



A Comprehensive Study of Combined Approach Sialendoscopy in Managing Salivary Gland Sialolithiasis

Original Investigation

✉ Milind Navalakhe, ✉ Monankita Sharma, ✉ Anoushka Sahai,
✉ Mruganayani Jadhav, ✉ Pooja Shriwastav, ✉ Ashwini Janerao

King Edward Memorial Hospital Seth Gordhandas Sunderdas Medical College, Clinic of Otorhinolaryngology, Maharashtra, India

Abstract

Objective: Obstructive salivary gland diseases were traditionally managed conservatively, with surgical treatment reserved for refractory cases only. These surgeries, ranging from papillotomy to sialadenectomy, often involved numerous complications. In the past two decades, sialendoscopy, a minimally invasive technique, has made tremendous progress due to its advantages. This study aims to describe the efficacy of combined approach sialendoscopy as a minimally invasive option for large-sized sialolithiasis that is not amenable to sialendoscopy alone.

Methods: It is an ambispective study of 12 patients over a span of 3.5 years at a tertiary care center conducted with all consenting patients who were treated with combined approach sialendoscopy. Ultrasonography and computed tomography of the patients was done. Therapeutic intervention in the form of combined approach sialendoscopy was done at the same sitting as diagnostic sialendoscopy and postoperative follow-up was conducted for a duration of six months.

Results: In this study of 12 patients undergoing sialendoscopy, glandular swelling was a universal presenting symptom, with 80% patients exhibiting meal-stimulated exacerbation and post-massage relief. Submandibular involvement predominated (83%), with parotid cases comprising the remainder. All patients had sialoliths >6 mm and underwent combined approach sialendoscopy, yielding a 100% immediate symptomatic resolution rate. Recurrence occurred in 16%, successfully managed with repeat sialendoscopy.

Conclusion: As endoscopy is integral to otorhinolaryngology, sialendoscopy represents the evolution of minimally invasive salivary gland surgery. This study highlights the different methods of combined approach sialendoscopy in managing larger as well as distally placed sialoliths, thus reinforcing its role as a superior gland-preserving modality.

Keywords: Sialolithiasis, sialendoscopy, salivary glands, minimally invasive surgical procedures, combined modality therapy

ORCID IDs of the authors:

M.N. 0009-0004-2854-7179
M.S. 0009-0006-4102-1678
A.S. 0009-0004-8923-4491
M.J. 0009-0004-7730-726X
P.S. 0009-0008-5916-7047
A.J. 0009-0009-8841-8201

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Corresponding Authors:

Monankita Sharma, MD, Milind Navalakhe MD;
drmonankita@gmail.com - drmilindn@gmail.com

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Introduction

Obstructive salivary gland diseases represent one half of the benign salivary gland diseases. Sialolithiasis is the most common cause of obstruction, affecting

almost 1.2% of the general population (1). The other causes of obstruction include strictures/stenosis of duct, juvenile recurrent parotitis or, post-radiotherapy duct stenosis, radioactive



iodine-induced stenosis, Sjögren's syndrome, ductal polyp, and foreign body. Prolonged ductal obstruction results in obstructive sialadenitis, characterized by symptoms such as pain and swelling around the involved gland, which worsen during meals and alleviate with massage. Other symptoms include pus discharge or passage of gritty substance in saliva. Recurrent attacks of sialadenitis can also be present (1,2).

Sialendoscopy is a minimally invasive technique which enables direct visualization of the duct lumen with a mini semi-rigid 0-degree sialendoscope as well as the management of the pathology in the ductal system. All major complications of traditional gland excision like facial or marginal mandibular nerve paralysis, Frey's syndrome, risk of salivary fistula are avoided and thereby morbidity rates are reduced greatly (1-4).

Combined approach sialendoscopy is the treatment of choice for larger sialolithiasis when other methods of stone fragmentation fail. In the case of the submandibular gland, the combined approach involves intraoral duct slitting, while for the parotid gland, it requires an external incision for stone retrieval after stone localization using sialendoscopy. While it tremendously increases the efficacy of sialendoscopic stone removal, it aids the functional recovery of the gland. This study aims to assess the efficacy of combined approach sialendoscopy as a minimally invasive, gland-preserving technique for the optimal management of large sialoliths that are not amenable to sialendoscopy alone.

