CASE REPORT

Is there a role for ultrasound-guided balloon sialoplasty technique in salivary gland structures

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Ductal stricture is a common cause of obstructive salivary gland disease. Balloon dilatation of the parotid duct as a minimally invasive technique is currently carried out under fluoroscopic guidance or during sialendocopy. We present a case report of ultrasound-guided balloon dilatation. A 45-year-old female presented with a long history of obstructive symptoms affecting the right parotid gland. Ultrasound examination revealed a tortuous right main parotid duct with marked dilatation throughout its course and multiple sites of focal stricture formation. A sialogram was carried out to further characterize the ductal system, it showed significant dilatation of the main duct but due to overlapping of the elements of sialodochitis the visualization of the location and presence of strictures was very difficult. It was felt that ultrasound would be a better imaging modality to utilize in order to guide balloon dilatation of the strictures. Therefore, a balloon dilatation was carried out under ultrasound guidance. The main advantage of this technique is to preserve the physician and the patient from radiation exposure. In our knowledge this is the first case reported yet in the literature.

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Introduction

Benign obstructive salivary gland disease has a classical presentation and is easily diagnosed by clinicians. It is characterized by pain and swelling of the affected gland particularly at meal times. The most common causes of obstruction are stones, ductal strictures and mucous plugging. Ngu et al reported that salivary calculi accounted for 73.2% of intraductal obstructions, ductal strictures accounted for 22.6% and the remaining patients obstruction was as a result of mucous plugging.¹ However, Lee et al reported that stones were identified on 31% of sialograms, strictures 23% and mucous plugs in 60% of sialograms.² Salivary duct strictures can be defined as a narrowing of the ductal lumen, which results in disrupted saliva clearance at times of peak

flow. Strictures can be point or diffuse and can be single or multiple.³ Strictures are most common in the parotid gland and seen to affect females more than males.¹

Although benign, obstructive symptoms resulting from ductal strictures are associated with considerable morbidity. Sialoadenectomy as the traditional surgical approach is associated with considerable risks including cosmetic deformity and neurological complications. Balloon dilatation of the parotid duct as a minimally invasive technique was first carried out in 1992 under fluoroscopic guidance.⁴ Since then these techniques have become more popular and are currently carried out under fluoroscopic guidance or during sialendocopy.⁵ To our knowledge there are no reported cases of totally ultrasound-guided balloon dilatation. The purpose of this report is to describe a case of ultrasound-guided balloon dilatation and the rationale for choosing this novel method.

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Figure 1 (a) pre-operative ultrasound of the right parotid hilum/gland with gross dilatation (arrow) (b) pre-operative ultrasound of the right main parotid duct/anterior opening (c) intraoperative ultrasound with guide wire in position (arrow) (d) intraoperative ultrasound with balloon in position (arrows) (e and f) post-operative images showing the resolution of the dilatation.

Case report

We present the case of a 45-year-old Hispanic female with no known medical conditions who presented to the oral and maxillofacial surgery department with an 8-year history of recurrent pain and swelling of the right parotid gland. On examination there was a right sided parotid swelling visible. Clear saliva was expressed from the orifice. Ultrasound examination revealed a tortuous right main parotid duct with marked dilatation throughout its course and multiple sites of focal stricture formation in the middle and distal third (Figure 1a,b). There was no marked chronic sialoadenitis affecting the parotid parenchyma. A sialogram was carried out to further characterize the ductal system. The sialogram was carried out via identification of the right parotid duct and cannulation (Rabinov Sialography Catheter, Cook Medical) followed by hand injection of a water-soluble contrast media (Omnipaque 300 mgI ml⁻¹, GE Healthcare, Chicago, Illinois). The sialogram was carried out with the patient in a supine position using a C-arm flat-panel detector

fluoroscopy unit (Artis Zee/Zeego, Siemens Healthcare). Contrast was injected under fluoroscopic guidance with use of digital subtraction, selected oblique lateral views were acquired.

It showed significant dilatation of the main duct and intraglandular structure with overlapping of the elements of sialodochitis (Figure 2). This made visualization of the location and presence of strictures very difficult. It was considered that a balloon dilatation procedure under radiological guidance would be effective in actively dilating the strictures. However, due to the ducts tortuous nature and difficulty in visualizing the sites of stricture on sialogram, it was felt that it would be difficult to navigate the duct under fluoroscopic guidance alone. Sialendoscopy was considered, however it was felt that a method of visualizing the duct in three dimensions was required. One that had been used previously in the department was 3D fluoroscopy, however it has an associated increased radiation exposure. The previous ultrasound scan had produced images of good quality and had enabled orientation of

Figure 2 Oblique lateral views from the right parotid sialogram, the first two are using digital subtraction and the third is an acquisition.

the ductal system and would provide a radiation free method of performing balloon dilatation under radiological guidance.

