Oral and Masticatory Rehabilitation Using Osseointegrated Dental Implants After Resective Treatment of Multicystic Ameloblastoma in the Lower Jaw with a Fibula Graft

Abstract
Ameloblastoma is an aggressive odontogenic tumor which typically occurs between third and fourth decade of life that often needs resective approach. Immediate reconstruction may show better results. The treatment of multicystic ameloblastoma in the mandible being a rare case that occurred in the late second decade of life, which was surgically removed along with the affected teeth with safety margins, and the region was immediately reconstructed using a vascularized graft, removed from the fibula. Its integration, in combination with osseointegrated dental implants and fixed implant-supported prostheses, restored chewing function and esthetics. After 6 years from fibular graft and 24 months of dental implants, an excellent outcome was observed, with oral health and normal functions properly restored, and the immediate reconstruction of the mandible in resective cases, associated with oral rehabilitation with dental implants, may be considered a suitable treatment option.

Keywords: Ameloblastoma, bone graft, dental implants, fibula graft, prosthetic rehabilitation

Introduction
Ameloblastoma represents 10% of odontogenic epithelial tumors[1,4-6] and is the second most prevalent after odontomas,[5] accounting for 1% of all tumors and jaw cysts that predominantly affect the mandible.[2,4,6,7] The region most affected is the body of the mandible and its ascending branch.[2] The evolution of this tumor is characterized by asymptomatic slow expansion with persistent and aggressive behavior being capable of infiltrating adjacent tissues, causing cortical bone expansion, severe facial deformities, functional impairment, paresthesia, and trismus[2,6,8] and may induce root resorption and high rates of relapse when inadequately treated.[1,8]

Ameloblastomas are classified into different types: solid or multicystic, unicystic, desmoplastic, peripheral or soft tissue,[2,4,5,9] and malignant, which are the most aggressive types.[2,7]

Diagnosis is achieved through radiographic examination at the time of routine consultations or when the tumor leads to facial asymmetry. Radiographically, it shows significant variation with multilocular and unilocular characteristics commonly seen, which may or may not be well defined,[2] appearing as “honeycomb” or “soap bubbles.”[6]

The recommended treatment relies on a surgical approach, the extent of which depends on the size of the lesion and the different characteristics of the tumor. Radical surgical treatment involves resection of the ameloblastoma with safety margins of at least 1–3 cm of normal bone[1,2,4,5,9] or with healthy bone surrounding the area where the teeth in direct contact with the tumor are removed. Conservative surgery involves total tumor enucleation and subsequent curettage; however, this method leads to an increased rate of relapse, usually occurring a few years following conservative treatment.[1,2,4,5,9]

These tumors usually develop between the third and the fourth decades of life.[1,2,4,5] In young patients, unicystic ameloblastomas are rare and their resections may generate future difficulties as it interrupts the growth and development of the anatomical structures affected by these tumors.[3]
Moreover, these tumors can lead to functional and esthetic problems, including chewing difficulties, which may benefit from more conservative treatment.\[^5\]

The aim of this paper was to report a clinical case of oral rehabilitation with dental implants and fixed prostheses, after the resective treatment of a multicystic ameloblastoma associated with immediate microvascularized fibular grafting.

**Outline of the Case**

A 28-year-old patient sought treatment for hemimandible rehabilitation with dental implants after the resective treatment of an ameloblastoma at the Positivo University. The patient was diagnosed with endodontic periapical cyst with chronic inflammation in lower right premolars at 18 years of age [Figure 1]. This was diagnosed through a panoramic radiography at the end of orthodontic treatment revealing the presence of a radiolucent circumscribed lesion located in the right side of the body of the mandible. No cortical bone expansion or dental displacement was observed, and biopsy of the region with intraoral bone curettage was performed.

