Answer Sheet: TMD Diagnosis and Pathology Module Two

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Educational Objectives

Upon completion of the course, the student will:

• Identify the major symptoms of Temporomandibular Dysfunction (TMD).
• Know the major diseases of TMD.
• Know the steps necessary in diagnosis.
• Understand disc issues related to TMD.
• Identify the major tools needed for evaluation and diagnosis.
• Understand the importance of radiographs in evaluation.

Introduction

Temporomandibular Dysfunction, (TMD) or TMJ syndrome, is an umbrella term covering acute or chronic pain in the masticatory system including the temporomandibular joint. There are many causes of TMD, including, but not limited to occlusal discrepancies, muscular spasm, trauma, and para-function (bruxism and clenching). The disorder and resultant dysfunction can result in significant pain and impairment of function. Because the disorder transcends the boundaries between several health-care disciplines, in both medicine and dentistry, there are a variety of treatment approaches.

For instance the temporomandibular joint is susceptible to many of the conditions that affect other joints in the body, including ankylosis, arthritis, trauma, dislocations, developmental anomalies, neoplasia, and reactive lesions.

An older name for the condition is "Costen's syndrome", after James B. Costen, who partially characterized it in 1934 (Beyers, Milton MD, Teich, Samuel MD, 1952).

Signs and symptoms of temporomandibular joint disorder vary in their presentation and can be very complex, but are often simple. On average the symptoms will involve more than one of the numerous anatomical components:

• joints
• muscles
• nerves
• tendons
• ligaments
• bones
• connective tissue
• teeth

Ear pain associated with the swelling of proximal tissue is a symptom of
temporomandibular joint disorder.

**About the Author**

William D. Bellavia, DDS, MAGD, a graduate of SUNY Buffalo Dental School, conducted a successful clinical practice in Western New York State, and specialized in treatment of the TMD (Temporomandibular Dysfunction). Dr. Bellavia served as a faculty member at the SUNY Buffalo School of Dental Medicine in the instruction of treatment modalities for diseases of the TMJ, as well as an instructor in Occlusion.

Dr. Bellavia has published many clinical articles, notably in The Journal of Neurological and Orthopaedic Medicine and Surgery. And he holds patents on various devices used in the treatment of TMJ disorders. Currently, Dr. Bellavia, continues to steadily write books and articles, while enjoying retirement with his wife, Marilyn.

**Symptoms of TMD Disorders**

Symptoms associated with TMJ disorders may be:

- Bruxing and Clenching
- Biting or chewing difficulty or discomfort
- Clicking, popping, or grating sound when opening or closing the mouth
- Dull, aching pain in the face
- Earache (particularly in the morning)
- Headache (particularly in the morning)
- Hearing loss
- Migraine (particularly in the morning)
- Jaw pain or tenderness of the jaw
- Reduced ability to open or close the mouth
- Tinnitus
- Neck and shoulder pain
- Dizziness

The overriding goal of the TMD Clinician is:

- to relieve oro-facial pain.
- to accomplish relief of pain in as simple and reversible manner as possible.

One of the principal elements of TMD treatment continues to be prescription of appropriate medications, and/or place anatomic structures in the most optimal positions to allow pain relief and/or healing. Yet the dental clinician must always keep in mind: “Do the patient no harm”. That advice, most often associated with the Hippocratic Oath, may be the most important aspect of TMD therapy and is one of the principal precepts.
Another way to state it is that, given an existing problem, it may be better not to do something, or even to do nothing, than to risk causing more harm than good. This ethical foundation reminds the dental clinician and other health care providers that they must consider the possible harm that any intervention might do. The concept is invoked when debating the use of an intervention that carries a permanent change and a less certain chance of benefit.

Over the years in my clinical practice and treatment of TMD, I have seen more harm done under the category of “curing” TMD than one can imagine. Some of the most common pitfalls include:

- extraction of healthy teeth
- sinus surgery
- TMJ surgery
- increased vertical dimension via crowns and bridges

But perhaps the most disturbing aspect in treatment TMD falls under the category of diagnosis. If the diagnosis is incorrect, the treatment rendered will often do the patient harm. And when that treatment is irreversible, the harm may be life-long. Therefore, in order to reach the goal of proper treatment, accurate diagnosis is paramount.

**Diagnosis/Pathology**

**Nomenclature:**

For years the condition itself was called ‘TMJ’ as if the joint were the disease. The name was changed not only to correct the nomenclature, but also recognizing that other structures contributed and may exist secondary or primary to joint disease. TMD or Temporomandibular Disorder is a more appropriate as well as accurate term.

