THE PATHOLOGY OF
TMJ DISORDER FOR THE
HEALTH CARE PROFESSIONAL

THIS IS A 6 HOUR COURSE

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The Pathology of TMJ Disorder for the Health Care Professional

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The Pathology of TMJ Disorder for the Health Care Professional

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COURSE DIRECTIONS

HOW TO BEST PROCEED WITH THIS COURSE
Each chapter should be approached systematically in a careful and objective manner. It is important to master each chapter before going on to the next. Relax, take your time, and go at your own pace. As 6 credits of continuing education are rewarded after successfully completing this course, the reading of this manual and completion of the test questions should not take less than 6 hours. Only after you have successfully mastered all the material in the course should you proceed to the test questions.

COMPLETING THE TEST
Read each question carefully before answering. Keep in mind that each question has only one correct answer. The test consists of 50 questions. For a passing grade, you must correctly answer 35 questions. We encourage your input and would welcome any suggestions to improve our course or test questions.

COURSE DESCRIPTION
In this course we discuss the anatomy and physiology of the jaw. Review the dysfunction of the jaw and TMJ. Clarify the causes, specific events and subtypes that result in TMJ disorder. Summarize the mechanism of mouthpieces to correct TMJD. Also, this course will elaborate on how integrate changes in patient’s lifestyle may prevent or ease the pain and discuss ongoing treatment management for TMJ disorder.
COURSE OBJECTIVES
Upon completion of this course, you will be able to:

1. Define the bone and muscle structures involved in the jaw.

2. Discuss some common dysfunctions of the TMJ joint and list symptoms that trigger these disorders.

3. Clarify the causes and specific events that result in TMJ disorder.

4. Identify the health impact from TMJ Disorder on one’s body and how this directly affects an individual’s emotional and physical environment.

5. Explain the importance of conducting a comprehensive evaluation of the patient’s jaw, head and neck to determine the structures causing TMJD symptoms so that a plan of treatment can be implemented for the underlying bio-mechanical problems.

6. Describe how to integrate changes in patient’s lifestyle such as modifying repetitive behavior, maintaining good posture and exercise to correct or moderate the condition and the symptoms.

7. Assess the importance of a team approach involving more than one healthcare professional to yield more benefits towards a patient’s treatment.

8. Evaluating different types of techniques that could possibly be used to create a synergistic effect.

9. Formulate a continuing manage treatment plan to reduce pain and stabilize the TM joint.

10. Recognize the importance of ethics when dealing with patients, their best interest, actions of the medical professional and ethical relationships.
Chapter I
Discuss the Anatomy and Physiology of the Jaw and TMJ Disorder

“I have TMJ”, is the confession that is often heard after the dinner guests hear the clicking and clack from the other side of the table. You may smile but the pain is real and the damage done to teeth when sleep grinding wears away valuable enamel is real also. But, “I have TMJ,” is inaccurate. Everyone has TMJ because it is a joint. The Temporo Mandibular Joint; better said, “I have TMJ disorder or dysfunction.’

The only way to understand the TMJ disorder is to understand the anatomy and physiology of the Temporomandibular Joint. The anatomy and physiology is of concern and within the scope of the practice of dentists and of medical professional because both have a part to play in the correction of the function of this joint.

On an average, an individual opens and closes the jaw almost 2000 times a day. This joint is structured by the temporal bone and the mandible which is the lower jaw and of course the articular disk which reduces the friction. Then the disk also allows for greater flexibility. So now that we’ve had a little introduction to TMJ and the dysfunction of that almighty joint. Now let’s look more closely at the anatomy and physiology of it.

The Anatomy

The anatomy of the TMJ involves bones structures and it involves muscle structures. The TMJ has been called one of the most complex joints and for good reason. Not only are there multiple bones in the joint but the anatomical arrangement includes muscles and nerves. All of these parts are involved in the function of the TMJ and all are involved in the pain and discomfort of the TMJ disorder.

The temporomandibular joint (TMJ) is between the condyle of the mandible and the squamous part of the temporal bone. This is the reason for the long name for this joint. ¹

- The **condyle**, elliptically-shaped is mediolaterally located.
- The **concave articular fossa** and **convex articular eminence** make up the temporal bone surface;
- The **Meniscus**, a fibrous, saddle-shaped structure, separates the condyle and the temporal bone and divides the superior and inferior spaces.
- The **superior joint space** (capacity of 1 cc or less) is bound above by the articular fossa and the articular eminence.
- The **inferior joint space** (capacity of 1 cc or less) is bound below by the condyle.
- The **central intermediate zone**, the thinner meniscus separates thicker portions;
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- The **anterior band** and the **posterior band** are thicker portions of menisus;
- The **bilaminar zone**, a vascular, innervated tissue allows the condyle to move forward. ¹

Now that is the setup of the TMJ joint in the jaw structure. When the function of the joint is normal it will involve all parts of the joint along with all the tissue parts acting harmoniously. In unharmonious function, the location of the disk has been targeted as the causative factor in symptomatic patients. Since some professionals in the field believe that it is not just the dislocation of one part of the joint but rather all parts of the joint, the diagnosis, which we will discuss later, has become more complex.²

There are two TMJs, one on the right side of the jaw and one on the left side of the jaw. They are supposed to work and move together. The TMJ also has two bones the temporal bone (on top) and the mandible bone (on the bottom). What is unique about this synovial joint is that there is an articular disk between the two bones. Besides this there are two different movements that this jaw is responsible for – rotational and translational. The disc, consequently sustains a lot of wear.³

**Physiology of the TMJ**

The function of the TMJ is to facilitate the opening and closing of the mouth when talking or when eating or when chewing gum, etc. Any time the jaw moves, this joint springs to action. That is the simple definition. In between the opening and closing of the mouth is the movement of chewing which is not always up and down as it may be sideways. This complex joint allows for the multiple movements. The two motions are rotational and translational. When the mouth opens the rotational motion occurs around the horizontal axis and through the condylar heads. The translational motion is second and occurs as the condyle and meniscus move together anteriorly.

When the mouth is closed, the thick posterior band of the meniscus is above the condyle but as the condyle moves forward (translational movement), the thinner intermediate zone of the meniscus becomes the working surface between the condyle and the articular eminence. When the mouth is fully open, the condyle may be beneath the anterior band of the meniscus.

So the TMJ is a ginglymoarthrodial joint which refers to its structure of two compartments in the joint and also the function. The articular disc divides the TMJ into two separate compartments -- the inferior compartment and the superior compartment.
The inferior compartment permits the rotation that is needed in the first 20 mm or so of the opening of the mouth. At that point, the superior compartment becomes engaged in the movement. The movements have now engaged the condylar head rotating with in the lower compartment (rotation) and all the while the condylar head and the articular disc engages in the translation motion.

So, the ever important articular disk follows the movements which the lower jaw does while talking or while chewing. This demonstrates the importance of freedom of movement less any obstruction so that the TMJ can achieve normal function.

The upper jaw maintains a fixed position because it is important to the facial skeleton structure. But even though the upper jaw is fixed and the lower jaw has the ability to accomplish a complex range of motion, teeth all must coordinate an effective bite. It is possible to manipulate the lower jaw to a different position depending on the type of chewing that needs to be done. The flexibility of the TMJ and the complex placement of the masticatory muscles allow this to occur.

*The Masticatory Muscles*

- Masseter Muscle

There are three groups that are elevators:

- Temporalis Muscle
- Lateral Pterygoid Muscle
- Medial Pterygoid Muscle

Opens Jaw
- Digastric Muscle

Stabilizes Jaw
- Neck

**Masseter Muscle** – The Masseter muscle is in two distinct layers which are superficial and deep. The deep layer of muscle inserts into the superior part while the superficial layer attaches into the inferior part of the mandibular ramus.

**Temporalis Muscle** – The Temporalis muscle is a complex muscle of three different fibers strung in three different directions of anterior (vertical), middle (oblique) and posterior (horizontal). The purpose of this muscle is to close the mouth by lifting the lower jaw and it also is involved in pulling the lower jaw backward.
Lateral Pterygoid Muscle – The function of this muscle is very important and multifaceted similar to some of the other muscles. The Lateral Pterygoid muscle is supposed to pull the articular disk forward when the mouth is closed because then it will not be smashed between two articular surfaces of the TMJ. If the LPM cannot accomplish this function they the articular disk can become caught, smashed or even fractured.

Medial Pterygoid Muscle – This muscle works in tandem with the Masseter muscle. They form a hammock of sorts with the masseter muscle is supporting the joint from the outside and the Medial Pterygoid muscle is on the inside of the lower jaw. Its purpose is primarily to close the mouth by lifting the lower jaw and any type of grinding motions.

Digastric Muscle – The digastrics muscle is only engaged when the mouth is forced open when the lower jaw is pulled further down. This is the muscle that facilitates the movements in the jaw when an individual is swallowing or coughing.

TMJ and the Teeth
Considering the posterior teeth and anterior teeth and their function, the posterior teeth support the bite down in the process of the initial bite down of the anterior teeth. With the posterior teeth involved in the front and rear action during biting or chewing food, it is better understood why the excessive wear on the TMJ and the articular disk. It also points out the necessity for this joint to function properly.

TMJ disorders can have their root in a condition referred to as malocclusion. This means that an individual has a “bad bite”. In malocclusion the upper and lower teeth do not close together in the correct way because they are misaligned. They can be misaligned in underbites and overbites.
Chapter II
Examine the Anatomy of the Dysfunction of the Jaw and the TMJ

Anatomy of the TMJ Dysfunction

Pain, discomfort and dysfunction in the TMJ is often referred to as TMJ which is inaccurate. TMJ is the name of the joint whereas TMD is the appropriate term for the disorder or dysfunction of the TMJ.

TMD affects the tendons, blood vessels, muscles and ligaments that are associated with this complex joint. While some medical professionals also include the neck, back and various secondary effects, they are not the primary impact areas.

The TMJ joint is complex, susceptible to injury and dysfunction partly because it is the hinge joint that connects the lower jaw (mandible) to the temporal bone of the skull. This bone is right in front of the ear on each side of the head. These joints on either side of the head are flexible which allows the jaw to move smoothly up and down and also side to side. All of these movements allow for the movement of the jaw to talk, to chew, and to yawn. There are vitally important muscles attached to and surrounding the jaw joint for the purpose of controlling the position and movement of the jaw.5

Some common dysfunctions of the TMJ joint are the following.

Disk Derangements
The most frequent structural dysfunctional cause in the temporomandibular joint is internal derangements of the progressive slipping or displacement of the articular disc. The articular disc is a piece of cartilage located between the condyle and fossa or the "ball and "socket" of the joint. It’s main purpose is to preventing the bones of the joint from rubbing together but rather allows the joint to move smoothly. If the disc slips out of place or is displaced, it can prevent the smooth movement of the condyle.

The disc can degenerate by becoming misshapen or even torn because the joint will continue to try to function even with pain and dysfunction. Tearing or stretching of the ligaments holding the disc in place often causes an internal derangement. The condition can be caused by an acute trauma, such as a blow to the face. It may also be caused by more chronic, micro-trauma, wear on the joint, such as from bruxism, a very bad bite (severe malocclusion) or repeated excessive jaw movements.

There are two basic types of soft-tissue internal derangements – soft-tissue and bony. Internal derangement with reduction is when the disc slides into and out of its normal
functional position as the jaw opens or closes. This causes a popping sound that is so characteristic of TMD. The internal derangement without reduction occurs when the disc is permanently displaced or dislocated thus limiting the jaw's range of motion.  

Disk derangement usually occurs in three stages:

- **Stage 1** -- an occasional click (audible or inaudible) signifies anterior disc displacement and mild to no pain.
- **Stage 2** -- reciprocal click (first click early in jaw opening; second click late in closing); the opening click is the slipping of the condyle under the displaced disk; the closing click is the condyle slipping posteriorly from under the disk to the retro-diskal lamina. Moderate pain is experienced.
- **Stage 3** -- reciprocal click (first click late in opening; second click early in closing. During this phase the pain is moderate to severe and the patient may experience locking episodes.

**Degenerative Joint Disease**
Arthritis is a joint disease which can lead to inflammation of the TMJ. Osteoarthritis or organic degeneration of the articular surfaces and recurrent fibrous and/or bony ankylosis, developmental abnormality, or pathologic lesions within the TMJ are generative conditions contributing to the TMD.

Osteoarthritis in the joint is found in approximately 80% to 90% of people over age of 60. It is usually unilateral and primarily due to repeated micro-trauma to the TMJ area, not just the joint but the adjoining bones, muscles and tendons. If the trauma impact is between the two articular surfaces, the pain and dysfunction is more intense. If an individual loses any of the posterior teeth, it causes a decrease in the resting joint space and then compression whenever there is joint movement.

Anatomical changes also seen with TMJ osteoarthritis are flattening of the condyle, flattening of the articular eminence, and narrowing of the joint space. Advanced OA of the TMJ can actually result in perforation of the disk and lipping around the articular surfaces.

**Muscle Imbalance**
The muscles of the TMJ are known as the muscles of mastication because they allow the mandible to move in the chewing and speaking process. The primary muscles involved are the masseter and temporalis, medial pterygoid and lateral pterygoid. When the muscles of both sides of the TMJ do not work together there will be a resulting dysfunction as the muscles fire out of synchrony. This dysfunction will lead to muscle
Inflammation
TMD would include tight muscles and inflamed or damaged joints. The synovium, retrodiscal tissue and the capsule are some of the tissues that can become inflamed in the TMJ. There are three major components at work in the TM joint, all of which can become inflamed and give considerable discomfort:
- Muscles contract and relax to open and close the joint.
- A disk absorbs pressure in the joint which allows the joint to move smoothly when the jaws open and close.
- Ligaments help to support the joint and connect the jaw bones to the skull.

Teeth
Disorders of the teeth can contribute to TMJ dysfunction. Impaired tooth mobility and tooth loss can be caused by destruction of the supporting bone and by heavy forces being placed on teeth. The movement of the teeth affects how they contact one another when the mouth closes, and the overall relationship between the teeth, muscles, and joints can be altered. Pulpitis, inflammation of the dental pulp, is another symptom that may result from excessive surface erosion. Perhaps the most important factor is the way the teeth meet together: the equilibration of forces of mastication and therefore the displacements of the condyle. Even to having the wisdom teeth extracted there are reports of TMD.

