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Etiology, Diagnosis and Management of Sialolithiasis

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ABSTRACT
Sialolithiasis is the most frequent cause of salivary gland swelling and it involves development of calcified structures within the ductal system of major salivary glands. The most frequent symptoms are recurrent episodes ofpain and swelling associated with meals. This article reviews the aetiology, clinical features and treatment of sialolithiasis.

KEYWORDS: sialolith, submandibular duct, obstruction and infection

INTRODUCTION

Sialolithiasis refers to formation of calcified intraluminal deposits in the ductal system of the major salivary glands (salivary calculi) which obstructs normal salivary flow andthis stasis paves the way for retrograde spread of infection from oral cavity. Sialolithiasis is a primary cause of major salivary gland swelling and the annual incidence of sialolithiasis in the range of 1 per 10,000 individuals to 1 per 30,000 individuals.[1] The majority of salivary calculi occur within the submandibular duct, and only about 20 per cent occur within Stensen's duct. Their occurrence within the submandibular and parotid glands proper is less common.[3] Incidence peaks between the age of 30 and 60 years[2,18]and mostly seen in males [2]

ETIOLOGY

The exact cause for sialolith is unclear. A series of events is believed to lead into the formation of a calculus. The initial factors include abnormalities in calcium metabolism, dehydration, reduced salivary flow rate, altered pH of saliva caused by infections, and altered solubility of crystalloids which leads to precipitation of mineral salts.[2,20]These micro calculi formed are intermittently secreted into the salivary ducts which serve as sources for further calicification.[1-6]It is also suggested that food debris or bacteria within the oral cavity may migrate into the salivary ducts and serve as a nidus for stone formation.[3,6]

This nidus is successively layered with organic and inorganic material, eventually forming a calcified mass. In about 15-20% of cases the sialolith will not be sufficiently calcified to appear radiopaque on a radiograph, and will be difficult to detect. [2,19]

80% of it develop within the ductal system of the submandibular gland (Warthin's duct); the formation of stones within the parotid gland system is distinctly less frequent. The long, tortuous, upward path of the submandibular duct, stagnation of saliva, the alkaline and viscous secretions of this gland, its higher concentration of calcium and phosphorous ions compared to other salivary glands may be responsible for its greater tendency to form sialolith.

DIAGNOSIS

HISTORY AND CLINICAL EXAMINATION

The patient with a salivary calculus is generally asymptomatic until the stone attains such a size that it interferes with the normal flow of saliva.[3] Patient gives a history of recurrent episodic pain and swelling of the affected gland, especially at mealtime with recurrent episodes of secondary infections.Pain and swelling get worsen when salivary flow is stimulated, for example with the sight, thought, smell or taste of food, or with hunger or chewing which is why its also known as "mealtime syndrome"[2],It is often associated with recurrent bacterial infectionswith fever and a purulent discharge at the papilla which is termed as Sialadenitis.In otherwise healthy adults, the presence of sialadenitis should raise a high index of suspicion that a sialolith is present and infection has occurred due to it.[3]. Theseverity of the symptoms may varybased on the degree of obstruction and the amount of backpressure exerted within the gland.

Physical examination with careful bimanual palpation of the duct of the involved gland will usually reveal the presence of a asymmetric swelling which is tender mostly within the duct. [1]Approximately 60% of parotid stones and 30% of submandibular stones will be located distally in their respective ducts. Salivary stones typically demonstrate an oval or round shape and a white or yellow colour on visual inspection if near the ductal opening. The stones are usually palpable along the anatomic course of the affected salivary duct [7,10]The chronic infection of the gland secondary to obstruction may lead to degenerative changes and fibrosis of the gland.

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COMPOSITION

Salivary stones are composed of a combination of organic and inorganic substances, including calcium carbonates and phosphates, cellular debris, glycoproteins, and mucopolysaccharides. Usually, organic matter predominates in the centre of the stone, whereas the periphery is essentially inorganic.[1,6]

HISTOPATHOLOGIC FEATURES:

On gross examination, Sialoliths appear as hard masses that are round, oval, or cylindrical. They are typically yellow, although they may be a white or yellow brown colour.

Microscopically, the calcified mass exhibits concentric laminations that may surround a nidus of amorphous debris. If the associated duct also is removed, then it often demonstratives squamous, oncocytic, or mucous cell metaplasia. Periductal inflammation is also evident. The ductal obstruction frequently is associated with an acute or chronic sialadenitis of the feeding gland [19]

INVESTIGATIONS

On radiographic examination, Sialoliths typically appear as radiopaque masses but may appear superimposed on the mandible and thus care must be exercised not to confuse it with an intrabony lesion. One of the maindisadvantages of plain radiograph is that itdoesn't give any information about the affected salivary gland.The radiolucent salivary stones which constitute about20-43% of submandibular and major percentage of parotid gland are also not visaulised.[7]Stones in the terminal portion of the submandibular duct are best demonstrative with mandibular occlusal radiographs.

Sialography, ultrasound, CT scan,MR Sialography may be usedas an additional imaging study of Sialoliths. Sialendoscopy allows for direct visualization of salivary stones and the salivary ducts, thus providing excellent sensitivity and specificity.[11]

MANAGEMENT

Small sialoliths of the major glands may be ejected spontaneously and those situated near the orifice of the duct can be removed by massaging and milking the stone toward the duct orifice. The other conservative methods include use of sialagogues, moist heat, and increased fluid intake. These may promote passage of the stone. Signs of infection, including cervical adenopathy, purulent discharge from the salivary ducts, or erythema surrounding the salivary ducts are indications for the need for antibiotic therapy.[1,7]

NEWER TREATMENT METHODS

Extracorporeal shock-wave lithotripsy, sialo endoscopy, laser intra-corporeal lithotripsy, endoscopically guided intra-corporeal lithotripsy, interventional radiology, the video-assisted conservative surgical removal of parotid and sub-mandibular calculi and botulinum toxin therapy are newer techniques that have been shown to be effective in the removal of sialoliths from the major glands.[2] These minimally invasive techniques have low morbidity and may avoid the necessity of gland removal[17]

Mobile submandibular stones measuring less than 5 mm located within the distal duct should initially undergo management with endoscopy. Impacted submandibular stones within the distal duct and stones larger than 5 mm should have treatment with transoral duct slitting. Stones of 5 to 7 mm within the proximal duct or hilar region should receive initial treatment endoscopically. If this is unsuccessful or the stone becomes impacted, the next step is a transoral surgical approach.[13]The calculus in the submandibular duct is removed trans orally under local anaesthesia by placing an incision directly on the calculi in the floor of mouth parallel to lingual vestibule after placing suture distal to the calculus to prevent posterior slipping of calculi. The stones posteriorly(in the phylum of gland) are managed by excising the gland itself through submandibular incision.

External shockwave lithotripsy (ESWL) is an option for not palpable stones or visualized under endoscopy. ESWL is generally unsuccessful for stones larger than 7 to 10 mm. Surgical excision of the submandibular gland should be a last resort.[8,14,15,16]

The calculus in the parotid gland duct in the portion that lies below the buccinator can be removed trans orally, but calculus that lies in the part of the duct over the masseter is removed through extraoral incision parallel to branches of facial nerve.

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