Methods

An ambispective observational study was conducted at the department of ear, nose and throat (ENT) of a tertiary care center from January 2019 to June 2022 with all consenting patients with symptoms of obstructive sialadenitis and treated with combined approach sialendoscopy. The study received approval from the Institutional Ethics Committee (IEC)-III Relating To Biomedical And Health Research (BHR). [IEC (III)/OUT/39/2022] on 12 January 2022 with project number EC/100/2021 and was conducted in compliance with ethical standards. Informed consent was obtained from the patients using the format approved by the ethics committee.

Inclusion criteria: Patients clinically suffering from obstructive salivary gland disease and confirmed on radiology with a large sialolith (>6 mm in size) or a distally placed sialolith requiring a combined approach sialendoscopy.

Exclusion criteria: Acute sialadenitis, mumps, history of surgically treated salivary gland disease, salivary gland malignancies involving ductal parenchyma, other causes of obstructive salivary gland diseases like ductal strictures, stenosis, or mucous plugs, and previous treatment with conventional sialendoscopy.

After detailed ENT examination all patients underwent pre- and post-sialogogue ultrasonography followed by computed tomography (CT) scanning to identify the location of the sialolith. They were given a course of antibiotics preoperatively and then taken for sialendoscopic stone removal under general anaesthesia. Local infiltration was done using 2% lignocaine + 1:200000 adrenaline solution.

For sialendoscopy, the ostia of Wharton's duct or Stensen's duct was visualized under the operating microscope and serial dilation of the ostia was done using a conical dilator, followed by serial dilators gradually. A guide wire of 0.4 mm was introduced through the dilated ostia and a 1.3 mm diagnostic channel threaded over the guidewire, and then the guidewire was removed. Then the Marchal's semi-rigid sialendoscope was inserted and sialendoscopy was performed using continuous irrigation with diluted steroid solution. It has two channels (0.25 mm rinsing channel and 0.65 mm working channel). If a sialolith that is intractable to sialendoscopy alone was visualized, then the decision for a combined approach was taken.

Surgical Technique of Combined Approach Sialendoscopy

Submandibular duct sialolith: Localization of the sialolith is done via sialendoscopy followed by the insertion of a ductal dilator for continuous localization of the duct. External pressure is applied to elevate the gland towards the oral cavity. An intraoral incision is taken over the floor of the mouth at the localized site of the sialolith. The lingual nerve is identified and preserved during the dissection. Another

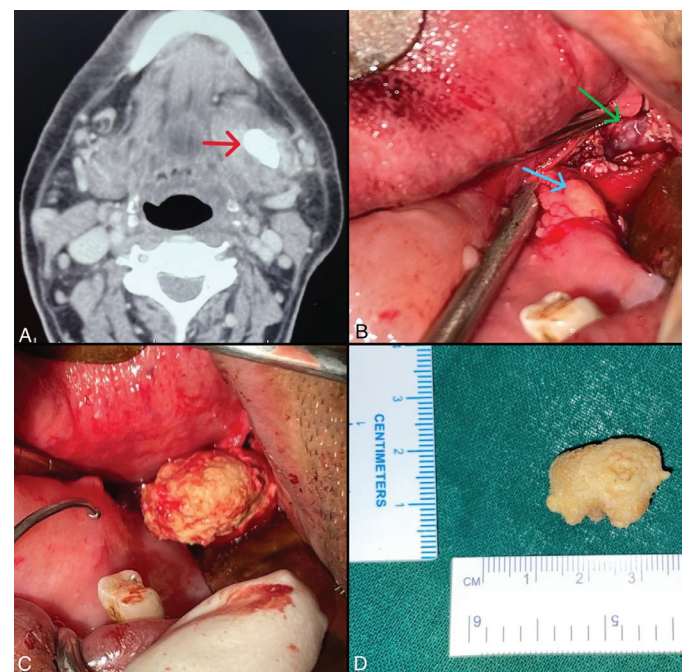


Figure 1. Combined approach submandibular duct sialendoscopy A. Red arrow: sialolith shown in proximal submandibular duct B. Green arrow: duct slitting incision, Blue arrow: lingual nerve C. Stone delivered through intraoral incision D. Calculus (2.5x1.5 cm)

incision is made over the duct, directly above the sialolith, to extract the stone (Figure 1). Subsequent distal sialendoscopy is performed to ensure complete removal of any additional stones or remnants. Repair of the Wharton's duct is done using Vicryl 3-0 round body sutures and followed by stenting of the duct. In some cases, duct marsupialization can also be done for proper salivary drainage, using Vicryl sutures as shown in Figure 2.

