



Temporomandibular Joint Disorders (TMD): A Clinical Assessment

**Primary authors: Betsy Mitchel DC, DABCO
Cathy Cummins DC, DABCO
Ron LeFebvre DC**

Edited by Ron LeFebvre DC

Drawings by Alyssa Salava

Reviewed and Adopted by CSPE Working Group (2014)

Amanda Armington DC, Daniel DeLapp DC, DABCO, Lac, ND, Stan Ewald DC, Lorraine Ginter DC, Shawn Hatch DC, Ronald LeFebvre DC, Owen T. Lynch DC, Ryan Ondick DC, Joseph Pfeifer DC, Anita Roberts DC, James Strange DC, Laurel Yancey DC,

UWS care pathways and protocols provide evidence-informed, consensus-based guidelines to support clinical decision making. To best meet a patient's healthcare needs, variation from these guidelines may be appropriate based on more current information, clinical judgment of the practitioner, and/or patient preferences.

These pathways and protocols are informed by currently available evidence and developed by UWS personnel to guide clinical education and practice. Although individual procedures and decision points within the pathway may have established validity and/or reliability, the pathway as a whole has not been rigorously tested and therefore should not be adopted wholesale for broader use.

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Introduction

Temporomandibular disorders are a collection of syndromes associated with pain and dysfunction caused by problems with the temporomandibular joint and its associated musculature.

Disorders of the temporomandibular joint complex are the most common cause of orofacial pain. (Shephard 2013) Temporomandibular joint dysfunction (TMD) should be considered as a possible cause or contributing factor in patients with jaw pain, face pain or headaches (see CSPE Cervicogenic Headache care pathway). When TMD is suspected, a thorough exam of the temporomandibular joint (TMJ), neck and surrounding structures should be performed.

Although about 5-12% of people in the United States suffer from TMJ problems at any given time, only about 5% of people (mostly female) with symptomatic TMD will seek therapeutic care. Many cases are self-limiting and can resolve with little or no therapeutic intervention. (DeVocht 2013) About 10% of cases can become chronic in nature. (Shephard 2013)

Several studies have revealed shared signs and symptoms between TMD and headaches, specifically tension-type headaches. (Armijo-Olivo 2012)

The practitioner should keep in mind that a major challenge in the diagnosis and treatment of TMD is the potential involvement of many components which contribute to the condition, including structural, functional and psychological. The following is a guide for evaluating the structural and functional components of the temporomandibular joints in patients presenting with headache or jaw, face, or neck symptoms. Consultation or co-treatment with a dentist (oral and maxillofacial/TMJ specialist), psychiatrist, counselor or stress management specialist, and other healthcare professionals (massage therapist, acupuncture, naturopathic physician, PCP) can often be helpful in complex cases.

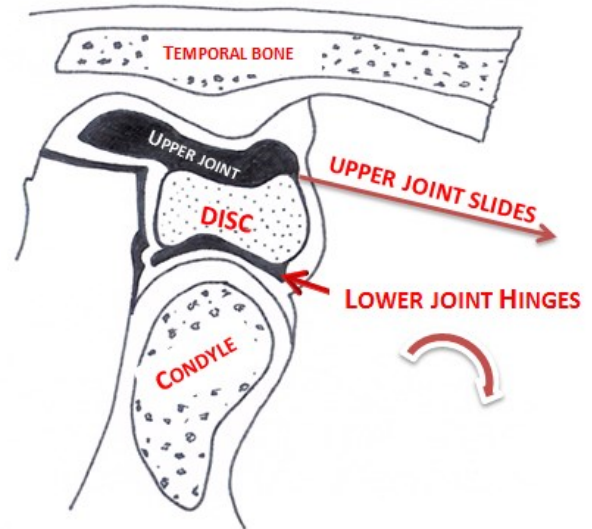
ICD-9 Code	ICD-9 Description	ICD-10 Code	ICD-10 Description
524.60	TEMPOROMANDIBULAR JOINT DISORDERS, UNSPECIFIED	M26.60	Temporomandibular joint disorder, unspecified
		M26.69	Other specified disorders of temporomandibular joint
524.61	ADHESIONS AND ANKYLOSIS (BONY OR FIBROUS)	M26.61	Adhesions and ankylosis of temporomandibular joint
524.62	ARTHRALGIA OF TEMPOROMANDIBULAR JOINT	M26.62	Arthralgia of temporomandibular joint
524.63	ARTICULAR DISC DISORDER (REDUCING OR NONREDUCING)	M26.63	Articular disc disorder of temporomandibular joint
524.64	TEMPOROMANDIBULAR JOINT SOUNDS ON OPENING AND/OR CLOSING THE JAW	M2669	Other specified disorders of temporomandibular joint
524.69	OTHER SPECIFIED TEMPOROMANDIBULAR JOINT DISORDERS	M26.69	Other specified disorders of temporomandibular joint
729.1	MYALGIA AND MYOSITIS, UNSPEC	M60.9	Myositis, unspecified
729.1	MYALGIA AND MYOSITIS, UNSPEC	M79.1	Myalgia
848.1	JAW SPRAIN	S03.4XXA	Sprain of jaw, initial encounter
830.0	CLOSED DISLOCATION OF JAW	S03.0XXA	Dislocation of jaw, initial

A Brief Review of Biomechanics

The muscular actions of the TM joint are very complicated and vary based on speed of motion, occlusional forces, posture and hyoid stabilization. Careful examination of the condylar movement in relationship to the disc and cranium as well as the level of muscular effort and coordination are essential in understanding biomechanical alterations in the TMJ.

Normal TMJ motion is generally described as hinging and sliding. The following looks at simplified joint biomechanics divided into two areas: the “lower joint” involving the disc and mandibular relationship and the “upper joint” involving the disc and temporal bone relationship.

Opening biomechanics are commonly described in two parts with the hinging of the lower joint occurring first followed by the translation of the upper joint. However, the relationship between these two movements is quite complex and may actually occur together and throughout the patient’s active range of motion. Muscular contraction leads to concurrent movement (mandibular depression) of the mandible and disc relative to the temporal bone.



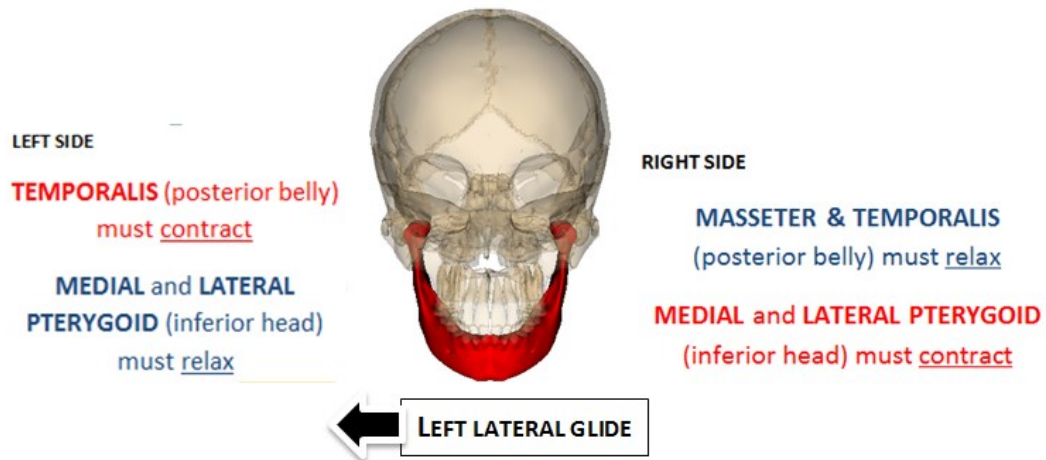
Initial opening motion is rotation or “hinging” and is thought to occur in the first 25 mm of movement. The relaxation of the elevator (closing) muscles, with gravity, drops the condyle which increases the joint space and decreases compression in the joint. Contraction of the suprahyoid muscles causes posterior rotation of the mandibular condyle under the disc. The second motion, translation, from 25-55 mm is where the mandibular condyle and meniscus move together anteriorly and inferiorly beneath the articular eminence of the temporal bone. Contraction of the inferior heads of lateral pterygoid pulls the condyles forward in the upper joint space. The disc is passively pulled forward by collateral attachments and is anchored to posterior wall of glenoid fossa and posterior aspect of mandibular rami.

TMJ protrusion involves the bilateral anterior translation of the mandibular condyles. Again, relaxation of the elevator (closing) muscles drops the condyle which increases the joint space and decreases compression in the joint and the inferior heads of external pterygoid contract pulling condyles forward in upper joint space while the disc is passively pulled by collateral attachments. The masseter, medial pterygoid, digastric and sternohyoid also play a role in protrusive actions.

Motion Example

Left lateral glide:

- Right side masseter and temporalis (posterior belly), and left side medial and lateral (inferior belly) pterygoids must relax
- Left temporalis must contract
- Right medial and lateral pterygoid inferior head must contract
- The right condylar head protrudes.



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Aberrant motion of left lateral glide, therefore, can be the result of short, hypertonic muscles preventing the glide or inhibited muscles not contracting in a coordinated fashion.

Taking a Thorough History

A thorough history, including the key components of both a medical and dental history, should be taken before any physical exam procedure. It is important to have a detailed understanding and working knowledge of each individual patient's symptom presentation. *As a baseline, the clinician should establish symptom "irritability," meaning how readily the pain can become escalated and how long it takes to subside.* This is very useful especially when determining physical evaluation and management strategies. (Shaffer et al 2014)

Location: Symptoms tend to be localized around the involved TMJ and the muscles of mastication. Often in chronic cases, dysfunction may occur bilaterally. If referral pain is occurring, it will typically follow a pattern involving structures also innervated by the trigeminal nerve and occurs on the side of irritation. Typical pain referral sites include the teeth, temple, ears, sinus areas, side of the neck, upper shoulder region, headaches around and behind the eyes, and pain radiating around the TMJ itself.

Onset: Onset can be recent or of a chronic nature and it is important to determine when and how the patient's symptoms began. Look for any history of jaw trauma or trauma to the head, neck and/or face. Macrotrauma can occur from a motor vehicle accident, dental surgery, chewing/biting injuries (e.g., accidentally biting an olive pit in a dinner salad) or a blow to the jaw. Microtrauma can occur from postures in which patients lean on their jaw, bruxism (teeth grinding), repetitive habits such as gum chewing, nail biting, sleep postures, or dental work (past or present), including braces, or wearing a night guard or splint. A chronic or chronic recurrent presentation may have underlying structural or dental issues that may need to be explored. Stress or anxiety may lead to episodes of jaw clenching. An appropriate psychosocial history may uncover key precipitating or sustaining psychological factors which may need to be further addressed. An insidious onset often may be a muscular issue, but underlying systemic or infectious diseases should be explored if indicated. Arthritides and diseases of the flat bones such as multiple myeloma and Paget's disease can manifest in the jaw.

Chronology: The pain may be acute, subacute or chronic or intermittent with exacerbations. Be sure to establish how many episodes have occurred and how long they have lasted. Also, note if there were any differences in presentation or symptoms between episodes. Intermittent pain may be related to postures, stress or specific precipitating events or habitual behaviors such as chewing or clenching.

Timing: Timing or pattern of the symptom onset and alleviation can be related to a variety of causes or influences. Symptoms that are worse upon waking may be due to clenching during sleep, or symptoms may be worse at the end of a stressful work day and significantly improved over a restful weekend.

Clinical Warning!!! Symptoms may be worse after eating. In such cases, ischemia of the masseter muscle due to temporal arteritis should be ruled out, especially in older patients with associated headaches and visual disturbances.

Quality: The pain may typically be an aching in the muscles of mastication, and/or sharp or dull pain in or around the TMJ. Sometimes brief, severe pain may be associated with joint compression or distraction. Occasionally, a patient may present with a *painless* global jaw restriction.

Aggravating or precipitating factors: Pain with chewing, especially solid objects such as ice, carrots and hard candy or chewy foods such as steak, bagels, jerky and gum can exacerbate a TM joint issue. Other aggravating factors include pounding sports such as running or soccer, patient habits or behaviors (e.g., nail biting, pen chewing, jaw clenching, leaning face or chin on hands, poor sleeping posture, or mouth breathing) or other activities (e.g. smoking a pipe, holding the phone with a cheek, playing violin or a wind instrument, use of a CPAP).

Associated symptoms:

- **Crepitus** (“Joint noise”) Crepitus can indicate degenerative problems such as disc damage (e.g. perforations), osteoarthritis, and in some cases end stage “bone on bone” grinding.
- **Clicking with movement.** If present, it is important to pay attention to the timing, the character of the sound and if the timing of the joint noise is predictable. Clicking may occur on opening, closing or both. Reciprocal clicking (clicking on both opening and closing) is usually associated with an anterior disc displacement with reduction. Clicking in the joint may be simply muscular or ligamentous and in the asymptomatic population may not necessarily indicate a need for treatment. However, it can be a sign of mechanical microtrauma or muscular imbalance. Unpredictable joint noise may indicate a potential unstable disc that may not be amenable to conservative care. Frequent or unsolicited joint cavitations may indicate mechanical dysfunction including joint hyper or hypomobility. Cracking or clunking joint sounds may indicate instability and instability may require a referral to a dentist with training or experience with TMD.
- **Locking.** Locking is the limited ability to open or close the mouth. This can be due to bony, discal, muscular, ligamentous, capsular, or other pathological causes. A mechanical obstruction generally causes the chin to deviate or deflect to the side of the obstruction.
- **Bruxism.** The patient may be grinding their teeth (especially at night) or clenching their jaw. The patient may be unaware or it may be obvious due to dental wear. In some cases they may need to ask a friend or spouse whether they have heard the patient grinding their teeth.
- **Headaches.** The most commonly reported headache locations associated with TMD are suboccipital and frontotemporal (Tellents 1994). Increased symptoms of pain-related TMD have been associated with increased frequency of temporal headaches (Schiffman 2014). Headaches have also been reported around and/or behind the eyes. Some patients describe a headache that comes up from the neck onto the skull (Steigerwald 1996).

