In reviewing the literature on disorders of the temporomandibular joint (TMJ), two distinct characteristics are immediately apparent. First, the majority claim to be successful with their methods of correction of this malady. Second, there is little interprofessional collaboration in standardization of treatment. Therefore, in providing a contemporary approach to the diagnosis and treatment of temporomandibular disorders, it is the intent of the author to provide a concise protocol for chiropractors which also incorporates a corroboration with the various allied professionals specializing in this area. The chiropractor's unique training in detecting and correcting joint dysfunction lends a distinct advantage in providing care to patients with TMJ disorders.

Often, the most useful tool in determining the cause of temporomandibular disorders is derived from the patient history. Seldom is a singular underlying traumatic event the cause of the condition. TMJ dysfunction is considered to be a multifactorial disease (Table 15.1) (1).

When the chiropractor encounters a patient presenting with possible TMJ dysfunction, great care should be taken to avoid a tunnel vision approach that would skew the ability to derive an accurate diagnosis and provide a corrective treatment program. For TMJ disorders, as in the case of the vertebral subluxation complex, the logical and most productive course of management is to start with noninvasive reversible forms of treatment and therapy and to escalate if necessary, as the severity of the condition dictates. All too often, chiropractors are quick to refer TMJ patients to dentists and other allied health professionals when they can be managed, and often times treated, with chiropractic methods. When the severity of the condition dictates a teamwork approach, the chiropractor should refer to a dentist or other allied health professional familiar with the TMJ and with whom a working relationship can then be established. The chiropractor may also want to refer the patient to a diagnostic imaging center or a comprehensive rehabilitation facility to obtain additional information in order to get an accurate diagnosis or to incorporate adjunctive therapies that may enhance the patient's recovery. Additionally, there is a need for the chiropractor to incorporate as many objective tools available as outcome measures for manual treatment and any adjunctive therapies.

**Surface Anatomy of the Temporomandibular Joint**

The temporomandibular joint is situated just anterior to the external acoustic meatus and below the posterior end of the zygomatic arch. When the mouth is open, the condyles move out of the mandibular fossa into the articular tubercle, at which time a depression is noted on palpation of the joint. When palpating for the location of the TMJ, it is the posterior lateral aspect of the condyle which the clinician locates to monitor the movement through its range of motion (2).

The temporomandibular joint is a three-joint complex that consists of the head of the condyle and its articulation with the inferior border of the articular discs. The superior boundary of the joint is housed within the glenoid fossa which articulates with the superior border of the articular disc. The head of the mandibular condyle is knuckle-shaped and convex in all directions and is accepted via the articular disc into the glenoid fossa which is oval and deeply concave (Fig. 15.1).

The articular disc is described as a firm, oval, fibrous plate. When viewed in the lateral plane (Fig. 15.2), its cen-

### Table 15.1. Proposed Causes of Temporomandibular Joint Dysfunction*  

<table>
<thead>
<tr>
<th>Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>External trauma to the joints and/or muscles</td>
</tr>
<tr>
<td>Motor vehicle accidents</td>
</tr>
<tr>
<td>Dental treatment</td>
</tr>
<tr>
<td>Orthodontia</td>
</tr>
<tr>
<td>Surgical procedures with intubation</td>
</tr>
<tr>
<td>Cervical traction</td>
</tr>
<tr>
<td>Contact sports</td>
</tr>
<tr>
<td>Occlusal disparity</td>
</tr>
<tr>
<td>Poor bite</td>
</tr>
<tr>
<td>Missing teeth</td>
</tr>
<tr>
<td>Jaw misalignment</td>
</tr>
<tr>
<td>Psychological factors</td>
</tr>
<tr>
<td>Anxiety</td>
</tr>
<tr>
<td>Tension</td>
</tr>
<tr>
<td>Nutritional factors</td>
</tr>
<tr>
<td>Nutrient deficiencies</td>
</tr>
<tr>
<td>Occlusal habits</td>
</tr>
<tr>
<td>Clenching</td>
</tr>
<tr>
<td>Bruxism</td>
</tr>
<tr>
<td>Gum chewing</td>
</tr>
</tbody>
</table>

entral portion is quite thin with respect to the periphery. The posterior border is especially thick. The disc is fused to the capsule at the anterior aspect where it extends forward in front of the condyle. This allows for the attachment of the superior fibers of the lateral pterygoid muscle. The capsule is continuous posteriorly with the retrodiscal pad.

The anterior portion of the articular disc is avascular in contrast to the retrodiscal pad, which is a vascularized and innervated thick layer of connective tissue attached to the posterior wall of the capsule. The unique avascular characteristic of the articular disc is complemented by avascular fibrous layers covering the mandible and the glenoid temporal surface of the TMJ. The lack of vascularized tissue suggests the presence of considerable mechanical stresses along this portion of the joint.

The capsule and articular discs are independently attached inferiorly to the medial and lateral poles of the condyle. This unique attachment of the disc to the respective poles of the condyle assures synchronization of normal biomechanical movements by the mandible and the articular disc.

Fibrous Capsule

The fibrous capsule of the TMJ is attached to the articular tubercle of the temporal bone and along the limits of the posterior root of the zygoma. Posteriorly, the fibrous capsule arises from the posterior aspect of the articular lip. Although the capsule is strongly reinforced laterally, it tends to be loosely arranged anteriorly, posteriorly, and medially. The lateral capsular region is strongly reinforced via the temporomandibular ligament. A wide fan-shaped lateral portion and a narrow medial band comprise the two separate layers of the temporomandibular ligament. The broad fan-shaped portion of this ligament is connected along the zygomatic process of the temporal bone and its narrow portion is attached to the neck of the mandible. Its posterior fibers present a vertical arrangement between the mandible and temporal bones, whereas the anterior fibers are obliquely arranged inferiorly and posteriorly. The medial portion of the fibers travel primarily in a horizontal manner and comprise a ligamentous band which attaches to the crest of the articular tubercle and extends along the lateral pole of the mandibular condyle and attaches to the disc.

The function of the ligaments is primarily to limit movements of the mandible. The lateral fan-shaped fibers prevent the mandibular condyle from being displaced away from the articular eminence. The medial band prevents excessive retrusive movements and thus prevents the condyle from pressing against and damaging the tissues behind the articulation (3).

The sphenomandibular and the stylomandibular are considered to be the accessory ligaments of the TMJ. The stylomandibular ligament extends from the styloid process and stylohyoid ligament to the angle of the mandible. The ligament tenses when the mandible is protruded and is loose when the jaw is closed. When the jaw is at its maximal opening, this ligament is in its most relaxed state. The suggested function of the stylomandibular ligament is to limit excessive protrusive movements (3). The sphenomandibular ligament originates from the sphenoid spine and inserts onto the mandibular lingula and neck of the mandible. Shore (4) suggests that the accessory ligaments function in a restrictive manner to keep the condyle, temporal bone and articular disc firmly opposed.

Synovial Membrane

The synovial membrane consists of a highly vascularized form of connective tissue which lines the entire fibrous capsule. It also covers the superior and inferior surfaces of the retrodiscal pad and the loose connective tissues anchoring the posterior border of the disc to the capsule.
The rich vascular supply which the synovial tissue requires is located in the posterior compartment via the superficial temporal artery. Essentially, the synovial membrane lines all of the TMJ articular structures which are not subject to shearing or compressive stresses. The synovial membrane is absent in the articular surfaces subjected to compressive and shearing forces, such as the mandibular condyle, articular disc, and the temporal bone.

Masticatory Muscle Action

When examining the masticatory muscle structures for possible extracapsular involvement, the clinician must carefully evaluate the agonist as well as the antagonist muscles. The musculoskeletal system provides the mechanical power in stabilizing, positioning, and movement of the TMJ articulation. It is critical to understand that no single muscle structure acts alone in this process. In order for normal movement to be performed, a cooperative effort between the agonist muscles and the antagonist muscles is necessary. As the agonist muscles initiate joint movement, the antagonist muscles working in concert, respond in opposition by producing a graduated and controlled muscular contraction.

