Big Sky Tanner
TMD1
2025

John R Droter DDS
Annapolis, Maryland

Hello. I am:

John R Droter DDS
Annapolis, Maryland

Milestones

Visiting Faculty LD Pankey Institute 2008-

Visiting Faculty Spear Education 2013-2020

Visiting Faculty Orthodontic Program
Washington Hospital Center 2000-2012

Past staff AAMC: Orthopedic Rounds
In OR for TMJ Surgeries

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

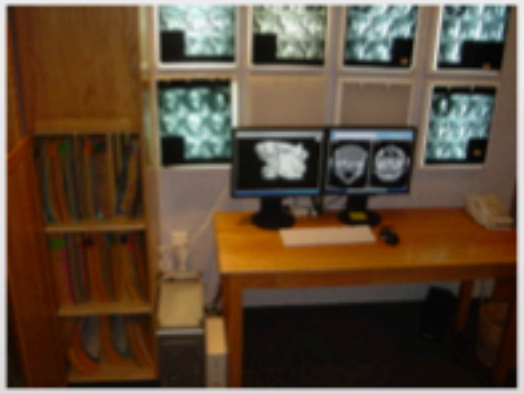
CT and MRI Imaging Joints 1992
Guy Haddix, DDS: Mentor
(3,000+ images and rising)

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

CT and MRI Scans in my practice since 1992.

Dr Guy Haddix
had been taking CT scans since 1990

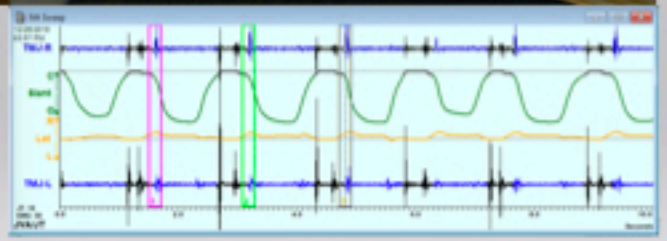
Compare CT, Mounted models, MRI, JVA before and after a case.
What can I see now looking back?



Closet full of printed scans just as digital appeared!!

The magic in the coronal view
The Load Zone

JVA since 2004



Herb Blumenthal
My friend, mentor, and colleague

Yoda of Muscles

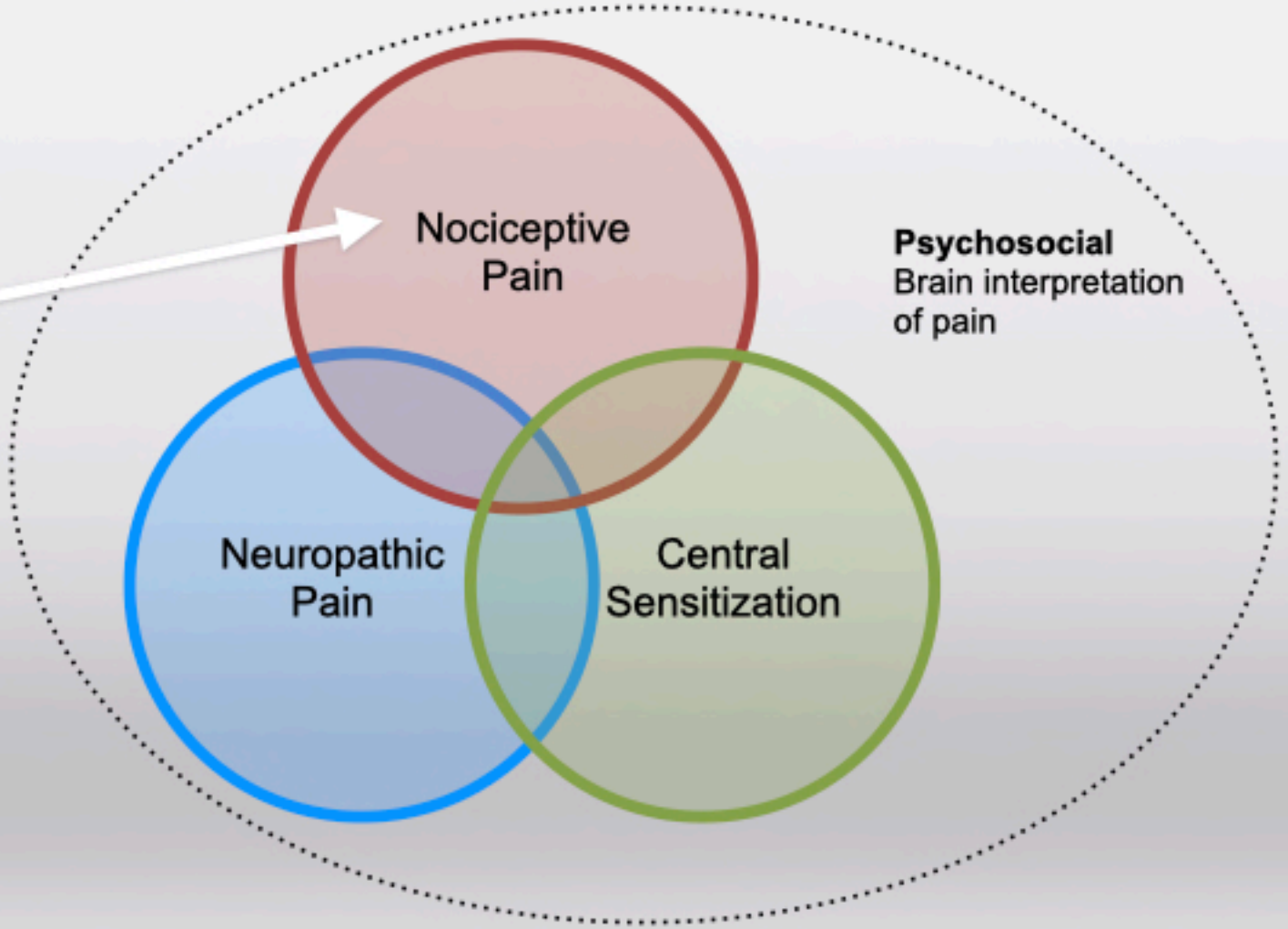
Pain: Three Types

Inflammation Pain
Physical Damage

Tissue
Muscles
Joints

Nerves Misbehaving

Brain Misbehaving



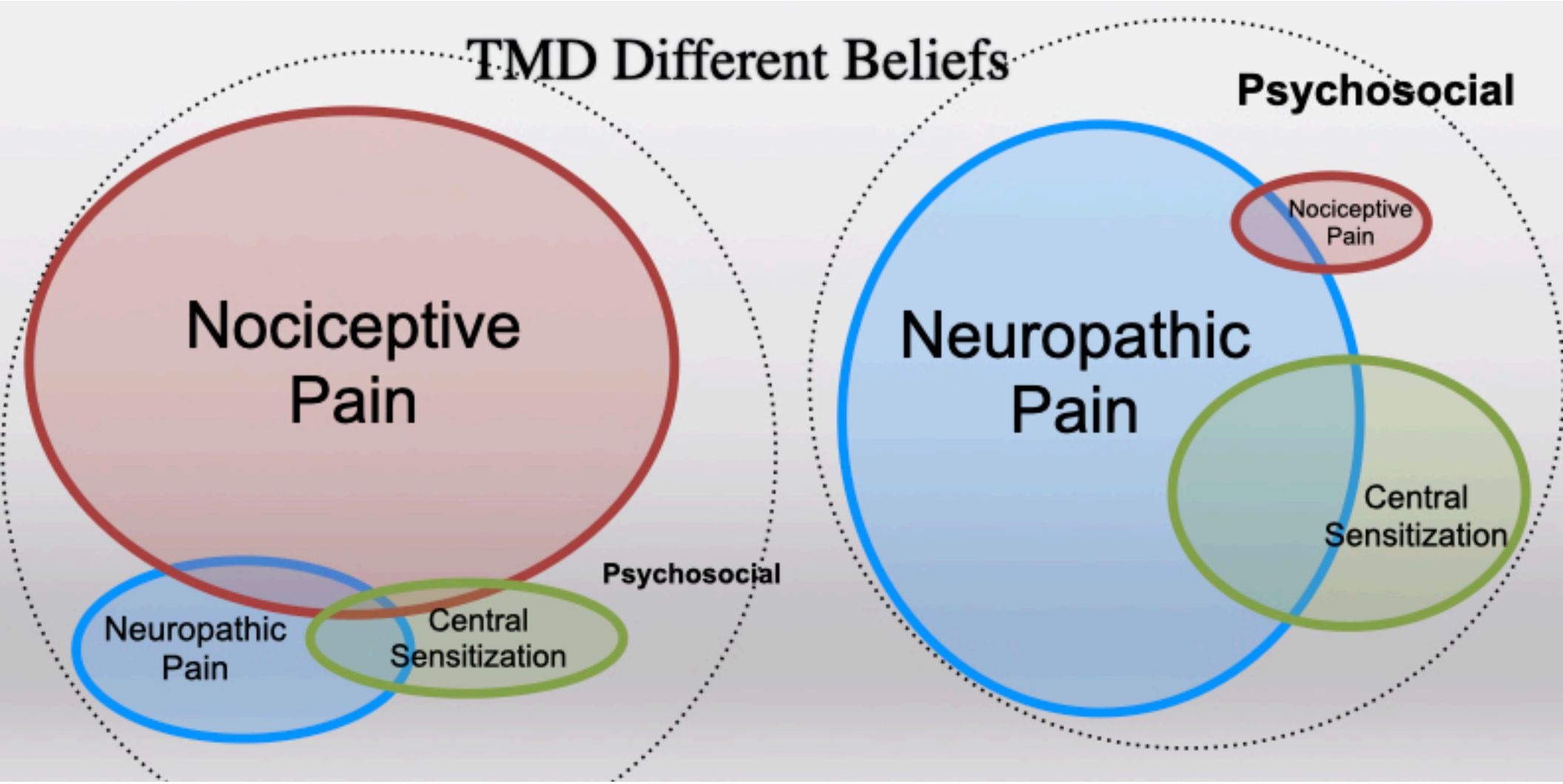
changepain.com

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

Disclosures:

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

Atomic Skis- Sponsored.
I got stuff.

LD Pankey Institute TMD Course
Honorarium

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

APS
ArrowPath Sleep

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

LIVING TREE
DENTAL LAB

TMJ/TMD Confusion

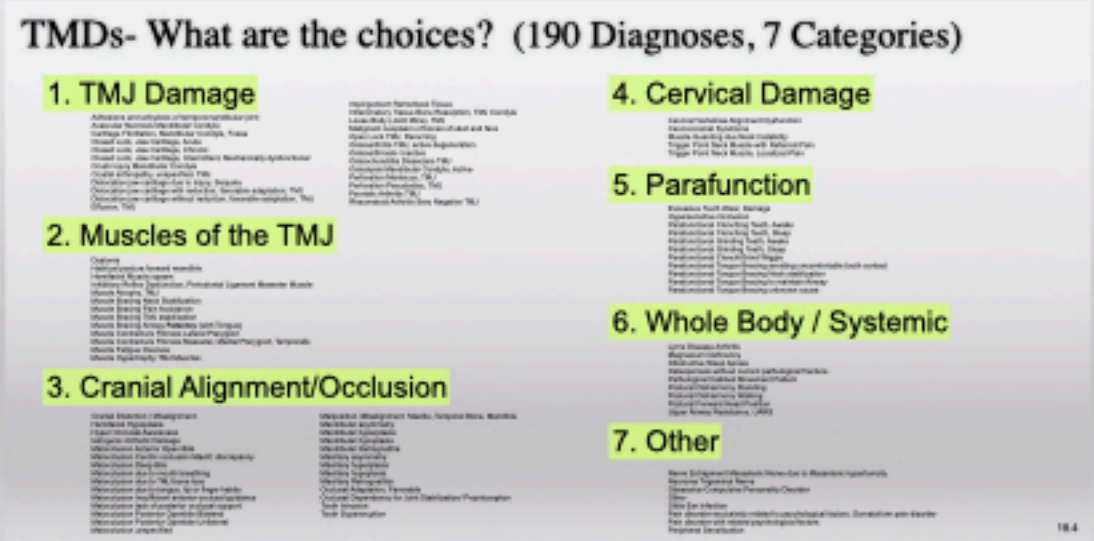
Dogmatic Arguments

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



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

1. TMJ Damage

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

2. Muscles of the TMJ

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

3. Cranial Alignment/Occlusion

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

4. Cervical Damage

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

5. Parafunction

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

6. Whole Body / Systemic

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

7. Other

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

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

Different Diagnoses have Different Therapies

Specific Diagnosis

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

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

Specific Therapy

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Surgical

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Refer: Total Joint Replacement
Refer: Orthognathic Surgery

70

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

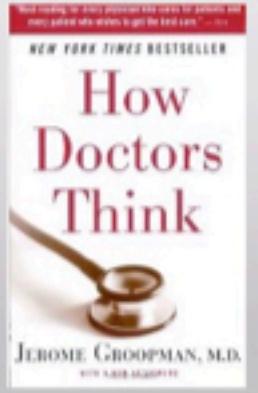
Not completely resolved

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

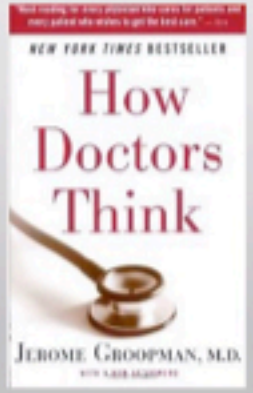
"My Tooth Hurts"



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

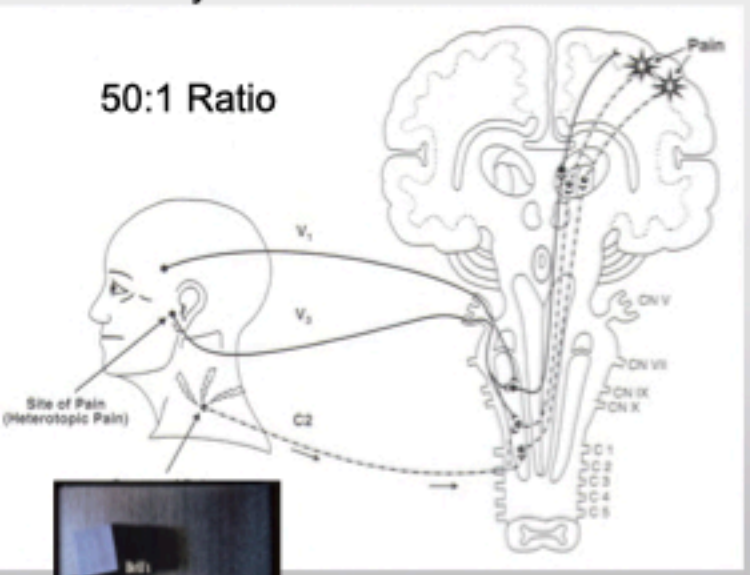


Referred Pain

Convergence

More primary sensory neurons than secondary neurons that travel to brain

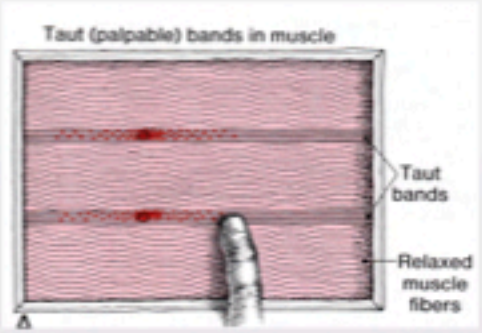
50:1 Ratio

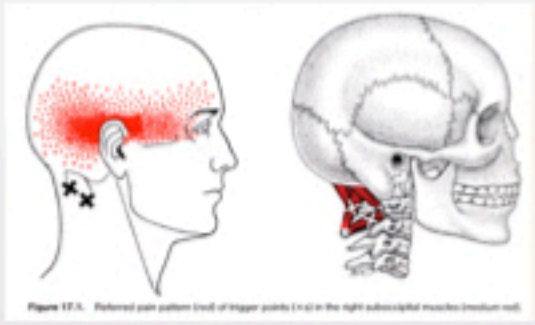


"Bells Orofacial Pain"
Jefery Okeson

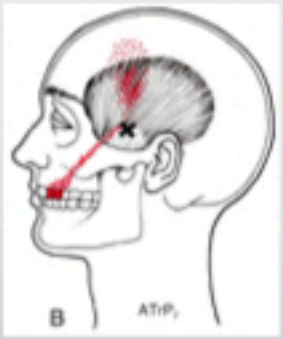
Trigger Points

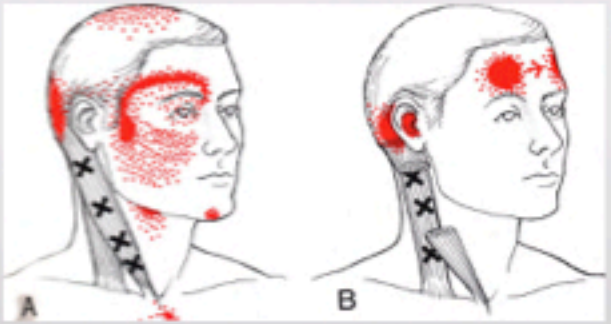
Contracted mass of actin, myosin and histamine

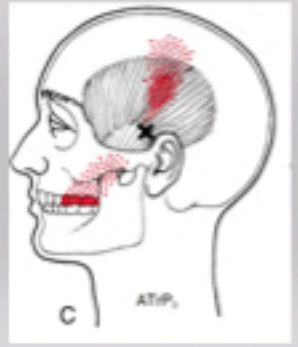


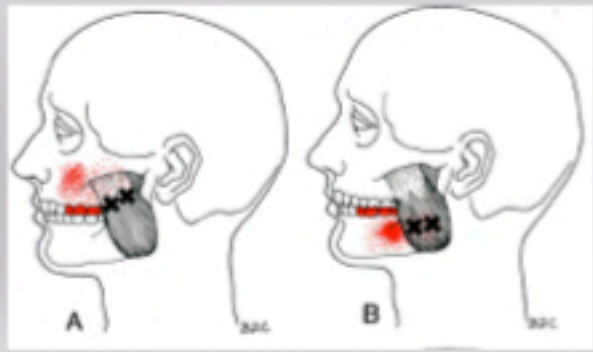


"The Trigger Point Manual"
Janet Travell, MD









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- Periodontal ligament inflammation secondary to Occlusal Trauma
- Pulpits secondary to Occlusal Trauma
- Other

"How Doctors Think", by Jerome E. Groopman

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

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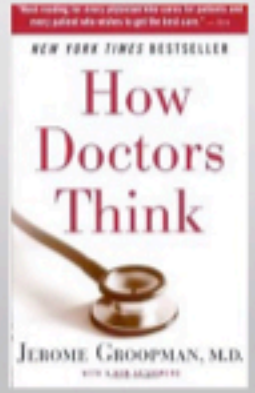

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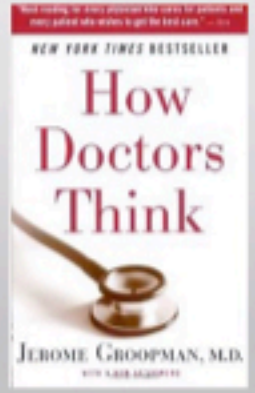

Common TMDs

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Pain disorder exclusively related to psychological factors. Somatoform pain disorder
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Peripheral Sensitization

6 Common TMDs

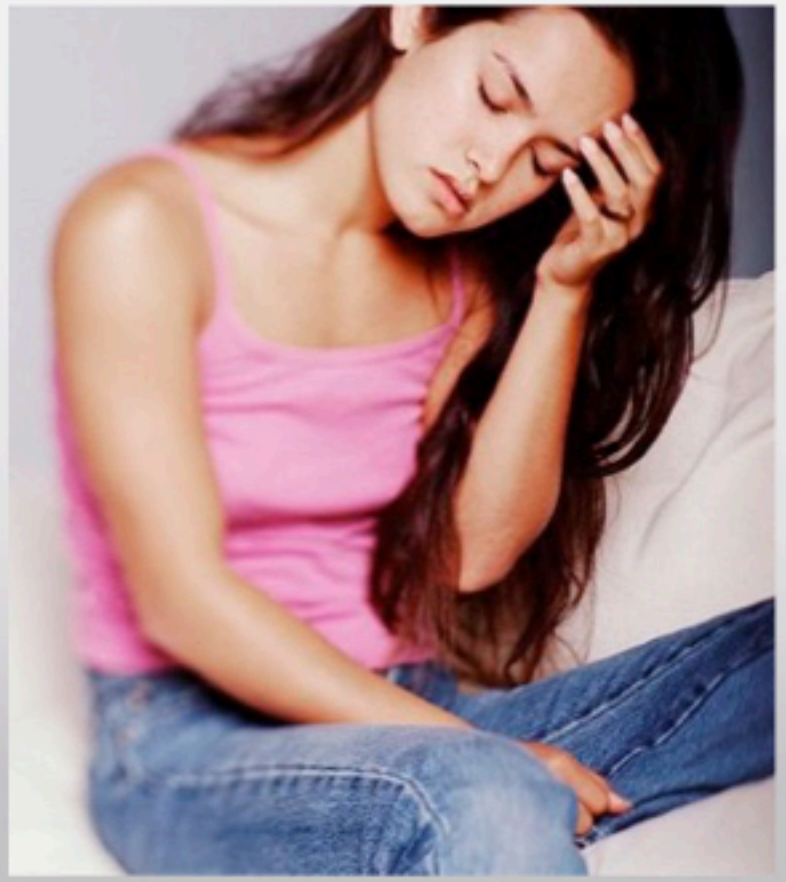
Parafunctional Clenching
Parafunctional Grinding
Occlusal Muscle Dysfunction
Osteoarthritis
Acute Sprain
Acute Closed lock of TMJ disc

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

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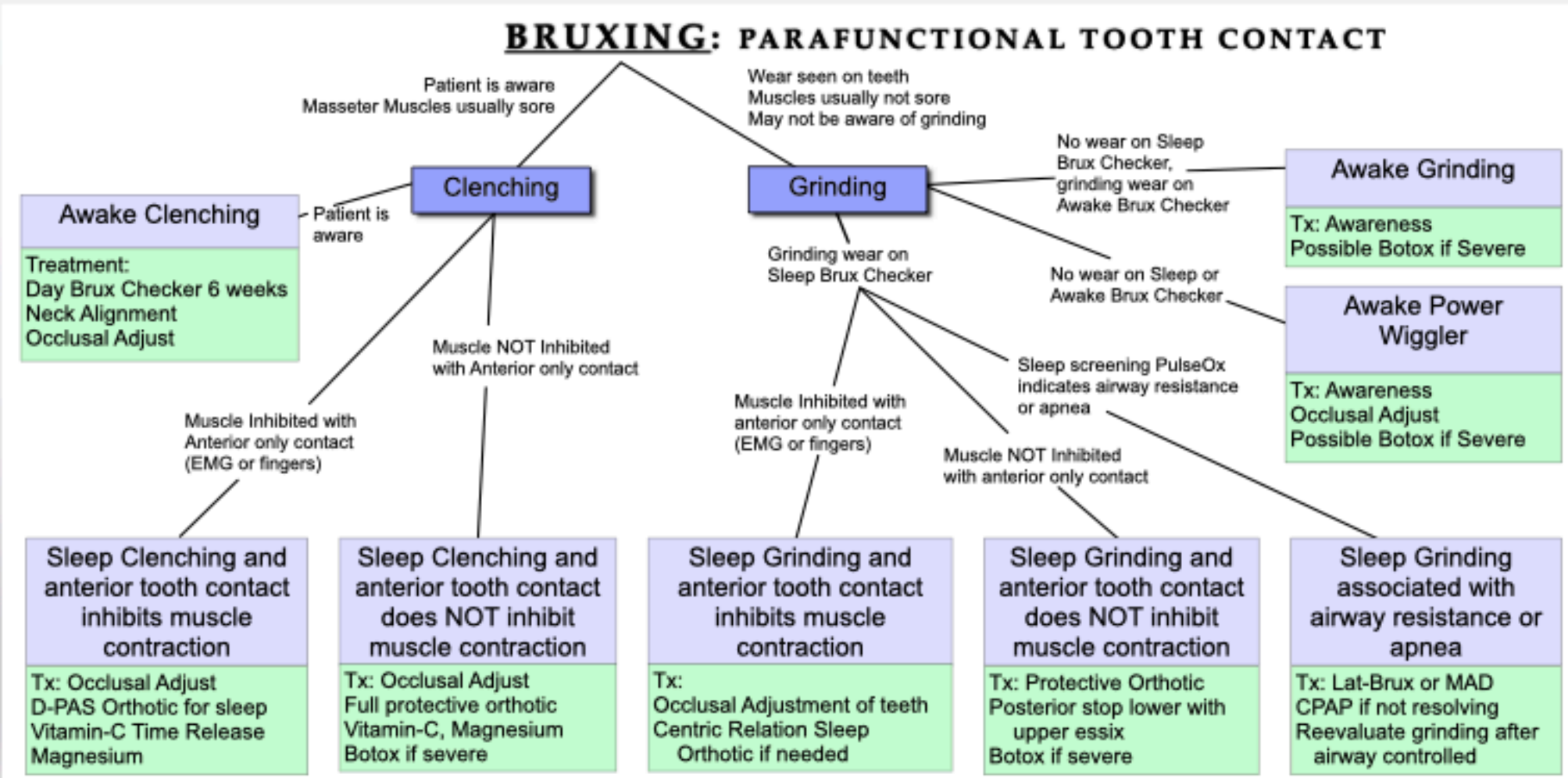
Acute Closed Lock TMJ	Sore TMJ Limited opening Hard end point active stretch	Arthrocentesis with PRP

BRUXING: PARAFUNCTIONAL TOOTH CONTACT



Clenchers destroy the joint,
Grinders destroy the teeth

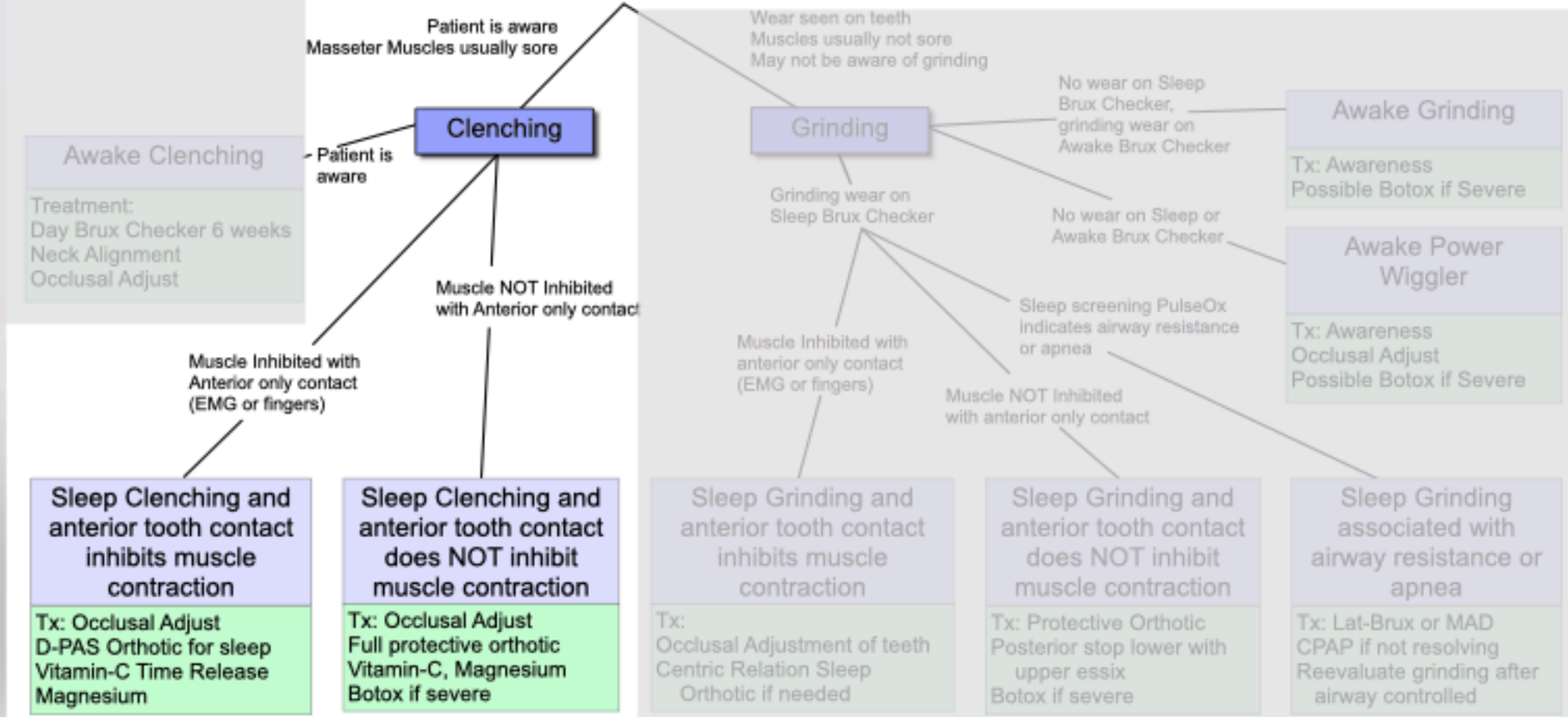
<u>Clenching</u>
Painful Muscles
Patient is usually aware of clenching
Fremitus
Strong Masseters
See slight wear around tooth contacts
Damage TMJ cartilage

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



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.

