

MedPharmRes (MPR) TITLE PAGE

Upload this completed form to website with submission

ARTICLE INFORMATION	Fill in information in each box below
Article Type	Review article
Article Title (within 20 words without abbreviations)	Parotitis Overview: An Integrated Approach From Classification To Treatment Strategies
Running Title (within 10 words)	Parotitis: Classification and Treatment Strategies
Author	TRAN DUC KY TRUONG ¹ , CHON NGUYEN THANH HO ¹² , TUAN VAN NGUYEN ¹
Affiliation	1 Department of Maxillofacial Surgery at National Hospital of Odonto-Stomatology 2 Department of Maxillofacial Surgery, Faculty of Odonto-Stomatology University of Medicine and Pharmacy at Ho Chi Minh City, Ho Chi Minh City, Vietnam
ORCID (for more information, please visit https://orcid.org)	TRAN DUC KY TRUONG (https://orcid.org/0009-0005-2575-9595) CHON NGUYEN THANH HO (https://orcid.org/0000-0002-2597-7884) TUAN VAN NGUYEN (https://orcid.org/0009-0009-6757-5646)
Competing interests	No potential conflict of interest relevant to this article was reported.
Funding sources State funding sources (grants, funding sources, equipment, and supplies). Include name and number of grant if available.	Not applicable.
Acknowledgements	Not applicable.
Availability of data and material	Not applicable. This study is based on publicly available data from previously published articles
Authors' contributions Please specify the authors' role using this form. Authors can't change and add items, but you can delete items that are not applicable.	Conceptualization: TRAN DUC KY TRUONG, TUAN VAN NGUYEN Data curation: TRAN DUC KY TRUONG Methodology: TRAN DUC KY TRUONG, CHON NGUYEN THANH HO Investigation: TRAN DUC KY TRUONG

	<p>Writing - original draft: TRAN DUC KY TRUONG, CHON NGUYEN THANH HO</p> <p>Writing - review & editing: CHON NGUYEN THANH HO, TUAN VAN NGUYEN, TRAN DUC KY TRUONG</p>
Ethics approval and consent to participate	Not applicable.

CORRESPONDING AUTHOR CONTACT INFORMATION

For the corresponding author (responsible for correspondence, proofreading, and reprints)	Fill in information in each box below
First name, middle initial, last name	TRUONG, DUC KY, TRAN
Email address – this is where your proofs will be sent	Truongduckytran@gmail.com
Secondary Email address	Kytrantu@gmail.com
Address	201A Nguyen Chi Thanh, District 5, Ho Chi Minh City, Vietnam
Cell phone number	+84962941642
Office phone number	
Fax number	

Abstract

Background: Parotitis is the inflammation of the largest salivary gland, with diverse aetiologies including infections, autoimmune disorders, and mechanical obstructions. The lack of a standardised classification system, along with varied clinical manifestations, poses significant challenges in diagnosis and management.

Objective: This review aimed to provide a comprehensive overview of the classification, diagnostic methods, and treatment strategies for parotitis, focusing on both acute and chronic forms.

Methods: A literature review was conducted using PubMed and Google Scholar up to January 2025. Inclusion criteria were English-written studies on human subjects related to parotitis, covering classification, diagnostic methods and treatment strategies. Data were extracted and synthesized to highlight current practices.

Results: Parotitis features 5 subtypes, namely: (1) acute viral, (2) acute suppurative, (3) sialolithiasis-associated, (4) chronic non-neoplastic, and (5) chronic neoplastic. Diagnostic tools include clinical evaluation, imaging (ultrasound, CT, MRI, sialography), and sialendoscopy. Treatment ranges from conservative management to minimally invasive procedures, with surgery reserved for severe cases.

Conclusion: Accurate classification and diagnosis are key to the effective management of parotitis. Advances in imaging techniques and sialendoscopy have significantly improved diagnostic accuracy and treatment outcomes. Implementing a standardised approach can optimize patient care, reduce recurrence rates, and prevent complications.

Keywords: Parotitis, sialadenitis, recurrent parotitis, sialolithiasis, sialendoscopy.

1. INTRODUCTION

Parotitis is an inflammatory condition affecting the largest salivary gland in the body, occurring across all age groups and posing significant challenges in diagnosis and treatment [1–3]. This condition has diverse aetiologies, including infections, ductal obstruction, autoimmune disorders, drug-induced effects, and other factors such as trauma or radiation therapy [4–7]. Parotitis not only causes localized pain and discomfort but also affects salivary gland function and the patient's quality-of-life [8–10].

Advances in imaging techniques such as ultrasound, CT, MRI, and sialendoscopy have enhanced the ability to identify underlying causes and assess glandular damage [11–14]. However, complex cases remain challenging to manage [1,15]. The lack of a standardised classification system and limited understanding of its pathogenesis further complicate diagnosis and treatment [16]. Despite ongoing improvements in medical and surgical therapies, recurrence and complications are still prevalent [1, 10].

Therefore, the key question is: What are the most effective diagnostic and treatment strategies for different types of parotitis, and how can classification guide clinical approaches to improve patient outcomes? Given these challenges, it is essential to compile and update recent advancements in the diagnosis and treatment of parotitis. A comprehensive review can assist clinicians in making optimal treatment decisions and ultimately improve patient's quality-of-life.

2. METHOD

This study is a literature review conducted by searching the PubMed and Google Scholar databases to identify studies related to parotitis. The search covered articles published in English on human subjects and was performed up to January 2025.

Search strategy

We conducted a literature search on PubMed and Google Scholar to collect studies related to parotitis. The search process utilized two main MeSH terms, "Parotitis" and "Sialadenitis", combined with relevant topics such as "diagnosis," "therapy," "classification," and "aetiology."

