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Articular Replacement for TMJ: A Comprehensive Literature Review and Clinical Case Presentation

Alejandro Alonso-Moctezuma[1,*], Agustín Alejandro Vallejo Rodas[2], Germán Malanche Abdala[3]

[1]*Oral and Maxillofacial Surgery Specialty, Postgraduate Division, Dental School, National Autonomous University of Mexico, Mexico City*

[2]*Dentist from the University of Cuenca, Ecuador 4th year resident of oral and maxillofacial surgery at UNAM*

[3]*Professor attached to the department of oral and maxillofacial surgery DEPeI UNAM*

[*]**Corresponding Author:** Alejandro Alonso-Moctezuma, Oral and Maxillofacial Surgery Specialty, Postgraduate Division, Dental School, National Autonomous University of Mexico, Mexico City, Tel: 525581213238, E-mail: alonsomoctezuma@fo.odonto.unam.mx

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Abstract

Introduction: TMJ ankylosis is a condition characterized by limited jaw mobility caused by bony or fibrous adhesions in the joint. It can lead to growth deformities and various problems, such as difficulties in eating, speaking, and maintaining oral hygiene. The causes of TMJ ankylosis include trauma and infection, among others. The text also discusses various techniques for treating TMJ ankylosis and the challenges involved, including a high recurrence rate. The purpose of this article is to describe a clinical case of a pediatric patient with post-traumatic ankylosis and to highlight joint replacement as a surgical alternative for patients with this condition, supported by a literature review.

Discussion: TMJ ankylosis is a challenging condition that can cause significant facial deformity and impact a patient's quality of life. There are various surgical approaches for its management, but no definitive consensus or protocol. Alloplastic joint reconstruction has become increasingly popular, with success rates exceeding 90%, and is considered a valuable treatment option for patients with ankylosis of the joint. The use of digital technology has significantly improved the success rate of this procedure, but long-term follow-up studies are still needed to assess its efficacy and safety over time. Factors such as patient age, comorbidities, and individual anatomy should be considered when selecting the appropriate treatment approach.

Conclusion: The use of alloplastic materials for TMJ replacement represents a promising area of research that has the potential to improve the quality of life for many patients suffering from this debilitating condition.

Keywords: TMJ ankylosis; surgical intervention; digital design.

Introduction

Temporomandibular joint (TMJ) ankylosis is a restrictive condition characterized by limited functional ability of the jaw with restricted movements due to bony or fibrous adhesions between the condyle and the glenoid cavity, the disk, and the eminence. The severity of the limitation varies from partial reduction of function to total immobility of the jaw. It can be a debilitating disorder causing problems in chewing, digestion, speech, function, aesthetics, and maintenance of oral hygiene. If TMJ ankylosis occurs during childhood, it can lead to patients developing growth deformities, which may result in maxillo-mandibular disharmony. Trauma, local or systemic infection, iatrogenic factors, radiation, burns, and genetic factors can contribute to this disease. Among all the above factors, trauma and infection are the major mechanisms by which this pathology is caused [1,3].

TMJ ankylosis can be classified using a combination of site (intra-articular or extra-articular), type of tissue involved (bony, fibrous, or fibro-osseous), and extent of fusion (complete or incomplete) [4,5].

Restoring normal function and mobility of the jaw in patients with TMJ ankylosis is difficult, and various techniques have been defined for its treatment. According to the theory of functional matrix and mandibular development, early surgical intervention should be applied regardless of the patient's age to prevent recurrence and subsequent occurrence of unilateral retrusion and asymmetry. The complication most frequently encountered in the postoperative period is restriction of mandibular mobility and recurrence of ankylosis [6-8].

Treatment of TMJ ankylosis to restore full mouth opening and normal oral function remains a significant challenge for physicians and patients (children and adults) due to technical difficulties and a high incidence of recurrence [4,9,10].

The purpose of this work is to describe a clinical case of a pediatric patient with a post-traumatic ankylosis of 15 years of evolution; through this case, describe by means of a literature review, the joint replacement technique as a surgical alternative in patients with this condition.

