When CR Does Not Work

John R Droter DDS
Annapolis, Maryland

Michigan Pankey Study Club 2019

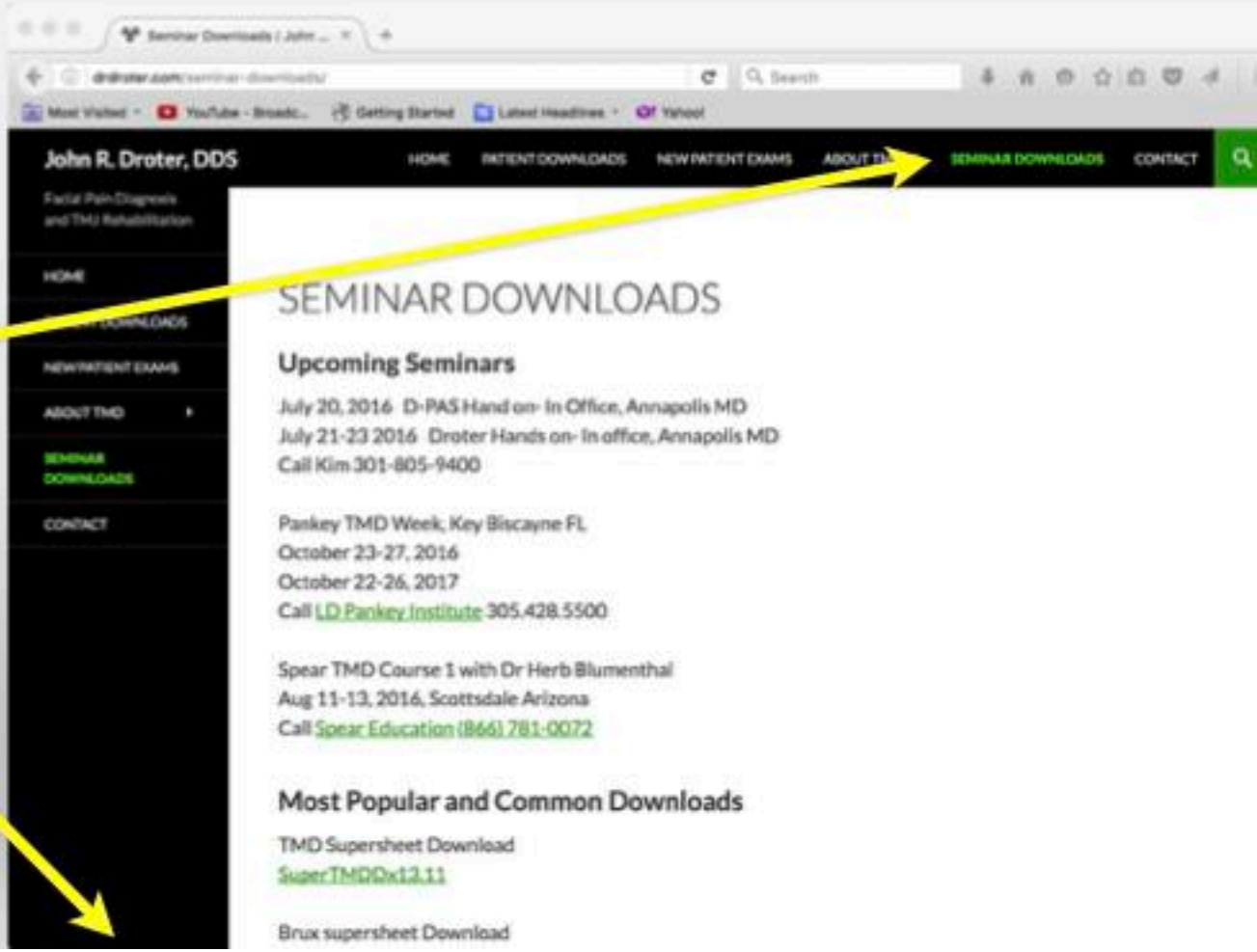
www.jrdroter.com

John R Droter, DDS

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

Seminar Download

Michigan Pankey Study Club



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

Hello. I am:

John R Droter DDS
Annapolis, Maryland

Milestones

Visiting Faculty Spear Education 2013

Visiting Faculty LD Pankey Institute 2008

Visiting Faculty Orthodontic Program
Washington Hospital Center 2000

On staff AAMC: Orthopedic Rounds
In OR for TMJ Surgery

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

CT and MRI Imaging Joints 1992
Guy Haddix, DDS: Mentor
(3,100 images and rising)

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

Disclosures:

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

Atomic Skis- Sponsored.
I do benefit financially.

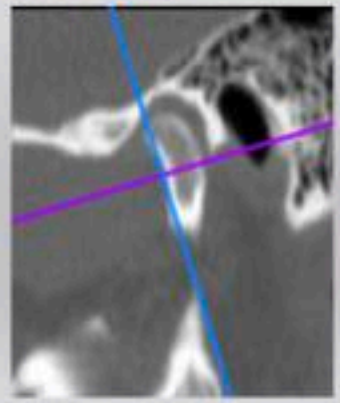
LD Pankey Institute- I am paid
a small honorarium for lectures

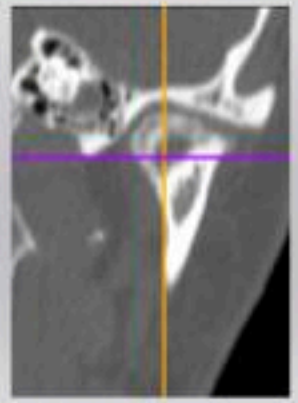
Spear Education- Paid
honorarium for lectures

Patent on sleep airway device- D-LAA
Co-Owner of Aeropath Sleep

All of my slides have been altered with
respect to cropping and exposure.
None have been "photoshopped" to misrepresent reality

I have chosen the most representative slice of and MRI and CT
scans to best represent what you would see if viewing all images





Restorative Dentistry

Pathological Occlusion

??Airway Related Bruxing?

Restore Function

Composite Trial Occlusion

AHI + 26 CPAP

Anterior guidance

or group function?

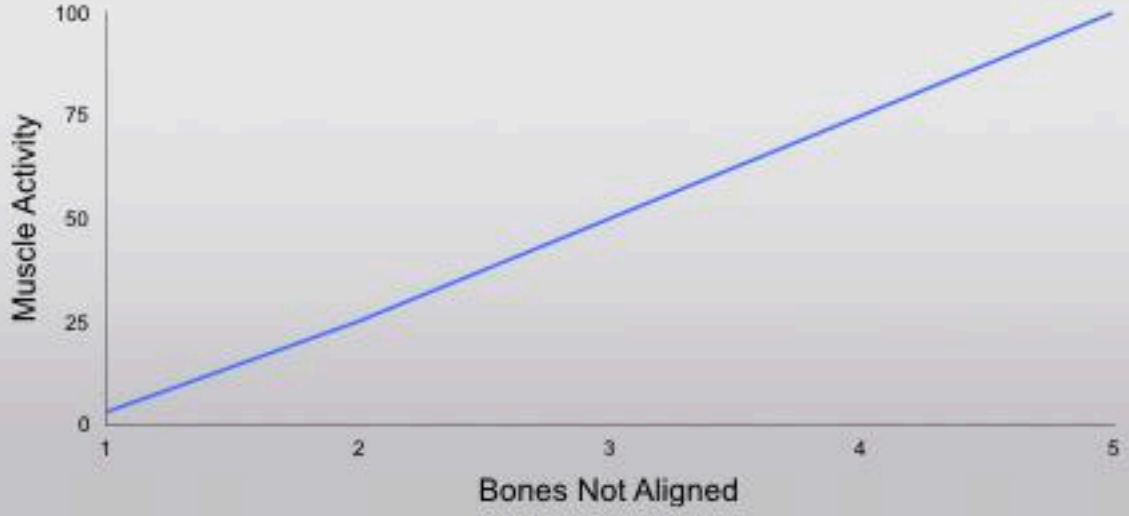
Is Centric Relation Important?

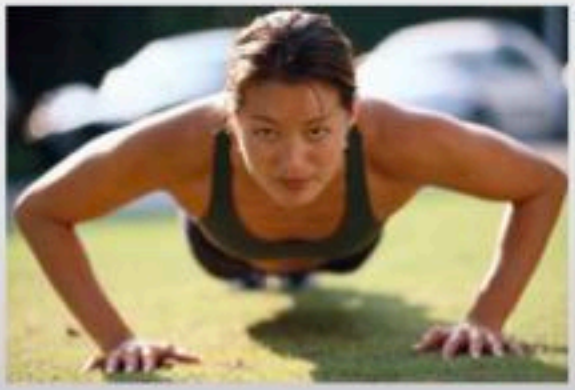
John R Droter DDS
Annapolis, Maryland

Orthopedic Medicine- Optimal Load Bearing Position

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

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





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

Is Centric Relation Important?

