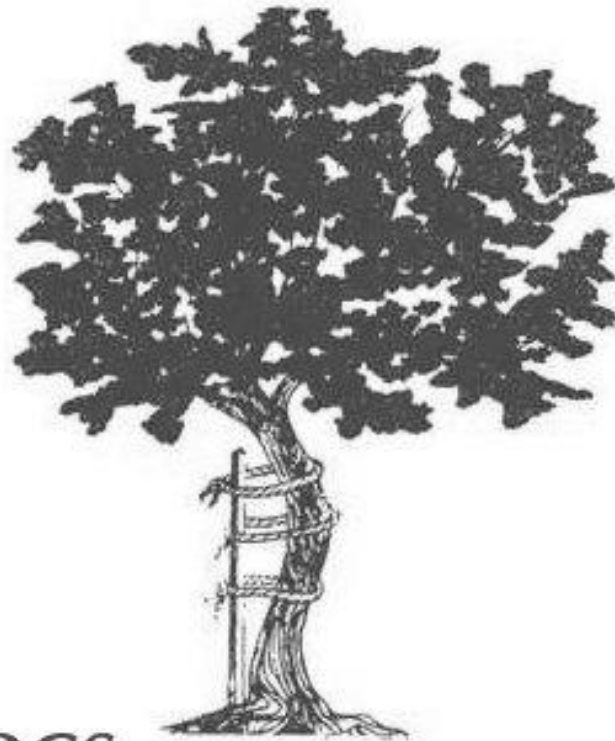
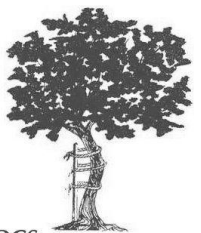


THE TEMPOROMANDIBULAR JOINT



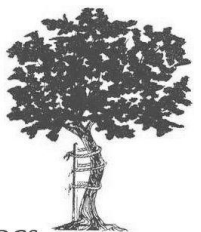
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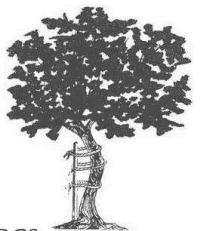
TMJ

- Prevalence: 33%
- Females 3-9 times more likely to be affected than males.
- Those who seek treatment are likely to be between the ages of 20 and 40 years.



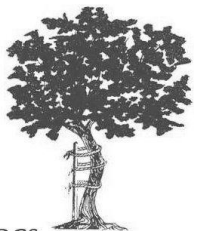
TMJ

- Includes the Temporal and Mandible bones
- Disk and articular tissues are composed of fibrocartilage rather than hyaline cartilage.
- The articular disk is biconcave and separates the joint into an upper and lower compartment.
 - The lower joint compartment involves rotation of the condyle in the fossa. (0-26 mm of opening)
 - The upper joint compartment involves anterior translatory glide of the condyle down the eminence (26-50 mm of opening).



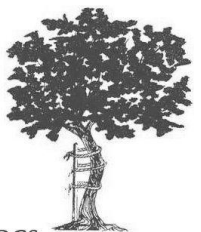
Divisions of the Disk

- Anterior: Neural innervations and vascular supply
- Intermediate: Aneural and avascular. Nutrition from synovial fluid
- Posterior: Neural innervations and vascular supply. The retrodiskal pad contains nerve fibers, blood vessels, and fat; inflammation in this area usually produces pain with palpation over the posterior aspect of the joint



Innervation

- Mandibular Division of Trigeminal Nerve
 - Deep Temporal and Masseteric Nerves – Anterior and Medial regions of TMJ
 - Auriculotemporal Nerve – Posterior and Lateral regions of the TMJ



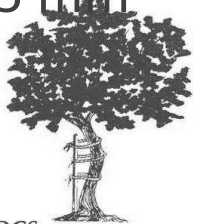
Muscle involved during TMJ Movements

- Opening (Depression): Initially gravity, followed by the digastrics with forceful opening
- Closing (Elevation): Masseter, Temporalis, Medial pterygoid
- Protrusion: Superficial Masseter, Superior lateral pterygoids, assisted by medial pterygoids
- Retrusion: Posterior temporalis, Assisted by deep massete
- Lateral excursion: Contralateral contraction of the lateral and medial pterygoids Ipsilateral: contraction of the temporalis and masseter.



