Midline Mandibulotomy for Reduction of Long-Standing Temporomandibular Joint Dislocation

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Abstract

Keywords

- temporomandibular joint
- long-standing dislocation
- midline mandibulotomy

Long-standing temporomandibular joint (TMJ) dislocation is an uncommon condition, and due to its rarity, no definitive guidelines have been developed for its management. Various reduction techniques ranging from indirect traction techniques to direct exposure of the TMJ have been used. Indirect traction techniques for reduction may fail in long-standing dislocation. Management of two cases of long-standing TMJ dislocation with midline mandibulotomy is discussed in which other indirect reduction techniques had failed. Midline osteotomy of the mandible can be used for reduction in difficult TMJ dislocations. An algorithm for the management of long-standing TMJ dislocation is proposed and related literature is reviewed.

Long-standing temporomandibular joint (TMJ) dislocation is an uncommon condition, and due to its rarity, no definitive guidelines have been developed for its management. There is no standard terminology, and various terms such as *irreducible*, *chronic persistent*, and *long-standing dislocation* have been used in the literature. Long-standing TMJ dislocation may be defined as any dislocation existing for more than a month.¹ Recently it has been redefined as an acute dislocation left untreated or inadequately treated for more than 72 hours.² Consensus is lacking in context of the required duration before one can call a dislocation long-standing. Prolonged TMJ dislocation is seldom treated successfully by conservative methods and needs surgical intervention ranging from various indirect traction techniques to direct exposure of the TMJ. Manual manipulation and indirect traction techniques for reduction are usually unsuccessful in long-standing TMJ dislocation. Direct exposure of the TMJ is invasive, damages the capsule and the normal TMJ anatomy, and may predispose to development of TMJ ankylosis. Lee et al described an indirect surgical technique in which midline mandibulotomy was done, which allows reduction of each joint individually.³ There are no studies to support the effectiveness of this technique. The purpose of this article is to validate the technique of midline mandibulotomy with the

help of two cases of long-standing TMJ dislocation that could not be reduced with other techniques. The authors also review the existing literature and propose an algorithm for the management of long-standing TMJ dislocation.

Case Report 1

A 55-year-old woman presented with a 3-month history of inability to close mouth. There was history of one episode of vomiting, following which she could not close her mouth. There was no history of any previous episodes of jaw dislocation. Clinical examination revealed protruding lower jaw, bilateral preauricular hollowing, and negligible jaw movements (► **Fig. 1A**). Orthopantomogram (OPG) revealed both condyles well beyond articular eminence (► **Fig. 1B**). These findings were confirmed by computed tomography scan as well (► **Fig. 1C**).

Manual reduction under local anesthesia was tried on an outpatient basis but was unsuccessful. The patient was posted for reduction of dislocation under general anesthesia. Manual manipulation to reduce the dislocation under general anesthesia failed. Next, reduction was tried by applying traction forces on the condyles with the help of transosseous wires at the angle region of the mandible. Failing this, intermaxillary

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Figure 1 (A) Preoperative frontal facial photograph of case 1. (B) Preoperative OPG of case 1 showing bilateral TMJ dislocation. (C) Preoperative sagittal computed tomography scan of case 1 showing TMJ dislocation. (D) Postoperative OPG showing reduced TMJ dislocation and midline mandibulotomy site fixed with miniplates. Abbreviations: LT, left; OPG, orthopantomogram; RT, right; TMJ, temporomandibular joint.

fixation screws were placed in the maxilla and mandible. This was followed by midline step osteotomy of the mandible. Bilateral hemimandibular segments could be easily reduced. Fixation of the midline osteotomy was done with two preadapted miniplates. Maxillomandibular fixation was maintained with the help of screws in the immediate postoperative period to prevent recurrence. One week later, secondary wires were replaced with elastics and jaw physiotherapy was started. Postoperative OPG showed complete reduction of the condyles bilaterally (►Fig. 1D). The patient's mouth opening improved slowly and there was no recurrence on further follow-up for 2 years.

Case Report 2

A 40-year-old man was referred to the maxillofacial outpatient department with a history of fall from bicycle a month before. The patient was unable to close his mouth properly. He was managed conservatively by a local doctor, but the condition did not improve in the subsequent weeks. On examination, there was bilateral preauricular hollowing with mild tenderness on palpation. An OPG showed bilateral TMJ dislocation (►Fig. 2A).

