

New era of Endoscopic Approach for Sialolithiasis: Sialendoscopy

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عصر جديد لعلاج حصي الغدد اللعابية عن طريق المنظار

راشد العبري ، فرانسيس مارشال

الملخص: يعتبر منظار الغدد اللعابية أحد الطرق المبتكرة في السنوات الاخيرة في مجال جراحة الانف والاذن والحنجرة والرأس والعنق . من جهة اخرى تعتبر حصي والتهابات الغدد اللعابية من أكثر أمراض الغدد اللعابية انتشارا، وعادة ما يتم تشخيصها بواسطة الأشعة ويتراوح علاجها بين الجراحة من داخل الفم أو تفتيت الحصى بالموجات الصوتية ، غير أن الطريقة الأكثر انتشارا تكون بإزالة الغدة اللعابية الكامل جراحيا. إن استخدام المنظار في علاج الغدد اللعابية له فوائد عديدة منها أنه أقل ضررا من الجراحة التقليدية، وكذلك يمكن مشاهدة القنوات اللعابية بشكل واضح، وبواسطتها يمكن ازالة الحصى بواسطة سلة مخصصة لهذا الغرض. ويستخدم منظار الغدد اللعابية للتشخيص والعلاج في آن واحد حسب المعطيات السريرية. هذه الطريقة يمكن ان يتم اجراؤها في جناح العناية اليومية والعيادة الخارجية تحت التخدير الموضعي.

مفتاح الكلمات: حصي الغدد اللعابية، منظار الغدد اللعابية، الغدد اللعابية.

ABSTRACT: Sialendoscopy is one of the innovations introduced in the last few years in the field of otolaryngology, head and neck surgery. Sialolithiasis and sialadenitis are two of the most frequently presenting disorders of the salivary glands. The diagnosis is most frequently confirmed by radiology and the treatment of sialolithiasis ranges from the use of surgery, intra-oral extraction or external lithotripsy, to the more frequent external excision of the gland. Sialendoscopy uses minimal invasive surgical techniques which allows for optical exploration of the salivary ductal system and extraction of the stones by a basket under endoscopic view. Sialendoscopy incorporates diagnostic with therapeutic procedures, as dictated by the clinical findings. This technique can be performed in most cases as an ambulatory, outpatient procedure under local anaesthesia.

Keywords: Sialolithiasis; Sialendoscopy; Salivary glands

SIALOLITHIASIS, THE FORMATION OF STONES in the salivary gland, results in a mechanical obstruction of the salivary duct, causing recurrent glandular swellings during meals which are transitory, or complicated by bacterial infections accompanied by fever, purulent discharge at the papilla, and painful glandular swelling. Salivary stones occasionally form in a salivary gland or duct, usually by deposition of calcium salts around a nidus of organic material, and have a layered microscopic structure.

In contrast to urolithiasis and cholelithiasis, the aetiology of sialolithiasis is unknown.¹ and various hypotheses have been proposed.^{2,3} Salivary stones can be either solitary or multiple, particularly in the parotid gland. They vary in size and shape, being either round or irregular [Figure 1]. They can either

float in the lumen, or become partially fixed due to an irregular shape, or even attach to the ductal wall. A less frequent diagnosis is intraductal stenosis, which might be localised [Figure 2], or diffuse on a portion of the main duct. Sialolithiasis is estimated to affect 1:10–20,000⁴ and the incidental ratio of submandibular/parotid is described as 90/10, but in the Geneva experience is a ratio of 60/40; this difference is possibly explained by the sensitivity of the new detection methods, and local recruitment.^{5,6}

In the classical approach, distal stones close to the papilla are simply extracted,⁷ whereas glandular resection is indicated for deeply located stones. In submandibular glands, sialolithiasis surgery still represents 70–90% of all actual indications⁸ for surgery, which may carry a risk of facial nerve injury.⁹ Parotidectomy is rarely performed for

