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Mandibular Setback as an Adjunctive Strategy for Reconstruction after Tumor Resection: A Technical Note and Case Report

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A B S T R A C T

Mandibular defects due to surgical resection of pathologies are common challenges for maxillofacial surgeons. In some clinical situations, alteration or combination of different surgical procedures is needed to reduce the size of bony defects and improve the success rate of bone grafts. In the current study, an 18-year-old female with a pathological lesion (ameloblastoma) in the mandible is presented. After tumor resection, bony defect reconstruction with autogenous bone graft was combined with a mandibular setback to facilitate the procedure. In this case, the simultaneous combination of orthognathic mandibular setback movement with tumor resection in a single surgical session helped to reduce the bony defect size. The adoption of this approach led to a decrease in the volume of graft harvesting and improved the success rate of the grafting procedure.

Keywords: Ameloblastoma; Bone Transplantation; Orthognathic Surgery

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INTRODUCTION

Mandibular defects caused as a result of surgical resection of pathologies are common clinical challenges for most maxillofacial clinicians [1]. Free bone grafts, vascularized bony flaps, and distraction osteogenesis techniques are successful reconstructive options used universally to treat patients with large defects [2].

The size of the bone defect is a key factor in adopting a surgical approach and predicting the outcome of reconstruction [2]. In some clinical situations, surgeons may employ or combine other surgical procedures to decrease the size of the bone defects and facilitate bone grafting procedures [2]. To the best of our knowledge, the combination of orthognathic and tumor resection surgeries in which orthognathic movements facilitate bone grafting and reconstruction, has not been previously reported in the literature.

CASE REPORT

An 18-year-old healthy girl presented to the oral and maxillofacial department of the Taleqani Hospital, Tehran, Iran, with a solid mass on the right side of the mandible. An incisional biopsy revealed ameloblastoma with no other abnormal clinical findings in extraoral and intraoral examinations. The lesion was multi-lacunar, radiolucent, and associated with an impacted third molar. Significant root resorption and some cortical bony perforations were detected in computed tomography (CT) imaging views. Coincidentally, the patient suffered from mandibular prognathism with a 3mm reverse overjet. No significant asymmetry was observed, and the profile view of the patient appeared straight to concave. The upper dental midline coordinated with the facial midline. The appearance of the gingiva and the teeth were normal in both smile and rest positions (Fig. 1).

Fig. 1: (A) Profile view of the patient shows mandibular prognathism. (B) Panoramic view of the right mandibular lesion. (C): Cross-sectional (computed tomography) view of the lesion

The cephalometric analysis confirmed the mandibular prognathism. The estimated bony defect size after segmental resection of the lesion with 1.5cm surgical margins was 5.5cm, and the possibility of a 5mm setback with an acceptable occlusion was determined using model surgery.

Under general anesthesia with nasal intubation, a sagittal split osteotomy was performed on the left side, and the bony lesion was approached via an extraoral submandibular incision while preserving the marginal mandibular nerve. Supraperiosteal dissection was performed around the lesion extra- and intraorally. The lesion was visualized, and osteotomy cuts with safety margins and indexing marks were designed on both sides to facilitate the predicted mandibular setback movement and proximal segment positioning. Before completing the osteotomies, a reconstructive locked plate was adapted from the subcondylar area to anterior index marks. The tumor site expansion was not too large and its consistency allowed us to pre-bend the plate by little compression of the tumor area. Firstly, the anterior border osteotomy was done, and dissection on the lingual side was completed via mandibular swinging. The posterior osteotomy was performed through the sigmoid notch; therefore, the coronoid process was also removed. The reconstruction plate was placed after tumor resection. The amount of mandibular setback (5mm) was determined by an occlusal surgical splint and preoperative model surgery. The proximal segment was guided by surgical indices, measurements before tumor resection, and placement of the reconstruction plate. Drilling for insertion of the screws of the plate was performed before resection. These surgical guides and indices were used to verify proximal segment positioning and to act as guides to adapt the anterior part of the plate on the right side. A mini-plate fixed the left side after the extraction of the third molar. Finally, the defect was reconstructed using a bicortical anterior iliac bone graft in the correct predicted size. The excisional biopsy report after surgery confirmed the results of the incisional biopsy. After four months,

dental implants were placed in the vital grafted bony site, and the patient follow-up after one year revealed no significant complications (Fig. 2). The inserted mini-plate was removed from the left side during implant placement.

