Tanner Big Sky 2

Sept 2025

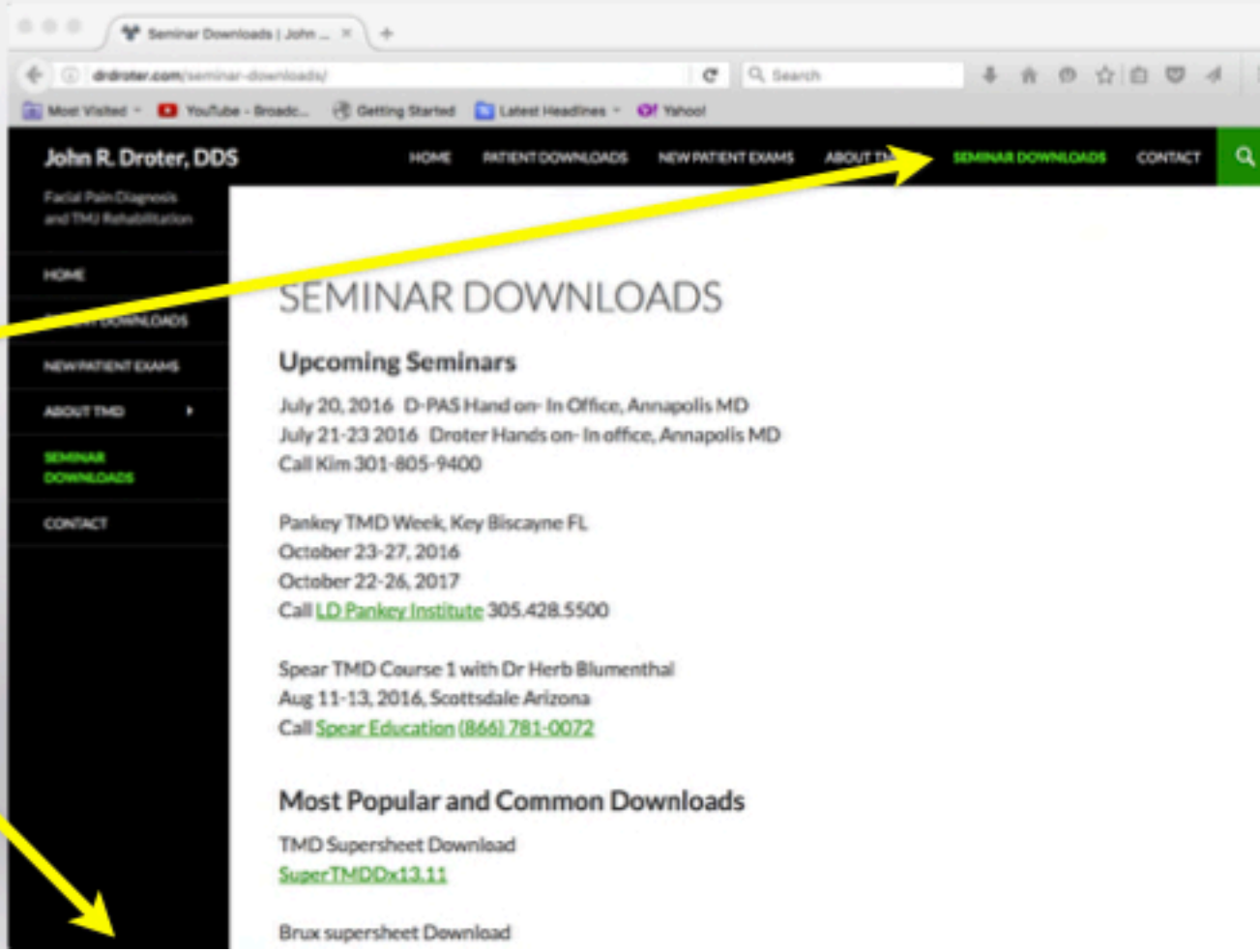
John R Droter DDS
Annapolis, Maryland

John R Droter, DDS

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

Seminar Download

Tanner Big Sky



Hello. I am:

John R Droter DDS
Annapolis, Maryland

Disclosures:

Atomic Skis- Sponsored.
I got stuff.

LD Pankey Institute TMD Course
Honorarium

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

APS
ArrowPath Sleep

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

LIVING TREE
DENTAL LAB

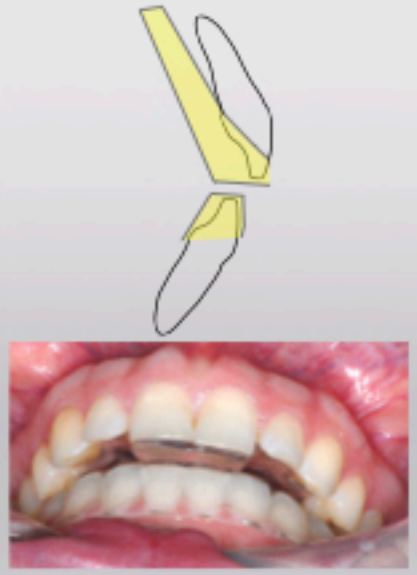
Ski Coach for National Ski Patrol
Level 3 Certified Professional Ski Instructors of America

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

3D Printed Orthotics

D-PAS
Diagnostic-
Palatal Anterior Stop

Brux-PAS
with lower Essix



Hard Lower Posterior Stop
with upper essix

Hard Lower Full Coverage
Centric Relation Orthotic

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
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

Lingual Light Wire- Crozat Arch Expansion

Age 29 Start

7 months LLW Age 30

Restorative Dentistry

Pathological Occlusion

??Airway Related Bruxing?

Restore Function

Composite Trial Occlusion

AHI + 26 CPAP

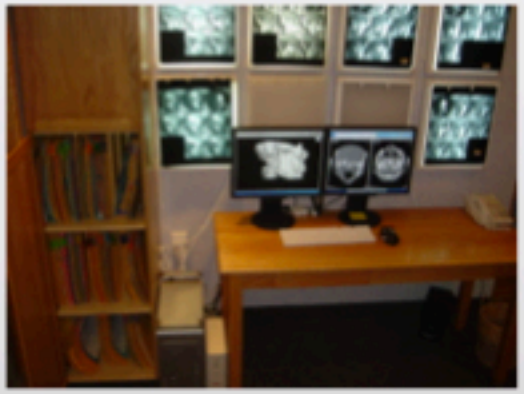
Anterior guidance

or group function?

CT and MRI Scans in my practice since 1992.

Dr Guy Haddix
had been taking CT scans since 1990

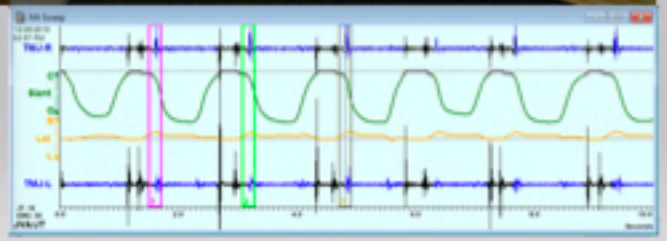
Compare CT, Mounted models, MRI, JVA before and after a case.
What can I see now looking back?



Closet full of printed scans just as digital appeared!!

The magic in the coronal view
The Load Zone

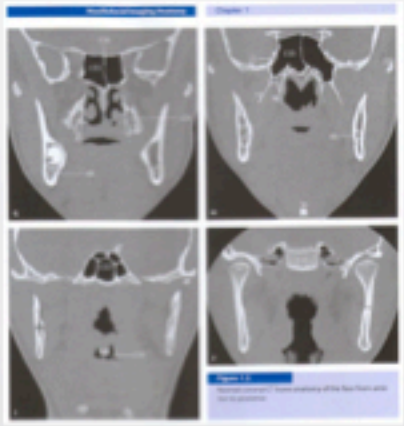
JVA since 2004

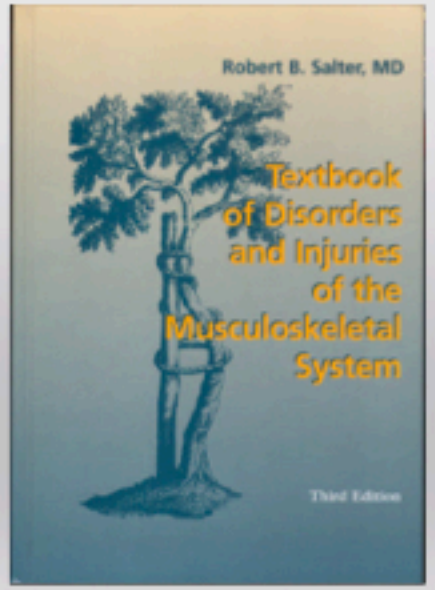


My Core Belief

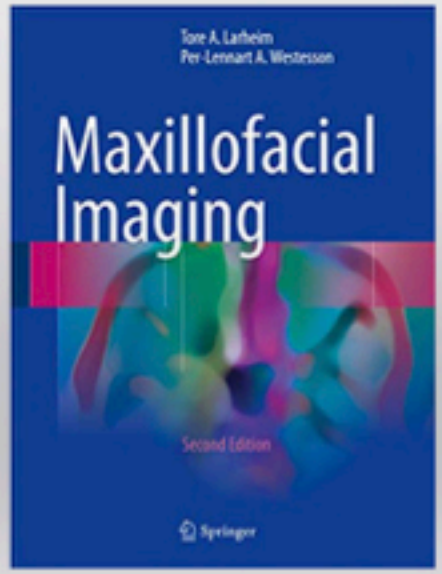
The TMJ is a synovial joint of the human body and will undergo the same disease processes as any other synovial joint

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





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



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

Maxillofacial Imaging
Larheim
Westesson

1. TMJ Damage and Diseases

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
Fracture of subcondylar process of mandible
Gout, TMJ
Growth Disturbance Prepuberty due to TMJ damage
Hemarthrosis TMJ, Traumatic
Hyperplasia Mandibular Condyle,
Hypoplasia Mandibular Condyle
Hypoxia Reperfusion Injury, TMJ Cartilage Damage
Hypoxic Progressive Condylar Resorption
Impingement Retrodiscal Tissue
Inflammatory Tissue Bone Resorption, TMJ Condyle
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
Rheumatoid Arthritis TMJ
Sprain Discal Ligament TMJ, acute with joint edema
Subluxation on Loading, TMJ
Subluxation on Movement, TMJ
Synovial Cyst (Ganglion Cyst)
Synovial Hyperplasia
Synovitis

Facial Pain Diagnosis

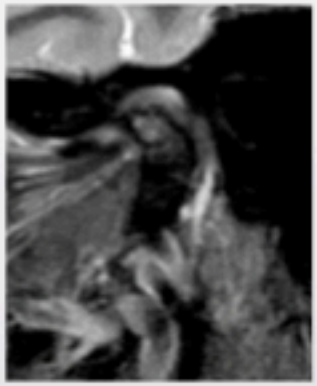
Diagnostic Tools

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



Review Tanner Big Sky 1

John R Droter DDS
Annapolis, Maryland

6 Common TMDs

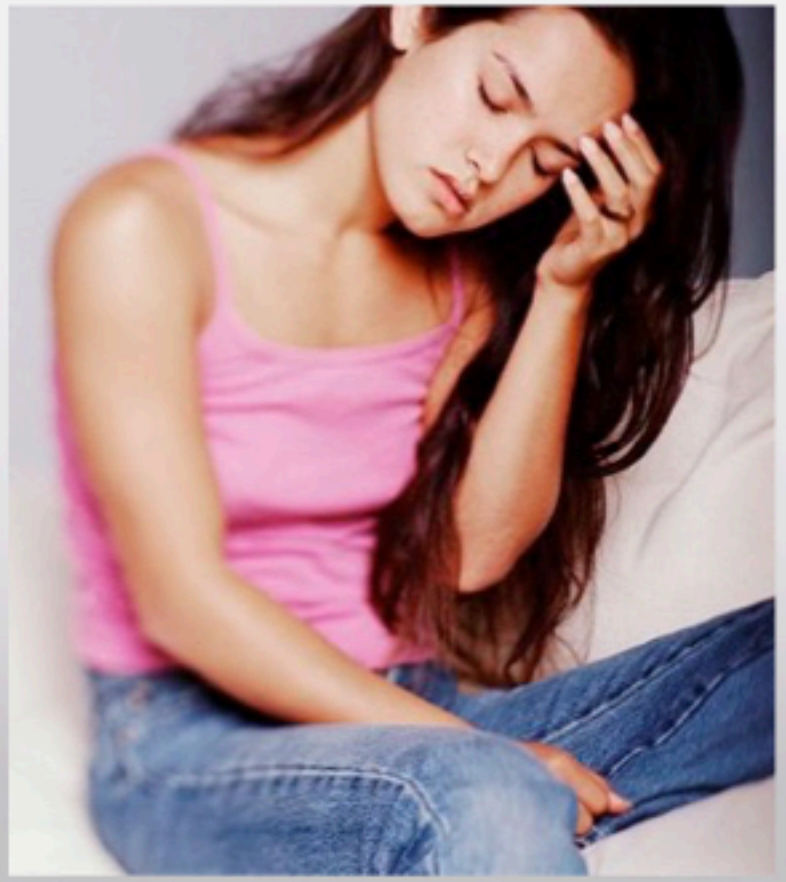
Parafunctional Clenching
Parafunctional Grinding
Occlusal Muscle Dysfunction
Osteoarthritis
Acute Sprain
Acute Closed lock of TMJ disc

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

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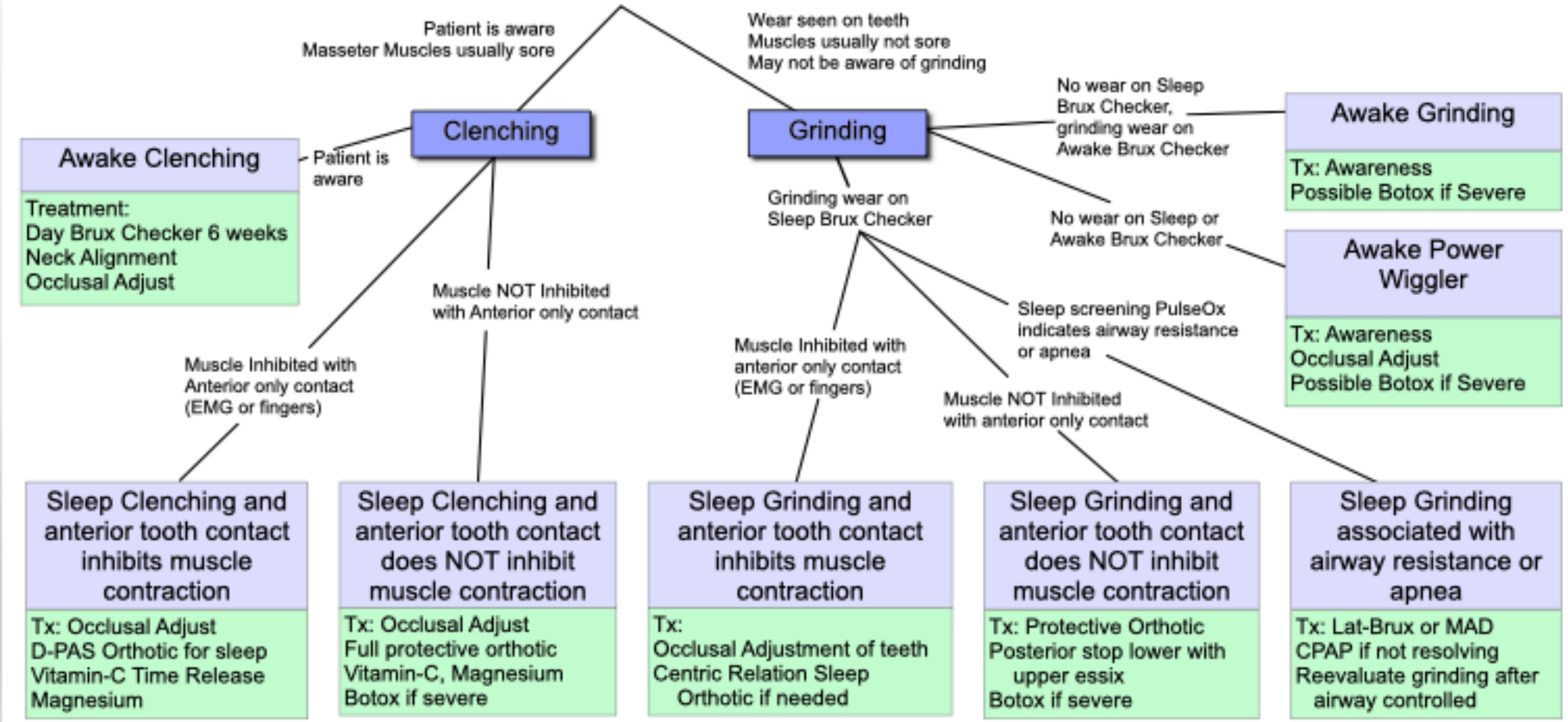
BRUXING: PARAFUNCTIONAL TOOTH CONTACT



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

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

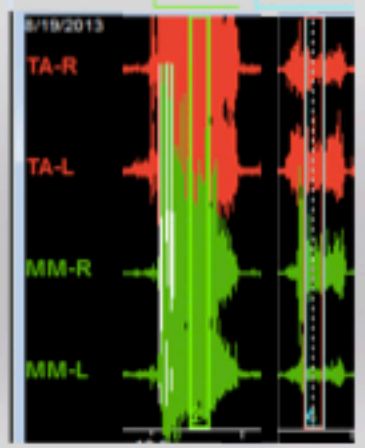
BioResearch EMG

BioResearch mScan

Diagnostic Palatal Anterior Stop

Patient with muscles inhibited by anterior only contact

	Clench MaxIC	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

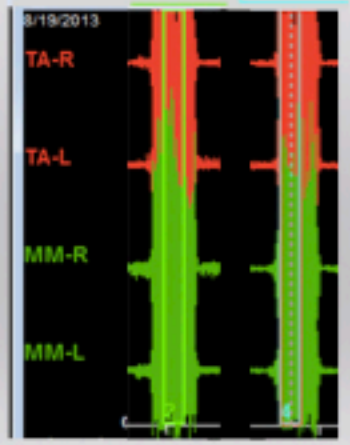


Major decrease in muscle power with D-PAS

BioResearch EMG

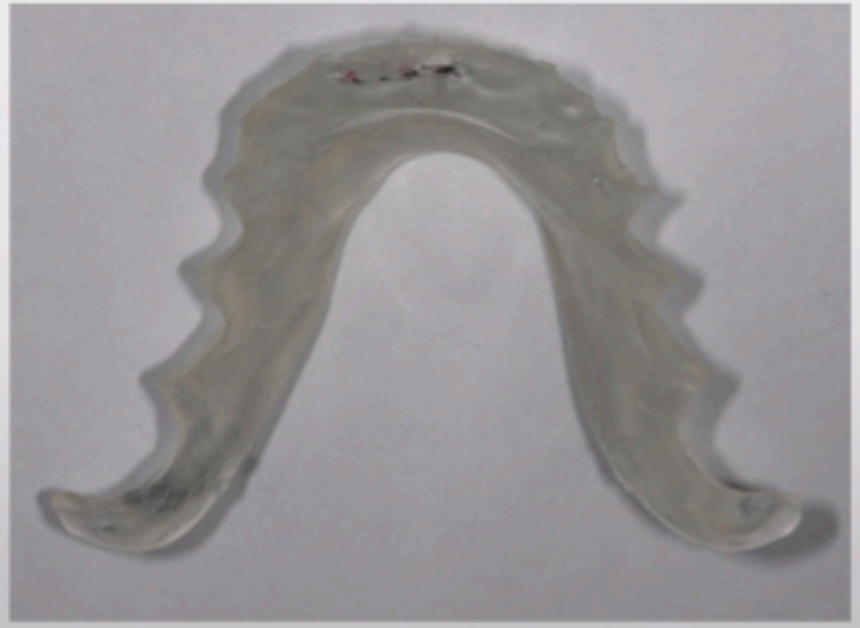
Another Patient with muscles NOT inhibited by anterior only contact

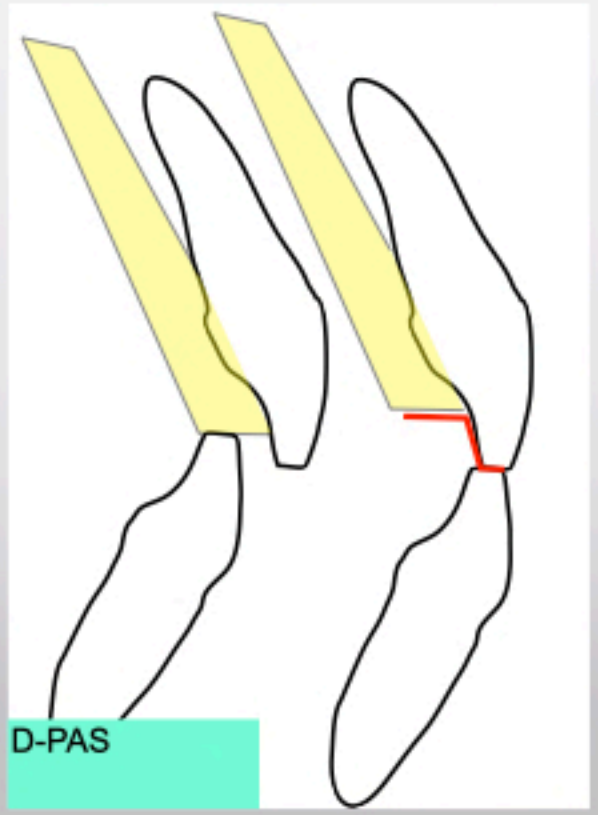
	Clench MaxIC	Anterior Stop D-PAS
	µV	µV
TA-R	82.2	77.9
TA-L	124.6	103.6
MM-R	185.0	169.0
MM-L	79.9	86.6



Muscle power same with D-PAS

Diagnostic Palatal Anterior Stop
D-PAS





Basically an upper Hawley with anterior stop without clasps or wire

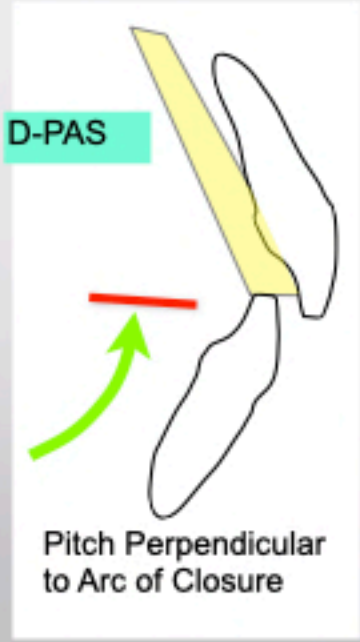
Diagnostic Palatal Anterior Stop

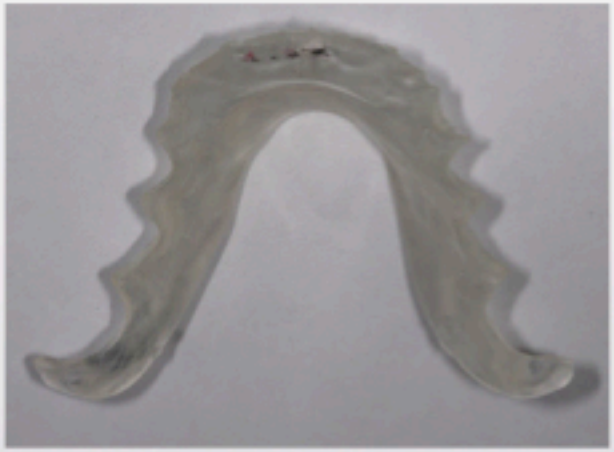
D-PAS Test: Wear 2 weeks for sleep, and occasional daytime

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

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

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





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

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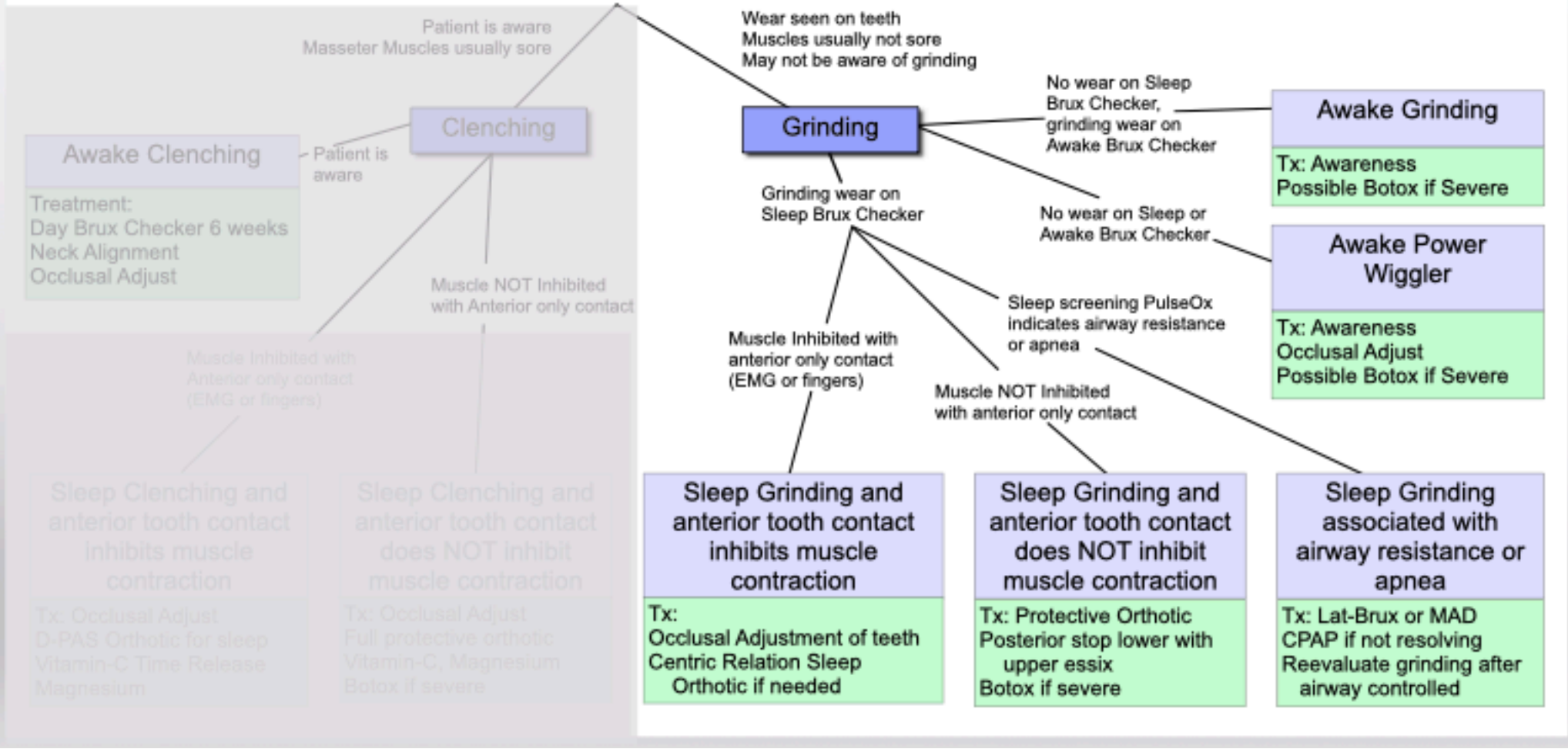
BRUXING: PARAFUNCTIONAL TOOTH CONTACT

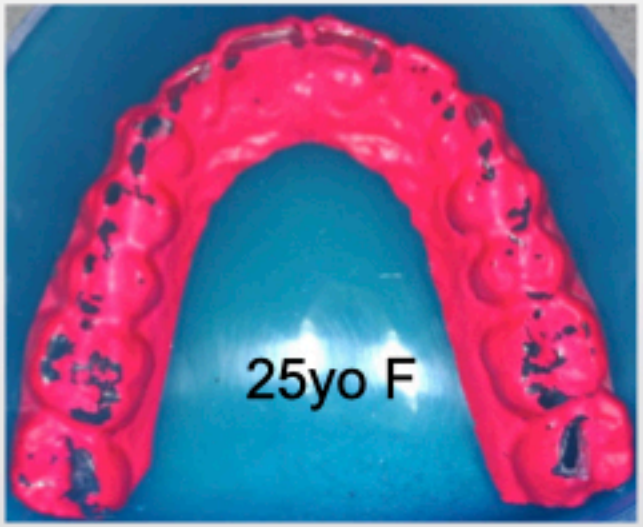


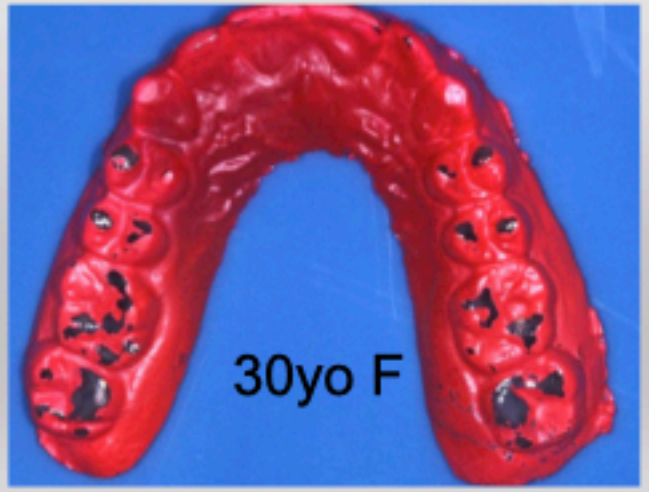
2. Does this occur awake or asleep?

Brux Checker
Great Lakes Orthodontics

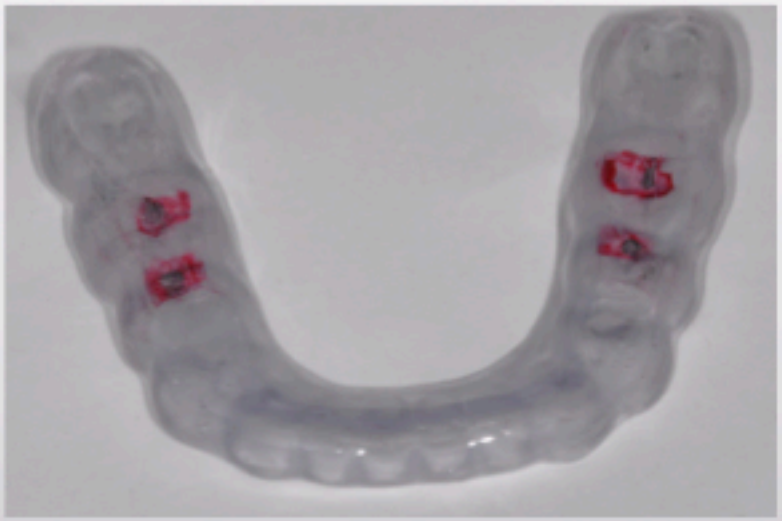
0.1mm Mylar

Made on Biostar Machine





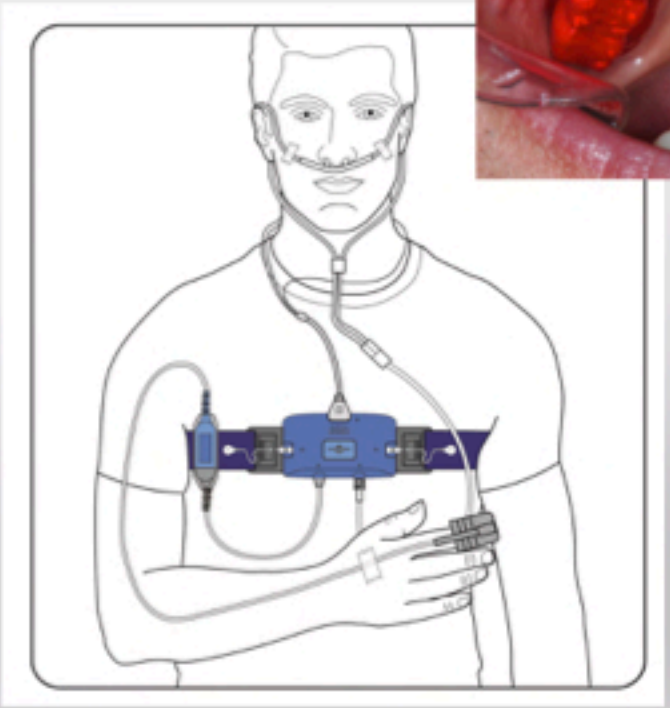
Lower Posterior Stop Night guard with upper Essix



zMachine

GENERAL sleep

zMachine + Brux Checker
+ Snore Lab



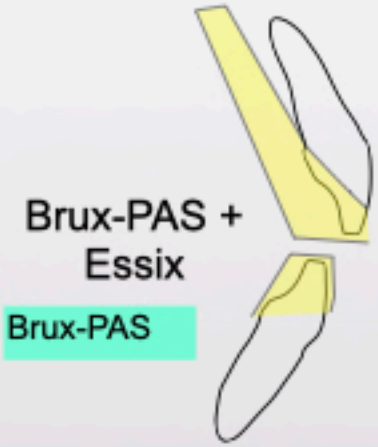
Call (888) 330-4424
Use Code: DROTER to receive special offer

Also ask for access to Droter Modified Report

Which Occlusal Orthotic for Grinding?

Lower Posterior Stop with upper essix

Upper Hard CR Orthotic



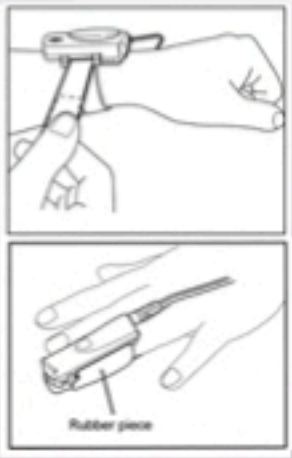
Lat-Brux

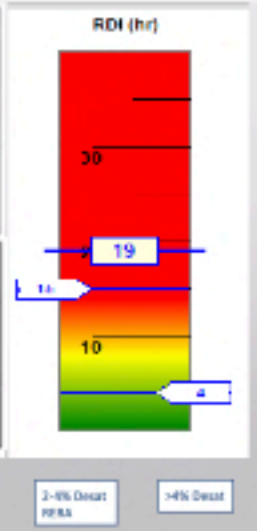
Nylon Herbst
Great Lakes Ortho

Treating Common TMDs in a General Practice

Management

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





Pulse Ox Screening

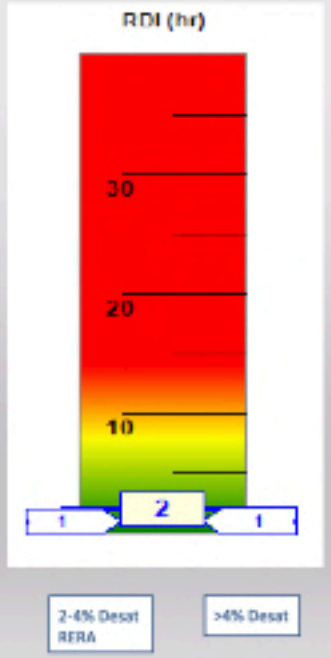
Refer to Medical Sleep Doctor

Get approval for Mandibular Advancement Appliance

Verify Airway Improves

19 events/hr before

2 events/hr with Orthotic



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

Nylon MAD
Great Lakes Ortho

D-SAD

PANTHERA

6 Common TMDs

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Occlusal Muscle Disharmony

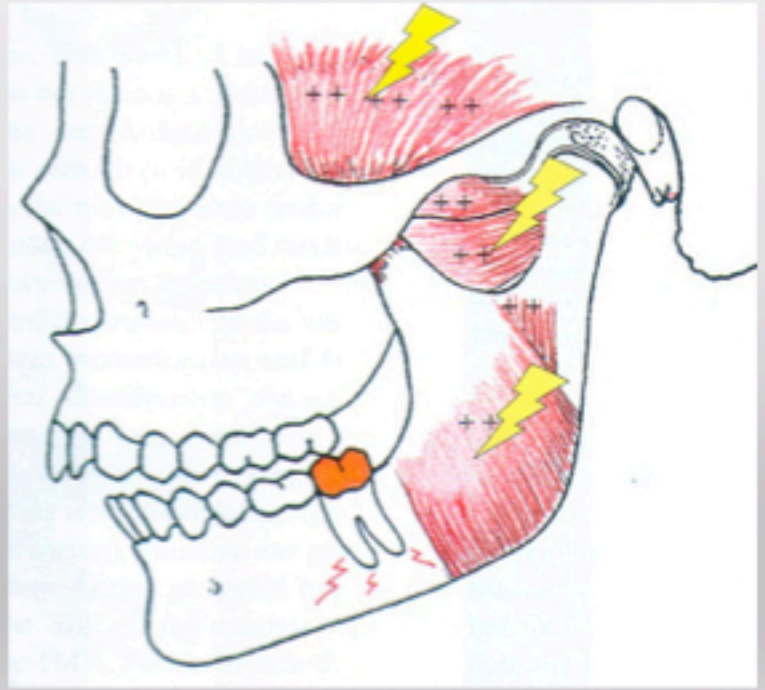
Uneven tooth contact with condyles fully seated triggers muscle activity

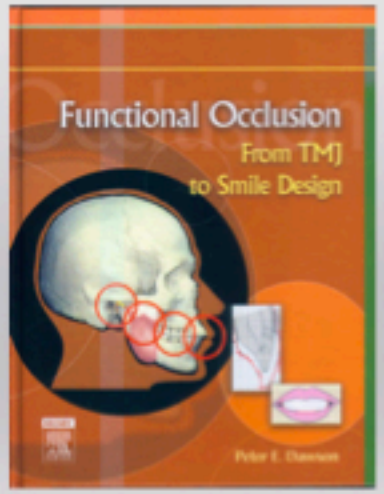
Lateral pterygoid fires out of sequence to create even tooth contact on closure

Disharmony in all muscles: Splinting/Bracing

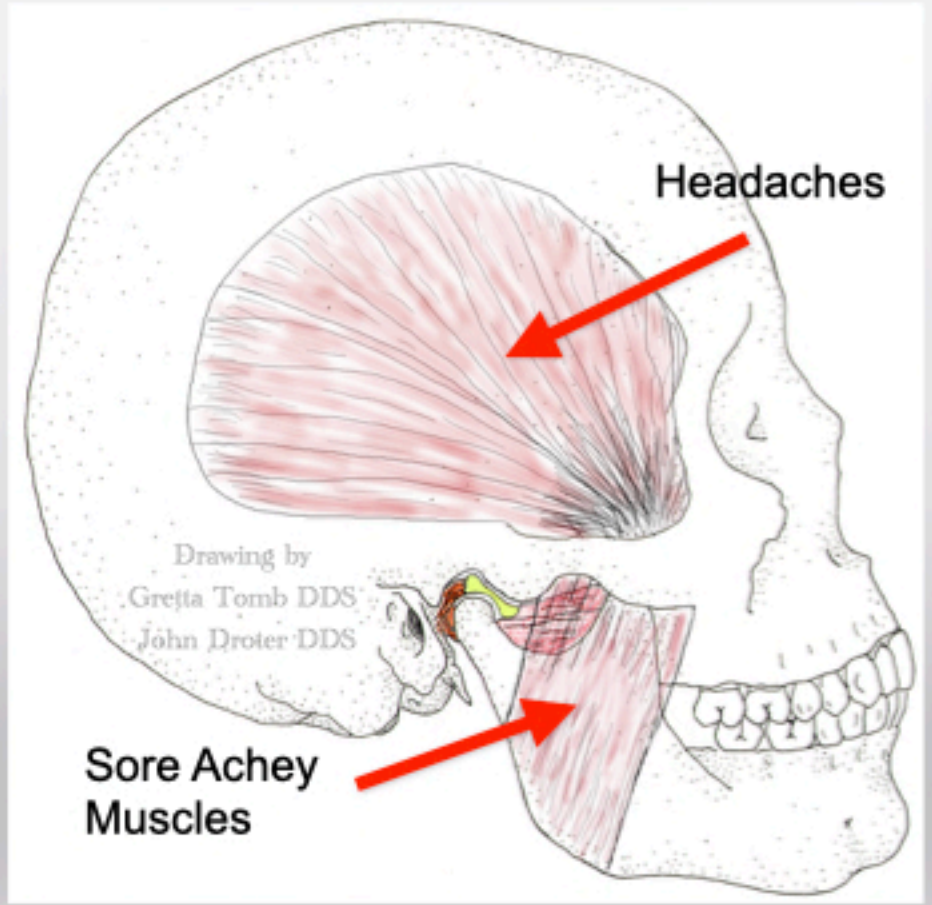
Muscles sore from overuse

Muscles do not think- CNS input



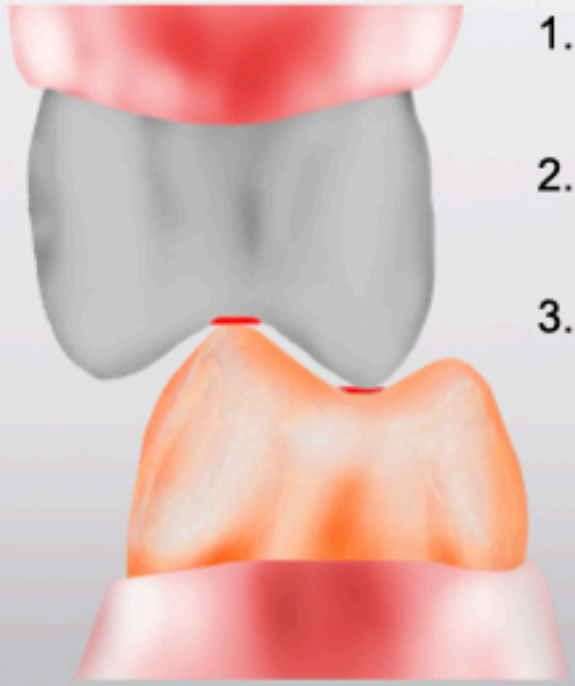


from Dawson's Textbook, "Functional Occlusion"

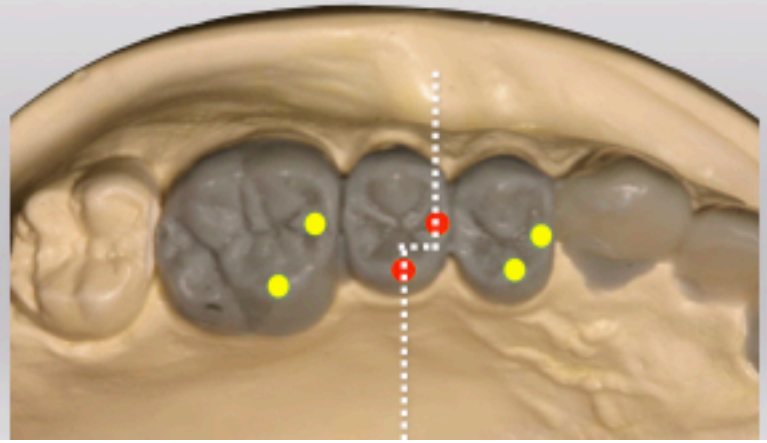

Headaches
Drawing by
Gretta Tomb DDS
John Droter DDS
Sore Achey
Muscles

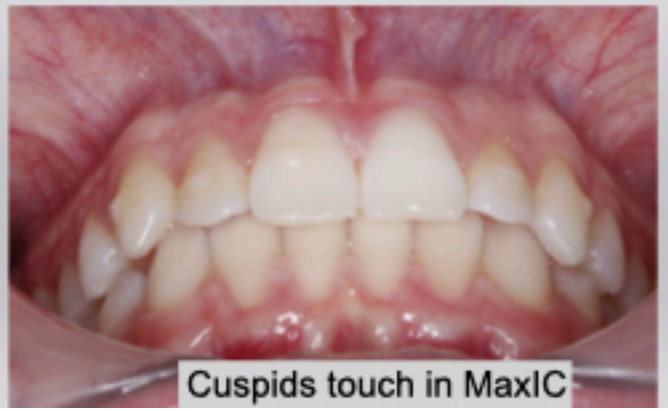
LD Pankey's Rules of Occlusion for Comfort and Function

(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.





Cuspids touch in MaxIC

Slide by Dr John Droter
Drawing by Dr Jim Kessler

Occlusal Muscle Dysfunction Diagnostic Tests

Occlusal Muscle Dysfunction is a daytime problem

Clenching can be both a daytime and nighttime problem

>30% of headaches have an occlusal component

D-PAS 2 week trial

OR

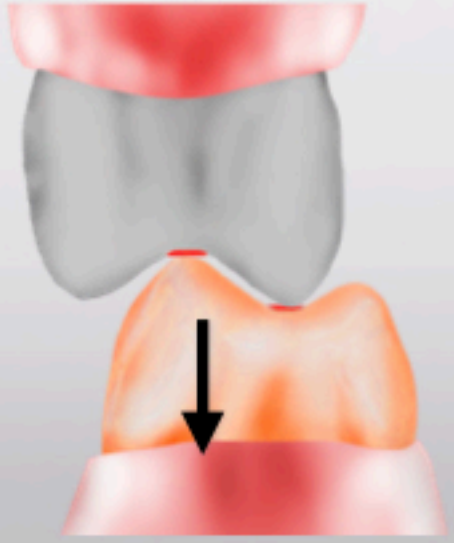
3-6 week lower CR orthotic

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

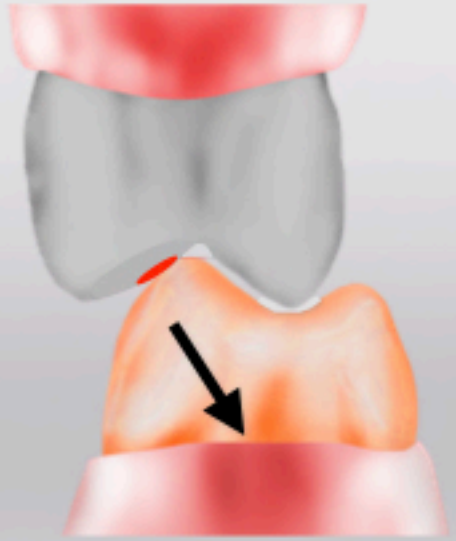
Response to occlusal treatment in headache patients previously treated by mock occlusal adjustment. Forssell H, Kirveskari P, Kangasniemi P. Acta Odontol Scand. 1987

Ideal Occlusion for Comfortable Muscles

Ideal
No sideways forces on back teeth.



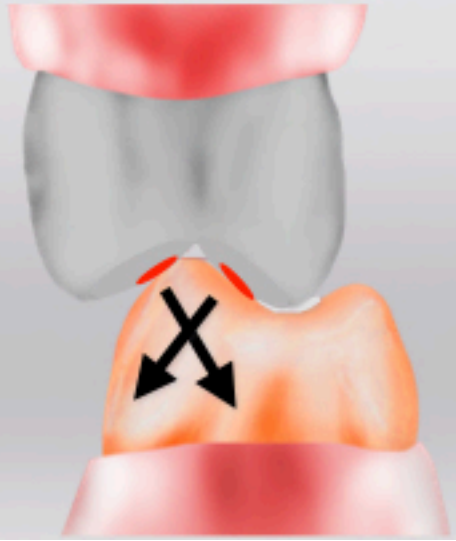
Not Ideal
Tense Muscles
Teeth can fracture



Sideways forces can fracture teeth

Not Ideal
Tense Muscles

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

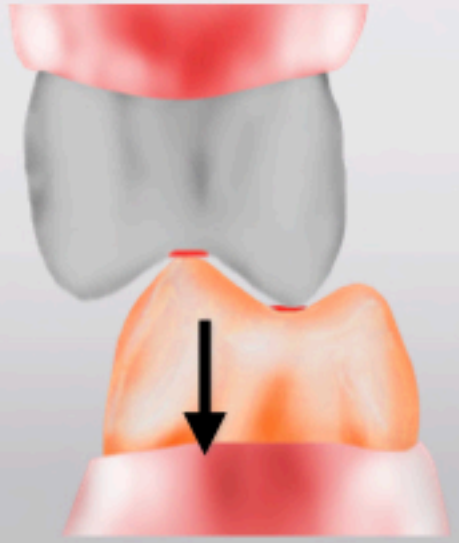


Not Ideal

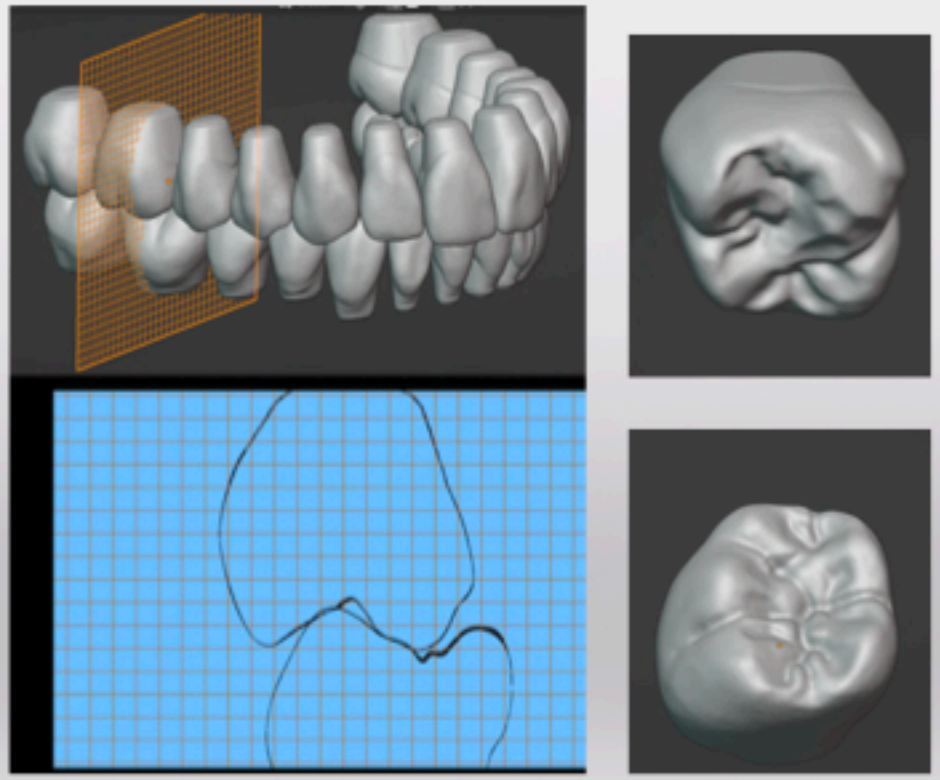
This is now a functionless tooth. Other teeth now have more force.

Ideal Occlusion

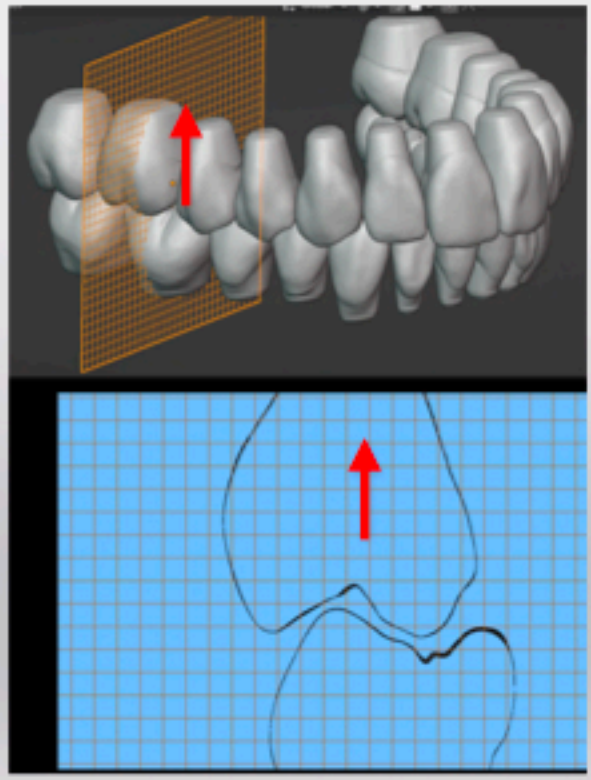
No sideways forces on back teeth.
Comfortable Muscles.