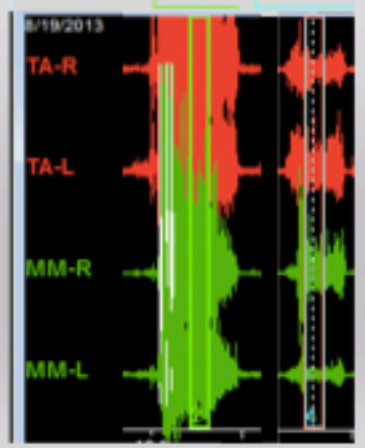
BioResearch EMG

BioResearch mScan

Diagnostic Palatal Anterior Stop

Patient with muscles inhibited by anterior only contact

	Clench MaxIC μV	Anterior Stop D-PAS 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

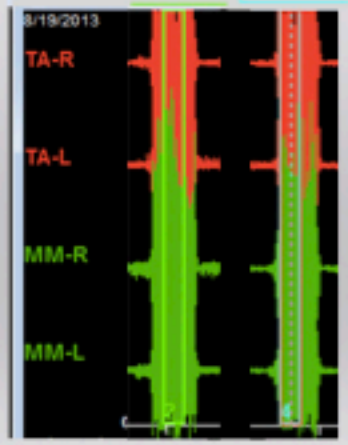


Major decrease in muscle power with D-PAS

BioResearch EMG

Another Patient with muscles NOT inhibited by anterior only contact

	Clench MaxIC μV	Anterior Stop D-PAS 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



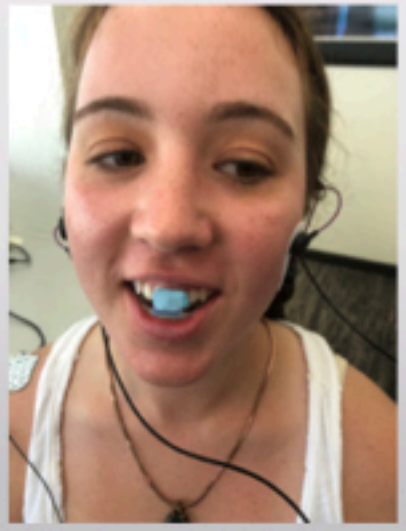
Muscle power same with D-PAS

Choosing the Correct Night Guard

M-Scan EMG
Electromyography

Clench back teeth

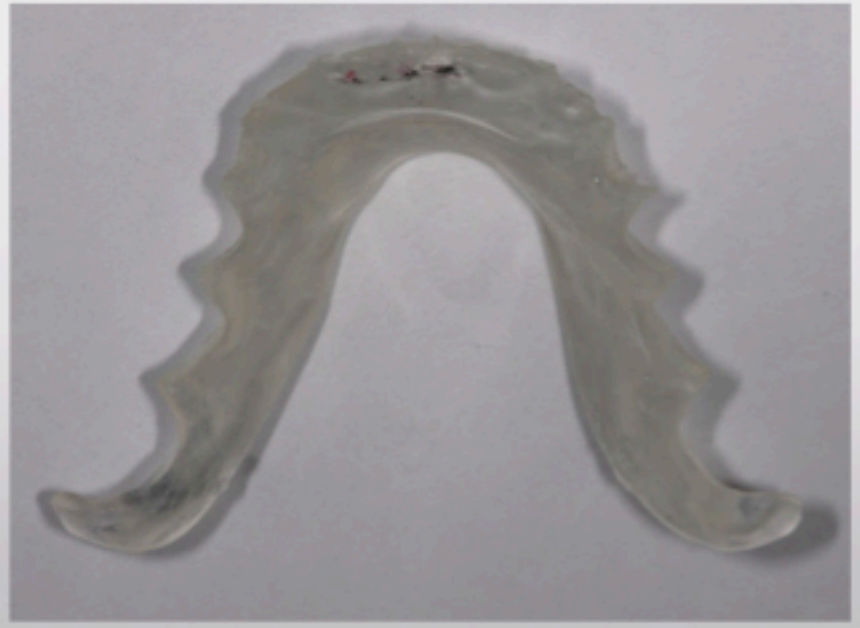
Clench
anterior stop

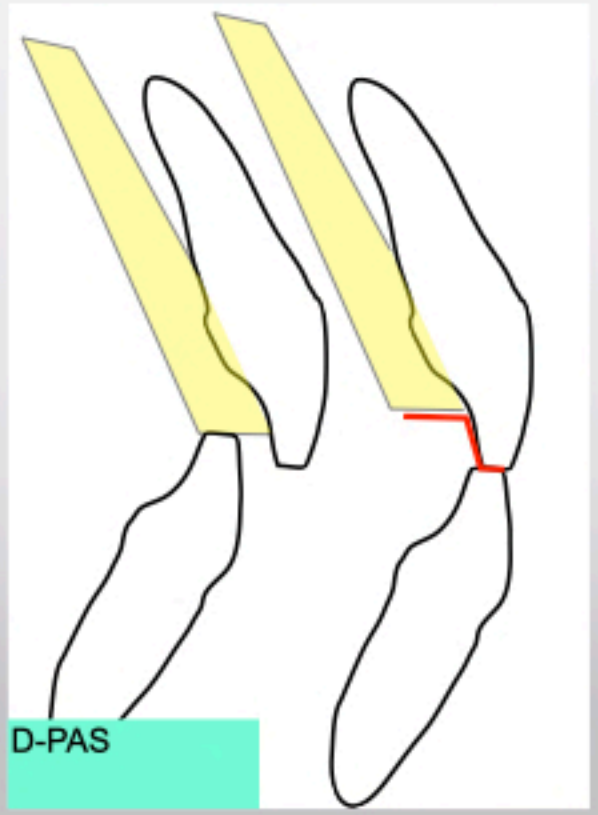


Can place moderate force on front teeth

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

Diagnostic Palatal Anterior Stop
D-PAS





Basically an upper Hawley with anterior stop without clasps or wire

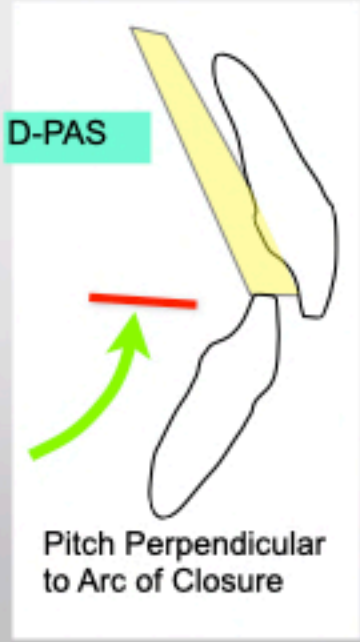
Diagnostic Palatal Anterior Stop

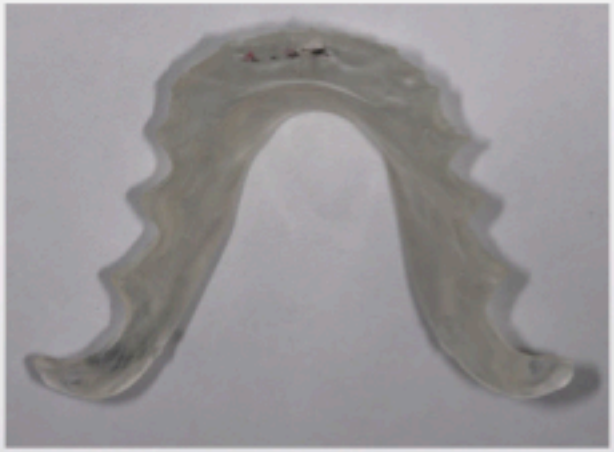
D-PAS Test: Wear 2 weeks for sleep, and occasional daytime

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

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

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





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

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

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

This is a diagnostic test, not treatment

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

TMD Therapies

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

Women add iron

Vit C 1,000 mg before exercise or clenching

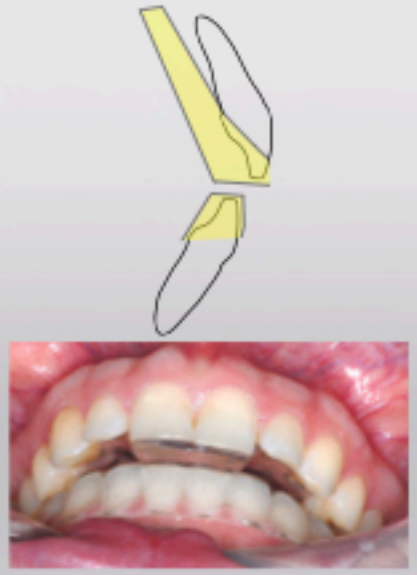
Mother Earth Ionic Angstrom
Magnesium 2 oz bottle
0.5 teaspoon sublingual

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

3D Printed Orthotics

D-PAS
Diagnostic-
Palatal Anterior Stop

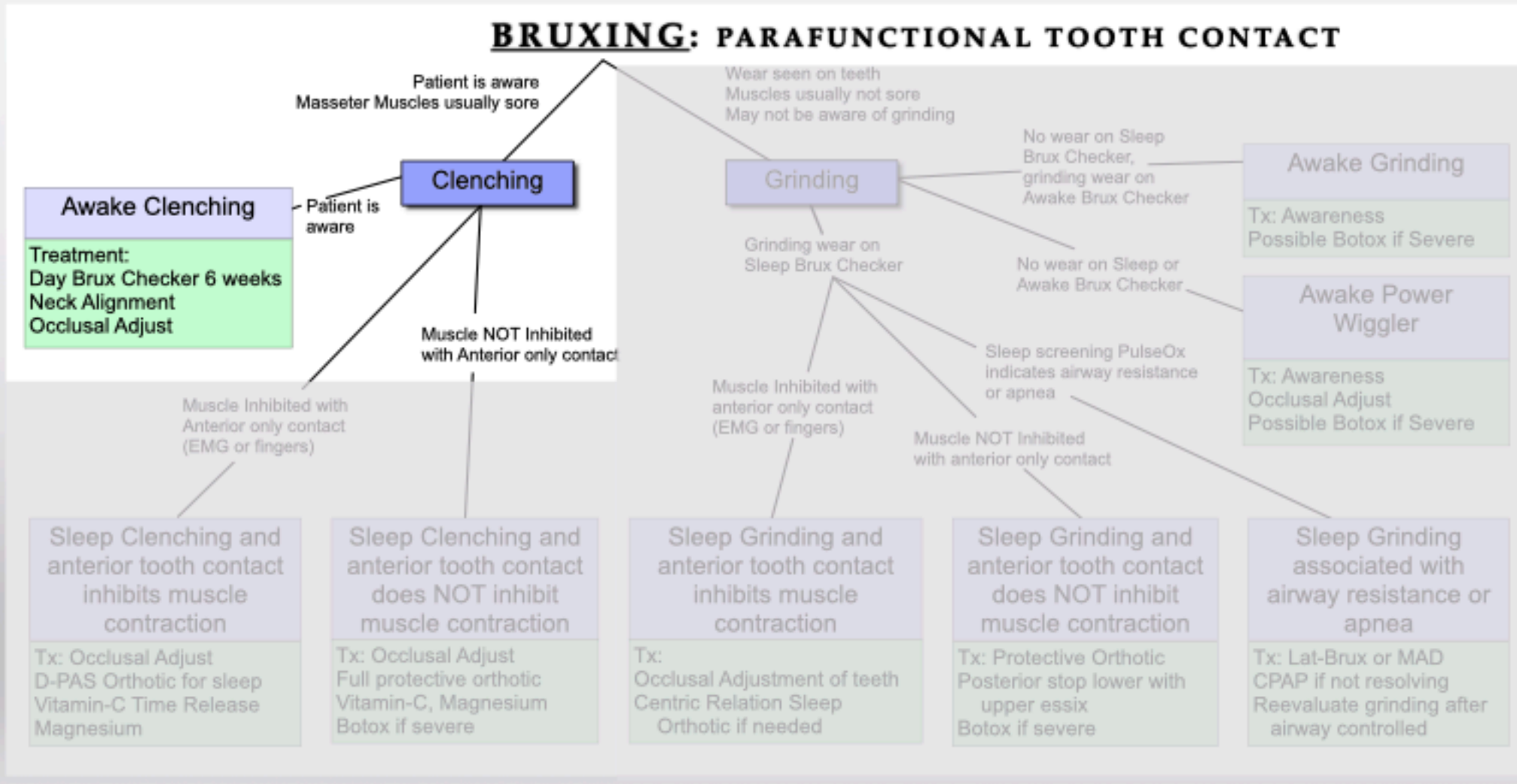
Brux-PAS
with lower Essix



Hard Lower Posterior Stop
with upper essix

Hard Lower Full Coverage
Centric Relation Orthotic

BRUXING: PARAFUNCTIONAL TOOTH CONTACT



Daytime Clenching- Clear Brux Checker

Increases awareness to break habit

Very thin: Similar to mylar used for composites

50 µm thick

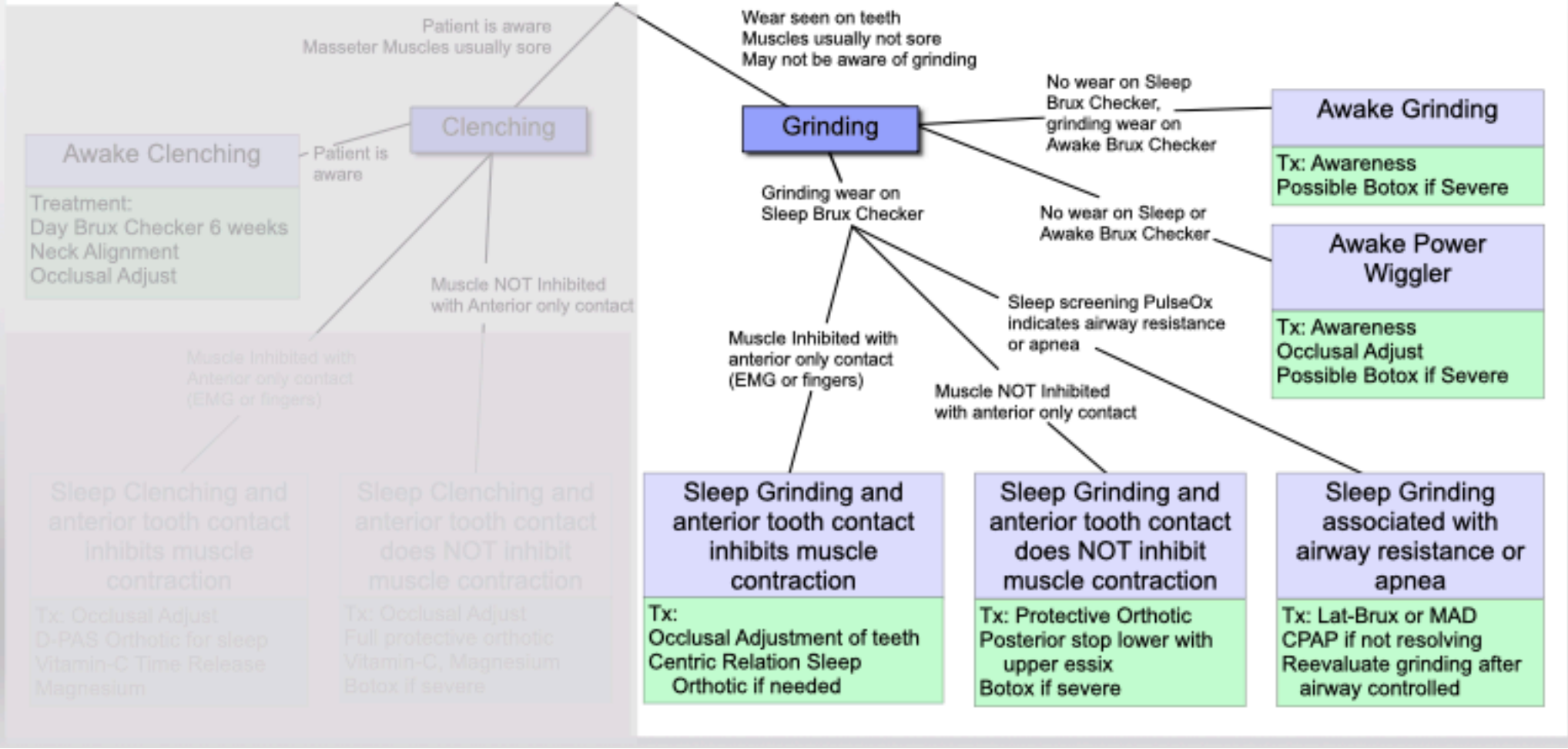
Living Tree Dental Lab
(865) 509-4509
connect@livingtreelab.com

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



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Do you clench?

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Buttressing bone if teeth are tight
If tooth mobility, on excursions
Strong Masseters
Slight if any soreness muscles
Usually no muscle pain

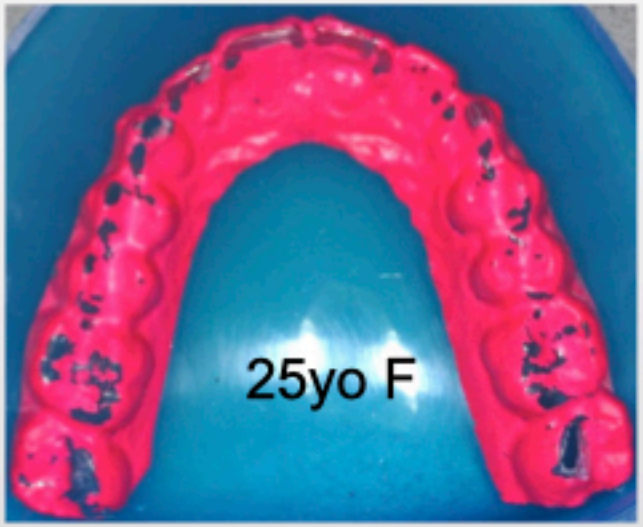
Parker Mahan-
"Women Hurt, Men destroy"

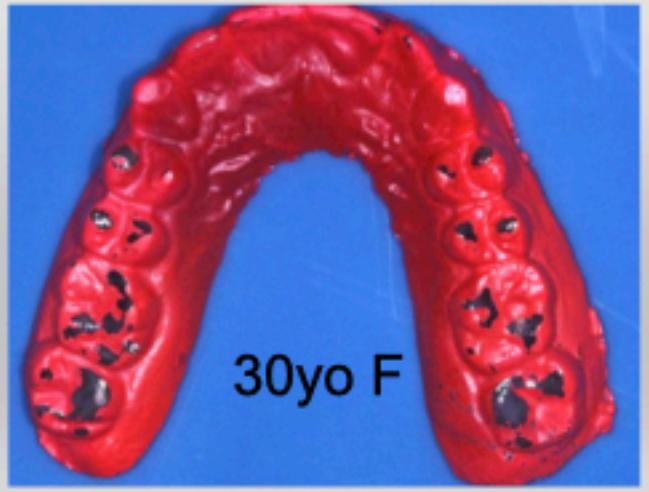
2. Does this occur awake or asleep?

Brux Checker
Great Lakes Orthodontics

0.1mm Mylar

Made on Biostar Machine

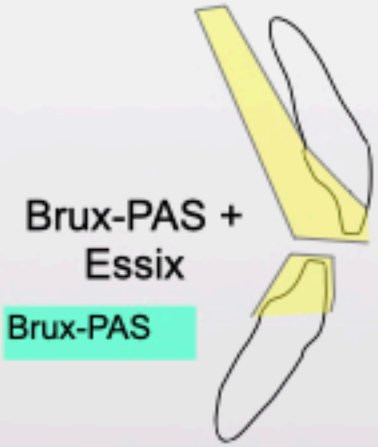




Which Occlusal Orthotic for Grinding?

Lower Posterior Stop with upper essix

Upper Hard CR Orthotic



Lat-Brux

Nylon Herbst
Great Lakes Ortho

APS
ArrowPath Sleep

LIVING TREE DENTAL LAB

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

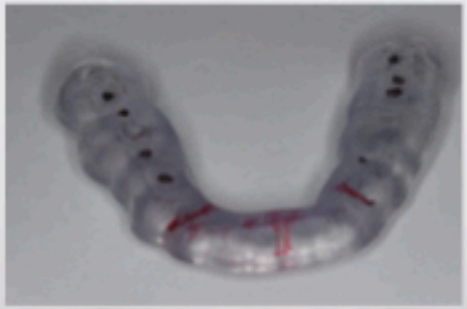
3D Printed Orthotics

D-PAS
Diagnostic-
Palatal Anterior Stop

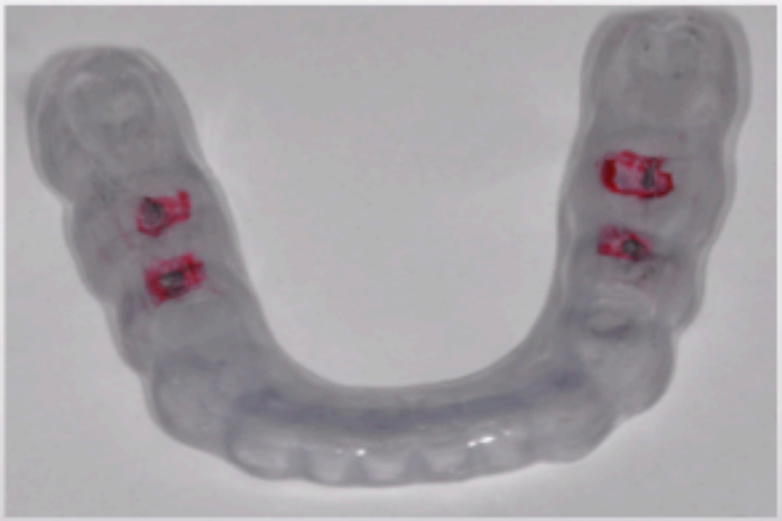
Brux-PAS
with lower Essix

Hard Lower Posterior Stop
with upper essix

Hard Lower Full Coverage
Centric Relation Orthotic



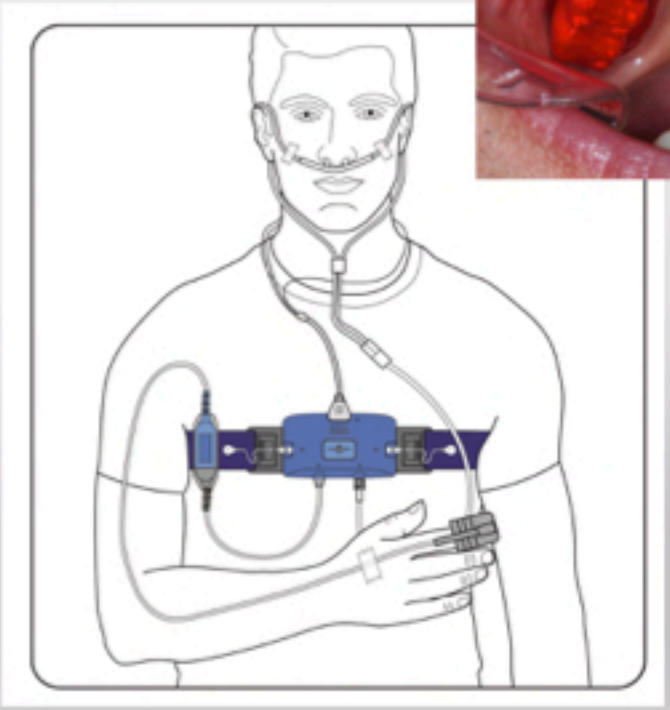
Lower Posterior Stop Night guard with upper Essix



zMachine

GENERAL sleep

zMachine + Brux Checker
+ Snore Lab



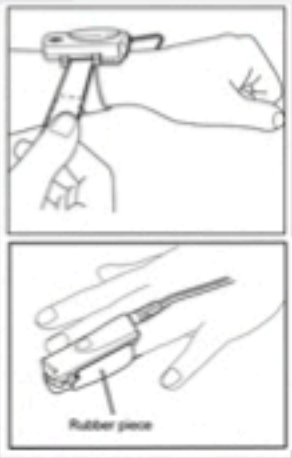
Call (888) 330-4424
Use Code: DROTER to receive special offer

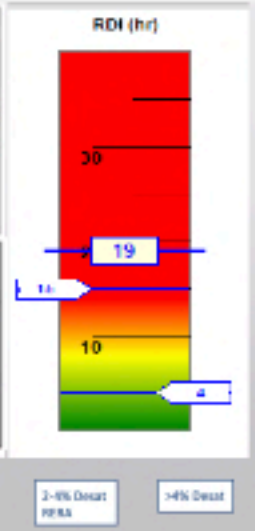
Also ask for access to Droter Modified Report

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

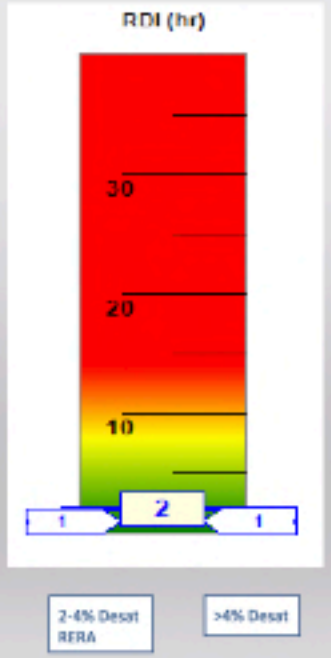
Refer to Medical Sleep Doctor

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

D-SAD

PANTHERA

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

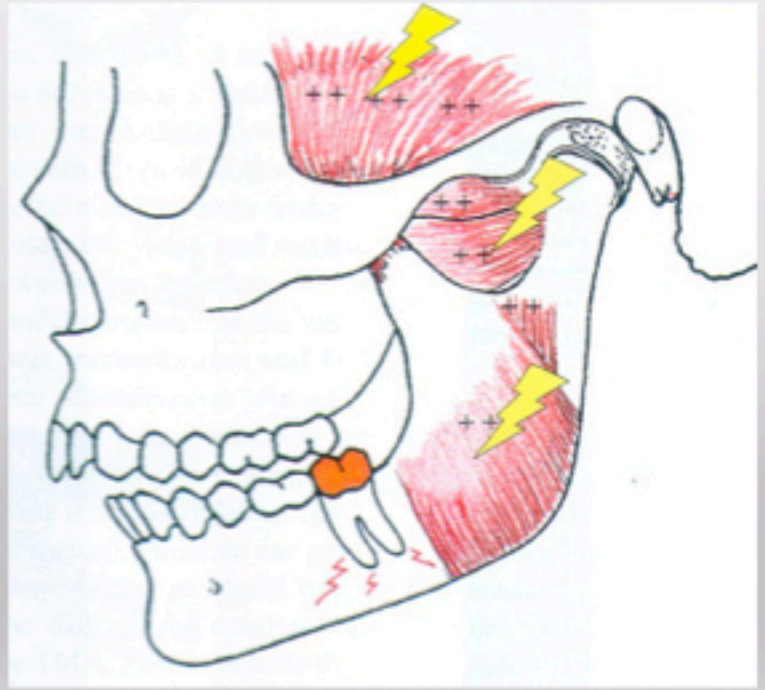
Uneven tooth contact with condyles fully seated triggers muscle activity

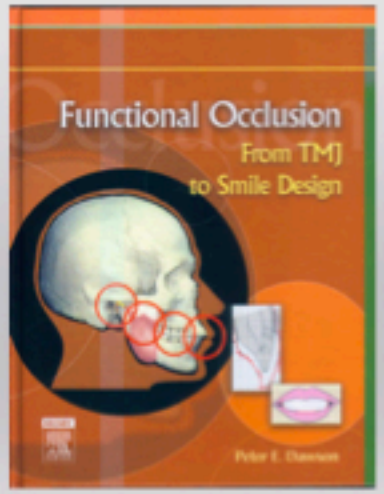
Lateral pterygoid fires out of sequence to create even tooth contact on closure

Disharmony in all muscles: Splinting/Bracing

Muscles sore from overuse

Muscles do not think- CNS input





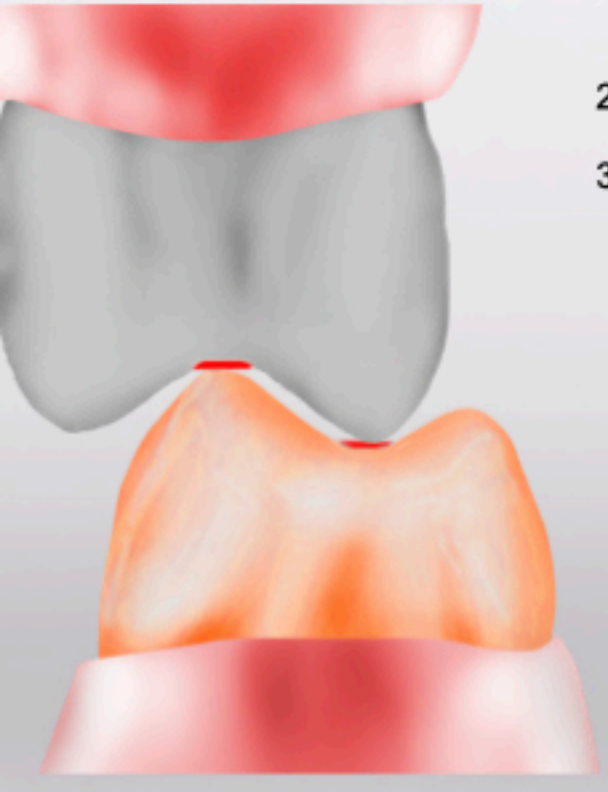
from Dawson's Textbook, "Functional Occlusion"

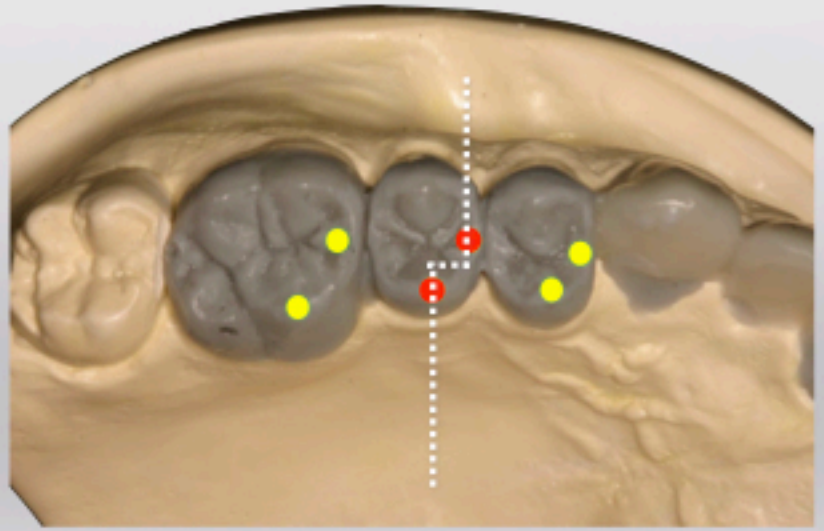
LD Pankey's 3 Rules of Occlusion (Clyde Schuyler)

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.

