The Click

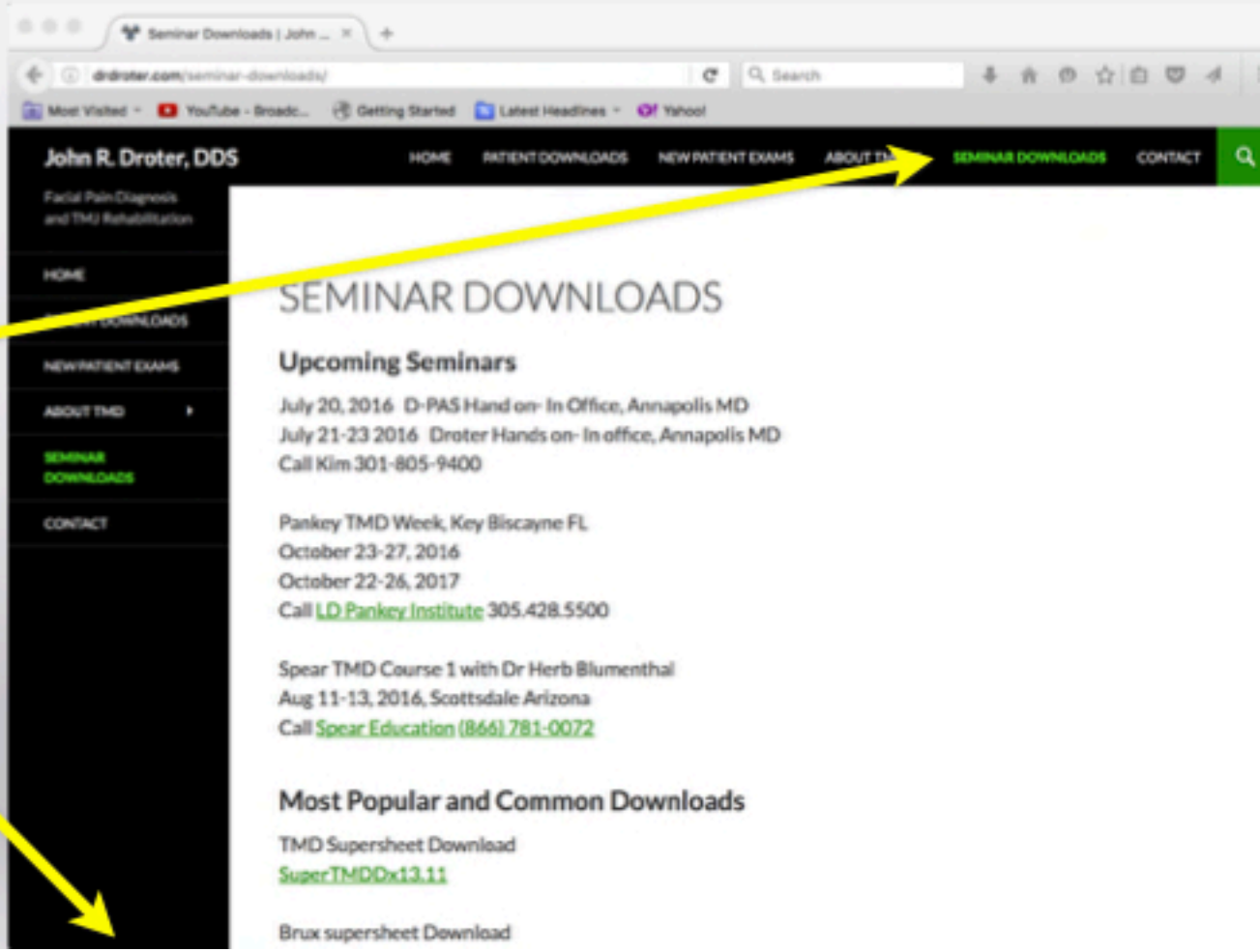
John R Droter DDS
Annapolis, Maryland

John R Droter, DDS

To get todays lecture slides:
go to www.drdroter.com

Seminar Download

Star of the North



Milestones

Visiting Faculty LD Pankey Institute 2008-

Visiting Faculty Spear Education 2013-2020

Visiting Faculty Orthodontic Program
Washington Hospital Center 2000-2012

Past staff AAMC: Orthopedic Rounds
In OR for TMJ Surgeries

Devoted Facial Pain Practice 1996
(No Hygiene to Check!!)

CT and MRI Imaging Joints 1992
Guy Haddix, DDS: Mentor
(3,000+ images and rising)

Post Grad CE- GPR, LD Pankey Institute, Dawson, Mahan, Gremillion, Spear, Kois

Disclosures:

Ski Coach for National Ski Patrol
Level 3 Certified Professional Ski Instructors of America

Atomic Skis- Sponsored.
I got stuff.

LD Pankey Institute TMD Course
Honorarium

Co-Owner of ArrowPath Sleep
Patent on sleep device: LatBrux

APS
ArrowPath Sleep

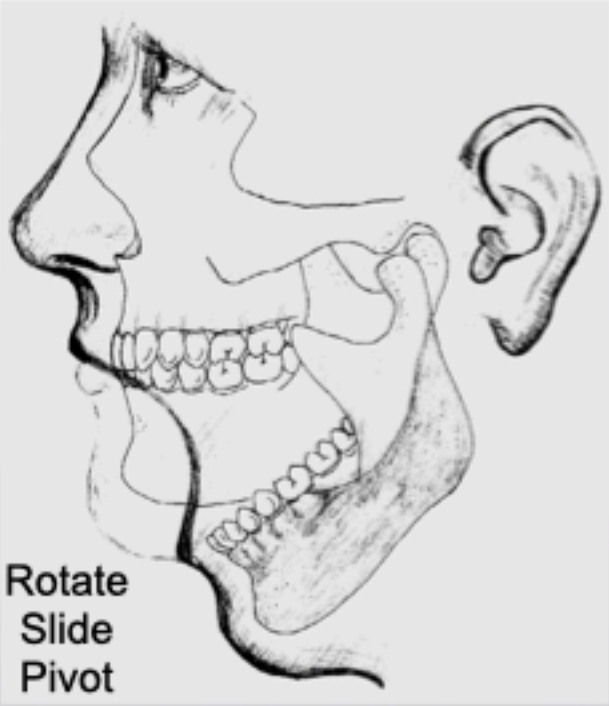
Living Tree Dental Lab
High Quality Dental Orthotics
License fee on my designs

LIVING TREE
DENTAL LAB

The Click

Key Points:

Clicking jaw joints are common, but not normal
All clicking joints are damaged
The “Click” usually does not need to treated
A non reducing disc is not the #1 cause of limited opening

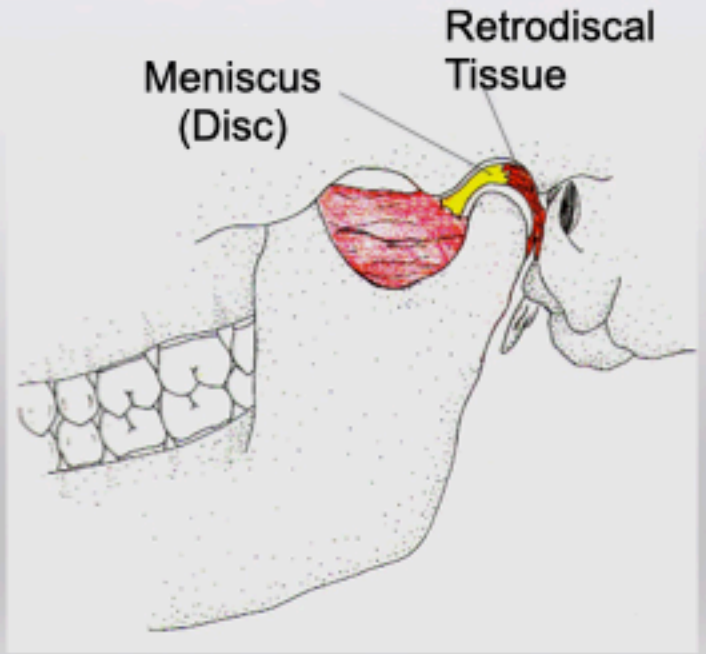


Rotation only 25mm

Max Open	40-55mm
Right Lateral	10-12mm
Left Lateral	10-12mm
Protrusive	10-12mm

TMJ has 2 Joint Compartments:

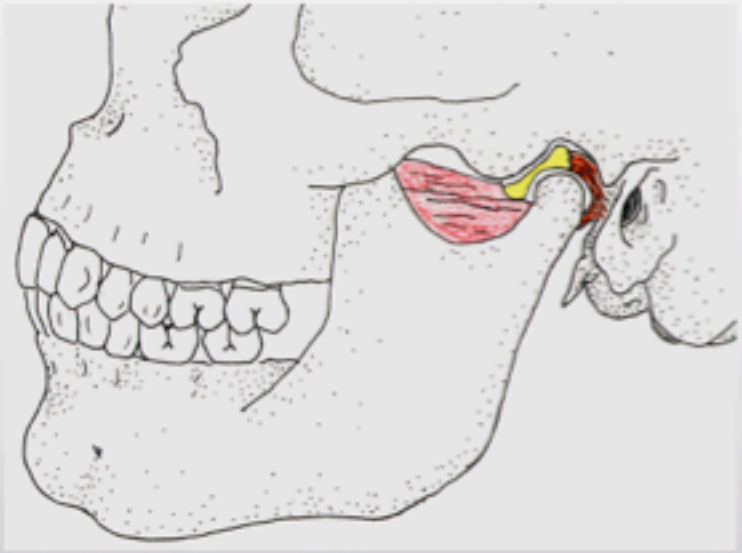
Upper- Translation
Lower- Rotation



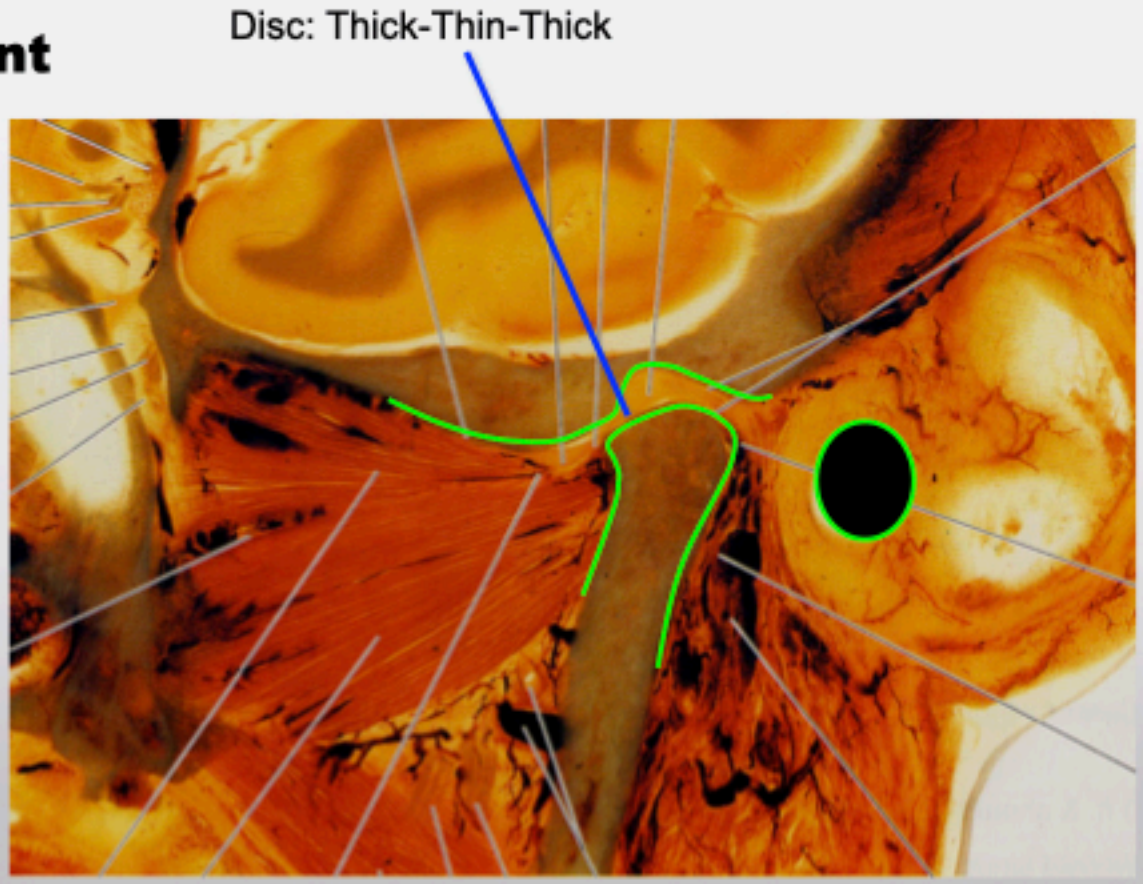
Reducing "Click"

non-Reducing Disc

The Temporomandibular Joint

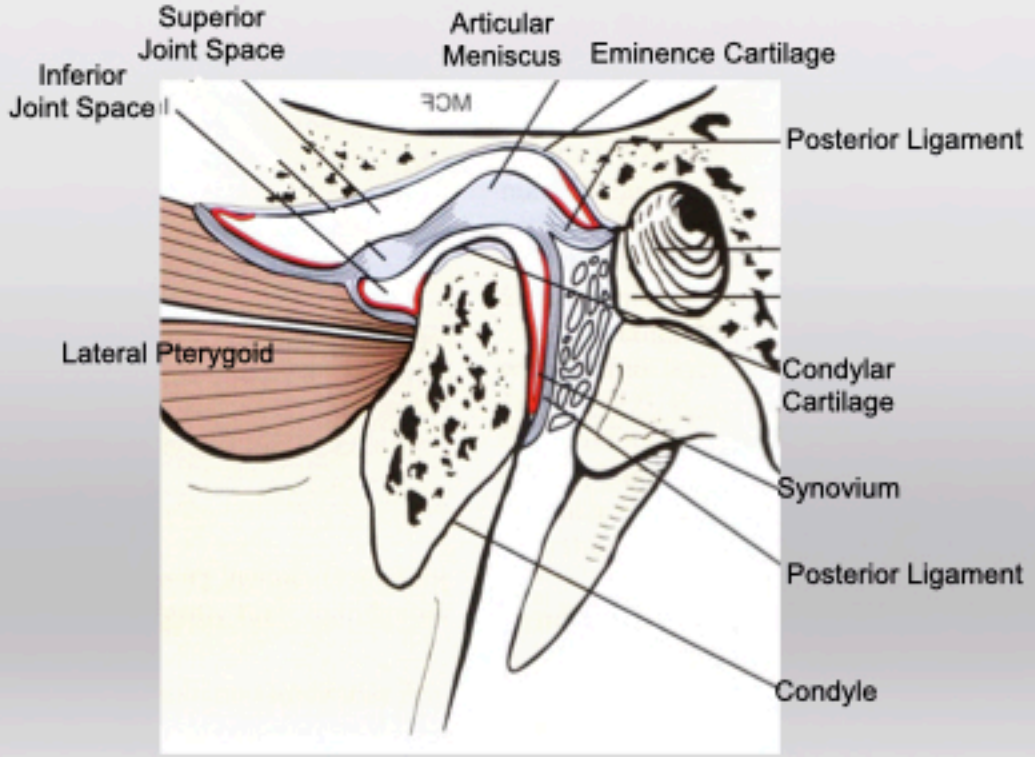


Ear
Sideways “S” Fossa
Condyle
Disc- Thick Thin Thick

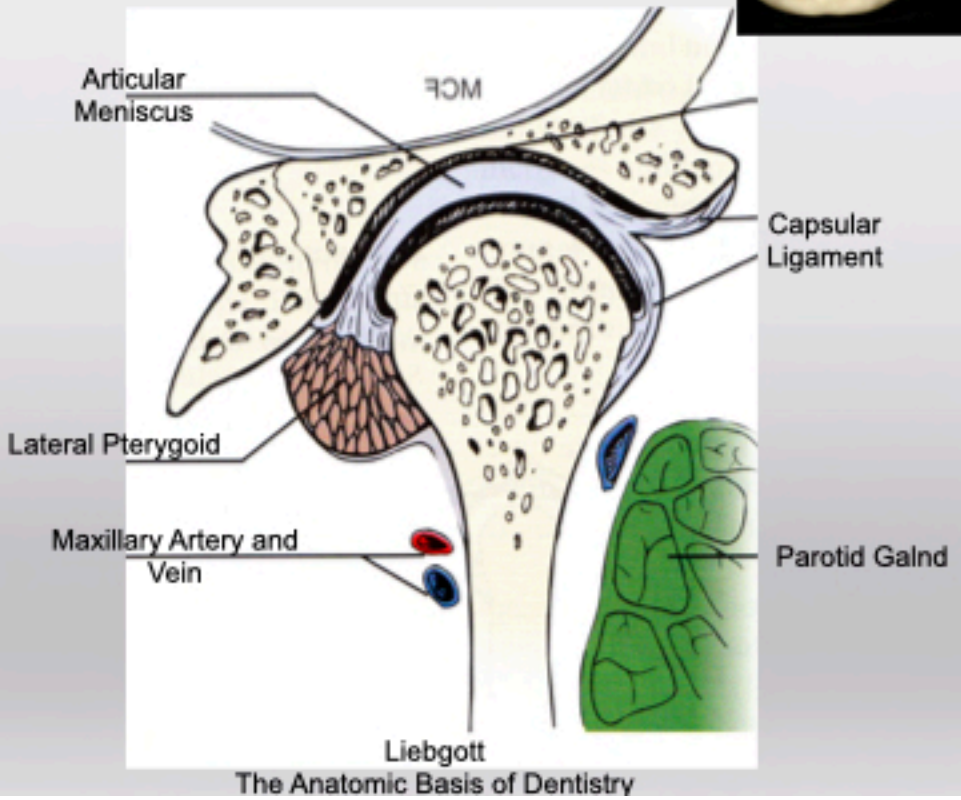


Oblique Sagittal View
Romrell, Mahan

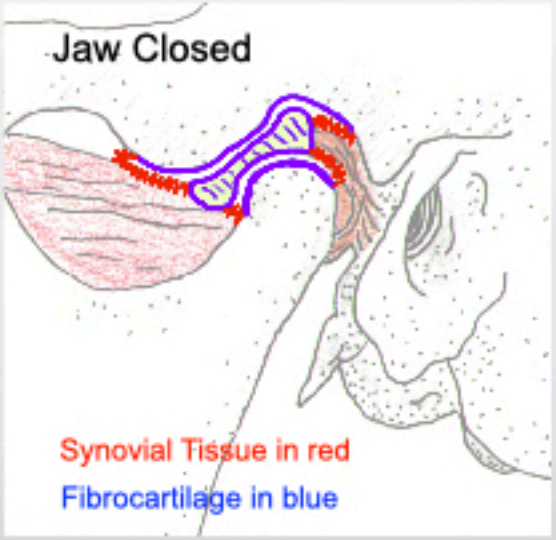
Left TMJ Sagittal View

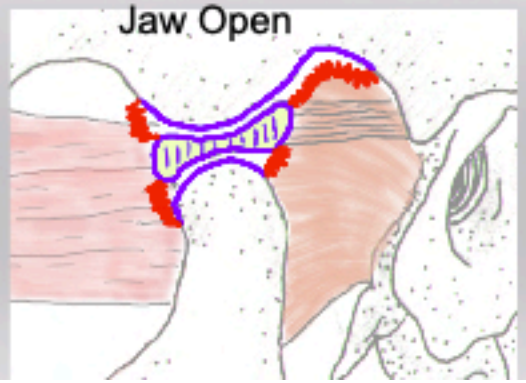


Left TMJ Coronal View



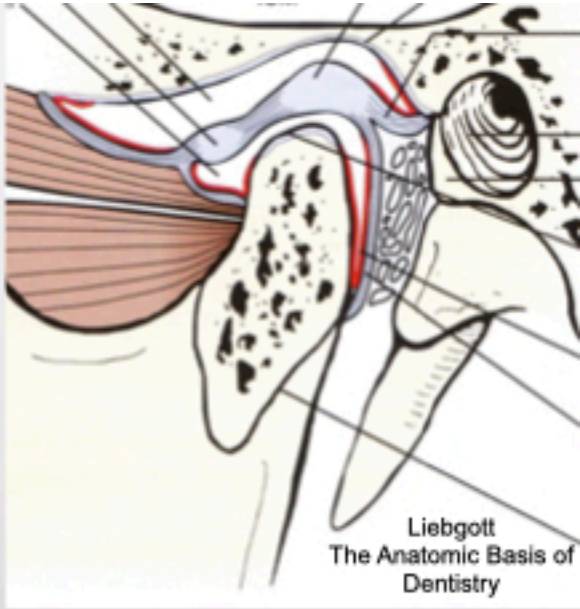
Normal TMJ- Synovium, Cartilage

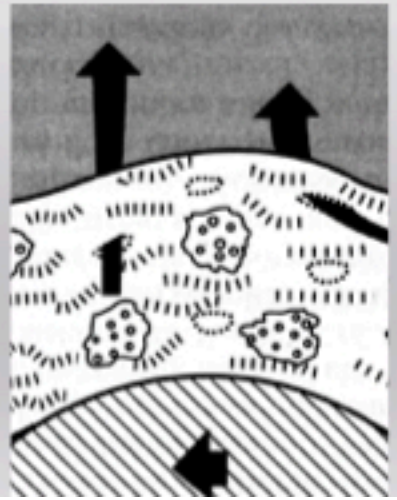




Fibrocartilage-
- Slope of Eminence
- Disc
- Top of Condyle

Synovial Tissue makes Synovial Fluid
- No blood vessels in a health joint
- Nutrition to the cartilage cells
- Lubrication- Hyaluronic Acid and Lubricin





Fibrocartilage surface covered in fluid
- Cartilage is hydrophilic
- Proteoglycan negative charge
- Surface Active Phospholipids
- Fluid slides against fluid
- 5x slipperier than ice

Normal TMJ

Discal Ligaments attach Disc to Condyle

Synovial Tissue
- Covers Front , Back and Sides
- Collapsed due to negative joint pressure

Disc viewed from above

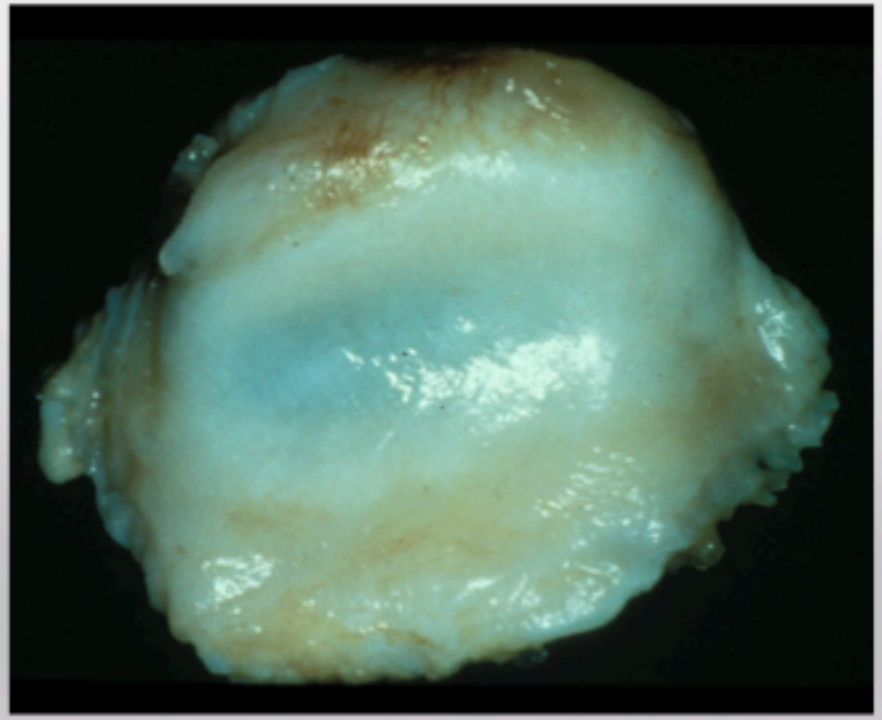
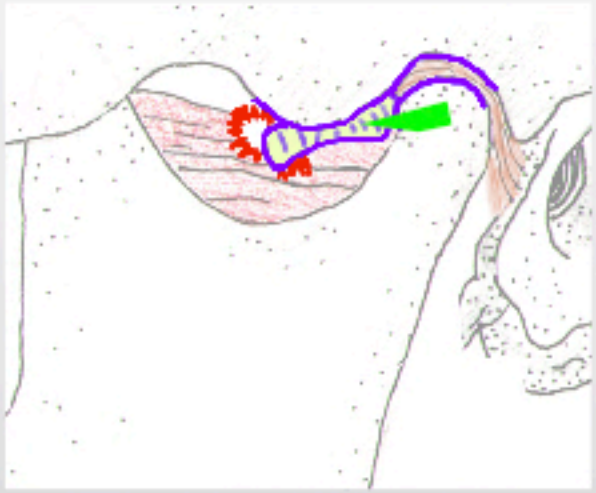


Photo Courtesy of Dr Henry Gremillion

Damaged TMJ- Anteriorly Dislocated Disc



Torn or stretched Meniscal ligaments

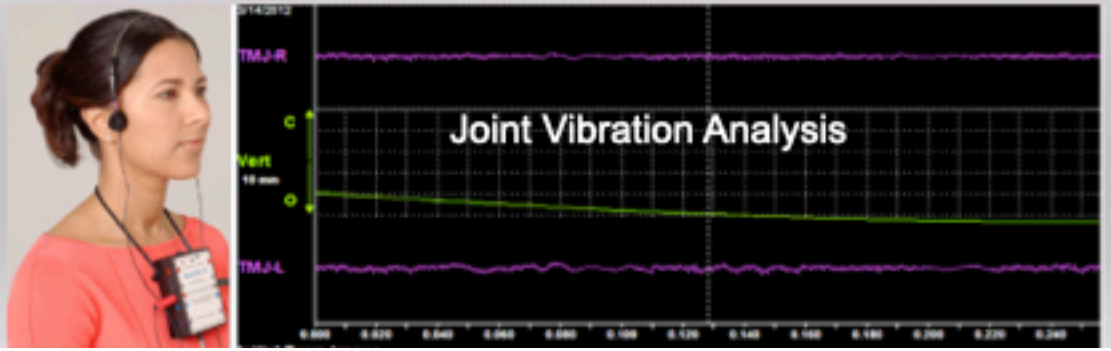
Anterior Dislocated Disc

Damaged Synovium

Retrodiscal Tissue pulled up and over the condyle
- Retrodiscal tissue in direct contact with fibrocartilage
- Major Increase in friction
- Retrodiscal tissue adapts into fibrous “pseudodisc”

85% of all damaged joints adapt favorably without treatment

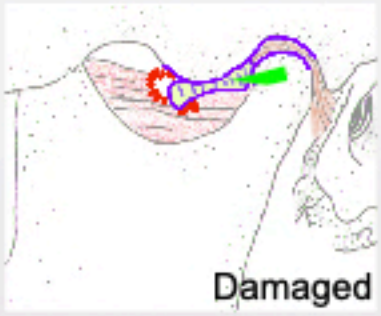
Cartilage sliding on tissue creates vibrations that can be detected

