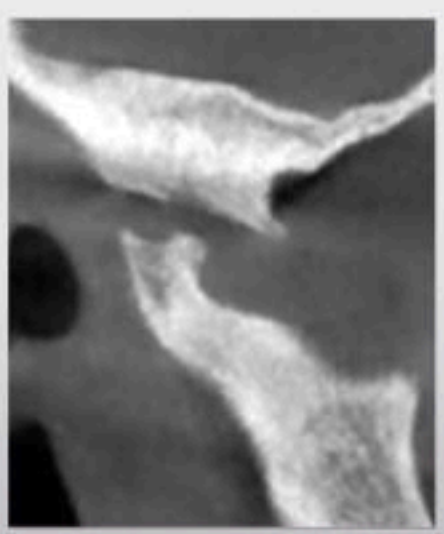
Pankey TMD
March 2024

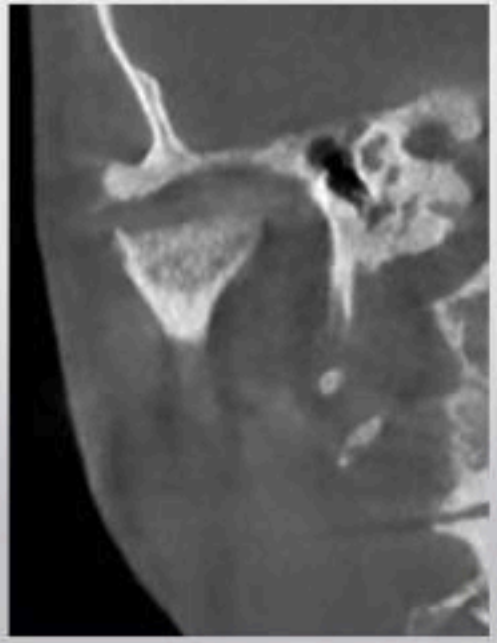
John R Droter DDS
Annapolis, Maryland

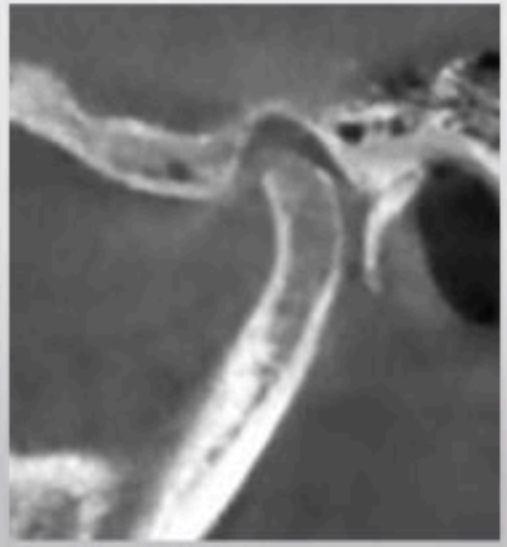
CBCT 74 yo F

Does this patient need treatment?

Expected Chin and Occlusal plane……







Hello. I am:

John R Droter DDS
Annapolis, Maryland

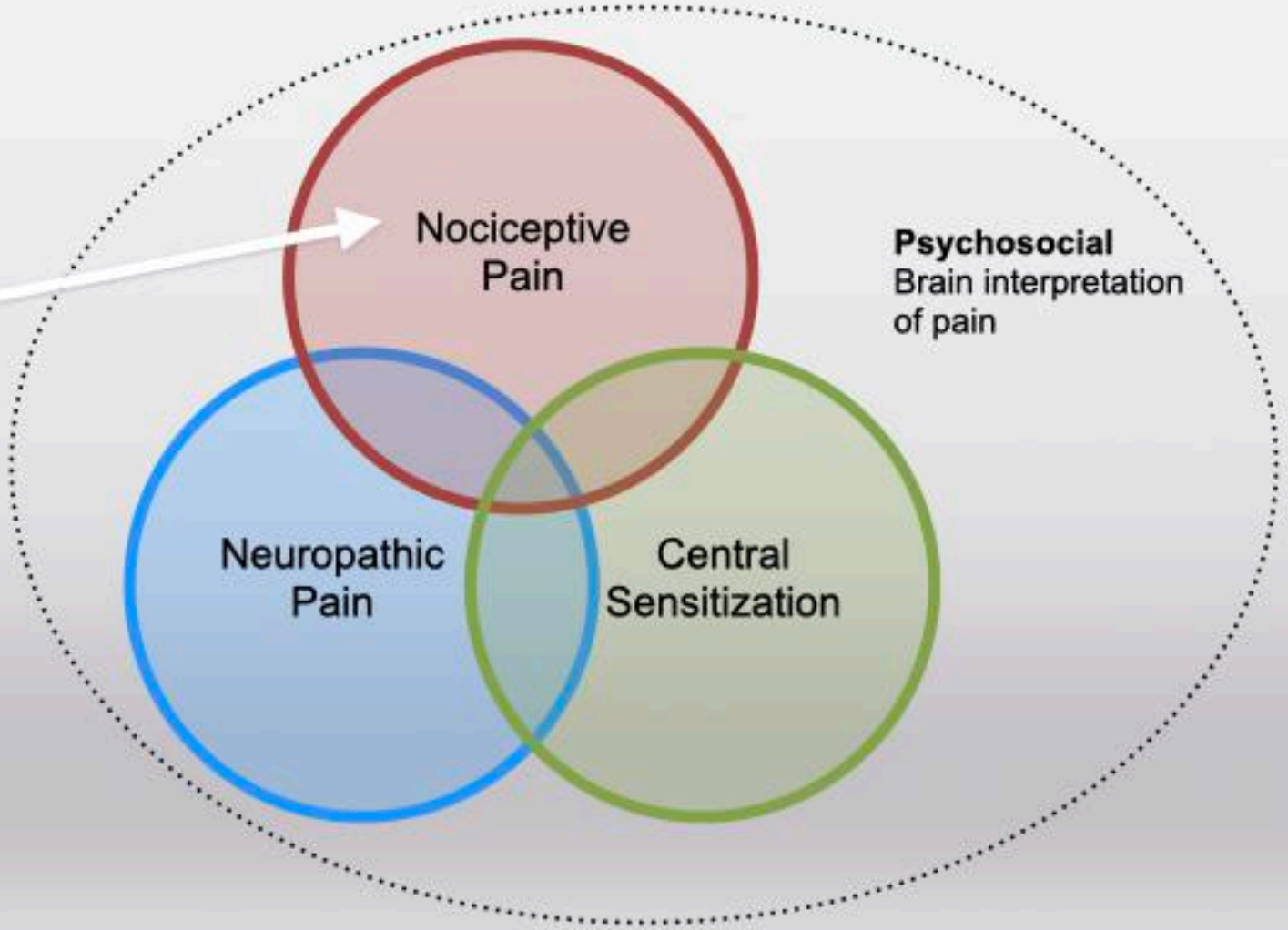
Pain: Three Types

Inflammation Pain
Physical Damage

Tissue
Muscles
Joints

Nerves Misbehaving

Brain Misbehaving



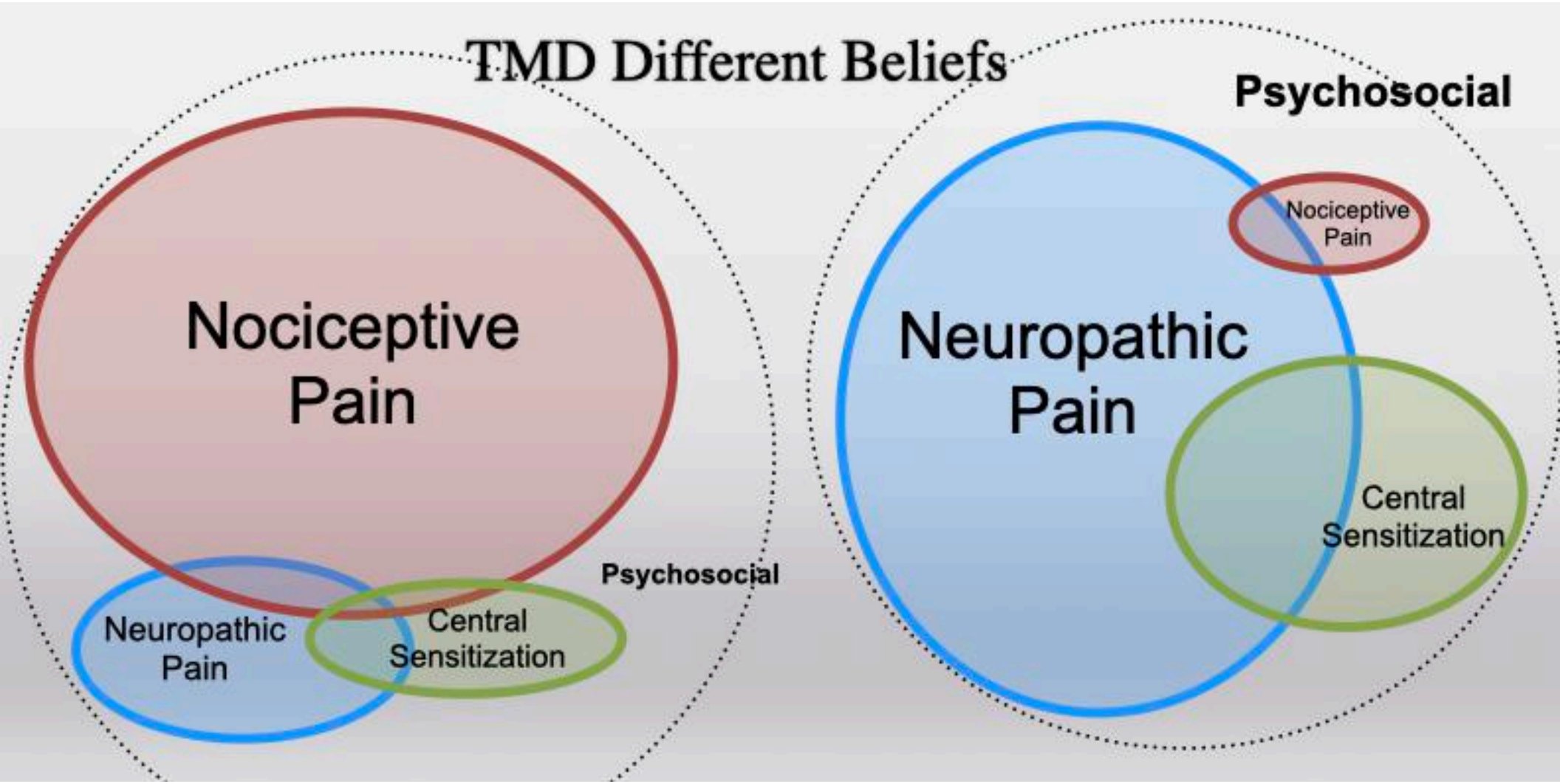
changepain.com

TMD Different Beliefs

Psychosocial
Behavioral

Brain interpretation
of pain

It is not about
the nail


TMD Different Beliefs
Nociceptive Pain
Neuropathic Pain
Central Sensitization
Psychosocial
Psychosocial
Nociceptive Pain
Neuropathic Pain
Central Sensitization

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
Lower Indexed
Brux Checker

Upper full coverage hard CR
Posterior Stop Night Guard
Mandibular Advancement Device
Anterior Stop Airway Bite
Facebow Verification
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

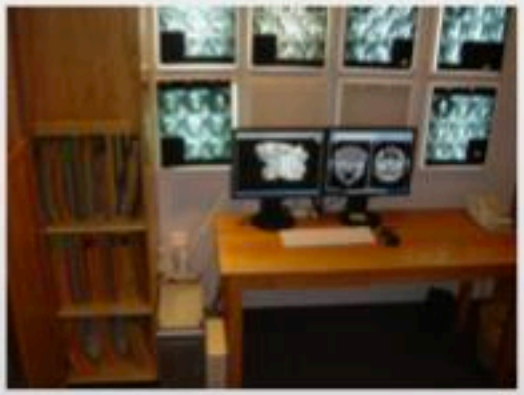
Surgical

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

CT and MRI Scans in my practice since 1992.

Dr Guy Haddix
had been taking CT scans since 1990

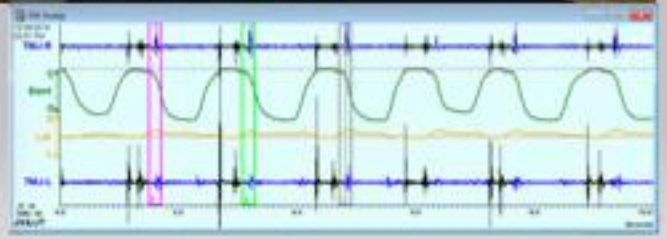
Compare CT, Mounted models, MRI, JVA before and after a case.
What can I see now looking back?



Closet full of printed scans just as digital appeared!!

The magic in the coronal view
The Load Zone

JVA since 2004



Observations

- Accurate
- Observation with Explanation
- Observation with no Explanation

Beliefs can limit observations

Needing to always know why is limiting

Explanations (beliefs)

- Best at the time
- Not always accurate
- Inherit from others
- Do not become emotionally attached to explanations

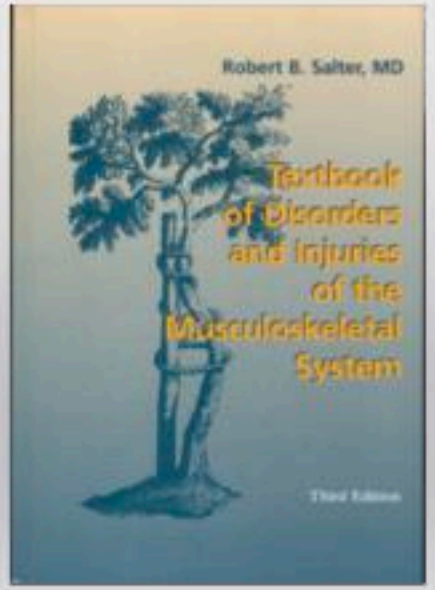
Mind exercise I use: Come up with 3 explanations for every observation.

Valium Example

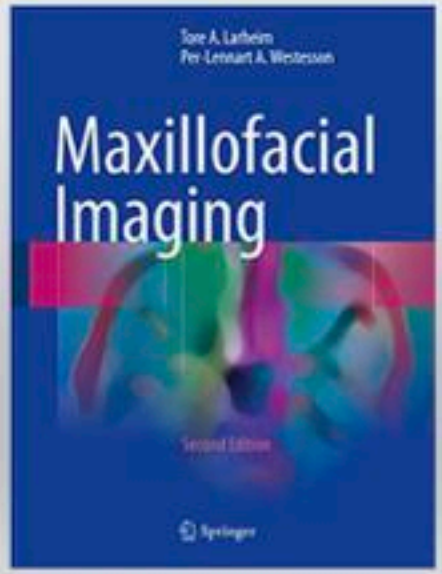
My Core Belief

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

Herb Blumenthal
My friend, mentor, and colleague

Yoda of Muscles

I had the pleasure of teaching side by side with Herb for 12+ Years

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

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

APS
ArrowPath Sleep

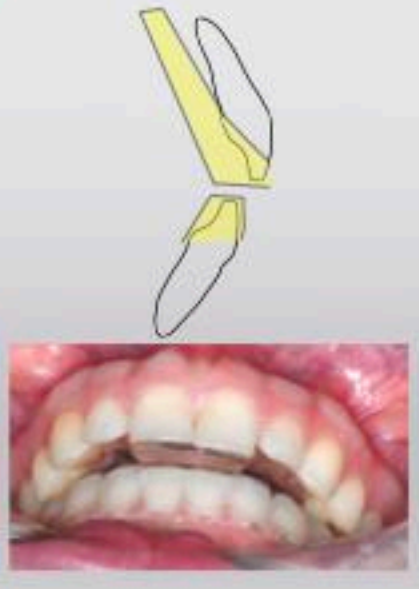
LIVING TREE DENTAL LAB

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

3D Printed Orthotics

D-PAS
Diagnostic-
Palatal Anterior Stop

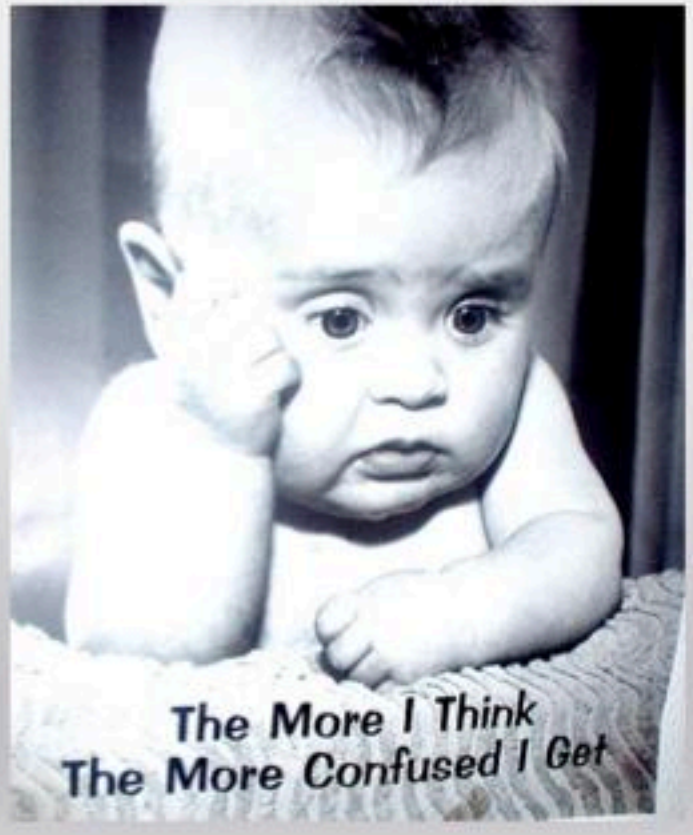
Brux-PAS
with lower Essix



Hard Lower Posterior Stop
with upper essix

Hard Lower Full Coverage
Centric Relation Orthotic

TMJ/TMD Confusion



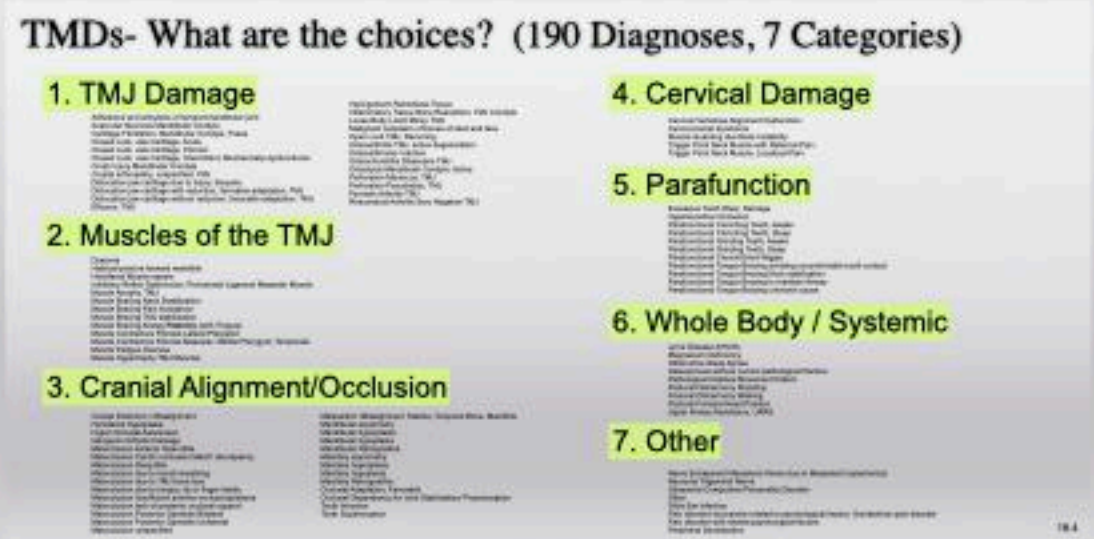
Dogmatic Arguments

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



The Diagnostic Process

When diagnosing and treating facial pain,
we have entered the world of medicine.

Think!!

Differential Diagnosis
All the choices

Diagnostic tests (Observations)
Narrow down the choices

Working Diagnosis
Treating as if

Not completely resolved

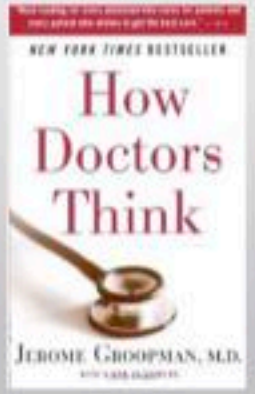
Final Diagnosis
Only after problem resolved

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

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

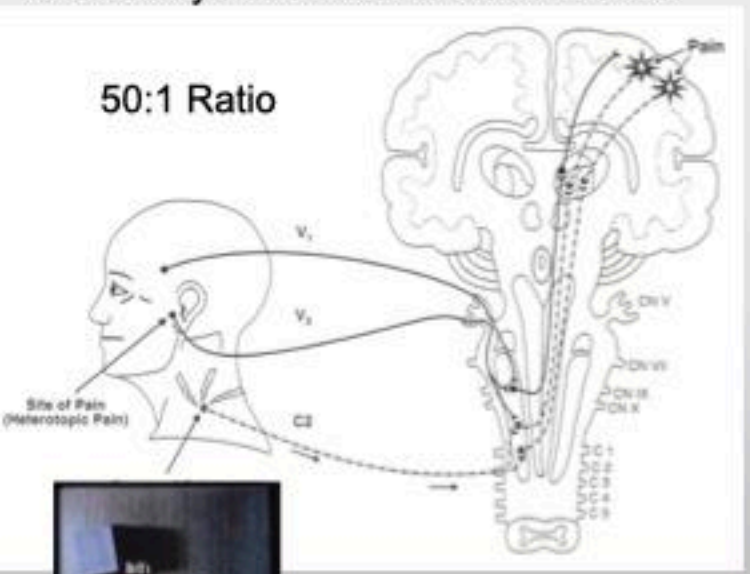


Referred Pain

Convergence

More primary sensory neurons than secondary neurons that travel to brain

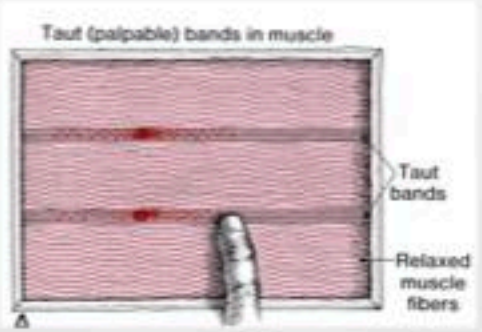
50:1 Ratio

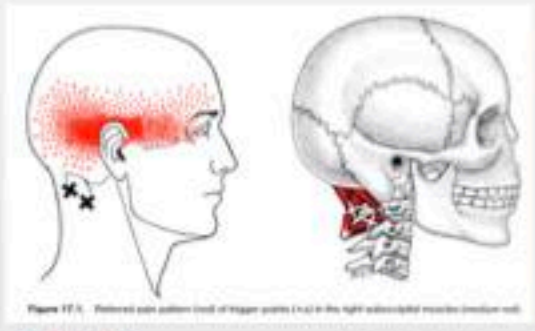


"Bells Orofacial Pain"
Jefery Okeson

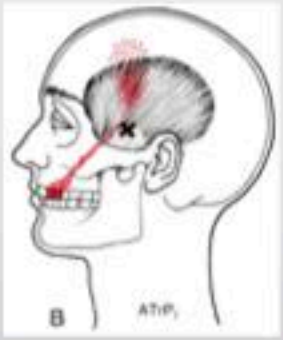
Trigger Points

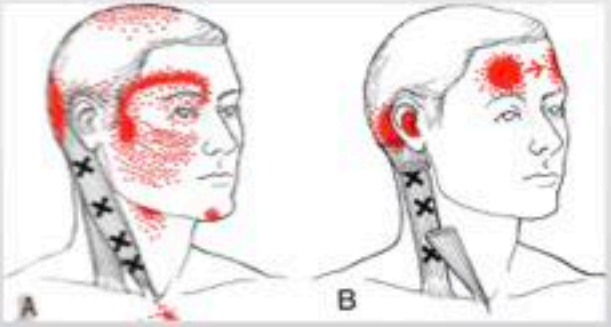
Contracted mass of actin, myosin and histamine

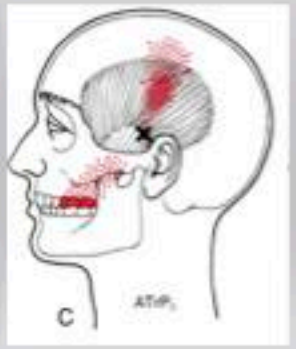


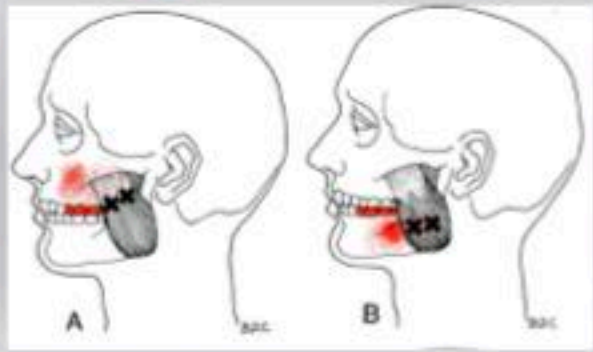


"The Trigger Point Manual"
Janet Travell, MD









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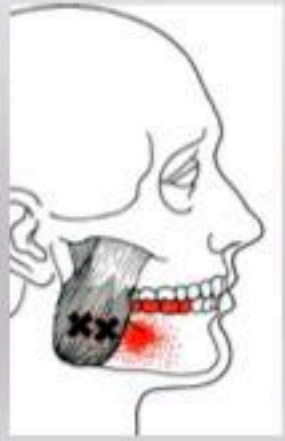

"How Doctors Think", by Jerome E. Groopman

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

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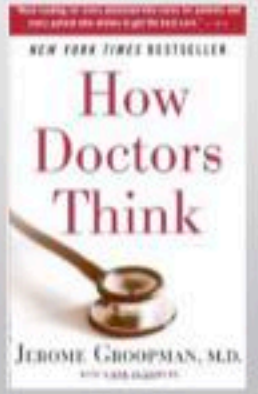

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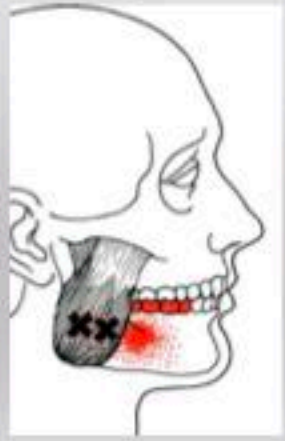

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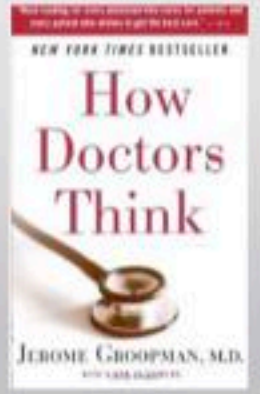

TMD Therapies

John R Droter DDS
Annapolis, Maryland

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

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 Orthogonal
Refer to Osteopathic MD: Body alignment
Breathe, Walk , Exercise

Medicinal

Anti Inflammatory:
NSAIDs,
Doxycycline low dose
CBD Topical
Glucosamine/Chondroitin MSM
Vitamins: Vit C, Vit D, Vit B12
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Refer Botox Masseter injections
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Food

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Aqualizer
Lower Soft Sectional
Lower posterior deprogrammer
Lower TMJ Rehab flat plane
Lower postured indexed
Lower CR Indexed
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Lateral Bruxing Device

Sleep/ Fatigue

Mouth taping
Diet Modification
Positional Therapy
Vitamins: Vitamin D, Vitamin B12, Vit C
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Lateral Bruxing Device Elastomeric
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CPAP

Surgical

Refer: Arthrocentesis w/ PRP
Refer: Discectomy w/ Fat Graft
Refer: Total Joint Replacement
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70

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Athletic Mouthguard
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Myobrace

Dental Orthotics

"Playing" with "Plastic"

ArrowPath Sleep
Anterior Stop

D-PAS

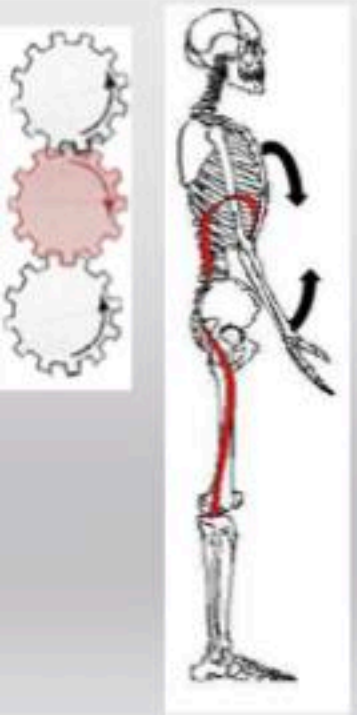
My goal is to **not** put an orthotic in someone's mouth.

Is there anyway I can do this without an orthotic?

If orthotic is needed, I want to have the least intrusive, for the shortest period of time.

Neck and Postural Instability

This is a **dynamic** orthopedic System



A change in any one area will affect the others

CNS/PNS

Skull

TMJ

Teeth

Mandible

Neck

Teeth

Muscle Neck

Muscle TMJ

venn diagram

Dental Orthotics

Diagnostic

ArrowPath Sleep
Anterior Stop

D-PAS

Management

Posterior Stop Night Guard

D-PAS

Therapeutic

Indexed Orthotic

Centric Relation Orthotic

Protective

Upper Hard Centric
Relation Night Guard

Two additional categories: Useless Harmful

Quad R Appliance
Random
no Rhyme
no Reason
not Recommended

Appliance rocks
Tooth #31 only contact
Note gap 7-10 incisal

Only good is not hard/soft

PISD Effect

TMD Therapies

Dental Orthotics

Diagnostic
Management
Therapeutic
Protective

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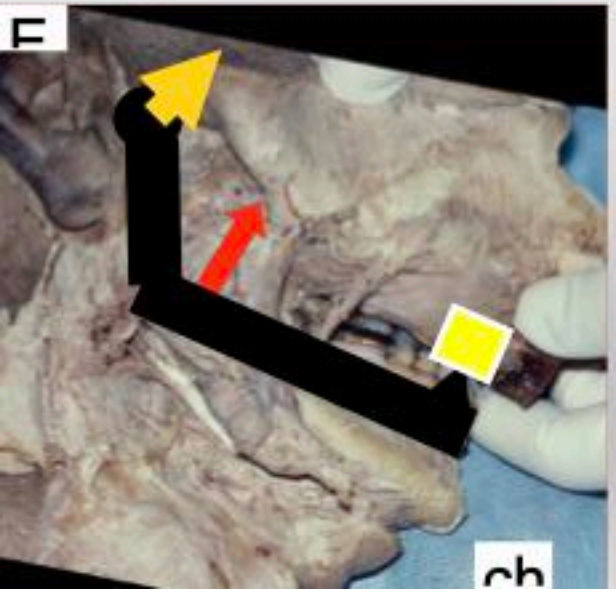
ArrowPath Sleep
Anterior Stop

Dental Orthotics

Pankey
Upper
Anterior
Stop



Pitch Perpendicular
to Arc of Closure

Test if the teeth have any role in pain and or dysfunction
- Eliminates posterior and anterior tooth interferences
- Condyles seat in fossa, optimal load bearing position

Test for decrease muscle contraction force

Allows Maxilla, Mandible, and Temporal bones to align

**Do not send home with patient

Anterior Stop Orthotic
In Office Diagnostic Test

Diagnostic
Management
Therapeutic
Protective

ArrowPath Sleep
Anterior Stop

Deprogram Muscle Engrams
Align Cranial Bones and Neck

If pain reduces, Occlusion/ Cranial Alignment and/or Muscle Engrams are part of the problem

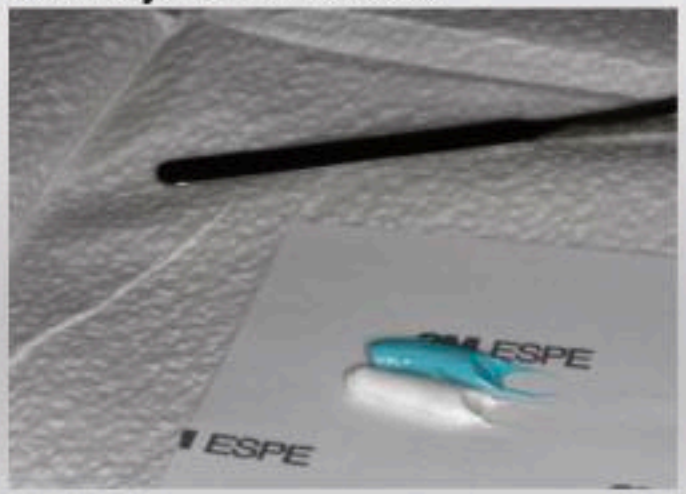
With anterior stop in place:

1. Open / Close slowly, gently, gentle tap 5-10 times. My hands are sensors.
2. Slide left and right, forward and back, slowly, gently, 5-10 times. "Easy, Easy"
3. Tap Right, Tap Left, gently, 5-10 times.
4. Occipital Lift with 3 deep breaths, full exhale. Posterior neck opening muscle massage.
5. Repeat 1-3. If still braced Dr unexpectedly accelerates closing a few times.

Office USE ONLY Do not send home with patient

Anterior Stop Orthotic
In Office Diagnostic Test

Can do 2nd mix to
overlay 1st if needed



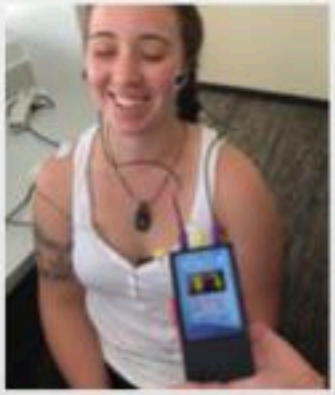
Anterior Stop Orthotic
In Office Diagnostic Test

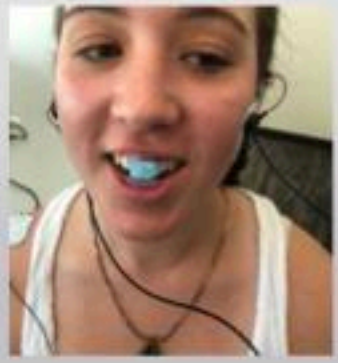
ArrowPath Sleep
Anterior stop 2.5 mm

Does the occlusion, cranial alignment, and/or muscle bracing have anything to do with the dysfunction or pain?

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

m-Scan
BioResearch





>30% of headaches have an occlusal component

Occlusal adjustment in patients with craniomandibular disorders including headaches. A 3- and 6-month follow-up. Vallon D, Ekberg E, Nilner M. Acta Odontol Scand. 1995

Response to occlusal treatment in headache patients previously treated by mock occlusal adjustment. Forssell H, Kirveskari P, Kangasniemi P. Acta Odontol Scand. 1987

TMD Therapies

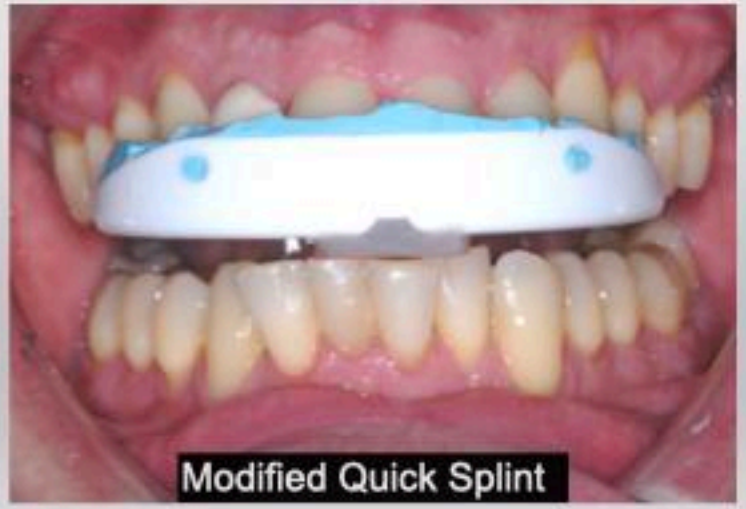
Dental Orthotics

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
Lower Indexed
Brux Checker

Reline with
Blue Mousse



Diagnostic
Management
Therapeutic
Protective

TMD Therapies

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
Lower Indexed
Brux Checker

APS Temp Anterior Stop

Form on teeth

Reline with Blue Mousse

Temporary Anterior Stop Test

Diagnostic
Management
Therapeutic
Protective

Wear for sleep for 1-2 weeks
Limited daytime wear if headache

This is a diagnostic test, not treatment

Better- Decrease Symptoms on Waking
Inhibits Sleep Clenching or Grinding
Orthotic Improved Airway

Worse- Increase in Symptoms
Mechanically Unstable TMJ (Joint subluxation)
Intracapsular Problem TMJ
Orthotic Made Airway Worse

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

TMD Therapies

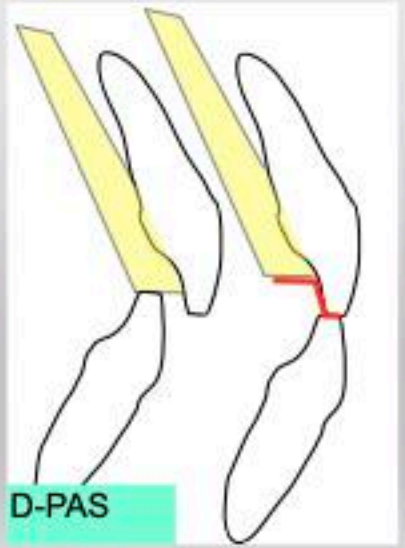
Dental Orthotics

Diagnostic
Management
Therapeutic
Protective

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
Lower Indexed
Brux Checker



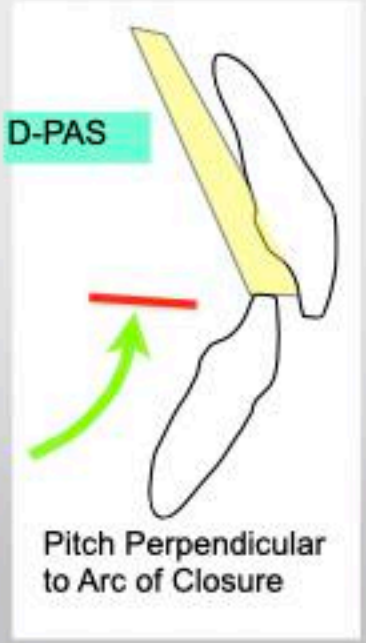
Diagnostic Palatal Anterior Stop

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

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

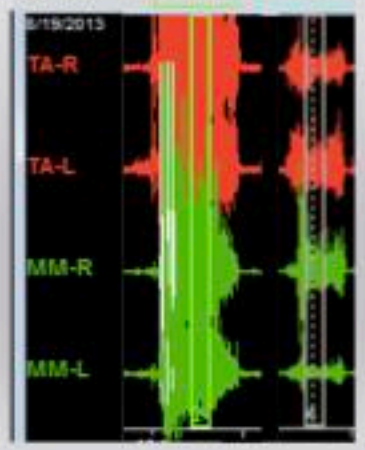
3. Are the TMJ muscles inhibited from full contraction with anterior only tooth contact?

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
<u>inhibited by anterior only contact</u>

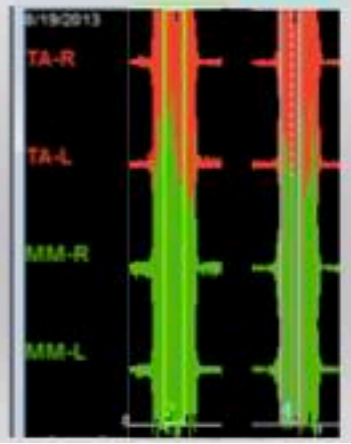
	Clench MaxIC	Anterior Stop D-PAS
	µV	µV
TA-R	100.6	15.7
TA-L	108.9	25.3
MM-R	115.4	25.5
MM-L	70.5	6.8



Major decrease in muscle power with D-PAS

Another Patient with muscles NOT
<u>inhibited by anterior only contact</u>

	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

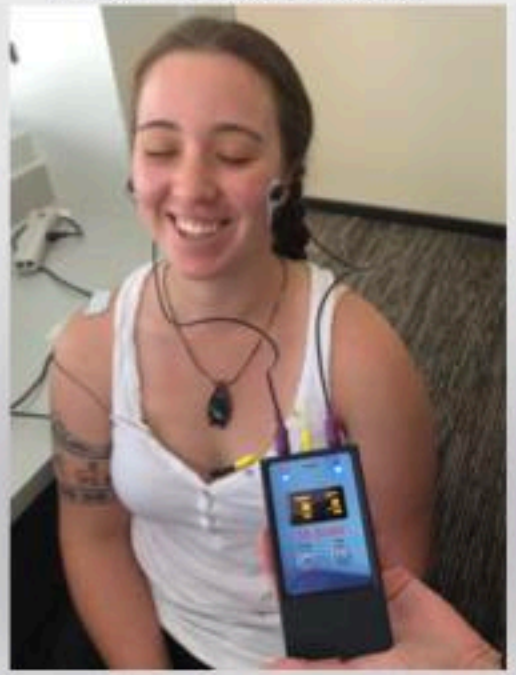
Choosing the Correct Night Guard

www.APSleep.com

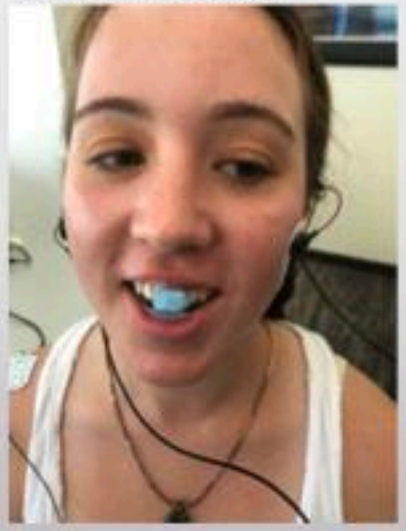
APS
ArrowPath Sleep

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

Dental Orthotics

Diagnostic
Management
Therapeutic
Protective

Brux-PAS +
Lower Essex

Manage and protect teeth Grinding
Slippery against slippery

Manage protect Grind Clench

Could use to manage clenching
however D-PAS is better

Must have some muscle inhibition!!!

TMD Therapies

Dental Orthotics

3-6 weeks trial of an ideal occlusion, 24/7.
If symptoms resolve, equilibrate the occlusion.

Holding Pattern: Awaiting neck therapy, patient acceptance.

Diagnostic
Management
Therapeutic
Protective

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
Lower Indexed
Brux Checker

Dots in the back,
lines in the front

Triad- No longer manufactured

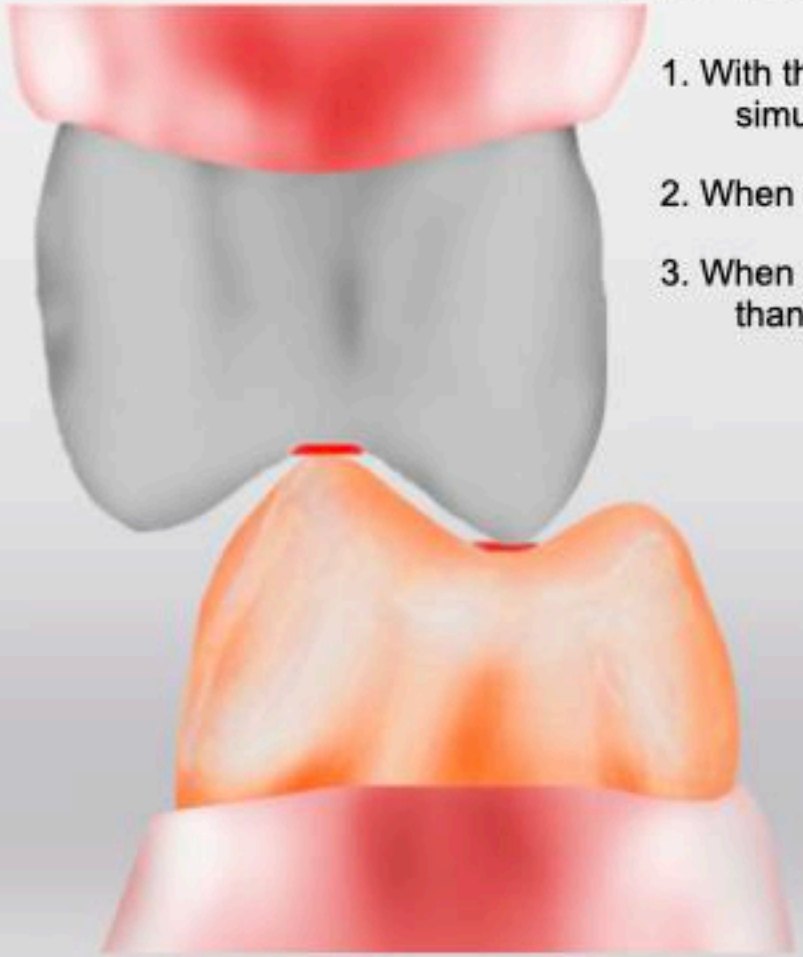
3D Printed Keysplint Hard with durasplint added to anterior

Lower Centric Relation Orthotic
by Dr. Glenn Kidder

Orthotic Acrylic: Solid, Retentive, Hard

If Symptoms resolve, equilibrate the occlusion

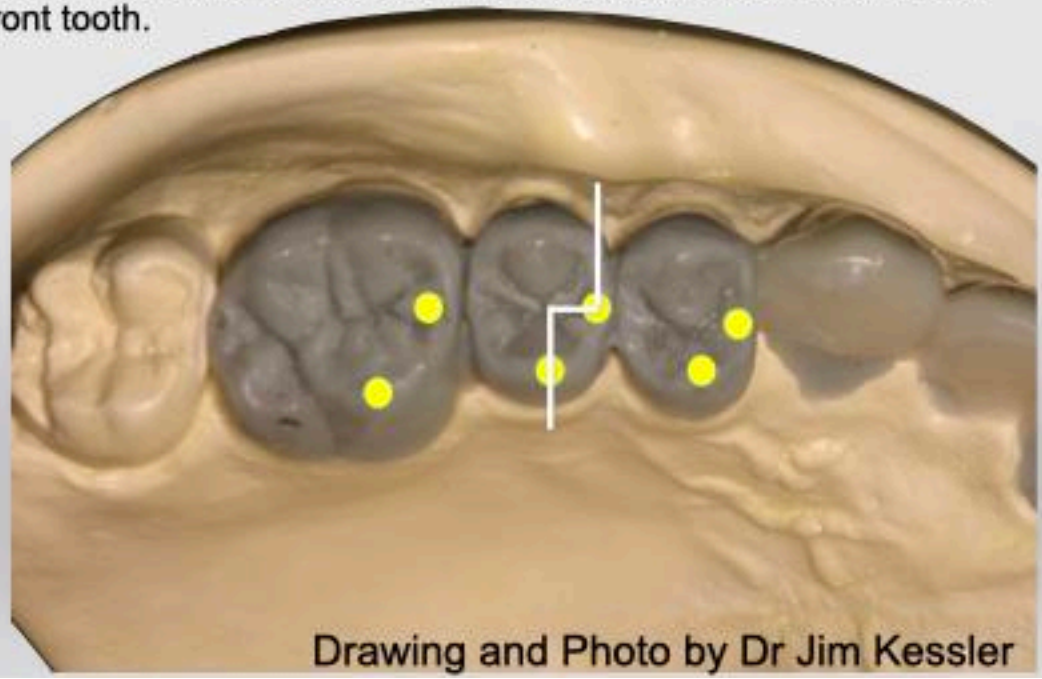
LD Pankey's 3 Rules of Occlusion (Clyde Schuyler)



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

TMD Therapies

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
Lower Indexed

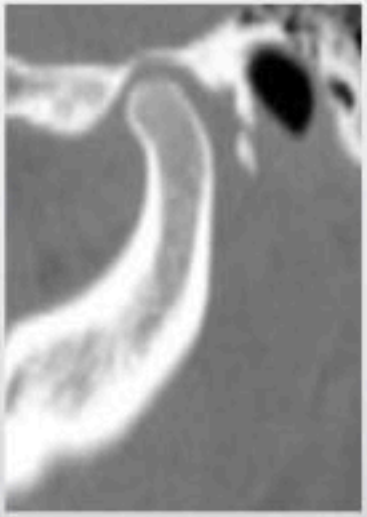
Brux Checker

Advanced TMD Orthotics

Diagnostic
Management
Therapeutic
Protective

All roads lead to lower CR as final orthotic then occlusal adjustment with DTR

I use both Centric Relation and Non-Centric Relation Orthotics



Treatment Position vs Final Position: Do Not Confuse the Two

Treatment Position Creates Change (Adaptation)
- Treat: Painful CR Load Zone
  - Mechanically Unstable Centric Relation Loading
  - Cranial bones misaligned

Final Position Creates Stability (Centric Relation)
- When the forces are balanced, Adaptation Stops

TMD Therapies

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
Lower Indexed

Brux Checker

Brux Checker
Great Lakes Orthodontics

Diagnostic
Management
Therapeutic
Protective

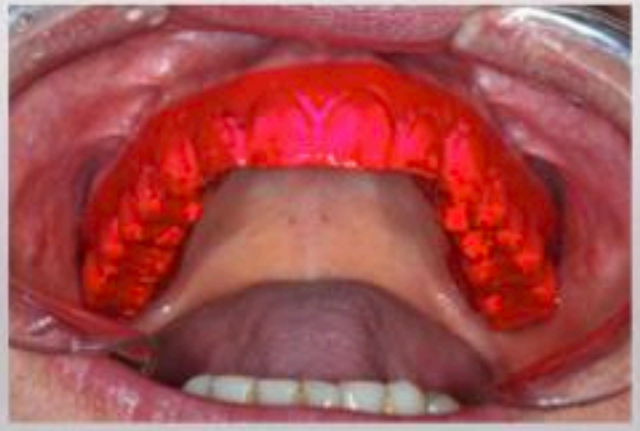
0.1mm Mylar: Same as mylar strip for composite

Made on Biostar Machine

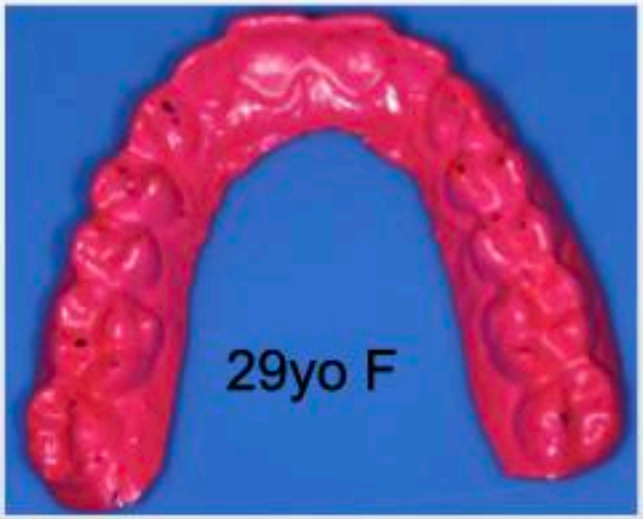
Does grinding occur awake or asleep?

