[4] However, their success rate for endoscopic sialolithotomy was 80% in an earlier series representing 3 years’ experience, during which they reported a total of 32 cases of sialolithiasis with 4 failures.[20]
Periprocedural Care

Preprocedural Planning

Noncontrast computed tomography (CT) is commonly used for preoperative evaluation of patients who are being considered for interventional sialendoscopy; other imaging modalities can be used as well.

A complete head and neck examination and an otolaryngology evaluation are recommended before the procedure. Features relevant to successful sialendoscopy should be assessed and documented, including the location of the papilla, the patency of the duct with or without salivary flow, the consistency and clarity of the saliva, any asymmetry or enlargement of the involved glands, the bimanual palpability of the gland, and the palpability and position of the stone.

In addition, the surgeon must evaluate the accessibility of the oral cavity by paying close attention to the size of the oral commissure (eg, microstomia) and the tongue, the ability to open the mouth (eg, preoperative trismus), any pathology of temporomandibular joints, and the presence or absence of mandibular tori. In addition, assessment of the nasal septum and upper airway helps the anesthesia team prepare for nasotracheal intubation, which is the preferred method for achieving maximal exposure.

Equipment

The basic equipment required to perform a diagnostic or interventional sialendoscopy procedure is listed below and is produced by Karl Storz (Tuttlingen, Germany).

- Marchal Miniature Endoscope for Diagnostic and Interventional Sialendoscopy (see the image below) - A semirigid forward-viewing 0° telescope with an outer diameter of 1.3 mm, a remote eyepiece, and 2 channels (a 0.25-mm rinsing channel and a 0.65-mm working channel for instrumentation)
- Marchal Operating Sheath for Interventional Sialendoscopy (balloon dilation) - A 16-cm oval sheath, 0.8 mm × 1.33 mm, with a working channel (0.85 mm) and a telescope channel (1.15 mm), each with an obturator, and 1 Luer-Lok adapter (Becton, Dickinson, Franklin Lakes, NJ) for use with a miniature endoscope (1 mm outer diameter)
- Marchal Miniature Straight Forward Telescope - A semirigid 0° scope with an outer diameter of 1 mm and a working length of 16 cm, along with 1 male Luer-Lok; fiberoptic light transmission is incorporated for use with a Marchal Operating Sheath in interventional sialendoscopy
- A set of salivary duct probes (10) with increasing diameters (No. 0000 to No. 6) (see the image below)
- A conical dilator for the salivary duct
- A wire basket or stone extractor for endoscopic removal of salivary stones
- A balloon catheter for dilation of strictures
A video tower for endoscopy with a light source and recording capabilities
An assistant-operated irrigation system with isotonic saline in a 20 mm syringe

Patient Preparation

Patient preparation includes adequate anesthesia and appropriate positioning.

Anesthesia

Sialendoscopy can be performed in the office setting with either local anesthesia alone or local anesthesia plus sedation. However, because of the discomfort some patients may experience, surgeons’ preferences, and the indications for sialendoscopy, it is most commonly performed in the operating room (OR), where either general anesthesia or local anesthesia with sedation may be used.

If general anesthesia is to be used, the surgeon should consult preoperatively or perioperatively with the anesthesia team regarding the positioning of the patient, as well as the placement, fixation, and route of insertion of an endotracheal tube (transnasal or transoral). The anesthesia team should absolutely avoid the use of anticholinergic medications before and during the procedure.[14] In general, nasotracheal intubation is preferred when possible because it allows optimal exposure of the openings of all major salivary glands.

Positioning

Patient positioning for sialendoscopy is similar to that for routine endoscopic sinus surgery. The patient’s mouth is kept open with a retractor, bite block, or dental splint. A disposable cheek retractor is often helpful to keep the cheek mucosa retracted (see the images below).

Illustration shows disposable plastic cheek retractor that is self-retaining and allows retraction of buccal mucosa. This retractor is especially useful for edentulous patients and often reduces need for additional assistant.

Disposable cheek retractor is in place, retracting lateral buccal mucosa and soft tissue. Dental splint placed between teeth provides adequate mouth opening for access to papilla.

The procedure requires a single assistant to perform all the perioperative maneuvers. In some instances, sialendoscopy may be combined with a surgical approach (transoral or an open external) to manage large or impacted salivary stones or strictures.[10, 13] For this combined approach, additional assistants may be required to provide exposure.