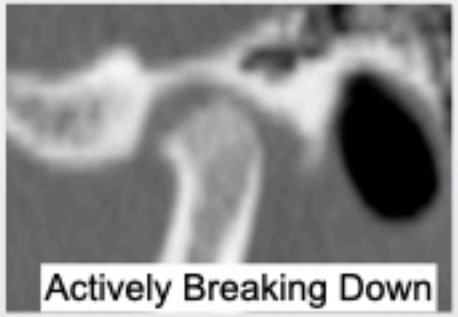


Basic Orthopedics

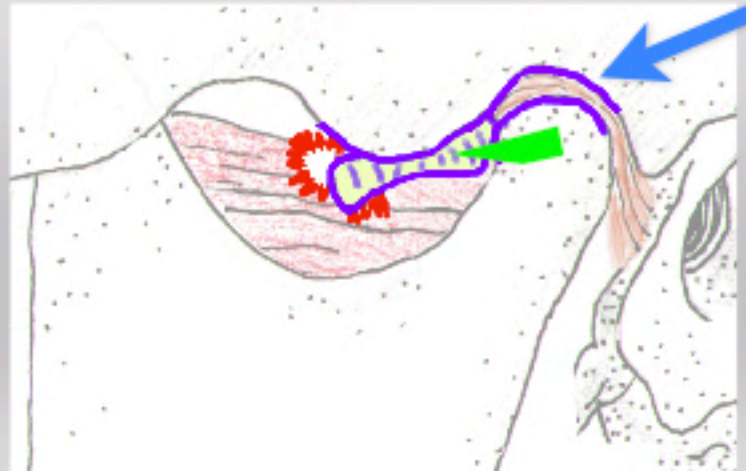
Joints are either
- Healthy or
- Damaged

If damaged, joints will be either:
- Actively Breaking Down
- Adapting
- Adapted
  - Structurally, Mechanically
  - Favorably, Unfavorably





Majority of damaged TMJs adapt favorably



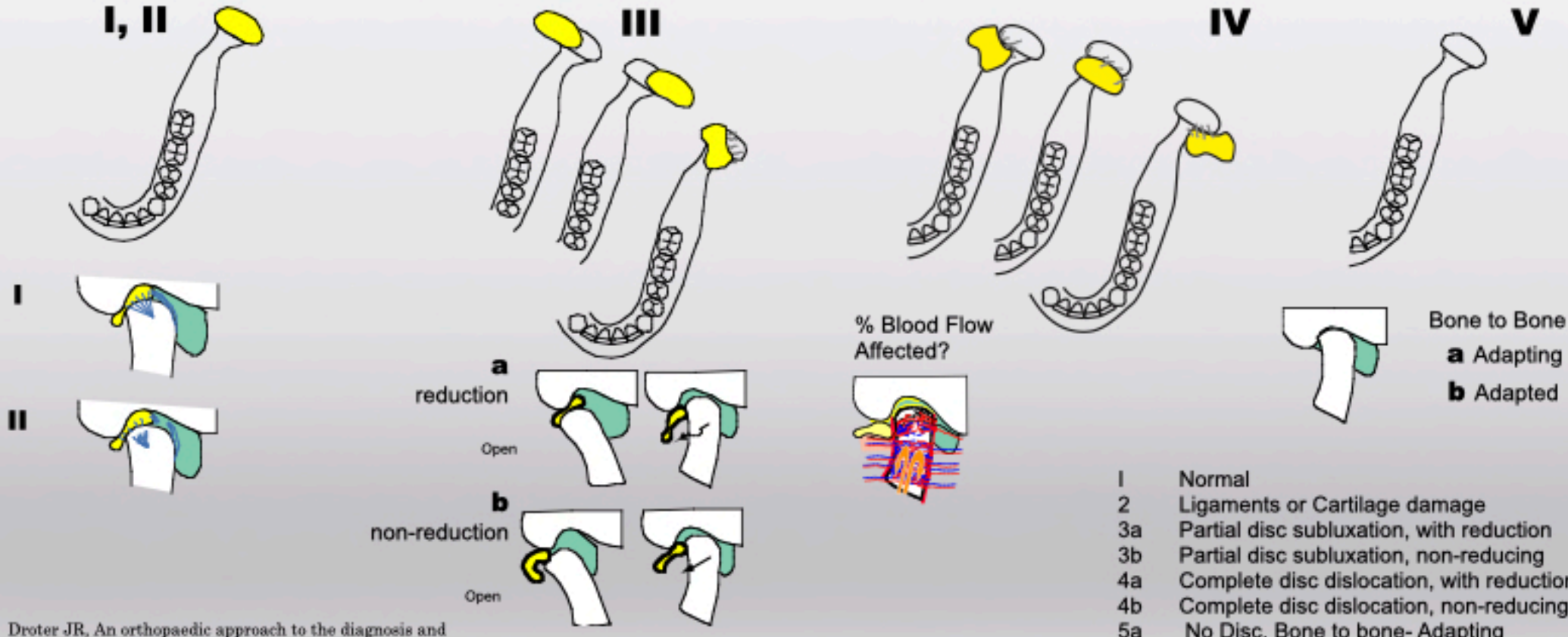
Posterior ligament, synovium, and retrodiscal tissue adapt to form a

Pseudo-disc

Tissue Fibrosis

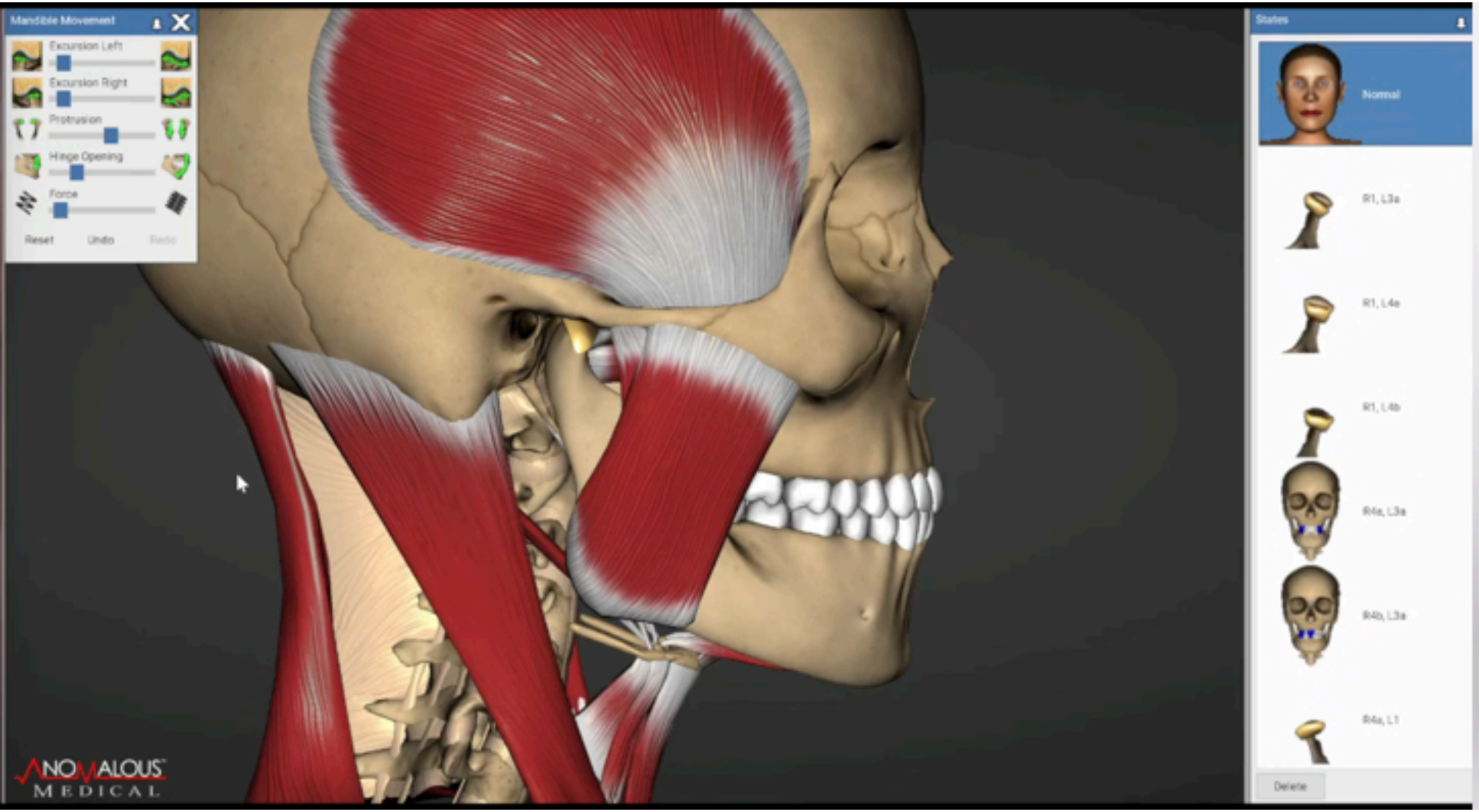
Dr. Mark Piper's Classification

Left TMJ

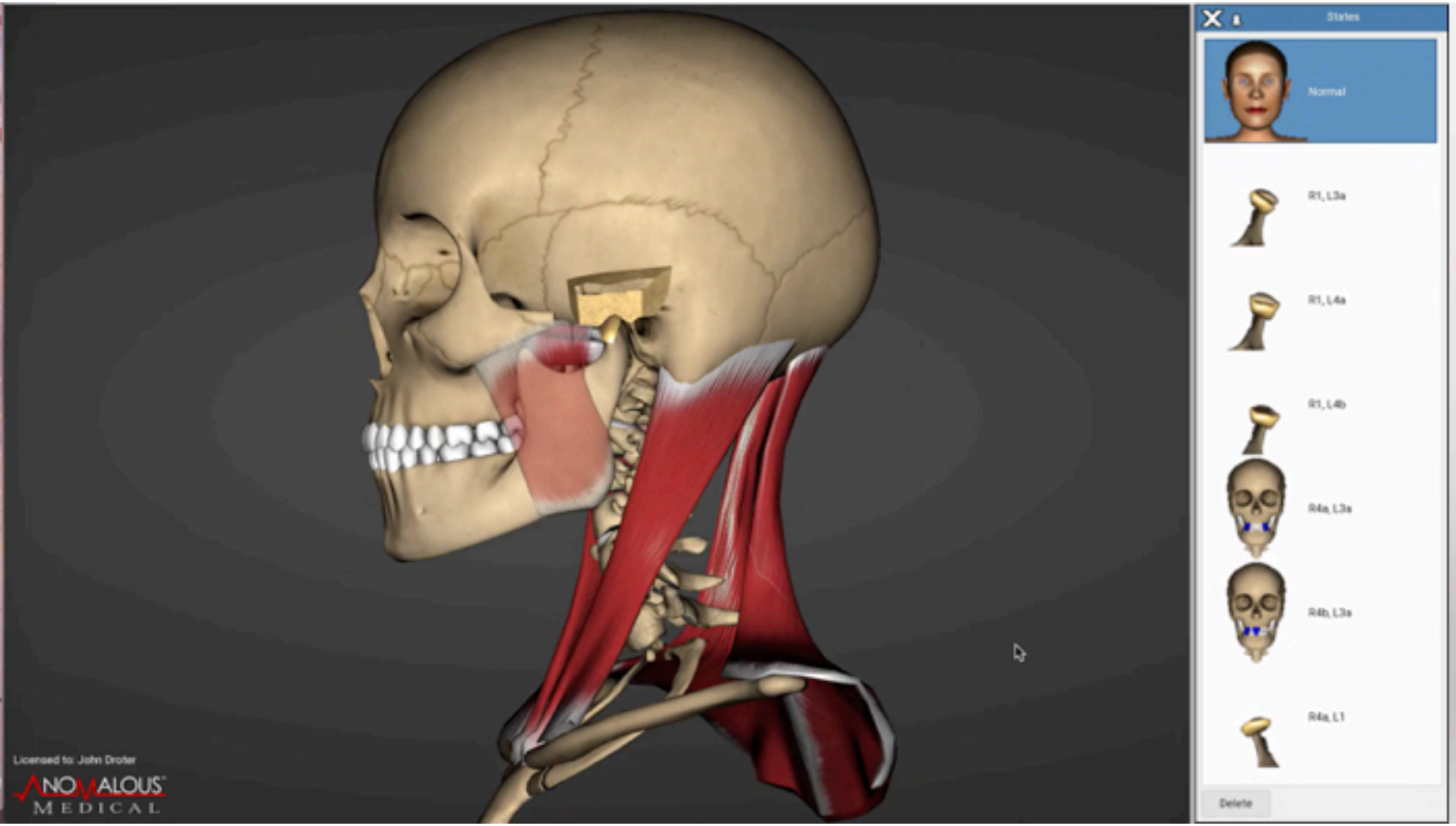


I	Normal
2	Ligaments or Cartilage damage
3a	Partial disc subluxation, with reduction
3b	Partial disc subluxation, non-reducing
4a	Complete disc dislocation, with reduction
4b	Complete disc dislocation, non-reducing
5a	No Disc, Bone to bone- Adapting
5b	No Disc, Bone to bone- Adapted

Droter JR, An orthopaedic approach to the diagnosis and treatment of disorders of the temporomandibular joint. Dent Today 2005 Nov;24(11):82, 84-8


Mandible Movement
Excursion Left
Excursion Right
Protrusion
Hinge Opening
Force
Reset
Undo
Redo
States
Normal
R1, L3a
R1, L4a
R1, L4b
R4a, L3a
R4b, L3a
R4a, L1
Delete
ANOMALOUS MEDICAL

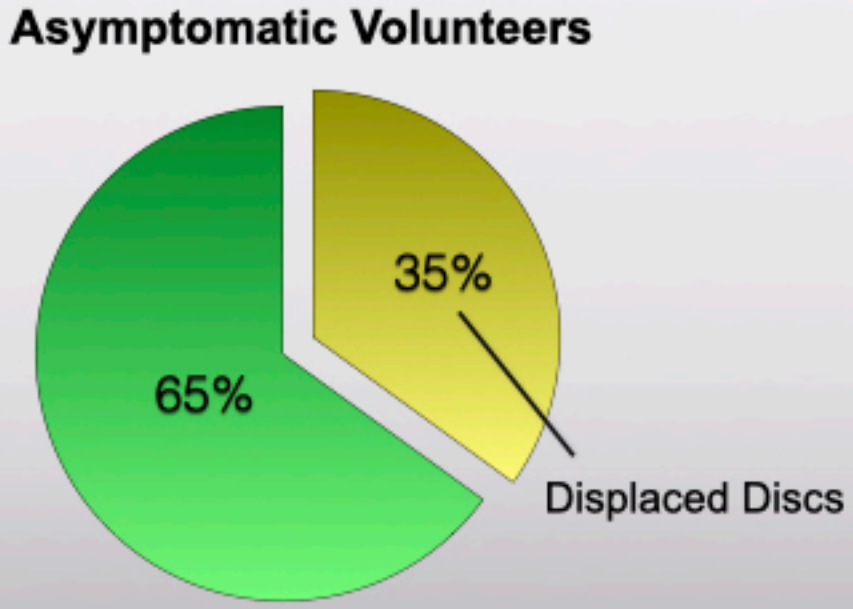
The Click



Skull Anatomy 4a

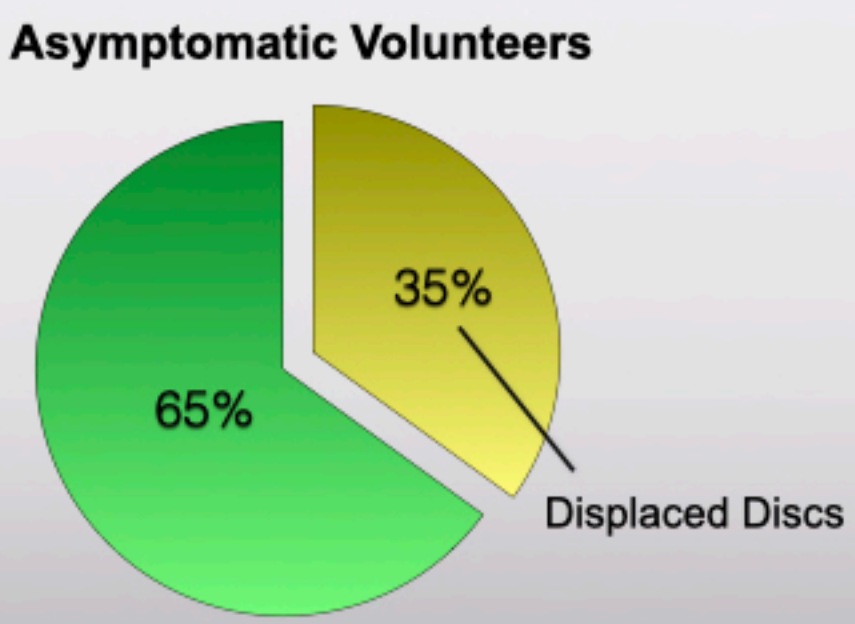

Condylar and Disk
Movements in Dissected
TMJ Autopsy Specimens

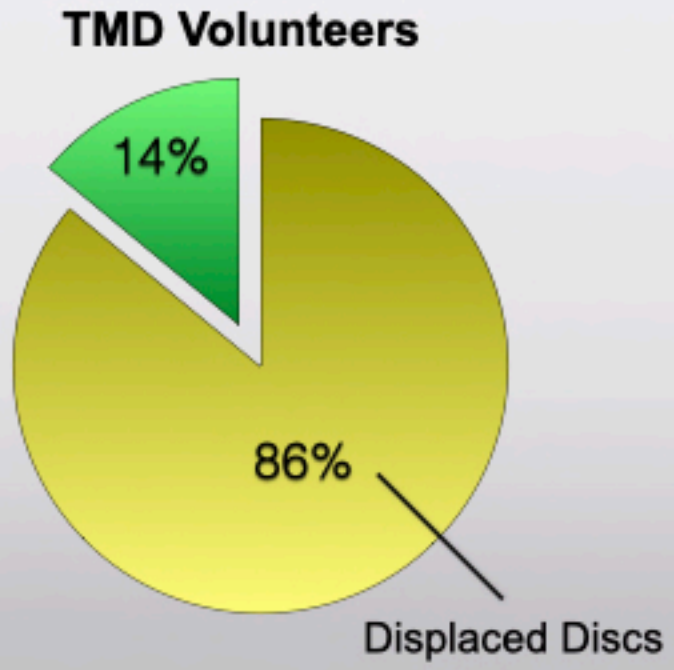
Prevalence Displaced Discs on MRI



The Prevalence of Disc Displacement in Symptomatic and Asymptomatic Volunteers
Ribeiro R, Tallents R, Katzberg R, J Oral Facial Pain 1997 ;11:37-47

Prevalence Displaced Discs on MRI

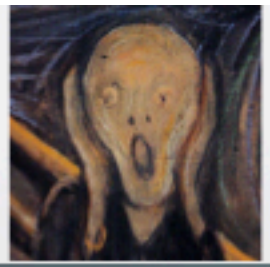




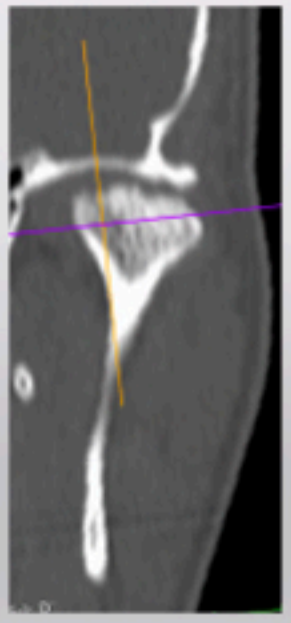
The Prevalence of Disc Displacement in Symptomatic and Asymptomatic Volunteers Aged 6 to 25 years
Ribeiro R, Tallents R, Katzberg R, J Oral Facial Pain 1997 ;11:37-47
MRI of 237 volunteers

What is the Clinical Relevance of TMJ Damage Post-Puberty?

John R Droter DDS
Annapolis, Maryland



Damaged TMJs



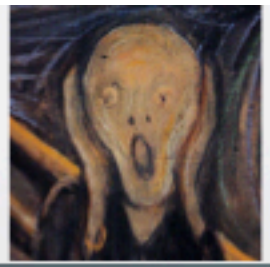
Adapt Favorably **85%**
Adapt Fairly **14%**
Adapt Poorly **<1%**

→ Occlusal Muscle Dysfunction
Osteoarthritis
Mechanically Dysfunctional

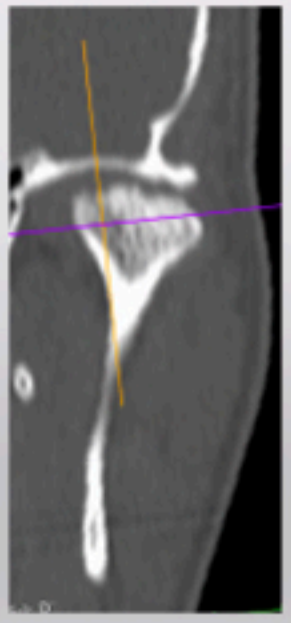
→ Avascular Necrosis

Progressive Condylar Resorption

*These are my guesses on %, no research to back up to backup



Damaged TMJs



Adapt Favorably **85%**

Adapt Fairly 14%

Adapt Poorly <1%

→ Occlusal Muscle Dysfunction
Osteoarthritis
Mechanically Dysfunctional

→ Avascular Necrosis

Progressive Condylar Resorption

*These are my guesses on %, no research to back up to backup

Symptoms of Temporomandibular Joint Osteoarthrosis and Internal Derangement 30 years after Non-Surgical Treatment.

Leeuw, Boering, Stegenga, Bont,
Journal of Craniomandibular Practice, April 1995, vol. 13, No. 2

- University Hospital, Netherlands: 134 TMD patients, 30 year follow up
- Patients received good clinical work up and diagnosis 30 years ago, but basically no treatment
  - (Reassurance, PT, exercise, limited occlusal adjust)
- 70% satisfied with results
- 25% still had pain on movement
- 15% not able to eat hard foods
- 35 control patients had no apparent symptoms

6 Common TMDs

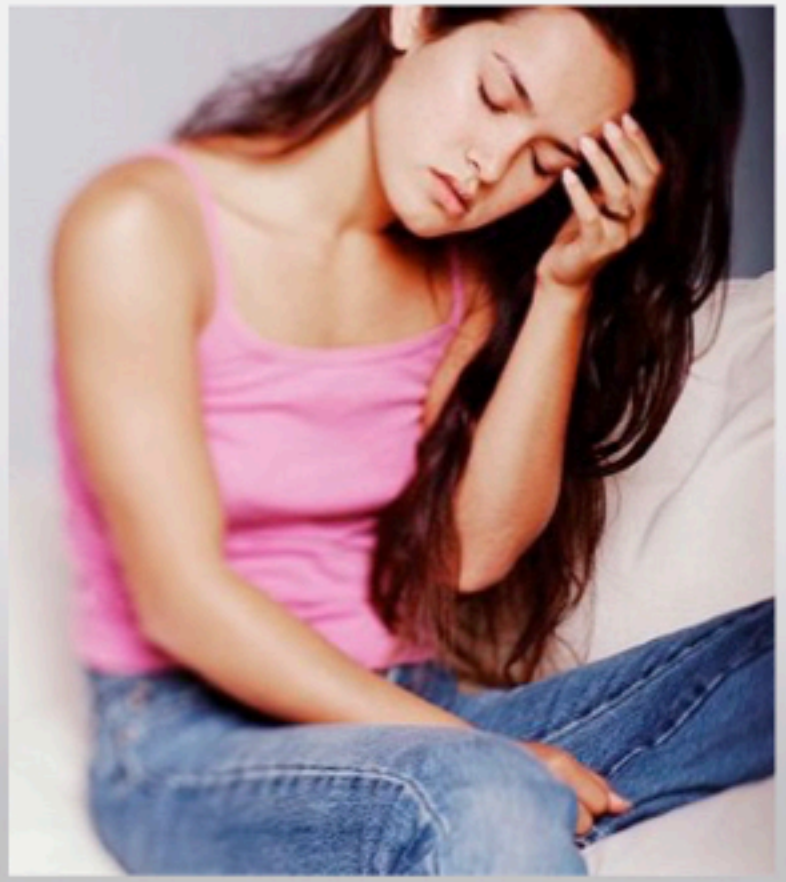
Parafunctional Clenching
Parafunctional Grinding
Occlusal Muscle Dysfunction
Osteoarthritis
Acute Sprain
Acute Closed lock of TMJ disc

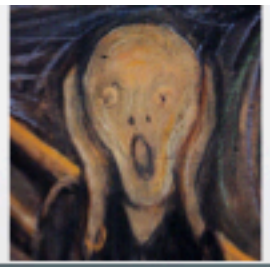
5 Common Obstacles

Neck and Postural Instability
Wobbly TM Joint (Subluxation)
Compromised Breathing/Airway
Avascular Necrosis
Referred Pain Muscle Triggerpoints

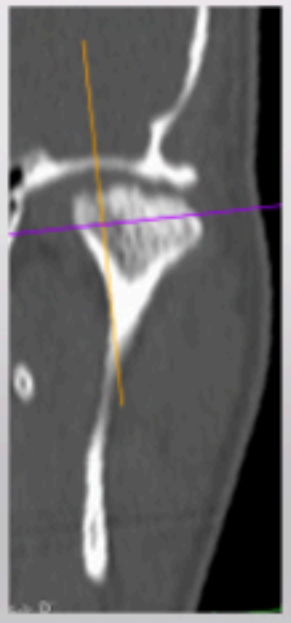
1 TMD that **usually** does not need therapy

TMJ Clicking





Damaged TMJs

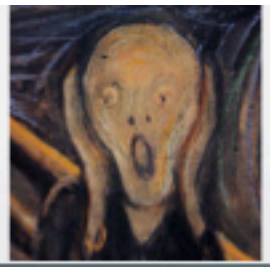


Adapt Favorably 85%

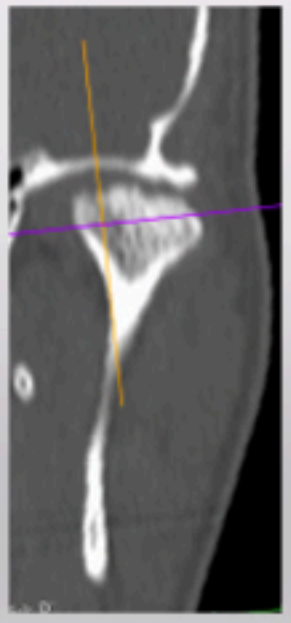
Adapt Fairly 14% → Occlusal Muscle Dysfunction
Osteoarthritis
Mechanically Dysfunctional

Adapt Poorly <1% → Avascular Necrosis
Progressive Condylar Resorption

*These are my guesses on %, no research to back up to backup



Damaged TMJs



Adapt Favorably	85%
Adapt Fairly	**14%**
Adapt Poorly	<1%

→ Occlusal Muscle Dysfunction
Osteoarthritis
Mechanically Dysfunctional

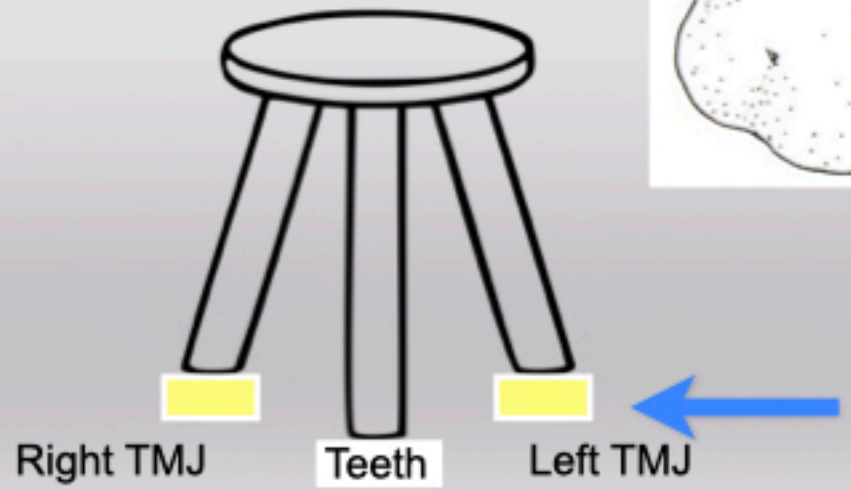
→ Avascular Necrosis
Progressive Condylar Resorption

*These are my guesses on %, no research to back up to backup

Normal Joint with Normal Occlusion

All teeth touch evenly with condyles seated in fossa

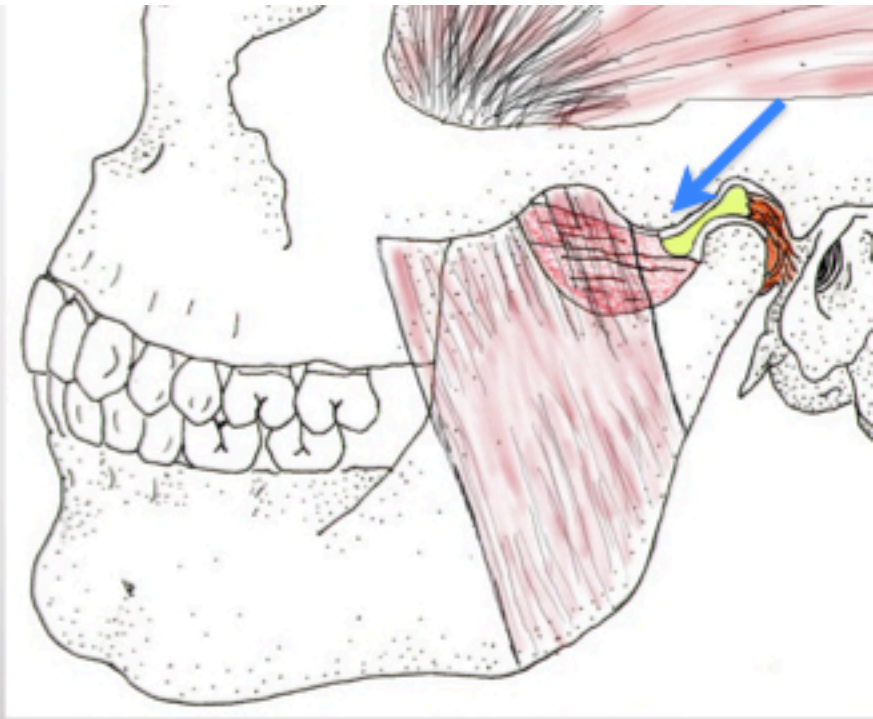
What happens to the occlusion if the disc is dislocated?