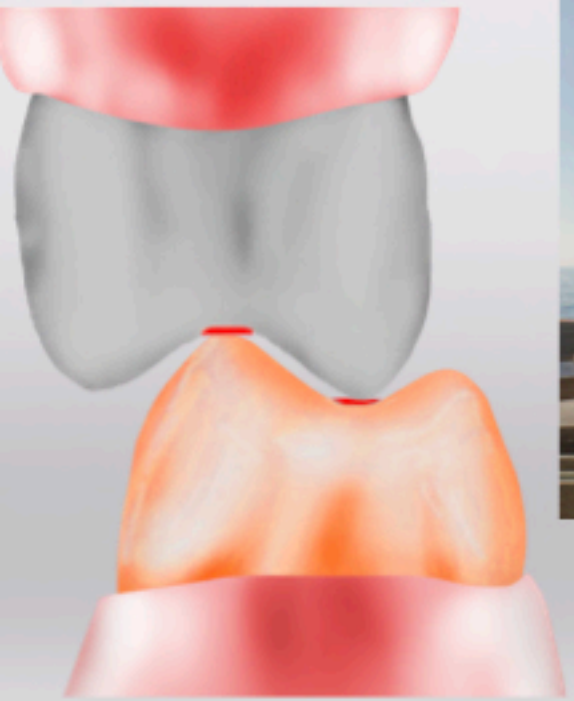




Drawing by Dr Jim Kessler

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

Rule #2 = Flat Landing Area



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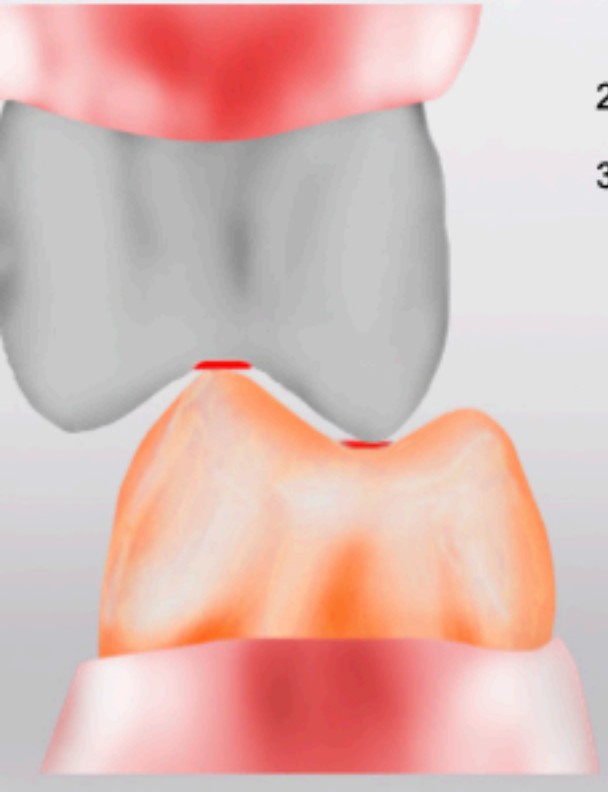
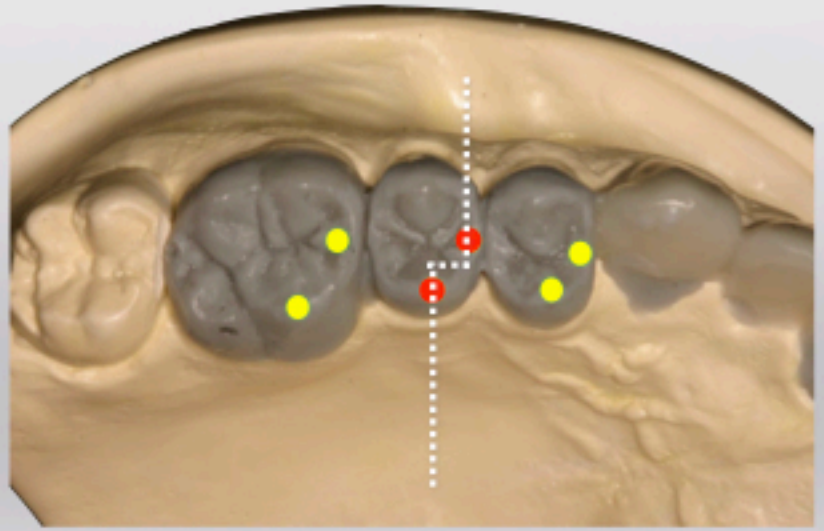


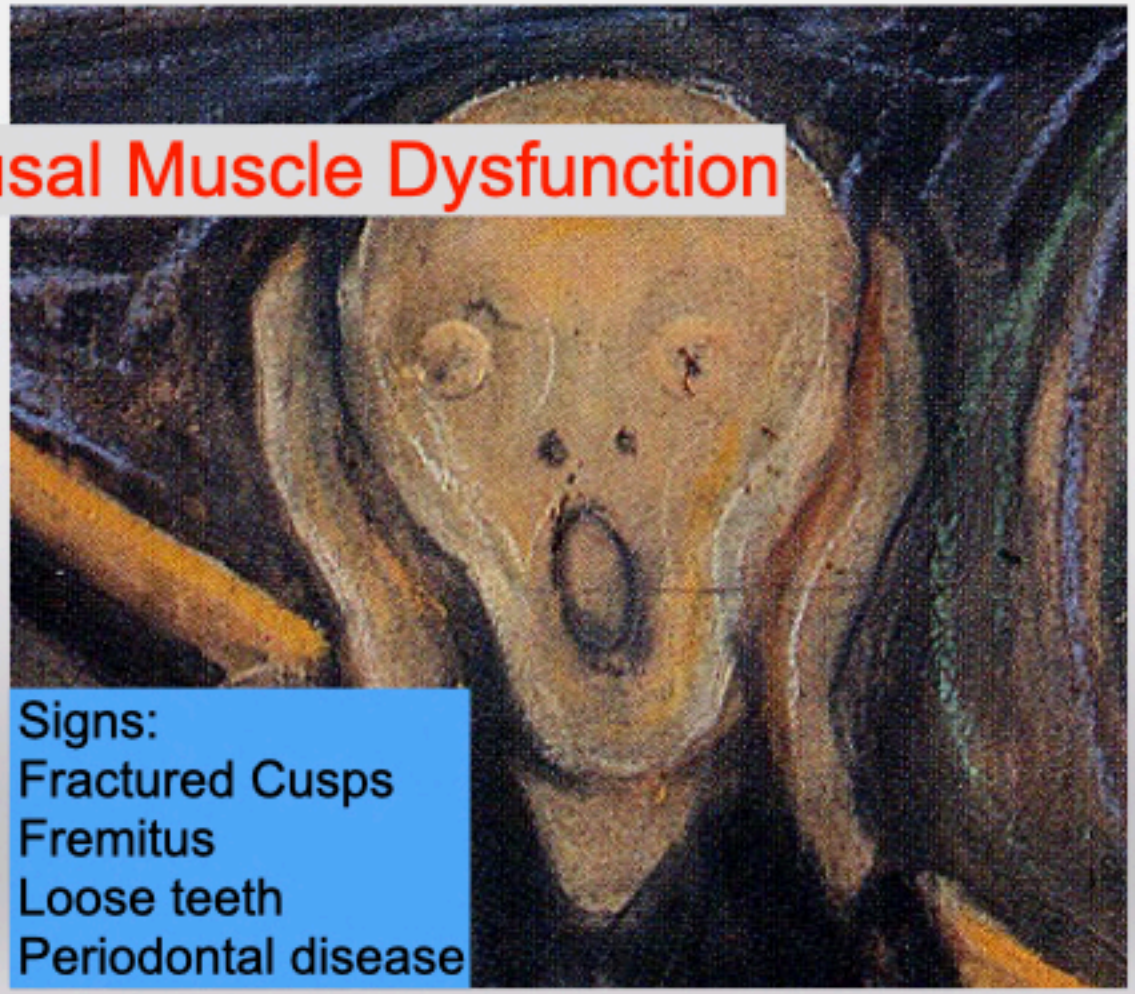


Drawing by Dr Jim Kessler

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

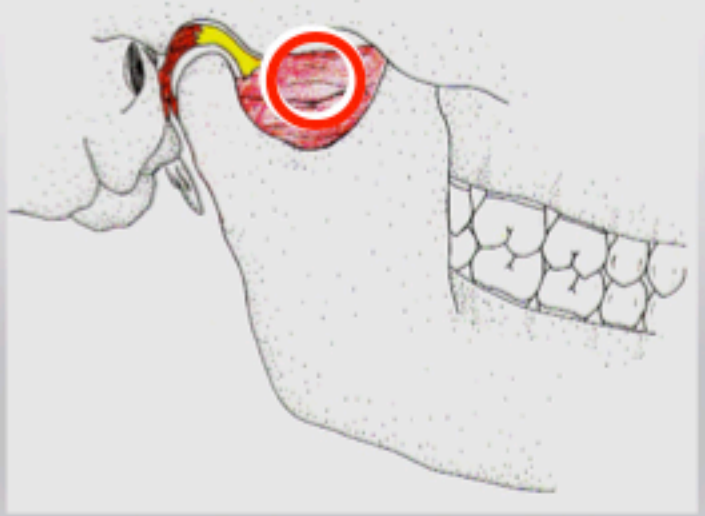
Occlusal Muscle Dysfunction

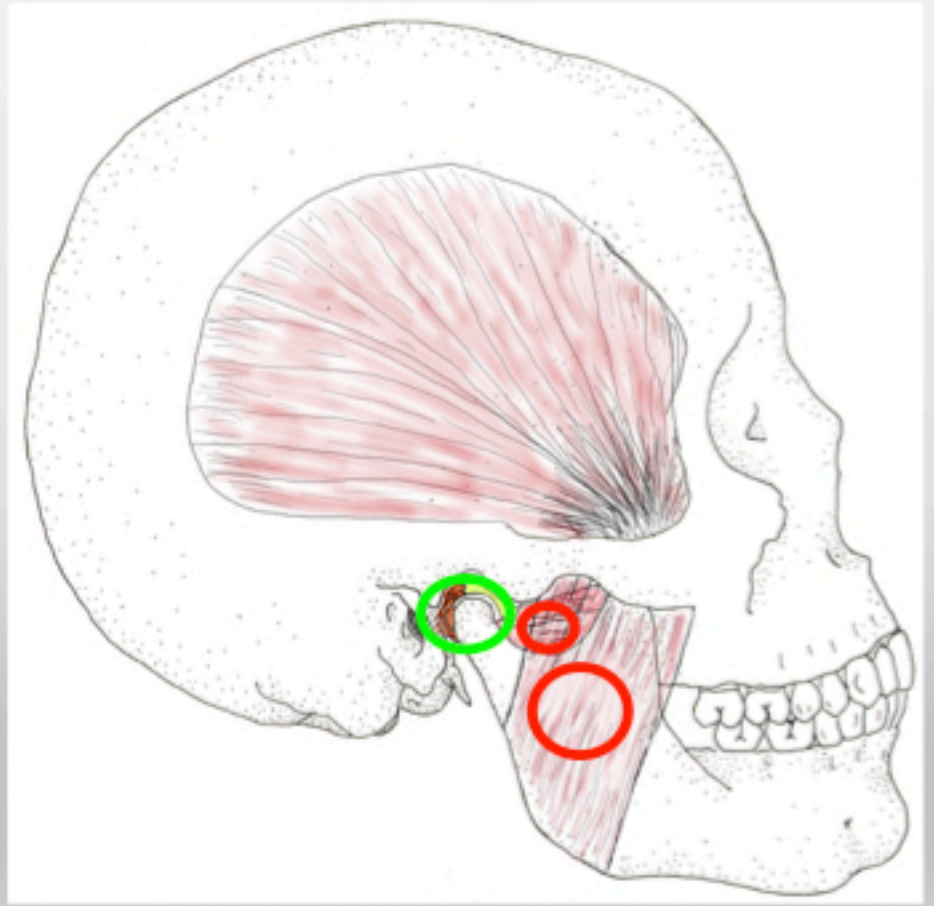


Signs:
Fractured Cusps
Fremitus
Loose teeth
Periodontal disease

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

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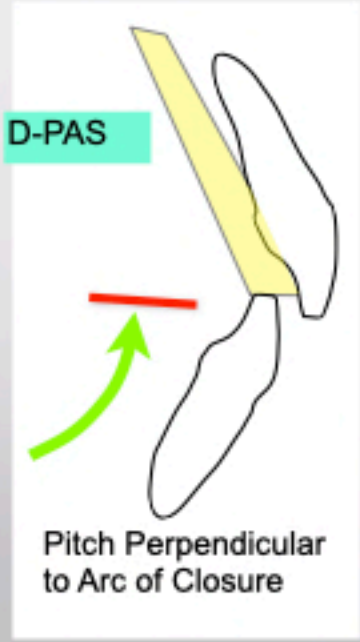
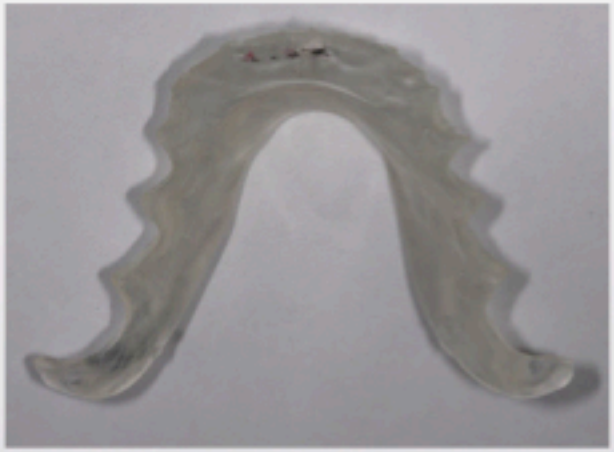
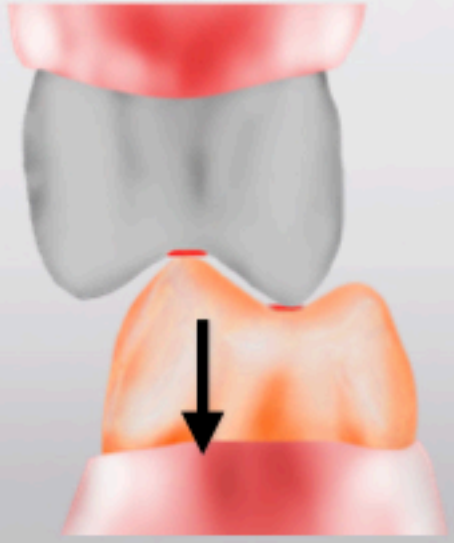




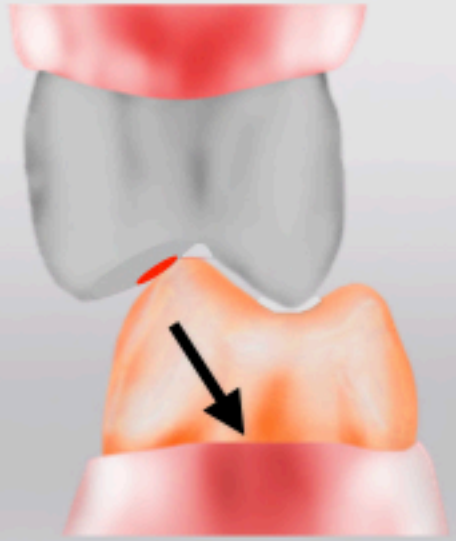
Stapelmann H, Türp JC. The NTI-tss device for the therapy of bruxism, temporomandibular disorders, and headache…..BMC Oral Health. 2008 Jul PMID: 18662411

Ideal Occlusion for Comfortable Muscles

Ideal
No sideways forces on back teeth.



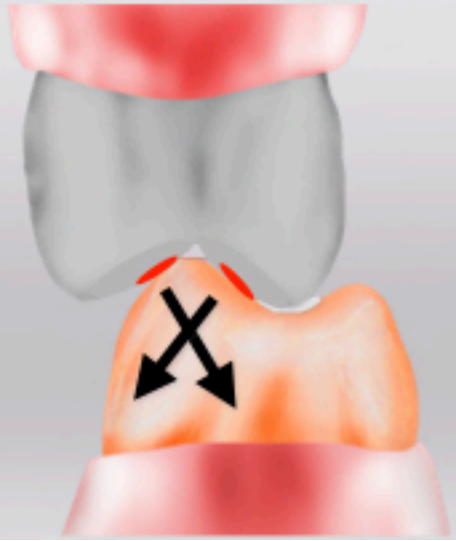
Not Ideal
Tense Muscles
Teeth can fracture



Sideways forces can fracture teeth

Not Ideal
Tense Muscles

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

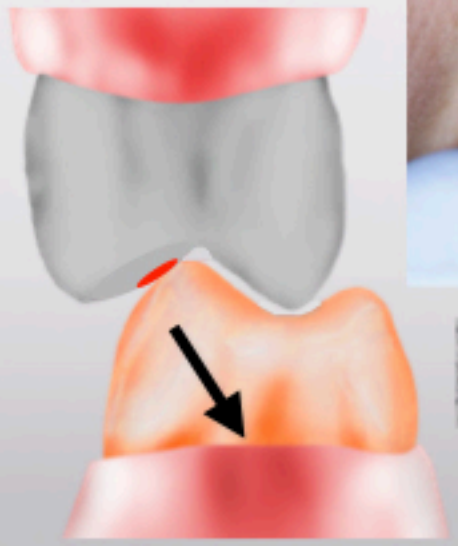


Not Ideal

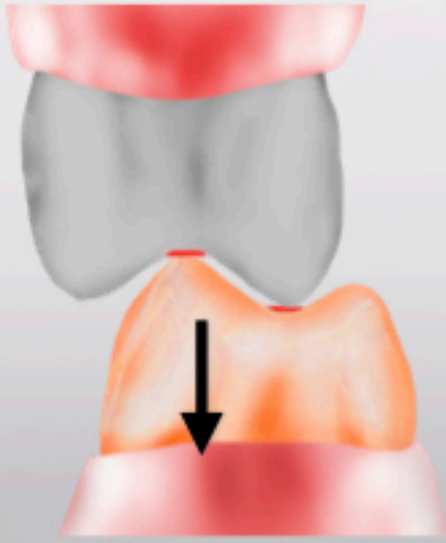
This is now a functionless tooth. Other teeth now have more force.

Occlusal Sculpting

Reshape



Polish

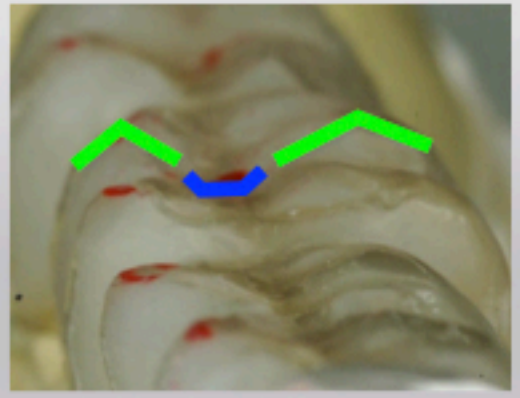


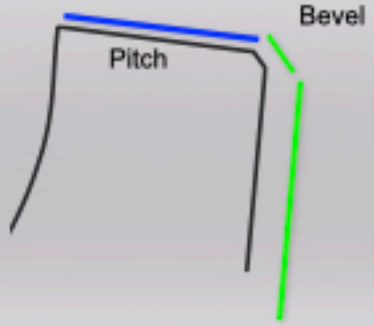
Occlusal Sculpting Tools, including Zirconia

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

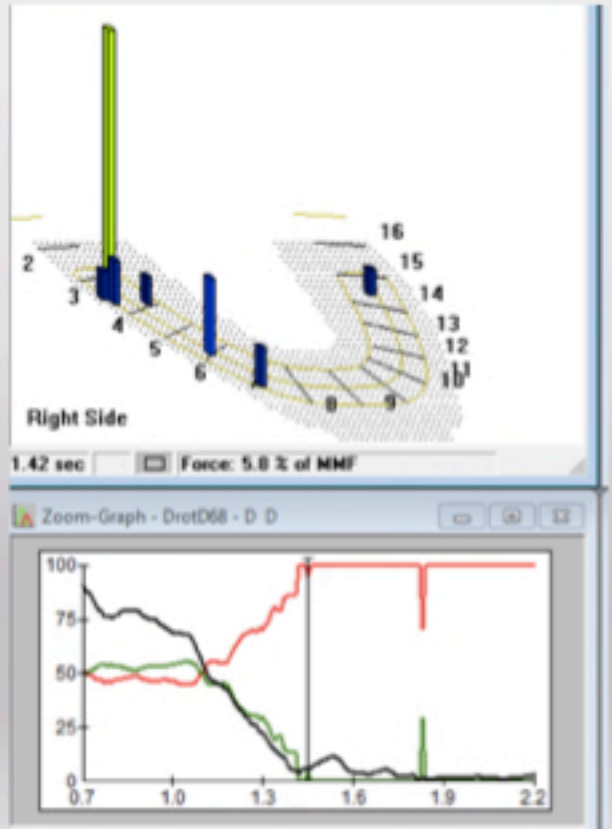
Treat Occlusal Muscle Dysfunction- Adjust the Occlusion

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

Before

After

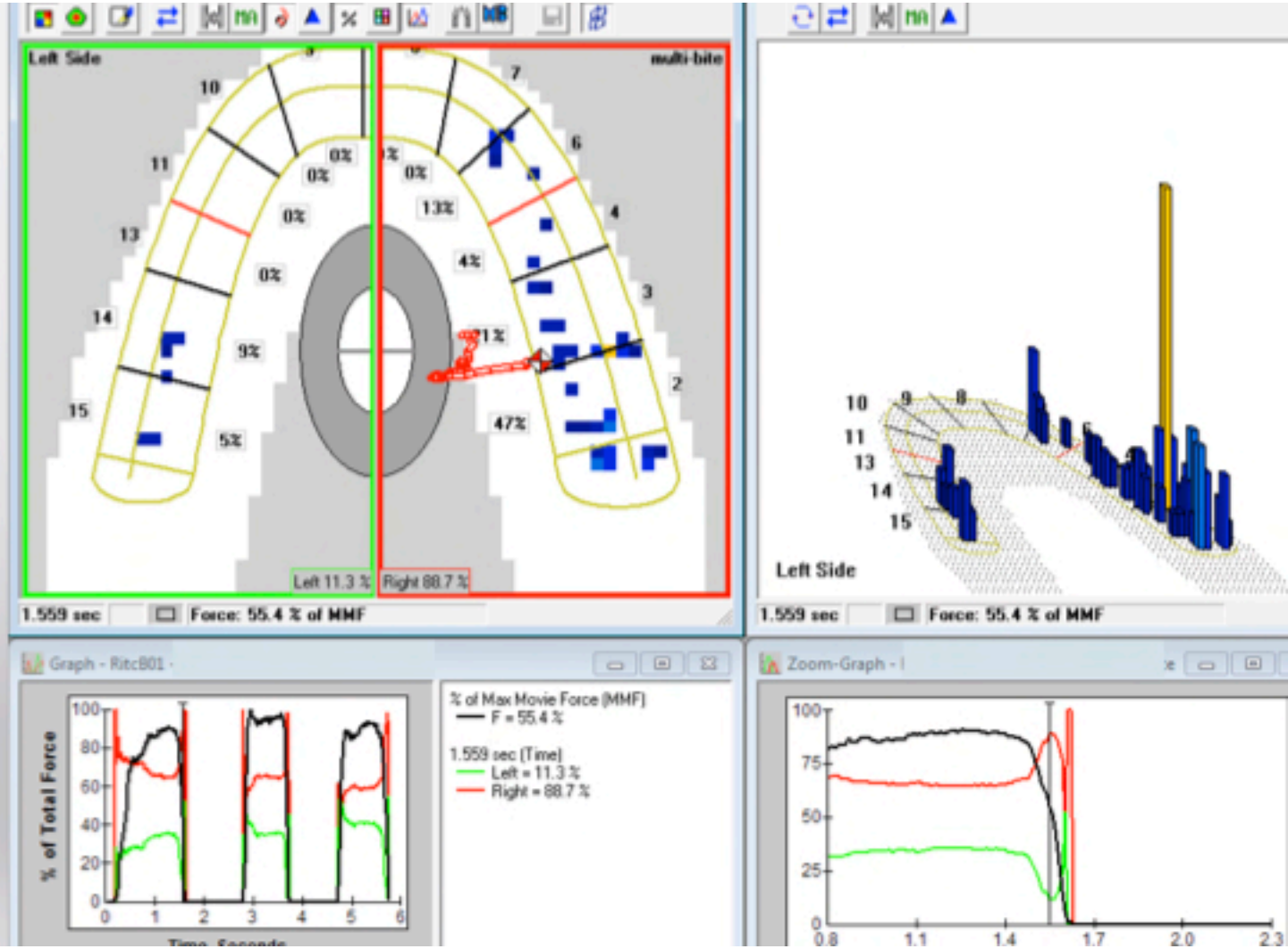
The indispensable value of T-Scan is not in finding heavy CR contacts, but working and nonworking contacts.



Is that a smudge or a muscle activating interference?

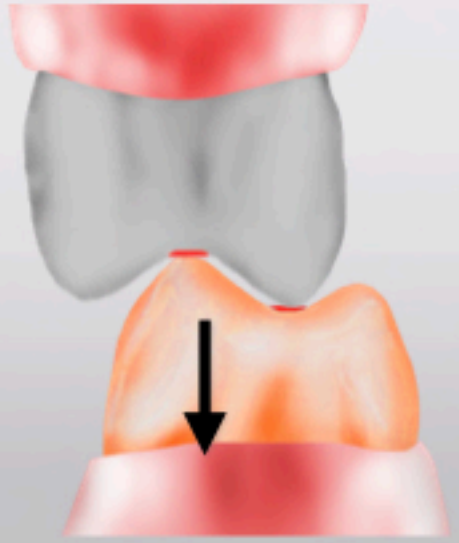
Remove too much and you decrease the ability to chew, especially lettuce. Chewing lettuce requires posterior inclines coming close enough to chew, but far enough apart to not touch and activate muscle.

T-Scan is excellent for Patient Education of Occlusal Pathology

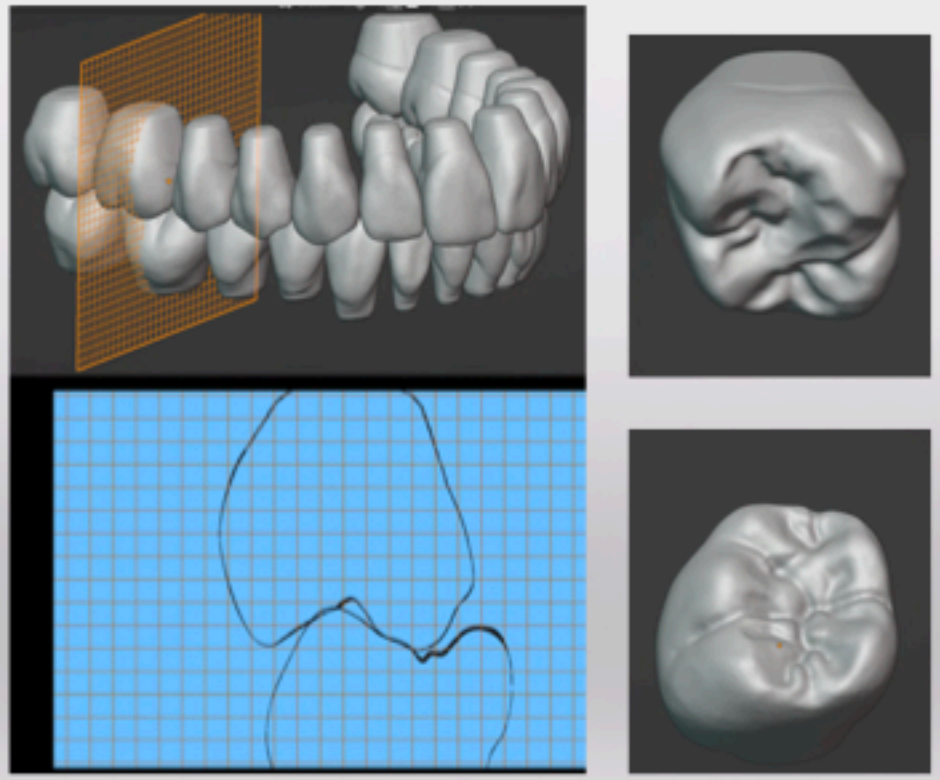


Ideal Occlusion

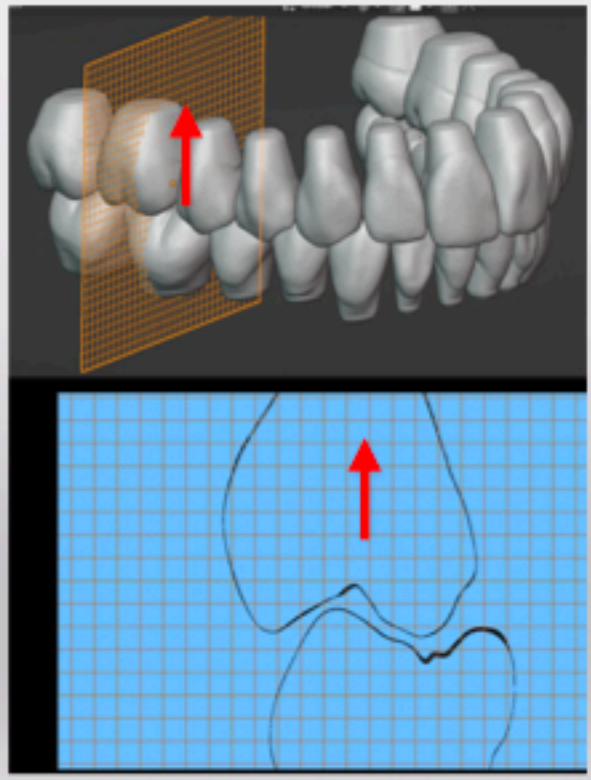
No sideways forces on back teeth.
Comfortable Muscles.

