

# Dislocation of the mandible: A case report

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*Dislocation of the mandible is a possible complication of direct tracheal laryngoscopy. The temporomandibular joint (TMJ) is unique in that any movement of the bone always causes movement in both joints simultaneously. The entire TMJ is surrounded by a ligamentous capsule and is stabilized by 3 ligaments. Four muscles of mastication move the mandible with great power. The lateral pterygoid muscle has nearly horizontal muscular fibers and is chiefly responsible for dislocating the mandibular condyle and articular disc past the articular eminence into the infratemporal fossa, causing the patient great pain and distress. If mandibular dislocation should occur, prompt recognition and treatment of the dislocation is recommended. There are steps, used by dentists, which can be employed by the nurse anesthetist to relocate the mandible. The technique for intraoral bimanual relocation of the mandible is described.*

**Key words:** Mandibular condyle, mandibular dislocation, mandibular subluxation, temporomandibular joint, temporomandibular joint dislocation.

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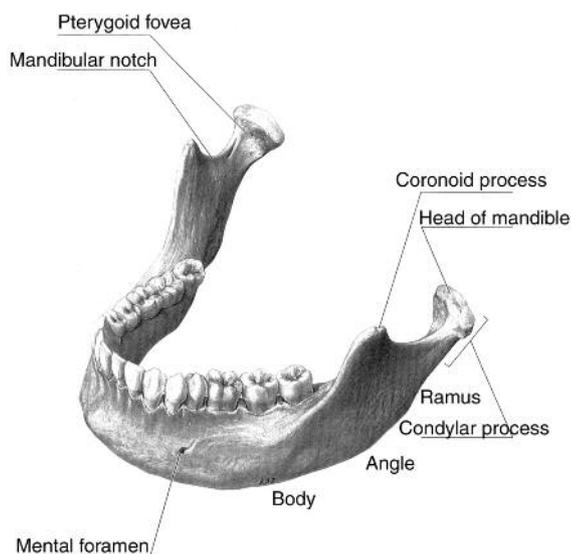
## Introduction

This is a case report of a patient who developed dislocation of the mandible during the course of a general anesthetic. Dislocation of the mandibular condyles may occur when direct laryngoscopy is employed. The anatomy of the temporomandibular joint (TMJ), the anatomy and etiology of dislocation, presenting symptoms, and the technique for bimanual reduction of the dislocation are reviewed.

## Case summary

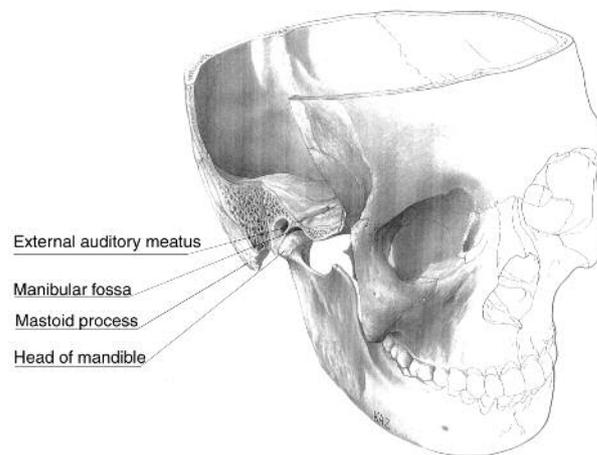
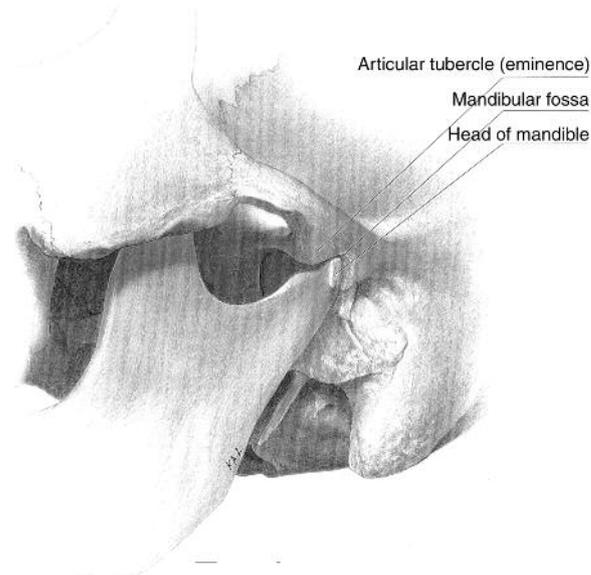
The patient was an edentulous 69-year-old man weighing 62 kg, who was experiencing urinary retention with chronic renal failure secondary to urinary obstruction. He was receiving hemodialysis via a left subclavian Hickman catheter, which became thrombosed. He was diagnosed with benign prostatic hypertrophy. Surgical procedures consisted of transurethral resection of the prostate and creation of an arteriovenous fistula. The patient had long-standing sarcoidosis, restrictive cardiomyopathy, restrictive lung disease, and intermittent atrial fibrillation. He reported no use of alcohol or tobacco. Premedication included intravenous metoclopramide 10 mg, midazolam 2 mg, and sodium citrate 30 mL by mouth. Maxillary and mandibular dentures were removed, and the patient was taken to the operating room.

