The occasional temporomandibular joint reduction

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INTRODUCTION

Although uncommon, temporomandibular joint (TMJ) dislocation is a painful condition that requires prompt reduction due to its potential to compromise the airway, communication and eating. The TMJ is unique because it is the only joint in the human body that can dislocate without external force being applied to the patient. Dislocation of the TMJ can happen while yawning, eating and even kissing. TMJ dislocation is the displacement of the mandibular condyle from the mandibular fossa (also known as the glenoid fossa) so that it is unable to self-reduce.[1] A partial dislocation ('subluxation') of the TMJ often self-reduces.[2] A complete dislocation of TMJ is the sudden inability to close the jaw due to the anterior band of the articular disc mechanically obstructing the posterior translation of an anteriorly displaced condyle into the mandibular fossa.[3] A complete dislocation requires reduction.

CLASSIFICATION

TMJ dislocation can be classified unilateral or bilateral, but unilateral dislocations are far more common.[4] They can be further categorised based on the movement of the mandibular condyle with respect to the mandibular fossa. The translation of the mandibular condyle during a dislocation most often occurs anteriorly,[4,5] and other directions of mandibular condyle translation (medial, lateral, superior and posterior) are rare and commonly associated with trauma.[6,7]

TMJ dislocations can further be described as acute, chronic protracted, or chronic recurrent. The appropriate treatment depends on correctly classifying the type of dislocation. Acute dislocation of the TMJ is a new-onset dislocation which occurs spontaneously or due to trauma,[1] chronic protracted arises from an acute dislocation that goes unrecognised and unreduced for longer than 1 month,[8] and chronic recurrent dislocation is characterised by repeated episodes of dislocation with daily activities over time.[9] Overall, acute unilateral anterior dislocation is the most common type of dislocation.

Figure 1 illustrates the normal structural anatomy of the TMJ (a) and the deviation of the structural

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anatomy present in a unilateral anterior dislocation(b).

ETIOLOGY

Facial trauma, seizures, medication- induced dystonia and excessive mouth opening during yawning, laughing, vomiting, singing and iatrogenic mechanisms, namely dental procedures, endotracheal intubation, laryngoscopy and bronchoscopy, are classic mechanisms for TMJ dislocation.[1,4,5,9,10] Ehlers–Danlos syndrome, orofacial dystonia, myotonic dystrophy, multiple sclerosis and Marfan syndrome are medical conditions associated with an increased risk for TMJ dislocation[1,4,5,11-15] In many cases, underlying pathological imbalances in neuromuscular function and/or structural deficits can contribute to TMJ dislocation.[1,5] Unfortunately, patients who experience one TMJ dislocation are at risk of recurrence of the condition.

CLINICAL FEATURES AND DIAGNOSIS

The diagnosis of TMJ dislocation is primarily based on a focused history and comprehensive clinical examination and it is confirmed by imaging studies.

A focused history should determine the duration of symptoms, potential causes and any history of TMJ dislocation or pathology.

The symptoms: severe pain in the pre-auricular region, limited jaw movements, impaired speech, decreased ability to chew and muscle spasms. Patients will often have trouble closing their mouths, drool, have difficulty speaking and may be anxious.

The signs: the mandibular condyle(s) will not be palpable within the mandibular fossa (s) and a preauricular depression or dimpling can often be palpated and visualised. If the dislocation is bilateral, the patient will present with an elongated

