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TMD Disease: Treatment Module Three

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Educational Objectives

Upon completion of the course, the student will:

- Understand the basic treatment options for TMJ.
- Identify the differing methods of treating TMJ.
- List the steps to follow in treating TMJ.
- Identify other diseases associated with TMJ.

The Principal Goals and Philosophy

The principal goals of treatment are:

- minimal treatment
- reversible treatment
- do the patient no harm

Once the diagnosis has been made it is time to home in on specific treatment.

In the management of this disease I found it useful to break treatment into three phases.

Phase I

Phase I can also be referred to as treatment of the acute stage. During this phase the chief complaint is the focus. Once that has been treated successfully other maladies may surface. Rather than charge a separate fee and begin the process anew, I found it advantageous for both the patient and the clinician to approach TMD with a global fee for Phase I and a time limit of six weeks. Six weeks seemed an adequate time to treat the chief complaint and determine any contributing underlying maladies.

The rationale for a global fee was similar; it allowed the clinician the freedom to treat muscle spasm, nerve impingements, sprains, etc. without having to revisit fees. This is by no means set in stone; it is the method I felt best suited this syndrome.


Moreover, since most patients have a myriad of problems in this anatomical region, it aids the patient in that the treatment is not limited to one diagnosis. It benefited the clinician in that he/she is able to determine the best modalities to treat each contributing condition.



I would explain to the patient that the six week treatment is like 'peeling an onion'. There are several layers or conditions which contribute to TMD other than their chief complaint. When we are finished concentrating on one 'layer' or complaint, often another becomes evident. This approach to treatment allows the clinician to move swiftly and smoothly from one diagnosis to another and to treat them in as an

effective and efficient means possible. This phase of treatment utilized reversible methods and modalities with minimal invasiveness. In my opinion, the 'one treatment fits all' for TMD has been and continues to be a failure.

Oral Medications

	The etiology of TMD falls mainly into the range of inflammatory conditions. Therefore, the initial treatment most often includes oral medications in an attempt to reduce pain and inflammation.
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Oral medications should be considered after a preliminary diagnosis has been made and the medical history has been reviewed. Only after the clinician is certain that there are no drug allergies or interactions with other medications presently being taken by the patient should these drugs be prescribed. Consultation with the primary care physician and or pharmacist is recommended for dosages and compatibility.

Analgesic: At this time the clinician should prescribe no more powerful an analgesic than a short term dosage of extra strength acetaminophen. A good rule of thumb is not to prescribe controlled substances to 'strangers'. Get to know your patients before prescribing addictive or mood altering drugs. Remember, many of the drugs used in treatment can be abused. That being said, some aspects of TMD may require controlled substances to regulate pain. Moreover, in a TMD practice, often the patient presents with a smorgasbord of analgesic prescriptions from other offices.

Muscle Relaxants: If MPD is a major component in the diagnosis, then a skeletal muscle relaxant such as **Robaxin (Methocarbamol)** or **Flexeril (Cyclobenzaprine hydrochloride)** should be considered.

NSAID: There are several *Non-Steroidal Anti-Inflammatory Drugs* which can be helpful. Long term use should be avoided due to heart complications. Yet, long term use of drugs such as **Mobic** can be very helpful to these patients (consult with the patient's physician and pharmacist should be made).

If the patient is not able to take long term medications, a drug such as **Motrin (ibuprofen 600 mg)** administered three times a day for a period of five days can at times act as an effective anti-inflammatory (take with food).

Prednisone when administered in a dose pack will quell almost any inflammatory malady within the family of TMD maladies. Again it should not be used long term and not prescribed unless the patient's pharmacy and physician are consulted and should be taken with food.

Tramadol hydrochloride (ultram), hydrocodone, and various codeine compounds are also an effective analgesic.

There are innumerable other drugs available, but the above are on the frontline of the battle against TMD.

Nutrition counseling



This is very important in this aspect of treatment because the use of high doses of sugar, caffeine, alcohol and other simple carbohydrates have been reported to cause and or precipitate various types of headaches and/or muscles to remain in spasm (<http://voices.yahoo.com/curing-sugar-headache-5071906.html>).

It is important to remember that the goal in rendering this advice is not to lose weight; the goal is to make the patient aware that foods such as sugars, refined flour, and salt can often be the root cause of pain. Minimizing these ingredients will significantly reduce pain and improve the overall health of the patient. If he/she presents as obese referral to proper nutritional professionals is advised.

Details: I instructed the patient to write down everything that he/she ate for two days. Since the patients were seen twice a week – Tues/Thurs. it was not difficult to review their progress. This aspect of treatment was easily delegated to expert nutritional personnel within the office.

Therefore, if one has a nutritional expert on staff, the clinician may begin nutritional counseling at this time. In our office, nutritional therapy was usually rendered while awaiting the construction of the intra-oral splint.

Hydrocollator

During these appointments and after ROM and muscle palpation, the clinician should consider utilizing a Hydrocollator Unit on the most painful musculature. Although this unit is most often associated with Physical Therapy, it does not preclude the dentist from taking advantage of this modality. It is merely a hot water unit housing gel packs. The packs render hot moist penetrating heat (for approximately 15 minutes) encouraging vasodilatation and a decrease in muscle spasm.



The Hydrocollator unit is a stainless steel heated water tub into which anatomically shaped gel packs are placed. When the gel packs are properly heated, they are placed into a similarly shaped terry- cloth 'envelope' and placed onto the patient. The gel pack is too hot to come in direct contact with the skin and must be shielded with at least a terry cloth covering.

Both fibromyalgia and MPD produce muscle spasm, which in turn causes vasoconstriction. Furthermore, since the blood flow is compromised by this constriction toxic byproducts build up causing discomfort; these products further enhance vasoconstriction and the muscle enters a seemingly endless: pain-spasm-pain cycle.

Increase in circulation not only carries away toxins, but brings in needed oxygen and nutrients restoring the muscles into proper physiologic function

Vasodilation opens both capillary and lymphatic beds to carry away the buildup of toxic byproducts of metabolism to proper organs for detoxification and expulsion.

Obviously, the area of greatest pain and concern are targeted first. The clinician should be guided by the palpation chart as to the area best suited for this modality.