**Figure 1. Bony anatomy of the mandible**



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**Figure 2. Anatomy of the temporomandibular joint**



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After application of standard monitors, the patient was preoxygenated for 5 minutes by face mask, after which anesthesia was induced with 250 mg of sodium pentothal and 16 mg of cisatracurium for neuromuscular blockade. The patient's trachea was intubated easily and atraumatically using direct visualization, which revealed a grade I laryngeal inlet. Anesthesia was maintained with inhaled isoflurane in oxygen, and nitrous oxide. The patient received 1,100 mL of crystalloid fluid, 500 mL of hetastarch, and 1 unit of packed red blood cells. Estimated blood loss was 610 mL. Occasional reductions in blood pressure were treated with phenylephrine intravenous boluses.

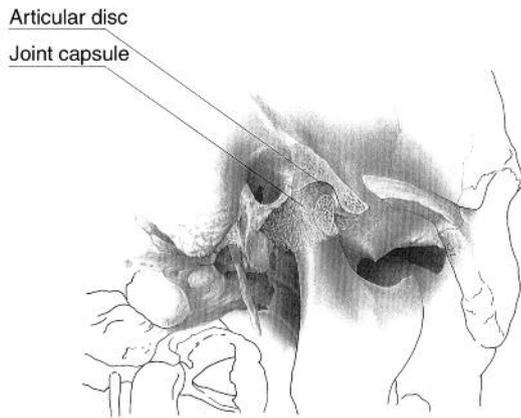
The case proceeded smoothly and uneventfully. The patient emerged from general anesthesia with protective reflexes intact, was extubated atraumatically, and brought to the postanesthesia care unit with oxygen by face mask. Approximately 30 minutes after admission to postanesthesia care unit, the patient became more conscious, and it became apparent that he was unable to close his mouth. The patient was able to speak but could not move his jaws in a normal range of motion. He reported bilateral pain and discomfort in the temporal region. Mandibular dislocation was recognized, and attempts were made to relocate the mandible with the patient awake. After several unsuccessful attempts, the decision was made to proceed with deep sedation.

The patient was oxygenated by face mask, and 100 mg of propofol was administered intravenously. The perimandibular musculature relaxed, and the mandible was bimanually reduced to normal neutral position. Dentures were replaced, and an elastic bandage wrap was applied to hold the mandible in place until the patient awoke fully from sedation. Upon awakening, the patient reported relief of muscular pain and spasm.

### Discussion

■ **Anatomy.** The *mandible* is the unpaired

**Figure 3. Temporomandibular joint and capsule**



The joint capsule is the fibrous sheet of connective tissue that encloses the temporomandibular joint. Its attachment extends around the glenoid fossa to around the condylar process. The inner surface of the capsule is lined by the synovial membrane, which has cilia-like folds and secretes the synovial fluid for lubrication of the joint. Covered by the joint capsule, an extension of the fibers from the disc is attached to the anterior border of the eminence and the condyle to near the anterior opening of the capsule. Thus in this area no fibers of the capsule directly connect the temporal bone and the mandible.

