



Diagnostic and Therapeutic Management of Submandibular Sialolithiasis: A Six-Case Series

A. AFIF¹

Y. NAJIM²/ H. YACHKOURI³/ Y. BENNAOUI⁴/ K. HATTAB⁵/ Z. AZIZ⁶
/ M. EL BOUIHI⁷/ N. MANSSOURI⁸

Department of Maxillofacial Surgery, Stomatology and Aesthetic Surgery
Ibn Tofail Hospital
Mohammed VI University Hospital Center (CHU)
Marrakech

1.1 Abstract

Submandibular sialolithiasis is the leading cause of salivary gland obstruction.

We retrospectively analyzed six cases treated in our department, assessing clinical features, imaging findings, management, and outcomes.

Patients presented mainly with salivary colic and submandibular swelling. Imaging confirmed lithiasis in all cases. Treatment included conservative measures, intraoral stone removal, lithotripsy referral, or submandibulectomy for complex cases. All patients showed favorable clinical evolution. A conservative and minimally invasive approach should be considered first-line therapy, reserving gland excision for refractory or complicated cases.

Keywords: Submandibular sialolithiasis, Sialadenitis, Wharton's duct, Salivary colic, Submandibular swelling, Purulent discharge, Ductal obstruction, Sialolithotomy, Submandibulectomy, Extracorporeal shock wave lithotripsy, Case series.

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2 Introduction

Submandibular sialadenitis secondary to sialolithiasis is defined as an inflammatory process of the submandibular gland resulting from obstruction of the salivary ducts by calculi. It represents the most common form of salivary gland lithiasis, accounting for nearly 80% of all cases, and is predominantly encountered in the adult population.

The diagnosis is primarily clinical, based on the presence of characteristic symptoms such as recurrent salivary colic, painful swelling of the gland, and purulent discharge from Wharton's duct. Confirmation is provided by appropriate imaging modalities, including ultrasonography, panoramic radiography, and, when necessary, computed tomography or sialendoscopy.

Therapeutic management depends on both the size and anatomical location of the calculi. Non-invasive modalities, such as extracorporeal shock wave lithotripsy, may be employed for small and accessible stones. Minimally invasive approaches, including sialendoscopy or intraoral surgical removal, represent the current standard of care for the majority of cases. In contrast, submandibulectomy is reserved for large, intraglandular, or recurrent stones, or when conservative measures have failed.

The prognosis is generally favorable, particularly when diagnosis is established early and appropriate treatment is initiated. Preventive strategies, including meticulous oral hygiene and adequate hydration, remain essential in reducing the risk of recurrence.

3 Clinical Case I

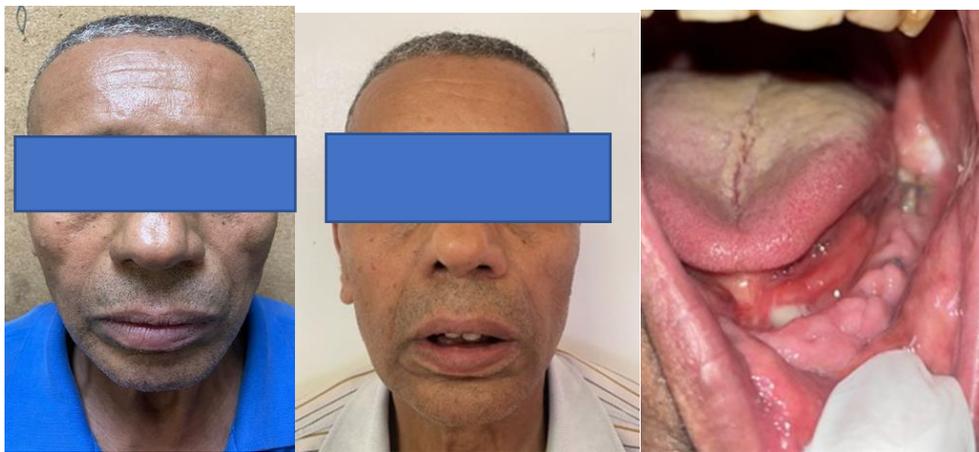
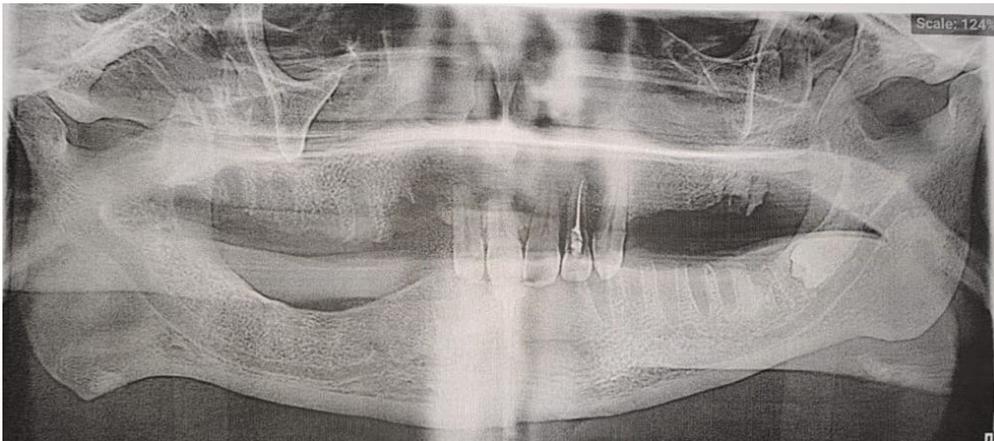