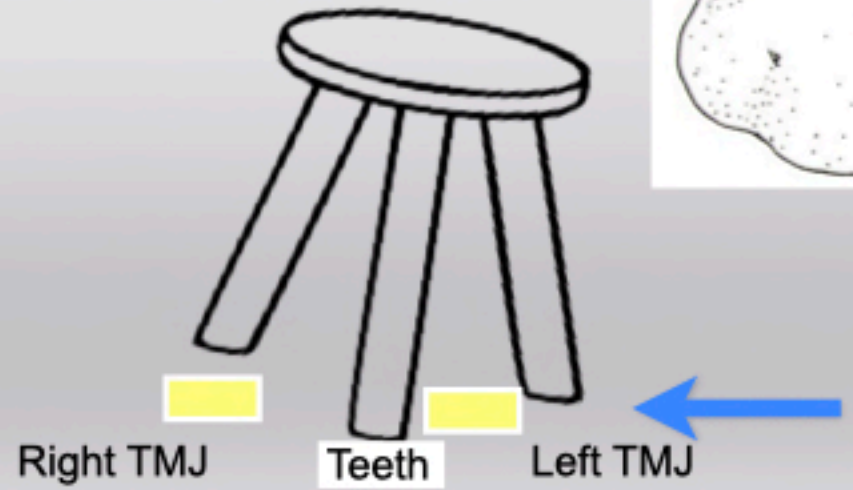


Normal Joint with Normal Occlusion

All teeth touch evenly with condyles seated in fossa

What happens to the occlusion if the disc is dislocated?





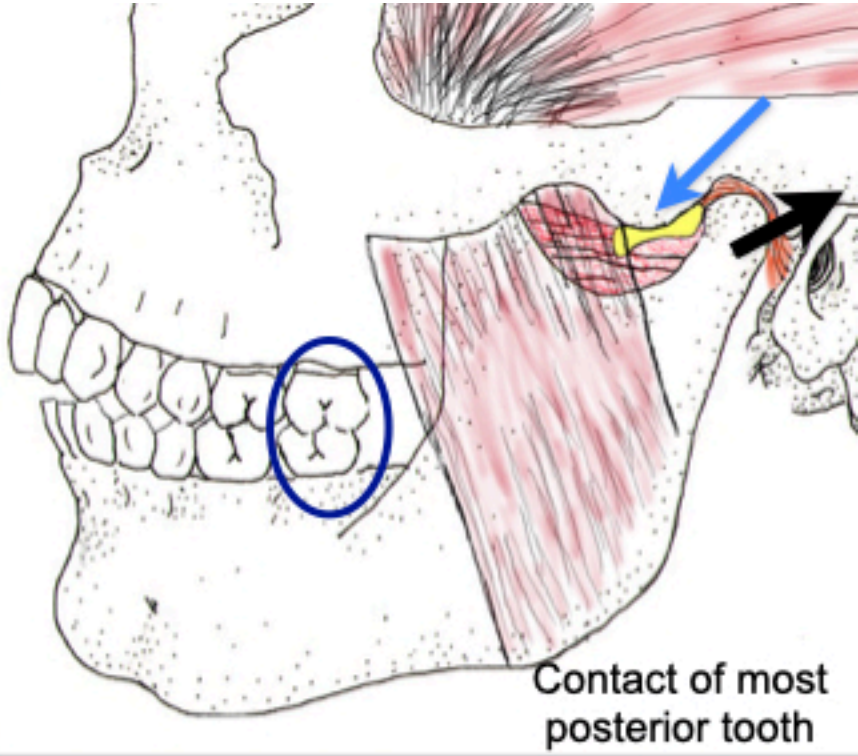
Damaged Joint with Malocclusion

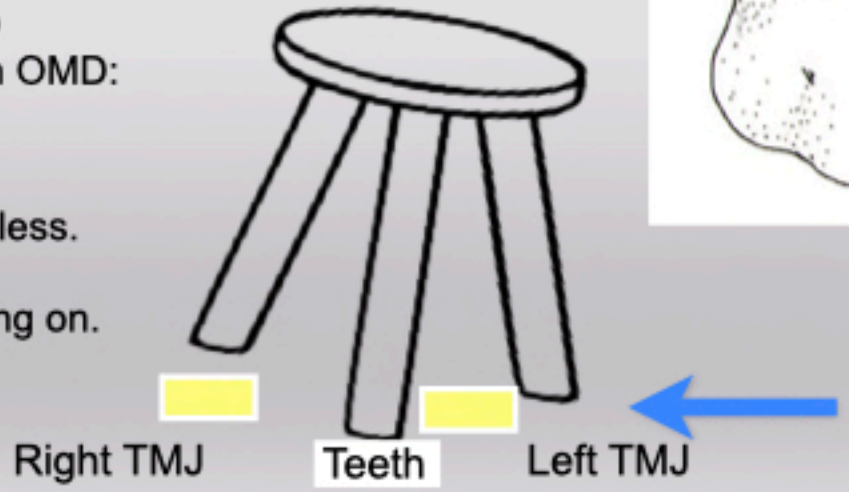
85% damaged joints adapt favorably with respect to the TMJ.

Anteriorly Dislocated Disc, Mandible shifts:
- Inadequate Anterior Guidance, Posterior Disclusion
- Uneven Occlusion,
- CR≠MaxIC
- Occlusal Muscle Disharmony develops.

Treat Adapted joints with OMD
the same as healthy joints with OMD:
Occlusal Adjustment

CR≠MaxIC should be 2mm or less.
(Horizontal 2mm)
If >2mm something else is going on.





Occlusal Muscle Disharmony

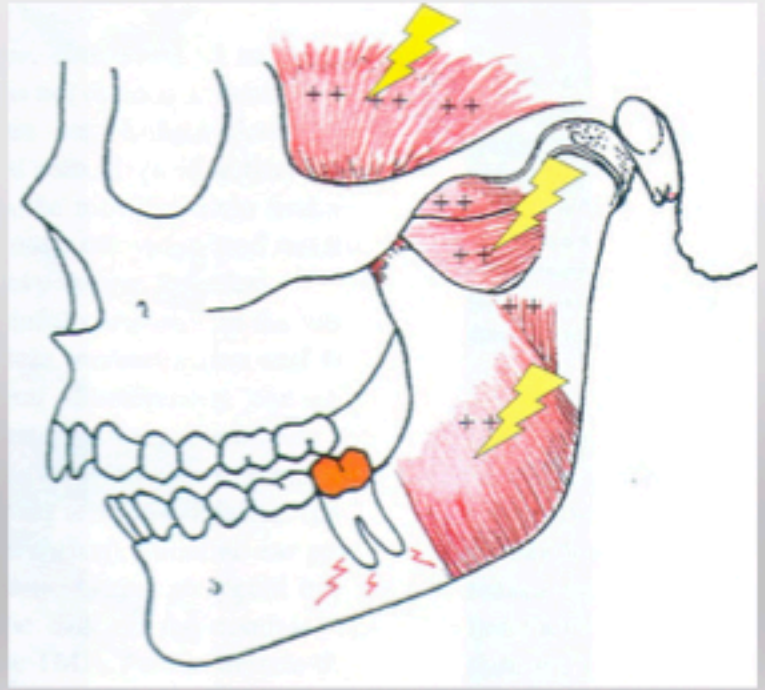
Uneven tooth contact with condyles fully seated triggers muscle activity

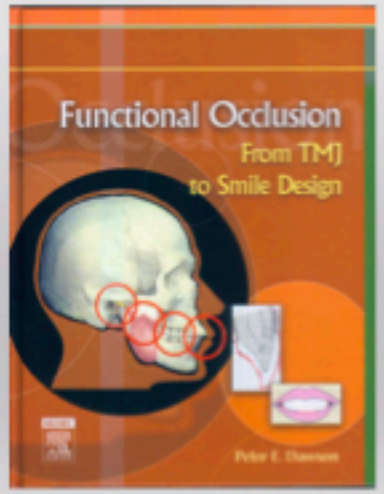
Lateral pterygoid fires out of sequence to create even tooth contact on closure

Disharmony in all muscles: Splinting/Bracing

Muscles sore from overuse

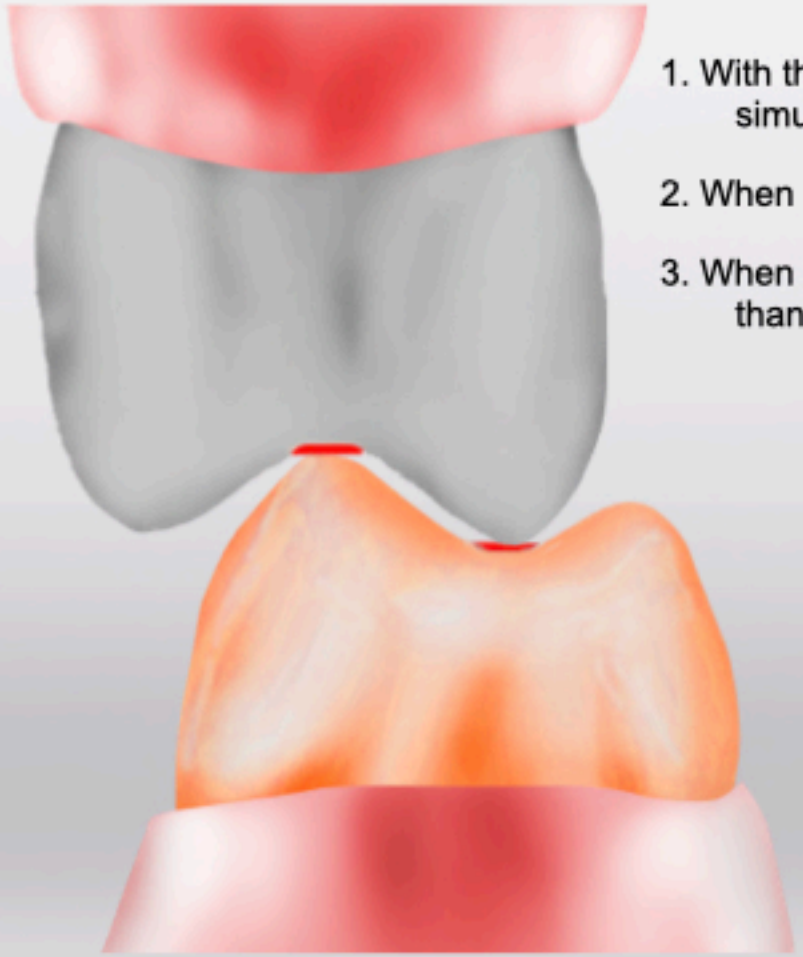
Muscles do not think- CNS input





from Dawson's Textbook, "Functional Occlusion"

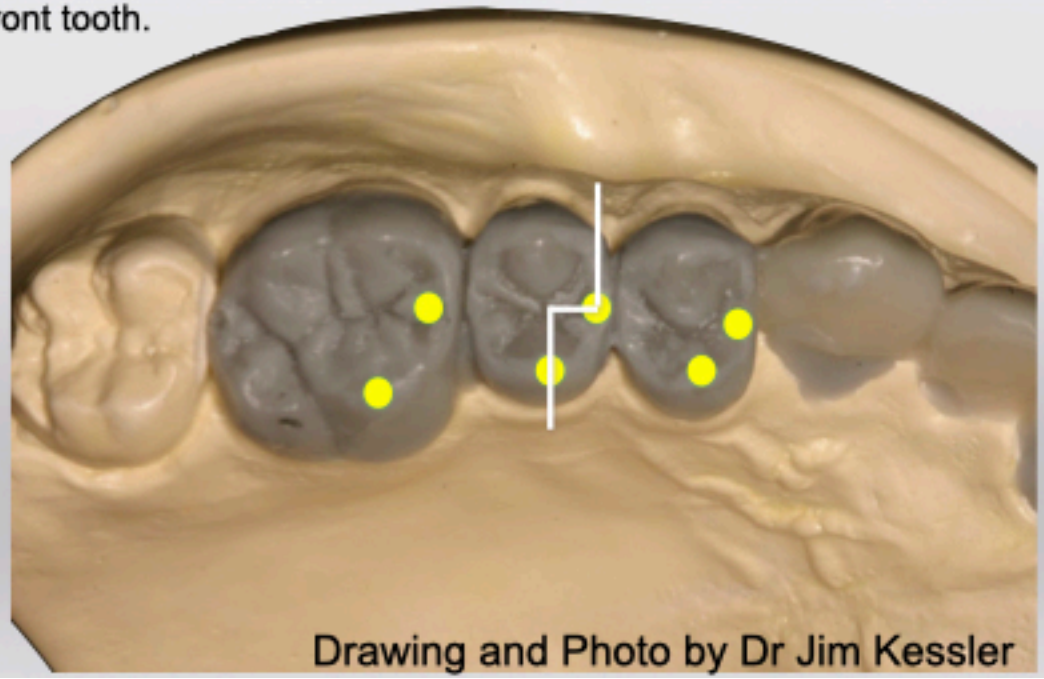
LD Pankey's 3 Rules of Occlusion (Clyde Schuyler)



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 (in a lateral direction).

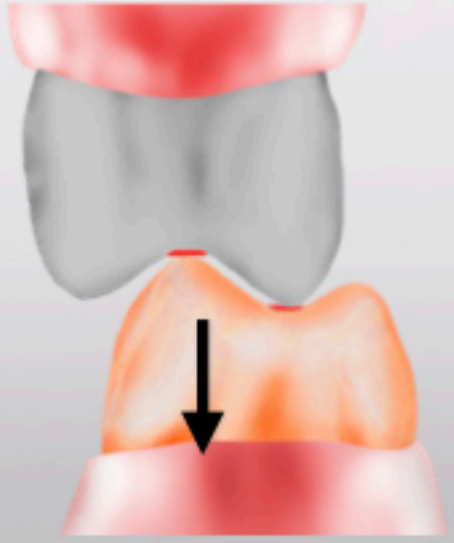
3. When you move the mandible in any excursion, no back tooth hits before, harder than, or after a front tooth.



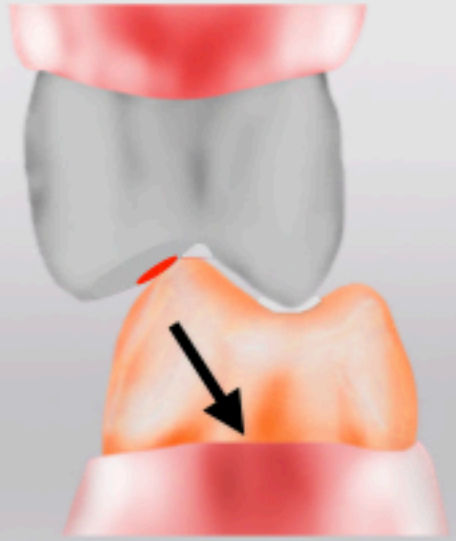
Drawing and Photo by Dr Jim Kessler

Ideal Occlusion for Comfortable Muscles

Ideal
No sideways forces on back teeth.



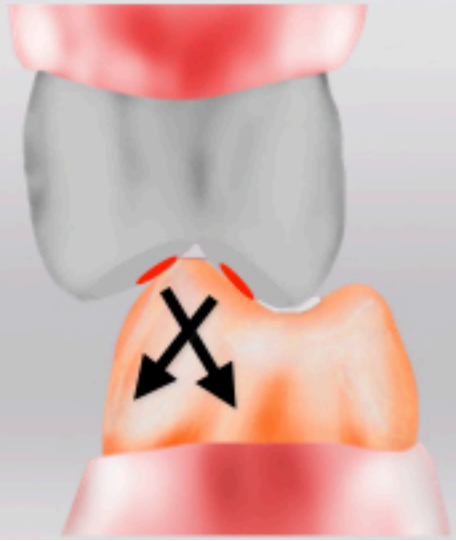
Not Ideal
Tense Muscles
Teeth can fracture



Sideways forces can fracture teeth

Not Ideal
Tense Muscles

Back teeth will have sideways force when the jaw moves left or right.

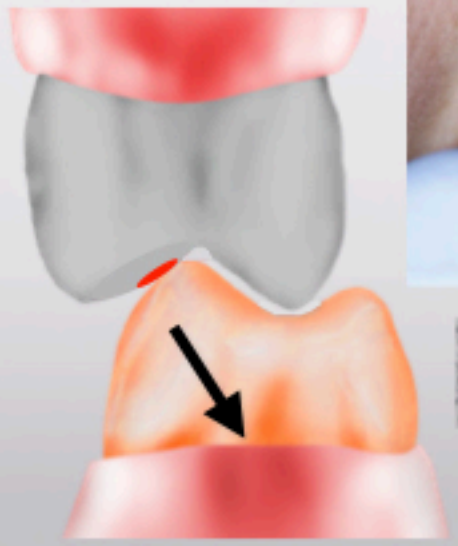


Not Ideal

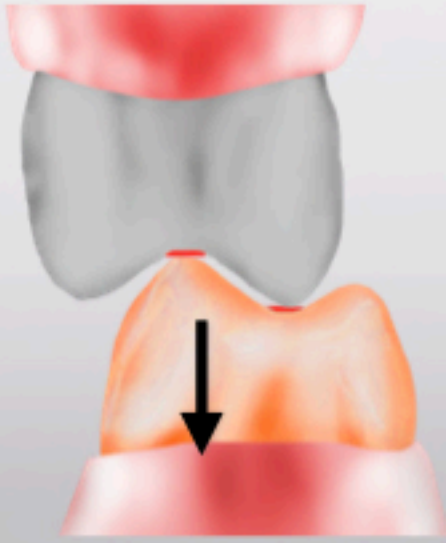
This is now a functionless tooth. Other teeth now have more force.

Occlusal Sculpting

Reshape



Polish

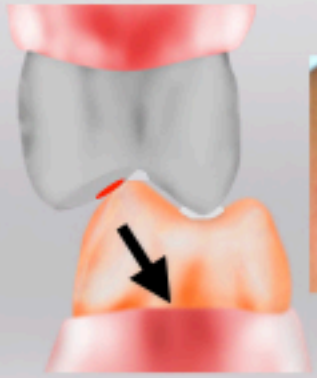


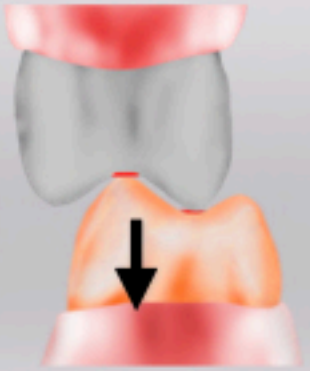
Treat Occlusal Muscle Dysfunction- Sculpt the Bite

Teeth are reshaped so no sideways forces on back teeth

Before

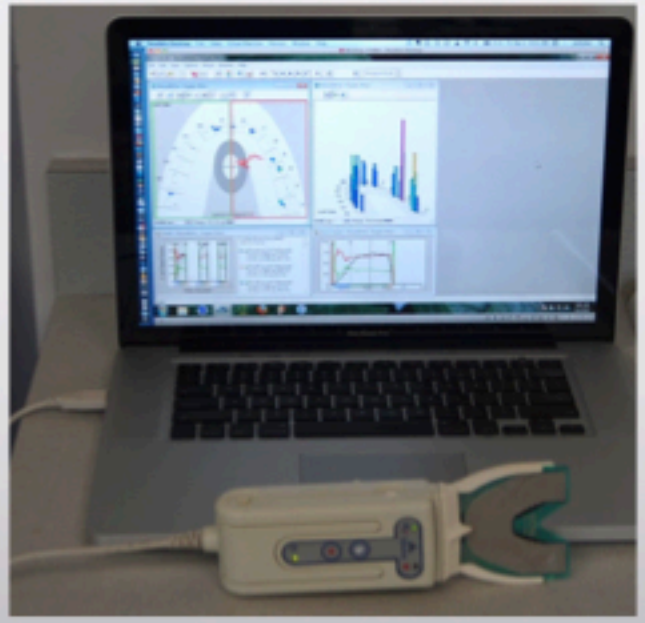
After

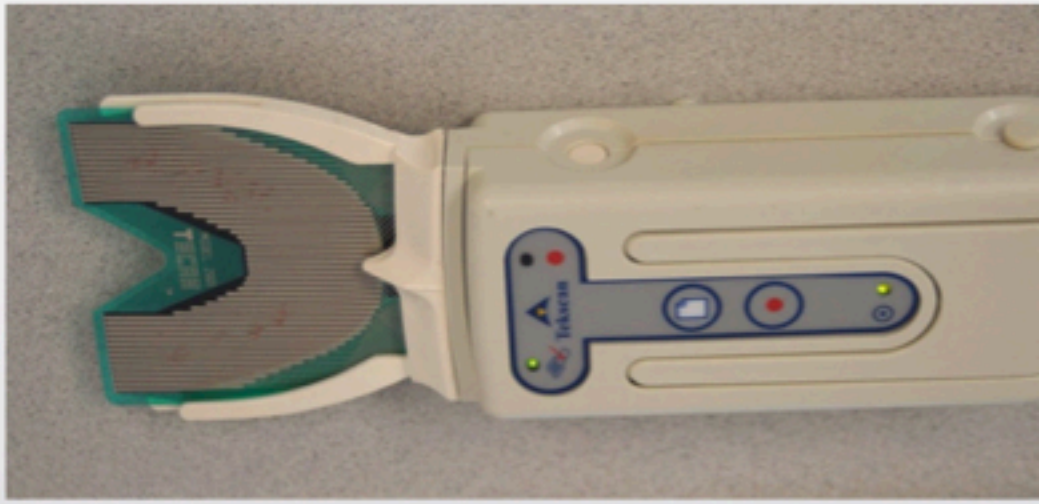




T-Scan Computerized Occlusion

Occlusion Live and in Slow Motion





Articulating Paper leaves evidence after the events

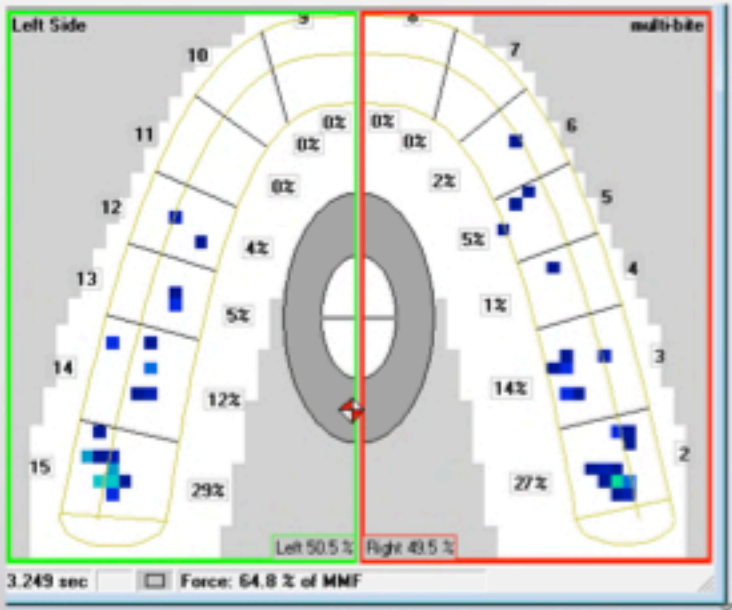
- Not Live
- All events lumped together

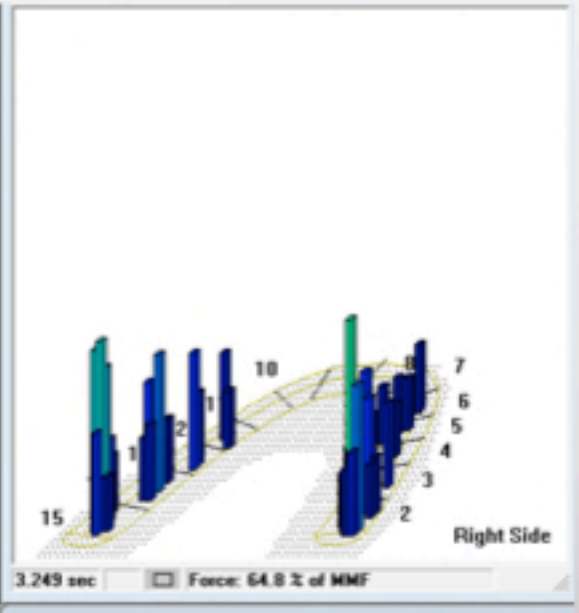
Using Since1999

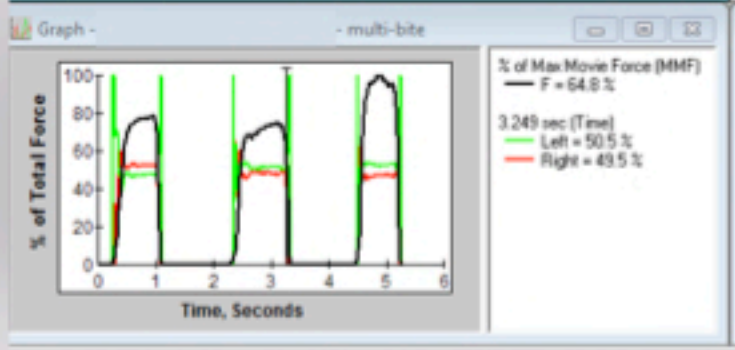
Time Force Graphic Representation of the Occlusion