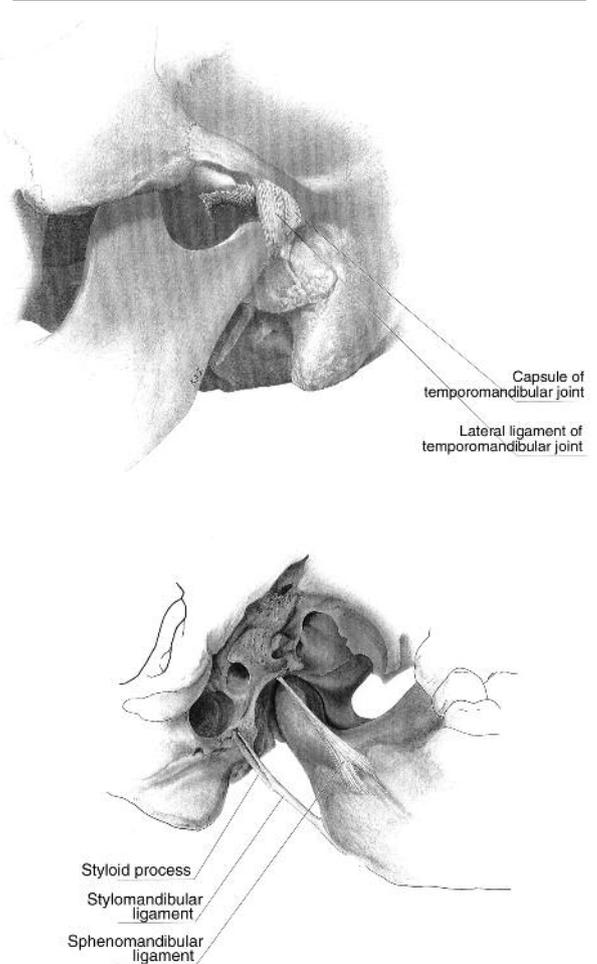
Around the glenoid fossa, the capsule is attached laterally to the lateral border of the fossa at the base of the zygomatic process and is attached posteriorly to the area anterior to the postglenoid process medial to the basal part of the spine of the sphenoid bone. As for the condylar attachments, the capsule is attached mediolaterally to the condyle below the poles and posteriorly to the posterior aspect of the condylar neck, where it is hard to distinguish the capsule from the connective tissue of the bilaminar zone.<sup>2</sup>

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bone of the lower jaw, consisting of the tooth-bearing body and the vertical ramus. The *ramus* receives the powerful muscles of mastication. The superior surface of the ramus forms the mandibular *condyle*, which articulates with the mandibular fossa of the temporal bone<sup>1-3</sup> (Figure 1). The ramus and the body meet posteriorly at the angle of the mandible. The body of the mandible is divided into 2 parts: the lower part is the base, and the upper part is the *alveolus*, which bears the teeth.

The mandible is a unique bone in that movement of any portion of the bone always causes movement in the 2 temporomandibular joints (TMJ) simultaneously. The TMJ is a simple joint with 2 synovial cavities: a superior cavity and infe-

**Figure 4. Ligamentous support of the temporomandibular joint**



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rior cavity, separated by an articular disc<sup>1-3</sup> (Figure 2). The entire TMJ is surrounded by a ligamentous joint capsule<sup>1-3</sup> (Figure 3). The capsule is lax between the articular disc and the temporal bone, but stronger both medially and laterally between the articular disc and the condylar process. The *lateral ligament*, *sphenomandibular ligament*, and *stylocondylar ligament* support, reinforce, and stabilize the mandible during movement<sup>1-3</sup> (Figure 4).

The *articular disc* is partly fibrocartilaginous but largely dense fibrous connective tissue. The articular disc is attached loosely to the posterior portion of the joint capsule but strongly attached to the anterior tendon of the *lateral pterygoid muscle*<sup>2-4</sup> (Figure 5). Four muscles of mastication move the mandible.<sup>2</sup> (Figure 6). The *masseter*, *temporal*,

and *medial pterygoid* muscles close the jaws for mastication. The temporal muscle retracts the mandible. During talking or chewing, the masseter holds the mandibular condyle in the mandibular fossa of the temporal bone. The lateral pterygoid muscle has nearly horizontal fiber direction and pulls the mandible forward (protraction). The upper head of the lateral pterygoid muscles also holds the articular disc against the mandibular fossa of the temporal bone.