Manual reduction was tried with intra-articular injection of local anesthesia. Unable to attain reduction, closed reduction with continuous elastic traction was planned. The arch bar was applied on the maxillary and mandibular teeth, and anterior elastics were applied for 48 hours with posterior bite blocks. Reduction could not be achieved over a period of 2 days.

The patient was posted for surgery under general anesthesia. Manual reduction was tried under the effect of muscle relaxants without success. Traction force was applied with 26-gauge stainless steel transosseous wires at the angle of the

mandible bilaterally. This was unsuccessful, and it was decided to do a step midline mandibulotomy via labial vestibule. The hemimandibular segments were manipulated and bilateral reduction could be achieved. The osteotomized segments were reduced and fixed with two preadapted miniplates. The patient was put on elastic traction postoperatively and an OPG confirmed reduction of the condyles (►Fig. 2B). Over a period of 10 days, the elastics were reduced and the patient was encouraged to perform jaw physiotherapy. Elastic traction was removed at the end of 10 days. The mouth opening

Figure 2 (A) Preoperative OPG of case 2 showing bilateral dislocated TMJ. (B) Postoperative OPG showing reduced TMJ dislocation and midline mandibulotomy site fixed with miniplates. Abbreviations: OPG, orthopantomogram; TMJ, temporomandibular joint.

Table 1 Review of literature of TMJ dislocation

1	Fordyce, 1965 ¹	Defined long-standing dislocation as one existing for more than a month
2	Adekeye, 1976 ⁴	Reviewed 24 cases, of which 4 were reduced manually and 20 required open procedures
3	Prabhakara, 1980 ⁸	Reduced a case of bilateral persistent anterior dislocation of the mandible with arch bars and anterior elastic traction
4	Stakesby Lewis, 1981 ¹⁰	Applied traction intraorally at the sigmoid notch to reduce the condyles
5	Hammersley, 1986 ⁹	Performed direct open reduction in 2 of 3 cases and advocated simultaneous detachment of lateral pterygoid insertion
6	el-Attar and Ord, 1986 ¹¹	Used traction with intraosseous wires passed through the angle of the mandible
7	Smith and Johnson, 1994 ⁷	Introduced the terms <i>reducible</i> and <i>irreducible</i> , and proposed mandibular setback procedure for the latter
8	Terakado et al, 2006 ¹³	Used intermaxillary screws in case of an edentulous mandible to apply traction force with elastics followed by intramuscular botulinum toxin A
9	Aquilina et al, 2004 ¹²	Used botulinum toxin A to reduce muscle spasm after reduction to prevent relapse
10	Ugboko et al, 2005 ⁵	In a multicentric study, reviewed 96 cases of TMJ dislocation (29 long-standing)
11	Lee et al, 2006 ³	Proposed midline mandibulotomy for treatment of long-standing dislocation
12	Rattan and Rai, 2007 ⁶	Treated 5 cases and proposed a stepwise treatment algorithm
13	Huang et al, 2011 ²	Treated 6 cases and proposed an algorithm based on duration of dislocation

Abbreviation: TMJ, temporomandibular joint.

and range of motion improved over a period of 1 month. The patient was on regular follow up until 1 year with no recurrence.

Discussion

The aim of any surgical intervention of long-standing TMJ dislocation should be the following: (1) complete reduction, (2) restoration of adequate jaw movement, (3) minimal morbidity to intra- and periarthral tissue, and (4) minimizing the chance of recurrence.

There are few series with substantial numbers of cases in the English literature. ► **Table 1** summarizes the existing literature on long-standing TMJ dislocation. Adekeye et al reviewed 24 cases of long-standing TMJ dislocation in which four were reduced manually and 20 required open procedure.⁴ Ugboko et al did the largest multicentric review paper of 96 cases of TMJ dislocation of which 29 were long-standing.⁵ Of these 29 cases, 24 were treated. Five cases were managed with manual reduction either in local or general anesthesia. Six were corrected by maxillomandibular fixation and anterior elastic traction, and 13 were treated with various surgical modalities like condylectomy, inverted L osteotomy, oblique ramus osteotomy, or vertical ramus osteotomy. Rattan and Rai presented a series of five cases and also proposed an algorithm for the management of similar cases.⁶ Of five cases, one case with an atraumatic etiology was reduced manually whereas the other four cases with traumatic etiologies had to be treated with various direct and indirect surgical approaches. They opined that etiology of the dislocation (traumatic or atraumatic) is the primary prognostic factor, whereas duration comes secondary.