Muscle Tone

Muscle tonus is characterized primarily by the muscles’ resistance to elongation or stretch. Clinically, muscle tonus is described as hypertonic or hypotonic. Hypertonicity relates to the muscles relative expansion in passive resistance to stretching of the muscle fibers. Hypotonicity relates to a diminished passive resistance to stretch.

Muscle Spasm

Muscle spasm is characterized by an abrupt involuntary muscle contraction, either individually or as a group. This phenomenon involves functionally related musculature and is accompanied by pain and mechanical interference to normal joint activity. When spastic muscle contraction is present, it may take the form of isometric or isotonic behavior. Isotonic muscle spasm creates a shortening of the muscle which leads to aberration in muscular movement and tone. Isometric muscle spasm produces a marked resistance to stretching and is characterized as muscular rigidity. Muscle spasm is readily observed and easily palpated on evaluation.

Muscle Splinting

Muscle splinting is characterized by an involuntary increase of tonicity of the musculature, which in turn impairs the stability and normal movement of the TMJ. It is believed that muscle splinting is a response to altered mechanical or proprioceptive sensory impulses. In contrast to muscle spasm, splinting readily returns the muscle fibers to normal tonus on cessation of the causative factor.

Clinical Implications

Often, masticatory conditions may be difficult to differentiate into exact categories, therefore hindering the administration of proper treatment. Masticatory muscle contractures are often categorized into involuntary responses and actuation of normal biomechanical movements. Muscle tonus, muscle splinting and muscle spasm are categories of involuntary responses. Muscle tonus is characterized as a varying degree of continuous contractions of a muscle at rest which furnishes mechanical stability to the craniomandibular articulation. Muscle splinting is a momentary state of hypertonicity induced by the body’s protective mechanism in an attempt to stabilize a threatened articular structure. Muscle splinting in and of itself does not produce any structural muscular dysfunction and tends to present itself as a feeling of weakness and inhibition of pain. Muscle spasm is a self-perpetuating muscle protracted state of involuntary tonic contraction. It is accompanied by pain and rigidity and induces structural muscular changes.

Actuation of normal biomechanical movement consists of conscious voluntary mandibular movements such as habitual chewing, sucking, kissing, and swallowing. These types of movements are based on patterns within the central nervous system and are kept in check by sensory and proprioceptive neuroreceptors (15).

Arthrokinematics

During the full range of mandibular movement from the closed position to maximal opening, both condyles of the mandible contribute equally. Opening and closing of the mouth is achieved through coupled motion of the condyle. This coupled motion consists of rotation and translation. Opening of the mouth is first initiated by pure rotation around the horizontal axis through the two condylar heads. This rotational motion is described as a hinged movement and occurs initially between the mandibular condyle and the articular disc (Fig. 15.3). As the opening of the mouth continues, the rotational hinge motion reaches its maximum at about the first 12 to 15 mm of mandibular movement. At this point, further opening of the mouth is allowed by the translatory or gliding motion of the mandibular condyle and meniscus as it articulates along the slope of the articular eminence. Therefore, the translational component contributing to opening and closing of the mouth occurs in the superior joint compartment. Even though rotation and translation make up the coupled motion when the mouth is open, it is important to understand that each of these movements is providing the dominant activity according to the posi-
tion of the mandibular condyle through its range of motion.

Muscles of Mastication

The muscles of mastication are comprised of the masseter, temporalis, medial pterygoid, and the lateral pterygoid (Figs. 15.4 and 15.5). The masseter, temporalis, and the medial pterygoid exert their forces primarily in the vertical plane, such as when closing the jaw.

The lateral pterygoid is anatomically situated in the horizontal plane and it acts to stabilize the TMJ and protraction of the mandible. These muscles are innervated by the motor branches of the mandibular division of the trigeminal nerve.

The muscles of mastication, suprahyoid and infrahyoid muscles, as well as the tongue and fascia work in concert in all mandibular movements and functions of deglutition. It is therefore important that the clinician have an understanding of these individual contributors to the external temporomandibular complex. Analysis of their individual functions is integral to the assessment of the function of the temporomandibular articulation.

MASSETER

The masseter muscle is rectangular and consists of a large superficial and a smaller deep portion. It arises from the zygomatic arch to the outer surface of the mandibular ramus. It is a powerful elevator of the mandible with its superficial portion directing its force at right angles to the posteriorly ascending occlusal plane of the molars. If the mandible is in a protruded position, the fibers of the deep portion are angled downward and forward. This action of the deep portion of the muscle may act to stabilize the condyle against the articular eminence during biting and chewing actions (3).

TEMPORALIS

The fan-shaped temporalis muscle occupies the entire temporal fossa of the skull. The muscle consists of three
parts: anterior, middle, and posterior. The anterior muscle fibers form the bulk of the muscle and are aligned vertically. The fibers of the middle part are aligned in an oblique manner and the posterior fibers are aligned in a horizontal fashion. The anterior and posterior muscle fibers of the temporalis act as strong elevators of the mandible as well as provide stabilization for the TMJ. The middle muscle fibers are capable of exerting strong retracting forces on the mandible.

MEDIAL PTERYGOID

The medial (internal) pterygoid muscle is a thick quadrilateral muscle which is anatomically positioned on the medial side of the mandibular ramus. This muscle is the counterpart to the masseter muscle, both functionally and anatomically. Although not as strong as the masseter muscle, the medial pterygoid assists in the movements of elevation and protrusion of the mandible. It also assists to laterally deviate the mandible to the contralateral side of contraction. The medial surface of this muscle comes into direct contact with the tensor veli palatini muscle. The tensor veli palatini muscle tenses the soft palate which results in the opening of the auditory tube during swallowing (6). The unique anatomic relationship which exists between the medial pterygoid and the tensor veli palatini muscle may contribute to eustachian tube dysfunction when the medial pterygoid muscle is influenced by aberrant forces from temporomandibular dysfunction.

LATERAL PTERYGOID

The lateral (external) pterygoid muscle is comprised of superior and inferior heads. The smaller superior head originates from the infratemporal surface of the greater sphenoid wing medial to the infratemporal crest. The larger inferior head originates from the outer surface of the lateral pterygoid plate (3). Elevation of the mandible


is achieved with contraction of the superior head, while mandibular movements of protraction and opening are achieved with contraction of the inferior head. The superior head may also function in stabilization of the mandibular condyle against the articular eminence. During biting and chewing the resultant forces are directed forward and inward, passing through the TMJ.

Resistance to opening of the jaw activates the superior head with its attachment to the articular disc and anterior portion of the meniscus. This is responsible for the forward pulling of the articular disc and meniscus, thus providing a cushion to the condyle during translational (gliding) motion. This unique action of the superior head of the lateral pterygoid muscle is vital when making a manual correction of the TMJ.

SUPRAHYOID MUSCLE GROUP

The suprahypoid muscles consist of the digastric, stylohyoid, mylohyoid, and the geniohyoid (Figs. 15.6 and 15.7). Although the suprahypoid group is technically not considered part of the muscles of mastication, they do exert an important influence in specific mandibular movements.

The digastric asserts its muscular influence in stabilizing the hyoid bone. With the hyoid in a static fixed position, the digastric assists the muscles of mastication to depress the mandible. Conversely, when the mandible is in a static fixed position, elevation of the hyoid bone will occur (7).

The digastric muscle is also thought to provide assistance during retractive mandibular motion and functions to assist the lower head of the lateral pterygoid muscle in opening movements of the mandible (3). The stylohyoid muscle, which elongates the floor of the mouth, acts to retract and raise the hyoid bone.

The mylohyoid muscle functions in raising the floor of the mouth when deglutition is initiated with accompanied elevation of the hyoid bone. This muscle acts in mandibular movement such as depression, retrusion, and lateral deviation on the ipsilateral side of contraction.

