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Parotid Duct Sialolithiasis - A Case Report and Critical Review

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Abstract

salivary Gland Stone is Condition Characterized by formation of Calculus in parenchyma of gland or duct, and most commonly affect submandibular gland than parotid and less in sublingual gland and almost non existing in minor salivary gland. Causes of sialolithiasis is a multifactorial. It is more common in submandibular duct as duct is long, tortuors , anatomical postion and more mineral contains favors for sialolithiasis, and as Stone causes obstruction to flow of the saliva , inflammatory changes seen in gland, The present study reports an uncommon case of large sialolithiasis in a 42-year-old male patient who presented with pain and swelling in the right parotid duct region and treated by surgical removal of the stone via an intraoral approach under local anaesthesia.

Conclusion: Mostly Diangosis of salivary gland Stones is clinical, Conventional X-ray, sialography and especially the digital subtraction sialography, combined with ultrasonography, is the method of choice in visualisation of salivary gland calculi. And even though there are many treatment approaches for cases of silolithiasis like salivary stimulants, ductal lavage, sialoendoscopy, lithotripsy etc., surgery remains as the last option and mode of treatment depends on size and site of the sialolithiasis.

Keywords:, salivary gland, Parotid's duct ,Sialolithiasis

Introduction

Sialolithiasis, or salivary stones, are the most common disease of the salivary glands in middle-aged patients. More than 80% of salivary sialoliths occur in the submandibular duct or gland, 6–15% occur in the parotid gland and around 2% are in the sublingual and minor

salivary glands. [1] Parotid sialolithiasis usually involves one gland at a time, and the stone are usually solitary and often involves the ductal system of the gland. Presence of multiple stones in the parenchyma of the gland is a rare finding. [2]

Parotid gland stone incidence in males to females is 2:1. It generally occurs at 3rd to 6th decades of life. Its incidence has been poorly studied but seems to be much higher than the classic data published by Rauch of 1 case per 300000 people per year. [3] In a recent study, based on hospital admission figures in England, Escudier and McGurk estimated this incidence to be between 1 per 15000 and 1 per 30 000. [4] Personal observations of an incidence between 1 per 10000 and 1 per 20000 seem to confirm these results (F.M. and P.D., unpublished data, 2017). [5]

Parotid calculi are unilateral, generally seen in duct and size is less than 1cm. Sialolith which are not detected by radiograph may require sialoendoscopy as 40% of parotid and 20% of submandibular stones are not radioopaque. [5]

The exact etiology and pathogenesis of salivary calculi is not known, but it is thought that the more alkaline, viscous, mucus-rich saliva, which contains a higher percentage of calcium phosphates, in addition to the long and tortuous position of Wharton's duct, contributes to stasis making the submandibular salivary system more prone to the development of sialoliths than the parotid gland. [6]

Sialolithiasis results in a mechanical obstruction of the salivary duct, causing repetitive swelling during meals, which can remain transitory or be complicated by bacterial infections. Traditionally, recurring episodes necessitate treatment by open surgery, and sialolithiasis still represents the most frequent reason for submandibular gland resection. [7]Interestingly, parotid gland resection remains less frequent, probably because of the higher incidence of postoperative complications such as facial paresis.[8]The objective of this article is to review the existing diagnostic and interventional modalities for sialolithiasis management.

Case report

A 42-year-old male reported to Dept. Of Dentistry, JIIUs Indian Institute of Medical Sciences, Warudi, Jalna for an opinion on a firm mass in the right cheek region. The patient gave history of the swelling from last two years. The pain was localized, pricking in nature continuous and aggravated at mealtimes. There was no history of trauma. Past-medical history revealed that the patient is having Polyarthritis and is on medication. On extraoral examination, the patient had facial asymmetry due to a slight swelling on the right side of the face. The swelling was diffused, extending 2 cm laterally from ala of the nose anteriorly till 2 cm in front of the ear posteriorly. The swelling was about approximately 6 x 5.4 cm^2 in size. The skin over the swelling was smooth, stretched. There were no secondary changes. Palpation revealed hard, non-tender swelling. Intra-orally, the mouth opening was normal without involvement of the teeth. A swelling was present in the right buccal mucosa extending from second Premolar tooth to the opening of the right Stensen's duct posteriorly, superiorly 2 cm below upper buccal sulcus to upto the level of occlusal plane inferiorly. The opening of the Stensen's duct was slightly inflamed and red. Bi-digital palpation revealed no pus discharge from the duct with reduced salivary flow.