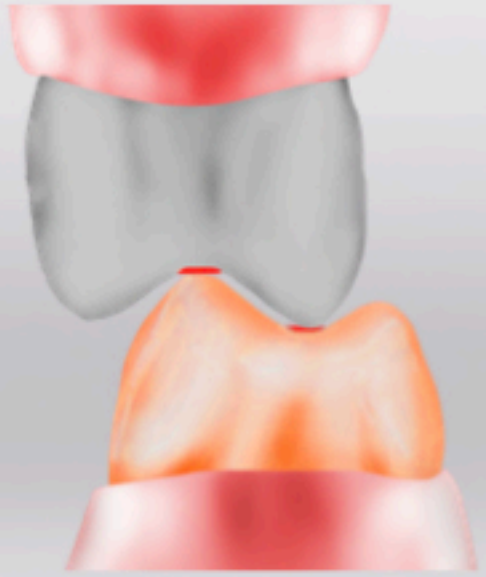


Digital Tooth Libraries
Occlusal Contacts on Inclines



Presets on how far out of occlusion to make crown





LD Pankey's 3 Rules of Occlusion Literature

(Clyde Schuyler)

Schuyler CH. J Florida Dent Soc, 1938.
Occlusal disharmony and its relation to oral discomfort.

Schuyler CH. J Am Dent Assoc. 1958 Aug;57(2):221-31.
Factors of occlusion to be observed in everyday practice.

Schuyler CH. J Pros Dent. 1963 Nov: 13(6): 1011-29.
The function and importance of incisal guidance in oral rehabilitation.

Kerstein, R. B., & Radke, J. (2012). Cranio 30(4), 243–254.
Masseter and temporalis excursive hyperactivity decreased by measured anterior guidance development.

Kerstein, R. B., & Radke, J. (2016). Cranio pp1–17.
Average chewing pattern improvements following Disclusion Time reduction.

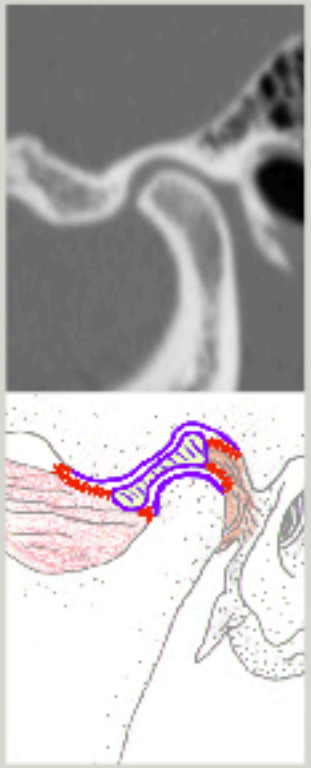
6 Common TMDs

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

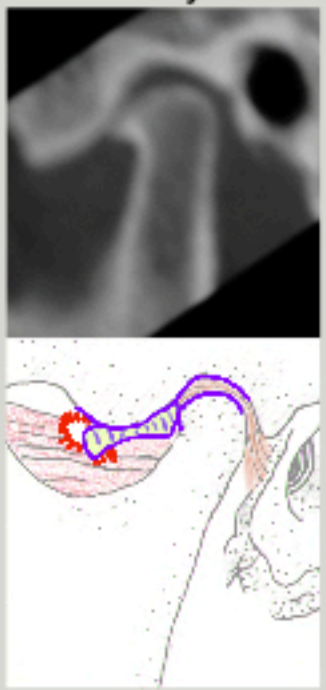
Osteoarthrosis/Osteoarthritis

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.

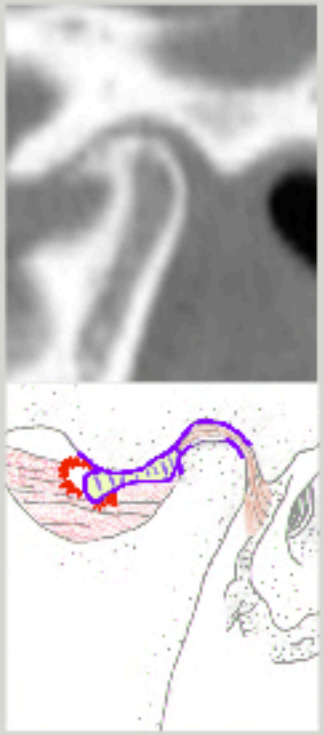
Normal



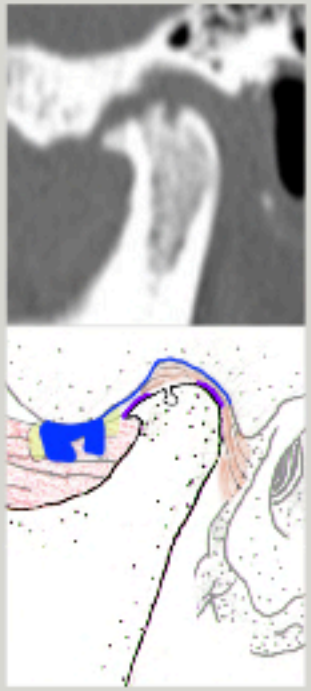
Early



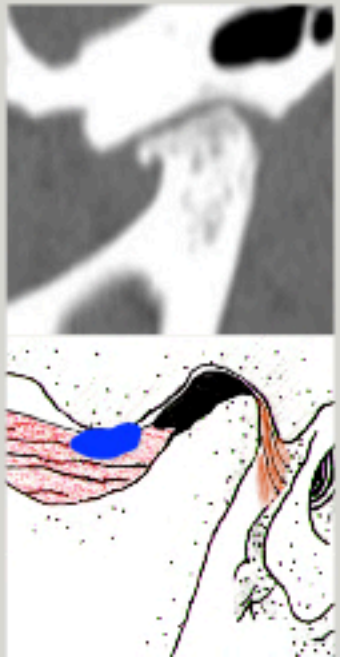
Early/ Moderate



Moderate



Severe OA, Eburnation

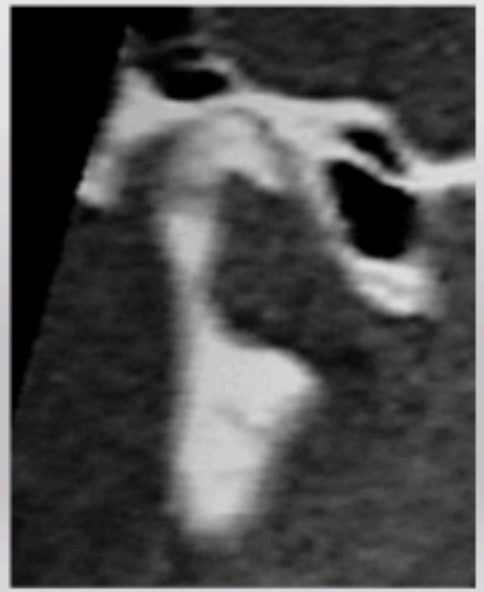


Representative examples of OA
in different patients

Drawings by Gretta Tomb DDS and John Droter DDS

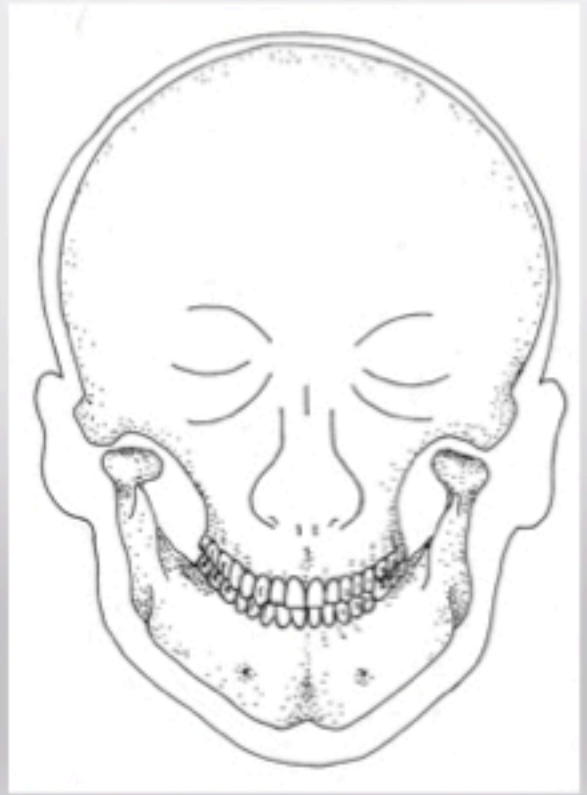
Adaptation Chronic Bilateral Osteoarthrosis

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

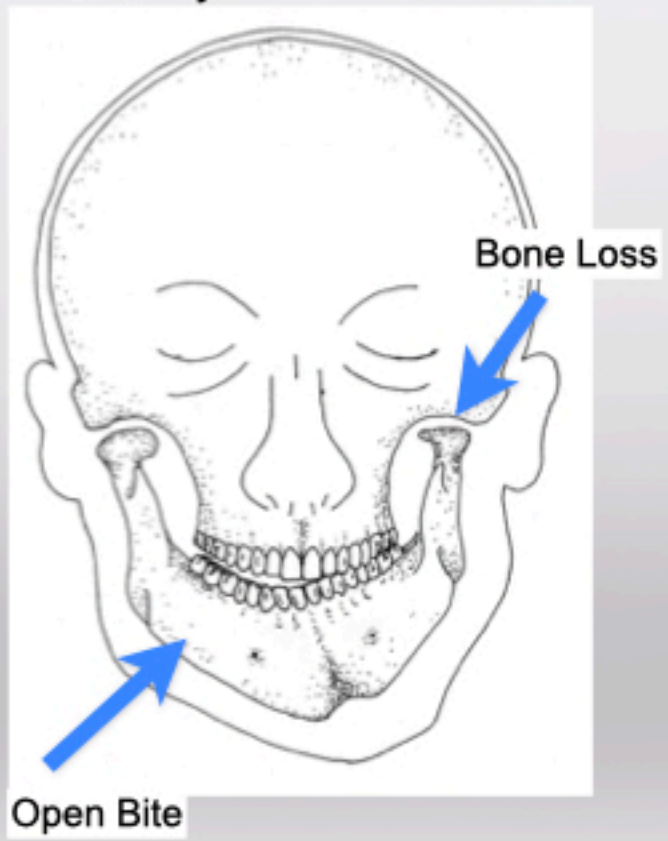


OA Right and Left Bone Loss
#8 Ankylosed

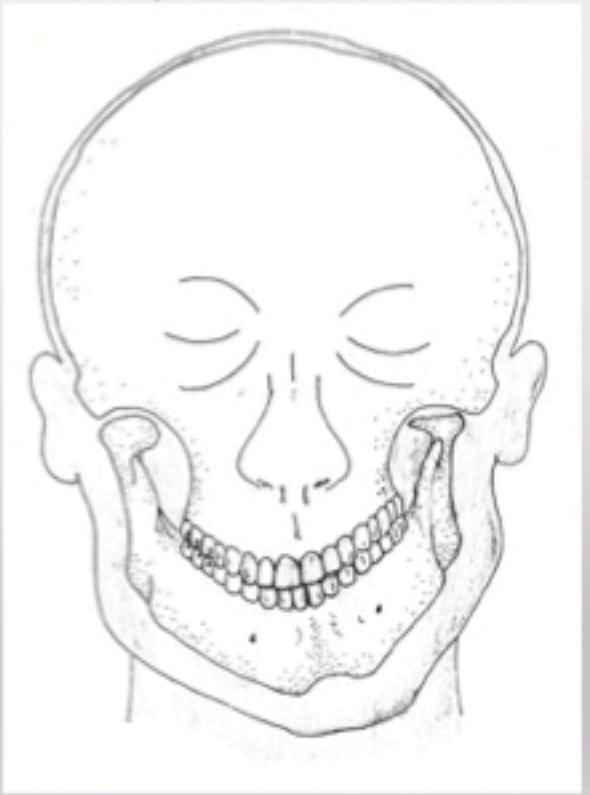
Diseases that cause bone loss in the TMJ alter the Occlusion



Condylar Bone Loss



Adaptation Over Time



Drawings by Gretta Tomb, DDS

Treatment OA

Osteoarthr**osis**

- Glucosamine 1500mg /Chondroitin 600 mg per day
- Minimize parafunction:
  - D-PAS
  - Brux Pas
  - Posterior stop night guard

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:

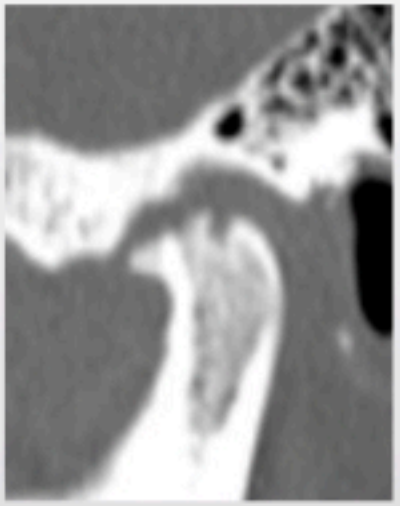
CPAP or Dental Airway Device

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)

Anterior stop

Jaw Movement Exercises

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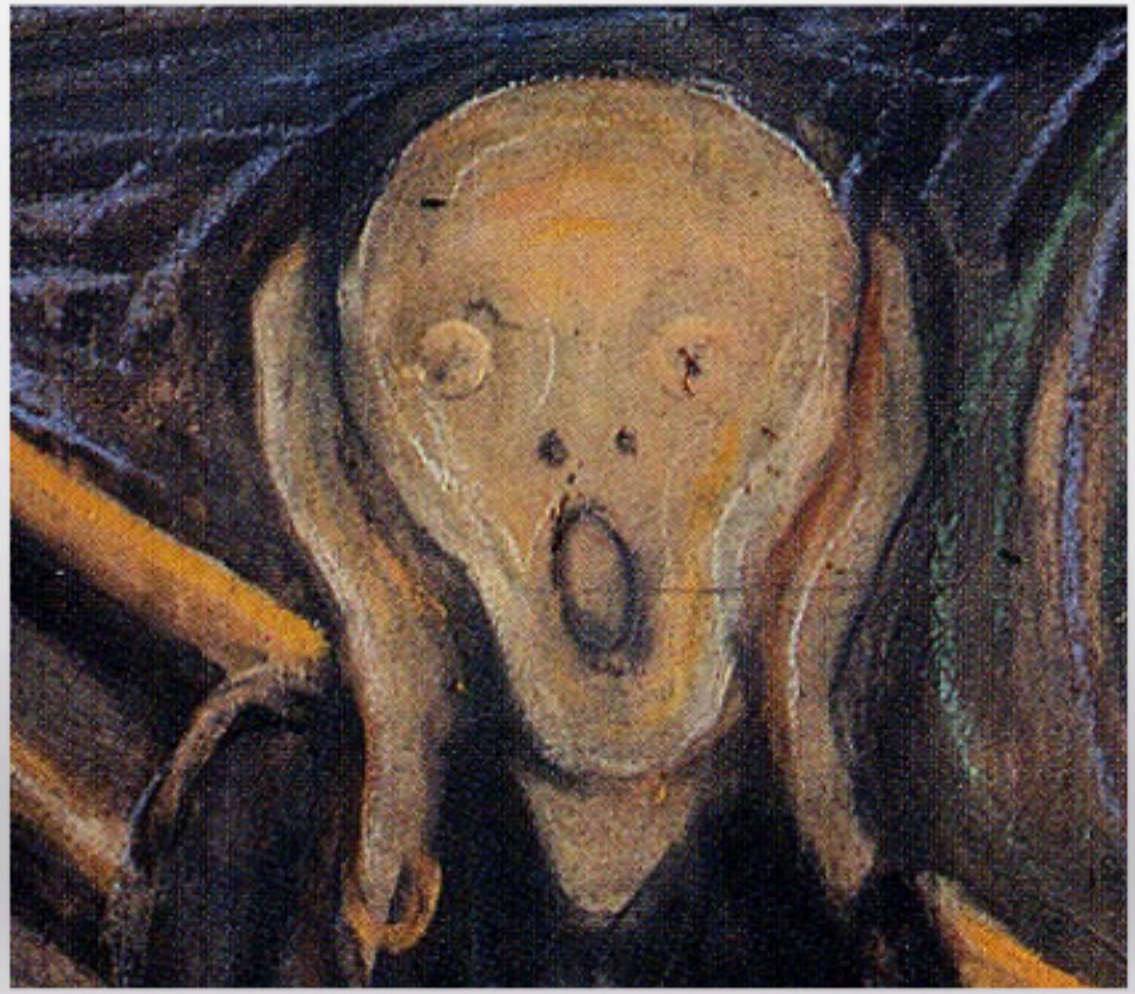
Acute Closed Lock TMJ	Sore TMJ Limited opening Hard end point active stretch	Arthrocentesis with PRP

TMD Symptoms

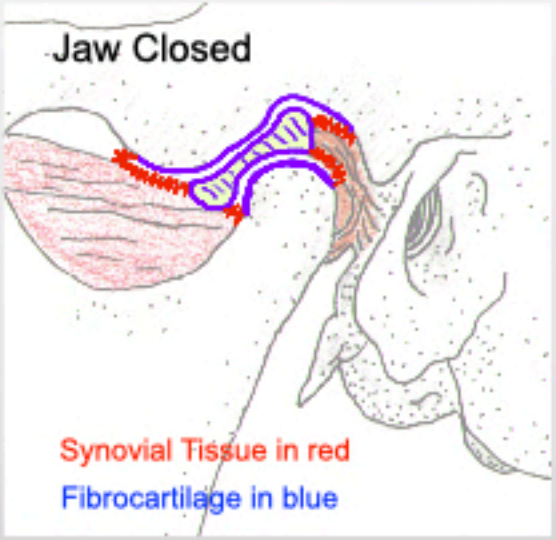
Limited Opening

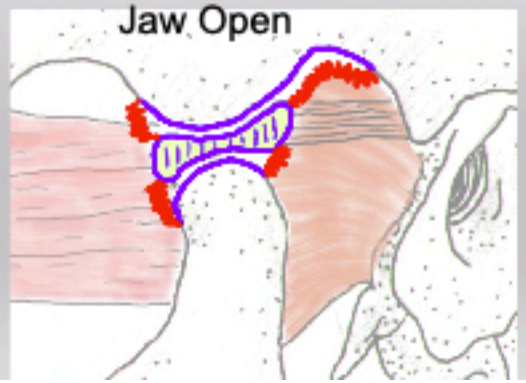
Diseases to consider and rule out:

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



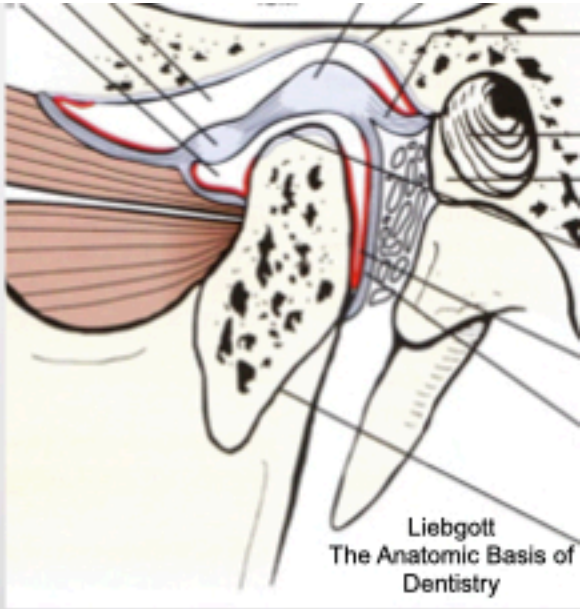
Normal TMJ- Synovium, Cartilage

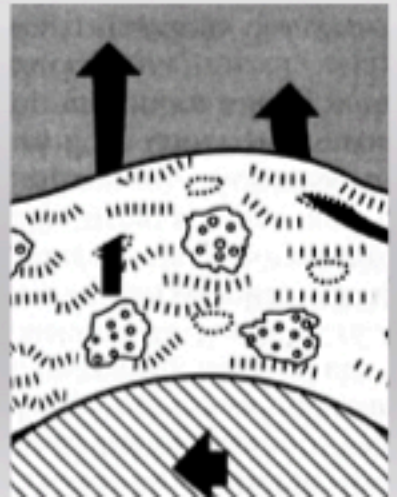




Fibrocartilage-
- Slope of Eminence
- Disc
- Top of Condyle

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

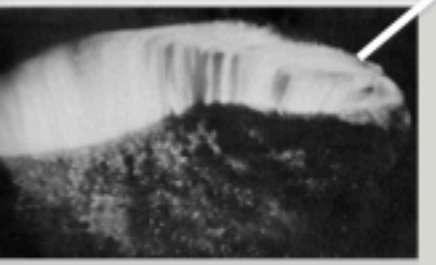
Differential Diagnosis: Limited Joint Motion

Muscle Spasm

Painful to Move
- Joint Pain
- Muscle Pain

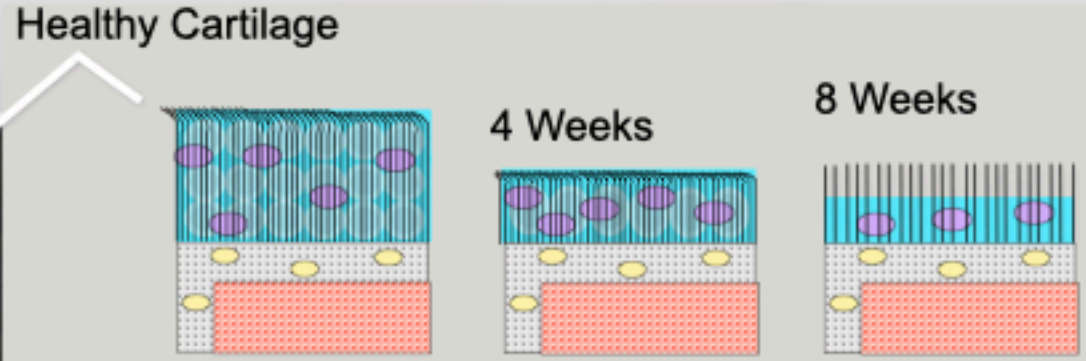
Mechanically Blocked
- 4b Acute
- Adhesion

Masseteric Space
- Infection
- Hematoma



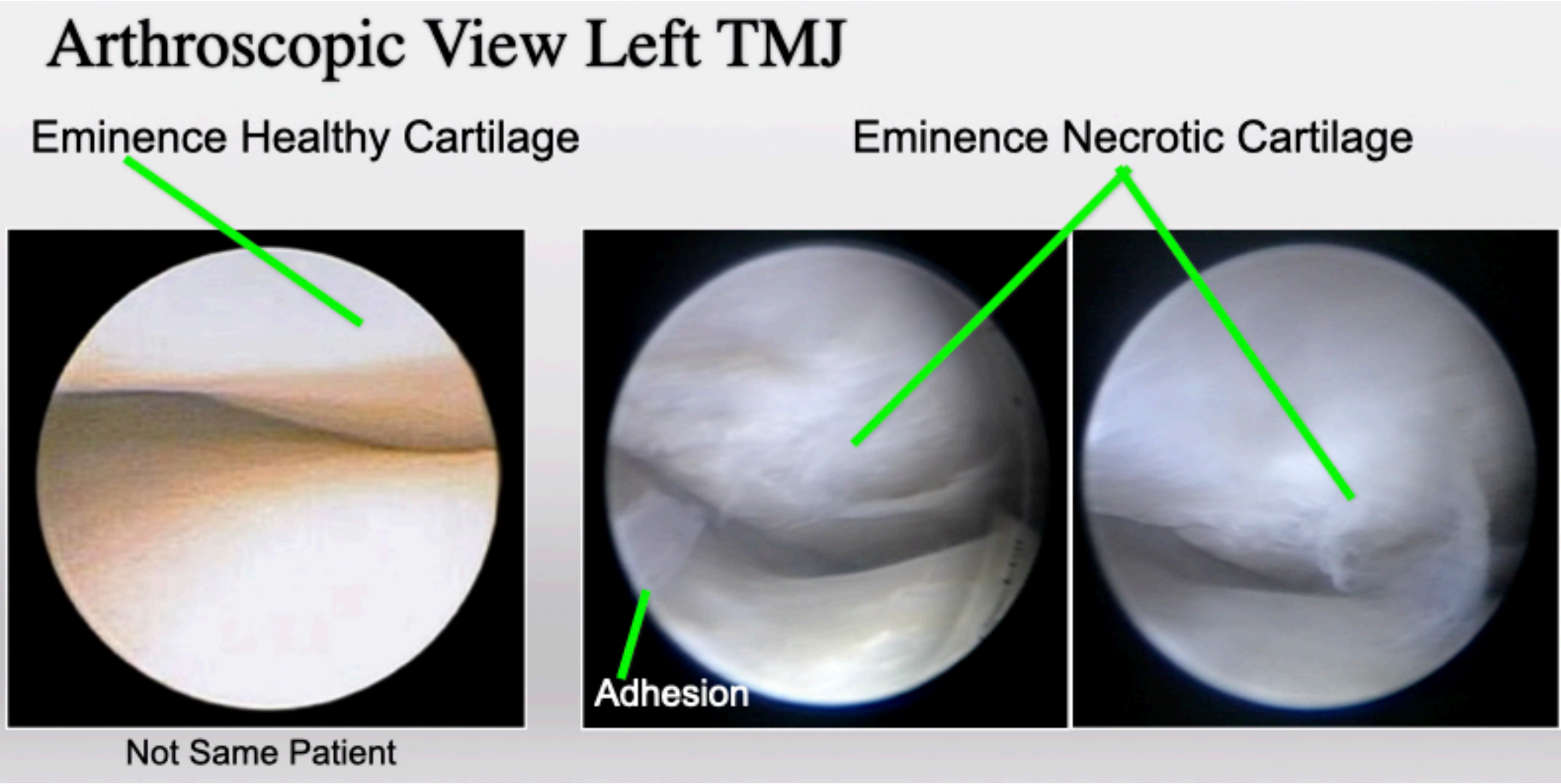
Lose 50% height of cartilage
Proteoglycans not being produced by Chondrocytes
Loss of 50% proteoglycans and water
Collagen still intact
Process is reversible
Move joint with light force/repetitive motion next 30 days

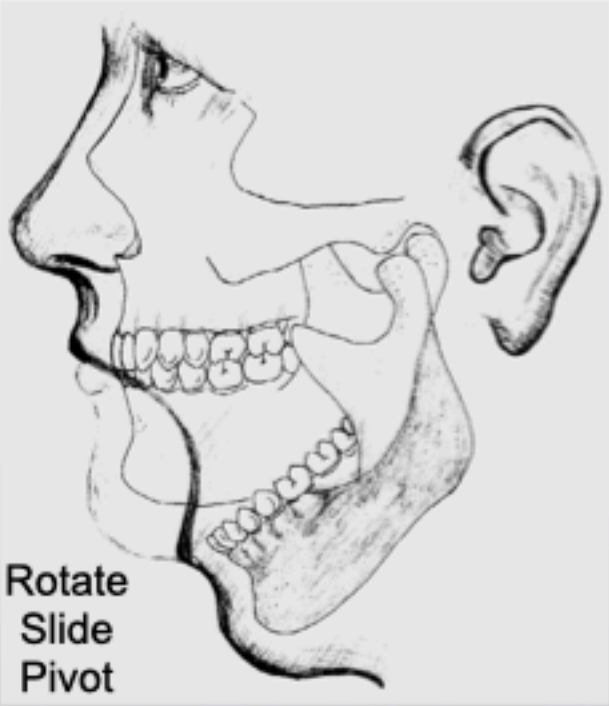
You have 6-8 weeks to get jaw moving before cartilage is irreversibly damaged, independent of the cause of the immobilization



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





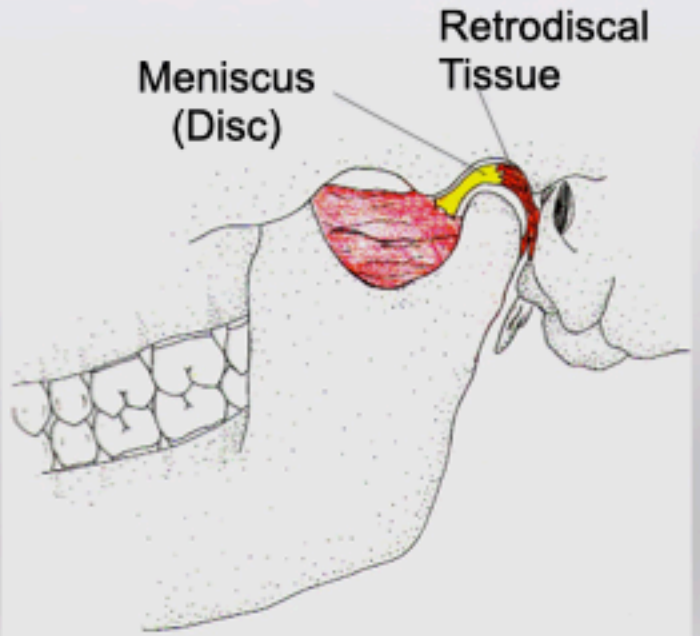
Rotate
Slide
Pivot

Rotation only 25mm

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

TMJ has 2 Joint Compartments:

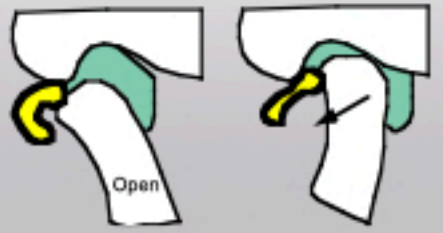
Upper- Translation
Lower- Rotation



Acute non-Reducing Disc
Limits Translation.