Additionally, based on McAnally's (1982) classification, we expanded the search scope using specific keywords, including "parotitis," "acute parotitis," "bacterial parotitis," "viral parotitis," "chronic/recurrent sialadenitis," "juvenile recurrent parotitis," "adult recurrent parotitis," "salivary duct obstruction," "salivary duct stenosis," "sialendoscopy," "sialoendoscopy," and "salivary endoscopy."

Furthermore, we conducted supplementary searches by reviewing the reference lists of selected studies to ensure the broadest possible coverage.

Selection criteria

Studies were included based on their research objectives on diagnosis, classification, treatment strategies, and clinical outcomes in parotitis patients. Eligible study types comprised systematic reviews, meta-analyses, randomized controlled trials (RCTs), cohort studies, case-control studies, and case reports. Additionally, editorials and letters to the editor were considered if they provided relevant insights into these areas. Studies were excluded if they focused on animal models or non-human subjects or were not published in English.

Data extraction was conducted systematically to ensure the reliability and reproducibility of the synthesized evidence. One reviewer performed the initial search across selected databases, followed by independent screening of study abstracts by two reviewers to assess relevance. In cases of disagreement, the full text was reviewed, and a final decision was made through discussion.

Data extraction focused on diagnostic criteria, classification systems, and treatment strategies for parotitis. Relevant information on clinical presentation, imaging findings, and therapeutic approaches was synthesized to provide a comprehensive overview of the condition.

3. ANATOMY OF THE PAROTID GLAND

The parotid gland is the largest salivary gland, classified as one of the major salivary glands along with the submandibular and sublingual glands. Located in the lateral cervical region, it has a prism-like shape consisting of a main body and two extensions, closely associated with the masseter muscle, the facial nerve, the external carotid artery, and the retromandibular vein. The Stensen's duct originates from the anterior part of the gland, passes through the masseter muscle, and opens into the oral mucosa opposite the second upper molar. The parotid gland is divided into a superficial and deep lobe by the facial nerve, a crucial anatomical feature in surgical procedures to prevent nerve damage [7, 11, 17].

At the microscopic level, the gland consists of parenchyma and stroma. The functional unit, the salivon, includes acini, intercalated ducts, and striated ducts. The acini are primarily

composed of serous cells, which secrete enzymes such as amylase, lysozyme, and lactoferrin through a merocrine secretion mechanism [18].

4. AETIOLOGY

Parotitis is a disorder with various aetiologies, which can be classified into major groups including infectious, non-infectious inflammatory, mechanical factors, and other causes.

Infectious parotitis

Parotitis due to infection is commonly caused by bacteria or viruses. The most frequent bacterial pathogens include *Staphylococcus aureus*, *Streptococcus viridans*, and anaerobic bacteria from the oral microbiota, while in neonates, group B *Streptococcus* is also a notable cause. Viral parotitis is most commonly associated with *Paramyxovirus* (mumps), along with other viruses such as *Coxsackievirus*, *Cytomegalovirus*, and *Influenza virus*. *Mycobacterium tuberculosis* can also lead to parotitis, particularly in immunocompromised patients [7, 19–22].

Non-infectious parotitis

Autoimmune diseases such as Sjögren's syndrome, systemic lupus erythematosus (SLE), and rheumatoid arthritis are common causes of chronic parotitis. These disorders often result in prolonged glandular damage, leading to impaired salivary secretion, xerostomia, pain, and persistent glandular swelling. Additionally, although rare, sarcoidosis and Heerfordt's syndrome can also cause parotitis [7, 15, 19].

Mechanical-factor-induced parotitis

Mechanical-factor-induced parotitis is often associated with salivary duct obstruction. Parotid gland stones are a common cause, blocking salivary flow and leading to inflammation. Additionally, congenital abnormalities or Stensen's duct stenosis can also result in recurrent parotitis [7, 21, 23].

Other risk factors

Dehydration, malnutrition, and certain medications such as anticholinergics, antihistamines, and antidepressants can reduce salivary secretion, leading to fluid stasis and an increased risk of parotitis. Additionally, iodide toxicity and other chemicals can also affect gland function, causing salivary secretion disorders [5, 24].

5. DIAGNOSTIC APPROACH TO PAROTITIS

The diagnosis of parotitis is primarily based on medical history and clinical examination to differentiate common causes such as infections, autoimmune diseases, or ductal obstruction. The initial assessment plays a crucial role in guiding appropriate diagnostic and treatment approaches.

[Insert Figure 1 here]

Figure 1: Diagnostic approach to parotid gland swelling based on Marchal and Bradley [25]

In bacterial parotitis, especially when purulent discharge is present from Stensen's duct, Gram staining, bacterial culture, and antibiotic susceptibility testing should be performed to identify the causative pathogen and select appropriate antibiotics. Laboratory markers such as

serum amylase, CRP, and ESR may be elevated in parotitis but are not specific diagnostic indicators [7].

Imaging techniques play a crucial role in evaluating cases of parotitis with atypical presentations or suspected complex aetiologies. The most commonly used imaging modalities include:

Sialography is still widely used for diagnosing salivary duct obstruction, providing detailed visualization of the ductal system. This technique is valuable for assessing salivary stones, ductal stenosis, and anatomical abnormalities, aiding in effective treatment planning [26].

Salivary gland ultrasound serves as the first-line imaging method, useful for detecting salivary stones, abscesses, differentiating solid from cystic lesions, and identifying hypoechoic areas caused by ductal dilation [11].

CT Imaging and the Role of CT Sialography: Computed tomography (CT) serves as an essential diagnostic tool for identifying salivary gland calcifications, particularly in cases of parotitis associated with sialolithiasis. Expanding on the diagnostic capabilities of standard CT, CT sialography combines advanced imaging techniques with contrast-enhanced visualization of the salivary ductal system. This approach offers superior spatial resolution and enables three-dimensional (3D) reconstruction, facilitating the accurate detection of small salivary stones, ductal narrowing, and structural anomalies that might not be apparent with conventional imaging. CT sialography is particularly advantageous for evaluating complex or deep-seated lesions, providing detailed anatomical insights that enhance clinical decision-making and support precise treatment planning, especially in surgical contexts [26, 27].

