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RETROSPECTIVE STUDY

Sialendoscopy in treatment of obstructive sialadenitis

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ABSTRACT

OBJECTIVES: Sialendoscopy is a relatively new mini-invasive method that allows direct visualisation and intervention in the salivary gland ductal system. The aim of the study was to evaluate the results of sialendoscopy in the treatment of obstructive sialadenitis.

MATERIALS AND METHODS: This is a 15-year retrospective study analysing the treatment results of patients treated in the period of 2007–2022 at the Department of Oral and Maxillofacial Surgery, Comenius University Bratislava, Slovakia.

RESULTS: The total number of performed sialendoscopies was 70, of which 44 (62.9 %) were performed on the submandibular gland and 26 (37.1 %) on the parotid gland; 46 procedures (65.7 %) were performed via natural ductal system opening without the need for surgical assistance while 24 sialendoscopies (34.3 %) required surgical assistance. The most frequent perioperative findings were the sialoliths (37) in quantities ranging from one to four. Non-calculi pathologies (23) included mucous plugs, strictures, plaque, erythema or foreign bodies. No pathology was found on 10 sialendoscopies. In 82 % (n = 55) of patients, sialendoscopy prevented the salivary gland from being excised. In 18 % (n = 12) of cases, sialendoscopy findings indicated that salivary gland excision was needed.

CONCLUSION: The study acknowledges the significant benefit of sialendoscopy in the treatment of obstructive sialadenitis *(Tab. 3, Fig. 6, Ref. 39)*. Text in PDF *www.elis.sk*

KEY WORDS: sialendoscopy, sialadenitis, duct obstruction, sialolith, minimally invasive surgery.

Introduction

Obstructive salivary gland disease is characterised by the history of recurrent pain and swelling of the gland. It is the most common non-neoplastic salivary disorder and may be caused by calculi, ductal stenosis, fibromucinous plugs, foreign bodies, or anatomical variants of the ductal system (1). The submandibular gland is involved in 80–90 % of cases, the parotid gland is involved in 5–10 % of cases, while the involvement of the sublingual gland is rare. Sialolithiasis occurs when a calcified mass develops within the salivary duct due to anatomical and pathological factors (2–5). A spontaneous stone extrusion may occur through the papilla. If this does not happen, the salivary flow can be affected, resulting in a partial or complete blockage. Insufficient salivary flow may lead to ascending salivary duct infection (6).

The initial conservative treatment for chronic or recurrent sialadenitis includes adequate oral hydration, gland massage, sialagogues, and antibiotics in cases of infection (7–9). Sialadenectomy is the treatment of last resort due to its associated risk of neurological, aesthetic, and functional complications (6). The complications include the risk of the facial, lingual, and hypoglossal nerves being injured (10).

Sialendoscopy is a relatively new mini-invasive method for direct visualisation of the salivary gland ductal system. This method allows both diagnosis and treatment of non-neoplastic salivary gland ductal pathologies (11–13). Since the first publications on sialendoscopy by Katz (14) and Gundlach (15), sialendoscopy went through a considerable technological development. The first article about distal ductal stone extraction that was performed blindly during sialography using a wire basket was published in 1991 (16). Technological advance allowed endoscopic extraction of sialoliths under direct endoscopic visualisation (17, 18). The efficacy rate in alleviating patients' symptoms ranges from 85 % to 90 % (19–21). Sialendoscopy has been proven to be a safe procedure that can avoid complications associated with classical sialadenectomy (6).

The aim of this study was to review a 15-year-long practice of utilizing sialendoscopy at the Department of Oral and Maxillofacial Surgery, Comenius University Bratislava, Slovakia. The specific aims of the study were to evaluate the success rate of sialendoscopy in treating patients with obstructive sialadenitis, to analyse factors involved in failures of sialendoscopy, and to present experience regarding the management of obstructive sialadenitis treated with this procedure.