Parotid duct sialolith: Sialendoscopy is done using the Marchal sialendoscope to locate the stone, followed by the placement of a guide wire which is taped in-situ. A Modified Blair incision is made, and the flap is elevated until the parotid duct is visible. The scope is then advanced over the guide wire to enable external transillumination over the duct. An incision is made over the duct externally, and the stone is carefully extracted to avoid injuring facial nerve branches. Repeat sialendoscopy is performed to ensure complete removal of any additional stones or remnants. Stensen's duct is repaired using 3-0 (round body) Vicryl sutures through the external wound, and intraoral irrigation is done via the parotid duct papilla to check for leaks from the duct at the external site. After confirming the duct repair's integrity, the external skin incision is sutured, and a Minivac drain is placed for 7-10 days (Figure 3). In addition, intraoral stenting of the parotid duct is kept in place for 4-6 weeks to ensure proper healing.

All patients were postoperatively followed up for a duration of six months with history taking and clinical examination which were recorded in the case record forms.



Figure 2. Duct marsupialization of submandibular duct post sialendoscopic sialolith removal with duct slitting

Results

The patients had a mean age of 30 years with the majority being male (66.6%). Ten out of 12 patients had submandibular gland involvement whereas two had parotid sialolithiasis.

The presenting complaints of the patients were mostly swelling that increased in size when eating food and getting relieved with massage. A few patients (16.6%) complained of recurrent attacks of sialadenitis associated with acute pain, fever, and pus discharge from the duct papilla. The presenting symptoms of patients are summarized in Table 1.

Ultrasonography and CT scans were done in all patients for a comparative analysis of their sensitivity in detecting sialolithiasis. This revealed that CT scans exhibited a superior sensitivity in detecting calculi. Ultrasonography could diagnose 75% of the sialolithiasis patients while CT scan proved to be beneficial in all of the cases. Figure 4 shows a sialolith as seen on ultrasonography and CT scan.

In our study, a combined approach was employed for patients with larger stones (more than 6 mm), for whom fragmentation and sialendoscopic extraction of the stone was not feasible. The technique of combined approach followed in each case is given in Table 2.

In one patient with submandibular sialolithiasis with two calculi, the distal sialolith was successfully extracted in toto, while the proximal sialolith underwent strategic fragmentation and was meticulously cleared through saline irrigation.

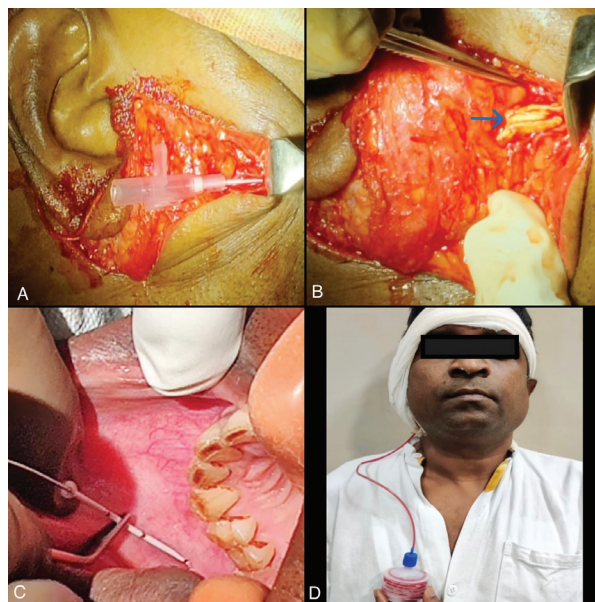
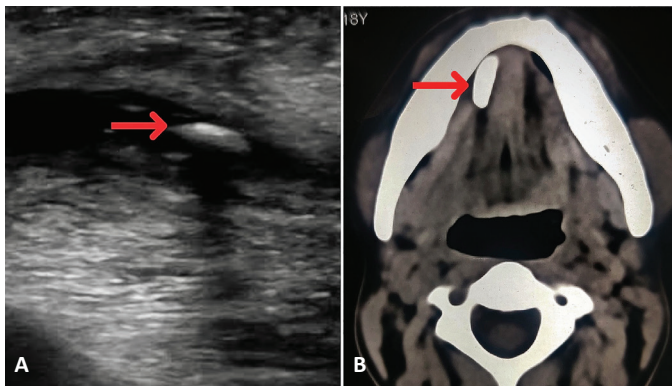


