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Customized Alloplastic Reconstruction of Unilateral TMJ Ankylosis in a Young Adult: A Case Report

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ABSTRACT

Temporomandibular joint (TMJ) ankylosis is a debilitating condition characterized by the fusion of the mandibular condyle to the glenoid fossa, leading to restricted mandibular motion.

We report the case of a 26-year-old female with left-sided TMJ ankylosis, presenting with limitation in mouth opening and degenerative changes. Preoperative imaging and planning facilitated the fabrication of patient-specific cutting guides and custom alloplastic components.

Surgical intervention involved careful osteotomies, resection of the ankylotic mass, and placement of custom joint components into the surgically prepared fossa. Postoperatively, the patient underwent intermaxillary fixation for 2 months, and was then referred to a physiotherapist, ultimately achieving a mouth opening of 30 mm. Follow-up at 1 and 3 months showed stable improvement, with no signs of re-ankylosis.

Customized TMJ reconstruction, combined with an autogenous fat graft, offers a viable solution for restoring mandibular mobility and improving quality of life in patients with TMJ ankylosis.

Introduction

Temporomandibular joint (TMJ) ankylosis is a debilitating condition characterized by the fusion of the mandibular condyle to the glenoid fossa, leading to restricted mandibular movement. This condition not only impairs essential functions such as mastication, speech, and oral hygiene but also significantly affects the patient's quality of life. TMJ ankylosis can be classified based on the location (intra-articular or extra-articular), the type of tissue involved (fibrous, bony, or fibro-osseous), and the extent of fusion (complete or incomplete) [1–3].

The etiology of TMJ ankylosis is multifactorial, with trauma and infection being the most common causes. Other, less frequent causes include systemic diseases such as ankylosing spondylitis, rheumatoid arthritis, and previous TMJ surgeries [4–6]. The condition is relatively rare, especially in young adults, and presents unique challenges in diagnosis and management due to the complex anatomy and critical functions of the TMJ.

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In this case report, we present a 26-year-old female patient with left-sided TMJ ankylosis, a rare presentation in this age group. The patient exhibited limited mouth opening and a noticeable lesion in the left TMJ region. This report aims to discuss the clinical features, diagnostic approaches, and surgical management of TMJ ankylosis—emphasizing the importance of early detection and intervention to prevent long-term functional deficits and facial deformities.

Case Presentation

A 26-year-old female patient presented to the Oral and Maxillofacial Surgery Department of Tabriz University of Medical Sciences with a chief complaint of an inability to open her mouth more than 5 millimeters for the past year. She reported no familial history, psychosocial history, history of facial trauma, or significant genetic factors.

On extraoral examination, movement of the left temporomandibular joint was non-perceptible. Deviation of the chin to the left side upon mouth opening was observed. No clicking or crepitus was noted on auscultation or palpation.

Intraoral examination revealed a maximal mouth opening of no more than 5 millimeters. The occlusion was Angle's Class I and appeared stable. Non-contrast computed tomography (CT) of the face revealed degenerative changes in the left TMJ, including irregularities, condylar expansion, and decreased joint space. An ill-defined lesion with a mixed radiolucent and radiopaque appearance was observed in the left mandibular ramus and condyle. Routine baseline blood investigations, electrocardiogram (ECG), chest X-ray, and viral marker tests were all within normal limits.

The primary treatment objectives were to restore mouth opening and correct the mandibular deviation. A comprehensive treatment plan was developed based on the patient's CT scans:

1. Osteotomy Design

• An inferior osteotomy cut was planned in the lower section of the ramus, approximately 5 mm above the mandibular foramen.

• A superior osteotomy cut was planned just below the zygomatic arch (Figure 1).

2. Prosthesis Construction and Customization Method:

• Using the 3D reconstructed CT data, patient-specific cutting guides were digitally designed to fit the anatomical landmarks of the ramus and zygomatic arch.

