Ameloblastoma: Reconstruction Using Titanium Plates adapted Using Stereolithographic Models

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Abstract

Ameloblastoma is a benign but locally invasive odontogenic tumor that causes significant morbidity. The aim is to study an ameloblastoma treatment with reconstruction using titanium plates adapted using stereolithographic models. A 48-year-old female patient referred due to asymptomatic osteolytic lesion between teeth 47 and 48 discovered during routine radiographic study. The pathoanatomical study described a desmoplastic ameloblastoma. Due to the possibility of it being a malignant lesion, a computerized axial tomography scan was performed, which showed that the tumor was not malignant. A stereolithographic model was prepared to make the cutting guides and facilitate fitting of reconstruction plates. Three-dimensional printing technology enables fast, accurate mandibular reconstruction, helping to shorten operation time.

Keywords: Ameloblastoma, stereolithographic models, titanium plates

Introduction

Ameloblastoma is a mainly benign but locally invasive odontogenic tumor that causes significant morbidity. Odontogenic tumors are a group of heterogeneous lesions derived from the epithelial tissue, the ectomesenchyme, or both, which are part of the tooth-forming apparatus. Several retrospective studies in different continents report differences related to the frequency of the different histological types of tumors.[1]

Clinical-radiographic and pathoanatomical diagnoses must be considered. A panoramic radiograph can be used to determine the location of the lesion, presence of sclerosis in the periphery, association with impacted teeth, and expansion of cortical bone of the lower mandibular edge. Ameloblastomas are rare neoplasms and seem to present variations according to location and patient sex and age.

Clinical features and images are useful for determining the most probable differential diagnosis before performing the biopsy. The frequency and incidence of odontogenic cysts and tumors are a matter of controversy, and reports vary according to the geographic location where they are studied. Ameloblastomas have great clinical and histopathological diversity and reflect a need for epidemiological profile to be considered when they are studied.[2]

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A computerized tomography scan is the most precise method for determining lesion shape, root resorption, calcifications, buccolingual expansion, and breakage of cortical bone. Although most ameloblastomas and keratocysts both present buccolingual expansion and bone cortex erosion, one of the differences between them is that usually only ameloblastomas present root resorption.[3,4]

Aim

The aim is to study a clinical case of ameloblastoma treatment with reconstruction using titanium plates adapted using stereolithographic models.

Case Report

A 48-year-old female patient referred by general dentist due to asymptomatic osteolytic lesion between teeth 47 and 48 discovered during a routine radiographic study. She was received at the hospital's surgery department, where it was decided to extract tooth 47 and take a sample from the lesion (partial biopsy) [Figures 1 and 2].

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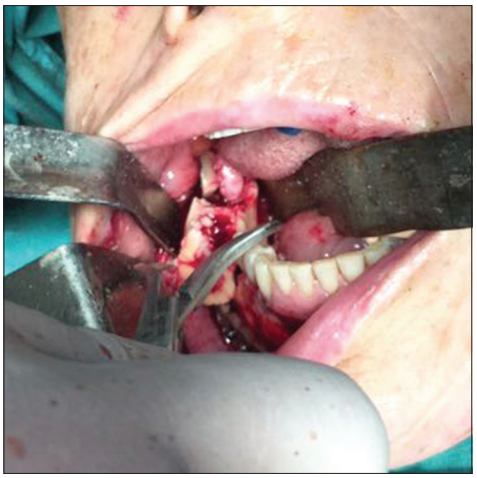