The geniohyoid muscle is activated with mandibular movements such as depression, protrusion, and lateral deviation on the ipsilateral side. When the mandible is in the static fixed position, the geniohyoid muscle functions to elevate the hyoid bone and as an antagonist of the stylohyoid muscle will move the hyoid bone forward.

INFRAHYOID MUSCLE GROUP

The infrahyoid muscle group consists of the sternohyoid, sternothyroid, thyrohyoid, and the omohyoid. This muscle group provides an antagonistic force to the suprathyroid muscle group by depressing the hyoid bone and securing the hyoid during suprathyroid muscle activity (8).

Terminology

Temporomandibular dysfunction refers to a collection of symptoms associated with functional and structural disturbances of the musculature and associated soft tissue elements. Some of the most common symptoms include: clicking of the joint, limitation in the joint mechanics during mandibular motion, and head and neck pain often accompanied by tenderness in the muscles of mastication (Table 15.2). Various health care disciplines specializing in TMJ disorders acknowledge that any dysfunction, pain, or paralysis of the masticatory system that occurs independently of mandibular dysfunction is not, by definition or classification, a TMJ disorder. It must be understood that “TMJ” is a generic term, much the same as the term, “whiplash.”

Table 15.3 shows the diverse clinical symptomaticity of TMJ dysfunction; however, it is not intended to be an

Table 15.2. Classification of Acute and Chronic TMJ Disorders

<table>
<thead>
<tr>
<th>Acute TMJ Disorders</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Masticatory Muscle Disorders (External Derangements) (9)</td>
</tr>
<tr>
<td>1. Muscle Splinting (9)</td>
</tr>
<tr>
<td>2. Myositis (9)</td>
</tr>
<tr>
<td>3. Myositis (9)</td>
</tr>
<tr>
<td>4. Myofascial Trigger Point Pain (Active) (9)</td>
</tr>
<tr>
<td>5. Muscle Hyperactivity (10)</td>
</tr>
<tr>
<td>6. Trismus (10)</td>
</tr>
<tr>
<td>7. Dyskinesias (10)</td>
</tr>
<tr>
<td>II. Disc-interference Disorders (Internal Derangements) (9)</td>
</tr>
<tr>
<td>1. Spontaneous Dislocation (11)</td>
</tr>
<tr>
<td>2. Derangements of the Condyle-Disc Complex (9)</td>
</tr>
<tr>
<td>a. Disc Displacements (11)</td>
</tr>
<tr>
<td>b. Disc Dislocations with Reduction (11)</td>
</tr>
<tr>
<td>3. Structural Incompatibility of the Articular Surface (9)</td>
</tr>
<tr>
<td>a. Adhesions (Synovial Stickiness) (11)</td>
</tr>
<tr>
<td>b. Alterations in Form (Tearing) (11)</td>
</tr>
<tr>
<td>4. Subluxations (rarely acute) (11)</td>
</tr>
<tr>
<td>5. Spontaneous Dislocations of the Condyle (11)</td>
</tr>
<tr>
<td>III. Inflammatory Disorders (Capsular Derangements) (9)</td>
</tr>
<tr>
<td>1. Synovitis (9)</td>
</tr>
<tr>
<td>2. Capsulitis (9)</td>
</tr>
<tr>
<td>3. Rotoritis (9)</td>
</tr>
<tr>
<td>IV. Hypomobility/Hypermobility Disorders (External or Capsular Derangements) (9)</td>
</tr>
<tr>
<td>1. Muscle Contracture (9)</td>
</tr>
<tr>
<td>2. Ligamentous Instability (9)</td>
</tr>
<tr>
<td>V. Postural/Proprioceptive Disorders (usually chronic) (External Derangements) (9)</td>
</tr>
</tbody>
</table>
**Table 15.2.**
Classification of Acute and Chronic TMJ Disorders—Continued

<table>
<thead>
<tr>
<th>Chronic TMJ Disorder</th>
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</tr>
</thead>
<tbody>
<tr>
<td>I. Masticatory Muscle Disorders (External Derangements) (9)</td>
<td></td>
</tr>
<tr>
<td>1. Muscle Spinning (rare to see in chronic form) (9)</td>
<td></td>
</tr>
<tr>
<td>2. Myospsasms (rare to see in chronic form) (9)</td>
<td></td>
</tr>
<tr>
<td>3. Myositis (9)</td>
<td></td>
</tr>
<tr>
<td>4. Myofascial Trigger Point Pain (Latent) (9)</td>
<td></td>
</tr>
<tr>
<td>II. Disc-Interference Disorders (Internal Derangements) (0)</td>
<td></td>
</tr>
<tr>
<td>1. Derangements of the Condyle-Disc Complex (9)</td>
<td></td>
</tr>
<tr>
<td>a. Disc Displacements (9)</td>
<td></td>
</tr>
<tr>
<td>b. Disc Dislocations with Reduction (9)</td>
<td></td>
</tr>
<tr>
<td>c. Disc Dislocations without Reduction (9)</td>
<td></td>
</tr>
<tr>
<td>2. Structural Incompatibility of the Articular Surface (9)</td>
<td></td>
</tr>
<tr>
<td>a. Adhesions (9)</td>
<td></td>
</tr>
<tr>
<td>b. Alterations in Form (Perforations) (9)</td>
<td></td>
</tr>
<tr>
<td>c. Osteoarthritis (10)</td>
<td></td>
</tr>
<tr>
<td>3. Dislocations (rarely chronic) or Subluxations (usually chronic) of the Condyle (9)</td>
<td></td>
</tr>
<tr>
<td>III. Inflammatory Disorders (Capsular Derangements) (9)</td>
<td></td>
</tr>
<tr>
<td>1. Synovitis (rarely chronic) (9)</td>
<td></td>
</tr>
<tr>
<td>2. Capsulitis (rarely chronic) (9)</td>
<td></td>
</tr>
<tr>
<td>3. Retropdisitis (rarely chronic) (9)</td>
<td></td>
</tr>
<tr>
<td>4. Degenerative Joint Disease (11)</td>
<td></td>
</tr>
<tr>
<td>5. Inflammatory Arthritis (10,11)</td>
<td></td>
</tr>
<tr>
<td>6. Rheumatoid Arthritis (10)</td>
<td></td>
</tr>
<tr>
<td>7. Polytarticular (10)</td>
<td></td>
</tr>
<tr>
<td>IV. Hypomobility/Hypermobility Disorders (External or Capsular Derangements) (9)</td>
<td></td>
</tr>
<tr>
<td>1. Muscle Contracture (9)</td>
<td></td>
</tr>
<tr>
<td>2. Capsular Fibrosis (11)</td>
<td></td>
</tr>
<tr>
<td>3. Coronid Impedance (11)</td>
<td></td>
</tr>
<tr>
<td>4. Ankylosis (10)</td>
<td></td>
</tr>
<tr>
<td>5. Ligamentous Instability (9)</td>
<td></td>
</tr>
<tr>
<td>V. Growth Disorders (External, Capsular, or Internal Derangements) (9)</td>
<td></td>
</tr>
<tr>
<td>1. Hypoplasia (9)</td>
<td></td>
</tr>
<tr>
<td>2. Hyperplasia (9)</td>
<td></td>
</tr>
<tr>
<td>3. Neoplasia (9)</td>
<td></td>
</tr>
<tr>
<td>4. Remodeling (11)</td>
<td></td>
</tr>
<tr>
<td>5. Condylar Position Abnormality (11)</td>
<td></td>
</tr>
<tr>
<td>a. Retroposition (11)</td>
<td></td>
</tr>
<tr>
<td>b. Anteroposition (11)</td>
<td></td>
</tr>
<tr>
<td>c. Decreased interarticular space (11)</td>
<td></td>
</tr>
<tr>
<td>6. Developmental Disturbances (10)</td>
<td></td>
</tr>
<tr>
<td>VI. Postural/Proprioceptive Disorders (9) (External Derangements)</td>
<td></td>
</tr>
</tbody>
</table>

exhaustive list of the signs and symptoms of TMJ disorders. Nevertheless, it does provide the clinician an appreciation for the complexity of this syndrome.