Digital Tooth Libraries
Occlusal Contacts on Inclines

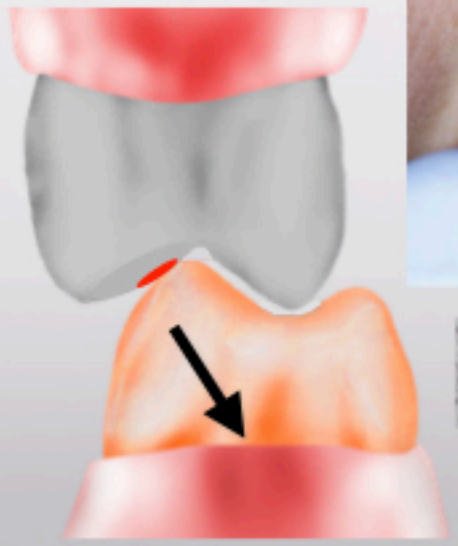


Presets on how far out of occlusion to make crown

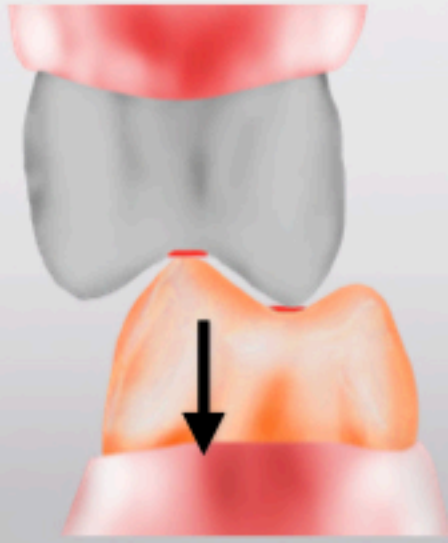


Occlusal Sculpting

Reshape



Polish

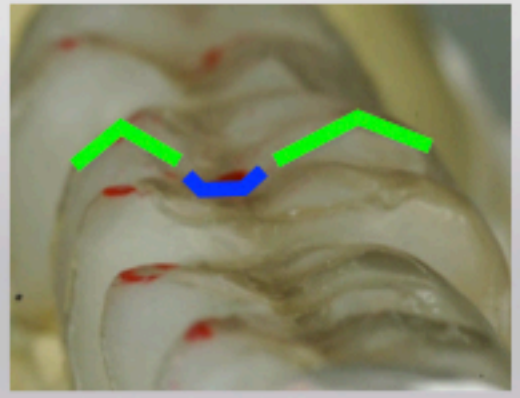


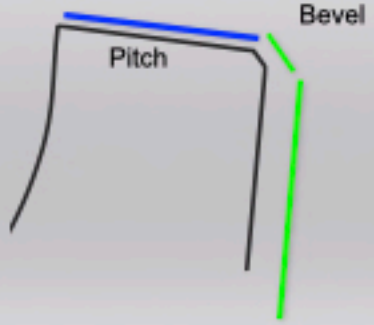
Occlusal Sculpting Tools, including Zirconia

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

Move and Shape Cusps, Inclines, Facial Surfaces

Brassler Brio Shine
FLBCER-1
FLBF-2





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

Bonding Zirconia, E.max, Porcelain, Gold

Roughen with Diamond

Microtech

Katana Cleaner, Kuraray
Removes phosphates, saliva

Clearfil Ceramic Primer Plus, Kuraray

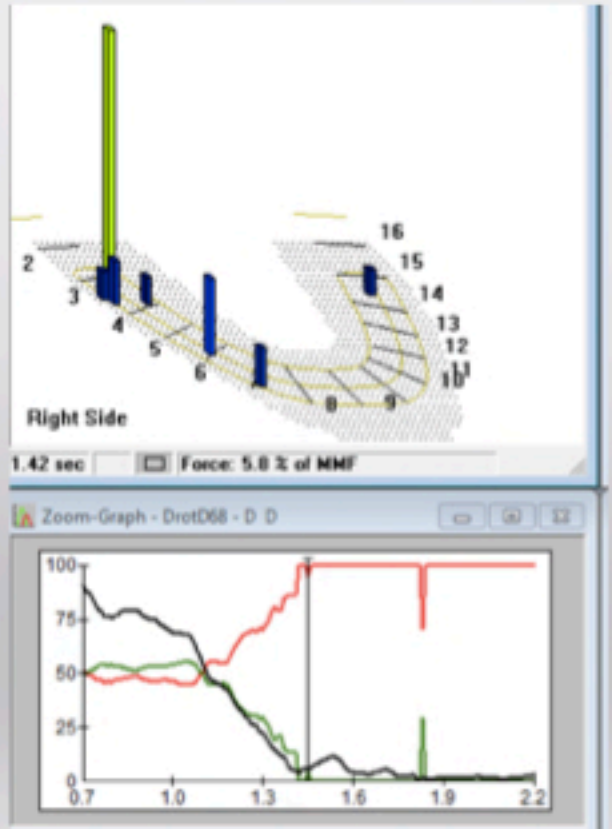
All Bond, Bisco

Light Cure
Critical step for stronger bond

Filtek Composite shade B1B

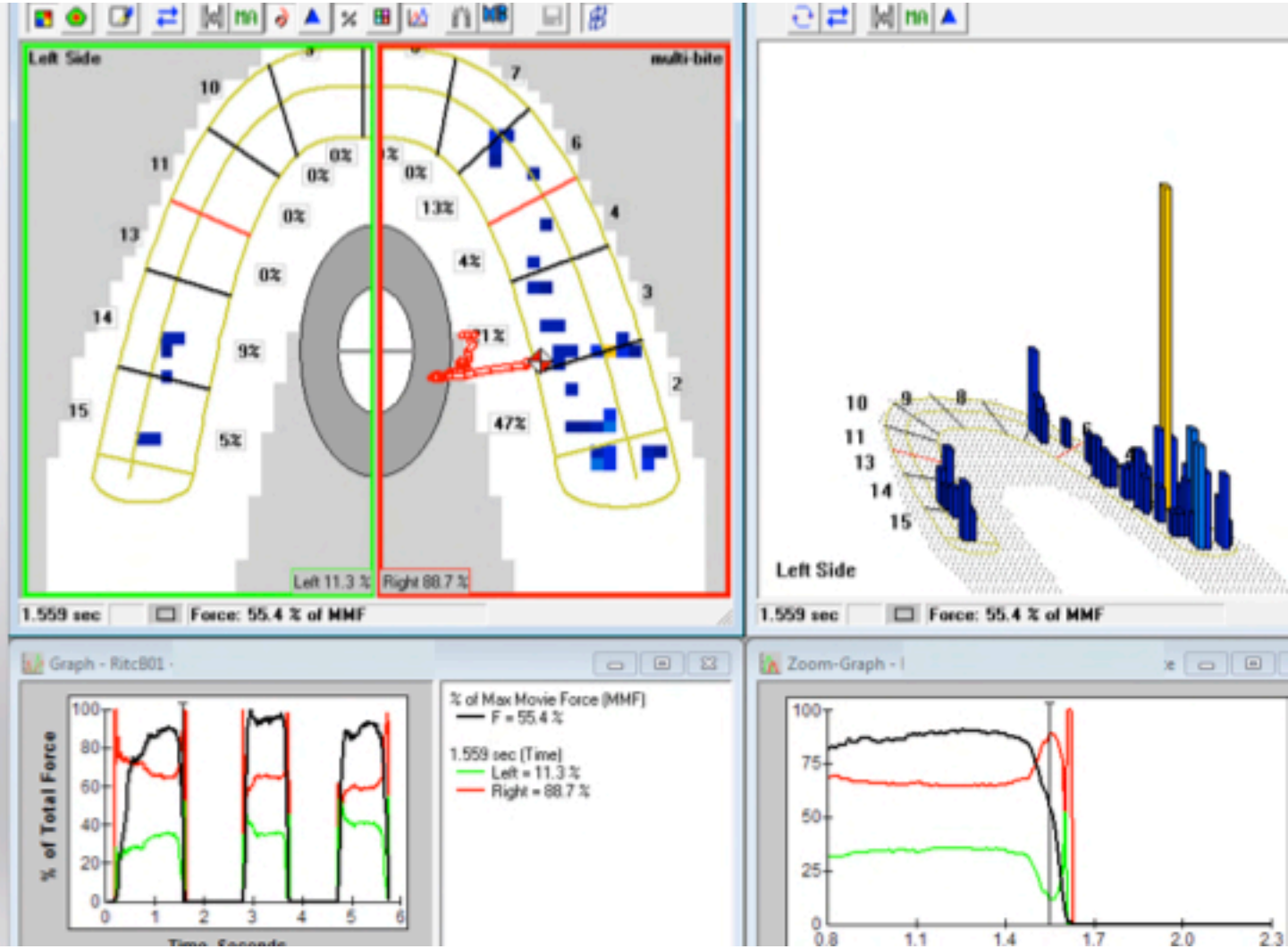
The indispensable value of T-Scan is not in finding heavy CR contacts, but working and nonworking contacts.

Is that a smudge or a muscle activating interference?



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

T-Scan is excellent for Patient Education of Occlusal Pathology



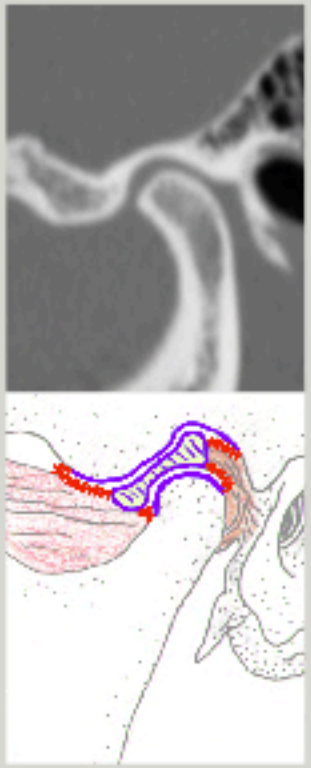
6 Common TMDs

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

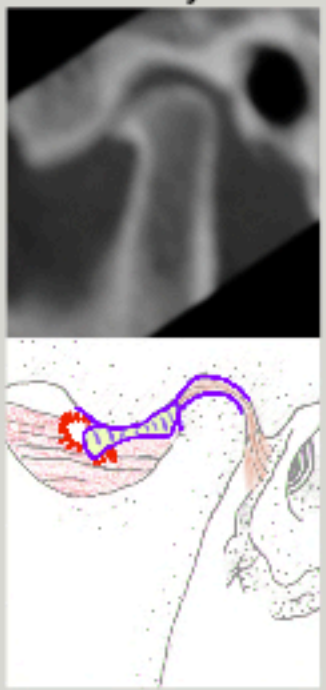
Osteoarthrosis/Osteoarthritis

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

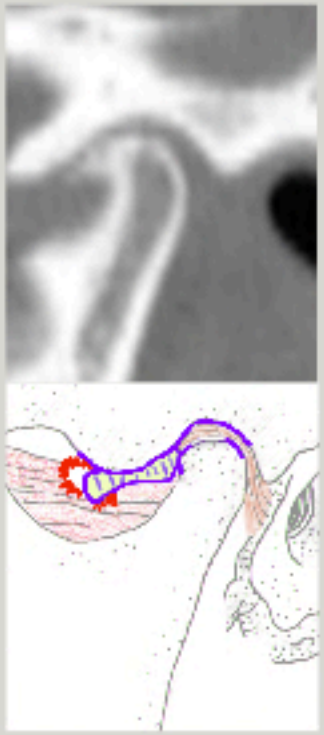
Normal



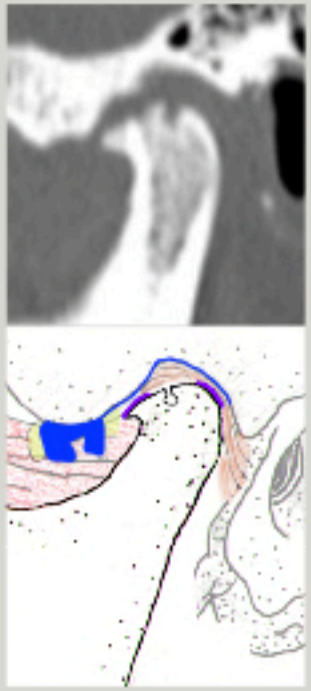
Early



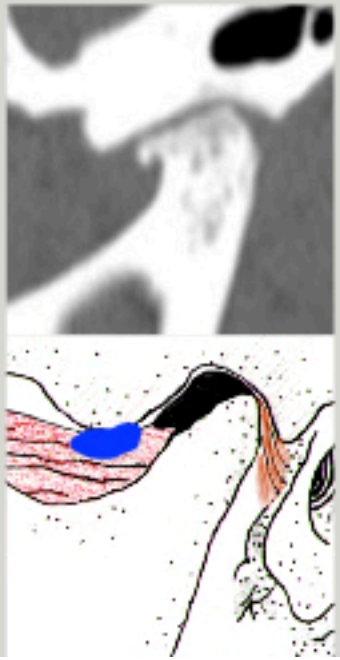
Early/ Moderate



Moderate



Severe OA, Eburnation

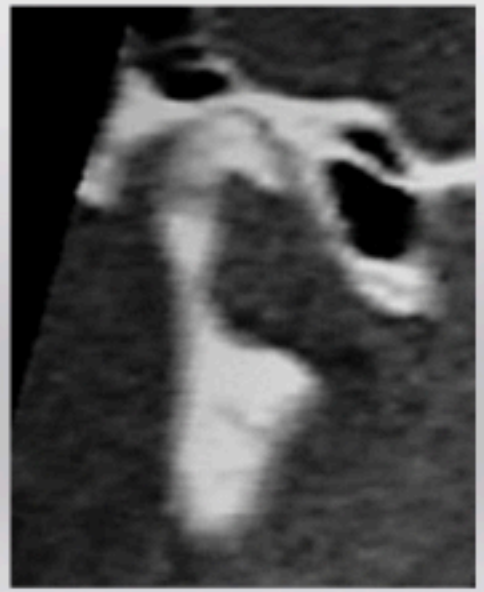


Representative examples of OA
in different patients

Drawings by Gretta Tomb DDS and John Droter DDS

Adaptation Chronic Bilateral Osteoarthrosis

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



OA Right and Left Bone Loss
#8 Ankylosed

Treatment OA

Osteoarthr**osis**

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

Shea Brand CBD

Osteoarthr**itis**

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

If still inflamed arthrocentesis with Platelet Rich Plasma (PRP)

MLS Laser
9 sessions over 4 weeks

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Limited Opening Algorithm

Differential Diagnosis Limited Opening:

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

Diagnostic Tests:

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

Dr Droter's Limited Opening Algorithm

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

Palpate First

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

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

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

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

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

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

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

No Signs Infection

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

Rule out Hematoma Dental injection

No Signs Hematoma

Body Temp Normal
Painful medial pterygoid area
Recent Dental Injection

Hematoma
Cold Laser Intraoral

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

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

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

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

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

Soft end point
TMJ Pain
Active stretch points to joint

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

Pain Avoidance, TMJ Arthralgia

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

Pain Avoidance, Muscle Pain

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

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

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

Pull Accufilm

Anterior Stop

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

Chronic Sprain: Sprain not resolving, evaluate for sleep bruxing

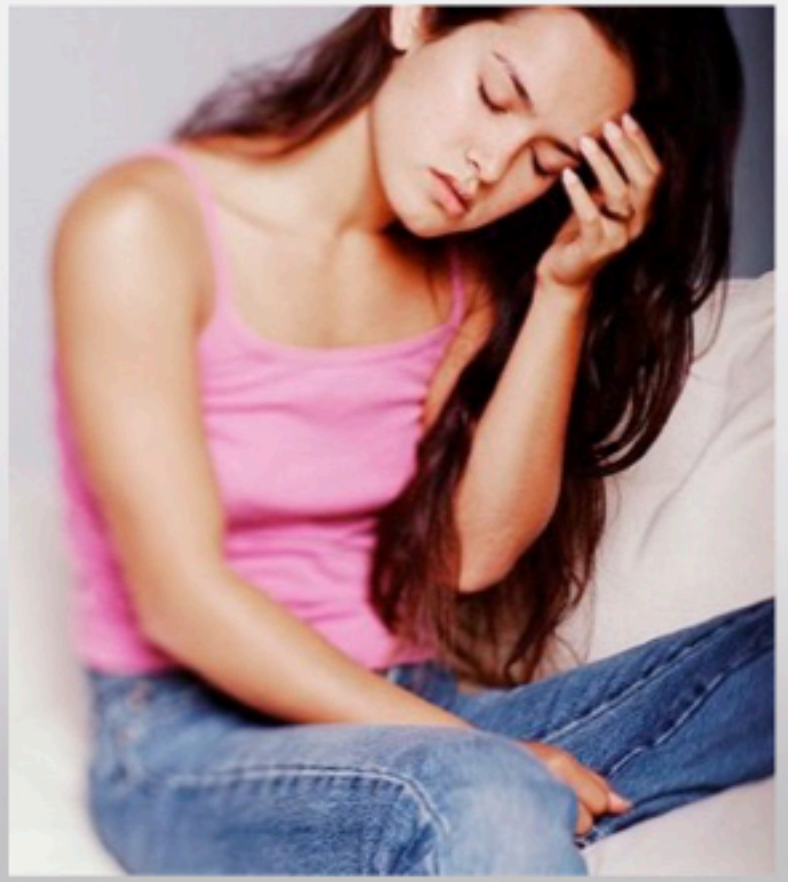
Osteoarthritis TMJ
OA on CBCT, NSAIDs 6-12 weeks, Cold Laser 3x week for 3w

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

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

5 Common Obstacles

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



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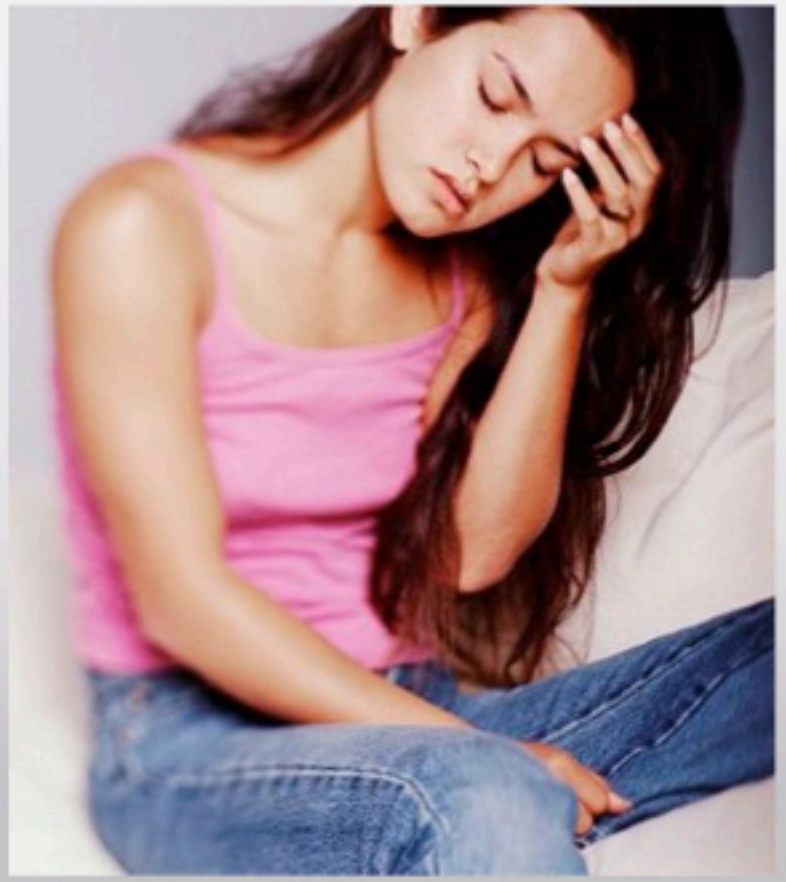
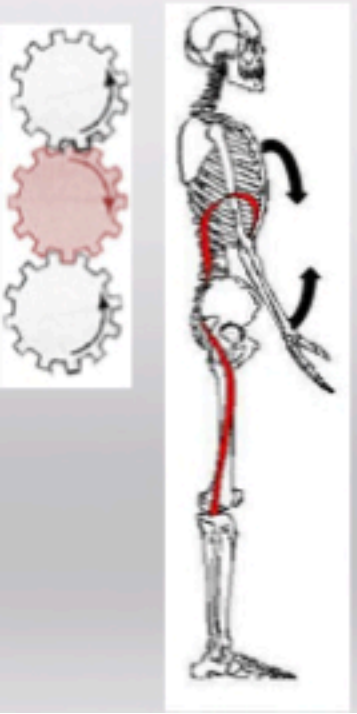


Neck and Postural Instability

This is a **dynamic** orthopedic System



A change in any one area will affect the others

CNS/PNS

Skull

TMJ

Teeth

Mandible

Teeth

Neck

Muscle Neck

Muscle TMJ

venn diagram

TMD Therapies

Physical

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

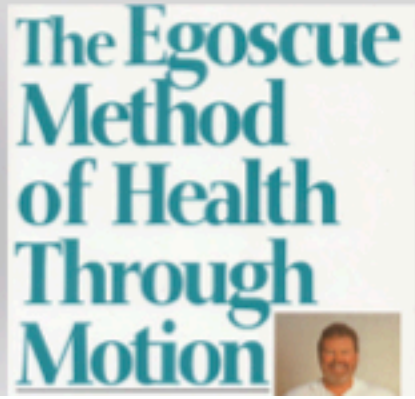
Postural Restoration Therapy

Dr Mariano Rocabado

Refer to Physical Therapy: Postural Restoration Therapy
Refer to Physical Therapy: Various Muscle Therapies
Refer to Physical Therapy: Rocabado mobilization

Refer to Chiropractic: Atlas Orthogonist
Refer to Osteopathic MD: Body alignment
Breathe, Walk , Exercise

If no access to professionals.
Do it yourself PT.
Strengthen weak opposing muscles



TMD Therapies

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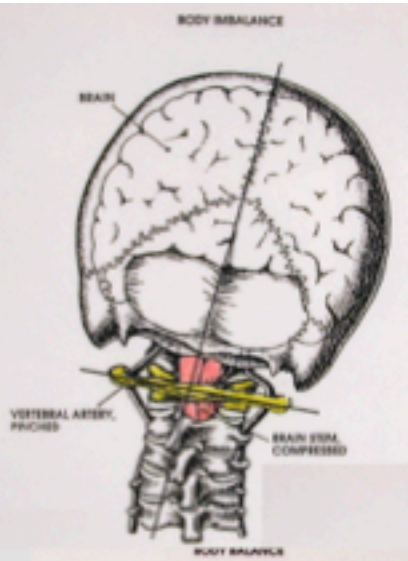
Refer to Physical Therapy: Postural Restoration Therapy
Refer to Physical Therapy: Various Muscle Therapies

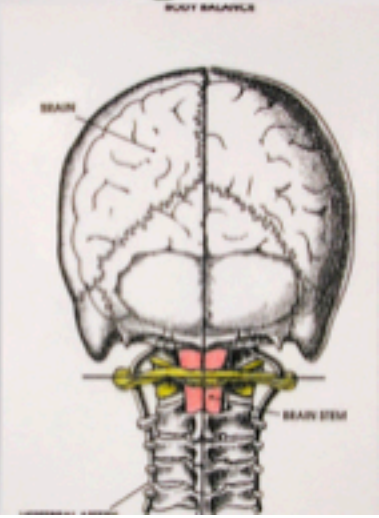
Refer to Chiropractic: Atlas Orthogonist

Refer to Osteopathic DO: Body alignment

Breathe, Walk , Exercise

Atlas
Alignment



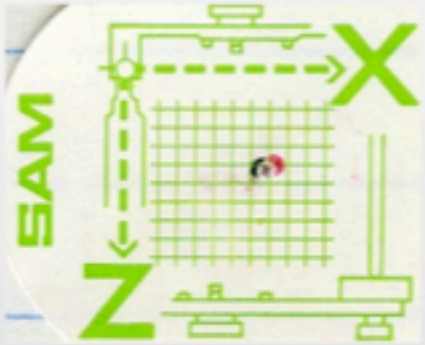


CR Changes with Atlas position

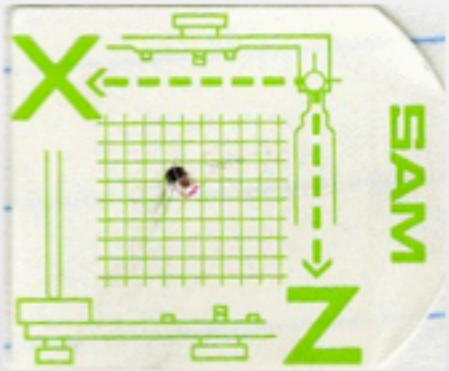
?Pressure on Occiput moves Temporal bone?

Put your teeth together and bend neck side to side

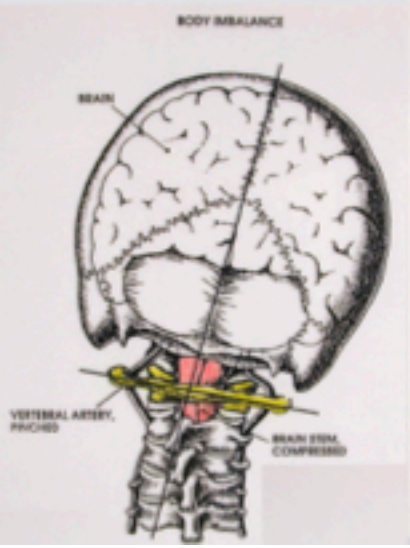
SAM Articulator Vericheck

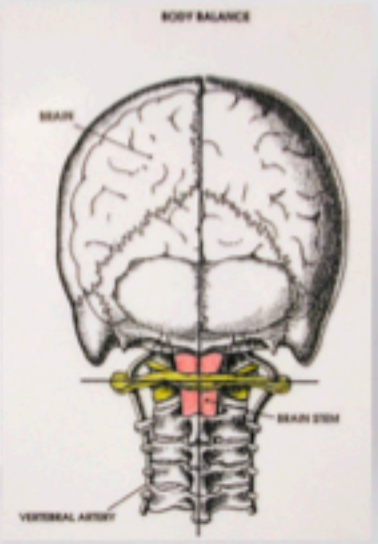


Right Condyle
Black- Atlas Out
Red- Atlas in shifts condyle up and forward 0.6mm



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





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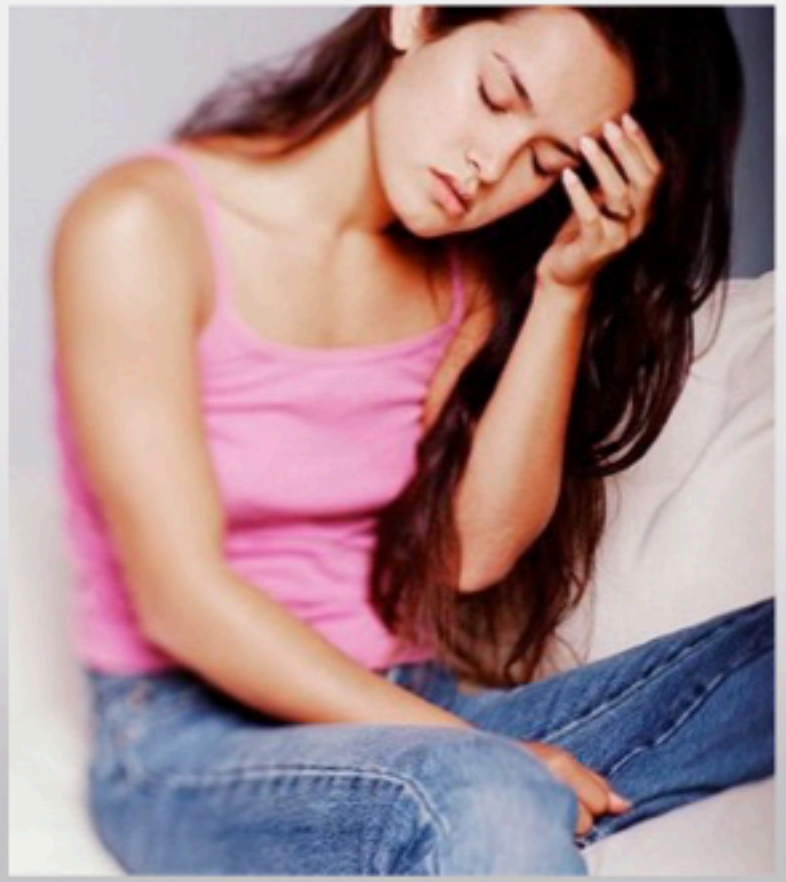
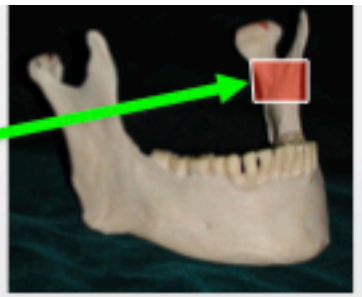


CR Load Zone

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

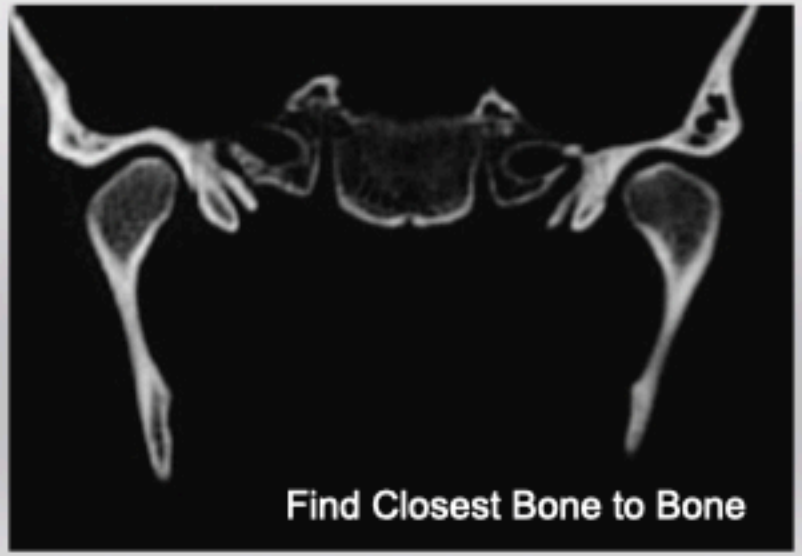
Sore Muscle

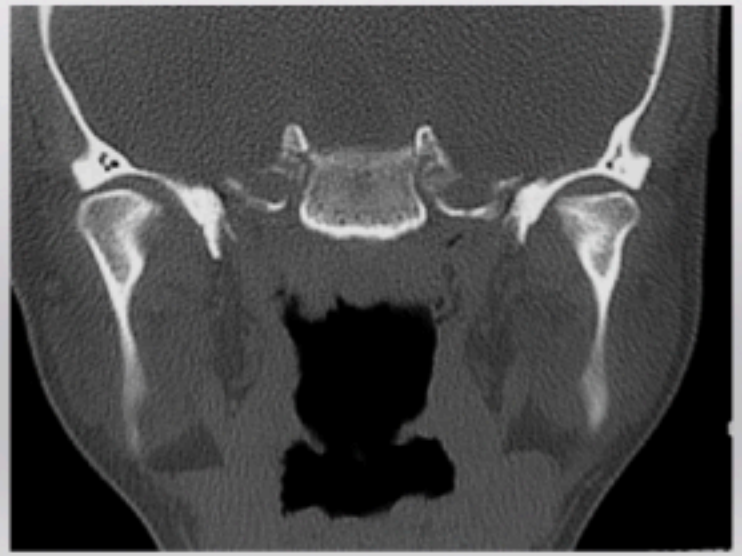


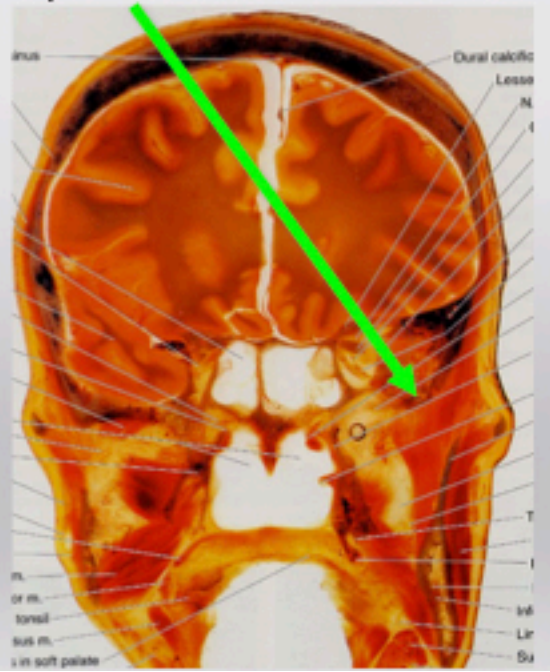
Medial Bracing is ideal

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

Deep Temporalis runs horizontally
Sphenoid to Inferior Coronoid







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

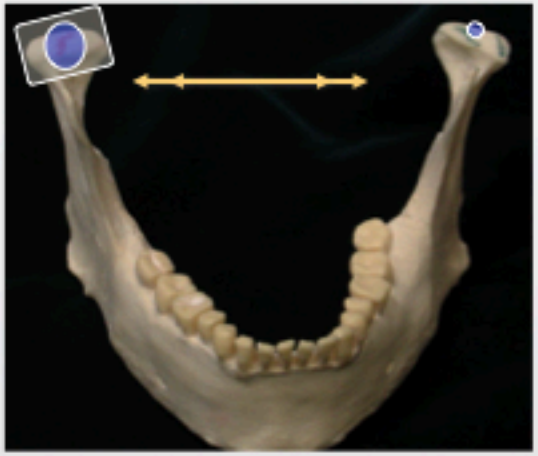
TM Joint subluxates under load
  Adapted CR "wobbles"

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

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

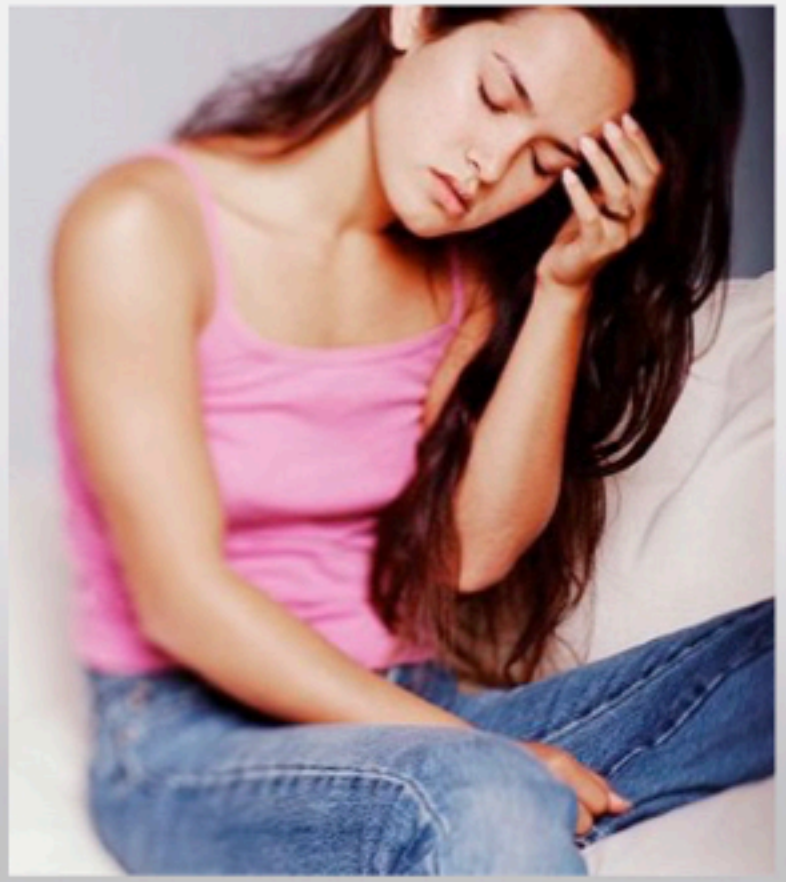
How to Avoid Missing Dx- Offer complete exam to crown patients
  Include anterior stop dx test
  Let patients decide which risk to take.

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



5 Common Obstacles

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



Disordered Breathing Disease Progression

Disease Stage 1

Predisposing Factors

Small Airway

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

Disease Stage 2

Compensation:
Airway Maintained

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

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

Disease Stage 3

Sleep
Airway Partial Collapse

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

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

Disease Stage 4

Sleep
Airway Full collapse

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

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

John R. Droter DDS

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

Patient Safety
Inc Pulse Ox
Sleep Screening

Brux PAS pm wear, jaw exercises

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

4% RDI = 3/h

Autonomic Arousals 19 /h

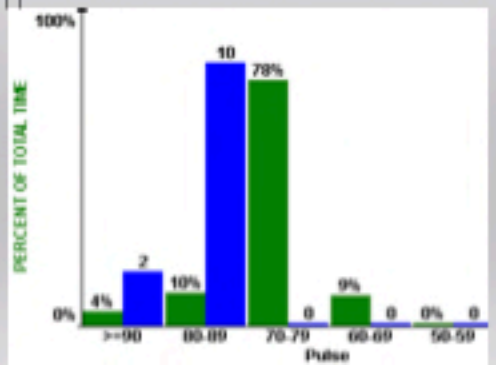
PULSE RATE DATA

Autonomic Arousals

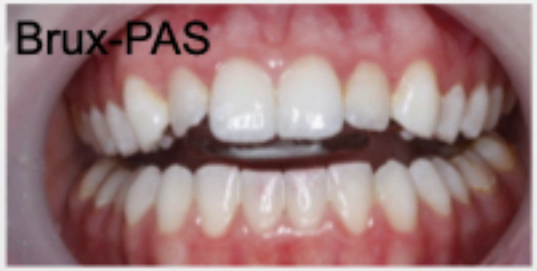
Index (#/hr): 19

Pulse Rate Range

Mean:	76	76
Min:	60	
Max:	225	



Brux-PAS



4% RDI = 1/hr

Autonomic Arousals 9 /h

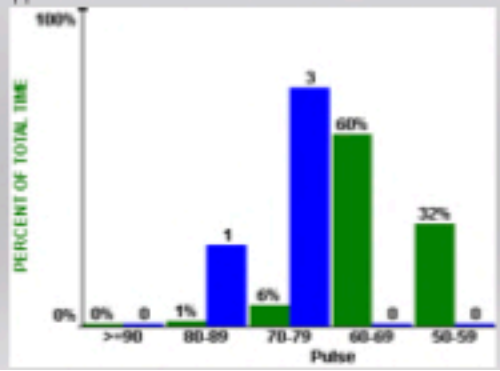
PULSE RATE DATA

Autonomic Arousals

Index (#/hr): 9

Pulse Rate Range

Mean:	63	63
Min:	52	
Max:	120	



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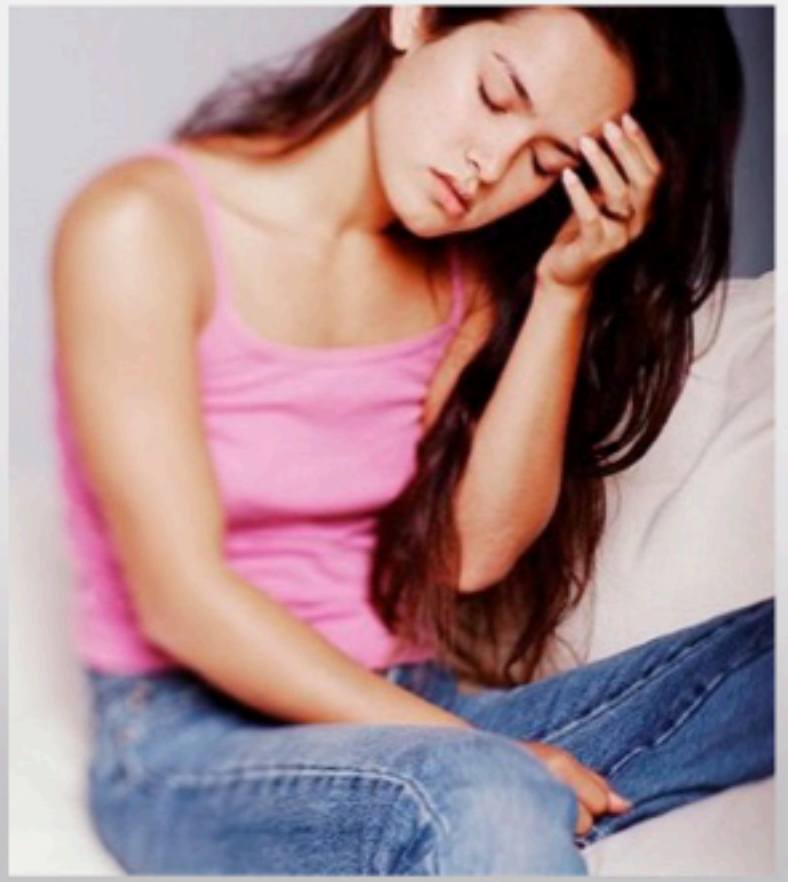


Adult Onset Anterior Open Bite Differential Diagnosis

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

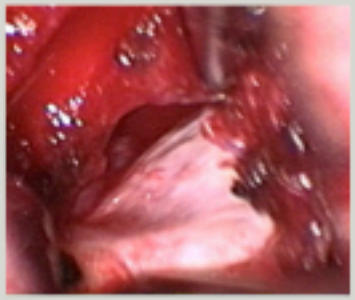
3 Outcomes of Compromised Condylar Perfusion

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

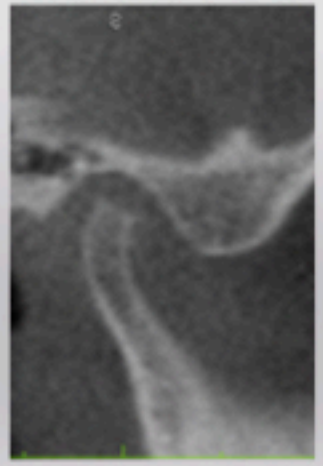
Cortex Collapses, Cartilage tears
Inflamed tissue contacting bone
Inflammatory cells activate Osteoclasts

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

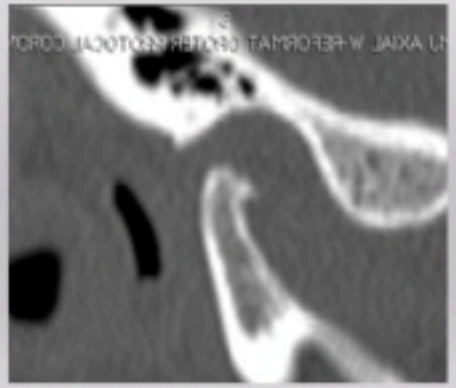
Anterior Openbite with Active TMJ Bone Loss

Use articulator to calculate how much distraction:

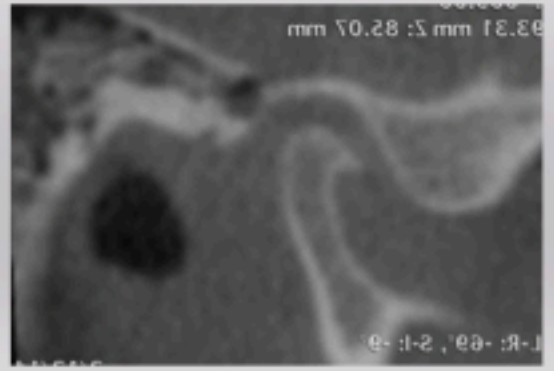
Right condyle down 6.2 mm back 2 mm
Left condyle down 4.5 mm back 2 mm



Condylar Distraction



Ball needs to land in the hole



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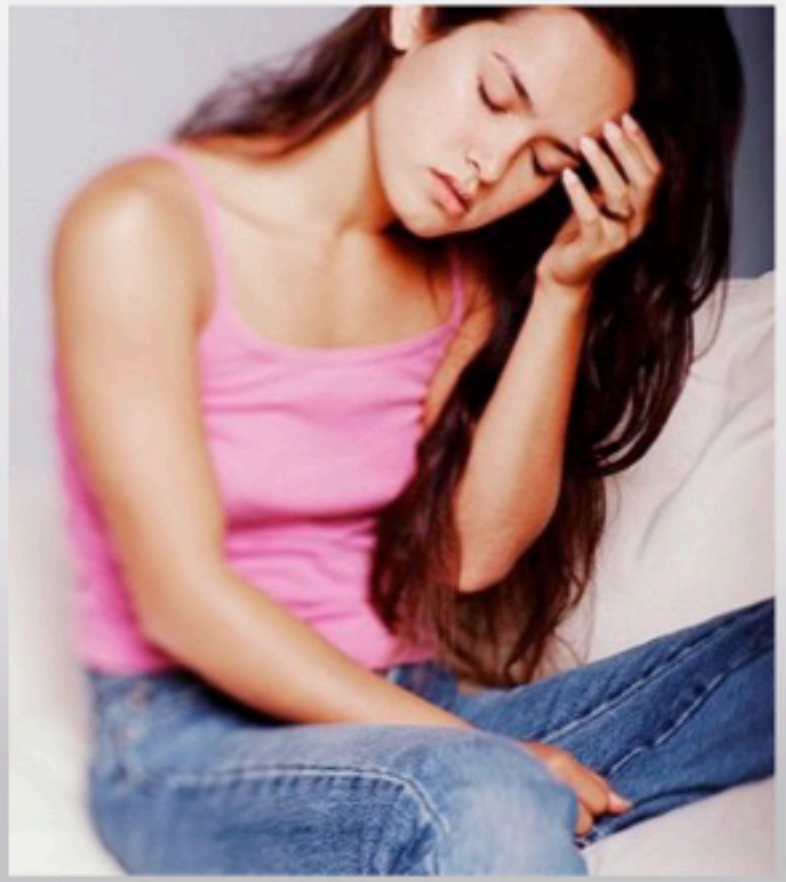
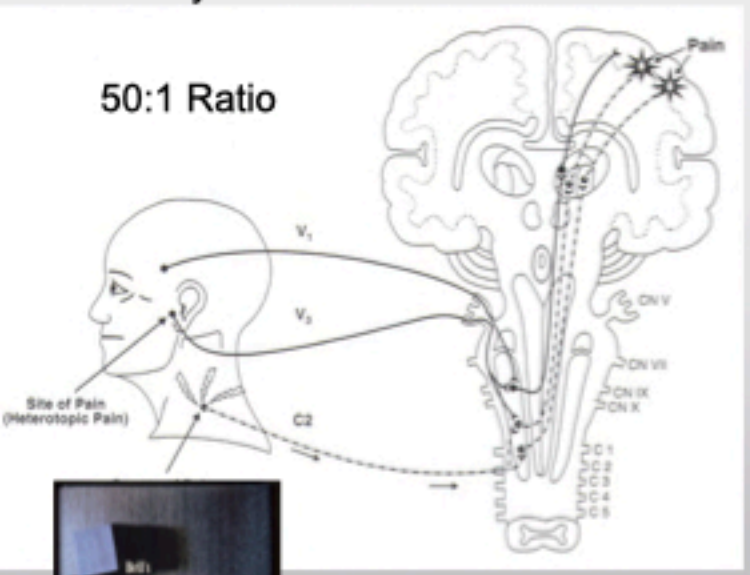


Referred Pain

Convergence

More primary sensory neurons than secondary neurons that travel to brain

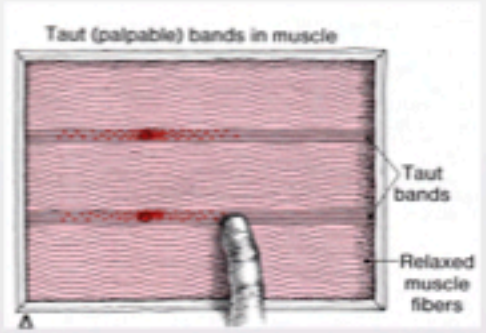
50:1 Ratio

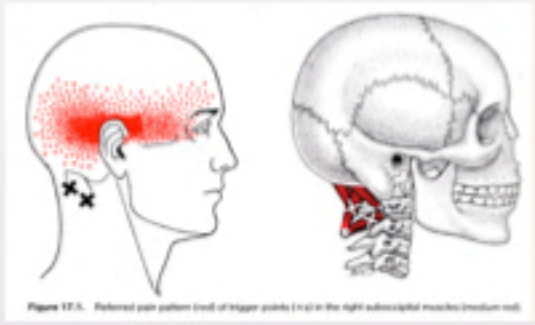


"Bells Orofacial Pain"
Jefery Okeson

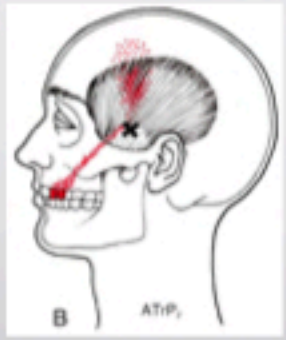
Trigger Points

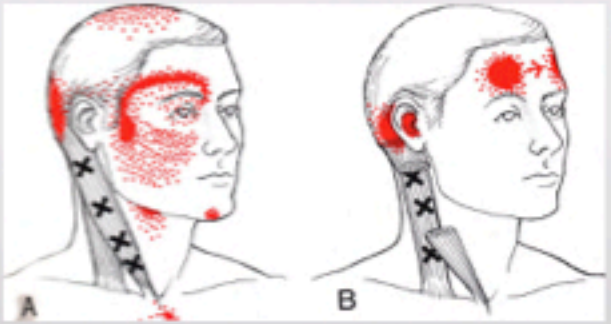
Contracted mass of actin, myosin and histamine

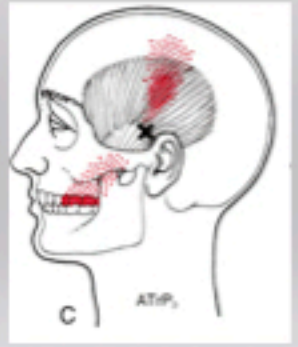


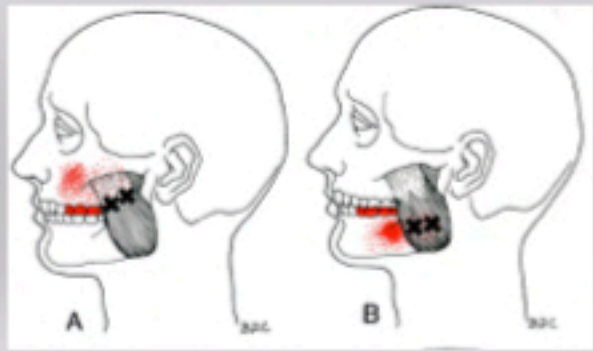


"The Trigger Point Manual"
Janet Travell, MD









TMD Therapies

Physical

Ice
Hot Cold Hot

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

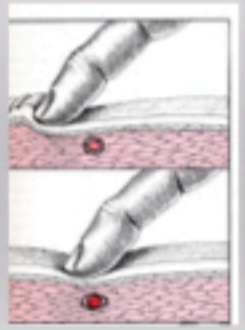
Ice Pack
15 min 3-5x a day

ThermoSafe
U-Tek Cold Pack
-23° C

Wet Towel in Microwave
3 Min Hot
3 Min Hot

3 Min Cold

Triggerpoint
in muscle



MLS Laser: BioResearch

808 nm Continuous, 905 nm Pulsed

Multiwave Locked System Laser

Diode Laser

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

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

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

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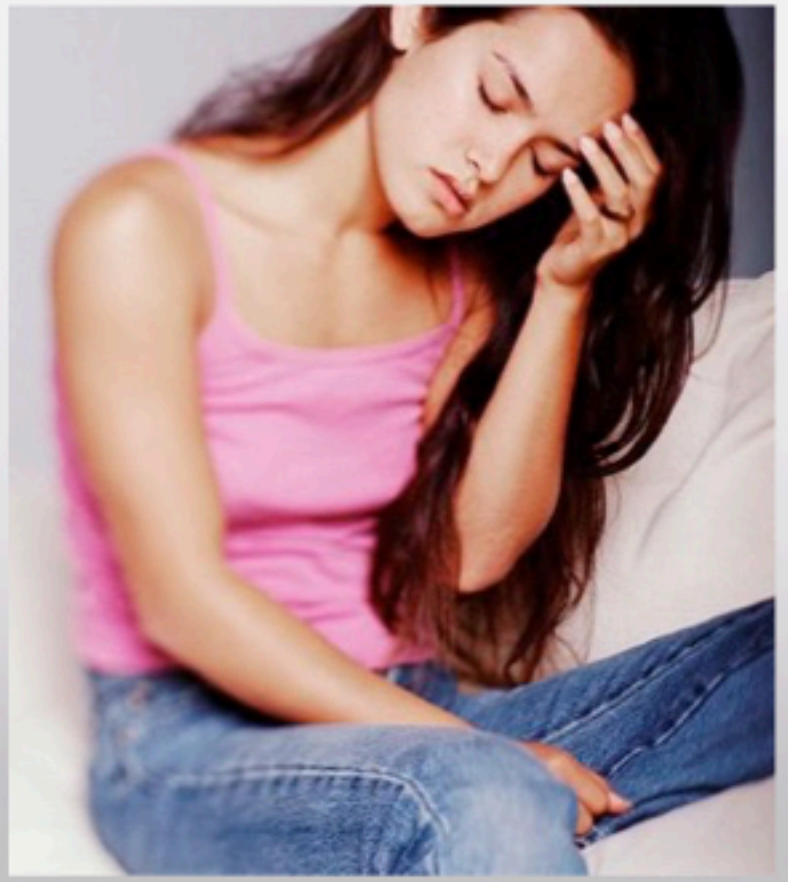
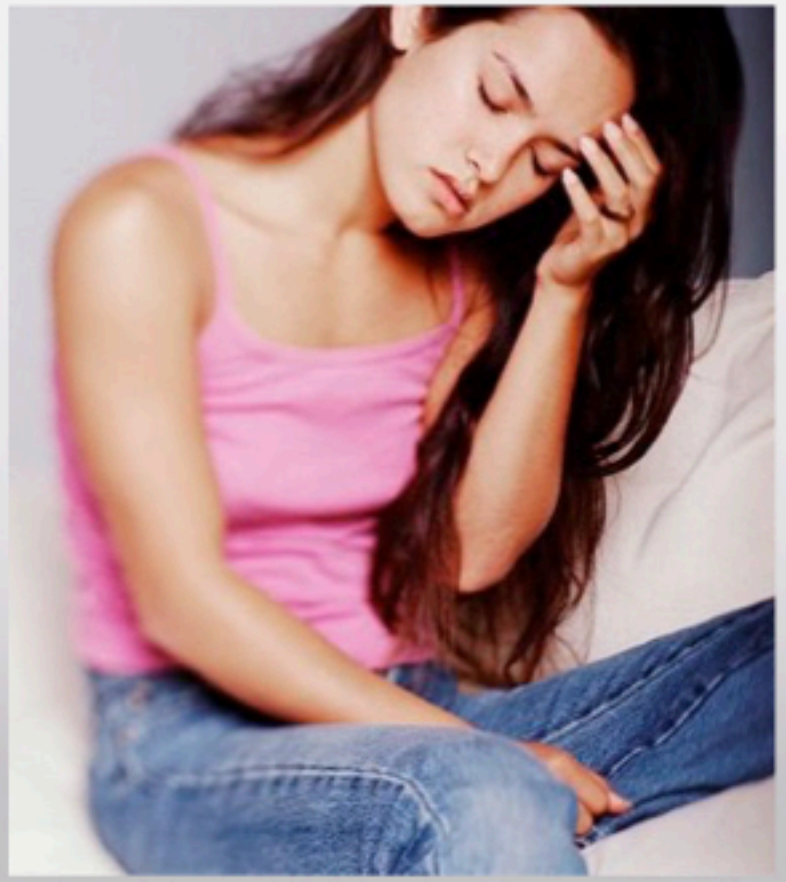


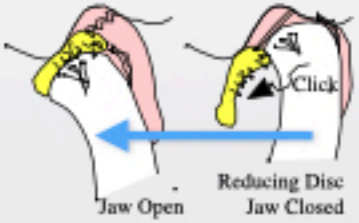
1 TMD that **usually** does not need therapy

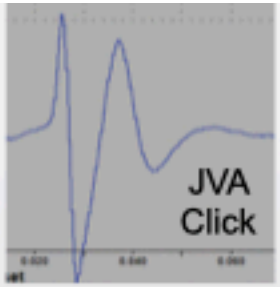
TMJ Clicking



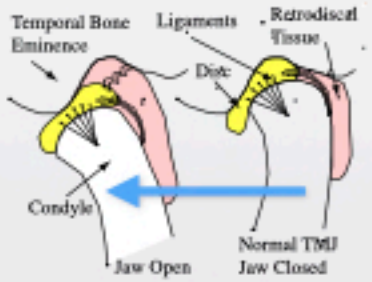
Differential Diagnosis of TMJ Clicking

Disc Reduction





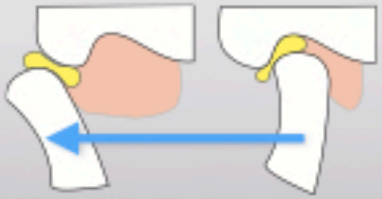
Normal



Adhesive Click

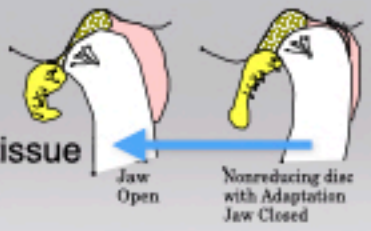
"Sticky Disc" - Disc sticks after prolonged clenching, then releases

Eminence Thud



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

Adhesion Crackle

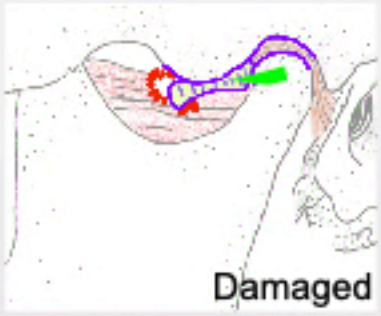


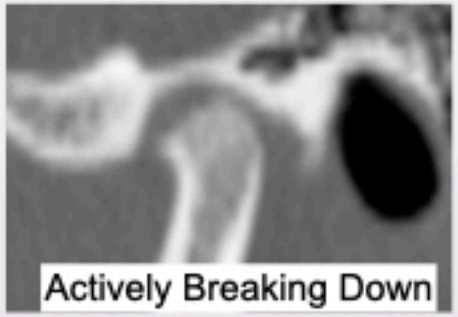
A small piece of fibrous tissue
4b joint is moved across

Basic Orthopedics

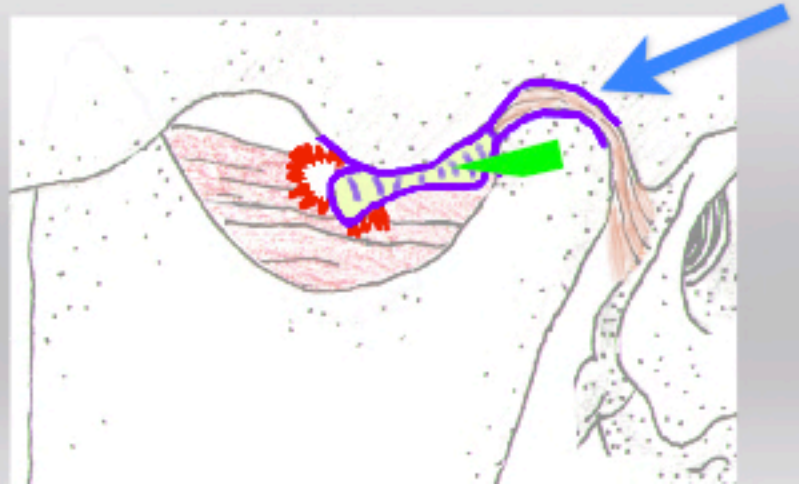
Joints are either
- Healthy or
- Damaged

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





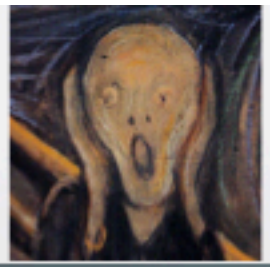
Majority of damaged TMJs adapt favorably



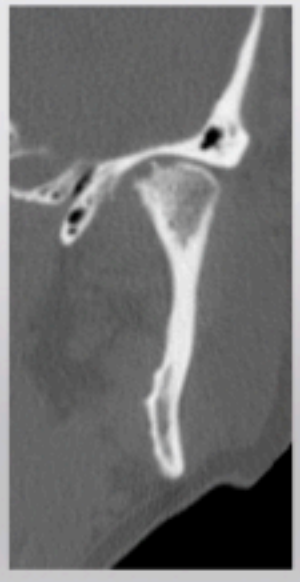
Posterior ligament, synovium, and retrodiscal tissue adapt to form a

Pseudo-disc

Tissue Fibrosis



Damaged TMJs



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

→ Occlusal Muscle Dysfunction

→ Osteoarthritis

→ Avascular Necrosis

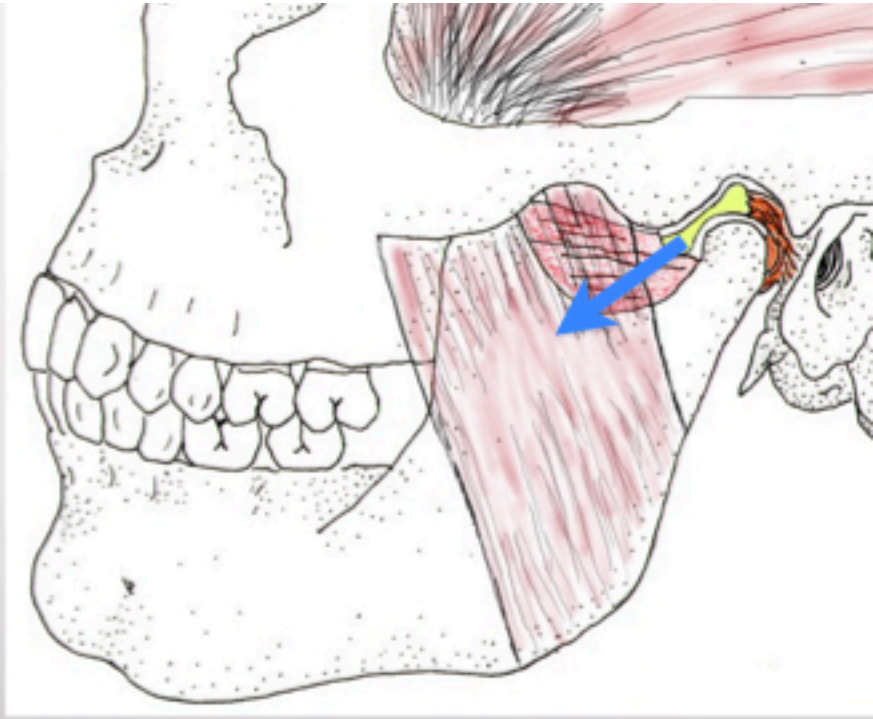
→ Progressive Condylar Resorption

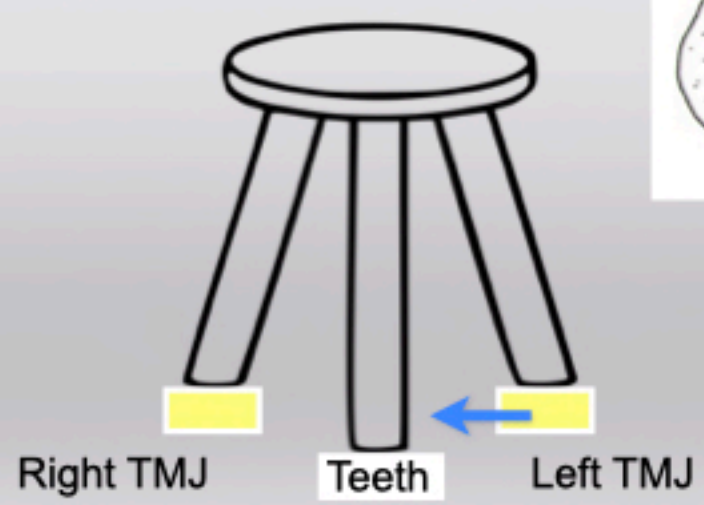
*These are my guesses on %, no research to back up to backup

Normal Joint with Normal Occlusion

All teeth touch evenly with condyles seated in fossa

What happens to the occlusion if the disc is dislocated?





