Interventional Sialendoscopy for Parotid Ductal Calculi: Our Preliminary Experience

P. P. Singh · Neelima Gupta · Arun Goyal ·
Sanjeev Tomar

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Abstract With this article we present our initial experience with interventional sialendoscopy of the parotid duct for the parotid calculi. We carried out a prospective study of patients of parotid calculi in a tertiary referral centre. Diagnostic and interventional sialendoscopy was performed in five cases of parotid calculi. The outcome was classified on the basis of clearance of the lumen of the duct and resolution of symptoms. Diagnostic sialendoscopy was able to diagnose the calculus in all cases. Interventional sialendoscopy was done under general anesthesia in all cases and calculus was successfully removed. The average size of sialolith was 8.2 mm. No complications occurred in any of the cases. Check sialendoscopy was done in all cases after a minimum follow up of 6 months, which showed the duct lumen to be free of stone with no stricture of the duct. Sialendoscopy is an optimal technique for removal of intraductal parotid calculi and avoids removal of the gland. In our series there was no associated morbidity and complication.

Keywords Salivary gland · Parotid stones · Sialendoscopy

Introduction

Sialolithiasis has been reported as the main cause of salivary obstructive disease and comprises of more than 60–70% of all salivary duct obstructions. The incidence of calculi is higher in the submandibular gland than the

parotid [1]. The concentration of sequestered calcium in the secretory granules is lower in the parotid gland than in the submandibular gland because the secretory glycoprotein is not acidic. This leads to a lower incidence of sialomicroliths and sialoliths in the parotid [1]. Patients typically present with recurrent and painful swelling of the gland, often associated with a purulent discharge from the opening of the duct.

The classic therapeutic approach to sialolithiasis is antibiotics and anti-inflammatory medicines for symptomatic relief. Repeated episodes of inflammation and failure of conservative treatment transform the normal gland into a chronically inflamed gland and also results in enlargement of the stone. This obstructive sialadenitis forms a major chunk of salivary gland disease. Until recently if the conservative treatment failed, gland removal was the therapeutic choice. However, removal of the parotid gland for a benign inflammatory disease was not favoured because of high incidence of transient or permanent facial nerve injury [2], sensory loss of greater auricular nerve, Frey's syndrome, salivary fistulas or wound infections. The last 15 years saw rapid development of minimally invasive techniques for diagnosing and treating salivary gland duct obstructions. Progress in equipment design led to a shift of conventional treatment from open surgical or gland resection procedures to endoscopic and gland preservation techniques, with the goal of treatment now being to leave a physiologically intact gland [3]. With the miniaturization of endoscopes and advances in optical technologies, complete exploration and visualization of salivary ductal system became possible using sialendoscopes.

We present our preliminary experience in five consecutive cases of parotid calculi over the last one and a half years, and take this opportunity to describe this new therapeutic approach of interventional sialendoscopy.

P. P. Singh · N. Gupta (✉) · A. Goyal · S. Tomar
Department of Otorhinolaryngology, University College
of Medical Sciences and GTB Hospital, A-304, Abhyant
Apartments, 2, Vasundhara Enclave, Delhi 110096, India
e-mail: write2drneelima@yahoo.com

Technique of Sialendoscopy

Sialendoscopy is done using semirigid endoscopes under local or general anesthesia. The general principle that is followed is that with the introduction of endoscope, continuous rinsing is done by means of a local anesthetic solution (mixture of 20 ml of lidocaine 2% and 20 ml of NaCl 0.9%). This solution dilates the lumen of the duct, cleans the tip of the endoscope and provides local anesthesia [4].

The procedure begins with localization of the papilla of the duct opening intra orally against the upper second molar. If it is difficult to localize the duct opening, massage of the gland is done, saliva is expressed and duct opening is localized. The duct opening is progressively dilated using a dilator and probes. The sialendoscope is then introduced gently and the irrigation is started so that the duct is dilated and the lumen is visualized for the slow and gentle advancement of the scope under direct vision. Diagnostic sialendoscopy is performed with a single channel device, while interventional sialendoscopy is performed with a double channel device. Once the stone is visualized during a diagnostic sialendoscopy as seen in Fig. 1, the endoscope with two channels is introduced and according to the size of the stone further method of removal of the stone is decided.