**Etiology**

When the patient presents with a TMJ disorder, it is imperative that the clinician make use of all available subjective information and objective findings to derive a well-defined etiology of the condition. The diversity of the signs and symptoms of this disorder has often complicated the clinician’s ability to accurately establish a diagnosis.

The nature of TMJ symptoms has made it necessary to formulate a reduction in the observable clinical symptoms to establish a more narrowed definition of the syndrome. As noted by Solberg (11), signs and symptoms of a TMJ disorder are:

**Table 15.3.**
Clinical Symptomatology Associated with TMJ Dysfunction

| 1. Asthma (12) |  |
| 2. Chronic Ear Infection (12) |  |
| 3. Hearing Loss (14) |  |
| 4. Tinnitus (13) |  |
| 5. Headaches (13) |  |
| 6. Neck Pain (12) |  |
| 7. Shoulder Pain (12) |  |
| 8. Inflammation (14) |  |
| 9. Earache (13) |  |
| 10. Lingual Pain or Numbness (13,15) |  |
| 11. Facial Pain (16) |  |
| 12. Vertigo (dizziness) (13) |  |
| 13. Sinus Congestion (12) |  |
| 14. Throat Infections (12) |  |
| 15. Functional Jaw Pain (14) |  |
| 16. Incoordination of Mandibular Joint (13) |  |
| 17. Painful Teeth and Gums (14,15) |  |
| 18. Oropharyngeal Syndromes (15) |  |
| 19. Speech Impairment (15) |  |
| 20. Bell’s Palsy (14) |  |
| 21. Reflex Sym pathetic Dystrophy Syndrome (16) |  |

1. Pain and tenderness in the region of muscles of mastication and the TMJs;
2. Incoordination and sounds during condylar movement; and
3. Limitation of mandibular movement.

To rely solely on the evaluation of signs and symptoms could inadvertently cause the clinician to make an inaccurate diagnosis, with little emphasis on assessing the patient’s prognosis. For example, the same TMJ pain or dysfunction may be caused by cervical nerve entrainment (vertebral subluxation complex), referred pain syndrome from a distant myofascial irritation or trigger point, intrinsic intracapsular pathology or intrinsic extracapsular pathology. The treatment for these conditions is quite different, therefore, the need for further objective evaluation is paramount. Kopp (17) states that the clinical signs and symptoms of patients with TMJ osteoarthritis do not differ from those patients with other mandibular dysfunctions, except in crepitation of the TMJ. This lack of apparent discrimination may very well account for many of the treatment failures in the clinical management of these disorders.

In reviewing the literature on TMJ, the term “syndrome” has been used to imply that a patient may present with all the symptoms simultaneously. From a clinical perspective, this is clearly not the case.

During the consultation with the patient, the natural history of the TMJ disorder (biologic gradient) should be developed. The diagnostic process is enhanced by the clinician’s ability to evaluate the soft tissue structures associated with biomechanical dysfunction and masticatory pain which are often present.

**Pathomechanics**

External macrotrauma and internal microtrauma should be considered in evaluating patients presenting with TMJ
disorders. External macrotrauma would include acceleration/deceleration hyperextension/hyperflexion cervical spine injuries (e.g., whiplash), surgical procedures involving intubation, cervical traction, dental treatment, orthodontia treatment, contact sports, and impacts that would cause any structure of the TMJ joint to be forced beyond its elastic barrier.

Etiologies of internal microtrauma include self-imposed psychic stress causing occlusal interference (e.g., tooth clenching, grinding, and bruxism), cracked tooth syndrome, chronic periodontitis causing such conditions as excessive tooth wear, and degenerative soft tissue changes, degenerative arthritis, and inflammatory arthritis.

Derangement of the internal TMJ implies an anatomic disturbance between the temporal bone, the articular disc and the mandibular condyle. Internal derangements include restriction of translational motion of the condyle, condylar dislocation, condylar subluxation, temporal adhesions, and discondylar lesions (18).

Proprioceptor and tactile neuromuscular activation are additional factors that must be considered probable causes of TMJ dysfunction. Traumatic forces influencing condylar malposition will produce noxious stimuli of these sensory fibers in the joint capsule, sometimes involving the periodontal membrane (18).

Malocclusion of the dentition may cause aberrances in condylar movement with resultant pain. Such irritating stimuli to the TMJ capsule is mediated by the masseteric and deep temporal nerves. A posterior condylar misalignment results in derangement of the articular disc, impingement of the retrodisceal tissue, and may cause vascular changes in the inner ear (18).

It is imperative that the clinician evaluate the entire spine, but especially the cervicothoracic area, for the presence of a VSC that could possibly cause postural abnormalities leading to acute or chronic TMJ instability. Rotational lesions of C1-C2 may also cause localized pain at the posterior margin of the joint.

Examination

The emphasis of the examination is on the neuromusculoskeletal relationships of the head, neck, and TMJ region. In obtaining a thorough history, the clinician should be particularly observant in recording the patient's subjective complaints. Often, the subjective information provides valuable clues to the location and nature of the symptoms.

Observation for the presence of asymmetry in the patient's posture, cranium, and facial architecture, dental occlusion and mandibular movement through its allowable ranges of motion may provide the clinician with valuable insight in determining if the TMJ disorder is due to extracapsular and/or intracapsular dysfunction.

Pincock and Dann (19) state that approximately 32% of the patients treated in their practice have dentofacial deformities associated with TMJ disorders. Palpation of trigger points of the involved musculature and determining the integrity of the tissue elements involved is also important.

NEUROLOGIC TESTS

Golberg (20) suggests an examination protocol consisting of a 4-minute neurologic exam. This would incorporate clinical testing and evaluation of the cranial and cervical nerves (Fig. 15.8) as well as the cerebellar and vestibular neurologic systems.

MUSCLE TESTS

Pain of the head and neck is commonly associated with TMJ disorders and masticatory dysfunction. Often, the origin of pain is myogenous in nature (21), thus necessitating a thorough orthopaedic evaluation of the TMJ and the associated masticatory muscle structures.

The primary movers involved in the opening of the mouth are the lateral pterygoid muscles. These muscles

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Figure 15.8. Lateral view of the head illustrating areas of innervation and nerve pressure points. The solid lines in this illustration separate the various fields which provide a guide for the clinician in examination of the head when a trauma has occurred. Trauma to the spinal nucleus of the trigeminal nerve may be easily recognized by the clinician by performing appropriate tests on the cutaneous distributions. Modified from Platzer W, ed. Perkmpp's Anatomy. Vol. 1. 3rd ed. Baltimore: Urban & Schwarzenberg, 1960:7. Definitions of labels can be found on page 453.
are tested by the clinician placing one hand just above the external occipital protuberance and the other hand under the chin. The patient is instructed to open the mouth slightly while the clinician applies a firm closing force to the chin. The muscle's strength should be noted. Care should be taken not to cause injury to potentially compromised soft tissue structures while performing the test.

The primary elevators include the masseter, temporalis, and medial pterygoid muscles. These muscles are tested by placing a separator between the patient's posterior teeth. The patient is then instructed to slowly bite down on the separator. While the patient is clenching the teeth together, the clinician should note any pain that may be elicited. As well, evaluation of the muscles' definition is essential. If the muscles are large and defined when contracting, it may indicate the patient experiences episodes of clenching or bruxism.

Lateral excursion movements of the TMJ are performed by the medial and lateral pterygoid muscles. This movement is tested by the clinician placing the contact hand on the side of the mandible and the stabilizing hand on the contralateral temporal region of the skull. The patient is instructed to resist against lateral pressure.

