

## Clinical report

# Temporomandibular joint prostheses: An alternative for impacted mandibular condyle in middle cranial fossa

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### ABSTRACT

The dislocation of the mandibular condyle in the middle cranial fossa is a rare condition with few reports in the literature. The authors described the first case reported of unilateral dislocation and fracture treated and reconstructed with a Temporo mandibular joint prostheses. Pre-surgical conduct, medical positions of the Neurosurgery, Radiology and Oral and Maxillofacial teams are described. Also, two years post-operative evaluations are detailed, including information regarding maximum interincisal opening, function, speech, pain and diet of the patient.

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### Prótesis de la articulación temporomandibular: una alternativa para la impactación del cóndilo mandibular en la fosa craneal media

### RESUMEN

La luxación del cóndilo mandibular con impactación en la fosa craneal media es un proceso poco frecuente –apenas se dispone de estudios publicados. Los autores describen el primer caso publicado de luxación y fractura unilateral combinadas, tratado y reconstruido con la implantación de una prótesis temporomandibular. Se describen la conducta quirúrgica y la postura médica de los equipos de neurocirugía, radiología y cirugía oral y maxilofacial. Se proporcionan detalles de las evaluaciones de los 2 primeros años postoperatorios, incluidos la abertura máxima interincisal, función articular, habla, sintomatología dolorosa y alimentación del paciente.

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#### Palabras clave:

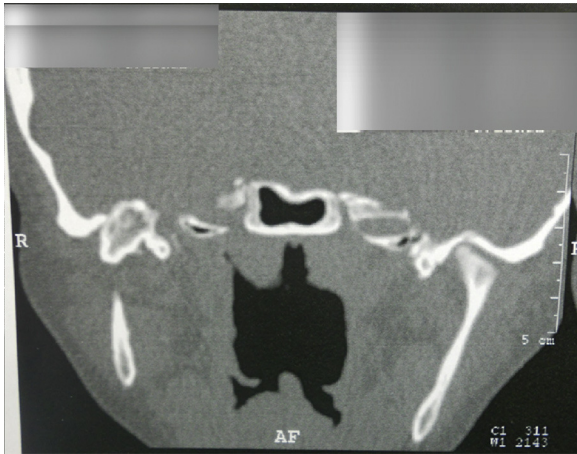
Articulación temporomandibular  
 Prótesis de ATM  
 Fosa craneal media  
 Traumatismo

## Introduction

Dislocation of the mandibular condyle into the middle cranial fossa is a rare condition with approximately 49 cases reported

in the literature.<sup>2,4,6</sup> In this case report we present the case of a female patient who suffered unilateral dislocation and fracture of the mandibular condyle in the middle cranial fossa, because of the anatomic conditions and type of trauma the removal of the condyle was unviable, and the reconstruction

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**Fig. 1 – Preoperative CT scans showed superior dislocation of mandibular condyle into the middle cranial fossa and the condylar fracture.**

with temporomandibular joint (TMJ) prostheses was chosen as the rehabilitation for this case. To our knowledge, this is the first report to describe the treatment of this condition with such reconstruction technique. Our objective to present the temporomandibular joint prostheses as an alternative for this condition, also to describe the procedure and the post-operative 2-year follow-up experience.

### Case report

A 33-year-old female with a history of a car accident was treated at the emergency room of the Santa Paula Hospital in Sao Paulo, Brazil, presenting limited mouth opening, pain, and deviation of the mandible to the right side. No neurological alterations were reported by the Neurosurgery department. After the evaluation of the Oral and Maxillofacial department and imaging confirmation by the Radiology department, the condition of the patient was diagnosed as right mandibular condyle dislocation and fracture in the middle cranial fossa (Fig. 1).

Immediate removal of the condyle was contraindicated after profound imaging analysis and discussion of the three medical teams because of the contact and proximity of the fragment to a major intracranial artery. Due to the danger that represented the removal of the fragment, even with the combined efforts of the neurosurgery and maxillofacial teams, a different approach was decided in the case presented. The reconstruction of the mandibular condyle with a Biomet/Lorenz Microfixation TMJ Replacement System (Jacksonville, FL, USA) was chosen, because it represented an optimal treatment for rehabilitating this patient with the less risks possible associated with her condition and the experience of the surgical team with the system.

### Pre-surgical treatment

As a first part of the rehabilitation of this patient, the waiting for the bone segment consolidation was the chosen as part

of the treatment, combined with orthodontics, orthopedics and physiotherapy where rubber bands, traction movement, and muscular exercises were chosen as the therapeutic method of maintaining the mandibular function during the condyle segment integration time in the cranial base.