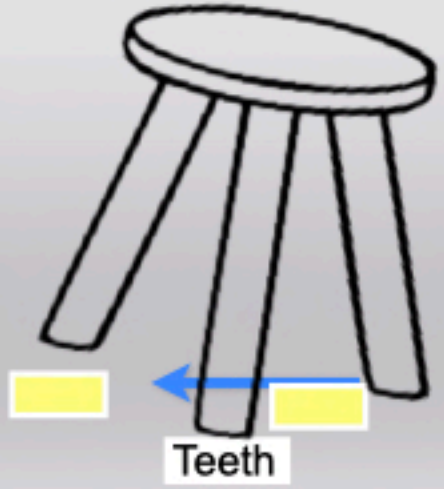
Damaged Joint with Malocclusion

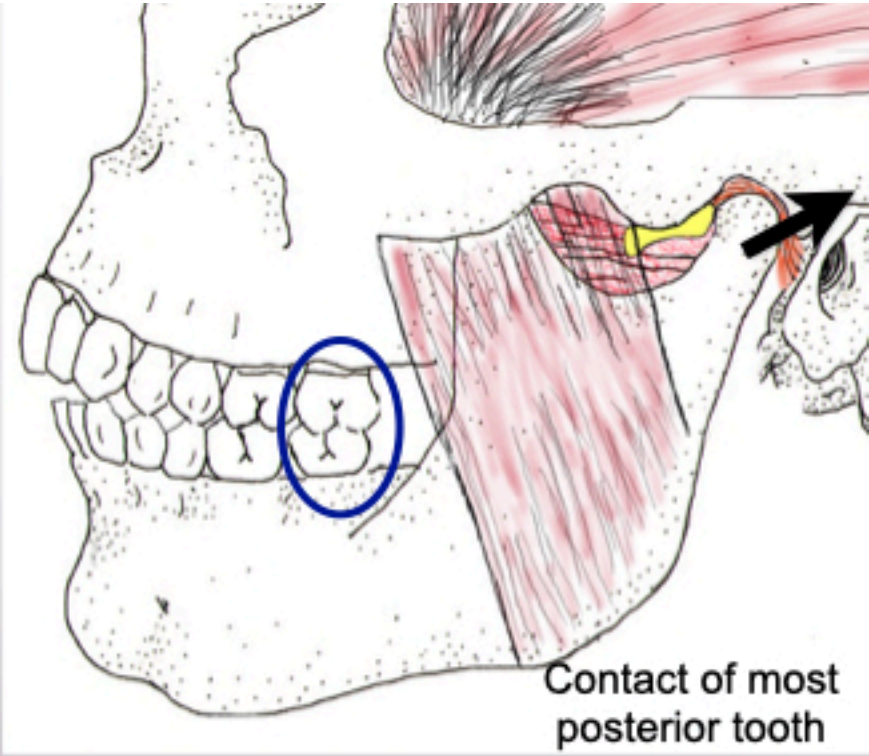
85% damaged joints adapt favorably with respect to the TMJ.

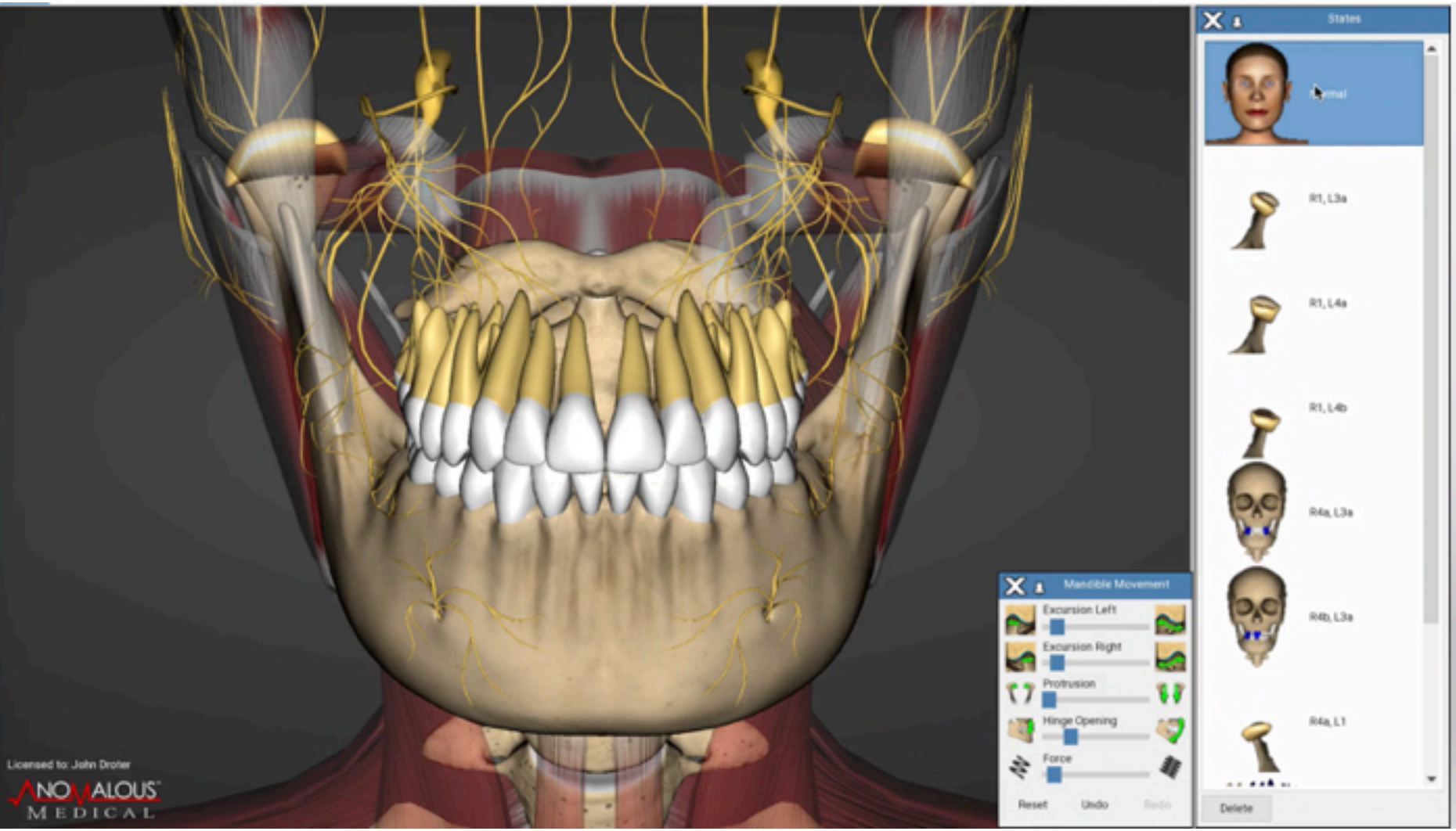
Anteriorly Dislocated Disc, Mandible shifts:
- Inadequate Anterior Guidance, Posterior Disclusion
- Uneven Occlusion,
- CR≠MaxIC
- Occlusal Muscle Disharmony develops.

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

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







Occlusal Shift

6 Common TMDs

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

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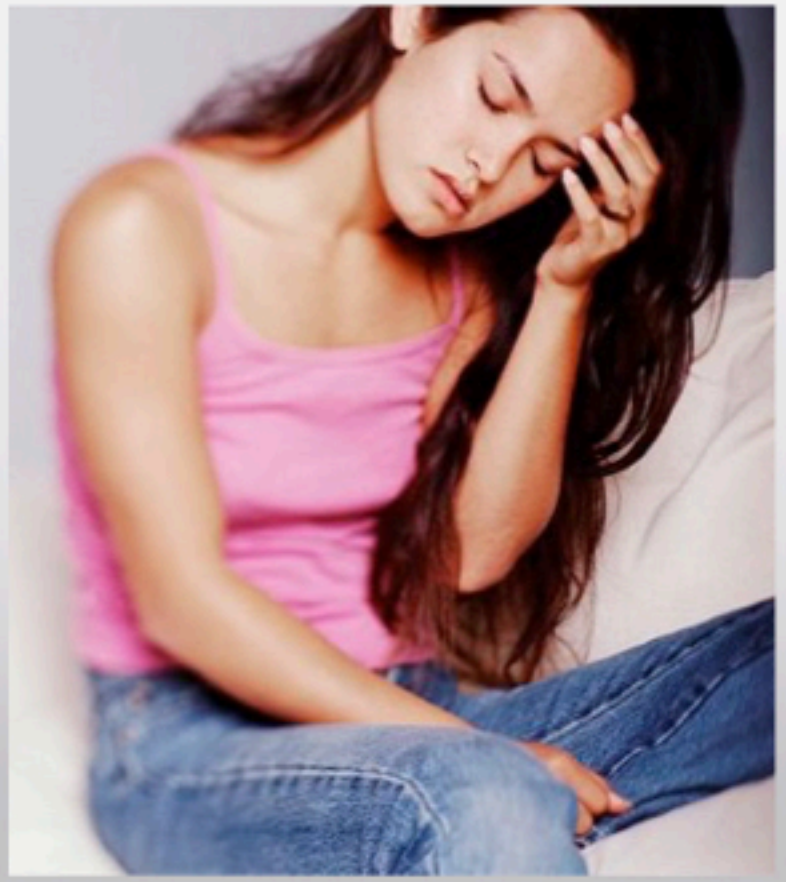


Exam and Diagnostic Tests

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 DTR, 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
Craniocranial Syndrome
Muscle Guarding due Neck Instability
Trigger Point Neck Muscle with Referred Pain
Trigger Point Neck Muscle, Localized Pain

5. Parafunction

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

6. Whole Body / Systemic

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

7. Other

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

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

Diagnostic Tests

Differential Diagnosis

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

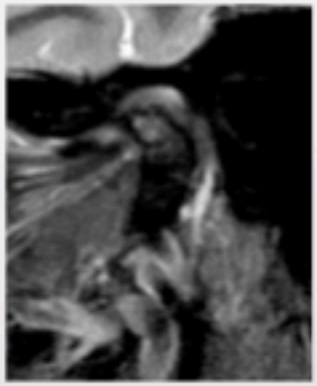
Diagnostic Tools

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

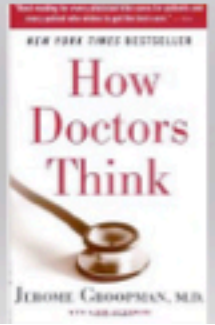
1. **Written and Oral History**
2. **Observation**
3. Physical Exam
   - Muscle Palpation
   - Joint Palpation
   - Joint Auscultation
   - Joint Motion
4. Anterior Stop Test
5. Sleep Airway Screening
6. CT Scan
   - MRI
   - Blood Tests

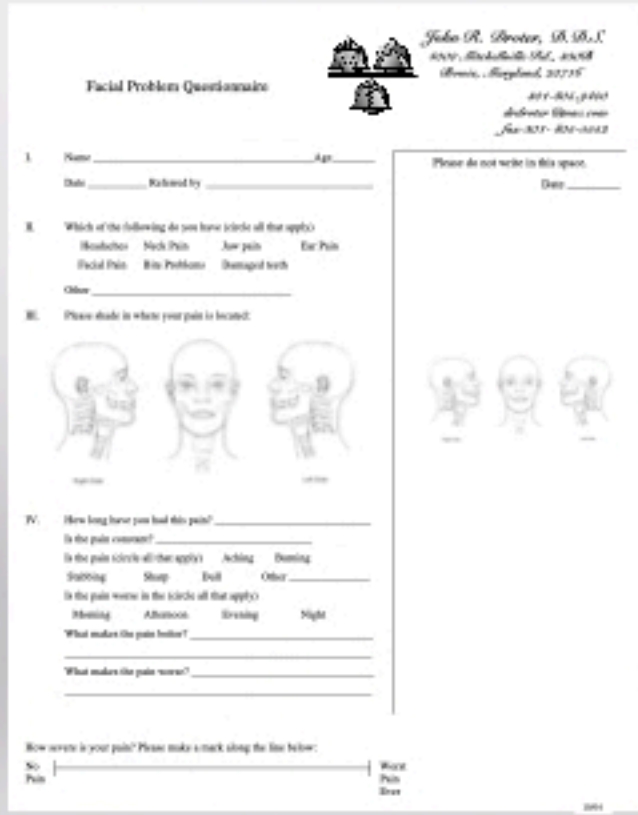
Most Important is the history. You have a good idea of what is going from this alone.

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

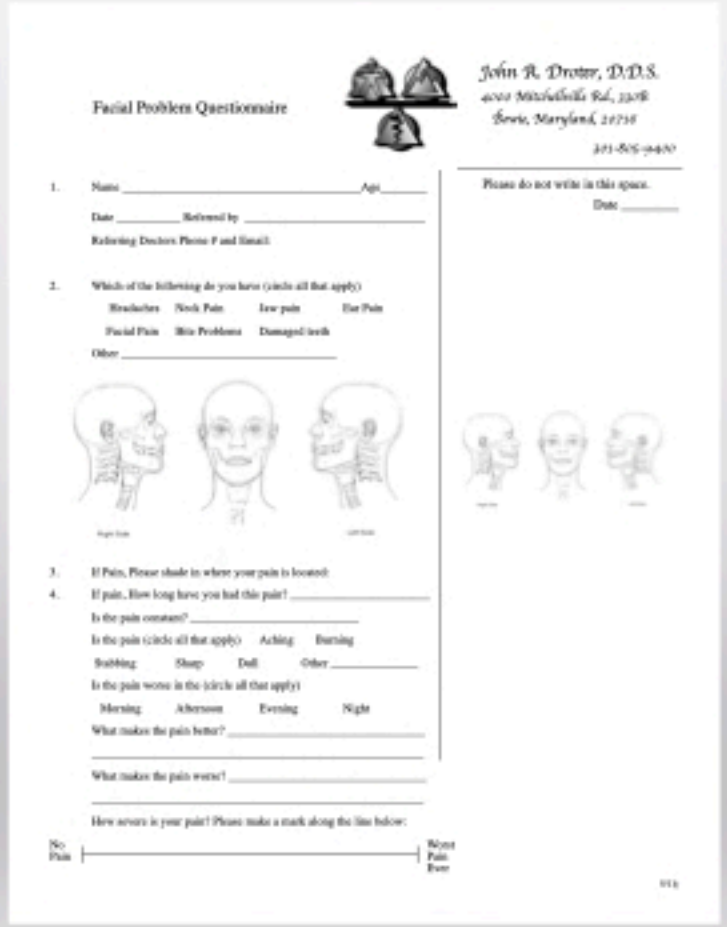
Need to resist the temptation to zero in on one diagnosis.

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




Facial Problem Questionnaire

Facial Problem Questionnaire



Facial Problem Questionnaire

John R. Droter, D.D.S.
4001 Mitchellville Rd., 330B
Bowie, Maryland, 20716
301-805-9400

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:

_____

_____

_____

_____

_____

_____

_____

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

_____

_____

_____

What would you like to accomplish with treatment here?

_____

_____

_____

Start Reading here when you first look at form

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

FAB
- Feature
- Advantage
- Benefit

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

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

Facial Pain Diagnosis

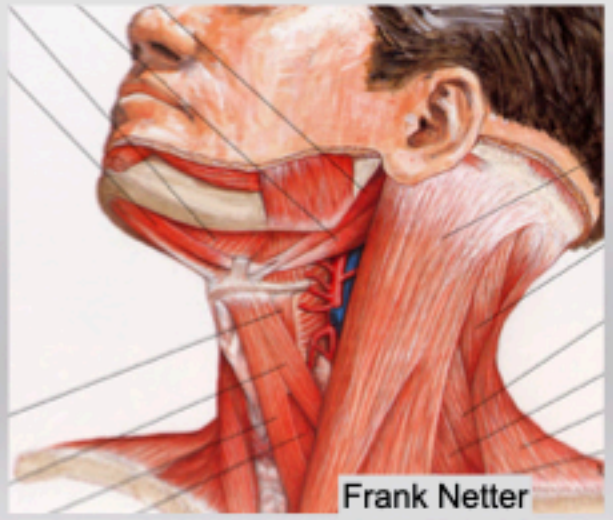
Diagnostic Tools

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

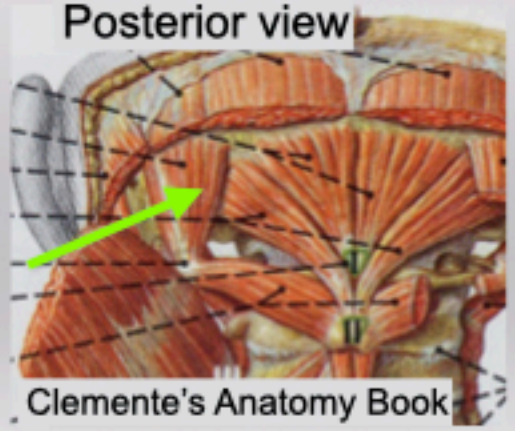
Also palpate:
- TMJ Lateral
- TMJ Posterior

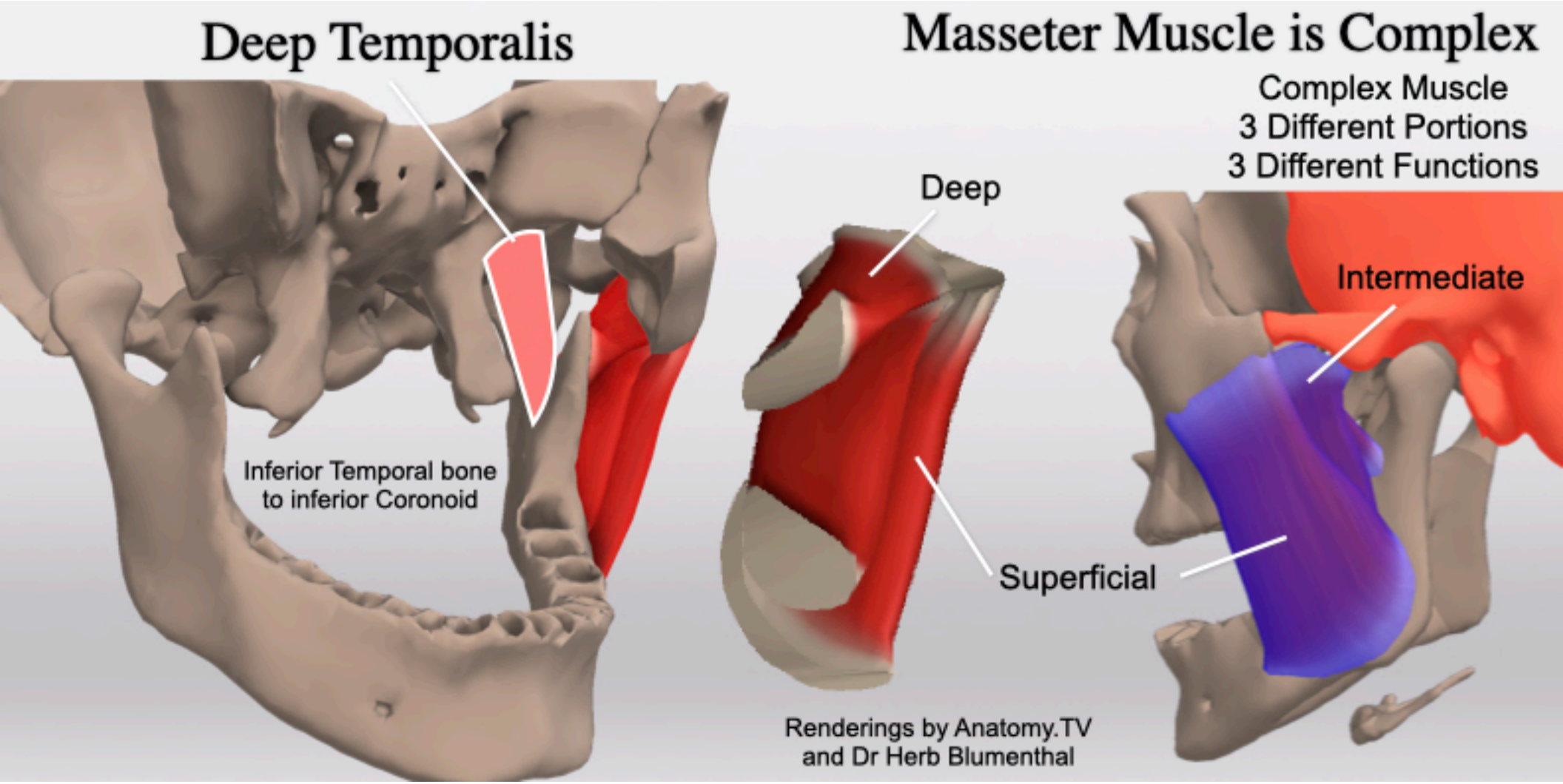
While I palpate many muscles, the ones I find key are:

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



Posterior view




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

Facial Pain Diagnosis

Diagnostic Tools

1. Written and Oral History
2. Observation
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   - Muscle Palpation
   - **Joint Palpation**
   - Joint Auscultation
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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

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

Load Testing

No pain does not mean stable

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

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

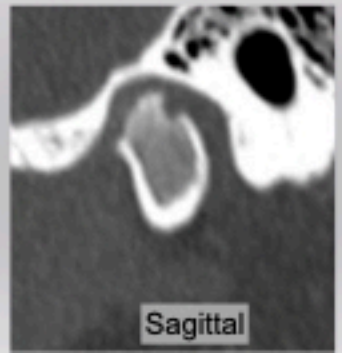
CR Load test on these 39 joints:
CR Load Positive Soreness 22/39 (56%)
Missed 17/39 structurally unstable joints (44%)

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%)

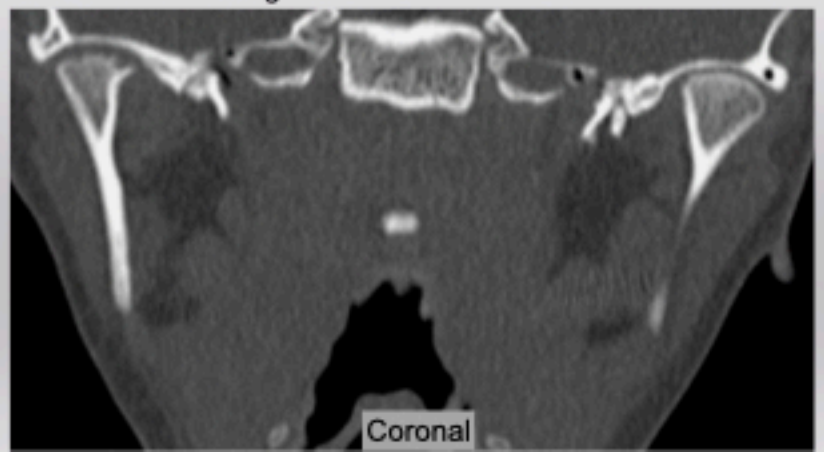
Load Test Bimanual Manipulation

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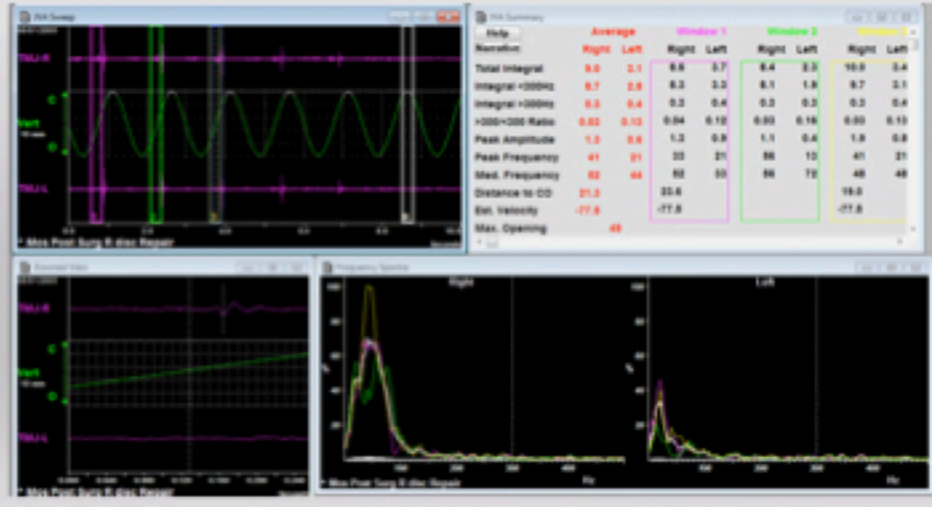
A healthy joint is quiet,
A damage joint is not.
A joint that does not move is also quiet.

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

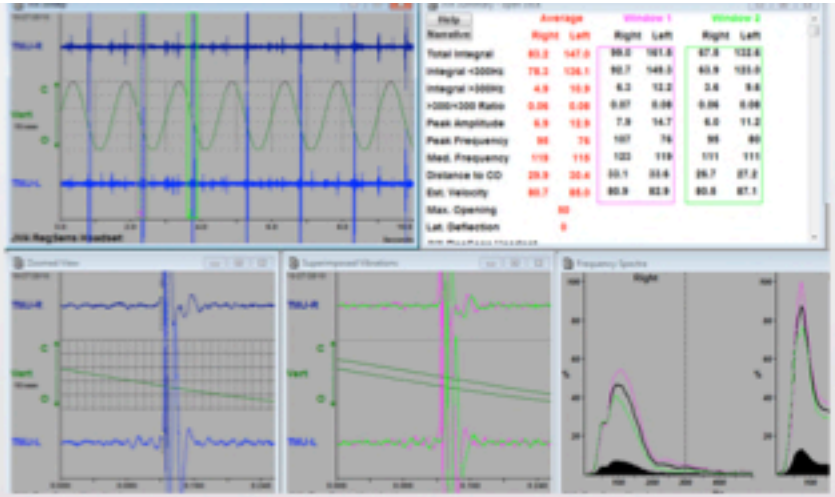
3M Littmann Classic II S.E. Stethoscope

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
			??

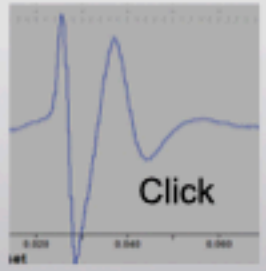
Joint Vibration Analysis

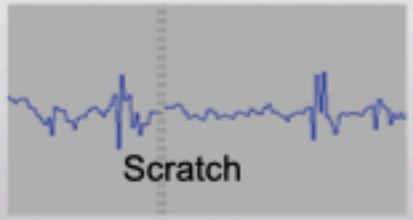
Objectively measures and quantifies joint vibrations during motion which is an indication of cartilage health

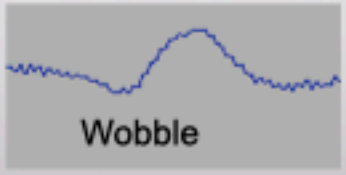


Based on Sonar.
It is not a microphone

Three main types of sounds





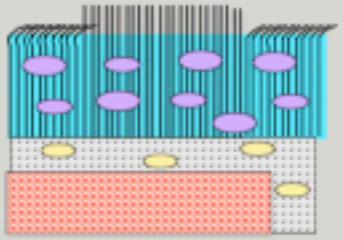


Disc Reduction
Disc Dislocation
Adhesion crackle
tooth tap

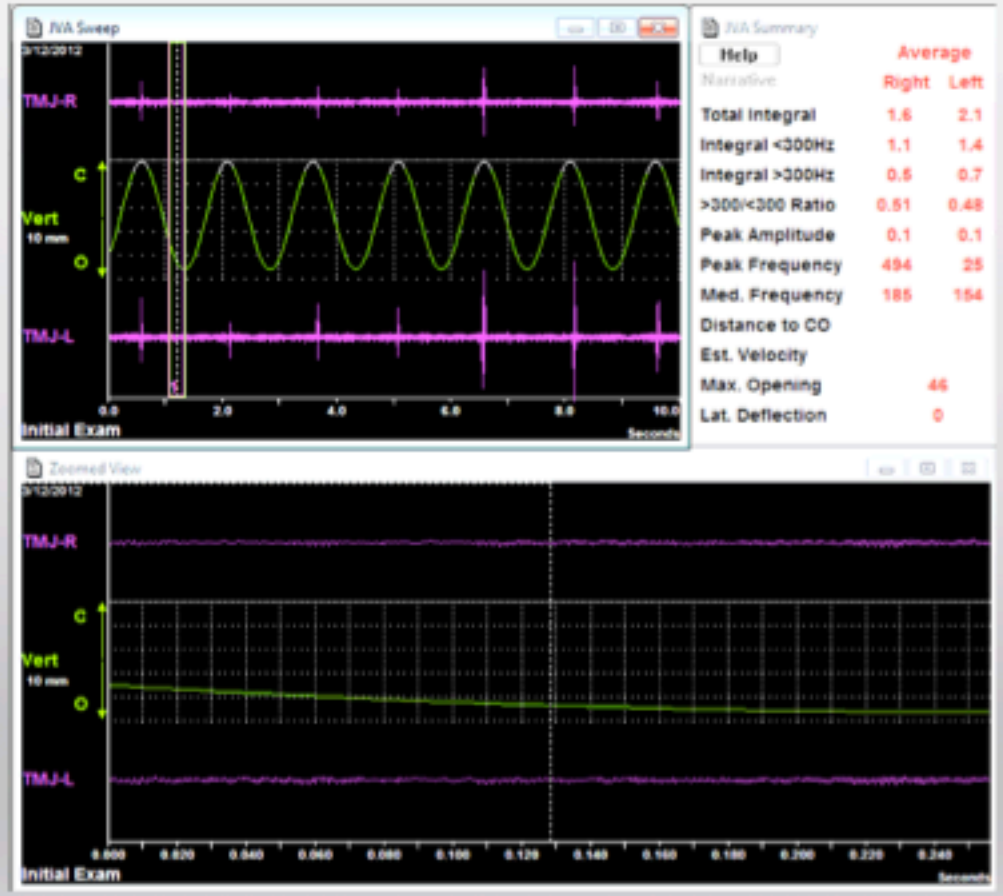
Osteoarthritis
Pseudo Disc
Damaged Cartilage

Disc Subluxation
Joint Subluxation
Disc Reduction
Disc Dislocation

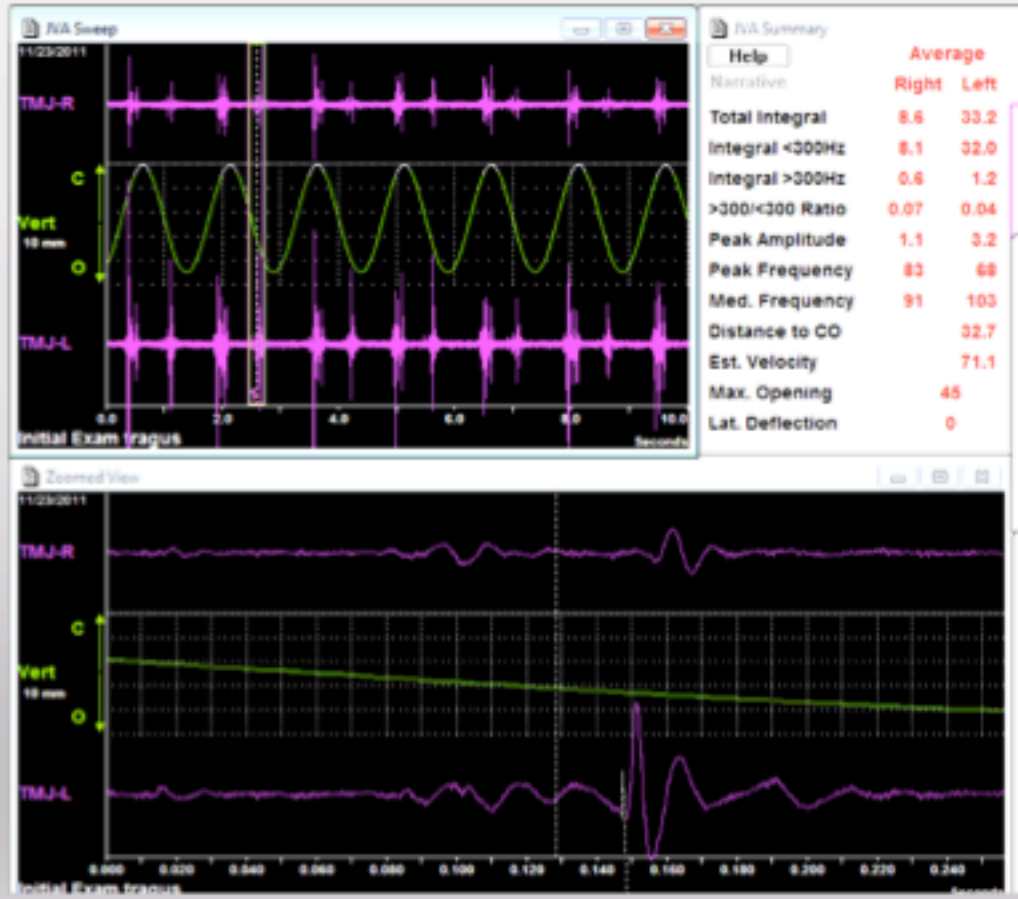
JVA measures the health of the cartilage



Healthy or Damaged?

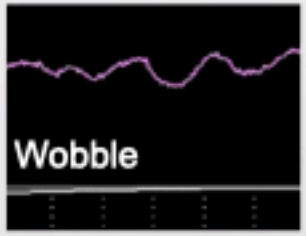


Healthy or Damaged?

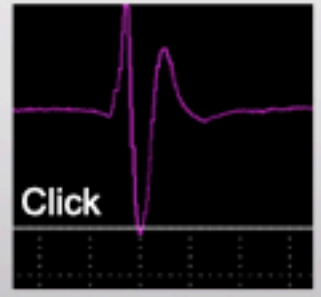


Why is Joint making this vibration?

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

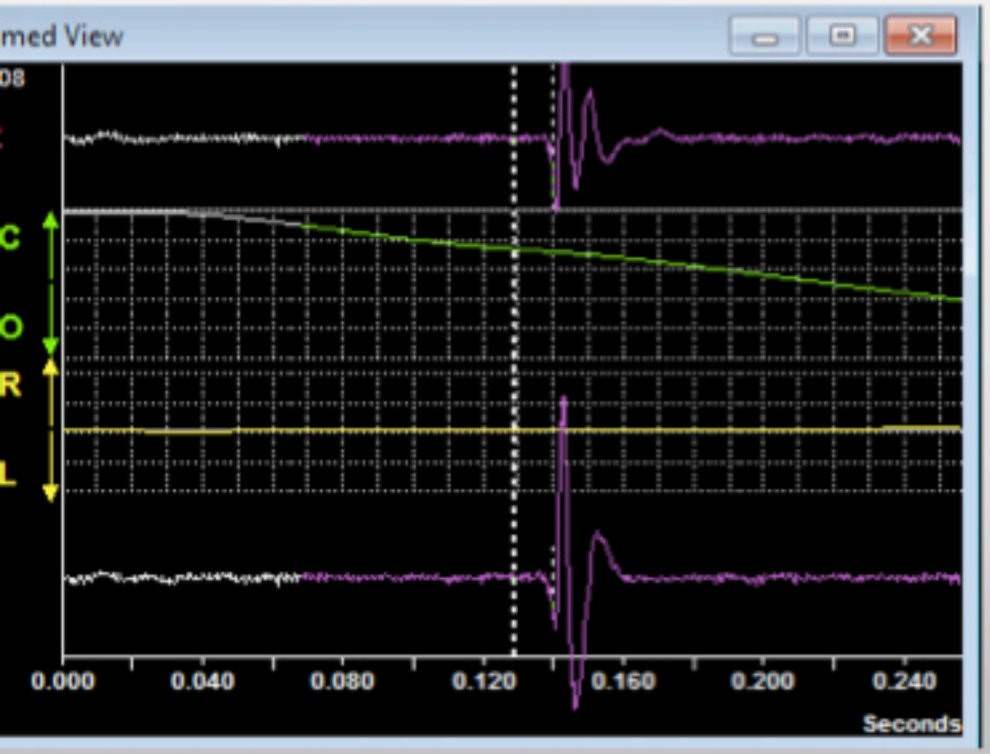
Diagnostic tests
Narrow down the choices

Working Diagnosis
Treating as if

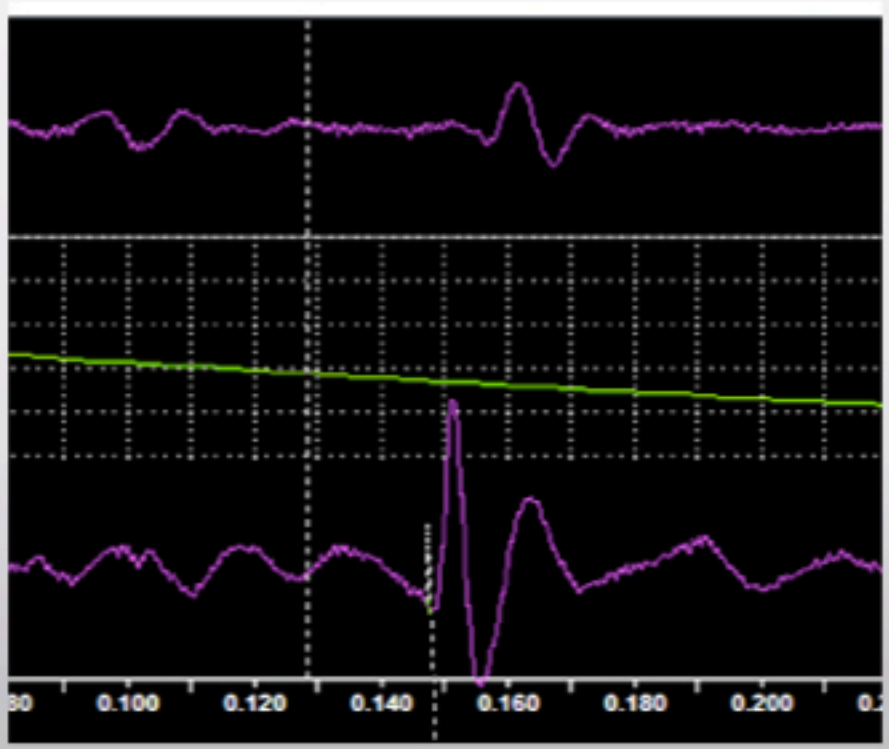
Not completely resolved

Final Diagnosis
Only after problem resolved

Simple or Complex



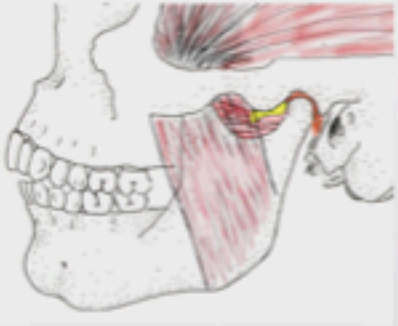
Simple left click with transference vibration to right
L4a

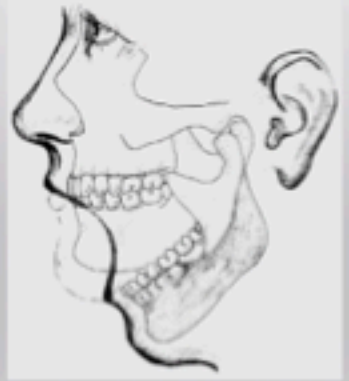


Complex Click
L3a, R4b

Magnetic Resonance Imaging

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



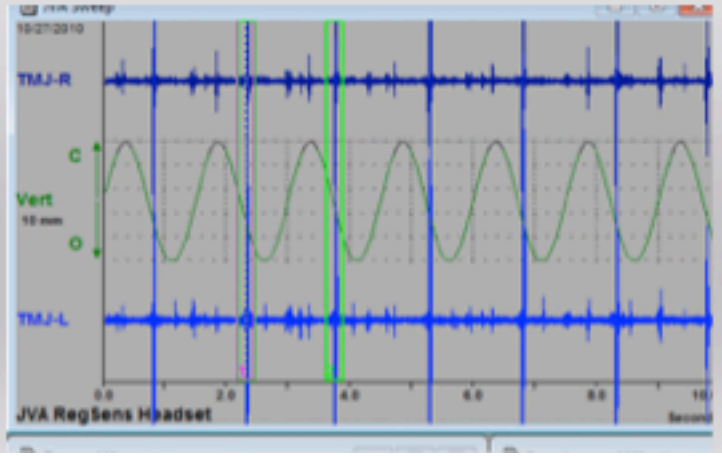


Joint Vibration Analysis

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

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

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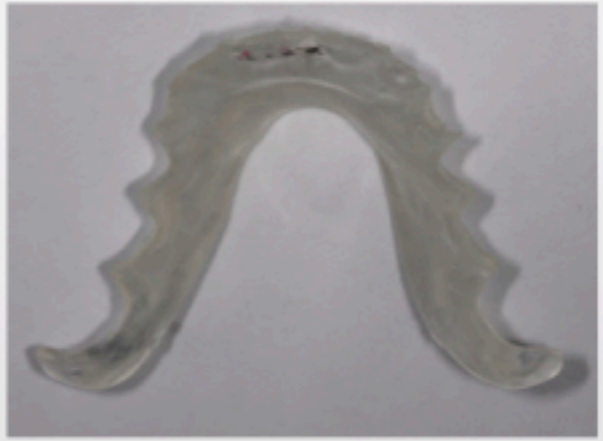
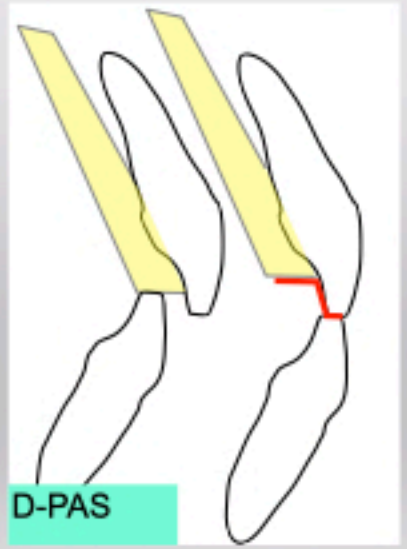
- Joint Auscultation
- Joint Motion

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

Short



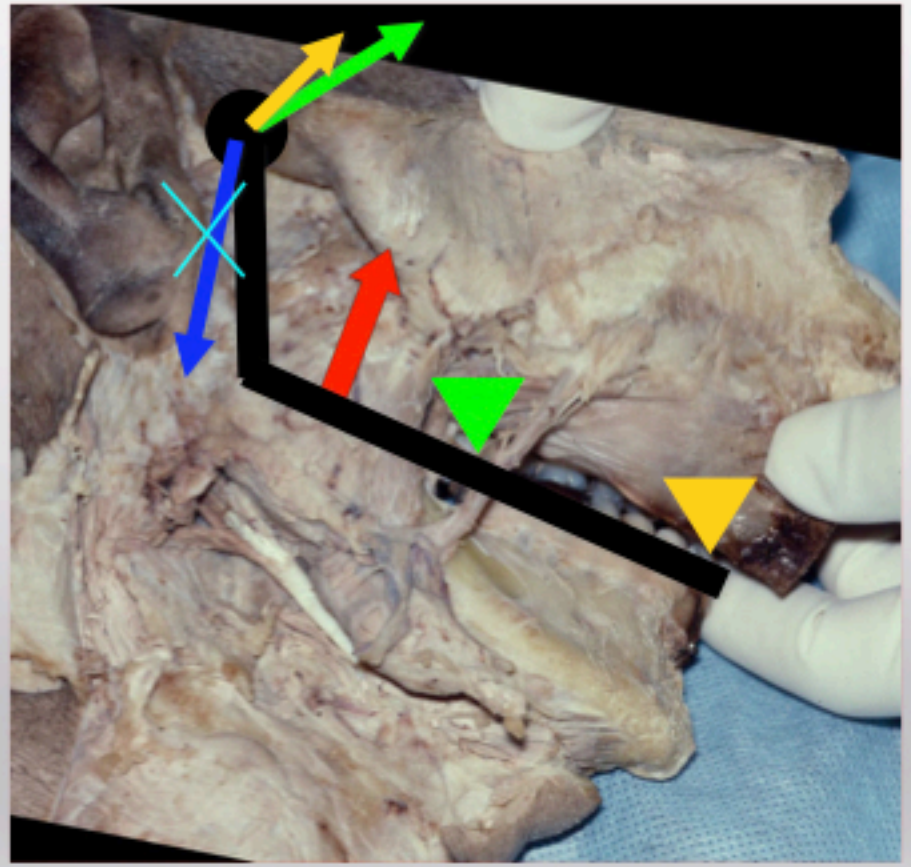


Anterior Stop Orthotics

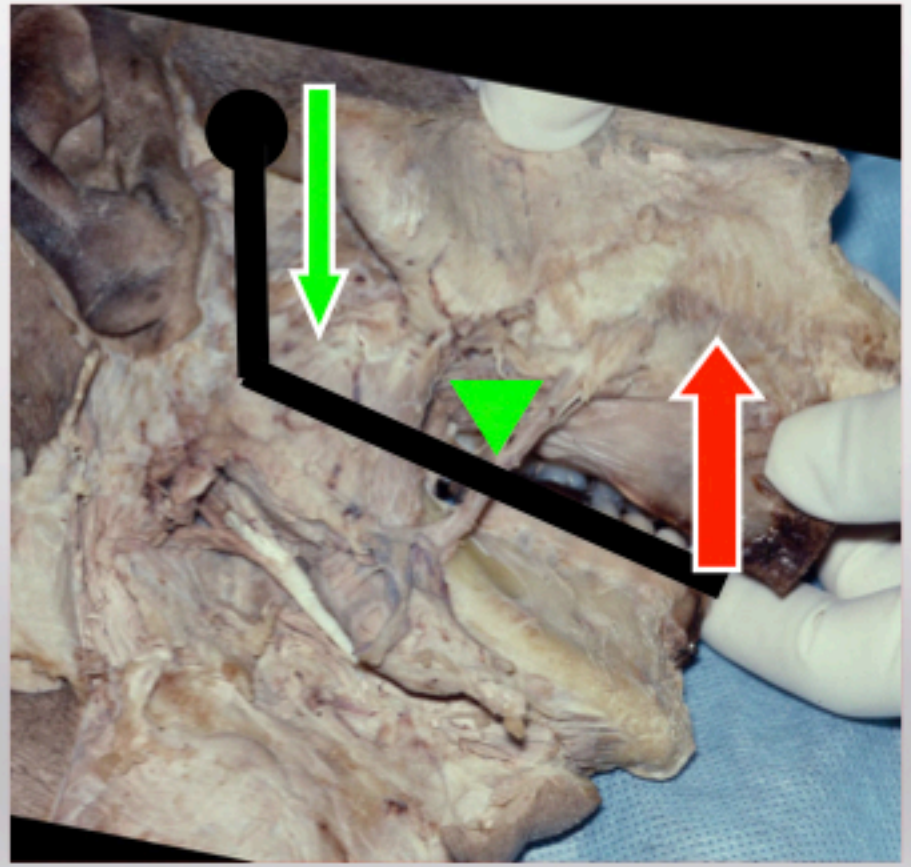
APS
ArrowPath Sleep

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

Can a Bilateral Pivot distract a condyle downward?

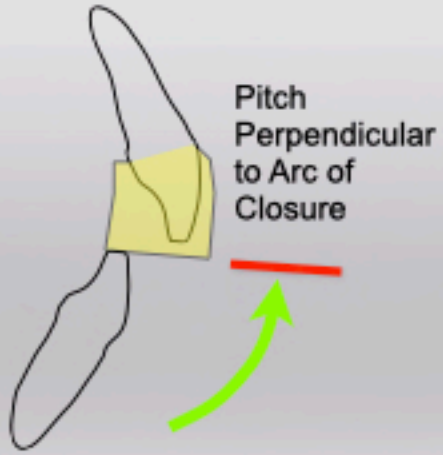


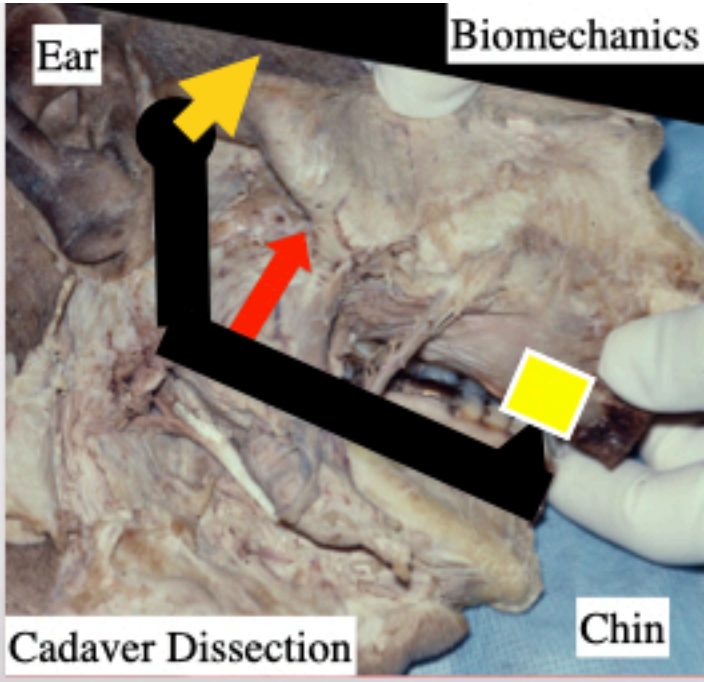
To distract both condyles need force upward in front of the pivot



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.