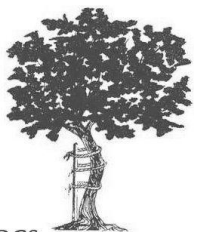
Biomechanics (Opening)

- Disk and the condylar head translate anteriorly together as a unit
- Rotation and translation occur simultaneously, the center of axis rotation is believed to be instantaneous, and is usually located anterior-inferior to the condylar neck
- Rolling of the condyle stretches the oblique fiber of the TMJ ligament which in turn initiates the late phase of the jaw opening through its increased tension
- Disk rotates posterior at the initiation of the opening due to the contraction of the posterior stratum fibers
- Rotation keeps the non-innervated middle portion of the disk on top of the condylar head as they both translate anteriorly as a unit through the rest of the opening phase
- Normal ROM: 40 mm to 45 mm for males and 45 mm to 50 mm for females (approximately 4 fingers' width of the non-dominant hand) (functional range of opening is measured by 3 fingers' width or 35 mm for both males and females)



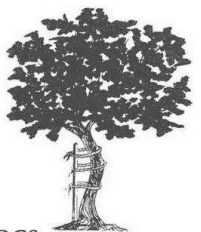
Biomechanics (Closing)

- Initiation of closing is by the tension of the superior retrodiskal lamina that retracts the disk
- Condylar head translates posteriorly along with the disk, and then the condyle (body) rotates anteriorly
- At the end of the range, disk rotates slightly anterior as a result of the contraction of the superior head of the lateral pterygoid, and progressive relaxation of the posterior stratum
- Non-innervated middle portion of the disk is maintained between the articular surfaces (condylar head and articular eminence) throughout the closing phase



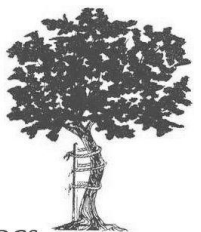
Biomechanics (Lateral Excursion)

- Ipsilateral condyle rotates and spins
- Contralateral condyle translates horizontally
- Normal ROM: (one fourth of the opening range ie, 10 mm in either direction for a 40-mm opening)
- Mandibular opening will improve in direct proportion to regaining lateral excursion



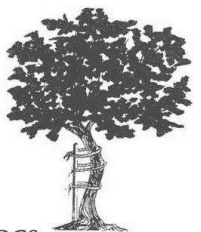
Biomechanics (Protrusion)

- Mandibular condyle (head) and the disk translate anteriorly and inferiorly symmetrically
- Normal ROM: 6 mm to 9 mm



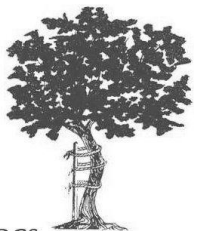
Biomechanics (Retrusion)

- Mandibular condyle and the disk translate posteriorly
- Mandible is maintained in the horizontal position by the synergistic action of the elevators and the depressors
- Normal ROM: 3 mm



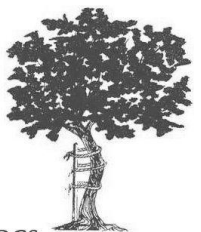
Pathomechanics

- Anterior disk displacement with reduction
 - Characterized by a louder opening click and a more diminished closing click
 - Reciprocal joint noises (popping or clicking) indicate the reduction of the disk during mouth open with the first noise, and dislocation occurs during closing of the mouth with the second noise
 - Disk rests in front of the condylar head while the mouth is closed
 - During opening, the disk “reduces” back on top of the condylar head that causes a clicking noise and then translates anteriorly with the condyle as a unit through the rest of the opening phase
 - As the mouth starts to close, the disk-condyle complex translates together posteriorly
 - At the end of the closing range, the disk displaces anteriorly again
 - This dislocation causes a second clicking noise, thus, the terminology of “reciprocal clicks”
 - Limited opening with or without pain
 - Mandible deflects to the ipsilateral side during opening
 - Altered mandibular dynamic shown by “C” curve or “S” curve