Magnetic resonance imaging (MRI) offers detailed information on soft tissue structures, helping differentiate chronic parotitis from malignant lesions. It also assists in diagnosing HIV-related parotitis by identifying characteristic cystic changes.

Sialendoscopy is effectively used for diagnosing and managing recurrent chronic parotitis. This minimally invasive technique allows direct visualization of the salivary ductal system, making it highly effective in identifying and treating salivary stones, ductal dilatation, and ductal strictures. It not only facilitates accurate diagnosis but also enables therapeutic interventions such as stone removal, ductal dilation, and irrigation, significantly improving patient outcomes [28].

Although generally not required for diagnosing parotitis, biopsy may be utilized in specific cases to support the diagnostic process. In suspected infections, a sample from the tail of the parotid gland can be cultured to identify the causative pathogen. For sarcoidosis, tissue analysis reveals non-caseating granulomas. In cases of suspected lymphoma, examining the tissue helps detect lymphocytic infiltration and destruction of glandular follicles, thereby aiding in accurate diagnosis [29].

6. CLASSIFICATION

Although several classification systems for parotitis have been proposed, there is a lack of consensus among clinicians regarding their applicability. Most recent classifications tend to focus on recurrent chronic parotitis rather than addressing parotitis as a whole. Therefore, an aetiology-based classification is considered a simpler and more practical approach in clinical practice. Among the existing classification systems, McAnally's classification (1982) is highly

regarded for its clarity, comprehensiveness, and ability to encompass the clinical aspects of this condition [19].

[Insert Table 1 here]

Table 1: Classification of parotitis types according to McAnally (1982) [19]

7. FROM DIAGNOSIS TO TREATMENT

7.1 Viral parotitis

7.1.1 Diagnosis

Viral parotitis, particularly caused by the mumps virus, primarily affects children and adolescents, presenting with characteristic clinical symptoms. Approximately 75% of cases exhibit bilateral painful parotid gland swelling, while 25% have unilateral involvement [19]. The disease typically begins with swelling on one side before progressing to the other. Accompanying symptoms include fever, fatigue, loss of appetite, and increased pain during chewing or swallowing. A key distinguishing feature from bacterial parotitis is the absence of purulent discharge from Stensen's duct, which aids in accurate diagnosis.

Serological testing: Detects IgM or IgG antibodies specific to the mumps virus.

Viral RNA detection: Uses PCR to identify the virus in saliva, urine, or blood samples. Other causes such as HIV or other viral infections that may lead to parotitis should be ruled out.

Imaging: In cases of suspected complications or diagnostic uncertainty, imaging studies play a crucial role in the evaluation process. Ultrasound is often the first-line modality, as it may reveal gland enlargement without evidence of abscess formation. When there is suspicion of malignancy or severe inflammation, more advanced imaging techniques such as magnetic resonance imaging (MRI) or computed tomography (CT) are recommended to provide detailed anatomical information and assist in establishing an accurate diagnosis.

7.1.2 Treatment

The treatment of viral parotitis primarily focuses on supportive care and symptom relief. Patients should rest and drink plenty of fluids to prevent dehydration. Pain and fever can be managed with analgesics and antipyretics such as paracetamol or ibuprofen, and warm compresses on the parotid gland area may help alleviate pain and swelling. In terms of nutrition, soft foods are recommended, while acidic or spicy foods should be avoided to reduce irritation of the salivary glands. To prevent the spread of infection, patients should be isolated, especially unvaccinated children, and adherence to the MMR (Measles - Mumps - Rubella) vaccination schedule should be ensured. Additionally, rare complications such as orchitis, pancreatitis, or meningitis should be monitored, with prompt medical intervention if they occur [2, 7, 19, 30, 31].

7.2 Sialolithiasis-associated parotitis

7.2.1 Diagnosis

Sialolithiasis-associated parotitis is more common in adults, particularly males, and is diagnosed based on medical history and characteristic clinical symptoms. One of the hallmark symptoms is painful swelling of the parotid gland, which typically worsens after eating and gradually subsides within a few hours as salivary secretion decreases. In cases of infection,

patients may experience a sensation of tightness and notice pus mixed with saliva [7, 19, 23]. Clinical examination may reveal a firm mass along the Stensen's duct (if the stone is located near the duct opening), with turbid or purulent secretions in infected cases.

Imaging plays a crucial role in diagnosis, among which ultrasound is useful for determining the location and size of the stone, particularly those larger than 2 mm. X-ray or CT scans are effective in detecting calcium-containing stones, which account for approximately 80% of cases. MRI or sialography is indicated for complex cases to provide a comprehensive evaluation of the ductal system and rule out other lesions.

7.2.2 Treatment

The treatment of sialolithiasis may include medical management, minimally invasive procedures, and surgical intervention. Medical management involves stimulating salivary secretion using sour foods or sialogogues, administering antibiotics if an infection is present, and applying warm compresses to relieve pain and improve salivary flow [7, 32, 33]. Minimally invasive techniques such as sialendoscopy allow for the detection and removal of small stones, while ductal dilation can help expel smaller calculi [27, 32, 34, 35]. In cases of large stones or recurrent inflammation causing significant damage, surgical intervention should be necessary, including transoral stone removal (for stones near the Stensen's duct orifice) or parotidectomy [32, 36].