Fig. 1. Treatment plan was developed based on the CT scans of patient. An inferior osteotomy cut was planned in the lower section of the ramus, approximately 5 mm above the mandibular foramen.A superior osteotomy cut was planned just below the zygomatic arch.

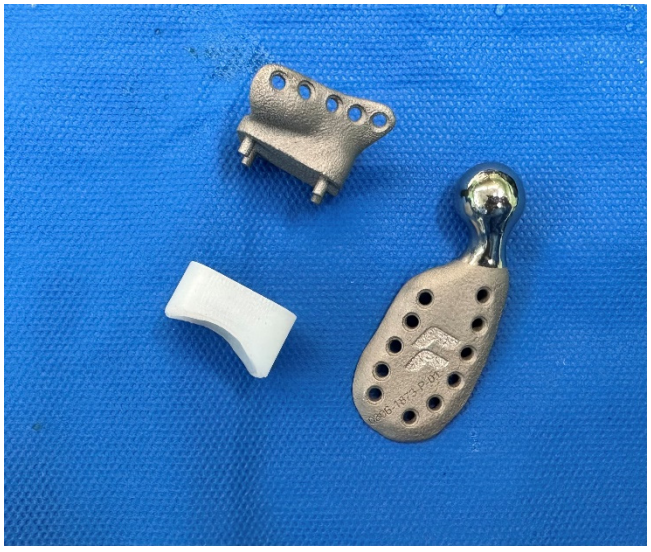

Fig. 2. Ramus-Condyle Unit component was milled from titanium. Fossa component composed of ultra-high molecular weight polyethylene fused to titanium

• Stereolithographic models of the facial skeleton and TMJ region were created to accurately plan the extent of bony resection.

• A custom joint prosthesis was engineered in two parts:

1. Fossa Component: Shaped to conform to the glenoid fossa region and attach securely to the zygomatic arch.

2. Ramus-Condyle Unit: Designed to replace the resected portion of the ramus and replicate the condylar head.

• The Ramus-Condyle Unit component was milled from titanium due to its biocompatibility, strength, and proven success in TMJ reconstructions. The fossa component was composed of ultra-high molecular weight polyethylene fused to titanium (Figure 2).

The patient was shaved in the left temporal region before surgery and positioned supine. Due to the limited mouth opening, the anesthetist performed a fiberoptic-assisted nasotracheal intubation. After preparation and draping, the condyle, ramus, zygomatic arch, preauricular (Al-Kayat Bramley) incision line, standard submandibular incision line, and Pitanguy line were marked. Maxillomandibular fixation (MMF) was performed with intermaxillary fixation screws in stable occlusion prior to extraoral incisions.

A tumescent solution was prepared using 500 mg lidocaine, 1 mg epinephrine, and 1 liter of 0.9% normal saline, and was injected subcutaneously 15 minutes before incisions.

Preauricular Al-Kayat Bramley and standard submandibular incisions were performed. The ankylotic mass was explored and meticulously removed using cutting guides fixed to the zygomatic arch and ramus. Piezoelectric surgery with irrigation was utilized to create a 20 mm gap.

The excised mass was stored in formalin solution for further pathological examination (Figure 3).

The fossa component was securely fixed to the zygomatic arch using four 7-mm screws via the preauricular incision. The ramus-condyle unit was stabilized to the mandibular ramus with eleven 9-mm screws through the submandibular incision, achieving successful TMJ reconstruction.

After removal of the MMF, mouth opening and occlusion were checked and confirmed (Figure 4).

To prevent recurrence, an abdominal fat pad was harvested from the hypogastric region and interposed around the alloplastic condyle and fossa, secured with 3-0 Vicryl sutures to the surrounding tissues. A Hemovac drain (No. 12) was placed to prevent hematoma formation and was secured to the postauricular skin with 2-0 silk sutures.

