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IMAGING

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Dislocation of the Temporomandibular Joint and Relocation Procedures

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ABSTRACT
Temporomandibular joint (TMJ) dislocation requires prompt medical attention due to the crucial impact of airway, nutrition acquisition, and communication. Recognition of this injury by the practitioner, based on clinical presentation and history, is paramount for identification of accurate diagnosis and prompt treatment of TMJ dislocation. Relocation or reduction methods vary on the basis of the severity of the injury and whether it is an acute or chronic dislocation. **Key words:** condyle, glenoid fossa, hypermobility, jaw dislocation, temporomandibular joint, TMJ, TMJ dislocation

TEMPOROMANDIBULAR JOINT (TMJ) is a bilateral synovial joint that is responsible for jaw movement via articulation between the mandibular condyle and the temporal bone, specifically in the glenoid fossa (see Figure 1). Articular disc cartilage of the temporal bone supports the movement of the mandible and is a flexible cartilage that acts as a cushion between the bones' surfaces during movement. The center of the articular disc that receives the impact from the condyle on the joint is void of blood vessels and nerve endings, thus not sensitive to pain. The posterior aspect of the articular disc attaches to retrodiscal tissue that is rich in blood vessels and nerves, whereas the anterior aspect of the articular disc attaches to the pterygoid muscle. As the mouth opens, the mandible lowers via a rotational movement of the condyle within the glenoid fossa, resulting in a 20- to 30-mm opening of the mouth. For any additional opening of the jaw, movement of the condyle and the articular disc out of the glenoid fossa is required. With this action, the condyle and the articular disc

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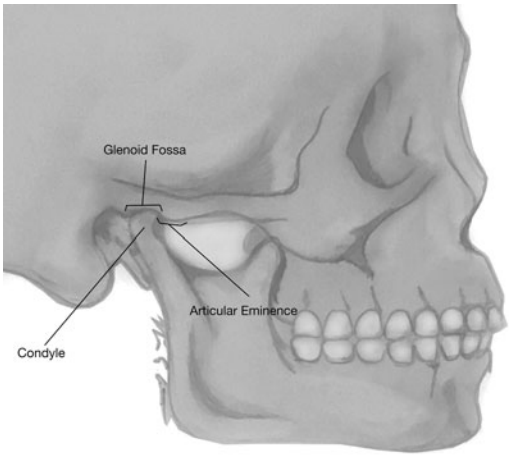

Figure 1. Temporomandibular joint in proper position; condyle in the glenoid fossa. Illustrations provided by Nicole Eaton.

travel forward through the glenoid fossa to the articular eminence, which is a convex bone located anteriorly to the fossa. Dislocation of the mandibular condyle occurs when the articular disc does not retract and remains in the anterior position, resulting in the retrodiscal pad being pulled into the TMJ between the mandibular condyle and the temporal bone. Dislocation of the mandibular condyle can occur in the anterior, posterior, lateral, or medial direction. The anterior direction of the mandibular condyle is the most commonly encountered in TMJ dislocations (see Figure 2).

INCIDENCE

The term "temporomandibular disorders" include various conditions associated with the "group of orofacial conditions affecting the temporomandibular joint and its associated structures" (Motta et. al., 2013, P. 4). The prevalence of TMJ instability in the general population is 25%–50% and has the highest incidence in middle-aged women (Awsare & Prakash, 2006). A reported annual incidence of TMJ dislocation is 5.3 per 100,000 patients presenting to emergency departments (Lowery, Beeson, & Lurn, 2004). Although the incidence is relatively low, it is crucial

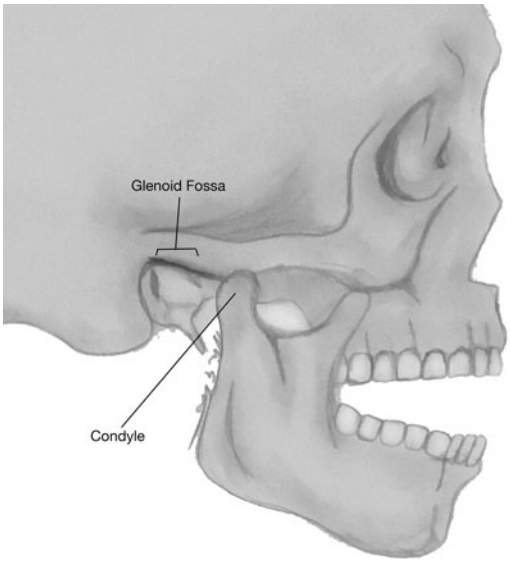

Figure 2. Anterior dislocation of the temporomandibular joint; condyle is anteriorly displaced from the glenoid fossa. Illustrations provided by Nicole Eaton.

to address TMJ dislocation because it has a vital impact specific to immediate factors of managing secretions for airway patency and pain management, as well as long-term factors of mastication required for eating and nutrition, and clarity of speech needed for effective communication.