Hypomobility
Mandibular hypomobility is a condition in which the patient lacks normal range of motion (ROM) in the TM joint. Limited jaw mobility may be related to problems with the jaw joint itself or the surrounding muscles. Limited jaw mobility may be idiopathic or due to other complications from HMD. Loss of mobility in the TMJ may result in pain and/or difficulty eating.

Hypermobility
The TMJ dysfunction often presents with hypermobility of the joint. Hypermobility is perhaps the most prevalent mechanical disorder can be managed with applying some modalities such as no chewing gum, ice, or fingernails or clenching teeth and definitely no wide jaw opening or eating tough, crunchy foods. Any of these actions could further cause injury to the hypermobile TMJ.
Para-functional Habits
Bruxism is a para-functional habit implicated in TMD based on the hypothesis that the increased muscle activity triggers pain in the masticatory muscles and temporomandibular joint. Other para-functional habits or conditions are excessive gum chewing, nail biting, eating very hard foods and jaw thrusting.\(^\text{11}\)

Bruxism, a contributory factor in the majority of TMD cases, is the repetitive unconscious clenching or grinding of teeth which normally occurs at night. Over-opening the jaw beyond its range for the individual or unusually aggressive or repetitive sliding of the jaw sideways (laterally) or forward (protrusive). These movements may also be due to para-functional habits or a mal-alignment of the jaw or dentition.

Stress
Populations with high anxiety level may more likely develop TMD and is one of the main factors in bruxism development. In many studies it has been shown that stress, anxiety, and depression has a high likelihood in TMD sufferers.

Stress and tension may awaken or aggravate or intensify an existing TMD but one that has not been symptomatic heretofore. The fact is, for stress to affect TMD the individual has to have an underlying predisposition for TMD. If a patient has healthy dental occlusion, muscle and jaw function, stress would not cause TMD.\(^\text{10}\)

An Improper Bite
A bite collapse has the potential of leading to an unnatural position of the lower jaw while chewing. It can occur in patients over age 40 due to the natural aging process or it can be due to bruxism. The loss of tooth height can also occur because of dental procedures which have been done in excess.

Mal-Alignment of the Occlusal Tooth Surfaces
Mal-alignment of the occlusal surfaces of the teeth due to genetics, defective crowns, restorative procedures, lack of cooperation during orthodontic treatment. Deciduous crowns and unilateral chewing has been revealed in studies of jaw and joint disparities to be present in high incidences of TMD in patients.\(^\text{11}\)

Orthodontia Practices
The process of extracting 4 bicuspids in orthodontic treatment of patients with small jaws and overcrowding, has led to joint dysfunction. Orthodontists have now been advised to use a palate expander based treatment plan rather than extracting teeth because of the possibility of future jaw and joint issues.
Symptoms

Temporomandibular joint dysfunction (TMD) is often overlooked even though the symptoms are many. Symptoms of OA in the TMJ include pain-free rotation between the condyle and disk but pain with translation between the disk and articular eminence which manifests clinically as a decrease in willingness to open the mouth beyond 11-25mm.  

Other symptoms include the jaw-opening reflex because it relies on activation of the lateral pterygoid and anterior digastric muscle in order to disengage the occlusion in response to mechanoreceptors stimulation. Excessive mechanoreceptor irritation via grinding or clenching may lead to lateral pterygoid fatigue and TMD symptoms.

Like other forms of TMD, internal derangement disorders can cause a wide range of pain symptoms. Symptoms often involve pain in the jaw joints which are generally associated with jaw movements. Dull aching, stabbing, or burning pain may also be felt in the surrounding muscles of the face. This pain can occasionally refer elsewhere, potentially leading to pain throughout the head and in the neck and shoulders. Earaches, tinnitus (ringing in the ear), or even the feeling of reduced hearing can sometimes occur.

Loud and/or painful clicking or popping sounds when opening or closing the jaw often characterizes internal derangement disorders. Patients may have a limited range of jaw opening, and/or will periodically or permanently feel that the jaw is locked.

Pain around the Jaw Joints;
Clenching from stress or anger will result in a common complaint of "sore jaws" particularly when first awakening in morning. The lack of overbite or cuspid protected occlusion will result in excessive forces directed to posterior teeth and more stress to muscles of mastication. This will increase the pain level around the jaw joints.

Myofascial Pain
Myofascial pain occurs in soft tissue such as muscles. Extreme muscle tension can cause areas to become trigger points for referred pain so tooth pain or other facial pain can be a result of pain that stems from the TMJ. There can be radiating pain in the face, neck and shoulders associated with TMD.

Inflamed joints can cause swelling, pain, burning sensation, redness and loss of function. Certain tissues surrounding the TMJ can become inflamed. This can result in
pain which increases with jaw movement. If ligaments of the TMJ are injured or become inflamed, the ligaments are unable to support the joint properly.

**Clicking and Popping Sounds**
Clicking and popping that occurs when the jaw moves, coupled with pain may indicate joint damage. When the disk slips out of place when opening or closing, clicking sound may be heard. The jaw may also become locked if the disk gets stuck in one position.

**Headaches**
Patients with TMD often experience migraines or headaches. Sometimes, a headache is just that, but other times, a headache can be a symptom of another condition so is referred to as a secondary headache.

The dentist must ensure a correct diagnosis does not mistake trigeminal neuralgia as a temporomandibular disorder. Oromandibular dystonia is another rare diagnosis which might cause some confusion.6 There will be further discussion of the diagnosis process in a later chapter.

**Loss of Hearing**
The cause of hearing loss may not be within the ear particularly if it has been accompanied with jaw ache, popping sounds, strained facial muscles and limited mobility of the jaw joint. The loss of hearing very well may be originating from TMD. Hearing loss as a result of severe TMJ disorder often occurs when TMD has been left untreated for a prolonged period of time.

The ear and the jaw joint are physically very close together and can have a deep impact on proper functioning of one another. The pain in the jaw joint may lead to contraction of the little muscles inside the inner ear which hold the ear bones malleus, incus and stapes in place. But all three ear bones are essential to the function of hearing also. The contraction and spasm of these inner ear muscles affects the proper functioning of the ear bones and thus causes hearing loss.13
Chapter III
Clarify the Causes and Specific Events That Result in TMJ Disorder

The cause of TMJD is not clear, but dentists believe that symptoms arise from problems with the muscles of the jaw or with the parts of the joint itself. TMJD is pain in the jaw joint which can cause head and neck pain, facial pain because the facial muscles control chewing, ear pain, headaches, a jaw that is locked in position or difficult to open, problems biting, and jaw clicking or popping sounds and also some experience loss of hearing.  

TMJD is aggravated by:

- Over Usage and Mis-abuse;
- Poor Movement Patterns;
- Emotional Stress with Heightened Muscle Spasms, etc.

- **Macro trauma** -- *a violent, sudden blow to the lower jaw with or without an overt fracture*
- **Micro trauma** – *The an insidious low grade stress to the jaw joint most commonly due to a poorly functioning occlusion/bite relationship between the upper and lower teeth such as Functional Occlusion causes*

**Macro Trauma**

Macro trauma refers to hard impacts such as a punch to the jaw, high impact in an accident that could break the jawbone, damage the cartilage disc of the joint or cause dislocation of the TMJ. Pain in the TMJ can also be brought on by dental work whereby the joint is stretched open for extended periods of time.

Injury to the jaw, temporomandibular joint, or muscles of the head and neck can cause TMJD. A macro trauma would include heavy blow or whiplash. If significant damage has occurred to the joint it will, like all joints, be more prone to swelling during changes in barometric pressure when the weather changes.

**Micro Trauma**

Micro trauma contains stressers that may be less violent and they happen less suddenly. Microtrauma is internal, such as grinding and clenching the teeth which in turn changes the alignment of the teeth. Muscle involvement causes inflammation of the membranes surrounding the joint. Teeth grinding and clenching are habits that may be diagnosed in people who complain of pain in the TMJ or have facial pain that includes the muscles involved in chewing, often referred to as myofascial pain.
Types of Stress that Affect TMJD

It has been said that stress can mimic any disease or condition. That does not mean that the disease or condition is not real, it means that stress is a very powerful factor that has to be considered when evaluating an individual for TMJD. Stress can manifest itself in the tightening and tensing of muscles. Over a period of time, tight muscles can change our postural dynamics and how we move. Stress can cause a person to tighten facial and jaw muscles or clench the teeth.

Active Relaxation is one of the better methods to manage stress. This is a state of self-awareness such as a form of meditation, prayer, deep breathing, or visualization, during an activity designed to calm the mind.  

Occupational Postural Stress
Of all the things that contribute to jaw pain, poor posture and stress are among the most common. Postural Stress puts a strain on the locomotor system. This is the body’s musculoskeletal system and its movement in order to cope with its environment. One of these movements is the forward head posture that can be a result of sitting at a desk working on a computer for long or short periods of time. Occupational tasks which result in an individual holding the telephone between the head and shoulder may contribute to TMJ disorders.

Moms, dads and teachers, all have given that fateful advice, “Sit up straight;” or “Don’t slouch.” When sitting or standing tall the force of gravity is most balanced around all of the joints. When an individual slouches, especially with the head jutting forward, postural muscles have to work harder so they become stressed, tired and sore. Also, when the head juts forward it causes the jaw bone to shift in such a way that it places great stress on the TMJ. This can lead to the clicking, locking, and the pain of TMD.

Nutritional Stress
Nutritional stress can promote the body’s manufacturing of chemicals that promote inflammation and thus cause pain in the TMJ area. The amount of sugar one consumes has had a direct correlation to bruxism and TMJD. It has been recommended for those with bruxism and/or TMJ Disorder to adopt a hypoglycemic diet. This is a diet that includes plenty of fresh vegetables and high-fiber fruits, is high in fiber and protein, legumes, raw nuts and seeds. It will also include skinless white turkey or chicken, broiled fish, and whole grains. Starchy vegetables and sweet fruits should be consumed in moderation because of their high sugar content.
**Environmental Stress**

Environmental stress refers to any chemical toxins that affect the optimum functioning of the body. These chemical toxins can include airborne allergens, heavy metal toxicity, reduced oxygen intake, root canal toxicity. Environmental conditions such as breathing polluted air or working in noisy environment can produce stress in the entire body which can include the bone and muscle, tendon structure of the TMJ.

**Sleep Stress**

Sleep stress is obvious – it is the inability to sleep well in a deep restful state. This causes a reduction in what is referred to as restorative sleep. It may seem strange but this affects all the muscles and joints by preventing them from returning to a healthy state prior to the next day’s demands. This includes the muscles surrounding the TMJ. Another stress that occurs to the TMJ during sleep is the grinding and clenching of the teeth. In the morning an individual can awaken with pain in the muscles and bones of the TMJ because of grinding and clenching of the teeth while sleeping.

**Breathing Stress**

Inability to breathe through the nose results in poor body posture, which causes a poor jaw position. Breathing stress tends to worsen due to environmental stress. Please note that poor diet can increase allergic responses which in turn can also affect one’s ability to breathe through the nose. So basically all the various stresses are all tied together and impact one another.

TMJD is a complex condition that may need to be treated from a variety of angles. The individual suffering from TMJD must understand the various platforms that need adjustment in the life and at their place of work.

**Endocrine Stress**

Thyroid and adrenal hormone deficiency strongly influences muscle function. These two hormones most directly affect TMD but, it can also be affected by many other hormone imbalances.

**Emotional Stress**

Nobel Prizes have been won for proving that stress has a resounding impact on how the body functions of any individual. Stressed emotions can disrupt an individual mentally and physically as well as other systems. Many TMJD sufferers have a condition that is partially dormant unless they get under emotional stress then the pain flares up in the jaw and the tendons and muscles around it.
Psycho-emotional stress is yet another category of emotional stress which is due to neuroses, life frustrations, or harbored destructive emotions like chronic anger.\textsuperscript{17}

**Organic Causes**

Jaw abnormalities, missing teeth, malocclusion which is a variety of dental problems and misalignment of the teeth. Patients may complain that it is difficult to find a comfortable bite or that the way their teeth fit together has changed. Chewing on only one side of the jaw can lead to or be a result of TMJD.

A discrepancy between the position of the jaws when the upper and lower teeth are fully together will result in constant bruxing on the teeth. This produces pressure on the joints harsh enough to cause traumatic changes in them like tearing and displacing the cartilage separates the ball from the socket. That cartilage also may bunch up in front of the ball.\textsuperscript{19}

When the jaw opens wide, the condyle ball, the ball on the lower jaw, moves forward. This in turn pushes the bunched up cartilage in front of it. When the condyle jumps the mass of bunched up cartilage, it snaps back hard onto the bone on the other side causing a loud pop and clicking sound. Since there is no pain accompanying the pops and clicks, sometimes the condition is left untreated.

**Crepitus**

When the bones are forced into such close approximation, you might hear a grinding noise when opening or closing the jaw. This is often referred to as Crepitus. Unfortunately, Crepitus can be an indication of advanced deterioration. There is cartilage that lines the condyle (the ball) and the articular fossa (the socket) inside the joint. Then there is the meniscus (disk) which is a third layer of cartilage sandwiched between the other two layers. \textsuperscript{19}

However, if crepitus is audible, it generally means that all three layers of cartilage have been damaged, or are actually missing. Consequently, the unprotected bone of the ball is left to grind into the unprotected bone of the socket. Whenever there is a suspected organic joint dysfunction linked to severe localized pain in the joint, special medical tests are needed to assess the extent of the damage. \textsuperscript{19}

Any missing teeth or misaligned teeth have the potential to trigger problems with the TMJ. If a tooth has to be pulled for whatever reason, dentists usually recommend having it replaced for this very reason among others.
Degenerative Joint Disease

Rheumatoid arthritis causes inflammation in all joints including the TMJ. This is a condition that affects children as well. As it progresses, the disease can cause destruction of cartilage and erode bone which ultimately causes the deforming of joints. Rheumatoid arthritis is an autoimmune disease. It causes disease in a variety of organs and its most common feature is joint inflammation.  

Osteoarthritis affects many joints in the body, including the jaw joint, by the breakdown of the joint in normal aging. Osteoarthritis is a result of several mechanical and biological factors and formation of new bone at the surface of the joint. Its prevalence increases with Repetitive microtrauma, macrotrauma, normal aging, immunologic and inflammatory diseases also contribute to the progression of the disease.

Whiplash Injury

The temporomandibular joint is a hinge at the back of the jaw that functions up to 5,000 times a day. Because of its anatomical complexity and vulnerability, it is susceptible to injury from physical trauma.