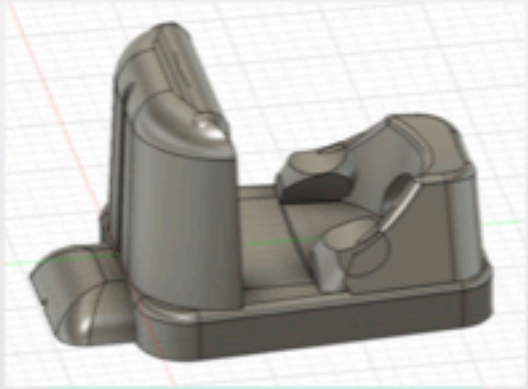




Anterior Stop Orthotic
In Office Diagnostic Test

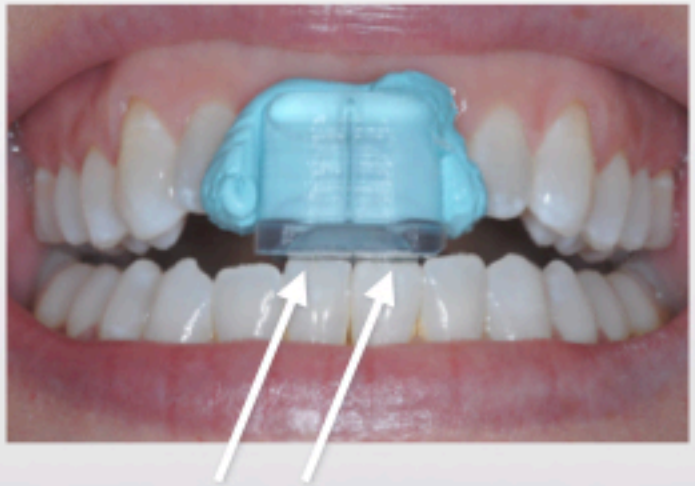
Reline with Parkell Blu-Mousse Super Fast

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

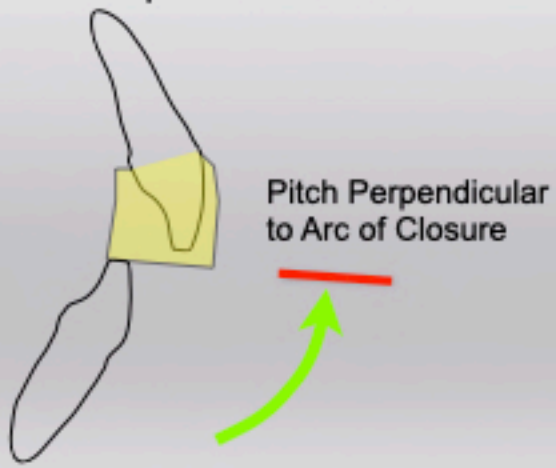


APS Anterior Stop 2.5mm

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



2 points of contact



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

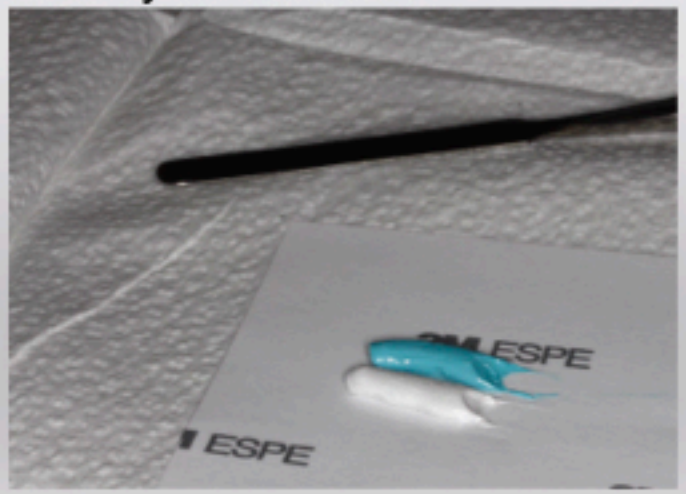
Occipital Lift with 3 deep breaths. Posterior neck opening muscle massage.

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

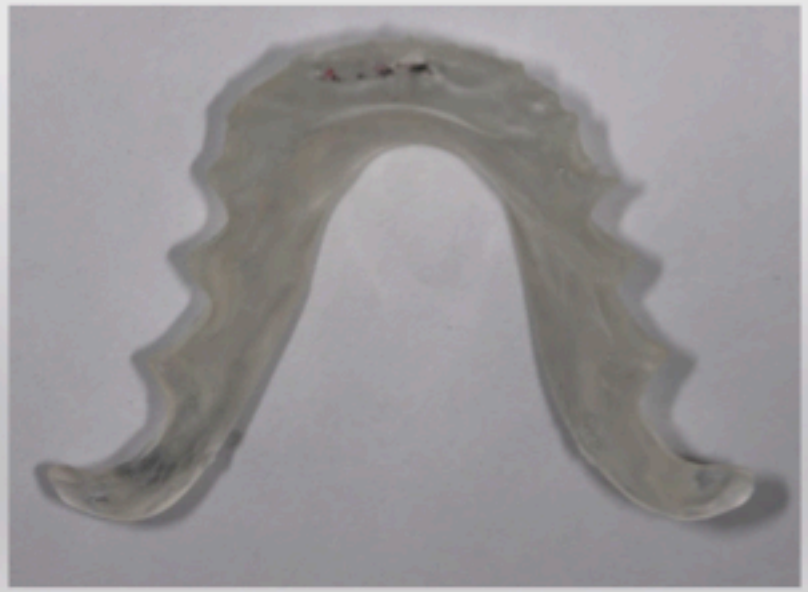
Pankey Anterior Stop
relined with bis-gma resin

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.

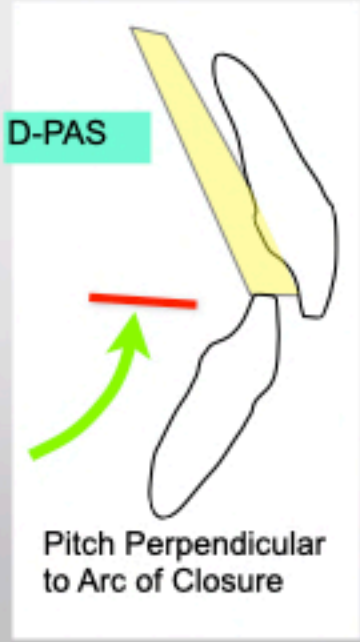
Diagnostic Palatal Anterior Stop

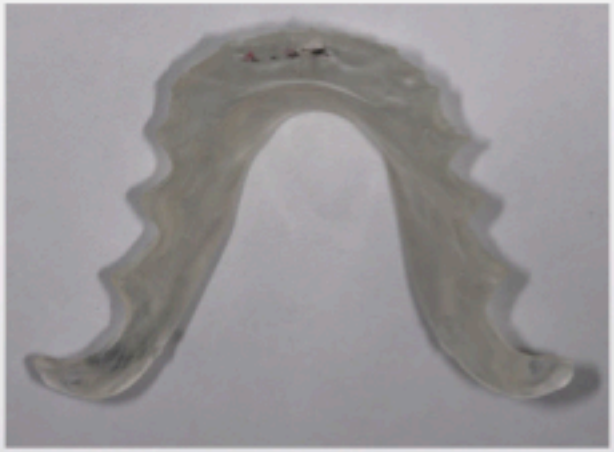
D-PAS Test: Wear 2 weeks for sleep, and occasional daytime

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

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

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



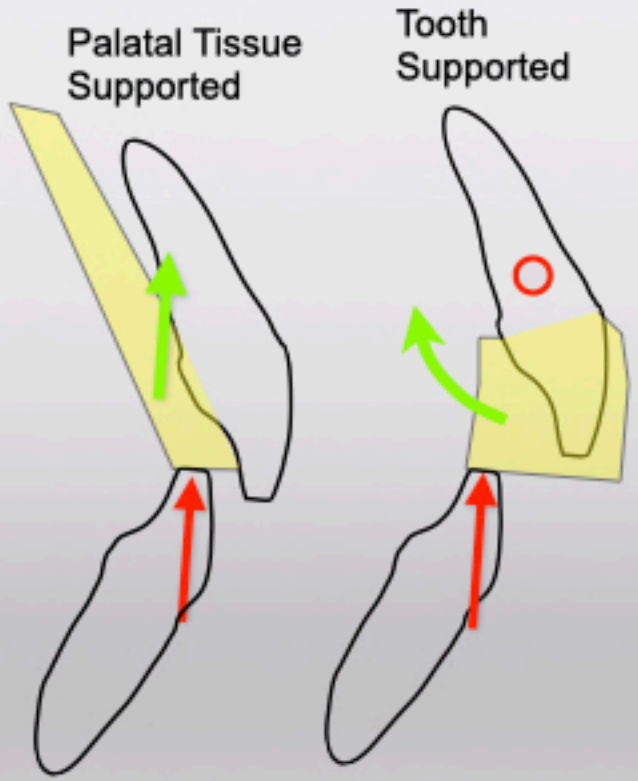


Stapelmann H, Türp JC. The NTI-tss device for the therapy of bruxism, temporomandibular disorders, and headache…..BMC Oral Health. 2008 Jul PMID: 18662411

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

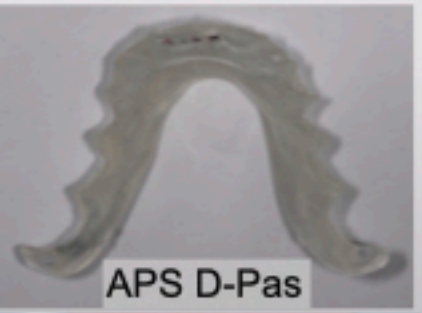
Stapelmann H, Türp JC. The NTI-tss device for the therapy of bruxism, temporomandibular disorders, and headache…..BMC Oral Health. 2008 Jul PMID: 18662411

Anterior Stop Orthotic 3 Effects

Allows Maxilla, Mandible, and Temporal bones to align.

Major decrease in muscle contraction force, most patients.

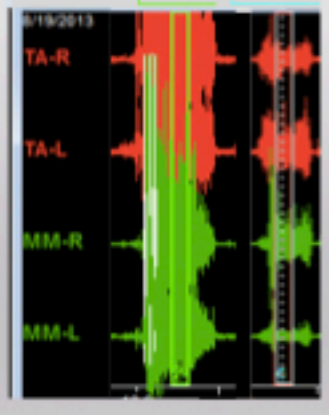
Breaks muscle engram avoidance and bracing patterns.



BioResearch EMG

Patient with muscles inhibited by anterior only contact

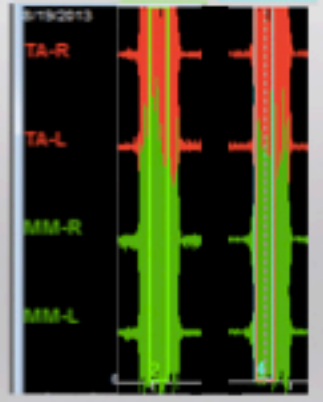
	Clench MaxIC µV	Anterior Stop D-PAS µV
TA-R	100.6	15.7
TA-L	108.9	25.3
MM-R	115.4	25.5
MM-L	70.5	6.8



Major decrease in muscle power with D-PAS

Another Patient with muscles NOT inhibited by anterior only contact

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

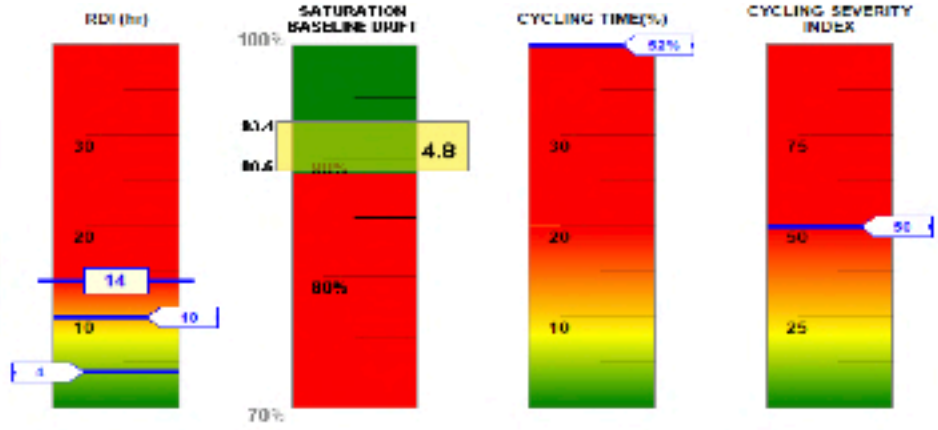


Muscle power same with D-PAS

Facial Pain Diagnosis

Diagnostic Tools

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



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

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

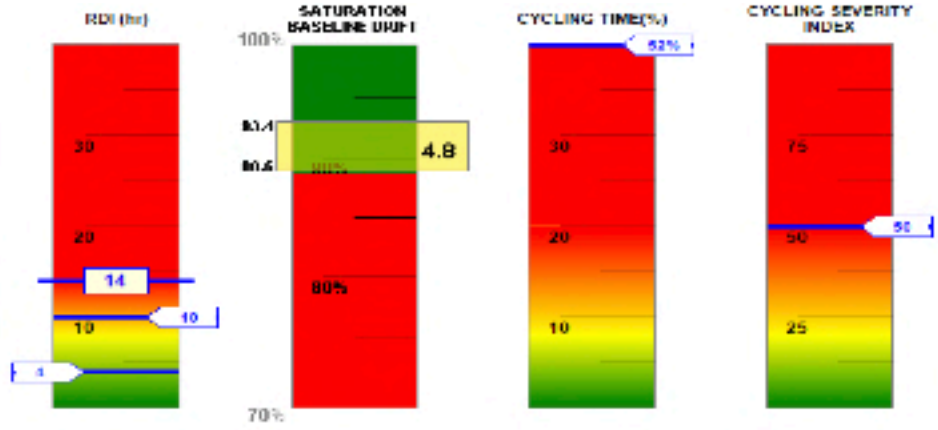
Patient Safety Inc.

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

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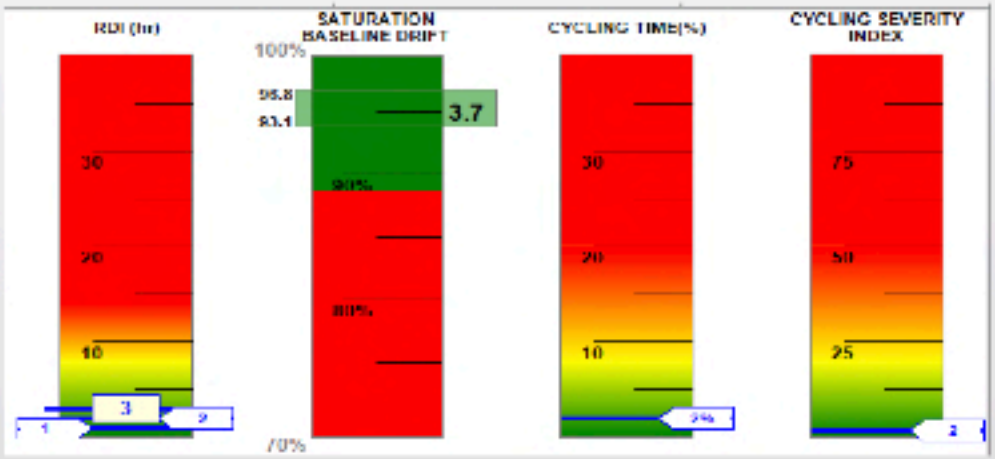
<= 70	00:00:00	0%
Total	05:27:42	100%
Motion Artifact	00:00:07	0.04%
Error Signal	00:00:05	0.03%

Does the dental orthotic make the airway better or worse?

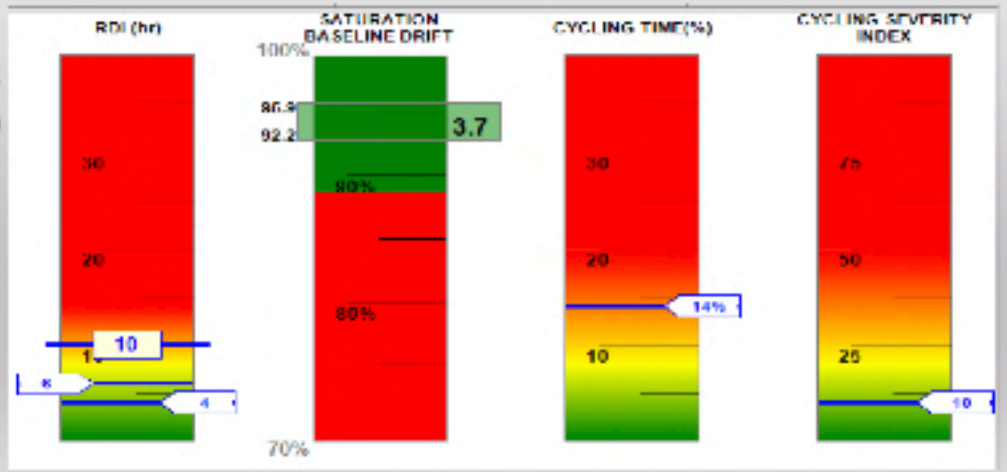
RDI= Respiratory Distress Index

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.

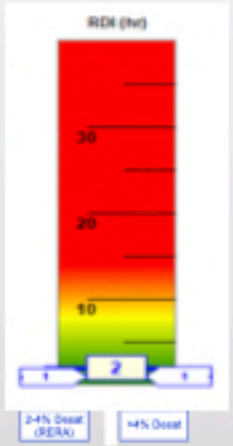
Age 16F
cc: Facial Pain, Excessive Daytime Fatigue

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

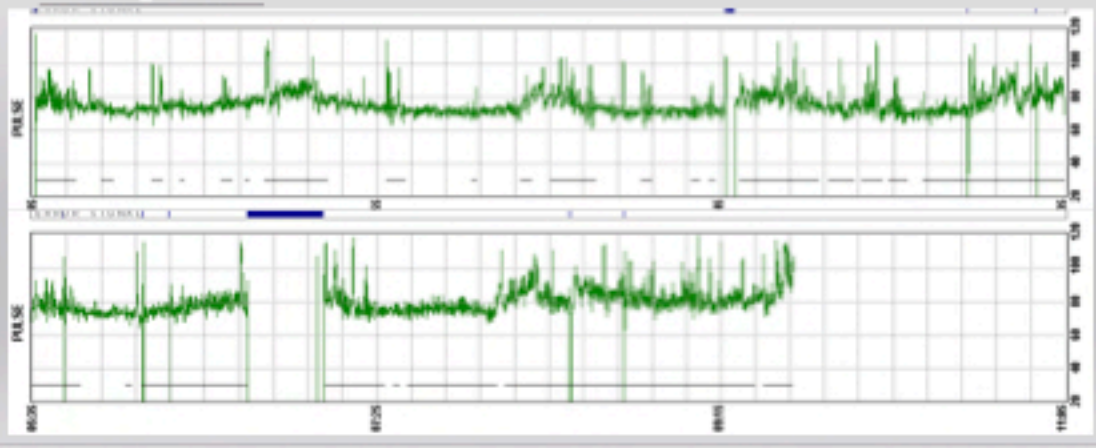
Autonomic Arousals
Index (#/hr): 31

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%

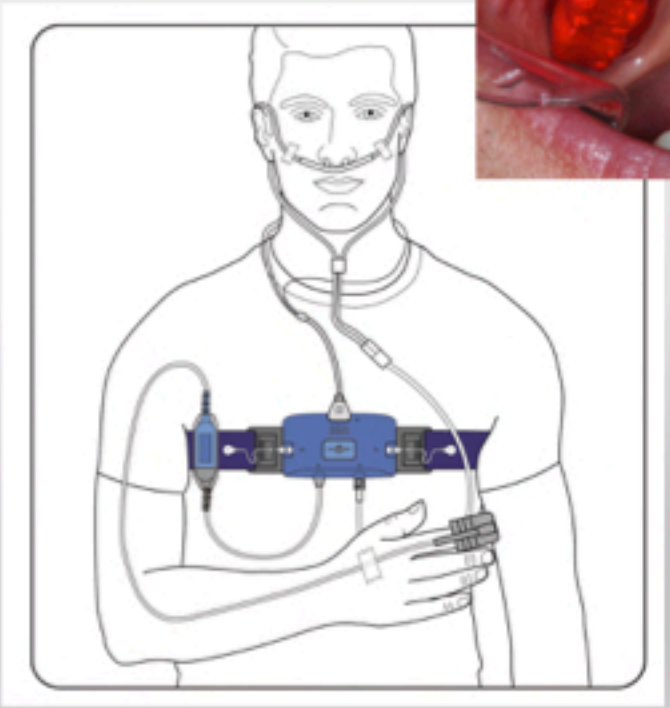
Heart Rate
>90 bpm
for 35 min



zMachine

GENERAL sleep

zMachine + Brux Checker
+ Snore Lab



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

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

Date of Birth: 1998
Age: 20
Sex: F

Height: 63 Inches
Weight: 105 Pounds
BMI: 18.60

Note:

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)	536.8 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)	6 min
Latency to Deep Sleep (LDEEP)	19 min
Latency to REM Sleep (LREM)	9.5 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	93.2 min. (23.5% 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

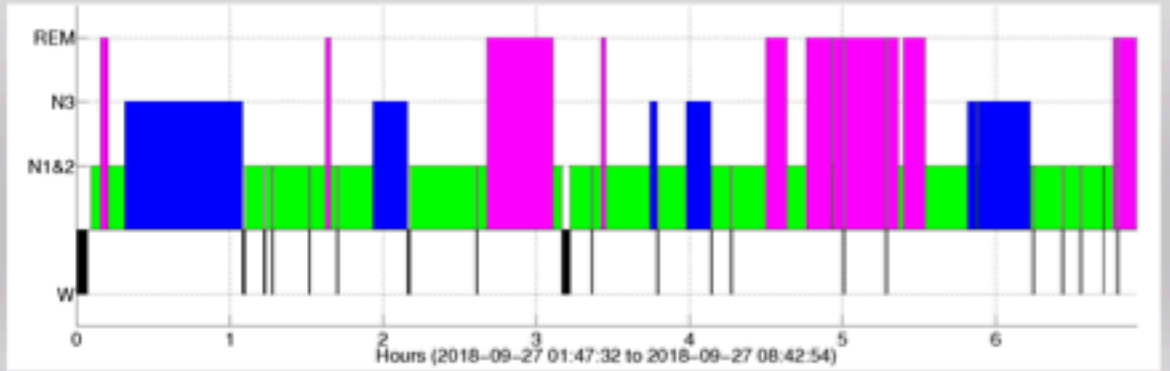
TRT is the total duration of the recording; TIB is the elapsed time from lights off to lights on; TST is the cumulative time scored as any stage of sleep; SE is 100×(TST÷TIB) expressed as a percentage; AHI is apneas + hypopneas per hour of sleep time; RDI is apneas + hypopneas + RERAs per hour of sleep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



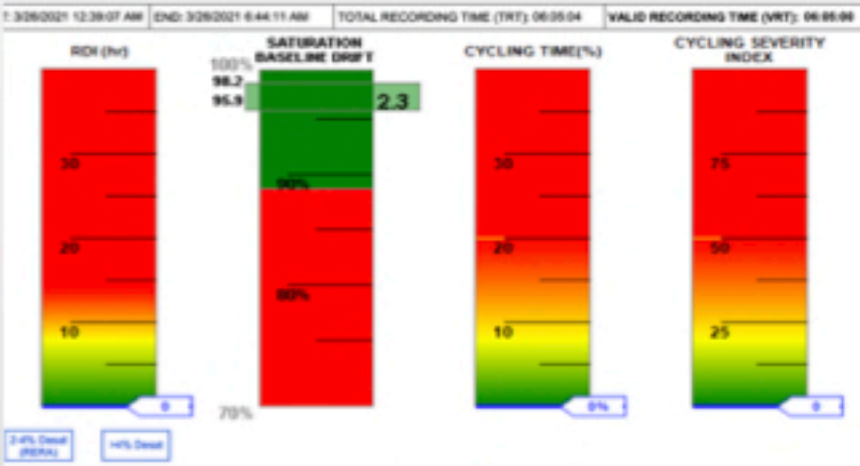
Sleep Simplified

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



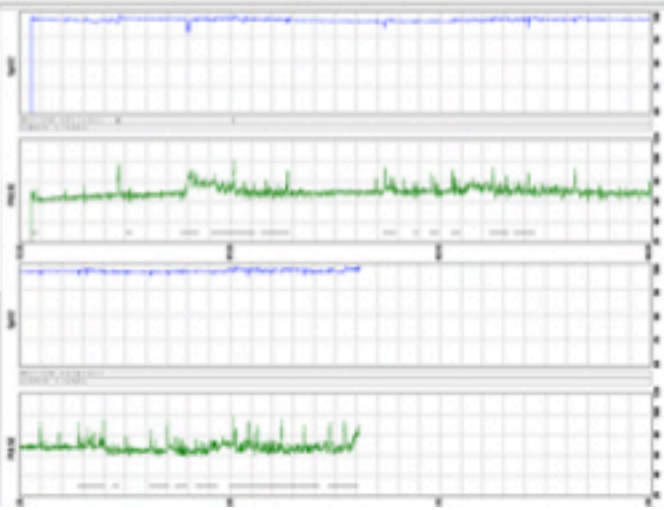
PULSE RATE DATA

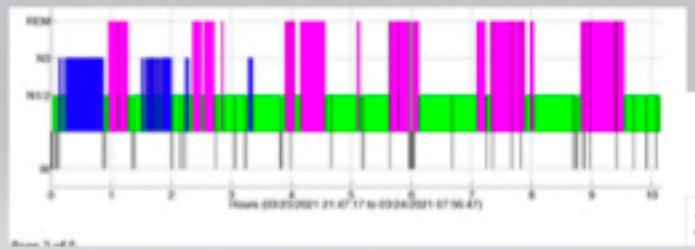
Autonomic Arousals

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

CBCT

John R Droter DDS
Annapolis, Maryland

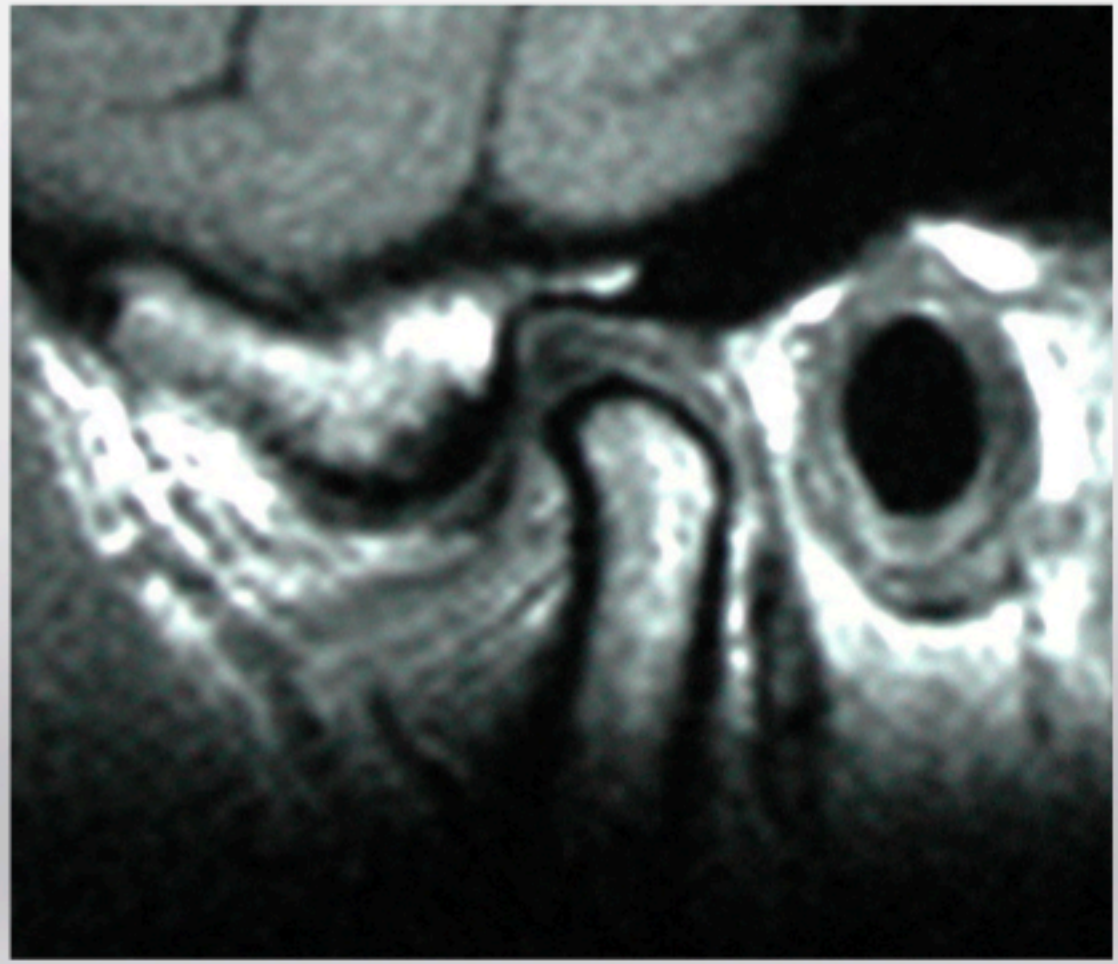
Facial Pain Diagnosis

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

Facial Pain Diagnosis

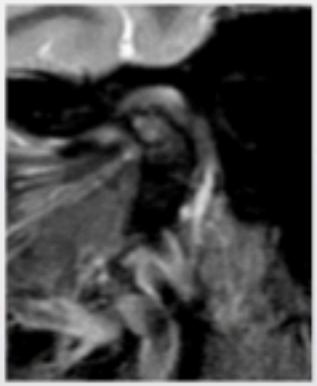
Diagnostic Tools

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

Diagnostic Tests

Differential Diagnosis

Specific Working Diagnosis

Treatment

No Signs

No Symptoms Final Dx

Doctor Re-Exam

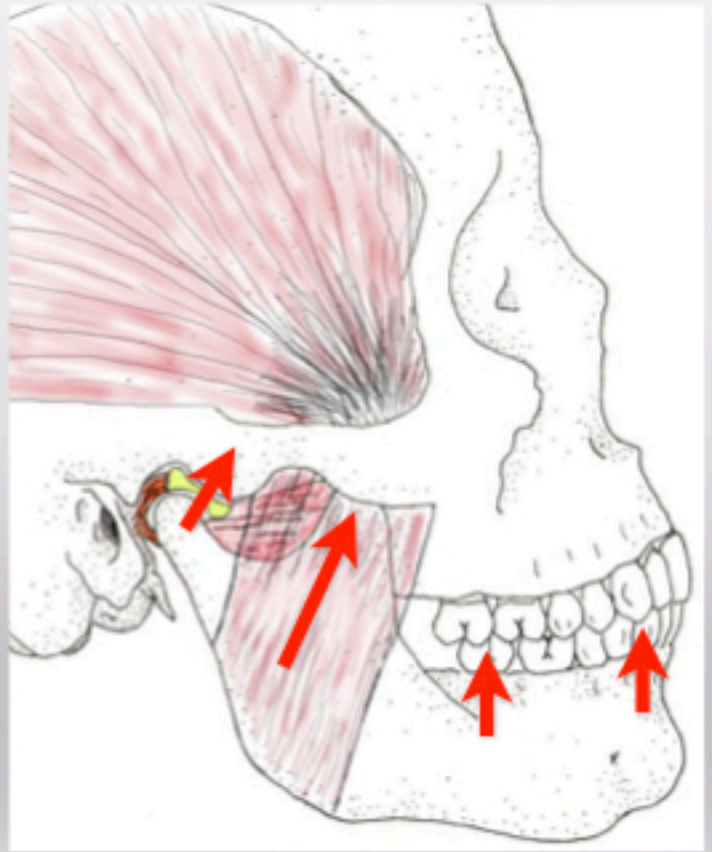
If not resolved

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

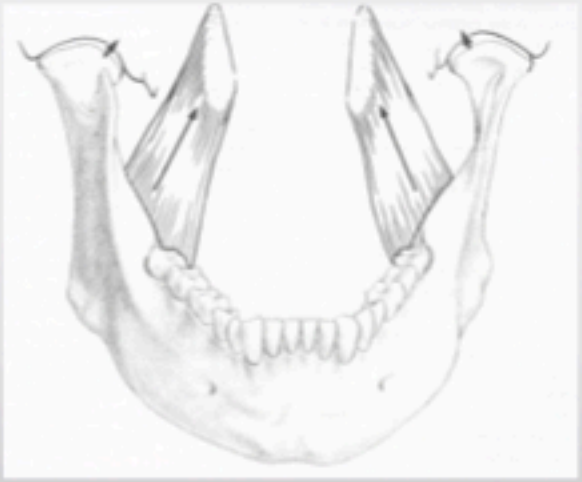
Centric Relation Load Zone Mechanical Stability

John R Droter DDS
Annapolis, Maryland

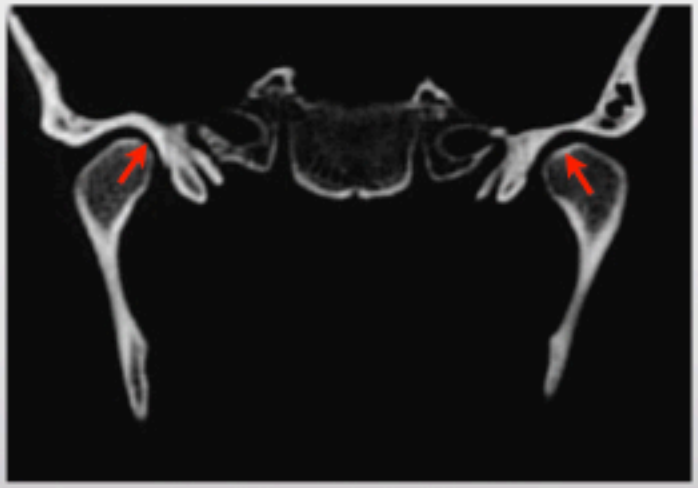
Biomechanics



Superior Medial loading is ideal

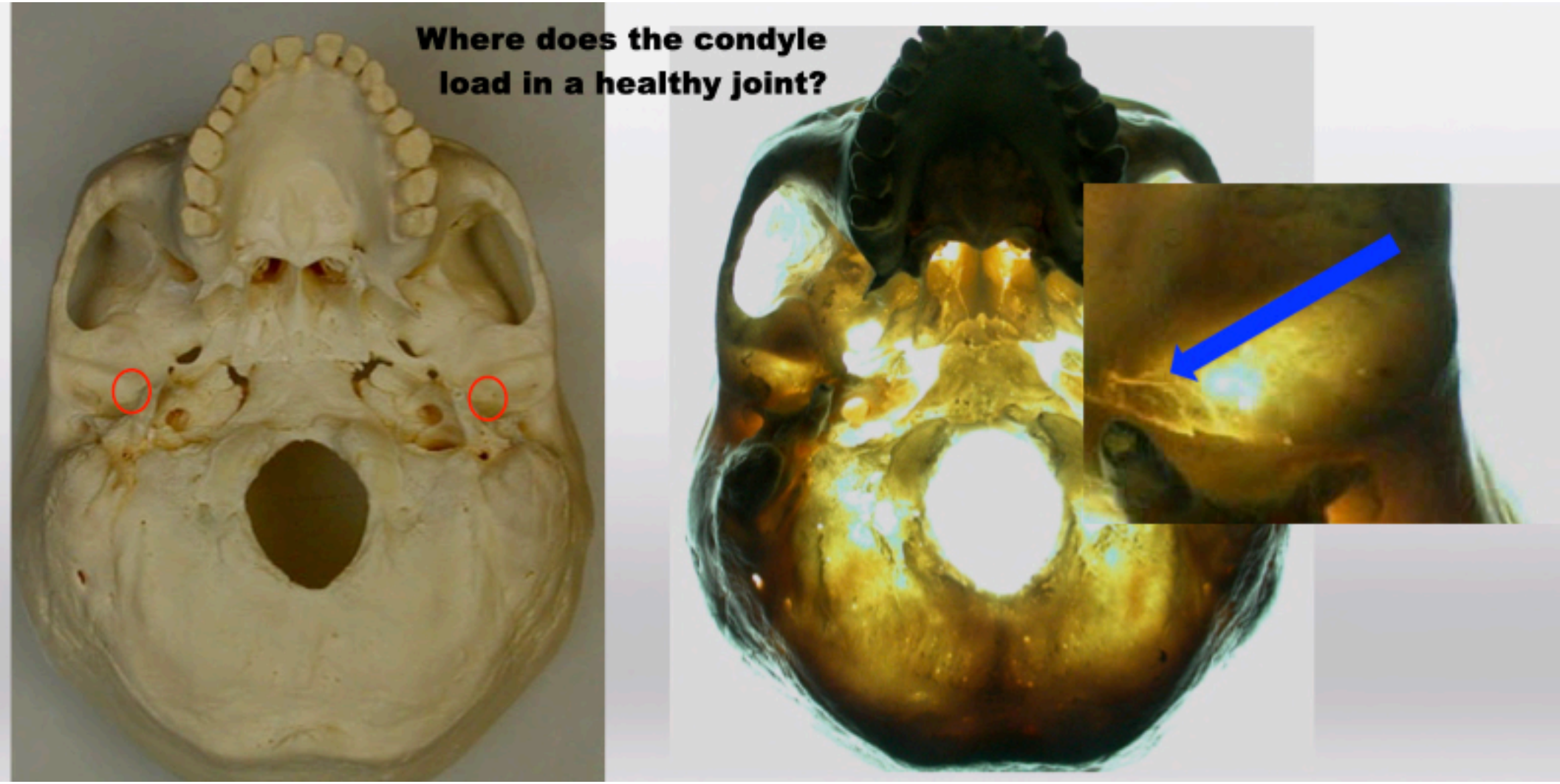


Peter Dawson Textbook

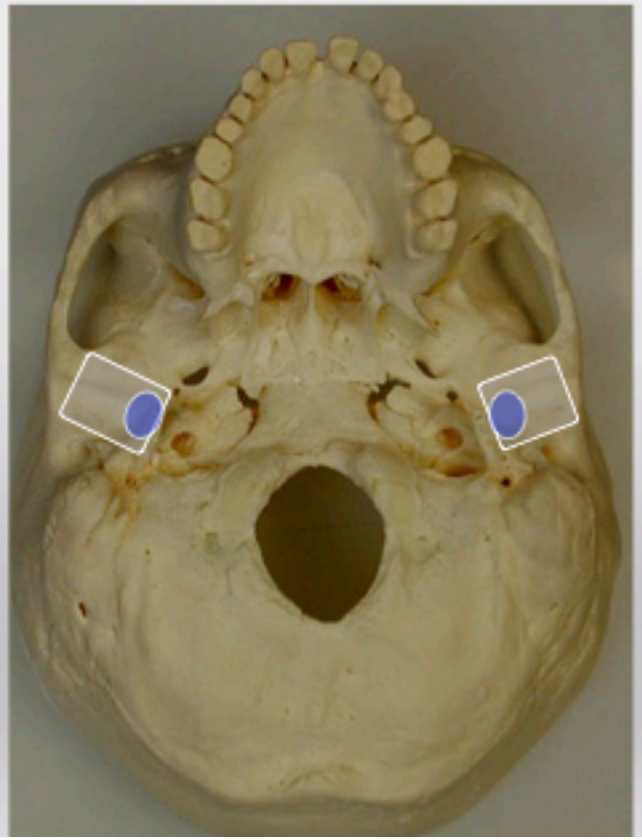


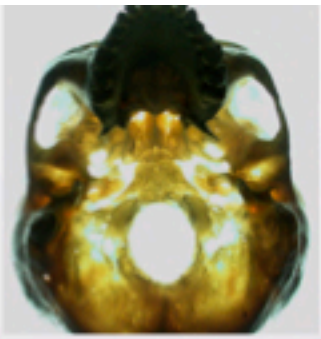
CT Coronal View

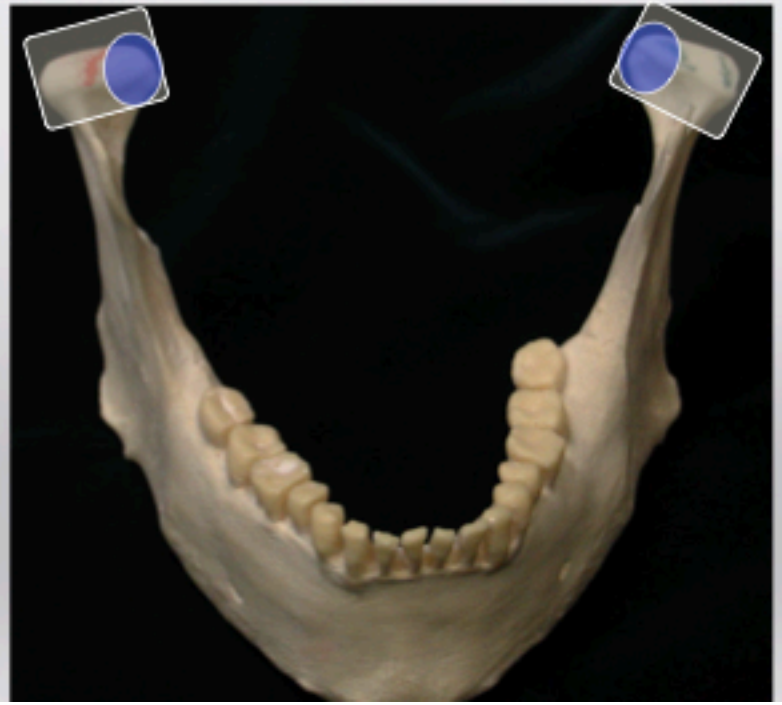
Coronal CT ask where is the bone the closest?
This is the load zone.


Where does the condyle
load in a healthy joint?

Centric Relation (CR) Load Zone



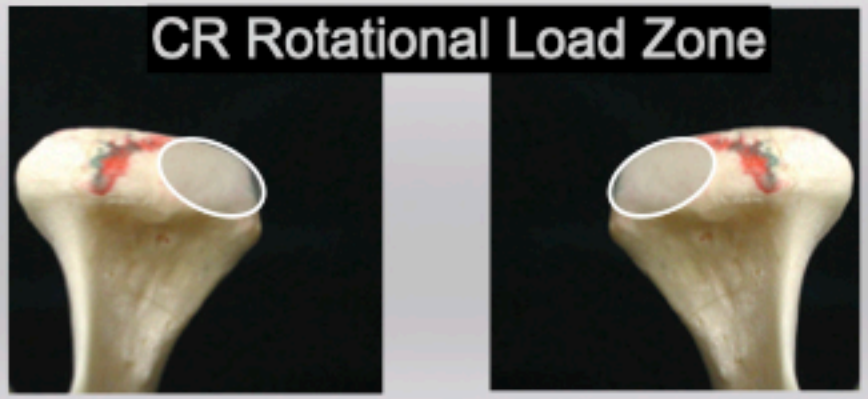




CR Load Zone

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

Medial is ideal

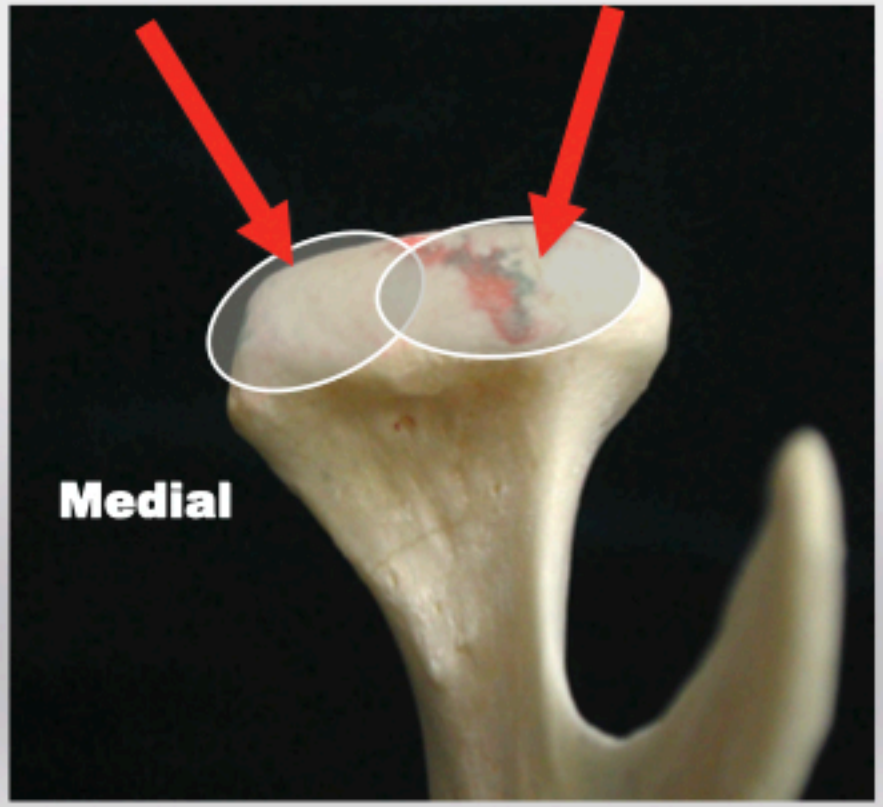


Find where the condyle is closest to the fossa

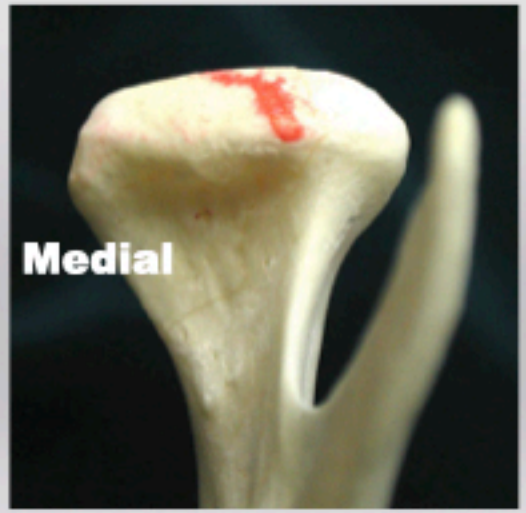
Centric Relation (CR), Translatory, and Pivot Load Zones

CR Rotational Load Zone

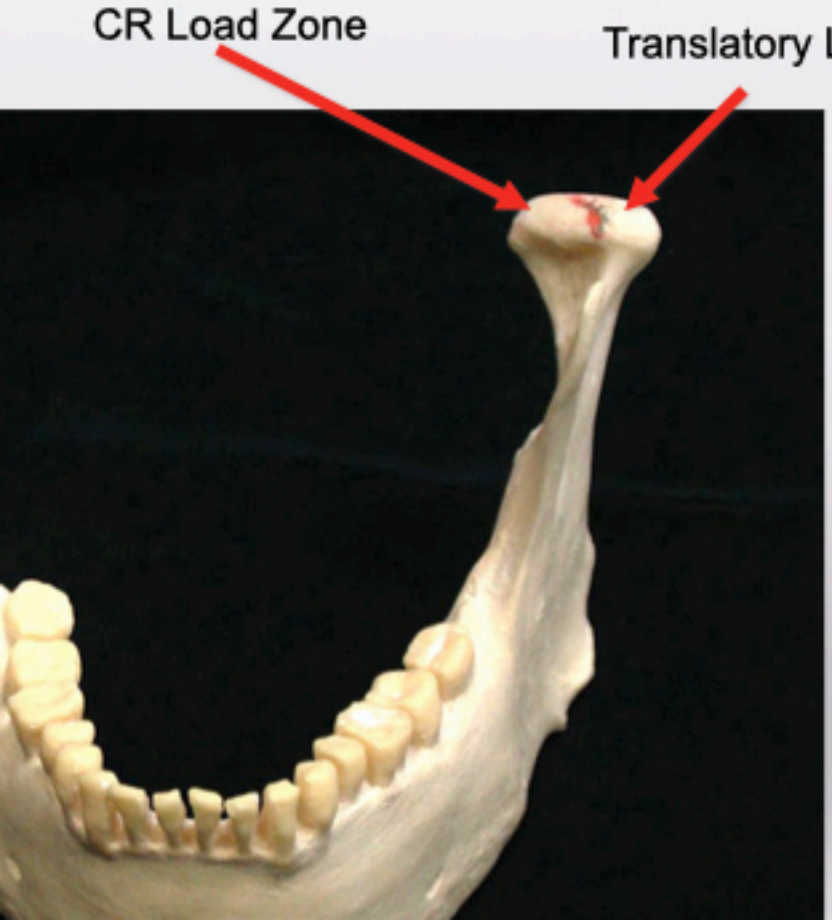
Translatory Load Zone



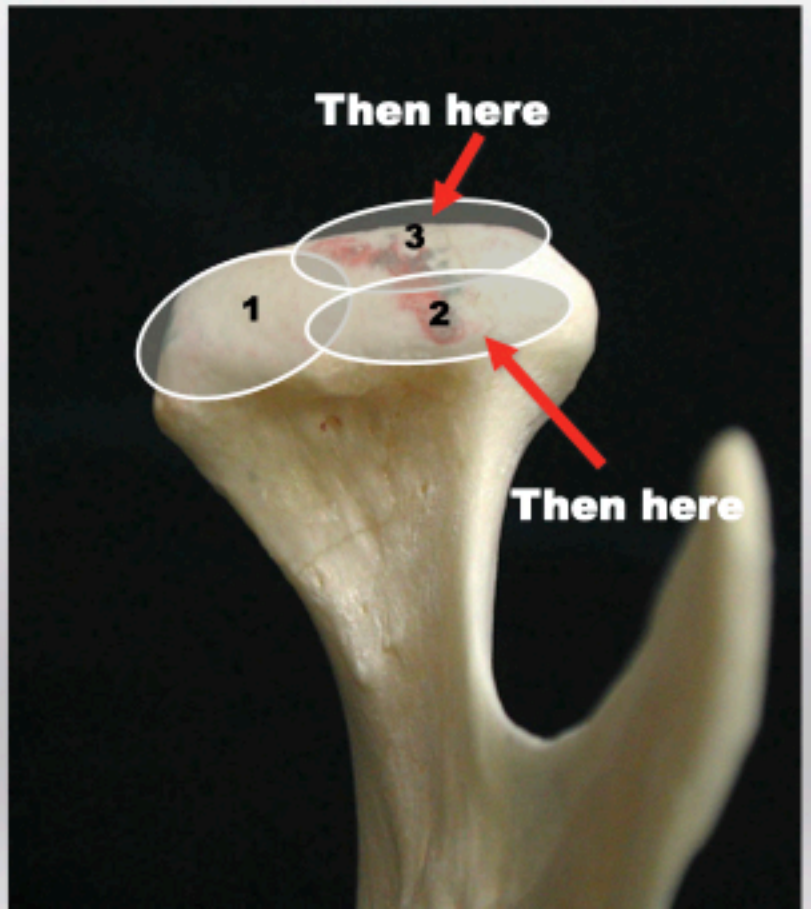
Left Condyle



CR and Translatory Load Zones

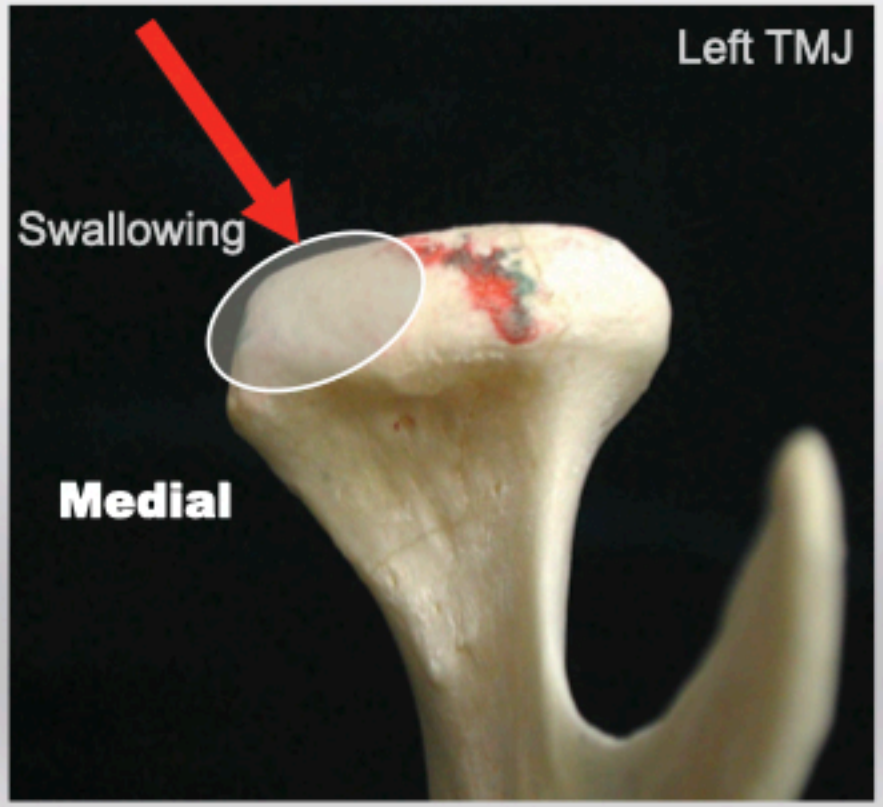


Load zones on opening



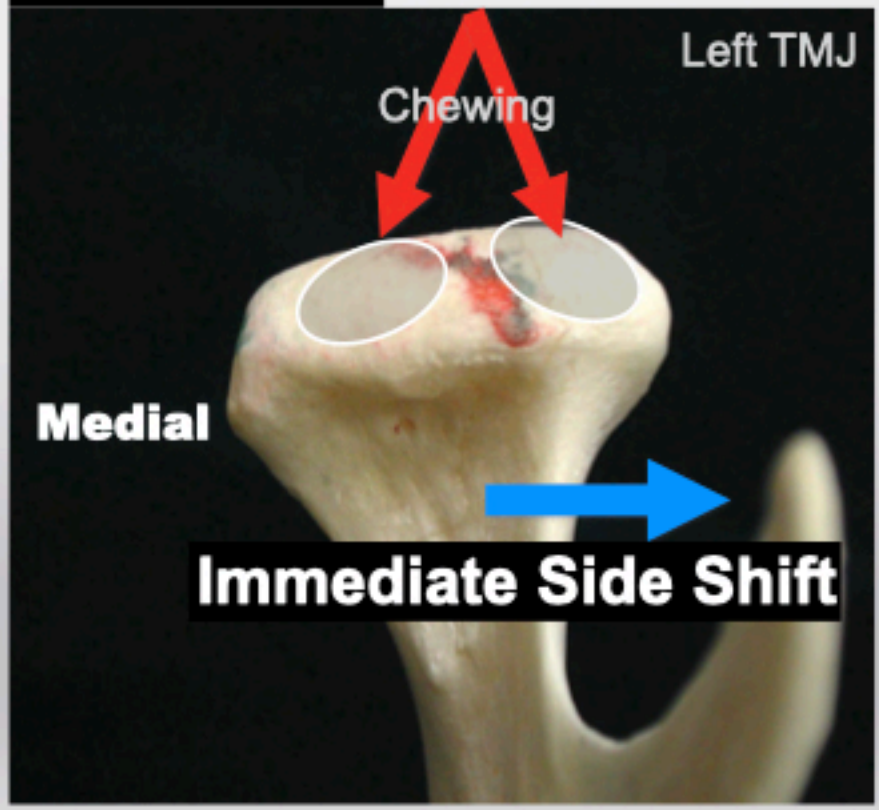
Centric Relation (CR), Translatory, and Pivot Load Zones