MECHANISM OF INJURY

Temporomandibular joint dislocation occurs when the articular disc is displaced anteriorly to the glenoid fossa, resulting in the retrodiscal tissue being pulled into the TMJ and being compressed with each mandibular movement. As the retrodiscal pad being rich in blood vessels and nerves, this results in pain. Dislocation of the mandibular condyle results in significant limitation of jaw movement, as well as a clicking or popping sound as the condyle moves over the disc at the articular eminence position. When the articular disc consistently remains anterior to the articular eminence, the condyle is forced to remain posterior to the disc, thus the limiting movement of the mandible with a loss of the

clicking or popping sound. Articular disc displacement or a locked jaw occurs. Temporomandibular joint dislocation can occur as an acute, chronic, or reoccurring event and can be partial (subluxation) or complete (luxation) in degree as well as unilateral or bilateral in location. Further classification regarding TMJ dislocations includes the associated causes of spontaneous or iatrogenic origins. Although the direction of the dislocated condyle can vary, the most common is anterior dislocation (Akinbami, 2011).

PREDISPOSING FACTORS

Temporomandibular joint dislocation is affected by factors specific to the structure and integrity of the components of the joint: condyle, glenoid fossa, articular disc, and articular eminence (Akinbami, 2011). A breech in these components predisposes a patient to a higher incidence of this injury. More generic factors with a higher incidence including the patient's age (middle-aged or advanced), dentition (unstable), and gender (female) are also key contributors.

Pradhan, Jaisani, Sagtani, and Win (2015) identify six categories of predisposing factors to TMJ dislocations: congenital weakness in articular ligaments, iatrogenic factors, trauma, drug-induced, physiological, and systemic factors. Iatrogenic causes include prolonged oral procedures, traumatic extractions, and manipulation under general anesthesia following procedures such as gastrointestinal endoscopy, bronchoscopy, airway manipulation, anesthetic inductions and pulmonary function testing. Injuries associated with trauma to the mandible or the joint components result in tissue inflammation, muscle spasms, fracture, or crushing injuries that alter the function of the joint. Drugs, primarily antipsychotics and neuroleptic medications, can cause dystonia-associated TMJ dislocation. Physiological actions associated with the jaw open in an exaggerated state such as with yawning, coughing, vomiting, laughing, chewing, or passionate kissing are frequent. Finally, systemic conditions such as epilepsy, arthritis, or other causes of involuntary muscle contraction also make patients prone to TMJ dislocations.

CLINICAL FEATURES/SYMPTOMS

Most TMJ dislocations are due to traumatic events such as physical assault, falls, and motor vehicle accidents. Non-trauma-related TMJ dislocations can occur as a result of excessive and/or prolonged mouth opening that can occur during a yawn, dental procedures, or surgical procedures when the jaw is opened excessively to maintain an airway. Dislocation can also occur spontaneously simply during laughing, eating, vomiting, or singing.

Upon physical examination, the patient is unable to close his or her mouth. Most TMJ dislocations occur anteriorly and bilaterally. During anterior dislocation, the mandible will protrude anteriorly. The patient will complain of masseter muscle spasm and discomfort. Because of this, salivation can be extreme and communication will be very difficult (Chhabra, Chhabra, & Gupta, 2015). A preauricular depression or dimpling can often be visualized and palpated (Lee, Shoenberger, & Wagner, 2015). In rare cases, dislocation can be unilateral. During unilateral dislocation, the practitioner will typically see the chin deviate laterally depending up which condyle is dislocated.

TYPES OF DISLOCATION

Dislocations can be anterior or posterior. In addition, a dislocation can occur when the head of the condyle is medial, lateral, or superior to the glenoid fossa. Dislocations can also be bilateral or unilateral. In clinical practice, the practitioner will mostly see bilateral anterior dislocations. Dislocations can also be classified as acute, chronic, or recurrent. Temporomandibular joint dislocation results when the mandibular condyle loses contact with its articulations. Dislocations can be defined as partial (subluxation) or complete (luxation). Anterior dislocations are the most common type. During anterior dislocation,

imaging will show a condylar head that is displaced anteriorly from the glenoid fossa. This type of a dislocation will occur when the mouth closes after being in an extreme opened position.

Posterior dislocations commonly occur when the patient receives a direct blow to the chin. This mechanism of injury causes the mandibular condyle to subluxate and move posteriorly toward the mastoid bone. This type of dislocation can also cause injury to the external auditory canal.

Superior dislocations occur when patients receive a direct blow to the mouth when the mouth is in a partially open position. These types of dislocations predispose the patient to fractures of the glenoid fossa. Patients with superior dislocations should be evaluated for facial nerve injury, intracranial hematomas, cerebral contusion, cerebrospinal fluid leaking, and eighth cranial nerve (acoustic) injury.