Brux Checker
Great Lakes Orthodontics

0.1mm Mylar



Made on Biostar Machine



TMD Therapies

Dental Orthotics

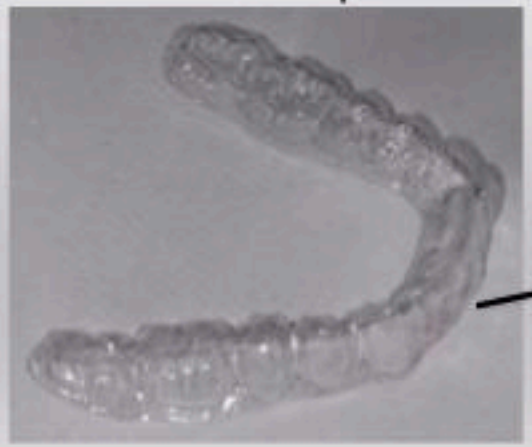
In Office Trial Anterior Stop
Temporary home use anterior stop
Diagnostic Palatal Anterior Stop
Brux-PAS
Lower full coverage CR
Lower posterior deprogrammer
Lower TMJ Rehab flat plane
Lower Indexed

Brux Checker

Clear Brux Checker
Treats Daytime Clenching
Increases awareness to break habit
Takes 6 weeks

Diagnostic
Management
Therapeutic
Protective

Very thin: Similar to mylar
used for composites



Great Lakes Orthodontics
Platzhalterfolie by Scheu

1-800-758-1487
Scheu Ref # 3202.1

Protective: Lower clear brux checker

Full Denture implant supported- Locator Attachments
E-max custom posterior denture teeth

clear brux checker
covers lower denture

Lasts about 3 weeks

Posterior Denture teeth e-Max

TMD Therapies

Dental Orthotics

Upper full coverage hard CR guard

Posterior Stop Night Guard
Mandibular Advancement Device
Anterior Stop Airway Bite
Facebow Verification
Lateral Bruxing Device
Condylar Distraction
Lingual Light Wire
Lower Soft Sectional

Upper hard full coverage
CR guard

Diagnostic
Management

Therapeutic
Protective

Patient can place severe force on front teeth.

Upper teeth +2 mobility

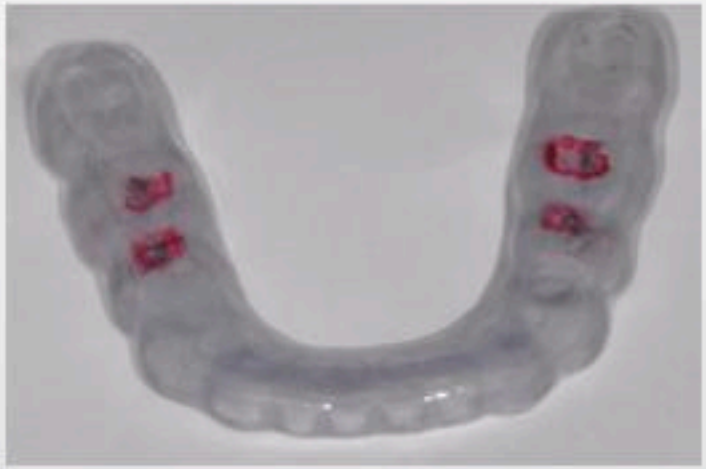
TMD Therapies

Dental Orthotics

Upper full coverage hard CR guard

Posterior Stop Night Guard

Mandibular Advancement Device
Anterior Stop Airway Bite
Facebow Verification
Lateral Bruxing Device
Condylar Distraction
Lingual Light Wire
Lower Soft Sectional



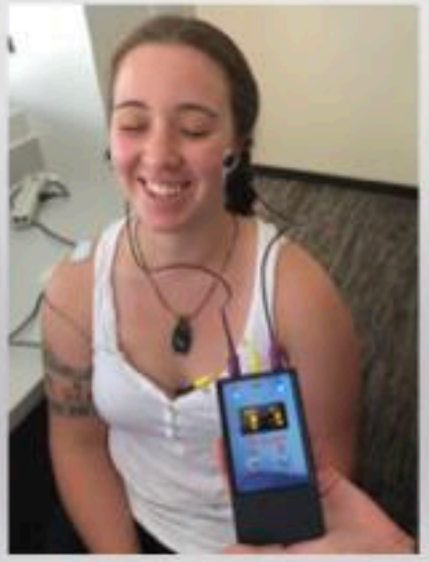
Diagnostic
Management
Therapeutic
Protective

TMD Therapies

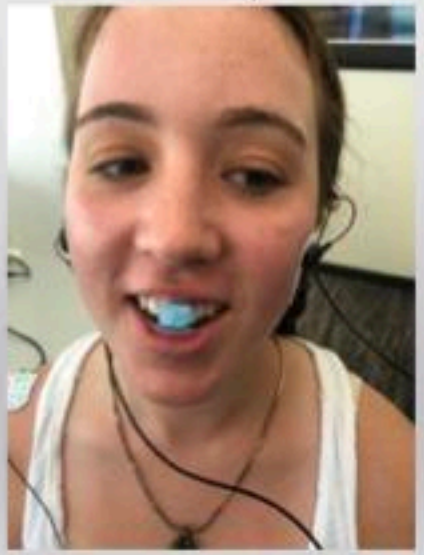
Dental Orthotics

Posterior Stop Night Guard

Clench
Back teeth



Clench
Anterior stop



m-Scan BioResearch

<u>Clench</u>

Back teeth +250 µv

Front teeth +121 µv

Some Inhibition but can place moderate force on front teeth.

Keeps forces centered in Maxilla

Optional upper essix. Most patients like without essix

TMD Therapies

Dental Orthotics

Diagnostic
Management
Therapeutic
Protective

Upper full coverage hard CR guard
Posterior Stop Night Guard

Mandibular Advancement Device

Anterior Stop Airway Bite
Facebow Verification
Lateral Bruxing Device
Condylar Distraction
Lingual Light Wire
Lower Soft Sectional

MyTAP

Great Lakes D-SAD by Panthera

TMD Therapies

Dental Orthotics

Upper full coverage hard CR guard
Posterior Stop Night Guard
Mandibular Advancement Device
Anterior Stop Airway Bite
Facebow Verification
Lateral Bruxing Device

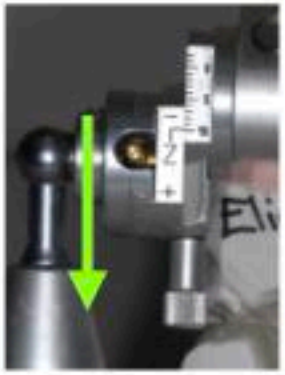
Condylar Distraction

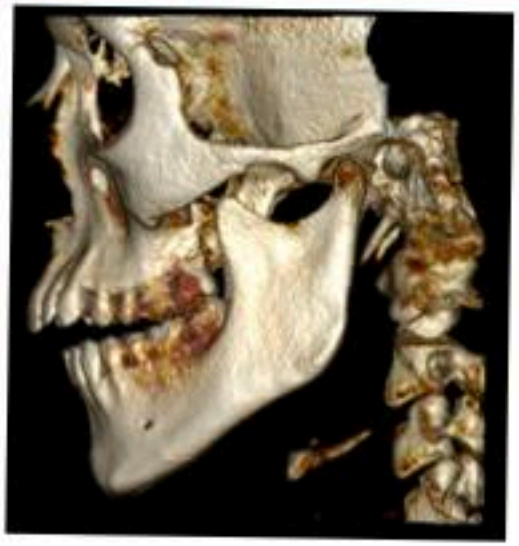
Lingual Light Wire
Lower Soft Sectional

Diagnostic
Management
Therapeutic
Protective

Anterior Openbite Treatment : Moving the Maxilla

Therapeutic





SAM MPV

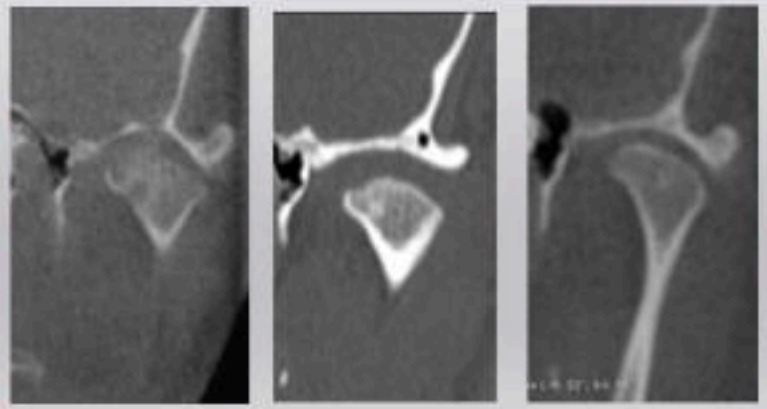
Anterior Openbite with Active TMJ Bone Loss

Diagnostic
Management
Therapeutic
Protective

Non Surgical Therapies

Condylar Distraction

Anti Inflammatory Therapies



TMD Therapies

Dental Orthotics

Upper full coverage hard CR guard
Posterior Stop Night Guard
Mandibular Advancement Device
Anterior Stop Airway Bite
Facebow Verification
Lateral Bruxing Device
Condylar Distraction

Lingual Light Wire

Lower Soft Sectional

Lingual Light Wire- Crozat Arch Expansion

Diagnostic
Management
Therapeutic
Protective

Age 29
Start

Age 30
7 months LLW

TMD Therapies

Dental Orthotics

Upper full coverage hard CR guard
Posterior Stop Night Guard
Mandibular Advancement Device
Anterior Stop Airway Bite
Facebow Verification
Lateral Bruxing Device
Condylar Distraction
Lingual Light Wire

Lower Soft Sectional

3 mm rubber guard that only covers lower molars

Intrudes lower posterior teeth

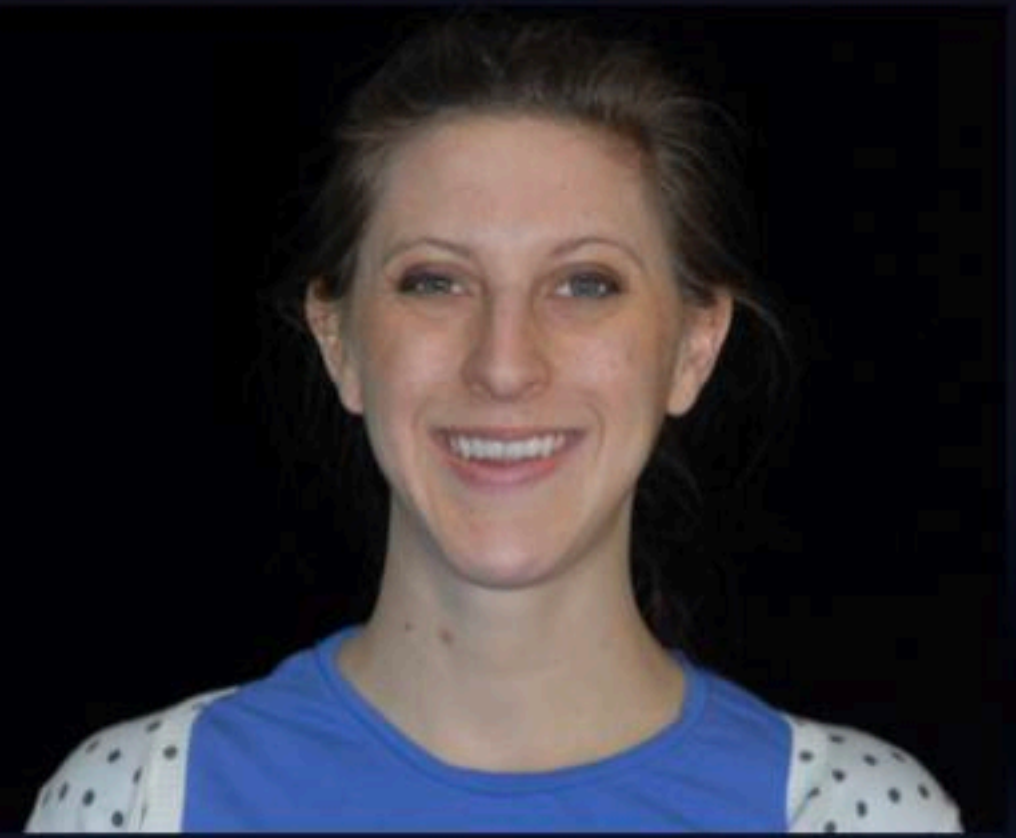
One of three ways to close anterior open bite

Start

Age 27

Age 32

Age 27



Age 32

TMD Therapies

Dental Orthotics

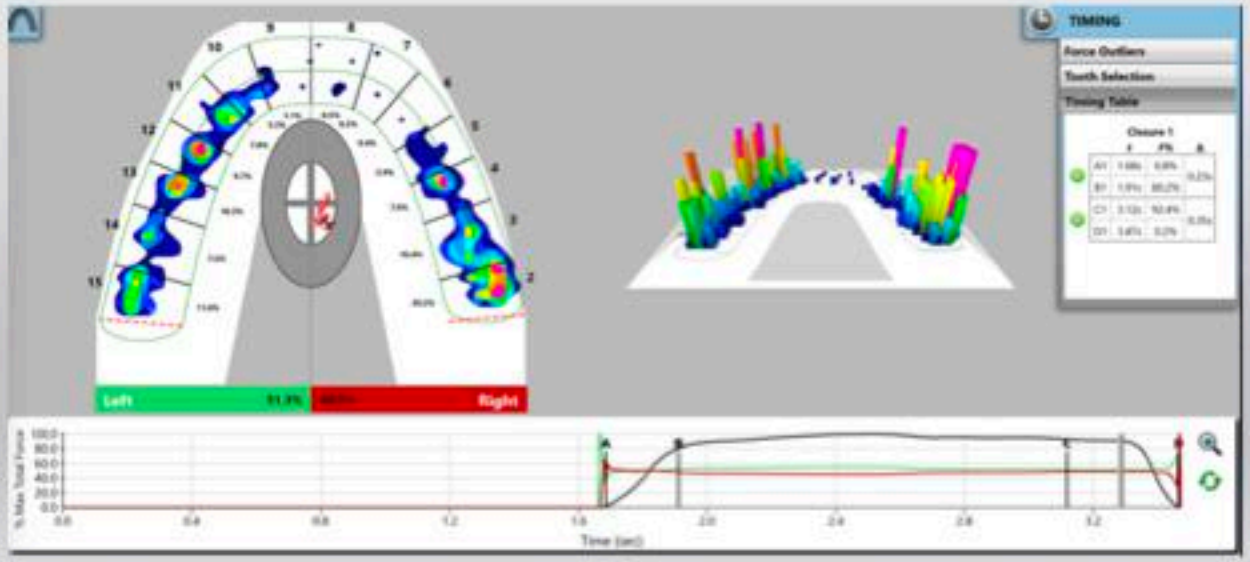
Athletic Mouthguard

Anterior Repositioning
Occlusal Adjust Assist
Aqualizer
Myobrace

Sports Guard
Upper soft full coverage

Diagnostic
Management
Therapeutic
Protective

***Adjusted with T-Scan



TMD Therapies

Dental Orthotics

Diagnostic
Management
Therapeutic
Protective

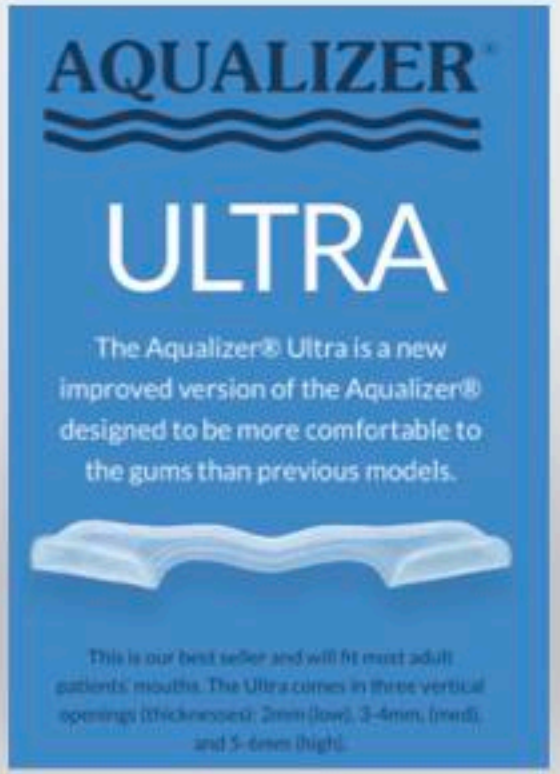
Athletic Mouthguard
Anterior Repositioning
Occlusal Adjust Assist

Aqualizer

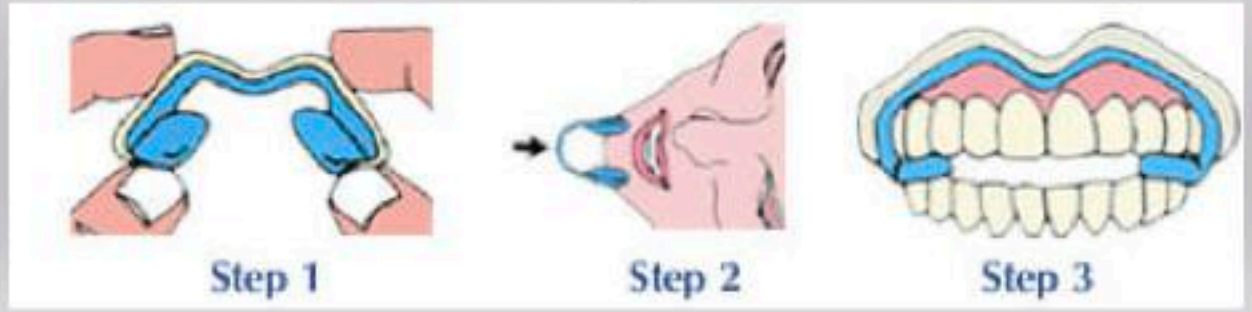
Myobrace

Water cushion for the teeth

I use the low and medium thickness.



Keep in Freezer



TMD Therapies

Dental Orthotics

Athletic Mouthguard
Anterior Repositioning
Occlusal Adjust Assist
Aqualizer

Myobrace

Protect sleep grinding

Manage Airway: Lower jaw forward

Trains Breathe through nose, swallow
Expands Maxilla

Diagnostic
Management
Therapeutic
Protective

MyoBrace
A1

MyoBrace
TMJ

Common TMDs

John R Droter DDS
Annapolis, Maryland

6 Common TMDs

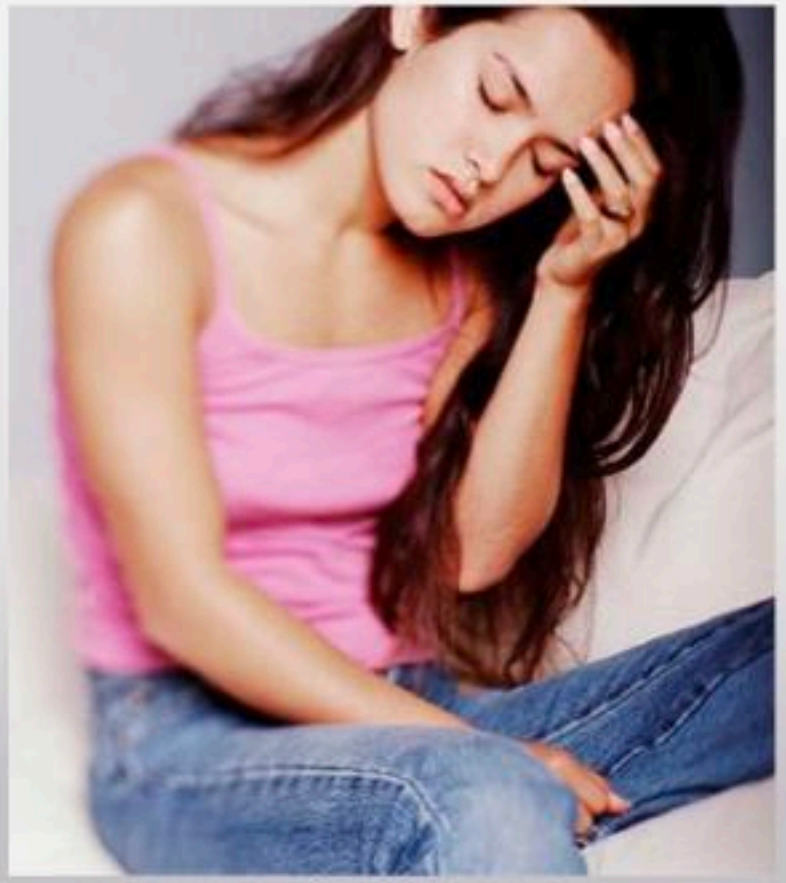
Parafunctional Clenching
Parafunctional Grinding
Occlusal Muscle Dysfunction
Osteoarthritis
Acute Sprain
Acute Closed lock of TMJ disc

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



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

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
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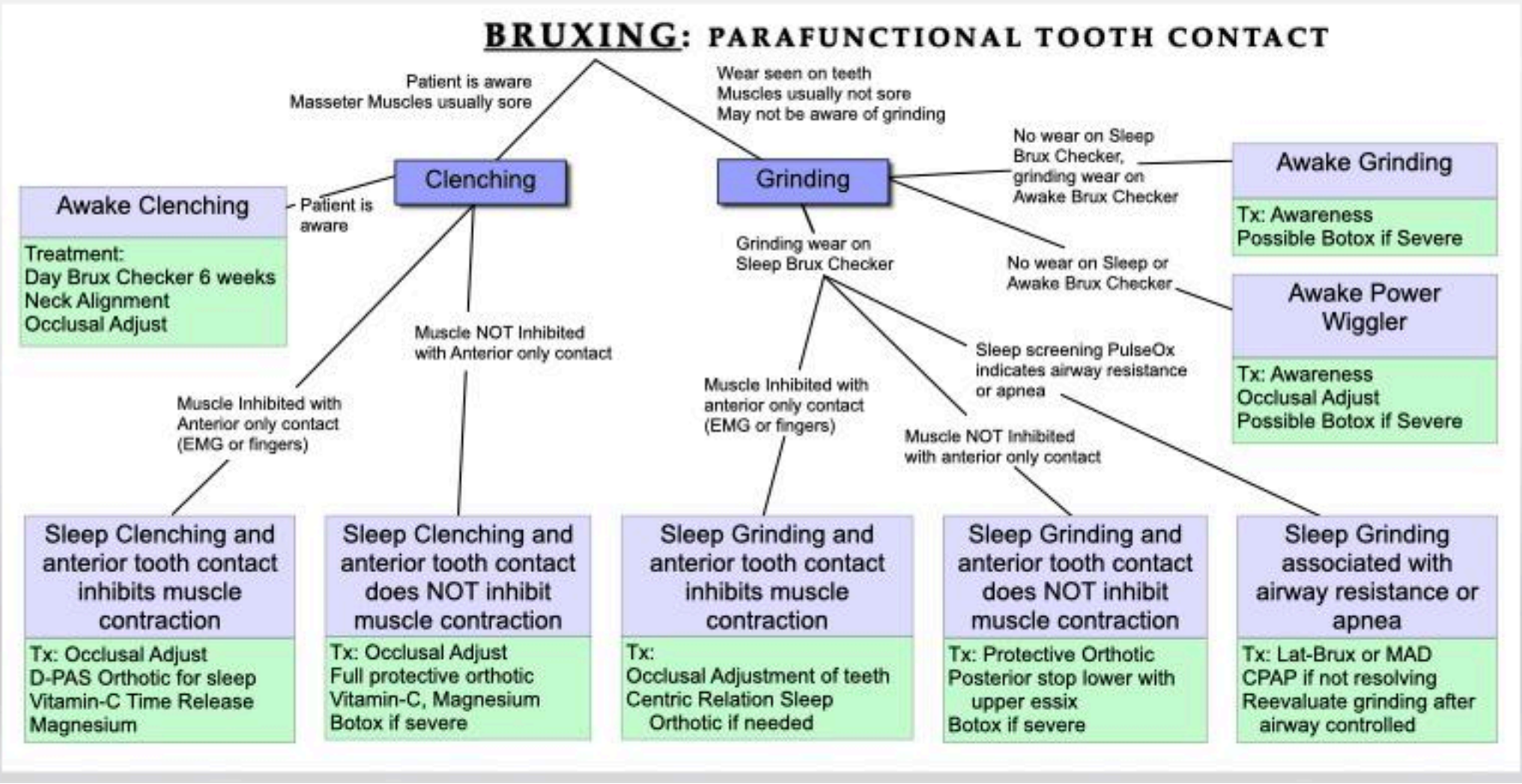
Sprain Discal Ligament TMJ, Acute	Sudden onset pain TMJ, sore TMJ Limited opening Soft end point active stretch	Cold Laser, Ice 15 min 3x a day Rest, Soft diet, NSAID 7 days Anterior Reposition Orthotic 7 days
Acute Closed Lock TMJ	Sore TMJ Limited opening Hard end point active stretch	Arthrocentesis with PRP

BRUXING: PARAFUNCTIONAL TOOTH CONTACT



Clenchers destroy the joint,
Grinders destroy the teeth

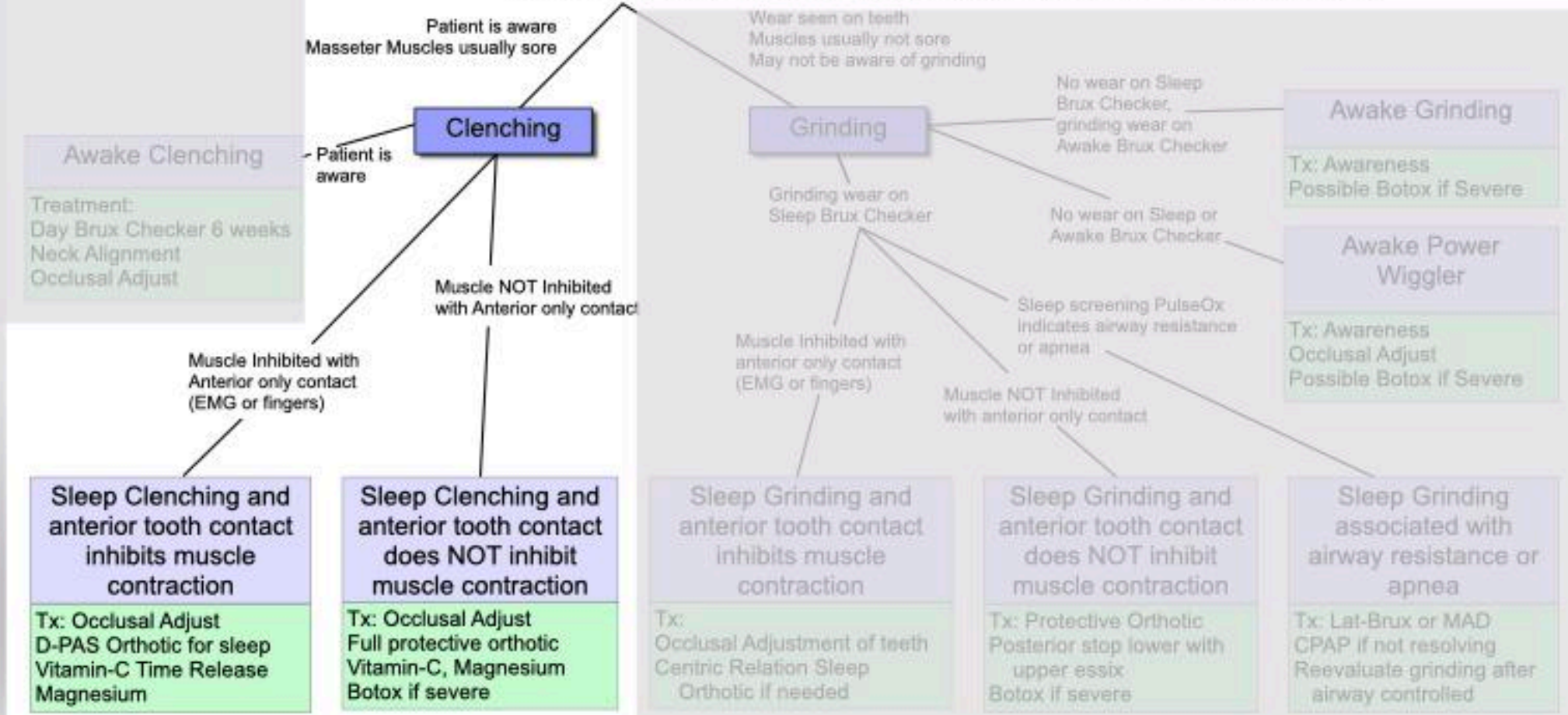
<u>Clenching</u>
Painful Muscles
Patient is usually aware of clenching
Fremitus
Strong Masseters
See slight wear around tooth contacts
Damage TMJ cartilage

If patient is unaware of clenching-
Plant seed at hygiene visit
Do you clench?

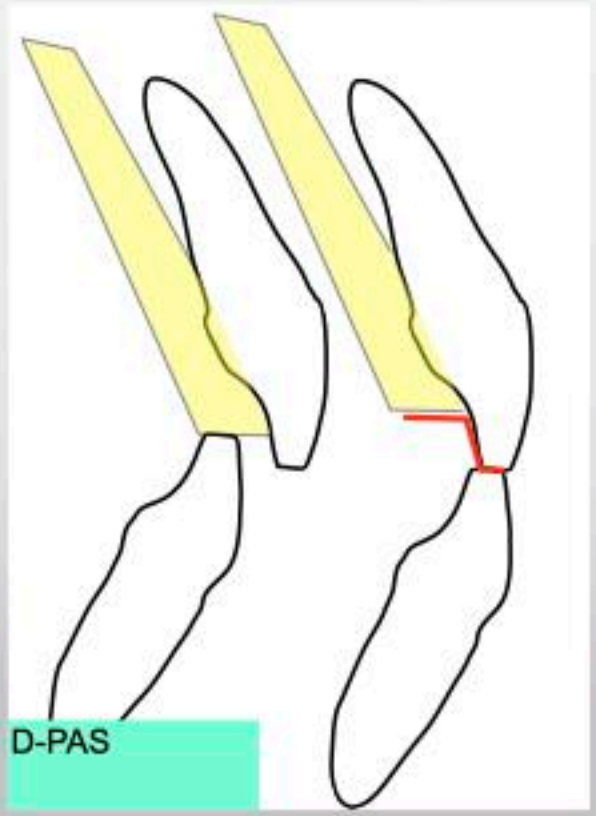
<u>Grinding</u>
See tooth wear
Patient is usually not aware
Buttressing bone if teeth are tight
If tooth mobility, on excursions
Strong Masseters
Slight if any soreness muscles
Usually no muscle pain

Parker Mahan-
"Women Hurt, Men destroy"

BRUXING: PARAFUNCTIONAL TOOTH CONTACT



Diagnostic Palatal Anterior Stop
D-PAS



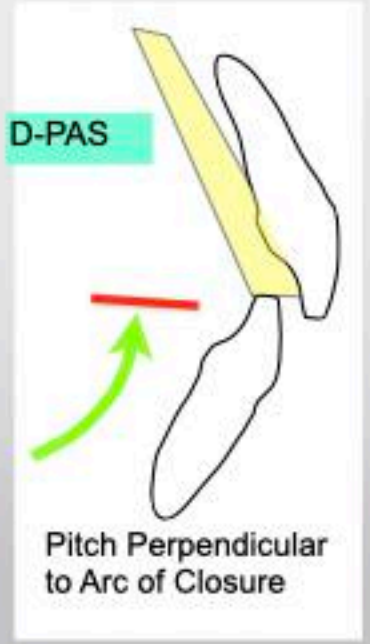
Basically an upper Hawley with anterior stop without clasps or wire

Diagnostic Palatal Anterior Stop

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

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.

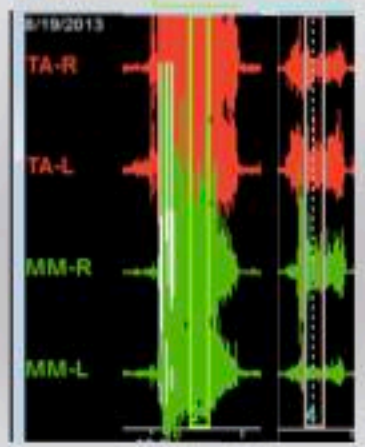
BioResearch EMG

BioResearch mScan

Diagnostic Palatal Anterior Stop

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

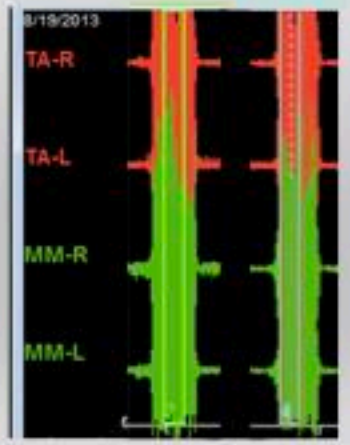


Major decrease in muscle power with D-PAS

BioResearch EMG

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

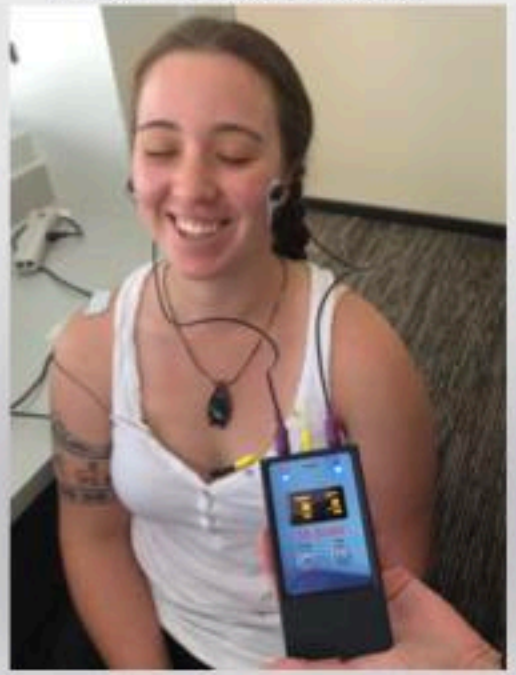


Muscle power same with D-PAS

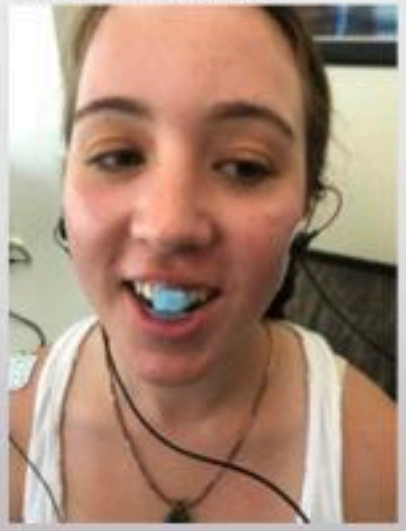
Choosing the Correct Night Guard

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

Parafunctional Clenching

Signs

- Strong Masseters
- No major wear on teeth
- Slight wear around tooth contacts
- Fremitus
- Tori
- Slight scratch vibration doppler/ JVA

Diagnostic Tests

EMG M-scan
- Determine if muscle inhibition

D-PAS for sleep

Adhesive Click- "Sticky Disc"

Symptoms

- Aware of clenching
- Sore muscles on waking
- Clicking on waking that goes away
- Headaches

Causes

- Uneven occlusion, especially heavy anterior
- Neck stabilization
- SSRI

Treatments

Occlusal Adjustment
Neck alignment/ stabilization
D-PAS as night guard
Time Release Vitamin C
Angstrom Magnesium
Clear Brux Checker daytime for 6 weeks

D-PAS Handout to patient

D-PAS Diagnostic Palatal Anterior Stop Test

This is a diagnostic test, not treatment.
D-PAS Instructions:

For next 2 weeks wear for sleeping and as much during the day as possible.
You will need to remove to eat.

Keep track of what changes you notice.

When out of the mouth always put it in its case.
Top 3 ways appliance are lost or broken:

1. Placed in a paper towel while eating and thrown out.
2. Placed in pocket and sat on.
3. Your dog finds it and uses it as a chew toy.

Clean by scrubbing off with toothbrush and toothpaste.

If facial tightness or muscle soreness increases for more than 2 days, you can stop wearing for 2 days and try again. If still sore stop wearing and contact us.

Symptoms will either get better, get worse, or stay the same.
If symptoms become worse you may have a more serious problem that will require further tests.

Diagnostic Palatal Anterior Stop

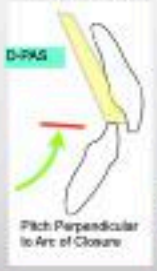
This is a diagnostic test, not treatment

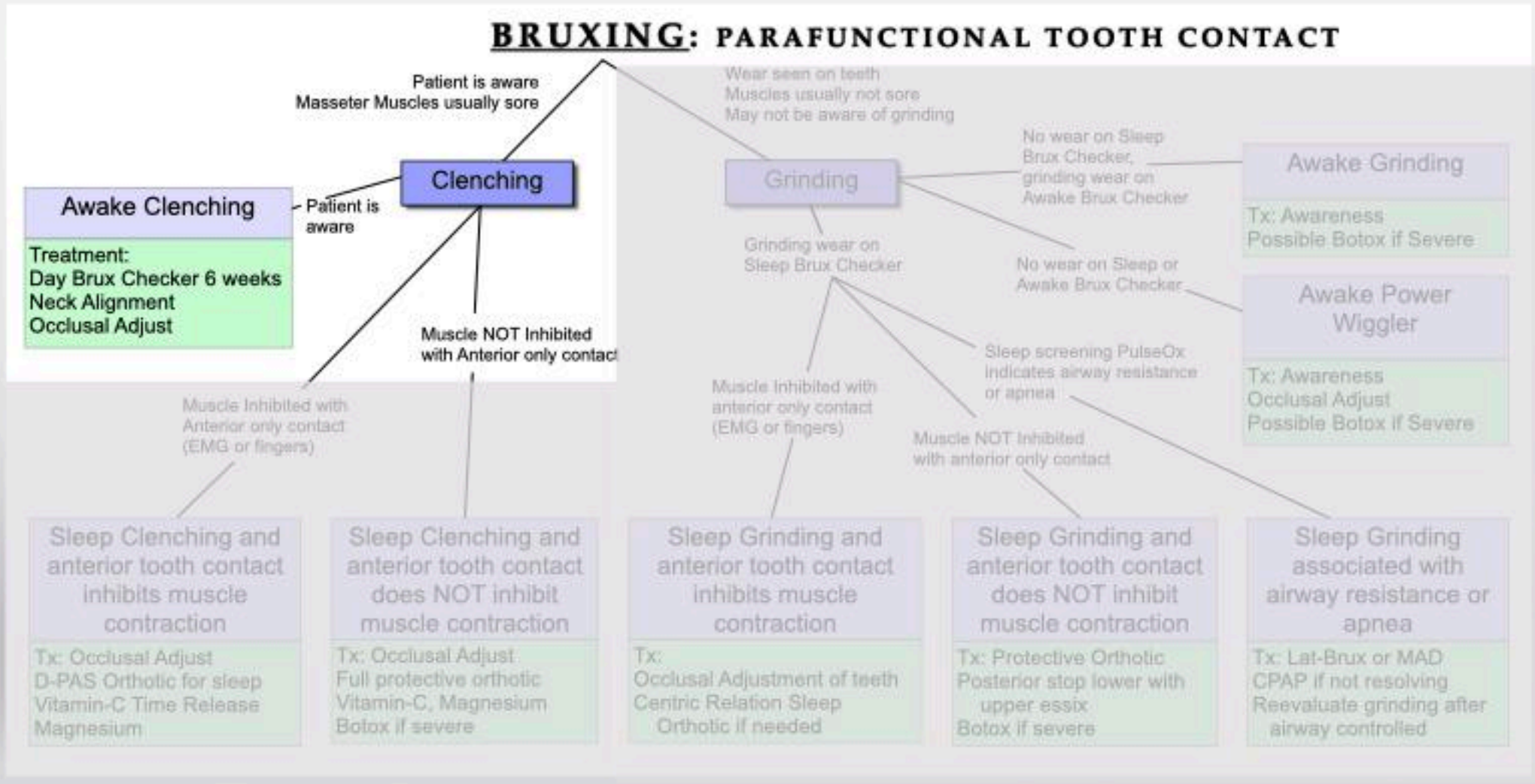
D-PAS Test: Wear 2 weeks, Day and Night

Better- Decrease Symptoms
Sleep Clenching: Wear D-PAS as night guard
Occlusal Muscle Disharmony: Occlusal Adjust

Worse- Increase Symptoms
Mechanically Unstable TMJ (Joint subluxation)
Intracapsular Problem TMJ

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




BRUXING: PARAFUNCTIONAL TOOTH CONTACT
Patient is aware
Masseter Muscles usually sore
Clenching
Awake Clenching
Patient is aware
Treatment:
Day Brux Checker 6 weeks
Neck Alignment
Occlusal Adjust
Muscle NOT Inhibited with Anterior only contact
Muscle Inhibited with Anterior only contact (EMG or fingers)
Sleep Clenching and anterior tooth contact inhibits muscle contraction
Tx: Occlusal Adjust
D-PAS Orthotic for sleep
Vitamin-C Time Release
Magnesium
Sleep Clenching and anterior tooth contact does NOT inhibit muscle contraction
Tx: Occlusal Adjust
Full protective orthotic
Vitamin-C, Magnesium
Botox if severe
Wear seen on teeth
Muscles usually not sore
May not be aware of grinding
Grinding
No wear on Sleep Brux Checker, grinding wear on Awake Brux Checker
Awake Grinding
Tx: Awareness
Possible Botox if Severe
Grinding wear on Sleep Brux Checker
No wear on Sleep or Awake Brux Checker
Awake Power Wiggler
Tx: Awareness
Occlusal Adjust
Possible Botox if Severe
Sleep screening PulseOx indicates airway resistance or apnea
Muscle Inhibited with anterior only contact (EMG or fingers)
Muscle NOT Inhibited with anterior only contact
Sleep Grinding and anterior tooth contact inhibits muscle contraction
Tx:
Occlusal Adjustment of teeth
Centric Relation Sleep Orthotic if needed
Sleep Grinding and anterior tooth contact does NOT inhibit muscle contraction
Tx: Protective Orthotic
Posterior stop lower with upper essix
Botox if severe
Sleep Grinding associated with airway resistance or apnea
Tx: Lat-Brux or MAD
CPAP if not resolving
Reevaluate grinding after airway controlled

Daytime Clenching- Clear Brux Checker

Increases awareness to break habit

Very thin: Similar to mylar used for composites

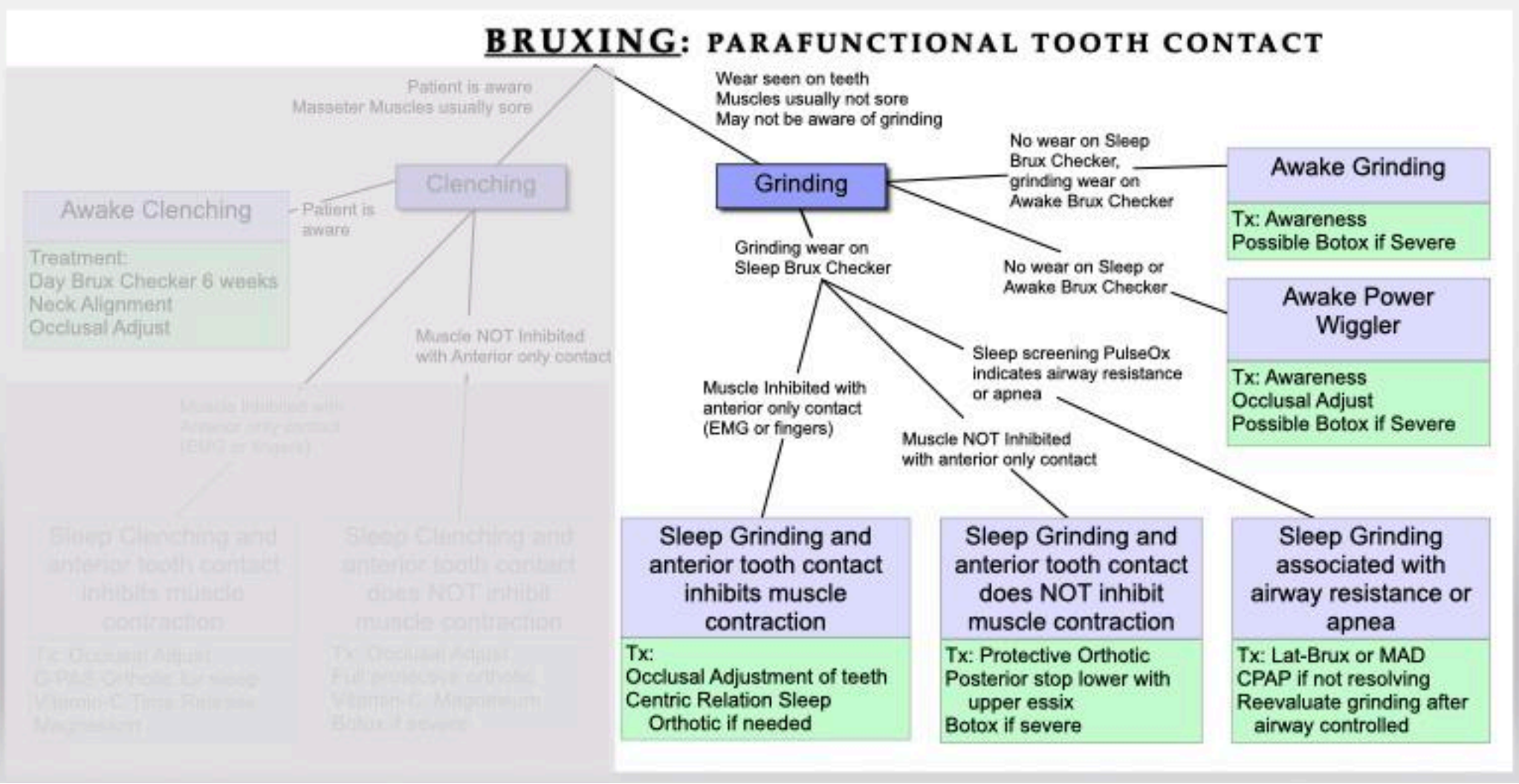
50 µm thick

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

Material from:
Great Lakes Orthodontics
Platzhalterfolie by Scheu
Scheu Ref # 3202.1

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 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


BRUXING: PARAFUNCTIONAL TOOTH CONTACT
Wear seen on teeth
Muscles usually not sore
May not be aware of grinding
Grinding
No wear on Sleep Brux Checker, grinding wear on Awake Brux Checker
Awake Grinding
Tx: Awareness
Possible Botox if Severe
Grinding wear on Sleep Brux Checker
No wear on Sleep or Awake Brux Checker
Awake Power Wiggler
Tx: Awareness
Occlusal Adjust
Possible Botox if Severe
Sleep screening PulseOx indicates airway resistance or apnea
Muscle Inhibited with anterior only contact (EMG or fingers)
Muscle NOT Inhibited with anterior only contact
Sleep Grinding and anterior tooth contact inhibits muscle contraction
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Occlusal Adjustment of teeth
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Sleep Grinding and anterior tooth contact does NOT inhibit muscle contraction
Tx: Protective Orthotic
Posterior stop lower with upper essix
Botox if severe
Sleep Grinding associated with airway resistance or apnea
Tx: Lat-Brux or MAD
CPAP if not resolving
Reevaluate grinding after airway controlled

Clenchers destroy the joint,
Grinders destroy the teeth

<u>Clenching</u>
Painful Muscles
Patient is usually aware of clenching
Fremitus
Strong Masseters
See slight wear around tooth contacts
Damage TMJ cartilage

If patient is unaware of clenching-
Plant seed at hygiene visit
Do you clench?

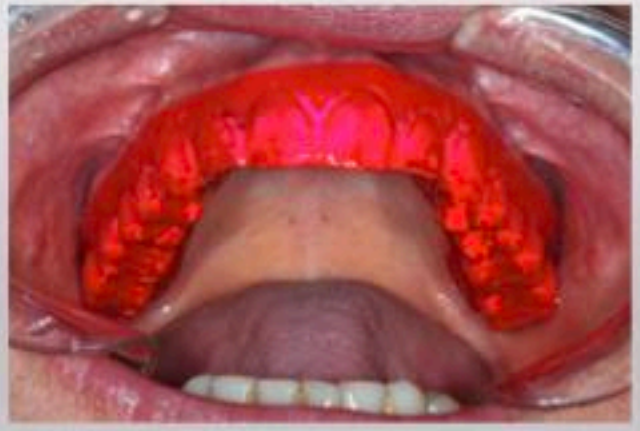
<u>Grinding</u>
See tooth wear
Patient is usually not aware
Buttressing bone if teeth are tight
If tooth mobility, on excursions
Strong Masseters
Slight if any soreness muscles
Usually no muscle pain

Parker Mahan-
"Women Hurt, Men destroy"

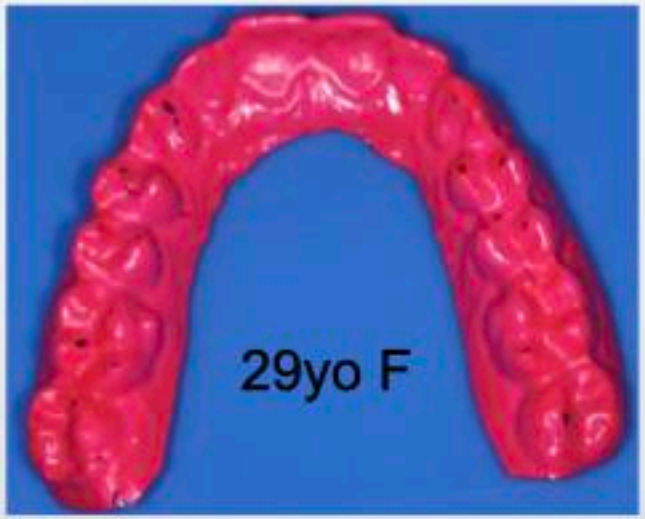
2. Does this occur awake or asleep?

Brux Checker
Great Lakes Orthodontics

0.1mm Mylar



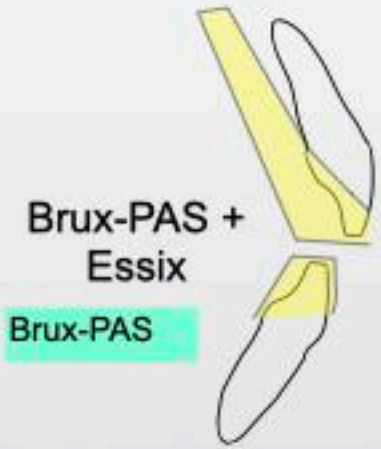
Made on Biostar Machine



Which Occlusal Orthotic for Grinding?

