Sialendoscopy: Introduction, Indications and Technique

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Introduction

Recent decades have been marked by clinical research in otolaryngology and head & neck surgery directed towards the concept of organ and function preservation. Morbidity in head and neck diseases has been greatly reduced with acceptance of conservation procedures and open surgical approaches are getting largely replaced with endoscopic ones, wherever possible.

Though there are more or less set treatment protocols for tumors of salivary glands, other pathologies like sialolithiasis and juvenile recurrent parotitis have been treated on arbitrary basis. Sialadenitis secondary to obstructive pathologies including sialoliths, strictures and ductal polyps, remains the most common disorder of the salivary gland [1–3]. Patients would receive sorts of treatment like antibiotics, steroids, sialogogues, anticholinergics or would undergo surgeries like intraoral incision and removal of the sialolith or even gland removal. Also, there were no answers to pathologies like ductal stenosis secondary to chronic inflammation.

Introduction of sialendoscope has brought in a paradigm shift in the management of these pathologies. This minimally invasive technique was first described by Katz and

Fritsch [4] in 1990s who used flexible endoscope for evaluation of salivary gland ducts. Since then, enhanced optical resolution and miniaturisation of instruments through various advances in technology has resulted in advanced techniques in sialendoscopy. Otolaryngologists and some other clinicians including oral surgeons at certain centres pioneered this speciality and have propagated the philosophy through structured training programmes. Sialendoscopy has emerged as a preferred diagnostic as well as therapeutic tool for management of salivary gland pathologies and has helped significantly reduce the morbidity, loss of work hours and hospital stay. Though a lot of research is still going on in this field, but a set of indications and techniques have evolved over a period of time.

Principle

When we deal with inflammation of salivary glands due to obstructive pathology in duct like calculus and stricture, we need to understand that the cause lies in the duct and symptoms are due to stasis of saliva and secondary infection. Sialendoscopy addresses the ductal pathology leading to resolution of gland pathology. This duct centric rather than gland centric approach is the defining feature of this intervention. This is akin to certain cases of sinusitis where symptoms of sinusitis are secondary to anatomical or pathological obstruction at the level of osteomeatal complex.

Advantages of Sialendoscopy

Sialendoscopy is a good diagnostic tool for ductal pathology and unlike other radiological procedures findings of sialendoscopy correlate fairly with the symptomatology.

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Sialendoscopy can be used both for diagnostic as well as therapeutic purposes and very often it can be done in a single sitting. Though it is also an invasive procedure, morbidity associated with sialendoscopy is mostly minor and that too most of the time is temporary.

Instrument: Sialendoscope

Sialendoscope in common use today is a semi rigid endoscope with a zero degree viewing angle, and a certain degree of flexibility (about 45°) so as to provide manoeuvrability through the delicate salivary ductal system. They are available as diagnostic scopes and as therapeutic scopes which have a parallel channel to pass instrument like forceps, wire basket, micro drill and laser fibre. Sialendoscopes are now available in different diameters ranging from 0.9 to 1.6 mm. Number of miniature instruments are available for use with sialendoscopes including grasping forceps, biopsy forceps, micro drills, wire baskets, high pressure balloon dilators and guide wires. More details about the sialendoscope and other instruments used in the procedure is beyond the scope of this introductory article (Fig. 1) (Courtsey Karl Storz).

Indications

Currently, sialendoscope is being most commonly used for removing submandibular and parotid duct calculi which is the most common obstructive pathology affecting the salivary glands [1–3].

Earlier, salivary duct stones were being managed surgically, either by removing the entire salivary gland or by marsupializing the duct and removal of the stone. But Stenson's duct stones were a real challenge. Though parotidectomy was advised for treatment of parotid stones, it was rarely performed, due to inherent risk of facial nerve injury. Thus most of these patients used to remain untreated and would suffer from recurrent parotitis. Sialendoscope has brought a paradigm shift in management of parotid duct stones. Smaller stones can be removed through the sialendoscope itself. Larger stones can either be broken down with extracorporeal shockwave lithotripsy (ESWL) or with laser fiber passed through the scope (intracorporeal lithotripsy). Alternatively these larger stones can be removed with combined approach (sialendoscope guided external approach).