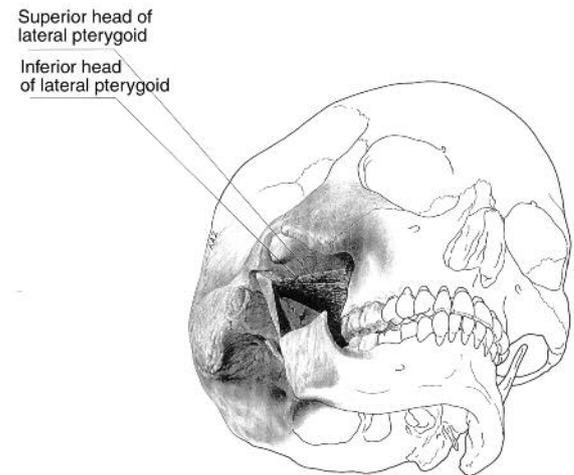
These powerful muscles balance each other and properly synchronize to bring about highly coordinated chewing and side-to-side grinding movements. The mandible moves like a hinge and rotates for normal chewing and talking. During wide mouth openings, such as during a yawn or shouting, the mandibular condyles will first rotate and then *translate* (slide) forward along the articular surface of the temporal bone.

■ *The anatomy of TMJ dislocation.* TMJ dislocation or TMJ subluxation occurs when forces, caused chiefly by the lateral pterygoid muscles, unilaterally or bilaterally protract the articular discs and mandibular condyles out of the mandibular fossa, causing both the condyles and the articular discs to cross over the articular eminence into the infratemporal fossa.<sup>59</sup> *Dislocation* is defined as displacement of the condyles past the articular eminence, which must be manually reduced, while *subluxation* refers to a self-reducing displacement of the condyles out of the mandibular fossa and past the articular eminence.<sup>10</sup>

Temporomandibular joint dislocation and subluxation, or *luxation*, are used interchangeably in dental terminology. Natural muscular neutral position and balance become altered due to this malposition of the muscles. The masseter and medial pterygoid muscles spastically contract, which locks the mandible in malposition, making it impossible for the patient to close his or her jaws, causing great discomfort and distress. Spastic muscular contraction also brings pressure and pain to the sensitive joint capsule synovial membranes.<sup>1</sup>

Temporomandibular joint dislocation can also be caused by acute mandibular trauma, prolonged dental or oral otolaryngological procedures, or the intraoperative use of the laryngoscope or bronchoscope.<sup>4,10</sup> Direct laryngoscopy can cause sufficient mandibular protrusion and stretch to the relaxed structures of the TMJ to cause dislocation of the TMJ.<sup>10</sup> Chronic dislocation also can occur periodically due to wide mandibular opening, such as with yawning, laughing, shouting, or chewing. Chronic dislocation can

**Figure 5. Relationship of the lateral pterygoid muscle to the articular disc**



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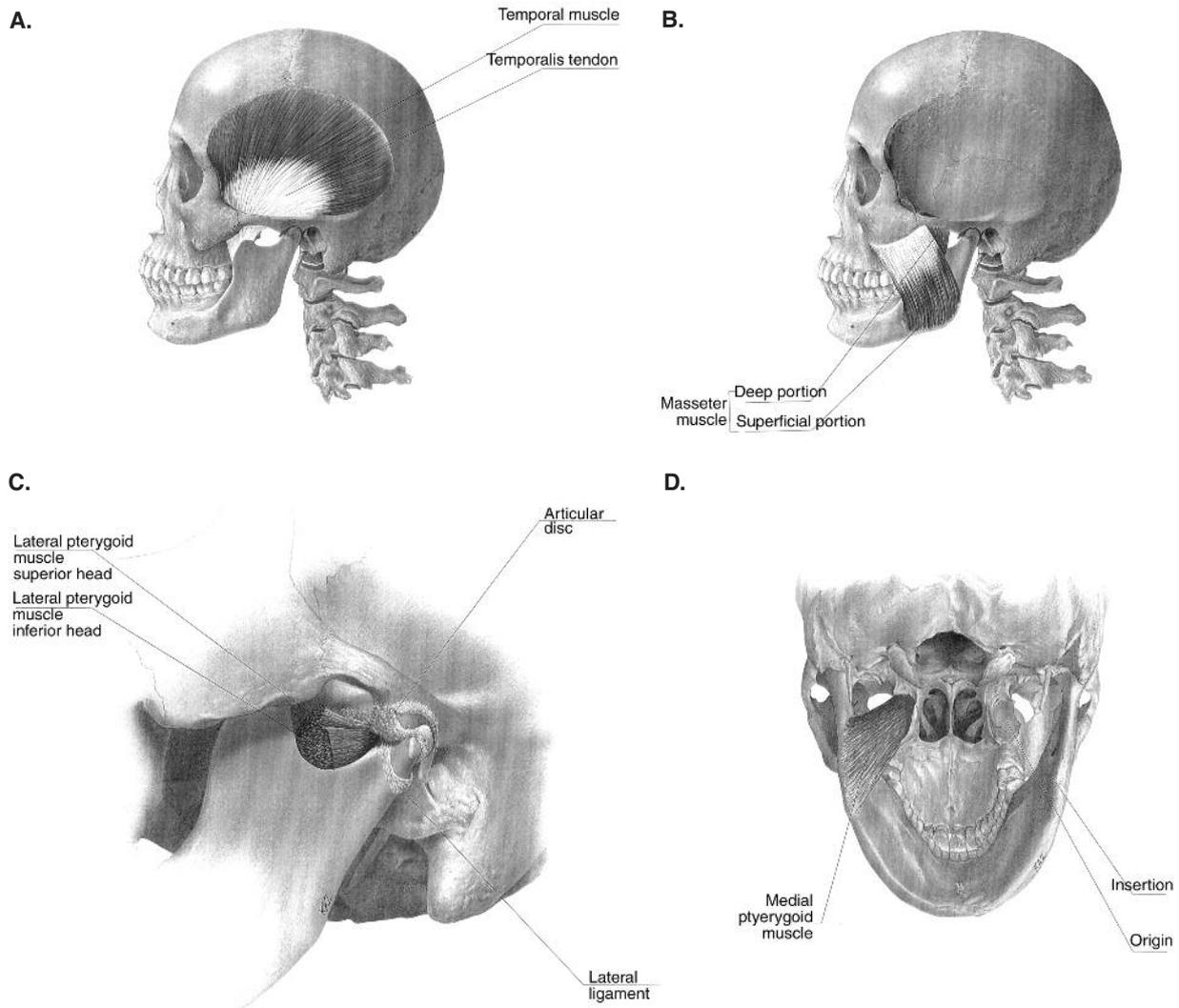
cause chronic myofascial pain and dysfunction and is a frequent cause for seeking medical help.<sup>1,11</sup> Myofascial pain related to TMJ muscular pain and spasm is the most common TMJ disorder.<sup>10</sup> Temporomandibular joint dislocation can occur unilaterally or bilaterally.