The current International Headache Society’s ICHD3 describes headaches associated with TMD as “usually most prominent in the pre-auricular areas of the face, masseter muscles and/or temporal regions.” (IHS 2013) Patients, in some cases, complain of headaches without any symptoms in the TMJ. The referral patterns associated with the trigeminocervical nucleus and the neurological pathways involved cause difficulty in locating the exact pain generator in the neck and jaw.

Schiffman (2014) reports “A subgroup of headache patients experience increased headache following masticatory system overuse such as clenching of the teeth. Longitudinal studies have found that the development of TMD was accompanied by an increase in headache and that the presence of TMD at baseline predicted the onset of headache. Finally, treatment of the masticatory system has also been associated with a report of decreased headaches. These findings suggest that some headaches may be secondary to TMD.”

ICHD3 suggests that a diagnosis of TMD-related headache can be made based on clinical exam and/or imaging evidence of a pathology affecting the TMJ, masticatory muscles and/or associated structures.

“Evidence of causation demonstrated by at least two of the following:

- 1) headache has developed in temporal relation to the onset of the TMD
- 2) headache has significantly worsened/significantly improved or resolved in parallel with progression of the TMD
- 3) the headache is produced or exacerbated by active jaw movements, passive movements through the range of motion of the jaw and/or provocative maneuvers applied to temporomandibular structures such as pressure on the TMJ and surrounding muscles of mastication
- 4) headache, when unilateral, is ipsilateral to the side of the TMD.

Headache attributed to TMD is usually most prominent in the preauricular areas of the face, masseter muscles and/or temporal regions. Pain generators include the disc, DJD, joint hypermobility and regional myofascial pain. Headache attributed to TMD tends to be unilateral when the temporomandibular complex is the generator of pain, but may be bilateral when muscular involvement is present. Pain referral to the face is common. There is some overlap between headache attributed to TMD as a result of muscular tension and tension-type headaches. When the diagnosis of TMD is uncertain, the headache should be coded as tension-type headache or one of its sub-types (presumably with pericranial muscle tenderness).” (IHS 2013)

(See also the CSPE pathway on Cervicogenic Headache for other headache differentials.)

- **Additional symptoms.** These may include dizziness, earaches, tinnitus, hearing changes, throat soreness or hoarseness, neck pain or stiffness. Pain, swelling or stiffness in other joints may suggest rheumatoid arthritis or some other connective tissue disease (e.g. PMR, JRA, CPPD, psoriatic arthritis). Rare conditions of the TMJ may present locally or systemically, including infections spread from middle ear through the squamotympanic fissure and neoplasms (e.g., osteoma, chordoma, chondrosarcoma, metastasis).

Biopsychosocial assessment: The RDC/TMD recommends 5 questionnaires which are in the public domain to assess psychological and behavioral factors. These questionnaires were identified through a comprehensive search of the literature. Biopsychosocial risk factors have been associated with TMD chronicity. These risk factors, if present, should be addressed in the initial management plan because the risk of developing chronic pain may be reduced by early biobehavioral intervention. The RDC/TMD suggests that this screening should be considered mandatory in cases of persistent pain lasting 6 months or longer or for patients with a history of treatment failure. (Schiffman 2014)

Instruments for Biopsychosocial Assessment

Instrument	Purpose	Interpretation & Action
The Patient Health Questionnaire-4 (PHQ-4)	Screen for psychological distress due to anxiety and/or depression.	A cutoff of > 6, suggests moderate psychological stress, warranting careful observation; > 9 suggests severe psychological distress, triggering referral to a mental health provider
The Graded Chronic Pain Scale (GCPS)	Two GCPS subscales: 1) Characteristic Pain Intensity (CPI), measures pain intensity, and 2) a pain-disability rating which is based on the number of days that pain interferes with activity and on the impact on social, work, or daily activities.	A CPI score \geq 50/100 considered “high intensity”; refer to mental health provider. Pain Disability Rating: High pain and high interference, or moderate to severe disability (classified as Grades 3 or 4), warrants further investigation, and suggests that the individual is experiencing significant impact from the TMD on his or her life.
Pain drawing of the head, jaw, and body.	Screen for widespread pain.	Widespread pain suggests potential rheumatic disease (or other systemic conditions) or central sensitization and signals the need for a broader and more comprehensive assessment.
Oral Behaviors Checklist (OBC),	Assess the frequency of oral parafunctional behaviors.	High frequency may signal a guarded prognosis and, if secondary to psychological distress, result in referral to mental health specialist. Frequent parafunctional behaviors may also repetitively traumatize TMJ masticatory system and are strongly associated with chronic TMD pain.
Short form (8 items) of the JFLS	Assesses global limitations across mastication, jaw mobility, and verbal and emotional expression.	May be useful as an outcome marker.

These instruments are available on the RDC/TMD Consortium website.

The Physical Examination

A TMD diagnosis is based on the history, clinical findings in the physical examination, and laboratory and imaging results when indicated. Currently, there is no “gold standard” for arriving at a diagnosis of TMD.

The clinical signs and symptoms of joint noises (e.g., clicking, crepitus), limitation in ROM, mandibular gait (deviation/deflection), tenderness of the mastication muscles (masseter, temporalis, lateral pterygoid, medial pterygoid, suprahyoid), posterior cervical muscles, and temporomandibular joint areas should be recorded.

Practice Tip: Before beginning the physical, be sure to ask the patient whether or not they are allergic to latex. Some providers prefer to use gloves made of substances other than latex.

Practice Note: Assessment of the TMJ region utilizes procedures that are similar to treatment procedures. It is the experience of the authors that, more so than many other musculoskeletal assessments, these procedures may provoke unexpected reactions in some patients. For this reason, a PARQ should be given before the physical examination. Besides physical effects such as soreness, dizziness or an aggravation of symptoms, these responses include but are not limited to feelings of anger, sadness, sleepiness, or euphoria. These emotional releases may occur later spontaneously, unprovoked by the patient’s daily activities.

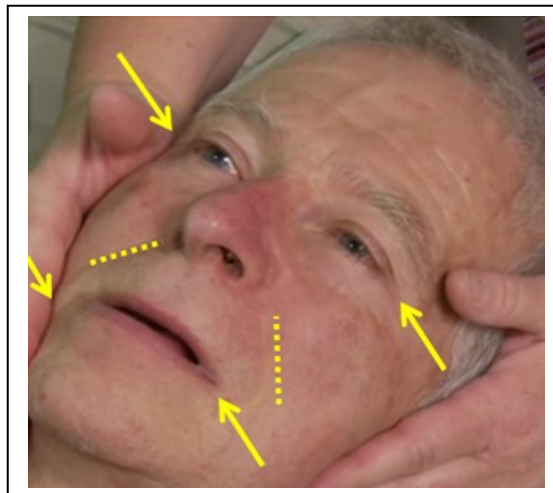
Key TMJ physical exam procedures (a complete assessment is required)

- Observation (and temperature if necessary)
- Range of motion & mandibular gait
- Joint palpation & muscular assessment of the TMJ, hyoid and cervical region
- Orthopedic/provocative tests
- Cervical and upper thoracic spine exam
- Full spine exam (optional)

OBSERVATION

Note the following:

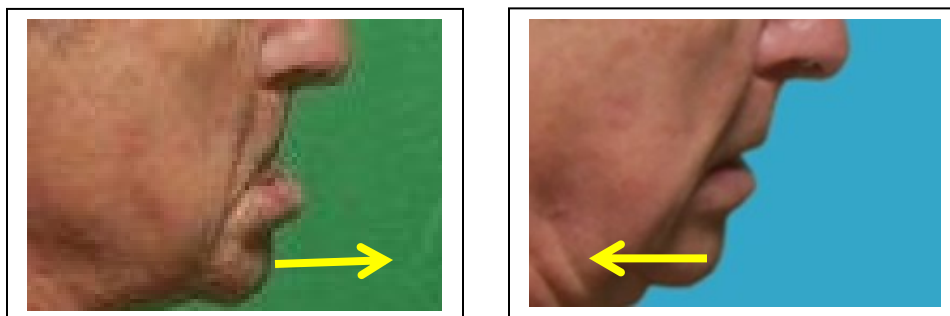
- **Facial shape and symmetry.** Practice tip: sometimes asymmetries may be easier to note if the provider stands at the head of the table and looks down at the supine patient; useful reference points include comparing the corners or the eyes, the nasolabial folds, and corners of the mouth.



- **Musculature development, unilateral tightness.**
- **Relaxed position of the jaw.** Note the ability to maintain a relaxed position of the TM joint (the relaxed TMJ position has the tongue placed gently on the hard palate just behind the front incisors with approximately 2/3 of top teeth covered by the relaxed lip and no bottom teeth visible).
- **Areas of edema, bruising or color change.**
- **Posture** (specifically anterior head carriage). This sustained stress may lead to pain in the jaw and/or surrounding musculature.
- **Occlusion and bite.** Observe and note the teeth alignment, accuracy of occlusion and for an over or under-bite. The dental state, teeth, oral cavity and tongue should be observed. Flattening or excessive wear of occlusal plate could indicate bruxing. Referral and co-treatment is often necessary with TMJ problems.
- **Teeth.** If a tooth lesion is suspected, a quick screen is to percuss with the blunt end of a pencil (covered by a finger cot) or tongue depressor, which may reveal pain.
- **Swallowing.** The swallowing mechanics and musculature should be observed and palpated, looking for symmetry of contraction and potential masses.

ACTIVE RANGE OF MOTION (AROM)

The patient is asked to slowly open, close, retract, protrude and laterally deviate (laterotrusion) the mandible. This can be done in a seated or supine position. Protrusion, retrusion and laterotrusion involve an initial slight opening of the mouth to allow for teeth clearance with movements. Additional information may be gained by examining in both a gravity dependent and non-gravity dependent position. Trismus is defined as a limitation in opening. Some have distinguished mild trismus as 20-30 mm interincisal opening, moderate as 10-20 mm, and severe as less than 10 mm.



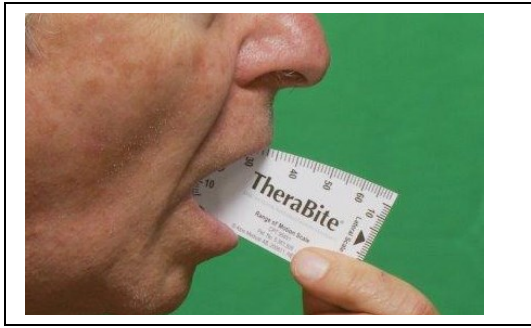
Clinical warning: A history of significant jaw trauma, protracted signs and symptoms or a very limited range of motion signal probable joint pathology and a guarded prognosis for conservative care. A second opinion and co-treatment with an oral or maxillofacial specialist is advised.

Measuring ROM

Generally only opening and laterotrusion need be measured. Protrusion and retraction measurements are more critical for professional appliance fitting.

NORMAL RANGES

Opening	40-55 mm
Protrusion	6-12 mm
Retraction	1-3 mm
Laterotrusion	8-12 mm.

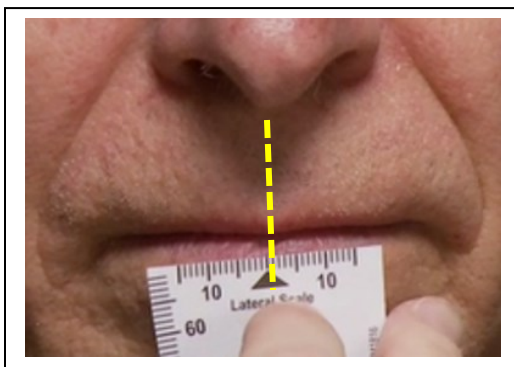


STARTING POSITION

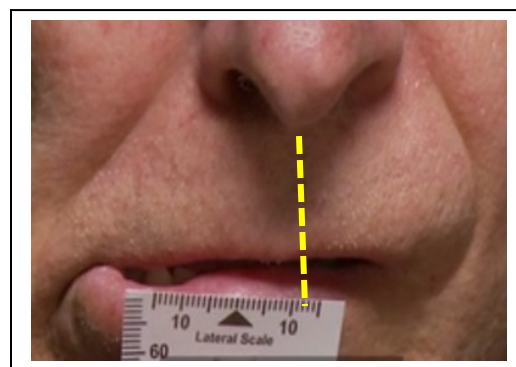


MEASURING POSITION

At the starting position, the edges of the measuring tool are placed between the two top and bottom front teeth. As the patient opens his mouth, the tool is rotated upward and the measurement is read along the upper edge.



