Diagnosis and Management Challenges of Sialolithiasis

Case Report

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LEARNING OBJECTIVES:

After reading this article, the individual will learn:

- the importance of relating the medical history, clinical exam, and radiographic assessment of a dental patient with a sialolith, and
- the symptoms, predisposing factors, and differential diagnosis of sialolithiasis.

ABOUT THE AUTHORS

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INTRODUCTION

Sialolithiasis, the most common disorder of the salivary glands, is defined as the formation of sialoliths in the oral-facial region. Sialoliths are calcified masses that develop in the intraglandular or extraglandular duct system as a result of mineralization of debris. The debris can include mucous plugs, bacterial colonies, epithelial cells, and even foreign bodies. Commonly, sialoliths range from 1 mm to 1 cm1 and primarily are comprised of calcium phosphate and calcium carbonate.2

Sialolithiasis accounts for more than 50% of diseases of the large salivary glands, and is therefore the most common cause of acute and chronic infections.3 Its occurrence in the adult population is approximately 12 per 1,000 patients, with a slight male predominance.4 More than 80% of salivary gland calculi can be found in the submandibular gland and located in the glandular parenchyma or the excretory duct.1 Submandibular sialolith formation is more common because its saliva is more alkaline, has an increased concentration of calcium and phosphate, and has a higher mucous content than saliva from the parotid or sublingual glands.3 Further, the submandibular duct is longer than that of the other major glands, and the saliva flows against gravity. Within the submandibular gland, the vast majority of sialoliths are found in the Wharton’s duct. The ratio of sialoliths found within the gland to those found in Wharton’s duct is 3:7.2

The etiological factors that account for sialolith formation are unknown, but saliva retention due to anatomical considerations, and saliva composition, are believed to be important.5 As patients age, and use of medications increases, saliva production often decreases. In addition, alterations of electrolyte concentrations, impairment of glycoprotein synthesis, and structural deterioration of the membranes of the cells in the salivary glands all occur. These may contribute to the higher incidence of calculi seen in the elderly.2

It is likely that for stone formation to occur, intermittent stasis of calcium-rich saliva occurs, producing a change in the mucoid element of saliva, and a gel forms. This gel produces the framework for deposition of salts and organic substances,
thus creating a stone. Histologically, sialoliths have a concentric, laminated structure of alternating layers of organic and inorganic material. The calculi are often built up around one or more central cores, although in some cases a central core is lacking.

Infection or inflammation of the salivary glands and the viscous nature of mucous secretions have been suggested as predisposing factors. In the case of bacterial infection, the development of sialoliths is favored as a result of an increase in salivary pH as well as an increase of organic matter that can obstruct the salivary ducts. Gout is the only systemic illness known to predispose patients to salivary stone formation. Studies of electrolytes and parathyroid hormone in patients with sialolithiasis have not shown abnormalities. A deficit of crystallization inhibitors such as phytate has also been suggested to be important as a predisposing factor in sialolith formation and development. Phytate is a component of plant seeds, and levels in the human body correspond with dietary intake.

CASE REPORT

A 28-year-old Asian American male presented to the Oral and Diagnostic Services Clinic at Howard University College of Dentistry for a routine examination. The medical and dental history was noncontributory, and clinical findings were within normal limits except for the presence of a swollen right submandibular gland (Figure 1). The patient noted that he experienced similar swellings intermittently since the age of 14. Further, the patient noted that swelling of the gland was mostly associated with sour foods, although no food in particular would lead to the swelling. The patient also stated that at times the gland would swell when he contemplated eating food.

Typically, the patient would manage the swelling by palpating and applying extraoral pressure, which would result in the secretion of a saliva-like fluid into his mouth. On occasion, when the patient would apply pressure to the area of the gland, the area would become tender, and the process of purging the gland would elicit mild discomfort. Since the age of 14 the patient identified only 2 instances when the gland had become swollen and he could not purge the saliva through palpation and extraoral pressure.

In these instances, the gland would swell to the point of causing slight pain, but the swelling would last only for a few hours. During the first episode of prolonged swelling, the patient was examined by his physician, who prescribed antibiotics.

