



Establish a Healthy TMJ

Prior to Restorative, Orthodontic
or Prosthetic Treatment

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Author: Dr. Brock Rondeau is one of North America's most sought after clinicians. He is the past president and senior certified instructor for the International Association for Orthodontics. He has an extremely busy practice, which is limited to the treatment of patients with orthodontic, orthopedic and TMJ problems. Dr. Rondeau is a Diplomat of the International Association for Orthodontics. He has published over 23 articles in orthodontic journals and has produced a series of videotapes on all phases of orthodontics. Dr. Rondeau was inducted into the Academy of Dental Facial Esthetics and received a Townie Award ("Dental Town") for 2003.

In my opinion, the dental profession has done an excellent job of training dentists to treat problems involving the teeth and gingival tissues but has been negligent in educating dentists in the diagnosis and treatment of TM disorders. The American Dental Association stated that 34% of the population in North America have at least one sign or symptom of TM dysfunction. The ADA also made the statement that dentists have the prime responsibility to diagnose and treat TMD problems to the limit of their ability.

It has been my experience in treating patients for over 30 years and teaching for 25 years that most general dentists worldwide do not feel competent to either diagnose or treat patients with TM dysfunction. This disorder has often been called the “great impostor” since so many of the signs and symptoms can mimic other disorders. These include headaches, neck pain or stiffness, earaches, congestion or ringing in the ears, clicking, popping or grating noises when opening and closing the mouth, tired jaws or pain when chewing, limited mouth opening or jaw locking, dizziness and fainting, difficulty in swallowing, pain behind the eyes, numbness in the hands, shoulder and back pain.

I firmly believe that the dental schools have to change the curriculum so graduating dentists will be competent to treat their patients. The other problem is that if the dentist is not properly trained to diagnose and treat extra-capsular and intra-capsular problems, the patient will suffer needlessly for many years, or in fact, could get worse as the restorative or prosthetic procedures performed could aggravate a pre-existing TMJ problem.

Restorative Procedure

This could worsen the situation. 1. A patient presents with a deep overbite and retrognathic mandible, i.e. Class II Div. 2. The dentist fabricates crowns on the maxillary central and lateral incisors. If the crowns are made thicker than the original teeth, this distalizes the condyle and can increase the signs and symptoms of TM dysfunction.



Figure 1

Prosthetic Procedure

If a new denture is fabricated and the posterior vertical dimension is decreased, the patient's TM dysfunction could get worse as the condyles go posteriorly or superiorly.

My experience has been that the medical profession is similarly not adequately equipped to treat these problems. They receive adequate instruction regarding all other