Figure 3. Combined approach parotid sialendoscopy A. Modified Blair incision with flap elevated and localization of duct (pink intravenous cannula was inserted in the parotid duct as a marker) B. Blue arrow: stone visualized through external incision C. Stenting of parotid duct D. Postoperative picture of patient with Minivac drain in-situ

Table 1. Presenting symptoms in patients with sialolithiasis of submandibular or parotid duct

Presenting symptoms	Submandibular		Parotid	
	No. of patients	Percentage	No. of patients	Percentage
H/o* swelling	10	100	2	100.00
Increase with meals	8	80	2	100
Decrease on massage	8	80	2	100
H/o pain	8	80	2	100
Recurrent attacks of sialadenitis	1	10	1	50
Passage of gritty material	1	10	1	50
Pus discharge in saliva	2	20	2	100

H/o*: History of


Figure 4. A. Sialoliths seen on ultrasonography with a dilated duct B. Sialolith seen in submandibular duct on CT scan

Post procedure stent was placed to maintain proper salivary flow in seven of the submandibular duct patients and the rest underwent duct marsupialization while in case of parotid duct all patients were stented. Almost all patients complained of mild pain and swelling in the first postoperative 24 hours that subsequently subsided with analgesics. Postoperative complications like long standing swelling, false passage, duct extirpation requiring emergency gland removal were not seen in any of the patients.

Following initial surgical intervention for submandibular sialolithiasis, recurrence of symptoms occurred after five months in one patient. This was managed with anti-inflammatory medication and antibiotics, followed by a repeat diagnostic sialendoscopy which revealed a mild ductal stenosis that was not diagnosed during the first procedure and no residual sialolith. Subsequently, the patient received weekly intraductal steroid injections for four weeks that lead to resolution of symptoms. On following up the patient for the next six months there was no further recurrence noted.

Another patient with parotid sialolithiasis experienced symptomatic recurrence six months post procedure. Repeat sialendoscopy unveiled residual intraductal debris, which was meticulously cleared through targeted irrigation with a diluted steroidal solution. The intervention resulted in

substantial symptomatic relief, reaffirming the efficacy of endoscopic management in recurrent sialolithiasis.

Discussion

Our study of 12 patients included chronic obstructive sialadenitis due to sialolithiasis which were all managed by sialendoscopy with a combined approach.

The age distribution of the patients in our study was highly variable without any specific pattern but the mean age was 30 years. Capaccio et al. (2), similarly, reported to have found the incidence peaks of obstructive salivary gland diseases to occur between 30-60 years of age. The most common indication for sialendoscopy in our study was sialolithiasis which is consistent with the study by Hald and Andreassen (3). The predominant clinical presentation among our patients was swelling of the affected gland region and intermittent pain exacerbated by food intake, referred to as “meal-time syndrome” (4).

Ultrasonography serves as a primary investigative tool for obstructive sialadenitis, accurately diagnosing most cases, including sialolithiasis (5). However, owing to its superior spatial resolution and sensitivity to calcification, CT is advantageous in acute sialadenitis and for detecting very small calculi. Unlike conventional sialography, which necessitates contrast dye injection, often associated with patient discomfort and potential sialolith dislodgement, CT imaging offers a non-invasive alternative that typically obviates the need for contrast agents, thereby enhancing patient safety (6). A preoperative CT was also helpful in surgical planning in cases where a combined approach would be required as it gives the exact location and orientation of the calculus (7). Magnetic resonance sialography is reserved for cases in which ultrasonography and CT yield inconclusive results in ductal pathology detection, offering excellent delineation of the ductal system (8). When radiology is inconclusive for chronic sialadenitis, diagnostic sialendoscopy is an excellent option. It allows for both identification and treatment of pathology in one procedure.

