John Herb Matt
2023

John R Droter DDS
Annapolis, Maryland

John R Droter, DDS

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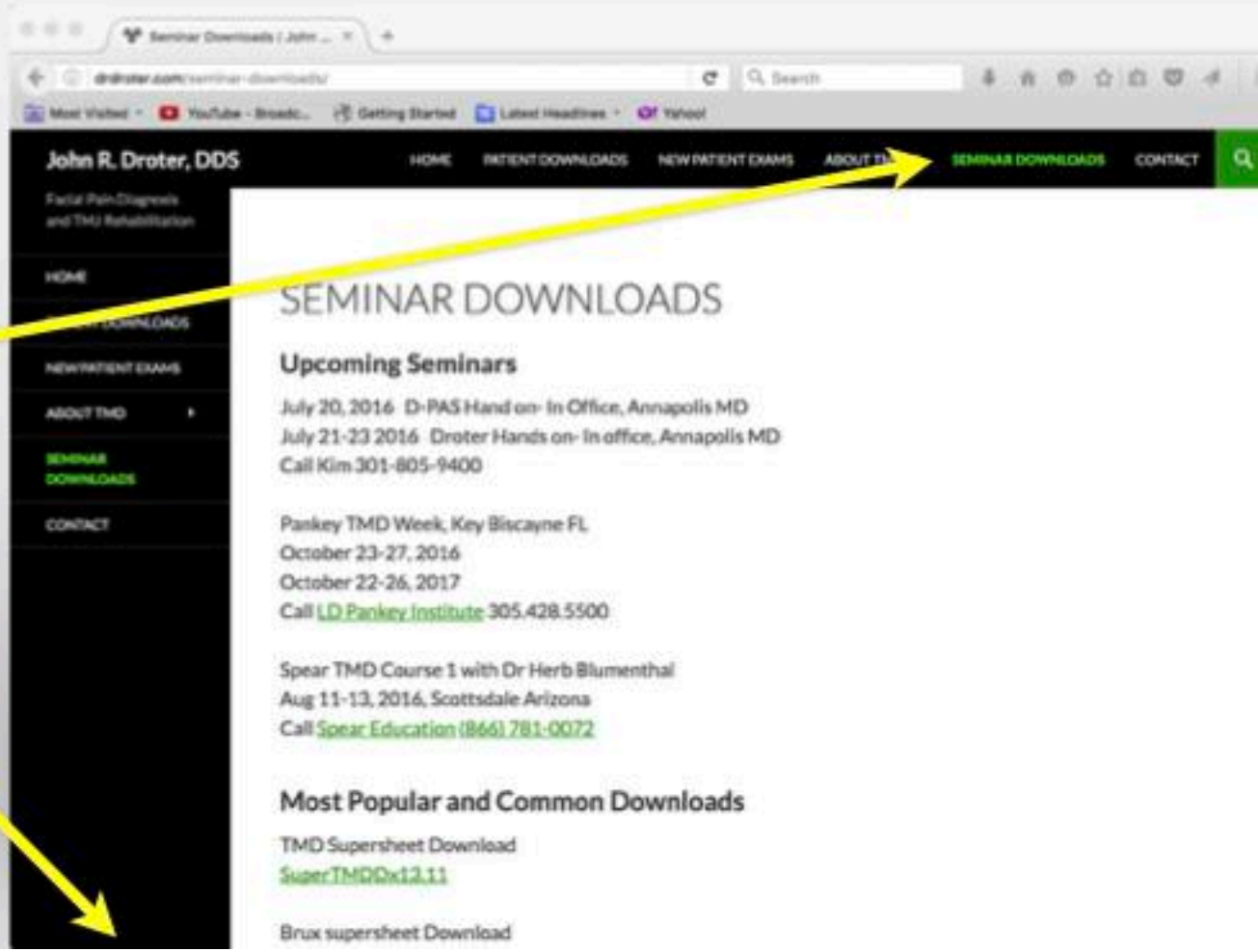
Seminar Download

John Herb Matt 2023



Hello. I am:

John R Droter DDS
Annapolis, Maryland

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

Disclosures:

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

Atomic Skis- Sponsored.
I got stuff.

TMD Course
LD Pankey Institute
A small honorarium for lectures

TMD Course
Spear Education
Honorarium for lectures

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

APS
ArrowPath Sleep

APS
ArrowPath Sleep

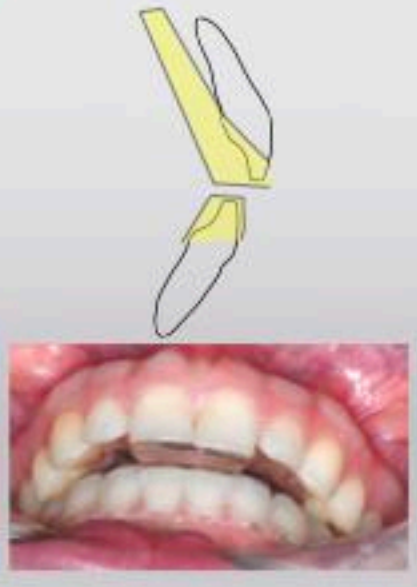
LIVING TREE DENTAL LAB

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

3D Printed Orthotics

D-PAS
Diagnostic-
Palatal Anterior Stop

Brux-PAS
with lower Essix



Hard Lower Posterior Stop
with upper essix

Hard Lower Full Coverage
Centric Relation Orthotic

Observations:

Always accurate

Trust your observations

Most beliefs we have are learned from teachers.

Beliefs can limit observations.

Become a great observer.

Have an open mind but not an empty head.

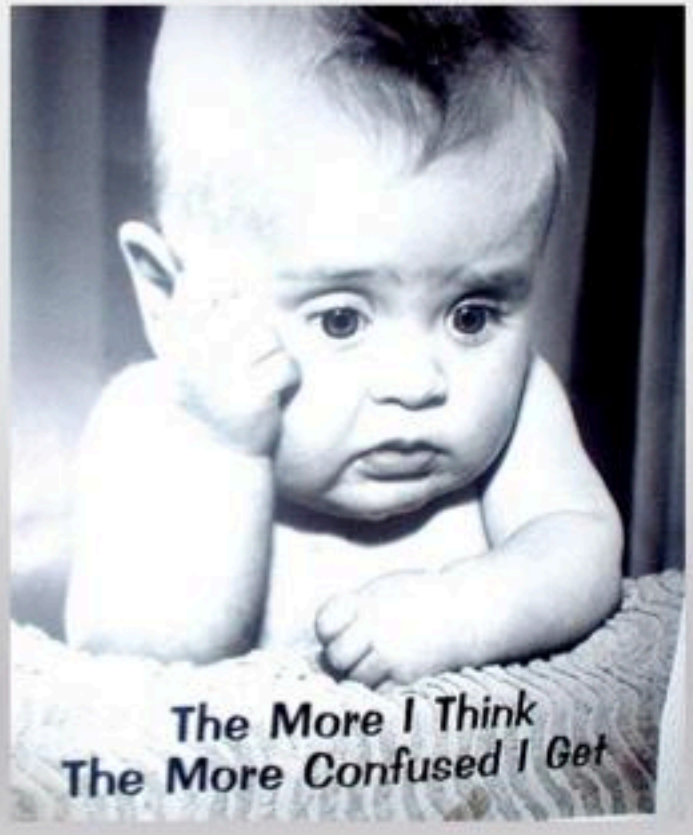
Explanations (beliefs):

Not always accurate

Best at the time

Do not become emotionally attached to explanations

TMJ/TMD Confusion



Dogmatic Arguments

TMD Therapies: (70 therapies)

Physical

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

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

Medicinal

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

Occlusal Orthopedic

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

Tongue Parafunction

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

Dental Orthotics

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

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

Athletic Mouthguard
Anterior Repositioning
Occlusal Adjust Assist
Aqualizer
Myobrace

Sleep/ Fatigue

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

Surgical

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

Different Diagnoses have Different Therapies

Specific Diagnosis

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

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

Specific Therapy

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Hot Cold Hot
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Lower TMJ Rehab flat plane
Lower postured indexed
Lower CR Indexed
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Lateral Bruxing Device

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Diet Modification
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Vitamins: Vitamin D, Vitamin B12, Vit C
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CPAP

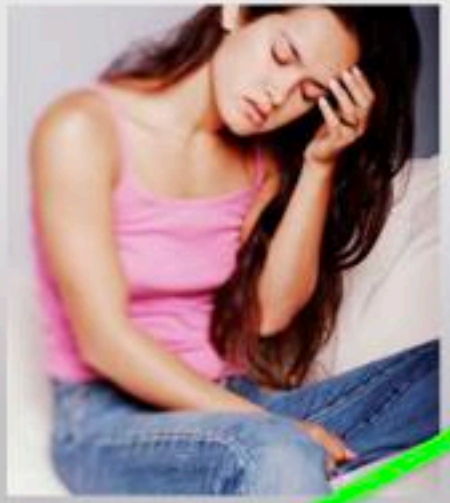
Surgical

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

70

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

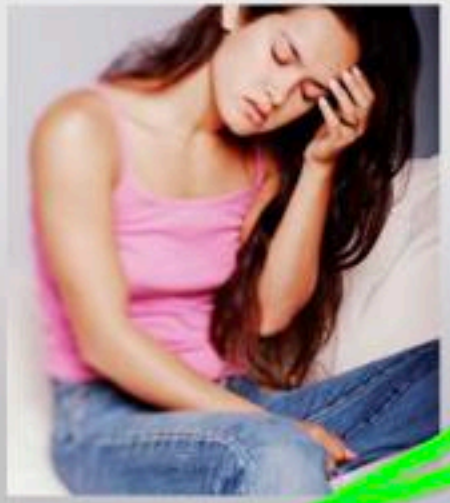
Doctor Re-Exam

If not resolved

Symptom Dx		Specific Dx
Tooth Pain	vs	Irreversible Pulpitis
Arthralgia	vs	Osteoarthritis

Diagnosis Treatment Flow Chart

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



Symptoms

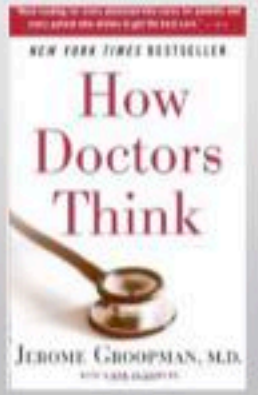
Less Symptoms

No 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

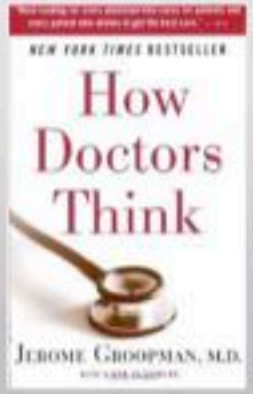
"My Tooth Hurts"



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
- Pulpits secondary to Occlusal Trauma
- Other

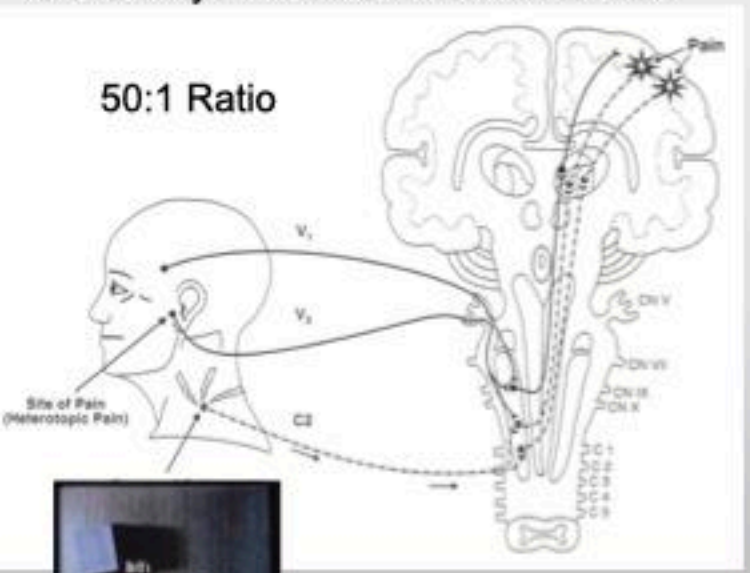


Referred Pain

Convergence

More primary sensory neurons than secondary neurons that travel to brain

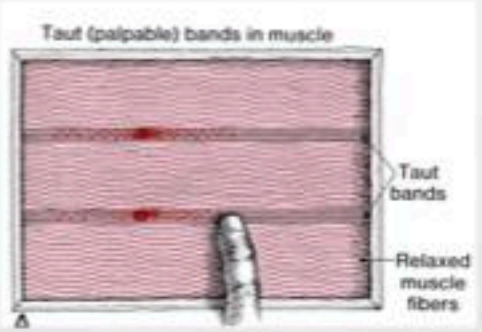
50:1 Ratio

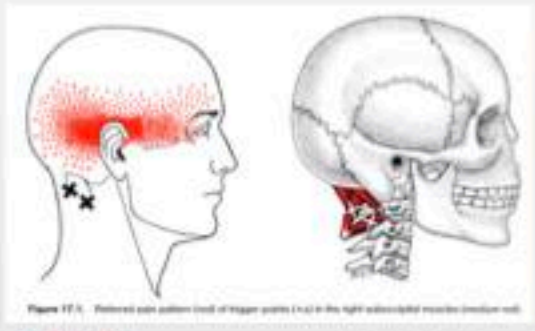


"Bells Orofacial Pain"
Jefery Okeson

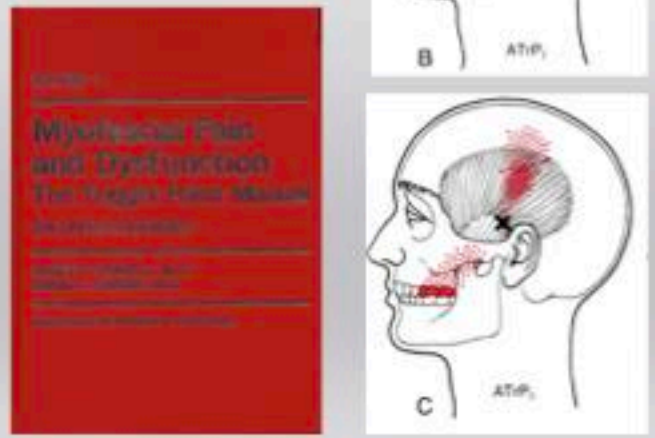
Trigger Points

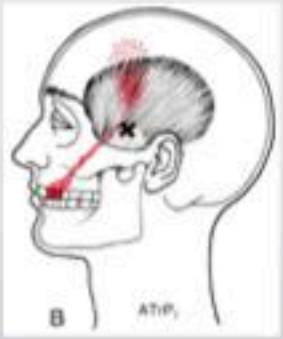
Contracted mass of actin, myosin and histamine

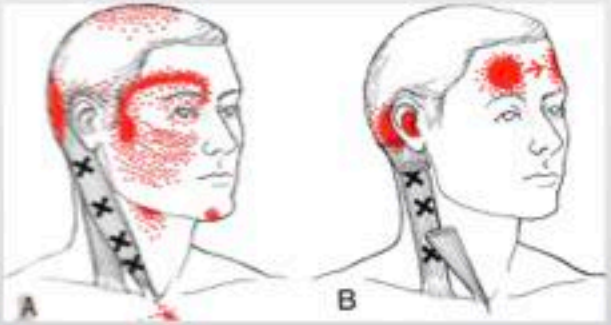


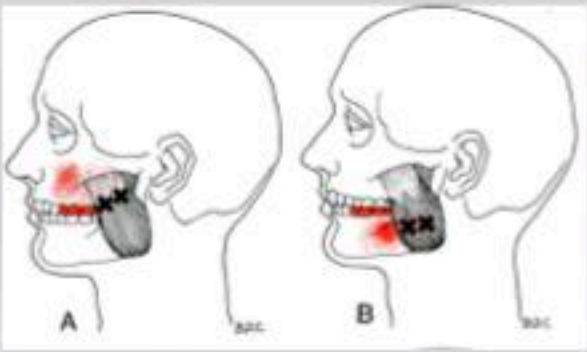


"The Trigger Point Manual"
Janet Travell, MD









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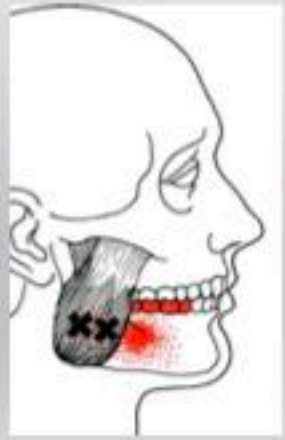
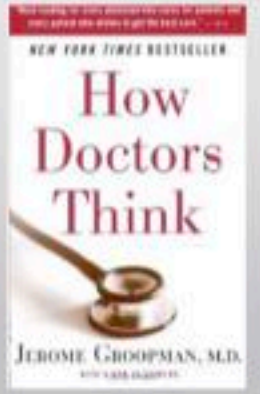
- Other



"How Doctors Think", by Jerome E. Groopman

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

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



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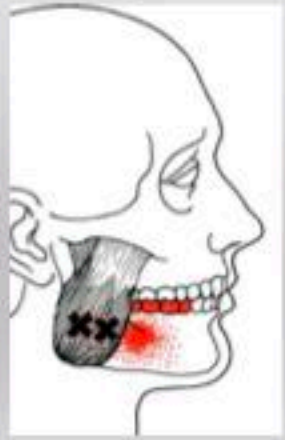

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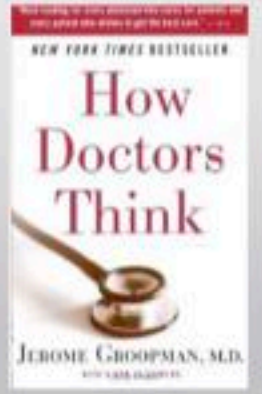


Common TMDs

John R Droter DDS
Annapolis, Maryland

6 Common TMDs

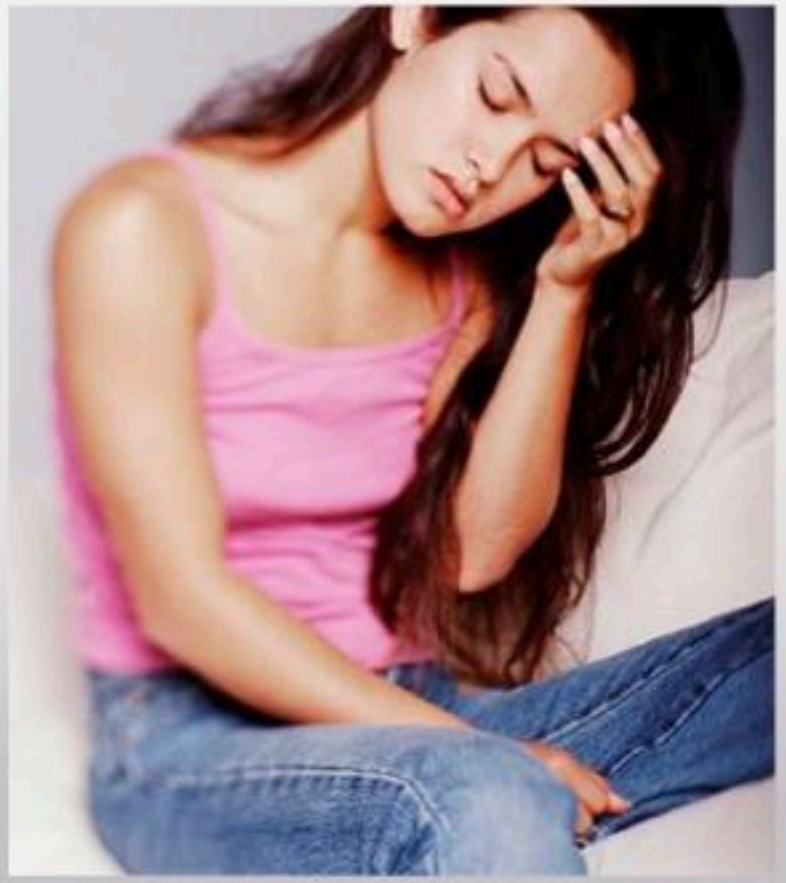
Parafunctional Clenching
Parafunctional Grinding
Occlusal Muscle Dysfunction
Osteoarthritis
Acute Sprain
Acute Closed lock of TMJ disc

5 Common Obstacles

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

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

TMJ Clicking



6 Common TMDs

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

6 Common TMDs

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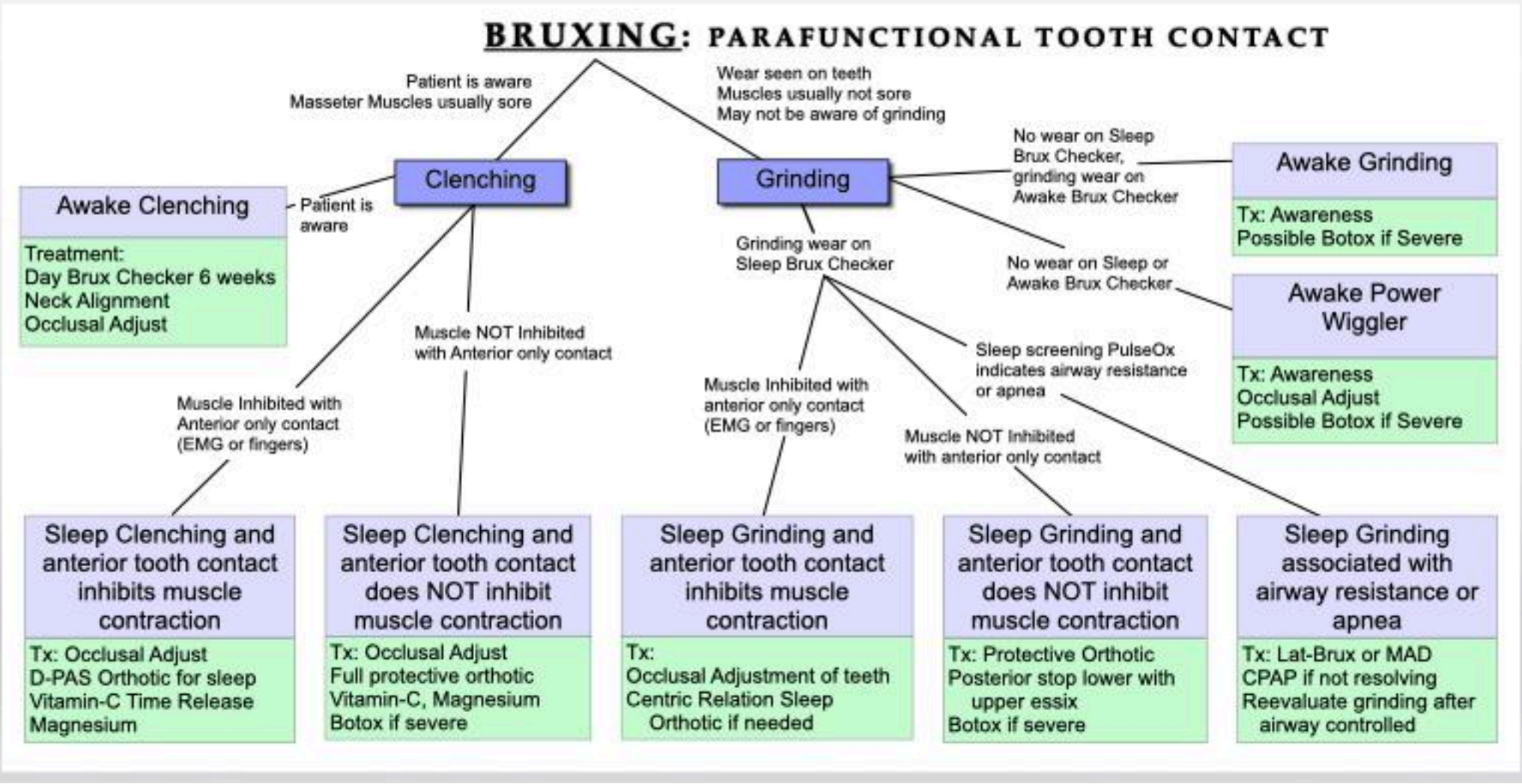
BRUXING: PARAFUNCTIONAL TOOTH CONTACT



Clenchers destroy the joint,
Grinders destroy the teeth

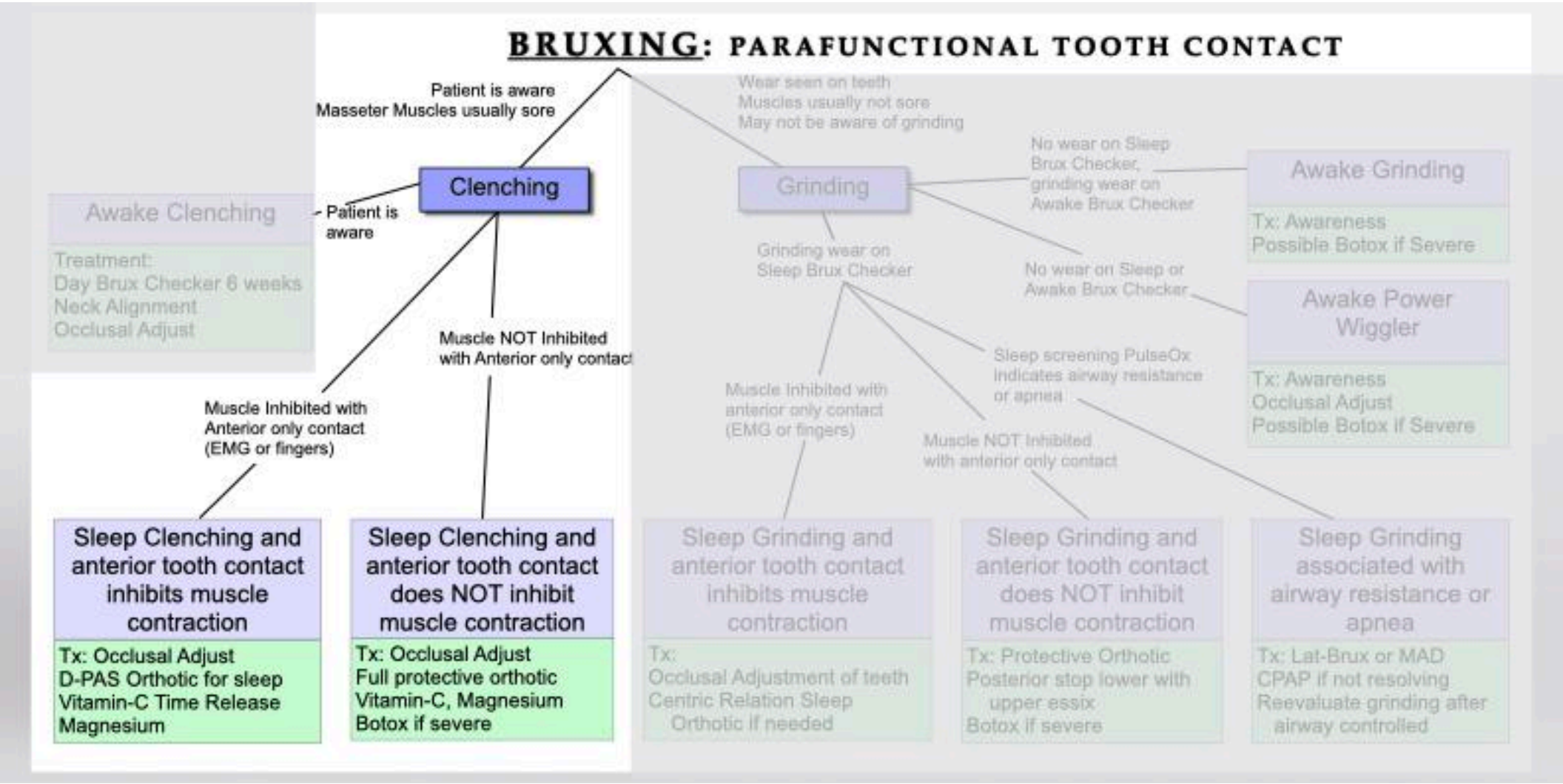
<u>Clenching</u>
Painful Muscles
Patient is usually aware of clenching
Fremitus
Strong Masseters
See slight wear around tooth contacts
Damage TMJ cartilage

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

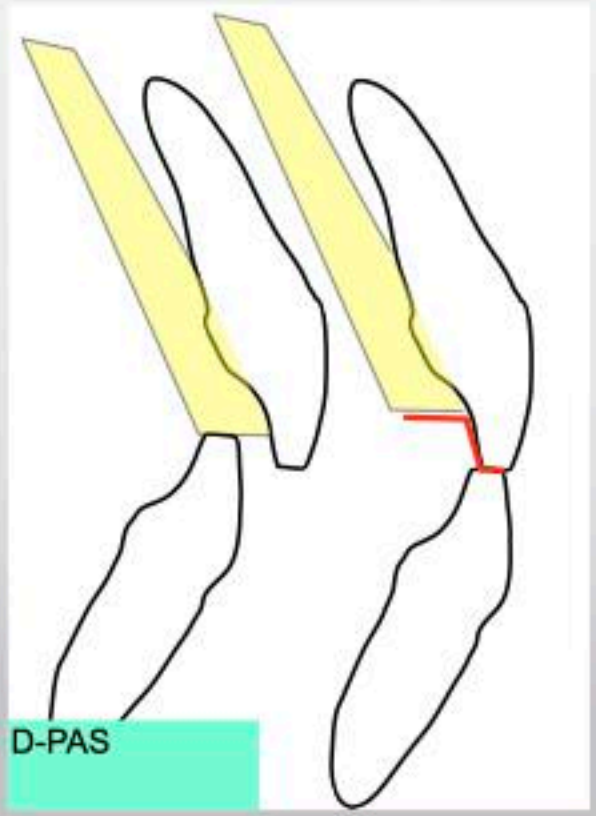
<u>Grinding</u>
See tooth wear
Patient is usually not aware
Buttressing bone if teeth are tight
If tooth mobility, on excursions
Strong Masseters
Slight if any soreness muscles
Usually no muscle pain

Parker Mahan-
"Women Hurt, Men destroy"

BRUXING: PARAFUNCTIONAL TOOTH CONTACT



Diagnostic Palatal Anterior Stop
D-PAS



Basically an upper Hawley with anterior stop without clasps or wire

Diagnostic Palatal Anterior Stop

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

Better- Decrease in Symptoms

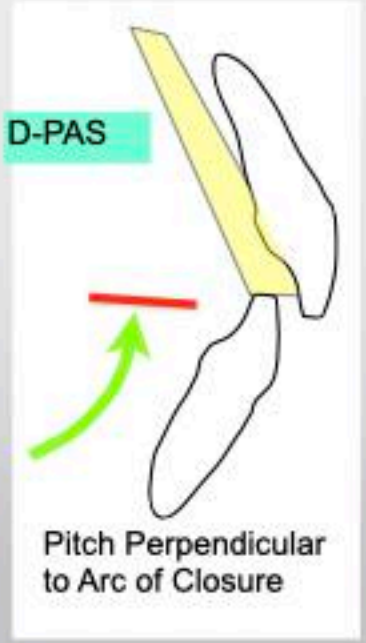
Sleep Clenching Inhibited: Wear D-PAS as night guard
Orthotic Improved Airway: D-PAS as night guard
Occlusal Muscle Disharmony: Occlusal Adjust

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

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

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

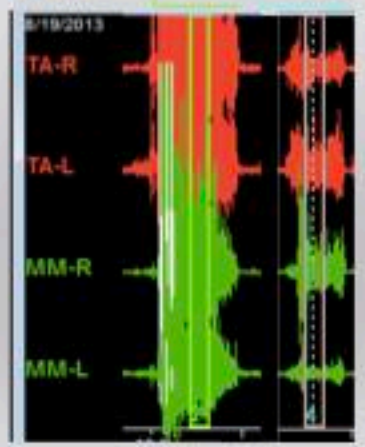
BioResearch EMG

BioResearch mScan

Diagnostic Palatal Anterior Stop

Patient with muscles inhibited by anterior only contact

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

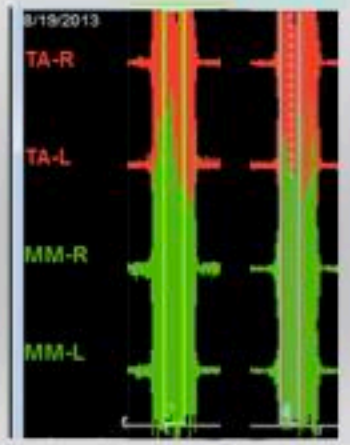


Major decrease in muscle power with D-PAS

BioResearch EMG

Another Patient with muscles NOT inhibited by anterior only contact

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

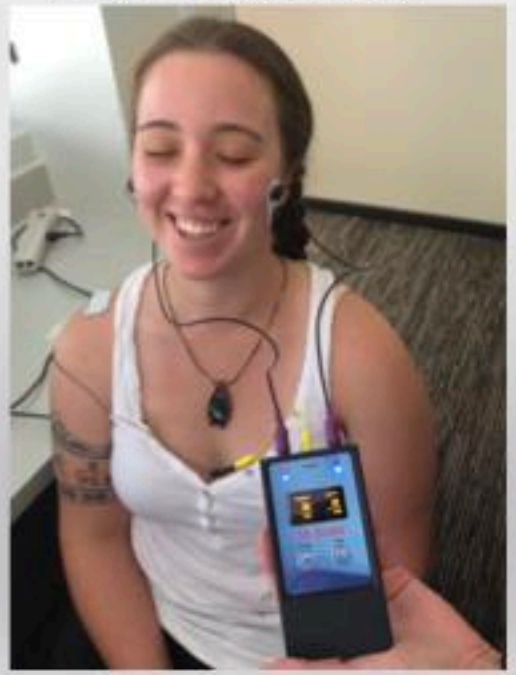


Muscle power same with D-PAS

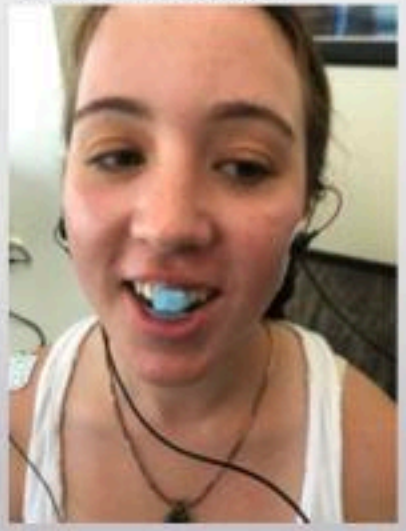
Choosing the Correct Night Guard

M-Scan EMG
Electromyography

Clench back teeth



Clench
anterior stop



Can place moderate force on front teeth

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

Parafunctional Clenching

Signs

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

Diagnostic Tests

EMG M-scan
- Determine if muscle inhibition

D-PAS for sleep

Adhesive Click- "Sticky Disc"

Symptoms

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

Causes

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

Treatments

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

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 ClC-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.

D-PAS Handout to patient

D-PAS Diagnostic Palatal Anterior Stop Test

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

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

Keep track of what changes you notice.

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

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

Clean by scrubbing off with toothbrush and toothpaste.

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

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

Diagnostic Palatal Anterior Stop

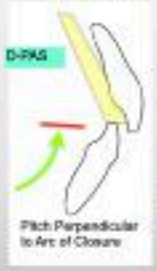
D-PAS Test: Wear 2 weeks, Day and Night

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

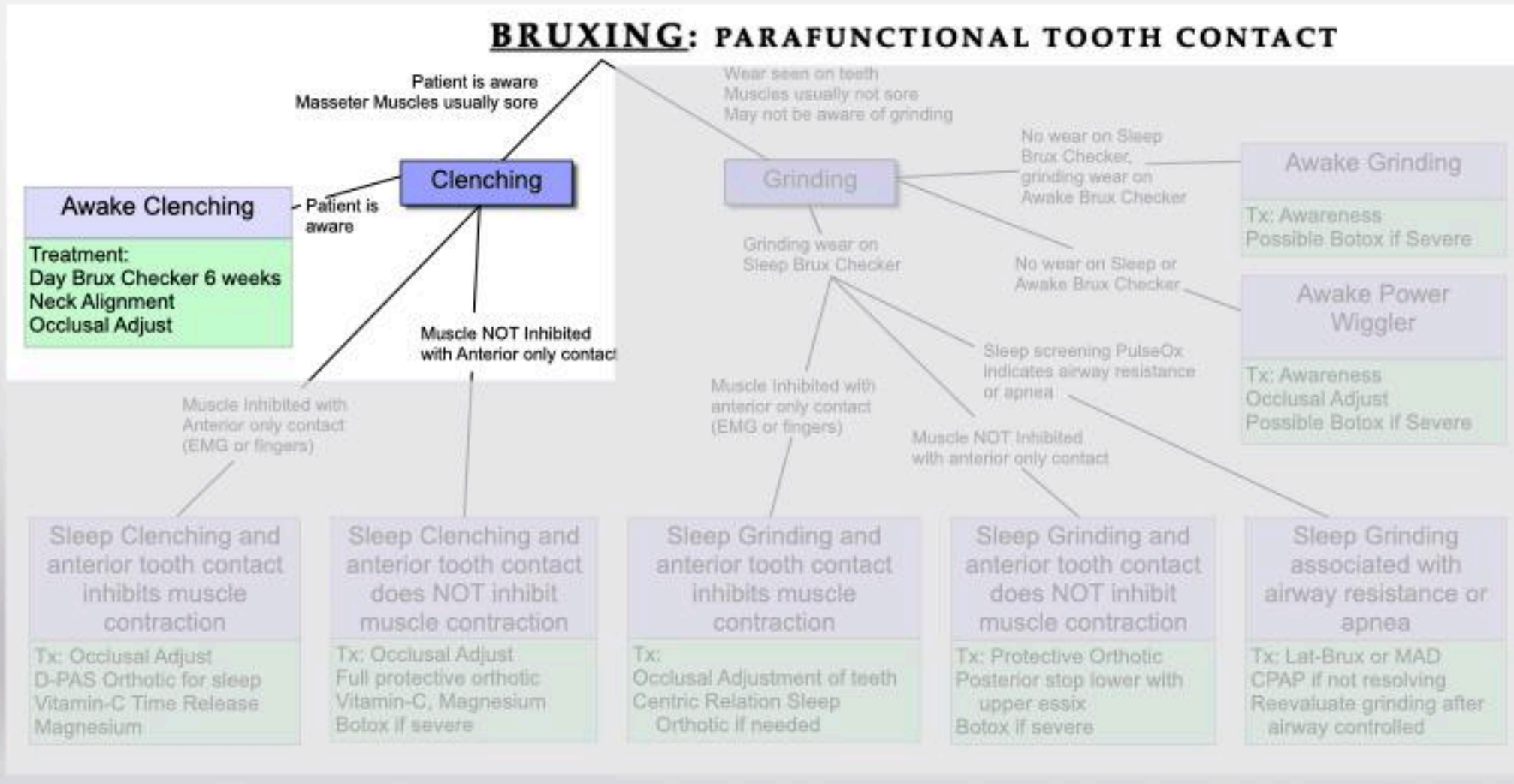
Worse- Increase Symptoms
Mechanically Unstable TMJ (Joint subluxation)
Intracapsular Problem TMJ

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

This is a diagnostic test, not treatment



BRUXING: PARAFUNCTIONAL TOOTH CONTACT



Daytime Clenching- Clear Brux Checker

Increases awareness to break habit

Very thin: Similar to mylar used for composites

50 µm thick

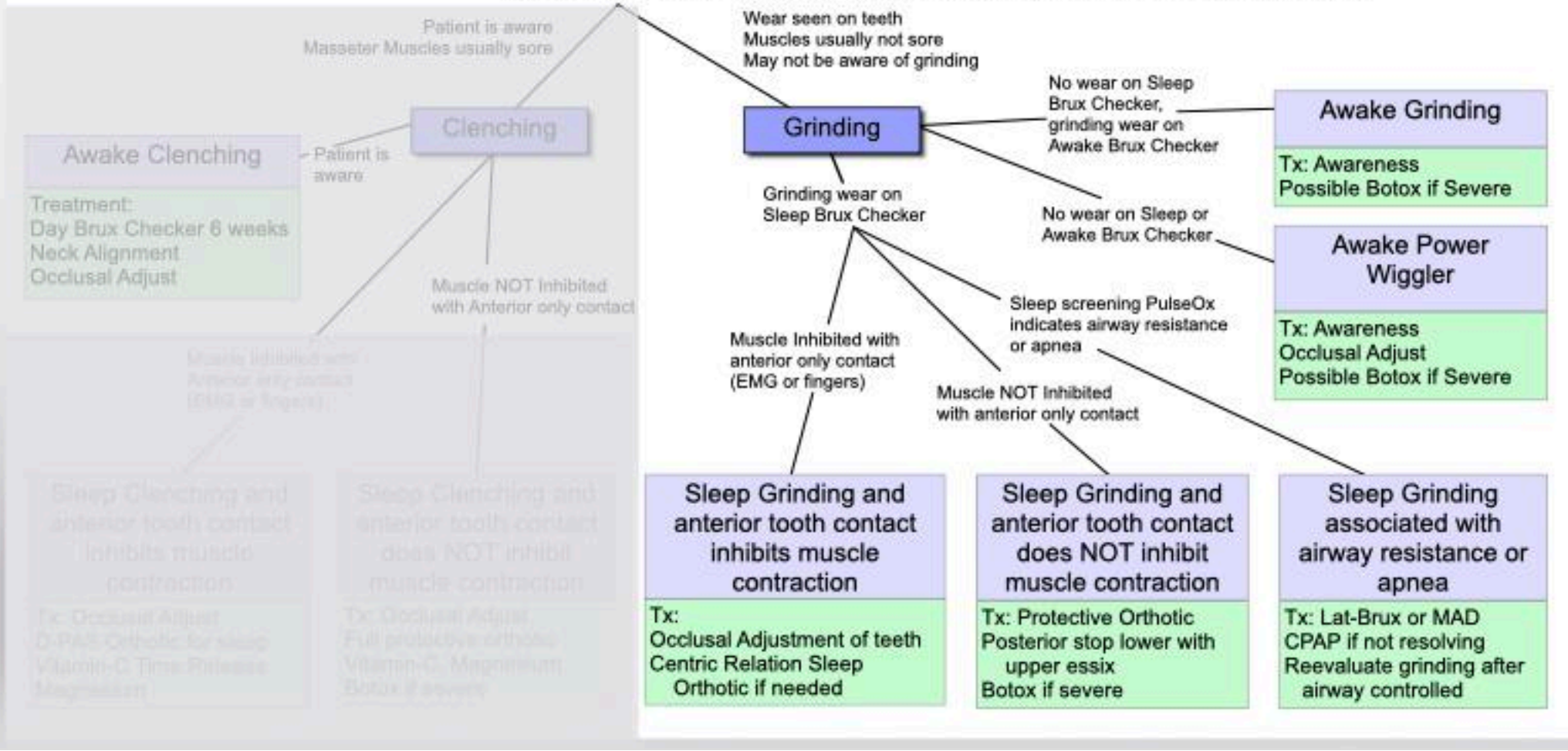
Living Tree Dental Lab
(865) 509-4509
connect@livingtreelab.com

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

6 Common TMDs

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

BRUXING: PARAFUNCTIONAL TOOTH CONTACT



Clenchers destroy the joint,
Grinders destroy the teeth

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

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

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

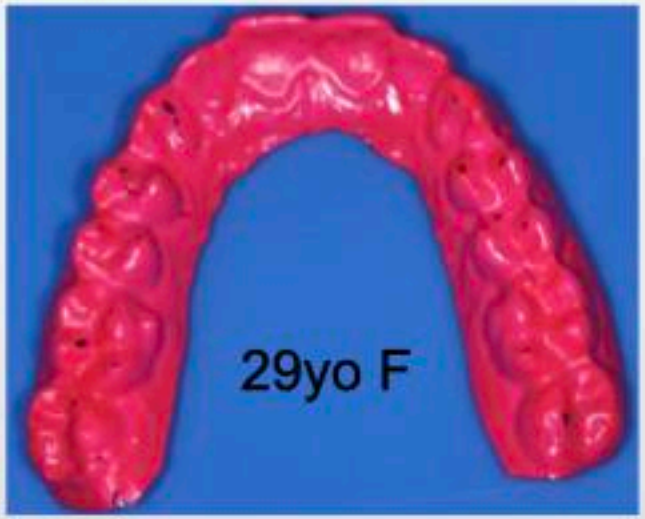
Parker Mahan-
"Women Hurt, Men destroy"

2. Does this occur awake or asleep?

Brux Checker
Great Lakes Orthodontics

0.1mm Mylar

Made on Biostar Machine



Which Occlusal Orthotic for Grinding?

