# The Role of Ultrasonography in Diagnosing and Managing Sialolithiasis: A Case Report and Literature Review

CME Credits

**Yen-Chun Chen[1,2,3], Hann-Ziong Yueh[1], Shih-Chun Lu[1], Che-Hsuan Lin[1,3]***

[1]Department of Otolaryngology, Taipei Medical University Hospital, Taipei, Taiwan, [2]Graduate Institute of Medical Sciences, College of Medicine, Taipei Medical University, Taipei, Taiwan, [3]Department of Otolaryngology, School of Medicine, College of Medicine, Taipei Medical University, Taipei, Taiwan



## Abstract

Sialolith-induced obstructive sialadenitis is a commonly encountered clinical scenario, yet the variations in the size and location of the stone can complicate immediate clinical assessment. Utilizing dynamic ultrasound imaging along with specific structural markers can provide valuable, immediate objective evidence in diagnosing submandibular sialolithiasis. This initial ultrasound evaluation streamlines the decision-making process by facilitating the timely scheduling of confirmatory computed tomography scans and guiding subsequent surgical interventions. This case report illustrates how in-office ultrasonography expedited the diagnosis and subsequent surgical decision-making process for submandibular sialolithiasis within a span of just 1 week.

**Keywords:** Obstructive sialadenitis, sialolithiasis, ultrasonography

## Introduction

Obstructive sialadenitis is frequently encountered during clinical practice, with salivary gland stones being the most common cause.[1] However, due to variations in the location, size, and degree of calcification of these stones, clinical assessment alone often cannot provide a definitive diagnosis in many cases. With recent advancements, ultrasound has been proven to possess excellent diagnostic capabilities and is recognized as the first-line tool for diagnosing obstructive/inflammatory salivary gland conditions.[2] For physicians and surgeons performing interventional procedures, conducting an ultrasound examination promptly at the suspicion of salivary gland stones based on clinical symptoms not only accelerates the diagnostic process but also allows for early communication with the patient regarding treatment options and related precautions. This significantly reduces the waiting time required for treatment. This case report introduces a 24-year-old female who, following the initial ultrasound findings, underwent relevant imaging confirmation promptly and then soon reached a consensus with the patient on minimally invasive interventional options.

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## Case Report

This 24-year-old female, without a history of systemic disease, visited our outpatient department due to the right upper neck pain for 10 days. She mentioned she had received 1 week of antibiotics from local clinic. Her pain relieved partially but dry mouth occurred. Physical examination showed tender swelling over the right submandibular gland, and pus-like saliva was noted from the orifice of her right Wharton's duct upon bimanual palpation of the gland. Acute sialadenitis in her submandibular gland was impressed, but no obvious induration was palpated over her mouth floor. In-office head and neck ultrasonography (Philips Clear Vue 350, MA, USA) was performed, which revealed relatively enlarged right submandibular gland with intraglandular ductal dilatation [Figure 1a], and an eggshell-like 0.6 cm hyperechoic lesion with posterior acoustic shadow near the right submandibular hilar area [Figure 1b]. Hence, computed tomography (CT) without contrast was soon scheduled, in which a 0.6 cm calcified nodule at the anterior aspect of her

**Address for correspondence:** Dr. Che-Hsuan Lin, Department of Otolaryngology, Taipei Medical University Hospital, Taipei, Taiwan.
E-mail: cloudfrank@gmail.com



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right submandibular gland was identified, with mild glandular swelling but without peripheral fat stranding. The results confirmed our diagnosis as right submandibular sialolithiasis with acute sialadenitis [Figure 2].