Table 2. Technique of combined approach undertaken for each case

Sl/no	Duct/Gland involved	Size of calculi	Location of calculi	Approach	Stenting
1	SMG	15x6 mm	Distally	Duct slitting and marsupialization	No
2	SMG	6.7x5 mm	Proximally	Duct slitting	Yes
3	P	12x5 mm	Distally	External incision	Yes
4	SMG	7x6 mm 3x2 mm	Distally Proximally	Duct slitting	Yes
5	SMG	7x3 mm	Distally (near ostium)	Duct slitting and marsupialization	No
6	SMG	6.5x3 mm	Proximally	Duct slitting	Yes
7	SMG	25x15 mm	Proximally	Duct Slitting	Yes
8	SMG	10x6 mm	Distally	Duct slitting	Yes
9	SMG	20x5 mm	Distally	Duct slitting and marsupialization	No
10	P	8x3 mm	Distally	External incision	Yes
11	SMG	14x5 mm	Distally	Duct slitting	Yes
12	SMG	8x4 mm	Distally	Duct slitting	Yes

SMG: Submandibular duct, P: Parotid duct

The traditional approach to obstructive salivary gland diseases that included sialadenectomy was associated with several postoperative complications like nerve injury, and loss of salivary gland function and was aesthetically unsatisfactory. Our minimally invasive approach of sialendoscopy prevented all such complications. Various instruments like burr, forceps, and Dormia's basket can be used for fragmentation and retrieval of the calculus during sialendoscopy. Alternative modalities such as extracorporeal or laser intraductal lithotripsy are often very costly, time-intensive, and carry a significant risk of residual stone fragments, rendering them suboptimal for the management of large sialoliths as encountered in our study (9).

In our study, the combined approach proved to be beneficial for the larger stones as they were not suitable for removal with conventional sialendoscopic intraductal techniques. Intraoral submandibular duct slitting is a viable option for submandibular duct calculi, with careful dissection to preserve the lingual nerve (10). Post procedure, the duct can be either stented or marsupialized. For larger calculi in the parotid duct, after localizing the calculus with sialendoscopy, an external incision is made, and a preauricular flap is raised to expose the parotid duct, facilitating external retrieval of the calculus. Such a technique of localizing the stone before external incision was described by McGurk et al. (8), a modified version of Nahlieli et al.'s (11) technique. The indications for the use of an external approach in cases of parotid duct stones were previously described by Nahlieli et al. (11) for stones positioned in the proximal one-third of Stensen's duct, in ducts with narrow diameter, stones larger than 5 mm, and for intraparenchymal stones (12). The use of a combined approach sialendoscopy helps in preserving the salivary glands and is thus superior to gland removal (13).

The success rate of combined approach sialendoscopy in our study was 100% with resolution of symptoms in the postoperative period, which can be compared to the 95% success rate in the review article on efficacy of combined approach submandibular sialolithiasis by Askoura et al. (14).

The two postoperative sequelae seen in most of our patients were swelling and pain within the initial 24 hours of surgery. Notably, swelling persisted beyond this timeframe in 50% of cases for which frequent self-massage was advised (15). It gradually resolved in all cases over the subsequent week. Other major complications like false passage or duct extirpation requiring emergency removal of the gland were not encountered in any of our patients.

Recurrence of symptoms was noted in two patients—one with submandibular and one with parotid sialolithiasis—who subsequently underwent successful repeat sialendoscopy at postoperative five and six months, respectively. This underscores the procedure's reproducibility without any contraindications (16).

Sialendoscopy is a minimally invasive surgery and greatly preferred over conventional sialadenectomy. It is a functionally superior procedure with lesser chances of neurological damage and much less morbidity.

The major drawbacks of this procedure are the high learning curve and the expensive setup it requires. Despite these limitations, sialendoscopy should be regarded as the primary approach for managing obstructive salivary gland diseases whenever it is available.

The strengths of this study lie in its comprehensive, stepwise protocol for performing combined approach sialendoscopy, offering valuable procedural guidance. However, a notable

limitation is the relatively small sample size, attributable to the paucity of patients presenting with large sialoliths exceeding 6 mm in size.

Conclusion

In the modern era of advanced endoscopic techniques, sialadenectomy for obstructive salivary gland pathology is obsolete. Sialendoscopy, being a minimally invasive technique, is functionally much superior and prevents major complications related to sialadenectomy. A combined approach sialendoscopy further broadens the scope in cases of larger and proximal sialoliths and is also helpful in cases where newer technologies like laser/lithotripsy are not feasible.

Ethics

Ethics Committee Approval: The study received approval from the Institutional Ethics Committee (IEC)-III Relating To Biomedical And Health Research (BHR). [IEC (III)/OUT/39/2022] on 12 January 2022 with project number EC/100/2021 and was conducted in compliance with ethical standards.

Informed Consent: Informed consent was obtained from the patients using the format approved by the ethics committee.