Lower Posterior Stop with upper essix

Upper Hard CR Orthotic

Lat-Brux
Great Lakes Ortho

Nylon Herbst
Great Lakes Ortho

APS
ArrowPath Sleep

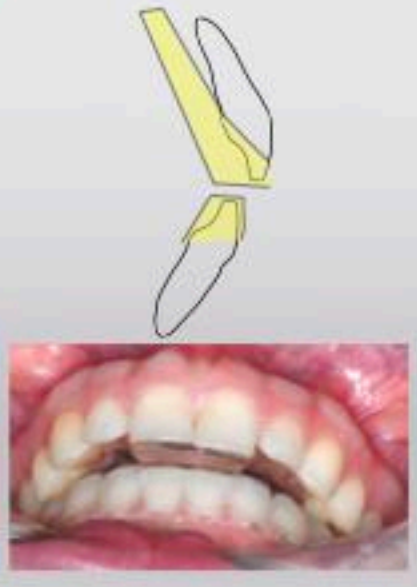
LIVING TREE DENTAL LAB

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

3D Printed Orthotics

D-PAS
Diagnostic-
Palatal Anterior Stop

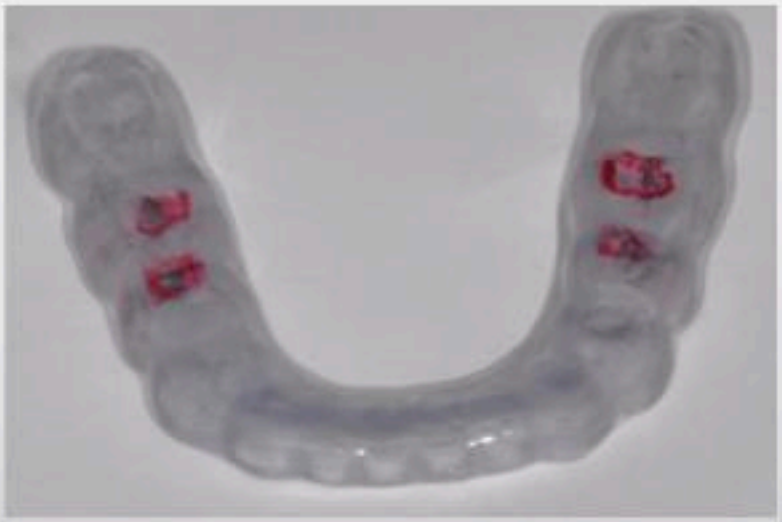
Brux-PAS
with lower Essix



Hard Lower Posterior Stop
with upper essix

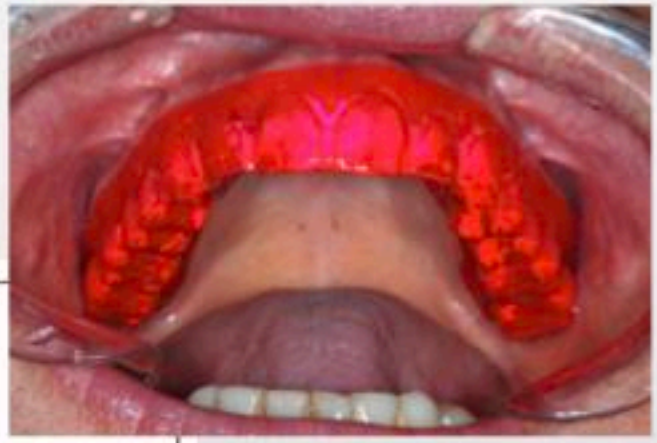
Hard Lower Full Coverage
Centric Relation Orthotic

Lower Posterior Stop Night guard with upper Essix

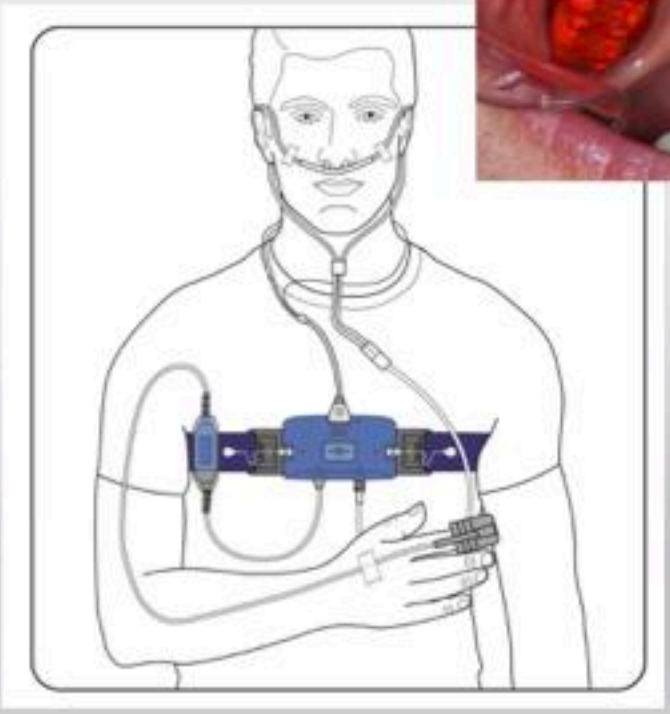


zMachine

zMachine + Brux Checker
+ Snore Lab



GENERAL sleep



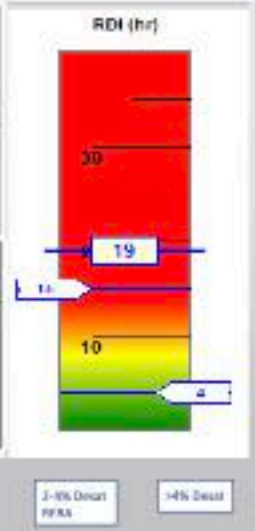
Call (888) 330-4424
Use Code: DROTER to receive special offer

Also ask for access to Droter Modified Report

Treating Common TMDs in a General Practice

Management

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



Pulse Ox Screening

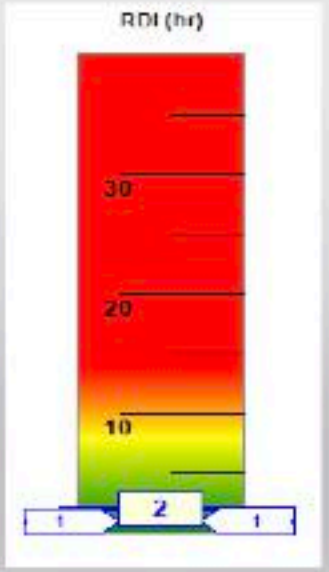
Refer to Medical Sleep Doctor

Get approval for Mandibular Advancement Appliance

Verify Airway Improves

19 events/hr before

2 events/hr with Orthotic



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

Nylon MAD
Great Lakes Ortho

6 Common TMDs

Diagnosis	Pattern	Treatment
Clenching	Patient is aware Masseters Ache Morning TMJ clicking that resolves	Occlusal Adjust D-PAS Night Guard (if inhibition) Magnesium and Vitamin C hs
Sleep Grinding	Worn Teeth	Protective night guard Airway night night guard
Occlusal Muscle Dysfunction	**Sore muscles when chewing** **Sore Lateral Pterygoid, Headaches** **Day D-PAS Relieves Symptoms**	**Occlusal Adjustment**
Osteoarthritis of TMJ	Arthralgia CBCT shows worn bone loss MRI T2, STIR ++	NSAID for 6-12 weeks Occlusal Adjustment Do not put in a night guard
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Occlusal Muscle Disharmony

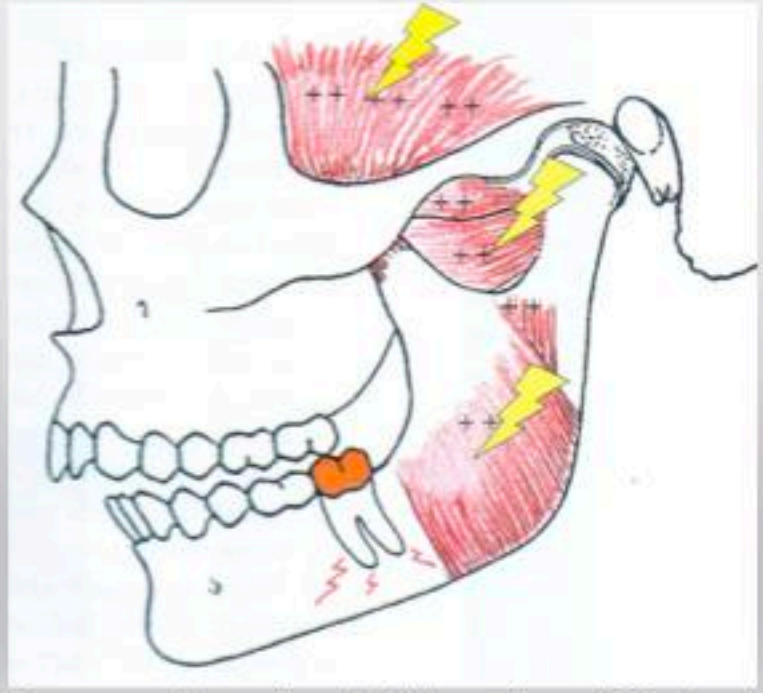
Uneven tooth contact with condyles fully seated triggers muscle activity

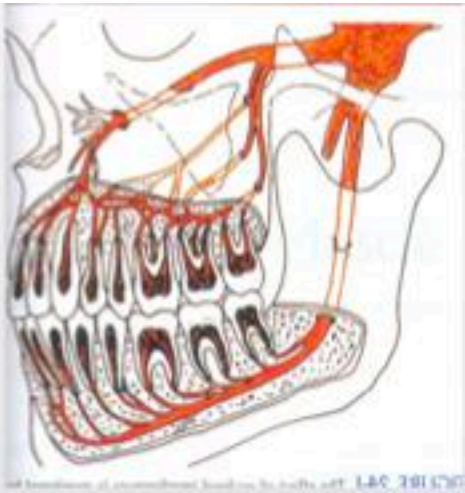
Lateral pterygoid fires out of sequence to create even tooth contact on closure

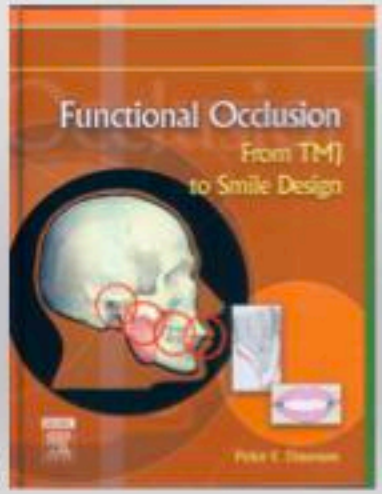
Disharmony in all muscles: Splinting/Bracing

Muscles sore from overuse

Muscles do not think- CNS input

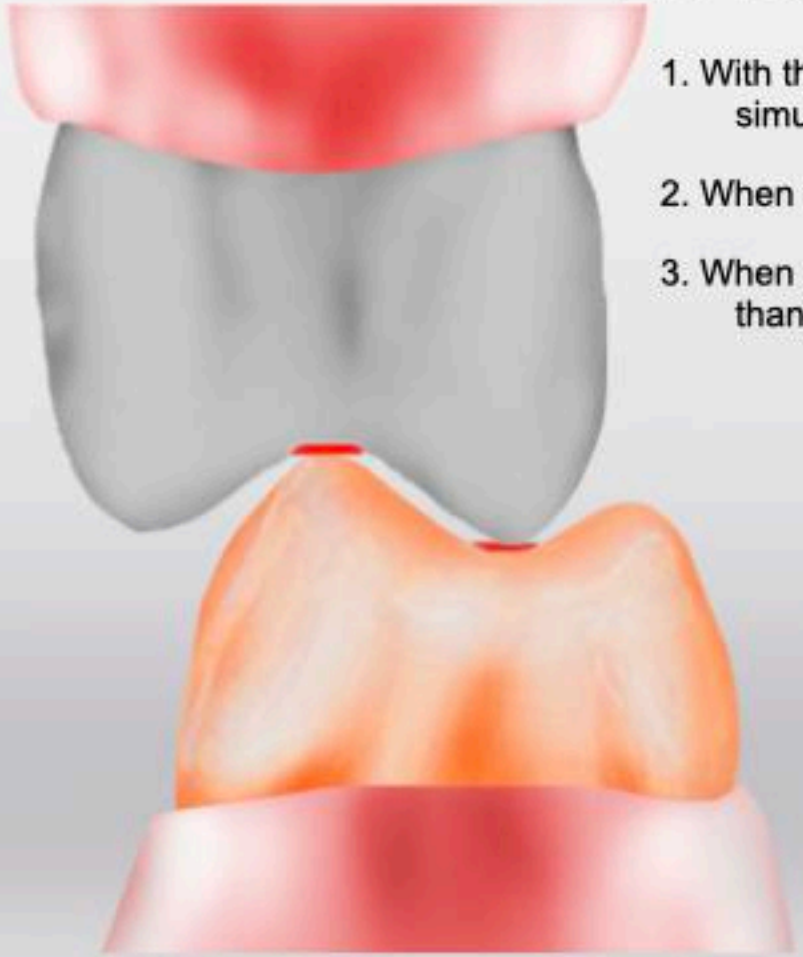






from Dawson's Textbook, "Functional Occlusion"

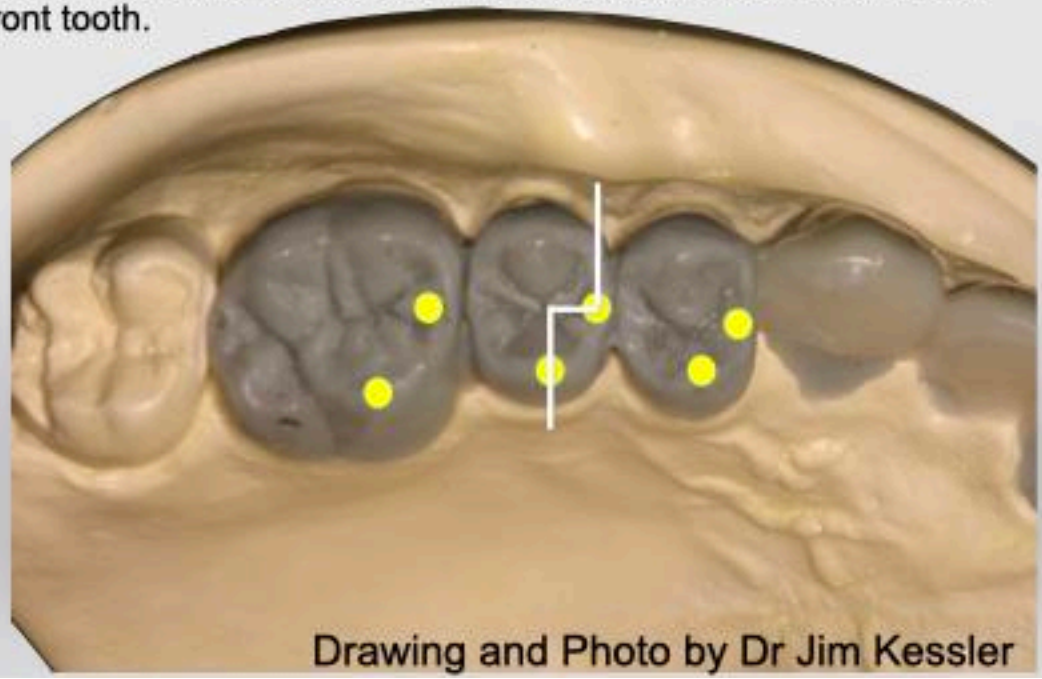
LD Pankey's 3 Rules of Occlusion (Clyde Schuyler)



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).

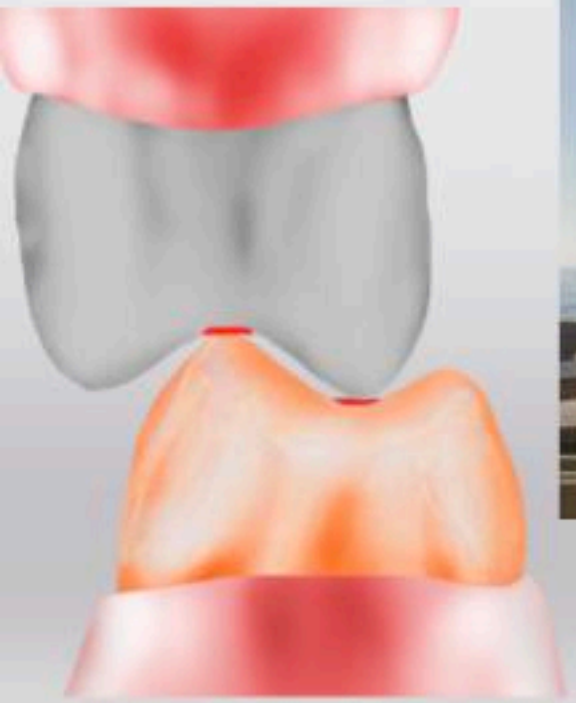
3. When you move the mandible in any excursion, no back tooth hits before, harder than, or after a front tooth.



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



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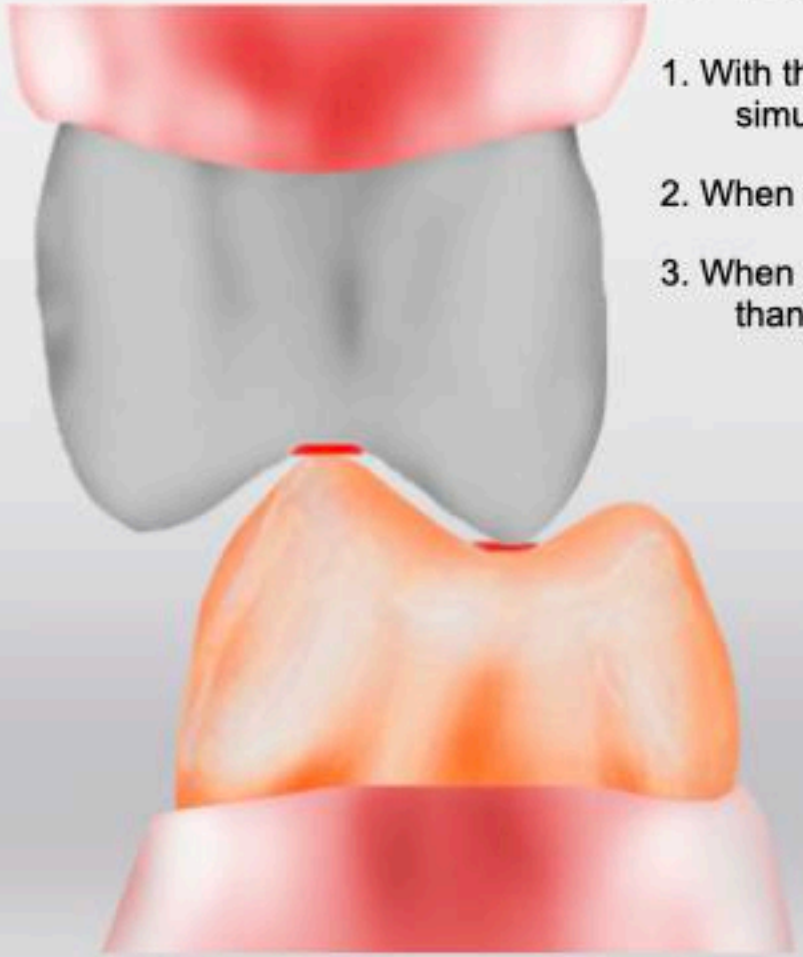

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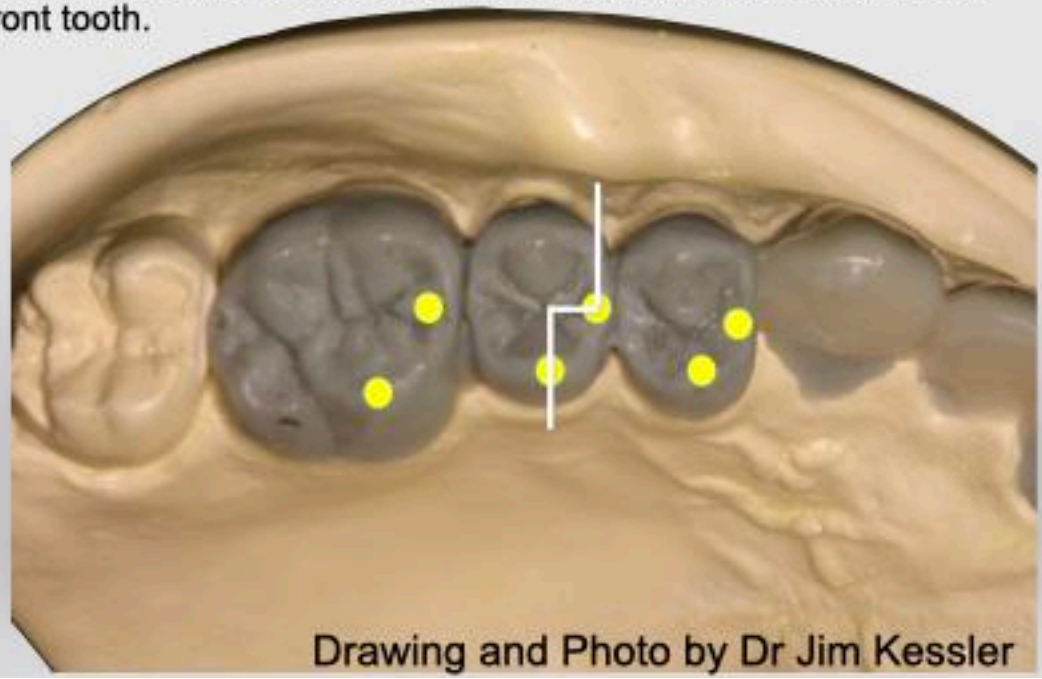
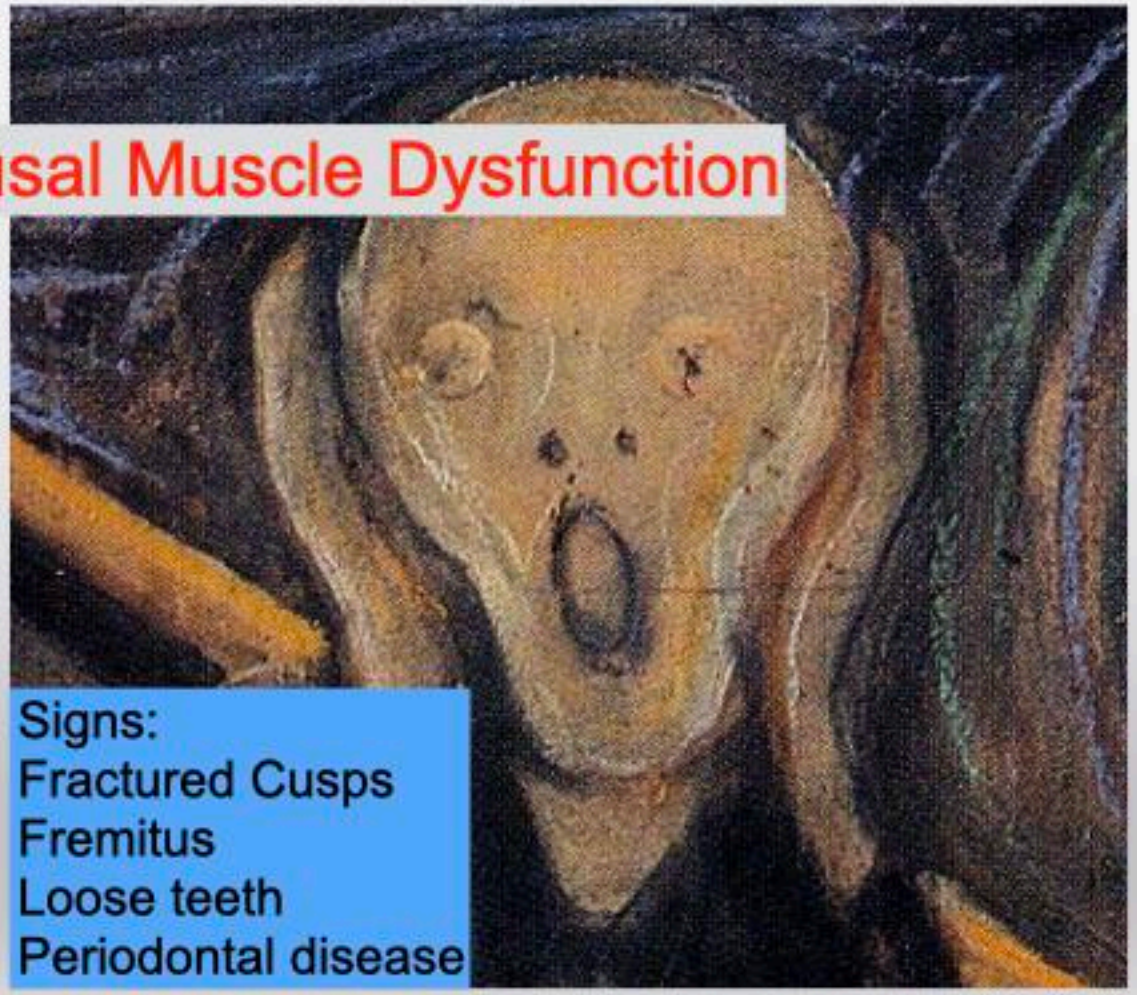


Drawing and Photo by Dr Jim Kessler

TMD Symptoms

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

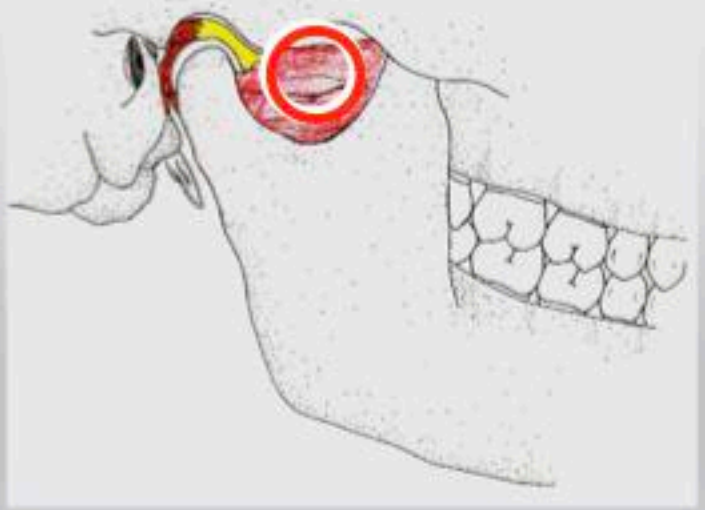
Occlusal Muscle Dysfunction

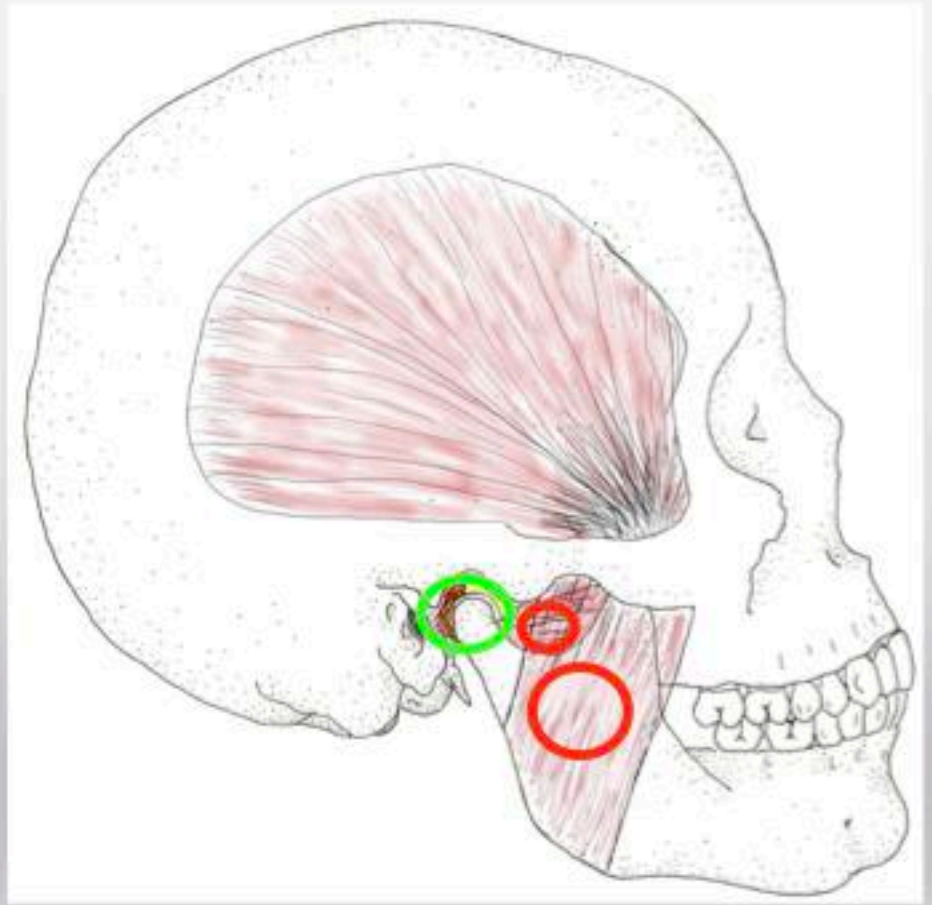


Signs:
Fractured Cusps
Fremitus
Loose teeth
Periodontal disease

Occlusal Muscle Dysfunction Pattern

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





Drawings by Gretta Tomb DDS and John Droter DDS

Occlusal Muscle Dysfunction Diagnostic Tests

Occlusal Muscle Dysfunction is a daytime problem

Clenching can be both a daytime and nighttime problem

D-PAS 2 week trial

OR

3-6 week lower CR orthotic

>30% of headaches have an occlusal component

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

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

Diagnostic Palatal Anterior Stop

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

Better- Decrease in Symptoms

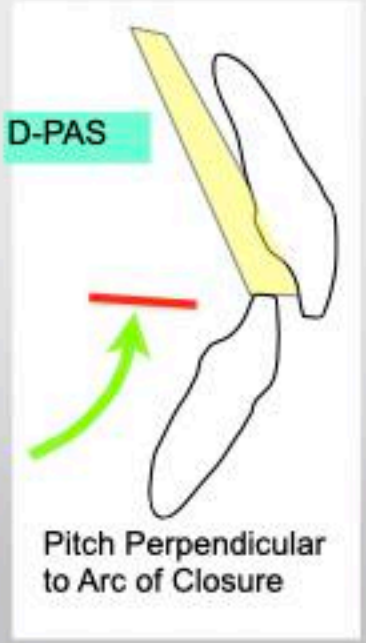
Sleep Clenching Inhibited: Wear D-PAS as night guard
Orthotic Improved Airway: D-PAS as night guard
Occlusal Muscle Disharmony: Occlusal Adjust

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

Why LD Never wrote a text book

Slide by Dr John R Droter

Treat Occlusal Muscle Dysfunction- Adjust the Occlusion

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

Before

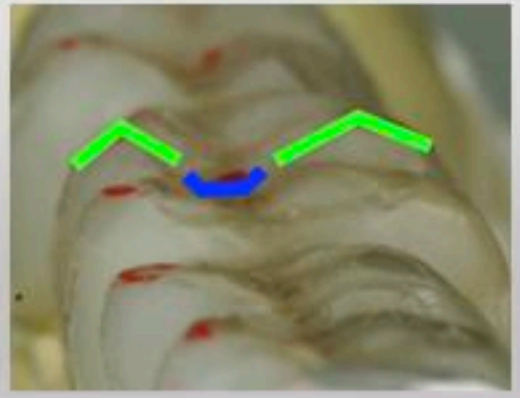
After

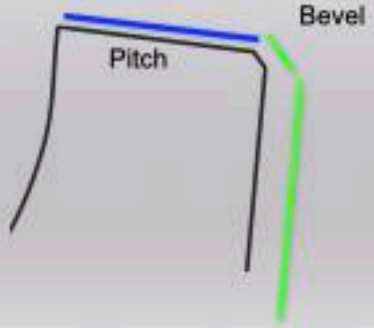
Occlusal Sculpting Tools, including Zirconia

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

Move and Shape Cusps, Inclines, Facial Surfaces

Brassler Brio Shine
FLBCER-1
FLBF-2

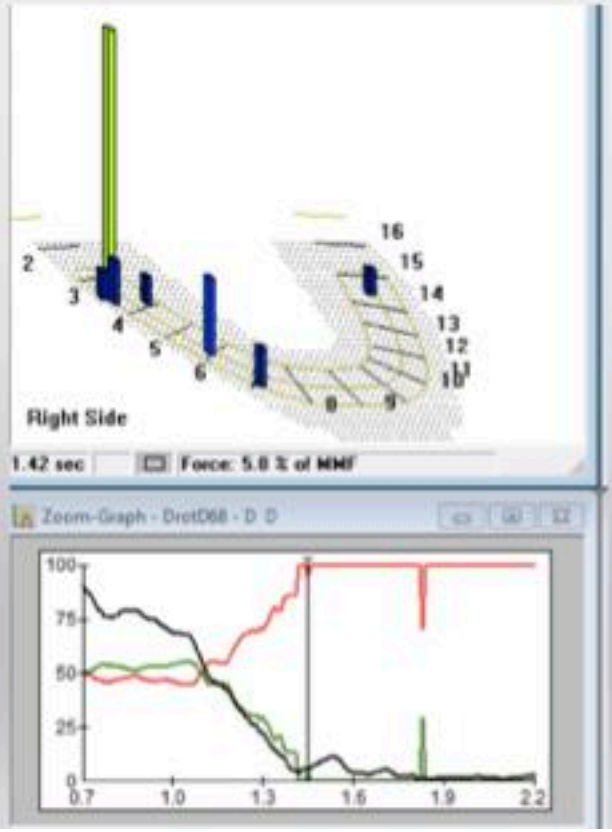


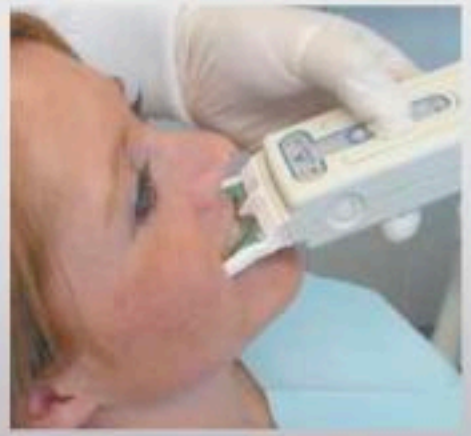


Premier 860.9 F Wheel Diamond
Premier 230 F Barrel Diamond
Neodiamond 1118.7F Roundend taper
Dedco Green Stone
White Arkansas stone
Filtek Supreme- B1B, Albond

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

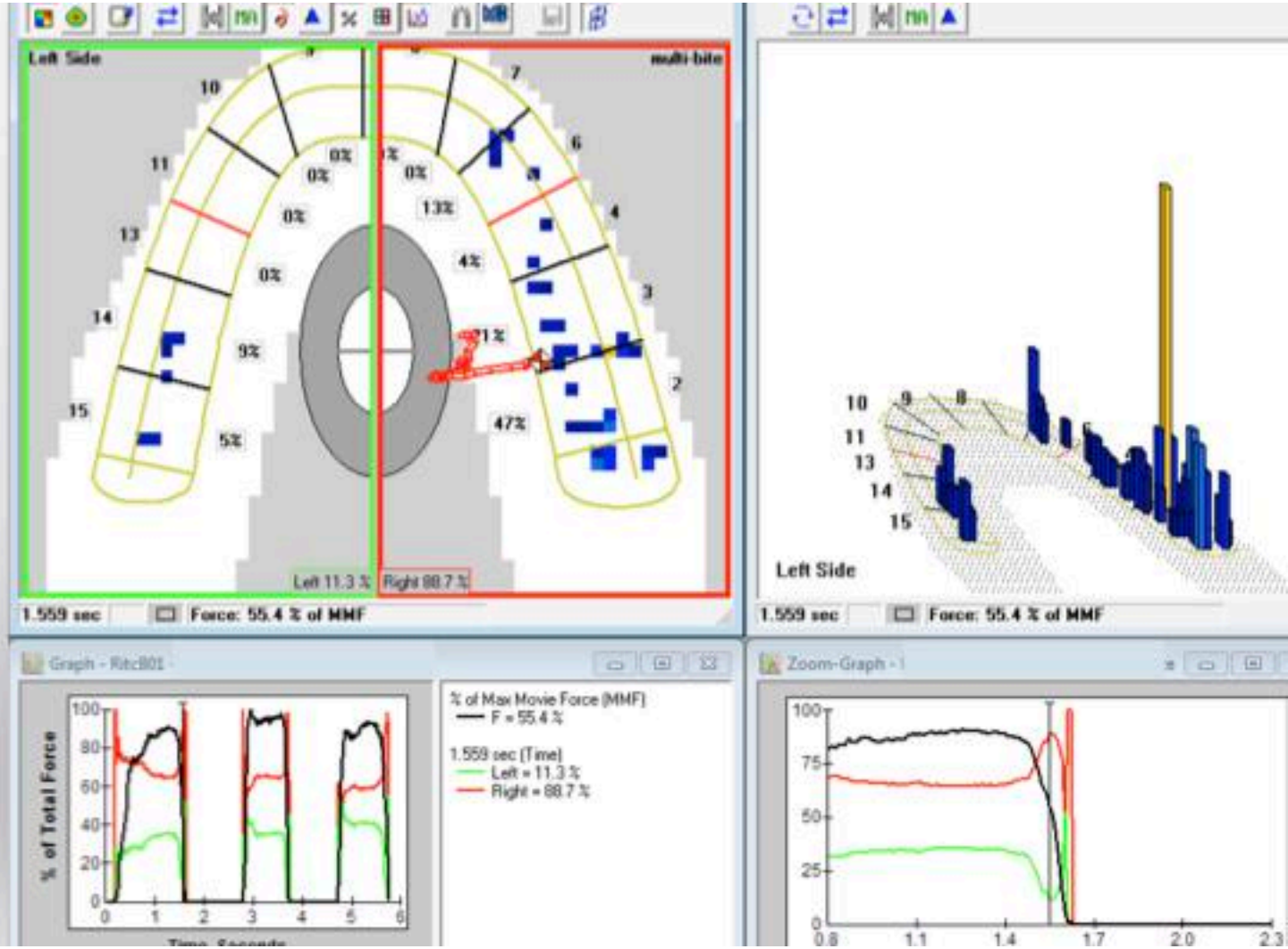
Is that a smudge or a muscle activating interference?





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

T-Scan is excellent for Patient Education of Occlusal Pathology



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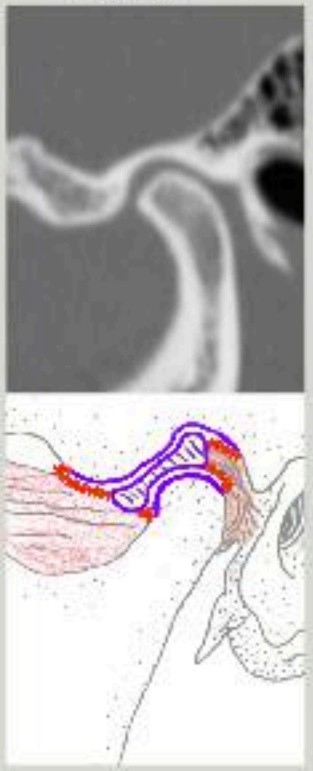
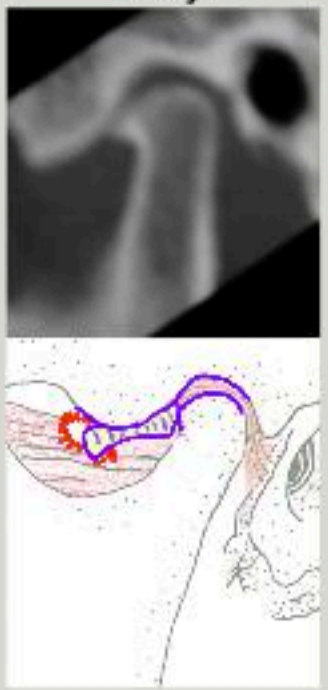
Osteoarthrosis/Osteoarthritis

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

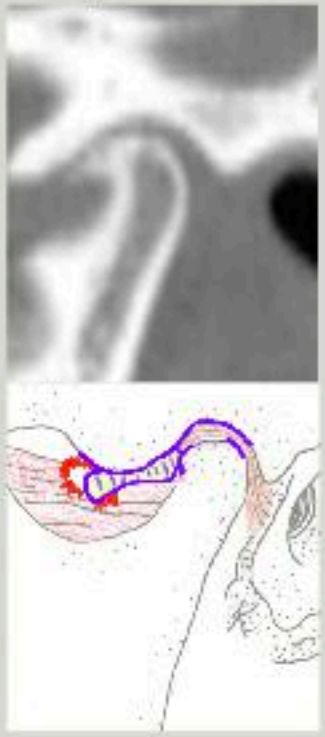
Normal



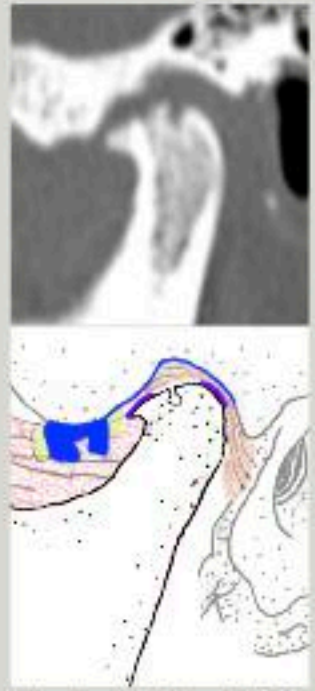
Early



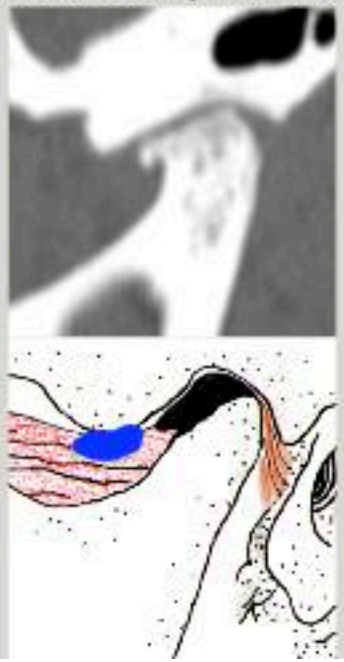
Early/ Moderate



Moderate



Severe OA, Eburnation



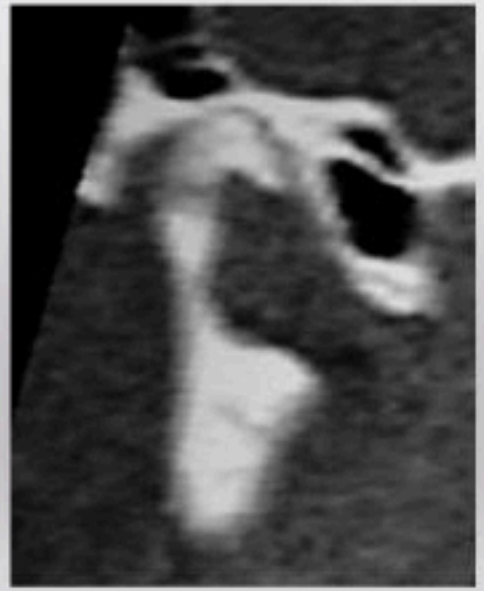
Representative examples of OA
in different patients

Drawings by Gretta Tomb DDS and John Droter DDS

Adaptation Chronic Bilateral Osteoarthrosis

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

OA Right and Left Bone Loss
#8 Ankylosed



Treatment OA

Osteoarthr**osis**

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

Shea Brand CBD

Osteoarthr**itis**

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

If still inflamed arthrocentesis with
Platelet Rich Plasma (PRP)

MLS Laser
9 sessions over 4 weeks

MLS Laser: BioResearch

808 nm Continuous, 905 nm Pulsed

Multiwave Locked System Laser

Diode Laser

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

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

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

Treatment OA

Osteoarthr**osis**

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

If still pain in 6 -12 weeks of NSAID:

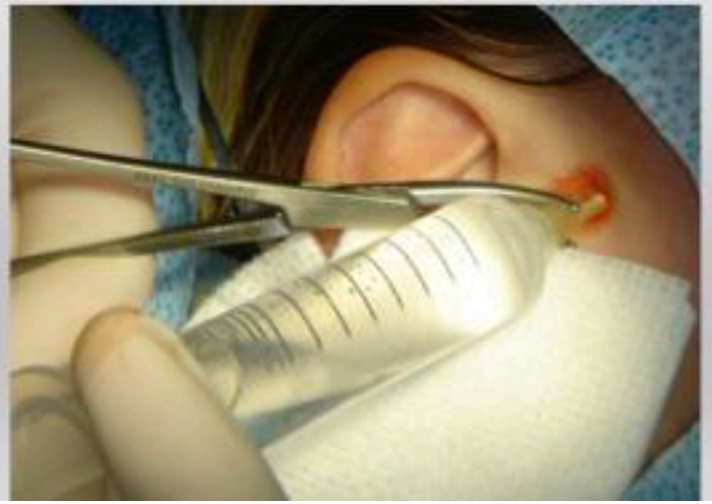
- Arthrocentesis
- Platelet Rich Plasma

Osteoarthr**itis**

All of the above plus eliminate inflammation……

- NSAIDs
- Cold Laser

If still inflamed arthrocentesis with Platelet Rich Plasma (PRP)



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

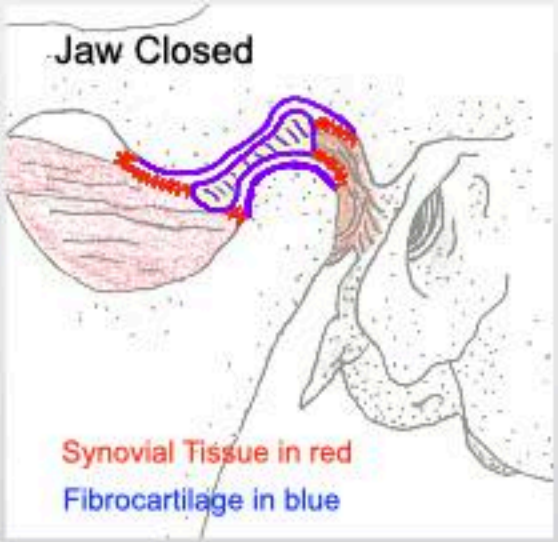
TMD Symptoms

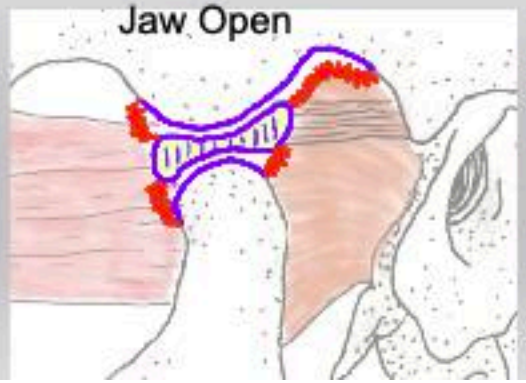
Limited Opening

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

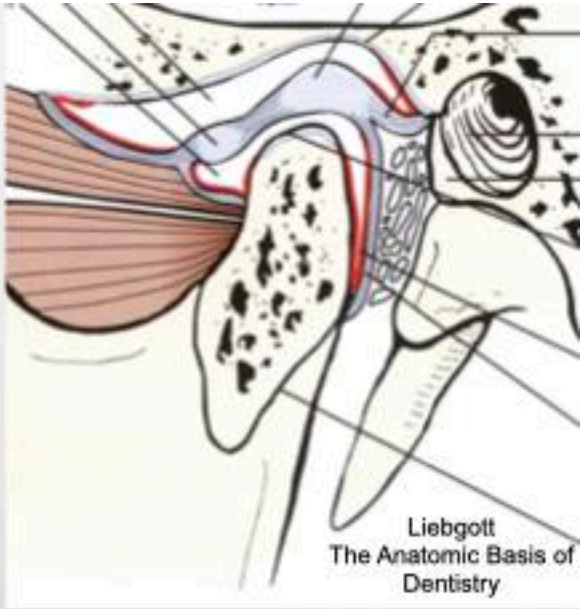
Normal TMJ- Synovium, Cartilage

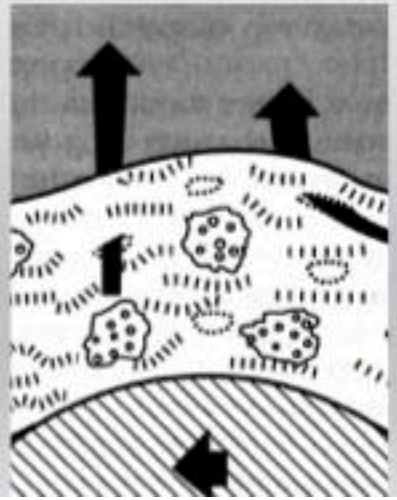




Fibrocartilage-
- Slope of Eminence
- Disc
- Top of Condyle

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

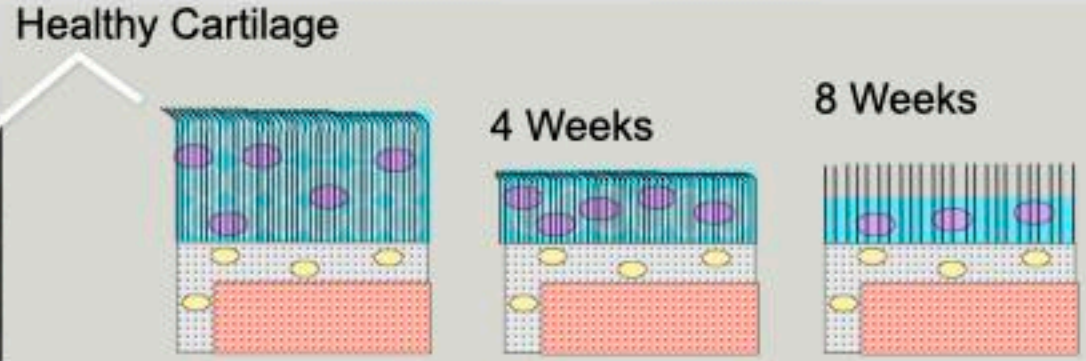
Painful to Move
- Joint Pain
- Muscle Pain