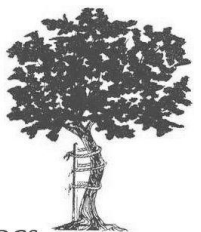
Pathomechanics

- Anterior disk displacement without reduction
 - Disk stays permanently in front of the condyle and unable to return to its normal position
 - No clicking noise during opening/closing
 - May have limited opening (when the disk is blocking the condylar head) or no limitation in opening (when the disk is completely displaced anteriorly)



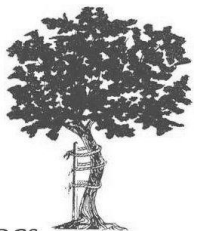
Pathomechanics

- Posterior disk displacement
 - Usually occurs after wide opening of the mouth such as in the case of prolonged dental procedure or yawning
 - Lateral pterygoid muscle is overly stretched and results in posterior displacement of the disk
 - Patients demonstrate an open-lock (inability to close the mouth) and may report closing clicks in the case of reduction



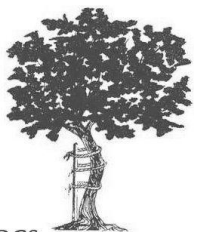
Pathomechanics

- Joint Dysfunction
 - TMJ osteoarthritis: crepitation or restriction in opening and lateral movement
 - TMJ capsulitis:
 - Palpable tenderness over the lateral capsule of the TMJ
 - Pain with opening, limited opening, “C” curve pattern of opening (deviation to the ipsilateral side)
 - Lateral excursion limited to the contralateral side
 - Protrusion towards the ipsilateral side



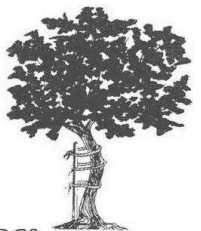
Pathomechanics

- Trismus
 - Acute closed lock of the jaw after a dental procedure is referred to as trismus
 - Caused by spasm of the masseter muscle after prolonged jaw opening and results in limited ROM
 - Clinical signs including onset history, limited opening range, and palpable tenderness/tightness over the masseter muscle belly



Pathomechanics

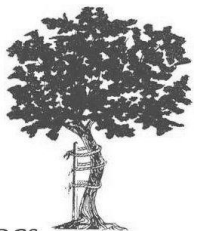
- Forward Head Posture
 - Causes the mouth to open wider, which in turn may result in TMJ hypermobility
 - Increased tightness of the suboccipital muscles will exert undesirable pressure on the greater occipital nerve, which in turn may cause radiating symptoms into the head, face, ear, neck, and even scapular area



Diagnostic Criteria Temporomandibular Disorders

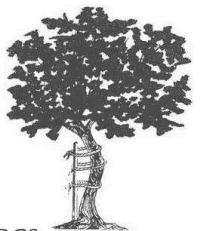
- 2 axes of focus for examination
 - Axis I: physical examination of the body structure/function impairments in the muscle and joint domains
 - Axis II: psychosocial characteristics that play a role in the primary complaints.

Harrison AL, Thorp JN, Ritzline PD. A proposed diagnostic classification of patients with temporomandibular disorders: implications for physical therapists. *J Orthop Sports Phys Ther.* 2014;44(3):182-9



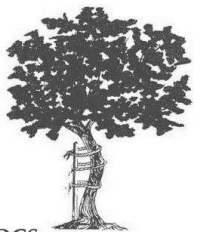
Axis I

- Masticatory muscle disorders
 - With normal opening
 - With limited opening
- Disc Displacements
 - With reduction
 - Without reduction with limited opening
 - Without reduction without limited opening
- Joint Dysfunction
 - Arthralgia
 - Osteoarthritis
 - Osteoarthrosis



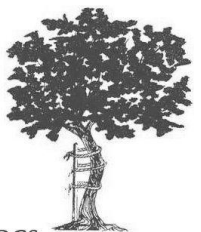
Axis II

- Anxiety
- Depression
- Anger
- Fear
- Physiologically over reactive to the environment



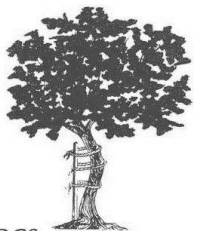
Differential Diagnosis

- Primary Headaches
- Secondary Headaches
- Cranial and Peripheral Neuralgias and Central Nervous System Disorders.



