

Note: Usually when the TMJ Disc is dislocated, cartilage is covering the condylar bone. By the time the cartilage wears, exposing the bone, the retrodiscal tissue no longer has a blood supply. The tissue has adapted into fibrous tissue. Bone rarely contacts inflamed tissue.

All Clicking joints are damaged

Not so dangerous Clicks:

- Unchanging click for 2 or more years
- Consistent, easy reduction of Disc
- Good range of motion with clicking
- Stable occlusion with clicking

Clicks that need further Evaluation- Order Scans

- Clicking that has stopped 2 yrs or less
- Clicking has changed in the last 2 years
- Wiggling jaw to open. Locking.
- Chronic Painful click
- Unstable Occlusion

Questions to ask Patients with clicks

- Has the clicking changed in the past year?
- Any pain with the clicking?
- Any difficulty opening your mouth?
- Any problems chewing food?

Limited Opening Needs Immediate Treatment

- Rule out masseteric space infection- Check molar area
- Rule out muscle spasm- Anterior deprogrammer, TENS
- Rule out TMJ pain avoidance- Auriculotemporal nerve block
- Tx mechanical joint obstruction- Arthrocentesis
- Post-op anterior repositioning orthotic

Two very important Question in diagnosing Pain around the TMJ:

Does the joint damage have anything to do with the discomfort or dysfunction that the patient is feeling?

It appears to be _____, but what else could it be?

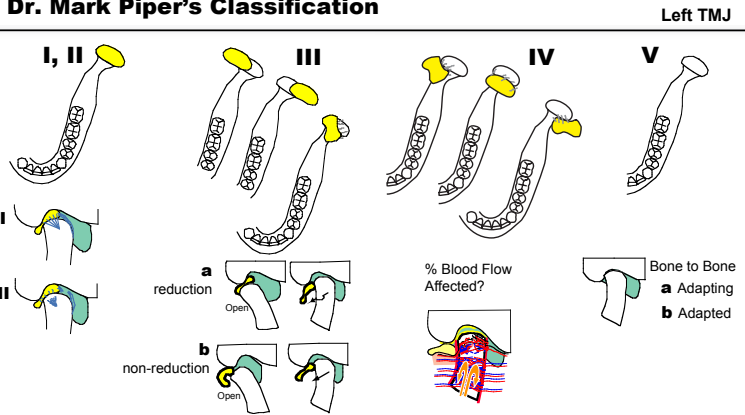
Specific Diagnosis of Damaged TMJs

- Ligaments- Stretched, Partial Tear, Complete tear
- Disc- Piper 1,2,3a,3b,4a,4b,5a,5b, Size, Location
- Cartilage Wear, Necrosis, Tear
- Synovium Inflamed- Synovitis, Hyperplasia, Fibrotic, Adhesed
- Bone Osteolytic, Hypertrophy, Ossification, OsteoNecrosis
- Remodel/ Adaptation, HyperCalcification
- Marrow Inflamed, Necrotic

MRI Scan Information

- T1 shows more fat than water- TE 15, TR 400
- T2 shows more water than fat- TE 110, TR 3500
- PD (Proton Density) is between a T1 and T2 and shows the disc- TE 15, TR 2500
- STIR (Short T1 Inversion Recovery) is more sensitive for water- TE 15, TR 4000

Dr. Mark Piper's Classification



- 1 Normal Healthy Disc, Ligament and Cartilage
- 2 Normal Disc Position but damage: Ligaments damage, Cartilage Fibrillation, Disc Distortion Perforation of Disc, Disc unstable from contralateral TMJ
- 3ae Early Partial disc subluxation, with reduction
- 3a Partial disc subluxation, with reduction
- 3b Partial disc subluxation, non-reducing
- 4ae Early Complete disc dislocation, with reduction
- 4a Complete disc dislocation, with reduction
- 4 adh Adhesed disc to eminence
- 4b Complete disc dislocation, non-reducing- Risk AVN 1st year
- 4b/a Complete disc dislocation, non-reducing in function
- 5a No Disc, Bone to bone- Adapting- OA Active
- 5b No Disc, Bone to bone- Adapted- OA adapted

