Traumatic Anterosuperior Dislocation of the Intact Mandibular Condyle into the Temporal Fossa

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Abstract

Temporomandibular joint (TMJ) dislocation, or luxation, occurs when the condyle crosses the articular eminence in such a way that it does not return to its correct anatomical position, unless aided by a reduction in external forces for TMJ. The diagnosis of condylar luxation is clinical; however, image exams are important in classifying the types of condylar luxation and associated fractures. Displacement of the TMJ can occur due to either an exaggerated mouth opening or a forced opening and occasionally is associated with a high-impact trauma to the jaw, the latter being an extremely rare condition. Few cases of anterosuperior dislocation of the intact mandibular condyles into the temporal fossa (ADIMC) have been documented in medical literature, many of which are associated with craniofacial trauma. This study describes the case of an ADIMC of the left side combined with facial fractures, as well as the treatment performed. A review of cases found in the literature from 1969 to 2017 was conducted through a detailed bibliographical study.

Keywords

- ▶ mandibular
- ▶ condyle
- ▶ dislocation
- ▶ maxillofacial

The way the condyle is displaced is closely linked to its physical shape and how the mouth was positioned upon impact, where the condyle strikes the glenoid fossa with intense force, being the condylar fractures more common than this displacement.¹

Although uncommon, the superolateral and medial cranial fossa dislocation is better described in the literature than the ADIMC, which is rare and poorly documented.^{1–5} The first reported cases by Allen and Young⁶ were divided into two

types: type I (lateral subluxation), in which the condyle is laterally dislocated out of the fossa, and type II (complete dislocation), in which the condyle passes laterally and above zygomatic arch, before actually entering the temporal fossa. Satoh et al⁷ reported one case, and further specified it from type II dislocation to type IIA, in which the condyle is not hooked above the zygomatic arch; type IIB, in which the condyle is hooked above the zygomatic arch; and type IIC, in

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which the condyle is lodged inside the zygomatic arch, which is fractured. In addition, Prabhakar and Singla² classified the type III dislocation, which describes the ADIMC with no zygomatic arch fracture and no mandible fracture.

This study aims to describe a case of ADIMC of the left side associated with maxillofacial fractures. This study, through a retrospective analysis, also presents a review of cases found in English-language literature from 1969 to 2017. In addition, this article describes a reduction technique, as well as the treatment sequence used in the clinical case, and suggests a subclassification of “displacement type III.”

Case Report

A 27-year-old male patient suffered a car accident on April 29, 2012, while sitting in the back seat without a seatbelt. He was admitted to the hospital, lucid and aware, with no change in his vital signs, hemodynamically stable. Upon maxillofacial examination, he presented facial trauma and mandibular deviation to the right when fully opening his mouth, and no spontaneous reduction. The patient presented with mild bleeding in the gums of the left posterior mandibular teeth, pain upon palpation of the right preauricular region, and a visible exacerbated edema in the area; the left condyle was not palpable and also presented crackling in left mandibular body. Pain medication was prescribed, and a computed tomography

(CT) of the face was requested. The results were as follows: left zygomatic arch fracture without dislocation; fracture of the right process condylar; fracture of the left mandibular body; and anterior and superior dislocation of the left condyle, now located in the temporal fossa (►Figs. 1 and 2). Both the patient and his family were advised about the surgical approach in the right TMJ for the second surgery, because an exacerbated edema had been identified. The patient was taken to the operating room, and after attempts to reduce the left TMJ, the surgeon then applied digital pressure on the coronoid process (using the thumb and forefinger of his left hand, intraorally), while using a bone hook in a minimally invasive reduction (was performed by means of a 3-mm skin incision slightly posterior to the coronoid process, below the zygomatic arch, and a zygomatic bone hook was inserted onto the mandibular notch), described by Melo et al (2015).⁸ Digital pressure was applied because there was a fracture of the left mandibular body. After having reduced the left TMJ dislocation, arch bars were utilized, and fixation of fracture in the mandibular body was performed with the use of 02 plates and 8 screws of the 2.0 fixation system.

Stable occlusion was maintained on the postoperative follow-up of the maxillomandibular fixation, using elastics for 2 weeks. The patient and his family excluded the proposed surgery in the right condyle; after 15 days, the patient was sent to functional myofascial treatment with speech therapy.

Fig. 1 (a, b) Three-dimensional face CT exam, showing mouth opening, with right deviation, right condylar fracture and left mandibular body, left zygomatic arch (no displacement), and dislocation of the left mandibular condyle; (c, d) coronal and axial section, showing displacement of the left mandibular condyle, in contact with the temporal fossa and left zygomatic arch fracture without dislocation.

