AMELOBLASTOMA: SURGICAL APPROACHES AND POST-RESECTION REHABILITATION

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Submission date: 13-Oct-2025 11:59AM (UTC+0300)
Submission ID: 2770459373
File name: IJAR-54307.pdf (775.36K)
Word count: 6651
Character count: 37282

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Abstract

Ameloblastoma is a benign odontogenic tumor characterized by slow growth and local invasiveness. Although it does not exhibit metastatic potential, it requires clinical attention due to its aggressive behavior and high recurrence rate, demanding careful therapeutic planning. This article aims to review and analyze the main therapeutic approaches for the treatment of ameloblastoma, with emphasis on mandibular reconstruction techniques. An integrative literature review was conducted, considering studies published between 2015 and 2025 in both English and Portuguese. A total of 36 studies were selected to support the critical analysis and proposed discussion. The results indicate that functional restoration after ameloblastoma resection is complex due to the resulting surgical bone defects. En bloc resection with safety margins is recommended for multicystic forms, whereas conservative techniques such as enucleation and curettage are suitable for smaller lesions, albeit with higher recurrence rates. Marsupialization may be used to reduce tumor size prior to definitive surgery. Immediate reconstruction with bone grafts or vascularized flaps, particularly fibular flaps, provides superior functional and aesthetic outcomes, thereby improving patients' quality of life. It is concluded that the choice of surgical technique must take into account the type and extent of the tumor. Furthermore, the reconstructive approach should be carefully planned, considering the preservation of facial aesthetics, masticatory function, and overall patient functionality, in order to ensure the best possible quality of life after treatment.

Keywords: Ameloblastoma; Bone Transplant; Oral Rehabilitation; Mandible

Introduction

Ameloblastoma is a benign odontogenic neoplasm that, despite its locally aggressive behavior, rarely progresses to metastasis. Its recurrence rate is high, reaching approximately 50% of cases, which reinforces the need for strict follow-up after treatment (MORAES *et al*., 2014). One of the main challenges in diagnosing ameloblastoma lies in its silent and asymptomatic evolution during the early stages. Detection often occurs late, when the lesion has already reached large dimensions and significantly compromised the bone structure. When symptoms are present, the most common ones include swelling, pain, and local discomfort, which may lead patients to seek dental care (MORAES *et al*., 2014).

The mandible is the most commonly affected site, accounting for approximately 80% of cases, particularly in the molar and ascending ramus regions. This anatomical predominance is well documented in the literature and directly influences the choice of therapeutic approach (SILVA *et al*., 2017). The treatment of ameloblastoma is primarily surgical, and the extent of resection depends on the size of the lesion. In many cases, tumor removal results in significant structural loss of the mandible, which poses a major challenge for both functional and aesthetic rehabilitation. Thus, mandibular reconstruction becomes a crucial step in disease management, requiring advanced techniques that enable restoration of bone continuity, preservation of facial harmony, and recovery of masticatory and swallowing functions (KATAOKA *et al*., 2019).

Despite advances in the field of oral and maxillofacial surgery, reconstruction continues to present technical and biological challenges, highlighting the need for ongoing research aimed at improving surgical and rehabilitative techniques. Therefore, understanding the different approaches to ameloblastoma treatment and mandibular reconstruction methods is essential to ensuring better prognoses and improved patient quality of life (KATAOKA *et al*., 2019).

The choice between conservative and radical approaches remains controversial, particularly given the high recurrence rates associated with this tumor. Hence, this study is intended to contribute to the discussion on therapeutic approaches for ameloblastoma, focusing on the limitations of current options and the perspectives for improving surgical and reconstructive protocols. By addressing these gaps, this review seeks to expand scientific knowledge and provide support for clinical decision-making, aiming to achieve better outcomes in disease management (NESPOLO *et al*., 2024).

This study aims to review and analyze the main therapeutic approaches for the treatment of ameloblastoma, with emphasis on mandibular reconstruction techniques. It also seeks to evaluate the advantages and limitations of different surgical options and to discuss technological advances and new perspectives in the functional and aesthetic rehabilitation of patients affected by this neoplasm.