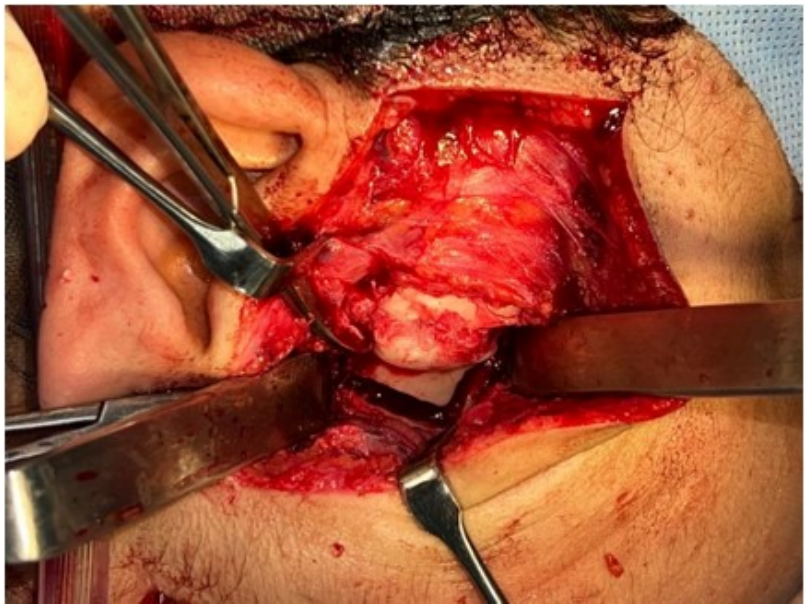
Case Review and Surgical Technique

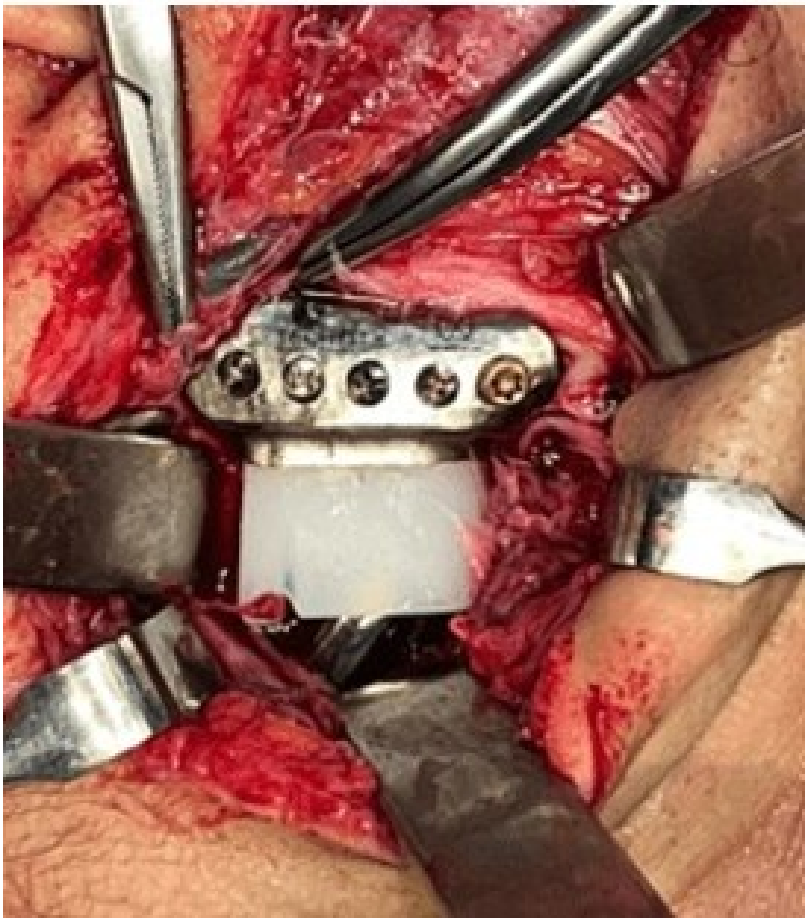
This literature review and case series were carried out through a bibliography analysis with reference to mandibular ankylosis and its management by means of joint replacement. For this purpose, we performed sequential searches in electronic databases (PubMed, EBSCO, ScienceDirect, The Cochrane Library, ClinicalKey) using the search terms "Osteogenic distraction, * OR Cleft palate*" AND "distracción osteogénica OR cleft lip* OR cleft palate* OR Osteogenic distraction*". The review is complemented by a clinical case study of a 16-year-old female patient who suffered from a long-term ankylosis due to a traumatic injury at the temporomandibular joint on the right side. This study sheds light on promising new approaches that can dramatically improve the quality of life for those suffering from this condition.