Fig. 2 Details of both condyle positions—right condylar fracture and left condyle dislocation: (a) axial; (b) coronal; (c) 3D face CT exam.

The arch bars were removed 45 days after the first surgery, with stable occlusion, mouth opening of 40 mm, and deviation to the right. After 70 days, during postoperative control, an anterior open bite, of approximately 2 mm, with premature touch molars was observed. A CT exam of the patient's face was requested, which revealed a resorption of the bone crest between teeth 36 and 37, as well as vertical osteolysis (► **Fig. 3**). To resolve this condition, a modeling prototype and a 2.4 locking plate and screws were proposed to the patient. Intraoral access surgery was performed 115 days after the accident, the inferior alveolar and the mental nerves were preserved, the fibrous connective tissue in the osteolysis area was debrided, and a fixation system (2.4 and 2.0) was performed. A particulate graft from the iliac crest was used, without applying a surgical approach in the fractured right condyle, as requested by the patient and his family (► **Fig. 4**), despite the information of potential changes related to the nonsurgical approach of the right TMJ. In 5 years of postoperative follow-ups, the patient showed no functional disturbances or ankylosis, and he had occlusal stability with no mouth opening restrictions. A discrete deviation from the median line to the right during the buccal opening that may be related to the presence of condylar fracture not surgically approached was observed. The left condyle remains well positioned and the right condyle is stable, presenting bone remodeling (► **Fig. 5**).

A retrospective analysis was performed through a systematic search based on two different methods: (1) main search: made in PubMed and Embase databases; (2) search handling: all references of the included studies were read to

find articles not found on PubMed or Embase. Including the present case report, nine cases were deemed acceptable for evaluation and analysis, showing the ADIMC as a rare condition in the literature. The diagnosis, management, and

Fig. 3 (a, b) Patient ~40 days after the surgery in the initial approach, with Erich maxillary and mandibular bars, stable occlusion, and maximum mouth opening, with a slight mandibular deviation to the right. (c) Occlusion at 70 days postoperatively, with anterior open bite and premature contacts on posterior molars. (d) CT image showing osteolysis between molars on the left.

Fig. 4 (a, b) Prototyping model with simulation surgery of osteolysis area; this served as the basis for the locking of the 2.4 plate modeling on approach for intraoral access; (c, d) stable dental occlusion and panoramic postoperative radiograph (right condyle partially visible, with displacement and left condyle well positioned).

Fig. 5 (a–c) Current picture of maximum mouth opening (45 mm, with a slight mandibular deviation to the right—condylar fracture not surgically approached) and stable occlusion. (d) Current panoramic radiograph: details of the left condyle remains well positioned and the right remodeling condylar.

correct classification of this type of dislocation has also been discussed in the literature, being that the open reductions^{2,9-12} were more applied than the closed reductions,^{8,13,14} being directly related to the time of approach in relation to the trauma, as shown in ►Table 1.^{2,8-14}

The anterior mandibular dislocation is the most common dislocation of the TMJ and is connected to common extension movements, such as yawning or hypermotility of the joint.¹⁵⁻¹⁸ Occasionally, it is associated with a high-impact trauma to the jaw, the latter being an extremely rare condition.^{12,19} The diagnosis of condylar luxation is clinical; however, image exams are important in classifying the types of condylar luxation and associated fractures.²⁰

Superior dislocation of the condyle into medial cranial fossa and lateral and posterior displacements are rare and usually associated with facial trauma.²¹ Shen et al²² collected 23 cases of superolateral dislocation (SD) of the mandibular condyle from the literature (1969–2011). Recently, Sharma et al (2016) reported one case of SD.²³ The present study reported only eight cases of anterosuperior dislocation of mandibular condyles into the temporal fossa.

Worthington⁹ suggested that traumatic dislocations occur due to a high-energy impact, or if the patient's mouth is open at the moment of trauma. Mandible fractures are also commonly associated with these types of dislocations.^{6,7,24}

Prabhakar and Singla² suggested an additional subtype classification proposed by Allen and Young⁶ and Satoh et al.⁷ The authors suggested a type III dislocation, which they described as “the clinical condition when the condyle has passed anteriorly and then superiorly to enter the temporal fossa and is lodged between the unfractured zygomatic arch on the lateral side and the temporal fossa and its contents on the medial side, with an intact mandible.” In the present study, regarding ►Table 1, the authors agreed that the nomenclature of anterosuperior dislocation is more appropriate than SD, as reported by other authors.^{13,22,24-26} However, mandible fracture was not considered in the Prabhakar and Singla classification. Thus, the present study proposes a new type III classification by dividing it into two categories: type IIIB, as described by Prabhakar and Singla, and type IIIB, which could be described as a “clinical condition when the condyle has passed anteriorly and then superiorly to enter the temporal fossa and is between the zygomatic arch fracture but without displacement to the lateral side and the temporal fossa and its contents on the medial side are associated with a mandible fracture.”