Are Condyles Important?

3-D Model from CT Scan

Missing Right Condyle

Removed Post trauma
20 years ago

Coronoid only remains

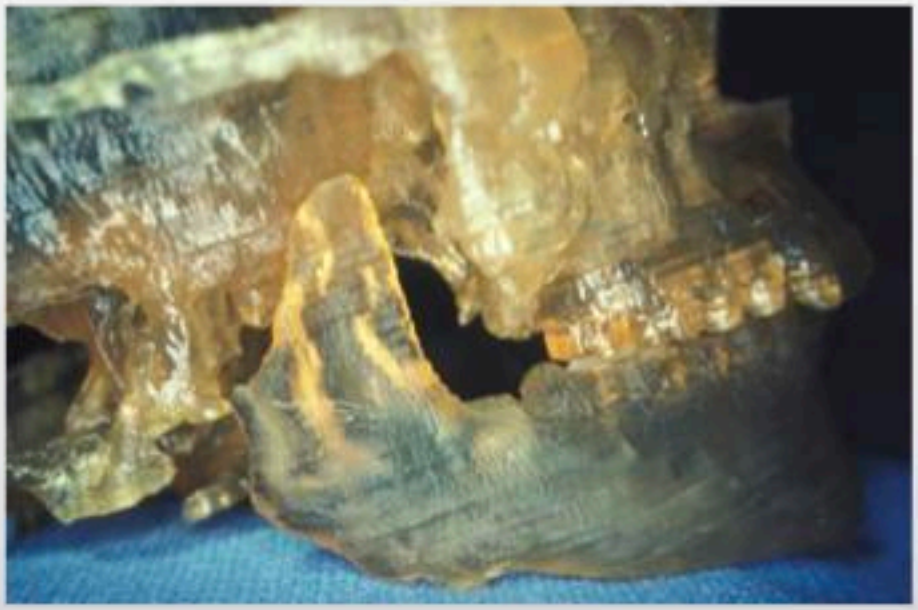
Can you hold the mandible down in space?

Several neuromuscular lecturers show tomograms with patients missing a condyle.

Their explanation is that the muscles and occlusion hold the mandible in position and that condyles and Centric Relation are not important.

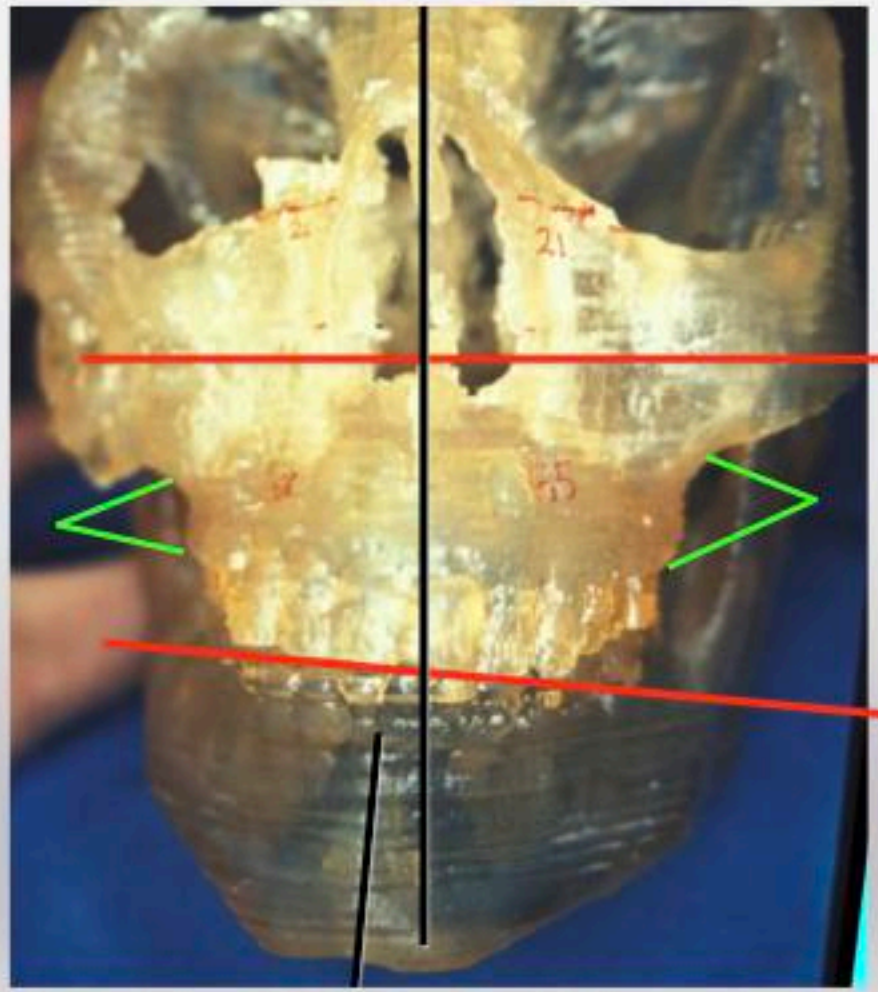
CT Scan Coronal view of TMJ
Missing Right Condyle

What Happens?



Can the Occlusion maintain the old mandibular position?

Can the Muscles maintain the old mandibular position?



Where do the Changes Occur?

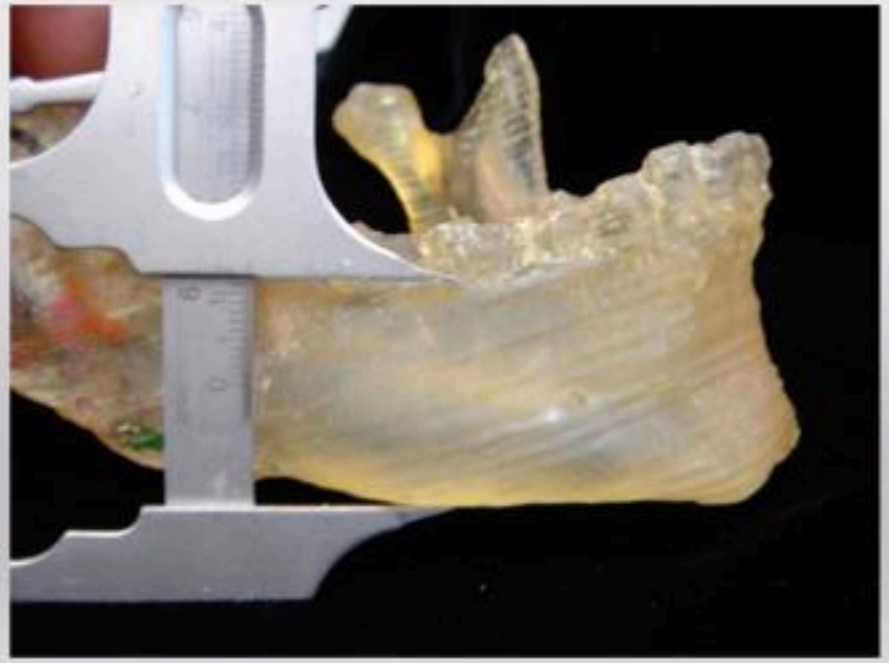
What happens to the Maxilla?

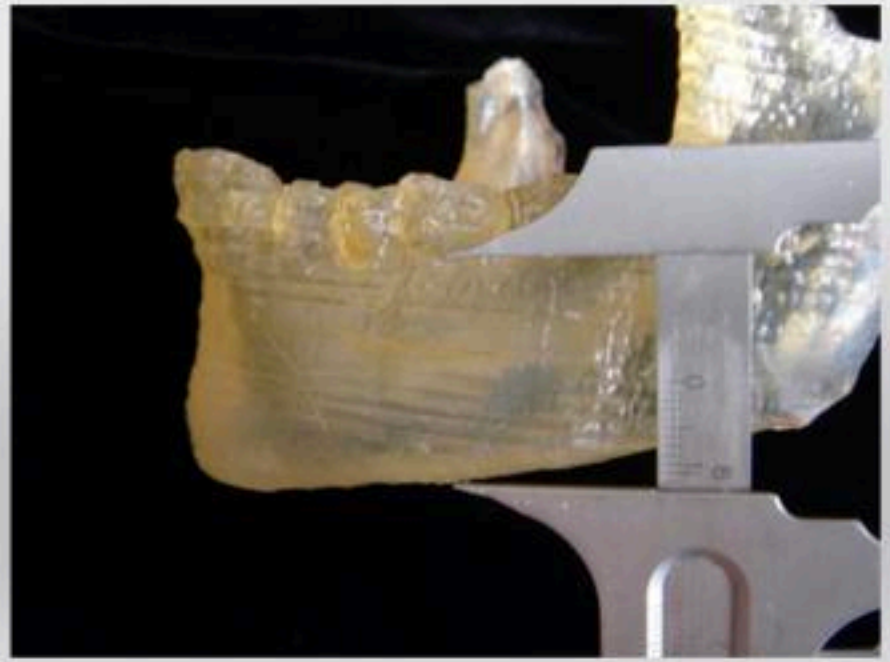
It Impacts on side of damage

Where do the Changes Occur?