TMJ injuries are an after effect of car crashes and other personal injury related accidents. Acute trauma to the jaw and/or muscles of the jaw like what happens in car crashes or other personal injury accidents is often a cause for TMJD. Auto collisions at a speed as low as 9 mph can cause whiplash, which, can then cause a dislocation of the jaw joint. There may be immediate pain associated with a TMJ injury or the pain may, actually be a secondary pain. It may take years for symptoms to arise.

It is not necessary that there be a whipping effect to produce TMJ injury. It can be caused by any force where there are opposing forces to the head and jaw like if either the head or chin strikes a fixed object. Delay in diagnosing TMJ injury may be caused by how the injury is perceived by those involved. Victims tend not to have the objective outward appearance of injury. What they have is a sensation of pain which stems from the cervical spine.

As complex as this jaw joint is, so complex is the diagnosis and recognition that something is wrong. All the different causes have to be considered when either diagnosing or treating the TMJD because it can appear from so many different angles.

TMJ injuries in 87% of patients who reported whiplash after automobile accidents shows that these patients had not suffered direct trauma to either the face, jaw, or mouth. It
has always been assumed that injuries to the cervical spine cause whiplash symptoms, 
but in the midst of concerns over stabilizing the cervical spine, they overlooked the TMJ.

The rapid snap back and forth of the head during the whiplash type injury causes the 
jaw to stretch soft tissue. This subsequently puts severe tension on the muscles and 
tendons involved with the TMJ injury.

The TMJ disc acts as a shock absorber between the bone of the condyle and the bone 
in the cranial socket. The rigid ligaments can be stretched in an injury so much as to 
allow the disk to have an unnatural degree of motion. This may allow the disk to slip 
forward past the condyle. At this point is no longer serves its function as a shock 
absorber and any TMJ motion can result in severe damage and displacement.

Trauma to the jaws or previous fractures in the jaw or facial bones can lead to TMJ 
disorders.

Sports that involve clenching the teeth such as weight lifting, will trigger TMJ in 
susceptible people. The clenching the teeth is a natural response to the stress of lifting. 
When people take up weight lifting, they may repeat this clenching activity many times 
in one exercise period causing spasms to begin or increase.21

Scuba divers also are susceptible to painful muscle spasms because of the biting down 
they must do on the breathing apparatus. This puts stress on the jaw and forces it into 
an arbitrary position that may trigger painful spasms. Many divers explain away the pain 
as a result of the pressure of being underwater.21

Any sport that involves either clenching the teeth or having the jaw in an unnatural 
position because of a mouth guard may trigger symptoms so participants must be 
aware of this particular trigger.21

**Prolonged Mouth and Upper Respiratory Breathing**

Of the nearly 10 million Americans suffering from TMJD each year will find that another 
cause for it relates to upper respiratory breathing and breathing through the mouth. Just 
because of the position that the jaw is in when breathing through the mouth leaves 
considerable strain, pressure or stress on that TM joint. Usually people breathe with 
their mouth closed and that leaves the TM joint in a more relaxed position.
Excessive Stress to the Joint

This stress may come from a variety of reasons which could include the following:

- Gum chewing,
- Fingernail biting,
- Yawning,
- Chewing on a pen,
- Chewing on ice,
- Grinding teeth.

Fingernail biting and gum chewing are two habitual things that can wear away at the TM joint causing the disc to slip along with teeth grinding and teeth clenching (bruxism) increase the wear on the cartilage lining of the TM joint as well as doing considerable damage to the articular disc.

Those who grind or clench their teeth may be unaware of this behavior unless they are told by someone observing this pattern while sleeping or by a dental professional noticing telltale signs of wear and tear on the teeth. Many patients awaken in the morning with jaw or ear pain which is indicative of grinding and clenching during the night. Stress and tension has often caused an individual to clench their teeth during the daytime also without even knowing they are doing it.
Chapter IV
Develop a TMJ Diagnosis

It is important that a qualified clinician such as a dentist, an orthopedist, a primary care provider, or an ear, nose and throat (ENT) doctor be involved with the diagnosis process so that an accurate diagnosis can be produced. This may depend on your symptoms. The TMJ evaluation is more involved and will usually take about an hour. A thorough examination may involve the following items:

- A dental examination to determine poor bite alignment;
- Feeling the joint and muscles for tenderness;
- Pressing around the head to locate areas that are sensitive or painful;
- Sliding the teeth from side to side;
- Watching, feeling, and listening to the jaw open and shut;
- X-rays or MRI of the jaw.
- Radius- Open mouth with an area of 3 middle fingers

If you involve a primary care provider and an ENT then all possibilities will be examined. If the physical exam appears normal, then the doctor or dentist will have to consider other conditions, such as infections, ear infections, or nerve-related problems and headaches, as the cause for the symptoms. Many other conditions can cause similar symptoms to TMJD – including a toothache, sinus problems, arthritis, or gum disease– a dentist will need to conduct a careful patient history and physical examination to determine the cause of the existing symptoms.

Dental Diagnosis

A dentist will need to do a full interview of the TMJD patient in order to fully review an individual’s general health and dental history and how it relates to the patient’s present condition.

A hands on examination evaluation of the patient’s jaw movement and occlusion as well as the muscles which are involved in the jaw function will be one of the first parts of the diagnosis.

Then the next process in the diagnosis will be to make accurate impressions of the upper and lower teeth as well as the registration of the jaw position, X-rays of the jaw joints and skull which would include the facial bones.
An orthodontic analysis will determine how the dysfunction has progressed as well as starting to establish a realistic treatment goal.

Types of Diagnostic Tools

Each medical professional with whom a patient consults for a diagnosis will have the opportunity to utilize one of the many pieces of technology in order to be accurate in the diagnosis. Below are some of the more common tools that can provide for the best care possible for the patient.

Axiographic Analysis

Axiographic Analysis examines how the jaw moves in space. It utilizes an ultrasonic tracking device to help identify what movement of the patient’s jaw is most affected by the jaw dysfunction. This process not only helps provide an accurate diagnosis but it will enable the dentist to objectively chart progress through a treatment plan. Axiographic Analysis also provides the laboratory with valuable information specific to the patient’s anatomy. This particular analysis and initial evaluation will evaluate the:

- joint function,
- joint and muscle pain, and possible contributing factors,
- other dental factors.

Panorex X-ray

A panorex is a two-dimensional dental x-ray displaying both the upper and lower jaws and the teeth, the temporomandibular joints, and sinuses. It clearly shows impacted teeth or other intrabony abnormalities, and surrounding anatomy. The film will be reviewed to determine if there are any bony abnormalities in the TMJ.

This type of x-ray can show the relationship of the developing tooth roots involved with the mandibular nerve and maxillary sinus cavities which can have an impact on TMJD. To be accurate, the panorex x-ray must have been taken within the last twelve months showing the level of development of the tooth roots.

- Screening for dental problems - can minimize TMJ symptoms. A tooth alleviated from an abscess can throw off a bite.

Cone Beam CT Scans will be taken of the joints to allow for visualization of the bone (condyles).

Scintigraphy (Bone scan)

The Scintigraphy involves injecting a radioactive substance into the bone cells to be absorbed. This shows whether a pathologic process is in an active or inactive state.
Scintigraphy is a diagnostic technique in which a two-dimensional picture of internal body tissue is created through the detection of radiation emitted by a radioactive substance administered into the body.\textsuperscript{24}

\textit{MRI Scan}

The MRI Scan will need to be done on both joints. This process can be performed at many outpatient facilities. This provides images of the disc as well as the muscles and other soft tissues which may be around the joint.

\textit{Computed Tomography (CT or CAT scan)}

Computerized (or computed) tomography (CT) is formerly referred to as computerized axial tomography (CAT) scan. This is an X-ray procedure that combining multiple X-ray images with the aid of a computer to generate cross-sectional views of a particular area. It is possible with the CT scan to create three-dimensional images of structures of the body such as the TMJ.\textsuperscript{22} Tomography is a machine which dentists have in their office to help diagnosis TMJD as it shows cross-sections of the jaw area.\textsuperscript{26}

CT scanning, a painless procedure takes X-ray images and with the aid of a computer generates cross-sectional views of the anatomy. CT scanning can identify normal and abnormal structures so that the dentist will have more information to determine the treatment plan. Iodine-containing contrast material may be used in CT scanning unless the patient has a history of allergy to iodine or contrast materials.\textsuperscript{22}

The CT scan appears to be a large donut-shaped X-ray machine/scanner which takes X-ray images at various angles of one targeted area in the body. Because the images are taken from various angles, after being processed by a computer, a cross-sectional picture of the targeted area in the body can be seen. The film picture is viewed as an X-ray "slice" of the body referred to as a tomogram. "Computerized axial tomography" (CAT) refers to the tomogram "sections" at different levels of the body.\textsuperscript{22}

Imagine the body as a loaf of bread and you are looking at one end of the loaf. As you remove each slice of bread, you can see the entire surface of that slice from the crust to the center. The body is seen on CT scan slices in a similar fashion from the skin to the central part of the body being examined. When these levels are further "added" together, a three-dimensional picture of an organ or abnormal body structure can be obtained.\textsuperscript{22}

\textit{Intraoral X-rays}

Intraoral X-rays are the most common type of dental X-ray taken under most circumstances. These X-rays provide a lot of detail and allow a dentist to find cavities,
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check the health of the tooth root and bone surrounding the tooth, check the status of developing teeth, and monitor the general health of teeth and jawbone.

The types of intraoral X-rays include:

- Bite-wing X-rays show details of the upper and lower teeth in one area from its crown to the level of the supporting bone. This type of X-ray is used to detect decay in teeth and the changes in bone density caused by gum disease; determining the proper fit of a crown and the marginal integrity of fillings.
- Occlusal X-rays are larger in order to show full tooth development and placement revealing the full arch of teeth in the upper or lower jaw.
- Periapical X-rays show the entirety of the tooth -- from the crown to where the tooth is anchored in the jaw. Each X-ray shows this full tooth dimension of one entire bite view of either the upper or lower jaw to detect an abnormality of the root structure and surrounding bone structure.

Extraoral X-rays

The Extraoral X-rays will show teeth, but on the other hand, their main focus is the jaw and skull. These X-rays may not show details such as can be seen in the Intraoral X-rays but rather they are used to determine impacted teeth, monitor growth and development of the jaws in relation to the teeth, and to identify potential problems between teeth and jaws and the TMJ.

- Panoramic X-rays show the entire mouth area on a single X-ray and is useful for detecting the position of fully emerged or already emerging teeth, while also identifying impacted teeth.
- Tomograms show a "slice" of the mouth and to do this efficiently, all the other parts are blurred. This type of X-ray is useful for examining structures that are easily visible to the naked eye because other structures are in close proximity to the x-rayed structure.
- Cephalometric projections show the entire side of the head and is useful for examining the teeth in relation to the jaw and profile of the patient.
- Sialography involves visualization of the salivary glands following the injection of a dye called radiopaque contrast agent. The dye is injected into the salivary glands making the organ or the structure visible on the X-ray film the organ can be the soft tissues around the TMJ that would not otherwise be seen. Dentists might order this type of test when examining the TMJ.
- Computed tomography or CT scanning shows the body's interior structures as a three-dimensional image used to identify problems in the bones of the face or jaw.
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Misdiagnosis

It is very important to be careful and not misdiagnosis the TMJD. It has a variety of side symptoms which can be misdiagnosed. The patient can become very disenchanted as he or she goes from medical professional to medical professional only for each one to say something a bit different. The medical professional must take all patient complaints, primary and secondary.

Sometime the symptoms which the patient is experiencing will not be directly connected to the jaw which can lead to a non TMJ diagnosis. Research is discovering that a large number of complaints related to the ear can be traced back to problems with the jaw. 27

As the dentist realizes in the midst of the diagnosis that the ear complaints may not need to be addressed by an ENT doctor but it may very well all stem back to the TMJD.

Because of the effects on the ear, TMJD diagnosis might also include repeated episodes of dizziness that can be severe enough to lead to nausea and/or vomiting resulting from the bone inside the ear which is responsible for controlling the equilibrium. When it is maladjusted or off balance it stimulates the gag reflex. This is the reason for the nausea. 27

When the diagnosis includes TMJ headaches and body pains, the dentist still must conclude that the TMJD is at the root.

Nerve pain is intense and often triggers tension in the area and, of course that causes more pain. The muscles in the ear and in the jaw are connected to the same nerve causing pain in both areas. Chronic ear pain can be misdiagnosed as an ear infection or persistent TMJ tinnitus.
Recognize the Subtypes of the TMJ Disorder

There are 3 subtypes of TMJD. They each affect different areas of the TMJ. They each have slightly different symptoms.

A subtype is a type that is subordinate to or it is included in another type. An example could be in reference to the blood group subtypes of the subtypes of a disease. For every type or subtype, another set of molecular markers must be developed because even though there is an element of alikeness, there are also elements of differences which have to be identified.

Subtyping TMJD must be understood by the physician who is treating such. The reason for this is TMJD can present itself as something else to the naked eye. Look closer and the pain can be a referred pain. Some of these are Myofascial pain with positive painful palpation of the masticatory muscles. It can also be joint disc displacements with or without the reduction characterized by the presence of opening, closing clicks or limitations in oral aperture. Then we have and osteoarthritis / osteoarthrosis which normally is characterized by the auscultation of friction sounds during mandibular movement, are the morbidity processes of TMJD.

Subtype of Myofascial Pain

Myofascial pain is a subtype of jaw conditions which affect the temporomandibular joint disorders. An intricate pathway of nerves and blood vessels run through muscles wherever they are in the body. So when a muscle forms a trigger point, it "clenches down" on the nerves and blood vessels, causing pain. These nerves pass through muscles everywhere in the body so it is possible for the pain to be felt in a muscle far from the originating muscle. This is known as "referred pain" and this is what classifies a pain as a subtype.

