3

TEMPOROMANDIBULAR JOINT

LEARNING OBJECTIVES

After completing this chapter, you will be able to do the following:

- Identify the joint kinematics of the temporomandibular joint
- Describe appropriate positioning, movements, and intentions of temporomandibular joint mobilization techniques
- Cite evidence supporting temporomandibular joint mobilization techniques

The temporomandibular joint (TMJ)—or craniomandibular joint, as some call it—is a synovial joint articulation between the mandible and the temporal bone. The TMJ is likely the most frequently used joint in the human body. TMJ dysfunction can therefore be quite problematic, frustrating the simplest activities of daily living. Also, the function of the TMJ is closely related to that of the cervical spine and vice versa.

Anatomy

The mandible bone is suspended from the temporal bones on either side of the skull by ligaments (figure 3.1). Each TMJ is divided into an upper joint space and a lower joint space by the articular disc. The articular disc is a biconcave fibrocartilaginous structure occupying the space between the mandibular condyle and the mandibular articular fossa. Each joint space has a separate joint capsule

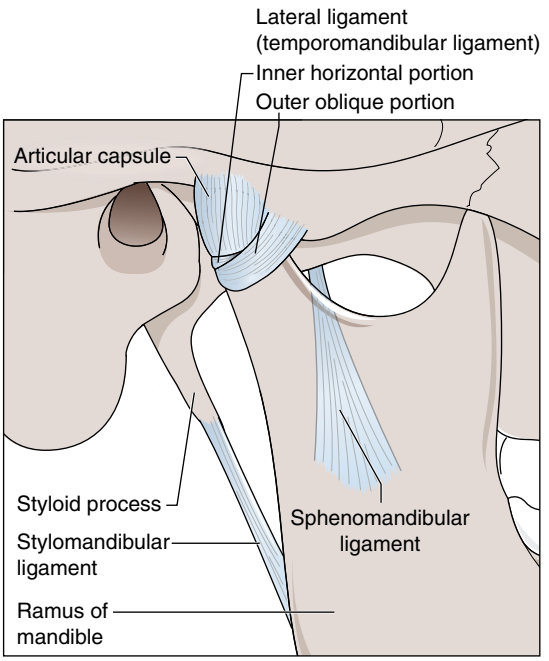


Figure 3.1 Ligaments of the TMJ.

with its own synovial lining. The lower joint is formed by the mandibular condyle and the inferior surface of the articular disc. The actual articulation with the temporal bone is indirect through the disc, and together with the articular disc and temporal bone form the TMJ. The lower joint space functions as a ginglymus (hinge) joint and an upper joint classified as an amphiarthrodial (plane) joint.

The lateral pterygoid muscle (figure 3.2) is the primary muscle responsible for jaw opening (mandibular protrusion), whereas the masseter and temporalis muscles (figure 3.3) are the primary muscles for jaw closing (mandibular retrusion). The masseter and temporalis muscles are also principal muscles of mastication.

Joint Kinematics

The function of the TMJ complex is unique in that movement in each of the joints is interdependent, simultaneous, and influenced significantly by each joint as well as by the occlusal surfaces of the teeth, cranium, and cervical spine. The arthrokinematics of the TMJ are complex because of the 3 degrees of freedom as well as the interdependent nature of the bicondylar joint structure. The motion in the lower joint space (articulation between the convex mandibular condyle and concave inferior surface of the articular disc) is primarily rotation. The motion in the upper joint space (articulation between the concave superior surface of the articular disc and the concave inferior surface of the articular fossa) is primarily translation between the disc and the articular eminence. The possible movements of the mandible are depression (mouth opening), elevation (mouth closing), protrusion, retrusion, and lateral deviation to each side.