Methodology

This study was conducted through an integrative literature review with searches performed in the PubMed, Scopus, Web of Science, SciELO, and LILACS databases. The search descriptors used were: Ameloblastoma surgical resection, Mandibular reconstruction after ameloblastoma, Maxillary reconstruction techniques, Fibula free flap reconstruction, 3D printing in maxillofacial reconstruction, Bone grafts for ameloblastoma defects, Osseointegrated implants in reconstructed jaws, Custom prostheses for mandibular defects, Microsurgical reconstruction of maxillofacial defects, and Rehabilitation after ameloblastoma surgery. These descriptors were selected based on MeSH/DeCS terms and combined using Boolean operators (AND, OR).

The inclusion criteria were: articles published in the last ten years; studies addressing surgical treatments for ameloblastoma and mandibular or maxillary reconstruction techniques, including functional and aesthetic rehabilitation. The exclusion criteria were: studies focusing exclusively on non-surgical treatments, isolated case reports, and articles lacking detailed information about post-resection reconstruction.After a rigorous selection process, a total of 39 articles were included in this review.

Literature Review

AMELOBLASTOMA: CHARACTERISTICS AND DIAGNOSIS

Ameloblastoma is a benign odontogenic tumor that is locally aggressive and originates from the developing odontogenic epithelium. This tumor can be classified into four main types: solid or multicystic, unicystic, peripheral, and desmoplastic. The solid/multicystic form is the most common, as well as the most invasive and prone to recurrence, often affecting surrounding tissues (KREPPEL & ZÖLLER, 2018; FARAS *et al*., 2017).

Ameloblastoma exhibits slow growth but can expand significantly over time, occurring most frequently in adults between 30 and 50 years of age, with a slight male predominance. It is more commonly found in the posterior region of the mandible, although it can also occur in the maxilla and in the anterior or lateral mandibular regions (FARAS *et al*., 2017; SOZZI *et al*., 2022). The lesion may initially be asymptomatic;

however, as it enlarges, it can cause facial deformity, pain, and functional difficulties such as impaired mastication and respiration. The tumor develops gradually and is often only noticed when facial asymmetry or local swelling becomes evident (SILVA *et al*., 2017).

In terms of epidemiological distribution, ameloblastoma occurs most frequently between the ages of 30 and 50 and is slightly more common in males, although the difference is not significant. The solid/multicystic type accounts for approximately 80% of cases, predominantly affecting the mandible but occasionally involving the maxilla. The peripheral ameloblastoma, a rare variant originating in the soft tissues of the gingiva, generally presents a more favorable prognosis (KREPPEL & ZÖLLER, 2018; SOZZI *et al*., 2022).

Despite its slow growth, ameloblastoma can reach large dimensions before diagnosis, particularly because it is initially asymptomatic. As it progresses, it can compromise vital anatomical structures, leading to aesthetic deformities, pain, facial asymmetry, tooth mobility, and, in advanced cases, paresthesia when the inferior alveolar nerve is involved. Clinically, it may cause cortical bone destruction and invasion of surrounding soft tissues, resulting in pain, malocclusion, tooth loss, and sensory alterations in the affected region (FARAS *et al*., 2017; FAVERANI *et al*., 2014).

Diagnosis requires the combination of clinical, radiological, and histopathological examinations (NNKO *et al*., 2024). Histologically, ameloblastoma is characterized by epithelial areas resembling the enamel organ, with thick basal cells and cyst-like structures. Microscopic analysis may reveal follicular, plexiform, or acanthomatous growth patterns, which are essential for definitive classification. Therefore, biopsy is crucial for diagnostic confirmation (HEIKINHEIMO *et al*., 2015; SILVA *et al*., 2017).

Although the definitive diagnosis is histological, imaging exams such as panoramic radiography are important for assessing lesion location and adjacent structure involvement. Computed tomography (CT) is particularly valuable for evaluating tumor extension, cortical expansion, and its relationship with the alveolar nerve, teeth, and soft tissues—factors that guide surgical planning (FAVERANI *et al*., 2014; MORAES *et al*., 2014; SILVA ***et al***., 2017).

