Case report

Patient's Customized Prosthesis would be a Better Alternative Choice than Macro-plate as a Reconstruction Method in Resected Mandible: A Case Report

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ABSTRACT

Ameloblastoma, a benign but locally aggressive neoplasm, frequently requires substantial surgical resection to avert recurrence, potentially leading to considerable mandibular abnormalities. This case report examines a 31-year-old female patient diagnosed with a multilocular ameloblastoma, originally treated with marginal excision and subsequent reconstruction utilizing a conventional plate. The patient was admitted to Velayat Hospital in Mashhad, Iran, in 2024 and received the necessary medical treatment there. Complications, including as plate exposure and jaw deviation, arose a year later, requiring further operation. The patient underwent a second operation to remove the defective plate and to insert a bespoke digital reconstructive plate. The customized plate was engineered to conform to her distinct anatomical configuration, guaranteeing accurate alignment and enhanced biomechanical efficacy. The post-operative recovery was positive, with restored mandibular alignment, enhanced function, and no recurrence of problems. This case demonstrates the effectiveness of tailored digital reconstruction plates in managing intricate mandibular abnormalities, yielding improved results in functionality, aesthetics, and patient comfort.

KEYWORDS
Ameloblastoma, Mandibular Reconstruction, Reconstruction Plate, Customized Plate, Case Report

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INTRODUCTION

The jawbone is mostly affected by benign odontogenic neoplasm ameloblastoma. Its invasiveness and high recurrence rate can cause significant morbidity if not appropriately controlled[1]. It is often categorized into unicystic, multicystic, peripheral, and malignant variants[2]. Multilocular ameloblastoma primarily manifest in the mandible, particularly in the molar-ramus area, and are more prevalent among adults [3-6]. No substantial gender preference exists; however, many research indicate a minor male predominance [4, 7]. These tumors often have "soap bubble" or "honeycomb" multilocular radiolucencies. The multilocular pattern is essential for diagnosis and is present in many

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cases[3-6]. Recurrent ameloblastoma typically display a multilocular morphology [6, 8].

Due of its low recurrence risk, aggressive surgical excision is the best treatment for multilocular ameloblastoma. This procedure involves significant local excision with adequate margins, often necessitating segmental resection of the mandible, followed by rebuilding[5, 9-11]. Conservative treatments, like enucleation and curettage, are less preferred due to their substantially elevated recurrence rates[10, 12]. Adjunctive methods like cryotherapy and cautery may be employed in cases where complete resection is challenging[13].

Due to the significant recurrence potential of multilocular ameloblastoma, even post-treatment, long-term monitoring is essential. Consistent postoperative surveillance facilitates the prompt identification of recurrence, rendering it a crucial aspect of patient management[10, 11, 14].

Mandibular reconstruction aims to achieve optimal functional and cosmetic outcomes following resection for invasive bone lesions. Various methods, including the use of reconstruction plates, are employed to restore mandibular continuity and stability[15-19]. Reconstruction plates encompass different types, including patient-specific mandible reconstruction plates (PSMPs), single stainless steel AO plates, pre-bent titanium plates with digital surgical guides, and 3D-printed plates, each addressing specific clinical needs[19-23]. Common complications of reconstruction plates include plate fractures and screw loosening, often influenced by biomechanical stress and plate design. The choice of plate should be tailored to the clinical scenario, balancing precision, esthetic outcomes, and potential risks[24-27].

Customized plates in mandibular reconstruction offer notable advantages over traditional methods, including reduced operative times and shorter hospital stays due to their precise fit and minimal need for intraoperative adjustments. They are associated with fewer complications, improved functional and aesthetic outcomes, and enhanced biomechanical performance. Additionally, their adaptability to various defect sizes and minimally invasive nature makes them an efficient and versatile option for complex reconstructions, contributing to better surgical outcomes and patient recovery[19, 28-31].

This case highlights the successful use of customized digital reconstruction to address late complications of a marginal resection for multilocular ameloblastoma, restoring mandibular function and correcting jaw deviation.