LATEROTRUSION STARTING POSITION



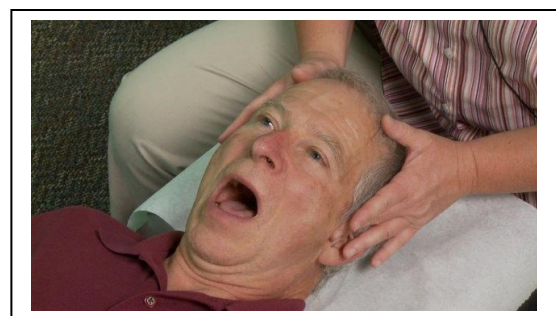
MEASURING POSITION

At the starting position, the arrow is aligned with the space between the two front teeth. The patient glides the jaw laterally as far as he can *with as little lip motion as possible*, and the measurement which now aligns with the space between the two front teeth is recorded

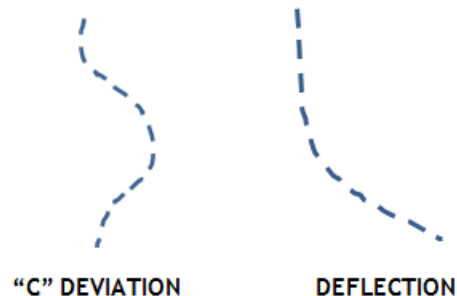
Protrusion, retraction and laterotrusion are also evaluated. ROM can be observed and then measured with a Therabite® measuring device or sanitized ruler. A general guideline for opening is that patient should be able to open wide enough (40 mm) to accommodate 2.5 knuckles or three fingers of the patient's dominant hand inserted between the front teeth.

MANDIBULAR GAIT

Any variation from linear tracking is noted. The RDC/TMD guidelines (2014) recommend standardizing the procedure by repeating gait 3 times. Deviations and deflections during temporomandibular gait may be caused by muscular, neuromuscular or mechanical dysfunction.



Deflection of the mandible is movement away from the midline during opening *without return to center* during the movement. *Deviation* of the mandible is movement away from midline followed by a *return to center* and is often described as either a “C” or “S” pattern. If there is a mechanical obstruction, the deviation or deflection is generally in the direction of the involved TMJ.



Deviation

Muscular causes of deviation generally present as large, inconsistent, sweeping alterations in gait that are not associated with clicking sounds. If clicking is present, this may implicate poor coordination of the lateral pterygoid bellies.

If the deviation occurs with an opening range of motion limited to 35mms or less and if the speed of the opening alters the location and pattern of the deviation, the problem is usually intraarticular. Intraarticular deviation is commonly associated with a joint noise at the apex of the opening deviation. This dysfunction can be caused by either a properly placed disc with motion restricted by **adhesions** or by a **disc displacement with reduction**.

The more repetitive and non-modifiable the deviation pattern is, the more likely the disc is **adhesively restricted** and **morphologically altered**. This dysfunction can be unilateral, causing a “C” type gait pattern of deviation or bilateral causing an “S” or “Z” type gait pattern. Once the disc is folded or morphologically altered enough to prevent full condylar translation in the superior joint space, the gait pattern may alter to a deflection.

The presentation of muscular dysfunction causing deviation can vary depending on the muscles involved. Often, muscular dysfunction does not affect protrusion as significantly as disc dysfunction does. Observing protrusive and laterotrusive motions may help to differentiate intraarticular causes from muscular issues. A pattern of deviation that is not consistent with ipsilateral joint noises requires advanced imaging to explore other pathologies.

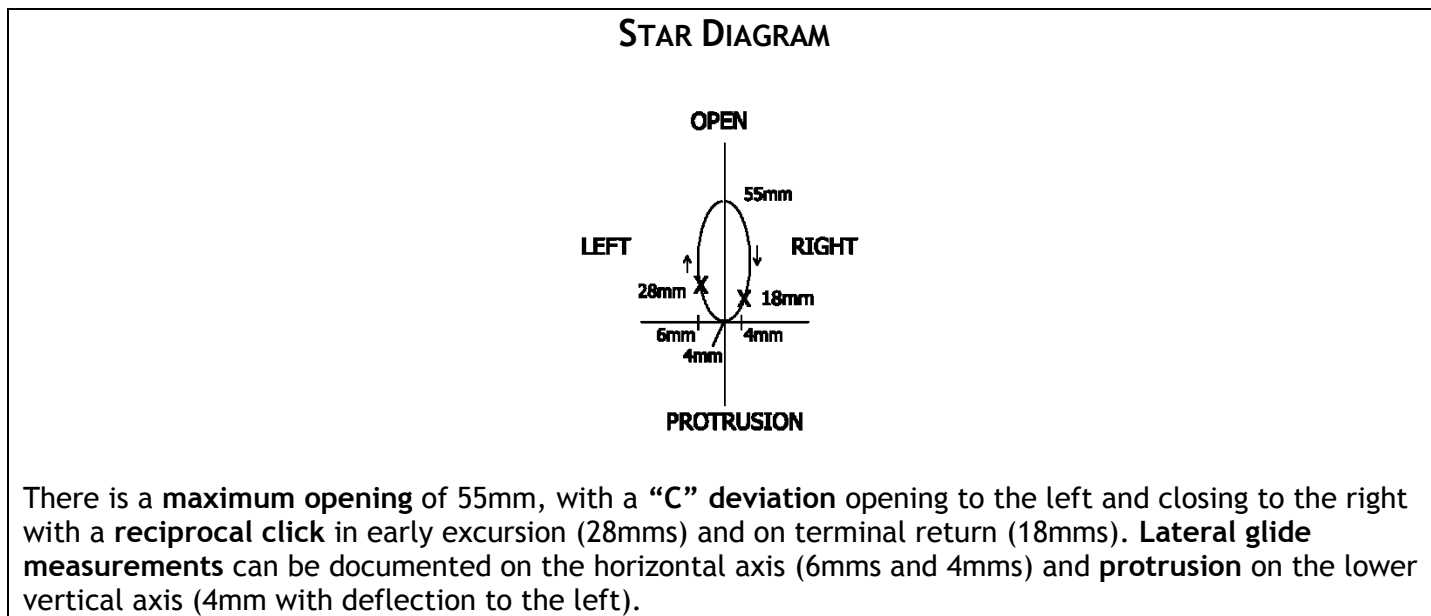
Deflection

Generally the mandible will open towards the side of the mechanical dysfunction and indicates a disc dislocation without reduction, capsular adhesions or joint ankylosis. Significant muscular hypertonicity can also cause TM joint deflection.

Protrusive range of motion may assist in differentiating intraarticular versus muscular causes of deflection. Ipsilateral motion will usually occur if an intraarticular block is present.

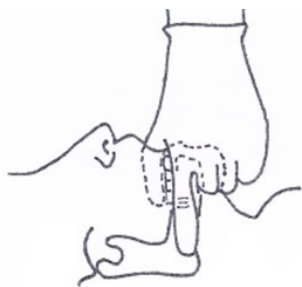
Charting Gait

Mandibular gait is often documented using a “star diagram.”¹ See the abnormal gait pattern example below.



PASSIVE RANGE OF MOTION (PROM)

Internal PROM is performed with gloved hands. This procedure is used to assess the ligamentous integrity and capsular movement, joint play and end feel.



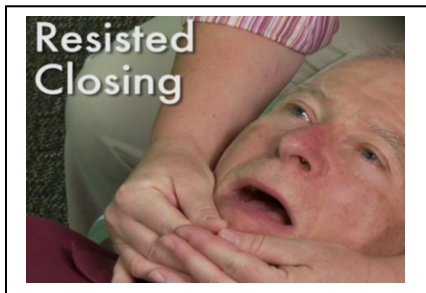
Thumbs are placed over the bottom molars and gentle inferior distraction is applied as the external index fingers and hand are wrapped around the mandible. The clinician can move the mandible through its range of motion looking for any limitations. The expected opening range of motion is similar to a reversed “J” shape. Increased passive ROM beyond the patient’s active range suggests that the limitation may be muscular in origin.

RESISTED RANGE OF MOTION

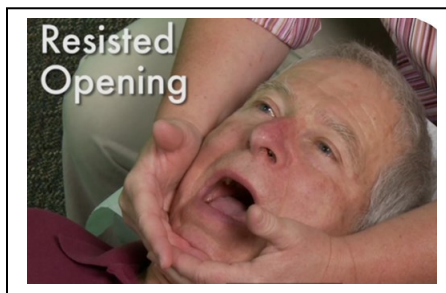
Mouth opening is challenged by having the patient open to mid-range and then having them resist a gradually increasing external closing pressure by the practitioner. Mouth closing is challenged by having the patient open to mid-range and having them resist a gradually increasing opening pressure on their chin. This is usually done by holding the mental notch area. Lateral movement is assessed by having the

¹ The star diagram is often not available in EHR.

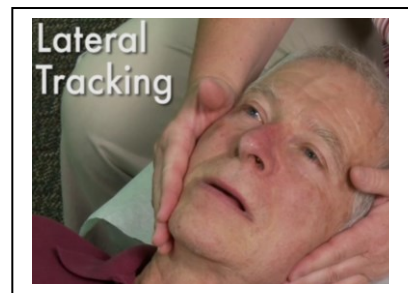
patient laterally shift into clinician's hand that is applying overpressure in the opposite direction. Resisted protrusion that causes pain is usually from the inferior head of the painful side lateral pterygoid muscle. Unilateral pressure can isolate each side for strength and involvement. (To correlate resisted ROM with specific muscle groups, consult Appendix I.)



RESISTED CLOSING



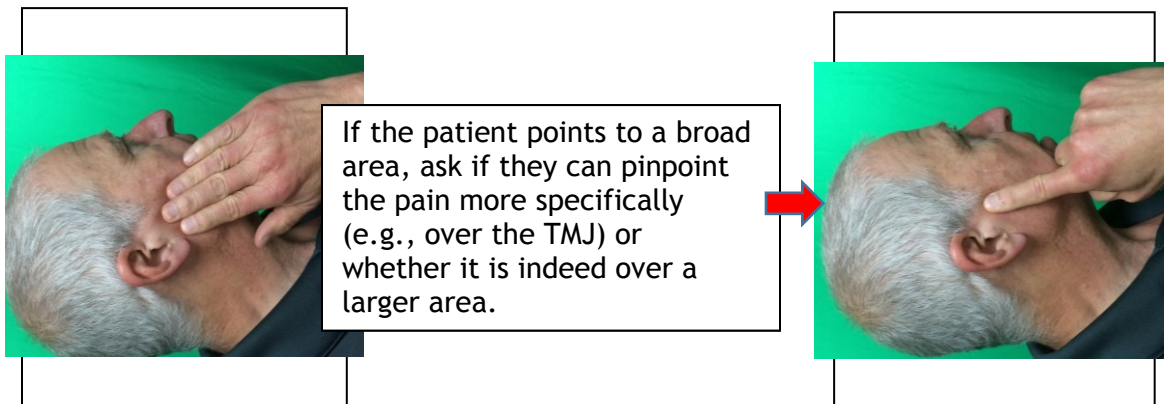
RESISTED OPENING



RESISTED LATEROTRUSION

PALPATION

The areas adjacent and involving the TMJ should be the focus. Static palpation should include the TMJ itself, mandible, zygoma and temple region, muscles of mastication and deglutition (swallowing), thyroid cartilage, and hyoid bone as well as the cervical spine and upper back. *The patient should be asked to point as specifically as possible to the location(s) of his/her pain.*



👉 **Practice tip:** Always ask permission to palpate someone's head, face and neck. This can be a sensitive area, especially if there is a history of trauma or abuse.

Temperature differences from side to side should be noted.

The RDC/TMD recommends palpating with approximately 0.5 kg (1.1 lbs.) of force over the lateral pole of the TM joint and around the condyle and 1.0 kg (2.2lbs) over the masseter and temporalis muscles. Alternatively, the practitioner can try to establish the patient's baseline tolerance to touch. One approach is to apply 5-10 pounds of digital pressure over the mastoid and gauge the patient's response. If increased sensitivity is elicited, the practitioner can adapt the evaluation to be more conservative and less provocative.

A useful screening technique (the **pressure test**) involves comparing the tenderness of the anterior belly of the temporalis muscle to the TMJ. Using external palpation with equal pressure, the more tender area usually indicates the pain generator and can possibly differentiate between muscular and inflammatory joint origin.

Joint palpation

Joint palpation is done first statically (checking for tenderness and malposition) and then with active jaw movement. Besides attempting to elicit local tenderness or referred pain, the goal of palpation is to detect any abnormalities with static positioning or motion.

The condyle should be palpated. In addition, the anterior, middle and posterior regions of the external temporomandibular joint space should be independently palpated. The anterior region is above the zygomatic arch and anterior to the TMJ. The middle region is palpated directly above the TMJ and superior to the zygomatic arch. The posterior region is palpated above and behind the ear and in the external auditory meatus.



👉 **Clinical Tip:** To palpate the TMJ through the external canal, finger tips are placed in the ear with the pads of the fingers facing the practitioner.



Palpation involving movement is focused on detecting any joint noise (crepitus, clicking or popping) and feeling for asymmetrical movement of the condyles. While the patient is actively opening the mouth, the condylar head is localized by placing fingertips over the lateral aspects of the joint just anterior to the tragus. To allow better direct palpation of the condylar joint surface, ask the patient to shift the mandible to the *opposite side of palpation*.