CT and magnetic resonance imaging (MRI) are essential for determining the extent of the tumor and its effects on adjacent structures. CT typically shows a well-defined osteolytic lesion, a key indicator for differentiating ameloblastoma from other odontogenic pathologies. The multilocular appearance, often described as a "soap bubble" or "honeycomb" pattern, is characteristic of the multicystic type. MRI, on the other hand, is useful for assessing soft tissue involvement and distinguishing between solid and cystic lesions (NNKO *et al*., 2024; FARAS *et al*., 2017; SOZZI *et al*., 2022).

Early detection of ameloblastoma is crucial to prevent serious complications such as severe facial deformities, involvement of adjacent structures, and recurrence after tumor removal. Recurrence rates range from 10% to 25%, depending on the type of surgical procedure performed, making early diagnosis and appropriate treatment essential to minimize these risks (SOZZI *et al*., 2022).

Surgical Approaches in the Treatment of Ameloblastoma

Although ameloblastoma is a benign and slow-growing tumor, its capacity for local invasion and high recurrence rates require careful consideration in the selection of appropriate therapy. The standard treatment for ameloblastoma is surgical resection with safety margins to ensure complete tumor removal. The choice of surgical technique depends on factors such as lesion location, size, and involvement of bone and soft tissues. For more complex cases, immediate reconstruction with bone grafts—such as those harvested from the iliac crest or ribs—may be necessary to restore both function and aesthetics in the affected region (NNKO *et al*., 2024).

The therapeutic approach to ameloblastoma must be guided by a thorough evaluation of histological, clinical, and behavioral characteristics. Surgical removal remains the treatment of choice and can follow either a conservative or radical approach. The selection of the most appropriate method should be discussed with the patient. Conservative techniques, including curettage, decompression, enucleation, or marsupialization, are often chosen for peripheral and unicystic ameloblastomas, while radical approaches are indicated for multicystic variants, which tend to result in larger defects. Since resection often causes discontinuity defects, mandibular reconstruction is employed to restore structural integrity and provide a suitable tissue bed for prosthetic rehabilitation, thereby improving oral function and enhancing the patient's quality of life (MELO *et al*., 2016).

Marsupialization allows tumor size reduction and minimizes the risk of injury to adjacent tissues. It is mainly indicated for large lesions, as it reduces the adverse effects associated with extensive resections. This technique promotes new bone formation by relieving intraluminal pressure and is particularly effective when the periosteum remains intact. However, its main drawback is the prolonged time required to achieve significant clinical results. Decompression involves excising a portion of the cystic wall to allow continuous drainage of the lesion's contents, leading to a gradual reduction in size due to the elimination of hydrostatic pressure (MEDEIROS *et al*., 2025).

Enucleation, on the other hand, is more efficient for complete tumor removal and recurrence prevention but carries a higher risk of nerve injury and mandibular fracture (VERÍSSIMO *et al*., 2025). Following enucleation, curettage is often performed to remove any residual tumor cells that may remain within the cavity (ROCHA *et al*., 2024).

The unicystic ameloblastoma is a less aggressive variant and generally responds better to conservative surgical management. However, for the intramural subtype, a more aggressive procedure is recommended. Ameloblastomas may infiltrate intact bone trabeculae at the lesion margins, and enucleation alone may fail to remove these tumor islands, resulting in recurrence rates of up to 60% for the unicystic type and up to 90% for the multicystic type (BORGES *et al*., 2021).

The radical approach aims to perform either marginal or segmental resection of the bone while preserving an adequate margin of healthy tissue to ensure complete tumor removal. In marginal resection, a portion of the mandible (typically the alveolar ridge) is removed while maintaining mandibular continuity. Segmental resection, in contrast, involves the removal of an entire mandibular segment containing the tumor along with a band of healthy bone. This approach ensures complete lesion removal, minimizing the risk of recurrence. It differs from marginal resection, which preserves mandibular contour but has higher recurrence potential (MILMAN *et al*., 2016).