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Materials and methods

This is a 15-year retrospective study analysing patients treated in the period of 2007–2022. All sialendoscopies were performed under general anaesthesia with nasotracheal intubation. Sialendoscopy was performed by a rigid Karl Storz sialendoscope (prof. Marschal sialendoscope, outer diameter of 1.0 mm, working channel length of 160 mm, diagnostic and interventional endoscopic outer sheaths diameters of 1.3 and 2.2 mm). The endoscope was inserted into the ductal system after dilating the papilla with salivary probes. When the method via the natural papillary duct was shown to be unsuccessful, an incision of the salivary duct behind the papilla was performed. The endoscope was inserted into the ductal system (Figs 1, 2, 3). The ductal system was irrigated with saline solution, the stones were extracted with wire baskets or grasping forceps (Figs 4, 5) and stenoses were dilated by dilatation balloons. If no calculi were identified, the ductal system was irrigated with saline solution while the dexamethasone solution was applied in cases of inflammatory changes at the end of the procedure.

Collected were the data on age, sex, surgical indication, duration of symptoms, imaging details, perioperative findings, endoscopic access (*per vias naturales* or by duct incision), operative time and postoperative evaluation. The standard follow-up was carried out one week after surgery and afterwards in 1, 3 and 6 months, and in 1 year after intervention. All collected data were entered into Microsoft Excel and statistically evaluated using RStudio and Microsoft Excel.

Informed consent was obtained from all participants of the study. The study was approved by Ethics Committee of University Hospital Bratislava Ružinov.

Results

In total, 70 sialendoscopies were carried out on 64 patients, while 6 patients underwent sialendoscopy twice; 49 patients were female and 21 were male. Age at the time of surgery ranged from 15 to 68 years (mean 42 years). There were 44 (62.9 %) and 26 (37.1 %) sialendoscopies performed on the submandibular gland and parotid gland, respectively. Before the procedure, the patients

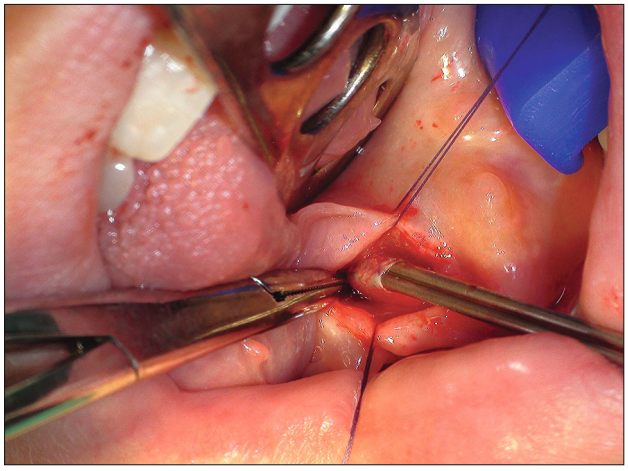

Fig. 1. Ductal cut-down.

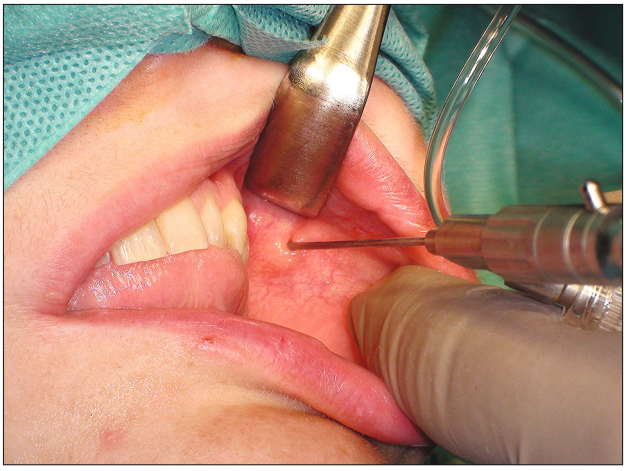

Fig. 3. Sialendoscopy via Stensen's duct.