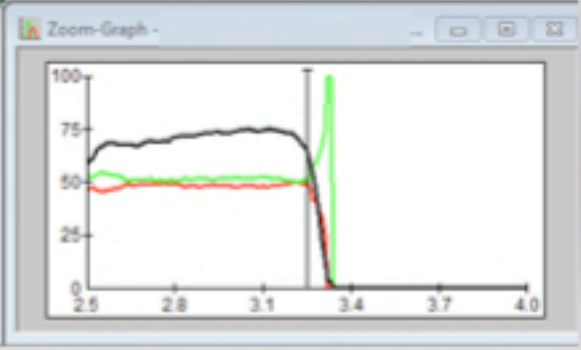
T-Scan Gives you:
Timing
Intensity
Location
Distribution

"Occlusion in Slow Motion"
Regular 10 msec intervals
Turbo 2.5 msec









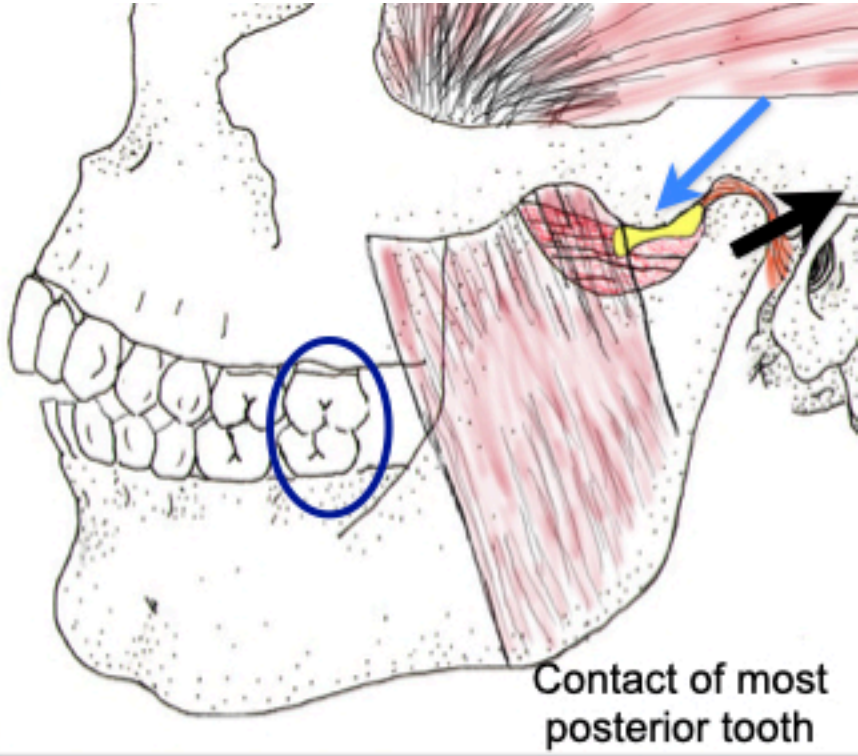
Damaged Joint with Malocclusion

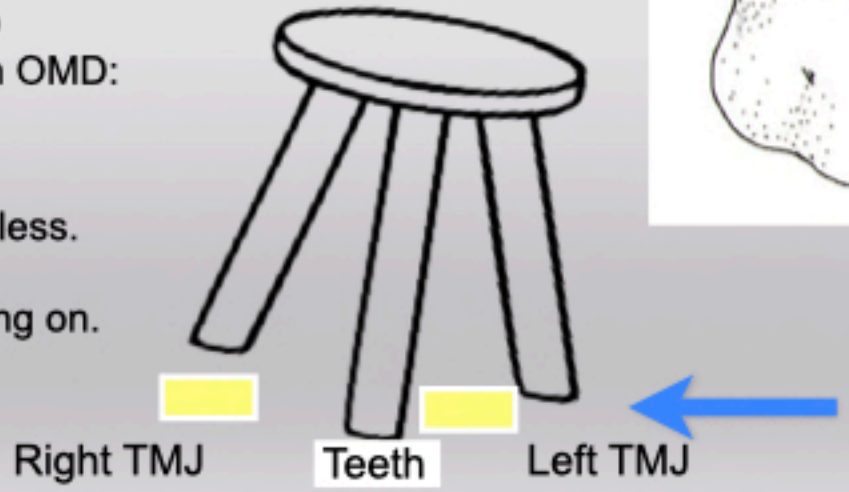
85% damaged joints adapt favorably with respect to the TMJ.

Anteriorly Dislocated Disc, Mandible shifts:
- Inadequate Anterior Guidance, Posterior Disclusion
- Uneven Occlusion,
- CR≠MaxIC
- Occlusal Muscle Disharmony develops.

Treat Adapted joints with OMD
the same as healthy joints with OMD:
Occlusal Adjustment

CR≠MaxIC should be 2mm or less.
(Horizontal 2mm)
If >2mm something else is going on.



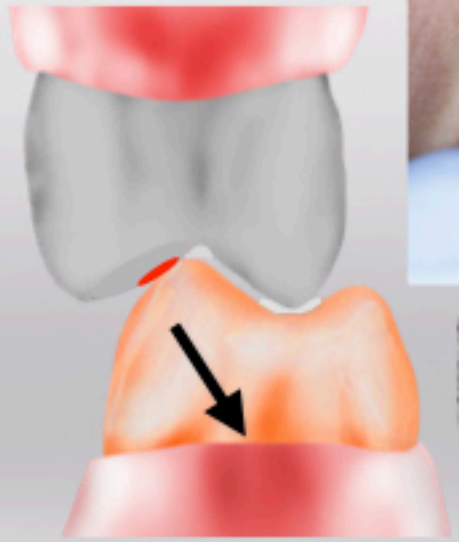


Learn Occlusal Equilibration

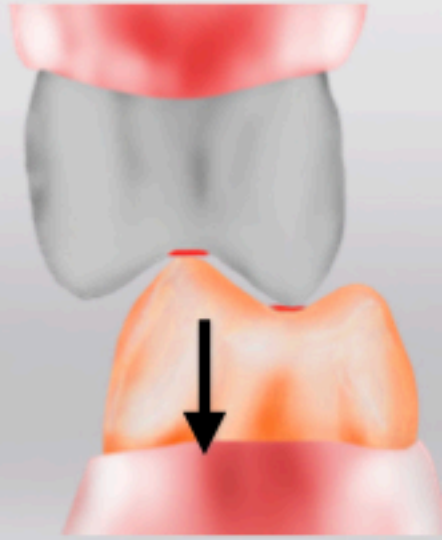
LD Pankey Institute
Robert Kerstein T-Scan Courses

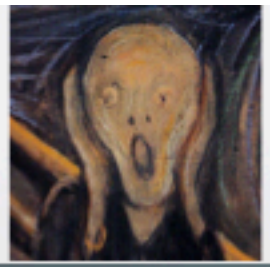
Kois Center
Spear Education
Dawson

Reshape

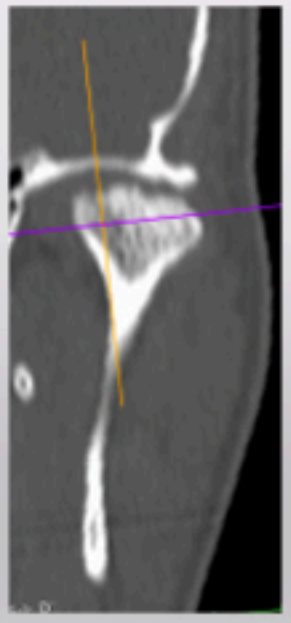


Polish





Damaged TMJs



Adapt Favorably	85%
Adapt Fairly	**14%**
Adapt Poorly	<1%

→ Occlusal Muscle Dysfunction
→ Osteoarthritis
→ Mechanically Dysfunctional

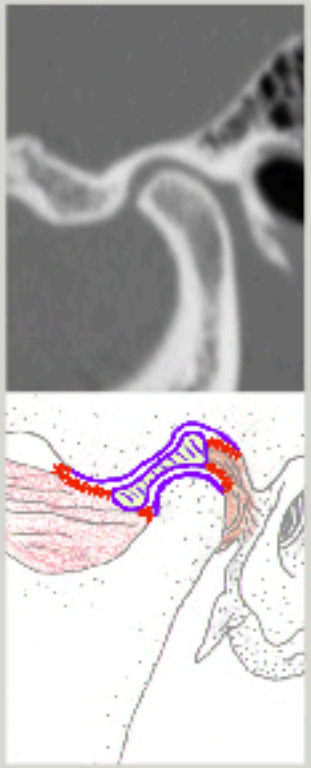
→ Avascular Necrosis
→ Progressive Condylar Resorption

*These are my guesses on %, no research to back up to backup

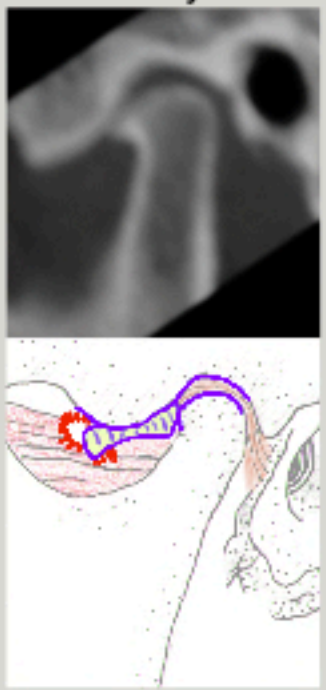
Osteoarthrosis/Osteoarthritis

Healthy joints have no friction or wear.
Damaged joints have Friction. Friction causes wear.
OA is a wearing out of a joint which starts in cartilage.
Parafunction increases wear.

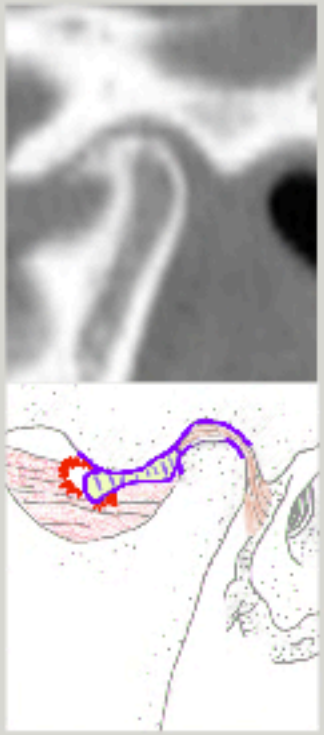
Normal



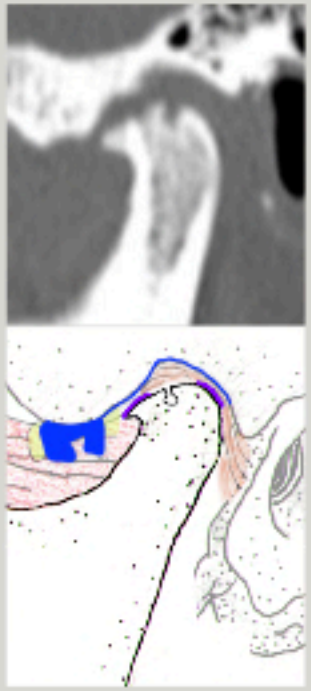
Early



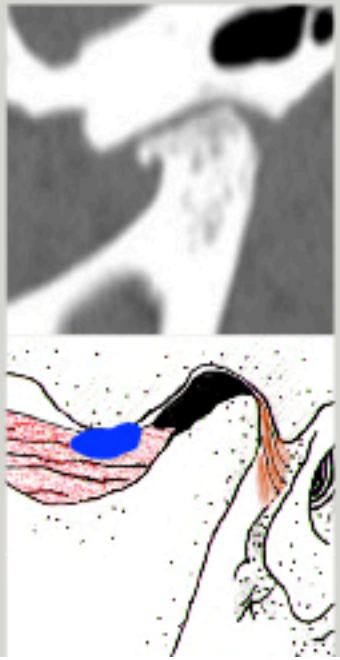
Early/ Moderate



Moderate



Severe OA, Eburnation

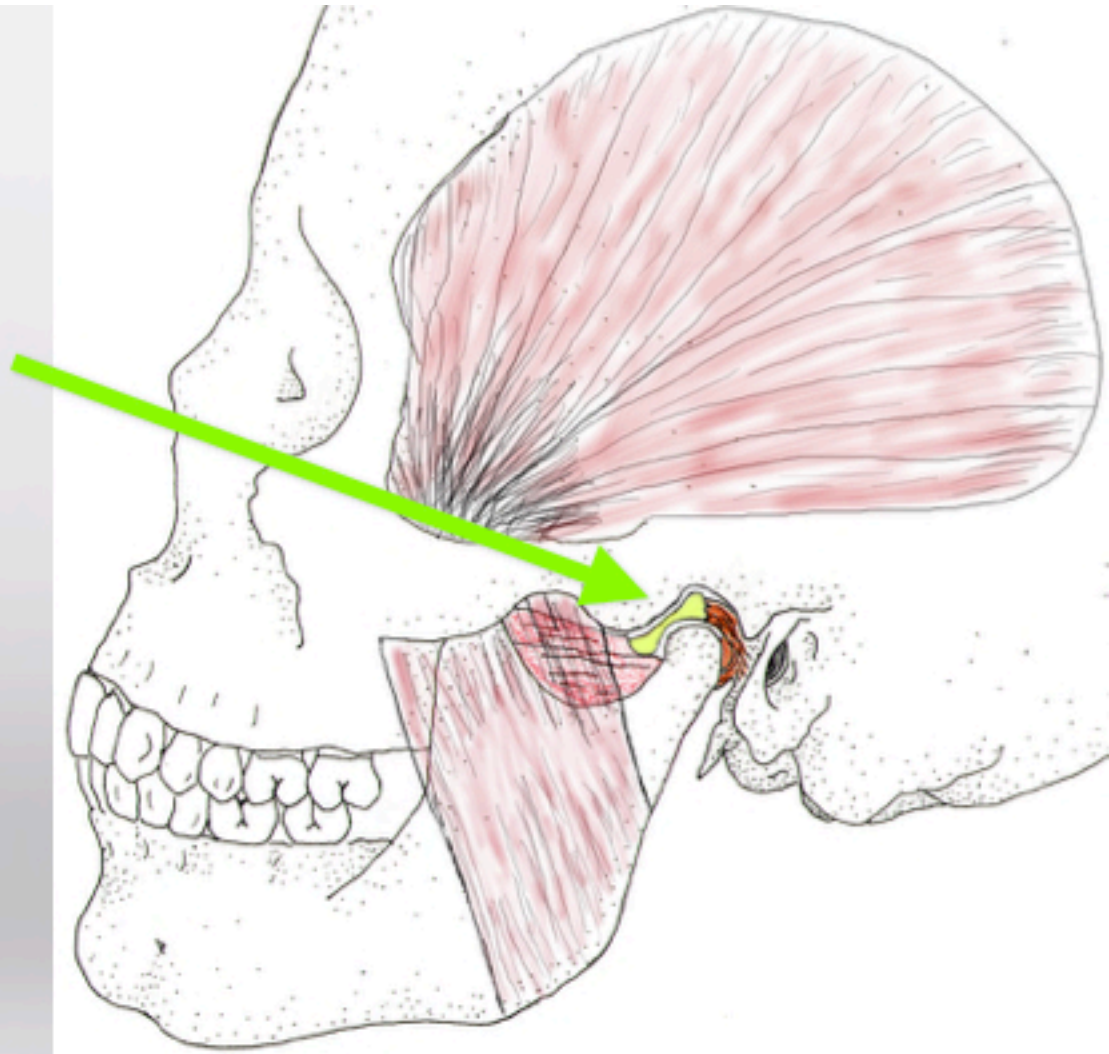


Representative examples of OA
in different patients

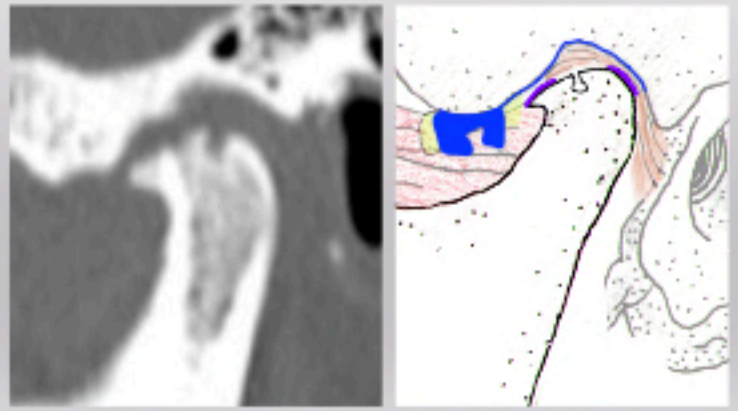
Drawings by Gretta Tomb DDS and John Droter DDS

Osteoarthritis is the most common of the 40 different diseases that affect all joints.

Heathy
Temporomandibular Joint
"TMJ"



Osteoarthritis of the TMJ

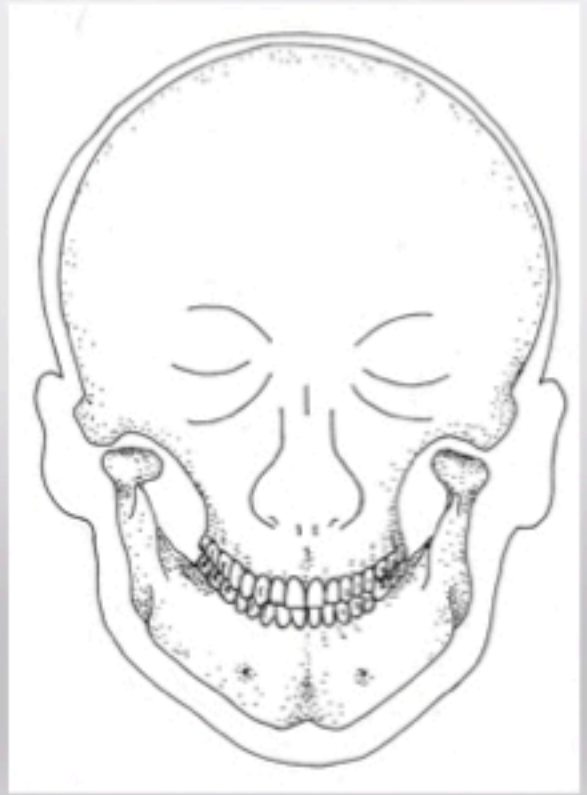


What happens if you lose 2mm joint height in both Right and Left TMJ?

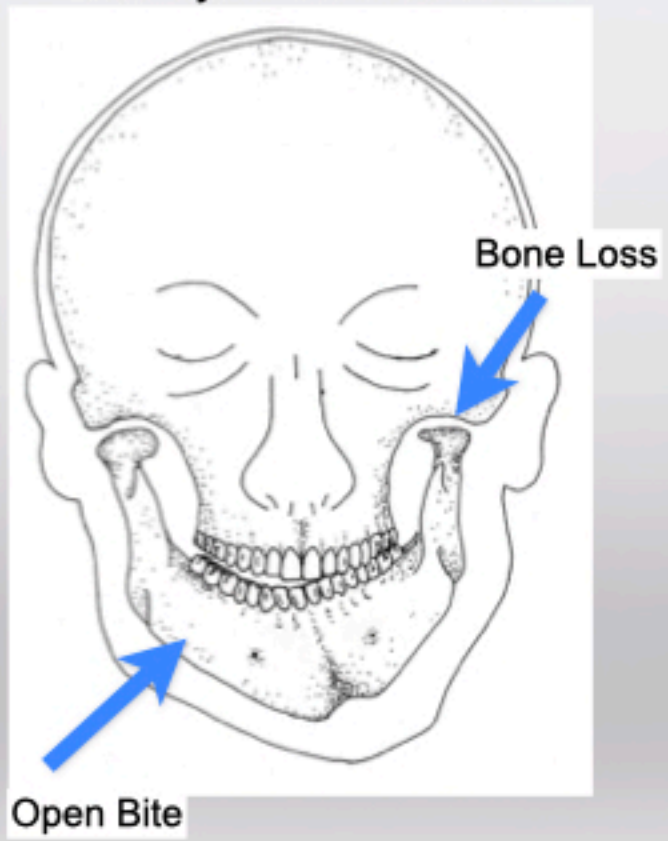
Can lose joint height with bone loss or disc displacement

Minus 2mm TMJ RL joint height

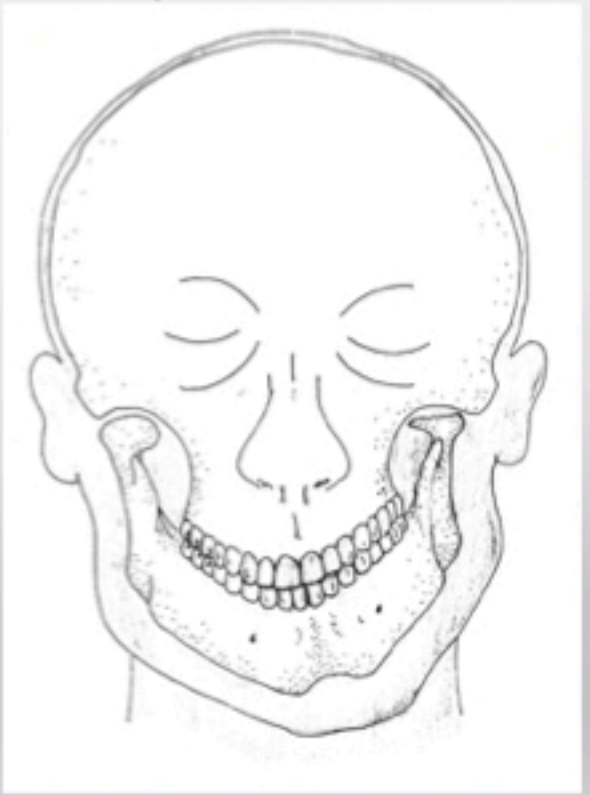
Diseases that cause bone loss in the TMJ alter the Occlusion



Condylar Bone Loss



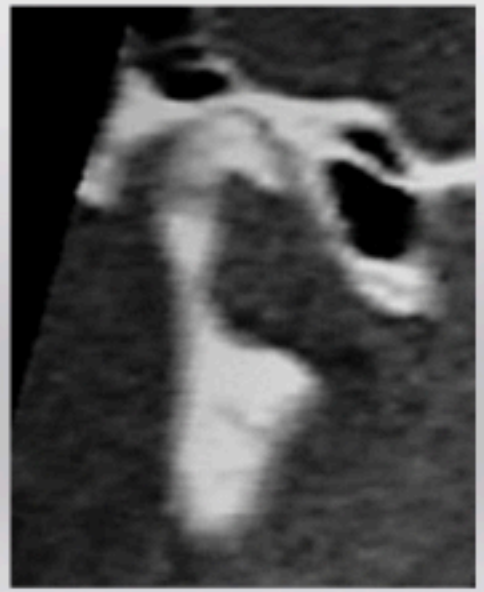
Adaptation Over Time



Drawings by Gretta Tomb, DDS

Adaptation Chronic Bilateral Osteoarthrosis

Mandible recedes Slowly
Teeth Move/ Adapt
Anterior Guidance gets steeper as Condylar Guidance get shallower



OA Right and Left Bone Loss
#8 Ankylosed

Treatment OA

Osteoarthr**osis**

Minimize parafunction:

If sleep grinding due to airway:

CPAP or Dental Airway Device

Glucosamine 1500mg /Chondroitin 600 mg

Shea Brand CBD

Osteoarthr**itis**

All of the above plus eliminate inflammation……

NSAIDs

Cold Laser

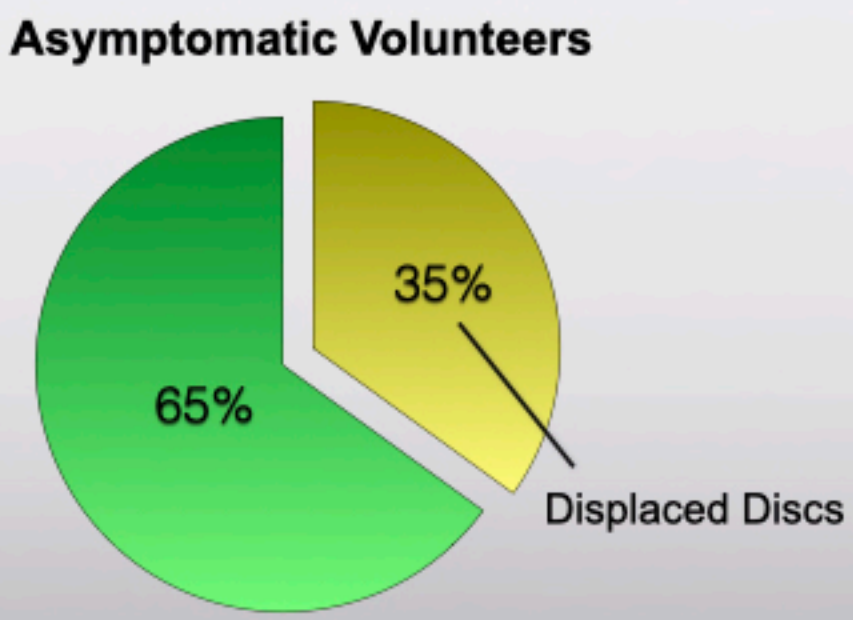
If still inflamed arthrocentesis with Platelet Rich Plasma (PRP)