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

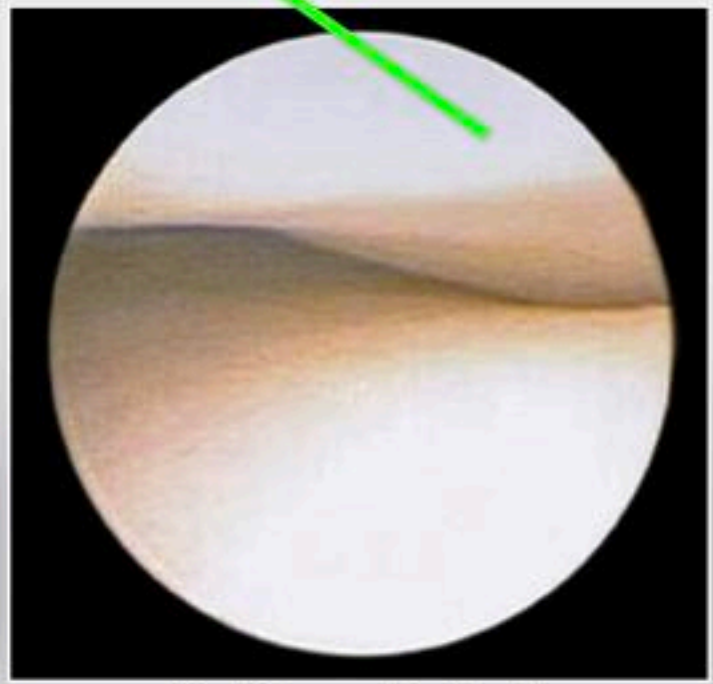
You have 6-8 weeks to get jaw moving before cartilage is irreversibly damaged, independent of the cause of the immobilization



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

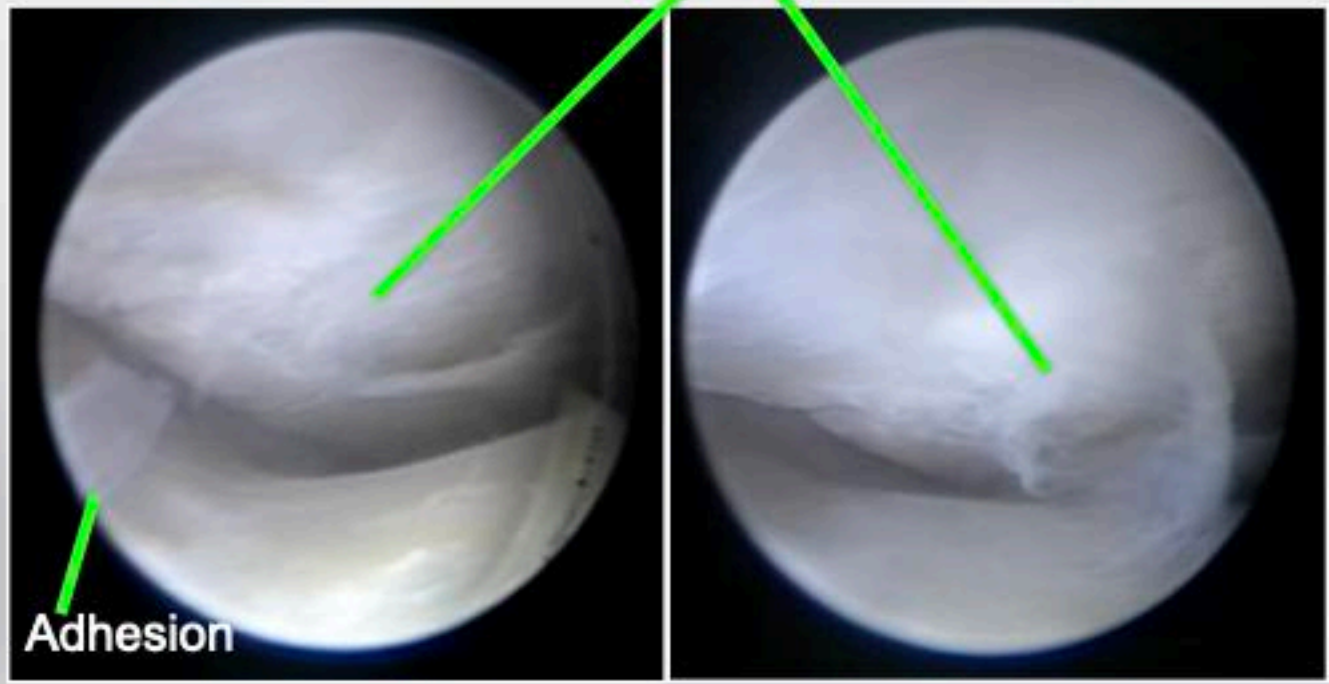
Arthroscopic View Left TMJ

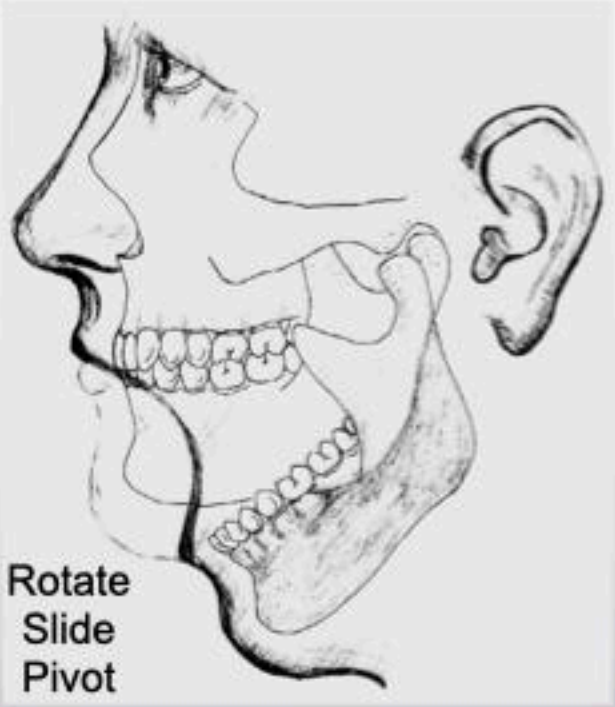
Eminence Healthy Cartilage



Not Same Patient

Eminence Necrotic Cartilage



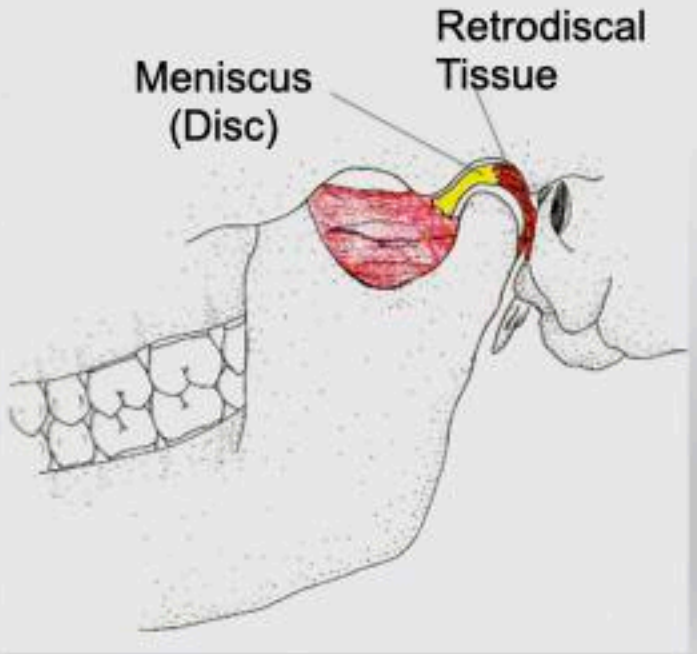


Rotation only 25mm

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

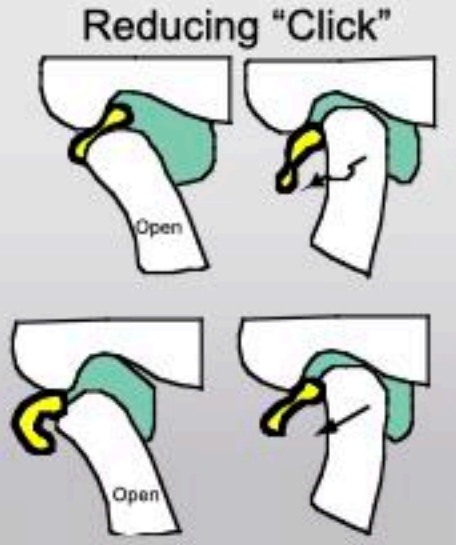
TMJ has 2 Joint Compartments:

Upper- Translation
Lower- Rotation



Acute non-Reducing Disc Limits Translation.

"Old Adapted" may have full range of motion.



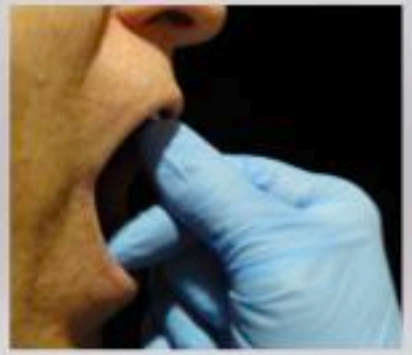
Limited Opening Algorithm

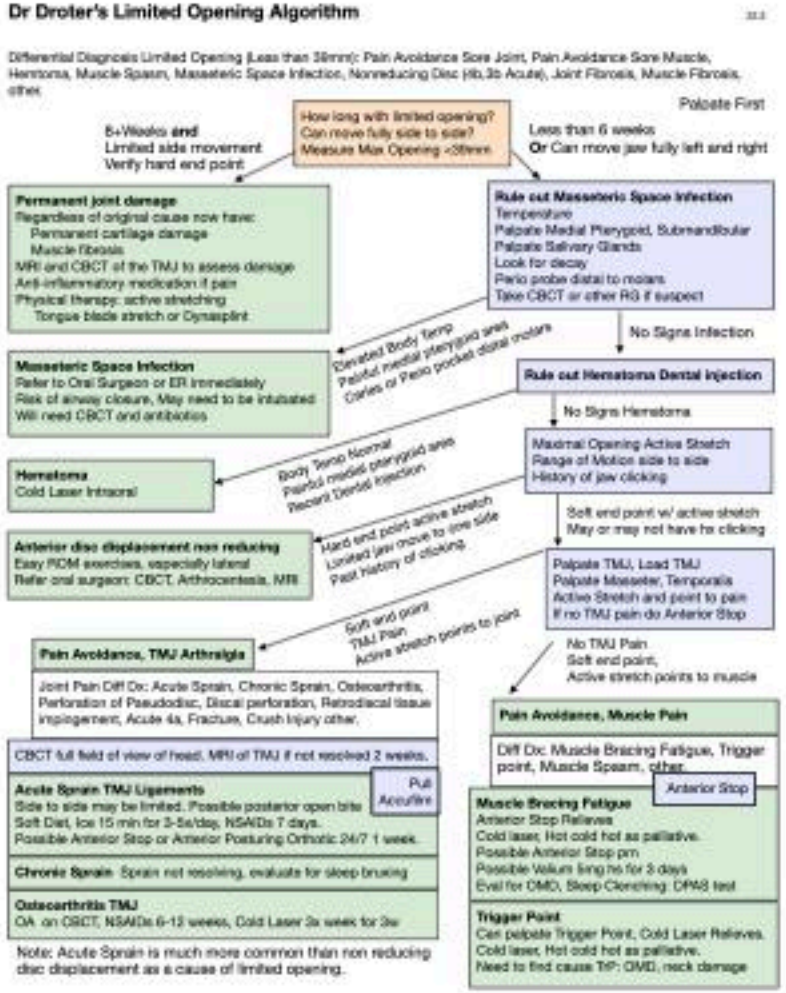
Differential Diagnosis Limited Opening:

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

Diagnostic Tests:

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





Subjective:

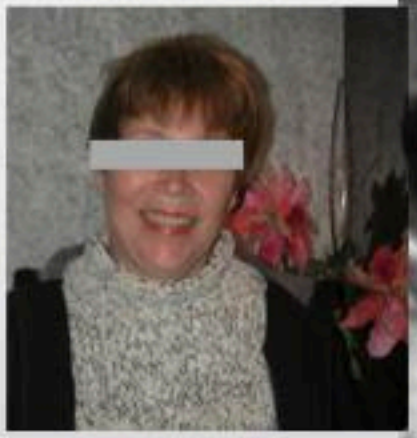
- Dentist doing crown prep #30 1 week ago
- Severe pain Right TMJ after moving jaw at end of appt
- Constant deep pain Right TMJ
- Limited opening

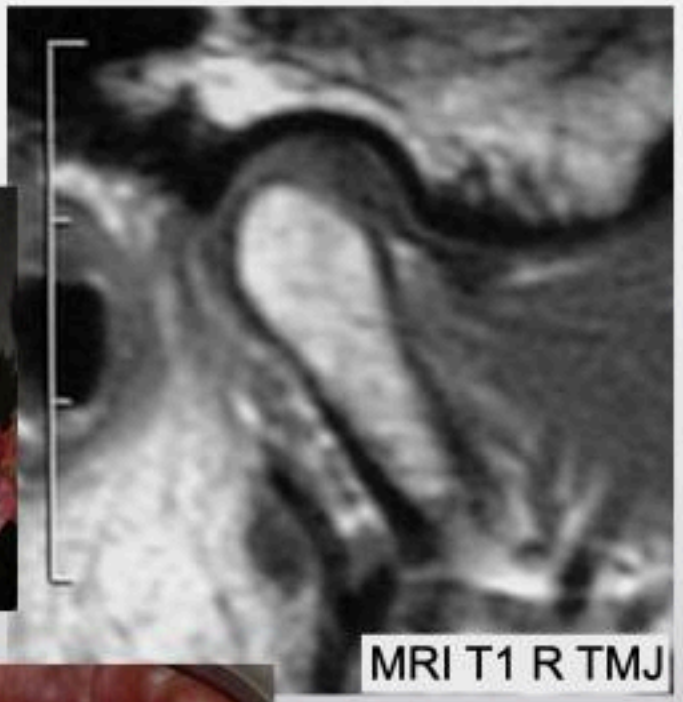
Objective:

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

Assessment:

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



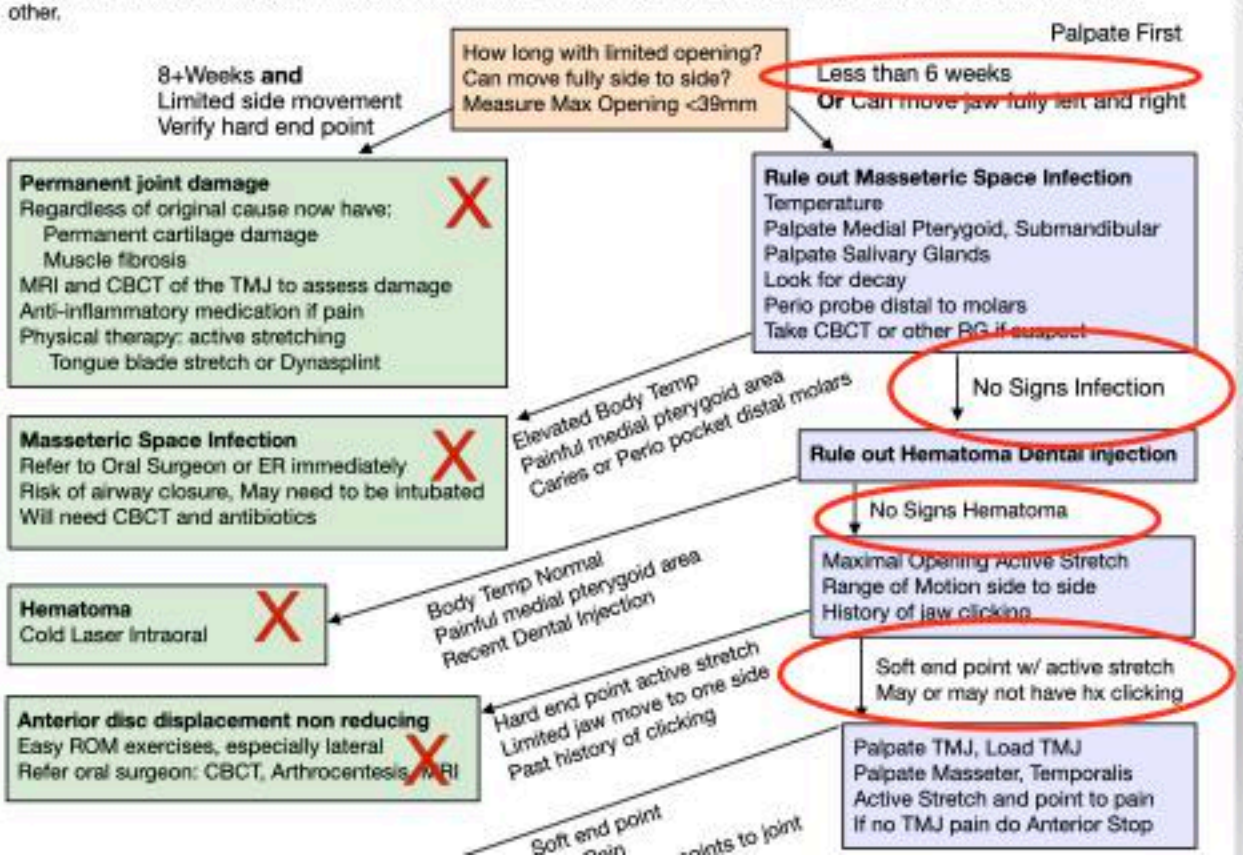


MRI T1 R TMJ

Dr Droter's Limited Opening Algorithm

22.3

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



Objective:

Limited opening 32mm, Mandible shifts Left

Normal side to side motion

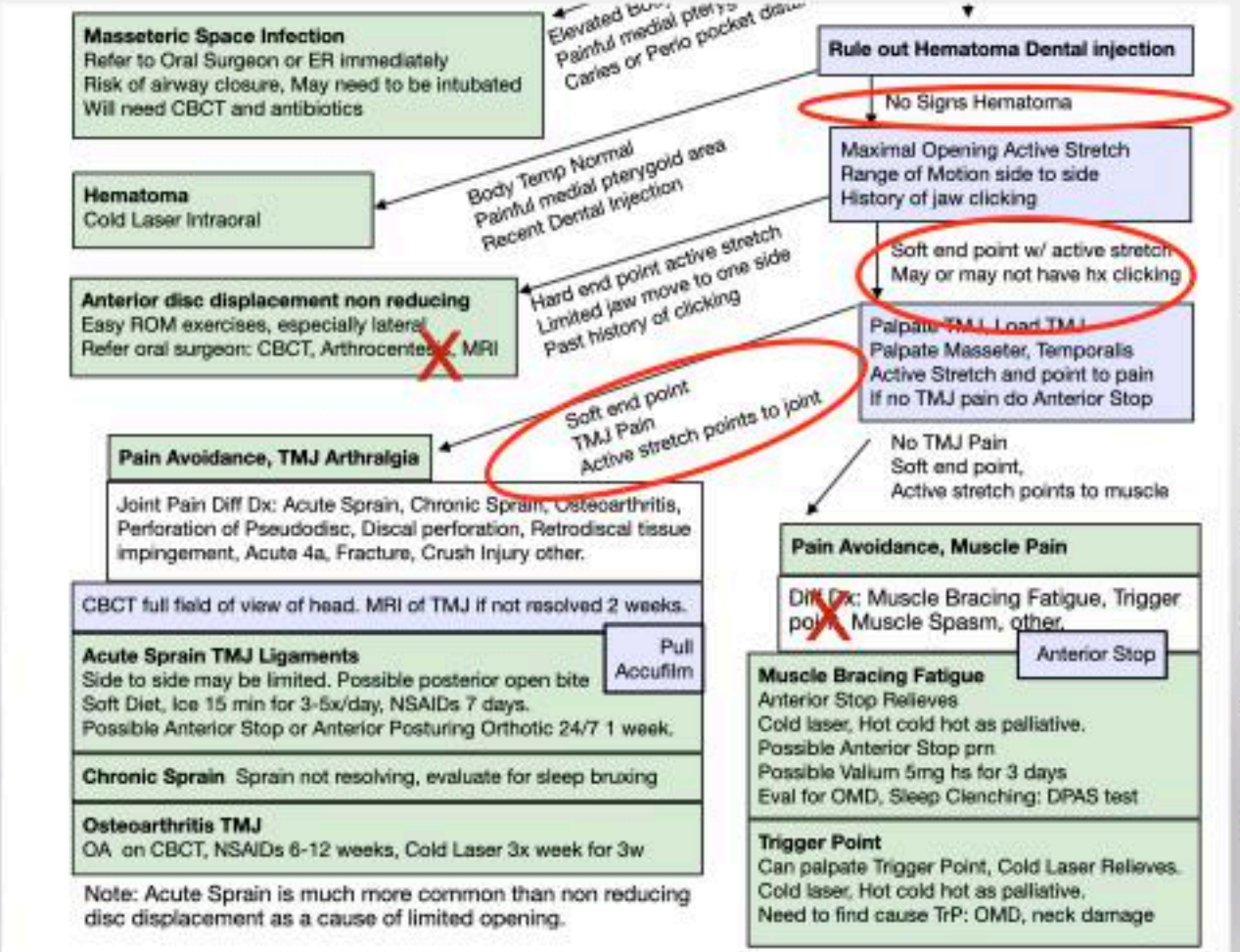
98 temp, normal perio probe 2nd molars, no caries

No pain palpation RL Medial Pterygoid

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

Right TMJ pain to palpation, Left TMJ normal

Posterior openbite Right, does not hold Accufilm



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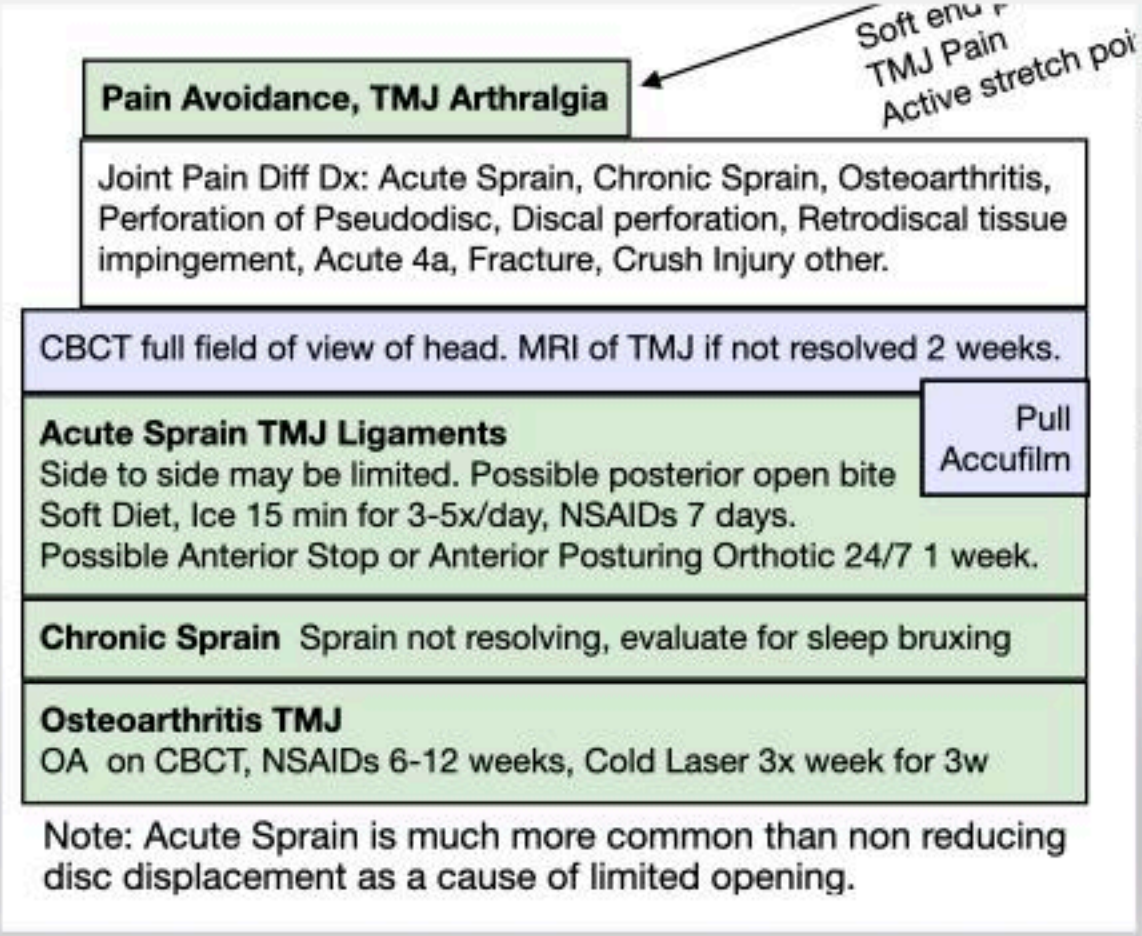

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Limited opening 32mm, Mandible shifts Left

Normal side to side motion

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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: S03.40xxA 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)

Current Sprain Protocol

Soft chew diet
Ice over TMJ 15 minutes 3-5 times a day for 3-5 days, 2-3x a day for additional 3 days
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

In 1 week if still sore fabricate temporary upper Anterior Stop
Can add Cold Laser 350 hz both joints: 30 seconds open, 30 seconds closed
If still sore in 1 week will need TMJ imaging: CBCT and MRI

MLS Cold Laser
BioResearch

Temporary Anterior Stop
ArrowPath Sleep

Ms MY

6 Common TMDs

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

6 Common TMDs

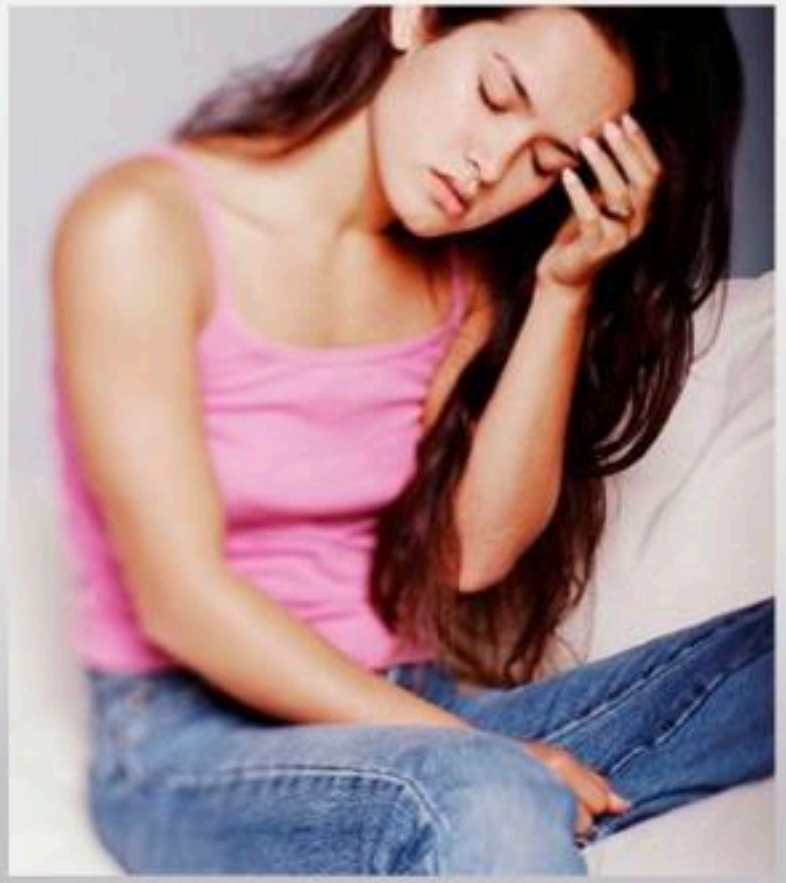
Parafunctional Clenching
Parafunctional Grinding
Occlusal Muscle Dysfunction
Osteoarthritis
Acute Sprain
Acute Closed lock of TMJ disc

5 Common Obstacles

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

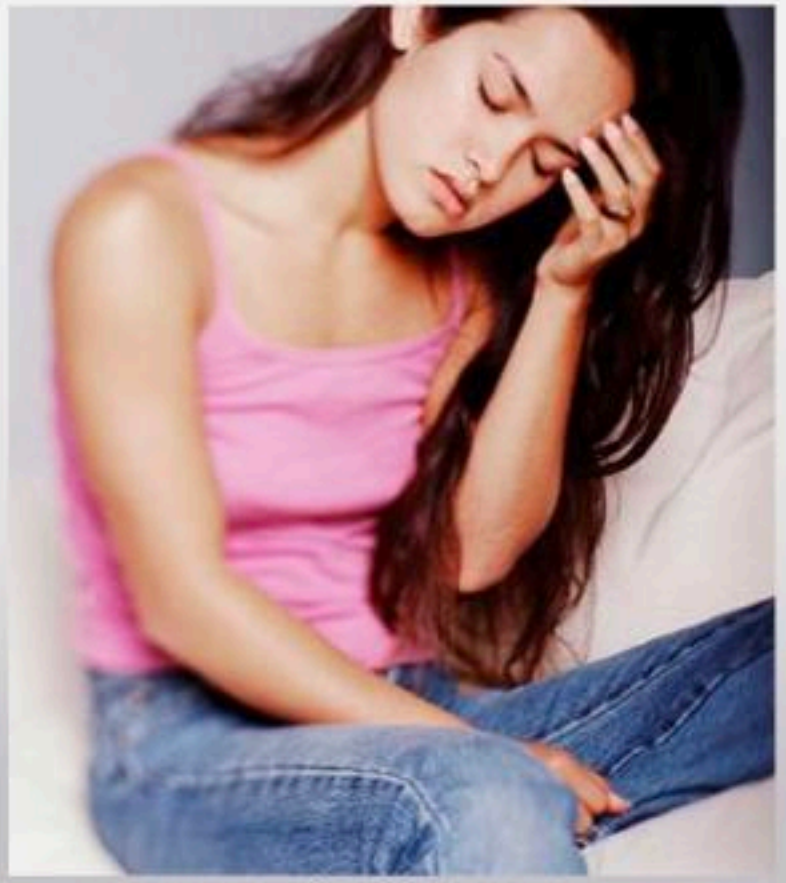
1 TMD that **usually** does not need therapy

TMJ Clicking



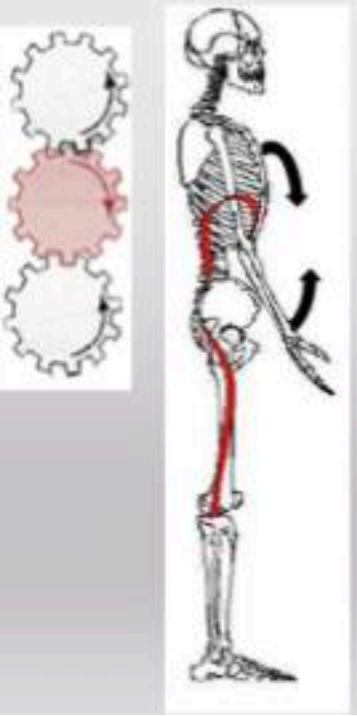
5 Common Obstacles

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



Neck and Postural Instability

This is a **dynamic** orthopedic System



A change in any one area will affect the others

CNS/PNS

Skull

TMJ

Teeth

Mandible

Neck

Teeth

Muscle Neck

Muscle TMJ

venn diagram

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

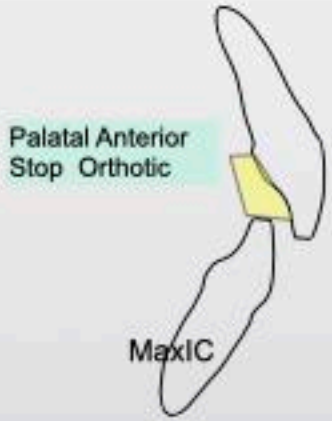
TM Joint subluxates under load
  Adapted CR "wobbles"

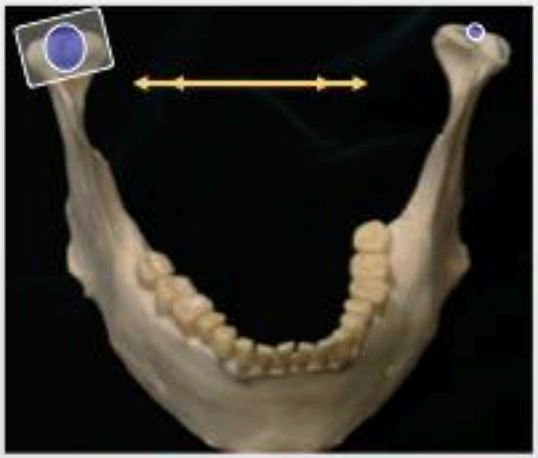
TMJ Muscle hyperactivity
  Looks similar to OMD
  Muscles must stabilize the joint
  Deep temporalis especially sore

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

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

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





Diagnostic Palatal Anterior Stop

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

Better- Decrease in Symptoms

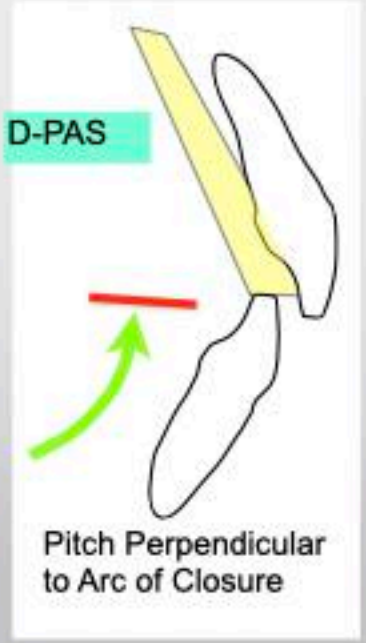
Sleep Clenching Inhibited: Wear D-PAS as night guard
Orthotic Improved Airway: D-PAS as night guard
Occlusal Muscle Disharmony: Occlusal Adjust

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

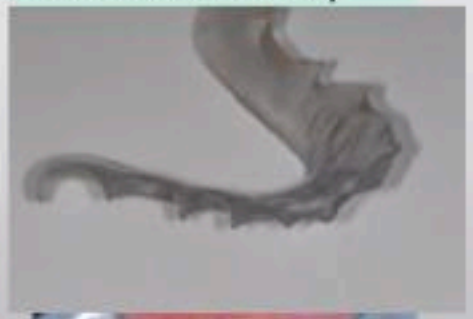
APS
ArrowPath Sleep

LIVING TREE
DENTAL LAB

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

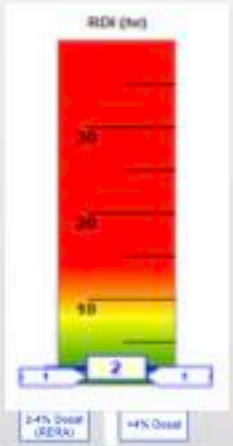
ArrowPath Sleep
Trial Anterior Stop Night Guard

Age 16F
cc: Facial Pain, Excessive Daytime Fatigue

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

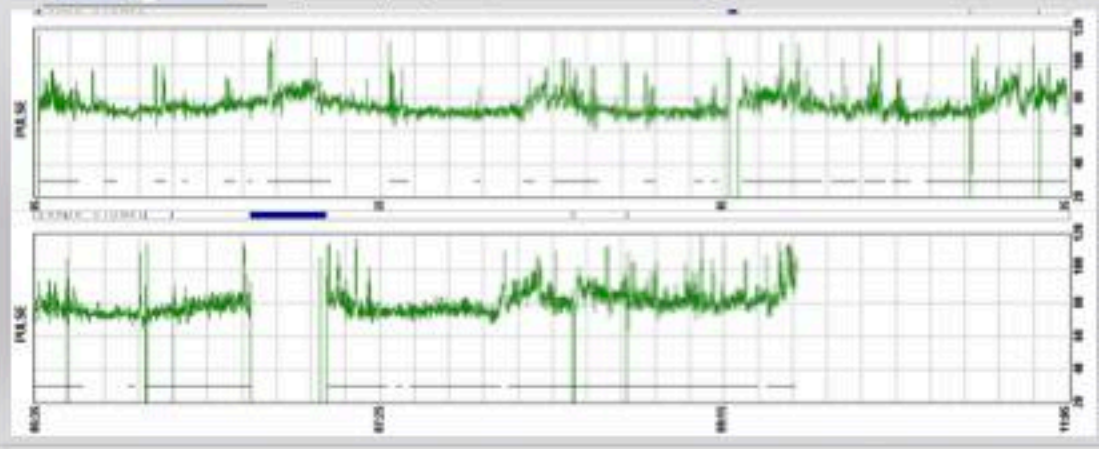
Sleep Latency Test
Dx: Narcolepsy
Recommend daytime medication

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



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

Heart Rate
>90 bpm
for 35 min



Disordered Breathing Disease Progression

Disease Stage 1

Predisposing Factors

Small Airway

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

Disease Stage 2

Compensation:
Airway Maintained

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

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

Disease Stage 3

Sleep
Airway Partial Collapse

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

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

Disease Stage 4

Sleep
Airway Full collapse

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

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

John R. Droter DDS

Disordered Breathing Disease Stage 4

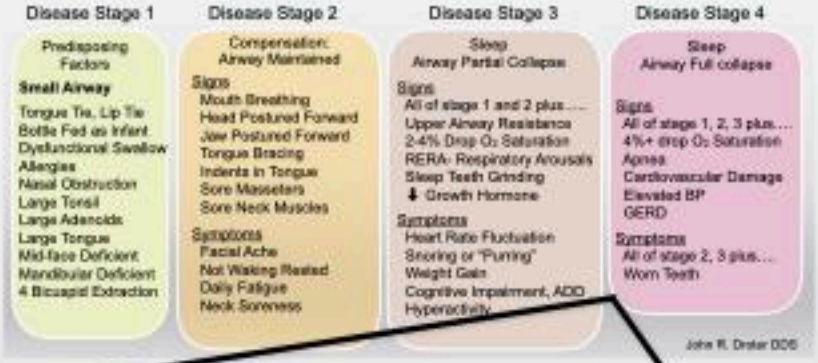
OSA- Obstructive Sleep Apnea

AHI- Apnea Hypopnea Index

Apnea and Hypopnea events per hour

Apnea- Stop airflow for 10 seconds

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



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

Signs

Apnea

4% drop O_2 Saturation

Cardiovascular Damage

Elevated BP

GERD

Symptoms

Not Waking Rested, Daily Fatigue

Cognitive Impairment

Irreversible Damage

John R. Droter DDS

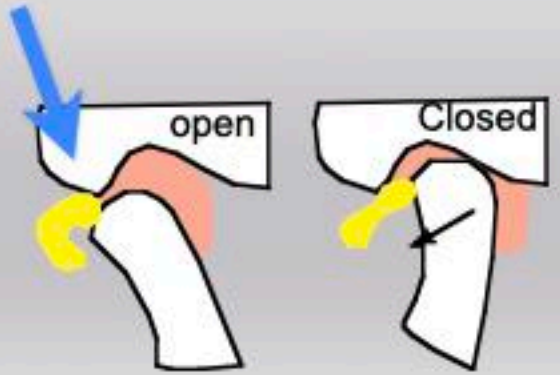
When the clicking stops (4a to 4b):

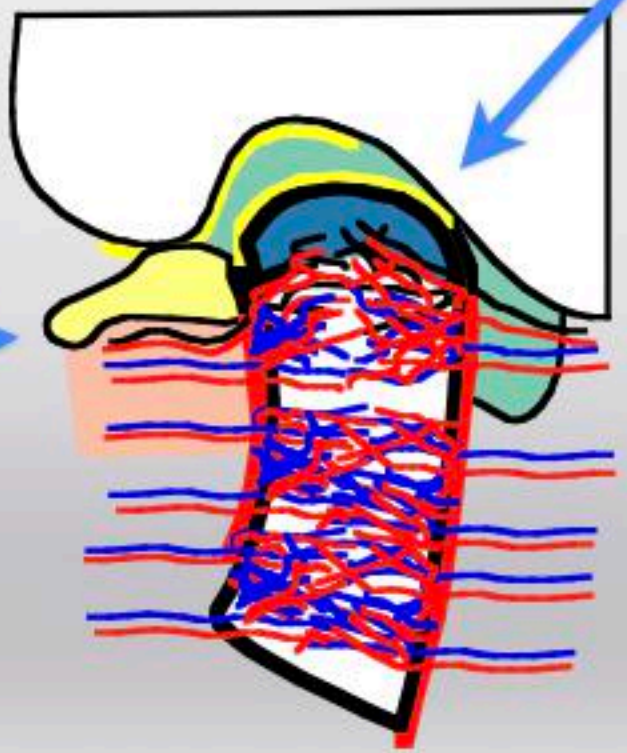
Condyle Distalized

Venous return compromised

Compromised Condylar Perfusion
Blood flow through condyle is decreased

Disc Anterior





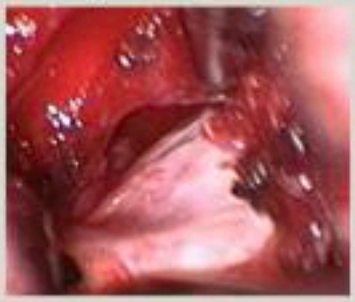
3 Outcomes of Compromised Condylar Perfusion

Bone cells die

Avascular Necrosis

One and Done

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



or

Nothing

Compromised but adequate.
99% patients have no problems

Inflammatory Tissue Bone Resorption

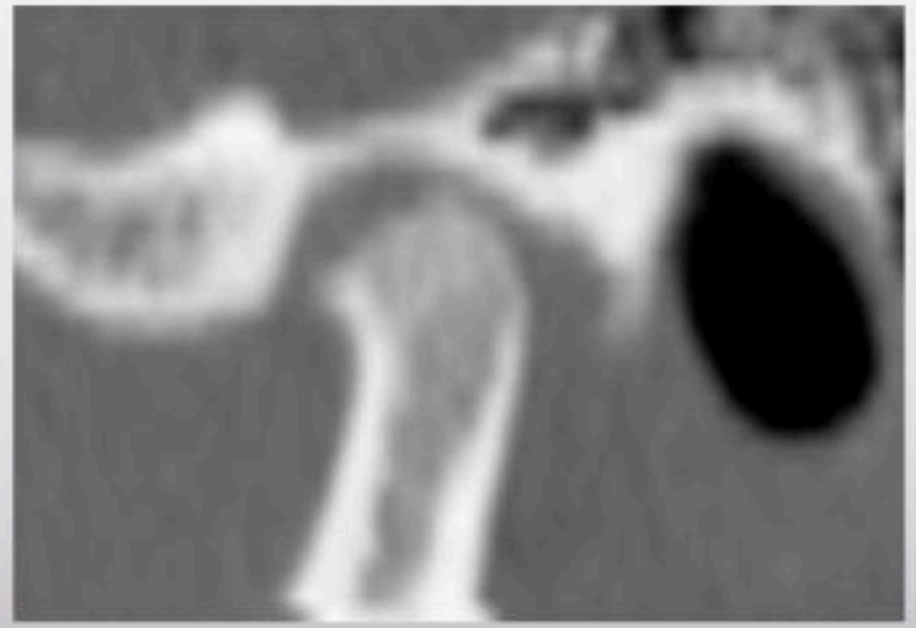
Cortex Collapses, Cartilage tears
Inflamed tissue contacting bone
Inflammatory cells activate Osteoclasts

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

Hypoxia Induced Progressive Condylar Resorption
HI-PCR

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

Occlusion will constantly be changing

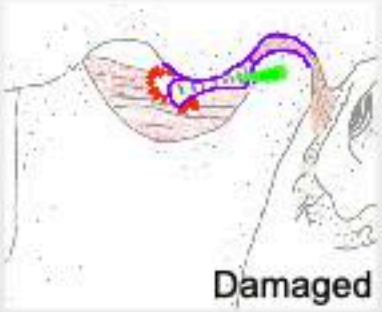


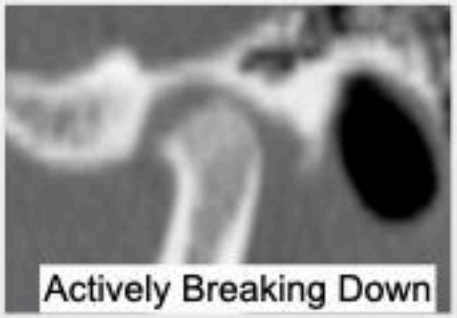
Basic Orthopedics

Joints are either
- Healthy or
- Damaged

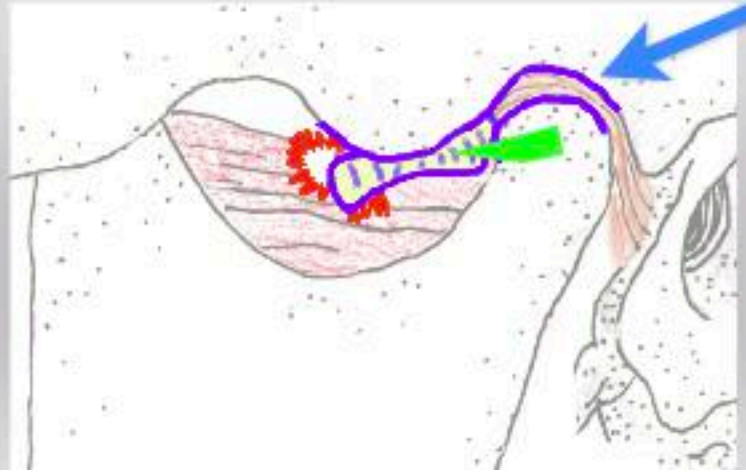
If damaged, joints will be either:
- Actively Breaking Down
- Adapting
- Adapted
  - Structurally, Mechanically
  - Favorably, Unfavorably


Healthy


Damaged


Actively Breaking Down

Majority of damaged TMJs adapt favorably



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

Pseudo-disc

Tissue Fibrosis

Adult Onset Anterior Open Bite Differential Diagnosis

Developed Post-Puberty

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

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

Both have loss of anterior coupling

Anterior Openbite with Active TMJ Bone Loss

Non Surgical Therapies

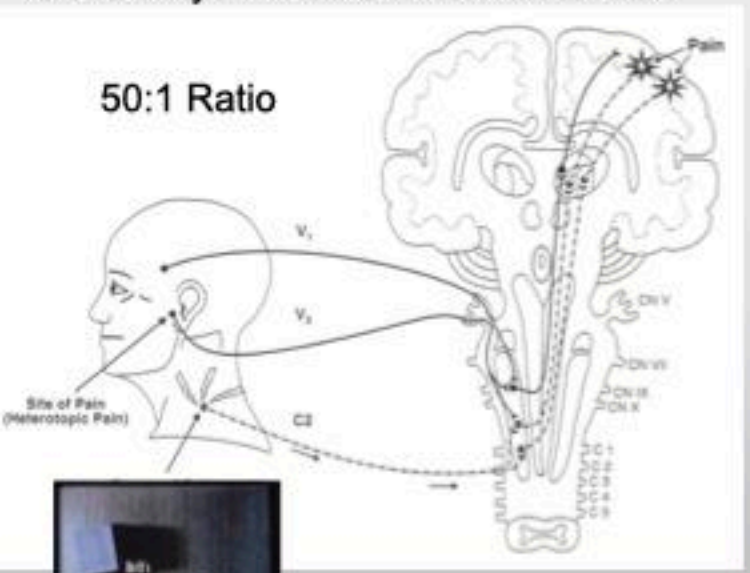
Condylar Distraction
Anti Inflammatory Medications