Fig. 2. Sialendoscopy via natural ductal opening.

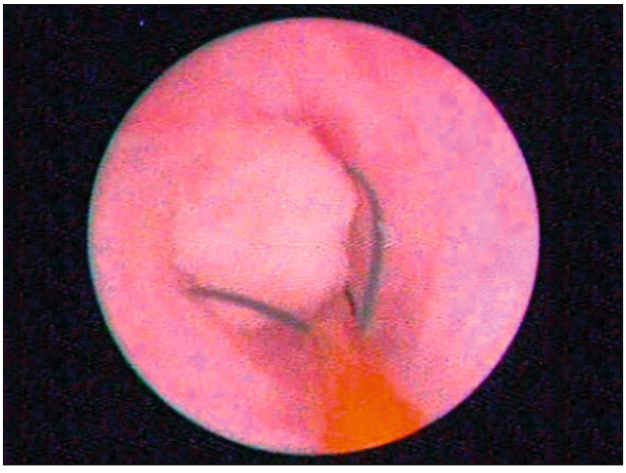

Fig. 4. Mucous plug extraction using a wire basket.

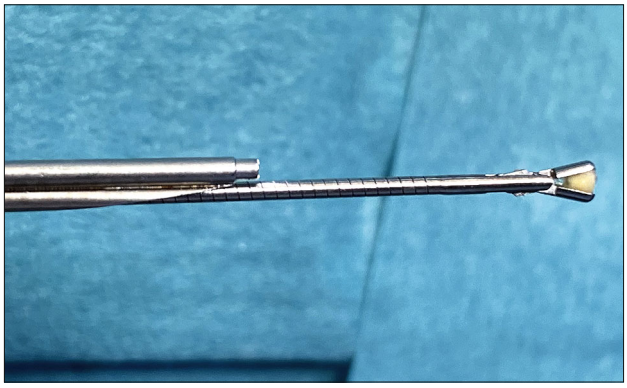

Fig. 5. Endoscopic sialolith removal using forceps.

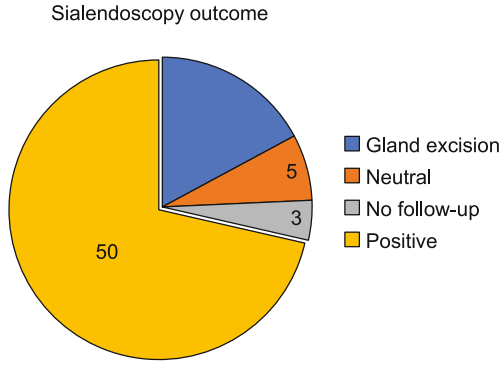

Fig. 6. Sialendoscopy outcome.

underwent X-ray imaging (OPG, CBCT), USG and MRI. Overall, 46 procedures (65.7 %) were performed via natural ductal system without the need of surgical assistance, while 24 sialendoscopies (34,3%) required surgical intervention allowing for the insertion of the sialendoscope into the ductal system (incision, opening after sialolithotomy or ductal cut-down) (Fig. 1). No sialendoscopies were performed with an assistance of an extraoral surgical intervention. The most frequent perioperative findings were the sialoliths (n = 37) in quantities ranging from one to four (Fig. 5). Non-calculi pathologies (n = 23) included mucous plugs (Fig. 4), strictures, plaque, erythema or foreign bodies. No pathology was found on 10 sialendoscopies. Ultrasonography was able to identify sialoliths in only 22 cases prior to sialendoscopy from the total number of 37 sialoliths findings (59.45 %). The use of sialendoscopy prevented sialadenectomy in 82 % (n = 55) of patients. There was a positive outcome and alleviation of symptoms in 50 patients (7 1%). During the follow-up period, 35 patients were symptom-free, while14 patients presented with minimal symptoms. In 5 patients (7 %), the outcome was neutral, i.e., the patients reported neither improvement nor worsening of the symptoms, and salivary gland excision was not necessary. In 12 patients (18 %), gland excision was necessary even after the sialendoscopy and was performed in range of 0 to 48 months after sialendoscopy. Three patients had no follow-up (Fig. 6).