Figure 1: Intraoperative view

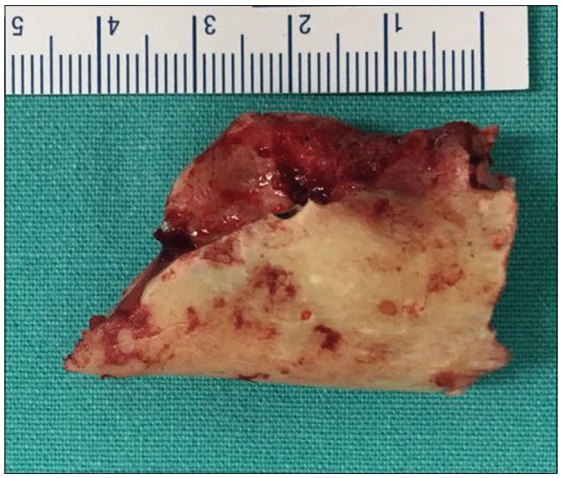

Figure 3: Resected specimen

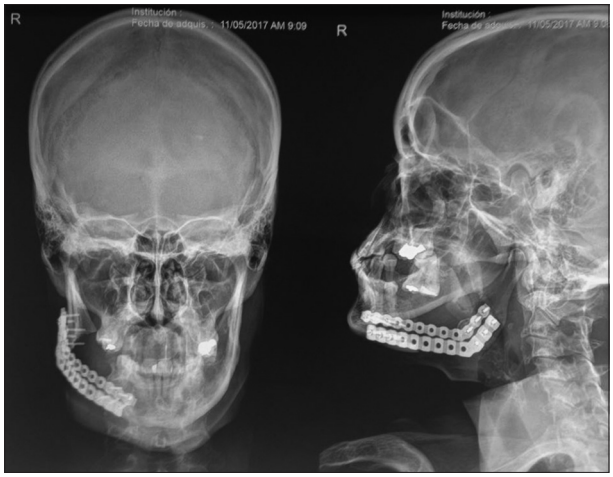

Figure 5: Computed tomography

The pathoanatomical study described a desmoplastic ameloblastoma. Due to the possibility of it being a malignant lesion, a computerized axial tomography scan was performed, which showed that the tumor was not malignant. Conventional

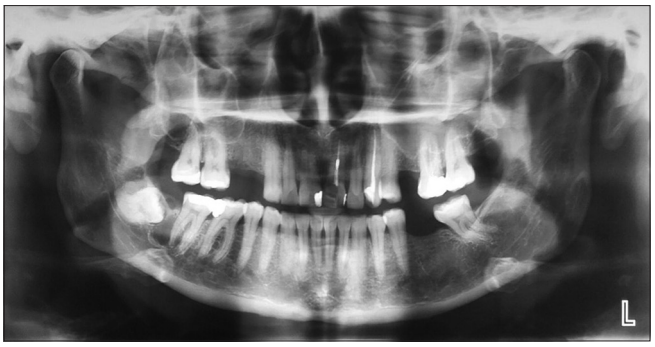

Figure 2: Preoperative radiography

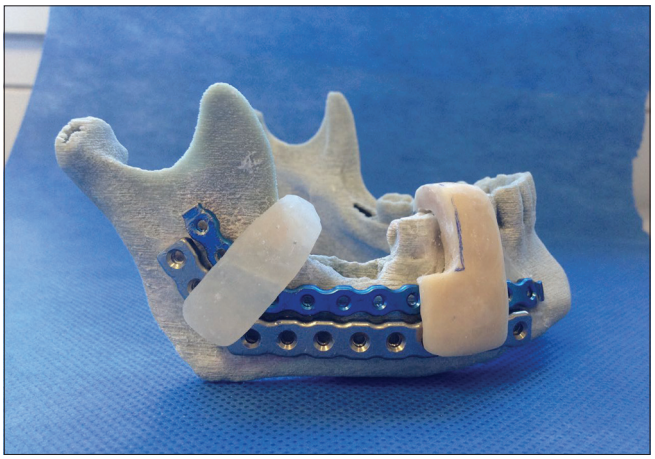

Figure 4: Stereolithographic model

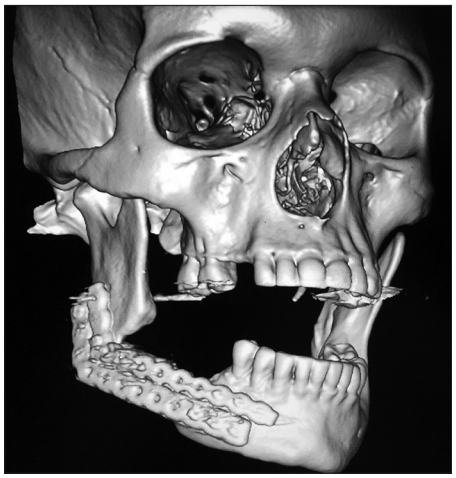

Figure 6: Three-dimensional computed tomography

presurgical tests were ordered to perform *en bloc* resection with safety margins. A stereolithographic model was prepared to make the cutting guides and facilitate fitting of reconstruction plates [Figures 3 and 4].