Figure 1. Preoperative clinical photograph showing small left submandibular swelling.

- A 70-year-old male with a history of valvular heart disease under long-term anticoagulation (Sintrom) presented with salivary colic and a foreign body sensation in the floor of the mouth evolving over ten days. Clinical examination revealed a left submandibular induration of the oral floor (1 × 2 cm), erythematous and painful on palpation, with purulent discharge from Wharton's duct. A left submandibular lymphadenopathy (1.5 cm, firm and painful) was also noted.
- **Laboratory** findings showed normal leukocyte count (7,340/mm³), neutrophils 5,930/mm³, and CRP 2 mg/L.
- **Ultrasonography** demonstrated a swollen left submandibular gland with maximal thickness of 16 mm compared to 8 mm on the contralateral side. Panoramic radiography was consistent with lithiasis.

Figure 2. Panoramic radiograph demonstrating radiopaque submandibular sialolithiasis.



3.1 Treatment Strategy

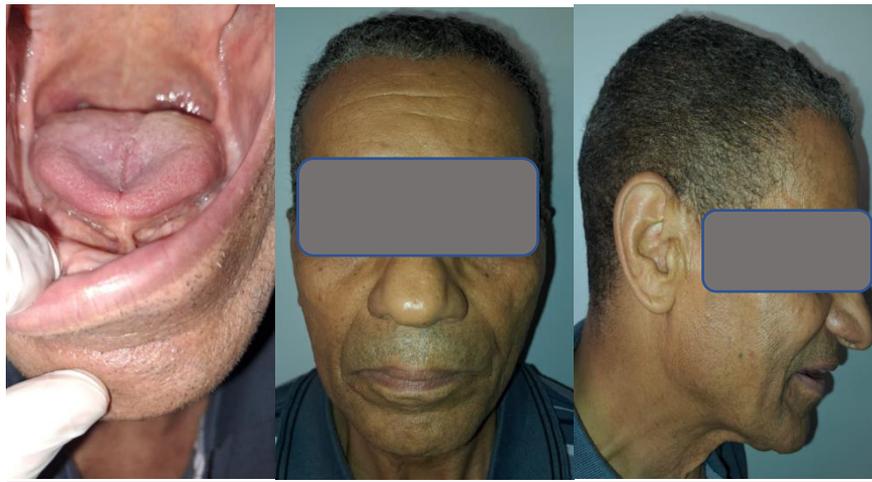
Figure 3. Macroscopic appearance of the extracted submandibular salivary calculus after surgical removal.



The patient was managed conservatively with intravenous antibiotic therapy, anti-inflammatory medication, and adequate hydration. Local gland massage and sialogogue agents were prescribed to promote salivary flow, in addition to strict oral and dental hygiene instructions.

3.2 Follow-up and Outcome

Figure 4 .At 6 months post-extraction of the calculus



The clinical course was favorable, with significant improvement in functional and physical findings. Salivary colic and purulent discharge resolved completely, accompanied by the disappearance of the submandibular swelling and absence of pain.

Figure 5 .At 12 months post-extraction of the calculus



Sustained clinical improvement was observed. There was no recurrence of salivary colic or purulent discharge, the submandibular swelling had completely regressed, and the patient remained pain-free.

4 Clinical Case II

Figure 6. Preoperative clinical photograph showing small left submandibular swelling with intraoral view .



A 50-year-old female with no relevant medical history presented with one month of recurrent salivary colic, purulent discharge, and lingual heaviness. Clinical examination revealed a 1 × 3 cm induration of the right oral floor, painful and erythematous, with tenderness of the right submandibular gland.