Materials and Methods

Out of our five consecutive cases three were males and two were females. The average age at presentation was

21 years. The presenting complaint in all patients was recurrent swelling in the parotid region more so after intake of meals, associated with mild pain. There was no history of fever, associated swelling of any other salivary gland or previous radiotherapy in any of the patients. There was history of occasional pus discharge inside the mouth in two patients. The average duration of symptoms before presentation was 7 months. Radiological investigations in all patients were performed, which included CT scan and MR sialography. These revealed the involved gland to be mildly bulky with mild heterogenous attenuation suggestive of parotitis. The calculus was demonstrated as a hyperdense focal lesion in the duct.

The detailed management of each of the cases is highlighted:

Case 1: A 42-year-old male presented with left recurrent parotid swelling. Calculus was visualized in the intra-buccal portion of the main duct as shown in Fig. 2. It was removed with forceps, after papillotomy, under sialendoscopic guidance.

Case 2: A 16-year-old male presented with recurrent swelling in right parotid region. A calculus was visualized in main duct on CT scan as shown in Fig. 3. The calculus was visualized using sialendoscopy; incision site was judged on the face using the light of the endoscope as a guide (Fig. 4). Removal of calculus was done using combined approach (sialendoscopy guided external approach) as shown in Fig. 5. Extramucosal repair of duct was done using 6/0 prolene.

Fig. 1 Endoscopic view of calculus in parotid duct

Fig. 2 CT scan axial cut showing hyperdense shadow (calculus) in the intrabuccal portion of the left parotid duct

Fig. 3 CT scan axial cut showing calculus in the right parotid duct

Fig. 5 The calculus is visible after the duct has been opened

Fig. 4 The *lighted area* shows the site of incision for combined approach removal of the calculus from right parotid duct

Fig. 6 CT scan axial cut showing calculus in the main duct on the left side

Case 3: A 16-year-old female presented with recurrent left parotid swelling and pus discharge intra orally. Calculus was visualized in the duct on CT and MR sialography (Figs. 6 and 7). Calculus (approx. 5.6 mm) removal was done using combined approach (facelift incision and SMAS approach).

Case 4: A 34-year-old female presented with recurrent swelling right parotid region. A calculus was visualized

in the parotid duct at the masseteric bend (Fig. 8). Removal of the calculus (approx. 4×5 mm) was done using sialendoscope assisted with dormia basket. Papil-lotomy was required at the time of delivery of the calculus.

Case 5: A 23-year-old male presented with left recurrent parotid swelling. Calculus (approx. 2.5 mm) was removed using sialendoscope assisted with endoscopic forceps.

Fig. 7 MR sialography showing calculus with left parotid ductal dilatation

Fig. 8 CT scan axial cut showing calculus at the masseteric bend of the right parotid duct

Results

All patients became asymptomatic after surgery. Check sialendoscopy after a minimum follow up of 6 months did not reveal any duct abnormality or residual disease. No other complications like facial nerve injury, fistula or wound infection were observed.

Discussion

Most of the published reports in the past reported a much higher incidence of submandibular stones in cases of

sialolithiasis. But with improved and more sensitive methods of detection now available, studies have reported up to 40% incidence of parotid stones in cases of sialolithiasis [5]. This also perhaps explains the higher reported incidence of multiple stones (58%) in the affected parotid gland. The size of sialoliths ranges from 2 mm to 2 cm, with the mean being 3.2 and 4.9 mm for parotid and submandibular stones, respectively [5]. In our series of five cases the diameter of stones ranged from 2 to 14 mm with the mean being 8.2 mm.

The various diagnostic approaches used to diagnose parotid calculi include ultrasonography, CT scan, sialography and MR sialography. Approximately 20–40% of the salivary lithiasis is not opaque on plain films, but most of these are visible on ultrasound. During ultrasound, salivary stimulation leads to more prominent intraglandular ducts facilitating the visualization of small lithiasis [6]. But ultrasound is operator dependant and does not give specific information to the surgeon. Sialography consists of an opacification of the salivary ducts by a retrograde intracannular injection of water soluble radiopaque dye. It is considered the gold standard because it gives a clear image of the stones and the duct morphology. But it has the disadvantage of having to cannulate the punctum of the salivary duct and exposing the patient to high dose of radiation. Also, for sialography a contrast solution is required and because a pressure injection is given, it can lead to a possible deeper displacement of obstruction [5]. CT scan picks up only very large stones and lacks precise localization.

