

TMD for the GP 2023

John R Droter DDS
Annapolis, Maryland

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John R Droter DDS

www.drdroter.com

John R Droter, DDS

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go to www.drdroter.com

Seminar Download

California 2023

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Upcoming Seminars

- July 20, 2016 D-PAS Hand on- In Office, Annapolis MD
- July 21-23 2016 Droter Hands on- In office, Annapolis MD
Call Kim 301-805-9400
- Pankey TMD Week, Key Biscayne FL
October 23-27, 2016
October 22-26, 2017
Call [LD Pankey Institute](http://LDPankeyInstitute.com) 305.428.5500
- Spear TMD Course 1 with Dr Herb Blumenthal
Aug 11-13, 2016, Scottsdale Arizona
Call [Spear Education](http://SpearEducation.com) (866) 781-0072

Most Popular and Common Downloads

- TMD Supersheet Download
[SuperTMDQx12.11](#)
- Brux supersheet Download



Hello. I am:

**John R Droter DDS
Annapolis, Maryland**

*Annapolis, Maryland
John R Droter DDS*

Milestones



Visiting Faculty Spear Education 2013

Visiting Faculty LD Pankey Institute 2008

Visiting Faculty Orthodontic Program
Washington Hospital Center 2000

On staff AAMC: Orthopedic Rounds
In OR for TMJ Surgery

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

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

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



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 Orthognist
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

Arthrocentesis/Arthroscopy
Arthroscopy/Arthroscopic Debridement
Arthroscopy/Arthroscopic Diskectomy
Arthroscopy/Arthroscopic Disk Repositioning
Arthroscopy/Arthroscopic Disk Resection
Arthroscopy/Arthroscopic Disk Replacement
Arthroscopy/Arthroscopic Disk Resection and Replacement
Arthroscopy/Arthroscopic Disk Resection and Replacement with Prosthesis
Arthroscopy/Arthroscopic Disk Resection and Replacement with Prosthesis and Bone Graft
Arthroscopy/Arthroscopic Disk Resection and Replacement with Prosthesis and Bone Graft and Bone Graft
Arthroscopy/Arthroscopic Disk Resection and Replacement with Prosthesis and Bone Graft and Bone Graft and Bone Graft
Arthroscopy/Arthroscopic Disk Resection and Replacement with Prosthesis and Bone Graft and Bone Graft and Bone Graft and Bone Graft

2. Muscles of the TMJ

Arthrocentesis/Arthroscopy
Arthroscopy/Arthroscopic Debridement
Arthroscopy/Arthroscopic Diskectomy
Arthroscopy/Arthroscopic Disk Repositioning
Arthroscopy/Arthroscopic Disk Resection
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Arthroscopy/Arthroscopic Disk Resection and Replacement with Prosthesis and Bone Graft and Bone Graft and Bone Graft

3. Cranial Alignment/Occlusion

Arthrocentesis/Arthroscopy
Arthroscopy/Arthroscopic Debridement
Arthroscopy/Arthroscopic Diskectomy
Arthroscopy/Arthroscopic Disk Repositioning
Arthroscopy/Arthroscopic Disk Resection
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Arthroscopy/Arthroscopic Disk Resection and Replacement with Prosthesis and Bone Graft and Bone Graft and Bone Graft

4. Cervical Damage

Arthrocentesis/Arthroscopy
Arthroscopy/Arthroscopic Debridement
Arthroscopy/Arthroscopic Diskectomy
Arthroscopy/Arthroscopic Disk Repositioning
Arthroscopy/Arthroscopic Disk Resection
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Arthroscopy/Arthroscopic Disk Resection and Replacement with Prosthesis and Bone Graft and Bone Graft

5. Parafunction

Arthrocentesis/Arthroscopy
Arthroscopy/Arthroscopic Debridement
Arthroscopy/Arthroscopic Diskectomy
Arthroscopy/Arthroscopic Disk Repositioning
Arthroscopy/Arthroscopic Disk Resection
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Arthroscopy/Arthroscopic Disk Resection and Replacement with Prosthesis and Bone Graft
Arthroscopy/Arthroscopic Disk Resection and Replacement with Prosthesis and Bone Graft and Bone Graft

6. Whole Body / Systemic

Arthrocentesis/Arthroscopy
Arthroscopy/Arthroscopic Debridement
Arthroscopy/Arthroscopic Diskectomy
Arthroscopy/Arthroscopic Disk Repositioning
Arthroscopy/Arthroscopic Disk Resection
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Arthroscopy/Arthroscopic Disk Resection and Replacement with Prosthesis and Bone Graft and Bone Graft

7. Other

Arthrocentesis/Arthroscopy
Arthroscopy/Arthroscopic Debridement
Arthroscopy/Arthroscopic Diskectomy
Arthroscopy/Arthroscopic Disk Repositioning
Arthroscopy/Arthroscopic Disk Resection
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Arthroscopy/Arthroscopic Disk Resection and Replacement with Prosthesis and Bone Graft and Bone Graft

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, Dynaspint
Refer to Physical Therapy: Rooted/mobilization
Refer to Physical Therapy: Various Muscle Therapies
Refer to Chiropractic: Atlas Orthogonal
Refer to Osteopathic MD: Body alignment
Breathe, Walk, Exercise

Medicinal

Anti-inflammatory:
NSAIDs,
Dicycliclow dose
CBSD 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 Botex: Masseter injections
Refer Botex: Lateral Pterygoid injections
Feed

Occlusal Orthopedic

Lingual Light Wire
Lower soft sectional orthotic
Condylar distraction
Sectional orthodontics
Expansion orthodontics/ orthodontics
Restorative Dentistry
Occlusal Adjustment with OTR, TestScan

Tongue Parafunction

Refer for Cervical Alignment/ Stabilization
Myofascial
Upper Lingual light wire
Clear Brux Checker
Frictionary
Myofunctional therapy

Dental Orthotics

In Office Trial/ Anterior Stop
Diagnostic: Paternal Anterior Stop
Brux Checker
Lower full coverage CR
Bi-Arch Posterior Deprogrammer
Upper full coverage hard CR guard
Temporary home use anterior stop
Myofascial

Aqualizer
Lower Soft Sectional
Lower posterior deprogrammer
Lower TMI Rehab flat plane
Lower postured indexed
Lower CR Indexed
Mandibular Advancement Device
Lateral Bracing Device

Sleep/ Fatigue

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

Surgical

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

Specific Therapy

Lingual Light Wire- Crozat Arch Expansion

Age 29

Start



7 months LLW

Age 30



Anterior Openbite Non Surgical Treatment: Moving the Maxilla



Anterior Openbite with Active Osteolysis due to Inflammatory Tissue Bone Resorption

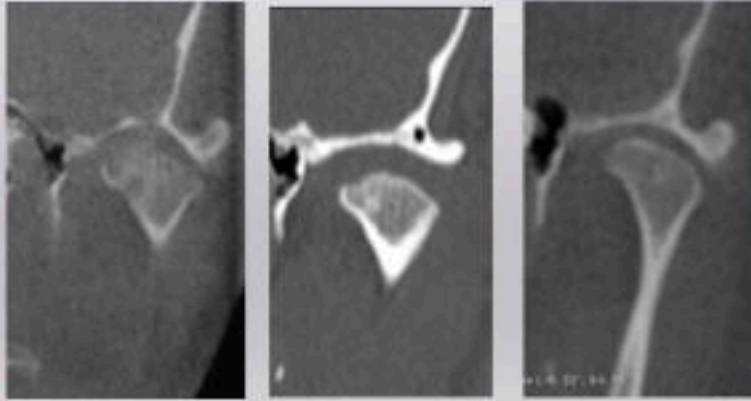
Non Surgical Therapies



Condylar Distraction



Anti Inflammatory Therapies



Restorative Dentistry

Pathological Occlusion

??Airway Related Bruxing?



Restore Function

Composite Trial Occlusion

AHI + 26 CPAP



Anterior guidance
or group function?



Disclosures:

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

Atomic Skis- Sponsored.
I got stuff.

LD Pankey Institute TMD Course
Honorarium

Spear Education TMD Course
Honorarium

Droter Seminars
My own Hands on TMD Courses

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





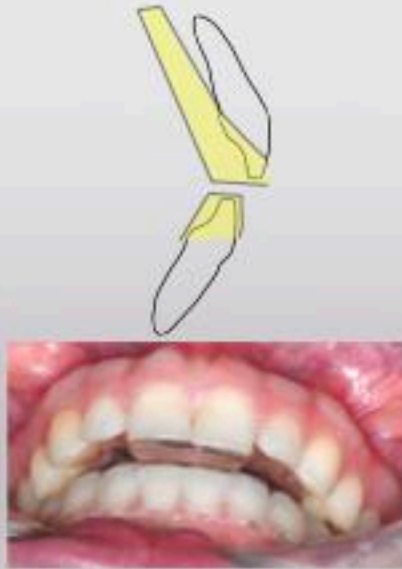
Nate Brock, CDT
(865) 509-4509
connect@livingtreelab.com

3D Printed Orthotics

D-PAS
Diagnostic-
Palatal Anterior Stop



Brux-PAS
with lower Essix



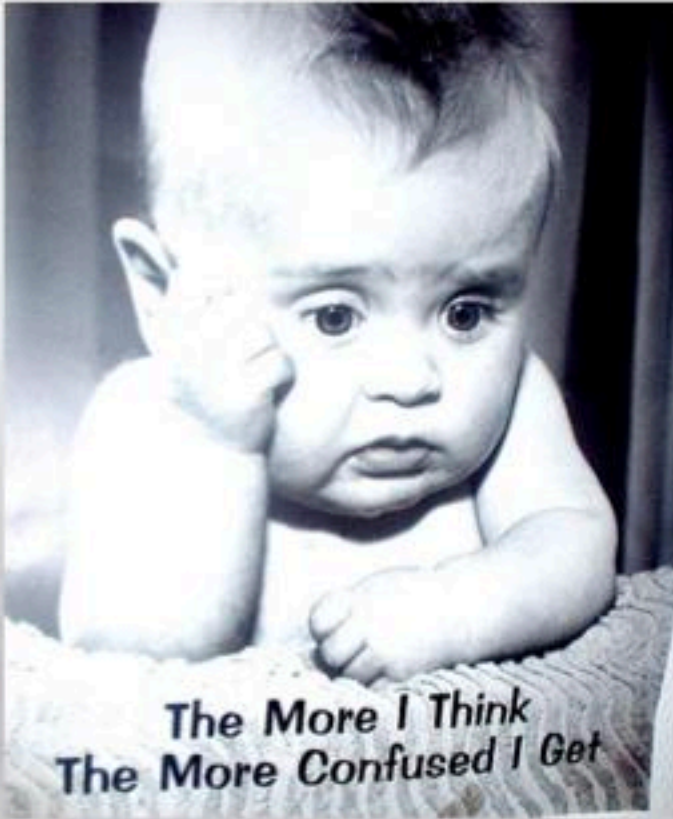
Hard Lower Posterior Stop
with upper essix



Hard Lower Full Coverage
Centric Relation Orthotic



TMJ/TMD Confusion



Dogmatic
Arguments



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
Osteoarthritis- Inactive
Osteochondritis Dissecans TMJ
Osteolysis Mandibular Condyle, Active
Perforation Mandibular, TMJ
Perforation Pseudodic, 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
Idiopathic Orthotic Damage
Malocclusion Anterior Open Bite
Malocclusion Centric occlusion MesioC 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
Cervicocranial 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 Deformity Standing
Postural Deformity Walking
Postural Forward Head Position
Upper Airway Resistance, UARS

7. Other

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

1. TMD: TMJ Damage and Diseases

Adhesions and ankylosis of temporomandibular joint
Avascular Necrosis Mandibular Condyle
Cartilage Fibrillation, Mandibular Condyle, Fossa
Closed Lock, Jaw Cartilage, Acute
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Dislocation jaw cartilage without reduction, favorable adaptation, TMJ
Effusion, TMJ
Fracture of subcondylar process of mandible
Gout, TMJ
Growth Disturbance Prepuberty due to TMJ damage
Hemarthrosis TMJ, Traumatic
Hyperplasia Mandibular Condyle,
Hypoplasia Mandibular Condyle
Hypoxia Reperfusion Injury, TMJ Cartilage Damage
Hypoxic Progressive Condylar Resorption

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Malignant neoplasm of bones of skull and face
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Osteolysis Mandibular Condyle, Active
Perforation Meniscus, TMJ
Perforation Pseudodisc, TMJ
Psoriatic Arthritis TMJ
Rheumatoid Arthritis Sero Negative TMJ
Rheumatoid Arthritis TMJ
Sprain Discal Ligament TMJ, acute with joint edema
Subluxation on Loading, TMJ
Subluxation on Movement, TMJ
Synovial Cyst (Ganglion Cyst)
Synovial Hyperplasia
Synovitis

TMD Therapies: (70 therapies)

Physical

Ice
Hot Cold Hot
Cold Laser
TENS in office
TENS home use
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Upper Lingual light wire
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Myofunctional therapy

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Temporary home use anterior stop
Diagnostic Palatal Anterior Stop
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Upper full coverage hard CR
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Condylar Distraction
Lingual Light Wire
Lower Soft Sectional

Athletic Mouthguard
Anterior Repositioning
Occlusal Adjust Assist
Aqualizer
Myobrace

Sleep/ Fatigue

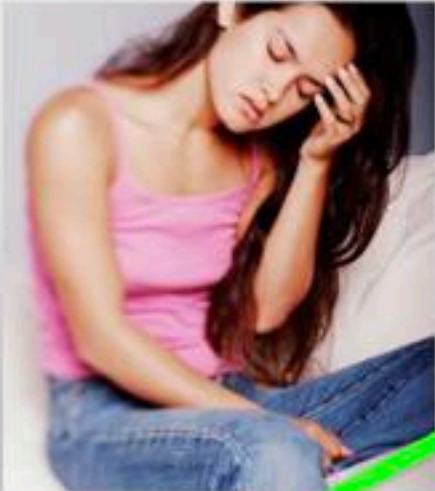
Mouth taping
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Mandibular Advancement Device
CPAP

Surgical

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

Diagnosis Treatment Flow Chart

From a patient perspective they want to go from symptoms to no symptoms



Symptoms

History

Signs

Doctor Exam

Differential Diagnosis

Diagnostic Tests

Specific Working Diagnosis

Treatment

No Signs

No Symptoms
Final Dx

Doctor Re-Exam

If not resolved

Symptom Dx

Tooth Pain
Arthralgia

Specific Dx

Irreversible Pulpitis
Osteoarthritis

vs
vs

Diagnosis Treatment Flow Chart

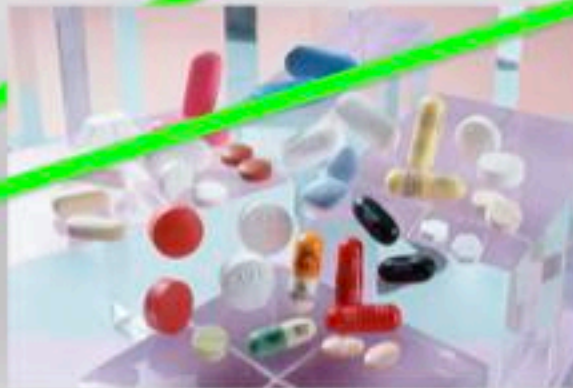
From a patient perspective they want to go from symptoms to no symptoms

No Symptoms

Less Symptoms



Symptoms

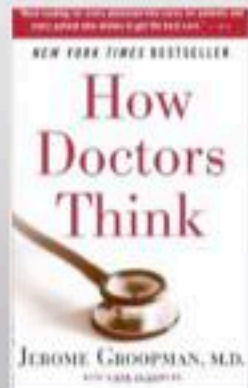


If you skip the exam, diagnostic tests, and diagnosis, you can give a therapy directed at symptoms. If you dull the symptoms the patient will perceive a benefit.

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

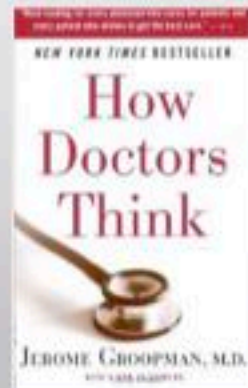
Inflamed Tissue secondary to
popcorn husk

Aphthous Ulcer

Periodontal ligament inflammation
secondary to Occlusal Trauma

Pulpitis secondary to Occlusal Trauma

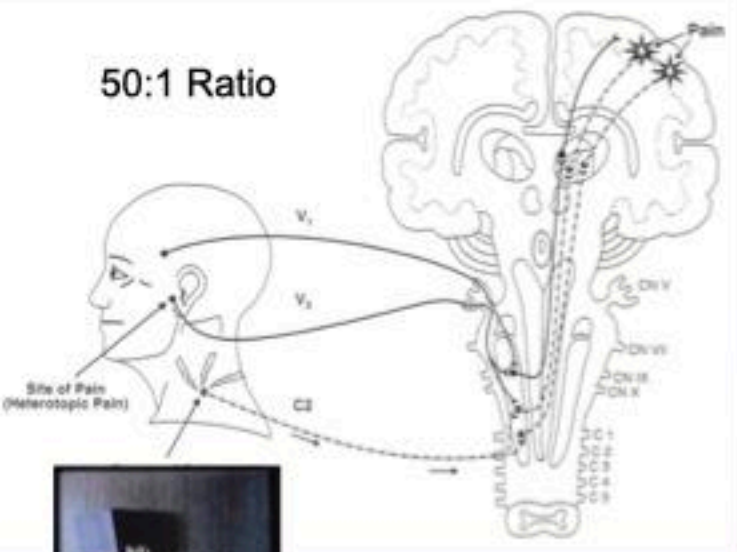
Other



Referred Pain Convergence

More primary sensory neurons than secondary neurons that travel to brain

50:1 Ratio



"Bell's Orofacial Pain"
Jeffery Okeson

Trigger Points

Contracted mass of actin, myosin and histamine

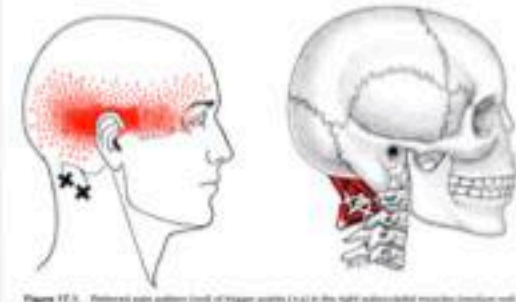
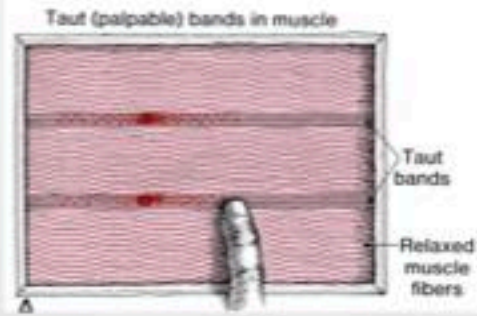
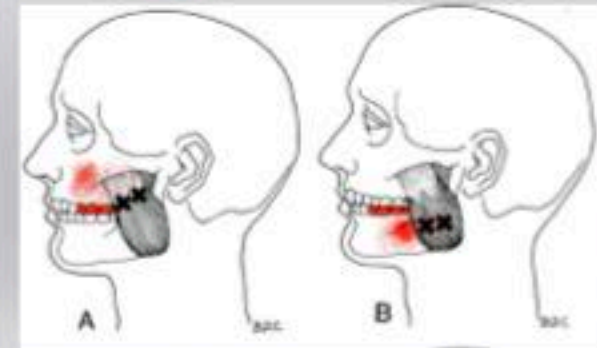
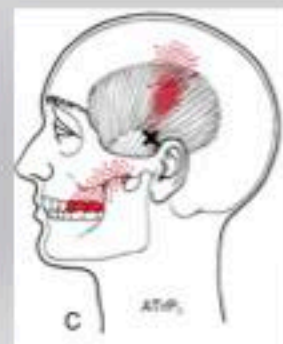
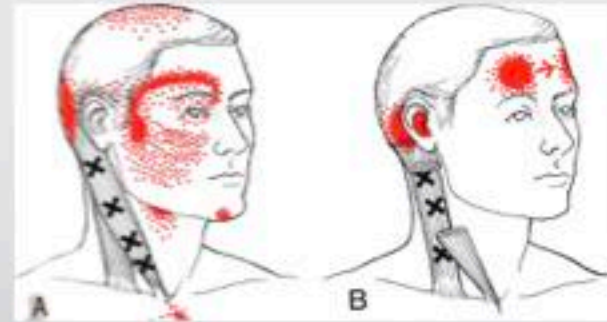


Figure 17.1. Referred pain pattern (red) of trigger points (x) in the right suboccipital muscles (American text)

"The Trigger Point Manual"
Janet Travell, MD



Differential Diagnosis

Diagnostic Boxes: Pattern Recognition

“My Tooth Hurts”

Reversible Pulpitis secondary to caries

Irreversible Pulpitis secondary to caries

Pulpitis secondary to split tooth

Referred Pain from Muscle
Trigger Point

Periodontal Infection

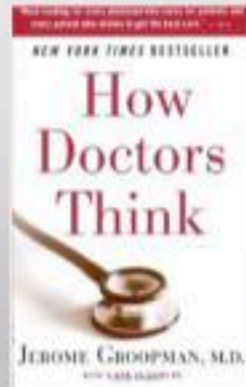
Inflamed Tissue secondary to
popcorn husk

Aphthous Ulcer

Periodontal ligament inflammation
secondary to Occlusal Trauma

Pulpitis secondary to Occlusal Trauma

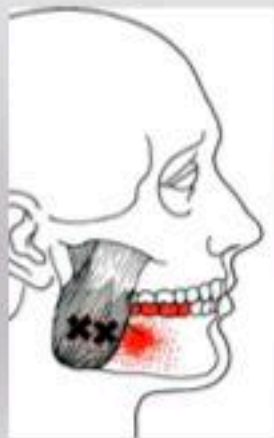
Other



“How Doctors Think”, by Jerome E. Groopman

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

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



Differential Diagnosis

Diagnostic Boxes: Pattern Recognition

"My Tooth Hurts"

Reversible Pulpitis secondary to caries

Irreversible Pulpitis secondary to caries

Pulpitis secondary to split tooth

Referred Pain from Muscle
Trigger Point

Periodontal Infection

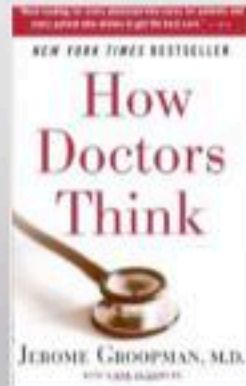
Inflamed Tissue secondary to
popcorn husk

Aphthous Ulcer

Periodontal ligament inflammation
secondary to Occlusal Trauma

Pulpitis secondary to Occlusal Trauma

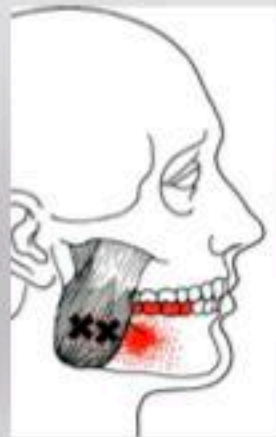
Other



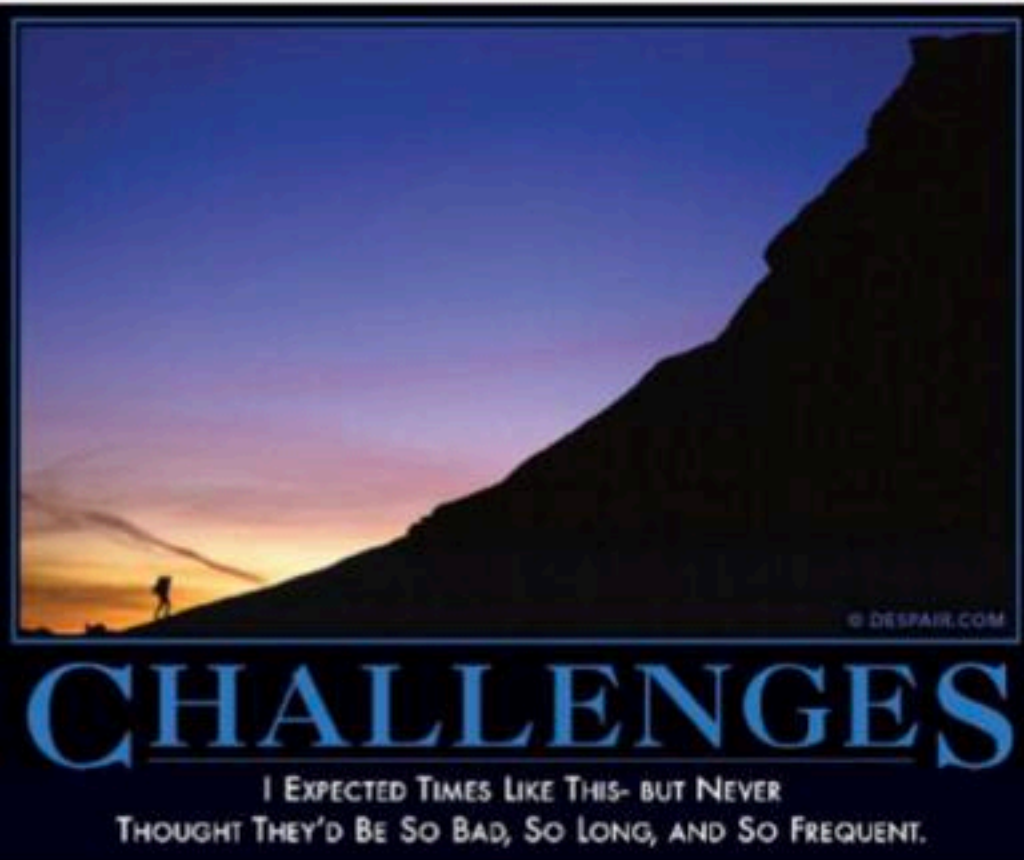
"How Doctors Think", by Jerome E. Groopman

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

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



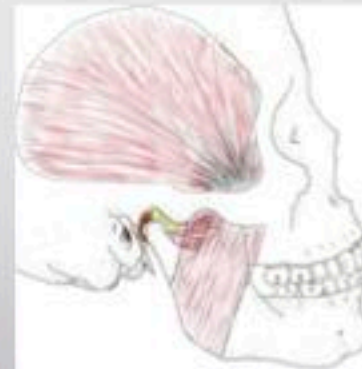
TMDs- What are the choices? 190 Diagnoses



despair.com

Don't **Despair**:

Learn a few new exam skills, a few diagnostic patterns, a few new treatments. Have a box called other.



Osteoarthritis

Acute Sprain of TMJ

Clenching

Occlusal Muscle Disharmony

Other

Common TMDs

John R Droter DDS
Annapolis, Maryland

Short

www.jdroter.com

6 Common TMDs

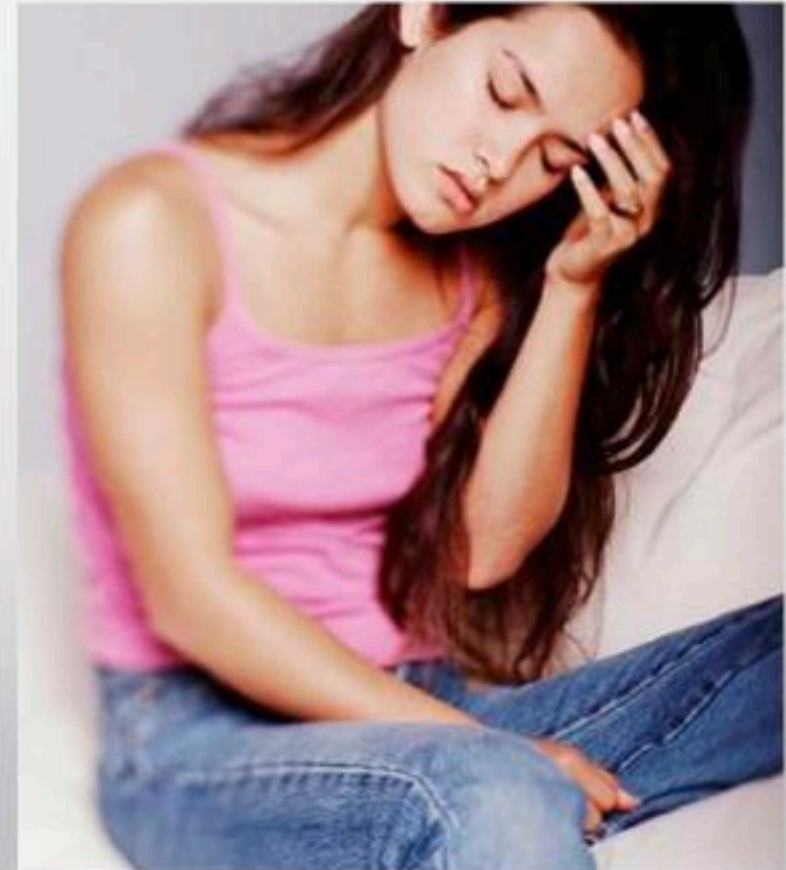
- Parafunctional Clenching
- Parafunctional Grinding
- Occlusal Muscle Dysfunction
- Osteoarthritis
- Acute Sprain
- Acute Closed lock of TMJ disc

5 Common Obstacles

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

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

- TMJ Clicking



6 Common TMDs

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

6 Common TMDs

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Which Orthotic to use for Bruxing?

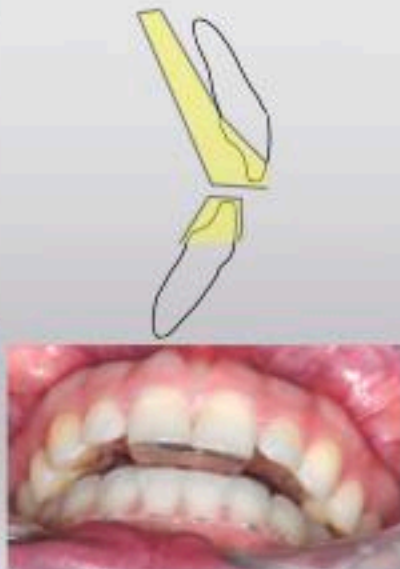
Not one disease, not one treatment

Bruxing: A diurnal or nocturnal parafunctional activity that includes clenching, bracing, gnashing and grinding of teeth.
American Academy of Orofacial Pain (2008)

D-PAS
Diagnostic-
Palatal Anterior Stop



Brux-PAS
with lower Essix



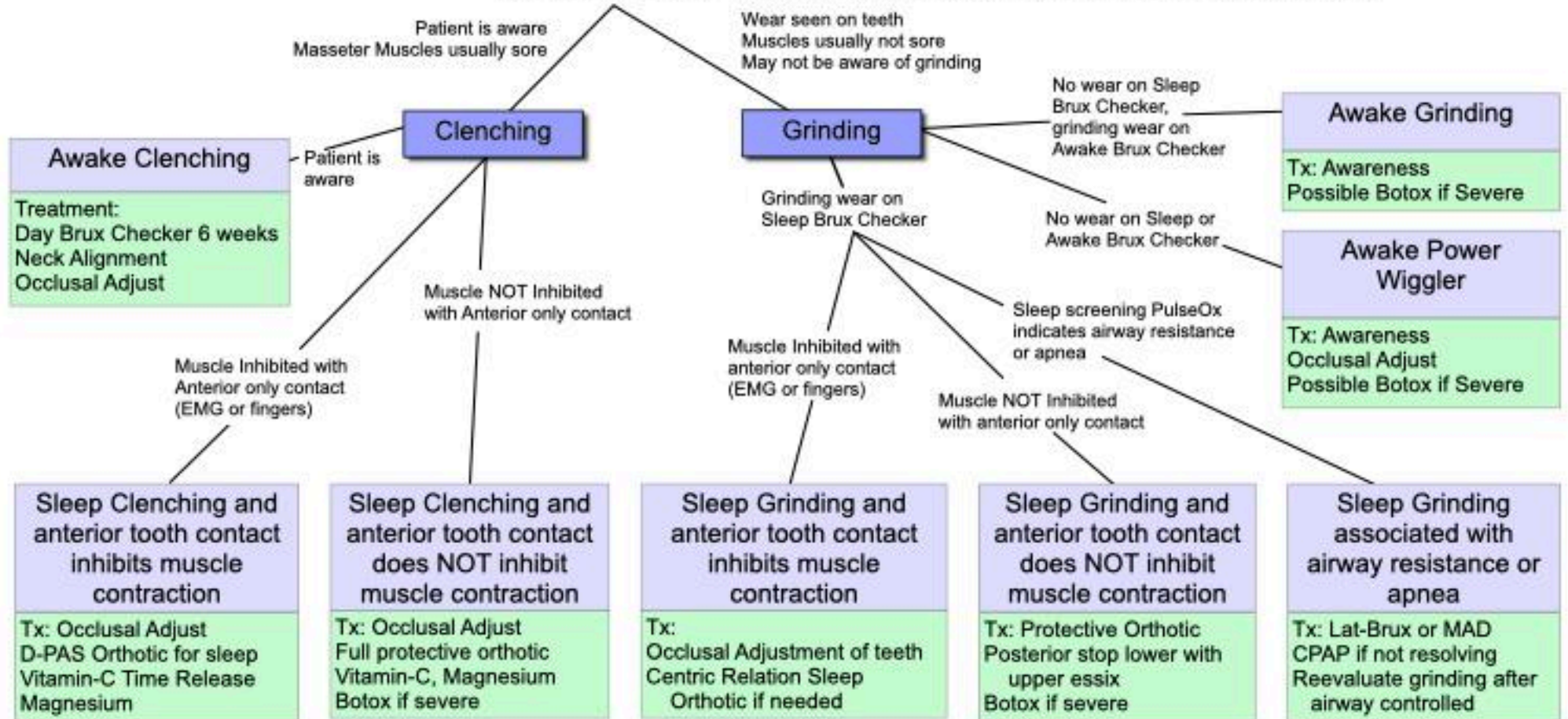
Hard Lower Posterior Stop
with upper essix



Hard Lower Full Coverage
Centric Relation Orthotic



BRUXING: PARAFUNCTIONAL TOOTH CONTACT



5 questions that will help identify the specific bruxing disorder:

1. Does the patient grind or clench their teeth?
2. When does/did this occur: Awake or asleep, past or present?
3. Are the TMJ muscles inhibited from full contraction with anterior only contact?
4. If sleep grinding, is there an airway issue?
5. Does the dental orthotic make the airway better or worse?

1. Does the Patient Grind or Clench?



Clenching you squeeze your teeth together
Grinding you rub your teeth together

16 yo





Clenchers destroy the joint,
Grinders destroy the teeth



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

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

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

Parker Mahan-
"Women Hurt, Men destroy"

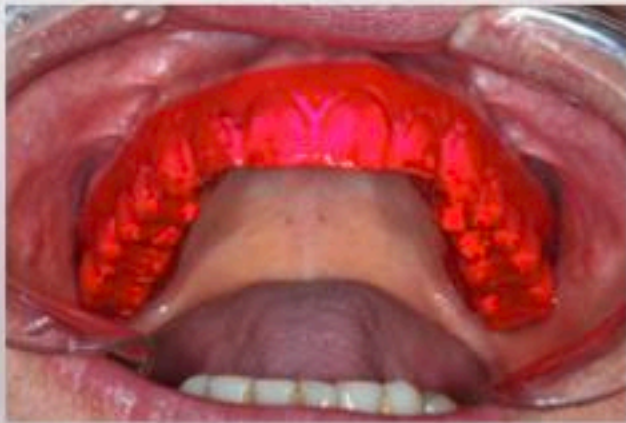
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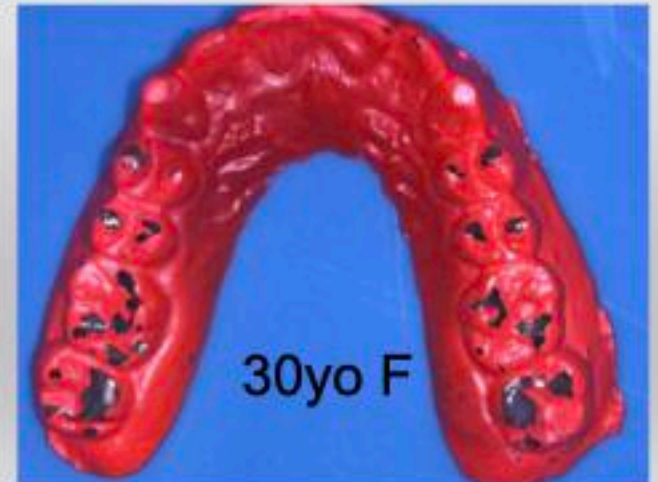
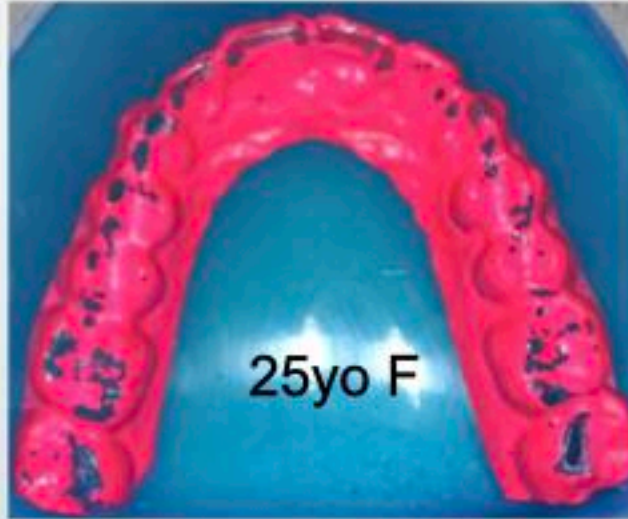
2. Does this occur awake or asleep?

Brux Checker
Great Lakes Orthodontics

0.1mm Mylar

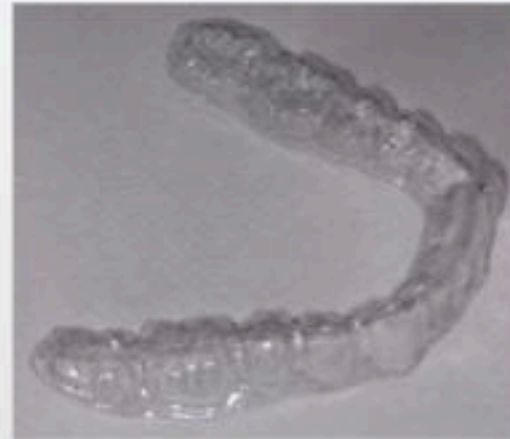


Made on Biostar Machine



Daytime Clenching- Clear Brux Checker Increase awareness to break habit

Very thin: Similar to mylar used for composites



Great Lakes Orthodontics
Biostar Platzhalterfolie
Item Ref 3202.1



5 questions that will help identify the specific bruxing disorder:

1. Does the patient grind or clench their teeth?
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3. Are the TMJ muscles inhibited from full contraction with anterior only tooth contact?

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

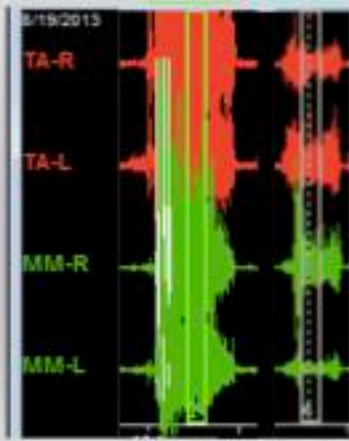


Diagnostic Palatal Anterior Stop Orthotic



Patient with muscles inhibited by anterior only contact

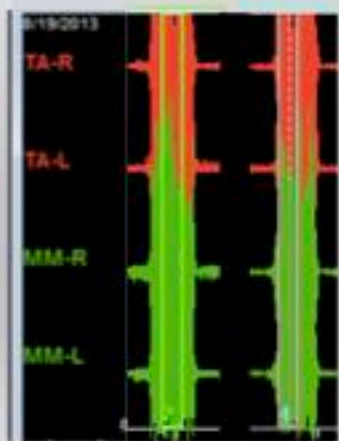
	Clench MaxIC μV	Anterior Stop D-PAS μV
TA-R	100.6	15.7
TA-L	108.9	25.3
MM-R	115.4	25.5
MM-L	70.5	6.8



Major decrease in muscle power with D-PAS

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



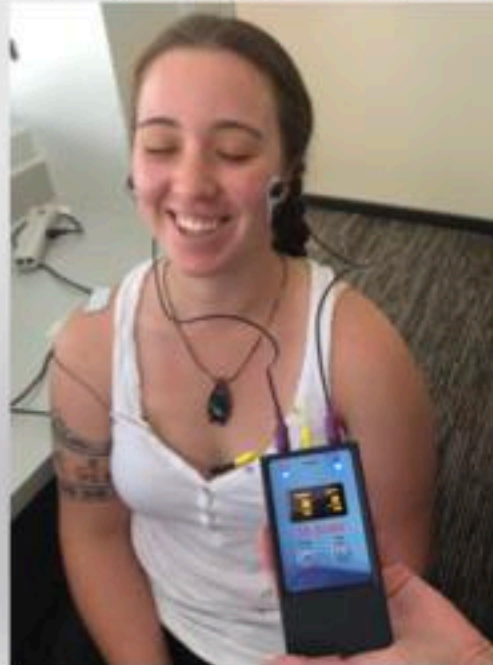
Muscle power same with D-PAS

Choosing the Correct Night Guard

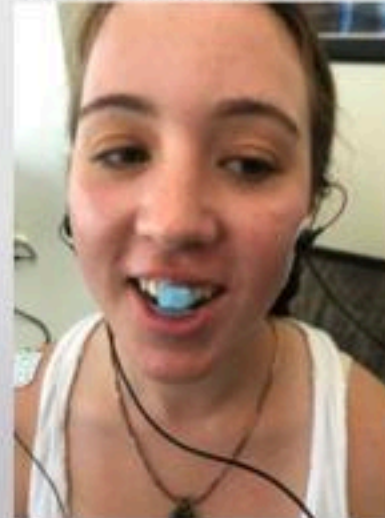
M-Scan EMG Electromyography



Clench back teeth



Clench
anterior stop



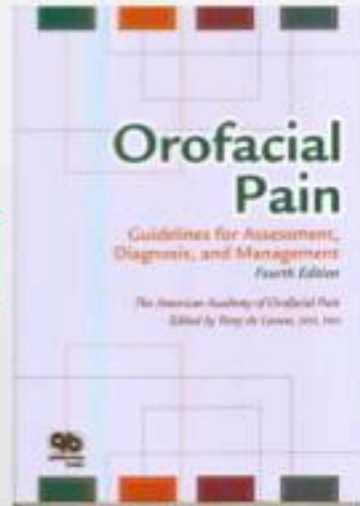
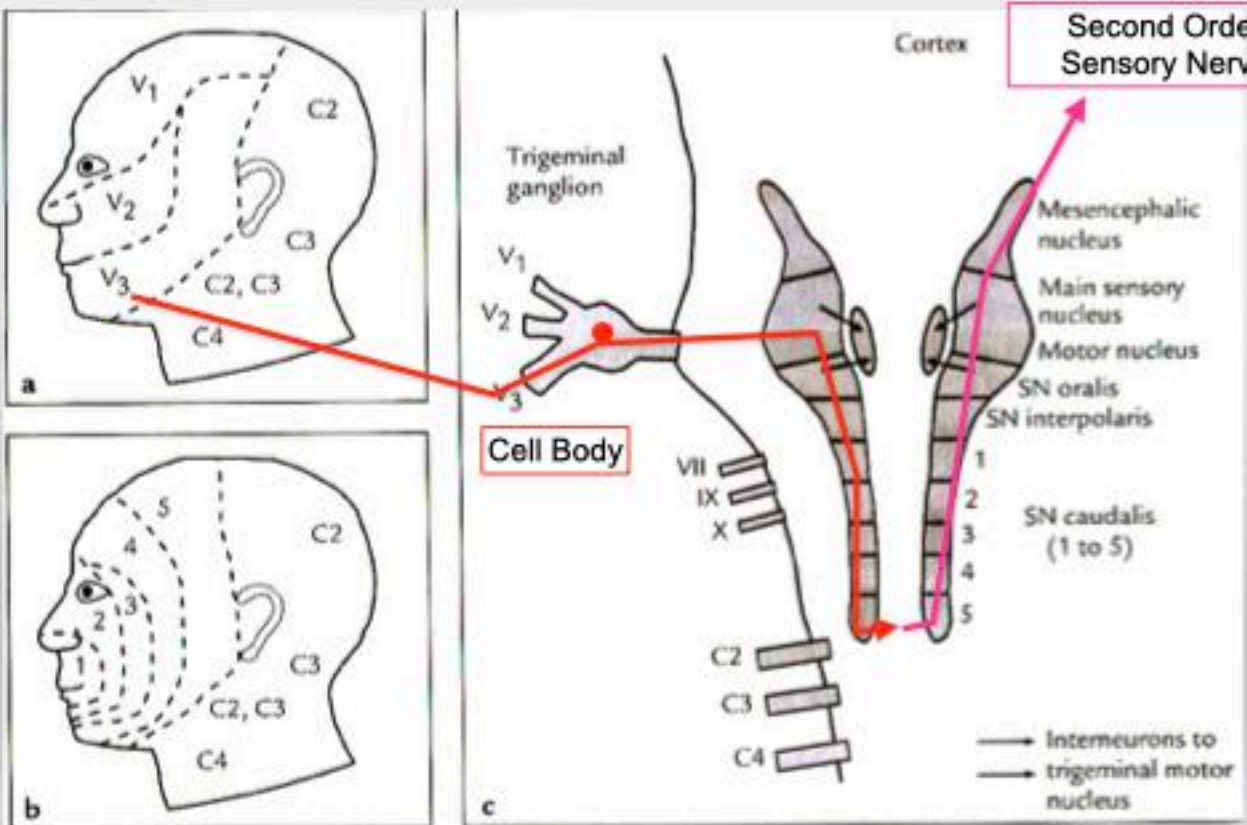
Can place moderate force
on front teeth

Clench
Back teeth +250 μv
Front teeth +121 μv



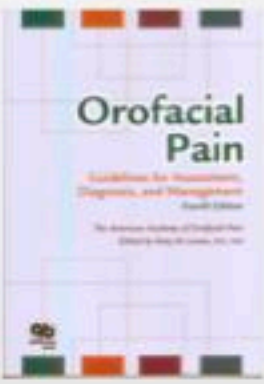
Trigeminal Ganglion-
 Cell bodies of trigeminal primary sensory neurons
 Trigeminal Nucleus
 Connection of primary neurons with secondary neurons

Afferent
 First Order
 Sensory Nerve

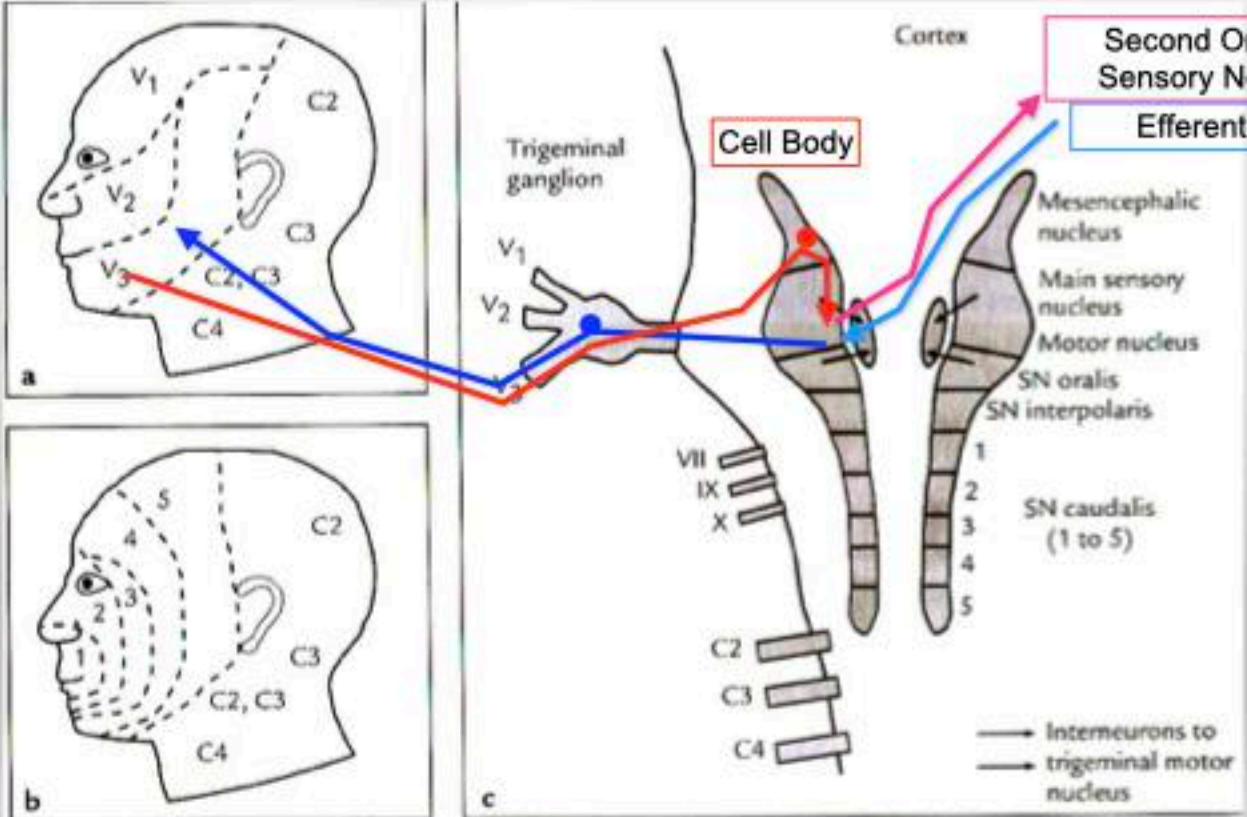


First Order PDL sensory neurons and proprioception neurons of TMJ closing muscles have their cell bodies in the upper section of the Trigeminal Nucleus and synapse with their second order neurons in the Motor nucleus

Efferent motor neurons to the TMJ muscles also synapse in the motor Nucleus



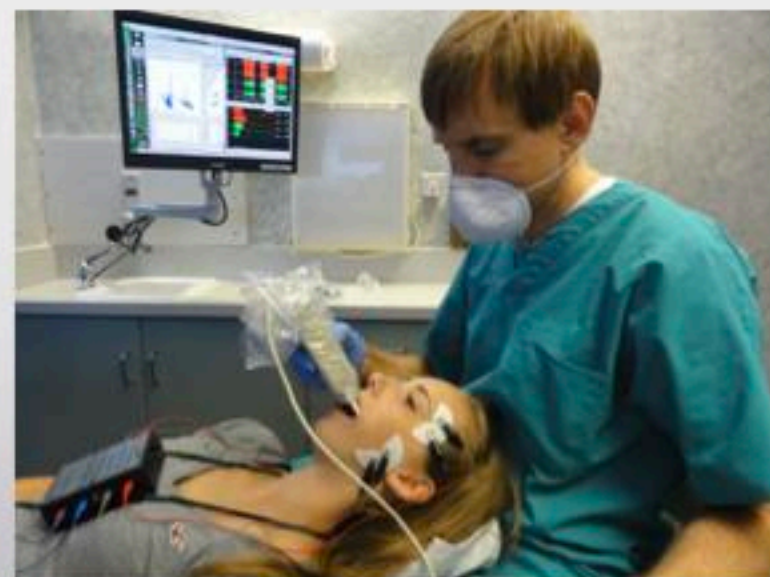
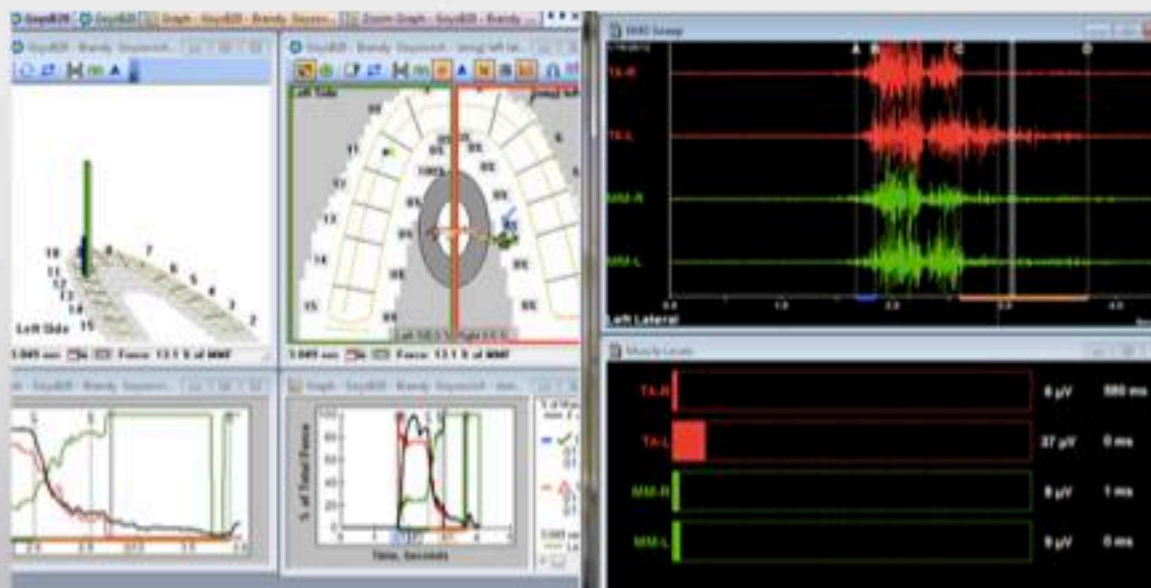
PDL Afferent
First Order
Sensory Nerve



Blink and PDL only peripheral nerves with cell bodies in CNS

TScan EMG Link

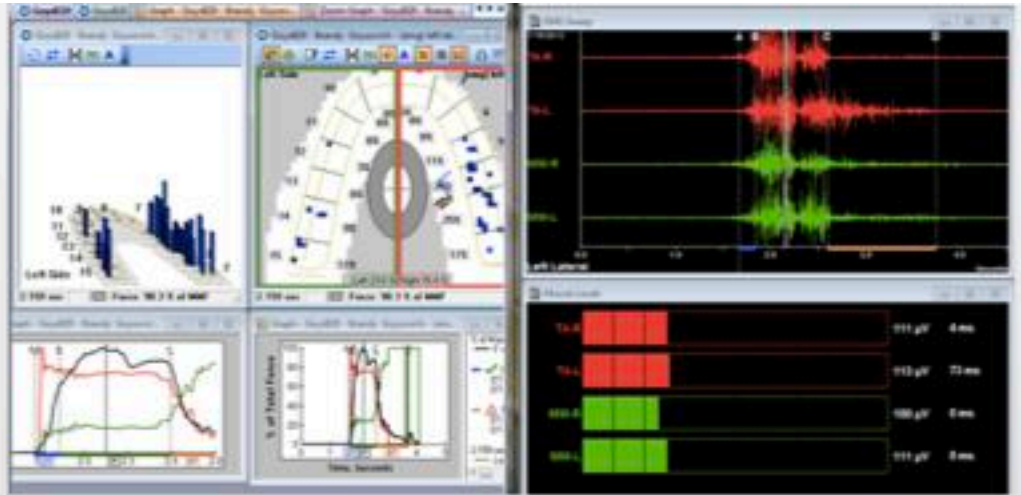
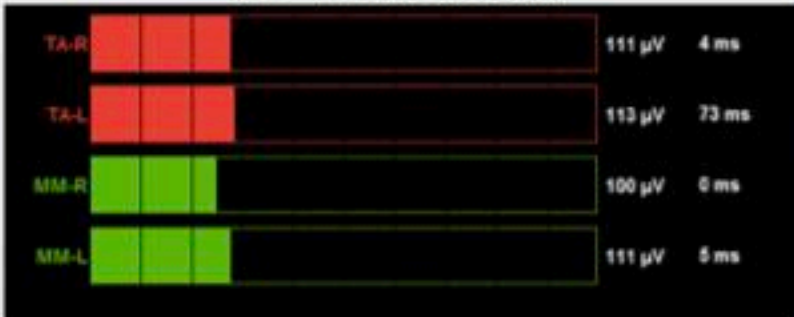
We can measure muscle activity chairside and link it to occlusal contacts
Muscles are inhibited from firing with anterior only contact
Gives endpoint to occlusal adjustment



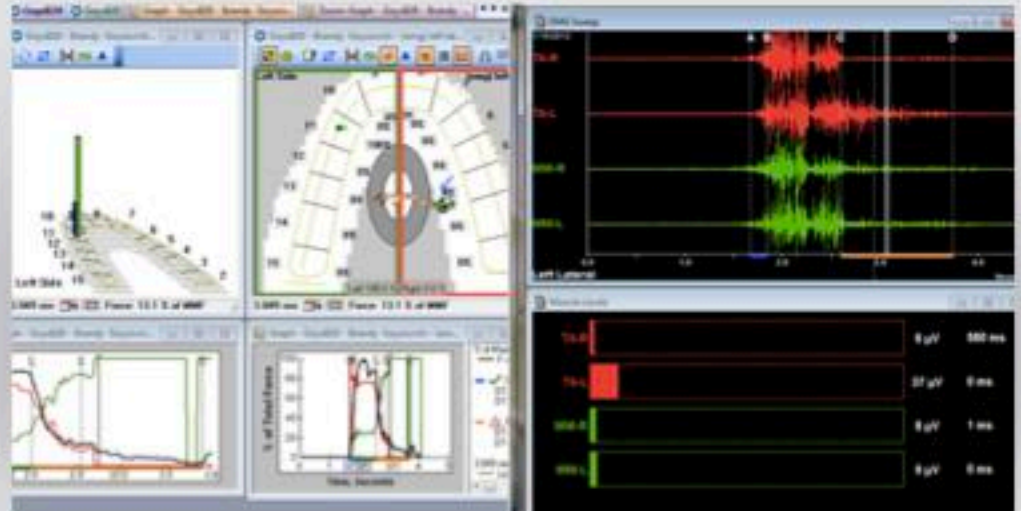
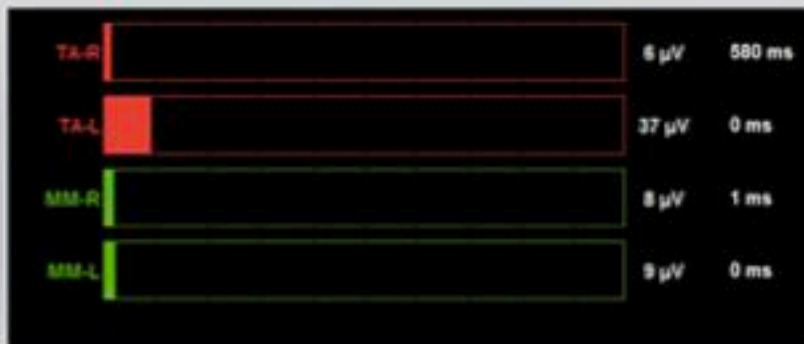
Williamson, E. H., Anterior Guidance: Its effect on electromyographic activity of the temporalis and masseter muscles. *J Prosthet Dent* 49-6:816-823, 1983.