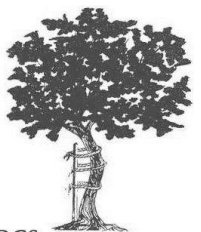
Primary Headaches

- Migraine: Unilateral side of head, may shift
 - Duration: 4-72 hours
 - Nausea, vomiting, aura, photophobia
- Tension: Bilateral tight band encircling head at the level of the temples
 - Duration: 30 min to 7 days
 - Head and neck pain, dull pressure
- Cluster: Severe unilateral orbital pain
 - Duration: 15 min to 2 hours
 - Sudden onset, rhinorrhea, headache “alarm clock” during morning sleep



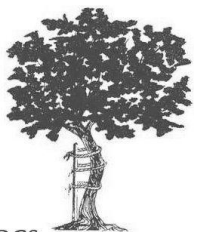
Secondary Headaches

- Cervical Spine Disorder
- Cardiac
- Eyes
- Ears
- Sinus
- Teeth
- Medication



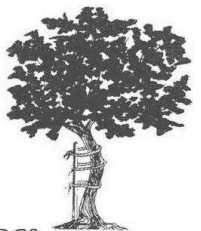
Cranial and Peripheral Neuralgias and Central Nervous System Disorders

- Herpes Zoster
- Postherpetic Neuralgia
- Optic Neuritis
- Trigeminal Neuralgia
- Occipital Neuralgia
- Meningitis
- Subarachnoid Hemorrhage
- Stroke



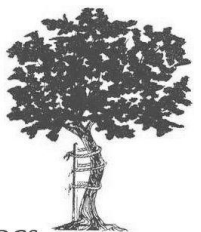
Physical Examination

- Palpate masseter muscles and temporal area
- Ask the patient to repeatedly open and close the mouth
- Note if popping or clicking is found during joint motion
- Note if the opening pattern of the jaw is straight, laterally deviated, or deviated with correction.
- Have the patient open their mouth as wide as possible, and measure the distance between the anterior maxillary and anterior mandibular teeth
- Examine the teeth for unusual wear patterns
- Take a tongue blade, place one end on each of the molars, and tap the other end with your finger. The patient's reaction if a toothache or tooth abscess is present will be obvious.
- Cranial Nerve Screen, particular attention to Trigeminal Nerve
- Cervical Spine Screen
- Systems Screen



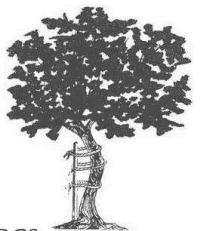
Immediate Referral Required

- Sudden onset severe headache
- Weakness
- Slurred Speech
- Altered gait and balance
- Symptoms and History suggesting Cardiac Pathology



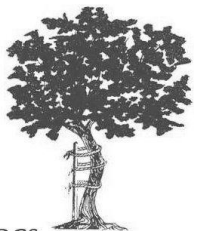
Other Indications for Referral

- Symptoms associated with primary or secondary headache related to:
 - Rheumatological disorders
 - Cardiac
 - Eye
 - Ear
 - Dental
 - Sinus



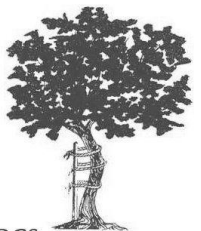
When physical therapists should refer to a dentist

- The patient awakes with TMD pain
- The patient has symptoms of tooth related pain