CASE PRESENTATION

A 31-year-old female patient exhibited a multilocular ameloblastoma in the jaw. The patient was admitted to Velayat Hospital in Mashhad, Iran, in 2024 and received the necessary medical treatment there. The lesion was substantial; nonetheless, mandibular continuity and the temporomandibular joint (TMJ) were maintained with marginal excision and the insertion of a reconstructive plate. The initial surgery was successful, employing five screws to hold the plate, so preserving mandibular integrity and facilitating jaw movements. The post-operative recovery was unremarkable, and the patient maintained functional mandibular range of motion during the first year of follow-up.

However, one year after the procedure, the patient reported complications including intraoral exposure of the reconstruction plate and deviation in jaw movements. The exposed plate led to significant discomfort and functional limitations, necessitating further investigation and treatment. A computed tomography (CT) scan was obtained, which revealed complications surrounding the previously placed reconstruction plate and changes in the condylar and coronoid regions, likely contributing to the jaw deviation. Based on the CT scans, a decision was made to digitally design a customized reconstruction plate to address the structural and functional deficits. Figure 1 illustrates the constructive plate positioned into the patient's mandible.

The patient underwent a subsequent surgical intervention to address the issues. The exposed reconstructive plate was meticulously excised intraorally (Figure 2), minimizing disturbance to the surrounding tissue. Furthermore, the coronoid and condylar processes were resected to facilitate optimal positioning and integration of the newly developed plate depicted in Figure 3.

A digital surgical guide was employed during the procedure to ensure precise positioning of the tailored plate. The new reconstructive plate, created to meet the patient's specific anatomical characteristics, was fastened in position, restoring mandibular alignment. Figure 5 illustrates the customized plate.

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The plate was enveloped by adjacent mucosal tissues to facilitate healing and limit the risk of further exposure. Figures 6-9 illustrates the technique for positioning a customized plate.

Post-operative rehabilitation aimed at restoring jaw function, correcting deviation, and maximizing mouth openness. The tailored plate demonstrated exceptional structural integrity, and the patient exhibited notable enhancements in functionality and cosmetic results. Subsequent evaluations verified