The medial pterygoid muscles may be evaluated bilaterally by performing a protrusive-retrusive test. To perform this procedure, the patient is instructed to protrude the jaw and resist as the clinician applies pressure to the jaw posteriorly.

Retrusive movement of the TMJ is performed by the posterior temporalis working in conjunction with the digastric muscle. This movement is tested by placing the clinician's gloved thumb intraoral on the patient's lower molars while wrapping the remaining fingers around the jaw (Fig. 15.9). The patient is instructed to resist as the clinician applies a slight pulling force to the mandible.

INSTRUMENTATION

A vernier caliper instrument is used to measure active range of motion of normal mandibular physiologic movements. Limitations or blockages in normal mandibular motion may be due to dysfunctional musculature, capsular damage or osseous derangement (e.g., fracture, congenital defects, etc.). As previously stated, the clinician should take care not to damage already compromised tissues.

Opening. Vernier caliper instrumentation is used to evaluate the limits of mandibular movement. The upper and lower incisors are the clinician's reference point to observe movement in the vertical plane. With normal movement, the mandible stays true through the midline of the incisors. The normal range of motion is considered to be 40 to 60 mm (Fig. 15.10). The mandibular position in its neutral resting posture, which consists of nonocclusal contact, is described as the interocclusal freeway space and is approximately 3 to 5 mm (Fig. 15.11).

Instrumentation is especially useful when a lateral deviation is noted during jaw opening and is determined with bilateral measurement at the beginning and end of the deviation. This measurement is helpful in documentation of treatment effectiveness.
**Protrusion.** If the patient presents with a protrusive deviation, the doctor may suspect internal capsular derangements. Because protrusive movement is almost a pure translation of the TMJ bilaterally, it is reasonable to assume that any loss of synchrony of mandibular movement would be caused by dysfunction occurring in the superior joint compartment. To perform this measurement, the upper and lower incisors are brought into centric occlusion. The incisors of the mandible are then drawn forward beyond the upper incisors. Approximately 6 to 9 mm of protrusion is considered normal in the adult.

**Lateral Excursion.** When evaluating lateral excursion of the mandible, the chiropractor should note the presence of pain or restriction of the desired movement. Using the midline of the upper and lower incisors as the reference point, the vernier caliper instrument is used to measure the distance of lateral mandibular movement. A measurement is noted during both left and right lateral excursions to evaluate the presence of asymmetry (Figs. 15.12 and 15.13). If asymmetry exists, this finding indicates masticatory musculature dysfunction, inflammation, coronoid process impingement, or internal capsular derangement such as discal adhesions or an anteriorly dislocated disc.

**Repetus.** When measuring reductive mandibular movement, the condyles are seated on the center of the articular discs. Referred to as the close-packed position, the condyle-disc complex is bilaterally positioned in the superior and posterior portion of the TMJ fossae. Normal retractive movement is approximately 3 to 4 mm.

**Range of Motion**

Assessing passive range of motion of the mandible is performed specifically to evaluate the integrity of the joint capsule and associated ligamentous structures. The range of motion evaluation is performed by testing the following temporomandibular movements: (1) open end-feel, (2) lateral glide, and (3) distractive joint play.

**OPENING**

Open end-feel is performed by placing a thick gauze pad over the lower incisors and applying a downward and slightly posteriorward pressure at the patient's end-range of jaw opening. For purposes of hygiene and safety, it is recommended that the doctor wear protective gloves while performing this procedure. During the procedure, the clinician should observe any aberrant joint motion or hypermobility of the supporting ligamentous structures. A normal capsular or ligamentous end-feel is described as a firm yet slightly giving sensation.

**LATERAL GLIDING**

Lateral glide is performed by contacting the lateral condylar poles of the TMJ with the distal tips of the first and second fingers. A slight lateral to medial pressure is applied to assess the integrity of the joint capsule and accessory ligaments. The clinician will note a short slight gliding motion with a firm end-feel if the joint is normal.

**DISTRACTION**

The distractive joint play procedure is performed with the patient in a seated or semirecumbent position. The clinician's gloved left thumb is pressed intraorally onto the lower molars while the remaining fingers are wrapped around the jaw. The palmar surface of the clinician's right hand cradles the skull while the tip of the index finger pal-
pates the condylar motion. Again, for hygiene and safety purposes, gloves are recommended. The clinician should direct the pressure downward and slightly lateral at about 15° to 20°. A slight gapping of the capsule with a firm end-feel is considered normal.

AUSCULTATION

The TMJ auscultation examination is performed by placing the bell end of the stethoscope over the area of the joint. The stethoscope is used to detect the presence of joint sounds during mandibular movements. Traditionally, it is considered that the occurrence of any joint sounds such as crepitus, popping, and clicking are indicative of TMJ dysfunction.

Osborne (22) describes the mechanism of reciprocal clicking on opening and closing of the jaw as it occurs during TMJ disc failure. In the resting postural position, the disc is distorted and lies on the anterior aspect of the condyle. As the mandible begins the opening movement, the disc becomes wedged ahead of the condyle. This movement becomes restrained because of the anterior attachment of the articular disc to the neck of the condyle. The involved compressive forces distorted the disc within the joint. As the potential energy increases in the distorted disc, it eventually overcomes the posterior annulus and retrodiscal restraint, and the disc pops posteriorward with an audible click. When the mandibular movement is reversed in the closing direction, the condyle tends to squeeze the disc anteriorward. The anteriorward movement of the disc is again restrained by the posterior annulus and retrodiscal tissues. As this wedging effect squeezes the disc anteriorward, the condyle snaps against the articular eminence with an articular click.

Vincent (23) and Saunders (24) suggest that the occurrence of some joint sounds on evaluation is a normal variant. When a joint noise has been ascertained by the use of auscultation, the clinician can note the type of sound and its duration, as well as when the sound occurs during mandibular gait.

MUSCLE PALPATION

When performing a palpatory muscle examination, many of the masticatory muscles are readily accessible. The lateral pterygoid, medial pterygoid, and posterior digastric, however, are more difficult to palpate. In performing this examination the clinician should be sensitive to the presence of inflammation, edema, trigger points, and changes in muscle tonus such as splinting, guarding, or spasm. When used in conjunction with other clinical examination procedures, the information obtained from the palpatory muscle examination may be extremely useful in ascertaining a specific cause of TMJ dysfunction.

IMAGING

Although there are several imaging modalities used to objectively examine and evaluate the temporomandibular joint, only two are widely used by the chiropractic profession. They consist of magnetic resonance imaging (MRI) and plain film radiography (PFR).

MRI is used to image histologic disc alterations, remodeling of discal tissues, masticatory muscles, disc adhesions, tumors, disc perforations, osseous remodeling, and anterior and medial disc positional alterations. Tissues heavily laden with hydrogen ions produce a high signal intensity which appears as a lighter contrast on the MRI. Conversely, tissues with minimal amounts of hydrogen ions produce a low signal intensity, which appears as a darker contrast on the MRI. This characteristic makes the MRI a superior modality for evaluating the presence of capsular and disc degeneration.

Plain film radiography is perhaps the most commonly used imaging modality in evaluating the TMJ. The projections commonly used include the transorbital (anterior to posterior), lateral cephalometric (lateral skull), trancranial (lateral oblique), and submentovertex (axial). Lombardi and Preti (24,25) used PFR to measure differences in condylar position. PFR enables the clinician to
observe severe osseous degenerative changes in the condyle or temporal region, as well as bone fractures or other osseous pathology. Capsular as well as extracapsular restriction of mandibular movement may also be confirmed with PFR (19).

EXAMINATION OF THE CHILD

Mechanical derangements of the TMJ and related structures from birth injuries may be related to a variety of childhood illnesses (12,26). If these mechanical derangements are left uncorrected in the infant/child, the pathology may remain into adulthood (2). Hence, when the clinician is conducting a neuromusculoskeletal exam on an infant/child, it is imperative that the TMJ and accompanied cranial bones be incorporated as well.