What is more this modality in itself is not to be construed as a cure all, but it is a great adjunct to assist the TENS Unit, oral medications, and splint therapy.

Transcutaneous Electrical Nerve Stimulations (TENS Unit)



The TENS unit is an electrical device which sends comfortable impulses through the skin, which in turn stimulate the nerve (or nerves) in the treatment area to relax capillary and lymphatic beds (see above) into a state of vasodilatation. In many cases, this stimulation will greatly reduce or eliminate pain.

Pain relief varies from individual to individual but many patients report the reduction of pain as lasting longer than the actual period of stimulation (sometimes as much as three to four times longer, and others, to a much lesser extent, attain freedom from discomfort). In resistant cases, pain is only modified while stimulation actually occurs.

The leads can be placed on the same target muscles identified by patient. One must follow instructions for indications and contra indications provided by the manufacturer. The TENS unit also acts to depolarize muscles hence stopping the pain/spasm/pain cycle common in MPD and Fibromyalgia. Some patients are encouraged to purchase these units for use outside of the office.

Frequently TENS Therapy can be administered to the appropriate musculature simultaneously with hydrocollator packs. Both of these modalities are reversible and minimally invasive. Moreover, many times these treatments are a great aid in reducing discomfort.

This therapy is continued throughout Phase I as long as there is discomfort, even after splint therapy. As these muscles relax the closing arc of the mandible may be affected, therefore, the splint should be checked and rebalanced after hot moist heat and TENS therapy have been accomplished.

Splint Therapy



The next aspect of treatment is proper splint therapy. There is not one splint that is proper for all treatment. The incorrect splint will worsen the condition, as much as the proper splint will improve it. But make no mistake, more times than not, proper splint therapy is the most effective treatment rendered; if the etiology is dental it may very well be curative, if it is not, it will alleviate symptoms and lead to proper alternate treatment or referral.

Splint therapy is an ideal treatment in that it meets our criterion of being both reversible and minimally invasive. Our goal is to have the proper splint in place at the end of the first week (in cases which did not involve a closed lock-- see below).

With palpation and ROM exams at each appointment painful structures can be targeted for proper treatment (see below). Splint therapy should be given a minimum of three weeks to ascertain effectiveness, unless pain is increasing. If pain is increasing, the diagnosis must be revisited.

Diagnosis MPD/Muscle Spasm

There are a several types of splints. Each has an expert advocate who claims that theirs is the cure-all and can be utilized for all TMD maladies. This is simply not the case. For the beginner it is necessary to master a Lucia Jig which allows the condyle to slide posterior and superior. If this simple device is successful it connotes a healthy joint. An maxillary splint which incorporates ideal occlusion (cuspid and anterior guidance without balancing side contacts) can be constructed. For those patients who cannot tolerate a maxillary appliance, a lower splint with an anterior 'cap' providing anterior and cuspid guidance can be prescribed (combi-splint).



Combi-splint

If the Lucia Jig has caused an increase in pain then the etiology is likely the joint itself. The Lucia Jig should be discarded and an NTI anterior splint placed.

Diagnosis Disc Displacement



This splint increases the vertical dimension while simultaneously encouraging the condyle to reposition anteriorly. If the disc injury is recent (acute) and can be recaptured, this device will be successful. If the disc displacement is chronic a recapture splint may be attempted.

Once this diagnosis has been confirmed the treatment will likely enter Phase II and III.

Other Types of Splints

Splint therapy is often the most important aspect of long or short term dental treatment of TMD. **The question should not be if one should place an occlusal splint, but what splint should one place.** There are many types of occlusal splints available to the clinician. Each is curative for a specific aspect of the disease. The greatest failure of the TMD clinician is to use one splint as universal for all maladies.

In any discussion of splints one must categorize them by their major difference: maxillary or mandibular. Maxillary splints are generally favored by the profession because they require less attention. A maxillary splint once balanced tends to stay balanced. This is in no small part due to the fact that although we were taught that cranial bones are fixed joints, they are not (Upledger, J.E. & Vredevoob, J. D., 2017). The maxillary splint tends to keep these sutures from moving, hence less adjustment. Unfortunately along with less adjustment comes less healing and the patient cannot achieve maximum benefit from this modality.

Moreover, not only is the mandibular splint more favored by the patient for ease of use and esthetics, but also it allows the movement of the cranial sutures. Therefore, for long

term use and greater compliance, a mandibular splint should be considered.

The following is not an exhaustive list of splints, but attempts to establish a splint/diagnosis relationship.

Maxillary splints



Lucia Jig – ligament posterior position tests integrity of capsular ligament; covers only maxillary anterior teeth; has 'ramp' which guides mandible posteriorly. Used to diagnose condition of joint



NTI – like the Lucia jig covers only the anterior teeth but instead of 'ramp' it has a flat surface which increases the vertical dimension and allows the condyle to move down the fossae into a forward position encouraging the recapturing of the disc; this device is made chair side – used for disc pathology

* Neither the Lucia Jig nor the NTI are to be worn long term due to intrusion and extrusion problems which will eventually occur

- Centric ligament position (formerly referred to as a Centric Relation Splint) which incorporates cuspid/anterior guidance is used only when capsular ligament is intact and prepares muscles and tendons for occlusal equilibration or registration of centric ligamentous position of condyle in fossae; incorporates the all aspects of the Lucia jig in the anterior aspect (see above) - used to relax musculature.
- Centric Occlusion Splint with cuspid/anterior guidance) use position of maximum inter-cuspatation used to relax musculature.



Myomonitor Splint - TENS Unit (Myomonitor) used to relax musculature and then record a true muscular position and vertical dimension without interference of occlusal contacts.

- Flat Splint – used to relax musculature
- Soft Splint – used to relax musculature
- Pull Forward Splint – used to recapture disc
- Sved Splint* used as aid to position cranial bones (contact of the area of the maxillary first molar only) – often used in conjunction with referral treatment by chiropractor or osteopath

Mandibular Splints – History

Gelb: lower splint the vertical dimension is increased but it does not incorporate anterior or cuspid guidance; moreover, long term use may lead to intrusion of teeth; utilizes a metal lingual bar for strength.

