Nebraska Alumni 2023
The 4 Question TMJ Evaluation

John R Droter DDS
Annapolis, Maryland

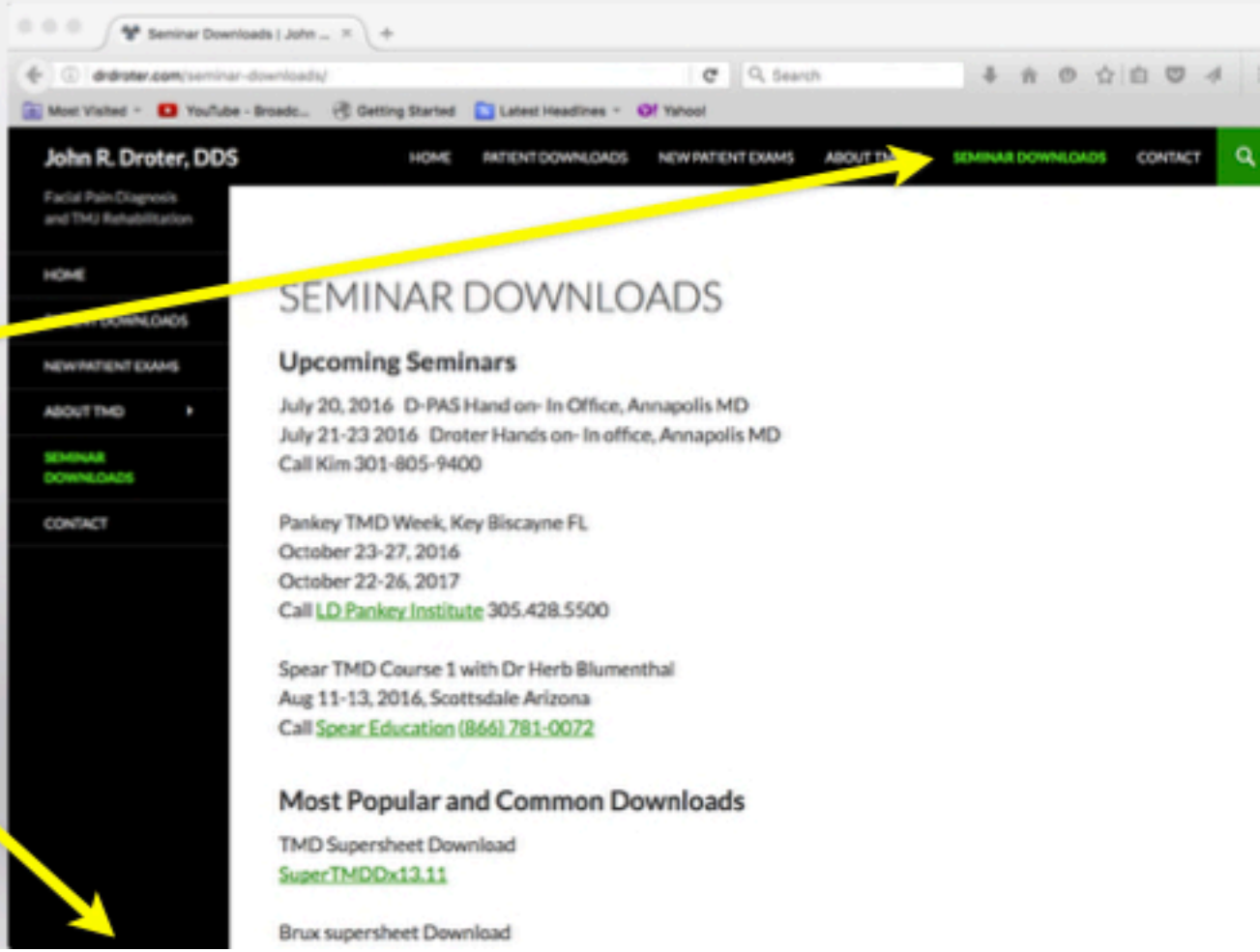
www.drdroter.com

John R Droter, DDS

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

Seminar Download

Nebraska Alumni 2023



Hello. I am:

John R Droter DDS
Annapolis, Maryland

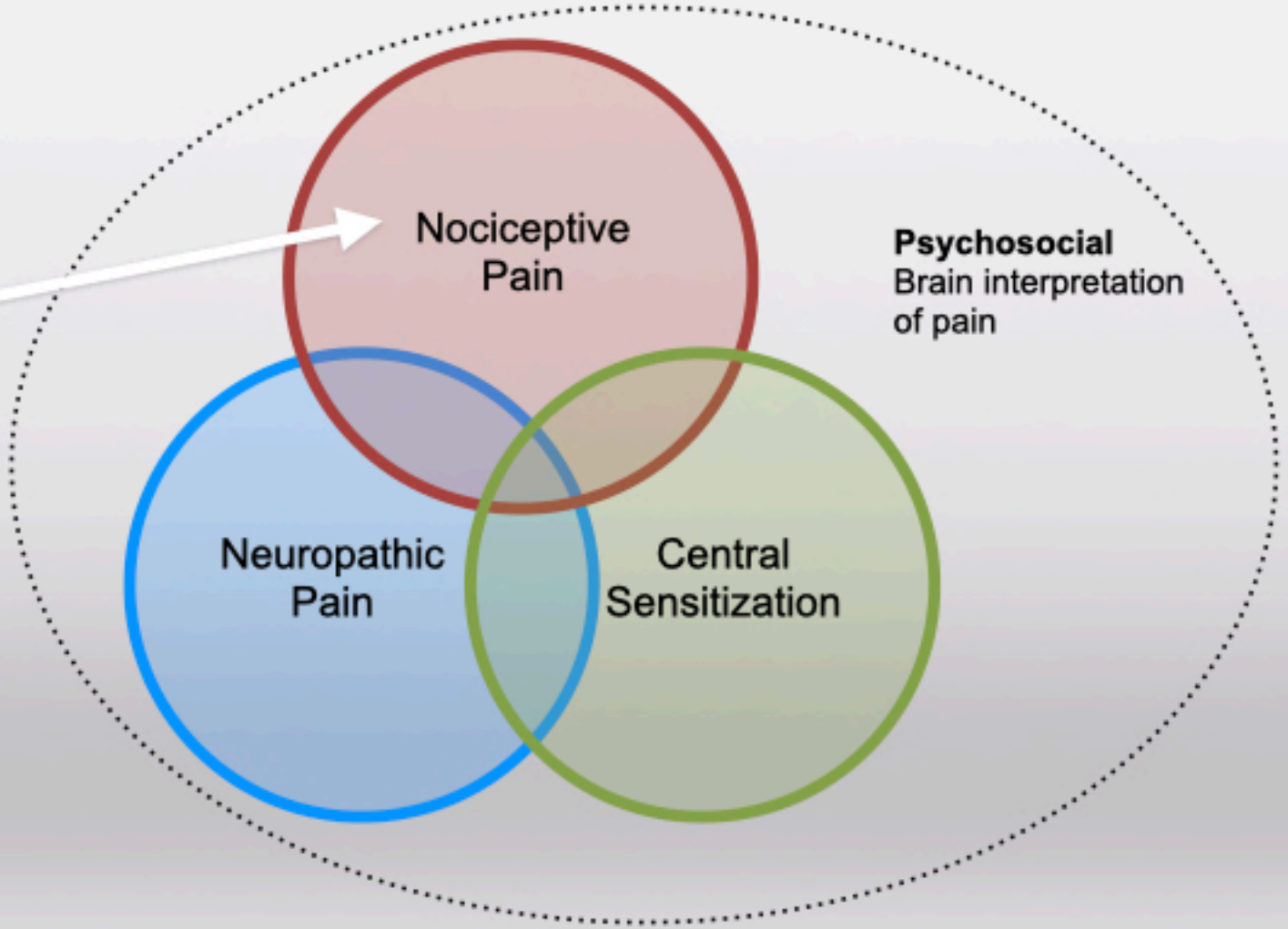
Pain: Three Types

Inflammation Pain
Physical Damage

Tissue
Muscles
Joints

Nerves Misbehaving

Brain Misbehaving



changepain.com

TMD Therapies: (70 therapies)

Physical

Ice
Hot Cold Hot
Cold Laser
TENS in office
TENS home use
Range of motion exercises
Active Stretching: Manual, Tongue Blades, Dynasplint
Refer to Physical Therapy: Rocabado mobilization
Refer to Physical Therapy: Postural Restoration Therapy
Refer to Physical Therapy: Various Muscle Therapies
Refer to Chiropractic: Atlas Orthogonist
Refer to Osteopathic MD: Body alignment
Breathe, Walk , Exercise

Brux Checker
Upper full coverage hard CR guard
BiArch Posterior Deprogrammer
Mandibular Advancement Device
Lateral Bruxing Device
Lingual Light Wire
Condylar Distraction

Medicinal

Anti Inflammatory:
NSAIDs,
Doxycycline low dose
CBD Topical
Glucosamine/Chondroitin MSM
Vitamins: Vit C, Vit D, Vit B12
Minerals: Magnesium, Electrolytes
Minerals: Iron
Refer to MD for Lyme therapies
Refer to MD Rheumatoid Arthritis therapies
Refer Botox Masseter injections
Refer Botox Lateral Pterygoid Injections
Food

Occlusal Orthopedic

Lingual Light Wire
Planas Tracks
Lower soft sectional orthotic
Sectional orthodontics
Expansion orthopedics/ orthodontics
Restorative Dentistry
Occlusal Adjustment with DTR, TekScan
Condylar distraction
Occlusal Adaptation

Tongue Parafunction

Refer for Cervical Alignment/ Stabilization
Myobrace
Upper Lingual light wire
Clear Brux Checker
Frenectomy
Myofunctional therapy

Dental Orthotics

In Office Trial Anterior Stop
Temporary home use anterior stop
Diagnostic Palatal Anterior Stop
Brux-PAS
Lower full coverage CR
Lower posterior deprogrammer
Lower TMJ Rehab flat plane
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Posterior Stop Night Guard
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Anterior Stop Airway Bite
Lateral Bruxing Device
Condylar Distraction
Lingual Light Wire
Lower Soft Sectional

Athletic Mouthguard
Anterior Repositioning
Occlusal Adjust Assist
Aqualizer
Myobrace

Sleep/ Fatigue

Mouth taping
Diet Modification
Positional Therapy
Vitamins: Vitamin D, Vitamin B12, Vit C
Minerals: Magnesium, Iron
Lateral Bruxing Device guided plane
Lateral Bruxing Device Elastomeric
Mandibular Advancement Device
CPAP

Surgical

Refer: Arthrocentesis w/ PRP
Refer: Discectomy w/ Fat Graft
Refer: Total Joint Replacement
Refer: Orthognathic Surgery

Milestones

Visiting Faculty Spear Education 2013

Visiting Faculty LD Pankey Institute 2008

Visiting Faculty Orthodontic Program
Washington Hospital Center 2000

On staff AAMC: Orthopedic Rounds
In OR for TMJ Surgery

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

Lingual Light Wire- Crozat Arch Expansion

Age 29 Start

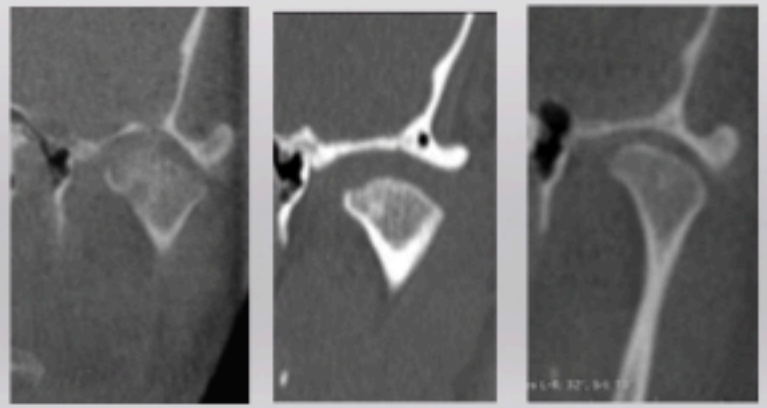
7 months LLW Age 30

Anterior Openbite with Active Osteolysis due to Inflammatory Tissue Bone Resorption

Non Surgical Therapies

Condylar Distraction

Anti Inflammatory Therapies



Restorative Dentistry

Pathological Occlusion

??Airway Related Bruxing?

Restore Function

Composite Trial Occlusion

AHI + 26 CPAP

Anterior guidance

or group function?

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

Spear Education TMD Course
Honorarium

Droter Seminars
My own Hands on TMD Courses

Co-Owner of ArrowPath Sleep
High Quality Dental Orthotics
Patent on sleep device: LatBrux

APS
ArrowPath Sleep

TMJ/TMD Confusion

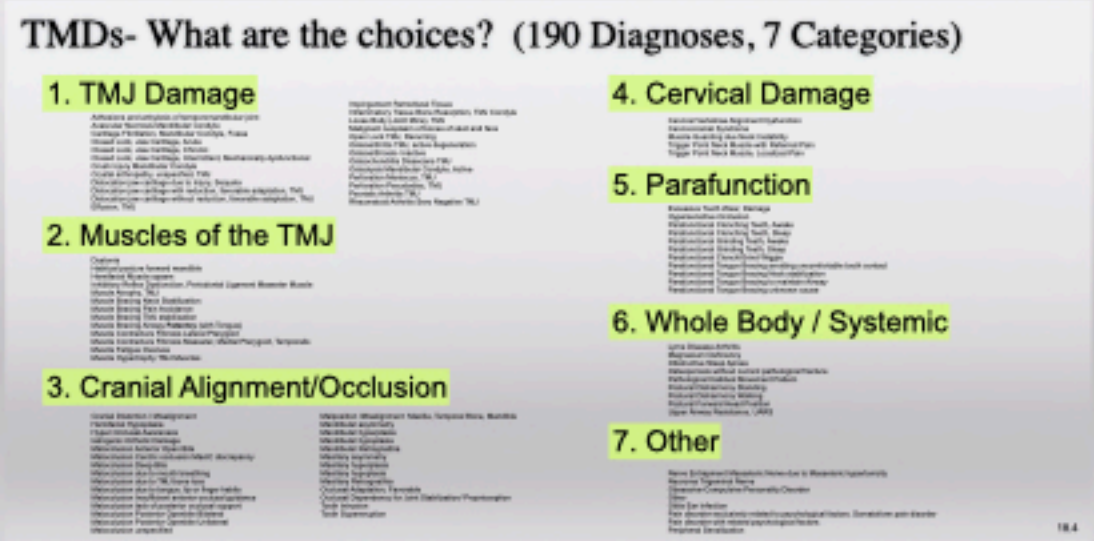
Dogmatic Arguments

Why Confusion?

Not One Disease

Temporomandibular Disorders (TMD) is an umbrella term covering any condition causing pain or dysfunction in the temporomandibular joint, muscles of mastication, trigeminal nerve, facial nerve, and associated head and neck musculoskeletal and neural structures.

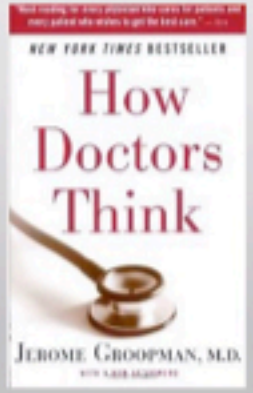
190+ Different Diseases



Differential Diagnosis
Diagnostic Boxes: Pattern Recognition

"My Tooth Hurts"

- Reversible Pulpitis secondary to caries
- Irreversible Pulpitis secondary to caries
- Pulpitis secondary to split tooth
- Pulpal necrosis
- Referred Pain from Muscle Trigger Point
- Sinus Infection
- Sympathetic Mediated Pain
- Neuroma
- Periodontal Infection
- Inflamed Tissue secondary to popcorn husk
- Aphthous Ulcer
- Periodontal ligament inflammation secondary to Occlusal Trauma
- Pulpits secondary to Occlusal Trauma
- Other

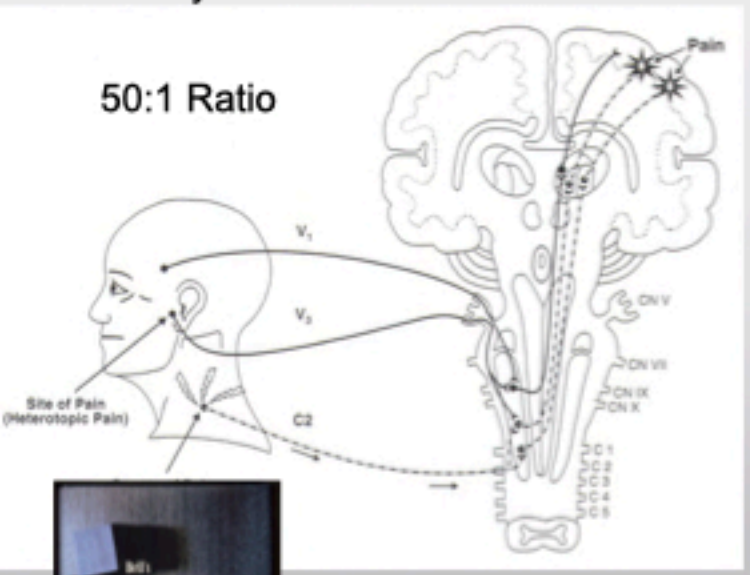


Referred Pain

Convergence

More primary sensory neurons than secondary neurons that travel to brain

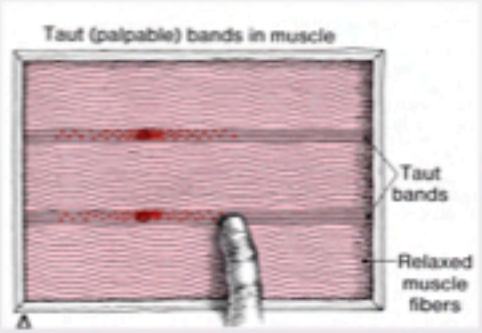
50:1 Ratio

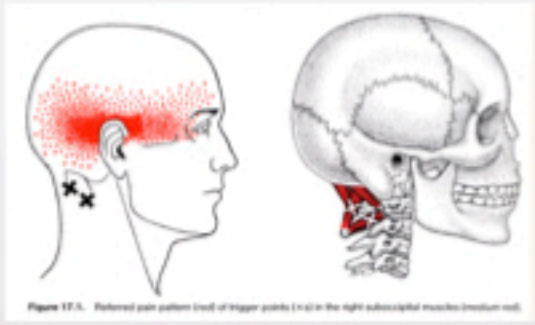


"Bells Orofacial Pain"
Jefery Okeson

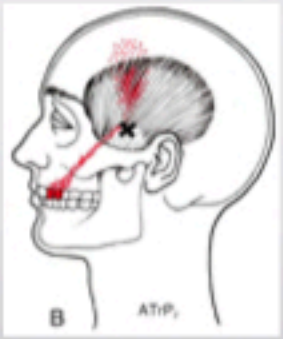
Trigger Points

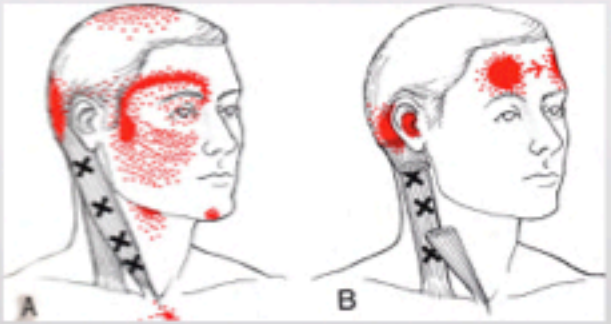
Contracted mass of actin, myosin and histamine

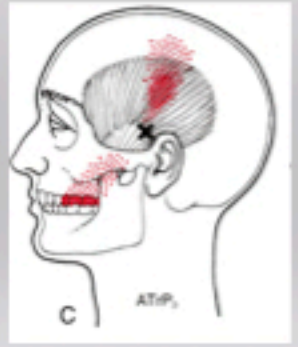


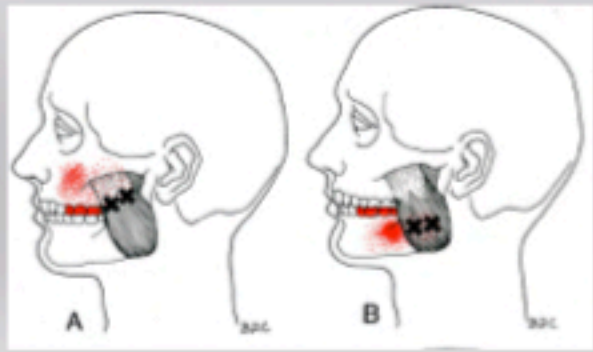


"The Trigger Point Manual"
Janet Travell, MD









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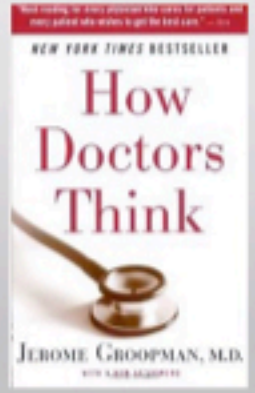
- Pulpits secondary to Occlusal Trauma
- Other

"How Doctors Think", by Jerome E. Groopman

Diagnose by Pattern Recognition
Tendency to make patients fit what we know
Ignore signs and symptoms that do not fit

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



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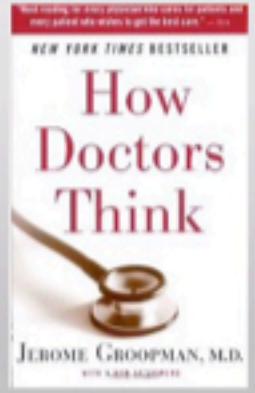

TMDs- What are the choices? (190 Diagnoses, 7 Categories)

1. TMJ Damage

Adhesions and ankylosis of temporomandibular joint
Avascular Necrosis Mandibular Condyle
Cartilage Fibrillation, Mandibular Condyle, Fossa
Closed Lock, Jaw Cartilage, Acute
Closed Lock, Jaw Cartilage, Chronic
Closed Lock, Jaw Cartilage, Intermittent, Mechanically dysfunctional
Crush Injury Mandibular Condyle
Crystal arthropathy, unspecified, TMJ
Dislocation jaw cartilage due to Injury, Sequela
Dislocation jaw cartilage with reduction, favorable adaptation, TMJ
Dislocation jaw cartilage without reduction, favorable adaptation, TMJ
Effusion, TMJ
Impingement Retrodiscal Tissue
Inflammatory Tissue Bone Resorption, TMJ Condyle
Loose Body (Joint Mice), TMJ
Malignant neoplasm of bones of skull and face
Open Lock TMJ, Recurring
Osteoarthritis TMJ, active degeneration
Osteoarthrosis- Inactive
Osteochondritis Dissecans TMJ
Osteolysis Mandibular Condyle, Active
Perforation Meniscus, TMJ
Perforation Pseudodisc, TMJ
Psoriatic Arthritis TMJ
Rheumatoid Arthritis Sero Negative TMJ
Synovitis