Lower Posterior Stop with upper essix

Upper Hard CR Orthotic



Lat-Brux
Great Lakes Ortho

Nylon Herbst
Great Lakes Ortho

APS
ArrowPath Sleep

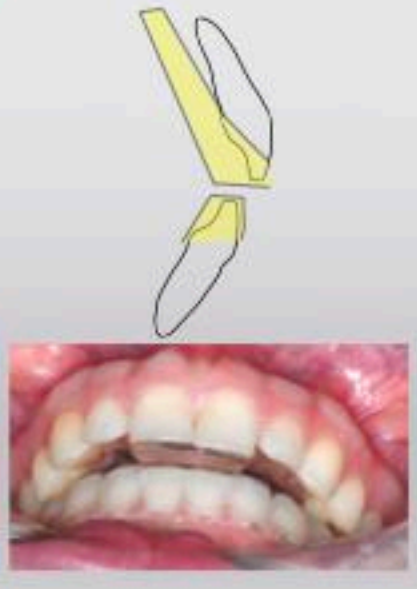
LIVING TREE DENTAL LAB

Nate Brock, CDT
(865) 509-4509
connect@livingtreelab.com

3D Printed Orthotics

D-PAS
Diagnostic-
Palatal Anterior Stop

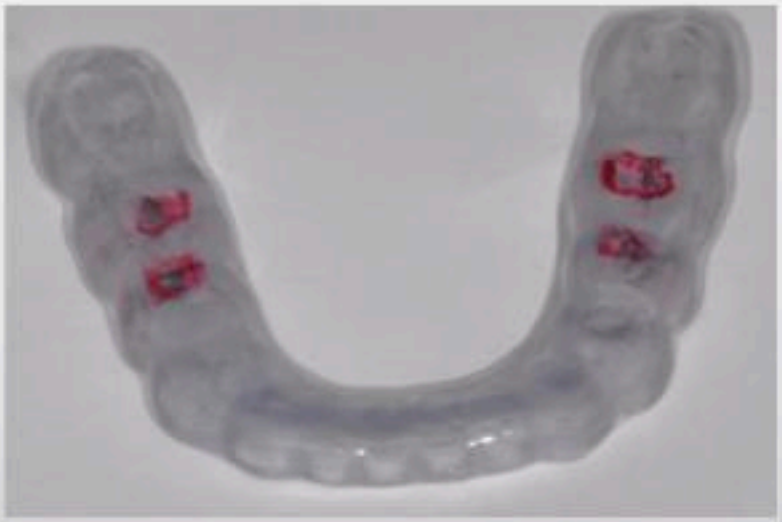
Brux-PAS
with lower Essix



Hard Lower Posterior Stop
with upper essix

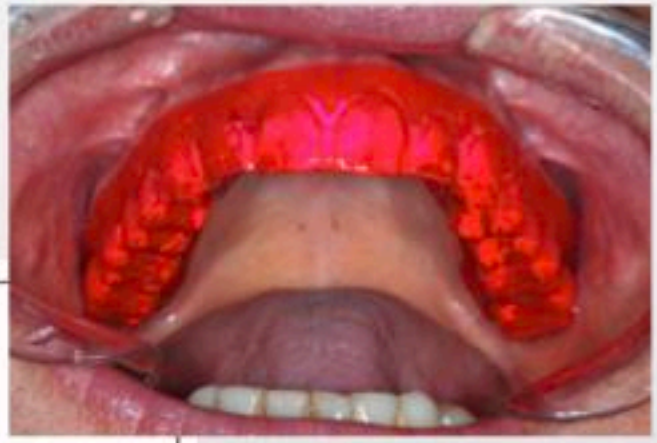
Hard Lower Full Coverage
Centric Relation Orthotic

Lower Posterior Stop Night guard with upper Essix

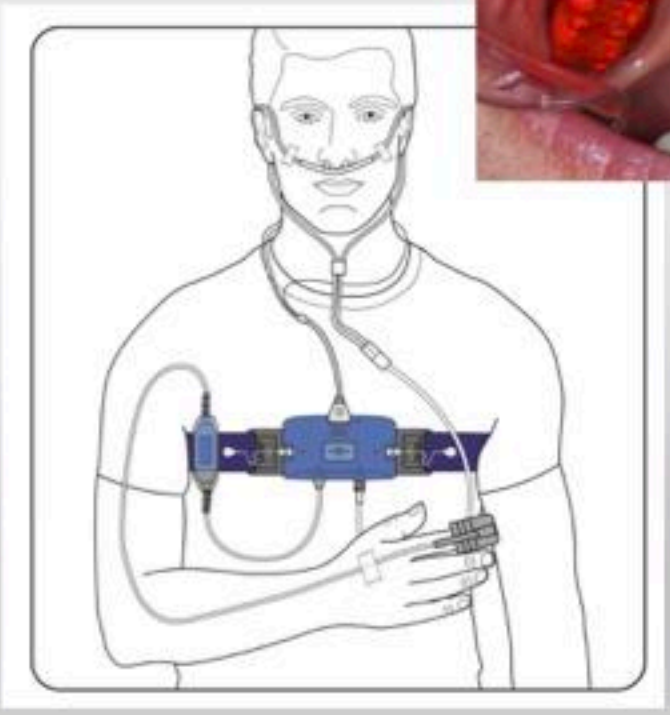


zMachine

zMachine + Brux Checker
+ Snore Lab



GENERAL sleep



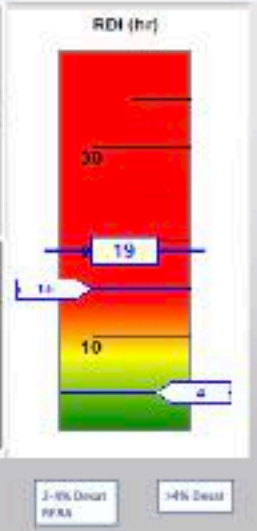
Call (888) 330-4424
Use Code: DROTER to receive special offer

Also ask for access to Droter Modified Report

Treating Common TMDs in a General Practice

Management

Diagnosis	Pattern	Treatment
Sleep Grinding Airway Related	Worn Teeth Upper Airway Resistance	Mandibular Advancement Appliance (after MD approves)



Pulse Ox Screening

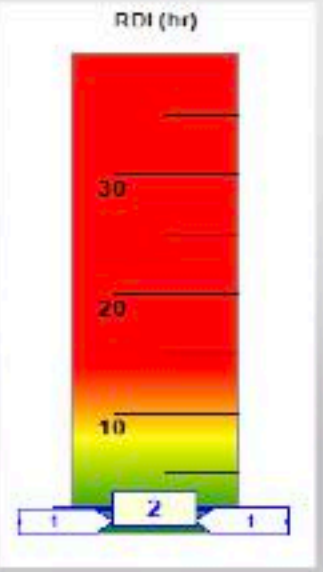
Refer to Medical Sleep Doctor

Get approval for Mandibular Advancement Appliance

Verify Airway Improves

19 events/hr before

2 events/hr with Orthotic



PULSOX 300i, Konica Minolta
with data analysis Patient Safety, Inc.

Nylon MAD
Great Lakes Ortho

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

Occlusal Muscle Disharmony

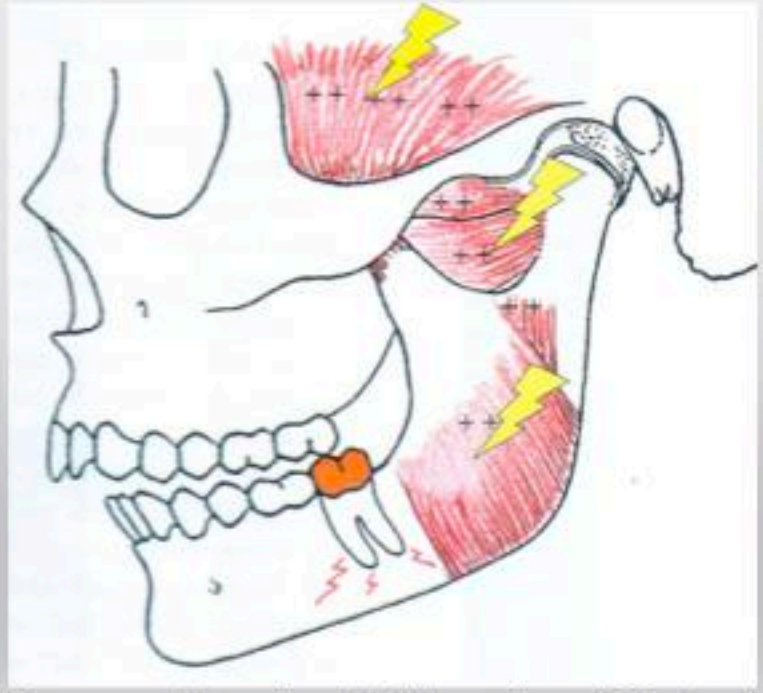
Uneven tooth contact with condyles fully seated triggers muscle activity

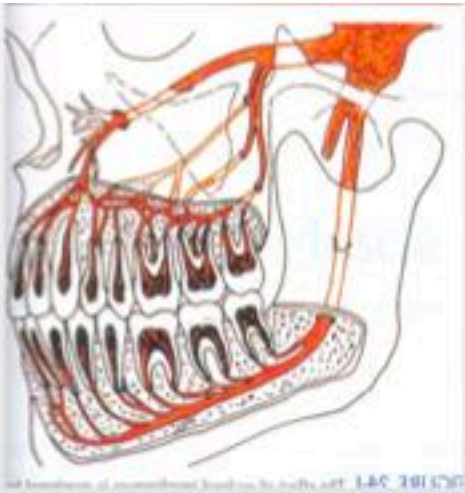
Lateral pterygoid fires out of sequence to create even tooth contact on closure

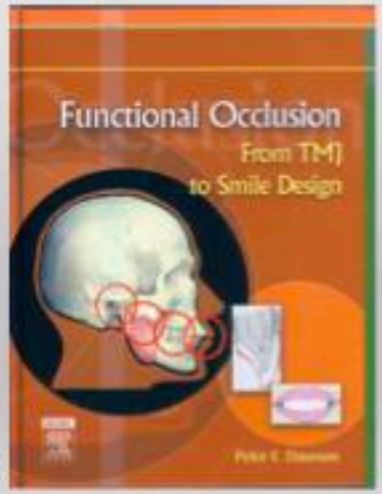
Disharmony in all muscles: Splinting/Bracing

Muscles sore from overuse

Muscles do not think- CNS input

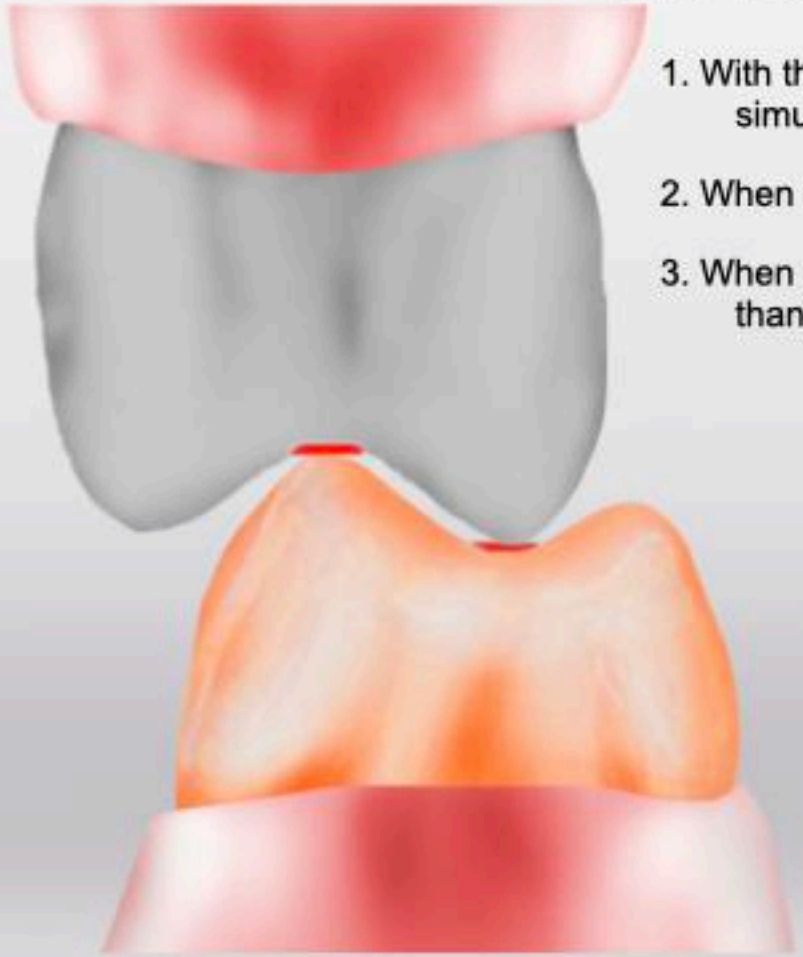






from Dawson's Textbook, "Functional Occlusion"

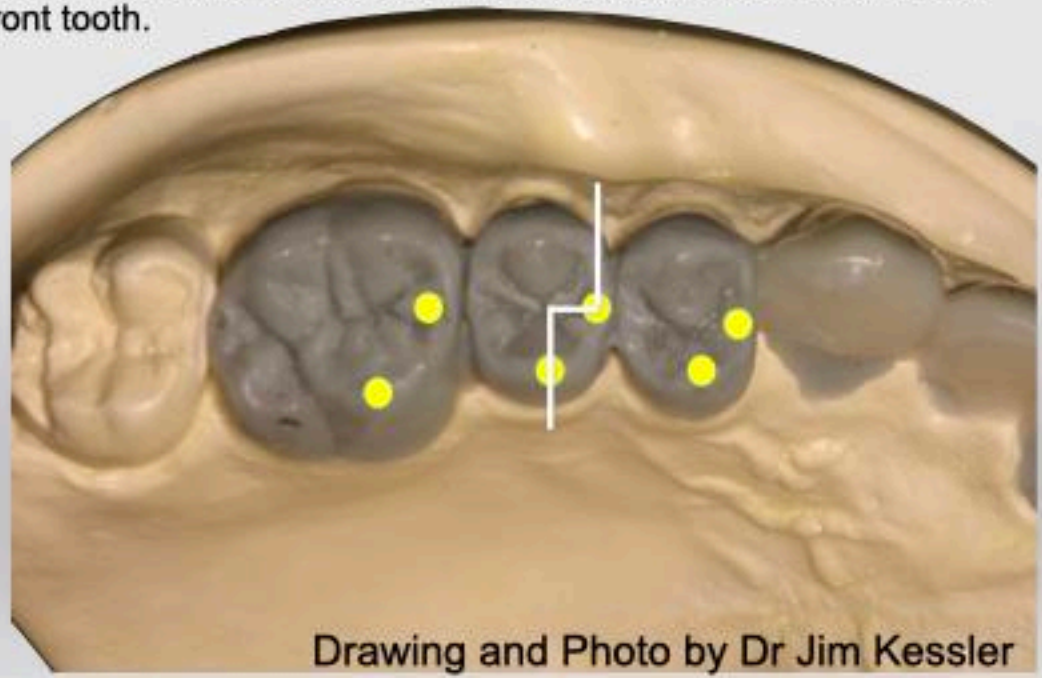
LD Pankey's 3 Rules of Occlusion (Clyde Schuyler)



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).

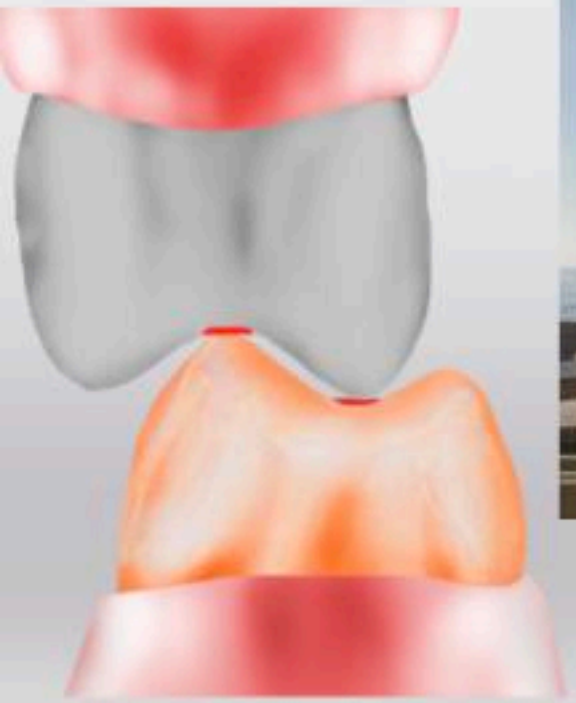
3. When you move the mandible in any excursion, no back tooth hits before, harder than, or after a front tooth.



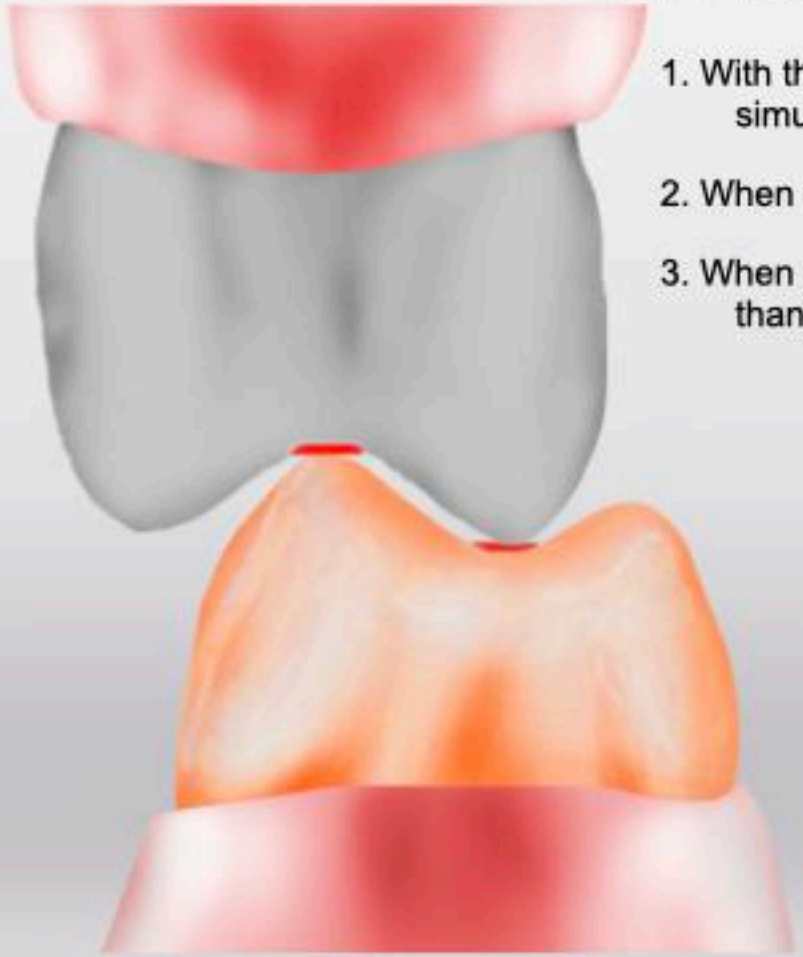
Drawing and Photo by Dr Jim Kessler

2. When you squeeze, neither a tooth nor the mandible moves (in a lateral direction).

Rule #2 = Flat Landing Area



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



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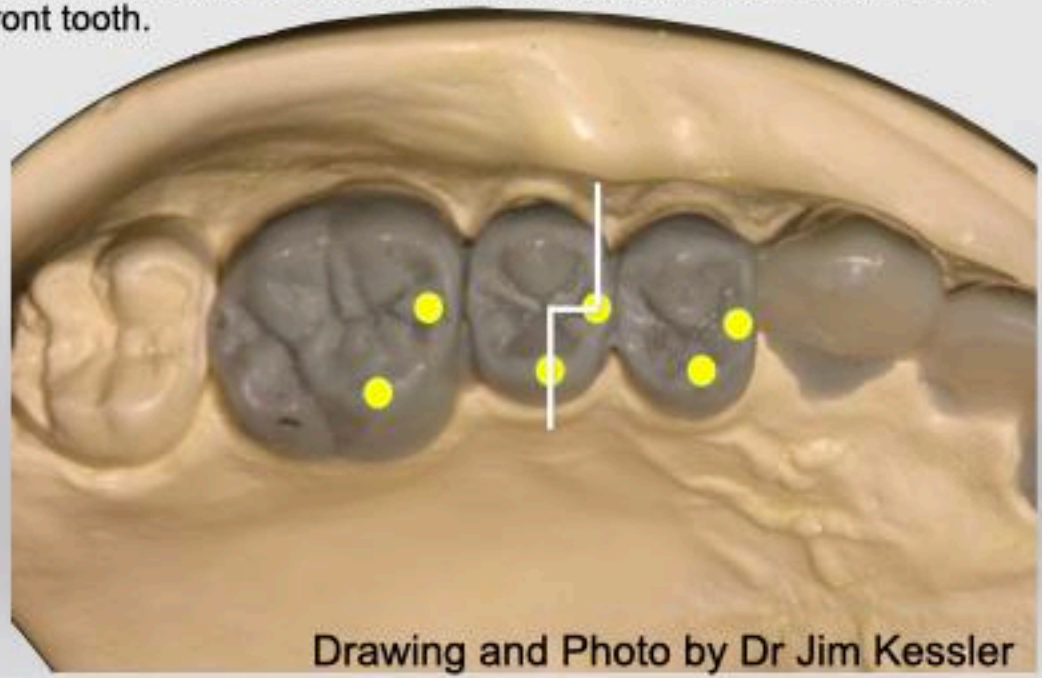
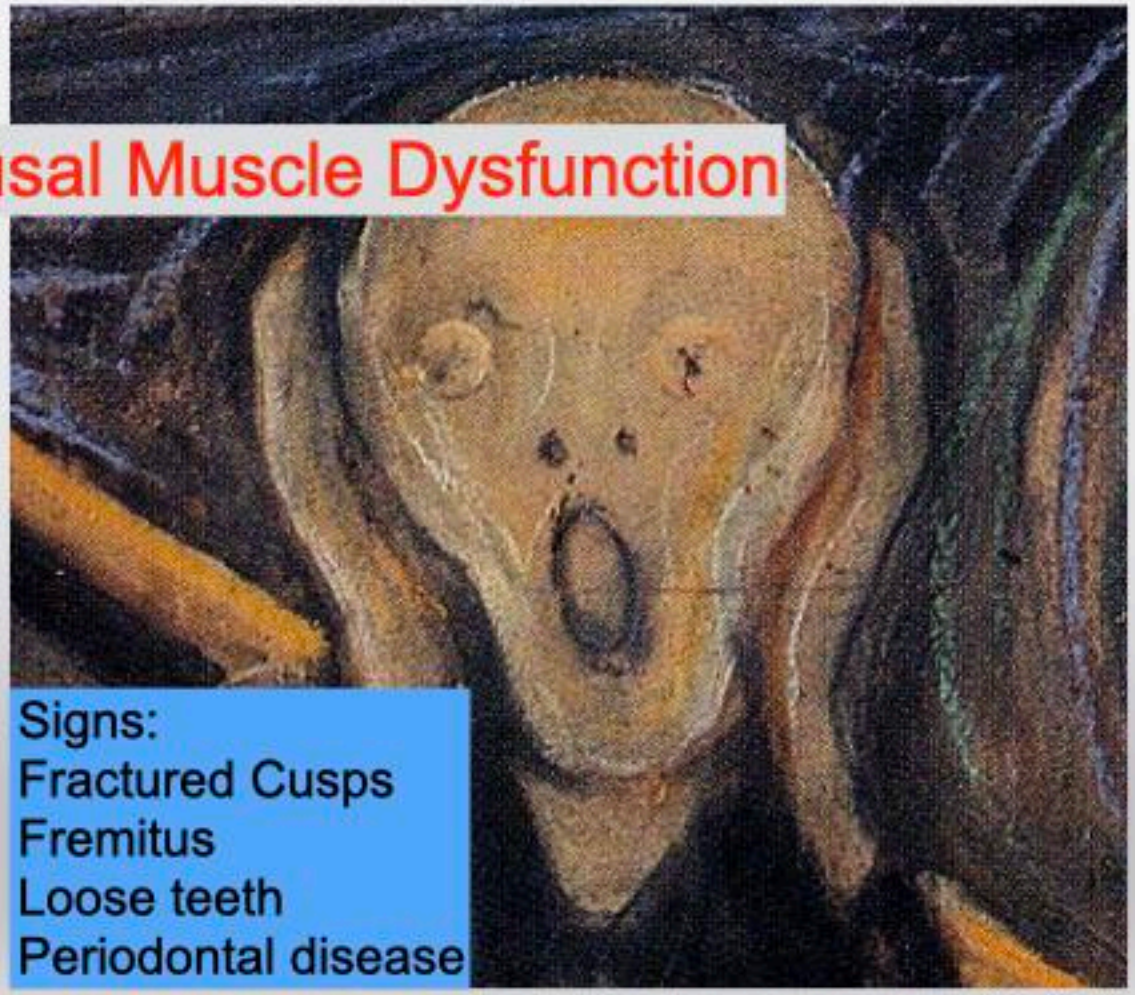


Drawing and Photo by Dr Jim Kessler

TMD Symptoms

Sore TM Joint
Sore TMJ muscles
Difficulty chewing
Headaches
Eye pain
Ear pain
TMJ clicking
Jaw locking
Limited opening
Difficulty open jaw
Difficulty closing jaw
Anterior Open Bite

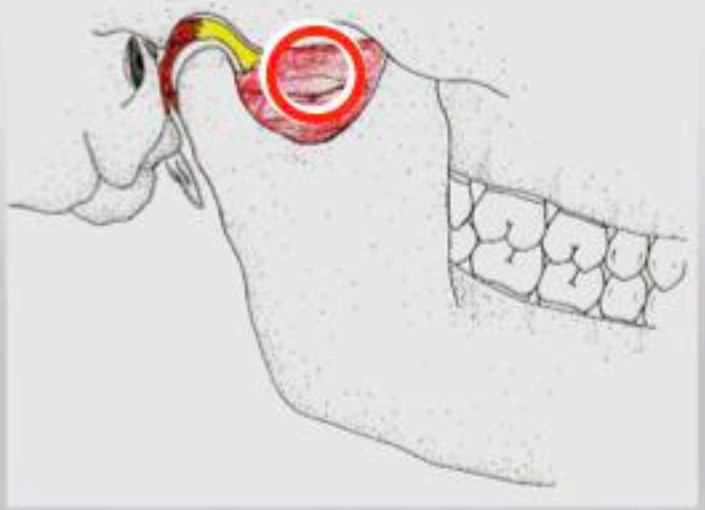
Occlusal Muscle Dysfunction

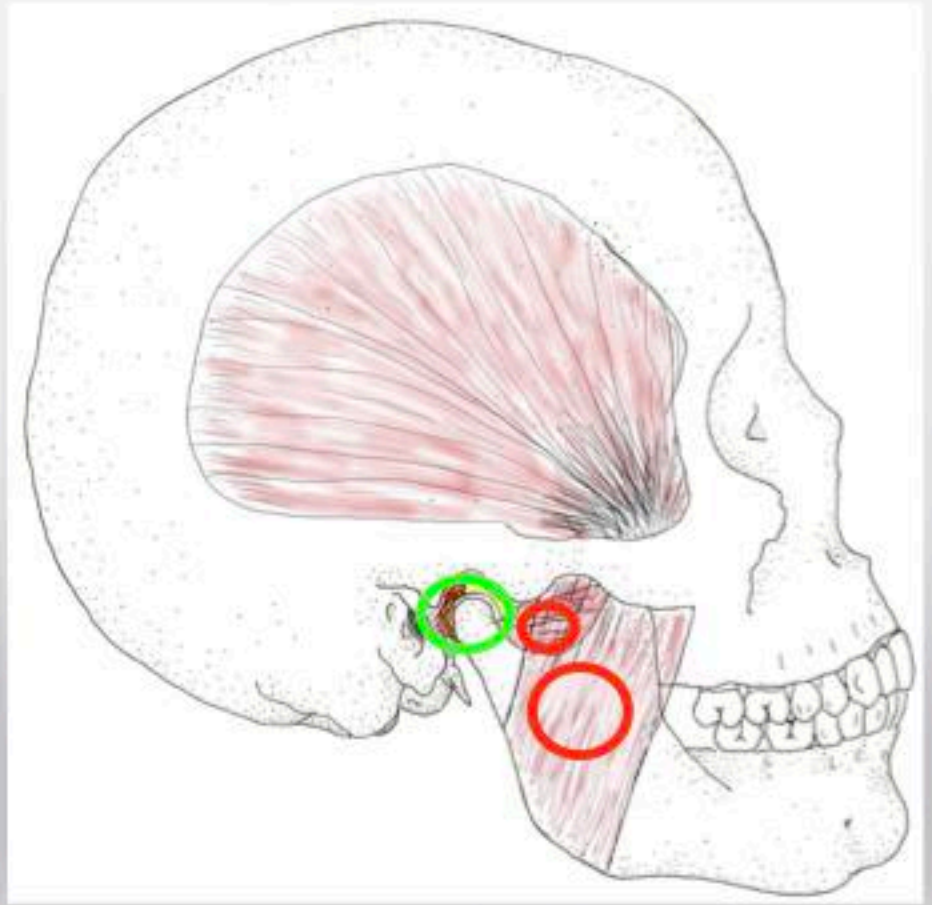


Signs:
Fractured Cusps
Fremitus
Loose teeth
Periodontal disease

Occlusal Muscle Dysfunction Pattern

Sore muscles when chewing
Sore Lateral Pterygoid
TMJ is not sore
Day orthotic relieves symptoms





Drawings by Gretta Tomb DDS and John Droter DDS

Occlusal Muscle Dysfunction Diagnostic Tests

Occlusal Muscle Dysfunction is a daytime problem

Clenching can be both a daytime and nighttime problem

D-PAS 2 week trial

OR

3-6 week lower CR orthotic

>30% of headaches have an occlusal component

Occlusal adjustment in patients with craniomandibular disorders including headaches. A 3- and 6-month follow-up. Vallon D, Ekberg E, Nilner M. Acta Odontol Scand. 1995

Response to occlusal treatment in headache patients previously treated by mock occlusal adjustment. Forssell H, Kirveskari P, Kangasniemi P. Acta Odontol Scand. 1987

Diagnostic Palatal Anterior Stop

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

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
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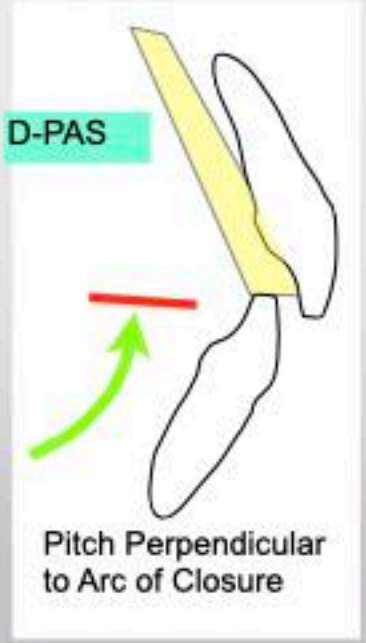

Stapelmann H, Türp JC. The NTI-tss device for the therapy of bruxism, temporomandibular disorders, and headache…..BMC Oral Health. 2008 Jul PMID: 18662411

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(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.

Bonus Rule- Harmonious Anterior Guidance. Cuspid guidance directs the mandible slightly forward, not backward, with smooth cross over from cuspid to anterior teeth. Protrusive contact even on both central incisors.

Bonus Observation- All the above work much better the closer the teeth are to being on the Curve of Spee and Curve of Wilson

Drawing by Dr Jim Kessler

Why LD Never wrote a text book

Slide by Dr John R Droter

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

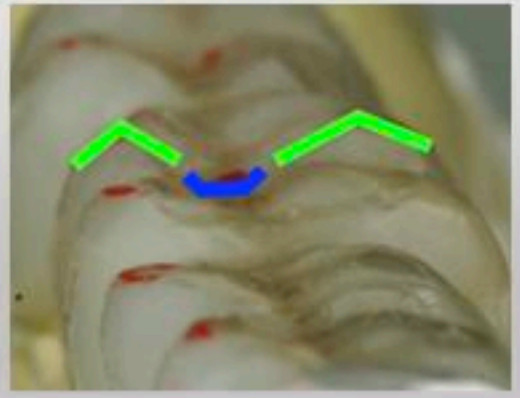
After

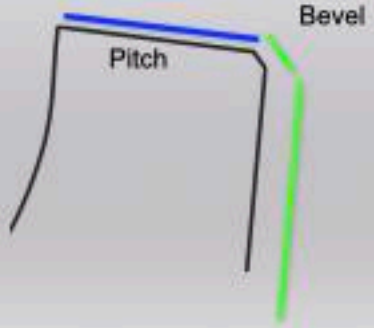
Occlusal Sculpting Tools, including Zirconia

Wheel
- Create Cusp Landing Zone
- Flatten Incisal edges
- Bulk reduction of inclines

Move and Shape Cusps, Inclines, Facial Surfaces

Brassler Brio Shine
FLBCER-1
FLBF-2

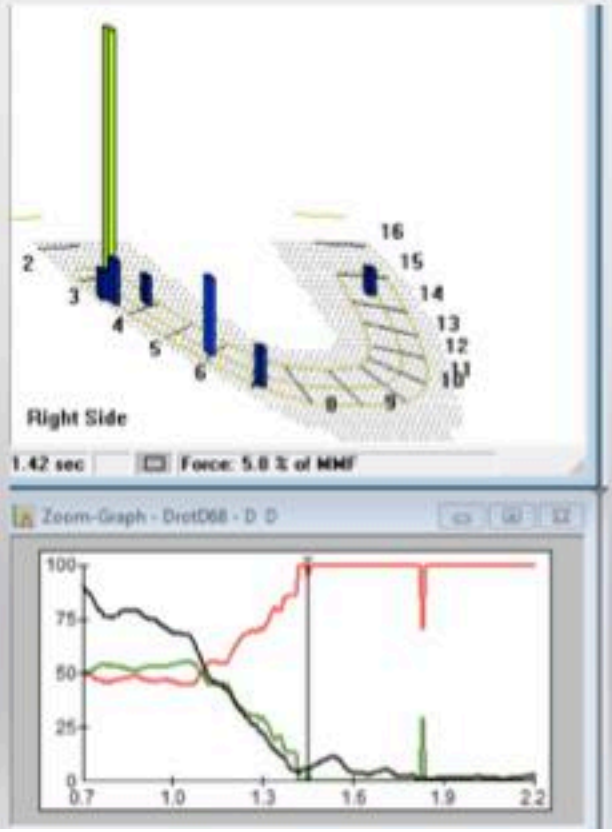




Premier 860.9 F Wheel Diamond
Premier 230 F Barrel Diamond
Neodiamond 1118.7F Roundend taper
Dedco Green Stone
White Arkansas stone
Filtek Supreme- B1B, Albond

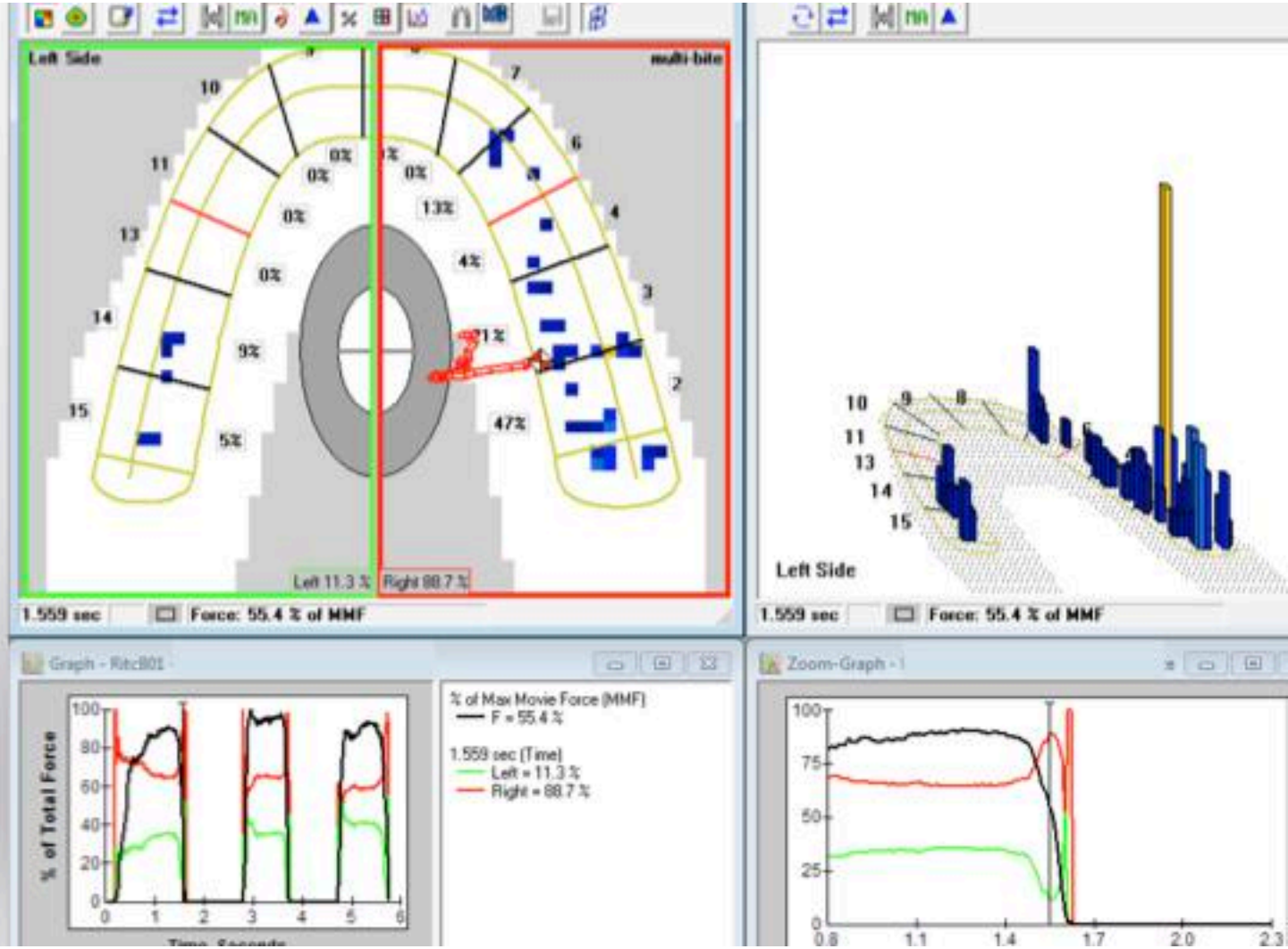
The indispensable value of T-Scan is not in finding heavy CR contacts, but working and nonworking contacts.

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.

T-Scan is excellent for Patient Education of Occlusal Pathology



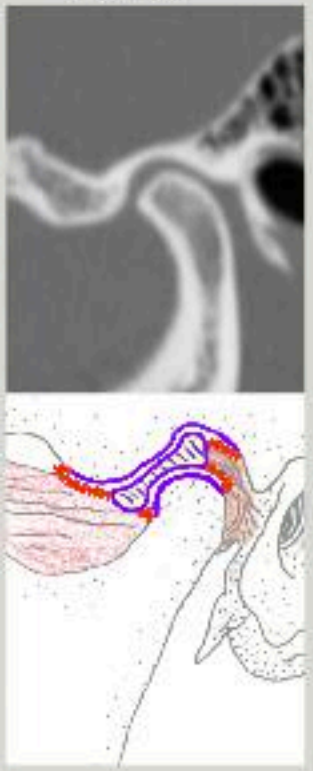
6 Common TMDs

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

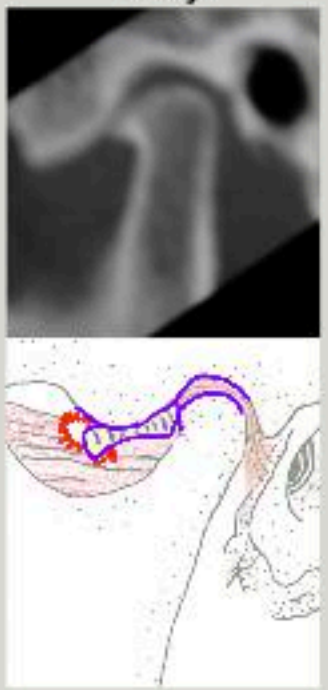
Osteoarthrosis/Osteoarthritis

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.

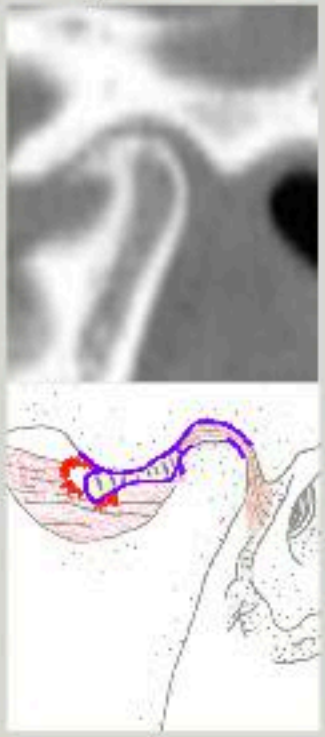
Normal



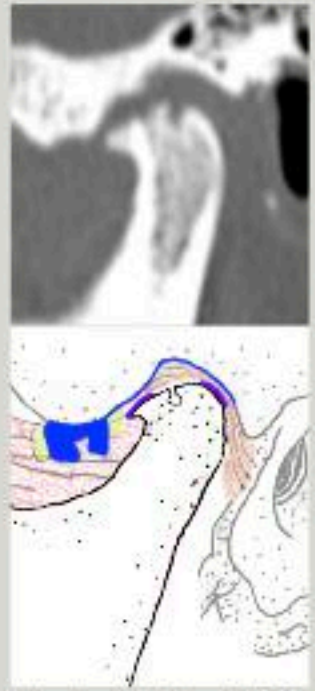
Early



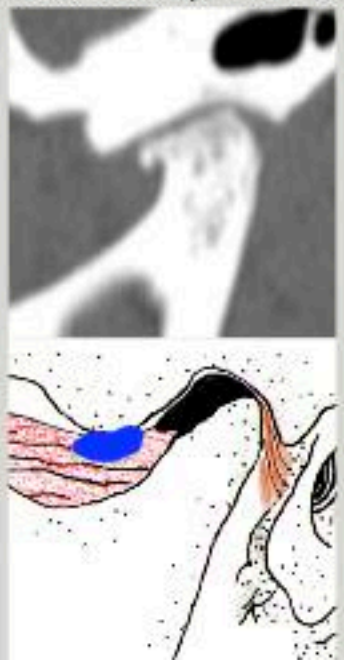
Early/ Moderate



Moderate



Severe OA, Eburnation



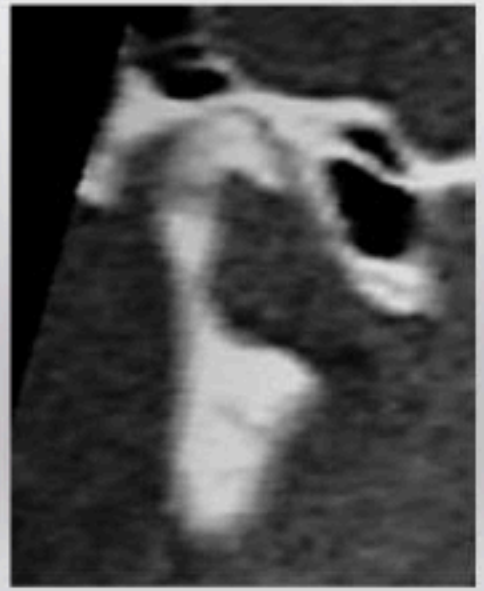
Representative examples of OA
in different patients

Drawings by Gretta Tomb DDS and John Droter DDS

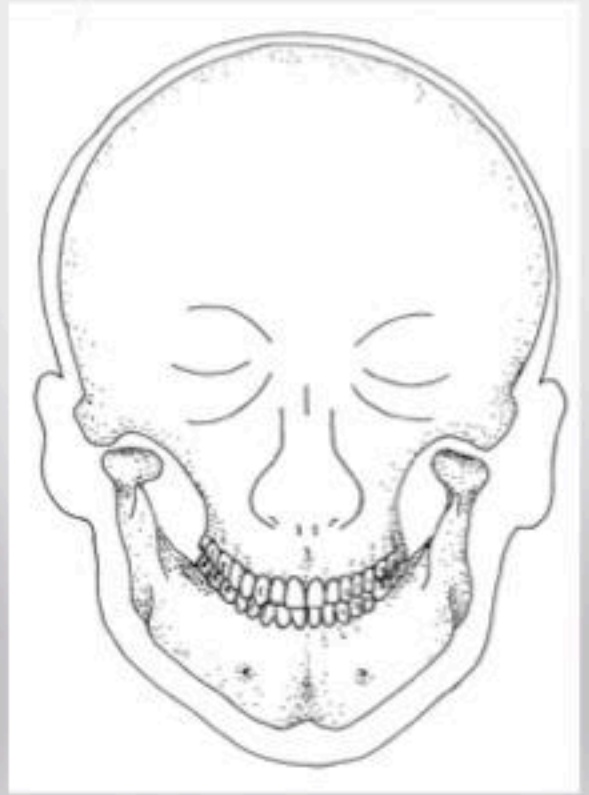
Adaptation Chronic Bilateral Osteoarthrosis

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

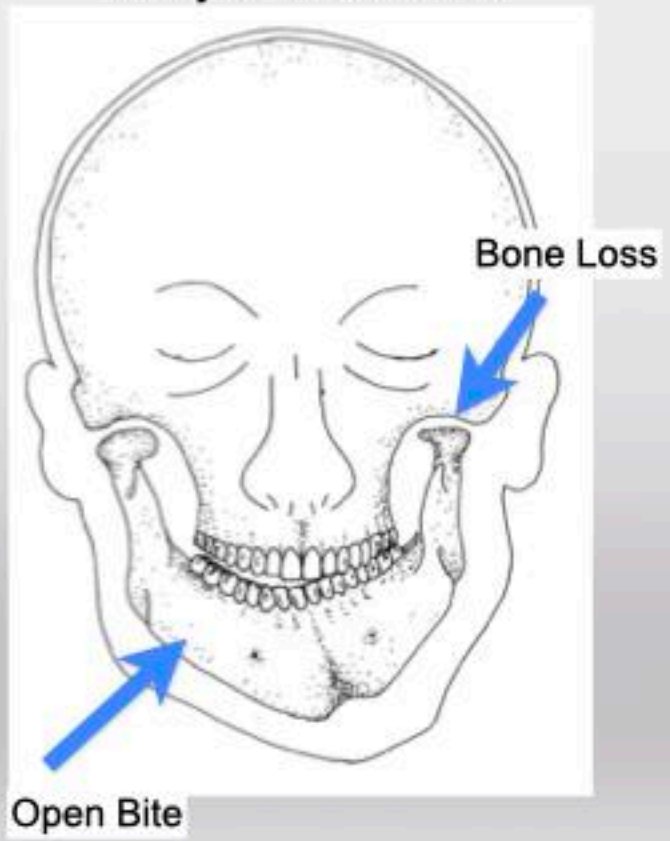
OA Right and Left Bone Loss
#8 Ankylosed



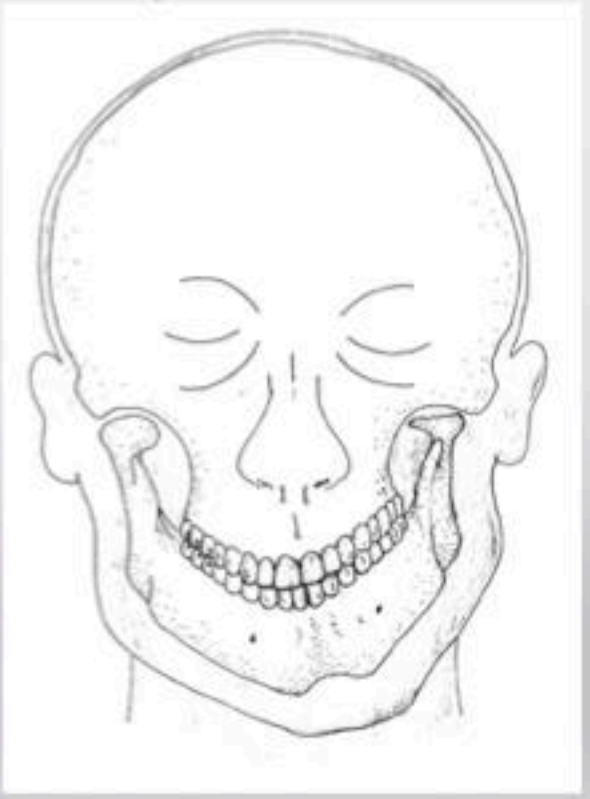
Diseases that cause bone loss in the TMJ alter the Occlusion



Condylar Bone Loss



Adaptation Over Time



Drawings by Gretta Tomb, DDS

Treatment OA

Osteoarthr**osis**

Glucosamine 1500mg /Chondroitin 600 mg per day
Minimize parafunction:
If sleep grinding due to airway
CPAP or Dental Airway Device

Shea Brand CBD

Osteoarthr**itis**

All of the above plus eliminate inflammation……
NSAIDs for 6+ weeks
Cold Laser

If still inflamed arthrocentesis with
Platelet Rich Plasma (PRP)

MLS Laser
9 sessions over 4 weeks

MLS Laser: BioResearch

808 nm Continuous, 905 nm Pulsed

Multiwave Locked System Laser

Diode Laser

Stimulates metabolic processes in cells
Increase release NO from cells
Decrease inflammation
Pain Reduction
Faster Healing
Eliminates Trigger Points
Much better than Dry Needling

Chung, H., Dai, T., Sharma, S. K., Huang, Y.-Y., Carroll, J. D., & Hamblin, M. R. (2012). The nuts and bolts of low-level laser (light) therapy. Annals of Biomedical Engineering, 40(2), 516–533.

Ilbuldu E, Cakmak A, Disci R, Aydin R. Comparison of laser, dry needling, and placebo laser treatments in myofascial pain syndrome. Photomed Laser Surg. 2004 Aug;22(4):306-11.