Jenkelson: use of myomonitor does not necessarily pay attention to anterior or cuspid guidance; is concerned mainly with muscular position and vertical dimension as well as free-way space**. Is made entirely of acrylic and subject to breakage.



Combination splint: considers proper vertical dimension as gained from TENS (Myo-monitor) and gains its strength from a stainless steel lingual bar similar to the Gelb splint. It also incorporates both anterior and cuspid guidance and attempts to duplicate ideal occlusion for long term use (Bellavia, WD Temporal Mandibular Joint Handbook of treatment Modalities; 1985, self-published.)

*Cranial bones do move in a minimal expansion and contraction, and a variety of conditions can be caused by trauma to the head, neck, and spine. The treatment of these maladies falls under the profession of Cranial Osteopathy, an Osteopathic Specialty (this condition may also be treated by specially trained dentists, depending on state regulations, and chiropractors).

When one places a maxillary splint it locks the palatal suture so that the splint stays balanced. If the sutures have not been injured the maxillary splints will suffice and the patient will improve. If the suture movement has been altered, then a mandibular or

maxillary Sved splint should be considered. The preferred mandibular splint, in my opinion, is a 'combi' splint (designed by this author, WD Bellavia). This splint is the most anatomic and is balanced (cuspid and anterior guidance). (See Upledger reference above)

** Free-way space is the space between the maxillary and mandibular teeth when the jaw is at rest.

New in Temporary Splints

According to Dental Research Journal, "The Aqualizer™, a hydrostatic oral splint, is a newer application that automatically eliminates the distorting influence of the occlusion on the functional position of the jaw, harmonizing muscles, bite, and body. Simple insertion of the Aqualizer™ bite splint creates a muscle-dominant functionally generated occlusion instantly. This occurs because the Aqualizer™ facilitates muscle-dominated mandibular repositioning while it equalizes, axializes, balances, distributes, and makes simultaneous all occlusal forces (Srivastava et al., 2013).

Further supporting this type of temporary splint in certain cases, is Spear Faculty and contributing author, Gary DeWood, who states, "A posterior-contact-only appliance can be life altering to wear when a patient is suffering from pain of an intra-articular origin. Because they 'unload' the joints by minimizing the force passed through them when teeth contact, they are often the only way to get a patient with intra-articular pain more comfortable. When a pre-fabricated temporary posterior appliance is required, my selection is the Aqualizer. An Aqualizer is composed of two reservoirs filled with water that cover the occlusal surfaces of posterior teeth. The reservoirs are connected by a channel that 'equalizes' the Aqualizer by moving water between the two reservoirs to produce equal pressure. Joints love the support that the Aqualizer provides. (Figs. 7-9)" (DeWood, 2015)



Aqualizer™ Taken from: <https://www.speareducation.com/spear-review/2015/09/temporary-occlusal-appliances> August 2017

DeWood goes on to recommend a great temporary splint for anteriors:

"Any anterior appliance that will be sent home must be large enough to resist

swallowing and aspiration. I want one that is very easy to fabricate, insert and adjust. It would be beneficial if it could also provide me with some information about what a patient does with his or her teeth by creating wear on the appliance that we can read. A QuickSplint appliance nicely fulfills these requirements.

The QuickSplint is lined with bite registration material, the excess is trimmed away, and the patient can be sent home with instructions for wearing the appliance. The chairtime required is minimal, and the functional surface of the appliance is made of material that is designed to wear, illustrating for me the pattern of parafunction. (Figs. 1-6)" (DeWood, 2015).



Quicksplint TM Taken from: <https://www.speareducation.com/spear-review/2015/09/temporary-occlusal-appliances> August 2017

Comparison of Splints

COMPARISON OF SPLINTS										
NAME	FARRAR	GELB	JENKELSON	SOS-FOX	TANNER	SEARS PIVOTAL	PH GUARD FLAT	FUNT PIVOTAL	SOFT	COMBINATION TANNER JENKELSON GELB
UPPER	YES	NO	NO	YES	NO	YES	YES	YES	YES	NO
INTRUSION	NO	YES	NO	NO	NO	POSSIBLE - EXTRUSION ALSO POSS.	NO	NO	NO	NO
CAPTURE	YES	NO	POSSIBLE	NO	NO	POSSIBLE	NO	POSSIBLE	NO	YES
ADJUSTMENT EASE	NO	YES	YES	YES	YES	EASIEST	NO	YES	YES	YES
STRENGTH	YES	YES	NO	YES	NO	YES	YES	NO	NO	YES
MODE OF CONSTRUCTION	SALT/PEPPER OR VACUUM	BAR ACRYLIC	ALL PLASTIC	VACUUM SELF CURE	ALL PLASTIC	ALL PLSTC. MOLARS ONLY	ALL PLSTC.	SOFT MOLD HARD PIV.	VACUUM FORMED	PLSTC. & METAL
CONSTRUCTION POSITION WHEN/WHERE USED	MANIP. CLOSING LOCKS EARLY MEDIAL RECIP. CLICK	ANATOMICAL X-RAY M.P.D. POST CAP.	T.E.W.S. MYOPRINT M.P.D. VERTICAL CRITICAL	CENTRIC RELATION M.P.D.	CENTRIC RELATION M.P.D. POST CAP.	VARIES M.P.D. DISC	CENTRIC RELATION BRUXISM M.P.D. POST CAP.	VARIES CRANIAL DISC	CENTRIC OCCLUSION BRUXISM M.P.D.	MYOPRINT MANIP. CENTRIC DI B M.P.D. Etc.
EASE OF CONSTRUCTION	DIFFICULT	EASY	DIFFICULT	EASY	EASY	EASIEST	DIFFICULT	EASY	EASY	EASY
ANTERIOR GUIDANCE	NO	SELDOM	YES	YES	YES	YES - NOT CONVENTIONAL	NO	YES - NOT CONVENTIONAL	NO	YES

Diagnosis MPD - Vapo-Coolant Sprays

Treatment of spastic musculature and or trigger points has been treated successfully with Fluormethane vapo-coolant sprays (see Travell above). Fluoromethane spray is nontoxic and tolerated well if inhaled. The trigger area is stretched by the clinician and the muscle is sprayed from origin to insertion (do not spray in back and forth motion). The clinician can utilize several sweeps with an optimum speed approximately 4 inches per second. Do not frost the skin.