1st Molar CEJ to border Mandible

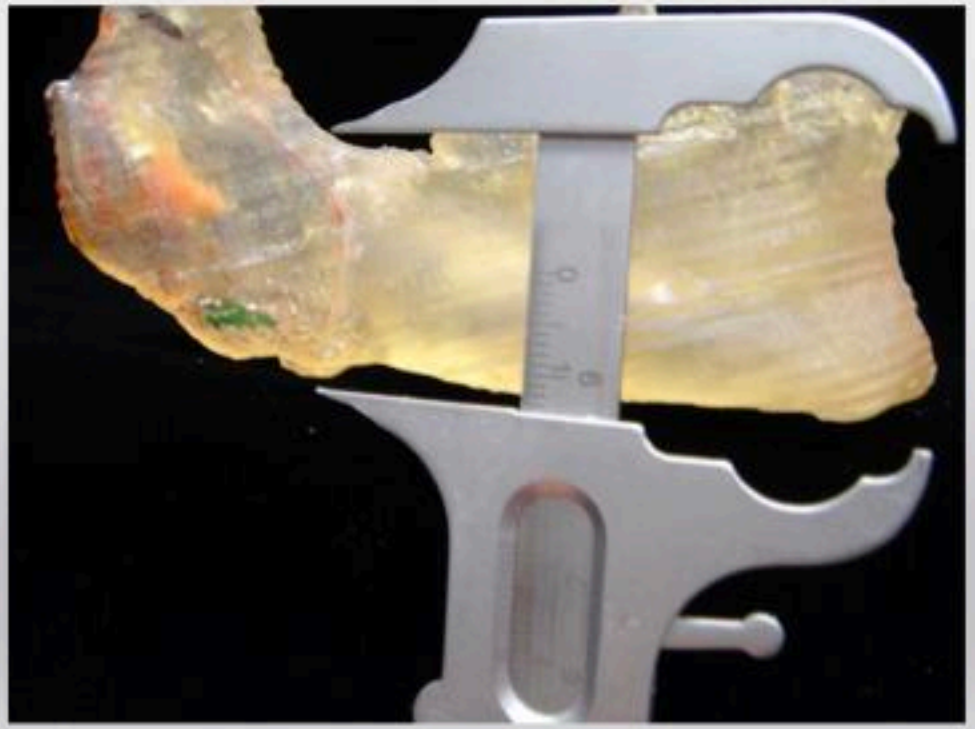
Same Right and Left- No intrusion of teeth





Where do the Changes Occur?

3mm difference

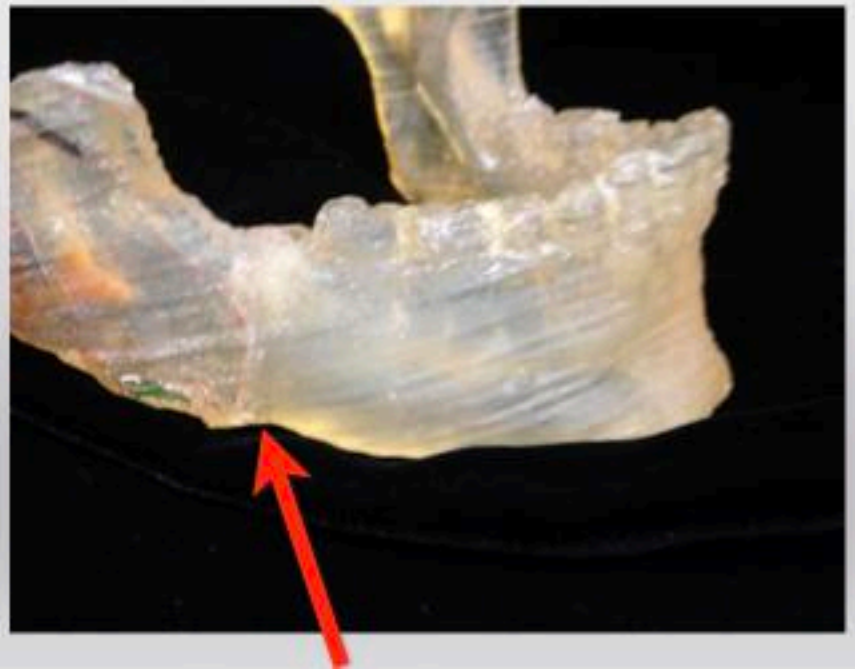


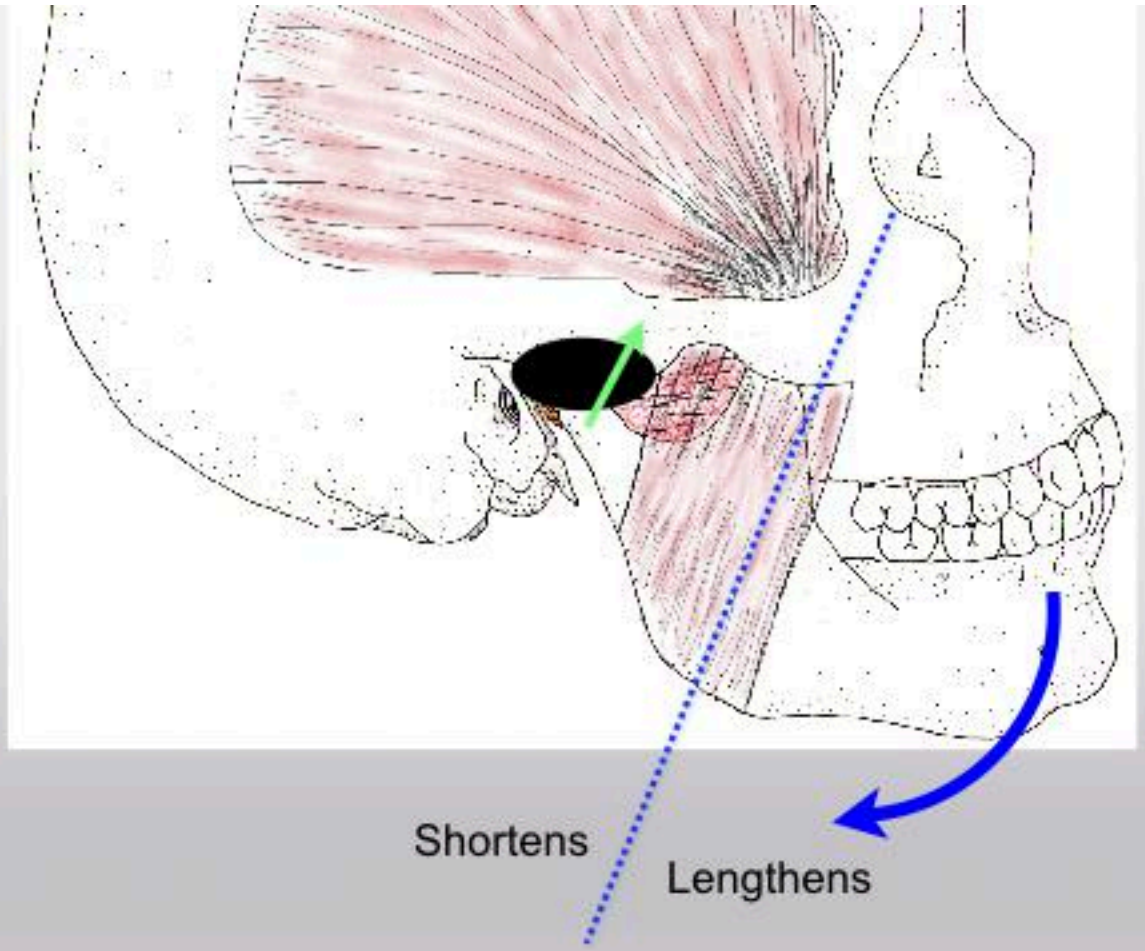
Gonial Notching

Mandible resorbs/distorts anterior masseter area

Only seems to occur if rapid condylar bone loss

- Trauma
- AVN
- Not OA





Does Vertical dimension increase or decrease with condylar bone loss?