CR Rotational Load Zone

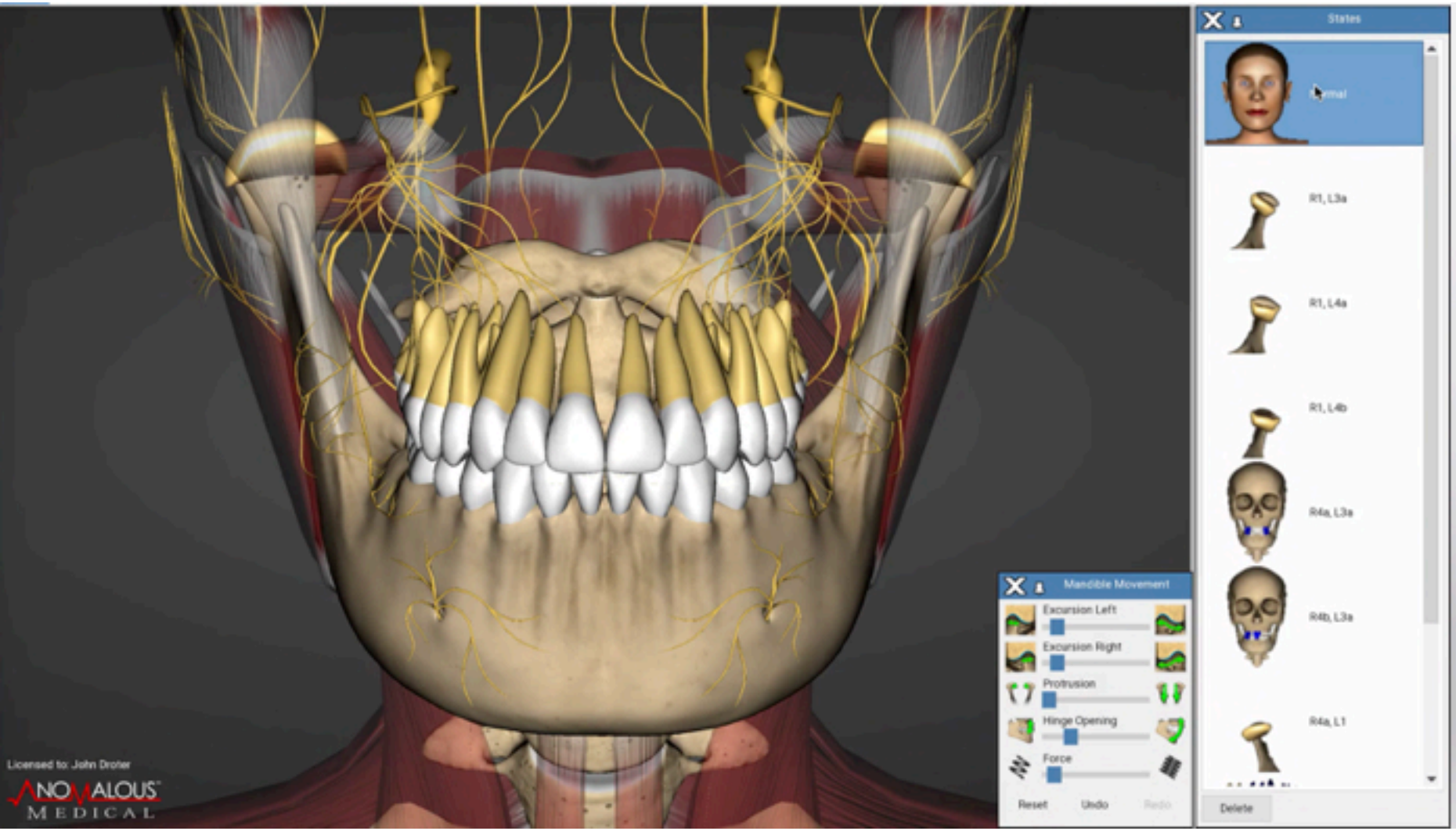


Right condyle is out of fossa

Pivotal Load Zone



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

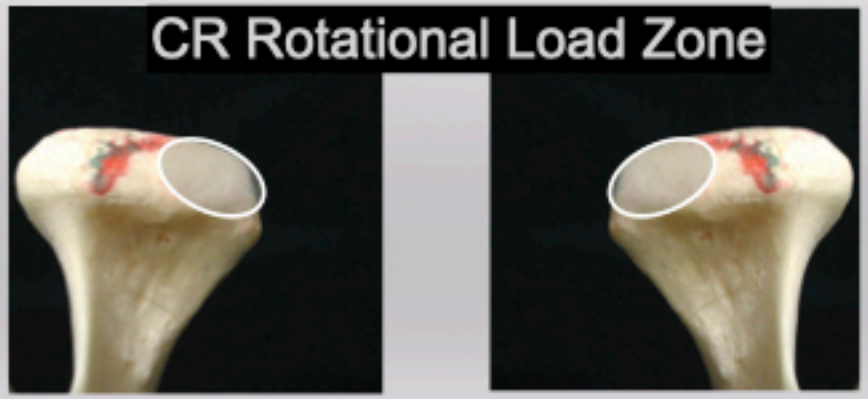


Occlusal Shift

CR Load Zone

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

Medial is ideal



Find where the condyle is closest to the fossa

Centric Relation (CR) Load Zone

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

Superior Medial CR Loading

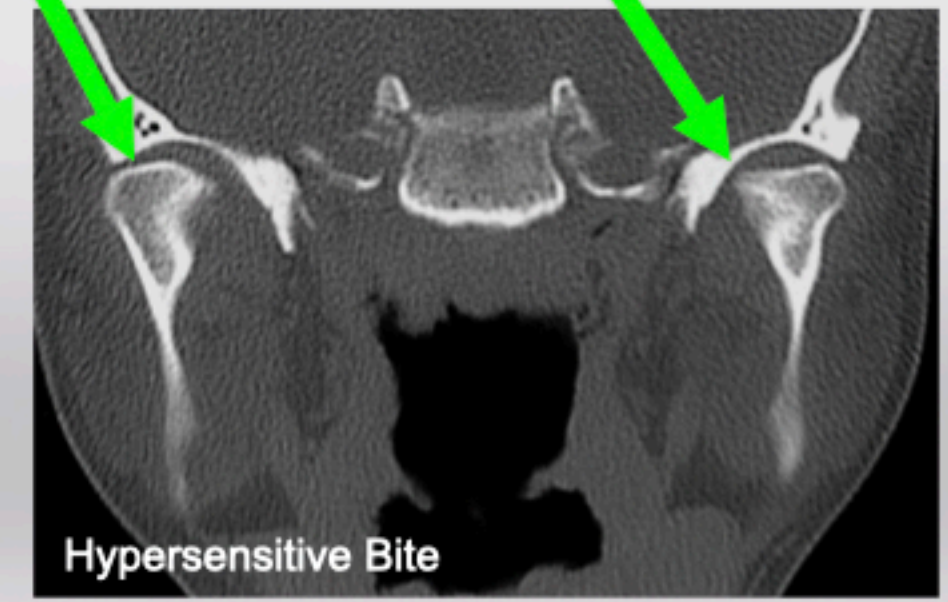
Superior Lateral CR Loading

Centric Relation (CR) Load Zone

Joint subluxates on load
"Wobbly Joint"

Medial is ideal

Right Superior Lateral,
Left Superior Medial CR Load



The TMJ:What You need to Know

Mechanical Stability

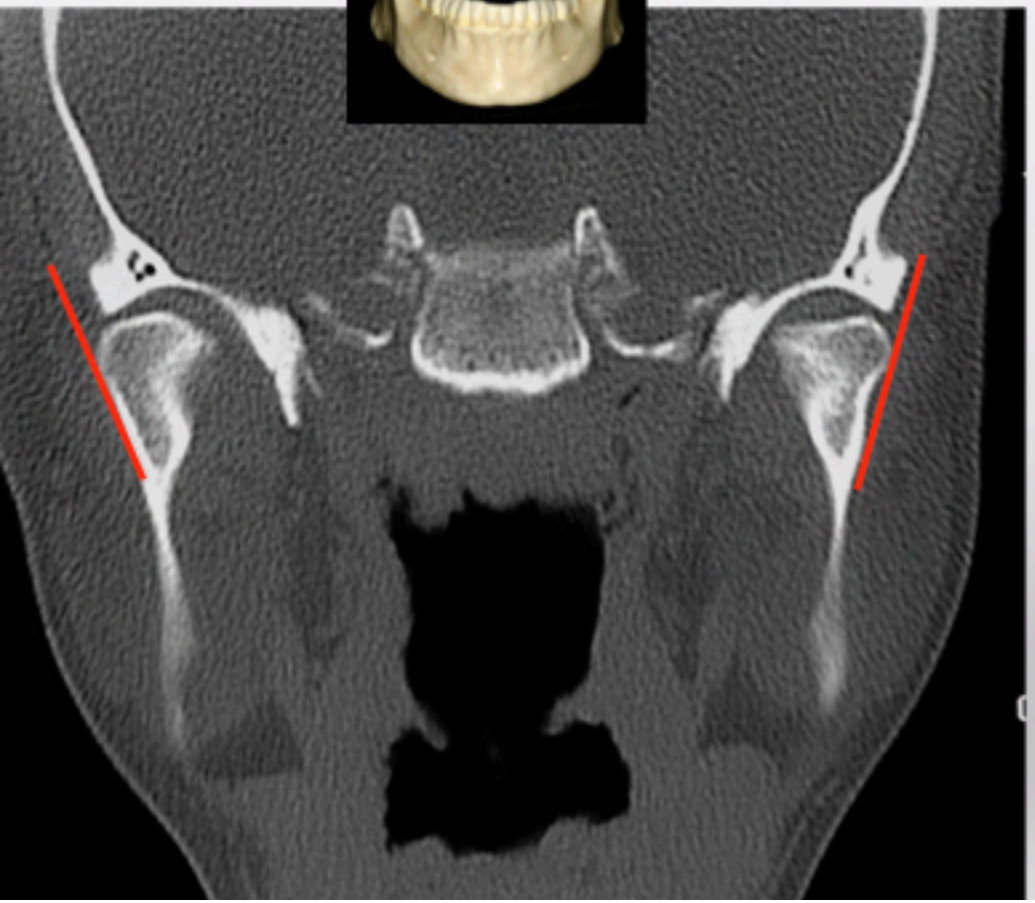
Mechanical Joint Stability

Shape condyle/disc/fossa provides stability when loaded

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

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

CT Coronal View



CT Axial View

Facial Pain Diagnosis

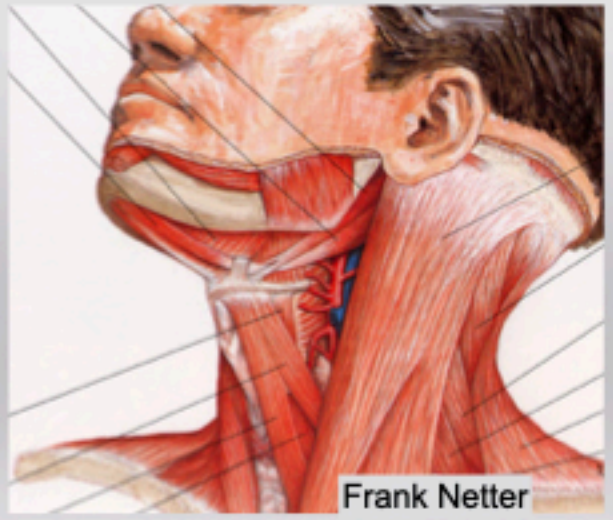
Diagnostic Tools

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

Also palpate:
- TMJ Lateral
- TMJ Posterior

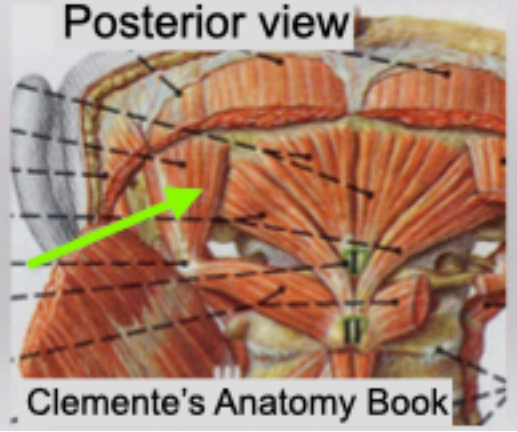
While I palpate many muscles, the ones I find key are:

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



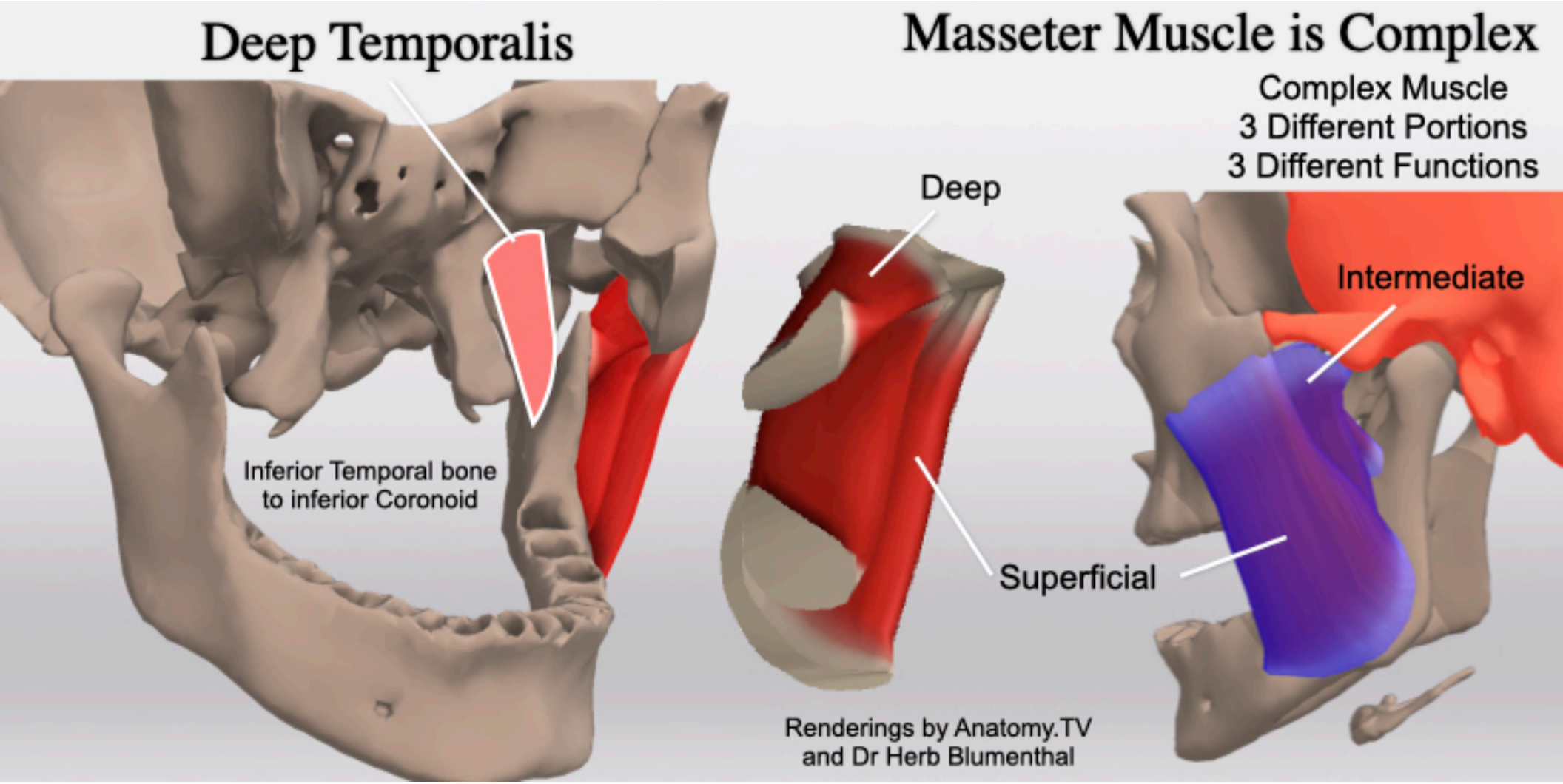
Frank Netter

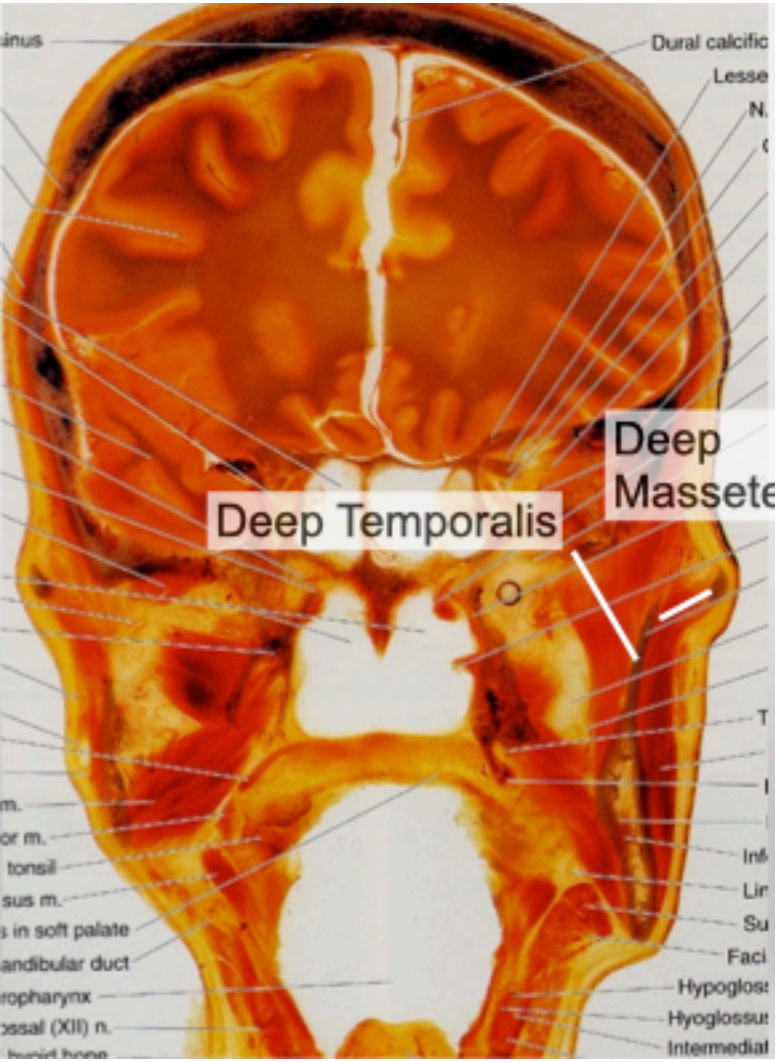
Posterior view

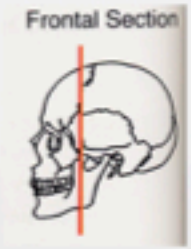


Clemente's Anatomy Book

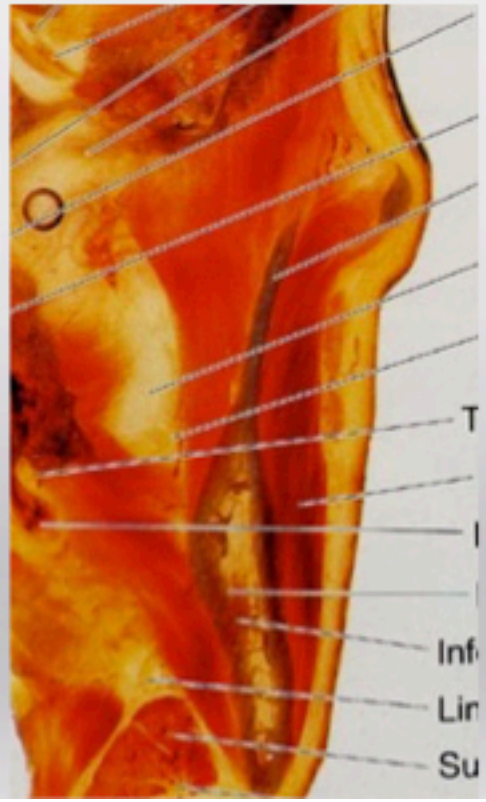
Anatomy TV


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

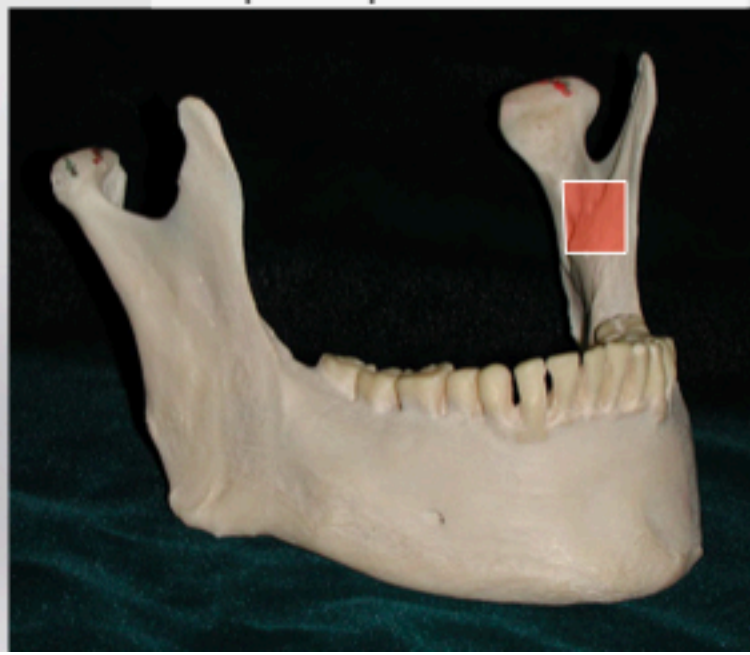




Deep Temporalis and Deep Masseter
Stabilizes TM joint side to side
Sore in "Wobbly Joints"



Deep Temporalis Attachment



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

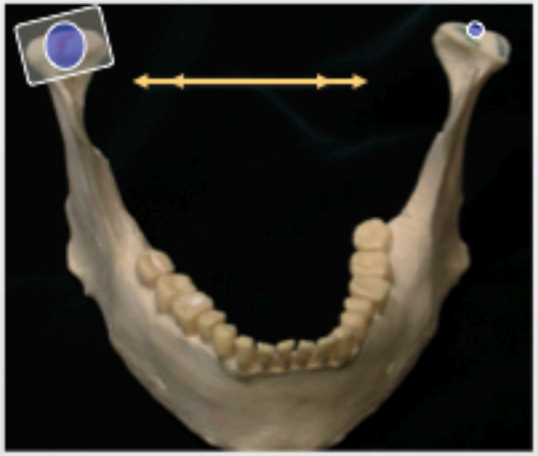
TM Joint subluxates under load
  Adapted CR "wobbles"

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

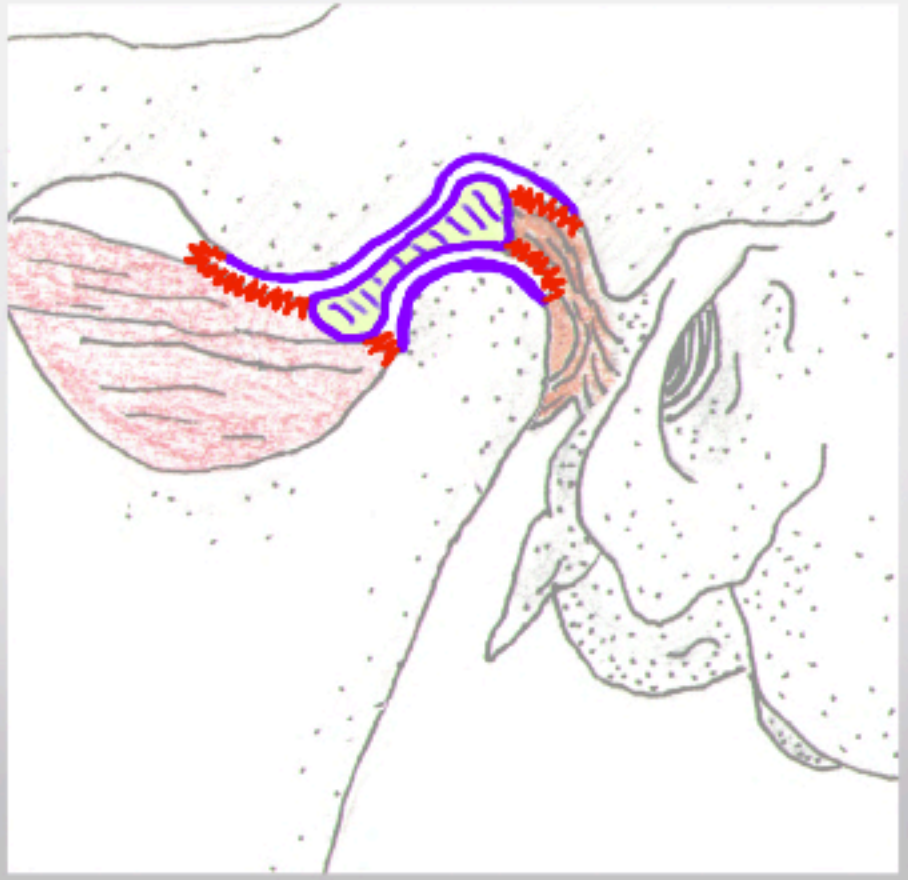
Clinically:
  Hypersensitive bite
  Increase muscle pain with anterior deprogrammer
  Continued muscle disharmony with flat plane orthotics
  CT Scan- CR load zone not medial
  JVA- after tooth tap see "wobble- 50hz vibration

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

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



Mechanical Joint Stability



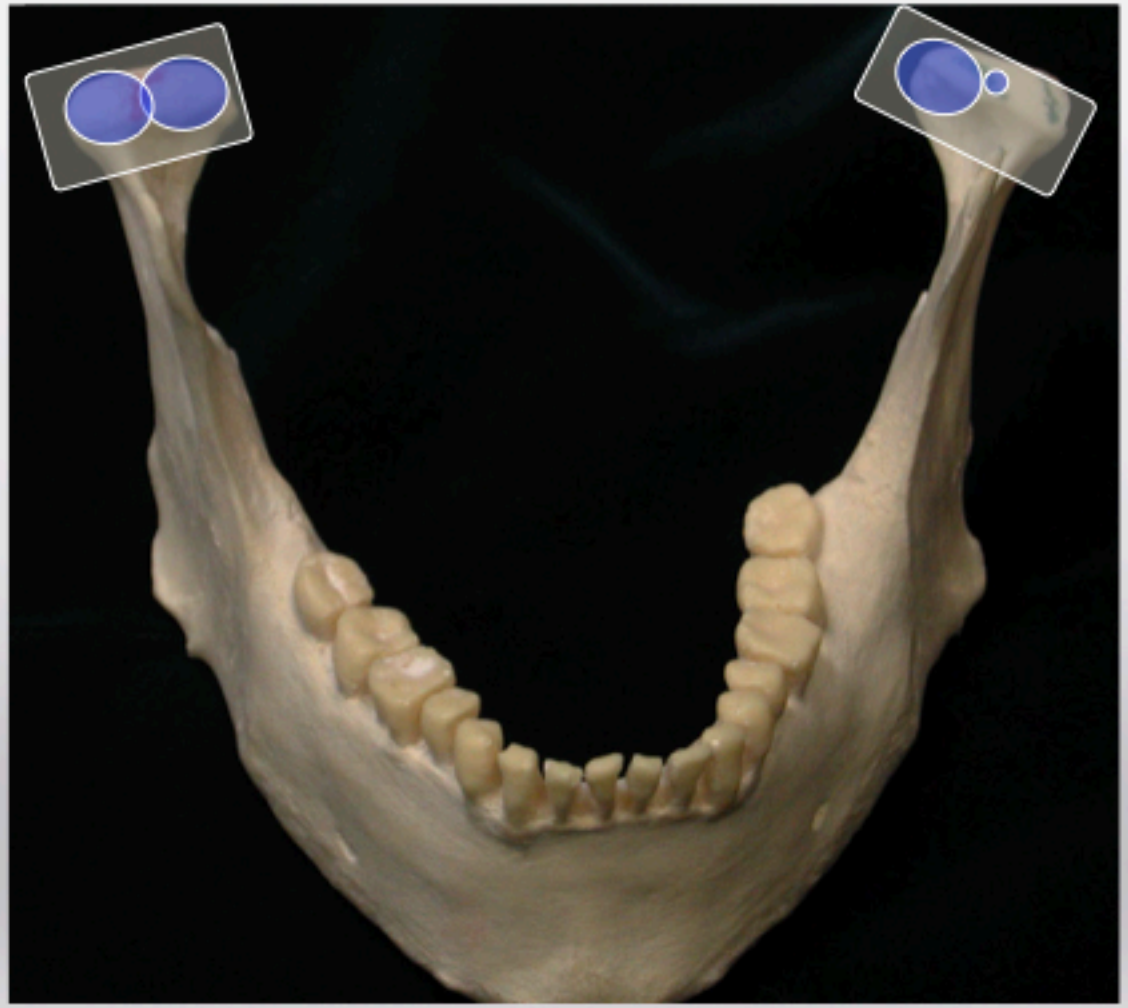
Shape condyle/disc/fossa provides stability when loaded

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

Ligaments other role is to provide end point of joint movement

Key word is shape- which you can see on scans

Condylar Loading in Disc Displacement



Run x3

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

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- Adapted CR "wobbles"

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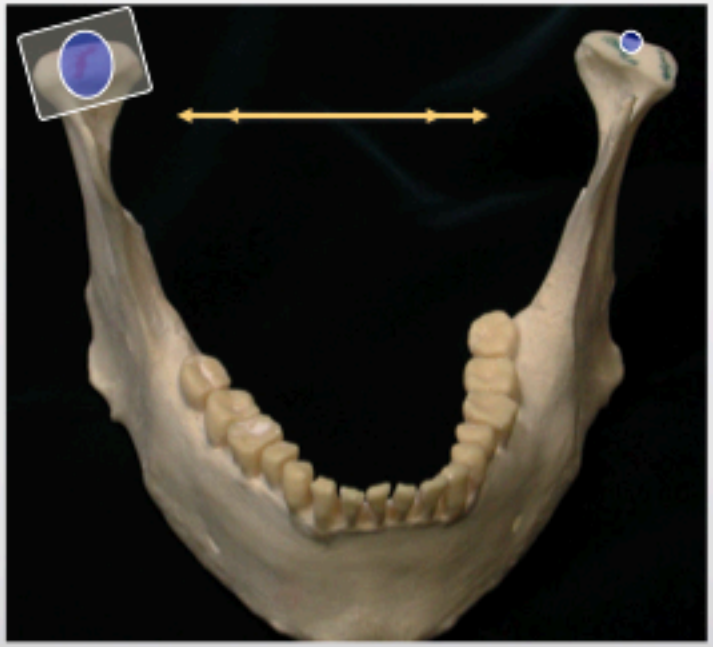


John R. Droter, DDS
drdroter@mac.com
301-805-9400

TMD Therapies

John R Droter DDS
Annapolis, Maryland

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

Diagnostic Tests

Differential Diagnosis

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

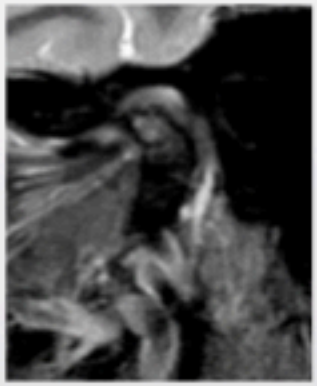
Diagnostic Tools

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



Diagnosis Treatment Flow Chart

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

Symptoms

No Symptoms

Less 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.

TMD: If only one Diagnosis, only need one Treatment

If only one Treatment, only need one Diagnosis

TMD is a symptom based (generalized) diagnosis

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

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Breathe, Walk , Exercise

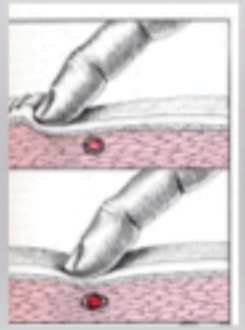
Ice Pack
15 min 3-5x a day

ThermoSafe
U-Tek Cold Pack
-23° C

Wet Towel in Microwave
3 Min Hot
3 Min Hot

3 Min Cold

Triggerpoint
in muscle



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Breathe, Walk , Exercise

Cold laser for sore joints, inflammation, muscle triggerpoints

3x week for 3 weeks

BioResearch MLS Laser 808, 905 pulsed Diode

Handheld TENS Acupuncture Pen

Past Dry Needling and ischemic Pressure

BioResearch QuadraTENS

MLS Laser: BioResearch

Multiwave Locked System Diode Laser
808 nm Continuous, 905 nm Pulsed

Stimulates metabolic processes in cells
Faster Healing
Increase release NO from cells
  Decrease inflammation
  Pain Reduction
Eliminates Trigger Points

Much better than Dry Needling
9 sessions over 3 weeks

25 watt

275 watt

"Somebody"
CBD Balm

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.

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,

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Breathe, Walk , Exercise

20 reps, 5x a day, non painful
Open close, side to side, front to back

Danger,
Danger,
Danger.

Must have MRI for all active stretches.
You will be irreversibly tearing/stretching ligaments.

TMD Therapies

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Active Stretching: Manual, Tongue Blades, Dynasplint

Postural Restoration Therapy

Dr Mariano Rocabado

Refer to Physical Therapy: Postural Restoration Therapy
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Refer to Physical Therapy: Rocabado mobilization

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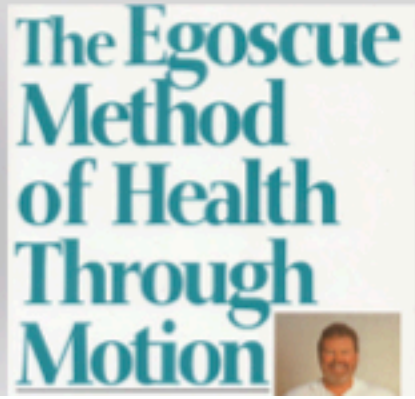
Refer to Osteopathic MD: Body alignment
Breathe, Walk , Exercise

If no access to professionals.
Do it yourself PT.
Strengthen weak opposing muscles



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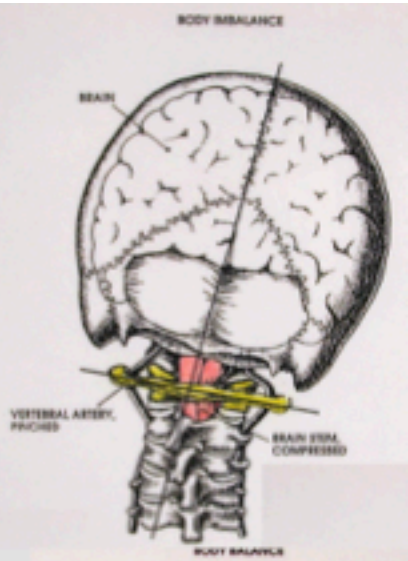
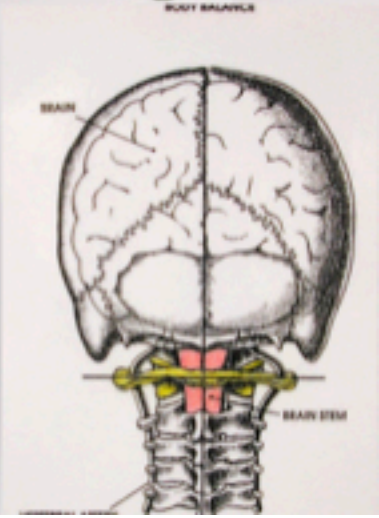
Breathe, Walk , Exercise

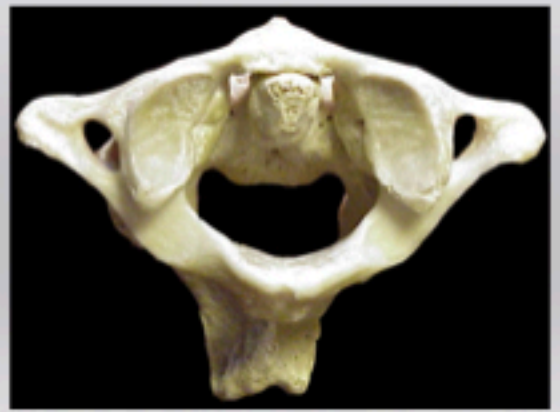
Atlas
Alignment

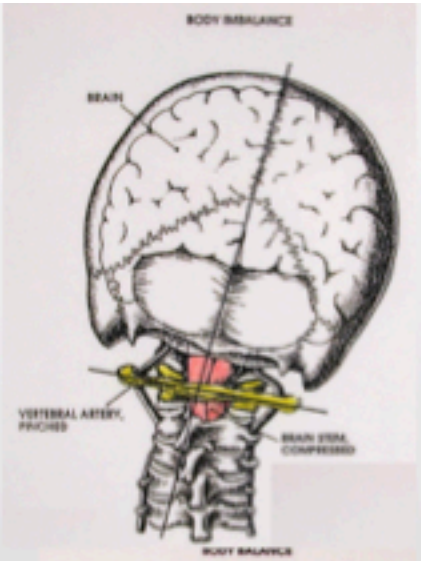


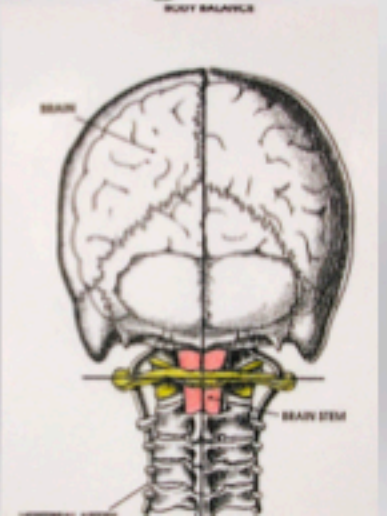


Atlas Orthogonist
Branch of Chiropractic Medcine

Uses sound wave to move atlas,
disrupts muscle bracing







TMD Therapies

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Breathe, Walk , Exercise

Postural Restoration PT addresses these

TMD Therapies

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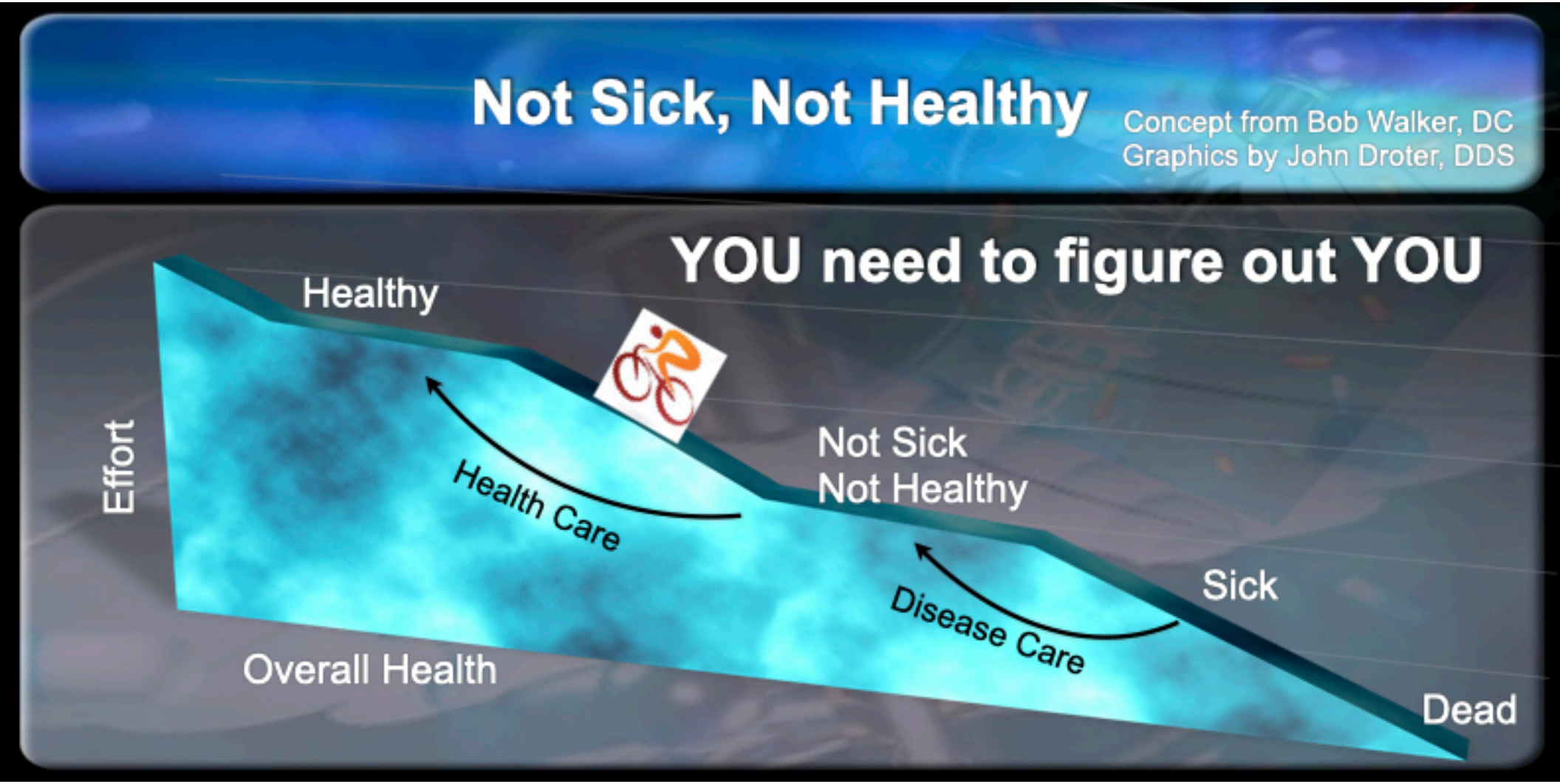
Breathe, Walk , Exercise

Diaphragmatic Breathing
Walk
Exercise

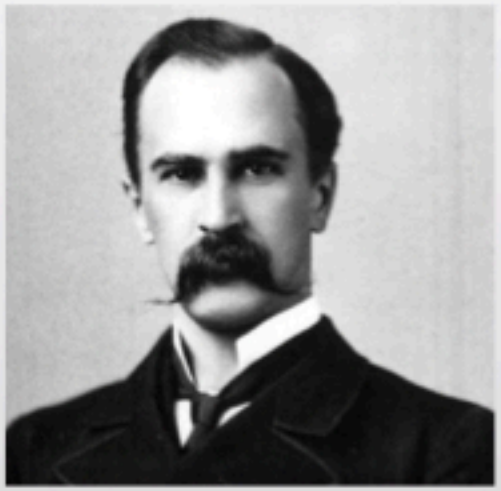

Not Sick, Not Healthy
Concept from Bob Walker, DC
Graphics by John Droter, DDS
YOU need to figure out YOU
Healthy
Effort
Health Care
Not Sick
Not Healthy
Sick
Disease Care
Overall Health
Dead

Which famous doctor published this?

A desire to take medicine separates man from animals. Why this appetite should have developed, how it could have grown to its present dimension, what it will ultimately reach, are interesting problems in psychology. We of the profession…..routinely administer nauseous mixtures on every possible occasion.

…..when we are able to say without fear of dismissal, that a little more exercise, a little less food, and a little less tobacco and alcohol may possible meet the indications of the case.

Sir William Osler, 1891



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"Recent Advances in Medicine," Science, March **1891**

Founding father of Johns Hopkins Medical School
Father of modern medicine
"Greatest diagnostician ever to wield a stethoscope"

from book: William Osler, A life in Medicine. Michael Bliss

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

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Temporary home use anterior stop
Diagnostic Palatal Anterior Stop
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Lower TMJ Rehab flat plane
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Facebow Verification
Lateral Bruxing Device
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Lower Soft Sectional

Athletic Mouthguard
Anterior Repositioning
Occlusal Adjust Assist
Aqualizer
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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

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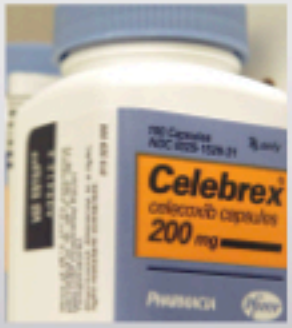
Food

Meloxicam 15mg qd
Doxycycline 20mg bid
Need Blood work CMP

No Sulfur Allergy



No women pre-menopause

TMD Therapies

Medicinal

Anti Inflammatory: Alternative

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
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Refer Botox Lateral Pterygoid Injections
Food

Anti Inflammatory Nutritional Supplements Alternative to NSAIDs

Take both of these supplements everyday for 6-8 weeks*

CoffeeGenic 400mg
Take 1 capsule three times a day
by Life Extension

BromInj
Take 4 tablets once a day
by Karuna Responsible Nutrition

Order from Life Nutrition Center
https://www.lifenutrition.center/

*If stomach issues develop discontinue

TMD Therapies

Medicinal

Anti Inflammatory:
- NSAIDs,
- Doxycycline low dose

CBD Topical

Glucosamine/Chondroitin MSM

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Minerals: Iron
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Food

Shea Brand CBD

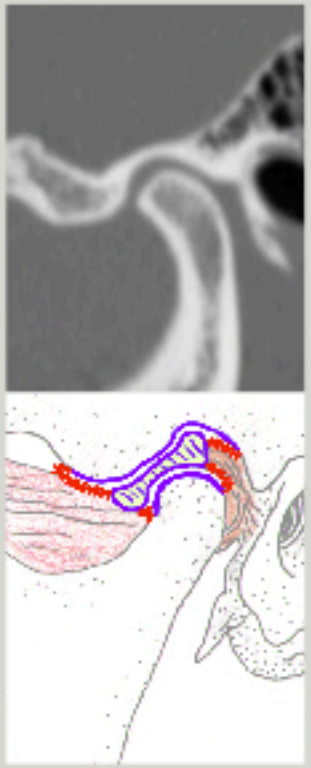
No Shellfish allergy

Vegan

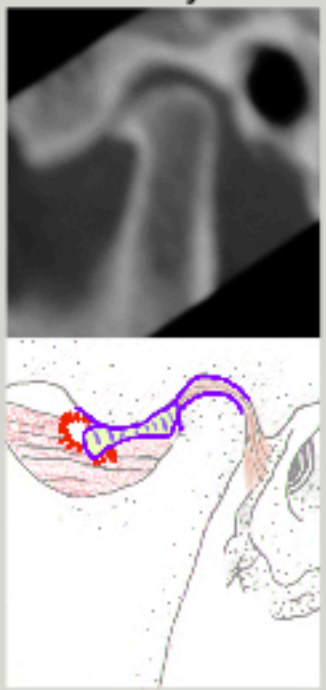
Osteoarthrosis/Osteoarthritis

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.