This treatment should be followed by the use of hydrocollator gel pack for at least five minutes for optimum results.

The mechanism: the spray crates an afferent barrage to the myelinated nerve fibers (hot and cold) which in turn overwhelms the central nervous system taking up receptor sites commonly used by unmyelinated (slower) afferent neurons carrying painful stimuli.

Diagnosis MPD – Electro/Ultrasound Therapy

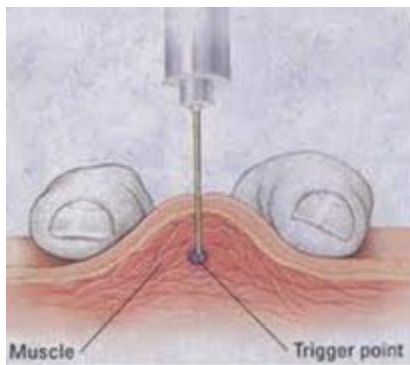
These are helpful modalities which can be used by a physical therapist or chiropractor.

Diagnosis MPD Muscle Spasm Resistant to TENS, Hydrocollator, and Splint Therapies Consider Injections

Injection Therapy

Trigger points are common in MPD as well as Fibromyalgia. They are areas or nodules of hyperactivity within a muscle. These areas are exquisitely painful to the touch and readily identified via palpation <http://www.triggerpoints.net/>.

The areas consist of concentrations of toxic byproducts of metabolism and the ensuing vasoconstriction does not allow adequate blood flow to bring in needed oxygen or eliminate harmful toxins. Therefore all injections into these areas must encourage vasodilatation. The use of epinephrine or other vasoconstrictors common in commercial preparations of dental local anesthetics must be avoided.



The most successful treatment of these areas utilizes a technique pioneered by Janet Travell, MD called dry needling (Travell, J.B. & Simons, D. C., 2013). This technique does not utilize any drugs. The clinician stimulates the trigger area with repeated shallow penetrations of the trigger area (muscle) by the tip of the needle. This often times will produce depolarization of said muscle. The ensuing relaxation of the muscle causes vasodilatation.

If this technique is not successful then an injection with local anesthetic (w/o vasoconstrictor) is recommended. Procaine is the drug of choice.

Successful treatment occurs when the trigger area subsides and or the relief of pain outlives the effect of the local anesthetic. If the muscle no longer exhibits a trigger point upon subsequent visits no further treatment is necessary. If the trigger persists, then re-inject using the local anesthetic (w/o vasoconstrictor) should be considered.

Botox Injections

The literature is replete with clinicians expressing the virtues of Botox injections into these muscles. Nevertheless, in a double blind study conducted by Dr. Susan Herring of the University of Washington in Seattle, strongly indicated the effectiveness of botulinum toxin type A for persistent myofascial TMD pain was no better than injections of saline. Therefore, I cannot recommend the use of this pharmaceutical when less costly and more effective drugs are readily available.

In a July 2015 article on the TMJ Association, Ltd website, it revealed astounding research against botox! It says, “An article published online in the journal Bone¹ by a team of French investigators [Kun-Darbois, J.-D., Libouban, H., Chappard, D.] confirms that injecting Botox® into jaw muscles leads to significant bone loss in adult rats. Two jaw-closing muscles—the right masseter and right temporalis, were treated, and the rats were compared with control animals that had salt solution (saline) injected into the same muscles. The authors were primarily interested in the mandible and whether it would lose bone when these muscles were injected with Botox®, which is a neurotoxin that causes temporary muscle paralysis. (This is similar to the bone loss experienced by astronauts in spaceflight conditions because bone is not subject to normal gravitational forces.) The Botox® rats evidently had some trouble chewing, because they lost a little weight, whereas the saline animals gained during the study. The mandibles were examined in detail one month after the Botox® or saline injections. Saline injection had no effect, with right and left sides of the mandible the same in all measurements. The uninjected left sides of the Botox® rats remained in the normal range, but on the injected right sides, substantial bone loss occurred. About 20% of bone was lost from a part of the mandible that supports the teeth while 35% was lost from the head of the mandible (the condyle). It is particularly striking that the loss was so rapid, taking place in only 4 weeks. Another finding of interest was that on the Botox® side, a lump of bony tissue formed where another muscle (the digastric) attaches to the mandible. The authors speculate that the digastric had become overactive in an attempt to compensate for the paralyzed muscles. The authors point out that if bone losses of this scope occur in the human mandible after Botox® treatment, patients might be at serious risk of jaw fractures. With this paper, mandibular bone loss (osteopenia) following Botox® injection into jaw muscles has now been demonstrated in two different animal species. A previous study on rabbits (Rafferty et al. Bone 50:651-662, 2012) also showed extensive bone loss in both the condyle and tooth-supporting region one month after masseter injection. That study also showed that the condyles were still osteopenic after a 3-month recovery period, and it is not clear whether full recovery ever takes place. This confirmation of bone loss in an unrelated mammal (rabbits are not rodents) strongly implies that the phenomenon must affect humans as well. A preliminary study (Raphael et al., 2014) in which members of the TMJ Association participated indicated that humans do indeed lose condylar bone after Botox® treatment of the jaw muscles. Patients and practitioners need to be aware that jaw muscle activity is an important element of jaw bone health, and that removing muscle activity with paralytic agents like Botox® has a deleterious effect.” (TMJ Association, Ltd, Kun-Darbois et al., 2019)

Continued Evaluation

If muscles, tendons, joints do not respond after four weeks (splint delivered at the end of the first week and the patient was seen twice a week), and after a course of oral

analgesics and or anti-inflammatory drugs, muscle relaxants, and nutrition counseling and if the patient claims he/she has been compliant, the following must be considered:

Is the diagnosis correct?

Patient compliance – has the patient followed the instructions for the use of the splint and is he/she taking medications properly. What is more, have they followed nutrition instructions?