Fig. 2: (A) Reconstructed defect with a bicortical iliac bone graft. (B) Panoramic view after reconstruction and implant placement. (C) Patient profile view six months after surgery

DISCUSSION

Ameloblastic carcinoma is an extremely rare odontogenic tumor, and according to a meta-analysis, it occurs primarily at 40 years of age with a 2.4-fold male predominance [3]. In the present case report, we demonstrated the surgical management of an 18-year-old female suffering from an ameloblastic tumor in the mandibular area. The management of ameloblastic tumors has remained contro-versial although surgery with healthy excision margins leads to the best prognosis and has remained the treatment of choice to date; most studies are in favor of surgery [4]. Therefore, in approaching tumor-involved patients demanding reconstruc-tive procedures concurrent with dentofacial deformities, according to the exact preoperative analysis and a comprehensive sight of view, maxillofacial surgeons could employ anticipated orthognathic techniques and bone movements to improve the results of reconstructive surgery.

Strategic reconstruction of the mandible following surgical resection of tumors is an important step in the treatment of tumor-involved patients [2]. Intelligent surgical reconstruction planning by considering simultaneous auxiliary techniques could benefit the patient and improve surgical conditions. These techniques include non-vascularized or vascularized bony flaps, distraction osteogenesis, soft tissue manage-ment techniques, implantable biomaterials, tissue-engineered grafts, and some adjunctive osteotomies to facilitate reconstruction conditions [5,6]. Vascularized bony flaps (pediculated or non-pediculated) are useful surgical options but could end up with latent risks and complications, such as fracture incidence, donor-related complications, and synchronous soft tissue problems; vascularized bony flaps are considered as sensitive techniques [5]. Distraction osteogenesis (transported or conventional) has great benefits, such as simultaneous soft tissue regeneration and the ability to reconstruct large defects but device dependence and long treatment courses are considered as its limitations [7]. Maxillofacial surgeons are familiar with different jaw osteotomies and adopt each of the approaches for a certain type of reconstruction. Patients' systemic condi-tions, the surgical defect size and extents, the location and the geometry of the lesion, and the surgeon's skills are crucial factors to determine the best treatment plan.

In some studies, other approaches, such as radiotherapy, have been suggested to decrease the size of the tumor before surgery [8] but the effectiveness of radiation therapy has remained controversial, and decreased hearing acuity seems to be a complication of

radiation therapy [9].

In the present case, orthognathic mandibular setback movement simultaneous with tumor resection helped in reducing the size of the bony defect. This adjunctive osteotomy and orthognathic movement did not compensate for the whole bony defect but decreased the gap size, which is a factor contributing to the success of grafting procedures [10]. The total number of interventions also reduced with this technique, which could be beneficial in decreasing surgical consequences. Technique sensitivity and difficulty in adapting the reconstruction plate are issues that may be considered as the limitations of this treatment approach; however, precise planning and stepwise operation could facilitate this procedure [11]. Complete preoperational aesthetic and cephalometric analyses and preparation of model surgery are essential parameters to determine patients who would benefit from a simultaneous combination of orthognathic and other reconstructive operations [2]. In the present case, the patient showed an acceptable success rate at one-year follow-up; however, observation must continue to witness the long-term results.

CONCLUSION

There is no consensus over a specific predictable measure for the reconstruction of different types of tumor sites. The best treatment plan is case dependent by considering each patient's conditions. In selected cases, surgical jaw movements, as an adjunctive strategy, could facilitate the reconstruction with bone grafting after tumor resection with an acceptable success rate.

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CONFLICT OF INTEREST STATEMENT

None declared.

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