2. Muscles of the TMJ

Dystonia
Habitual posture forward mandible
Hemifacial Muscle spasm
Inhibitory Reflex Dysfunction, Periodontal Ligament Masseter Muscle
Muscle Atrophy, TMJ
Muscle Bracing Neck Stabilization
Muscle Bracing Pain Avoidance
Muscle Bracing TMJ stabilization
Muscle Bracing Airway **Patency** (with Tongue)
Muscle Contracture Fibrosis Lateral Pterygoid
Muscle Contracture Fibrosis Masseter, Medial Pterygoid, Temporalis
Muscle Fatigue Overuse
Muscle Hypertrophy TMJ Muscles

3. Cranial Alignment/Occlusion

Cranial Distortion / Misalignment
Hemifacial Hypoplasia
Hyper Occlusal Awareness
Iatrogenic Orthotic Damage
Malocclusion Anterior Open Bite
Malocclusion Centric occlusion MaxIC discrepancy
Malocclusion Deep Bite
Malocclusion due to mouth breathing
Malocclusion due to TMJ bone loss
Malocclusion due to tongue, lip or finger habits
Malocclusion Insufficient anterior occlusal guidance
Malocclusion lack of posterior occlusal support
Malocclusion Posterior Openbite Bilateral
Malocclusion Posterior Openbite Unilateral
Malocclusion unspecified
Malposition /Misalignment: Maxilla, Temporal Bone, Mandible
Mandibular asymmetry
Mandibular hyperplasia
Mandibular hypoplasia
Mandibular Retrognathia
Maxillary asymmetry
Maxillary hyperplasia
Maxillary hypoplasia
Maxillary Retrognathia
Occlusal Adaptation, Favorable
Occlusal Dependency for Joint Stabilization/ Proprioception
Tooth Intrusion
Tooth Supereruption

4. Cervical Damage

Cervical Vertebrae Alignment Dysfunction
Craniocranial Syndrome
Muscle Guarding due Neck Instability
Trigger Point Neck Muscle with Referred Pain
Trigger Point Neck Muscle, Localized Pain

5. Parafunction

Excessive Tooth Wear, Damage
Hypersensitive Occlusion
Parafunctional Clenching Teeth, Awake
Parafunctional Clenching Teeth, Sleep
Parafunctional Grinding Teeth, Awake
Parafunctional Grinding Teeth, Sleep
Parafunctional Clench/Grind Wiggle
Parafunctional Tongue Bracing avoiding uncomfortable tooth contact
Parafunctional Tongue Bracing Neck stabilization
Parafunctional Tongue Bracing to maintain Airway
Parafunctional Tongue Bracing unknown cause

6. Whole Body / Systemic

Lyme Disease Arthritis
Magnesium Deficiency
Obstructive Sleep Apnea
Osteoporosis without current pathological fracture
Pathological Habitual Movement Pattern
Postural Disharmony Standing
Postural Disharmony Walking
Postural Forward Head Position
Upper Airway Resistance, UARS

7. Other

Nerve Entrapment Masseteric Nerve due to Masseteric hypertonicity
Neuroma Trigeminal Nerve
Obsessive-Compulsive Personality Disorder
Other
Otitis Ear Infection
Pain disorder exclusively related to psychological factors. Somatoform pain disorder
Pain disorder with related psychological factors
Peripheral Sensitization

1. TMD: TMJ Damage and Diseases

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Dislocation jaw cartilage due to Injury, Sequela
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Effusion, TMJ
Fracture of subcondylar process of mandible
Gout, TMJ
Growth Disturbance Prepuberty due to TMJ damage
Hemarthrosis TMJ, Traumatic
Hyperplasia Mandibular Condyle,
Hypoplasia Mandibular Condyle
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Rheumatoid Arthritis TMJ
Sprain Discal Ligament TMJ, acute with joint edema
Subluxation on Loading, TMJ
Subluxation on Movement, TMJ
Synovial Cyst (Ganglion Cyst)
Synovial Hyperplasia
Synovitis

TMD Therapies: (70 therapies)

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Hot Cold Hot
Cold Laser
TENS in office
TENS home use
Range of motion exercises
Active Stretching: Manual, Tongue Blades, Dynasplint
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CPAP

Surgical

Refer: Arthrocentesis w/ PRP
Refer: Discectomy w/ Fat Graft
Refer: Total Joint Replacement
Refer: Orthognathic Surgery

Different Diagnoses have Different Therapies

Specific Diagnosis

TMDs- What are the choices? (190 Diagnoses, 7 Categories)

1. TMJ Damage
2. Muscles of the TMJ
3. Cranial Alignment/Occlusion
4. Cervical Damage
5. Parafunction
6. Whole Body / Systemic
7. Other

Specific Therapy

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70

6 Common TMDs

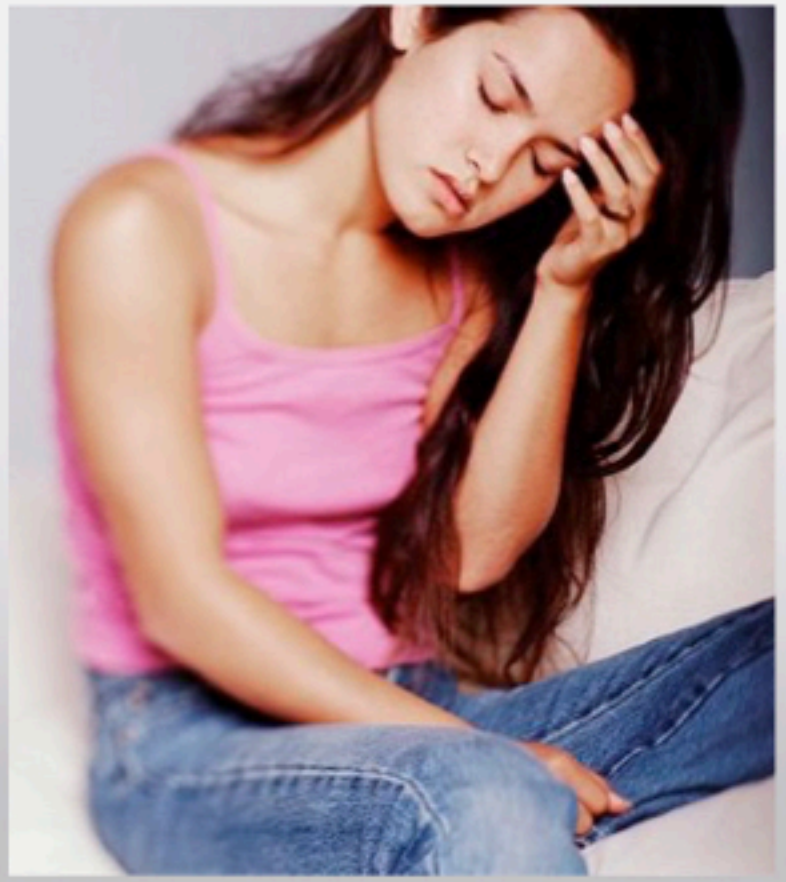
Parafunctional Clenching
Parafunctional Grinding
Occlusal Muscle Dysfunction
Osteoarthritis
Acute Sprain
Acute Closed lock of TMJ disc

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



What is a Click?

John R Droter DDS
Annapolis, Maryland

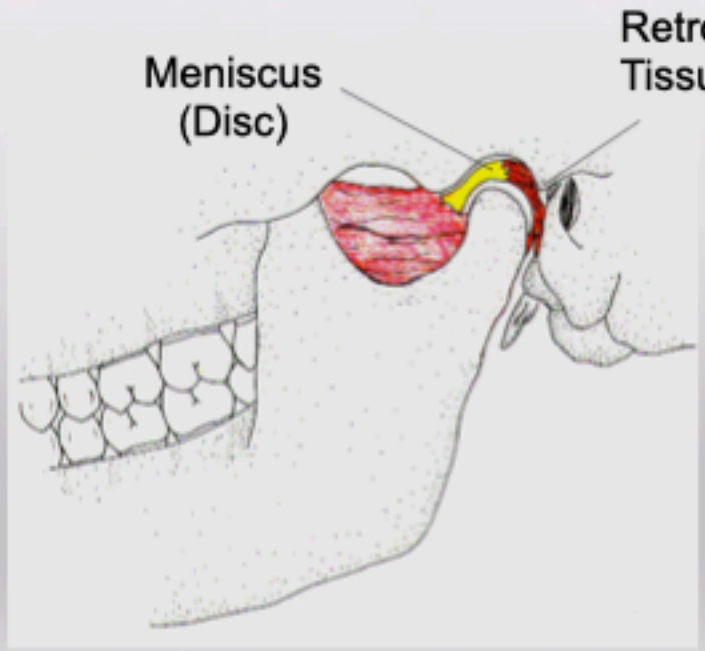
Rotate
Slide
Pivot

Solid end point closing
Ligamentous end point opening

A joint joins two bones that allows movement between the two bones

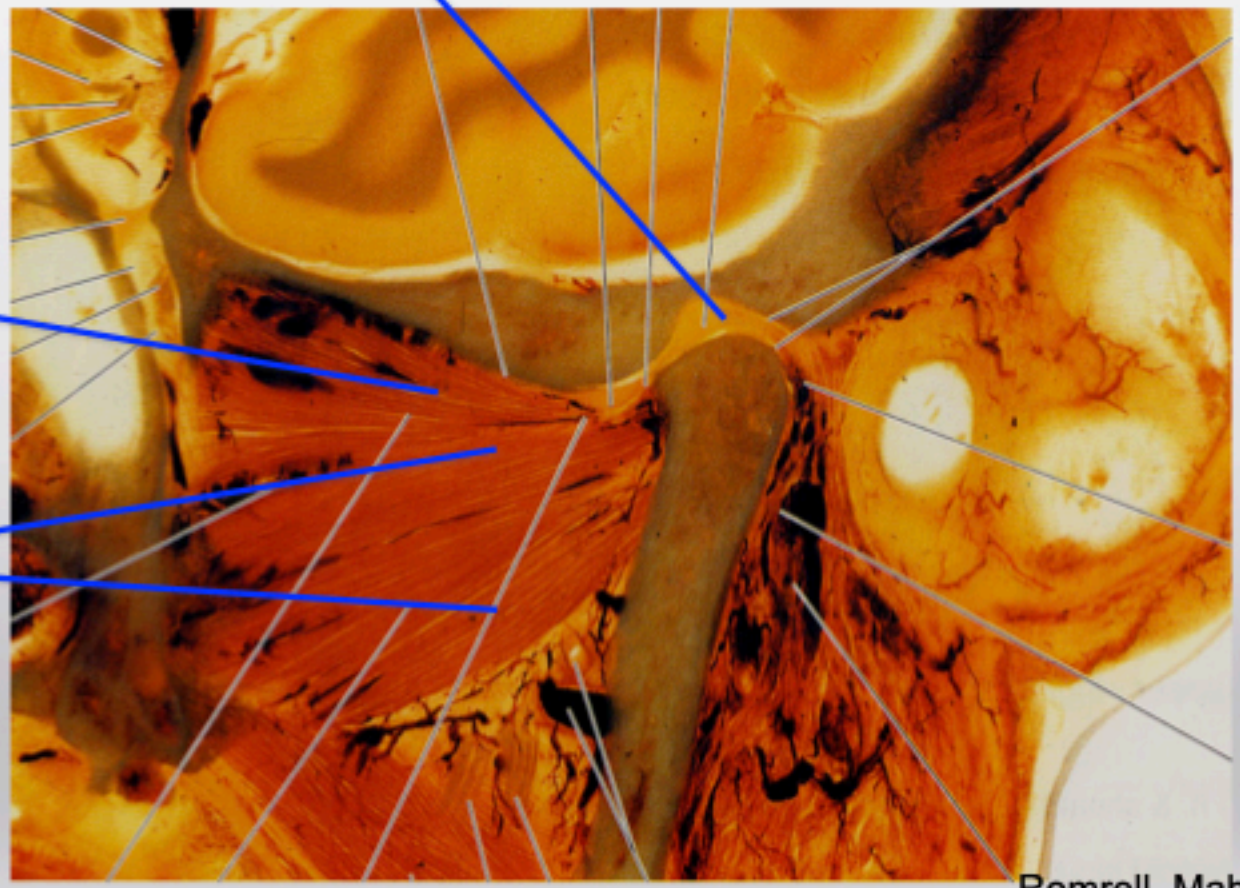
TMJ has 2 Joint Compartments:

Upper- Translation
Lower- Rotation

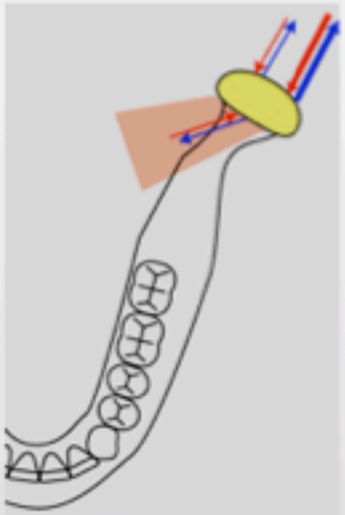



Condylar and Disk
Movements in Dissected
TMJ Autopsy Specimens

Oblique Sagittal View



Axial View



Normal TMJ Blood Flow, Marrow

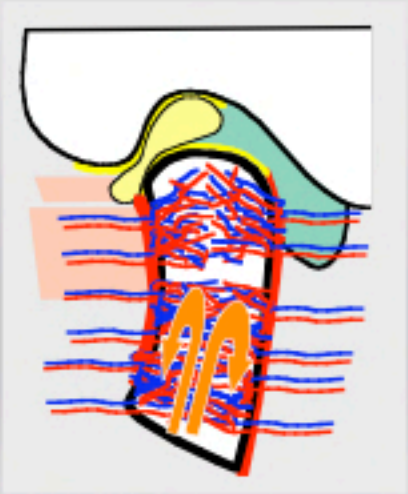
Condylar head limited collateral circulation

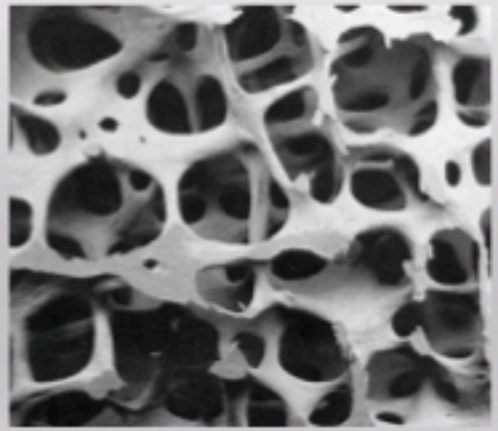
Epiphyseal growth center

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

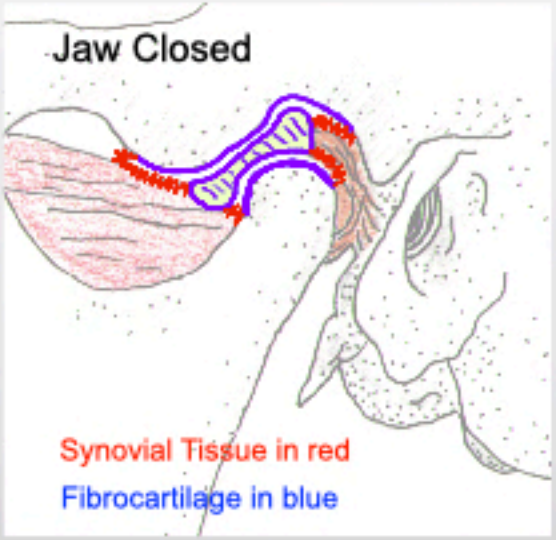
No Blood vessel inside joint

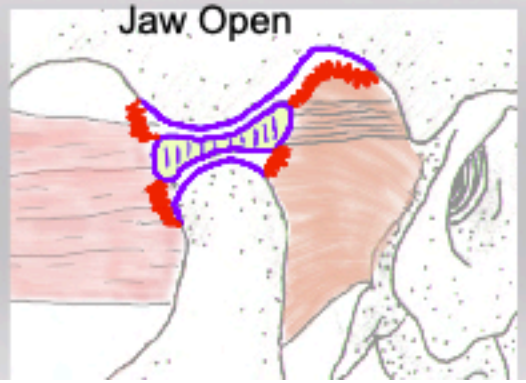
Closed Sagittal





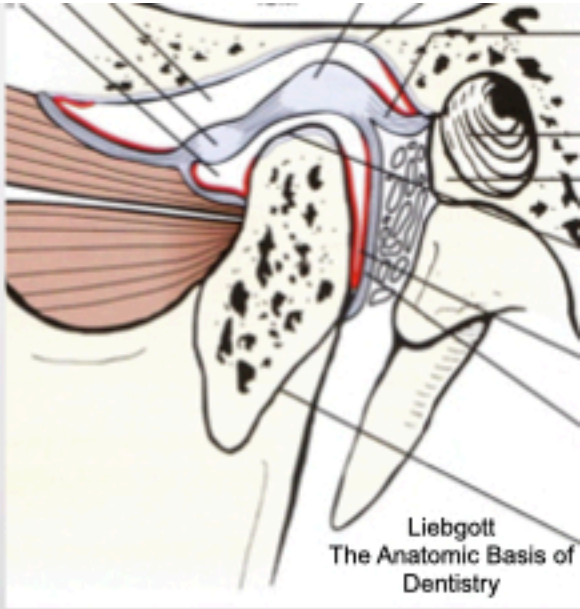
Normal TMJ- Synovium, Cartilage

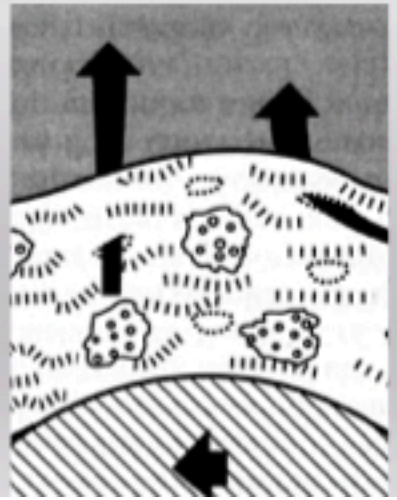




Fibrocartilage-
- Slope of Eminence
- Disc
- Top of Condyle

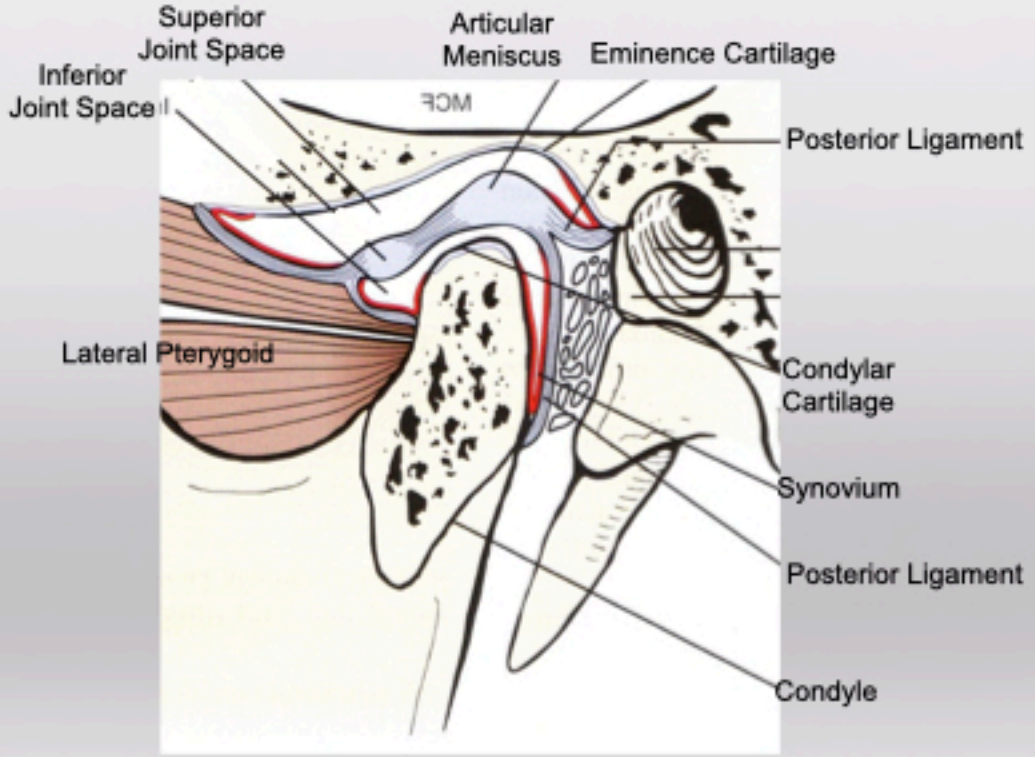
Synovial Tissue makes Synovial Fluid
- No blood vessels in a health joint
- Nutrition to the cartilage cells
- Lubrication- Hyaluronic Acid and Lubricin



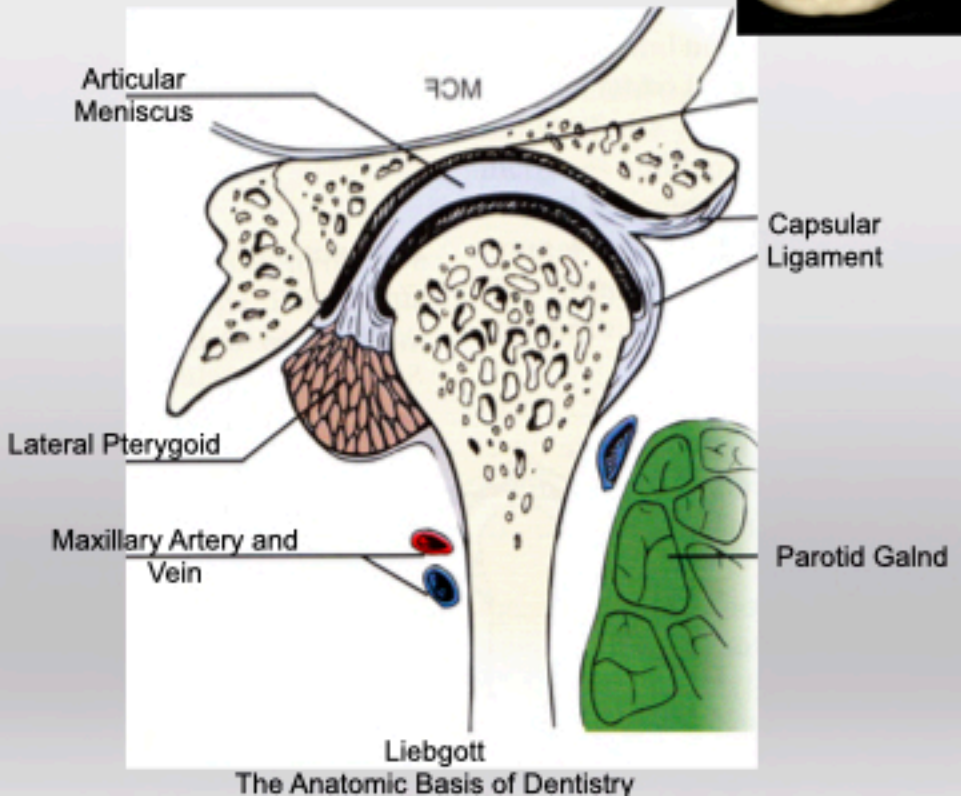


Fibrocartilage surface covered in fluid
- Cartilage is hydrophilic
- Proteoglycan negative charge
- Surface Active Phospholipids
- Fluid slides against fluid
- 5x slipperier than ice