As we begin this segment on the Diagnosis of TMD, we will first discuss the pathology (diseases and differential diagnosis) of the structures and the best method available by which to diagnose them. Most of the diseases are inflammatory in nature, thus they carry the suffix ‘itis’ which connotes inflammation.

It is absolutely pertinent to remind oneself that any disease which can affect a similar structure in other parts of the body, i.e. tendons, ligaments, muscles, nerves, joints, etc., can disturb the head and neck in the same or similar manner. Often times, when one considers the emotional aspect of facial pain, these effects may be exaggerated.
Symptoms associated with TMD according to the University of North Carolina at Chapel Hill:

- Headaches/Migraines
- Neck, shoulder or back pain
- Facial pain
- Clicking or grating sounds in the jaw joints
- Limited movement or locking jaw
- Unexplained loose, worn, or cracked teeth
- Pain or soreness around the jaw joints
- Congestion or stuffiness of the ears

(Saib, 2013).

Common Maladies Associated with TMD

1. Disc Displacement and ensuing Osteoarthritis of the TMJ
2. Diseases of the Musculature
   - Myofacial Pain Dysfunction (MPD)
   - Fibromyalgia
3. Temporal Tendonitis
4. Ligamentitis (inflammation in ligament due to tear or sprain)
   - Stylomandibular Ligamentitis
   - Stylohyoid Ligament (calcification – Eagles’ Syndrome)
   - Capsular Ligament
5. Nerve Impingements
   - Greater Occipital Nerve Impingement
   - Lesser Occipital Nerve Impingement
6. Neuralgias associated with the Central Nervous System (Cranial Nerves)
   - Trigeminal Neuralgia
   - Glossopharyngeal Neuralgia
   - Central Nervous System (examination)
7. Dental Disease
   - Periapical abscess
   - Periodontal disease
   - Periapical neuralgia (alveolitis, dry socket)
   - Occlusal trauma, Bruxism, Erosion
Displacement of the Disc

Disc Displacement and ensuing Osteoarthritis of the TMJ

The most common aspect of TMD is disc displacement and ensuing osteoarthritis of the TMJ.

- Anatomy Review:

  The Temporomandibular joint is a paired joint so that every action on one side (ipsilateral) will have an effect on the opposite (contralateral) side. For instance when the right TMJ moves laterally (to the right), the left TMJ must move medially. This demands a specific co-ordination of the disc with the muscles and condyle. The external pterygoid is the most important of the muscles of mastication in lateral movements.

All types of arthritis affect the TMJ (Rheumatoid, Psoriatic, etc.) The most common is osteoarthritis which begins with disc displacement (often caused by occlusal interferences and or trauma). Disc dislocation, left untreated, will degenerate into osteoarthritis.

A common clinical scenario:

Grinding, bruxing or clenching teeth with balancing side contacts (occlusal contacts on opposite side of lateral movement) causes spasm in that (balancing side) External Pterygoid muscle, which in turn causes a medial and anterior pull on the disc eventually resulting in a strain or tear of the capsular ligament.

The capsular ligament is injured (stretched, tear) when the disc becomes dislodged, anterior and medial to the condyle. Since the disc’s movement is dictated by the external pterygoid muscle (superior belly), it must move toward the origin of that muscle (superior belly is attached to the disc and inserts medially on the pterygoid process of the sphenoid bone which is both medial and anterior to the disc’s natural position): thus
in this type of dislocation the disc is always found medial and anterior to the condyle.

This is emphasized to a greater extent when this muscle is in spasm (a state of constant contraction). Moreover, the muscle is very difficult (if not impossible) to inject due to its location.

The pathology is acute when the disc locks the condyle so that it is unable to translate (open) or move medially.

As the pathology becomes chronic, the disc sometimes attempts to ‘pop’ back onto the condyle. This is the familiar ‘clicking’ sound. The click occurs early in the acute phase and late in the chronic phase. In the advanced arthritic phase it no longer is able to function because the ligament will have lost its elasticity and the disc will remain in the medial anterior position as the joint undergoes arthritic change (“bone on bone”).
In the acute stage, the primary effect on the condyle (as the disc moves medial and anterior) is to push the condyle against the highly innervated posterior disc space (auriculotemporal nerve) often times resulting in acute pain.

Often the diagnosis of joint pathology can be made via charting the Range of Motion and scoring the pain caused by the clinician’s palpation of structures.

**Disease of the Musculature**

Pain Dysfunction (MPD) and Fibromyalgia are both diseases that appear related to exogenous stress in a patient’s life.