EMG Tscan- Masseter and Temporalis

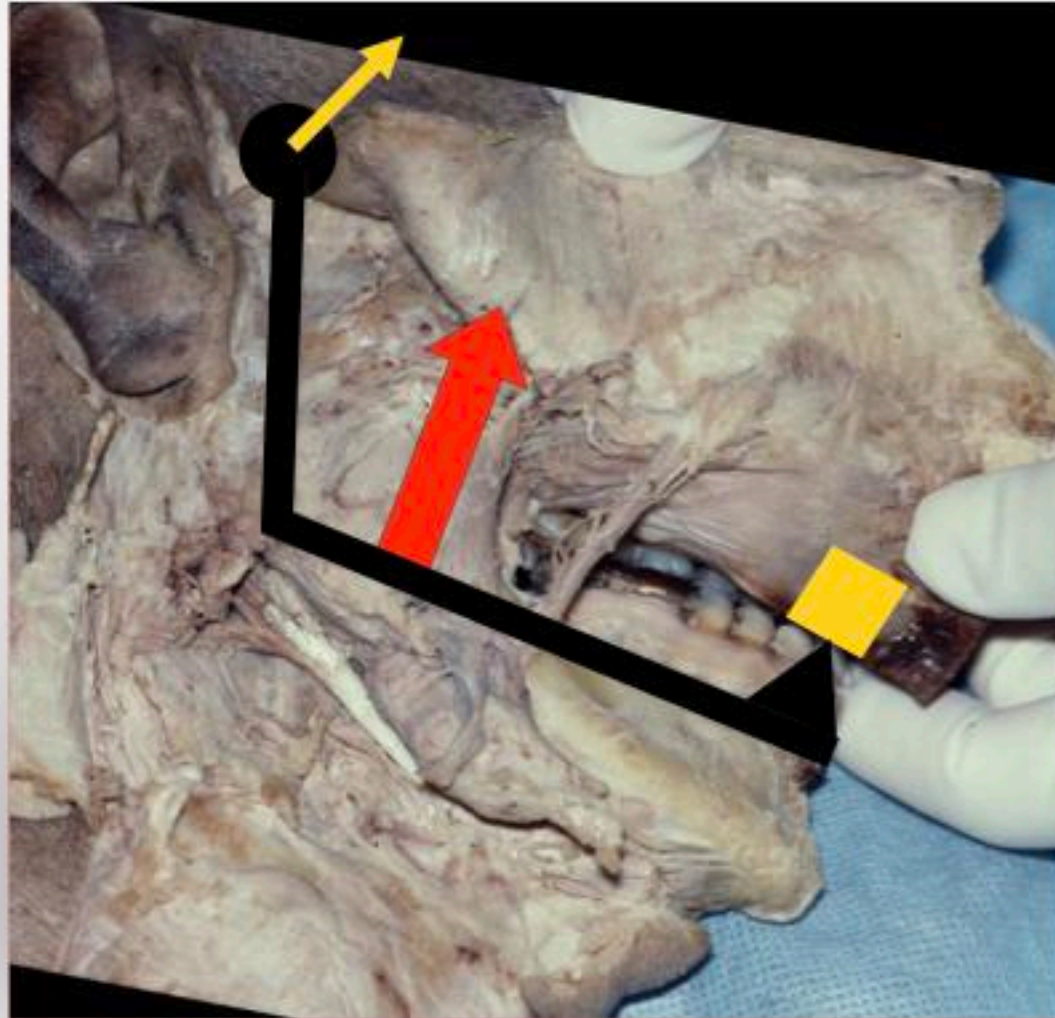
Maximum Intercuspsation Clench
100-113 microvolts



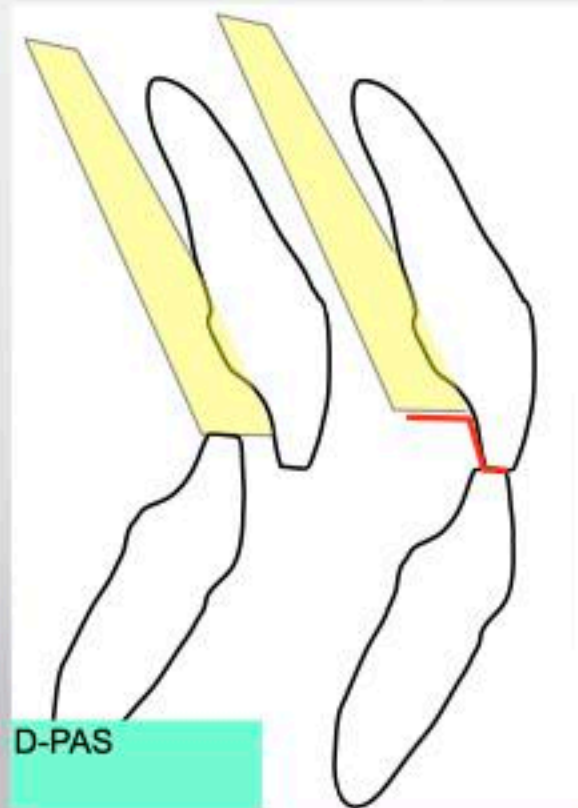
Left Lateral Excursion



Biomechanics of Anterior Stop Orthotic



Diagnostic Palatal Anterior Stop D-PAS



Basically an upper Hawley with anterior stop without clasps or wire

Muscle inhibition with anterior teeth only contact: D-PAS

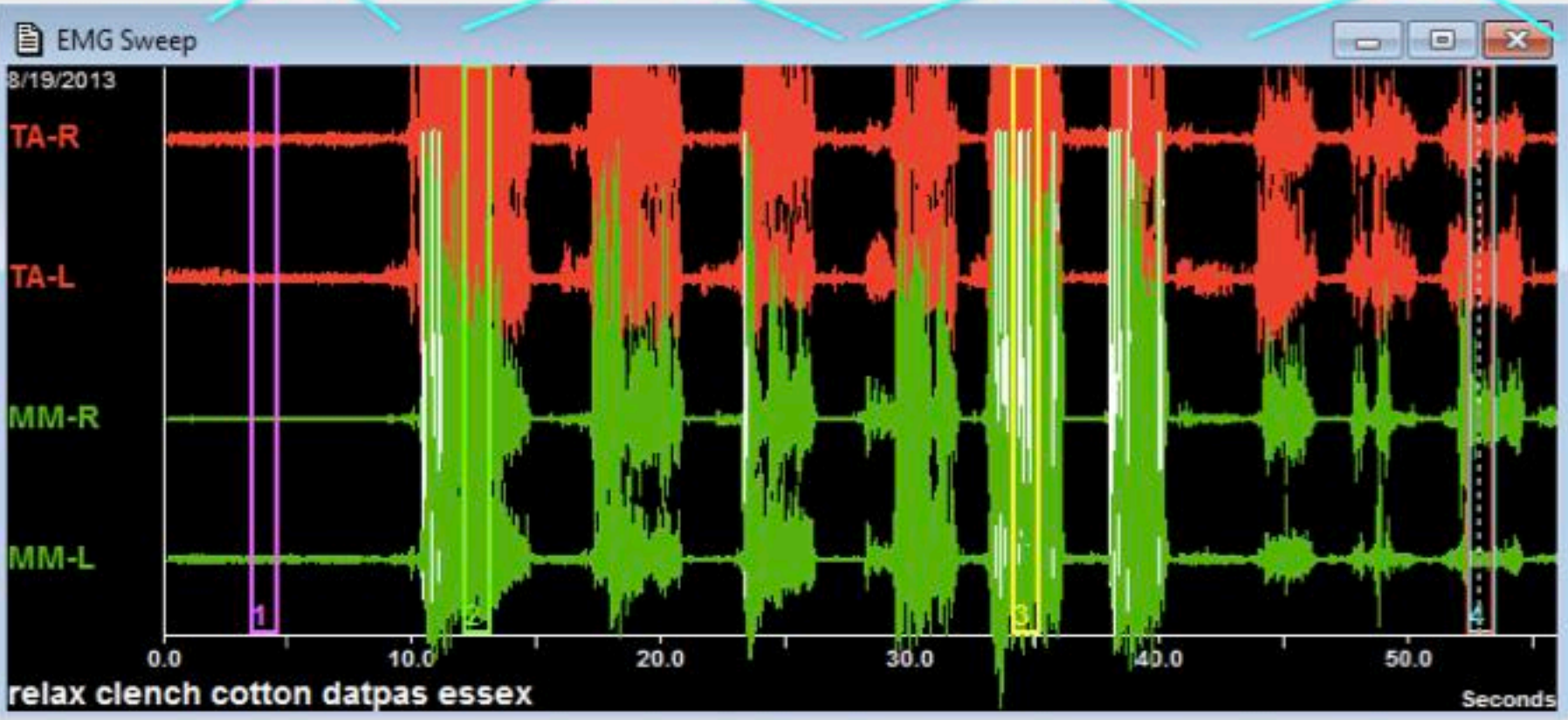
50-90% decrease EMG

Relax 10 sec

Clench 3x

Clench cotton 3x

D-PAS clench 3x



No muscle inhibition with anterior teeth only contact- D-PAS

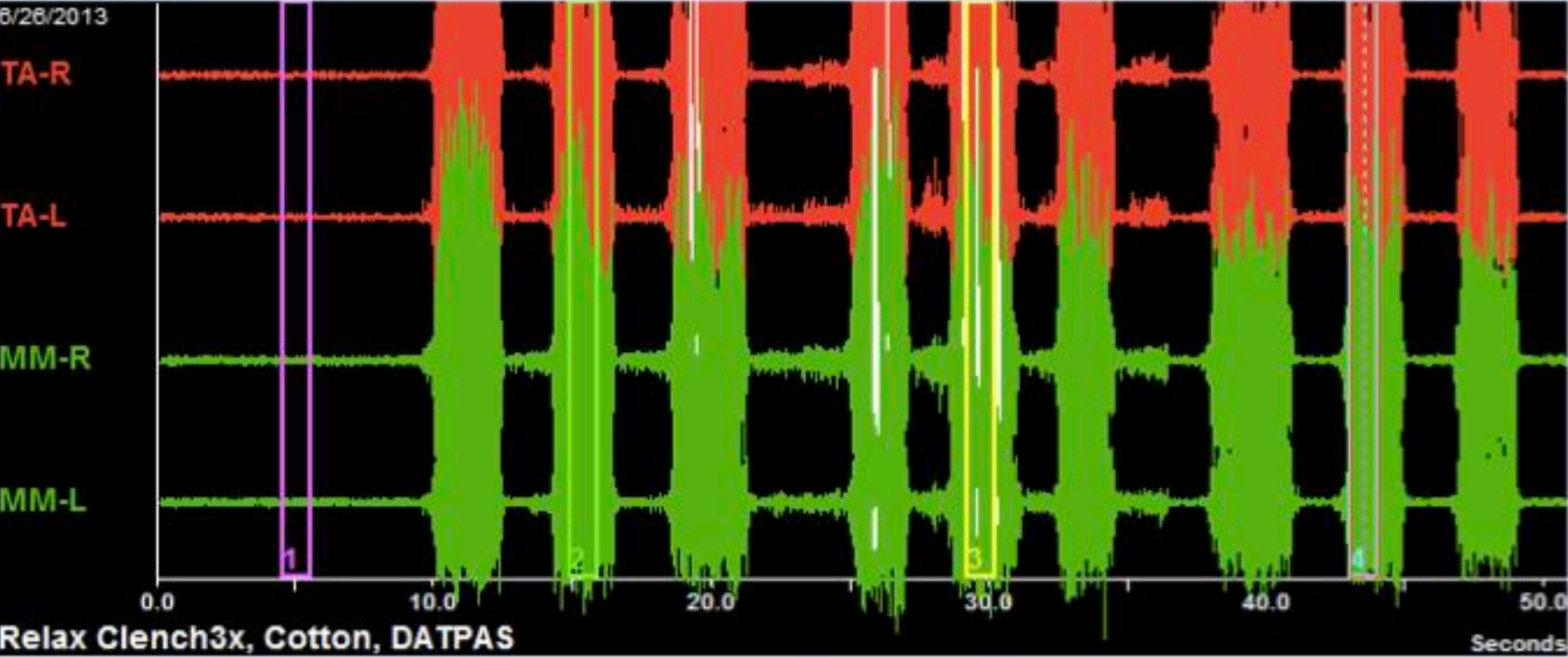
Relax 10 sec

Clench 3x

Clench cotton 3x

D-PAS clench 3x

EMG Sweep



5 questions that will help identify the specific bruxing disorder:

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3. Are the TMJ muscles inhibited from full contraction with anterior only contact?
- 4. If sleep grinding, is there an airway issue?**
5. Does the dental orthotic make the airway better or worse?

4. Is there an airway issue? (Upper Airway Resistance or Obstructive Sleep Apnea)

"Sleep Airway Screening"



High Resolution
Pulse Oximetry

Data every 1
second average
over 3 seconds

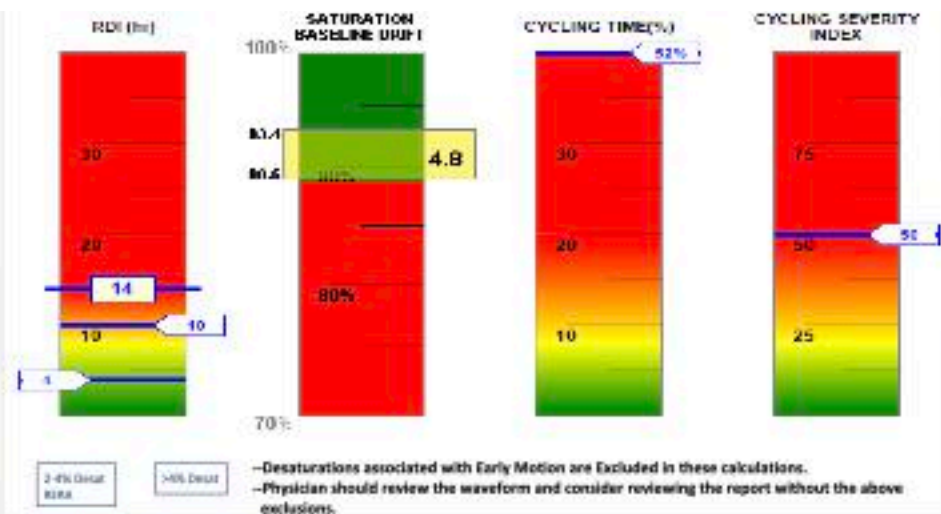


Patient Safety Inc.



Order Pulse Ox and Software: Go to my website or
www.patientsafetyinc.com

Sleep SAT is the replacement for
PULSOX 300i, Konica Minolta no longer made



OXYGEN SATURATION BASELINE ANALYSIS

Oxygen Saturation Baseline	
Drift(OSBG) (normal <= 5)	5
Initial Saturation Baseline	93
Lowest Saturation Baseline	89
Highest Saturation Baseline	93

Baseline is determined by the Mean SpO2 during 2 Minute window without Artifact and without Events.

PATTERN BASED REPORT

SPO2 CYCLING

% Time in Cycling (Duration)	52%	(02:50:14)
Cycling Frequency	45	
96% - Lowest Sat	13	
Cycling Severity Index	58	

The total time oxygen saturation was <= 88% was: 00:13:39

TRADITIONAL REPORT

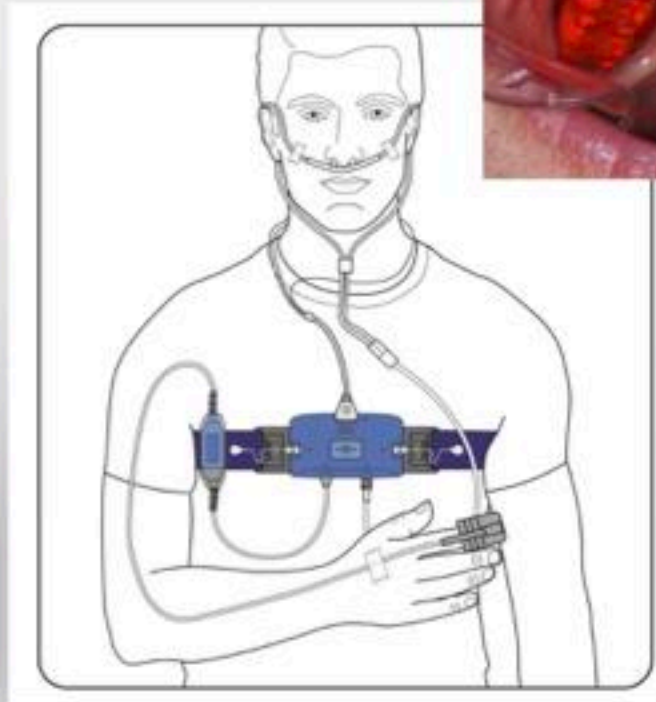
OD4:		%SpO2	DURATION	%TOTAL
Total OD4 Events:	11	94-100	00:16:37	5%
Time in OD4 Events:	58	88-94	04:57:26	91%
Avg OD4 Event Duration:	06:29:26	80-88	00:13:39	4%
<=88% OD4 Events:	00:00:28	70-80	00:00:00	0%
<=88% Longest Duration:	23	<= 70	00:00:00	0%
Minimum SpO2:	00:01:21	Total	05:27:42	99%
Avg Low 10% SpO2:	84	Motion Artifact	00:00:07	0.04%
Avg Low SpO2:	86	Error Signal	00:00:05	0.03%
Avg Low SpO2 <=88%:	89			
	87			

Definition of OD4 Event: a fall in oxygen saturation of at least 4% and persisting greater than 3 seconds.

zMachine

zMachine + Brux Checker
+ Snore Lab

GENERAL
sleep



Call (888) 330-4424

Use Code: DROTER to receive special offer

Patient: M Y
 Study Date: 2018-09-27 Study ID: 1124990576

3% Threshold

AHI: **8.9**
 AHI is how many times an hour your blood oxygen goes down.

RDI: **8.9**
 RDI is how many times an hour your sleep is disturbed due to respiration

Date of Birth: 1988 Height: 63 inches
 Age: 20 Weight: 105 Pounds
 Sex: F BMI: 18.60 Note:

GENERAL
sleep
 Zmachine® Synergy
 Home Sleep Test Report
 Study Ordered by:
 John R. Droter, DOS
 Scored by: Computer

Study Details: Computer Generated Scoring

The following parameters were recorded using a Zmachine Synergy (General Sleep Corporation): EEG for sleep staging & arousals; respiratory inductance plethysmography for thoracic respiratory effort; pressure transducer for respiratory airflow & snore; pulse oximeter for SpO₂, pulse, & optical plethysmograph; and tri-axial accelerometer for body position. Hypopneas were scored per AASM recommended definition of 3% desaturation.

Times and Durations	
Lights off	2018-09-27 01:47:32
Lights on	2018-09-27 08:42:54
Total Recording Time (TRT)	595.8 min.
Time in Bed (TIB)	414.0 min. (81.7% of TRT) [6 hours 54 minutes.
Total Sleep Time (TST)	396.8 min. (95.9% of TIB)
Sleep Efficiency (SE)	95.9 % of TIB
Latency to Persistent Sleep (LPS)	8 min
Latency to Deep Sleep (LDEEP)	29 min
Latency to REM Sleep (LREM)	8.5 min
Total Light Sleep Time N1+N2	207.9 min. (52.4% of TST)
Total Deep Sleep Time N3+SWS	85.7 min. (21.6% of TST)
Total REM Time	82.2 min. (20.8% of TST)
SpO ₂ < 89% cumulative time	0 min.
SpO ₂ < 89% longest span	0 min.

Sleep Study Ranges of Normal
 Sleep Latency: 10-20 min
 Latency to REM Sleep: 10-20 min
 Sleep Efficiency: 85%

N1 2% - 5%
 N2 45% - 55%
 N3 Deep Sleep: 12% - 20%
 REM Sleep: 10% - 25%
 REM Latency: 10-20 min
 REM Latency: 10-20 min
 REM Latency: 10-20 min

REM to REM is about 90 min.
 4-5 cycle per night
 REM Latency longer as night goes on

Deep N3 SWS slow wave sleep in first third of night. Less as we age.

TST is the total duration of the recording. TIB is the elapsed time from lights off to lights on. TIB is the cumulative time scored as any stage of sleep. SE is 100*(TST/TIB) expressed as a percentage. AHI is apneas + hypopneas per hour of sleep time. RDI is apneas + hypopneas + RERAs per hour of sleep time. and RDI is apneas + hypopneas + RERAs per hour of recording time.

LPS is the elapsed time to the beginning of the first period in which 10 of 30 minutes are scored as any stage of sleep (i.e. the start of persistent sleep). LDEEP is the elapsed time to the beginning of first epoch of Deep Sleep, and LREM is the elapsed time to the beginning of first epoch of REM.

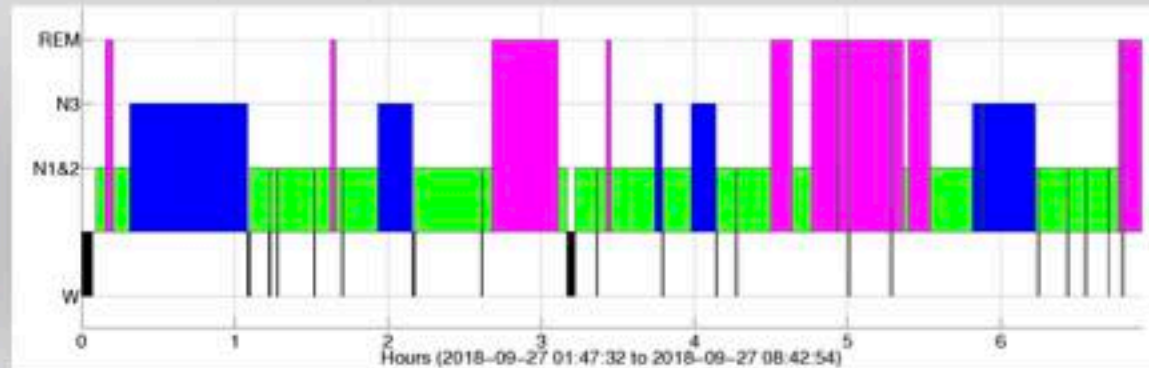
Awakenings During Sleep	
Wake After Sleep Onset (WASO)	13 min
≥ 1-Epoch Awakenings	18 (2.7 per sleep hour)
≥ 3-Epoch Awakenings	0 (0 per sleep hour)

WASO is the cumulative wake time following LPS. ≥ 1-Epoch Awakenings is the number of times the patient wakes for one epoch (i.e. 30 seconds) or more after LPS, and ≥ 3-Epoch Awakenings is the number of times the patient wakes for three epochs or more after LPS. This is a subset of a ≥ 1-Epoch

Respiratory Events

Body Position	72.1% Supine/hr	9.0
	0% Prone/hr	0
	12.9% Left/hr	4.5
	14.8% Right/hr	9.8

Sleep Stages



5 questions that will help identify the specific bruxing disorder:

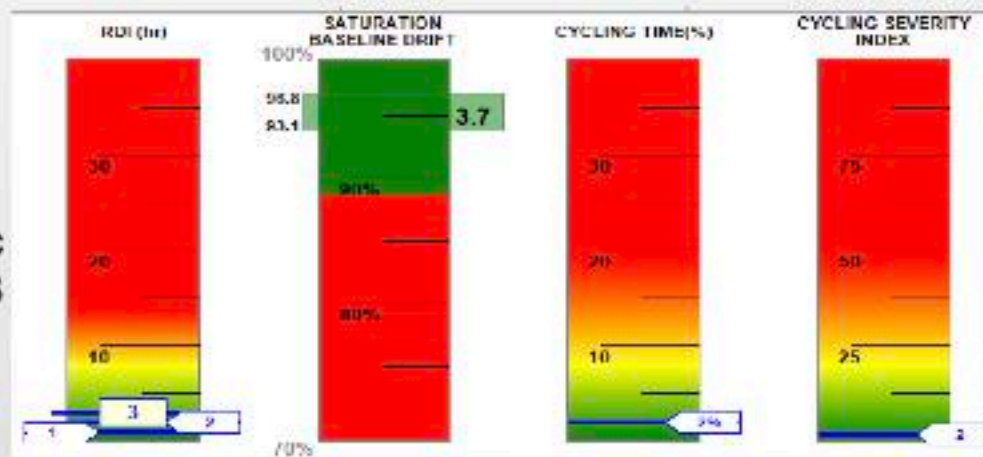
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4. If sleep grinding, is there an airway issue?
5. Does the dental orthotic make the airway better or worse?

5. Does the dental orthotic make the airway better or worse?

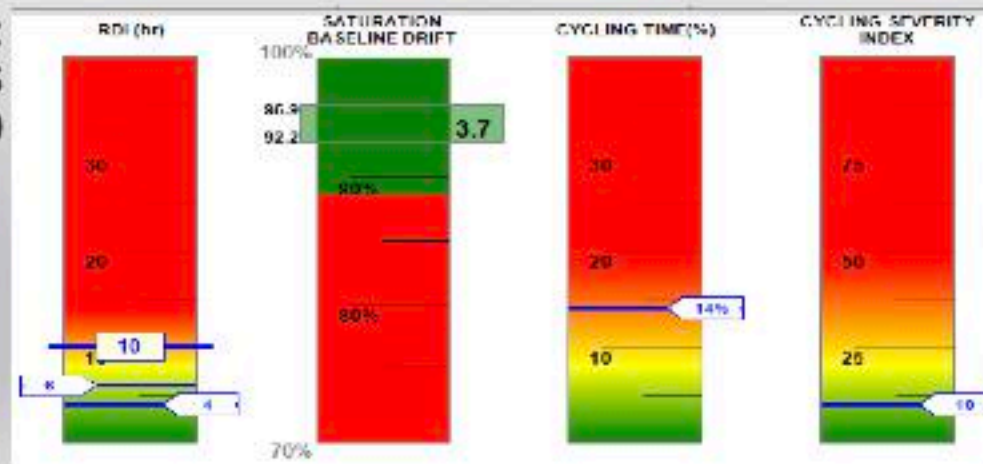
RDI = Respiratory Distress Index

Sometimes D-PAS makes airway better, sometimes worse

No dental orthotic
RDI = 3



Dental Orthotic:
Anterior Stop: D-PAS
RDI = 10



High Resolution
Pulse Oximetry

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

5 questions that will help identify the specific bruxing disorder:

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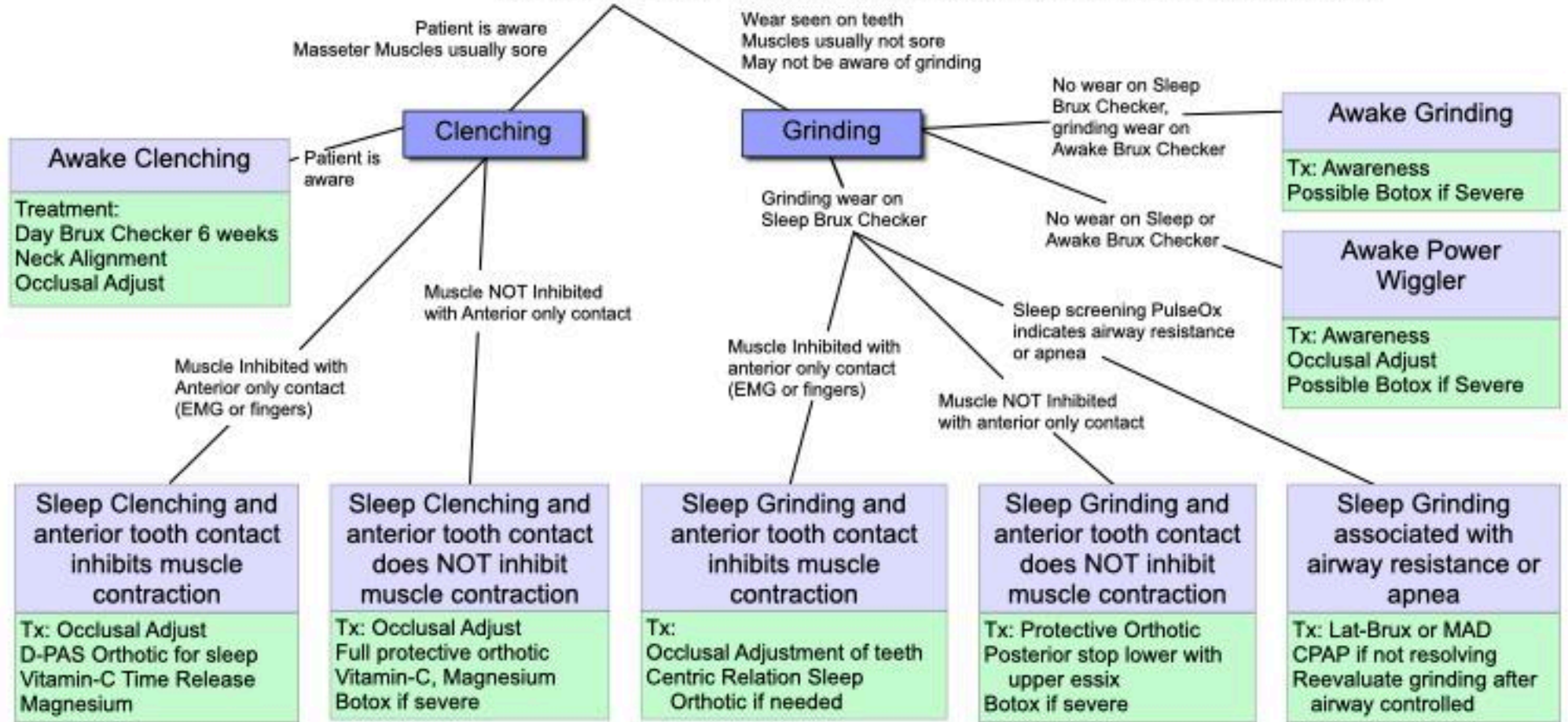
Choosing Night Guards Grind and Clench

John R Droter DDS
Annapolis, Maryland

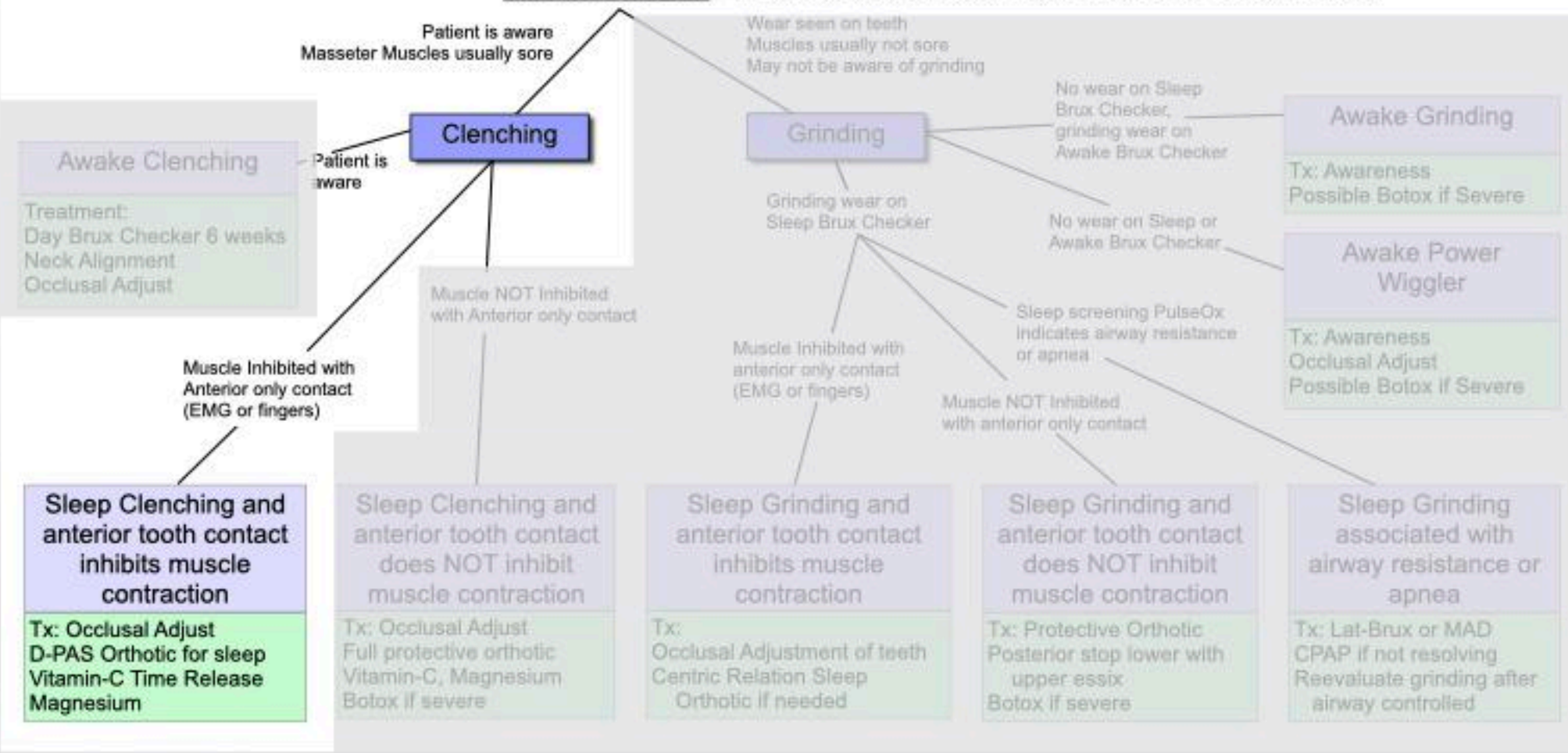
Annapolis, Maryland
John R Droter DDS

www.drdroter.com

BRUXING: PARAFUNCTIONAL TOOTH CONTACT



BRUXING: PARAFUNCTIONAL TOOTH CONTACT



Awake Clenching

Treatment:
Day Brux Checker 6 weeks
Neck Alignment
Occlusal Adjust

Clenching

Grinding

Awake Grinding

Tx: Awareness
Possible Botox if Severe

Awake Power Wiggler

Tx: Awareness
Occlusal Adjust
Possible Botox if Severe

Sleep Clenching and anterior tooth contact inhibits muscle contraction

Tx: Occlusal Adjust
D-PAS Orthotic for sleep
Vitamin-C Time Release
Magnesium

Sleep Clenching and anterior tooth contact does NOT inhibit muscle contraction

Tx: Occlusal Adjust
Full protective orthotic
Vitamin-C, Magnesium
Botox if severe

Sleep Grinding and anterior tooth contact inhibits muscle contraction

Tx:
Occlusal Adjustment of teeth
Centric Relation Sleep
Orthotic if needed

Sleep Grinding and anterior tooth contact does NOT inhibit muscle contraction

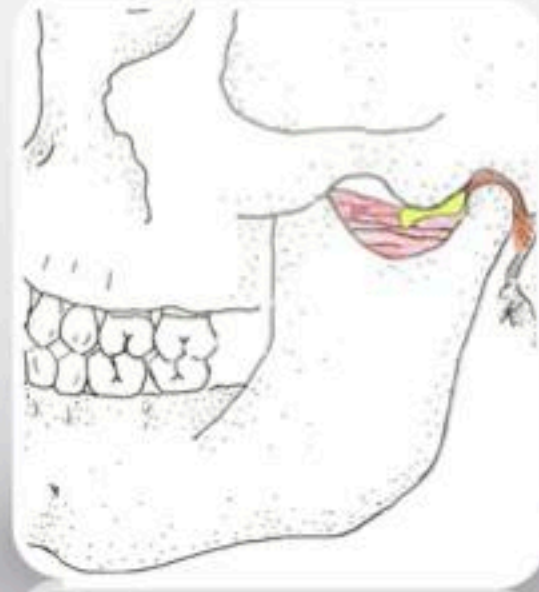
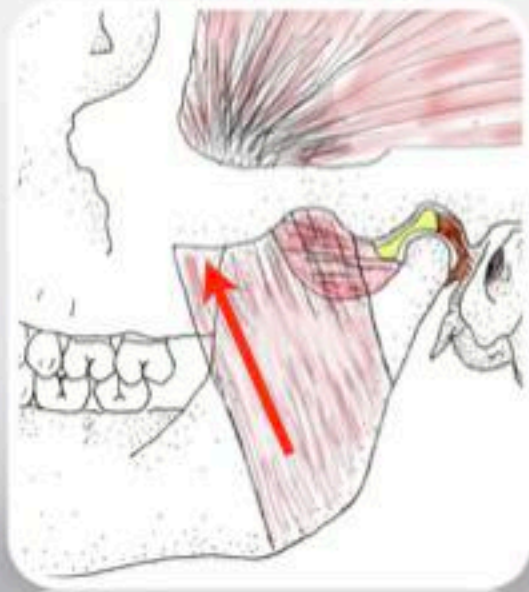
Tx: Protective Orthotic
Posterior stop lower with upper
essix
Botox if severe

Sleep Grinding associated with airway resistance or apnea

Tx: Lat-Brux or MAD
CPAP if not resolving
Reevaluate grinding after airway controlled

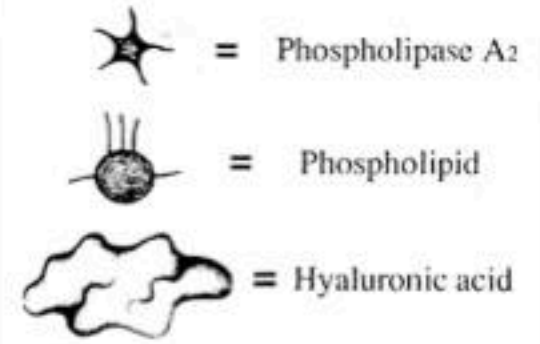
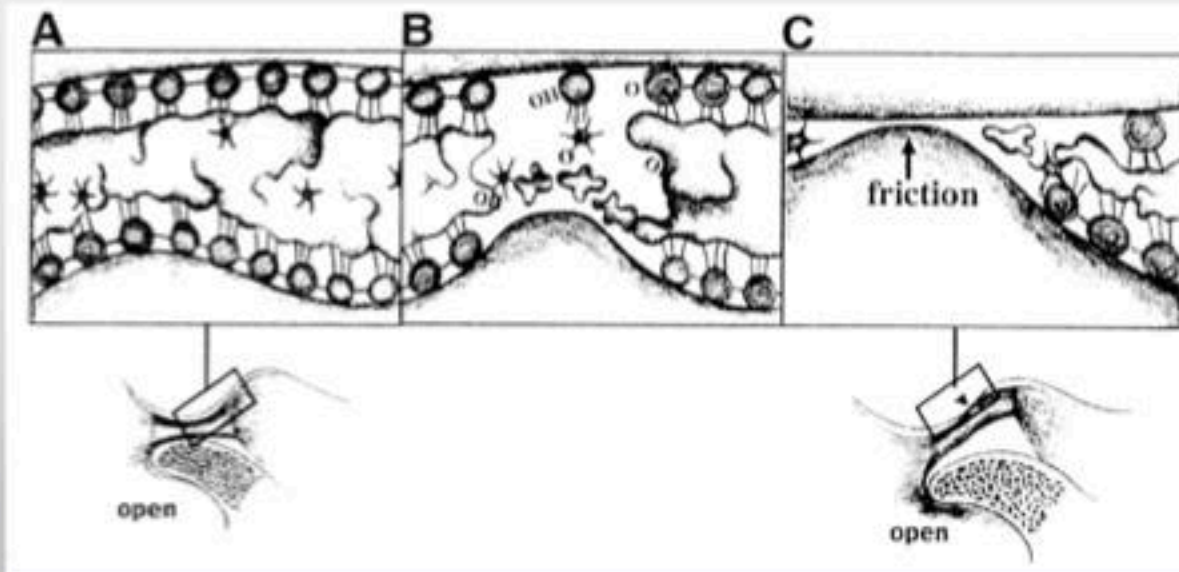
Clenching can cause disc subluxation

Chronic Micro Trauma from clenching



Clenching breaks down Hyaluronic Acid and Phospholipids

Creates "Sticky disc"



Nitzan, DW, The Process of lubrication impairment and its involvement in temporomandibular joint disc displacement: a theoretical concept, *J Oral Maxillofac Surg.* 59:36-45, 2001

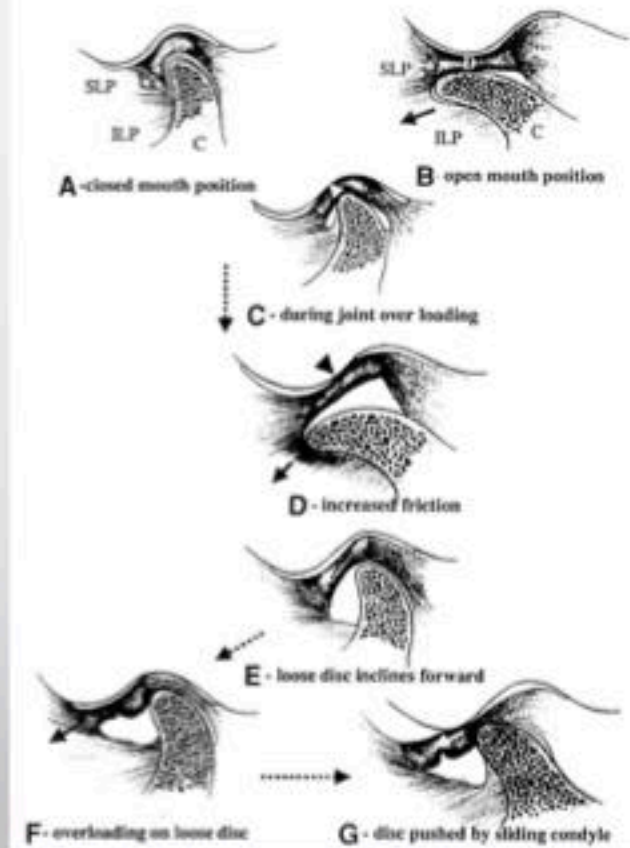
Sticky Disc sticks as mandible moves

Ligaments loosen

Disc Distorts

Eventually ADD

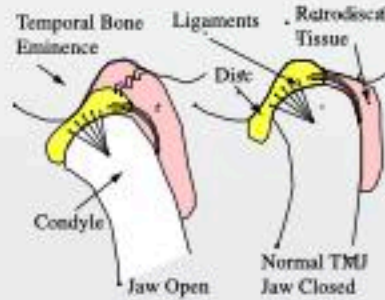
Dr. Dorit Nitzan



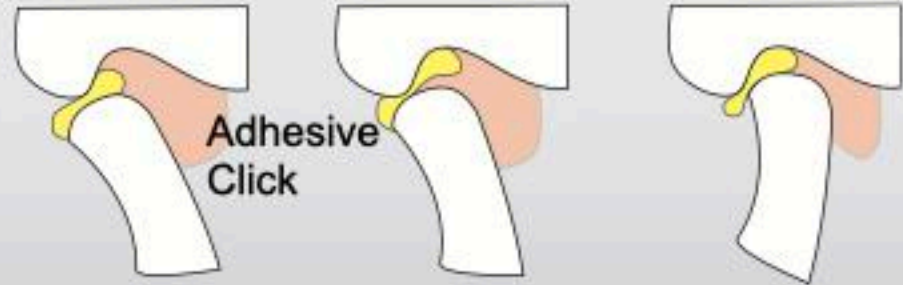
Nitzan, DW, The Process of lubrication impairment and its involvement in temporomandibular joint disc displacement: a theoretical concept, *J Oral Maxillofac Surg.* 59:36-45, 2001

Clenching can lead to disc dislocation

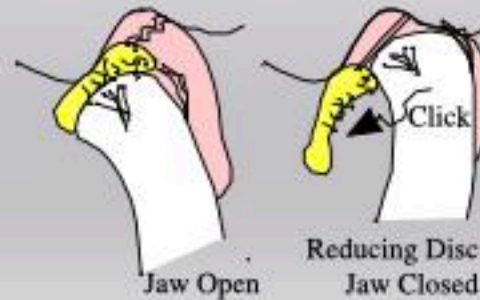
Normal



“Sticky Disc” - Clenching causes disc to stick in upper joint compartment. As condyle moves forward, disc distorts and eventually releases, making a clicking sound. On closing disc is slow to return, stretching discal ligaments.



Over time can lead to Anterior Disc Dislocation with Reduction



Hypoxia Re-perfusion Injury

Clenching: Static Loading No Oxygen/Hypoxia
On waking with joint motion get re-perfusion of Oxygen
Oxygen Free Radicals cause Oxidative Damage

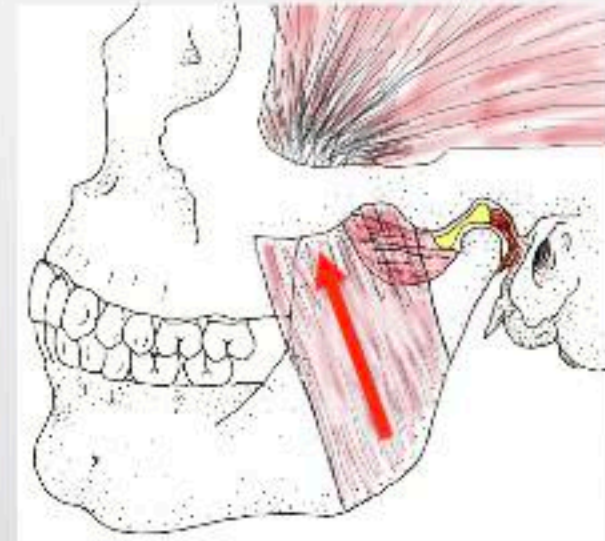
If antioxidants (Vitamin A, C, E) around:

Protects tissue from damage

Vitamin C 1000 mg at dinner with other vitamins

NOW Vitamin C Sustained Release 1000 mg

Shaklee Vitamin C Sustained Release 500 mg x2



Tx for Clenchers: Vitamin C at dinner, possible add Mg++ at 8pm , D-PAS



Blake DR, Merry P, Unsworth J, Kidd BL, Outhwaite JM, Ballard R, Morris CJ, Gray L, Lunec J. Hypoxic-reperfusion injury in the inflamed human joint. Lancet. 1989 Feb 11;1(8633):289-93.

McAlindon TE, Jacques P, Zhang Y, Hannan MT. Do antioxidant micronutrients protect against the development and progression of knee osteoarthritis?. Arthritis Rheum. 1996 Apr;39(4):648-56.

Magnesium Nutritional Supplementation

Magnesium is the “Muscle Relaxation” mineral- used in ER and Obstetrics
Magnesium deficiency may increase clenching
Most Magnesium is intracellular so blood test may not detect deficiency

Supplemental Magnesium

Take 2h before bed (8pm).

Too much will cause Diarrhea. Right amount will loosen stools.

Need to be sure kidneys are healthy

Natural Calm Magnesium Citrate- 1 teaspoon (162mg)

Mother Earth Ionic Angstrom Magnesium- 0.5 teaspoon sublingual (5mg)



www.naturalvitality.com



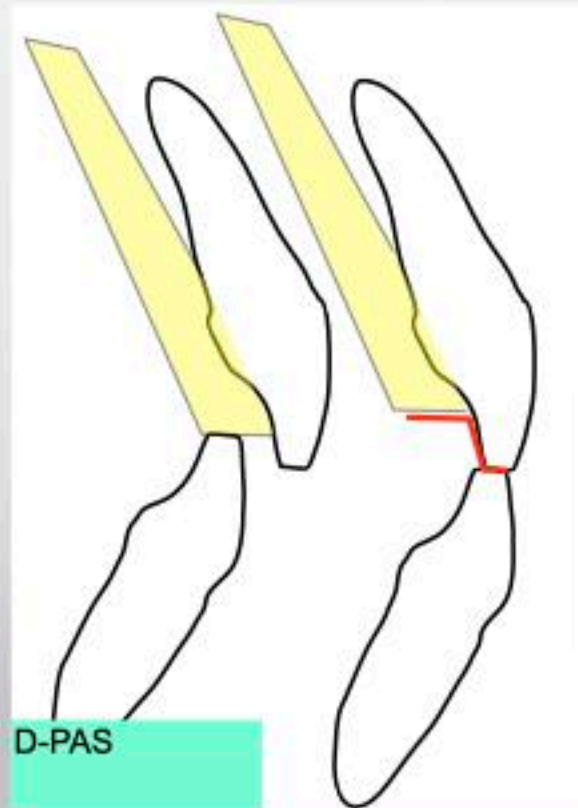
www.meminerals.com

Muscle Nerve. 2014 Apr 8. doi: 10.1002/mus.24260. Extracellular magnesium and calcium reduce myotonia in isolated CIC-1 inhibited human muscle. Skov M1, de Paoli FV, Lausten J, Nielsen OB.

Gynecol Endocrinol. 2007 Jul;23(7):368-72. Magnesium ion inhibits spontaneous and induced contractions of isolated uterine muscle. Tica VI1, Tica AA, Carlig V, Banica OS.

Studies on magnesium deficiency in animals: i. symptomatology resulting from magnesium deprivation. H. D. Kruse, Elsa R. Orent and E. V. McCollum. J. Biol. Chem. 1932, 96:519-539.