Monitoring and Follow-up

http://emedicine.medscape.com/article/1520153-overview#showall
Antibiotic prophylaxis may be administered in the immediate perioperative period. However, some practitioners advocate antibiotic coverage for 1 week postoperatively, especially if the case was difficult, if complications develop, or if an indwelling stent is present. The patient is instructed to massage the gland frequently to promote expression of collected secretions and residual debris. Postoperative swelling is normal for the first 48 hours but may last for 3-5 days after the procedure.

**Technique**

**Approach Considerations**

The basic approach to sialendoscopy is similar for the submandibular gland and for the parotid gland. However, most authors agree that entry into and dilation of the submandibular (Wharton) duct are technically more challenging, even though the duct itself is easier to navigate than the parotid (Stensen) duct is. The papilla of the submandibular duct is narrow and difficult to catheterize, whereas the papilla of the parotid duct is wider and allows easier catheterization.

In a study by Nahlieli et al, the overall rate of immediate failure (in which introduction of the endoscope into the gland was not possible) was 1.1% (0.8% in the submandibular gland, 0.3% in the parotid gland). The overall diameter of the parotid duct is about 1 mm smaller than the diameter of the Wharton duct (approximately 2-3 mm). Consequently, navigating the parotid duct requires more dexterity.

In addition, the parotid duct turns sharply over the anterior border of the masseter. Both the smaller ductal diameter and the presence of the masseteric bend can lead to impaction of smaller stones being impacted and may prevent advancement of the scope. In this situation, manipulation of the cheek often reduces the acute bend in the Stensen duct around the masseter muscle, allowing further advancement of the sialendoscope.

**Endoscopy of Salivary Glands**

Sialendoscopy is performed as follows.

**Cannulation of papilla**

The most challenging portion of the procedure is identifying and cannulating the papilla in an atraumatic fashion. Identification of the papilla is facilitated by using magnification in the form of a microscope or surgical loupes. In addition, massage of the gland to express saliva helps localize the papilla. Once the ductal opening is identified, injection of 2 mL of lidocaine with epinephrine in its periphery makes the opening more prominent and stiffens the tissue, thereby facilitating manipulation, which is more important in submandibular sialendoscopy.

**Dilation of salivary duct**

Salivary duct probes of increasing diameter are inserted to achieve progressive dilation of the salivary duct and thereby allow the introduction of the sialendoscope. Alternatively, the papilla and duct may be dilated by means of the Seldinger technique (see below).

Nahlieli et al have suggested performing a papillotomy to allow introduction of the scope. In the authors' experience, however, papillotomy prevents the creation of a mucosal seal around the endoscope, resulting in leakage of the irrigant, which may prevent maximum dilation of the duct by exerting hydraulic pressure. The authors reserve the use of a papillotomy for 2 scenarios: (1) difficult cases in which standard dilation or the Seldinger technique fails and (2) delivery of larger stones at the end of a procedure (small papillotomy).

A nontoothed tissue forceps is applied to the mucosa near the papilla to help straighten the tortuous course of the salivary duct and to fixate the papilla as the dilators are introduced. Salivary probes are sequentially introduced into the duct, beginning with the smallest probe (No. 0000) and continuing the largest probe (No. 6) can be introduced.

Although the most important use of the salivary probes is to dilate the proximal portion of the salivary ducts, the natural tendency is to insert the probe as far into the duct as possible. This tendency must be resisted because inserting the probe too far may displace the sialolith proximally or result in inadvertent ductal wall injury and the creation of a false passage. Accordingly, the probes must not be inserted more than 1.5 cm beyond the ductal opening.
Similarly, larger probes are introduced only if it is possible to do so in an atraumatic fashion. If a larger probe does not pass easily, it may be necessary to return to the next smaller size and perform further dilation with that probe before continuing. As an alternative, it may be helpful to use a lacrimal conical dilator as an interim dilator after passing the No. 3 probe before proceeding to a larger probe. Careful dilation is critical because excessive force may lead to ductal perforation and the creation of a false passage.

Saliva around the papilla can be dabbed gently with cotton swabs or Q-tips. Suction tips may be traumatic and cause edema of the tissues around the papilla, obscuring the opening of the duct.

If standard dilation fails or cannot be used for some other reason, the Seldinger technique may be attempted.