"Old Adapted" may have
full range of motion.

Reducing "Click"



non-Reducing Disc

Limited Opening Algorithm

Differential Diagnosis Limited Opening:

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

Diagnostic Tests:

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

Dr Droter's Limited Opening Algorithm

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

Palpate First

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

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

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

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

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

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

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

No Signs Infection

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

Rule out Hematoma Dental injection

No Signs Hematoma

Body Temp Normal
Painful medial pterygoid area
Recent Dental Injection

Hematoma
Cold Laser Intraoral

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

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

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

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

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

Soft end point
TMJ Pain
Active stretch points to joint

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

Pain Avoidance, TMJ Arthralgia

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

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

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

Pull Accufilm

Chronic Sprain Sprain not resolving, evaluate for sleep bruxing

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

Pain Avoidance, Muscle Pain

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

Anterior Stop

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

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

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

Subjective:

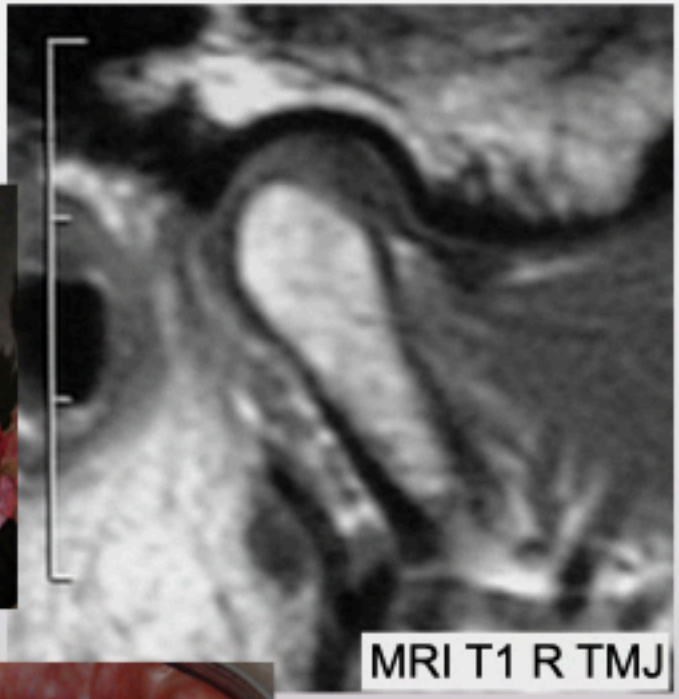
- Dentist doing crown prep #30 1 week ago
- Severe pain Right TMJ after moving jaw at end of appt
- Constant deep pain Right TMJ
- Limited opening

Objective:

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

Assessment:

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

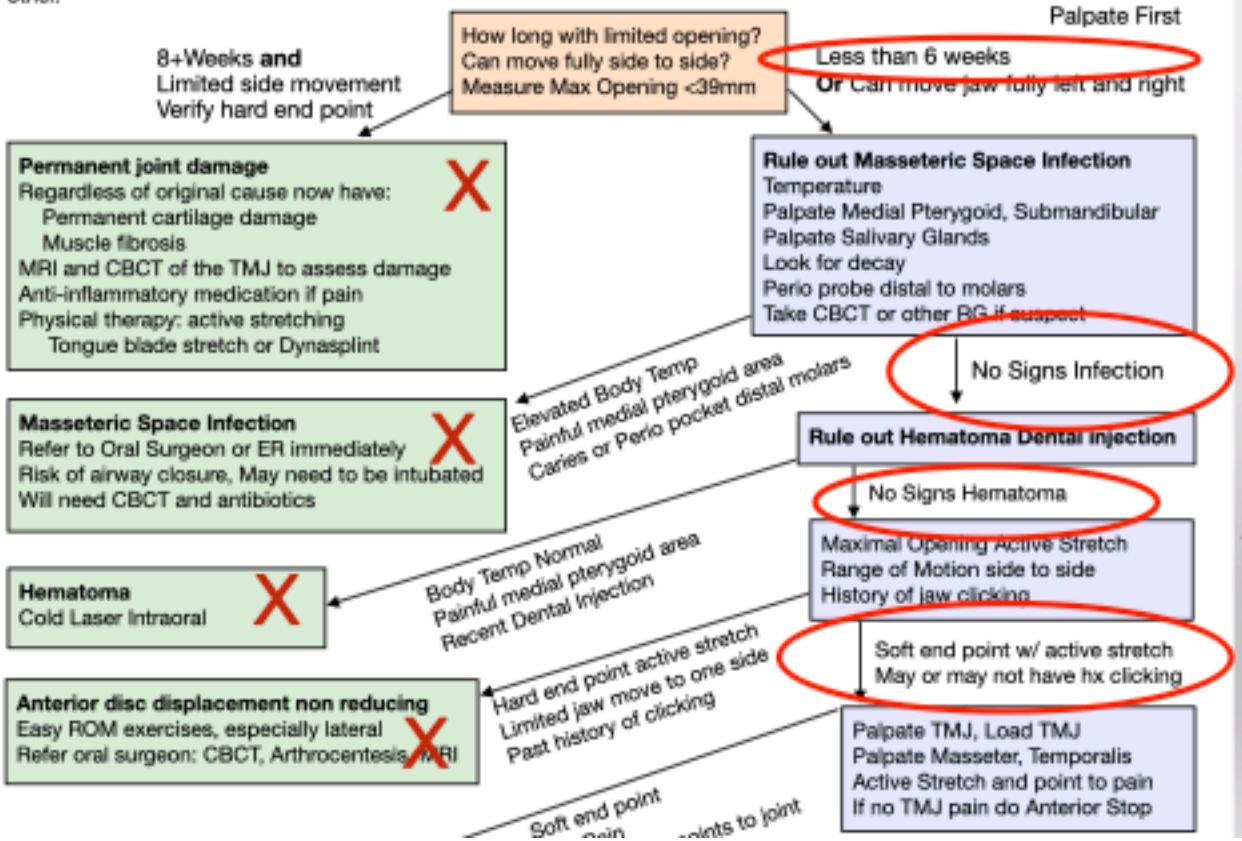


MRI T1 R TMJ

Dr Droter's Limited Opening Algorithm

22.3

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



Objective:

Limited opening 32mm, Mandible shifts Left

Normal side to side motion

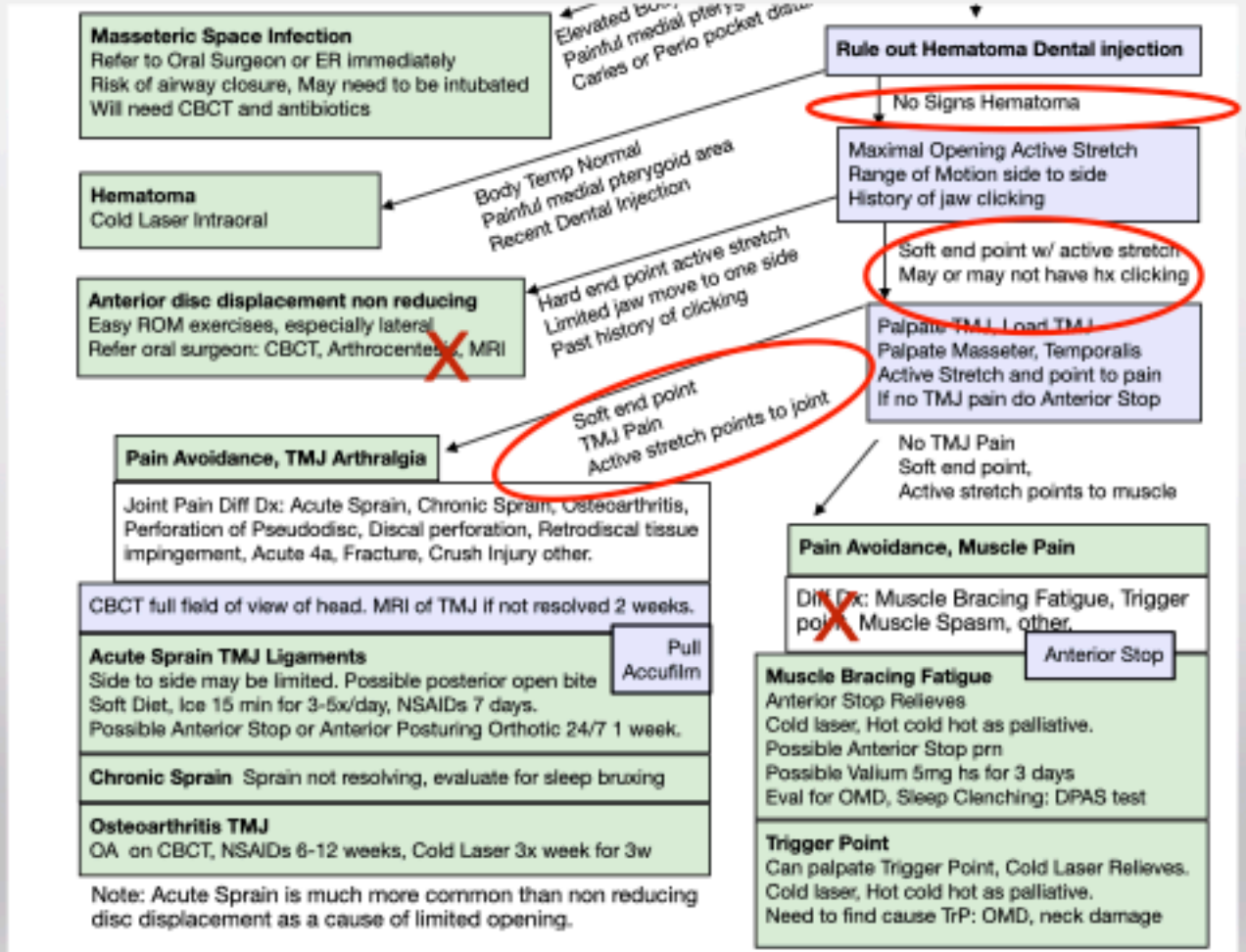
98 temp, normal perio probe 2nd molars, no caries

No pain palpation RL Medial Pterygoid

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

Right TMJ pain to palpation, Left TMJ normal

Posterior openbite Right, does not hold Accufilm



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No pain palpation RL Medial Pterygoid

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Right TMJ pain to palpation, Left TMJ normal

Posterior openbite Right, does not hold Accufilm

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

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

At 4 weeks patient had full ROM
No clicking

Another Case Limited Opening :

Subjective:

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

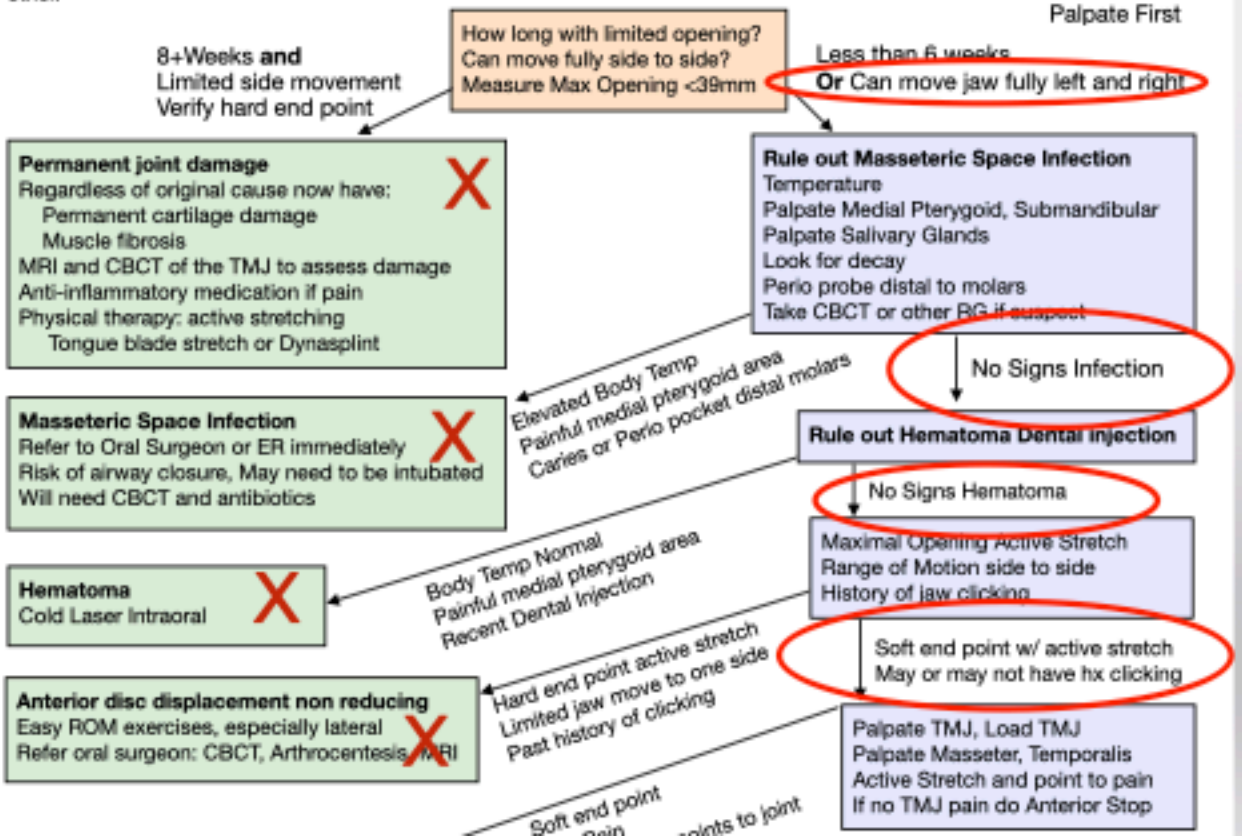
Objective:

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

Dr Droter's Limited Opening Algorithm

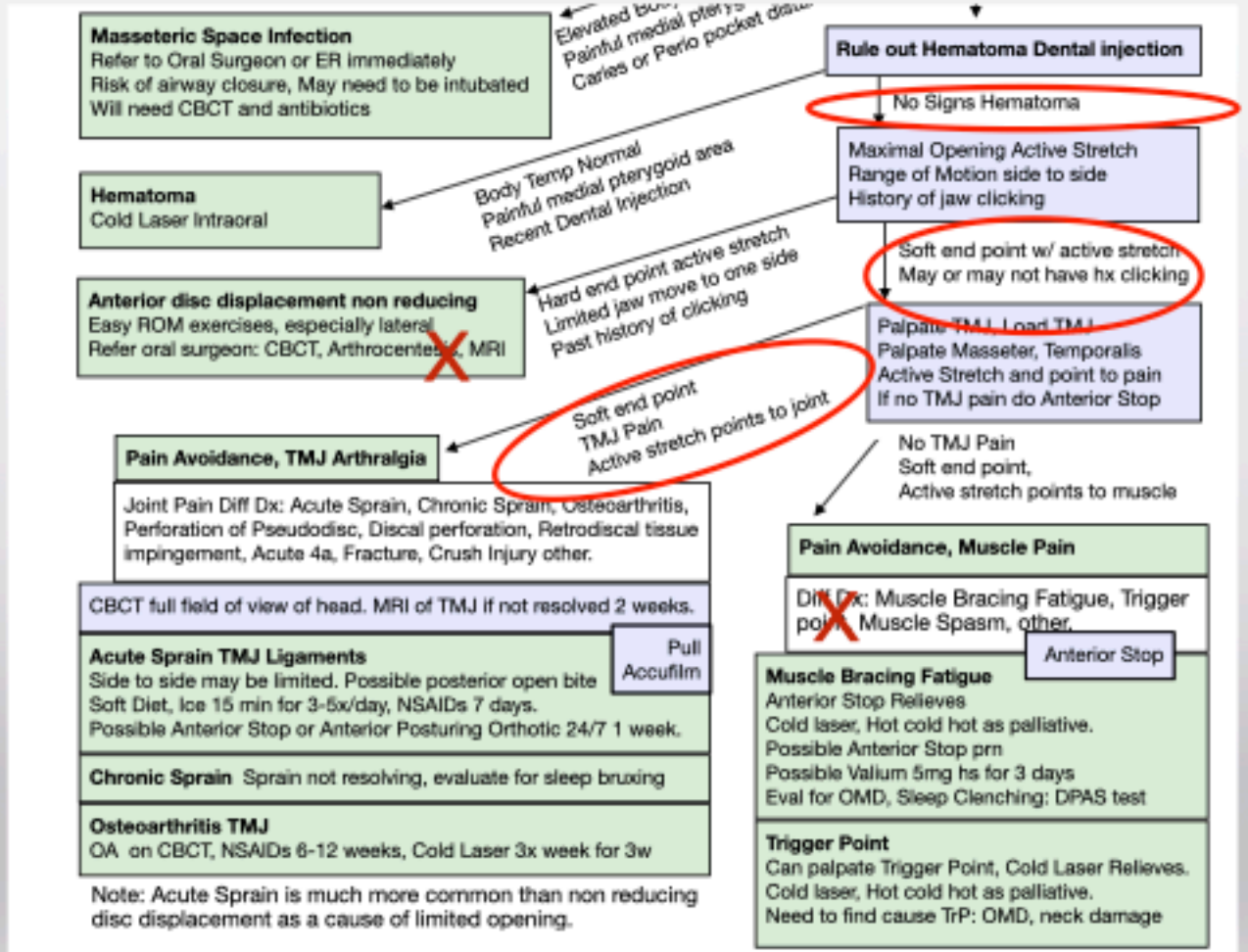
22.3

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 25mm, Mandible shifts Left
- Normal side to side motion
- Normal temp, normal perio probe 2nd molars
- No caries
- No pain palpation RL Medial Pterygoid
- Soft end point on active stretch, 35mm, with R TMJ pain
- Right TMJ pain to palpation, Left TMJ normal



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

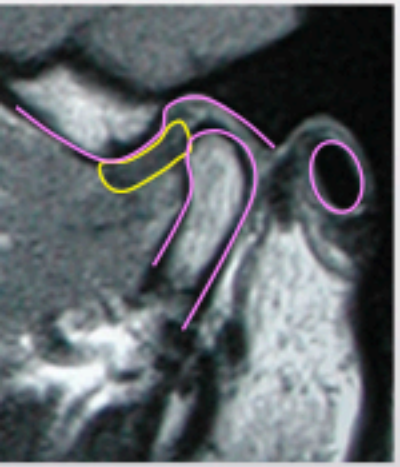
Temporary Anterior Stop
ArrowPath Sleep

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

Treatment Acute Closed Lock



Anterior Stop or D-PAS for 3 weeks

Jaw Movement Exercises
- Open Close
- Front Back
- Left Right

Cold Laser
Ice
NSAID

If still locked arthrocentesis with:
- Platelet Rich Plasma (PRP)
- Anterior stop
- Jaw Movement Exercises

6 Common TMDs

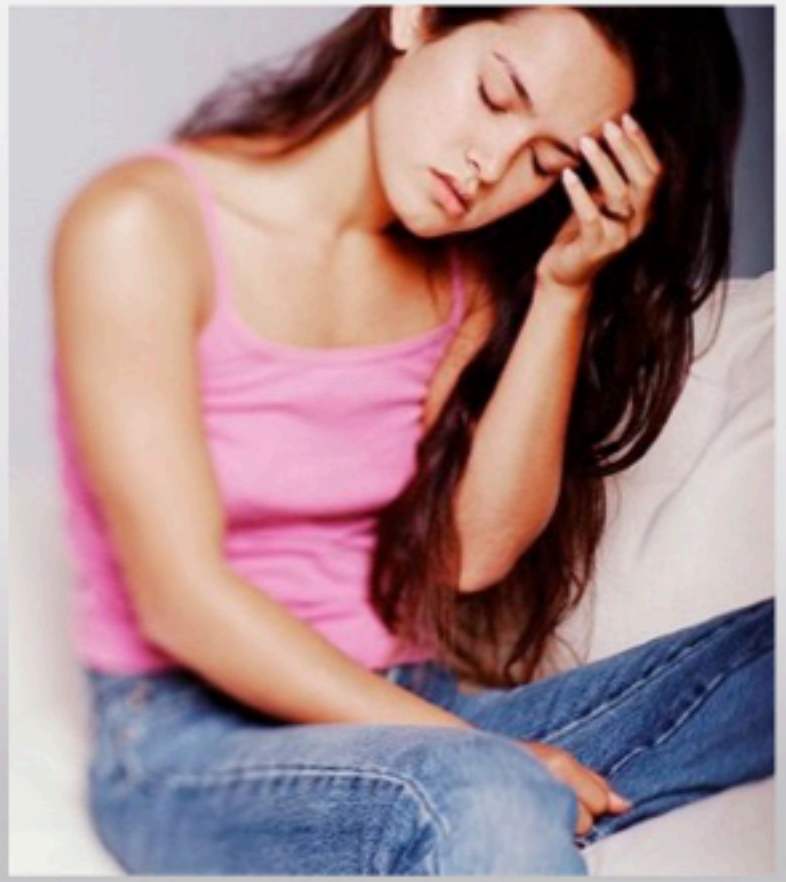
Parafunctional Clenching
Parafunctional Grinding
Occlusal Muscle Dysfunction
Osteoarthritis
Acute Sprain
Acute Closed lock of TMJ disc

5 Common Obstacles

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

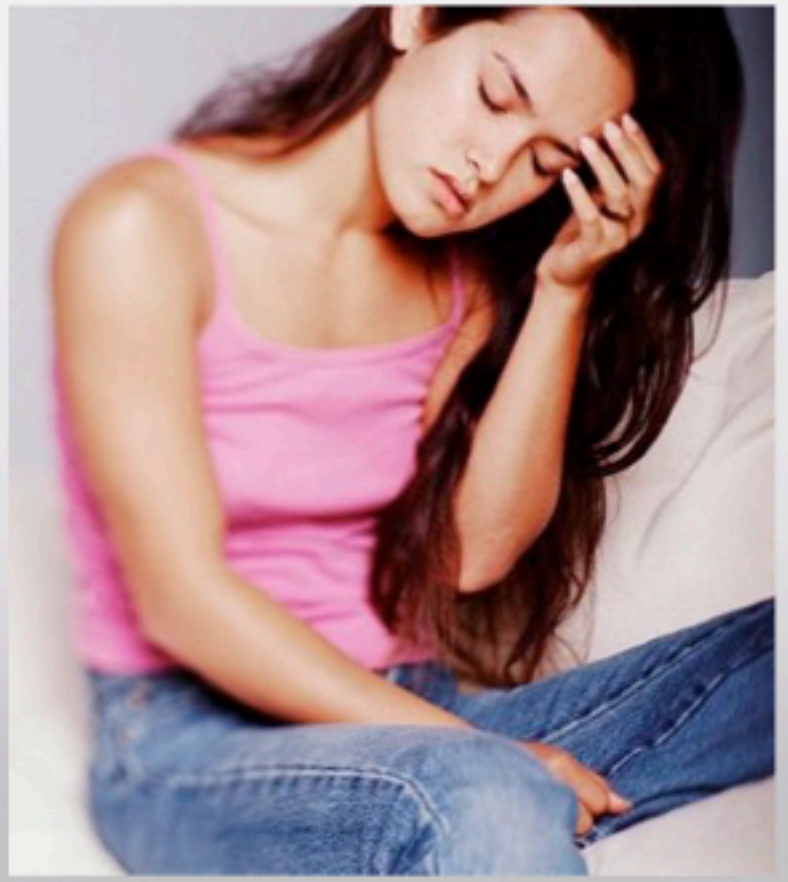
1 TMD that **usually** does not need therapy

TMJ Clicking



5 Common Obstacles

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



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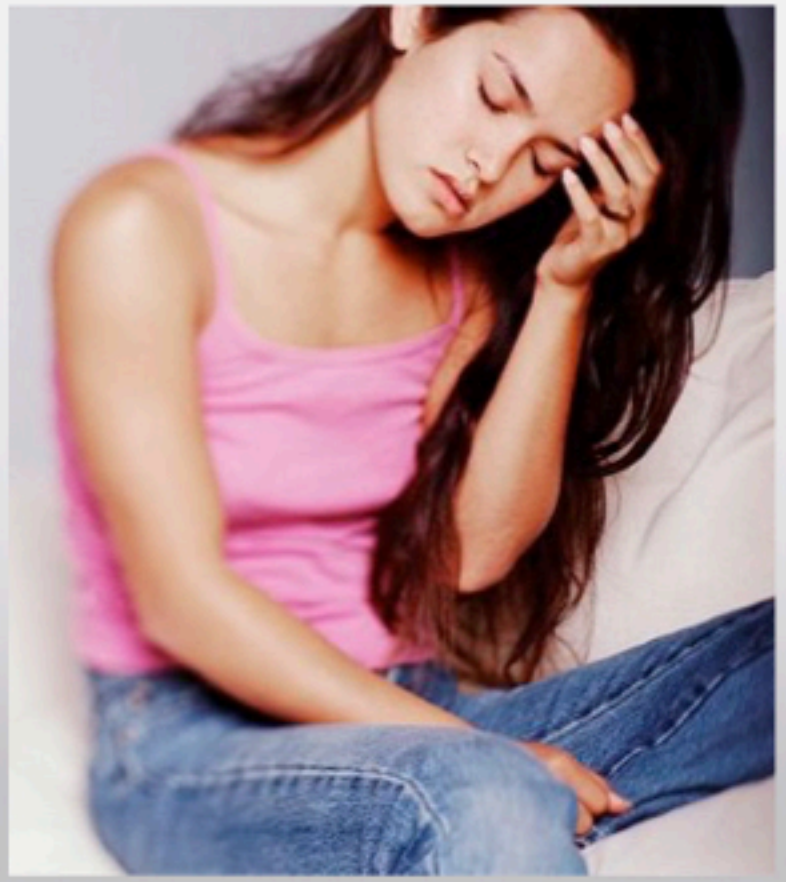
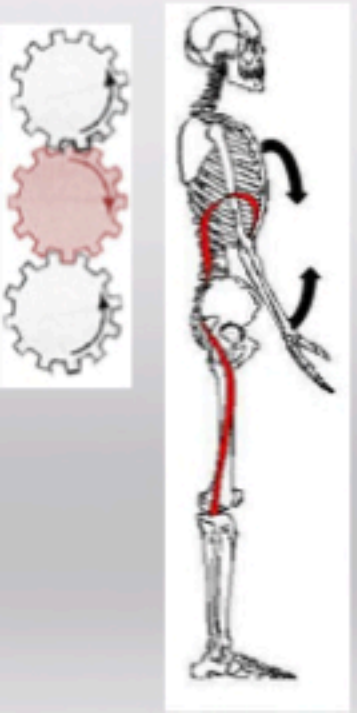


Neck and Postural Instability

This is a **dynamic** orthopedic System



A change in any one area will affect the others

CNS/PNS

Skull

TMJ

Teeth

Mandible

Teeth

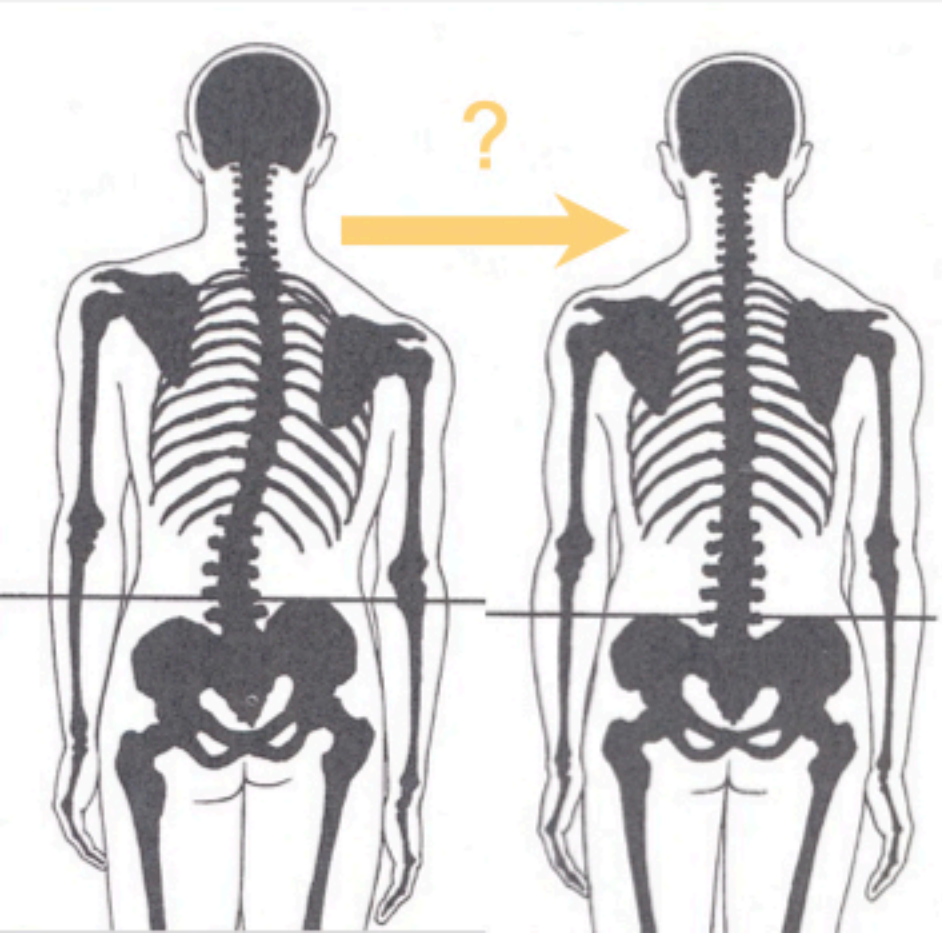
Neck

Muscle Neck

Muscle TMJ

venn diagram

How to Rehabilitate?