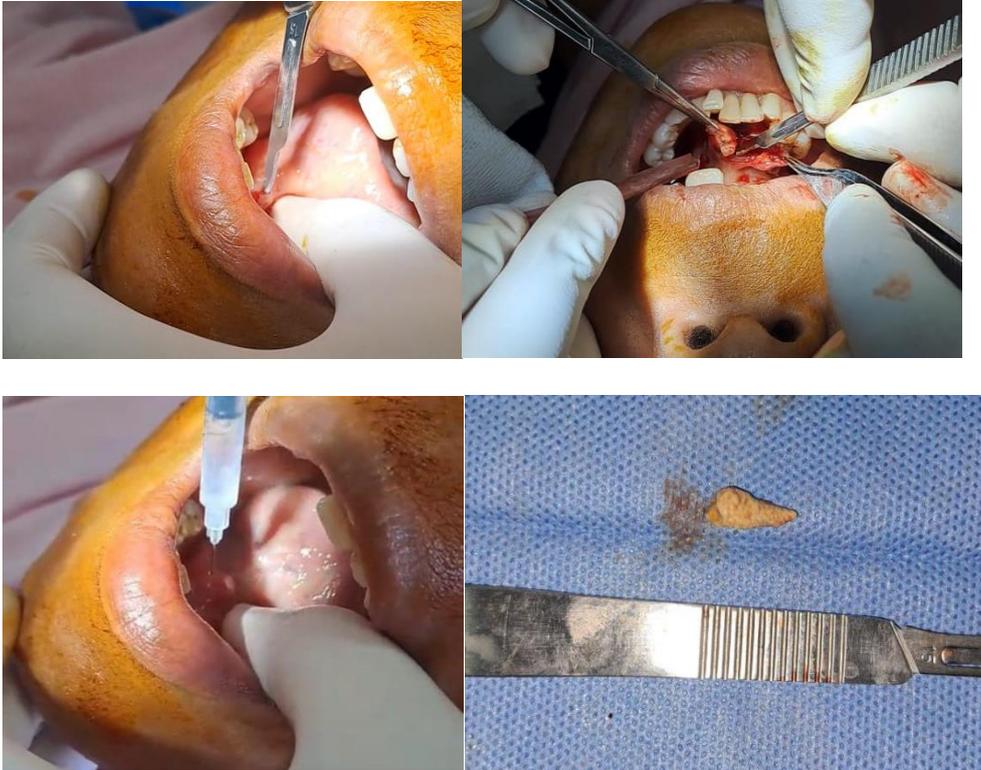
Ultrasound showed a sialolithiasis in Wharton's duct (10 × 3 mm) with upstream ductal dilatation (2.2 mm).

Figure 7. Panoramic radiograph demonstrating radiopaque submandibular sialolithiasis.



4.1 Therapeutic Approach

Figure 8. a sialolithotomy with calculus extraction, performed under local anesthesia in an outpatient setting



4.2 Follow-up and Outcome

Figure 9. At 30 days post-extraction



The clinical condition was characterized by complete resolution of inflammatory signs and salivary colic, with no further purulent discharge. The lingual numbness also resolved.

Figure 10 .At 18 months post-extraction



Sustained improvement was noted, with absence of inflammatory signs, salivary colic, and purulent discharge. Lingual numbness had completely resolved.

Spectrophotometric Analysis of the Calculus:

The stone composition was identified as **carbonate apatite (carbonated calcium phosphate)**.

5 Clinical Case III

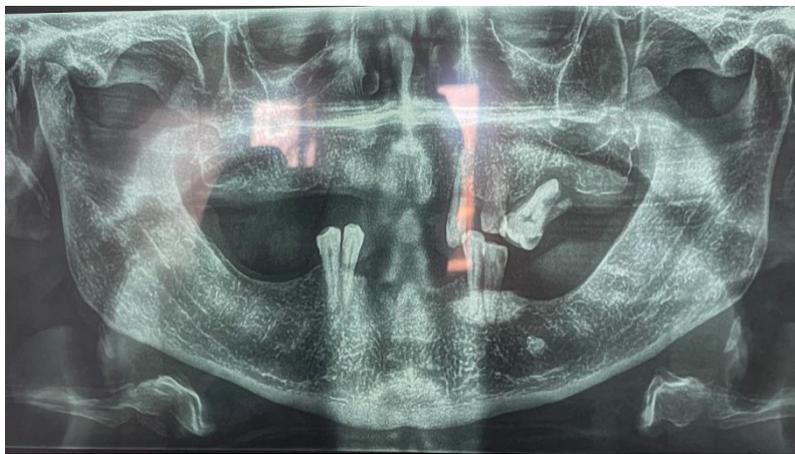
Figure 11. Preoperative clinical photograph showing small left submandibular swelling with intraoral view .



A 61-year-old male with no significant history reported a 5-year history of foreign body sensation in the oral cavity, meal-related pain, submandibular swelling, intermittent purulent discharge, febrile episodes, and general health deterioration.

On examination, a palpable calculus (1 × 2 cm), hard and painful, was detected at the orifice of Wharton's duct, associated with Garel's hernia. Panoramic radiography showed a well-defined, radiopaque ovoid calculus (5 mm), consistent with intra-ductal or intra-glandular lithiasis.

Figure 12. Panoramic radiograph Well-defined, radiopaque ovoid shadow (5 mm), compatible with an intra-ductal or intra-glandular salivary calculus (right Wharton's duct or submandibular gland).