Hemostasis was achieved, and thorough irrigation was performed. Layered closure involved 4-0 Vicryl

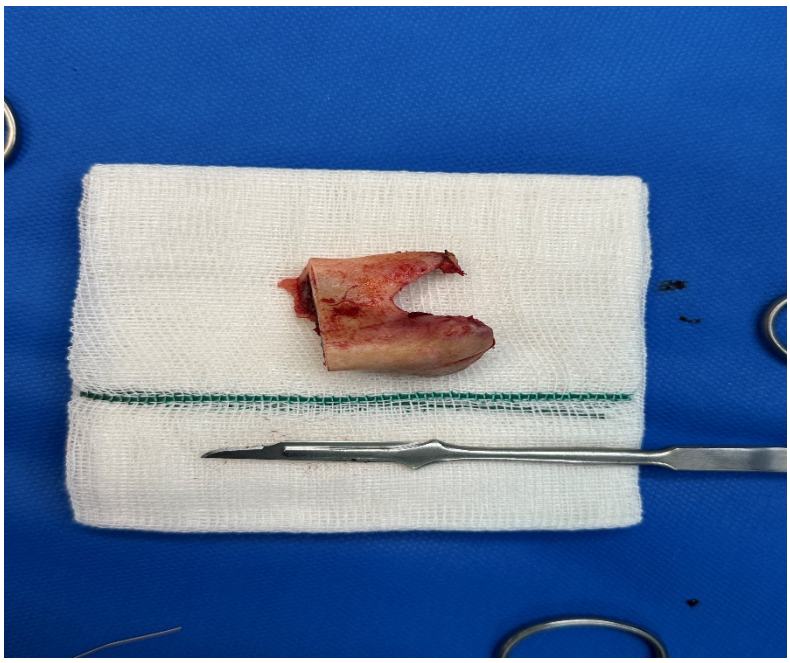

Fig. 3. The excised mass was stored in formalin solution for further pathological examinations

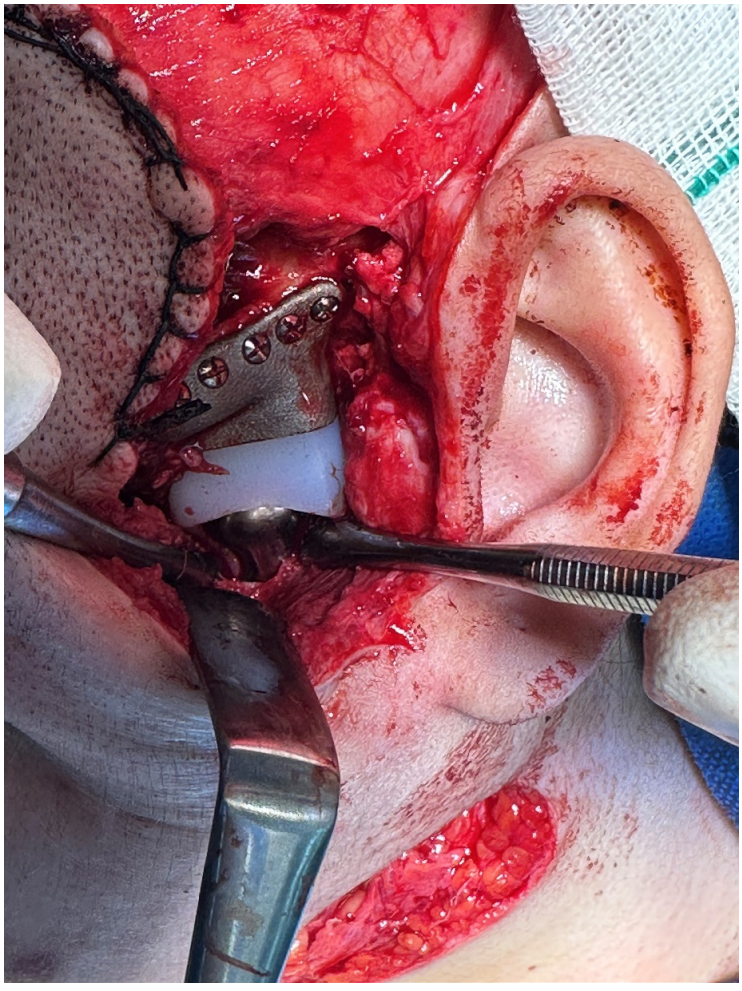

Fig. 4. The fossa component was securely fixed to the zygomatic arch and the ramus-condyle unit was stabilized to the mandibular ramus.

for deep tissues and 5-0 monofilament nylon for the skin, using a continuous suture pattern. The incision sites were dressed with 3% tetracycline paste.