Left TMJ Sagittal View



Left TMJ Coronal View



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

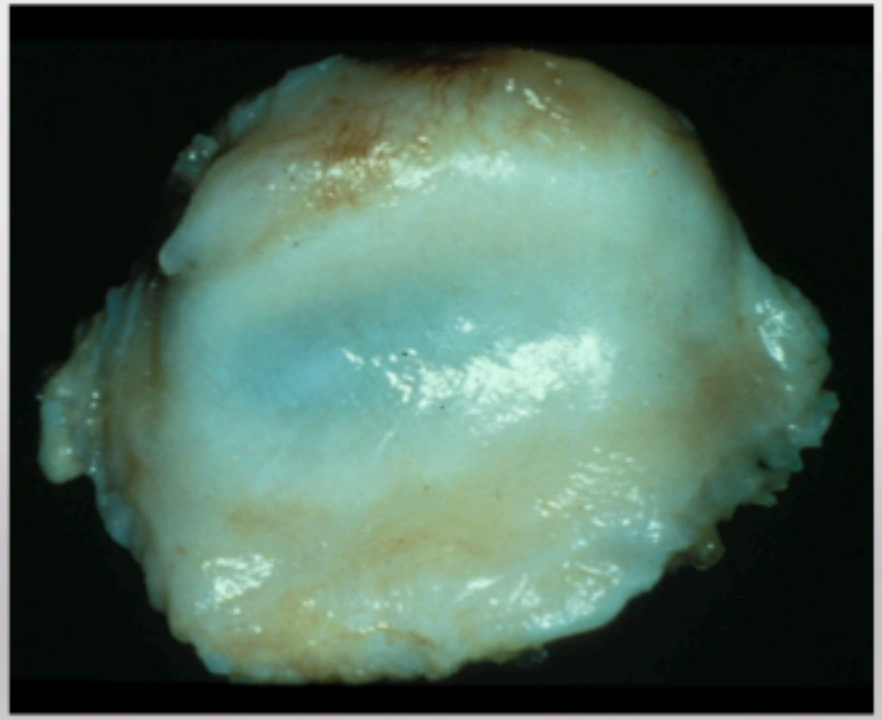
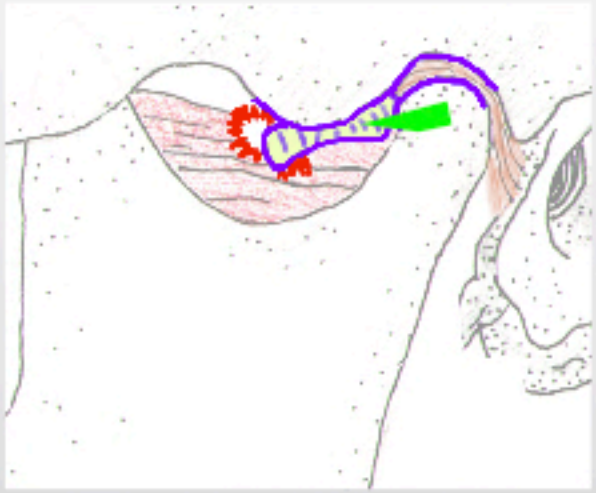


Photo Courtesy of Dr Henry Gremillion

Damaged TMJ- Anteriorly Dislocated Disc



Torn or stretched Meniscal ligaments

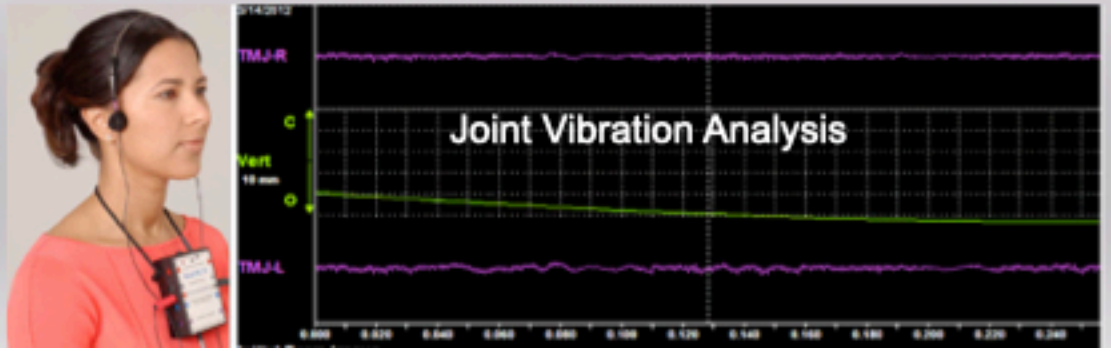
Anterior Dislocated Disc

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”

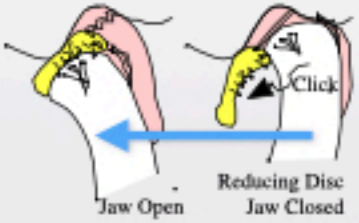
85% of all damaged joints adapt favorably without treatment

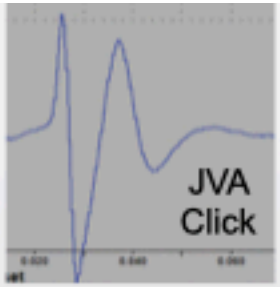
Cartilage sliding on tissue creates vibrations that can be detected



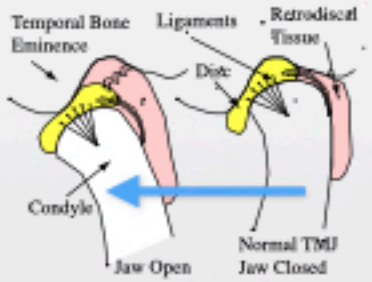
Differential Diagnosis of TMJ Clicking

Disc Reduction





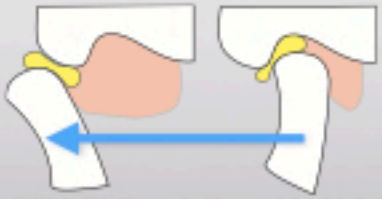
Normal



Adhesive Click

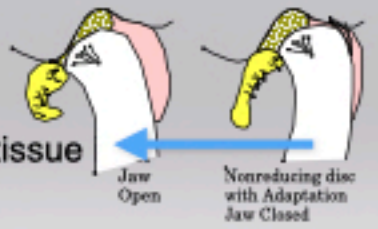
"Sticky Disc" - Disc sticks after prolonged clenching, then releases

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

3a Condyle Distalized, Disc is in proper location, Lateral pole click on translation

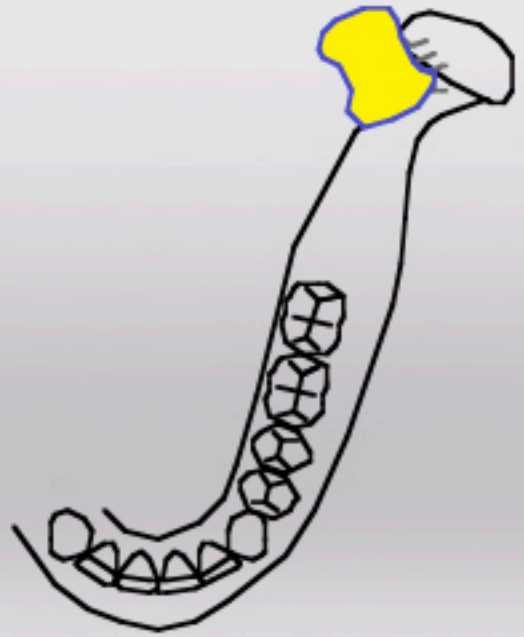
What is the Clinical Relevance of TMJ Damage Pre-Puberty?

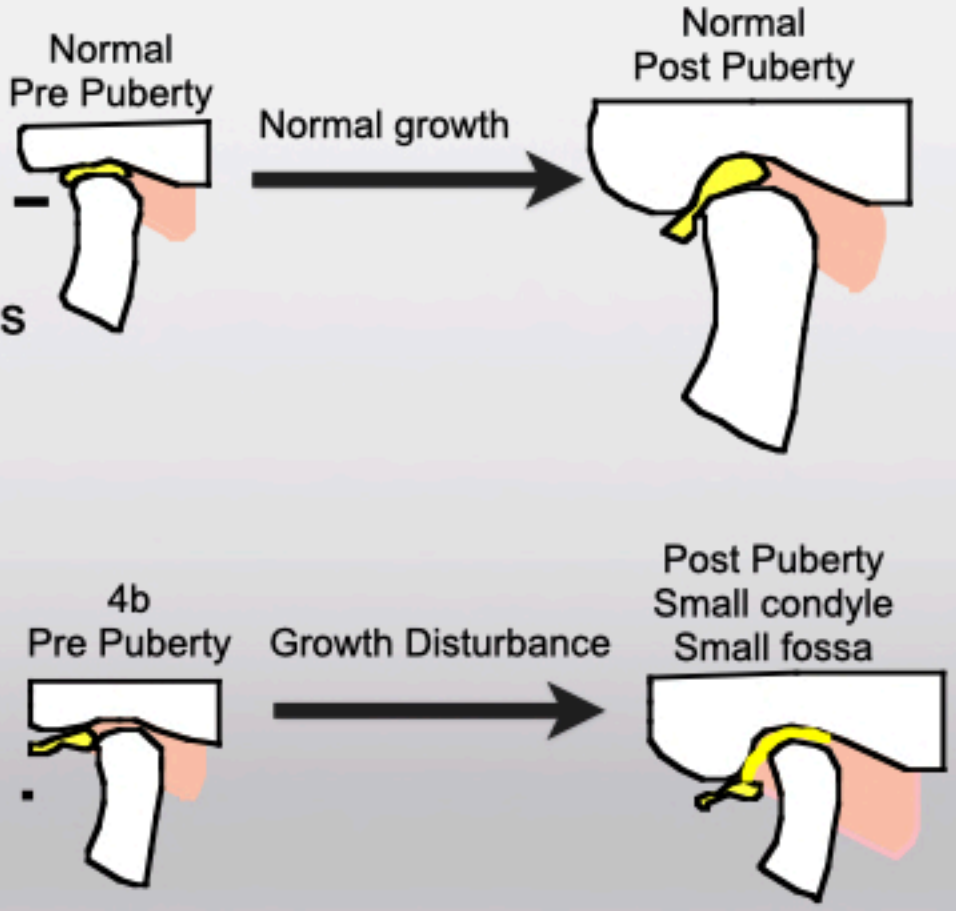
John R Droter DDS
Annapolis, Maryland

TMJ Damage Prepuberty

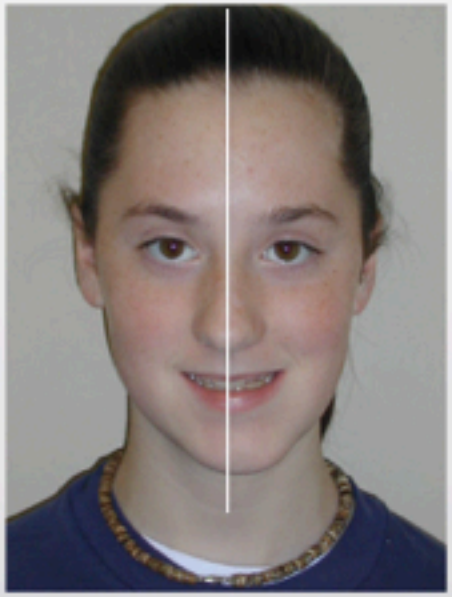
4b Pre-puberty is not a degenerative process

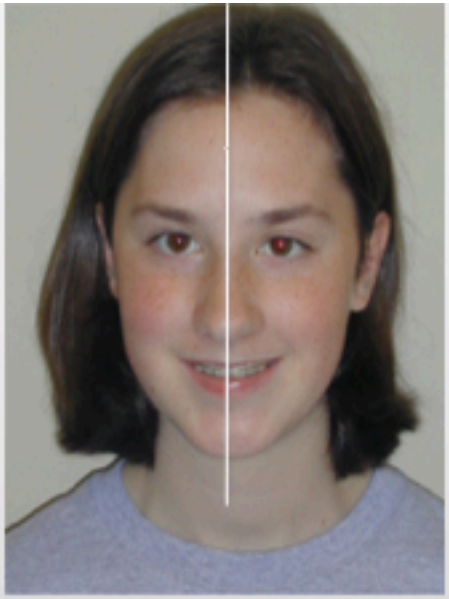
Can affect growth



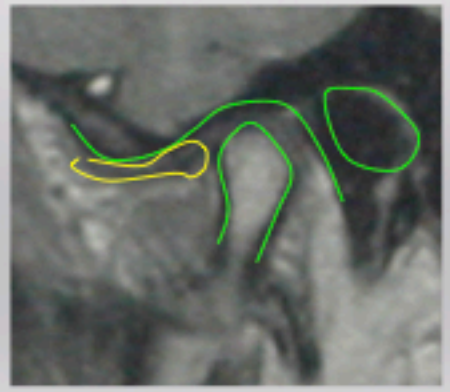


Age 17





R TMJ



L TMJ

Identical Twin Sister Age 17

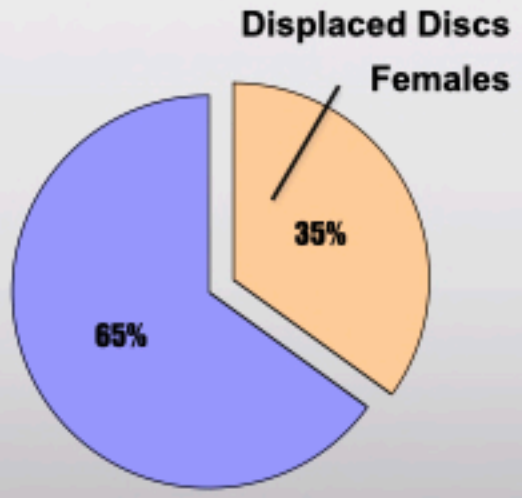
Pt of Ed Zebovitz, DDS

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.

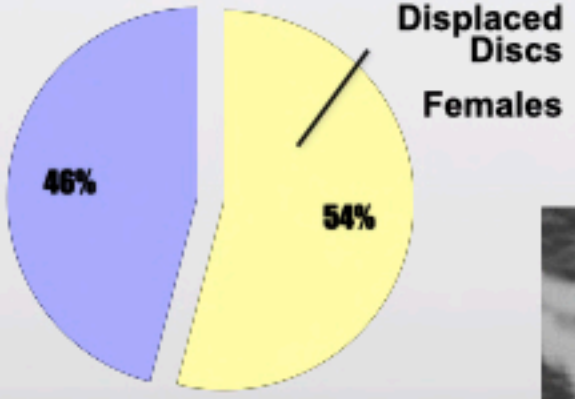
TMJ Damage Prepuberty

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

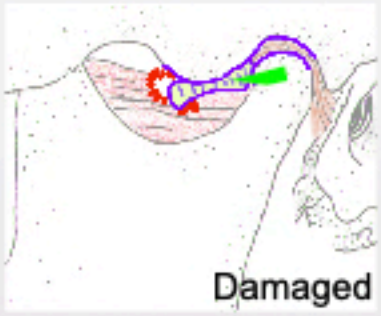
What is the Clinical Relevance of TMJ Damage Post-Puberty?

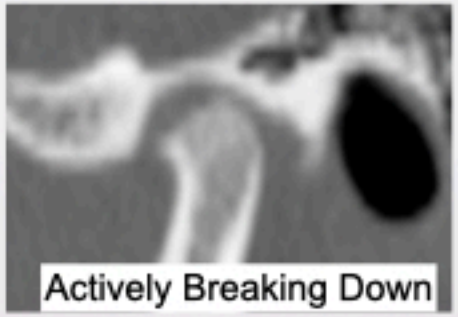
John R Droter DDS
Annapolis, Maryland

Basic Orthopedics

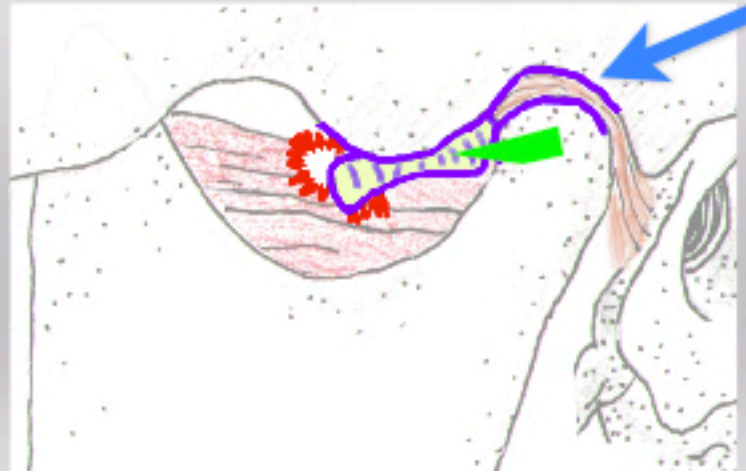
Joints are either
- Healthy or
- Damaged

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





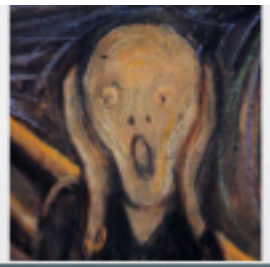
Majority of damaged TMJs adapt favorably



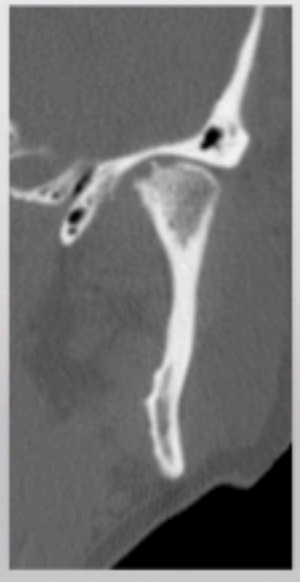
Posterior ligament, synovium, and retrodiscal tissue adapt to form a

Pseudo-disc

Tissue Fibrosis



Damaged TMJs



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

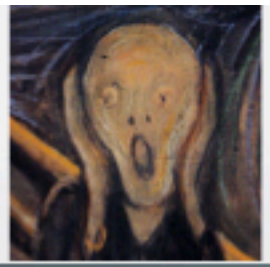
Occlusal Muscle Dysfunction

Osteoarthritis

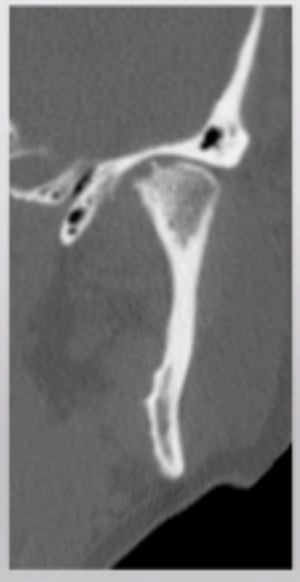
Avascular Necrosis

Progressive Condylar Resorption

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



Damaged TMJs



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Adapt Fairly 14% → Occlusal Muscle Dysfunction

Osteoarthritis

Adapt Poorly <1%

Avascular Necrosis

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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

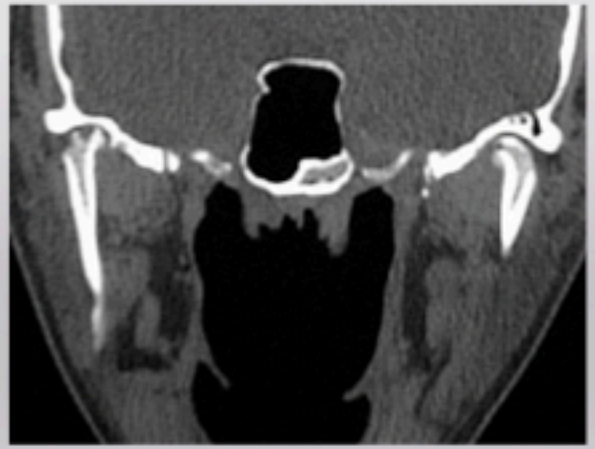
- University Hospital, Netherlands: 134 TMD patients, 30 year follow up
- Patients received good clinical work up and diagnosis 30 years ago, but basically no treatment
  - (Reassurance, PT, exercise, limited occlusal adjust)
- 70% satisfied with results
- 25% still had pain on movement
- 15% not able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

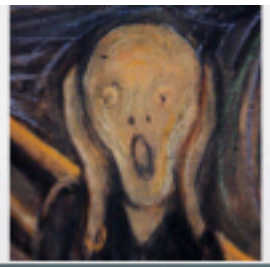
www.jrdroter.com

If you have a disease that is one in a thousand, it is 100% for you

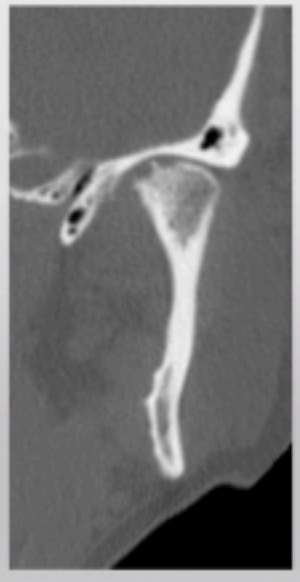
There is no love sincerer than the love of food.

G. B. Shaw





Damaged TMJs



Adapt Favorably 85%

Adapt Fairly 14% → Occlusal Muscle Dysfunction, Osteoarthritis

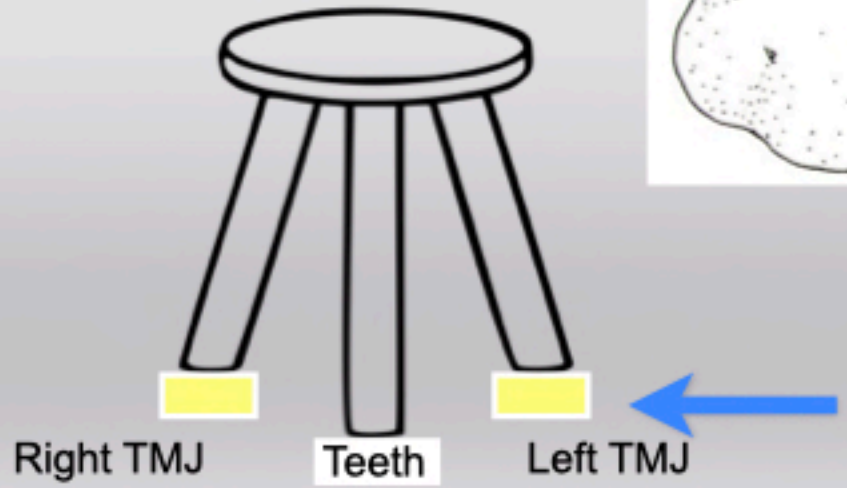
Adapt Poorly <1% → Avascular Necrosis, Progressive Condylar Resorption

*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?



