

OBSTRUCTIVE SALIVARY DISEASE

Introduction

The salivary glands can be affected by a wide variety of clinical conditions. However, the vast majority can be classified on the basis of the nature of their complaint into:

- Obstructive salivary disease
- Dry mouth
- "Lumpy"
 - whole gland (possible underlying systemic condition)
 - part gland (possible tumour)

Definition

Obstructive salivary disease can occur mainly as a result of:

Sialolithiasis

Strictures

Mucocoeles and salivary cysts

Sialolithiasis

This is a chronic and recurring disease, which may cause symptoms by:

- swelling of glands
- decrease of salivation
- increased viscosity of saliva
- inflammation
- salivary gland "colic"

Strictures

Strictures of a salivary gland duct occur either as a complication of a pre-existing calculus, mucous plugs or following trauma to the duct wall. Such trauma may be the result of cheek biting, overextended denture flanges, damage during dental procedures, following surgery in the region or as a result of assaults or accidents.

Mucocoeles and salivary cysts

Salivary retention or extravasation cysts commonly occur following trauma to minor salivary glands or their ducts. They can occur anywhere in the oral cavity where there are minor salivary glands but the lower lip and posterior buccal mucosa are the

common sites as cheek and lip biting are usually the cause. Lichen planus predisposes to *superficial* mucocoeles.

A ranula is a similar cyst arising in the floor of mouth from the sublingual gland. Rarely, congenital cysts of the major salivary glands are seen. A sialocoele may arise in a major salivary gland following obstruction or previous surgery. Multiple cystic changes in a major salivary gland can occur bilaterally in HIV positive patients.

Epidemiology

Sialolithiasis

This is a common finding, accounting for 50% of major salivary gland disease. Post mortem studies suggest that the prevalence of salivary calculi is approximately 1.2% of the population. However, the prevalence of symptomatic salivary calculi may be 0.45%. There is a slight male preponderance, and the peak incidence is between the ages of 30 and 60. They grow by deposition and range in size from 0.1mm to 30mm. The commonest site is the submandibular gland where 80-90% of calculi are found, 5-10% are found in the parotid gland and approximately 5% in the sublingual and other minor salivary glands. The majority are formed from phosphate and oxalate salts with a clear distinction between submandibular and parotid stones both in frequency and composition. Parotid gland stones contain more acidic mineral phases, such as brushite and octacalcium phosphate and contain about 70% more organic matrix, 40% more protein and 54% more lipids. The organic matrix of submandibular stones, however, is richer in protein and has a higher (13%) content of lipids.

Strictures

These are a small but important cause of obstruction of the duct. Parotid duct strictures are a more common sialographic finding than submandibular duct strictures and account for up to 25% of recurrent parotid gland swellings.

Mucocoeles and salivary cysts

The majority of mucocoeles (80%) occur in patients below the age of 40 years, with the peak incidence in the 10-20 year age group. The site most commonly affected is the lower lip (60-70%) while the floor of the mouth is only involved in 6% - 15% of cases.

Clinical presentation

Obstructive salivary gland disease can cause pain and swelling. The pain is

experienced during salivary stimulation and is intensified at mealtimes, so called "meal time syndrome". The accumulation of saliva in the gland, duct or surrounding tissues produces swelling and the area becomes enlarged and firm.

Sialolithiasis

Sialoliths may present acutely as a result of acute bacterial infection secondary to stasis (sialadenitis). In such cases there is often facial asymmetry and the affected gland is painful, hot and swollen. The duct orifice may also be inflamed and pus may be expressed on milking the gland.

More commonly they present with a history of recurrent swelling, which has increased in both frequency and severity over time, particularly at mealtimes. This swelling resolves spontaneously, or with massage over a period of time. Milking of the gland in such cases may reveal a reduced salivary flow from the affected gland. Submandibular calculi situated in the region of the ostium may be visible, while those in the anterior part of Wharton's duct may be easily detected clinically by bimanual palpation. Calculi located in the posterior half of the duct are more difficult to palpate, especially if small, and will require intraoral occlusal radiographs to demonstrate them. Palpation of calculi located within Stensen's duct is more difficult, the bulk of the buccinator and masseter muscles masking the presence of calculi, and detection has traditionally relied on radiography.