**Myofacial Pain Dysfunction (MPD or MPDS)**

This malady can affect any skeletal muscle in the body. Pioneering research in the field of MPD was conducted by the late Janet Travell, MD. Dr. Travell found that the most frequent symptom is muscle spasm accompanied by trigger points in the affected muscle. These triggers can be identified via palpation. MPD is usually localized in the same musculature (although several muscles can be involved, trigger points tend to be located in the same general area, i.e. head and neck, shoulders, etc.) and can be reversed via several modalities (will be discussed in the treatment segment).

MPD is seen equally in men and women.
Fibromyalgia

Fibromyalgia is every bit as painful and disconcerting to the patient as MPD, but this condition tends to move from muscle to muscle. The pain may be in the shoulders one day and subsequently travel to the arms or legs the next. The only location which is seemingly void of this disease is the head and face. The pain is chronic in nature (see below).

The similarity to MPD is remarkable and the maladies not only have a close relationship, but may someday be included in the same syndrome or treated as the same disease. Fibromyalgia, not unlike MPD, also exhibits trigger spots from which the pain emanates.

The cause is unknown. Possible causes or triggers of fibromyalgia include:

- Physical or emotional trauma
- Abnormal pain response - areas in the brain that are responsible for pain may react differently in fibromyalgia patients.
- Sleep disturbances
- Infection, such as a virus, although none has been identified.

Fibromyalgia is most common among women aged 20 to 50.

The following conditions may be seen with fibromyalgia or mimic its symptoms:

- Chronic neck or back pain
- Chronic fatigue syndrome
- Depression
- Hypothyroidism (underactive thyroid)
- Lyme disease
- Sleep disorders

Diagnosis:

The diagnosis of Fibromyalgia requires the following:

- At least 3 months of widespread pain

Pain and tenderness in at least 11 of 18 areas, including:

- Arms (elbows)
- Buttocks
- Chest
- Knees
- Lower back
- Neck
- Rib cage
- Shoulders
- Thighs

Blood and urine tests are usually normal. However, tests may be done to rule out other conditions that may have similar symptoms (NIH, 2017).

Please note that the symptoms of fibromyalgia do not involve the head or face. Therefore, if the discomfort is above the neck it is diagnosed as MPD. When the discomfort is located below the neck and meets the above parameters it is diagnosed as Fibromyalgia.

Fibromyalgia falls within the boundaries of medicine, not dentistry, while the treatment of MPD resides in both professions.

**Temporal Tendonitis**

The temporalis muscle inserts itself onto the coronoid process of the mandible. Often the tendon inserts not only on the tip of the bony structure but anterior to it. This tendon is frequently stretched and/or torn due to over opening. Other tendons can also exhibit pathology, but in my experience this was by far the most frequent.
Ligamentitis (sprain, tear, or rupture resulting in inflammation at the insertion of the ligament)

**Stylomandibular /Sphenomandibular Ligaments**

The stylo-mandibular ligament runs from the styloid process of the temporal bone (behind and inferior to the ear) to the angle of the mandible; while the sphenomandibular ligament originates on the sphenoid bone and attaches near the linguae and mylohyoid ridge of the interior side of the mandible.

Both can be injured in sudden traumas such as whiplash accidents. Ligaments are avascular, but the attachment to the bone has both nerve and vascular components.

**Capsular Ligament**

The TMJ capsular ligament is susceptible to sprains, tears, and ruptures as in any other joint. The etiology can be sudden trauma (whiplash) or gradual stretching and eventual tearing from occlusal pathology (see disc displacement).

![Diagonal view of the joint](image)

**Stylohyoid Ligament (calcification – Eagles’ Syndrome)**

This malady dubbed Eagle’s Syndrome connotes a feature in an x-ray. The calcification resembles an eagle in flight. The cause of the calcification is unknown, but often the discomfort is usually referred to the throat. It is due to the unforgiving lack of elasticity and fracture of the calcified ligament; in my opinion treatment lies beyond that of the General Practitioner.
Nerve Impingements

- Greater Occipital Nerve Impingement
- Lesser Occipital Nerve Impingement

The greater and lesser occipital nerves reside in the posterior skull along the occipital ridge. The nerves often get damaged in whiplash accidents (see below) or become victims in the muscle spasm of MPD or Fibromyalgia. Moreover, the fascia of posterior neck muscles can be torn and the subsequent healing ‘scars’ over these nerves.

The greater and lesser occipital nerves reside in the posterior skull along the occipital ridge.