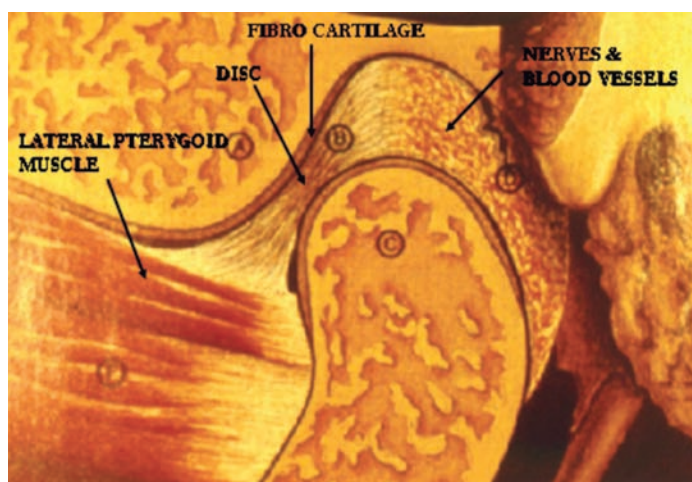


Figure 2 — Normal TMJ

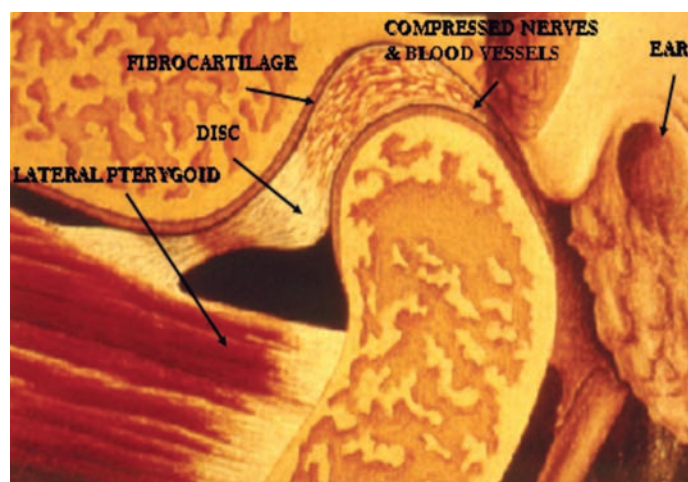


Figure 3 — Condyle posteriorly displaced

*Only a medical doctor can fix a dislocated shoulder
but only a dentist can fix a dislocated jaw.*

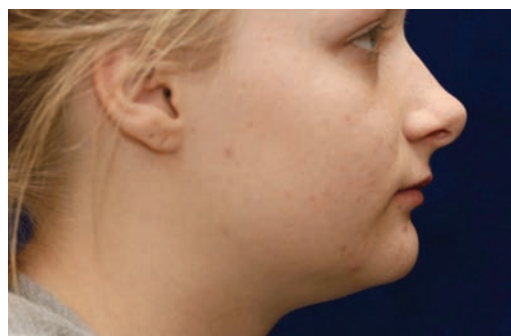


Figure 4 — Retrognathic profile

MARA Appliance

9 months



Figure 5 — Straight profile

joints of the body except the temporomandibular joint. Most medical doctors treat the symptoms with medications such as muscle relaxants, anti-inflammatories, pain medication and even anti-depressants. This is a temporary solution and is designed to treat the symptoms and not to address the causes of the problem. To permanently solve the problem, the clinician must first diagnose what is causing the problem and then treat it. The dental profession must be regarded as the primary care provider for patients suffering from TM dysfunction.

I submit that it is the dental profession's responsibility to help our patients who suffer from this disorder but I am frustrated with the lack of knowledge we received in dental school. Most of us were taught that the correct position of the condyle in the fossa was up and back and that flat plane maxillary splints and occlusal adjustments would solve most problems. This information is totally misleading and indeed false.

Most dentists are taught in dental school that the correct position of the condyle in the fossa is upwards and backwards. A careful review of the anatomy of the TM joint reveals that this could not possibly be the correct position since nerves and blood vessels occupy the area posterior to the head of the condyle. The fact is that most patients suffering from internal derangements have the condyle posteriorly displaced. The treatment of choice for these patients is to reposition the condyle downward and forward utilizing appliances such as anterior repositioning splints and functional orthopedic appliances (Twin Block, Rick-A-Nator or MARA Appliances). Following the use of these appliances, most patients experience a significant reduction in the signs and symptoms of TM dysfunction.

As you can see from the photos above there is a significant adjustment in the patient's profile.

If you do not diagnose what is causing the problem, then it is possible to make the situation worse if you implement the incorrect treatment plan.

Signs of TM Dysfunction

1. Limitation of Maximum Opening

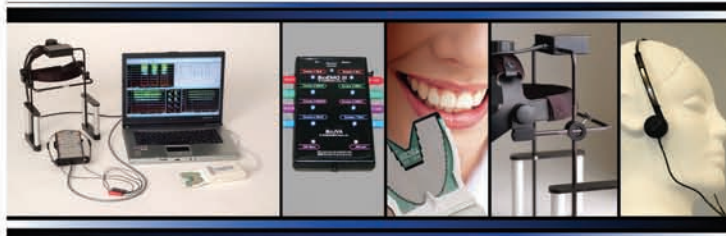
Patients with no limitation of movement can open 48 to 52 mm. This measurement is taken between the incisal edges of the maxillary and mandibular incisors when the patient has opened his/her mouth as wide as he/she can.