Masseter both shortens and lengthens

This will reshape the inferior border of the mandible

Gonial Notching

Drawings by Gretta Tomb DDS and John Droter DDS

Gonial Notching

Mandible resorbs/distorts anterior masseter area

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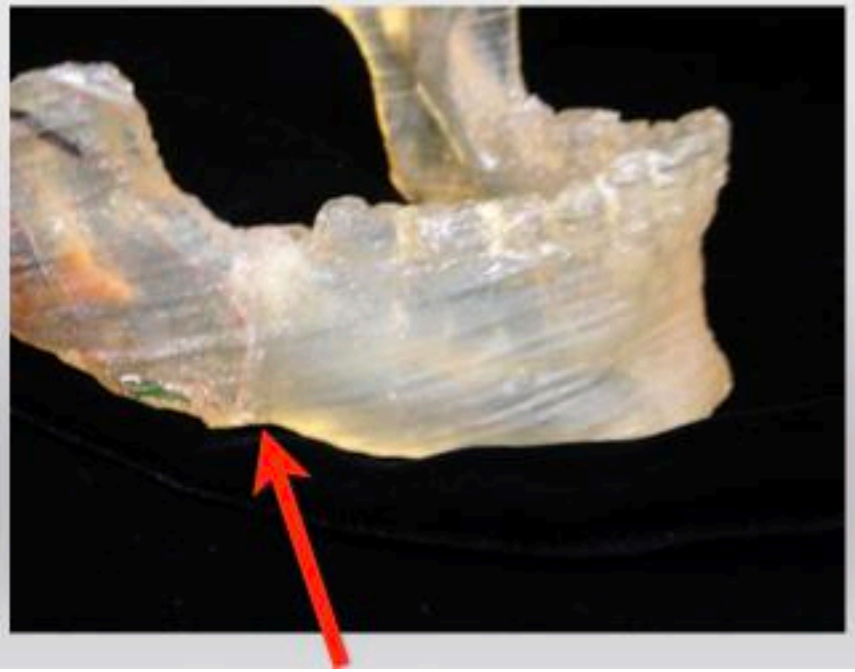
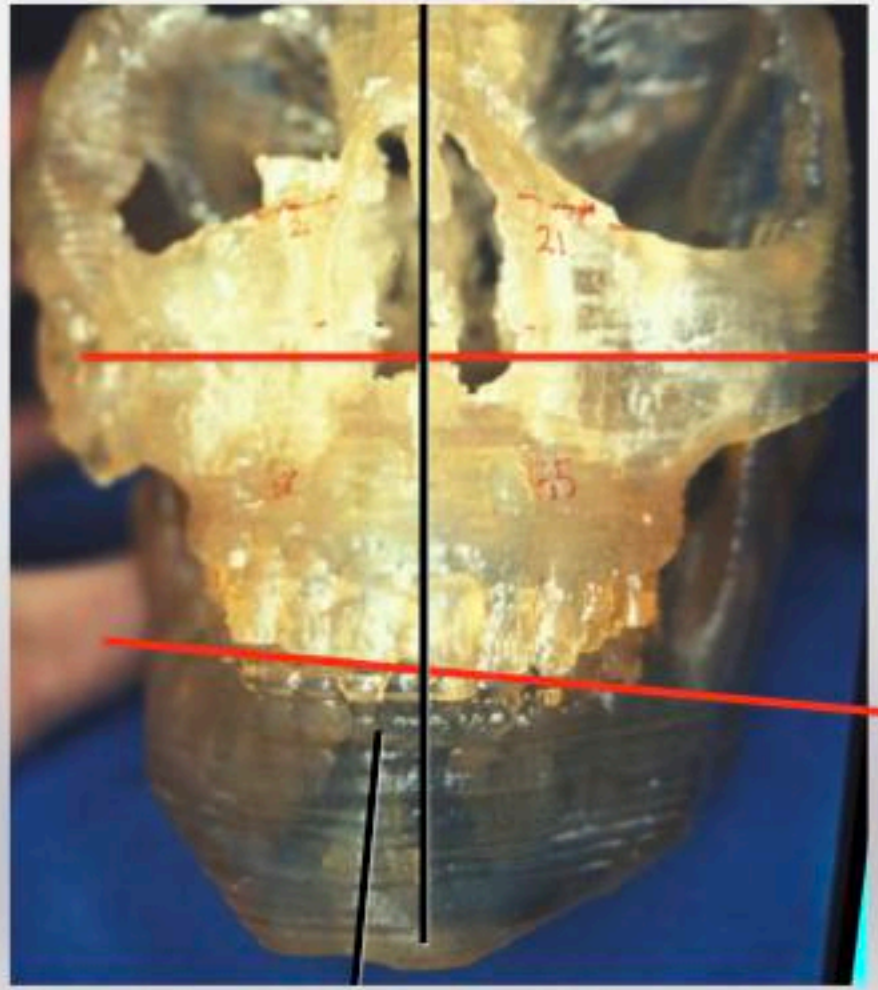




No Right Condyle

Whole Maxilla Impacts

Mandible Distorts/ Bends

Teeth will move

Some Supereruption

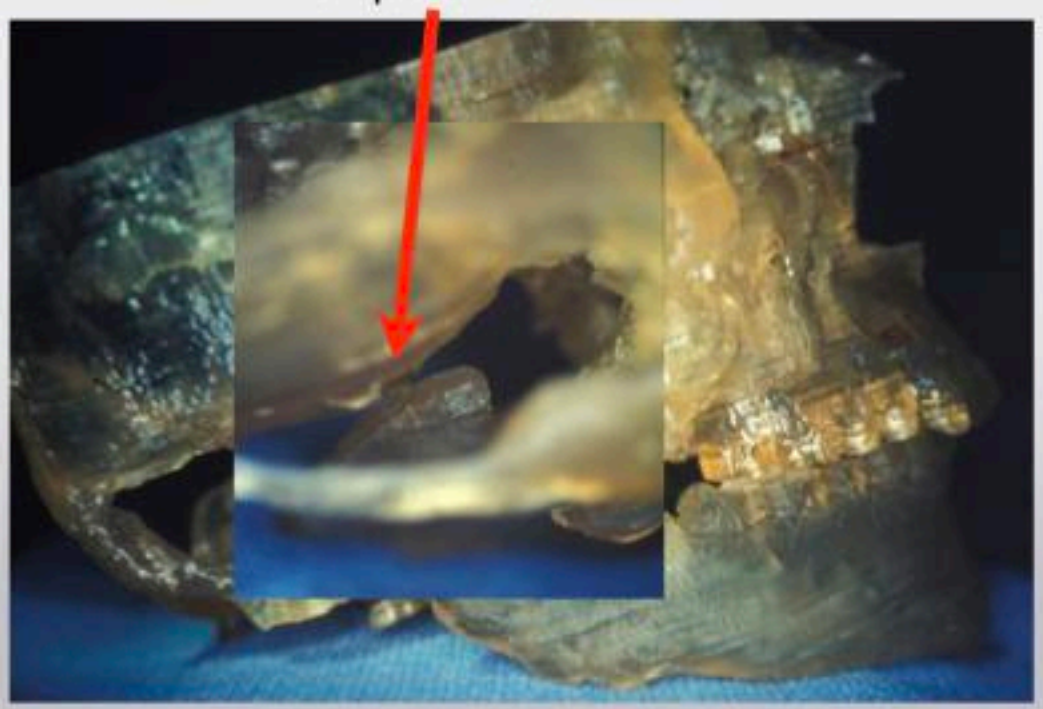
Some Intrusion

When does adaptation stop?