Juvenile recurrent parotitis (JRP) is recurrent inflammatory condition of the parotid glands affecting the paediatric population, with unknown aetiology. Sialendoscopy in these patients helps in understanding the pathology,

ruling out any localized cause and it has a therapeutic role also. Steroids which are being used systemically for this pathology can now be delivered directly to the desired site, through the scope. This increases the efficacy and reduces the systemic side effects of the steroid treatment, reflecting in overall improved control and/or cure rate.

Ductal strictures which may be secondary to ductal calculus can be very effectively treated with the help of sialendoscopes. Sialendoscopy helps in direct and precise evaluation of the nature, site and length of the ductal strictures and consequently the optimal intervention.

Sialendoscopy is being used to better understand the pathological changes associated with radioiodine induced sialadenitis and its treatment [5, 6].

Contraindications

Sialendoscopy should not be attempted during the acute inflammation of salivary glands. It may increase the pain and swelling in an already inflamed gland. Inflammation results in decreased cannulation rate, poor visibility of the ductal system which may result in complication like perforation of the duct leading to stenosis of the duct, thus increasing the overall failure and complication rate.

Technique

Anaesthesia

We perform all our sialendoscopies in operating room; however diagnostic sialendoscopy can be performed as an outpatient (OPD) procedure in selected few. Most of the diagnostic sialendoscopies are performed under local anaesthesia. About 20–30 min before starting the procedure we place a 4 × 4 cm sterile gauze piece soaked in 4 % lignocaine over the floor of mouth in submandibular gland sialendoscopy or along the upper gingivobuccal sulcus in parotid sialendoscopy. Therapeutic procedures like removal of duct calculus and dilatation & stenting of the ductal strictures are preferably done under general anaesthesia however local anaesthesia may be considered in selected cooperative subjects and in patients who are unfit for general anaesthesia. Antisecretory agents like atropine and glycopyrrolate are avoided. We use a freshly prepared irrigation solution for all sialendoscopies done under local anaesthesia. It is prepared by mixing 20 mL of 2 % lidocaine and 20 mL of normal saline (0.9 %) [7]. Care needs to be taken to limit the use of this irrigation solution to avoid lidocaine toxicity and swelling of the gland.

Fig. 1 Instruments used in Sialendoscopy. **a** sialendoscope, modular, **b** sialendoscope, all in one; **c** biopsy and grasping forceps; **d** forceps; **e** bougies; **f** probes; **g** dilator; **h** stone extractor; **i** microdrill; **j** balloon catheter (Courtesy Karl Storz)

Positioning

Patient is placed supine with head fixed on a head rest and turned towards the surgeon. Patient's mouth is kept open by applying Doyen's mouth gag.

Sialogogues

Just before starting diagnostic sialendoscopy, we prefer to give sialogogues like lemon or Vitamin C tablet to patient to augment the salivary secretion. This facilitates easy identification of duct opening and manoeuvring of scope through the ductal anatomy.

Identification and Cannulation of Punctum

Position of Wharton's duct punctum is quite variable. We have found infiltration of about 0.5 mL of local anaesthetic (2 % lignocaine with one in two lacs adrenaline) around Wharton's duct papilla to be particularly helpful in

identification and cannulation of punctum. Punctum of Stenson's duct is easier to identify. It is located over the buccal mucosa opposite upper second molar. Punctum is serially dilated with conical dilator and probes of various sizes.

Sialendoscopic Evaluation

After adequate dilatation, sialendoscope is introduced through the dilated punctum. Irrigation fluid is pushed through the irrigation channel of the scope. This helps in keeping the ductal lumen wide open for easy passage of the sialendoscope. It also washes out the debris and sludge accumulated in the ductal system thus increasing the intraductal visibility. Sialendoscope is slowly and gently passed from the punctum till hilum of the gland or till the point pathology permits, always keeping the ductal lumen in centre. As the scope is guided through the primary and secondary ducts, anatomy and presence of pathology viz. color and texture of the mucosa, polyps, strictures, ectasia,

purulent debris, sludge, calculus or any other pathology is noted. In relation to calculus it is important to assess the approximate size of the calculus, whether it is floating or an impacted one, any sharp bands or strictures distal to the stone.