5.1 Therapeutic Approach

Figure 13 .Macroscopic appearance of the extracted submandibular salivary calculus after surgical removal.



On May 27, 2024, the patient underwent manual extraction of the calculus in an outpatient setting.

6 Clinical Case IV

Figure 14 . Preoperative clinical photograph showing small left submandibular swelling with intraoral view .



A 46-year-old male with no medical history presented with a one-month history of postprandial painful swelling in the left submandibular region. The episode was preceded by toothache due to a carious mandibular third molar (tooth 38). Examination revealed a well-circumscribed, mobile, hard, and painless submandibular mass. The oral floor was free, but Wharton's duct ostium was dilated with purulent discharge. Multiple dental caries and partial edentulism were

noted.

Laboratory values were normal (WBC 5,000/mm³, CRP 1.9 mg/L).

Figure 14 .. Ultrasound of the submandibular gland demonstrating sialolithiasis and ductal changes.



Figure 15 .. Well-circumscribed ovoid radiopaque lesion, denser than the surrounding bone structures.



6.1 Therapeutic Approach

Following unsuccessful attempts at manual extraction and intraoral sialolithotomy, the patient underwent submandibulectomy.

7 Clinical Case V

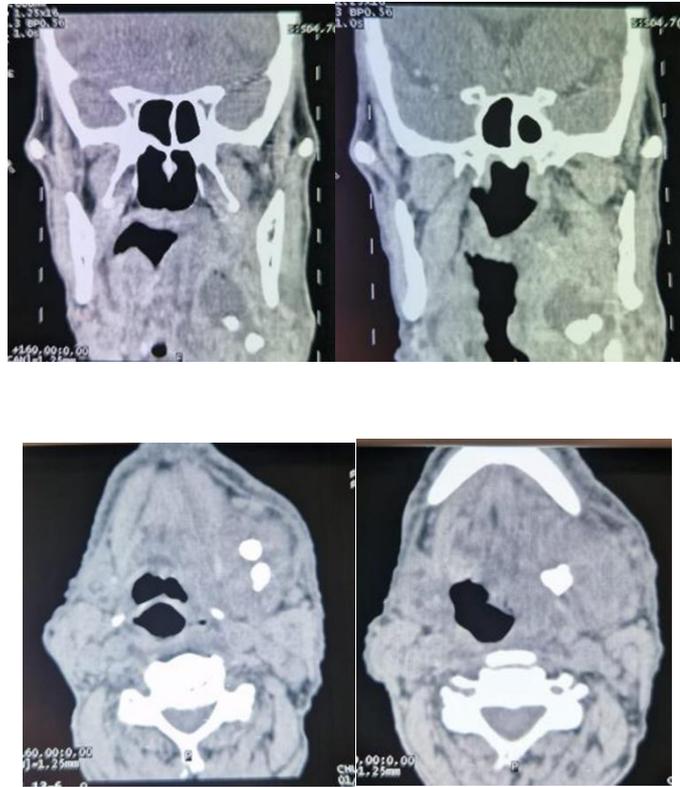
Figure 16. Preoperative clinical photograph showing small left submandibular swelling with intraoral view .



An 81-year-old male with no significant history presented with left submandibular swelling, fever, and dysphagia to both solids and liquids. Examination revealed a painful, non-fluctuant swelling fixed to deep planes, purulent discharge from Wharton's duct, and restricted tongue protrusion.

Laboratory findings were notable for marked leukocytosis ($29,000/\text{mm}^3$) and elevated CRP (282 mg/L). Ultrasound demonstrated a large necrotic lesion with ipsilateral cervical lymphadenopathy. Contrast-enhanced CT revealed left submandibular sialadenitis upstream of macrolithiasis, complicated by a floor-of-mouth abscess measuring $31 \times 26 \times 30$ mm. Naso-fibroscopy confirmed salivary stasis.

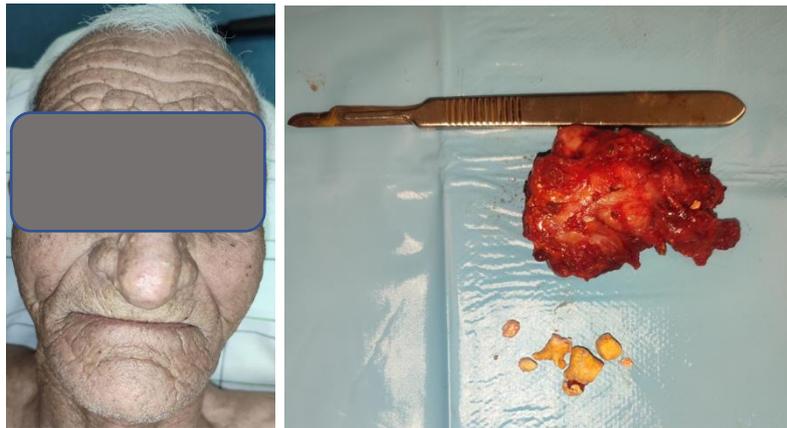
Figure 17. Contrast-enhanced CT scan showing submandibular sialadenitis and associated complications.