Stops when bone loads against bone

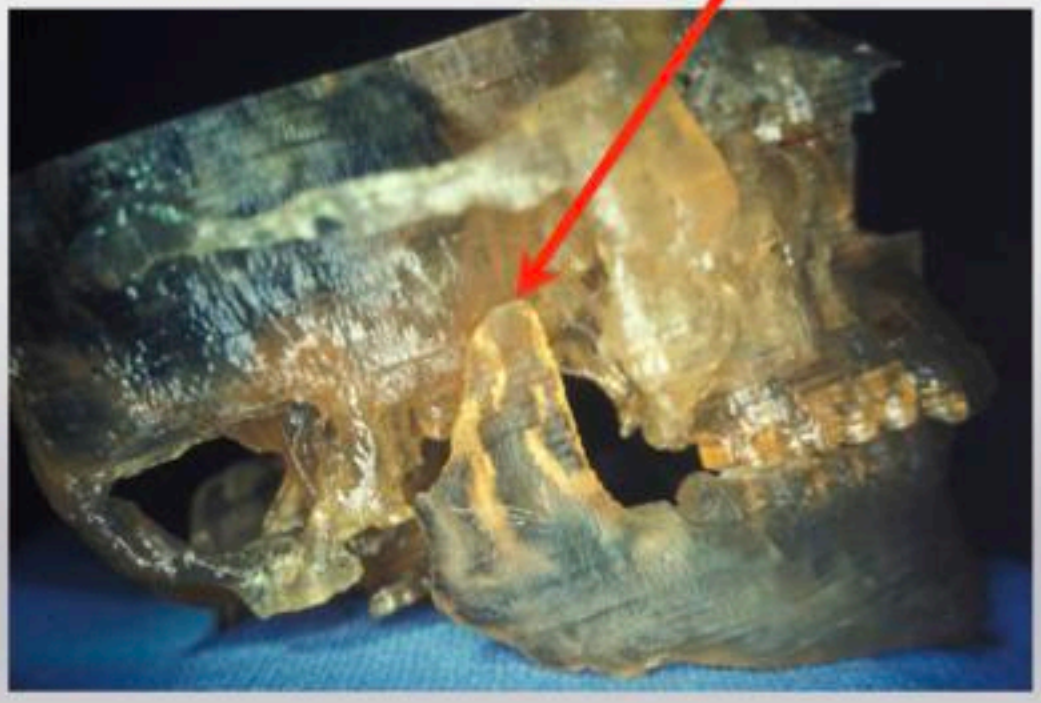
Coronoid Process rests on wear facet

Temporal wall

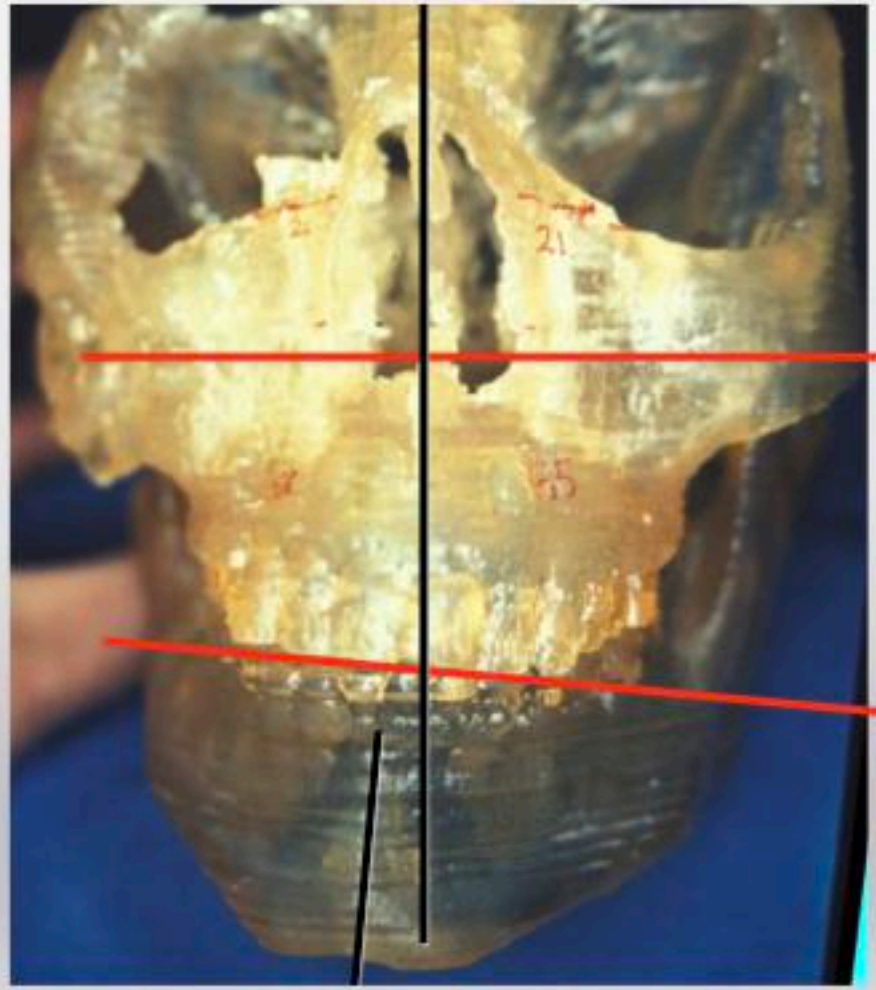


Stops when bone loads against bone

New CR Load Zone



Changes occur in the maxilla and mandible until bone loads against bone between the mandible and some part of the skull



What Happens?

Changes occur in the maxilla and mandible until bone loads against bone between the mandible and some part of the skull

Can you hold the mandible down in space?

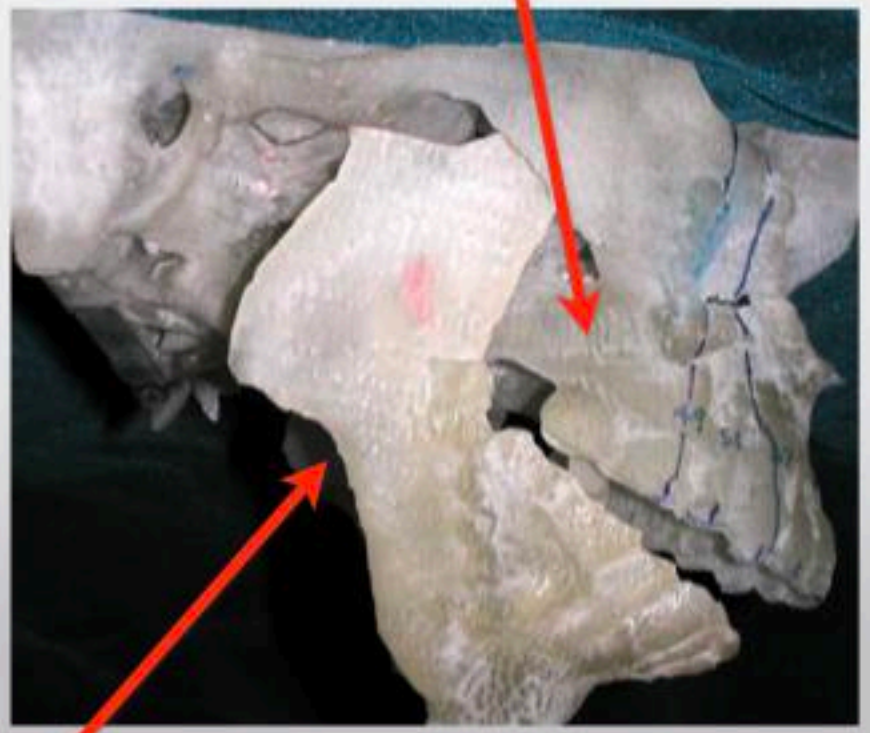
Short term yes,
long term **No**

CT Scan Coronal view of TMJ
Missing Right Condyle

What if you lose both Condyles?