- If there is an overbite, you must add the overbite measurement to the maximum opening measurement.
- If there is an open bite, you must subtract the open bite measurement from the maximum opening measurement.

Limited opening could be caused by trismus due to excessive muscle contractions or an anteriorly displaced disc (closed lock disc).

2. Limitation of Lateral Movement

Patient is asked to separate his teeth very slightly and move laterally to the left side. The condyle will not be able to translate properly due to the anteriorly displaced disc on the right side and he may only be able to move 5 or 6 mm laterally in this case. In a normal functioning condyle, the lateral movements should be approximately the same on both sides and should be close to 12 mm each.



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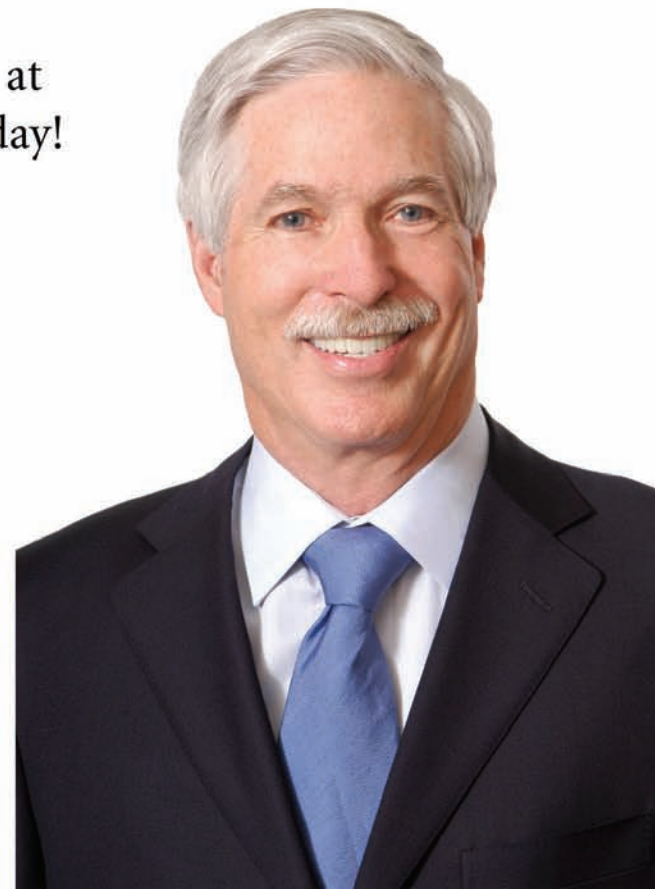
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Brock Rondeau DDS IBO DABCP



3. No Deviation/Deflection Upon Opening

In a normal TMJ without derangement, the condyles move smoothly, without jerking motions, during opening and closing of the mandible. If the condyle on the right side has an anteriorly displaced disc, the patient will deviate to the same side (right side) upon opening. Also seen with this could be an increase in velocity of mandibular opening and a click is often heard if the condyle snaps under the posterior rim of the disc. If the condyle does not snap under the disc, it will be held back and this could cause a deviation of the mandible to the right side. In a normal condyle-disc relationship, the disc is above the head of the condyle.

4. Clicking on Opening or Closing

As mentioned previously, if the disc is displaced anteriorly when the patient opens, sometimes a click occurs if the condyle snaps under the posterior rim of the disc (opening click). You could also hear a click on closing as the condyle snaps under the posterior rim of the disc (closing click).

5. Crepitus on Opening or Closing

Crepitus is a more serious condition than clicking. This is a bone to bone sound and is indicative of advanced osteoarthritis of the TMJ.

6. Pain Upon Opening

In a normal, healthy TMJ there is no pain upon opening.