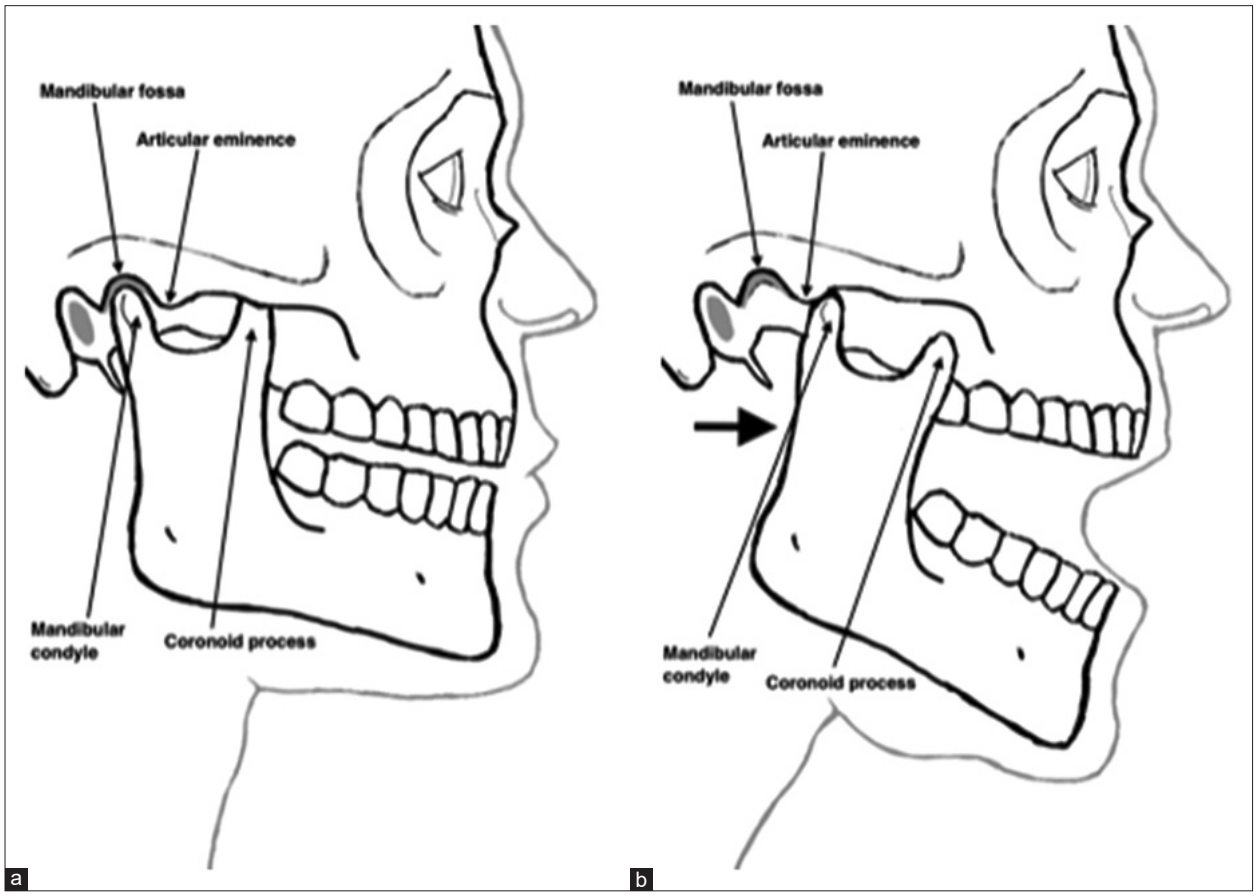


Figure 1: (a) Normal structural anatomy of the temporomandibular joint and (b) deviation of the anatomy present in an anterior unilateral temporomandibular joint dislocation. Adapted from Pendery, L, Mount Sinai Emergency Medicine. The Syringe Technique for TMJ Dislocation. https://sinaiem.org/the-syringe-technique-for-tmj-dislocations/. Published 2016. Accessed September 16, 2019.

face and a prognathic profile, with an anterior open bite and a loss of the height of the bite between the back teeth. [16] Patients with unilateral dislocation present with a deviated mandible (contralateral to the dislocated joint) and a crossbite. [16]

Imaging

A panoramic X-ray can confirm the diagnosis of a dislocated TMJ.[17,18] If panoramic X-ray is unavailable, the following plain x-ray views can confirm the diagnosis: transpharyngeal, transcranial, reverse Towne and submental-vertex.[17,18]

If plain x-rays look normal, but a TMJ dislocation is still highly suspected, patients should be referred to a regional centre for craniofacial computed tomography (CT). A CT scan is the first-line imaging modality in the setting of traumatic dislocation in order to rule out a condylar fracture. A CT scan can also be used to look at degenerative in the TMJ in the setting of chronic dislocations.[17]

Magnetic resonance imaging is used to evaluate patients with persistent symptoms following an acute dislocation, those with chronic recurrent dislocations to evaluate for underlying degenerative changes or internal joint derangement,[17,18] or for those with a suspected open lock.[3]

MANAGEMENT

Since the majority of clinical TMJ dislocations involve anterior translation of the mandibular condyle, this section will only discuss the management of acute, chronic protracted and chronic recurrent anterior TMJ dislocation. Reduction techniques for unilateral and bilateral TMJ dislocations are the same; for patients with a bilateral dislocation, it is generally recommended to reduce one joint at a time.[4]

Table 1: Equipment needed

IV diazepam or midazolam drawn up with a needle and syringe
Lidocaine 2%
Non-sterile gloves
Non-sterile 4x4inch gauze
5cc syringe
10cc syringe
tongue depressor
2 tensor bandages and 2 clips

Acute dislocation

Acute TMJ dislocations caused by trauma can be associated with concomitant injury, including head and cervical spine trauma and thus should not be reduced until the provider is confident that no other injuries (especially c-spine injuries) are present.[6] Although acute anterior TMJ dislocation is a painful condition, it is relatively easy to manage conservatively with analgesia and manual reduction.[4,5] However, the longer the mandible is dislocated, the more difficult it will be to reduce due to muscle spasm and the greater the risk of recurrence;[4] hence, the timely reduction is necessary.