Also, clinical and radiographic control follow-ups were performed, with no neurological alteration or intracranial alteration found during the bone consolidation period.

Surgery was performed after a seven-month period to secure the consolidation of the condyle fragment. This was also confirmed by the Radiology department, with the use of bone windows and Hounsfield unit analysis in the bone formed around the condyle fragment and the glenoid fossa.

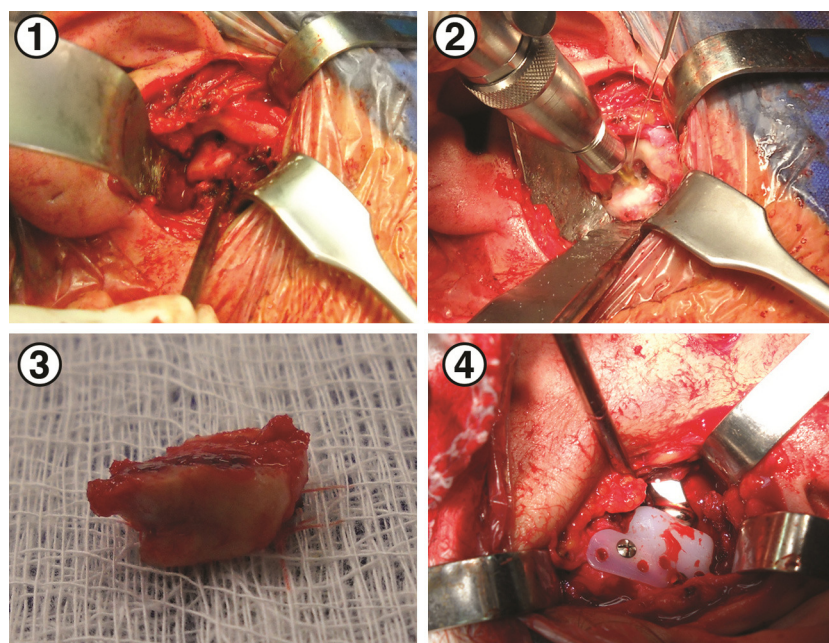
### Surgical procedure

The patient underwent surgery under general anesthesia, with nasotracheal intubation and complete muscle relaxation, prophylactic antibiotic and steroid anti-inflammatory also administered during the procedure. After infiltration of local anesthetic in the preauricular region, TMJ was accessed through preauricular incision, dissection of muscle layers and identification and preservation of the facial nerve until the identification of the joint capsule area where the impacted mandibular condyle was localized. Under intense irrigation, an arthrotomy cut was performed at the level of the sigmoid notch for removal of the extra cranial fragment of the compromised condyle. Bone remodeling was performed with chisels and round burs. The temporal region was then flattened, and the temporal component template of the prosthetic system was adapted. Consequently, the temporary intermaxillary fixation was performed to restore the vertical dimension and occlusion, and the mandibular ramus was accessed through Risdon incision and the communication of the accesses was achieved. The lateral surface of the mandibular ramus was regularized and mandibular component template was adapted and secured to articulate with the temporal component previously installed.

The intermaxillary blockage was then removed, and occlusion, vertical dimension and mandibular movement were checked. The templates were then replaced for the final prosthetic components and a new mouth opening evaluation was performed. The wounds were rinsed with saline solution and then closed with 4-0 absorbable suture (polyglactin-910) for the deeper layers and 5-0 nylon suture for the skin. No intermaxillary fixation was left after surgery. Post-operative medications (antibiotic, anti-inflammatory and analgesic) were prescribed (Fig. 2).

### Post-operative follow-up

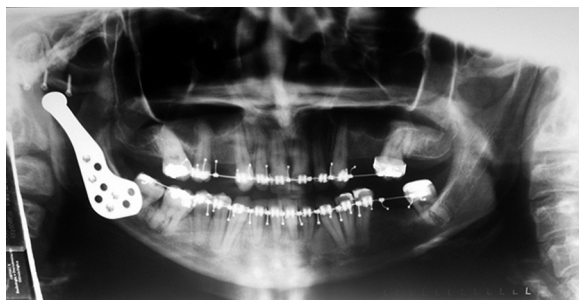
The patient was discharged from hospital 48 h after surgery and was allowed to function immediately, with freedom to choose any diet. This case report includes the follow-up until two years after the surgery. Plain film (panoramic) radiographs were obtained at the first post-operative evaluation, at six months and at the following annual visits after surgery, respecting the radiographic principle of ALARA (as low as possible applied radiation justified). In all the radiographic