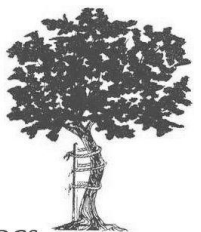
When dentists should refer to a physical therapist

- The patient has neck pain worthy of treatment
- The patient has cervicogenic headaches
- The patient has moderate to severe forward head posture
- The patient's symptoms increase with abnormal postural activities
- The patient did not obtain adequate symptom relief from initial treatment
- The patient is to have TMJ surgery



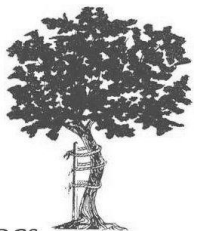
Differentiating between muscle and joint involvement (Cotton Roll Test)

- Patient bites down on an object with back molars (gapping/unloading ipsilaterally and compressing/loading contralaterally)
- Patient complains of pain on one side of the jaw, have patient bite down on a cotton roll with the back molars on the side of complaint
 - Pain increases indicates symptoms of a muscular origin due to the activation of ipsilateral masticatory muscles
 - Pain decreases which indicates symptoms may be joint related (disk or retrodiskal pad) since unloading the joint results in a decrease in pain.
- Can be confirmed by asking the patient to bite down on the cotton roll with the back molars of the contralateral side
 - It should result in pain on the ipsilateral side due to loading of the ipsilateral joint



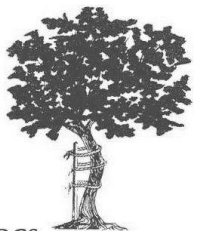
Masticatory Muscle Disorder

- **Masseter and Temporalis:** palpation of either produces chief complaint. Mouth opening painful at end range and may be limited to 40 mm or less (confirming if lateral excursion and protrusion are not painful or limited)
- **Lateral Pterygoid:** chief complaint is lateral face pain. Pain reproduced with resisted protrusion. Pain with power stroke or biting on bilateral separators. (confirming if end range mouth opening does not reproduce complaint)



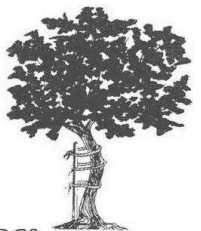
Disc Displacements

- With Reduction: opening and closing clicks during 1 of 3 repetitions, or opening and closing click during 1 of 3 repetitions and click with 1 of 3 lateral excursion or protrusion.
- Without reduction with limited opening: history of jaw locking or catching, no current joint clicks or pops, and ROM opening of 40 mm or less
- Without reduction without limited opening: history of jaw locking or catching, no current joint clicks or pops, and ROM opening of 40 mm or greater.



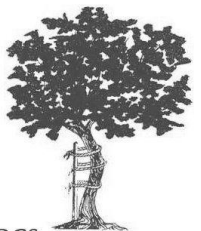
Joint Dysfunction

- Arthralgia: preauricular pain with joint palpation, end range movements, and/or power stroke, but joint crepitus is not reported. Special test: Cotton Roll, reproduction of joint pain contralateral to the cotton roll suggests arthralgia.
- Osteoarthritis: suspected if arthralgia and crepitus.



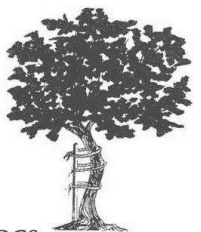
Medical/Dental/Surgical Interventions

- Pharmacological Interventions - include simple painkillers (analgesics) and medicines which reduce inflammation and treat pain (for example, non-steroidal anti-inflammatory drugs, corticosteroids). Benzodiazepines are sometimes used to reduce tension and spasm in the muscles affected by TMD. In addition, some antidepressant medicines (called tricyclic antidepressants) are used in low doses to help patients with TMD and are thought to be effective because they reduce muscle tension in patients who grind their teeth.
- Cochrane Review: there was not enough evidence to decide which medicines are effective in reducing pain due to chronic TMD.