Referred Pain

Convergence

More primary sensory neurons than secondary neurons that travel to brain

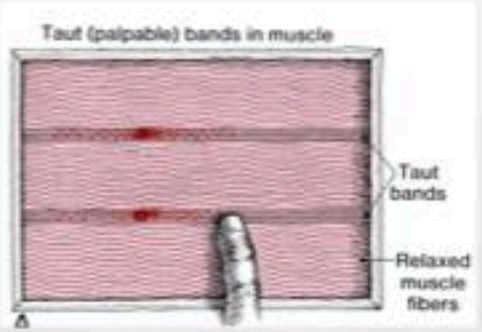
50:1 Ratio

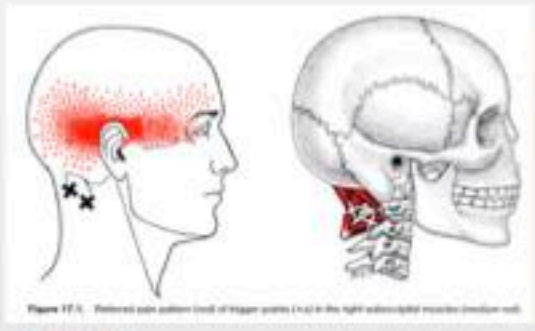


"Bells Orofacial Pain"
Jefery Okeson

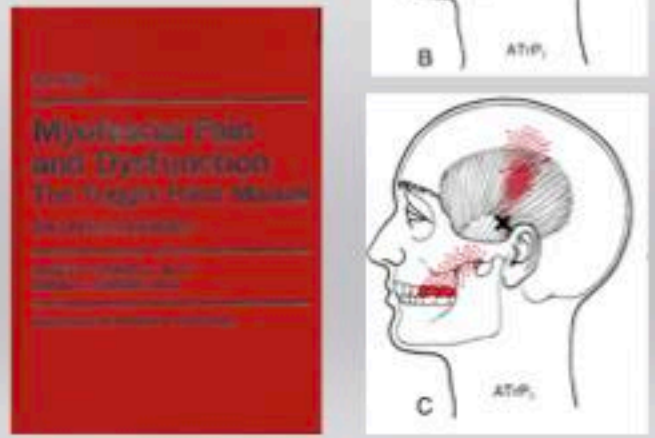
Trigger Points

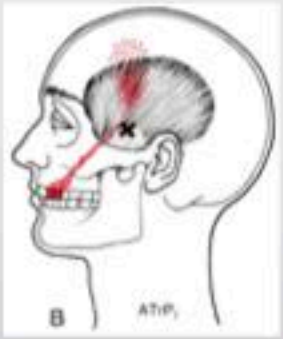
Contracted mass of actin, myosin and histamine

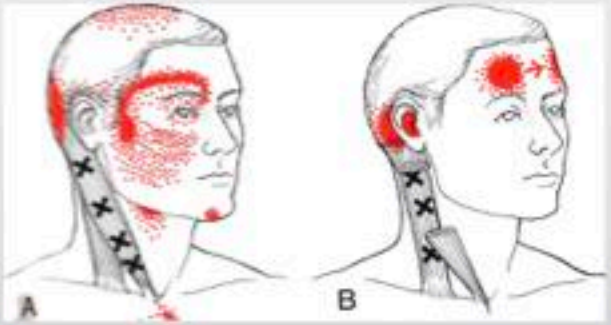


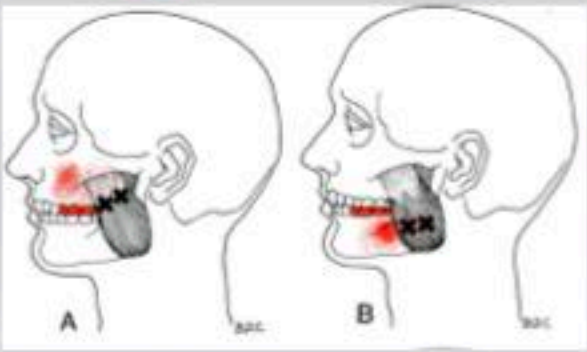


"The Trigger Point Manual"
Janet Travell, MD









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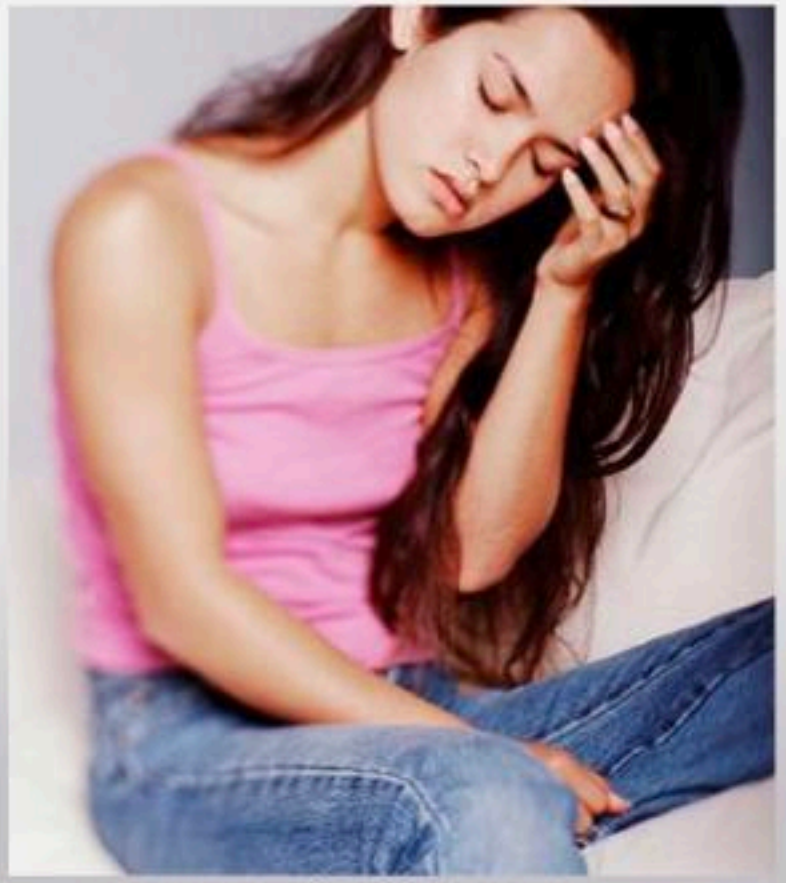
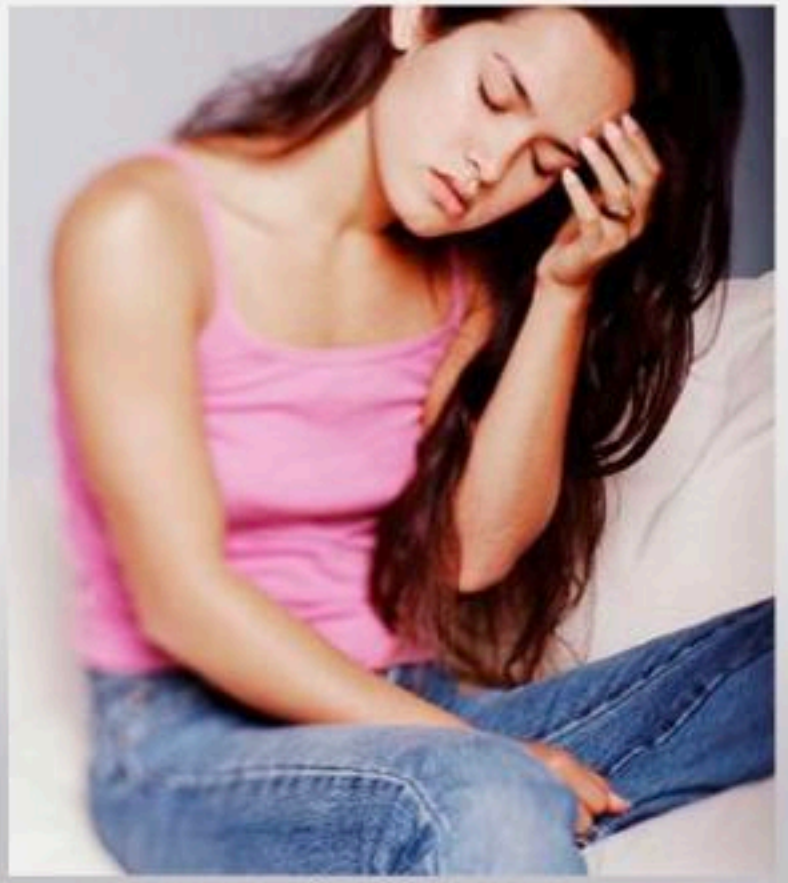
Neck and Postural Instability
Wobbly TM Joint (Subluxation)
Compromised Breathing/Airway
Avascular Necrosis
Referred Pain Muscle Triggerpoints



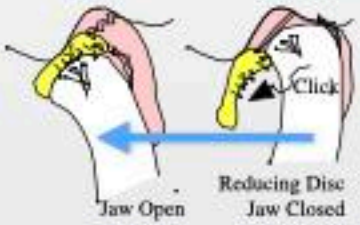
1 TMD that **usually** does not need therapy

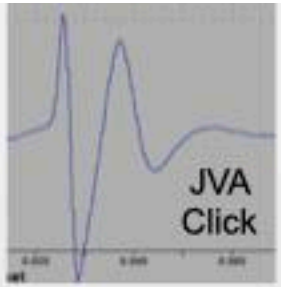
TMJ Clicking



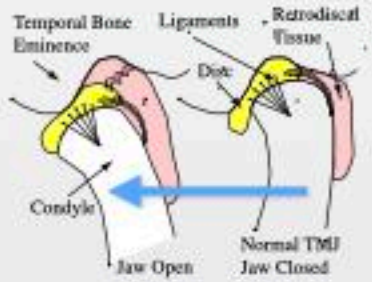
Differential Diagnosis of TMJ Clicking

Disc Reduction

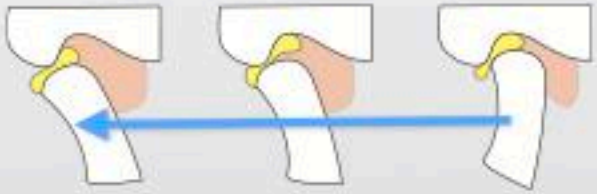




Normal

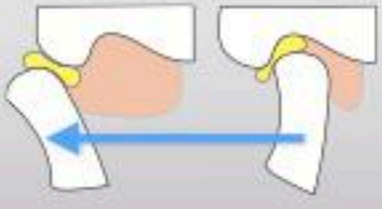


Adhesive Click



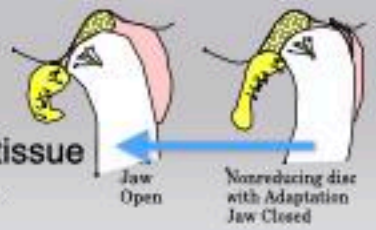
"Sticky Disc" - Disc sticks after prolonged clenching, then releases

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

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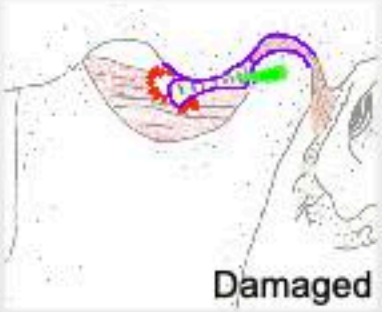
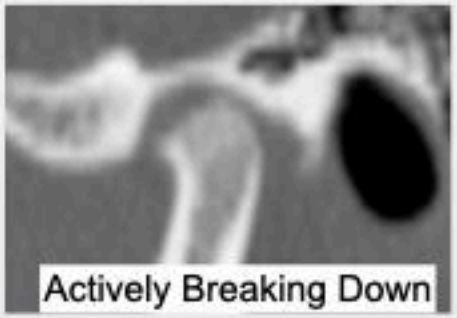
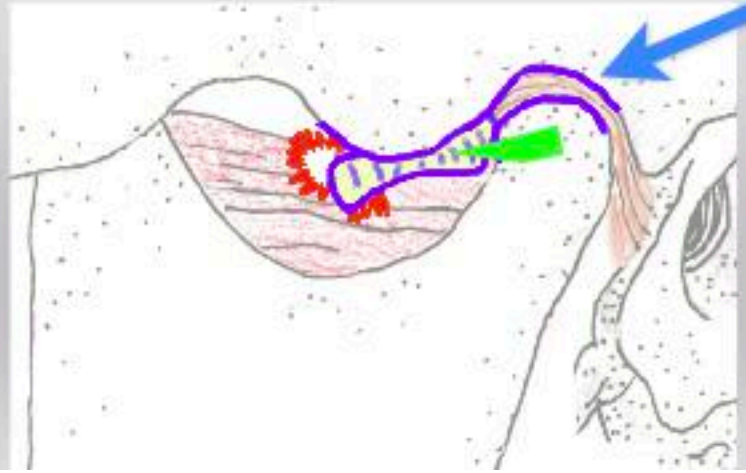

Damaged


Actively Breaking Down

Majority of damaged TMJs adapt favorably



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

Pseudo-disc

Tissue Fibrosis

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

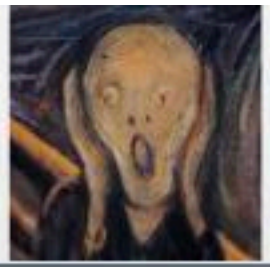
Leeuw, Boering, Stegenga, Bont,
Journal of Craniomandibular Practice, April 1995, vol. 13, No. 2

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

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

There is no love sincerer than the love of food.

G. B. Shaw



Damaged TMJs

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

→ Occlusal Muscle Dysfunction

→ Osteoarthritis

→ Avascular Necrosis

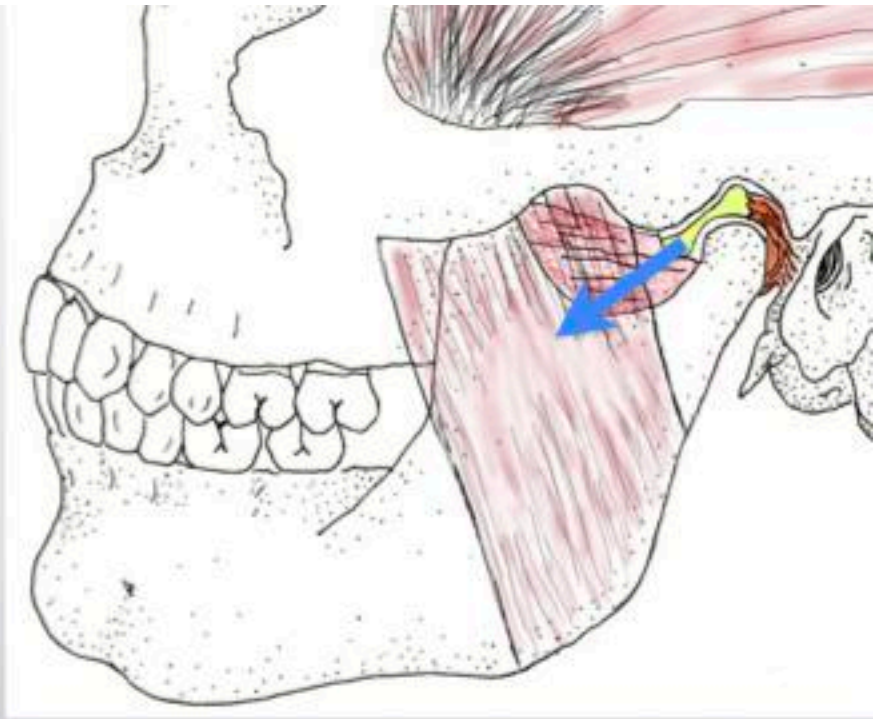
→ Progressive Condylar Resorption

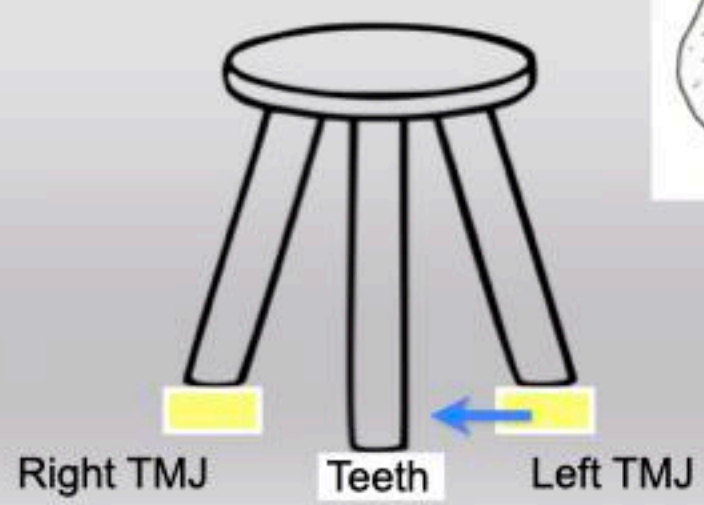
*These are my guesses on %, no research to back up to backup

Normal Joint with Normal Occlusion

All teeth touch evenly with condyles seated in fossa

What happens to the occlusion if the disc is dislocated?





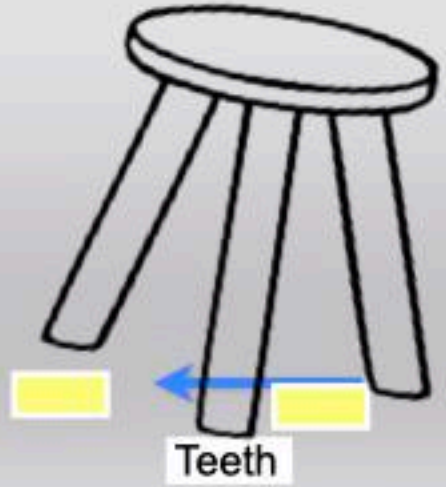
Damaged Joint with Malocclusion

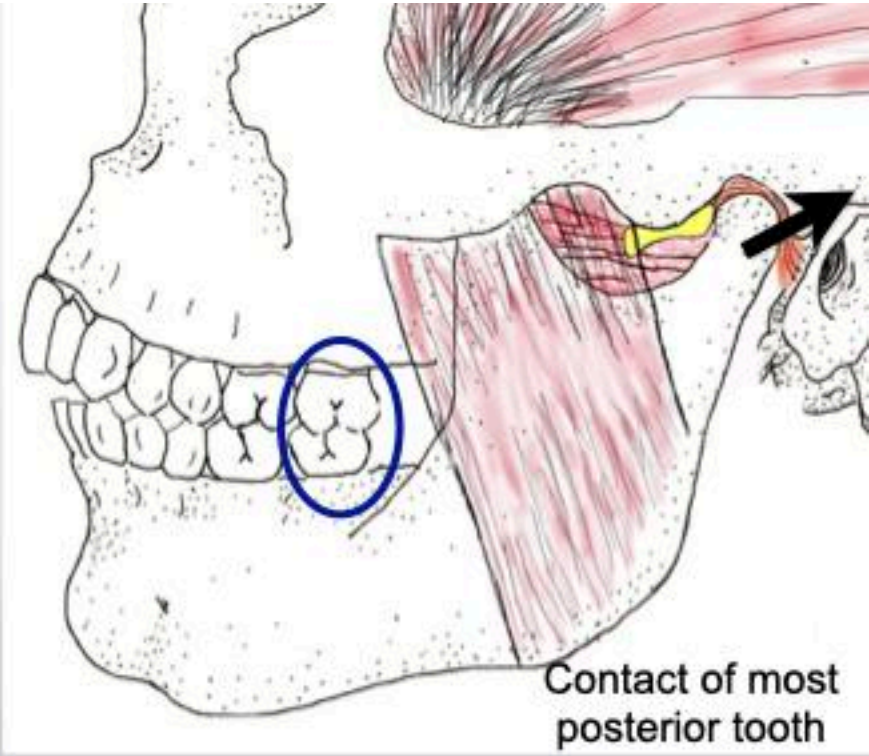
85% damaged joints adapt favorably with respect to the TMJ.

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

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

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





Occlusal Muscle Disharmony

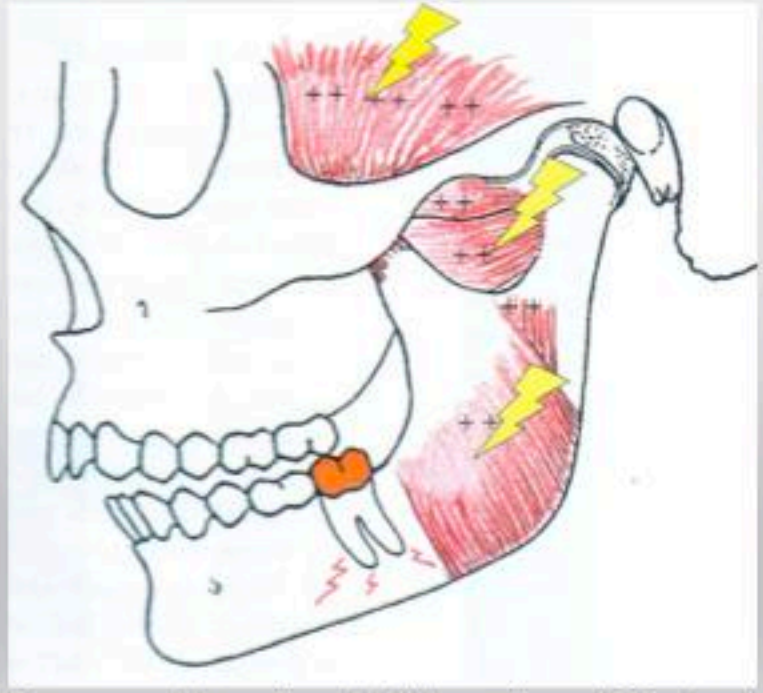
Uneven tooth contact with condyles fully seated triggers muscle activity

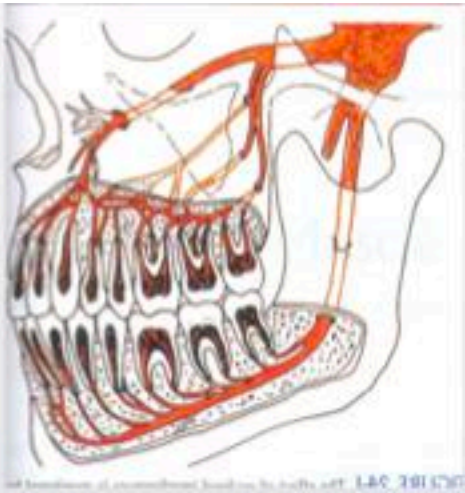
Lateral pterygoid fires out of sequence to create even tooth contact on closure

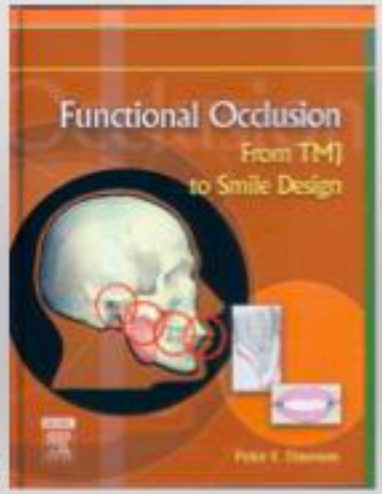
Disharmony in all muscles: Splinting/Bracing

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

Why LD Never wrote a text book

Slide by Dr John R Droter

Treat Occlusal Muscle Dysfunction- Adjust the Occlusion

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

Before

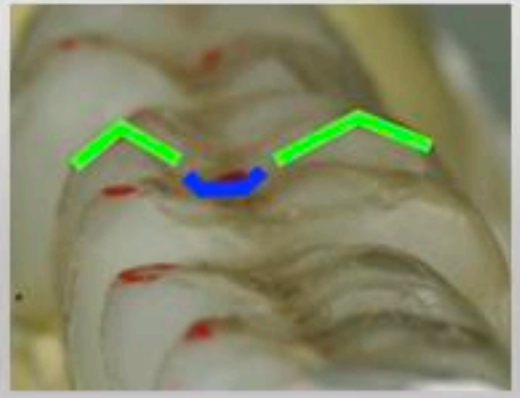
After

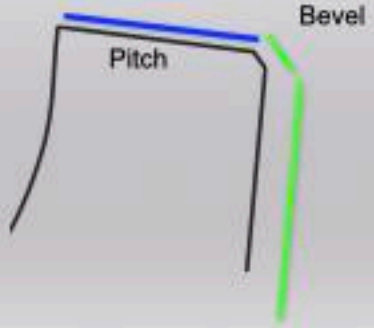
Occlusal Sculpting Tools, including Zirconia

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

Move and Shape Cusps, Inclines, Facial Surfaces

Brassler Brio Shine
FLBCER-1
FLBF-2





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

6 Common TMDs

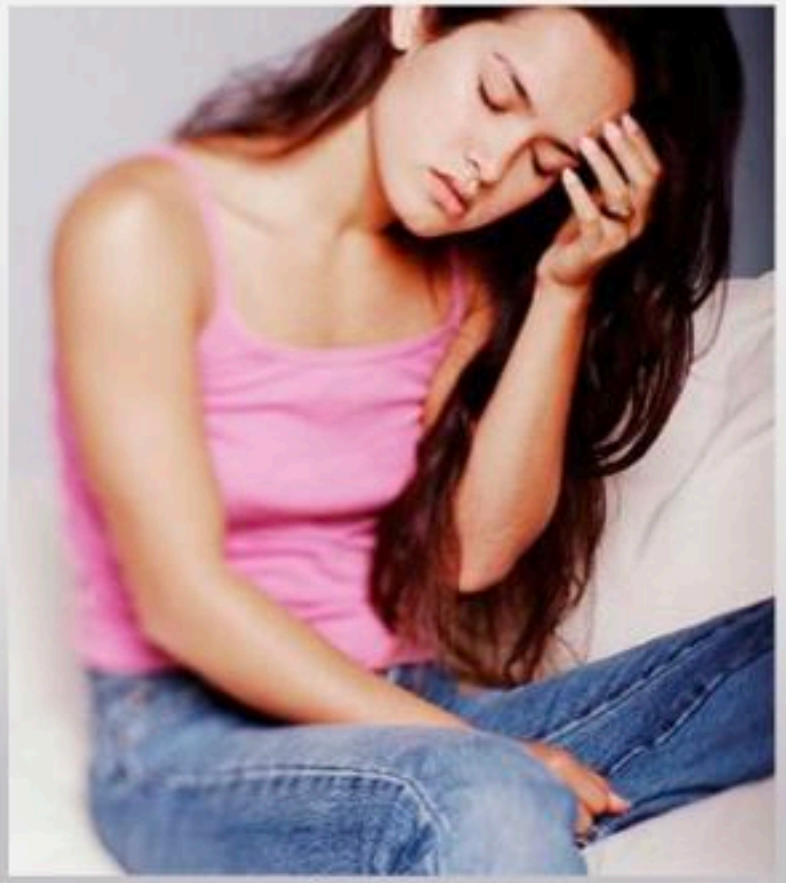
Parafunctional Clenching
Parafunctional Grinding
Occlusal Muscle Dysfunction
Osteoarthritis
Acute Sprain
Acute Closed lock of TMJ disc

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



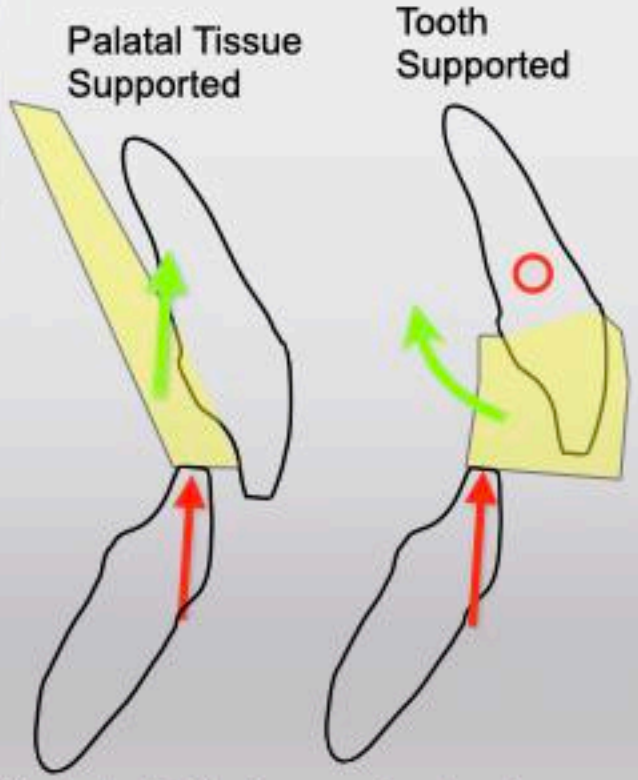
Anterior Stops

John R Droter DDS
Annapolis, Maryland

Anterior Stop Force Distribution: D-PAS vs NTI

D-PAS
Diagnostic Palatal
Anterior Stop

Must be relined



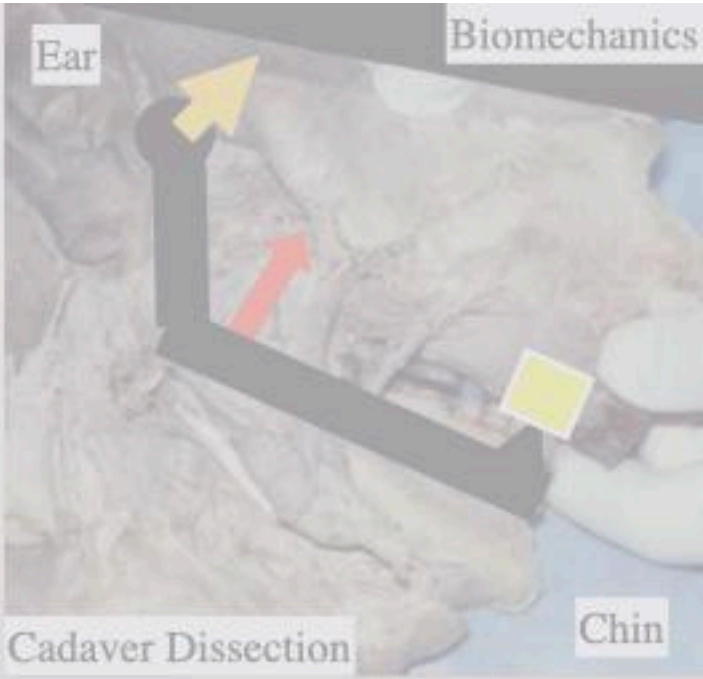
NTI-tss Splint
Nociceptive Trigeminal Inhibition
Tension Suppression System

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

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

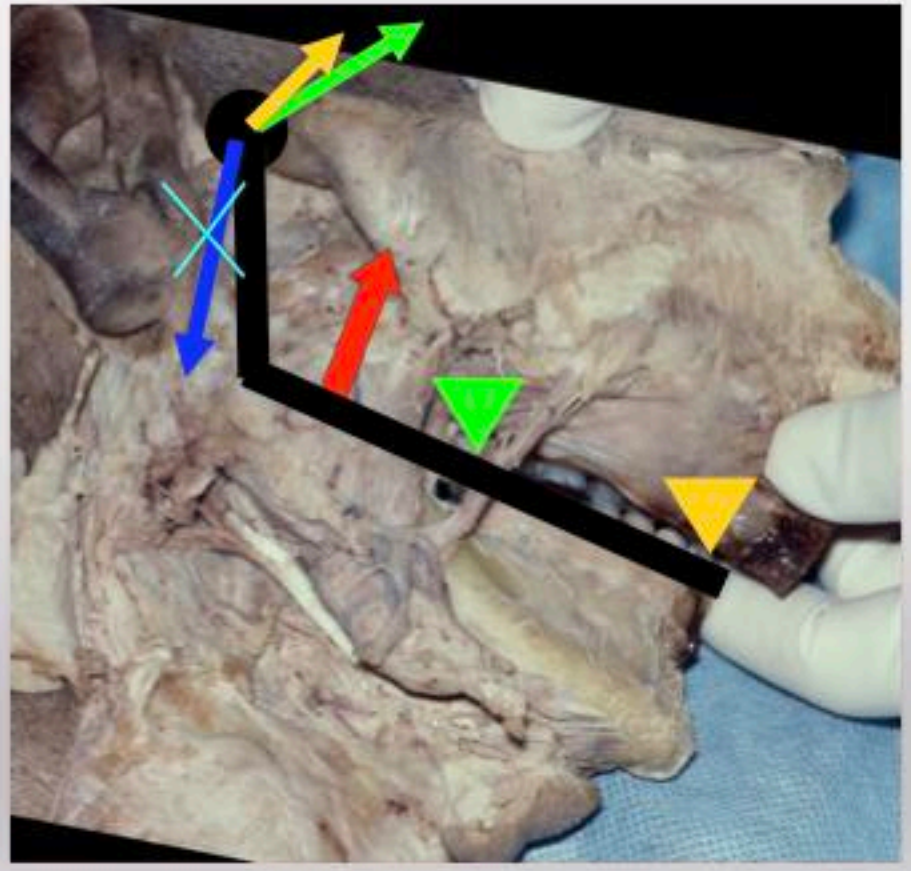
1. Allows Maxilla, Mandible, and Temporal bones to align.
2. Major decrease in muscle contraction force, most patients.
3. Breaks muscle engram avoidance and bracing patterns.



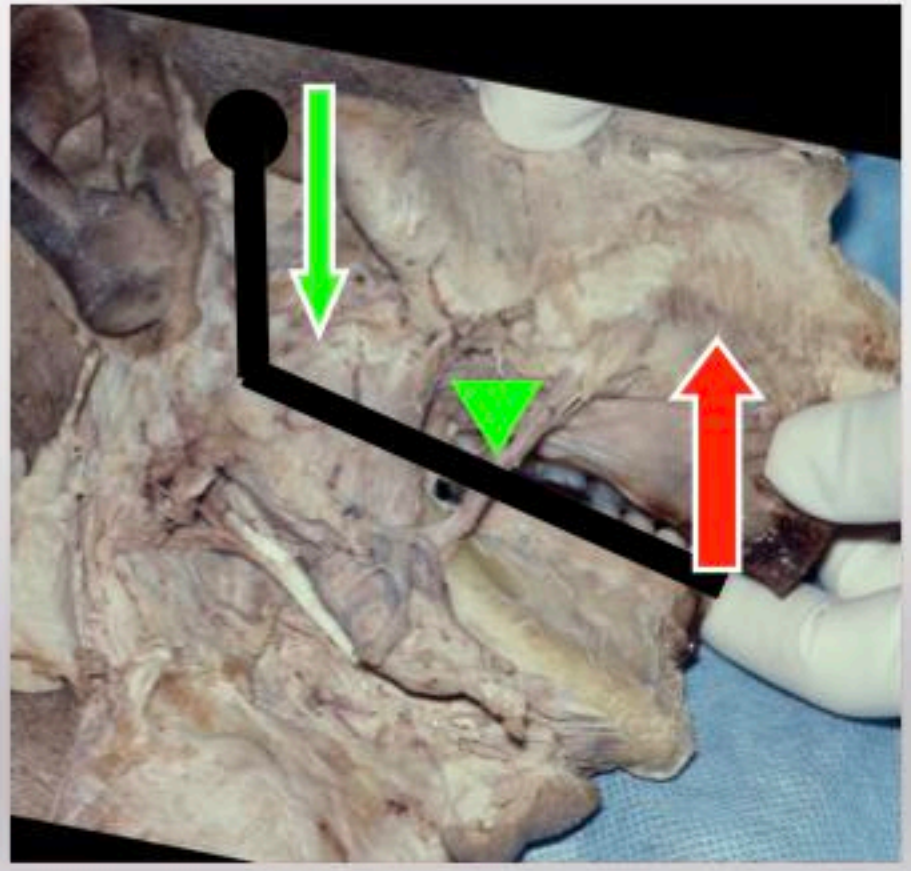
	µV	µV
TA-R	100.6	15.7
TA-L	108.9	25.3
MM-R	115.4	25.5
MM-L	70.5	6.8

Major decrease in muscle power with D-PAS

Can a Bilateral Pivot distract a condyle downward?



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



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3. Breaks muscle motor engram avoidance and bracing patterns.

Mikaela Shiffrin
World Championships 2021

Jaw and Neck

Motor Engrams: Muscle Contracture Patterns

- Functional (to varying degrees)
- Protective: Pain Avoidance
- Protective: Bracing Stabilization of Joint

Monfils, M. H. In Search of the Motor Engram: Motor Map Plasticity as a Mechanism for Encoding Motor Experience. The Neuroscientist 2005

Lerman MD. The muscle engram: the reflex that limits conventional occlusal treatment. Cranio. 2011

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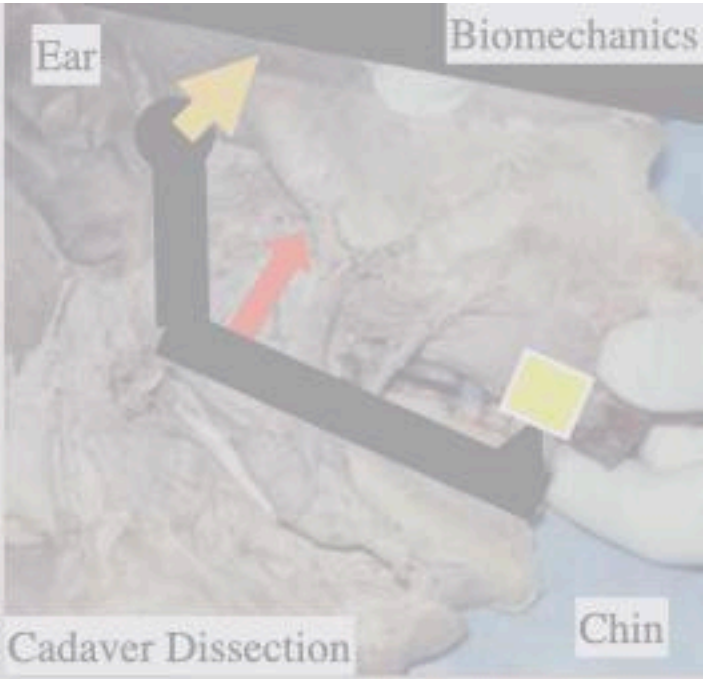

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Major decrease in muscle power with D-PAS

Anterior Stop Orthotics

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

APS Airway Bite Anterior Stop 4mm

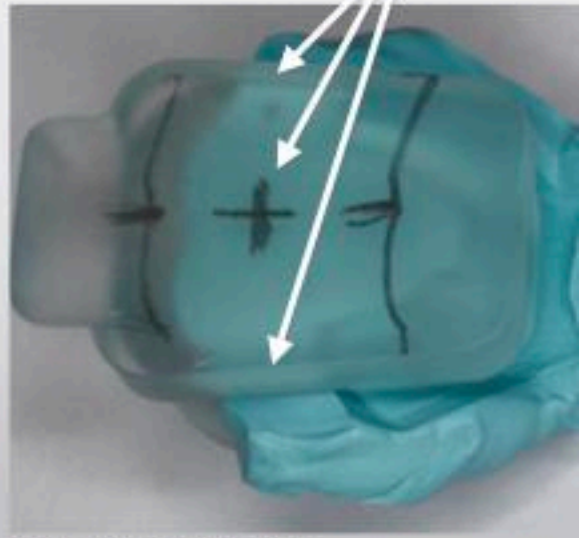
George Gauge

Airway Metrics

ArrowPath Sleep Airway Bite

Mark furthest forward and back jaw position and midline with sterile disposable pencil

Place bonding agent



Measure and mark the amount of protrusive you want to build into the Mandibular Advancement Device

50% is typically a good place to start

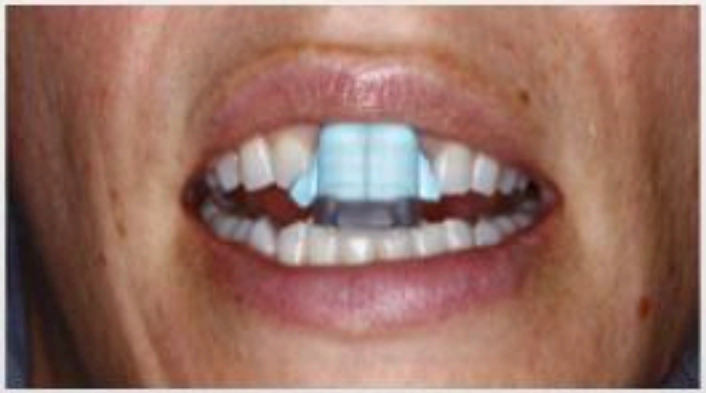
ArrowPath Sleep Airway Bite

Move jaw into position, verify with tap tap, then flow flowable composite in front of lower incisors, cure.

At edge of anterior stop flow some composite behind teeth and cure.

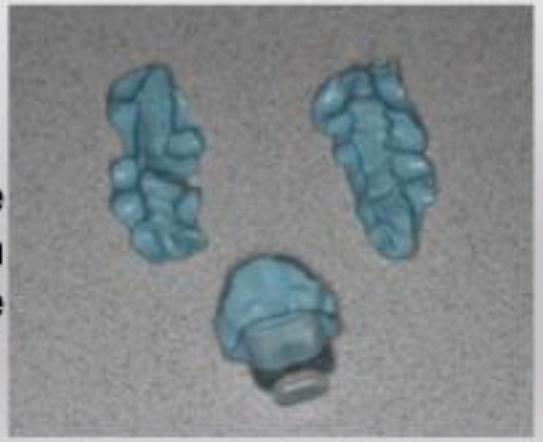
Jaw is now held stable in forward position.

ArrowPath Sleep Airway Bite

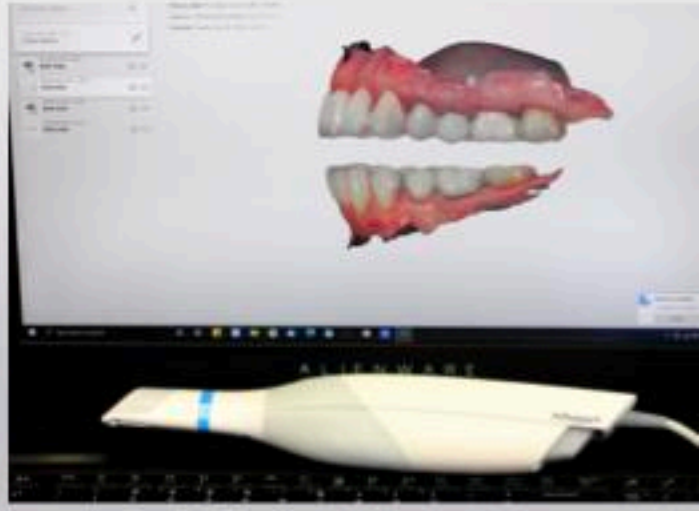


Jaw is held stable in forward position.