After clinical and radiographic monitoring for 3 years, the patient presented with tumor relapse, which required surgical removal showing pain and swelling that affected the body of the mandible and its ascending ramus. An irregular fragment of bone tissue was resected for a new histopathological examination [Figure 2]. Along with this histopathological examination, new imaging tests including bone densitometry and panoramic radiography were performed, which confirmed the diagnosis of multicystic ameloblastoma.

After the confirmation of this new diagnosis, the patient underwent a resective hemimandibulectomy, in which five teeth adjacent to the tumor were removed and an autogenous microvascularized fibula graft was simultaneously performed, fixed at the remaining stumps of the jaw using plates and screws [Figure 3].

Final rehabilitation was scheduled after 12 months for the incorporation and maturation of the graft. However, the patient decided not to install the dental implants within the stipulated period. The postsurgical evolution, incorporation, and maturation of the fibular graft occurred without complications and the region appeared completely healthy, with no signs of tumor recurrence or inflammation [Figure 4]. This indicated that the procedure is feasible for the reconstruction of this region with dental implants.

Five years after tumor removal and the incorporation of the fibular graft, the patient began to notice the effect of partial edentulism in the right mandibular region, and the upper teeth appeared uneven. The installation of three dental implants was then planned since the patient did not present any systemic problems.

For the surgical procedure, extra and intraoral antisepsis was achieved using 0.12% chlorhexidine and local anesthetic infiltration administered with 4% articaine hydrochloride. An intrasulcular incision was made using a 15C blade in the region and extended over the bone crest. Total detachment of the flap was performed using a Molt periosteal elevator [Figure 5].

Three implants were installed following the manufacturer protocol was placed in the region and suturing was performed with nylon thread 5–0 [Figure 6].
For managing postoperative pain, 500 mg amoxicillin every 8 h for 7 days, 400 mg etodolac every 8 h for 3 days, and 750 mg paracetamol every 8 h for 2 days were prescribed. A mouthwash with a solution of chlorhexidine digluconate without alcohol every 12 h for 14 days, and the sutures were removed after 10 days. The recovery of the patient was monitored monthly.

A minimum period of 90 days to allow time for osseointegration and for the reopening of the implants and subsequent oral rehabilitation with implant-supported prostheses, and after this period, the dental implants were reopened through an incision on the bone crest for the installation of bone healing abutments, measuring 4 mm in height. A 4% articaine hydrochloride local anesthesia was infiltrated and suturing was performed with wire 4–0.

Seven days after removal of the sutures, dental moldings were obtained for fabrication of the implant-supported prostheses, owing to the difference in height between the mandibular and the grafted edge. The prosthetic planning for the rehabilitation of this region was established by creating a fixed prosthesis in porcelain with four elements, supported by three implants as showed on panoramic radiograph [Figure 7] and compensated with pink porcelain [Figures 8 and 9], which reestablished the masticatory function and esthetics of the region [Figures 10 and 11].

After the installation of the prosthesis, the patient complained of severe pain in the region due to chewing and biomechanical loads related to the return of the correct occlusion. Therefore this, the use of muscle relaxants was prescribed and the remission of symptoms was observed within 5 days. The patient was monitored for 36 months after prosthetic rehabilitation, with assessment of the function and esthetics of the region. The patient was very pleased with the outcome of this treatment as the patient noticed a significant improvement in function, esthetics, and phonetic quality [Figure 12].

**Discussion**

According to these authors, multicystic or solid ameloblastoma more commonly develops in patients aged 44 years and was confirmed that it is rare in younger patients. In this case report, the first manifestations of the disease were observed at 18 years of age. Clinically, multicystic ameloblastoma is the most aggressive variant, owing to its ability to infiltrate into bone trabeculae.
In this case, tumor aggressiveness was observed during the radiographic follow-up when, in a relatively short period of time, the injury spreads throughout the whole body and into the ascending ramus of the right jaw.