In myofascial pain and dysfunction, the muscles of mastication are the muscles which are affected. Myofascial pain may be associated with bruxism or clenching as this produces excessive use of the muscles which tends to their tenderness. Next the Myofascial pain can prevent the proper opening of the mouth and limit mandibular movement. The muscle pain can also cause headaches in the temporal regions of the head. Patients with myofascial pain have cyclic pain, as bruxism most often occurs at night while the individual is sleeping so is unconscious of the action. These individuals may experience tooth pain and also wear facets on the teeth from the bruxing and the clenching.
There are many factors that are involved in causing trigger points which cause myofascial pain. Any one of these can cause injury to the muscles and tendons in and around the TMJ. These are some of the factors:

- Sudden trauma to musculoskeletal tissues or injury to intervertebral discs;
- Chilling of body muscles;
- Systemic conditions, Nutritional deficiencies, Excessive exercise
- Hypoglycemia, Menopause, Hormonal changes, Obesity
- Nervous tension, Stress, Depression, Anxiety, General fatigue
- Poor posture; Muscle strain, Lack of activity, Repetitive motion.¹⁹

**Subtype of Internal Derangement**

Internal derangement results when the articular disc is dislocated from its position in the glenoid fossa. As the mandibular condyles move during normal function, they catch the discs. This catching is the reduction of the disc in the fossa. As the discs reduce they may cause clicking and pain. The location of the disc may prevent the condyles from positioning normally in the glenoid fossa. When this occurs, the patient feels the jaw has locked.

**Subtype of Osteoarthritis**

Osteoarthritis involves degeneration of the articular disc. This subtype of TMJ syndrome is usually seen in elderly people. Crepitus is pathognomonic for osteoarthrosis and is found in osteoarthritis of the TMJ. Pain coupled with crepitus is characteristic of osteoarthritis. Bony degeneration of the condyles may be noted on panoramic radiographs or CT in people with osteoarthritis.

The elevation of local cytokine concentrations can alter immune cell function and cause tissue damage, which in the case of the TMJ could manifest as osteoarthritis, hyperlaxity and joint pain.³¹

Cytokines implicated in TMJ inflammation and pain have been interleukin-1-beta (IL-1-β) and tumor necrosis factor-alpha (TNF-α) and they are associated with the most active and advanced forms of destruction of a variety of joints. They induce the release of enzymes that can damage the tissues and both cytokines moreover have been associated with the production of nitric oxide in certain cell lines.
Subtype of Tinnitus

Tinnitus is considered to be highly heterogeneous but it has not yet been clearly demonstrated whether and to which extent the etiologic factors, etc. are related to each other but it is for sure that there is referred pain.

22% of tinnitus patients have TMJD complaints even if the individuals are significantly younger or are at a lower age than the normal tinnitus onset. There is usually not specifics for tinnitus duration, type of onset (gradual/abrupt), onset related events (whiplash etc.), character (pulsatile or not), hyperacusis, hearing impairment, tinnitus distress, depression, quality of life and subjective ratings (loudness etc.).\(^{30}\)

All of these items mark the individual for secondary pain from the TMJD. It is important that the diagnosing physician be keenly aware of referred pain so that he or she will diagnosis correctly. The referred pain of the subtype can be as intense and continual as the direct pain so must be clearly diagnosed.
Chapter VI
Describe the Mechanism of Mouthpieces to Correct TMJD

Modern-day mouthguards and oral applications have been used since the early 20th century for the correction of TMJD as well as for protection against athletic injuries; bruxism and sleep apnea; and athletic performance enhancement. The treatment of bruxism was the first use of modern mouthguards and was followed by customized designs to protect the oral structures and to treat specific conditions. More recently there has been a resurgence of interest in athletic performance mouthguards, which have been found in a number of studies to improve reaction time, muscle strength and sensory functions. The purpose of a mouth guard dictates the materials and designs most suitable for optimal results.

Considering the information above, a medical professional may very well prescribe a mouthpiece, guard or splint to treat the patient suffering from temporomandibular joint disorders – TMJD. TMJD involves the masticatory, or chewing, muscles and the jaw joints also causing non-dental pain amplified by certain psychological factors as the pain becomes more chronic.

Even though the TMJ mouth piece is one of the more popular forms of TMJD treatment, there are many unique factors in every case which result in the wrong type of device being made for their patient. An experienced TMJ dentist will know the various types of mouthpieces and the types of design which will work best in one particular patient’s mouth. There may be generic mouthpieces on the market but if the patient wants the best results, it is important that he or she is fitted with the precise mouthpiece for him or her.

Materials Used to Create the Mouthpiece

A TMJ mouth piece is made from plastic, worn at night and is designed to keep the jaw in a relaxed state at night in order to relieve the symptoms of TMJD. It also works by preventing tooth grinding at night, a symptom of TMJD that can cause other oral health problems and worsen the effects of TMJD. A mouth piece works best as part of a complete TMJ plan.

Methods Used to Create the Dental Splint

In the process of making a TMJ splint, a dentist must, first, make an impression of the patient’s mouth with dental putty or something similar. When the impression set, it is sent to a lab where a custom splint is made. The entire process for the TMJ splint
construction in the lab, the fitting and the adjustment by the dentist will take several weeks. The process for the dentist is to sand a splint to ensure that it will be comfortable and effective for the patient.

**Types of TMJD Mouthpieces**

They have many different names -- removable appliances, mouth guard, removable appliances or retainers. But they are all basically small, custom-fit devices made of plastic and metal. Upper retainers fit in the roof of the mouth whereas lower retainers can be removed or permanently fixed to lower teeth. Retainers are most often used after wearing dental braces to hold teeth in position. In other cases, orthodontic patients may wear removable appliances to close gaps or spaces between teeth, or to move a single tooth. In these cases, braces aren't necessary; removable appliances are sufficient.

Four types of TMJ mouthpieces are commonly prescribed:

- Soft acrylic guards;
- Hard acrylic guards;
- Talon splint;
- Hard/soft occlusal guards.

**Soft Acrylic Guard**
If the TMJD condition is mild or moderate, a dentist may suggest a soft acrylic guard. It molds to the shape of the mouth, but it is possible to bite through it over time. The soft acrylic Occlusal Guard is for patients who brux. This type is designed to prevent wear on the TMJ as well as wear on the dentition.

**Hard Acrylic Guard**
A hard acrylic guard provides more durability and is appropriate if a patient is suffering from severe clenching. Hard Acrylic guards are waxed and processed in a fashion similar to what is used to create dentures. Fabricated with clear acrylic and heat cured for maximum strength, the hard acrylic guard offers no flexibility but they are easily modified, repaired and are beneficial for moderate bruxing/clenching. If the patient wishes, Special Clasps can be utilized for improved retention.

**The Talon Splint**
The Talon splint is composed of hard acrylic on the outside and softer acrylic on the tooth side. The Talon Splint is often used as a treatment option for patients needing a splint for bruxism, TMJ dysfunction, orthodontic stabilization or periodontal splinting.
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The Talon Splint is created with Flexite and soft, thermoplastic, resilient Talon® polymer. The resilient Talon polymer is a retentive base that becomes flexible when heated under warm tap water for easy adjustment for fitting. The flexibility allows the base to return to its original shape as it cools.

There are advantages to the Talon Splint and these are listed below:

- Comfort;
- Maintains shape with normal wear;
- No leaking of plasticized chemicals;
- No wires or extensions to break into the gums;
- Reduction of orthodontic pressure on teeth;
- Retains flexibility over time.

Occlusal Splints

Bite guards or night guards, bite splints, bite planes, are all the various types of occlusal splints. They are removable dental appliances which are worn to modify the bite. Occlusal splints are custom-fitted to the upper or lower teeth, also are used for treating problems caused by jaw issues, such as headaches and neck aches, as well as stabilizing a bite before a dental procedure.³⁶

Bite splints and night guards are designed to relieve pain caused by teeth grinding or clenching as well as reducing the wear and tear on the teeth. If the splint is made as a night guard, it should only be worn at night rather than in the day and night. The splint is constructed differently if it is to be worn 24/7.³⁶

Hard or Soft Occlusal Guards are most popular because of their extreme comfort and durability so more dentists choose this type also because of patient compliance. Occlusal splints are made of soft or semi-hard plastic for night guards, or hard, hard-soft polyester, acrylic or nylon for bite splints. The soft or “resilient” type is less durable, more difficult to adjust and harder to keep clean. In some patients, it may actually encourage clenching and grinding, essentially increasing the symptoms it is meant to correct.³⁶

The hard/soft occlusal guards will give maximum comfort and a more precise fit. The hard soft concept has to do with flexibility of the occlusal guard to be softened when necessary to reshape. If it becomes too tight due to lack of use, the appliance can be simply soaked in warm tap water for a minute and reinserted into the mouth until cooled. The soft material will readapt to the teeth and allow for a better fit. The outer hard layer will bond to acrylic for dental modification.
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*Hard Occlusal Guards* -- These traditional acrylic mouthguards are used for patients who clench and grind to help protect the teeth and the TMJs. Patients report of reduced muscle fatigue when using either hard or hard/soft bite splints. They both alleviate pain and further destruction to the dentition and the TMJ.

**Other Mouthguard Options**

*Thermoplastic Nightguards*
The Thermoplastic night guard is constructed from strong acrylic compounds to provide durability. However, they become pliable with the influence of warm temperatures. Talon ® is a thermoplastic night guard and it loses rigidity at mouth temperatures. This, in turn, engages dental undercuts. Thermoplastic night guards are considered to be a very versatile material with a soft/hard composition and a hard outer occlusal layer.\(^{38}\)

*Dual Laminates*
The Dual Laminates is a combination of two materials merged into a single appliance designed to provide a more functional service. The Dual Laminates is two layers -- a soft inner liner to ensure comfort, and a hard outer layer to establish durability.\(^{38}\)

*Gelb*
The Mandibular Orthopedic Repositioning Appliance (MORA), or Gelb appliance, was designed to manipulate the position of the lower jaw and the condyle. The Gelb appliance consists of clear acrylic bite pads covering the molars and bicuspid teeth, which are connected by a lingual bar.\(^{38}\)

Gelb posterior splints will cover the occlusal surfaces of the mandible bicuspid teeth and also the molars. This type of splint is more accurate, offers the patient less discomfort and takes less chair time to adjust than other splints.\(^{39}\)

*M.O.R Appliance*
The Mandibular Occlusal Rise device is primarily used for the relief and for the treating of TMJD pain and discomfort.\(^{38}\)

**The Mechanism and Benefits of the Mouthpiece Splints**

Different splints work differently on various individuals. Some designs are more effective than others and some may fit one dental structure but not be successful for another. The dentist must be aware and knowledgeable regarding all designs so that he or she can construct the best design for the patient. Comfort and relief from pain is the
objective of the mouthpiece splint. That may require 24/7 wearing except when eating. However, on the other hand, all the patient may need is to wear the splint at night. For each of these needs a different type of splint is needed.  

The mechanism of the mouthpiece splint is to take pressure off of the TMJ so that the disc can heal. The other reason a splint is utilized is to eliminate the wearing down on the enamel of the teeth with night bruxism. Bruxism also puts additional stress on the TMJ so that maximizes the pain element. The mouthpiece splint can alleviate the pressure on the TMJ when an individual has bruxism.

Studies of therapies with mouthpiece appliances report that patients experience a reduction in the level of jaw, facial and mouth pain. The results may be mildly favorable to extremely favorable. As stated above, it is vitally important to be sure and have the right design of mouthpiece splint and that other therapies be incorporated into the treatment plan for the best outcome. Other types of therapies may include behavioral modification or self-management strategies, pain management and massage techniques to relax the muscles and tendons involves in the TMJ.

The patient must also be aware that he or she will have to make some changes in his or her lifestyle as far as sitting posture, sleeping posture and care as to eating hard candy and chewing gum. All these things are elements that the patient will have to control and modify in his or her environment.
Correlate Health Impact from TMJ Disorder

A disorder which affects men and women alike in the amount of almost 35 million people is the TMJD. The majority seeking treatment may be women in childbearing years with a ratio of women to men approaching 9 to 1 of patients with limitations in jaw movements and a range of chronic to unrelenting pain.\textsuperscript{41}

TMJD not only impacts one’s body, it directly affects an individual’s emotional and physical environment:

- It can re-arrange one’s activities;
- It can manipulate social behavior;
- It can change one’s personality and emotional barometer.

TMJ is a psychogenic illness, meaning that it has an emotional rather than a physical cause. Stressors such as depression, anxiety and prolonged negative feelings can heighten your level of tension, insecurity or distressful feelings. Those stressful feelings can strain your masticatory system, increasing the pressure on your para-functional habits -- the movements connected to speech, breathing and chewing. For instance, you may suffer from the habitual clenching or grinding of your teeth, called bruxism.\textsuperscript{33}

The Full Spectrum of TMJD Impacts on an Individual's Health

TMJD is a malfunction of the temporomandibular joint. This is one of the most complicated and complex joints in the body. It connects the jaw to the rest of the skull. When this one joint becomes inflamed, irritated or compromised, the pain may soar to the excruciating in a short period of time due to the central location of this complex joint. The discomfort and distress can very well spread beyond the jaw itself and into the mouth and teeth, the ears and eyes, the neck, shoulders and head.\textsuperscript{40}

The TMJD is additionally aggravated by many repetitive tasks such as eating, talking and yawning to the position in which the individual sleeps, sits at a computer and holds his or her jaw when in a supposedly relaxed state. When left untreated, the condition only worsens in the joint and the radiating referred pain only increases and spreads.\textsuperscript{40}

\textit{Pain}

Pain can become debilitating in a short amount of time if not tended to. To begin with TMJD sufferers will attempt to alleviate their chronic TMJD pain through a variety of methods such as over the counter mouth pieces, pain medications, etc. Unfortunately,
pain relievers to ease the symptoms can convert to a full-blown addiction. Just a side bar, TMJD sufferers fall into alcoholism and drug abuse because the pain and frustration is so great and is affecting so many elements of their everyday life.

This constant pain coupled with the stress it causes can result in night time teeth grinding. What does this lead to? It leads to more pain and disturbed sleep patterns and insomnia so the individual awakens not feeling rested.

**Depression**
Long term continual pain can also result in varying levels of depression because pain can be very controlling and demanding. The pain as well as the depression can consequently negatively impact anything from job performance, personal relationships and general quality of life.

**Adverse Dental Consequences**
TMJD will negatively affect dental health because of the premature wear and tear on the teeth from grinding the teeth as well as from favoring one side of the jaw to masticate food. The TMJD patient may also favor one side of the jaw to the other because the jaws are off-center. This can also cause swelling on one side of the jaw which, in turn causes another negative – unsymmetrical muscle growth.

**Malnutrition**
The pain and discomfort of chewing and eating stemming from TMJD can lead to malnourishment or even eating disorders. Patients may attempt to avoid the problem by eating soft foods, liquids, or not eating at all.

Everyone has two TMJs and either one or both of these joints may be involved. Even if only one side is involved, the individual’s ability to speak, eat, chew, swallow, make facial expressions, and even breathe can be affected in varying degrees.