Silicone bite registration of airway bite



or take digital scan with anterior stop in place and jaw positioned forward



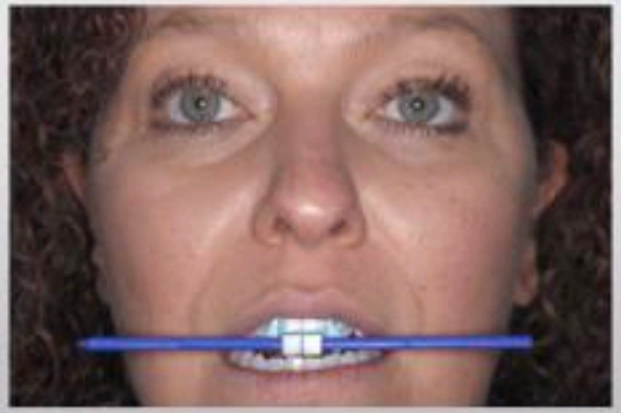
APS
ArrowPath Sleep

LIVING TREE
DENTAL LAB

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

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

Facial Analyzer



Airway bite

Anterior Stop Orthotics

Diagnostic Test

Patient Awareness

Disease Management

Bite Recording Tool

*** Verify muscle inhibition with anterior only contact before sending home

APS Home Trial Anterior Stop

Modified Quick Splint

Temporary Anterior Stop Test

This is a diagnostic test, not treatment

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

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

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

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

Diagnostic Palatal Anterior Stop

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

Better- Decrease in Symptoms

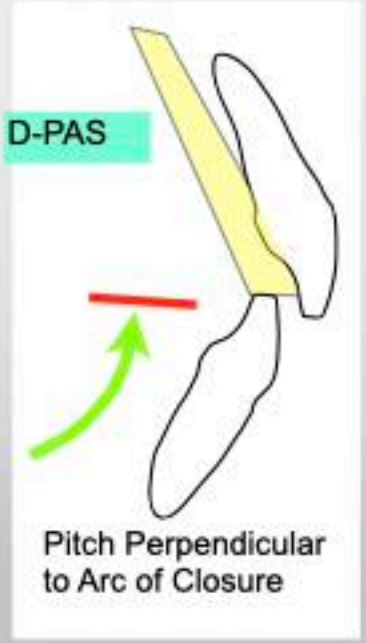
Sleep Clenching Inhibited: Wear D-PAS as night guard
Orthotic Improved Airway: D-PAS as night guard
Occlusal Muscle Disharmony: Occlusal Adjust

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

Lingual Light Wire Arch Expansion LLW

John R Droter DDS
Annapolis, Maryland

Lingual Light Wire Orthopedics
LLW

Age 25 female Pre LLW Orthopedics

Age 26 Post LLW Orthopedics

KK

Age 29

Start

Age 30

7 months LLW

Lingual Light Wire Orthopedics
LLW

Age 50 Male

Age 51

Age 29F

Anterior Openbite

4 Weeks Later

KK

KK

Age 29

Start

Age 30

7 months LLW

KK

Sectional Ortho

KK

Age 29

Age 32

KK Pre LLW

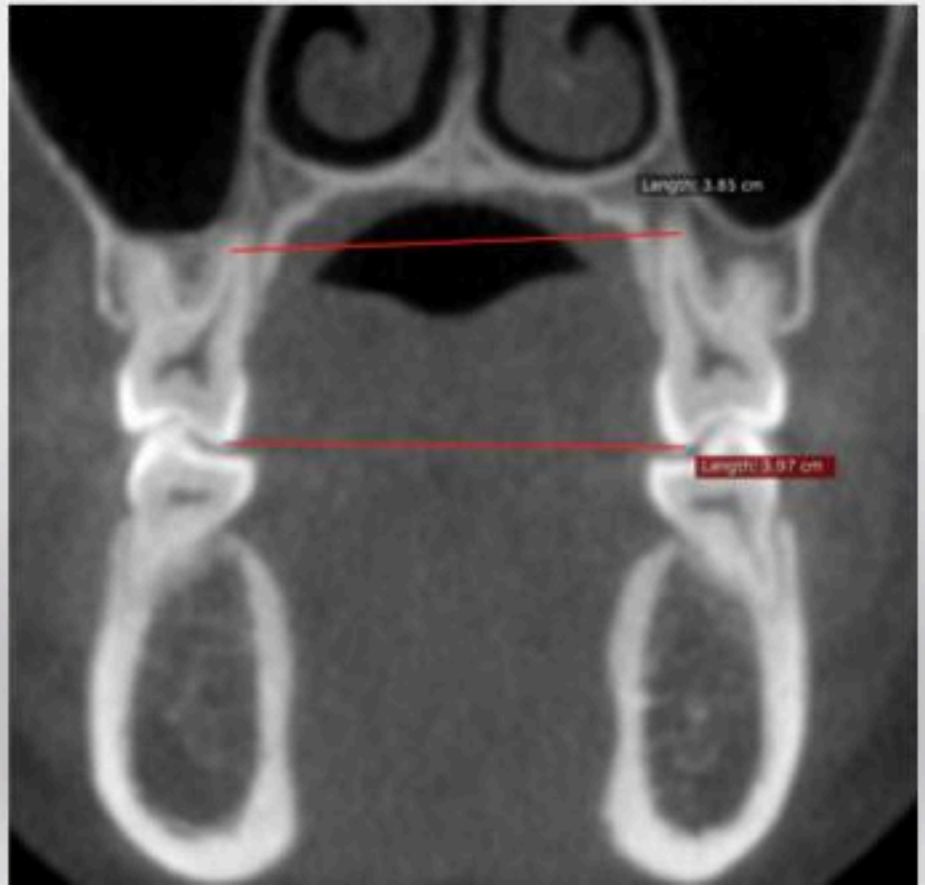
Age 29

1st Molar

Age 32 Post LLW

Increase Apex 0.5mm

Increase Coronal 1mm



KK

Pre LLW

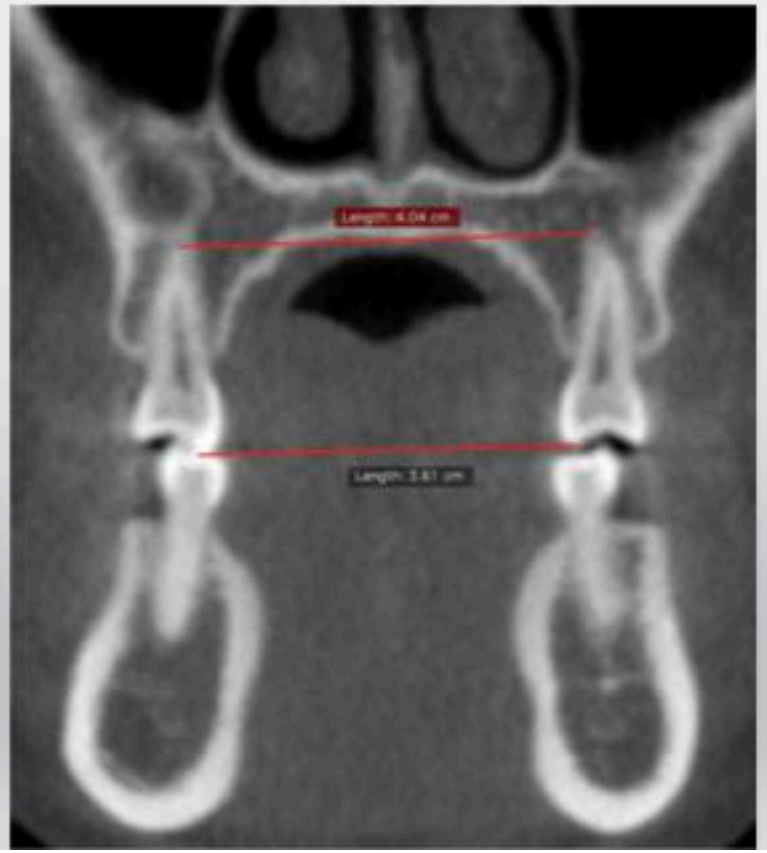
Age 29

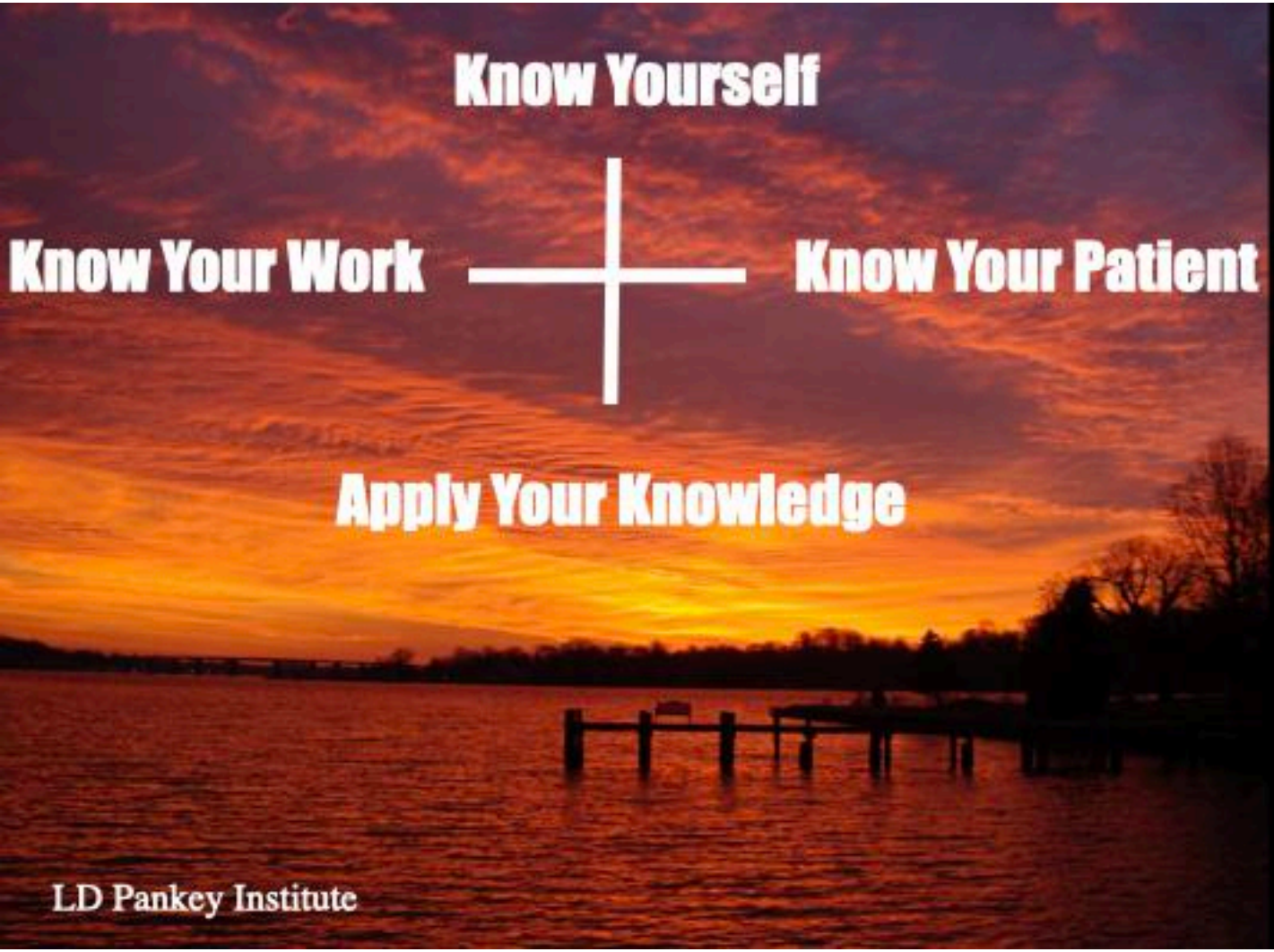
2nd Bi

Age 32 Post LLW

Increase Apex 1mm

Increase Coronal 2.3mm





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

Facial Pain Diagnosis

Diagnostic Tools

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

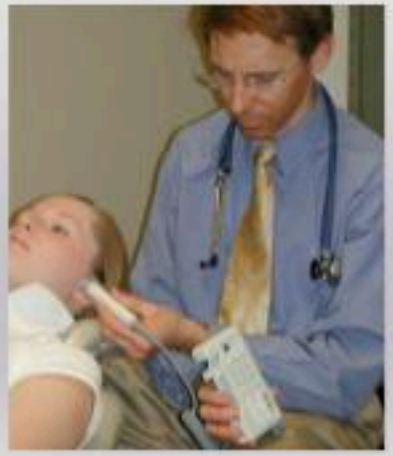
A healthy joint is quiet,
A damage joint is not.
A joint that does not move is also quiet.

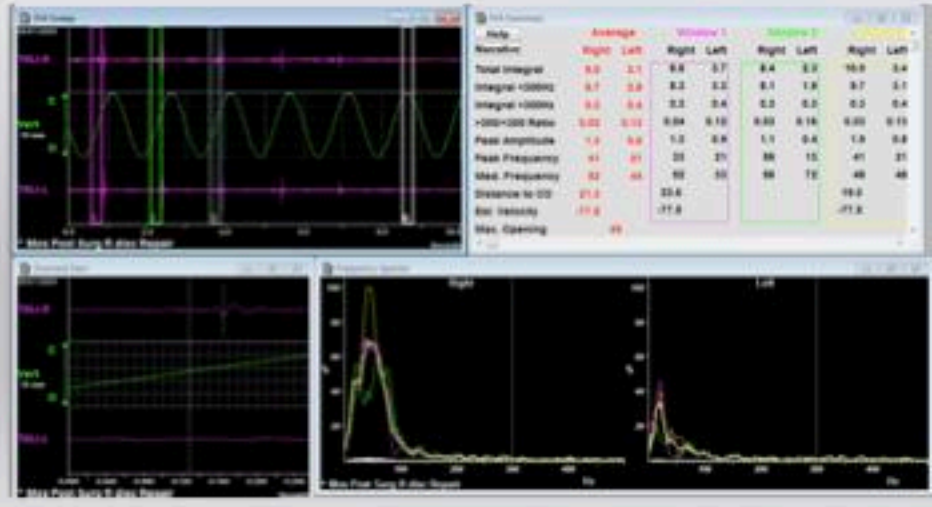
Sounds/ Vibrations

Stethoscope

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

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





Sounds/ Vibrations
Stethoscope

Use Bell side, not Diaphragm side, over the TMJ

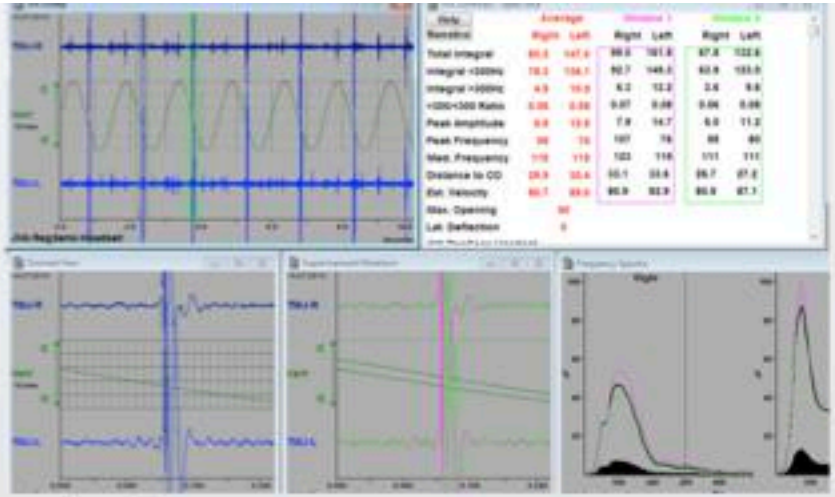
3M Littmann Classic II S.E. Stethoscope

My Subjective Description of Joint Sounds

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

Joint Vibration Analysis

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



Based on Sonar.
It is not a microphone

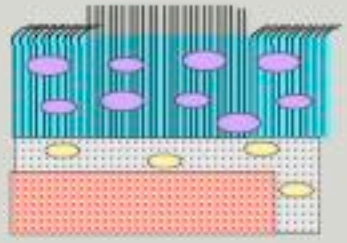
Three main types of sounds

Disc Reduction
Disc Dislocation
Adhesion crackle
tooth tap

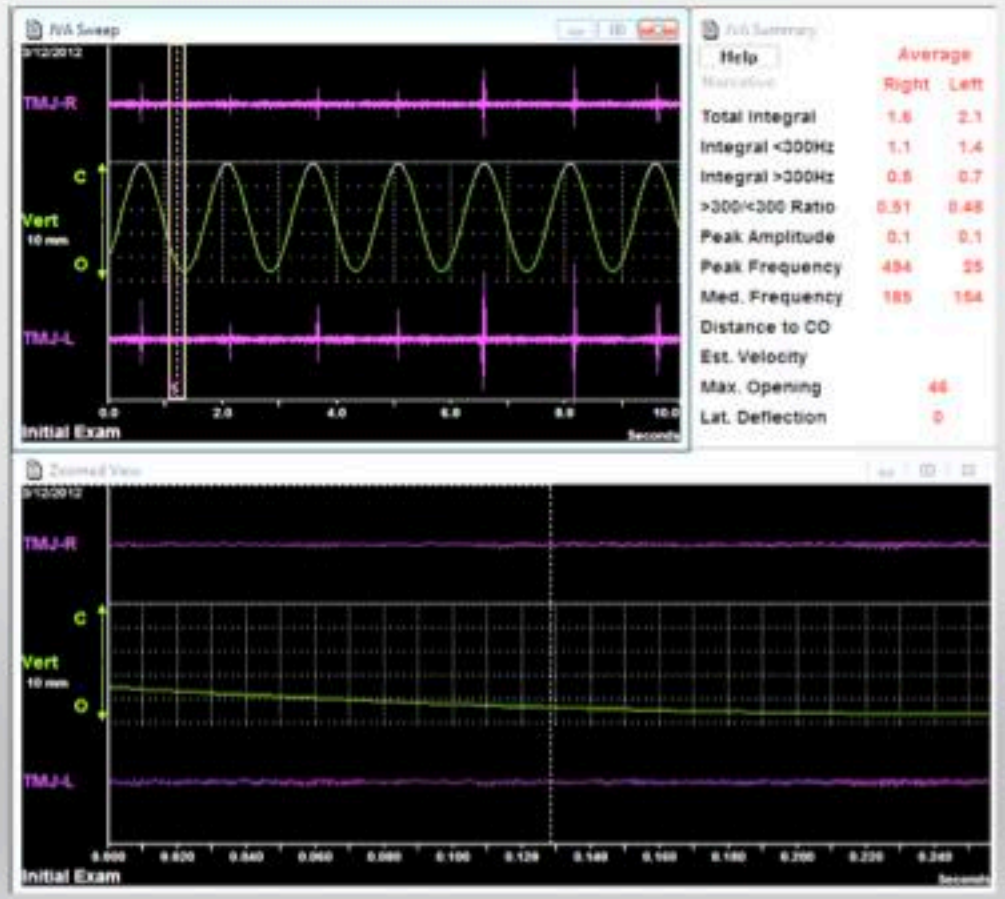
Osteoarthritis
Pseudo Disc
Damaged Cartilage

Disc Subluxation
Joint Subluxation
Disc Reduction
Disc Dislocation

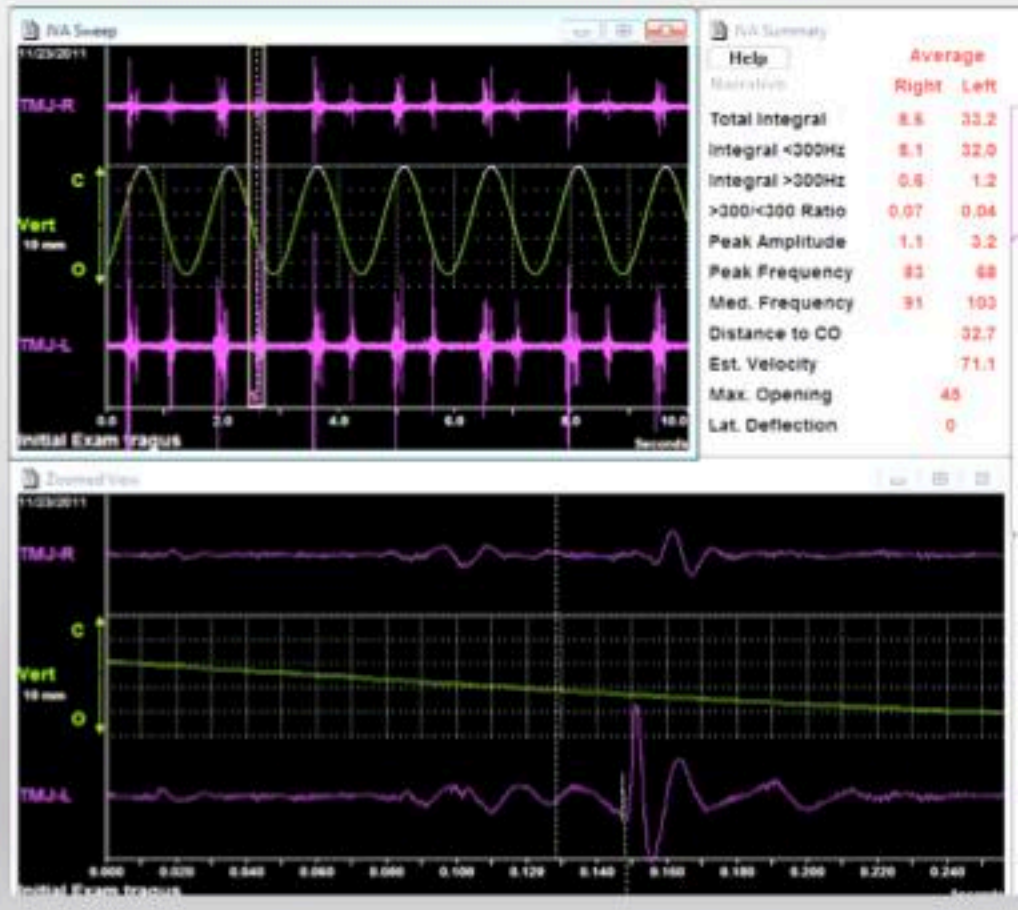
JVA measures the health of the cartilage



Healthy or Damaged?



Healthy or Damaged?



Why is Joint making this vibration?

Good Vibrations
Healthy Cartilage
No Movement

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

Click
Disc Reduction
Disc Dislocation
Adhesion Crackle
Tooth Tap
Contralateral Transference

Scratch
Cartilage Fibrillation
Cartilage against tissue
Bone against bone
Velcro Noise

Differential Diagnosis
All the choices

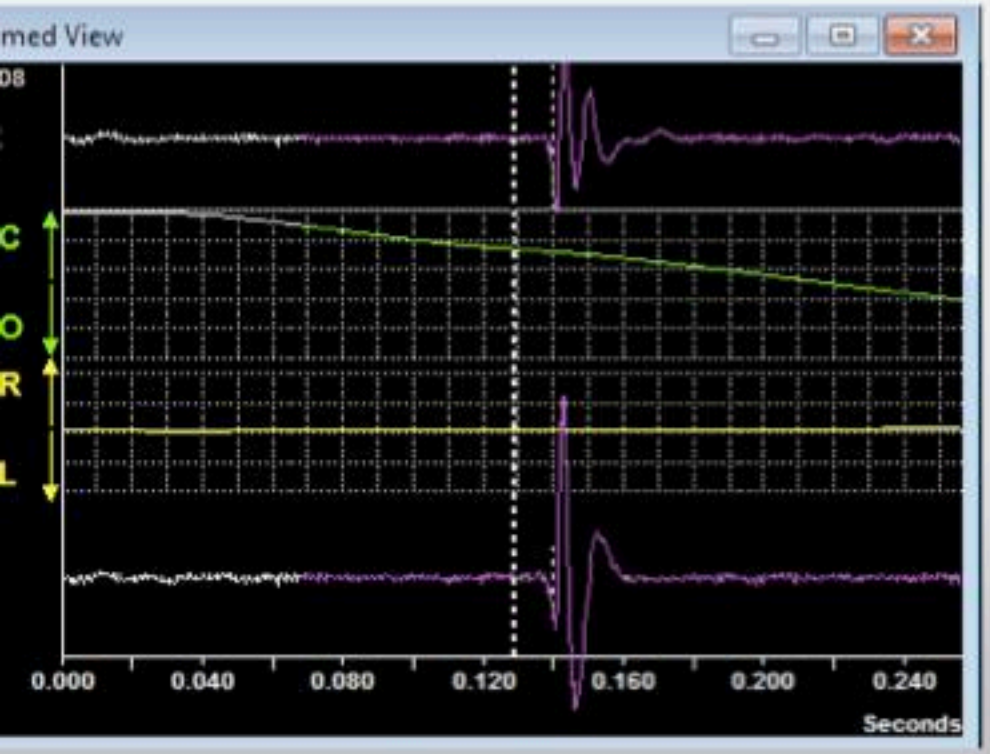
Diagnostic tests
Narrow down the choices

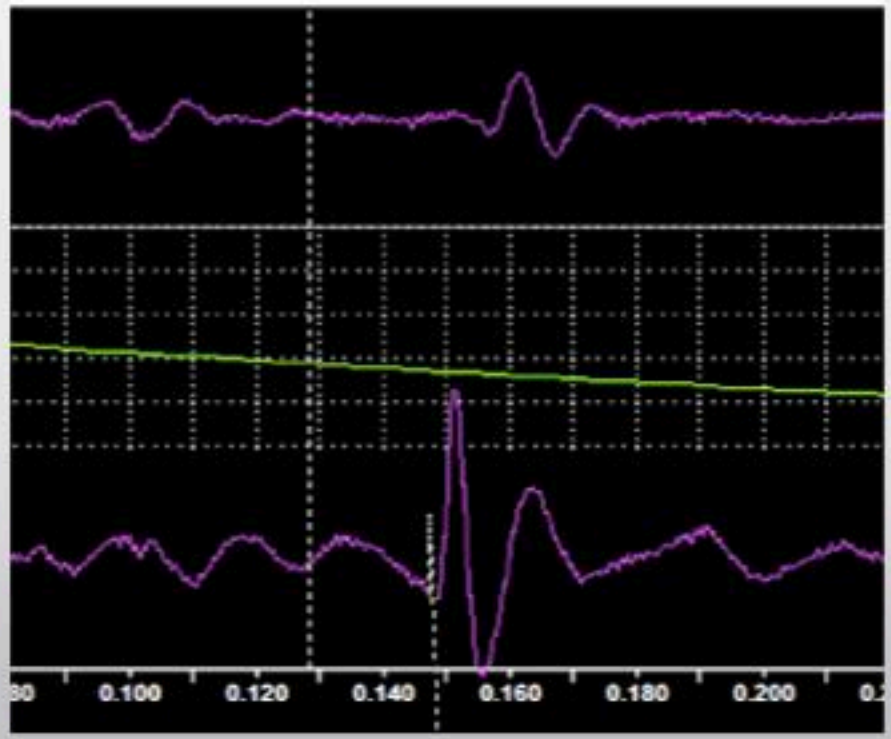
Working Diagnosis
Treating as if

Not completely resolved

Final Diagnosis
Only after problem resolved

Simple or Complex





Simple left click with transference vibration to right
L4a

Complex Click
L3a, R4b

Magnetic Resonance Imaging

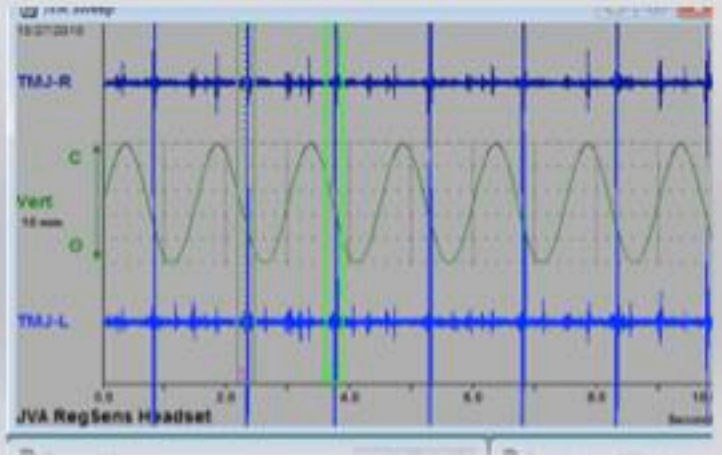
MRI gives you the start and finish
You have to infer what happened in between

Joint Vibration Analysis

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

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

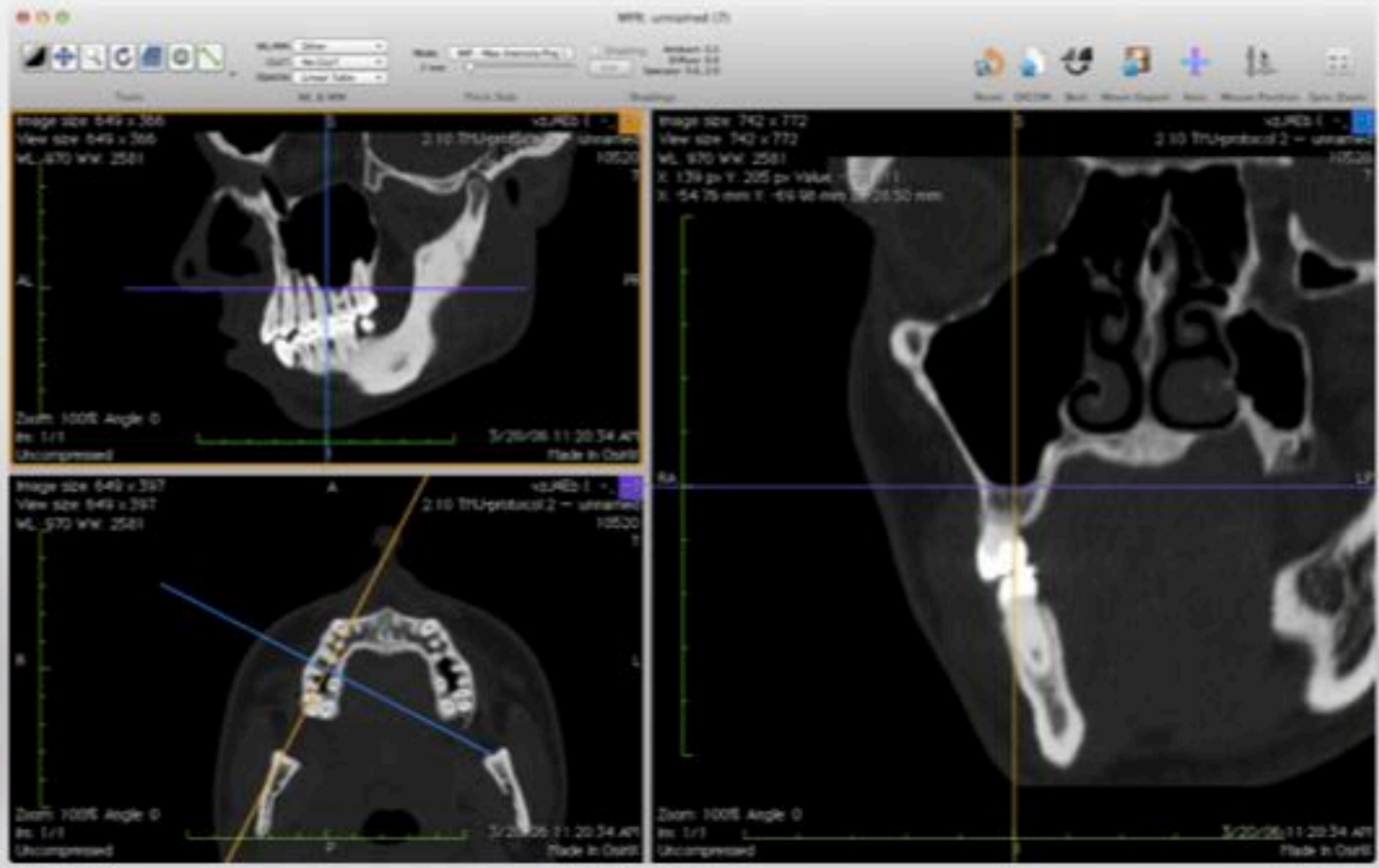
JVA allows you to view
the joint in function



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

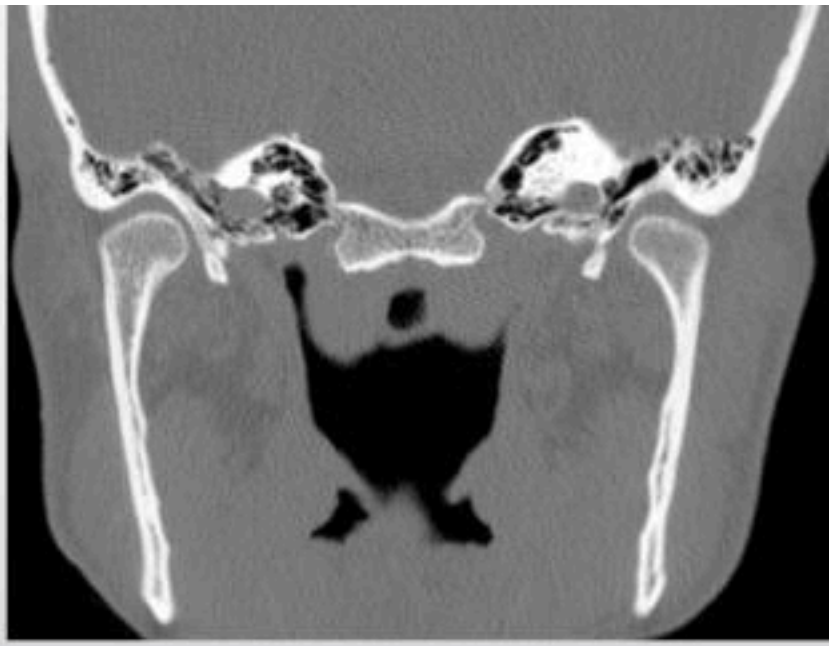
Condyle Centered in Fossa

- Coronal and Sagittal
- Room for Disc

Stable CR load Zone

- Condyle closest to fossa

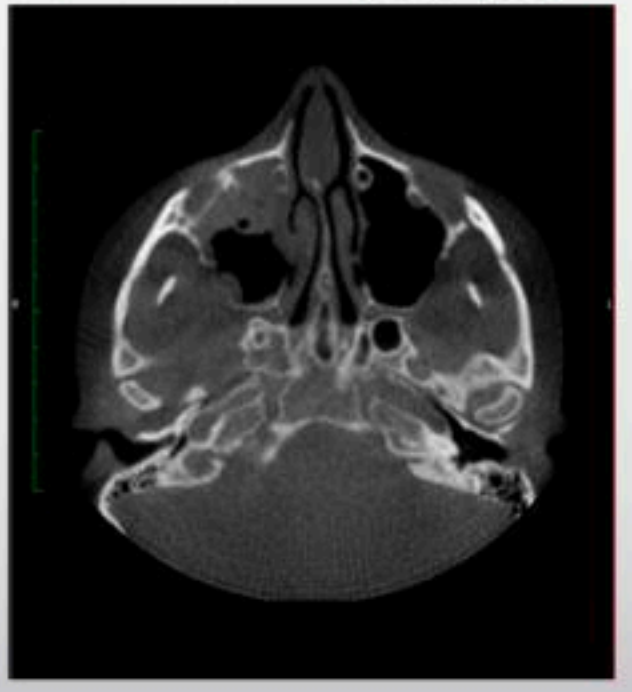
CT Scan
Coronal View



CT Scan
Sagittal View

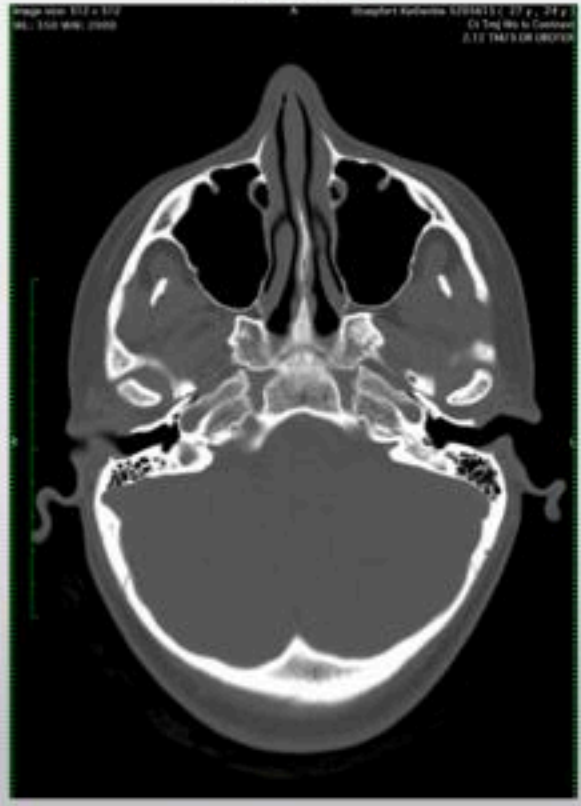
Compare CT scans

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

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

Right TMJ Scroll Corrected Sagittal and Corrected Coronal

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

Left TMJ Scroll Corrected Sagittal and Corrected Coronal

Condyle:	☐ Normal Size	☐ Small condylar size ☐
	☐ Normal Shape	☐ Altered condylar shape ☐
	☐ Cortex Intact	☐ Cortex not intact ☐
	☐ Cortex Even	☐ Hyperadolfication ☐
Fossa:	☐ Normal Size	☐ Small fossa size ☐
	☐ Normal Shape	☐ Flattened fossa shape ☐
	☐ Cortex Intact	☐ Cortex not intact ☐
Condyle Position	☐ Centered in fossa	☐ Condyle distalized ☐
Joint spacing	☐ Room for disc	☐ No room for disc ☐
CR Load Zone	☐ Superior medial	☐ Superior Lateral ☐
Estimate Piper:	L1 L2 L3a L3b L4a L4b L5a L5b	
Left TMJ Health:	☐ Healthy	☐ Damaged ☐ Active Degeneration ☐ Adapting ☐ Adapted

Scrolling Coronal View, Sagittal View, Axial View

All Tissue:	☐ Right = Left:	☐ = Except _____
Look for tumors:	Brain, Muscle, Parotid Submand Gland, Hypertrophy	
All Bones:	☐ Right = Left	☐ = Except _____
Look for hyperadolfied or radiolucent areas, cysts		
Nasal (Sagittal, Cor):	☐ Open	☐ Restricted ☐ Deviated Septum ☐
Sinuses "	☐ Clear	☐ Thickened Lining ☐ Sinus Polyps ☐
Airway "	☐ Adequate	☐ Restricted ☐
Teeth (Sagittal, Cor):	☐ No PAP	☐ PAP # _____ ☐
(Axial):	☐ No Gross Caries	
Perio (Thick Sagittal):	☐ No Gross Perio Bone Loss	
Atlas XD	☐ Appears Centered	☐ Not Level with Skull Base ☐
C2, C3, C4 XD	☐ Aligned	☐ Misaligned
Max Maxil Relation	☐ Normal Sagittal	☐ Retrognathic ☐ Maxilla ☐ Mandible
Max Maxil Canting	☐ Normal Coronal	☐ Asymmetric Cant ☐ Maxilla ☐ Mandible

Impression:

Signature: _____

Review of Scan: CT/CBCT Guide

John R Droter DDS

TMJ

Condyle

Fossa

☐ Normal Size, Normal Shape, Cortex Intact

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

Condylar Position

☐ Centered in fossa

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

Joint Spacing

☐ Centered in fossa

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

CR Load Zone (Centric Relation Load Zone)

☐ Superior medial

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

Estimate Piper

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

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

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

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

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

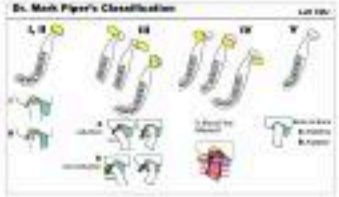
4a The disc is fully displaced off the head of the condyle and reduces on opening. There will be a shifting of the mandible which can be seen on the CBCT. **Condyle not centered in fossa.** Clinically there will "click or wobble" vibration as the disc reduces and subluxates. While most vibrations are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

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

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

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

Dr. Mark Piper's Classification



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

Right TMJ Scroll Corrected Sagittal and Corrected Coronal

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

Estimate Piper: R1 R2 R3a R3b R4a R4b R5a R5b

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

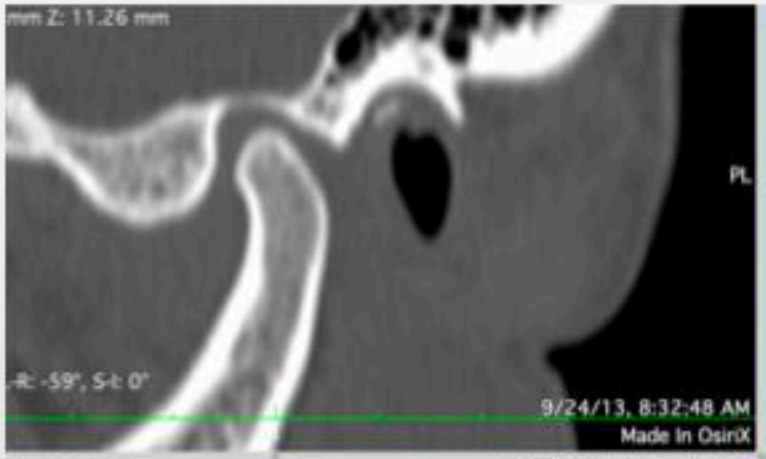
CT Left
Piper 2 from MRI

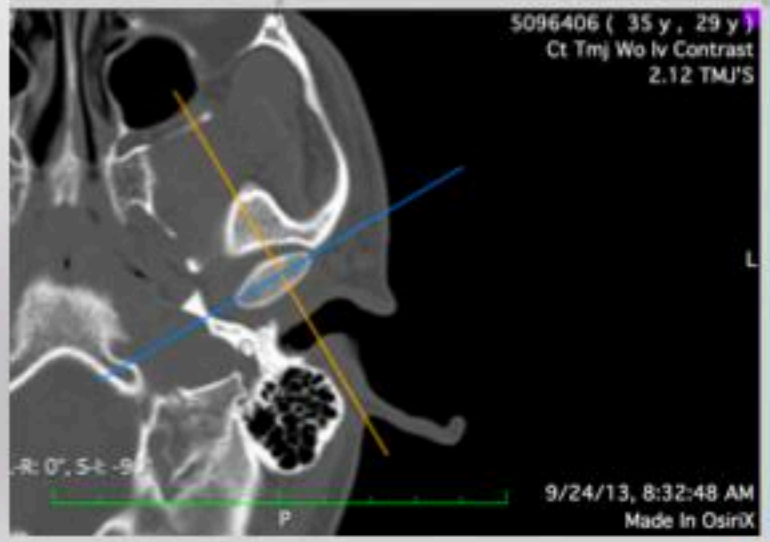
Condyle:	☑ Normal Size
	☑ Normal Shape
	☑ Cortex Intact
	☐ Cortex Even
Fossa:	☑ Normal Size
	☑ Normal Shape
	☑ Cortex Intact
Condyle Position	☐ Centered in fossa
Joint spacing	☑ Room for disc
CR Load Zone	☐ Superior medial

☑ Hypercalcification

☑ Condyle distalized

☑ Superior Lateral





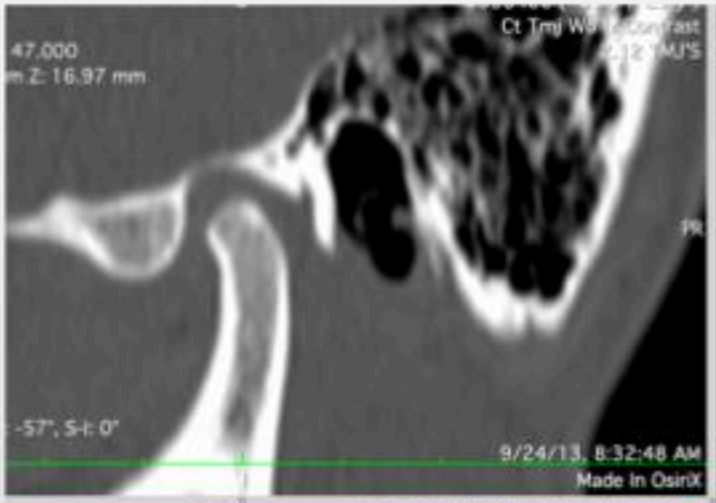
CT Right
Piper 4a-e from MRI

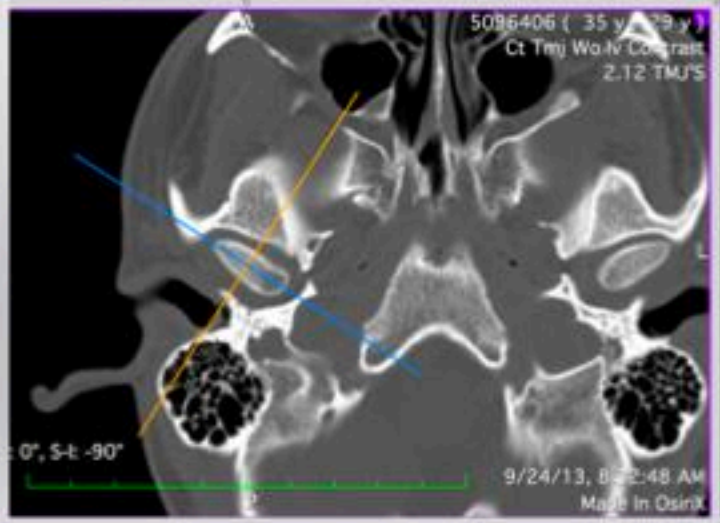
Condyle:	☑ Normal Size
	☑ Normal Shape
	☑ Cortex Intact
	☐ Cortex Even
Fossa:	☑ Normal Size
	☑ Normal Shape
	☑ Cortex Intact
Condyle Position	☑ Centered in fossa
Joint spacing	☑ Room for disc
CR Load Zone	☐ Superior medial

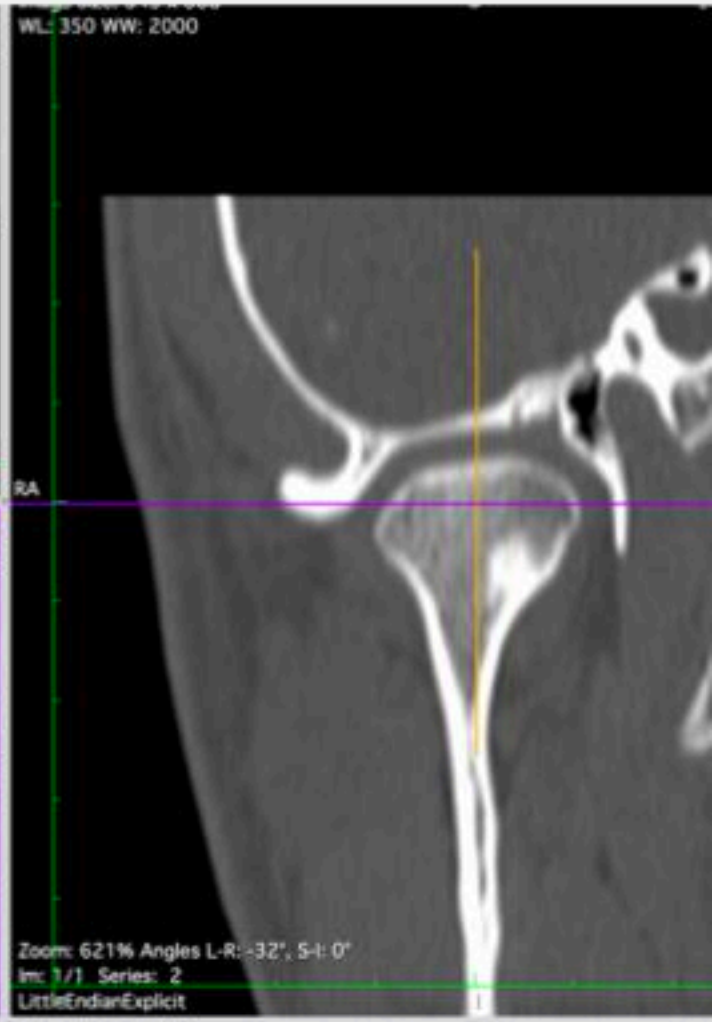
☑ Hypercalcification

☑ Superior Lateral

✔ Note: Large joint space





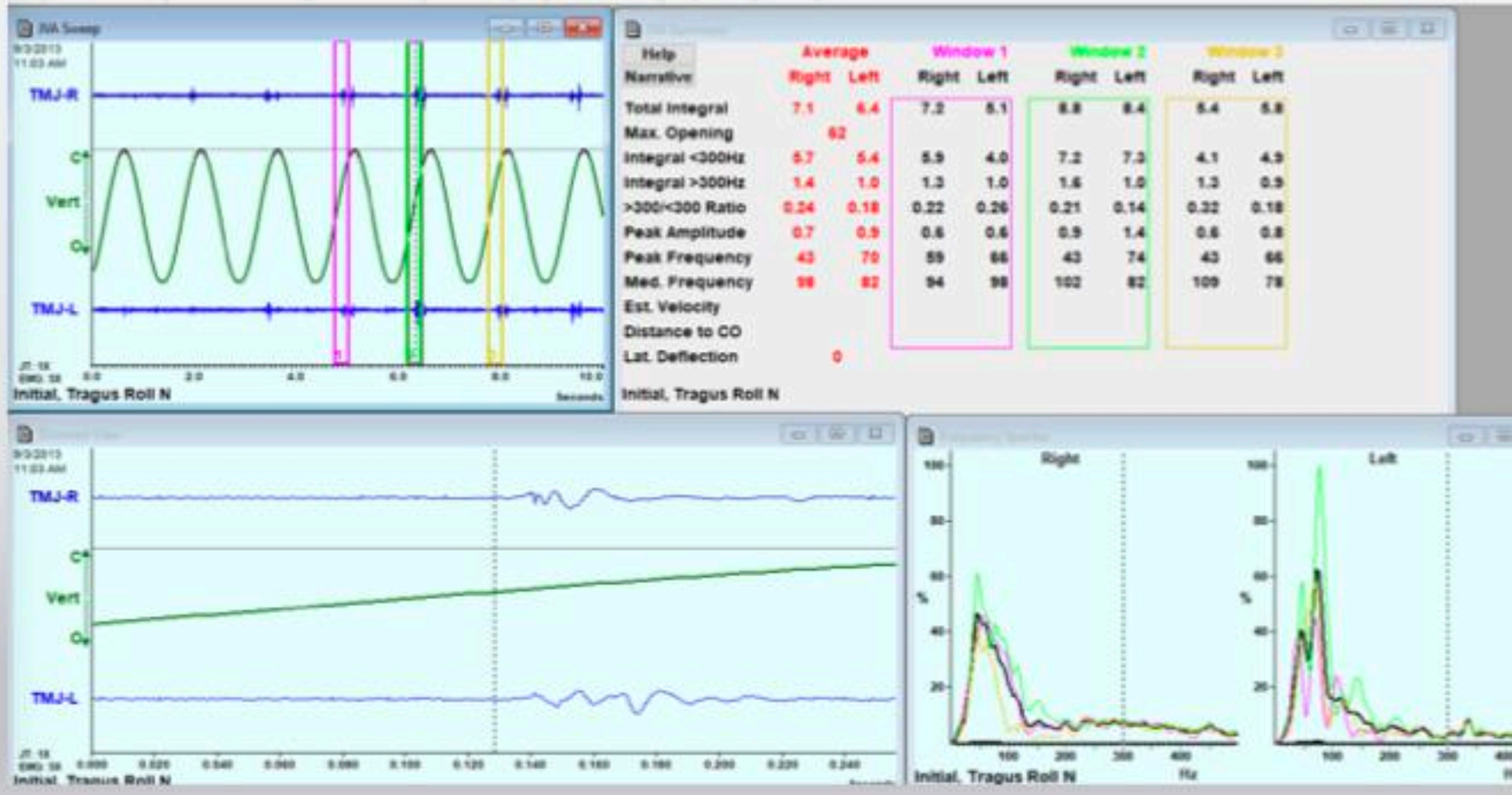


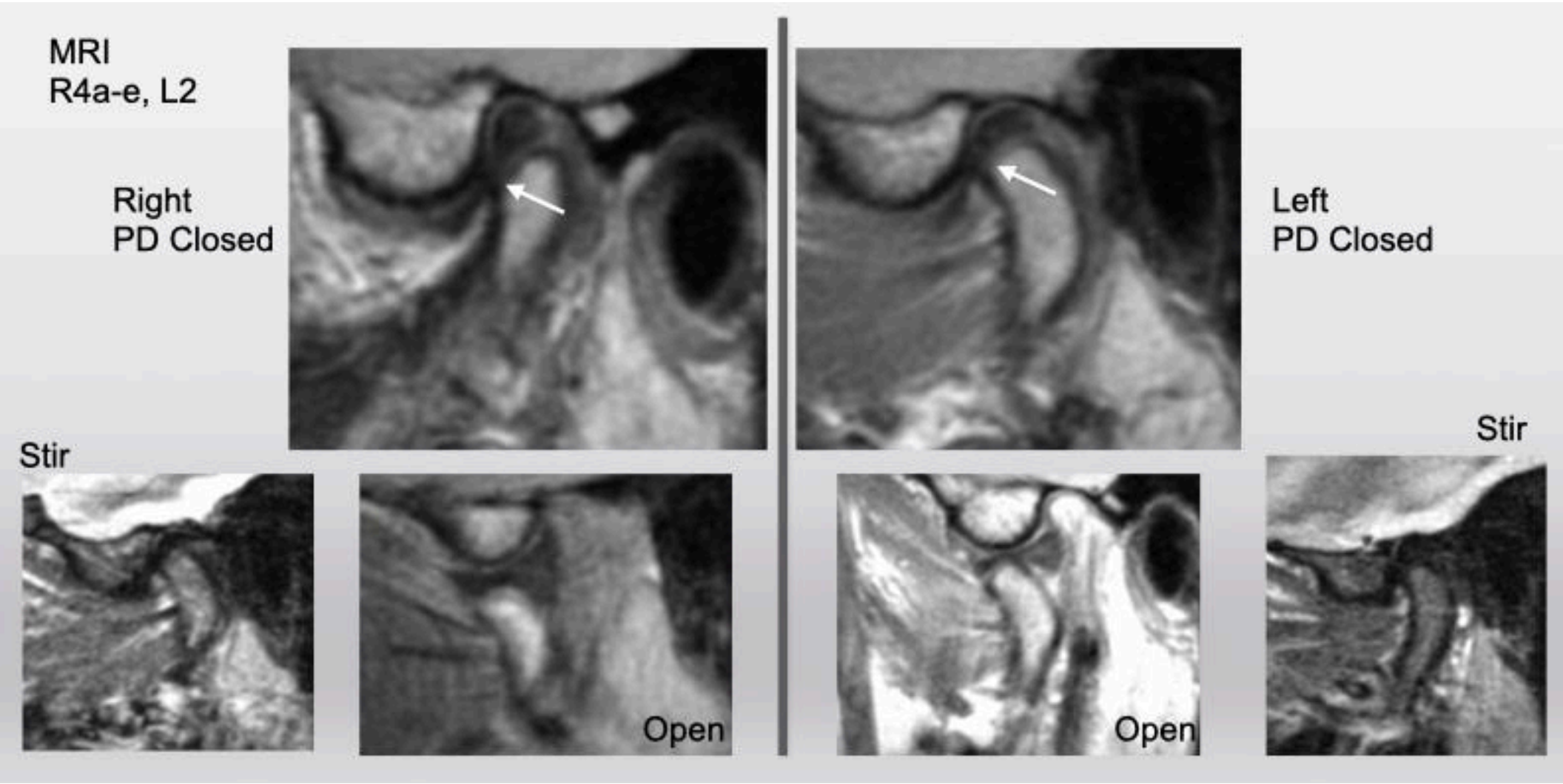
Slight Wobble before tooth contact

Joint subluxation on movement

Clinical Relevance?