MR sialography is a new technique. It consists of 3 mm T2 weighted fast spin–echo slides in the sagittal and axial planes. Volumetric reconstruction then allows the visualization of the ducts without any dye injection and therefore without any pain and radiation. It however suffers from its disadvantages of time required for reconstruction, MR-imaging associated inconveniences and artifacts due to dental bridges. In our series MR sialography was able to show the calculus in all cases as a hyperdense focal lesion with mild dilatation of the duct as seen in Fig. 7.

Diagnostic sialendoscopy is a minimally invasive technique which may become the investigation of choice for salivary duct disease [5], because of its direct visualization of findings and no exposure to radiation.

Earlier literature described various techniques for removal of parotid stones. These included removal using an angioplasty balloon, extraoral parotid sialolithotomy and parotidectomy. Extracorporeal shock wave lithotripsy was advocated by Iro et al. [7] in the early 1990s. Electrohydraulic and pneumoblastic devices have also been used for fragmentation of salivary stones. The first parotid stone extraction was performed in 1994 with the use of a dormia basket [8]. This was a blind procedure.

Marchal et al. [4] reported a new, minimally invasive technique of salivary duct exploration and treatment under direct endoscopic control. This interventional sialendoscopy aims to treat salivary ductal disease, majorly comprising of removal of salivary stones. Its role in other ductal diseases is also becoming popular. In a large series of more than 100 interventional sialendoscopies [4], comprising of both submandibular and parotid sialendoscopies, no significant complications such as damage to the facial nerve, gross hemorrhage or major duct wall perforations were encountered. However, impaction of the grasping basket in two cases and duct wall perforation in three cases where the stone was partially embedded in the duct wall was encountered. These cases could be managed with firm traction to the basket and conservative treatment, respectively. No serious infections or postoperative strictures were reported in this large series.

In parotid sialoliths, size is probably the most important factor in predicting the success of interventional sialendoscopy. Marchal et al. [5] reported that 97% of parotid stones smaller than 3 mm could be retrieved with the wire basket without fragmentation, while for larger stones the success of this technique was 35%. For larger stones fragmentation before extraction was necessary [9].

Marchal [10] has also reported that 20% of interventional sialendoscopies failed because of large sized stones (more than 6 mm), or because of stenotic ducts in the parotid. To avoid these failures and subsequent removal of these glands, he described the combined endoscopic and external approach for removal of large stones or even small stones; in settings where laser fragmentation was not available. In this approach, classic sialendoscopy is done and the stone is visualized. The patient is taken under general anesthesia and the surgical approach can be classic or facelift type. A U-shaped superficial musculoaponeurotic system (U-SMAS) flap is prepared around the lighted area from the light of the sialendoscope. The salivary tissue is dissected cautiously and the duct is prepared. The duct is then incised over the stone and the stone is removed. In his series of 37 cases Marchal [10], reported resolution of symptoms in 92% cases over a mean follow up of 19 months. In our one patient there was slight discolouration of the edges of the skin flap which normalized within 24 h on conservative treatment.

Walvekar et al. [11] also recommended taking the consent of patients for a combined approach when a difficult endoscopic removal is anticipated because they could save the glands with acceptable complication rates.

Conclusion

Interventional sialendoscopy is a new procedure which is gaining wider acceptance. It is minimally invasive and is able to remove majority of sialoliths without complications. Combined approach is preferred for larger stones especially where facility for fragmentation of stone is not available. Gland removal should be considered only when the endoscopic management of salivary obstruction fails or in cases of intraoperative complication [12]. There is a definite learning curve for acquiring adequate sialendoscopic skills. Tentatively it was proposed to perform fifty sialendoscopic procedures before such skills are acquired (personal communication).

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