Radiographs and CT exams can help confirm and classify the type of condylar dislocation, as well as identify maxillofacial fractures.²⁵ In the present study, the CT proved to be useful in the classification of the condylar dislocation (type III).

Closed reduction is the first choice of treatment for anterosuperior dislocation. It is less traumatic and safer than all other techniques.^{25,26} However, condylar luxation may cause muscle spasms and, depending on the time span between the injury and treatment, fibrous adhesion in the TMJ, which in turn disturbs condyle reduction.²⁷ In the present case, the approach was performed under general anesthesia, and manual and minimally invasive reduction

Table 1 Reported cases of anterosuperior dislocation of intact mandibular condyles into the temporal fossa (from 1969 to 2017)

Authors	Age (y)	Sex	Etiology	Reduction time (d)	Reduction method	Mandible condition	Other associated facial fractures	Results after treatment
Worthington (1982) ⁹	11	F	Road traffic	14	Open	Right parasymphyseal fracture and right condyle	Not associated	Not described
DeVita et al (1988) ¹⁰	28	F	Road traffic	Not available	Open	Without mandibular fracture	Not associated	Not described
Yoshii et al (2000) ¹¹	1	F	Hit by a truck	16	Open	Right symphyseal fracture	Left zygomatic arch	20-mm mouth opening
Bu et al (2007) ¹³	42	M	Motorcycle accident	5	Closed	Without mandibular fracture	Not associated	37-mm mouth opening
Prabhakar and Singla (2011) ²	47	F	Fall with trauma on the chin	45	Open	Without mandibular fracture	Not associated	33-mm mouth opening
Alemán Navas and Martínez Mendoza (2011) ¹⁴	17	M	Traffic accident	1	Closed	Without mandibular fracture	Not associated	Not described
Özalp et al (2014) ¹²	17	F	Motor vehicle accident	33	Open	Right mandible corpus fracture	Left infraorbital rim and zygomatic body	24-mm mouth opening
Melo et al (2015) ⁸	47	M	Bicycle accident	9	Closed	Fractures of the left body mandible, comminuted dentoalveolar mandible, and left coronoid process	Maxilla	35-mm mouth opening
Current study (2017)	27	M	Vehicle accident	1	Closed	Fractures of the right condylar process and left body mandible	Left zygomatic arch	45-mm mouth opening

Abbreviations: F, female; M, male.

were used together to reduce the left condyle and then stabilize the left mandibular body fracture.

Different dislocations require different approaches, as the closed techniques to open approaches can be observed in the approaches of different authors. Choosing the right approach depends on the displacement's evolution time. Shorter times appear to be linked to better results.^{8,13}

The present literature review (► **Table 1**) showed that the time between injury and reduction ranged from 1 to 45 days, and most cases were treated with open reduction presenting a delayed approach, which was different from the cases treated with closed reduction, using less development time.^{2,8,9,13}

The reduction of late time seems to be related to increased difficulty reduction by manual techniques.²⁸

Conclusion

Different approaches can be used for different types of mandibular condyle displacements, whether fractured or not. Based on the case presented herein, as well as on literature review, it can be concluded that the anterosuperior specific offset for temporal fossa is a rare occurrence, and the treatment can range from a noninvasive approach to even more complex surgical approaches.

We observed in this clinical case (mandibular fracture that needs to be stabilized with a 2.0 fixation system—load sharing) that it was possible to perform a closed reduction under general anesthesia and the minimally invasive reduction, simultaneously, before load sharing (to avoid plate deformation). Such results were obtained in a scenario where treatment started in a small time span after the trauma. Some factors may make it difficult, or even impossible, to achieve a noninvasive/minimally invasive reduction: time elapsed, fractures in the condyle, and other mandibular fractures, among other relevant factors.²⁸