Palpating bilaterally as gently as possible, opening gait should be observed. As indicated earlier in this protocol, rotation and translational ROMs should be documented for each side. Observe for symmetry and quality of motion in both the upper (hinge) joint during the initial phase of opening and then in the lower joint when disc translation is occurring. Repeat with each TMJ ROM.

With the fingertips on the lateral pole of condyle, medial force is applied to the joint area (in the direction of the joint facet toward the anterior aspect of the foramen magnum). Record aberrant movement, pain or tenderness.

If crepitus is reported by the patient but not palpable by the practitioner, auscultation with a stethoscope can be used (move slightly anterior to the joint to avoid facial hair noise if necessary).

Muscle assessment

The muscular actions in the TMJ are relatively complex and a thorough understanding of the muscle actions is necessary to differentially diagnose (See Appendix I.) The muscles should also be evaluated for size and symmetry of action.

A) External palpation

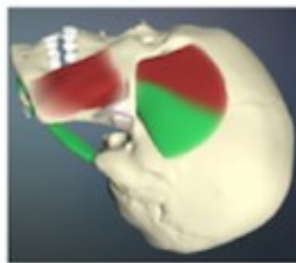
Initially, the muscles of mastication are palpated externally.

Begin the muscular evaluation externally by palpating all 3 bellies of the temporalis muscle noting bilaterally the size, symmetry, tenderness, trigger points and efficiency of contraction. The masseter muscle bellies are also examined similarly and palpated bilaterally from their superior to their inferior attachments. Palpate the supra and infrahyoid muscles and note changes as listed above. Muscles such as the temporalis and masseter can be palpated in both a relaxed state and under load (by asking the patient to open their mouth or by clenching). Have the patient clench and palpate. Expect the masseters and temporalis muscles to contract in synchrony and with symmetrical muscle bulk.

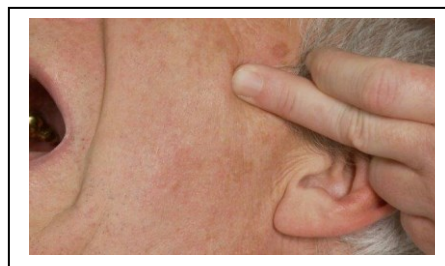
The palpation of temporalis and masseter should be sustained for approximately 2 seconds to give the patient an opportunity to respond (a rapid scanning palpation may be too quick for the patient to register the tenderness and accurately notify the practitioner of the symptom location). Sustained palpation over the muscle for up to 5 seconds may provoke pain in referral areas.



MASSETER



TEMPORALIS



TEMPORALIS TENDON



MEDIAL PTERYGOID

For myalgia and the three types of myalgia diagnoses, palpation of only the temporalis and masseter muscles is required. (Schiffman 2014) Other muscles that should also be palpated externally include buccinators, medial pterygoid insertion, digastric, and the suprahyoid group.

B) Intraoral palpation

A more thorough evaluation, however, requires both internal and external palpation. Internally the muscles of mastication are examined one side at a time, with a gloved finger, using only short, well-groomed nails.

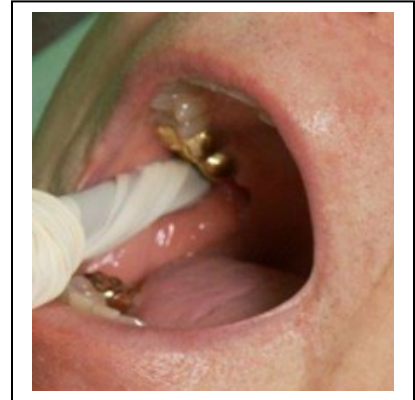
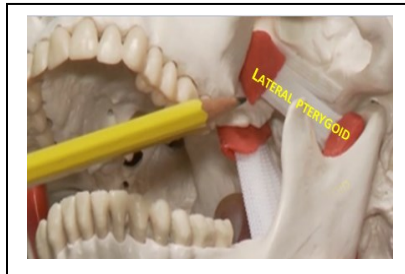
- **Masseter.** Begin at the outer edge of the lower teeth on the lateral alveolar ridge (between the cheek and the gum), palpate proximally to the inferior edge of the coronoid process to find the anterior border of the masseter muscle. With one finger inside the ipsilateral cheek and several external fingers on the cheek, ask the patient to clench so you can capture the bulk of the masseter muscle between your fingers. Have the patient relax and palpate specifically up and down the 2 bellies looking for changes in tone, pain and trigger points.



- **Temporalis tendon.** Release the masseter and proceed up the coronoid process to the insertion of the temporalis tendon at its tip. Gentle pressure on the tendon can assess tension and tenderness of the temporalis tendon/muscle.



- **Lateral pterygoid.** The lateral pterygoid muscle stretches from the lateral side of the lateral pterygoid plate to the condyle. Gently probe superiorly, posteriorly and medially in the pocket between the teeth and the cheek. Shifting the mandible from side to side can allow for better access to the lateral pterygoid muscle. Instructing the patient to open their mouth can also bring the muscle inferiorly towards your finger for easier palpation.



PALPATING THE LATERAL PTERYGOID



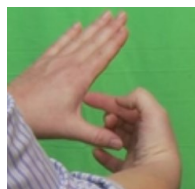
- **Medial pterygoid.** Cross medially under the lateral pterygoid plate to palpate the medial pterygoid as it courses down to the ipsilateral angle of the mandible. If a gag reflex is an issue, begin from the insertion.



- **Strap muscles.** Next palpate the digastric muscle and the suprahyoid muscles in the floor of the mouth, avoiding the glandular tissues.

👉 *Practice tips to aid palpation*

- Patients must open their mouths just wide enough for the provider to conduct the assessment, but otherwise the jaw should be relaxed as much as possible. The patient should be advised not to open too wide or the resulting tension and potential reactive muscle spasms may hinder the exam.
- Patients should be told to indicate areas of tenderness or increasing pain with hand signals, rather than attempting to talk during the assessment. Hand signals such as thumbs up/down, “stop,” or holding up fingers indicating a numerical pain scale are viable options. In addition, the practitioner should be aware of non-verbal responses reflecting discomfort (e.g., furrowing of the brow, clenching the fist).
- Palpation in this area should be performed with caution, avoiding excessive palpatory pressure, and informing the patient that the examination may temporarily aggravate their symptoms.
- When describing the impending internal palpation to the patient, the provider can use their hand as a prop, with the web of the thumb representing the pterygoid muscles.

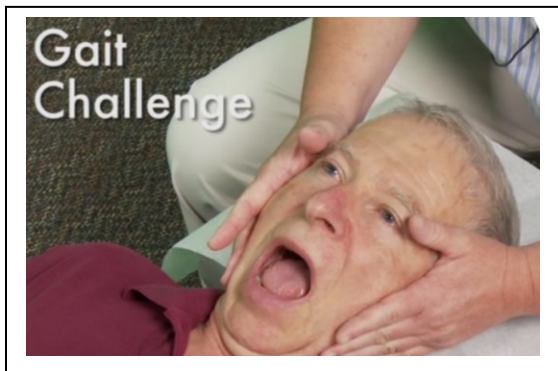


- When palpating both the lateral and medial pterygoid muscles, inserting the gloved hand with some lateral pressure against the cheek (as well as saying “Ahhh”) may prevent a gag reflex.

SPECIAL ORTHOPEDIC EXAMINATION

The majority of information needed for a diagnosis can be gained prior to orthopedic testing. This testing is meant to be provocative and may potentially aggravate injured tissue. These procedures should be used sparingly and not repetitively. Aggressive or over-testing may potentially impede healing.

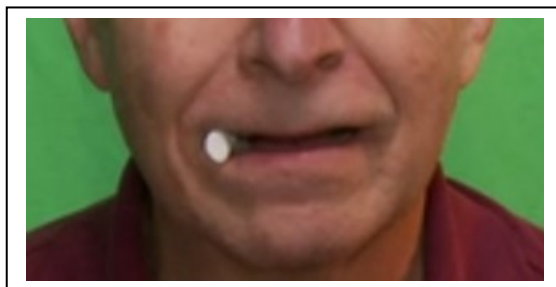
Gait Challenge. After observing the mandibular gait without interference, challenge the gait by gently guiding the mandible to follow a normal course of excursion. Feeling the direction and amount of resistance can help indicate the tissues involved. The softer the resistance offered by the tissues, the more likely the involvement is muscular; whereas altered gait with harder resistance to the practitioner's guiding force may indicate potential disc involvement. Note: *Temporary correction of the gait or reduction in symptoms may indicate a better prognosis for conservative care.*



Flexion/Extension Test. Suprahyoid muscular involvement can be assessed by having the patient flex and extend the cervical spine to end ranges while keeping the mouth closed, *tongue in contact* with the roof of the mouth and the front teeth in contact. Loss of contact may indicate glossal or hyoid hypertonicity.

Swallow test. This procedure is also used to evaluate the suprahyoid structures. The patient is asked to swallow while the practitioner watches for recruitment patterns such as extension in the upper cervical spine and activation of the suboccipital group of muscles. Occipital extension, head protrusion or suboccipital activation may indicate weak, inhibited or slowly responding suprahyoid muscles.

Separation Clench. Distraction or compression of the joint and muscles can help isolate the possible pain generators. The patient is asked to unilaterally clench on a cotton roll, wax separator or rolled up exam glove to distract the ipsilateral joint and compress the contralateral. The patient should point to the side that is experiencing pain. If the pain is from a muscle that closes the mouth, it may be reproduced regardless of which side the cotton roll is in because the muscle will be under active tension. If the pain is articular in origin pain aggravation on the distraction side suggests a capsular problem and on the compression side it is likely due to inflammation secondary to a plica, OA, retrodiscits, or an acute (not a chronic) disc injury. This can also be done bilaterally to compare muscular activation with joint compression and distraction. Clenching for a few seconds should not be painful in the normal jaw in full occlusion.



Passive Mandibular Distalization* (AKA Passive mandibular compression). To evaluate for inflammation in the posterior aspect of the joint, the passive mandibular distalization test is performed. The clinician is behind the patient, cups the mandible bilaterally, and applies an anterior to posterior, inferior to superior pressure through the condyle into the joint. Symptom reproduction can indicate retrodiscal inflammation. Pain can also be recreated by a protective contraction of the lateral pterygoid to prevent the joint surfaces from approximating.

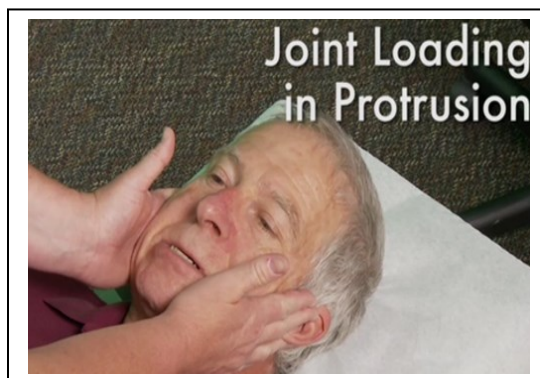


“PULL” COMPRESSION



“PUSH” COMPRESSION

Joint Loading in Protrusion. To evaluate the anterior joint space (slope of the eminence), joint loading in protrusion is performed. With the patient supine, they are asked to slightly open the mouth and protrude the mandible as the clinician adds overpressure in an anterior and superior direction. The goal is to load the slope to access the protrusive glide mechanism. Symptom reproduction can indicate anterior joint inflammation or disc involvement. Locking, a limitation in excursion, or an increase in the volume or a delay in clicking indicates an anteriorly adhered, restricted disc. **Note: This may indicate a more guarded prognosis for conservative care.**



Clinical Warning!!! Use caution with this test as it can be very provocative and aggravate the patient's injury.

Joint distraction. Distraction and evaluation of capsular movements can be achieved unilaterally or bilaterally. The thumbs are placed over the mandibular teeth and a gentle superior to inferior pressure is applied while the external fingers are applying an inferior to superior pressure on the chin. Be careful not to pinch the lower lip against the teeth. The goal is to distract and protract the condyle and assess the integrity and tone of the muscles and joint capsule. Pain in the joint indicates joint or capsule inflammation or adhesions while pain in the masseter or temporalis may indicate trigger points or hypertonicity of the closing muscles.

* Distalization refers to the posterior movement of the mandible.



JOINT DISTRACTION

The **Reload test**. If clicking or popping is felt during palpation, the patient is asked to open to the point that the noise appears and a tongue blade is placed between the teeth on that side. With the tongue blade inserted, the patient is instructed to open and close, trying to reproduce the sound. If it is eliminated, a splint may help reduce full posterior loading to allow remodeling time. In this case, the tongue depressor indicated that full occlusion was necessary to “reload” the disc and create the joint noise.



RELOAD TEST

Cervical and upper thoracic spine evaluation. According to Armijo-Olivo (2012) “signs and symptoms of cervical spine disorders such as neck pain, cervical joint tenderness and segmental limitations (especially at the C0 to C3 levels), and presence of tender points especially in the SCM and trapezius muscles have been found to more likely be present in patients with TMD than healthy controls” (Armijo-Olivo 2012). Multiple vertebral levels may be involved and can be unilateral or bilateral. Cervical involvement can possibly be confirmed through symptom reduction with manual therapy.

Full spine and kinetic chain assessment. In some cases a broader assessment may be necessary to identify a distant contributing factor to the TMJ dysfunction.