Diagnostic Palatal Anterior Stop D-PAS



D-PAS



Frontal view orthotic in



Basically an upper Hawley with anterior stop without clasps or wire

Diagnostic Palatal Anterior Stop

D-PAS Test: Wear for 2 weeks, 24/7, take out to eat

Better- Decrease in Symptoms

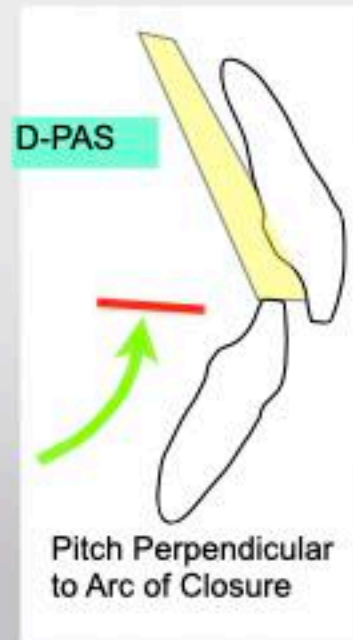
- Sleep Clenching Inhibited: Wear D-PAS as night guard
- Orthotic Improved Airway: D-PAS as night guard
- Occlusal Muscle Disharmony: Occlusal Adjust

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

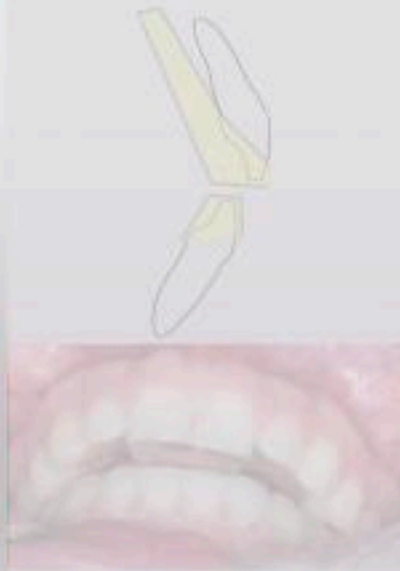
Which Orthotic to use:

Sleep Clenching with anterior inhibition

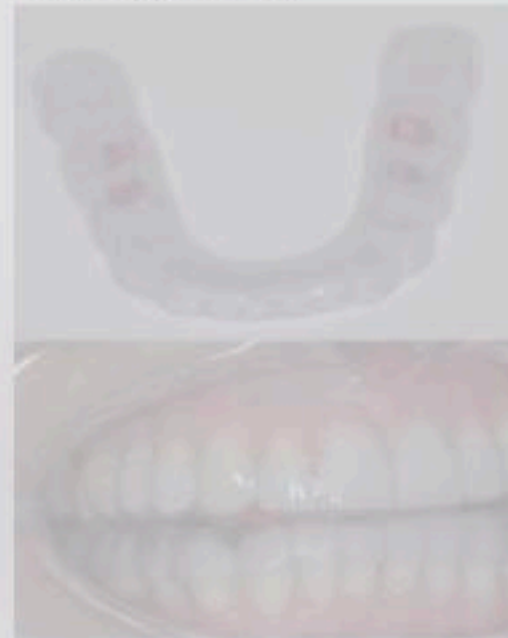
D-PAS
Diagnostic-
Palatal Anterior Stop



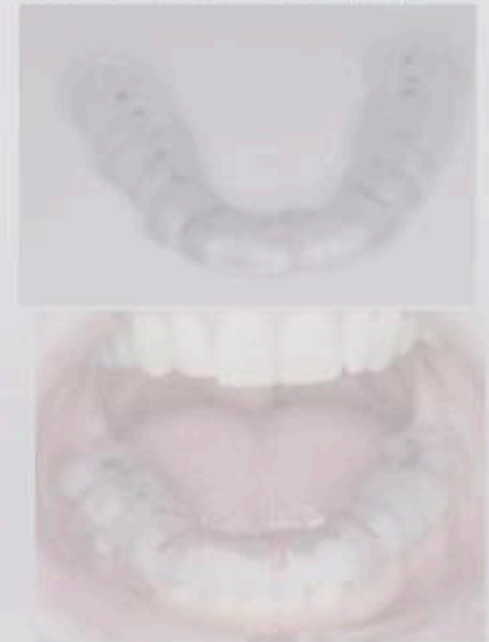
Brux-PAS
with lower Essix



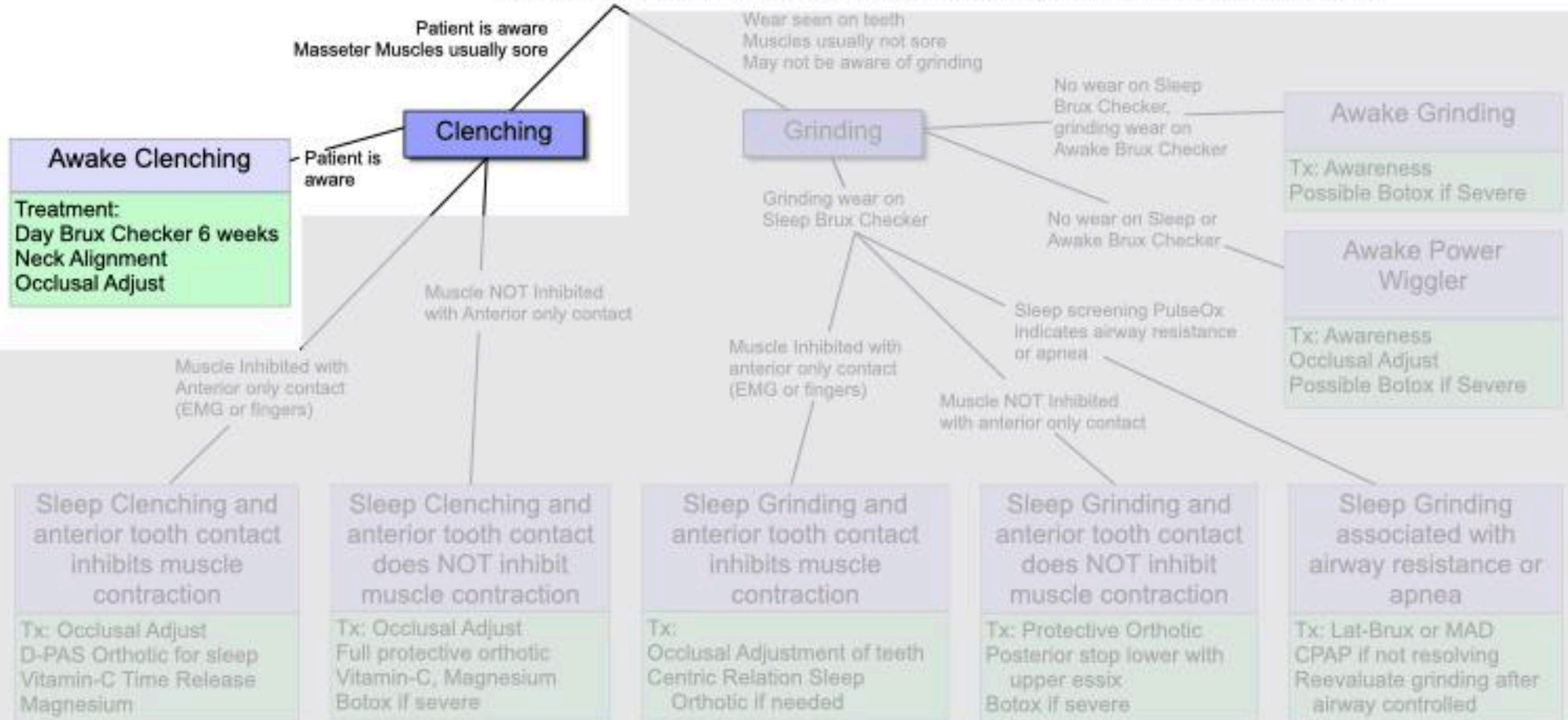
Hard Lower Posterior Stop
with upper essix



Hard Lower Full Coverage
Centric Relation Orthotic

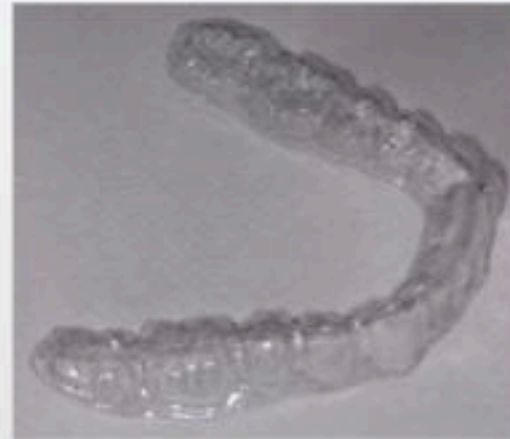


BRUXING: PARAFUNCTIONAL TOOTH CONTACT



Daytime Clenching- Clear Brux Checker Increase awareness to break habit

Very thin: Similar to mylar used for composites

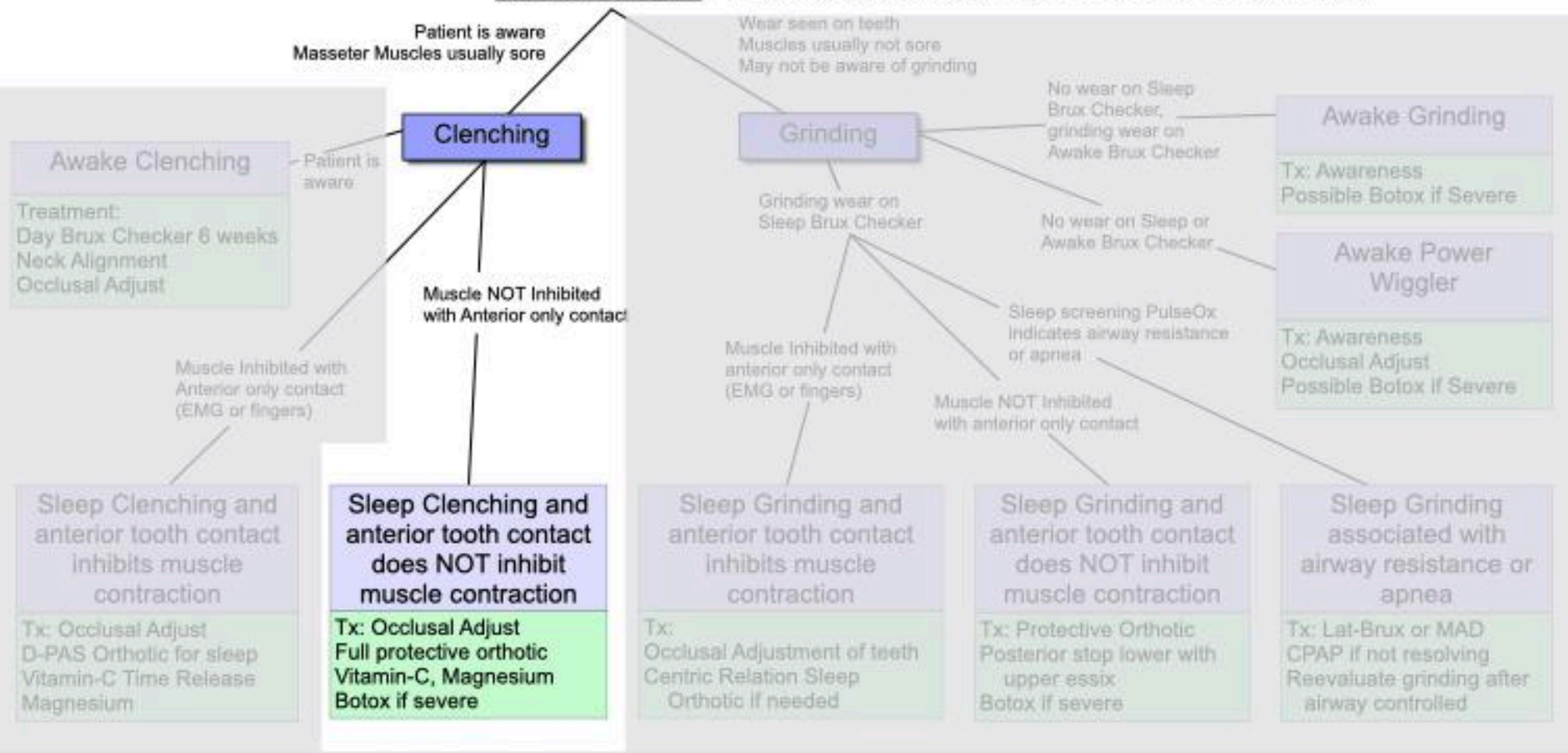


Great Lakes Orthodontics
Biostar Platzhalterfolie
Item Ref 3202.1

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



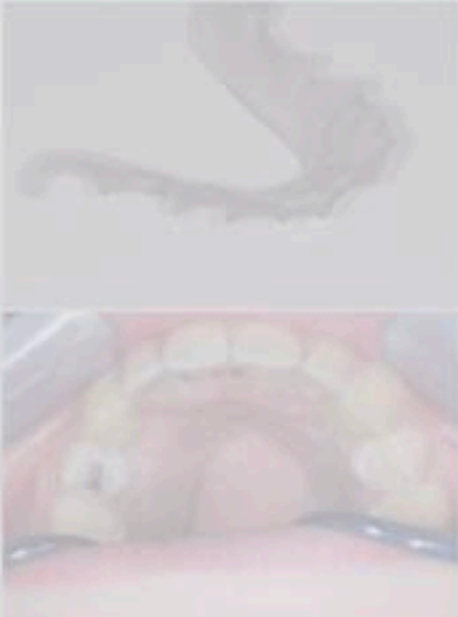
BRUXING: PARAFUNCTIONAL TOOTH CONTACT



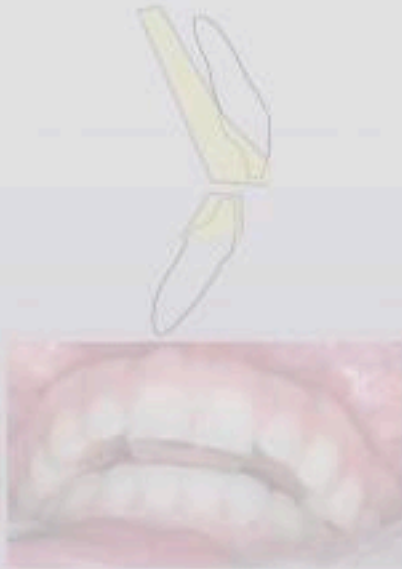
Which Orthotic to use:

Sleep Clenching with NO anterior inhibition

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



Medications that affect Parafunction

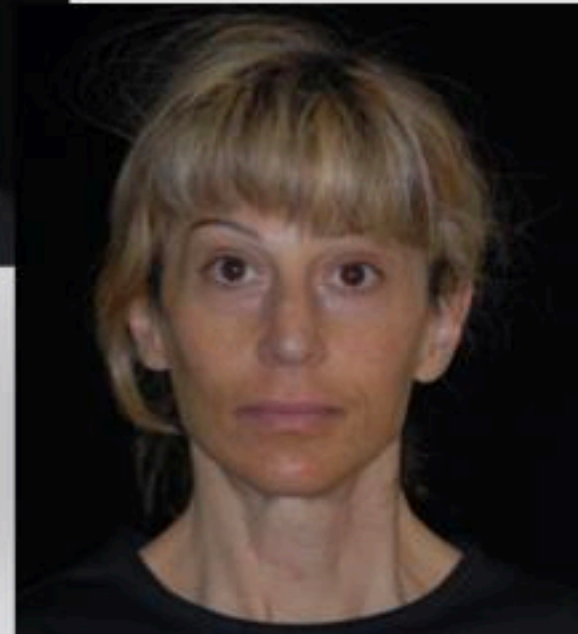
Botox will decrease strength of bruxing contraction
Decrease Masseter Hypertrophy

Botox injection
Masseter Muscles



Need to address cervical and occlusal issues along with Botox therapy

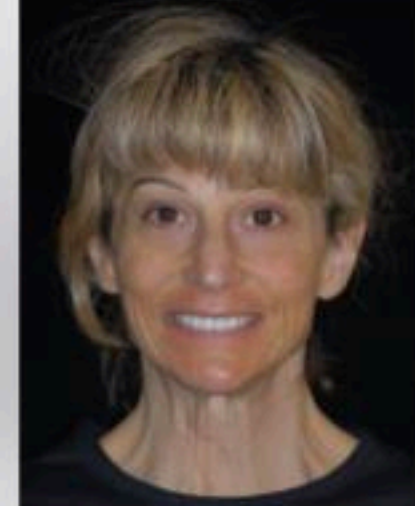
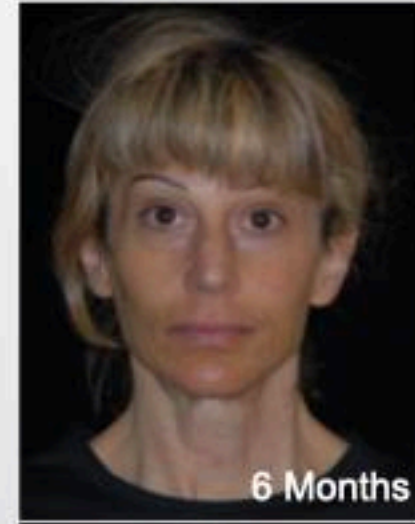
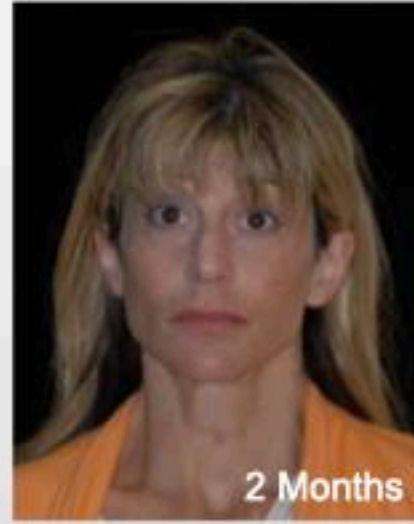
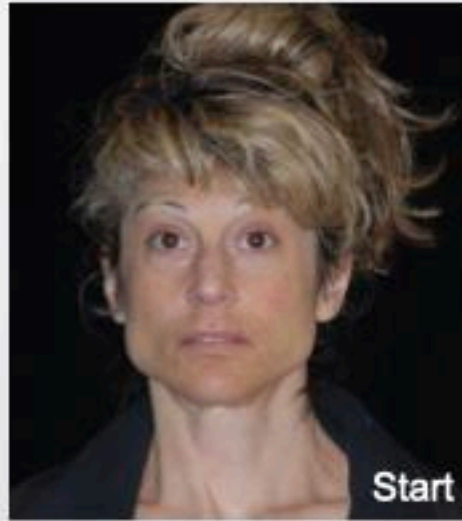
6 months



J Plast Reconstr Aesthet Surg. 2010 Dec;63(12):2026-31. Evaluation and selecting indications for the treatment of improving facial morphology by masseteric injection of botulinum toxin type A. Gaofeng L1, Jun T, Bo P, Bosheng Z, Qian Z, Dongping L.

Medications that affect Bruxing

Botox injection
Masseter
Muscles



Medications that affect Bruxing

Selective Serotonin Reuptake Inhibitors

SSRI that increase bruxing: Prozac, Zoloft

SSRI neutral on bruxing: Cymbalta, Wellbutrin

Klonopin/Clonazepam (benzodiazepine)

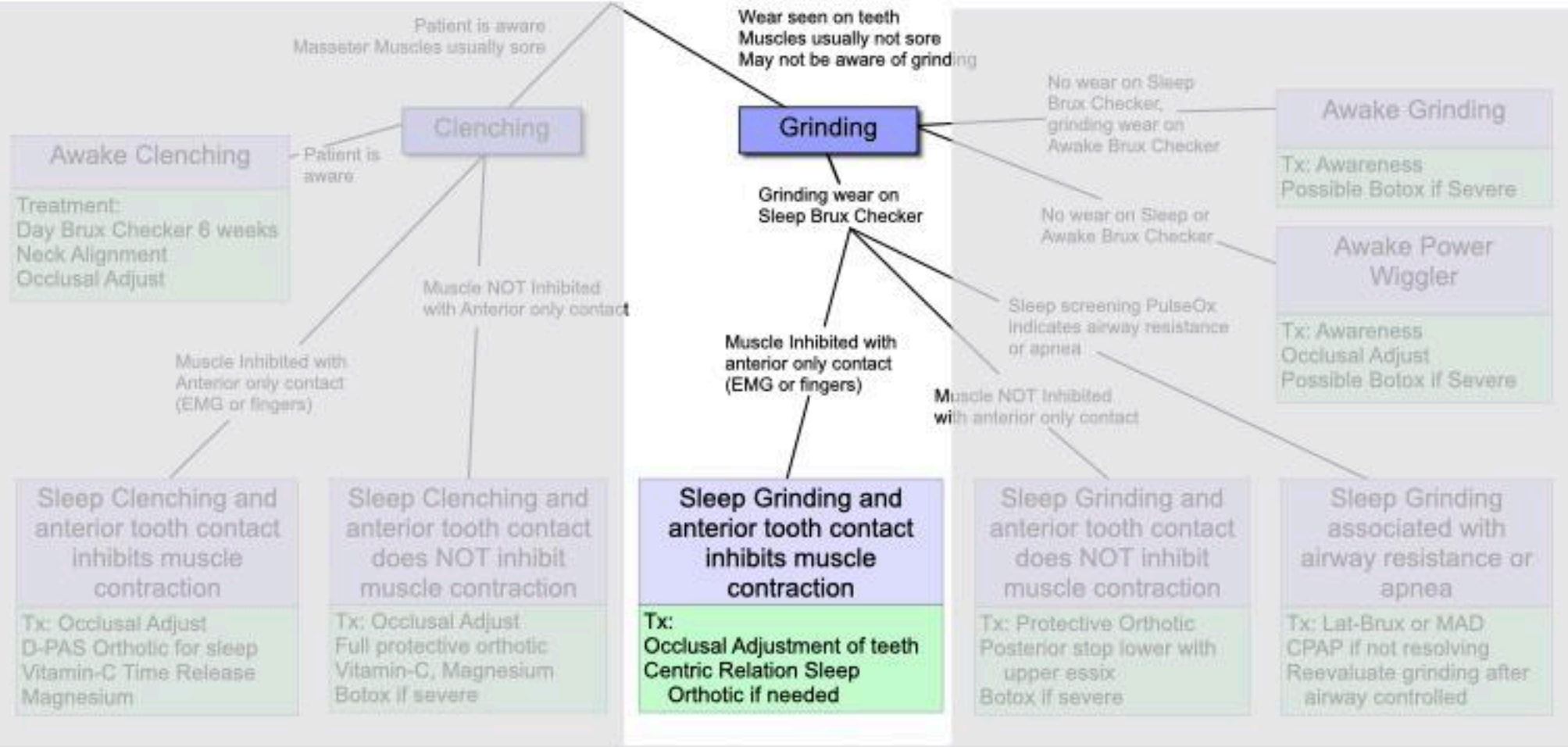
May decrease sleep bruxing

Addiction potential, causes low BP

Not a long term solution



BRUXING: PARAFUNCTIONAL TOOTH CONTACT



Awake Clenching

Patient is aware

Treatment:
Day Brux Checker 6 weeks
Neck Alignment
Occlusal Adjust

Sleep Clenching and anterior tooth contact inhibits muscle contraction

Muscle Inhibited with Anterior only contact (EMG or fingers)

Tx: Occlusal Adjust
D-PAS Orthotic for sleep
Vitamin-C Time Release
Magnesium

Sleep Clenching and anterior tooth contact does NOT inhibit muscle contraction

Muscle NOT Inhibited with Anterior only contact

Tx: Occlusal Adjust
Full protective orthotic
Vitamin-C, Magnesium
Botox if severe

Sleep Grinding and anterior tooth contact inhibits muscle contraction

Grinding wear on Sleep Brux Checker
Muscle Inhibited with anterior only contact (EMG or fingers)

Tx:
Occlusal Adjustment of teeth
Centric Relation Sleep
Orthotic if needed

Sleep Grinding and anterior tooth contact does NOT inhibit muscle contraction

Muscle NOT Inhibited with anterior only contact

Tx: Protective Orthotic
Posterior stop lower with upper essix
Botox if severe

Sleep Grinding associated with airway resistance or apnea

Sleep screening PulseOx indicates airway resistance or apnea

Tx: Lat-Brux or MAD
CPAP if not resolving
Reevaluate grinding after airway controlled

Awake Grinding

No wear on Sleep Brux Checker, grinding wear on Awake Brux Checker

Tx: Awareness
Possible Botox if Severe

Awake Power Wiggler

No wear on Sleep or Awake Brux Checker

Tx: Awareness
Occlusal Adjust
Possible Botox if Severe

Which Orthotic to use:

Sleep Grinding with anterior inhibition

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





Anatomic Orthotic by Dr. Buzz Raymond



Pankey Study Clubs
Tanner Study Clubs

Occlusal Muscle Disharmony

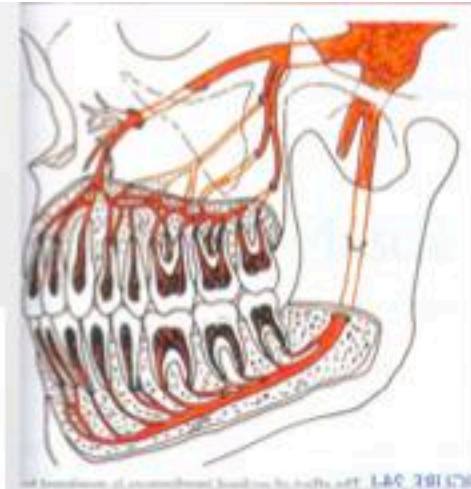
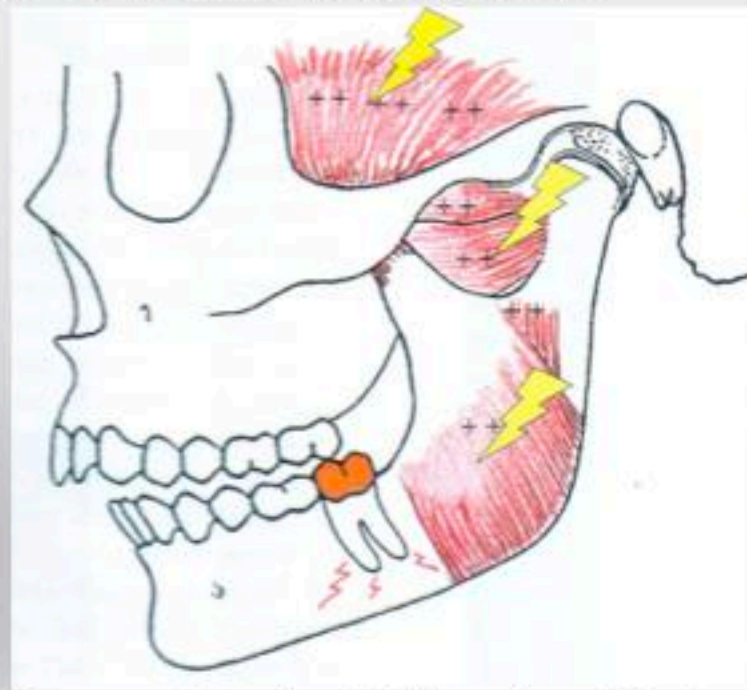
Uneven tooth contact with condyles fully seated triggers muscle activity

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

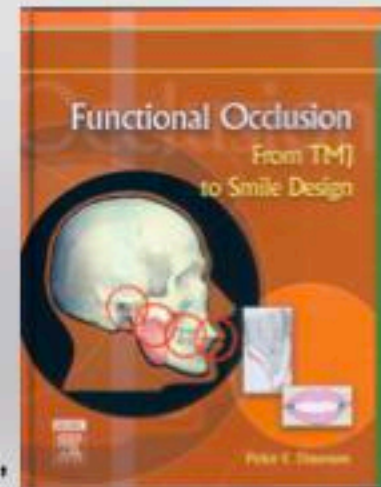
Disharmony in all muscles: Splinting/Bracing

Muscles sore from overuse

Muscles do not think- CNS input



from Dawson's Textbook, "Functional Occlusion"



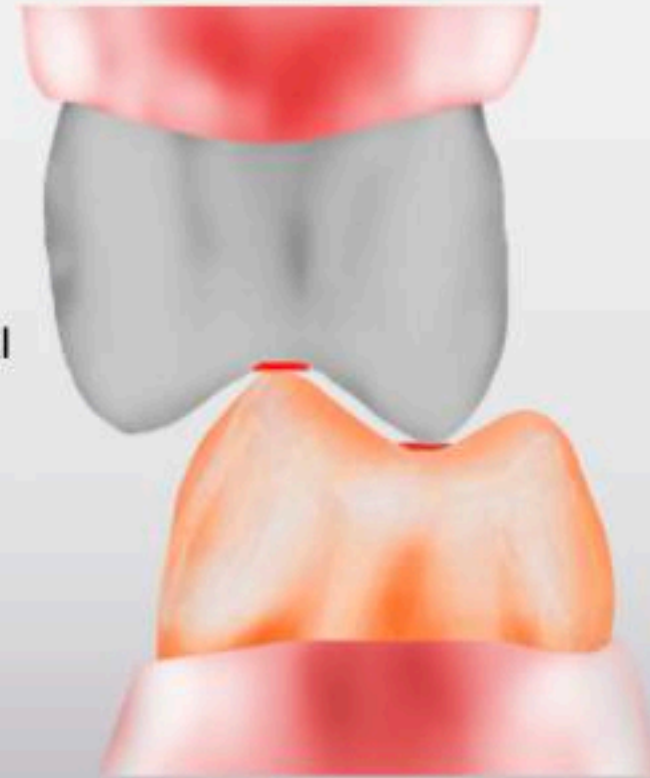
LD Pankey's 3 Rules of Occlusion

(Clyde Schuyler)

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

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

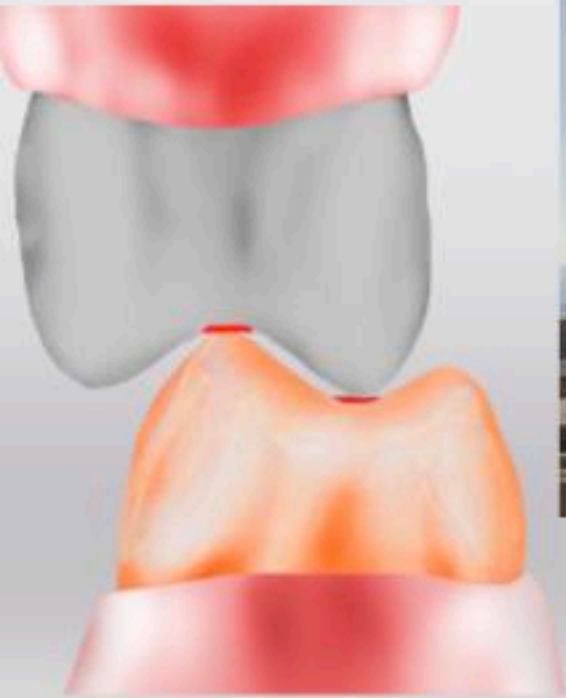
Bonus Observation- All the above work much better the closer the teeth are to being on the Curve of Spee and Curve of Wilson



Drawing by Dr Jim Kessler

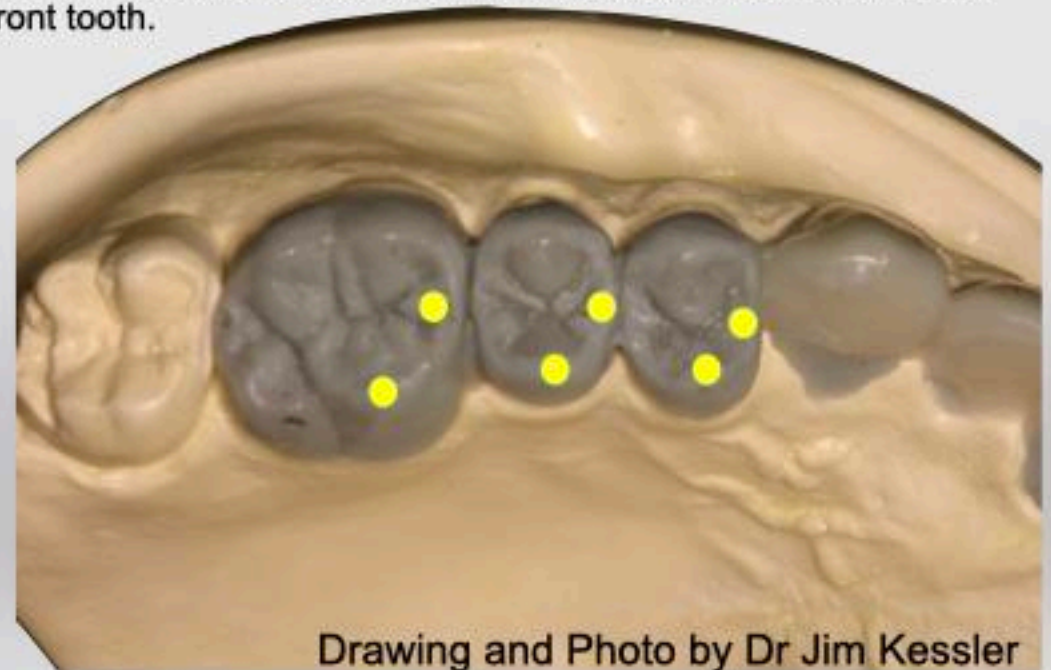
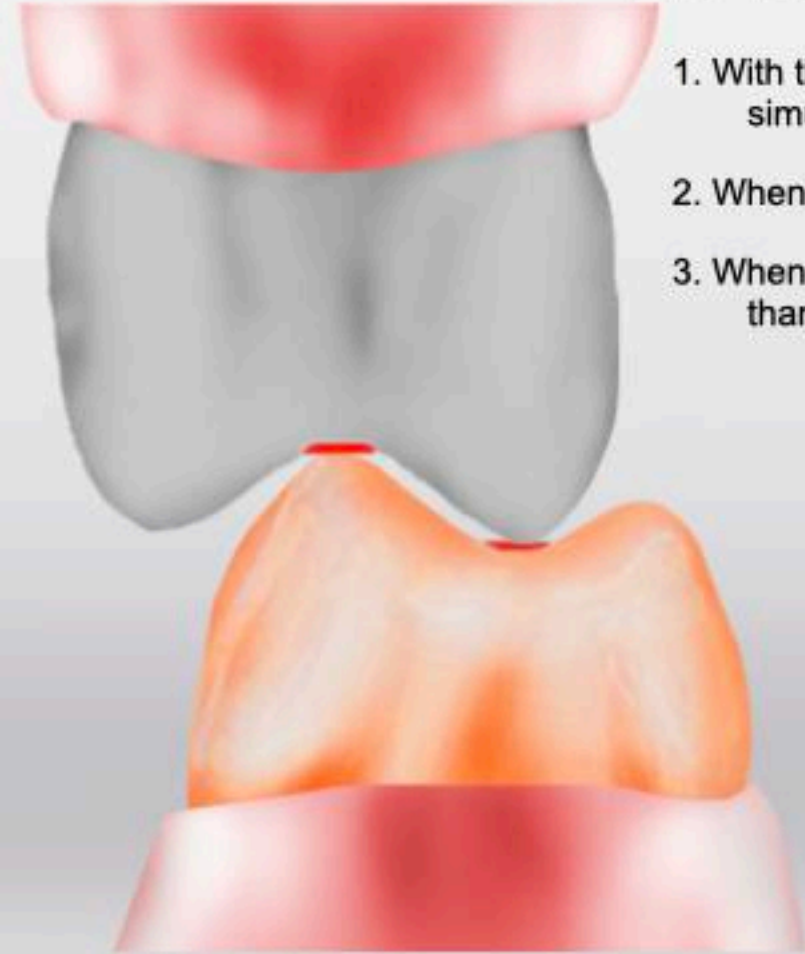
2. When you squeeze, neither a tooth nor the mandible moves (in a lateral direction).

Rule #2 = Flat Landing Area



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

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



Drawing and Photo by Dr Jim Kessler

Which Orthotic to use:

Sleep Grinding with anterior inhibition

D-PAS
Diagnostic-
Palatal Anterior Stop



Brux-PAS
with lower Essix



Hard Lower Posterior Stop
with upper essix

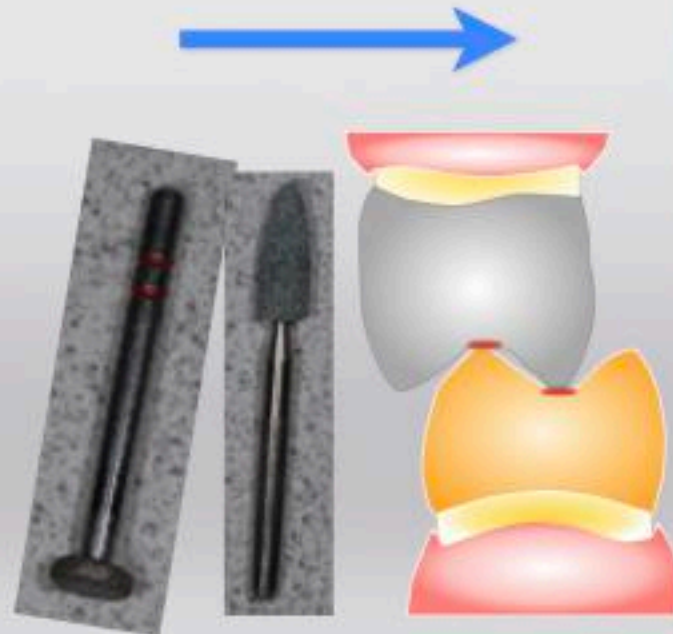
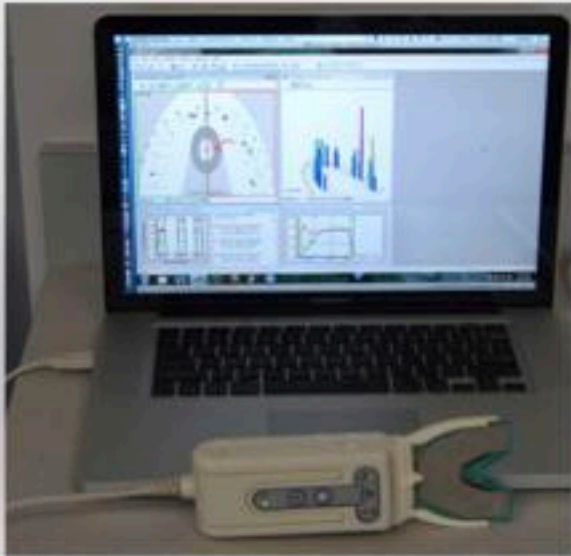


Hard Lower Full Coverage
Centric Relation Orthotic

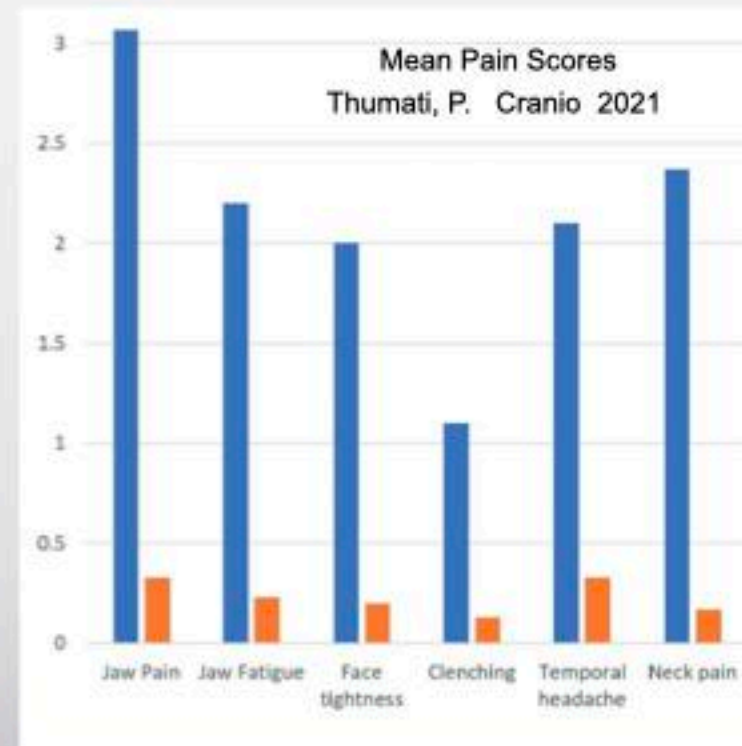
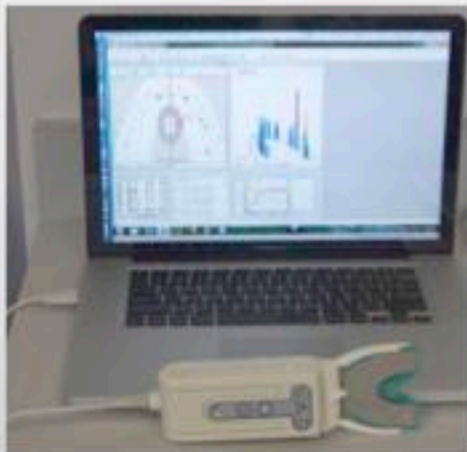


The best orthotic may be no orthotic with teeth adjusted to a disclusion time of less than 400 mSec with T-Scan

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



The best orthotic may be no orthotic with teeth adjusted to a disclusion time of less than 400 mSec with T-Scan



Kerstein, RB. Cranio 1995

Treatment of myofascial pain dysfunction syndrome with occlusal therapy to reduce lengthy disclusion time—a recall evaluation.

Thumati, P. J Indian Prosthodont 2016

The effect of disocclusion time-reduction therapy to treat chronic myofascial pain: A single group interventional study with 3 year follow-up of 100 cases.

Thumati, P. Cranio 2021

A retrospective five-year survey on the treatment outcome of disclusion time reduction (DTR) therapy in treating temporomandibular dysfunction patients.

The best orthotic may be no orthotic with teeth adjusted to a disclusion time of less than 400 mSec with T-Scan

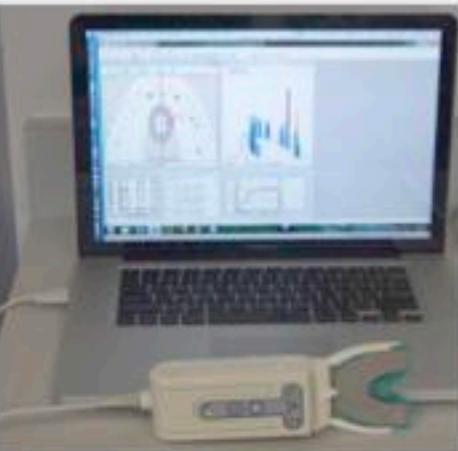


Table of Signs and Symptoms Associated with Bruxing

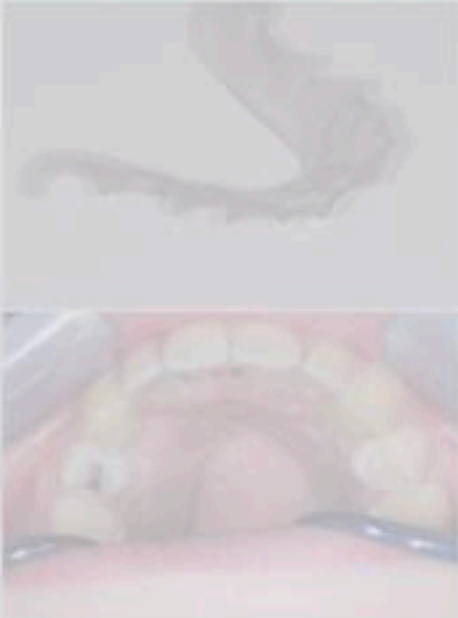
Patient Report with Bruxism None = 0, occasional = 1, often = 2, always = 3	Pre-treatment	Day 1 post	1 Week post	1 month post	12 months post
Aware of nighttime tooth grinding	88	38	21	20	11
Morning facial muscle soreness	89	38	2	2	0
Morning headache	94	31	23	20	3
Afternoon or evening headache	55	35	1	1	0
Teeth sensitive to cold	74	33	0	0	0
Daytime tooth clenching or grinding	48	36	9	7	1
Clinical examination never = 0, minor = 1, moderate = 2, severe = 3	p =	0.00078		0.00715	
	0.00408	0.02275			
Current Tooth Wear	57	57	57	57	57
Masseter muscle hypertrophy	49	49	15	15	15
Muscles tender to palpation	44	37	1	1	1
Wear facets	46	46	46	46	46
Indentations on the tongue	45	45	10	6	0
Linear Alba on inner cheek	15	15	4	4	0

Thumati, Kerstein, Radke. Advanced Dental Technologies & Techniques. December 2021
 Bruxism Improvements After Disclusion Time Reduction (DTR) – A Pilot Study.

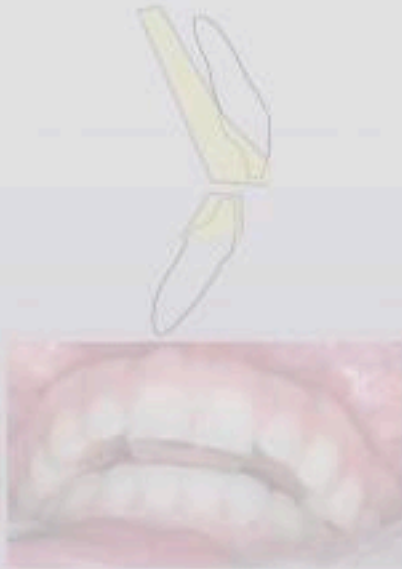
Which Orthotic to use:

Sleep Grinding with NO anterior inhibition

D-PAS
Diagnostic-
Palatal Anterior Stop



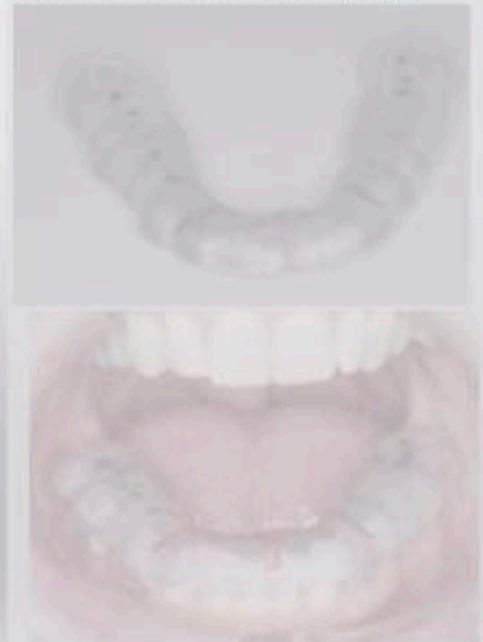
Brux-PAS
with lower Essix



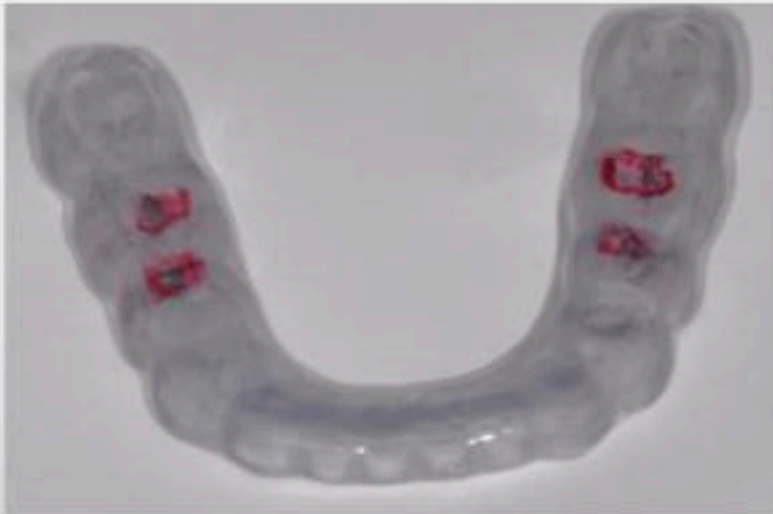
Hard Lower Posterior Stop
with upper essix



Hard Lower Full Coverage
Centric Relation Orthotic



Lower Posterior Stop Night guard with upper Essix





Side to Side Severe Grinding

Sleep Disorder
?Airway Related?



How to Restore??



Lavigne GJ, Khoury S, Abe S, Yamaguchi T, Raphael K., Bruxism physiology and pathology: an overview for clinicians. *J Oral Rehabil.* 2008 Jul;35(7):476-94

Delivery

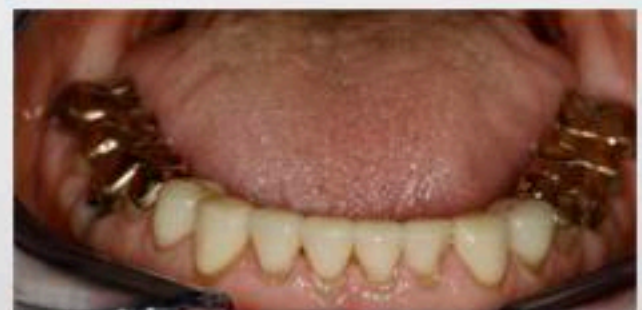




5 years post tx



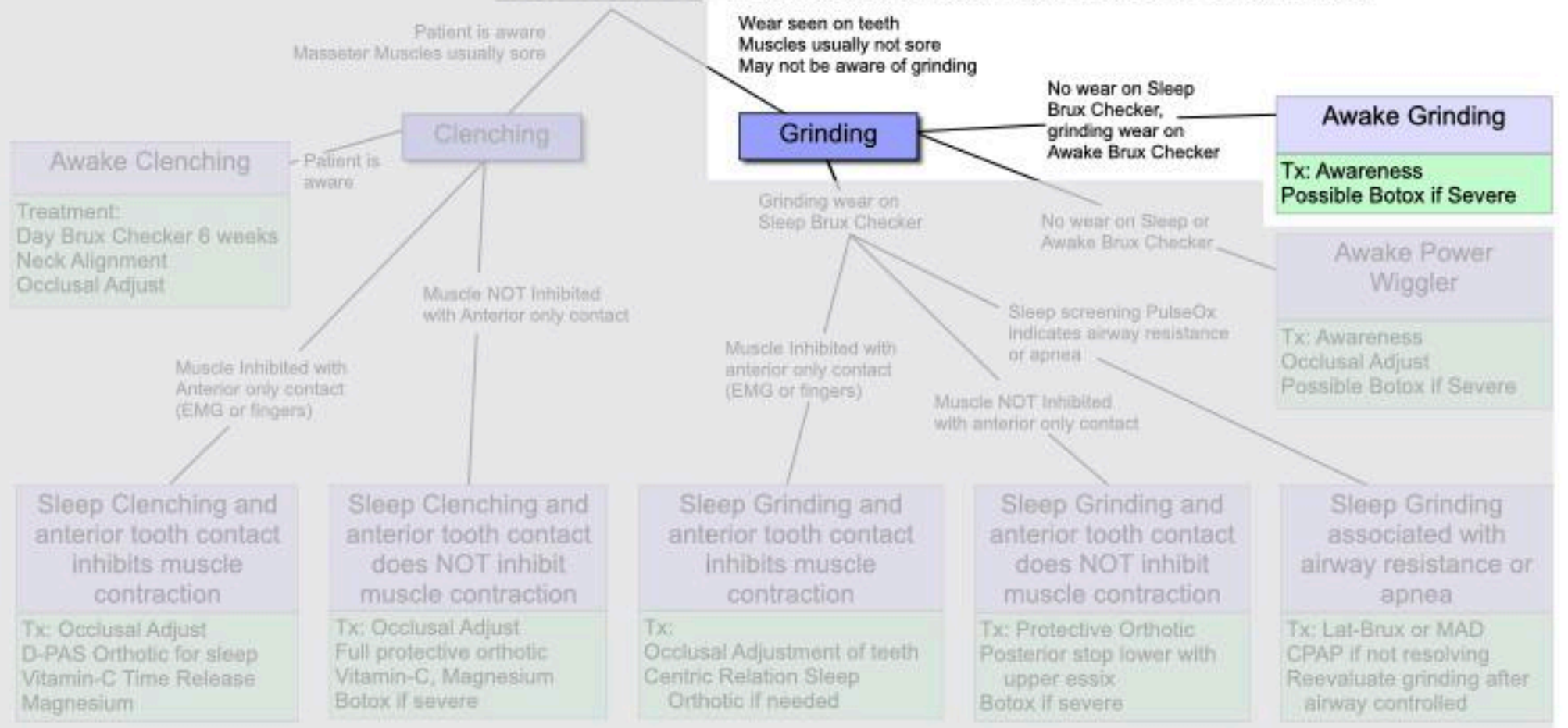
Key Point:
Build in group function
Side to Side Grinders.



Kids 25-35% Grind

Serra-Negra JM, Paiva SM, Seabra AP, Dorella C, Lemos BF, Pordeus IA., Prevalence of sleep bruxism in a group of Brazilian schoolchildren. *Eur Arch Paediatr Dent.* 2010 Aug;11(4):192-5.

BRUXING: PARAFUNCTIONAL TOOTH CONTACT



Awake Clenching

Treatment:
Day Brux Checker 6 weeks
Neck Alignment
Occlusal Adjust

Sleep Clenching and anterior tooth contact inhibits muscle contraction

Tx: Occlusal Adjust
D-PAS Orthotic for sleep
Vitamin-C Time Release
Magnesium

Sleep Clenching and anterior tooth contact does NOT inhibit muscle contraction

Tx: Occlusal Adjust
Full protective orthotic
Vitamin-C, Magnesium
Botox if severe

Sleep Grinding and anterior tooth contact inhibits muscle contraction

Tx:
Occlusal Adjustment of teeth
Centric Relation Sleep
Orthotic if needed

Sleep Grinding and anterior tooth contact does NOT inhibit muscle contraction

Tx: Protective Orthotic
Posterior stop lower with
upper essix
Botox if severe

Awake Grinding

Tx: Awareness
Possible Botox if Severe

Awake Power Wiggler

Tx: Awareness
Occlusal Adjust
Possible Botox if Severe

Sleep Grinding associated with airway resistance or apnea

Tx: Lat-Brux or MAD
CPAP if not resolving
Reevaluate grinding after
airway controlled

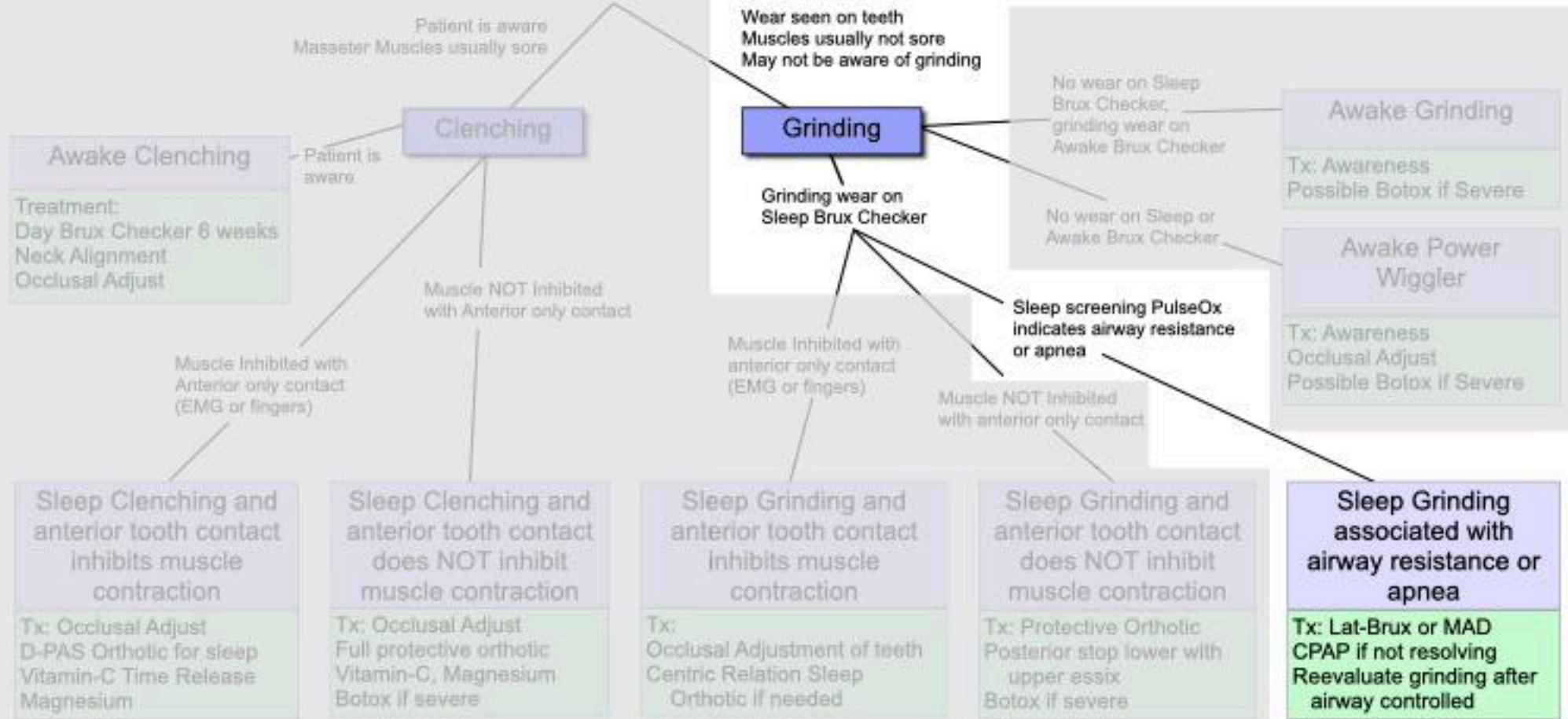
Fracture of porcelain and fracture of lower teeth 6 months
after delivery of full mouth crowns
(Not my crowns)



Occlusal Adjustment on curve Spee/Wilson
Set up group function
Long term Radica Temps 23-26
Pt reported crowns finally felt natural



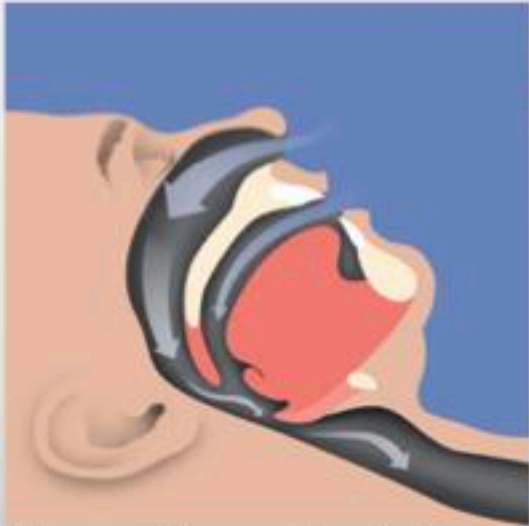
BRUXING: PARAFUNCTIONAL TOOTH CONTACT



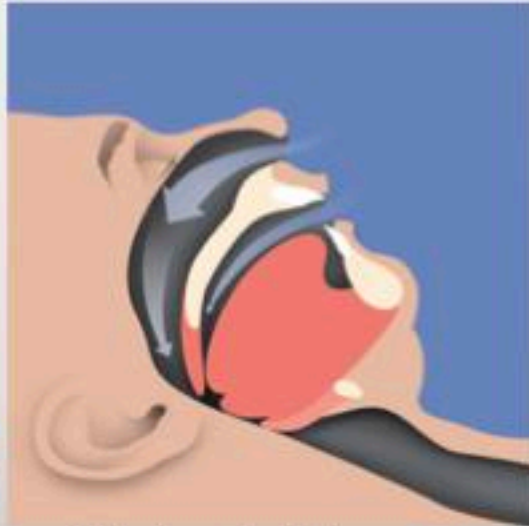
Mandibular Advancement Devices (MAD)
Open the airway by advancing the mandible and tongue



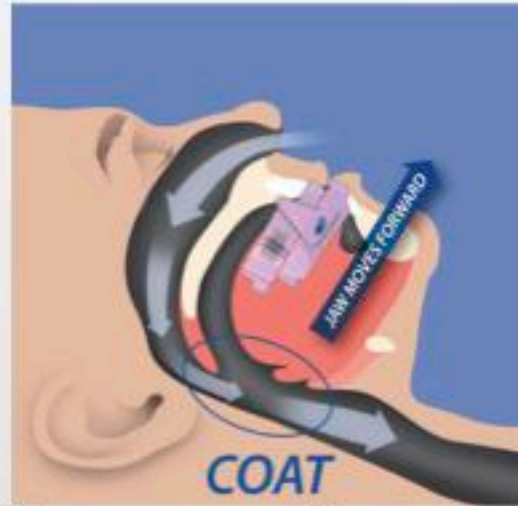
Normal Airway



Upper Airway Resistance
Snoring in men
Purring in women



Obstructed Apnea
Airway



Airway opens with
Mandibular Advancement

Better Solutions:
Treat Causes

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

Disease Stage 2

Compensation: Airway Maintained

Signs

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

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 O₂ Saturation
RERA- Respiratory Arousals
↓ 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 O₂ Saturation
Apnea
Cardiovascular Damage
Elevated BP
GERD
Sleep Teeth Grinding

Symptoms

All of stage 2, 3 plus....
Worn Teeth

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 3+% O₂ Desaturation

Disordered Breathing Disease Progression

Disease Stage 1	Disease Stage 2	Disease Stage 3	Disease Stage 4
Predisposing Factors	Compensation: Airway Maintained	Deep Airway Partial Collapse	Sleep Airway Full collapse
Small Airway Tongue Tie, Lip Tie Sottle Fed as Infant Dysfunctional Swallow Allergies Nasal Obstruction Large Tonsil Large Adenoids Large Tongue Mid-face Deficient Mandibular Deficient	Signs Tongue Grinding Indents in Tongue Head Postured Forward Jaw Postured Forward Sore Masseters Sore Neck Muscles Mouth Breathing Symptoms Facial Ache Not Waking Rested Daily Fatigue Neck Stiffness	Signs All of stage 1 and 2 plus... Upper Airway Resistance 2-4% Drop O ₂ Saturation RERA- Respiratory Arousal ↓ Growth Hormone Symptoms Hair Hair Fluctuation Snoring or "Purring" Weight Gain Cognitive Impairment, ADD Hyperactivity	Signs All of stage 1, 2, 3 plus... 4%+ drop O ₂ Saturation Apnea Cardiovascular Damage Elevated BP GERD Sleep Teeth Grinding Symptoms All of stage 2, 3 plus... Worn Teeth

AHI 1-4

"Normal" ??

Signs

- Apnea
- 4% drop O₂ Saturation
- Cardiovascular Damage
- Elevated BP
- GERD
- Sleep Teeth Grinding

Symptoms

- Not Waking Rested, Daily Fatigue
- Cognitive Impairment
- Worn Teeth

AHI 5-15

Mild OSA

AHI 15-30

Moderate OSA

AHI 30+

Severe

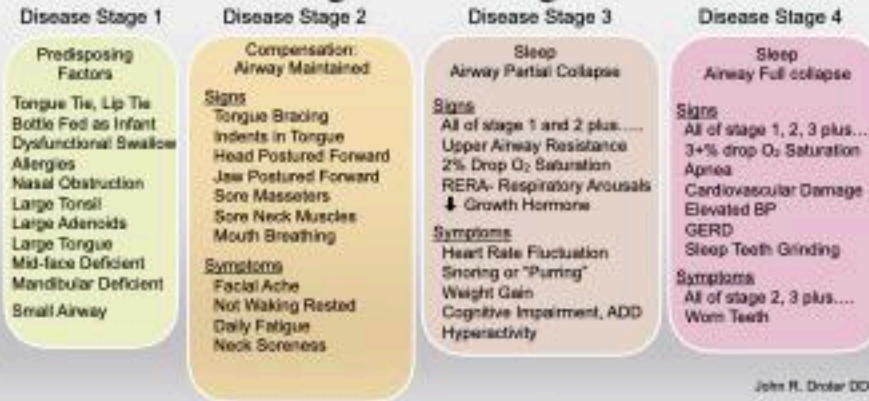
Irreversible Damage

John R. Droter DDS

Handout for Patients

www.drdroter.com

Disordered Breathing Disease Progression



*John R. Droter,
D.D.S.*
1000 Mitchellville Rd., 5805B
Bowie, Maryland, 20716
801-805-9400
www.drdroter.com

Disordered Breathing is a very serious condition that can be fatal.

Young patients can be treated, older patients can only be managed.

There are many causes. This is not a single disease with a single treatment.