The patient was taken to the operating room under general anesthesia and nasotracheal intubation. Cutting guides were placed and *en bloc* resection performed, which included teeth 48 and 46 and an ameloblastic lesion measuring 0.8 cm × 0.4 cm × 0.4 cm with marked sclerosis

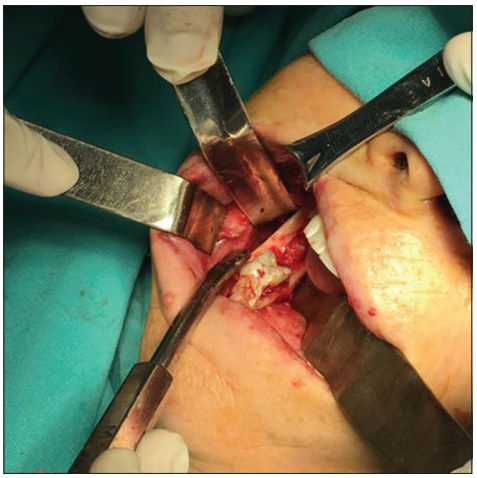

Figure 7: En bloc resection of ameloblastic section of mandible

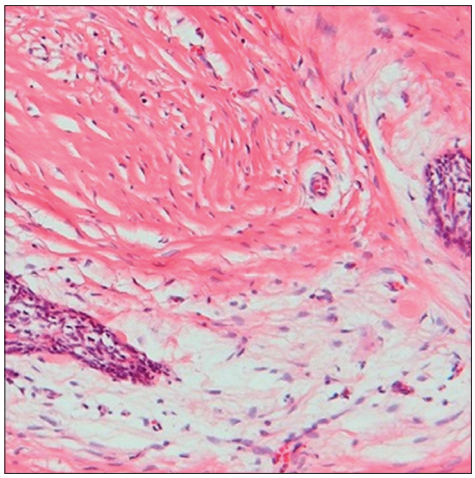

Figure 8: Histopathology

Figure 9: Extracted sample

Figure 10: Incision during surgery

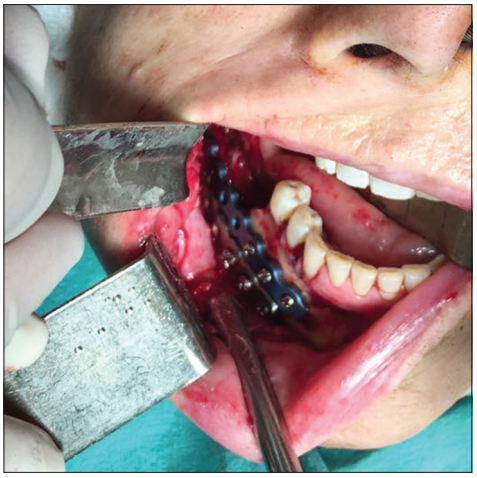

Figure 11: Plate placed

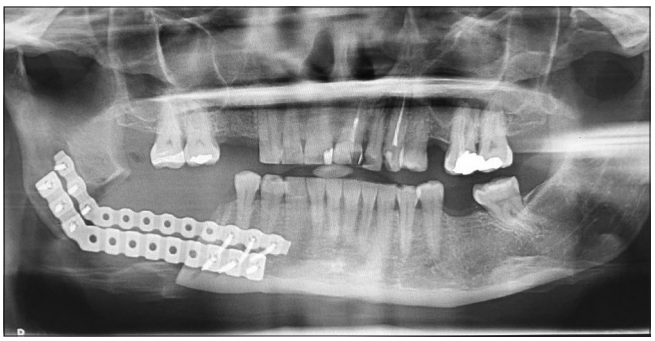

Figure 12: Post 10 days of surgery

and reactional bone neoformation. A 2.4 system plate for basal reconstruction and a 2.0 system locking plate were placed. While adapting the plates, the occlusion must be checked using IMF screws. The patient spent the 1st h in intensive care, after which she was moved to the general ward, released from hospital, and attended outpatient checkups [Figures 5-11].