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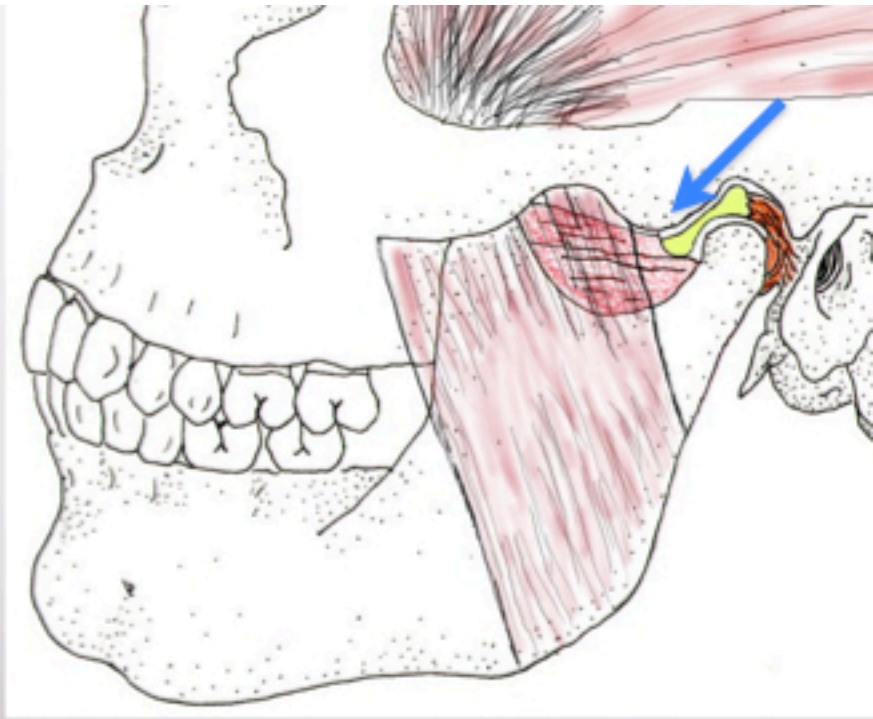
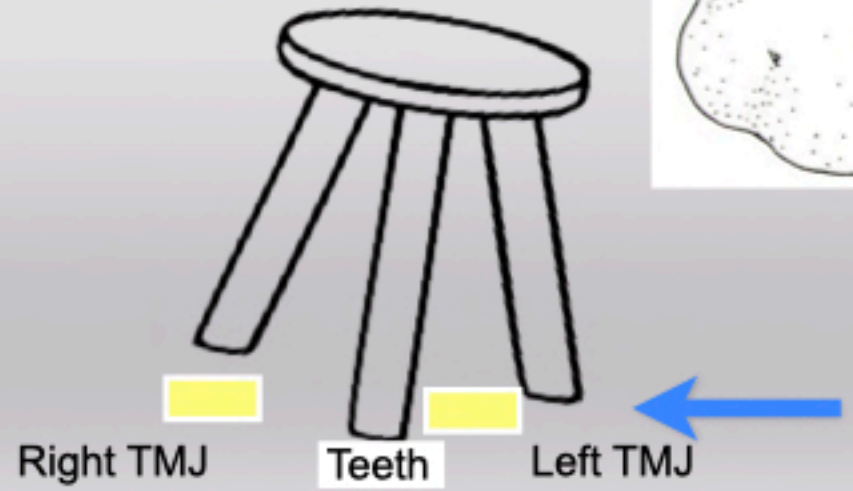




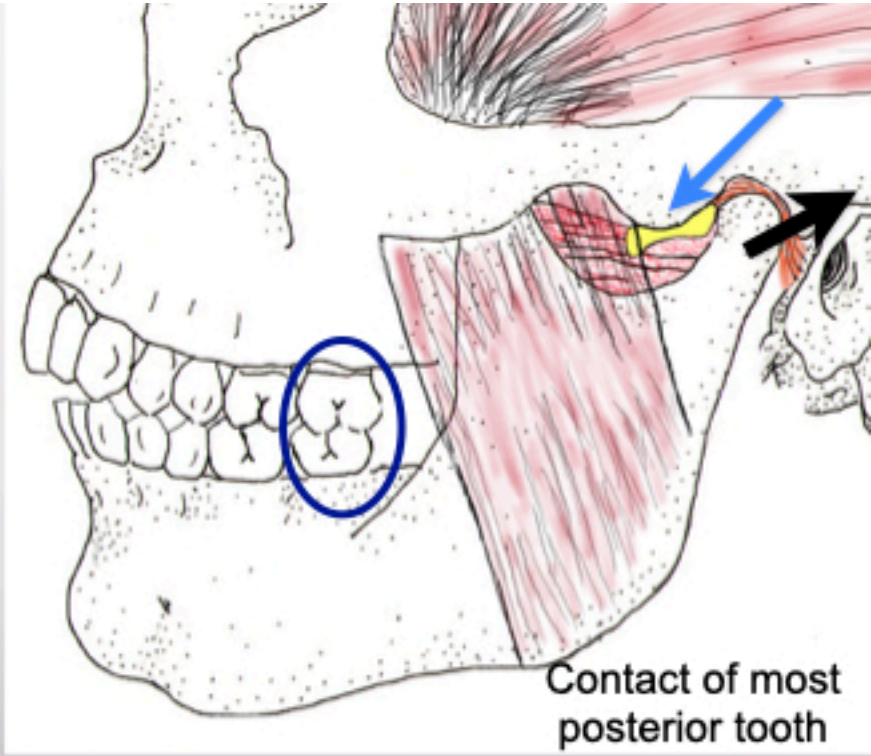
Damaged Joint with Malocclusion

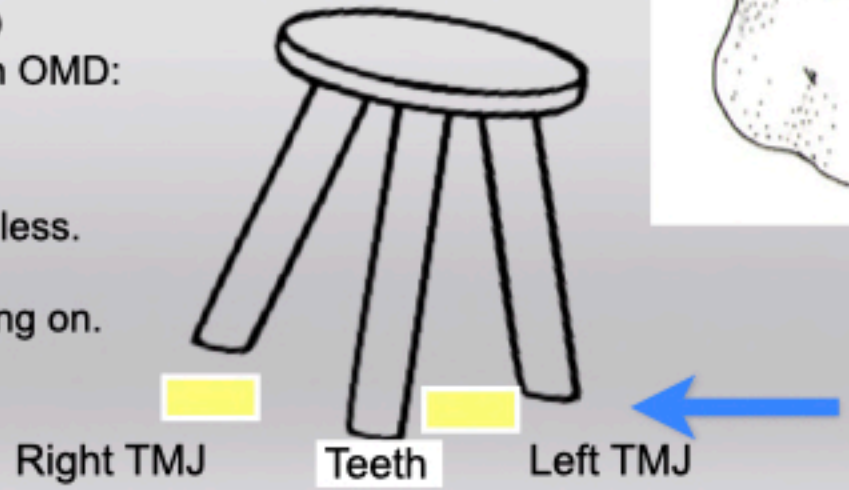
85% damaged joints adapt favorably with respect to the TMJ.

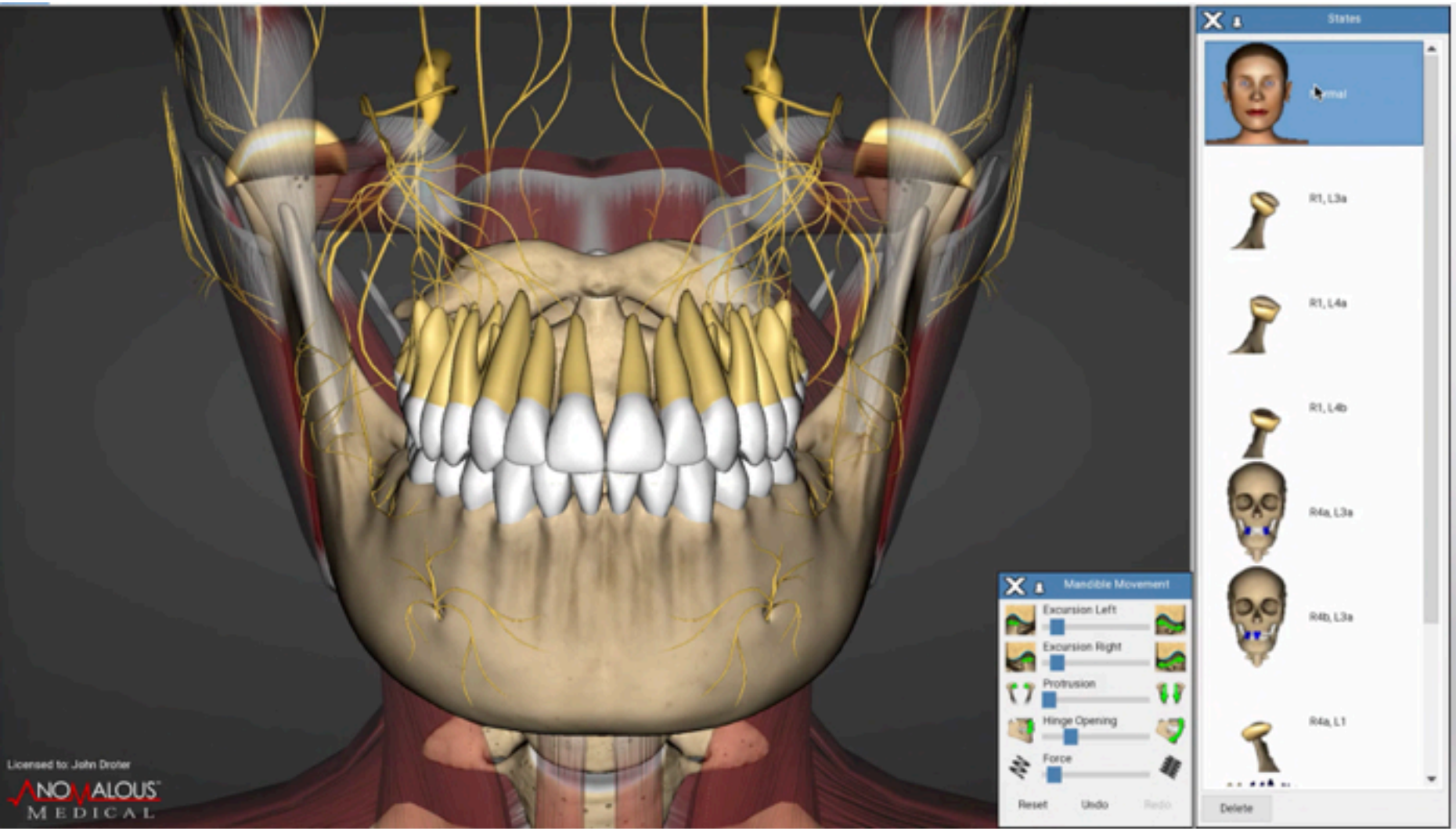
Anteriorly Dislocated Disc, Mandible shifts:
- Inadequate Anterior Guidance, Posterior Disclusion
- Uneven Occlusion,
- CR≠MaxIC
- Occlusal Muscle Disharmony develops.

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

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







Occlusal Shift

Occlusal Muscle Disharmony

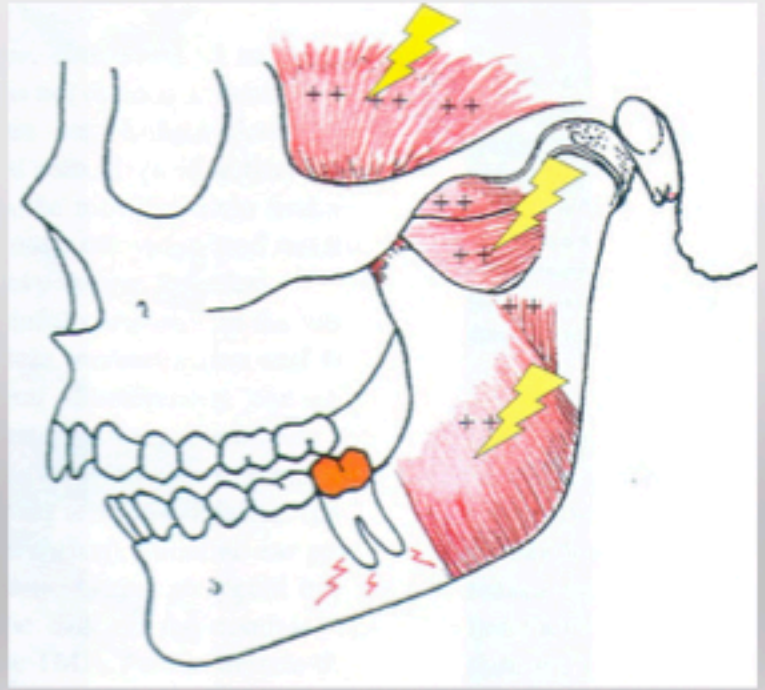
Uneven tooth contact with condyles fully seated triggers muscle activity

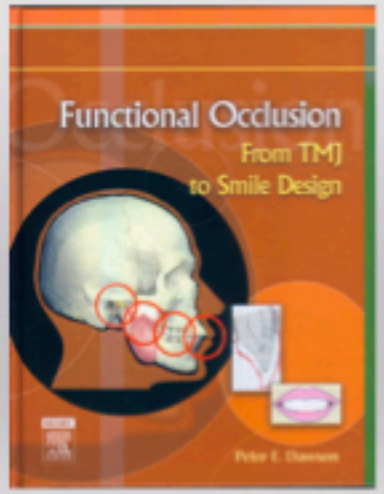
Lateral pterygoid fires out of sequence to create even tooth contact on closure

Disharmony in all muscles: Splinting/Bracing

Muscles sore from overuse

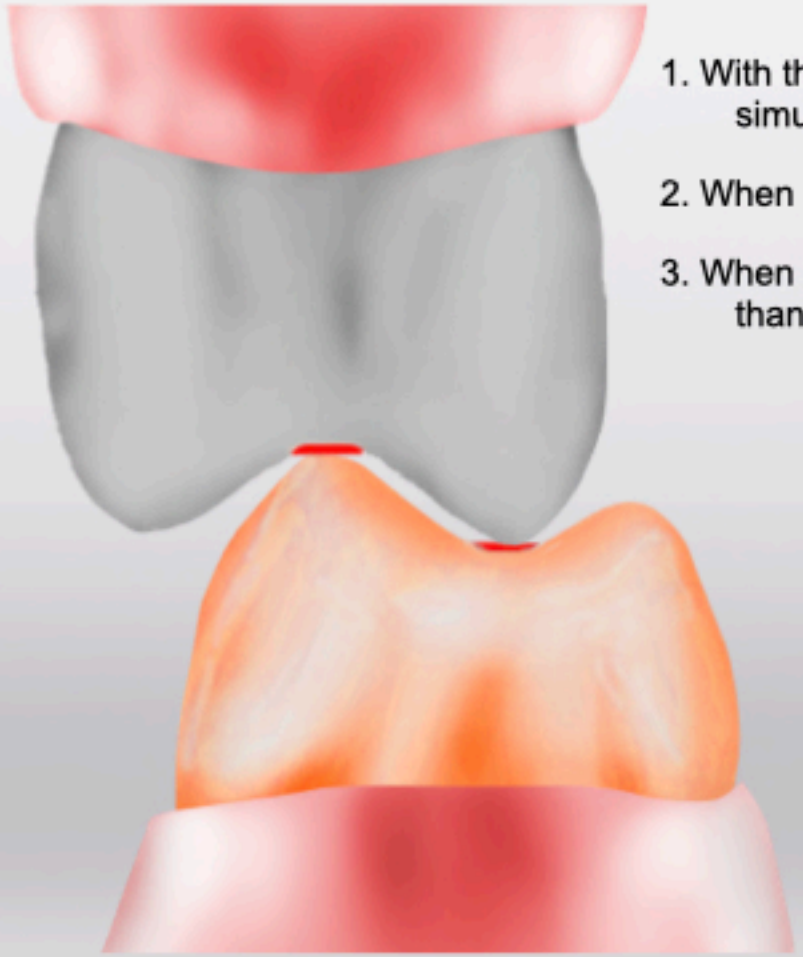
Muscles do not think- CNS input





from Dawson's Textbook, "Functional Occlusion"

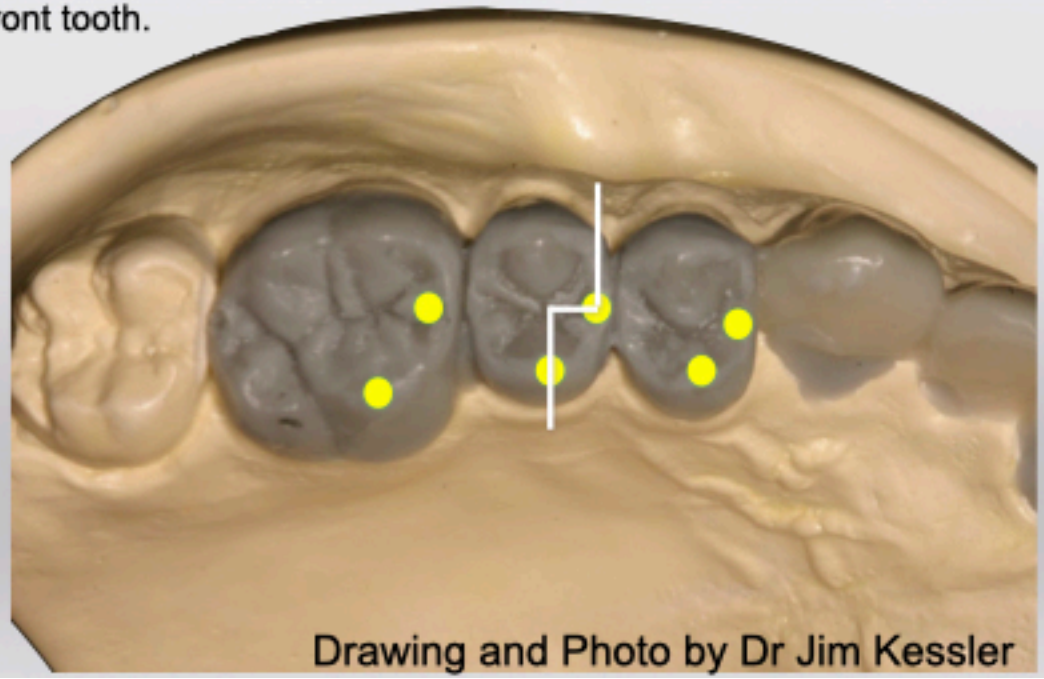
LD Pankey's 3 Rules of Occlusion (Clyde Schuyler)



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

Treat Occlusal Muscle Dysfunction- Adjust the Occlusion

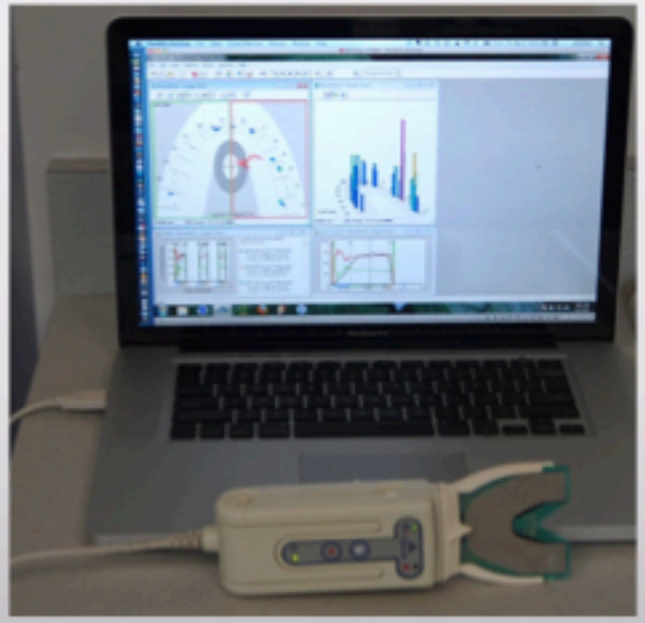
Teeth reshaped so all teeth hit even with condyles seated in fossa. Posterior teeth separate on lateral and anterior excursions.

