

An educational resource for general practitioners on Sialolithiasis

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Abstract

One of the most prevalent illnesses of the salivary glands is sialolithiasis. It is characterised by sialoliths, or salivary gland stones, which can prevent saliva from draining from the salivary ducts. In what is referred to as "mealtime syndrome," these stones are accompanied by discomfort and swelling as the pressure in the ducts rises prior to, during, and following meals. Attendance at primary care services is frequently a patient's initial port of contact. Because symptoms often coincide with those that have a dental origin, being well-informed on the subject can help with prompt referral and streamlining the patient care process.

Clinical case scenario.

John Smith, a 37-year-old male attends his general practitioner with a 5-day history of a painful swelling in the floor of his mouth which is painful to touch. John, a regular smoker of 20 cigarettes a day describes his pain is worse around mealtimes. Over the past 2 days, he reports he feels that his mouth is dry, and he's also noticed that he has a painful swelling in his submandibular region. He takes no regular medications, and his daily fluid intake is average. He reports similar symptoms 2 years ago, which self-resolved. He is worried he has an infection in one of his teeth.

On examination, a firm mass can be felt in the neck, inferior to the mandible and the lower border of the mandible can still be felt. There are no other swellings in the neck. Intraorally, there is no obvious dental infections or swellings on the buccal side of the teeth. There is swelling at the base of the tongue that extends backwards towards the back of the mouth. Adjacent to the first pre-molar tooth in this swelling there is a distinct lump which is raised. On bimanual palpation John is tender in the floor of mouth with a discrete firm 0.5cm lump palpated. There is no saliva visible draining from Wharton's duct on the right side.

A diagnosis of sialolithiasis is made. Conservative management is advised with red flag signs and symptoms discussed.

Sialolithiasis

Of the diseases of the large salivary glands of the head and neck region, sialolithiasis accounts for more than 50% of the overall number cases.(Zenk et al., 1994) It is reported that the incidence of salivary gland stones is 1.2% (S Rauch and Gorlin, n.d.) with a higher incidence in males aged between 30 and 60 years old. (Andretta et al., 2005)

Stones generally consist of a mixture of organic and inorganic substances present in saliva including calcium, phosphates and cellular debris.(Huoh and Eisele, 2011) The composition may differ dependant on where the stones are located. A stone can be located within the parenchyma or ductal system of any of the major or minor salivary glands.

Salivary glands

The major salivary glands consist of three pairs of glands; submandibular, parotid and sublingual. In addition to these there are numerous minor salivary glands distributed throughout the oral mucosa. More than 80% of sialoliths affect the submandibular duct or gland due to its anatomical location, long tortuous duct and narrow duct papilla (Wharton's duct). This makes it more likely to develop sialoliths than the parotid gland. The majority of the rest occur in the Parotid gland (6-15%), with around 1% affecting the sublingual gland and other minor salivary glands. (Graziani et al., 2006)

The exact pathogenesis of sialoliths is not fully understood. It has been suggested that microcalculi are intermittently secreted that can serve as sources of further calcification (Harrison et al., 1997) or that food debris and/or bacteria within the oral cavity can serve as a nidus for stone formation.(Huoh and Eisele, 2011)(Marchal et al., 2001)

In functional terms, it is thought that stone formation results from either a reduction in salivary flow, or salivary stasis.(Huoh and Eisele, 2011) This means that conditions that predispose to either of these, may lead to stone formation.

History

The aim of a clinical consultation is to differentiate between benign and malignant salivary gland pathology. As there is a reduction in the number of face-to-face consultations taking place in the UK during the current COVID-19 pandemic, it has never been more important to conduct a thorough and specific history to allow the patient to be triaged correctly.

A patient will generally present with one or more of the symptoms listed in Box 1. It is important to establish the duration and course of symptoms.

Box 1: Signs and symptoms of sialolithiasis

Swelling:

- Blockage of the duct with a stone can lead to swelling of the gland.
- Patients typically present with a unilateral swelling. This swelling is located in the submandibular region of the neck.

Pain:

- “Meal-time syndrome”: Increased saliva production due to eating causes glandular swelling secondary to distal outflow obstruction by a stone. Patients describe immediate pain and swelling on eating or even on the sight of food, which normally resolves once the stimulus is removed. (Capaccio et al., 2007)

Xerostomia:

- Blockage of salivary duct outflow may lead to a dry mouth.
- This may lead to worsening oral hygiene and caries development.
- May also cause dysphagia and increased thirst.