- *Mandibular depression* (mouth opening) is believed to occur in 2 phases, a rotation phase and a translation phase (figure 3.4*a*). With initial mouth opening, the condylar head rotates under the inferior surface of the articular disc (lower joint motion). This usually occurs in the first 35 to 50% of available opening. Once the capsular ligaments restrict further rotation of the mandibular head on the disc, the condyle and disc (condyle–disc complex) move together and translate anteriorly and inferiorly on the articular eminence (upper joint motion) to complete the final 50 to 65% of opening. Therefore, with mouth opening, an initial rotation motion in the lower joint is followed by a translation motion in the upper joint.

- *Mandibular elevation* (mouth closing) arthrokinematics occur in reverse order to mandibular depression—an initial translation motion in the upper joint is followed by a rotation motion in the lower joint.

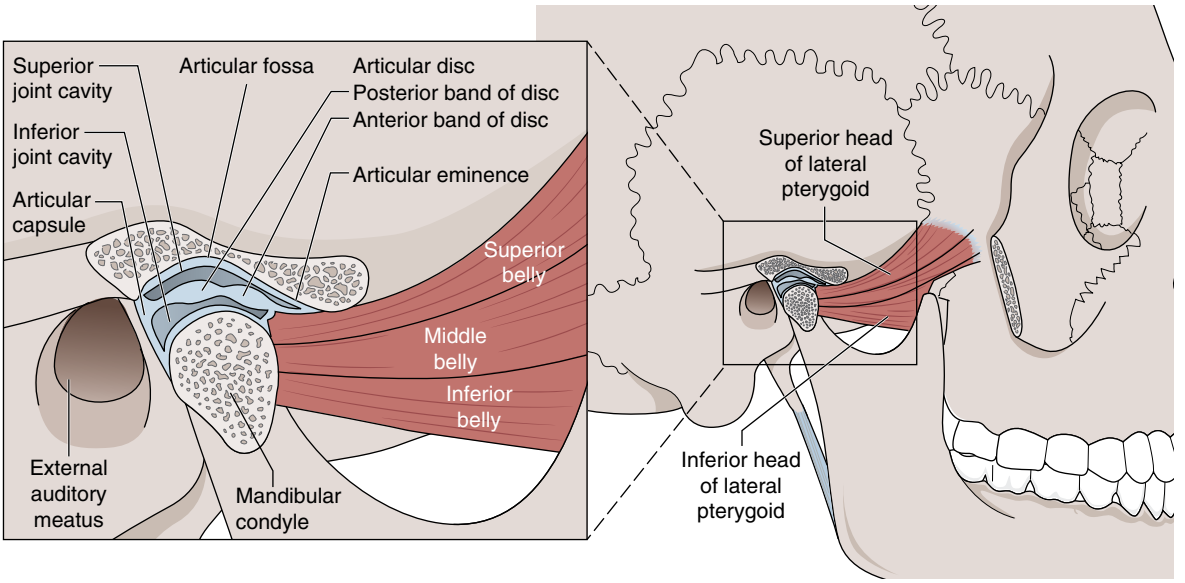


Figure 3.2 Anatomy of the TMJ joint.

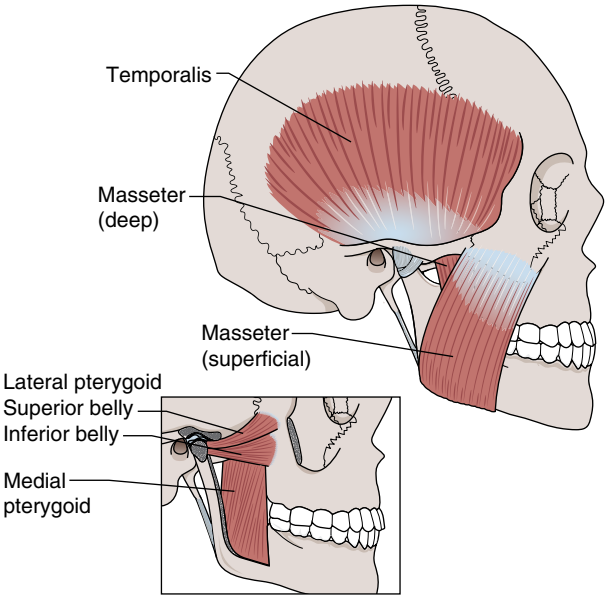


Figure 3.3 Muscles of the TMJ involved in mastication.