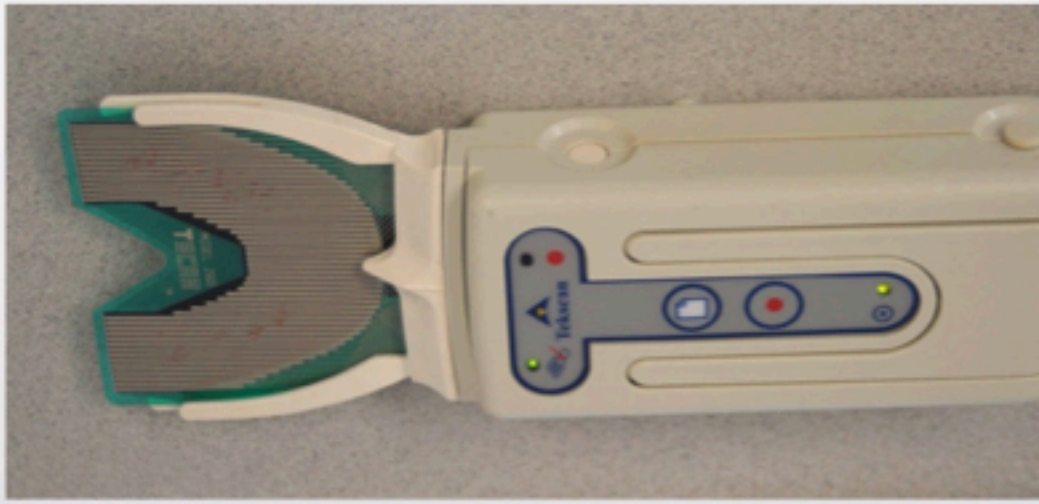
Before

After

T-Scan Computerized Occlusion

Occlusion Live and in Slow Motion





Articulating Paper leaves evidence after the events

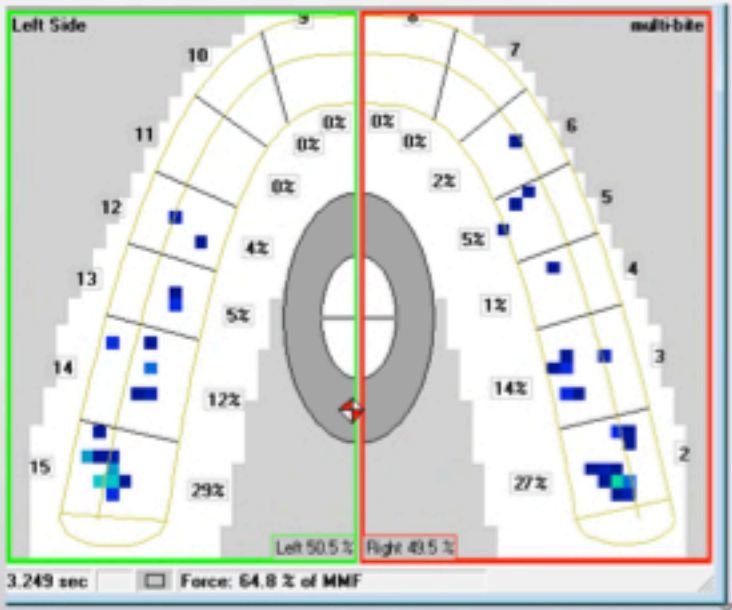
- Not Live
- All events lumped together

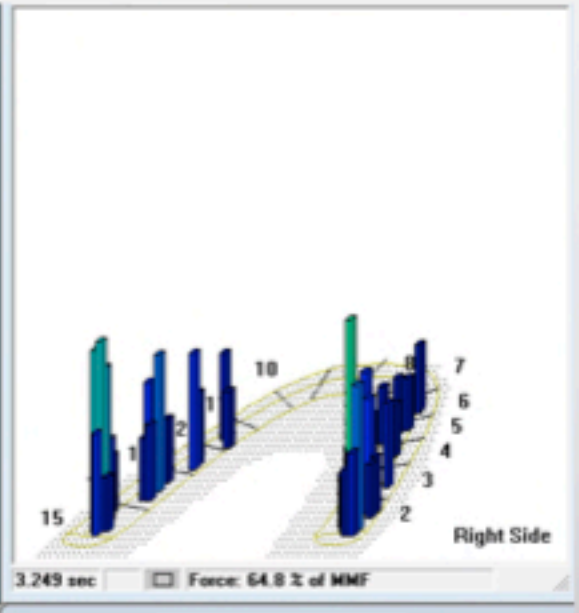
Using Since1999

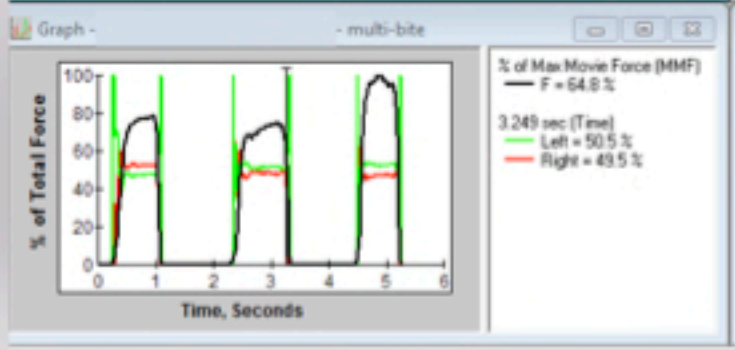
Time Force Graphic Representation of the Occlusion

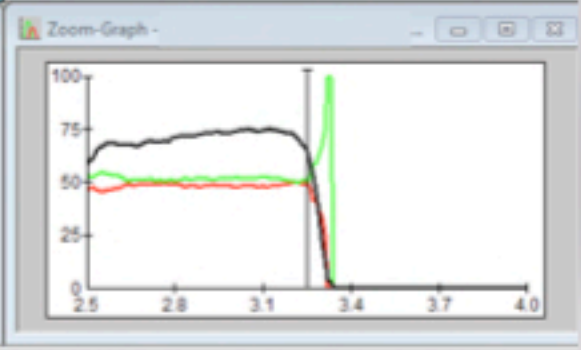
T-Scan Gives you:
Timing
Intensity
Location
Distribution

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



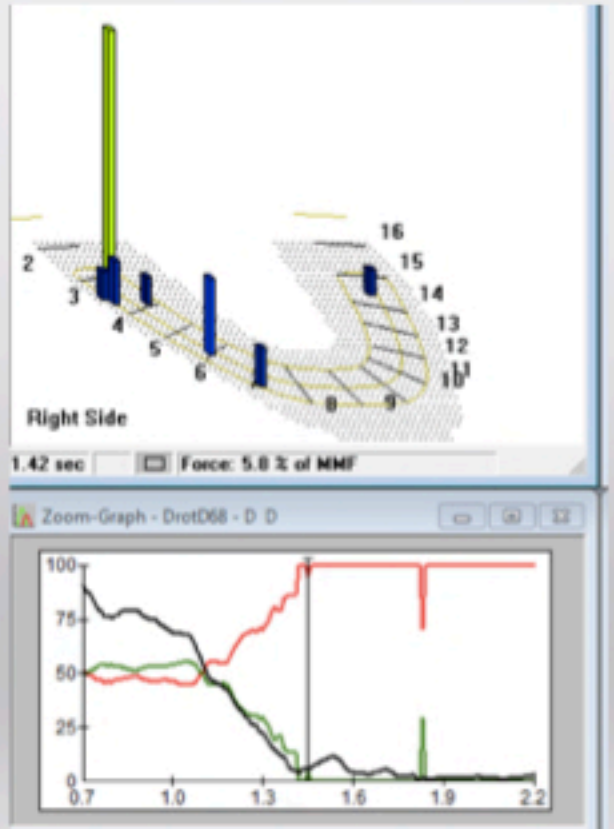




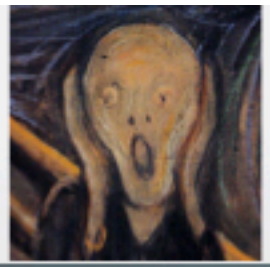


The indispensable value of T-Scan is not in finding heavy CR contacts, but working and nonworking interferences.

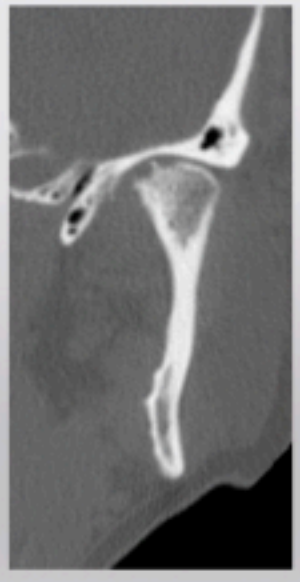
Is that a smudge or a muscle activating interference?



Remove too much and you decrease the ability to chew, especially lettuce. Chewing lettuce requires posterior inclines coming close enough to chew, but far enough apart to not touch and activate muscle.



Damaged TMJs



Adapt Favorably 85%

Adapt Fairly 14% → Occlusal Muscle Dysfunction, Osteoarthritis

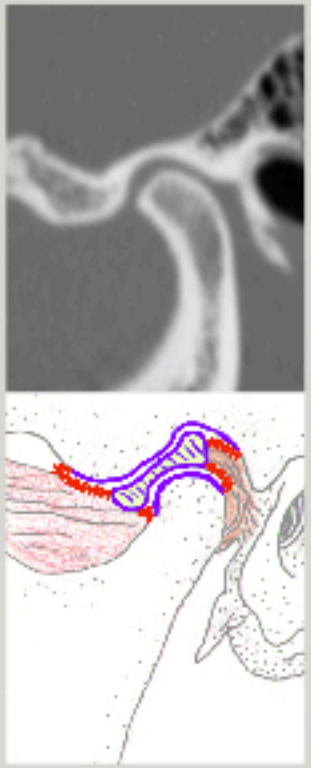
Adapt Poorly <1% → Avascular Necrosis, Progressive Condylar Resorption

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

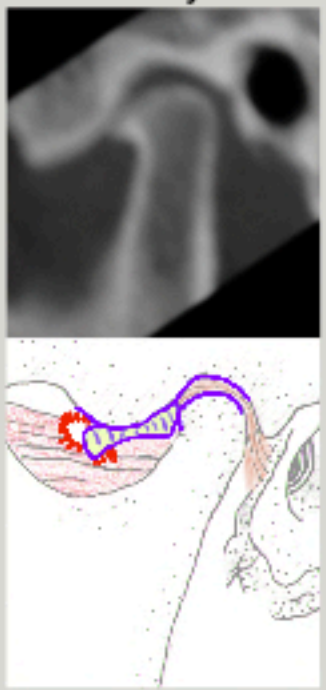
Osteoarthrosis/Osteoarthritis

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.

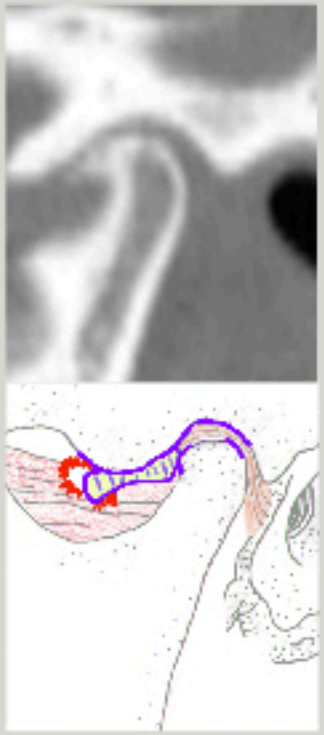
Normal



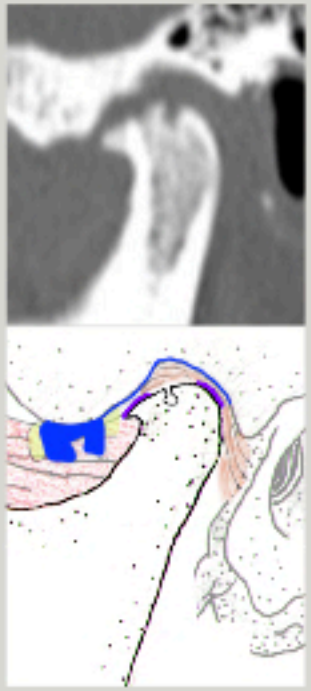
Early



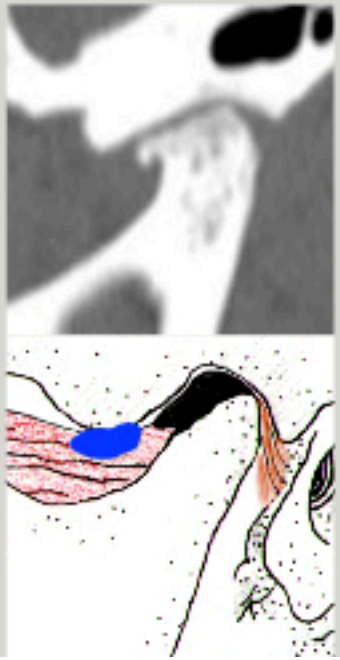
Early/ Moderate



Moderate



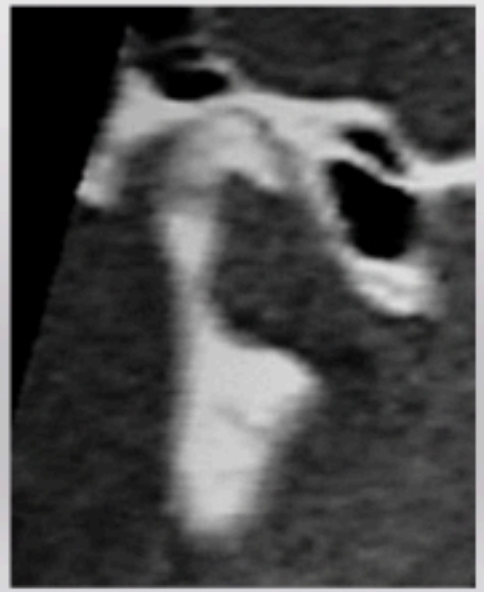
Severe OA, Eburnation



Representative examples of OA
in different patients

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 parafunctional bruxings
Glucosamine 1500mg /Chondroitin 600 mg

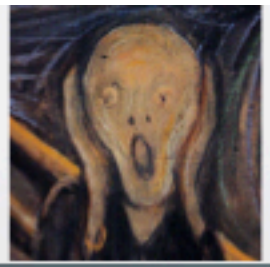
Shea Brand CBD

Osteoarthr**itis**

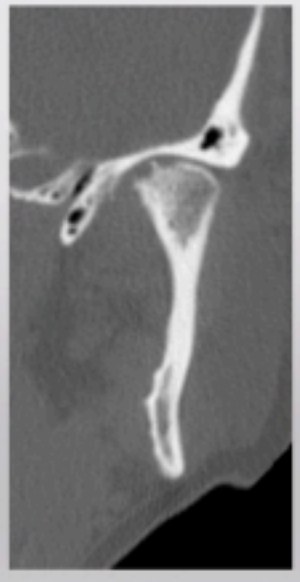
All of the above plus eliminate inflammation……
NSAIDs
Cold Laser

If still inflamed arthrocentesis with
Platelet Rich Plasma (PRP)

MLS Laser
3x week for 3 weeks



Damaged TMJs



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

→ Occlusal Muscle Dysfunction

→ Osteoarthritis

→ Avascular Necrosis

→ Progressive Condylar Resorption

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

Age 30 Female
Start

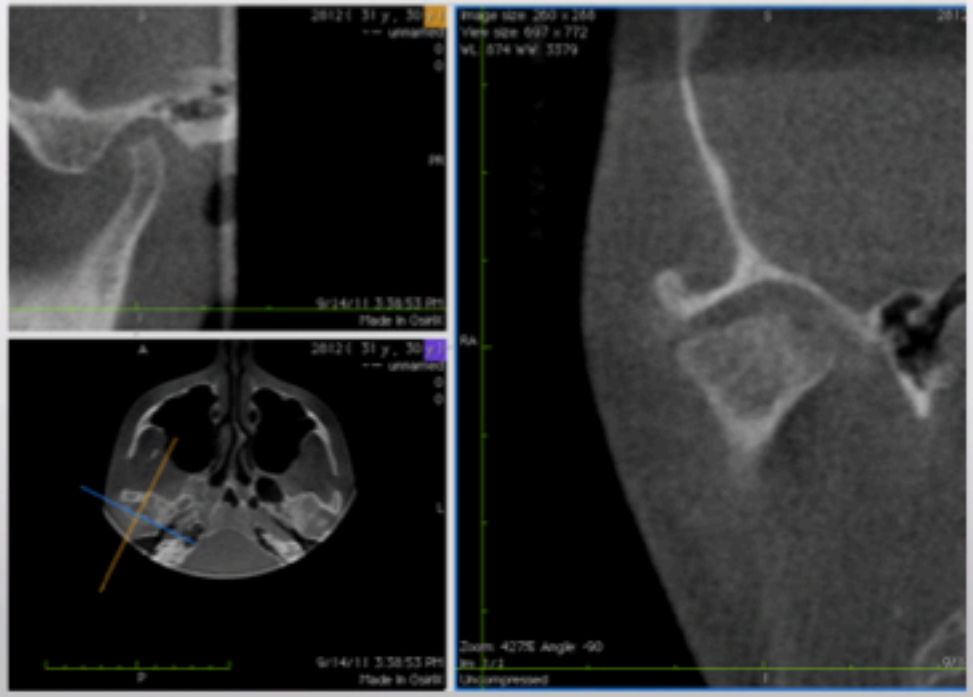
Front teeth use to touch 1 year ago

Age 30 Female
Start

Front teeth use to touch 1 year ago

Start

Right Condyle Missing Cortex= Active Degeneration



Left Condyle Missing Cortex= Active Degeneration

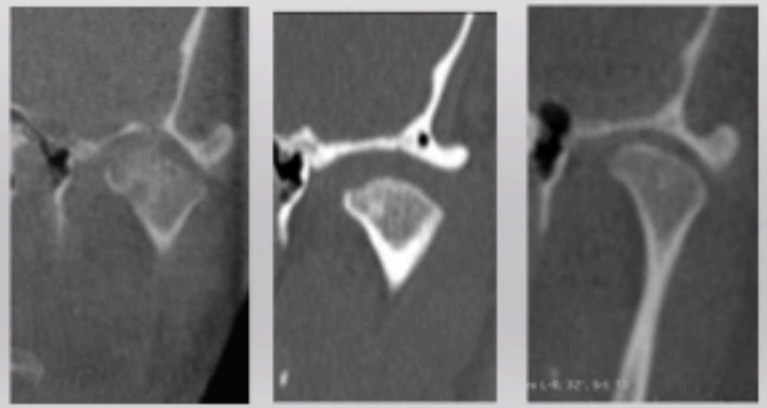
Differential Diagnosis condylar bone loss: Avascular Necrosis, Inflammatory Tissue Bone Resorption, Rheumatoid Arthritis, Joint Infection, Lyme Disease, Osteoarthritis, Osteochondritis Dissecans, Other.

Anterior Openbite with Active Osteolysis due to Inflammatory Tissue Bone Resorption

Non Surgical Therapies

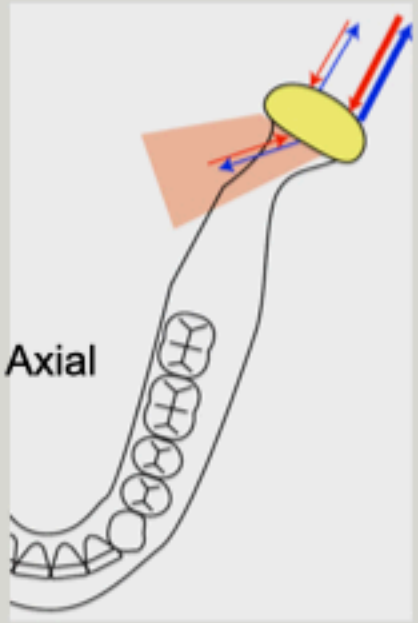
Condylar Distraction

Anti Inflammatory Therapies

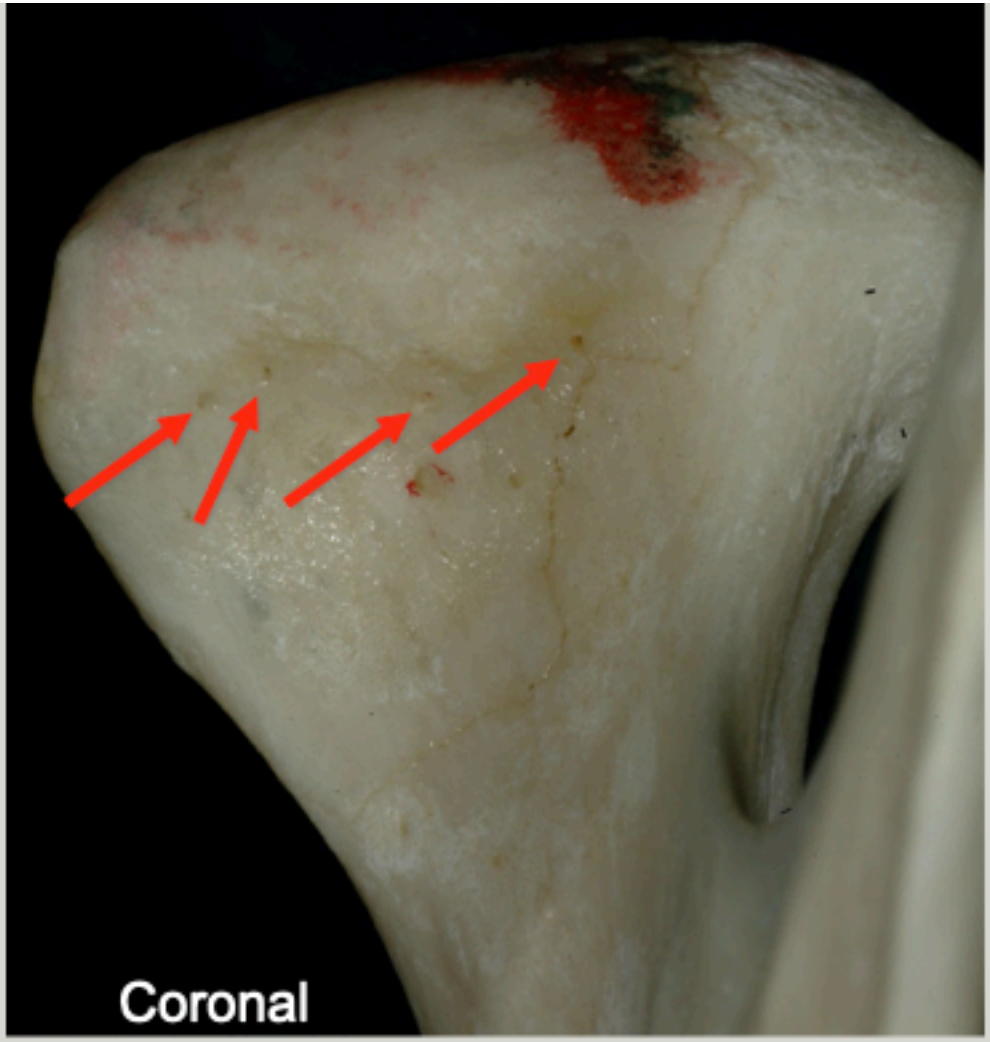


Condylar Perfusion

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



Sagittal



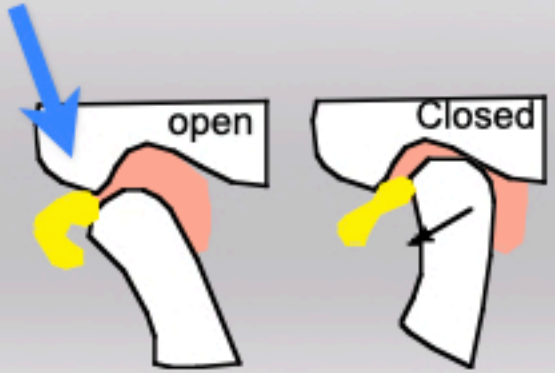
When the clicking stops (4a to 4b):