Footnotes

Authorship Contributions

Surgical and Medical Practices: M.N., M.S., A.S., Concept: M.N., Design: M.N., M.S., Data Collection and/ or Processing: A.S., M.J., P.S., A.J., Analysis and/or Interpretation: M.S., A.S., M.J., P.S., A.J., Literature Search: M.S., M.J., P.S., A.J., Writing: M.S.

Conflict of Interest: There is no conflict of interest to disclose.

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Main Points

- Obstructive salivary gland diseases represent half of the salivary gland diseases and sialolithiasis is the most common.
- Sialendoscopy has replaced conventional sialadenectomy in the management of sialolithiasis cases.
- Combined approach sialendoscopy broadens the scope of sialendoscopy manifold.
- This ambispective study describes the advantages of combined approach sialendoscopy achieved in 12 patients in a tertiary care center.

References

1. Bachalli PS, Moorthy A. Obstructive salivary gland disease and sialendoscopy. Bonanthaya K, Panneerselvam E, Manuel S,

- Kumar VV, Rai A, editors. Oral and Maxillofacial Surgery for the Clinician. Singapore: Springer; 2021. p. 975-80. [Crossref]
2. Capaccio P, Torretta S, Ottavian F, Sambataro G, Pignataro L. Modern management of obstructive salivary diseases. Acta Otorhinolaryngol Ital. 2007; 27: 161-72. [Crossref]
3. Hald J, Andreassen UK. Submandibular gland excision: short- and long-term complications. ORL J Otorhinolaryngol Relat Spec. 1994; 56: 87-91. [Crossref]
4. Scully C. Lumps and swellings in the salivary glands. Oral and Maxillofacial Medicine. 3rd ed. London: Churchill Livingstone; 2013. [Crossref]
5. Andretta M, Tregnaghi A, Prosenikiev V, Staffieri A. Current opinions in sialolithiasis diagnosis and treatment. Acta Otorhinolaryngol Ital. 2005; 25: 145-9. [Crossref]
6. Badash I, Raskin J, Pei M, Soldatova L, Rassekh C. Contemporary review of submandibular gland sialolithiasis and surgical management options. Cureus. 2022; 14: e28147. [Crossref]
7. Walvekar RR, Carrau RL, Schaitkin B. Endoscopic sialolith removal: orientation and shape as predictors of success. Am J Otolaryngol. 2009; 30: 153-6. [Crossref]
8. McGurk M, MacBean AD, Fan KF, Sproat C, Darwish C. Endoscopically assisted operative retrieval of parotid stones. Br J Oral Maxillofac Surg. 2006; 44: 157-60. [Crossref]
9. Konstantinidis I, Chatziavramidis A, Iakovou I. Combined Approaches in Sialolithiasis of Major Salivary Glands [Internet]. Salivary Glands - New Approaches in Diagnostics and Treatment. IntechOpen; 2019. Available from: <http://dx.doi.org/10.5772/intechopen.72308> [Crossref]
10. Koch M, Zenk J, Iro H. Algorithms for treatment of salivary gland obstructions. Otolaryngol Clin North Am. 2009; 42: 1173-92. [Crossref]
11. Nahlieli O, London D, Zagury A, Eliav E. Combined approach to impacted parotid stones. J Oral Maxillofac Surg. 2002; 60: 1418-23. [Crossref]
12. Kopeć T, Szyfter W, Wierzbicka M. Sialoendoscopy and combined approach for the management of salivary gland stones. Eur Arch Otorhinolaryngol. 2013; 270: 219-23. [Crossref]
13. Schwartz N, Hazkani I, Goshen S. Combined approach sialendoscopy for management of submandibular glandsialolithiasis. Am J Otolaryngol. 2015; 36: 632-5. [Crossref]
14. Askoura AM, Youssef TA, Elgabry PM, Nassif MM. Efficacy of combined sialendoscopic-assisted surgery in management of submandibular sialolithiasis: a systematic review. Egypt J Otolaryngol. 2023; 39: 91. [Crossref]
15. Marchal F, Becker M, Dulguerov P, Lehmann W. Interventional sialendoscopy. Laryngoscope. 2000; 110: 318-20. [Crossref]
16. Navalakhe MM, Ravi S, Kurup BS. Role of sialendoscopy in obstructive salivary gland diseases. Acta Biomedica Scientia. 2019; 6: 1-6. [Crossref]