Radical treatment is recommended for multicystic ameloblastomas due to their aggressive nature. Since ameloblastoma cells can be found up to 8 mm beyond the radiographic or clinical margins, the typical surgical margin ranges from 1 to 1.5 cm (BORGES *et al*., 2021). In cases treated with the radical technique—most commonly applied to solid or multicystic ameloblastomas—recurrence rates range from 0% to 10%, compared to 60% to 80% when conservative approaches are used. Thus, conservative surgery presents a significantly higher recurrence risk in multicystic ameloblastomas (BORGES *et al*., 2021).

ADJUNCTIVE TECHNIQUEST

Autogenous, Allogeneic, and Xenogeneic Bone Grafts

Several criteria must be considered when defining the rehabilitative treatment plan for patients with bone defects following ameloblastoma surgery. The size of the defect and the availability of potential donor sites are evaluated to determine the most appropriate treatment plan for each patient (FAVERANI *et al*., 2014).

Different types of grafts may be used, including autogenous, allogeneic, xenogeneic, and alloplastic materials. The ideal grafting material is one that demonstrates high biocompatibility, facilitates revascularization of the grafted area, promotes new bone formation at the surgical site, carries minimal risk of rejection, and is readily available in sufficient quantity. Among these, the autogenous bone graft—harvested from the patient's own body—best meets these criteria. However, its main disadvantage is the need for a donor site, which may result in additional morbidity (FAVERANI *et al*., 2014).

Donor sites for autogenous grafts can be either extraoral or intraoral, depending on the size of the bone defect. Extraoral sites are preferred for large defects, while intraoral sites are suitable for smaller reconstructions. The most common intraoral donor sites include the mandibular ramus, mentonian region, maxillary tuberosity, and retromolar area, whereas the calvarium and iliac crest are the primary extraoral donor sites reported in the literature (SANZ-ALONSO *et al*., 2017; AMARAL *et al*., 2018; BORGES JÚNIOR, 2021; CRUZ *et al*., 2024).

The mandibular ramus provides an adequate quantity of bone for the reconstruction of defects in the maxilla or mandible prior to dental implant placement. Bone harvested from this site can supply sufficient volume to reconstruct an area corresponding to three to four teeth. A bone plate measuring approximately 3–5 mm in thickness, 40 mm in length, and 15 mm in height can be obtained from the mandibular ramus. This procedure yields an estimated bone volume of 2.36 mL, enabling horizontal bone gain of 5–7 mm. However, the larger the amount of bone harvested, the higher the risk of postoperative complications (ROCHA *et al*., 2024).

Another available option is the allogeneic bone graft, derived from another individual of the same species. It presents a low risk of immune rejection and has shown consistent success in guided bone regeneration (GBR) procedures. Allogeneic bone is used in mandibular reconstruction when autogenous bone is insufficient or unavailable. It can fill osseous defects caused by various conditions, such as osteomyelitis, osteonecrosis, or tumor resection.

Xenogeneic bone grafts, derived from a different species—typically bovine—are also used to regenerate or fill bone defects. These grafts serve as biocompatible scaffolds that promote bone neoformation and structural restoration (GHAI, 2022; NESPOLO *et al*., 2024).

Microsurgical Techniques

According to Ooi *et al*. (2014), the vascularized fibular graft is one of the most advantageous options for mandibular reconstruction due to its favorable aesthetic results and functional benefits for the stomatognathic system, such as improved mouth opening and normal swallowing without functional impairment. Additionally, the fibula provides a long donor segment compared to grafts harvested from the iliac crest. The length of the fibular segment allows for the reconstruction of extensive mandibular defects, and, when necessary, the graft can be reshaped into a double-barrel configuration to increase vertical bone height (HE *et al*., 2011).