Risk factors

There are a few known risk factors for sialolithiasis. Knowledge of these is important when offering advice in the primary care setting. Smoking adversely affects the cytotoxicity and thus antimicrobial potential of saliva and reduced salivary amylase

leading to microbes within the ductal system and increasing risk of infection.(Huoh and Eisele, 2011; Nagler et al., 2002). Certain drugs such as anticholinergics and antisialogogues can lead to drug induced xerostomia, a known risk factor. Males generally are more likely to experience sialolithiasis compared with females with a ratio of 2:1 (Moghe et al., 2012). Other risk factors such as local trauma, head and neck radiotherapy, advancing age and renal impairment all increase risk (Eigner et al., 1986).

Examination

Clinical examination consists of inspection and palpation. With regards to **parotid** swellings, it is important to establish the exact site (preauricular/posterior auricular). Pre auricular lesions usually indicate sialoliths in the superficial lobe, post-auricular usually indicate the lesion in the tail of the parotid. Unilateral swelling is the most common presentation, it is very rare for a patient to present with bilateral symptomatic sialoliths. If there is bilateral swelling consider alternative diagnoses.

Are there any overlying skin changes?

Skin changes are more likely to indicate infection or malignancy. Skin changes such as redness could be from sialadenitis causing a collection. Other local signs suggestive of malignancy over sialolithiasis include; cutaneous lesions on the ear or scalp and facial nerve weakness.

Can you express saliva from the parotid duct (Stenson's duct)?

By milking this duct you can see whether saliva is actively being secreted into the mouth. The presence of pus may indicate infection or debris or small sialoliths blocking the duct. Looking intraorally for the parotid duct opening adjacent to the 2nd maxillary molar tooth and massage the cheek in the direction of salivary flow (see Figure 1).



Figure 1- Stenson's duct opening near the upper second molar.

Submandibular sialolithiasis

Swelling can be located below the lower boarder of the mandible. Bi-manual palpation with one finger in the mandibular triangle below the lower border of the mandible and one in the floor of the mouth is a key aspect of the examination. (See Figure 2). The clinician should palpate the floor of the mouth along the course of the submandibular duct and visualise the submandibular duct opening (Wharton's duct). This opens on the floor of the mouth adjacent to the lingual frenulum. (Figure 3).



Figure 2- Bimanual palpation of the sublingual gland and duct. One finger intraorally, other hand palpating in submandibular region.



Figure 3- Wharton's ducts opening adjacent to the lingual frenulum.

In some cases, the stone can be palpable, thus confirming the diagnosis. Salivary stones may be visualised and appear as white or yellow oval structure. (Figure 4). A blueish mucocele swelling can develop in the floor of the mouth because of a stone blocking the duct. This is called a ranula. Abnormal tongue movement and sensation, weakness of the marginal mandibular nerve resulting in smile asymmetry are normally signs of malignancy and not sialolithiasis.



Figure 4- Salivary gland stone situated in the right Wharton's duct. Image sourced from NHS website. ("<https://www.nhs.uk/conditions/salivary-gland-stones>")

Referral to secondary care

When a salivary gland calculus is suspected on clinical examination, a referral should be made to either an oral and maxillofacial surgeon (OMFS) or an ear nose and throat (ENT) surgeon depending on the local service provision available. Outpatient review should be arranged in secondary care.

Differential diagnosis

Sialadenitis

Infection of the gland can complicate simple sialolithiasis. This is called sialadenitis. Sialadenitis may be associated with exudate, erythema and may lead to more systemic effects such as fever. Prescribing antibiotics in the community is first line management.

Dental abscess

A dental abscess is a collection of pus in the tooth, gums, or in the bone and surrounding tissues. A soft swelling inside the mouth in the buccal sulcus can often be seen. A dental abscess in a mandibular tooth can lead to extraoral swelling in the lower jaw. If severe, it may lead to loss of definition and the inability to palpate the lower border of the mandible. Swelling tends to be associated with continuous tooth pain that can be sharp in nature. This can often be elicited by percussion on the affected tooth. Referral to a dentist or OMFS on call is required for definitive management of the abscess and the tooth.