When a pattern of TMJ dislocation occurs, then it is classified as chronic recurrent. These dislocations are usually limited to patients who commonly engage in wide mouth opening. Once these dislocations occur, self-reduction will often fix the problem.

DIAGNOSTIC IMAGING

If available, panorex imaging can be used to diagnose TMJ dislocation (see Figure 3). If panorex films are not available, the practitioner can use plain radiographs to assist in making the diagnosis. Specifically, the practitioner will want to consider panoramic, transpharyngeal, transcranial, and submental-vertex views. Plain radiographs provide an anteroposterior, bilateral, and submental-vertex views. If plain radiographs show negative findings and the practitioner still suspects TMJ dislocation, computerized axial tomographic scan can be used to help evaluate the TMJ and well as other bones in the face. Magnetic resonance imaging is not commonly used to evaluate TMJ dislocation. It is generally reserved to evaluate chronic TMJ changes and internal derangement.

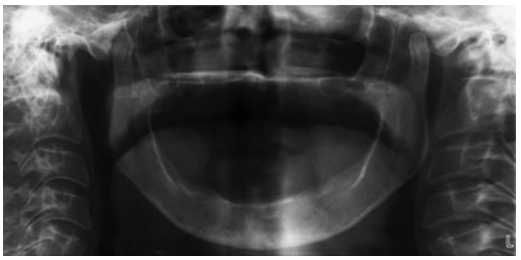

Figure 3. Labeled panorex demonstrating condyles out of the fossa with bilateral anterior temporomandibular joint dislocations. From "Treatment of Long Term Anterior Dislocation of the TMJ," by D. A. Baur, J. R. Jannuzzi, U. Mercan, and F. A. Quereshy, 2013, *International Journal of Oral & Maxillofacial Surgery, 42*(8), pp. 1030–1033. Copyright 2013 by Elsevier. Reprinted with permission.

NONSURGICAL RELOCATION PROCEDURE

There are several different nonsurgical methods to reduce a TMJ dislocation. The most popular method is the Hippocratic method, followed by the wrist pivot method (Oliphant, Key, & Chung, 2008). Conscious sedation can be considered to facilitate reduction techniques. In the Hippocratic method, the practitioner will stand in front of the patient with an anterior TMJ dislocation. With gloved hands, the practitioner's fingers are positioned laterally around the mandible. The practitioner's thumbs will be used to apply downward pressure (inferiorly) over the molars of the lower jaw using nonsterile gauze or a foam finger splint. The chin is rotated in an upward motion, followed by pushing the mandible posteriorly.

Another reduction technique to consider is the wrist pivot method. The practitioner will again stand in front of the patient. With gloved hands, the practitioner's thumbs are positioned at the apex of the mentum. The gloved fingers are placed on the mouth at the occlusive surface of the lower molars. A force is generated superiorly through the thumbs and inferior pressure with the fingers with a "pivoting" motion at the wrists until successful reduction is achieved.

One conservative technique to consider is stimulation of the gag reflex. This technique involves the use of a dental mirror. The mirror is swept across the soft palate to induce a gag reflex. This method is generally safe, speedy, and most of all simple. When the gag reflex is initiated, this results in "auto-reduction" of the condyle. During this noninvasive technique, aspiration can be prevented. When the gag reflex is stimulated, the glottis is closed, the tongue is retracted, and respirations briefly ceased.

POSTREDUCTION CARE

After reduction techniques have been successful, care should be taken at reducing further dislocations for a 2-week period of time. Immobilization will help prevent further incidence. Cervical collars can be considered one conservative nonsurgical option. They are user-friendly, and the cost is considerable lower than other treatment modalities such as uncomfortable head/chin straps and taping. A cervical collar provides adequate immobilization without interfering with food intake, and clothing will help mask the appearance of this device. Cervical collars are indicated in the elderly population due to ease of use, and they do not interfere with nutrition.

CONCLUSION

Temporomandibular joint dislocation requires a comprehensive interview and examination to ascertain the cause, type, and location of the injury. Diagnostics such as panorex imaging, radiography, and computed tomography pinpoint examination location and validate examination findings. Dislocation can be painful, thus analgesics are recommended to decrease pain, anxiety, and muscle tightness and spasms, which are necessary for treatment. Most TMJ dislocations can be resolved by nonsurgical methods of manipulation including the Hippocratic and wrist pivot methods as well as the conservative technique of stimulating the gag reflex. Postreduction education and care focus on immobilization to minimize a repeated exaggerated jaw for 2 weeks to facilitate healing. Additional recommendations include a thorough and ongoing nutritional assessment to promote healing and address potential nutritional deficits. The practitioner should consider a dietary consult to provide individualized instruction.

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Dr. Ramponi has disclosed that she lectures on pain management for Gebauer Company. All other authors and planners have no financial relationships related to this article to disclose.