7. Condyle is Flattened or There is Evidence of Beaking

The normal condyle as it appears radiographically on either the panorex, transcranial or tomograms, will appear concentric and smooth. If there is evidence of osteoarthritic changes, the condyle will be flattened, irregular and there may be evidence of beaking in extreme cases.

8. Trigger Points

One of the main causes of temporomandibular joint problems is the lack of proper posterior vertical dimension, which results in the condyles being displaced posteriorly causing impingement of the nerves (auriculo-temporal nerve) and blood vessels (superior carotid artery) in that area. This reduction in blood supply to the muscles that open and close the mandible, can lead to the muscles going into spasm with resultant discomfort.

If the muscles that open and close the mandible become shortened, this can lead to bruxism and grinding. Patients will brux as a way of preventing their muscles from going into spasm. The clinician must palpate the muscles around the TMJ carefully to check for trigger points. If there are several trigger points in the area of muscle contractions, the clinician knows that there is a problem with lack of proper posterior vertical dimension. A prime example would be trigger points evident at the zygomatic portion of the masseter muscle (the inferior portion), and the anterior fibres of the temporalis.

9. Bruxism

Grinding of the teeth at night. Look for sign of attrition on the anterior and posterior teeth.

10. Clenching Habits

These habits are aggravating to muscles of the TM joints that are already sore.

Diagnosis of TM Dysfunction

In addition to the above signs of TM dysfunction, as well as the symptoms of TM dysfunction as previously discussed, I would like to recommend the following to help dentists with their diagnosis.

1. Joint Vibration Analysis (JVA)

The JVA is a simple diagnostic device which has been utilized by clinicians treating patients with TMD for over 20 years. The JVA allows us to painlessly and easily isolate and measure any vibrations within the TM joint. A normal, healthy TMJ has no vibrations. The test itself is extremely simple, done by the staff, and takes approximately 5 minutes.

A headset similar to a stereo headset is placed on the patient's head with the vibration sensors over the TM joints themselves. The patient is simply asked to open and close the mouth 6 times and the computer will then record and evaluate the vibrations. The JVA is over 98% accurate in determining if the TMJ is normal or has an internal derangement (problem within the joint itself). Then using a simple formula supplied by BioResearch (manufacturer of the JVA), the dentist can determine, based on the vibration recorded, whether or not the patient has a normal TMJ or an internal derangement. The JVA helps the clinician determine what stage of internal derangement exists.

Summary of 5 Stages of Internal Derangement (Anterior Disc Displacement)

- Stage 1 Clicking, slight pain
- Stage 2 More clicking, intermittent locking, moderate pain
- Stage 3 Permanent locking, severe pain
- Stage 4 Early degenerative joint disease, pain
- Stage 5 Advanced degenerative joint disease, crepitus, pain

Clinicians who treat patients restoratively or prosthetically need to diagnose TM dysfunction and to be able to evaluate what stage of disc displacement (internal derangement) exists prior to treatment. General dentists and specialists need to know before they start any restorative, prosthetic or orthodontic case the state of health of the TMJ. As I mentioned previously, the TMJ must be stabilized prior to any dental procedure, except for emergency treatment. ***I urge dentists in the beginning of their treatment of patients with TM dysfunction to treat only the patients in Stage I or 2 of internal derangement or patients who have parafunctional problems due to clenching and bruxing.***

Joint Vibration Analysis (JVA) {BioResearch}

Readings are taken of the vibrations within the TM joints upon opening and closing movements. Basically, a normal joint is noiseless and has no vibrations. A pathological joint has different patterns of vibrations depending on the seriousness of the problem.

The JVA readily informs the clinician whether the joint is normal or which stage of the possible five stages of internal derangement (disc displacement) is present on either side.

The JVA is an excellent and highly accurate diagnostic device to assist clinicians evaluate and treat their patients. The purpose of the JVA is to evaluate the soft tissue and, in particular, the position of the disc in the fossa prior to treatment. If the disc is positioned too far forward because the condyle is too far posteriorly, then obviously the treatment objective would be to try and reposition the mandible forward and downward to recapture the displaced disc before permanently changing the patient's occlusion.