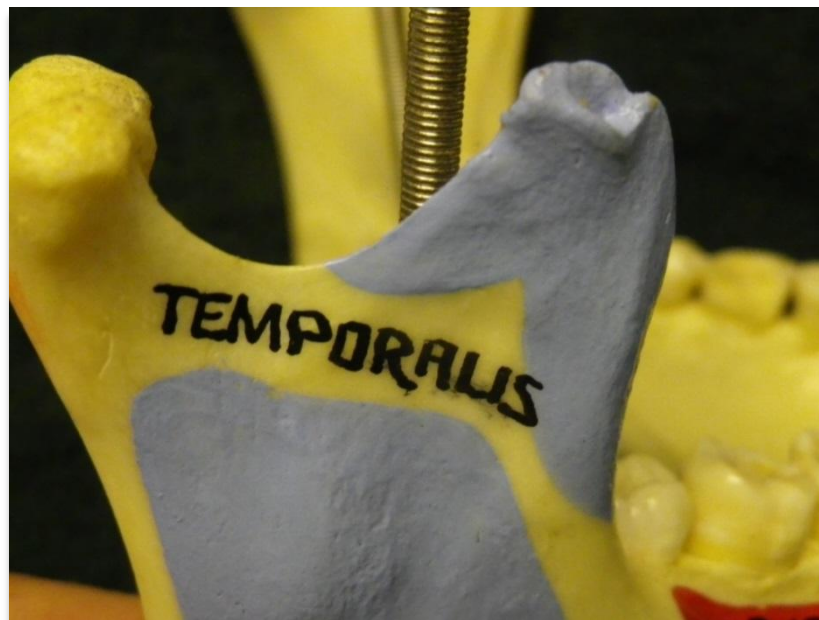
Corticosteroid Injections

Corticosteroids - methylprednisolone acetate – brand name Depro-Medrol 10 mg/cc. This injectable can be mixed with the local anesthetics injected into insertion sites of affected ligaments and tendons.

Diagnosis Temporal Tendonitis/Stylomandibular Ligamentitis/TMJ Capsulitis

The sites of insertions of both tendons and ligaments into bone are basically avascular.

Stylomandibular Ligamentitis is the king of referrals. It masquerades by sending pain throughout the face and dentition. It has also been referred to as Ernest Syndrome (Shankland, WE, 1987).



Note the arthritic change on the above dried specimen most likely caused by temporal tendonitis at the insertion on the coronoid process

Temporal Tendonitis sends (refers) most pain over the temporal muscle and has often

been called a “migraine-mimic”. It is associated with severe headaches (Ernest, Edwin III, 2017).

Therefore, in order to insure long lasting pain relief at these sites, injections of local anesthetic should contain vasoconstrictors. The drug of choice is Xylocaine (fast acting) with vasoconstrictor. After the Xylocaine has acted and it has proven effective by eliminating the pain at palpation and the referral sites, it should be followed by Marcaine with epinephrine. Although Marcaine takes longer to take effect than do most other local anesthetics, its duration is almost twice as long as others. Corticosteroids are added to the Marcaine (see below).

Stylomandibular Ligamentitis

The insertion of the stylomandibular ligament is often the source of pain in the head and neck. This can refer pain throughout the region (see below).



TMJ

Although success of corticosteroids injected into the TMJ has been proven in juvenile idiopathic arthritis of that joint (TMJ), caution must be taken when injecting steroids into a fibrocartilage joints for fear of steroid necrosis with repeated applications. My rule of thumb was a maximum of two steroid injections into the TMJ.

These injections can be painful; therefore it is important to first use a fast acting local anesthetic such as Xylocaine with epinephrine (1/100,000) to anesthetize the area. Next inject a mixture of prednisone 10mgr (see above Depro-Medrol) and Marcaine.

Conclusion Phase I

If Phase I treatment has been successful and pain no longer exists, the patient is dismissed and splint is used as a night guard.

The patient is then scheduled for a follow-up ROM and muscle palpation in approximately four weeks (new fees apply). If all is well, they then move to a six months office visit and are dismissed back to the referring dentist or into your own re-care system.

If the patient has not improved, referral must be considered (see below Phase II).

A third scenario is that the patient has improved, but the splint must be worn full time. This is common in vertical dimension and/or lack of anterior guidance considerations. Phase II should be initiated with these patients as well (see below).

Phase II

In Phase II our goal is to wean the patient from full time use of the splint and determine their ability to live comfortably without the increase in vertical dimension and condylar position provided by the splint.

This is a phase in which the clinician attempts to decrease the dependency of the patient to her/him and takes a watch and wait approach to establish the success of Phase I or necessity for more treatment. Fees are applied for treatment as it is rendered. In this phase the dentist should consider referrals, reshaping of teeth (occlusal equilibration), and observation.

Diagnosis MPD - Occlusal Equilibration

The only exception to the avoidance of permanent dental change in Phase II is the process of limited occlusal equilibration. The goal of the clinician is to eliminate all balancing side contacts and (if possible) establish cuspid and anterior guidance.



Since this is a permanent treatment it should first be attempted via mounted study models. By spraying the models with paint and then removing the offending 'tooth' structure it can be determined if the clinician is able to accomplish this procedure by reshaping enamel without exposing dentin. If this cannot be accomplished on the study models then a permanent solution, via fixed or removable prosthesis should be considered in Phase III.

Referrals

Surgical Referral

If the joint is the definitive cause of pain; i.e. pain is relieved via auriculotemporal block and the diagnosis of proper sophisticated radiographic surveys agree with clinical evaluation, a surgical referral should be made. Post-surgical follow up and/or occlusal rehabilitation will be necessary as a Phase III treatment. The surgeon will determine whether the patient is in need of lavage or open surgery.

Referral for Counseling



When the patient presents as an emotional or depression risk, then referral to a Professional (psychologist, psychiatrist, or counselor) in a team approach must be considered.

Moreover, if the joints, musculature, tendons, and or ligaments are deemed to be the source and have been successfully treated, but the pain persists referral for counseling is strongly advised.

Chiropractic or Physical Therapy Referral

When Phase I treatment has had limited success, but the clinician is certain the etiology is physical, referral to an Osteopathic Physician, Physical Therapist, or Chiropractor should be considered.