7.2.3 Follow-up and recurrence prevention

Drinking plenty of water can help reduce the risk of stone formation [19]. Additionally, dietary adjustments, such as avoiding foods that cause dehydration or increase the viscosity of saliva, may be beneficial [36]. Sialolithiasis-associated parotitis generally has a good prognosis if detected and treated promptly. Minimally invasive techniques, such as sialendoscopy, are increasingly favoured due to their effectiveness and low complication rates [34].

7.3 Acute suppurative parotitis

7.3.1 Diagnosis

Acute suppurative parotitis is commonly seen in elderly individuals, immunocompromised patients, or those with prolonged dehydration (postoperative or chronic illnesses). Typical symptoms include sudden onset of painful swelling in a unilateral parotid gland, with overlying skin appearing red, tense, and warm. Purulent discharge from Stensen's duct may be observed upon gland compression. Systemic symptoms such as high fever, chills, and generalized fatigue may also be present [2, 7, 22].

Laboratory tests: Pus culture plays a pivotal role in the evaluation of parotitis, as it is essential for identifying the causative bacterial pathogen. The most commonly isolated organisms are *Staphylococcus aureus* and anaerobic bacteria, particularly species of *Prevotella* and *Porphyromonas*, which are frequently associated with suppurative infections. In addition, a complete blood count (CBC) often reveals an elevated white blood cell count, accompanied by increased levels of C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR), which are indicative of an acute inflammatory response [22].

Imaging should be performed in the assessment of suppurative parotitis, especially in cases with suspected complications. Contrast-enhanced CT is particularly valuable for detecting large abscesses or identifying the spread of infection to adjacent structures, which is critical in

patients at risk of developing mediastinitis or deep soft tissue infections. Moreover, ultrasound serves as a useful, non-invasive imaging modality to identify abscesses or fluid collections within the parotid gland, aiding in both diagnosis and management planning [37].

[Insert Figure 2 here]

Figure 2. Infectious parotitis: (A) Contrast-enhanced CT image shows an enlarged left parotid gland with surrounding inflammatory changes. (B) Contrast-enhanced CT image reveals left parotitis with an intraglandular abscess (marked with an asterisk) [37].

[Insert Figure 3 here]

Figure 3. Parotid gland abscess. (a) Longitudinal ultrasound image shows a well-defined hypoechoic lesion (arrow) within the parotid gland, containing debris and internal echoes. (b) Increased vascularity (arrow) is observed in the abscess of another patient [38].

7.3.2 Treatment

Empirical medical treatment for acute suppurative parotitis includes intravenous antibiotics for 7–10 days, with first-line options such as amoxicillin-clavulanate or ceftriaxone. In cases of suspected methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin may be used. If anaerobic bacterial infection is suspected, clindamycin or metronidazole should be added to broaden antimicrobial coverage. Additionally, patients should receive analgesics and antipyretics such as paracetamol or NSAIDs, along with intravenous fluid therapy for severe dehydration to alleviate symptoms and support recovery [2, 7, 22].

In severe cases requiring further intervention, drainage of large abscesses should be performed, either by ultrasound- or CT-guided incision and drainage, ensuring no injury to the facial nerve. Irrigation of the parotid gland with antiseptic solution through Stensen's duct can help remove pus and bacteria. Additionally, monitoring for signs of infection spread, such as cervical cellulitis or mediastinitis, is essential. Addressing risk factors like dehydration, poor oral hygiene, or underlying conditions (diabetes, Sjögren's syndrome) is also crucial. Surgery is only indicated in cases of severe inflammation, abscesses unresponsive to treatment, or significant glandular damage, typically involving partial or total parotidectomy [2, 15, 27].

Acute suppurative parotitis is a serious infection that requires timely and aggressive treatment to prevent complications such as deep soft tissue infection, glandular necrosis, or systemic spread of infection. With appropriate antibiotic therapy and proper drainage, most patients have a good prognosis and achieve full recovery.

7.4 Chronic non-suppurative parotitis (chronic/recurrent parotitis)

7.4.1 Diagnosis

Chronic or recurrent parotitis is characterized by recurrent episodes of swelling and pain that persist for years, often unrelated to diet. Patients may experience unilateral or bilateral gland enlargement, typically mild and non-tender between flare-ups, along with reduced salivary secretion and persistent dry mouth. Upon gland compression, a greyish to slightly white precipitate may be expressed. Baurmash noted that while this substance is often mistaken for pus, it is not an indication of infection but rather a precipitate resulting from chronic inflammatory processes in the parotid gland [36]. During acute exacerbations, the gland becomes tense, painful, and may discharge pus through Stensen's duct. In such cases, other

causes such as Sjögren's syndrome, bacterial parotitis, or malignant tumours should be ruled out [15, 27, 33, 36].

Imaging: Sialography is an effective diagnostic method that provides detailed imaging of ductal dilation or obstruction within the salivary gland system. This technique can identify characteristic dilation patterns, such as punctate sialectasis, globular sialectasis, or a sausage-like appearance [36]. Additionally, modern imaging modalities such as CT and MRI are also used to detect chronic lesions and rule out other causes, such as glandular tumours or autoimmune diseases. The combination of these imaging techniques allows for a comprehensive and accurate assessment of salivary gland abnormalities.

[Insert Figure 4 here]

Figure 4. (A) Parotid sialography showing a characteristic “sausage-like” appearance. (B) and (C) Parotid sialography demonstrating a punctate sialectasis pattern [27].

7.4.2 Treatment

Ductal lavage is an essential step in the treatment of chronic recurrent parotitis, helping to restore salivary flow and reduce obstruction. The most commonly used technique involves irrigating the duct with saline solution for cleansing, combined with lacrimal duct probes to dilate narrowed ducts and improve salivary duct function [36]. A more advanced approach is sialendoscopy, which utilizes a salivary endoscope to directly visualize the ductal system, replacing lacrimal probes in removing precipitates and dilating stenotic areas. This method not only effectively cleanses the ducts and restores salivary flow but also enables precise diagnosis and therapeutic intervention during the procedure [28]. Due to its minimally invasive nature and high efficacy, sialendoscopy is increasingly being adopted for the management of recurrent parotitis caused by ductal obstruction or sialolithiasis [14, 32, 39].