**Fig. 2 – Surgical approach for the partial removal and reconstruction of the temporomandibular joint with Biomet/Lorenz TMJ Joint Replacement System. (1) Impacted condyle in the middle cranial fossa approach after a 7-month waiting period for bone consolidation. (2) Partial removal of the impacted condyle using burs. (3) Removed portion of the impacted mandibular condyle. (4) Reconstruction of the temporomandibular joint with the mandibular and temporal components of the cited TMJ prostheses system.**

evaluation, non-alterations were reported in the TMJ prostheses or the structures associated (Fig. 3).

For clinical evaluation the patient was monitored weekly during the first two post-operative months. After this period, assessments were performed monthly until the twelfth post-operative month and then, monitoring was held twice a year to review progress of the case. In every visit, maximum interincisal opening, diet, pain, function and speech were evaluated. The numerical results of maximum interincisal opening were obtained by using a caliper rule, with reference to the incisal of the upper and lower central incisors on the same side. The subjective evaluation of the data (and speech function, diet and pain) was performed using a visual analog scale, where for each variable were instituted six scores (ranging from 0 to 5).



**Fig. 3 – Post-operative panoramic radiography showed the stability of the TMJ prostheses system after a 2-year follow-up.**

### Physiotherapy

Physiotherapy was initiated 48 h after surgery. The physical therapy consisted, in the first two post-operative weeks, of mandibular opening and closing exercise and stimulation of maximum mouth opening by keeping the mouth open at wider range limit for a few seconds. From the third post-operative week on, forced mouth opening exercises were introduced with the help of wooden spatulas inserted between the posterior teeth bilaterally, alternating sides, or simultaneously for 2-3 min. The proposed therapy was performed in sessions of weekly frequency for a period of two months. The patient was encouraged to keep the exercise routine at home doing them 3-5 times a day during the period of at 12 weeks.

### Maximum interincisal opening (MIO)

The MIO previous to the surgical procedure was 8.4 mm. Immediate measures after surgery showed an MIO of 27.4 mm. The patient reported not having performed properly the physical therapy, which allowed the re-evaluation and instruction of the exercises. MIO results augmented in each evaluation reaching the maximum opening after six months (35 mm), maintaining this measure in each subsequent evaluation for the rest of the 2-year follow-up.

### Function and speech

This evaluation was performed by the use of a visual analog scale (VAS). The scores used by the evaluator for this variable were: 0 = no function, 1 = uncomfortable sensation of the

system limited speech and jaw movement, 2 = uncomfortable sensation with no jaw movement limitation, 3 = comfortable sensation with some jaw movement and/or speech limitation, 4 = comfortable sensation with infrequent jaw movement and/or speech limitation and 5 = optimal condition. The pre-operative VAS score was 1. Mandibular function and speech significantly improved at the 7-day follow-up, reaching the score 3. Significant improvements were observed over time at each post-operative clinical evaluation until the 2-year follow-up, achieving scores of 5 every evaluation after the 3-month evaluation.

### Diet

For diet consistency evaluation the VAS scores were 0 = no diet at all, 1 = just liquids, 2 = creams and liquids, 3 = soft solids, 4 = general diet with some limitations, 5 = general diet with no limitations. The preoperative VAS score was 3. This value presented an improvement at the 7-day follow-up, reaching 4. However, at the first month evaluation consistency of the diet improved significantly and the VAS average was 5.

### Pain

The VAS for pain evaluation were 0 = no pain, 1 = soft pain present occasionally, 2 = constant soft pain, 3 = mild pain, 4 = severe pain occasionally, 5 = constant severe pain. Pain scores of 1 were registered before and after surgical evaluation. Scores of 0 were registered every other post-operative.