**Seldinger technique**

In the Seldinger technique, a guide wire is placed through the papilla and into the duct after passage of the No. 0000 salivary probe. The guide wire is made of titanium and is of a diameter equal to that of the No. 0000 probe. Once the guide wire is in place, the duct is dilated with a 2.5-mm Marchal bougie that has a central channel that accepts the guide wire (see the images below). The dilation is performed very slowly by gently turning the bougie around the guide wire and allowing sufficient time for the duct to expand.

Once papilla is dilated with Seldinger technique, there are 2 options for introduction of scope. First involves removal of guide wire followed by introduction of scope. Second, as illustrated, involves threading scope onto guide wire and then inserted it into duct. This latter technique allows more controlled entry of scope into duct.

Potential complications of the Seldinger technique include ductal perforation and distal displacement of the sialolith by the guide wire.

**Endoscopy of salivary duct**

Once dilation of the duct opening has been achieved, the sialendoscope is introduced into the duct. The intensity of the light source is set at 30% of maximum strength. In the authors’ experience, the 1.3-mm Marchal sialendoscope and the 1.1 mm and 1.6 mm Erlangen all-in-on” scopes (Karl Storz, Tuttlingen, Germany) have been the most useful for this procedure; however, salivary endoscopes with diameters ranging from 0.8 to 1.6 mm...
are available to facilitate both diagnostic and interventional procedures across all age groups.

Because the ductal walls are naturally collapsed, the duct must be dilated and splinted by means of the hydraulic pressure provided by irrigation with normal saline (NS). Irrigation with NS lubricates the lumen, maintains the optical tunnel, and allows advancement of the endoscope into the proximal ductal system.[4] Often, the scope must be moved within the duct in a gentle circular motion to achieve a centered view of the duct.

If sialendoscopy is being performed with the patient under sedation and monitored anesthesia care, the duct is initially irrigated with lidocaine 2% (first 10 mL) before being irrigated with NS. Subsequent therapeutic interventions are guided by the pathology present.

For sialolithiasis, endoscopic removal of the stones is most commonly performed with the use of a wire basket. Once the stone has been located, the assistant passes the closed wire basket through the working channel of the sialoendoscope. The closed basket is advanced past the stone and then opened. Gentle to-and-fro movement of the wire allows the stone to be captured in the basket.

Once the stone is manipulated into the wire basket, the basket is closed; the basket with the stone and the scope are then withdrawn together under direct vision (see the image below). The assistant is responsible for withdrawing the wire basket while the surgeon withdraws the sialoendoscope.

![Image shows stone trapped endoscopically in stone wire basket. Stone can then be withdrawn under endoscopic guidance.](http://emedicine.medscape.com/article/1520153-overview#showall)

Stones that are free-floating are more amenable to endoscopic removal. In these situations, a grasping forceps can also be used to remove the stone (see the images below).

![Shown is 3-mm free-floating stone within submandibular duct.](http://emedicine.medscape.com/article/1520153-overview#showall)
Stone forceps engages 3-mm submandibular duct stone; 1.6-mm all-in-one Erlangen sialendoscope permits placement of stone cup forceps in its interventional channel for endoscopic stone removal.

The surgeon should be careful not to pull on a stone that is impacted; doing so may result in avulsion of the duct or breakage of the basket, which would necessitate an open procedure. With most sialoliths, a small papillotomy is usually performed to facilitate delivery. For larger stones, the combined approach is often useful for stone removal; laser fragmentation can also be employed.

Ductal dilation for the management of stenosis proceeds similarly, except that a balloon dilator is used instead of a wire basket (see the images below).

Complications of Procedure

In general, sialendoscopy is considered to be a safe outpatient procedure and has been validated as a safe technique in several large studies. However, both major and minor complications are known to occur.

Although diagnostic sialendoscopy is possible in most patients, ductal stenosis, inflammation, or the presence of an acute masseteric bend of the parotid duct can make navigation with the scope difficult and may result in failure to pass the scope along the entire ductal system. In addition, it may be difficult to enter the papilla with the sialendoscope, a situation that may be compounded by active inflammation.

The most common iatrogenic complication is avulsion of the duct. This complication can be prevented by avoiding excessive traction on the stone while it is engaged in the wire basket, especially if the stone is large and not floating freely in the duct. Other complications may include inability to retrieve the stone, minor ductal tearing, and superficial mucosal necrosis at the site of lidocaine-epinephrine injection.

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References


