Immediate Total Temporomandibular Joint Replacement With TMJ Concepts Prosthesis as an Alternative for Ameloblastoma Cases

Carlos Alberto Ruiz Valero, DDS,* Gabriel Duran-Rodriguez, DDS,† Nicolás Solano-Parra, DDS,‡ and Jaime Castro-Niñez, DMD§

Ameloblastoma is a common epithelial odontogenic tumor, representing 1 to 3% of all cysts and tumors of the oral and maxillomandibular region. It has been more commonly found in the mandible than in the maxilla. Treatment of ameloblastoma is essentially surgical, ranging from conservative therapy such as enucleation, marsupialization, and curettage, to more radical approaches, including marginal, segmental, or composite resection. It has a high tendency to recur and, in some instances, has shown malignant development when treated inadequately. When resection is indicated, reconstructive measures must be considered. The aim of the present study is to report on 2 cases of large ameloblastomas of the solid/multicystic type that were treated by hemimandibulectomy and reconstructed with a novel technique consisting of a custom-made TMJ Concepts prosthesis (TMJ Concepts, Ventura, CA). The role and outcomes of custom-made temporomandibular joint prostheses in these circumstances are discussed.

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Address correspondence and reprint requests to Dr Ruiz Valero: Department of Oral and Maxillofacial Surgery, Hospital Universitario Clínica San Rafael, Bogotá, Colombia; e-mail: caruizv2000@yahoo.com

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marsupialization, curettage, and cryosurgery. A radical approach is essentially resection, whether marginal, segmental, or composite. Surgical resection can represent a substantial challenge for the surgeon, especially in the context of large tumors developing in young patients. When resection is indicated, reconstructive measures such as bone and skin grafts, distraction osteogenesis (DO), free tissue transfer, dental prostheses, and other alternatives, must be included in the surgical plan. The purpose of the present study was to report 2 cases of large ameloblastomas of the solid/multicystic type treated by hemimandibulectomy and reconstructed with a novel technique consisting of a custom-made TMJ Concepts prosthesis (TMJ Concepts, Ventura, CA). The role and outcomes of custom-made temporomandibular joint (TMJ) prostheses in these circumstances are discussed.

**Case Report**

**CASE 1**

A 28-year-old female patient presented to the oral and maxillofacial surgery department at the Hospital Universitario Clínica San Rafael (OMSD-HUCSR) in Bogotá, Colombia with the chief complaint of a swelling in the left side of her face. On noticing a painless swelling at the lower left molar area, she had visited a general dentist 2 days later. The dentist ordered a panoramic radiograph, which revealed a large, multilocular, radiolucent lesion with well-defined borders compromising the vertical ramus and body of the left mandible (Fig 1). The clinical provisional diagnosis was ameloblastoma. The differential diagnosis was myxoma.

The dentist then sent the patient to the OMSD-HUCSR, where the diagnosis of ameloblastoma, solid/multicystic type, was made after an incisional biopsy performed with the patient under local anesthesia. A computed tomography (CT) scan with 3-dimensional reconstruction documented buccal and lingual cortical expansion (Fig 2). The clinical examination revealed facial asymmetry directly related to the growing mass inside the jawbone. The oral mucosa was within normal limits. From the clinical, radiographic, and histologic features of the case, the following treatment plan was proposed: left hemimandibulectomy and immediate total TMJ reconstruction with the TMJ Concepts prosthesis system (TMJ Concepts) (Figs 3, 4).

One month later, after informed consent and in accordance with the standard TMJ Concepts protocol, with the patient under general anesthesia, a left hemimandibulectomy was performed. A submandibular approach was used to gain access to the body of the mandible, with a modified endaural approach, as described in 2001 by the senior author (C.A.R.V.),21 used for access to the TMJ. Resection included the TMJ, vertical ramus, and body of the mandible to the lower left second molar (Figs 5, 6). The resection

![FIGURE 1. Panoramic radiograph revealing a multilocular radiolucent lesion at the left side of the ramus mandible.](image)
margins were all 1 cm. The overlying soft tissue was re-
moved because of cortical perforation. The wound
was closed in layers and healed uneventfully.

The specimen was sent to the pathology depart-
ment, where it was stained with hematoxylin-eosin.
The microscopic examination findings were consis-
tent with multicystic ameloblastoma. At 5 years of
follow-up, the patient had no evidence of recurrence,
adequate cosmetic and functional rehabilitation, and
was satisfied with the outcome. The patient agreed
to continue follow-up for another 5-year observation
period (Figs 7, 8).

CASE 2

A 30-year-old male patient was referred by his den-
tist to the OMSD-HUCSR for additional evaluation
and treatment of a mandibular lesion that had started
FIGURE 4. TMJ Concepts prosthesis system (TMJ Concepts, Ventura, CA) showing the glenoid fossa and mandibular components.