It is known that restrictions in normal biomechanical movement of the craniomandibular mechanism may lead to chronic head and neck pain in infants/children (26). The infant/child may also elicit hyperactive behavior due to the physical stresses in the craniomandibular structures caused by aberrant neurologic function. These symptoms are often associated with vertebral subluxation complex of the upper cervical spine, thoracic spine or temporomandibular joint. Netter (27,28) presents two hypotheses as to the cause of asthma; vagal nerve reflex bronchospasm and intrinsic smooth muscle defect. Both of these hypotheses may be directly influenced by chiropractic manipulation and soft tissue therapy. Gillespie and Barnes (12) present a plausible explanation for the first postulate of vagal nerve reflex bronchospasm. They suggest that the mechanical motion and positional influences of the temporal bones, occiput, and the atlas as having a possible effect on the vagus nerve passing through the jugular foramen. An intrinsic smooth muscle defect of the trachea and bronchi may be mediated by patterns of myofascial soft tissue tensioning from the head, jaw and cervical spine. It is reasonable to assume that aberrant tensile forces placed on the myofascial structures would inhibit normal function of these tissues thus creating patterns of irritation.

EXAMINATION OF THE ADULT

In the adult, the clinician seeks to find the underlying cause of TMJ dysfunction, which is often a chronic biomechanical abnormality. Acute TMJ trauma does occur however (e.g., whiplash).

Royer (29) makes a case for evaluating the sacroiliac region in patients with TMJ disorders. Abnormalities in this region may create postural disturbances above, such as scoliosis, which influences the TMJ. It becomes apparent that a treatment protocol which includes the lower extremities, pelvis, and the lumbar spine is necessary as part of the regime for a TMJ disorder should dysfunction exist in related areas.

The cervicothoracic region should be examined and evaluated for biomechanical improprieties. Mechanical restrictions in this area may lead to dysfunction in the temporomandibular region via the scalene, spinalis capitis, splenius capitis, sternocleidomastoideus, and associated long muscles of the neck (See Figs. 15.6 and 15.7).

Somatic dysfunction of the occipitoatlantal and atlantoaxial regions can affect mandibular positioning to the extent that the suprathyroid and infrahyoid muscles would not be able to open the jaw without distortion of the TMJ on one side or the other (30).

When examining the TMJ region, the clinician must make every effort to determine if there is an intracapsular, capsular or extracapsular derangement (Fig. 15.14). It is important both diagnostically and therapeutically that the clinician’s approach to evaluating TMJ dysfunction be comprehensive so that the precise location of biomechanical restraint is identified. Bell (31) describes three distinct symptomatic categories of masticatory dysfunction as follows:

1. Restriction of biomechanical mandibular movement;
2. Interference during mandibular movement; and
3. Acute malocclusion disturbances.

Intracapsular restriction is frequently caused by obstruction of the articular disc which in turn restricts mandibular movement by preventing translatory motion of the condyle. Several factors that may contribute to the obstruction of the articular disc include, fibrous adhesion formation or osseous ankylosis, altered gross tissue changes in the joint capsule due to arthritis, and trauma or functional displacement to the intracapsular tissue structures resulting in a dislocated articular disc.
The impairment to normal transitory movement is commonly associated with alterations in both size and function of the capsular ligament. Alterations to the capsular ligament resulting in restriction to mandibular movement may be the result of capsulitis (inflammatory edema) or capsular fibrotic adhesions due to previous episodes of capsulitis or traumatic injury. Capsular restraint has effects on condylar movement, such as protrusion opening and contralateral excursion.

Extracapsular restriction is commonly caused by contracted or immobilized mandibular elevator musculature. This may be precipitated by inflammation or neurologic dysfunction. Clinical evaluation of extracapsular restriction of mandibular movement differs from capsular restriction in that opening of the jaw is restricted, but protrusion and contralateral excursion remain fairly normal. The doctor will note a deflection of the midline incisal path with jaw opening movements. The direction in which the midline incisal path deviates depends on the location of the involved muscle(s). For example, contraction of the masseter or temporalis muscle would permit ipsilateral deflection of the midline incisal path. If the patient's deflection is induced solely by a contracted medial pterygoid muscle, the midline incisal path is deviated contralaterally.

Factors that may skew the clinician's ability to visibly note the presence of deflection with opening movement of the jaw include: contracted musculature involving the medial pterygoid muscle in conjunction with the masseter muscle, or the medial pterygoid muscle in conjunction with the temporalis muscle, and if both TMJs are involved, the presence of bilateral extracapsular restriction.

Acute malocclusion is sensed subjectively by the patient as spontaneous physical changes in the way the teeth occlude. It is common for the patient to experience pain and masticatory discomfort when the teeth are forcefully brought into maximal intercuspation. Two of the more common causes that may influence acute malocclusion are muscle spasm or changes in the TMJ, specifically the disc-condyle-eminence complex. Muscle spasm of the lateral pterygoid muscle may induce acute malocclusion by drawing the condyle forward on the ipsilateral side, thus causing occlusal disarticulation of the patient's posterior teeth and premature contact of the anterior teeth contralaterally. Spasm of the masseter muscle draws the mandible laterally, while spasm of the medial pterygoid muscle would displace the mandible medially. Trauma to the TMJ structures or osseous surface deterioration due to arthritic conditions or infection would effectively change the relationship of the disc condyle complex with the articular eminence, leading to acute malocclusion.

When examining the patient with complaints of malocclusion, it is important for the clinician to understand that such altered occlusion is often accompanied by masticatory dysfunction or pain. If pain accompanies the patient's symptoms of acute malocclusion, the doctor can expect to see an increase in the sensation of pain with maximal intercuspation, which may be relieved by biting against a separator on the ipsilateral side of involvement.

If the chiropractor suspects a cracked tooth, tooth abscess, periodontal disease, or tooth pain as being the causative factor contributing to acute malocclusion, it would be reasonable to perform a dental fremitus (percussion) test. This test is performed by simply asking the patient to sharply close the teeth together without clenching, while the clinician listens and observes for any singular striking dentition sounds and/or pain. If this test results in a positive finding, the clinician should perform a tooth-specific manual percussion test by carefully striking the individual posterior tooth with a firm, blunt sterilized metal object. To assure doctor-patient hygiene and protection, the wearing of gloves is advised. If the test elicits a positive finding for pain or tooth dysfunction, then referral to a dentist or orthodontist is appropriate.

Articular disc jamming is classically understood to be any obstruction of the disc condyle and articular eminence complex which would interfere with transitory movement of the jaw. Factors such as dysfunctional articular discal ligaments, increased passive interarticular pressure, physiologic incompatibility between articular sliding surfaces, and discal trauma are frequent causes of disc jamming. Provided that the disc condyle complex function remains undamaged, disc jamming will usually cause the patient to experience only momentary episodes of obstructed translatory movement of the jaw.

When performing a clinical assessment of a patient presenting with disc jamming, the clinician should note the following: the patient will be relatively pain-free, maximal intercuspation will not elicit symptoms of acute malocclusion, and lateral and protrusive mandibular movement will be normal and unobstructed. Disc jamming usually responds favorably to chiropractic adjutice therapy.

A functional anteriorly dislocated disc is described as an obstruction which blocks the return phase of transitory mandibular movement. A contraction of the superior lateral pterygoid muscle is often the causative factor. Because of the nonexistence of surface to surface contact of the condyle, articular disc, and articular eminence, the articular disc is trapped anterior to the mandibular condyle due to the collapsing of the articular disc spaces.

During the examination of a patient presenting with functional anterior dislocation of the articular disc, the clinician should note the following: mandibular movements within the patient's permitted range of motion will elicit noises such as grinding and grating; on maximal intercuspation the patient will sense symptoms of acute malocclusion of the posterior teeth on the ipsilateral side of involvement; and translatory mandibular movements in protrusion and lateral excursion are proportionately restricted with opening.