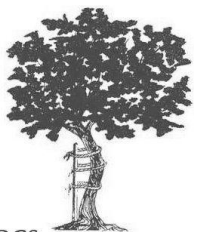
Medical/Dental/Surgical Interventions

- Occlusal Appliances /Stabilization Splint Therapy - a type of bite plate used at night when people otherwise may grind their teeth more. The stabilization splint (SS) is one type, also known as the Tanner appliance, the Fox appliance, the Michigan splint or the centric relation appliance.
- Cochrane Review: there is not enough evidence from trials to show whether or not stabilization splints can reduce TMJ pain dysfunction.



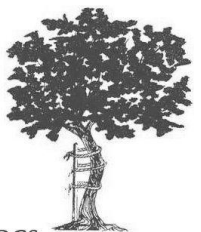
Medical/Dental/Surgical Interventions

- Occlusal Adjustment - involves adjusting the biting surface of teeth by grinding the enamel.
- Cochrane Review: there is no evidence from trials to show that occlusal adjustment can prevent or relieve temporomandibular disorders.



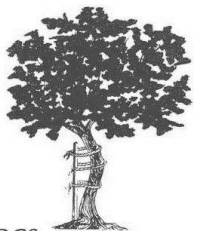
Medical/Dental/Surgical Interventions

- Orthodontic Appliances – used to move teeth as part of orthodontic treatment.
- Cochrane Review: there is no evidence from trials to show that active orthodontic treatment can prevent or relieve temporomandibular disorders adding support to teeth not being part of its cause.



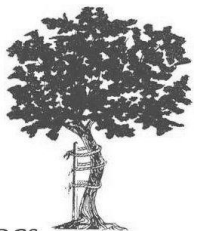
Medical/Dental/Surgical Interventions

- TMJ Arthrocentesis - a procedure during which the joint is washed out with sterile saline. Anti-inflammatory steroids, long-acting local anesthetics, painkillers or collagen components can also be inserted at that time. Two small needles are inserted into the joint, one allows saline to be pumped into the joint, while the other allows the saline to drain out of the joint.
- Cochrane Review: there is not enough evidence to judge whether arthrocentesis is more helpful for people with temporomandibular joint disorders than arthroscopy.



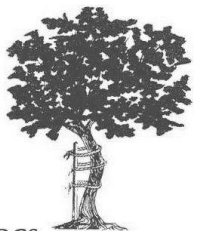
Medical/Dental/Surgical Interventions

- TMJ Arthroscopy – a procedure in which the surgeon may, remove scar tissue and thickened cartilage. Reshape parts of the jawbone, Reposition the disc, tighten the joint to limit movement, lavage the joint, insert anti-inflammatory medicine.
- Cochrane Review: Both arthroscopy and non surgical treatments reduced pain after 6 months. When compared with arthroscopy, open surgery was more effective at reducing pain after 12 months. Nevertheless, there were no differences in mandibular functionality or in other outcomes in clinical evaluations. Arthroscopy led to greater improvement in maximum interincisal opening after 12 months than arthrocentesis; however, there was no difference in pain.



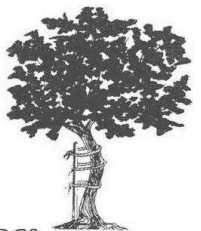
Medical/Dental/Surgical Interventions

- Open Joint Arthroplasty for TMJ - an incision is made to expose the joint. The surgeon may repair, reposition, or replace the disc with the patient's own tissue or an artificial disc. Scar tissue or bony growths in the jaw joint can also be removed.



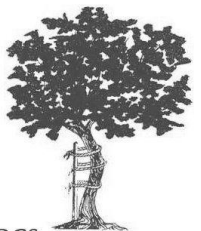
Systematic Review

- List T, Axelsson S. Management of TMD: evidence from systematic reviews and meta-analyses. *J Oral Rehabil.* 2010 May;37(6):430-51.
- Some evidence that the following can be effective
 - Occlusal appliances
 - Acupuncture
 - Behavioral therapy
 - Jaw exercises
 - Postural training
 - Some pharmacological treatments
- No effect
 - Occlusal adjustment