Mandibular protrusion is the movement of sliding the mandible and lower teeth anteriorly relative to the maxilla and upper teeth (figure 3.4*b*). During protrusion, the condyle and disc translate anteriorly and slightly inferiorly until the complex abuts the articular eminence. Therefore, this motion is solely in the upper joint of the TMJ.

Mandibular retrusion is the reverse of mandibular protrusion. It is the movement of the mandible and lower teeth sliding posteriorly relative to the maxilla and upper teeth (figure 3.4*c*). During this movement, the mandibular condyle and the articular disc translate posteriorly and increase the space between the anterior condyle–disc complex and the articular eminence. The posterior aspect of the complex approximates the posterior glenoid spine and compresses the soft tissue between the bony components of the posterior joint. Again, this motion is solely in the upper joint of the TMJ.

Lateral deviation/excursion is the lateral movement of the mandible from side to side, sliding the lower teeth laterally relative to the upper teeth (figure 3.4*d*). The direction of lateral deviation is named for the side that the mandible is gliding toward. Lateral deviation/excursion occurs with small multiplanar movements because of the sloping of the articular eminence and happens primarily as a side-to-side translation. Lateral deviation/excursion of the mandible is typically combined with slight rotations. This rotation most likely occurs in the upper portion of the joint because of the laxity of the joint capsule. Therefore, right lateral deviation is the movement of the mandible (and lower teeth) to the right of the maxilla (and upper teeth).

Clinical Tips

These tips apply to all intra-oral TMJ techniques:

- An important part of relaxing the client is to provide instruction on what the technique involves.
- Give the client frequent breaks to swallow.
- Prior to beginning the technique, the clinician and client should agree on signals to use during the technique. For example, a thumb-up sign indicates the client is doing fine; a thumb down indicates the technique is painful or that the client needs a break.
- Unless otherwise noted, the client's head should be kept in a neutral position.
- The clinician's gloves should remain clean throughout the technique.
- Ask the client about any latex allergies, dentures, loose teeth, or fillings.
- During all thrust and nonthrust techniques (for any joint), be sure to maintain visual observation of the client's reaction to the technique.