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Figure 1: Salivary stones can be unique or multiple and vary in size and shape, and be either round or irregular as demonstrated in this endoscopic view



Figure 2: Endoscopic view of a concentric stenosis in the second branch of Stensen's duct as shown by sialendoscopy

inflammatory conditions in parotid glands, because it remains a tedious procedure and involves a higher incidence of postoperative paresis.¹⁰

A possible reason for this high rate of submandibular resections might be the common belief that a gland suffering from long standing sialolithiasis is no longer functional. In a clinical-histopathological study on 48 patients afflicted with sialolithiasis and treated with glandular resection, half of the patients had subnormal histology patterns, and there was no correlation between the number of infectious episodes and the alteration of the gland.¹¹ Therefore, numerous infectious episodes or a long duration of symptoms cannot be used to predict the degree of glandular alteration, and thus a minimally invasive approach towards sialolithiasis appears justified.

Several new techniques have been developed since 1990 to fragment sialoliths such as extracorporeal lithotripsy.¹² Success rates for extracorporeal lithotripsy vary from 40–75% for the submandibular and parotid glands, respectively. Performed on an outpatient basis, this technique is now widely practised, but often requires multiple sessions. The main problem remains the clearance of fragments, which can be incomplete and could become the cause of recurrent sialolithiasis. The classical investigation methods of salivary glands are radiography, including X-rays, ultrasound and computed tomography scans and sialography.¹³ Ultrasound remains an excellent primary diagnostic method for the detection of salivary stones; however,

calculi with a size less than 3 mm can hardly be visualised.¹⁴ Another new non-invasive diagnostic option is nuclear magnetic resonance tomography, which provides scans of the salivary ducts by opacification of the natural salivary pathway without the need for administration of contrast medium and without exposing the patient to ionising irradiation.⁵ These procedures aim to visualise the ductal system for the diagnosis of obstructive pathologies, typically stones or other rarer diseases.

Sialendoscopy is a new procedure, aiming to visualise the lumen of the salivary ducts and their pathologies. The first reported attempts to visualise the ducts were conducted in the early 1990s.^{15,16} Major advances in optical technologies and the development of semirigid sialendoscopies are responsible for significant progress in salivary gland endoscopy.¹⁷ This procedure, by allowing the complete exploration of the salivary ductal system, is positioned to replace sialography and other radiological studies¹⁵ because of its higher specificity and cost-effectiveness. Patients with suspected sialolithiasis comprise the major population for whom sialendoscopy is indicated. This technique can be performed in most cases as an ambulatory, outpatient procedure¹⁸ with advantages of no scar, elimination of facial nerve paralysis of the marginal mandibular branch, and lower morbidity, especially for older patients with co-occurring disorders.

They are two types of sialendoscopy, diagnostic and interventional. The diagnostic and

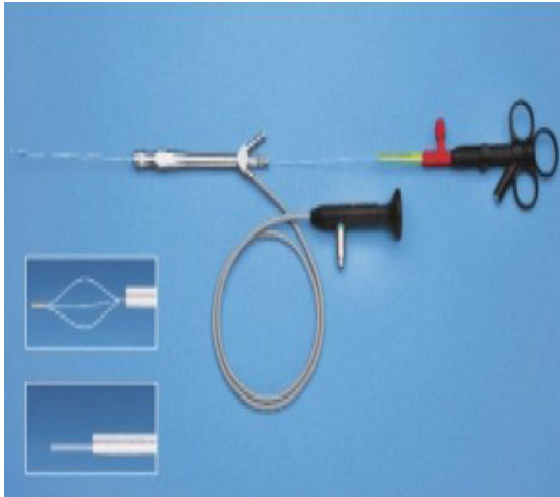


Figure 3: Diagnostic and interventional Marchal sialendoscope (inset – wire basket and laser fibre)

interventional sialendoscope (1.33 mm² surface, 1.3 mm diameter) [Figure 3] provides excellent vision and is recommended both for diagnostic and interventional procedures as it has a rinsing channel as well as a working channel. Recently new generations of all-in-one endoscopes became available to be used for the same purposes.