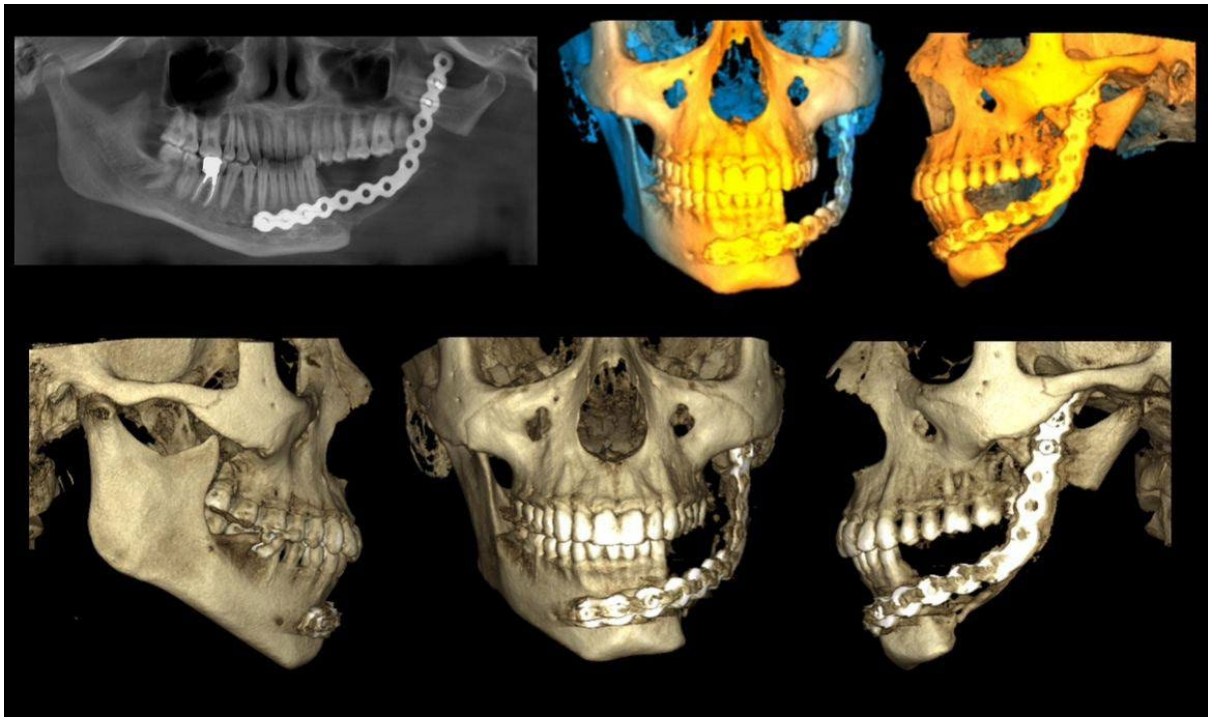


Figure 1: 3-Dimentional view of reconstruction plate

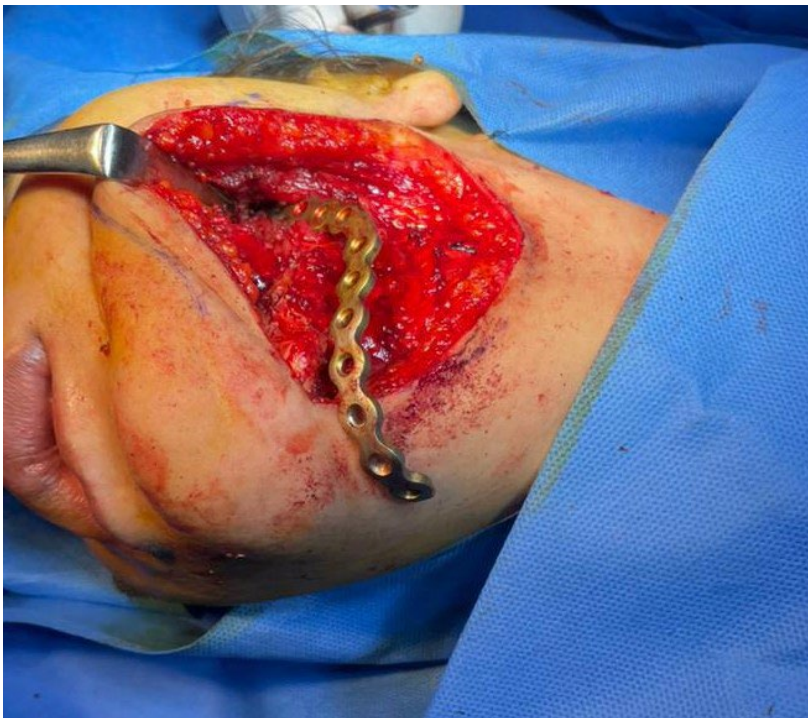


Figure 2: The Reconstructive plate removing process

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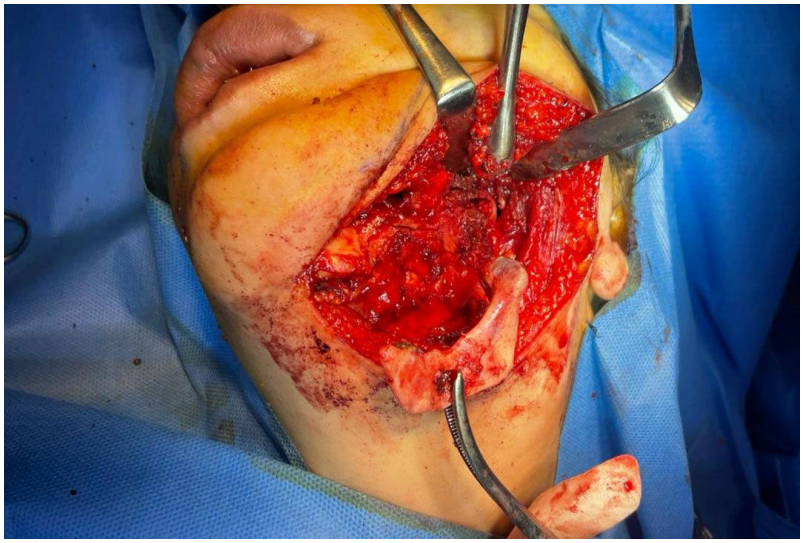