FIGURE 5. Intraoperative view after left submandibular approach and hemimandibulectomy.

FIGURE 6. Left modified endaural approach showing installation of the TMJ Concepts custom-made total joint prosthesis.
as a painless swelling around the lower right third molar. A panoramic radiograph documented a multilocular, radiolucent lesion involving the body and angle of the right mandible (Fig 9). The provisional diagnosis was ameloblastoma. The findings from an incisional biopsy taken at a different institution was consistent with ameloblastoma, solid/multicystic type.

Three months later, after informed consent and in accordance with the standard TMJ Concepts protocol, with the patient under general anesthesia, a right

![Image](image1.png)

**FIGURE 7.** Lateral radiograph of the TMJ Concepts custom-made total joint prosthesis components after installation.


![Image](image2.png)

**FIGURE 8.** Mouth opening at 5 years of follow-up after hemimandibulectomy and reconstruction with a custom-made TMJ Concepts prosthesis.

hemimandibulectomy was performed. A submandibular approach was used to gain access to the body of the mandible, with a modified endaural approach, as described in 2001 by the senior author (C.A.R.V.), used for access to the TMJ. After disarticulation, a custom-made TMJ Concepts prosthesis (TMJ Concepts) was placed (Figs 10-13). The resection margins were all 1 cm. Because the buccal cortex had been perforated, the overlying soft tissue was also removed. The wound was closed in layers and healed uneventfully. The specimen was sent to the pathology department for hematoxylin-eosin staining. The pathologist’s report confirmed the initial diagnosis. At 22 months of follow-up, no evidence of recurrence was seen, and the patient had adequate functional and esthetic results. The patient was placed in a 10-year follow-up scheme (Figs 14, 15).

Discussion

Surgical resection of the mandible dates back to the late 18th and early 19th centuries. In 1793, Fischer removed mandibular fragments resulting from a gunshot injury. Seventeen years later, Deadrik performed a resection without disarticulation, and, in 1812, Dupuytren reported the same procedure. It was Gräfe, in 1821, who described, for the first time, hemimandibulectomy with disarticulation. Total mandibulectomy with disarticulation was attributed to Signorini in 1843. Since then, mandibulectomy or hemimandibulectomy with disarticulation has been used to treat different conditions, especially tumors and cysts involving the vertical ramus of the mandible and the TMJ.

It has been reported that large tumors requiring partial or total mandibulectomy with disarticulation can cause serious cosmetic and functional problems. Currently, segmental defects of the mandible involving the TMJ can be restored using iliac crest grafts, costochondral grafts, a pectoralis major myocutaneous flap, transport distraction osteogenesis, microvascular free bone flaps, and custom-made TMJ prostheses. Regardless of the reconstruction method chosen, the aim of TMJ reconstruction is to restore the form and function of the joint.

TMJ reconstruction with an anterior iliac crest graft provides a high-quality bone; however, the risk of causing a nerve lesion must be considered. Costochondral grafts are appropriate for TMJ reconstruction mainly in the context of growing patients with ankylosis or neoplasms of the condylar head requiring condylectomy with immediate reconstruction. In either case, the objective will be to restore the posterior vertical dimension and occlusion and to allow for dynamic growing of the condyle as the cartilage of the rib continues to grow.

The pectoralis major myocutaneous flap constitutes another option for reconstruction of mandibular
defects.25 DO and microvascular free bone flaps have also been described, with various degrees of success.26,27 Although the use of alloplastic TMJ prostheses was highly questioned during the 1990s because of the negative experience with the Vitek-Kent system (Vitek, Houston, TX),37 by the early 2000s, novel systems marketed initially in the United States had proved to be reliable for TMJ reconstruction.

One such system was developed in 1989 by Techmedica (Camarillo, CA), which eventually became known as the TMJ Concepts prosthesis (TMJ Concepts). The TMJ Concepts total joint prostheses system is composed of 2 parts: a glenoid fossa and a mandible. Although the first part is composed of commercially pure titanium mesh backing containing a dense ultra-high-molecular-weight polyethylene articulating surface, the latter is a condylar head composed of cobalt-chromium-molybdenum attached to a mandibular body composed of titanium, aluminum, and vanadium. TMJ rehabilitation with the TMJ Concepts prosthesis (TMJ Concepts) requires a CT scan to construct a stereo laser protocol from which the TMJ parts can be fabricated according to the patient’s individual anatomic characteristics.37,38

The indications for alloplastic TMJ prostheses include ankylosis,32,33 congenital disorders,34 avascular necrosis,35 condylar fractures,36 failed autogenous grafts,33 severe inflammatory and degenerative TMJ disease,37 and tumors requiring extensive resection.33-36 Large, invasive ameloblastomas have been included among the malignancies that can be treated by hemimandibulectomy with disarticulation and, thus, requiring additional reconstructive measures. Although the surgical management of ameloblastoma remains controversial4,39 and a consensus has not yet been reached regarding the most pertinent treatment modality, it has been suggested that the prognosis for those with ameloblastoma is more dependent on the surgical approach than on the histologic presentation of the tumor.6