Ancillary Studies

X-rays may be of little assistance when initially evaluating the TMJ or planning treatment in uncomplicated cases. On the other hand, they should be taken to rule out a suspected fracture (i.e. post trauma) or possible pathology such as osteoarthritis or if the patient is not responding to care. The tongue blade test is a quick screen to determine whether radiographs should be performed in cases of suspected condylar fracture. The patient bites down on a tongue depressor and stabilizes as the clinician tries to twist and break it. Failure to stabilize and therefore not break the blade is a positive test and shows the need for films to rule out a fracture. The test is rated 95% sensitive and 65% specific. (Shaffer et al 2014) Most dental patients have had a panorex x-ray taken every few years. This is a two dimensional x-ray of the TMJ and can help visualize bony changes of the condyle and fractures or severe dislocations of the

condyle. Soft tissues are not well visualized, so the disc cannot be evaluated by this test. If these are available, they should be requested and used for a bilateral comparison of the TMJs over time.

TOMOGRAM

A tomogram is performed with a specially designed x-ray machine that produces images that represent a "slice" through the TMJ. It is superior to a conventional radiograph especially when there is a strong clinical need for determining the position of the condyle in the glenoid fossa with opening and closing. It does require more imaging time therefore delivering a higher dose of ionizing radiation. A tomogram does not image soft tissue, so the disc cannot be evaluated.

MRI

Magnetic resonance imaging is considered the "gold standard" of imaging options and is the best choice for visualizing the soft tissues of the temporomandibular joint. MRI is noninvasive and requires no ionizing radiation. There is direct visualization of the soft tissues of the joint including the disc and structures outside the joint including the joint capsule and muscles of mastication. MRI is often used to verify dislocations of the disc and perforations of the disc can sometimes be seen.

ARTHROGRAM

An arthrogram is an x-ray utilizing a contrast dye injected into the TMJ joint capsule as the radiographs are performed. It is a sensitive and highly specific test for disc abnormalities (e.g., dislocation, degeneration or perforation). Sometimes in cases of mild disc dislocations this test may be therapeutic in itself as the fluid dye allows the disc to "float" back into place. It is an invasive test, however, and can be uncomfortable for the patient.

DIAGNOSTIC ULTRASOUND

Ultrasound may be a useful aid in the diagnosis of TMJ disorders based on a 2013 review (Kundu 2013). It has reported moderately acceptable sensitivity in the diagnosis of disc derangement and joint effusion when compared to MRI as the gold standard. High resolution (10 MHz) ultrasound appeared to be more effective than lower resolutions with positive predictive values ranging from 72-100% and with negative predictive values ranging from 71-97% for most studies. These ranges were dependent on the particular TMD disorder and whether the ultrasound was done in the open or closed mouth position. The review, unfortunately, did not include quality assessment of the individual studies.

It has become one of the most recommended methods in recent decades because of its non-invasive, inexpensive, and usefulness in evaluating the integrity and relationship, both static and dynamically, of the hard and soft tissues of the temporomandibular joint. (Kundu 2013)

Ultrasound has added advantages over other imaging methods including its use in smaller clinical/office settings, no ionizing radiation, can be used on patients with pacemakers/metallic implants and in claustrophobic patients. Its usefulness is limited in clearly visualizing the articular disc. Only the lateral aspect of the disc is seen because the medial part is anatomically blocked from view. Medial displacements of the disc could be overlooked. (Kundu 2013)

BLOOD TESTS

Blood tests are rarely indicated except in cases where an inflammatory TMJ arthritic condition or temporal arteritis as a cause of the jaw pain is suspected. Tests for inflammatory arthritis include ESR or CRP, rheumatoid factor and anti-CCP. Tests for temporal arteritis include ESR and/or CRP, a CBC with platelets and perhaps a liver panel (AST or ALP are elevated in 15-30% of temporal arteritis patients).

General Assessment Strategy

While performing the history and physical examination, the practitioner generally has 3 main goals in mind.

1. Find out if the TMJ is the primary pain generator.
2. Rule out pathological or competing diagnoses.
3. Determine the specific TMJ lesion.

Step 1: Find out if the TMJ is the primary pain generator.

The history and physical examination as noted on the previous pages should supply the needed clinical evidence to confirm that the TM joint and associated structures are the primary etiology.

Step 2: Rule out pathological or competing diagnoses.

Before committing to an uncomplicated, mechanical diagnosis, TM differentials such as fractures, dislocations, bone-softening diseases, tumors, infections, dental pathology, arthritides and anomalies should be ruled out. **NOTE: Signs of infection or bleeding² in the TM joint require urgent referral and treatment to avoid complications.** Other competing conditions should also be assessed and ruled out. See table for additional oro-facial origins of pain.

Differential Diagnosis of Oro-Facial Pain (Modified from Buescher 2007)		
<i>Condition</i>	<i>Symptoms</i>	<i>Signs</i>
Dental pathology		
Abscessed tooth	Pain with chewing over affected tooth	Visible tooth decay; gum line redness/swelling; possible pain with tooth tapping
Wisdom tooth eruption	Dull ache behind molars	Tenderness to palpation
Infection or inflammatory processes		
Herpes zoster and postherpetic neuralgia	Prodrome of pain followed by vesicular rash	Rash is unilateral; dermatomal distribution
Mastoiditis	Fever; ear pain	Redness and swelling behind the ear; mastoid process tender to touch
Otitis externa	Itching, pain, and tenderness of the external ear	External auditory canal swollen and red
Otitis media	Fever; tired; ear pain	See Otitis Media Care Pathway. Tympanic membrane dull, bulging, red.
Parotitis	Fever; tired; aching muscles; pain over parotid gland	Tenderness and firmness over parotid gland
Sialadenitis	Pain and swelling of salivary gland	Tenderness, firmness, and/or redness of salivary gland; usually unilateral
Temporal arteritis	Jaw pain, headache, visual disturbances	Tender scalp, thicker artery possible
Trigeminal neuralgia	Paroxysmal, unilateral lancinating pains in trigeminal nerve distribution	Examination generally normal except TN pain is typically triggered by a light touch to the face and then disappears between attacks.
!!! Warning: Conditions that cause jaw pain and require immediate referral are <u>acute coronary syndrome</u> (urgent-emergent) and <u>temporal arteritis</u> (semi-urgent).		

² Signs of bleeding include swelling, tenderness, bruising or discoloration of the area. An inability to achieve posterior occlusional contact on the ipsilateral side may also be an indicator in trauma cases.

Step 3: Determine the specific TMJ lesion.

The diagnosis will depend, in part, on where the patient is in the pathological cascade.

Pathophysiologic Cascade

Repetitive micro or macrotrauma can begin a sequence of physiologic and mechanical changes which may result in stress adaptations and possible degenerative osteoarthritis of the TMJ over time. Outlined below is a possible degenerative cascade that involves the condition transitioning from initial adhesions causing internal derangements and eventually degenerative changes. Patients may present to your office at any of these stages.

Stage 1 Meniscal Hesitation (Adhesions). The degenerative process begins with static loading causing a “drying” of the disc and increased friction often associated with a simple joint click. Or trauma leads to adhesion formations, usually without pain or deviation. The patient often describes restricted opening in the morning that resolves with a loud “pop.”

Stage 2 Meniscal Attachment Damage (Internal Derangement). Often with continued microtrauma (friction) or post macrotrauma (ligament elongation), the bilaminar posterior ligament stretches. At this point, patients may experience multiple clicks, stiffness, intermittent locking, or pain particularly with hard biting.

Stage 3 Reducible Meniscal Displacement (Functional Disc displacement with reduction). The disc displaces anteriomedial to the condyle. The patient can maneuver the jaw away from and then toward the affected side to reduce the meniscus, but occasionally the jaw may temporarily lock. Pain is expected as the capsular nociceptive fibers are distorted.

Stage 4 Irreducible Meniscal Displacement (Disc displacement without reduction)

At this stage the disc can no longer move or be maneuvered around. Painful joint motion and a feeling of joint locking is likely. There is deflection toward the involved side with severe joint pain and muscle spasm accompanied by decreased ROM.

Stage 5 Resolution (Pseudodisc). As the joint begins to adapt to the mechanical pressures, retrodiscal tissue remodels into a “pseudodisc,” resulting in some reduction in pain and inflammation and occasionally slightly improved range of motion and gait.

Stage 6 Degeneration (Arthritis). The pseudodisc acts as a new articular surface causing less acute pain, but variable chronic exacerbations occur as gross remodeling results in progressive degeneration. Crepitus and pain with use is quite common.

Making a Diagnosis

Various diagnostic categories have been established in an attempt to standardized TMJ disorders. We have chosen a taxonomy established by the RDC TMD, although others exist (de Leeuw 2008). The RDC/TMD diagnostic categories were updated in 2014 as a result of a structured literature review and data from a TMD validation project filtered through a consensus process facilitated by an international panel of dentists and clinical and basic science TMD pain experts. A minimum threshold for diagnostic validity was set at 70% sensitivity and 95% specificity. For some disorders, however, a lower sensitivity/specificity or simple content validity was used when there was no other alternative. The panel’s recommendations for reliability rating were based on data from an ongoing TMJ Impact Project.

We have taken this basic system and modified it to include other TMD entities that are discussed in the literature, some of which may be of particular interest to manual therapists.

It is generally thought that uncomplicated, mechanical diagnosis of temporomandibular diseases/disorders fall into three main categories: intra-capsular/intra-articular, capsular, or extracapsular.

Differentiating Joint vs Muscle Pain

One major differentiation is to separate primary joint disorders from those which are more muscular in origin. Here are some general principles which may help (Okeson 2013).

- Joint problems usually continue or progressively worsen from an initiating event (if one is reported) whereas disorders which are primarily muscular are more likely to fluctuate based on the patient's activities, stress levels, etc.
- If the temporalis (or masseter) is more tender to palpation, the primary TMD is likely a muscular issue and if the joint is more tender by comparison, then the problem is likely joint inflammation.
- Restrictions in mouth opening that occur at 25-30mm that cannot be opened wider even with gentle passive force (and are met with a "hard" end feel) are suggestive of a joint problem (e.g., a disc displacement without reduction), whereas a restriction of opening to 8-10mm is more likely muscle in origin, especially if gentle passive force achieves at least some increased motion and is met with a "soft" end feel.
- Biting down unilaterally on a tongue depressor on the involved side will often decrease the pain of a joint problem and increase the pain of a muscle problem, while biting on the contralateral side may have the opposite effect.

A word about the making individual diagnoses (recommendations from the RDC/TMD) (Schiffman 2014):

- The patient should confirm the exact location of pain by pointing to it and must report that his/her familiar pain is aggravated or relieved by jaw movement, jaw function (e.g., clenching), or by physical examination procedures.
- To be clinically reliable, joint noise should be detected during the physical exam or recalled by the patient as having occurred during the prior 30 days.*
- Each jaw range of motion test should be repeated multiple times (e.g., 3 repetitions).
- Cardinal signs of inflammation (i.e., swelling, warmth and redness), autonomic signs, or sensory or motor deficiencies are unusual presentations for TMD and are red flags for disease.
- The patient may have multiple TMD diagnoses (e.g., myalgia and disc displacement without reduction).

*The RDC/TMD recommends using the 30 day window to increase the reliability of the patient report. Practitioners may extend this at their own discretion.

TMJ Disorders

(Diagnoses in italics are recognized by the RDC-TMJ.)

Intracapsular

Adhesions (includes scar tissue and hypomobility)

Ankylosis

Arthralgia

Arthritis (local inflammatory)

Disc derangement

- Internal derangement (various stages of mechanical disc dysfunction, including perforations, tears and folds of the disc)
- *Disc displacement with reduction*
 - *Disc displacement with reduction (without a history of intermittent locking)*
 - *Disc displacement with reduction with a history of intermittent locking*
- *Disc displacement without reduction*
 - *Disc displacement without reduction with limited opening* (on the day of the exam)
 - *Disc displacement without reduction without limited opening* (on the day of the exam)
- Retrodiscitis

Mechanical joint dysfunction

- *Hypermobility ("medical" subluxation & dislocation)*
- *Hypomobility (adhesions or scar tissue)*

Osteoarthritis

Capsular

Capsulitis

Capsular sprain

Plica

Extracapsular

Myalgia

Local myalgia

Myofascial pain

Myofascial pain with referral

Myospasm

Strain

Tendonitis

Fracture

Misc.

Cranial Abnormalities

Inflammatory Arthropathy (RA, JRA, SLE, AS, Psoriatic, CPPD)

Infection

Neoplasm

Neuralgia

Other less common diagnoses may include mandibular periostitis, congenital & developmental 1st & 2nd branchial arch syndromes (aplasia, hypo and hyperplasia of the condyle) and Eagle's syndrome (calcification of stylohyoid ligament). These conditions are beyond the scope of this care pathway.

Adhesions

(ICD-9 524.61; ICD-10 M26.61)

Description

In this disorder, intracapsular fibrous adhesions are thought to occur as a result of inflammation due to direct macrotrauma, excessive repetitive or sustained loading, or inflammatory disease associated with polyarthritis. Adhesions are also typically associated with disc disorders.

Presentation

The symptoms begin with a simple joint click after static loading or trauma, usually presenting initially without pain or deflection/deviation. The patient often describes restricted opening in the morning that resolves with a loud “pop.” Before the adhesion is released, joint rotation may be inhibited. Jumpy, early translation can occur with possible reduced opening to about 30mms with slight contralateral deviation.