CT Scan- Normal

- Cortex intact- No cysts, no hypercalcification
- Trabecular bone has a good pattern
- Normal Size and shape of right and left condyle (70% condyle to fossa)
- Non congruent ovoid shape of condyle
- No flat areas
- CR Load Zone- Condyles load on superior medial condyle
- Closest bone distance superior medial surface
- Condyles are centered medial-laterally.
- The Mandible sits centered under the skull base
- Inferior border mandible Right/Left equidistant to the fossa
- Condyles centered in fossa in sagittal axial, and coronal views
- The joint space indicates adequate room for a disc
- No lesions or tumors in the TMJ and surrounding areas

MRI- Normal

- Disc is in a proper position on both the medial and lateral pole
- If not; Off both medial and lateral?
- Where is it? Size of disc?
- Recaptures? Does Disc move in open view (Adhesed?)
- PseudoDisc formation (fibrosis?)
- Cortex intact- No cysts,
- No areas indicative of either sclerotic or necrotic bone
- Normal Size and shape of right and left condyle
- 70% condyle to fossa
- Non congruent ovoid shape of condyle
- No flat areas, No lipping
- Condyles are centered anterior-posteriorly in fossa
- No edema in the joint, synovial tissue or bone marrow
- T2 and STIR images.
- No lesions or tumors in the TMJ and surrounding areas

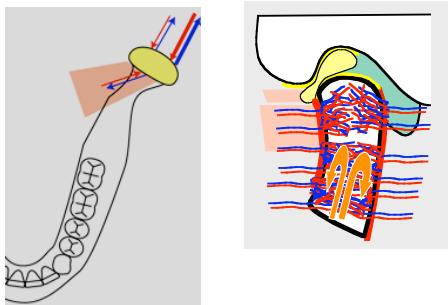
Tissue	T1	T2
Fat	Bright	Intermediate
Water	Dark	Bright
Tissue	Intermediate	Dark
Meniscus	Dark	Dark
Bone	Dark	Dark
Fibrotic Tissue	Dark	Dark
Necrotic Tissue	Dark	Dark
Air	Dark	Dark

Normal TMJ Bone

- Bone Density
- Intact Cortex
- Even pattern Trabecular bone
- Normal Size/Shape Condyle/Fossa
- Ovoid Condylar Shape
- Non-Congruent Condyle/Fossa
- Condyle 70% Size Fossa
- Condyle Centered in Fossa
- Coronal and Sagittal
- Room for Disc
- Stable CR load Zone
- Condyle closest to fossa

Normal TMJ Condyle Blood Flow

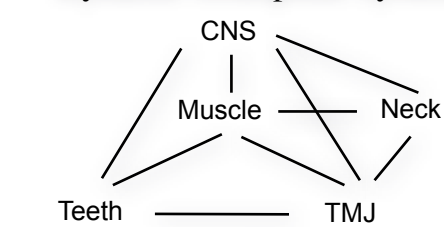
- Condylar head limited collateral circulation
- Marrow is fatty tissue with blood vessels
- Marrow contains the precursor for blood cells
- No Blood vessel inside joint



Detecting TMJ Health

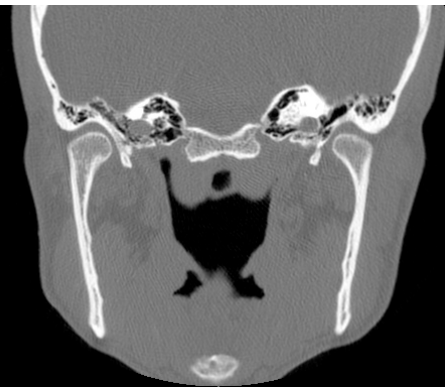
- Palpation and Load- No Pain
- anterior lateral pole, posterior lateral pole, indirect through ear
- Load in CR
- History- No: Click, Limited opening, pain, trauma
- Motion- Full, Smooth Range of Motion
- 40-55 mm, 300mm/sec velocity, straight path, consistent arc
- Sounds/Vibrations
- Stethoscope - No Sounds
- No abnormal subtle sounds- paper, sand, pebbles, rocks, crackle
- Doppler Auscultation- No joint vibrations
- Joint Vibration Analysis- No joint vibrations
- Mechanical Stability- Pass the DATPAS test 24/7 3-7 days
- Not occlusally hypersensitive
- Stable Occlusion- No changes over one year