Medical treatment for chronic recurrent parotitis includes anti-inflammatory and analgesic medications, with low-dose corticosteroids in cases of persistent inflammation. Salivary stimulation can be achieved using sour candies or cholinergic agents such as pilocarpine to enhance salivary flow. Antibiotics are only indicated during acute exacerbations when signs of infection are present to control inflammation promptly [15, 27, 36]. Supportive and preventive measures include maintaining adequate hydration to sustain salivary flow, improving oral hygiene, and avoiding risk factors such as dehydration, smoking, or alcohol consumption [7].

In the management of chronic recurrent parotitis, conservative treatment should be prioritized. Surgery is only considered when conservative measures fail. Surgical options include duct ligation, superficial parotidectomy, or total parotidectomy [36]. Surgery should be performed by an experienced surgeon to avoid facial nerve injury.

8. COMPLICATIONS

Although parotitis generally has a good prognosis, it can sometimes lead to complications, especially if not diagnosed and treated promptly. Potential complications include:

Parotid gland infection: Acute parotitis, if left untreated, can result in serious complications such as parotid abscess, cellulitis, and sepsis. An abscess may develop as a result of severe infection. This leads to the accumulation of pus within the gland, which causes pain

and often necessitates drainage. If the infection spreads beyond the gland, it can cause cellulitis, characterized by swelling, pain, and overlying erythema. In rare cases, bacteria may enter the bloodstream, leading to sepsis, a life-threatening condition requiring intensive treatment [7].

Recurrent salivary stones: Chronic parotitis increases the risk of salivary stone formation, leading to recurrent ductal obstruction and inflammation [27].

Salivary gland dysfunction: Chronic inflammation may cause glandular tissue damage, resulting in reduced saliva production, dry mouth, difficulty swallowing, and an increased risk of dental caries.

Psychological impact: Persistent pain, swelling, and complications of parotitis can negatively affect a patient's psychological well-being and quality-of-life.

Neurological complications: Prolonged inflammation or surgical intervention may lead to facial nerve injury, causing temporary or permanent facial paralysis. After parotidectomy, some patients may develop Frey's syndrome, characterized by sweating and flushing in the preauricular region while eating [7, 40–42].

Several factors increase the risk of complications in patients with parotitis. Immunosuppression, whether due to underlying diseases or immunosuppressive therapy, makes patients more susceptible to severe complications. Severe infections, particularly those caused by drug-resistant bacteria or those that spread extensively, also significantly heighten the risk. Additionally, delayed diagnosis and treatment can lead to disease progression and a higher likelihood of complications. To minimize these risks, timely diagnosis, appropriate treatment, and close monitoring for abnormal signs are essential.

This study has several limitations that should be acknowledged. First, as it is not a systematic review, the scope of the research may not comprehensively cover all literature on parotitis and does not apply quality assessment criteria. Additionally, the study only included articles published in English, which may introduce selection bias by excluding relevant studies in other languages. The reliance on data primarily from PubMed and Google Scholar may also result in the omission of relevant studies from other databases. Furthermore, there is currently no widely-recognized standardised classification system for parotitis. In this study, we refer to the classification by McAnally (1982), as it is one of the few references addressing this topic. However, this system does not fully encompass all forms of parotitis and has not been widely standardised or validated, particularly in cases associated with autoimmune diseases such as Sjögren's syndrome. Finally, treatment approaches for parotitis are highly diverse, especially for chronic recurrent parotitis, a condition that remains controversial in terms of management. Differences in study designs, diagnostic criteria, and outcome measures may affect the generalizability of the findings. Therefore, rather than delving into specific treatment techniques, this study focused on summarizing the most commonly used treatment strategies to provide practical clinical guidance.

9. CONCLUSION

Parotitis is a common condition that can occur at any age, presenting with diverse clinical symptoms that may be confused with other salivary gland disorders. Identifying the underlying cause of parotitis is the most crucial factor in treatment planning, allowing for appropriate interventions and reducing the risk of recurrence. Due to the variety of aetiologies, the rational application of ancillary diagnostic methods is essential for accurately determining

the cause and assessing the extent of glandular damage. Parotitis is a significant condition that can lead to severe complications if not diagnosed and treated promptly. Therefore, specialists in Oral and Maxillofacial Surgery should enhance their awareness of this disease to ensure effective diagnosis and management, ultimately safeguarding patient's overall health.

COMPETING INTERESTS

The authors declare no competing interests.

AUTHORS' CONTRIBUTIONS

- **Conceptualization:** Duc Ky Tran Truong, Van Tuan Nguyen
- **Data curation:** Duc Ky Tran Truong
- **Methodology:** Duc Ky Tran Truong, Nguyen Thanh Chon Ho
- **Investigation:** Duc Ky Tran Truong
- **Writing – original draft:** Duc Ky Tran Truong, Nguyen Thanh Chon Ho
- **Writing – review & editing:** Nguyen Thanh Chon Ho, Van Tuan Nguyen, Duc Ky Tran Truong

ACKNOWLEDGEMENTS

The article made use of materials from three publications with approval from Elsevier, which were:

1. Sodhi KS, Bartlett M, Prabhu NK. "Role of high-resolution ultrasound in parotid lesions in children." *International Journal of Pediatric Otorhinolaryngology*. Elsevier; 2011;75(11):6. Used with permission from Elsevier (License Number: 5959171337642).
2. Prasad RS. "Parotid Gland Imaging." *Otolaryngologic Clinics of North America*. Elsevier; 2016;49(2):28. Used with permission from Elsevier (License Number: 5959170387455).
3. Tucci. "Juvenile recurrent parotitis: Diagnostic and therapeutic effectiveness of sialography. Retrospective study on 110 children." © Elsevier. Used with permission (License Number: 5957410025950).