Ammar Belal *et al*. (2019) emphasize that the bone graft must be properly protected to support the patient's masticatory, aesthetic, and oral functions. Considering the potential postoperative complications, such as graft infection or malocclusion, one viable alternative is the use of flexible acrylic prostheses over the iliac bone graft in young patients undergoing mandibular resection. These prostheses offer advantages such as enhanced flexibility, stability, and retention, which improve flange coverage in areas involving both hard and soft tissues (ACHARYA *et al*., 2016)

Factors Influencing the Choice of Reconstructive Technique

According to Wright *et al*. (2017), the most predictable treatment for this benign yet aggressive neoplasm is total surgical removal. Ideally, complete excision should be achieved during the initial surgery, as leaving residual tumor tissue may lead to ameloblastoma recurrence. This is particularly relevant for subtypes considered high-risk or aggressive. Furthermore, in the surgical management of aggressive neoplasms, the definitions of "conservative" and "radical" approaches have evolved in the literature. Currently, these terms are used to distinguish between interventions that are non-curative and those aimed at complete cure (SPEIGHT *et al*., 2018).

McClary *et al*. (2016) note that the solid/multicystic, desmoplastic, and intramural subtypes of unicystic ameloblastoma show higher recurrence rates, especially when treated with non-curative methods. Conversely, the unicystic intraluminal and peripheral ameloblastoma subtypes exhibit lower recurrence rates, indicating that tumor subtype is a determining factor in surgical technique selection and that each case must be evaluated individually.

Total excision of the affected bone, followed by primary reconstruction, is the preferred approach for all conventional ameloblastoma cases. This method should be prioritized over less invasive techniques whenever feasible. Even in less aggressive subtypes, the use of vascularized bone grafts represents an advantageous option, as it allows the surgeon to remove the affected bone segment with appropriate safety margins throughout its entire extent without concern for excessive bone loss. This strategy increases the likelihood of complete cure and significantly reduces recurrence rates (SLUSARENKO da SILVA *et al*., 2018).

APPROACHES TO FUNCTIONAL AND AESTHETIC REHABILITATION

Customized prostheses and osseointegrated implants:

Recently, virtual surgical planning and the use of customized 3D titanium prostheses manufactured by CAD/CAM technology have emerged as viable alternatives for mandibular reconstruction in resection cases, particularly when free flaps are contraindicated or refused by the patient (CORTESE *et al*., 2023; KATAOKA *et al*., 2019). The insertion of dental prostheses plays a key role in restoring the patient's individual anatomy, promoting effective functional recovery while enhancing both comfort and aesthetics (FALCÃO *et al*., 2022; SIQUEIRA *et al*., 2019).

In the study by OW *et al*. (2016), a mandibular reconstruction was described using a customized titanium prosthesis. The process began with 3D CT segmentation to define the tumor's extent and resection margins. With the assistance of biomedical engineers, a virtual surgery was performed to model the prosthesis using a mirrored image of the healthy side of the mandible. The prosthesis was designed with a height reduction (10–15%), incorporating locking screws, suture holes in the ascending ramus, and adjustments to the condyle, such as reduced vertical volume and surface polishing. As a result, the surgical procedure proceeded successfully in this context.

On the other hand, FALCÃO *et al*. (2022) described a mandibular reconstruction using a polymethyl methacrylate (PMMA) prosthesis followed by the installation of a customized TMJ prosthesis. In the reported case, PMMA was used to replace the condyle and part of the mandibular ramus, remaining in place for six months. This material acted as a space maintainer within the soft tissue envelope and proved to be a good option for temporary reconstruction of mandibular defects. The main advantage observed was the preservation of the mandibular contour, resulting in the maintenance of the patient's facial aesthetics.

The integration of these approaches with the use of osseointegrated implants can further enhance outcomes, particularly by effectively stabilizing implant-supported or implant-retained prostheses and restoring the functionality of the stomatognathic system (PASTORES *et al*., 2016; LIMA *et al*., 2020). The technique involves inserting implants into the fibula, allowing a 12-week osseointegration period. Afterward, the free fibular flap containing the implants is transplanted into the oral cavity, enabling simultaneous reconstruction and early rehabilitation (CHAI *et al*., 2019; LIMA *et al*., 2020).