An acute dislocation can be successfully reduced without adjunctive anesthesia or analgesia if there is manageable muscle spasm, pain and anxiety. If necessary, average-sized adult patients can be premedicated with diazepam 5–10 mg IV or midazolam 3–5 mg IV with an opioid such as fentanyl 0.5–1 mcg/kg IV.[19]

Local anesthesia can be administered as an alternative or an adjunct to general anesthesia to reduce pain and muscle spasm and facilitate reduction. A local anaesthetic (e.g. 2-5 mL of 2% lidocaine) can be injected into the affected joint(s) (behind the condylar neck approximately 1 cm below the articulating surface of the condyle to cause a auriculotemporal nerve block)[4] [Figure 2]; this may allow the joint to reduce spontaneously.

Different techniques have been described to manually reduce a TMJ dislocation, including the Hippocratic method, which is the most widely described technique, wrist pivot reduction, interdental block, gag technique. [4,20-22] Successful reduction techniques may vary from patient to patient, so multiple techniques may need to be performed.

Hippocratic method: See Table 1 for equipment needed in these procedures

1. Wrap each thumb with multiple layers of gauze.
2. Stand anterior to the seated patient at the 11 o'clock position. Place gauze-wrapped thumbs on the occlusal surface of the patient's molar or

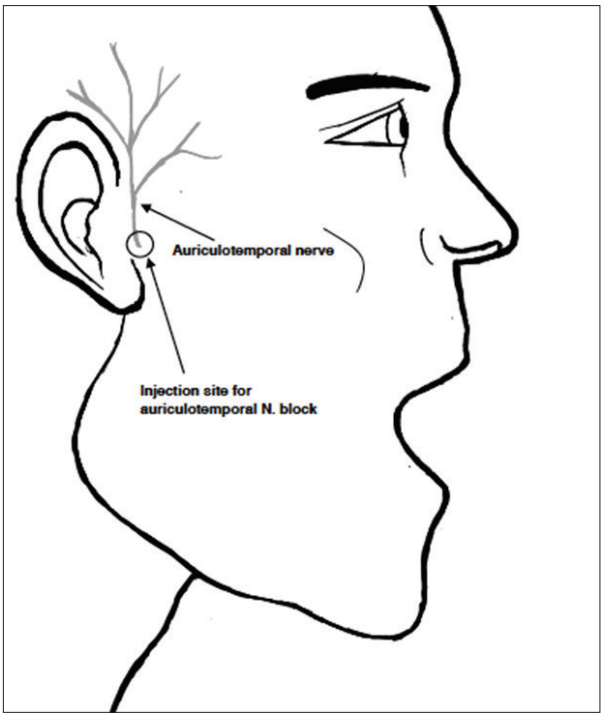


Figure 2: Local anaesthetic injection site for the auriculotemporal nerve block (behind the condylar neck approximately 1 cm below the articulating surface of the condyle to cause a auriculotemporal nerve block).[4]

retro-molar/ascending ramus and wrap fingers around the body of the mandible.

3. Apply a gentle downward constant force with increasing pressure to overcome the spastic muscles and distract the mandibular condyle from the anterior slope of the articular eminence. At the same time elevate the chin with your fingers and apply a constant posterior force to the mandible to reposition the mandibular condyle in the glenoid fossa[4,21] [Figure 3].

Wrist pivot reduction:

1. Stand anterior to the seated patient. Place both thumbs on the patient's chin. Place the second, third and forth fingers of both hands bilaterally on the lower occlusive surfaces of the patient's molars.
2. While applying a gentle and constant upwards force with your thumbs on the patient's chin, exert a downwards pressure with your fingers on the patient's molars; this will cause a pivoting motion of the patient's mandibular condyle down the anterior slope of the articular eminence into the glenoid fossa[22] [Figure 4].