The usage followed the principles of the Law on Science and Technology No. 29/2013/QH13 and the Law on Intellectual Property 2005 in Vietnam.

The works are shared in good faith and in keeping with the values of academic integrity and ethical research.

Any copyrighted material included here is not meant to imply endorsement by the original copyright holder, nor is it intended to violate any rights.

If you believe your rights have been impacted, please reach out to the corresponding author or the MedPharmRes to explore a resolution in line with fair use guidelines.

FUNDING

Not applicable.

10. REFERENCES

1. Wang S, Marchal F, Zou Z, Zhou J, Qi S. Classification and management of chronic sialadenitis of the parotid gland. 2009;

2. Brook I. Diagnosis and Management of Parotitis. *Archives of Otolaryngology–Head & Neck Surgery* 1992;118(5):469–71.
3. Rolfes MA, Millman AJ, Talley P, Elbadawi LI, Kramer NA, Barnes JR, et al. Influenza-Associated Parotitis During the 2014–2015 Influenza Season in the United States. *Clin Infect Dis* 2018;67(4):485–92.
4. Lazaridou M, Iliopoulos C, Antoniadis K, Tilaveridis I, Dimitrakopoulos I, Lazaridis N. Salivary Gland Trauma: A Review of Diagnosis and Treatment. *Craniomaxillofac Trauma Reconstr* 2012;5(4):189–96.
5. Thompson DF. Drug-induced parotitis. *Journal of Clinical Pharmacy and Therapeutics* 1993;18(4):255–8.
6. Vinagre C, Martínez MJ, Avendaño LF, Landaeta M, Pinto ME. Virology of infantile chronic recurrent parotitis in Santiago de Chile. *Journal of Medical Virology* 2003;70(3):459–62.
7. Wilson M, Pandey S. Parotitis. In: *StatPearls*. Treasure Island (FL): StatPearls Publishing; 2024.
8. Ramazani F, Hamour A, Jeffery (Xu) C, Biron V, Alrajhi Y, O’Connell D, et al. Development of a patient reported outcome instrument for chronic sialadenitis. *Journal of Otolaryngology - Head & Neck Surgery* 2022;51:4.
9. Weigelt F, Borzikowsky C, Hoffmann M, Laudien M. Success of minimally invasive salivary gland surgery—Quality of life, prognostic factors. *Laryngoscope Investigative Otolaryngology* 2020;5:1–7.
10. Gillespie MB, O’Connell BP, Rawl JW, McLaughlin CW, Carroll WW, Nguyen SA. Clinical and quality-of-life outcomes following gland-preserving surgery for chronic sialadenitis. *The Laryngoscope* 2015;125(6):1340–4.
11. Orlandi MA, Pistorio V, Guerra PA. Ultrasound in sialadenitis. *J Ultrasound* 2013;16(1):3–9.
12. Huisman TAGM, Holzmann D, Nadal D. MRI of chronic recurrent parotitis in childhood. 2001;
13. Mandel L, Bijoor R. Imaging (Computed Tomography, Magnetic Resonance Imaging, Ultrasound, Sialography) in a Case of Recurrent Parotitis in Children. 2006;
14. Erkul E, Gillespie MB. Sialendoscopy for non-stone disorders: The current evidence. *Laryngoscope Investig Otolaryngol* 2016;1(5):140–5.
15. Harbison JM, Liess BD, Templer JW, Zitsch RR, Wieberg JA. Chronic Parotitis: A Challenging Disease Entity. *Ear Nose Throat J* 2011;90(3):E13–6.

16. Garavello W, Redaelli M, Galluzzi F, Pignataro L. Juvenile recurrent parotitis: A systematic review of treatment studies. *International Journal of Pediatric Otorhinolaryngology* 2018;112:151–7.
17. Sriram Bhat M. SRB's Surgical Operations: Text & Atlas. JP Medical Ltd; 2014.
18. Holsinger FC, Bui DT. Anatomy, Function, and Evaluation of the Salivary Glands. In: Myers EN, Ferris RL, editors. *Salivary Gland Disorders*. Berlin, Heidelberg: Springer Berlin Heidelberg; 2007. page 1–16.
19. McAnally MT. Parotitis. *Postgraduate Medicine* 1982;71:2:87–99.
20. Fattahi TT, Lyu PE, Sickels JEV. Management of acute suppurative parotitis. *J Oral Maxillofac Surg* 2002;60:446–8.
21. Schapher M, Goncalves M, Mantsopoulos K, Iro H, Koch M. Transoral Ultrasound in the Diagnosis of Obstructive Salivary Gland Pathologies. *Ultrasound in Medicine and Biology* 2019;45:2338–48.
22. Brook I. The Bacteriology of Salivary Gland Infections. *Oral and Maxillofacial Surgery Clinics of North America* 2009;21(3):269–74.
23. Chitre VV, Premchandra DJ. Recurrent parotitis. *Archives of Disease in Childhood* 1997;77:359–63.
24. Brooks KG, Thompson DF. A Review and Assessment of Drug-Induced Parotitis. *The Annals of Pharmacotherapy* 2012;46:1688–99.
25. Marchal F, Bradley PJ. Management of Infections of the Salivary Glands. In: Myers EN, Ferris RL, editors. *Salivary Gland Disorders*. Berlin, Heidelberg: Springer Berlin Heidelberg; 2007. page 169–76.
26. Kandula S, Nagi R, Nagaraju R. Sialography: a pictorial review. *Oral Radiology* 2022;39(2):225–34.
27. Nahlieli O, Bar T, Shacham R, Eliav E, Hecht-Nakar L. Management of chronic recurrent parotitis: Current therapy. *Journal of Oral Maxillofacial Surgery* 2004;62:1150–5.
28. Wójcik M, Schrötmair F. Sialendoscopy - How I Do It. *ENT & Audiology News* 2021;
29. Sève P, Pacheco Y, Durupt F, Jamilloux Y, Gerfaud-Valentin M, Isaac S, et al. Sarcoidosis: A Clinical Overview from Symptoms to Diagnosis. *Cells* 2021;10(4):766.
30. Grennan D. Mumps. *JAMA* 2019;322(10):1022.
31. Wood J, Toll EC, Hall F, Mahadevan M. Juvenile recurrent parotitis: Review and proposed management algorithm. *International Journal of Pediatric Otorhinolaryngology* 2021;142:110617.