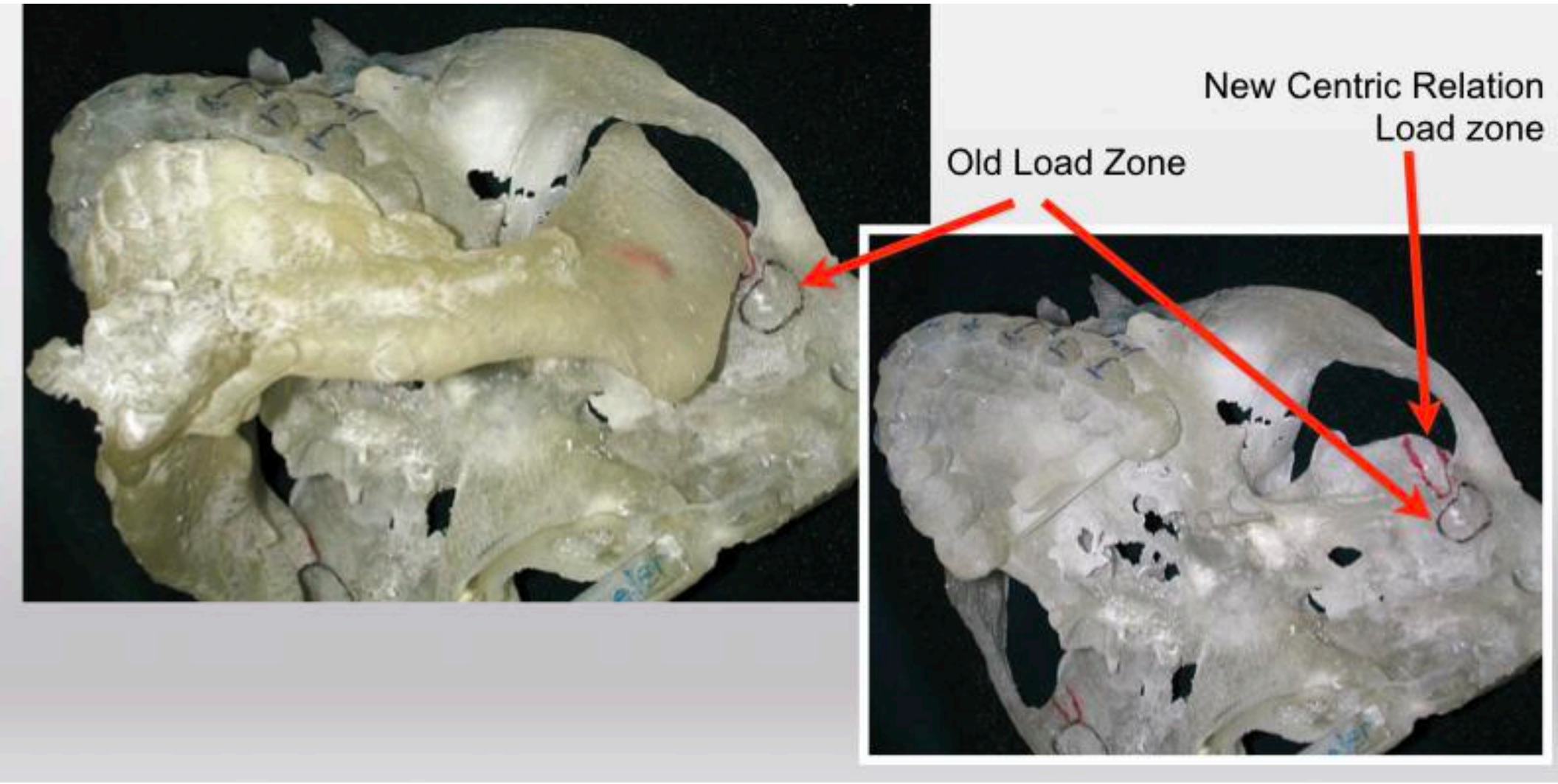
Maxilla Impacts- Adaptive Capacity

Mandible bends/distorts

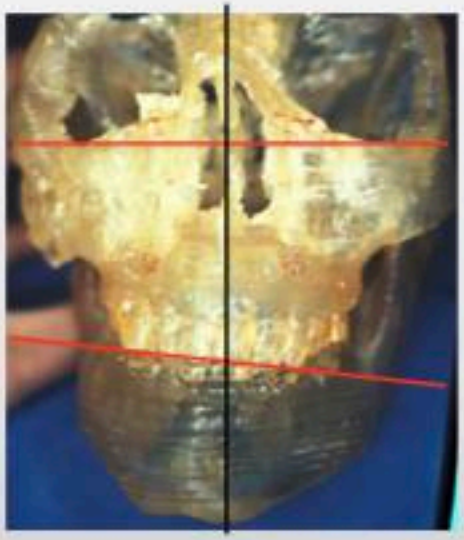


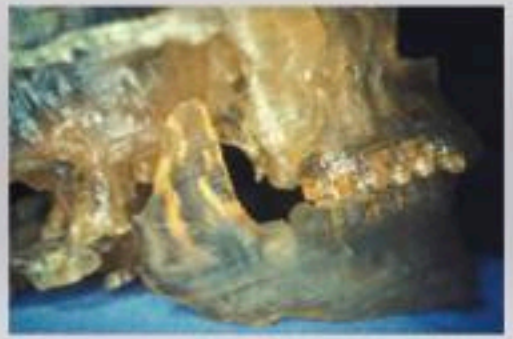
When does it stop?

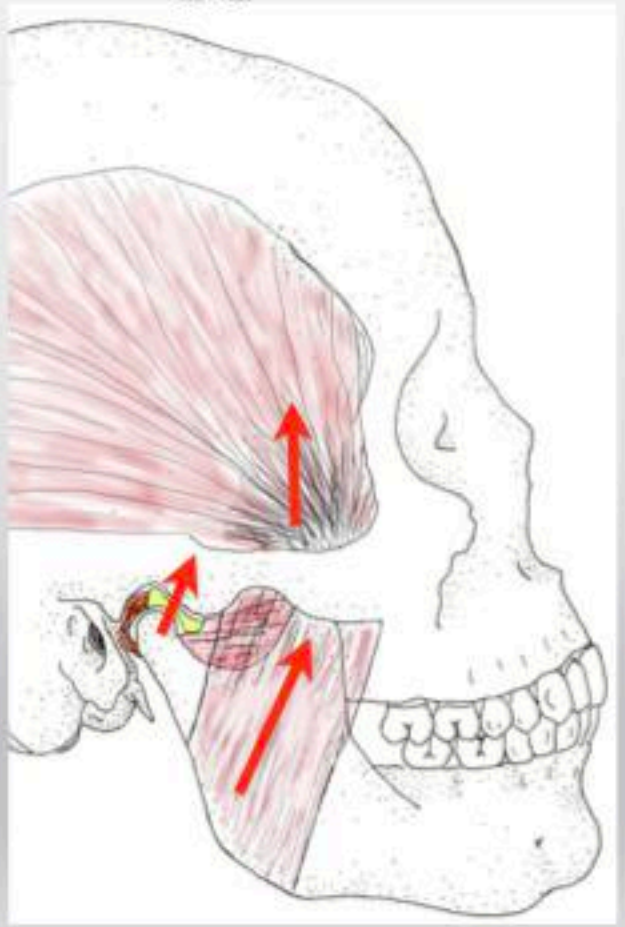
CR Load zone


New Centric Relation
Load zone
Old Load Zone

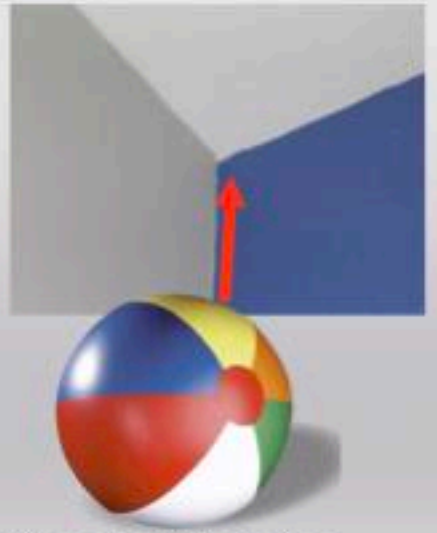
Centric Relation Happens







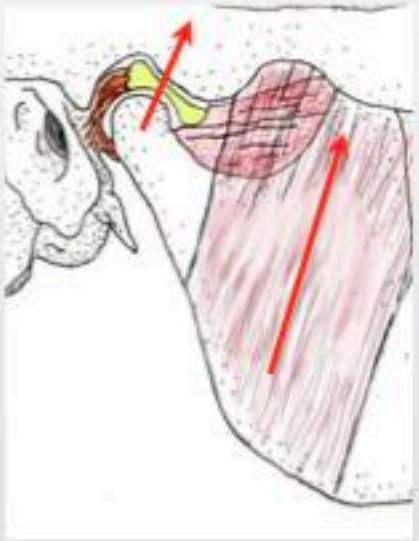
When will the ball stop?



Cartilage 5x slipperier than ice

A Condyle will always seek CR when loaded.
Anything in the way will be altered.

"The ball goes in the hole"
Dynamic Orthopedic System

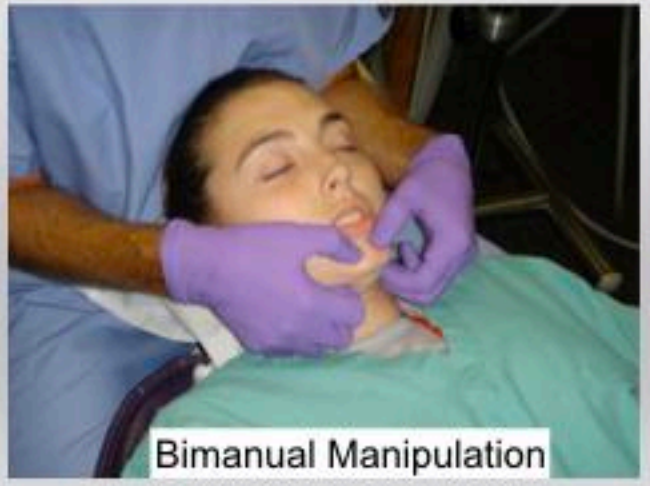


If you know this, it will be your friend.