Thus a surgical approach using sialendoscopy with holmium: yttrium aluminum garnet laser-assisted lithotripsy was determined and performed. After serial dilatation of her right Wharton duct's orifice using 4-0 to Number 4 conical dilators (Karl Storz, Tuttlingen, Germany), the Miniature Straight Forward Telescope 0° (Karl Storz, Tuttlingen, Germany) along with the operating sheath was gently inserted into the main duct. One impacted stone was identified around the hilum and was fragmented into pieces through directly delivering laser energy under sialendoscopic visualization [Figure 3]. The stone fragments were removed using grasping forceps or flushed out of the salivary duct. After thorough inspection to confirm no residual stone, a silastic stent with 1.7-mm diameter was inserted into the duct in case of ductal stricture. She received outpatient steroid intraductal irrigation once per week after discharge. After 2 weeks, her glandular swelling totally subsided, and the stent was removed. The postsurgery healing process continued without any complications for approximately 1.5 months during the most recent follow-up.

## Discussion

Our case report illustrated that the use of ultrasonography has substantially accelerated the diagnosis of submandibular sialolithiasis. As sonographic equipment becomes more widely available across medical institutions of varying sizes, this initial confirmation via sonography for salivary stones facilitates prompt decision-making processes, including referrals or the timely scheduling of further CT scans. In addition, it encourages the selection of the most suitable intervention, fostering effective communication and collaboration between patients and healthcare providers.

Ultrasonography has been demonstrated to possess 94.7% of sensitivity and 97.4% of specificity in diagnosing salivary gland stones.[1] Sialoliths are the most common cause of obstructive sialadenitis, but they are often challenging to palpate directly in clinical settings due to their relatively small sizes[3] and location deep within the gland or ducts. In such cases, dynamic ultrasound imaging, along with relevant structural features such as crescent or granular echogenic lesions with posterior acoustic loss, associated proximal ductal dilation, and additional parenchymal changes such as sialectasis,[4] can provide immediate objective evidence effectively. Ultrasound is noninvasive, radiation-free, cost-effective, and has become the preferred tool for diagnosing salivary gland stones among many healthcare professionals.

CT scanning also offers high sensitivity and specificity in diagnosing salivary gland stones, making it a preferred choice for most clinical practitioners.[5,6] However, CT scans often involve longer waiting times,[7,8] which not only increases the burden on patients but may also allow the disease to progress, potentially leading to complications in minimally invasive surgery or necessitating more invasive interventions. In our case, an ultrasound examination was soon performed during the outpatient visit, and a CT scan was scheduled immediately and confidently after the abnormality was detected. In cases where a preliminary diagnosis of salivary gland stones was

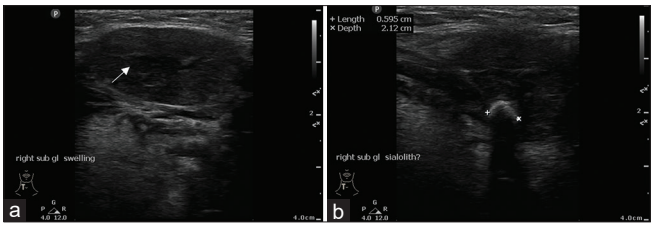


**Figure 1:** (a) Relatively hypoechoic, enlarged right submandibular gland with intraglandular ductal dilatation (arrow). (b) Crescent-shaped hyperechoic lesion located over the right submandibular hilar area

**Figure 2:** Computed tomography scan showed a small calcified nodule at the anterior aspect of right submandibular gland along with mild glandular swelling

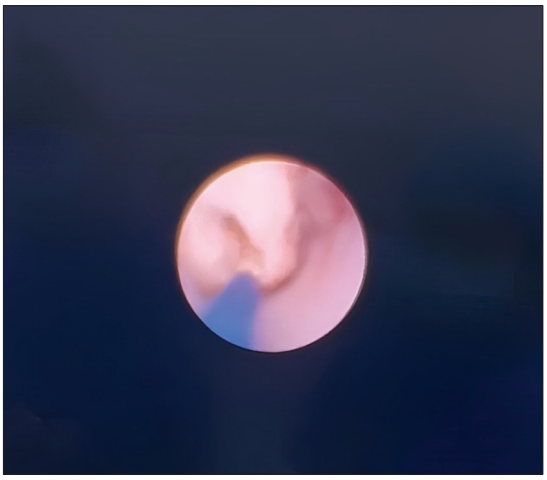

**Figure 3:** One impacted stone was identified and fragmented into pieces through directly delivering laser energy under sialendoscopic visualization

made without prior history of recurrent gland swelling, the feasibility of minimally invasive surgery could be discussed early on. A follow-up outpatient appointment 1 week later not only involved reviewing the reports but also confirmed the scheduling for the subsequent minimally invasive surgical procedure.