Strictures

The presentation is very similar to that of salivary calculi with the difference that no calculus can be palpated. In such cases sialographic examination will be required to confirm the diagnosis.

Mucocoeles and salivary cysts

In the case of mucocoeles there is often a history of trauma following which a swelling slowly develops and increases in size. As it increases in size it may take on a bluish colouration and eventually bursts discharging the contents, which may have a salty taste, before recurring at the original site and repeating the cycle.

A ranula (so named because of the resemblance to the bulging underbelly of a frog) is a mucocoele in the lingual gutter. The fact that these arise from the sublingual gland is demonstrated by the protein and amylase content of the cyst fluid.

Aetiopathogenesis

Sialolithiasis

At present no single theory appears to fully explain the aetiology of salivary calculi. Hence, it is likely that several factors, working in parallel or in series, contribute to the development of a sialolith. The requirements for stone formation are saturation, crystal inhibition, crystal nucleation, growth and aggregation and crystal retention in the ductal system

Saturation

The level of saturation may be altered by pH, dehydration, diet and stagnation. However, at present none have been shown to play a significant role.

Crystal inhibition

Saliva contains a family of calcium binding proteins and it is possible that variations in these may play a role. However, it cannot be a major cause as bilateral and recurrent stones are uncommon.

Nucleation, growth, aggregation

Several factors have been implicated in this area and include bacteria, foreign bodies, cellular debris, infection and the continual and spontaneous formation of microcalculi.

Retention in the ductal system

The cells lining the duct may play a role while simple anatomical factors, such as the mylohyoid bend, long course of the submandibular duct and the fact that the saliva is secreted against gravity should not be overlooked.

Strictures

Strictures of a salivary gland duct occur either as a complication of a pre-existing calculus, mucous plugs or following trauma to the duct wall. Such trauma may be the result of cheek biting, overextended denture flanges, damage during dental procedures, following surgery in the region or as a result of accidents.

Mucocoeles and salivary cysts

Mucocoeles are usually either extravasation cysts (85%) or retention cysts (15%). The former are thought to arise as a result of trauma to the gland or duct and the latter by retention. However, there is probably a combination of the two mechanisms as there is evidence that intraductal cysts result in necrosis and then extravasation.

Diagnosis

In all cases the diagnosis is based on a careful history, clinical examination supported by the relevant special investigations. As the history and clinical findings

have been discussed under the section on clinical presentation we will limit this section to the special investigations, which will confirm the diagnosis.

Special investigations

Traditionally, plain radiographs are often used as a simple first line investigation. This has the disadvantage of requiring ionising radiation, will not demonstrate strictures and gives no information on the condition of the affected gland. In addition it will not demonstrate radiolucent calculi, which account for 20-43 % of submandibular stones and more in the parotid. It is therefore necessary to supplement plain radiography with a sialographic examination.

Sialography is able to diagnose the presence and position of radiopaque and radiolucent salivary calculi, as well as strictures and the extent of ductal and glandular inflammatory destruction secondary to an obstruction. However this technique is painful, time consuming, technically demanding and requires ionizing radiation.

Ultrasound by comparison is a safe, simple and well-tolerated technique for the detection of salivary calculi and strictures. It is able to detect radiolucent stones even though the acoustic shadow is not as marked. Calculi detection rates vary between 63% and 94% and are equal to those for sialography. The distal portion of the submandibular and parotid ducts, require the use of intraoral probes.

In contrast to ultrasound, which depicts architecture, radioisotope imaging of the salivary glands gives some measure of the secretory function and allows comparison between the major glands. However, it exposes the patient to a relatively high radiation dose to the whole body. Miniature endoscopes allow direct visualisation of the ductal system and are increasingly used.