You will be able to do things that others cannot.

If you are unaware of this, it will be your unseen enemy.

This force contributes to, or is the main cause of, broken teeth, loose teeth, worn teeth, pulpal damage, failed dentistry, periodontal bone loss,, orthodontic relapse, muscle disharmony, muscle hyperactivity.



Bimanual Manipulation

LD Pankey's 3 Rules of Occlusion

(Clyde Schuyler)

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

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

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

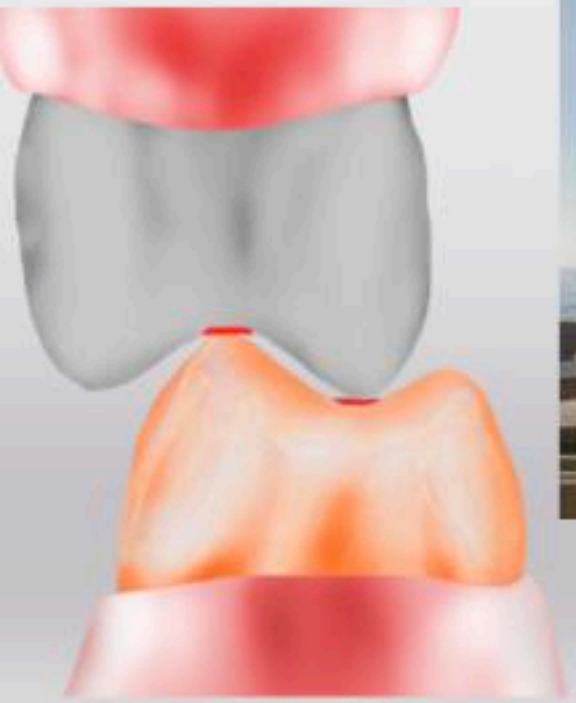
Drawing by Dr Jim Kessler

Why LD Never wrote a text book

Slide by Dr John R Droter

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

Rule #2 = Flat Landing Area



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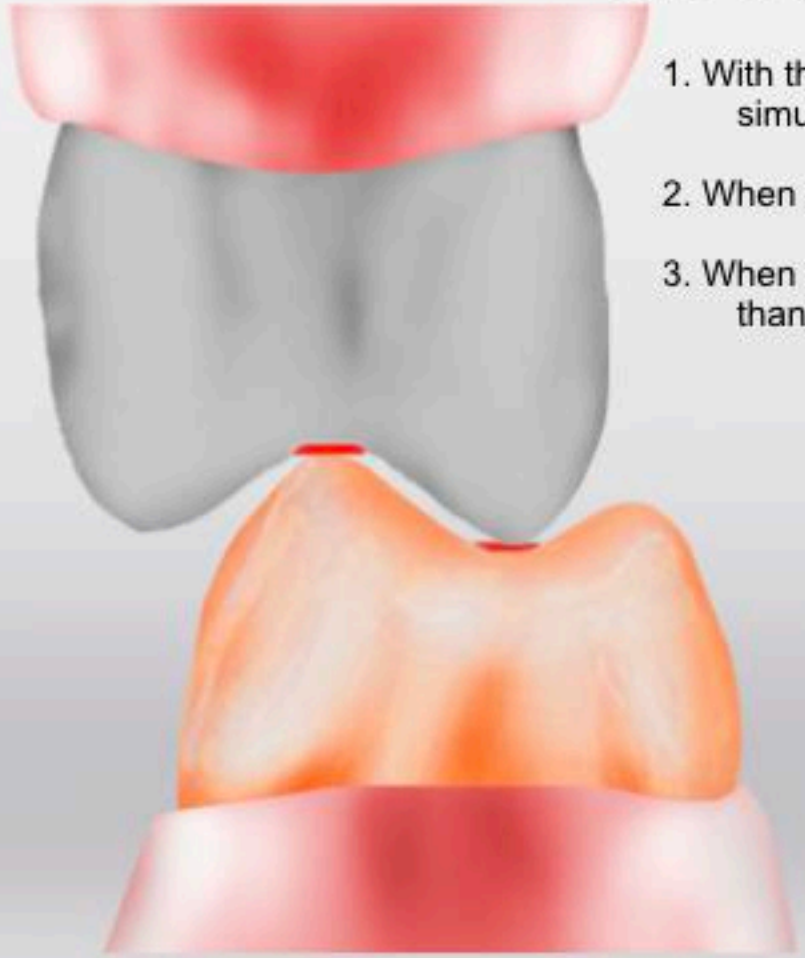

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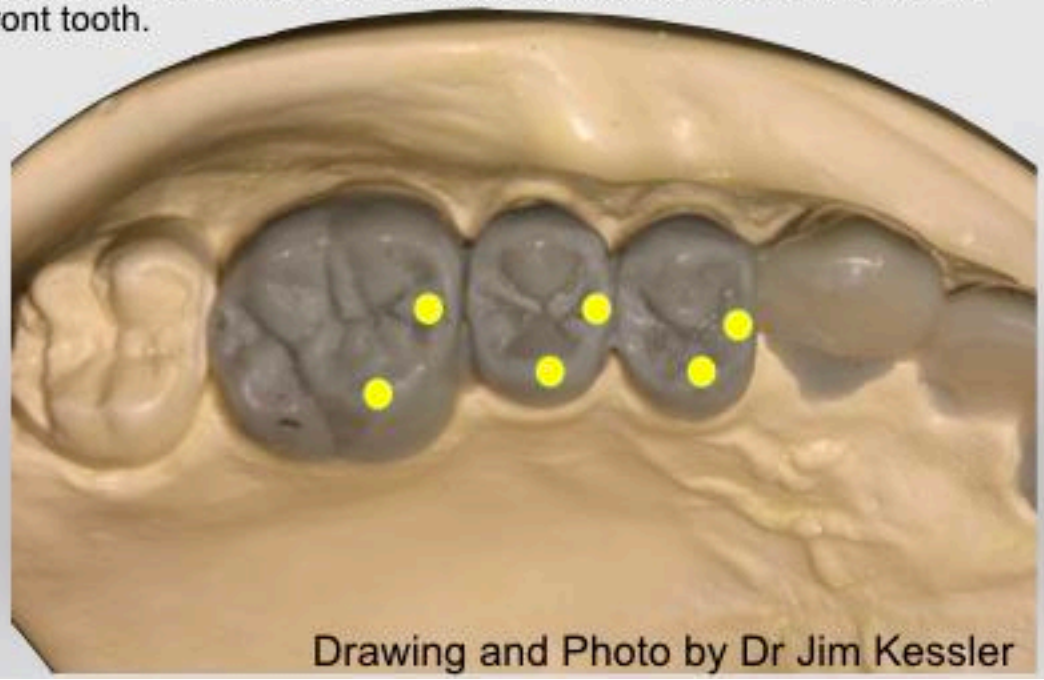