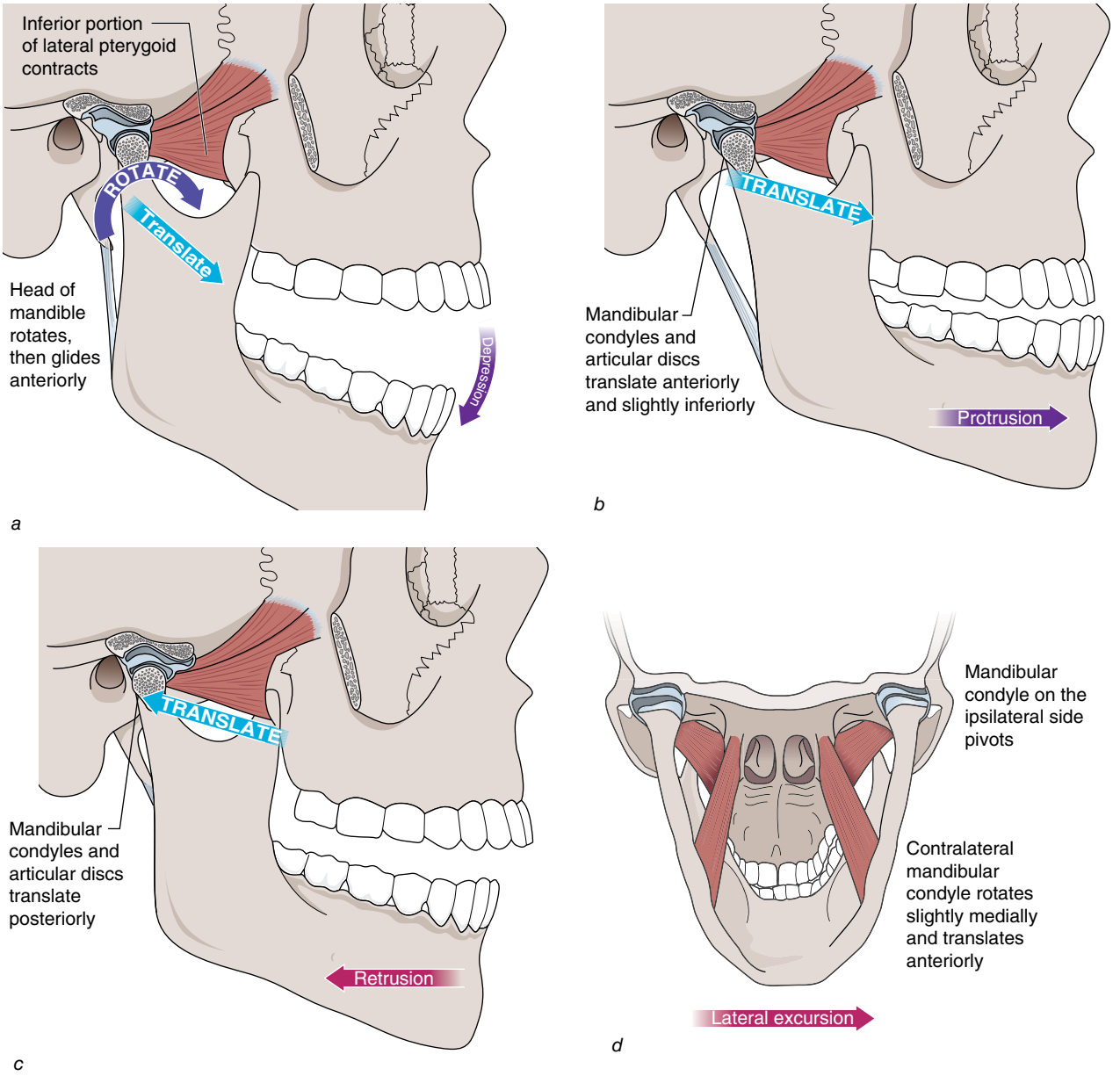


Figure 3.4 TMJ movements: *(a)* depression, *(b)* protrusion, *(c)* retrusion, and *(d)* lateral excursion.

TEMPOROMANDIBULAR JOINT ARTHROLOGY

Articular surfaces	Closed packed position	Resting position	Capsular pattern	ROM norms	End-feel
TMJ					
Lower joint Convex mandibular condyle articulating with concave inferior surface of articular disc **Upper joint** Concave superior surface of articular disc articulating with concave surface of articular fossa	Full occlusion	Teeth separated by 2–3 mm	Restriction in inferior glide	40- to 55-mm opening 3- to 6-mm protrusion 3- to 4-mm retrusion 10- to 12-mm lateral excursion	Soft tissue stretch for opening (mandibular depression) Bony during full occlusion of teeth (mouth closed/mandibular elevation Firm for protrusion and retrusion Capsular for lateral excursion

TMJ = temporomandibular joint; mm = millimeters

Inferior (Caudal) Glide

***VIDEO 3.1* in the web study guide shows this technique.**

Client position: Supine on treatment table with arms and legs relaxed.

Clinician position: Standing at client's head facing client.

Stabilization: The position of the body on the treatment table serves as a stabilizing force; the clinician's cranial hand and deltopectoral groove stabilize the cranium.

Mobilization: Clinician's distal thumb is placed on the superior aspect of the posterior teeth and fingers along the lateral mandible. Distraction force is applied in a caudal direction primarily via the thumb. Force is low-velocity oscillations and/or sustained stretch.