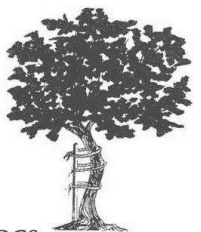
Physical Therapist Interventions

- Education
- Improved Sleep Hygiene
- Relaxation, Postural Correction, Body Mechanics Instruction
- Oral Habit Modification
- Soft Diet
- Modalities
- Soft Tissue Mobilization
- Joint Mobilization
- Thrust Manipulation
- Passive and Active Range of Motion
- Dry Needling to reduce trigger points
- Address Cervical Spine if Needed
- Home Exercise



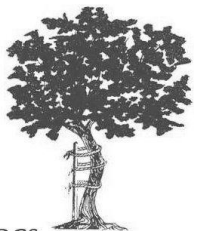
Physical Therapist Interventions

- **Masticatory Muscle Disorder**
 - Modalities and manual therapy to reduce pain, muscle guarding, and trigger point activation, and to increase mandibular ROM.
 - Dry Needling
 - High Velocity Low Amplitude Thrust Manipulation to the Cervical Spine



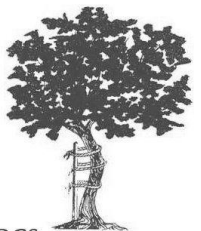
Physical Therapist Interventions

- **Interventions for an anterior disk displacement**
 - Primary focus: patient education regarding proper head/neck and jaw positioning, avoidance of parafunction and clicking/popping of the joint, explanation of precipitating/perpetuating factors
 - Exercise for restoring normal head/neck and TMJ alignment
 - Mobilization: longitudinal distraction, anterior translation, lateral glide (anterior disk displacement with reduction: for (anterior disk displacement without reduction—add a small amount of posterior rotation of the condylar head with ulnar deviation of the wrist before anterior translation.



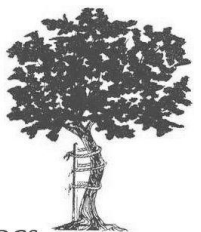
Physical Therapist Interventions

- **Interventions for posterior disk displacement**
 - Primary focus: patient education regarding proper head/neck and jaw positioning, avoidance of parafunction and clicking/popping of the joint, explanation of precipitating/perpetuating factors
 - Exercise for restoring normal head/neck and TMJ alignment
 - Mobilization: longitudinal distraction
 - Most importantly, avoid maximal mouth opening with submaximal ROM exercise.



Physical Therapist Interventions

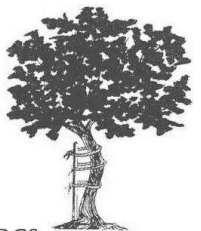
- Joint Dysfunction
 - Manual therapy to improve capsular mobility.
 - Examine muscles of mastication in an effort to reduce pain and improve joint kinematics.



Physical Therapist Interventions

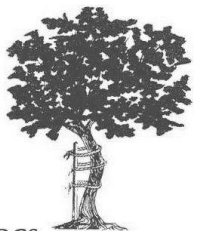
- Trismus

- Instruction in the cause and prognosis of the condition to ease the patient's anxiety
- Relaxation through imagery and diaphragmatic breathing
- Active opening with the application of a heat pack
- Transcutaneous electrical stimulation (TENS) to relieve acute spasms
- Soft tissue release and passive stretching may be added to further relieve symptoms
- Patient should be advised to stay on a soft diet and avoid excessive contractions of the muscle for one to (two weeks)
- 2 to 4 sessions of physical therapy within 1-2 weeks is recommended to ensure optimum recovery



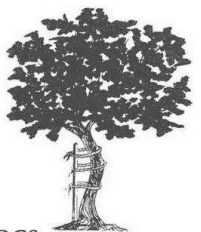
Systematic Review (Physical Therapy)