The **Reload test** (raising the bite) eliminates the click indicating a splint may help reduce full posterior loading to allow remodeling time. Tongue depressors are used between the teeth to prevent the full occlusion necessary to “reload” the disc and create the joint noise.

Opening in retrusion can test for adhesions by limiting upper joint translation; reduced clicking confirms translation issues.

Management implications

Gentle manipulative or mobilization procedures may be appropriate to treat adhesions. (Peterson 2003)

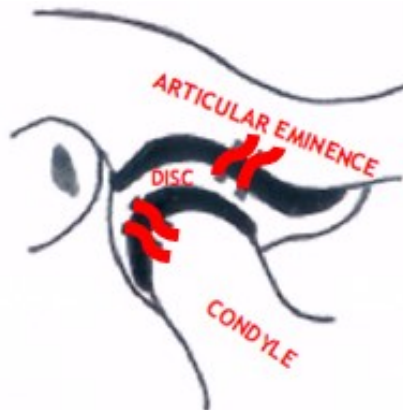
Minimum RDC/TMD diagnostic criteria (based on Schiffman 2014)

History: Positive for both of the following: a history of TMJ clicking AND loss of jaw mobility.

Physical Examination: Positive for all of the following: Limited range of motion AND BOTH of the following: jaw deflection to the affected side on opening when present unilaterally AND marked limited laterotrusion to the contralateral side.

Imaging: In cases when this diagnosis needs to be confirmed, imaging demonstrates a normal contour of the disc, negative tomograms, and no bone structure changes. Arthrography or MRI may demonstrate the presence of adhesions.

Validity of Diagnostic Criteria: Sensitivity and specificity have not been established.



Ankylosis

(ICD-9 524.61; ICD-10 M26.61)

Description

Ankylosis of the joint may be bony or fibrous in nature and is triggered by either trauma or disease. Bony ankylosis, a rarer disorder, results in union of the bones of the joint and may lead to complete immobility. Bony ankylosis is characterized by radiographic evidence of bony bridges. In fibrous ankylosis, fibrous bands form which lead to reduced range of motion and translation. Fibrous ankylosis may be considered a more severe form of TMJ adhesions/adherence.

Presentation

Frequently pain is not associated with this disorder. Range of motion will be decreased to various degrees. Palpation will detect reduced translation on the affected side during maximum ranges of motion often resulting in deflection to the ipsilateral side during the opening phase of gait. In the case of bony ankylosis, even the initial rotation motion during opening may be lost.

Management implications

In the case of bony ankylosis, referral for surgical reconstruction may be necessary.

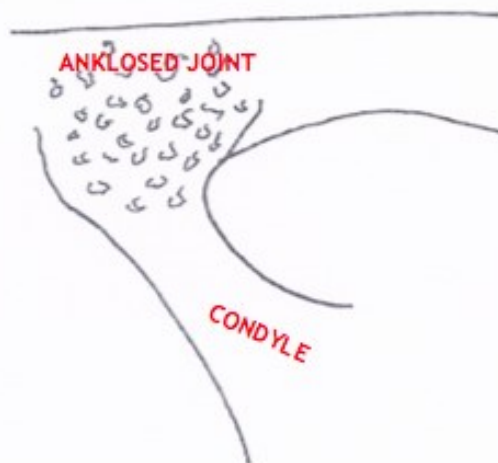
Minimum RDC/TMD diagnostic criteria (based on Schiffman 2014)

History: Progressive loss of jaw mobility.

Physical Exam: Range of motion severely limited on opening WITH BOTH deflection to the affected side AND marked limited laterotrusion to the contralateral side. In the case of bony ankylosis, there is complete absence of or severely limited jaw mobility with ALL movements.

Validity of Diagnostic Criteria: Sensitivity and specificity have not been established.

Imaging: Indications of fibrous ankylosing are CT/CBCT (cone beam CT) evidence of BOTH decreased ipsilateral condylar translation on opening and the presence of a disc space between ipsilateral condyle and eminence. Indications of bony ankylosing are bone proliferation with obliteration of part or all of the joint space.



Arthralgia

(ICD-9 524.62;ICD-10 M26.62)

Description

A common TMD diagnosis which simply denotes that the pain originates from the temporomandibular joint (as opposed to the muscles of mastication). Use this diagnosis when a more specific joint or disc diagnosis is not possible.

Presentation

The patient presents with jaw pain around the TMJ or ear which is affected by jaw movement and function and which can be replicated by provocation testing during the physical exam. DDX: When it is associated with clicking, locking or mechanically decreased opening, consider a disc displacement diagnosis. When associated with overt inflammatory findings in the physical or demonstrable by imaging, consider a local arthritis diagnosis. When associated with crepitus and relevant imaging changes, consider osteoarthritis.

Minimum RDC/TMD diagnostic criteria (based on Schiffman 2014)

History: Pain within the prior 30 days localized around the jaw, temple, ear or front of the ear AND the patient confirms the location of the pain by pointing to it where it is felt AND reports that it is modified by movements or functional loading of the jaw (e.g., eating, talking, clenching).

Physical Exam: Palpatory tenderness of the lateral pole of condyle that is recognized as the familiar pain OR reproduction of familiar pain by movement of the jaw in any direction (active/assisted opening, lateral movement or protrusion).

Validity of Diagnostic Criteria: Sensitivity 0.89; specificity 0.98.

Imaging: Not required except when needing to differentiate from inflammatory arthritis or osteoarthritis.

Arthritis (local inflammatory)

Description

Pain of joint origin attributed to a local inflammatory disease or process.

Presentation

Overt signs of inflammation are not always present and the diagnosis may depend on the presence of dental occlusal changes and/or inflammatory changes detected by imaging. Must be differentiated from uncomplicated arthralgia and osteoarthritis and systemic inflammatory disease (e.g., RA, sero-negative spondyloarthropathies, gout, SLE, scleroderma). (Schiffman 2014)

Management implications

Arthritis (local inflammatory): Local inflammatory signs (swelling, redness and/or increased temperature in front of the ear, reduction in dental occlusal contacts) may also indicate an infection and suspicion should prompt an urgent referral to avoid joint destruction. Joint erosion is also possible in the case of hemarthrosis and an urgent referral may be required.

Minimum RDC/TMD diagnostic criteria (based on Schiffman 2014)

History: The usual symptoms of arthralgia: pain within the prior 30 days localized around the jaw, temple, ear or front of the ear) AND the patient confirms the location of the pain by pointing to the structures where it is felt AND reports that it is modified by movements or functional loading of the jaw (e.g., eating, talking, clenching).

Physical Examination: Palpatory tenderness of the later pole of condyle that is recognized as the familiar pain OR reproduction of familiar pain by movement in of the jaw in any direction (active or assisted opening, lateral movement or protrusion). Either local inflammatory signs (swelling, redness and/or increased temperature in front of the ear) OR “reduction in dental occlusal contacts noted between two consecutive measurements (unilateral/bilateral posterior open bite), and not attributable to other causes.”

Validity of Diagnostic Criteria: The above diagnostic criteria must be fulfilled and no competing diagnosis can more fully account for the patient’s presentation. Negative for generalized rheumatologic disease. Sensitivity and specificity are unknown.

Disc internal derangement

(ICD-9 524.63;ICD-10 M26.63)

Description

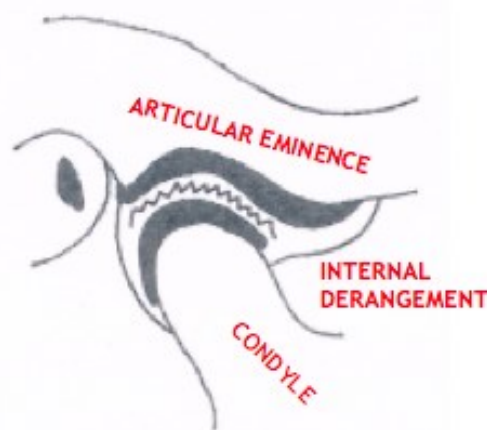
Internal derangement represents a group of intra-capsular disorders, involving a damaged, perforated, torn or folded TM disc. It must be differentiated from disc displacement.

Presentation

The patient presents with clicking or stiffness and may or may not have pain, or perhaps pain only with repetitive or hard clenching. Clicking or popping may occur with opening/closing, but it tends to be more of an intermittent nature than in disc displacement and usually without a reciprocal pattern (i.e., not present during *both* opening and closing). The pattern of clicking does not fulfill the RDC-TMJ criteria for disc displacement. Palpatory findings may include premature anterior glide of the involved condyle (asymmetrical and in the first 25mm of opening—a phase of gait where the TMJ normally functions primarily as a hinge without anterior movement). This premature translatory motion can also be associated with altered gait (deviation to the contralateral side). A key diagnostic finding is that the practitioner can temporarily correct these findings by helping the patient normalize the movement pattern. This is accomplished by applying pressure and tactile cues to the sides of the jaw while guiding and encouraging the patient to correct the aberrant movement. If there is disc displacement or more significant disc damage, the patient will be unable to immediately correct these mechanical faults. The inability of the practitioner to physically guide the jaw into a normal gait pattern can signal a more severe degree of displacement (e.g., disc displacement without reduction) or a significant discal fold. Loud “bone on bone” grinding during opening and closing may signal a perforation of the disc.

Management implications

The patient’s ability to correct a faulty movement pattern during the physical assessment is a good prognostic sign and indicates that the patient may initially be managed without a dental referral. Disc perforation, on the other hand, should signal an immediate referral.

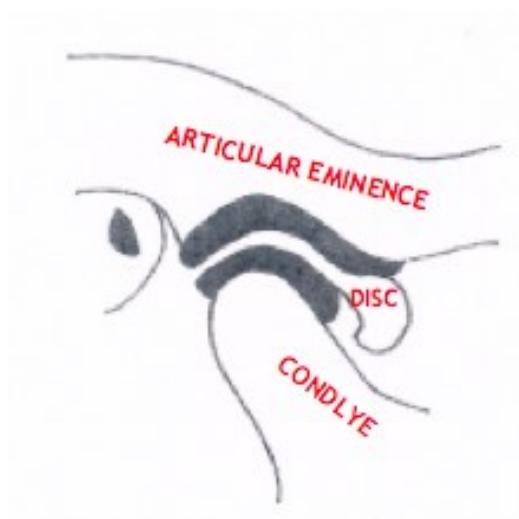


Disc displacement

(ICD-9 524.63;ICD-10 M26.63)

Disc displacement refers to a malpositioned and malfunctioning TM disc. This disorder can broadly be divided into displacement with or without reduction and has the potential to result in a closed mouth locking of the jaw. Its presentation is not to be confused with joint hypermobility related to subluxation and dislocation of the jaw which results in an open mouth lock. The RDC/TMD further subdivides each of these disc displacement diagnoses into 2 subgroups: *disc displacement with reduction* with or without a history of prior intermittent locking; and two versions of *disc displacement without reduction*, one with and one without limited opening at the time of the assessment.

Note: both the ICD 9 and 10 codes are identical for all of the disc displacement variations.



(Continue to next page for disc displacement with reduction.)

Disc displacement WITH reduction

Description

With the mouth closed, the disc is malpositioned anterior to the condyle (or less commonly medial or lateral to the condyle) and returns to its proper place when the mouth is opened, often producing joint noise (i.e., snap, pop or click). Then on closed relaxation, the disc slips anteriorly creating a second joint noise. A variation of this condition occurs when the disc temporarily does not reduce and the patient experiences intermittent episodes of the jaw locked in a closed mouth position.* (Schiffman 2014)

Presentation

Clicking or popping with opening/closing produces a unilateral reciprocal joint noise (at the time of the exam or in the last 30 days triggered by jaw movement); not usually associated with locking; can be associated with an opening “C” deviation (or an “S” deviation if bilateral); when reciprocal clicking is present, the opening click may occur when the mouth is in a wider position than when the closing click occurs (Wright 2010); possible palpatory pain in the cervical/masticatory muscles and capsule; compression of the joint will usually be positive for recreation of pain.

Management implications

If associated with pain, this condition should be co-managed with a dentist who specializes in TMD and may include the use of an appliance or splint. Some degree of disc derangement or displacement, however, is present in about 30% of asymptomatic individuals (Stegen 2001). Schiffman (2014) reports “Based on available data, DD with reduction is highly prevalent and is probably without clinical consequence unless pain occurs with the noise, or functional limitations such as limited opening or interference in mastication are present.” However, when associated with detectable muscle imbalance, practitioners may choose to treat to restore normal biomechanics as a prophylactic measure.

Minimum RDC/TMD diagnostic criteria (based on Schiffman 2014)

History: The patient reports any TM joint noise during the physical examination or in the prior 30 days associated with jaw movement or function.

In the *intermittent locking* variation, the patient must report episodes in the prior 30 days of the jaw locking with limited ability to open (even if for only a moment) and then unlocking.

Physical Exam: Palpatory detection of joint noise (e.g., clicking, popping and/or snapping) during at least one of 3 repetitions of either 1) *both* opening and closing or 2) in two different planes of movement (during opening or closing and during lateral movement or protrusion).

In the intermittent locking variation, the jaw may lock in a closed mouth position and require the patient or practitioner to aid in its unlocking.