The recurrence of ameloblastoma is directly related to the surgical approach.16 Although recurrence with conservative modalities has ranged from 55% to 90%,
radical treatment has resulted in lower recurrence rates, but poor cosmetic and functional outcomes. \(^3\)\(^9\) Despite this, during the past 20 years, it has been the experience of the senior author (C.A.R.V.) to treat aggressive ameloblastomas with radical surgery—this cannot be overstressed. In all cases, however, individualization of the patient is a must, with no room for the ‘one-treatment-fits-all’ strategy.

Notwithstanding the previous paucity of predictable reconstructive possibilities, the advent of...
dependable custom-made TMJ prostheses has opened new horizons for the reconstruction of patients targeted by invasive ameloblastomas requiring radical therapy. In the 2 cases we have presented, extensive ameloblastomas affecting the body, vertical ramus of the mandible, and the TMJ required hemimandibulectomy. This approach is in agreement with the algorithm recently proposed by Sammartino et al.39 As a reconstructive method, we chose immediate total TMJ reconstruction with the TMJ Concepts prostheses system (TMJ Concepts) because its structural and functional characteristics make it a reliable option for TMJ reconstruction.

The use of this custom-made prosthesis system, fabricated with orthopedically proven structural materials, clearly constitutes a valid and predictable alternative for the rehabilitation of patients diagnosed with invasive ameloblastoma and treated by radical resection. Other mandibular reconstruction cases with or without TMJ involvement have been managed by a myriad of methods, with autogenous reconstruction the most common owing to its predictability.40,41 Although expensive and technique sensitive, we have noted the advantages of alloplastic TMJ reconstruction devices over autogenous grafts. Not only do they allow possible immediate function after implantation, they also eliminate the need for a secondary donor site, making them an attractive option, not only for the surgeon, but also for the patient.

Two final considerations regarding the use of alloplastic TMJ reconstruction are the replication of the anatomy and longevity. With the technology currently available, an exact replication of the patient’s anatomy can be obtained. Mercuri et al12 published a prospective study of 215 patients who had undergone reconstruction with the TMJ Concepts total joint prosthesis (TMJ Concepts, Ventura, CA). A life span table analysis was performed, demonstrating the excellent durability of the prostheses over time. In 2003, Wolford et al15 showed that the TMJ Concepts total joint prosthesis (TMJ Concepts) works well in the long term and is a viable technique for TMJ reconstruction, both as a primary procedure when indicated and for patients with previous multiple TMJ procedures and violated TMJ anatomy. Regarding the durability of alloplastic prostheses in patients affected by invasive ameloblastoma, it has been our experience that the TMJ Concepts total joint prosthesis system (TMJ Concepts) is reliable, with a follow-up period of 5

FIGURE 13. Right modified endaural approach showing installation of the TMJ Concepts custom-made total joint prosthesis.
years for the first patient and 22 months for the second.

To the best of our knowledge, ours is the first study reporting the use of the TMJ Concepts prosthesis system (TMJ Concepts) to reconstruct a mandible and TMJ affected by ameloblastoma. We have not proposed future dental implant placement because both of our patients were satisfied with the esthetic and functional results obtained. When discussing rehabilitation options, they did believe undergoing an autogenous graft procedure under general anesthesia to place 2 titanium implants would be advantageous in the future. They were satisfied with the option of removable partial dentures with buccal guiding flanges to restore their partially edentulous arches.

The lack of previous reports on this specific topic has made comparisons impossible. Our findings, however, suggest that total TMJ replacement with the TMJ Concepts prosthesis system (TMJ Concepts) does not lead to functional or cosmetic impairment, such as that which has been reported with other reconstructive methods. Our experience with these 2 patients has demonstrated that with this treatment modality, the aims of TMJ reconstruction (ie, reinstallation of form and function) can be met fully with exceptional cosmetic results.

In conclusion, we believe the TMJ Concepts prosthesis system (TMJ Concepts) represents a reliable alternative with great utility for the reconstruction of patients affected by large ameloblastomas, showing outstanding results in terms of providing adequate form, function, and quality of life. Although adequate form has been confirmed radiographically, function was evaluated clinically by the lack of pain, an adequate mouth opening, and the absence of joint dysfunction.

FIGURE 14. Lateral radiograph of the TMJ Concepts custom-made total joint prosthesis components after installation.

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References


FIGURE 15. Mouth opening at 14 months of follow-up after hemimandibulectomy and reconstruction with the custom-made TMJ Concepts prosthesis.


