Total joint prosthesis for ankylosis after multiples condylar traumas

ABSTRACT
Temporomandibular joint (TMJ) ankylosis is a disease commonly associated with facial trauma, especially in the condylar region. Described as a heterotopic bone growth that causes mouth opening limitation, it may occur in trauma cases misdiagnosed or mistreated. We present the case of a 37-year-old female, with decreased mouth opening after three traumas in the region of the right condyle by a motorcycle accident. We performed custom-made total joint replacement of the TMJ to rehabilitate the patient post arthroplasty. TMJ Concepts® protocol was followed to perform the patient's rehabilitation. She is being followed since then by a physical therapist to regain the pre-pathosis status of mouth opening, speech, and mastication function.

Keywords: Computer-aided design and computer-aided manufacturing total joint replacement, condylar trauma, custom total joint replacement, temporomandibular ankylosis, temporomandibular joint

INTRODUCTION
Temporomandibular joint (TMJ) is a bilateral synovial articulation between the head of the mandible and mandibular fossa in the temporal bone, and disorders can occur frequently, commonly referred as temporomandibular disorders (TMD). Conditions such as condylar hyperplasia/hypoplasia, arthritis, trauma, tumors, and ankylosis eventually present in TMJ. Trauma is the leading cause of TMJ ankylosis (TMJA),[1] that is the fusion between bone surfaces inside the articulation.

Total joint replacement (TJR) surgery is an invasive treatment for TMD cases where the nonsurgical conservative treatment cannot be applied.[2] There are two types of alloplastic TJR devices available: “stock” and customized (computer-aided design and computer-aided manufacturing [CAD-CAM]).[3,4]

This case report aims to show the gold standard treatment for TMJA.

CASE REPORT
In this case, a 37-year-old female, without systemic impairment, complained of “limitation of mouth opening after a motorcycle accident.” In addition, she could not perform mastication and phonation movements properly. She suffered an accident 13 years ago in the mandibular parasymphysis and condyle, being treated with open reduction and internal fixation (ORIF). Few years later, the patient underwent another motorcycle accident and...
fractured one condyle plate. In a third moment, another trauma happened, breaking the other plate. The patient did not choose for surgery to plate removal. She reported a progressive decrease in oral opening in the due course of time.

On clinical examination, a 15-mm mouth opening was observed [Figure 1], and radiographic examination presented bone formation in the entire right intra-articular space [Figure 2]. Three-dimensional reconstruction from computed tomography scan showed heterotopic bone between the surface mandibular fossa and head [Figures 3 and 4]. TMJ Concepts® protocol was followed from Digital Imaging and Communications in Medicine (DICOM) images for surgical planning [Figure 5]. Using preauricular and retromandibular approach, the ankylosic mass was removed from the TMJ and the prosthesis was placed at the mandibular ramus and fossa [Figures 6-8]. Fat was removed from the abdominal region through a 5- to 7-cm transverse incision made in the midline through the skin and subcutaneous tissue to obtain a 3- to 5-mm thickness monobloc of the fat pad and was added on the fossa–condyle interface, in an attempt to prevent re-ankylosis [Figures 9 and 10]. Microscopically, an excessive amount of dense fibrous connective tissue and new bone formation was observed, with irregular destruction of cartilage and bone with lymphocytic infiltration, giving the final diagnosis of TMJA [Figure 11].

A panoramic examination showed both condylar/ramus and fossa components placed and the resolution of the ankylosis [Figure 12]. The patient is under physical therapy to restore the masticatory function, presenting a 38-mm mouth opening at present [Figure 13].

**DISCUSSION**

Condylar fractures are present in 30% of the cases after...
facial trauma, with patients presenting at least one condyle fractured. These fractures are best treated with ORIF in most cases, except when patients are young or in growing phase. This is because the titanium plates would not permit the mandible head to grow properly with the rest of the mandible, causing facial asymmetry. 

Figure 5: Temporomandibular joint custom prosthesis template by temporomandibular joint Concepts® showing the planning of the temporomandibular joint total joint replacement

Figure 6: Preauricular approach showing the ankylosic mass in the right temporomandibular joint. Note that there is no space between the mandibular head and fossa

Figure 7: Ramus component of the prosthesis placed

Figure 8: Macroscopic view of the ankylosic mass. One piece is the mandibular fossa and the other, the mandibular head. Note the fractured plates in the condylar piece

Figure 9: Fat graft removed from the umbilical region

Figure 10: Fat graft placed at the surface to prevent re-ankylosis of the temporomandibular joint prosthesis
Historically, alloplastic TJR is indicated for ankylosis or re-ankylosis with severe anatomic abnormalities; failure of autogenous grafts in patients after multiple operations; destruction of autogenous graft tissue by pathosis; failure of Proplast-Teflon or Vitek-Kent total or partial joints, resulting in severe TMJ mutilation; and severe inflammatory joint disease, such as rheumatoid arthritis and juvenile idiopathic arthritis, that results in anatomic deformation of the joint components and functional impairment.[6]

As previously mentioned, trauma is one of the leading causes of TMJA that is best treated with the removal of the bone mass in the TMJ. Regardless of whether it is reconstructed with alloplastic, allogenic, or autogenous materials, the goals of such treatment are as follows: to give the patient the possibility of reduce suffering and improve TMJ range of motion; to reduce impairment; to reduce the amount of operations and the cost, time, and psychological outcomes of this; and to prevent higher morbidity. It is important that both the surgeon and the patient to understand that TMJ reconstruction is aimed primarily at the restoration of form and function and that any pain relief gained is only a secondary benefit. Because of the complex nature of joint function and its relation to muscular function, it is difficult to reconstruct any joint back to its “normal,” premorbid function. There will always be disability involved in a reconstructed joint.[7,8] Especially for the treatment of TMJA, many techniques have been developed since the use of gap resection with or without the use of graft to the application of customized joint replacement.[9]

At present, surgeons have the possibility of doing a TJR using one of the two types of prosthesis: “stock” and “custom made” (“CAD-CAM”). Both have fossa and ramus/condyle components, which are fixated and stabilized to the temporal bone and the lateral aspect of the ramus of the mandible, respectively. The first type comes in three sizes (S, M, and L) and the second one is produced especially for the patient using DICOM images.[3,4] Another difference between both prosthesis is that the first one does not give the best mandibular movements like that of prepathosis because it allows only open–close movements,[4] meanwhile the second allows lateralization movements as much as the open–close movements. These customized replaced joints are designed to allow the perfect positioning and function of both fossa and condyle components, which does not occur stock prosthesis once it is from a premade anatomy and size, needing to be adjusted to the anatomy of the patient.[3,4]

One of the biggest concerns of surgeons in this matter of TJR is the growth of heterotopic bone surrounding the prosthetic device. This growth may cause problems such as movement limitation and cause ankylosis relapse. Therefore, it has been described that the use of interposition fat graft prevents the formation of this heterotopic bone formation, avoiding the re-ankylosis. The best site described to collect the fat graft is the umbilical region.[10]
CONCLUSION

This work presented a case of TMJA, treated with the gold standard treatment TMJ TJR with a customized prosthesis, which allowed the patient to have all the movements from the prepatoasis joint. The correct diagnosis allowed the surgeon to treat the patient with the best technique, restoring the patient's function, esthetic, and releasing her from pain.

Declaration of patient consent
The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

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