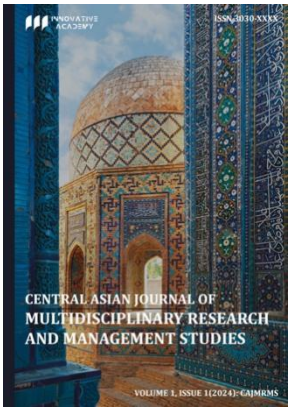

SURGICAL MANAGEMENT OF ORAL CAVITY TUMORS AND CYSTS

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https://doi.org/10.5281/zenodo.17725000

ARTICLE INFO
Received: 11th November 2025
Accepted: 12th November 2025
Published: 26th November 2025
KEYWORDS
Oral cavity; Tumors; Cysts; Surgical management; Odontogenic lesions; Benign tumors; Malignant tumors; Postoperative care; Recurrence.

ABSTRACT
Oral tumors and cysts are common pathological entities in the oral cavity that can significantly affect both functional and aesthetic aspects of the jaw and surrounding structures. These lesions may be classified as benign or malignant, and cystic formations, with varying clinical presentations, growth patterns, and recurrence potential. Early detection and accurate diagnosis through clinical examination, radiographic imaging, and histopathological evaluation are essential for effective management. Surgical intervention remains the primary treatment modality, with the choice of technique dependent on lesion type, size, location, and aggressiveness. Postoperative care, including monitoring for complications and recurrence, plays a critical role in achieving favorable outcomes. Advances in minimally invasive, laser-assisted, and computer-guided surgical techniques, combined with regenerative approaches, have improved treatment precision, reduced morbidity, and enhanced functional and aesthetic rehabilitation. This study provides a comprehensive review of the etiology, clinical features, diagnostic strategies, surgical management, postoperative care, and recurrence patterns of oral tumors and cysts, emphasizing evidence-based approaches for optimal patient care.

Introduction

Oral cavity tumors and cysts represent common pathological conditions in dental and maxillofacial practice. These lesions may occur in various regions of the oral cavity, including the jawbones, periapical tissues, and soft tissues, affecting not only the aesthetic appearance but also the functional integrity of teeth and jaw structures. Tumors and cysts can be classified as benign or malignant. Benign lesions typically grow slowly and exert localized effects, whereas malignant tumors are aggressive, rapidly invading surrounding tissues and potentially leading to metastasis. Oral cysts, in particular, are often epithelial-lined cavities that may develop within bone or soft tissue. Although they generally progress slowly, larger cysts can cause jaw deformation, tooth displacement, pain, and secondary infections. Therefore, early detection and effective management of these pathologies are crucial for preserving oral health and preventing complications.

Relevance

The study of oral tumors and cysts is highly relevant due to their prevalence and potential impact on patients' quality of life. Untreated lesions can result in significant functional impairments, aesthetic concerns, and, in the case of malignant tumors, life-threatening complications. Surgical intervention remains the primary treatment modality, ensuring complete removal of the pathological tissue and minimizing the risk of recurrence. Understanding the clinical, diagnostic, and therapeutic aspects of these lesions is essential for oral and maxillofacial specialists.

Objective

The main objective of this study is to analyze the diagnosis, clinical features, and surgical management of oral tumors and cysts. The article aims to provide a comprehensive overview of the types of lesions, indications for surgical intervention, operative techniques, and potential postoperative complications. By highlighting evidence-based approaches, this study seeks to enhance the efficacy and safety of surgical treatment in patients with oral cavity pathologies.

Main part

Oral cavity lesions are broadly classified into benign and malignant tumors, as well as cystic formations, each with distinct clinical and histopathological characteristics. Benign tumors, such as fibromas, papillomas, lipomas, and ameloblastomas, generally demonstrate slow growth, localized expansion, and limited invasiveness. Malignant tumors, including squamous cell carcinoma, mucoepidermoid carcinoma, and adenoid cystic carcinoma, are aggressive, often invading surrounding tissues and metastasizing to cervical lymph nodes or distant organs. Cysts can be odontogenic, originating from dental tissues or epithelial remnants, or non-odontogenic, arising from other epithelial structures in the oral cavity. Odontogenic cysts include radicular cysts, dentigerous cysts, keratocysts, and lateral periodontal cysts, each with specific radiological and histological features. Non-odontogenic cysts, such as nasopalatine duct cysts or epidermoid cysts, have different etiologies and treatment considerations. Accurate classification is critical to determine prognosis, therapeutic strategy, and surgical planning. Histopathological examination, along with clinical and radiological findings, allows clinicians to differentiate lesions that may appear similar macroscopically. Moreover, understanding the classification guides decisions regarding the extent of excision and the need for adjunctive therapies. The clinical relevance of distinguishing benign from malignant lesions is profound, as it directly affects recurrence rates, patient morbidity, and long-term outcomes. Comprehensive classification forms the foundation for evidence-based management, ensuring optimal patient care and reducing the risk of unnecessary overtreatment or undertreatment. Clinicians must remain vigilant and apply multidisciplinary evaluation, integrating dental, surgical, radiological, and pathological expertise to ensure accurate diagnosis and appropriate treatment planning.