Investigations

- Posteroanterior mandible revealed a radiopaqueimage on the right ramus of the mandible
- Complete blood count, which was Normal and Insignificant.
- Ultrasonography (USG) of the right side ofthe face which was suggestive of radiopaquemass of 5.6× 4.4

cm^2 size confirmed the provisional diagnosis of sialolith in the right parotid duct.

Treatment

After Anaesthesia fitness from Dept of Anaesthesiology, and Under Monitored anaesthesia care,surgical exploration under local anaesthesia, a stone measuring about 5.6 × 4.4 cm2 size was visible at the orifice ,which was retrieved with Enlargement of parotid duct by circumferential elliptical incision to duct Through intra-oral approach . The dilated duct was left open and circumferential elliptical incision Closed with 4-0 Vicryl suture. Patient was kept on antibiotics and analgesics and was discharged with the advice to take lemon and Orange juices frequently. No recurrence of pain and swelling,when patient was reviewed in subsequent appointments.

Discussion

Systemic diseases like Sjögrens, gout, medications (anticholinergics, antisialogogues), local trauma, radiotherapy in head and neck region, old age and renal impairment are conditions that increases chances of Salivary stone formation. It is estimated that sialolithiasis affects 12 of every 1000 patients in the adult population, with men affected twice as often as women. [9]Most salivary calculi are small and usually less than 1 cm, but megaliths or giant calculi have been reported. Sialoliths are mineralised debris containing calcium phosphate, carbon and trace amounts of magnesium, potassium and ammonium. Salivary calculi grow by deposition at an estimated rate of 1–1.5 mm/year. [10]In the submandibular duct, multiple salivary stones are rare.[11]Sialoliths are most the common cause of acute and chronic infections of salivary glands. Obsruction due to stone causes bacterial retrograde infection into the gland and then increases the risk of bacterial colonisation and acute salivary gland infection. [12]

Review of Parotid Duct Sialolithiasis

Classic therapeutic approaches

In the early 1990s, several authors have attempted to cure sialolithiasis conservatively. interventional Radiologists during sialography tried to retrieval of these stones by Dormia basket either blindly or under sialographic control.[13]in urology extracorporal lithotripsy uses for renal calculus removal the same techniques, applied as extracorporal lithotripsy for sialolithiasis.[13] Although endocannular lithotripsy was also available, a lack of adequate instrumentation prevented complete ductal exploration and treatment. Major development in field of optical technologies, complete exploration of the salivary ductal system and a precise examination of its pathologic state are now possible. Sialendoscopy or sialoendoscopy is a new procedure, aiming to visualize the lumen of the salivary ducts to diagnose and treat ductal diseases. [13

The classic treatment of sialolithiasis is antibiotics and anti-inflammatory agents, hoping for a spontaneous stone expression through the papilla. In cases of submandibular stones located close to Wharton papillae, a marsupialization (sialodochoplasty) is performed and the stone removed. [14] Interestingly, although sialolithiasis is the most frequent reason for submandibular gland resection, stones are often left in the Wharton duct remnant. Surgical intervention for posterior-located submandibular or parotid stones, whenever possible should be avoided because parotidectomy for infectious conditions is associated with a high incidence of facial nerve complications. [15] It is commonly believed that a gland with sialolithiasis is no longer functional.[16]A recent study on submandibular glands removed because of sialolithiasis demonstrated the following: (1) there was no correlation between the degree of gland alteration and the number of infectious episodes; (2) there was no correlation between the degree of gland alteration and the

duration of evolution; and (3) maximum indicated submandibular gland removal, close to 50% of the removed glands were histopathologically normal or close to normal. A conservative approach even in chronic sialolithiasis appears therefore to be justified. [17]