Treatment OA

Osteoarthr**osis**

- Minimize parafunction:
  - If sleep grinding due to airway:
  - CPAP or Dental Airway Device
- Glucosamine 1500mg /Chondroitin 600 mg per day

If still pain in 6 -12 weeks of NSAID:

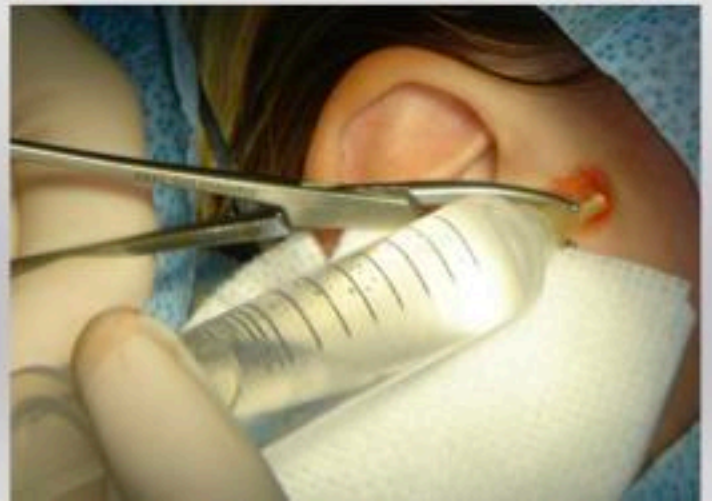
- Arthrocentesis
- Platelet Rich Plasma

Osteoarthr**itis**

All of the above plus eliminate inflammation……

- NSAIDs
- Cold Laser

If still inflamed arthrocentesis with Platelet Rich Plasma (PRP)



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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

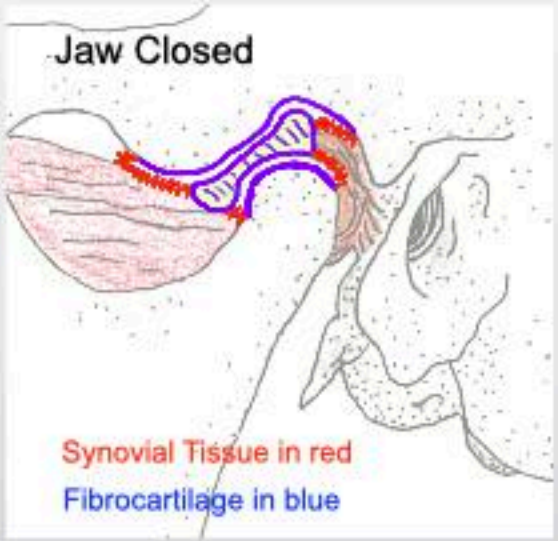
TMD Symptoms

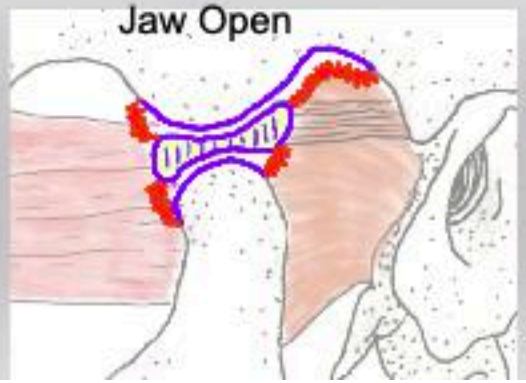
Limited Opening

Diseases to consider and rule out:

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

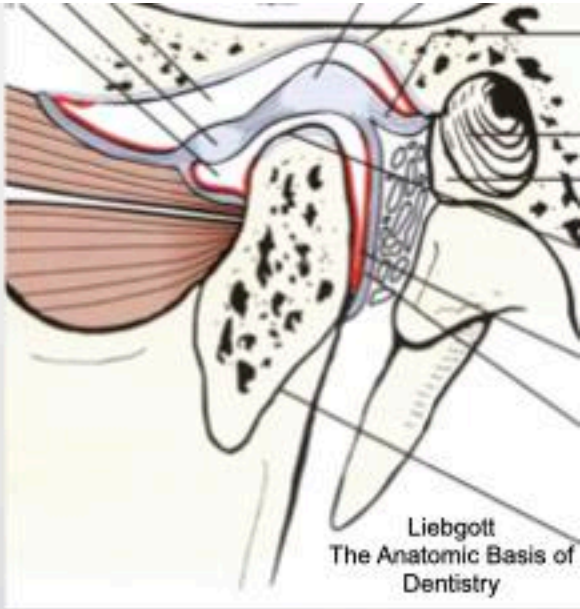
Normal TMJ- Synovium, Cartilage

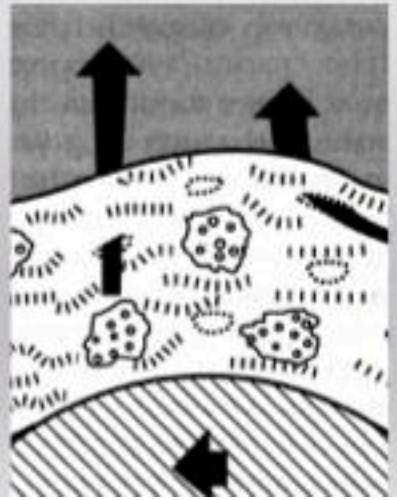




Fibrocartilage-
- Slope of Eminence
- Disc
- Top of Condyle

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

Differential Diagnosis: Limited Joint Motion

Muscle Spasm

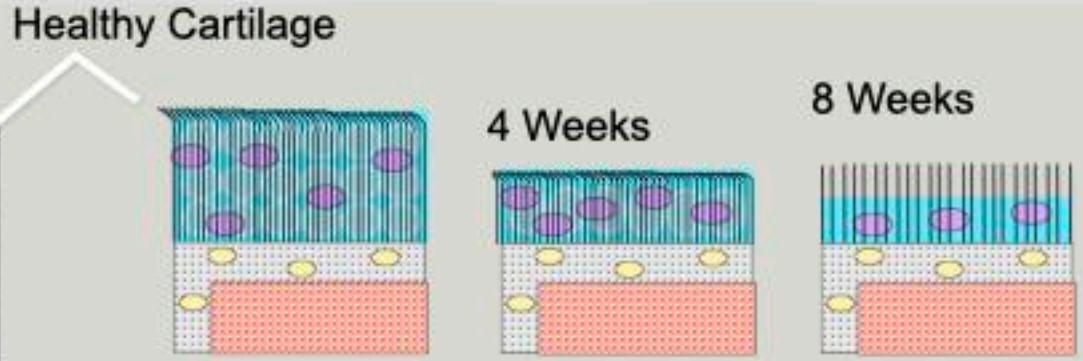
Painful to Move
- Joint Pain
- Muscle Pain

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

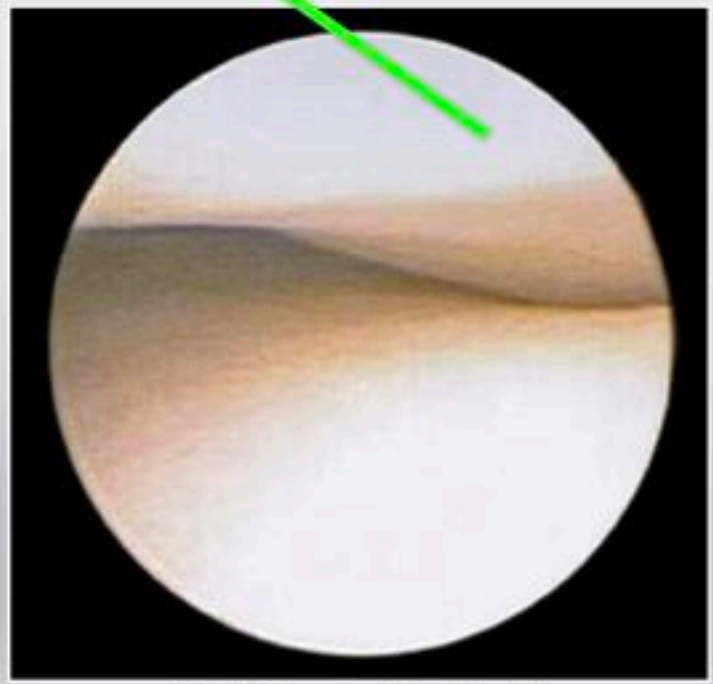


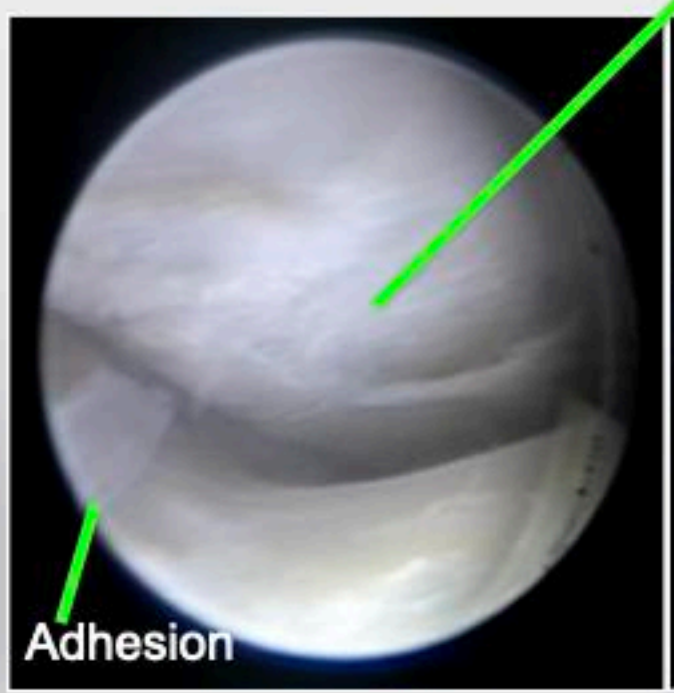
E.B. Evans, GWN Eggers, J.K. Butler, and J. Blumel, Experimental immobilization and remobilization of rat knee joints, J Bone Joint Surg Am, 1960 vol. 42 (5) pp. 737-758
Enneking WF, Horowitz M. The intra-articular effects of immobilization on the human knee. J Bone Joint Surg Am. 1972 Jul;54(5):973-85.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

Arthroscopic View Left TMJ

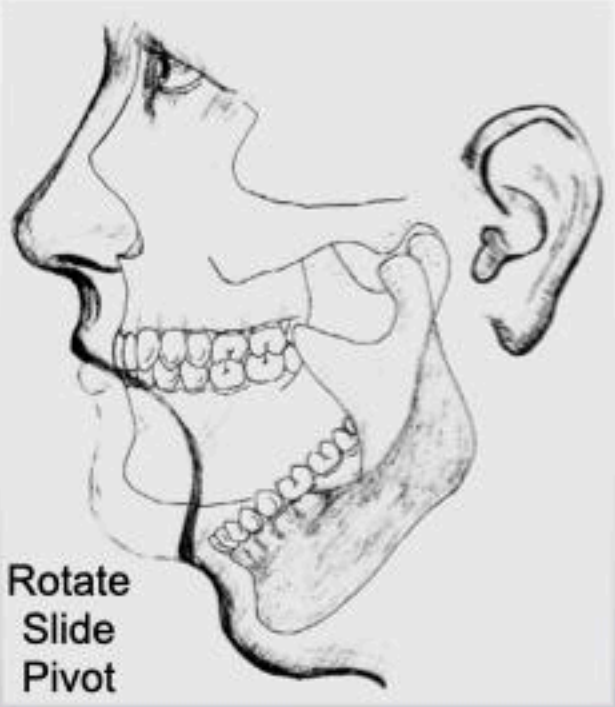
Eminence Healthy Cartilage

Eminence Necrotic Cartilage





Not Same Patient

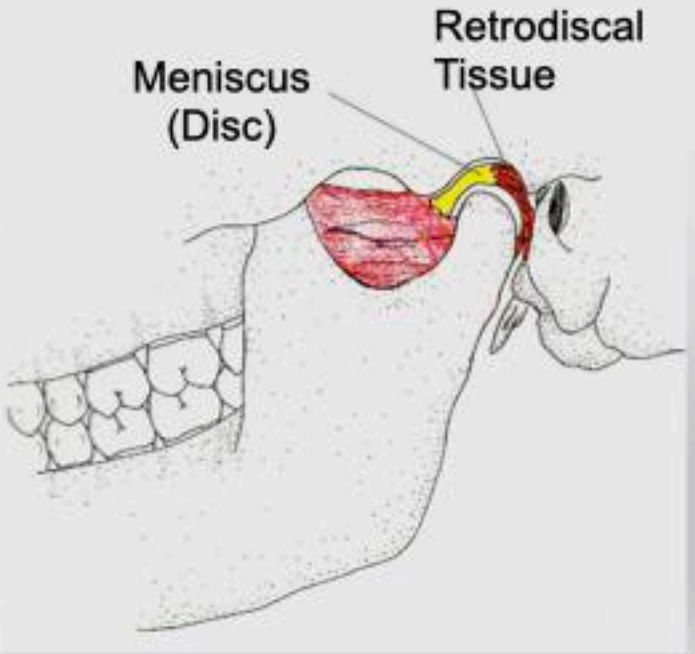


Rotation only 25mm

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

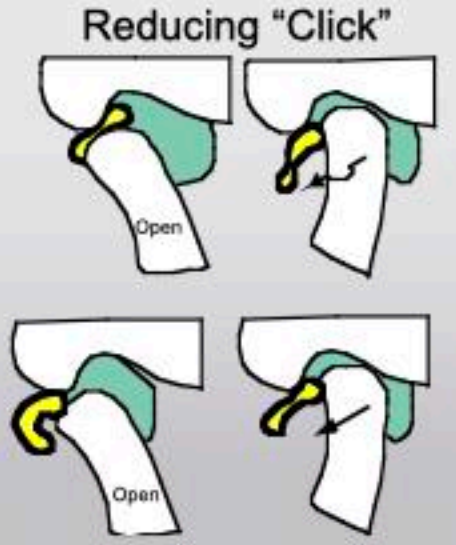
TMJ has 2 Joint Compartments:

Upper- Translation
Lower- Rotation



Acute non-Reducing Disc Limits Translation.

"Old Adapted" may have full range of motion.



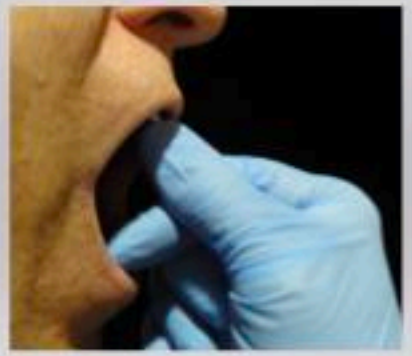
Limited Opening Algorithm

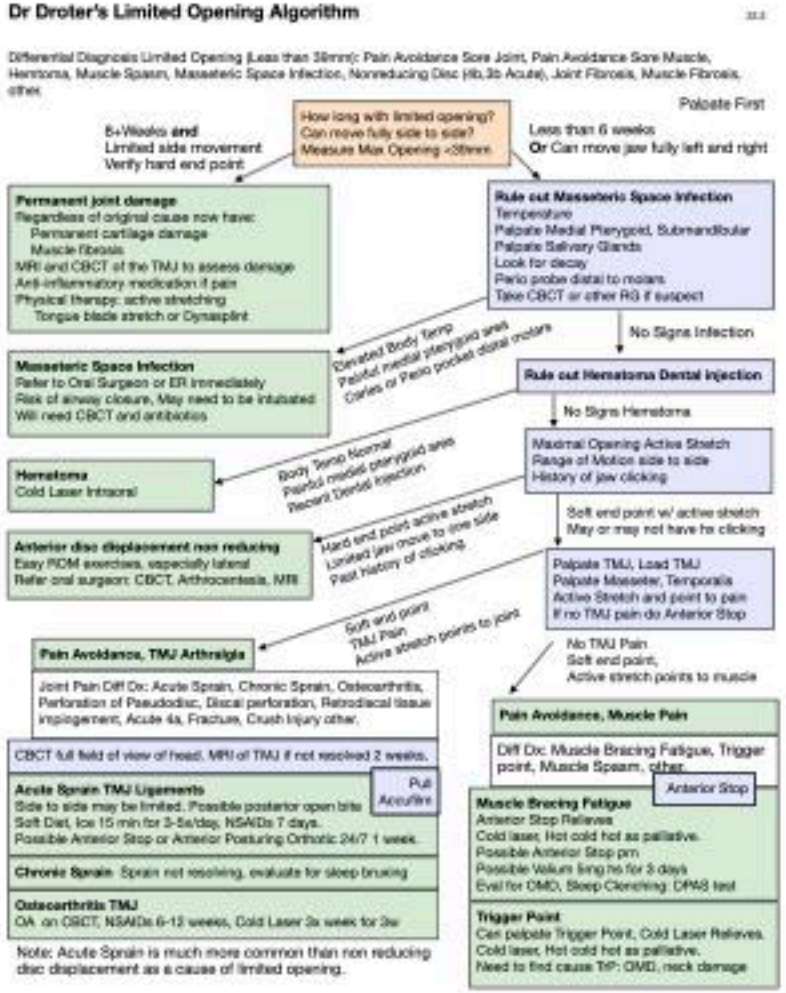
Differential Diagnosis Limited Opening:

- 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





Subjective:

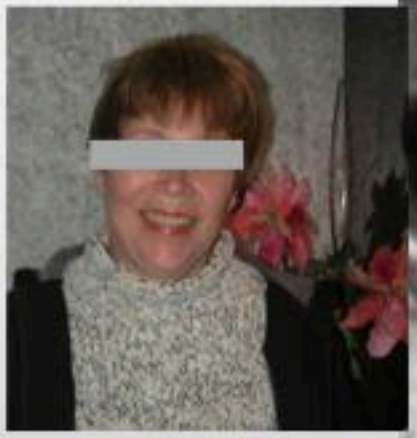
- Dentist doing crown prep #30 1 week ago
- Severe pain Right TMJ after moving jaw at end of appt
- Constant deep pain Right TMJ
- Limited opening

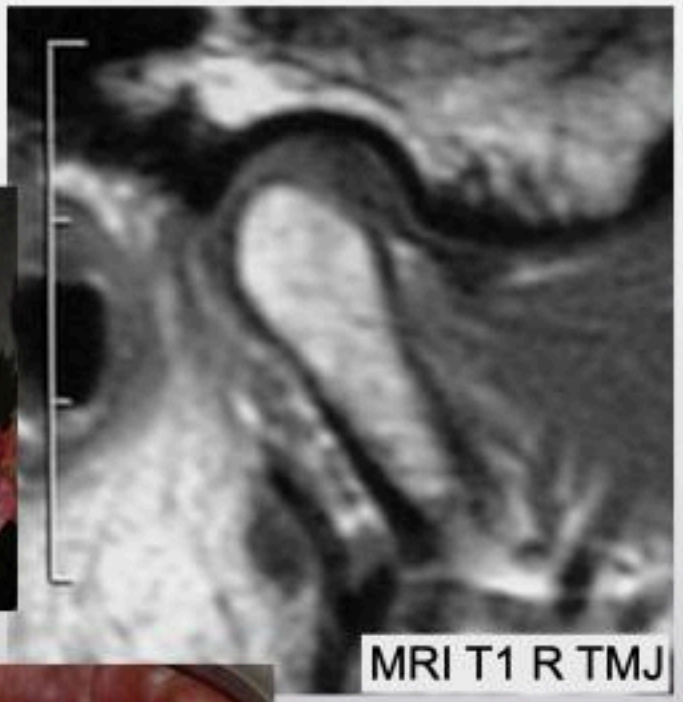
Objective:

- 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



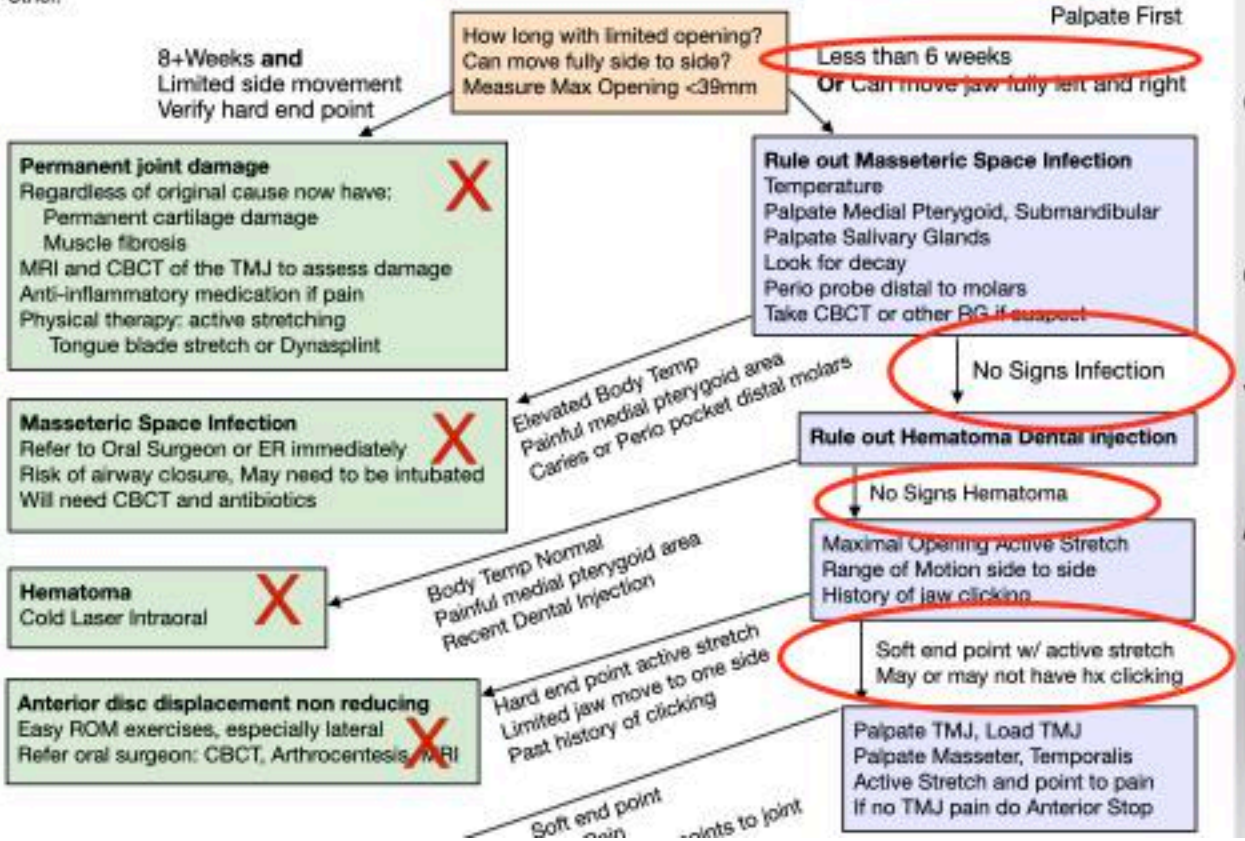


MRI T1 R TMJ

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

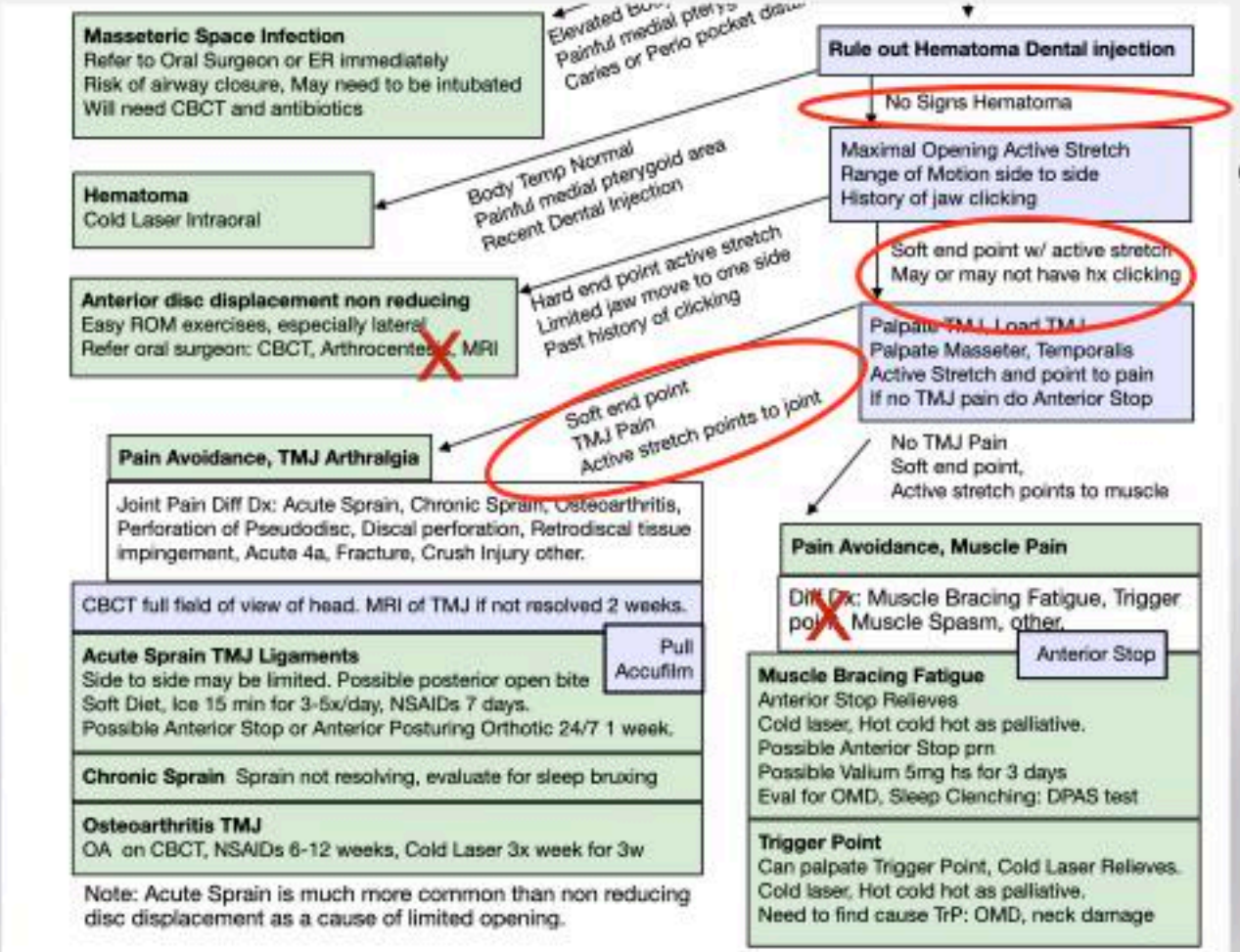
98 temp, normal perio probe 2nd molars, no caries

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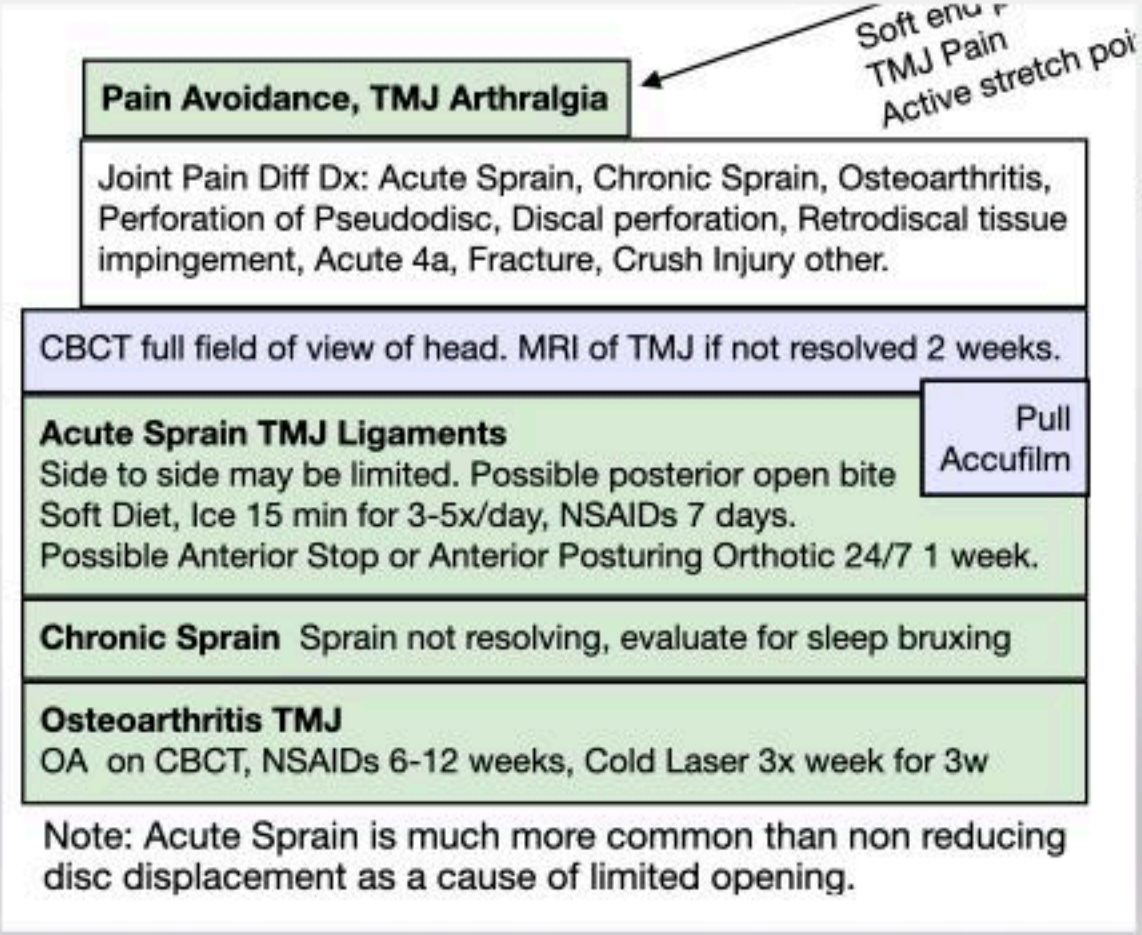


Objective:

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

Right posterior openbite 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

Verify Orthotic does not rub lingual tissue of mandible

At 4 weeks patient had full ROM
No clicking

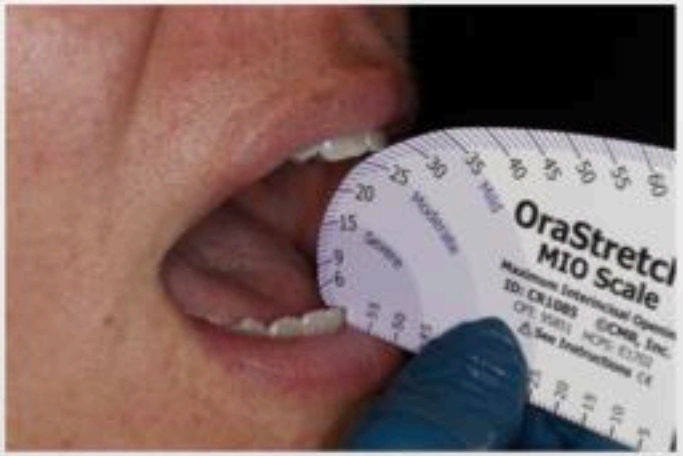
New addition to protocol
Cold Laser (MLS Laser- 1500 hz 15 seconds, 10 hz 30 seconds)

Subjective:

Finished Invisalign 1 year ago
Has been clenching her teeth
Months ago jaw started cling in the morning on waking
8 weeks ago pain right jaw joint, could not open all the way
Motrin 800 mg upset stomach

Objective:

Limited opening 25, Mandible shifts right
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, 35mm, R TMJ pain
Right TMJ pain to palpation, Left TMJ normal
Posterior cross bite on left



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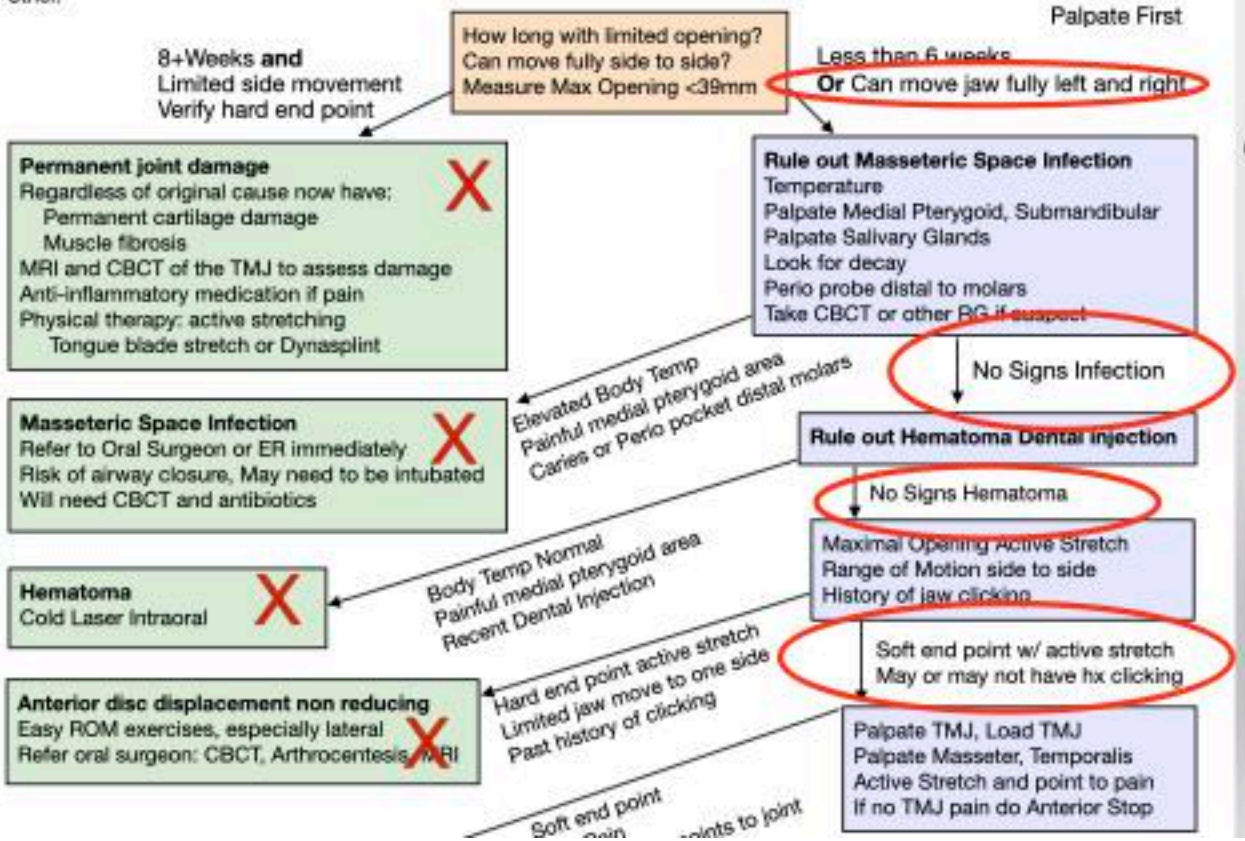

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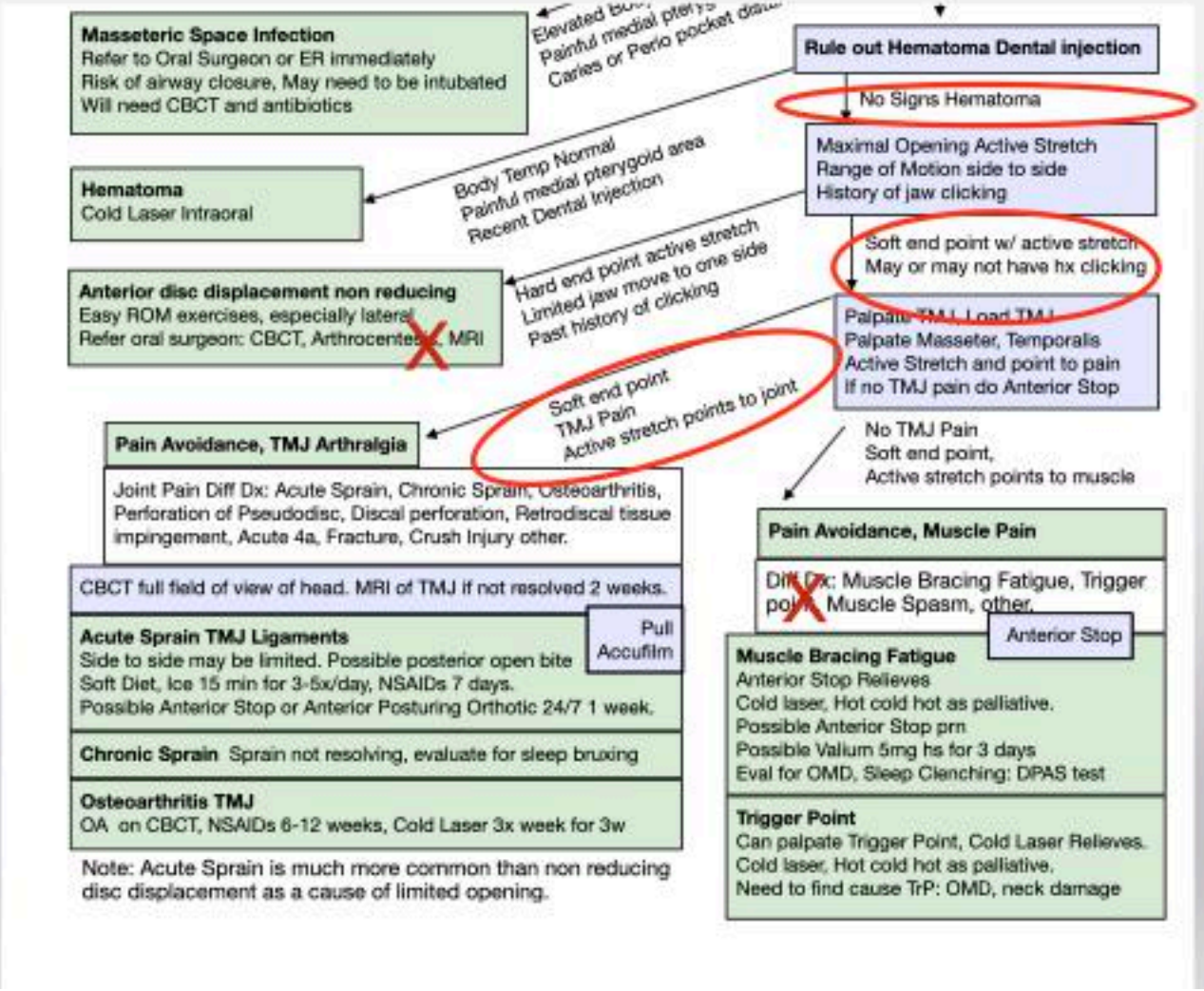


Working Diagnosis:

Acute Sprain Right TMJ Ligaments

Limited opening due to muscle bracing Right TMJ pain

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

Ms MY

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

6 Common TMDs

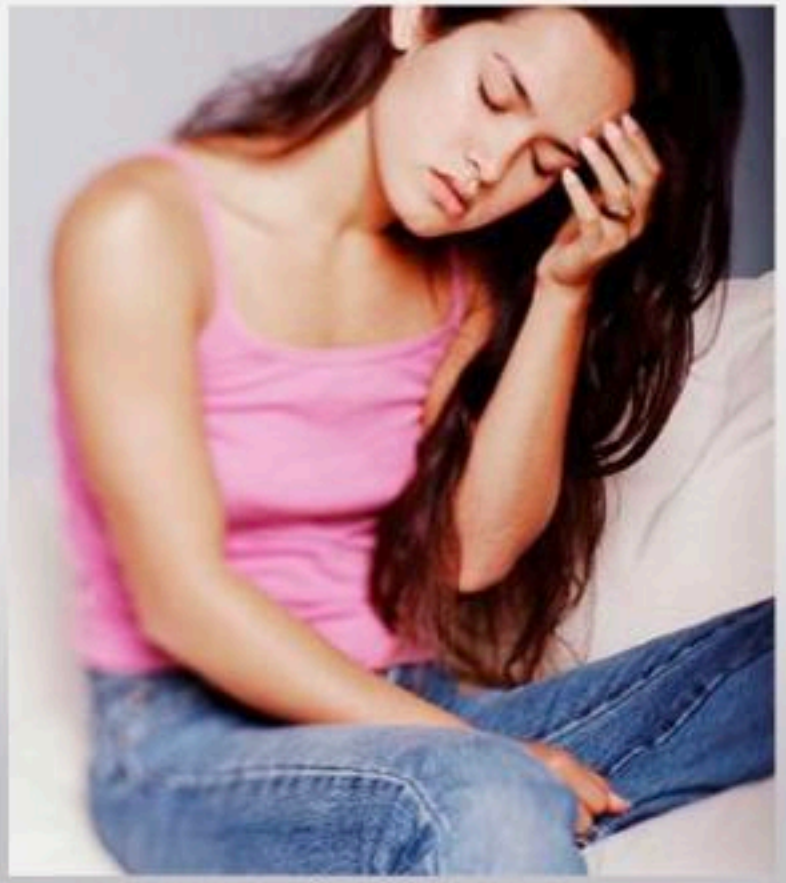
Parafunctional Clenching
Parafunctional Grinding
Occlusal Muscle Dysfunction
Osteoarthritis
Acute Sprain
Acute Closed lock of TMJ disc

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



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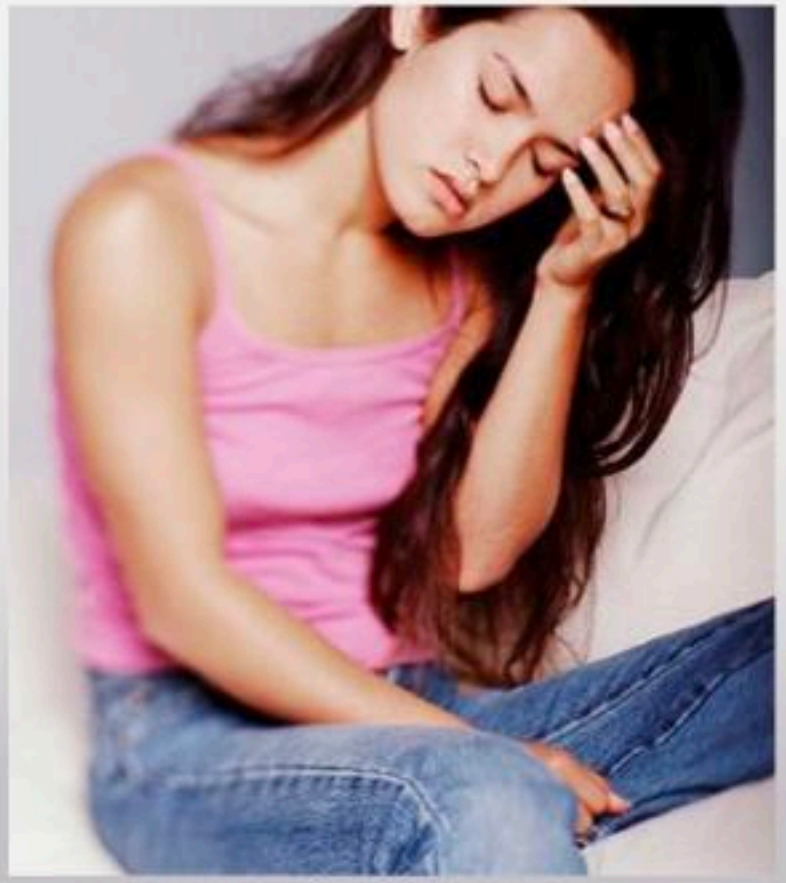
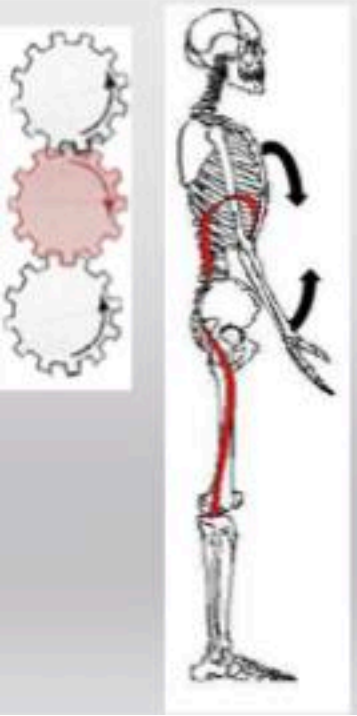


Neck and Postural Instability

This is a **dynamic** orthopedic System



A change in any one area will affect the others

CNS/PNS

Skull

TMJ

Teeth

Mandible

Neck

Teeth

Muscle Neck

Muscle TMJ

venn diagram

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

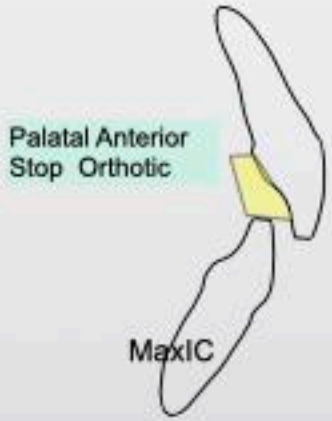
TM Joint subluxates under load
  Adapted CR "wobbles"

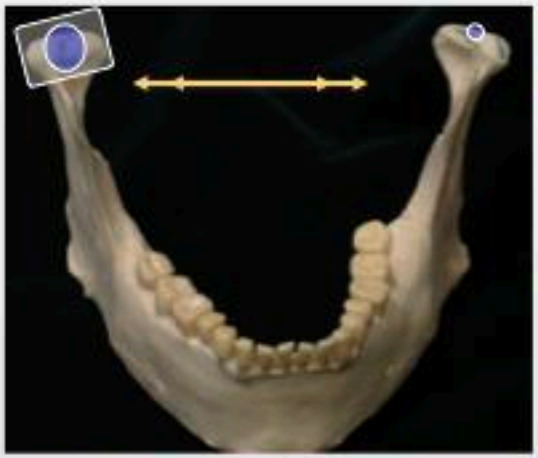
TMJ Muscle hyperactivity
  Looks similar to OMD
  Muscles must stabilize the joint
  Deep temporalis especially sore

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

How to Avoid Missing Dx- Offer complete exam to crown patients
  Include anterior stop dx test
  Let patients decide which risk to take.

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





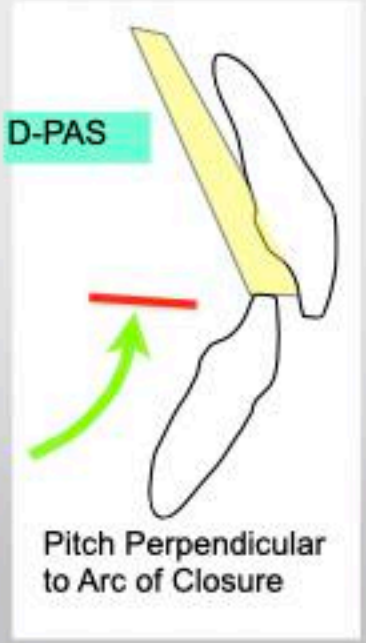
Diagnostic Palatal Anterior Stop

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

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

APS
ArrowPath Sleep

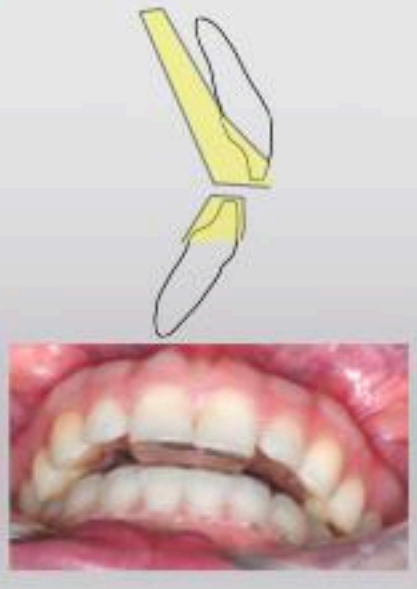
LIVING TREE DENTAL LAB

Nate Brock, CDT
(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

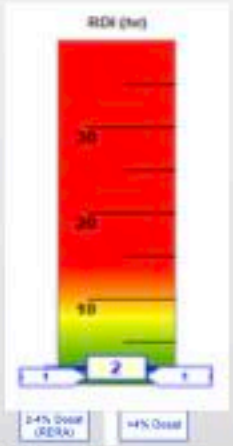
Hard Lower Full Coverage
Centric Relation Orthotic

Age 16F
cc: Facial Pain, Excessive Daytime Fatigue

Medical Sleep Study in Lab RDI = 1
Dx: Snoring without evidence of gas exchange abnormalities or sleep disruptions

Sleep Latency Test
Dx: Narcolepsy
Recommend daytime medication

Patient Safety Inc Pulse Ox Sleep Screening
RDI = 2, Autonomic Arousals 31 /h



PULSE RATE DATA

Autonomic Arousals
Index (#/hr): 31

Pulse Rate Range

Mean:	78
Min:	34
Max:	122

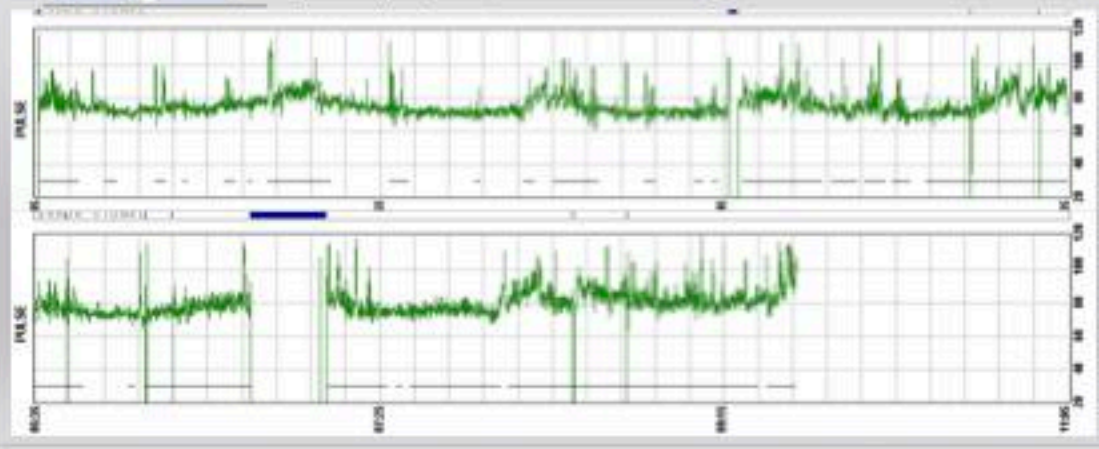
Tachycardia - Sleep (>90 bpm)

Duration:	00:34:56
% (VRT):	6%

Bradycardia - Sleep (<50 bpm)

Duration:	00:00:35
% (VRT):	0%

Heart Rate
>90 bpm
for 35 min



Disordered Breathing Disease Progression

Disease Stage 1

Predisposing Factors

Small Airway

Tongue Tie, Lip Tie
Bottle Fed as Infant
Dysfunctional Swallow
Allergies
Nasal Obstruction
Large Tonsil
Large Adenoids
Large Tongue
Mid-face Deficient
Mandibular Deficient
4 Bicuspid Extraction

Disease Stage 2

Compensation:
Airway Maintained

Signs
- Mouth Breathing
- Head Postured Forward
- Jaw Postured Forward
- Tongue Bracing
- Indents in Tongue
- Sore Masseters
- Sore Neck Muscles

Symptoms
- Facial Ache
- Not Waking Rested
- Daily Fatigue
- Neck Soreness

Disease Stage 3

Sleep
Airway Partial Collapse

Signs
- All of stage 1 and 2 plus…..
- Upper Airway Resistance
- 2-4% Drop O_2 Saturation
- RERA- Respiratory Arousals
- Sleep Teeth Grinding
- ⬇ Growth Hormone

Symptoms
- Heart Rate Fluctuation
- Snoring or "Purring"
- Weight Gain
- Cognitive Impairment, ADD
- Hyperactivity

Disease Stage 4

Sleep
Airway Full collapse

Signs
- All of stage 1, 2, 3 plus….
- 4%+ drop O_2 Saturation
- Apnea
- Cardiovascular Damage
- Elevated BP
- GERD

Symptoms
- All of stage 2, 3 plus….
- Worn Teeth

John R. Droter DDS

Disordered Breathing Disease Stage 4

OSA- Obstructive Sleep Apnea

AHI- Apnea Hypopnea Index

Apnea and Hypopnea events per hour

Apnea- Stop airflow for 10 seconds

Hypopnea- <50% airflow or 4+% O_2 Desaturation

AHI 1-4 "Normal" ??	AHI 5-15 Mild OSA	AHI 15-30 Moderate OSA	AHI 30+ Severe

Signs

Apnea

4% drop O_2 Saturation

Cardiovascular Damage

Elevated BP

GERD

Symptoms

Not Waking Rested, Daily Fatigue

Cognitive Impairment

Irreversible Damage

John R. Droter DDS

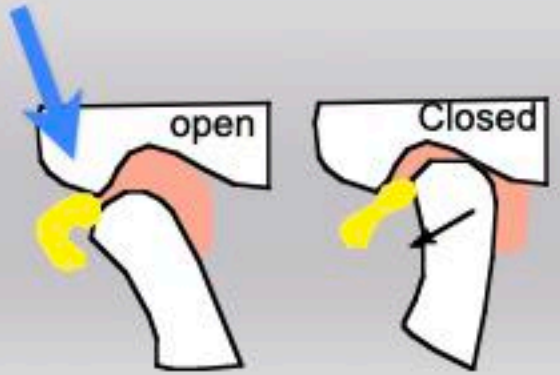
When the clicking stops (4a to 4b):

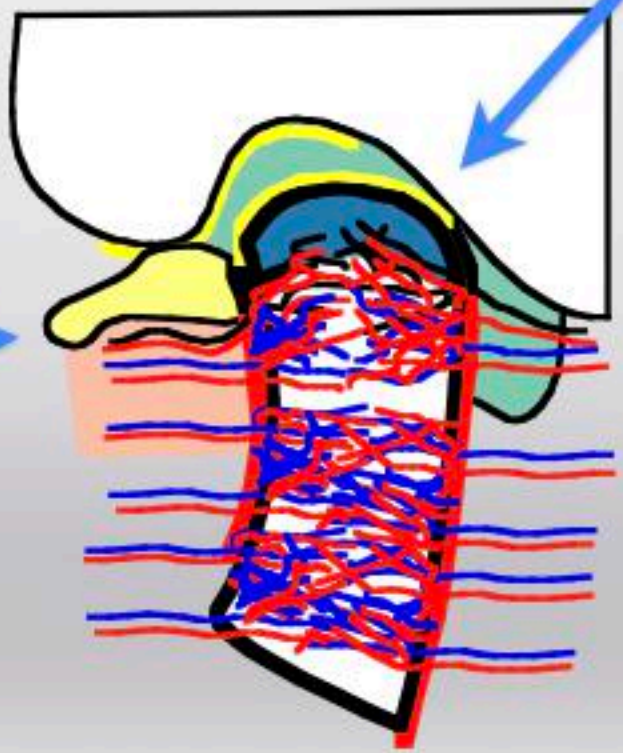
Condyle Distalized

Venous return compromised

Compromised Condylar Perfusion
Blood flow through condyle is decreased

Disc Anterior





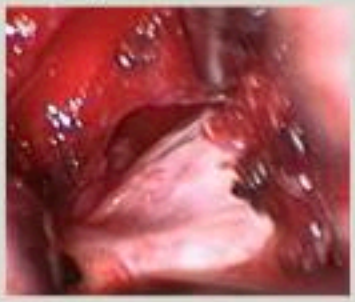
3 Outcomes of Compromised Condylar Perfusion

Bone cells die

Avascular Necrosis

One and Done

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



or

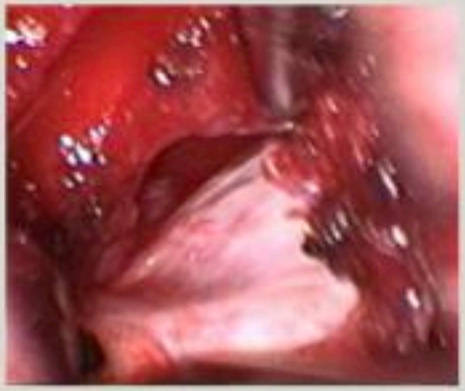
Nothing

Compromised but adequate.
99% patients have no problems

Inflammatory Tissue Bone Resorption

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

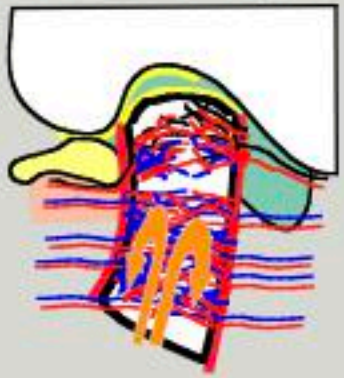
Droter JR, An orthopaedic approach to the diagnosis and treatment of disorders of the temporomandibular joint. Dent Today 2005 Nov;24(11):82, 84-8