Therapeutic Sialendoscopy

Sialoliths

Wharton's Duct Sialolith of size up to 3.5–4 mm can be removed with sialendoscope with the help of grasping forceps or with wire basket (Fig. 2). But very long thin stones with their long axis along the ductal lumen can also be removed with sialendoscope alone [8]. Minimal surgical papillotomy is required in few cases where the instrument along with the calculus gets stuck at papilla. Larger stones can either be broken down with intracorporeal lithotripsy using mini drill or with laser beam delivered through the fibres passed through the scope. Holmium and NdYag laser are being used for this purpose. Smaller pieces of stones thus produced are removed with wire basket or grasping forceps and very tiny fragments get washed out with salivary flow in post operative period. Though ESWL is another option for larger stones but its high cost remains the limiting factor. Some large impacted stones are better managed by targeted and precise combined approach (transoral stone removal). After localizing the stone in the duct, small incision is made in the floor of mouth mucosa, duct is dissected and opened with incision right on the stone. Stone is delivered gently, the duct is closed with absorbable extramucosal sutures and floor of mouth mucosa is reapproximated and sutured back. Stenting of the duct is done in cases where ductal mucosa is found too macerated or if there is presence of stricture due to chronic inflammation secondary to calculus. In our experience, large hilar stones are difficult to manage with sialendoscope alone and often require an intraoral incision for their removal. Approximately half of them would still require gland removal.

Stenson's Duct Stones less than 3 mm in Stenson's duct can be managed with sialendoscopy alone. Larger stones are broken down to smaller size, most commonly with ESWL or with microdrill or laser. Alternatively, larger stones of the parotid duct can be removed with combined approach. Combined approach sums up the precision of the endoscope and ease of the external approach. It also decreases the morbidity by decreasing the amount of dissection needed to localize the stone in the duct. Sialendoscopy is done to localize the stone. A skin incision is marked as in parotidectomy, skin flap is raised anteriorly only up to the point where the light of the scope can be

localized. Parotid duct is dissected in this area and is incised open to deliver the stone. Duct is closed with fine, absorbable sutures placed extramucosally and skin flap is repositioned back after putting a mini suction drain. Use of facial nerve monitor may be of particular help in these cases.

Ductal Strictures

Short length, soft ductal strictures are primarily managed with dilatation alone. These strictures are dilated by serially passing scopes in ascending order of diameter or with high pressure balloon dilators passed through the working channel of the sialendoscope. Alternatively bougies may be passed on the guidewire to dilate the strictures (Seldinger technique). Tough strictures need to be released with either laser or with microdrill. We prefer to stent all ducts in which dilatation has been done. Different performed stents are available for Stenson's and Wharton's ducts.

Post Operative Care

All patients receive antibiotics for 5 days. Subjects operated under local anaesthesia go home same day after few hours of monitoring. Patients receiving general anaesthesia are relieved either same evening or on the next morning. Patients are advised to take soft, cold, bland diets and fluid intake is increased. Parotid or submandibular massage is demonstrated and advised, as the case may be. Patient is again seen on 7th day and then after a month. Stents, if placed are removed after 2–4 weeks.

Complications

Self resolving pain and swelling of the gland due to ductal irrigation and fluid retention is the only frequent complaint in the post operative period. Complications including perforation of the duct wall, lingual nerve paresis, facial nerve paresis, stenosis of the papilla and ductal stenosis have been reported and need to be kept in mind.

Comments

Sialendoscopy has emerged as the method of choice for treatment of small and mobile sialoliths [9, 10]. As compared to submandibular stones, a significantly higher number of parotid stones can be removed with sialendoscopy alone. This can be attributed to the facts that the average size of submandibular stones is larger as compared to parotid stones and that the submandibular stones are less

Fig. 2 Sialolith removal with the wire basket. **a** Sialendoscopic view of sialolith in Wharton's duct. **b** Sialolith engaged in the wire basket. **c** View of the duct after stone removal

mobile and far more adherent to the surrounding ductal tissue [1]. Large, immobile submandibular stones are removed transorally (intraoral incision) but we prefer not to use this method for parotid stones in view of high probability of severe ductal stricture after these procedures. Till the time safety and efficacy of intracorporeal lithotripsy is established, ESWL with sialendoscopy is considered the method of choice for larger parotid stones. In nonavailability of ESWL and in failed cases, the combined surgical approach is preferred for large parotid stones.

In obstructive salivary pathologies, sialendoscopy is currently being used largely for therapeutic purposes and its role as the first diagnostic tool of investigation is being evaluated. Availability of new miniaturised instruments for therapeutic purposes and enhanced optical resolution should increase the efficacy and precision of sialendoscopy in the management of salivary gland pathologies.

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Conflict of interest The Authors declare that there are no conflicts of interest involved in this manuscript.

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