Acute and chronic dislocations are a result of internal derangement of the TMJ, such as permanent stretching and weakening of the TMJ capsular ligaments, masticatory muscle dysfunction, disharmony of the chewing surfaces of the teeth, or atrophy of the articular eminence.<sup>18</sup> In the edentulous patient, since, by definition, there is no opposing dentition, the mandible may become hypermobile and overclose. If overclosure is not corrected with prosthetic dentures, the TMJ capsule and lateral ligament can permanently stretch and loosen, which can lead to dislocation when force is placed on the mandible.<sup>12</sup>

It is likely that the TMJ dislocation described here was caused by a combination of overstretched and loose capsular and supporting ligaments, relaxed musculature from the induction of general anesthesia, along with neuromuscular paralysis and the forces of direct laryngoscopy.

■ *Treatment.* Treatment for TMJ dislocation ranges from bimanual relocation of the mandible to invasive surgical procedures<sup>4,8,10-16</sup> (Table 1). Conservative therapy usually is employed before more aggressive therapies are employed. Conservative therapy usually is inadequate for control of chronic

**Figure 6. The muscles of mastication**



Right lateral movement of the mandible is shown in view D. The medial pterygoid muscle is rectangular, arising from the area around the pterygoid fossa and inserting into the medial surface of the ramus. Close examination reveals that the origin is divided into a deep and a superficial portion. The deep portion arises mostly from the medial surface of the lateral pterygoid plate and partially from the pyramidal process of the palatine bone in the lower part of the anterior wall of the pterygoid fossa. The superficial portion arises from the tuberosity of the maxilla. The anterior margin of the muscle arises from the distal surface of the mandible facing the pterygoid process and covers one-fifth to one-third of the origin of the lateral pterygoid muscle. Its insertion is at the medial surface of the angle of the mandible, and in most cases its medial border is beyond the mylohyoid sulcus. The medial pterygoid is associated with the masseter at the inferior border of the mandible and with the lateral pterygoid muscle at its anterior part. Working in cooperation with the masseter, it acts to elevate the mandible for occlusion with bilateral contraction and to produce a lateral movement of the mandible with unilateral contraction. The muscle is innervated by the medial pterygoid branches of the mandibular division of the trigeminal nerve and its arterial supply is from the medial pterygoid branches of the mandibular division of the trigeminal nerve and its arterial supply is from the medial pterygoid branch of the maxillary artery.<sup>2</sup>

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TMJ dislocation, and surgery is the treatment of choice.<sup>8</sup> Surgery carries potential morbidity for the patient due to associated pain, swelling, and the

required disuse of the mandible postoperatively.