Functional anterior dislocation of the articular disc
appears to respond favorably to chiropractic adjutant therapy. The preferred method of manual treatment is to apply a distracting technique to stretch the superior retrodiscal lamina.

Conservative Management

The author suggests a conservative therapeutic approach be exhausted before escalating to more invasive treatment. The effectiveness of conservative management has been reported to be effective 70 to 90% of the time for patients with TMJ dysfunction and related syndromes (32). Treatment methods used include the following:

1. Application of ice, alternating every 20 minutes until the swelling has been reduced.
2. Upon the reduction of swelling, the application of moist heat packs and passive mobilization.
3. Trigger-point therapy to relax restrictive muscle tonus.
4. Superficial muscle massage utilizing spray and stretch techniques.
5. Physical therapy modalities such as ultrasound, biofeedback, and TENS unit.

Manual Adjutant Procedures

Manual adjutant/manipulative procedures have been widely reported as being successful methods in the treatment of TMJ (10,12,33–40). The clinician has a variety of manual corrective procedures to choose from which fall into two distinct categories. The two categories include distraction and translational manual corrective methods. In this section, three of the most common TMJ misalignments will be discussed and recommendations to the most beneficial corrective method will be made.

The types of mandibular adjutant/manipulative methods described herein are of a modified high-velocity low amplitude type. Often, the term “thrust” is used in describing a mandibular manual procedure; however, the clinician should understand that the use of a thrust is unlike adjustments of the spinal column. Loughner, Larkin and Mahan (41) demonstrated that middle ear damage can occur when tension is applied to the anterior malleolar (AML) and to a lesser degree, the discomalleolar ligaments (DML). The AML connects to the malleus with the lingula of the mandible via the sphenomandibular ligament (SML), and the DML passes from the medial retrodiscal tissue to the malleus. When the condyle is distracted inferiorly, tension was directly applied to the AML via the SML, which demonstrated the potential to cause middle ear damage. Therefore, every distractive adjutant/manipulative procedure which the clinician may choose to use, should emphasize a very low amplitude movement technique, rather than a thrust. This is to ensure that the ligamentous structures of the TMJ are not injured during the maneuver.

When using mandibular adjutant/manipulative procedures, the desired treatment outcomes are to provide alleviation of pain, reduce the presence of inflammation, reduce nerve irritation, re-establish normal motion of osseous joint structures, normalize masticatory muscle tonus, and reduce microadhesions which may exist between discal structures and the adjacent articular surfaces.

If the patient is experiencing an acute episode of TMJ dysfunctions, it is suggested that the mandibular adjutant/manipulative procedures be performed on a daily basis for a two to three week period. In chronic cases, where derangement of TMJ structures has occurred, the clinician may not see a significant improvement for approximately 2 to 4 weeks. Because of the intricate structures of the TMJ and their constant bombardment of external forces, the clinician must take care to not get discouraged too quickly, if resolution of symptoms are slower than anticipated. Lawrence (32) reports the use of conservative treatment therapy for approximately 3 to 6 months before considering more invasive procedures and subsequent referral to an oral surgeon.

ACUTE CLOSED LOCK

In conditions of acute closed lock, the patient is only able to open the mouth to a distance of 13 to 20 mm. The displacement of the articular disc to an anteromedial direction is a result, in part, of the tractional forces of the superior head of the lateral pterygoid (Fig. 15.15). Acute closed lock of the TMJ is characterized by restriction of mandibular movement, absence of joint sounds during condylar motion, pain and tenderness located in the TMJ region, and acute malocclusion (42).

![Figure 15.15. Anterior to posterior view of the left condyle demonstrating the displacement of the articular disc in an anteromedial direction. Trauma or ligamentous laxity may act to displace the disc from its normal position. The lateral pterygoid collateral ligaments and the retrodisal tissues are additional support structures which permit displacement of the disc as a result of trauma or joint dysfunction. Modified from Curi DD. Acute closed lock of the temporomandibular joint: manipulation paradigm and protocol. Chiropractic Technique 1991;3:14](image-url)
Because of the anterior articular disc displacement, the condyle migrates into the temporal fossa posterior-lateral, thus causing premature contact of the dentition on the ipsilateral side of involvement (Fig. 15.16). This type of condylar misalignment is characterized as a posterior superior TMJ subluxation.

Name of technique procedure: Unilateral Acute Closed Lock Mandibular Distraction Maneuver (Figs. 15.17 and 15.18)

Indications: The disc is blocking translatory glide of the condyle resulting in restrictions during mandibular movement. Opening distance of the mandible is usually only 13 to 20 mm, hence, the term closed lock.

Contraindications: All other listings, hypermobility, instability, destruction of joint capsule, fracture or infection of the TMJ complex.

Patient position: Seated or supine

Doctor’s position: Standing opposite of the affected TMJ, the clinician uses an intraoral contact with the thumb placement on the last mandibular molar ipsilateral to the side of involvement.

Supporting hand: Stabilization of the patient’s head.

Pattern of thrust: First, the clinician must visualize the slope of the eminence to determine the line of drive (Fig. 15.19). The distraction maneuver is produced by directing the force 90° to the slope of the articular eminence (Fig. 15.20). Once the remaining
joint play has been brought to tension, the thrust is applied perpendicular and away from the slope of the eminence.

Name of technique procedure: Bilateral Acute Closed Lock Mandibular Distraction Maneuver (Figs. 15.21 and 15.22)

Indications: Bilateral disc involvement blocking transulatory glide of the condyles resulting in restrictions during mandibular movement. Opening distance of the mandible is usually only 13 to 20 mm, hence, the term closed lock.

Contraindications: All other listings, hypermobility, instability, destruction of joint capsule, fracture or infection of the TMJ complex.

Patient position: Seated or supine

Figure 15.20. To initiate the distractive maneuver, it is necessary to gap the TMJ by acting 90° to the slope of the articular eminence at its midline. Modified from Curl DD. Acute closed lock of the temporomandibular joint: manipulation paradigm and protocol. Chiropractic Technique 1991;3:15.

Doctor’s position: Standing on either side of the patient using a bilateral intraoral thumb contact

Supporting hand: An assistant should stabilize the patient’s head.

Pattern of thrust: The bilateral distraction maneuver is produced by directing the force 90° to the slope of the articular eminence (Fig. 15.23). Once the remaining joint play has been brought to tension, the thrust is applied perpendicular and away from the slope of the eminences.

Name of technique procedure: Gonstead Unilateral Anterior-inferior condyle subluxation translational maneuver

Indications: Anteroinferior positional dyskinesia of the condyle

Figure 15.22. Clinician’s intraoral hand placement for bilateral disc involvement using the distractive maneuver. Modified from Curl DD. Acute closed lock of the temporomandibular joint: manipulation paradigm and protocol. Chiropractic Technique 1991;3:17.

Figure 15.23. Direction in which the distractive maneuver is directed is 90° to the axial plane. The point at which recapture of the disc is inferior or anterior to the articular eminence. Modified from Curl DD. Acute closed lock of the temporomandibular joint: manipulation paradigm and protocol. Chiropractic Technique 1991;3:17.

Figure 15.21. Bilateral distractive maneuver with the patient in the supine position. It may be necessary to have an assistant stabilize the patient’s head into the table.
Contraindications: All other listings, hypermobility, instability, destruction of joint capsule, fracture or infection of the TMJ complex.

Patient position: Seated

Doctor’s position: Standing behind the patient, contacting the involved side first. The fingertips are placed on the chin, the pisiform on the ramus of the mandible and the thenar on the lateral pole of the condyle (Fig. 15.24).

Supporting hand: This hand is placed contralateral to the side of involvement with the fingertips on the chin, pisiform on the ramus of the mandible and the thenar on the lateral pole of the condyle. Also, the Gonstead condyle block is used to support the patient’s neck (Figs. 15.25 and 15.26).