Early damage from parafunction

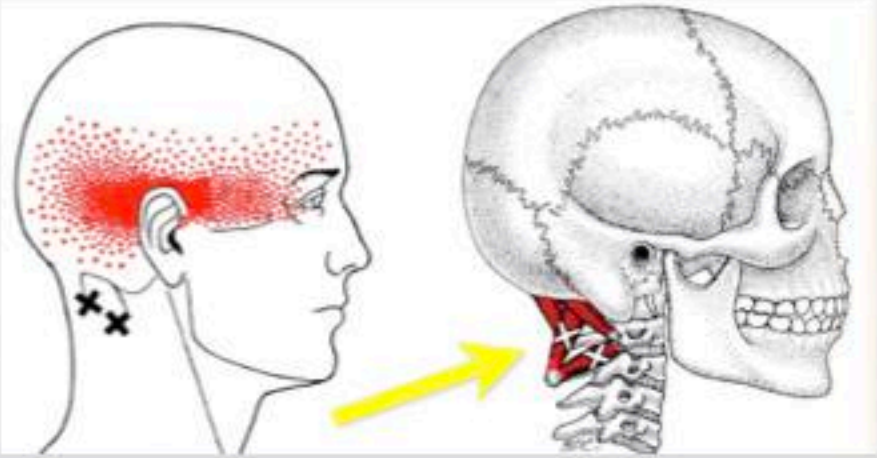


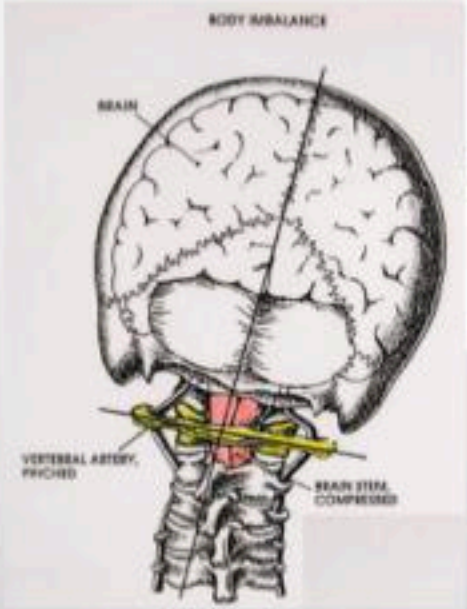

MRI
R4a-e, L2
Right
PD Closed
Left
PD Closed
Stir
Open
Open
Stir

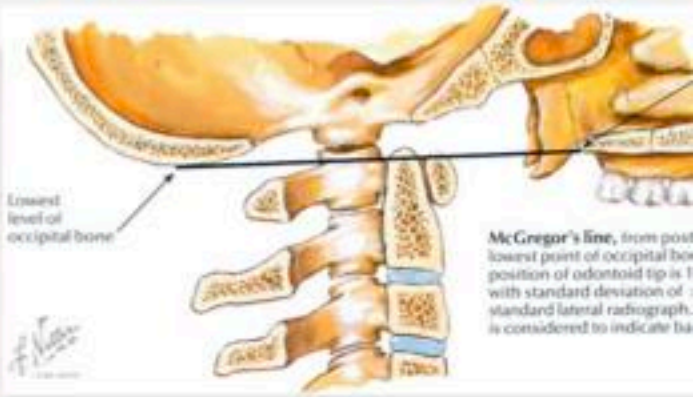
Atlas

John R Droter DDS
Annapolis, Maryland

What is this knot of muscle at base of skull?
Will neck alignment affect jaw alignment?







Skull is 10 lbs supported by occiput on atlas

My observations years ago:

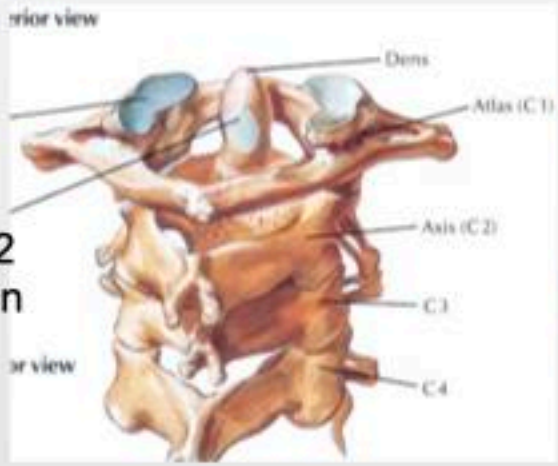
- Could not get rid of the suboccipital knot, no matter what tx.
- While most OMD patients improved with occlusal therapies, some had persisting neck symptoms
- Migraines managed but not eliminated with medication and ideal occlusion
- Suboccipital accupuncture helped some migraines

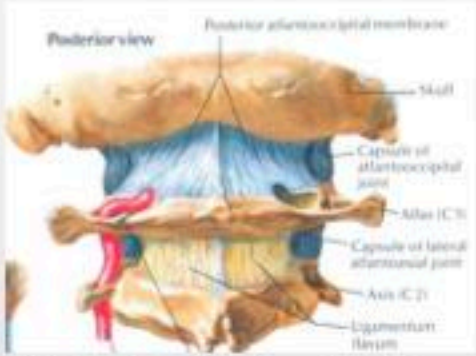
Treatments tried in past to eliminate suboccipital knot: Physical Therapy, TENS, Ultrasound, Neck Manipulation by PT, Massage, Triggerpoint Injections, Acupuncture- Suboccipital, Chiropractic, CR Appliance followed by Equilibration

Atlas (C1)

Top bone of spinal cord supports the skull

No disc C1-C2
Allows Rotation





Atlas is attached to the skull by ligaments

Discs are Hyaline Cartilage
Fibrous union: 8° rotation

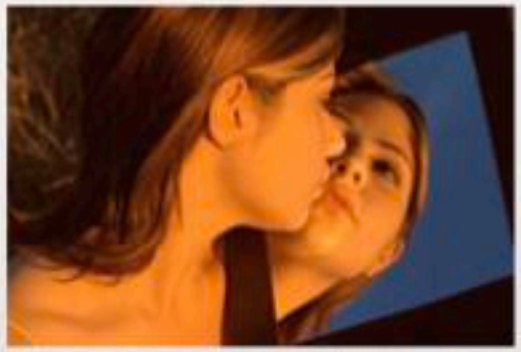
Rotation:

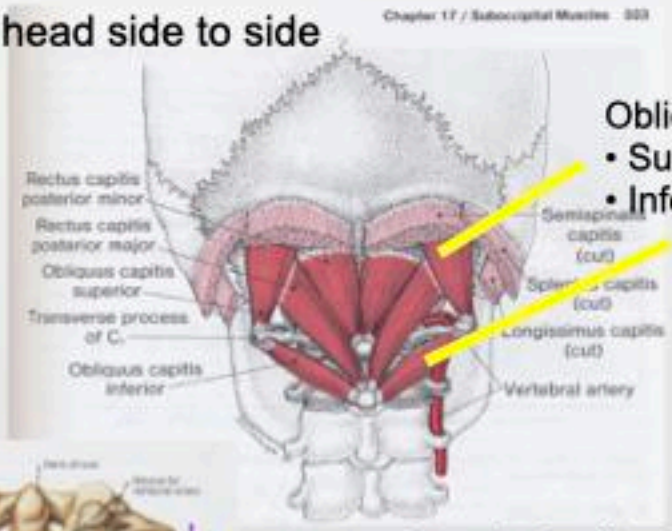
Atlas to skull	4°
C1 to C2	160°
C2 to C3	8°
all others	8°

Flex-Extend:

Atlas to skull	25°
C1 to C2	20°
C2 to C3	12°

C1/C2 allows you to turn your head side to side





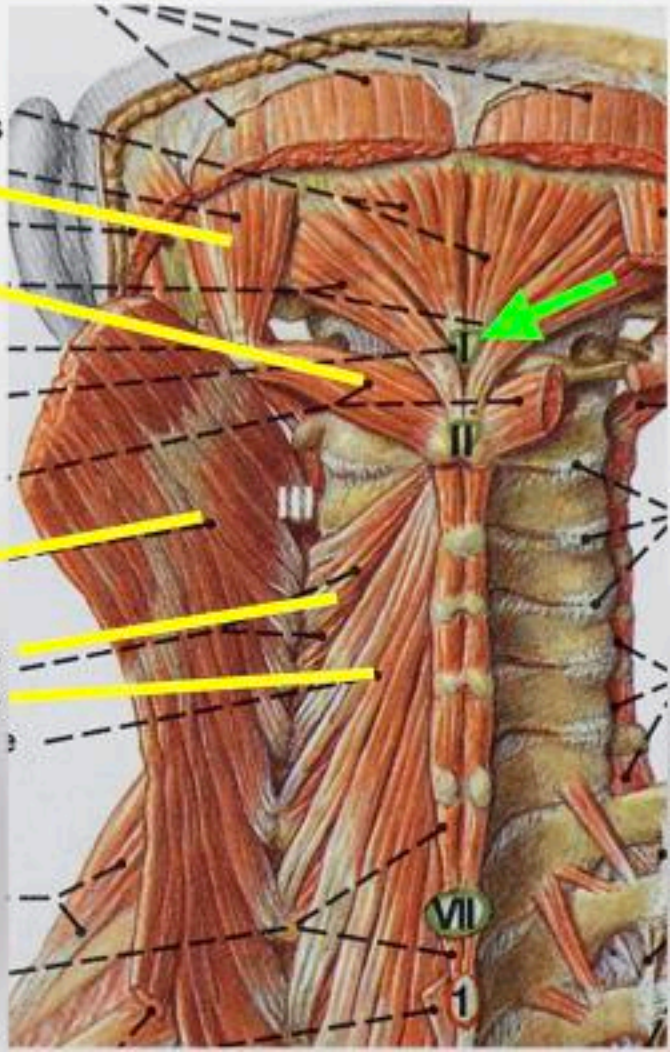
Oblique Capitus
- Superior
- Inferior

Semispinalis Capitus

Multifidus
Semispinalis Cervicus

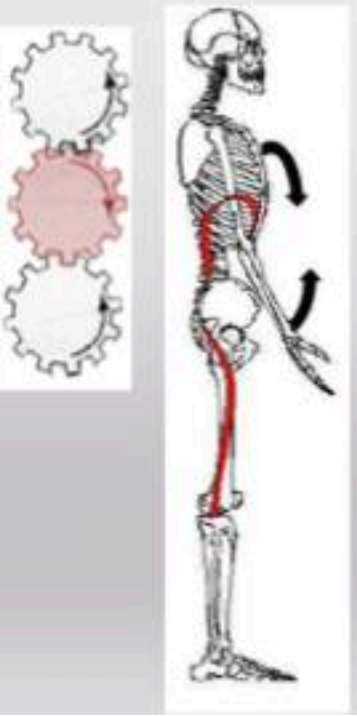
Atlas spinal process not attached to a lower transverse process

From Clemente's Anatomy Book



Neck and Postural Instability

This is a **dynamic** orthopedic System



A change in any one area will affect the others

CNS/PNS

Skull

TMJ

Teeth

Mandible

Neck

Teeth

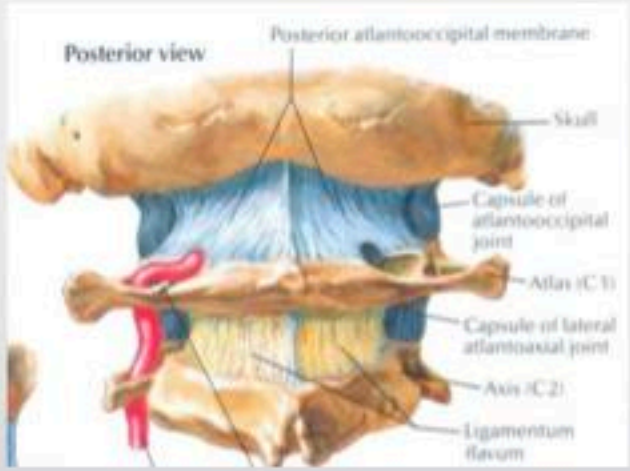
Muscle Neck

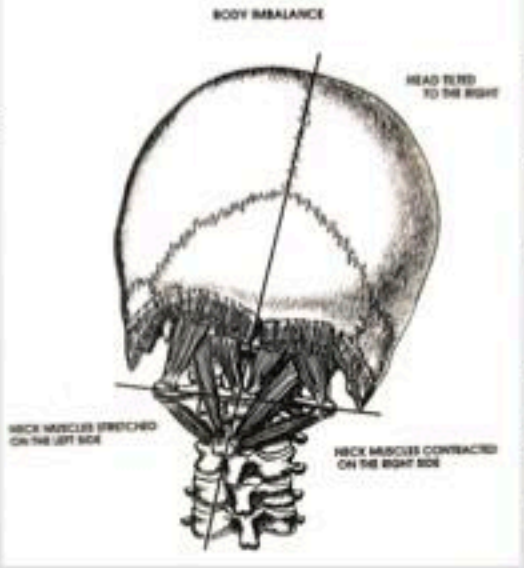
Muscle TMJ

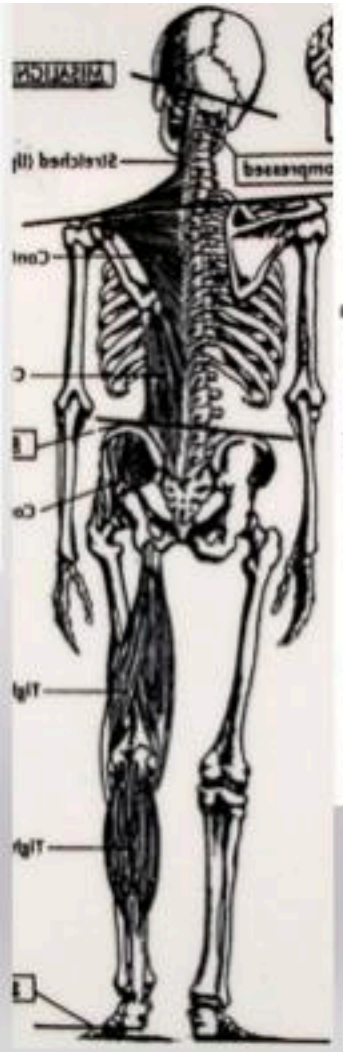
venn diagram

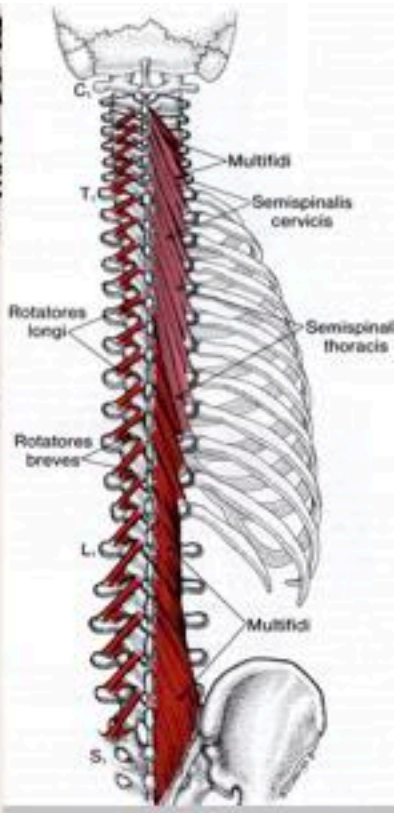
Atlas Subluxation

Trauma tears or stretches C1/ Skull ligament









Atlas Subluxation causes muscle bracing throughout the whole spinal muscle complex. One hip will be elevated giving the appearance of a short leg.

A change in any one area will affect the others

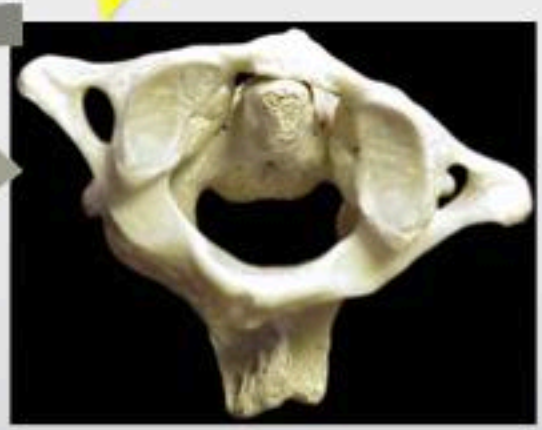
This is a dynamic orthopedic System

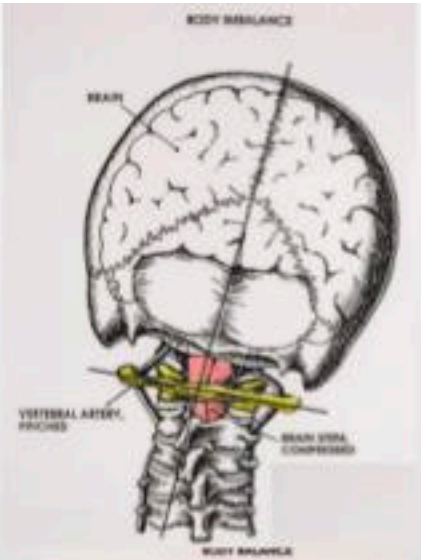
Atlas Orthogonal Adjustment

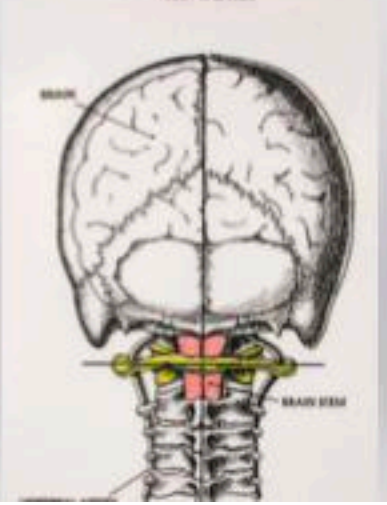
Dr. Roy Sweat

Atlas Orthogonist
Branch of Chiropractic Medcine

Uses sound wave to move atlas,
disrupts muscle bracing

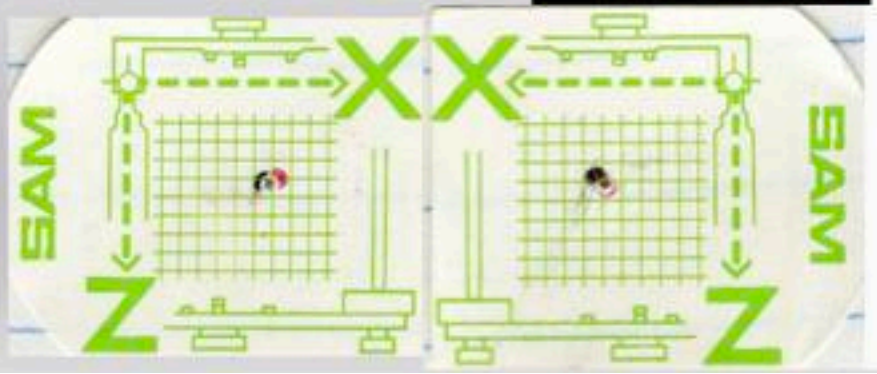






Atlas (C1) Observations:

Once atlas is reduced, other therapies progress much better.
Atlas can subluxate again as ligaments are still damaged
The longer atlas is in, the more likely it will stay in
Cartilage and bone changes shape over time.
Occlusion will be different with atlas in and atlas out, about 0.5mm
Occlusal appliances can help stabilize the atlas once it is reduced
Glucosamine helps neck become stable- ?cartilage adaptation?



CR Changes with Atlas position

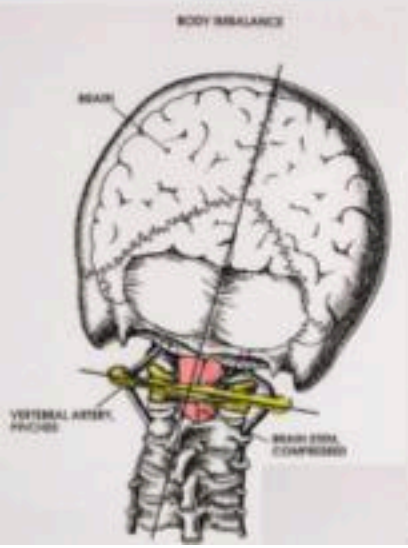
?Pressure on Occiput moves Temporal bone?

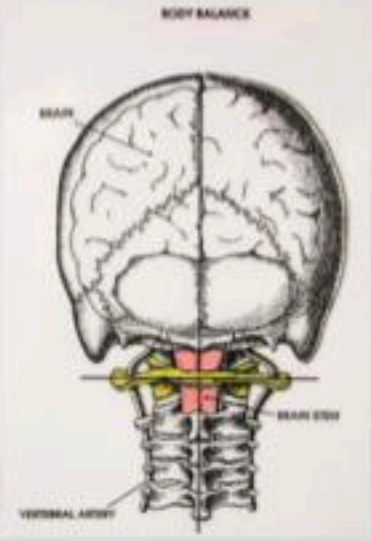
Put your teeth together and bend neck side to side

SAM Articulator Vericheck

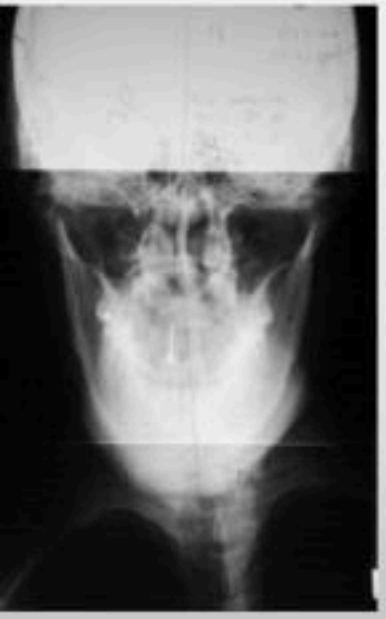
Right Condyle
Black- Atlas Out
Red- Atlas in shifts condyle up and forward 0.6mm

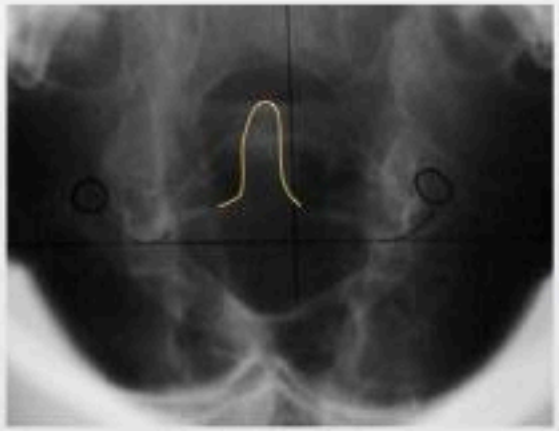
Left Condyle
Black- Atlas Out
Red- Atlas in shifts condyle down and back 0.5mm



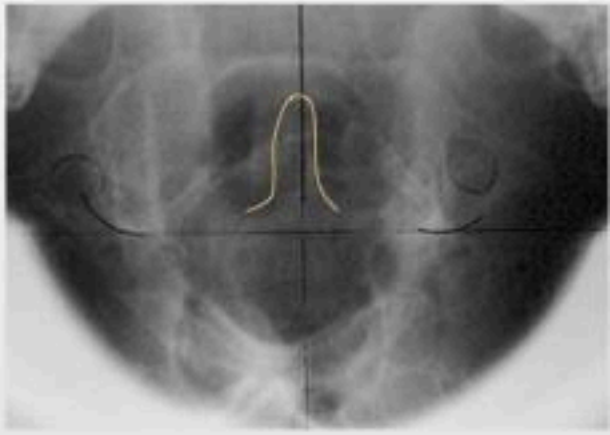


My Neck



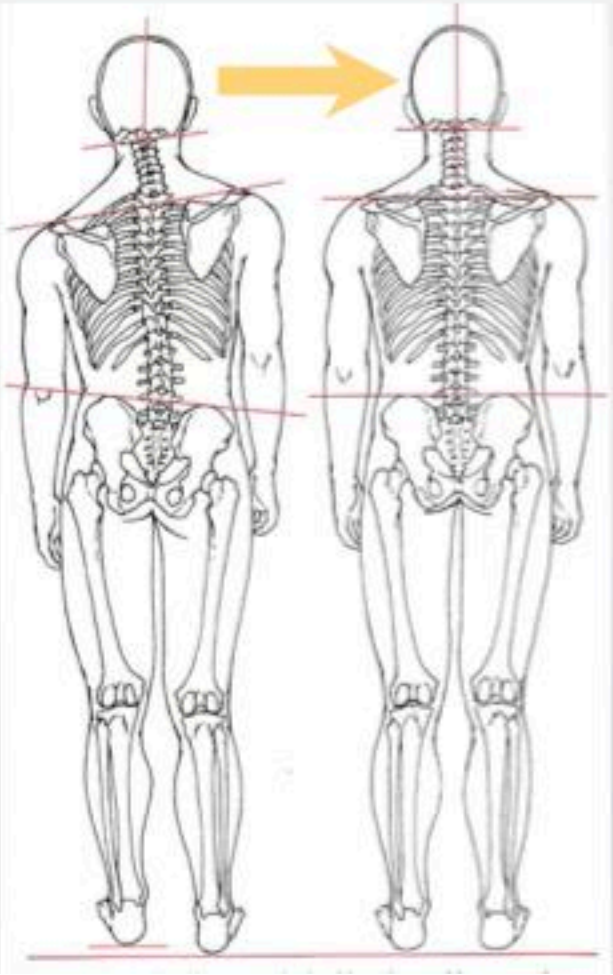


Before Atlas Adjustment



After Atlas Adjustment

Atlas Reduction



Many therapist place a heel lift thinking it is a leg length discrepancy

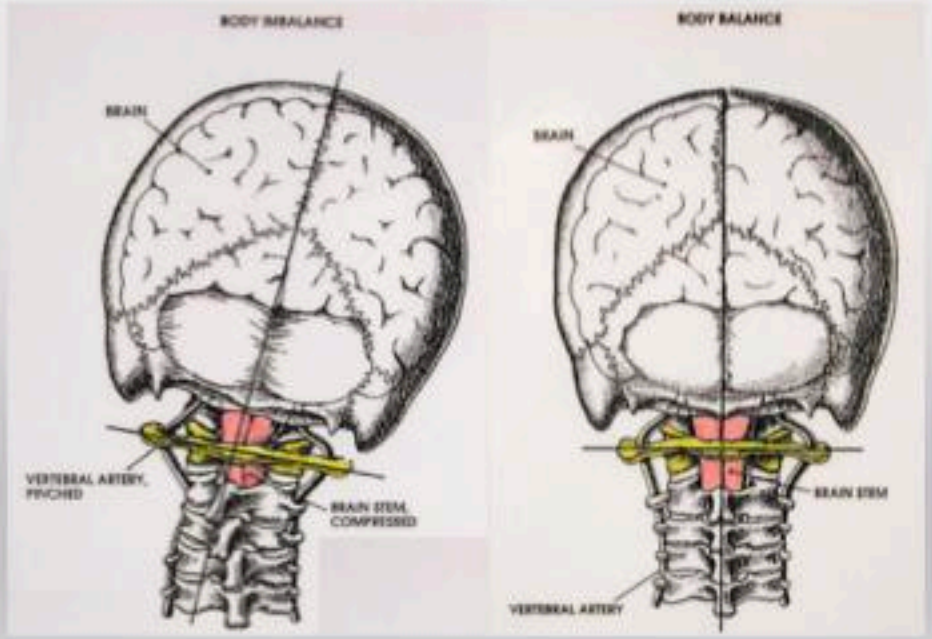
With atlas reduction the hip drops and the knot at the base of the skull clears instantly

Note: you do not get perfect realignment of all the bones as illustrated, but it is a start.

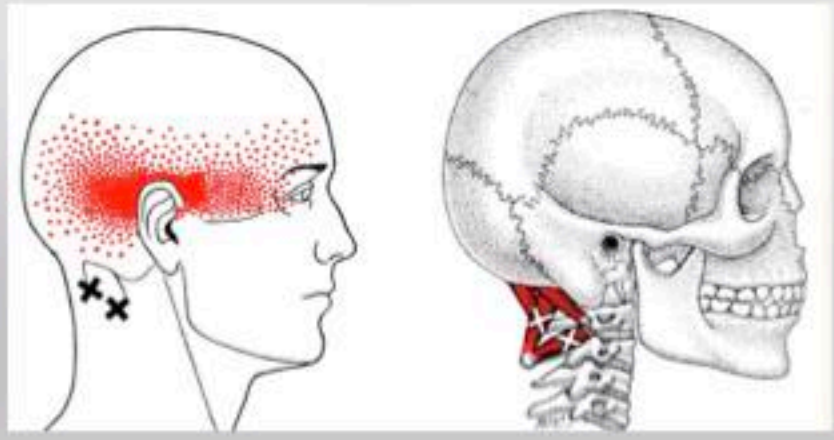
Finding An Atlas Orthogonist

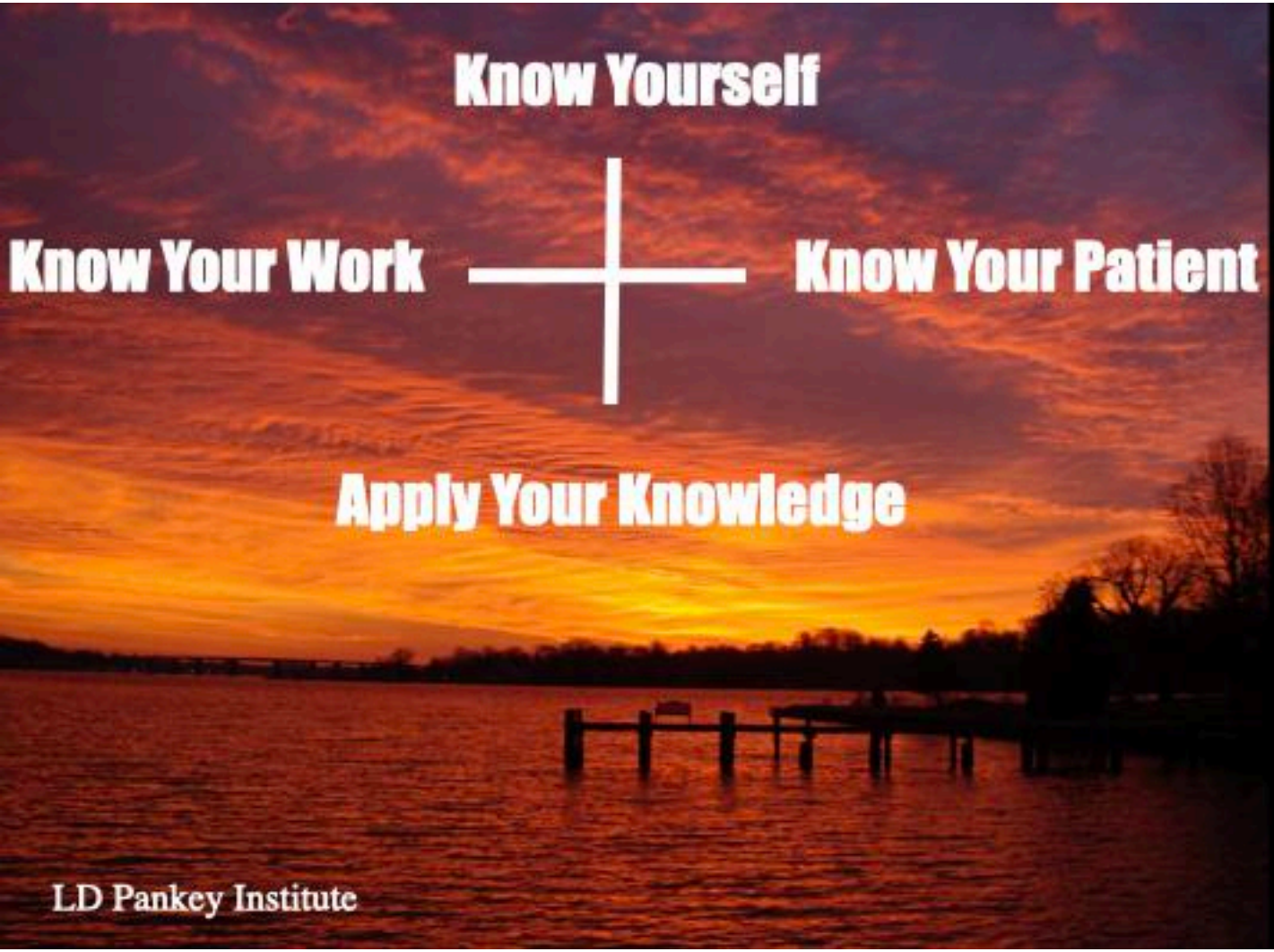
www.atlasorthogonality.com

My Observations
- 50% of Atlas Doctors seem to be good
- Most snappers and crunchers are useless or dangerous



Atlas Orthogonist is only group of therapist I have found who can get rid of muscle knot at C2





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

Specific Therapy

TMD Therapies: (70 therapies)

Physical

Ice
Hot Cold Hot
Cold Laser
TENS in office
TENS home use
Range of motion exercises
Active Stretching: Manual, Tongue Blades, Dynasplint
Refer to Physical Therapy: Rocabado mobilization
Refer to Physical Therapy: Postural Restoration Therapy
Refer to Physical Therapy: Various Muscle Therapies
Refer to Chiropractic: Atlas Orthogonist
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 Botox Masseter injections
Refer Botox Lateral Pterygoid injections
Food

Occlusal Orthopedic

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

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
Diagnostic Palatal Anterior Stop
Brux Checker
Lower full coverage CR
BiArch Posterior Deprogrammer
Upper full coverage hard CR guard
Temporary home use anterior stop
Myobrace
Aqualizer
Lower Soft Sectional
Lower posterior deprogrammer
Lower TMJ Rehab flat plane
Lower postured indexed
Lower CR Indexed
Mandibular Advancement Device
Lateral Bruxing Device

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

70

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

1. TMJ Damage

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

2. Muscles of the TMJ

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

3. Cranial Alignment/Occlusion

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

4. Cervical Damage

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

5. Parafunction

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

6. Whole Body / Systemic

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

7. Other

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

The Diagnostic Process

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

Think!!

Differential Diagnosis
All the choices

Diagnostic tests (Observations)
Narrow down the choices

Working Diagnosis
Treating as if

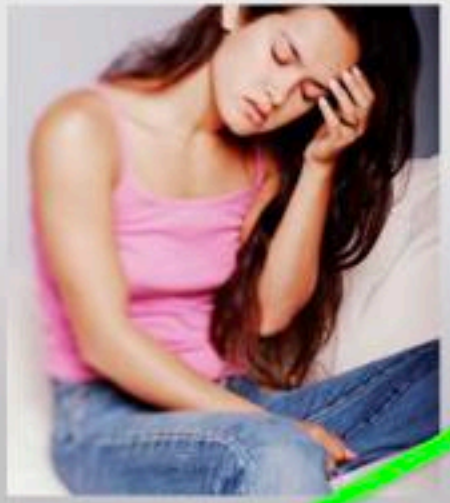
Not completely resolved

Final Diagnosis
Only after problem resolved

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

Diagnosis Treatment Flow Chart

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

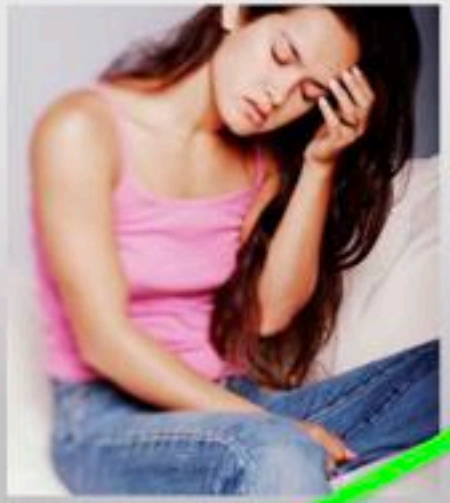


Symptoms

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

No Signs

No Symptoms
Final Dx

Doctor Re-Exam

If not resolved

Symptom Dx		Specific Dx
Tooth Pain	vs	Irreversible Pulpitis
Arthralgia	vs	Osteoarthritis

Facial Pain Diagnosis

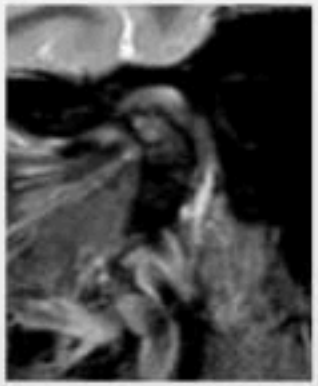
Diagnostic Tools

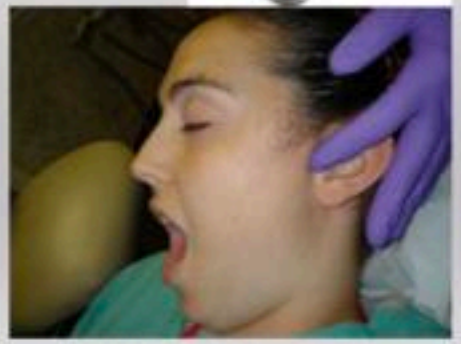
1 Written and Oral History
2 Observation
3 Physical Exam
- Muscle Palpation
- Joint Palpation
- Joint Auscultation
- Joint Motion

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

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

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





Facial Pain Diagnosis

Diagnostic Tools

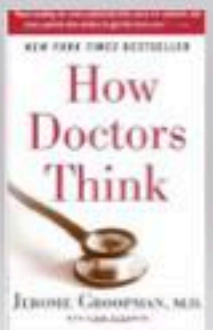
1. **Written and Oral History**
2. **Observation**
3. Physical Exam
   - Muscle Palpation
   - Joint Palpation
   - Joint Auscultation
   - Joint Motion
4. Anterior Stop Test
5. Sleep Airway Screening
6. CT Scan
   MRI
   Blood Tests

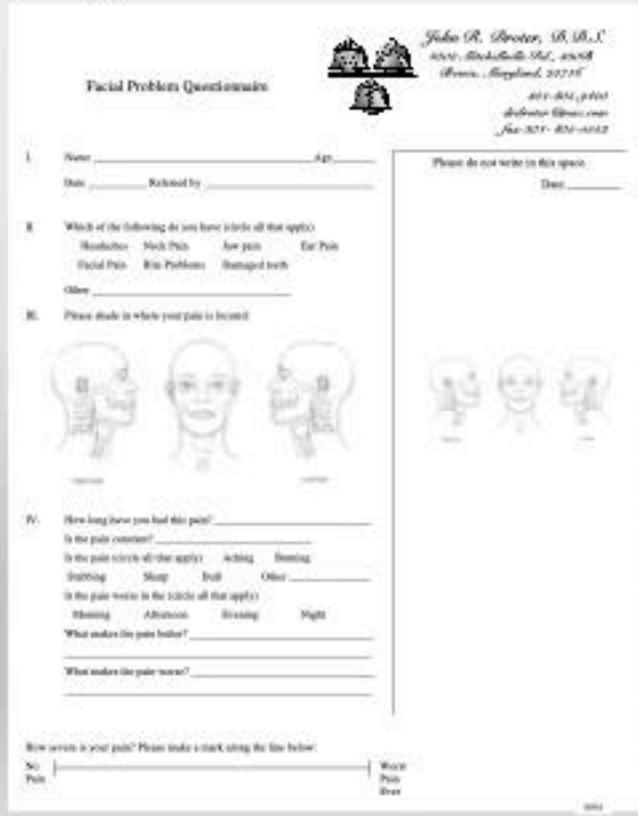
Most Important is the history. You have a good idea of what is going from this alone.

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

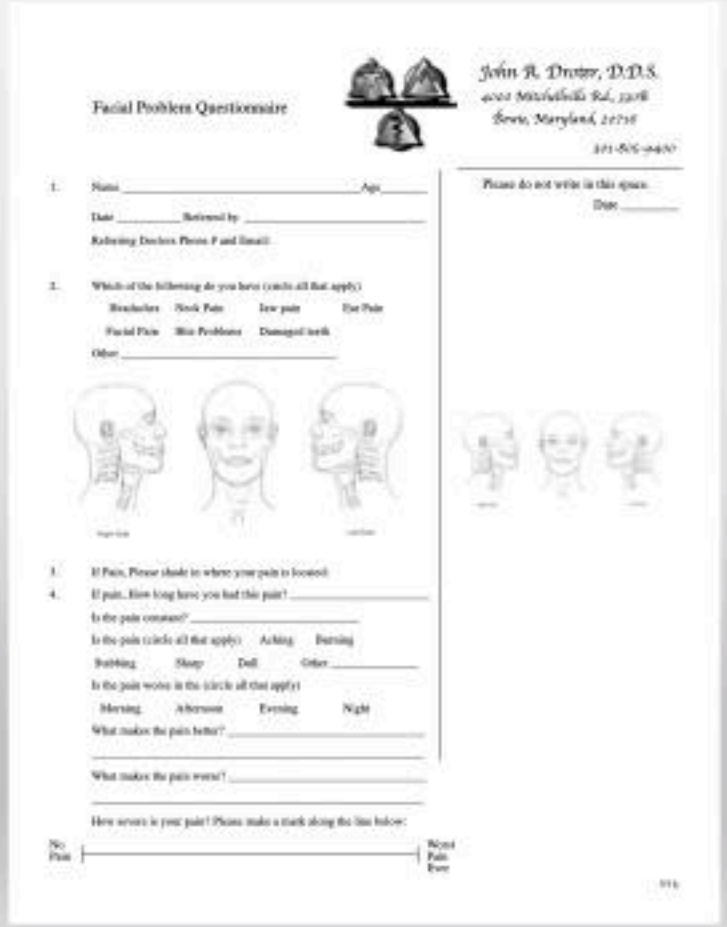
Need to resist the temptation to zero in on one diagnosis.

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





Facial Problem Questionnaire



Facial Problem Questionnaire

John R. Droter, D.D.S.
4101 Mitchellville Rd., 320B
Bowie, Maryland, 20716
301-805-0400

Please do not write in this space.
Date _____

1. Name _____ Age _____
Date _____ Referred by _____
Referring Doctors Phone # and Email:

2. Which of the following do you have (circle all that apply):
Headaches Neck Pain Jaw pain Ear Pain
Facial Pain Bite 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
Stabbing 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

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 wether they have pain or not

Question 20 is the most important of all

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

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.

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

FAB
- Feature
- Advantage
- Benefit

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

What would you like to accomplish with treatment here?