Investigations

In some cases, further investigations may be indicated. These can be briefly mentioned to patients to make them aware of potential future tests. When the diagnosis of sialolithiasis is easily established with clinical history and examination alone, no specific investigations are required prior to referral to secondary care. However, the following are beneficial, and their results would speed up the patient pathway:

Radiographs

When submandibular stones are queried, a lower standard occlusal radiograph or orthopantomogram (OPG) are beneficial. (Madani and Beale, 2006)

Availability should be checked with the local referral centre, as these views are not always available in a hospital setting. 10-20% of sialoliths are radiolucent on standard radiographs.

Ultrasound

When requesting the ultrasound scan, it is important to specify which gland is affected and also that the working diagnosis is a salivary gland stone. With this information, the sonographer should not only image the gland itself, but also the duct. They should report on the exact location of the stone and its size as these have direct implications on the type of treatment offered to the patient. The sensitivity of

ultrasonography has been found to be 59-94% with a specificity of 86-100% (Bhullar et al., 2015)

Sialogram

The ductal opening is cannulated, and radiopaque dye is administered into the gland. Plain radiographs are taken at different time intervals to visualise the ductal system, the glandular parenchyma as well as filling defects and strictures. Sensitivity has been shown to be 64-100% and specificity 88-91%.(Jäger et al., 2000)

Management

Traditionally the treatment for symptomatic obstructive sialolithiasis was surgical gland excision. This is now considered a last resort treatment due to the associated morbidity including potential facial nerve damage (marginal mandibular nerve). Current treatment includes a combination of conservative management and minimally invasive techniques.

Conservative treatments

The aim of conservative management is to promote salivary flow around an obstructing stone and alleviate symptoms. Patients can be advised to use any of these minimally invasive strategies from the NHS website to minimise/alleviate symptoms. There is not a “prescribed” maximum on any of these measures. With regards to gland massage, increased frequency may offer added benefit. Conservative managements can be seen in Box 2.

Box 2: Conservative management of sialolithiasis

1. Sugar free lemon/citrus drops or chewing gum
 - Promoting salivation
 - Lemon drops can be bought over the counter or prescribed as Salivix®
2. Ensuring good hydration throughout the day
 - This increases salivary flow.
3. Extra oral warm compress around inflamed areas
4. Glandular massage in the direction of salivary flow.
 - For submandibular glands this would be from below the angle of the mandible towards the chin.
 - For parotid stones preauricular to oral commissure.
5. Simple analgesia for pain control- Paracetamol.
6. Avoidance of picking out stones with sharp objects.
 - Risks further trauma and introducing infection.
7. Sucking on an ice cube/ice lolly can also promote symptomatic relief and alleviate pain.

Minimally invasive techniques

Specialist secondary care units can provide treatment of sialoliths with minimally invasive techniques. These include sialendoscopy to directly visualise the duct using a fibrotic camera. Once the stone is identified, it can be removed using specialised stone retrieval baskets. Larger stones, above 4mm can be broken down into smaller fragments using intracorporeal lithotripsy devices inserted under direct vision through the endoscope (similar technique as used by urologists to fragment ureteric stones). (Capaccio et al., 2017) Some centres offer basket retrieval of stones under radiological guidance similar to the sialogram technique described above.

Surgical treatment can be subdivided into minimally invasive and radical. Minimally invasive options include trans-oral sialolithotomy which shows reasonable results when removing large stones.(Bodner, 2002) Radical surgical options include removal of the stone by intra or extra oral approach or excision of the gland itself.

Safety netting/red flag symptoms

There are some important signs and symptoms which might merit further review or referral. These can be seen in box 3.

Box 3: Safety netting and red flag symptoms. Guidance for secondary care referral.

- Explain the risk with concomitant infection associated with stones (sialadenitis), which can require antibiotic treatment.
- Review again at GP practice:
 - No improvement following simple conservative interventions.
- Attend Emergency department:
 - Large swelling that may start to impact on swallowing.
 - Swelling spreading into/across the midline.
 - Swelling that impedes the airway.
 - Spreading cellulitis.
 - Signs of sepsis.

Key points

- Submandibular (glandular) and floor of mouth (ductal) swelling occurs secondary to distal outflow obstruction by a salivary stone.
- Pain occurs around mealtimes as the pressure in the system builds. Blockage of a salivary duct may lead to a dry mouth.
- Important to ask about dental pathology and make sure submandibular swelling is not secondary to dental abscess.
- Conservative management should be attempted initially, this includes analgesia, lemon drops and gland massage.

- If suspecting a salivary gland calculus, the patient should be referred to OMFS or ENT surgeon depending on local service provision.

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