Pattern of thrust: The patient is first instructed to open their mouth as wide as possible (Fig. 15.27A). The patient is then instructed to slowly close their mouth as the doctor’s stabilization hand pulls in a posterior direction on the contralateral side through the first 1/3 of mandibular movement. The clinician then stabilizes the jaw contralateral to the involved side by applying a medialward force with the stabilization hand (Fig. 15.27B). When this stabilizing force has been accomplished, the primary contact hand continues to follow the travel of mandibular movement with a sustained force posterior and superiorward (Fig. 15.27C). Just as the mouth is about to close, the primary contact hand will give a light and quick movement posterior, superior and medialward to re-establish the condyle into its fossa.

**DEVIATED NASAL SEPTUM**

The nasal septum can often be injured during sport activities such as boxing, basketball and wrestling. A blow to the nose may deviate the septal cartilage to one side.

As with any head trauma, a thorough neurologic assessment should be made to determine if emergency room referral is required. In the absence of neurologic signs or gross injury, this disorder can be managed conservatively. Contusions of the maxillary and frontal sinus
areas, and the orbits, should be examined to rule out concomitant injury (e.g., fracture) to these structures.

The nose may be visibly deviated to one side. This should correlate with the mechanism of injury. There will usually be localized swelling, which can be reduced with cryotherapy. Airway occlusion may occur on the side of deviation.

Adjustment

The patient is seated for the maneuver (Fig. 15.28). The doctor should stand behind the patient, so as to visualize the deviation from an aerial view. The cartilage just inferior to the junction with the nasal bone is contacted with the thumb pad on the side of septal deviation. The stabi-

Figure 15.27. A, After hand position has been established and the patient’s mouth is fully opened, the patient is instructed to slowly close their mouth so as to resist the manual force applied by the clinician. The resistance of the patient activates the lateral head of the pterygoid and tensions the articular disc, thereby permitting its recapture. B, When the patient has closed their mouth approximately one third, the supporting hand stabilizes the unaffected TMJ. C, The contact hand completes the translational maneuver by guiding the condyle in a posterior superior direction into the articular fossa.

Figure 15.28. Adjustment for a deviated nasal septum (See text).

Figure 15.29. Frontal sinus adjustment. A posteriorward pressure is applied with the doctor’s hand over the frontal bone. Stabilization is provided at the posterior.
The maxillary sinus is adjusted by directing a pressure with the thumb pad in a posterior, lateral and inferior direction. The back of the patient’s head should be supported with the stabilization hand. The fingers of the adjusting hand are used to stabilize the mandible.

A controlled thrust is made lateral to medial and slightly superior to inferior.

SINUSES

The frontal and maxillary sinuses can be adjusted. While not a “true” articulation, a manual pressure can be applied to the areas, which may alleviate symptoms such as headache or congestion (Figs. 15.29 and 15.30).

References

34. Segami N, Ken-Ichiro M, Tadahiko I, Michio F. Arthographic evaluation of disc position following mandibular manipulation for

Definitions of Labels

C₂, C₃ = 2nd and 3rd cervical dermatomes
G.1. = Boundary between trigeminal n. distribution and 2nd cervical cermatome ("vertex-ear-chin line")
S.v. = Anterior segment of trigeminal n., related to the cranial part of the spinal nucleus of V
S.m. = Middle segment of trigeminal n., related to the middle part of the spinal nucleus of V
S.h. = Posterior segment of trigeminal n., related to the caudal part of the spinal nucleus of V
V₁, V₂, V₃ = Areas of innervation of the three branches of the trigeminal n.

+₁ = Pressure point for medial br. of supraorbital n.
+₂ = Pressure point for infraorbital n.
+₃ = Pressure point for mental n.
X = Pressure point for greater occipital n.

Au.m = Great auricular n. field
O.m = Lesser occipital n. field
O.mj = Greater occipital n. field
T.c = Transverse cervical n. field.
The spinal column has long been the primary focus of the chiropractic profession. As patients increasingly use chiropractors as their primary source of health care, the need to address other anatomic areas of dysfunction becomes increasingly important. The evaluation and treatment of disorders afflicting the extravertebral articulations have become an integral component of chiropractic practice.

As in the area of conservative spinal health care, the chiropractic approach to dysfunction of the extremities fulfills a void that has not been addressed by allopathic medicine. The area of sports medicine has expanded dramatically in recent years. The chiropractic profession has an important perspective and contribution to make with regard to athletic and recreational injuries.

This chapter is designed to assist the Doctor of Chiropractic in gaining the basic knowledge necessary to clinically address conditions of the upper and lower extremities.

The peripheral joints like those of the spine and pelvis are subject to injury which may result in articular malpositions causing abnormal biomechanical function, as well as potentially altering neural, vascular, and muscular function. It is for this reason that Gonstead (1) conceptualized a philosophical basis for including extraverted spinal adjustment within the purview of chiropractic care. Furthermore, normal spinal biomechanics not only contribute to, but are dependent on, the integrity of both the upper and lower extremities. To neglect these areas of the body does not provide the patient with optimal care.

The doctor should always consider that many patients presenting with chief complaints which suggest extremity pathology may actually be suffering from symptoms which are secondary to visceral pathology or lesions of the spinal column (e.g., vertebral subluxation complex).

It is the responsibility of the practitioner to arrive at a differential diagnosis through the patient history, physical examination, and special diagnostic procedures: x-ray, MRI, hematologic tests, thermography, etc. As with most diagnostic work-ups, the patient history is generally the most valuable tool.

EXAMINATION

The initial approach to the patient presenting with extremity symptoms as the chief complaint should include a comprehensive spinal evaluation to aid in the detection of the origin of the condition (Table 16.1). If and when vertebral subluxation, as well as visceral pathology, have been eliminated as possible sources of symptomatology, attention should be focused at the peripheral joint in question. Many of the conditions for which the clinician is consulted for are not the result of a macrotraumatic episode and are generally less complicated to properly diagnose. The selective extraction of historical subtleties will ultimately lead to a proper diagnosis. As it is not in the interest of this chapter to instruct on general history-taking procedures, only pertinent questions which supply data helpful in extremity care shall be discussed. Inclusion of such inquiries will be discussed within each portion of the standard health history.

I. Bibliographical Information
II. Chief Complaint
III. Present Illness
IV. Past History
V. Family History
VI. Review of Systems:
   1) Physical
   2) Sociological
   3) Psychological

Table 16.1. Origin of Pain: Peripheral Joints vs. Vertebral Subluxation Complex (VSC)*

<table>
<thead>
<tr>
<th>Factors</th>
<th>Peripheral Joint</th>
<th>VSC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onset</td>
<td>General history of specific incident or action</td>
<td>Gradual or insidious</td>
</tr>
<tr>
<td>Provocative</td>
<td>Joint use or load</td>
<td>Spinal postures, stresses, aggravation</td>
</tr>
<tr>
<td>Palliative</td>
<td>Joint rest, support, ice, etc.</td>
<td>Ameliorating factors for spinal conditions</td>
</tr>
<tr>
<td>Quality of pain</td>
<td>Sharp, throbbing</td>
<td>Dull, ache</td>
</tr>
<tr>
<td>Region</td>
<td>Localized, specific, usually unilateral</td>
<td>Diffuse, difficult to isolate, possibly bilateral</td>
</tr>
<tr>
<td>Radiation</td>
<td>Generalized, nonspecific pattern</td>
<td>Dermatomal, scleratomal, myotomal</td>
</tr>
<tr>
<td>Intensity</td>
<td>Mild to severe</td>
<td>Mild to moderate</td>
</tr>
<tr>
<td>Timing</td>
<td>Generally correlated to joint function</td>
<td>Temporally related to spinal factors</td>
</tr>
</tbody>
</table>

*General information obtained during routine history procedures often leads to the specific site of the lesion.