**Inner Ear and Balance Concerns**
The TMJ is located directly underneath the ears causing many patients to contend with pain in their ears leading eventually to tinnitus or even permanently compromised hearing. One health problem rarely is confined to one area or one negative health complication. Inner ear problems are tied directly to balance and recurring dizziness and even compromised vision.⁴⁰

**Tinnitus**
TMJD leads to a variety of serious jaw problems. From the jaw being permanently “stuck” open which will end in a trip to the emergency room. The breakdown of the
cartilage in the jaw over weeks and months not only leads to pain and unpleasant grinding sounds or even the dislocation of the jaw.\textsuperscript{40}

A Complex Joint, Disorder and Consequences

As research advances to understand TMJDs, it becomes clear that it presents as a complex family of conditions even to hypertension or diabetes. Because of that, the treating medical professional must view the TMJD patient as a whole individual liable to a host of hormonal, genetic, environmental and behavioral factors. The medical professional must be aware that the TMJD is not an isolated joint with isolated conditions limited to the teeth and jaws. This complex joint can be the cause of multiple conditions coexisting with a range of systemic pain conditions.\textsuperscript{41}

Continuing medical research and surveys point to overlapping conditions such as chronic fatigue syndrome, chronic headache, endometriosis, fibromyalgia, interstitial cystitis, irritable bowel syndrome, sleep disorders, and vulvodynia. These disorders may be as poorly understood as the TMJD. A patient may experience one condition initially and then go on to develop others or they may occur at the outset of TMJD.\textsuperscript{41}
Chapter VIII
Integrate Changes in the Patient’s Lifestyle

The healthcare professional may have medical options that will diagnosis, correct or moderate the condition and the symptoms. However, if the patient does not make changes in his or her life style the medical treatments and solutions will not be effective.

Prevention

Prevention is always the best solution for any condition. However, if an individual does not know what to do to prevent TMJD, then prevention is worthless.

The best prevention against TMJD is high control on the contributing factors of TMJD. Many of these prevention aids have to happen at home and have to be under the control of the patient. These four items may seem insignificant but they are not so the patient must take them seriously.

- Avoid biting down on hard foods;
- Minimize the chewing of gum;
- Become aware of the position of one’s jaw
- Learn relaxation techniques to reduce muscle tension;
- Maintain a good ergonomic posture when sitting in front of a computer;
- Change positions frequently to keep muscles and joints relaxed;
- Reduce the risk of fractures and dislocations.

The tricky thing about TMJD is that there are a variety of causes and there are a variety of either existing conditions or developed conditions which are at the root. All cases must be individualized and personalized for the contributing factors because there are several options available to correct a TMJD.

- Dental Malocclusions are one of reasons for TMJD in one or both jaws. A malocclusion refers to any number of misalignments of teeth, incorrect relation between one or more teeth of either of the two dental arches. Coined by Edward Angle, the "father of modern orthodontics", malocclusion simply means that two or more teeth are off at any point where two teeth meet. Malocclusions are generally divided into three groups -- the sagittal relation of teeth and jaws, Angle’s classification method and simply the crowding of teeth.

The remedy is orthodontic treatments also ranging in aggressiveness.
• Presence of wisdom teeth can cause TMJD because of the angle of entry. Wisdom teeth often come in where there is a very small space or on an angle, etc. Because of this they can be the cause of issues with the TM joint. The remedy here is relatively simple -- surgical extraction of the wisdom teeth to eliminate that dental conflict.

• Bruxism is a relatively common condition often occurring at night during sleep. For this reason the patient may awake in the morning with their teeth at odds with one another but not know why unless they have a sleeping companion. Bruxism can be a problem in the day time but its sister condition is more common during the day which is that of clenching. It may not have the dental wearing affect but it has the same impact on the TMJ. Simplicity again has a remedy -- nightly occlusal splint or a splint with can be worn in the day and in the night. The structure is slightly different.

• Anxiety, stress, depression are all cause of jaw rigidity and tension leading to TMJD. If the patient becomes aware of his or her jaw position at any time during the day, it may become evident that the position of the jaw is putting the joint under direst. If the patient finds himself or herself with a jaw that is protruding a bit this is not a relaxed position so is putting stress on the TM joint. The remedy here is for the patient to become more aware of jaw position through the day and purposefully let the jaw hang loose and pull it in a bit. The patient can seek psychotherapy and psychiatric treatment, etc. and in some cases this may be necessary with severe anxiety. Home relaxation techniques can be utilized first.

• Postural habits may have plagued a patient his or her entire life but with a simple change in posture being the possibility of relieving TMJD pain and discomfort, it may very well be worth it. Posture affects an individual whether standing, sitting, sleeping or walking. The remedy is to make small changes in how the individual sits, stands or labors over a computer all day. It is called postural habits modification. It is easy to become tense over a computer trying to beat tomorrow’s deadline. Dropping the arms to one’s side and lifting the shoulders up and down a few times can alleviate tension.

• Sleep disorders may seem like a strange thing to be the contribution factor but it can be. If you’re not sleeping well at night your body is stressed and tense. The patient must be aware of the pillow(s) arrangement when he or she is sleeping. They can cause stress in the neck when too many are piled up and that ultimately affects the TMJ muscle structure.

• Then sleep studies can also be performed but may not reveal much more than what the patient has the ability to adjust on his or her own time.44
Relaxation Techniques

The TMJ is not only a complex joint but it is used for multiple purposes such as talking, eating, yawning, laughing, chewing, etc. So at best the joint is subject to continual motion and not only the same motion in the same direction but it is one of the few joints that has a sliding motion as well as the hinged up and down motion. Therefore, when total relaxation of the TMJ and surrounding muscles is considered it probably seems most difficult. We will discuss the repetitive motion or activity situation in another section. Here we are discussing methods of relaxing the joint and the accompanying muscles and tendons.

When not talking or eating, etc., it is important that the patient becomes aware of how he or she is holding the jaw. Once becoming aware of this, the patient may find out that he or she is holding it in a clenched or forward tense position. It probably is a subconscious thing so it is important to become conscious of relaxing that TM joint so that it is in a loose non-taut position. This will take practice because of the subconsciousness that is involved here but it is manageable.

Developing a habit of dropping the jaw and just letting it hang for a few seconds will reap great benefits. The following suggestions will help diminish pain. Simple, gentle therapies are recommended first because the joint area will no doubt be extremely tender and in considerable pain. The purpose of relaxation is not to add to the pain but to give some relief to the fatigued muscles and tendons involved in the TMJ.

Gentle Stretching, Relaxing, and Massaging the TMJ Muscles

The healthcare professional will have medical approved or recommended massages, however, at home the patient can gently massage the area around the TM joint to relax the muscles that are tense because of the distress within the joint.

The muscles on the neck just below the back of the ear can be gently massaged in circular motions to relieve tension and pain around the TM joint. The TMJ contains fibrocartilage meniscus that is the cushion to help mitigate the motion of the joint. They are a unit of strong muscles to stabilize all the different movements of this joint. The muscles are

- the temporalis,
- the masseter,
- the lateral;
- the medial pterygoid.
Together these muscles are referred to as the muscles of mastication. These are the muscles that also tense up and cause considerable pain when fatigued.

**Moist Heat, Cold or Ice Packs**

Any type of moist heat from letting the shower flow over the painful irritated area to folding up a hot wet towel and applying it to the TMJ area for 20 minutes 2 to 4 times daily can relieve the intensity of the discomfort for some people. If moist heat does not do it, then another option is a cold wrap, an ice pack or simply a few ice cubes wrapped in a washcloth. This can also be applied 10 minutes two to four times daily. It is important to keep the ice on the painful joint and muscles long enough for the skin to begin to feel numb. This helps to relax those taut muscles and tendons which are overworking for a dysfunctional joint.

Learn stress-reducing techniques such as exercising several times each week to increase the ability to handle pain. On the other hand the exercising in and of itself can help relax the muscles all over the body.

**Medications**

Medications may be utilized along with other treatment therapies to help relieve the pain associated with TMJ disorders:

- **Pain relievers** – An individual may benefit from simply over-the-counter pain medication if taken consistently. However, if they are not sufficient then a medical professional can prescribe a pain medication.

- **Tricyclic antidepressants** – Amitriptyline is commonly used for depression, but can also be prescribed for a pain medication.

- **Muscle relaxants** – A muscle relaxant could be used for a short time as a pain medication and is successful because pain is derived from tensed muscles.

- **Sedatives** – When clenching and teeth grinding is a problem for the patient at night then, the medical profession can prescribe a sedative such as clonazepam. This in and of itself will relax the muscles and alleviate the need to clench and grind. 49

- **Corticosteroid shots** may be administered sometimes in order to treat inflammation from TMJD.

Short-term use of acetaminophen (Tylenol) or ibuprofen (Advil, Motrin), naproxen (Aleve, Naprosyn), or other nonsteroidal anti-inflammatory drugs can be used by the patient if he or she is not under the care of the medical professional. Non-steroidal anti-
inflammatory and pain reducing medications such as ibuprofen or Motrin can reduce joint and muscle pain.\textsuperscript{42}

It's important to remember that aspirin, acetaminophen, and ibuprofen may mask minor symptoms, but will not cure the real problem. These pain relievers just raise the person's threshold for being bothered by the discomfort so the disharmony in the TM joint must be treated appropriately to make the adjustments needed to correct the problem.

If relief is to be found with over-the-counter pain killers, they are most effective when taken as the pain first starts. However, for most people with other than very mild TMJ symptoms, this self-help measure is of little use. Many patients take over-the-counter pain meds out of hope that relieving the pain will correct the problem.

**Modifying Repetitive Behavior**

Avoid actions that aggravate symptoms, such as:

- Singing;
- Chewing gum;
- Yawning (wide open);
- Prolonged dental procedures;
- Eating tough or hard foods.

**Singing**

Probably better said is, all things in temperance. Singing is another motion and movement using the TM joint, so this behavior has to be only modified and the individual can still sing. However, when an individual is suffering from TMJD, the pain is enough to interrupt all parts of one's life. A singer needs the jaw working freely and optimally so treatment is of the essence. At home, merely seek ways to open the jaw when singing in a way to protect the complex TM joint.

**Gum Chewing**

So what is wrong with chewing gum? What is wrong with chewing is that it is causing continual stress on a joint that is already in disharmony with itself and the general skeletal structure. That disharmony will be agitated minute after minute and hour after hour with this gum chewing motion. Chewing gum can create problems in these two ways.

- It overworks the muscles causing the pain;
The teeth do not touch each other so the neuromuscular system is tricked. Chew gum and think about the motions it creates in the TMJ and how the teeth interact with one another. The teeth do not touch each other directly so the neuromuscular system thinks something else is happening. It consequently relaxes which in turn allows a vulnerability to a spasm-triggering mechanism. Then when the gum has been spit in the trash, the neuromuscular system is confused as to whether to be relaxed or tightened to do other work.43

**Yawning**
It is a well-known fact that an individual has to yawn. In fact, yawning serves an important purpose. It helps to fill the lungs with air. Some functions just cannot be eliminated. However, learning to do it in a way that is TMJ safe is possible. Just being aware of that complex TM joint throughout the day and finding alternative ways of doing what every individual does every day is the name of the game here. Rather than saying “avoid” yawning, it is better said, “modify” yawning. Normally, when an individual yawns, the mouth is thrown wide open and, “ouch” goes the TM joint and all the muscles around it.

**Prolonged Dental Treatments**
Before starting any type of extended dental treatment on a patient, he or she must be questioned as to whether there are any TMJD symptoms. If so then there must be frequent breaks during the dental work to give a chance for the patient to close his or her mouth and rest those muscles surrounding the TM joint.42

**Eating Tough or Hard Foods**
French bread and bagels plus TMJD equals pain and more pain and more joint stress. Even chewing steak may prove to put too much stress on the TM joint until some adjustments and healing can happen. Then steak eaters, do it in moderation. Hard candy and ice lovers, remember TMJD will prohibit this.

Something that must be remembered by TJMD patients is that some of the eliminations will not be a lifetime prison sentence. As medical professional administers various treatments and correction mechanisms and symptoms relieve, then certain things can be reintroduced to the palate.

All fresh fruits and vegetables must be cut into small pieces so as to eliminate the need to over extend the jaw. No matter what joy it brings to bury one’s teeth into a juicy Red Delicious apple, refrain. Slice it up for the time being till some changes have made to the TMJD. Even at best apples may be on the “do not consume unless cut” list.42
As far as the eating rules go for TMJD sufferers, the best advice may be to slow the eating process down and think more about the movements of that complex and now dysfunctional joint. Chewing food on both sides of the mouth at the same time will reduce strain on one or the other side.\textsuperscript{42} Even though it is natural to chew where it does not hurt, in the long run this one thing will help to start restoring the balance between the two TM joints and the muscles surrounding them.

\textbf{Pipe, Cigar and Cigarette Users}
If the patient is a pipe, cigar or cigarette user, then this behavior will need to be modified if he or she is to realize subsiding of pain. The patient may have already stopped smoking but still has headaches which he or she believes to be from the elimination of nicotine. Not so. After years of biting down on a pipe or a cigar or holding a cigarette between the lips, TMJ disorder may have developed. Chewing gum to help cope with the withdrawal period after smoking then has increased symptoms. Most patients first attributed these headaches to nicotine withdrawal, then realized that this was not the case, since the headaches did not go away.\textsuperscript{43}

Since chewing and clamping down on pipes and cigars can have the same unbalancing effect on the jaw, both behaviors have to be modified or eliminated. When the jaw is out of balance, the temporo-mandibular joint is stressed so it will continue to trigger symptoms.\textsuperscript{43}

\textbf{Separate the Tongue and Teeth}
“Tongue in cheek?” No, it is “tongue and teeth”. The teeth should never be touching except slightly when masticating. An individual must become aware of his or her jaw position during the day in order to maintain the jaw in a relaxed, comfortable position. The medical professional can do their part, but the patient has to take the daily responsibility to change and modify behaviors.

To keep the teeth apart, remember the letter “N”. Say the letter “N” and notice how this puts the tongue on the roof of the mouth behind the front teeth. It also keeps the top and bottom jaw separate. This action takes the pressure off of the little disc in the TM joint and it relaxes the jaw muscles. Put the letter “N” on a post-it note and place it in the places where you are most generally throughout the day. This will help to keep it on one’s radar until it becomes a habit. Old habits have to be broken and new habits must be formed so that the medical therapies can profit the most.\textsuperscript{42}
Maintain Good Posture

From childhood moms and teachers have been trying to get their children to have better posture when sitting, standing or even when watching TV. Posture is important for a variety of reasons but one of the most important is that it prevents pressure points on the skeletal structure. It also prevents nerves from being pinched, etc.