Goal of technique: To help with multiplanar joint mobility limitations, pain with joint compression, pain with chewing, and general stiffness or capsular restriction. This mobilization is effective for increasing general TMJ motion.

Notes: The mobilization is most effective if the client can relax. Palpation of the TMJ joint can provide the clinician with feedback on the technique.

Anterior (Ventral) Glide

Client position: Supine on treatment table with arms and legs relaxed.

Clinician position: Standing at client's head facing client.

Stabilization: The position of the body on the treatment table serves as a stabilizing force; the clinician's cranial hand and deltopectoral groove stabilize the cranium.

Mobilization: Clinician's distal thumb is placed on the superior aspect of the posterior teeth and fingers along the lateral mandible. Distraction force is applied in a caudal-anterior direction primarily via the thumb. A slight initial caudal force is implemented prior to anteriorly directed force. Force is low-velocity oscillations and/or sustained stretch.

Goal of technique: To increase translation motion in the upper joint; beneficial for end-range mouth opening (mandibular depression), protrusion, and retrusion motions.

Notes: The mobilization is most effective if the client can relax. Palpation of the TMJ joint can provide the clinician with feedback on the technique.

Medial Glide

Client position: Supine on treatment table with arms and legs relaxed.

Clinician position: Standing at client's head facing client.

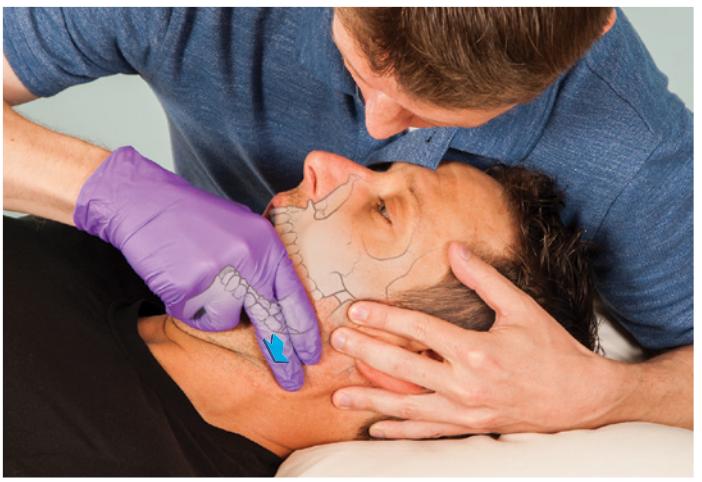
Stabilization: The clinician's cranial hand and deltopectoral groove stabilize the cranium.

Mobilization: Clinician's distal thumb is placed on the superior aspect of the posterior teeth, with the second and third fingers on lateral aspect of mandible with cranium stabilized. Distraction inferior followed by medial direction imparted primarily via second and third fingers extra-orally (finger over finger placement if needed). Force is inferior distraction followed by medial glide of condyle. Force is low-velocity oscillations and/or sustained stretch.

Goal of technique: To increase medial/lateral joint mobility and lateral excursion movement.

Note: The primary force is through the second and third fingers so broad (and comfortable) finger purchase is necessary.

Lateral Glide



Client position: Supine on treatment table with arms and legs relaxed.

Clinician position: Standing at client's head facing client.

Stabilization: The clinician's cranial hand and deltopectoral groove stabilizes the cranium.

Mobilization: Clinician's cranial thumb is placed on the medial aspect of the mandible, with the second and third fingers of same hand placed on lateral aspect of mandible with cranium stabilized. Distraction inferior followed by lateral direction imparted primarily via the thumb (on medial aspect of condyle) with stabilization from cranial hand. Force is inferior distraction followed by lateral glide of condyle. Force is low-velocity oscillations and/or sustained stretch.

Goal of technique: To increase medial/lateral joint mobility; particularly beneficial to increase contralateral lateral excursion motion.