Findings consistent with left submandibular sialadenitis upstream of macrolithiasis, complicated by a floor-of-mouth abscess measuring 31 × 26 × 30 mm.

7.1 Therapeutic Approach

Figure 18. On March 18, 2025, the patient underwent submandibulectomy.



7.2 Outcome:

Postoperative evolution was favorable, with resolution of infection and restoration of oral function.

8 Clinical Case VI

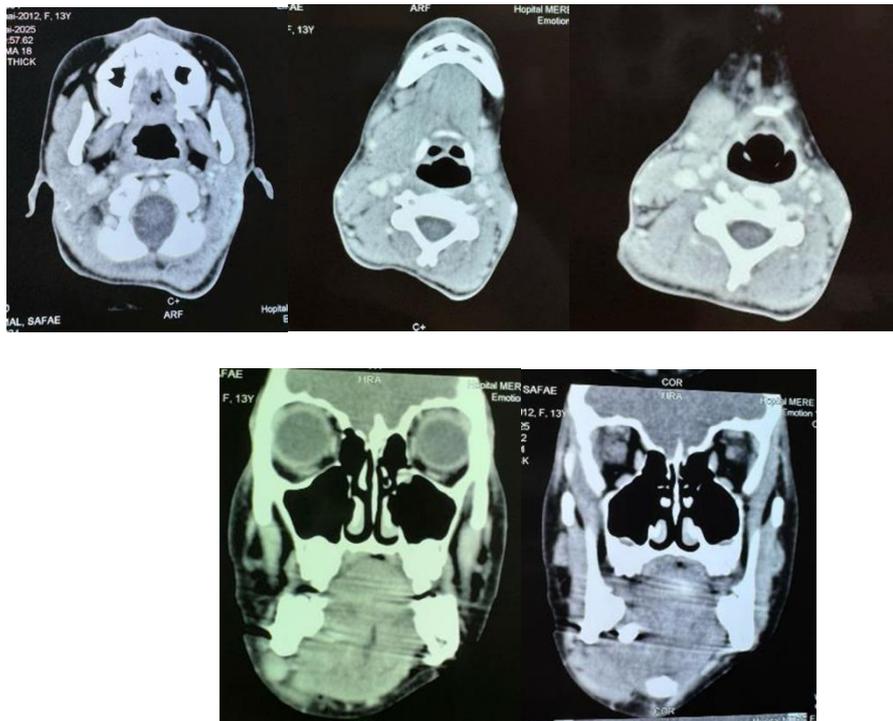
Figure 19. Preoperative clinical photograph showing small left submandibular swelling with intraoral view .



A 13-year-old female with a history of recurrent tonsillitis presented with a 7-day history of right submandibular swelling and salivary colic. Clinical examination revealed a painful, non-fluctuant, non-warm right jugal swelling with ipsilateral lymphadenopathy.

Laboratory evaluation demonstrated leukocytosis ($13,400/\text{mm}^3$) and elevated CRP (60 mg/L). Ultrasound revealed an enlarged right submandibular gland with a lobulated contour, heterogeneous echotexture, and a stone measuring 8.2 mm. CT confirmed gland enlargement ($40 \times 18 \times 41 \text{ mm}$) with a macro-calculus ($12 \times 9 \text{ mm}$). Renal and phosphocalcic panels were normal. Pediatric evaluation, including parathyroid hormone (20), pelvic ultrasound, and sterile urine culture, excluded systemic metabolic disorders.

Figure 20. *Facial CT scan demonstrating enlarged submandibular gland with macro-calculus.*