32. Erkul E, Çekin E, Güngör A. Long-Term Outcomes of Sialendoscopy in the Management of Sialolithiasis and Idiopathic Chronic Sialadenitis with Ductal Scars. *Turk Arch Otorhinolaryngol* 2019;57(2):75–80.
33. Motamed M, Laugharne D, Bradley PJ. Management of chronic parotitis: a review | *The Journal of Laryngology & Otology*. *The Journal of Laryngology & Otology* 2003;117:521–6.
34. Capaccio P, Canzi P, Gaffuri M, Occhini A, Benazzo M, Ottaviani F, et al. Modern management of paediatric obstructive salivary disorders: long-term clinical experience. *Acta Otorhinolaryngol Ital* 2017;37(2):160–7.
35. Kim JE, Lee SS, Lee C, Huh KH, Yi WJ, Heo MS, et al. Therapeutic effect of intraductal saline irrigation in chronic obstructive sialadenitis. *BMC Oral Health* 2020;20(1):86.
36. Baurmash HD. Chronic recurrent parotitis: a closer look at its origin, diagnosis, and management. *Journal of Oral Maxillofacial Surgery* 2004;62:1010–8.
37. Prasad RS. Parotid Gland Imaging. *Otolaryngologic Clinics of North America* 2016;49(2):285–312.
38. Sodhi KS, Bartlett M, Prabhu NK. Role of high resolution ultrasound in parotid lesions in children. *International Journal of Pediatric Otorhinolaryngology* 2011;75(11):1353–8.
39. Canzi P, Occhini A, Pagella F, Marchal F, Benazzo M. Sialendoscopy in juvenile recurrent parotitis: a review of the literature. *Acta Otorhinolaryngol Ital* 2013;33(6):367–73.
40. Wilson IV J, Gorelik M, Gulliver J, Jaju A, Bhushan B, Rastatter J, et al. Superficial Parotidectomy for Juvenile Recurrent Parotitis. *The Laryngoscope* 2023;133(6):1495–500.
41. Lans RJL van der, Lohuis PJFM, Gorp JMHH van, Quak JJ. Surgical Treatment of Chronic Parotitis. *Int Arch Otorhinolaryngo* 2019;23:83–7.
42. Sharma R. Superficial parotidectomy for chronic parotid sialadenitis. *International Journal of Oral and Maxillofacial Surgery* 2013;42(1):129–32.

Table 1: Classification of parotitis types according to McAnally (1982) [19]

Type	Onset	Symmetry	Pain	T°	Parotid Duct
Acute viral (mumps)	1–2 day prodrome	Bilateral in 75% of cases	+	↑	Inflamed, clear saliva
Sialolithiasis (acute stone)	Sudden while eating	Unilateral	±	N	Palpable stone
Acute suppurative	Acute	Unilateral	+	↑	Expressable pus
Chronic non-neoplastic	Persistent vs recurrent	Varies	–	N	N
Chronic neoplastic	Gradual	Unilateral	–	N	N
*Legends: T°: Temperature; N: Normal; + : Present; – : Not present; ±: Variable; ↑ : High; ↓ : Low					

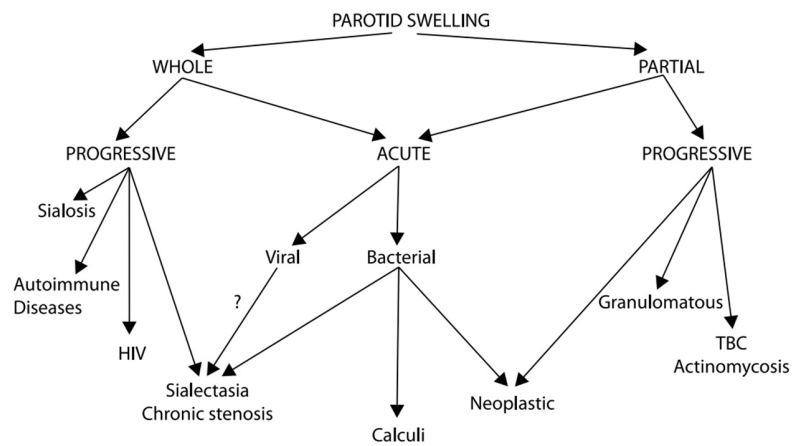


Figure 1: Diagram of diagnostic approach to parotid gland swelling based on Marchal and Bradley [25]