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## Discussion

The displacement of the mandibular condyle into the middle cranial fossa is a rare condition, and because of that the initial evaluation of this injury is sometimes misdiagnosed and treated as other type of dislocation. Based on few reports, this kind of condition has no specific neurological alterations or central nerve symptoms. According to previous reports, the immediate diagnosis and prompt treatment of this injury is important to provide a safe treatment avoiding major difficulties. In the case presented in this article, the diagnosis and treatment strategies were made by the oral and maxillofacial surgery, neurosurgery and radiology in the first 48 h.<sup>1,6,7,10</sup>

Patients with dislocation of the mandibular condyle in the middle cranial fossa show specific characteristics, such as, deviation of the mandible to the affected side, anterior open bite, restriction of mouth movements, malocclusion and preauricular tenderness. The reported case patient only presented deviation to the affected side and restriction of the mandibular movements.<sup>4,6</sup>

Barron et al.<sup>1</sup> recommend the Computed Tomography (CT) scan for the evaluation of this kind of injury. He also reported that this evaluation was essential for a correct diagnosis in 17 of 48 patients in their cases report. The main decisions regarding the treatment in this case were only made after the analysis of the CT scan, where the risk of an internal cranial bleeding of the intracranial artery was acknowledged by the radiology team. Also in the experience of the authors, the radiographic controls after surgery represent a proper

evaluation for this kind of cases and to keep an optimal control of the prosthetic device and the patient's condition.

As referred by Man et al.<sup>4</sup>, various therapeutic methods have been described in the literature for the treatment of the mandibular condyle dislocation into the middle cranial fossa (open and closed reduction). In cases where no condylar fractures are associated, closed reduction should be considered, including different types of tractions. It should also be considered the first treatment option for this type of dislocation if no other risk had been found. If there is a condylar fracture or major risk associated with the patient condition, like neural alterations or intracranial bleeding, open reduction should be contemplated as an option. Some articles have also proposed alternative treatments; Man et al.<sup>4</sup>, presented the use of muscular graft and titanium net as a valid option for the reconstruction of those patients.

Several authors<sup>3,5,8,9</sup> describe that the TMJ prostheses, when compared to other reconstructive procedures, represent a better alternative because of the reduction of surgical time and morbidity since there is no need of a donor site or no need of intermaxillary fixation after surgery, but also some disadvantages have been found, such as fracture of the prosthesis, loss of some mandibular movements and secondary failures after loosening screws, none of those negative conditions were found in this case.

The results shown in the post-operative controls evidenced that this procedure is a functional solution for reconstruction of the temporomandibular joint in this kind of patients, leaving aside complications like bone resorption, secondary surgical sites for autograft bone collection and its co-morbidities. The authors also recommend that further studies and comparisons between the multiple options of treatment in this rare kind of cases should be made.

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## Ethical responsibilities

**Protection of human and animal subjects.** The authors declare that no experiments were performed on humans or animals for this investigation.

**Confidentiality of Data.** The authors declare that no patient data appears in this article.

**Right to privacy and informed consent.** The authors declare that no patient data appears in this article.

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## Ethical approval

Not required.

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None.

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## Conflict of interest

None declared.

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## REFERENCES

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1. Barron RP, Kainulainen VT, Gusenbauer AW, Hollenberg R, Sándor GK. Fracture of glenoid fossa and traumatic dislocation of mandibular condyle into middle cranial fossa. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2002;93:640.
2. Ihalainen U, Tasanen A. Central luxation or dislocation of the mandibular condyle into the middle cranial fossa a case report and review of the literature. *Int J Oral Surg.* 1983;12:39-45.
3. Long X, Hu C, Zhao J, Li J, Zhang G. Superior dislocation of mandibular condyle into the middle cranial fossa. *Int J Oral Maxillofac Surg.* 1997;26:29-30.
4. Man C, Zhu SS, Chen S, Jiang L, Hu J. Dislocation of the intact mandibular condyle into the middle cranial fossa: a case report. *Int J Oral Maxillofac Surg.* 2011;40:106-23.
5. Mercuri LG. The use of alloplastic prostheses for temporomandibular joint reconstruction. *J Oral Maxillofac Surg.* 2000;58:75-80.
6. Ohura N, Ichioka S, Sudo T, Nakagawa M, Kumaido K, Nakatsuka T. Dislocation of the bilateral mandibular condyle into the middle cranial fossa: review of the literature and clinical experience. *J Oral Maxillofac Surg.* 2006;64:1165-72.
7. Van der Linden WJ. Dislocation of the mandibular condyle into the middle cranial fossa: report of a case with 5 year CT follow-up. *Int J Oral Maxillofac Surg.* 2003;32:215-8.
8. Westermark A. Total reconstruction of the temporomandibular joint. Up to 8 years of follow-up of patients treated with Biomet total joint prostheses. *Int J Oral Maxillofac Surg.* 2010;39:951-5.
9. Wolford LM. Factors to consider in joint prosthesis systems. *Proc (Bayl Univ Med Cent).* 2006;19:232-8.
10. Worthington P. Dislocation of the mandibular condyle into the temporal fossa. *J Maxillofac Surg.* 1982;10:24.