Define the Problem:
Bones not Stacked
Disproportionate Weak/Strong opposing muscle groups

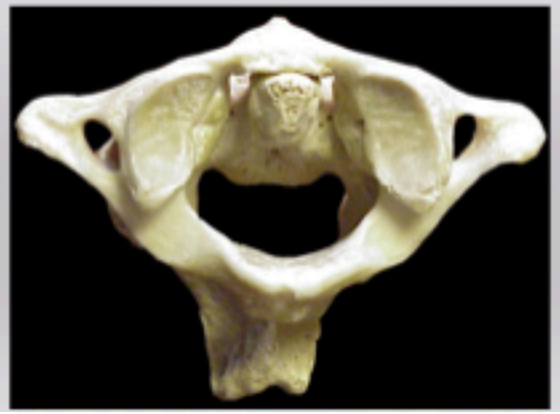
Causes:
Postural- Habitual, Functional
Pain Avoidance- sore joint, sore muscle
Adaptation from physical damage
Genetics

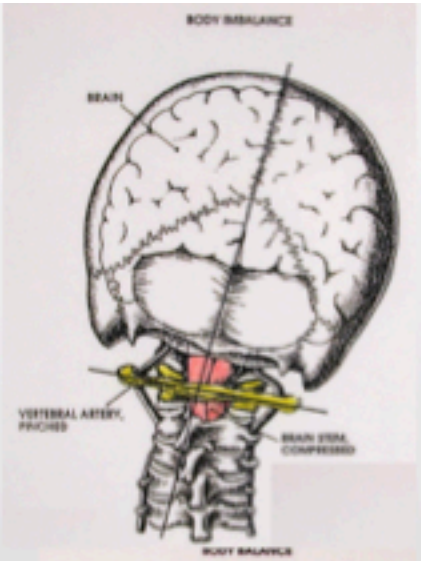
Treatment:
Eliminate Pain
Mobilize Joints
Stack the bones
Strengthen weak muscle groups

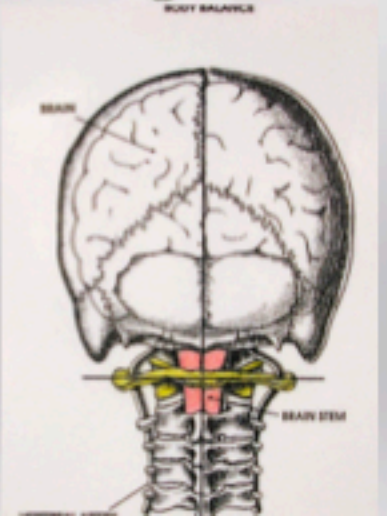
Does stretching and palliatively eliminating TrP fix this?

Atlas Orthogonist
Branch of Chiropractic Medcine

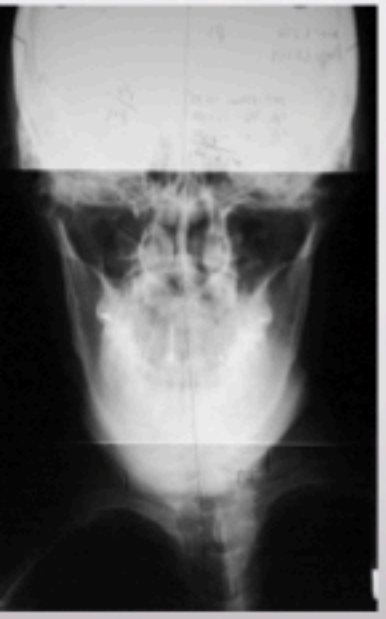
Uses sound wave to move atlas,
disrupts muscle bracing

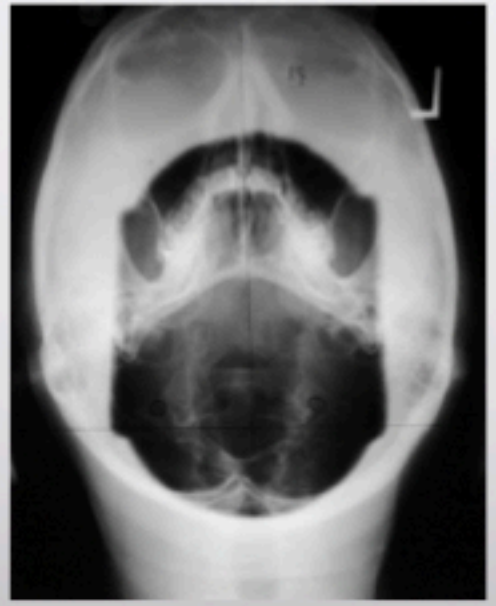


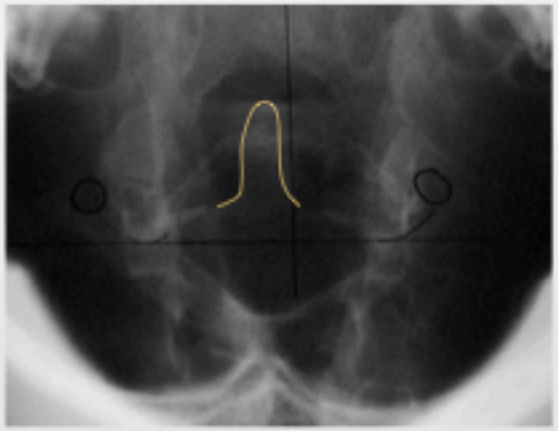




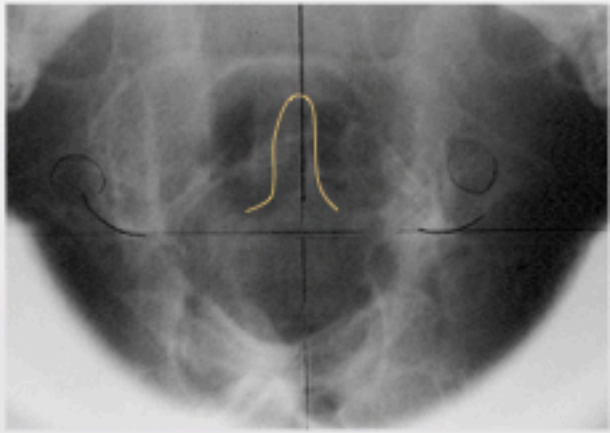
My Neck







Before Atlas Adjustment



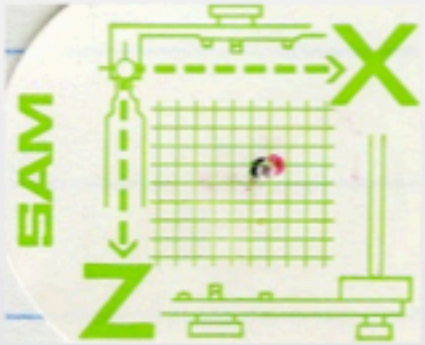
After Atlas Adjustment

CR Changes with Atlas position

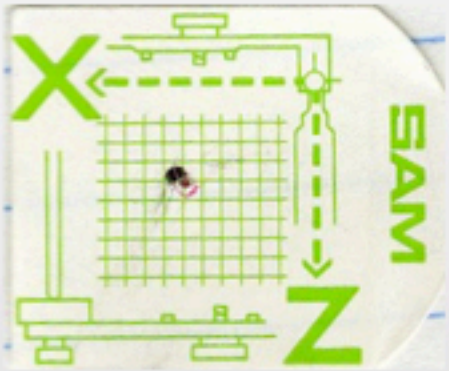
?Pressure on Occiput moves Temporal bone?

Put your teeth together and bend neck side to side

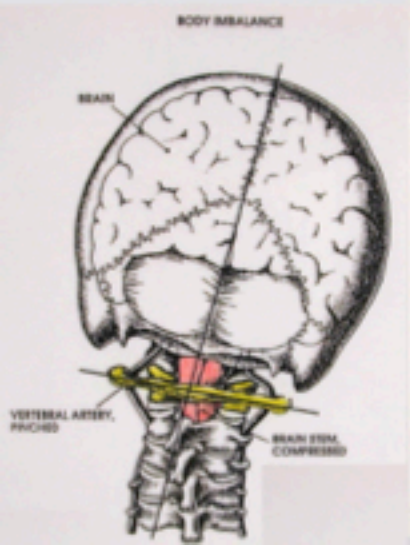
SAM Articulator Vericheck

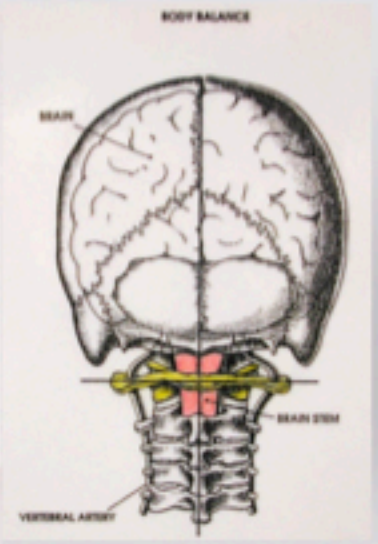


Right Condyle
Black- Atlas Out
Red- Atlas in shifts condyle up and forward 0.6mm



Left Condyle
Black- Atlas Out
Red- Atlas in shifts condyle down and back 0.5mm





Postural Restoration Therapist

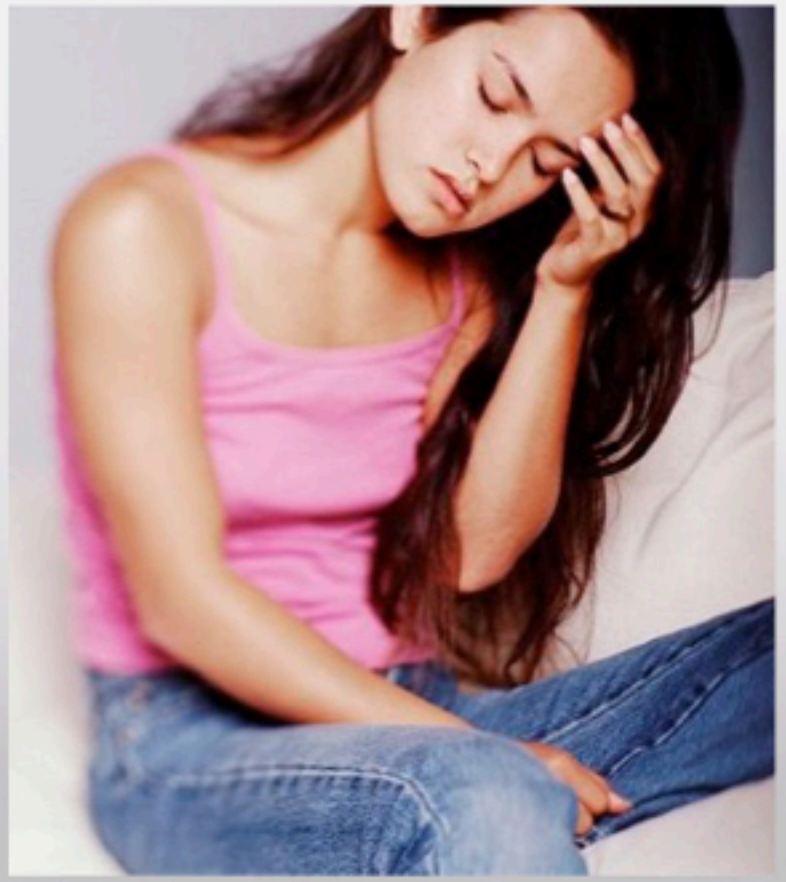
Postural Restoration Institute®

posturalrestoration.com/

Physical Therapist with additional training

5 Common Obstacles

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



The TMJ:What You need to Know

Mechanical Stability 

Mechanical Joint Stability

Shape condyle/disc/fossa provides stability when loaded

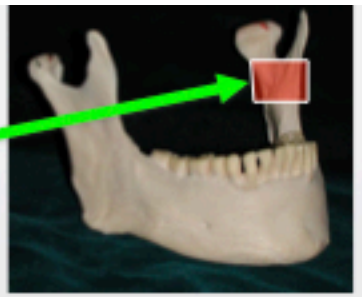
Capsular Ligaments provide stability when not loaded so pieces will be aligned and ready for loading.

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

CR Load Zone

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

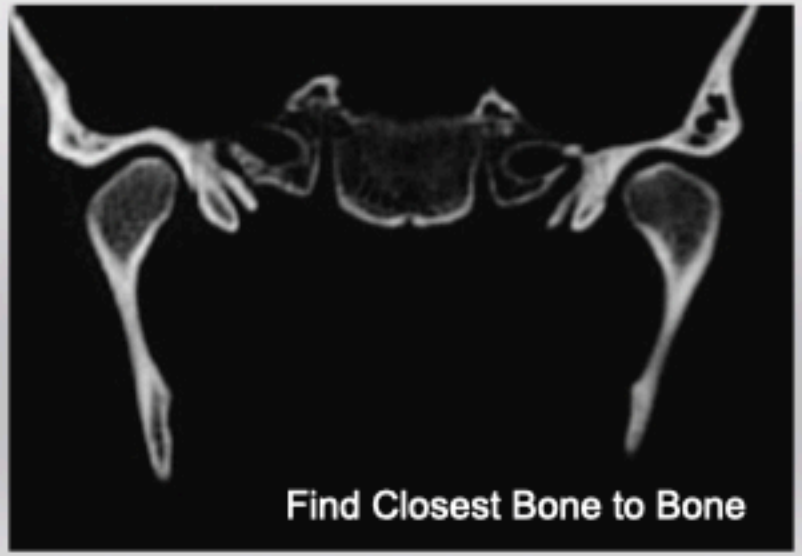
Sore Muscle

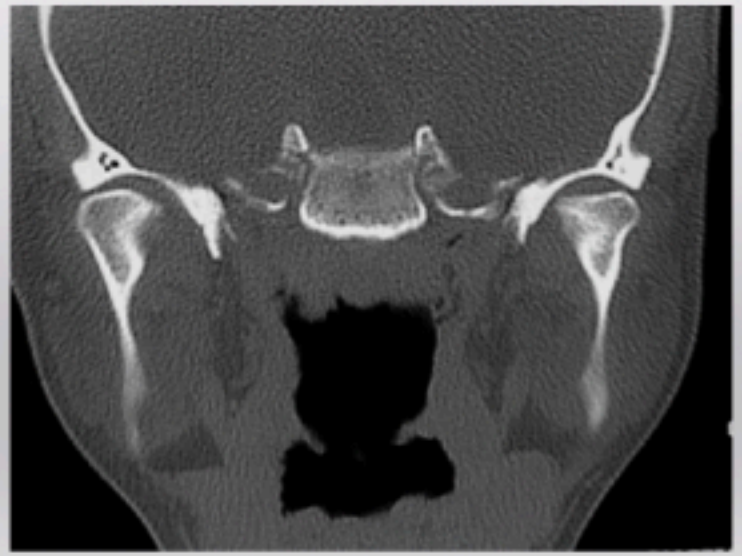


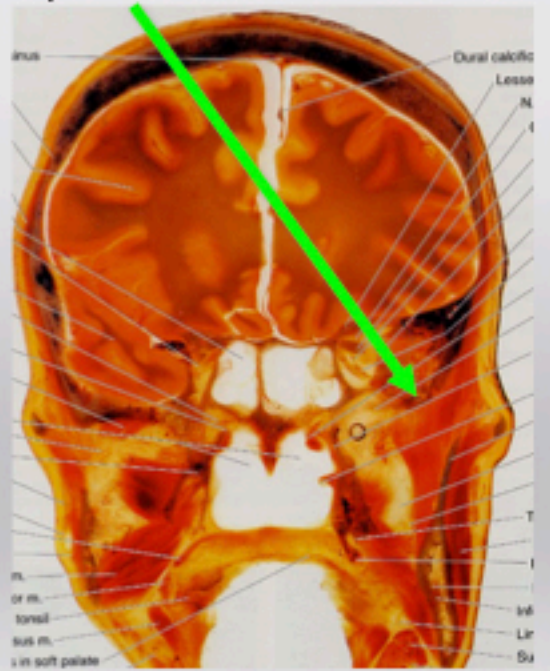
Medial Bracing is ideal

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

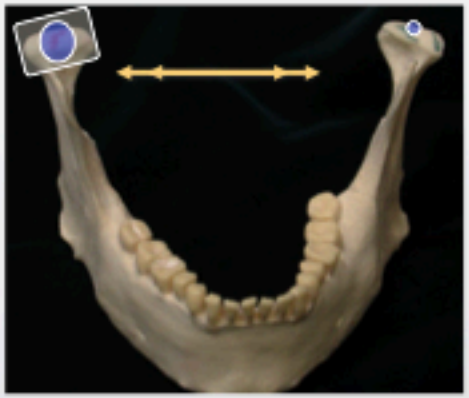
Deep Temporalis runs horizontally
Sphenoid to Inferior Coronoid

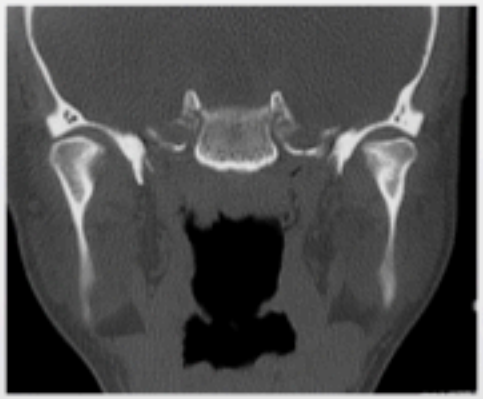






Diagnosis:
Hypersensitive Bite





Non-Linear Joint Subluxation
- There is not a mechanically stable CR load zone.
- The joint deforms when loaded

Clinical Presentation:
- The deep temporalis will be sore.
- Their muscles will not relax with a CR splint.
- They will not like an anterior deprogrammer like the D-PAS.
- Muscles are braced to stabilize the joint, not to protect from occlusal interferences.
- Coronal CT images will show CR load zones that allow side to side movement.
- On JVA you will see "wobble" near the tooth tap.
- They are dependent on their working and nonworking interferences for some stability.
- Do not remove the working and nonworking interferences.

How to Avoid Missing the Diagnosis of Non-Linear Joint Subluxation:
- Clinical History- Changes of microns to the teeth affect patients comfort level
- Identify CR load zone on CBCT
- Anterior deprogrammer test 24/7 for 2 days

Palatal Anterior Stop Orthotic

Lock in Orthotic

Dentists can inadvertently remove a critical bracing tooth contact with a crown prep or occlusal adjustment

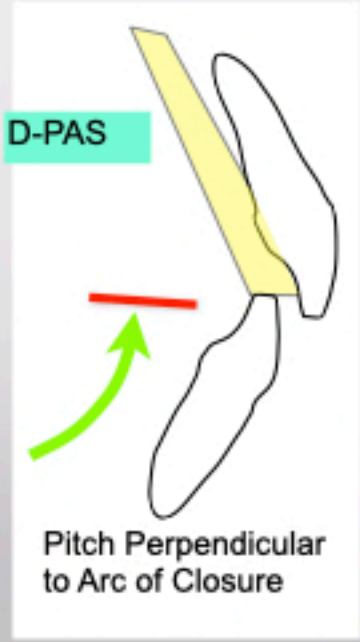
Diagnostic Palatal Anterior Stop

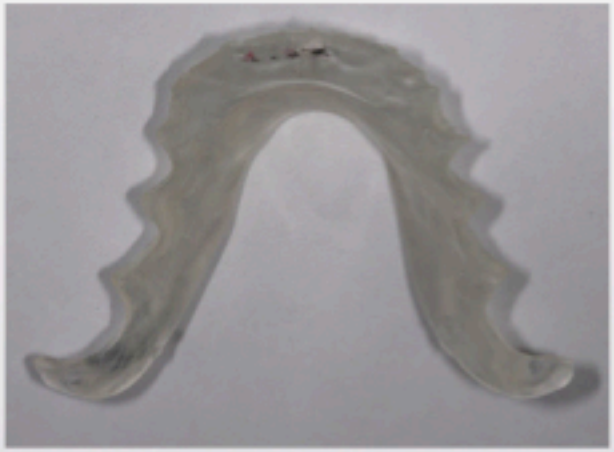
D-PAS Test: Wear 2 weeks for sleep, and occasional daytime

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

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

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





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

APS
ArrowPath Sleep

LIVING TREE DENTAL LAB

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

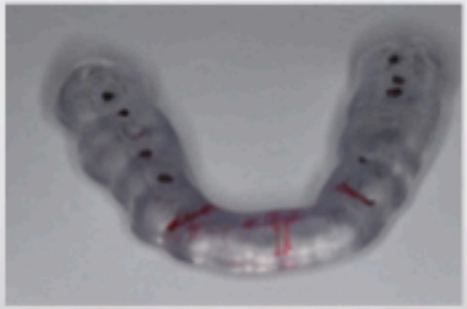
3D Printed Orthotics

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



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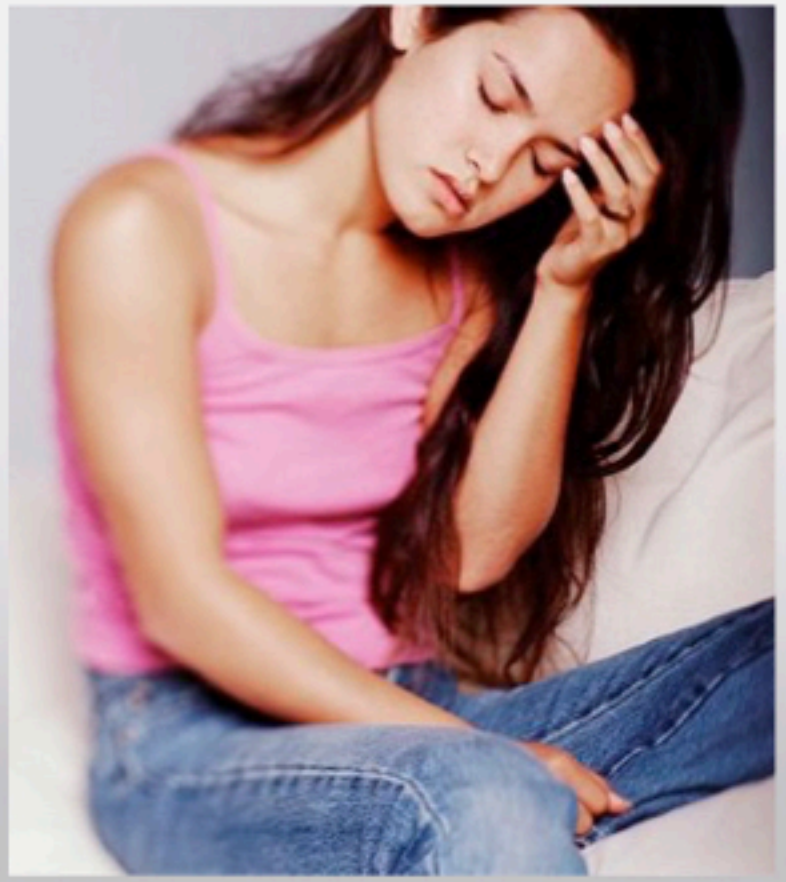
Neck and Postural Instability
Wobbly TM Joint (Subluxation)
Compromised Breathing/Airway
Avascular Necrosis
Referred Pain Muscle Triggerpoints



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

Age 19F
cc: Severe jaw pain since 12y/o, Wiggle jaw to open

Patient Safety
Inc Pulse Ox
Sleep Screening

Brux PAS pm wear, jaw exercises

1 week, significant decrease in pain, much less wiggle to open.

4% RDI = 3/h

Autonomic Arousals 19 /h

PULSE RATE DATA

Autonomic Arousals

Index (#/hr): 19

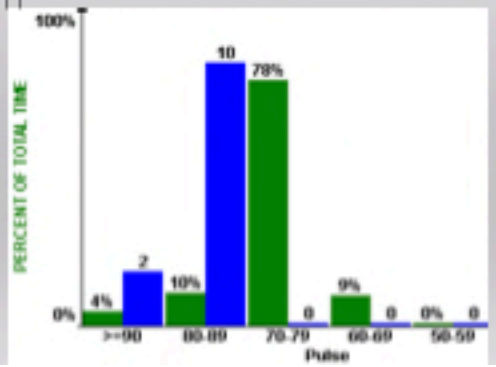
Pulse Rate Range

Mean: 76

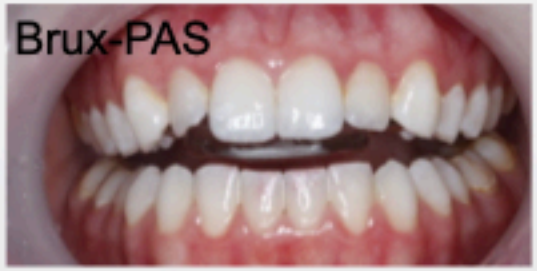
Min: 60

Max: 225

76



Brux-PAS



4% RDI = 1/hr

Autonomic Arousals 9 /h

PULSE RATE DATA

Autonomic Arousals

Index (#/hr): 9

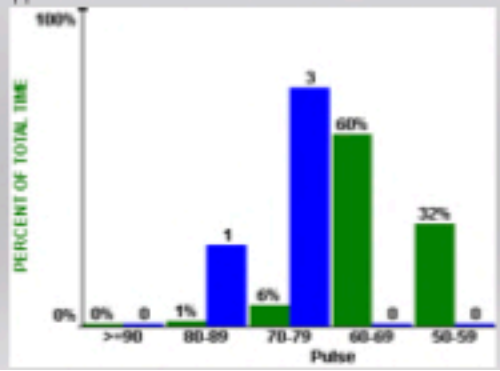
Pulse Rate Range

Mean: 63

Min: 52

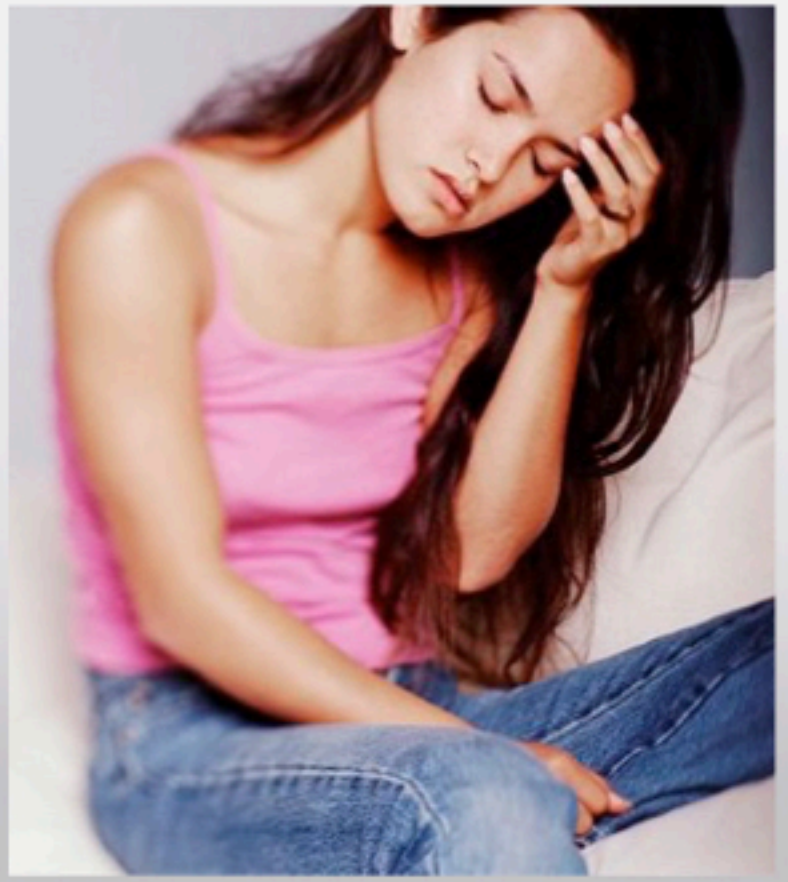
Max: 120

63



5 Common Obstacles

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



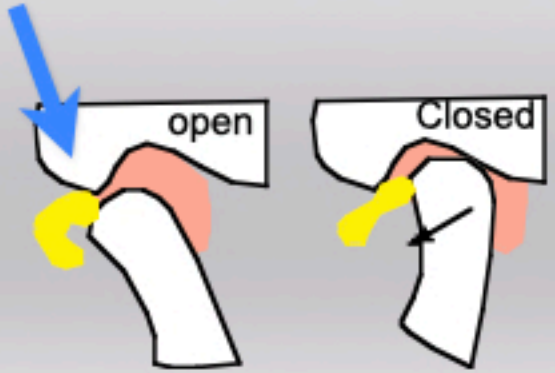
When the clicking stops (4a to 4b):