At Work Posture
Most of the time at work will probably be spent in front of a computer. This is one of the critical places where it is essential to have a good posture. The position of one’s arms and the posture of the neck, particularly, and the back has to be ergonomically correct in order to prevent all types of disorders.

It has been calculated that computer users, on the average, perform approximately 50,000 to 200,000 keystrokes daily. This usage has often been done in awkward postures, forceful exertions and substantial repetition. Any or all of these postures can be related to nerve, muscle, tendon, and ligament damage over a period of time for the healthiest of individuals. Then if an individual has a predisposition to something like TMJD, the risk for damage can be much more.

The muscles affected by TMJD are not only in the facial area but also in the neck and upper back so the posture of the neck and the posture of the arms will have a bearing on the amount of pain radiating from the TMJ area.

There are three variables in the setting up of a workstation and all of them will affect a pre-existing TMJD and they could also be an underlying cause for a TMJD to develop. The three variables are:

- The chair;
- The work surface;
- The computer monitor.

All of these elements have to be the responsibility of the patient to create, modify or ignore and then continue with facial, neck and upper back pain. And what is important to impress on the patient is that all the work that the medial professional does in the office can be undone by the patient if he or she does not control his or her work environment as well as the home work and sleep environment. It is important that the medical professional impress on the patient that medical treatment and personal responsibility away from the doctor’s office work in tandem.
The Chair
The chair must not only be comfortable but it must conform to the body for overall size. Most office chairs are adjustable so it is important adjust it so that the feet can rest flat on the floor at all time. Even though this is about alleviating pain and distress in the TMJ area, the spine is so constructed that providing support to the lumbar area can actually relieve stress in the upper skeletal structure. If the office chair does not have lumbar support built into it, it is simple to place a small pillow in that lower area to give support.

It is best if the chair has armrests at about the level of the waist so that from the elbow to the wrist is at a supported angle or level. If the base of the chair has five points with rollers, it will provide a more consistently stable seat.\textsuperscript{46}

Work Surface
The work surface and the chair must be in harmony with one another because if they are not then the most perfect ergonomically designed chair will benefit nothing. From the elbow to the wrist of the arms must not be bent. So for this to happen the arms of the chair are to be level with the top of the work surface area.\textsuperscript{46}

Most office chairs are height adjustable and if it is necessary to raise the height of the chair enough to make it level with the work surface that the individual’s feet will be off the floor, it is always possible to put a block of wood on the floor to place the feet on.

The Computer Monitor
Next is to bring the computer monitor positioning into the mix. The computer monitor is at the correct level if the individual can sit in a chair and the monitor is eye level. The individual should not have to bend his or her head forward and for sure not backward. If the individual has bifocals then the computer monitor may need to put placed on a stack of books so that it is high enough. \textsuperscript{46}

It is also possible to push the computer monitor to the back of the desk so that it is furtherer away from the individual’s eyes and creating a better angle. If the head if bent downward, even if at a small degree, there will be stress on the muscles and tendons directly c.

These things may seem laborious, particularly in the beginning when a lot of changes are being made in the individual’s personal life. Just one thing will not remedy the TMJD issue and the patient must be made aware of this. His or her environment must be, as it were, in harmony in order to relieve stress on the skeletal structure.
Sleeping Posture

It is generally believed that lying on the stomach when sleeping has more negative impacts on one’s bone structure than positive. This is particularly true with the neck and upper back both of which are trigger points for the TMJD scenario. Stomach sleeping also puts adverse forces on the jaw as well as the neck muscles. It is also advisable to sleep equally on both sides because it must be remembered that when sleeping on one’s side pressure is on the jaw as well.

So now that the discussion has solely been about how “not to sleep”, let’s look at the best sleeping position. The thing that an individual wants to achieve with TMJD is a sleeping position that reduces facial pain, neck pain and shoulder pain. This position is to sleep on the back. The chances of clenching or grinding when sleeping on one’s back is greatly diminished.

Sleeping usually involves some type of pillow or support under the head and neck. Some use a thin, flat pillow, while others stack up three or more pillows for an elevated head position. This is not good under normal circumstances for a non-symptomatic individual much less for someone prone to TMJD.

Some have advised to roll a regular pillow into a cylinder and duct tape it to hold that shape. Place it in a pillow case and position it under the neck. This keeps the head in a position to work with gravity and mitigates the grinding and clenching that often happens at night during sleep. And this position also forces the muscles and tendons into a relaxed position.

The Complexity of Sleep

The National Sleep Foundation found that 20% of adults report some degree of pain to disrupt their sleep a few nights a week or more. Pain can interrupt sleep. Without sufficient restful sleep, pain increases causing more interruptions to sleep. So there is surely an answer to this merry-go-round. Relieve the pain and sleep quality returns.

The TMJD pain will be alleviated in multiple ways. The dentist may prescribe a mouth guard to wear all the time or only at night. The healthcare professional may use techniques to calm the muscle and tendon tension. But the patient spends the majority of time outside the medical professional’s care so those hours and the activities during those hours must be positively structured for the treatment to be successful.
Exercises

It may seem like exercises are the answer to everything and in some manner they may alleviate many symptoms and base factors which in reality can allow the joint to correct itself.

- **Neck stretches** -- To do this stretch, lean your head to one side, as if you are trying to touch your ear to your shoulder. The muscles in the opposite side of your neck are stretched. Hold for about 5 seconds. Then lean your neck to the other side. Finally, lean your head forward and stretch the muscles in the back of your neck. You may want to support your head with your hand. Repeat in each directions a few times. Try to do this 2-4 times per day. This stretch may help your facial pain because tight neck muscles contribute to tightness in facial muscles.42

- **Alignment** – Standing in front of a mirror, say “N”, open the mouth noting lateral movements of teeth. Open as wide as possible without strain, close it, looking for the same lateral movements. The goal here is for both jaw joints to have equal control over mouth to counteract the damage that TMJ disorders have done.

- **Sit ’n Stretch** -- Sit in a straight-backed chair and rest the jaw on a soft, firm object then move the head back and forth using the chin and without moving sideways or opening the mouth. Relax and repeat with the teeth slightly apart.50

- **Joint Strength I** – With the palm of the hand slowly push on one side of the jaw as the bottom of the hand is pressing on the chin. Push back with the jaw but make sure the teeth are aligned. Start slowly with a small amount of pressure and gradually increasing it on both sides to increase the strength and control of the joint.

- **Joint Strength II** -- Push down on the bottom teeth with two fingers while pushing up with the jaw to strengthen the vertical muscles around the TMJ.

- **Joint Strength III** -- Hold the mouth open slightly and aligned while with the palm is pushing the chin inward. This may adjust the muscles when there is an overbite causing the TMJ disorder.

- **Neck Muscles** -- To help loosen up neck muscles and alleviate pain in facial and neck muscles because they are working extra to compensate for muscle weakness around the TM joint.

Put hands in an “X” shape on the chest, with the right hand on the left collarbone and the left hand on the right side to stretch the neck backwards and to the right or left. Grip hands on the chest and hold for about 10 seconds. Repeat this on the opposite side.

- **Finger ’n Teeth** -- To stretch the masseter muscles open the mouth wide and insert two to three fingers. Rest them on the upper teeth without the lower teeth
touching the upper. Hold your mouth in this position for 5 - 10 seconds, close, relax and repeat. Do this exercise after applying moist heat.  

- **Chin 'n Neck** -- Stretch the neck muscles by pressing the chin into the neck without bending the head down so it appears there is a “double chin” but the face is looking straight forward. Hold for 10 seconds.

### Cautions

Because it seems that treatment may be failing with conservative methods is not the signal to accept a more invasive procedure or more aggressive treatment. More caution should be taken about nonreversible treatment methods, such as orthodontics or surgery. These can permanently change the bite and not necessary address the real problem.

As a matter of information, it is rare that reconstructive surgery of the jaw, or joint replacement is required or is effective. There is more likelihood that damage will be done rather than there being a successful outcome.
Chapter IX
Evaluate the TMJ Disorder for Physical Therapy

TMJD affects 28% of the adult population which equals to approximately 80 million people. Many sufferers seek help from their dentist or orthodontist but usually there is additional pain, stiffness, or misalignment in the neck and shoulders. But not many think about utilizing the techniques of physical therapy. But physical therapy can teach the TMJD sufferer how to improve posture and joint motion. PT can also decrease muscle tension, and actually strengthen the neck and jaw.  

Resolution of jaw pain requires the involvement of a dentist and a therapist who does bodywork. Simultaneous treatment of the chronic pain from TMJD will yield more benefits than if one treatment is done and the next treatment is tended to subsequently. It is called synergistic. There is a synergistic effect with a team approach for TMJD to the path of regaining health.

Defining the Technique of Massage

Massage can be accomplished either manually or mechanically. It is the manipulation of muscles as well as other soft tissue. Massage therapy encompasses covers a group of practices and techniques of over eighty types of massage techniques. The techniques involve the action of pressing, rubbing, or otherwise maneuvering through soft tissues. These actions can be in varying pressure and varying types of movements. The purpose of massage for TMJD is to relax the soft tissues, increase delivery of blood and oxygen to the massaged areas, warm them, and decrease pain. All of these exist in TMJD sufferers

In treating TMJD, the massage therapist focuses on the muscles around the TM joint. There are several muscles because this joint is complex and multi-purpose. The focus of all the treatment must be on the reduction of tension in the masticatory muscles. The purpose of this is to eliminating those trigger points. The trigger points can be felt with finger movements into the muscle as knots. These hyperirritable “knots” are what refers pain elsewhere. If the hyperirritable knots can be worked out with a massage, the tension in the fascia around the jaw area can be relieved. The fascia is the tough, densely woven connective tissue surrounding the body’s organs, bone, blood vessels, muscle and nerve similar to a shrink-wrap.
Evaluating What the Physical Therapist Can Do

The physical therapist can achieve great relief for the patient with noninvasive pressure. This pressure will be aimed primarily at the jaw, the head and the neck. This pressure can help the body to release tension.

The physical therapist will need to conduct a comprehensive evaluation of the individual’s neck, thoracic spine and shoulder girdle. This evaluation will determine the structures causing TMJD symptoms so that a plan of treatment can be implemented for the underlying bio-mechanical problems. The physical therapist no doubt will put on exam gloves and feel the jaw muscles and joints from inside of the mouth also. This may not seem important but it is because the muscles which are causing the problem are in the inside and the outside and consequently much tension can be relieved with massaging inside and out.

TMJD and Evaluation for Bodywork

Bodywork is a technique which can be used to relieve the pain of TMJD. Bodywork involves working with the human body by way of breath work, manipulative therapy, or energy medicine. Bodywork focuses on the assessment and then the improvement of posture as well as the “mind-body connection” which surrounds the human body and thus affects the health and well-being of the individual.

Bodywork is an essential element of any recovery from chronic pain and encompasses all the modalities of therapy -- physical therapy, osteopathic manual therapy (OMT), chiropractic, Rolfing, acupuncture, Jin Shin Do, Trager therapy, Feldencrisis therapy, massage therapy and Acupressure.

These therapies can be utilized in retraining the body to assume its proper balance and symmetry. The TMJD patient will want to seek out the physical therapists with advanced training in cranial sacral therapy, myofascial release techniques, and osteopathic manual therapy techniques.

TMJD and Physical Therapy Evaluation

The massage therapy professionals believe that massage therapy should be focused toward the reduction of tension in the masticatory muscles, by releasing tension in fascia, and the elimination of trigger points.
First Things First
In order to evaluate the patient and determine which of the therapies will be of the most benefit, a thorough history must be taken by the physical therapist. This examination will include questions regarding mechanism of injury if there was an injury, any previous treatment, pain level, location of pain and what makes symptoms better or worse.

Patient Journal -- It may be a good idea for the patient to keep a journal for a few days and weeks before visiting the physical therapist for treatment so that the treatment assessment can be as accurate as possible. Record headaches, sleep disturbances, chewing, past history of neck pain, any clicking or popping, smoking, dizziness, gum bruxating or grinding the teeth during sleep, voice changes, recent dental work, locking of jaw and difficulty or pain with eating.

“C Curve” and “S Curve” -- The physical evaluation not only involves inspection of posture, muscle development of jaw and neck, and resting space of the jaw but the jaw is evaluated during opening and closing. The physical therapist will also evaluate the “C curve” for deviation. This will indicate a tight capsule ipsilateral to curve direction. The “S curve” will undergo evaluation also for if there is a deviation it will indicate weakness in the lateral pterygoids. The resting position of teeth for any overbite or cross bite may affect the dynamics of the TMJD.

Active Range of Motion -- Active range of motion (AROM) is measured using a tape measure or with a tongue depressor to measure the depression/elevation, protrusion/retrusion, and lateral deviation.

Passive Range of Motion – If the AROM is limited by pain then the physical therapist will proceed with the passive range of motion (PROM) measurements to distinguish difference between disk displacement and tight structures.

After the range of motion on the patient has been measured, the physical therapist will assess the strength using a device for isometric manual muscle testing. This will involve the following planes of motion of the jaw:

- depression,
- protrusion,
- elevation,
- lateral deviation.
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The only reason this will be sidestepped is when it causes a lot of pain for the patient. It will be very painful if the jaw is locked or if it is unstable.

The TMJD evaluations will also include an examination for joint mobility to include distraction, anterior glide, and medial glide. Palpation for tenderness is performed both externally and intra-orally using a gloved hand. Internally the masseter and pterygoids can be palpated; and externally the TM joint, the thyroid cartilage, and temporalis can be palpated.

It is also important for the therapist to evaluate the cervical spine and upper body posture because the TMJ shares musculo-tendinous attachments with the cervical spine. This has to be included in the treatment for the entirety of the procedure to comprehensive particularly if the TMJ issue is secondary to a primary cervical problem. Some examples could include whiplash injury, cervical fracture, and any cervical surgery.

Evaluating Types of Jaw Deviation

There are variations and degrees of TMJD thus the reason for the extensive evaluations. The treatments and therapy plan will change according to these variations. If the treatment plan is successful, then full recovery can be more promising.