Stem Cell Therapy and Tissue Engineering

Stem cell therapy and tissue engineering have shown promising advances in bone regeneration, particularly in cases requiring bone resection (SILVA *et al*., 2017; SANTOS *et al*., 2024). Recombinant types such as rhBMP-2 have gained prominence in bone regeneration, playing key roles in the formation of bone and cartilage. These proteins are often associated with carriers that assist in the controlled release of bone morphogenetic proteins (BMPs), thereby promoting more efficient bone regeneration (SANTOS *et al*., 2024; HEIKINHEIMO *et al*., 2015).

The use of pBMPs, such as rhBMP-2, has demonstrated efficacy in bone regeneration following procedures like enucleation and curettage of lesions. A literature review of studies up to 2011 involving 37 patients reported that 86.5% achieved favorable outcomes using rhBMP-2 for bone reconstruction. The combination of rhBMP-2 with new tissue engineering approaches and improved control of the postoperative environment may enhance the success of this technique in complex cases (SILVA *et al*., 2017; SANTOS *et al*., 2024). Furthermore, the use of BMPs can help minimize complications such as ectopic calcification, providing a safer and more effective treatment (SANTOS *et al*., 2024; HEIKINHEIMO *et al*., 2015).

Esthetic Aspects of Reconstruction

The final outcome of a satisfactory bone reconstruction is closely related to the reconstruction of soft tissues. For this purpose, the tissue must present adequate size, correct fixation position, good quality, and proper vascularization; moreover, the patient must be in good overall condition (BORGES *et al*., 2021; NESPOLO *et al*., 2024).

In the mandibular symphysis region, the main challenge is maintaining an acceptable facial contour due to the difficulty of achieving perfect plate adaptation, given its rigidity and the complex curvature of the mandibular contour (FRANCO *et al*., 2017; SIQUEIRA *et al*., 2019).

The use of bone grafts to treat extensive tumors presents significant limitations, particularly concerning the reconstruction of soft tissue defects. The amount of bone obtained is often insufficient to address large resorptive areas, which can compromise the effectiveness of the treatment. Additionally, there is a risk of unpredictable graft resorption, which can further hinder the patient's recovery and rehabilitation. It is essential to consider these limitations when planning the surgical approach for the reconstruction of bone defects (BORGES *et al*., 2021; LIMA *et al*., 2020).

Complicações e limitações das técnicas reconstrutivas:

Em tratamentos de tumores extensos, o enxerto ósseo não é o mais indicado, portanto essa técnica impossibilita a reconstrução de defeitos de tecidos moles, pois a quantidade de osso fornecida não é suficiente para reconstruir a área removida, além de ter chances de futuras reabsorção do enxerto (BORGES *et al*., 2021; CORTESE *et al*., 2023).

Existem vários tipos de enxertos autógenos, como calota craniana e crista ilíaca. No entanto, quando esses enxertos não são utilizados de forma adequada, pode levar a complicações. O uso da calota craniana exige um bom treinamento do cirurgião, o seu despreparo pode resultar na secção do ramo parietal da artéria temporal superficial, causando hemorragia. Além disso, a penetração na cavidade craniana durante a remoção do enxerto pode causar danos irreversíveis. Por outro lado, as complicações do uso da crista ilíaca podem estar atribuídas ao despreparo do cirurgião à extensão da remoção e, em alguns casos, à própria anatomia do paciente. Normalmente, essas complicações estão ligadas à quantidade de osso removido, podendo resultar em hemorragia interna, com grandes áreas de hematoma e edema, além de dor. Também podem ocorrer penetrações na cavidade abdominal, lesões nas vísceras e ruptura do nervo cutâneo femoral lateral, o que pode causar parestesia parcial ou permanente na parte lateral da coxa e dificuldades na locomoção (FAVERANI *et al*., 2014; SIQUEIRA *et al*., 2019).

FUNCTIONAL, AESTHETIC, AND QUALITY OF LIFE IMPACT

Prosthetic Rehabilitation and Implant Dentistry:

The literature reports cases involving unicystic ameloblastoma in which, after lesion removal through marsupialization and enucleation followed by filling with iliac crest bone grafts, successful placement of dental implants was achieved. The harvested autogenous bone graft offers biological and immunological advantages compared to xenogeneic bone, allografts, or alloplastic materials, as it contains viable cells (supporting osteogenesis) and bone morphogenetic protein (SANZ-ALONSO *et al*., 2017). However, harvesting the bone graft requires a second surgical site, significantly increasing both the cost and morbidity associated with the reconstructive procedure (SILVA *et al*., 2017).