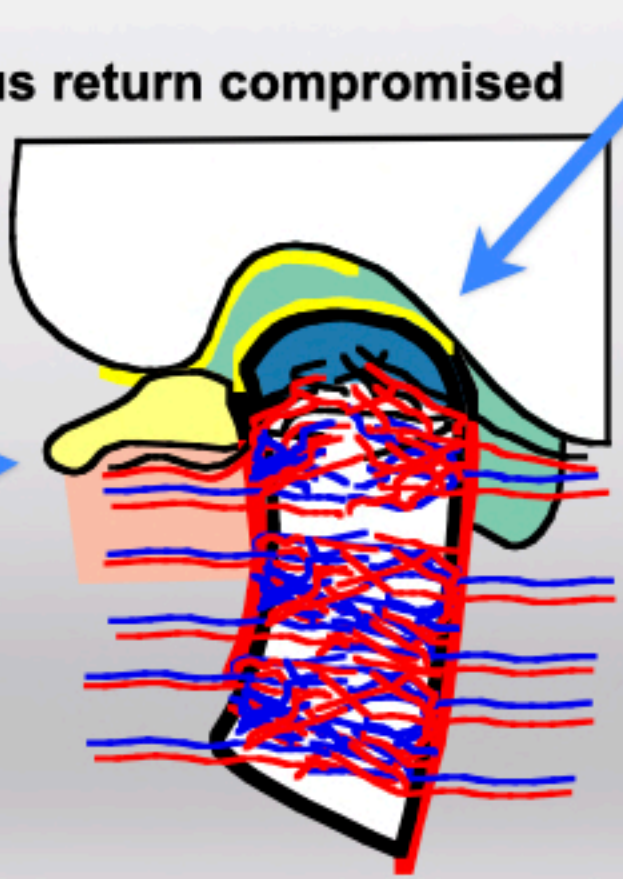
Condyle Distalized

Venous return compromised

Compromised Condylar Perfusion
Blood flow through condyle is decreased

Disc Anterior





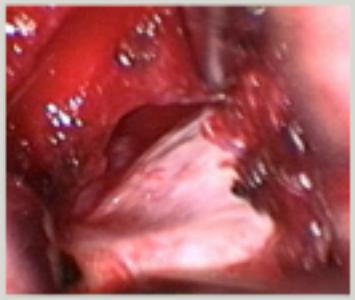
3 Outcomes of Compromised Condylar Perfusion

Bone cells die

Avascular Necrosis

One and Done

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



or

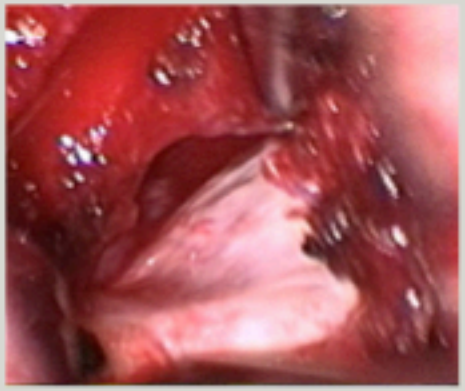
Inflammatory Tissue Bone Resorption

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

Nothing

Compromised but adequate.
99% patients have no problems

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



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

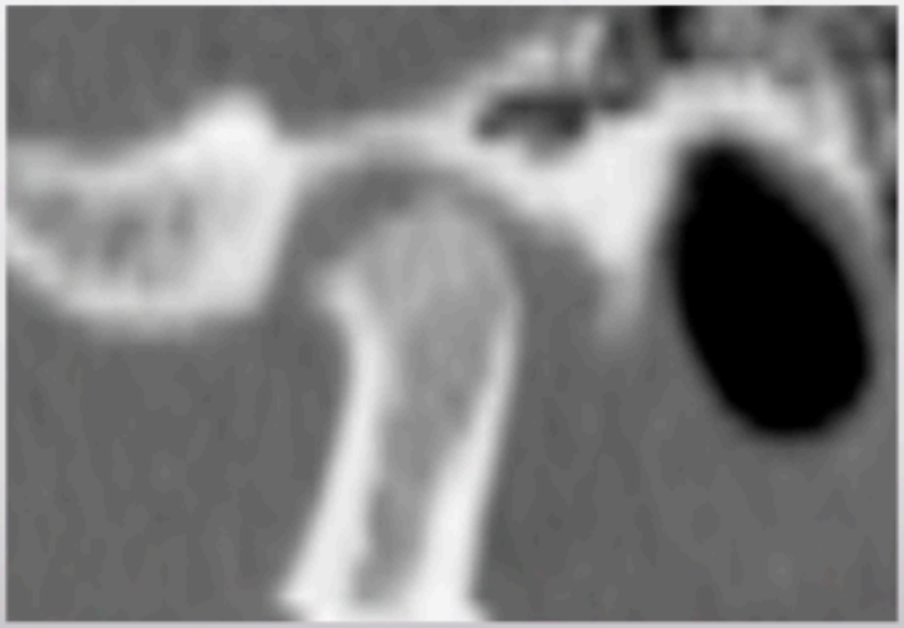
Inflammatory Tissue Bone Resorption

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

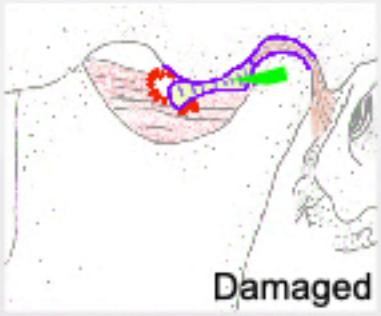
Occlusion will constantly be changing

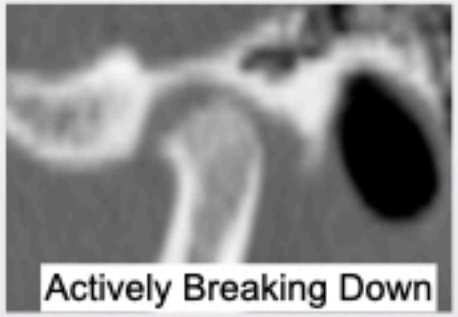


Basic Orthopedics

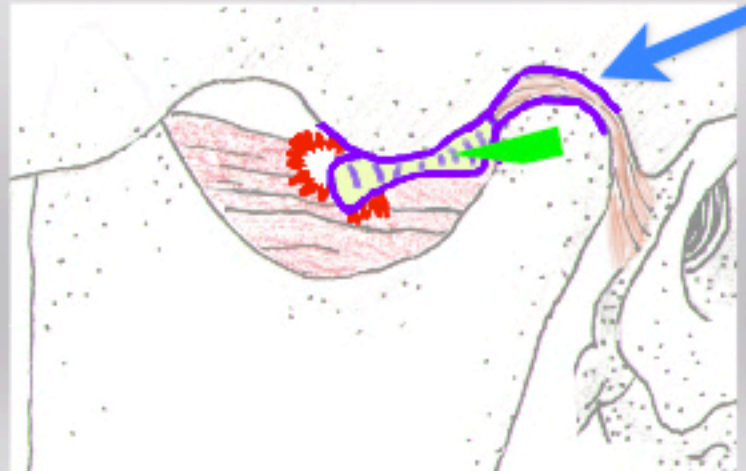
Joints are either
- Healthy or
- Damaged

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





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

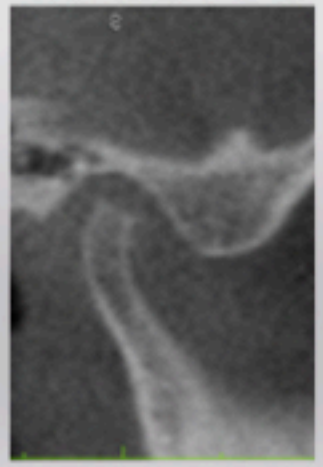
Teeth have moved
- Tongue- used as occlusal cushion
- Tongue used to stabilize neck or TMJ
- Iatrogenic- Orthotics, Retainers

Both have loss of anterior coupling

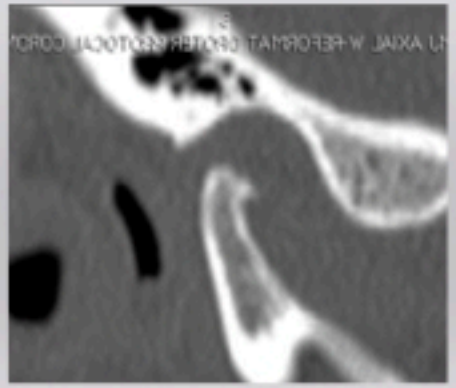
Anterior Openbite with Active TMJ Bone Loss

Use articulator to calculate how much distraction:

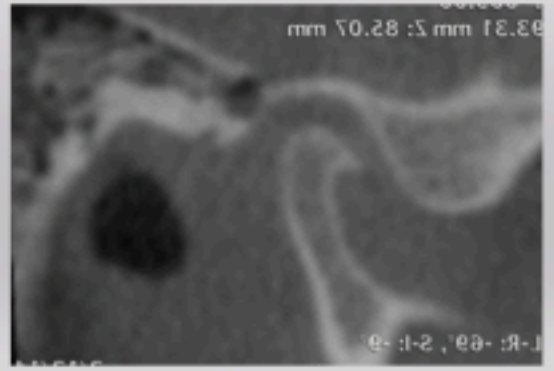
Right condyle down 6.2 mm back 2 mm
Left condyle down 4.5 mm back 2 mm



Condylar Distraction



Ball needs to land in the hole

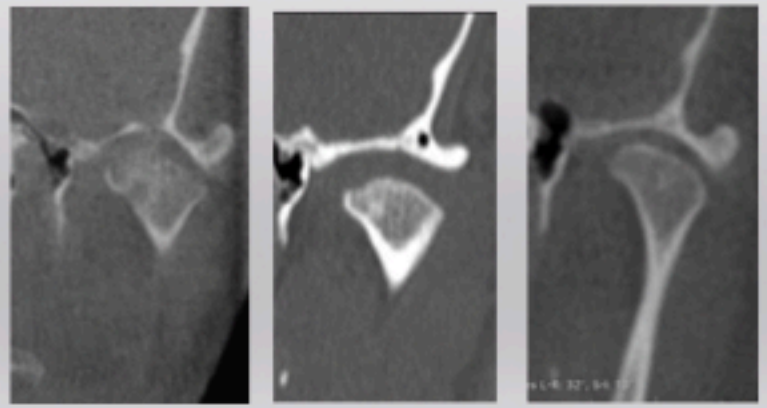


Anterior Openbite with Active TMJ Bone Loss

Non Surgical Therapies

Condylar Distraction

Anti Inflammatory Therapies



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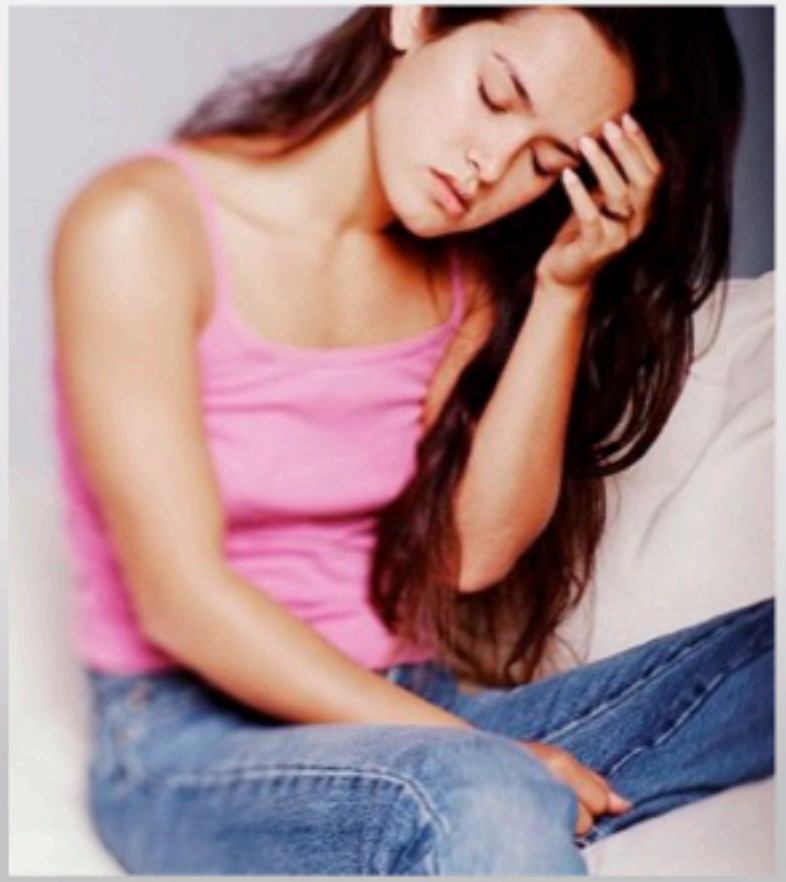
Referred Pain Muscle Triggerpoints

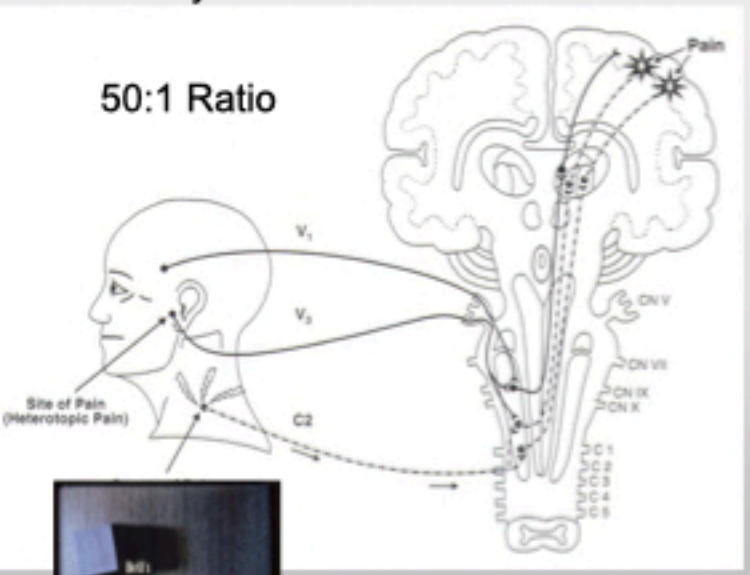


Referred Pain

Convergence

More primary sensory neurons than secondary neurons that travel to brain

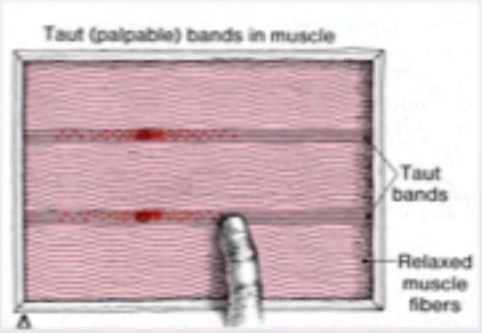
50:1 Ratio

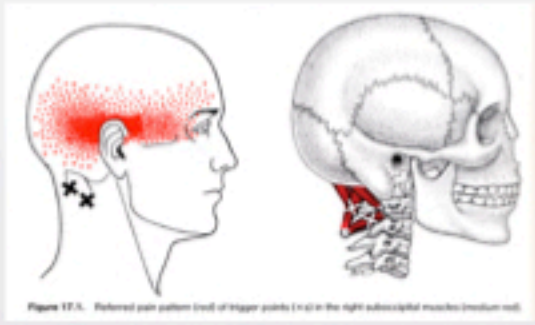


"Bells Orofacial Pain"
Jefery Okeson

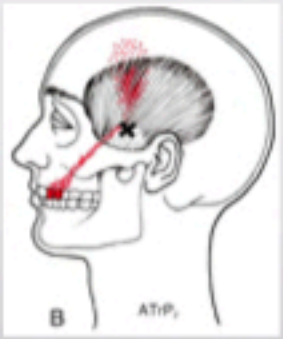
Trigger Points

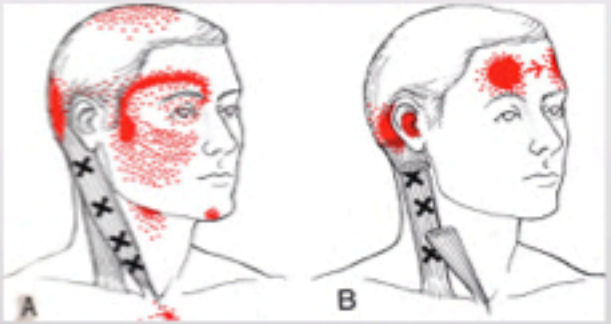
Contracted mass of actin, myosin and histamine

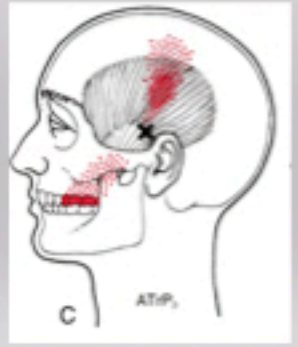


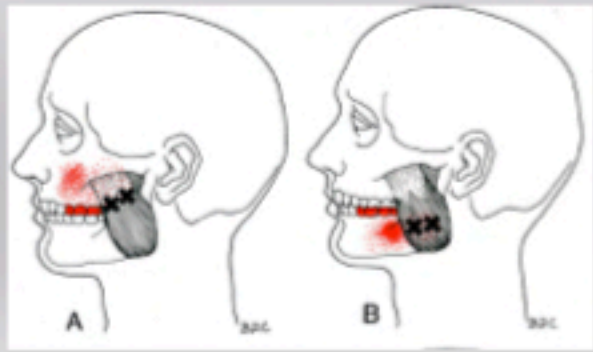


"The Trigger Point Manual"
Janet Travell, MD









TMD 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

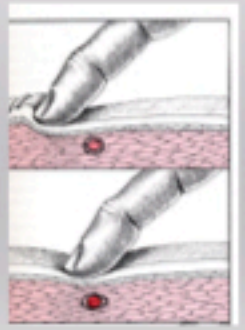
Wet Towel in Microwave
3 Min Hot
3 Min Hot

3 Min Cold

Ice Pack
15 min 3-5x a day

ThermoSafe
U-Tek Cold Pack
-23° C

Triggerpoint
in muscle



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.

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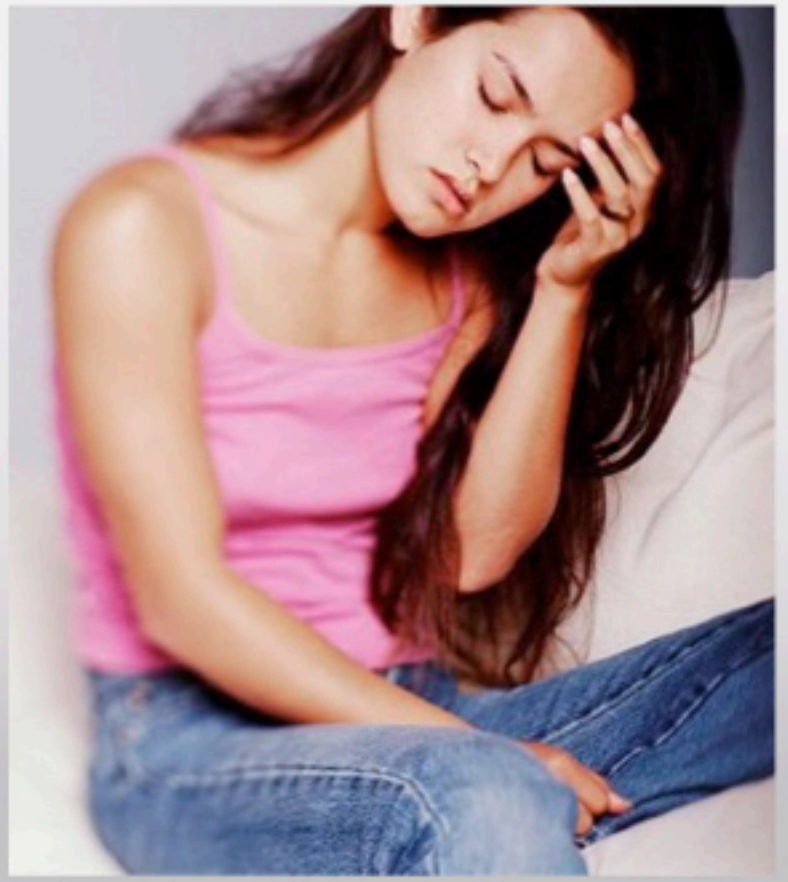
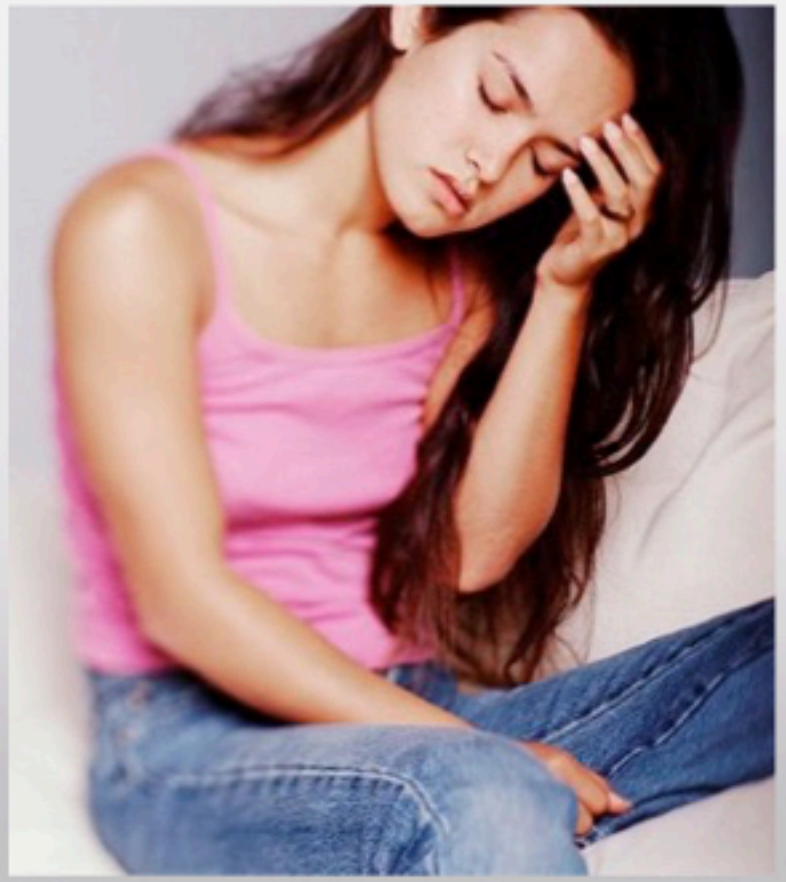


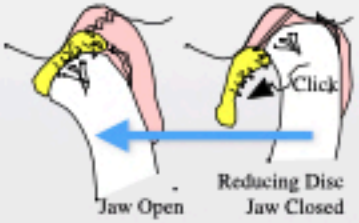
1 TMD that **usually** does not need therapy

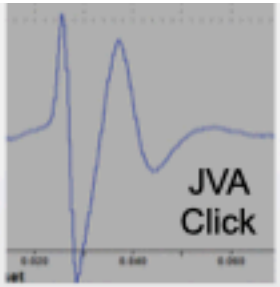
TMJ Clicking



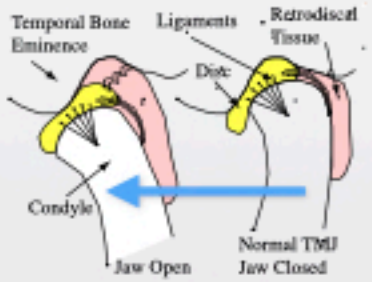
Differential Diagnosis of TMJ Clicking

Disc Reduction





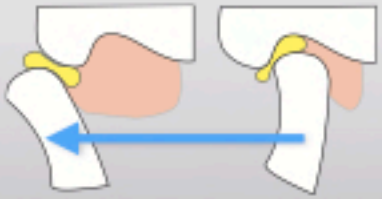
Normal



Adhesive Click

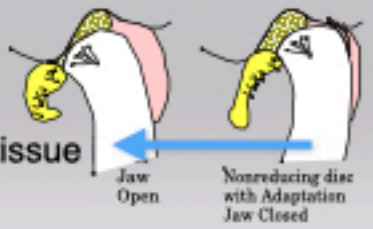
"Sticky Disc" - Disc sticks after prolonged clenching, then releases

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

Basic Orthopedics

Joints are either
- Healthy or
- Damaged

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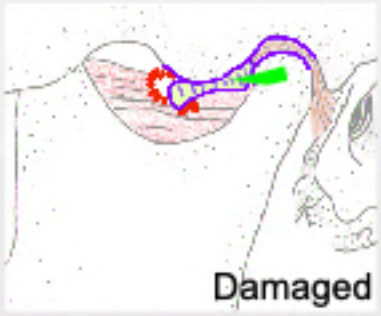
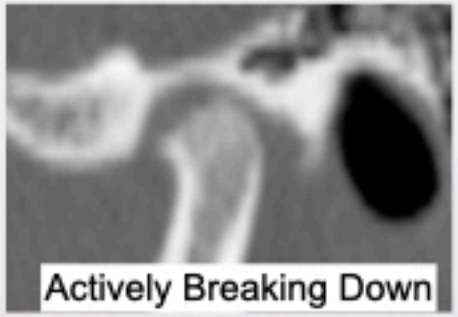
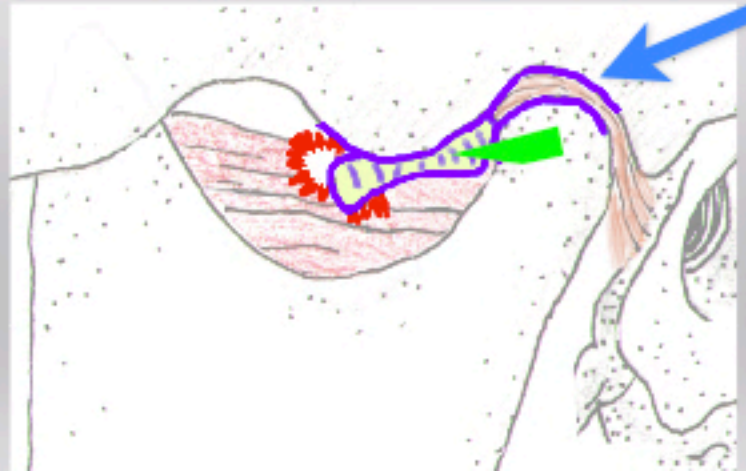
- Adapting
- Adapted
  - Structurally, Mechanically
  - Favorably, Unfavorably





Majority of damaged TMJs adapt favorably



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

Pseudo-disc

Tissue Fibrosis

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

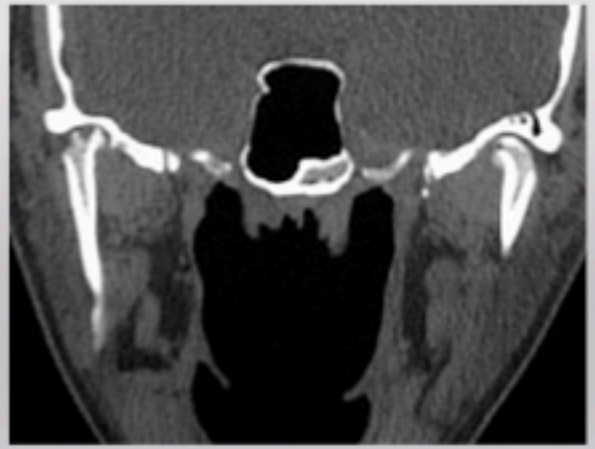
Leeuw, Boering, Stegenga, Bont,
Journal of Craniomandibular Practice, April 1995, vol. 13, No. 2

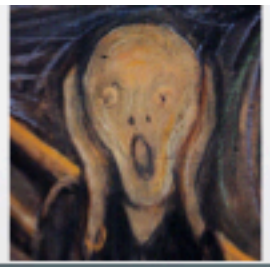
- University Hospital, Netherlands: 134 TMD patients, 30 year follow up
- Patients received good clinical work up and diagnosis 30 years ago, but basically no treatment
  - (Reassurance, PT, exercise, limited occlusal adjust)
- 70% satisfied with results
- 25% still had pain on movement
- 15% not able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

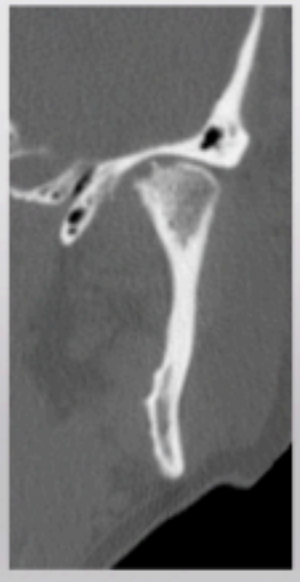
There is no love sincerer than the love of food.