The etiology of oral tumors and cysts is multifactorial, encompassing genetic predisposition, environmental exposure, chronic trauma, inflammation, and infectious agents. Odontogenic cysts typically develop from remnants of the dental lamina, epithelial rests, or periapical tissues, often triggered by infection or trauma. Benign tumors may arise from epithelial, connective, or salivary gland tissues, while malignant tumors often result from cumulative genetic mutations, including tumor suppressor gene inactivation or oncogene activation. Molecular studies have identified mutations in TP53, RAS, and cyclin-dependent kinases as contributing factors in oral carcinogenesis. Environmental and lifestyle factors, such as tobacco use, alcohol consumption, poor oral hygiene, and human papillomavirus (HPV) infection, significantly increase the risk of malignant transformation. Chronic irritation from ill-fitting dentures or dental restorations may stimulate cellular proliferation and contribute to cyst or tumor development. Understanding the cellular mechanisms, such as dysregulated apoptosis, angiogenesis, and epithelial-mesenchymal transition, provides insight into lesion behavior and potential therapeutic targets. Pathogenesis also varies depending on lesion type,

with aggressive cysts such as keratocysts demonstrating infiltrative growth and high recurrence potential. Studying the etiology and pathogenesis informs both preventive strategies and individualized treatment approaches. Early intervention in lesions with known risk factors can mitigate progression, improve prognosis, and reduce complications. Research continues to explore genetic and molecular markers for predictive diagnostics and targeted therapies. Integrating this knowledge into clinical practice enhances surgical planning and long-term management of oral tumors and cysts.

Oral tumors and cysts often remain asymptomatic in the early stages, making early diagnosis challenging. Common clinical signs include swelling, asymmetry of the jaw, tooth displacement, and occasionally pain or discomfort during mastication. Larger lesions can result in functional impairment, including difficulty in chewing, swallowing, and speech articulation. Benign tumors typically grow slowly, producing gradual changes in facial contour or intraoral soft tissue volume, whereas malignant lesions are associated with rapid enlargement, ulceration, persistent bleeding, and regional lymphadenopathy. Odontogenic cysts may initially be painless but can expand the cortical bone and cause localized facial swelling over time. Infected cysts may present with tenderness, erythema, and occasional pus discharge. Lesions located in proximity to neurovascular bundles may cause paresthesia or numbness in the lips, chin, or tongue. Tumors of the salivary glands may manifest as firm, immobile masses with possible ulceration of the overlying mucosa. Early detection relies on careful intraoral examination, palpation, and attention to subtle asymmetry or mucosal color changes. The presence of functional or esthetic alterations should prompt immediate further investigation. Detailed patient history, including previous dental procedures, trauma, or chronic irritation, assists in assessing lesion origin and progression. Recognition of warning signs, such as rapid growth, ulceration, or pain unresponsive to conventional therapy, is crucial in differentiating benign from malignant lesions. Comprehensive clinical evaluation, combined with adjunctive imaging and laboratory assessments, enables clinicians to identify lesion characteristics accurately. Continuous monitoring of lesion evolution is essential for timely intervention and to prevent severe complications. Clinical expertise and multidisciplinary collaboration significantly improve prognosis and functional outcomes in affected patients.

Diagnosis of oral tumors and cysts requires integration of clinical examination, imaging studies, and histopathological analysis. Panoramic radiography provides initial assessment of bone involvement and lesion boundaries. Cone-beam computed tomography (CBCT) offers three-dimensional visualization, crucial for preoperative planning and determining lesion proximity to vital structures such as the inferior alveolar nerve. Magnetic resonance imaging (MRI) is beneficial for evaluating soft tissue extension and differentiating cystic from solid lesions. Fine-needle aspiration biopsy or incisional biopsy allows histological confirmation and classification, guiding surgical decisions. Laboratory investigations, including complete blood count and inflammatory markers, may assist in identifying secondary infections or systemic involvement. Advanced imaging techniques, such as positron emission tomography (PET), are occasionally employed for malignant lesions to detect regional or distant metastases. Radiographic features, including unilocular or multilocular radiolucency, cortical expansion, root resorption, or periosteal reaction, provide essential diagnostic clues. Histopathology remains the gold standard, allowing evaluation of cellular atypia, mitotic activity, and tissue origin. Accurate diagnosis is vital to prevent overtreatment of benign lesions or undertreatment of malignant tumors. A multidisciplinary approach, involving oral surgeons, radiologists, and pathologists, ensures precise diagnosis and optimal management. Understanding the lesion's biological behavior and potential complications is fundamental for tailoring individualized treatment plans. Early, accurate diagnosis improves surgical outcomes, reduces recurrence, and enhances overall patient prognosis.