2 Possible Outcomes of Avascular Necrosis

or

AVN Finished- Condyle Remodels



Cortex Collapses
Cartilage intact
Remodels fast- 3-6 weeks
Condyle can look smooth
and normal, only smaller
Retrodiscal Tissue Fibroses
OA develops gradually

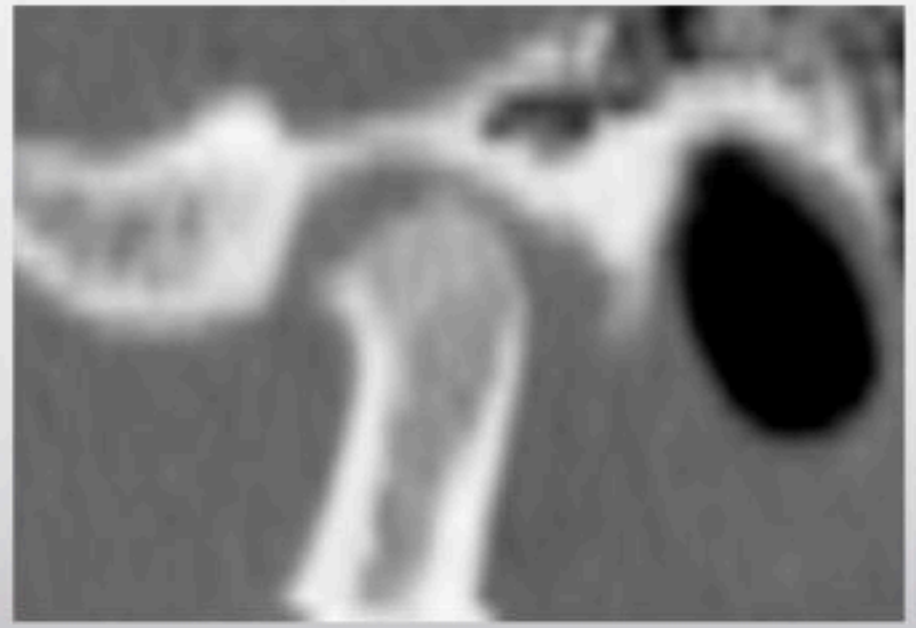
Inflammatory Tissue Bone Resorption

Cortex Collapses, Cartilage tears
Inflamed tissue contacting bone
Inflammatory cells activate Osteoclasts
Progressive Condylar Resorption
Does not have to be very painful
Eventually OA also develops

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

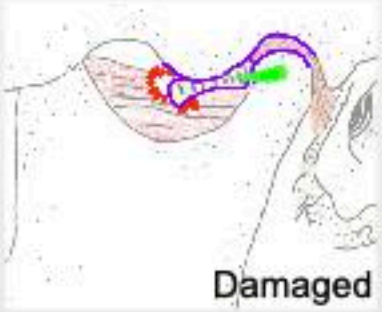


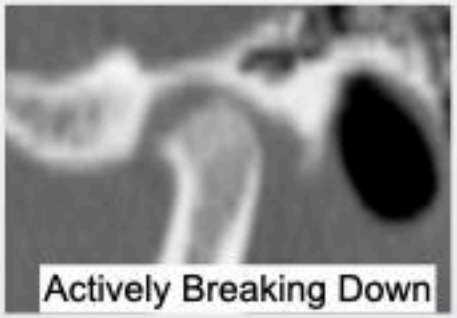
Basic Orthopedics

Joints are either
- Healthy or
- Damaged

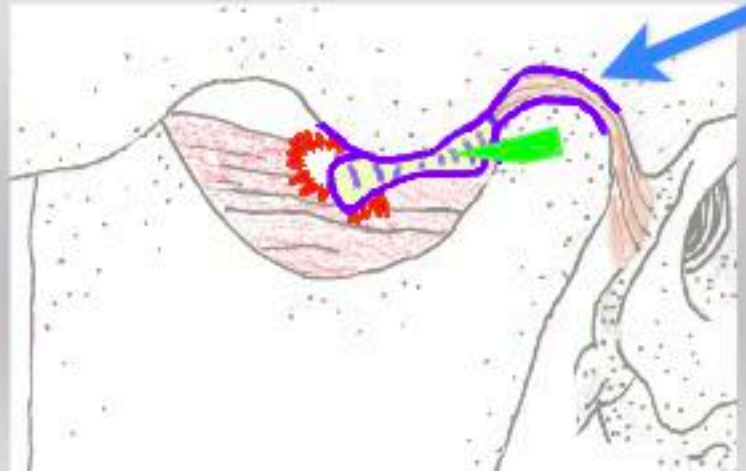
If damaged, joints will be either:
- Actively Breaking Down
- Adapting
- Adapted
  - Structurally, Mechanically
  - Favorably, Unfavorably


Healthy


Damaged


Actively Breaking Down

Majority of damaged TMJs adapt favorably



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

Pseudo-disc

Tissue Fibrosis

Adult Onset Anterior Open Bite Differential Diagnosis

Developed Post-Puberty

TMJ has changed
- TMJ Bone Loss (See bone loss choices)
- Recent Large Disc Displacement
- Condylar Fracture

Teeth have moved
- Tongue- used as occlusal cushion
- Tongue used to stabilize neck or TMJ
- Iatrogenic- Orthotics, Retainers

Both have loss of anterior coupling

Anterior Openbite with Active TMJ Bone Loss

Non Surgical Therapies

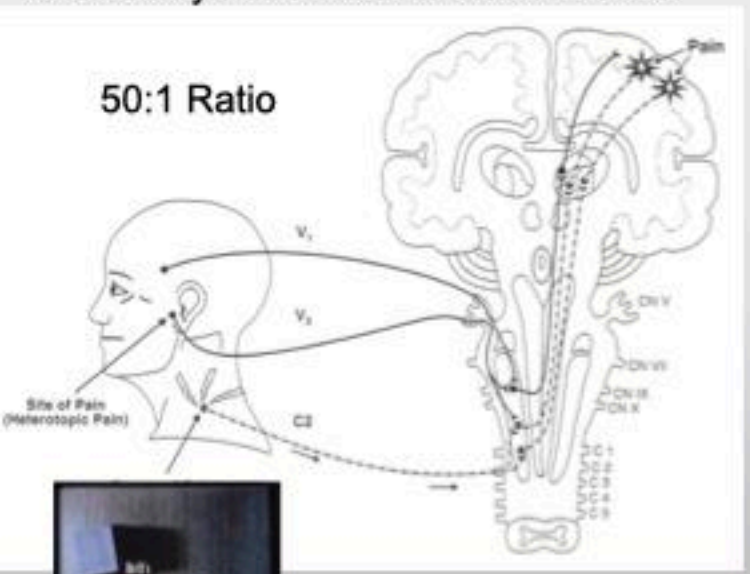
Condylar Distraction
Anti Inflammatory Medications

Referred Pain

Convergence

More primary sensory neurons than secondary neurons that travel to brain

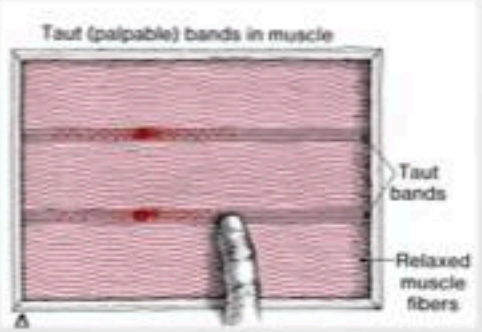
50:1 Ratio

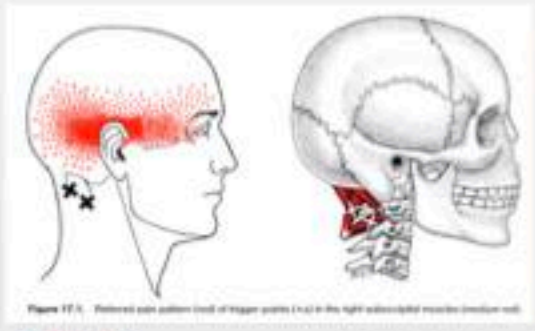


"Bells Orofacial Pain"
Jefery Okeson

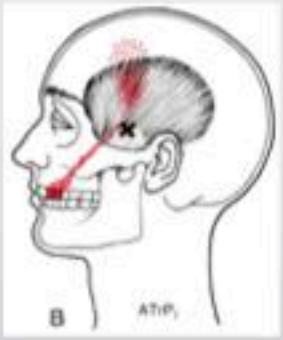
Trigger Points

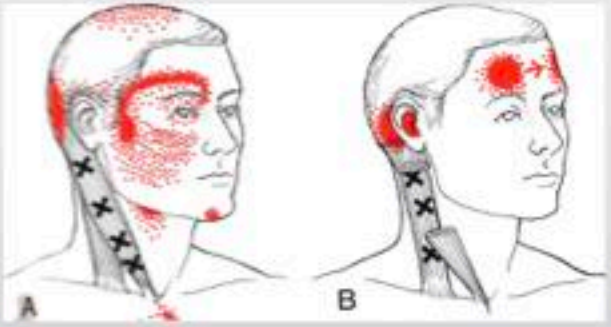
Contracted mass of actin, myosin and histamine

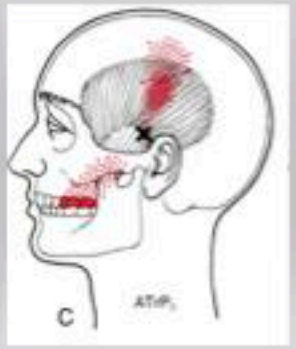


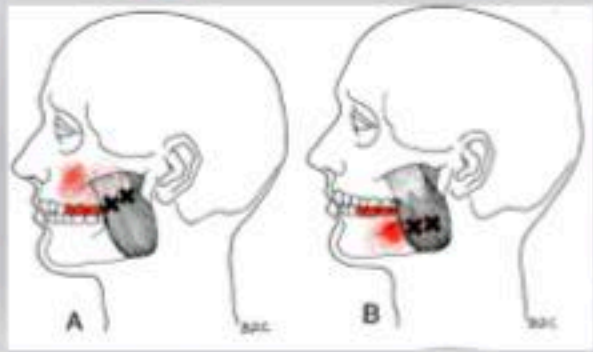


"The Trigger Point Manual"
Janet Travell, MD









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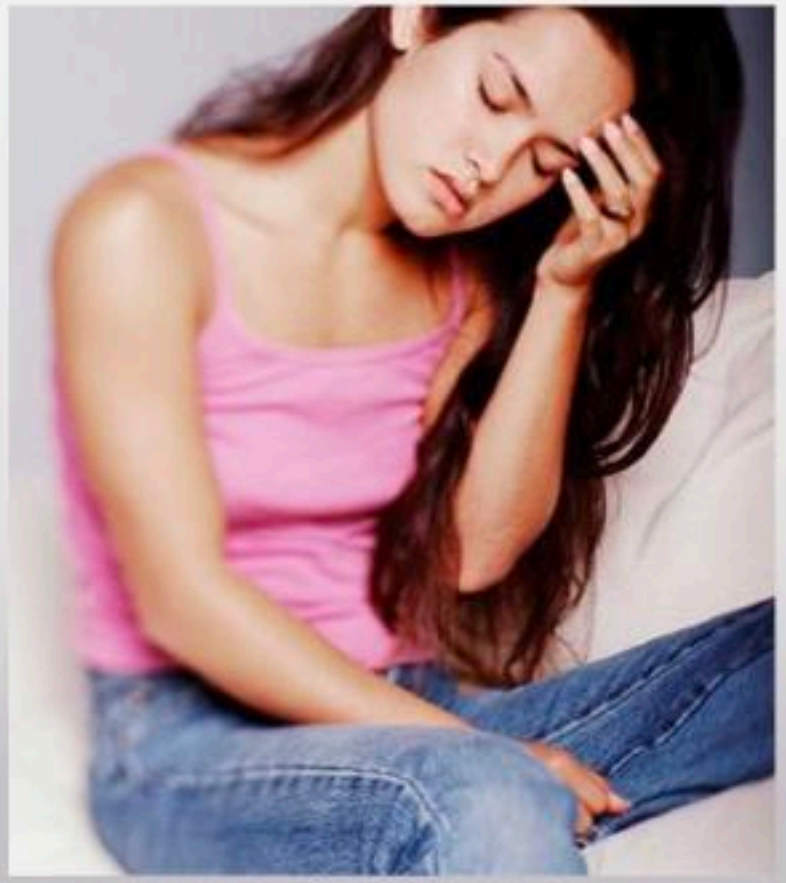
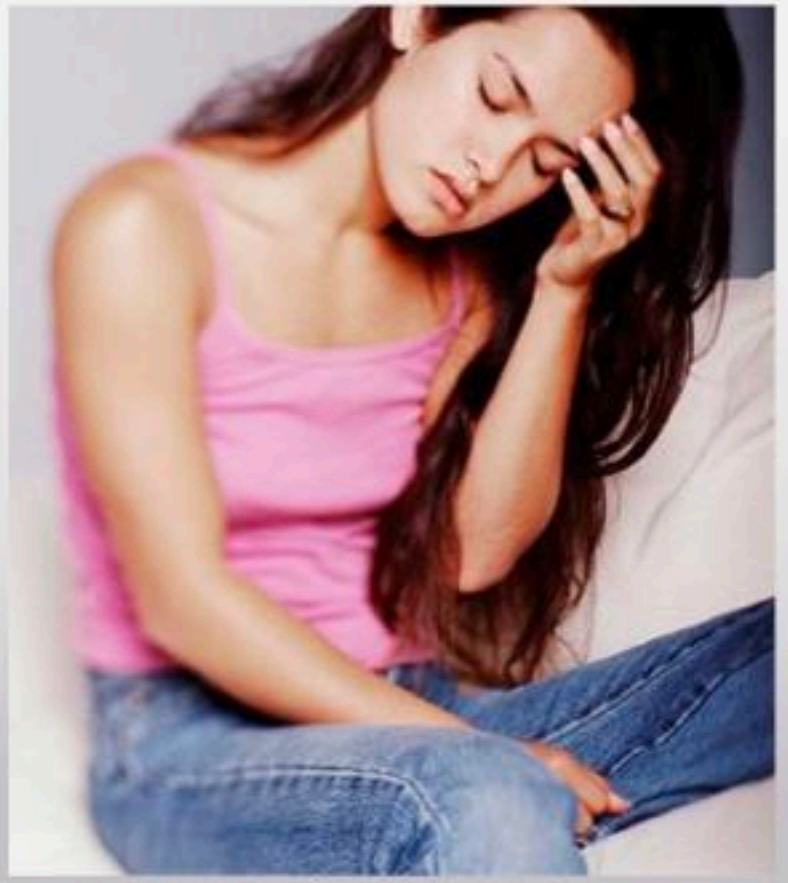


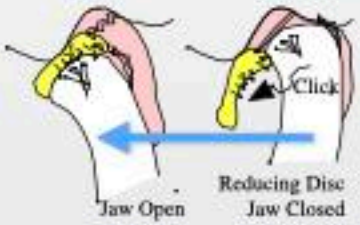
1 TMD that **usually** does not need therapy

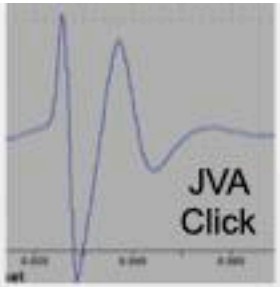
TMJ Clicking



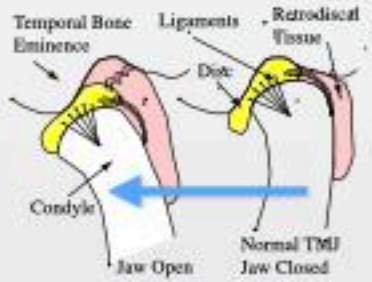
Differential Diagnosis of TMJ Clicking

Disc Reduction

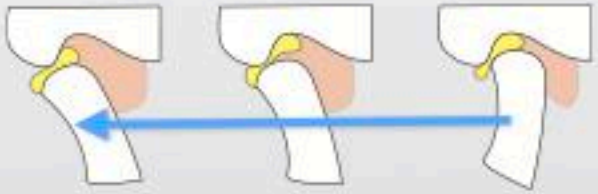




Normal

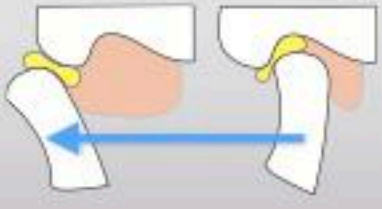


Adhesive Click



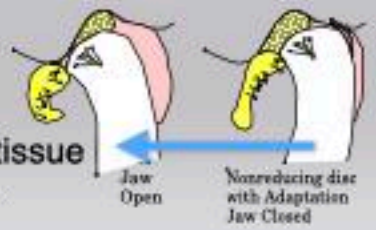
"Sticky Disc" - Disc sticks after prolonged clenching, then releases

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

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- Adapting
- Adapted
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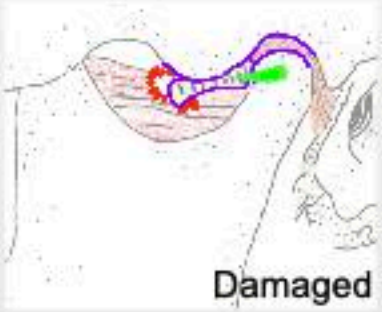
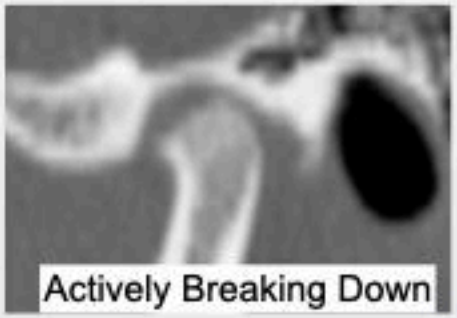

Damaged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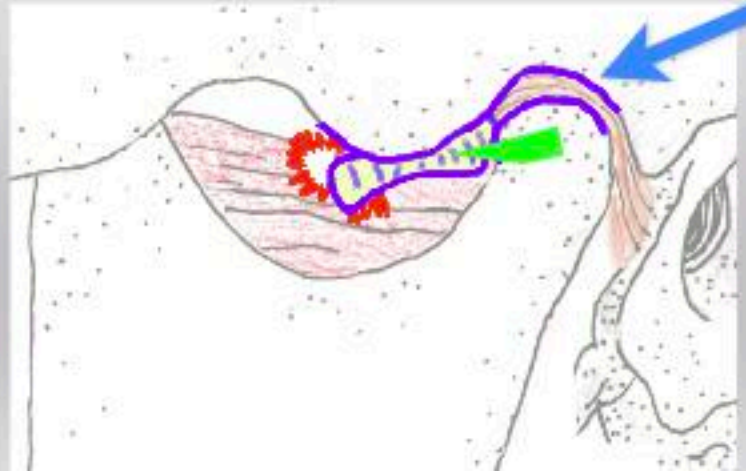

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Pseudo-disc

Tissue Fibrosis

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

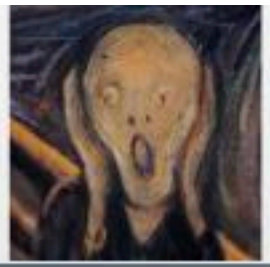
Leeuw, Boering, Stegenga, Bont,
Journal of Craniomandibular Practice, April 1995, vol. 13, No. 2

- 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

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

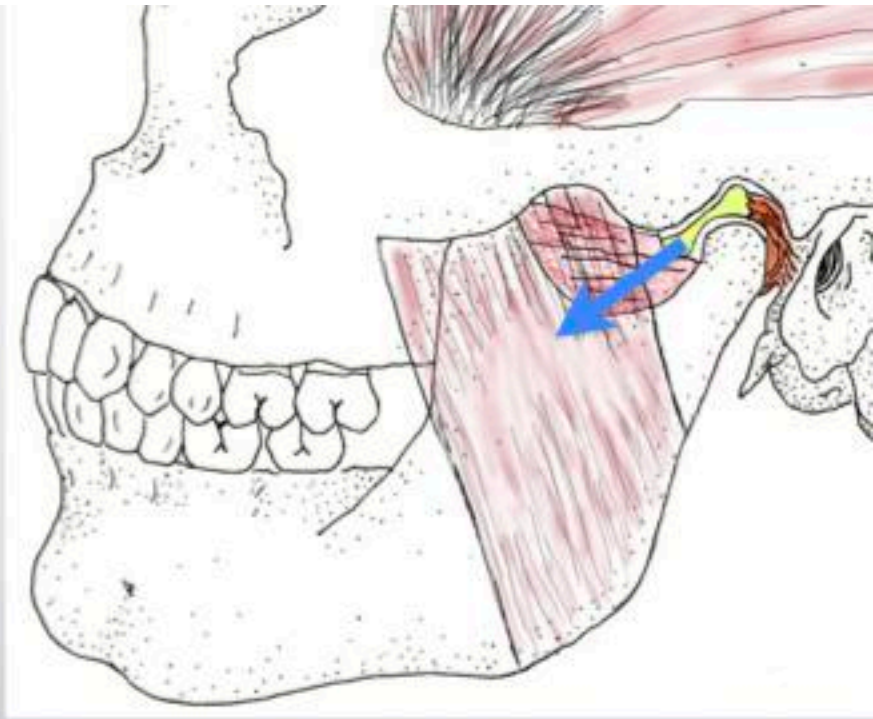
Adapt Favorably **85%**
Adapt Fairly **14%** → Occlusal Muscle Dysfunction, Osteoarthritis
Adapt Poorly **<1%** → Avascular Necrosis, Progressive Condylar Resorption

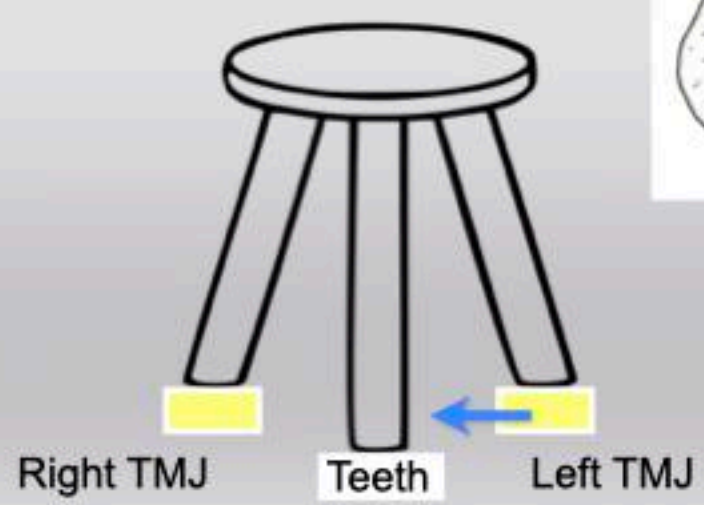
*These are my guesses on %, no research to back up to backup

Normal Joint with Normal Occlusion

All teeth touch evenly with condyles seated in fossa

What happens to the occlusion if the disc is dislocated?





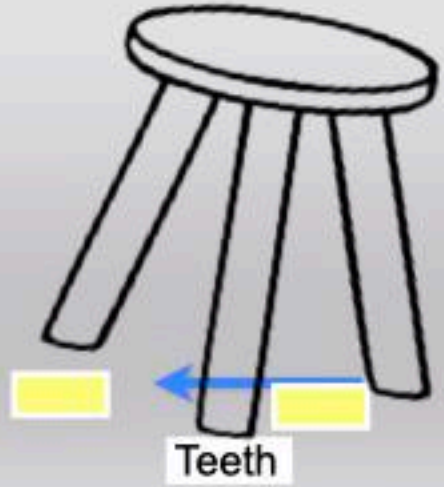
Damaged Joint with Malocclusion

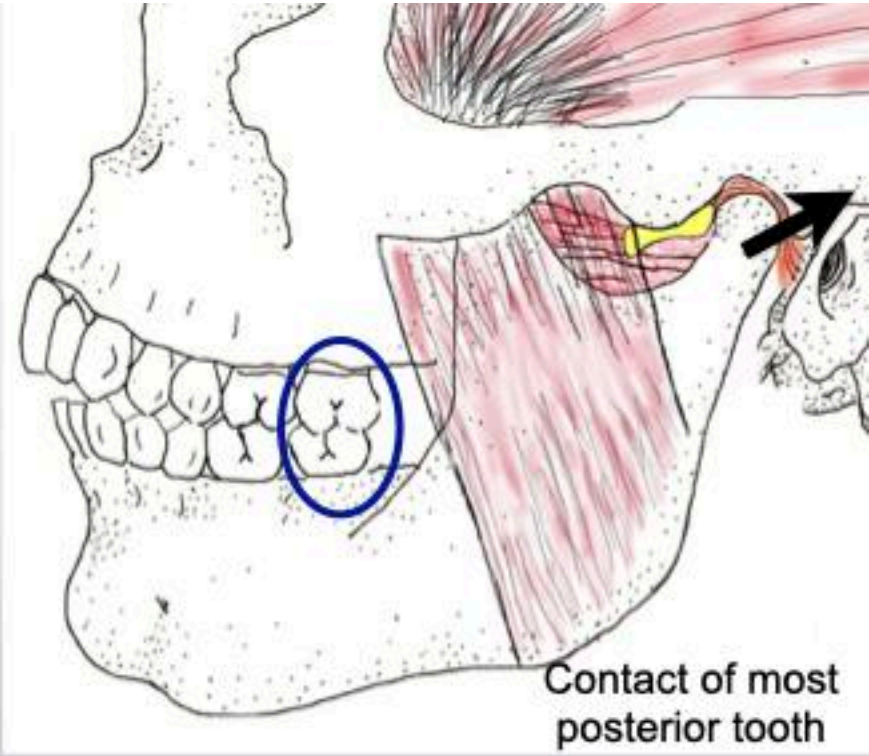
85% damaged joints adapt favorably with respect to the TMJ.

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

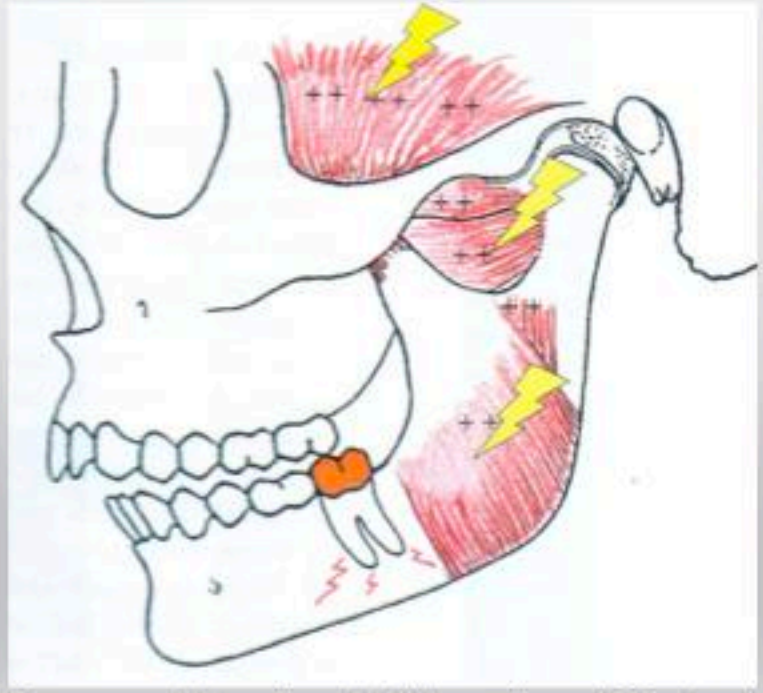
Uneven tooth contact with condyles fully seated triggers muscle activity

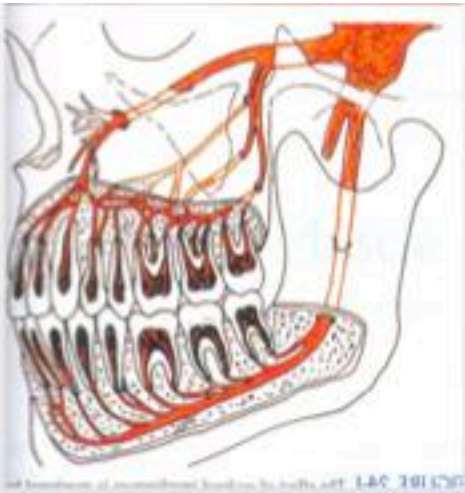
Lateral pterygoid fires out of sequence to create even tooth contact on closure

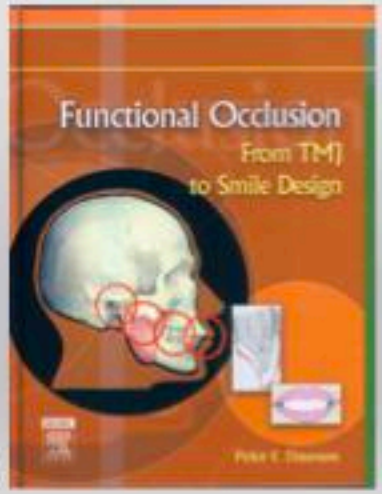
Disharmony in all muscles: Splinting/Bracing

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.

Bonus Rule- Harmonious Anterior Guidance. Cuspid guidance directs the mandible slightly forward, not backward, with smooth cross over from cuspid to anterior teeth. Protrusive contact even on both central incisors.

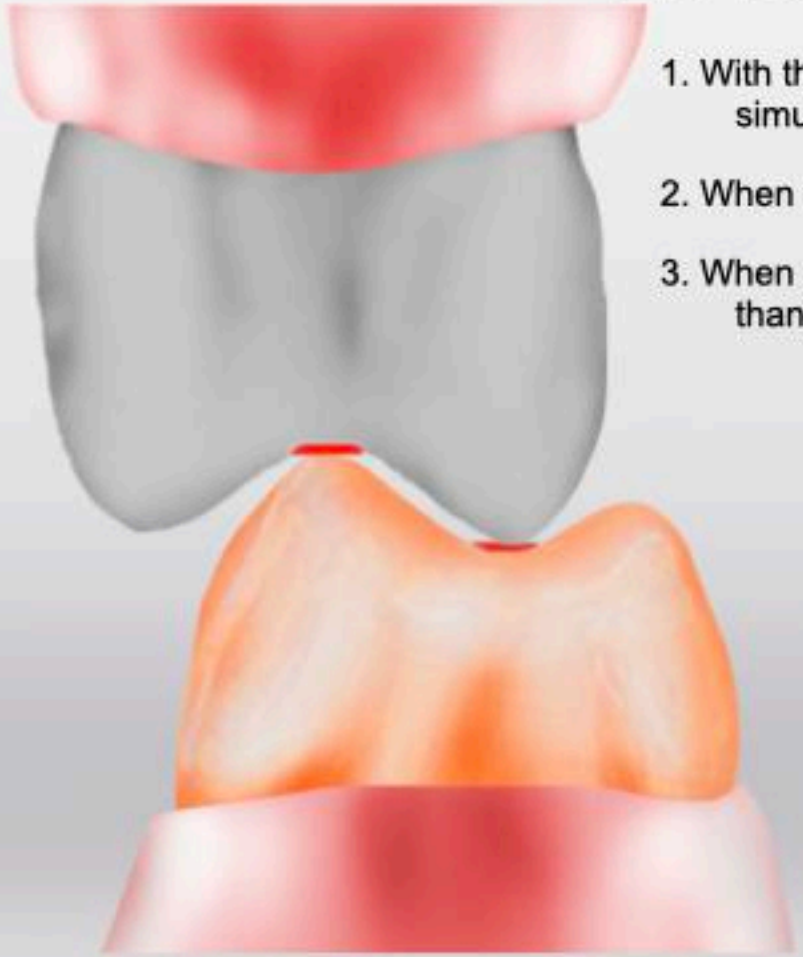
Bonus Observation- All the above work much better the closer the teeth are to being on the Curve of Spee and Curve of Wilson

Drawing by Dr Jim Kessler

Why LD Never wrote a text book

Slide by Dr John R Droter

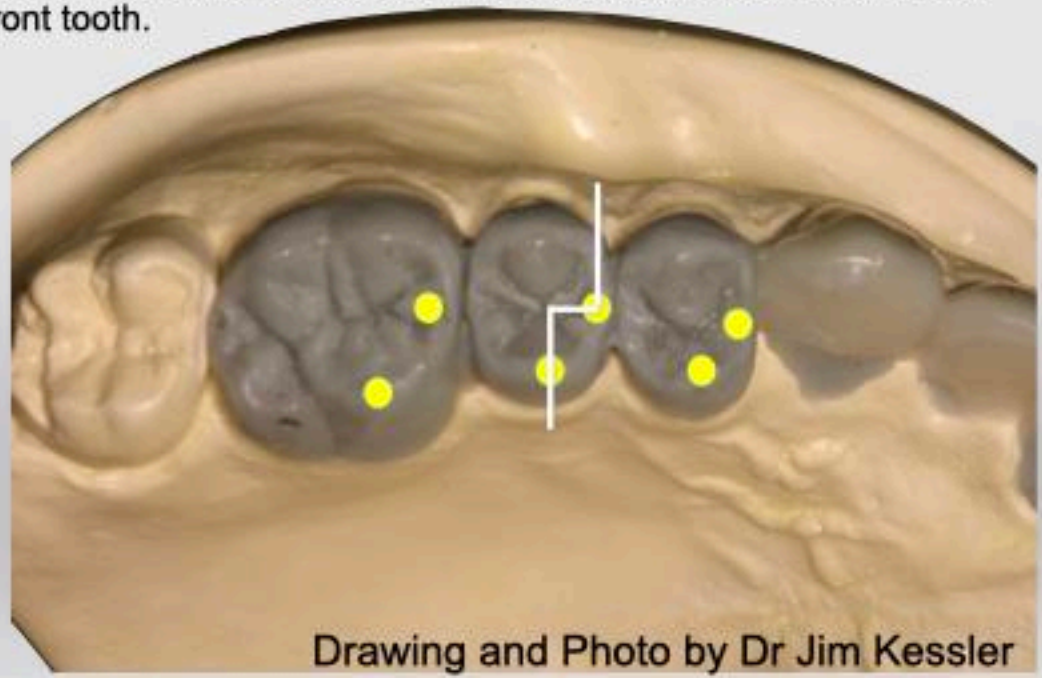
LD Pankey's 3 Rules of Occlusion (Clyde Schuyler)



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

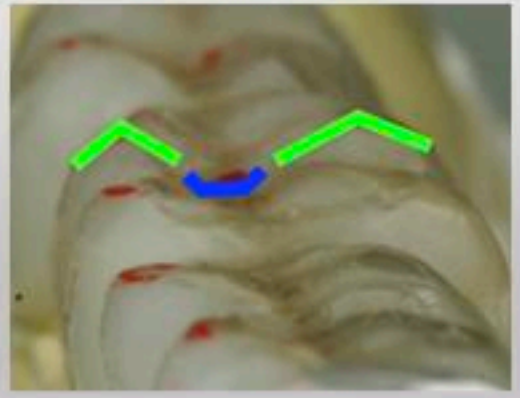
After

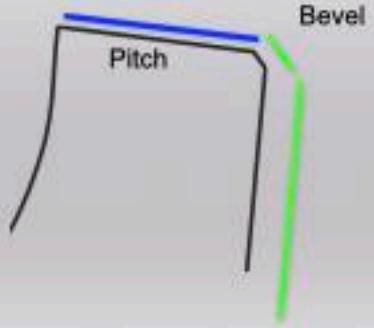
Occlusal Sculpting Tools, including Zirconia

Wheel
- Create Cusp Landing Zone
- Flatten Incisal edges
- Bulk reduction of inclines

Move and Shape Cusps, Inclines, Facial Surfaces

Brassler Brio Shine
FLBCER-1
FLBF-2





Premier 860.9 F Wheel Diamond
Premier 230 F Barrel Diamond
Neodiamond 1118.7F Roundend taper
Dedco Green Stone
White Arkansas stone
Filtek Supreme- B1B, Albond

6 Common TMDs

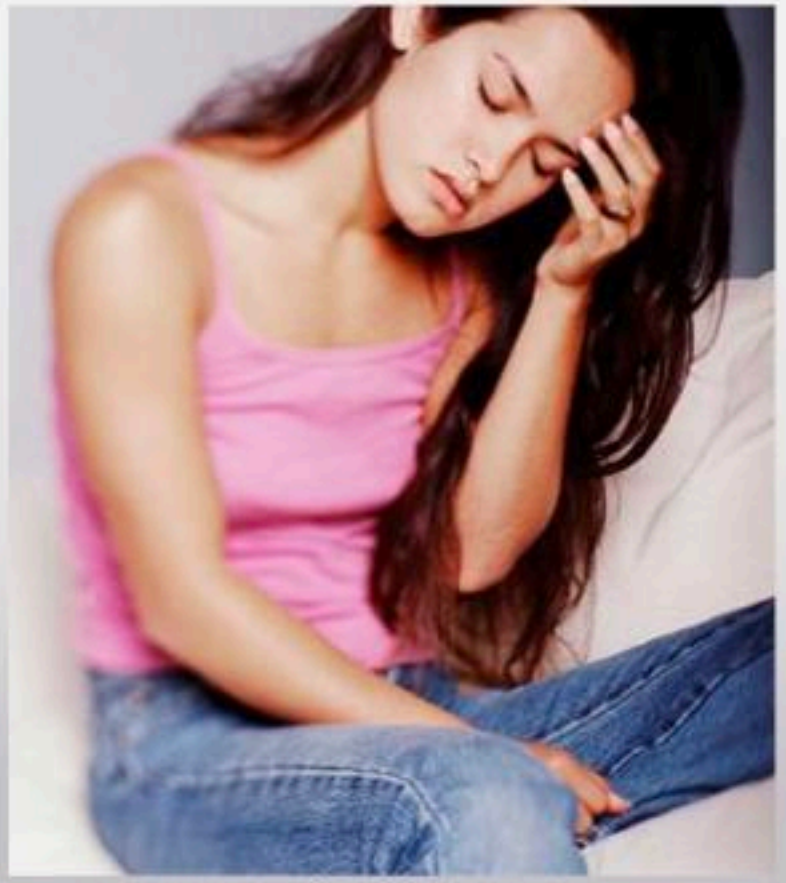
Parafunctional Clenching
Parafunctional Grinding
Occlusal Muscle Dysfunction
Osteoarthritis
Acute Sprain
Acute Closed lock of TMJ disc

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

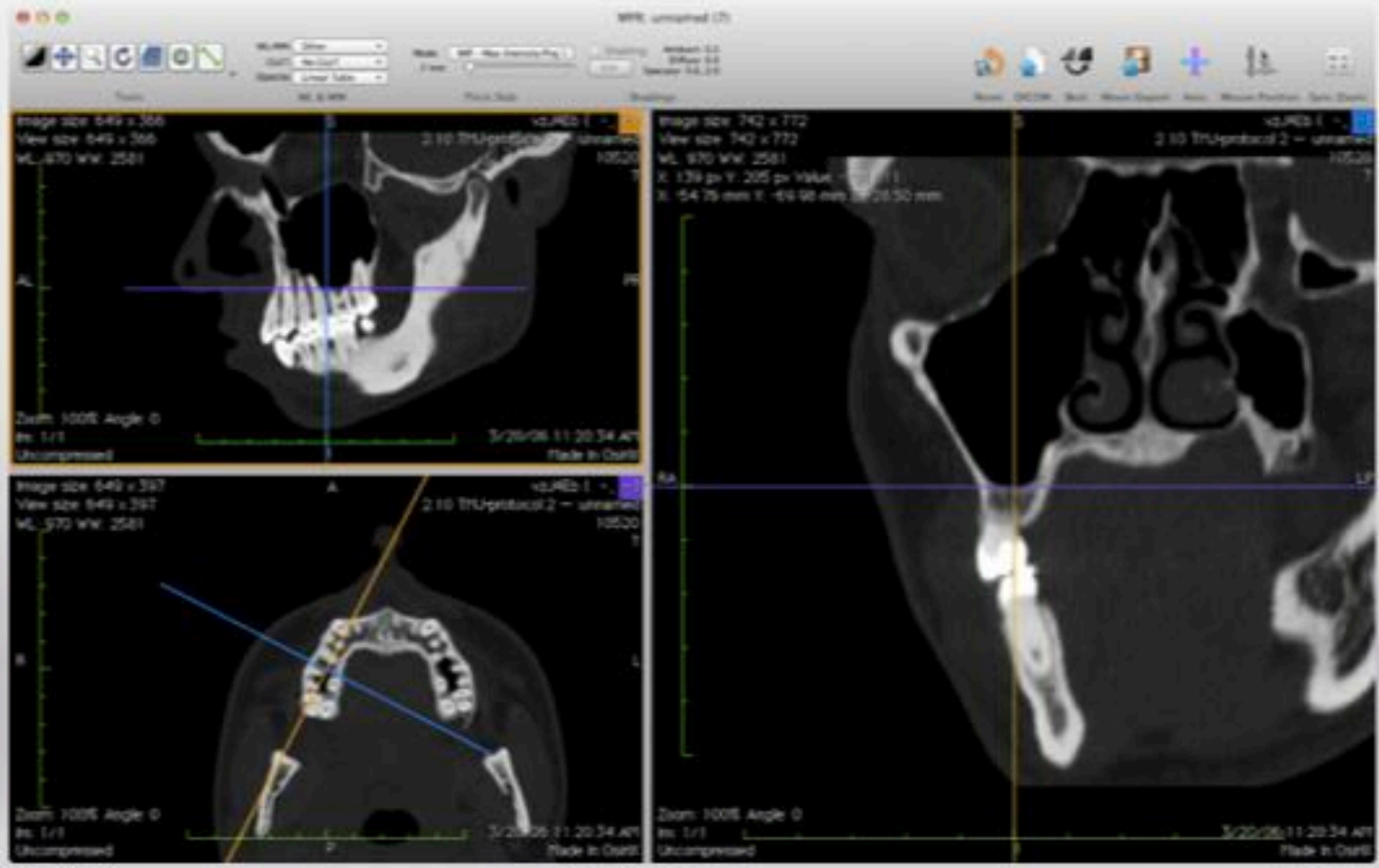
TMJ Clicking



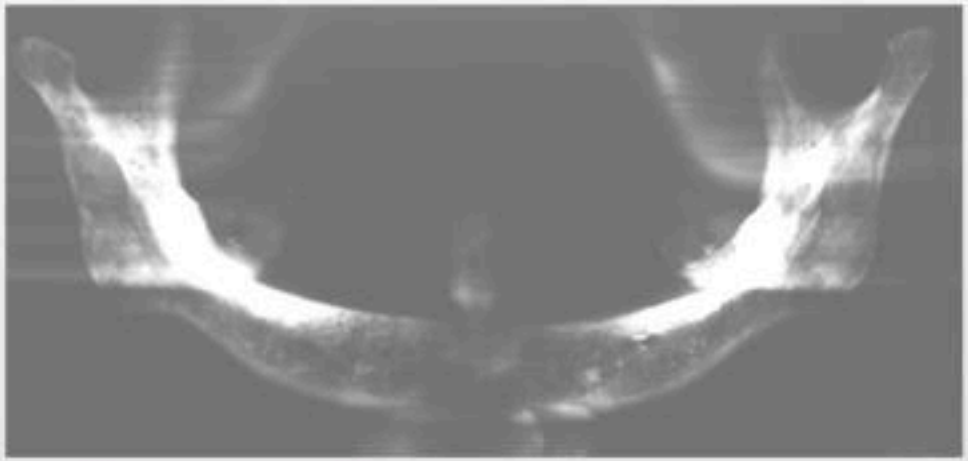
Facial Pain Diagnosis

Diagnostic Tools

1. Written and Oral History
2. Observation
3. Physical Exam
   - Muscle Palpation
   - Joint Palpation
   - Joint Auscultation
   - Joint Motion
4. Anterior Stop Test
5. Sleep Airway Screening
6. **CT Scan**
   - MRI
   - Blood Tests

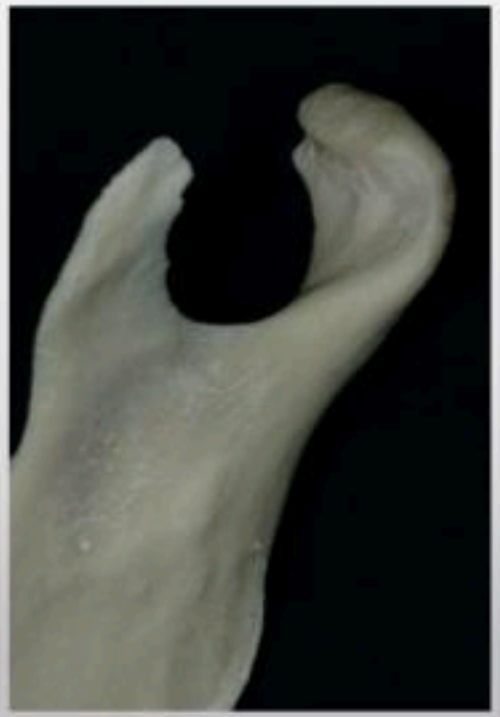


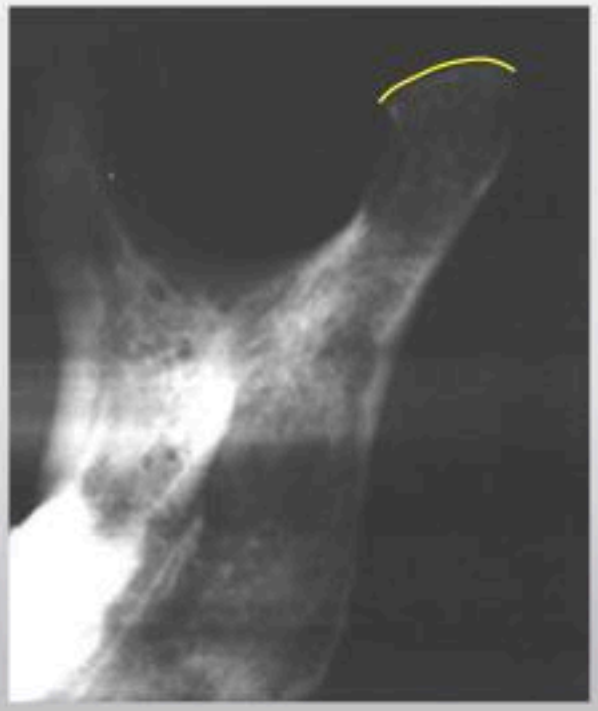
Pan-X of Skull Mandible



Note: This Mandible had plastic teeth added

Pan-X not Accurate





Fallon S, Fritz G, Laskin D, Panoramic Imaging if the Temporomandibular Jointa: An experimental Study Using Cadaveric Skulls. J Oral Maxillofac Surg 64:223-229, 2006

Computerized Axial Tomography (CT, CAT)

Spiral CT Scanner
12 sec acquisition Time

Note: prior to 2001 CT Scan took 25 min

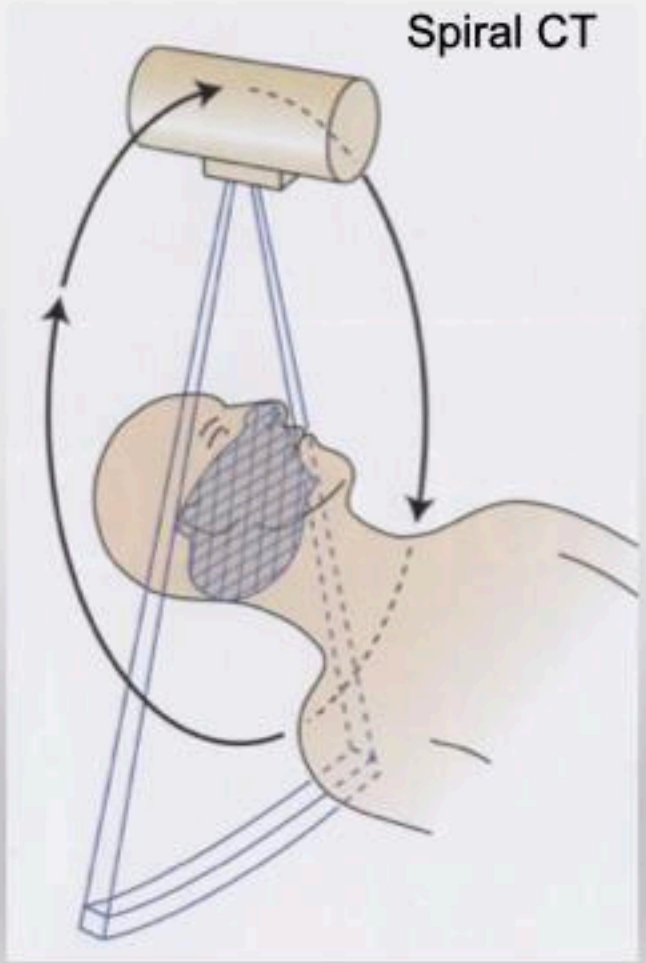
Cone Beam CT Scanner
20 sec acquisition time

vatech

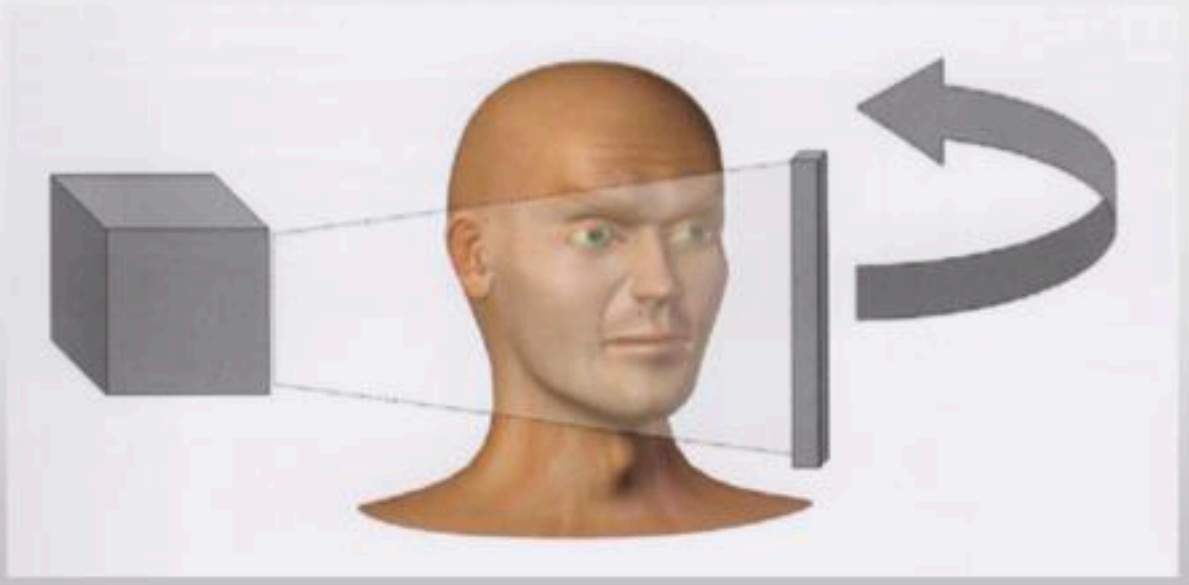
i3D Premium

iCAT

Spiral CT



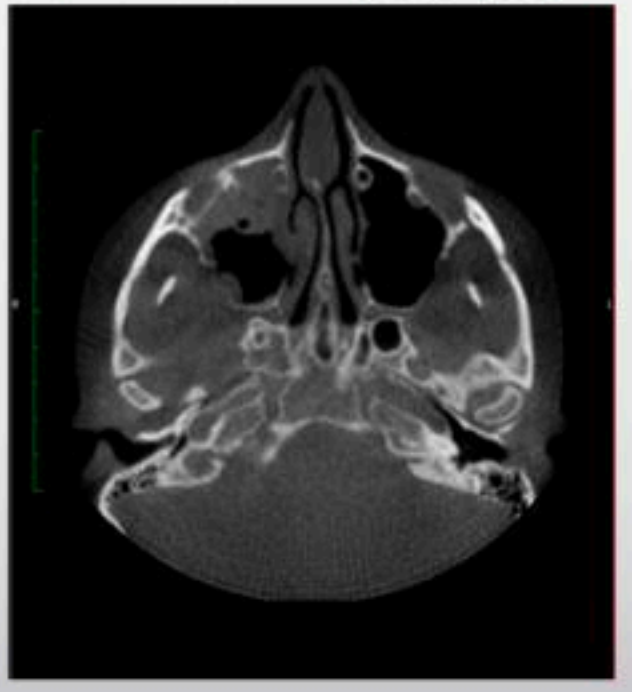
CBCT



Atlas of Cone Beam Imaging
Dale Miles DDS

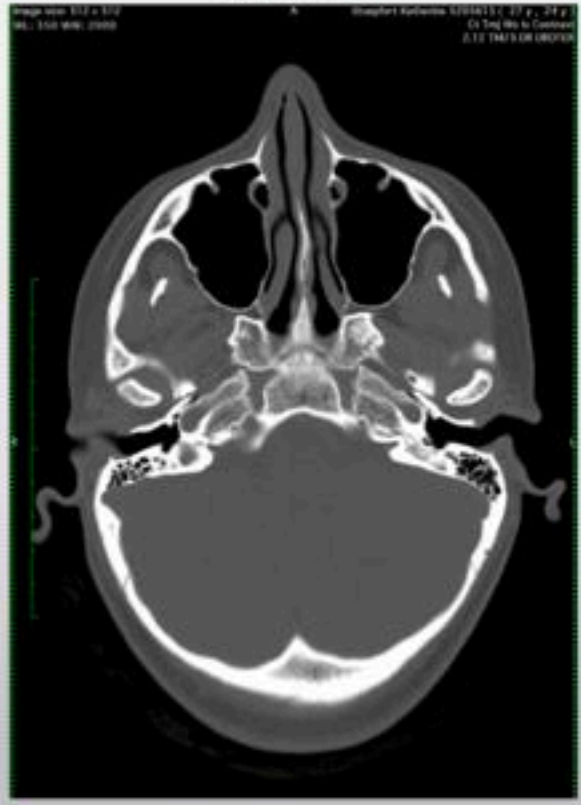
Compare CT scans

CBCT- iCAT



CBCT- Vatech i3D Premium

Spiral CT

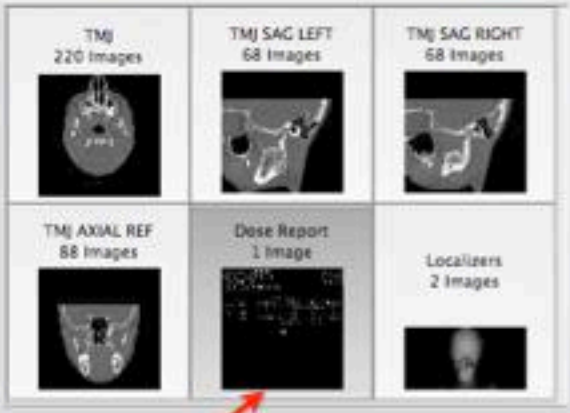


Best Contrast
Much more radiation

Radiation Exposure Comparison

Daily Background/day	0.008 mSv	
Panoramic	0.02 mSv	
1 Trans Atlantic Flight	0.03 mSv	
Chest Film	0.1 mSv	(0.1-0.2 mSv)
i-CAT Head	0.1 mSv	
Full Mouth Series Digital	0.12 mSv	
Full Mouth Series F Speed	0.17 mSv	
Conventional CT Head	0.5 mSv	
Spiral CT Head	2.7 mSv	
Daily Background/year	3.1 mSv/year	
Airline Crews (additional)	4.6 mSv/year	
Highest Safe Dose (public)	20 mSv/year	
Max Safe Exposure US Worker	50 mSv/year	
Exposure that can lead to Cancer	100 mSv/year	
Japanese Government Safe Level (After Fukushima 2011 Disaster)	250 mSv/year	

Comparison conversions done by John R Droter DDS
Gy converted to Sv using 1mGy/cm head = .0022mSv
Gy= Gray (Joules/kg)
Sv=Sievert (Joules/kg)



Spiral CT Dose Report → Dose Length Product
1244 mGy/cm x .0022 = 2.7 mSv

Spiral CT 27x more than CBCT, but about half of airline crews yearly exposure.
Radiation is cumulative over lifetime.
Safe dose of a harmful substance?
MRIs have no Radiation.