A new pre-operative ultrasound scan was carried out using a 15 MHz linear transducer (Logiq E9, GE Healthcare) in order to confirm radiological landmarks and ductal pathology. Local anaesthetic was injected around the parotid papilla. Following dilation of the duct orifice, a guide-wire (V-18 Control Wire, Boston Scientific, Boston, MA) was inserted and its progress through the duct and through the stricture was visualized on the ultrasound machines display.

Advancement of the guide-wire was stopped once it had reached the proximal region of the main duct, dilated behind the strictures (Figure 1c,d). A balloon catheter 40 mm in length of 2 mm diameter (Pacific Plus PTA Catheter, Medtronic, Minneapolis, Minnesota) was then passed over the guide-wire (Figure 3a,b)

and beyond the strictures. The guide-wire was then withdrawn and the balloon dilated to 8 atmospheres at three locations (Figure 3c). Once the balloon had been withdrawn ultrasound images revealed that the ductal strictures had been successfully dilated and the proximal duct had markedly contracted (Figure 1e,f). The patient was counselled on the importance of regular gland massage and keeping well hydrated.

Discussion

Balloon dilatation is a safer and less invasive modality than gland removal for the management of salivary duct strictures.⁶ Balloon dilatation can be done under fluoroscopic guidance or during sialoendoscopy both of which have been shown to have good success rates.

Therapeutic sialoendoscopy for the management of ductal strictures can be achieved by endoscopy with cortisone rinsing, endoscopy with saline irrigation under pressure, balloon dilatation or forced manipulation with a blunt obturator. Based on an evaluation of the former three methods, Nahiel *et al* reported that 80% of patients were asymptomatic following treatment; in all cases a polyethylene stent was implanted for 2 weeks after dilatation.⁵ Koch *et al* explain that strictures can be classified into 3 groups based upon their extent and tissues characteristics when visualized during sialendoscopy. He found that sialendoscopy-guided rinsing with cortisone was effective in 73.0% of cases in what he terms inflammatory stenosis.⁷

There are two main case series to draw upon when discussing the success of fluoroscopy-guided balloon dilatation procedures. Drage *et al* found that on an immediate post treatment sialogram 82% of strictures had demonstrated complete elimination and 14% partial, 48% of patients had reduced symptoms and 48% were asymptomatic.⁸ Brown *et al* reported that 57% of patients were asymptomatic, 39% showed an improvement in symptoms.⁹ Ultrasound-guided balloon dilatation follows the same technique, the only difference being the method of radiological guidance. As strictures can be adequately diagnosed using ultrasound, we believe that ultrasound-guided procedures could have a high success rate.

The key advantage of ultrasound over fluoroscopy is that it is a radiation free procedure to the patient and

Figure 3 Photographs to demonstrate the type of balloon catheter and guide wire used. (a and b) show the guide wire and balloon catheter as they should be assembled. (c) shows an example of the balloon when deflated and inflated.

to the operator. Ultrasound does not require the use of a contrast agent, therefore can be safely used in patient who are allergic to Iodine. Motion artefact can be an issue during fluoroscopy; therefore ultrasound may be advantageous when treating the paediatric patient. Finally it is an excellent alternative when a tortuous duct is difficult to interpret on a two dimensional sialogram. Sialendoscopy is a radiation free technique and has the advantage that the tissue characteristics can be visualized but ductal architecture is more difficult to interpret. The main problem with balloon dilatation under endoscopic guidance is the vision being obscured by the balloon when inflated. Visualization of the strictures and balloons is easier under radiological guidance.¹⁰ Surgeons rely on an experienced radiologist to diagnose the cause of obstruction and in many units it is the radiologist who is able to carry out the minimally invasive treatment.

Fluoroscopy and ultrasound practice is the profession of the radiologist. Not only does endoscopy come with an associated setup cost it is also a new skill for a radiologist who is already experienced in head and neck ultrasound. Luers *et al* in their study stated that

the learning curve in sialendoscopy required 30 cases to reach satisfactory operation times and performance ratings.¹¹

We would suggest that a sensible treatment protocol would be as follows: ultrasound is carried out as a first line in diagnosis of suspected benign obstructive salivary gland pathology. If strictures are easily visualized on ultrasound then ultrasound-guided balloon dilatation could be considered. If stones are not identified and strictures are not easily visualized then a sialogram is indicated and minimally invasive treatment can be planned from then on. If the surgeon or radiologist is experienced in performing sialendoscopy then this can be considered for both diagnostic and therapeutic purposes.

Informed consent

Written informed consent for the case to be published (including images, case history and data) was obtained from the patient(s) for publication of this case report, including accompanying images.

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