Correct Jaw Deviations via Stretching

Some individuals with TMJD have a slight deviation when opening and closing the jaw and can be evaluated and determined by holding a piece of dental floss in a vertical line in front of one’s face while opening the mouth as wide as possible. The dental floss is a base line and it can be determined if there is deviation by comparing the jaw movement with the base line of the dental floss. Physical therapy can correct this abnormality as well and it can also reduce pain and subsequent jaw noises. Open and close the mouth in a straight line to retrain the TM joint and the surrounding muscles a new posture for better alignment to reduce TMJD symptoms.

Position Your Head and Neck Properly

Another evaluation for the TMJD is to assess if pressure has been placed on the joint system when the patient consistently postures with improper head and neck positions. If the patient generally sits for long periods with his or her head tilted forward the neck and jaw muscles could be fatigued and aggravating TMJ pain. Neck stretches for muscle strain and to alleviate pressure on the jawbone can be accomplished by tipping the head to one side so the ear comes as close as possible to the shoulder without raising the shoulder.
**Massage Sore Jaw Muscles before Stretching**
The massaging of jaw muscles before doing physical therapy exercises can reduce soreness and tightness after the therapy exercises. To do a simply massage, simply use the fingertips to find the spot where the lower jaw meets the temporal bone in an area in front of the upper part of the ear. Using a circular motion with the massage will give some relief after a few minutes. Do not press deep into the muscle, particularly at the being of the treatment period as the pain could be intensified. If there is soreness of swelling, use a warm compress to or a cold pack, respectively.\(^{52}\)

**TMJD and Evaluation for Dental Therapy**

There are various methods of oral orthotics or specially designed mouth splints which can help the muscles and joints to return to a more optimum position and function. There is nothing like hands-on therapy to address the jaw mobility issues. This may include the use of therapeutic local anesthetic and/or cold laser therapy into inflamed associated muscles, ligaments and tendons of the jaw. Manual mobilization techniques may also be used including, but not limited to, Craniosacral therapy, Myofascial release and Post-isometric Relaxation.\(^{14}\)

**Prosthodontics and TMJD**

Prosthodontics is a dental specialty for the non surgical treatment of both the functional and cosmetic aspects of the mouth, teeth, gum tissues, jaws and jaw joints. A prosthodontist has to complete post doctorate training in a two year residency program.\(^{55}\)

**Prosthodontic Evaluation for Treatment**
The evaluation will be to determine the specific TMJD but not necessarily a recipe to treat TMJD patients. If the TMJ disc is displaced, a highly refined jaw positioning device, a Stabilization Prosthesis Appliance may be determined to be the best intervention device to find the comfortable jaw position to relieve pressure from the jaw joints. This one thing may bring remission of headache and other jaw related symptoms.\(^{55}\)

In the evaluation for other TMJD patients, it may be determined that medications along with acupuncture and physical therapy will be the best approach to treatment. Another treatment option may be the two above mentioned processed administered consecutively.

Whoever the doctor or therapist, etc. may be, the advice will no doubt be to avoid, among other things, prolonged speaking in order to give the joints time for healing. At
home, the patient can always apply moist heat to the face in joint areas to assist in the relaxation process of the tense muscles. In the medical professional office, jaw exercises with biofeedback and ultrasound/electrical stimulation can be engaged in to further the treatment prototype to speed healing and resolve symptoms.\textsuperscript{55}

\textit{Evaluating the Length of Therapy}

The length of therapy is always dependent on the severity of the dysfunction which will include also the length of time that the TMJD has existed. Initial therapy, which is designed to dramatically reduce pain and dysfunction, should last approximately three months to six months. Second phase dental therapy for TMD usually depends on the severity of the occlusal dysfunction. Treatment may involve the reshaping of the surfaces of the teeth to coordinate a better occlusion and a more optimum jaw function. All orthodontic therapies will focus on the achievement of long-lasting jaw stability.

A successful therapy for TMJD does not mean a total reversal in joint damage. There may always be a certain level of dysfunction, but not total dysfunction. Therapy can very well resolve in a 70-80\% reduction in symptoms and a restoration that gives acceptable function.\textsuperscript{14}

\textit{Evaluation for Additional Treatment}

In cases of internal derangement, other procedures may have to be put in place such as orthodontic restorations in the form of crowns on the posterior teeth. This will make an adjustment on a defective bite to restore proper harmony between:

- the teeth,
- muscles,
- the jaw joints.

All evaluations and assessments will involve:

- dental facial examination of the bite,
- the jaw muscles,
- the jaw joints.
TMJ dysfunction involves a myriad of mechanisms which includes

- the bones;
- the joint;
- the muscles; the connective tissue around the muscles;
- the intra-oral factors.

It may be overkill to list the factors once again that are involved in the TMJD but the reason it is necessary is because the medical professional treating, evaluating, diagnosing or treating must remember the complexity of the dysfunction. If an accurate diagnosis is achieved and if comprehensive treatment is mastered, it will be because each of these factors were recognized and given due diligence. \(^{57}\)

The more research is done regarding the head and neck, the less often surgery is needed. Degenerating muscle and connective tissue can be restored with massage and tension relieving mechanisms. Teeth may need to be added and misaligned teeth may need to be straightened to all play a role in correcting TMJ disorders.

With the TMJD being a multi-dysfunctional condition then it will take multi-operations to make adjustments, corrections and hopefully in the end, a resolution. Each of the following professions can work hand in hand to effectuate recovery:

- chiropractic manipulation;
- massage therapy;
- dentistry.

Relaxed muscles to open and close the jaws smoothly and a centered axis culminating with proper neck alignment as well as proper positioning of the teeth is what will give the desired outcome. \(^{57}\)

**Beginning the Massage Treatment for TMJD Sufferer**

The physical therapist will analyze the jaw mobility and release the muscle tension in the head and neck region. The therapist and/or the dentist may insert a gloved hand into the mouth to massage down the jaw closure muscles from the inside as they are the muscles most affecting the dysfunction in the TM joint. This creates movement in the mobility restricted TM joint in order to facilitate movement again. \(^{53}\)
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Not to be repetitive but this fact bears repeating. The neck, the jaw, muscles – all interact with one another so when the muscles around the TM joint are massaged down, the neck may benefit passive joint mobilization.

Mobilization comes first then stabilization comes second in the treatment process. The stabilization will be discussed more in the management of the treatment process because that will be an ongoing procedure. But for now the strengthening and stabilization of the TM joints will take times because the muscles, the tendons, the bones and joints all have to be retrained. Exercises will be a big part of this phase of the treatment as they will help to correct postural alignment, range of motion, jaw mobility and isometric holding exercise to strengthen the TMJ.53

Types of Massage Therapy for TMJD Patients

There are new and creative and inventive methods and theories on massage therapy and body work therapy being developed and recognized on a regular basic. But for now, we will look at the following modalities which have been proven to be successful in the treatment of TMJ disorders. Training in the following modalities is particularly valuable when treating jaw pain.

Neuromuscular Therapy
Pressure application at points in jaw muscle is referred to as neuromuscular therapy. It provides comfort to the patient because it relaxes the jaw muscles. The therapist will apply pressure to trigger points in the jaw muscles which will help relieve tension and also to return muscles to a relaxed state.51

Neuromuscular Therapy includes trigger point therapies and myofascial therapies. Neuromuscular therapy on the lateral and medial pterygoid muscle can yield the most benefits when considering the trigger points of TMJD. Secondarily the neuromuscular therapy can be enacted on the masseter and temporalis muscles as they may have substantial involvement in the pain level.

Neuromuscular Therapy has its origins in bodywork. We will not address bodywork separately in this chapter, separately from other types of therapy because there is a large amount of overlap. Neuromuscular Therapy (NMT) incorporates superior skills of massage therapists using trigger point therapy, mobilization, heat and ice, and stretching. It is to be noted that NMT therapists differ from other therapist or body workers because they work intra-orally effectuating more long lasting change in alleviating pain and making specific changes in the muscles. Intra-orally also helps
significantly to help correct off-balance movement patterns. Causes, symptoms and other perpetuating factors including low nutritional status, stress, bruxism, postural imbalance will all be uncovered as the therapy treatment moves forward.60

**Cranial-Sacral Therapy**
In addition to activating the classic still point, adjustments to several bones and muscles will provide relief to the TM joint. These bones are

- the mastoid bones;
- the temporal bones;
- the zygomatic bones;
- the sphenoid bones.

The modality of the Cranial-Sacral Therapy focuses on gently working with

- the spine;
- the skull;
- the cranial sutures;
- diaphragms;
- fascia.

This therapy will ease the restrictions of nerve passages, to optimize movement of cranial sacral fluid through the spinal cord, and to restore misaligned bones to their proper position. It has been proven to provide great relief for temporomandibular joint disorder (TMD).51

**Trigger Point Therapy**
If the muscle cramp or contraction is of the ordinary style then an individual can move around or stretch, etc. and more than likely the pain will be relieved. Trigger points do not. Instead, they lock into spasm, a strong state of painful contraction. This spasm is basically a localized hardening of the muscle. Once it hardens, it becomes locked in that state and creates a self-perpetuating cycle of pain and spasm. Often, a single muscle will have multiple trigger points.58

Trigger points are hypersensitive taut bands located within the muscles. When they are compressed they cause referred symptoms in the form of pain. The pain may be far away from the site of the trigger point. But there are other symptoms besides pain. Referred pain can cause weakness in the muscle with taut bands within it. This can be more serious when the jaw muscles are affected only on one side of the mouth because the trigger points can alter the biomechanics of the TMJ.60
When the therapist applies sustained, systematic and direct pressure to the trigger point he or she can release the spasm, thus breaking the cycle of pain. When the physical therapist or massage therapist applies this sustained pressure, it is referred to as "trigger point release therapy." When the trigger point tension has been released, the muscle will start the process of returning to a relaxed, elongated state. What the therapist is actually doing is deactivating the trigger point so that the muscle spasm can be released. This is considered to be one of the most effective ways to achieve long-lasting relief from on-going pain and spasms.59

Trigger point release therapy is used in various muscles of the body particularly the back or shoulders because they are easy to access. However, the majority of trigger points in TMJD pain are intra-oral making them more difficult to access.59

**Hydrotherapy**

The hydrotherapy process is simple and can be done at the patient’s home. In the tub the process would be to lay in the tub and have the water deep enough to cover the neck and up as far as possible on the back of the head. The water should be as hot as possible. However it is not only the heat but the therapy also comes from the essence of water.

The other method is to stand in the shower and have the shower spray on the neck, the jaw and the back of the head. If the shower head can be adjusted, put it on a spray that has some force or that pulsates. Have the therapy session last as long as possible or until your hot water runs out.

**Acupressure**

Massaging the meridians, both distally and locally, that have some direct relationship to the jaw can bring increased circulation and pain relief to TMJ. The primary meridians are involved also in the TMJ as they are in line with the meridians to the jaw. The Gallbladder, Stomach, Large Intestine and Triple Warmer are in the meridian lines that surround the jaw and the patient can realize pain reduction using acupressure. The therapist massages the meridians which are considered to be energy channels. These energy channels, when manipulated around the jaw increase circulation and provide relief from pain from the temporomandibular joint disorder (TMD).51
Acupuncture
Even though there are a variety of ways to treat TMJ disorders, acupuncture has been rated in multiple studies to be, not only effective but also safe. Acupuncture provides short-term muscle pain relief as well as reduction in pain intensity as well as long-term pain improvement for patients. The theories of Chinese medicine follow the belief that acupuncture acts to restore the balanced flow of energy. One way in which acupuncture reduces pain sensation is through direct stimulation of the nerve. This changes the quality of signaling along the nerve cells. Acupuncture can directly stimulate the release of endorphins and neurotransmitters which are naturally occurring substances helping to dampen and block pain perception by the brain.

It is not important if the Qi or biological chemicals are the reason for the improvement, it is important that improvement is realized. The acupuncture points of (ST-6, ST-7, SI-18, GV-20, GB-20, BL-10, and LI-4) are most used on a weekly basis and for a duration of 30 minutes per session. The needles do not need to be inserted in the exact location of the pain but because of the interconnecting pathways between the meridians, the needles may be inserted in other places such as near the elbows, knees, and big toe. These locations can alter the flow of Qi flowing through the jaw thus relieving pain and inflammation.

The treatment plan should include four to six acupuncture treatments but chronic conditions may require more. While these treatments do lead to decreased pain, long-term treatment may be necessary to reeducate the muscles surrounding the temporomandibular joint (TMJ), preventing further complications. As was discussed in a previous chapter, the patient must be aware that many lifestyle changes must occur if the treatment plan is most successful. The patient can adjust his or her posture, diet, dental work, and decreasing stress.

At the beginning of treatment at least twice a week is a good regularity but then when symptoms improve, the treatments can be reduced to a weekly basis. On the other hand if the symptoms do not show a significant improvement within a few weeks, the treatment strategy should be adjusted.

Swedish Massage
The Swedish Massage is the most common and best-known massage modality that relaxes the full-body. Stress is one of the major contributors to TMJD so the immediate initiation of the relaxation response will be significant in the reduction of the tension in the jaw. The Swedish Massage may hold multiple benefits but the primary one is relaxation. Facilitating relaxation through a full-body can also have a major impact in jaw tension.
Post-Isometric Relaxation
With this technique, the therapist can restore the decreased range of motion that is usually found with TMJ dysfunctions. The post-isometric relaxation through a systematic process of stretching and providing resistance. Post-isometric relaxation is an extremely important tool for the restoration of the range of motion.

The application of ischemic pressure to trigger points in the jaw muscles (temporalis, masseter, lateral pterygoid, and medial pterygoid) can help relieve the spasms from the TMJ dysfunction. Using isometric contraction to actively stretch tensed muscle fibers, adding minimal resistance for a further stretch, followed by relaxation allows for enhanced relief of the targeted muscle. This technique can restore the range of motion that typically regresses with TMJ disorders.

The post-isometric relaxation exercises or therapy can be defined in this manner and with this specific structure:
- Start where the muscle to be treated is in a stable posture and lengthened but not stretched. Have the patient exhale deeply.
- Begin to inhale, bring the muscle against gravity to a shortened position and hold for about 8 to 10 seconds. If the breath inhalation does not last long enough, instruct the patient to hold his or her breath.
- Slowly "let go" of the lengthened position as the exhaling begins.
- Repeat 3 to 5 times.

One of the things which is important is to understand what the function of a muscle is before apply the therapy technique to it.