CNS Neuralgias

Trigeminal Neuralgia (Tic Douloureux) - Cranial Nerve V

The etiology of trigeminal neuralgia is unknown. The pain is sharp and can occur any place along the three branches. This neuralgia has been called the greatest pain known to mankind. It is always accompanied by a trigger spot. Almost diagnostic is the fact that
the patient will point to the spot, but not touch it. The pain is both debilitating and episodic. Some have claimed the etiology is vascular compression of the ganglion itself, but this does not account for all etiology.

**Glossopharyngeal Neuralgia - Cranial Nerve IX**

Glossopharyngeal neuralgia is not unlike trigeminal neuralgia, but on the pathway of the glossopharyngeal nerve. Both of these neuralgias are similar in that they are intense and emanate from cranial nerves.
Screening Examination of Cranial Nerves in the Central Nervous System

Most of the Cranial Nerves and consequently the CNS can be eliminated as a source of pain with a simple clinical test (see below). This is not an exhaustive test, nor does treatment of the CNS reside within the parameters of dentistry. But this simple examination and elimination of pathology is necessary and within the dental limits of differential diagnosis. See “Clinical Examination”, Screening of CNS.

Dental Disease

Periapical abscess and Differential Diagnosis

A periapical abscess is caused by the spread of dental caries (bacteria) into the pulp. The pulp becomes necrotic and the bacterium spreads throughout the root in its attempt to enter the body. The body’s defenses prevent the spread of the bacteria by localizing the invasion and walling off the invader via an abscess. The pressure caused by the
multiplication of bacteria and ensuing by-products (dead White Blood Cells, Serous fluids, etc.) is the most common cause of toothaches. A toothache can refer pain to any branch of the trigeminal nerve and must be eliminated in the differential diagnosis.

Periodontal disease

Although the etiology of periodontal disease is bacterial the disease is closely related to occlusal trauma and bruxism. Tipping pressures on the tooth cause alveolar bone resorption on one side of the tooth and apposition on the opposite side. Most experts feel that this resorption predisposes the patient to the invasion of the bacterium.

Periapical neuralgia (dry socket)

This painful condition is a post extraction complication. The blood clot is lost and oral bacteria invade the exposed alveolus and nerve tissue. The condition is painful, difficult to treat, and can be long lasting. At times epithelial tissue will cover the socket masking this disorder.
Occlusal Trauma, Bruxism, Excessive Wear (Loss of Vertical Dimension)

The ideal occlusion for the musculature as revealed by electromyography is a centric occlusion position (muscle/tooth determined position) with the maxillary anterior six teeth ‘lightly touching (or just missing) and able to dis-occlude the posterior teeth when the jaw slides forward (protrusion).

**Lateral Movement:** The side to which the jaw moves is called the working side, the opposite side is called the balancing side. When the jaw moves laterally (i.e. left) it should slide on #11 which in turn should dis-occlude all other teeth (cuspid protected occlusion) and vice versa.

In the above example when # 11 is engaged (working side) if #2, 3, 4, or 5 (balancing side) touch it is referred to as a balancing side contact.

When number 11 is engaged (working side) and is assisted by number 12, 13, 14, or 15 (working side) the occlusion is referred to as a group occlusion (working side occlusion).
Moreover, when #11 is engaged, the balancing side external pterygoid muscle should be relaxed. Nevertheless, when there is a balancing side contact, the external pterygoid muscle on that side contracts and attempts to pull the condyle and disc forward, rather than allow passive medial movement. The ensuing confusion causes a neuromuscular response of spasm in said muscle. This spasm is paramount in disc displacement and eventual osteoarthritis of that TMJ.

Cuspid guided occlusion is most ideal because it results in the least damage to the dentition as well as musculature.

When the anterior six teeth are engaged the posterior teeth should disengage. This is a protrusive or forward movement and is dependent on the anterior guidance provided by the six maxillary anterior teeth.

Occlusal diagnosis should be made by a combination of clinical observation and an evaluation of the occlusion via mounted study models. Mounted study models are a pertinent and necessary aspect of diagnosis.

It is thought that bruxism and or clenching often arises as a result of emotional stress. The result can be a loss of occlusal tooth structure and vertical dimension, which in turn places more stress on both TM Joints. This is in no small part due to the loss of cuspid and anterior guidance.
Erosion has a different etiology than bruxism or clenching in that it is unrelated to stress. Erosion occurs over long periods of time when the patient’s diet contain acidic foods and drinks, i.e. colas, citrus fruits, etc. As the eroded (cratered) borders fracture it can have the same clinical effect as bruxism.