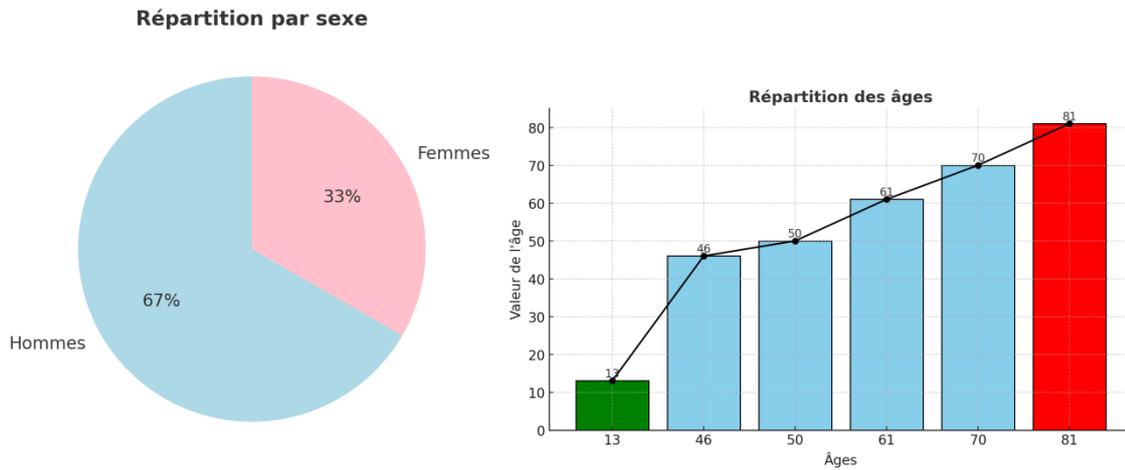
8.1 Therapeutic Approach

Given the clinico-biological improvement, the patient was discharged on May 8, 2025, with referral for extracorporeal shock wave lithotripsy.

8.2 Outcome

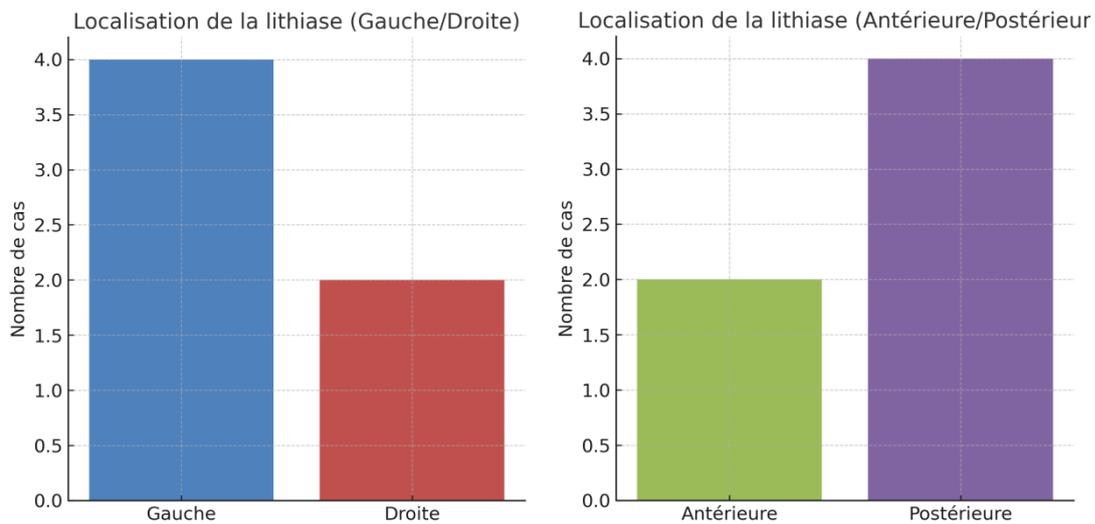
Clinical symptoms improved significantly before discharge, and long-term management was planned with minimally invasive lithotripsy.

9 Results and Discussion

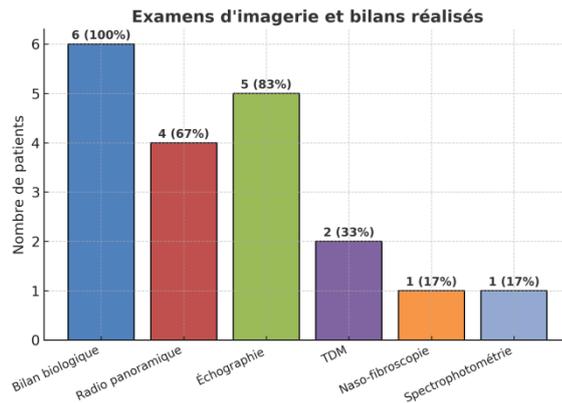
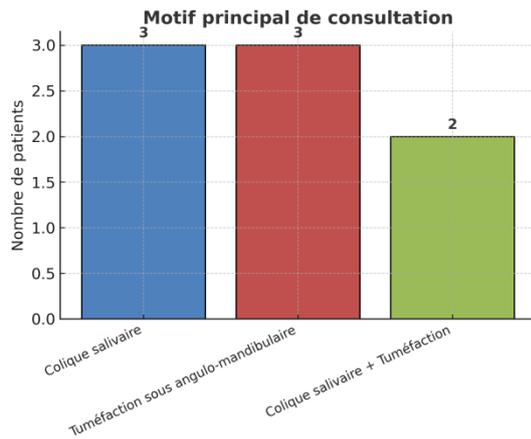


Regarding sex distribution, our series demonstrated a male predominance, with four men and two women.

The age distribution of our patients showed wide variability, ranging from 13 to 81 years.