Conclusion Phase II

Phase II treatment is concluded after approximately 8-10 months. It is mainly a referral and 'watch and wait' phase to protect the patient from overzealous dental treatments which time alone may heal. If the patient is now pain free but still dependent 24/7 (not night guard use) on her/his splint, then phase III must be initiated.

Phase III Treatment

The goal of Phase III treatment is to render to the patient a long lasting solution for their need of an increase in Vertical Dimension and or jaw repositioning. Therefore, other than post-surgical rehabilitation Phase III treatment is aimed at a stable jaw position guided and supported by the dentition.

This phase entails a permanent change in both condylar position and the dentition, therefore should be undertaken only when the patient has been unable to function without using her/his splint 24/7. A patient who is still in need of a 'night guard' does not qualify for Phase III treatment, only those who are not able to function without the 'splint

position' and after a pain free Phase II has been accomplished.

Time Interval One Year after Phase I

If the patient has not been able to wean from the splint (and wearing full time) and every attempt at weaning has failed (over a minimum period of 12 months), then a permanent increase in vertical dimension should be considered. This can be accomplished by:

- Orthodontics/orthopedics
- Bonding
- Crowns and Bridges
- Overlay Partial
- Fixed and or Removable Prosthesis incorporating implants
- Full Dentures

Occlusal Position

No matter the method chosen the splint position must be the goal of treatment in Phase III. The easiest method to capture this position is to use the splint as a guide by using a 'wash' material in the splint (thin or liquid material, i.e. silicone impression material, etc.) and placing it into the splint, then over the dentition using the splint + the 'wash' to mount the study models.

When fixed prosthetics is the treatment of choice it would be best to preparing one side at a time. When one side is prepared the record may be taken (see above). The unprepared side would act as a guide for an accurate jaw position. After preparation of the opposite side use the impression wash/splint as a matrix for the second wash of the newly prepared side.

In the case of orthodontics/orthopedics, removable prosthesis, and bonding mounted study models using the splint 'wash' technique will act as the guide and goal for the final orthopedic position.

Review and Detailed Treatment of Disorders Inclusive in TMD

Disc Displacement leading to Osteoarthritis

- **Early click:** MTI Splint or pull forward splint (both maxillary) to be worn 24/7 only removed for cleaning. **Surgical soft diets are mandatory for all attempts to 'recapture' disc dislocations.** Attempting to recapture the disc and place the condyle in the proper position for the healing of the capsular ligament (6 week splint therapy).

If a 'pull forward' splint is used it must be slowly altered allowing the condyle

to slowly recede into its original position (if possible). After the flattening of the pull forward splint or weaning off the MTI the patient must be placed on a night guard (usually a maxillary splint reflecting their centric occlusion incorporating anterior and cuspid guidance) for an extended period of time. Thus, the patient will continue long term 'night guard' therapy. If the patient is unable to function without full time use of the splint in the new orthopedic position, Phase II and III treatment must be considered.

- **Moderate click:** treat same as early click
- **Late click:** treat same as early click but inform patient the later the click the worse the prognosis for non-invasive treatment, most likely will need Phase II and III treatment or perhaps surgical intervention
- **Closed Lock:** the disc is trapped anterior and medially to condyle preventing both lateral and anterior movement on the affected side. Have patient open as wide as possible. The clinician should place their thumb over the mandibular molar teeth of the affected side and with a forceful and sudden push down ward the disc should 'pop' back on the condyle. **Then proceed as with early click.**
- **Open lock (dislocation of mandible):** this occurs when the disc is trapped posterior to the condyle or the condyle has 'over shot' the eminence of the fossae. In either case the joint must be reduced. Use the same method above in the open lock to reduce the dislocation. If the condyle chronically dislocates beyond the eminence of the glenoid fossae an eminence reduction should be considered (referral to oral surgeon).



Myofascial Pain Dysfunction: Recommended Treatment

- **Hydrocollator**
- **TENS**
- **Splint:** begin with Lucia Jig to ascertain condition of joint; if successful proceed to maxillary splint incorporating anterior and cuspid guidance; if joint is involved see above (MTI).
- **Trigger** Points sprayed and injected (no epinephrine)

- **Fibromyalgia** – after diagnosis refer to primary care physician
- **Nutrition**

Tendonitis (Temporal)

Palpate (intra-oral) coronoid process.

If positive inject this area with Xylocaine. If the pain dissipates follow with Marcaine (long lasting anesthetic) with epinephrine plus corticosteroid (prednisone 10mg).

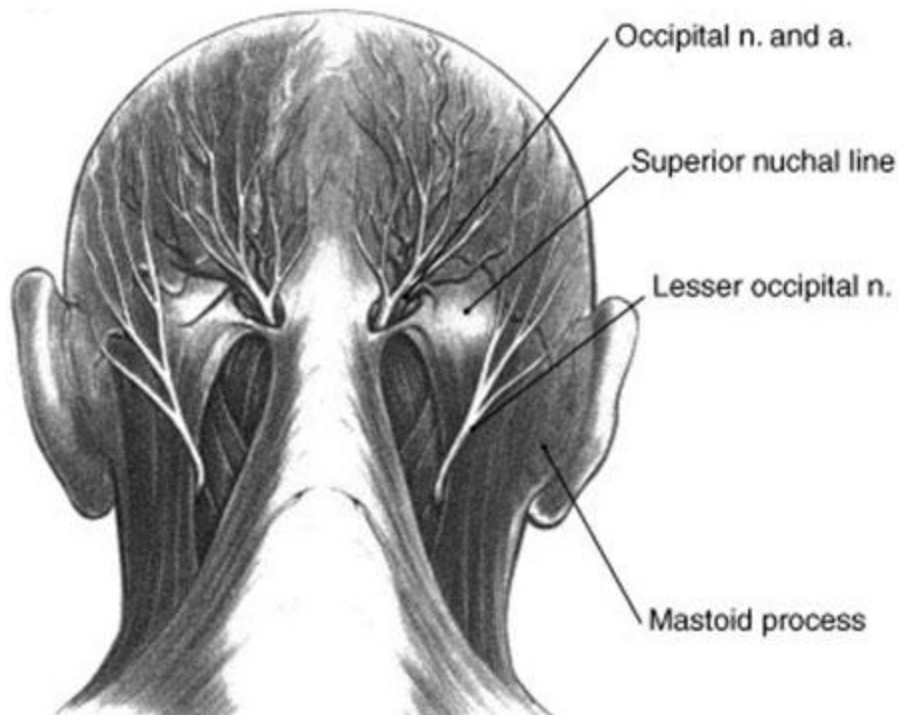
Ligament tear, sprain, ligamentitis, stylomandibular ligament injury (*the king of referral pain*). The key to this injury may not just be pain upon palpation at the angle of the mandible, but the referral of pain which is often the patient's chief complaint. Therefore, a thorough palpation of all structures on the chart should be accomplished at each visit in order to make a proper diagnosis and render proper ensuing treatment. After the Xylocaine has been injected the referral pain should be resolved.