G. B. Shaw





Damaged TMJs



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

Occlusal Muscle Dysfunction

Osteoarthritis

Avascular Necrosis

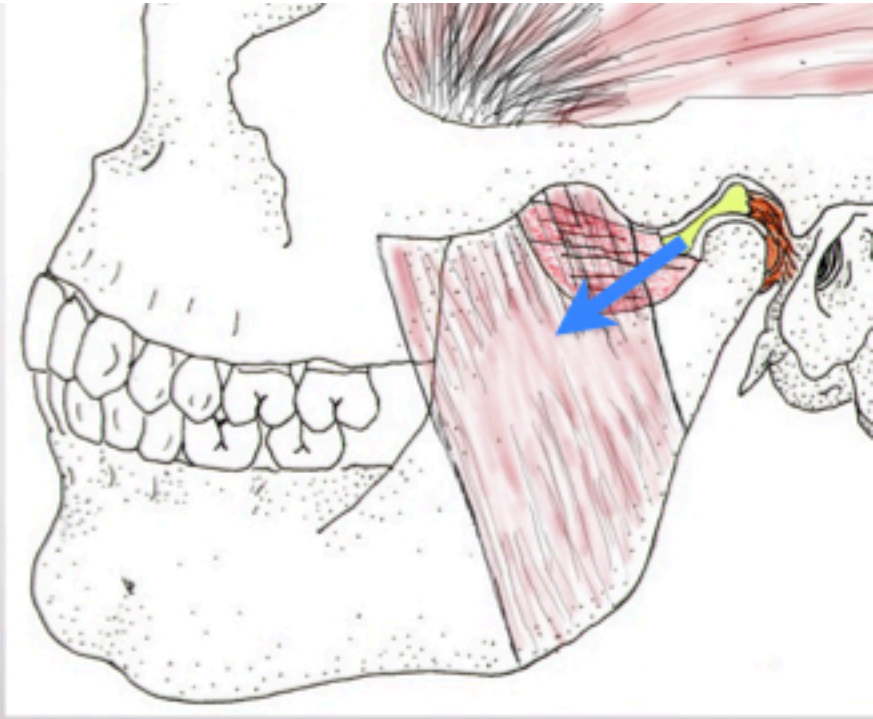
Progressive Condylar Resorption

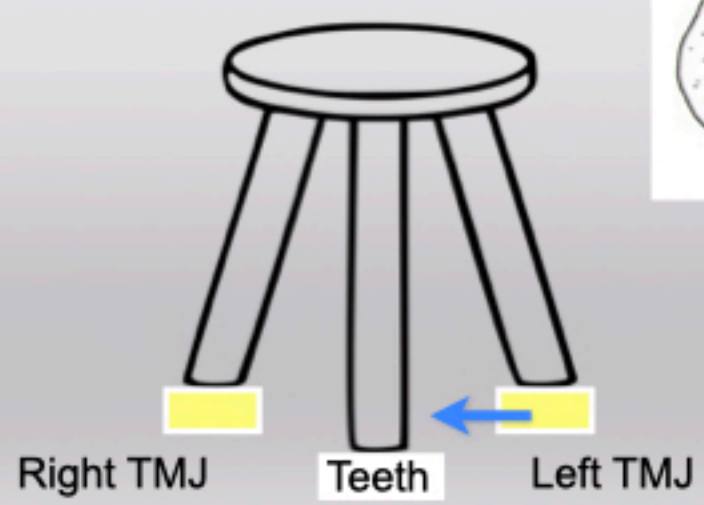
*These are my guesses on %, no research to back up to backup

Normal Joint with Normal Occlusion

All teeth touch evenly with condyles seated in fossa

What happens to the occlusion if the disc is dislocated?





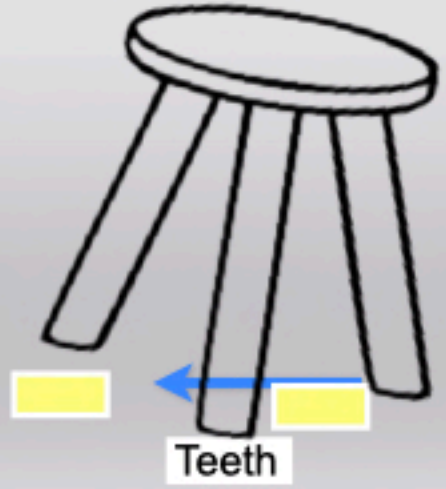
Damaged Joint with Malocclusion

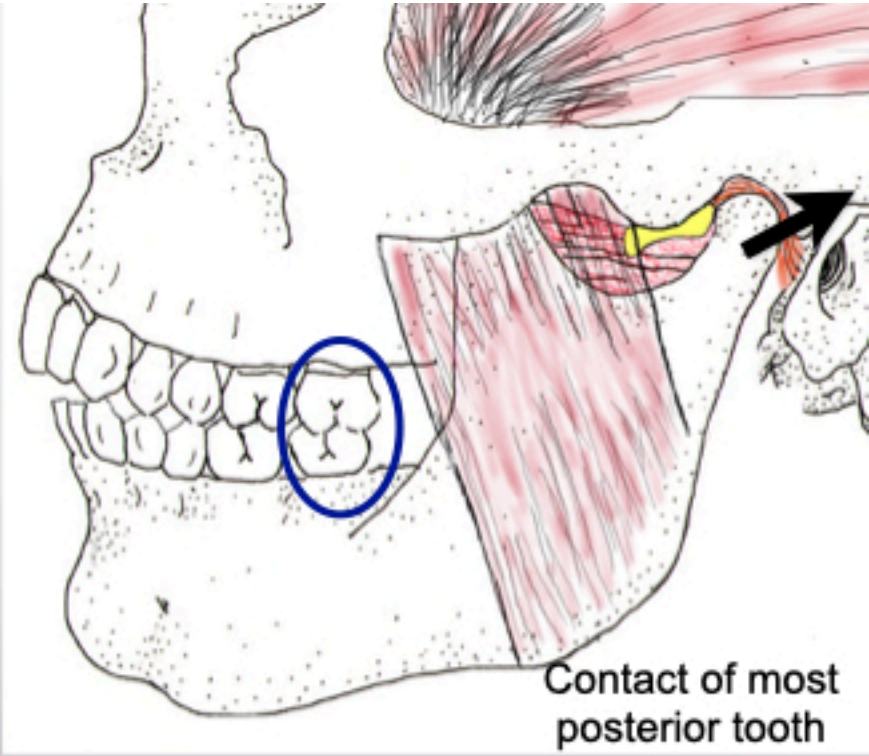
85% damaged joints adapt favorably with respect to the TMJ.

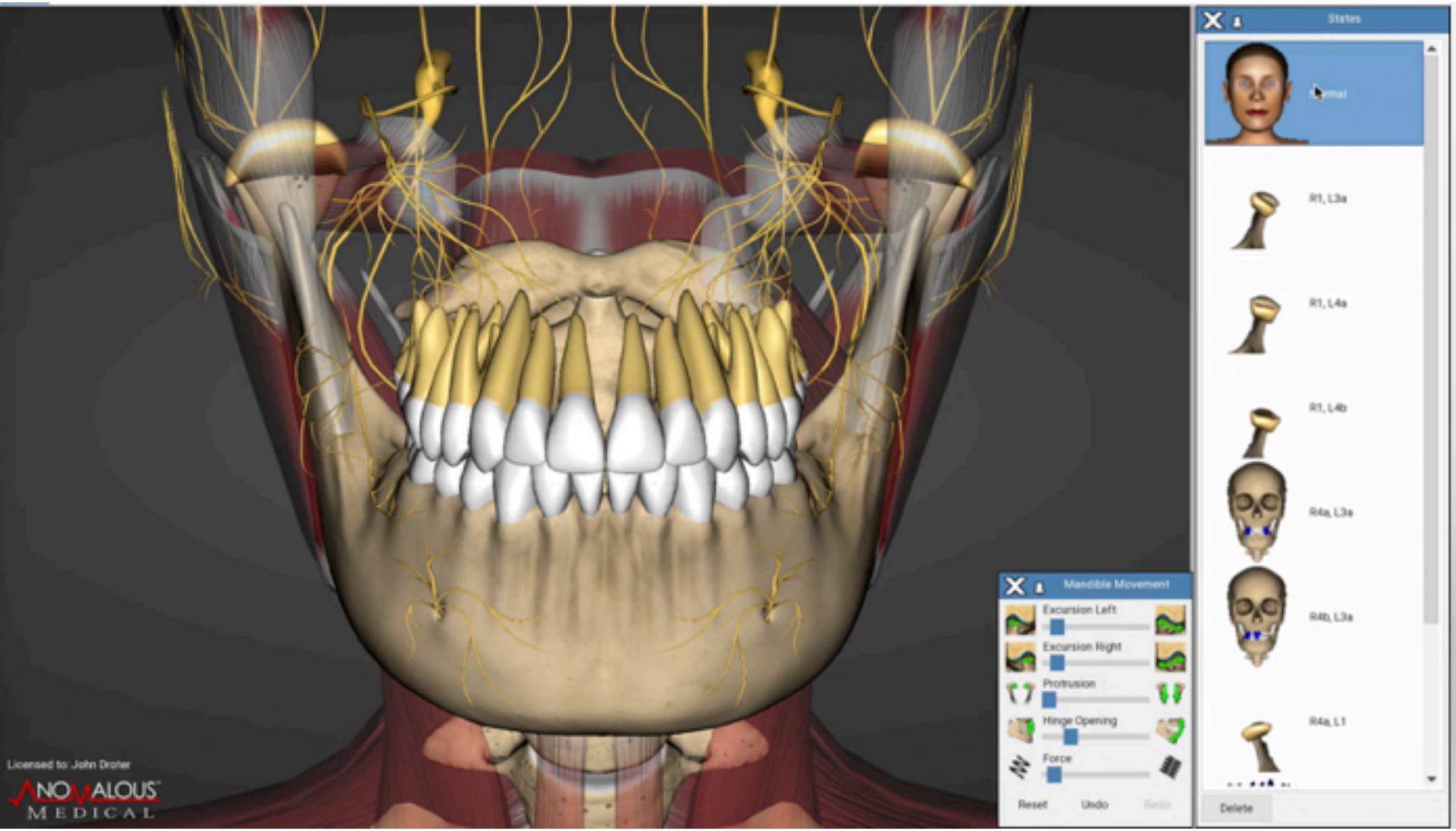
Anteriorly Dislocated Disc, Mandible shifts:
- Inadequate Anterior Guidance, Posterior Disclusion
- Uneven Occlusion,
- CR≠MaxIC
- Occlusal Muscle Disharmony develops.

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.



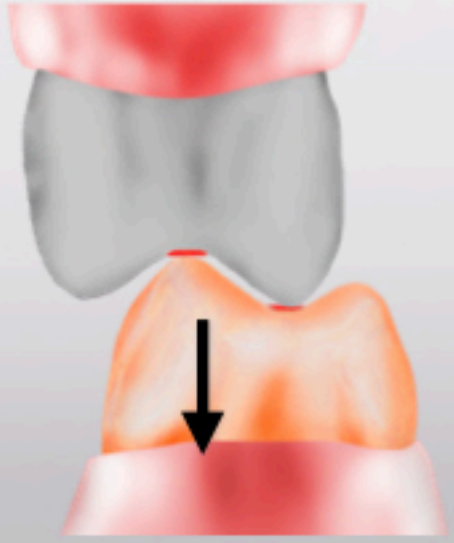




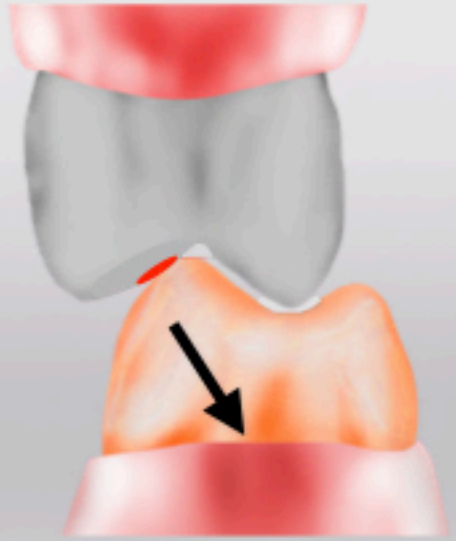
Occlusal Shift

Ideal Occlusion for Comfortable Muscles

Ideal
No sideways forces on back teeth.



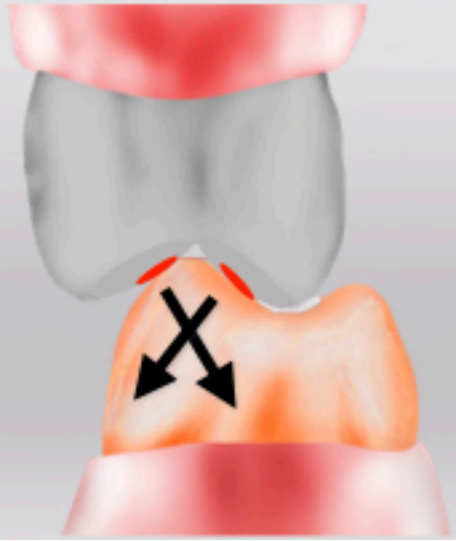
Not Ideal
Tense Muscles
Teeth can fracture



Sideways forces can fracture teeth

Not Ideal
Tense Muscles

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

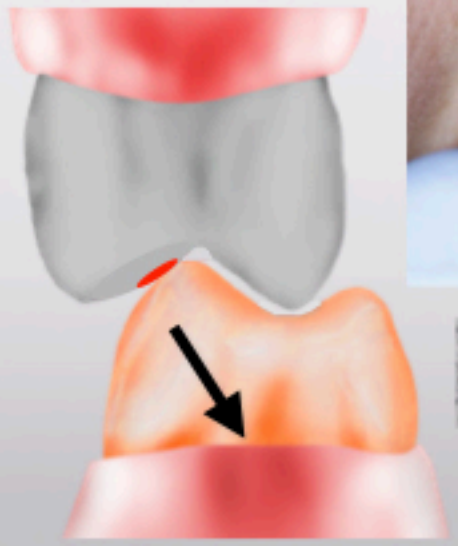


Not Ideal

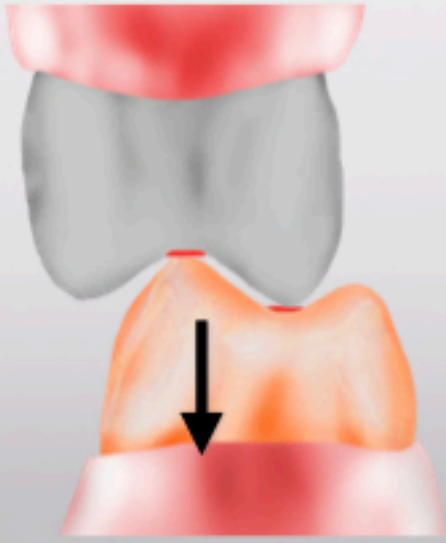
This is now a functionless tooth. Other teeth now have more force.

Occlusal Sculpting

Reshape



Polish

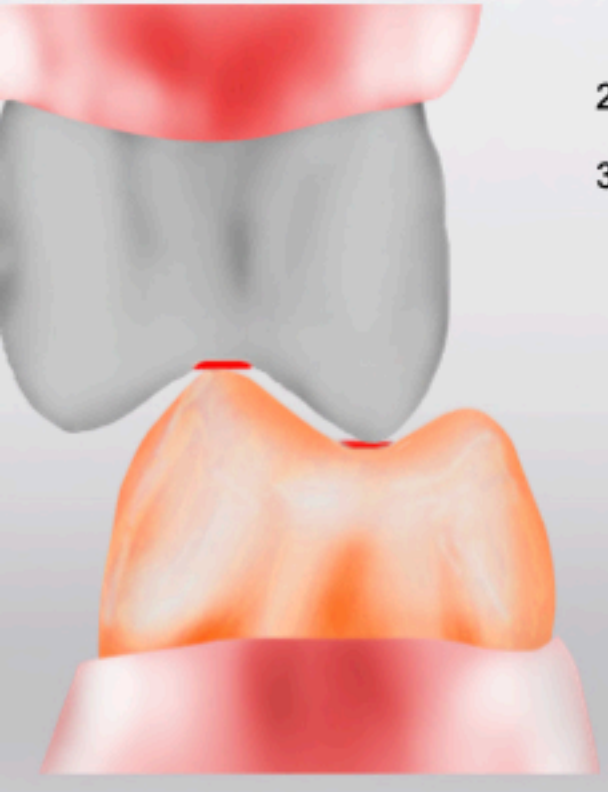


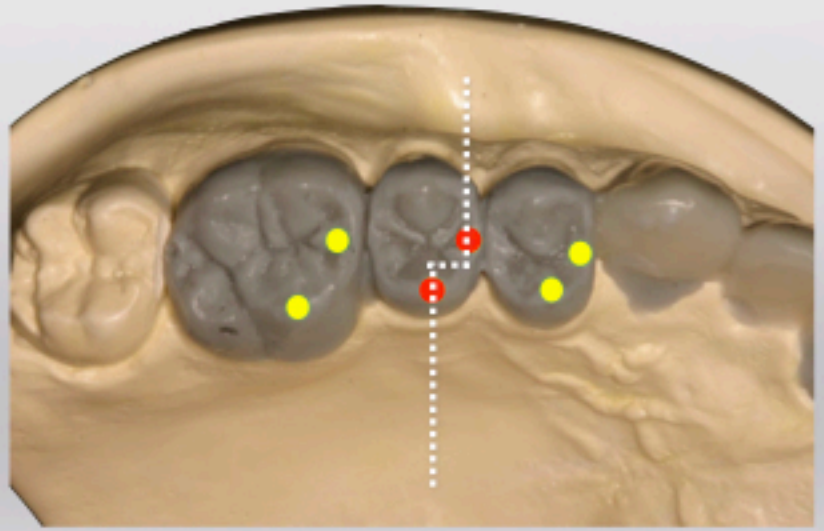
LD Pankey's 3 Rules of Occlusion (Clyde Schuyler)

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 by Dr Jim Kessler

6 Common TMDs

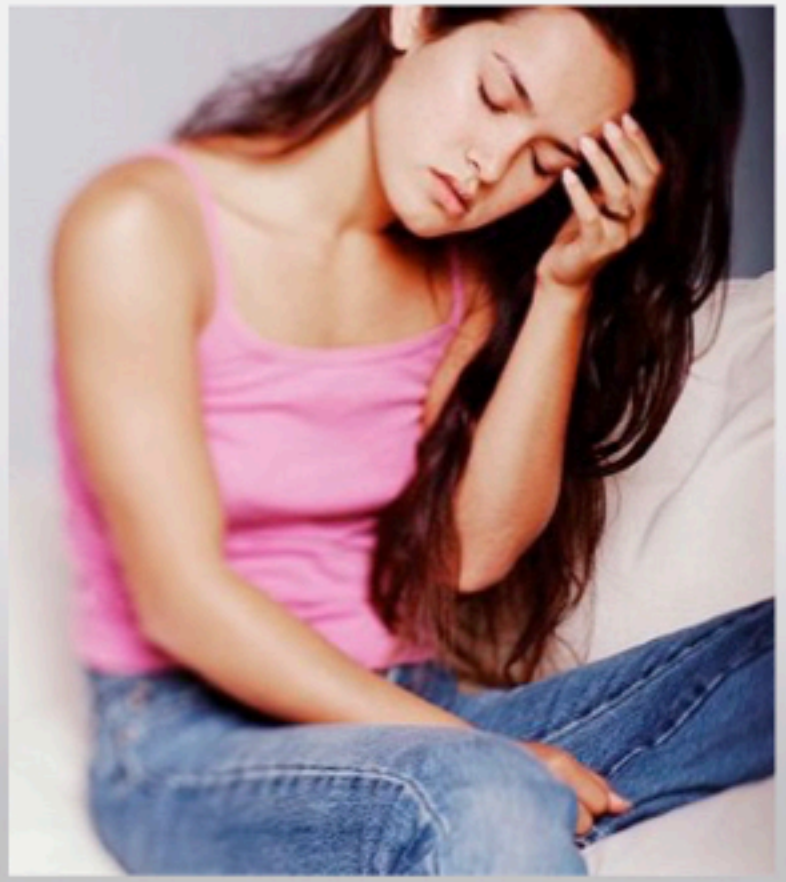
Parafunctional Clenching
Parafunctional Grinding
Occlusal Muscle Dysfunction
Osteoarthritis
Acute Sprain
Acute Closed lock of TMJ disc

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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Facial Pain Diagnosis

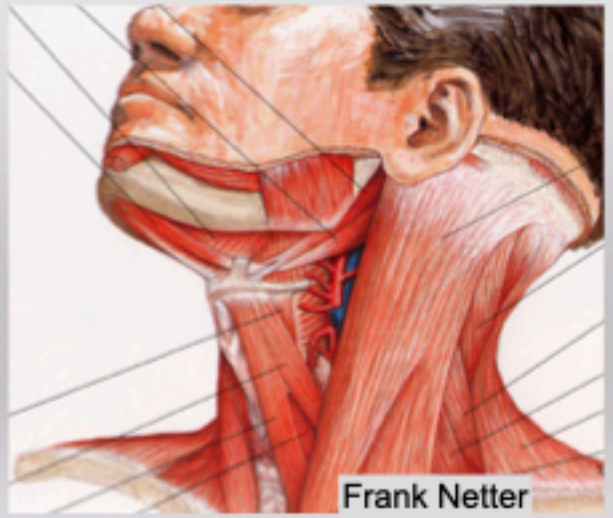
Diagnostic Tools

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

Also palpate:
- TMJ Lateral
- TMJ Posterior

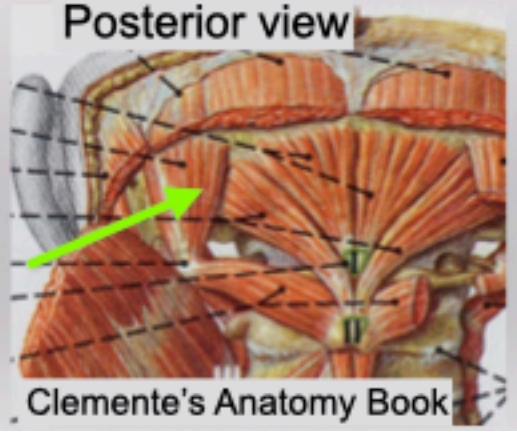
While I palpate many muscles, the ones I find key are:

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



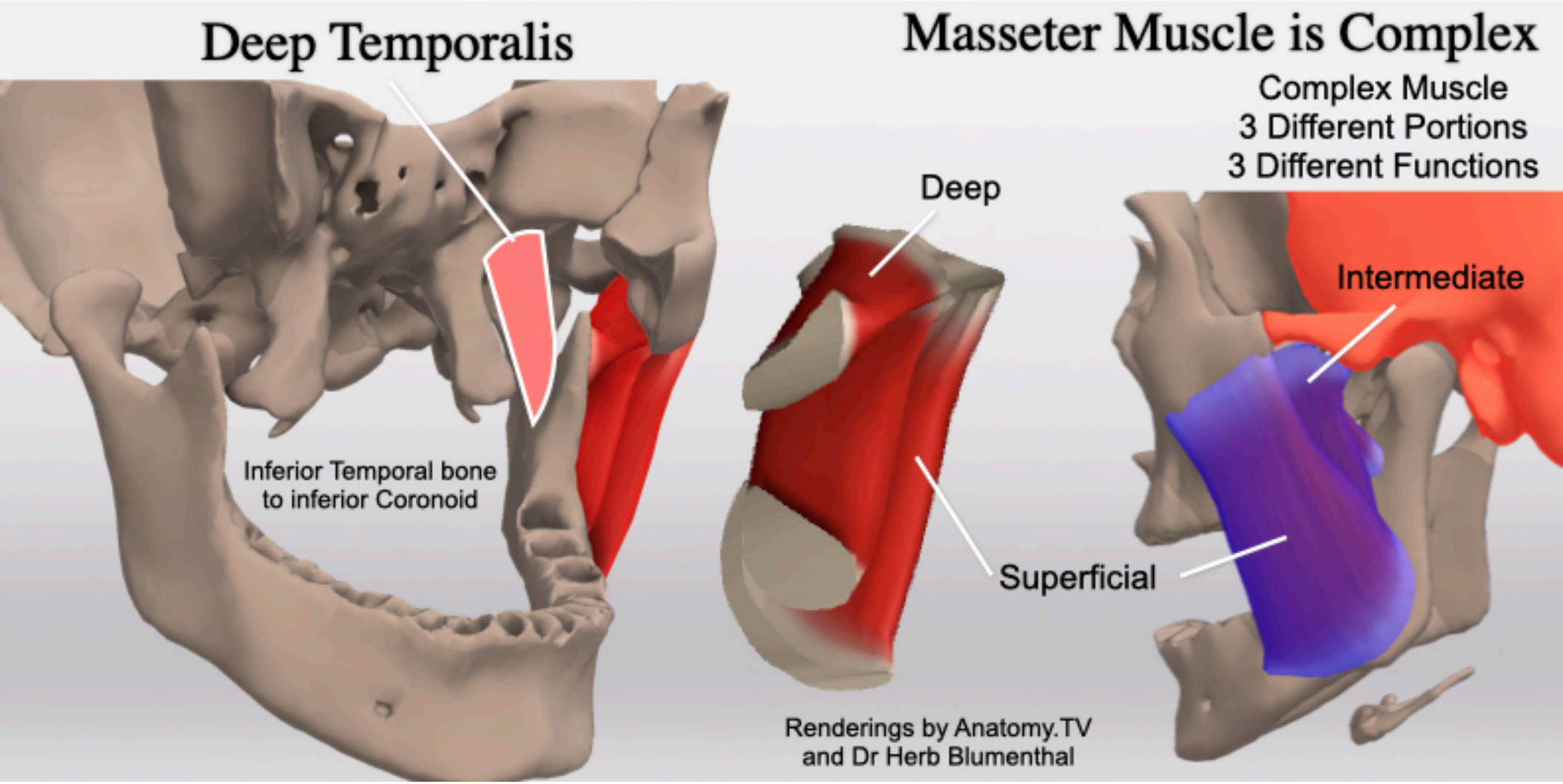
Frank Netter

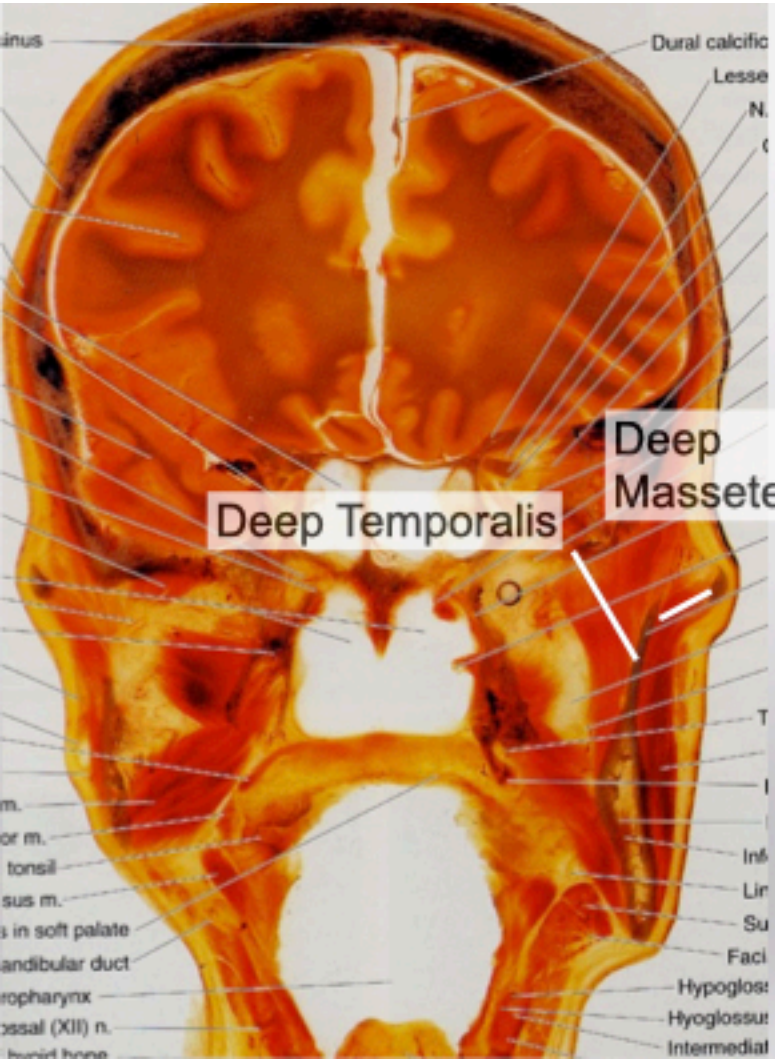
Posterior view

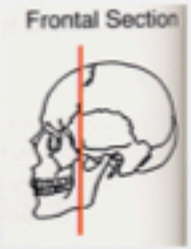


Clemente's Anatomy Book

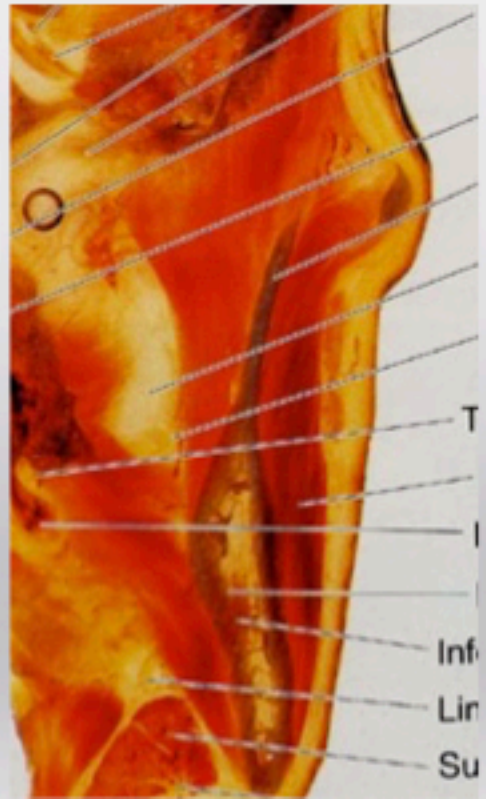
Anatomy TV


Deep Temporalis
Inferior Temporal bone
to inferior Coronoid
Masseter Muscle is Complex
Complex Muscle
3 Different Portions
3 Different Functions
Deep
Superficial
Intermediate
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