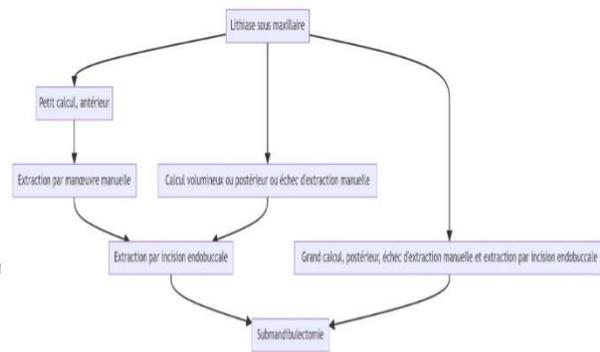
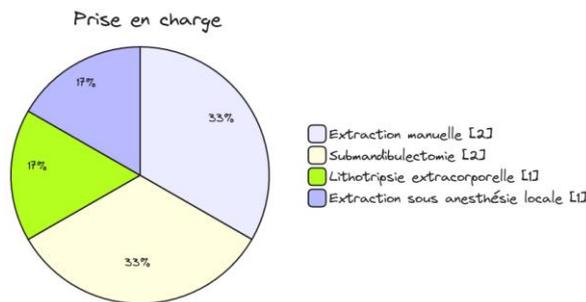


The localization of submandibular sialolithiasis was predominantly on the left side in four cases, with posterior positioning in four patients.



The main presenting complaints were salivary colic and submandibular swelling, either isolated or in association. Both symptoms were noted concomitantly in two patients.

Submandibular lymphadenopathy was associated in three patients. Purulent discharge through Wharton’s duct was observed clinically in two cases.



All patients received medical treatment including intravenous therapy, gland massage, and reinforcement of oral hygiene with education emphasizing the importance of adequate hydration. Three patients additionally underwent dental extractions to restore oral health status.

Discussion

The submandibular gland accounts for approximately 80–90% of sialolithiasis cases. This predisposition is explained by three main factors:

1. The mucous and viscous nature of submandibular saliva (rich in mucins), which favors calcium ion saturation and subsequent crystal nucleation.
2. The upward course of Wharton’s duct against gravity, slowing salivary outflow and increasing the risk of stasis.
3. The narrow caliber and considerable length of the excretory duct, which creates resistance to salivary flow and facilitates intraductal deposition.

Minimally Invasive Versus Conventional Surgery

In our series, the management of submandibular sialolithiasis was primarily based on intraoral manual extraction of calculi. This technique is simple, minimally invasive, and suitable for stones located in the distal portion of Wharton's duct. Our therapeutic approach aligns with current literature, which advocates conservative management in the majority of uncomplicated cases, particularly for calculi smaller than 15 mm.

Submandibulectomy remains indicated only in cases of failed conservative treatment, inaccessible intraglandular macrolithiasis, or recurrent suppurative complications. Although radical, this technique carries specific risks such as lingual paresthesia (lingual nerve injury), impaired tongue mobility (hypoglossal nerve involvement), and cervical hematoma or secondary infection. These risks are consistent with those reported by Luers et al. (2020) in a German cohort study.

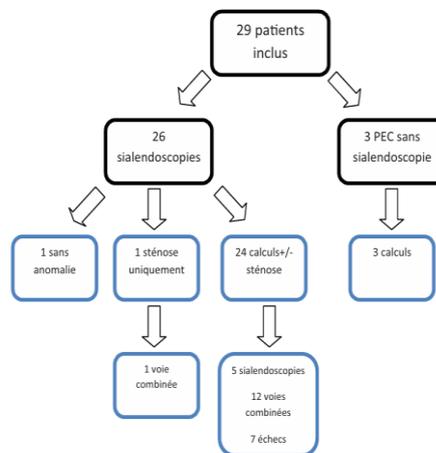


Fig. 2. Modes de prise en charge des 29 patients inclus dans l'étude.

A retrospective study conducted at Strasbourg University Hospital (2009–2015) involving 29 patients with acute submandibulitis emphasized the value of sialendoscopy for early management, given the high incidence of associated calculi. In this series, sialendoscopy alone was curative in 5 cases, while 13 patients required a combined approach. Submandibulectomy was reserved for refractory cases.

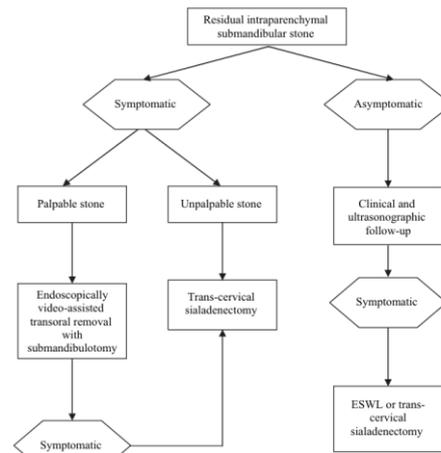
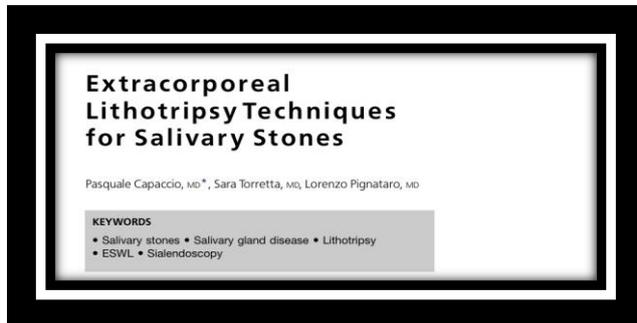


Fig. 25. Therapeutic algorithm for failure of ESWL for residual intraparenchymal submandibular stones.