Clinical Examination

Diagnosis rises and falls with the thoroughness of the examination. First and foremost enough time must be scheduled to accomplish this most important phase of analysis.
First Appointment TMD Examination

- Medical History, TMJ Questionnaire
- Physical examination of the head and neck:
  1. Range of Motion (ROM)
  2. Auscultation of joint (evaluating sounds)
  3. Otoscope exam of ears
  4. Palpation scoring
  5. Occlusion
  6. Screening CNS
- FMX/Panoramic/Photographs
- Study Models and occlusal recording
- Instructions do’s and don’t
- Schedule consultation

Medical History and Questionnaire

Medical History Questionnaires are readily available.

The TMJ Questionnaire must include several pertinent questions:

1. If there were only one symptom which could be cured, what would that symptom be? (Chief Complaint)
2. Have you ever experienced significant trauma to jaw, face, and neck (recent as well as historic)
3. Do you have a history of headaches? If so how long do they last; from where do they originate; when do they occur (upon awakening, midafternoon, etc.)?
4. Do you have a history of neck and shoulder pain
5. Do you have a history of whiplash injury?
6. History of TMJ pain
7. Are you able to open your jaw wide without pain?
8. Does your TMJ make sounds? Describe sounds: clicking, grinding, etc.
9. Have you ever been unable to open your jaw?
10. Have you ever been treated for TMD (TMJ)? Do you wear a splint? Has a dentist changed the shape of your teeth (occlusal equilibration)?
11. Do you engage in activities which cause repeated jaw movements (i.e. singing, musical instruments, public speaking, gum chewing, oral sex, etc.)?
**Physical Examination Temporal Mandibular Joint (TMJ)**

After a review of history and questionnaire, we move to the Range of Motion (ROM) of TMJ.

**Range of Motion (ROM)**

Place a caliper on the midline (maxillary central incisors); check to make certain the mandibular midline co-insides (if it does not using a lead pencil draw a line on the mandibular teeth which matches the maxillary midline).

Have the patient open maximally. Measure and record the opening… distances from the maxillary incisor to mandibular incisor and note if the jaw deviates to one side or the other. Record both the opening and deviation on the chart in centimeters.

Lateral movements right then left.

Place the caliper on the midline of the maxillary teeth. Have the patient open slightly (no more than 1 cm clearance between maxillary and mandibular dentition); with the caliper steadied at the midline ask the patient to move right; record measurement, then left and record that measurement (in centimeters).

The normal opening for the average adult is approximately 48 mm with lateral movements of 12 mm.

**Range of Motion**

If the disc is displaced it will limit the opening of the mandible and deviated to the affected side. The affected condyle is restricted by the anteriorly displaced disc.

The lateral movement of the affected side will be normal, because the disc is exclusively
blocking anterior (protrusion/opening see above) and medial movements. Therefore, when the patient attempts to move to the opposite (contralateral) side the displaced disc inhibits this medial movement.

**Normal Jaw Opening**

![Normal Jaw Opening Diagram]

Opening is straight and lateral movements are normal

**Acute Dislocated Left Disc (closed lock)**

![Acute Dislocated Left Disc Diagram]

Disc is locked medial and anterior (the term closed lock refers to the mandible which is not able to open normally or is ‘closed), and the jaw deflects to the affected side (left) upon opening and the translation is limited (22mm); the right lateral (medial) movement is blocked by the disc thus limited; the left lateral movement is free, thus normal.

**Left Dislocated Disc with Click**

![Left Dislocated Disc with Click Diagram]
Left disc reduces as seen by the disc ‘clicking’ back into place. The beginning translation deviates to the affected side but straightens after reduction.

- Left untreated the disc will remain in the anterior/medial position and the condyle will eventually crush it. In rare cases the condyle can move a head of the crushed disc and lock open. This results in an ‘open lock’, as the disc lags behind the condyle. This condition demands reduction (often times a general anesthetic is needed).
- Left untreated the joint advances to an osteoarthritic stage and often the ROM returns to normal, albeit at times painful.

**Chronic Dislocated Disc with Advanced Osteoarthritis**

One can readily see that almost any scenario of disc displacement can be recorded and diagnosed via a simple ROM study.
**Ausculation (Sounds) of the TMJ**

Listening to the TMJ via a Doppler Auscultation or stethoscope can provide valuable information i.e. crepitus, early, moderate, or late click, etc.

**Otoscope**

The ear drum should be eliminated as a source of pain. This can easily be accomplished by use of an Otoscope. Should you view pathology, a referral to the appropriate medical professional must be made.

**Palpation**

One of the most effective diagnostic tools I used in my practice was palpation. The structures to be palpated were:

- the Temporomandibular Joints
- the opening and closing musculature
- nerve impingements
- ligaments,
- tendons in the head and neck region:
The patient is instructed to score the pain from 1 – 10; 10 being unbearable, and 1 the most tolerant. As the patient responds to the pressure of touch (painful stimulus) record the results.