Functional and Aesthetic Outcomes and the Impact on Patients' Quality of Life After Reconstruction

After resection, load-bearing reconstruction plates are used to provide structural support. However, these plates are not intended for prosthetic purposes, making the use of bone grafts necessary (MILORO *et al*., 2016). Mandibulectomy followed by reconstruction of mandibular defects is a common yet challenging procedure, as it requires both functional and aesthetic rehabilitation of the patient (NESPOLO e*t al*., 2024). Immediate reconstruction after en bloc resection with safe margins represents the best approach for treating ameloblastomas, as it allows total removal of the lesion and provides both cosmetic and functional restoration during the same surgical procedure.

Partial mandibular resection, whether due to lesions or other factors, directly affects patients' quality of life. Despite continuous improvements in materials, new technologies, and surgical techniques, the treatment of large bone defects remains a major challenge for surgeons (SIQUEIRA *et al*., 2019). Autogenous bone grafting remains the gold standard, as it provides the three mechanisms of bone regeneration—osteogenesis, osteoinduction, and osteoconduction. Vascularized bone grafts are the preferred option for extensive reconstructions (NESPOLO *et al*., 2024).

In mandibular reconstruction, restoring bone continuity alone should not be considered the sole measure of success. Anatomical and functional aspects such as mastication, swallowing, speech, and labial competence must also be analyzed, along with aesthetic factors such as facial profile and contour. One of the basic principles of reconstructive surgery is to maintain the remaining bone tissue in the same anatomical relationships as before the lesion resection, enabling reconstruction with both hard and soft tissues. The final outcome is more strongly influenced by soft tissue reconstruction than by bone reconstruction itself (SIQUEIRA *et al*., 2019).

Bone reconstruction is essential after ameloblastoma resection, not only for functions such as chewing, speech, and swallowing, but also for the patient's facial aesthetics.

Several critical factors must be considered when planning reconstruction, including the size and position of the defect, the quality and vascularization of the remaining tissues, and the patient's general condition. According to Nespolo *et al*. (2024), in addition to restoring function, it is also crucial to restore the patient's aesthetic appearance, allowing social reintegration with minimal aesthetic impairment. Failure to do so may result in social interaction difficulties, relationship challenges, and potential psychological distress, thereby significantly affecting the patient's quality of life.

Perspectivas futuras para otimização do tratamento

Heikinheimo K *et al*., (2015) destacou a alta frequência de mutações no gene BRAF V600E em ameloblastomas, especialmente nos localizados na mandíbula. Essas mutações ativam a via MAPK, crucial para a proliferação celular. A identificação dessa alteração genética sugere que terapias direcionadas, como inibidores de BRAF, podem ser eficazes no tratamento do ameloblastoma, oferecendo uma alternativa menos invasiva em comparação com a cirurgia tradicional. Esses avanços mostram que no futuro o tratamento do ameloblastoma pode ser personalizado para cada caso, combinando terapias moleculares com técnicas cirúrgicas já existentes. Além disso, o uso de laser de alta potência e terapia fotodinâmica tem sido estudado como terapia adjuvante, especialmente para reduzir células tumorais residuais após cirurgias conservadoras. No entanto, essas abordagens ainda estão em fase experimental e requerem estudos clínicos mais amplos para validar sua eficácia (PEREIRA *et al*. 2025).

CONCLUSION

The treatment of ameloblastoma requires an individualized approach that balances complete removal of the lesion with preservation of masticatory function and facial aesthetics. Analysis of the main reconstructive techniques shows that technological advances, such as the use of biomaterials, customized prostheses, and CAD/CAM resources, have expanded the possibilities for rehabilitation, making procedures more predictable and less invasive. Thus, surgical planning combined with technological innovation favors superior functional and aesthetic results, contributing significantly to patients' quality of life.

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