Stylomandibular Ligament Injury (tear, sprain): Palpate the angle of the mandible (external) to ascertain the condition of the insertion of the stylomandibular ligament. If it is inflamed the palpation will elicit pain and has several areas to which it refers pain (see below).

If palpation is positive consider injection with Xylocaine with epinephrine. If the pain dissipates it should be followed with Marcaine (long lasting anesthetic) with epinephrine plus corticosteroid (prednisone 10mg.) (Shankland, WE 1987).

Greater and Lesser Occipital Nerve Impingement

The palpation of these structures is easily accessible. The treatment is injection at the point of pain with Xylocaine. If the pain dissipates then the injection is followed by Marcaine and corticosteroid. The dentist must check with her/his state dental association to ascertain if the state practice code allows them to treat this area. Therefore, after diagnosis referral may be necessary.

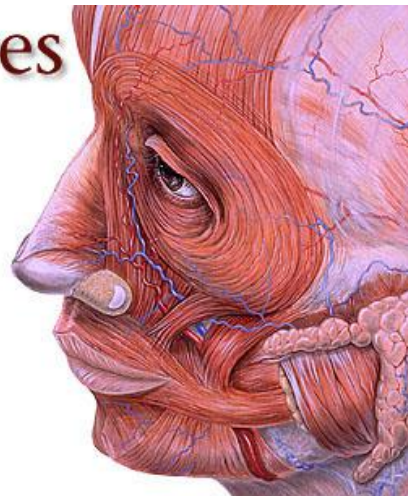


Neuralgias (Cranial Nerve)

After the diagnosis has been made referral for treatment should be made to a neural surgeon, neurologist or oral surgeon (Trigeminal neuralgia) and or ENT for glossopharyngeal neuralgia. Treatment may run the gamut from Tegretol (oral medication, Carbamazepine) to brain surgery. Serious side effects have been reported including erythema multiforme or Steven Johnson's Syndrome and blood life threatening dyscrasias with the use of Tegretol. In my opinion, prescription of this drug falls outside of the parameters of dentistry.

Cranial Nerves

- I Olfactory
- II Optic
- III Oculomotor
- IV Trochlear
- V Trigeminal
- VI Abducens
- VII Facial
- VIII Vestibulocochlear
- IX Glossopharyngeal
- X Vagus
- XI Accessory
- XII Hypoglossal



However, that is not to say that all treatment falls outside of dental expertise. Success has long been reported with the use of injections to obliterate peripheral nerves utilizing absolute alcohol. This modality is especially useful, although not a permanent cure, in medically compromised patients or patients not wishing to undergo other forms of treatment. Injections of Xylocaine (with epinephrine) are first used to make certain the site is accurate via the elimination of pain. Then the clinician may proceed with the alcohol injection (Shah, SA, Khan, MN, et. al. 2019).

These injections are frequently intraoral and likely fall within the dental practice code of most states, but the clinician is responsible for reviewing these parameters in her/his individual state.

What is more, I have found the routine use of occlusal splints to be of benefit to most of these patients, and seemed to improve successful treatment (this is a clinical observation and has not been proven via a double blind study).

Dental Disease/Differential Diagnosis

Dental Disease

Dental disease often refers pain to the TMJ, sinus, or ear, and may well cause headaches. Although periodontal disease rarely causes referral and/or discomfort, both pulpal and periapical pathology often do. Moreover, both frequently refer pain to other areas in the head and neck. As stated in the diagnostic module of this course another area of underdiagnosis is periapical neuralgias better known as 'dry sockets'.

Dry Socket



Dry Socket

Dental Pathology may be the best reason to insist on a panoramic radiograph or full mouth set of x-rays in the examination phase.

Treatment of these conditions (periodontal, pulpal, and periapical pathology) is well documented and basic in dental school training, therefore, will not be covered in this segment.

Iatrogenic TMD

It is often true that the extraction process itself, as well as long dental treatment may precipitate, or even be the primary cause of TMD. The clinician must guard against iatrogenic TMD by allowing the patient several breaks during treatment and placing a balancing force opposed to the extraction force so that the TMJ will be protected from possible dislocation.

Other areas of Differential Diagnosis include:

Sinus Pathology: sinusitis, ethmoid, sphenoid, and most often maxillary may refer pain to many regions of the head and neck. Treatment should be referred to the patient's medical clinician.

CNS Diseases (i.e. TIA, stroke, Multiple Sclerosis, etc.) can be screened via examination of the cranial nerves (see Diagnosis), but definitive diagnosis and treatment resides with our medical colleagues.