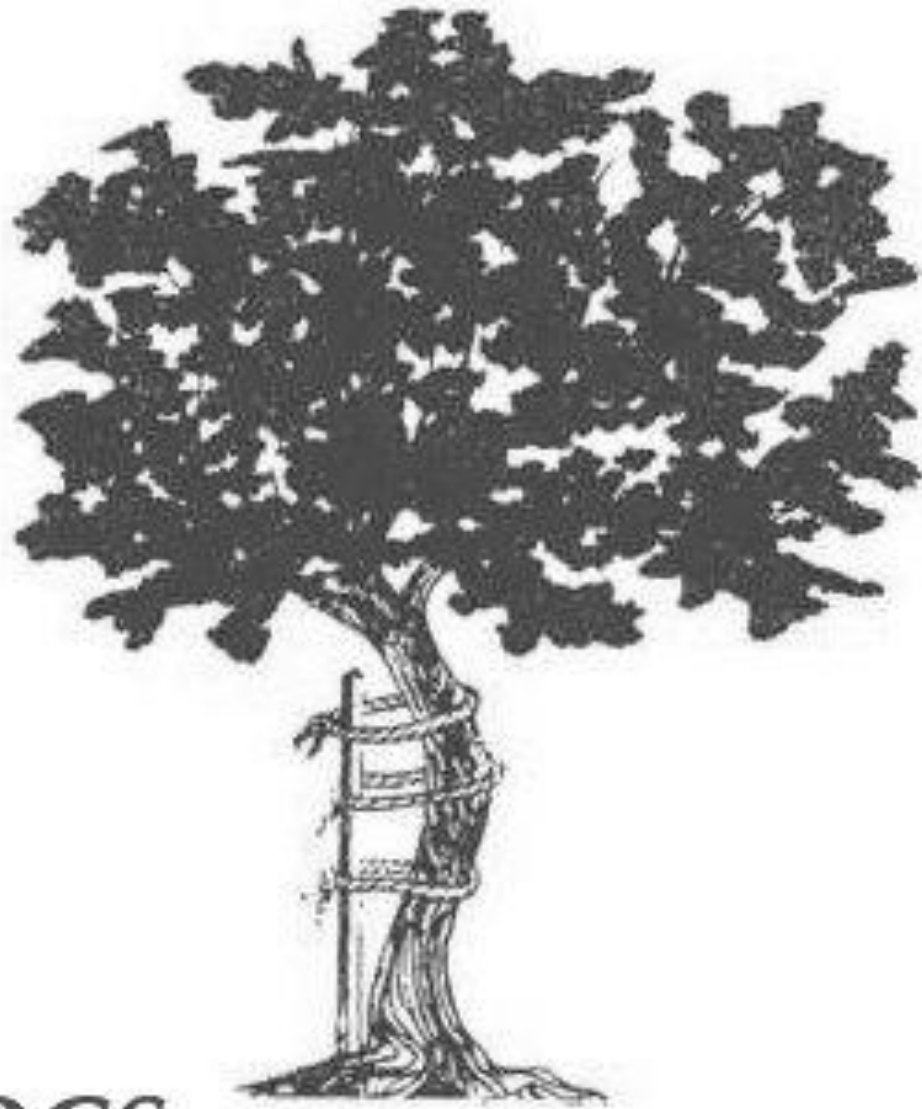
- McNeely ML, Armijo Olivo S, Magee DJ. A systematic review of the effectiveness of physical therapy interventions for temporomandibular disorders. *Phys Ther.* 2006 May;86(5):710-25.
- 12 studies reviewed
- Evidence
 - Postural exercises
 - Manual therapy in combination with active exercise
 - Acupuncture (Conflicting)
 - Relaxation therapy
 - Biofeedback
 - Low level laser



Systematic Review (Physical Therapy)

- Medlicott MS, Harris SR. A systematic review of the effectiveness of exercise, manual therapy, electrotherapy, relaxation training, and biofeedback in the management of temporomandibular disorder. *Phys Ther.* 2006 Jul;86(7):955-73.
- 30 studies reviewed
- Recommendations
 - Active exercise and manual mobilizations
 - Postural training in combination with other interventions
 - Laser more effective than other electrotherapeutic modalities
 - Relaxation techniques and biofeedback





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