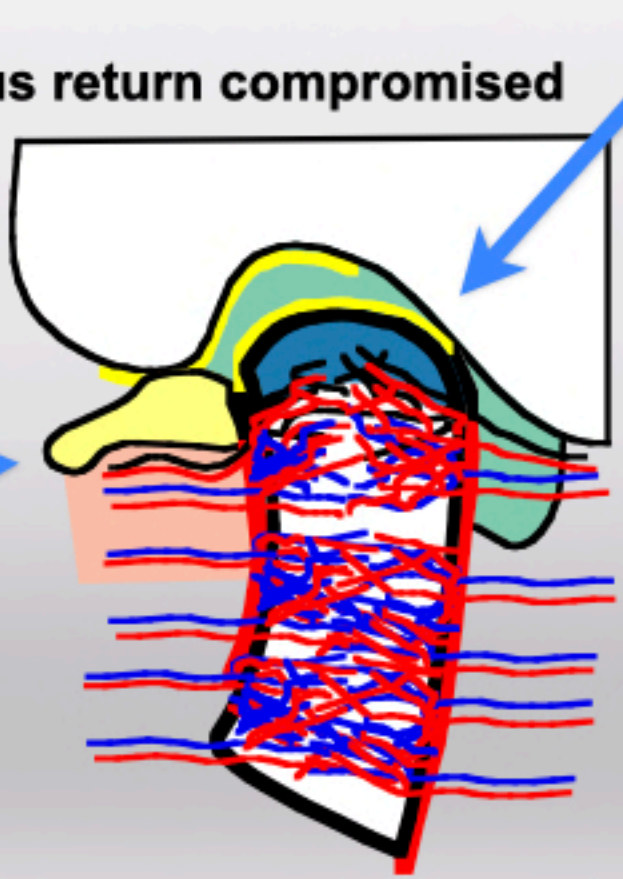
Condyle Distalized

Venous return compromised

Compromised Condylar Perfusion
Blood flow through condyle is decreased

Disc Anterior





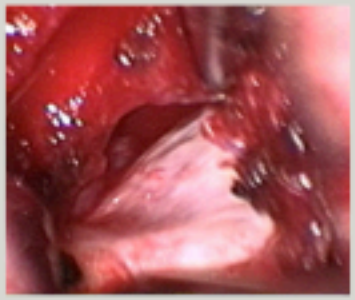
3 Outcomes of Compromised Condylar Perfusion

Bone cells die

Avascular Necrosis

One and Done

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



or

Nothing

Compromised but adequate.
99% patients have no problems

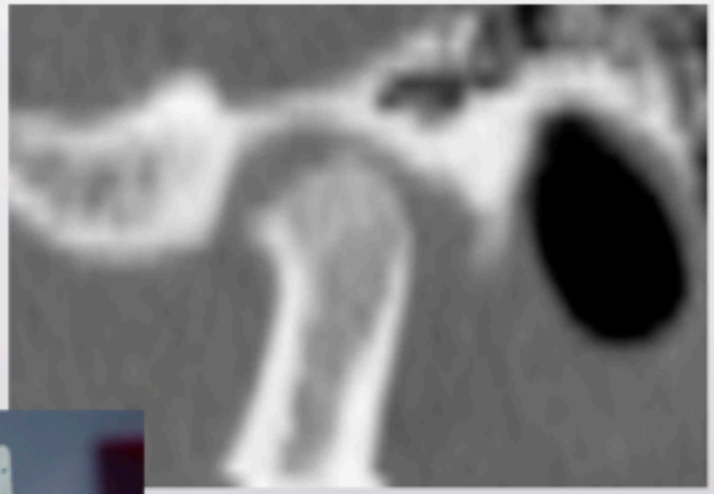
Inflammatory Tissue Bone Resorption

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

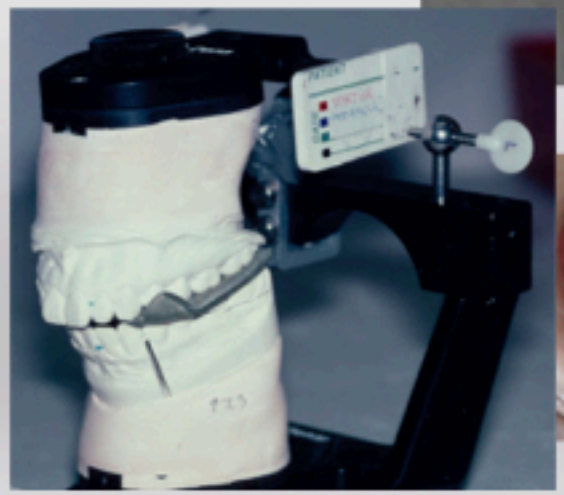
Droter JR, An orthopaedic approach to the diagnosis and treatment of disorders of the temporomandibular joint. Dent Today 2005 Nov;24(11):82, 84-8

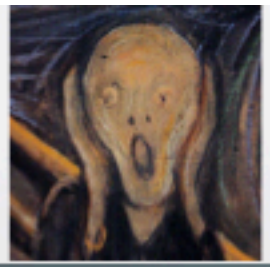
1 year after the clicking stops is the “Danger Zone”

Look for TMJ bone loss, anterior open bite developing
- Avascular Necrosis
- Inflammatory Tissue Bone Resorption

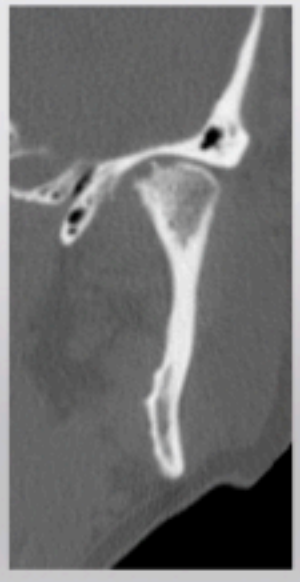


After clicking stops:
- Get CT or CBCT scan of the TMJ
- Maintain jaw motion: PT, exercises
- Get photos
- Mounted models
- Monitor occlusion over the next year
- Follow up CBCT scan 1 year later
- After 1 year “Adapted Favorably”





Damaged TMJs



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

Occlusal Muscle Dysfunction

Osteoarthritis

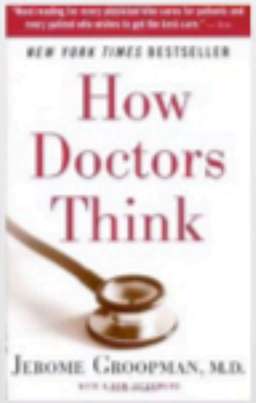
Avascular Necrosis

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.

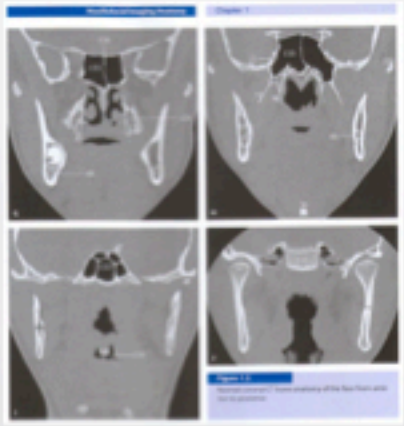
How do I Examine the TMJ?
The 4 Question TMJ Evaluation

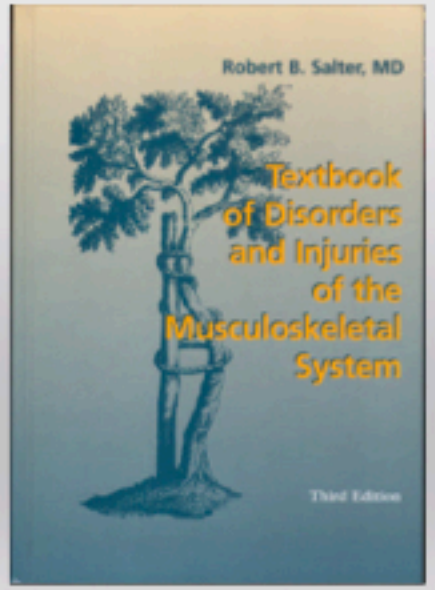
John R Droter DDS
Annapolis, Maryland

My Core Belief

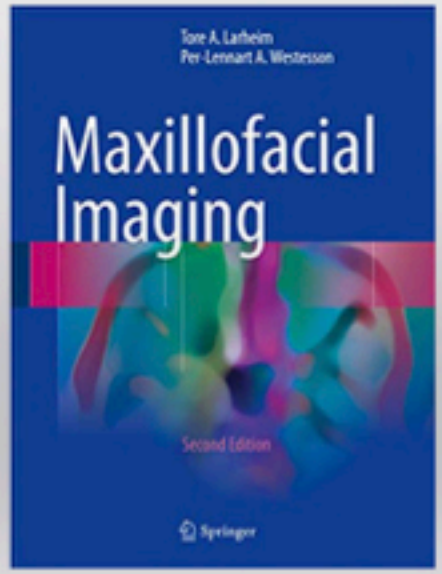
The TMJ is a synovial joint of the human body and will undergo the same disease processes as any other synovial joint

Understanding orthopedic medicine is the key to understanding joints, including the TMJ





Buy Salter's Orthopedic Textbook.
When you have a patient with specific disease (i.e. osteoarthritis), read that chapter.



Textbook of Disorders and Injuries of the Musculoskeletal System
Robert Salter MD

Maxillofacial Imaging
Larheim
Westesson

TMDs- What are the choices? (190 Diagnoses, 7 Categories)

1. TMJ Damage

Adhesions and ankylosis of temporomandibular joint
Avascular Necrosis Mandibular Condyle
Cartilage Fibrillation, Mandibular Condyle, Fossa
Closed Lock, Jaw Cartilage, Acute
Closed Lock, Jaw Cartilage, Chronic
Closed Lock, Jaw Cartilage, Intermittent, Mechanically dysfunctional
Crush Injury Mandibular Condyle
Crystal arthropathy, unspecified, TMJ
Dislocation jaw cartilage due to Injury, Sequela
Dislocation jaw cartilage with reduction, favorable adaptation, TMJ
Dislocation jaw cartilage without reduction, favorable adaptation, TMJ
Effusion, TMJ
Impingement Retrodiscal Tissue
Inflammatory Tissue Bone Resorption, TMJ Condyle
Loose Body (Joint Mice), TMJ
Malignant neoplasm of bones of skull and face
Open Lock TMJ, Recurring
Osteoarthritis TMJ, active degeneration
Osteoarthrosis- Inactive
Osteochondritis Dissecans TMJ
Osteolysis Mandibular Condyle, Active
Perforation Meniscus, TMJ
Perforation Pseudodisc, TMJ
Psoriatic Arthritis TMJ
Rheumatoid Arthritis Sero Negative TMJ
Synovitis

2. Muscles of the TMJ

Dystonia
Habitual posture forward mandible
Hemifacial Muscle spasm
Inhibitory Reflex Dysfunction, Periodontal Ligament Masseter Muscle
Muscle Atrophy, TMJ
Muscle Bracing Neck Stabilization
Muscle Bracing Pain Avoidance
Muscle Bracing TMJ stabilization
Muscle Bracing Airway **Patency** (with Tongue)
Muscle Contracture Fibrosis Lateral Pterygoid
Muscle Contracture Fibrosis Masseter, Medial Pterygoid, Temporalis
Muscle Fatigue Overuse
Muscle Hypertrophy TMJ Muscles

3. Cranial Alignment/Occlusion

Cranial Distortion / Misalignment
Hemifacial Hypoplasia
Hyper Occlusal Awareness
Iatrogenic Orthotic Damage
Malocclusion Anterior Open Bite
Malocclusion Centric occlusion MaxIC discrepancy
Malocclusion Deep Bite
Malocclusion due to mouth breathing
Malocclusion due to TMJ bone loss
Malocclusion due to tongue, lip or finger habits
Malocclusion Insufficient anterior occlusal guidance
Malocclusion lack of posterior occlusal support
Malocclusion Posterior Openbite Bilateral
Malocclusion Posterior Openbite Unilateral
Malocclusion unspecified
Malposition /Misalignment: Maxilla, Temporal Bone, Mandible
Mandibular asymmetry
Mandibular hyperplasia
Mandibular hypoplasia
Mandibular Retrognathia
Maxillary asymmetry
Maxillary hyperplasia
Maxillary hypoplasia
Maxillary Retrognathia
Occlusal Adaptation, Favorable
Occlusal Dependency for Joint Stabilization/ Proprioception
Tooth Intrusion
Tooth Supereruption

4. Cervical Damage

Cervical Vertebrae Alignment Dysfunction
Craniocranial Syndrome
Muscle Guarding due Neck Instability
Trigger Point Neck Muscle with Referred Pain
Trigger Point Neck Muscle, Localized Pain

5. Parafunction

Excessive Tooth Wear, Damage
Hypersensitive Occlusion
Parafunctional Clenching Teeth, Awake
Parafunctional Clenching Teeth, Sleep
Parafunctional Grinding Teeth, Awake
Parafunctional Grinding Teeth, Sleep
Parafunctional Clench/Grind Wiggle
Parafunctional Tongue Bracing avoiding uncomfortable tooth contact
Parafunctional Tongue Bracing Neck stabilization
Parafunctional Tongue Bracing to maintain Airway
Parafunctional Tongue Bracing unknown cause

6. Whole Body / Systemic

Lyme Disease Arthritis
Magnesium Deficiency
Obstructive Sleep Apnea
Osteoporosis without current pathological fracture
Pathological Habitual Movement Pattern
Postural Disharmony Standing
Postural Disharmony Walking
Postural Forward Head Position
Upper Airway Resistance, UARS

7. Other

Nerve Entrapment Masseteric Nerve due to Masseteric hypertonicity
Neuroma Trigeminal Nerve
Obsessive-Compulsive Personality Disorder
Other
Otitis Ear Infection
Pain disorder exclusively related to psychological factors. Somatoform pain disorder
Pain disorder with related psychological factors
Peripheral Sensitization

1. TMD: TMJ Damage and Diseases

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Cartilage Fibrillation, Mandibular Condyle, Fossa
Closed Lock, Jaw Cartilage, Acute
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Dislocation jaw cartilage without reduction, favorable adaptation, TMJ
Effusion, TMJ
Fracture of subcondylar process of mandible
Gout, TMJ
Growth Disturbance Prepuberty due to TMJ damage
Hemarthrosis TMJ, Traumatic
Hyperplasia Mandibular Condyle,
Hypoplasia Mandibular Condyle
Hypoxia Reperfusion Injury, TMJ Cartilage Damage
Hypoxic Progressive Condylar Resorption
Impingement Retrodiscal Tissue
Inflammatory Tissue Bone Resorption, TMJ Condyle
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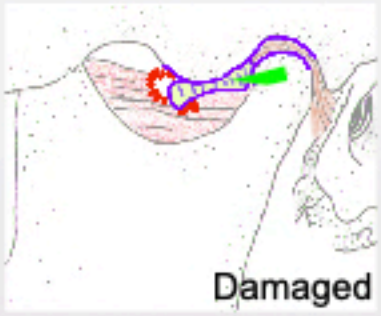
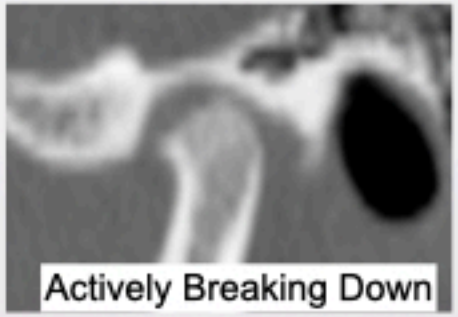
Perforation Pseudodisc, TMJ
Psoriatic Arthritis TMJ
Rheumatoid Arthritis Sero Negative TMJ
Rheumatoid Arthritis TMJ
Sprain Discal Ligament TMJ, acute with joint edema
Subluxation on Loading, TMJ
Subluxation on Movement, TMJ
Synovial Cyst (Ganglion Cyst)
Synovial Hyperplasia
Synovitis

Basic Orthopedics

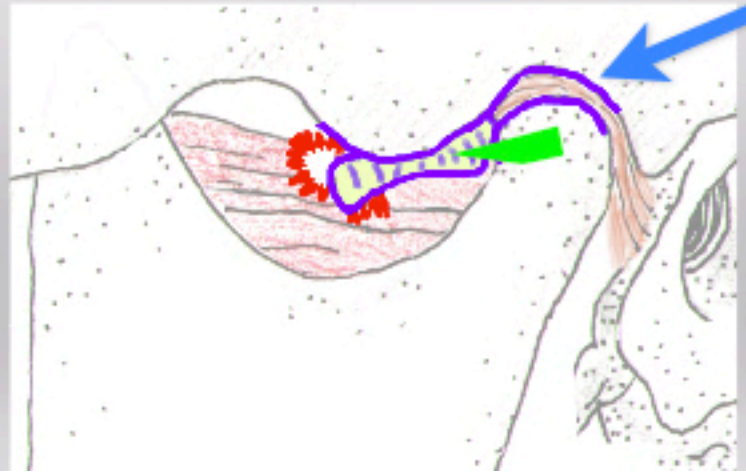
Joints are either
- Healthy or
- Damaged

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

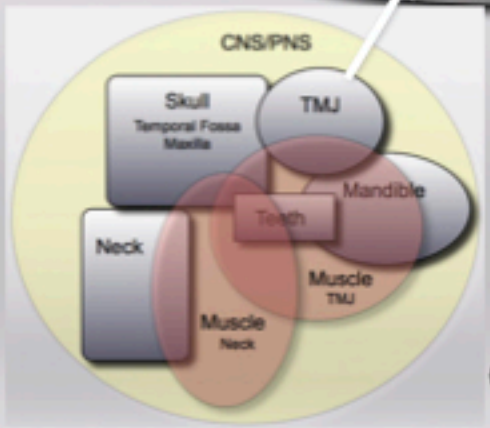
Pseudo-disc

Tissue Fibrosis

The TMJ:What You need to Know

TMJ

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



Evaluate every TM joint for:

1. Comfort
2. Movement
3. Mechanical stability- Does the joint wobble on loading?
4. Structural stability- Will the joint lose bone with a resulting occlusal shift?

If there is a TMJ problem it will be in one of these four areas.

Correct Answer: No, Yes, No, Yes

The TMJ:What You need to Know

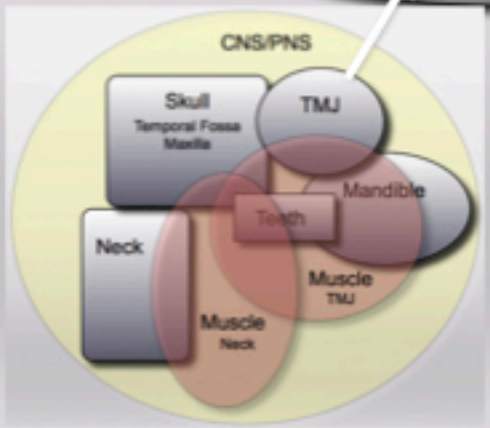
TMJ

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

Evaluate every TM joint for:

1. Comfort
2. Movement
3. Mechanical stability- Does the joint wobble on loading?
4. Structural stability- Will the joint lose bone with a resulting occlusal shift?

Palpate Joint
Load Test



Palpation and Load

Load in CR- gradual increase pressure
Load In Excursions if negative in CR
No pain does not mean stable

Anterior Lateral Pole

Posterior Lateral Pole

Indirect through Ear

Load Testing

No pain does not mean stable

Reviewed 600 cases (MRI and CT Scans) at my practice of facial pain:

6.5% cases had structurally unstableTM joints. 39/600
(A general practice will have less % structurally unstableTM joints)

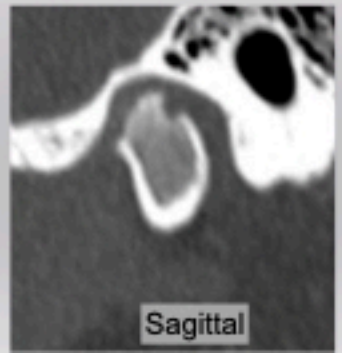
CR Load test on these 39 joints:
CR Load Positive Soreness 22/39 (56%)
Missed 17/39 structurally unstable joints (44%)

CR and Lateral Load test on these 39 joints:
Positive Soreness of one or both test 33/39 (85%)
Missed 6/39 structurally unstable joints (15%)

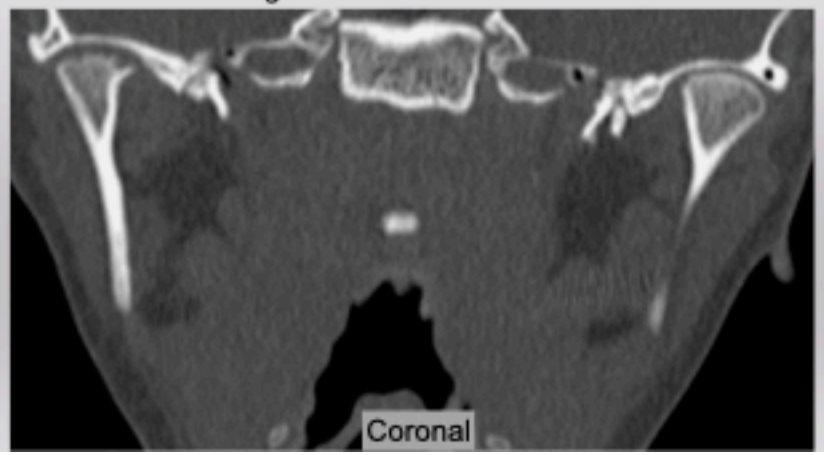
Load Test Bimanual Manipulation

46yo F
CR Load Normal
Excursion Load Normal

40yo F
CR Load Normal
Excursion Load Slight



12yo F- CR Load Normal
Excursion Load Slight



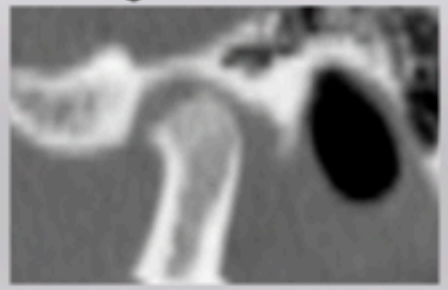
Differential Diagnosis: Painful TMJ Must get CBCT

Inflamed Bone
- Osteoarthritis
- RhA
- Lyme Arthritis
- Psoriatic Arthritis
- Avascular Necrosis

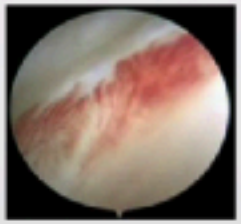
Inflamed Tissue
- Acute Ligament Sprain
- Synovitis/Capsulitis
- Pannus
- Retrodiscal Tissue Impingement
- Retrodiscal Tissue Inflammation
- Inflammatory Tissue Bone Resorption
- Deep Masseter inflammation
- Ear Inflammation

OA cyst

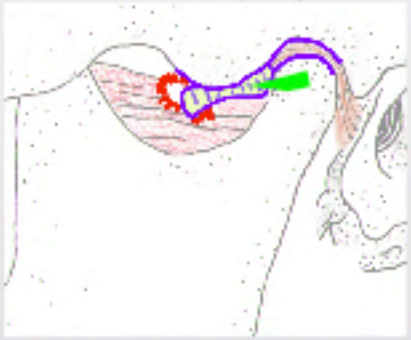
Missing cortex



Synovitis



Retrodiscal impingement

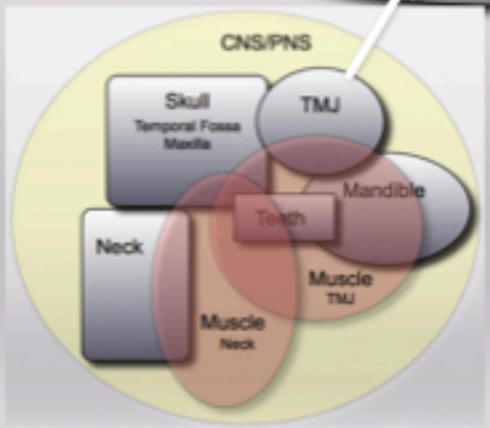


Inflamed tissue in joint

The TMJ:What You need to Know

TMJ

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



Evaluate every TM joint for:

1. Comfort
2. Movement
3. Mechanical stability- Does the joint wobble on loading?
4. Structural stability- Will the joint lose bone with a resulting occlusal shift?