Causes:
Nasal Obstruction
Tonsil Adenoids Obstruct
Mouth breathing
Tongue hypertrophy
Tongue Adipose
Inflammation Pharyngeal Tissue
Central Apnea

Disordered Breathing Disease Stage 4

OSA- Obstructive Sleep Apnea

AHI- Apnea Hypopnea Index

Apnea and Hypopnea events per hour

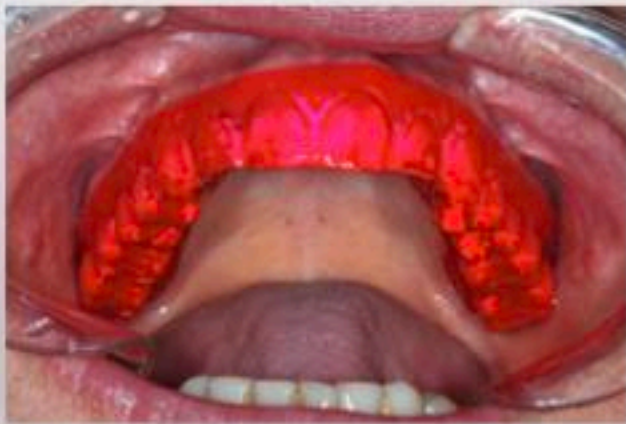
Apnea- Stop airflow for 10 seconds

Hypopnea- <50% airflow or 3+% O₂ Desaturation

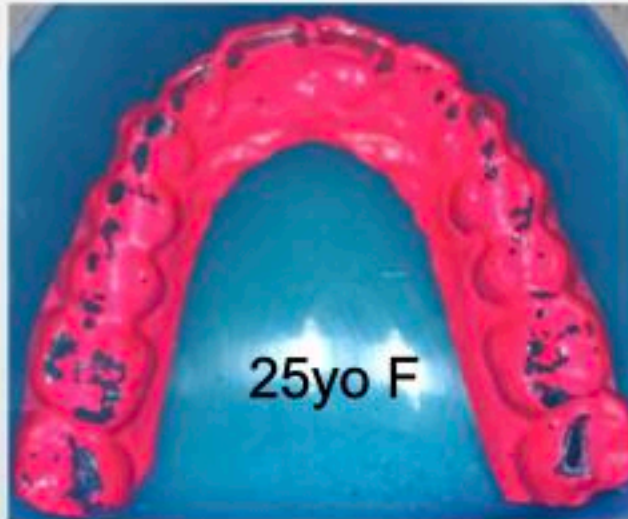


Brux Checker
Great Lakes Orthodontics

0.1mm Mylar



Made on Biostar Machine



25yo F

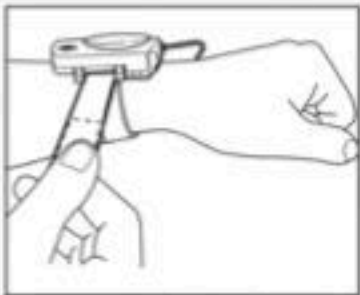


29yo F



30yo F

**If sleep grinding, is there an airway issue?
(Upper Airway Resistance or Obstructive Sleep Apnea)**



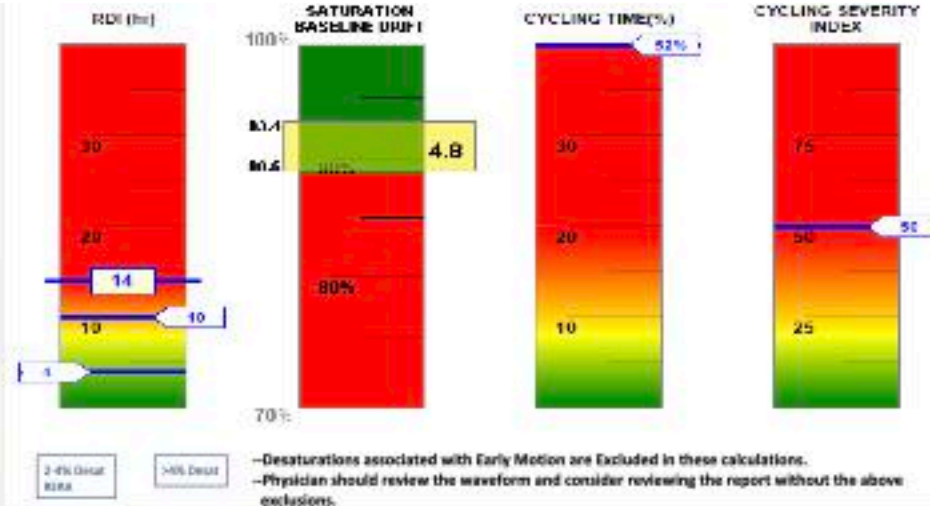
**High Resolution
Pulse Oximetry**

**Data every 1
second average
over 3 seconds**



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

**Order PULSOX: Go to my website
jdroter.com Doctor Links**



OXYGEN SATURATION BASELINE ANALYSIS

Oxygen Saturation Baseline	
Drift(OSBG) (normal <= 3)	5
Initial Saturation Baseline	93
Lowest Saturation Baseline	89
Highest Saturation Baseline	93

PATTERN BASED REPORT

Baseline is determined by the Mean SpO2 during 2 Minute window without Artifact and without Sweats.

The total time oxygen saturation was <= 88% was: 00:13:39

SPO2 CYCLING

% Time in Cycling (Duration)	52%	(02:50:14)
Cycling Frequency	45	
96% - Lowest Sat	13	
Cycling Severity Index	58	

TRADITIONAL REPORT

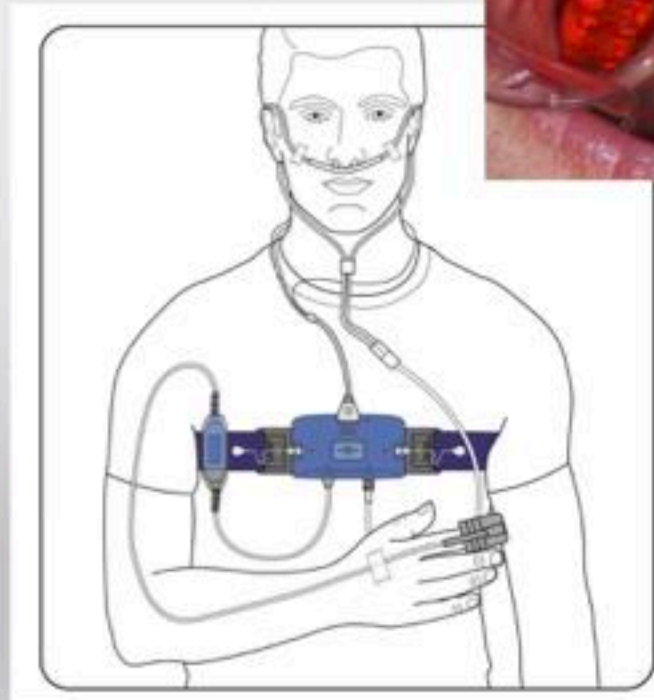
OD4:	5SpO2	DURATION	%TOTAL
Total OD4 Events: 58	94-100	00:16:37	5%
Time in OD4 Events: 06:29:26	88-94	04:57:26	91%
Avg OD4 Event Duration: 00:00:28	80-88	00:13:39	4%
<=88% OD4 Events: 23	70-80	00:00:00	0%
<=88% Longest Duration: 00:01:21	<= 70	00:00:00	0%
Minimum SpO2: 84	Total	05:27:42	99%
Avg Low 10% SpO2: 86	Motion Artifact	00:00:07	0.04%
Avg Low SpO2: 89	Error Signal	00:00:05	0.03%
Avg Low SpO2 <=88%: 87			

Definition of OD4 Event: a fall in oxygen saturation of at least 4% and persisting greater than 3 seconds.

zMachine

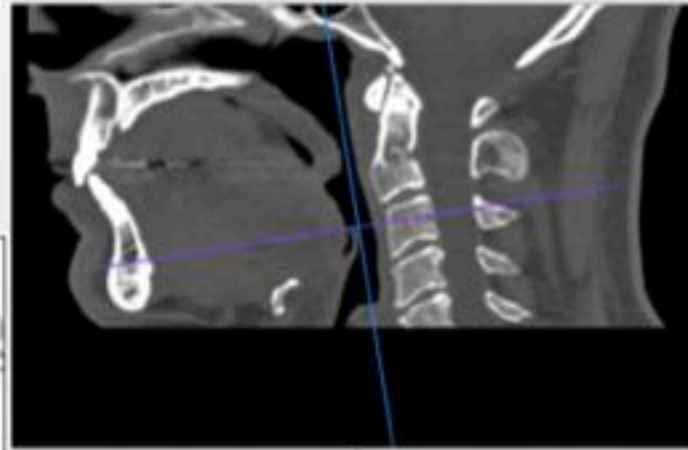
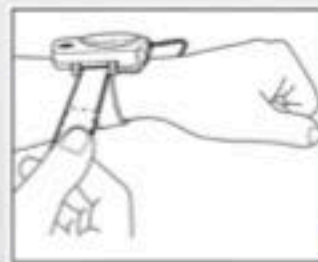
zMachine + Brux Checker
+ Snore Lab

GENERAL
sleep

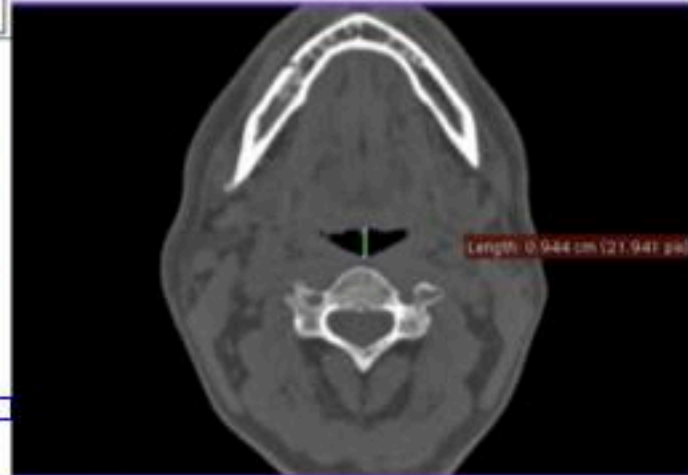


Call (888) 330-4424
Use Code: DROTER to receive special offer
Also ask for access to Droter Modified Report

Mild Obstructive Sleep Apnea



Referred to pulmonologist
 Medical Sleep Study
 PSG- Polysomnogram
 RDI 10

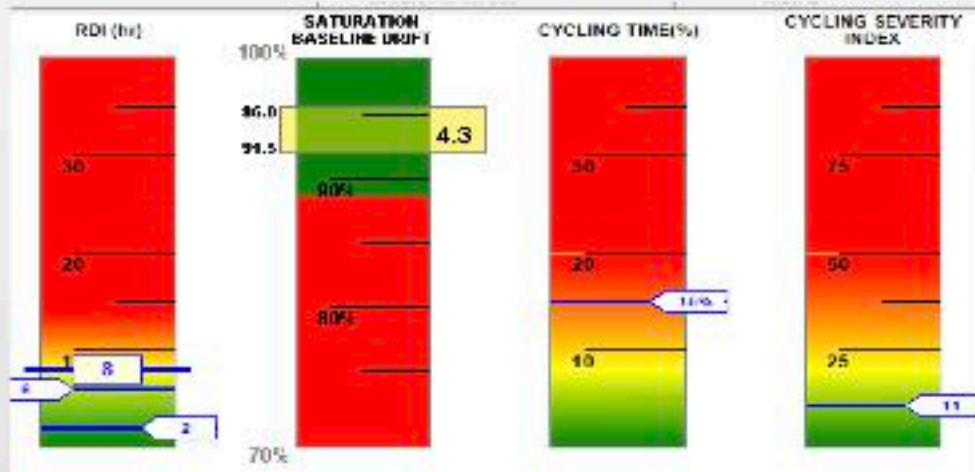


Home Sleep Airway Screening- RDI 10

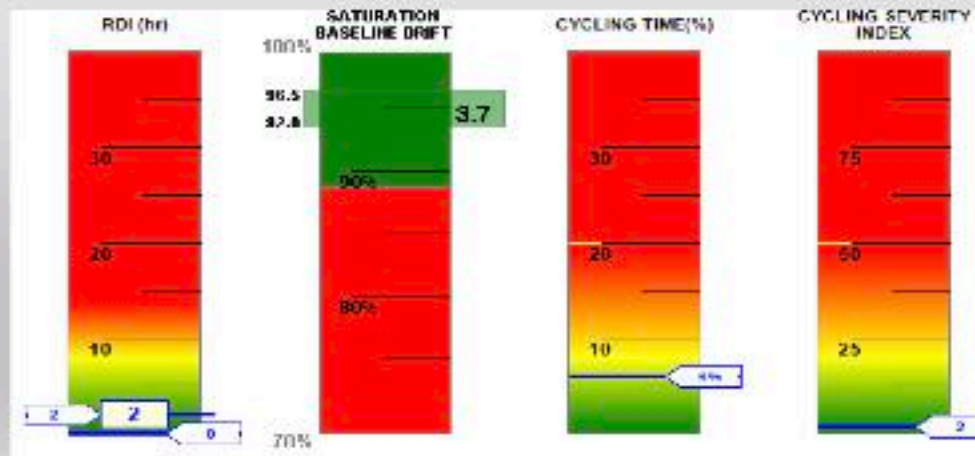
RDI= Respiratory Distress Index

Mild OSA = 5-15 Apnea/hr

MyTAP
Mandible
Advanced 4mm
RDI 8



MyTAP
Mandible
Advanced 5mm
RDI 2



RDI= Respiratory Distress Index



Treating Common TMDs in a General Practice

Management

Diagnosis

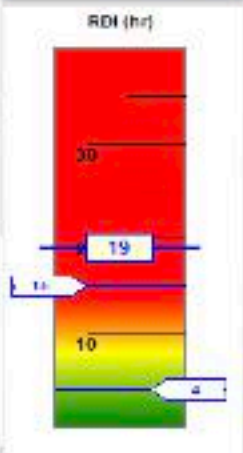
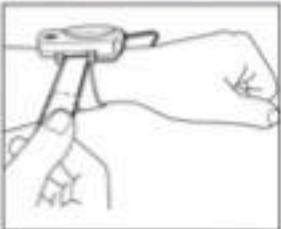
Sleep Grinding Airway Related

Pattern

Worn Teeth
Upper Airway Resistance

Treatment

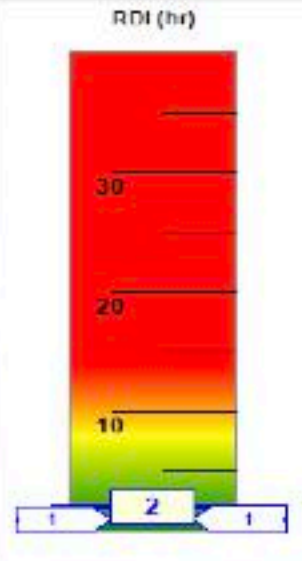
Mandibular Advancement
Appliance (after MD approves)



2-4% Desat
RERA

>4% Desat

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



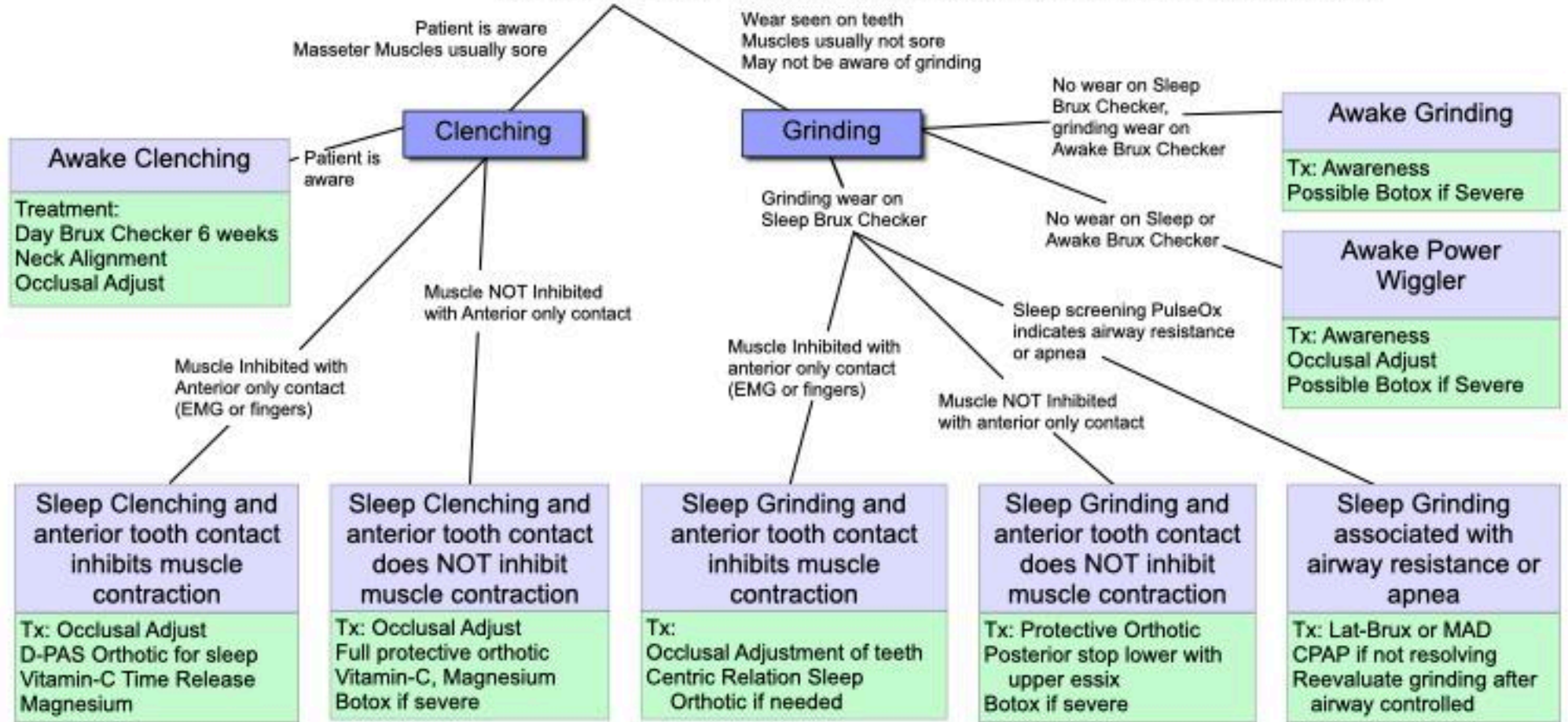
2-4% Desat
RERA

>4% Desat

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

Nylon MAD
Great Lakes Ortho

BRUXING: PARAFUNCTIONAL TOOTH CONTACT



If you want super simple:

Sleep Clenching with anterior inhibition

D-PAS
Diagnostic-
Palatal Anterior Stop

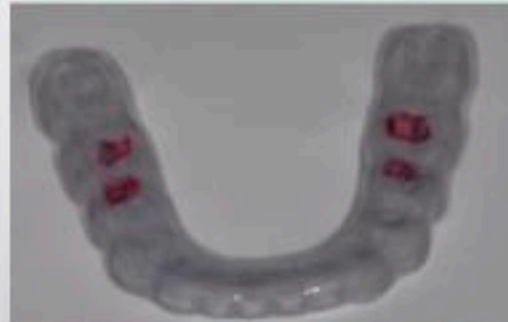


Brux-PAS
with lower Essix



Everybody else

Hard Lower Posterior Stop
with upper essix



Hard Lower Full Coverage
Centric Relation Orthotic



Which Orthotic to use:

D-PAS
Diagnostic-
Palatal Anterior Stop



Manage Sleep Clenching with anterior inhibition
To diagnose Occlusal Muscle Dysfunction



Which Orthotic to use:

Brux-PAS
with lower Essix



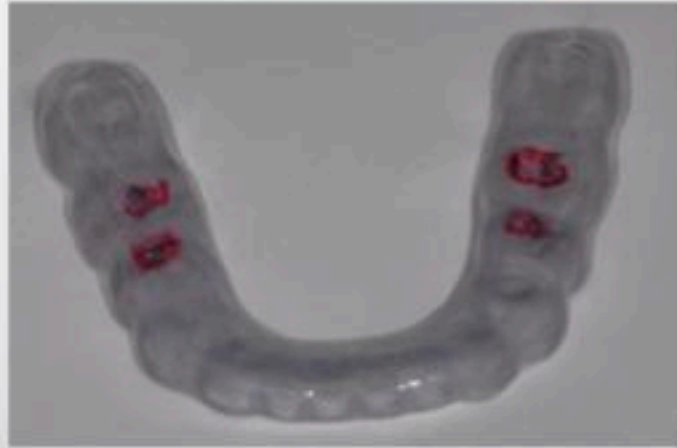
Sleep grinding with anterior inhibition
Sleep grinding with slight anterior inhibition
Sleep Clenching with only slight anterior inhibition
Power Wigglers: Grind Clench



Which Orthotic to use:

Sleep Clenching with NO anterior inhibition
Sleep Grinding with NO anterior inhibition

Hard Lower Posterior Stop
with upper essix



Which Orthotic to use:

Sleep Clenching with NO anterior inhibition
Sleep Grinding with anterior inhibition
To Diagnose Occlusal Muscle Dysfunction

Hard Lower Full Coverage
Centric Relation Orthotic



Which Orthotic to use:

Sleep Grinding with airway issues

AHI 20+
I like to use CPAP

Apnea Hypopnea Index
AHI less than 5



Lat-BruX
Great Lakes Ortho

Obstructive Sleep Apnea
AHI 5- to 20



Nylon MAD
Great Lakes Ortho



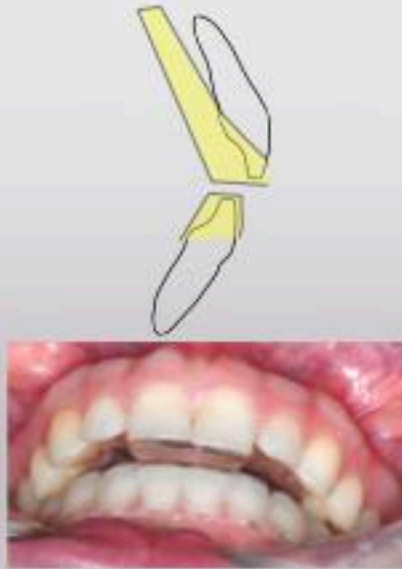
Nylon Herbst
Great Lakes Ortho

Which Orthotic to use:

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



6 Common TMDs

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

Occlusal Muscle Disharmony

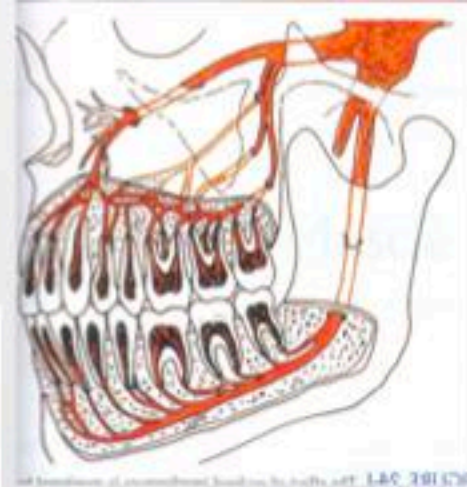
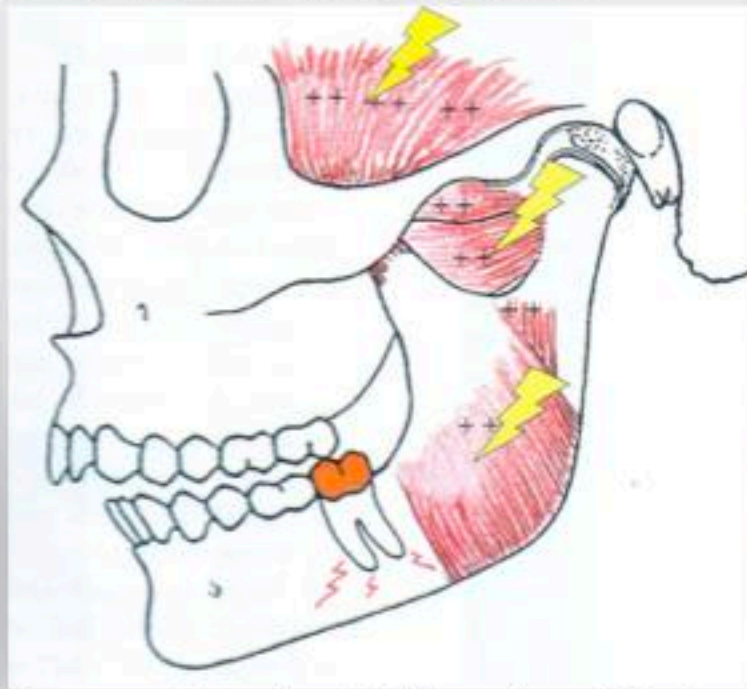
Uneven tooth contact with condyles fully seated triggers muscle activity

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

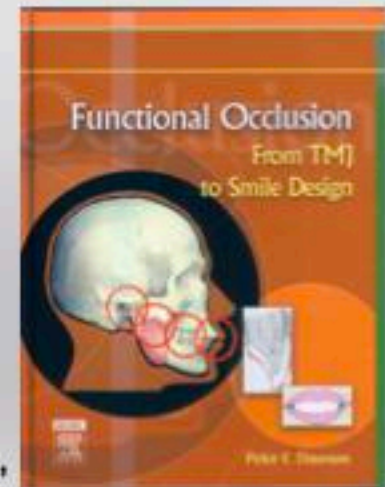
Disharmony in all muscles: Splinting/Bracing

Muscles sore from overuse

Muscles do not think- CNS input

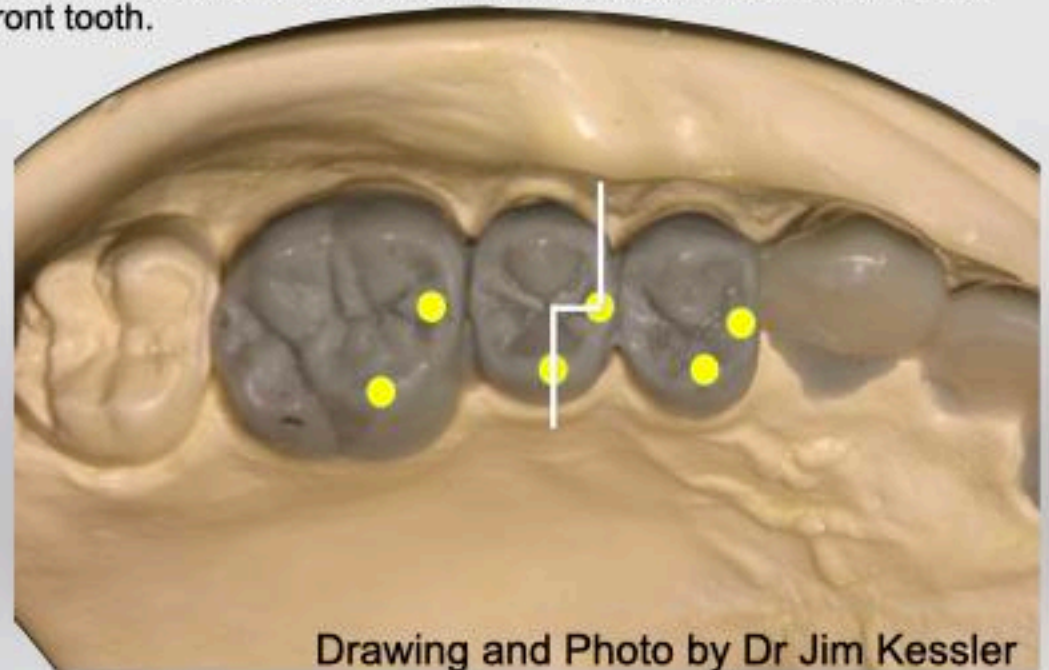
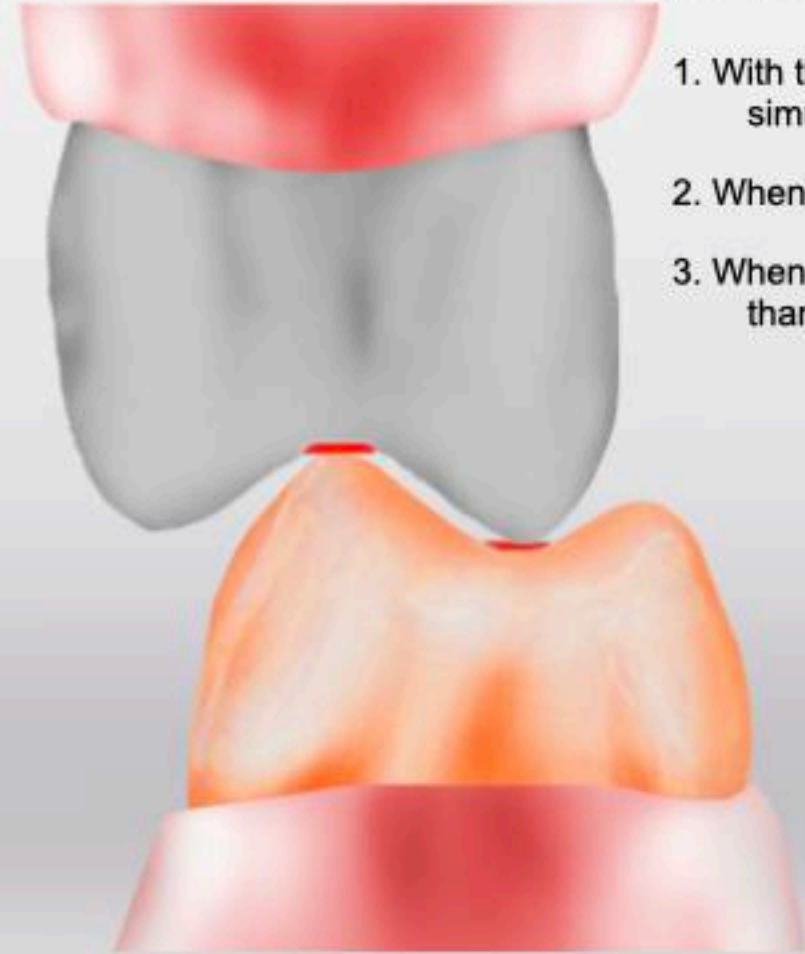


from Dawson's Textbook, "Functional Occlusion"



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

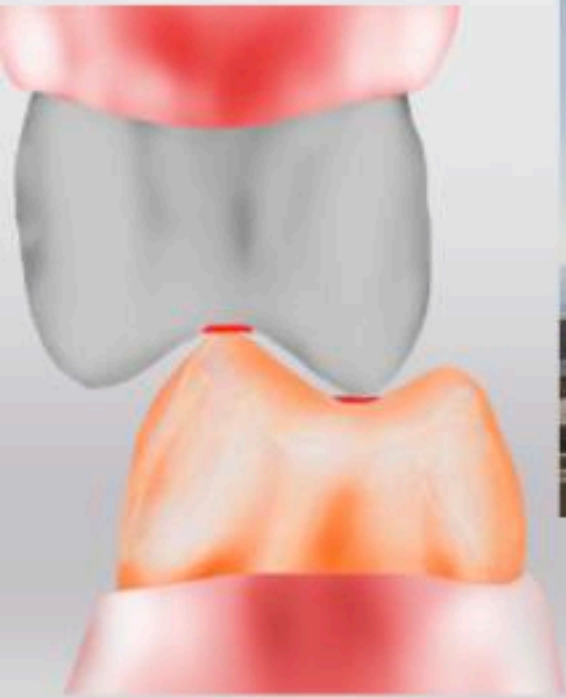
1. With the condyles fully seated in the fossa, all the posterior teeth touch simultaneously and even, with the anterior teeth lightly touching.
2. When you squeeze, neither a tooth nor the mandible moves (in a lateral direction).
3. When you move the mandible in any excursion, no back tooth hits before,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



Drawing and Photo by Dr Jim Kessler

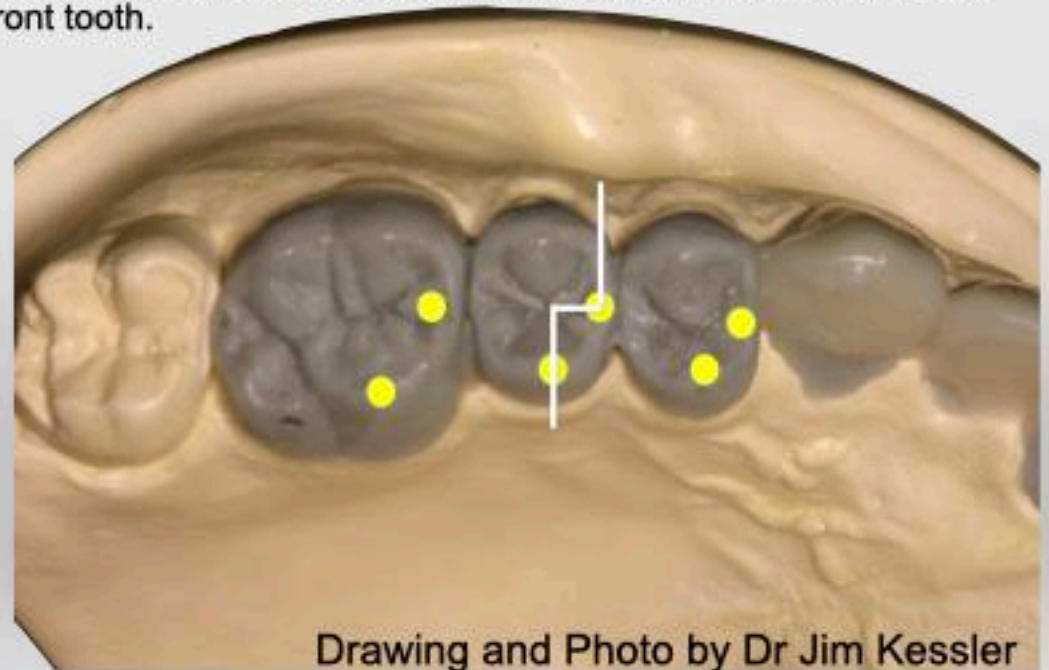
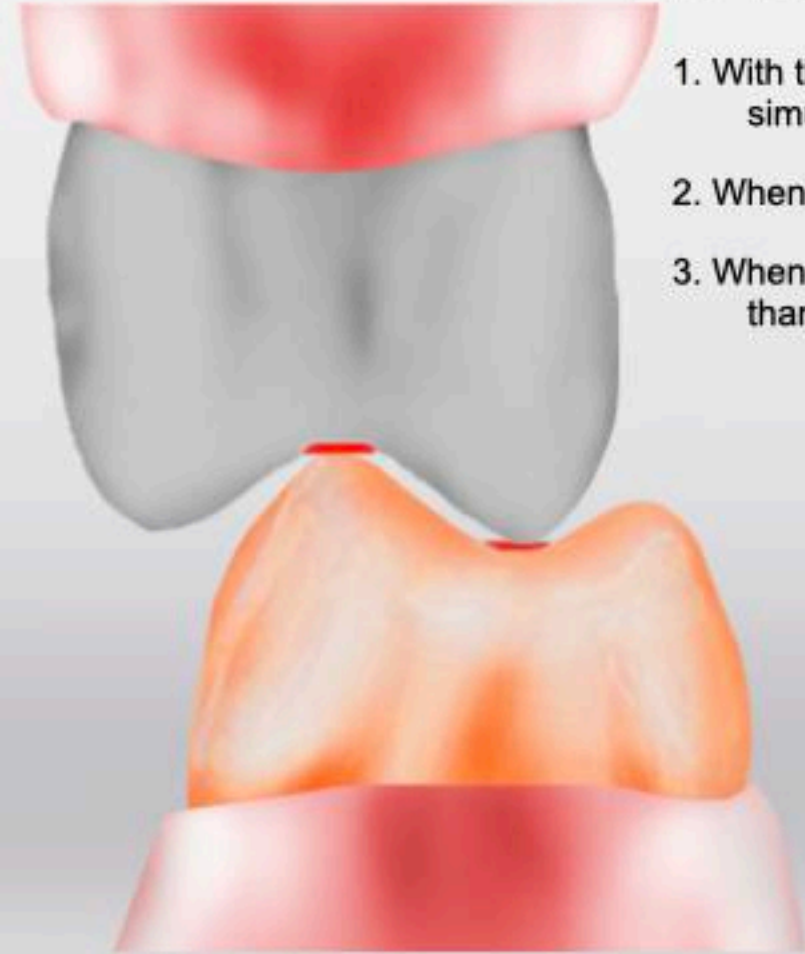
2. When you squeeze, neither a tooth nor the mandible moves (in a lateral direction).

Rule #2 = Flat Landing Area



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

1. With the condyles fully seated in the fossa, all the posterior teeth touch simultaneously and even, with the anterior teeth lightly touching.
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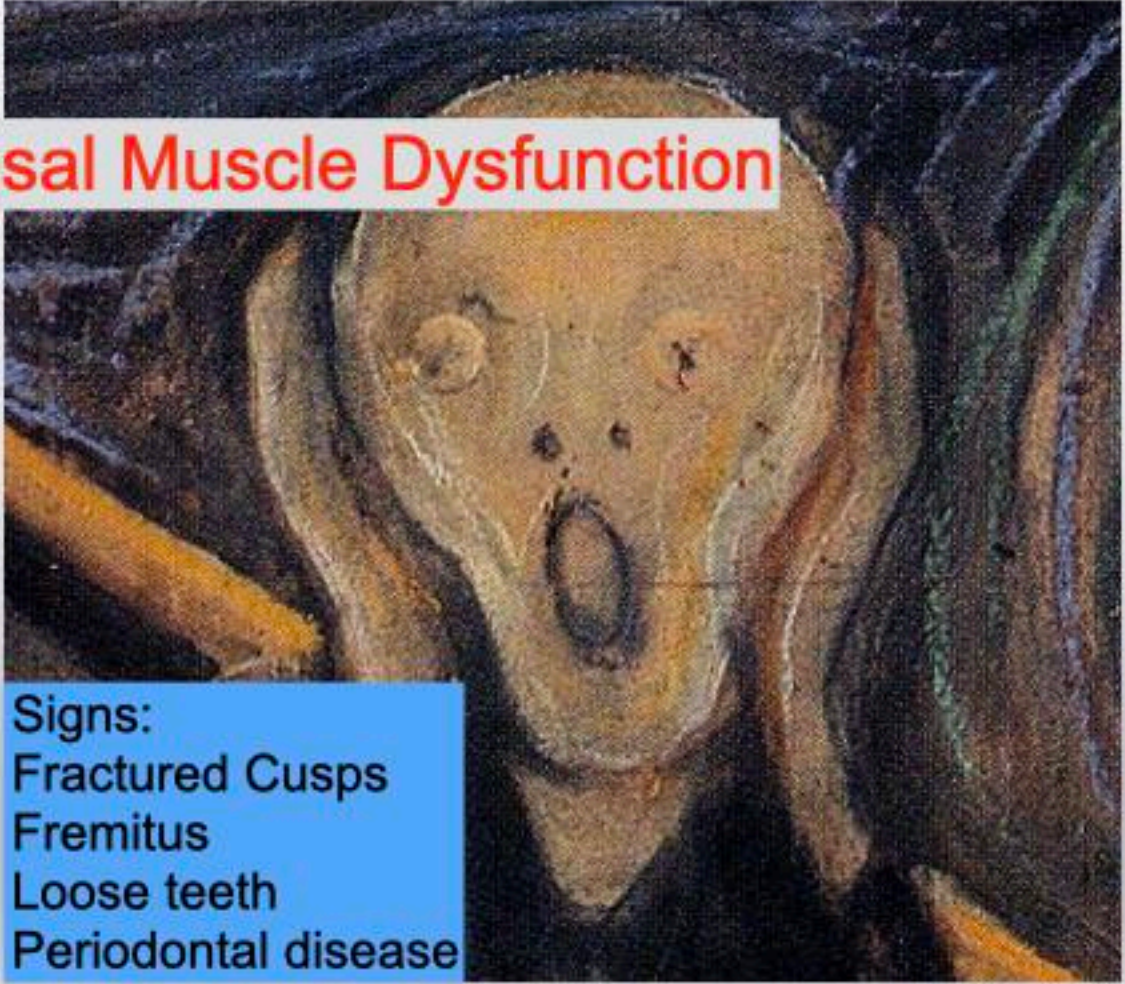


Drawing and Photo by Dr Jim Kessler

TMD Symptoms

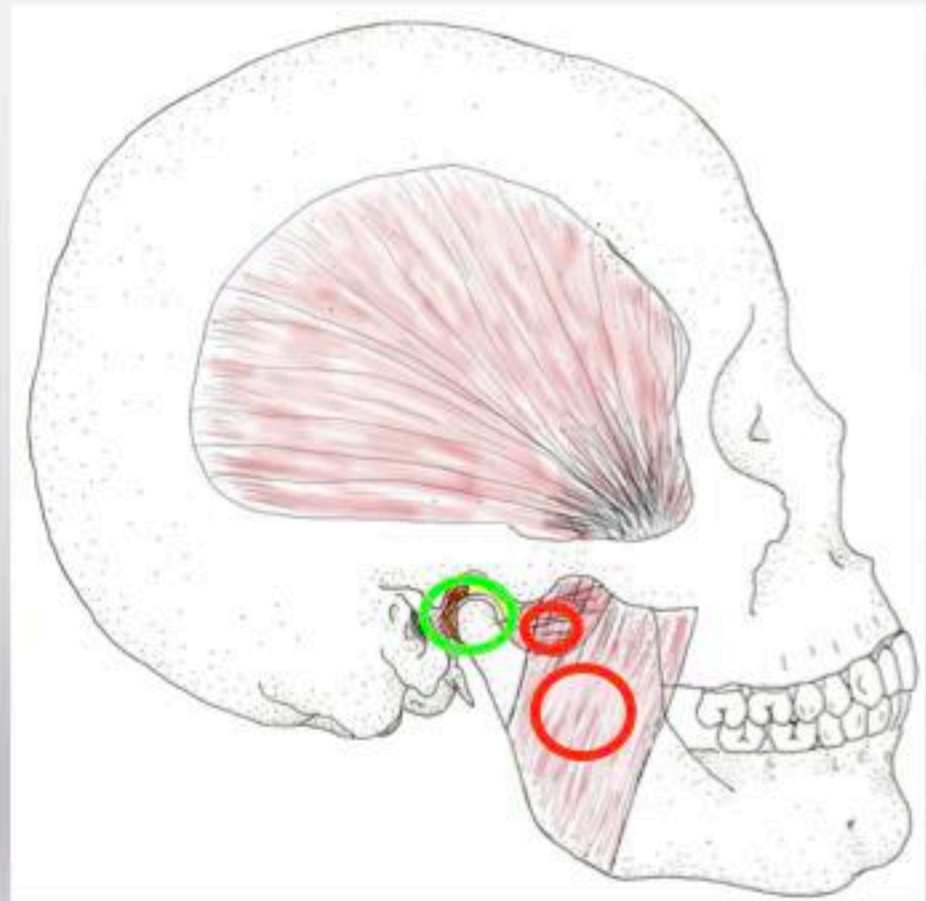
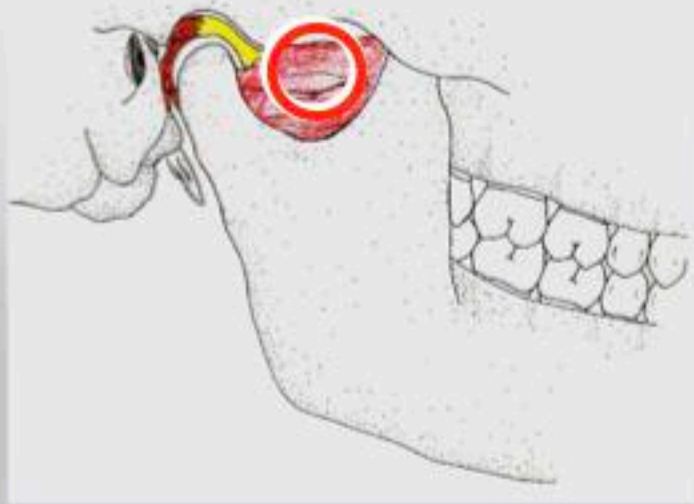
- Sore TM Joint
- Sore TMJ muscles
- Difficulty chewing
- Headaches
- Eye pain
- Ear pain
- TMJ clicking
- Jaw locking
- Limited opening
- Difficulty open jaw
- Difficulty closing jaw
- Anterior Open Bite

Occlusal Muscle Dysfunction

- 
- Signs:
- Fractured Cusps
 - Fremitus
 - Loose teeth
 - Periodontal disease

Occlusal Muscle Dysfunction Pattern

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



Drawings by Gretta Tomb DDS and John Droter DDS

Occlusal Muscle Dysfunction Diagnostic Tests

Occlusal Muscle Dysfunction is a daytime problem

Clenching can be both a daytime and nighttime problem

>30% of headaches have an occlusal component

D-PAS 2 week trial



OR

3-6 week lower CR orthotic



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

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

Diagnostic Palatal Anterior Stop

D-PAS Test: Wear for 2 weeks, 24/7, take out to eat

Better- Decrease in Symptoms

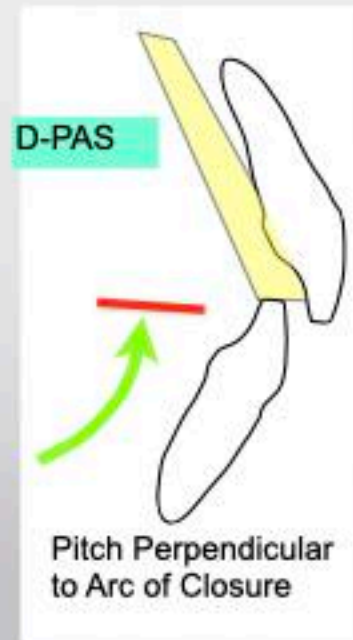
Sleep Clenching Inhibited: Wear D-PAS as night guard
Orthotic Improved Airway: D-PAS as night guard
Occlusal Muscle Disharmony: Occlusal Adjust

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

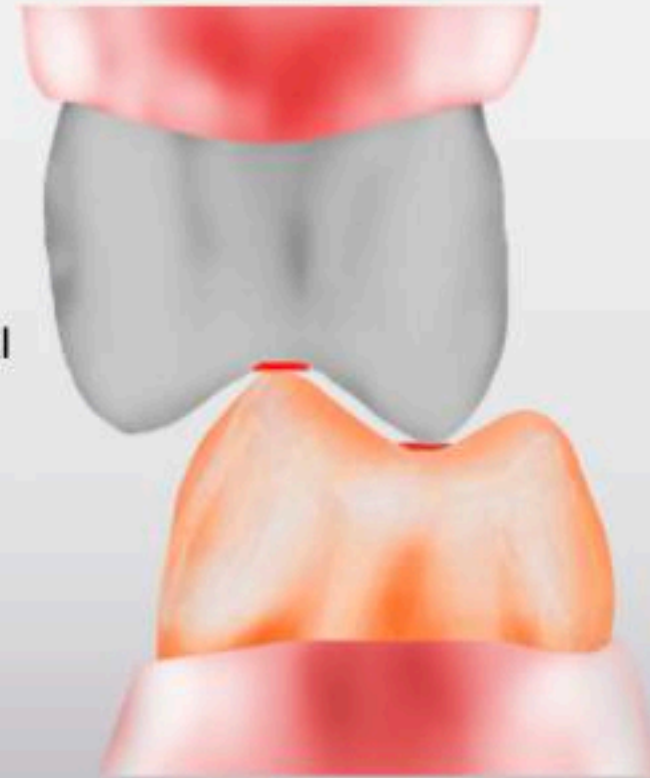
LD Pankey's 3 Rules of Occlusion

(Clyde Schuyler)

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

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

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

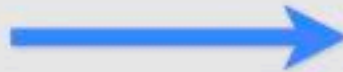


Drawing by Dr Jim Kessler

Treat Occlusal Muscle Dysfunction- Adjust the Occlusion



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



Before

After



Occlusal Sculpting Tools, including Zirconia



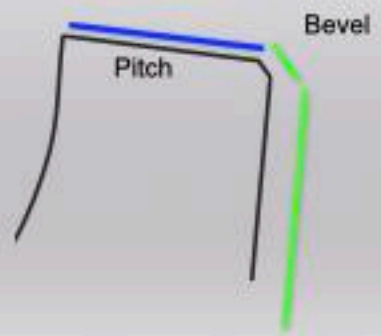
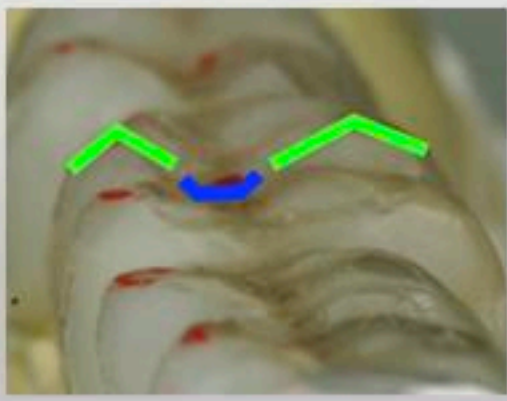
Wheel
 Create Cusp Landing Zone
 Flatten Incisal edges
 Bulk reduction of inclines



Move and Shape Cusps,
 Inclines, Facial Surfaces



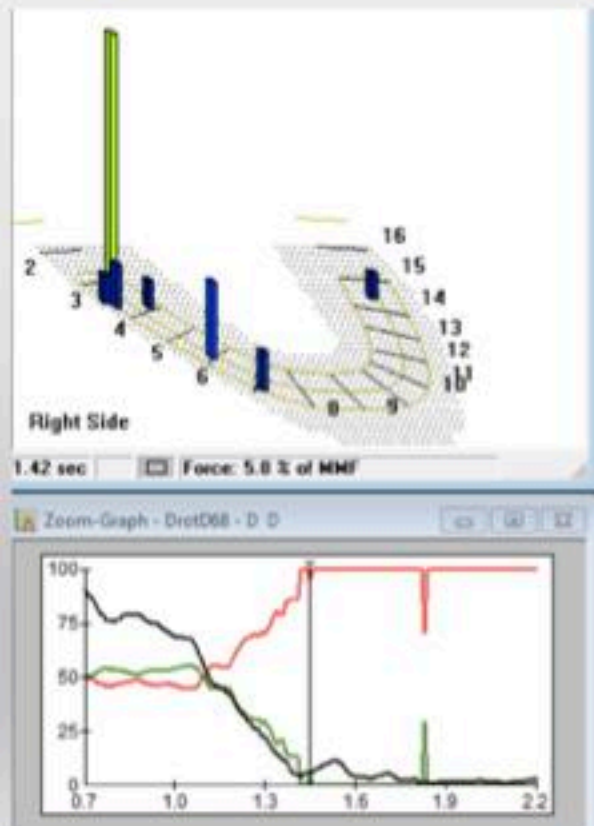
Brassler Brio Shine
 FLBCER-1
 FLBF-2



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

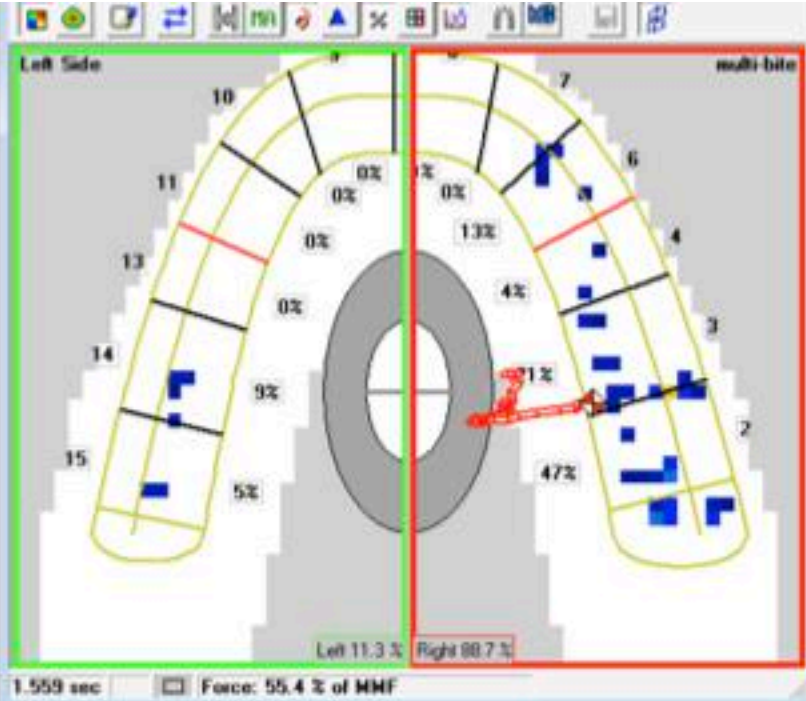
The indispensable value of T-Scan is not in finding heavy CR contacts, but working and nonworking contacts.

Is that a smudge or a muscle activating interference?

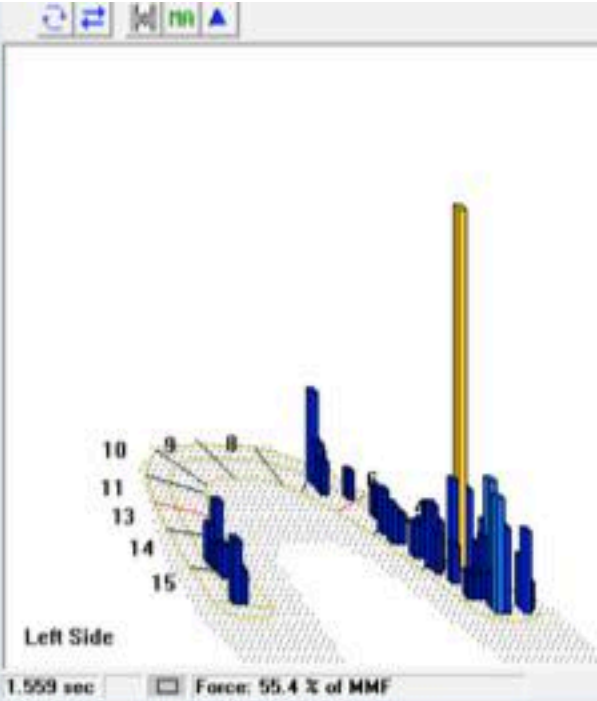


Remove too much and you decrease the ability to chew, especially lettuce. Chewing lettuce requires posterior inclines coming close enough to chew, but far enough apart to not touch and activate muscle.

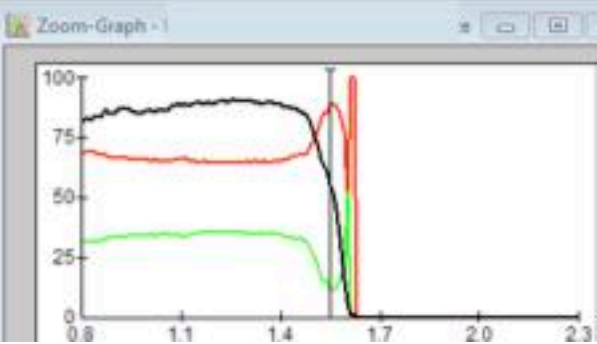
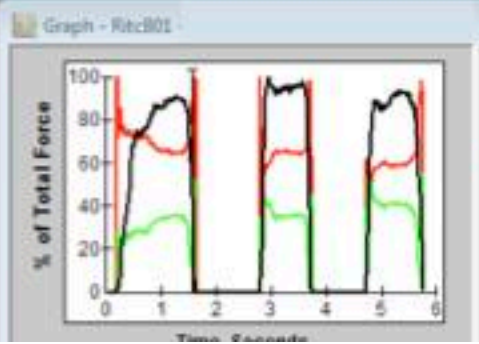
T-Scan is excellent for Patient Education of Occlusal Pathology



1.559 sec Force: 55.4 % of MMF



1.559 sec Force: 55.4 % of MMF

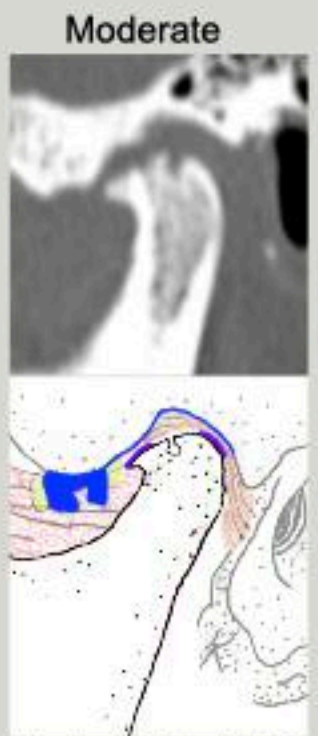
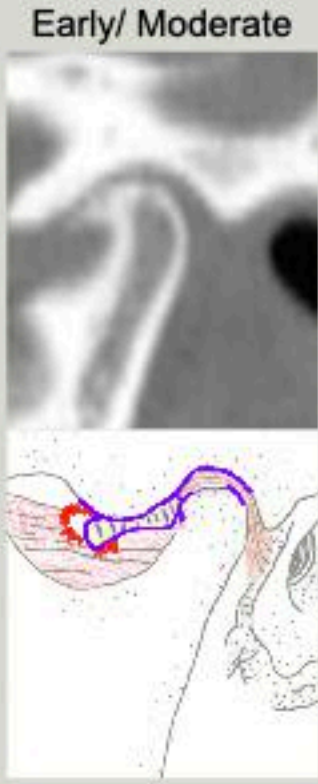
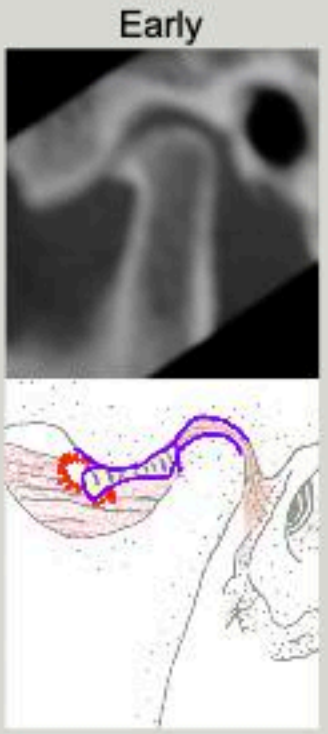
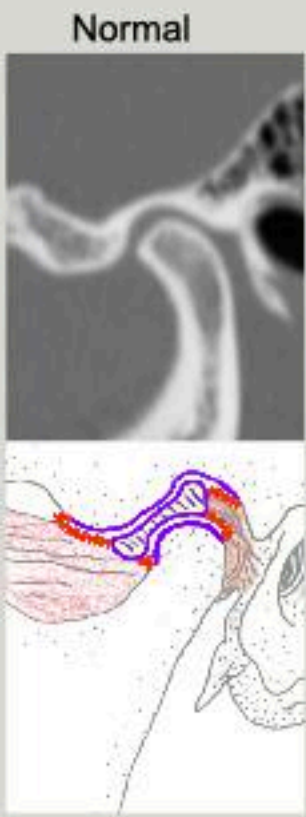


6 Common TMDs

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.