Normal TMJ- Bone

Bone Density

- Intact Cortex
- Even pattern Trabecular bone

Normal Size/Shape Condyle/Fossa

- Ovoid Condylar Shape
- Non-Congruent Condyle/Fossa
- Condyle 70% Size Fossa

Condyle Centered in Fossa

- Coronal and Sagittal
- Room for Disc

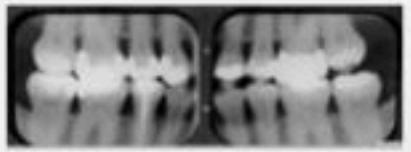
Stable CR load Zone

- Condyle closest to fossa

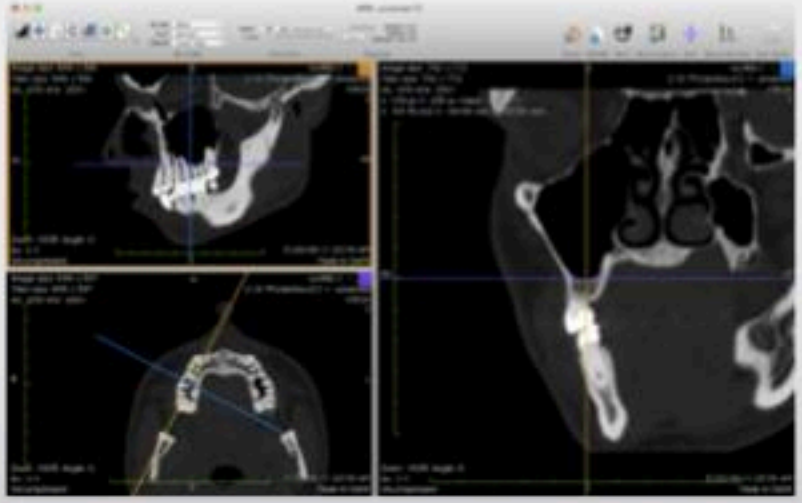
CT Scan
Coronal View

CT Scan
Sagittal View

Would you do full mouth rehabilitation with only a set of bitewing radiographs?



If you need to see all of the tooth surfaces,
why would you not want to see all of the TMJ surfaces?



Which do you use:

- FMX, PanX
- FMX, CBCT
- ✔ CBCT, 4bw, 4pa anterior

2.5x more PAP found w/ CBCT

Patel S, Wilson R, Dawood A, Mannocci F., Detection of periapical pathology using intraoral radiography and cone beam computed tomography. Int Endod J. 2011 Dec.

Endodontic lesion bacteria found in blood clots of Myocardial Infarctions

Pessi T1, Karhunen V. Bacterial signatures in thrombus aspirates of patients with myocardial infarction. Circulation. 2013 Mar. PMID: 23418311

CBCT

John R Droter DDS
Annapolis, Maryland

Key Features for TMJ Images

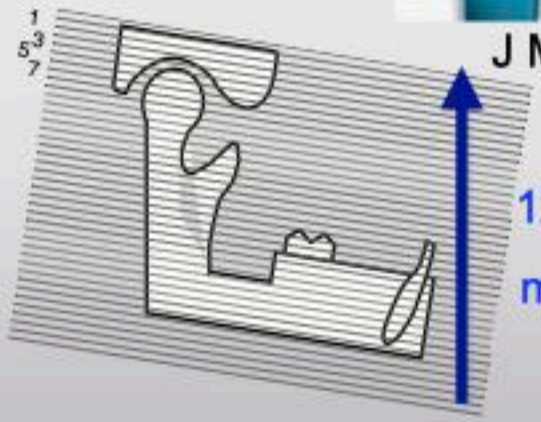
Large Field of View 15cm Tall (12cm is minimum)
Excellent raw image quality

J Morita

VaTech

Recommend Best Raw Image Quality:
3D Accutomo 170 J Morita 12cm
VaTech i3D Premium 19cm

Most important is service behind the product
Benco vs others



Not recommend:
Any Sirona including Galileos: Marginal raw image quality, motion artifact

Green = LOW Contrast

Making a Great TMJ Scan

Rx for CBCT

Can get from JRDroter.com

Adding a chair vastly improves image quality

1. LargeField of View
15cm tall field of view or greater
At 12cm tall you will miss some joints. 15cm and up is better
Note: 17cm x12 cm is 12 cm tall. The smaller # is the height, and is listed last

2. Scan Area
Scan Area to include 1cm above condylar head,
1 cm behind condylar head and 1 cm below chin.

3. KVP and AMP
Use highest KVP and Amperage the machine allows to get best contrast.

4. Voxel Size
Lesser scan time minimizes movement artifact. 0.3 voxel will give a better image than 0.1 voxel

5. No Metal-
No hair ties/clips, facial piercings, partials, glasses, etc.

6. Natural Neck Posture
Side view: Neck in natural postural alignment, and Frankfurt horizontal plane parallel to the floor. Avoid reaching for chin-rest with head forward posture.
Align head frontal view: Laser aligner down middle of face, can see both ears equally

7. Hold Still
Goal: Patient to hold very, very still for 20 seconds while scan is being taken
Sitting is more stable than standing. A hard chair works well.
Practice swallowing, back teeth touching, tongue lightly resting back of front teeth.
Practice lightly breathing.
Give patient a 7 second warning before you take the scan so they can swallow, get back teeth touching, and have tongue lightly resting back of front teeth.

Normal TMJ- Bone

Bone Density

- Intact Cortex
- Even pattern Trabecular bone

Normal Size/Shape Condyle/Fossa

- Ovoid Condylar Shape
- Non-Congruent Condyle/Fossa
- Condyle 70% Size Fossa

Condyle Centered in Fossa

- Coronal and Sagittal
- Room for Disc

Stable CR load Zone

- Condyle closest to fossa

CT Scan
Coronal View

CT Scan
Sagittal View

Interpreting CBCT

www.jrdroter.com

Review of Scan: CBCT

John R Droter, DDS

Name _____ Scan Date _____

Review Date: _____

First do quick scroll through axial, coronal and sagittal for global impression. Scan Quality: Good Fair Marginal

Right TMJ Scroll Corrected Sagittal and Corrected Coronal

Condyle:	☐ Normal Size	☐ Small condylar size
	☐ Normal Shape	☐ Altered condylar shape
	☐ Cortex Intact	☐ Cortex not intact
	☐ Cortex Even	☐ Hyperadolfication
Fossa:	☐ Normal Size	☐ Small fossa size
	☐ Normal Shape	☐ Flattened fossa shape
	☐ Cortex Intact	☐ Cortex not intact
Condyle Position	☐ Centered in fossa	☐ Condyle distalized
Joint spacing	☐ Room for disc	☐ No room for disc
CR Load Zone	☐ Superior medial	☐ Superior Lateral

Estimate Piper: R1 R2 R3a R3b R4a R4b R5a R5b

Right TMJ Health: ☐ Healthy ☐ Damaged ☐ Active Degeneration ☐ Adapting ☐ Adapted

Left TMJ Scroll Corrected Sagittal and Corrected Coronal

Condyle:	☐ Normal Size	☐ Small condylar size
	☐ Normal Shape	☐ Altered condylar shape
	☐ Cortex Intact	☐ Cortex not intact
	☐ Cortex Even	☐ Hyperadolfication
Fossa:	☐ Normal Size	☐ Small fossa size
	☐ Normal Shape	☐ Flattened fossa shape
	☐ Cortex Intact	☐ Cortex not intact
Condyle Position	☐ Centered in fossa	☐ Condyle distalized
Joint spacing	☐ Room for disc	☐ No room for disc
CR Load Zone	☐ Superior medial	☐ Superior Lateral

Estimate Piper: L1 L2 L3a L3b L4a L4b L5a L5b

Left TMJ Health: ☐ Healthy ☐ Damaged ☐ Active Degeneration ☐ Adapting ☐ Adapted

Scrolling Coronal View, Sagittal View, Axial View

All Tissue: ☐ Right = Left ☐ = Except _____

Look for tumors Brain, Muscle, Parotid Submand Gland, Hypertrophy

All Bones: ☐ Right = Left ☐ = Except _____

Look for hyperadolfied or radiolucent areas, cysts

Nasal (Sagittal, Cor)	☐ Open	☐ Restricted ☐ Deviated Septum
Sinuses "	☐ Clear	☐ Thickened Lining ☐ Sinus Polyps
Airway "	☐ Adequate	☐ Restricted
Teeth (Sagittal, Cor)	☐ No PAP	☐ PAP # _____
(Axial)	☐ No Gross Caries	
Perio (Thick Sagittal)	☐ No Gross Perio Bone Loss	
Atlas XD	☐ Appears Centered	☐ Not Level with Skull Base
C2, C3, C4 XD	☐ Aligned	☐ Misaligned
Max Maxil Relation	☐ Normal Sagittal	☐ Retrognathic ☐ Maxilla ☐ Mandible
Max Maxil Canting	☐ Normal Coronal	☐ Asymmetric Cant ☐ Maxilla ☐ Mandible

Impression:

Signature: _____

Review of Scan: CT/CBCT Guide

John R Droter DDS

TMJ

Condyle

Fossa

☐ Normal Size, Normal Shape, Cortex Intact

Condyle is 70% size of the fossa, with an ovoid shape. The condyle and fossa are noncongruent convex surfaces. The outer cortex of bone is a solid continuous line with no breaks. Look for areas of hyperadolfication which are indicative of excess load in that area or damage and repair. The right and left TMJs should be the same size.

Condylar Position

☐ Centered in fossa

The condyle should be centered in the fossa. A distalized condyle is indicative of either joint damage and disc dislocation anteriorly or heavy anterior tooth contact. An anteriorly positioned condyle is indicative of a large CR/CO discrepancy, usually associated with an adapted mandibular retrognathia.

Joint Spacing

☐ Centered in fossa

There should be room to "draw" a disc between the condyle and fossa.

CR Load Zone (Centric Relation Load Zone)

☐ Superior medial

Ideally the condyle in its optimal load bearing position (Centric Relation) should load on the superior medial surface. In the coronal view the area where the condyle is closest to the fossa is the Centric Relation Load Zone. A variant of normal is to have both condylar load on the superior lateral surfaces. If the load zones of the right and left do not match (i.e. one is medial the other lateral) this is indicative of joint damage and disc dislocation. Need to evaluate for joint mechanical stability (joint wobble) with a DJPAS. Clinically these patients may have a hypermobile "bite".

Estimate Piper

This estimation combines clinical data from the clinical history, exam, joint palpation, stethoscope auscultation, Doppler, JVA(Joint Vibration Analysis) and the CT scan. If the you see a left distalized condyle and the left TMJ clinically clicks, my estimation would be a Piper 4a. A left distalized condyle and no clicking is either a Piper 4b or a health joint distalized due to heavy anterior contact (usually iatrogenic). In the case of the 4b, JVA would show some slight "scratch vibrations", where as a health TMJ distalized due to occlusion would show "smooth vibrations", and clinically have tremitus on the anterior teeth.

1 Normal joint- **MRI and CT are normal** (See all above). No joint sounds, full range of motion. JVA no vibrations, quiet Doppler.

2 The TMJ is damaged but disc is still in place so **MRI and CT are normal**. Usually the cartilage is damaged, roughened from parafunctional bruxing. Doppler and JVA will both indicate slight vibrations. A well adapted 4b will also have the same vibratory signals as a Piper 2, but the 4b will show changes in condylar position on the CBCT, and the MRI will show the disc dislocation.

3a This a partial dislocation of the disc, usually in an anterior medial direction with the lateral ligament being torn or stretched. The joint reduces on opening and will make a vibration, either a click or wobble on JVA. If a 3a is opposite a health joint there is not a change in occlusion so **CT is normal**. A Piper 3a is often contralateral to a 4b. With loss of the opposing disc, the mandible shifts coronally, the CR load zone changes in both joints leading to 3a.

3b Same as above except nonreducing and therefore no clicking vibration. **CT is normal**

4a The disc is fully displaced off the head of the condyle and reduces on opening. There will be a shifting of the mandible which can be seen on the CBCT, **Condyle not centered in fossa**. Clinically there will "click or wobble" vibration as the disc reduces and subluxates. While some vibrations are in the audible range some may not be. These will be detected with JVA.

4b The disc is fully displaced off the head of the condyle and does not reduce on opening. This will look the same on CBCT as A. **4a, Condyle not centered in fossa.** While limited opening may occur, many can have a full range of motion. Range of motion should not be a sole determine factor on wether a joint is 4b.

5a Osteoarthritis There will be **changes to the condylar shape and cortex** seen on the CBCT. Osteoarthritis is the inflammatory phase of Osteoarthrosis. Look for missing cortex indicative of active degeneration. The joint will be tender to palpation. An MRI is helpful in detecting extent of inflammation.

5b Osteoarthrosis There will be **changes to the condylar shape and cortex** seen on the CBCT. The Cortex however will be intact and the joint will not be tender to palpation. Hyperadolfication will be seen having reinforced the damaged areas. There is a loss of congruency as the condyle and fossa wear down and become flattened. Parafunctional tooth grinding increases OA bone wear.

First do quick scroll through axial, coronal, and sagittal for global impression.

Right TMJ Scroll Corrected Sagittal and Corrected Coronal

Condyle:	☐ Normal Size	☐ Small condylar size	☐
	☐ Normal Shape	☐ Altered condylar shape	☐
	☐ Cortex Intact	☐ Cortex not intact	☐
	☐ Cortex Even	☐ Hypercalcification	☐
Fossa:	☐ Normal Size	☐ Small fossa size	☐
	☐ Normal Shape	☐ Flattened fossa shape	☐
	☐ Cortex Intact	☐ Cortex not intact	☐
Condyle Position	☐ Centered in fossa	☐ Condyle distalized	☐
Joint spacing	☐ Room for disc	☐ No room for disc	☐
CR Load Zone	☐ Superior medial	☐ Superior Lateral	☐

Estimate Piper: R1 R2 R3a R3b R4a R4b R5a R5b

Right TMJ Health: ☐ Healthy ☐ Damaged ☐ Active Degeneration ☐ Adapting ☐ Adapted

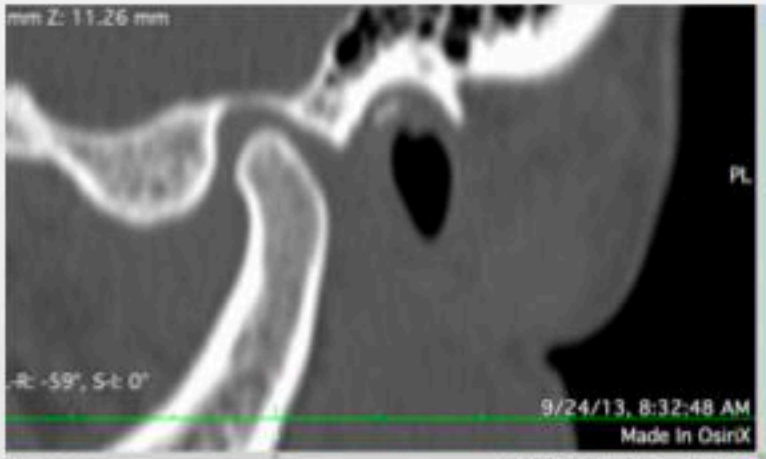
CT Left
Piper 2 from MRI

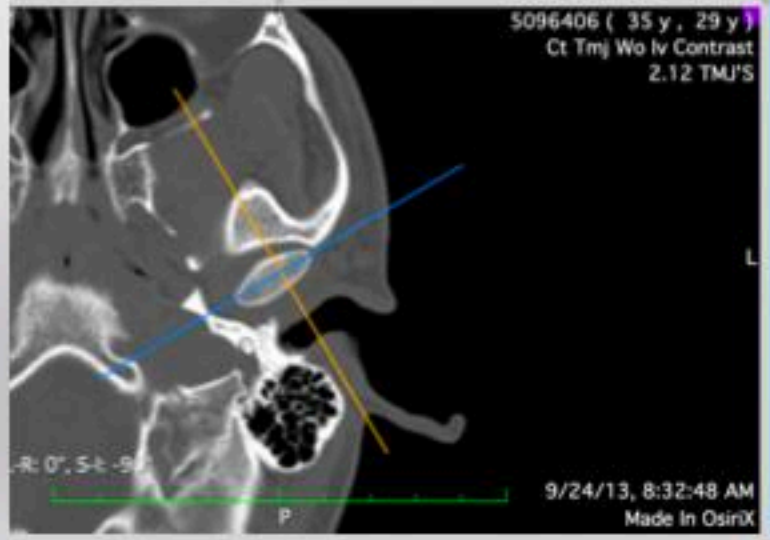
Condyle:	☑ Normal Size
	☑ Normal Shape
	☑ Cortex Intact
	☐ Cortex Even
Fossa:	☑ Normal Size
	☑ Normal Shape
	☑ Cortex Intact
Condyle Position	☐ Centered in fossa
Joint spacing	☑ Room for disc
CR Load Zone	☐ Superior medial

☑ Hypercalcification

☑ Condyle distalized

☑ Superior Lateral





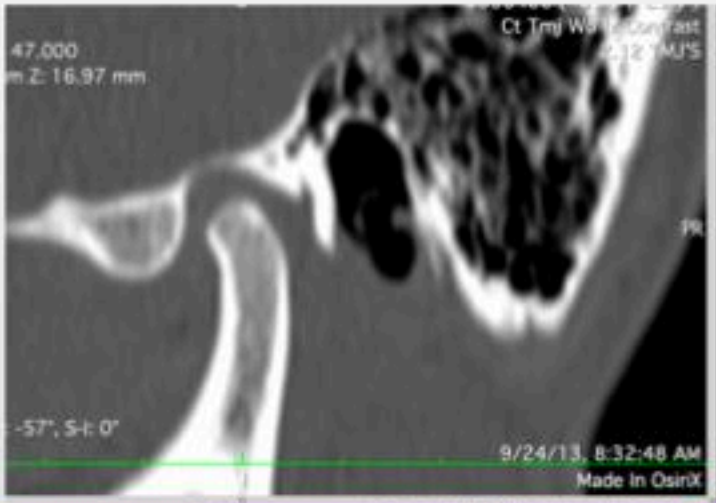
CT Right
Piper 4a-e from MRI

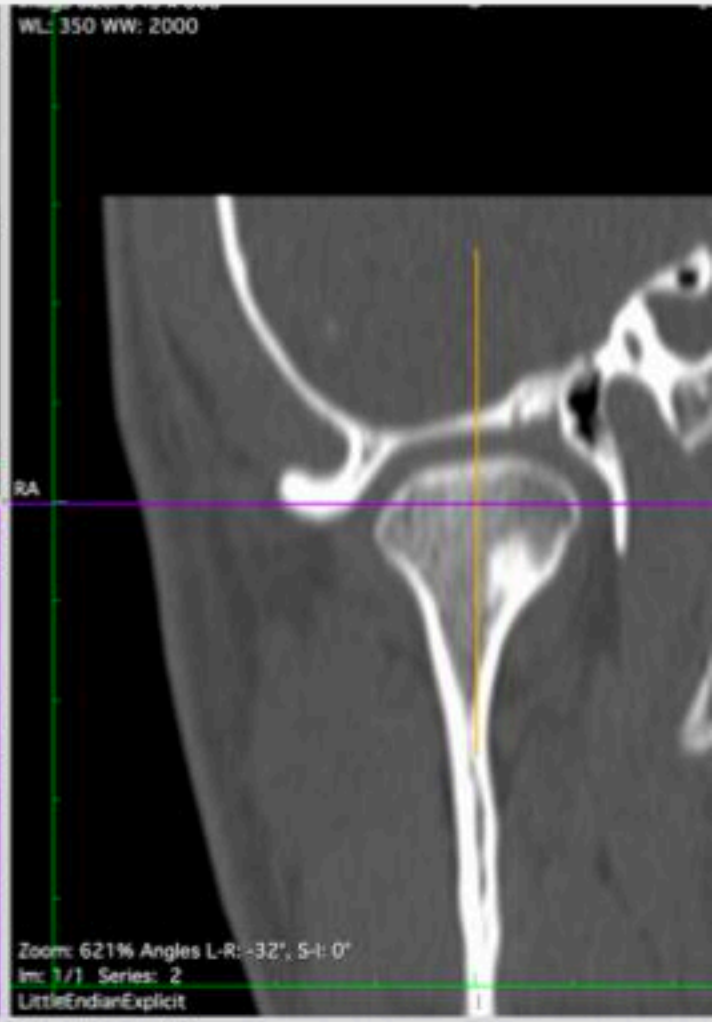
Condyle:	☑ Normal Size
	☑ Normal Shape
	☑ Cortex Intact
	☐ Cortex Even
Fossa:	☑ Normal Size
	☑ Normal Shape
	☑ Cortex Intact
Condyle Position	☑ Centered in fossa
Joint spacing	☑ Room for disc
CR Load Zone	☐ Superior medial

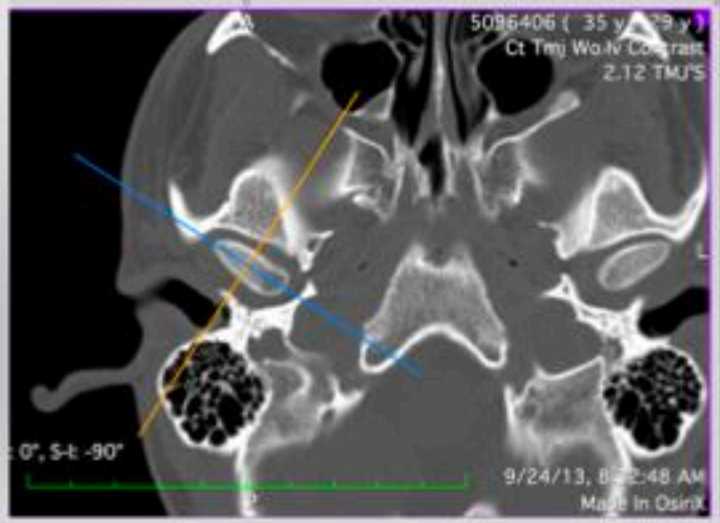
☑ Hypercalcification

☑ Superior Lateral

✔ Note: Large joint space





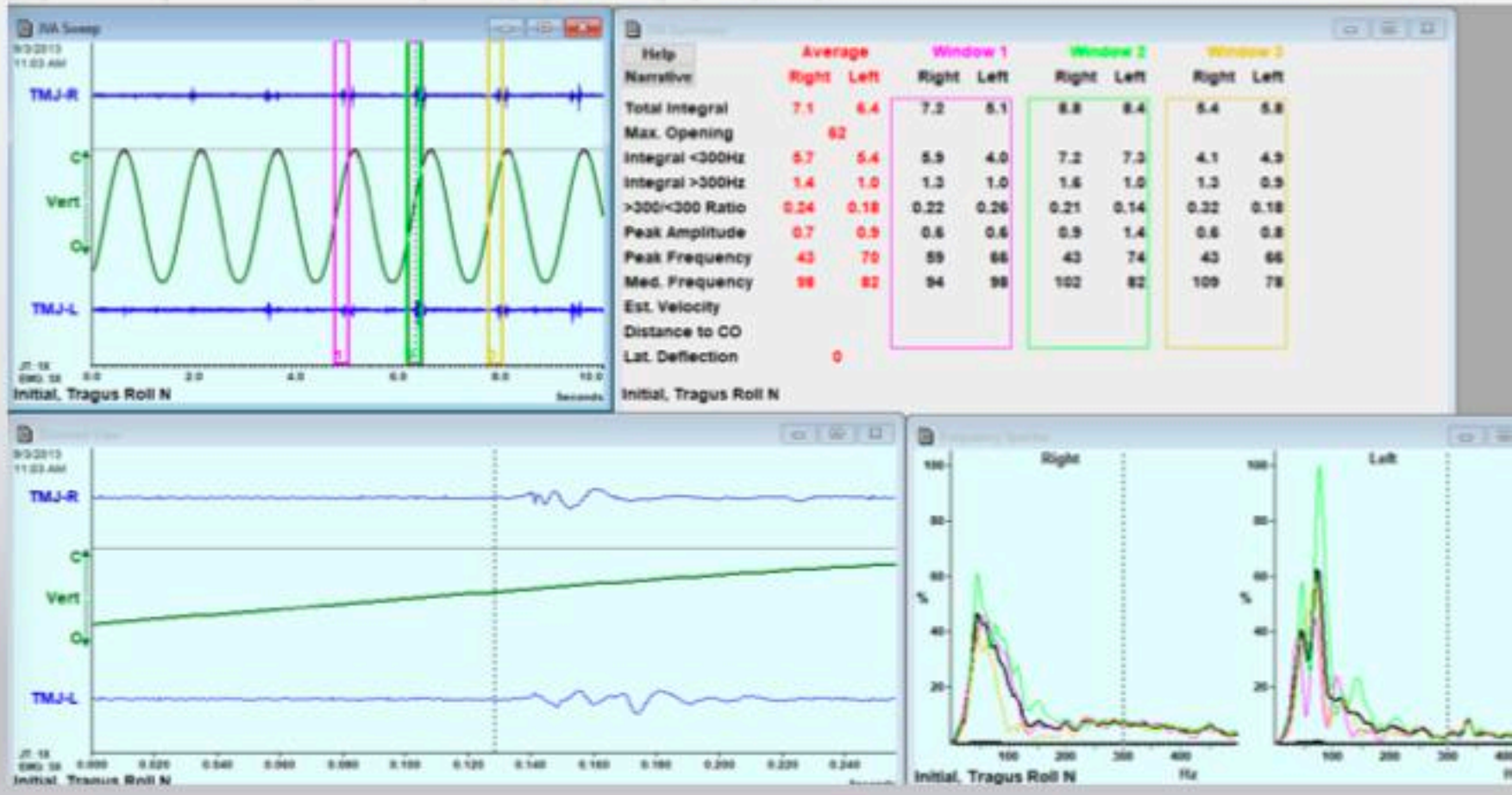


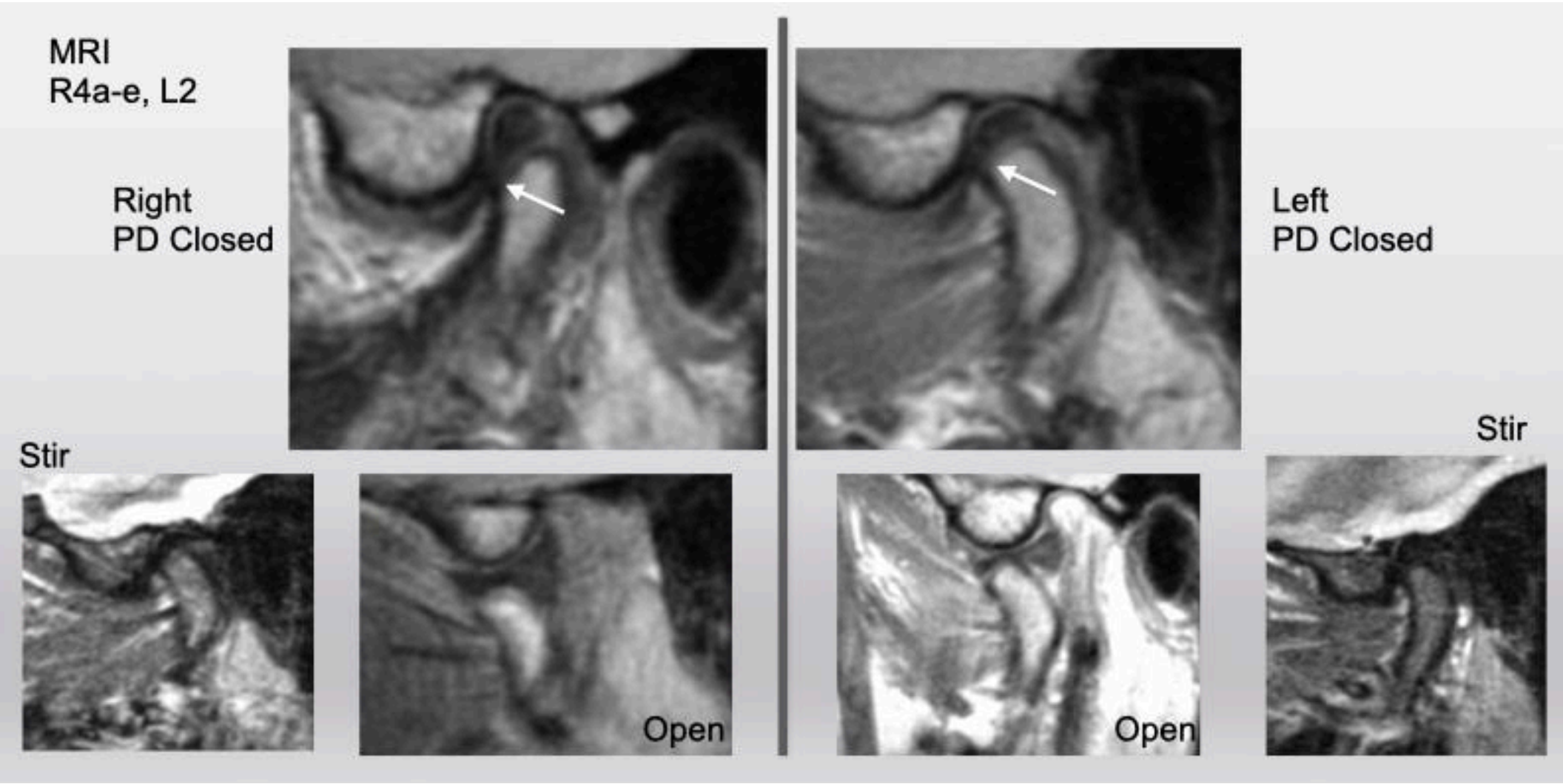
Slight Wobble before tooth contact

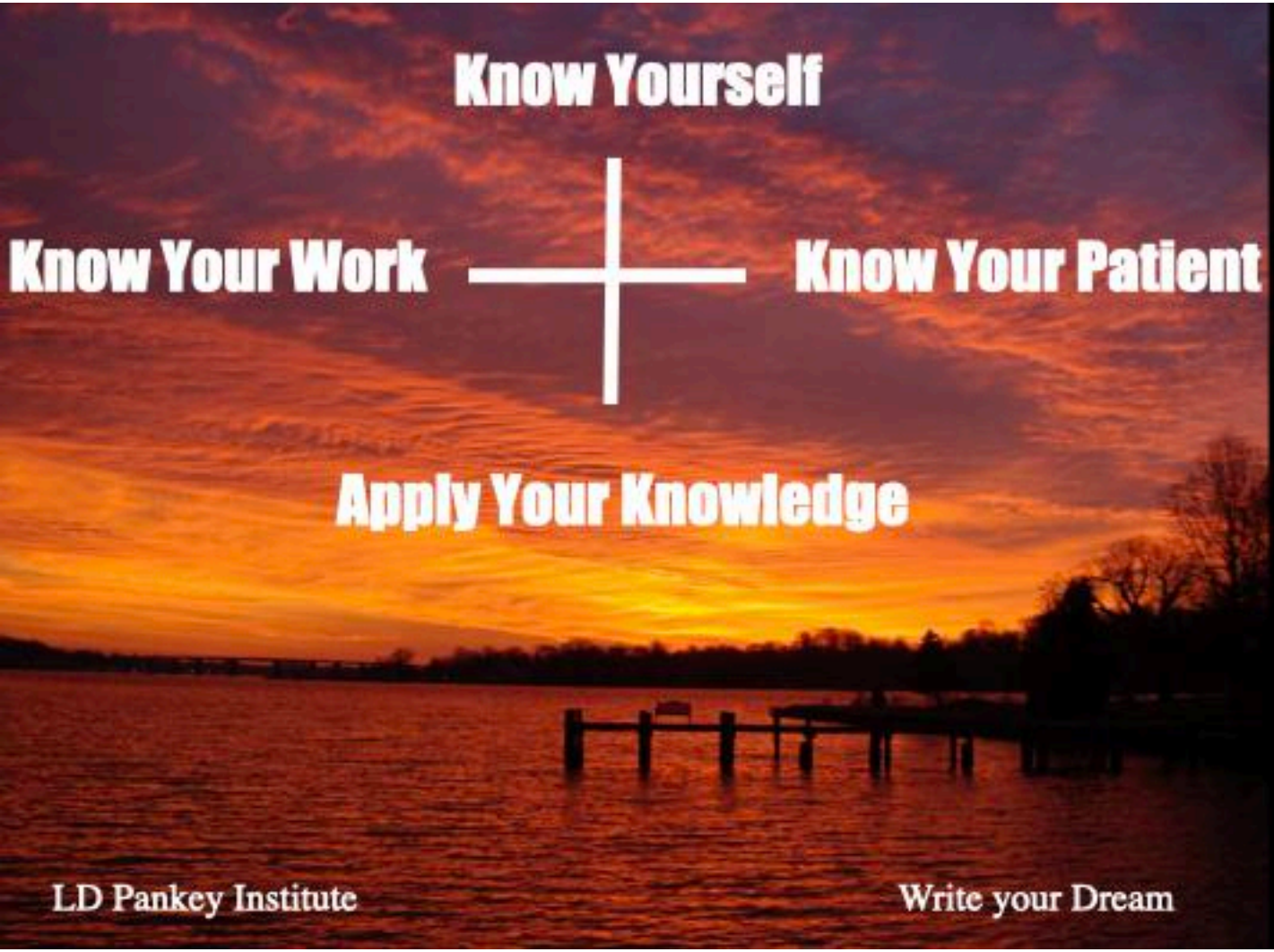
Joint subluxation on movement

Clinical Relevance?

Early damage from parafunction




MRI
R4a-e, L2
Right
PD Closed
Left
PD Closed
Stir
Stir
Open
Open



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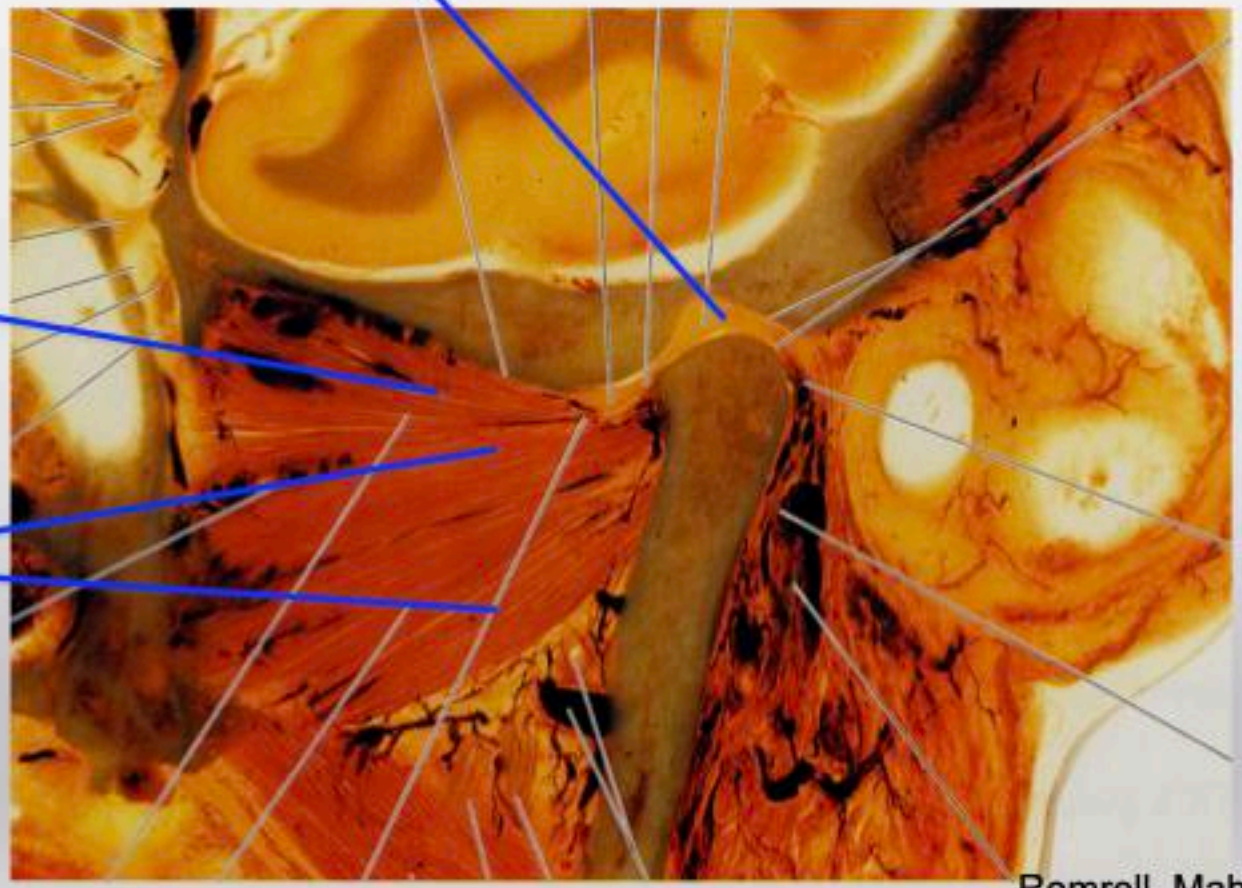
Disc: Thick-Thin-Thick

Oblique Sagittal View

Lateral Pterygoid
Superior Head

Lateral Pterygoid
Inferior Head



Romrell, Mahan

Facial Pain Diagnosis

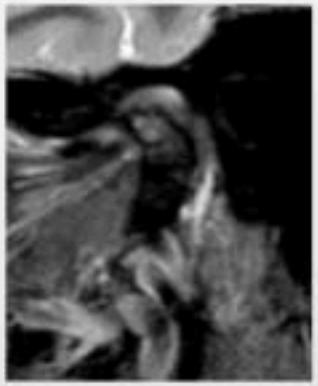
Diagnostic Tools

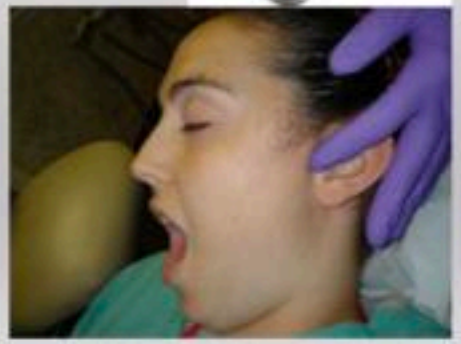
1 Written and Oral History
2 Observation
3 Physical Exam
- Muscle Palpation
- Joint Palpation
- Joint Auscultation
- Joint Motion

4 Anterior Stop Test
5 Sleep Airway Screening
6 CT Scan
- MRI
- Blood Tests

Occlusion: CR Mounted Study Models
Complete Dental Exam
Clinical Photographs
Dx Blocks
Dx Orthotics- Brux Checker, CR Orthotic

<u>Biometrics</u>
Joint Vibration
Jaw Tracker
Electromyography
T-Scan





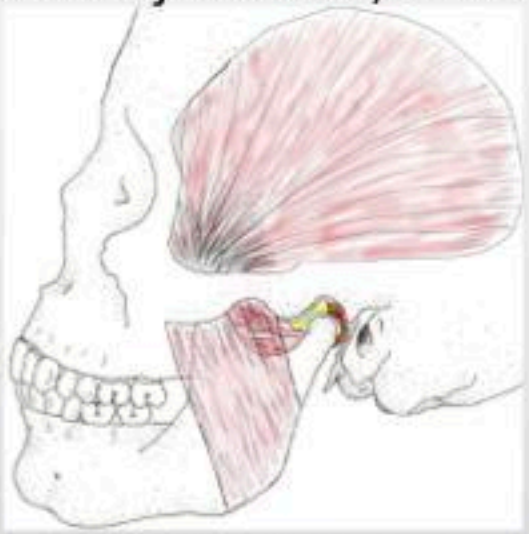
Facial Pain Diagnosis

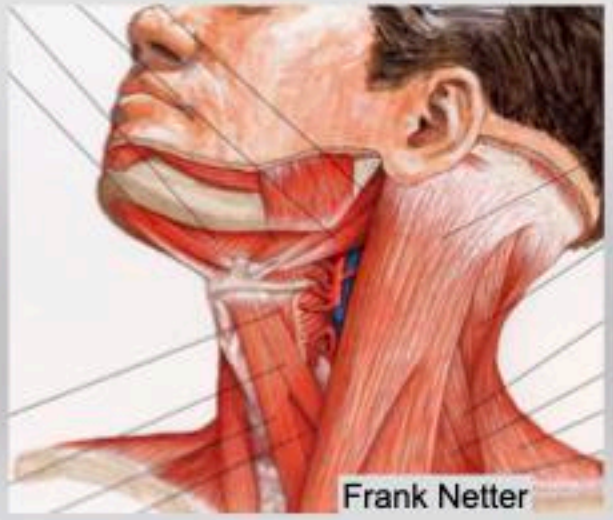
Diagnostic Tools

1. Written and Oral History
2. Observation
3. **Physical Exam**
   - **Muscle Palpation**
   - Joint Palpation
   - Joint Auscultation
   - Joint Motion
4. Anterior Stop Test
5. Sleep Airway Screening
6. CT Scan
   - MRI
   - Blood Tests

While I palpate many muscles, the ones I find key are:

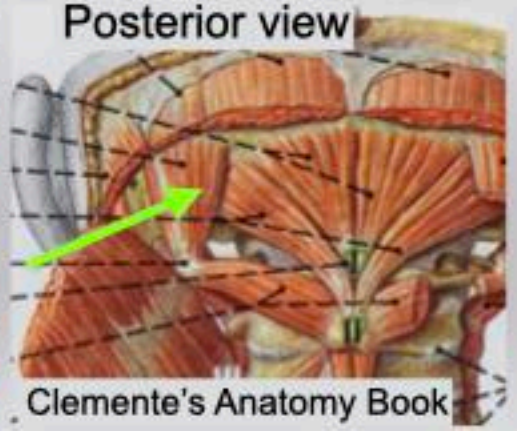
Anterior Temporalis
Masseter
Posterior Digastric
Superior Oblique Capitus
Deep Temporalis
Lateral Pterygoid





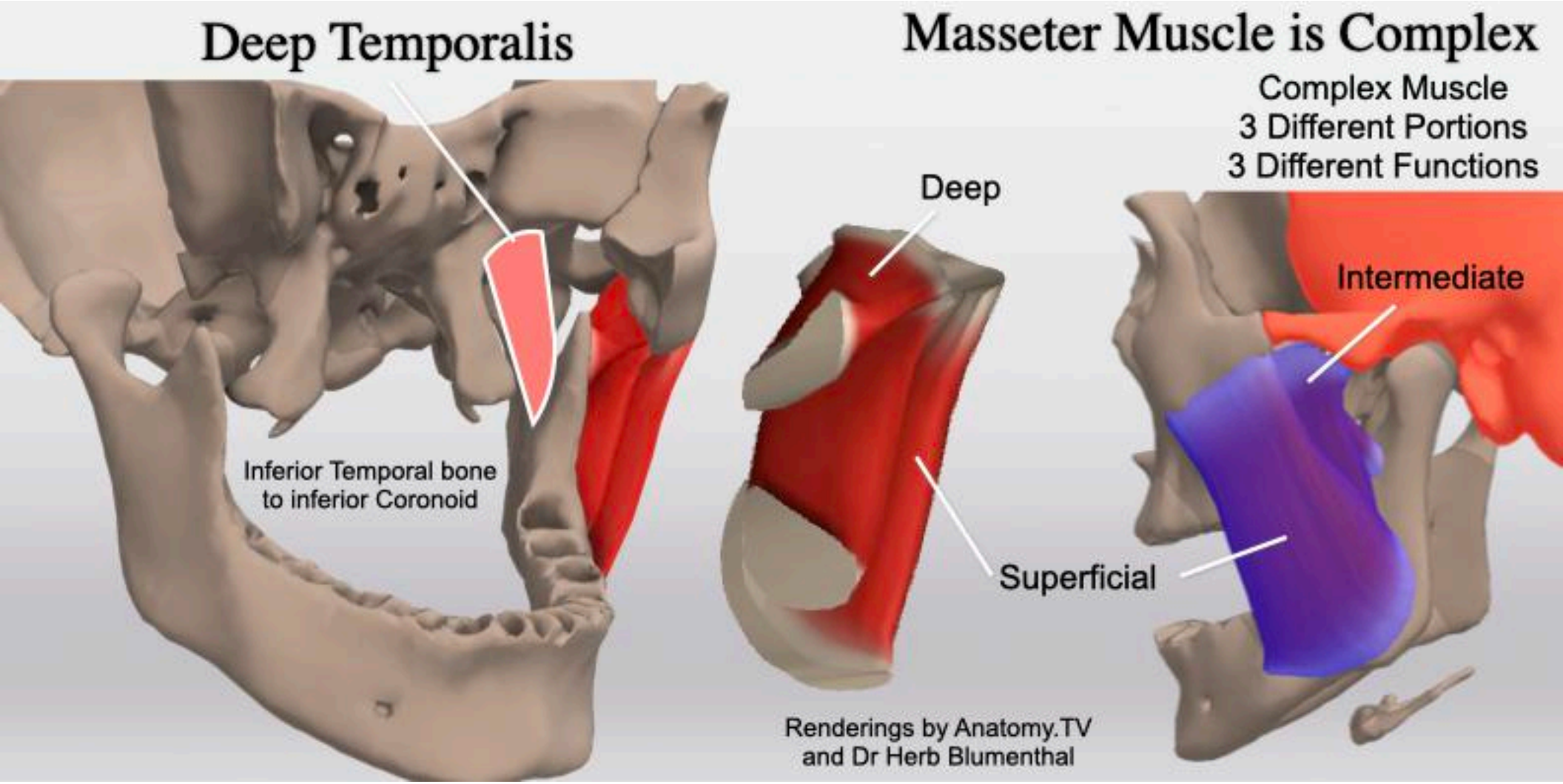
Frank Netter

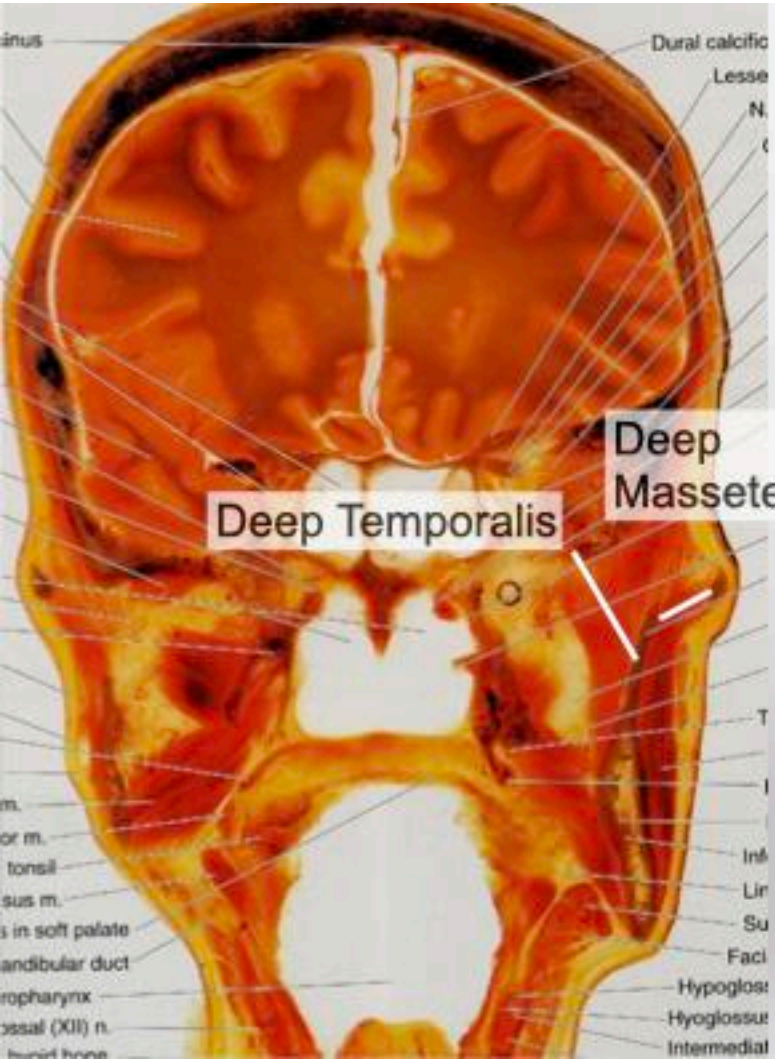
Posterior view

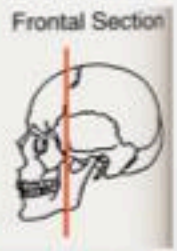


Clemente's Anatomy Book

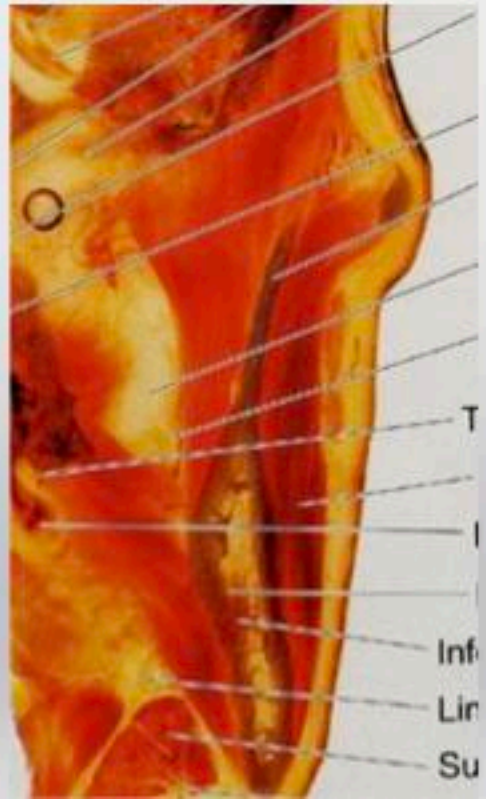
Anatomy TV


Deep Temporalis
Inferior Temporal bone
to inferior Coronoid
Masseter Muscle is Complex
Complex Muscle
3 Different Portions
3 Different Functions
Deep
Intermediate
Superficial
Renderings by Anatomy.TV
and Dr Herb Blumenthal

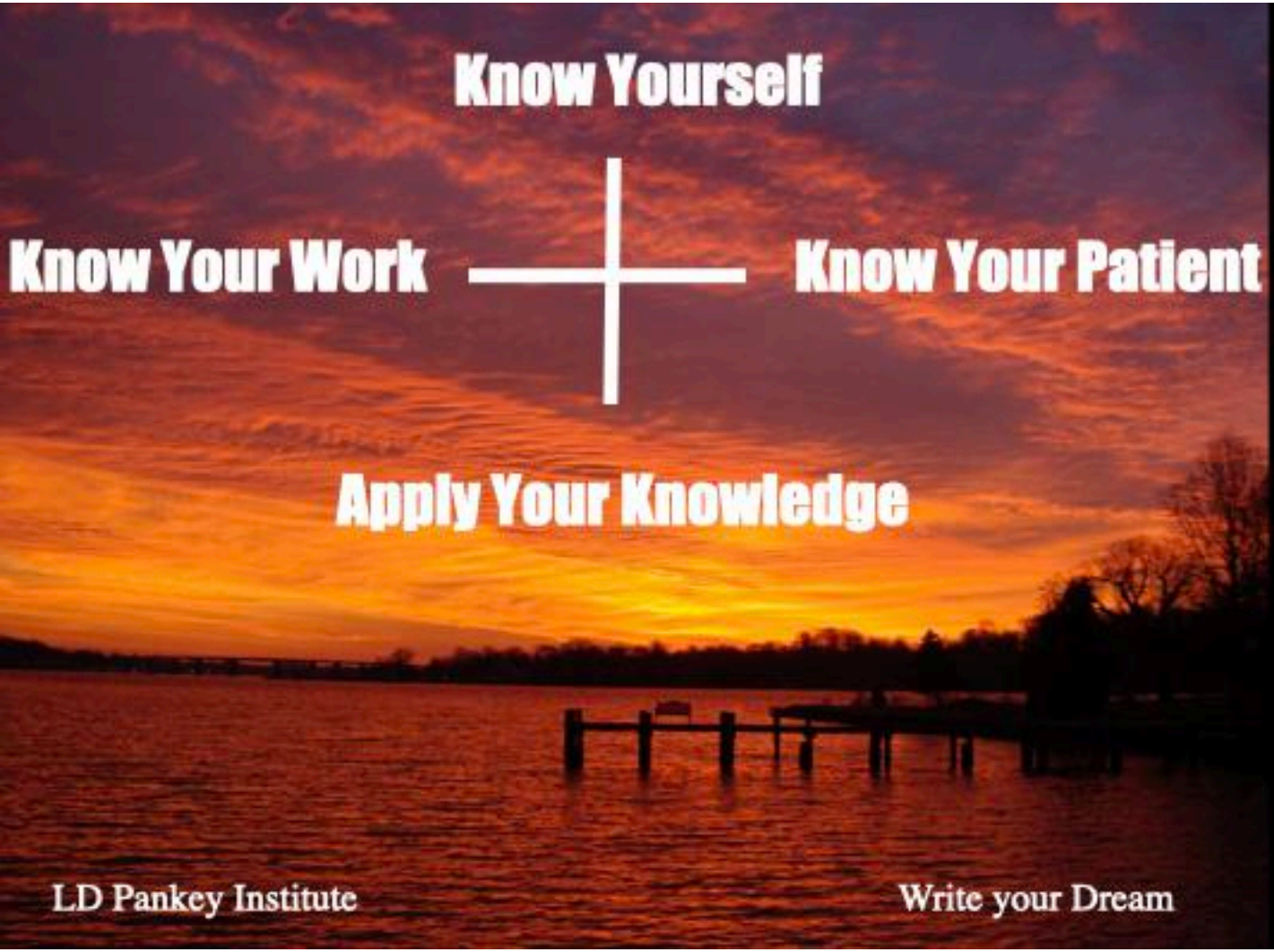




Deep Temporalis and Deep Masseter
Stabilizes TM joint side to side
Sore in "Wobbly Joints"



Deep Temporalis Attachment



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Adult Onset Anterior Open Bite Differential Diagnosis

Developed Post-Puberty

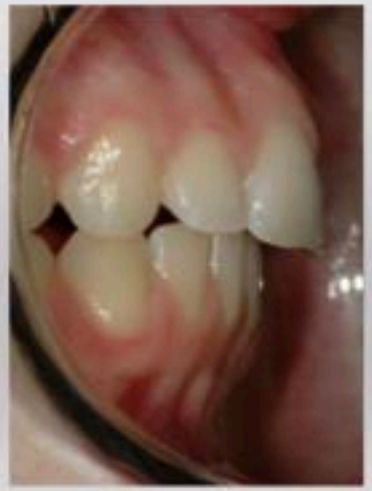
What causes?
Only 2 choices.