Take History
Measure Movement
Listen for Vibration

TMJ Movement/Function History

No Clicking, no Pain,
no Limited opening, no Trauma

Can They Chew?

Has the clicking changed?

Download Facial Problem Questionnaire
www.jrdroter.com

6.	Does it hurt to move your jaw?	Y	N
	Does it hurt to chew?	Y	N
	Any discomfort upon chewing hard foods like carrots?	Y	N
	Do your jaw muscles get tired from chewing?	Y	N
	Does it hurt to open wide?	Y	N
	Which side of your jaw makes a clicking/popping noise?	R	L
	Which side of your jaw makes other noises?	R	L
	What Noises? _____		
	When did you first notice the noises or clicking? _____		
	Have you noticed any changes in noises or clicking?	Y	N

7.	Have you ever not been able to open your jaw all the way?	Y	N
	Have you ever had to wiggle your jaw to get it open?	Y	N
	Has your jaw ever been stuck open and you could not close it?	Y	N
	When did this first happen? _____		
	When did this last happen? _____		

12. Have you ever injured or sustained any form of trauma or whiplash to your (circle all that apply) Jaw Head Neck

None of the above

(If any past trauma, please complete the trauma questionnaire)

Have you ever had stitches to your chin?	Y	N
Do you feel there is any connection between the trauma you have had and the problems you are having?	Y	N

Evaluate for Full, Smooth Range of Motion

40-55 mm, 300mm/sec velocity, straight path, consistent arc

38+4 indicates 38mm edge to edge
plus 4mm overbite for a total of 42mm

Take 4 Measurements:

Maximum Opening	40-55mm
Right Lateral	10-12mm
Left Lateral	10-12mm
Protrusive	10-12mm

Normal excursion are 25% of the max open

Evaluate Smoothness:
Light hold on chin as patient moves jaw

Therabite, 1-800-217-0025
www.therabite.com
Quick, Disposable, Inexpensive

Sounds/ Vibrations

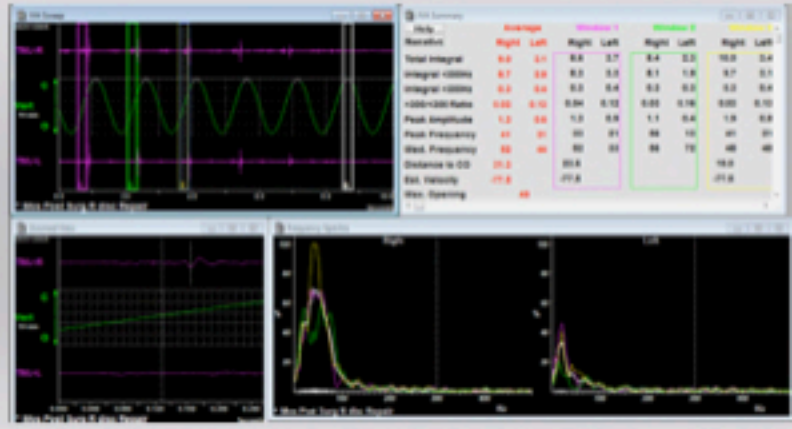
Stethoscope

Doppler - Landmark Healthcare 800-334-5618
Huntleigh Mini Dopplex 5hz
Great Lakes Orthodontics 800-828-7626

Joint Vibration Analysis/Jaw Tracker
BioResearch 800-251-2315

A Healthy Joint is Quiet
A damage joint is not

A joint that does not move is also quiet



Sounds/ Vibrations
Stethoscope

Use Bell side, not Diaphragm side, over the TMJ

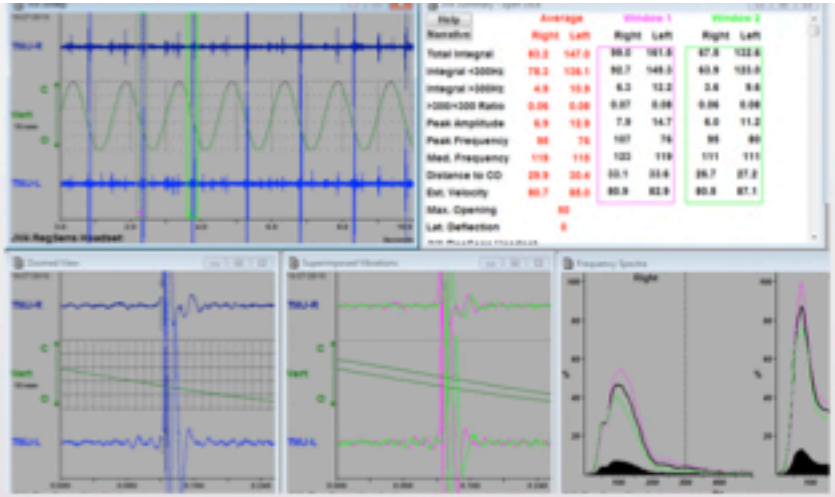
3M Littmann Classic II S.E. Stethoscope

My Subjective Description of Joint Sounds

smooth	fine	crackle	<u>Click</u>
paper	med	crunchy	soft
sand	coarse	squeaky	crisp
pebbles		scratch	squishy
rocks			early
glass			late
			100%
			75%
negative joint movement			50%
minimal joint movement			25%
			sporadic
			??

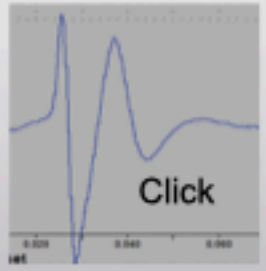
Joint Vibration Analysis

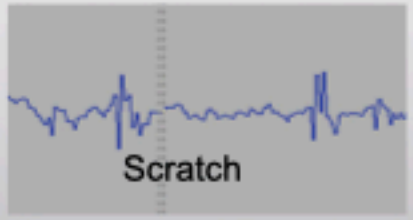
Objectively measures and quantifies joint vibrations during motion which is an indication of cartilage health

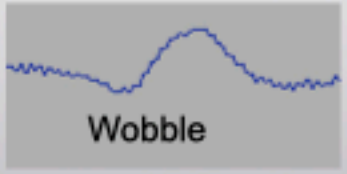


Based on Sonar.
It is not a microphone

Three main types of sounds





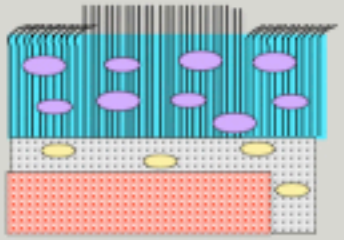


Disc Reduction
Disc Dislocation
Adhesion crackle
tooth tap

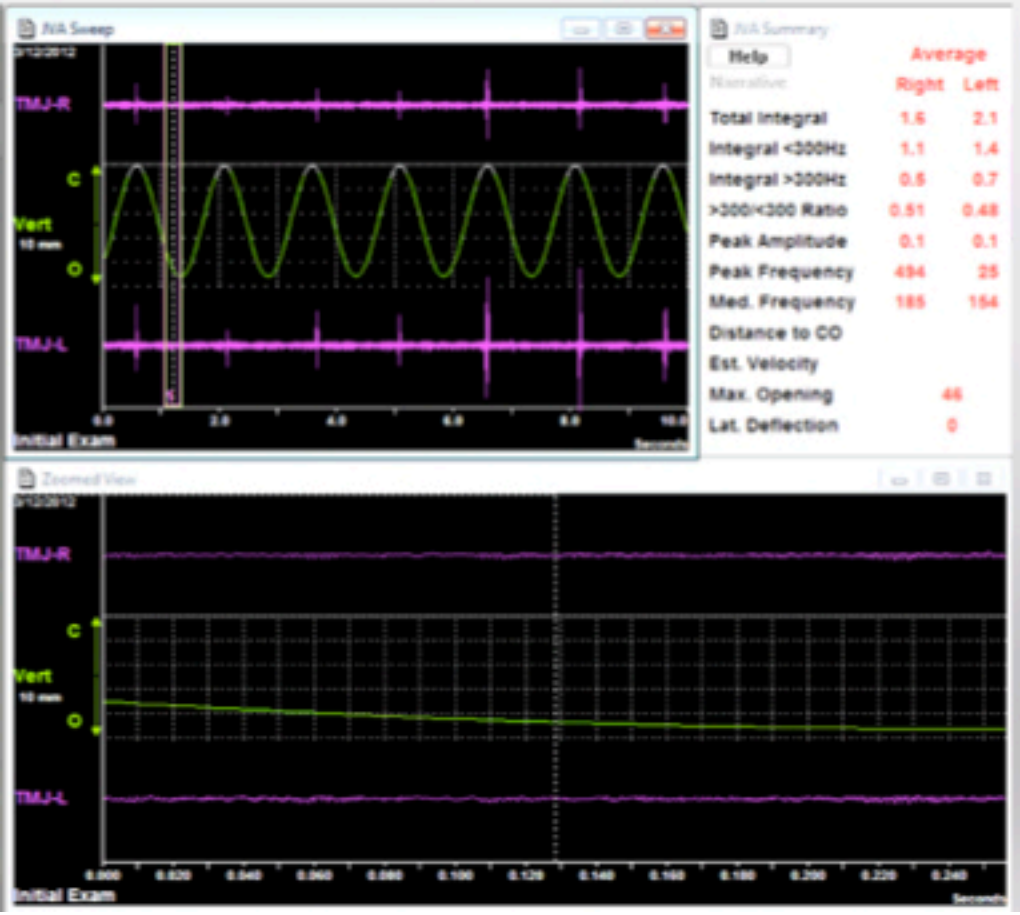
Osteoarthrosis
Osteoarthritis
Pseudo Disc
Damaged Cartilage

Disc Subluxation
Joint Subluxation
Disc Reduction
Disc Dislocation

JVA measures the health of the cartilage



Healthy or Damaged?



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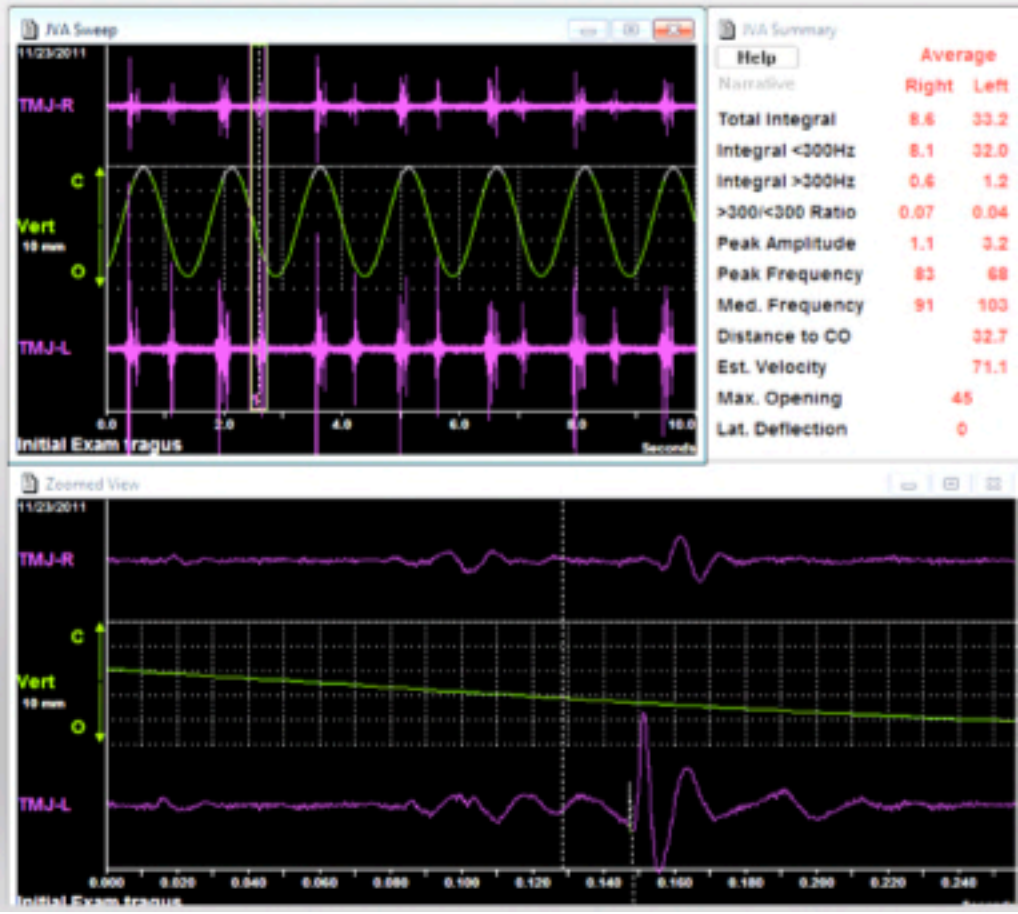
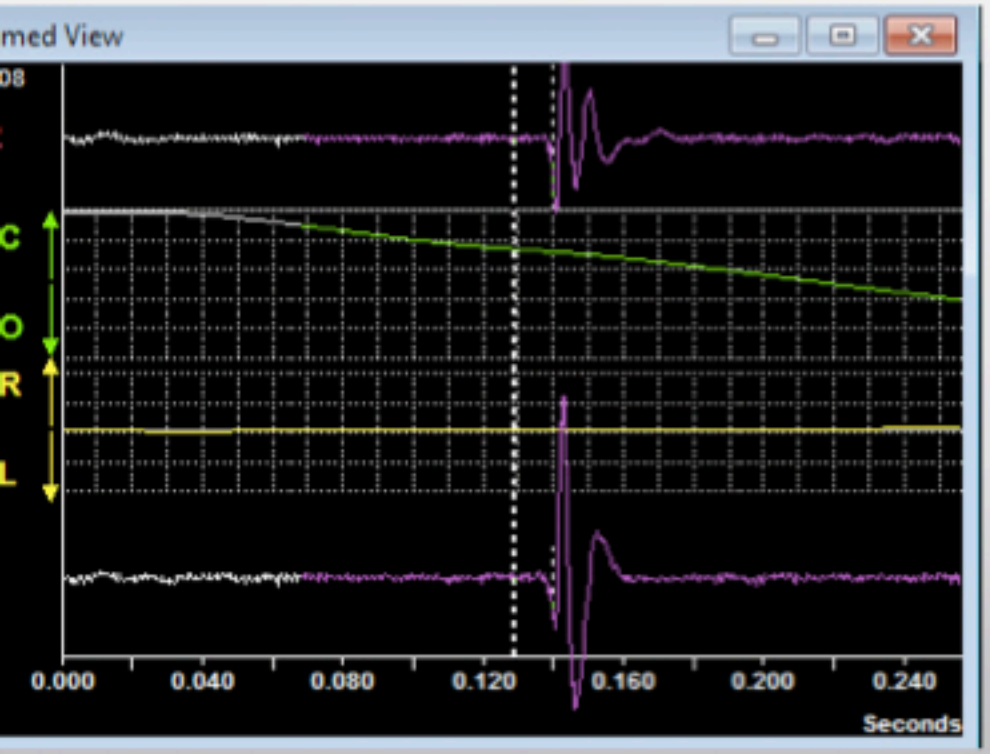
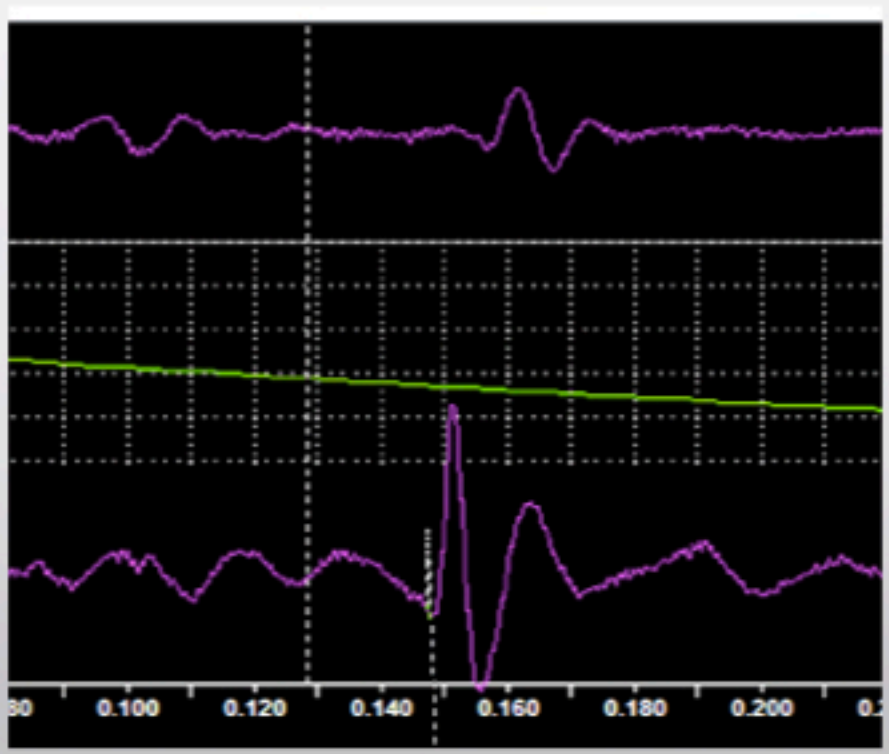


Simple or Complex



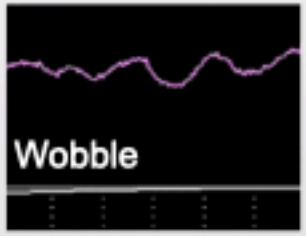


Simple left click with transference vibration to right
L4a

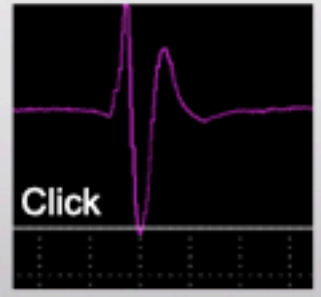
Complex Click
L3a, R4b

Why is Joint making this vibration?

Good Vibrations
Healthy Cartilage
No Movement



Wobble
Disc Dislocation
Disc Reduction
Disc subluxation
Joint subluxation
Condyle bumps Disc
Sensor roll on face



Click
Disc Reduction
Disc Dislocation
Adhesion Crackle
Tooth Tap
Contralateral Transference

Scratch
Cartilage Fibrillation
Cartilage against tissue
Bone against bone
Velcro Noise

Differential Diagnosis
All the choices

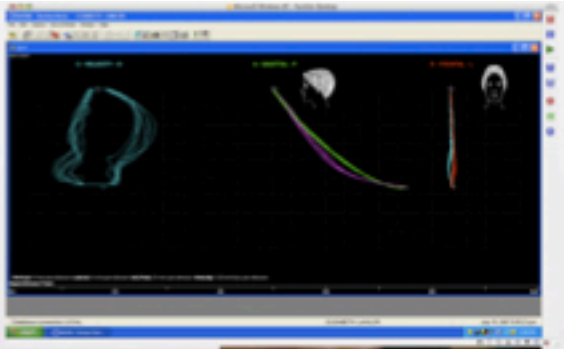
Diagnostic tests
Narrow down the choices

Working Diagnosis
Treating as if

Not completely resolved

Final Diagnosis
Only after problem resolved

Evaluating TMJ Movement



History

No Click, No Limited opening, no pain, no trauma

Can They Chew?

Download Facial Problem Questionnaire, www.jrdroter.com

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

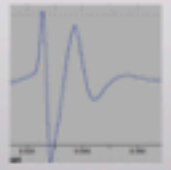
Doppler Auscultation- No joint vibrations

Joint Vibration Analysis- No joint vibrations

Click

Scratch

Wobble



The TMJ:What You need to Know

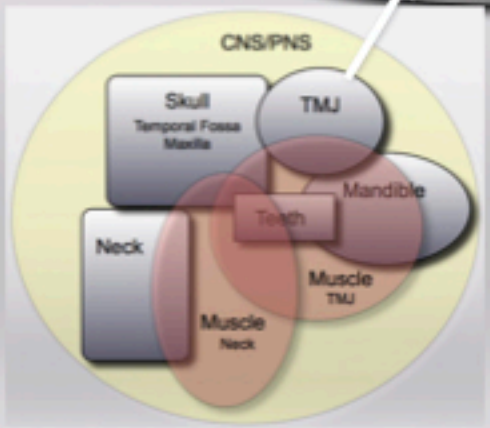
TMJ

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

Evaluate every TM joint for:

1. Comfort
2. Movement
3. Mechanical stability- Does the joint wobble on loading?
4. Structural stability- Will the joint lose bone with a resulting occlusal shift?

D-PAS 24/7 for 1-2 days



The TMJ:What You need to Know

Mechanical Stability 

Mechanical Joint Stability

Shape condyle/disc/fossa provides stability when loaded

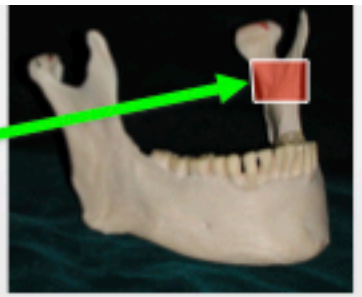
Capsular Ligaments provide stability when not loaded so pieces will be aligned and ready for loading.

Capsular Ligaments other roles are to provide end point of joint movement and proprioception

CR Load Zone

When the masseter fires and seats the joint, where do the condyles load?