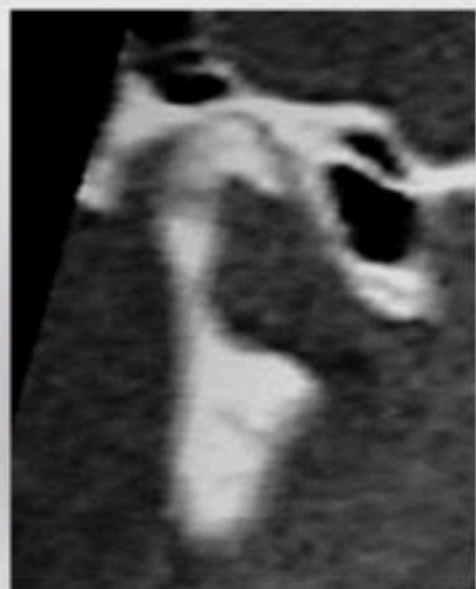
Representative examples of OA in different patients

Drawings by Gretta Tomb DDS and John Droter DDS

Adaptation Chronic Bilateral Osteoarthritis

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

OA Right and Left Bone Loss
#8 Ankylosed



Treatment OA

Osteoarthrosis

Glucosamine 1500mg /Chondroitin 600 mg per day

Minimize parafunction:

If sleep grinding due to airway
CPAP or Dental Airway Device

Osteoarthritis

All of the above plus eliminate inflammation.....

NSAIDs for 6+ weeks

Cold Laser

If still inflamed arthrocentesis with
Platelet Rich Plasma (PRP)



Shea Brand CBD



MLS Laser
9 sessions over 4 weeks

MLS Laser: BioResearch

Multiwave Locked System Laser

808 nm Continuous, 905 nm Pulsed

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

Osteoarthrosis

Minimize parafunction:

If sleep grinding due to airway:

CPAP or Dental Airway Device

Glucosamine 1500mg /Chondroitin 600 mg per day

Osteoarthritis

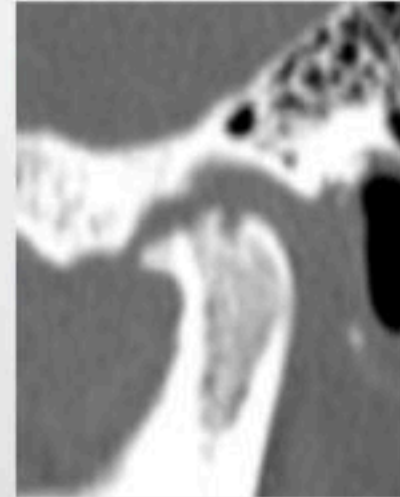
All of the above plus eliminate inflammation.....

NSAIDs

Cold Laser

If still inflamed arthrocentesis with Platelet Rich Plasma (PRP)

If still pain in 6 -12 weeks of NSAID:
Arthrocentesis
Platelet Rich Plasma



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

TMD Symptoms

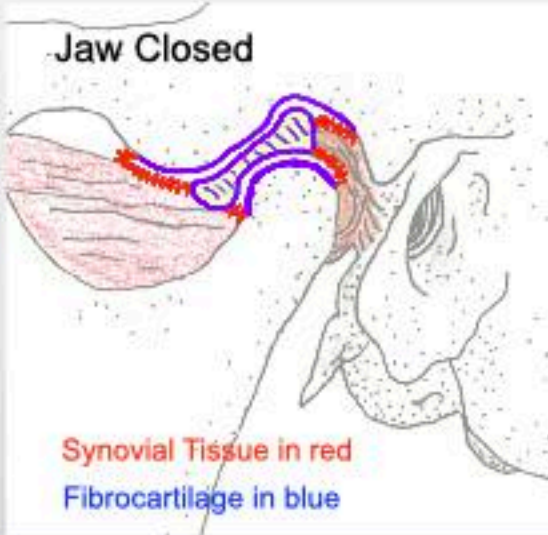
Limited Opening

Diseases to consider and rule out:

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

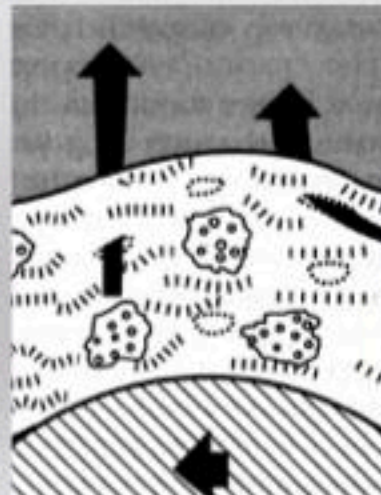
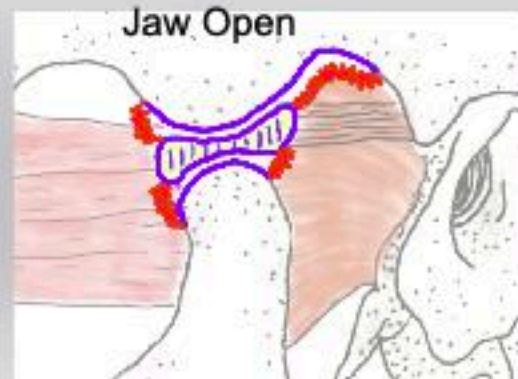
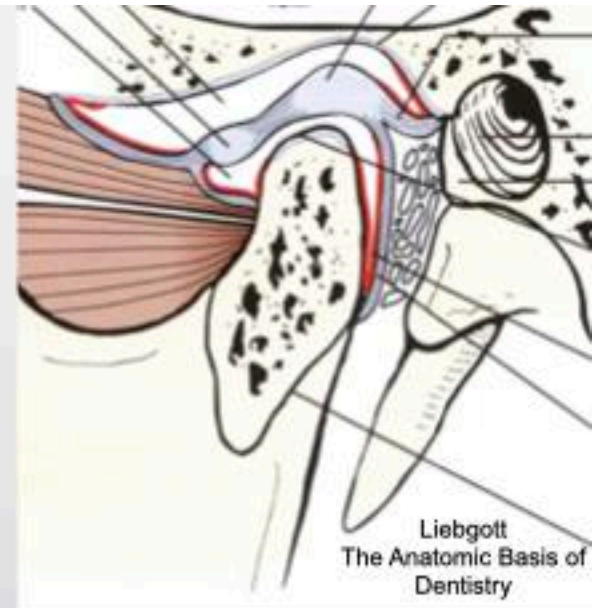


Normal TMJ- Synovium, Cartilage



Fibrocartilage-
Slope of Eminence
Disc
Top of Condyle

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



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

Differential Diagnosis: Limited Joint Motion

Muscle Spasm

Painful to Move
Joint Pain
Muscle Pain

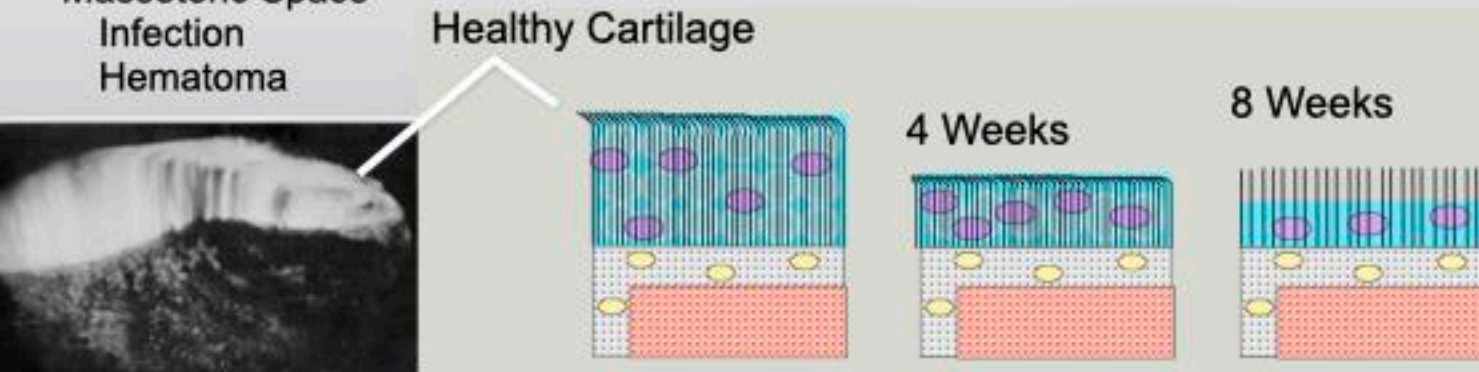
Mechanically Blocked
4b Acute
Adhesion

Masseteric Space
Infection
Hematoma

Lose 50% height of cartilage
Proteoglycans not being produced by Chondrocytes
Loss of 50% proteoglycans and water
Collagen still intact
Process is reversible

Move joint with light force/repetitive motion next 30 days

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

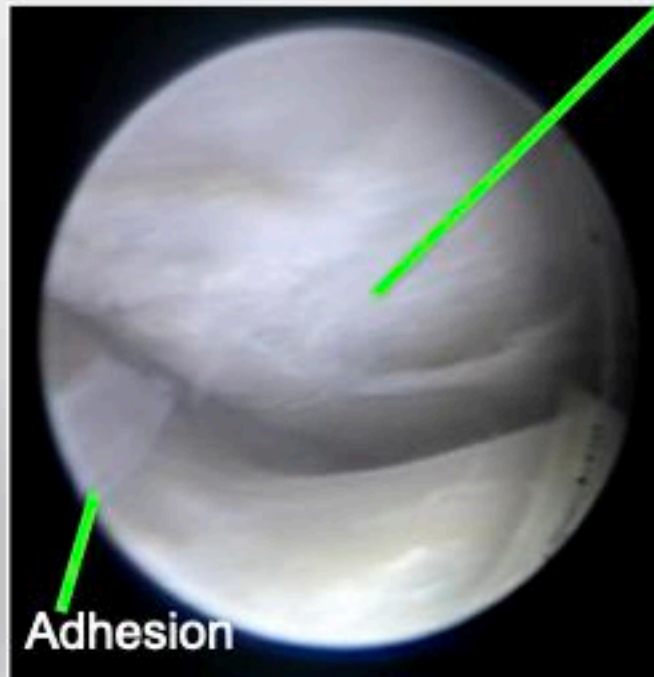
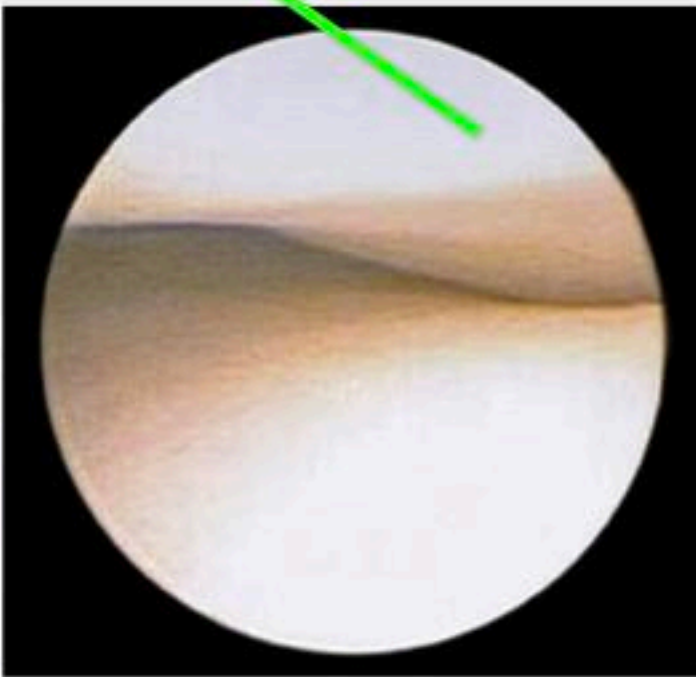


E.B. Evans, GWN Eggers, J.K. Butler, and J. Blumel, Experimental immobilization and remobilization of rat knee joints, J Bone Joint Surg Am, 1960 vol. 42 (5) pp. 737-758
Enneking WF, Horowitz M. The intra-articular effects of immobilization on the human knee. J Bone Joint Surg Am. 1972 Jul;54(5):973-85.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

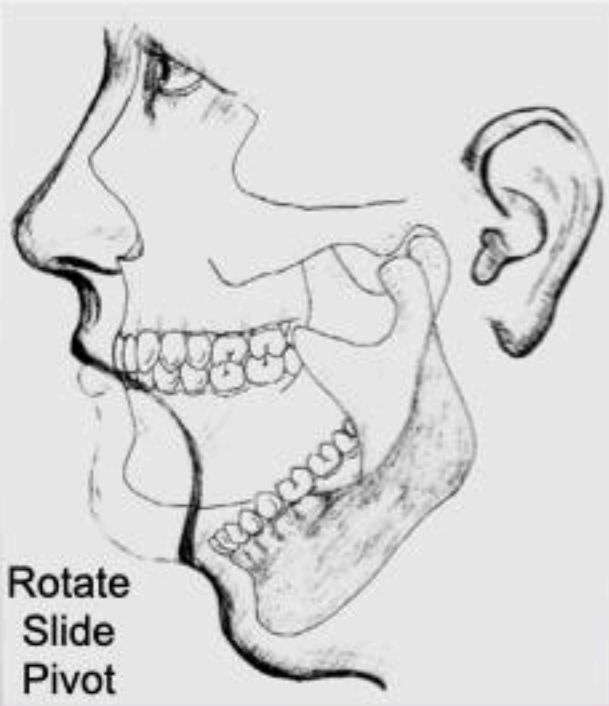
Arthroscopic View Left TMJ

Eminence Healthy Cartilage

Eminence Necrotic Cartilage



Not Same Patient



Rotate
Slide
Pivot

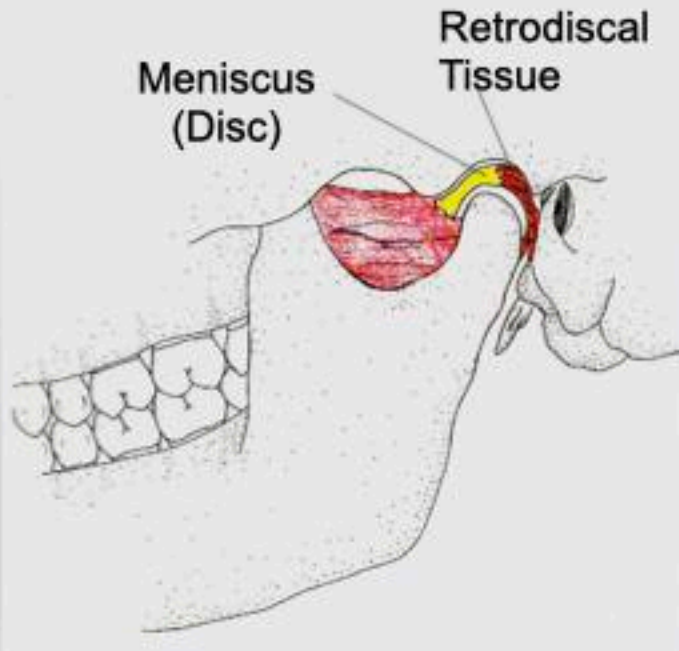
Rotation only 25mm

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



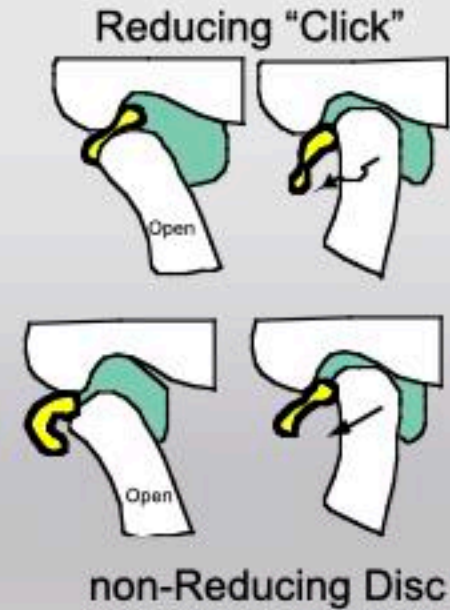
TMJ has 2 Joint Compartments:

Upper- Translation
Lower- Rotation



Acute non-Reducing Disc
Limits Translation.

"Old Adapted" may have
full range of motion.



non-Reducing Disc

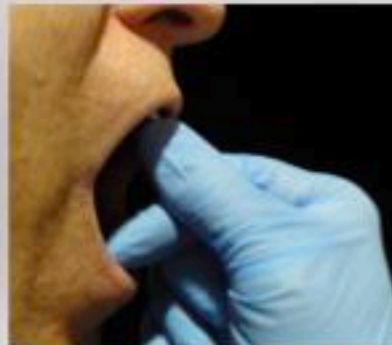
Limited Opening Algorithm

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

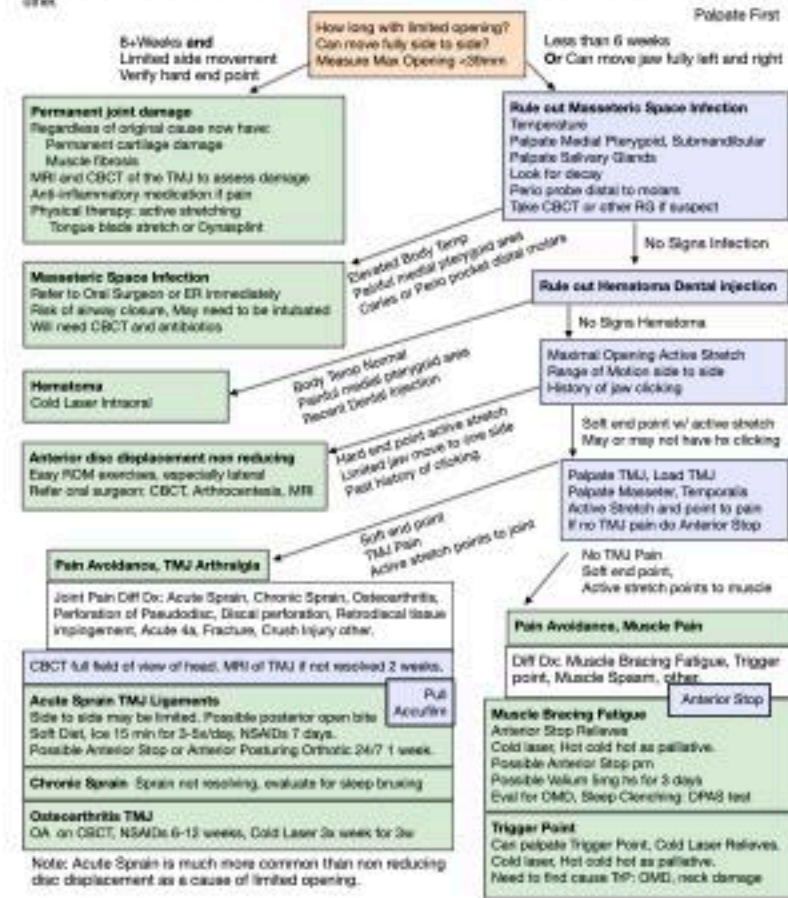
Diagnostic Tests:

- 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 30mm): Pain Avoidance Sore Joint, Pain Avoidance Sore Muscle, Hematoma, Muscle Spasm, Masseteric Space Infection, Nonreducing Disc (4b,3b Acute), Joint Fibrosis, Muscle Fibrosis, 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.

Chronic Sprain: Sprain not resolving, evaluate for sleep bruxing.

Osteoarthritis TMJ: OA on CBCT, NSAIDs 6-12 weeks, Cold Laser 2x week for 2w.

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

Subjective:

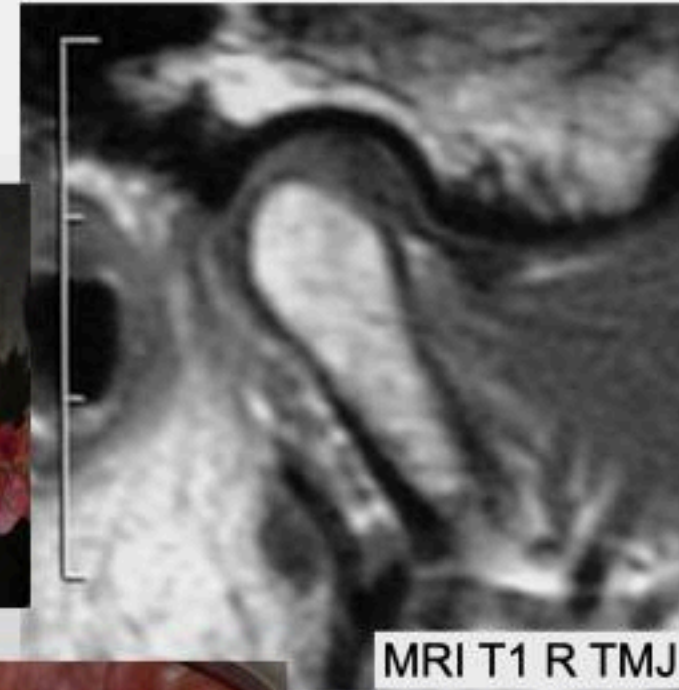
Dentist doing crown prep #30 1 week ago
Severe pain Right TMJ after moving jaw at end of appt
Constant deep pain Right TMJ
Limited opening

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:

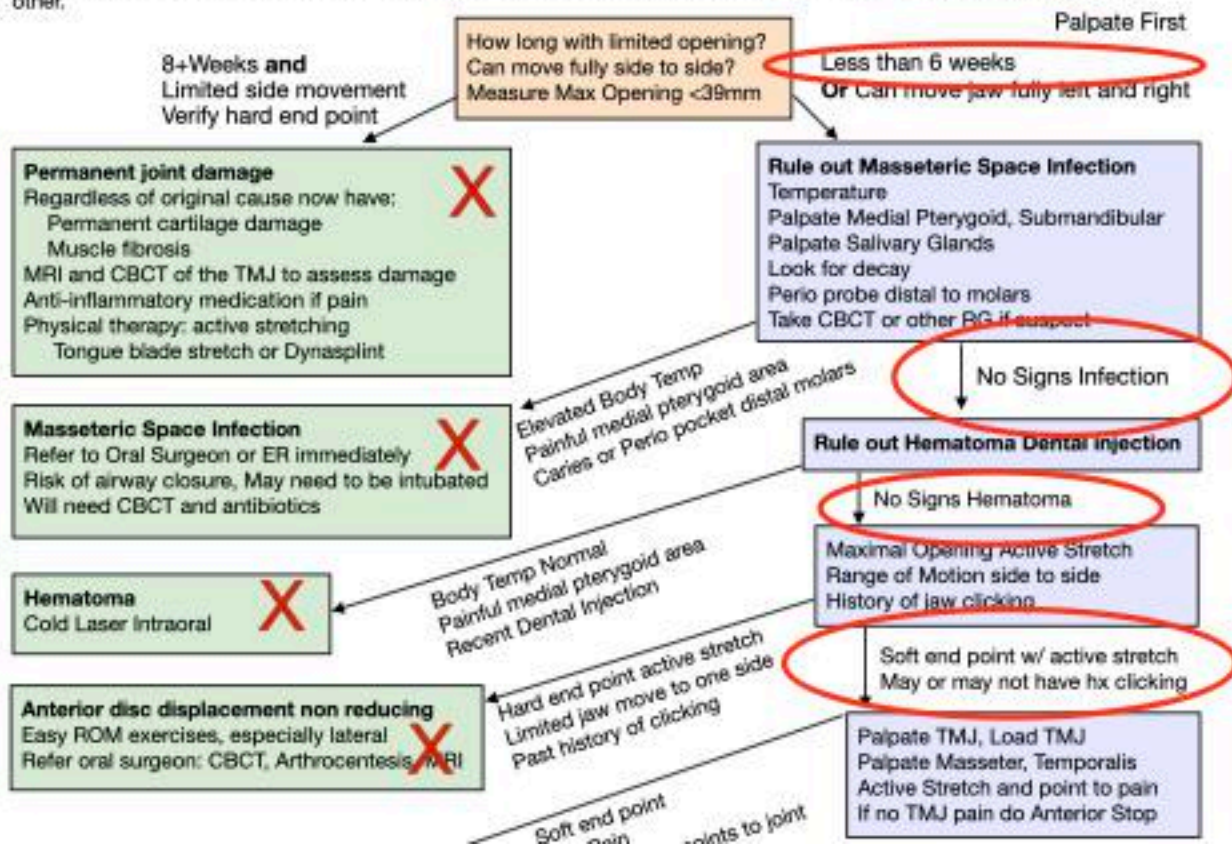
Limited opening due to Right TMJ pain avoidance
Acute Sprain Right TMJ Ligaments



Dr Droter's Limited Opening Algorithm

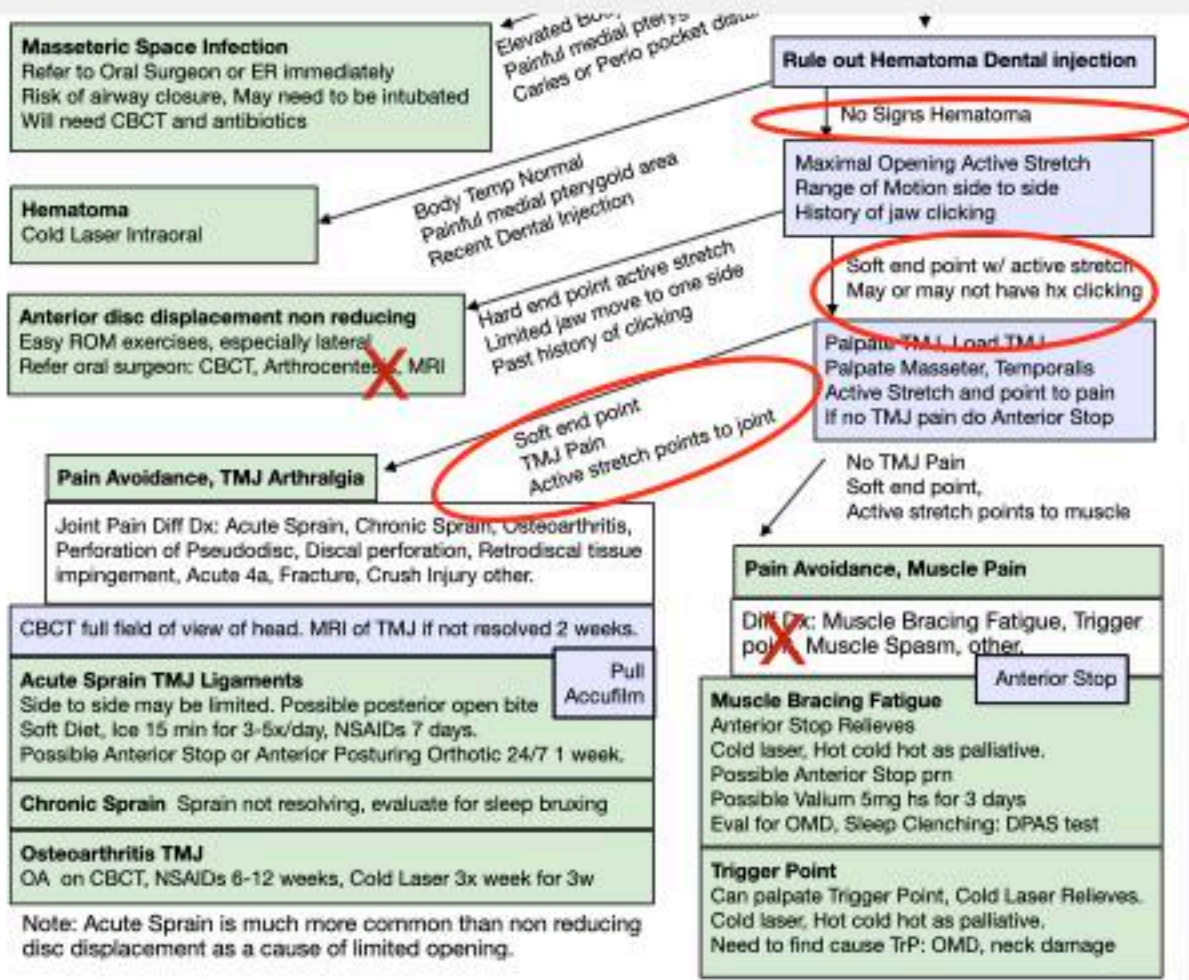
22.3

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

Pain Avoidance, TMJ Arthralgia

Soft end point
TMJ Pain
Active stretch point

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

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

Right posterior openbite does not hold Accufilm

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

Treatment:

Ice 15-20 minutes for 3-5x 2 days only

Anterior repositioning orthotic 24/7 one week

NSAID for 5 days- 800mg Advil Liquid gel caps, q8h

Soft chew diet

At 1 week Anterior repositioning orthotic sleep only for second week

Week 3, no orthotic, reintroduce harder foods



Verify Orthotic does not rub
lingual tissue of mandible



At 4 weeks patient had full ROM
No clicking

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

Subjective:

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

Objective:

Limited opening 25, Mandible shifts right
Normal side to side motion
98 temp, normal perio probe 2nd molars, no caries
No pain palpation RL Medial Pterygoid
Soft end point on active stretch, 35mm, R TMJ pain
Right TMJ pain to palpation, Left TMJ normal
Posterior cross bite on left

Assessment:

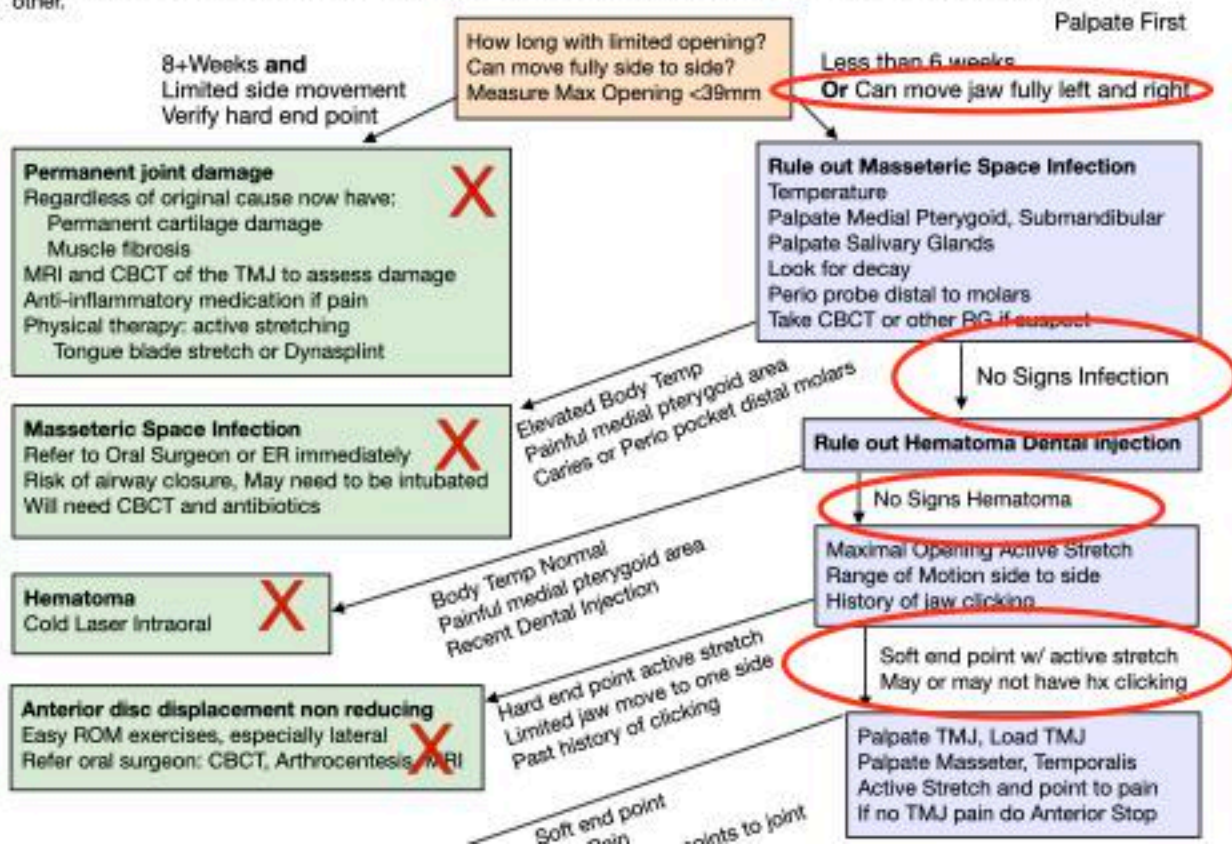
Limited opening due to Right TMJ pain avoidance
Acute Sprain Right TMJ Ligaments



Dr Droter's Limited Opening Algorithm

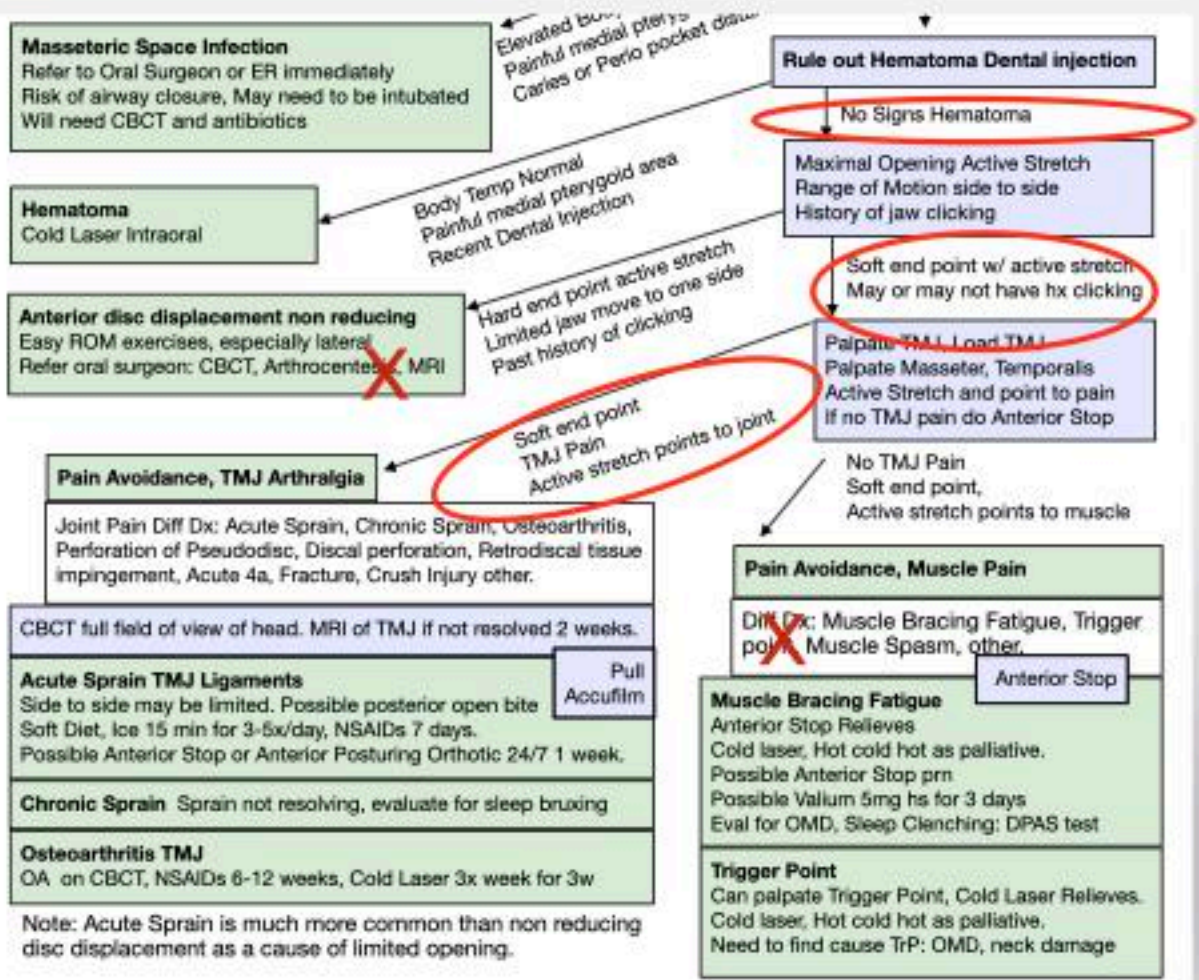
223

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



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



Temporary Anterior Stop
ArrowPath Sleep



MLS Cold Laser
BioResearch

Ms MY

6 Common TMDs

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

6 Common TMDs

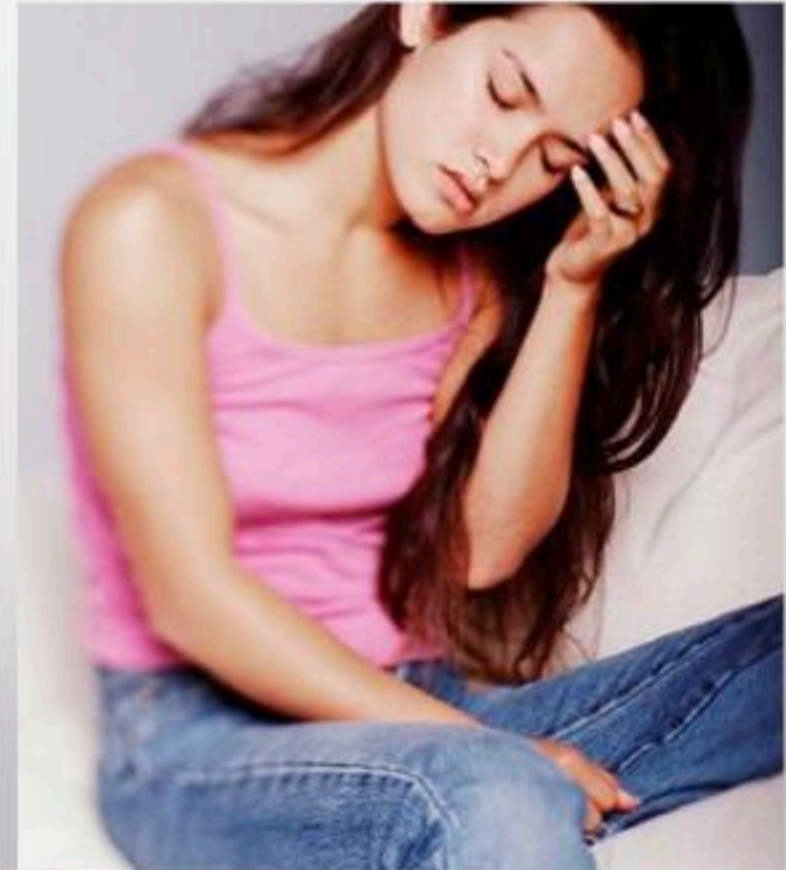
- Parafunctional Clenching
- Parafunctional Grinding
- Occlusal Muscle Dysfunction
- Osteoarthritis
- Acute Sprain
- Acute Closed lock of TMJ disc

5 Common Obstacles

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

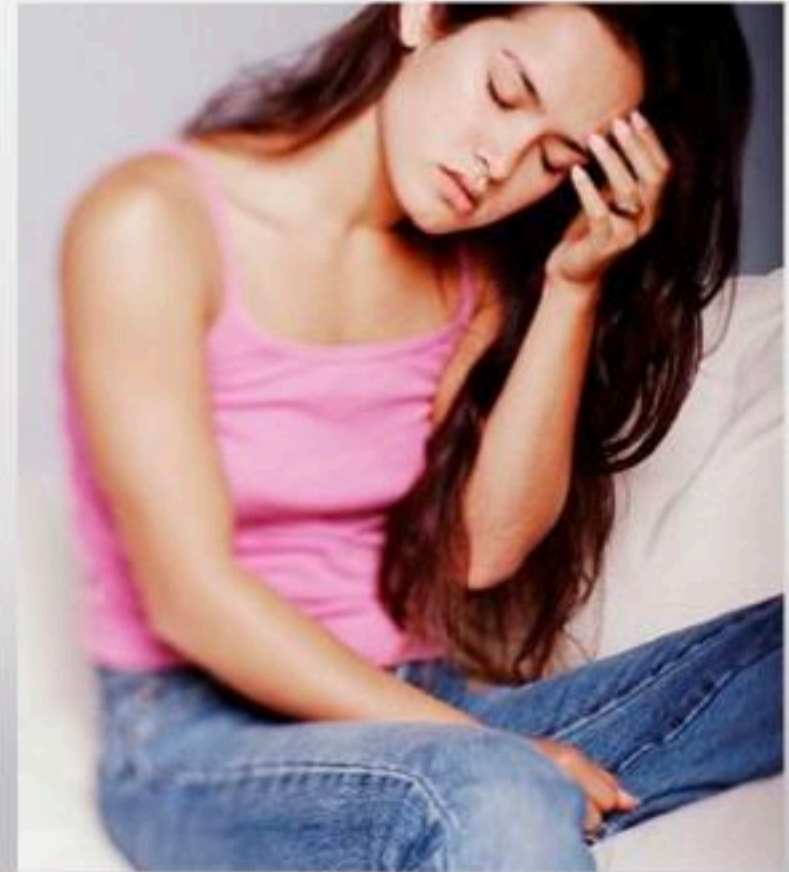
1 TMD that **usually** does not need therapy

- TMJ Clicking



5 Common Obstacles

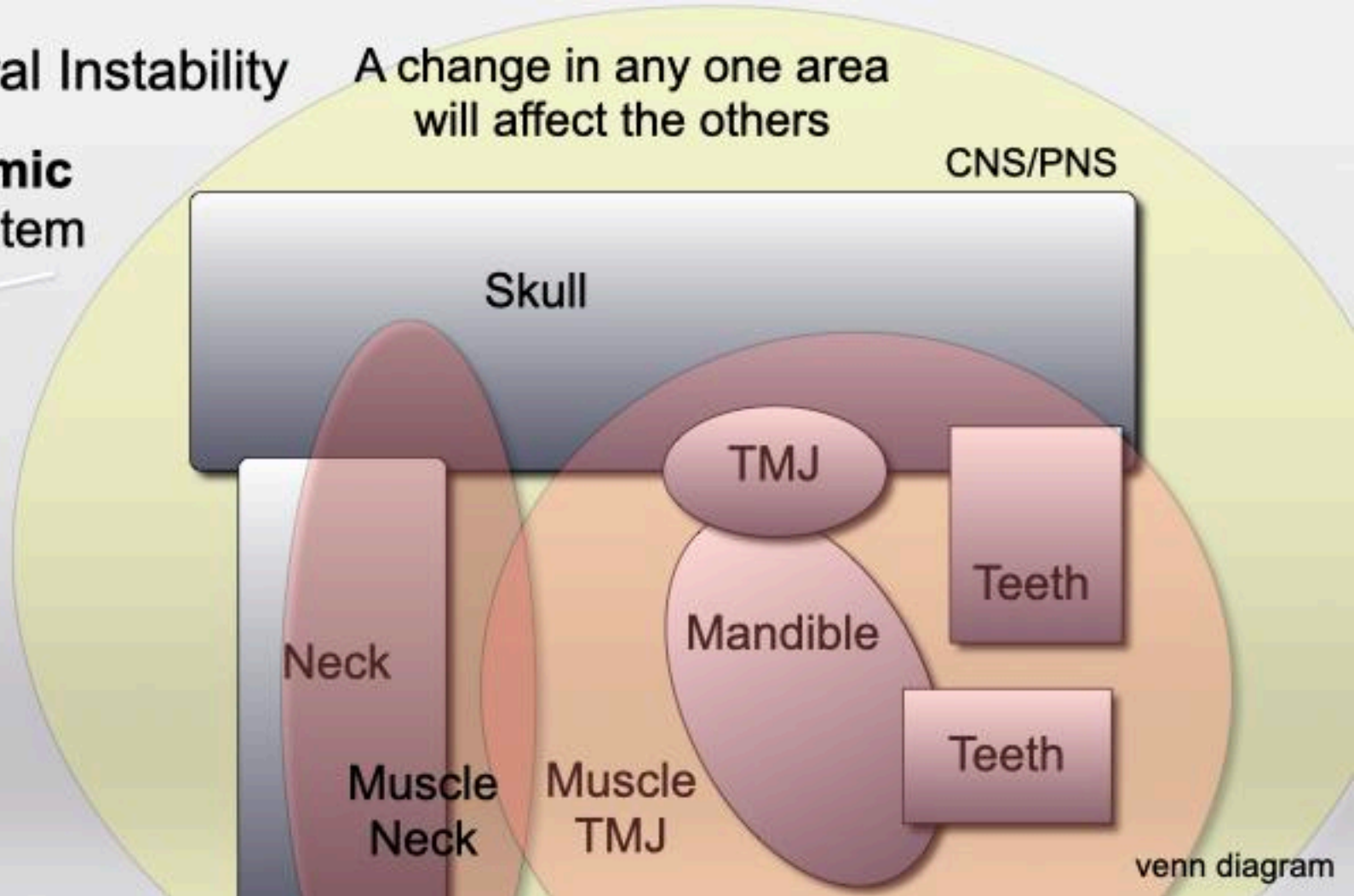
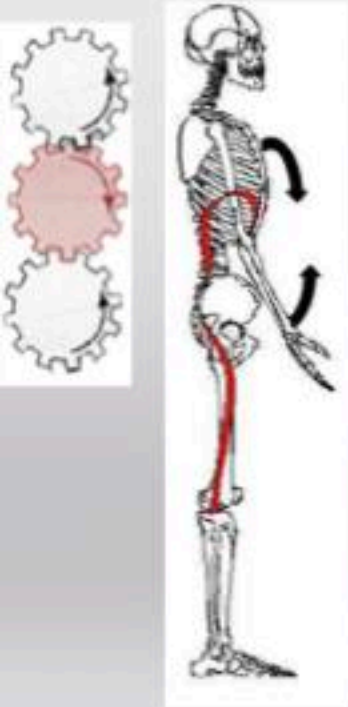
Neck and Postural Instability
Wobbly TM Joint (Subluxation)
Compromised Breathing/Airway
Avascular Necrosis
Referred Pain Muscle Triggerpoints



Neck and Postural Instability

A change in any one area will affect the others

This is a **dynamic** orthopedic System



venn diagram

Non-Linear Joint Deformity- Mechanically Unstable TMJs- “Wobbly Joint”

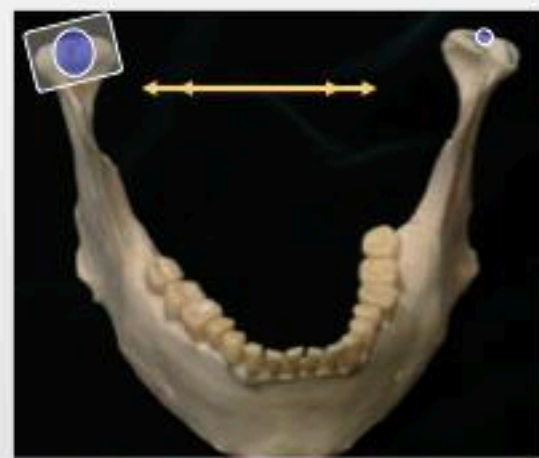
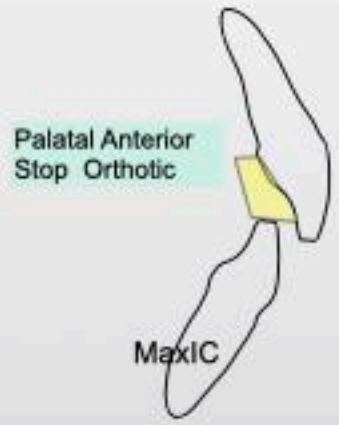
TM Joint subluxates under load
Adapted CR “wobbles”

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

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

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

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



Diagnostic Palatal Anterior Stop

D-PAS Test: Wear for 2 weeks, 24/7, take out to eat

Better- Decrease in Symptoms

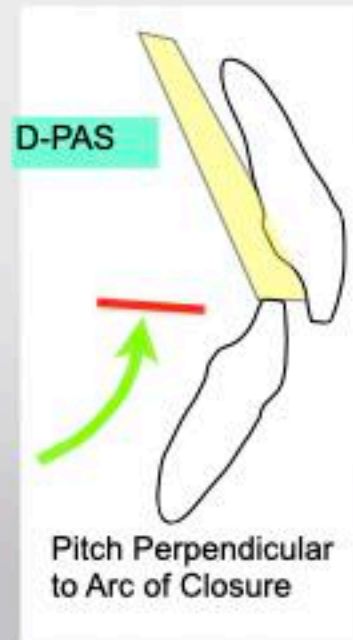
Sleep Clenching Inhibited: Wear D-PAS as night guard
Orthotic Improved Airway: D-PAS as night guard
Occlusal Muscle Disharmony: Occlusal Adjust

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



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

ArrowPath Sleep
 3.9 mm Anterior Stop
 Muscle Deprogrammer
 Airway bite
 Facial Analyzer



ArrowPath Sleep
 D-PAS
 Diagnostic-
 Palatal Anterior Stop



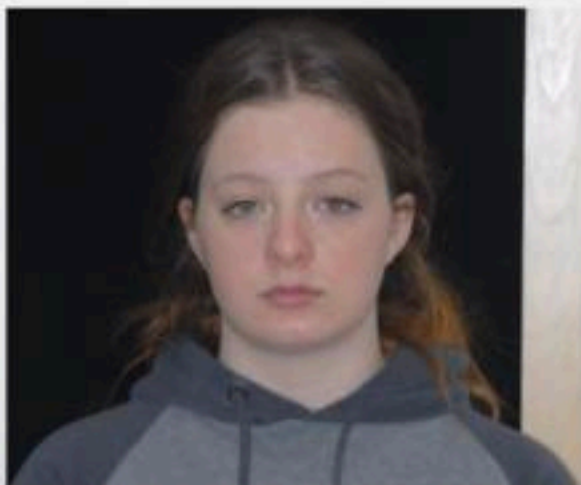
ArrowPath Sleep
 Lower Posterior Stop
 Night Guard



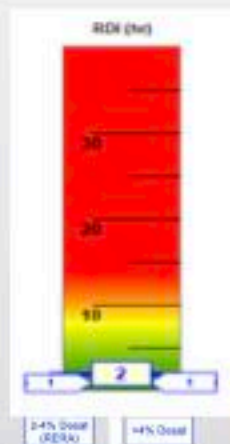
ArrowPath Sleep
 Trial Anterior Stop Night Guard



Age 16F
 cc: Facial Pain, Excessive Daytime Fatigue



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



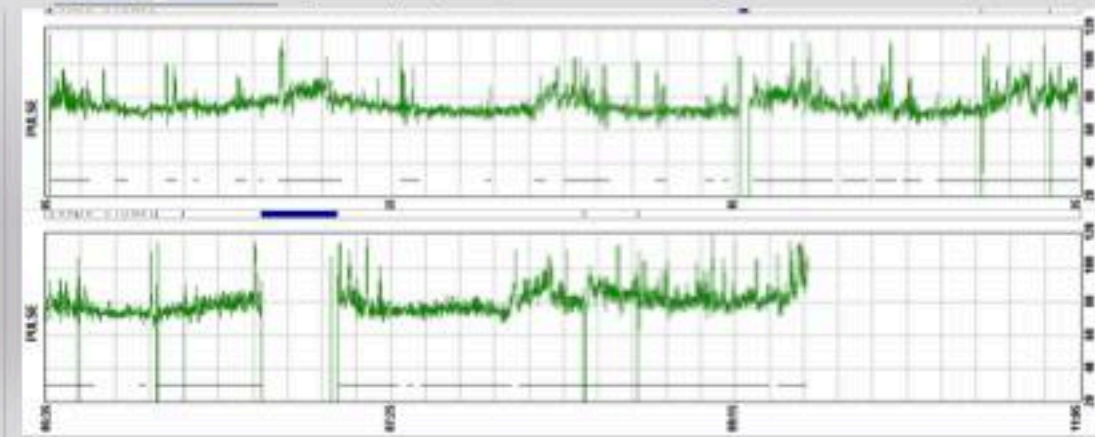
PULSE RATE DATA	
Autonomic Arousal	
Index (#/hr):	31
Pulse Rate Range	
Mean:	78
Min:	34
Max:	122
Tachycardia - Sleep (>90 bpm)	
Duration:	00:34:56
% (VRT):	6%
Bradycardia - Sleep (<50 bpm)	
Duration:	00:00:35
% (VRT):	0%



Heart Rate
 >90 bpm
 for 35 min

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

Sleep Latency Test
 Dx: Narcolepsy
 Recommend daytime medication



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 O₂ 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 O₂ Saturation
Apnea
Cardiovascular Damage
Elevated BP
GERD

Symptoms

All of stage 2, 3 plus....
Worn Teeth

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+% O₂ Desaturation

Disease Stage 1	Disease Stage 2	Disease Stage 3	Disease Stage 4
<p>Predisposing Factors</p> <p>Small Airway</p> <p>Tongue Tie, Lip Tie</p> <p>Bottle Fed as Infant</p> <p>Dysfunctional Swallow</p> <p>Allergies</p> <p>Nasal Obstruction</p> <p>Large Tonsil</p> <p>Large Adenoids</p> <p>Large Tongue</p> <p>Mid-face Deficient</p> <p>Mandibular Deficient</p> <p>4 Buccal Ectraction</p>	<p>Compensation: Airway Maintained</p> <p>Signs</p> <p>Mouth Breathing</p> <p>Head Postured Forward</p> <p>Jaw Postured Forward</p> <p>Tongue Beating</p> <p>Indents in Tongue</p> <p>Sore Masseters</p> <p>Sore Neck Muscles</p> <p>Symptoms</p> <p>Facial Ache</p> <p>Not Waking Rested</p> <p>Daily Fatigue</p> <p>Neck Soreness</p>	<p>Sleep Airway Partial Collapse</p> <p>Signs</p> <p>All of stage 1 and 2 plus....</p> <p>Upper Airway Resistance</p> <p>2-4% Drop O₂ Saturation</p> <p>RERA- Respiratory Arousal</p> <p>Sleep Teeth Grinding</p> <p>↓ Growth Hormone</p> <p>Symptoms</p> <p>Heart Rate Fluctuation</p> <p>Snoring or "Purring"</p> <p>Weight Gain</p> <p>Cognitive Impairment, ADD</p> <p>Hyperactivity</p>	<p>Sleep Airway Full collapse</p> <p>Signs</p> <p>All of stage 1, 2, 3 plus....</p> <p>4%+ drop O₂ Saturation</p> <p>Apnea</p> <p>Cardiovascular Damage</p> <p>Elevated BP</p> <p>GERD</p> <p>Symptoms</p> <p>All of stage 2, 3 plus....</p> <p>Worn Teeth</p>

John R. Droter DDS

AHI 1-4
"Normal" ??

AHI 5-15
Mild OSA

AHI 15-30
Moderate OSA

AHI 30+
Severe

Signs

- Apnea
- 4% drop O₂ Saturation
- Cardiovascular Damage
- Elevated BP
- GERD

Symptoms

- Not Waking Rested, Daily Fatigue
- Cognitive Impairment

Irreversible Damage

John R. Droter DDS

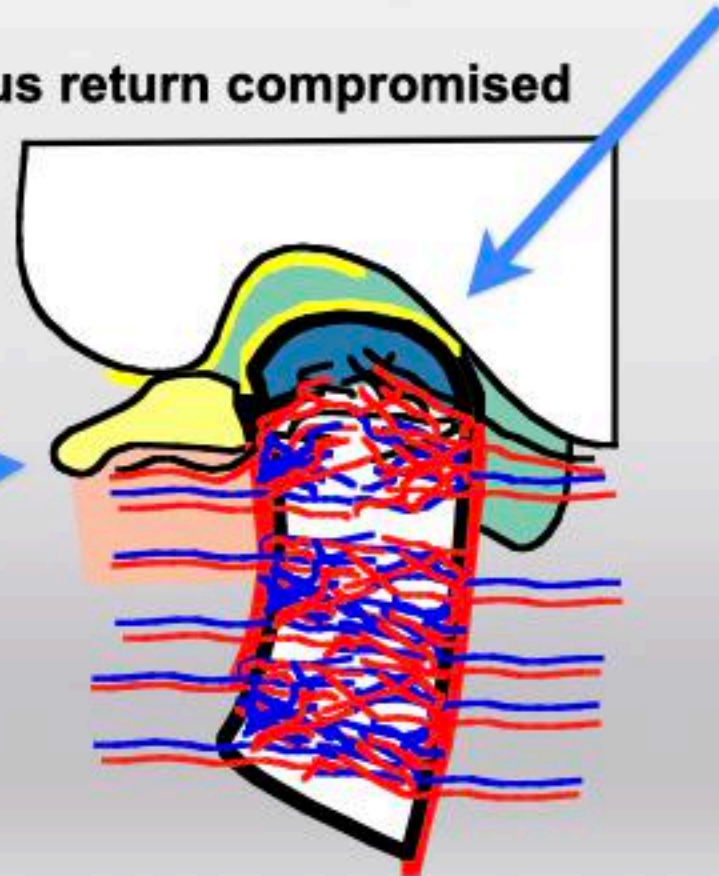
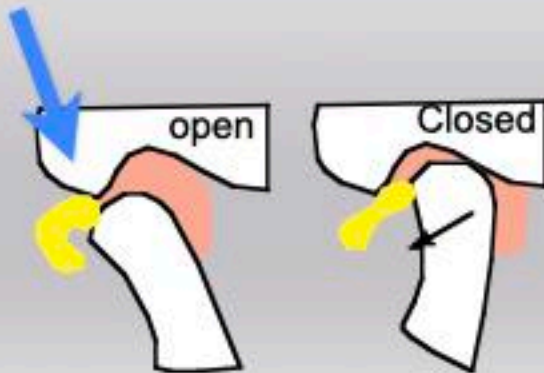
When the clicking stops (4a to 4b):

Condyle Distalized

Venous return compromised

Compromised Condylar Perfusion
Blood flow through condyle is decreased

Disc Anterior

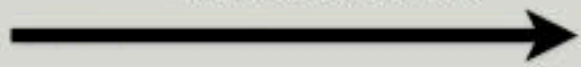


3 Outcomes of Compromised Condylar Perfusion

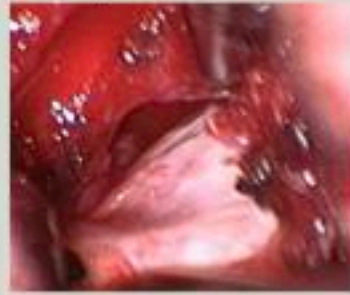


Bone cells die

Avascular Necrosis

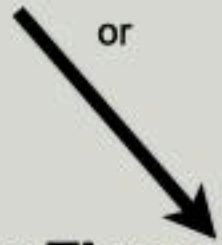


One and Done
 Condyle collapses 1y later.
 Cartilage remains intact
 Occlusion shifts once, AVN is finished.