Extraoral examination of the patient revealed that the right submandibular gland was more firm than the left submandibular gland. Intraoral examination revealed 2 separate firm masses within the right submandibular gland (Figure 2). Secretion of saliva from the gland was possible when palpating from the posterior to the anterior. The secreted saliva was clear and showed no evidence of purulence.
The sialoliths were first noticed on a panoramic radiograph as a radiopacity overlapping the apices of the teeth from tooth No. 26 through to the mesial root of tooth No. 30 (Figure 3). Further radiographic examination utilizing an occlusal film (Figure 4) demonstrated 2 distinct tube-like radiopaque masses within the ductal system of the right submandibular gland. The anterior radiopacity was approximately 7 mm in length and 2 mm in width at the widest point. The more posterior radiopacity was approximately 18 mm in length and 5 mm in width at its widest point.

After diagnosing the patient with sialolithiasis, a referral was made to the oral surgery department for evaluation and possible removal of the sialoliths. After consultation with an oral surgeon, the patient elected to have the sialoliths removed through a nonsurgical approach utilizing lacrimal probes. Typically, the lacrimal probe is used to cannulate the duct, and with each increase in the size of the lacrimal probe the duct is dilated. Once a sufficient dilation is achieved the sialolith will either be excreted from the duct due to pressure buildup from saliva, or it can be physically removed by digital manipulation. In this case, cannulation of the duct could not be achieved, and internal surgical removal of the sialoliths was elected due to the location of both sialoliths and the expected favorable outcome (Figure 5). This surgical process, referred to as sialodo-choplasty, involved a blunt incision along the duct between the 2 sialoliths. The sialoliths were then physically purged from the duct through digital manipulation (Figure 6). This digital manipulation resulted in the sialolith fragmenting into smaller pieces. Removal of all fragments was confirmed with a postoperative occlusal radiograph (Figures 7 and 8). Chromic gut sutures were placed, and the patient was prescribed a narcotic analgesic (acetaminophen and oxycodone) for pain relief and an antibiotic (dicloxacillin) to minimize the possibility of postoperative infection. Home care instructions included utilization of non-steroidal anti-inflammatory drugs to reduce swelling, salt water rinsing, a soft diet, and consumption of lemons to promote salivary flow.
DISCUSSION

Dentists may note a radiopacity on a panograph and mistake it for an artifact or unrelated benign condition. This failure to connect radiographic findings with the medical and dental history and the clinical findings can lead to misdiagnosis, and then ineffective treatment measures such as the prescription of antibiotics. Therefore, it is critical that dentists, in addition to taking a detailed medical history from the patient, carefully evaluate all radiographs and consider the findings in relation to the clinical examination and medical and dental history.

In this case, the patient noted swellings upon anticipation of food. Sialoliths have been identified in the literature as causing repeated swelling during meals. However, symptomless sialoliths are common. If pain is present, the severity of the symptoms depends on the degree of obstruction, which is related to the size and location of the sialolith. Sialolithiasis causes pain and swelling of the involved area by obstructing the food-related surge of salivary secretion. In some cases, the sialolith may cause stasis of the saliva, leading to bacterial contamination of the parenchyma of the gland, and clinical infection, with pain and swelling of the gland. Long-term obstruction in the absence of infection can lead to atrophy of the gland with resultant lack of secretory function and eventual fibrosis.

Correct diagnosis of a sialolith requires a proper history and clinical examination. Sialoliths can occasionally be palpated using a bidigital palpation approach at the floor of the mouth and parotid regions. Bi-manual palpation of the gland itself can identify a hypofunctional or nonfunctional gland associated with a uniformly firm and hard mass. The most common radiographic techniques used to diagnose sialolithiasis are panoramic or occlusal views. Ultrasound, scintigraphy, or sialography (radiographic examination of the salivary glands and ducts after the introduction of a radiopaque material into the ducts) can be useful for obtaining a diagnosis. Magnetic resonance sialography is a newer method of diagnosing sialolithiasis. It provides 2-dimensional or 3-dimensional images of the salivary gland without contrast medium and excessive exposure to radiation.