Validity of Diagnostic Criteria: Without imaging: sensitivity 0.34; specificity 0.92. Imaging is the reference standard for this diagnosis. The intermittent locking variation without imaging has 0.38 sensitivity and 0.98 specificity. A history of noise and the presence of clicking during the physical assessment helps to rule this diagnosis in (+LR 4.25). But the -LR of 0.63 is very poor and some cases there will be displacement with reduction but without the requisite jaw noise.

DD without reduction with limited opening (i.e., “closed lock”), on the other hand, shows good diagnostic validity without imaging (i.e., sensitivity 80%; specificity 97%).

Imaging: When confirmation is necessary, an MRI must demonstrate that, with the jaw in the intercuspal position, the intermediate zone of the disc is anterior to the condylar head while the posterior aspect of the disc is anterior to the 11:30 position of the condylar head and that with maximum opening the intermediate zone is located between the condylar head and the articular eminence. Imaging using MRI is required for a definitive diagnosis of TMJ DD.

*The RDC/TMD created a separation category for disc displacement with reduction which sometimes locks with a closed mouth.

Disc displacement WITHOUT reduction

Description

With the mouth closed, the disc is malpositioned anterior to the condyle (or less commonly medial or lateral to the condyle) and does NOT return to its proper place when the mouth attempts to open. This malposition results in *persistent* limited opening (i.e., closed lock position) present during the time of the examination or locked historically, but with normal opening at the time of the examination. A click with full opening or other TM noise does not preclude this diagnosis. (Schiffman 2014)

Presentation

Presents with an inability to fully open the mouth due to the anteriorly displaced disc and inability of the condyle to translate anteriorly in the superior joint space; an opening deflection (usually to the side of dysfunction); painful joint motion; possible history of reducing displacement or locking (lasting from seconds to days); usually no current popping or clicking, possible palpatory pain in the cervical/masticatory muscles and capsule, compression of the joint will be positive for recreation of pain.

Note: In chronic cases where the capsule has stretched and adapted (i.e., with formation of a pseudodisc), there may no longer be joint tenderness and range of motion may increase with decreased locking. If, however, the muscle tone increases, locking can recur temporarily. DDX: a lateral pterygoid spasm can cause a similar closed lock.

Management implications

This condition should be co-managed with a dentist who specializes in TMD and may include surgical intervention or the use of an appliance or splint.

Minimum RDC/TMD diagnostic criteria (based on Schiffman 2014)

History: The patient reports that the jaw has locked in the prior 30 days preventing the mouth opening to its normal range AND this limitation *interfered with the ability to eat*.

Physical Exam: Maximum opening (with the practitioner's assistance) < 40 mm (including vertical incisal overlap). In a variation of disc displacement without reduction, patient assisted maximal opening may equal or exceed 40 mm on the day of the examination.

Validity of Diagnostic Criteria: Patients with limited opening the day of the examination (without imaging): sensitivity 0.80; specificity 0.97. Patients without limited opening the day of the examination: sensitivity 0.54; specificity 0.97. Imaging is the reference standard for this diagnosis.

Imaging: When confirmation is necessary, an MRI must demonstrate that, with the jaw in the intercuspal position, the intermediate zone of the disc is anterior to the condylar head. At the same time the posterior aspect of the disc is anterior to the 11:30 position of the condylar head. With maximum opening the intermediate zone remains in a fully anterior position.

Hypermobility (“orthopedic” subluxation & dislocation)

Subluxation (ICD-9 830.0; ICD-10 S03.OXXA)

Description

Hypermobility of the TMJ results in the entire disc-condyle complex slipping partly or entirely anterior to the articular eminence with the jaw when the mouth is opened. It may then lock in an opened mouth position and must be reduced with a manipulative maneuver. When the malposition can be reduced by the patient, this is referred to as a subluxation.* When the patient presents with the open locked position to a clinician and the clinician must reduce the dislocation to normalize jaw movement, this is referred to as a luxation (or dislocation). This disorder is not to be confused with a displaced disc because locking in that disorder is closed mouthed. Note that occasionally a dislocation will also result in an anterior or posterior displacement of the disc.

Presentation

Opening contralateral deflection when the condyle passes the slope of the eminence, capsular tenderness toward the anterior joint line, palpatory pain in the masticatory muscles, joint clicking/clunking as the condyle partially dislocates, and possible joint locking in an open position resulting in a subluxation (lasting a variable length of time) or dislocation.

Management implications

A distraction procedure may be necessary to unlock the jaw. (Peterson 2003)

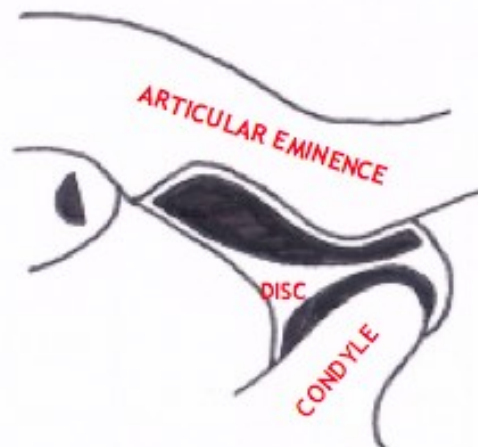
Minimum RDC/TMD diagnostic criteria (based on Schiffman 2014)

History: The patient reports in the last 30 days that the jaw “caught” or locked (even if only momentarily) when the mouth was in a wide open position and the patient needed to perform a self-maneuver to free it.

Physical Examination: No exam findings are required. If it happens during the office visit, the patient demonstrates their ability to unlock the jaw. In the case of a dislocation, the jaw is in an open locked position and requires the practitioner to unlock it.

Validity of Diagnostic Criteria: Without imaging and based only on history: sensitivity 0.98; specificity 1.00.

Imaging: In the case of a dislocation, if confirmation is necessary, imaging reveals that the condyle is positioned beyond the height of the articular eminence.



*This an “orthopedic” subluxation (i.e., a significant malposition just short of a dislocation) as opposed to a “chiropractic” subluxation suggesting a stable joint dysfunction.

Osteoarthritis/Degenerative joint disease

(ICD-9 715.18; ICD-10 M19.91)

Description

Jaw pain associated with TMJ degeneration changes.

Presentation

Crepitus either palpable, audible or both, painful joint motion, opening restricted by pain, palpable joint line and capsular tenderness especially in the symptomatic phase, limitation of condylar translation, opening deflection, possible palpatory pain in the cervical/masticatory muscles. Malocclusions can occur, such as an anterior open bite associated with bilateral DJD and a contralateral posterior open bite associated with unilateral DJD. (Schiffman 2014)

Management implications

Osteoarthritis: Significant crepitus may indicate end-stage DJD. Referral for co-management to a dentist or TMJ specialist may be advised.

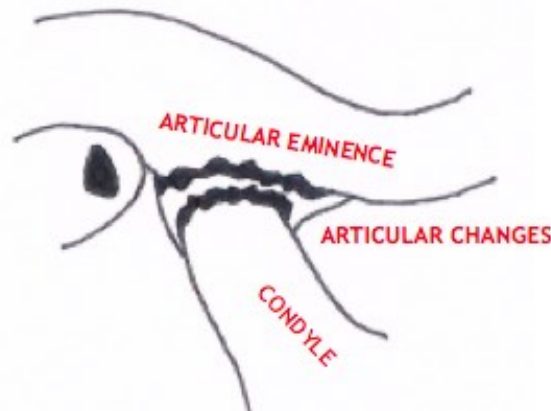
Minimum RDC/TMD diagnostic criteria (based on Schiffman 2014)

History & physical: All of the following criteria must be fulfilled:

- Patient reports pain within the prior 30 days localized around the jaw, temple, ear or front of the ear AND the patient confirms the location of the pain by pointing to the structures where it is felt AND reports that it is modified by movements or functional loading of the jaw (e.g., eating, talking, clenching).
- The patient reports TMJ noise either in the prior 30 days associated with jaw movement or function OR reports noise during the physical exam.
- Crepitus is detected with palpation during at least one of the following movements: opening, closing, right or left lateral, or protrusion.
- Palpatory tenderness of the later pole of condyles is present which is recognized as the familiar pain OR reproduction of familiar pain by movement in of the jaw in any direction (active or assisted opening, lateral movement or protrusion).

Validity of Diagnostic Criteria: Unknown.

Imaging: In cases when confirmation is necessary at least one of the following must be detectable on CT: subchondral cysts, erosions, generalized sclerosis, or osteophytes. Flattening of the condyle and cortical sclerosis alone may be a normal variation, simple age-related changes, remodeling, or a precursor to DJD.



Retrodiscitis

(ICD-9 727.9; ICD-10 M67.90)

Description

Pain can be caused by inflammation of the retrodiscal tissues as a result of acute macro or micro trauma. The condyle presses against swollen, distended tissues during maximum tooth contact. The retrodiscal tissue, also known as the bilaminar zone, is in an area posterior to the articular disc and is comprised of two separate layers or laminae that are heavily innervated and vascularized. (Wilkinson 1994) This structure is folded in an accordion-like fashion when the mandible is at rest or the teeth are in full contact and is stretched and extended during protrusive and mouth opening movements causing a tensile force and imbibition to the articular disc.

Presentation

Usually caused by an acute traumatic event (Mark 2014). Local TMJ pain is aggravated by (and sometimes initially caused by) clenching and “parafunctional overload” habits such as nail biting, thumb sucking, bruxism, or resting the jaw in the hands or against a phone. Chronic disc displacement and dislocation may also irritate the retrodiscal tissues. If pain becomes continuous and constant, referred pain may develop.

The condyle may be displaced anteriorly in the rest position causing a slight contralateral shift with little or no tooth contact on the involved side (due to effusion), both at rest and when opening. Pain aggravation may occur if the patient attempts to fully occlude the involved side (Curl 1993). If the condition is bilateral, the entire mandible may be displaced forward with contact solely on the anterior teeth.

Palpation may detect tenderness over the posterior joint through the external meatus of the ear. (Prabhu 2008) Joint pain may be reproduced by any of the following: superior/posterior motion of the TMJ, the passive mandibular distalization test, passive mandibular elevation (creating superior/anterior loading). Biting down on a tongue depressor may reduce pain by preventing full closure (Prabhu 2008).

Retrodiscitis and synovitis are closely related and may be clinically difficult to separate. Some authors clinically equate retrodiscitis with synovitis (Curl 1993).

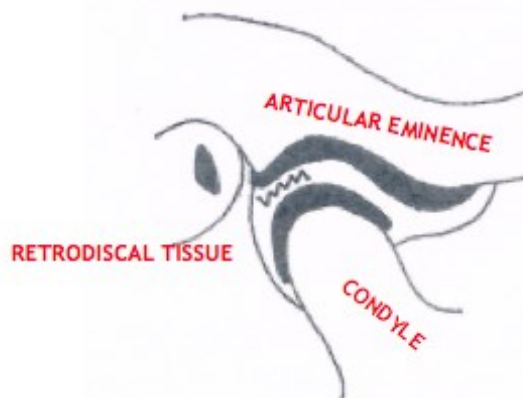
This condition can also be associated with disc displacement and in these cases can be associated with clicking and closed mouth locking. (See disc displacement with and without reduction).

Management implications

Manipulation of the jaw is relatively contraindicated, especially any maneuver that compresses the retrodiscal space or stretches the retrodiscal lamina.

Minimum RDC/TMD diagnostic criteria (based on Schiffman 2014)

This specific diagnosis is not recognized by the RDC/TMD classification system.



Capsular sprain

(ICD-9 848.1;ICD-10 S03.4XXA)

Pain with stretching of the capsule, painful jaw motion especially with protrusion, lateral movement and wide opening, chewing on the ipsilateral side, palpatory pain in the capsule, pain with joint loading in protrusion, pain with joint distraction maneuvers.

Management implications

Patient education and activity modifications may be necessary to avoid further stretching of the capsule and tissues, such as wide yawning, or chewing a large food bolus on the involved side. Manipulation that causes an overstretching of the capsule and stabilizing ligaments in the acute stage may be contraindicated.

Capsulitis/synovitis

(ICD-9 727·9; ICD-10 M67·90;)

Description

The joint capsule itself (along with the synovial lining) may become inflamed. Capsulitis and synovitis are difficult to differentiate from each other and some consider the conditions to be clinically indistinguishable (Ongole 2014).

Presentation

The patient may be in significant pain and be aware of a feeling of swelling or pressure around the condyle. This disorder is precipitated by hard chewing, grinding of the teeth, clenching or a traumatic event. Usually the patient is in continuous pain whenever the condition is active, experiencing pain at rest exacerbated by maneuvers that stretch the capsule (e.g., wide opening, lateral translation, contralateral chewing, protrusion) (Curl 1993)

Palpation elicits tenderness (and perhaps swelling) over or around the condyle that is at least equal to or greater than tenderness from muscle palpation (although the muscles may also be in a reactive spasm). Passive distraction of the mandible is painful. Resisted closing or protrusion may also cause pain due to the pull of the lateral pterygoid on the capsule. Having the patient gently clench and relax the jaw 3-5 times may cause temporary relief of the pain or diminish the feeling of pressure (thought to be due to a “milking” action of the capsule).

Management implications

Manipulation of the jaw is contraindicated until the acute phase and swelling subsides.

Minimum RDC/TMD diagnostic criteria (based on Schiffman 2014)

This specific diagnosis is not recognized by the RDC/TMD classification system.

Plica

(ICD-9 727·9; ICD-10 M67·90)

Description

Plica are folds, pouches, or redundancies of the joint capsule that can become inflamed or entrapped.