Conventional Management

The parotid duct and gland stone were divided into two groups

1. Intraoral sialolithotomy for stone removal**:** This technique is useful only for stones located in the distal part of parotid duct which is anatomically demarcated by the curvature of the duct around the masseter muscle to where the duct penetrates the buccinator muscle.
2. Cannot be removed via intraoral approach, requiring extirpation of the parotid gland

Traditional Intraoral Parotid Sialolithotomy

- Generaly procedure perform under local anaesthesia, inject local anaesthesia with vasoconstrictor around the papilla of Parotid duct after securing anesthesia then advance probe along the duct until one feels the stone, use haemostat to ensure a safe tract upto the stone then give circumferential elliptical incision around the papilla and do blunt Dissection of duct up to the stone's location, remove the stone and granulation tisuue arount stone with Curette, give normal saline wash and massage the gland to release saliva and plaque, Suture the ductal layer to the oral mucosa with several 4/0 Vicryl sutures to maintain ductal patency

Advanced Management

External lithotripsy, initially reported by Iro and colleagues in the early 1990s, is becoming popular but requires several sessions at intervals of a few weeks. [18] Once fragmented, stones are expected to evacuate spontaneously since no stone extraction is described with this technique. The remaining stone debris can be seen as the ideal nidus for further calcification and sialolithiasis recurrence. Success rates up to 75% for the parotid and up to 40% for the submandibular gland are reported and are similar for external and intracannular lithotripsy. [19] Although sialendoscopy might be adapted as an adjuvant procedure to external lithotripsy to retrieve the fragments, we see little use in de novo investing in the expensive equipment. In addition, these techniques could result in significant damage to the gland.

Other techniques for sialolithiasis fragmentation have been described, such as those using electrohydraulic and pneumoblastic devices. [20]Electrohydraulic devices, initially described as promising, have been proven to be of low efficacy at low voltages. Although we have found that at higher voltages destruction of stones was possible, injuries of the canal wall have been described and the technique criticized. [21]Pneumoblastic devices are based on the delivery of mechanical energy to the stone. Although no clinical trials using this technique for salivary stones have been published, in vitro investigations tend to emphasize the risks of canal wall perforations.[22]

A new approach: diagnostic sialendoscopy

Diagnostic sialendoscopy is a recently described procedure that allows an almost complete exploration of the ductal system, including the main duct and secondary and tertiary branches. [23]This is possible thanks to the most recently manufactured endoscope (Karl Storz, Tübingen, Germany), which has a small outside diameter (2 channels of respectively 0.9- and 1.3-mm diameter) and incorporates a rinsing channel, necessary for dilatation of the ductal system and for cleaning and rinsing of the debris during the procedure. The need for a semirigid system has been demonstrated by the difficulty in directing a flexible system without a mobile tip and its fragility and poor image quality.[24] Among the last 450

endoscopies performed, diagnostic sialendoscopy was achieved in 98% of cases, while others report a 96% success rate.[25] Rare limitations include an extremely tortuous canal that could hamper endoscope progression and difficulties in directing the endoscope at the distal end of the canal system.

Sialendoscopy can be done as an outpatient procedure in the clinic with the patient sitting in a chair or partially recumbent. Local anaesthesia is used. Progressive dilatation of the papilla is performed with salivary sounds of progressively larger diameters. Endoscopy is performed with progressive endoluminal irrigation using a local aesthetic solution. The diagnostic and interventional sialendoscope that we recommended (1.33-mm^2 surface and 1.3-mm diameter) provides excellent vision and is suitable for both diagnostic and interventional procedures. [26]

Sialendoscopy provides direct, reliable information about most ductal pathologic conditions and reduces the need for radiological investigations. The indications for diagnostic sialendoscopy are all intermittent salivary gland swellings of unclear origin. There are no specific contraindications, mostly because sialendoscopy is a minimally invasive, outpatient procedure performed under local anaesthesia. Even children and senior populations are suitable candidates for this technique. [27]