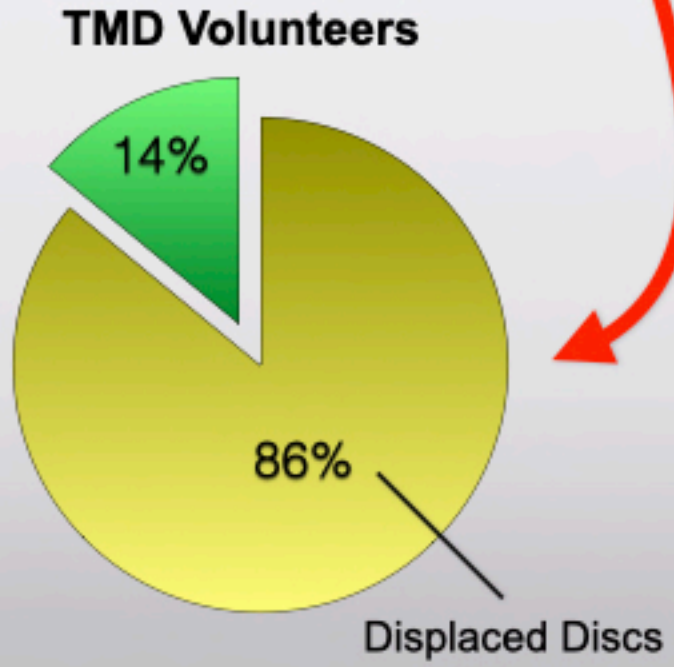
MLS Laser

3x week for 3 weeks

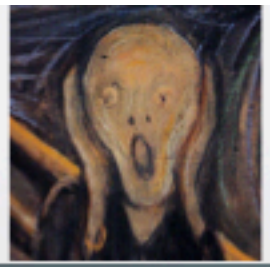
Prevalence Displaced Discs on MRI

Occlusal Muscle Disharmony
Osteoarthritis

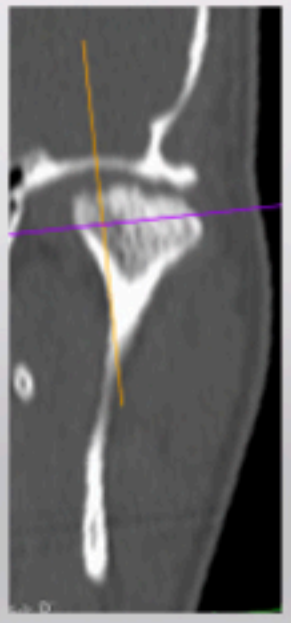




The Prevalence of Disc Displacement in Symptomatic and Asymptomatic Volunteers Aged 6 to 25 years
Ribeiro R, Tallents R, Katzberg R, J Oral Facial Pain 1997 ;11:37-47
MRI of 237 volunteers



Damaged TMJs



Adapt Favorably 85%

Adapt Fairly 14%

Adapt Poorly <1%

→ Occlusal Muscle Dysfunction
Osteoarthritis
Mechanically Dysfunctional

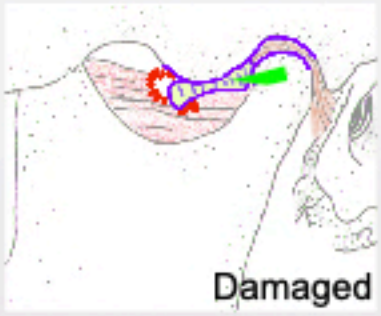
→ Avascular Necrosis
Progressive Condylar Resorption

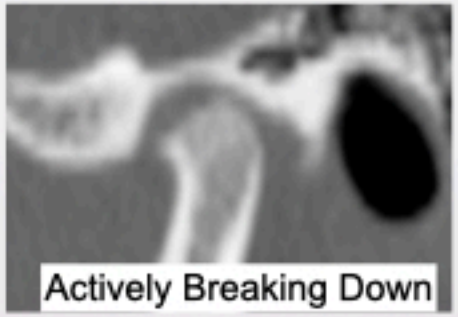
*These are my guesses on %, no research to back up to backup

Basic Orthopedics

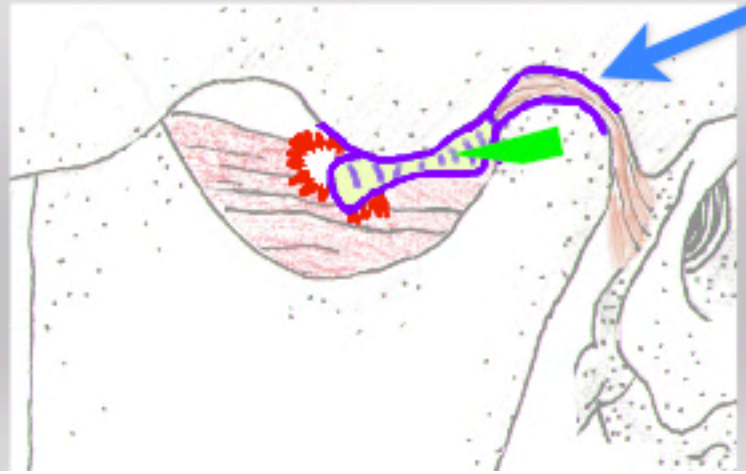
Joints are either
- Healthy or
- Damaged

If damaged, joints will be either:
- Actively Breaking Down
- Adapting
- Adapted
  - Structurally, Mechanically
  - Favorably, Unfavorably





Majority of damaged TMJs adapt favorably

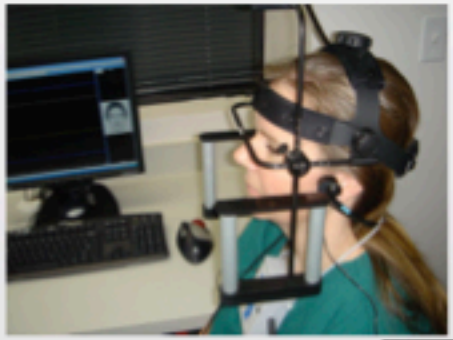


Posterior ligament, synovium, and retrodiscal tissue adapt to form a

Pseudo-disc

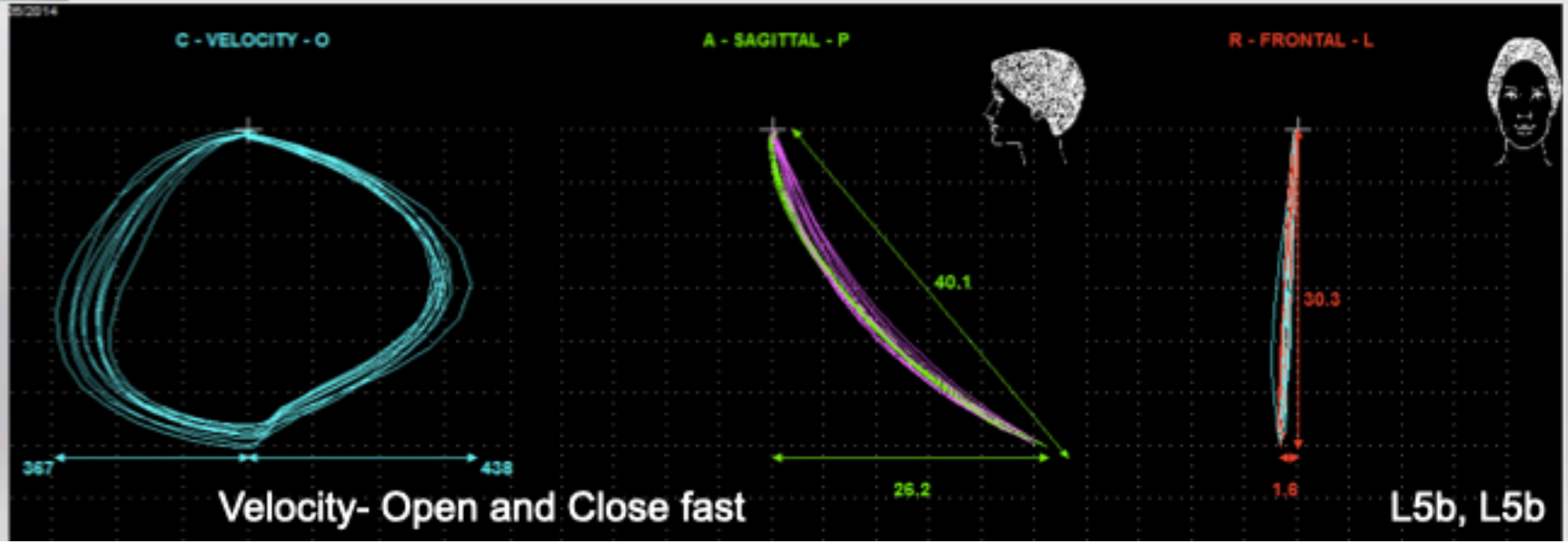
Tissue Fibrosis

BioResearch Jaw Tracker



Normal TMJ- Motion

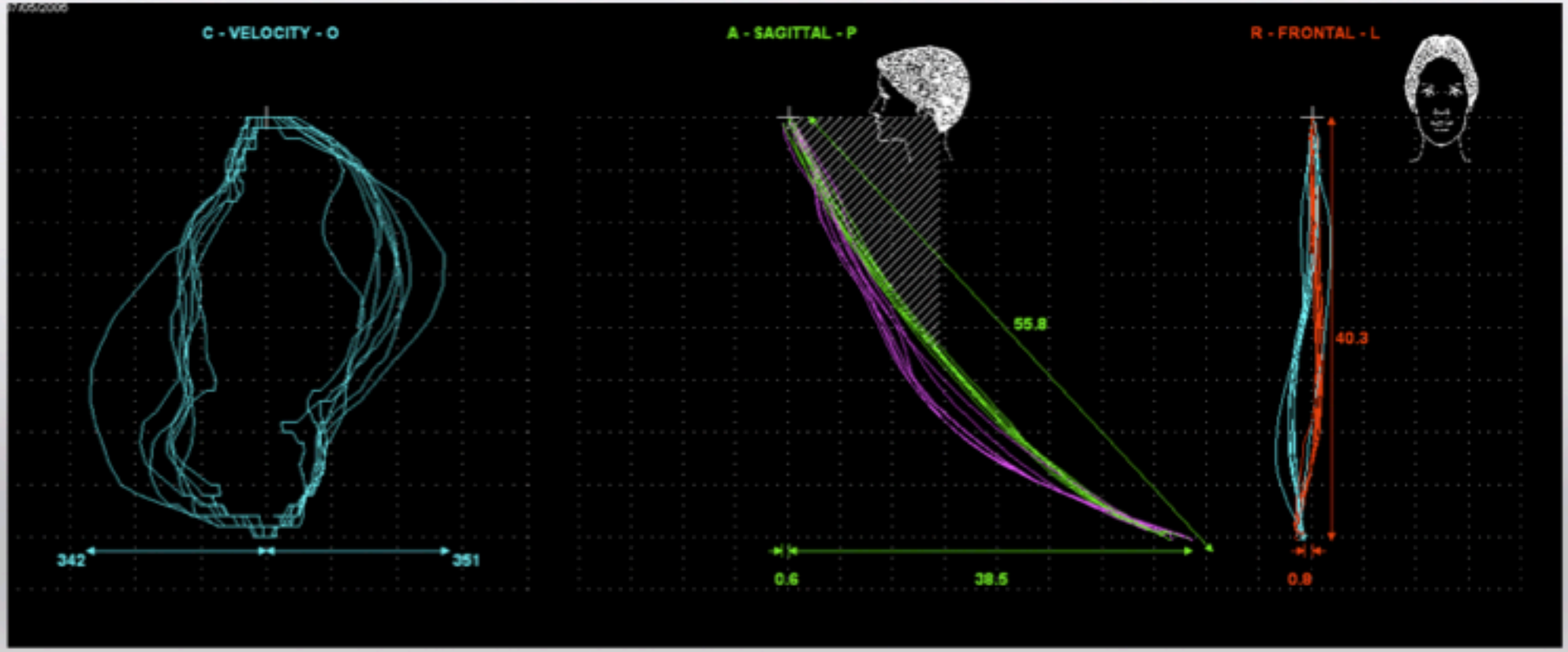
ROM- 40-55mm
Velocity 300+mm/sec
Consistent arc open/close
sagittal path
Straight frontal path



Velocity- Open and Close fast

L5b, L5b

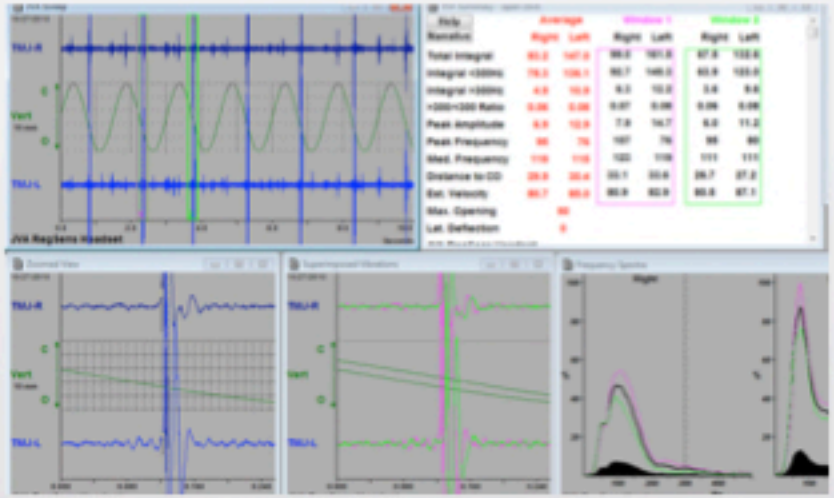
Jaw “Gymnatics” to open and close



Jaw Tracker- Bioresearch

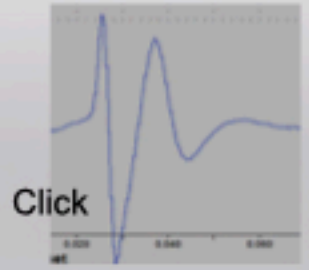
Joint Vibration Analysis

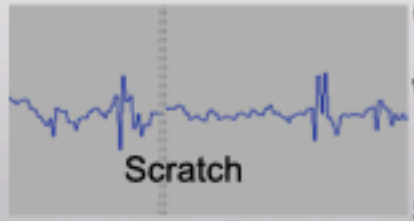
Objectively measures and quantifies joint vibrations during motion which is an indication of cartilage health

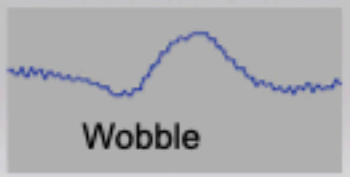


Based on Sonar.
It is not a microphone

Three main types of sounds





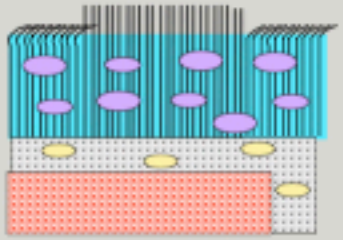


Click
- Disc Reduction

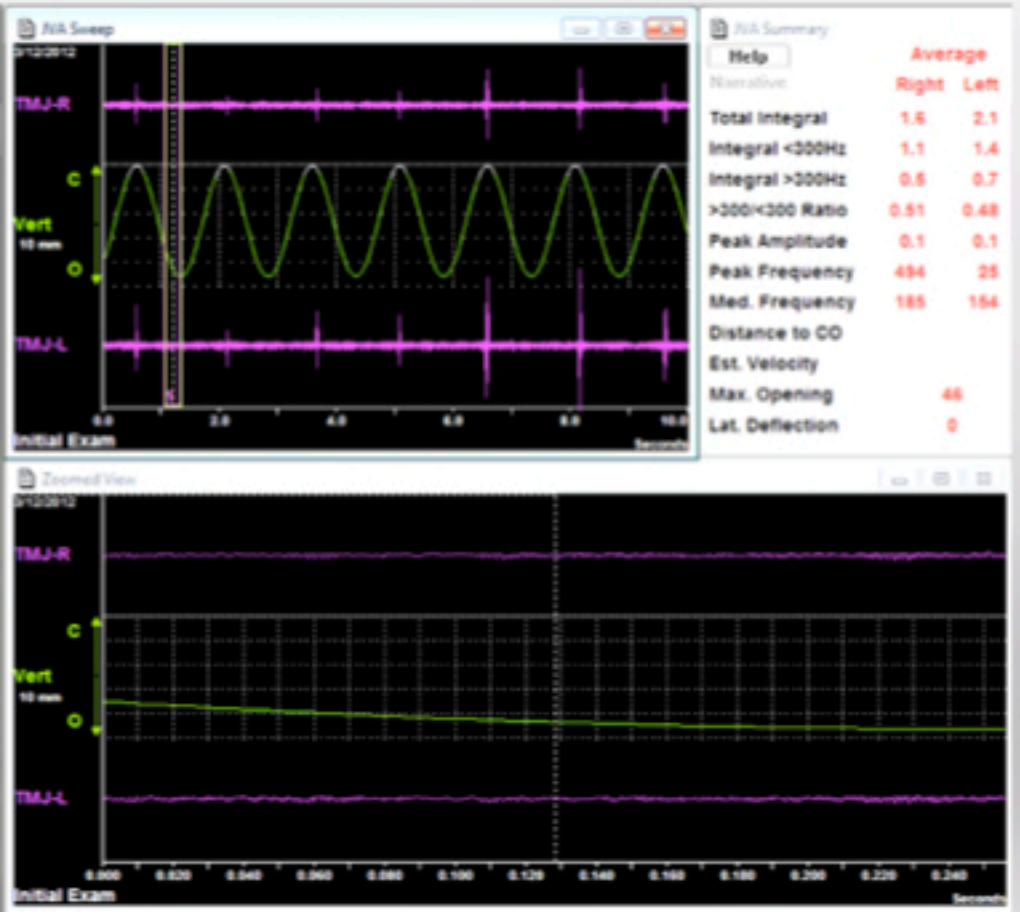
Wobble
- Disc subluxation
- Joint subluxation

Scratch
- Oseoarthritis
- Tissue against cartilage (Piper 4b)
- Rough cartilage- clenching

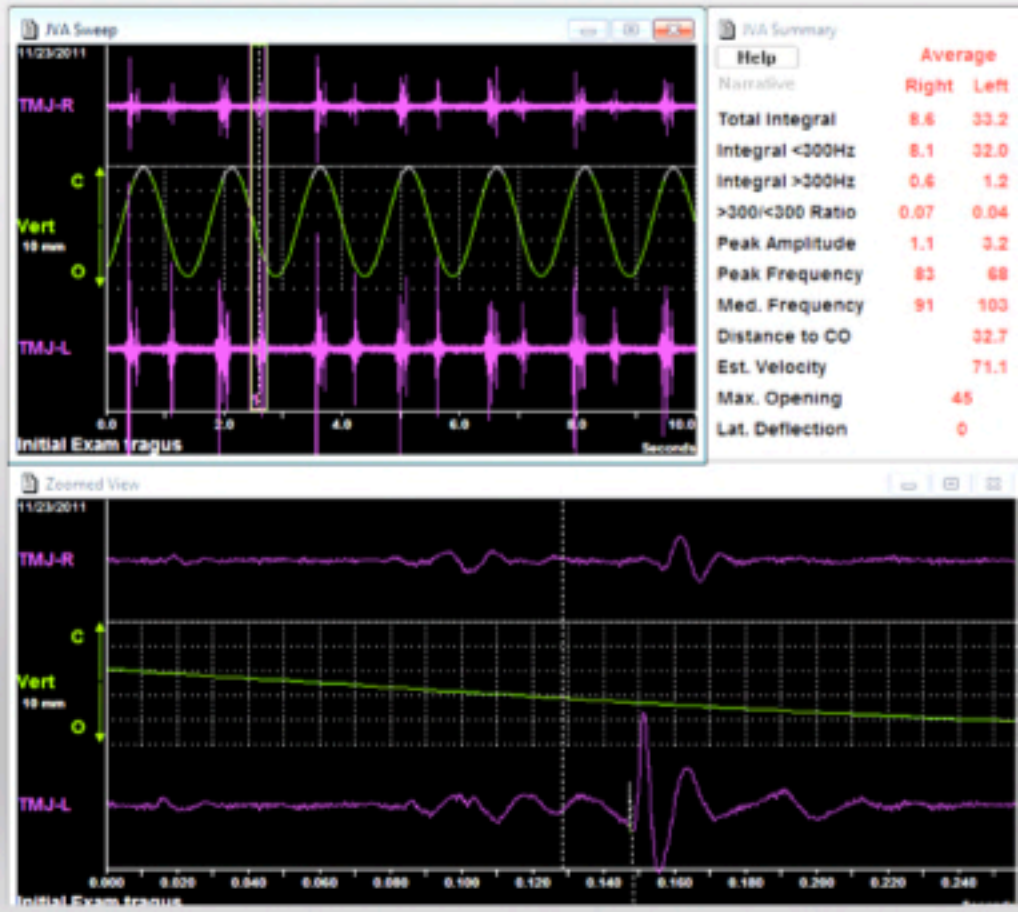
JVA measures the health of the cartilage



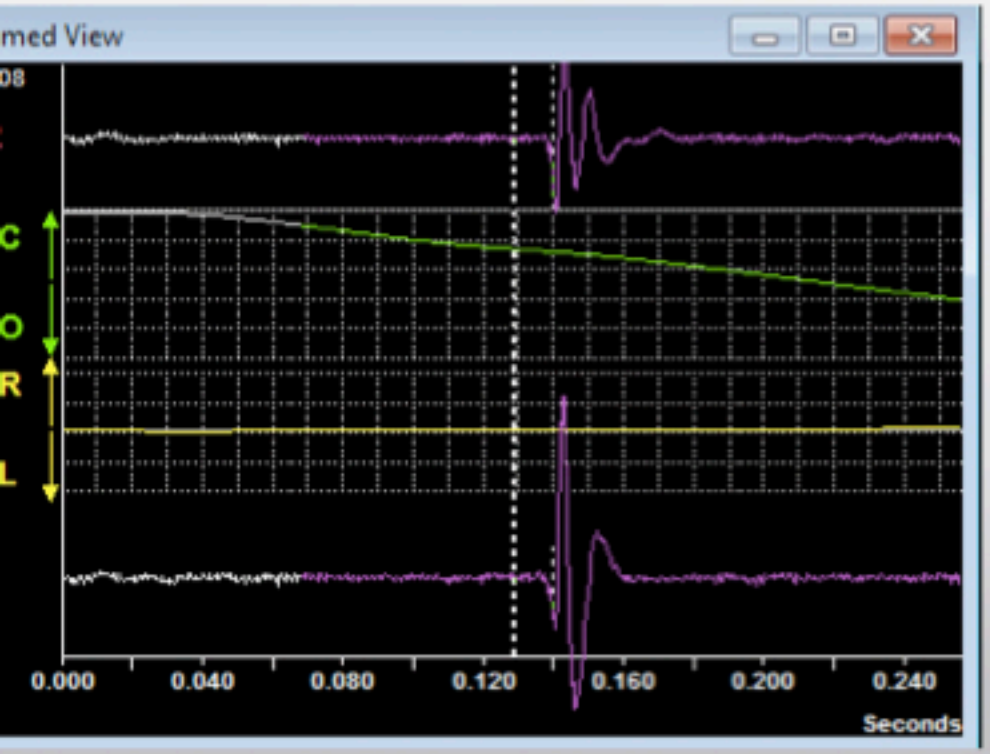
Healthy or Damaged?

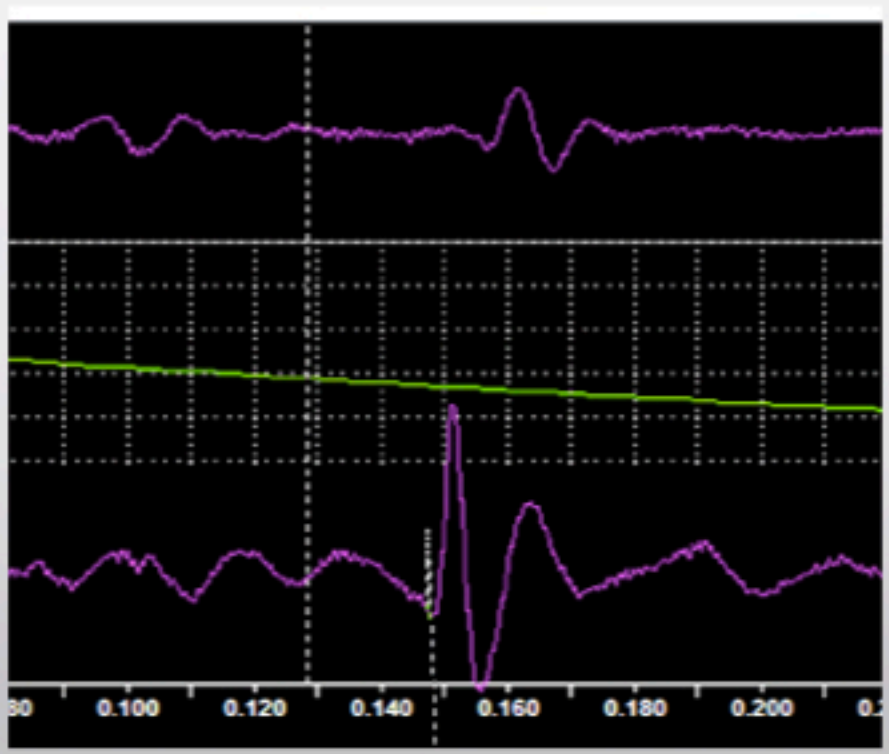


Healthy or Damaged?