2017 Newer Alternative Treatments / Less Invasive

In a 2016 RDH Magazine online article titled "Treating TMD with orofacial myofunctional therapy" by authors Timbrey Lind, RDH, and Shirley Gutkowski, RDH, BSDH they explain an intriguing newer, less-invasive alternative for some (not all) TMD sufferers:

A study done by a TMD expert and OMT leader in São Paulo, Brazil, Claudia Maria de Felicio, called 'The Effects of Orofacial Myofunctional Therapy on Temporomandibular Disorders' reported, 'OMT had... a significant reduction of pain sensitivity to palpations for all muscles studied... increased measures of mandibular range of motion... reduced frequency and severity of signs and symptoms...' With orofacial myofunctional therapy, a main goal is to establish nasal breathing and correct oral posture by toning and repatterning the head and neck muscles. By 'repatterning,' I literally mean re-creating strong pathways between the brain and these muscles. This is what makes it so successful. We do this by identifying compensations. When we focus on establishing nasal breathing and correcting oral posture, this insinuates a lip seal and tongue to the palate at ALL times, unless they are in use. An article written on lack of lip seal (Harari et al., 2010) and how it leads to occlusal dysfunction goes right along with the video I recommended. Training children to keep their lips together and tongue to the palate encourages balanced muscles and forward growth in their faces. Harmonious muscle pattern is important to correct a muscle-related TMD. Myofunctional therapists are trained to identify compensations such as mouth breathing and eliminate habits that develop because of the compensations. This allows the muscles to habituate into a physiological normal way. Doing the least

invasive treatment first is always best (Lind & Gutkowski, 2019).

Conclusion

TMD is not a disease; it is a syndrome consisting of several maladies. In this author's opinion the disorder is best treated in phases with a global fee in Phase I. The clinician must become adept at flowing from malady to malady as she/he peels the layers of this debilitating condition.

All too often the patient is rushed into an extensive surgical or dental treatment without first allowing the body a chance to heal itself. That is why I highly recommend treatment in three phases, with only the third phase rendering the patient permanently 'changed'.

The principal goals of treatment must remain constant:

- minimal treatment
- reversible treatment
- do the patient no harm

What is more, it should not be considered a failure if the patient is in need of long-term or even lifelong use of a removable splint as a 'night guard'. These devices are minimally invasive and can prevent harmful tooth abrasion as well as muscle spasm. The condition of these devices should be checked regularly at dental hygiene appointments.

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Course Test: TMD Disease: Treatment Module Three

1. Occlusal Splint Therapy is the least important aspect of TMD treatment
 - a. True
 - b. False
2. All TMD patients must undergo permanent dental treatment in order to be cured.
 - a. True
 - b. False
3. Dentists no longer need to use study models in order to treat TMD?
 - a. True
 - b. False
4. Before occlusal equilibration is accomplished on the patient this procedure should first be accomplished on mounted study models.
 - a. True
 - b. False
5. TMD is not considered mainly an inflammatory disease.
 - a. True
 - b. False
6. The patient exhibits trigger points upon palpation at the initial examination. What should the clinician do next?
 - a. Immediately inject the site
 - b. Conclude the diagnosis of MPD
 - c. Utilize TENS and Hydrocollator Therapy
 - d. Continue to question the patient to ascertain if they have MPD or Fibromyalgia

7. After the diagnosis of MPD has been made and trigger points have been located the following are methods of treatment:
- a. Injection of trigger points with Xylocaine and epinephrine
 - b. Splint therapy
 - c. Injection of trigger points with Marcaine and corticosteroid
 - d. Hydrocollator and TENS Therapy
 - e. B & D
8. All disc displacements will need a permanent change in vertical dimension.
- a. True
 - b. False
9. After the diagnosis of a closed lock is made, the following should be part of treatment:
- a. Hydrocollator and TENS Therapy
 - b. Physical Reduction of the disc
 - c. Pull forward splint
 - d . All of the Above
10. After the diagnosis of a late click has been made the following can be expected:
- a. The patient will respond to a pull forward splint.
 - b. The patient must undergo Phase III or a permanent change in vertical dimension.
 - c. The joint may undergo arthritic changes.
 - d. The patient may respond to Phase I treatment modalities.
 - e. C & D only
11. The Philosophy of Treatment Changes depending on the physical condition presented by each patient.
- a. True
 - b. False

12. When trigger points are found and other modalities have been tried the drug of choice for injection is:
- a. Marcaine
 - b. Procaine
 - c. Xylocaine
13. Trigger points should always be injected without epinephrine because:
- a. Local anesthetics with epinephrine cost more
 - b. Epinephrine causes vasoconstriction
 - c. The patient will not wish to be numb for a long period of time
 - d. Vasodilatation is caused by epinephrine
14. Spastic musculature always need:
- a. Oxygen
 - b. Vasodilatation
 - c. Vapo-coolant sprays
 - d. A & B only
15. Spastic Musculature may be helped by the following:
- a. Hydrocollator, TENS, and NSAIDS
 - b. Splint therapy and injections of procaine w/o vasoconstrictor into trigger points
 - c. Occlusal equilibration
 - d. All of the above
16. Temporal tendonitis cause severe headaches.
- a. True
 - b. False

17. Temporal tendonitis can be injected at the site of insertion on the:
- a. Pterygoid process
 - B. Angle of the mandible
 - C. Coronoid Process
 - D. All of the above
18. Stylomandibular ligamentitis should be treated by injecting the following:
- a. Xylocaine, Marcaine, and corticosteroid (anesthetics with epinephrine)
 - b. Xylocaine, Procaine, and corticosteroids (anesthetics without epinephrine)
 - c. Marcaine, Procaine and corticosteroids (anesthetics with epinephrine)
 - d. None of the above
19. When the clinician inquires about nutrition, his/her main goal is to encourage the patient to lose weight.
- a. True
 - b. False
20. Oral Medications may include the following:
- a. Analgesics and muscle relaxants
 - b. Dose pack of corticosteroids and analgesics
 - c. Controlled substances and muscle relaxants
 - d. All of the above
21. The Goal of Phase III Treatment is to return the patient to their original condylar position.
- a. True
 - b. False

22. A patient who is still in need of a night guard after one year should enter Phase III Treatment and have their dentition changed to that of the night guard.
- a. True
 - b. False
23. Permanent change in the vertical dimension of the patient is undertaken only after:
- a. One month
 - b. One week
 - c. One year
24. The Phase of Treatment associated with increase in vertical dimension is:
- a. Phase I
 - b. Phase II
 - c. Phase III
25. The best method to record the new vertical dimension is:
- a. Utilizing an accurate liquid impression material and the splint.
 - b. Pushing the mandible back and having the patient close gently into wax.
 - c. Protruding the mandible and having the patient close gently into silicone.
 - d. Using a Lucia Jig.