Treatment

Sialolithiasis

Approximately 40% of submandibular stones lie in the distal portion of the duct and can be removed by simple intra-oral procedures performed under local anaesthesia.

However, for calculi that lie in the proximal duct or gland the treatment of choice has been sialadenectomy which is effective in eradicating symptoms but carries a moderate (3-7%) but real risk of nerve injury (facial, lingual and hypoglossal).

Alternative, minimally invasive approaches include fluoroscopically guided basket retrieval, and lithotripsy. Using a combination of these techniques it is possible to render at least 70% of cases both stone free and symptom free. The selection criteria for these techniques are detailed in table 1. The principle that underpins this development is that the secretory function of the affected gland can regenerate after removal of the obstruction.

Strictures

Until recently the only treatment for symptomatic strictures was adenectomy. This carried with the attendant risks of neurological damage and cosmetic deformity, which are important considerations in the management of benign disease. Balloon dilatation under fluoroscopic guidance and local anaesthesia is now being used although it is not always possible to negotiate the stricture (63%-90%). However in those where it was possible post-operative sialographic examination showed partial or total elimination of the stricture in 96% of cases with an associated improvement in symptoms.

Mucocoeles and salivary cysts

The mainstay of management for those affecting the lips or buccal mucosa is surgical removal under local anaesthesia. However, cryotherapy may provide a suitable alternative where there is a need or wish to avoid surgery. In the case of a ranula a wide variety of treatments have been used with varying degrees of success. The key fact is that the sublingual gland must be removed if recurrence is to be avoided.

Prognosis and complications

Sialolithiasis and strictures

In the absence of intervention there is progressive reduction in salivary flow as a result of increasing obstruction often with superimposed infection. As a result, the gland progressively degenerates until it eventually ceases to function or presents with acute sialadenitis which requires sialoadenectomy.

Following glandular removal there is the risk of neurological deficit and the aesthetic complication of a facial scar. In comparison the morbidity associated with the newer techniques are minimal and relate primarily to post-operative infection and short-term discomfort. In addition in the case of strictures there is the possibility of it reforming which does not appear to be a significant problem in the case of salivary calculi.

Mucocoeles and salivary cysts

Those on the lips and buccal mucosa may resolve spontaneously or become chronic. In the case of the ranula it will persist until surgically removed as detailed above. The common complications of treatment are short-term discomfort and the risk of recurrence.

Prevention

Sialolithiasis

As there is no known aetiology there are no specific preventive measures.

Stricture/Mucocoeles

As with calculi, there are no specific preventive measures which the patient can undertake. However, it is important that the duct is handled with care during any surgical procedure. It should also be remembered that mucocoeles can occur as a complication of any lip biopsy.

Table 1

Submandibular calculus	Mobile	Any	Basket retrieval	
	Fixed	Any	Intra-oral surgical release	
Parotid calculus	Mobile	Any	Basket retrieval	
	Fixed	Ostium	Surgical release	
		Any	< 7 mm	Lithotripsy
		Any	> 7 mm	-Combined endoscopic/surgical

Further reading

- 1 McGurk M and Renehan A. Chronic salivary diseases and calculi in Controversies in the management of salivary gland disease Section 4. Oxford University Press 2001, p 249-316.
- 2 Drage N, Brown J, Escudier M, McGurk M. Balloon dilatation of salivary duct strictures - report on 36 treated glands. *Cardiovasc Intervent Radiol* 2002; 25:356-9
- 3 Drage N, Brown J, Escudier M, McGurk M. Minimally invasive radiologically-guided intervention for the treatment of salivary calculi. *Cardiovasc Intervent Radiol* 2002; 25:352-5
- 4 Escudier MP, Brown JE, Drage NA, McGurk M. Extracorporeal shockwave lithotripsy in the management of salivary calculi. *Br J Surg* 2003; 90:482-5