Not only does this reveal which areas were most painful, but also as treatment progresses it provides a comparison of pain relief or exacerbation. Most importantly, palpation aids in diagnosis, which in turn may dictate proper treatment. And demonstrable improvement encourages the patient and clinician; on the other hand, degeneration of the condition alerts the clinician to the possibility of an inaccurate diagnosis or the necessity for referral.

Before one begins to palpate, the dentist must inform the patient what they are about to do and receive their permission to proceed. After informing the patient of my intentions and asking permission to palpate areas both intra-orally (gloves) and extra-orally (no gloves). I would show them on my body where I was going to palpate. Then I would choose an area of their body which was free from pain (i.e. I would ask permission to palpate the elbow or for them to choose an area which was free from pain). That gave the patient an example of the sensation and amount of pressure elicited for a score of zero. Then I would proceed to the shoulders, posterior neck, base of the skull (greater
and lesser occipital nerves), etc. (see chart above); next to the face, palpating the temporalsis and TMJ.

After all external structures had been palpated and scored, I would glove (history would reveal latex allergies) to begin intra-oral palpation: Internal pterygoid; masseter, coronoid process following it down the slope of the mandible; external pterygoid space, etc.

Occlusion

Once the ROM and Palpation chart has been completed, we next chart the occlusion. The Angles' Classification, missing teeth, eroded teeth, 'worn' teeth, cracked restorations, prosthesis (condition), periodontal condition, and clinical caries noted.

Review of Occlusion: The ideal occlusion for the musculature as revealed by electromyography, is a centric occlusion position (muscle/tooth determined position) with the maxillary anterior six teeth 'lightly touching or just missing) and able to dis-occlude the posterior teeth when the jaw slides forward (protrusive movement).

Lateral Movement: The side to which the jaw moves is called the working side, the opposite side is called the balancing side. When the jaw moves laterally (left) it should slide on #11 which in turn should dis-occlude all other teeth (cuspid protected occlusion) and vice versa.

In the above example when # 11 is engaged if #2, 3, 4, or 5 touch it is referred to as a balancing side contact.

When number 11 is engaged and is assisted by number 12, 13, 14, or 15 the occlusion is referred to as a group occlusion (working side occlusion).

Contralateral (opposite side) teeth touching in lateral movements cause muscle spasm in the External Pterygoid muscles. They are referred to (see above) as balancing side interferences and should be eliminated when possible.

The favorability of the cuspid-guided occlusion is that it causes the least damage to the dentition as well as musculature.

The clinical symptoms and diagnosis made from the above range of motion, palpation, and clinical evaluation of the occlusion is invaluable to the clinician and costs her/him nothing in the way of sophisticated instrumentation and/or x-ray technology.

More often than not a diagnosis can be made from this clinical data, but MUST be supported by radiographs, study models, etc.
The screening of the CNS involves testing six cranial nerves.

The **optic nerve (II)** can be tested by shining a bright light (overhead light) into the patient’s eyes one at a time. The pupil should constrict.

Next have the patient move their eyes, look, up, down, left, and right. This is a test of the **Cranial Nerve III (Ocular Motor Nerve)** and the **Trochlear Nerve (IV)**.

**Trigeminal Nerve (V)** can be tested by light touch to eliminate numbness.

The **Facial Nerve (VII)** can be tested by the patient’s ability to move the facial muscles frown, smile, jaw movements, etc.

**Nerves IX (Glossopharyngeal) and XII (Hypoglossal)** can be tested via tongue movement and gag reflex.

This screening is in no way, nor meant to be, exhaustive, but in my practice it resulted in the eventual diagnosis of brain cysts, brain tumors, strokes, and TIAs. But more importantly early diagnosis enabled proper medical referral and prevented life threatening misdiagnosis.
Radiographs and Imaging

Full Mouth X-rays (FMX)

Differential Diagnosis:
- Dental abscess
- Periodontal involvement (often accompanying bruxism)
- Caries
- Abrasion
- Erosion

Panoramic Radiographs

Panoramic films are an excellent tool for screening:
- Eagle’s Syndrome – calcified stylohyoid ligament
- Sinus infections and or cysts and tumors
- Dental Pathology
- TMJ – ascertain condition of condyle – smooth, fractured, osteoarthritis, rheumatoid arthritis, etc.
- Coronoid Process – smooth, fractured, arthritic
Diagnostic Technology

Dentistry is a technology laden profession. Our profession is exposed to a myriad of diagnostic and treatment modalities. Yet when keeping to our primary goal of a thorough clinical examination and history, much of this technology is unnecessary for diagnosis.