References

- He Y, Zhang Y, Li ZL, An JG, Yi ZQ, Bao SD. Treatment of traumatic dislocation of the mandibular condyle into the cranial fossa: development of a probable treatment algorithm. *Int J Oral Maxillofac Surg* 2015;44(07):864–870
- Prabhakar V, Singla S. Bilateral anterosuperior dislocation of intact mandibular condyles in the temporal fossa. *Int J Oral Maxillofac Surg* 2011;40(06):640–643
- Vaezi T, Rajaei SA, Hosseini Abrishami M, Erfanian Taghvaei M. Dislocation of the mandibular condyle into the middle cranial fossa: a case report. *Oral Maxillofac Surg* 2014;18(01):69–73
- Oberman B, Setabutr D, Goldenberg D. Traumatic dislocation of intact mandibular condyle into middle cranial fossa. *Am J Otolaryngol* 2014;35(02):251–253
- Rahman T. Unusual superolateral dislocation of mandibular condyle. *Craniomaxillofac Trauma Reconstr* 2017. Doi: 10.1055/s-0037-1601433
- Allen FJ, Young AH. Lateral displacement of the intact mandibular condyle. A report of five cases. *Br J Oral Surg* 1969;7(01):24–30
- Satoh K, Suzuki H, Matsuzaki S. A type II lateral dislocation of bilateral intact mandibular condyles with a proposed new classification. *Plast Reconstr Surg* 1994;93(03):598–602
- Melo MFS, Oliveira RB, Silveira RL, Amaral MBF. Anterosuperior dislocation of the intact condyles into the temporal fossa. *J Craniofac Surg* 2015;26(03):990–991
- Worthington P. Dislocation of the mandibular condyle into the temporal fossa. *J Maxillofac Surg* 1982;10(01):24–27
- DeVita CL, Friedman JM, Meyer S, Breiman A. An unusual case of condylar dislocation. *Ann Emerg Med* 1988;17(05):534–536
- Yoshii T, Hamamoto Y, Muraoka S, Teranobu O, Shigeta Y, Komori T. Traumatic dislocation of the mandibular condyle into the temporal fossa in a child. *J Trauma* 2000;49(04):764–766
- Özalp B, Elbey H, Durgun M, Selçuk CT. An alternative surgical procedure for anterosuperior dislocation of intact mandibular condyle. *J Craniofac Surg* 2014;25(04):e382–e384
- Bu SS, Jin SL, Yin L. Superolateral dislocation of the intact mandibular condyle into the temporal fossa: review of the literature and report of a case. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2007;103(02):185–189
- Alemán Navas RM, Martínez Mendoza MG. 'Inverse' temporomandibular joint dislocation. *Int J Oral Maxillofac Surg* 2011;40(08):877–879
- Chan TC, Harrigan RA, Ufberg J, Vilke GM. Mandibular reduction. *J Emerg Med* 2008;34(04):435–440
- Myrhaug H. A new method of operation for habitual dislocation of the mandible; review of former methods of treatment. *Acta Odontol Scand* 1951;9(3–4):247–260
- Young AL, Khan J, Thomas DC, Quek SY. Use of masseteric and deep temporal nerve blocks for reduction of mandibular dislocation. *Anesth Prog* 2009;56(01):9–13
- Li Z, Li ZB, Shang ZJ, Wu ZX. An unusual type of superolateral dislocation of mandibular condyle: discussion of the causative mechanisms and clinical characteristics. *J Oral Maxillofac Surg* 2009;67(02):431–435
- Ogawa M, Kanbe T, Kano A, et al. Conservative reduction by lever action of chronic bilateral mandibular condyle dislocation. *Cranio* 2015;33(02):142–147
- Shorey CW, Campbell JH. Dislocation of the temporomandibular joint. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2000;89(06):662–668
- Tutela JP, Verbist DE, Kelishadi S, Little JA. Traumatic dislocation of the mandibular condyle into the middle cranial fossa in an elderly patient. *J Craniofac Surg* 2013;24(05):1703–1705
- Shen L, Li P, Li J, Long J, Tian W, Tang W. Management of superolateral dislocation of the mandibular condyle: a retrospective study of 10 cases. *J Craniomaxillofac Surg* 2014;42(01):53–58
- Sharma D, Khasgiwala A, Maheshwari B, Singh C, Shakya N. Superolateral dislocation of an intact mandibular condyle into the temporal fossa: case report and literature review. *Dent Traumatol* 2017;33(01):64–70
- Tauro D, Lakshmi S, Mishra M. Superolateral dislocation of the mandibular condyle: report of a case with review of literature and a proposed modification in the classification. *Craniomaxillofac Trauma Reconstr* 2010;3(03):119–123
- Kapila BK, Lata J. Superolateral dislocation of an intact mandibular condyle into the temporal fossa: a case report. *J Trauma* 1996;41(02):351–352
- Amaral MB, Bueno SC, Silva AA, Mesquita RA. Superolateral dislocation of the intact mandibular condyle associated with panfacial fracture: a case report and literature review. *Dent Traumatol* 2011;27(03):235–240
- Huang IY, Chen CM, Kao YH, Chen CM, Wu CW. Management of long-standing mandibular dislocation. *Int J Oral Maxillofac Surg* 2011;40(08):810–814
- Lello GE. Treatment of long-standing mandibular dislocation. *J Oral Maxillofac Surg* 1987;45(10):893–896