Beyond its diagnostic capabilities, sonography plays a pivotal role in operative decision-making and intraoperative assessment for sialolithiasis. One notable benefit is the ability to assess surrounding tissues for complications, such as inflammation and increased fat stranding. Increased fat stranding, indicative of a more severe inflammatory response, may guide clinicians in deciding whether to perform the minimally invasive sialendoscopy or not to prevent possible complications such as ductal ectasia or ductal rupture.[9] Furthermore, Goncalves *et al*.[10] mentioned that in some false-negative cases after sialendoscopic examination, some peripheral located stones might become mobile to sonographic favorable sites after profuse ductal irrigation. A second ultrasound check may be valuable to prevent residual stones.

As minimally invasive techniques for organ preservation become more prevalent, sialendoscopic-assisted surgery is gaining popularity as a treatment for obstructive or functional salivary disorders. In cases where there are larger stones (>5 mm) or multiple sialoliths, laser lithotripsy with repeated entrance of the salivary duct papilla may be required. However, this can result in possible ductal thermal injury or salivary papillary mucosal erosion, which can increase the potential for postoperative ductal stenosis. In such circumstances, salivary stent placement is usually necessary to prevent further stenosis or stricture during the recovery phase. The estimated period of stent placement may be shortened to 2 weeks, as previous literature[11] has described.

While sonography is a valuable tool, it does have limitations in the diagnosis of sialolithiasis. One significant constraint is its inability to visualize smaller stones. In fact, one study[10] reported that the average size of salivary stones in cases where sonography produced false-negative results was approximately 2.27 mm in the submandibular gland and 3.0 mm in the parotid gland. Besides, in around 80% of cases,[10] where false-negative results occurred for submandibular gland sialoliths, the stones were situated at the most distal portion of the duct, often obstructed by the acoustic shadow of mandible. However, these stones are easier to be retrieved by sialendoscopy. Furthermore, examples of competing hyperechoism[10] caused by intraductal fibrosis, peripheral calcified tissue, or even air bubbles at the oral mucosal surface can interfere with evaluation. At this time, CT imaging has higher specificity than ultrasonography in determining the number, the size, and the location of salivary stones.[12] However, CT imaging may fail to reveal radiolucent calculus, which can account for 10%–20% of all sialolithiasis. Therefore, sonography should be used in conjunction with other imaging modalities and clinical assessments for a comprehensive evaluation. However, if obstructive symptoms persist but none of the noninvasive diagnostic imaging demonstrates positive evidence, diagnostic sialendoscopy may be considered to reveal any ductal stricture, recurrent inflammation-related fibrotic stenosis, or other pathology.

In conclusion, sonography has revolutionized the diagnosis and operative decision-making process for sialolithiasis. Its ability to swiftly identify salivary gland stones and assess surrounding tissue changes has accelerated the initiation of appropriate treatment strategies, thereby enhancing patient care. However, clinicians must be aware of its limitations, particularly in cases of smaller stones or nearby competing hyperechoic structures. As an integral component of the diagnostic armamentarium, sonography should be complemented with other clinical and imaging tools for a comprehensive evaluation of sialolithiasis. Nonetheless, its role in expediting diagnosis and guiding operative decisions cannot be understated, ultimately contributing to improved patient outcomes in the management of this condition.

## Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent form. In the form, the patient has given her consent for her images and other clinical information to be reported in the journal. The patient understands that her name and initials will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

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## Conflicts of interest

There are no conflicts of interest.

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