Presentation

The patient may complain of a “sharp” pain and point to the superior aspect of the TMJ. There usually is no report or indication of swelling and the pain may be experienced only when biting down. Motion of the jaw is not accompanied by clicks or other joint sounds. An entrapped plica may present like a dislocation, causing an open mouth lock. Pain is aggravated by the passive mandibular distalization/compression test.

Management implications

If the jaw is locked due to an intraarticular blockage, a distraction manipulation may release it. (Peterson 2003)

Minimum RDC/TMD diagnostic criteria (based on Schiffman 2014)

This specific diagnosis is not recognized by the RDC/TMD classification system.

EXTRACAPSULAR DIAGNOSES (pp 38-40)

Myalgia/Myofascial Pain

(ICD-9 729.1: ICD-10 M79.1)

Description

Myalgia is an umbrella term for jaw pain thought to originate from the jaw muscles.* It can be subdivided into *local myalgia* (i.e., familiar pain can be provoked by both palpation and by muscle loading maneuvers such as maximum opening of the jaw), *myofascial pain* (familiar pain is reproduced by palpation), and *myofascial pain with referral* (familiar referred pain provoked by palpation).

Presentation

Myalgia/myofascial pain is often secondary to other types of TMJ disorders. The pain, often bilateral, is provoked by eating or clenching. There is palpatory pain in the masticatory muscles (e.g., temporalis, masseter, pterygoids) and there may be palpable myofascial trigger points. There may also be palpatory pain in the cervical musculature. Pain may be exacerbated by joint distraction maneuvers.

Minimum RDC/TMD diagnostic criteria (based on Schiffman 2014)

History (for all of the muscular diagnoses): The patient complains of jaw pain (or pain around the temple, anterior to the ear or in the ear) AND this pain is aggravated/provoked by movement of the jaw or functional loading (e.g., clenching).

Physical Examination: The patient can point to and confirm the location of his/her pain in the masseter or temporalis muscle (this applies to all of the muscular diagnoses) AND reports provocation or aggravation of the *familiar* pain by either palpation (i.e., *myofascial pain syndrome*) OR by both palpation and maximum unassisted/assisted opening movement(s) (i.e., *local myalgia* diagnosis). Prolonged palpation (e.g., 5 seconds) of a tender point in a muscle may reproduce a familiar pain referral (i.e., diagnosed as *myofascial pain with referral*) Note: other masticatory muscles can be assessed as needed and palpation may reproduce the familiar pain (i.e., myofascial pain syndrome).

Validity of Diagnostic Criteria: For the general diagnostic category of myalgia: Sensitivity 0.90; Specificity 0.99. Diagnostic criteria must be fulfilled and no competing diagnosis can more fully account for the patient's presentation. Sensitivity and specificity have not been established for the other muscle diagnoses or for muscles other than temporalis or masseter.

* Other systems (de Leeuw 2008) further break down muscle involvement into *protective splinting* (which is thought to differ somewhat from myalgia or myospasm in that it is a protective contraction associated with little or no pain at rest, near normal ROM, and a complaint that the jaw muscles "tire easily"), and *muscle soreness* which can result from extended periods of prolonged contraction. For the purposes of this document, these conditions can be combined under the more general diagnosis of local myalgia.

Myospasm

(ICD-9 728-85; ICD-10 M62-838)

Description

A sudden, involuntary, reversible tonic contraction of a muscle. Spasm may affect any of the masticatory muscles. Acute malocclusion may be present.

Presentation

Rapid onset of severe, cramping pain. Pain at rest (Okeson 2013). Can occur in any muscle but may be more common in the pterygoids (Wright 2010). In an inferior lateral pterygoid spasm, active opening may be reduced and pain is significantly increased by forward translation of the condyles or retracting the jaw to achieve maximal occlusion. Attempting to press the posterior teeth together can be especially painful. Gentle stretching can reduce the pain and begin to increase range of motion. DDX: The rapidity of onset and limited ROM may help differentiate it from local myalgia. NOTE: rarely, what appears as muscle spasm may actually be spasticity associated with an upper motor neuron lesion.

Management implications

In office and home stretches are indicated.

Minimum RDC/TMD diagnostic criteria (based on Schiffman 2014)

History: The patient complains of a sudden onset of jaw pain (or pain around the temple, anterior to the ear or in the ear) that is aggravated/provoked by movement of the jaw or functional loading (e.g., clenching) AND results in immediate reduction in range of jaw motion.

Physical Exam: The patient reports provocation or aggravation of the *familiar* pain by palpation AND there is limited range of jaw motion in the direction that elongates the affected muscle; (i.e. for jaw closing muscles, opening will be limited to <40 mm; for lateral pterygoid muscle, ipsilateral movement will be limited to <7 mm)

Note: The pain is not better accounted for by another pain diagnosis.

Validity of Diagnostic Criteria: Sensitivity and specificity have not been established.

Laboratory testing: In rare circumstances if this diagnosis needs to be confirmed, EMG activity is elevated when compared to contralateral unaffected muscle.

Tendonitis

(ICD-9 727·9; ICD-10 M67·90)

Description

The temporalis tendon or other tendons of masticatory muscles are the pain generators in this TM disorder.

Presentation

Pain may be related to clenching, talking, eating or other common jaw functions and may be provoked or aggravated by palpation over the tendon. Jaw range of motion may be limited due to pain. Pain may refer to the teeth. Limitation of mandibular movement(s) secondary to pain may be present. (Schiffman 2014)

Management implications

Aggressive, repetitive habits and actions should be avoided, such as gum or jerky chewing and other parafunctional oral behaviors. Muscle balance and function should be examined after the inflammation subsides.

Minimum RDC/TMD diagnostic criteria (based on Schiffman 2014)

History (for all of the muscular diagnoses): The patient complains of jaw pain (or pain around the temple, anterior to the ear or in the ear AND is aggravated/provoked by movement of the jaw or functional loading (e.g., clenching).

Physical Examination: The patient can point to and confirm the location of his/her pain in any tendon of the masticatory muscles AND reports provocation or aggravation of the *familiar* pain by palpation of the tendon.

Validity of Diagnostic Criteria: The diagnosis depends on fulfilling the above criteria and no competing diagnosis can more fully account for the patient's presentation. The sensitivity and specificity of these criteria are unknown.

APPENDIX I: ACTIONS OF MUSCLES OF THE TMJ

Interpreting aberrant AROM and resisted ROM depends on understanding the actions of the TMJ muscles.

Action	Muscles
Mandibular elevation (closing) AKA: adduction	Masseter muscle (superficial fibers; deep fibers stabilize condyle against articular eminence while biting) Medial Pterygoid muscle (deep & superficial fibers) Temporalis muscle (anterior and middle fibers fire against resistance; posterior fibers are controversial) Sphenomandibularis (often considered a part of the temporalis) Lateral Pterygoid muscle (superior head activates during power strokes to stabilize disc and condyle against articular eminence)
Mandibular depression (opening)	Digastric (posterior on initial movement, if hyoid is stable) Sternohyoid (isotonic contraction allows hyoid bone to move) Geniohyoid (on initial movement) Mylohyoid (on initial movement) Lateral pterygoid muscles (bilaterally assists with the digastric; inferior heads act during the translation phase) Gravity
Mandibular Protrusion (anterior glide)	Masseter (superficial fibers) Lateral Pterygoid (inferior head bilaterally) Medial Pterygoid (superficial fibers) Digastric (anterior bellies bilaterally) Sternohyoid
Mandibular Retrusion (posterior glide)	Temporalis (middle and posterior fibers) Masseter (oblique, middle fibers) Digastric Mylohyoid Sternohyoid
Mandibular Excursion (lateral glide)	Temporalis (ipsilateral: posterior) Medial pterygoid (bilaterally excursion; unilateral contraction, contralateral excursion; superficial fibers, deep fibers) Lateral pterygoid (unilateral contraction, contralateral excursion: inferior head; superior head in a minor role) Masseter Digastric Sternohyoid
Hyoid elevation	Stylohyoid Mylohyoid Geniohyoid
Hyoid depression	Thyrohyoid Sternohyoid Sternothyroid Omohyoid

References:

- American Society of Temporomandibular Joint Surgeons. Guidelines for diagnosis and management of disorders involving the temporomandibular joint and related musculoskeletal structures. *Cranio*. 2003;21:68-76.
- Armijo-Olivo S, Silvestre RA, Fuentes JP, da Costa BR, Major PW, Warren S, Thie NM, Magee DJ. Patients with temporomandibular disorders have increased fatigability of the cervical extensor muscles. *Clin J Pain*. 2012 Jan;28(1):55-64.
- Buescher JJ. Temporomandibular Joint Disorders, , *Am Fam Physician*. 2007 Nov 15;76(10):1477-1482.
- Curl DD, Stanwood G. The Chiropractic Management of Capsulitis and Synovitis of the temporomandibular joint. *J Orofacial Pain* 7(3):283-293, Summer 1993.
- Dao TT, LeResche L. Gender differences in pain. *J Orofac Pain*. 2000;14:169-184; discussion 184-195.
- De Laat A, Meuleman H, Stevens A, et al. Correlation between cervical spine and temporomandibular disorders. *Clin Oral Investig*. 1998;2:54-57.
- de Leeuw R. Orofacial Pain: Guidelines for Classification, Assessment, and Management, ed 4, Chicago 2008. 2008
- DeVocht JADA 2013 Pilot Study of a Chiropractic Intervention for Management of Chronic Myofascial Temporomandibular Disorder
- Johansson A, Unell L, Carlsson GE, Soderfeldt B, Halling A. Gender difference in symptoms related to temporomandibular disorders in a population of 50-year-old subjects. *J Orofac Pain*. 2003;17:29-35.
- Mark, BM. *Acupuncture Today*, 2014 (15(3))
- Marklund S, Wänman A. Risk factors associated with incidence and persistence of signs and symptoms of temporomandibular disorders. *Acta Odontol Scand* 2010;68:289-99.
- Okeson JP. *Management of Temporomandibular Disorders and Occlusions* Elsevier 2013.
- Ongole R, Praveen BN. *Textbook of Oral Medicine, Oral Diagnosis and Oral Radiology*. Elsevier, 2nd edition, 2014.
- Peck CC, Goulet J-P, Loggezoo F, et al. Expanding the taxonomy of the diagnostic criteria for temporomandibular disorders. *J Oral Rehabil*. 2014 Jan;41(1):2-23.
- Prabhu SR. *Oral Diseases and Disorders” Differential Diagnosis*, 2008
- Reneker, *Journal of Orthopedic and Sports Physical Therapy* 2011
- Reneker J, Paz J, Petrosino C, Cook C. Diagnostic accuracy of clinical tests and signs of temporomandibular joint disorders: a systematic review of the literature. *J Orthop Sports Phys Ther* 2011;41:408-16.
- Rocabado M. Arthrokinematics of the temporomandibular joint. *Dent Clin North Am*. 1983;27:573-594.
- Schiffman E, Ohrbach R, Truelove E, et al. Diagnostic criteria for temporomandibular disorders (DC/TMD) for clinical and research applications: Recommendations of the International Headache Society 2013 768 Cephalalgia 33(9) RDC/TMD Consortium Network and Orofacial Pain Special Interest Group. *J Orofacial Pain* 2013 (in press).
- Schiffman ES, Ohrbach R, List T, et al. Diagnostic criteria for headache attributed to temporomandibular disorders (TMD). *Cephalalgia* 2012; 32: 683-692.
- Shaffer SM, Brismée JM, Sizer PS, Courtney CA. Temporomandibular disorders. Part 1: anatomy and examination/diagnosis. *Journal of Manual and Manipulative Therapy*, Volume 22 Issue 1 (February 2014)

Shepard, Headache 2013 Orofacial Pain: A Guide for the Headache Physician

Souza T. Differential Diagnosis and Management for the Chiropractor, Jones and Bartlett, Sudbury, Massachusetts, 2009, 4th edition.

Stegenga B. Osteoarthritis of the temporomandibular joint organ and its relationship to disc displacement. J orofac Pain 2001;15(3):193-205.

Steigerwald DP, Verne S, Young D. A retrospective evaluation of the impact of temporomandibular joint arthroscopy on the symptoms of headache, neck pain, shoulder pain, dizziness and tinnitus. J Craniomand Prac. 1996; 14(l):46-54.

Tallents RH. The prevalence of TMJ internal derangements in asymptomatic volunteers and symptomatic TMD patients. TMJ pain and dysfunction update: diagnosis and management. U.C. Davis Dept. Of Radiology and Office of Continuing Medical Education. April 6-8, 1994:7-18.

The Headache Classification Committee of the International Headache Society (IHS) (2013) International Classification of Headache Disorders, 3rd edition (beta version). Cephalalgia 33(9):629-808. doi:10.1177/0333102413485658.

Wänman A. Longitudinal course of symptoms of craniomandibular disorders in men and women. A 10-year follow-up study of an epidemiologic sam- ple. Acta Odontol Scand 1996;54:337-42.

Warren MP, Fried JL. Temporomandibular disorders and hormones in women. *Cells Tissues Organs*. 2001;169:187-192.

Wilkinson TM and Crowley CM. A histologic study of retrodiscal tissue of the human temporomandibular joint in the open and closed position. J Orofac Pain 1994; 8(l):7-17.

Wright EF. Manual of Temporomandibular Disorders. Wiley-Blackwell 2nd edition 2010