If you ignore the fact that the patient has an anteriorly displaced disc (internal derangement) and permanently change the occlusion to hold the disc in the incorrect position, you are treating that patient in a pathological position. If you have an unstable TMJ and the patient clenches and bruxes all night, whatever occlusion you establish for that patient would be unstable and will eventually result in fractured teeth, root canal therapy and chronic pain.

An example of this is when orthodontic clinicians extract upper first bicusps in the wrong case. If the patient has a Class II skeletal malocclusion with a normally positioned maxilla and a retrognathic mandible with an internal derangement (TM dysfunction), evidenced by signs and symptoms of TMD, limited range of motion, clicking jaw when the patient opens and closes in centric occlusion (maximum intercuspation), sore muscles upon palpation, condyles posteriorly displaced, disc anteriorly displaced, the extraction of the first bicusps in many cases will increase the signs and symptoms of TM dysfunction. I have observed this many times in my practice and have been told by hundreds of dentists worldwide that they have also observed this in their practice in similar cases.

The extraction of the first bicusps and the subsequent retraction of the maxillary anterior teeth is called retractive orthodontics. My preference for the treatment

Joint Vibration Analysis (JVA)

i)	Normal TMJ	No vibrations	Normal range of motion
ii)	Stage 1	Specific vibrations	Normal range of motion
iii)	Stage 2	Specific vibrations	Limited range of motion
iv)	Stage 3	No vibrations	Limited range of motion
v)	Stage 4	Specific vibrations	Limited range of motion
vi)	Stage 5	Specific vibrations	Limited range of motion



Figure 6 — Retrognathic profile
Headaches

MARA Appliance
9 months



Figure 7 — Straight profile
No headaches

of the patient who presents with the above malocclusion would be to utilize a functional jaw orthopedic appliance such as a Twin Block, Herbst Appliance or MARA Appliance to reposition the lower jaw and condyle downward and forward. Hopefully, the anteriorly displaced disc will be recaptured and the patient's signs and symptoms of TM dysfunction will be significantly reduced. This also results in an elimination of the clicking and the patient demonstrates less muscle soreness and a normal range of motion.

The definition of ideal TM position is based upon that of the American Association of Oral Facial Pain Guidelines, which the ADA has adopted. Dr. Jeff Okeson calls it the “optimum functional relationship” position of the condyle in the fossa when the patient is occluding in centric occlusion (maximum intercuspation of the teeth). In this position, the condyles are located supero-anteriorly in the glenoid fossa and braced against the posterior slopes of the articular eminence. The disc between the head of the condyle and the articular eminence acts like a shock absorber between the two bones (condyle and temporal bone).

Historically, many clinicians held the position that the condyle should be posteriorly and superiorly located. Checking the anatomy of the joint, this could not possibly be the case since the nerves and blood vessels are located distal to the condyle. Most patients need at least a 4 mm space distal to the condyle on tomogram x-rays to prevent compression of these retrodiscal tissues.

Currently, TMD authorities such as Harold Gelb, Brendan Stack, Ralph Garcia, Clifton Simmons, Bob Talley, Jeff Okeson, and Peter Dawson all agree that the correct position for the condyle is anteriorly and superiorly.

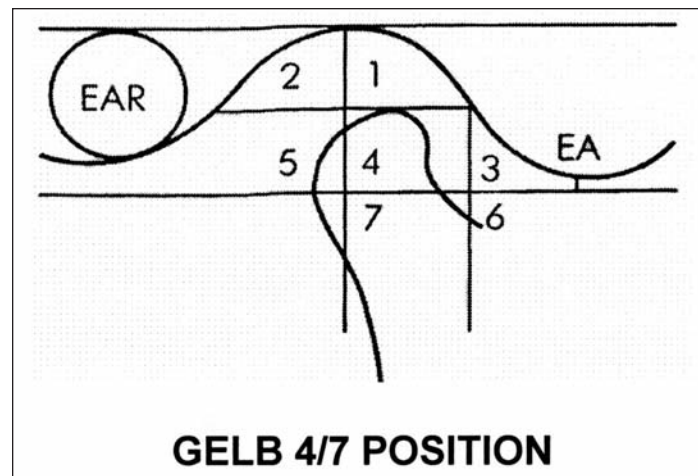


Figure 8

Some of the causes of TM dysfunction include:

1. When the lower jaw is too far back in relationship to the upper jaw, the condyles become posteriorly displaced. This causes the discs to be displaced anteriorly when the patient occludes in centric occlusion. Typically these are patients with Class II skeletal malocclusions with normally positioned maxillas and retrognathic mandibles.
2. Clenching and grinding habits — Occlusal interferences, lateral and protrusive movements
3. Deep overbite which frequently causes the condyles to be posteriorly displaced.
4. Vertical or lingually inclined maxillary incisors which cause the condyles to be posteriorly displaced (e.g. Class II Div. 2)



Figure 9 — Retrognathic profile

Twin Block

9 months



Figure 10 — Straight profile

5. Constricted maxillary arch which causes the condyles to be posteriorly displaced since the mandible cannot come forward to its proper position.
6. Forward head posture. (Class II skeletal, retrognathic mandible)
7. Other cases of TM dysfunction are trauma to the head or neck such as whiplash injuries from automobile accidents and intubation procedures in hospitals.
8. Occlusal interferences.

All of the above malocclusions and habits can be corrected at any age using various types of splints as outlined or with functional appliances. Ideally, treatment for the malocclusion such as narrow upper arches, vertical maxillary incisors and retrognathic mandibles should be treated early prior to the eruption of the permanent teeth. Statistics have shown that malocclusions and TM dysfunction left untreated worsen with age. Therefore, it is critical to treat these malocclusions and TMJ problems as soon as they are diagnosed. Therefore, one of the keys

to treating problems of the TMJ is to diagnose and treat patients with malocclusions listed above as early as possible with functional appliances.

The key to any successful treatment is diagnosis. One of the most important roles a dentist can play is to determine if the patient is suffering from extra-capsular problems or intra-capsular problems.

Patients with extra capsular or muscle related problems usually have the condyle in a physiologically correct position in the glenoid fossa (downward and forward). If the condyle-disc relationship is normal, then there is no clicking or crepitus.

Extra-capsular problems are mainly caused by occlusal interferences in lateral or protrusive movements or parafunctional habits such as clenching or grinding. To solve this problem, an upper appliance should be worn at night with an anterior biteplate with the only contact during swallowing being the lower central and lateral incisors.



Figure 11 — MX anterior deprogrammer



Figure 12 — MX anterior deprogrammer



Figures 13 and 14 — MX anterior deprogrammer incisal ramp air hole




When the posterior teeth do not touch, the temporalis and masseter muscles are unable to contract excessively and this eliminates the parafunctional habits such as clenching and grinding as well as the resultant headaches.

If the diagnosis is that the muscle spasms are being caused by occlusal interferences, then occlusal adjustments will be the treatment of choice to eliminate the extra-capsular problems. The T-Scan is the ideal device that is used to diagnose occlusal problems and how to correct them.

With intra-capsular problems, the disc is usually anteriorly or antero-medially displaced in relation to the condyle which is usually posteriorly displaced. There are five stages of internal derangements (intra-capsular) ranging from clicking, intermittent locking, frequent jaw locking and eventually to advanced degenerative osteoarthritis.


Since internal derangements can worsen over time, it is essential that treatment be initiated as early as possible. The treatment of choice would be to use some form of functional jaw orthopedic appliance or an anterior repositioning splint to try and recapture the displaced disc.