During postsurgical checkups, the patient presented trismus, which was treated with myofunctional therapy. Follow-up showed good evolution and good functionality of the jaw, without esthetic sequels or tumor recurrence [Figure 12 and 13].

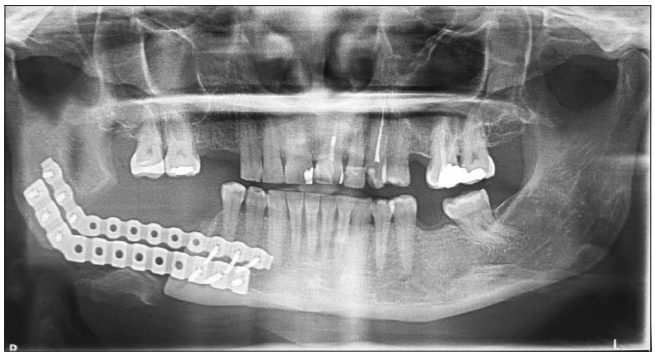

Figure 13: Post 12 months of surgery

Discussion

Epidemiological studies of odontogenic tumors performed in different parts of the world have reported different incidence and distribution patterns.

Desmoplastic ameloblastoma is a unique variant with peculiar clinical, radiographic, and pathoanatomical characteristics. Pathohistological characteristics include extensive stromal desmoplasia and small tumor nests of odontogenic epithelium scattered in the stroma. From these findings, differential diagnosis is required to distinguish ameloblastic fibroma, odontogenic fibroma, and squamous odontogenic tumor.[5]

Bhagwat *et al*. report that ameloblastomas were the second most common benign tumors (35.43%), followed by odontoma (7.08%). In contrast, in India, the most frequent was ameloblastoma (49%), followed by keratinizing cystic odontogenic tumor (32%) and odontoma (6.2%).[6] Ameloblastomas showed a high prevalence in the jaw (82.22%), in particular the posterior zone, in agreement with the case presented herein.[1] Ameloblastoma growth is aggressive but slow, so it can take many years until the patient decides to visit the dentist, which makes treatment more complicated due to the size of the tumor.[6]

Tumor growth characteristics have been classified into two main types: expansive and invasive. Ameloblastoma is the most controversial jaw tumor because there is a greater diversity of opinion concerning the clinical behavior, treatment, and malignant potential of this tumor than any other neoplasms found elsewhere in the body.[7]

Petrovic *et al*. suggested that favorable outcomes were associated with the administration of adjuvant postoperative radiotherapy for patients with positive margins and a repeat resection for patients with recurrences. Complete excision with negative margins, however, remains the gold standard for curative treatment.[8]

Another treatment could be marsupialization, and it is effective in reducing tumor size for both unicystic ameloblastoma and multicystic ameloblastoma. Marsupialization plus second-stage curettage is recommended as the primary treatment for mandibular cystic ameloblastoma.[9,10]

The conventional one is the same we reported, but the originality in this case is the use of new protocols for mandibular reconstruction using computer-aided design and computer-aided manufacturing for custom-made cutting guides and titanium plates, or adaptation of standard plates provides a viable method for replicating the patient's anatomical contour. They give surgeons better control of the procedure and shorten surgical procedure time, since the reconstruction plate does not need to be contoured during surgery. Three-dimensional (3D) printing technologies provide prefabricated stereolithographic models.[11,12] In the current clinical case, we present mandibular reconstruction after excising the tumor, using titanium plates adapted on stereolithographic models.

3D printing technology enables fast, accurate mandibular reconstruction, helping to shorten operation time (and therefore decreases exposure time to general anesthesia, decreases blood loss, and reduces wound exposure time, thereby reducing the likelihood of potential infection), and makes the surgical procedure easier.[12]

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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