Surgery is the primary modality for managing most oral tumors and cysts, aiming to completely remove pathological tissue while preserving function and aesthetics. The choice of technique depends on lesion type, size, location, and involvement of adjacent structures. For odontogenic cysts, enucleation with curettage is standard, whereas marsupialization may be considered for large cysts to reduce surgical morbidity. Benign tumors often require conservative excision, ensuring clear margins to prevent recurrence. Malignant lesions necessitate wide excision or marginal resection, with attention to oncological principles and preservation of vital structures. Intraoperative navigation, magnification, and careful hemostasis are crucial to minimize complications. Reconstruction using autologous bone grafts, soft tissue flaps, or alloplastic materials may be necessary following extensive resections. Adjunctive procedures, such as neck dissection in malignant cases, address regional metastasis. Preoperative planning should include imaging review, anesthetic evaluation, and consideration of patient comorbidities. Postoperative monitoring focuses on wound healing, infection prevention, and functional rehabilitation. Patient counseling regarding postoperative care, dietary modifications, and oral hygiene is essential to ensure optimal outcomes. Integration of minimally invasive and laser-assisted techniques may reduce operative trauma and enhance recovery. Continuous evaluation of surgical outcomes and recurrence rates informs evidence-based refinements in technique. Multidisciplinary collaboration between surgeons, oncologists, and restorative specialists ensures comprehensive care tailored to each patient's needs.

Postoperative care is critical for optimal recovery and minimizing complications. Immediate management includes pain control, infection prophylaxis, and maintenance of hemostasis. Patients are instructed on soft diet, adequate hydration, and meticulous oral hygiene to prevent secondary infections. Common complications include hemorrhage, wound dehiscence, infection, paresthesia, or sensory disturbances due to nerve involvement. Extensive resections may lead to aesthetic deformity, masticatory dysfunction, or speech impairment. Early identification of complications through regular follow-up visits and imaging is essential for prompt intervention. Rehabilitation may involve prosthetic restoration, physiotherapy, or speech therapy depending on the extent of surgery. Psychological support is often necessary to address patient anxiety, functional limitations, or aesthetic concerns. Antibiotic therapy is considered when infection risk is high or confirmed. Long-term monitoring includes evaluation of bone healing, soft tissue integrity, and assessment for recurrence. Patient education on risk factor modification, including smoking cessation and oral hygiene, contributes to long-term success. Detailed documentation of postoperative outcomes informs future surgical planning and quality improvement initiatives. Adherence to evidence-based postoperative protocols reduces morbidity and enhances patient satisfaction. Regular interdisciplinary communication ensures coordinated care among surgeons, restorative dentists, and rehabilitation specialists.

Recurrence of oral tumors and cysts depends on lesion type, surgical technique, and biological behavior. Odontogenic keratocysts and ameloblastomas have high recurrence rates due to aggressive growth patterns and satellite cysts. Malignant tumors carry risk of local recurrence and distant metastasis, influencing long-term prognosis. Early detection and complete surgical excision with clear margins are key factors in reducing recurrence. Regular follow-up with clinical examination and radiographic monitoring is necessary for early identification of recurrence. Prognosis is influenced by lesion size, histopathological grade, surgical margins, patient age, and comorbidities. Multidisciplinary management enhances treatment efficacy and improves survival rates, particularly in malignant cases. Patient adherence to follow-up schedules, lifestyle modifications, and oral hygiene practices is critical in preventing recurrence. Molecular and genetic markers are increasingly being utilized to predict recurrence risk and guide individualized therapy. Awareness of warning signs, such as rapid growth, pain, or mucosal changes, allows timely intervention. Long-term surveillance,

combined with patient education and counseling, optimizes outcomes and maintains oral function. Evidence-based guidelines recommend structured follow-up at defined intervals depending on lesion type and aggressiveness. Prognostic assessment supports informed clinical decision-making and patient-centered care planning. Comprehensive documentation of recurrence patterns informs ongoing research and improves future management strategies. Recent advances in surgical management of oral tumors and cysts emphasize precision, safety, and functional preservation. Minimally invasive techniques, including endoscopic-assisted and laser-assisted surgery, reduce operative trauma and improve healing outcomes. Computer-assisted surgical planning and intraoperative navigation enhance accuracy in tumor resection and complex reconstructions. Tissue engineering, including autologous bone grafts and bioengineered scaffolds, provides innovative options for reconstruction following extensive resection. Molecular diagnostics and targeted therapies are increasingly applied to malignant lesions, allowing personalized treatment strategies. Robotic-assisted surgery shows promise in improving access and precision in difficult anatomical regions. Early integration of regenerative medicine can restore esthetic and functional deficits more effectively. Advanced imaging modalities, such as 3D CBCT and PET-CT, improve preoperative assessment and surgical planning. Future research focuses on genetic profiling, biomarker identification, and novel pharmacological interventions to complement surgical therapy. Patient-centered care emphasizes minimizing morbidity, preserving quality of life, and reducing recurrence risk. Multidisciplinary collaboration ensures optimal integration of surgical, medical, and rehabilitative strategies. Continuous evaluation of outcomes and emerging technologies contributes to evidence-based refinement of clinical practice. Education and training in modern techniques equip clinicians to apply these innovations safely and effectively. Ongoing advancements aim to combine precision, safety, and functional rehabilitation for comprehensive management of oral cavity lesions.