Syringe Technique:

1. Ensure the patient is seated. If possible, place a 5–10 cc syringe between the patient's upper and lower molars and ask them to bite down gently. The size of syringe depends on the patient's ability to open their mouth.
2. Ask the patient to roll the 5–10 cc syringe between their teeth to create a fulcrum between the syringe and their molars. If they are able to, the patient should continue to roll the syringe for a few minutes or until reduction is achieved; reduction typically occurs in <1 min.[20]

Gag technique:

1. Use a tongue depressor to trigger the patient's gag reflex. The gag reflex relaxes the muscles used to close the mouth, which can potentially allow for spontaneous reduction.[23] This technique is unlikely to be successful if is performed more than 30 min after the dislocation. [24]

Post-reduction management prevents recurrence of the condition and allows for the stretched or ruptured ligaments and capsule to strengthen and heal. If the patient is willing, a Barton bandage can be made out of elastic bandages and worn by the patient for 3–7 days to immobilise the TMJ[4,19] [Figure 5 and Table 1]. Alternatively, a cervical collar can be worn for 1 week to immobilise the TMJ.[25]

Barton bandage application:

1. Ensure the patient is seated. Begin by placing and holding one end of the tensor bandage 2 cm superior to the patient's right temporal fossa. While applying the bandage always ensure there is tension in the bandage.
2. Wrap the tensor bandage clockwise, circumferentially around the patient's head on an angle (so that the bandage angles down towards the patient's occiput and then back up above the left temporal fossa and along the forehead). Do this once.
3. Continue wrapping the bandage clockwise, circumferentially around the patient's head a second time. This time, once you return to the patient's right temporal fossa, proceed by wrapping down the patient's cheek, around the patient's chin and up towards the left temporal fossa along their left cheek.

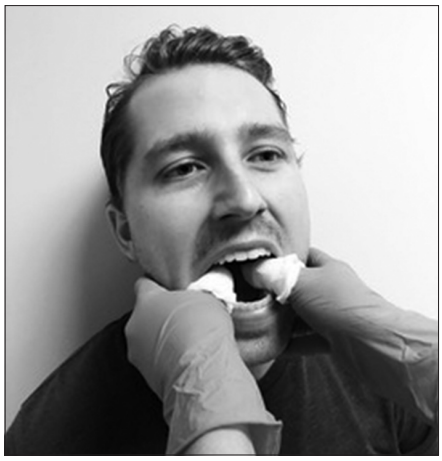


Figure 3: Hippocratic reduction method for an anterior temporomandibular joint dislocation as described in text. [4]



Figure 4: Wrist pivot reduction method for an anterior temporomandibular joint dislocation as described in text. [22]



Figure 5: Barton bandage post-temporomandibular joint reduction management as described in text. [4,19]

4. Continue applying the bandage overtop of the patient's head towards the back of their right ear, around the base of their occiput, along the left side of their mandible.
5. Continue applying the bandage around the front of the patient's chin and towards the back of their head along the right side of their mandible.
6. To finish, once the bandage has returned to the patient's occiput, arc it anteriorly towards their left temporal fossa and anchor it with clips or tape to the underlying bandage.

The most important post-reduction management factor is for the patient to avoid opening their mouth wide for 1 week.[4] Food should be cut into small pieces to prevent excessive chewing during this time. Furthermore, if the patient anticipates a yawn, they should place a closed fist under their chin to prevent the mouth from opening widely. During the post-reduction phase, the pain medication should be used as needed.

Chronic protracted dislocation

Muscle and joint fibrosis make a TMJ dislocation that has persisted for 3-4 weeks unlikely to respond to manual reduction.[26] Conservative techniques should, however, be attempted prior to referring the patient for surgery. Thus, the techniques outlined above can be attempted for a chronic protracted TMJ dislocation. Premedication is often required in these clinical situations.[26,27]

If manual reduction is unsuccessful, the patient should be referred to an oral maxillofacial (OMF) surgeon at a regional centre. Private OMF surgery clinics may offer necessary management options, but these may not be covered under provincial/territorial care plans and, thus, for many patients this will not be a feasible option. Many invasive techniques are outlined in the literature (open reduction, midline osteotomy, eminectomy, condylectomy, ramus osteotomies and total joint replacements) and the technique is best chosen by the surgeon.[27,28]

Chronic recurrent dislocation

Chronic recurrent TMJ dislocations should initially be managed with manual reduction of

the TMJ. Patients whose TMJ dislocations fail to respond to conservative methods should be referred to regional centres to explore minimally invasive techniques (botulinum toxin injection, intermaxillary fixation, autologous blood injection, exogenous sclerosants and prolotherapy).[26,27] Finally, if conservative and minimally invasive techniques do not resolve recurrent dislocations, open surgical treatment may be indicated. Currently, eminectomy procedures are the most promising invasive techniques to manage recurrent TMJ dislocations.[26,29]

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the journal. The patient understands that name and initials will not be published and due efforts will be made to conceal the identity, but anonymity cannot be guaranteed.

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