Nothing

Compromised but adequate.
 99% patients have no problems



or

Inflammatory Tissue Bone Resorption

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

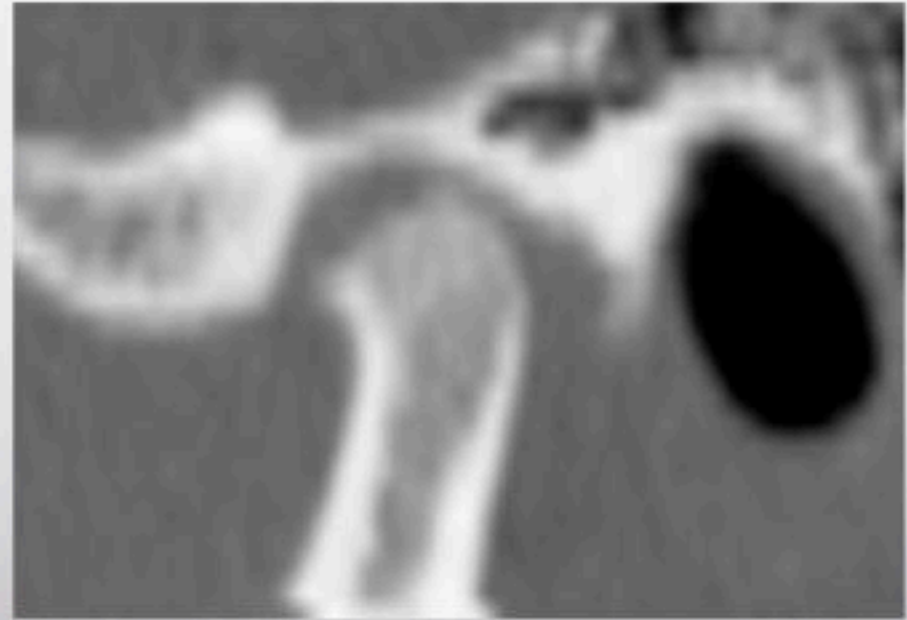


Droter JR, An orthopaedic approach to the diagnosis and treatment of disorders of the temporomandibular joint. Dent Today 2005 Nov;24(11):82, 84-8

Hypoxia Induced Progressive Condylar Resorption HI-PCR

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

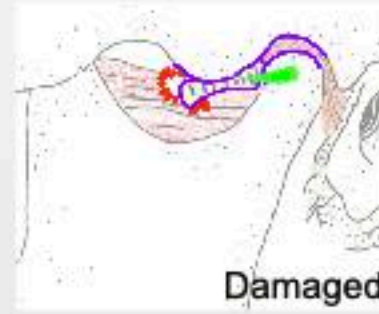
Occlusion will constantly be changing



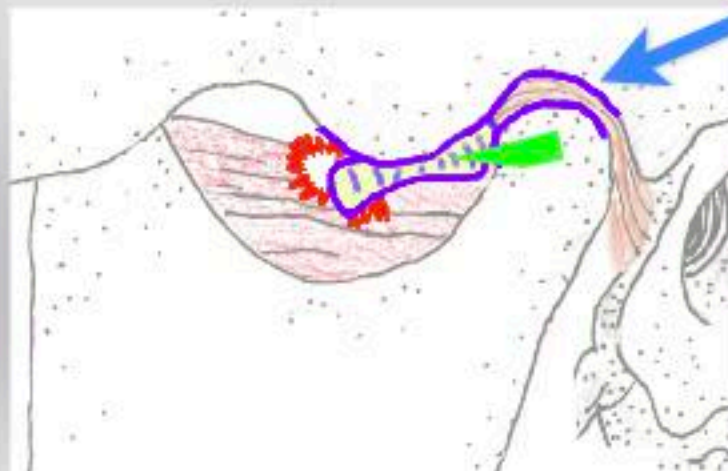
Basic Orthopedics

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

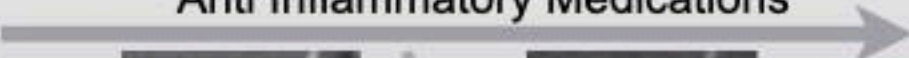
Both have loss of anterior coupling

Anterior Openbite with Active TMJ Bone Loss

Non Surgical Therapies



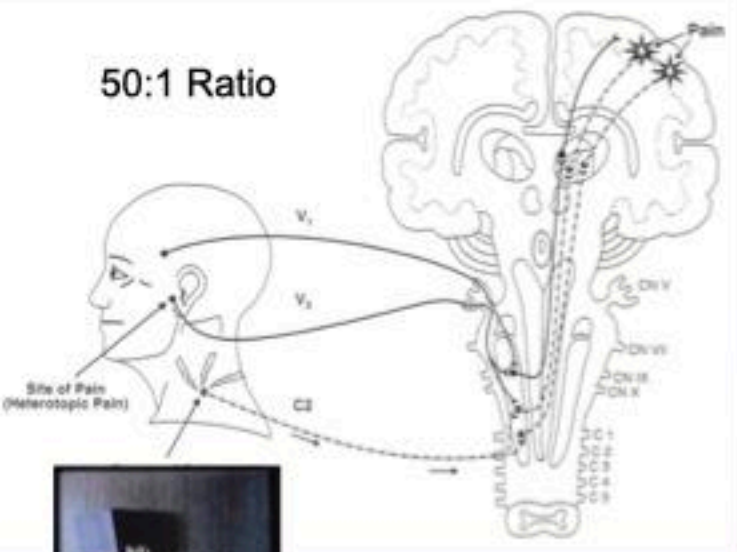
Condylar Distraction
Anti Inflammatory Medications



Referred Pain Convergence

More primary sensory neurons than secondary neurons that travel to brain

50:1 Ratio



"Bell's Orofacial Pain"
Jeffery Okeson

Trigger Points

Contracted mass of actin, myosin and histamine

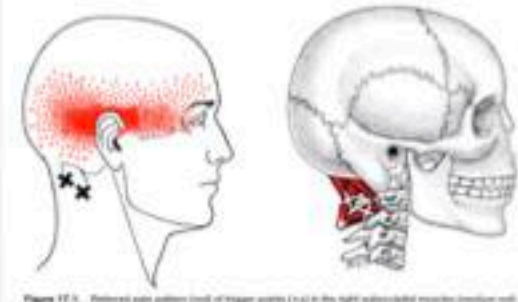
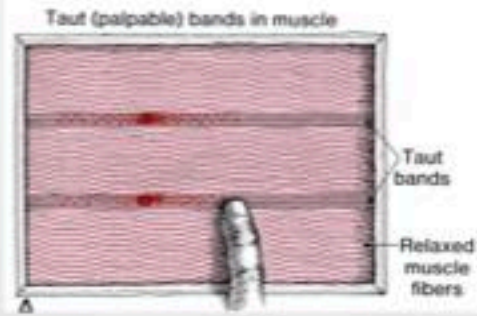
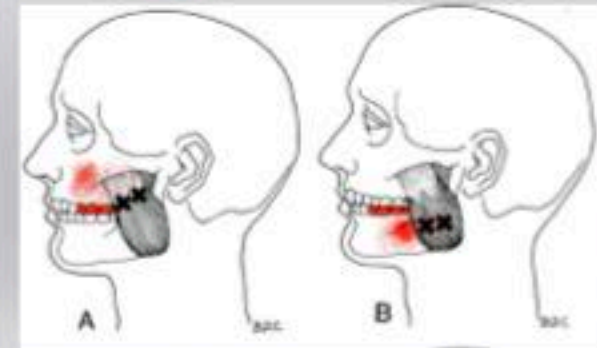
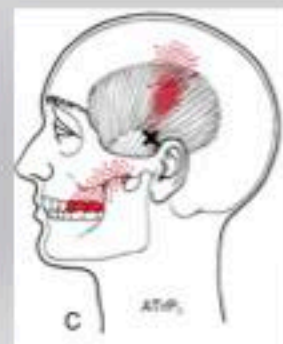
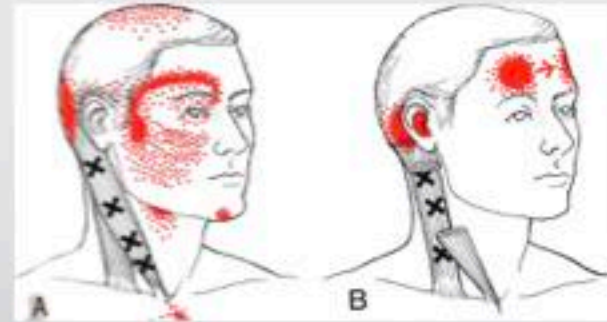


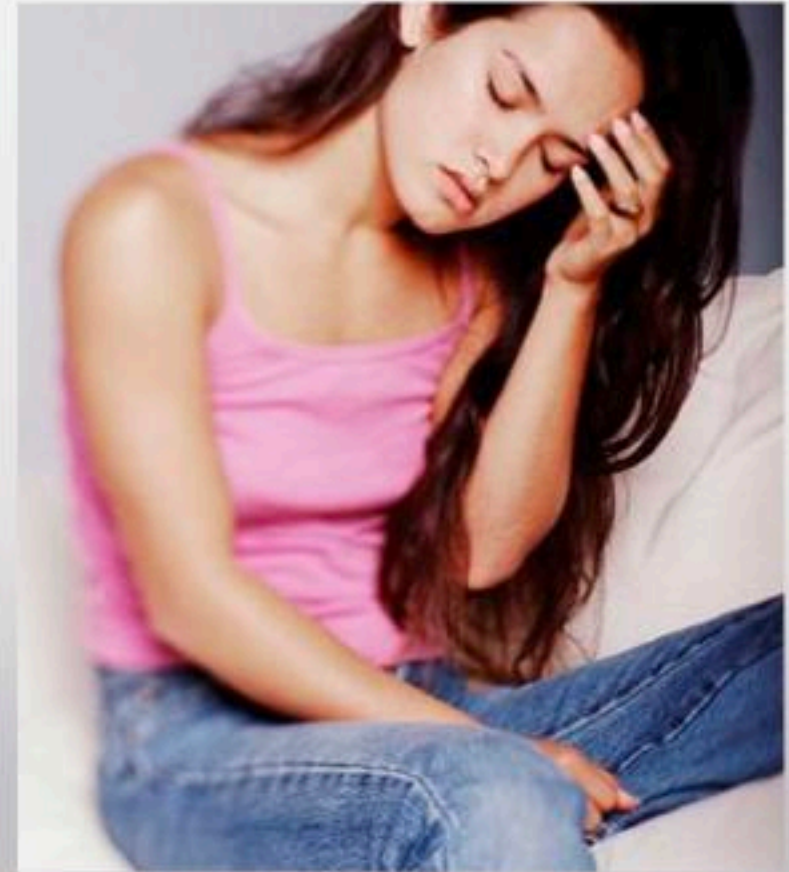
Figure 17.1. Referred pain pattern (red) of trigger points (x) in the right suboccipital muscles (American opt.)

"The Trigger Point Manual"
Janet Travell, MD



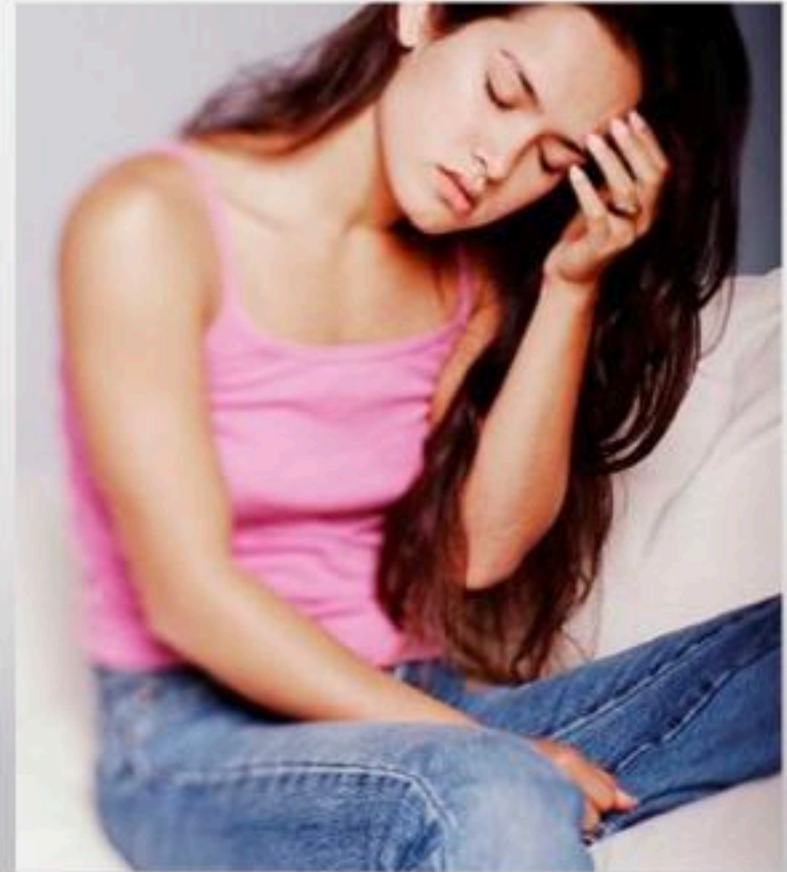
5 Common Obstacles

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



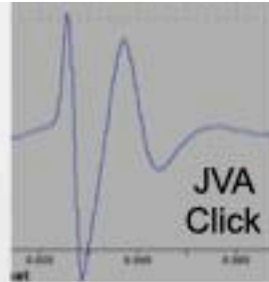
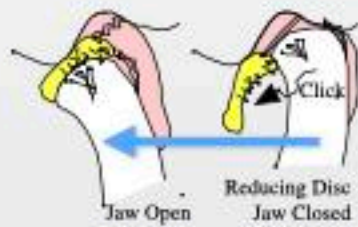
1 TMD that **usually** does not need therapy

TMJ Clicking

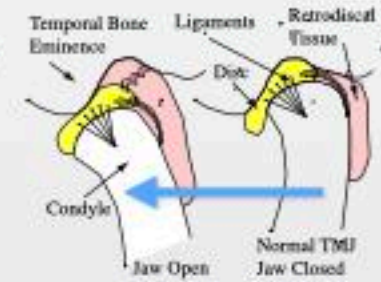


Differential Diagnosis of TMJ Clicking

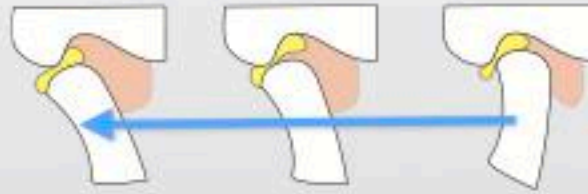
Disc Reduction



Normal

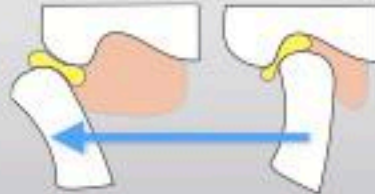


Adhesive Click



“Sticky Disc” - Disc sticks after prolonged clenching, then releases

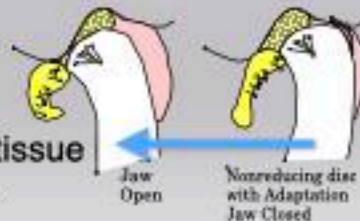
Eminence Thud



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

Adhesion Crackle

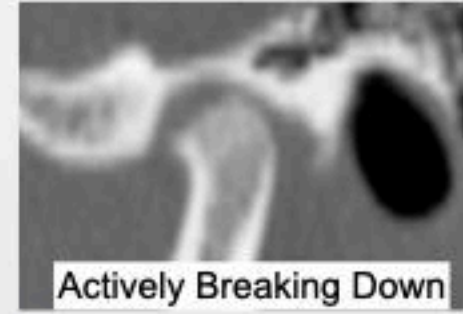
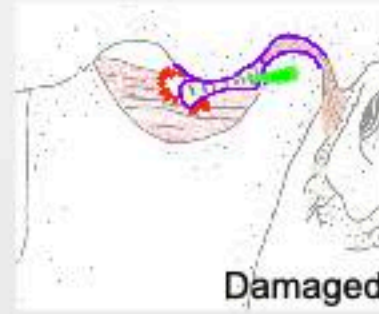
A small piece of fibrous tissue
4b joint is moved across



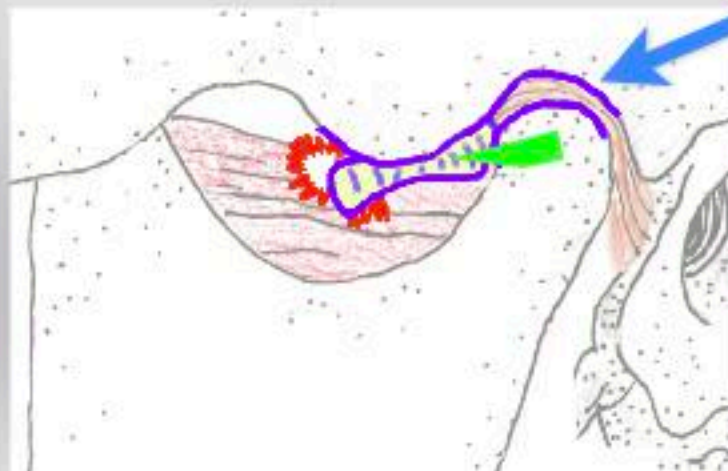
Basic Orthopedics

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Posterior ligament, synovium,
and retrodiscal tissue adapt to
form a
Pseudo-disc

Tissue Fibrosis

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

Leeuw, Boering, Stegenga, Bont,

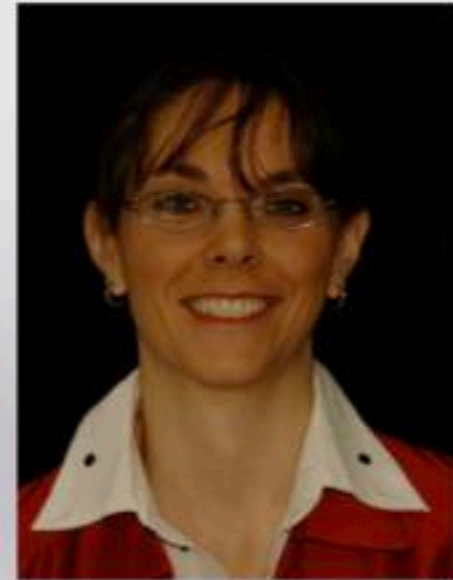
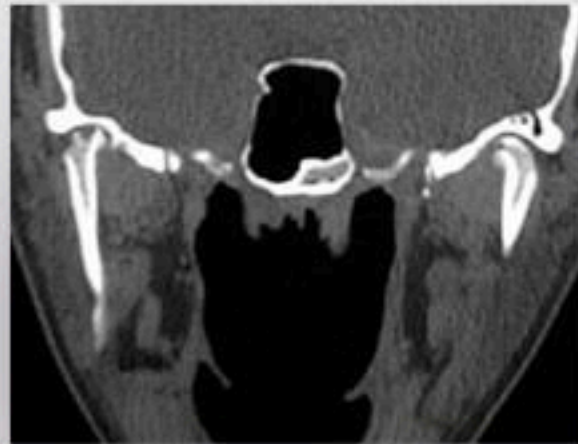
Journal of Craniomandibular Practice, April 1995, vol. 13, No. 2

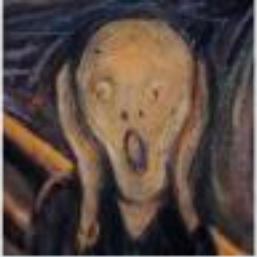
- University Hospital, Netherlands: 134 TMD patients, 30 year follow up
- Patients received good clinical work up and diagnosis 30 years ago, but basically no treatment
 - ┆ (Reassurance, PT, exercise, limited occlusal adjust)
- 70% satisfied with results
- 25% still had pain on movement
- 15% not able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



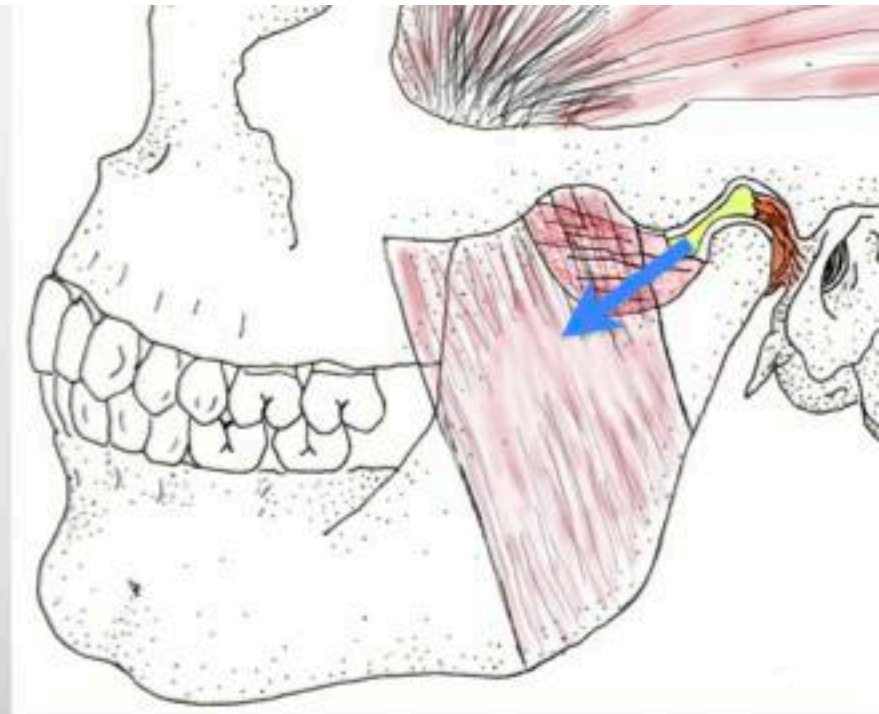
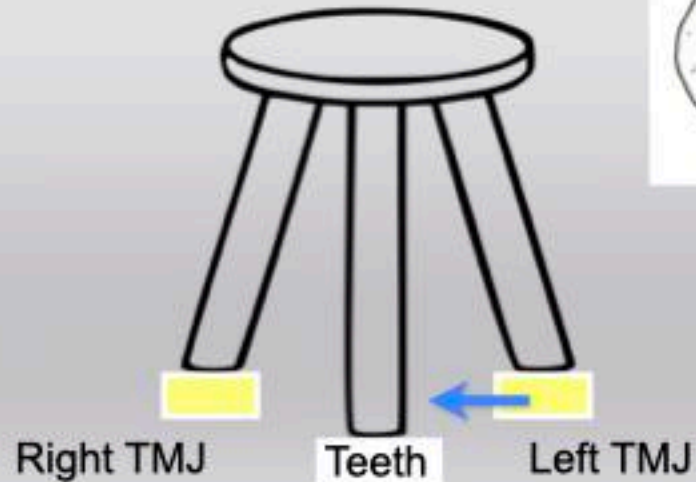
Avascular Necrosis
Progressive Condylar Resorption

*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?



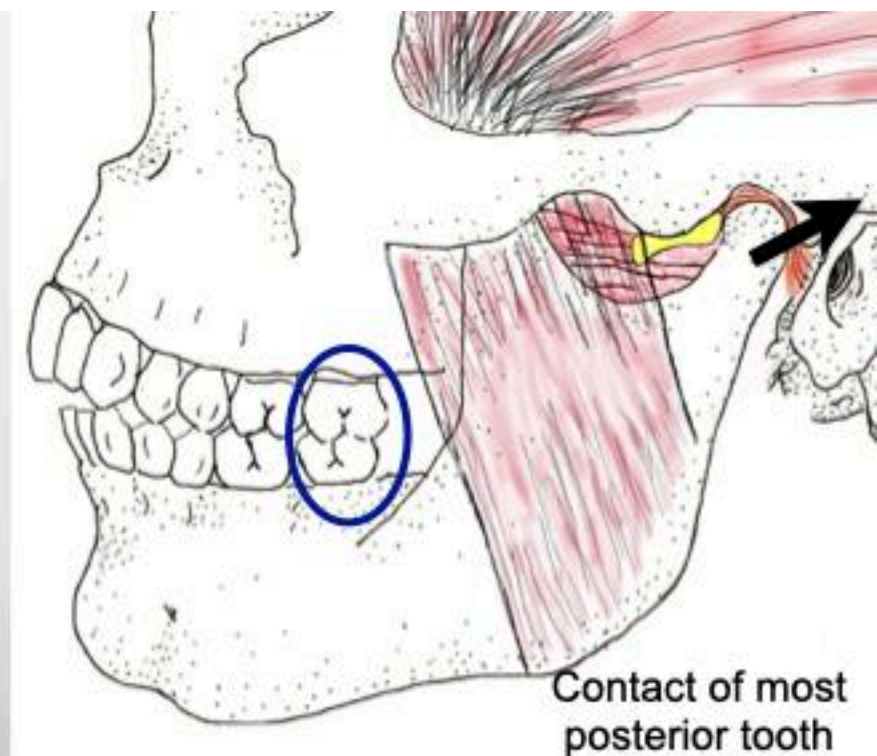
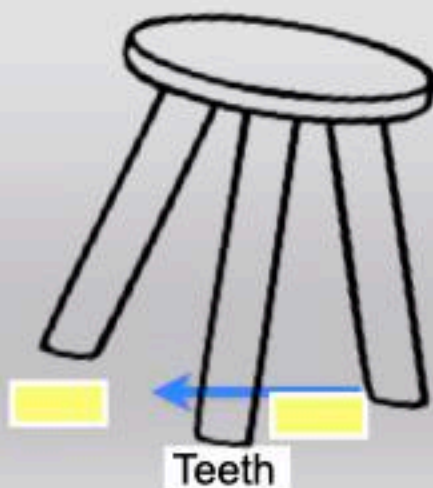
Damaged Joint with Malocclusion

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.
(Anterior Posterior 2mm)
If >2mm something else is going on.



Occlusal Muscle Disharmony

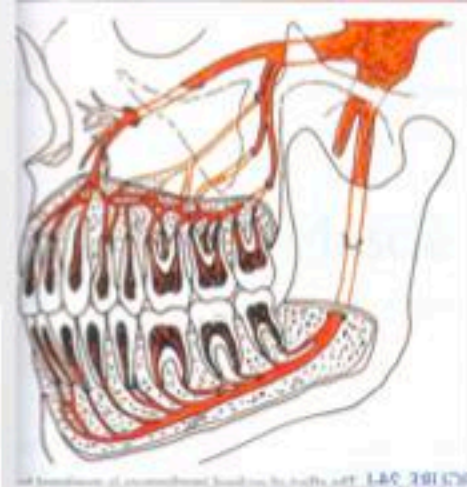
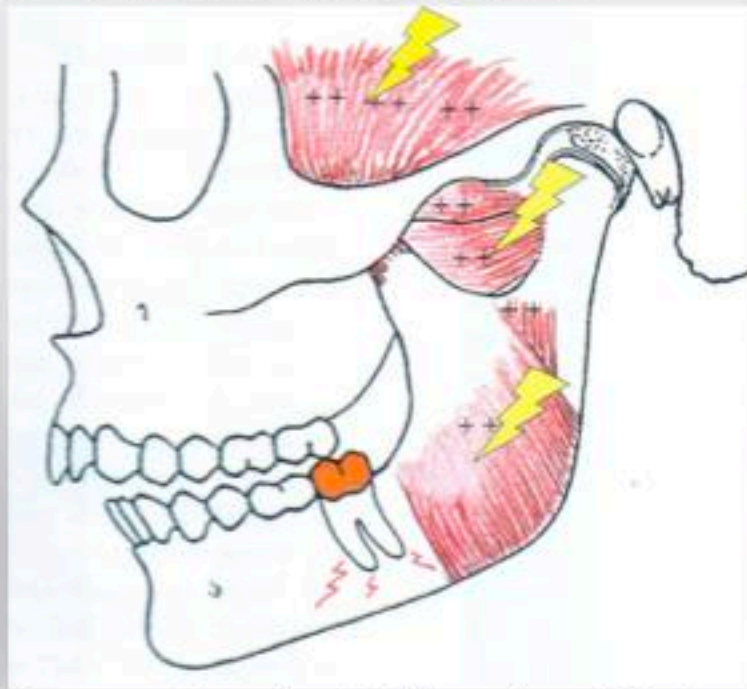
Uneven tooth contact with condyles fully seated triggers muscle activity

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

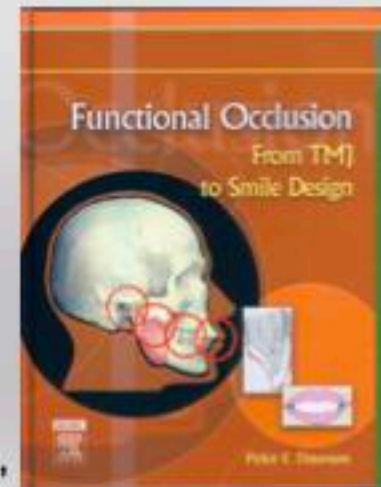
Disharmony in all muscles: Splinting/Bracing

Muscles sore from overuse

Muscles do not think- CNS input



from Dawson's Textbook, "Functional Occlusion"



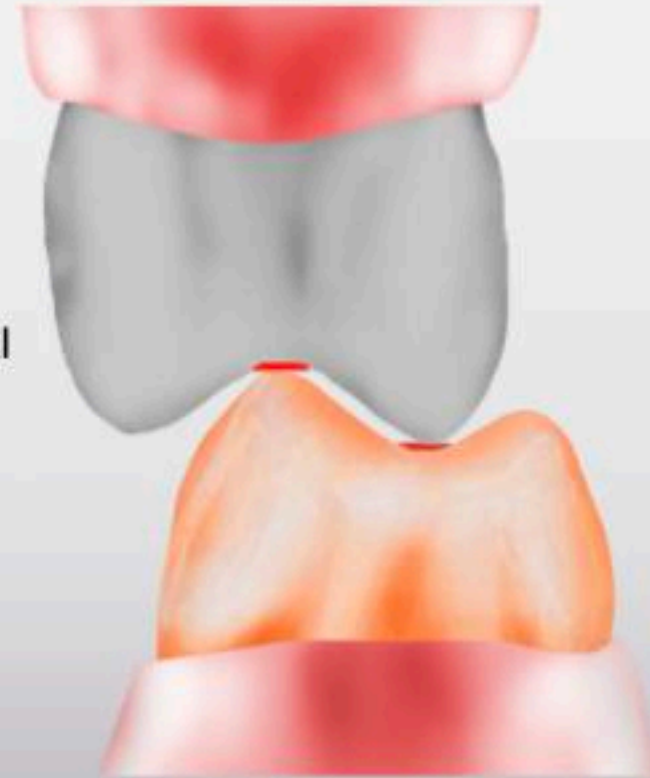
LD Pankey's 3 Rules of Occlusion

(Clyde Schuyler)

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

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

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

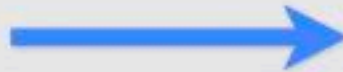


Drawing by Dr Jim Kessler

Treat Occlusal Muscle Dysfunction- Adjust the Occlusion



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



Before

After



Occlusal Sculpting Tools, including Zirconia



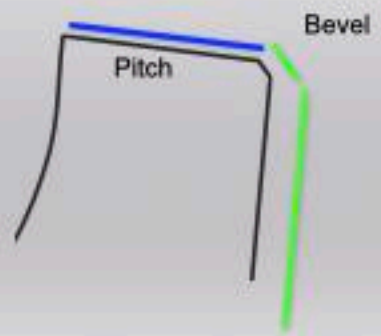
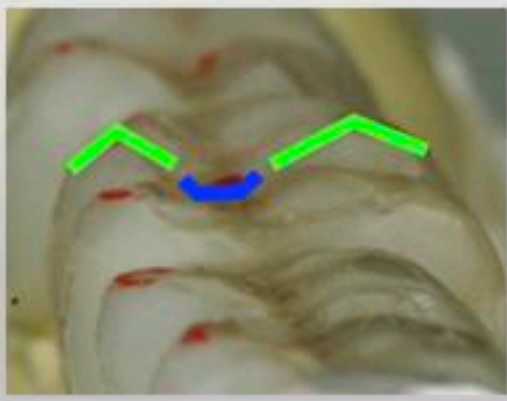
Wheel
 Create Cusp Landing Zone
 Flatten Incisal edges
 Bulk reduction of inclines



Move and Shape Cusps,
 Inclines, Facial Surfaces



Brassler Brio Shine
 FLBCER-1
 FLBF-2



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

6 Common TMDs

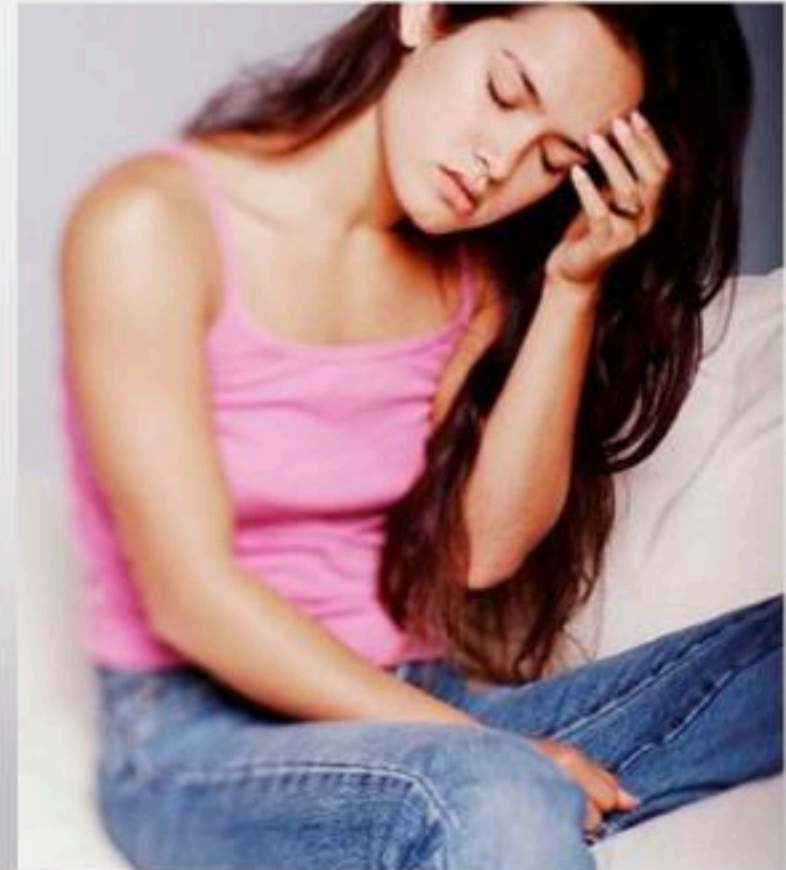
- Parafunctional Clenching
- Parafunctional Grinding
- Occlusal Muscle Dysfunction
- Osteoarthritis
- Acute Sprain
- Acute Closed lock of TMJ disc


5 Common Obstacles

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

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

- TMJ Clicking





Know Yourself

Know Your Work



Know Your Patient

Apply Your Knowledge

LD Pankey Institute

Write your Dream

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

Exam and Diagnostic Tests

John R Droter DDS
Annapolis, Maryland

Different Diagnoses have Different Therapies

Specific Diagnosis

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

1. TMJ Damage

Arthritis
 Dislocation
 Fracture
 Infection
 Injury
 Osteoarthritis
 Osteoporosis
 Osteomyelitis
 Paget's Disease
 Rheumatoid Arthritis
 Spondyloarthritis
 Trauma
 Xeroderma Pigmentosum

Alveolar Bone Loss
 Ankylosis
 Condylar Head Fracture
 Condylar Head Dislocation
 Condylar Head Erosion
 Condylar Head Infection
 Condylar Head Injury
 Condylar Head Osteoarthritis
 Condylar Head Osteoporosis
 Condylar Head Osteomyelitis
 Condylar Head Paget's Disease
 Condylar Head Rheumatoid Arthritis
 Condylar Head Spondyloarthritis
 Condylar Head Trauma
 Condylar Head Xeroderma Pigmentosum

2. Muscles of the TMJ

Bruxism
 Clenching
 Fatigue
 Hypertrophy
 Injury
 Irritation
 Myofascial Pain
 Myofascial Trigger Points
 Myofascial Tightness
 Myofascial Weakness
 Myofascial Dysfunction
 Myofascial Pain Syndrome
 Myofascial Spasm
 Myofascial Strain
 Myofascial Tear
 Myofascial Trauma

3. Cranial Alignment/Occlusion

Abnormal Occlusion
 Abnormal Occlusal Contact
 Abnormal Occlusal Interference
 Abnormal Occlusal Trauma
 Abnormal Occlusal Wear
 Abnormal Occlusal Damage
 Abnormal Occlusal Injury
 Abnormal Occlusal Infection
 Abnormal Occlusal Irritation
 Abnormal Occlusal Myofascial Pain
 Abnormal Occlusal Myofascial Dysfunction
 Abnormal Occlusal Myofascial Spasm
 Abnormal Occlusal Myofascial Strain
 Abnormal Occlusal Myofascial Tear
 Abnormal Occlusal Myofascial Trauma

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 Abnormal Occlusal Myofascial Dysfunction
 Abnormal Occlusal Myofascial Spasm
 Abnormal Occlusal Myofascial Strain
 Abnormal Occlusal Myofascial Tear
 Abnormal Occlusal Myofascial Trauma

4. Cervical Damage

Arthritis
 Dislocation
 Fracture
 Infection
 Injury
 Osteoarthritis
 Osteoporosis
 Osteomyelitis
 Paget's Disease
 Rheumatoid Arthritis
 Spondyloarthritis
 Trauma
 Xeroderma Pigmentosum

5. Parafunction

Bruxism
 Clenching
 Fatigue
 Hypertrophy
 Injury
 Irritation
 Myofascial Pain
 Myofascial Trigger Points
 Myofascial Tightness
 Myofascial Weakness
 Myofascial Dysfunction
 Myofascial Pain Syndrome
 Myofascial Spasm
 Myofascial Strain
 Myofascial Tear
 Myofascial Trauma

6. Whole Body / Systemic

Alveolar Bone Loss
 Ankylosis
 Condylar Head Fracture
 Condylar Head Dislocation
 Condylar Head Erosion
 Condylar Head Infection
 Condylar Head Injury
 Condylar Head Osteoarthritis
 Condylar Head Osteoporosis
 Condylar Head Osteomyelitis
 Condylar Head Paget's Disease
 Condylar Head Rheumatoid Arthritis
 Condylar Head Spondyloarthritis
 Condylar Head Trauma
 Condylar Head Xeroderma Pigmentosum

7. Other

Abnormal Occlusion
 Abnormal Occlusal Contact
 Abnormal Occlusal Interference
 Abnormal Occlusal Trauma
 Abnormal Occlusal Wear
 Abnormal Occlusal Damage
 Abnormal Occlusal Injury
 Abnormal Occlusal Infection
 Abnormal Occlusal Irritation
 Abnormal Occlusal Myofascial Pain
 Abnormal Occlusal Myofascial Dysfunction
 Abnormal Occlusal Myofascial Spasm
 Abnormal Occlusal Myofascial Strain
 Abnormal Occlusal Myofascial Tear
 Abnormal Occlusal Myofascial Trauma

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: Root canal mobilization
 Refer to Physical Therapy: Various Muscle Therapies
 Refer to Chiropractic: Atlas Orthogonal
 Refer to Osteopathic MD: Body alignment
 Breathe, Walk, Exercise

Medicinal

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

Dental Orthotics

In Office Trial Anterior Stop
 Diagnostic Palatal Anterior Stop
 Brux Checker
 Lower full coverage CR
 BiArch Posterior Deprogrammer
 Upper full coverage hard CR guard
 Temporary home use anterior stop
 Myofascial

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

Sleep/ Fatigue

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

Surgical

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

Occlusal Orthopedic

Lingual Light Wire
 Lower soft sectional orthotic
 Condylar distraction
 Sectional orthodontics
 Expansion orthodontics/ orthodontics
 Restorative Dentistry
 Occlusal Adjustment with OTR, TestScan

Tongue Parafunction

Refer for Cervical Alignment Stabilization
 Myofascial
 Upper Lingual light wire
 Clear Brux Checker
 Frereactory
 Myofunctional therapy

Specific Therapy

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 neoplasms of bones of skull and face
Open Lock TMJ, Recurring
Osteoarthritis TMJ, active degeneration
Osteoarthritis- Inactive
Osteochondritis Dissecans TMJ
Osteolysis Mandibular Condyle, Active
Perforation Mandibular, TMJ
Perforation Pseudocyst, 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
Idiopathic Orthotic Damage
Malocclusion Anterior Open Bite
Malocclusion Centric occlusion Mx/C 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
Cervicocranial 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 Deformity Standing
Postural Deformity Walking
Postural Forward Head Position
Upper Airway Resistance, UARS

7. Other

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

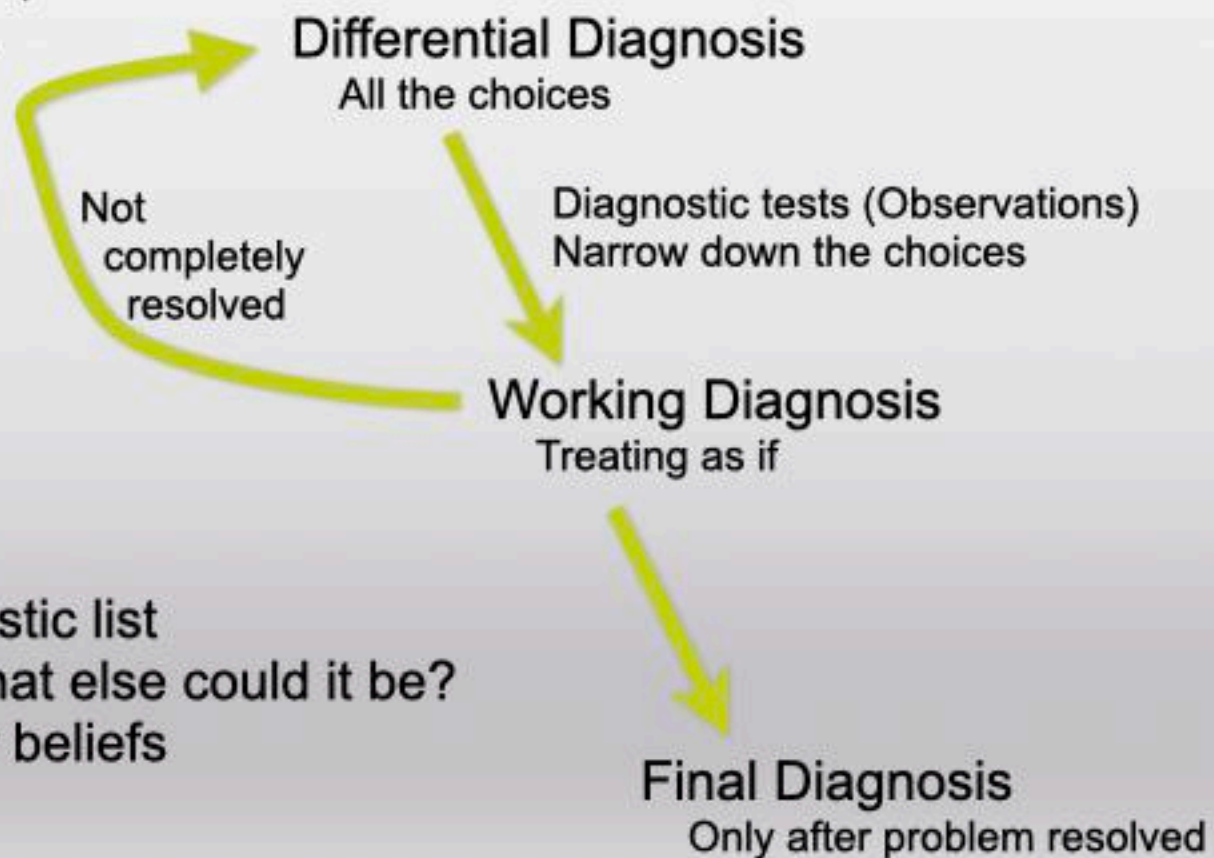
The Diagnostic Process

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



Think!!

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



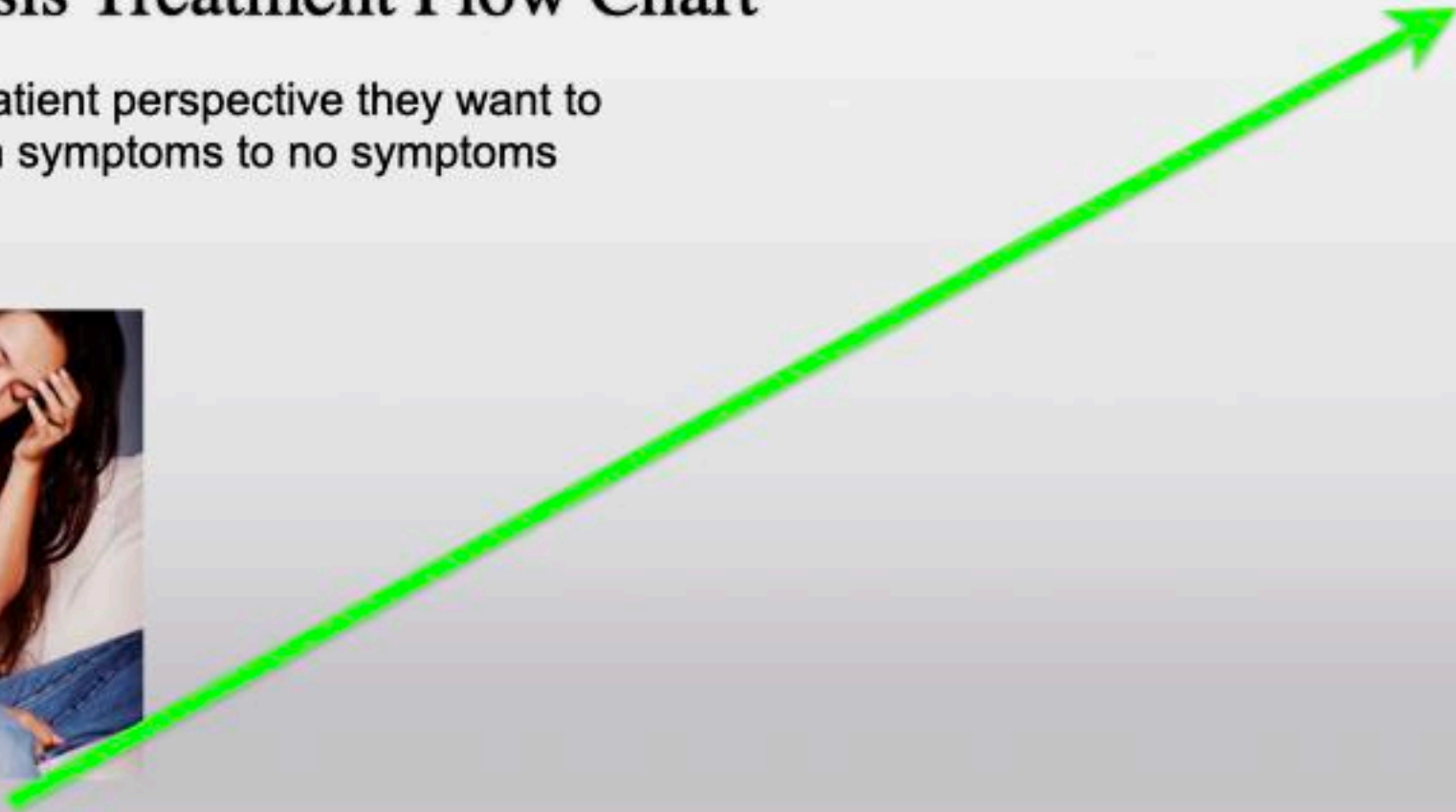
Diagnosis Treatment Flow Chart

From a patient perspective they want to go from symptoms to no symptoms



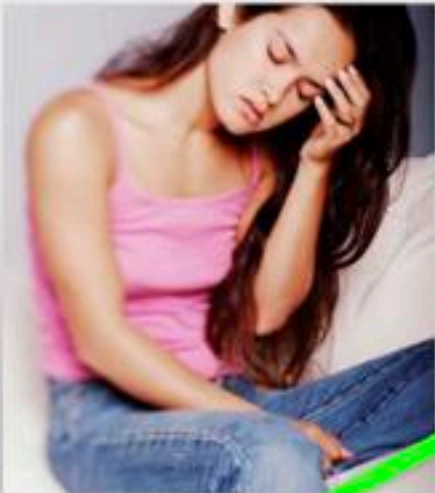
Symptoms

No Symptoms



Diagnosis Treatment Flow Chart

From a patient perspective they want to go from symptoms to no symptoms



Symptoms

History

Signs

Doctor Exam

Differential Diagnosis

Diagnostic Tests

Specific Working Diagnosis

Treatment

If not resolved

No Signs

No Symptoms
Final Dx

Doctor Re-Exam

Symptom Dx

Tooth Pain
Arthralgia

vs
vs

Specific Dx

Irreversible Pulpitis
Osteoarthritis

Facial Pain Diagnosis

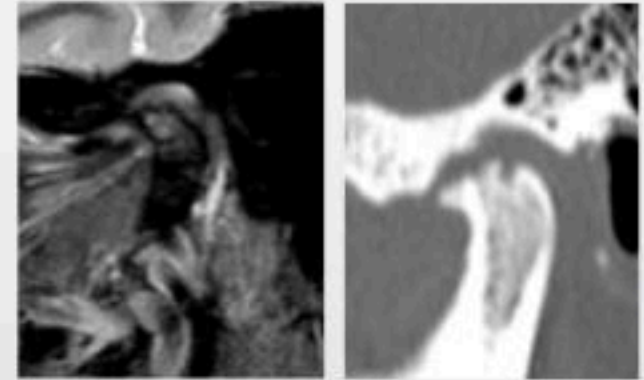
Diagnostic Tools

- 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

Biometrics

- Joint Vibration
- Jaw Tracker
- Electromyography
- T-Scan

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



RESEARCH

Applications | Products | Services

Home | TMJ | Orthodontics | Cosmetic Dentistry | General Practice | Sleep Dentistry

JVA **EMG** **JT-3D** **T-Scan II**

Facial Pain Diagnosis

Diagnostic Tools

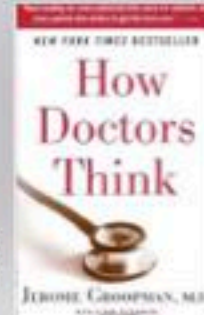
- 1 **Written and Oral History**
- 2 **Observation**
- 3 Physical Exam
 - Muscle Palpation
 - Joint Palpation
 - Joint Auscultation
 - Joint Motion
- 4 Anterior Stop Test
- 5 Sleep Airway Screening
- 6 CT Scan
- MRI
- Blood Tests


Most Important is the history. You have a good idea of what is going from this alone.

You can also observe speech, jaw movements, neck movements, demeanor, body posture during the oral history.

Need to resist the temptation to zero in on one diagnosis.

Still need make a Differential Diagnosis.
It appears to be, but what else could it be?




 John R. Brooker, D.D.S.
 4545 Woodloch Hill, #200
 Denver, Colorado 80221
 303-454-9400
 drbrooker@aaaop.com
 Fax: 303-454-0102

Facial Problem Questionnaire

I. Name _____ Age _____
 Date _____ Referred by _____

II. Which of the following do you have (circle all that apply):
 Headaches Neck Pain Jaw pain Ear Pain
 Facial Pain Eye Problems Damaged teeth
 Other _____


III. Please shade in where your pain is located:

IV. How long have you had this pain? _____
 Is the pain constant? _____
 Is the pain worse at (circle all that apply): Working Resting
 Standing Sleep In bed Other _____
 Is the pain worse in the (circle all that apply):
 Morning Afternoon Evening Night
 What makes the pain better? _____
 What makes the pain worse? _____

How severe is your pain? Please make a check along the line below:

No Pain _____ Worst Pain _____

Facial Problem Questionnaire




John R. Droter, D.D.S.
 4000 Massachusetts Rd., 200B
 Bowie, Maryland, 20716
 410-502-0400

Facial Problems Questionnaire

1. Name _____ Age _____
 Date _____ Referred by _____
 Referring Doctor: Please Print Name: _____

2. Which of the following do you have (circle all that apply):
 Headaches _____ Neck Pain _____ Jaw pain _____ Ear Pain _____
 Facial Pain _____ Skin Problems _____ Damaged teeth _____
 Other _____



3. If Pain, Please shade in where your pain is located.

4. If pain... How long have you had this pain? _____
 Is the pain constant? _____
 Is the pain (circle all that apply): Aching _____ Burning _____
 Itching _____ Sharp _____ Dull _____ Other _____
 Is the pain worse in the (circle all that apply):
 Morning _____ Afternoon _____ Evening _____ Night _____
 What makes the pain better? _____
 What makes the pain worse? _____
 How severe is your pain? Please make a mark along the line below:
 No Pain |-----| Worst Pain Ever

116

Pt fills out FPQ and mails in prior to appointment being made
 It is reviewed and type of appointment is determined.

FPQ is a combination of:
 Parker Mahan, DDS
 Henry Gremillion, DDS
 Mark Piper, MD
 John R Droter, DDS

Feel free to download and use
www.jrdroter.com
 Patient Download

All patients fill out whether they have pain or not

Question 20 is the most important of all

20. Describe the problem (s) in your own words:

How have these problems affected your life? Does it keep you from doing anything that you want to do? (work, play, chores, eating, talking)

What would you like to accomplish with treatment here?

Start Reading here when you first look at form

What we want to know first, is best answered by the patient last. Patient's memory has been focused on the details of the problem for the previous 5 pages. Now when they answer, it is a much more focused answer.