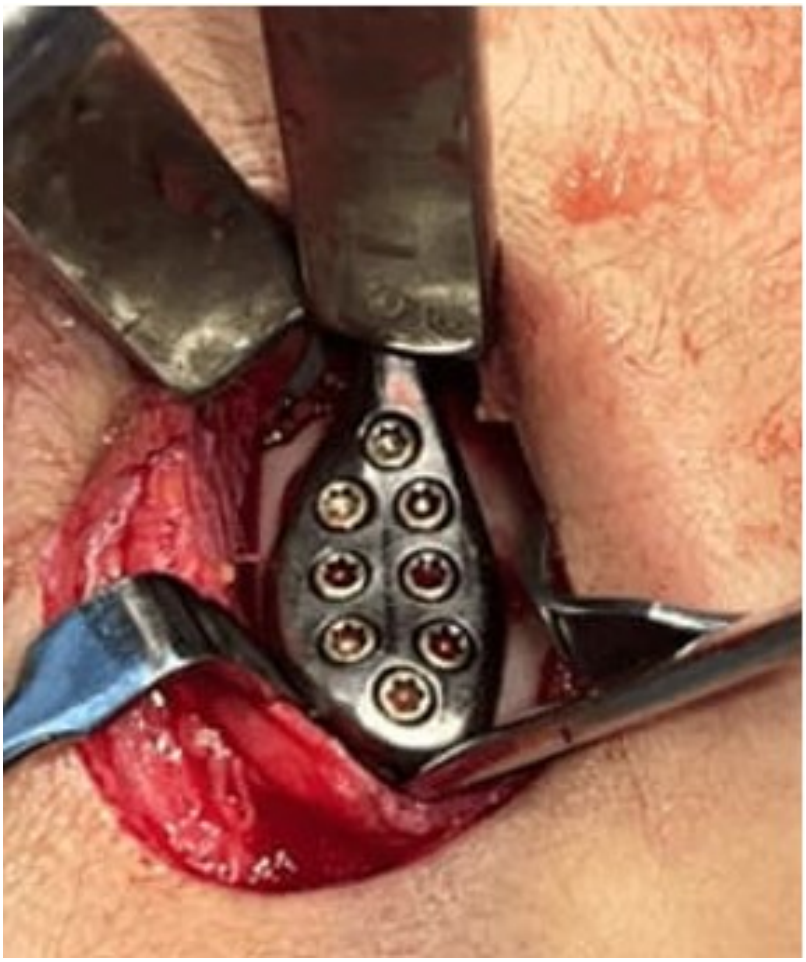
The patient and her tutors signed an informed consent for the use of her data and accepted the procedure. There were no records of previous orthognathic surgery. Simultaneous reconstruction of the secondary defect of cleft lip plus correction of low nasal defect was performed under general anesthesia.