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 $$

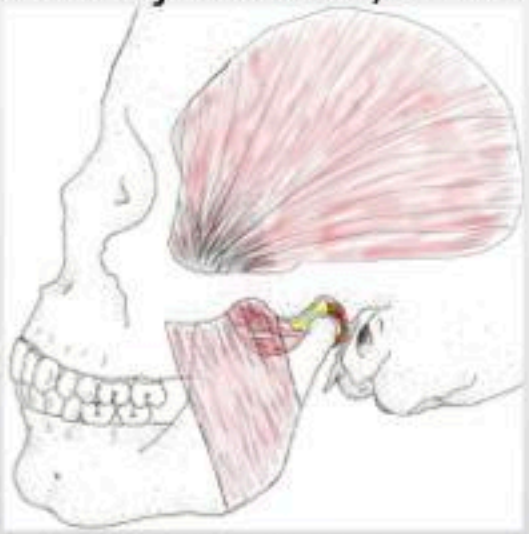
Facial Pain Diagnosis

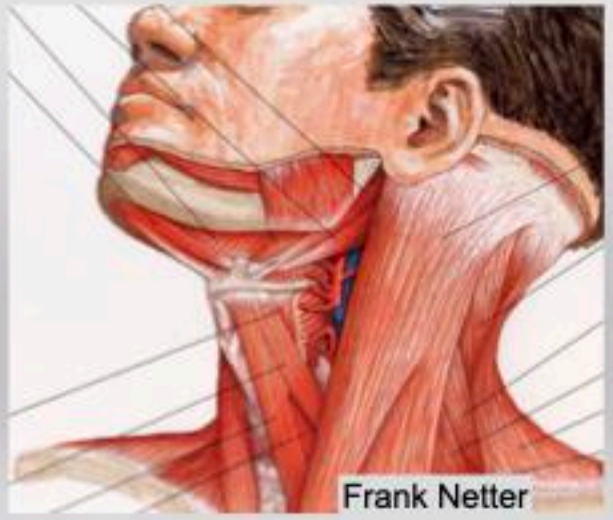
Diagnostic Tools

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

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

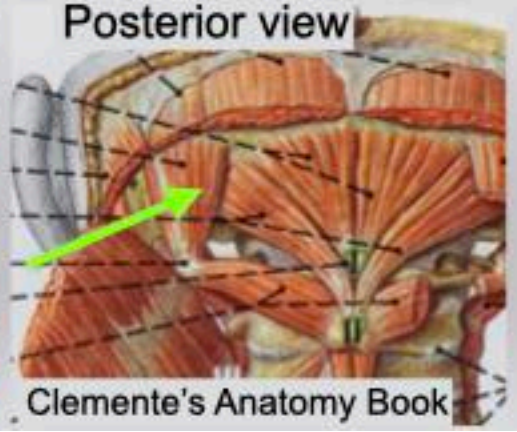
Anterior Temporalis
Masseter
Posterior Digastric
Superior Oblique Capitus
Deep Temporalis
Lateral Pterygoid





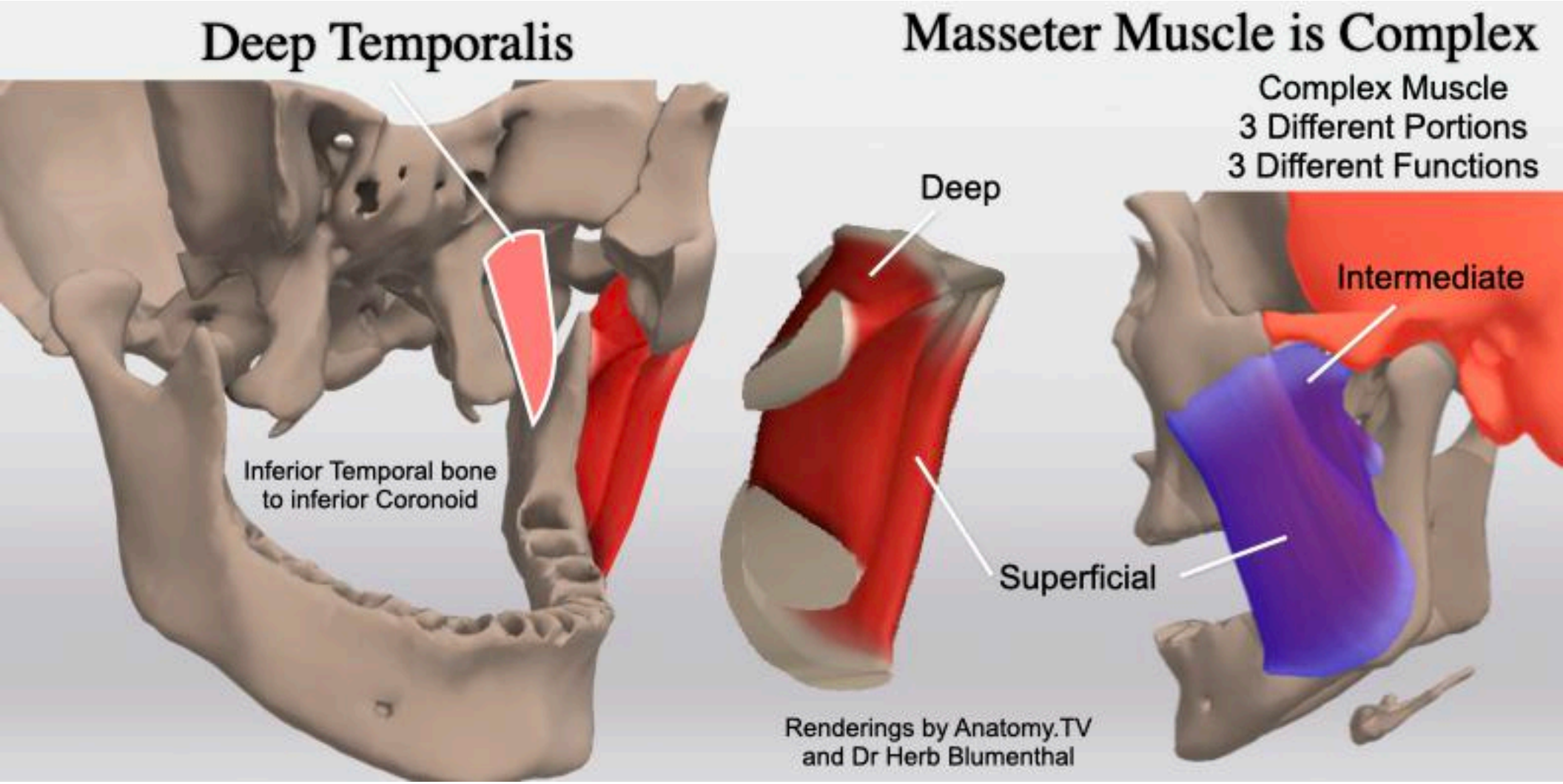
Frank Netter

Posterior view



Clemente's Anatomy Book

Anatomy TV


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

Facial Pain Diagnosis

Diagnostic Tools

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   - Muscle Palpation
   - **Joint Palpation**
   - Joint Auscultation
   - Joint Motion
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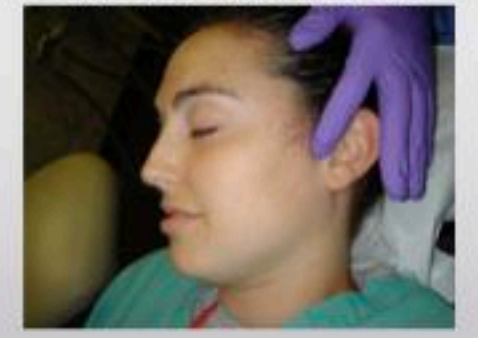
6. CT Scan
   - MRI
   - Blood Tests

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

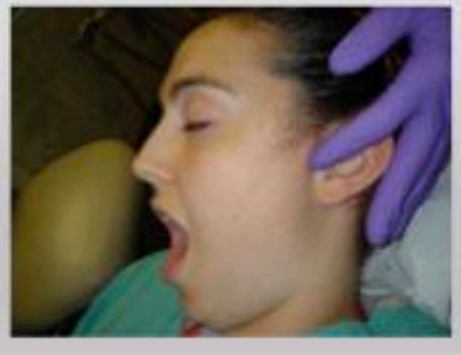
Palpation and Load

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

Anterior Lateral Pole



Posterior Lateral Pole



Indirect through Ear

Load Testing

No pain does not mean stable

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

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

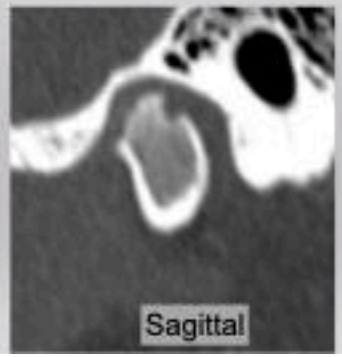
CR Load test on these 39 joints:
CR Load Positive Soreness 22/39 (56%)
Missed 17/39 structurally unstable joints (44%)

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

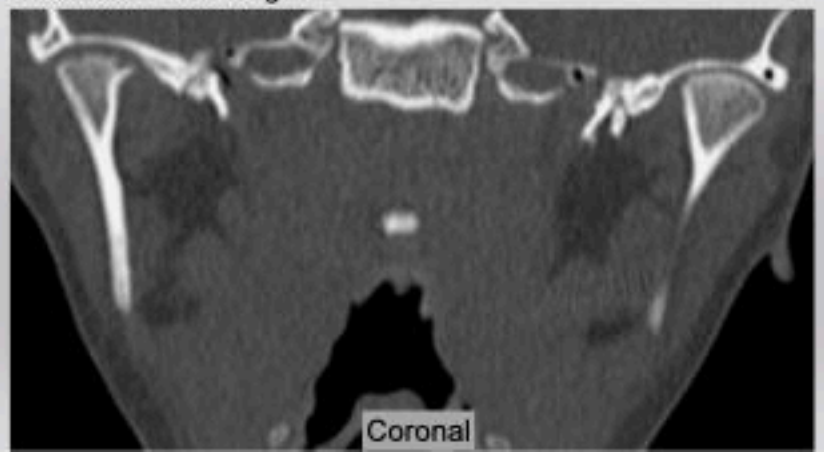
Load Test Bimanual Manipulation

46yo F
CR Load Normal
Excursion Load Normal

40yo F
CR Load Normal
Excursion Load Slight



12yo F- CR Load Normal
Excursion Load Slight



Facial Pain Diagnosis

Diagnostic Tools

1 Written and Oral History
2 Observation
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  Joint Auscultation
  Joint Motion
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6 CT Scan
  MRI
  Blood Tests

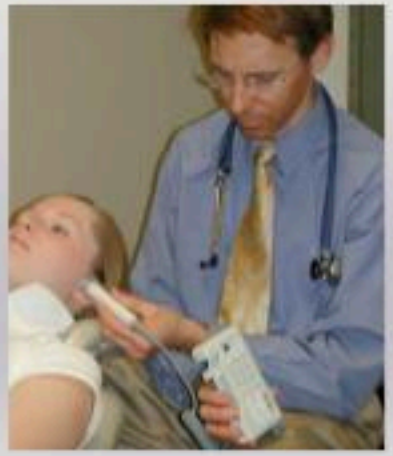
A healthy joint is quiet,
A damage joint is not.
A joint that does not move is also quiet.

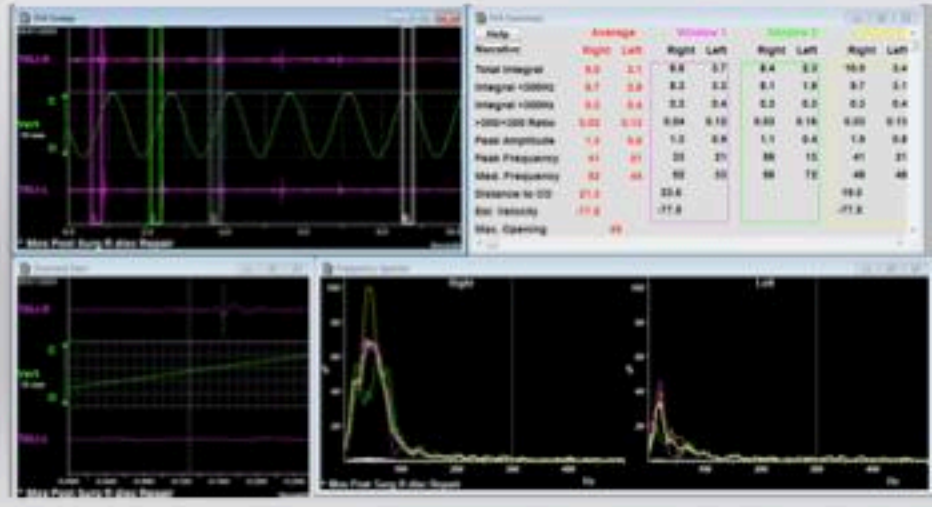
Sounds/ Vibrations

Stethoscope

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

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





Sounds/ Vibrations
Stethoscope

Use Bell side, not Diaphragm side, over the TMJ

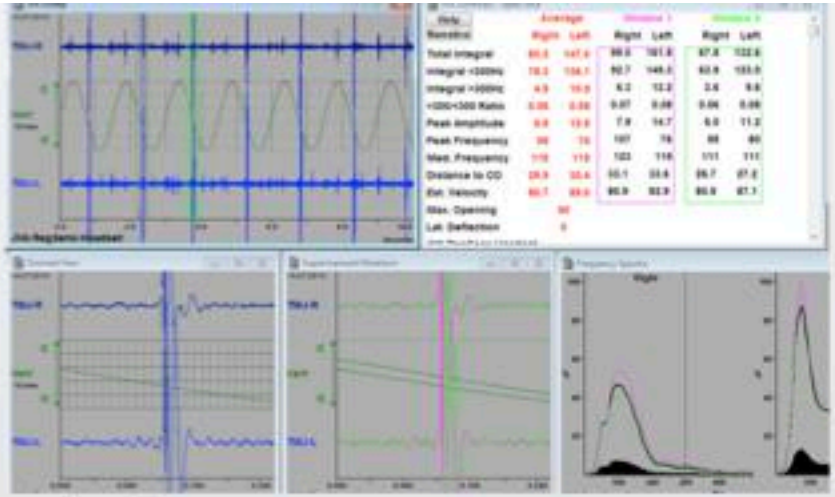
3M Littmann Classic II S.E. Stethoscope

My Subjective Description of Joint Sounds

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

Joint Vibration Analysis

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



Based on Sonar.
It is not a microphone

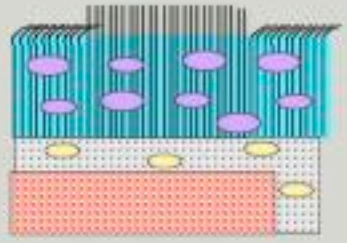
Three main types of sounds

Disc Reduction
Disc Dislocation
Adhesion crackle
tooth tap

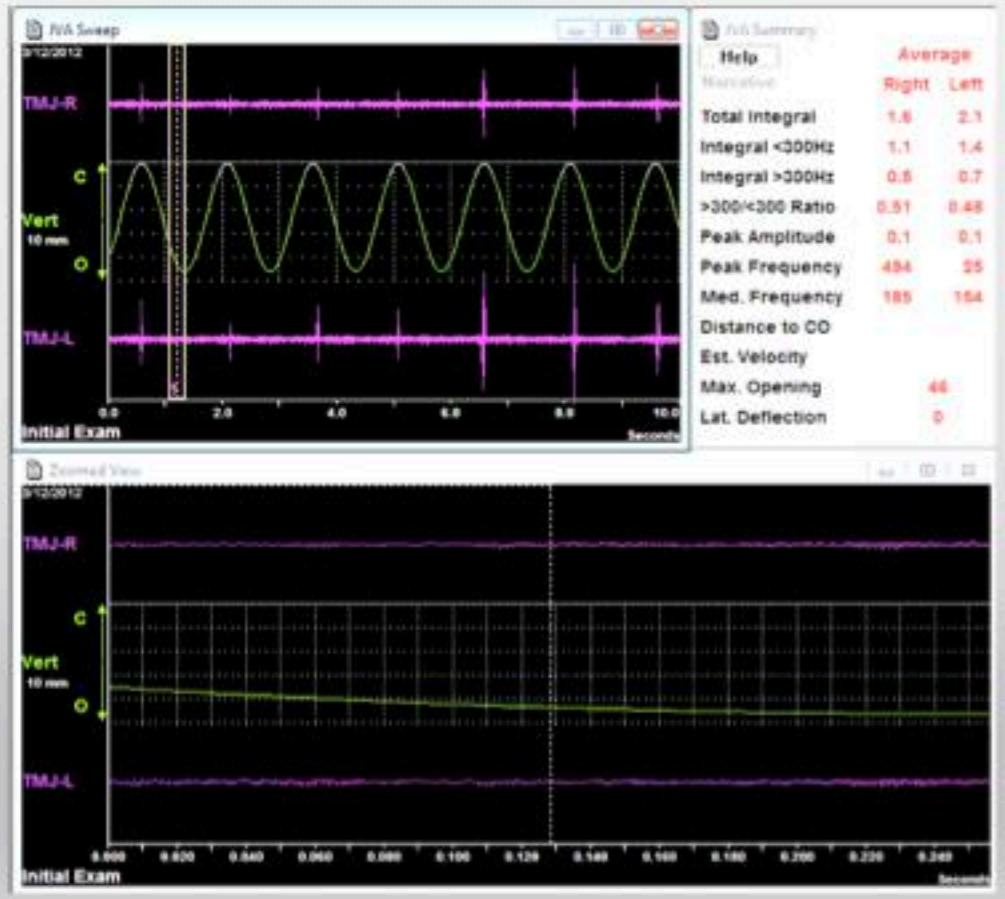
Osteoarthritis
Pseudo Disc
Damaged Cartilage

Disc Subluxation
Joint Subluxation
Disc Reduction
Disc Dislocation

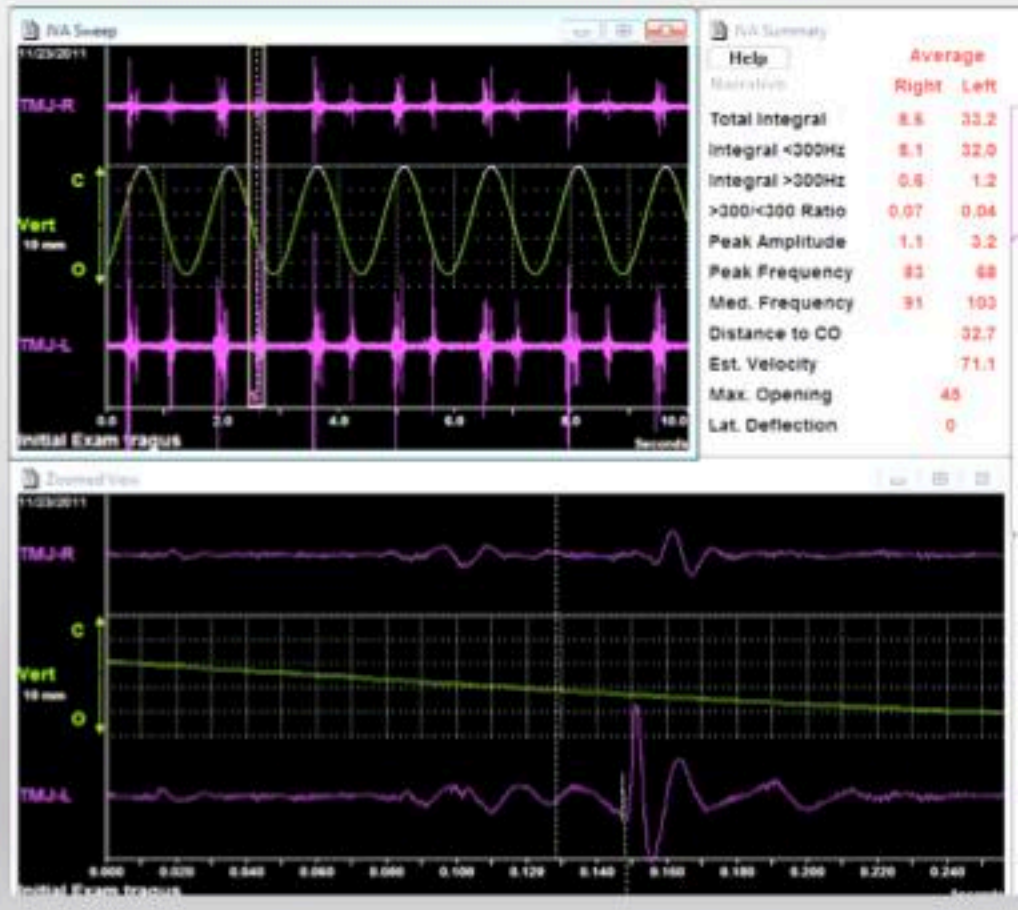
JVA measures the health of the cartilage



Healthy or Damaged?



Healthy or Damaged?



Why is Joint making this vibration?

Good Vibrations
Healthy Cartilage
No Movement

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

Click
Disc Reduction
Disc Dislocation
Adhesion Crackle
Tooth Tap
Contralateral Transference

Scratch
Cartilage Fibrillation
Cartilage against tissue
Bone against bone
Velcro Noise

Differential Diagnosis
All the choices

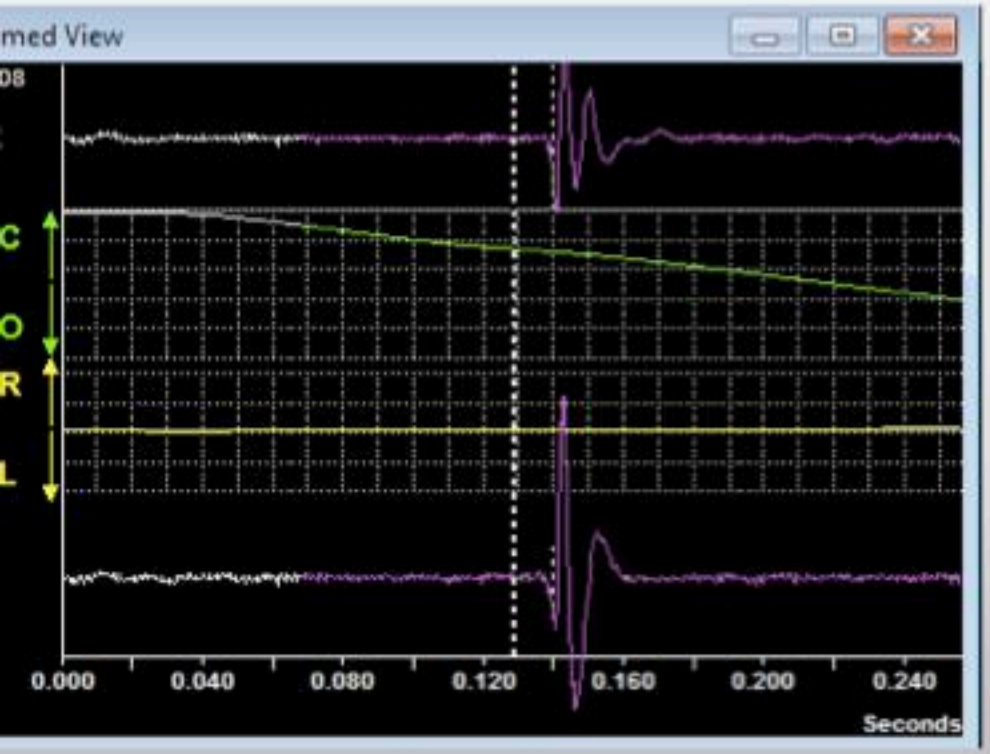
Diagnostic tests
Narrow down the choices

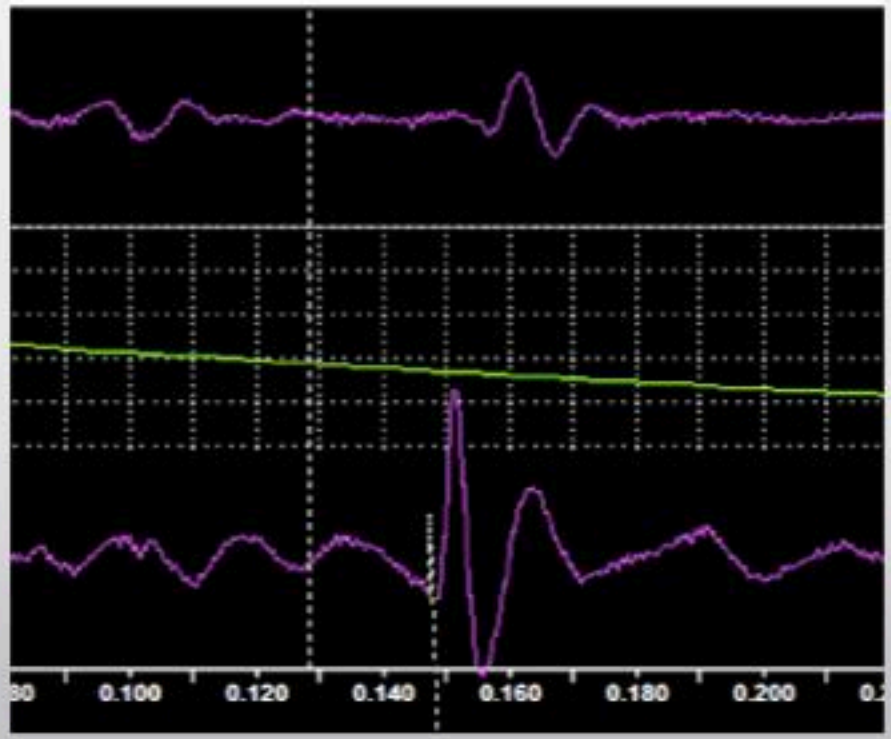
Working Diagnosis
Treating as if

Not completely resolved

Final Diagnosis
Only after problem resolved

Simple or Complex





Simple left click with transference vibration to right
L4a

Complex Click
L3a, R4b

Magnetic Resonance Imaging

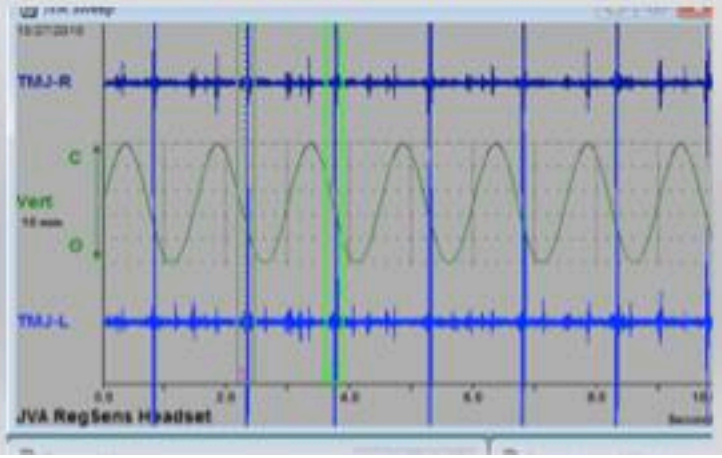
MRI gives you the start and finish
You have to infer what happened in between

Joint Vibration Analysis

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

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

JVA allows you to view
the joint in function



Facial Pain Diagnosis

Diagnostic Tools

1. Written and Oral History
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   - **Joint Motion**
4. Anterior Stop Test
5. Sleep Airway Screening
6. CT Scan

   MRI

   Blood Tests

Evaluate for Full, Smooth Range of Motion

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

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

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

Normal excursion are 25% of the max open

Evaluate Smoothness:
Light hold on chin as patient moves jaw

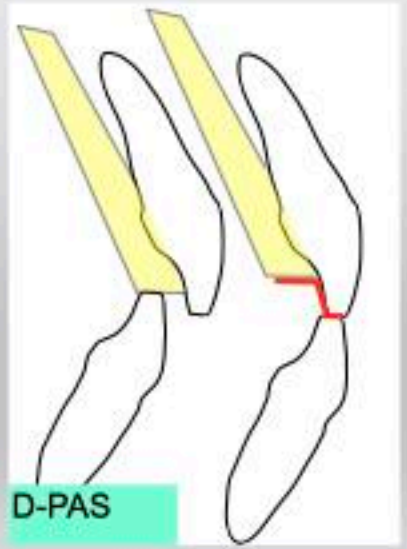
Facial Pain Diagnosis

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

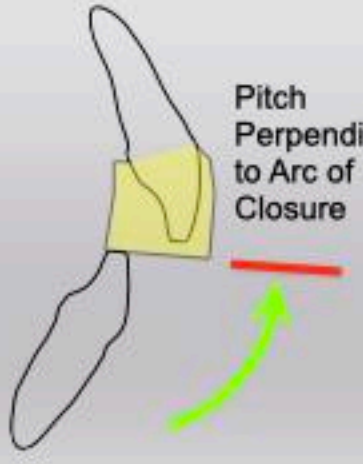


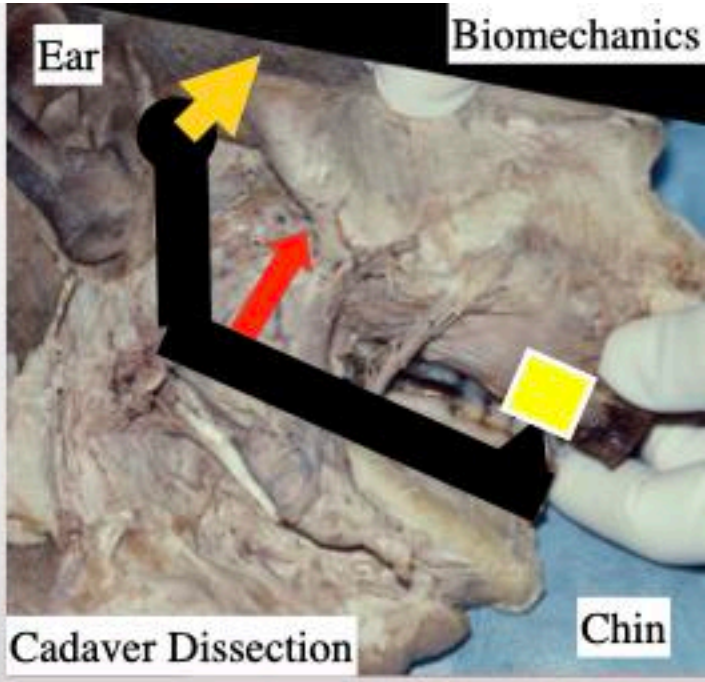
Anterior Stop Orthotics

APS
ArrowPath Sleep

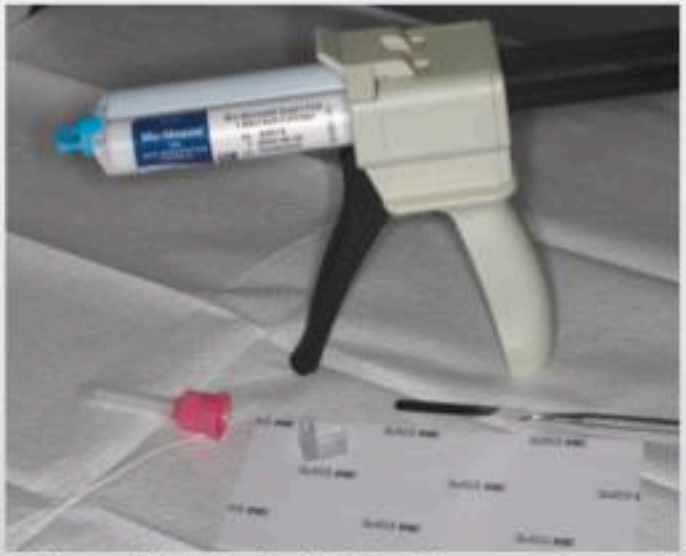
Anterior Stop Orthotic 3 Effects

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.



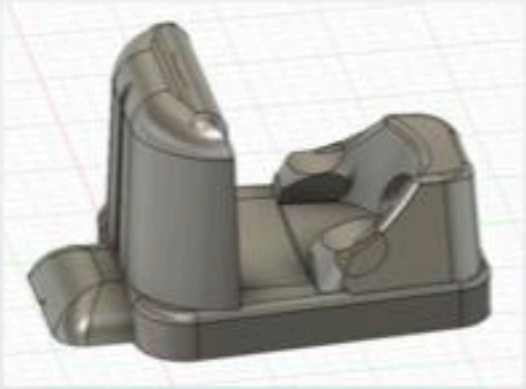


Anterior Stop Orthotic
In Office Diagnostic Test



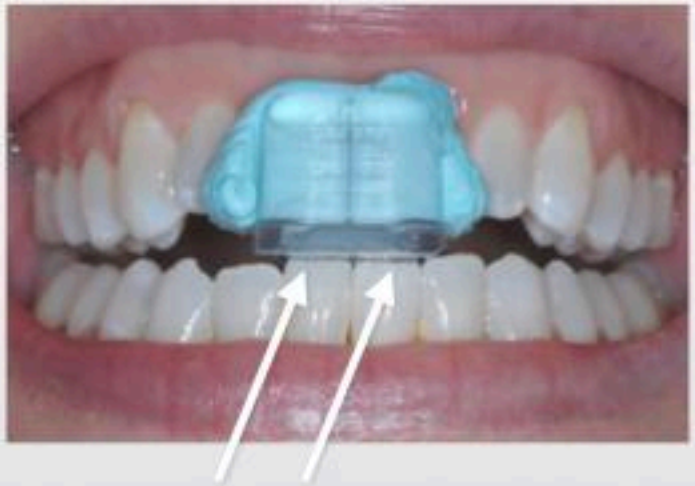
Reline with Parkell Blu-Mousse Super Fast

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

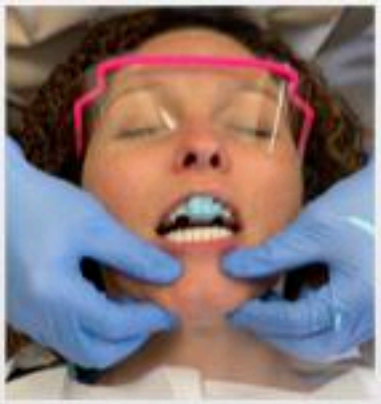


2 points of contact

Pitch Perpendicular
to Arc of Closure

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

<u>With anterior stop in place:</u>

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

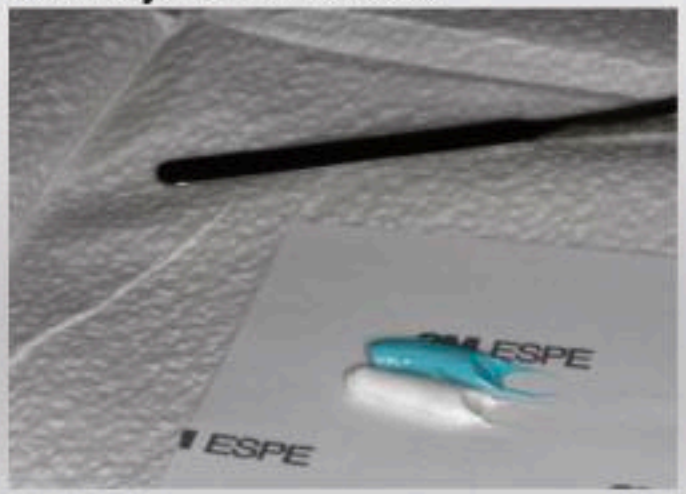
Occipital Lift with 3 deep breaths. Posterior neck opening muscle massage.

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

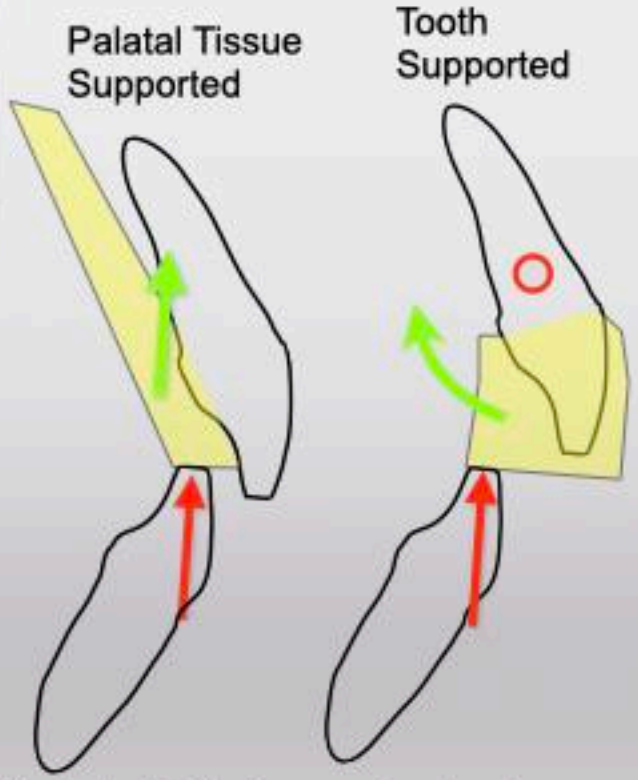
The D-PAS
Diagnostic Palatal Anterior Stop

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

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

Diagnostic Palatal Anterior Stop

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

Better- Decrease in Symptoms

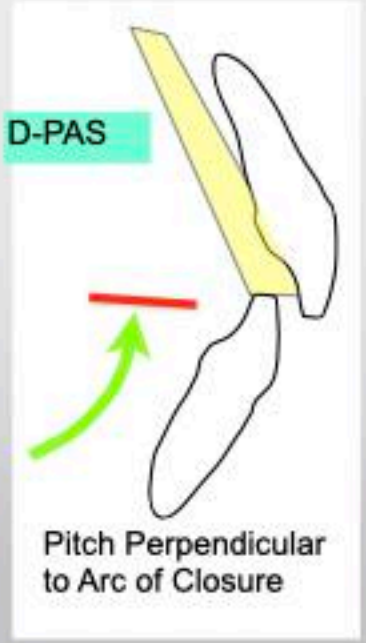
Sleep Clenching Inhibited: Wear D-PAS as night guard
Orthotic Improved Airway: D-PAS as night guard
Occlusal Muscle Disharmony: Occlusal Adjust

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.

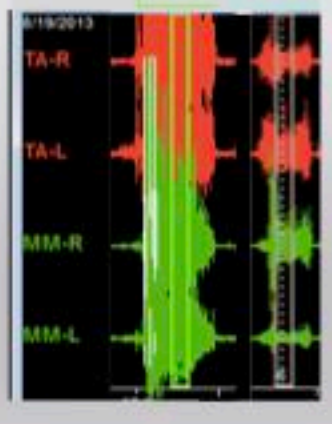
Breaks muscle engram avoidance and bracing patterns.

APS D-Pas

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

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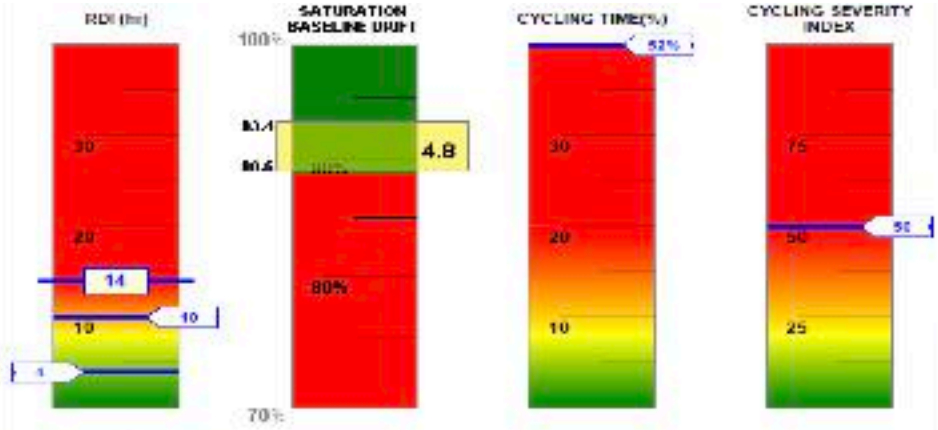


PATTERN BASED REPORT

OXYGEN SATURATION BASELINE ANALYSIS

Oxygen Saturation Baseline Drift(OSBD) (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.

SPO2 CYCLING

% Time in Cycling (Duration)	52%	(02:50:14)
Cycling Frequency	45	
96% - Lowest Sat	12	
Cycling Severity Index	50	

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

TRADITIONAL REPORT

ODI4:	11
Total ODI4 Events:	58
Time in ODI4 Events:	00:29:26
Avg ODI4 Event Duration:	00:00:28
<=88% ODI4 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 ODI4 Event: a fall in oxygen saturation of at least 4% and persisting greater than 3 seconds.

%SpO2	DURATION	%TOTAL
94-100	00:16:37	5%
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

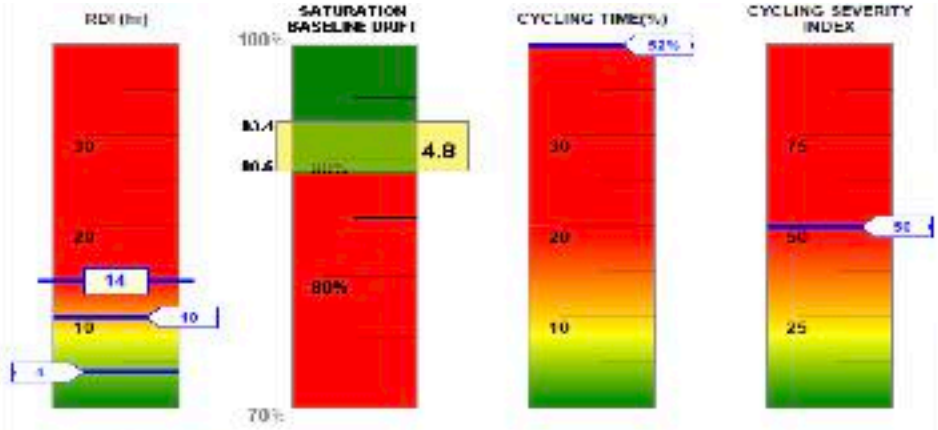
Patient Safety Inc.

SLEEPSAT

SATSCREEN

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



--Desaturations associated with Early Motion are Excluded in these calculations.
--Physician should review the waveform and consider reviewing the report without the above exclusions.

PATTERN BASED REPORT

OXYGEN SATURATION BASELINE ANALYSIS

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

Baseline is determined by the Mean SpO2 during 3 Minute window without Artifact and without Events.

SPO2 CYCLING

% Time in Cycling (Duration)	52%	(02:50:14)
Cycling Frequency	45	
96% - Lowest Sat	12	
Cycling Severity Index	50	

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

TRADITIONAL REPORT

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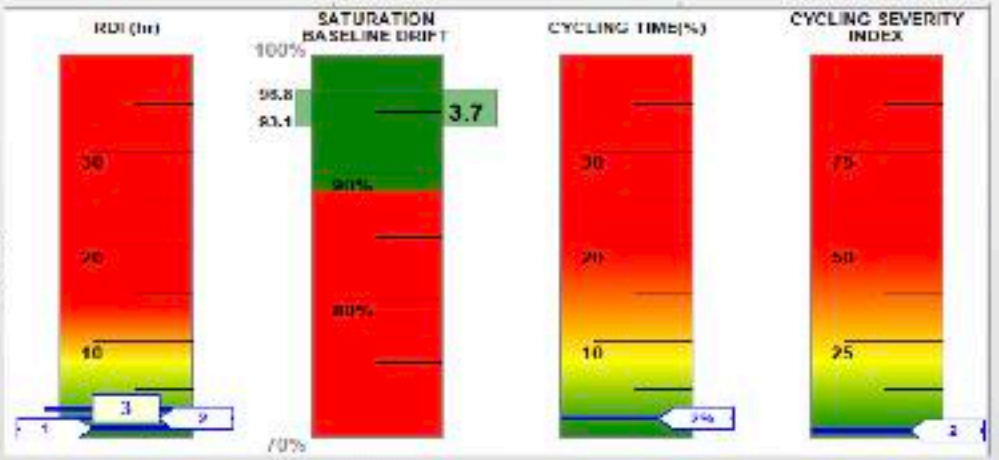
<= 70	00:00:00	0%
Total	05:27:42	100%
Motion Artifact	00:00:07	0.04%
Error Signal	00:00:05	0.03%

Does the dental orthotic make the airway better or worse?

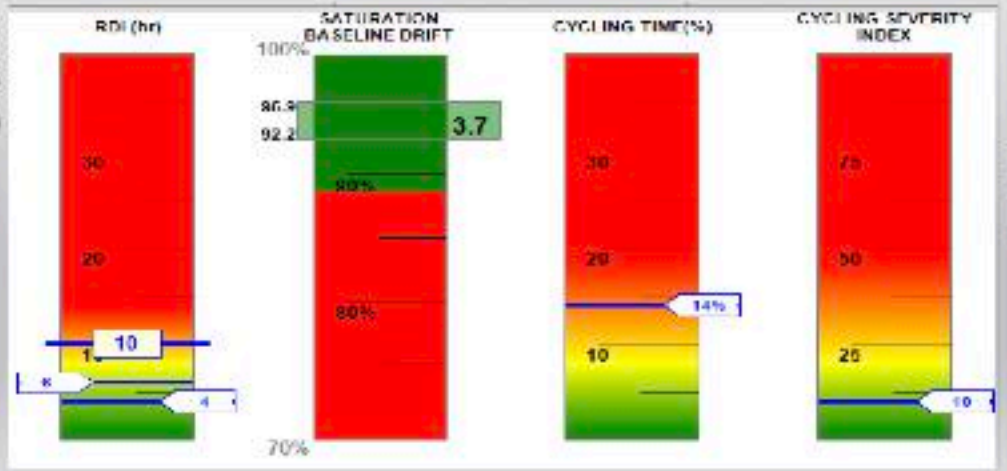
RDI= Respiratory Distress Index

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.

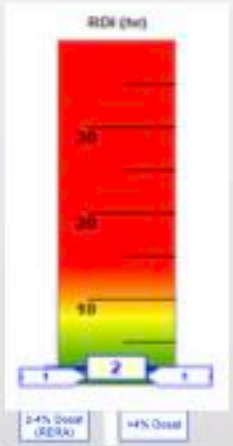
Age 16F
cc: Facial Pain, Excessive Daytime Fatigue

Age 16F
cc: Facial Pain, Excessive Daytime Fatigue

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

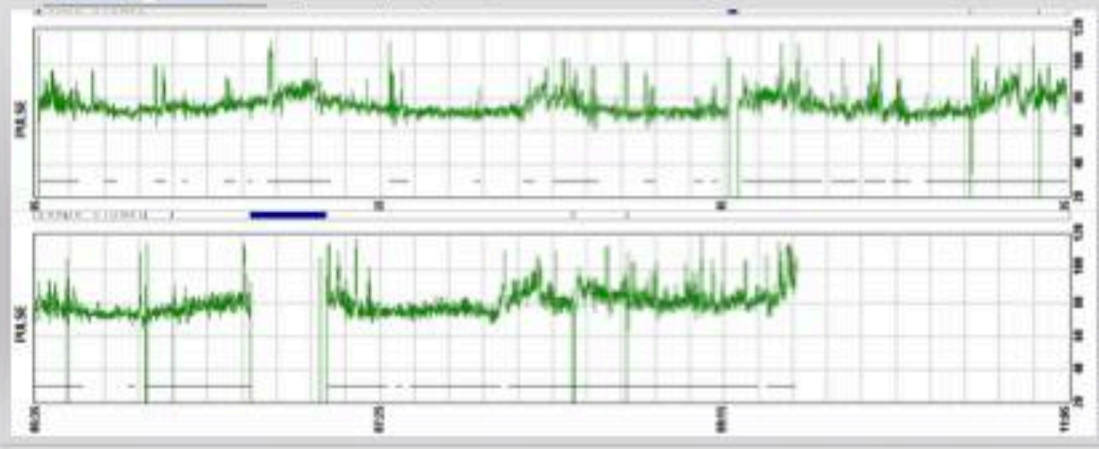
Sleep Latency Test
Dx: Narcolepsy
Recommend daytime medication

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



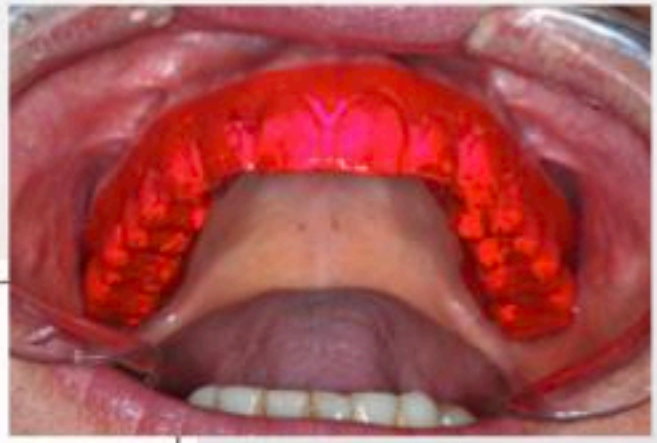
PULSE RATE DATA
Autonomic Arousals
Index (#/hr): 31
Pulse Rate Range
Mean: 78
Min: 34
Max: 122
Tachycardia - Sleep (>90 bpm)
Duration: 00:34:56
% (VRT): 6%
Bradycardia - Sleep (<50 bpm)
Duration: 00:00:35
% (VRT): 0%

Heart Rate
>90 bpm
for 35 min

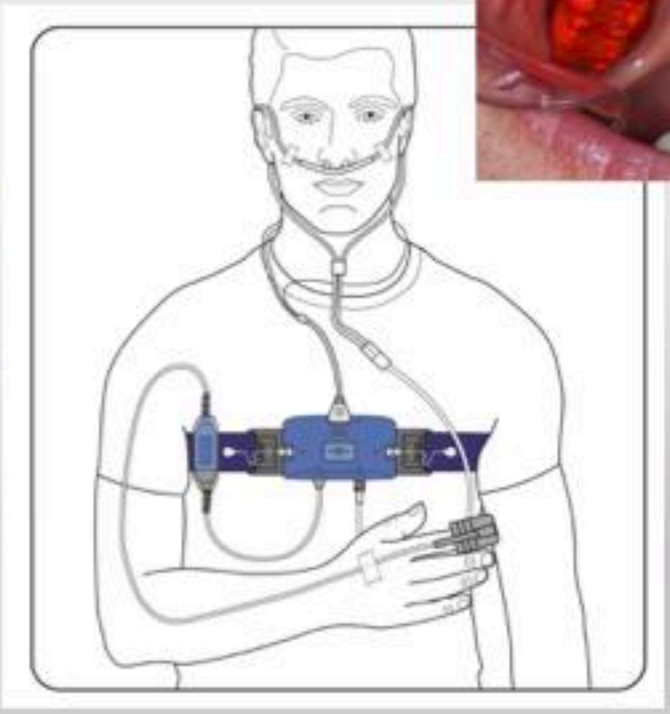


zMachine

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: 1124990976
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: 1998
Age: 20
Sex: F

Height: 63 Inches
Weight: 105 Pounds
BMI: 18.60

Note:

GENERAL sleep
Zmachine® Synergy
Home Sleep Test Report
Study Ordered by:
John R. Droter, DDS
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-axis 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)	936.8 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)	19 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. (34.1% of TST)
Total REM Time	83.2 min. (33.5% of TST)
SpO_2 < 89% cumulative time	0 min.
SpO_2 < 89% longest span	0 min.