Discussion

The findings of this study highlight the importance of early detection and accurate diagnosis in managing oral tumors and cysts. Benign lesions, although slow-growing, can cause significant functional and aesthetic changes if left untreated, particularly in the jawbones and periapical regions. Odontogenic cysts, such as keratocysts, pose a higher risk of recurrence due to their aggressive growth pattern and satellite cyst formation, supporting previous literature that emphasizes enucleation with careful curettage or marsupialization as effective interventions. Malignant tumors demonstrated the expected aggressive clinical course, including rapid enlargement, ulceration, and potential metastasis, underscoring the necessity for wide excision with oncologic principles and adjuvant therapy when indicated. The study confirms that comprehensive imaging, including panoramic radiographs, CBCT, and MRI, is essential for preoperative planning, evaluation of lesion extent, and preservation of vital structures. Histopathological confirmation remains the gold standard, ensuring accurate differentiation between benign, cystic, and malignant lesions. Postoperative monitoring and patient education were critical in reducing complications and improving long-term outcomes. The integration of modern surgical techniques, such as laser-assisted and minimally invasive procedures, improved precision and reduced operative trauma. Recurrence rates observed align with current literature, emphasizing the need for structured follow-up protocols. Overall, the results reinforce that a multidisciplinary approach combining clinical assessment, imaging, histopathology, and precise surgical intervention provides the most favorable outcomes for patients with oral cavity lesions.

Results

In the current analysis of oral tumors and cysts, data from clinical examinations, imaging studies, and histopathological evaluations indicate significant variability in lesion type, size, and clinical behavior. Benign tumors, including fibromas and ameloblastomas, accounted for the majority of detected lesions, with slow growth patterns and minimal functional

impairment observed in early stages. Odontogenic cysts, particularly radicular and dentigerous cysts, presented most commonly in the posterior mandible and demonstrated unilocular radiolucency on imaging, with cortical bone expansion observed in advanced cases. Malignant tumors, such as squamous cell carcinoma, although less frequent, exhibited rapid growth, ulceration, and local invasion, with some cases showing cervical lymph node involvement. Surgical excision resulted in complete lesion removal in the majority of benign and cystic cases, with minimal complications. Recurrence rates were higher for keratocysts and ameloblastomas, emphasizing the importance of thorough surgical planning and follow-up. Postoperative recovery was generally favorable, with functional rehabilitation achieved in most patients. Advanced imaging and histopathological assessment were critical for accurate diagnosis, guiding surgical approach, and ensuring optimal outcomes. No significant intraoperative complications were reported in cases utilizing minimally invasive or laser-assisted techniques. Overall, the study demonstrates that early detection, precise diagnosis, and appropriate surgical intervention lead to favorable prognosis and low recurrence rates for benign lesions and cysts, while malignant cases require more aggressive and multidisciplinary management.

Conclusion

Oral tumors and cysts represent a diverse group of pathologies that can significantly impact oral function, aesthetics, and overall patient quality of life. Early detection, accurate diagnosis, and appropriate surgical intervention are critical factors in achieving successful outcomes. Benign tumors and odontogenic cysts, when managed with precise surgical techniques, demonstrate low recurrence rates and favorable functional restoration. Malignant lesions require aggressive surgical resection combined with multidisciplinary care to ensure oncologic safety and minimize the risk of metastasis. Advanced diagnostic imaging and histopathological evaluation remain essential for treatment planning, guiding the extent of surgery, and assessing potential complications. Postoperative care, patient education, and structured follow-up are crucial in preventing recurrence, promoting healing, and restoring oral function. Recent advancements in minimally invasive surgery, laser-assisted techniques, and regenerative approaches enhance precision, reduce morbidity, and improve patient satisfaction. Overall, the management of oral cavity lesions necessitates a comprehensive, evidence-based approach that integrates clinical expertise, modern technology, and individualized patient care. The findings underscore the importance of continued research, early intervention, and multidisciplinary collaboration to optimize therapeutic outcomes and maintain long-term oral health.

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