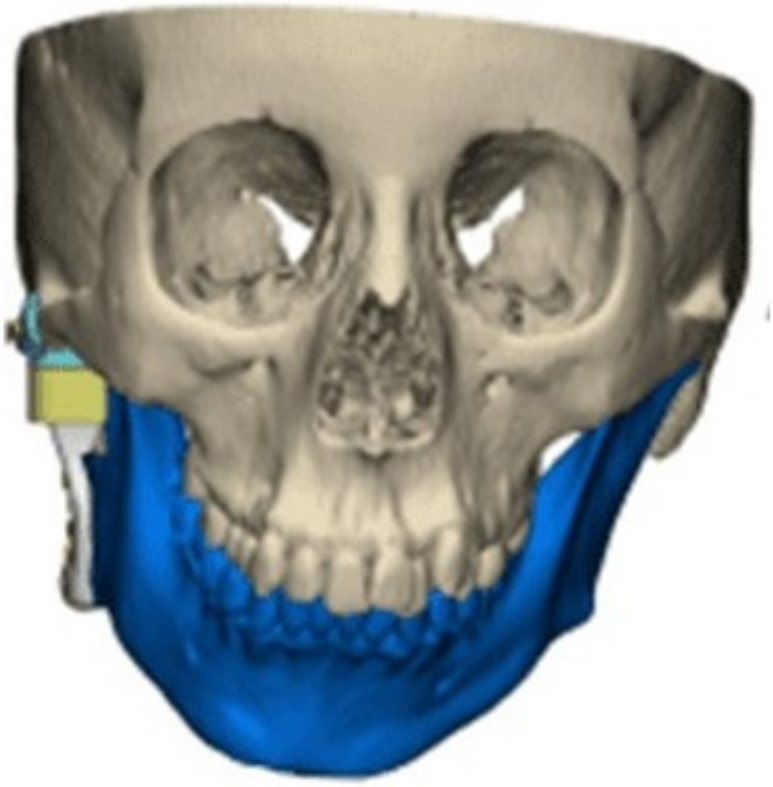
With the patient placed under general anesthesia and using proper aseptic and antiseptic techniques, a preauricular approach was carried out to identify the zone of ankylosis. Subsequently, a Hinds approach was performed to carry out the necessary osteotomies at the condyle and coronoid process level. Prior to the surgery, the design of the temporomandibular joint and glenoid fossa prostheses had been planned. The cavity prosthesis was fixed first, followed by the mandibular condyle prosthesis. The different planes were closed with absorbable sutures, and the skin was closed to end the procedure without complications. (Figures 1-5)

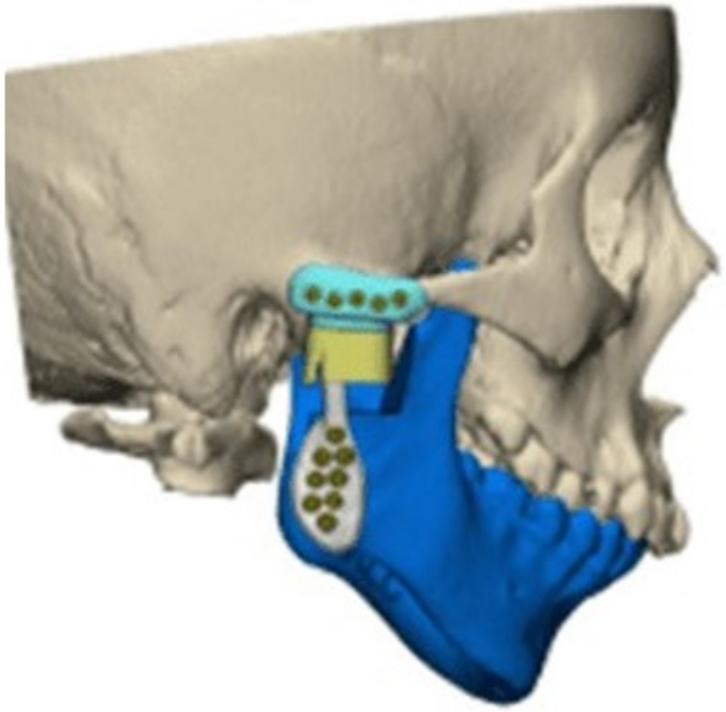
The patient had a preoperative mouth opening of 9mm, which increased to 20mm immediately postoperatively.











Discussion

Temporomandibular joint (TMJ) ankylosis is a debilitating condition that can severely impact a patient's quality of life. Surgical intervention is often necessary to restore function and alleviate pain, but the ideal method of treatment remains a subject of debate. Recently, digital design and 3D printing have revolutionized the field of orthopedic prosthetics, and the use of alloplastic materials for TMJ replacement has become increasingly popular. However, there is still a need for high-quality scientific research to guide clinical decision-making and optimize patient outcomes.