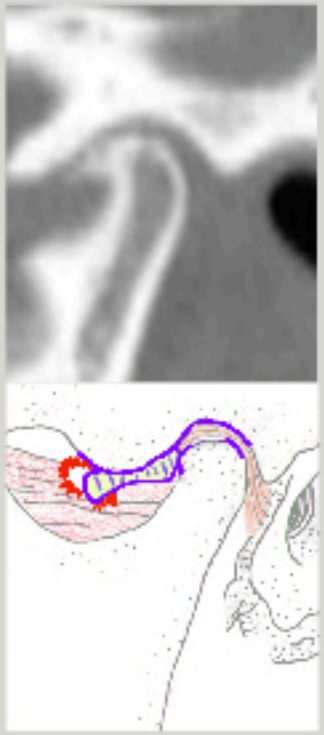
Normal



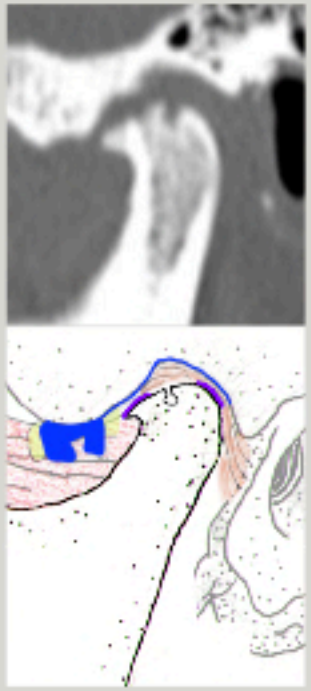
Early



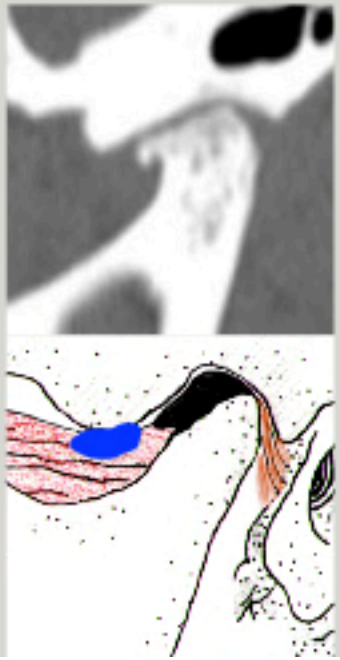
Early/ Moderate



Moderate



Severe OA, Eburnation



Representative examples of OA
in different patients

Drawings by Gretta Tomb DDS and John Droter DDS

Treatment OA

Osteoarthr**osis**

Minimize parafunction:

If sleep grinding due to airway:

CPAP or Dental Airway Device

Glucosamine 1500mg /Chondroitin 600 mg

Shea Brand CBD

Osteoarthr**itis**

All of the above plus eliminate inflammation……

NSAIDs

Cold Laser

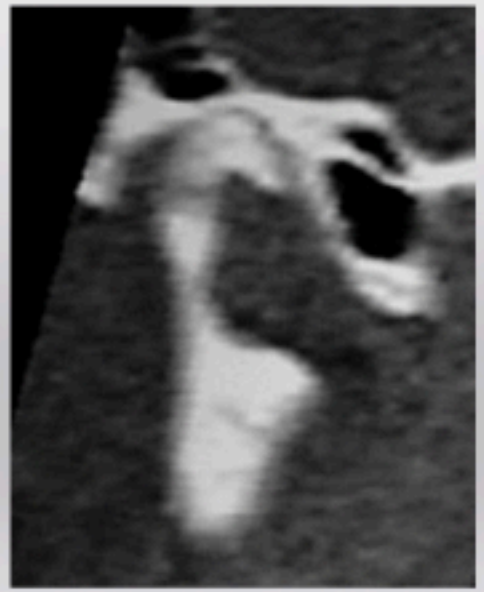
If still inflamed arthrocentesis with Platelet Rich Plasma (PRP)

MLS Laser

3x week for 3 weeks

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

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Food

Women add iron

Vit C 1,000 mg before exercise or clenching

Magnesium 2 oz bottle
0.5 teaspoon sublingual

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Women
add iron

Natural Calm
Magnesium Citrate
1 teaspoon (162mg)

Vit C 1,000 mg
before exercise
or clenching

Mother Earth Ionic Angstrom
Magnesium 2 oz bottle
0.5 teaspoon sublingual

www.meminerals.com

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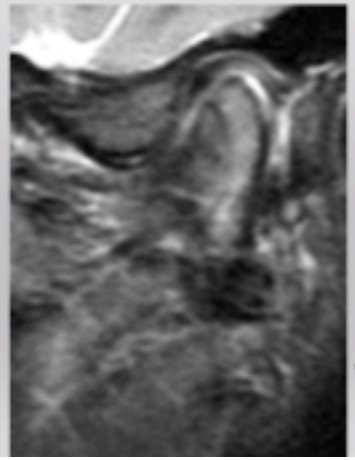
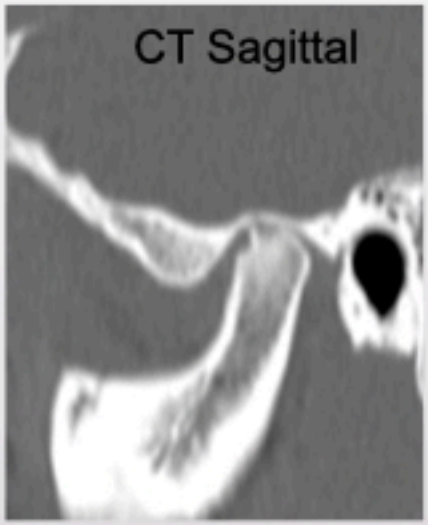


MRI STIR
Disc Lysis
Joint infection



Spikey = Rheumatoid Arthritis

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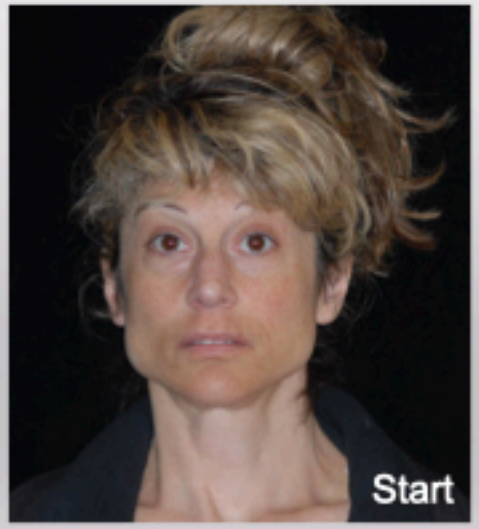
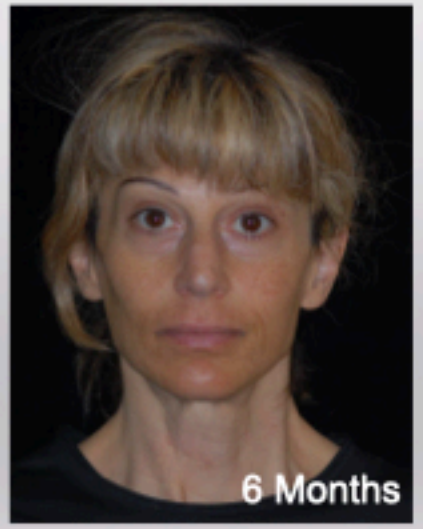
Food

Botox for Hypertrophic Masseters from chronic clenching





Medications that affect Bruxing

Selective Serotonin Reuptake Inhibitors
- SSRI that increase bruxing: Prozac, Zoloft
- SSRI neutral on bruxing: Cymbalta, Wellbutrin

Klonopin/Clonazepam (benzodiazepine)
- May decrease sleep bruxing
- Addiction potential, causes low BP
- Not a long term solution

Maria Clotilde Carra DMD, Nelly Huynh PhD, and Gilles Lavigne DMD PhD FRDC
Sleep Bruxism: A Comprehensive Overview for the Dental Clinician Interested in Sleep Medicine.
Dental Clinics of NA, 56(2), 387–413. doi:10.1016/j.cden.2012.01.003

Valium

Valium
5mg
6 pills
1 or 2 pills 1 hour before sleep

20h half life: then active metabolites
Diazepam → Nordiazepam, Oxazepam, and Temazepam
72 hours later you are still clearing active metabolytes from single 5mg dose

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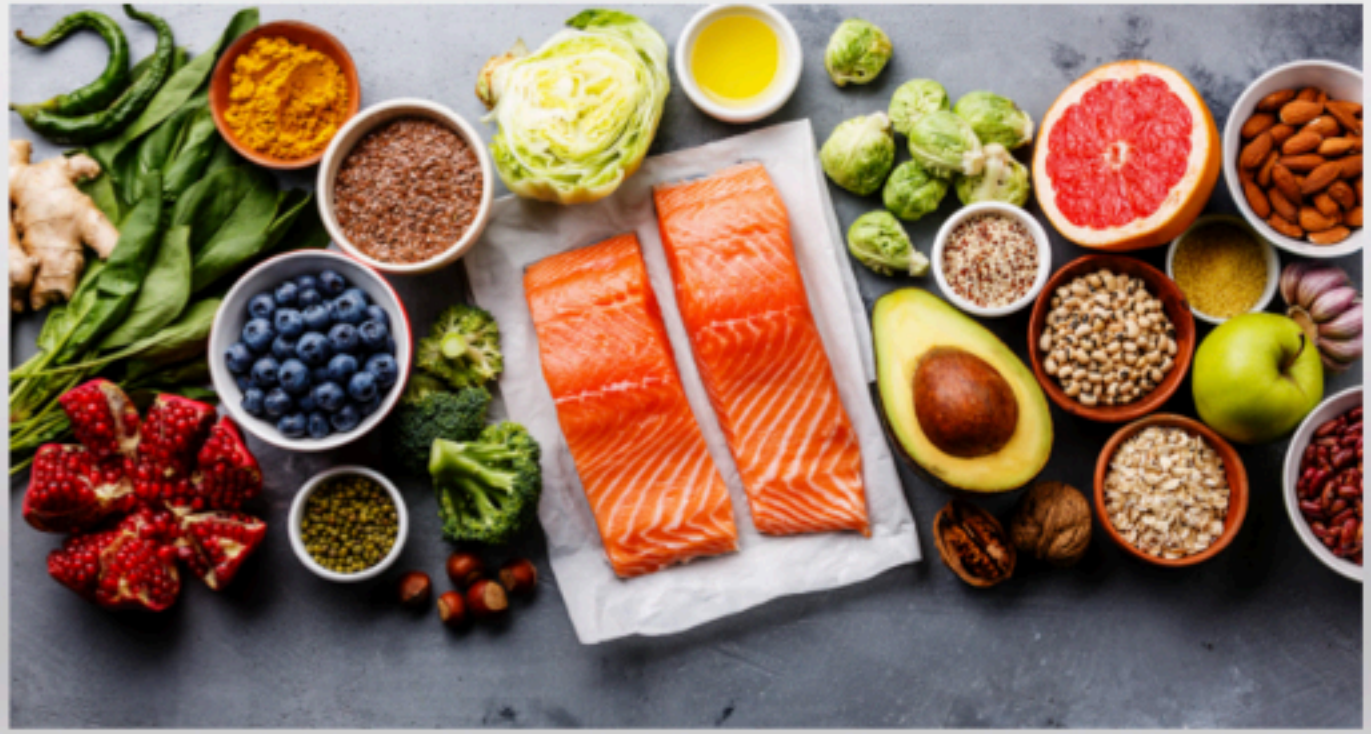
Food

Anti- Inflammatory Diet



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Breathe, Walk , Exercise

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Mandibular Advancement Device
Lateral Bruxing Device
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Lower soft sectional orthotic
Sectional orthodontics
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Temporary home use anterior stop
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Lateral Bruxing Device guided plane
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CPAP

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

Dental Orthotics

Diagnostic Orthotics

In Office Trial Anterior Stop
Temporary home use anterior stop
D-PAS Diagnostic Palatal Anterior Stop
Lower Centric Relation Orthotic
    wear 24/7 for 3-6 weeks
Brux Checker

Night Guards

D-PAS night guard
Brux-PAS with lower essix
PSNG Posterior Stop Night Guard
Lower Centric Relation Night Guard
Upper Centric Relation Night Guard
Essix

Airway Night Guards

Brux-PAS with lower Essix
PSNG Posterior Stop Night Guard
Lat-Brux Lateral Bruxing Device
MAD Mandibular Advancement Device

Therapeutic Orthotics

Lower 2nd bi turned into:
    same day Centric Relation Orthotic**
    same day TMJ Rehabilitation Orthotic**
    same day Postured Arc of Closure Orthotic**

Lower 2nd bi, add posterior after neck Therapy
    Centric Relation Orthotic**
    TMJ Rehabilitation Orthotic**

**May need indexing if more joint stabilization needed

Clear Brux Checker
Condylar Distraction
Lingual Light Wire
Lower Soft Sectional

Other Orthotics

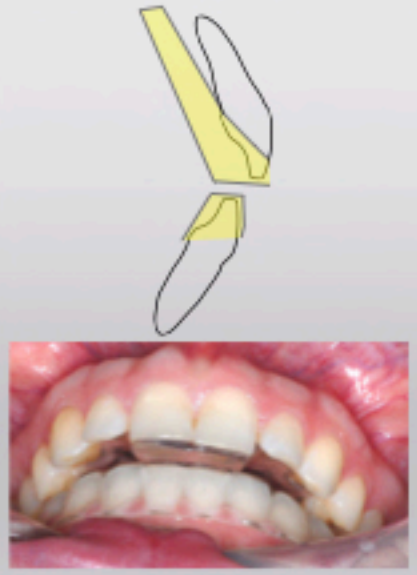
Athletic Mouthguard
Reha Splint
Myobrace

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

3D Printed Orthotics

D-PAS
Diagnostic-
Palatal Anterior Stop

Brux-PAS
with lower Essix



Hard Lower Posterior Stop
with upper essix

Hard Lower Full Coverage
Centric Relation Orthotic

Dental Orthotics

Diagnostic Orthotics

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Diagnostic Orthotics

In Office Trial Anterior Stop

Temporary home use anterior stop

D-PAS Diagnostic Palatal Anterior Stop
Lower Centric Relation Orthotic
    wear 24/7 for 3-6 weeks
Brux Checker

Form on teeth

Reline with Blue Mousse

Temporary Anterior Stop Test

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

This is a diagnostic test, not treatment

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

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

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

Diagnostic Orthotics

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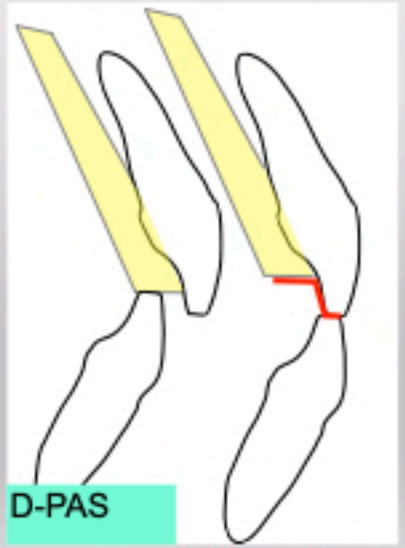
Temporary home use anterior stop

D-PAS Diagnostic Palatal Anterior Stop

Lower Centric Relation Orthotic
wear 24/7 for 3-6 weeks
Brux Checker



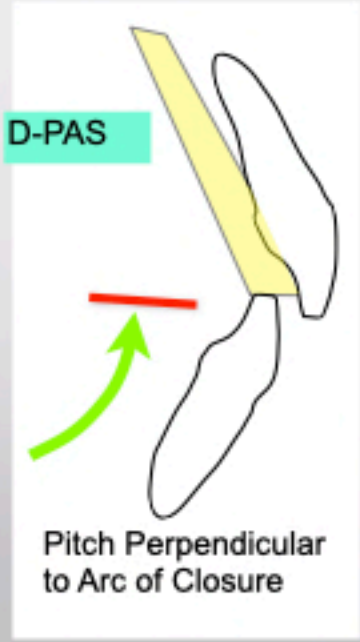
Diagnostic Palatal Anterior Stop

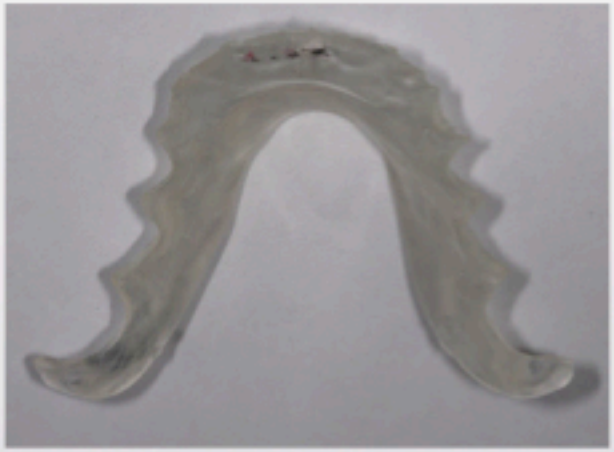
D-PAS Test: Wear 2 weeks for sleep, and occasional daytime

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

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

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





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Diagnostic Orthotics

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D-PAS Diagnostic Palatal Anterior Stop

Lower Centric Relation Orthotic
wear 24/7 for 3-6 weeks

Brux Checker

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

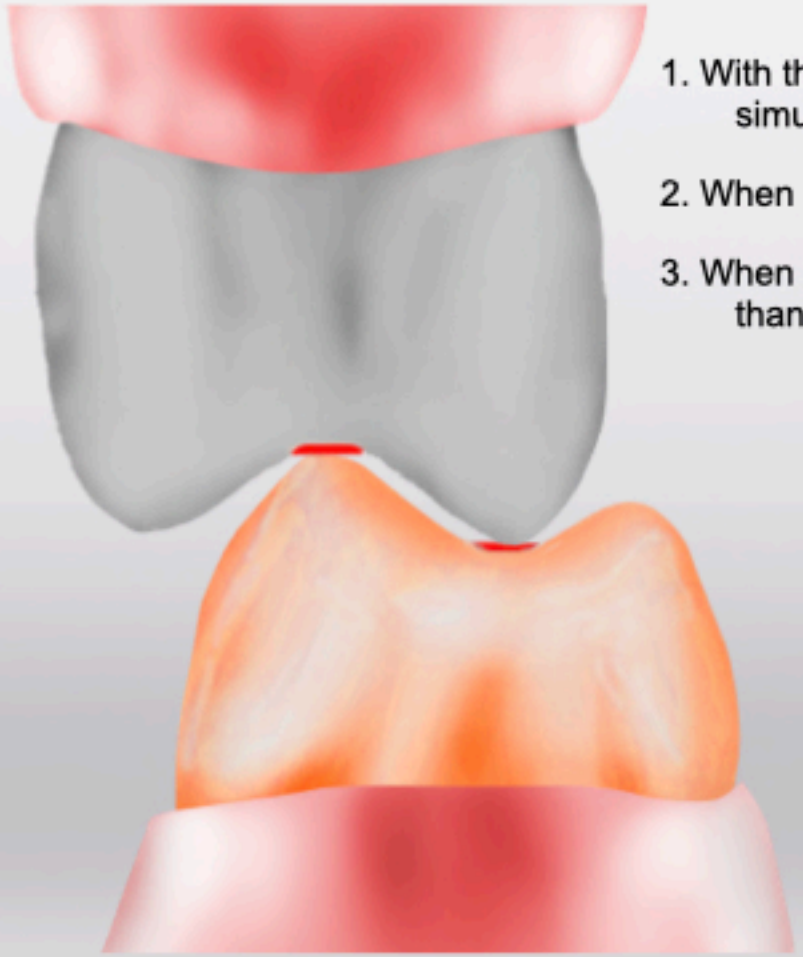
Holding Pattern: Awaiting neck therapy, p

Dots in the back,
lines in the front

Triad- No longer manufactured

3D Printed Keysplint Hard with
durasplint added to anterior

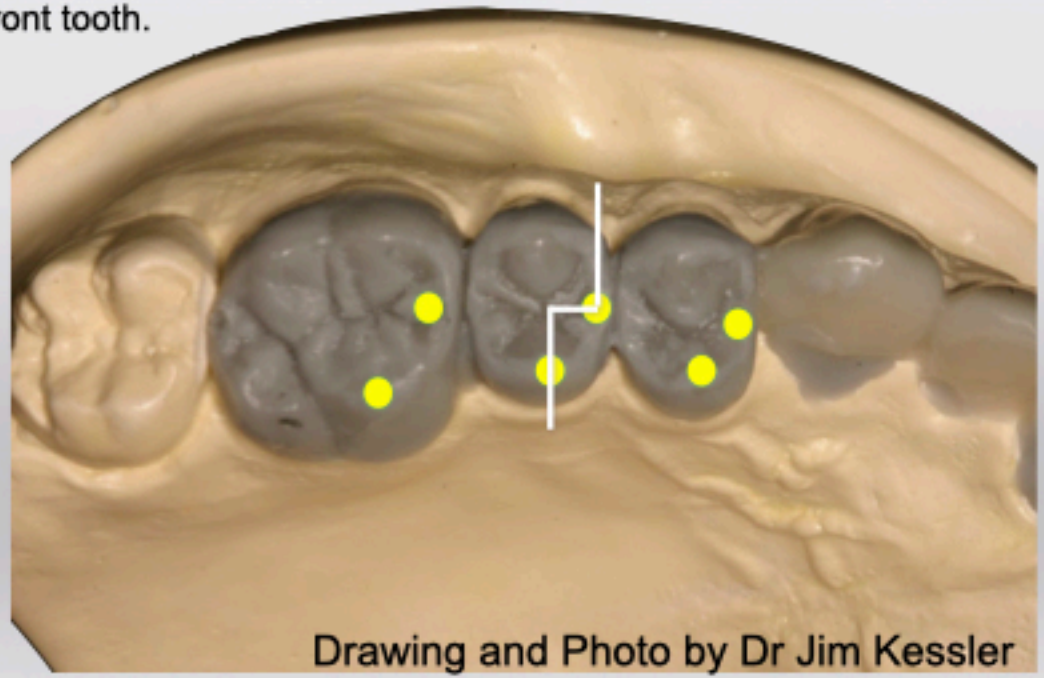
LD Pankey's 3 Rules of Occlusion (Clyde Schuyler)



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

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Brux Checker

Brux Checker
Great Lakes Orthodontics

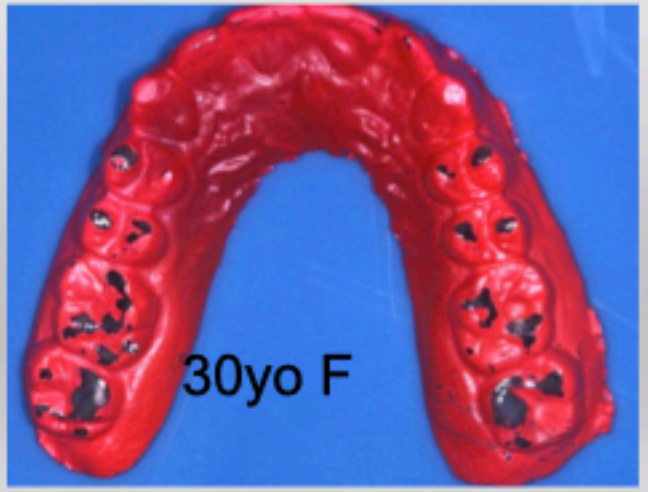
0.1mm Mylar: Same as mylar strip for composite

Made on Biostar Machine

Brux Checker
Great Lakes Orthodontics

0.1mm Mylar

Made on Biostar Machine



Dental Orthotics

Diagnostic Orthotics

In Office Trial Anterior Stop
Temporary home use anterior stop
D-PAS Diagnostic Palatal Anterior Stop
Lower Centric Relation Orthotic
    wear 24/7 for 3-6 weeks
Brux Checker

Night Guards

D-PAS night guard
Brux-PAS with lower essix
PSNG Posterior Stop Night Guard
Lower Centric Relation Night Guard
Upper Centric Relation Night Guard
Essix

Airway Night Guards

Brux-PAS with lower Essix
PSNG Posterior Stop Night Guard
Lat-Brux Lateral Bruxing Device
MAD Mandibular Advancement Device

Therapeutic Orthotics

Lower 2nd bi turned into:
    same day Centric Relation Orthotic**
    same day TMJ Rehabilitation Orthotic**
    same day Postured Arc of Closure Orthotic**

Lower 2nd bi, add posterior after neck Therapy
    Centric Relation Orthotic**
    TMJ Rehabilitation Orthotic**

**May need indexing if more joint stabilization needed

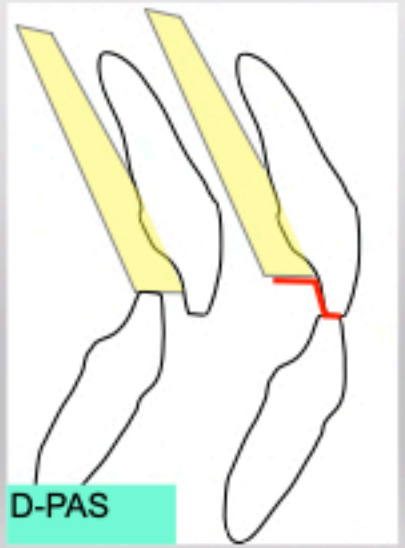
Clear Brux Checker
Condylar Distraction
Lingual Light Wire
Lower Soft Sectional

Other Orthotics

Athletic Mouthguard
Reha Splint
Myobrace

Night Guards

D-PAS night guard
Brux-PAS with lower essix
PSNG Posterior Stop Night Guard
Lower Centric Relation Night Guard
Upper Centric Relation Night Guard
Essix



Night Guards

D-PAS night guard
Brux-PAS with lower essix
PSNG Posterior Stop Night Guard
Lower Centric Relation Night Guard
Upper Centric Relation Night Guard
Essix

Brux-PAS +
Lower Essex

Manage and protect teeth Grinding
Slippery against slippery

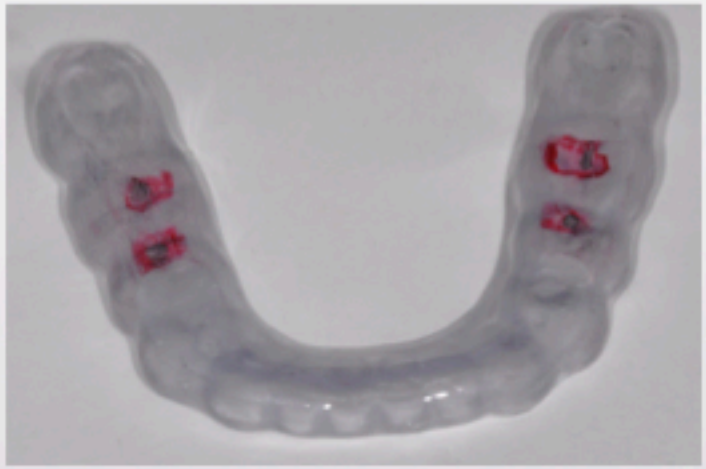
Manage protect Grind Clench

Could use to manage clenching
however D-PAS is better

Must have some muscle inhibition!!!

Night Guards

D-PAS night guard
Brux-PAS with lower essix
PSNG Posterior Stop Night Guard
Lower Centric Relation Night Guard
Upper Centric Relation Night Guard
Essix



Night Guards

D-PAS night guard
Brux-PAS with lower essix
PSNG Posterior Stop Night Guard

Lower Centric Relation Night Guard

Upper Centric Relation Night Guard
Essix

Dots in the back, lines in the front

Triad- No longer manufactured

3D Printed Keysplint Hard with durasplint added to anterior

Night Guards

D-PAS night guard
Brux-PAS with lower essix
PSNG Posterior Stop Night Guard
Lower Centric Relation Night Guard

Upper Centric Relation Night Guard

Essix

Upper hard full coverage
CR guard

Patient can place severe force on front teeth.

Upper teeth +2 mobility

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Airway Night Guards

Brux-PAS with lower Essix

PSNG Posterior Stop Night Guard
Lat-Brux Lateral Bruxing Device
MAD Mandibular Advancement Device

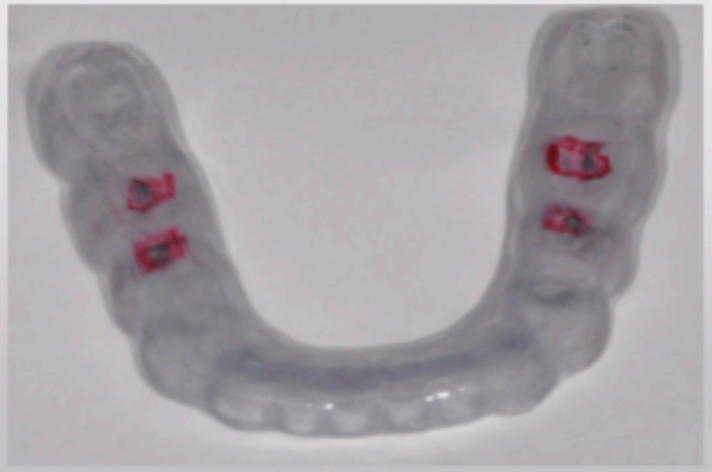
Brux-PAS +
Lower Essex

Airway Night Guards

Brux-PAS with lower Essix

PSNG Posterior Stop Night Guard

Lat-Brux Lateral Bruxing Device
MAD Mandibular Advancement Device



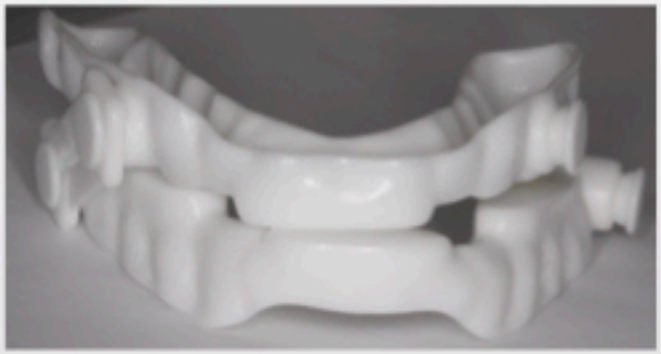
Airway Night Guards

Brux-PAS with lower Essix
PSNG Posterior Stop Night Guard

Lat-Brux

Lateral Bruxing Device

MAD Mandibular Advancement Device

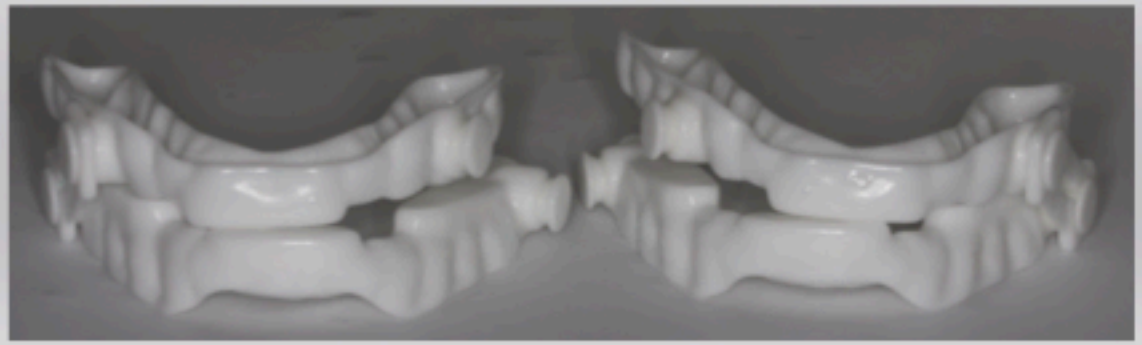


Midline sits left

APS
ArrowPath Sleep

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

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



Airway Night Guards

Brux-PAS with lower Essix
PSNG Posterior Stop Night Guard
Lat-Brux Lateral Bruxing Device

MAD Mandibular Advancement Device

Great Lakes Nylon Herbst

Great Lakes D-SAD by Panthera

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

Anterior Stop Orthotics

Airway Bite Options

Droter Airway Bite
Anterior Stop 4mm

George Gauge

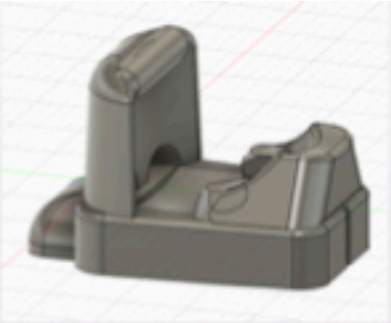
Airway Metrics

Airway Bite

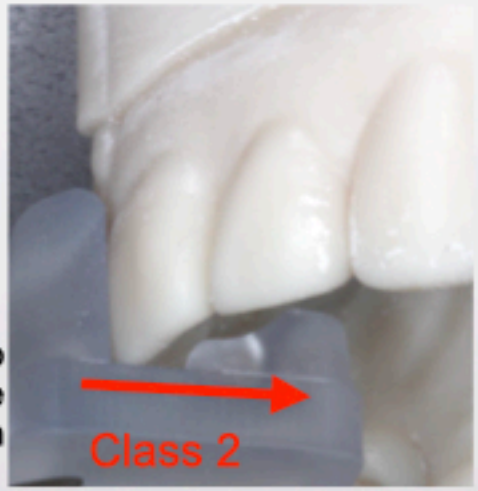
Try in anterior stop before reline.
Verify where patient occludes in full range of excursions

Droter Airway Bite
Anterior Stop 4mm

Reline with Parkell Blu-Mousse Super Fast
Can do 2nd reline over top of the first if needed

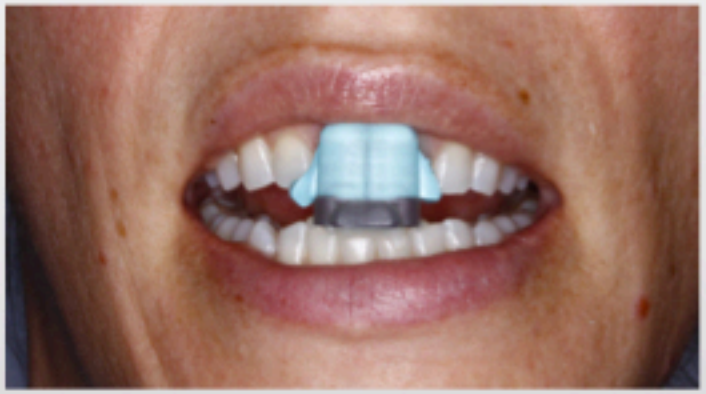


Device shifted back so flush with buccal surface of front teeth



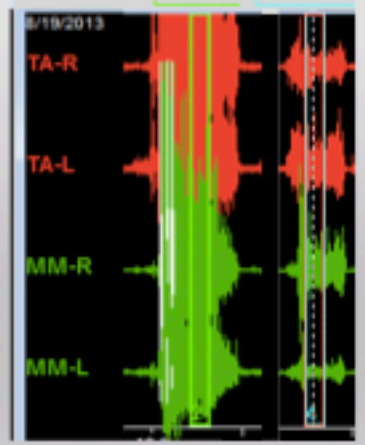
Device shifted forward so lingual surface of front teeth touch device.

Use anterior stop and an EMG to choose style of sleep device:



Patient with muscles
<u>inhibited by anterior only contact</u>

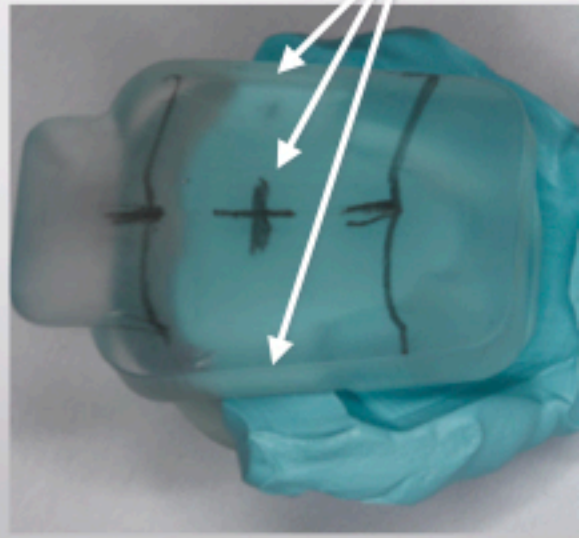
	Clench MaxIC	Anterior Stop D-PAS
	µV	µV
TA-R	100.6	15.7
TA-L	108.9	25.3
MM-R	115.4	25.5
MM-L	70.5	6.8



Will sleep airway device have an anterior stop or posterior contact?

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

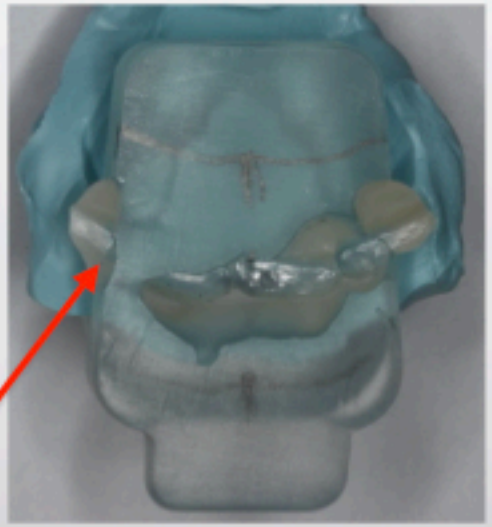
Place bonding agent

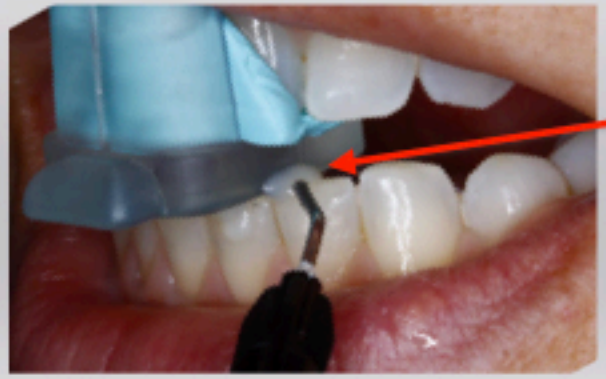


Measure and mark the amount of protrusive you want to build into the Mandibular Advancement Device

50% is typically a good place to start

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





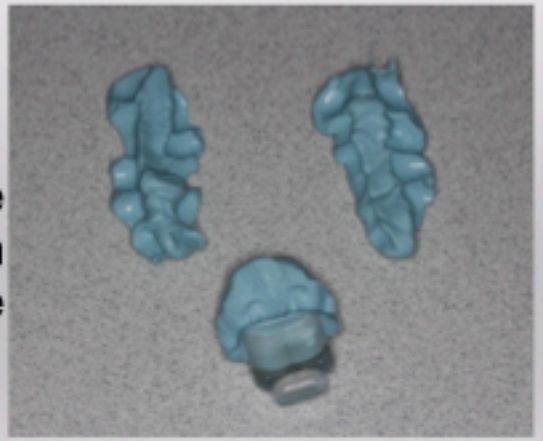
At edge of anterior stop flow some composite behind teeth and cure.

Jaw is now held stable in forward position.

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

Anterior Stop Orthotics

Modified Quick Splint

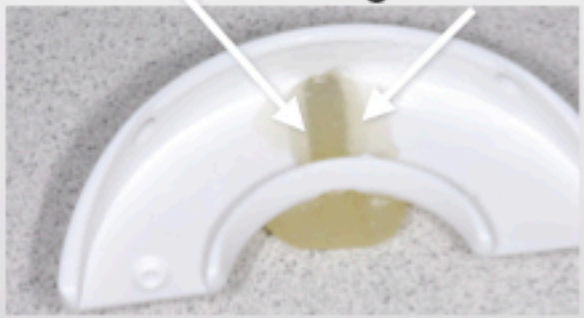
Emergency Temporary Trial Nightguard

Triad Trans Sheet

Reline Blue Mousse

Reverse bevel slot

Slight over fill



Left Lateral Excursion

Right Lateral Excursion

Diagnostic Orthotics

In Office Trial Anterior Stop

Temporary home use anterior stop

D-PAS Diagnostic Palatal Anterior Stop
Lower Centric Relation Orthotic
    wear 24/7 for 3-6 weeks
Brux Checker

Form on teeth

Reline with Blue Mousse

Temporary Anterior Stop Test

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

This is a diagnostic test, not treatment

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

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

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

TMD Therapies

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

TMD Therapies

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

Lingual Light Wire
Planas Tracks

Start Age 7

Age 8
9 Months from start

TMD Therapies

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

Intrudes lower posterior teeth

Lower Soft Sectional

LSS and Lingual Light Wire

TMD Therapies

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

Start Age 50

Lingual Light Wire w/ Sectional Ortho

Post Occlusal Reshaping

TMD Therapies

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

Restorative Dentistry

Pathological Occlusion

??Airway Related Bruxing?

Restore Function

Composite Trial Occlusion

AHI + 26 CPAP

Anterior guidance

or group function?

TMD Therapies

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

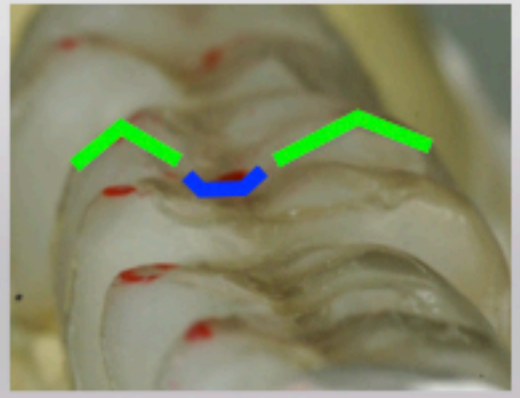
Disclusion Time Reduction with TekScan is more precise and more objective than occlusal adjusting with articulating paper/ribbon/film alone.

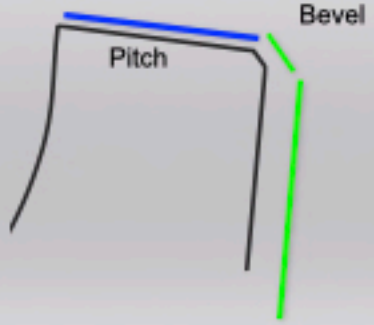
Occlusal Sculpting Tools, including Zirconia

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

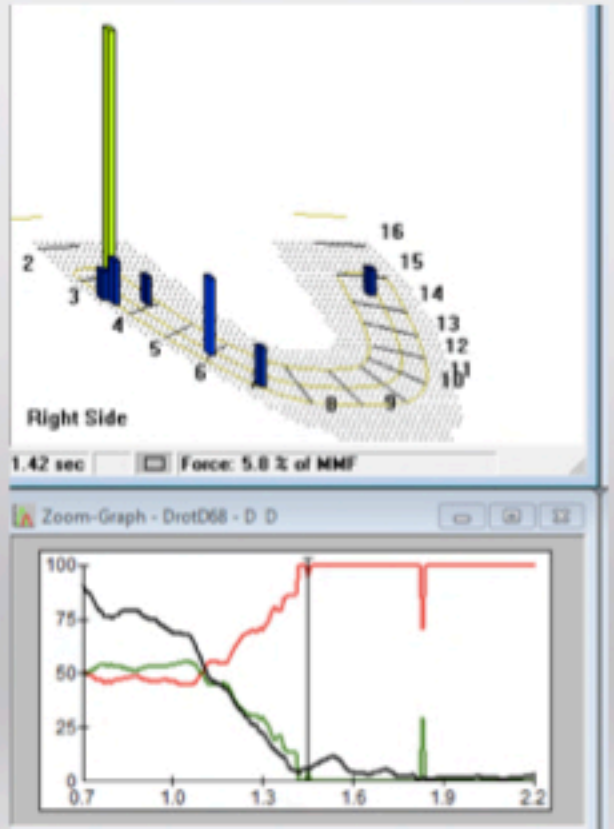




Premier 860.9 F Wheel Diamond
Premier 230 F Barrel Diamond
Neodiamond 1118.7F Roundend taper
Dedco Green Stone
White Arkansas stone
Filtek Supreme- B1B

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

Is that a smudge or a muscle activating interference?



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

TMD Therapies

Occlusal Orthopedic

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

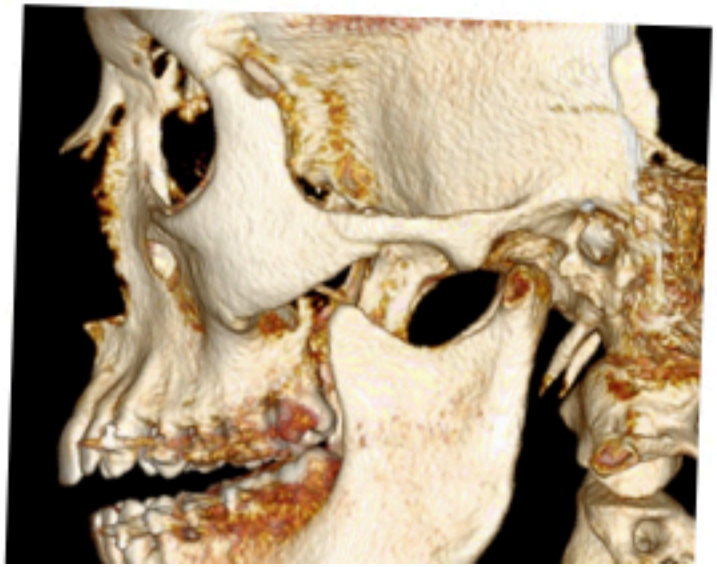
Occlusal Adaptation

Condylar distraction

Occlusal Adaptation

Orthopedically move the Maxilla

Anterior Openbite Non Surgical Treatment: Moving the Maxilla



Anterior Openbite with Active TMJ Bone Loss

Non Surgical Therapies

Condylar Distraction
Meloxicam and Doxycycline

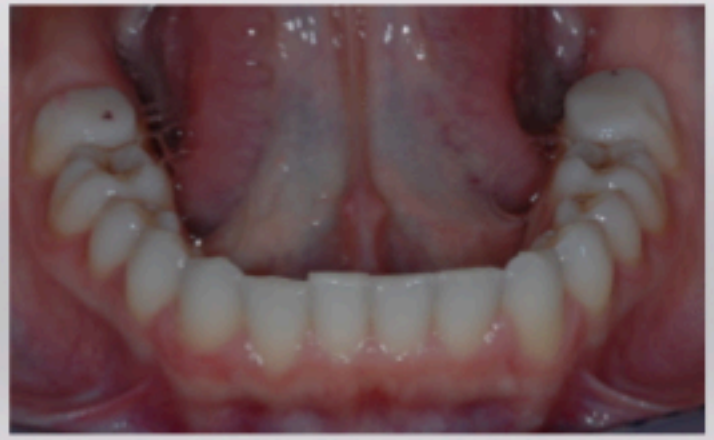
TMD Therapies

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

Close Posterior Open Bites
Add Composite to 2nd Molars



Age 21
Post disc repair

Added Composite #18,31

Start Occlusal Adaptation

Age 22
3 Months Occlusal Adaptation

2 months later

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

TMD Therapies

Surgical

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

TMD Therapies

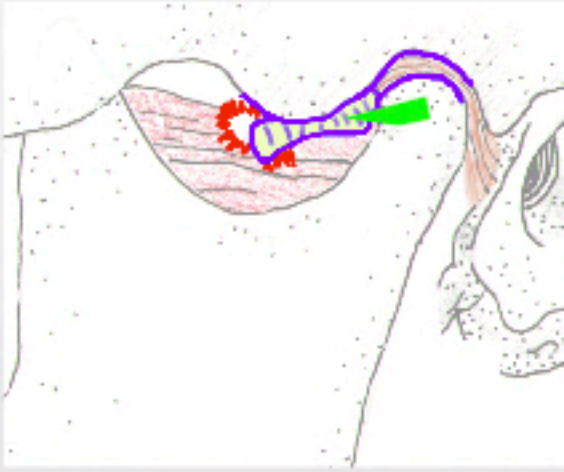
Surgical

Refer: Arthrocentesis w/ PRP

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

Needle into superior joint space
Flush out debris
Inject Platelet Rich Plasma

Indications:
Acute Closed Lock
Less than 6 weeks



Joint inflammation not responding to NSAIDs

TMD Therapies

Surgical

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

Refer: Orthognathic Surgery

Pre-surgical Orthodontics

Maxillary Expansion with Lingual Light Wire and orthodontics

Orthopedics and Orthodontics by Dr John Droter

TMD Therapies

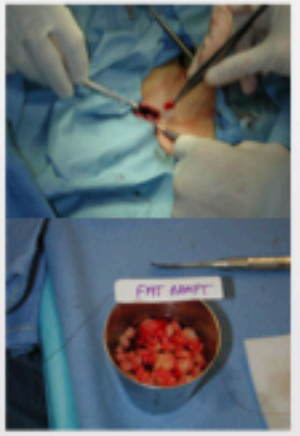
Surgical

Refer: Arthrocentesis w/ PRP

Refer: Discectomy w/ Fat Graft

Refer: Total Joint Replacement

Refer: Orthognathic Surgery



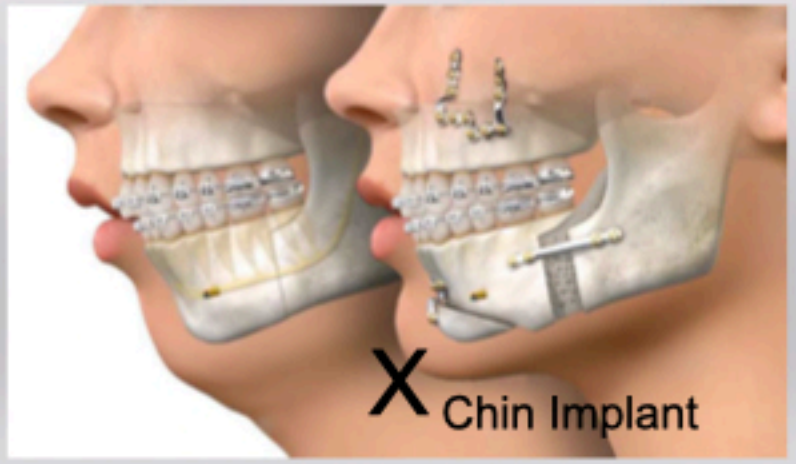
Condylar Distraction

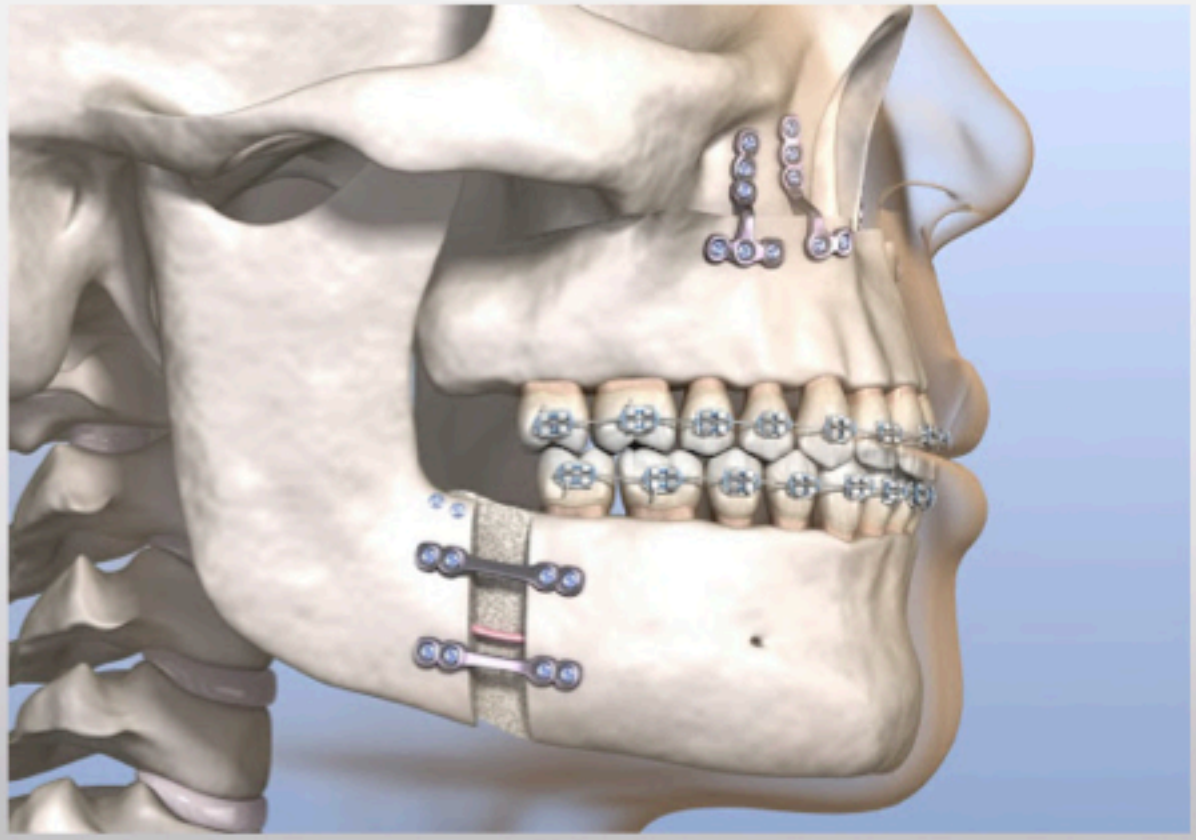
TMD Therapies

Surgical

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

Refer: Orthognathic Surgery





TMD Therapies

Surgical

Upper and Lower Jaw Surgical Advancements
by Dr Edward Zebovitz

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

Refer: Orthognathic Surgery

TMD Therapies

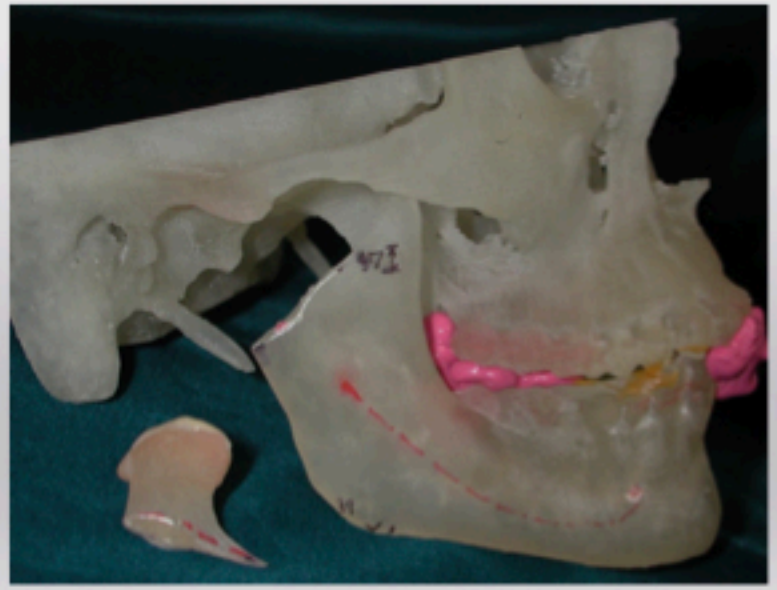
Surgical

Bite by Dr John Droter
Total Joint Replacement by Dr Edward Zebovitz

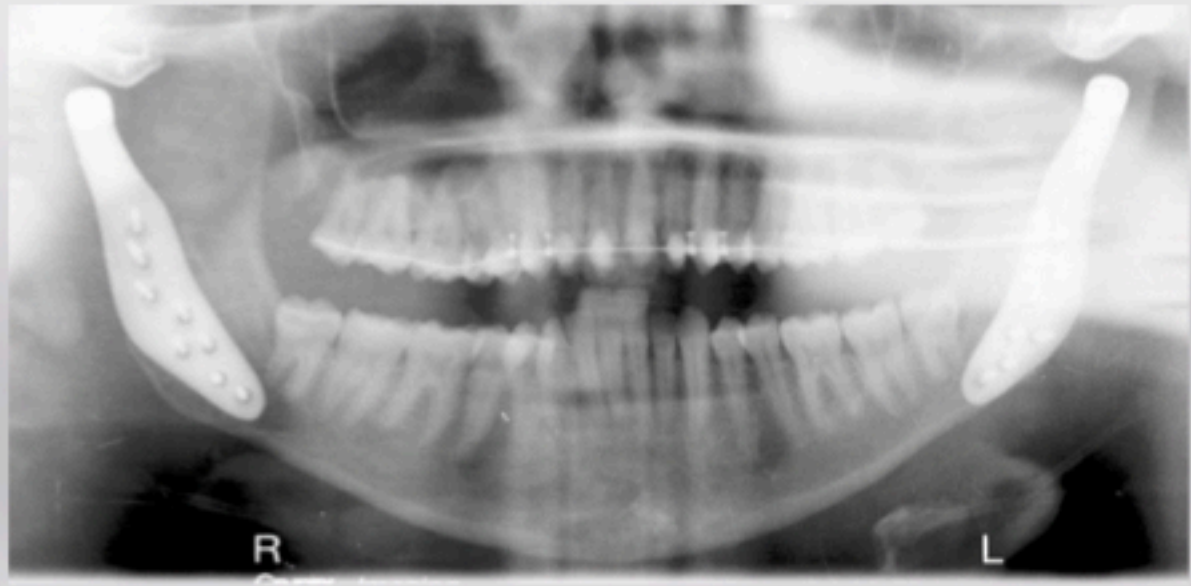
Refer: Arthrocentesis w/ PRP
Refer: Discectomy w/ Fat Graft

Refer: Total Joint Replacement

Refer: Orthognathic Surgery



Lateral Pterygoid Attached



Oral Surgical Support for a TMD Practice

Dx Blocks
Muscle Trigger Point Injections
Sympathetic Nerve Blocks
Botox for Severe Parafunction
Arthrocentesis
Discectomy, Fat Graft, Condylar Distraction
Orthognathic Surgery Malocclusion
Orthognathic Surgery Airway
Total Joint Replacement

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

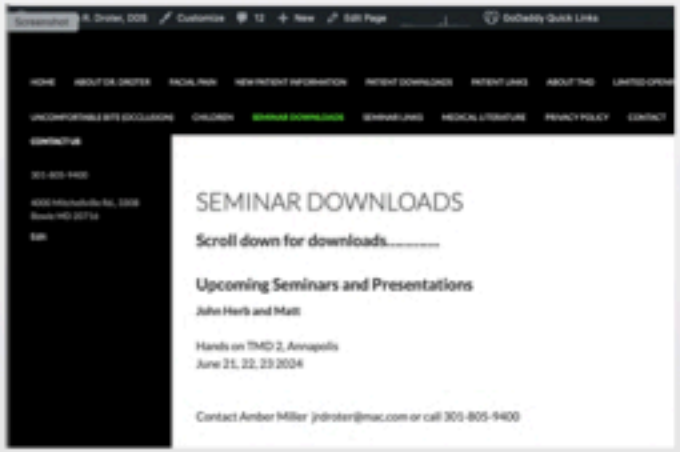
Refer: Arthrocentesis w/ PRP
Refer: Discectomy w/ Fat Graft
Refer: Total Joint Replacement
Refer: Orthognathic Surgery