Diagnostic Sialendoscopy

The endoscopic technique described^{19,20} allows almost complete exploration of the ductal system (main duct, secondary and tertiary branches) [Figure 4], mainly because of the small diameter of the scopes (0.9 and 1.3 mm). Diagnostic sialendoscopy was used to classify ductal lesions into sialolithiasis, stenosis, sialodochitis, and polyps. Over the last 1,000 endoscopies performed, diagnostic sialendoscopy could be achieved in 98% of cases and reduced the need for radiological investigations. Rare limitations include convoluted sections that are impassable with a rigid endoscope.^{18,1} Mobility of the endoscope is also limited at the distal end of the gland. Diagnostic findings showed that mucous plugs are found in cases of sialolithiasis and also in cases of Sjögren syndrome and in several cases of chronic parotitis in children [Figure 5].



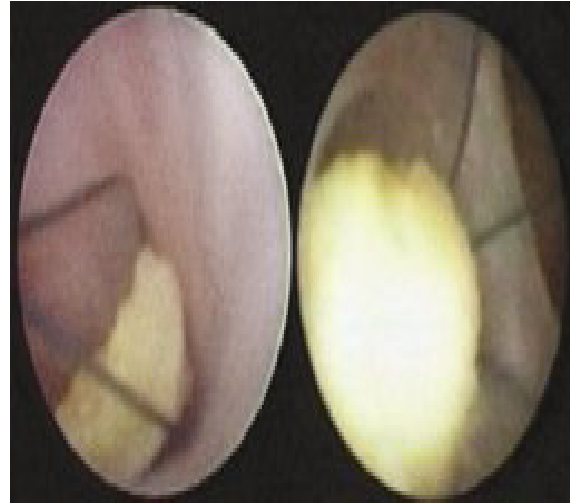
Figure 4: Endoscopic view shows the salivary ductal system (main duct, secondary and tertiary branches)

Interventional Sialendoscopy

Interventional sialendoscopy is used to treat disorders discovered during diagnostic sialendoscopy. The attitude is the same for the submandibular and parotid glands,¹ although the diameter of the ductal system is smaller in the parotid duct. For small stones less than 4 mm in diameter in submandibular cases and less than 3 mm for parotid cases [Figure 6], extraction is performed with custom designed wire baskets of various sizes [Figure 7]. In cases of bigger stones, *a priori* fragmentation is necessary, using a laser system [Figure 8], or possibly an extracorporeal lithotripter. Stenoses are treated with metallic dilators or with balloon catheters. All these techniques of fragmentation and stone retrieval are performed under endoscopic control, as described by others.²¹ We do not recommend the “semi-blind” technique, consisting of introducing the basket after the removal of the optic fibre, because of its lack of precision and the potential danger of perforation. In recent published studies, the overall success rates were above 85%.^{17,1,22} It is important to keep in mind that a combined endoscopic-external approach may be required in cases with larger size stones especially the ones positioned deeper in the salivary ducts and not easily retrievable or fragmented by laser.



Figure 5: Endoscopic view demonstrates the presence of a mucosal plug in a salivary gland ductal system



Figures 6: Stone being removed by use of a wire basket

Technique Indications and Contraindications

The indications for sialendoscopy are all salivary gland swellings of unclear origin.²³ There are no specific contraindications, mostly because sialendoscopy is a minimally invasive outpatient procedure performed under local anaesthesia. All ages can benefit from this technique.^{24,3}

The interventional sialendoscopy is a technically challenging procedure. Operating the rigid sialendoscope is delicate, requires experience and might be hazardous due to the theoretical risks of perforation and vascular or neural damage. Progression in the canal should be performed only under adequate vision. Perforations of iatrogenic origin can lead to diffuse swellings of the floor of mouth, with potential risks of life-threatening swellings.