The patient was extubated and recovered from anesthesia without complications. An immediate postoperative mouth opening of 30 mm was recorded.

After recovery from anesthesia, the patient underwent intermaxillary fixation with six intermaxillary fixation screws and stainless-steel wires to minimize prosthesis movement and reduce the risk of prosthesis and screw osteointegration failure. After 2 months, the intermaxillary fixation was removed, and the patient was referred to a physiotherapist to regain normal mouth opening and jaw movements.

Pathologic examination of the excised mass revealed a fragment of hard bone tissue measuring 1.5 × 2 × 1.2 cm in formalin. Microscopic evaluation showed necrotic bone trabeculae surrounded by fibrotic and inflamed marrow spaces. Evidence of sequestrum adjacent to granulation tissue and chronic inflammatory infiltrates composed of lymphocytes and plasma cells, with occasional neutrophils, was observed. No evidence of malignancy was present, and the final diagnosis was osteomyelitis.

Discussion

Temporomandibular joint (TMJ) ankylosis represents a significant challenge in maxillofacial surgery due to the complex functional and anatomical considerations of the joint. The condition can severely compromise quality of life by limiting essential activities such as mastication, speech, and oral hygiene maintenance. While trauma and infection are the most commonly cited etiologies, idiopathic or systemic factors may also contribute to joint ankylosis [2,7]. In this case, a 26-year-old female patient presented with unilateral left-sided TMJ ankylosis and limited mouth opening without a clear history of trauma or infection, underscoring the potential multifactorial etiologies.

Autogenous costochondral grafts are frequently favored in pediatric patients due to their growth potential, whereas alloplastic reconstruction with custom or stock prostheses can be highly advantageous in adults because of reduced donor-site morbidity and predictable joint space maintenance [5,8].

Several similar case reports and clinical studies in the literature support the use of custom alloplastic TMJ reconstruction: Satyapriya et al. [1] and Al-Raweea et al. [2] have described successful outcomes with interpositional grafting (fat, fascia, or muscle) to prevent re-ankylosis. Ukwas et al. [3] highlighted the significance of early diagnosis and management to avoid long-term facial deformities and functional deficits. Movahed and Mercuri [6] emphasized the utility of customized total joint prostheses in adults for predictable restoration of mandibular function with a lower risk of reoperation.

As illustrated in this case, adherence to rigorous postoperative physiotherapy, scheduled follow-ups, and consistent evaluation of mouth opening are essential to sustain functional improvements. Literature suggests that lack of compliance with jaw exercises is one of the leading factors contributing to re-ankylosis [9].

In summary, this case demonstrates the successful management of unilateral TMJ ankylosis in a young adult using advanced imaging, custom alloplastic reconstruction, and interpositional grafting. By integrating these principles, functional improvement and enhanced quality of life are achievable.

Conclusion

Customized TMJ reconstruction, combined with autogenous fat graft interposition, offers a viable solution for restoring mandibular mobility and improving quality of life in patients with TMJ ankylosis. While there is no single gold standard for TMJ reconstruction, patient-specific prostheses can reduce operative time, donor-site morbidity, and the risk of re-ankylosis. Further refinement of materials, biologically engineered interpositional tissues, and structured rehabilitation protocols may optimize outcomes and minimize recurrence rates in the long term.

Ethical Considerations

Compliance with ethical guidelines

There were no ethical considerations to be considered in this article.

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Conflict of Interests

The authors have no conflict of interest to declare.

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