Dynamic Orthopedic System

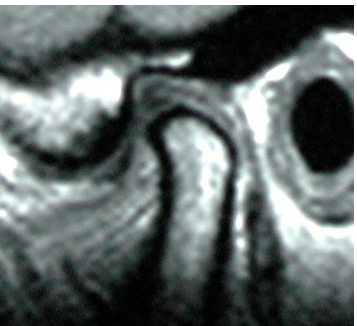


A change in any one area will affect the others

Healthy Joints



Normal MRI



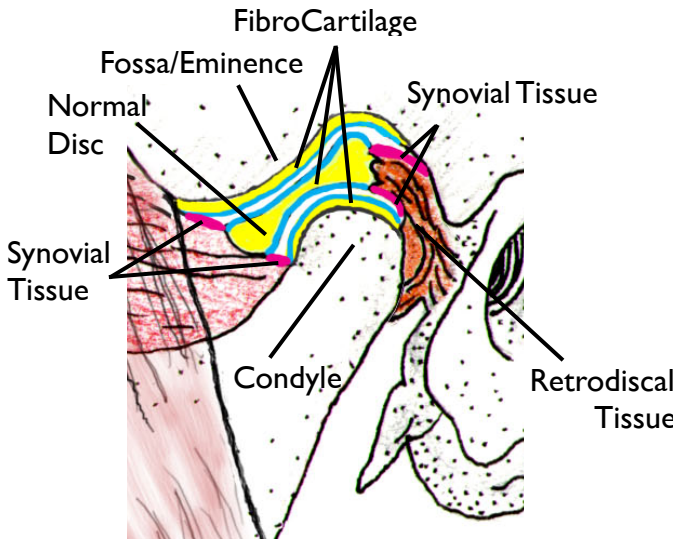
Normal Synovial Tissue

- Synovial Tissue lines inside periphery of joints
- Synovial Tissue makes Synovial Fluid
- Filters out Red Blood Cells from plasma
- Adds Hylaronic Acid and Lubricin to the plasma
- Synovial fluid lubricates the joint
- Synovial fluid provides nutrition to cartilage cells

Healthy Cartilage

- Water layer in blue covers Fibrocartilage
- There are no blood vessel in joints
- Synovial Fluid brings in nutrition and O₂

Cartilage is 80% water. The surface of cartilage is fluid (surface active phospholipids). When cartilage slides against cartilage, the surfaces never touch- it is fluid sliding against fluid- very little friction, no wear.



TMD Diagnosis Supersheet

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7 Basic Rules for Diagnosing Pain

1. Listen to the patient
 - Get both written and oral History
2. Patients can have more than one disease.
3. Develop a differential diagnosis
 - Ask: It appears to be, but what else could it be?
4. Run tests that will increase or decrease the pain
 - Palpate, Diagnostic blocks, Diagnostic Orthotics
 - Verify in more than one way if possible
 - Radiographs, Doppler, Joint Vibration Analysis
5. Develop a working diagnosis
6. Diagnosis confirmed after Tx
 - Confirm that the patient got better
7. Don't chase a diagnosis too long before ruling out cancer. Cancer is rare but can mimic other diseases.

Suspect Cancer if:

- Sudden onset headache in 50+ year old
- Numbness
- Past history of cancer elsewhere in the body
- Pain description not quite the same as other TMD patients.
- Pain does not resolve with TMD therapy.

70% of damaged joints adapt favorably w/out therapy
Increased Risk of unfavorable adaptation:
Large Disc anteriorly dislocated nonreducing Already has Anterior Open bite
Distalized condyle Bone Marrow edema on T2/STIR of MRI
Limited opening

LD Pankey's 3 Rules of Occlusion

1. With the condyles fully seated in the fossa, all the posterior teeth touch simultaneously and even, with the anterior teeth lightly touching.
2. When you squeeze, neither a tooth nor the mandible moves.
3. When you move the mandible in any excursion, no back tooth hits before, harder than, or after a front tooth.

Top Diseases of the TMJ

Physical Damage Disc and Ligament:
See Piper Classification on back page

Osteoarthritis:
The wearing out of a joint. Cartilage is damaged from either too much force, too much friction or lack of nutrients. Subchondral bone reacts and adapts. Damage occurs in the cartilage first and then affects the bone. Occurs slowly over time.