Figure 3: Condyle and coronoid excision



Figure 4: Extruded plate with condyle and coronoid



Figure 5: Customized plate used in second Op

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Figure 6: Customized Plate Surgery Guide

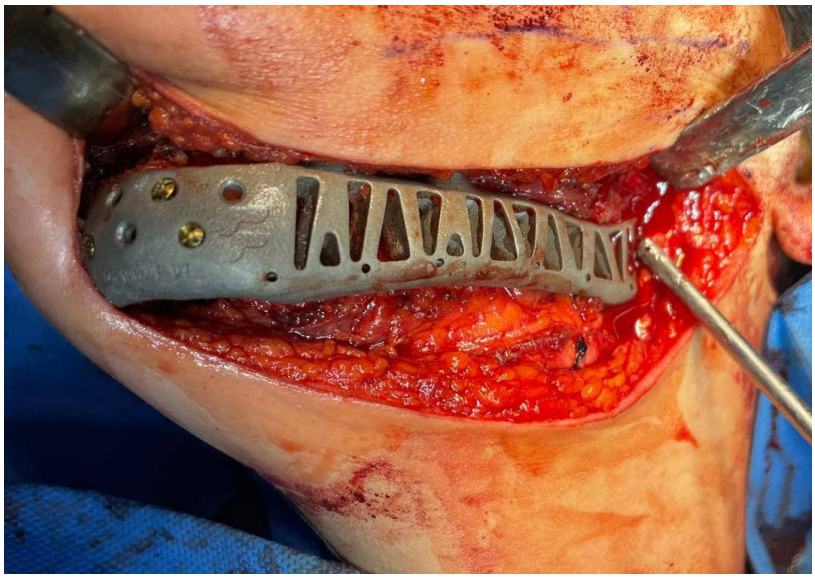


Figure 7: Customized plate placement

effective rehabilitation, demonstrating recovered occlusion, enhanced mandibular mobility, and absence of intraoral plate exposure or deviation recurrence. Figure 10 illustrates the postoperative orthopantomogram of the personalized plate.

Upon obtaining informed consent and in compliance with the ethical code of Mashhad University of Medical Sciences (IR.MUMS.REC.1404.046), the patient will be apprised of the surgical plan and the nature of the operation.

DISCUSSION

Ameloblastoma is a benign yet locally aggressive odontogenic tumor that predominantly impacts the mandible, although it may also arise in the maxilla. The tumor enlarges by degrading cortical bone and invading cancellous bone, potentially jeopardizing the structural integrity of the mandible. If neglected, it may result in deformity, pathological fractures, and functional impairment,

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Figure 8: Customized plate placement - 2