Furthermore, as dentists we are expected to purchase, maintain, and house this equipment. It is time that dentistry gleans from one of medicine’s most successful models: delegation of the cost of technology.

While this course will review the latest technology, I must stress that knowledge of anatomy and physiology, along with clinical skills necessary for a comprehensive examination will at least be as pertinent, if not more pertinent, to your diagnosis and treatment as the latest and most sophisticated paraphernalia.

Radiographic Referrals

Contrast arthrography, MRI’s, and CT Scans are rapidly being replaced by 3D Cone Beam CT Scans:

Magnetic Resonance Imaging (MRI)

MRI have been available for some time, but due to high costs are not routinely utilized.

Three Dimensional Cone Beam Computerized Tomography (3D Cone Beam CT Scan)
This newest modality offers the most detailed images to date. They are being used not only for diagnosis in TMD, but also orthodontics and implant dentistry. This is perhaps the most exciting breakthrough in the past ten years.

Considerable progress has been made in diagnostic, medical imaging devices such as computed tomography (CT). However, these devices are not used routinely in dentistry and orthodontics because of high cost, large space requirements and the high amount of radiation involved (Nakajima, Akira, Sameshima, Gleen, Et. Al. 2005).

Purchasing a 3D Cone Beam CT Scan may be prohibitive not only from a cost standpoint but also from that of sharing the responsibility of diagnosis. Should a brain lesion, tumor, etc. be undetected by the clinician, but present in the image, the diagnosing dentist may be held legally responsible. I feel it is a much better scenario to share this cost and responsibility whenever possible.

Consultation

I always utilized a separate appointment for consultation. In that way I could not only explain my diagnosis, but also my treatment approach (treatment plan).

This appointment was to inform the patient not only of the diagnosis, but of the proposed treatment (Phase I Treatment). I would also render a prognosis and the likelihood for more treatment (Phase II or III) at a later date.

Phase I

An all-inclusive global treatment accompanied by a global fee.

Phase II may involve:

Physical Therapy, Chiropractic, Counseling, and/or surgery.

Phase III

Dental restorative treatment. (i.e. crown and bridge, removable prosthetics, overlays,
orthopedics, orthodontics, etc.)

Phase I typically entails 6 weeks of treatment – patient seen 2 times a week, utilizing various modalities in an attempt to relieve and or cure the diagnosed disease (i.e. pain, limited opening, headaches, etc.).

**Psychological Ramifications**

First and foremost, the face is the most viewed portion of the body. It is how we meet the public; a smile, a frown, eyes wide, eyes tired, hair, etc. Furthermore the head and neck is the region of the body which is paramount in the initiation of two basic necessities of life, digestion and respiration. Therefore, this region is fraught with probabilities of fear and protection. With this in mind, any unidentified source of discomfort is naturally accompanied by psychological ramifications.

It was Laskin and Green (1990) who, several decades ago, suggested the futility of occlusal splints and treatment with their double blind study utilizing placebos for treatment. It is with this in mind that a thorough examination should include a questionnaire and an open mind to the possibility of counseling by the appropriate medical personnel in Phase I or II treatment.

**Advancements In TMD**

As of December 2016, the National Institute of Dental and Craniofacial Research (NIDCR), one of the National Institutes of Health (NIH), leads the federal research effort on temporomandibular joint and muscle disorders. In a landmark study, NIDCR is tracking healthy people over time to identify risk factors that contribute to the development of these conditions. Preliminary results from this study have identified a series of clinical, psychological, sensory, genetic and nervous system factors that may increase the risk of having chronic TMJ disorders. These new findings expand our scientific understanding of the onset and natural course of TMJ disorders and may lead to new diagnostic and treatment approaches.

The online article goes on to state: Because pain is the major symptom of these conditions, NIH scientists are conducting a wide range of studies to better understand the pain process, including: understanding the nature of facial pain in TMJ disorders and what it may hold in common with other pain conditions, such as headache and widespread muscle pain, exploring differences between men and women in how they respond to pain and to pain medications, pinpointing factors that lead to chronic or persistent jaw joint and muscle pain, examining the effects of stressors, such as noise, cold and physical stress, on pain symptoms in patients with TMJ disorders to learn how lifestyle adjustments can decrease pain, identifying medications, or combinations of medications and conservative treatments, that will provide effective chronic pain relief,
investigating possible links between osteoarthritis and a history of orofacial pain (NIH, 2016)

In better news, the NHI reports that: Research is also under way to grow human tissue in the laboratory to replace damaged cartilage in the jaw joint. Other studies are aimed at developing safer, more life-like materials to be used for repairing or replacing diseased temporomandibular joints, discs, and chewing muscles (NIH, 2016).