Despite its apparent simplicity, sialendoscopy is technically challenging. Operating the rigid sialendoscope is delicate, requires experience, and may be hazardous because of theoretical risks of perforation and vascular or neural damage. Progression in the canal should be completely atraumatic and performed only under adequate vision. Significant trauma to the ductal wall could result in subsequent stenosis. Marsupialization of the ductal papillae should be avoided or kept as small as possible to prevent retrograde passage of air and aliments. Perforations of iatrogenic origin outside the gland can lead to diffuse swelling of the floor of mouth, with potential risk of life-threatening swelling.

Sialolithiasis Lithotripsy

Lithotripsy for kidney stones was first reported in 1980. The first report on the use of shock waves to fragment sialoliths was in 1986 by Marmary. [28] The problems initially were due to the large lithotripsy machine that had very broad focus. They can cause removal of dental fillings and periosteal irritation. There are three external lithotripsy methods depending on the system of generating the shock waves: electrohydraulic, electromagnetic, and piezoelectric. The waves are brought to focus through acoustic lenses. The shock waves pass through a water-filled cushion to the sialolith, where two mechanisms, stress and cavitation, act to fragment the calculus. The soft tissue and the water around the stone do not interfere with the passage of the shock waves. A compressive wave is propagated through the stone, subjecting it to stress. The energy from the sialolith- water contact results in the formation of expansion waves, inducing cavitation bubbles. [29]

When the bubbles collapse, a jet of water is projected through the bubbles to the surface of the stone. This force is enough to fragment the stone. Development of smaller machines with a more finely focused beam of waves led to a few centres in Europe using it. From 1989 they can find in the literature articles discussing the results of ESWL. The technique delivers 1000 to 5000 shock waves per session. Usually three sessions are needed. The location of the stone is identified and targeted through an inline ultrasound 7.5 MHz probe. [30]

Intracorporeal Lithotripsy

In this technique, the lithotripsy energy is delivered to the target stone through a fine probe. Several methods used to generate the energy for the lithotripsy procedures include

the electrohydraulic technique, pneumoballistic technique, dye pulsed laser, and holmium laser. [31] The probes are delivered to the location of the stone under the supervision of the endoscope. Electrohydraulic and pneumoballistic techniques are most effective in fragmenting the calculus to small pieces, although the particles are not always small enough for free passage through the ductal lumen. The main disadvantage of these energies is the damage of the shock waves to glandular tissues, especially using the electrohydraulic technique. [32] The holmium laser, which is a gold standard technique in urology, also causes severe damage to the surrounding tissues and can easily cause ductal perforation. Another disadvantage of this technology is the high cost of the equipment. A new and promising development in the intracorporeal lithotripsy field is a new generation of lithotripters designed especially for the salivary glands based on erbium: yttrium-aluminum garnet (YAG) laser technology. [33] The advantage of this method is the quality of the fragmentation, to a dust that can easily be washed out from the gland with minimal collateral damage to the surrounding tissues. The fragmentation is done under endoscopic supervision and can be done under local anaesthetic as an ambulatory procedure. Other important advantages of this technique are the low cost and the availability of the instruments (the basic laser unit is the same as that for dental use).

Conclusion

Conventional X-ray, sialography and especially the digital subtraction sialography, combined with ultrasonography, is the method of choice in visualisation of salivary gland calculi. Interventional sialography is less invasive than the surgical treatment. Parotid sialolithiasis is less frequent than that of submandibular sialolithiasis, generally unilateral and predominantly affects the salivary duct than gland. Sialendoscopy can be used as newer diagnostic and therapeutic aid. Treatment depends on size and location of sialolith .An alternative, non-invasive diagnostic method of salivary gland calculi and salivary duct stenosis detection is MRI or MR sialography. Finally, we conclude that even though there are many treatment approaches for cases of silolithiasis like salivary stimulants, ductal lavage, sialoendoscopy, lithotripsy, etc., surgery remains as the last option and mode of treatment depends on size and site of the sialolithiasis.

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