Reiki Massage
Reiki, a combination of two Japanese words rei and ki (universal life energy) is an ancient laying-on of hands healing technique that uses the life force energy to heal. Reiki balances the energies within the body by addressing emotional, physical, spiritual and mental imbalances. Reiki's ki-energies flow from the practitioner's body through the hands to the patient's body.

For body-workers, TMJ is no mystery. Many clients present jaw pain as their primary complaint, or as a secondary nuisance. Approaching TMJ pain by utilizing techniques from the described five modalities provides an inclusive, holistic and effective treatment.
Chapter XI
Manage Treatment for TMJ Disorder

The treatments for TMJD can be divided into six general treatment types:

- Physical medicine treatments;
- Intraoral orthopedic appliances;
- Pharmacological therapy;
- Behavioral and psychological therapy;
- Temporomandibular joint surgery and arthrocentesis;
- Occlusal treatments.

No matter what the initial diagnosis and treatment has been over the past three months or six months, etc., there will always be a future management of symptoms and malalignment and mal-adjustment for additional months. If the existing treatment has been effective then it will have reduced TMJD pain and the consequences of the joint issue.

Management of the Intra-oral Splint Treatment

Splints show modest active therapeutic effects in reducing TMJD pain compared to a placebo control in more severe patients. Stabilization splints can reduce TMJD pain compared to non-occluding splints in those subjects with more severe TMJD pain. All patients generally will have a mixed diagnosis of muscle and joint pain.

Stabilization splints, short term, can be equally effective in reducing TMJD pain compared to physical medicine, behavioral medicine, and acupuncture treatment for TMJD. For treatment of headache pain that is associated with TMJD, the stabilization appliance therapy is generally more effective than pharmacological treatment. However, the anterior positioning splints are as effective, or more so, in treating TMJ clicking and locking as stabilization splints.

Anterior bite planes are not generally the most effective for reducing pain or for the correction of TMJ misalignment. Besides that there has been concern voiced that partial coverage splints may contribute to tooth pain or occlusal changes. The bottom line is that there is not one splint or one type of therapy that precludes all others in effectiveness. The success with appliance therapy does not only depend on appliance selection but also on how well it is adjusted to accommodate the comfort of the patient. If it is uncomfortable or stressful in some way the entire situation can be worsened.

Complications can occur from excessive, or incorrect use of appliances and gingival inflammation, occlusal changes, speech difficulties and mouth odors from these
appliances may be involved. Long-term, full-time use of partial coverage appliances and repositioning splints, in particular, can cause reversible negative changes to occlusal and functional jaw relationships.\textsuperscript{63}

**Management of Occlusal Treatment**

Dental treatment of malocclusion including occlusal adjustment, restorative dentistry, orthodontics, and orthognathic surgery has been advocated for treatment and prevention of TMJD. In the patient studies already done there is insufficient evidence to suggest that any occlusal treatment is more or less effective than placebo in treating TMJD pain. With the medical research done so far, the occlusal treatment cannot be considered to be more effective than any other rehabilitation treatments for TMJD pain.

The reality of occlusal treatments is that they are generally irreversible. Considering the fact that occlusal treatments are not proven to be 100% correction therapy then, most patients will not want to “experiment” with something that more than likely will fail.

That is the reason that it is more advisable for all medical professionals to adhere to reversible treatment such as physical therapy, self-care, splints, and cognitive-behavioral therapy to manage TMJD. It is also acknowledged that these occlusal dental treatments can be used successfully to correct a malocclusion or uncomfortable occlusion in a patient with or without TMJD. Since occlusal stability can be affected by problems in the muscles or joints, the medical professional should first stabilize TMJD signs and symptoms as well as jaw position with reversible treatments. When the TMJD is severe, the patient will be in high levels of pain so all treatments will have to be paced. Particularly, intra-oral manipulations may be very painful in the beginning before the muscle structure stress has been alleviated.

A jaw position can be evaluated for stability using several methods. Generally these methods include:

- improvement in the signs and symptoms;
- no changes in TMJ computed tomography scans in the past six months;
- no increase in incisal edge to incisal edge measurements;
- splint adjustments have not changed in past two or three months.

Failure to ensure jaw position is stable may result in continued occlusal dysfunction.\textsuperscript{63}
Management of the Physical Therapy Aspect

The primary goal in the initial TMJD treatment is to treat the pain. The modalities may vary with different patients but generally include:

- moist heat,
- ultrasound,
- laser,
- infrared,
- iontophoresis,
- phonophoresis,
- cold application.

These modalities will continue to be used in the ongoing treatment with the medical professional and for the patient to do at home to manage discomfort and/or pain when engaging in the exercises needed to strengthen and stabilize the TM joint.

**Acute Management**

For acute TMJD pain, the therapist may use laser followed by a gentle intra-oral massage, then ice and iontophoresis. Even though pain is symptomatic and control and minimizing it will not correct the root cause of it, pain has to be minimized for other corrective measures to be beneficial. So when the pain is managed then, the second goal is to either stabilize or mobilize the joint and to restore normal ROM.

This is initially accomplished by manual techniques including: caudal glides, ventral glide, and lat/med glides. The patient can and should also be instructed in home self-mobilization techniques as an ongoing treatment plan for the maximum recovery of motion.

**Ongoing Treatment Management**

In the secondary treatment phase there will be levels also that are different than the acute level and different for different individuals. So a sample of what treatment might be like in the secondary phase of treatment would be for the therapist to use deep heat followed by aggressive massage and mobilization.

Active motion is also used to re-establish TMJ movement with an increased rotary motion, tongue placement on palate and movements to increase protrusion/retrusion. Once normal ROM is established, the TMJD rehab program should emphasize strength and balance of the supportive muscles in area. Strength programs can begin with
isometric exercise using the patient’s or therapist’s hand for resistance, and then progress to more dynamic exercise such as therapeutic chewing with tongue manipulation of the food as directed by the therapist to target specific weak directions.

**Patient Education Management**

It is important to educate the patient about eating habits to avoid unnecessary pain. For example, avoiding chewy, thick food and chewing gum can significantly reduce pain, inflammation, and further trauma to the area.

Thicker or stiffer foods can be utilized to gradually increase resistance to improve strength of the tongue and TMJ musculature. The patient can use warm drinks prior to exercise for the purpose of improving blood flow and joint excursion. On the other hand, cool or cold drinks may be used after exercise along with external ice to decrease post-exercise pain and inflammation.

The patient must be educated sufficiently during the first stages of treatment to realize that the TMJD will be corrected and managed as long as he or she is willing to engage in a comprehensive home exercise program.7

**Summarying the Biomechanics of the TMJD**

TMJ is a bi-condylar joint. This means that there are two condyles and the movable round upper ends function at the same time. The biomechanics of the TMJ has two angles:

- jaw opening the lower portion of the joint operates when the condyle of the mandible rotates up to 28 mm without translates on an articular disk
- upper joint acts as the disk and condyle translates anteriorly together against the articular side which allows a remaining 15 to 25 mm distance for the opening of the mouth.64

The full opening range of the jaw is generally at plus or minus 48 mm or the width of three fingers. The full closing the jaw is the reverse of the opening and add to it the upper joint initiating movement and the lower completing the movement. Full functional TMJ closure is the meeting of the upper incisors which also permits chewing.64

The TMJ is a multi-functional joint so is also capable of jutting forward or protrusion. Normal range of motion for protrusion is 9 mm. Further movement is halted by the posterior attachments of the disk as they stretch up to 6-9 mm. Return of the jaw to resting from this position is called retrusion which is generally measured at 3 mm.64
Finally, the TMJ is also capable of lateral motion, referred to as lateral deviation. Normal range of motion is 12mm to either side. Functional range of motion is considered to be movement past the width of one central incisor.⁷
Chapter XII
Analyzing Ethics of Personal Responsibility for the Medical Professional

The spirit of personal responsibility and professional behavior must be the primary focus during the relationship between the medical professional and the patient whether it is in the diagnosis stage, initial treatment or the ongoing management of the appropriate treatment. It will always be necessary to remind the medical professional that he or she has the task every day and with every patient to carve out a diaphragm of behavior that is responsible, professional and competent. There are three issues that a medical professional must look at seriously and place on their priority list every day and with each client:

• **The Best Interest of the Client;**
  If the medical professional defines the best interest of the client as “wanting to do what's in the client's best interest provided it does not go against my own best interest in the process,” he or she may need to revisit foundation of personal and professional ethics. Best Interest of the Client must be at the forefront of every decision that is made regarding the patient and every action and reaction during the treatment process.

• **The Actions of Medical Professional;**
  Professionalism should have a high mark in the ethical scheme of things even though the general population seems to feel that the smallest effort possible will just have to do. An individual can miss 15% of the driving-test answers but unfortunately, he or she can still get a license to drive on the streets with everyone else. "Just getting by" is an attitude of amateurs, however, and has no place in the medical profession. Professionalism is too important of a standard to be an amateur at it. Actions on all levels have repercussions which must be considered before acting.

• **The Standard for Ethical Relationships.**
  A relationship commences with expectations from both parties. Whatever the professional, he or she will develop a relationship with the individual who is seeking expertise advice. An employer creates a relationship with a new employee who punches out on his or her time card come Friday 5 pm. A cancer patient establishes a relationship with his or her oncologist.

The client goes to the professional because he or she needs specialized expertise to resolve a need. With the medical professional, this has something to do with one’s health, life and well-being. The client goes to a professional with of honesty, respect, and competent knowledge.
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The Best Interest of the Client

If the medical professional is in doubt about what is in the best interest of his or her client, make it personal. Would you do it for yourself or for one of your loved ones? As with any part of ethics, it is not always a clean black line.

Right is taught or not taught at a very young age by parents, teachers and religious organizations. This “right” can have different faces because of who was teaching and giving the instruction. As an individual matures and is influenced by other ethical cultures then the ethical foundation is honed to be more accurate or forsaken as a farce.

As an adult, in the business world particularly in any of the helping professions, the medical professional will have to make sure that his or her ethical compass is pointed directly north because human lives are at stake in every decision that is made. The decision has to be in the best interest of the client even if the client may be unhappy with the treatment plan.

Determining the best interest of the client has to be done from:

- a professional reference point,
- a legal reference point,
- a human person point of view.

As a professional, you know more than the client and are supposed to know the best of the best, rather than just the best. The client came to you because you had recommendations and credentials that led him or her to believe you would act in their best interest. It is your responsibility to be competent in your knowledge of your profession.

When acting in the best interest of the client, you do need to consider legal ramifications. However, it is not your first concern where you will be sued by the client. Your highest concern should be if you are utilizing the absolutely best treatment plan to result in a full recovery.

When acting in the best interest of the client, you will naturally look at it from a human point of view because you are human and that is not all bad. Medical professionals need to be connected to their client on a personal level to maintain a good humanity level. A client is an individual not just another appointment in your schedule book.
The Actions of Medical Professional

“Actions speak louder than words” is what we’ve always heard from mothers, teachers and religious leaders. The fact of the matter is, that is the truth. Sometimes individuals think that if they can always say the right thing or a semblance of the right thing then actions can be “off-center”.

That is not true because actions are what counts. If a medical professional tells a patient what treatment plan would be the best for him or her, then just not doing exactly what if said he would recommend to the patient.

The actions of a medical professional must always be clean and precise as well as timely. At all times the medical professional is responsible to remember that he or she is the expert and the patient has come to consult and to get answers for health issues they are experiencing.

Actions of the medical professional must be documented for accuracy and authenticity reference. Documentation is probably the single most important thing to consider for the medical professional and often the most often neglected, at least done on a consistent basis. Documentation must be continual, immediate and accurate.

The documentation is also for the purpose of tracking the patient’s progress over a short or long period of time. Documentation is important not because the regulating industries say is required. The medical professional needs to document because it creates continuity to treatment and the outcomes.

The actions of the medical professional will be generally known to him or her and to the patient. But the repercussions of the actions will be known to many more but that really does not matter. The actions of the medical professional should be right and in the best interest of the patient no matter the audience. Being in the “business of human life” is a tremendous responsibility and privilege. The medical professional has the expertise and the professional knowledge to be an agent of healing.

The actions of a medical professional are put in motion by competent knowledge. Then that is what changes a patient’s life from continual pain to relief and from maladjustment to mobility. Actions of the medical professional have their own reward for him or her in a consciousness that he or she is making a difference in the patient’s life that no one else could.
The Standard for Ethical Relationships

Relationships have been built and destroyed at the hand of a medical professional intervention. Patients and doctors alike have been known to have indiscretions within the duration of a relationship. But the medical professional is to have the helm of the relationship with the client and it is his or her duty to hold a high standard for each relationship with each patient.

High Expectations
When the professional accepts the client into his or her care, there are also expectations. The medical professional has to know that the client needs a medical professional for information, wants answers from a medical professional, or is expecting to benefit from the medical professional’s expertise. This puts the professional in a very influential position with the client.

High expectations are a good thing to help keep the medical professional honest and on his or her toes. The professional will have frequent if not daily ethical dilemmas. The professional may not know what the ethical thing is to do. Because of this, it is important for the professional to have resources to confer with so that the best interest of both parties is respected.

Respects the Client Relationship
Respect for a client relationship is born out of building a partnership. Partnership speaks of equality between both parties. This means that even though the professional is superior in knowledge and expertise, the relationship with the client will be successful if it starts and continues as a partnership. The professional must have an understanding of his or her value to the client in order to make this partnership an effective relationship.

The professional needs to understand a client needs to have respect and control. Some of this control comes when the medical professional sincerely listens to the opinion of the client. In today’s world of free internet access the patient has the opportunity to research about his or her condition and to also research options for treatment.

Respecting Client Control
A client should want to have some control over his or her treatment plan because it is their body and their health that is at stake. A medical professional is not handing over the reins when he or she lets the patient dictates in some capacity. The medical professional must let the patient know how important it is that he or she accurately relay
symptoms so that the treatment plan is as comprehensive as possible. When the medical professional sets up a partnership with the patient then he or she will feel and acceptance into the professional's world. The internet is great for information but if it is not tempered by a medical professional, then the patient can be subject to information overload so he or she needs the facts, suggestions, and a treatment plan from you.

Respecting a Place of Disagreement
When the medical professional advises for a certain type of treatment plan and the patient adamantly disagrees, there will need to be a method of arriving at the right option which can be agreed on. What both parties need to understand is that respecting someone, whether it is the medical professional respecting the patient or the patient respecting the medical professional, does not mean there is 100% agreement. Effective pertinent questions will need to be asked and answered so there can be a meeting of the minds.
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