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Figure 15 — Deep overbite 5 mm

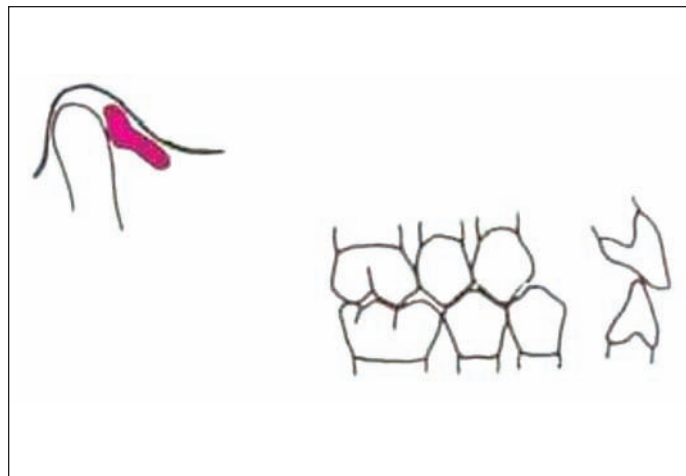


Figure 16 — Condyle posterior displaced
Disc anteriorly displaced



Figure 17 — Lower repositioning splint

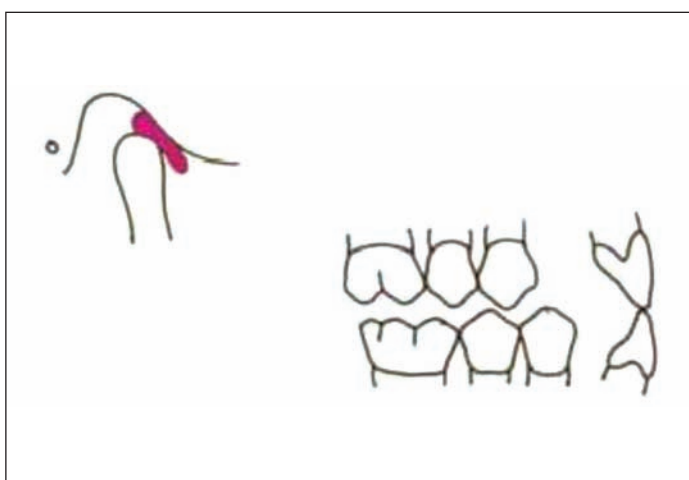


Figure 18 — Condyle moved forward
Disc recaptured

Treatment of Patients with TM Dysfunction

Phase One: Diagnostic Phase (4 - 6 months)

Extra-Capsular

- Anterior Deprogrammer only contact lower central & lateral incisors at night to disclude posterior teeth
- Occlusal equilibration

Intra-Capsular

- Anterior Repositioning Splint
- Functional Jaw Orthopedic Appliances (Twin Block, MARA)

The objective of Phase I is to reduce the signs and symptoms of TM dysfunction, improve the range of motion of the lower jaw, reduce the muscle spasms, recapture anteriorly displaced discs, and establish a normal disc-condyle relationship (find the correct position).

Phase Two: Treatment Phase

Orthodontic	Utilizing functional jaw orthopedic appliances and fixed braces
Restorative	Crown & Bridge, Implants
Prosthetic	Overlay Partial, Complete Dentures, Partial Dentures



Figure 19 — MD repositioning splint
Gelb bar





Figure 20 — MD repositioning splint
3 ball clasps each side

The objective of Phase II is to alter the occlusion so when the teeth contact in centric occlusion, the condyle is in the correct position in the glenoid fossa. This objective can be accomplished orthodontically, restoratively and prosthetically.

Part II of this article will include a discussion about the indications for flat plane splints compared to anterior

repositioning splints and anterior deprogrammers. It will also include indications for orthodontic, restorative and prosthetic Phase II case finishing. The article will also discuss the importance of Tomogram X-Rays in the diagnosis and treatment of patients with TM Dysfunction. The role of the T-Scan Diagnostic Device cannot be overlooked when it comes to the final stage of ensuring TMJ health by removing all occlusal interferences. TW





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