FAB
Feature
Advantage
Benefit

All treatment discussions are made in reference to the benefit to the patient

Nobody ever wants to own a feature: an occlusal adjustment, a crown, or a root canal.
The first step to achieving(Benefit for patient).... is
The cost to(Benefit for patient).... is \$\$

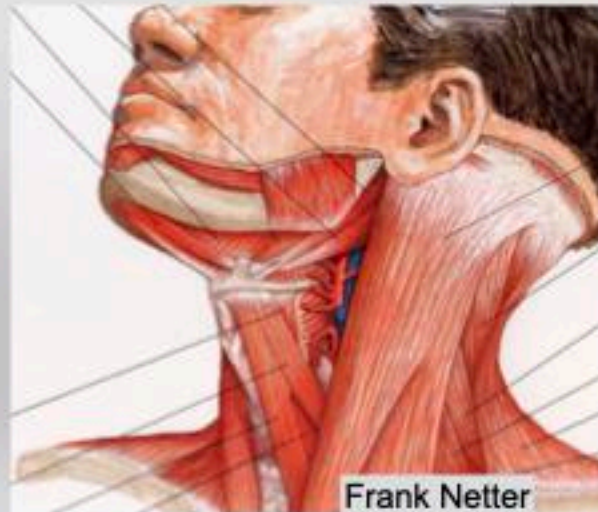
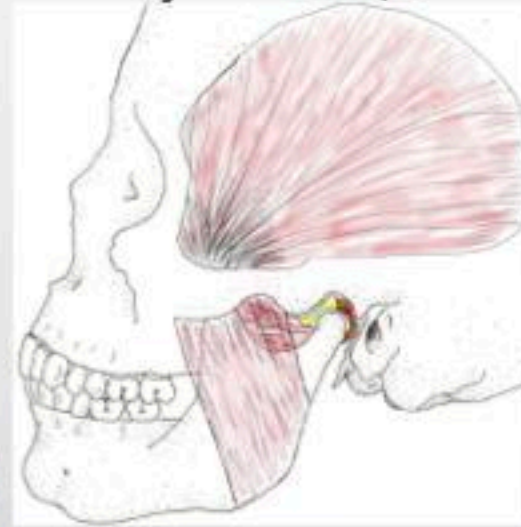
Facial Pain Diagnosis

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

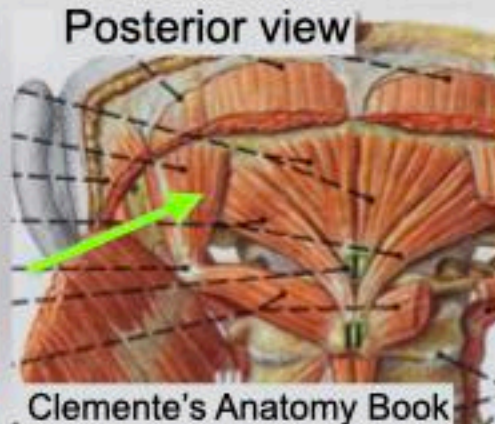
Diagnostic Tools

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- 3 **Physical Exam**
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 - Joint Palpation
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- Blood Tests

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



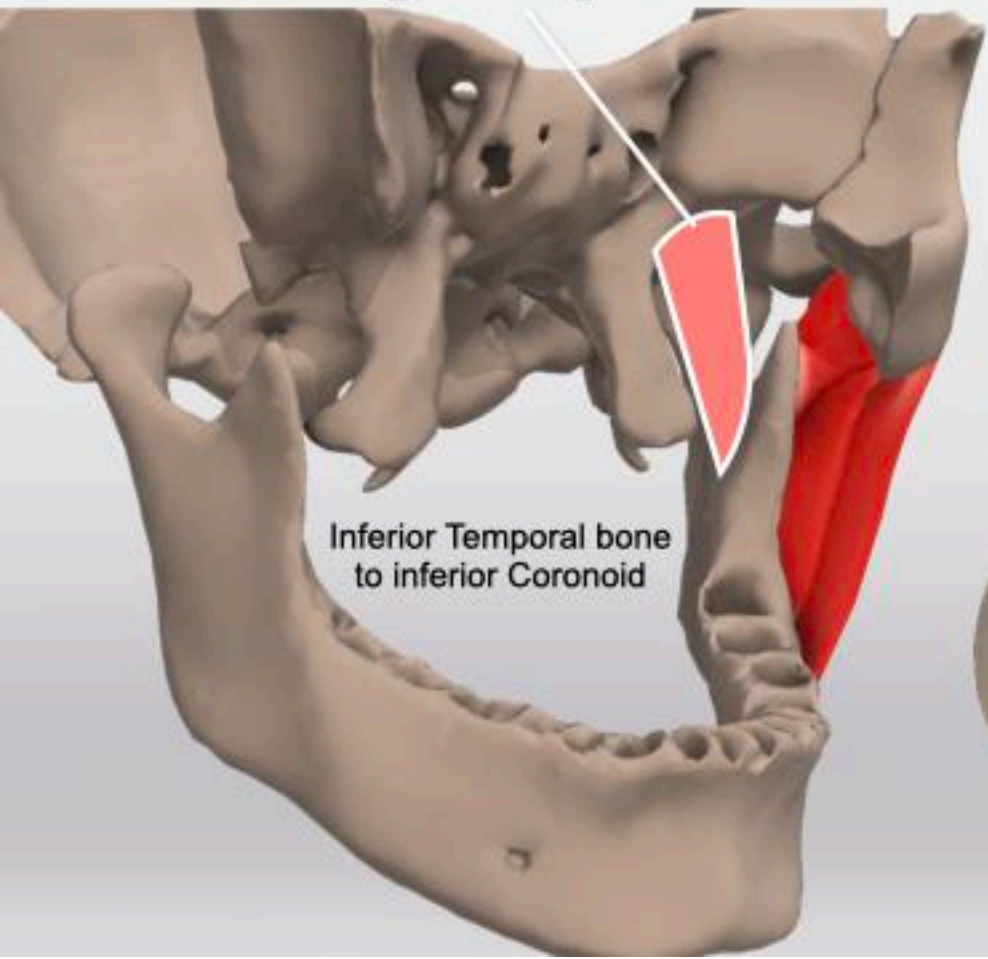
Frank Netter



Clemente's Anatomy Book

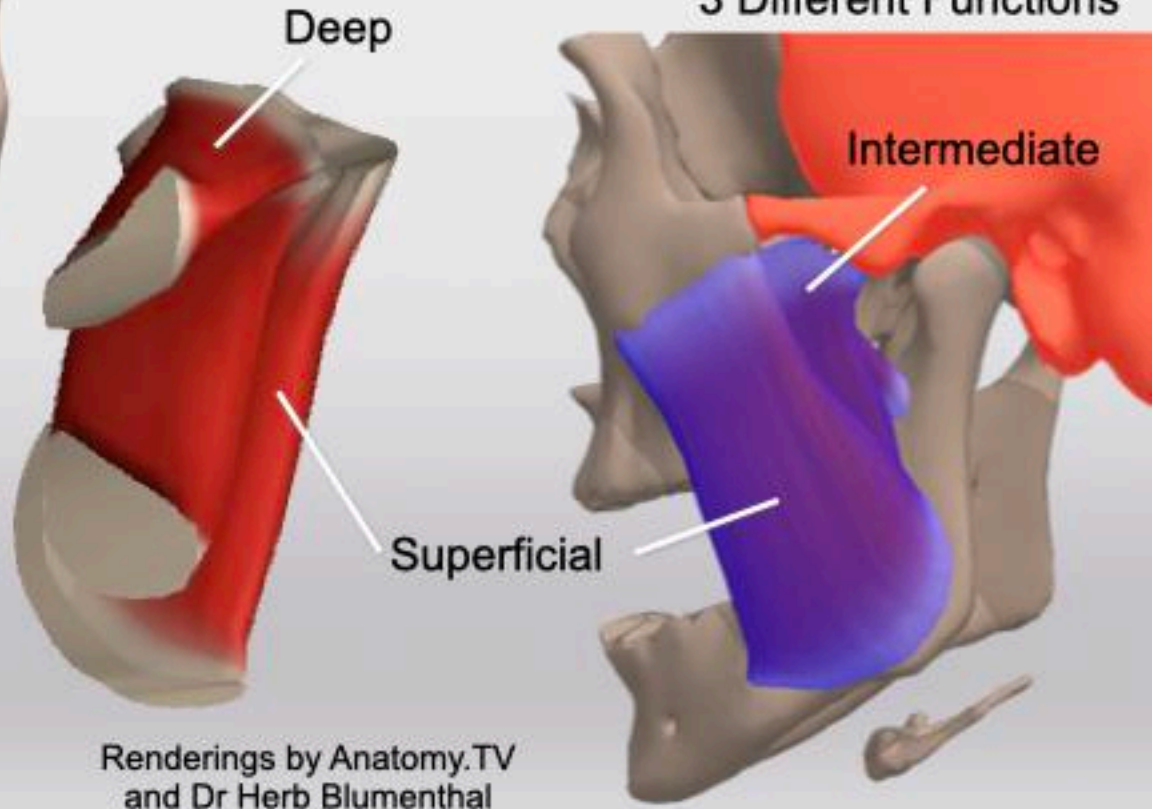
Anatomy TV

Deep Temporalis



Masseter Muscle is Complex

Complex Muscle
3 Different Portions
3 Different Functions



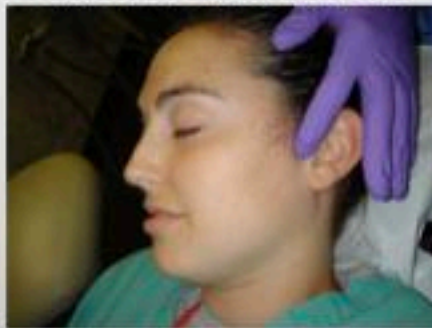
Renderings by Anatomy.TV and Dr Herb Blumenthal

Facial Pain Diagnosis

Diagnostic Tools

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

Anterior Lateral Pole



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



Posterior Lateral Pole



Indirect through Ear



Key Question: What is sore?
Is it the joint, or is it muscle,
or both, or neither?

Load Testing

No pain does not mean stable

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

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

CR Load test on these 39 joints:

CR Load Positive Soreness 22/39 (56%)

Missed 17/39 structurally unstable joints (44%)

CR and Lateral Load test on these 39 joints:

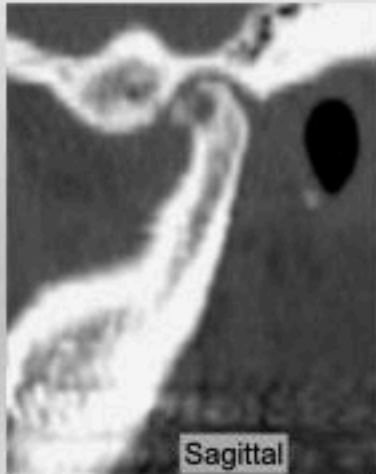
Positive Soreness of one or both test 33/39 (85%)

Missed 6/39 structurally unstable joints (15%)

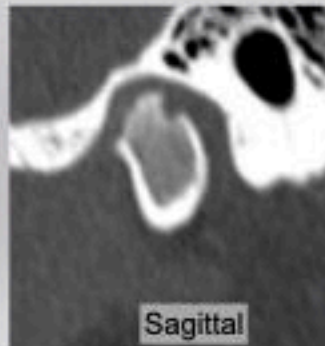


Load Test Bimanual Manipulation

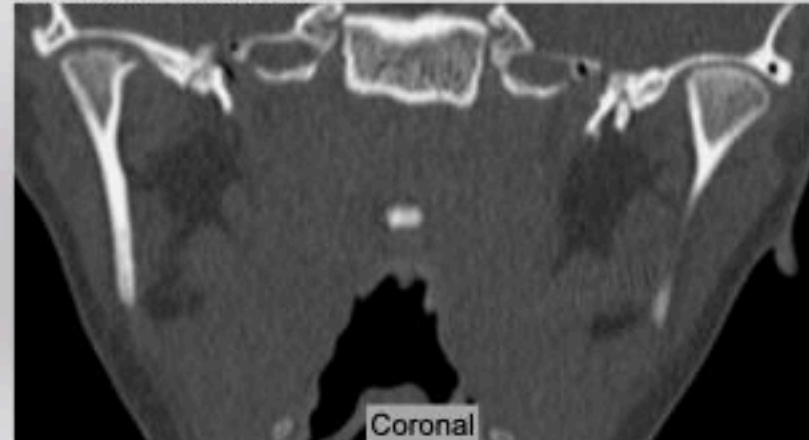
46yo F
CR Load Normal
Excursion Load Normal



40yo F
CR Load Normal
Excursion Load Slight



12yo F- CR Load Normal
Excursion Load Slight



Facial Pain Diagnosis

Diagnostic Tools

- 1 Written and Oral History
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 - Joint Auscultation**
 - Joint Motion
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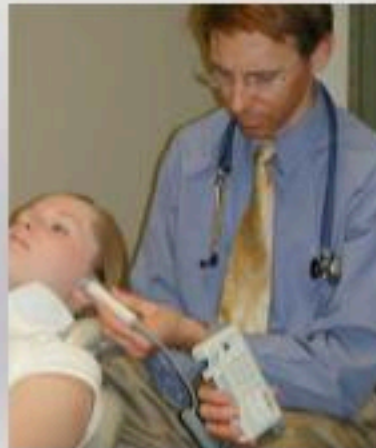
A healthy joint is quiet,
A damage joint is not.

A joint that does not move is also quiet.

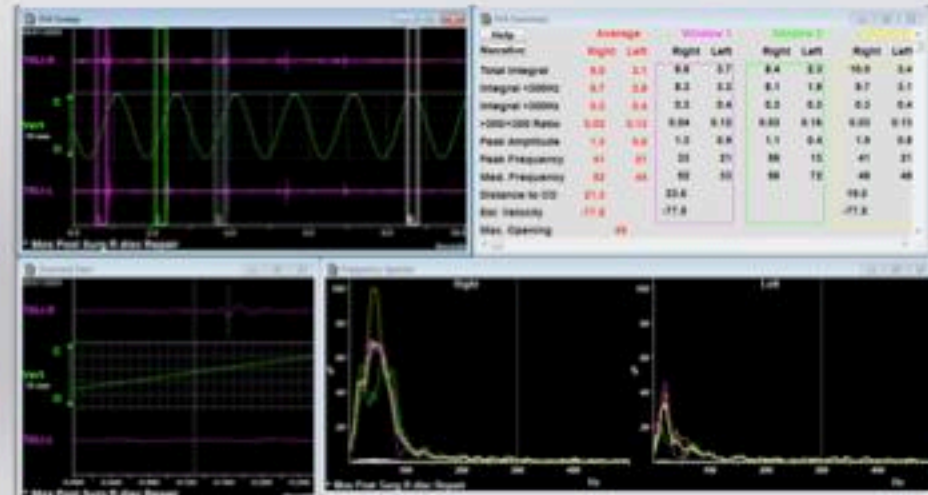
Stethoscope

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

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



Sounds/ Vibrations



Sounds/ Vibrations Stethoscope



Use Bell side, not Diaphragm side,
over the TMJ

3M Littmann Classic II S.E. Stethoscope

My Subjective Description of Joint Sounds

smooth
paper
sand
pebbles
rocks
glass

fine
med
coarse

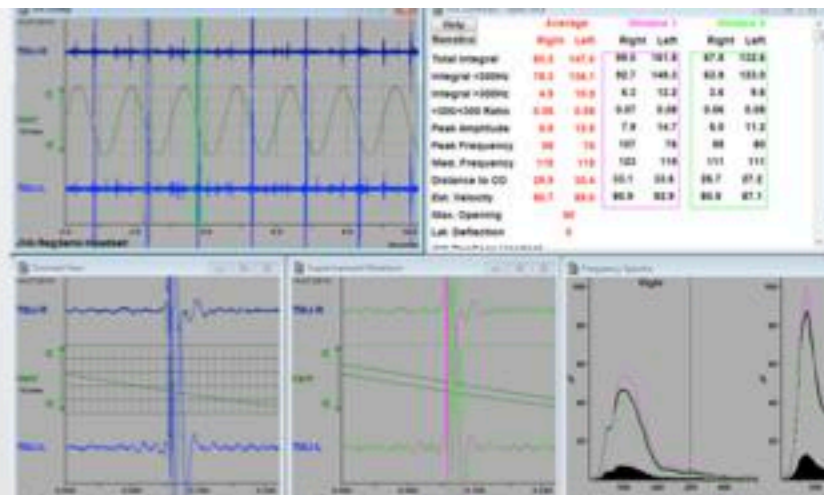
crackle
crunchy
squeaky
scratch

Click
soft
crisp
squishy
early
late
100%
75%
50%
25%
sporadic
??

negative joint movement
minimal joint movement

Joint Vibration Analysis

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



Based on Sonar.
It is not a microphone

Three main types of sounds

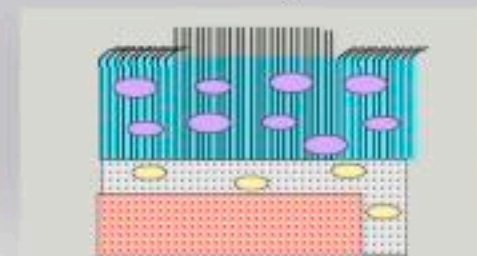


Disc Reduction
Disc Dislocation
Adhesion crackle
tooth tap

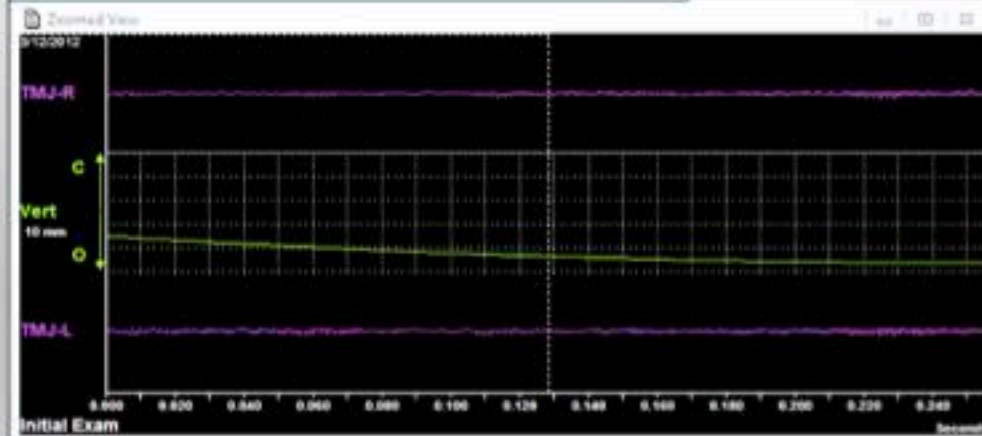
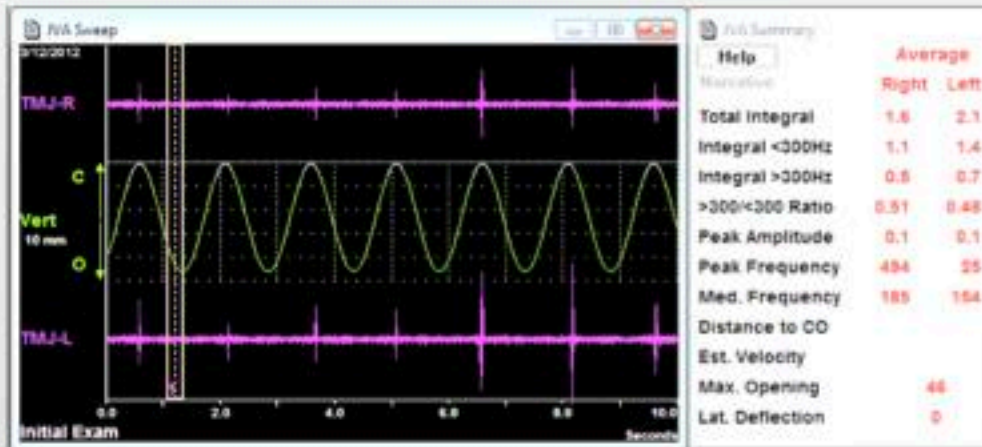
Osteoarthritis
Pseudo Disc
Damaged Cartilage

Disc Subluxation
Joint Subluxation
Disc Reduction
Disc Dislocation

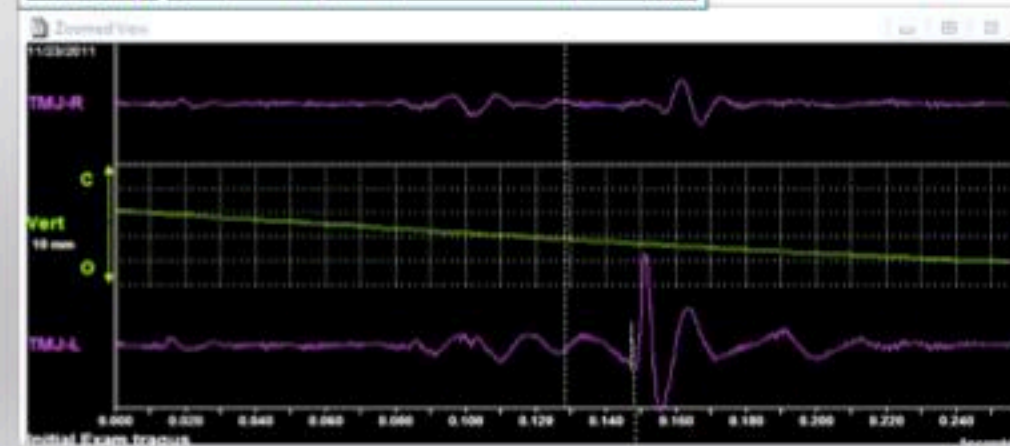
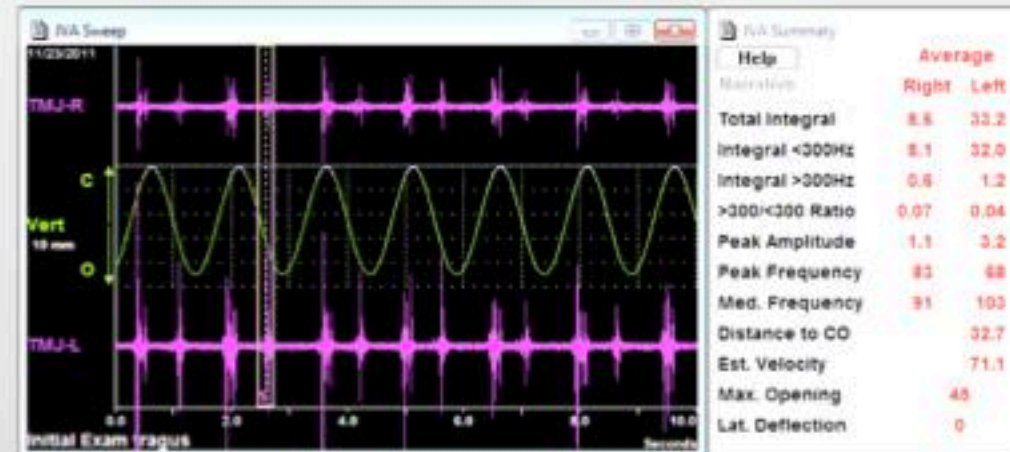
JVA measures the health of the cartilage



Healthy or Damaged?



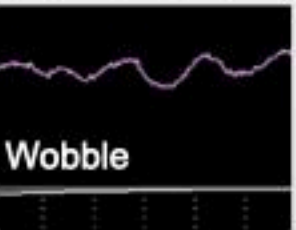
Healthy or Damaged?



Why is Joint making this vibration?



Good Vibrations
Healthy Cartilage
No Movement



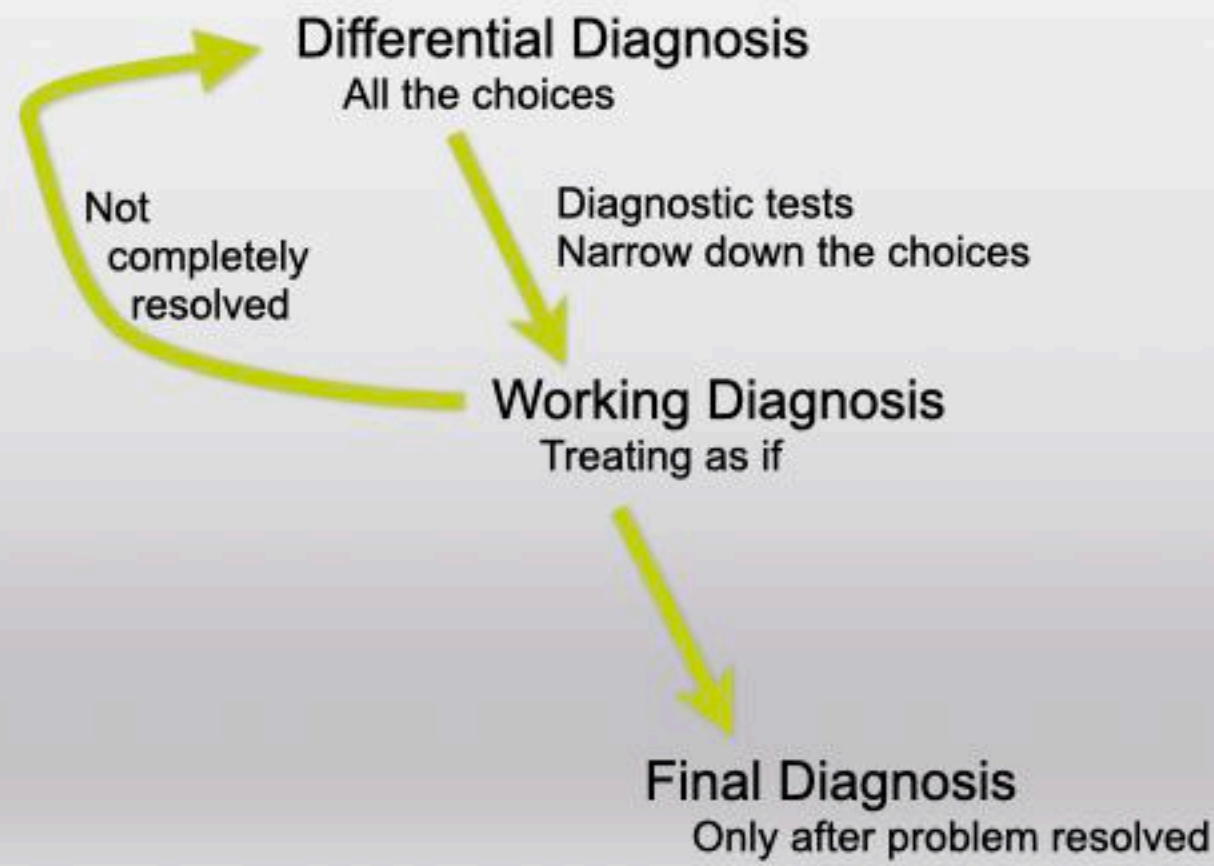
Wobble
Disc Dislocation
Disc Reduction
Disc subluxation
Joint subluxation
Condyle bumps Disc
Sensor roll on face



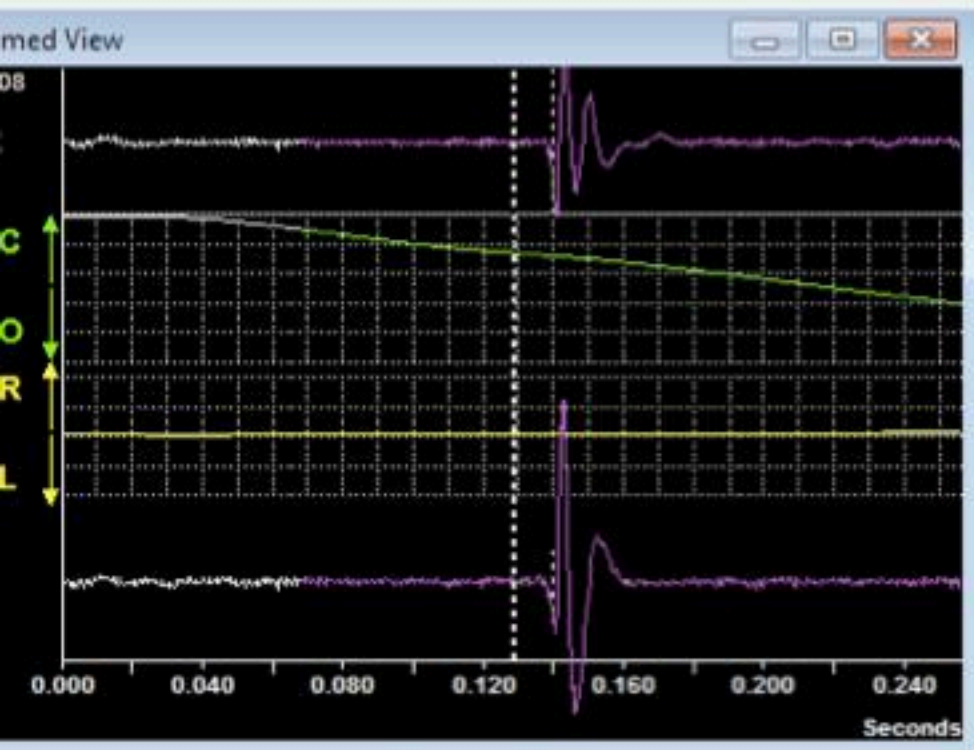
Click
Disc Reduction
Disc Dislocation
Adhesion Crackle
Tooth Tap
Contralateral Transference



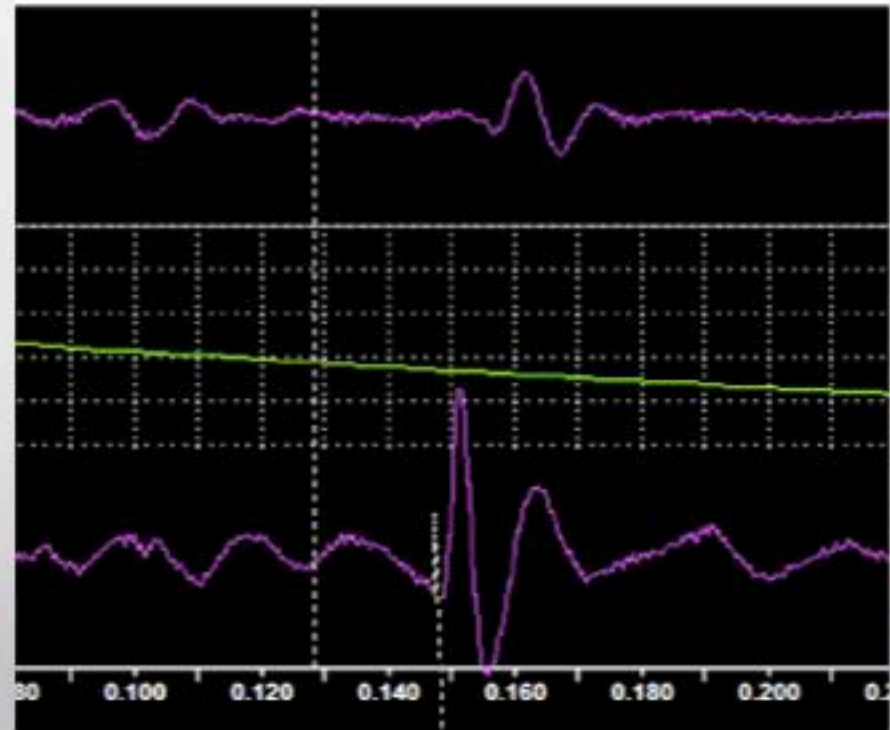
Scratch
Cartilage Fibrillation
Cartilage against tissue
Bone against bone
Velcro Noise



Simple or Complex



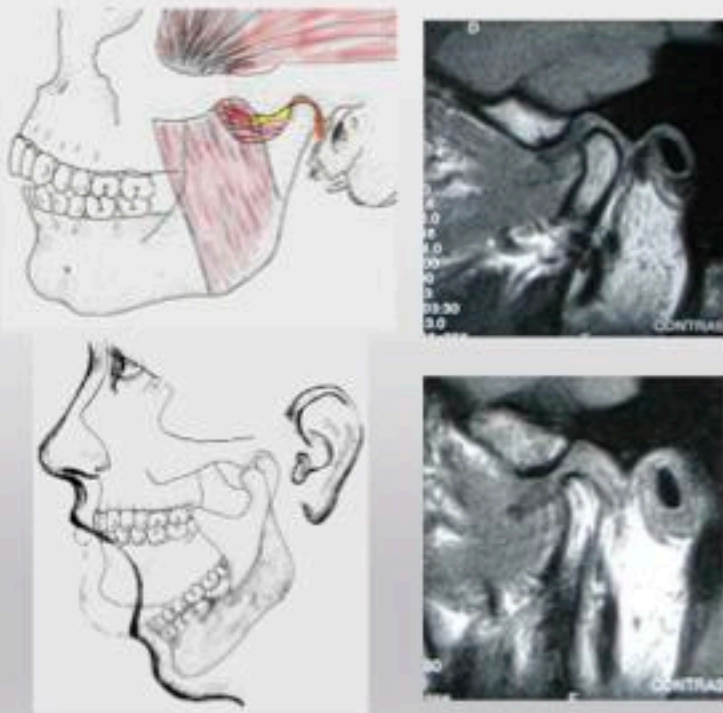
Simple left click with transference vibration to right
L4a



Complex Click
L3a, R4b

Magnetic Resonance Imaging

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



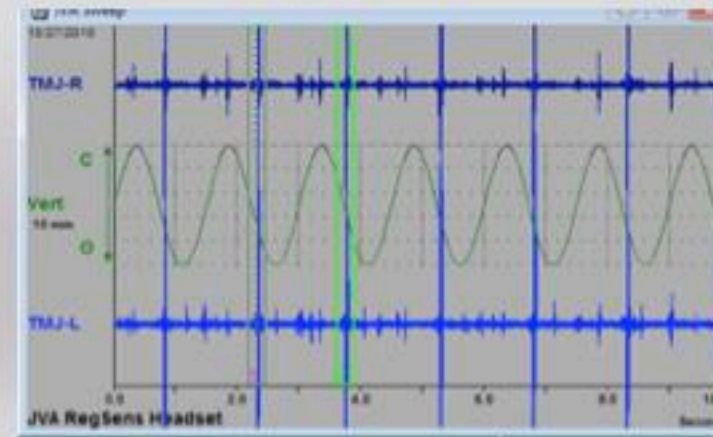
Joint Vibration Analysis

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



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

JVA allows you to view
the joint in function



Facial Pain Diagnosis

Evaluate for Full, Smooth Range of Motion

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

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

Take 4 Measurements:

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

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

Normal excursion are 25% of the max open

Evaluate Smoothness:
Light hold on chin as patient moves jaw

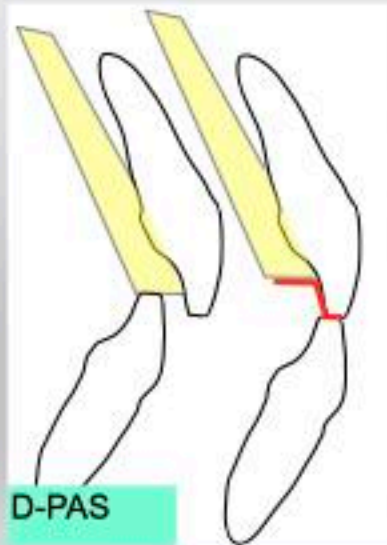


Therabite, 1-800-217-0025
www.therabite.com

Facial Pain Diagnosis

Diagnostic Tools

- 1 Written and Oral History
- 2 Observation
- 3 Physical Exam
 - Muscle Palpation
 - Joint Palpation
 - Joint Auscultation
 - Joint Motion
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- 5 Sleep Airway Screening
- 6 CT Scan
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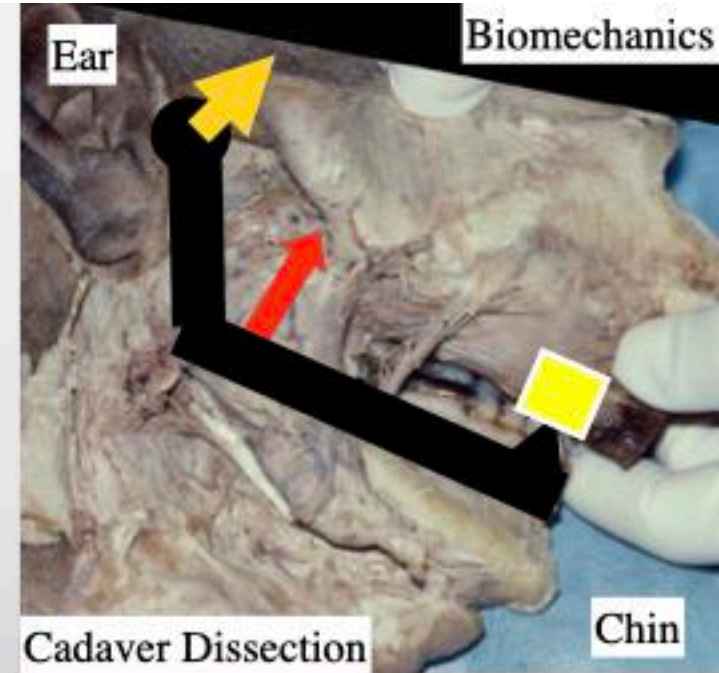
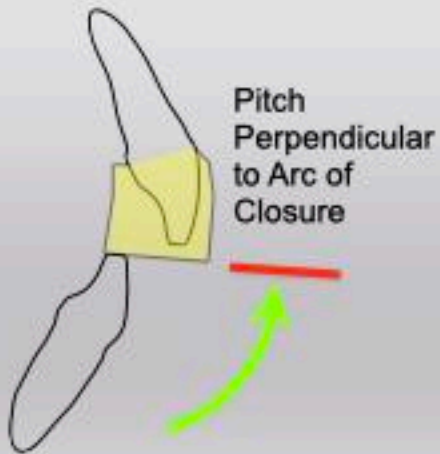
D-PAS

Anterior Stop Orthotics

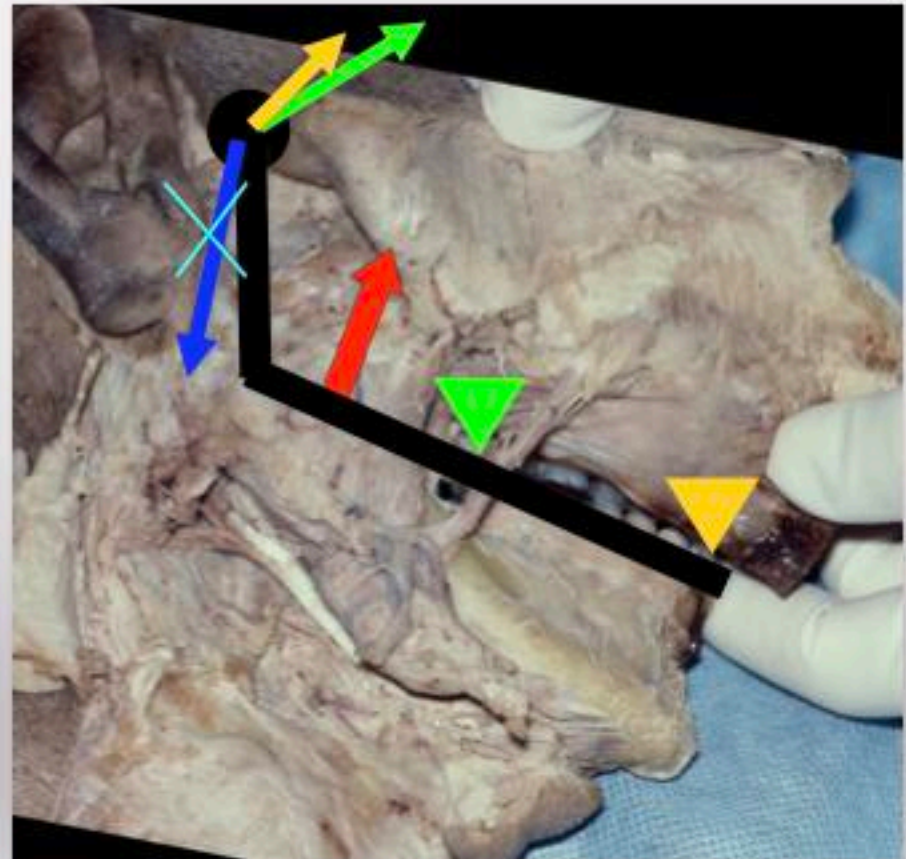


Anterior Stop Orthotic 3 Effects

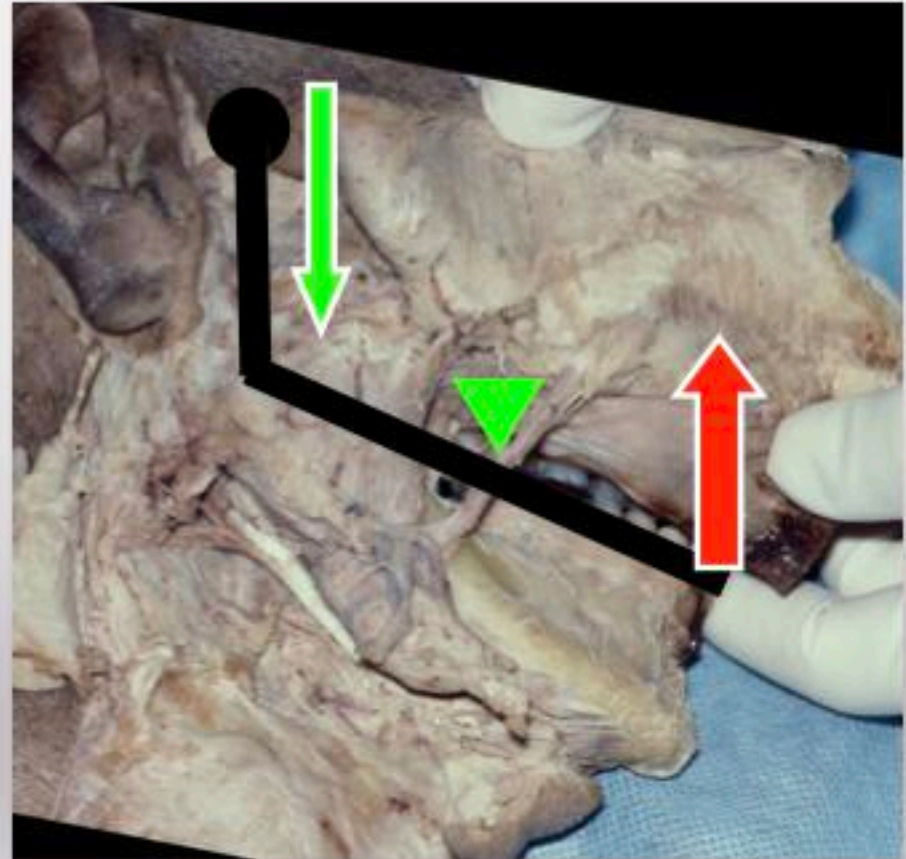
1. Allows Maxilla, Mandible, and Temporal bones to align.
2. Major decrease in muscle contraction force, most patients.
3. Breaks muscle engram avoidance and bracing patterns.



Can a Bilateral Pivot distract a condyle downward?



To distract both condyles need force upward in front of the pivot



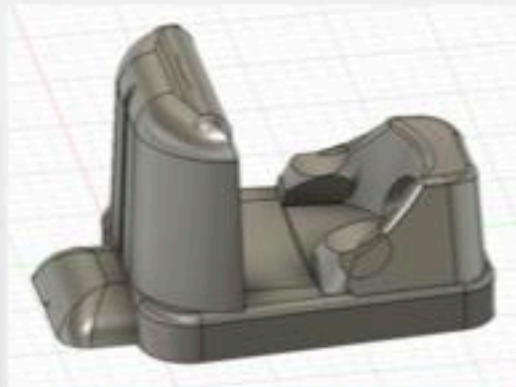
Anterior Stop Orthotic In Office Diagnostic Test



Reline with Parkell Blu-Mousse Super Fast

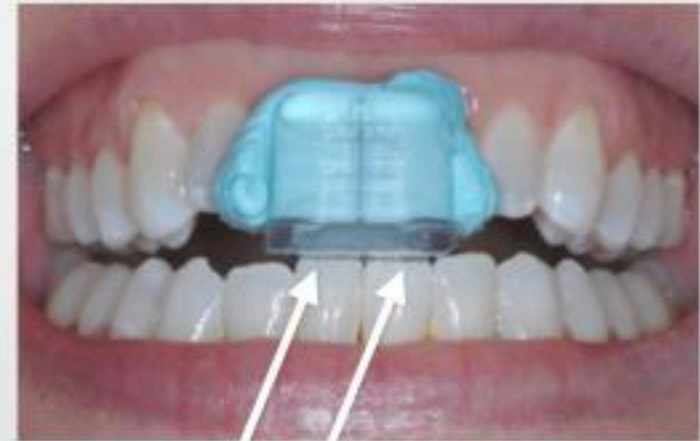


Can do 2nd reline over top of the first if needed

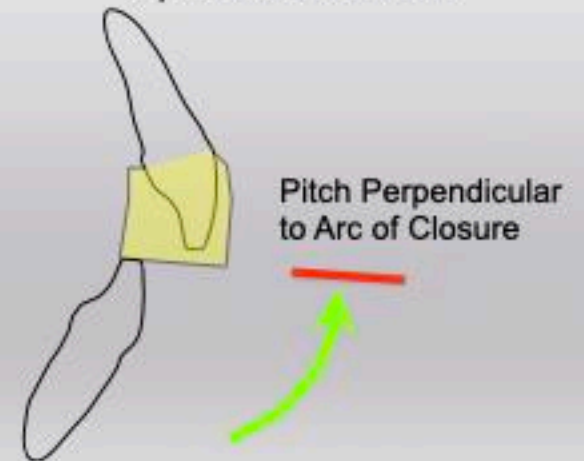


APS Anterior Stop 2.5mm

- Easy to hold and align
- Built in undercuts
- Long enough for class 2 and class 3
- Is bondable to composite



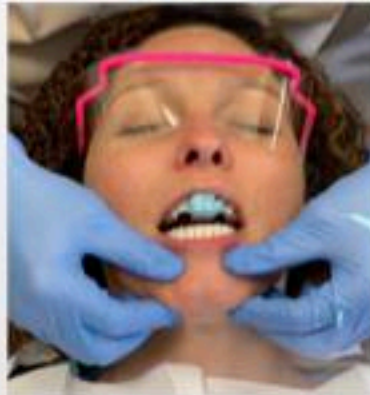
2 points of contact



Anterior Stop Orthotic In Office Diagnostic Test



ArrowPath Sleep
Anterior Stop



Deprogram Muscle Engrams

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

With anterior stop in place:

5-10x wide open solid tap, open tap far left, open tap far right

2nd round same except Dr unexpectedly accelerates closing a few times

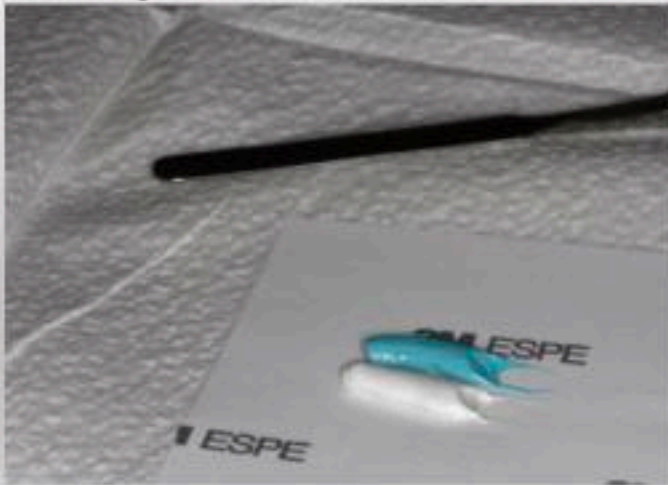
Occipital Lift with 3 deep breaths. Posterior neck opening muscle massage.

3rd round same as first except less taps each position

Office USE ONLY Do not send home with patient

Anterior Stop Orthotic In Office Diagnostic Test

Can do 2nd mix to
overlay 1st if needed



Anterior Stop Orthotic In Office Diagnostic Test

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

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



ArrowPath Sleep
Anterior stop 2.5 mm

>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

19 yo F Limited opening for past year 30-2 mm

Not able to eat solid foods for past 6 months
and scheduled for TMJ surgery next month



Anterior stop placed:
5 minutes of jaw manipulation
Pain level went from 8/10 to 0
Opening went from 30-2 to 48-3



Pankey Anterior Stop
relined with bis-gma resin

Working Diagnosis:
Protective Muscle Bracing
Occlusal Muscle Dysfunction
Anterior Openbite

Anterior Stop Orthotics

- Diagnostic Test
- Patient Awareness
- Disease Management
- Bite Recording Tool

The D-PAS Diagnostic Palatal Anterior Stop



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

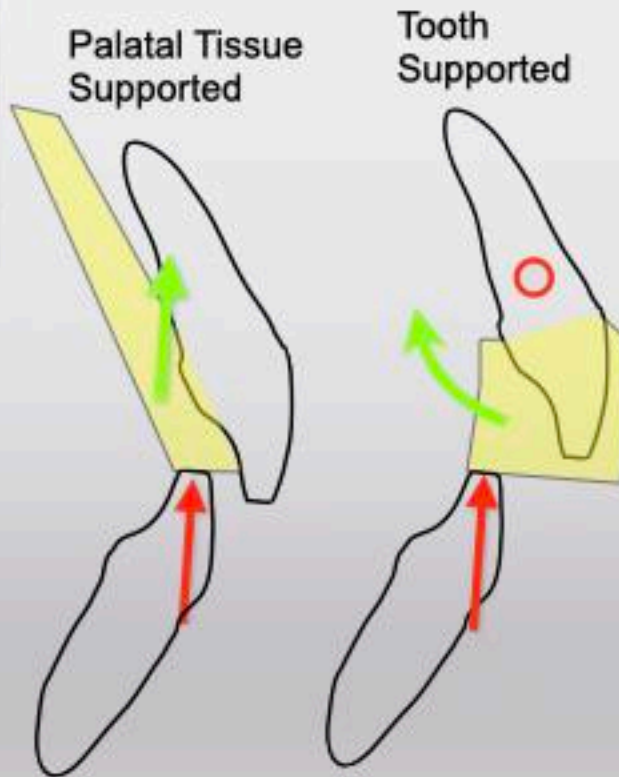


Anterior Stop Force Distribution: D-PAS vs NTI



D-PAS
Diagnostic Palatal
Anterior Stop

Must be relined



NTI-tss Splint
Nociceptive Trigeminal Inhibition
Tension Suppression System



NTI is tooth supported, hard reline.
Contact causes tooth flexure and rotation
Cranial/Skull unfriendly
Can end up being inhaled or swallowed

Diagnostic Palatal Anterior Stop

D-PAS Test: Wear for 2 weeks, 24/7, take out to eat

Better- Decrease in Symptoms

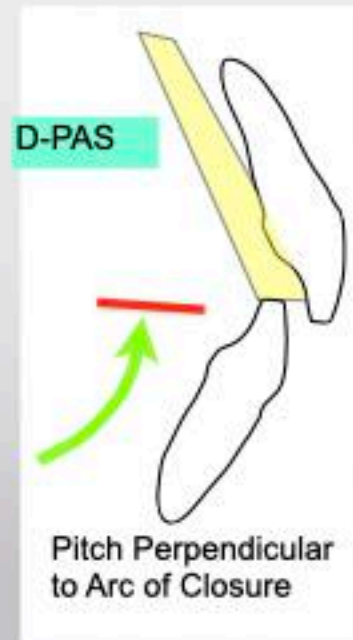
Sleep Clenching Inhibited: Wear D-PAS as night guard
Orthotic Improved Airway: D-PAS as night guard
Occlusal Muscle Disharmony: Occlusal Adjust

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

Anterior Stop Orthotic 3 Effects

Allows Maxilla, Mandible, and Temporal bones to align.

Major decrease in muscle contraction force, most patients.

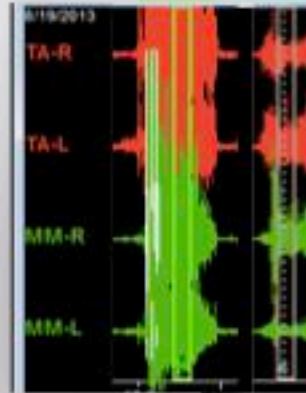
Breaks muscle engram avoidance and bracing patterns.



BioResearch EMG

Patient with muscles inhibited by anterior only contact

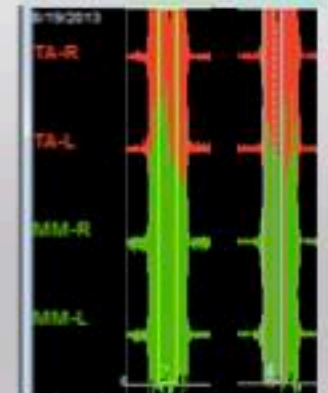
	Clench MaxIC μV	Anterior Stop D-PAS μV
TA-R	100.6	15.7
TA-L	108.9	25.3
MM-R	115.4	25.5
MM-L	70.5	6.8



Major decrease in muscle power with D-PAS

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

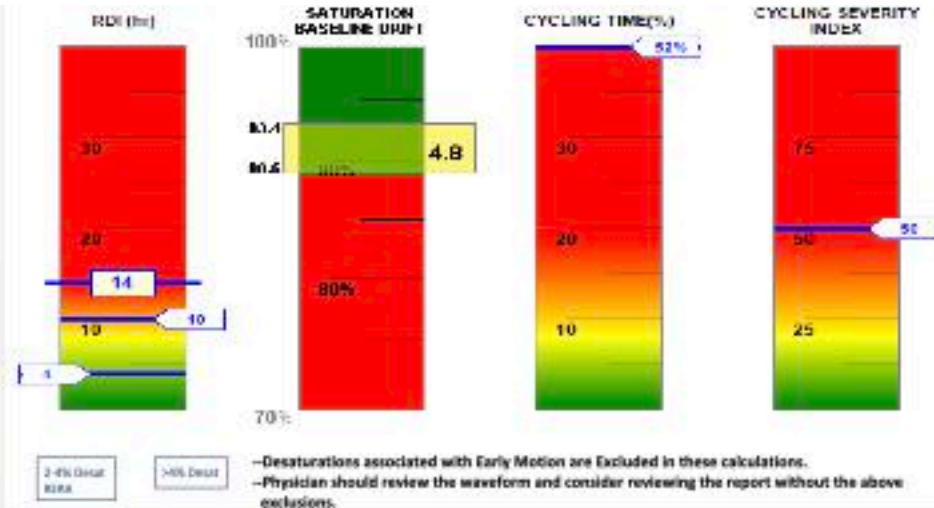
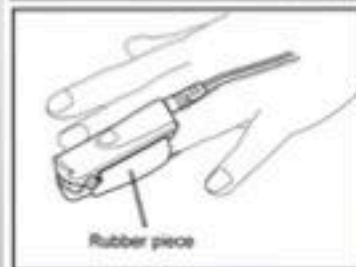
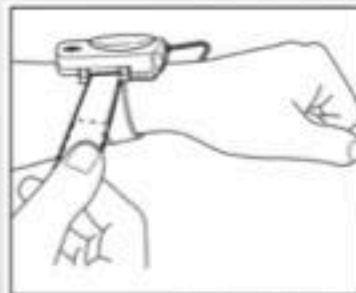


Muscle power same with D-PAS

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



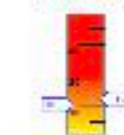
OXYGEN SATURATION BASELINE ANALYSIS

Oxygen Saturation Baseline	
Drift(OSBG) (normal <= 3)	5
Initial Saturation Baseline	93
Lowest Saturation Baseline	89
Highest Saturation Baseline	93

Baseline is determined by the Mean SpO2 during 2 Minute window without Artifact and without Events.

PATTERN BASED REPORT

0.45 / 3.1-9.7
 3.0 / 1.0-1.0



SPO2 CYCLING

% Time in Cycling (Duration)	52%	(02:50:14)
Cycling Frequency	45	
96% - Lowest Sat	13	
Cycling Severity Index	58	

The total time oxygen saturation was <= 88% was: 00:13:39

TRADITIONAL REPORT

OD4:	11
Total OD4 Events:	58
Time in OD4 Events:	06:29:26
Avg OD4 Event Duration:	00:00:28
<=88% OD4 Events:	23
<=88% Longest Duration:	00:01:21
Minimum SpO2:	84
Avg Low 10% SpO2:	86
Avg Low SpO2:	89
Avg Low SpO2 <=88%:	87

Definition of OD4 Event: a fall in oxygen saturation of at least 4% and persisting greater than 1 seconds.

SpO2	DURATION	%TOTAL
94-100	06:16:37	9%
88-94	04:57:26	91%
80-88	00:13:39	4%
70-80	00:00:00	0%
<= 70	00:00:00	0%
Total	05:27:42	100%
Motion Artifact	00:00:07	0.04%
Error Signal	00:00:05	0.03%

Is there an airway issue? (Upper Airway Resistance or Obstructive Sleep Apnea)

"Sleep Airway Screening"



High Resolution
Pulse Oximetry

Data every 1
second average
over 3 seconds

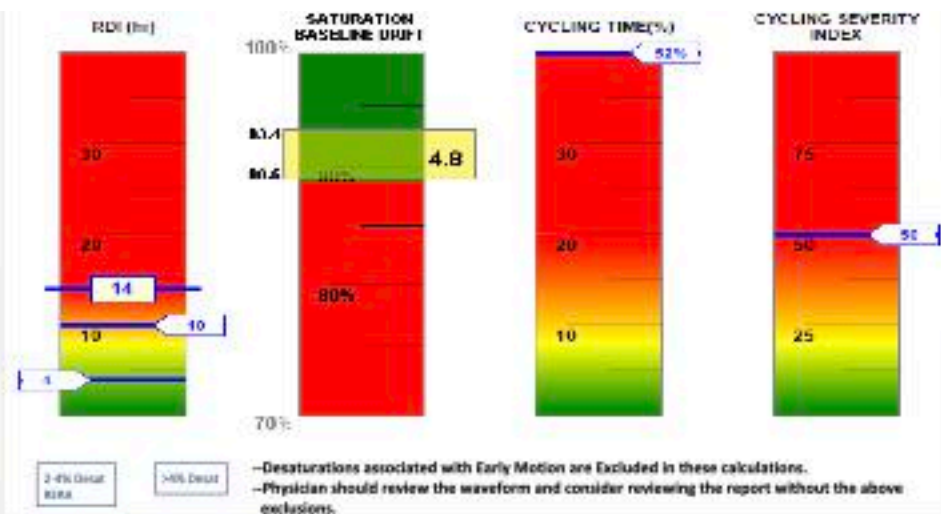


Patient Safety Inc.



Order Pulse Ox and Software: Go to my website or
www.patientsafetyinc.com

Sleep SAT is the replacement for
PULSOX 300i, Konica Minolta no longer made



OXYGEN SATURATION BASELINE ANALYSIS

Oxygen Saturation Baseline	
Drift(OSBG) (normal <= 5)	5
Initial Saturation Baseline	93
Lowest Saturation Baseline	89
Highest Saturation Baseline	93

PATTERN BASED REPORT

SPO2 CYCLING

% Time in Cycling (Duration)	52%	(02:50:14)
Cycling Frequency	45	
96% - Lowest Sat	13	
Cycling Severity Index	50	

Baseline is determined by the Mean SpO2 during 2 Minute window without Artifact and without Events.

The total time oxygen saturation was <= 88% was: 00:13:39

TRADITIONAL REPORT

OD4:		%SpO2	DURATION	%TOTAL
Total OD4 Events:	11	94-100	00:16:37	5%
Time in OD4 Events:	58	88-94	04:57:26	91%
Avg OD4 Event Duration:	06:29:26	80-88	00:13:39	4%
<=88% OD4 Events:	00:00:28	70-80	00:00:00	0%
<=88% Longest Duration:	23	<= 70	00:00:00	0%
Minimum SpO2:	00:01:21	Total	05:27:42	99%
Avg Low 10% SpO2:	84	Motion Artifact	00:00:07	0.04%
Avg Low SpO2:	86	Error Signal	00:00:05	0.03%
Avg Low SpO2 <=88%:	89			
	87			

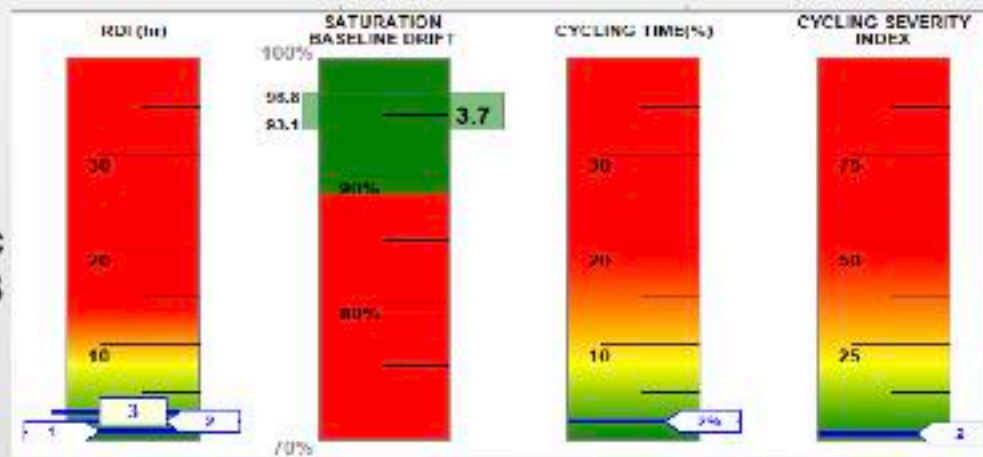
Definition of OD4 Event: a fall in oxygen saturation of at least 4% and persisting greater than 3 seconds.

Does the dental orthotic make the airway better or worse?