Differential diagnosis of a sialolith could include a calcified lymph node, an avulsed or impacted tooth or...
foreign body, a phlebolith, or myositis ossificans. Once a diagnosis of sialolithiasis is determined, effective treatment of the sialolith depends on the location of the stone, and is accomplished by extraoral or intraoral surgical removal of the sialolith. Removal of the affected salivary gland and its associated duct may also be necessary. In 2002, a sialoendoscopic system was introduced, which made it possible to diagnose and treat sialolithiasis with minimal intervention.

In a study by Nahlieli and Baruchin, 32% of stones in the submandibular gland were not detected by routine imaging methods. In some cases, appropriate diagnosis is particularly important because sialoliths involving the parotid gland, which occur in 10% to 20% of cases, can lead to gland degeneration and the subsequent need for gland removal if the condition is not diagnosed and treated early.

**CONCLUSION**

The dental practitioner has an important role to play in the management and possible treatment of sialolithiasis. In this case, the general dentist performed an appropriate review of the medical and dental history, clinical examination, and radiographic assessment, which was based on familiarity with the etiology, symptoms, and diagnostic techniques for sialolithiasis.

The findings in this case are important because the patient did not present as an emergency. The findings on the radiograph correlated with the clinical examination. Upon more detailed questioning, and further imaging (occlusal film), the diagnosis of sialolithiasis was made.

This case report highlights the importance of taking a detailed medical and dental history along with panoramic radiography, followed by a more selective, individualized radiographic assessment as necessary. More specifically, the general practitioner should routinely and systematically analyze radiographs to identify any variation from normal. Any variations from normal must be evaluated in consideration of the medical and dental history. Further questioning of the patient should be considered along with additional radiographic imaging. Finally, after a diagnosis is made, the patient should be treated or referred for treatment.

In summary, patients often present with vague symptoms, and the dentist should combine his or her knowledge of diseases with the 3 critical factors necessary to achieve the correct diagnosis: a thorough medical and dental history, a complete, individualized clinical examination, and corresponding radiographic assessment. In this way, a realistic working diagnosis can be made, and the appropriate referral, or treatment plan, will follow.

**REFERENCES**

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**POST EXAMINATION QUESTIONS**

1. Sialoliths are calcified masses that may develop around all of the following EXCEPT ______.
   a. foreign bodies  
   b. mucous plugs  
   c. bacterial colonies  
   d. red blood cells

2. The occurrence of sialolithiasis in the adult population is approximately ______.
   a. 2 in 100  
   b. 2 in 50  
   c. 12 in 1,000  
   d. 1.2 in 50

3. Submandibular sialolith formation is more common because ______.
   a. saliva is less alkaline  
   b. there are decreased levels of calcium phosphate in submandibular saliva  
   c. the duct flows against gravity  
   d. there is a lower mucous content in submandibular saliva as compared to other glands

4. Which of the following may contribute to a greater incidence of calculi formation in the elderly?
   a. more medication is consumed and salivary flow is reduced  
   b. alterations of electrolyte concentrations  
   c. structural deterioration of cell membranes of cells in the salivary gland can occur  
   d. all of the above

5. Which of the following is the only systemic condition known to be a predisposing factor for salivary stone formation?
   a. high cholesterol  
   b. gout  
   c. hepatitis  
   d. Marfan’s syndrome

6. A deficiency of crystallization inhibitors has been suggested as an important predisposing factor in sialolith formation and development. Which of the following is an example of a crystallization inhibitor?
   a. phytate  
   b. aspartame  
   c. phosphate  
   d. folic acid

7. In a patient with sialolithiasis, if pain is present, the severity of the symptoms depends on which of the following?
   a. the degree of obstruction  
   b. the size of the sialolith  
   c. the location of the sialolith  
   d. all of the above

8. Differential diagnosis of a sialolith is least likely to include ______.
   a. a calcified lymph node  
   b. an avulsed or impacted tooth or foreign body  
   c. condensing osteitis  
   d. a phlebolith
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