Tab. 1. Numbers of gland excisions in correlation to salivary gland type.

Outcome	Parotid	Submandibular	Total
Gland excision	3	9	12
Neutral	2	3	5
Positive	22	28	50
Total	27	40	67

Tab. 2. Endoscopic approach type in correlation to salivary gland type.

Endoscopic approach	Parotid	Submandibular	Total
Via incision	4	20	24
Vias naturales	23	23	46
Total	27	43	70

Tab. 3. Duration of symptoms in correlation with sialendoscopy outcome.

Outcome	Duration of symptoms		Total
	Less than a year	Over a year	
Gland excision	7	3	10
Neutral	1	4	5
Positive	22	22	44
Total	30	29	59

In 58 patients with a pathological finding, there were differences between the success rates in the sialolith group and non-calculi obstruction group. The Fisher´s exact test was used (because of low number of neutral outcomes, p = 0.429). There were no statistically significant differences found between sialolith and non-calculi obstruction patients. In 67 patients who had been followed up, no statistically significant differences were found between the outcomes on *glandula parotis* and *glandula submandibularis* (Fisher exact test, p = 0.472) (Tab. 1).

The difference in rates of the necessity to involve surgical assistance in sialendoscopy of glandula parotis (15 %; n = 4) as opposed to glandula submandibularis (47 %; n = 20) was significant (Chi squared test; p = 0.007) (Tab. 2).

The mean operation time was 59.87 minutes (SD = 17.73). In patients with a positive sialendoscopy outcome, the mean operation time was 57.86 minutes (SD = 16.7). In patients, who required gland excision later on, the mean sialendoscopy duration was 67.33 minutes (SD = 19.66). The Kruskal–Wallis test was used with a borderline statistically insignificant result (p = 0.079).

Among 59 patients with follow-up documentation, there was no statistically significant difference found between the outcomes of patients in correlation with the duration of symptoms (less than 1 year vs over 1 year since sialendoscopy). Fisher´s exact test was used (p = 0.194) (Tab. 3).

Discussion

Standard treatment of chronic sialadenitis relies often on sialadenectomy which is connected to a potential risk of surgical complications such as nerve injury (facial, lingual and hypoglossal nerve), wound infection and salivary fistula. Obstructive salivary

gland disease manifests mostly as swelling, tenderness, pain and discomfort that is amplified during salivary stimulation.

As reported in the literature (2, 22–25), the primary causes of obstructive sialadenitis are sialoliths, mucous plugs, kinks, strictures, polyps and foreign bodies. Obstructive sialadenitis is the most frequent non-neoplastic disorder of the salivary glands with salivary stones being responsible for about 50 % of major salivary glands diseases. The submandibular gland, parotid gland and sublingual gland are involved in 80 to 95 %, 5 to 20 % and 2 % of all cases with salivary stones, respectively (2). The incidence rates of sialolithiasis in studies conducted by Koch et al and Nahlieli et al (22, 23) were 60 to 70 % and 79 %, respectively. Accordingly, the reported incidence of strictures was 12 % in a large study by Nahlieli et al, 19.7 % in a study by Papadaki et al and 25.9 % in a study by Ardekian et al (22–25). The other most common causes of obstruction were mucoid debris, foreign bodies, and anatomical variations of the duct.

The incidence of sialolithiasis in the study of Moorthy et al was 51 % (submandibular gland accounting for 84.2 % of cases), and incidence of strictures was 35 % (parotid gland accounting for 80.7 % of cases) (26). The incidence of strictures in this study was noticeably higher in comparison to that reported in previous literature.