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 woke for one epoch (i.e. 30 seconds) or more after LPS; and ≥ 3-Epoch Awakenings is the number of times the patient woke for three epochs or more after LPS (this is a subset of ≥ 1-Epoch

Sleep Study Ranges of Normal
Sleep Latency 10-20 min
Latency to REM 90 min
Sleep Efficiency >85%

N1 2% - 5%
N2 45% - 55%
N3 Deep Sleep 10% - 20%
If 8h: then: 48 min. to 96 min
REM Sleep 20% - 25%
If 8h: then 96 min to 120 min

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

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

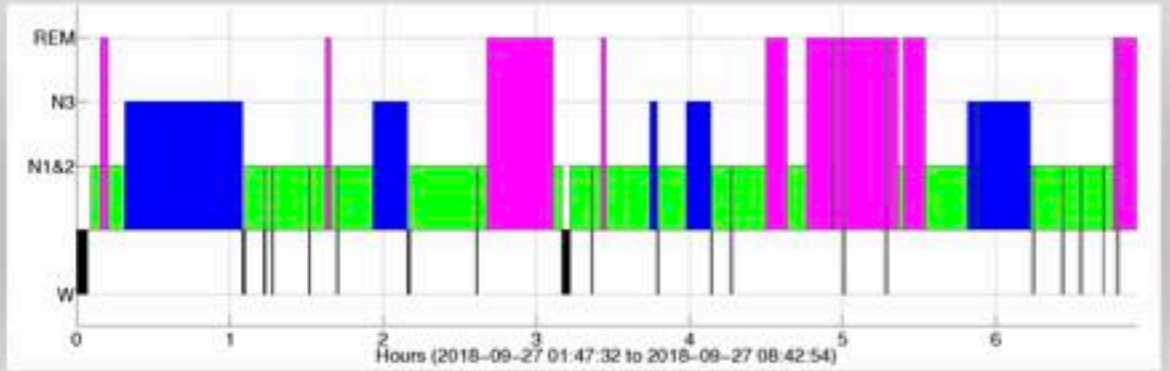
TRT is the total duration of the recording; TIB is the elapsed time from lights off to lights on; TST is the cumulative time scored as any stage of sleep; SE is 100x(TST÷TIB) expressed as a percentage; AHI is apneas + hypopneas per hour of sleep time; RDI is apneas + hypopneas + RERAs per hour of sleep time; and REI 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 11 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.

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



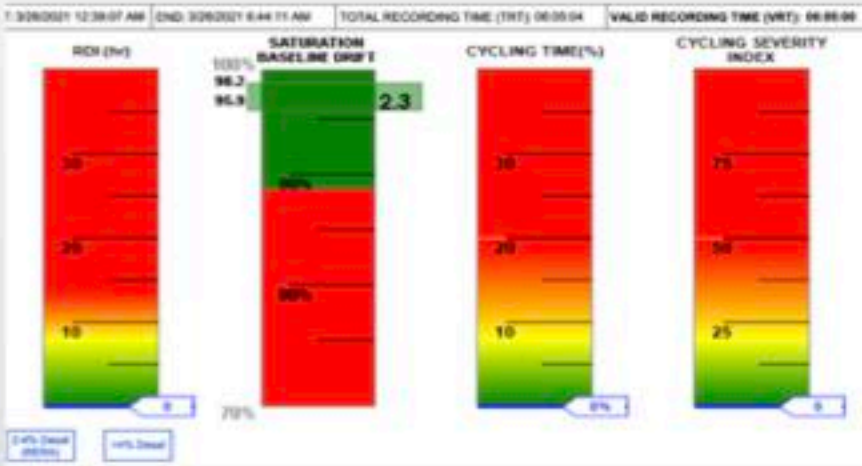
Sleep Simplified

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

Sat Screen by Patient Safety Inc



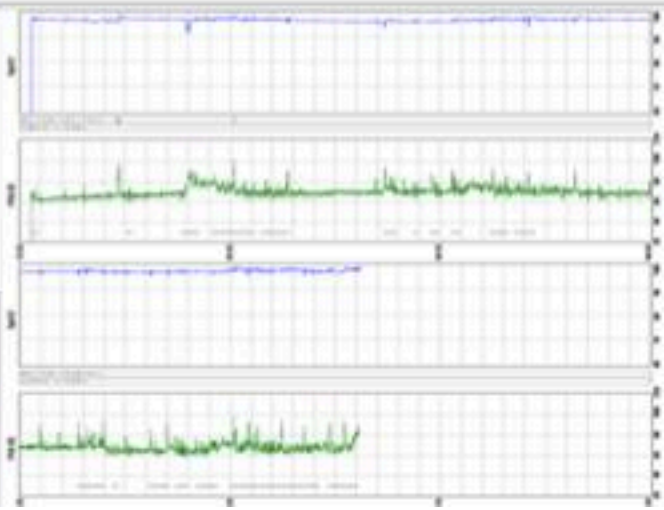
PULSE RATE DATA

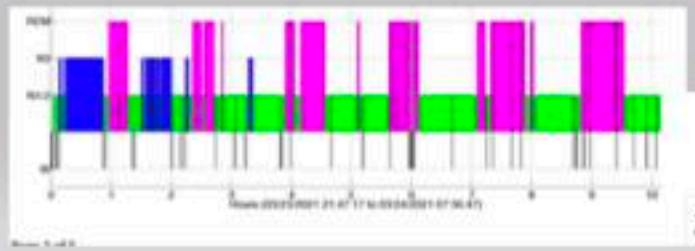
Autonomic Arousals

Index (#/hr): 23

Pulse Rate Range

Mean:	69
Min:	58
Max:	102





AHI: 0.5

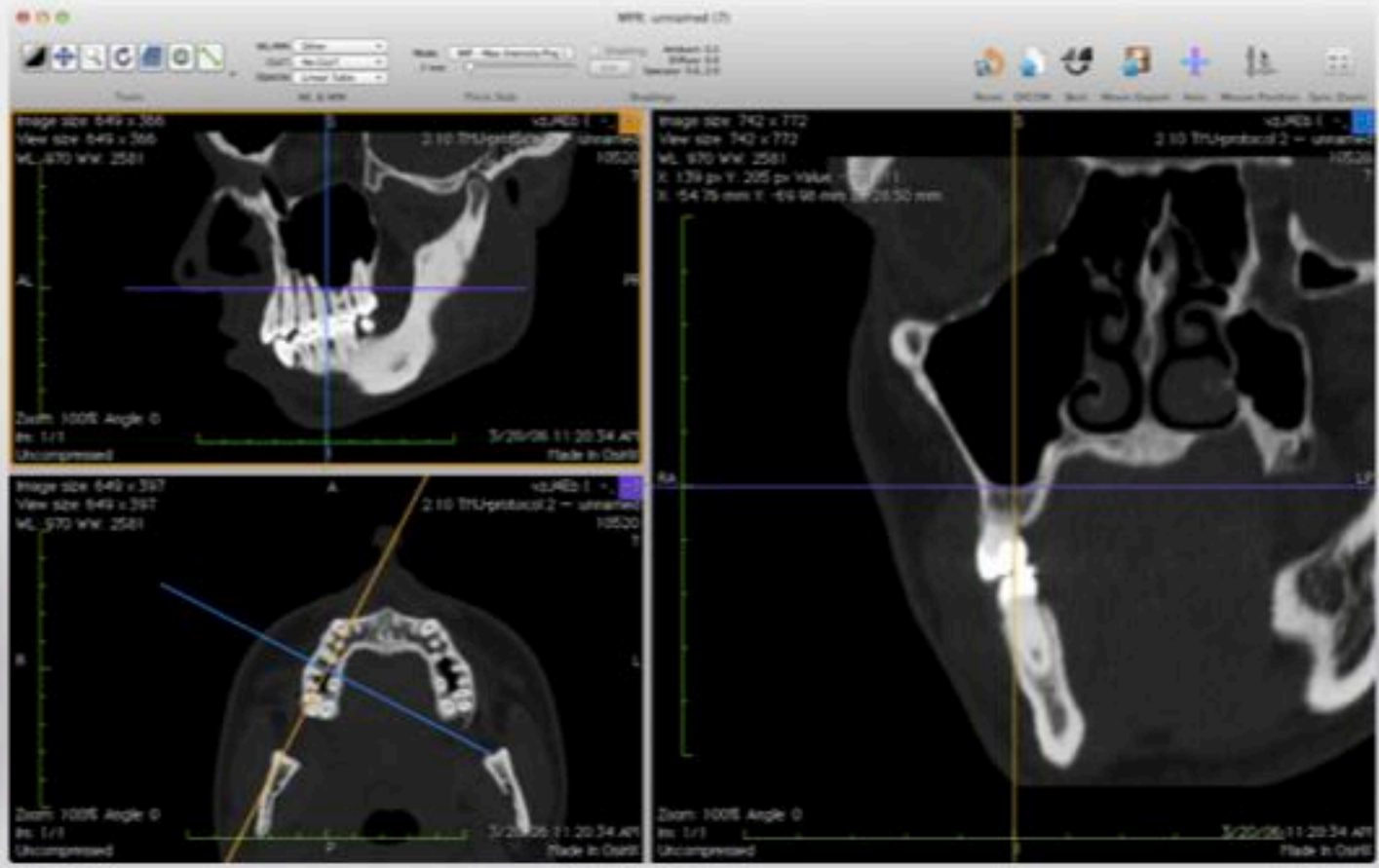
AHI is how many times an hour your blood oxygen goes down.

zMachine: Interrupted Deep and REM

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

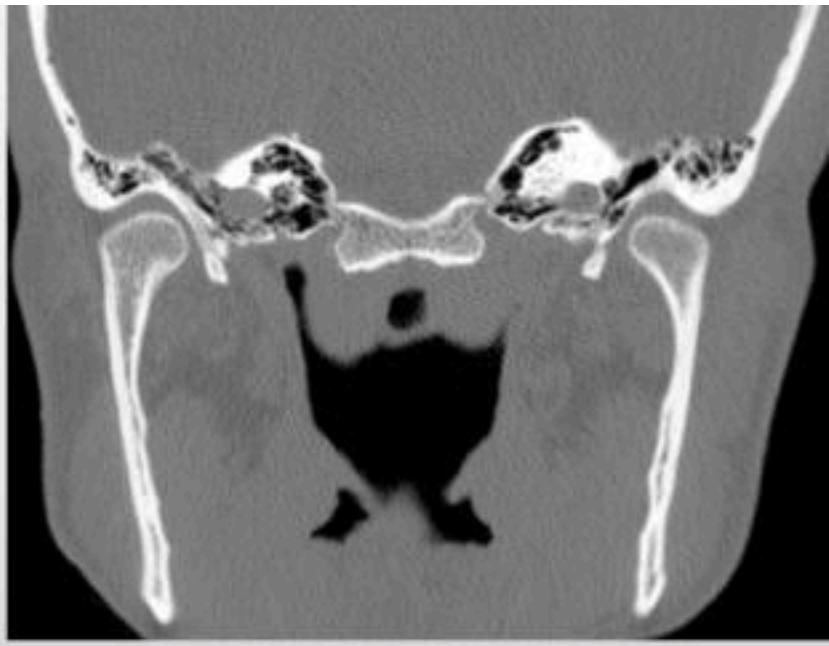
Condyle Centered in Fossa

- Coronal and Sagittal
- Room for Disc

Stable CR load Zone

- Condyle closest to fossa

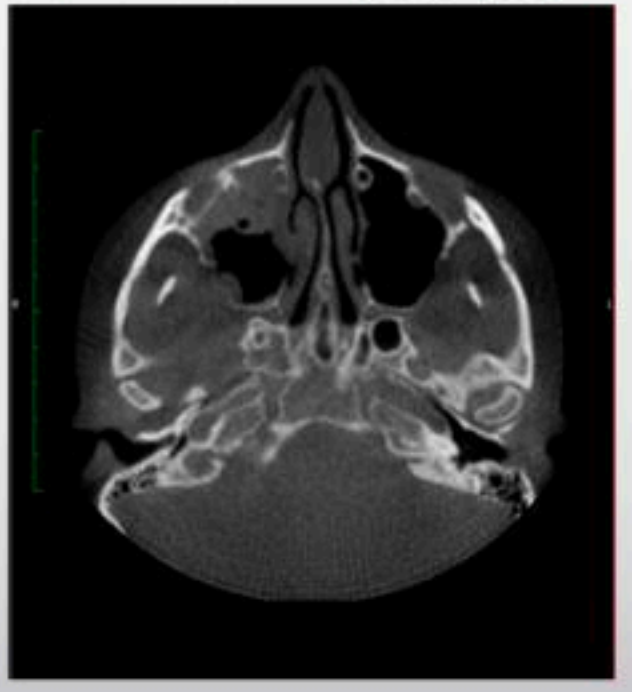
CT Scan
Coronal View



CT Scan
Sagittal View

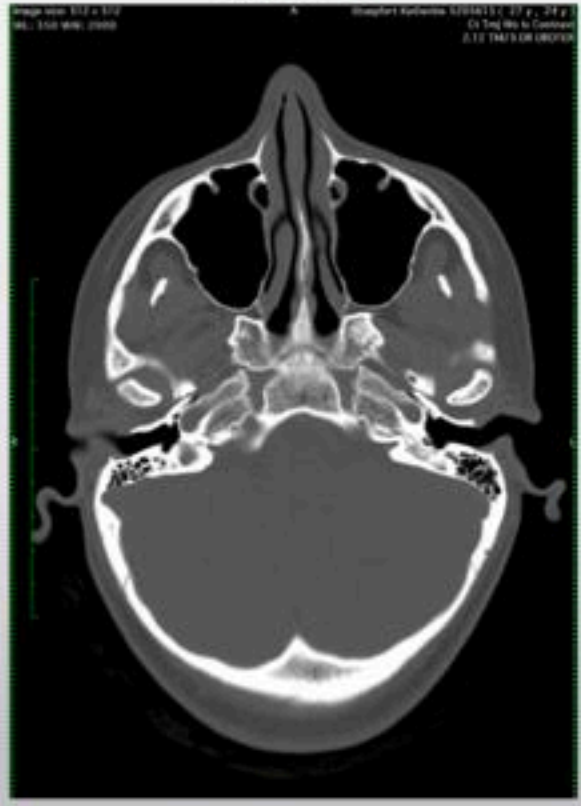
Compare CT scans

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

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

Right TMJ Scroll Corrected Sagittal and Corrected Coronal

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

Left TMJ Scroll Corrected Sagittal and Corrected Coronal

Condyle:	☐ Normal Size	☐ Small condylar size ☐
	☐ Normal Shape	☐ Altered condylar shape ☐
	☐ Cortex Intact	☐ Cortex not intact ☐
	☐ Cortex Even	☐ Hyperadolfication ☐
Fossa:	☐ Normal Size	☐ Small fossa size ☐
	☐ Normal Shape	☐ Flattened fossa shape ☐
	☐ Cortex Intact	☐ Cortex not intact ☐
Condyle Position	☐ Centered in fossa	☐ Condyle distalized ☐
Joint spacing	☐ Room for disc	☐ No room for disc ☐
CR Load Zone	☐ Superior medial	☐ Superior Lateral ☐
Estimate Piper:	L1 L2 L3a L3b L4a L4b L5a L5b	
Left TMJ Health:	☐ Healthy	☐ Damaged ☐ Active Degeneration ☐ Adapting ☐ Adapted

Scrolling Coronal View, Sagittal View, Axial View

All Tissue:	☐ Right = Left:	☐ = Except _____
Look for tumors:	Brain, Muscle, Parotid Submand Gland, Hypertrophy	
All Bones:	☐ Right = Left	☐ = Except _____
Look for hyperadolfied or radiolucent areas, cysts		
Nasal (Sagittal, Cor):	☐ Open	☐ Restricted ☐ Deviated Septum ☐
Sinuses "	☐ Clear	☐ Thickened Lining ☐ Sinus Polyps ☐
Airway "	☐ Adequate	☐ Restricted ☐
Teeth (Sagittal, Cor):	☐ No PAP	☐ PAP # _____ ☐
(Axial):	☐ No Gross Caries	
Perio (Thick Sagittal):	☐ No Gross Perio Bone Loss	
Atlas XD	☐ Appears Centered	☐ Not Level with Skull Base ☐
C2, C3, C4 XD	☐ Aligned	☐ Misaligned
Max Maxil Relation	☐ Normal Sagittal	☐ Retrognathic ☐ Maxilla ☐ Mandible
Max Maxil Canting	☐ Normal Coronal	☐ Asymmetric Cant ☐ Maxilla ☐ Mandible

Impression:

Signature: _____

Review of Scan: CT/CBCT Guide

John R Droter DDS

TMJ

Condyle

Fossa

☐ Normal Size, Normal Shape, Cortex Intact

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

Condylar Position

☐ Centered in fossa

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

Joint Spacing

☐ Centered in fossa

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

CR Load Zone (Centric Relation Load Zone)

☐ Superior medial

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

Estimate Piper

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

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

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

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

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

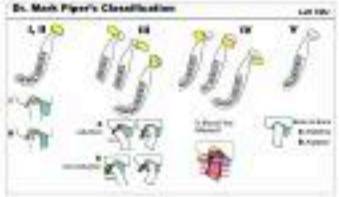
4a The disc is fully displaced off the head of the condyle and reduces on opening. There will be a shifting of the mandible which can be seen on the CBCT. **Condyle not centered in fossa.** Clinically there will "click or wobble" vibration as the disc reduces and subluxates. While most vibrations are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

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

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

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

Dr. Mark Piper's Classification



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

Right TMJ Scroll Corrected Sagittal and Corrected Coronal

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

Estimate Piper: R1 R2 R3a R3b R4a R4b R5a R5b

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

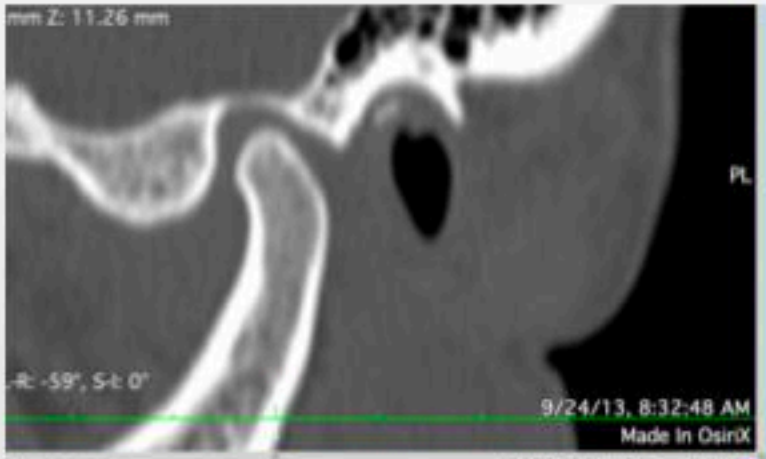
CT Left
Piper 2 from MRI

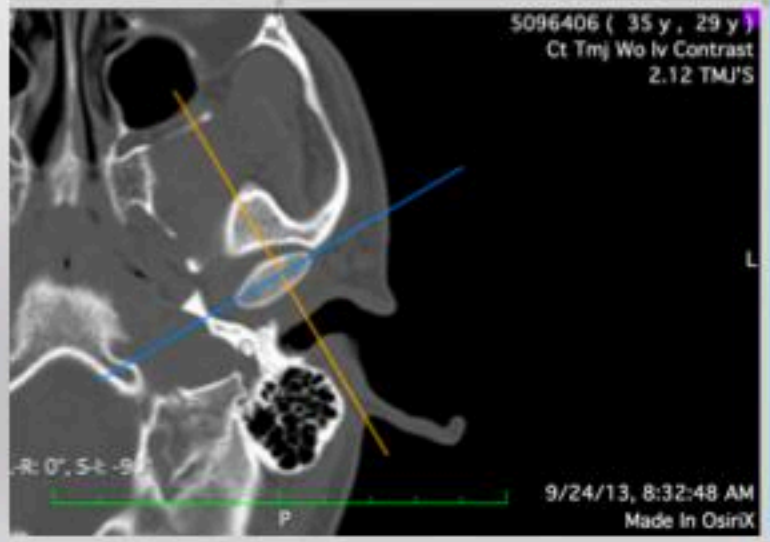
Condyle:	☑ Normal Size
	☑ Normal Shape
	☑ Cortex Intact
	☐ Cortex Even
Fossa:	☑ Normal Size
	☑ Normal Shape
	☑ Cortex Intact
Condyle Position	☐ Centered in fossa
Joint spacing	☑ Room for disc
CR Load Zone	☐ Superior medial

☑ Hypercalcification

☑ Condyle distalized

☑ Superior Lateral





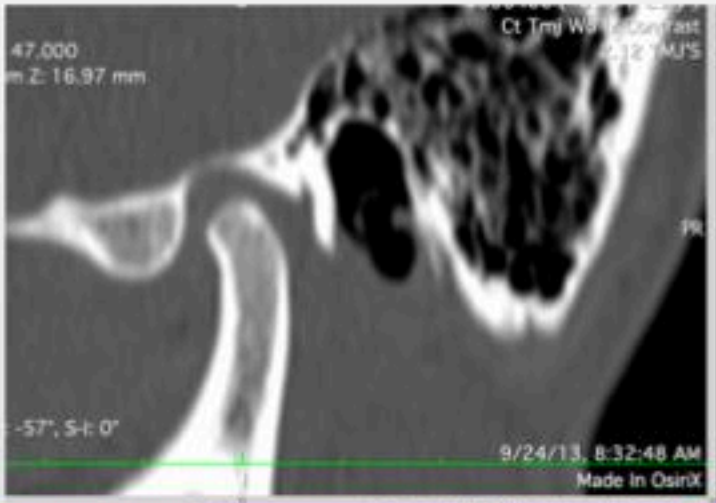
CT Right
Piper 4a-e from MRI

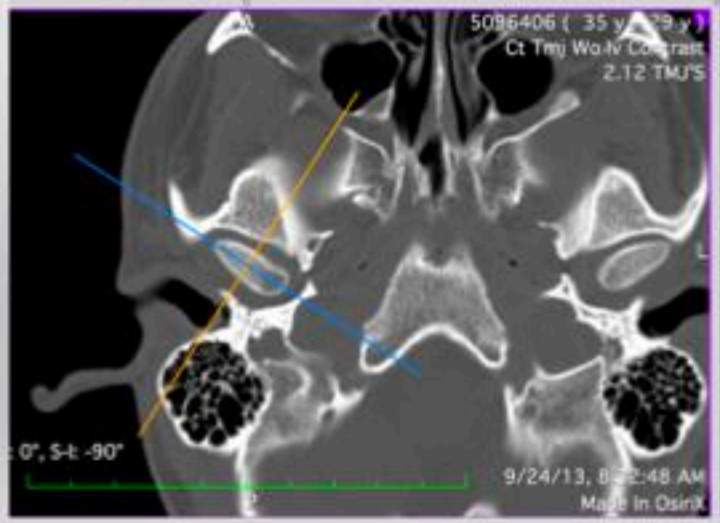
Condyle:	☑ Normal Size
	☑ Normal Shape
	☑ Cortex Intact
	☐ Cortex Even
Fossa:	☑ Normal Size
	☑ Normal Shape
	☑ Cortex Intact
Condyle Position	☑ Centered in fossa
Joint spacing	☑ Room for disc
CR Load Zone	☐ Superior medial

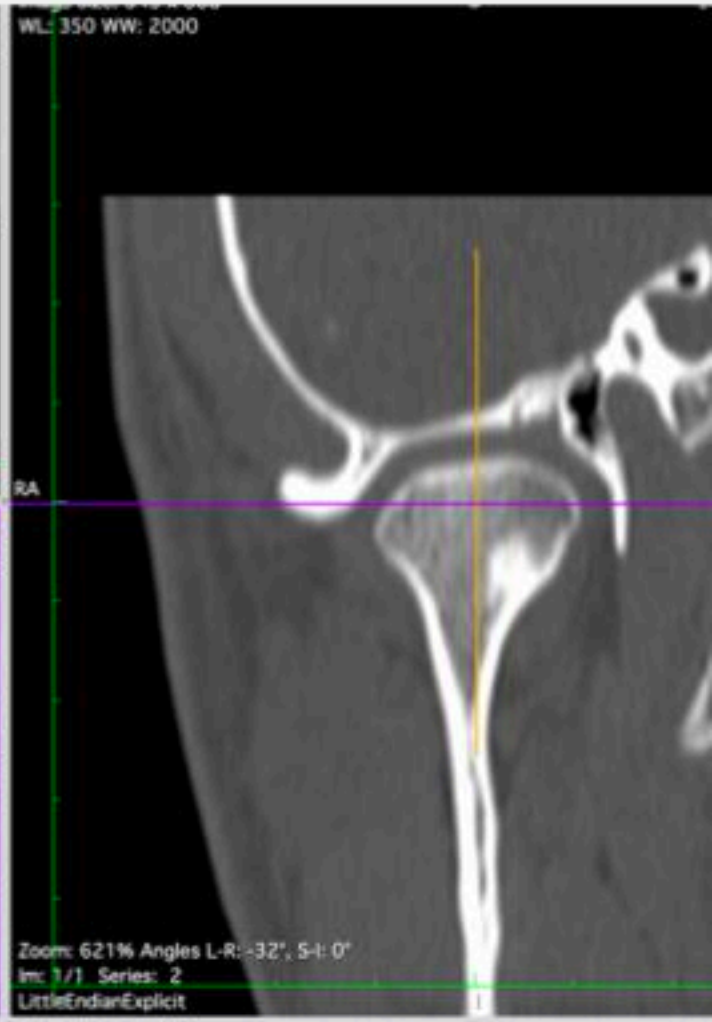
☑ Hypercalcification

☑ Superior Lateral

✔ Note: Large joint space





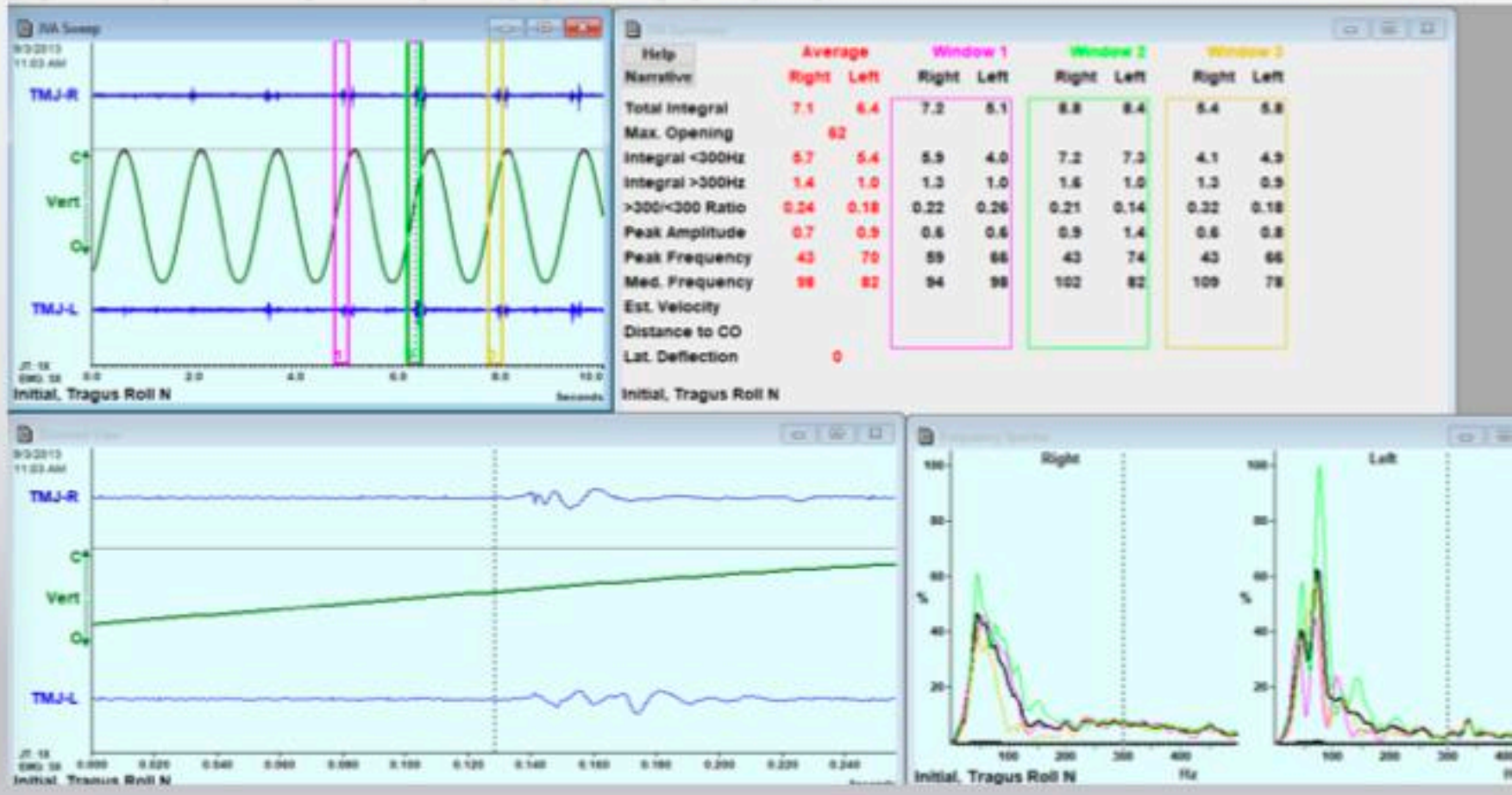


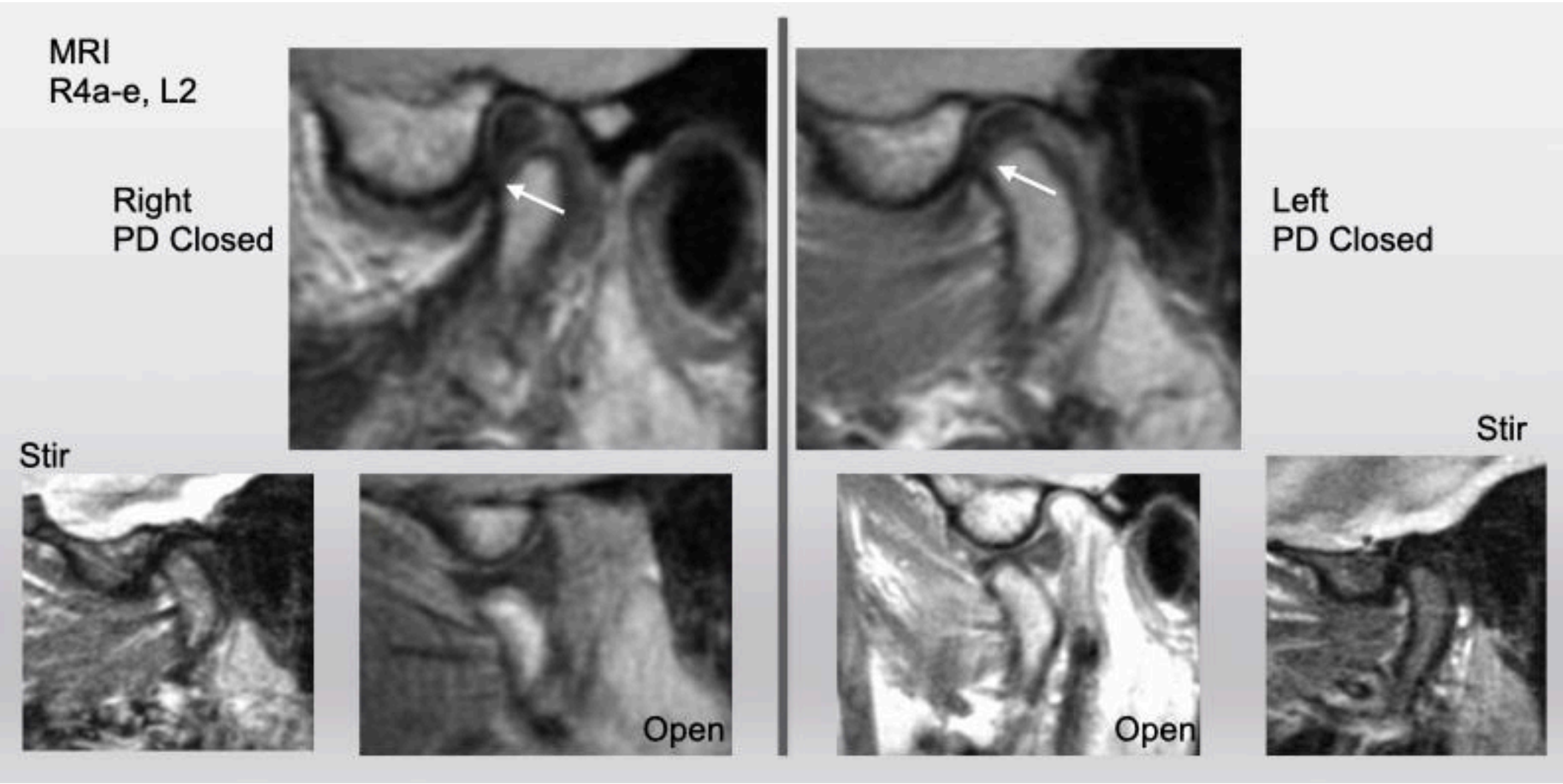
Slight Wobble before tooth contact

Joint subluxation on movement

Clinical Relevance?

Early damage from parafunction




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

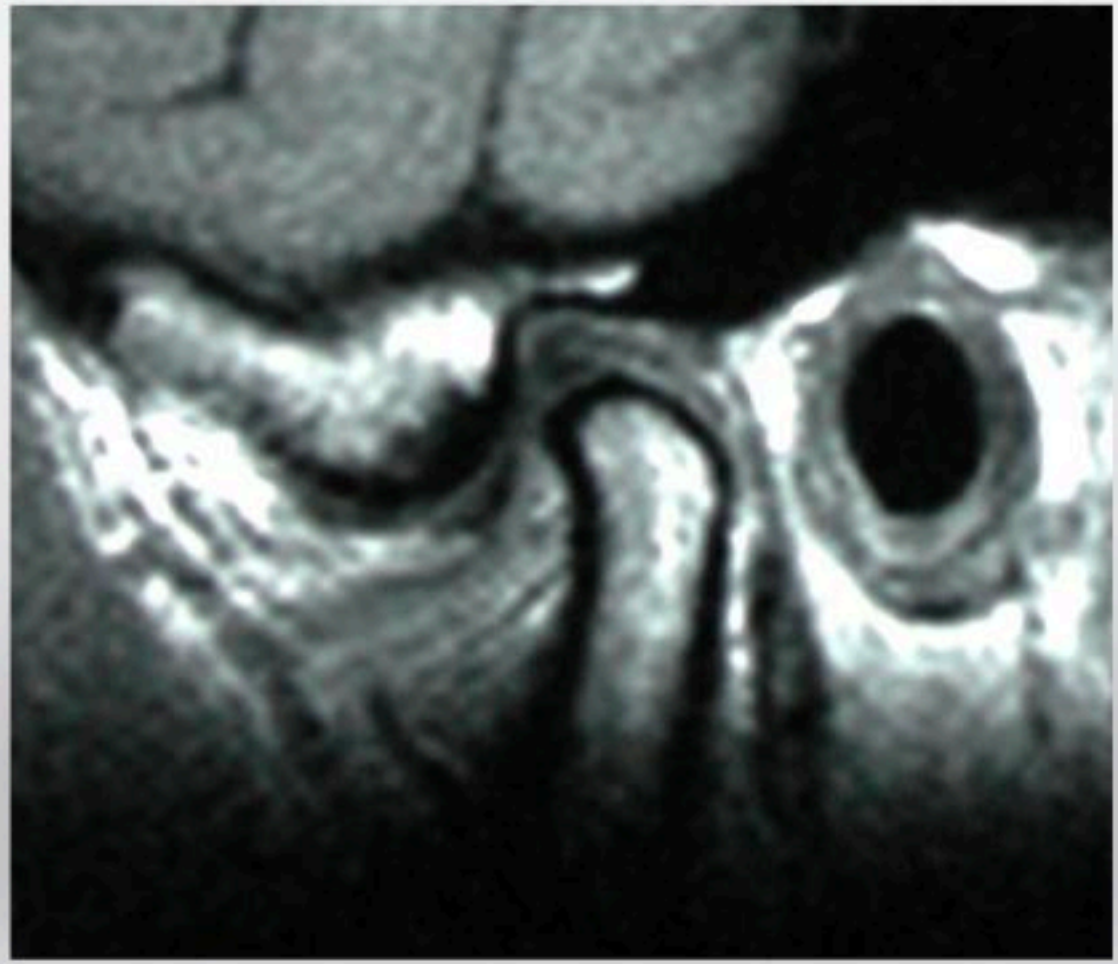
Facial Pain Diagnosis

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

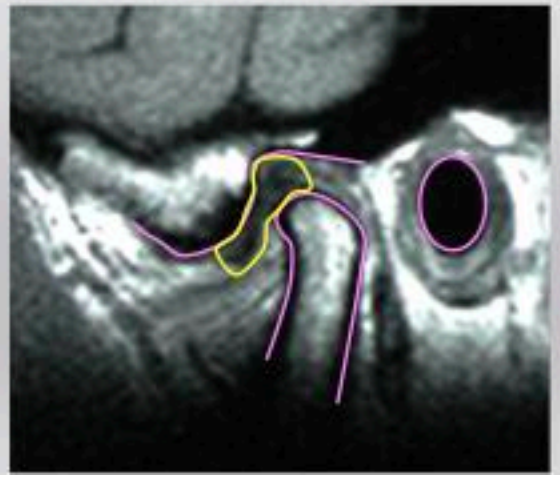
Blood Tests



Short

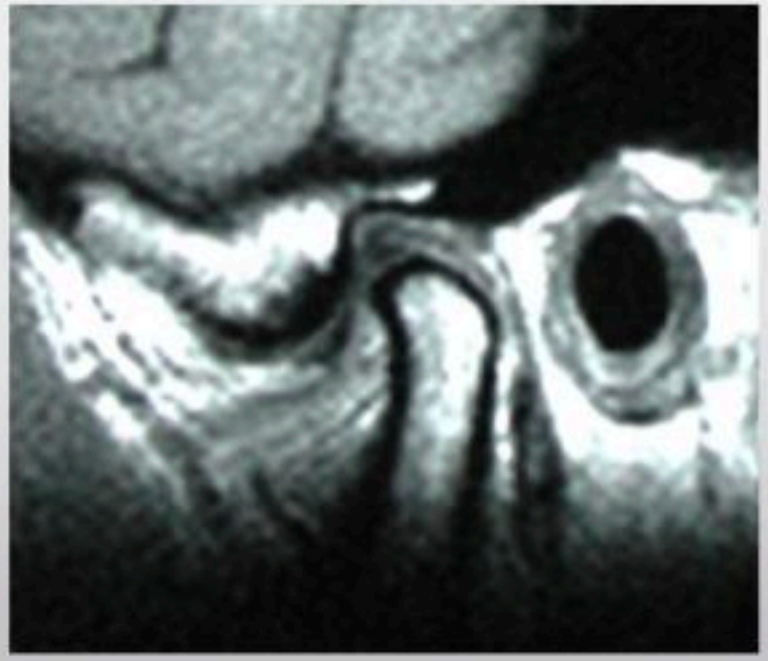
T1 Inverted

T1 Sagittal Closed



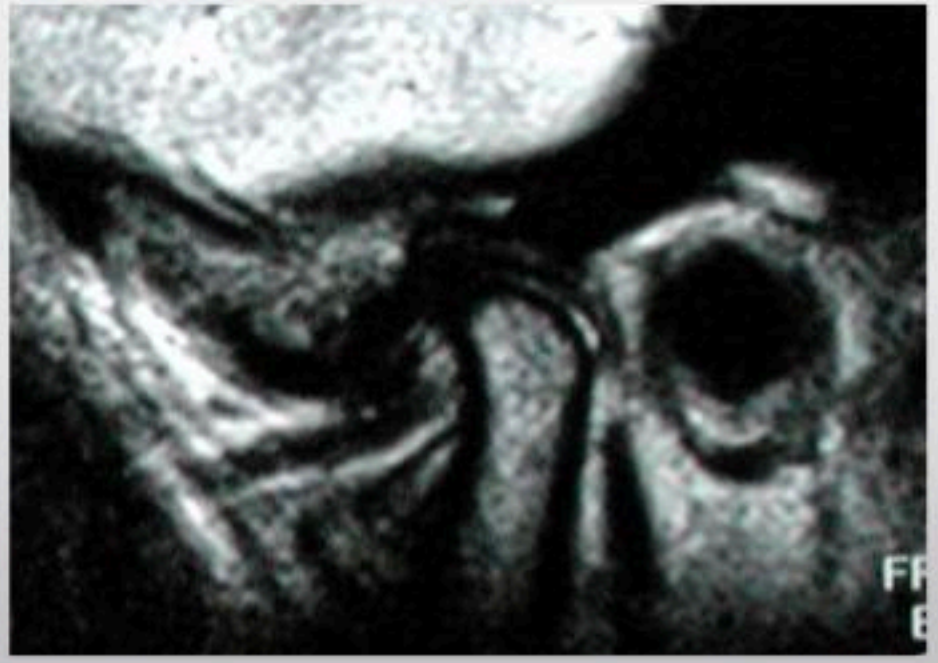
Normal MRI T1 and T2

T1 Sagittal Closed



T1 shows more fat

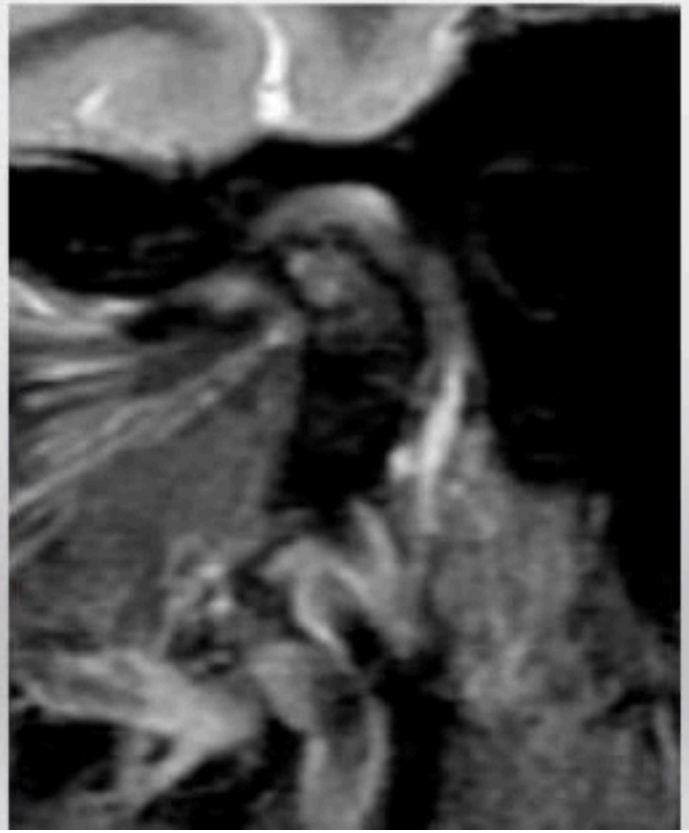
T2 Sagittal Closed



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

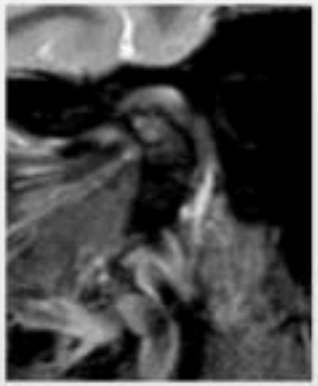
Diagnostic Tools

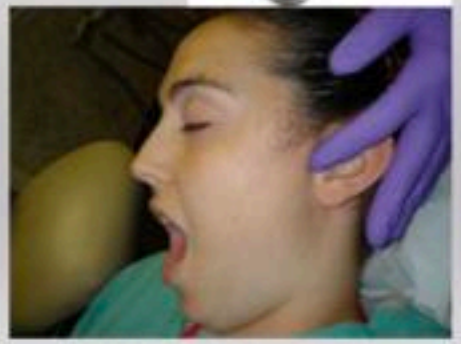
1 Written and Oral History
2 Observation
3 Physical Exam
- Muscle Palpation
- Joint Palpation
- Joint Auscultation
- Joint Motion

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

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

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





Blood Work

CMP- Complete Metabolic Panel non-fasting
Iron Panel
Vitamin D
hs-CRP- High Sensitivity Reactive Protein

____ CMP ~~Fasting~~ Complete Metabolic Panel, Chem 14, ~~Fasting~~ ~~Glucose~~

____ Total Iron, Serum
____ TIBC Total Iron-Binding Capacity
____ Ferritin, Serum
____ % Transferrin Saturation

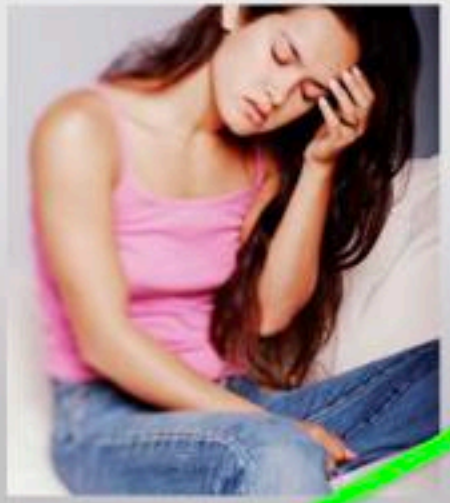
____ Vitamin D, 25(OH) and 1,25 Dihydroxy (LC/MS technique)
____ Vitamin B12
____ Homocysteine

____ hs-CRP High Sensitivity C-Reactive Protein
____ ESR, Westergren Erythrocyte Sedimentation Rate, Westergren

____ HbA1C Hemoglobin A1c, Glycated hemoglobin
____ Fasting Insulin

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		Specific Dx
Tooth Pain	vs	Irreversible Pulpitis
Arthralgia	vs	Osteoarthritis