Figure 3 (A, B) Diagrammatic representation of anteromedially dislocated condyles (black arrow). Movement required for reduction of dislocated condyles is downward and outward (green arrow). Vector of forces needed for reduction of one condyle is resisted by the contralateral condyle. Midline osteotomy of the mandible allows each condyle to be moved separately, thus eliminating resistance.

Case reports advocating different techniques ranging from traction at different mandibular sites to direct joint exposure have been used to reduce the condyle. Orthognathic surgery or condylectomy have also been mentioned to achieve a functional occlusion where reduction was unattainable.^{5,7} Prabhakara reduced a case of bilateral persistent anterior dislocation of the mandible with arch bars and anterior elastic traction.⁸ Hammersley performed direct open reduction in two of three cases and advocated simultaneous detachment of lateral pterygoid insertion.⁹ Indirect traction at various mandibular sites sparing the joint area is a popular method of reduction. Stakesby applied traction intraorally at the sigmoid notch to reduce the condyles,¹⁰ and el-Attar and Ord used traction with intraosseous wires passed through the angle of the mandible.¹¹ In recent times, adjunctive procedures have also been added for the benefit of the treatment. Aquilina et al used botulinum toxin A to reduce muscle spasm after reduction to prevent relapse.¹² Similarly, Terakado et al

used intermaxillary screws in case of an edentulous mandible to apply traction force with elastics followed by intramuscular botulinum toxin A.¹³

Lee et al introduced a novel technique of a mandibular midline osteotomy that allows reduction of each joint individually.³ The authors treated two cases with this technique and achieved satisfactory results. The advantage of this technique is that it allows reduction of condyles without direct exposure of the TMJ, thus preventing the morbidity associated with surgical exposure of the TMJ bilaterally. The direction of forces needed for reduction of anteromedially dislocated condyles is downward and outward. The vector of forces is such that it is resisted by the contralateral side. The midline osteotomy of the mandible allows each condyle to move individually, thus eliminating resistance from the contralateral side (►Fig. 3A, B). The two cases mentioned earlier were treated successfully with this technique where other indirect reduction techniques had failed.

Figure 4 Algorithm for management of temporomandibular joint dislocation. Abbreviations: IMF, intermaxillary fixation; TMJ, temporomandibular joint.

The prognostic factors can be outlined broadly into three points: (1) Etiology: A traumatic etiology initiates hemorrhage and subsequent fibrosis intra- and extra-articularly. The fossa is filled with a nonelastic tenacious fibrous tissue that hinders the condyle to translate back. An atraumatic etiology mainly because of the laxity of the ligament holds a better prognosis for reduction. (2) Time lapse: The longer the time period, the poorer the prognosis. (3) Patient cooperation: Postoperative jaw physiotherapy is mandatory.

—**Fig. 4** summarizes the proposed algorithm for management of TMJ dislocation. Manual reduction under the effect of intra-articular local anesthesia should be tried initially. Keeping in mind the prognostic factors, the clinician should judge and anticipate the nature of difficulty to be encountered for individual cases. For example, a long-standing dislocation with traumatic etiology is liable to resist reduction due to the amount of fibrosis in and around the joint. Compared with this, a recently occurred dislocation with atraumatic etiology will be easier to reduce. Applying force at the angle or at the mandibular notch region by indirect technique may prove unsuccessful in the former case. Therefore, we propose that this step may be omitted and the midline osteotomy technique may be preferred as this has a greater chance of success. Direct exposure of the TMJ should be the last resort and should be tried when all other means of reduction have failed.

Potential complications with midline mandibulotomy may include lingual hematoma, inadvertent damage to the root apices in proximity, malocclusion, and nonunion. With careful surgical technique (a stepped midline osteotomy, stable fixation with the help of miniplates, and preadapting and placing screw holes before beginning the osteotomy cut), these complications can be avoided. Neither of the two patients reported earlier had any complication with this technique.

In conclusion, midline mandibulotomy is an effective technique with minimal morbidity for the management of long-standing TMJ dislocation. This technique should be

included in the surgical armamentarium for managing TMJ dislocation before more invasive surgical procedures of direct exposure of TMJ is tried.

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