Similarly, between 2015 and 2018, 39 patients with salivary calculi were treated with extracorporeal shock wave lithotripsy at the Nasreddin Tusi Clinic in Azerbaijan. Of these, 33 had submandibular stones and 6 parotid stones. With a mean patient age of 50 years, the authors highlighted the efficacy of lithotripsy as a promising alternative to surgery, particularly given the risks associated with parotid gland lithiasis.



The technique of extracorporeal lithotripsy involves five key steps:

1. **Patient selection** based on imaging (ultrasound, panoramic radiography) to confirm stone size and location.
2. **Patient preparation**, including informed consent and local anesthesia or light sedation.
3. **Positioning and adjustment** of the lithotripter relative to the calculus, optimizing distance, density, and anatomical orientation.
4. **Application of shock waves** with gradual intensity to fragment the stone, sometimes requiring multiple sessions.
5. **Post-procedure follow-up**, including evaluation of fragment clearance, monitoring for complications (hematoma, cutaneous ecchymosis, bradycardia), and reinforcing hydration and oral hygiene.

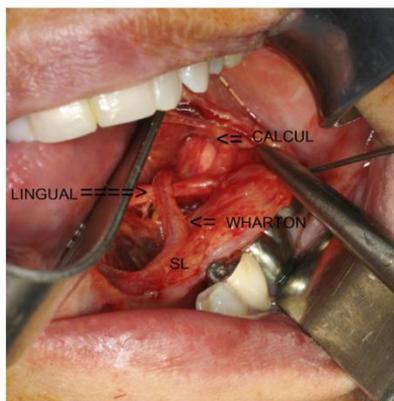


Figure 1. Vue endobuccale peropératoire.

Tableau 1 Épidémiologie des 36 patients de la série.	
Caractéristiques des patients	Nombre (%)
Sexe	
Hommes	20 (55,6 %)
Femmes	16 (44,4 %)
Âge	
Moyen	47 ans
Extrêmes	8-81 ans
Nombre de lithiases	
Unique	29 patients (80,6 %)
Multiples	7 patients (19,4 %)
Diamètre des lithiases	
4-10 mm	16 patients (44,4 %)
10-16 mm	8 patients (22,2 %)
> 16 mm	4 patients (11,1 %)
Non précisée	8 patients (22,2 %)
Imagerie	
Orthopantomogramme	22 patients (61,1 %)
Échographie	18 patients (50 %)
Scanographie	31 patients (86,1 %)
Mode de révélation	
Infectieux	14 patients (38,9 %)
Mécanique	20 patients (55,6 %)
Non précisé	2 patients (5,5 %)
Type d'anesthésie	
Générale	34 cas (94,5 %)
Locale	2 cas (5,5 %)

Another study, conducted at the Department of Oral and Maxillofacial Surgery, CHU Timone Marseille, evaluated 36 patients (16 women, 20 men) with ductal or intraglandular calculi. Endo-buccal excision was proposed as a less invasive alternative to submandibulectomy. The success rate was 89%, with no permanent neurological complications. Only transient lingual hypoesthesia occurred in 8% of cases, and recurrence was observed in 5%. The authors concluded that intraoral excision of submandibular lithiasis is safe, effective, and less morbid than submandibulectomy, particularly for palpable calculi in the posterior third of Wharton's duct.

Summary of Findings

Submandibular sialolithiasis is most effectively managed with minimally invasive techniques such as extracorporeal lithotripsy or sialendoscopy when stones are small and accessible. Larger or more complex cases often necessitate direct surgical intervention, ranging from intraoral extraction under local anesthesia to submandibulectomy. In our series, treatment strategies were tailored to the complexity and location of the calculi. Post-treatment outcomes demonstrated significant symptomatic improvement and resolution of inflammatory signs, corroborating results from previously published studies.

10 Conclusion

Submandibular sialolithiasis, although relatively uncommon, can be reliably diagnosed through characteristic clinical findings and targeted paraclinical investigations.

Our series confirms the effectiveness of minimally invasive approaches, which provide excellent functional outcomes while limiting complications. Submandibulectomy should be reserved for complex, recurrent, or inaccessible intraglandular cases.

The development of modern techniques such as sialendoscopy highlights the value of a conservative and individualized therapeutic strategy.

Finally, prevention through optimal oral hygiene and adequate hydration remains essential in reducing the risk of recurrence.

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