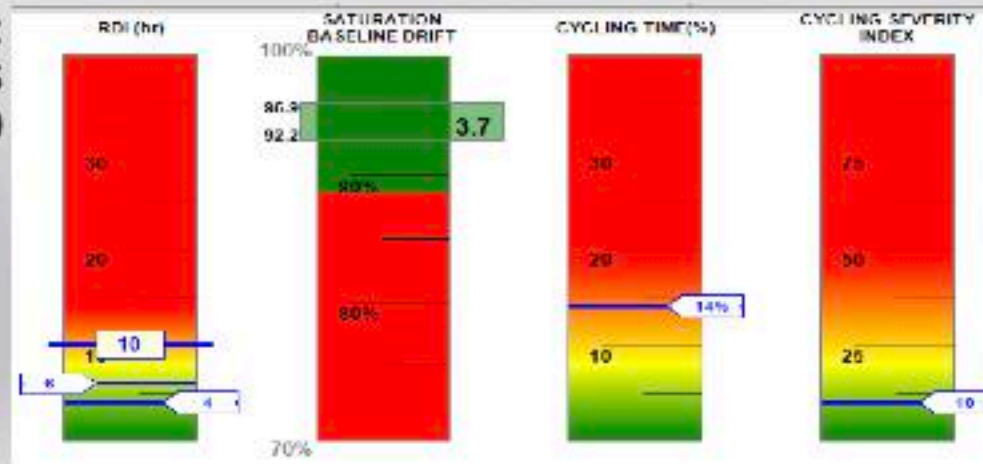
RDI= Respiratory Distress Index

Sometimes D-PAS makes airway better, sometimes worse

No dental orthotic
RDI = 3



Dental Orthotic:
Anterior Stop: D-PAS
RDI = 10



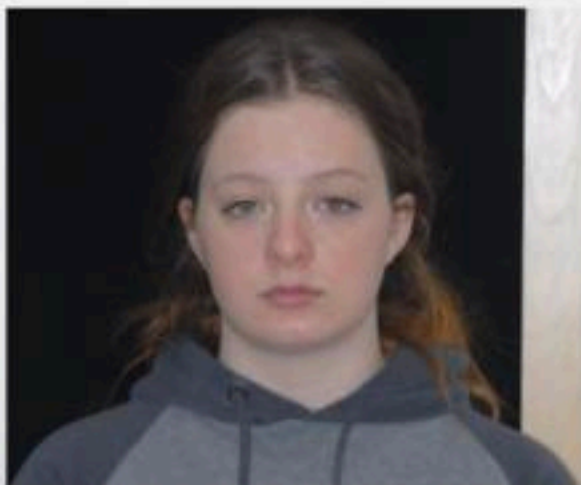
High Resolution
Pulse Oximetry

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

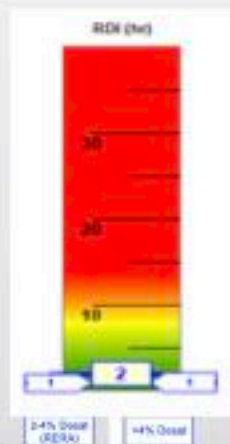
Age 16F
cc: Facial Pain, Excessive Daytime Fatigue



Age 16F
 cc: Facial Pain, Excessive Daytime Fatigue



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



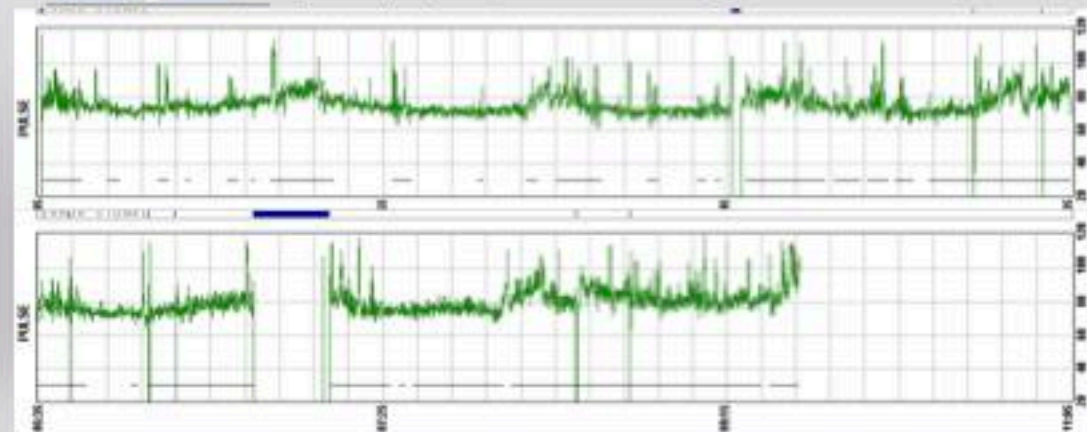
PULSE RATE DATA	
Autonomic Arousal	
Index (#/hr):	31
Pulse Rate Range	
Mean:	78
Min:	34
Max:	122
Tachycardia - Sleep (>90 bpm)	
Duration:	00:34:56
% (VRT):	6%
Bradycardia - Sleep (<50 bpm)	
Duration:	00:00:35
% (VRT):	0%



Heart Rate
 >90 bpm
 for 35 min

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

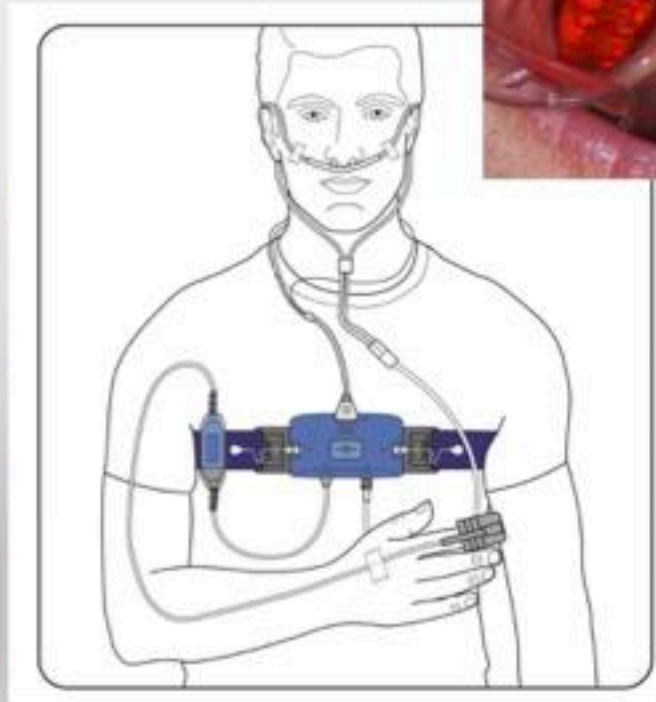
Sleep Latency Test
 Dx: Narcolepsy
 Recommend daytime medication



zMachine

zMachine + Brux Checker
+ Snore Lab

GENERAL
sleep



Call (888) 330-4424

Use Code: DROTER to receive special offer

Patient: M Y
 Study Date: 2018-09-27 Study ID: 1124990576

3% Threshold

AHI: 8.9
 AHI is how many times an hour your blood oxygen goes down.

RDI: 8.9
 RDI is how many times an hour your sleep is disturbed due to respiration.

Date of Birth: 1988 Height: 63 inches
 Age: 20 Weight: 105 Pounds
 Sex: F BMI: 18.60 Note:

GENERAL sleep
 Zmachine® Synergy
 Home Sleep Test Report
 Study Ordered by:
 John R. Droter, DOS
 Scored by: Computer

Study Details: Computer Generated Scoring

The following parameters were recorded using a Zmachine Synergy (General Sleep Corporation): EEG for sleep staging & arousals; respiratory inductance plethysmography for thoracic respiratory effort; pressure transducer for respiratory airflow & snore; pulse oximeter for SpO₂, pulse, & optical plethysmograph; and tri-axial accelerometer for body position. Hypopneas were scored per AASM recommended definition of 3% desaturation.

Times and Durations	
Lights off	2018-09-27 01:47:32
Lights on	2018-09-27 08:42:54
Total Recording Time (TRT)	596.8 min.
Time in Bed (TIB)	414.0 min. (81.7% of TRT) [6 hours 54 minutes.
Total Sleep Time (TST)	396.8 min. (95.9% of TIB)
Sleep Efficiency (SE)	95.9 % of TIB
Latency to Persistent Sleep (LPS)	8 min
Latency to Deep Sleep (LDEEP)	29 min
Latency to REM Sleep (LREM)	8.5 min
Total Light Sleep Time N1+N2	207.9 min. (52.4% of TST)
Total Deep Sleep Time N3+SWS	85.7 min. (21.7% of TST)
Total REM Time	82.2 min. (20.8% of TST)
SpO ₂ < 89% cumulative time	0 min.
SpO ₂ < 89% longest span	0 min.

Sleep Study Ranges of Normal
 Sleep Latency: 10-20 min
 Latency to REM Sleep: 10-20 min
 Sleep Efficiency: 85%

N1 2% - 5%
 N2 40% - 55%
 N3 Deep Sleep: 10% - 20%
 REM Sleep: 10-20%
 REM Latency: 10-20 min
 REM Latency: 10-20 min

REM to REM is about 90 min.
 4-5 cycle per night
 REM Latency longer as night goes on

Deep N3 SWS slow wave sleep in first third of night. Less as we age.

TST is the total duration of the recording. TIB is the elapsed time from lights off to lights on. TIB is the cumulative time scored as any stage of sleep. SE is 100*(TST/TIB) expressed as a percentage. AHI is apneas + hypopneas per hour of sleep time. RDI is apneas + hypopneas + REMs per hour of sleep time, and RDI is apneas + hypopneas + REMs per hour of recording time.

LPS is the elapsed time to the beginning of the first period in which 10 of 30 minutes are scored as any stage of sleep (i.e. the start of persistent sleep). LDEEP is the elapsed time to the beginning of first epoch of Deep Sleep, and LREM is the elapsed time to the beginning of first epoch of REM.

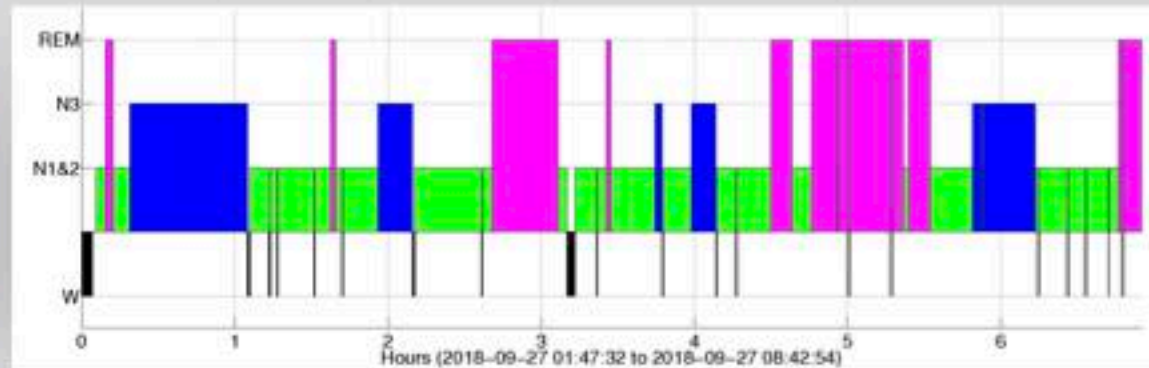
Awakenings During Sleep	
Wake After Sleep Onset (WASO)	13 min
≥ 1-Epoch Awakenings	18 (1.7 per sleep hour)
≥ 3-Epoch Awakenings	0 (0 per sleep hour)

WASO is the cumulative wake time following LPS. ≥ 1-Epoch Awakenings is the number of times the patient wakes for one epoch (i.e. 30 seconds) or more after LPS, and ≥ 3-Epoch Awakenings is the number of times the patient wakes for three epochs or more after LPS. This is a subset of a ≥ 1-Epoch

Respiratory Events

Body Position	72.1% Supine/hr	9.0
	0% Prone/hr	0
	12.9% Left/hr	4.5
	14.8% Right/hr	9.8

Sleep Stages



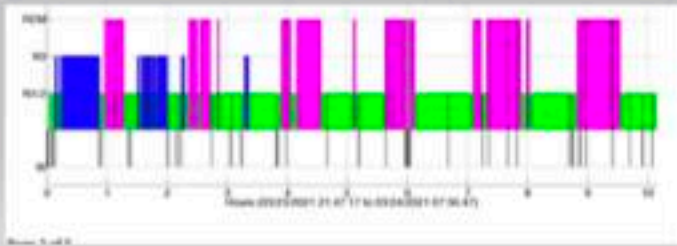
Sleep Simplified

1. Need adequate Deep and REM Sleep every night.
2. Need to get oxygen through the nose to lungs, unimpeded, all the time.
3. Parasympathetic Dominance in non REM Sleep

Sleep Complexity:

- Problems are Numerous.....
- Tests are Numerous.....
- Therapies are Numerous.....

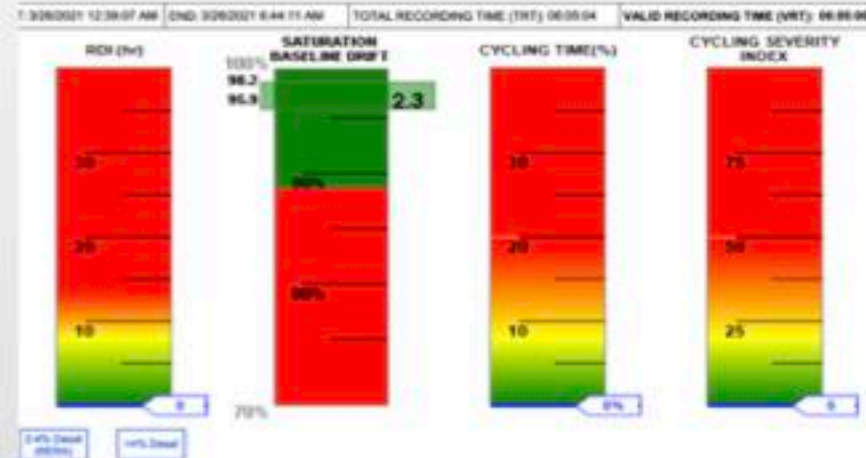
Always go to the back to basics:
 60+min Deep and 90+min REM
 Air from Nose to Lungs
 Large periods of calm, steady heart rate



AHI: 0.5
 AHI is how many times an hour your blood oxygen goes down.

zMachine: Interrupted Deep and REM

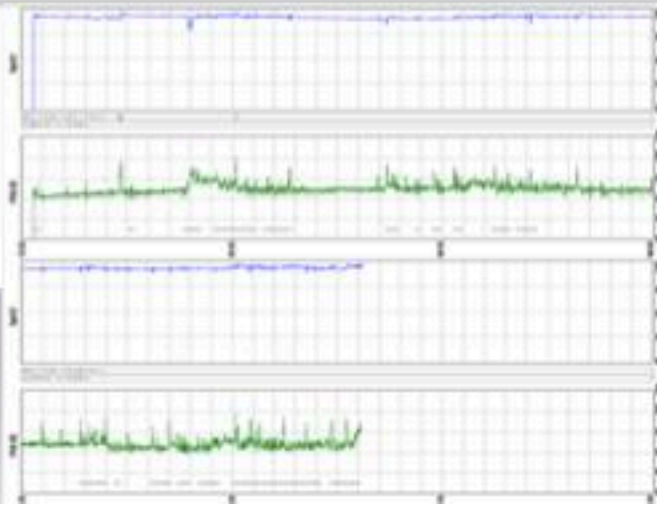
Sat Screen by Patient Safety Inc



PULSE RATE DATA

Autonomic Arousal
 Index (#/hr): 23

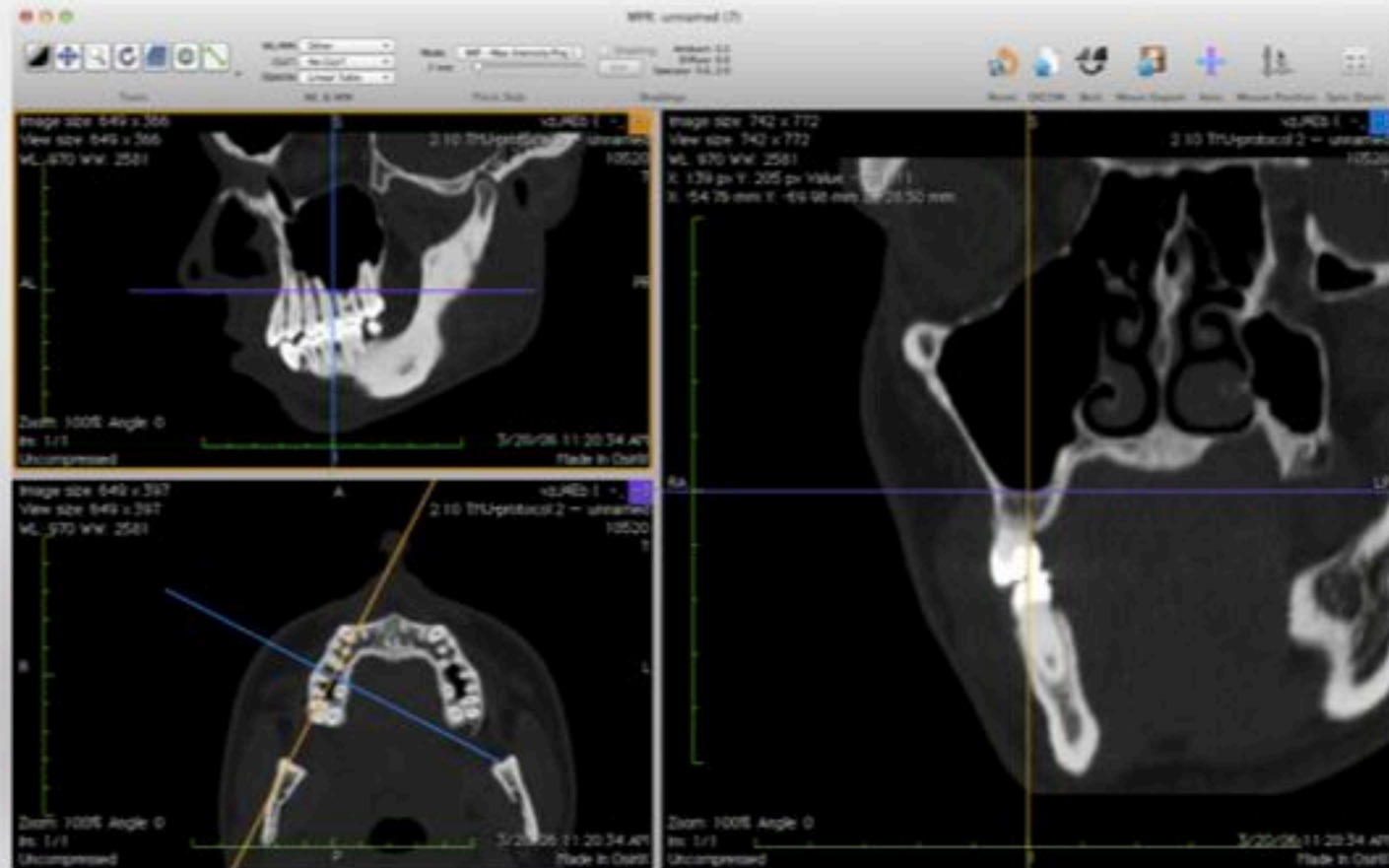
Pulse Rate Range
 Mean: 69
 Min: 58
 Max: 102



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



Normal TMJ- Bone

Bone Density

Intact Cortex

Even pattern Trabecular bone

Normal Size/Shape Condyle/Fossa

Ovoid Condylar Shape

Non-Congruent Condyle/Fossa

Condyle 70% Size Fossa

Condyle Centered in Fossa

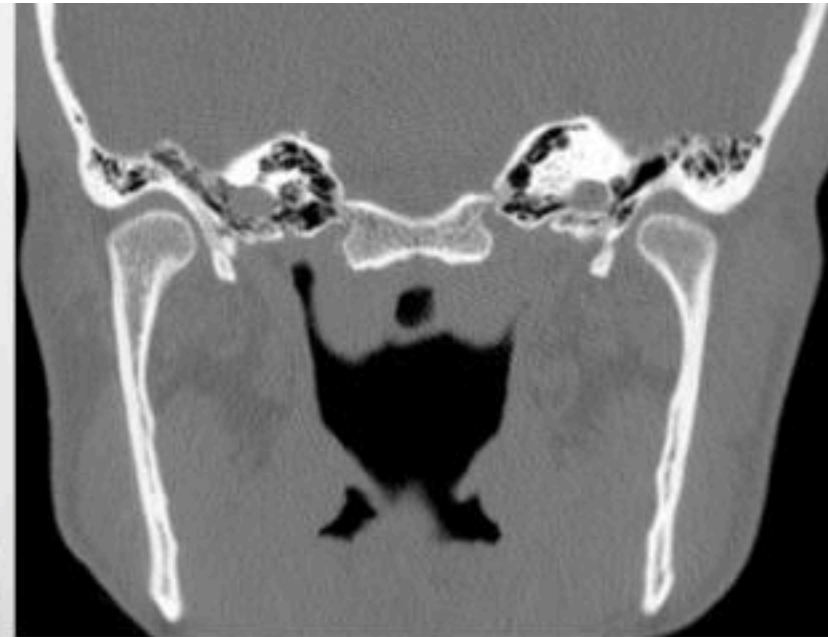
Coronal and Sagittal

Room for Disc

Stable CR load Zone

Condyle closest to fossa

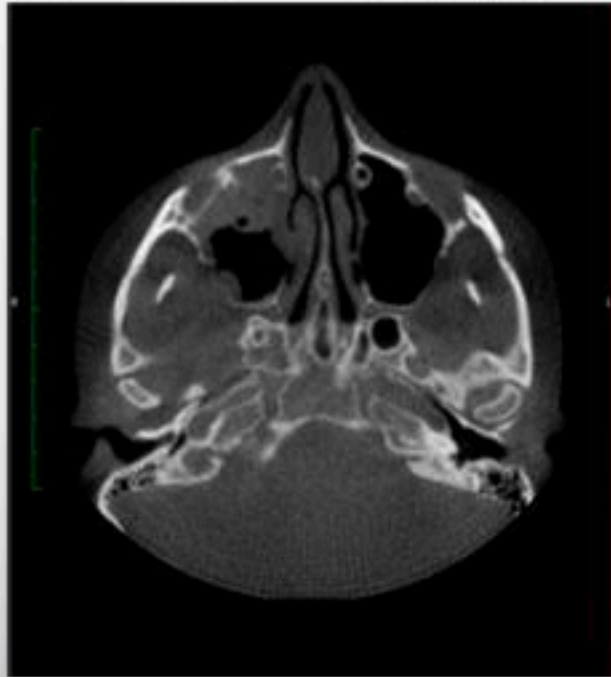
CT Scan
Coronal View



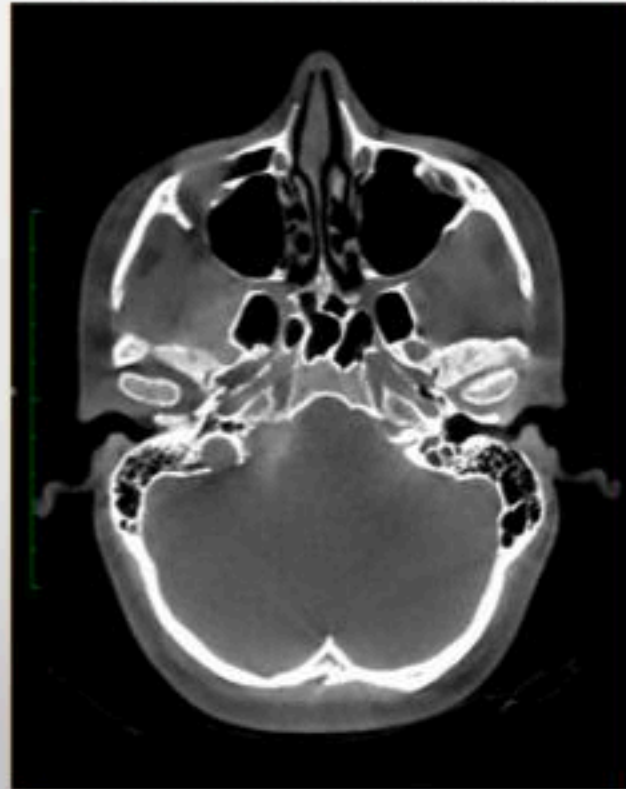
CT Scan
Sagittal View

Compare CT scans

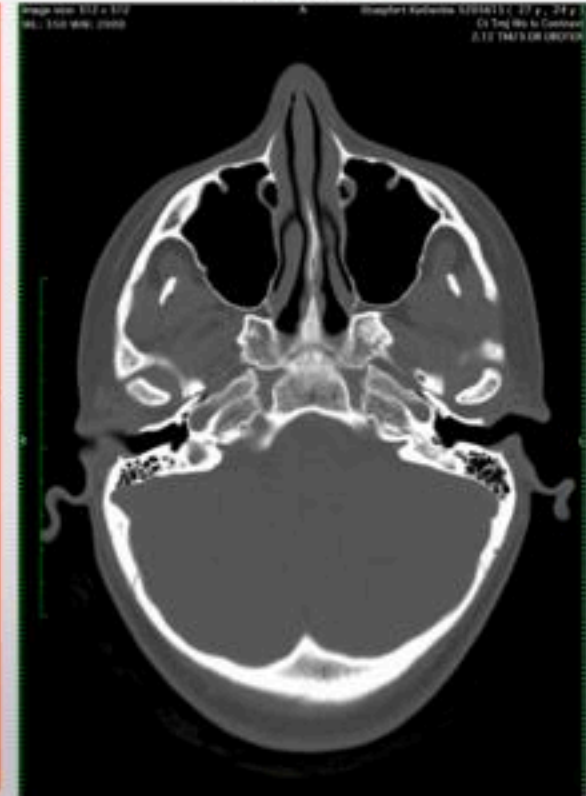
CBCT- iCAT



CBCT- Vatech i3D Premium



Spiral CT



Best Contrast
Much more radiation

Interpreting CBCT

www.jrdroter.com

Review of Scan: CBCT

John R Droter, DDS

Name _____ Scan Date _____

Review Date: _____
Scan Quality: Good Fair Marginal

How to quickly scroll through axial, coronal, and sagittal for global impressions:

Right TMJ *Small Coronal Sagittal and Coronal Coronal*

Condyle: Normal Size Small condylar disc
 Normal Shape Abnormal condylar shape
 Cortex Intact Cortex not intact
 Cortex Even Hypertrophia

Fossa: Normal Size Small fossa size
 Normal Shape Flattened fossa shape
 Cortex Intact Cortex not intact

Condyle Position Centered in fossa Condyle distalized
 Joint spacing Room for disc No room for disc
 CR Lead Zone Superior medial Superior Lateral

Estimate Piper: R1 R2 R3a R3b R4a R4b R5a R5b
 Right TMJ Health: Healthy Damaged Active Degeneration Adapting Adapted

Left TMJ *Small Coronal Sagittal and Coronal Coronal*

Condyle: Normal Size Small condylar disc
 Normal Shape Abnormal condylar shape
 Cortex Intact Cortex not intact
 Cortex Even Hypertrophia

Fossa: Normal Size Small fossa size
 Normal Shape Flattened fossa shape
 Cortex Intact Cortex not intact

Condyle Position Centered in fossa Condyle distalized
 Joint spacing Room for disc No room for disc
 CR Lead Zone Superior medial Superior Lateral

Estimate Piper: L1 L2 L3a L3b L4a L4b L5a L5b
 Left TMJ Health: Healthy Damaged Active Degeneration Adapting Adapted

Swelling *Coronal View, Sagittal View, Axial View*

All Tissues Right = Left = Except _____
 Look for cancer Brain, Muscle, Parotid Submandibular Gland, Hypertrophy

All Bones Right = Left = Except _____
 Look for hypercalcified or radiolucant areas, cysts

Mand *(Sagittal, Cor)* Open Restricted Deviated Superior
 Sinuses Clear Thickened Lining Dense Polyps
 Airway Adequate Restricted
 Teeth *(Sagittal, Cor)* No PNP PNP # _____
(Axial) No Gross Caries

Perio *(Thick Sagittal)* No Gross Perio Bone Loss

Axis Appears Centered Not Level with Skull Base
 C2, C3, C4 Aligned Misaligned

Max Mand Relation Normal Sagittal Retrognathia Maxilla Mandible
 Max Mand Casting Normal Coronal Asymmetric Cast Maxilla Mandible

Impression: _____

Signature: _____

Review of Scan: CT/CBCT Guide

TMJ

Condyle

Fossa

Normal Size, Normal Shape, Cortex Intact
 Condyle is 30% size of the fossa with an oval shape. The condyle and fossa are noncongruent convex surfaces. The outer cortex of bone is a solid continuous line with no breaks. Look for areas of hypertrophia which are indicative of excess load in that area or damage and repair. The right and left TMJ should be the same size.

Condylar Position

Centered in fossa

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

Joint Spacing

Centered in fossa

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

CR Lead Zone (Centric Relation Lead Zone)

Superior medial

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

Estimate Piper

This estimation combines clinical data from the clinical history, exam, joint palpation, microscope visualization, Doppler (JA) (Joint Vibration Analysis) and the CT scan. If the joint has a left distalized condyle and no clicking in either a Piper 4b or a health joint distalized due to heavy anterior contact (usually isometric), in the case of the 4b, JA would show some slight "scratch vibrations", whereas a health TMJ distalized due to occlusion would show "smooth vibrations", and clinically have fremitus on the anterior teeth.

1. Normal joint: PIP and CR are normal (See all above). No joint sounds, full range of motion, JA no vibrations, quiet Doppler.

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

3. This is a partial dislocation of the disc, usually in an anterior medial direction with the lateral ligament being taut or stretched. The joint reduces on opening and will make a vibration, either a click or wobble on JA. If a 2a is opposite a health joint there is not a change in occlusion so CT is normal. A Piper 2a is often contralateral to a 4b. With loss of the opposing disc, the mandible shifts coronally, the CR lead zone changes in both joints leading to 2a.

- 3a. Same as above except nonloading and therefore no clicking vibration. CT is normal.

4. The disc is fully displaced off the head of the condyle and reduces on opening. There will be a shifting of the mandible which can be seen on the CBCT. Condyle not centered in fossa. Clinically there will "click or wobble" vibration as the disc returns and subluxates. While most vibrations are in the audible range some may not be. These will be detected with JA.
- 4b. The disc is fully displaced off the head of the condyle and does not reduce on opening. This will look the same on CBCT as a 4a. Condyle not centered in fossa. While limited opening may occur, many can have a full range of motion. Range of motion should not be a sole determining factor on whether a joint is 4b.

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

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

John R Droter DDS



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

Right TMJ

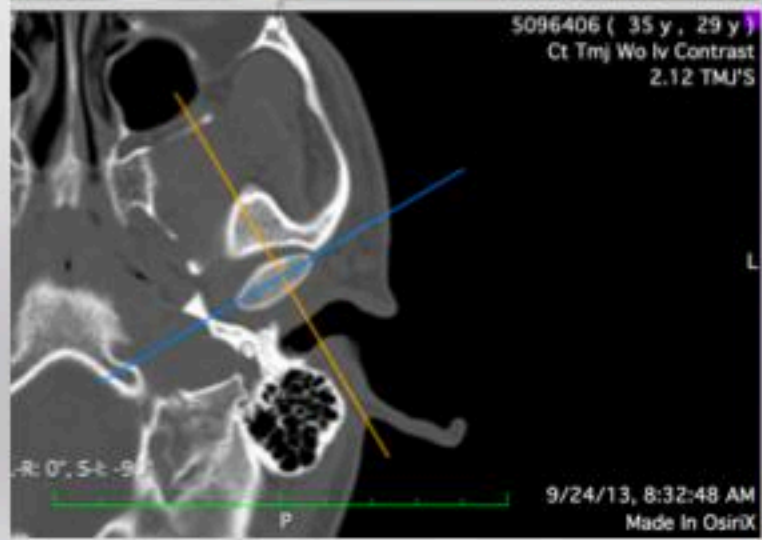
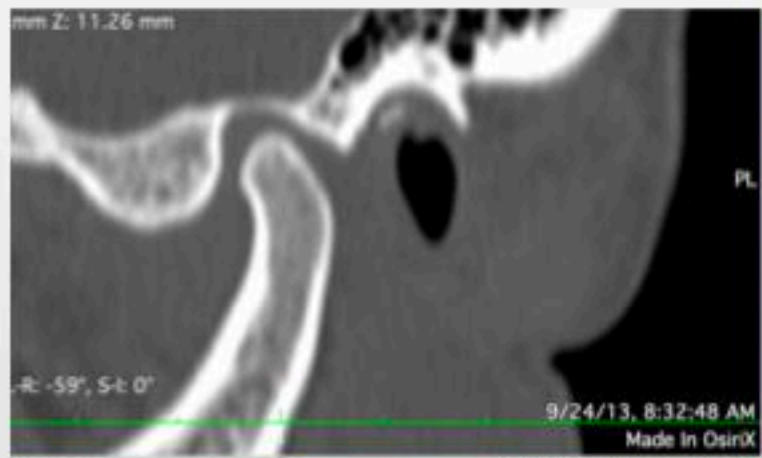
Scroll Corrected Sagittal and Corrected Coronal

- | | | | |
|-------------------|--|---|--|
| Condyle: | <input type="checkbox"/> Normal Size | <input type="checkbox"/> Small condylar size | <input type="checkbox"/> |
| | <input type="checkbox"/> Normal Shape | <input type="checkbox"/> Altered condylar shape | <input type="checkbox"/> |
| | <input type="checkbox"/> Cortex Intact | <input type="checkbox"/> Cortex not intact | <input type="checkbox"/> |
| | <input type="checkbox"/> Cortex Even | <input type="checkbox"/> Hypercalcification | <input type="checkbox"/> |
| Fossa: | <input type="checkbox"/> Normal Size | <input type="checkbox"/> Small fossa size | <input type="checkbox"/> |
| | <input type="checkbox"/> Normal Shape | <input type="checkbox"/> Flattened fossa shape | <input type="checkbox"/> |
| | <input type="checkbox"/> Cortex Intact | <input type="checkbox"/> Cortex not intact | <input type="checkbox"/> |
| Condyle Position | <input type="checkbox"/> Centered in fossa | <input type="checkbox"/> Condyle distalized | <input type="checkbox"/> |
| Joint spacing | <input type="checkbox"/> Room for disc | <input type="checkbox"/> No room for disc | <input type="checkbox"/> |
| CR Load Zone | <input type="checkbox"/> Superior medial | <input type="checkbox"/> Superior Lateral | <input type="checkbox"/> |
| Estimate Piper: | R1 R2 R3a R3b | R4a R4b R5a R5b | |
| Right TMJ Health: | <input type="checkbox"/> Healthy | <input type="checkbox"/> Damaged | <input type="checkbox"/> Active Degeneration |
| | | <input type="checkbox"/> Adapting | <input type="checkbox"/> Adapted |

CT Left Piper 2 from MRI

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

- Hypercalcification
- Condyle distalized
- Superior Lateral



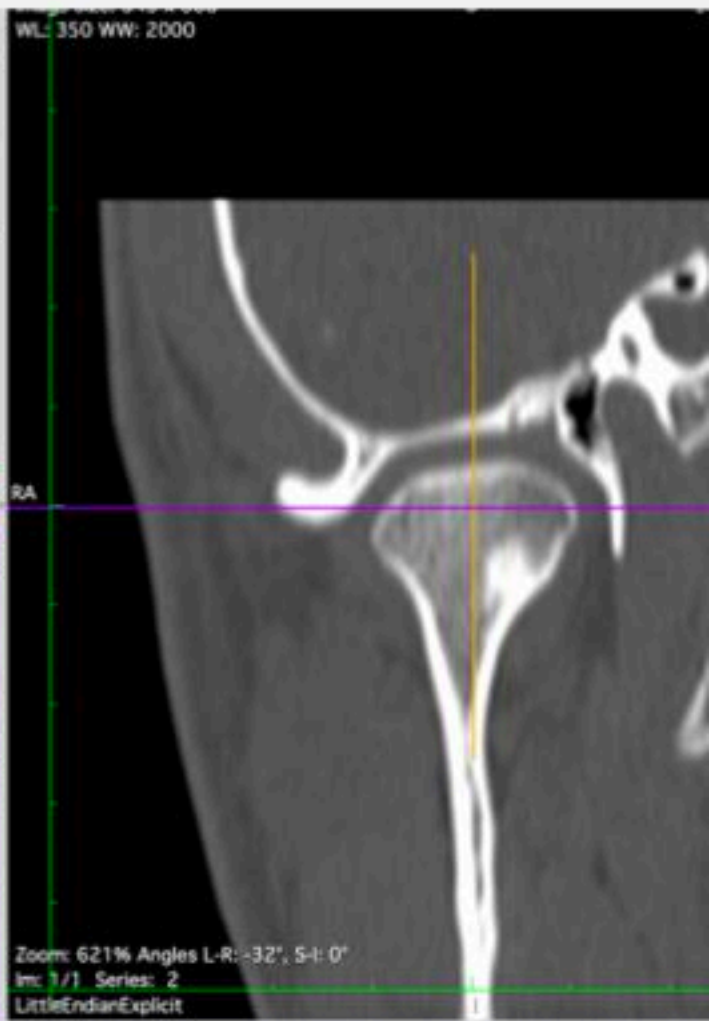
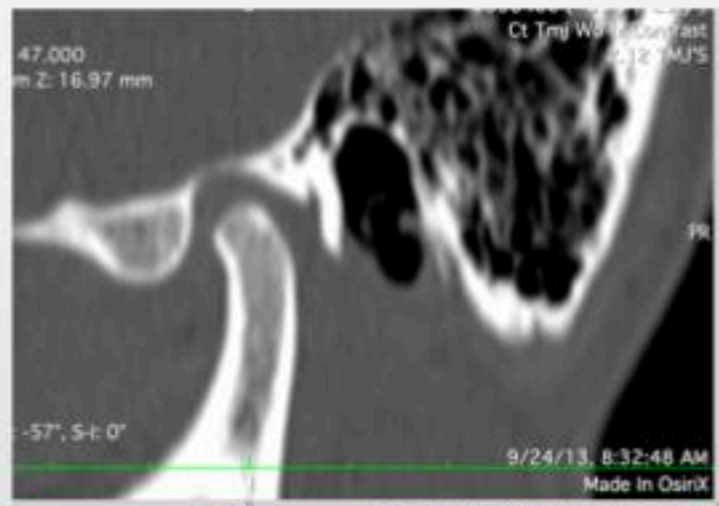
CT Right Piper 4a-e from MRI

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

Hypercalcification

Superior Lateral

Note: Large joint space



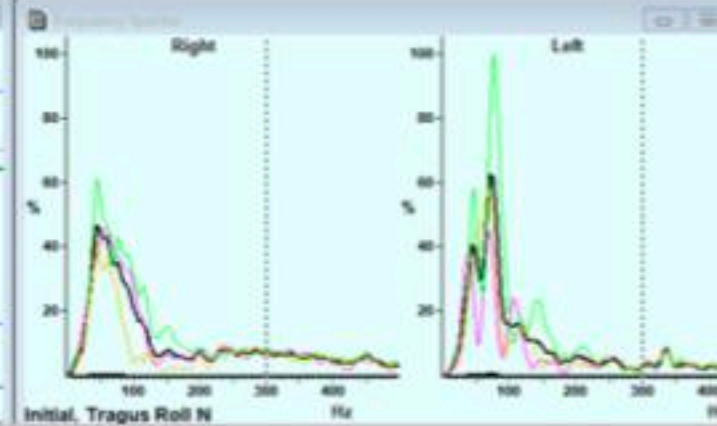
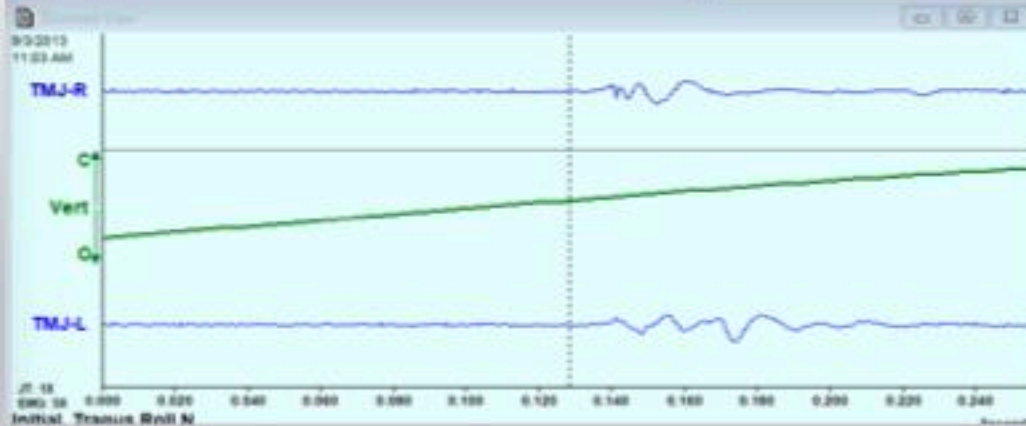
Slight Wobble
before tooth
contact

Joint
subluxation
on movement



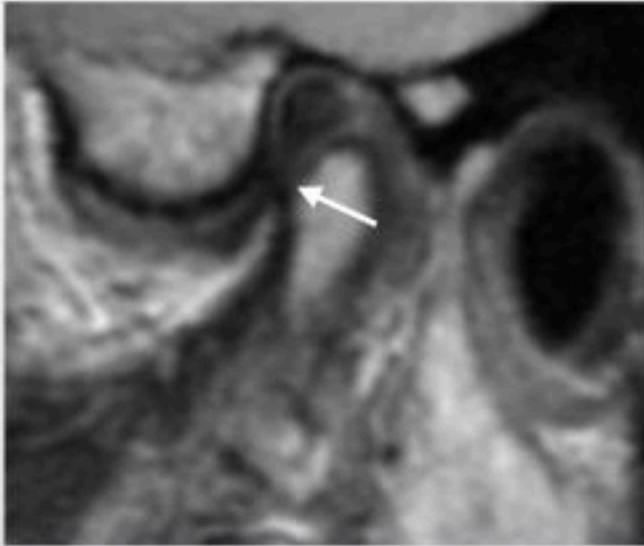
Clinical
Relevance?

Early damage
from
parafunction

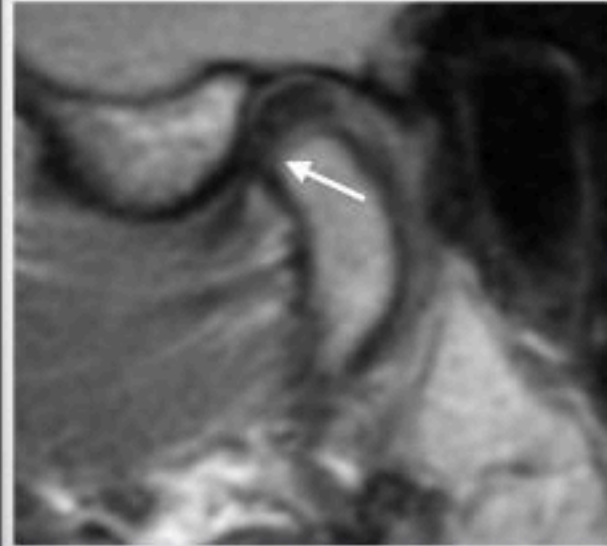


MRI
R4a-e, L2

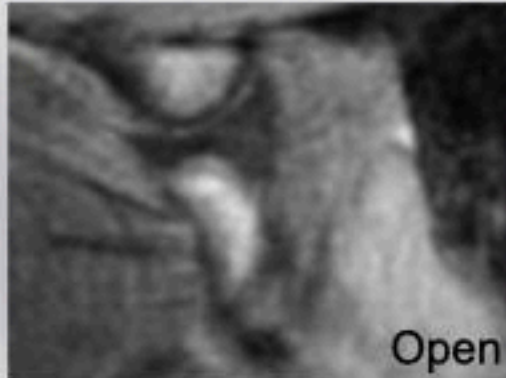
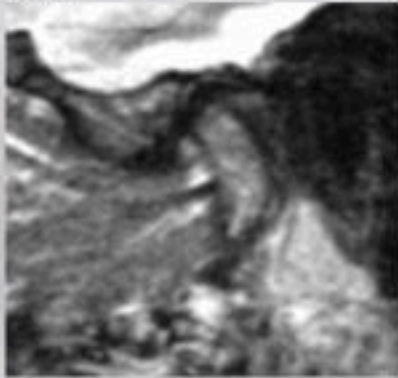
Right
PD Closed



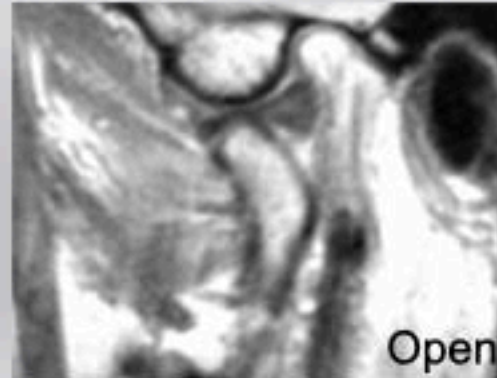
Left
PD Closed



Stir



Stir



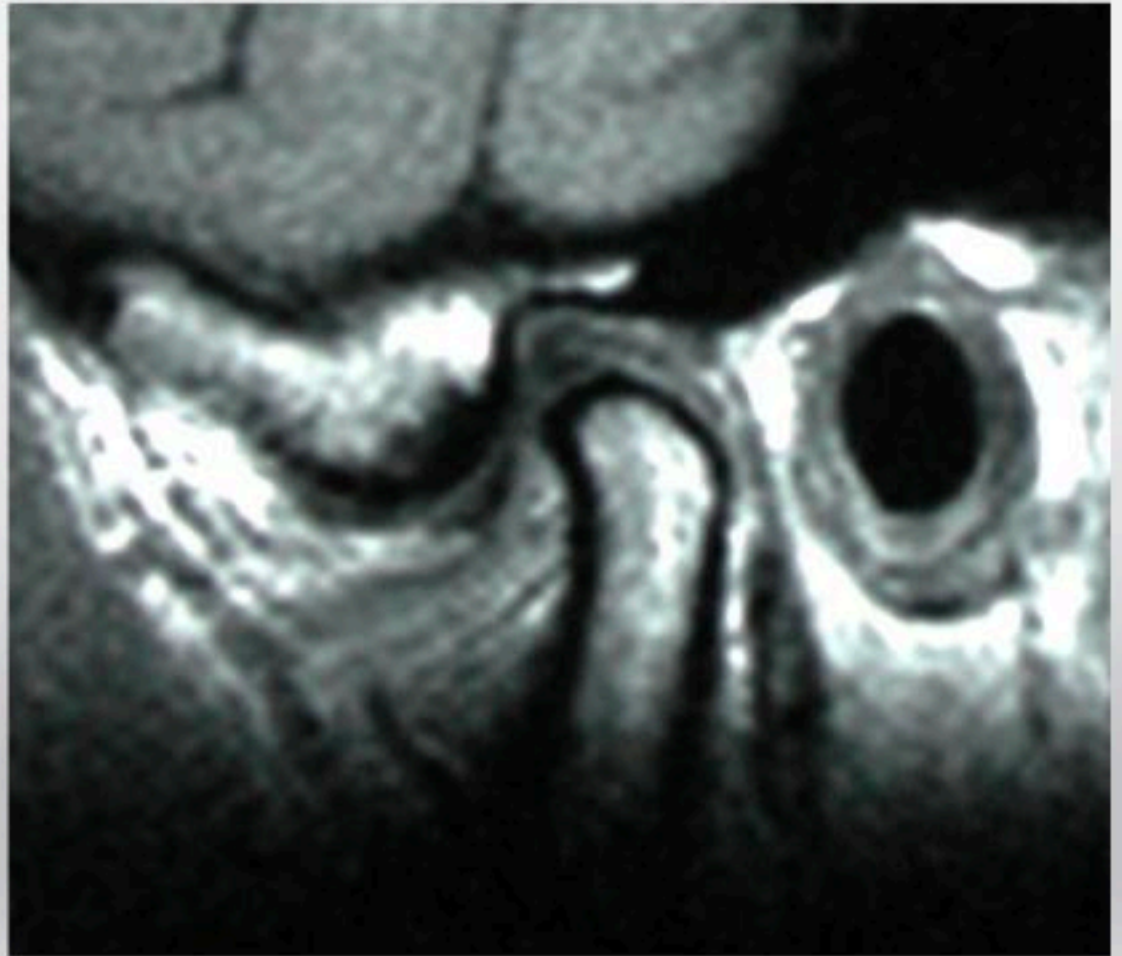
Facial Pain Diagnosis

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

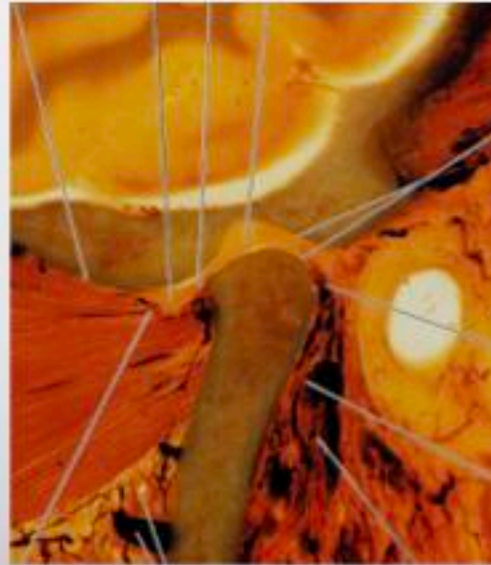
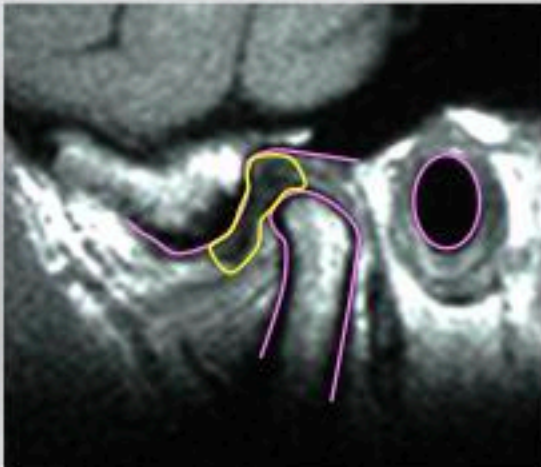


Short

T1 Inverted

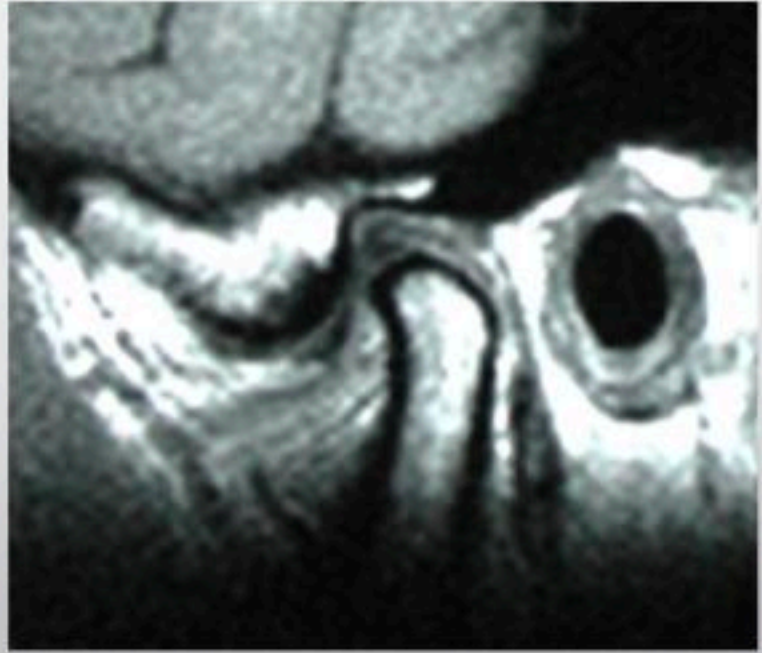


T1 Sagittal Closed



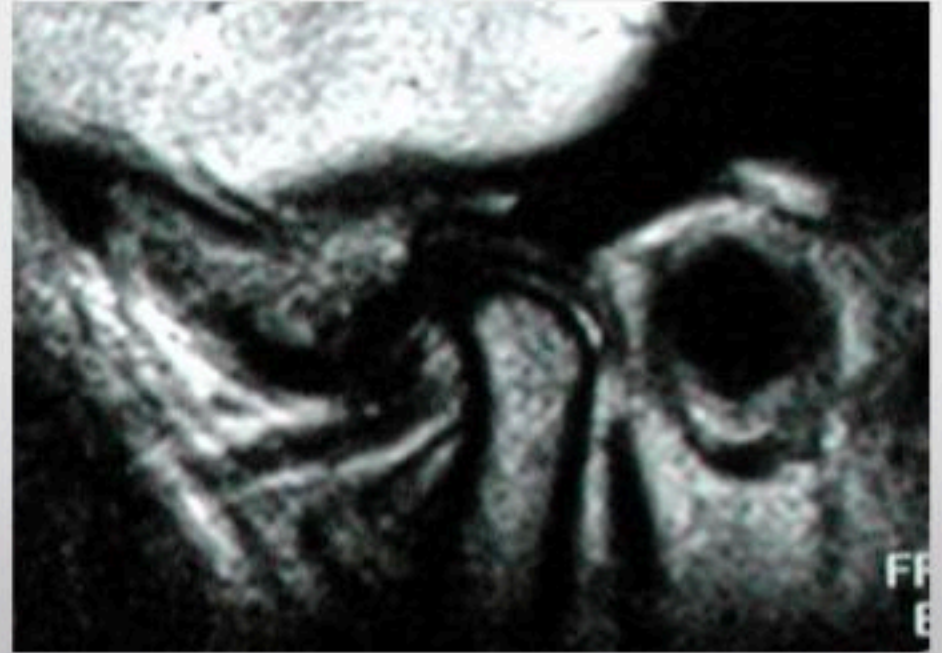
Normal MRI T1 and T2

T1 Sagittal Closed



T1 shows more fat

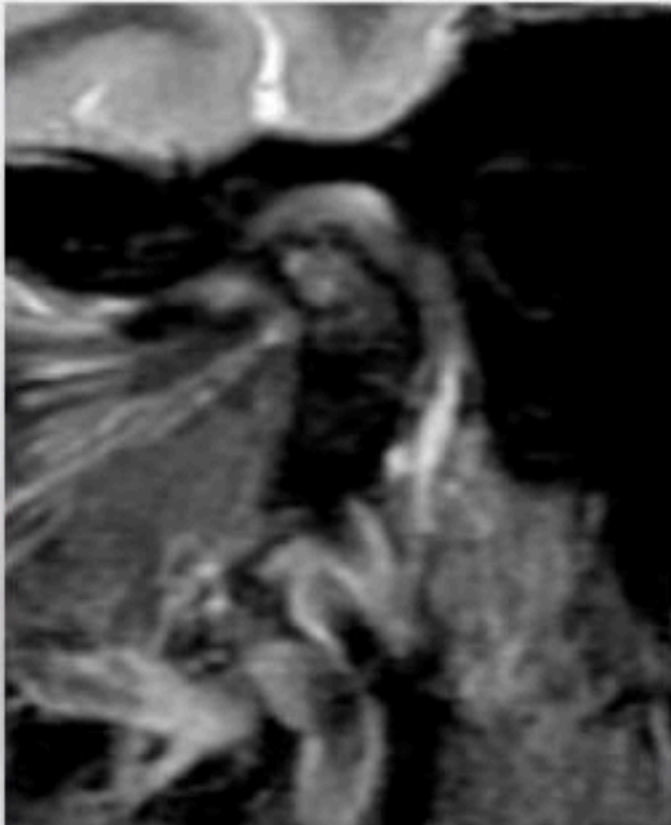
T2 Sagittal Closed



T2 shows more water:
Inflammation
Pathology

MRI STIR Image

STIR- Short T1 Inversion Recovery



STIR- "Supercharged" T2

Retrodiscal Inflammation

Marrow Edema

Diff Dx is active AVN, Osteoarthritis, Lyme Ds, RhA, Hypoxic Progressive Condylar Resorption, Other.

STIR and T2 shows water as white

Facial Pain Diagnosis

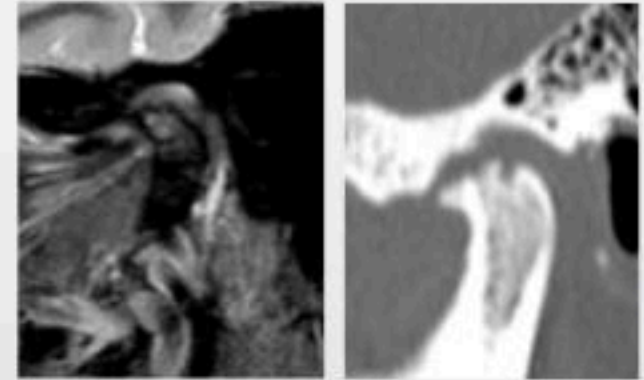
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- 6 CT Scan
- MRI
- Blood Tests

Biometrics

- Joint Vibration
- Jaw Tracker
- Electromyography
- T-Scan

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



Diagnosis Treatment Flow Chart

From a patient perspective they want to go from symptoms to no symptoms



Symptoms

History

Signs

Doctor Exam

Differential Diagnosis

Diagnostic Tests

Specific Working Diagnosis

Treatment

No Signs

No Symptoms
Final Dx

Doctor Re-Exam

If not resolved


Symptom Dx

Tooth Pain
Arthralgia

Specific Dx

Irreversible Pulpitis
Osteoarthritis

vs
vs



Know Yourself

Know Your Work

Know Your Patient

Apply Your Knowledge

LD Pankey Institute

Write your Dream

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