Notes: The primary force is through the thumb, so broad (and comfortable) thumb purchase is necessary. Ensure that hand purchases are not unnecessarily uncomfortable.

Medial/Lateral Glide (Extra-Oral)

Client position: Supine on treatment table with arms and legs relaxed.

Clinician position: Standing at client's head (more cranial than inferior and anterior glides).

Stabilization: The position of the body on the treatment table serves as a stabilizing force; the clinician's cranial hand and deltopectoral groove stabilize the cranium.

Mobilization: Clinician's thenar eminence is purchased against the lateral mandible with the cranium stabilized. The thenar eminence imparts a medially directed force while the cranium is stabilized. Force is medially directed (or relative lateral force on contralateral TMJ). Force is low-velocity oscillations and/or sustained stretch.

Goal of technique: To increase medial/lateral joint mobility; particularly beneficial to increase contralateral lateral excursion motion.

Notes: The primary force is the heel of the hand extra-orally, as described, so broad (and comfortable) heel of the hand purchase is necessary. Primary stabilization will be with clinician's deltopectoral groove and cranial hand. As always, broad hand purchase is advised for comfort.

Clinical tip: The clinician should be cautious of imparting an inferior distraction force if this is not warranted. Using the heel of the hand can encourage this inferior distraction. As with all mobilization/manipulation techniques, the clinician should monitor for immediate and latent response to treatment, modifying treatment accordingly.

Go to the web study guide and complete the case study for this chapter. The case study discusses a 50-year-old female with right-side jaw pain.

EVIDENCE FOR MANUAL THERAPY OF VARIOUS TEMPOROMANDIBULAR JOINT PATHOLOGIES

Study	Clients	Intervention and comparison (if any)	Outcome(s)
Utilization of thrust and nonthrust mobilization for various temporomandibular pathologies: Grade B			
Martins et al., 2016 (Level 1a)	8 studies (375 clients)	Musculoskeletal and osteopathic manipulative techniques versus various control groups	A significant difference ($p < 0.0001$) and large effect on active mouth opening and on pain during active mouth opening in favor of musculoskeletal manual techniques when compared to other conservative treatments for TMD.
Calixtre et al., 2015 (Level 1a)	8 studies	Myofascial release, soft tissue techniques, TMJ mobilizations, cervical and thoracic spine mobilizations versus various control groups	Moderate-to-high evidence that MT techniques are effective for pain and pain pressure threshold.
Armijo-Olivo et al., 2016 (Level 1a)	48 studies	Various MT treatment approaches versus various control groups	• MT targeted to the orofacial region in myogenous TMD: improved mouth opening and reduced jaw pain from baseline in all 3 groups; no superiority of intervention over control. • MT mobilization of the cervical spine and myogenous TMD: cervical spine mobilizations drastically decreased pain intensity and pain sensitivity immediately posttreatment. • MT plus jaw exercises in arthrogenous TMD: MT plus exercises significantly increased active mouth opening; symptoms and ROM compared to various controls. • MT and mixed TMD: mixed results for pain, mouth opening, and ROM across studies and treatment types. • MT plus exercises for mixed TMD: MT targeted to the orofacial region or in combination with cervical treatment was better than home exercises for the jaw and neck alone or treatment to cervical spine alone for improving mouth opening. Overall conclusion: MT alone or in combination with exercises at the jaw or cervical level showed promising effects. No high-quality evidence was found, indicating there is great uncertainty about the effectiveness of exercise and MT for treatment of TMD.
Crane et al., 2015 (Level 4)	1 subject with past medical history of head and neck lymphedema and temporomandibular dysfunction	Multimodal treatment plan, including complete decongestive therapy, MT, therapeutic exercise, and home program	Improved mandibular depression, decreased head and neck lymphedema, improved deep neck flexor endurance, decreased pain, and improved self-rated function.

MT = manual therapy; ROM = range of motion; TMD = temporomandibular disorder