Conclusion

By now one should understand not only the anatomy and pathology associated with TMD, but that this condition does not occur as a single entity. While a patient may be diagnosed and initially treated for their disc displacement; MPD, Temporal Tendonitis, and or other conditions may co-exist and be contributing factors to their disorder.

I would explain to the patient TMD was very much a 'layered' condition. As we treat and conquer one malady, a secondary or tertiary condition is likely to surface and require treatment. More often than not these conditions can be treated in Phase I and is the rational for a global fee in this phase of treatment.

The next module, Treatment Modalities and Methods in TMD will review each disorder separately and outline specific methods and pharmaceuticals necessary for successful treatment in our attempt to bring our patient’s disorder to an effective conclusion.

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**Course test: TMD Diagnosis and Pathology Module Two**

1. The goal of the TMD clinician should be to treat via definitive irreversible means in order to assure a cure.
   a. True
   b. False

2. The acronym TMD is used to connote: Temporal Mandibular Disease.
   a. True
   b. False

3. The TMJ is unique in that it has a disc:
   a. Which is predominately fibrous tissue
   b. Has a muscle which moves both the bone and the disc.
   c. Is a paired joint
   d. All of the above
   e. A & C
4. Headaches are no longer associated with TMD.
   a. True
   b. False

5. Disc Displacement in the TMJ eventually leads to Rheumatoid Arthritis
   a. True
   b. False

6. Diseases and dysfunctions effecting other parts of the body can affect facial and oral Structures in a similar manner
   a. True
   b. False

7. A click or popping sound in the TMJ connotes:
   a. Osteoarthritis
   b. A displaced disc
   c. A disc which can be captured
   d. Calcification within the joint
   e. B & C only

8. In order for the TMJ Disc to be displaced there must be:
   a. Spasm in the masseter muscle
   b. Spasm in the Superior Belly of the External Pterygoid Muscle
   c. A stretching or tearing of the capsular ligament
   d. A tear in the stylomandibular ligament

9. The term MPD is synonymous with Fibromyalgia.
   a. True
   b. False
10. Fibromyalgia:
   a. Is always present in the facial musculature
   b. Effect only one segment of the body at a time
   c. Has a greater number of men than women affected
   d. Is not related to sleep disorders
   e. None of the above

11. In MPD the muscles are always associated with:
   a. Spasm
   b. Trigger points
   c. Tenderness
   d. All of the above

12. Temporal Tendonitis:
   a. Involves the tendon which attaches the external pterygoid to the coronoid process.
   b. Involves the tendon which attaches the temporal muscle to the temporal bone.
   c. Involves the tendon which attaches the temporal muscle to the coronoid process.
   d. Involves the tendon which attaches the temporal muscle to the maxillae.

13. The suffix 'itis' connotes:
   a. Malignancy
   b. Inflammation
   c. Ligament damage
   d. Sprain
14. In the head and neck, neuralgia occurs only in the Fifth Cranial Nerve.
   a. True
   b. False

15. A screening of the CNS can be achieved by checking:
   a. Pupillary response to light
   b. Eye movement
   c. Tongue movement
   d. Gag reflex
   e. All of the above

16. Erosion and bruxism may result in:
   a. An increase in vertical dimension
   b. A decrease in vertical dimension
   c. Is not related to vertical dimension

17. A balancing side contact means that teeth touch in a lateral movement on the opposite side to which the jaw is moving.
   a. True
   b. False

18. Anterior guidance assists the mandible in lateral movements.
   a. True
   b. False

19. Palpation of various structures in the head and neck:
   a. Helps discern the extent of pain
   b. Helps discern location of pain
   c. Helps in treatment plan
   d. All of the above
20. In order to accurately listen to joint noises one must use a (an):
   a. Stethoscope
   b. Doppler instrument
   c. Otoscope
   d. A & b

21. When the jaw opens without deviation it always connotes a healthy joint.
   a. True
   b. False

22. With a closed lock the disc always travels anterior and medial.
   a. True
   b. False

23. Clinical examination, palpation, and ROM recording can be diagnostic.
   a. True
   b. False

24. Left untreated a TMJ disc displacement will result in osteoarthritis.
   a. True
   b. False

25. 3 Dimensional Cone Beam CT Scans are the only means to diagnose TMJ disc displacement.
   a. True
   b. False