Ankylosis, which develops in childhood or early development stages, is a joint disorder that causes significant facial deformity and is most commonly due to trauma. Loss of mandibular function and significant dentofacial sequelae lead to various psychosocial problems, which is why early and effective treatment of the pathology is necessary to repair function and facial development. [6,11]

Different types of operations for the management of TMJ ankylosis have been described in the literature, but there is no agreed-upon treatment for either fibrous or bony ankylosis. It remains a challenge for oral and maxillofacial surgeons. Multiple techniques have been published with varying success rates, and there is still no definitive consensus or protocol for the treatment of this complex disease, and results have often been variable and less than satisfactory. [1,12]

The use of alloplastic joint reconstruction for TMJ ankylosis has been validated and demand has increased in adult patients as the procedure becomes more reliable. This is the result of the predictability of successful subjective and objective outcomes and a higher quality of life for patients. Pediatric patients represent a greater challenge due to incomplete growth. The main advantage of using an articulation replacement in TMJ ankylosis is that it allows for immediate reconstruction and function, including the possibility of early aggressive physiotherapy, which is considered essential for rehabilitation and long-term success for most patients, as well as an important factor in preventing recurrence. [3,13]

Some surgeons prefer to treat TMJ ankylosis using a two-stage protocol, with the first stage being the resection of the ankylosed mass and the extraction of heterotopic bone, followed by alloplastic reconstruction in the second stage. However, others prefer a one-stage approach, as in this case.

Complex anatomy, inadequate visualization, and the risk of profuse bleeding in the area are some of the factors associated with insufficient excision of the bony or fibrous mass. Currently, the use of technology, including virtual surgical planning, stereolithographic models, cutting guides, and intraoperative navigation, allows the surgeon to achieve greater precision, safety, and predictability in the resection of ankylosis.

The use of digital programs associated with the expertise of surgeons, employed simultaneously, often solves cases of high complexity; however, it should never be forgotten that there are clinical determinants that must always be taken into account. [9,14]

In their study, Mittal and colleagues determined that there is a higher rate of recurrence of ankylosis when arthroplasty is performed alone compared to arthroplasty with reconstruction, with autogenous and alloplastic grafts having similar results. [1]

Several studies have demonstrated the efficacy of joint replacement and glenoid cavity as an alternative for the management of ankylosis, whether fibrous or bony, with success rates even exceeding 90%. This replacement improves patient symptoms such as facial, head, TMJ, and mandibular dysfunction, dietary limitations, and certain disabilities that have a direct impact on the quality of life of patients, with improvements in mouth opening of between 20 and 30mm reported with one year of follow-up and no recurrence with joint replacement using alloplastic material. [3,15-18].

Although there is no standard surgical concept in TMJ ankylosis surgery, sufficiently broad surgical exposure, sufficient and radical resection, long-term early physiotherapy, and patient compliance are considered factors that positively influence treatment success. The replacement of the temporomandibular joint with alloplastic materials is a valuable treatment option for patients with ankylosis of the joint. The use of digital technology in designing and creating custom-made prostheses has significantly improved the success rate of this procedure. However, there is still a need for long-term follow-up studies to assess the efficacy and safety of these devices over time. It is also important to consider patient factors such as age, comorbidities, and individual anatomy when selecting the appropriate treatment approach. Overall, the use of alloplastic materials for temporomandibular joint replacement represents a promising area of research that has the potential to improve the quality of life for many patients suffering from this debilitating condition. [12,19-23]

In this case, and supported by the literature, joint replacement was employed as the best option to improve the patient's quality of life. This approach is in line with the results of various studies that support the use of joint replacement as a treatment for TMJ ankylosis. These studies have shown high success rates, with improvements in symptoms such as facial, head, TMJ, and mandibular dysfunction, dietary limitations, and certain disabilities that have a direct impact on the quality of life of patients. Additionally, the use of digital technology in designing and creating custom-made prostheses has significantly improved the success rate of this procedure. Therefore, the use of alloplastic materials for temporomandibular joint replacement represents a promising area of research that has the potential to improve the quality of life for many patients suffering from this debilitating condition.

Conclusion

The use of alloplastic materials for joint replacement in patients with TMJ ankylosis has proven to be a safe and effective method for improving quality of life and restoring function. Numerous studies have demonstrated the successful outcomes of this approach, with high rates of patient satisfaction and improved joint mobility. Considering the literature review and our own case with favorable results, the use of alloplastic materials for temporomandibular joint replacement in patients with ankylosis is a viable and effective treatment option. This approach provides a significant improvement in the quality of life for these patients, allowing for restoration of joint function and reduction of pain and discomfort. While there are potential risks and complications associated with the procedure, proper patient selection and meticulous surgical technique can minimize these risks and optimize outcomes. In conclusion, we support the use of alloplastic joint replacement as a valuable treatment option for patients with temporomandibular joint ankylosis.

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