Figure 9: Surgical end suture

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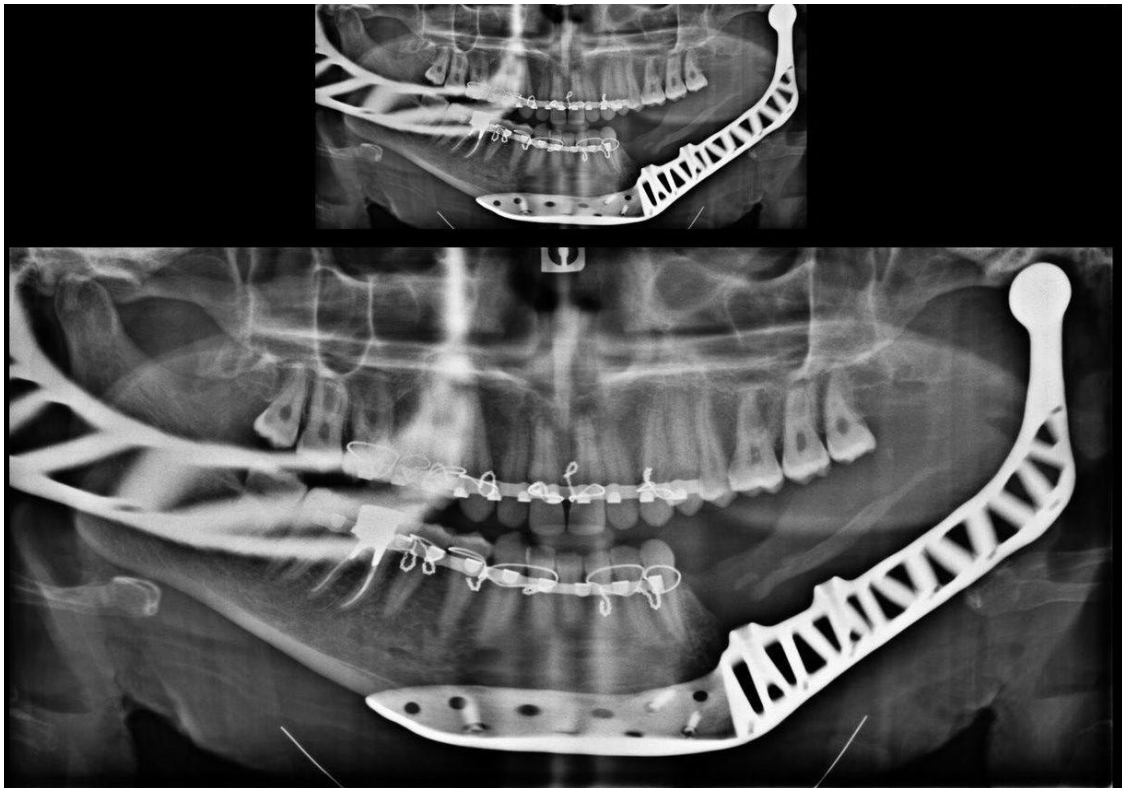


Figure 10: Post-up customized plate

highlighting the necessity for timely diagnosis and surgical excision with broad margins to avert recurrence[1, 2, 6, 9].

Ameloblastoma is generally managed with extensive local excision or segmental mandibulectomy to reduce the likelihood of recurrence[32, 33]. Reconstruction with free flaps, such as fibula or iliac crest grafts, is frequently executed to restore both function and aesthetics[33-35]. This method markedly diminishes recurrence relative to conservative therapies and yields elevated patient satisfaction[36].

Mandibular reconstruction seeks to attain best functional and aesthetic results after the removal of invasive bone abnormalities. Diverse techniques, such as the use of reconstructive plates, are utilized to restore mandibular continuity and stability[15-19]. Customized plates offer benefits including enhanced fit, superior functionality, and decreased surgery duration, particularly in intricate scenarios such as significant bone abnormalities[37, 38]. However, they come with higher costs and a more intricate design process[37, 39]. Pre-made plates are more cost-effective, quicker to use, and have a proven track record, but they may not offer the same precise anatomical fit, thus leading to lengthier surgery durations[38, 39]. Therefore, the choice between customized and pre-made plates depends on clinical factors such as cost, complexity, and desired surgical outcomes, with customized plates generally being preferred for challenging cases.

The utilization of bespoke plates in mandibular restoration is crucial owing to the distinct anatomical obstacles presented by each patient. Standard plates, although helpful in several situations, may insufficiently resolve intricate instances involving substantial bone deficiencies or distinctive anatomical configurations. Customized plates provide a bespoke fit that improves the accuracy of the reconstruction, resulting in superior functional and cosmetic results. This accuracy decreases surgery duration and mitigates the likelihood of complications, including plate exposure or mechanical failure. Our methodology emphasizes the utilization of digital design and fabrication technology to develop patient-specific solutions that enhance functionality, increase patient comfort, and guarantee long-term efficacy. This technology overcomes the limits of conventional reconstructive procedures, offering a more dependable and patient-focused treatment pathway.

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CONCLUSION

Replacing the plates resolved the patient's issues and facilitated the eventual placement of a prosthesis with prefabricated plate attachments. This method illustrates the considerable benefit of employing tailored reconstruction plates for intricate mandibular abnormalities, resulting in superior structural integrity, higher functioning, and increased patient satisfaction. This instance highlights the significance of accuracy in surgical planning and execution, eventually promoting improved long-term results.

CONFLICTS OF INTEREST

The authors declare that there is no conflict of interests.

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