Intraoral bimanual relocation succeeded for the patient described. More force for reduction

**Table. Treatments for temporomandibular joint dislocations**

**Prophylactic**

- Prolonged rest of the temporomandibular joint for at least 1 month

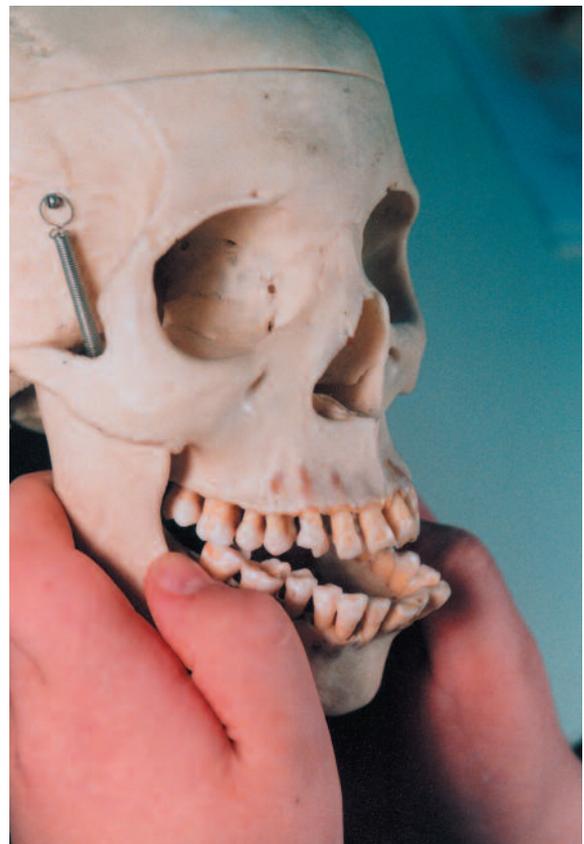
**Conservative**

- Intraoral or extraoral bimanual relocation
- Local injections of fibrosing solutions to tighten the joint capsule
- Botulinum toxin injections into the lateral pterygoid muscle

**Surgical**

- Lateral pterygoid myotomy
- Articular eminence augmentation
- Mandibular condyle anchoring procedures
- Removal of interfering mechanical factors to condylar movement

**Figure 7. Correct finger placement for bimanual relocation of the temporomandibular joint**



can be generated with the fingers positioned intraorally (Figure 7). An extraoral bimanual relocation technique also has been described.<sup>6</sup> Some patients are able to self-reduce their dislocated TMJ.<sup>14</sup>

The technique for intraoral bimanual reduction of the mandible is described as follows. Stand facing the patient. Have the patient sit with his or her back firmly against the wall, with jaws at a comfortable height relative to the height of your arms. With gloved hands, place your thumbs inside the mouth on the buccal surfaces of the alveolar ridges. Your remaining fingers should grasp the inferior surface of the body of the mandible. Apply firm, even downward pressure on the entire mandible. Rotate the chin upward and then push posteriorly. Picture in your mind the shape of the articular eminence with the mandibular condyles sliding over them.

This maneuver forces the condyles over the articular eminence and back into the mandibular fossa.<sup>6</sup> Be careful not to place fingers over the lower teeth or the superior surface of the alveolar ridge since the mandible may rapidly snap shut due to the muscular spasm in some patients after the condyles slide over the articular eminence. Carefully position both hands before starting the procedure.

Since the patient described was bedridden immediately after surgery, his position was supine with the back of the bed raised vertically to allow for a firm surface to manipulate the mandible bimanually after heavy sedation was induced.

**Summary**

A clinical case of bilateral mandibular dislocation was described. The anatomy of the temporomandibular joint, muscles of mastication, and ligamentous supporting structures were described. The strength of the muscles of mastication combined with failure of the supporting ligaments can be responsible for dislocation of the mandibular condyles from the mandibular fossae in an awake patient. The forces generated during direct laryngoscopy, when combined with stretched ligaments and neuromuscular paralysis, also can cause dislocation of the mandible. The technique for bimanual reduction of the mandible was detailed. The nurse anesthetist must be able to recognize mandibular dislocation and could assist with or treat a patient's mandibular dislocation.

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