

SIALOLITHIASIS DIAGNOSTIC METHODS

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Abstract. *One of the most common disorders of the salivary glands is sialolithiasis. A history of pain or/and swelling in the salivary glands, especially during meal suggests this diagnosis. For small and accessible stones conservative therapies like milking of ducts with palliative therapy can produce satisfactory results. Surgical management should be considered when the stone/stones are inaccessible or large in size as conservative therapies turned out to be unsatisfactory. In this paper, we present three cases of sialolithiasis in the submandibular gland along with a review of existing literature. The purpose of this paper is to add three more cases to the literature and review the theories of etiology, clinical features, available diagnostic and treatment procedures.*

Keywords: *salivary stone disease, subclinical hypothyroidism, subclinical hyperthyroidism, mineral metabolism, bone remodeling, thyroid.*

Sialolithiasis is the main cause of unilateral diffuse parotid or submandibular gland swelling. Its incidence has been poorly studied but seems to be much higher than the classic data published by Rauch of 1 case per 300 000 people per year. In a recent study, based on hospital admission figures in England, Escudier and McGurke estimated this incidence to be between 1 per 15 000 and 1 per 30 000. Personal observations of an incidence between 1 per 10 000 and 1 per 20 000 seem to confirm these results (F.M. and P.D., unpublished data, 2002). Sialolithiasis results in a mechanical obstruction of the salivary duct, causing repetitive swelling during meals, which can remain transitory or be complicated by bacterial infections. Traditionally, recurring episodes necessitate treatment by open surgery, and sialolithiasis still represents the most frequent reason for submandibular gland resection. Interestingly, parotid gland resection remains less frequent, probably because of the higher incidence of postoperative complications such as facial paresis. In the early 1990s, several authors have attempted to cure sialolithiasis conservatively. Radiologists dealing with sialoliths during sialography have attempted retrieval of these stones using a Dormia basket either blindly or under sialographic control. Initial attempts to explore salivary ducts were also performed during the same period, but equipment limitations precluded adequate visualization. Others, inspired by urologic techniques, developed extracorporeal lithotripsy for sialolithiasis. Although endocannular lithotripsy was also available, a lack of adequate instrumentation prevented complete ductal exploration and treatment. Thanks to major advances in optical technologies, complete exploration of the salivary ductal system and a precise evaluation of its pathologic state are now possible. Sialendoscopy, or sialoendoscopy as it is called by others, is therefore a new procedure, aiming to visualize the lumen of the salivary ducts to diagnose and treat ductal diseases. The objective of this article is to review the existing diagnostic and interventional modalities for sialolithiasis management. The exact pathogenesis of sialolithiasis remains unknown, and various hypotheses have been proposed. The first is based on the existence of intracellular microcalculi that, when excreted in the canal, may become a nidus for further calcification. The second hypothesis suggests that aliments, substances, or bacteria present within the oral cavity may migrate into the salivary ducts and become the nidus for further calcification. Both hypotheses presuppose an

initial organic nidus that progressively grows by the deposition of layers of inorganic and organic substances. According to most published data, salivary stones are localized in the submandibular gland in 80% to 90% of sialolithiasis cases. In our experience, parotid glands are affected more frequently (in up to 40% of cases), a difference possibly explained by the sensitivity of the new detection methods used. This may also explain a high incidence of multiple sialolithiasis that was found in 58% (29/50) of parotid and 29% (31/106) of submandibular affected glands. The annual growth rate of established salivary stones has been estimated to be 1 mm per year. They vary in shape, being round or irregular. According to 2 recent studies, the size ranges from 2 mm to 2 cm, with the mean being 3.2 mm and 4.9 mm for parotid and submandibular stones, respectively, a finding that emphasizes the need for fragmentation before extraction of these stones. The classic occlusal film effectively shows ductal stones, while intraglandular and small stones can be missed. According to an early report by Rauch and Gorlin, only 20% of sialoliths are radiotransparent; hence, this method should only be used for screening when no other method is available.

Magnetic resonance sialography is a new diagnostic procedure, with promising results. It consists of 3-mm T2-weighted fast spin-echo slides, performed in the sagittal and axial planes. Volumetric reconstruction is then performed, allowing a visualization of the ducts and their condition. The advantages include a rapid, totally noninvasive technique, no dye injection, no irradiation, and no associated pain. The disadvantages are (1) the 45 minutes required for the reconstruction (although the acquisition time is 10 minutes); (2) MR imaging-associated inconveniences such as equipment costs, ferromagnetic implants, and examination intolerance by claustrophobic patients; and (3) limitations because of artifacts resulting from dental bridges. This new technique has been shown to be an excellent radiological technique for sialolithiasis.

Diagnostic sialendoscopy is a recently described procedure that allows an almost complete exploration of the ductal system, including the main duct and secondary and tertiary branches ([Figure 1](#)). This is possible thanks to the most recently manufactured endoscope (Karl Storz, Tübingen, Germany), which has a small outside diameter (2 channels of respectively 0.9- and 1.3-mm diameter) and incorporates a rinsing channel, necessary for dilatation of the ductal system and for cleaning and rinsing of the debris during the procedure. The need for a semirigid system has been demonstrated by the difficulty in directing a flexible system without a mobile tip and its fragility and poor image quality. Among the last 450 endoscopies we performed, diagnostic sialendoscopy was achieved in 98% of cases, while others report a 96% success rate. Rare limitations include an extremely tortuous canal that could hamper endoscope progression and difficulties in directing the endoscope at the distal end of the canal system.

The classic treatment of sialolithiasis is antibiotics and anti-inflammatory agents, hoping for a spontaneous stone expression through the papilla. In cases of submandibular stones located close to Wharton papillae, a marsupialization (sialodochoplasty) is performed and the stone removed. Interestingly, although sialolithiasis is the most frequent reason for submandibular gland resection, stones are often left in the Wharton duct remnant. In cases of posterior-located submandibular or parotid stones, a conservative approach is adopted whenever possible, probably because parotidectomy for infectious conditions is associated with a high incidence of facial nerve complications.

In conclusion, the approach toward unilateral salivary gland swelling is the same for the submandibular and parotid glands, although the smaller diameter of the parotid ductal system renders the procedure more challenging. Once a clinical suspicion of a ductal obstruction is

present, we tend to favor diagnostic sialendoscopy as the initial procedure of choice, mainly because of its minimally invasive nature and excellent patient acceptance. In cases of multiple glandular symptoms or unclear clinical presentation, MR sialography should be performed so that the texture of the gland, surrounding tissue, and ductal system of several salivary glands can be assessed.

If diagnostic sialendoscopy reveals 1 or more stones (or other ductal pathologic conditions, such as stenosis), the interventional procedure can be conducted in the same setting. For small stones less than 4 mm in diameter in submandibular cases and less than 3 mm in parotid cases, extraction is performed with custom-designed wire baskets of various sizes. In cases of bigger stones, prior fragmentation is necessary using an external lithotripter or, preferably, a dedicated laser system. Stenoses are treated with metallic dilators when located in the main duct or with balloon catheters under endoscopic control for localized or more peripheral strictures.

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