The joint has changed

or

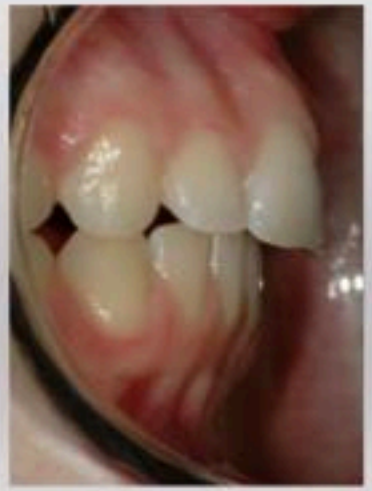
The teeth have moved

Anterior Open Bite Differential Diagnosis



Anterior Open Bite Differential Diagnosis

TMJ Bone loss



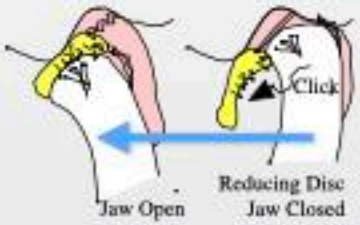
TMJ Bone loss

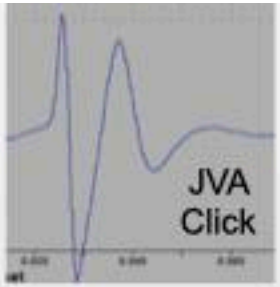
Iatrogenic

Tongue moved teeth

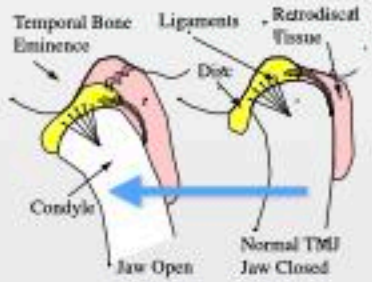
Differential Diagnosis of TMJ Clicking

Disc Reduction

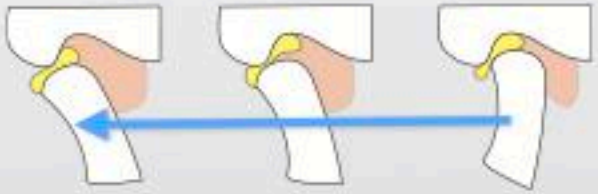




Normal

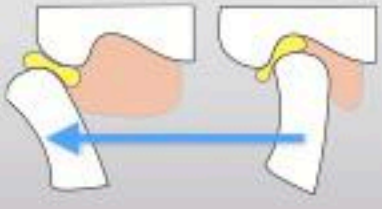


Adhesive Click



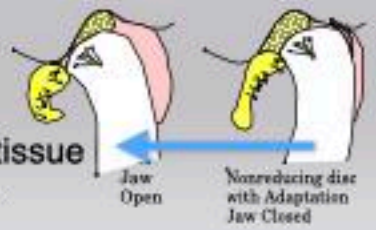
"Sticky Disc" - Disc sticks after prolonged clenching, then releases

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

Facial Pain Diagnosis

Diagnostic Tools

1 Written and Oral History
2 Observation
3 Physical Exam
- Muscle Palpation
- Joint Palpation
- **Joint Auscultation**
- Joint Motion

4 Anterior Stop Test
5 Sleep Airway Screening
6 CT Scan
- MRI
- Blood Tests

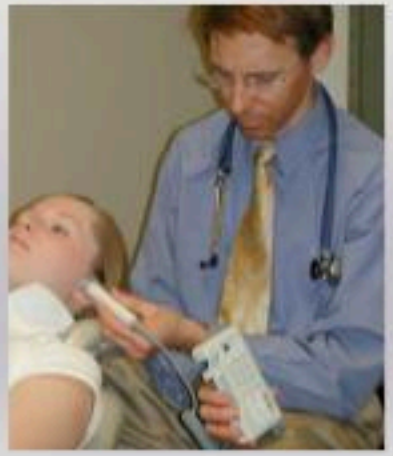
A healthy joint is quiet,
A damage joint is not.
A joint that does not move is also quiet.

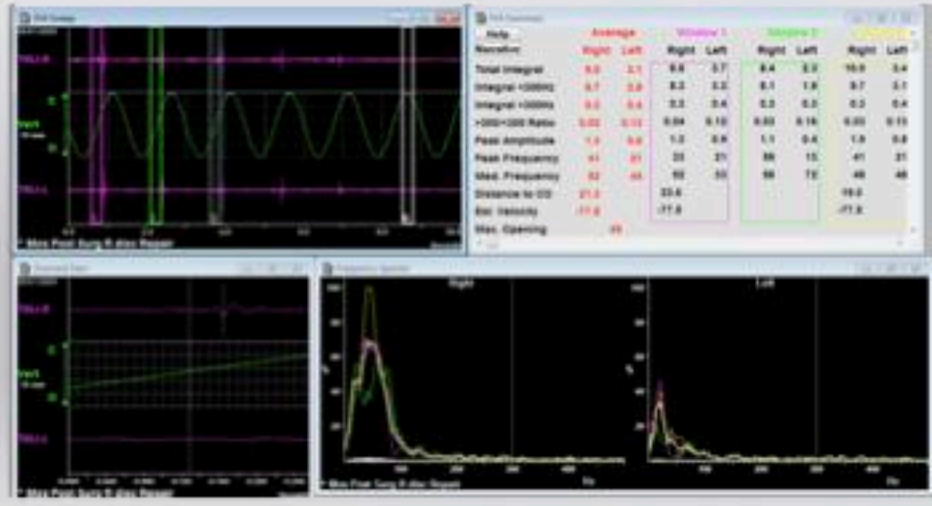
Sounds/ Vibrations

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





Sounds/ Vibrations Stethoscope

Use Bell side, not Diaphragm side, over the TMJ

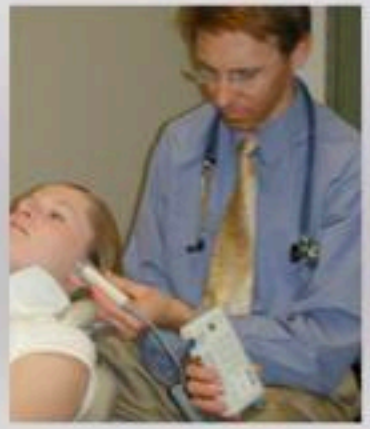
3M Littmann Classic II S.E. Stethoscope

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
			??

Sounds/ Vibrations
Doppler

Doppler measures motion toward or away from the source



A Health Joint is Quiet

Find Superficial Temporal Artery
Listen for Retrodiscal Expansion
Cavernous Vein Expansion
Pin back Tragus, Aim for eye
Rapid velocity to find best location
Diagnostic velocity jaw movement

Skin Movement causes errors

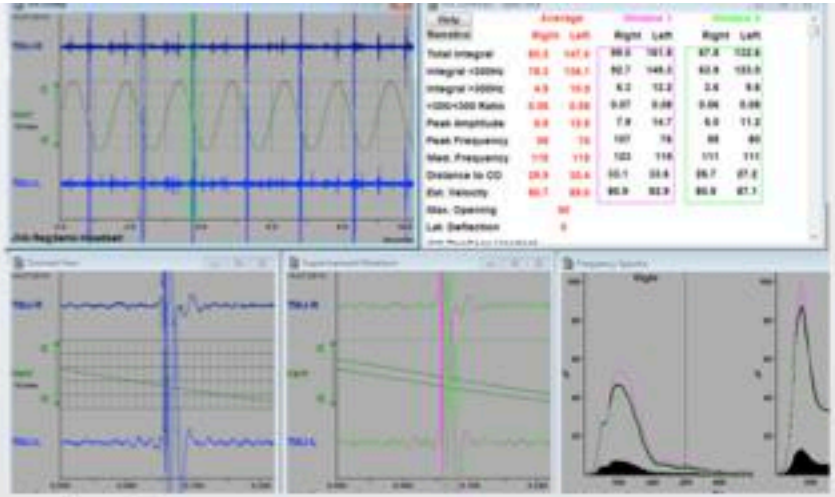
Doppler only hears what occurs at lateral portion of condyle.
Small degenerated condyles are quiet.

All dopplers generate different sounds for different motions

Landmark Medical, Inc. 800-334-5618
Huntleigh Mini Dopplex 5hz
Great Lakes Orthodontics 800-828-7626

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

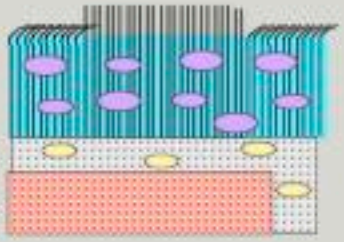
Three main types of sounds

Disc Reduction
Disc Dislocation
Adhesion crackle
tooth tap

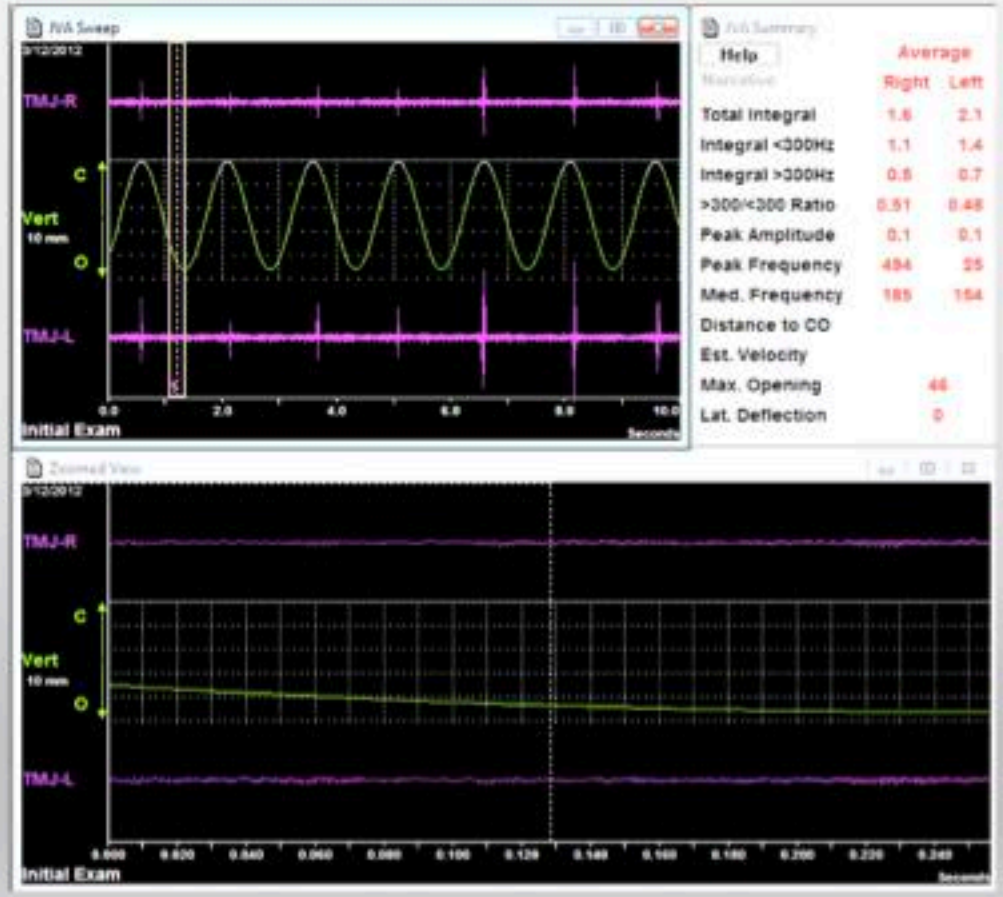
Osteoarthritis
Pseudo Disc
Damaged Cartilage

Disc Subluxation
Joint Subluxation
Disc Reduction
Disc Dislocation

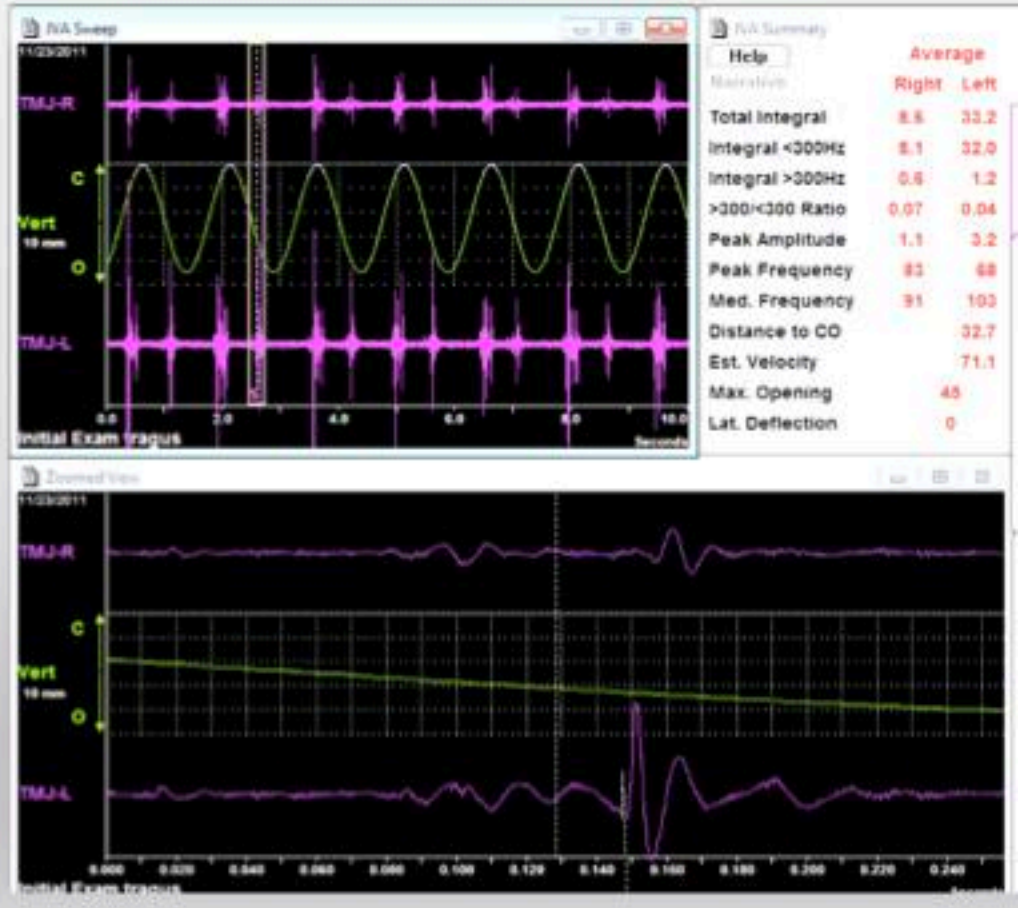
JVA measures the health of the cartilage



Healthy or Damaged?

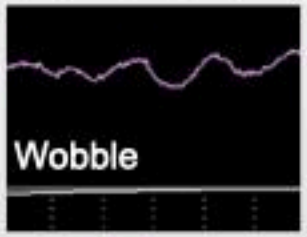


Healthy or Damaged?



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

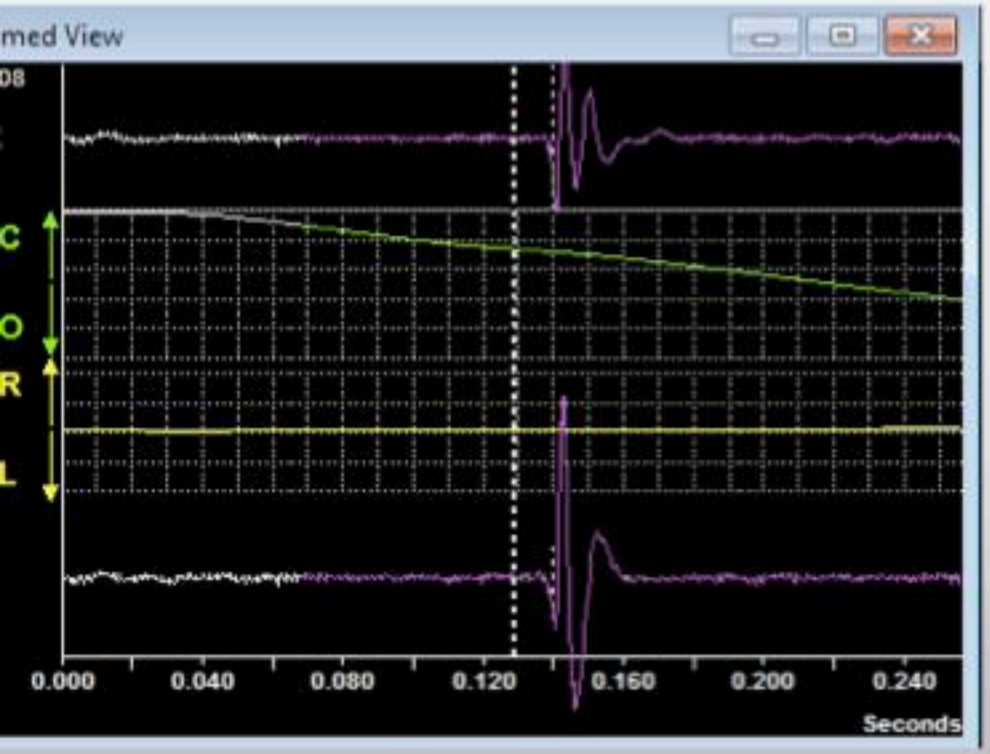
Diagnostic tests
Narrow down the choices

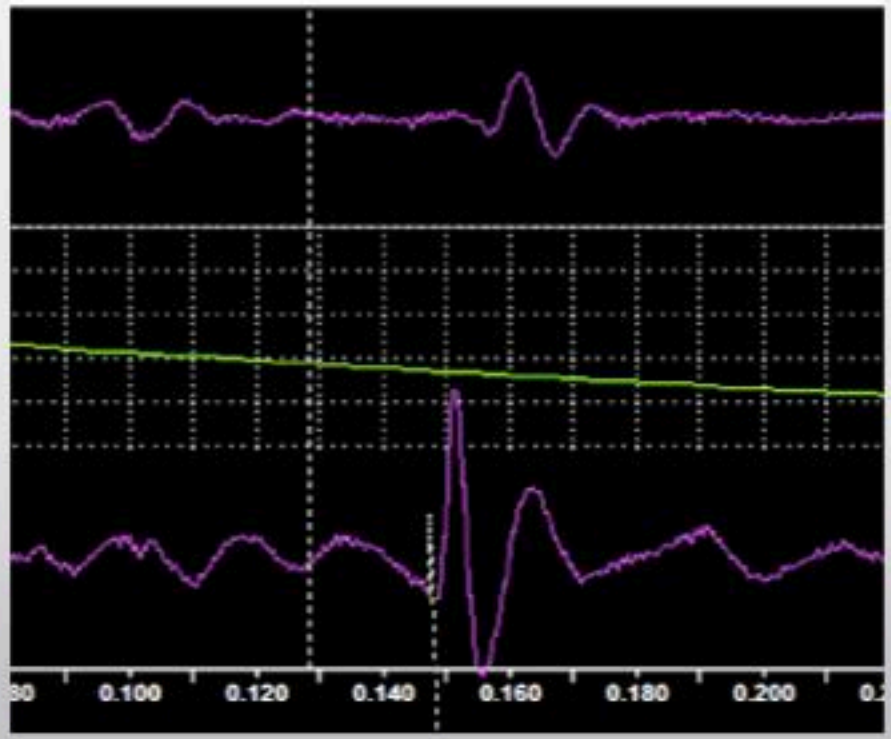
Working Diagnosis
Treating as if

Not completely resolved

Final Diagnosis
Only after problem resolved

Simple or Complex





Simple left click with transference vibration to right
L4a

Complex Click
L3a, R4b

Magnetic Resonance Imaging

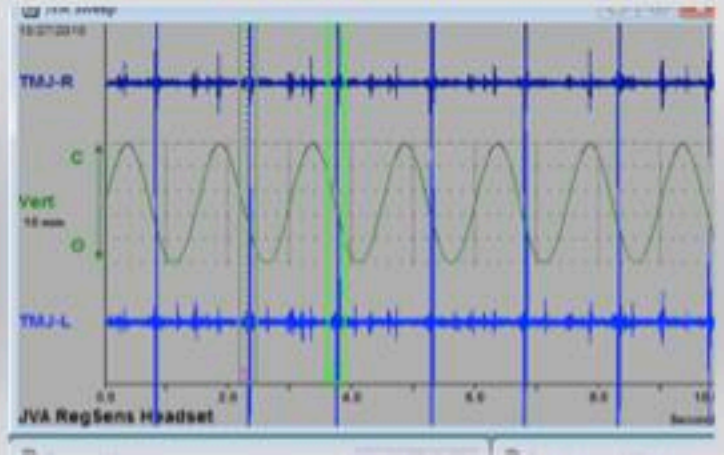
MRI gives you the start and finish
You have to infer what happened in between

Joint Vibration Analysis

JVA gives you what happens in between
open and closed. It records "motion".
You then infer the start and finish

JVA records *Objectively* the vibrations of the TMJ as you open and close.
Ability to compare from year to year.

JVA allows you to view
the joint in function



6 Common TMDs

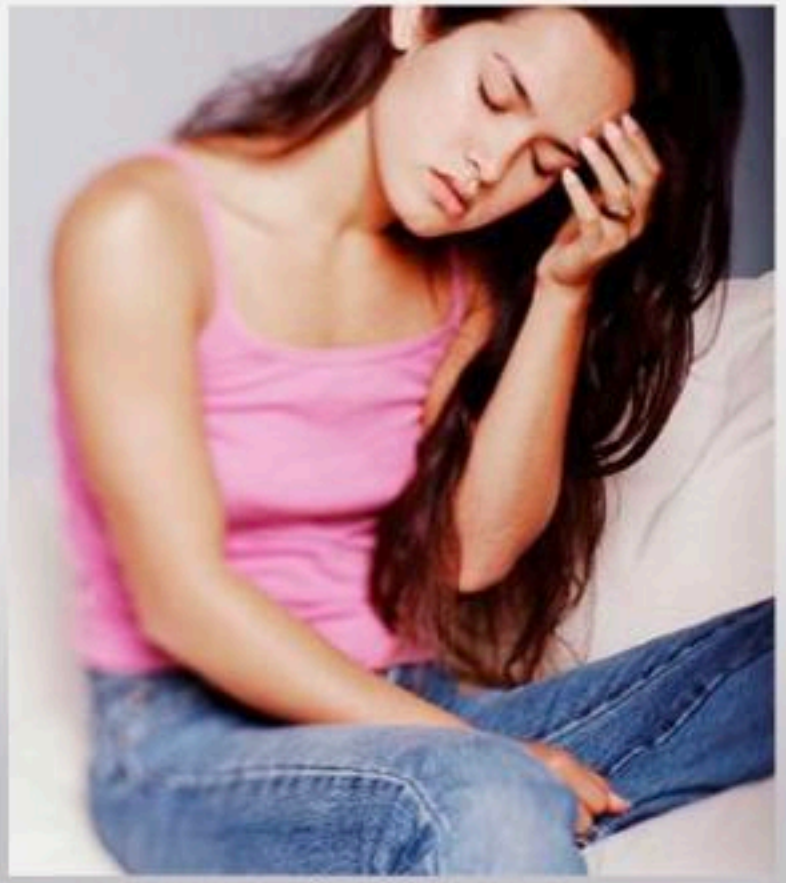
Parafunctional Clenching
Parafunctional Grinding
Occlusal Muscle Dysfunction
Osteoarthritis
Acute Sprain
Acute Closed lock of TMJ disc

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



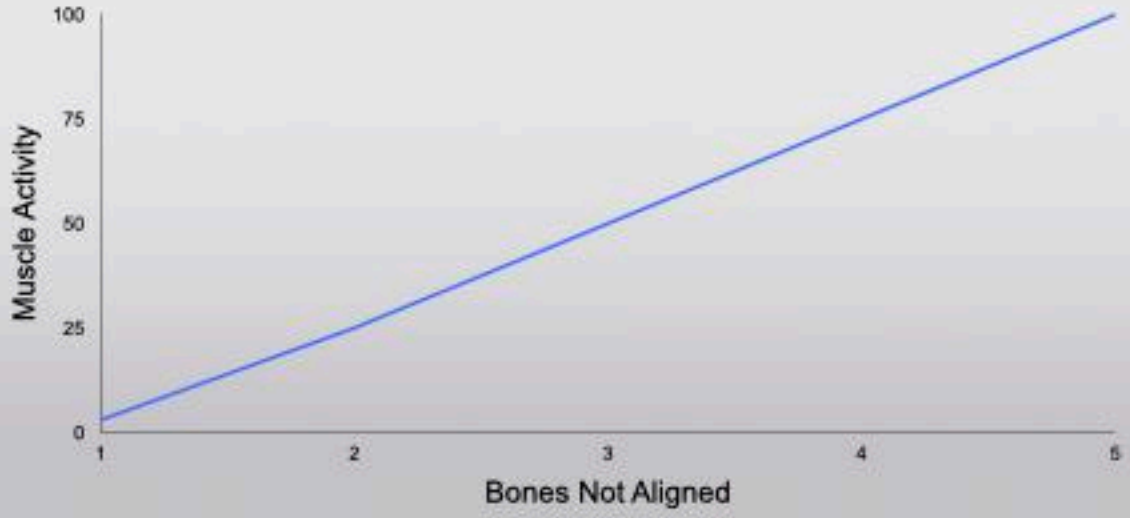
Centric Relation Load Zone Mechanical Stability

John R Droter DDS
Annapolis, Maryland

Orthopedic Medicine- Optimal Load Bearing Position

Every joint has an optimal load bearing position-
Most Bone Support/ Least Muscle Bracing when Loaded

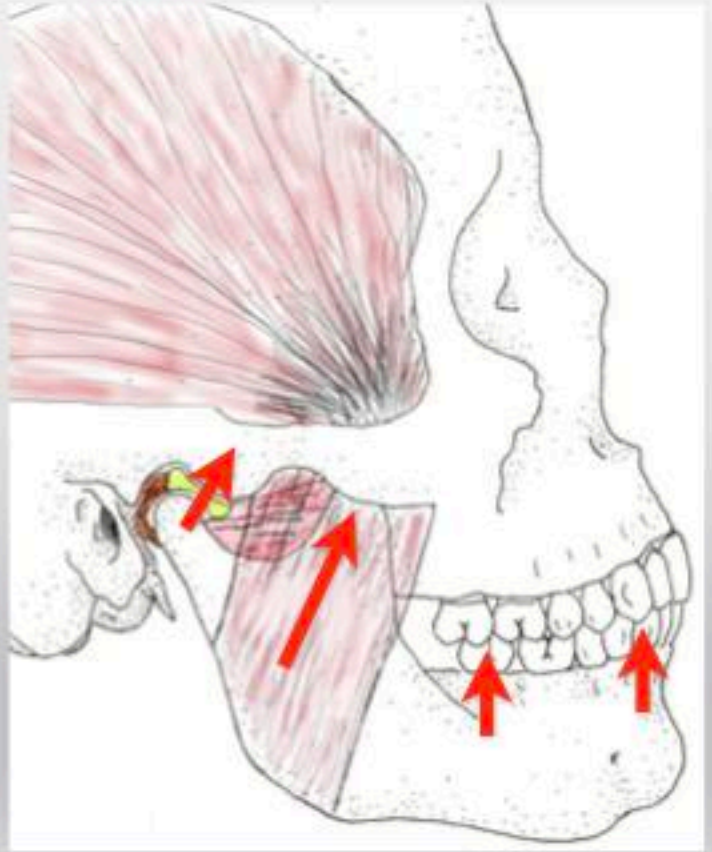
Centric Relation- Optimal Load bearing position of the TMJ-
Most Bone Support/ Least Muscle Bracing when Loaded



Which position can you hold the longest?

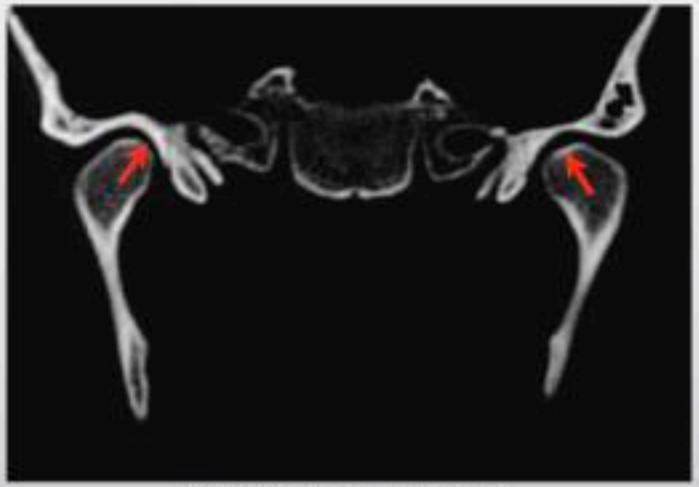
Nemeth G, On hip and lumbar biomechanics. A study of joint load and muscular activity, Scand J Rehabil Med Suppl. 1984;10:1-35.

Biomechanics



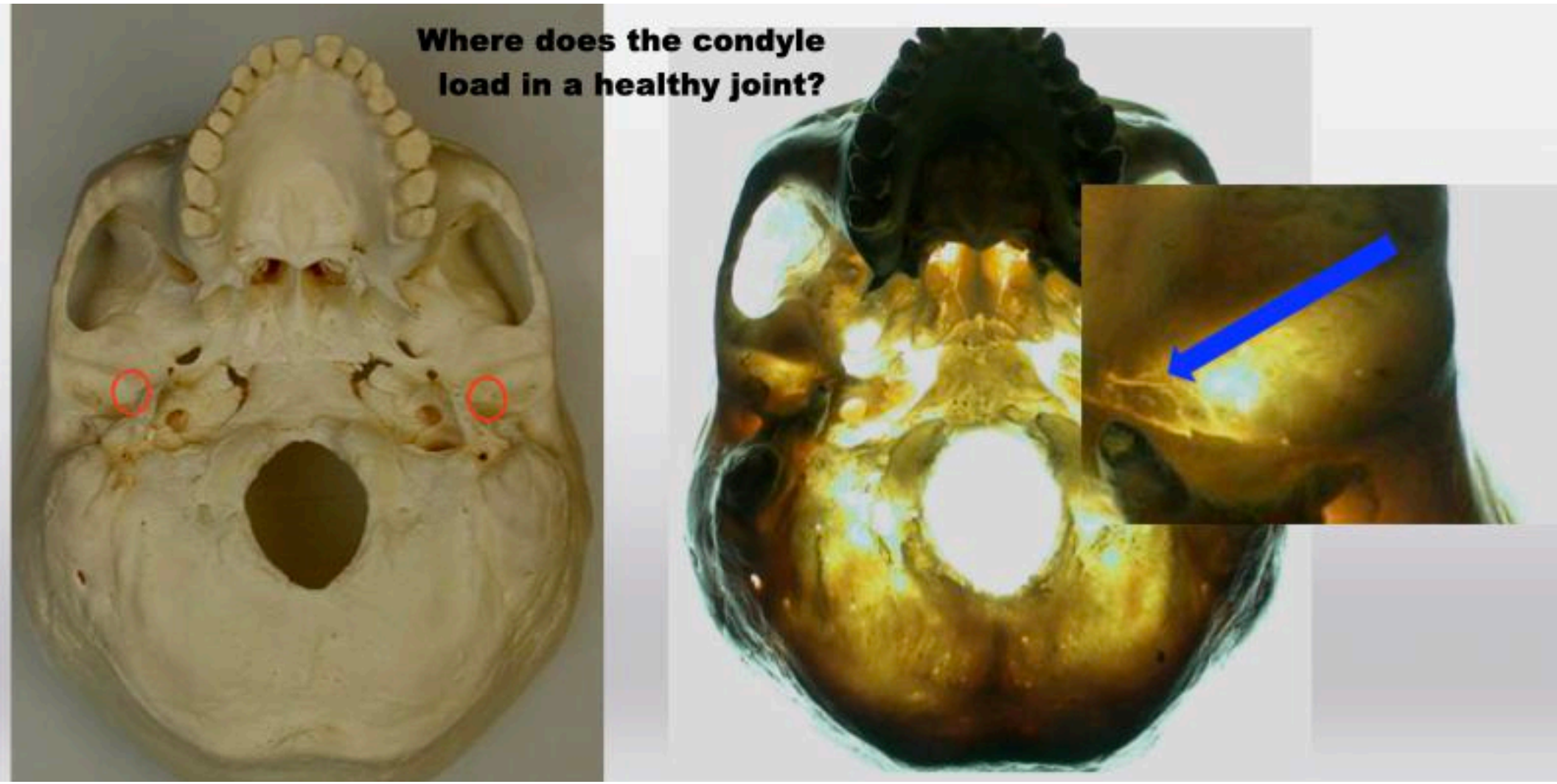
Superior Medial loading is ideal

Peter Dawson Textbook

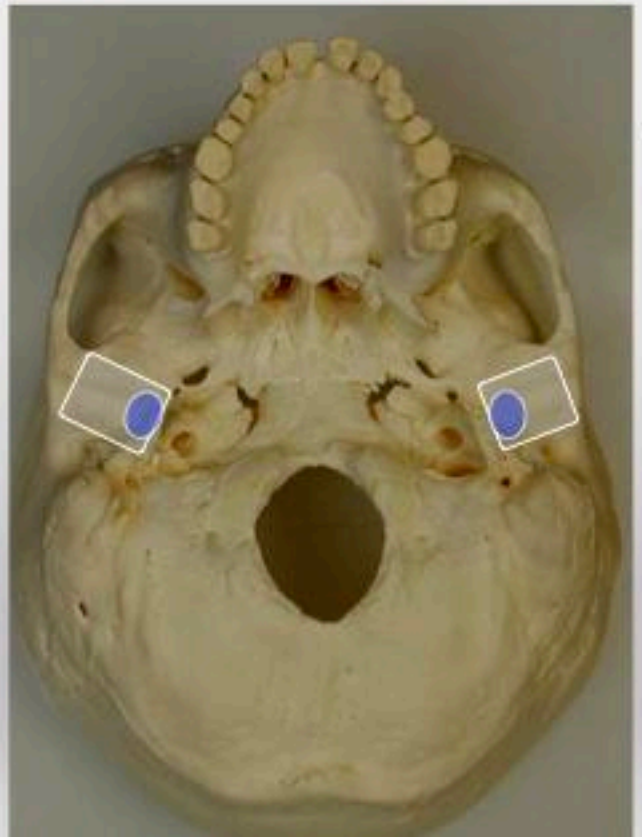


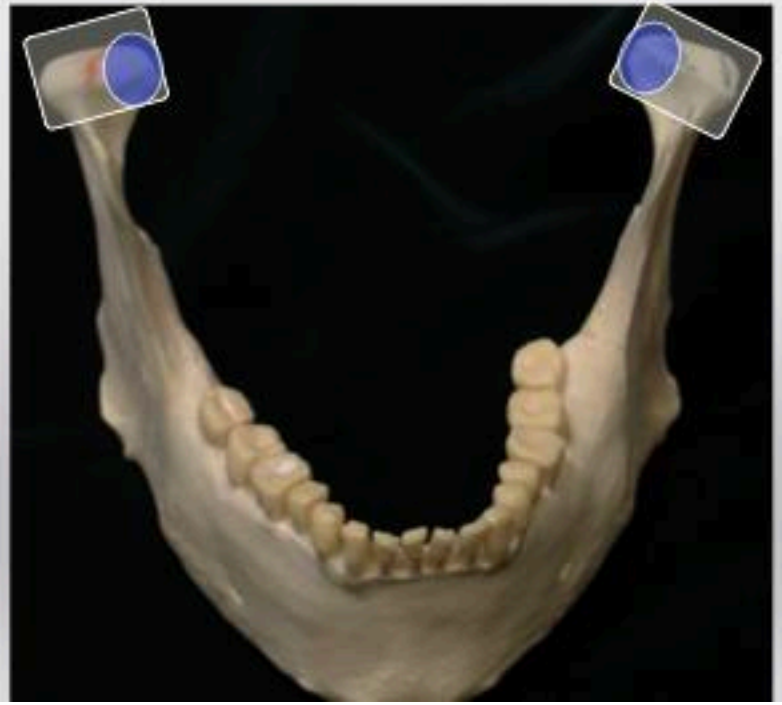
CT Coronal View

Coronal CT ask where is the bone the closest?
This is the load zone.


Where does the condyle
load in a healthy joint?

Centric Relation (CR) Load Zone

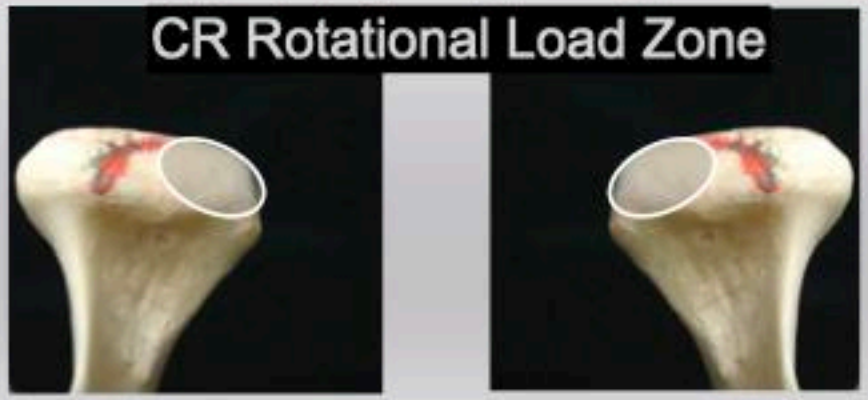




CR Load Zone

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

Medial is ideal

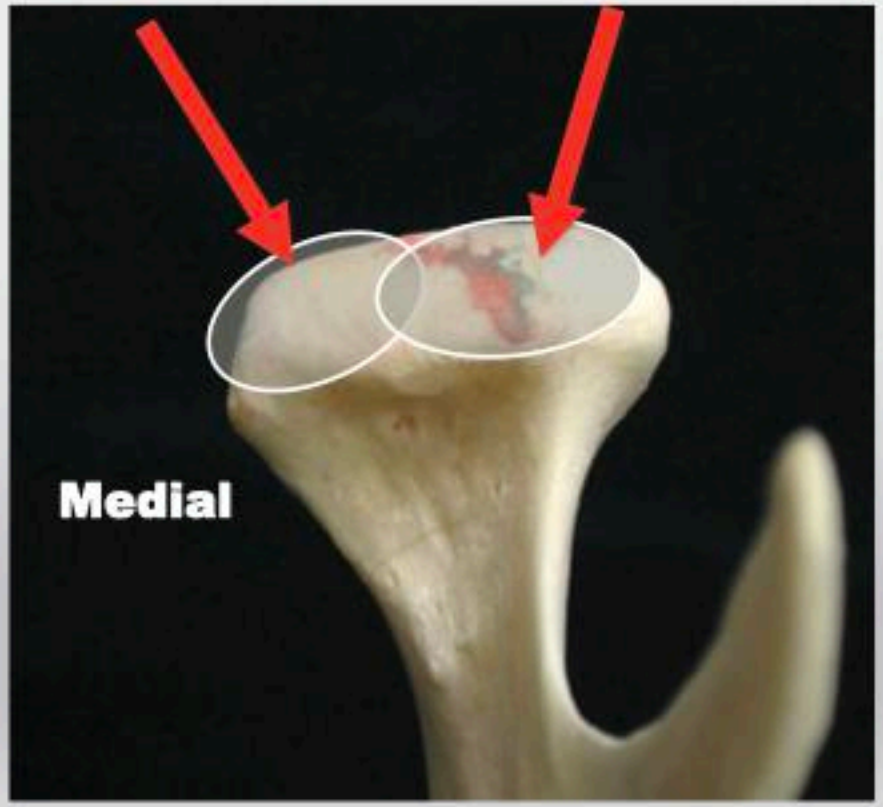


Find where the condyle is closest to the fossa

Centric Relation (CR), Translatory, and Pivot Load Zones

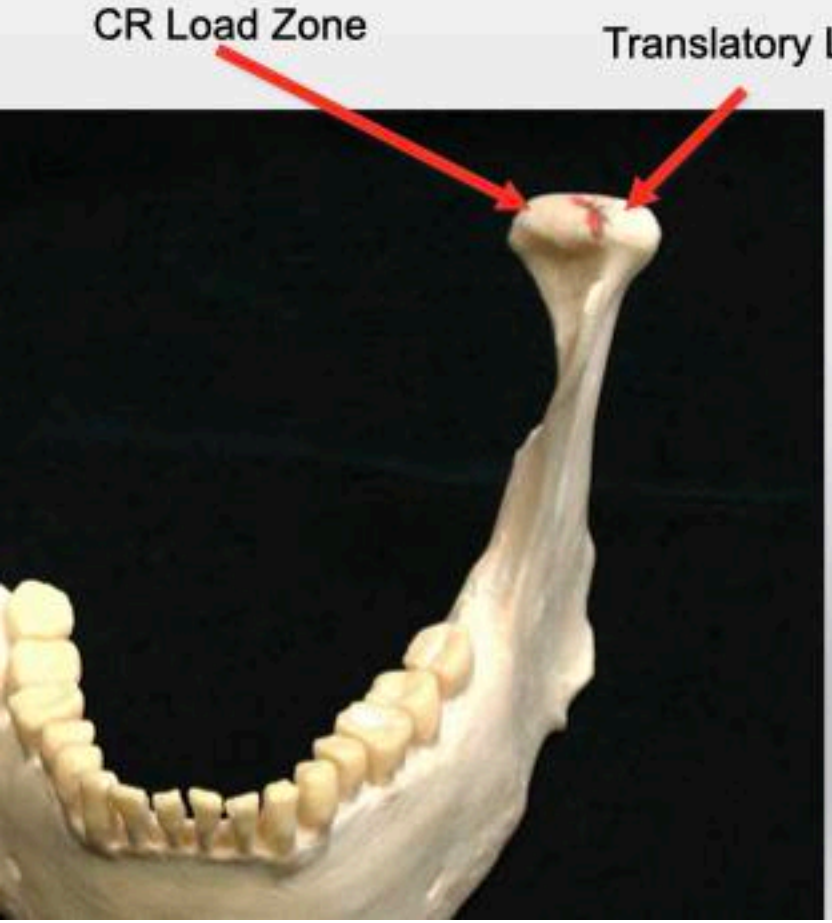
CR Rotational Load Zone

Translatory Load Zone

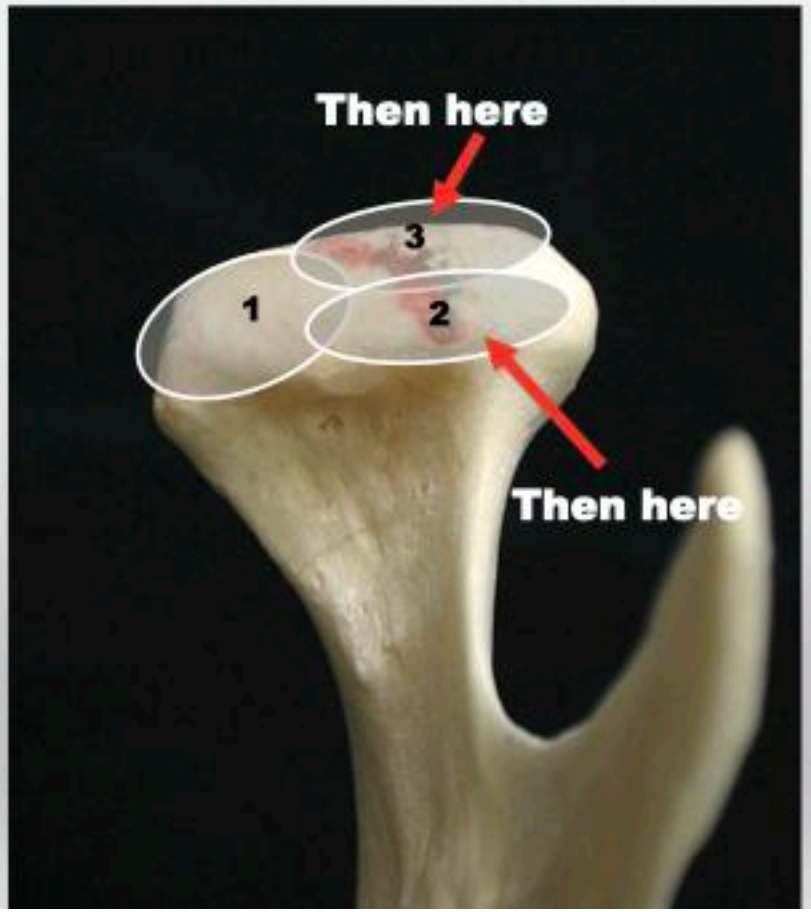


Left Condyle

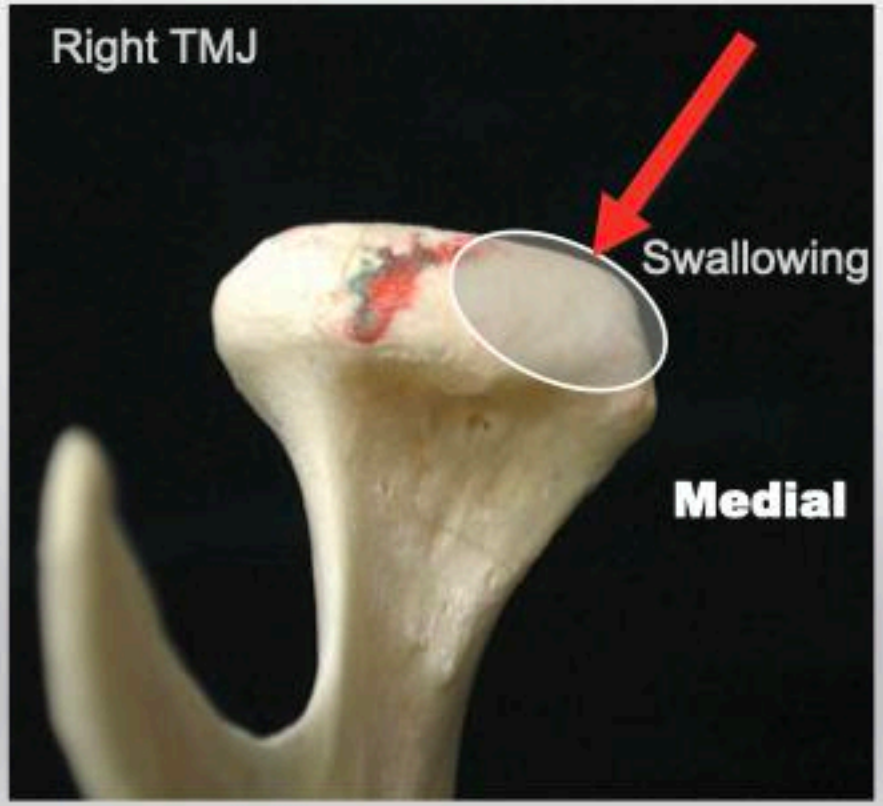
CR and Translatory Load Zones

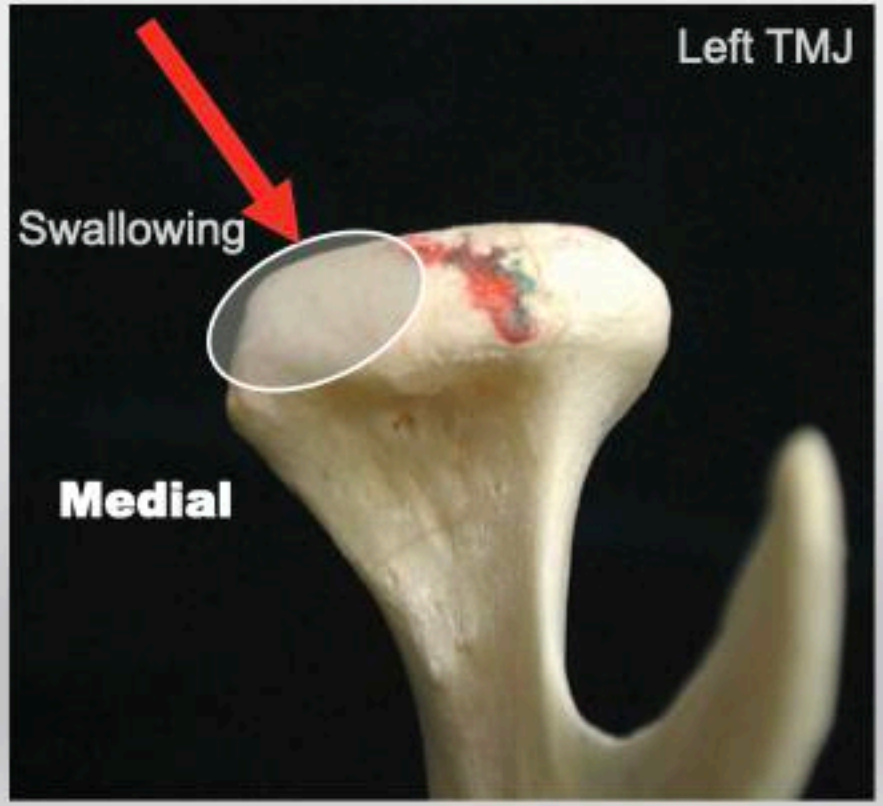


Load zones on opening



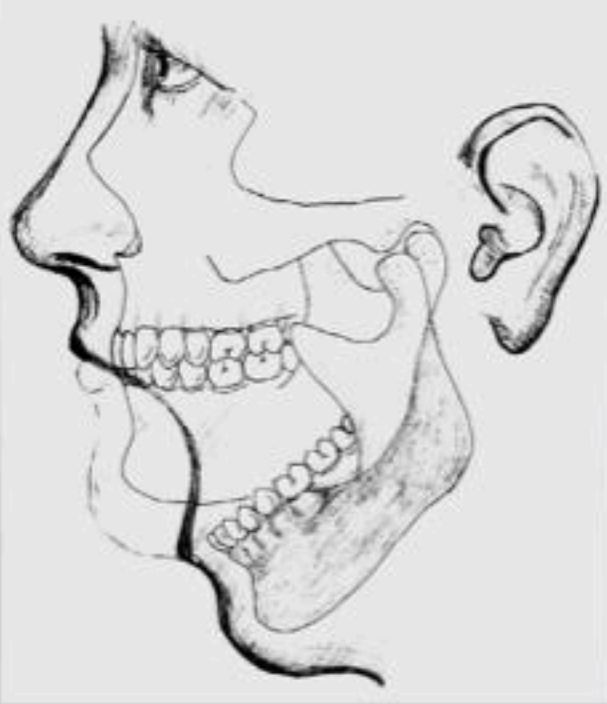
Centric Relation (CR), Translatory, and Pivot Load Zones