Simple or Complex





Simple left click with transference vibration to right
L4a

Complex Click
L3a, R4b

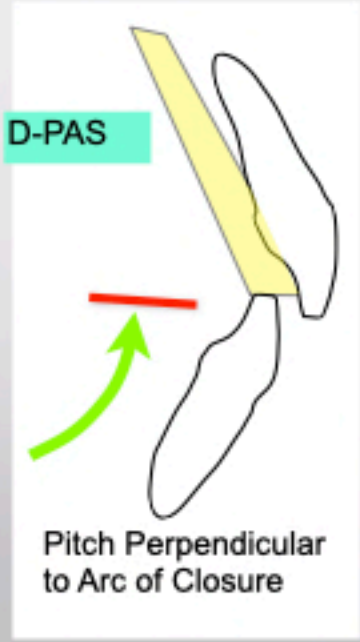
Diagnostic Palatal Anterior Stop

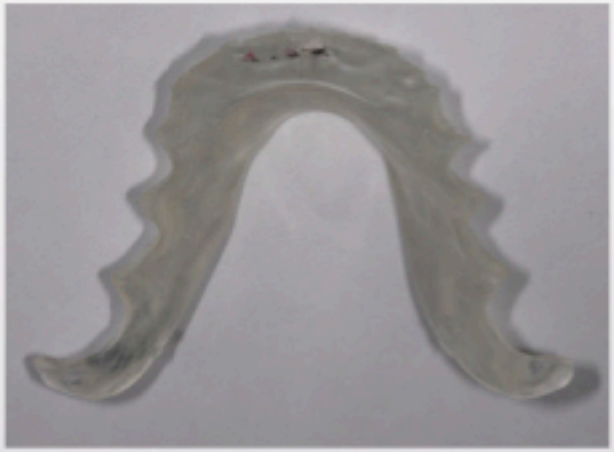
D-PAS Test: Wear 2 weeks for sleep, and occasional daytime

Better- Decrease in Symptoms
- Sleep Clenching Inhibited: Wear D-PAS as night guard
- Orthotic Improved Airway: D-PAS as night guard
- Occlusal Muscle Disharmony: Occlusal Adjust

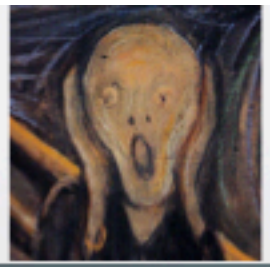
Worse- Increase in Symptoms
- Mechanically Unstable TMJ, joint subluxation
- Intracapsular Problem TMJ
- Orthotic Made Sleep Airway Worse

Stays the Same- No Change in Symptoms
- Damaged TMJ are mechanically stable
- Pain not related to occlusion

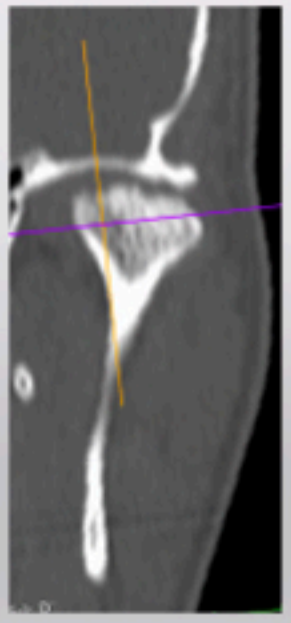




Stapelmann H, Türp JC. The NTI-tss device for the therapy of bruxism, temporomandibular disorders, and headache…..BMC Oral Health. 2008 Jul PMID: 18662411



Damaged TMJs

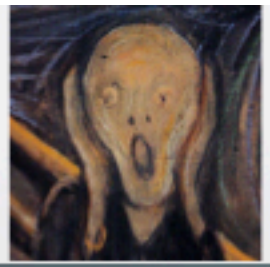


Adapt Favorably 85%

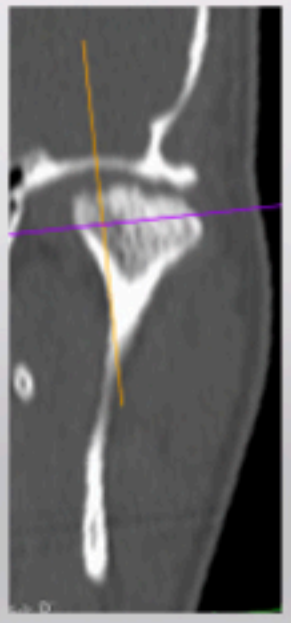
Adapt Fairly 14% → Occlusal Muscle Dysfunction
Osteoarthritis
Mechanically Dysfunctional

Adapt Poorly <1% → Avascular Necrosis
Progressive Condylar Resorption

*These are my guesses on %, no research to back up to backup



Damaged TMJs



Adapt Favorably	85%
Adapt Fairly	14%
Adapt Poorly	**<1%**

→ Occlusal Muscle Dysfunction
Osteoarthritis
Mechanically Dysfunctional

→ Avascular Necrosis

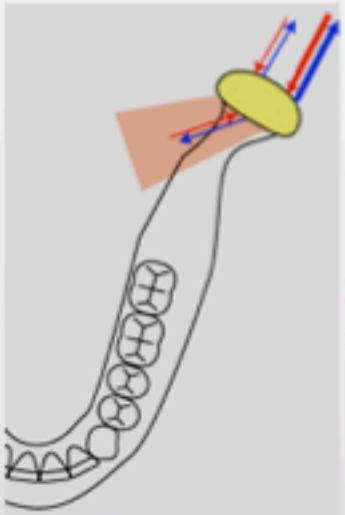
Progressive Condylar Resorption

*These are my guesses on %, no research to back up to backup

Age 30 Female
Start

Front teeth use to touch 1 year ago

Axial View



Normal TMJ Blood Flow, Marrow

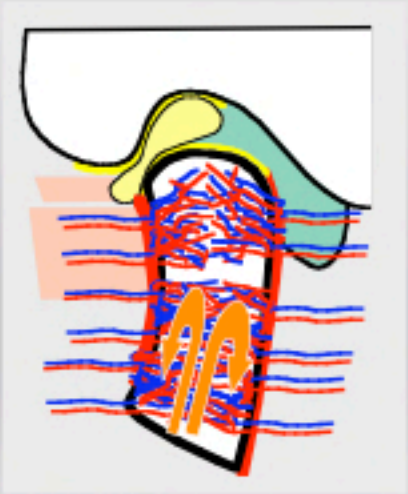
Condylar head limited collateral circulation

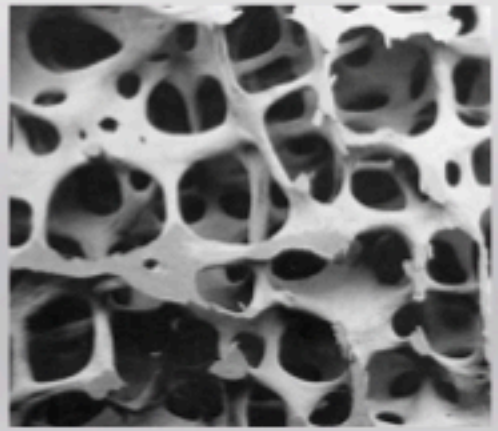
Epiphyseal growth center

Marrow is fatty tissue with blood vessels, containing the precursor for blood cells

No Blood vessel inside joint

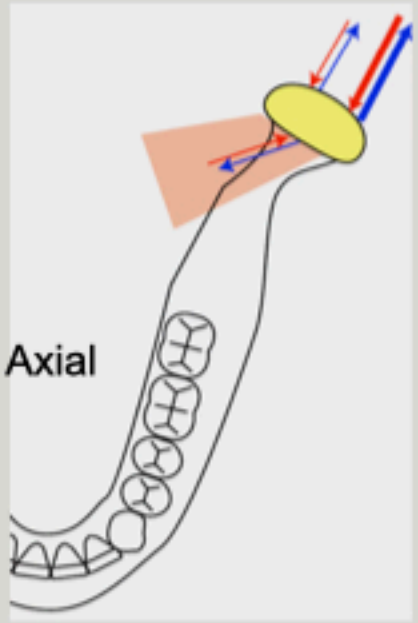
Closed Sagittal



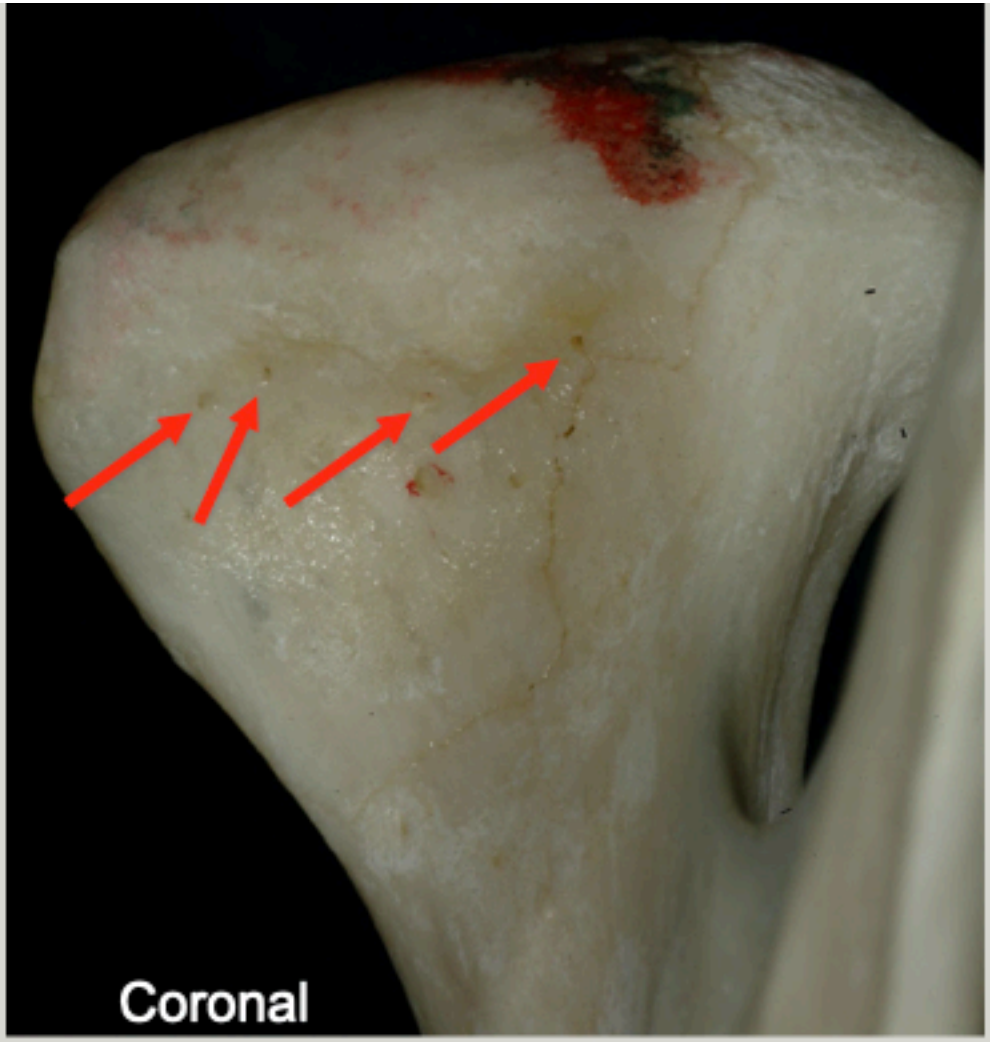


Condylar Perfusion

Blood flows in and out of the condylar head through vessels that pierce the cortex



Sagittal



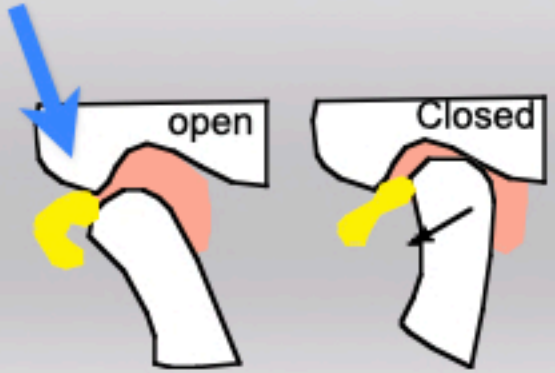
When the clicking stops (4a to 4b):

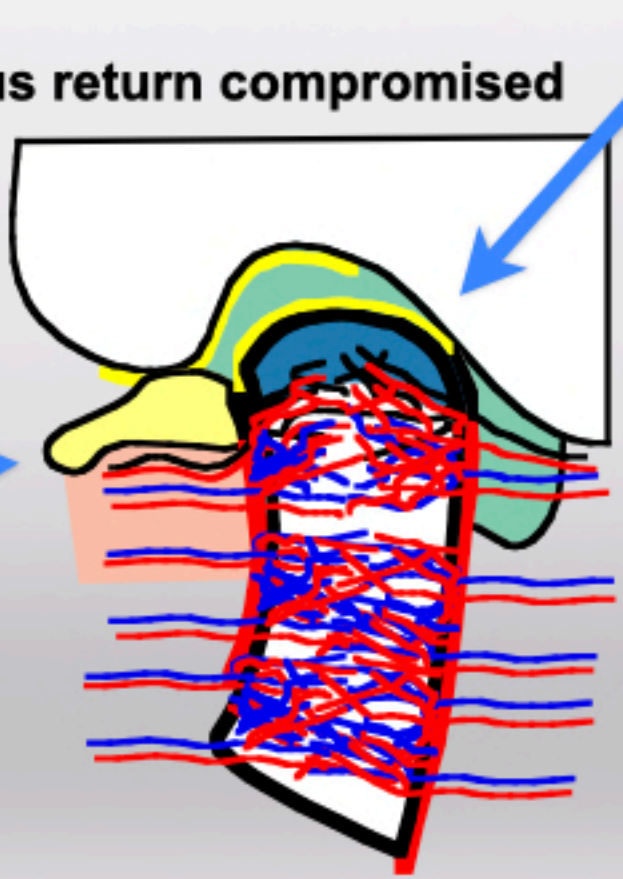
Condyle Distalized

Venous return compromised

Compromised Condylar Perfusion
Blood flow through condyle is decreased

Disc Anterior





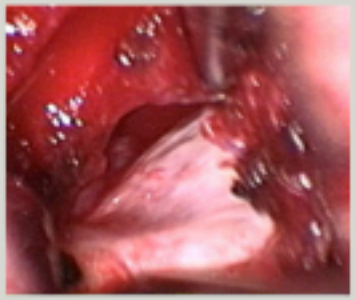
3 Outcomes of Compromised Condylar Perfusion

Bone cells die

Avascular Necrosis

One and Done

Condyle collapses 1y later.
Cartilage remans intact
Occlusion shifts once, AVN is finished.



or

Inflammatory Tissue Bone Resorption

Cortex Collapses, Cartilage tears
Inflamed tissue contacting bone
Inflammatory cells activate Osteoclasts

Nothing

Compromised but adequate.
99% patients have no problems

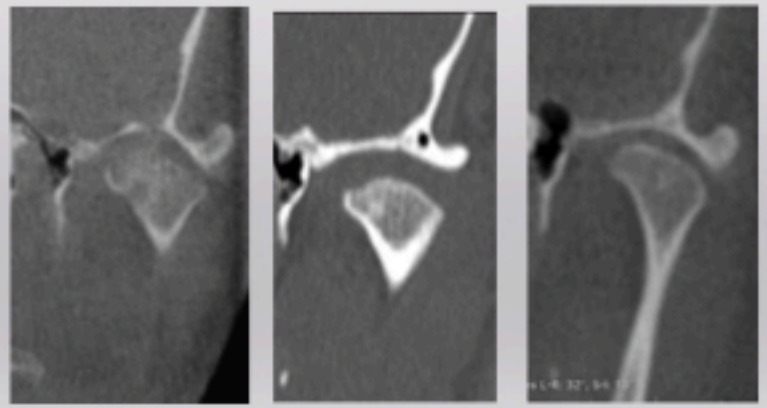
Droter JR, An orthopaedic approach to the diagnosis and treatment of disorders of the temporomandibular joint. Dent Today 2005 Nov;24(11):82, 84-8

Anterior Openbite with Active Osteolysis due to Inflammatory Tissue Bone Resorption

Non Surgical Therapies

Condylar Distraction

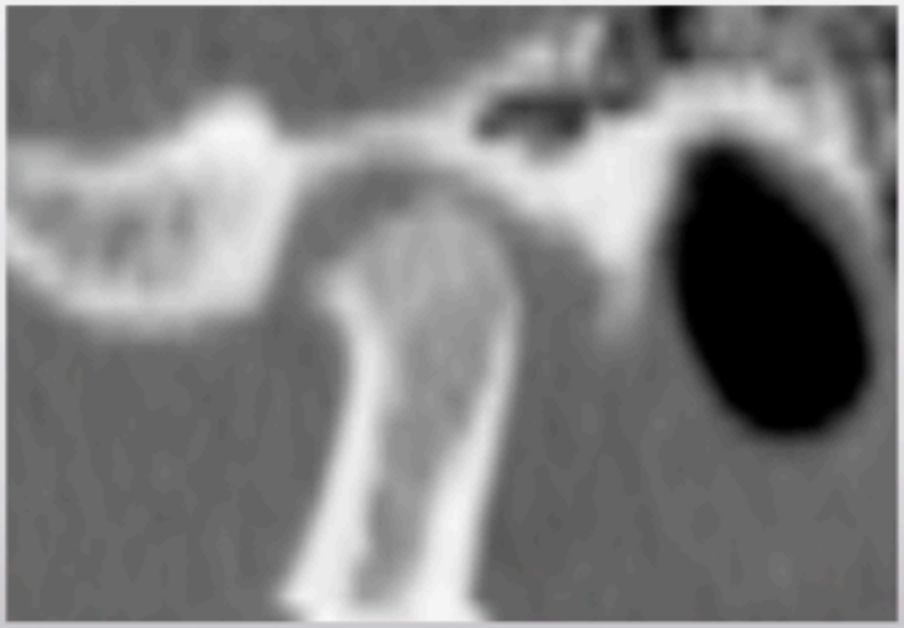
Anti Inflammatory Therapies



Hypoxia Induced Progressive Condylar Resorption
HI-PCR

On CT see Flat condylar surface
Missing Subchondral Cortex During Active Phase
Slow, Progressive Condylar Resorption

Occlusion will constantly be changing



$558,000 Malpractice Verdict

Failure to diagnose condylar resorption during orthodontic treatment

Dental Liability Alert, Vol 5, Issue 6, May 2002

Additional Dental Malpractice Verdicts

■ **$558,000 VERDICT - Failure to diagnose Condylar Resorption - Excessive use of cervical head-gear as part of orthodontic treatment - TMJ Syndrome - Occlusal deficiencies - Osteotomy recommended for minor plaintiff.**

This dental malpractice action was brought on behalf of the minor female plaintiff, age 11 at the time in question, against her treating orthodontist. The plaintiff alleged that the defendant failed to diagnose idiopathic condylar resorption (a condition similar to osteoarthritis) and excessively utilized cervical head gear in her orthodontic treatment, causing permanent mouth and jaw injuries.

The minor plaintiff treated with the defendant for approximately two years for a Class II malocclusion (secondary to crowding in the upper arch), a midline shift and a deep bite/overbite. The defendant prescribed cervical headgear, comprised of a wire which connects behind the head to pull the molars rearward and leave more room for the incisors. The plaintiff wore the headgear for approximately nine months.

The plaintiff's dental experts testified that the plaintiff suffered from condylar resorption of the jaw during the time period the plaintiff was under the defendant's care and that the condition would have been evidence on x-ray. The plaintiff contended that the standard of care required the defendant to stop all orthodontic treatment under these circumstances and allow the condylar resorption to run its course. The plaintiff contended that the defendant failed to recognize that the plaintiff's jaw was rotating open due to the loss of calcification of the teeth and jaw associated with condylar resorption and that the defendant negligently attempted to reverse the open bite by inappropriate methodology.

The plaintiff's dental expert testified that the methodology employed by the defendant worsened the plaintiff's open bite, causing her to develop TMJ syndrome and requiring a future Lafort I (lower jaw) osteotomy. The cost of the plaintiff's surgery was estimated as between $25,000 and $30,000, according to the plaintiff's oral surgeon. The plaintiff alleged that had the defendant performed a proper examination, treated the dental dysfunction adequately and referred her to the proper specialists, the plaintiff would have suffered no injury.

The defendant denied negligence and contended that the plaintiff's resorption process was not detectable with any routine diagnostic study normally used in orthodontic treatment. The defense expert opined that the treatment provided by the defendant comported with the standard. The defense expert additionally maintained that all injuries suffered by the plaintiff were the result of her idiopathic condition. The defendant asserted that he made a timely referral to an oral surgeon who diagnosed the bilateral condylar resorption, a rare condition which is not well understood by the medical community.

The jury found for the plaintiff and awarded $558,000.

EXPERTS:

Plaintiff's orthodontia expert: Ira Yerkes from Woburn, Ma. Plaintiff's expert oral surgeon: Charlotte White from Tallahassee, Fla. Defendant's dental experts: Charles S. Green from Skokie, Ill. and Daniel M. Laskin from Richmond, Va. Defendant's orthodontia expert: Cyril Sadowsky from Skokie, Ill.

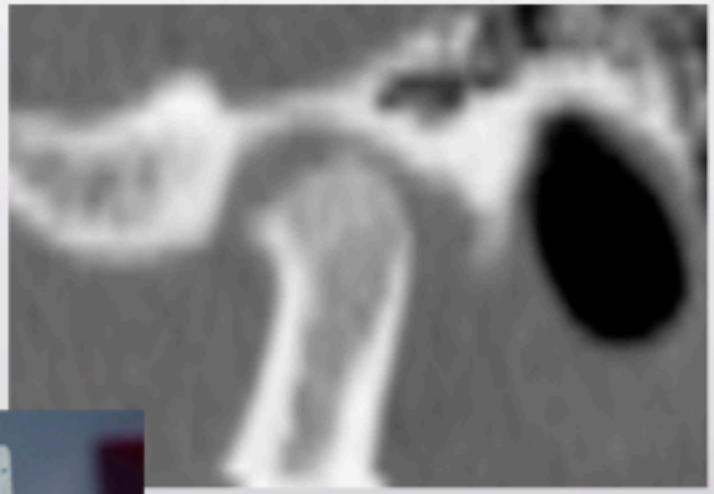
REFERENCE:

Orange County, Fla. Haughey vs. Fravel. Case no. 96-1024; Judge Jeffords D. Miller. Attorney for plaintiff: Christopher M. Larmoyeux of Montgomery & Larmoyeux in West Palm Beach, Fla.; Attorney for defendant: Kenneth L. Baker and John S. Derr of Bush & Derr in Orlando, Fla. □

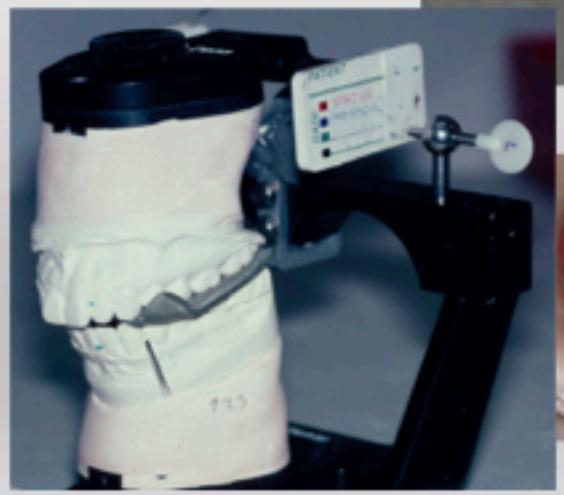
"DENTAL LIABILITY ALERT (ISSN 015947) is published Bi-monthly for $150/year by Jury Verdict Review Publications, Inc., 45 Springfield Ave., Springfield, N.J. 07081. Periodical Postage Paid at Springfield, N.J. and additional mailing offices. Postmaster: Send Address Changes to Dental Liability Alert, 45 Springfield Ave., Springfield, N.J. 07081"

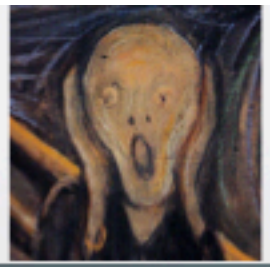
1 year after the clicking stops is the “Danger Zone”

Look for TMJ bone loss, anterior open bite developing
- Avascular Necrosis
- Hypoxia Induced Progressive Condylar Resorption

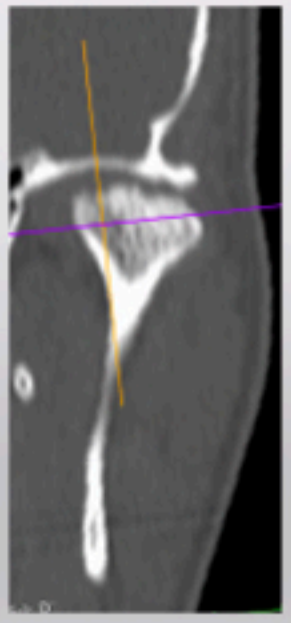


After clicking stops:
- Get CT or CBCT scan of the TMJ
- Maintain jaw motion: PT, exercises
- Get photos
- Mounted models
- Monitor occlusion over the next year
- Follow up CBCT scan 1 year later
- After 1 year “Adapted Favorably”





Damaged TMJs



Adapt Favorably **85%**
Adapt Fairly **14%**
Adapt Poorly **<1%**

→ Occlusal Muscle Dysfunction
Osteoarthritis
Mechanically Dysfunctional

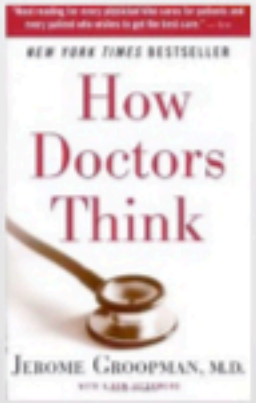
→ Avascular Necrosis

Progressive Condylar Resorption

*These are my guesses on %, no research to back up to backup

Blinded by the Click

There is no rule that says you only get one disease



Always make a differential diagnostic list
Ask, " It appears to be this, but what else could it be?
Be aware you are blinded by your beliefs

Jaw is clicking, ear pain

Jaw is clicking, sudden onset headache, 53 year old

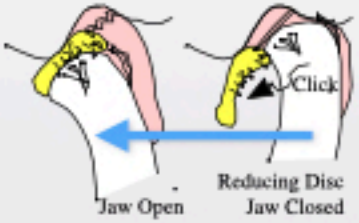
Jaw is clicking, temple pain, pain increases with chewing, 62 year old

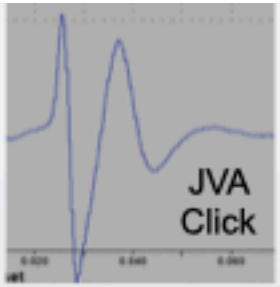
Jaw use to click, Jaw stopped clicking and can not open wide

History is key, physical exam is next most important, palpate the muscles and joint.
Notice the age group does not fit OMD for the second and third patient.