Avascular Necrosis:

Blood supply to bone marrow is compromised, bone marrow dies, trabecular bone dies. Cortical bone collapses up to 1-year after marrow dies. Damage is to marrow first, then bone, then cartilage.

Progressive Condylar Resorption:

When bone comes directly in contact with the inflammatory system, osteoclasts are activated and bone resorbs. Inflammatory cells must contact bone directly. There are 3 main types:

- Inflammatory Tissue Bone Resorption (ITBR):

With a displaced disc, the retrodiscal tissue is dragged up on top of the condyle. If the cartilage covering the condyle is also damaged exposing subchondral bone, osteoclasts can be activated. A joint is very susceptible to this following AVN bone collapse if the cartilage tears during the collapse. Note that tissue in contact with cartilage covering bone does not elicit the bone resorption response

- Rheumatoid arthritis- An overgrowth of synovial tissue stops synovial fluid flow through joint. Cartilage dies exposing subchondral bone. Bone is now in direct contact with inflamed tissue. Damage is to the synovium first, then to the cartilage, then to the bone.
- Joint Infection- The synovium releases inflammatory and immune cells into the bacteria laden synovial fluid. Cartilage is destroyed, exposing bone. Cartilage and bone are not in direct contact with tissue, but they are in direct contact with inflammatory cells in the synovial fluid.
- Others- Crystalline deposition disease, Psoriatic Arthritis, Cancer

TMD/Facial Pain Non Joint related

TMD with Damaged TM Joints

- Physical Damage to Disc & Ligaments
- Osteoarthritis
- Avascular Necrosis
- Inflammatory Tissue Bone Resorption
- Rheumatoid Arthritis
- Lyme Disease
- Joint Infection- Staph, Strep, Syphilis
- Compromised Condylar Perfusion
- Osteochondritis Dissecans
- Fracture/Crush condylar head or fossa
- Psoriatic Arthritis
- Crystalline Deposition Diseases
- Cancer TM Joint/ TM Bones
- Scleroderma
- Ganglion (Synovial) cyst

- TMD Muscle Hyperactivity Choices
- Occlusal Muscle Disharmony (OMD)
 - Posterior Interferences
 - Disharmonious Anterior Guidance
- Clenching
- Parafunctional Grinding- CNS mediated
- Pain avoidance- TMJ Pain
- Joint Stabilization- CR Subluxation
 - Translatory Slippage
- Neck Stabilization
- Dystonia

Slow- Progressive	(Occlusion Adapts)
Osteoarthritis- Lose 0.2mm/yr or less.	
Not Slow- Single Event	(Anterior Open-Bite Develops)
Avascular Necrosis	
Not Slow- Progressive	(Anterior Open-Bite Develops)
AVN followed by Inflammatory Tissue Bone Resorption	
Rheumatoid Arthritis	
Infection- Lyme Disease, Syphilis	
Others- Crystalline Deposition, Cancer, Psoriatic Arthritis	

Note: If see disease early may not have lost bone to change occlusion.
Adaptation after rapid bone loss may close open-bite over time.

- Pre-Puberty
 - Genetic
 - Damage to TMJ growth center
 - Habit- Thumb, Finger, Pacifier, Tongue
 - Airway/ Mouth breather

Mandibular Asymmetry Choices

Pre-Puberty
Damage to TMJ growth center
Birth Trauma
Post-Puberty
Class2 = Condylar bone loss
Class 3 = Condylar Hyperplasia

- TMJ has changed
 - Condylar Hyperplasia
 - Synovial Hyperplasia
 - Acute Sprain joint effusion
- Teeth have moved
 - Tongue- Used as cushion.
 - Iatrogenic- Orthotics, Retainer

- CR orthotic not working
- Verify CR orthotic well executed:
 - No rocking- orthotic hard, solid fit
 - No Nonworking or working interferences
 - No Anterior Arc of Closure Interferences
- Painful CR
- Disarmonious Anterior Guidance- Condylar Guidance has changed
- Joint Subluxation - CR joint subluxation on load
- Joint Subluxation- Translatory disc slippage
- Neck
- Other- Not an Occlusal Problem