TMJ has 3 Movements

Rotate
Slide
Pivot

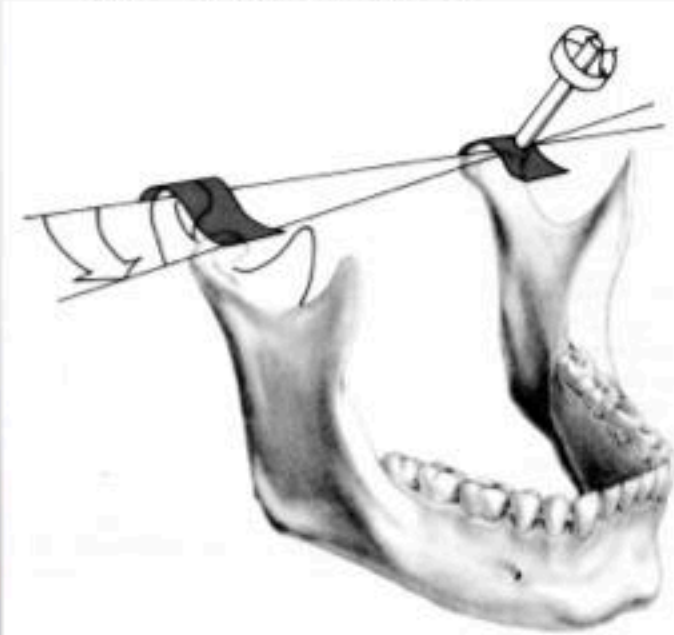


Open to 25mm rotation

Move jaw forward translation (slide)

Open + 25mm rotation with translation (slide)

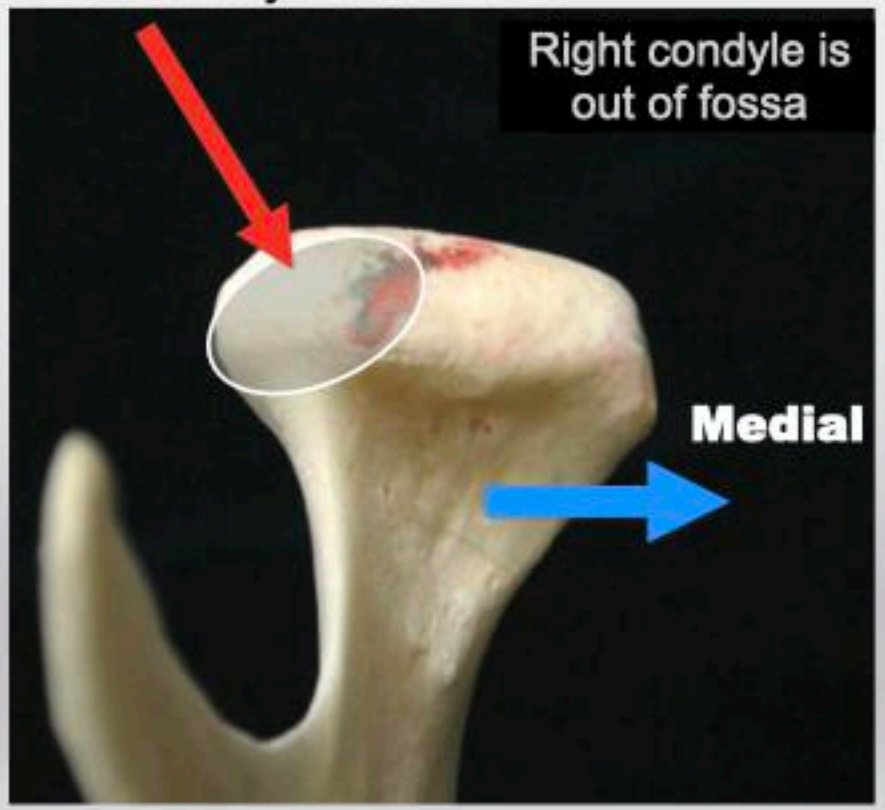
In left lateral movement, the left joint pivots, the right slides.



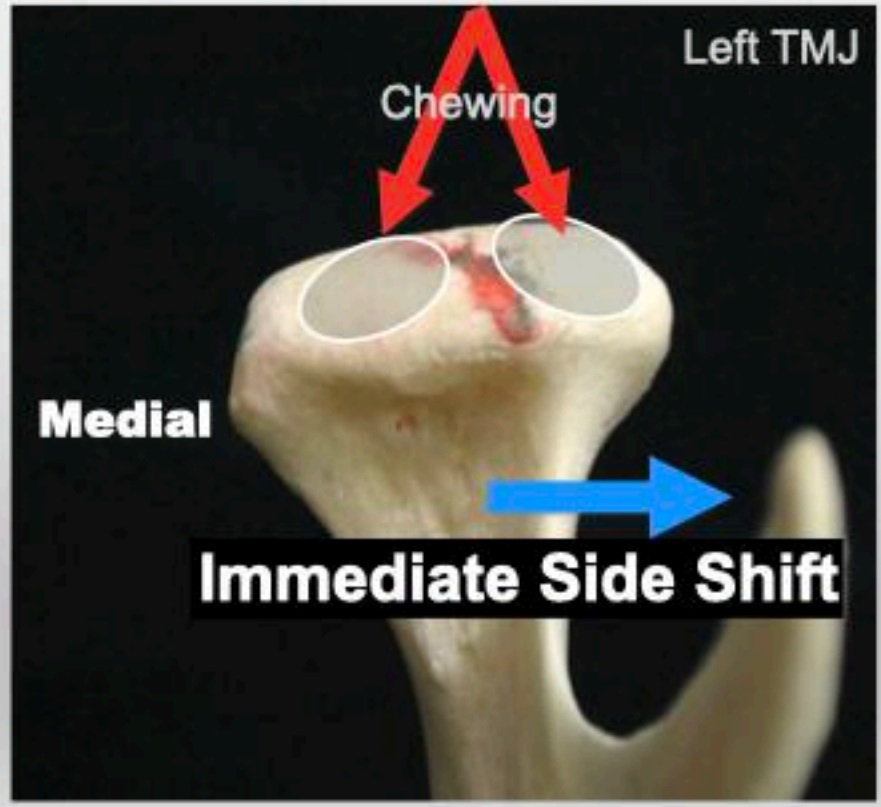
Dawson, Peter E. Evaluation, Diagnosis, Treatment of Occlusal Problems. Second Edition. 1989

Centric Relation (CR), Translatory, and Pivot Load Zones

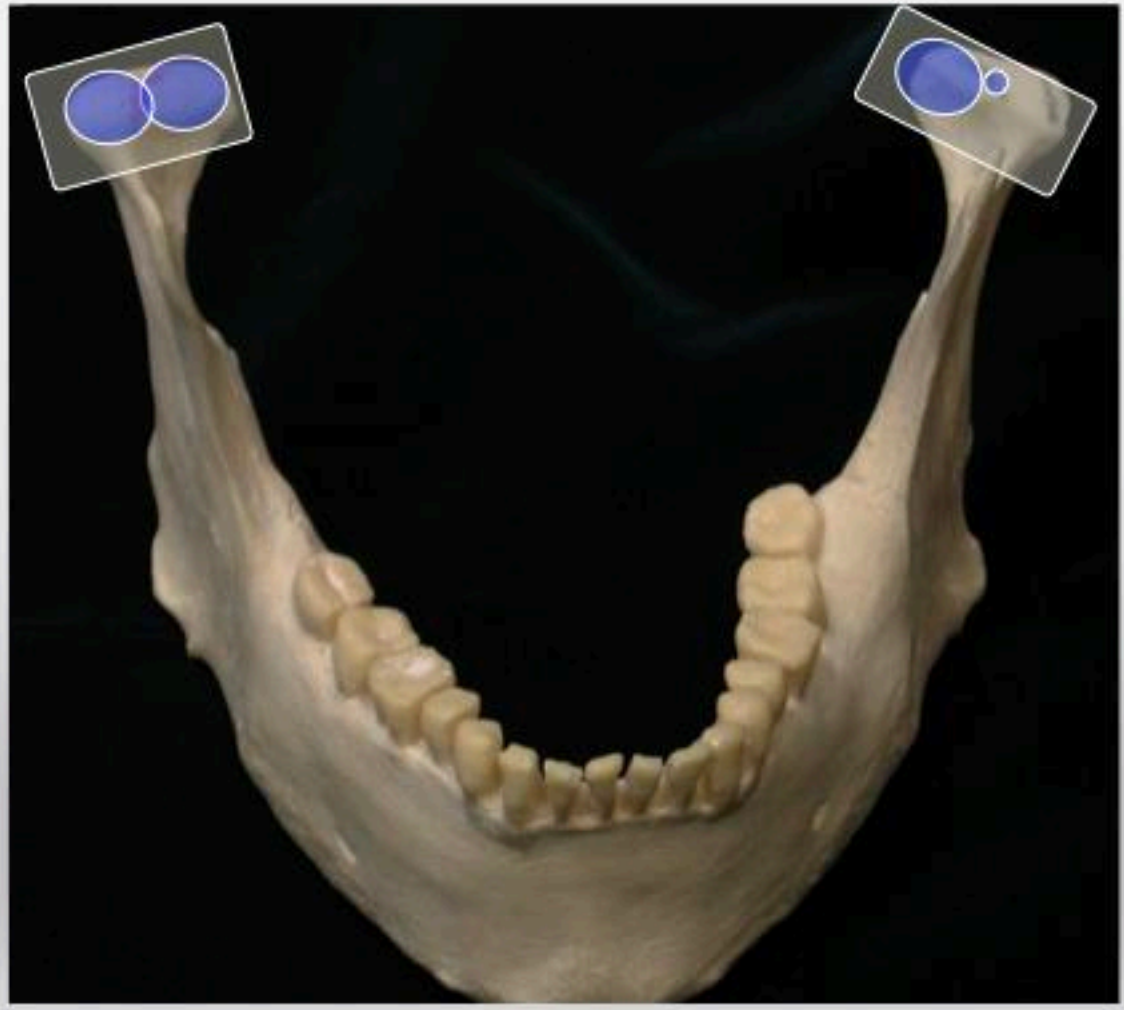
Translatory Load Zone



Pivotal Load Zone



Condylar Loading in Disc Displacement



Run x3

Centric Relation (CR) Load Zone

Joint subluxates on load
"Wobbly Joint"

Medial is ideal

Right Superior Lateral,
Left Superior Medial CR Load

The TMJ:What You need to Know

Mechanical Stability

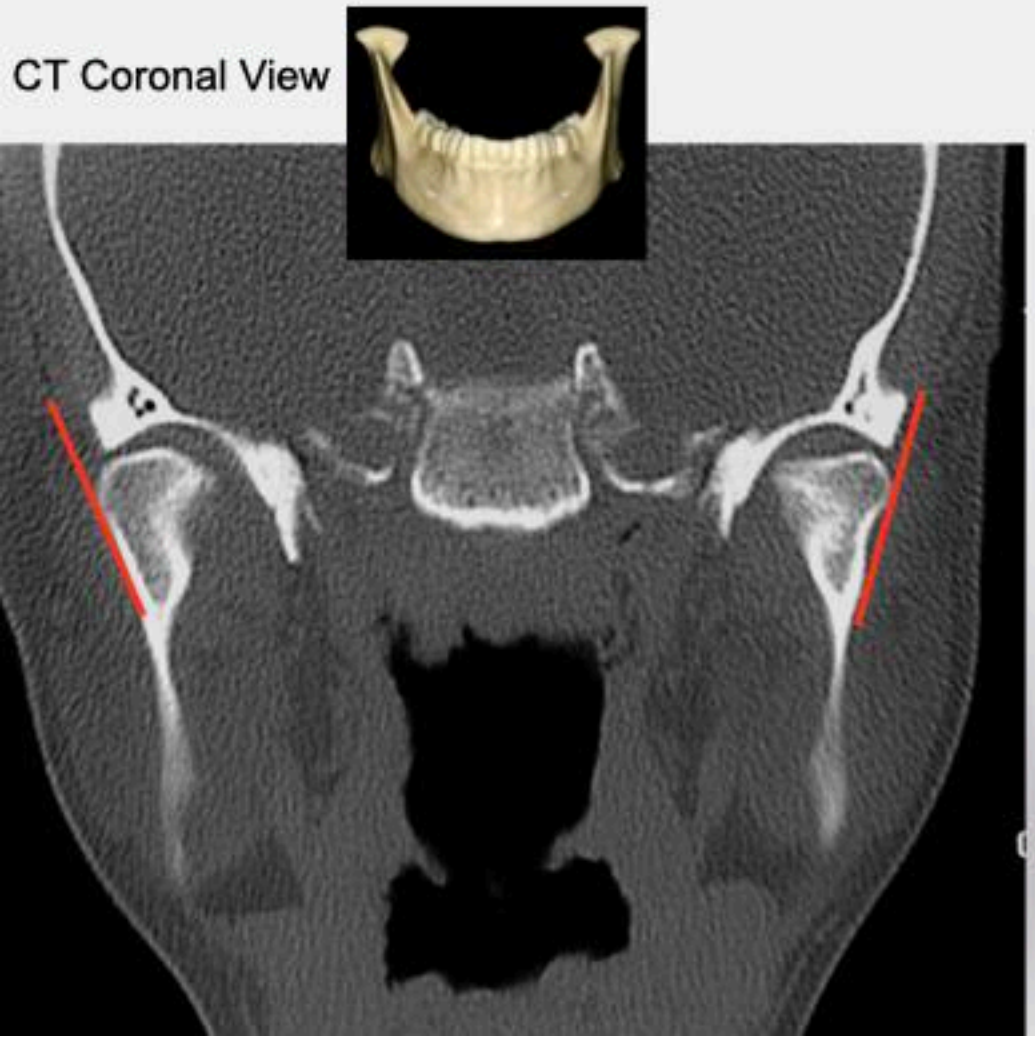
Mechanical Joint Stability

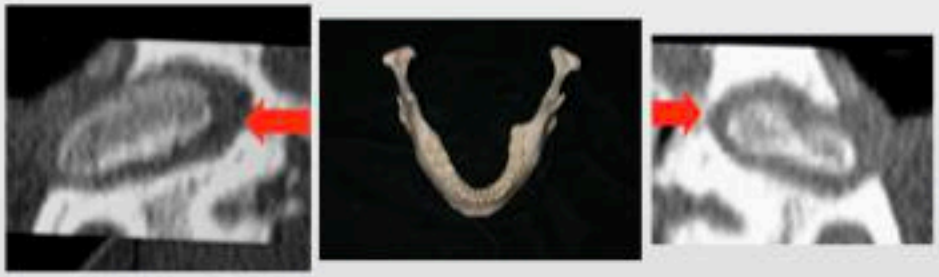
Shape condyle/disc/fossa provides stability when loaded

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

CT Coronal View

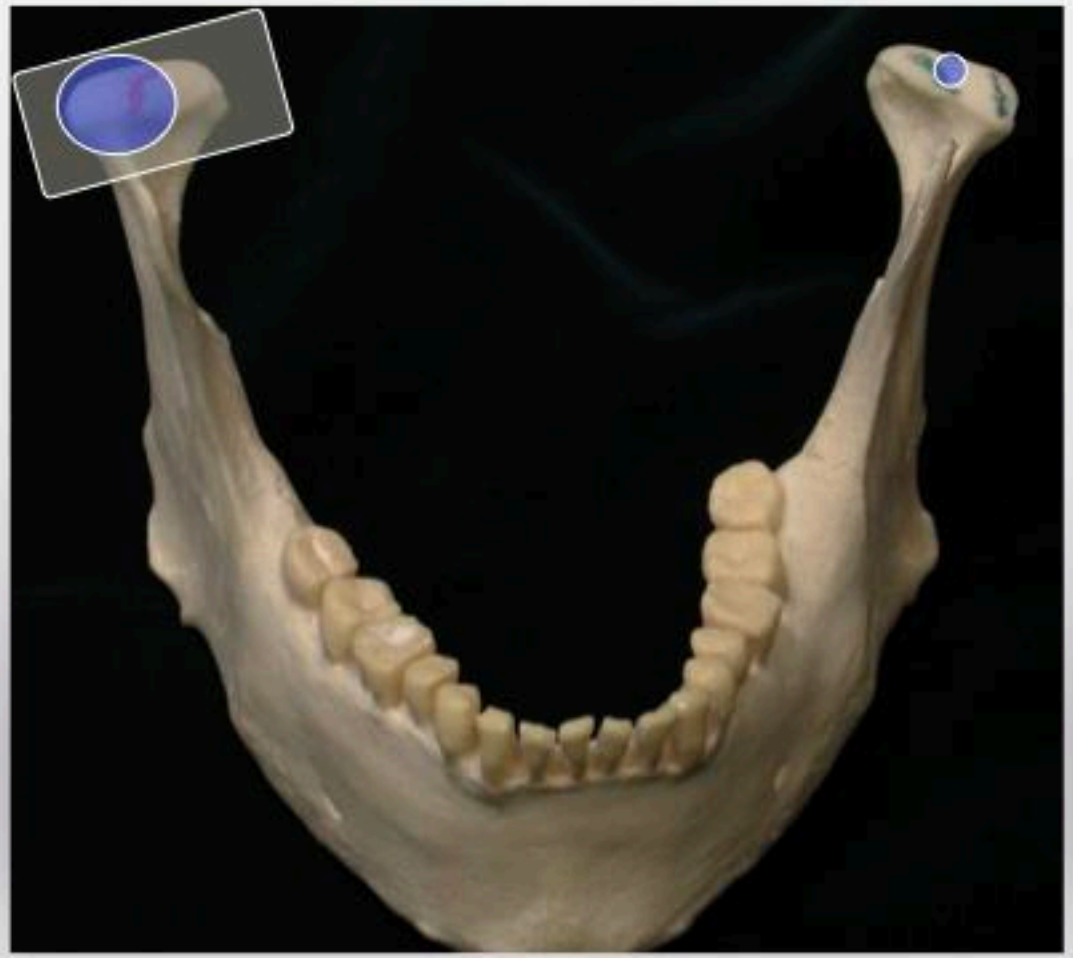




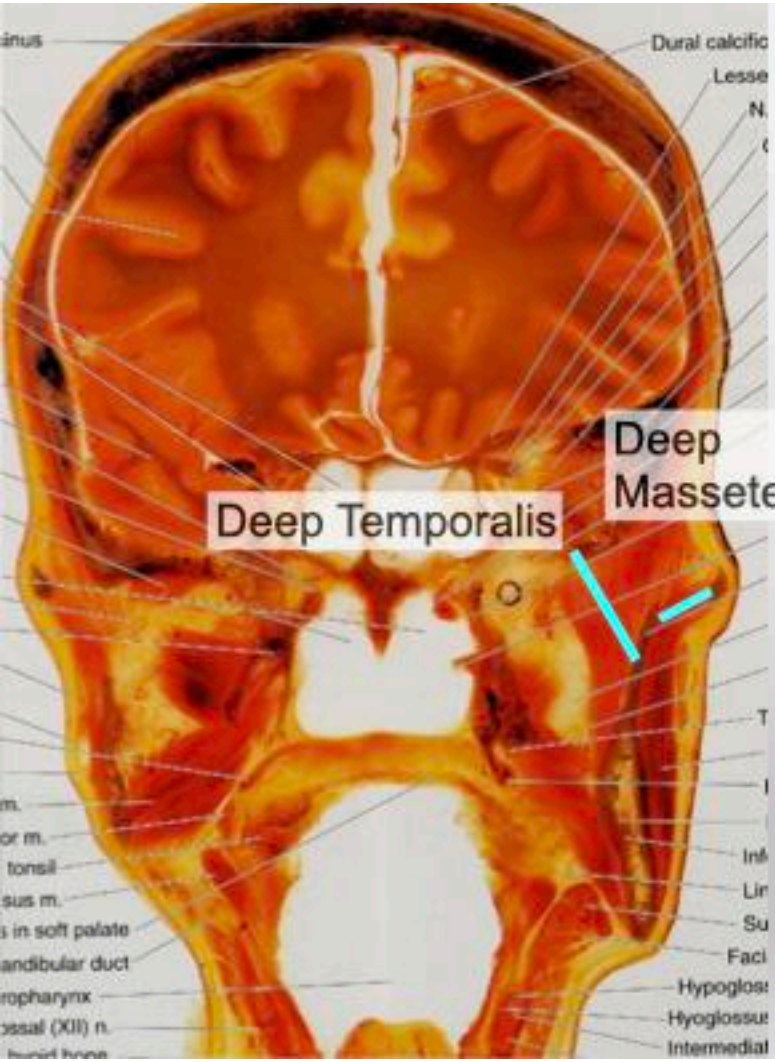
CT Axial View

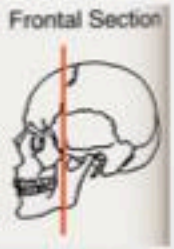
Mechanically Unstable TMJs
"Wobbly Joint"

Joint Subluxates under Load

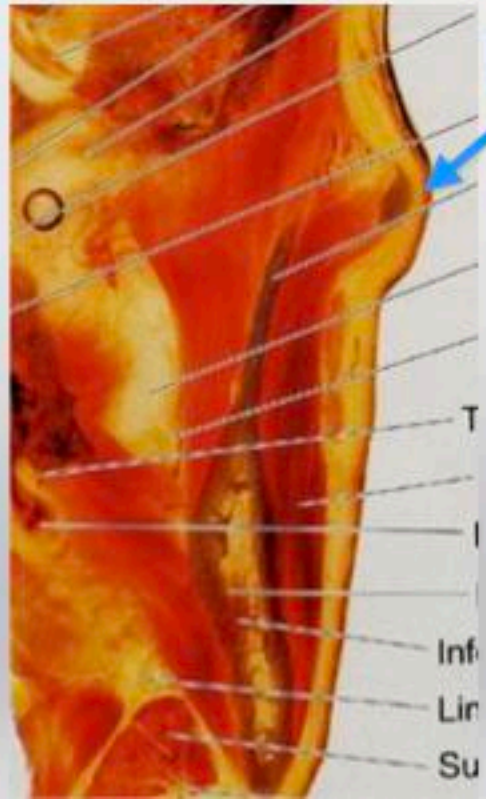


Run Demo

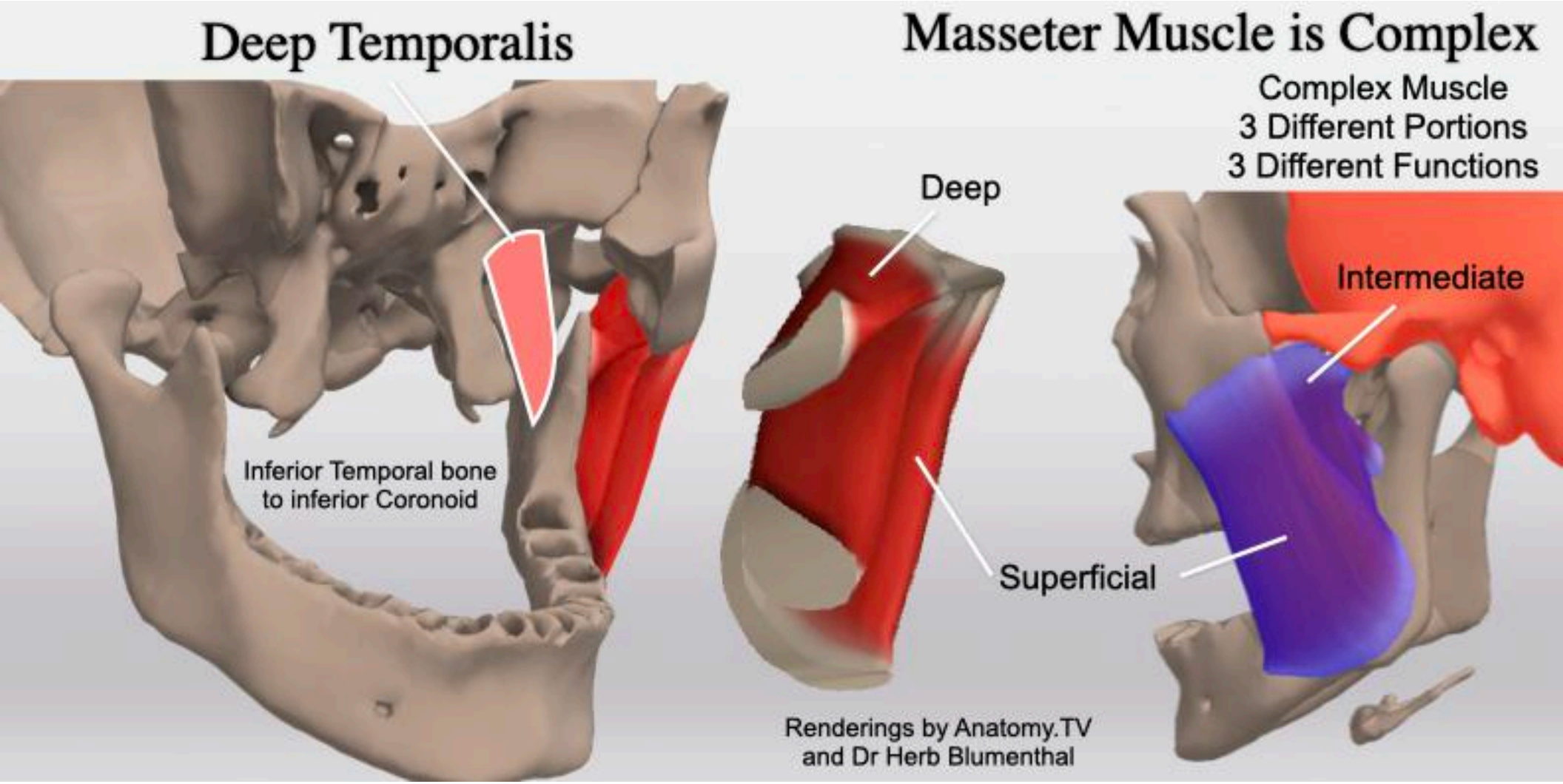




Deep Temporalis and Deep Masseter
Stabilizes TM joint side to side
Sore in "Wobbly Joints"



Deep Temporalis Attachment

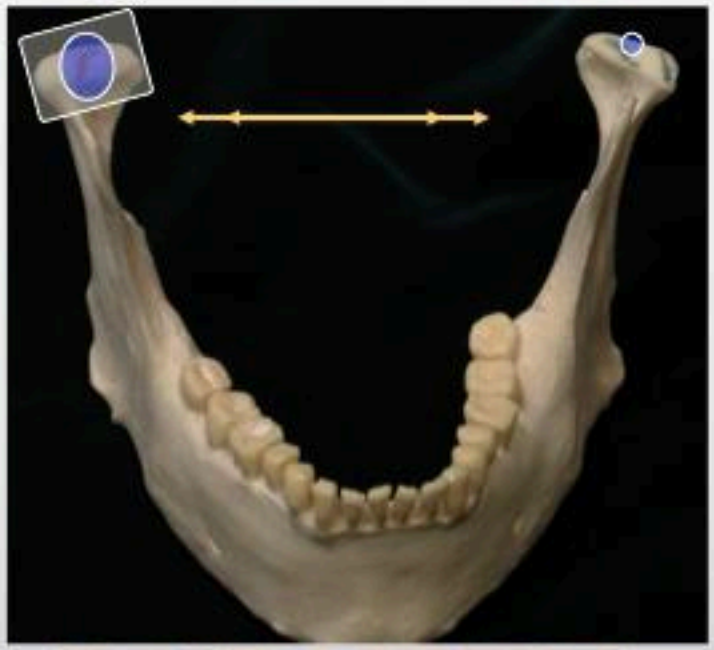

Deep Temporalis
Inferior Temporal bone
to inferior Coronoid
Masseter Muscle is Complex
Complex Muscle
3 Different Portions
3 Different Functions
Deep
Intermediate
Superficial
Renderings by Anatomy.TV
and Dr Herb Blumenthal

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

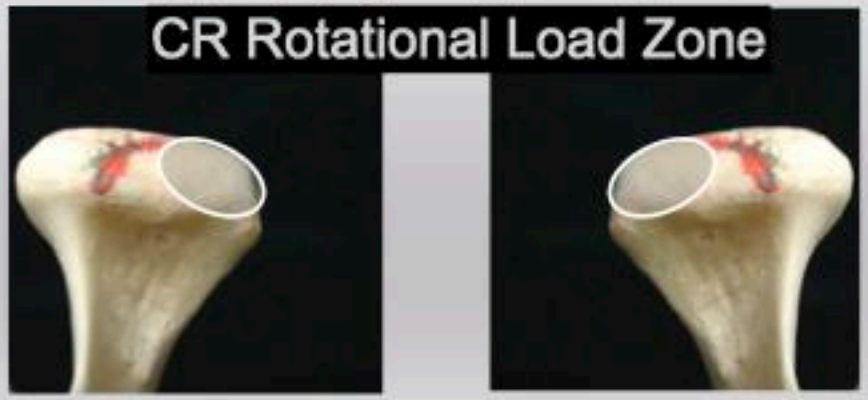
Clinically:
- Hypersensitive bite
- Increase muscle pain with anterior deprogrammer
- Continued muscle disharmony with flat plane orthotics
- CT Scan- CR load zone not medial
- JVA- after tooth tap see "wobble- 50hz vibration



CR Load Zone

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

Medial is ideal



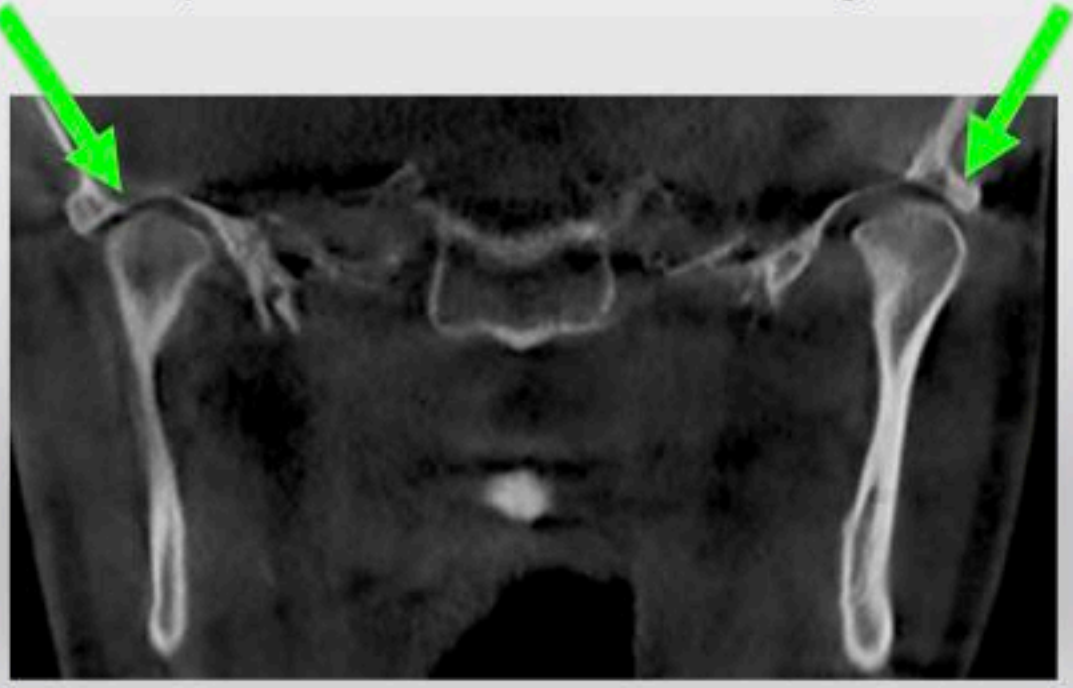
Find where the condyle is closest to the fossa

Centric Relation (CR) Load Zone

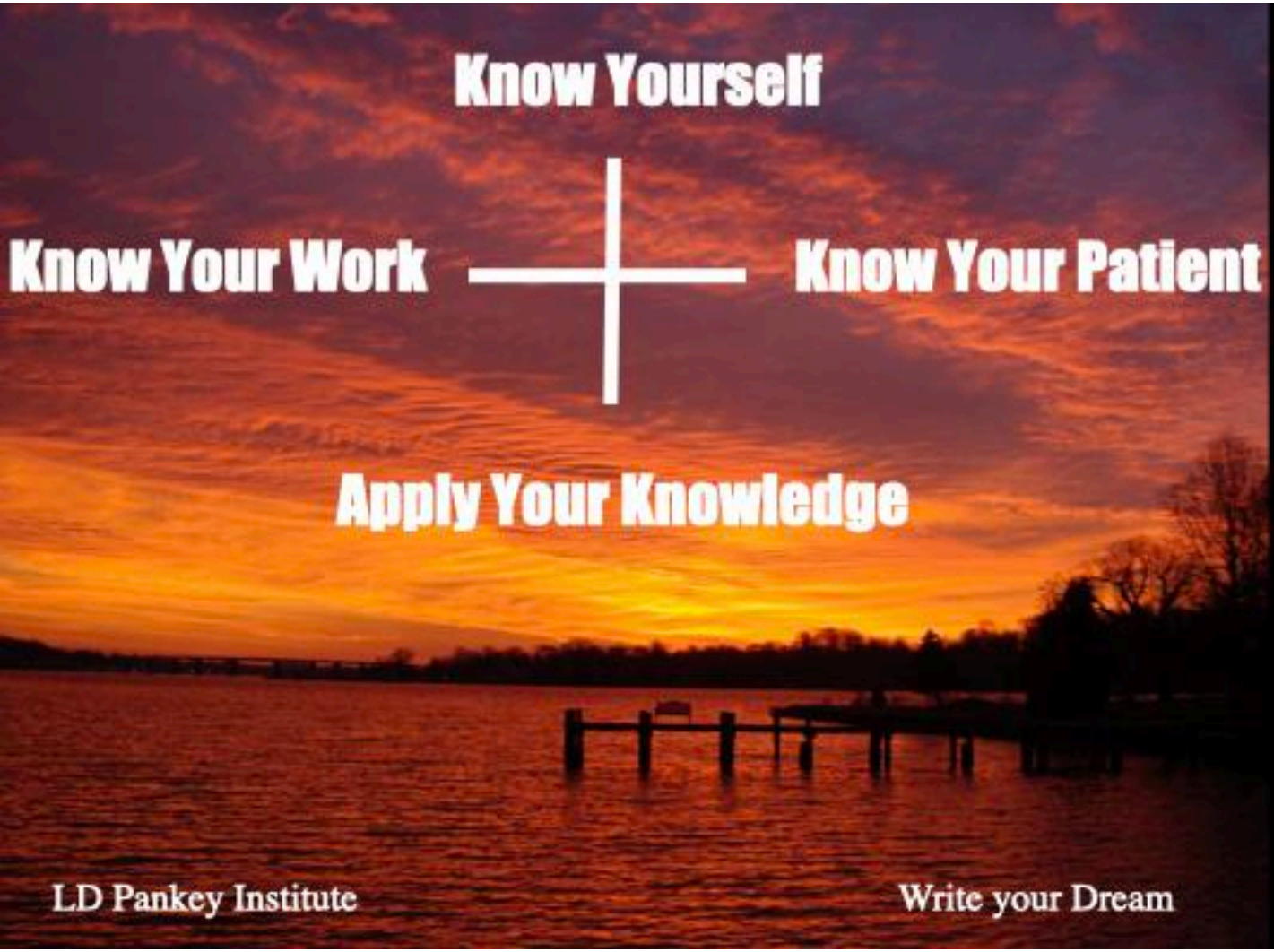
When the masseter fires and seats the joint, where do the condyles load?

Superior Medial CR Loading

Superior Lateral CR Loading



CR zone in damaged joints may not be on the medial pole



John R. Droter, DDS
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The Six Most Important Slides

John R Droter DDS
Annapolis, Maryland

www.jrdroter.com

Observations

- Accurate
- Observation with Explanation
- Observation with no Explanation

Beliefs can limit observations

Needing to always know why is limiting

Explanations (beliefs)

- Best at the time
- Not always accurate
- Inherit from others
- Do not become emotionally attached to explanations

Mind exercise I use: Come up with 3 explanations for every observation.

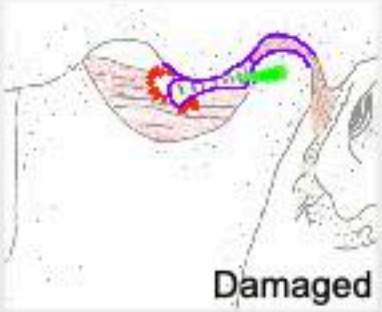
Valium Example

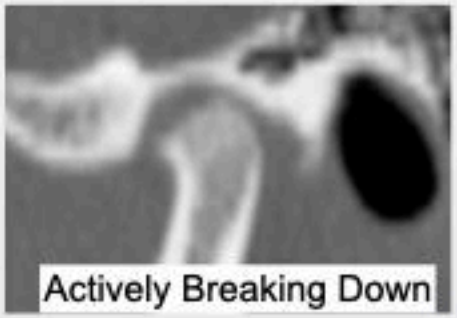
Basic Orthopedics

Joints are either
- Healthy or
- Damaged

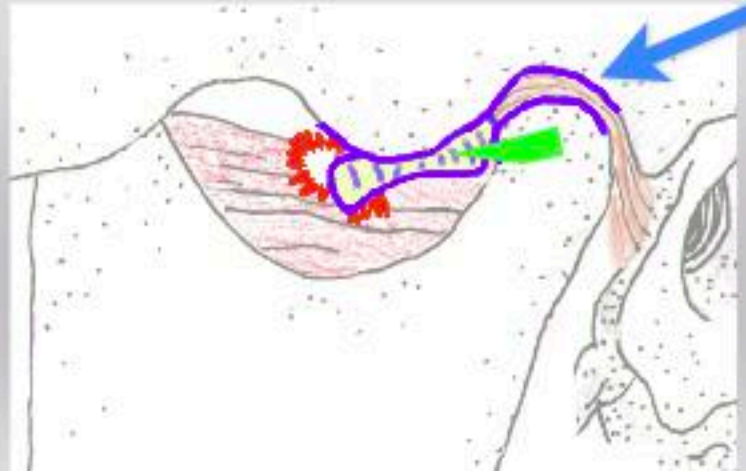
If damaged, joints will be either:
- Actively Breaking Down
- Adapting
- Adapted
  - Structurally, Mechanically
  - Favorably, Unfavorably


Healthy


Damaged


Actively Breaking Down

Majority of damaged TMJs adapt favorably

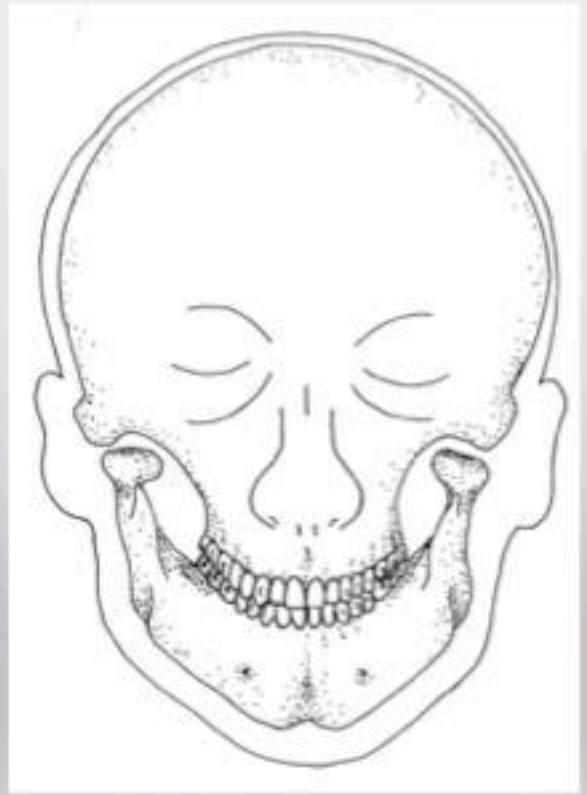


Posterior ligament, synovium, and retrodiscal tissue adapt to form a

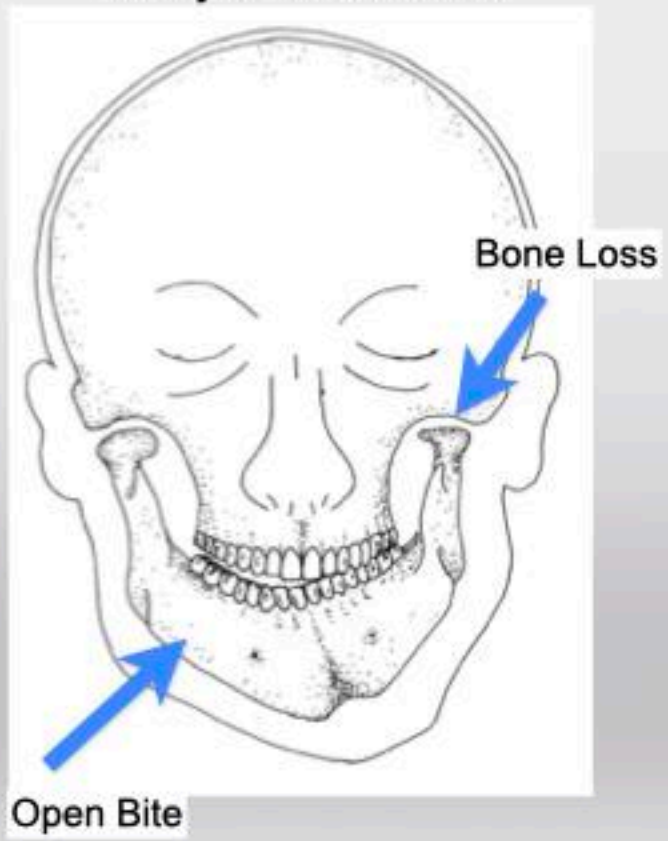
Pseudo-disc

Tissue Fibrosis

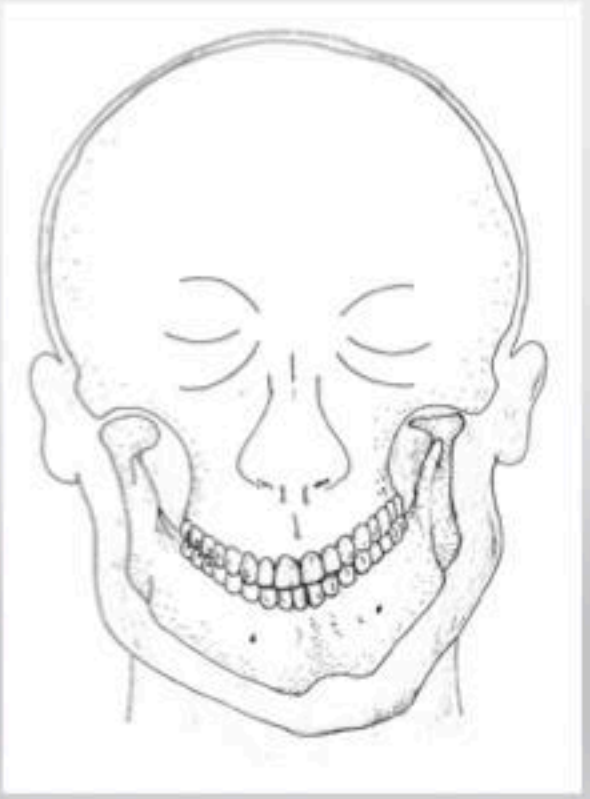
Diseases that cause bone loss in the TMJ alter the Occlusion



Condylar Bone Loss



Adaptation Over Time



Drawings by Gretta Tomb, DDS

Basic Orthopedics

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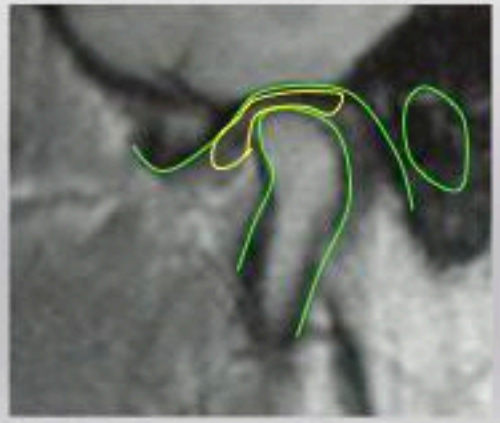
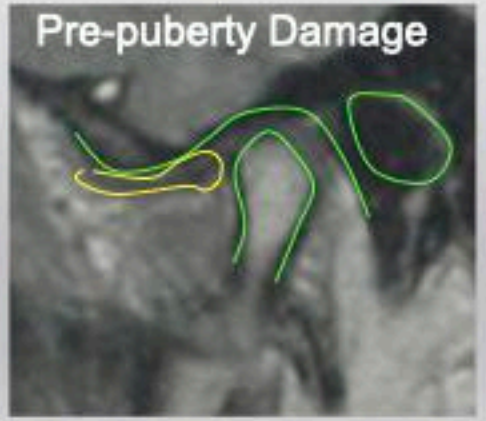
If damaged, joints will be either:
- Actively Breaking Down
- Adapting
- Adapted Favorably Structurally and Mechanically
- Adapted Unfavorably





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

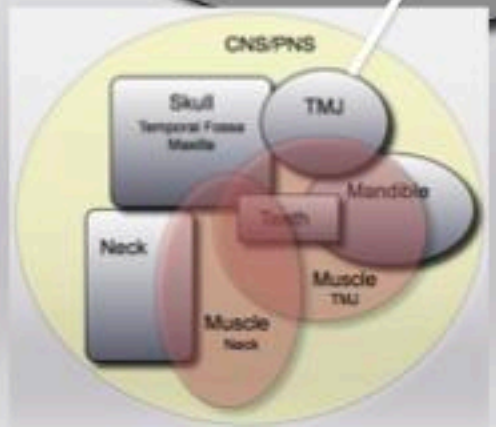
The TMJ: What You need to Know before you change an occlusion

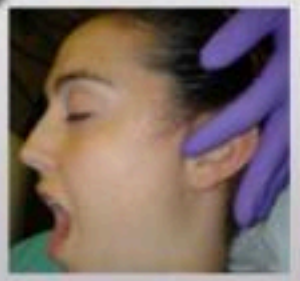
TMJ

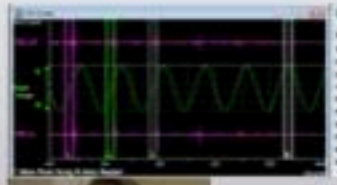
Does it Hurt?
Does it Move?
Does it Wobble?
Is it Structurallv Stable?

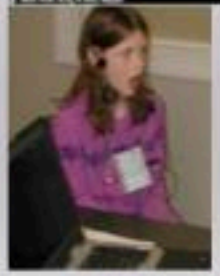
Palpate and Load the TMJ.
Measure Smoothness and Range of Motion (Quality and Quantity), Record JVA
Put in Anterior Stop Orthotic for 7 nights and 2 days- Not Painful
Take CT scan- see intact cortex of condylar bone and fossa
CR to Max IC less than 2mm (horizontal), not more than 3mm.

History: No change in joint sounds, ROM, or occlusion in past year.
No joint pain on chewing.



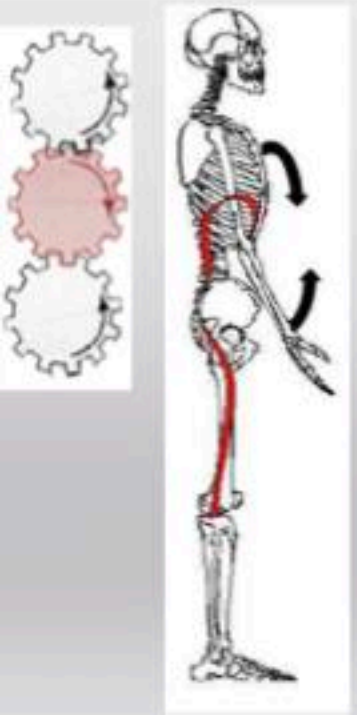






Neck and Postural Instability

This is a **dynamic** orthopedic System



A change in any one area will affect the others

CNS/PNS

Skull

TMJ

Teeth

Mandible

Neck

Teeth

Muscle Neck

Muscle TMJ

venn diagram