The treatment should be very well evaluated and planned as the choice of treatment depends on the clinical characteristics of the patient, tumor location, size, and margins as well as the age of the patient and the degree of morbidity that the treatment may cause. The major problem faced with treatment of all types of ameloblastoma is their high recurrence rate, which was previously reported. Moreover, when not removed correctly, ameloblastic islands remain within the trabecular bone or soft tissue and may continue to proliferate, thus leading to the recurrence of this type of tumor, a statement reinforced by another author.

In the case analyzed in this study, three biopsies were performed before arriving at the correct diagnosis. The early diagnosis of endodontic periapical cyst resulted in two relapses and favored the proliferation of the tumor. When the correct diagnosis was reached 5 years after the beginning of the treatment, the size of the tumor had significantly increased, thus necessitating a surgical approach. Mandibular hemisection and the immediate reconstruction were performed using a fibular graft. This is the most radical treatment, requiring surgical excisions with safety margin from 1 to 2 cm of healthy bone as recommended by many authors before. This technique resulted in a slight facial asymmetry and loss of sensitivity of the adjacent structures, owing to the interruption of the main nerves of this region.

Moreover, the different rates of relapse depend on the surgical technique that was used the number of cases and the monitoring period. The clinical and radiographic follow-up of these lesions is therefore very important, in particular, owing to a recurrence rate of 50% of the cases within the first 7 years of tumor removal.

Tumor recurrence depends on several factors, such as the choice of treatment for the primary tumor, the extent of the injury, the proliferation of residual portions of the tumor that was not removed with the surgery, and the implantation of tumor tissue in other organs during surgery.

The treatment began in a conservative manner in this patient, using the curettage technique. Tumor recurrence occurred during the 3rd year of follow-up. After this relapse, the tumor recurred within 2 years.
Mandibular reconstructions are performed with reconstruction plates, bone, and skin grafts used to replace the absence of mucosa, and dental implants are installed to rehabilitate part of the dentition that was lost and to finalize the prosthetic reconstruction, according to previous cases reported.[1,2,6,7]

The grafts placed immediately after tumor removal show better results[1,5] as delayed or late reconstruction of this region may cause lingual collapse and the displacement of the remaining vertical and horizontal mandibular branches. In addition, the dissection and placement of remaining bone stumps is difficult and delicate.

Immediately following tumor resection, the reconstruction of the region promotes an anatomical and functional restoration of the defect. This allows the repair of the affected area in a single surgical procedure, without distortions, deviations, atrophies, and the formation of scars inherent to secondary surgeries. This renders the technique described more reliable, thus being considered as the best alternative treatment for ameloblastomas.[2,3,5,6] as it promotes the complete removal of the tumor with esthetic and functional rehabilitation during the same surgical procedure. Moreover, rehabilitation with dental implants can be performed after a relatively short time, thus providing the patient the return of normal chewing functions.

Segmental defects of the mandible can be reconstructed using vascularized or nonvascularized grafts, with vascular grafts being the first choice for mandibular reconstructions.[5] Nevertheless, this method is not optimal since it increases the operating time, morbidity of the donor site, and cost.

Conclusions
In this case, a microvascularized fibular graft was used immediately after tumor resection. It was considered the best surgical option, owing to the extent of the lesion and the favorable conditions of the patient to undergo this procedure. The installation of dental implants and rehabilitation with implant-supported prostheses occurred 5 years after the resective treatment, as chosen by the patient.

Multicystic ameloblastoma is an extremely aggressive tumor, requiring the removal of a large area of adjacent tissue for its complete removal and the extraction of the teeth involved. Nevertheless, this study concludes that excellent long-term results are observed when a correct diagnosis and treatment plan is formulated. The fibula is a good option for an immediate reconstructive surgical approach with vascularized autogenous grafts. After its complete incorporation, this graft becomes viable to receive dental implants that support functions and chewing loads. Esthetics and oral health are restored with minor or no consequences, reduced morbidity and minimal treatment time, owing to a reduced number of surgical interventions. This subsequently increases long-term functional and esthetic prognosis.

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

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Conflicts of interest
There are no conflicts of interest.

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