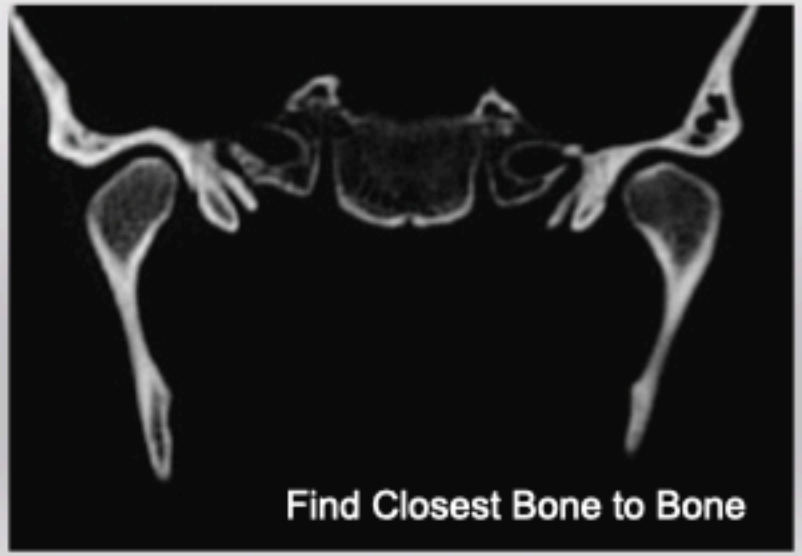
Sore Muscle

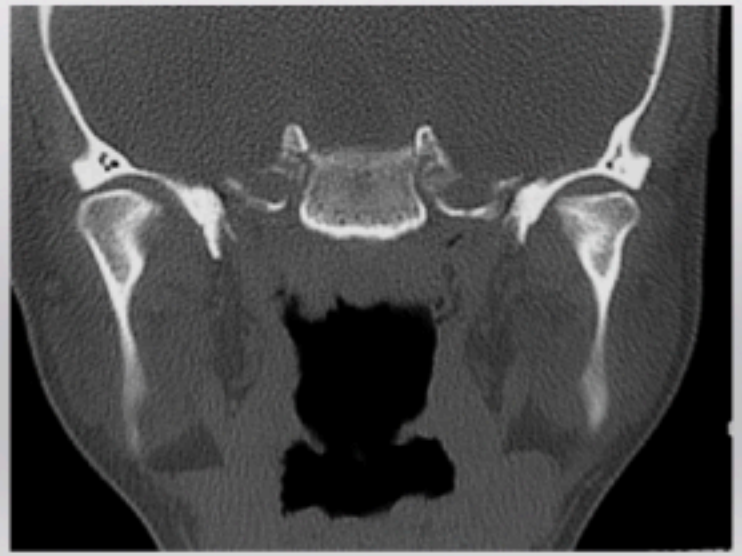


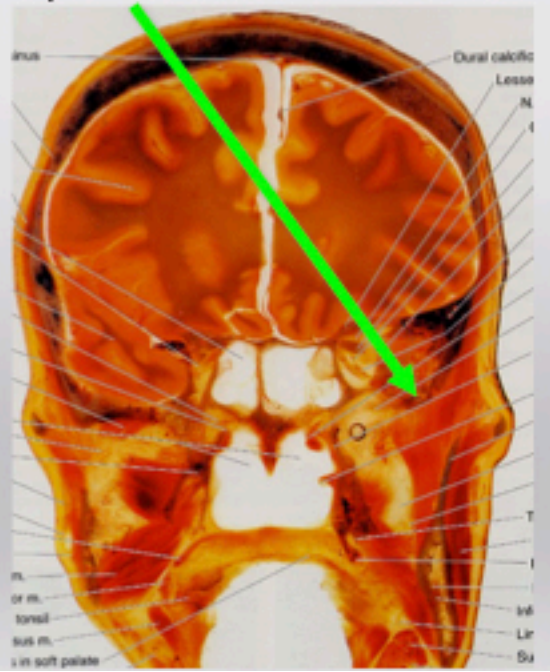
Medial Bracing is ideal

Lateral Load right TMJ
This joint can "wobble" side to side
Non-Linear Joint Deformity

Deep Temporalis runs horizontally
Sphenoid to Inferior Coronoid







Non-Linear Joint Deformity
Mechanically Unstable TMJs
"Wobbly Joint"

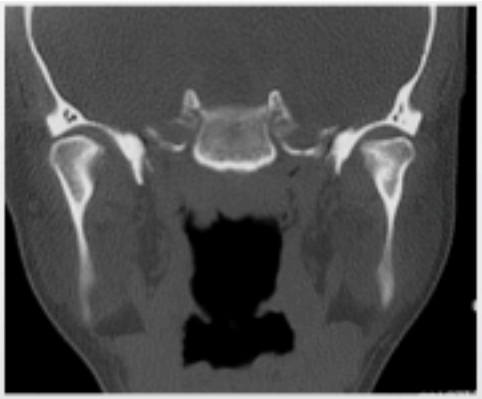
TM Joint subluxates under load
  Adapted CR "wobbles"

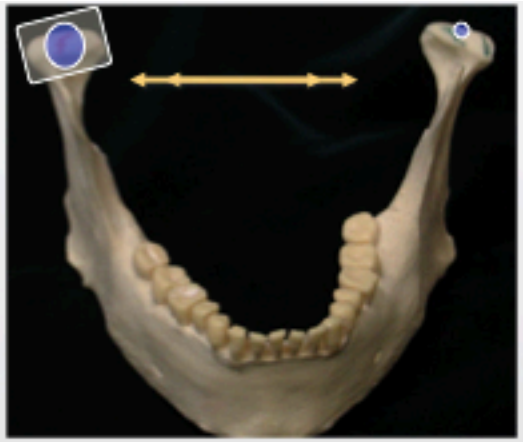
TMJ Muscle hyperactivity
  Looks similar to OMD
  Muscles must stabilize the joint
  Deep temporalis especially sore

Clinically:
  Hypersensitive bite
  Increase muscle pain with anterior deprogrammer
  Continued muscle disharmony with flat plane orthotics
  CT Scan- CR load zone not medial
  JVA- near tooth tap see "wobble- 50hz vibration

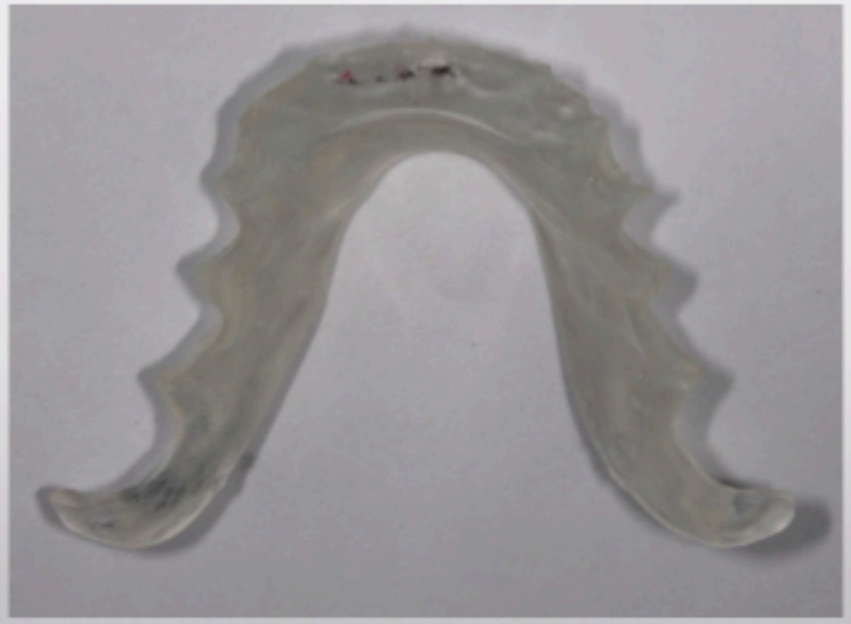
How to Avoid Missing Dx-
  Clinical History, Identify CR load zone on CBCT, D-PAS test

Treatment: Indexed Orthotic 6 months, the CR orthotic, then D-PAS.





The D-PAS
Diagnostic Palatal Anterior Stop



Basically a relined upper Hawley retainer with anterior stop, no wire, no buccal restrictions.

Diagnostic Palatal Anterior Stop

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

Better- Decrease in Symptoms

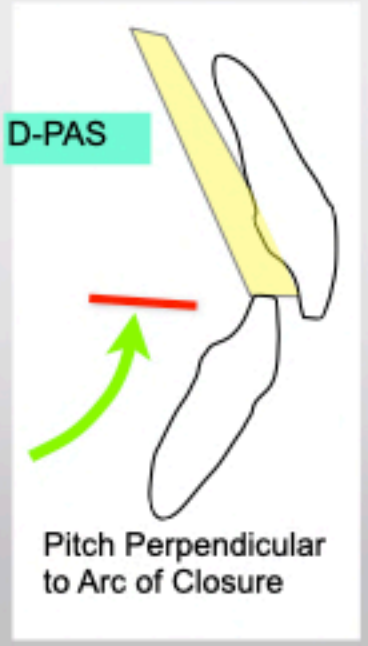
Sleep Clenching Inhibited: Wear D-PAS as night guard
Orthotic Improved Airway: D-PAS as night guard
Occlusal Muscle Disharmony: Occlusal Adjust

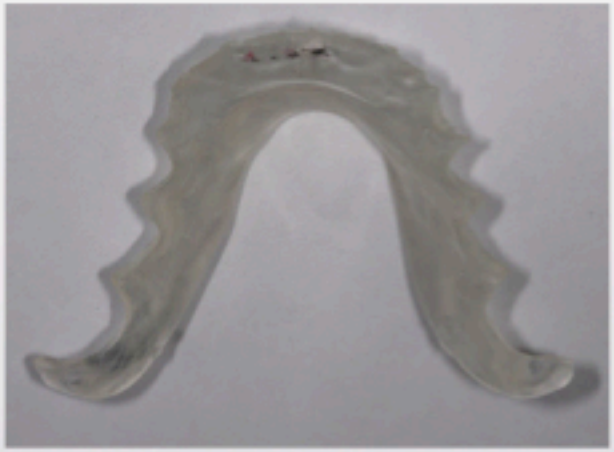
Worse- Increase in Symptoms

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

The TMJ:What You need to Know

TMJ

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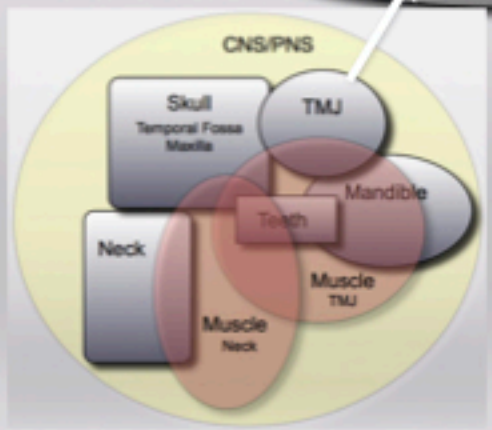
Does it Move?
Does it Wobble?
Is it Structurally Stable?



Evaluate every TM joint for:

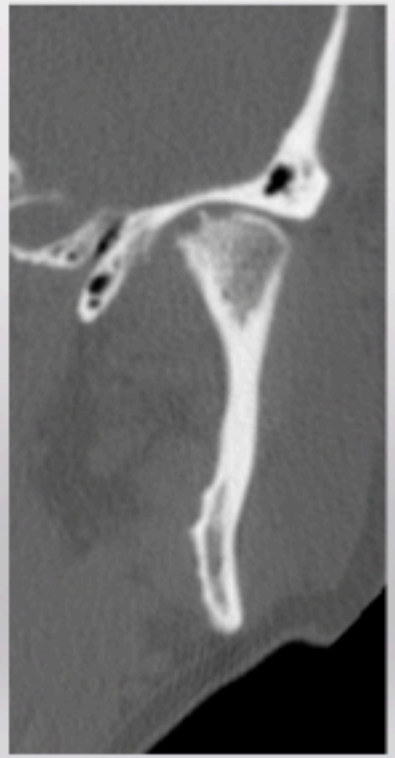
1. Comfort
2. Movement
3. Mechanical stability- Does the joint wobble on loading?
4. Structural stability- Will the joint lose bone with a resulting occlusal shift?

Monitor for Occlusal Changes over 1 year
CT scan- look for missing cortex

Which is most structurally Stable?

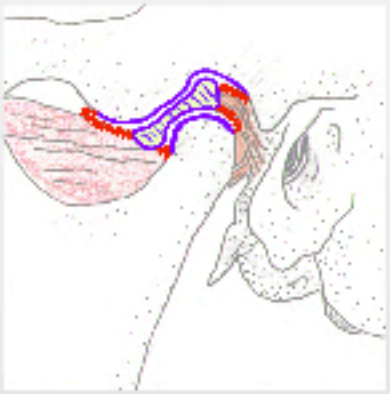
To Do: Take CBCT before starting any major occlusal changes

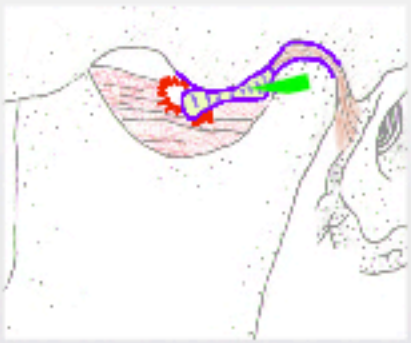
Coronal Views
CT



CBCT
7 Vert BW

Differential Diagnosis: Changes in Joint Height



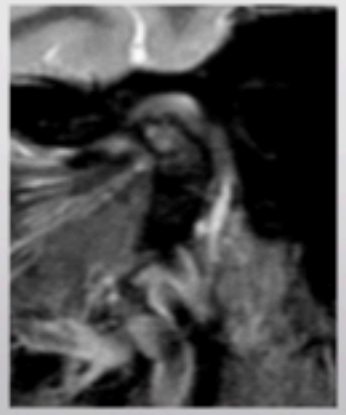


Lose of Bone**
- Osteoarthritis
- AVN
- TIBR
- RhA
- Lyme Arthritis
- Psoriatic Arthritis

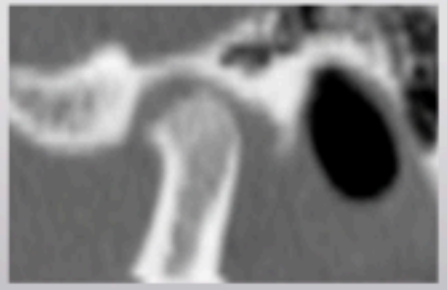
Decrease Tissue Thickness
- Acute Piper 4

Bone Growth
- Condylar Hyperplasia

Tissue Growth
- Synovial Hyperplasia



Inflamed tissue in joint



Missing cortex

OA cyst

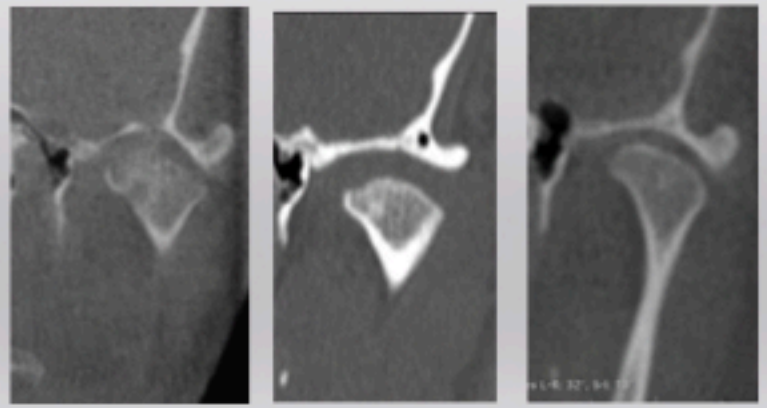
**Notice that loss of bone and sore TMJs have similar diseases

Anterior Openbite with Active Osteolysis due to Inflammatory Tissue Bone Resorption

Non Surgical Therapies

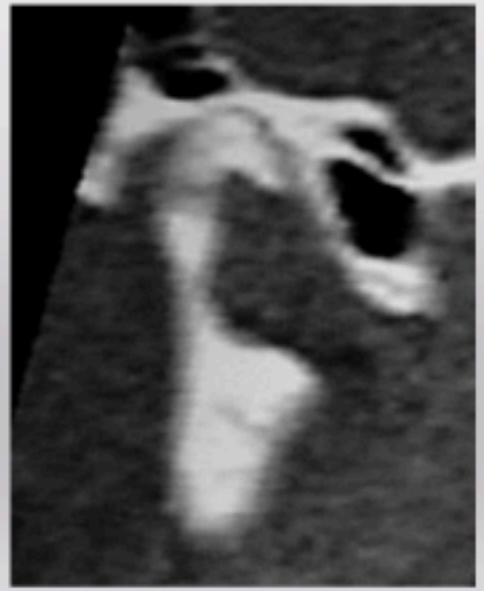
Condylar Distraction

Anti Inflammatory Therapies



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

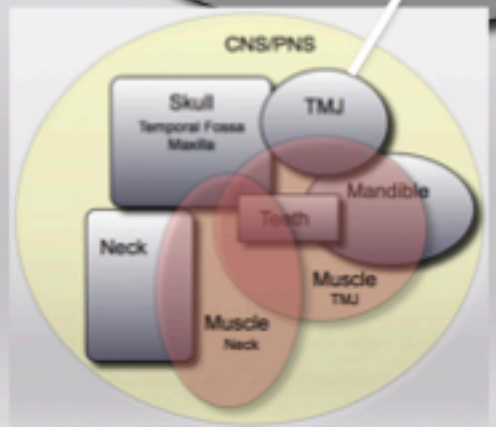
The TMJ: What You need to know before you change an occlusion

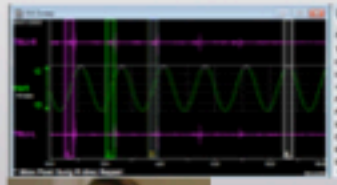
TMJ

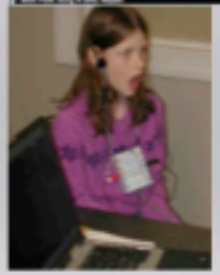
Does it Hurt?
Does it Move?
Does it Wobble?
Is it Structurallv Stable?

Palpate and Load the TMJ.
Measure Smoothness and Range of Motion (Quality and Quantity), Record JVA
D-PAS Test: Wear for sleep 2 weeks, Wear daytime for 2 days
Take CT scan- see intact cortex of condylar bone and fossa

History: Chews well, no pain. No change joint sounds, ROM, or occlusion in past year.







Palatal Anterior
Stop Orthotic

Diagnostic Palatal Anterior Stop

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

Better- Decrease in Symptoms

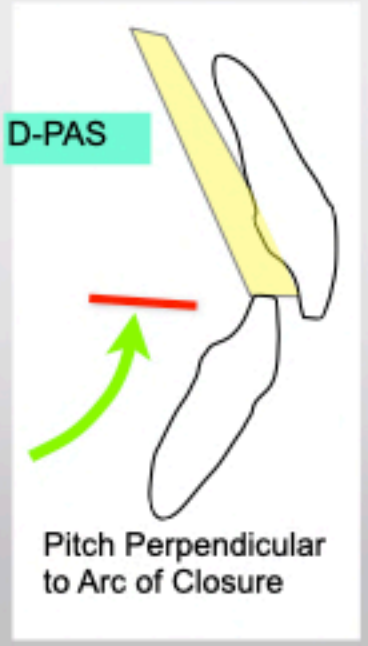
Sleep Clenching Inhibited: Wear D-PAS as night guard
Orthotic Improved Airway: D-PAS as night guard
Occlusal Muscle Disharmony: Occlusal Adjust

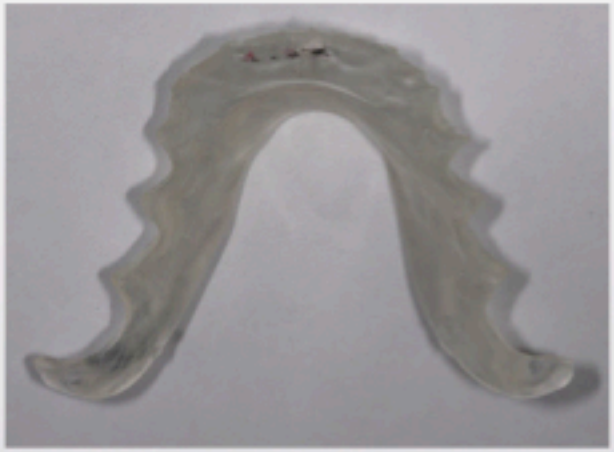
Worse- Increase in Symptoms

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

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APS
ArrowPath Sleep

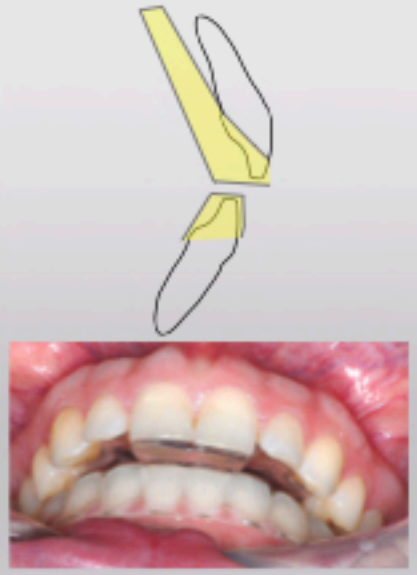
LIVING TREE DENTAL LAB

Living Tree Dental Lab
(865) 509-4509
connect@livingtreelab.com

3D Printed Orthotics

D-PAS
Diagnostic-
Palatal Anterior Stop

Brux-PAS
with lower Essix



Hard Lower Posterior Stop
with upper essix

Hard Lower Full Coverage
Centric Relation Orthotic

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DENTAL TECHNOLOGIES

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716.871.1161

ArrowPath Sleep
Lat Brux
Lateral Bruxing Guard

Moves lower jaw laterally
Arm only attached on one side
Printed nylon
Can convert to MAD if needed

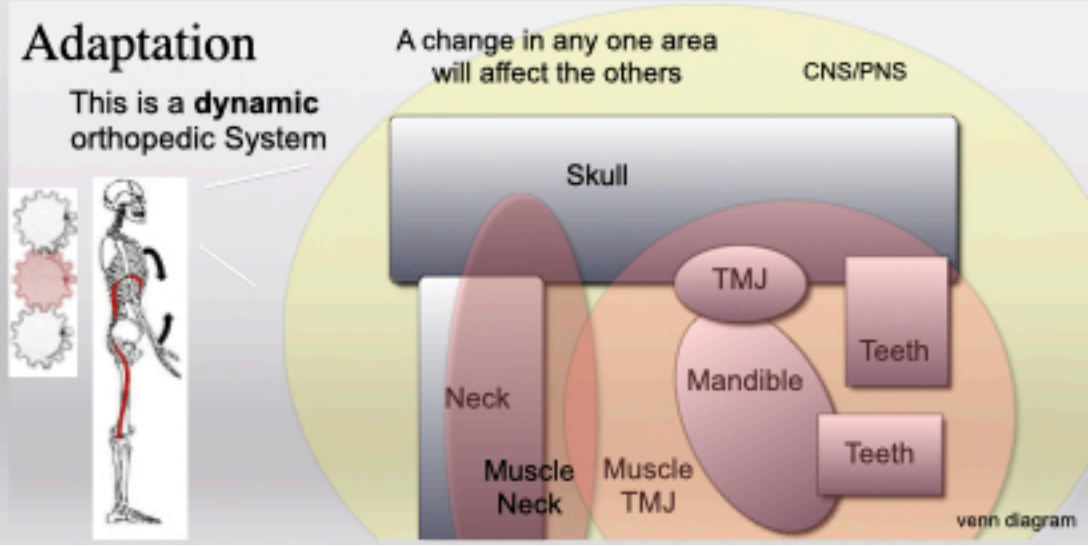
Patient will have a right and left guard.
Move the jaw to the right one night, left the next

TMD Hands on: John, Herb, and Matt
Annapolis Maryland

TMD 2: June 20, 21, 22 2024

John Droter DDS
Herb Blumenthal DDS
Matt Stensrud PT

Class size limited to 12
Send email or call Amber
jrdroter@mac.com
301-805-9400



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