Minimally invasive treatment options have replaced the invasive resection of the affected salivary gland in the management of obstructive sialadenitis and significantly altered the prognosis of patients with these diseases (27). Witt et al emphasized the need for flexibility in surgical indications while challenging the dogma of ‘‘all endoscopic’’ management. Thus, even if the results of sialendoscopy are good, this technique has its own complications and failures (26, 28–31).

Sialoliths in the anterior part of the Wharton’s or Stensen’s duct can easily be reached by using conventional methods, but in the area where the duct turns inferiorly at the mylohyoid muscle, it is advised to use the endoscopic technique in order to retrieve the obstruction. Open surgery in this region is extremely dangerous because of its proximity to the lingual nerve (32).

Although transoral surgical calculi removal is described as a possible treatment option for parotid stones (33), duct strictures were described after these procedures (22).

Eighty percent of papillary strictures are due to scarring after transoral surgical calculi removal. For this reason, thought is to be given to calculi in the parotid duct, which means that greater efforts are made to mobilize, fragment, and extract a parotid stone with drill, basket, mini-forceps, or ESWL (34).

Chuan-Bin Wu presented successful results in the treatment of chronic obstructive parotitis of 31 patients (35). Endoscopy-assisted dilatation and irrigation of the ducts were commonly used. Mucous plugs and debris were flashed out by massive irrigation. Stones were removed using stone retrieval wire basket. Pace et al published a success rate of sialendoscopy of 84 % (36).

Studies by Pace et al reported complete resolution of symptoms in 87.5 % of their patients at the 6-month review (36). Long-term follow-up (mean, 98.48 months) data reported by Koch et al also showed complete resolution in 50 % of their patients and general improvement in 76.8 % after sialendoscopy. The study of Galdermans et al extracted data from 13 published trials conducted on a total of 1,285 patients with parotid salivary stones. The success rates of sialendoscopy ranged from 71.4 to 100 % (37).

The authors of this paper confirmed an alleviation of symptoms and presented a success rate up to 83 %. Atienza et al concluded that the necessity of sialoadenectomy after sialendoscopy ranged from 0–24 % (3).

Considering the long-term follow-up of patients who underwent sialendoscopy in this study, out of the total number of patients who ended up with sialadenectomy (n = 12), 6, 3 and 3 patients had their salivary gland excised within 6, 12 and 48 months after sialendoscopy, respectively. The success rate of sialendoscopy in this study within a 6-month follow-up was 91.4 %. This short period of follow-up may lead to misinterpretation of the results, which is why authors recommend longer, i.e., 12- to 24-month follow-up periods.

These results support the disclosure that sialendoscopy should be more commonly used in the treatment of chronic obstructive sialadenitis. Experience and literature data indicate that sialendoscopy has an important role as a treatment modality in obstructive sialadenitis.

Disease chronicity might eventually lead to severe chronic inflammatory changes with fibrosis of the ducts and a much less favourable long-term result of sialendoscopy. Early intervention might possibly improve the outcome. Thus, a shorter period of conservative management before considering intervention might be appropriate (38).

Obstructive salivary gland pathology usually resonates with some practitioners as sialolithiasis. However, in the absence of salivary stones, the obstructive symptoms do not tend to be investigated further. Because of distinct pathologies seen in the submandibular and parotid glands, the knowledge of each is vital. Sialendoscopy is found to be an effective investigative tool and treatment modality with minimal morbidity as compared to conventional methods (26).

Authors believe this study will influence the treatment of obstructive salivary gland diseases in other departments as it happened in Denmark, where the introduction of sialendoscopy as a standard procedure in obstructive sialadenitis treatment resulted in a decrease in the necessity of salivary gland excision by26% (39).

Presented results support the notion published in literature, namely that sialendoscopy is an effective method in the treatment of obstructive sialadenitis and suggest that this method should be more commonly utilized.

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