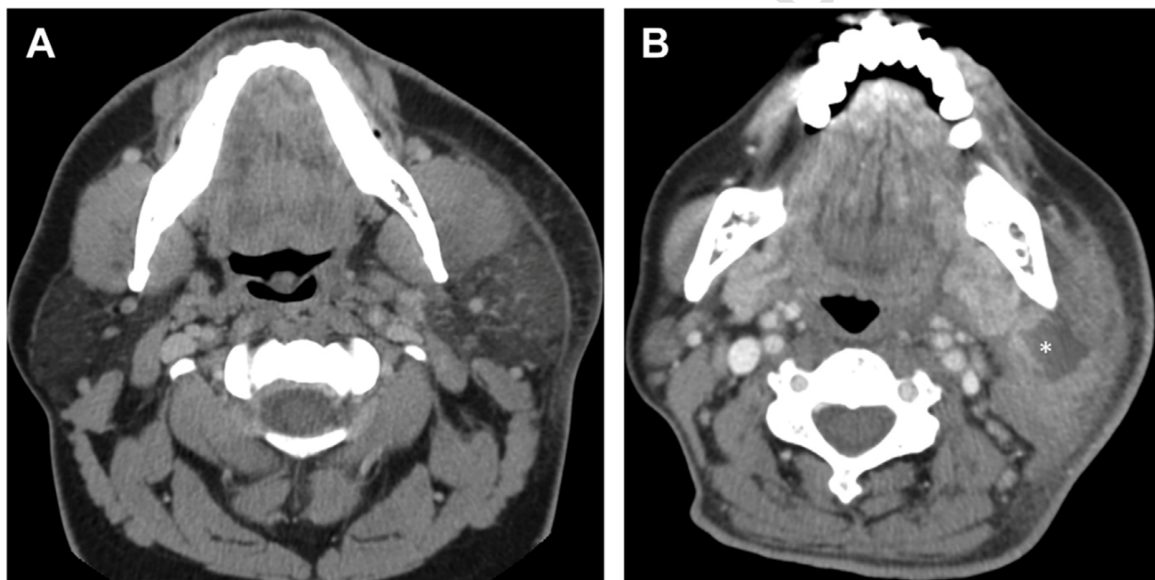


Figure 2. Example from Prasad (2016) on Infectious parotitis: (A) Contrast-enhanced CT image shows an enlarged left parotid gland with surrounding inflammatory changes. (B) Contrast-enhanced CT image reveals left parotitis with an intraglandular abscess (marked with an asterisk).

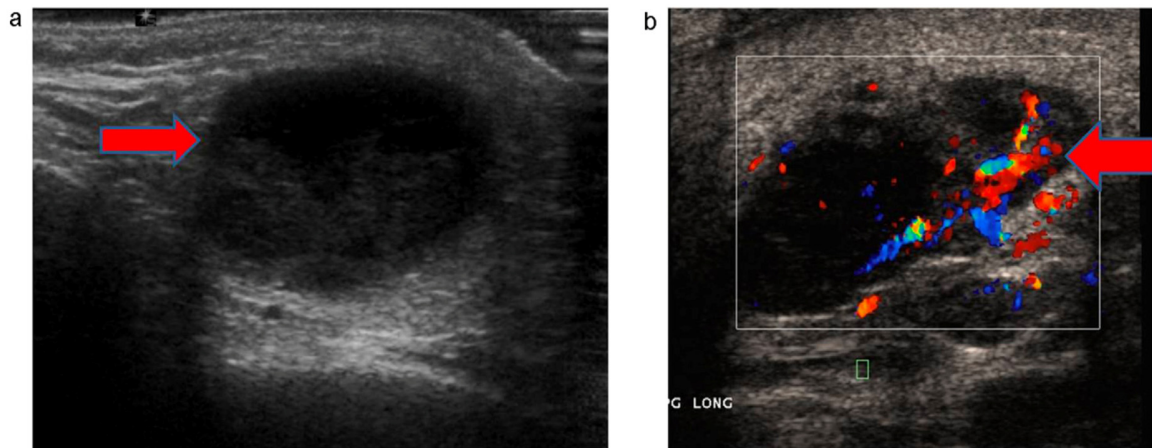


Figure 3. Example from Sodhi et al (2011) on Parotid gland abscess. (a) Longitudinal ultrasound image shows a well-defined hypoechoic lesion (arrow) within the parotid gland, containing debris and internal echoes. (b) Increased vascularity (arrow) is observed in the abscess of another patient.

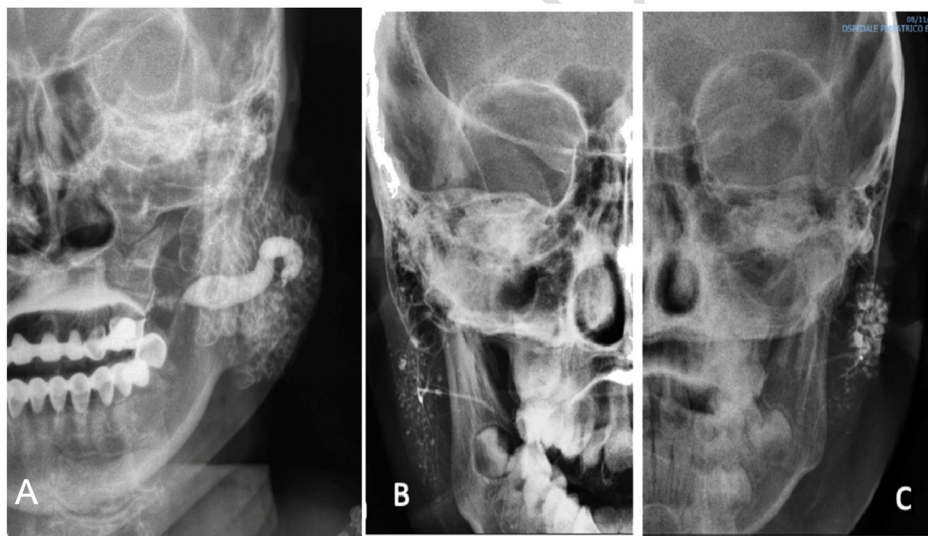


Figure 4. Example from Tucci et al (2019) on Parotid sialography: (A) Parotid sialography showing a characteristic “sausage-like” appearance. (B) and (C) Parotid sialography demonstrating a punctate sialectasis pattern