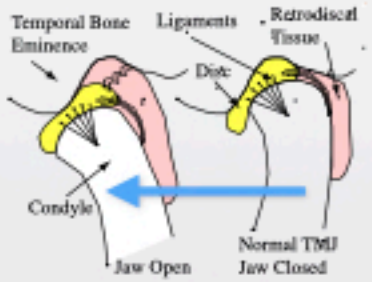
Differential Diagnosis of TMJ Clicking

Disc Reduction





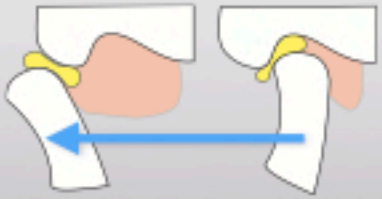
Normal



Adhesive Click

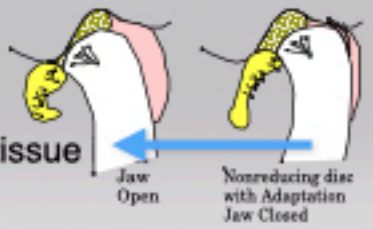
"Sticky Disc" - Disc sticks after prolonged clenching, then releases

Eminence Thud



A hypermobile condyle moves past the crest of the eminence and makes a thud sound

Adhesion Crackle



A small piece of fibrous tissue
4b joint is moved across

6 Common TMDs

Diagnosis	Pattern	Treatment
Clenching	Patient is aware Masseters Ache Morning TMJ clicking that resolves	Occlusal Adjust D-PAS Night Guard (if inhibition) Magnesium and Vitamin C hs
Sleep Grinding	Worn Teeth	Protective night guard Airway night night guard
Occlusal Muscle Dysfunction	Sore muscles when chewing Sore Lateral Pterygoid, Headaches Day D-PAS Relieves Symptoms	Occlusal Adjustment
Osteoarthritis of TMJ	Arthralgia CBCT shows worn bone loss MRI T2, STIR ++	NSAID for 6-12 weeks Occlusal Adjustment Do not put in a night guard
Sprain Discal Ligament TMJ, Acute	Sudden onset pain TMJ, sore TMJ Limited opening Soft end point active stretch	Cold Laser, Ice 15 min 3x a day Rest, Soft diet, NSAID 7 days Anterior Reposition Orthotic 7 days
Acute Closed Lock TMJ	Sore TMJ Limited opening Hard end point active stretch	Arthrocentesis with PRP

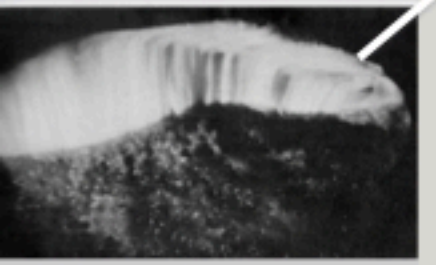
Differential Diagnosis: Limited Joint Motion

Muscle Spasm

Painful to Move
- Joint Pain
- Muscle Pain

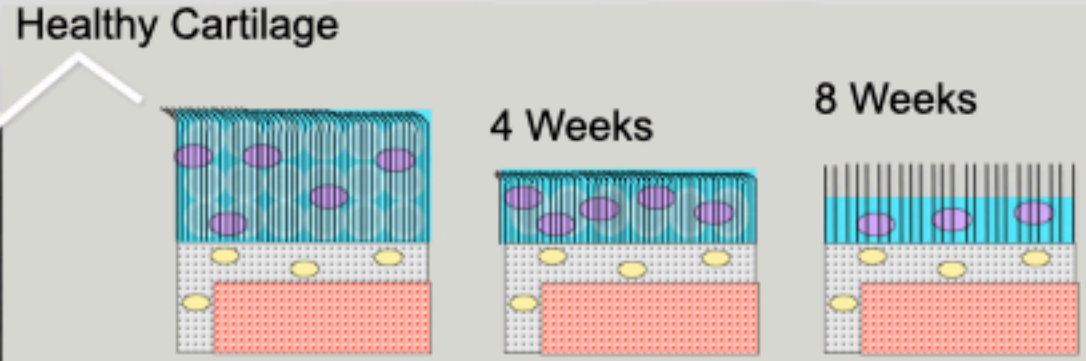
Mechanically Blocked
- 4b Acute
- Adhesion

Masseteric Space
- Infection
- Hematoma



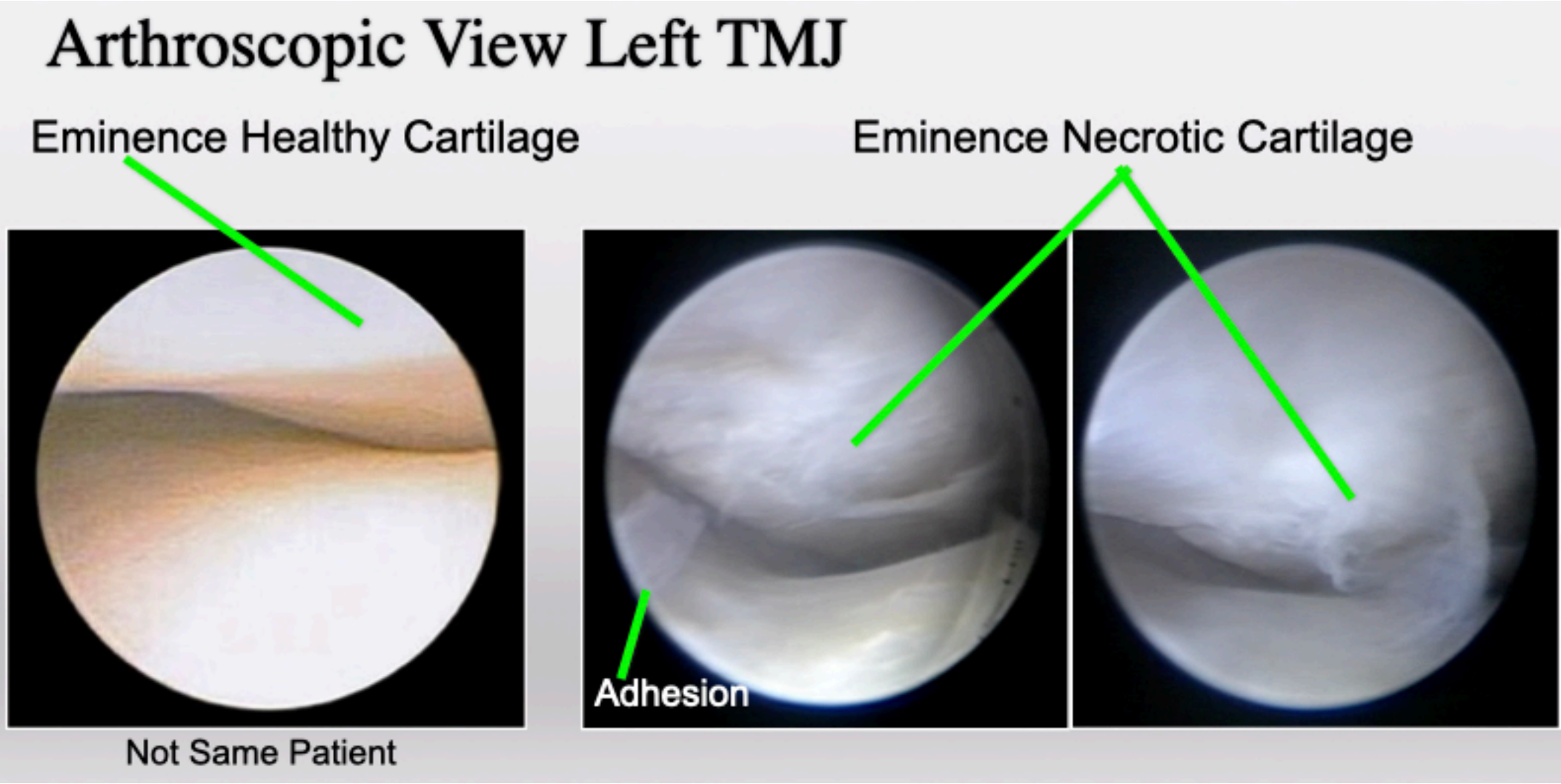
Lose 50% height of cartilage
Proteoglycans not being produced by Chondrocytes
Loss of 50% proteoglycans and water
Collagen still intact
Process is reversible
Move joint with light force/repetitive motion next 30 days

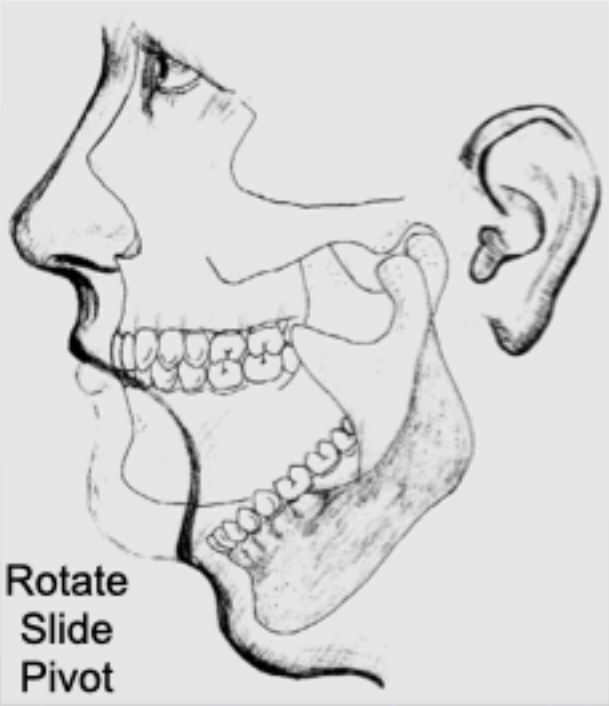
You have 6-8 weeks to get jaw moving before cartilage is irreversibly damaged, independent of the cause of the immobilization



E.B. Evans, GWN Eggers, J.K. Butler, and J. Blumel, Experimental immobilization and remobilization of rat knee joints, J Bone Joint Surg Am, 1960 vol. 42 (5) pp. 737-758
Enneking WF, Horowitz M. The intra-articular effects of immobilization on the human knee. J Bone Joint Surg Am. 1972 Jul;54(5):973-85. PMID: 5068717

Arthroscopic View Left TMJ





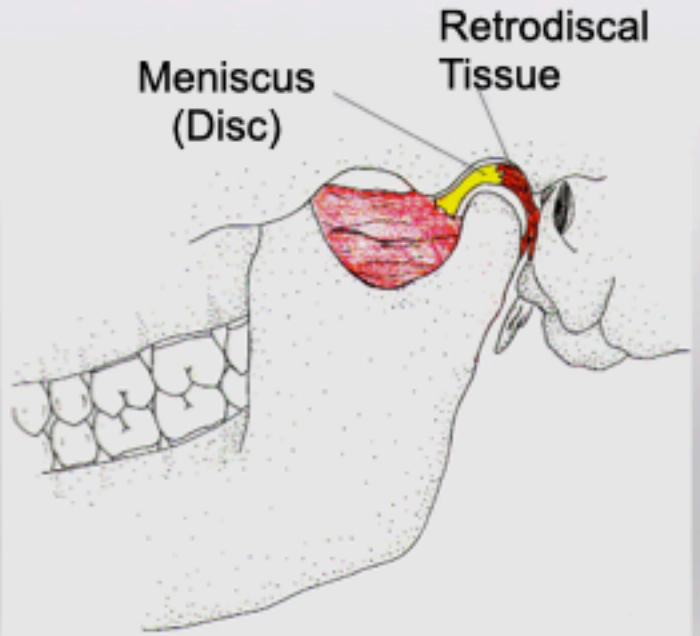
Rotate
Slide
Pivot

Rotation only 25mm

Max Open	40-55mm
Right Lateral	10-12mm
Left Lateral	10-12mm
Protrusive	10-12mm

TMJ has 2 Joint Compartments:

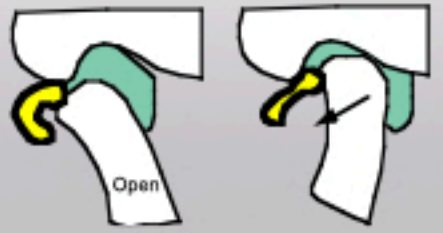
Upper- Translation
Lower- Rotation



Acute non-Reducing Disc
Limits Translation.

"Old Adapted" may have
full range of motion.

Reducing "Click"



non-Reducing Disc

Limited Opening Algorithm

Differential Diagnosis Limited Opening:

- Pain Avoidance Sore Joint
- Pain Avoidance Sore Muscle
- Hematoma
- Muscle Spasm
- Masseteric Space Infection
- Nonreducing Disc (4b,3b Acute)
- Joint Fibrosis, Muscle Fibrosis
- Other

Diagnostic Tests:

- History: How long limited
- Body Temperature
- Caries Exam, Perio exam
- ROM open, side to side
- Gentle Active stretch
  - Point to area of pain
- Anterior Stop
- If needed CBCT, MRI

Dr Droter's Limited Opening Algorithm

Differential Diagnosis Limited Opening (Less than 38mm): Pain Avoidance Sore Joint, Pain Avoidance Sore Muscle, Hemtoma, Muscle Spasm, Masseteric Space Infection, Nonreducing Disc (4b,3b Acute), Joint Fibrosis, Muscle Fibrosis, other.

Palpate First

How long with limited opening?
Can move fully side to side?
Measure Max Opening <38mm

8+Weeks **and**
Limited side movement
Verify hard end point

Less than 6 weeks
Or Can move jaw fully left and right

Permanent joint damage
Regardless of original cause now have:
- Permanent cartilage damage
- Muscle fibrosis

MRI and CBCT of the TMJ to assess damage
Anti-inflammatory medication if pain
Physical therapy: active stretching
- Tongue blade stretch or Dynasplint

Rule out Masseteric Space Infection
Temperature
Palpate Medial Pterygoid, Submandibular
Palpate Salivary Glands
Look for decay
Perio probe distal to molars
Take CBCT or other RG if suspect

Elevated Body Temp
Painful medial pterygoid area
Caries or Perio pocket distal molars

No Signs Infection

Masseteric Space Infection
Refer to Oral Surgeon or ER immediately
Risk of airway closure, May need to be intubated
Will need CBCT and antibiotics

Rule out Hematoma Dental injection

No Signs Hematoma

Body Temp Normal
Painful medial pterygoid area
Recent Dental Injection

Hematoma
Cold Laser Intraoral

Maximal Opening Active Stretch
Range of Motion side to side
History of jaw clicking

Hard end point active stretch
Limited jaw move to one side
Past history of clicking

Soft end point w/ active stretch
May or may not have hx clicking

Anterior disc displacement non reducing
Easy ROM exercises, especially lateral
Refer oral surgeon: CBCT, Arthrocentesis, MRI

Palpate TMJ, Load TMJ
Palpate Masseter, Temporalis
Active Stretch and point to pain
If no TMJ pain do Anterior Stop

Soft end point
TMJ Pain
Active stretch points to joint

No TMJ Pain
Soft end point,
Active stretch points to muscle

Pain Avoidance, TMJ Arthralgia

Joint Pain Diff Dx: Acute Sprain, Chronic Sprain, Osteoarthritis, Perforation of Pseudodisc, Discal perforation, Retrodiscal tissue impingement, Acute 4a, Fracture, Crush Injury other.

CBCT full field of view of head. MRI of TMJ if not resolved 2 weeks.

Acute Sprain TMJ Ligaments
Side to side may be limited. Possible posterior open bite
Soft Diet, Ice 15 min for 3-5x/day, NSAIDs 7 days.
Possible Anterior Stop or Anterior Posturing Orthotic 24/7 1 week.

Pull Accufilm

Chronic Sprain Sprain not resolving, evaluate for sleep bruxing

Osteoarthritis TMJ
OA on CBCT, NSAIDs 6-12 weeks, Cold Laser 3x week for 3w

Pain Avoidance, Muscle Pain

Diff Dx: Muscle Bracing Fatigue, Trigger point, Muscle Spasm, other.

Anterior Stop

Muscle Bracing Fatigue
Anterior Stop Relieves
Cold laser, Hot cold hot as palliative.
Possible Anterior Stop prn
Possible Valium 5mg hs for 3 days
Eval for OMD, Sleep Clenching: DPA8 test

Trigger Point
Can palpate Trigger Point, Cold Laser Relieves.
Cold laser, Hot cold hot as palliative.
Need to find cause TrP: OMD, neck damage

Note: Acute Sprain is much more common than non reducing disc displacement as a cause of limited opening.

Subjective:

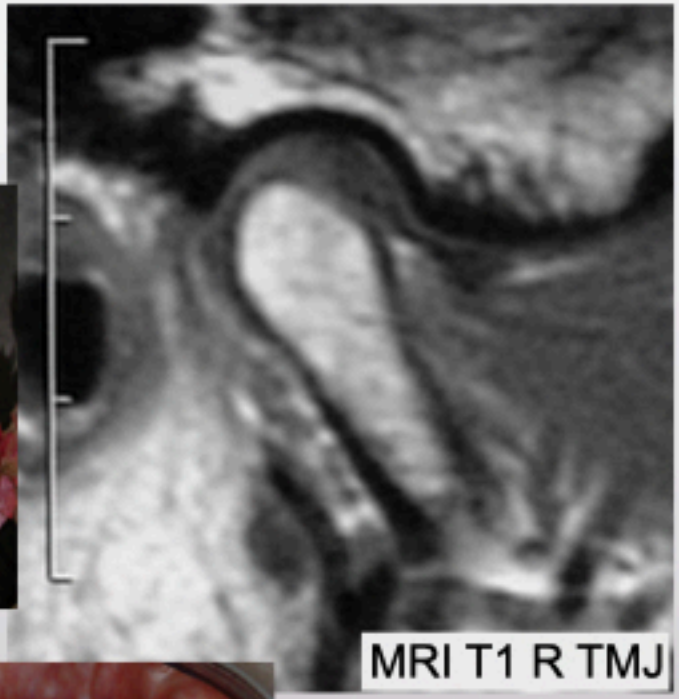
- Dentist doing crown prep #30 1 week ago
- Severe pain Right TMJ after moving jaw at end of appt
- Constant deep pain Right TMJ
- Limited opening

Objective:

- Limited opening 32mm, Mandible shifts Left
- Normal side to side motion
- 98 temp, normal perio probe 2nd molars, no caries
- No pain palpation RL Medial Pterygoid
- Soft end point on active stretch, 45mm, R TMJ pain
- Right TMJ pain to palpation, Left TMJ normal
- Posterior openbite Right, does not hold Accufilm

Assessment:

- Limited opening due to Right TMJ pain avoidance
- Acute Sprain Right TMJ Ligaments

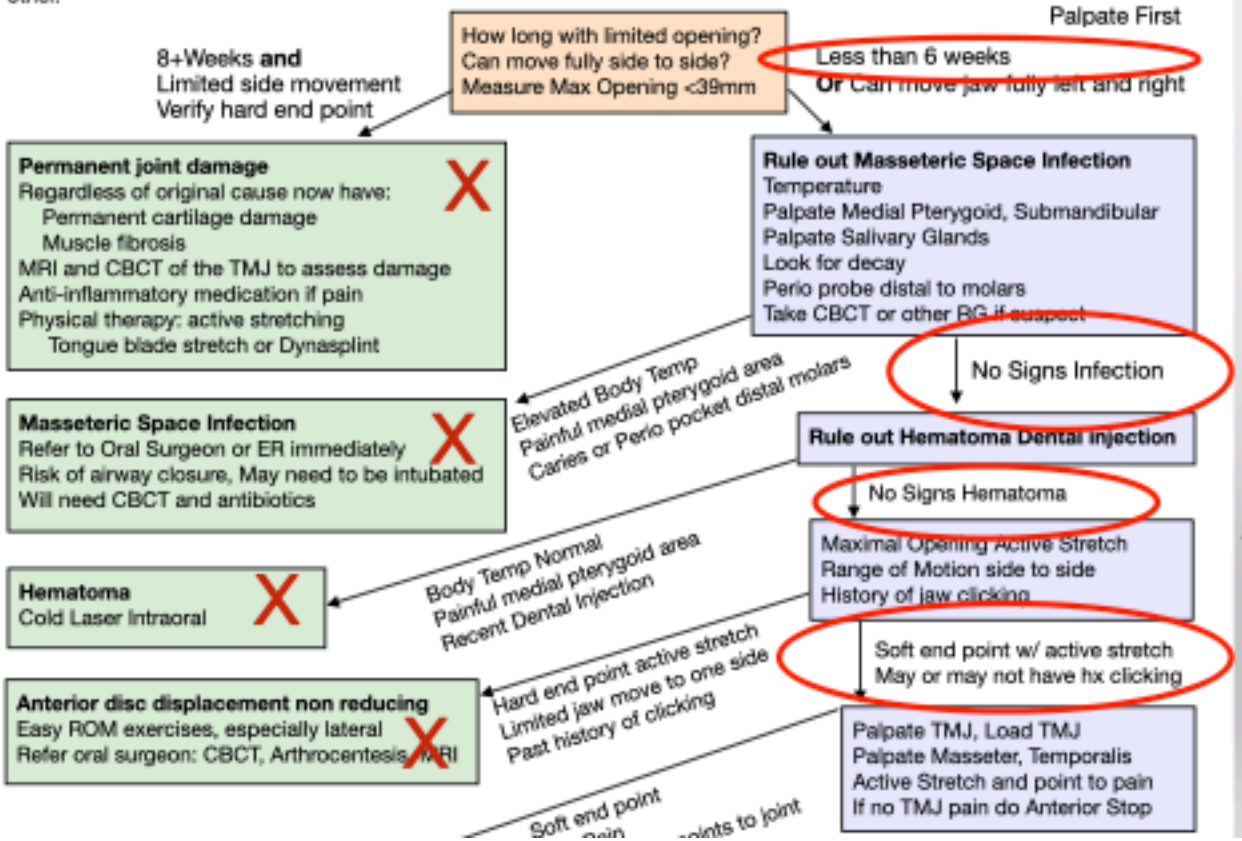


MRI T1 R TMJ

Dr Droter's Limited Opening Algorithm

22.3

Differential Diagnosis Limited Opening (Less than 39mm): Pain Avoidance Sore Joint, Pain Avoidance Sore Muscle, Hemtoma, Muscle Spasm, Masseteric Space Infection, Nonreducing Disc (4b,3b Acute), Joint Fibrosis, Muscle Fibrosis, other.



Objective:

Limited opening 32mm, Mandible shifts Left

Normal side to side motion

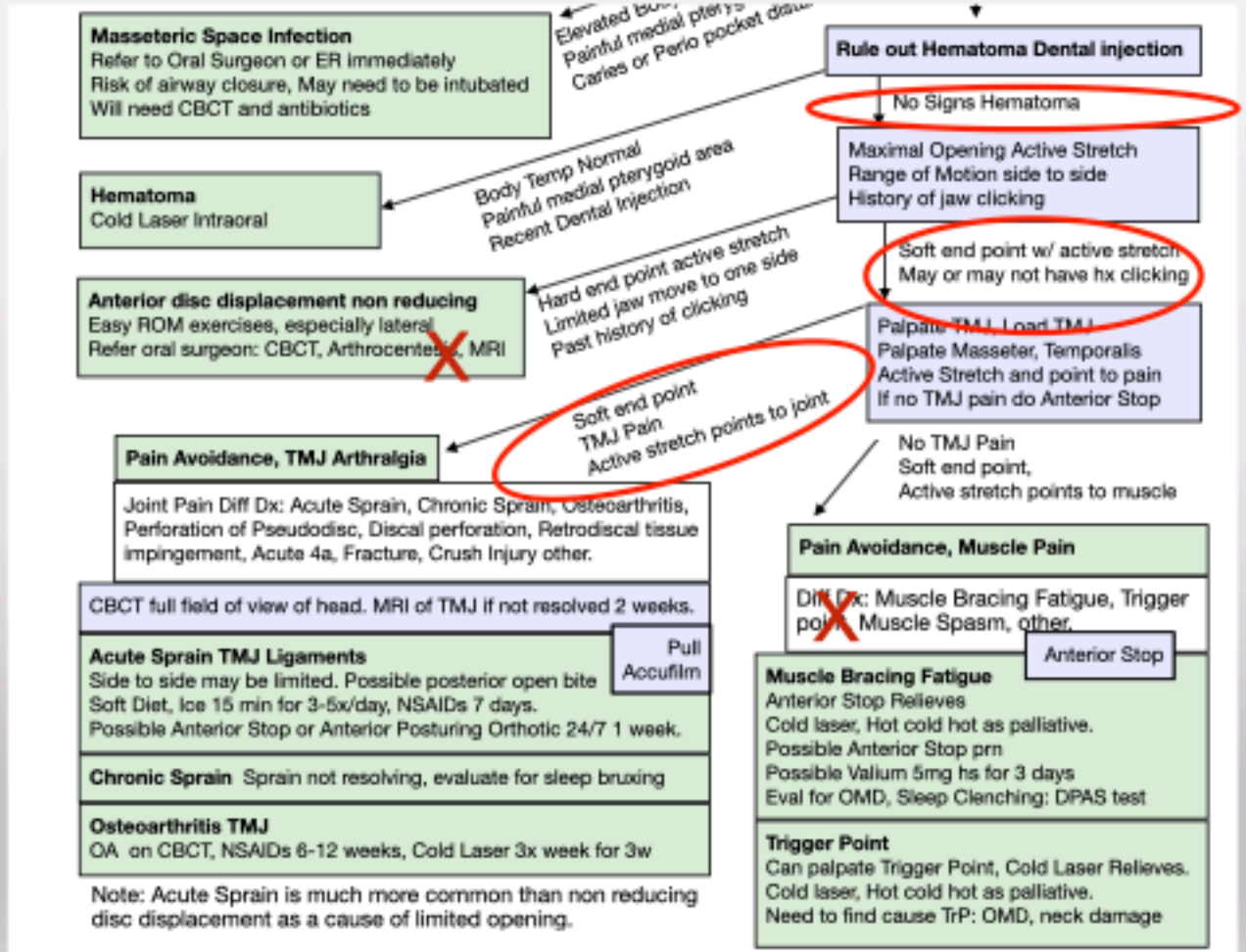
98 temp, normal perio probe 2nd molars, no caries

No pain palpation RL Medial Pterygoid

Soft end point on active stretch, 45mm, R TMJ pain

Right TMJ pain to palpation, Left TMJ normal

Posterior openbite Right, does not hold Accufilm



Objective:

Limited opening 32mm, Mandible shifts Left

Normal side to side motion

98 temp, normal perio probe 2nd molars, no caries

No pain palpation RL Medial Pterygoid

Soft end point on active stretch, 45mm, R TMJ pain

Right TMJ pain to palpation, Left TMJ normal

Posterior openbite Right, does not hold Accufilm

Working Diagnosis: Sprain Discal Ligament TMJ, acute with joint edema.
Pain Avoidance Sore Joint. Muscle bracing painful joint.

Treatment:
Ice 15-20 minutes for 3-5x 2 days only
Anterior repositioning orthotic 24/7 one week
NSAID for 5 days- 800mg Advil Liquid gel caps, q8h
Soft chew diet
At 1 week Anterior repositioning orthotic sleep only for second week
Week 3, no orthotic, reintroduce harder foods

At 4 weeks patient had full ROM
No clicking

Current Sprain Protocol

We used Advil gel caps
600mg tid with food

Soft chew diet
Ice over TMJ 15 minutes 3-5 times a day for 3-5 days,
Ice 2-3x a day for additional 3 days if needed
NSAID: Advil Liquid Gel Caps 200mg, 3 caps 3x a day
or Aleve Liquid Gel Caps 220mg, 1 cap twice a day for 5 days or
Temporary upper Anterior Stop for sleep
Cold Laser 350 hz both joints: 30 seconds open, 30 seconds closed
If still sore in 1 week will need TMJ imaging: CBCT and MRI

MLS Cold Laser
BioResearch

Temporary Anterior Stop
ArrowPath Sleep

The Click

Key Points:

Clicking jaw joints are common, but not normal
All clicking joints are damaged
The “Click” usually does not need to treated
A non reducing disc is not the #1 cause of limited opening

John R. Droter, DDS
drdroter@mac.com
301-805-9400

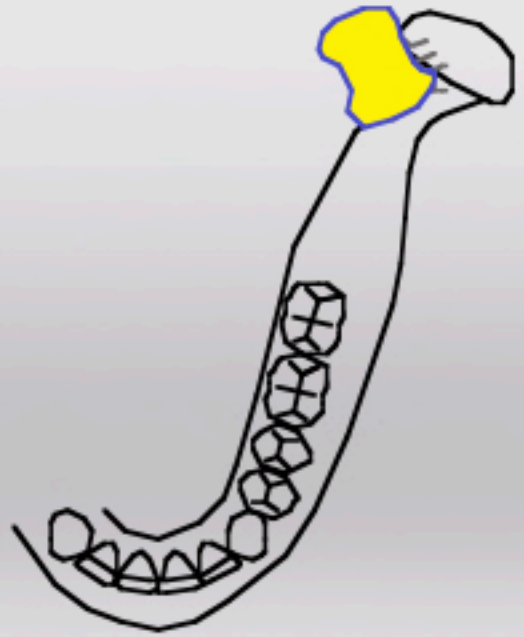
What is the Clinical Relevance of TMJ Damage Pre-Puberty?