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

Down Load Sample MR/CT

www.DrDroter.com
Seminar Downloads

Download:
Sample CBCT Case JP Dropbox
CT/MR Samples



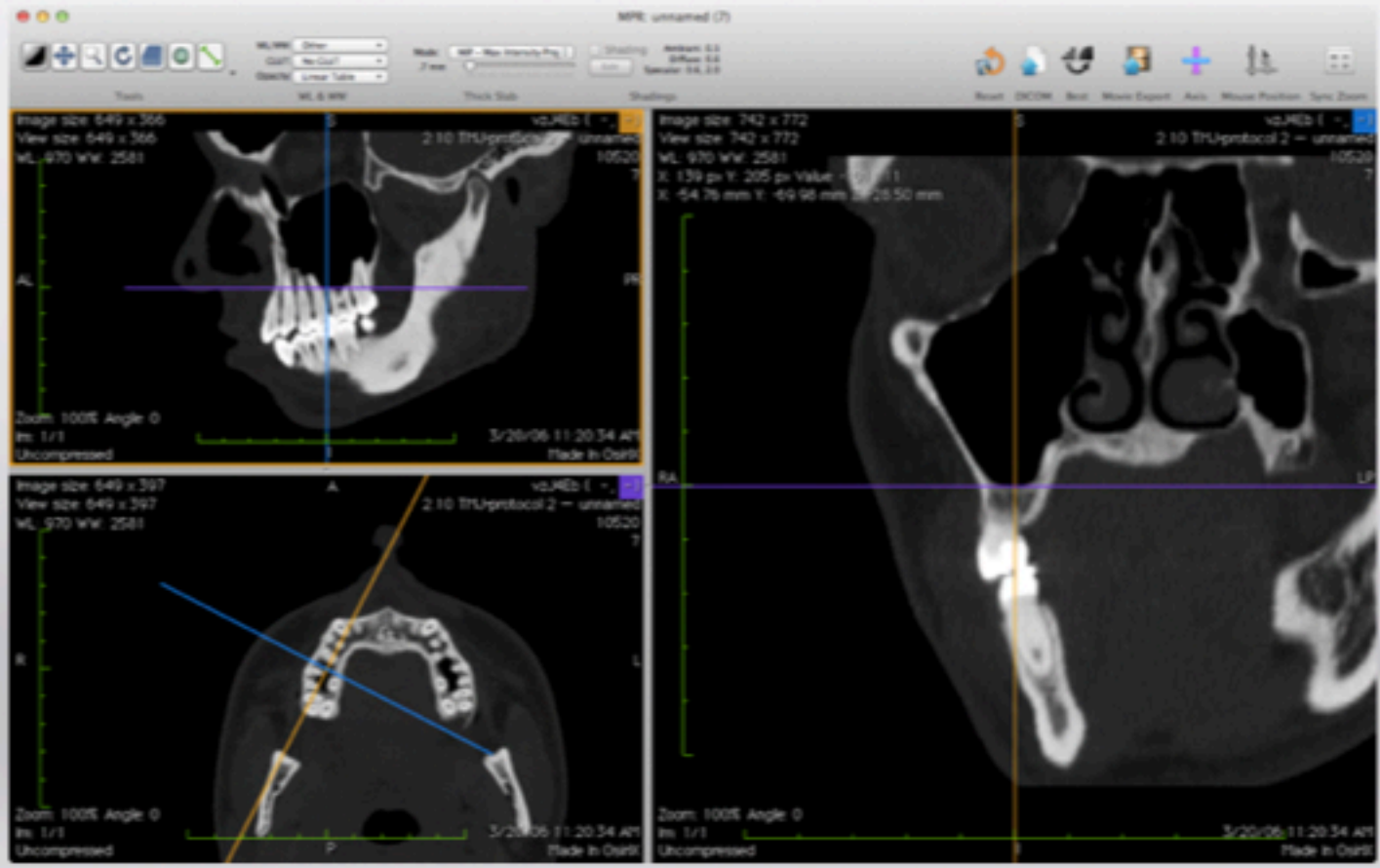
Facial Pain Diagnosis

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 / CBCT Scan**

   MRI

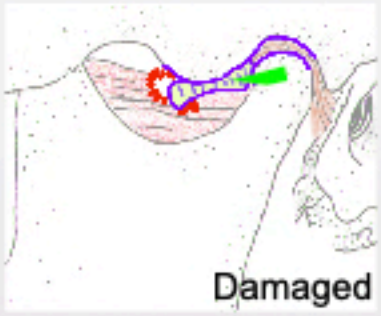
   Blood Tests

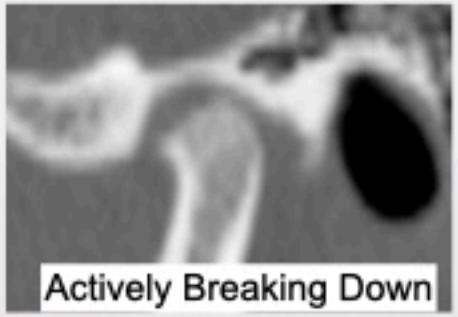


Basic Orthopedics

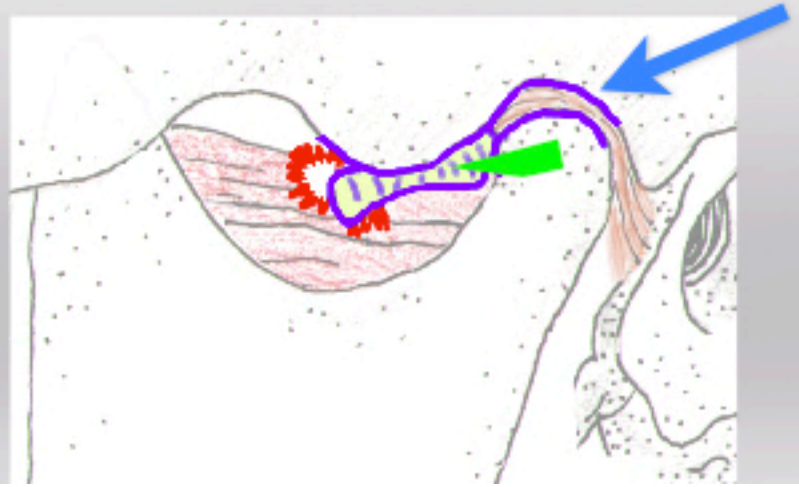
Joints are either
- Healthy or
- Damaged

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





Majority of damaged TMJs adapt favorably

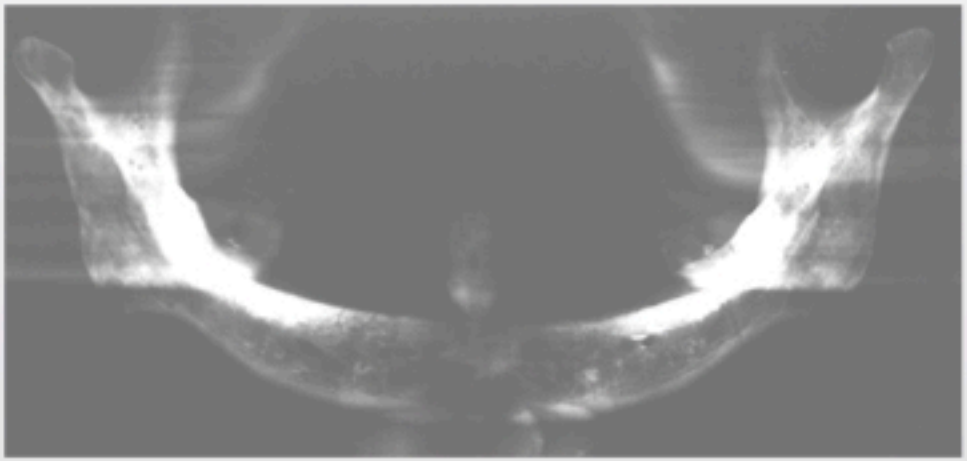


Posterior ligament, synovium, and retrodiscal tissue adapt to form a

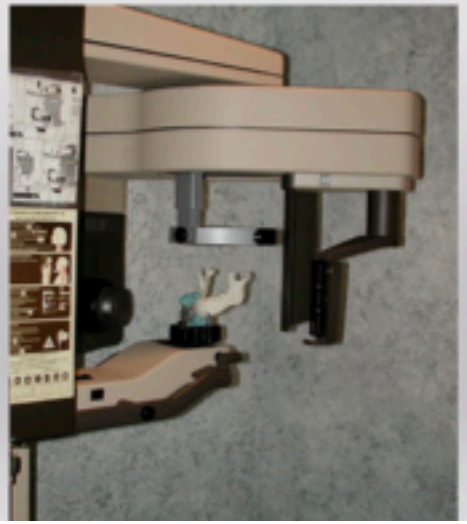
Pseudo-disc

Tissue Fibrosis

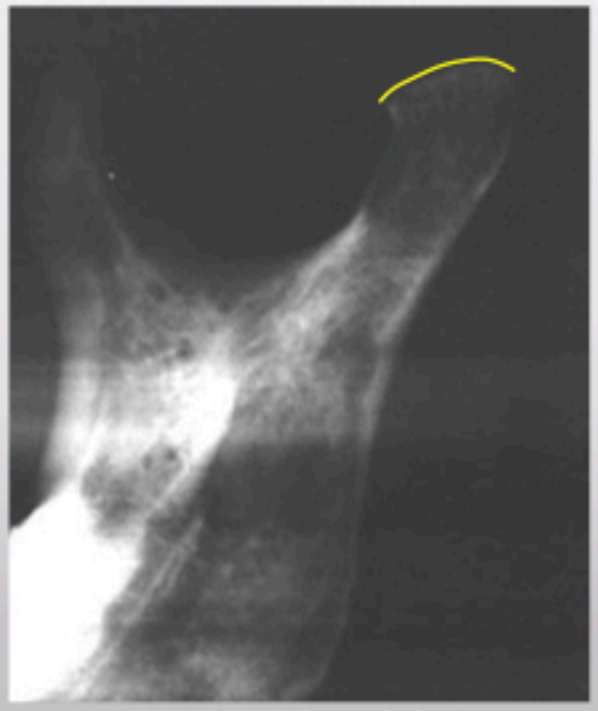
Pan-X of Skull
Mandible



Note: This Mandible had plastic teeth added



Pan-X not Accurate



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

Computerized Axial Tomography (CT, CAT)

Spiral CT Scanner
12 sec acquisition Time

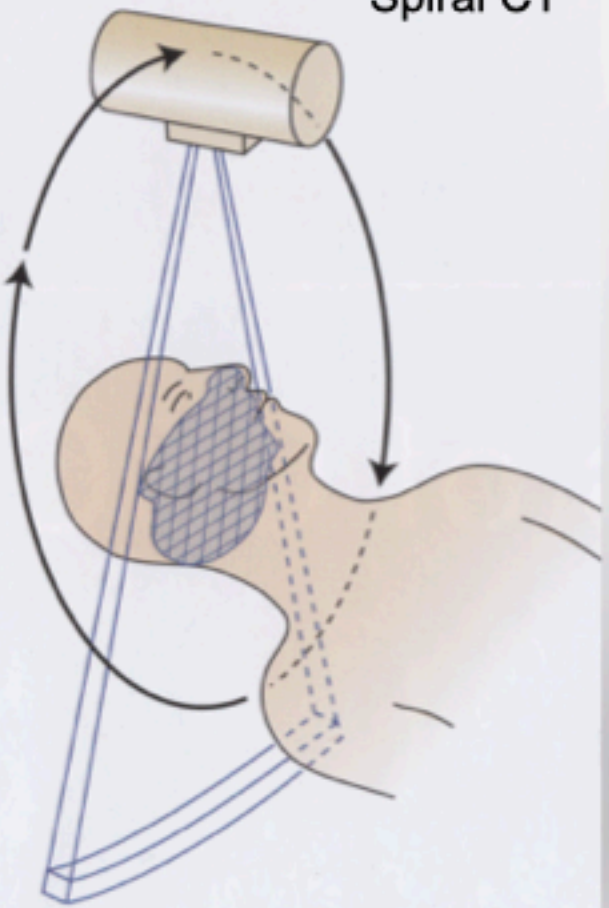
Note: prior to 2001 CT Scan took 25 min

Cone Beam CT Scanner
20 sec acquisition time

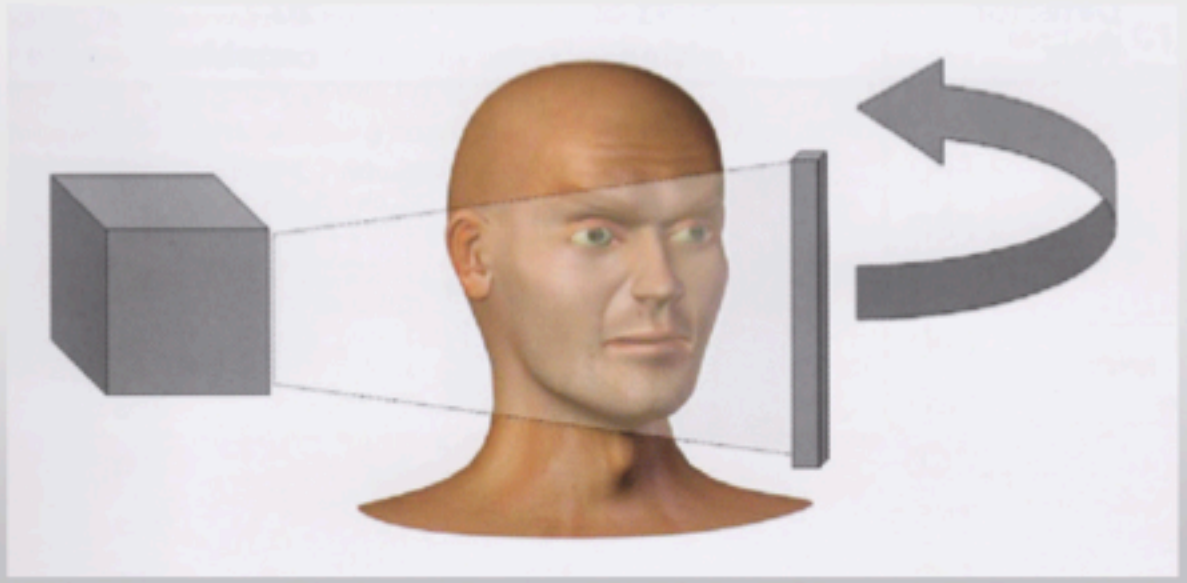
vatech

i3D Premium

Spiral CT



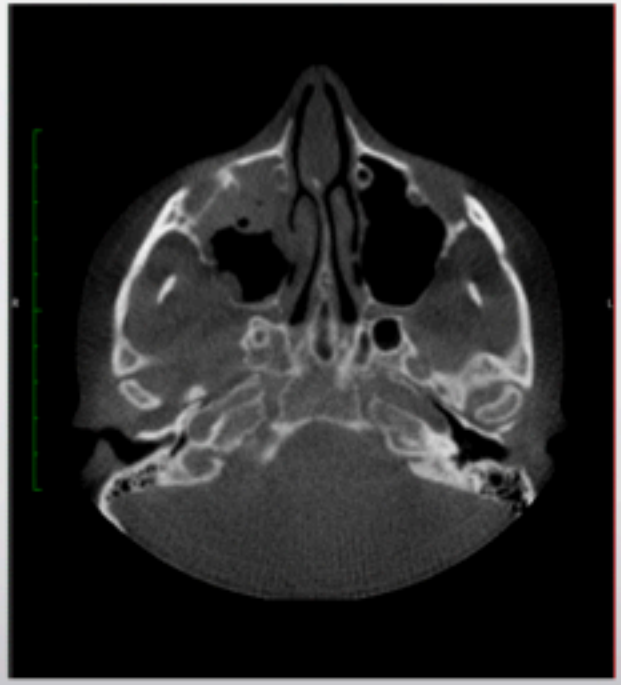
CBCT



Atlas of Cone Beam Imaging
Dale Miles DDS

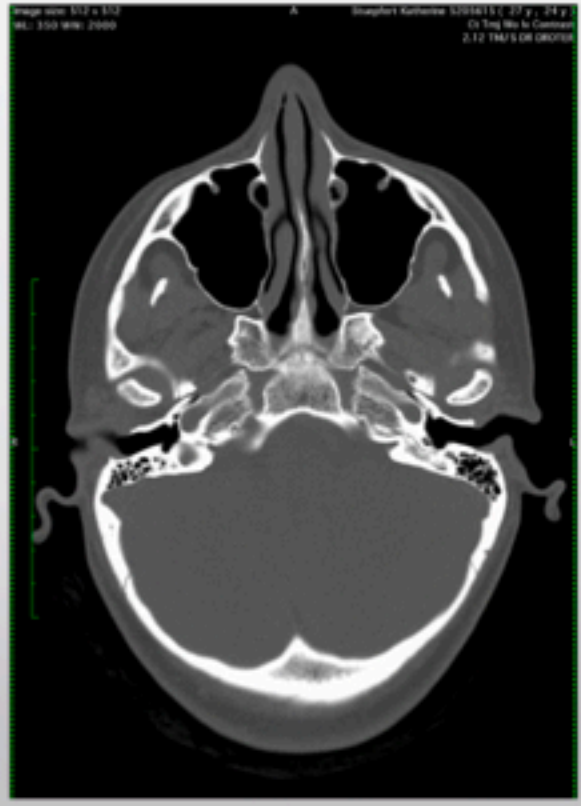
Compare CT scans

CBCT- iCAT



CBCT- Vatech i3D Premium

Spiral CT

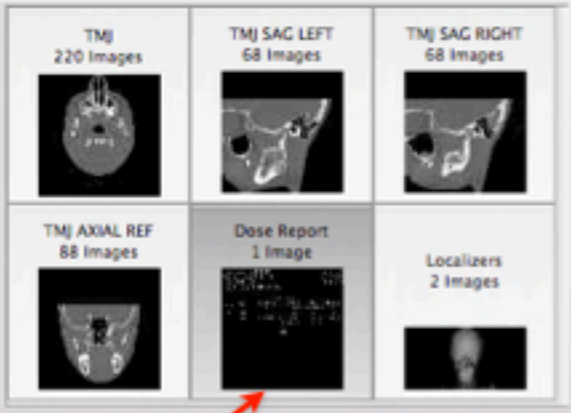


Best Contrast
Much more radiation

Radiation Exposure Comparison

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

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



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

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

Key Features for TMJ Images

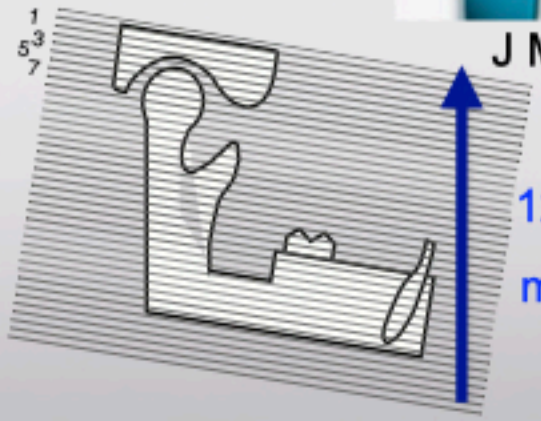
Large Field of View 15cm Tall (12cm is minimum)
Excellent raw image quality

J Morita

VaTech

Recommend Best Raw Image Quality in 2017:
3D Accutomo 170 J Morita 12cm
VaTech i3D Premium 19cm

Most important is service behind the product



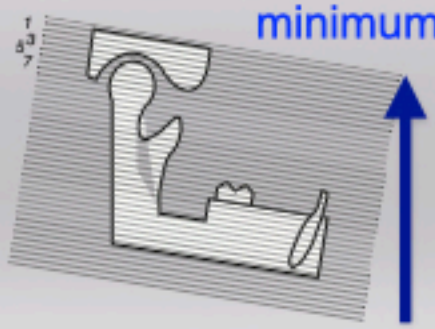
Not recommend:
Any Sirona including Galileos: Marginal raw image quality, motion artifact

Green = LOW Contrast

VaTech Green Series

12 cm tall

minimum



VaTech Green X

15mm tall

VaTech Green X 21

19mm tall

	FOV 4x4/5x5	FOV 8x5/8x8	FOV 12x5/12x9	FOV 18x15	FOV 21x19
REGION	- Single tooth capture	- Central dentition - TMJ (R or L)	- Dual arch including sinus and nerve - TMJ (R or L)	- Back border of jaw (Ramus) - Dual arches back to the 3rd molars plus sinus - Central incisor to spine	- Nearly entire cranium - Tip of nose to posterior of cranium - C5, C6 to superior sinus
CLINICAL IMPLICATION	- Implant single site - Endo - Perio - Complex impaction (3rd) - OMS - Supernumerary : Ortho	- Implantology - Guided Surgery - General Dentist - OMS - Orthodontics	- Surgical guides - Sinus lifts - Bone grafting - Bi lateral sinus augmentation	- Surgical Guides - Sinus lifts for both sinuses - Complex orthognathic cases - Simultaneous diagnosis for both TMJs	- Airway - Oral and maxillofacial surgery facial reconstructions - Orthodontic treatment planning for complex orthognathic cases

Making a Great TMJ Scan

Rx for CBCT

Adding a chair vastly improves image quality

Form on drdroter.com seminar downloads

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

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

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

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

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

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

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

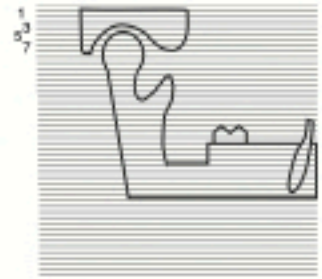
Rx for Medical Grade CT

Form on
drdroter.com
seminar downloads

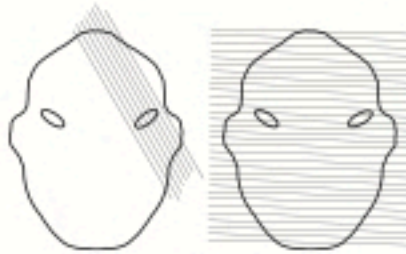
- Do not take scan if not able to send DICOM images to me.
- Must be a spiral CT scanner, 16 or 64 slice. Do not show the head holder in any images.

1. Please review the "Patient Instructions" with the patient before starting the scan.

2. <u>Axial C.T.</u>
   Head stabilization to prevent movement, pads on zygoma
   Superior-Inferior
   Bone Algorithm/ No contrast
   Teeth together. If patient has Dr. Droter's appliance, that is to be worn.
   1mm slices or less. The smaller the better.
   Start 5 mm superior to the roof of the TMJ fossa and
   continue down to include the hyoid bone and C4
   Be sure to capture the tip of the chin and the back of the Occipital Bone



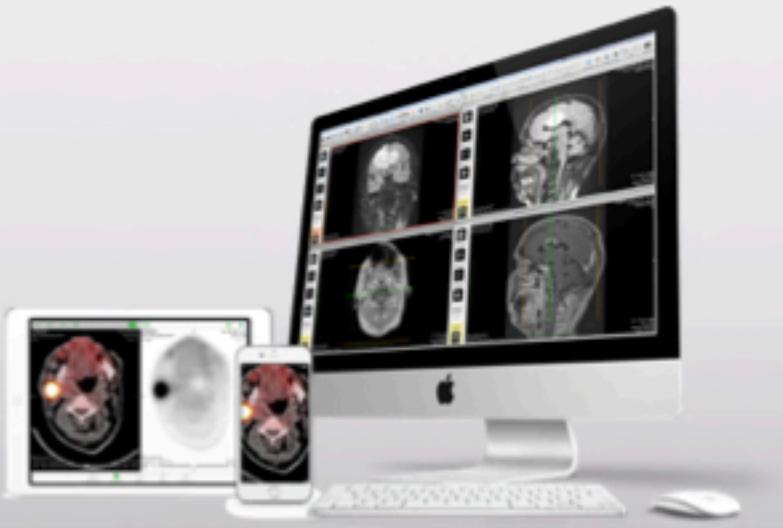
3. <u>Reconstruct Coronal and Corrected Sagittal Views off of the Axail Scan</u>
   1mm slice thickness or less



❑ If Checked: Direct <u>Coronal C.T.</u>
   Head stabilization, 2/3 weight on zygoma,1/3 on chin
   Force on chin is superior not posterior
   Teeth together. If patient has Dr. Droter's appliance, that is to be worn.
   Bone Algorithm/ No contrast
   PA, both right and left TMJ in same slice.
   1mm slices or less. The smaller the better.
   Start behind auditory canal and continue past the crest of the eminence.
   This usually takes about 25 slices
   Align slices so they are parallel with the posterior ramus

4. Printed images not acceptable. Must be Dicom digital images.
   Do not take the scan if you can not send DICOM images.

Dicom Viewers



Mac

OsiriX — FDA Cleared

Horos — Free but not FDA cleared

Both Mac and PC

Planmeca Romexis

PC

Invivo 7 - was Anatomage
Dolphin
Scanner software that comes with 3D Scanners

Viewer on CD disc— very slow

Normal TMJ- Bone

Bone Density

- Intact Cortex
- Even pattern Trabecular bone

Normal Size/Shape Condyle/Fossa

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

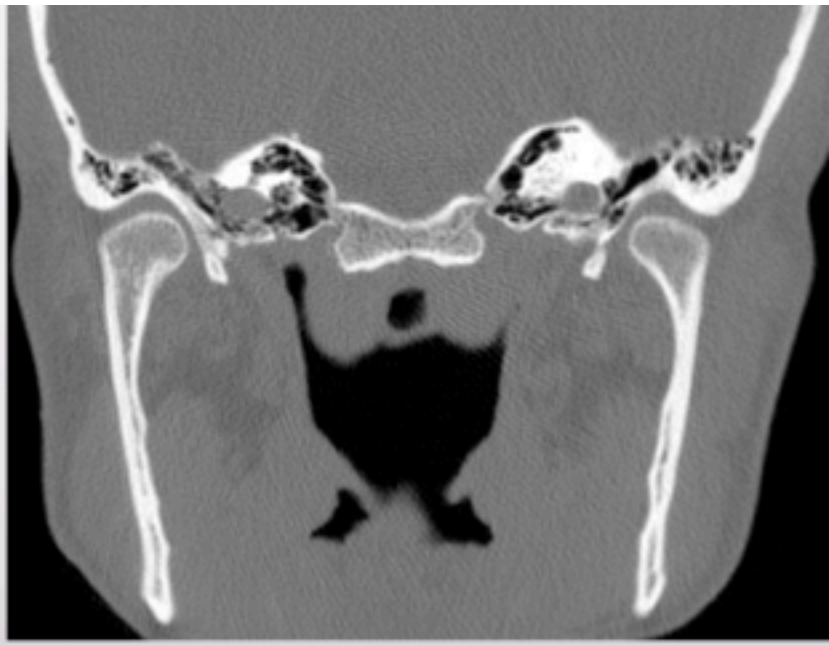
Condyle Centered in Fossa

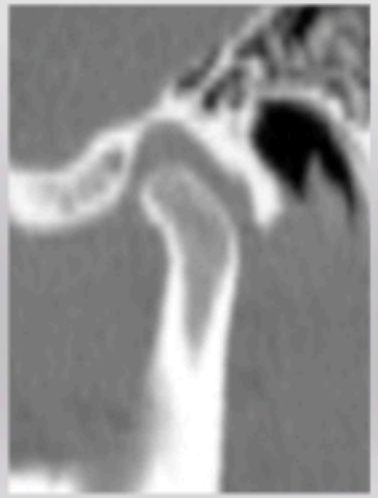
- Coronal and Sagittal
- Room for Disc

Stable CR load Zone

- Condyle closest to fossa

CT Scan
Coronal View





CT Scan
Sagittal View

Interpreting CBCT

www.jrdroter.com

Review of Scan: CBCT

John R Droter, DDS

Name _____ Scan Date _____

Review Date: _____

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	☐ Hyperostiffication	☐
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	☐ Hyperostiffication	☐
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

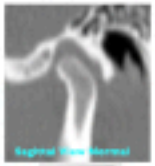
All Tissue	☐ Right = Left	☐ = Except _____
Look for tumors	Brain, Muscle, Parotid Submand Gland, Hypertrophy	
All Bones	☐ Right = Left	☐ = Except _____
Look for hyperostiffied or radiolucent areas, cysts		
Nasal (Sagittal, Cor)	☐ Open	☐ Restricted ☐ Deviated Septum ☐
Sinuses "	☐ Clear	☐ Thickened Lining ☐ Sinus Polyps ☐
Airway "	☐ Adequate	☐ Restricted ☐
Teeth (Sagittal, Cor)	☐ No PAP	☐ PAP # _____ ☐
(Axial)	☐ No Gross Caries	
Perio (Thick Sagittal)	☐ No Gross Perio Bone Loss	
Atlas 3D	☐ Appears Centered	☐ Not Level with Skull Base ☐
C2, C3, C4 3D	☐ 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 hyperostiffication 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 condyles 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 DJMS. Clinically these patients may have a hypersensitive "bite".

Estimate Piper

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

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

2 The TMJ is damaged but disc is still in place so **MRI and CT are normal**. Usually the cartilage is damaged, roughened from parafunctional bruising. 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 convalescent 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 non-reducing 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. Hyperostiffication will be seen having reinforced the damaged areas. There is a loss of congruency as the condyle and fossa wear down and become flattened. Parafunctional tooth grinding increases OA bone wear.

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

Right TMJ Scroll Corrected Sagittal and Corrected Coronal

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

Estimate Piper: R1 R2 R3a R3b R4a R4b R5a R5b

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

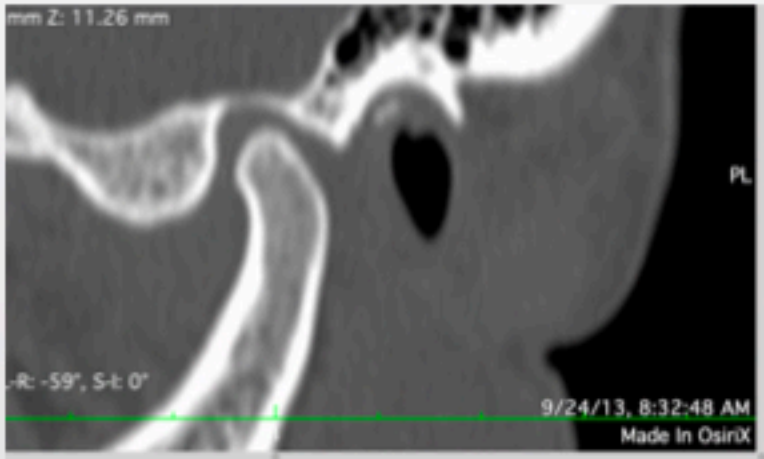
CT Left
Piper 2 from MRI

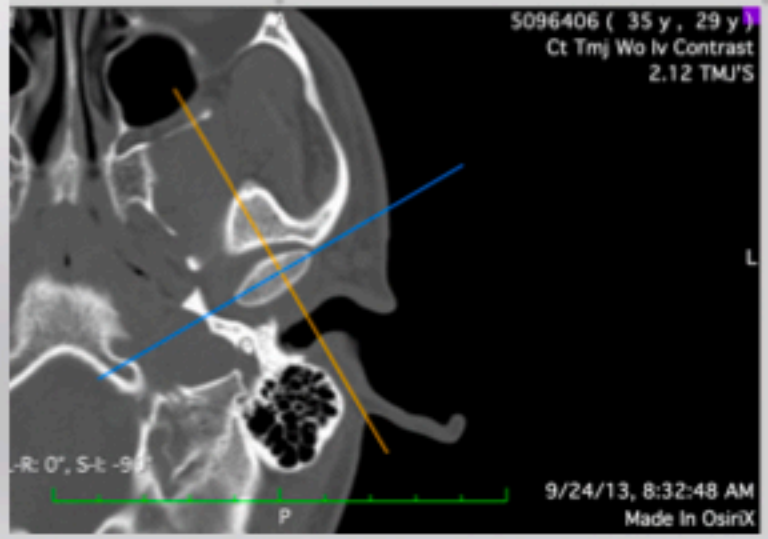
Condyle:	☑ Normal Size
	☑ Normal Shape
	☑ Cortex Intact
	☐ Cortex Even
Fossa:	☑ Normal Size
	☑ Normal Shape
	☑ Cortex Intact
Condyle Position	☐ Centered in fossa
Joint spacing	☑ Room for disc
CR Load Zone	☐ Superior medial

☑ Hypercalcification

☑ Condyle distalized

☑ Superior Lateral





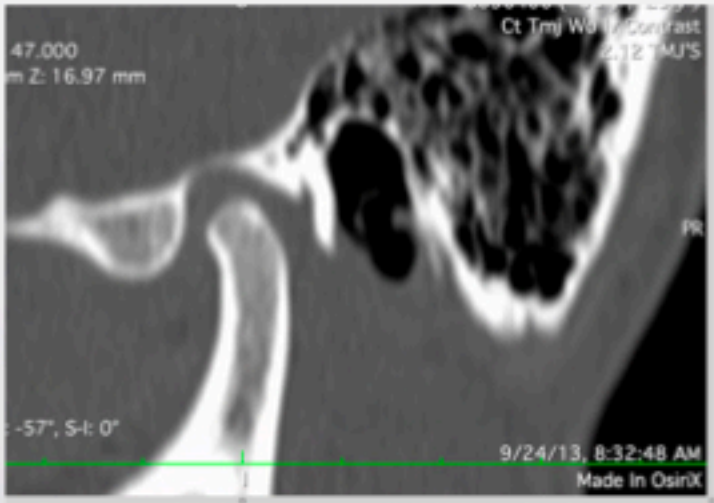
CT Right
Piper 4a-e from MRI

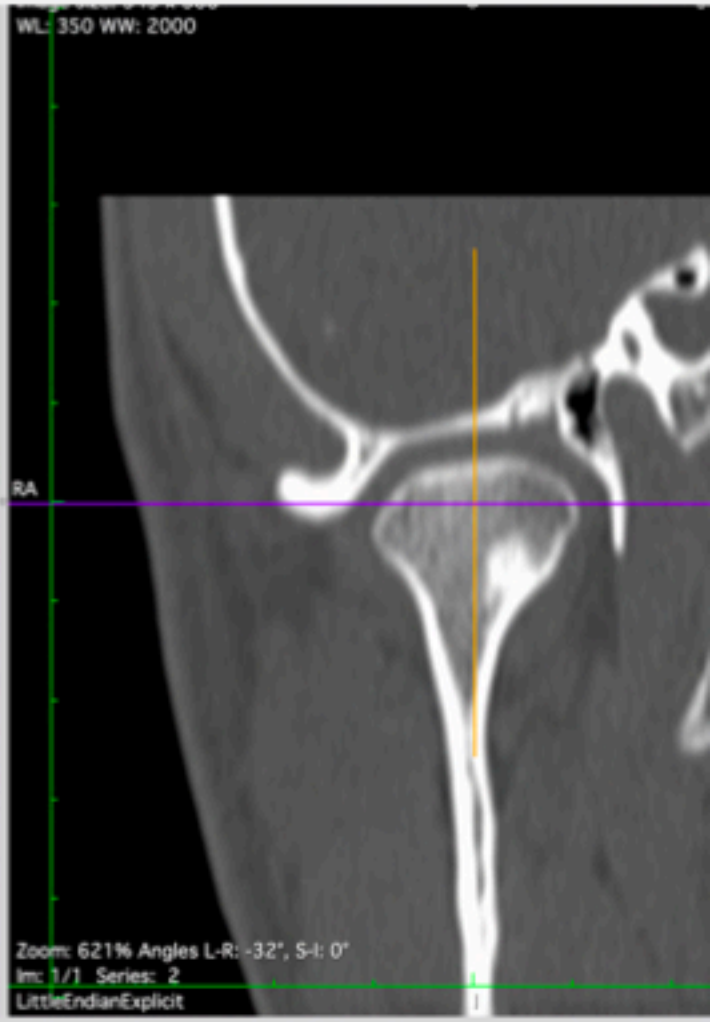
Condyle:	☑ Normal Size
	☑ Normal Shape
	☑ Cortex Intact
	☐ Cortex Even
Fossa:	☑ Normal Size
	☑ Normal Shape
	☑ Cortex Intact
Condyle Position	☑ Centered in fossa
Joint spacing	☑ Room for disc
CR Load Zone	☐ Superior medial

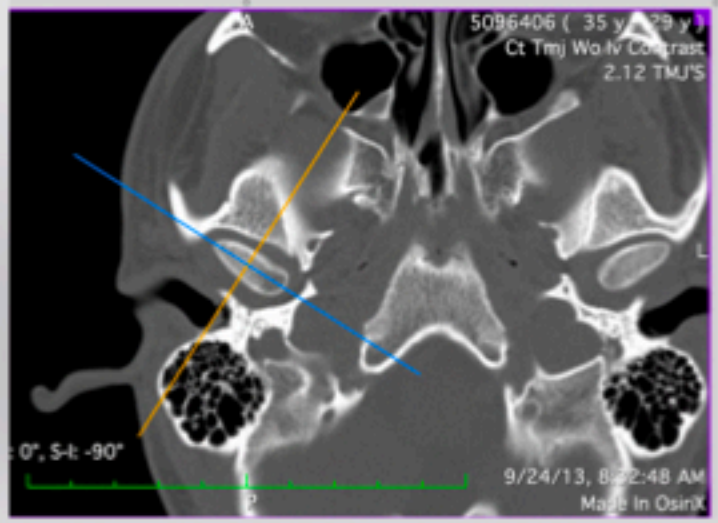
☑ Hypercalcification

☑ Superior Lateral

✔ Note: Large joint space





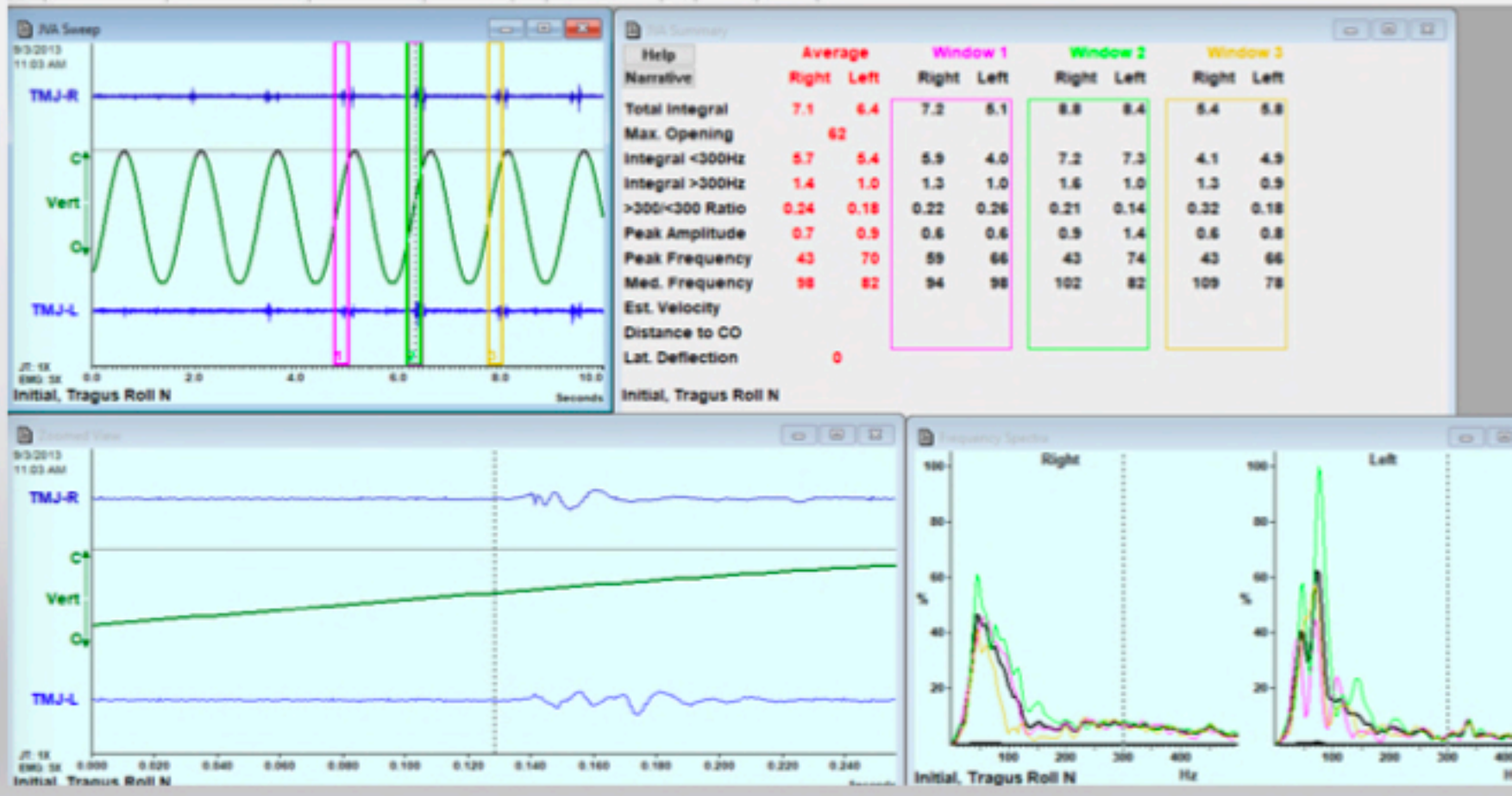


Slight Wobble before tooth contact

Joint subluxation on movement

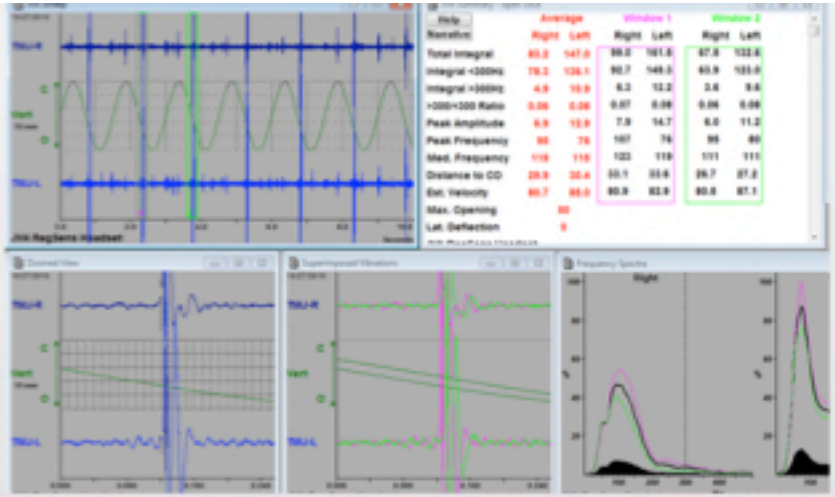
Clinical Relevance?

Early damage from parafunction



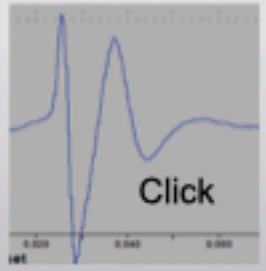
Joint Vibration Analysis

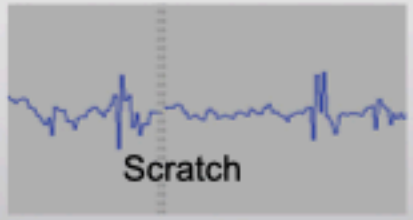
Objectively measures and quantifies joint vibrations during motion which is an indication of cartilage health

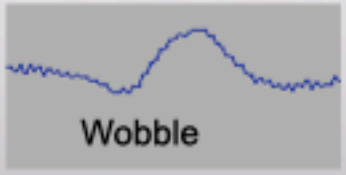


Based on Sonar.
It is not a microphone

Three main types of sounds





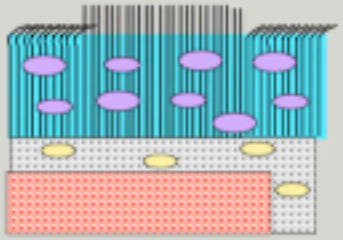


Disc Reduction
Disc Dislocation
Adhesion crackle
tooth tap

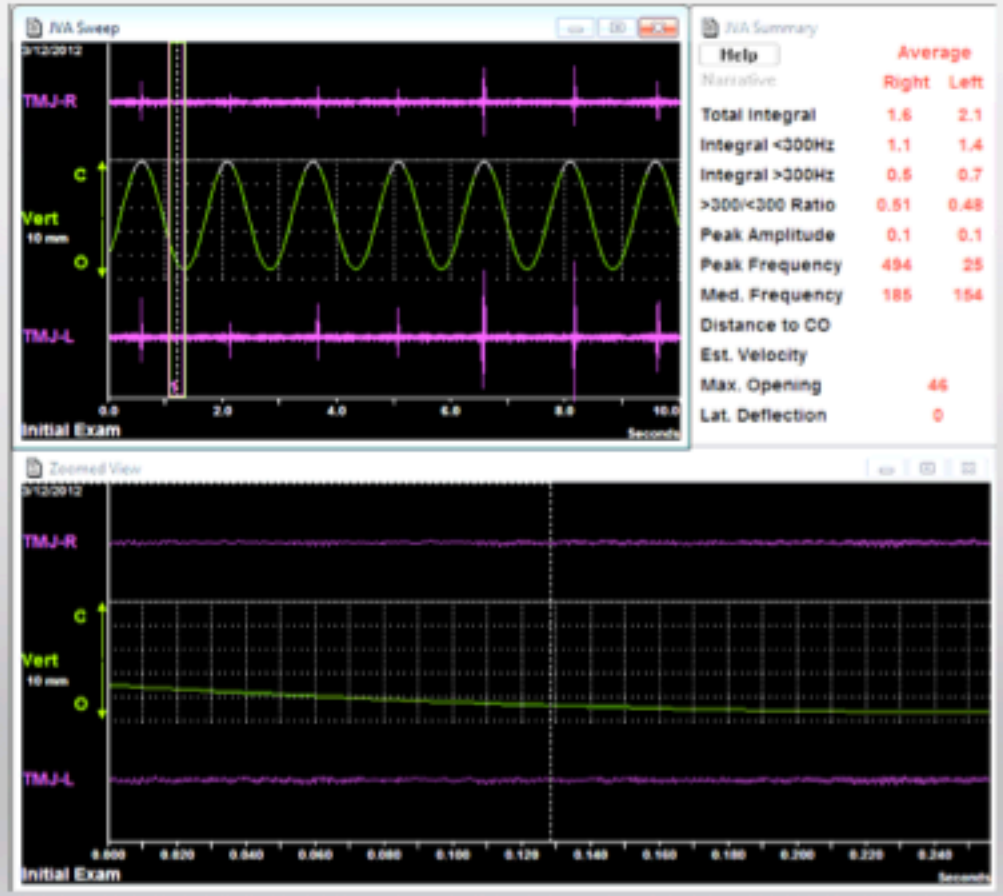
Osteoarthritis
Pseudo Disc
Damaged Cartilage

Disc Subluxation
Joint Subluxation
Disc Reduction
Disc Dislocation

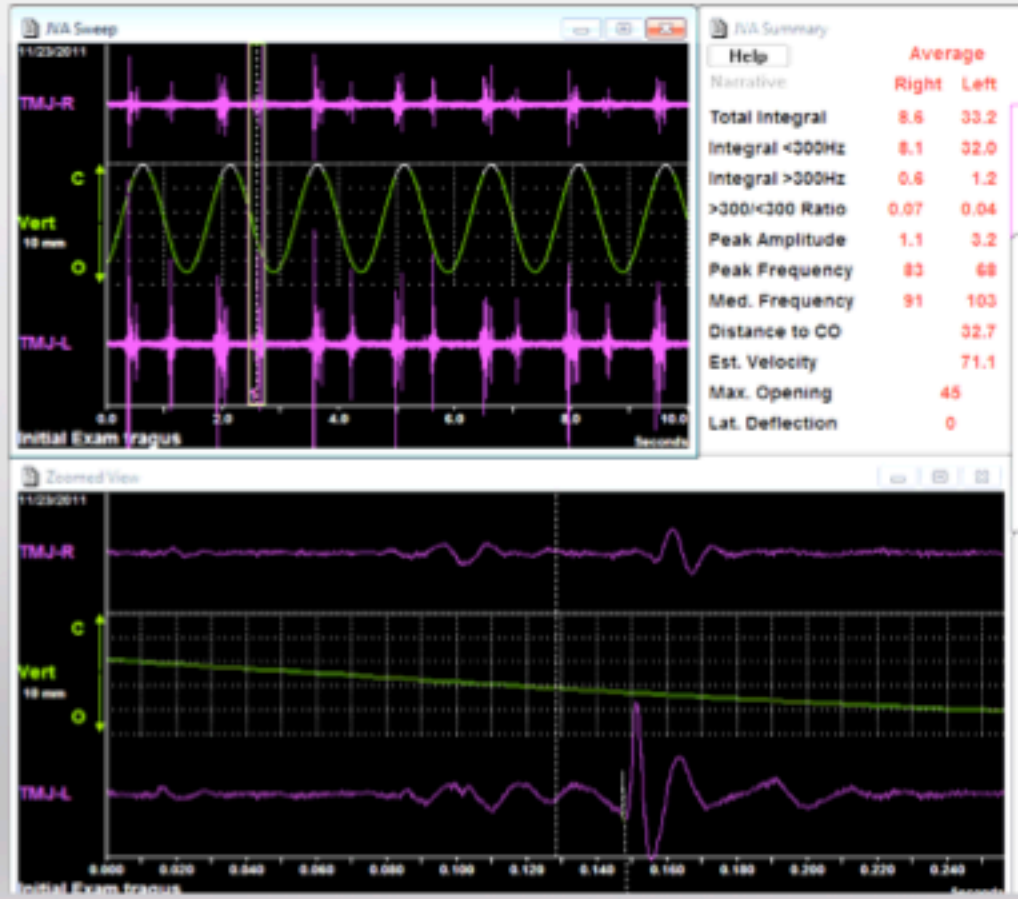
JVA measures the health of the cartilage



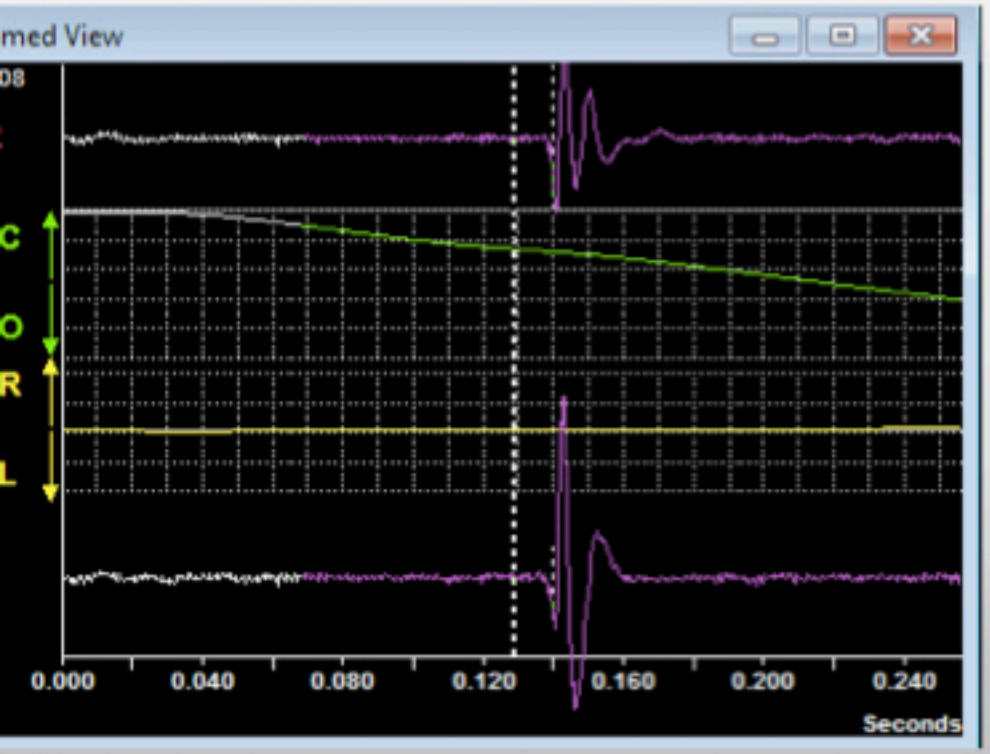
Healthy or Damaged?



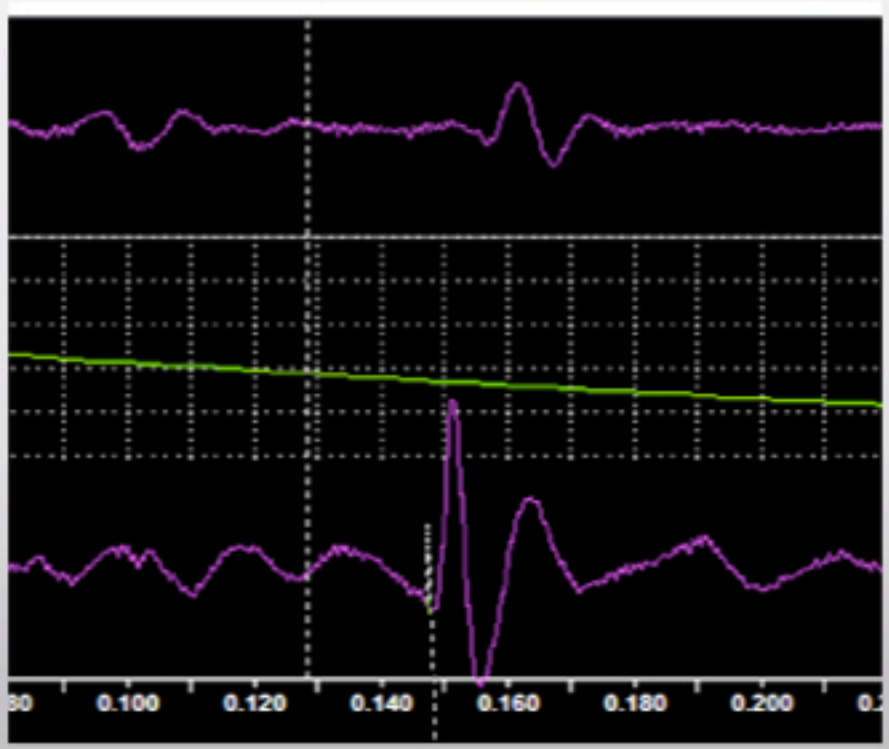
Healthy or Damaged?