Operative Technique

Sialendoscopy can be done as an outpatient procedure with the patient sitting in a chair or partially recumbent. Anaesthesia is purely local, but occasionally general anaesthesia (GA) may be required for some cases. Progressive dilatation of the papilla is performed with salivary sounds of progressively larger diameters. Endoscopy is performed with progressive endoluminal irrigation using a local anaesthetic solution and, if GA is administered, irrigation is performed using normal saline solution.

Limitations

The writhing course of the canal puts certain limitations on semi-rigid endoscopy, especially in cases of sharply bent curvatures. Also, manoeuvring within the small salivary ducts has to be absolutely atraumatic because of possible ductal perforation of yet uncertain consequences. Significant trauma to the ductal wall could result in later stenosis. Marsupialisation of the ductal papillae should either be completely avoided, or kept as small as possible to prevent retrograde passage of air and aliments.

Efficacy

In the reviewed literature, the procedural success rate of sialendoscopy (resolution of obstruction) ranged from 82% (90/110)²⁵ to 87% (47/54).²⁶ In a study of 72 patients, 8% (n = 6) had clinical or subjective problems which did not improve after the procedure and required removal of the gland. In another study of 129 patients, 110 of whom underwent interventional sialendoscopy, sialendoscopy treatment in 18% (n = 20) of patients was considered a failure, with five patients requiring gland resection.²⁵ Recurrence of obstructive symptoms were reported in two other studies with rates of 2% (4/236)²⁷ and 5% (3/55),¹⁷ respectively. All recurrences occurred between 15 and 24 months after the procedure.



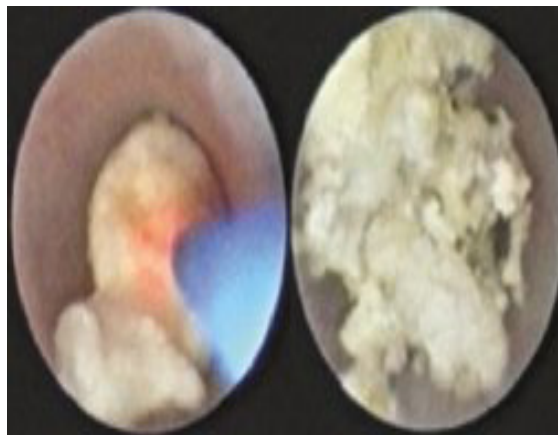
Figure 7: Wire basket for endoscopy

Safety

Few complications were reported in the reviewed literature. The most common complication reported by patients following sialendoscopy was temporary swelling of the gland. In one study of 129 patients,²⁵ ductal wall perforation occurred in 11 patients (9%), with two of these patients requiring hospitalisation and one patient undergoing gland resection. Three other studies reported cases of perforation with an incidence of 3/55,¹⁷ 1/103,²⁸ 1/236²⁷ respectively. One patient (1/236) suffered from lingual nerve paraesthesia caused by the perforation, and ductal strictures were also reported in seven patients in a case series study of 236 patients.²⁷ Five of these underwent successful dilatation with two requiring further surgery. Other complications included wire basket blockages, infection and ductal avulsion.

Conclusion

As the most frequent ductal pathology is sialolithiasis, interventional sialendoscopy aims to retrieve salivary stones following their fragmentation and allows almost complete exploration of the ductal system (main duct, secondary and tertiary branches), mainly because of the small diameter of the scopes (0.9 and 1.3 mm).¹⁸ Diagnostic sialendoscopy is a low morbidity minimally invasive technique, which becomes the investigational procedure of choice for salivary duct pathologies in all ages and especially in elderly patients with concurrent diseases. Interventional sialendoscopy allows the treatment of sialolithiasis and stenosis, and help therefore to prevent salivary gland excisions and to minimise postoperative



Figures 8: View of bigger stones in the salivary ducts, which required fragmentation using a laser system prior to removal.

complications. Finally, it should be noted that in the early phases of sequential learning complications rates are significant. However, major complications are infrequent and in general can be rectified by standard salivary gland surgery.²⁹

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