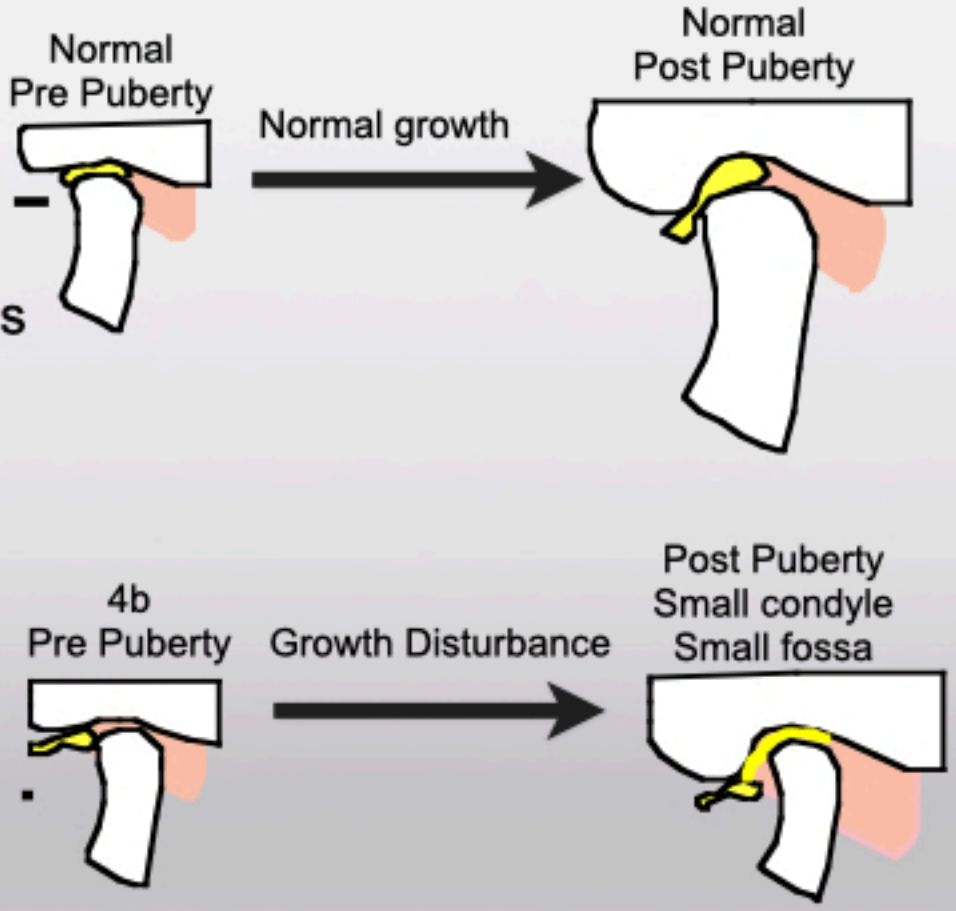
John R Droter DDS
Annapolis, Maryland

TMJ Damage Prepuberty

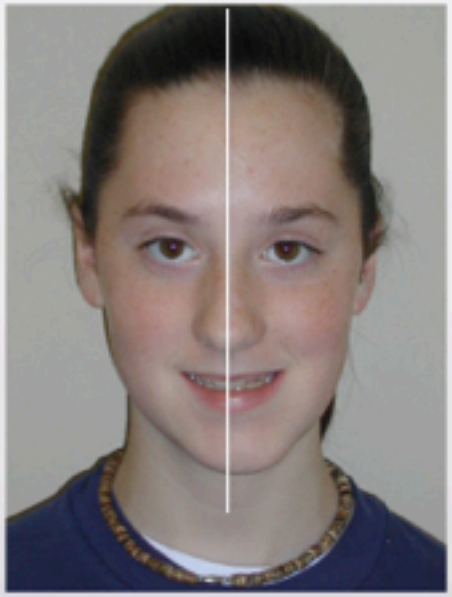
4b Pre-puberty is not a degenerative process

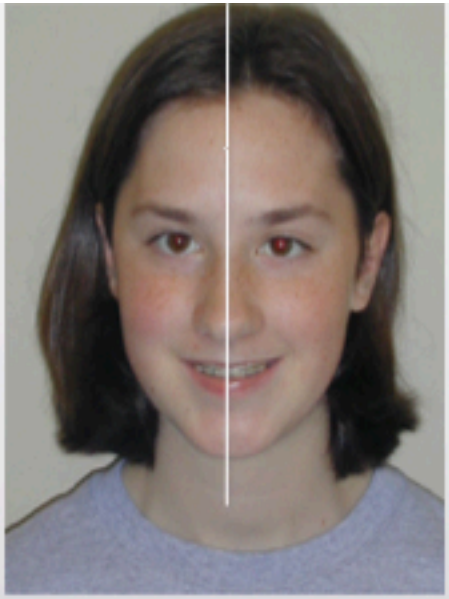
Can affect growth



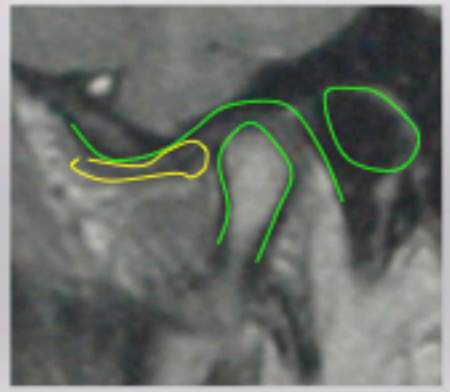


Age 17





R TMJ



L TMJ

Identical Twin Sister Age 17

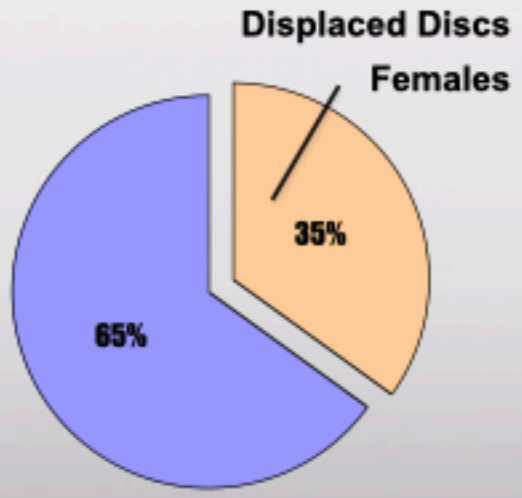
Pt of Ed Zebovitz, DDS

Şakar, O., Çalişir, F. (2013). Evaluation of the Effects of Temporomandibular Joint Disc Displacement and Its Progression on Dentocraniofacial Morphology in Symptomatic Patients Using Posteroanterior Cephalometric Analysis. Cranio, 31(1), 23–31.

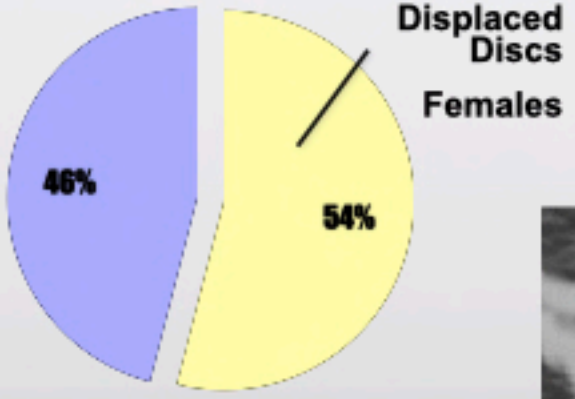
TMJ Damage Prepuberty

Prevalence Displaced Discs

Asymptomatic Volunteers



Presenting to Ortho Office



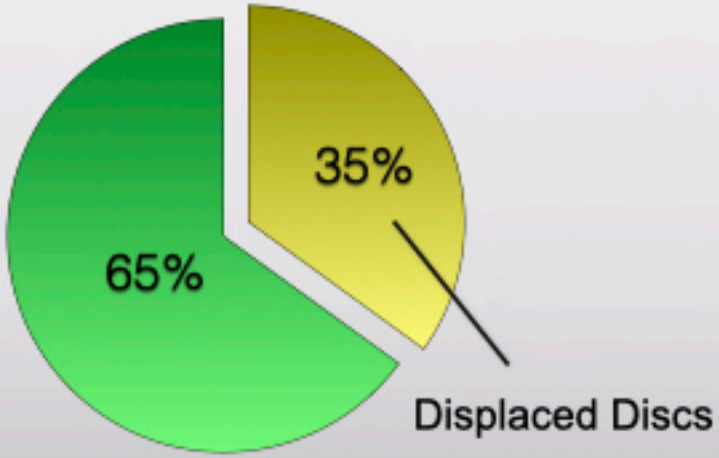
In patients with Displaced Discs
Condyles of Females Distalized
Significantly more than Males

The Prevalence of Disc Displacement in Symptomatic and Asymptomatic Volunteers
Ribeiro R, Tallents R, Katzberg R, J Oral Facial Pain 1997 ;11:37-47

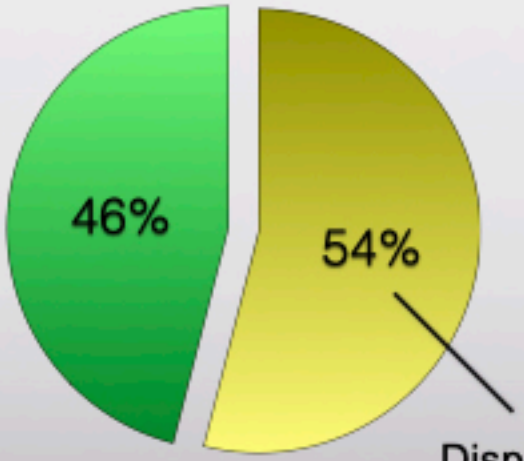
Osseous Morphology and Spatial Relationships of the TMJ Comparisons of Normal and Anterior Disc Positions, Kinniburgh R, Major P, Nebbe B, Angle Orthod 2000;70:70-80

Prevalence Displaced Discs on MRI

Asymptomatic Volunteers



Females Presenting to Ortho Office



In patients with Displaced Discs
Condyles of Females Distalized
Significantly more than Males

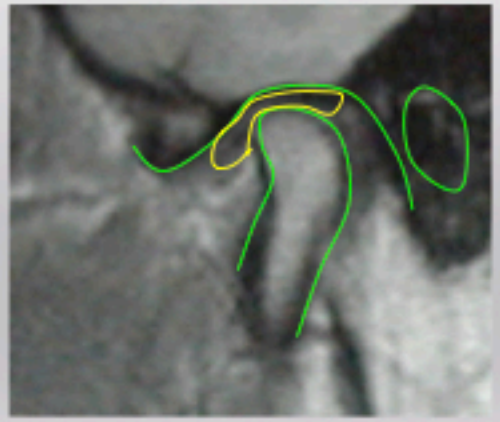
The Prevalence of Disc Displacement in Symptomatic and Asymptomatic Volunteers
Ribeiro R, Tallents R, Katzberg R, J Oral Facial Pain 1997 ;11:37-47

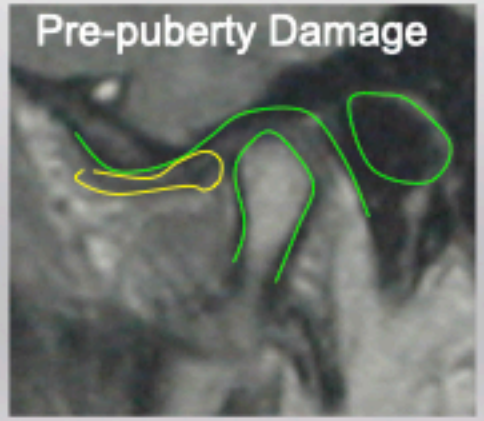
Osseous Morphology and Spatial Relationships of the TMJ Comparisons of Normal and Anterior Disc Positions, Kinniburgh R, Major P, Nebbe B, Angle Orthod 2000;70:70-80

Basic Orthopedics

Joints are either
- Healthy or
- Damaged

If damaged, joints will be either:
- Actively Breaking Down
- Adapting
- Adapted Favorably Structurally and Mechanically
- Adapted Unfavorably





Small condyles due to TMJ damage:

Pre-puberty TMJ damage, the joints adapted, but did not grow.

Post-puberty TMJ damage will be a degenerative process.

Note ratio condyle size to fossa size

John R. Droter, DDS
drdroter@mac.com
301-805-9400

The TMJ: What You need to Know before you change an occlusion

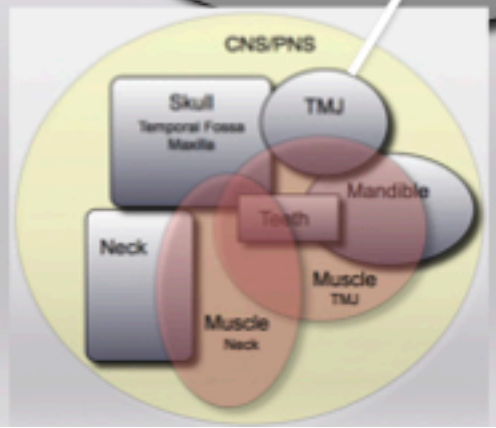
TMJ

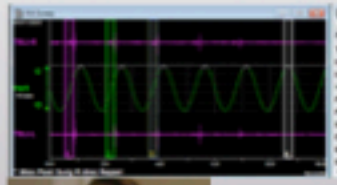
Does it Hurt?
Does it Move?
Does it Wobble?
Is it Structurallv Stable?

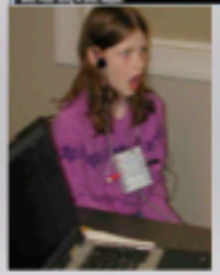
Palpate and Load the TMJ.
Measure Smoothness and Range of Motion (Quality and Quantity), Record JVA
Take CT scan- see intact cortex of condylar bone and fossa
CR ≠ Max IC less than 2mm (horizontal), not more than 3mm.

D-PAS test

History: No changes to the clicking.
Non-painful.
Can eat and chew what they want

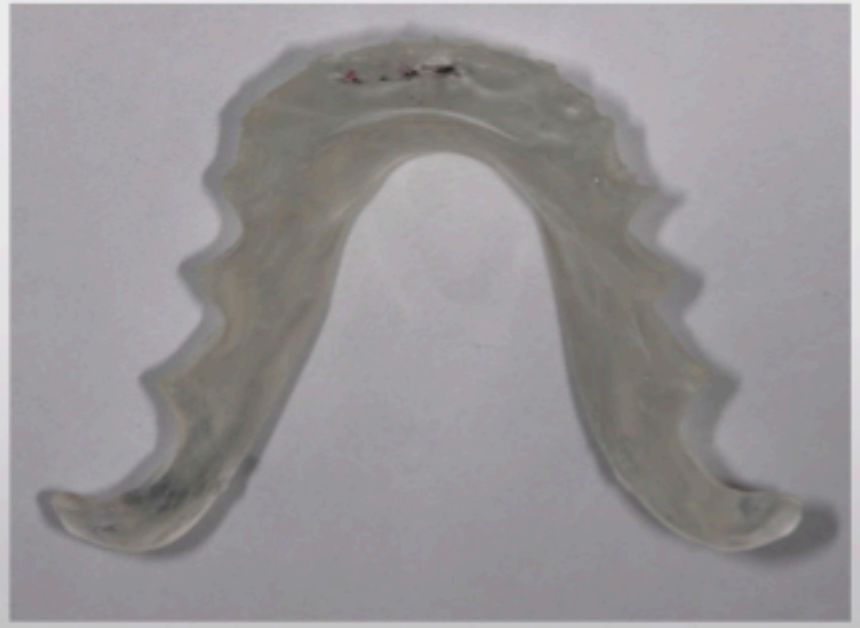


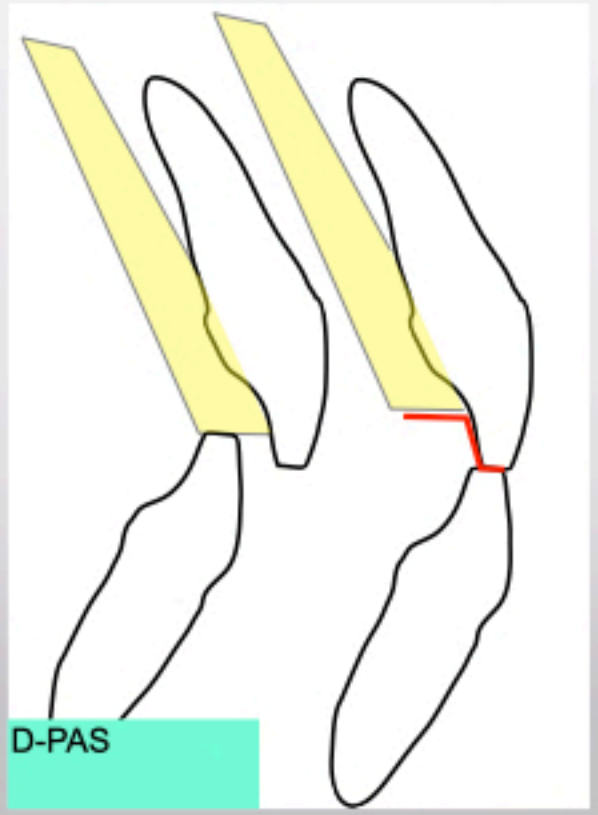




Palatal Anterior
Stop Orthotic

Diagnostic Palatal Anterior Stop
D-PAS





Basically an upper Hawley with anterior stop without clasps or wire

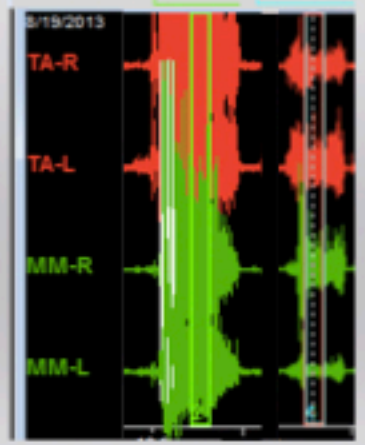
3. Are the TMJ muscles inhibited from full contraction with anterior only tooth contact?

Detect with EMG or muscle palpation- Clench full power on posterior teeth and then with D-PAS orthotic.

Diagnostic
Palatal Anterior Stop
Orthotic

Patient with muscles
inhibited by anterior only contact

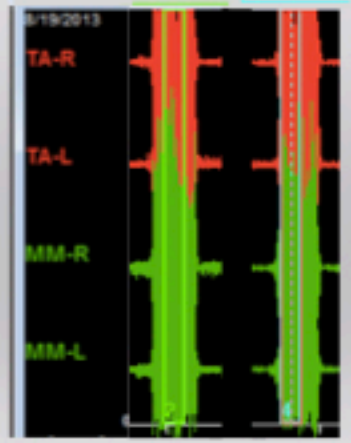
	Clench MaxIC	Anterior Stop D-PAS
	µV	µV
TA-R	100.6	15.7
TA-L	108.9	25.3
MM-R	115.4	25.5
MM-L	70.5	6.8



Major decrease in muscle power with D-PAS

Another Patient with muscles NOT
inhibited by anterior only contact

	Clench MaxIC	Anterior Stop D-PAS
	µV	µV
TA-R	82.2	77.9
TA-L	124.6	103.6
MM-R	185.0	169.0
MM-L	79.9	86.6



Muscle power same with D-PAS

Choosing the Correct Night Guard

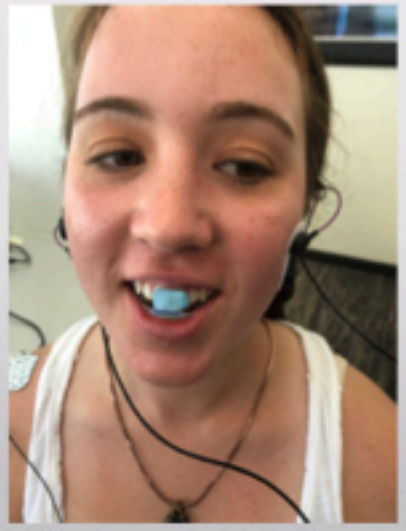
www.APSleep.com

APS
ArrowPath Sleep

M-Scan EMG
Electromyography

Clench back teeth

Clench
anterior stop



Can place moderate force on front teeth

<u>Clench</u>
Back teeth +250 µv
Front teeth +121 µv

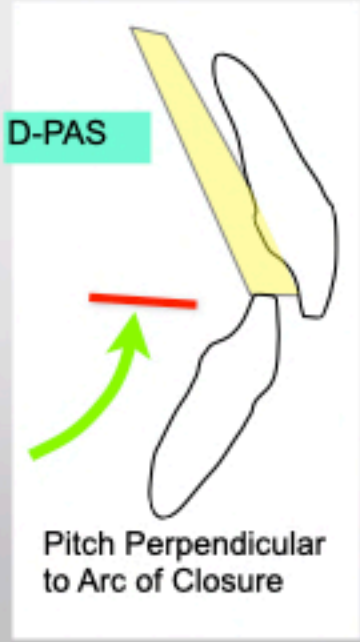
Diagnostic Palatal Anterior Stop

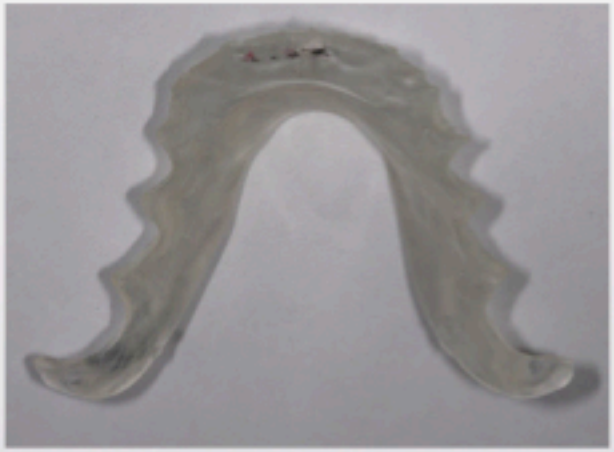
D-PAS Test: Wear 2 weeks for sleep, and occasional daytime

Better- Decrease in Symptoms
- Sleep Clenching Inhibited: Wear D-PAS as night guard
- Orthotic Improved Airway: D-PAS as night guard
- Occlusal Muscle Disharmony: Occlusal Adjust

Worse- Increase in Symptoms
- Mechanically Unstable TMJ, joint subluxation
- Intracapsular Problem TMJ
- Orthotic Made Sleep Airway Worse

Stays the Same- No Change in Symptoms
- Damaged TMJ are mechanically stable
- Pain not related to occlusion



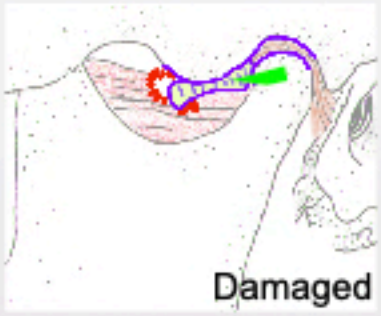


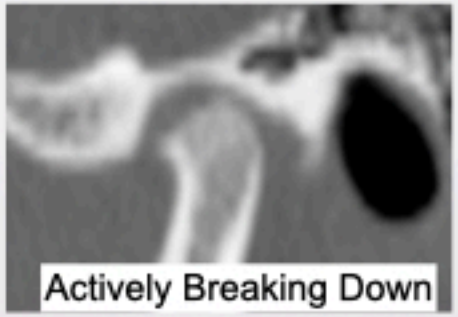
Stapelmann H, Türp JC. The NTI-tss device for the therapy of bruxism, temporomandibular disorders, and headache…..BMC Oral Health. 2008 Jul PMID: 18662411

Basic Orthopedics

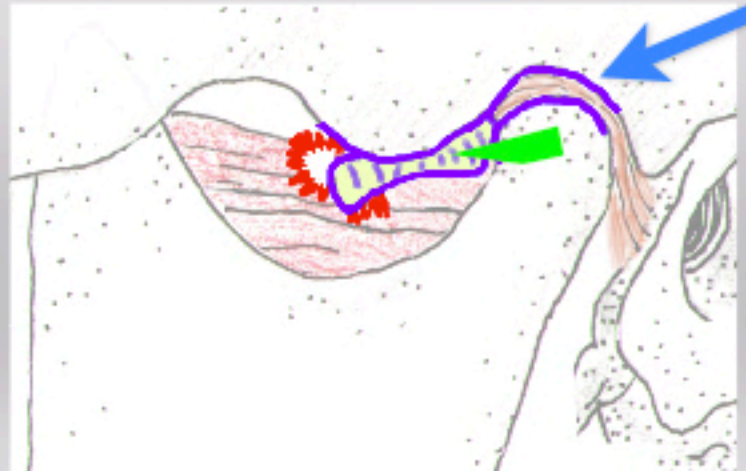
Joints are either
- Healthy or
- Damaged

If damaged, joints will be either:
- Actively Breaking Down
- Adapting
- Adapted
  - Structurally, Mechanically
  - Favorably, Unfavorably





Majority of damaged TMJs adapt favorably



Posterior ligament, synovium, and retrodiscal tissue adapt to form a

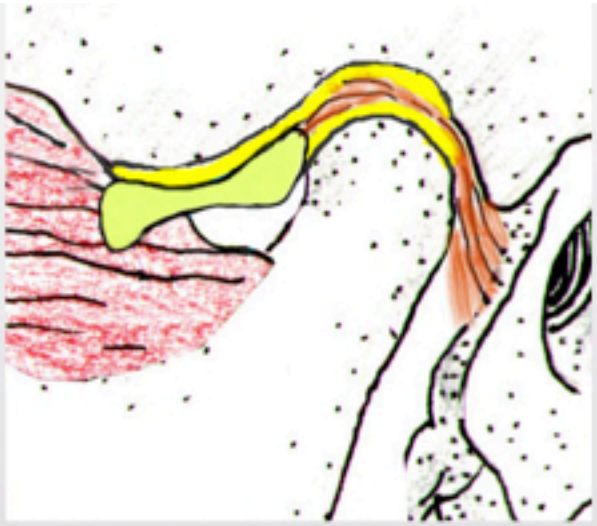
Pseudo-disc

Tissue Fibrosis

All Clicking Joints are Damaged

Not so Dangerous Clicks

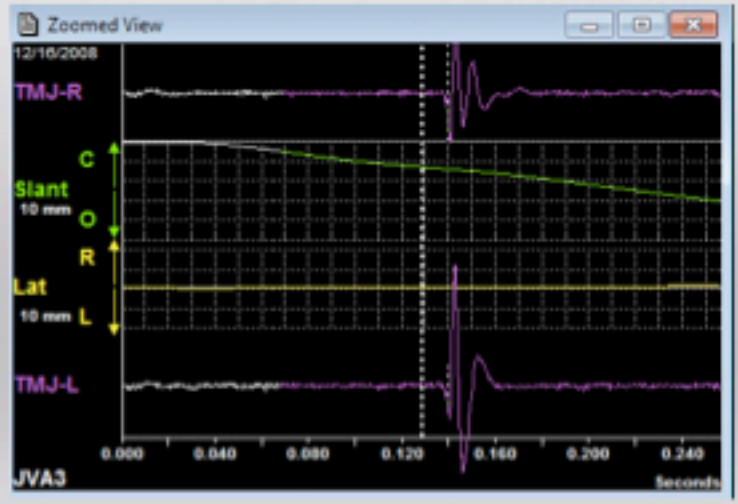
- Unchanging click for 2+ years
- Consistent, easy reduction of Disc
- Good range of motion with clicking
- Stable occlusion with clicking



Clicks that need further Evaluation/ Scans

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

Simple Click on JVA
Joint Vibration Analysis
BioResearch



John R. Droter, DDS
drdroter@mac.com
301-805-9400