Simple or Complex



Simple left click with transference vibration to right
L4a



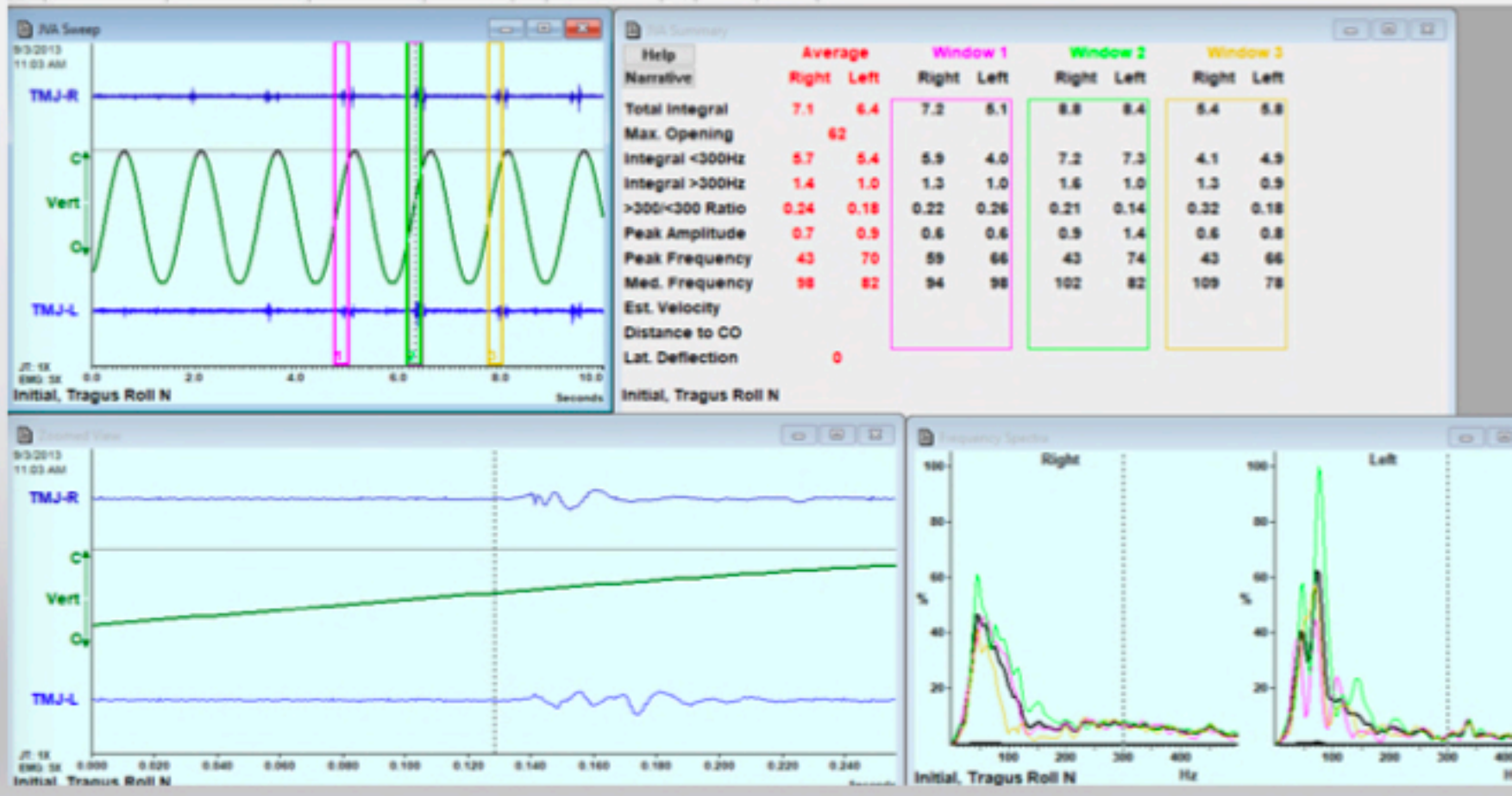
Complex Click
L3a, R4b

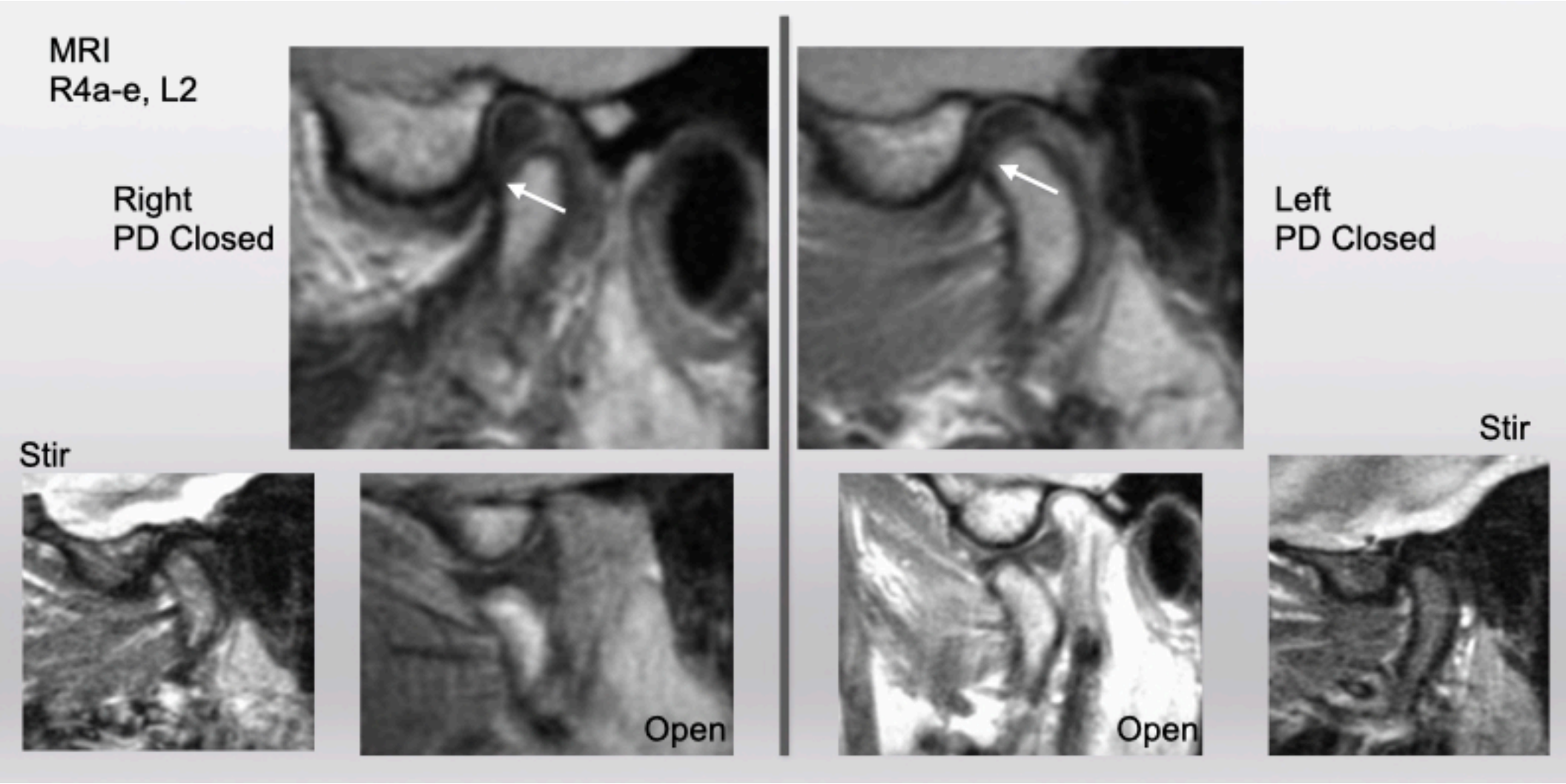
Slight Wobble before tooth contact

Joint subluxation on movement

Clinical Relevance?

Early damage from parafunction




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

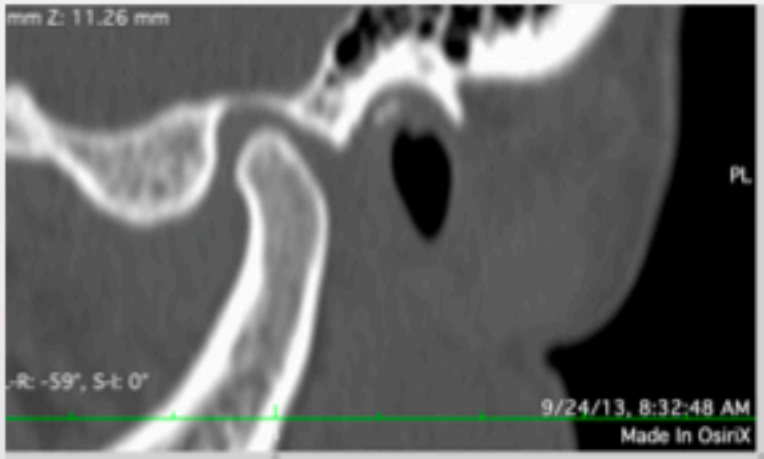
CT Left
Piper 2 from MRI

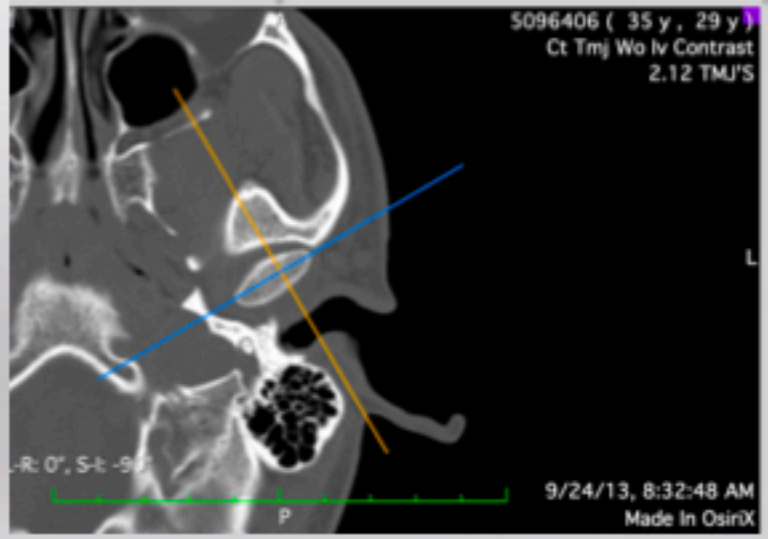
Condyle:	☑ Normal Size
	☑ Normal Shape
	☑ Cortex Intact
	☐ Cortex Even
Fossa:	☑ Normal Size
	☑ Normal Shape
	☑ Cortex Intact
Condyle Position	☐ Centered in fossa
Joint spacing	☑ Room for disc
CR Load Zone	☐ Superior medial

☑ Hypercalcification

☑ Condyle distalized

☑ Superior Lateral





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Piper 4a-e from MRI

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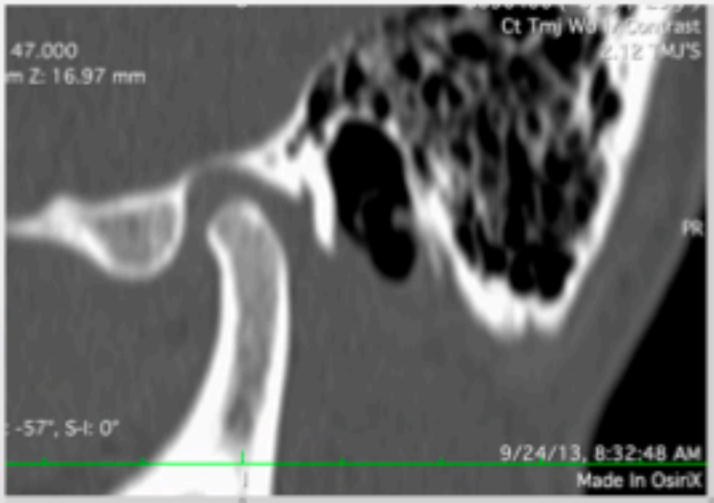
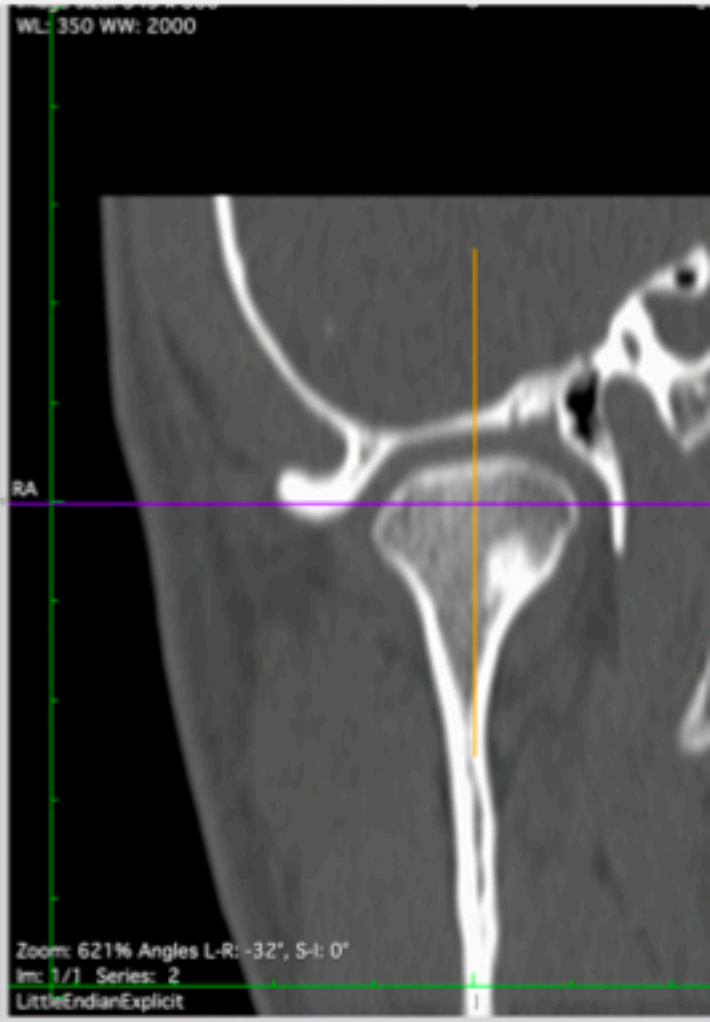
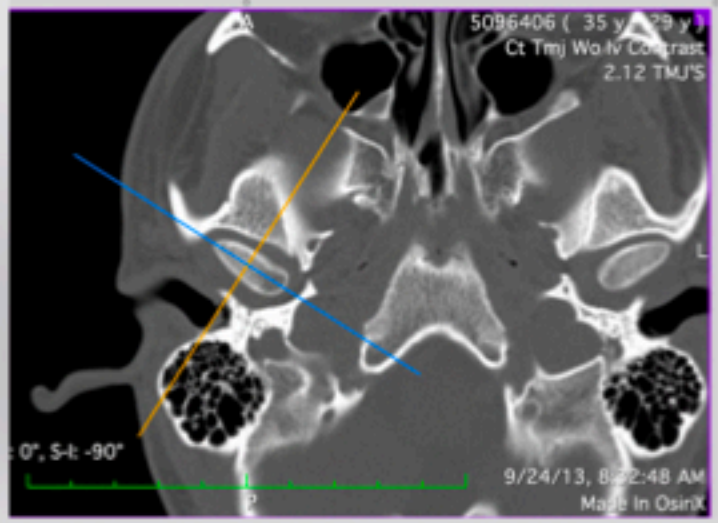
✔ Note: Large joint space







Diseases to consider and rule out:
Clenching
Early TMJ damage

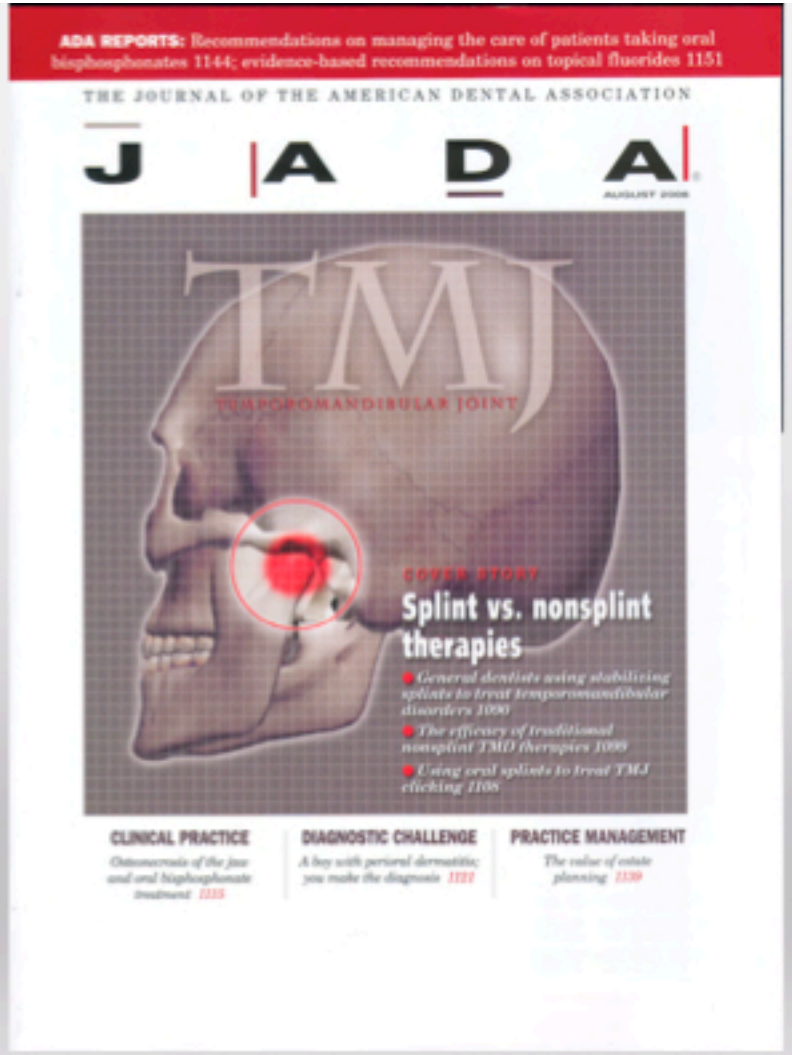
Possible Treatment:
Dental Orthotic 6-12w 24/7
Occlusal Adj
D-PAS night guard

TMD is not a disease

Journal Articles Pubmed Search:

Knee Disorder	0
Temporomandibular Disorder	518

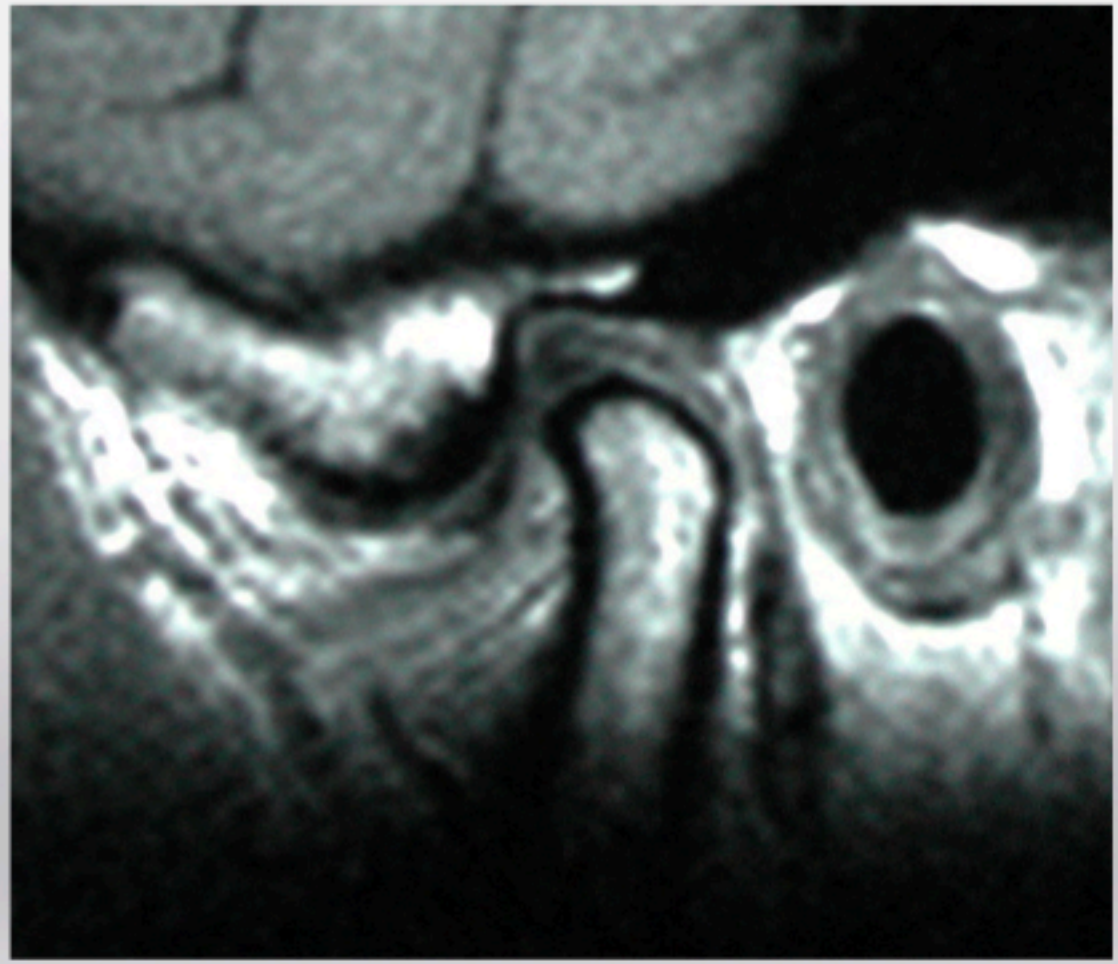
31% “Usual Treatment” nonsplint patients quit study so not counted in data



Facial Pain Diagnosis

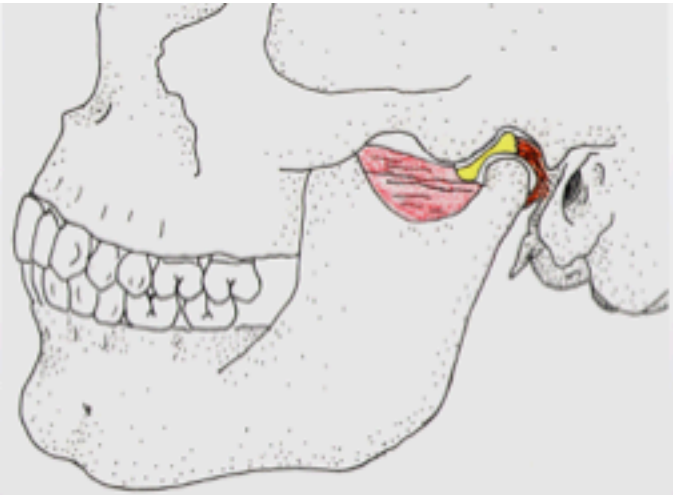
Diagnostic Tools

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



MRI- T1 Oblique Sagittal View

MRI you can see soft tissue



Find the...

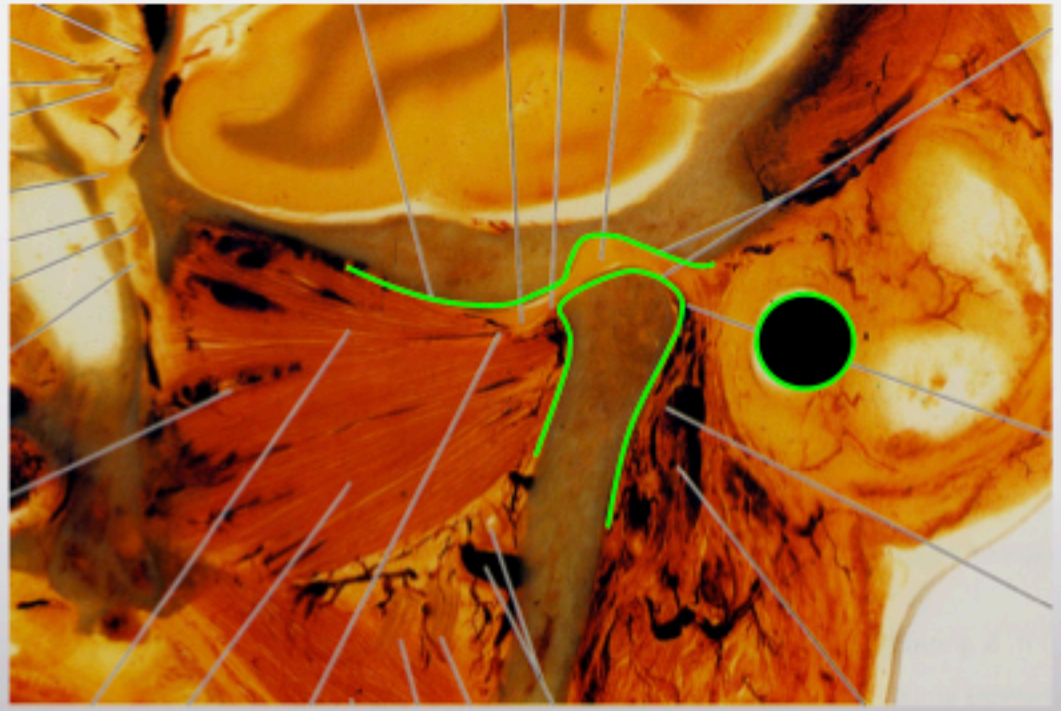
Ear

S-shaped Bone

Condyle

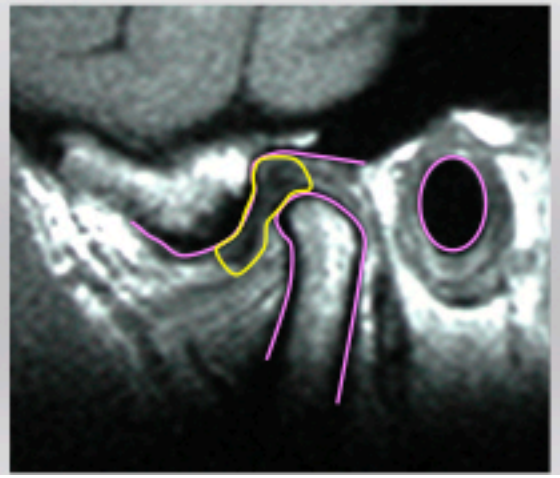
Disc

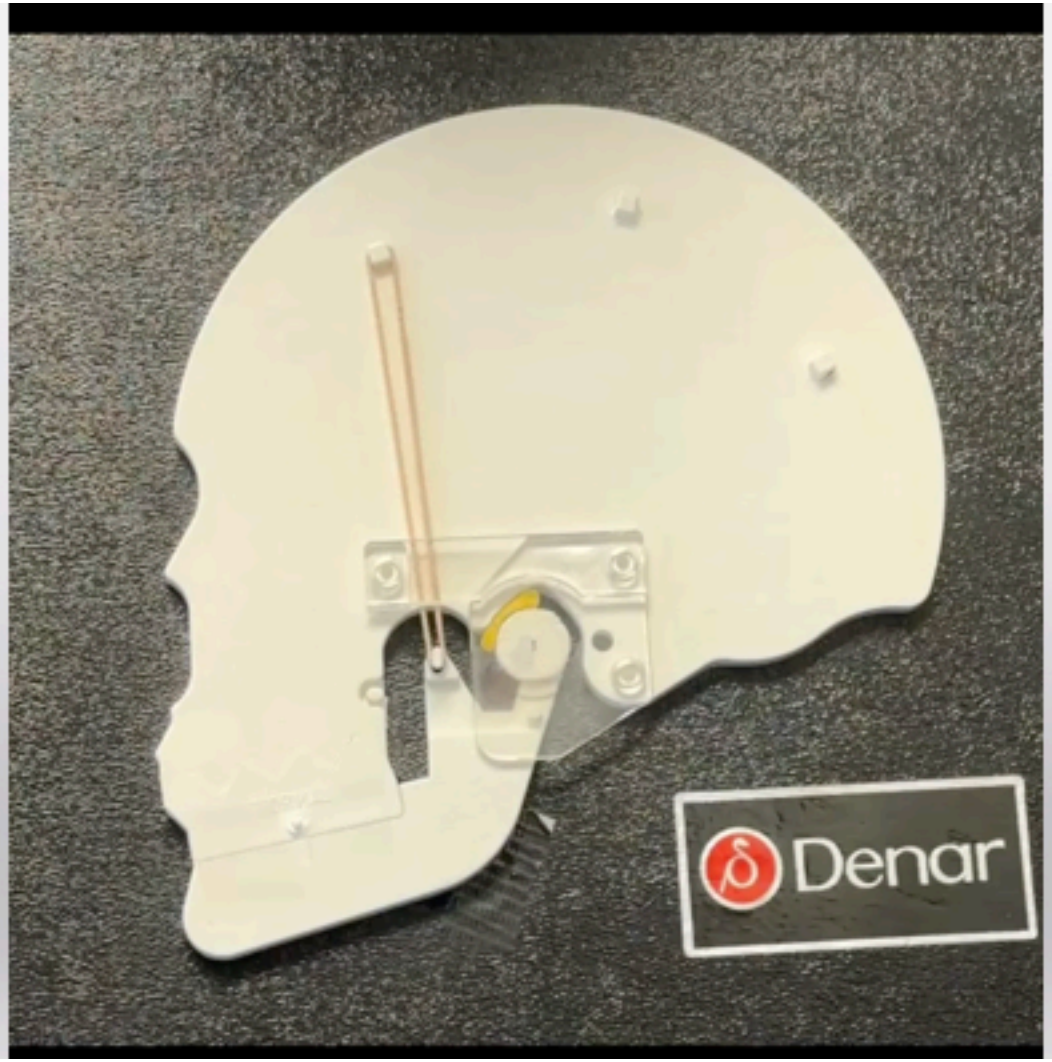
Oblique Sagittal View



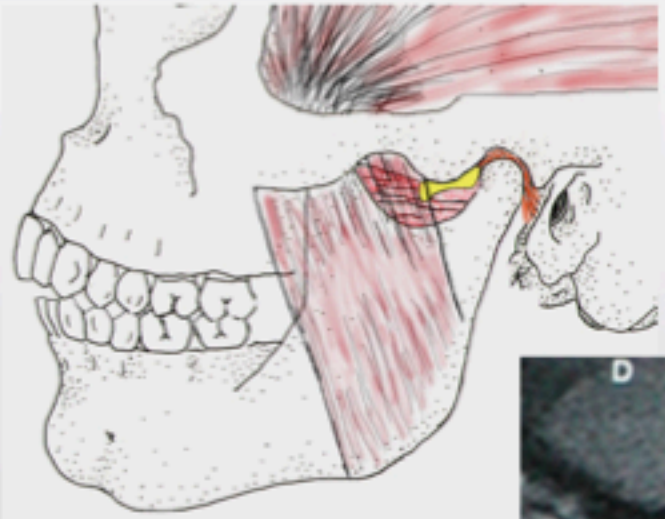
T1 Inverted

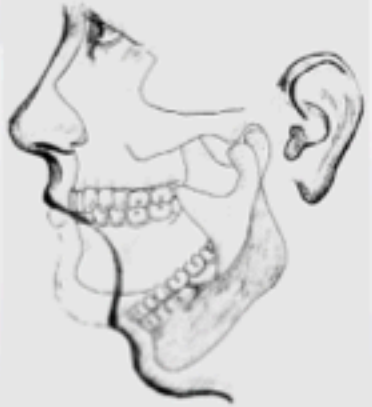
T1 Sagittal Closed

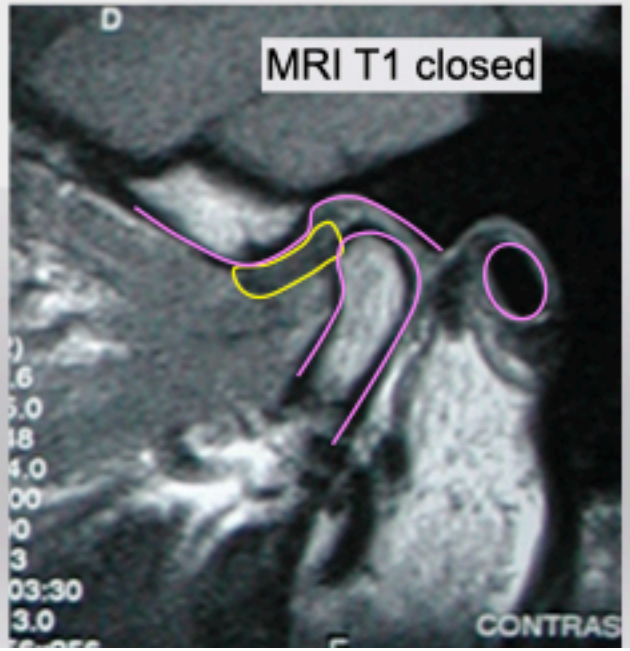



Denar

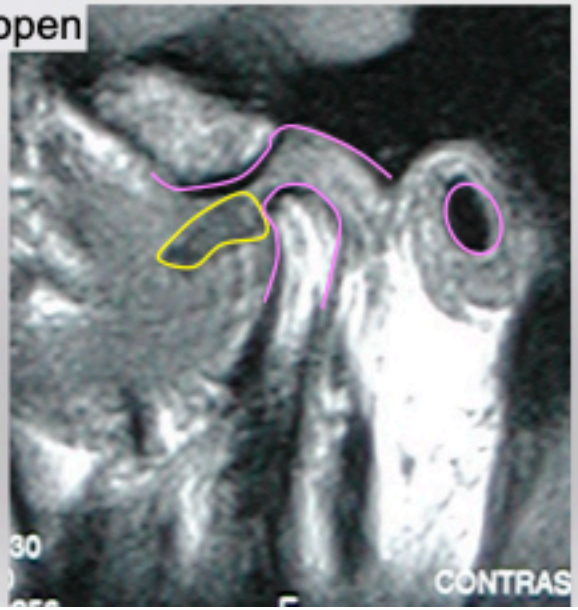
Dislocated Disc and Condyle Subluxation







open



MRI Scanners

MRI Scanner
3 Tesla
Magnet Strength

Head Coil

MRI Scan of the Temporomandibular Joint
3 Tesla Magnet

_____
date

Please evaluate _____

Significant History: ☐ See Exam Form

☐ Facial Pain 784.0
☐ Avascular Necrosis 526.4
☐ Osteoarthritis 715.2

_____

_____

_____

- Use 3 Tesla Magnet. Use highest resolution as possible. Do not use a short flip angle.
- Limit field of view to the TMJ to allow for maximal resolution.
- Share orientation views
- Closed views are with back teeth together.
- Use a roll of tape (3M Transpore Tape 1 inch wide) for the open view. The roll is two inches in diameter. Have patient open as wide as they can comfortably and place the tape roll as far back as possible with the flat side toward the teeth. They should be biting into the tape with their back molars on both sides.
- Copy DICOM images to a CD and give to patient.
- If at Anne Arundel Medical Center, Radiologist Kerry Thompson, MD is to read the scan.

☐ Patient has wax index to wear on teeth to stabilize jaw for closed view.

☐ Patient is to wear Dr. Doster's appliance for all closed views.

☐ Give Rx for _____. They will take it 1 hour before scan.

☐ Patient to get braces off molars before scan. No orthodontic wire in place.

1. T1 mouth closed, corrected sagittal projection, right and left TMJ.
   8 or more views: lateral, medial, 4 cuts through condylar head.

2. T2 scan mouth closed, corrected sagittal projection, right and left TMJ.
   8 or more views: lateral, medial, 4 cuts through condylar head.

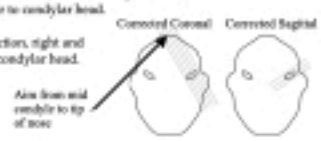
3. STIR (T1 inversion recovery) corrected sagittal projection, right and left TMJ.
   8 or more views: lateral, medial, 4 cuts through condylar head.

4. Proton Density, mouth closed, corrected sagittal projection, right and left TMJ.
   8 or more views: lateral, medial, 4 cuts through condylar head.

5. Proton Density, mouth closed, corrected coronal projection, right and left TMJ.
   8 or more views: in front of condylar head, through condylar head, behind condylar head.
   Be sure to go at least one slice distal, and one slice anterior to condylar head.

6. Proton Density, mouth open fully, corrected sagittal projection, right and left TMJ. 8 or more views: lateral, medial, 4 cuts through condylar head.
   Use roll of tape for open view as described above.
   Take this view last.

Thank You



Rx 3T MRI of the TMJ

- Use 3 Tesla Magnet. Use highest resolution as possible. Do not use a short flip angle.
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- Show orientation views
- Closed views are with back teeth together.
- Use a roll of tape (3M Transpore Tape 1 inch wide) for the open view. The roll is two inches in diameter. Have patient open as wide as they can comfortably and place the tape roll as far back as possible with the flat side toward the teeth. They should be biting into the tape with their back molars on both sides.
- Copy DICOM images to a CD and give to patient.
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☐ Patient has wax index to wear on teeth to stabilize jaw for closed view.

☐ Patient is to wear Dr. Droter's appliance for all closed views.

☐ Gave Rx for _____. They will take it 1 hour before scan.

☐ Patient to get braces off molars before scan. No orthodontic wire in place.

Rx 3T MRI of the TMJ

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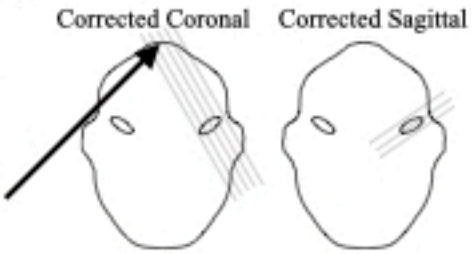
Thank You



Older MRI Scanners

MRI Scanner
1.5 Tesla
Magnet Strength

Open MRI Scanner
0.7 Tesla

Shoulder Coil

Dual TMJ Coils

How an MRI Works

Magnet lines up protons: Water and fat

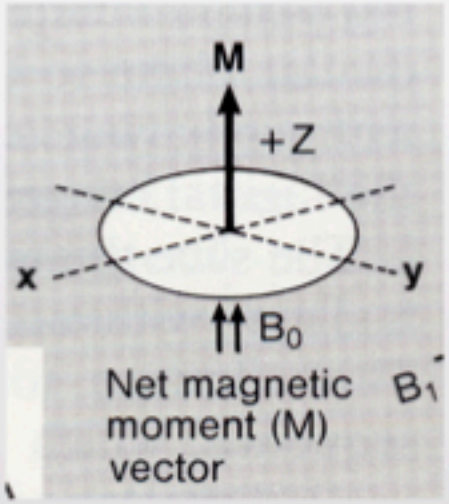
- Magnet is on the whole time

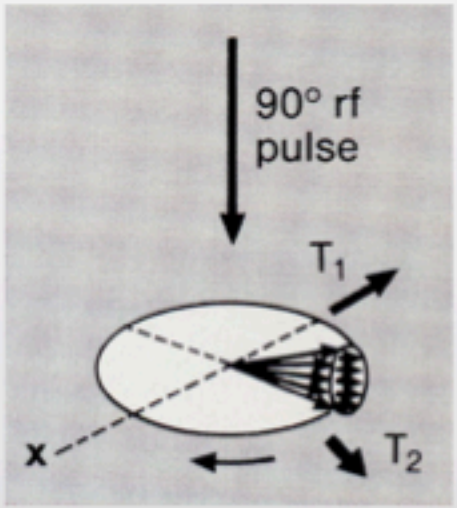
RF Pulse (Radiofrequency): 1 millisecond

- Knocks protons out of alignment

Time Constant: RF pulse off and then look

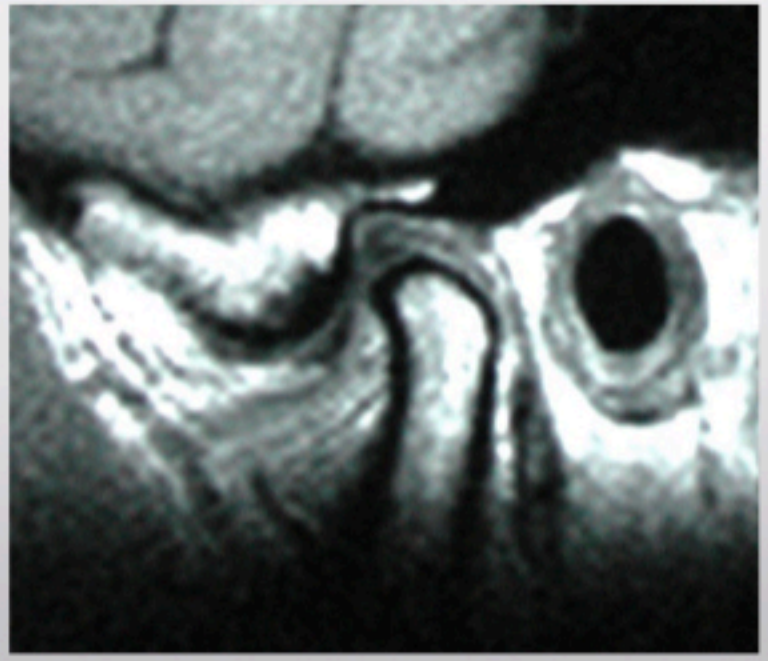
- T1 : Shows more fat
- T2 : Shows more water
- PD Proton Density- Between T1 and T2
- STIR Short T1 Inversion Recovery- Shows more water





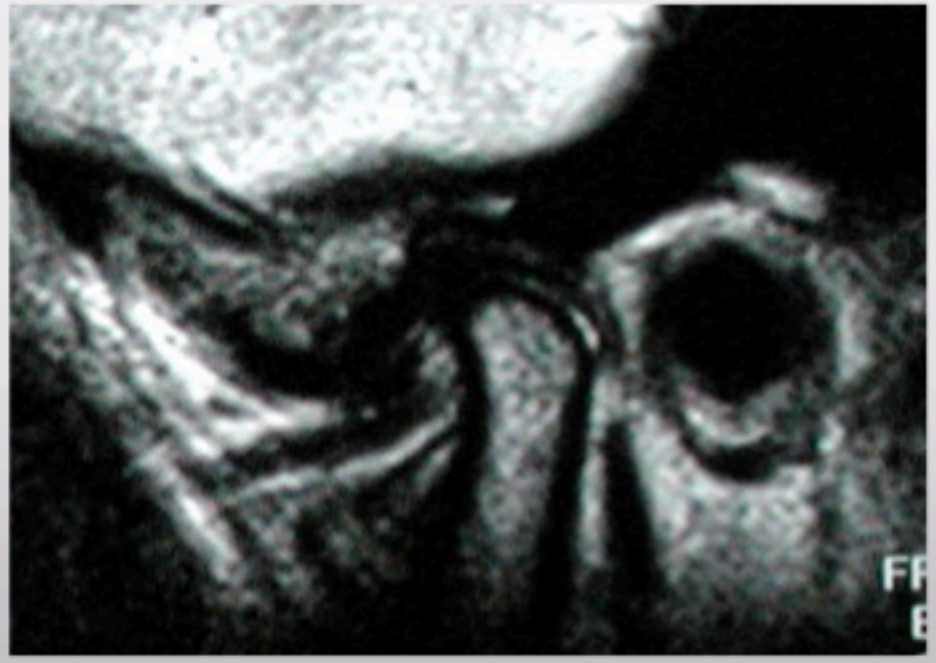
Normal MRI T1 and T2

T1 Sagittal Closed



T1 shows more fat

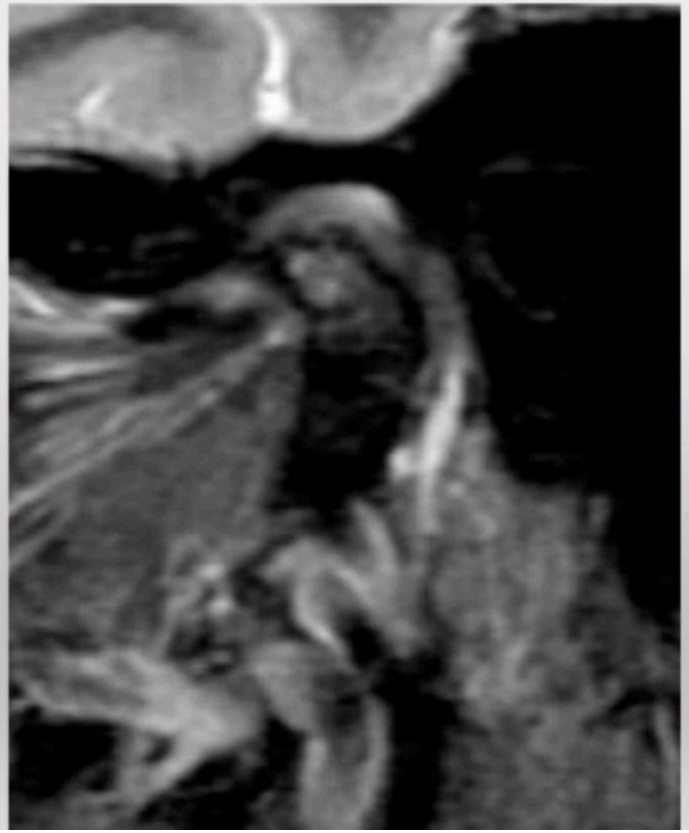
T2 Sagittal Closed



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

STIR and T2 shows water as white

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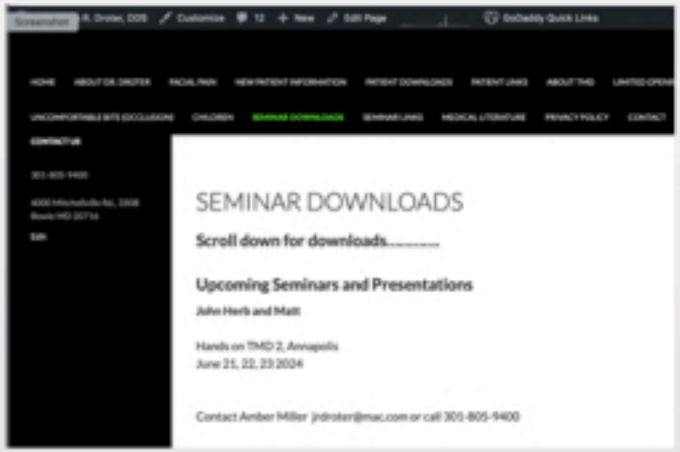
301-805-9400

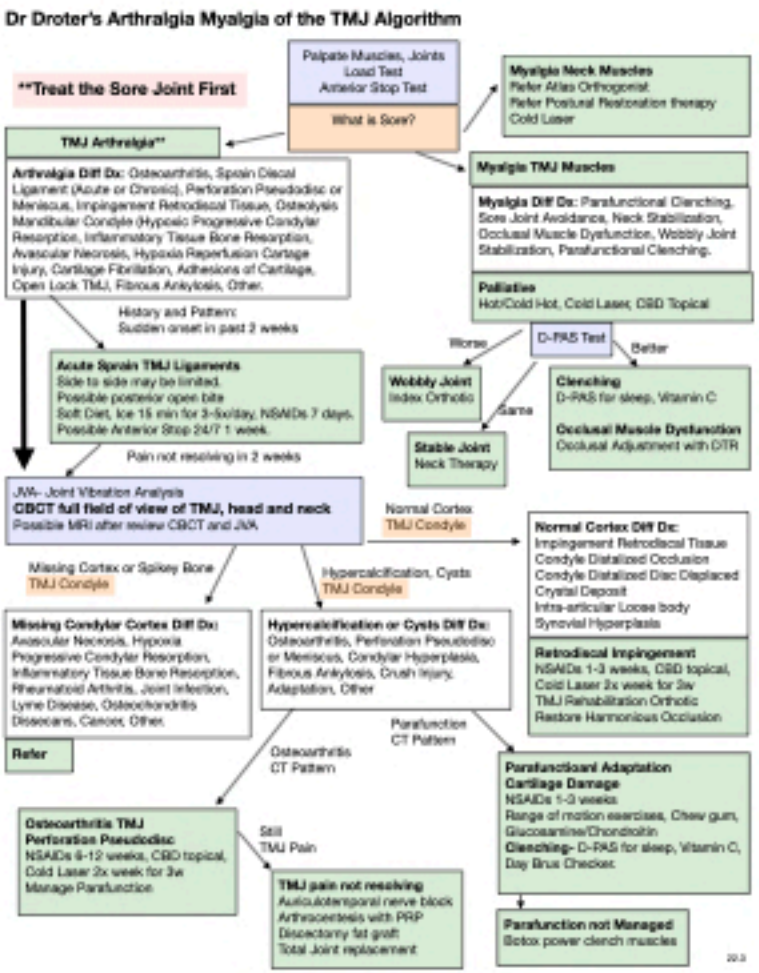
Down Load Sample MR/CT

www.DrDroter.com
Seminar Downloads

Download:
Sample CBCT Case JP Dropbox
CT/MR Samples



Dr. Droter's Arthalgia/ Myalgia Algorithm



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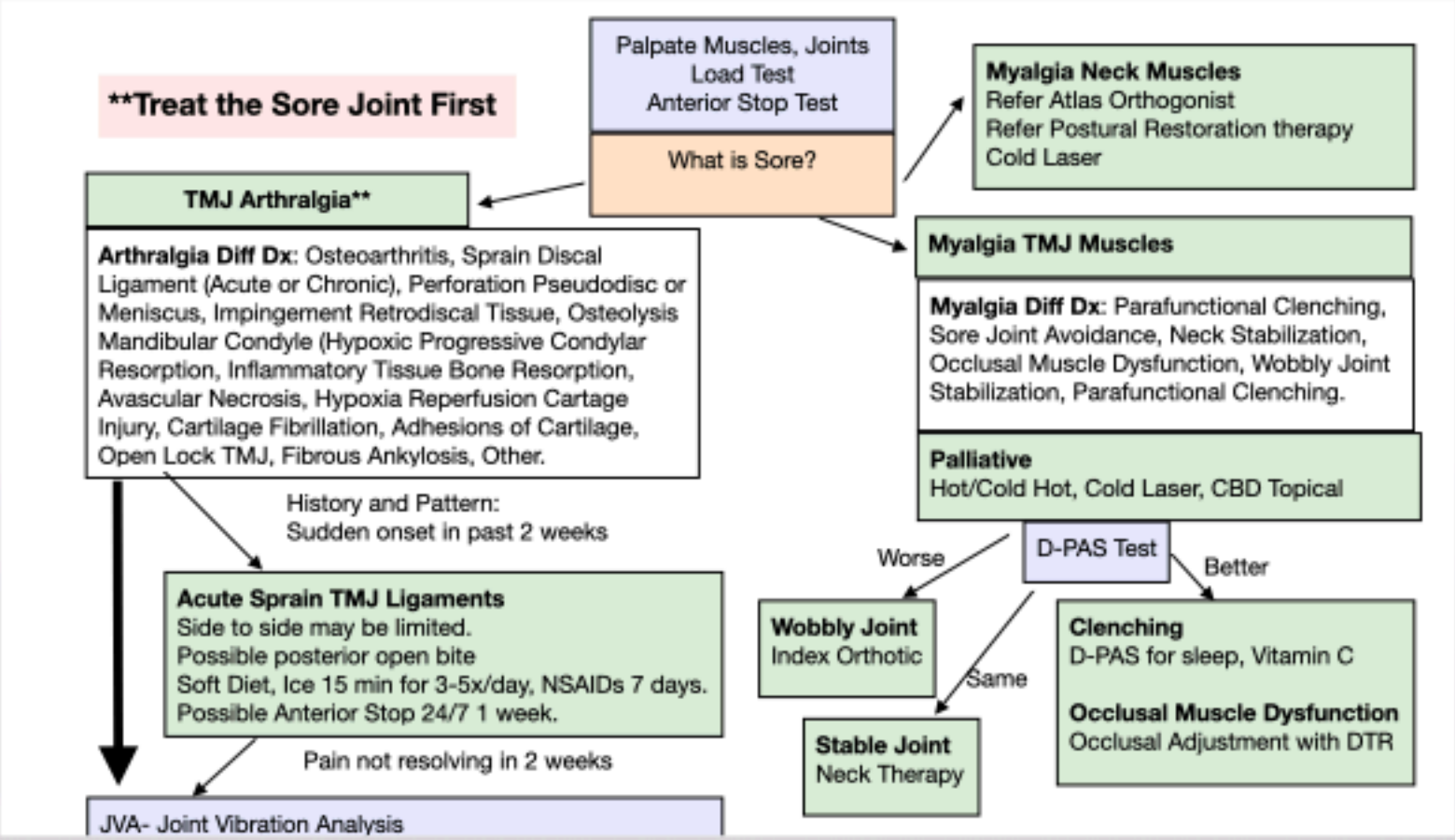
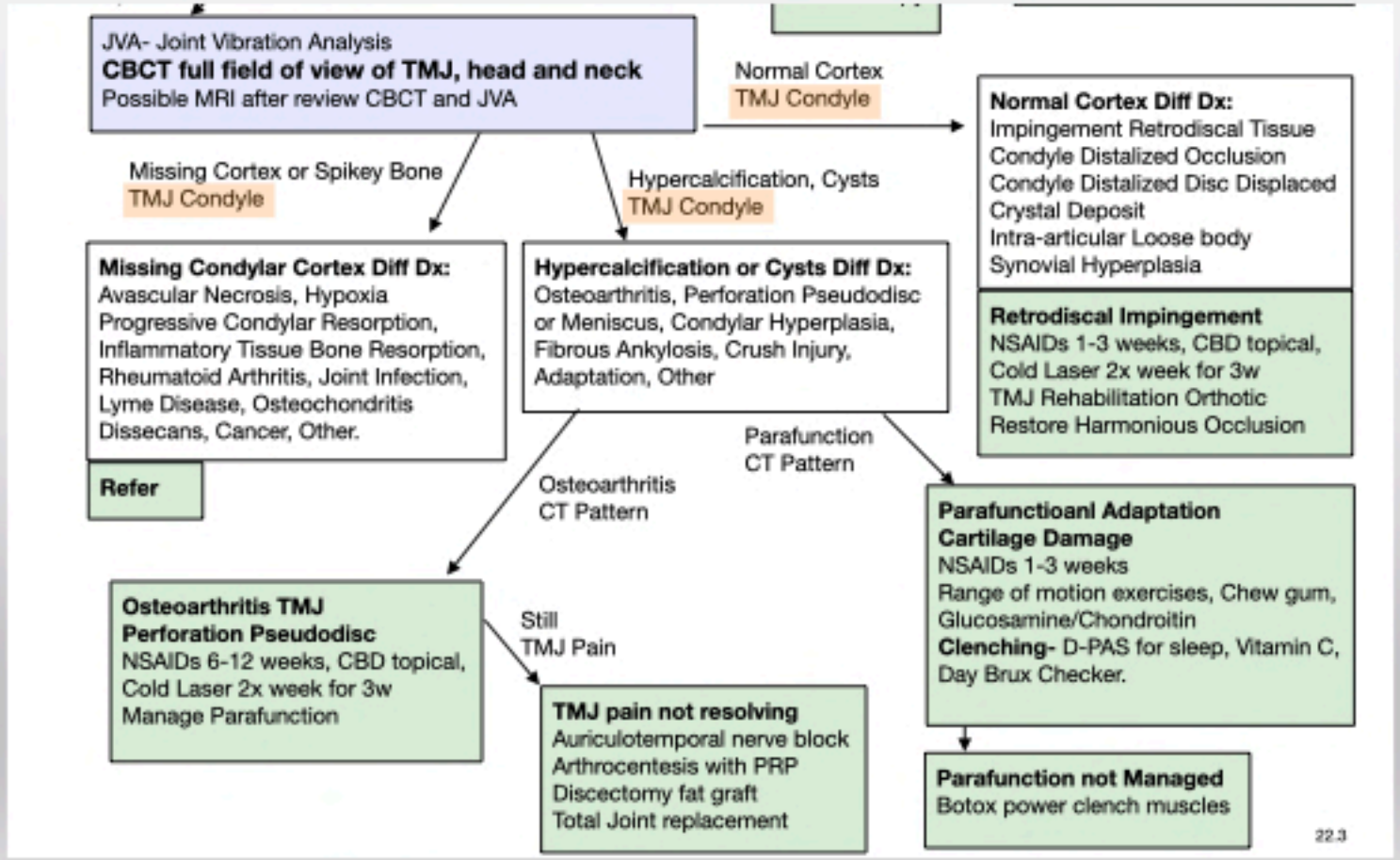


Dr. Droter's Arthalgia/ Myalgia Algorithm



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301-805-9400

Observations:

- Always accurate
- Trust your observations

Most beliefs we have are learned from teachers.

Beliefs can limit observations.

Become a great observer.

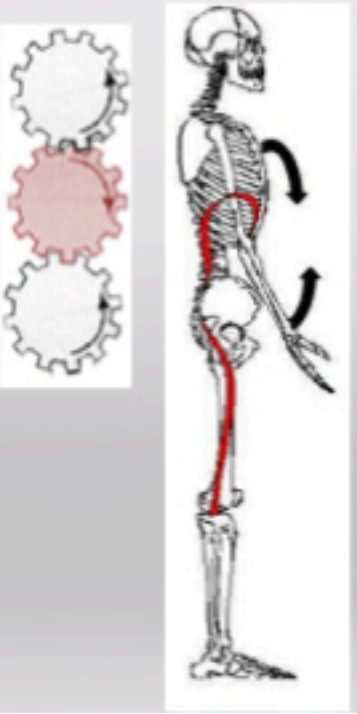
Have an open mind but not an empty head.

Explanations (beliefs):

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

Neck and Postural Instability

This is a **dynamic** orthopedic System



A change in any one area will affect the others

CNS/PNS

Skull

TMJ

Teeth

Mandible

Teeth

Neck

Muscle Neck

Muscle TMJ

venn diagram