Drawing and Photo by Dr Jim Kessler

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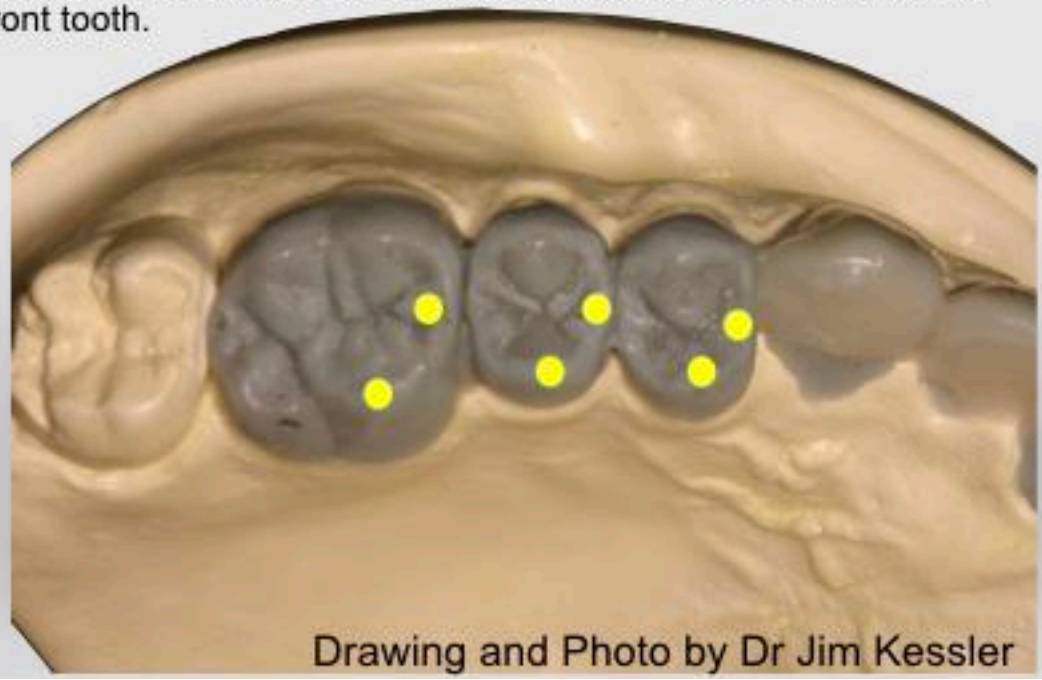
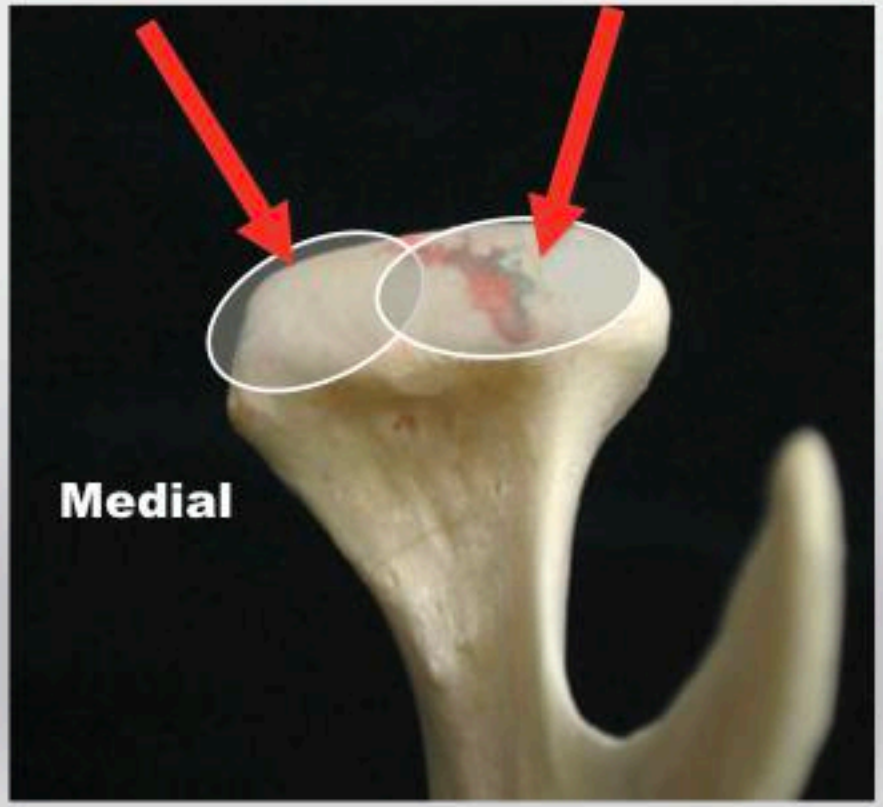


Drawing and Photo by Dr Jim Kessler

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

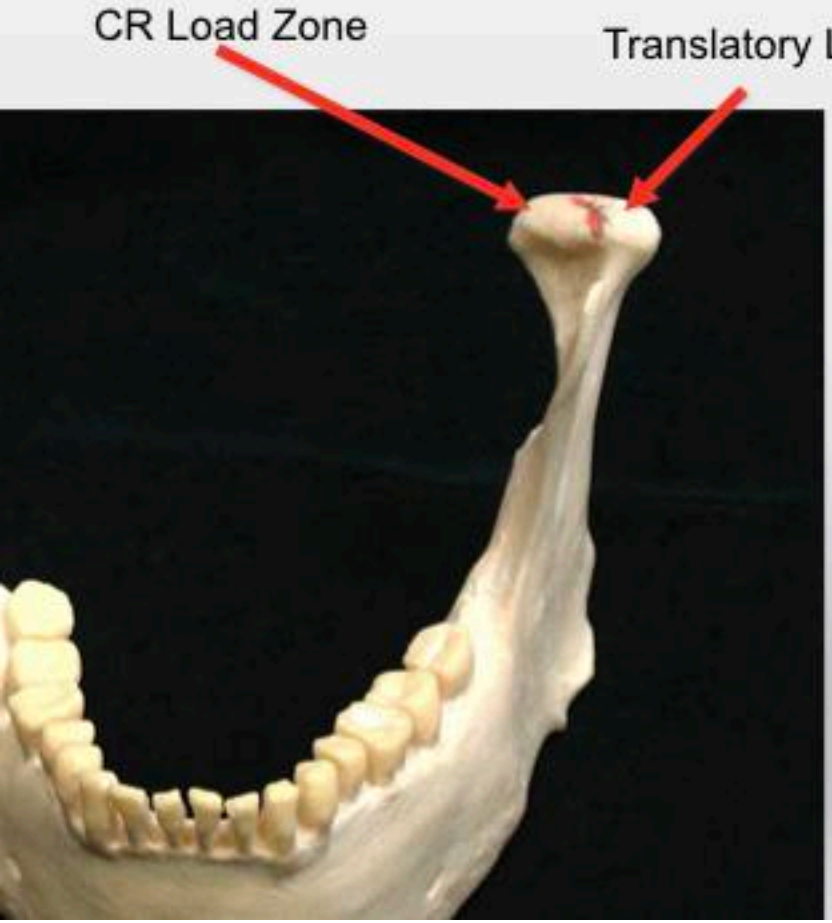
CR Rotational Load Zone

Translatory Load Zone

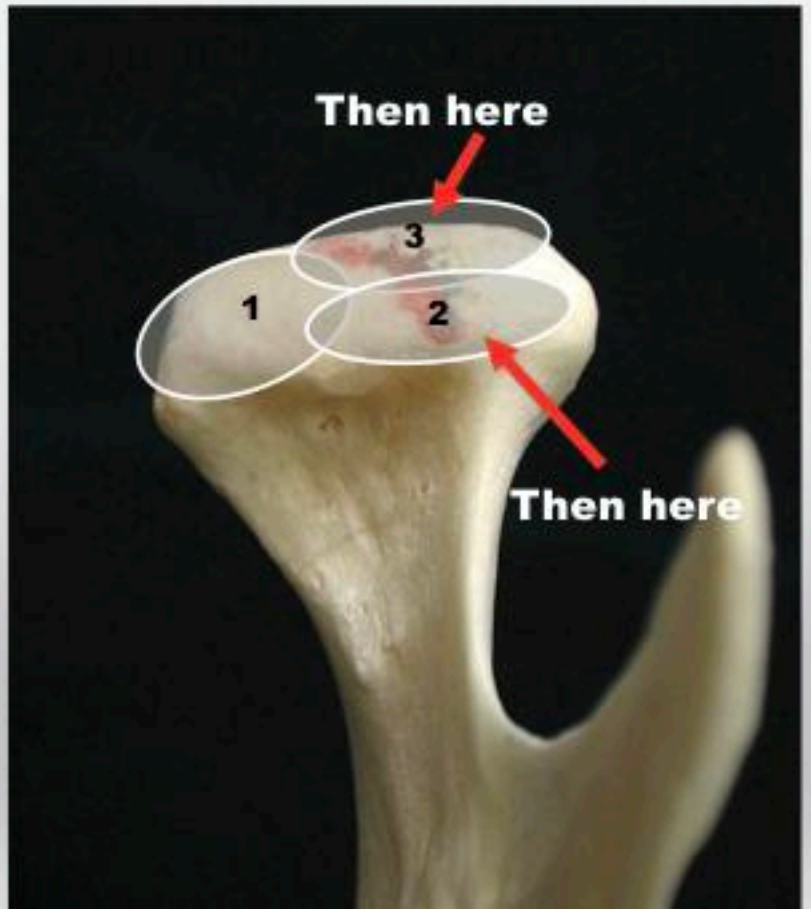


Left Condyle

CR and Translatory Load Zones

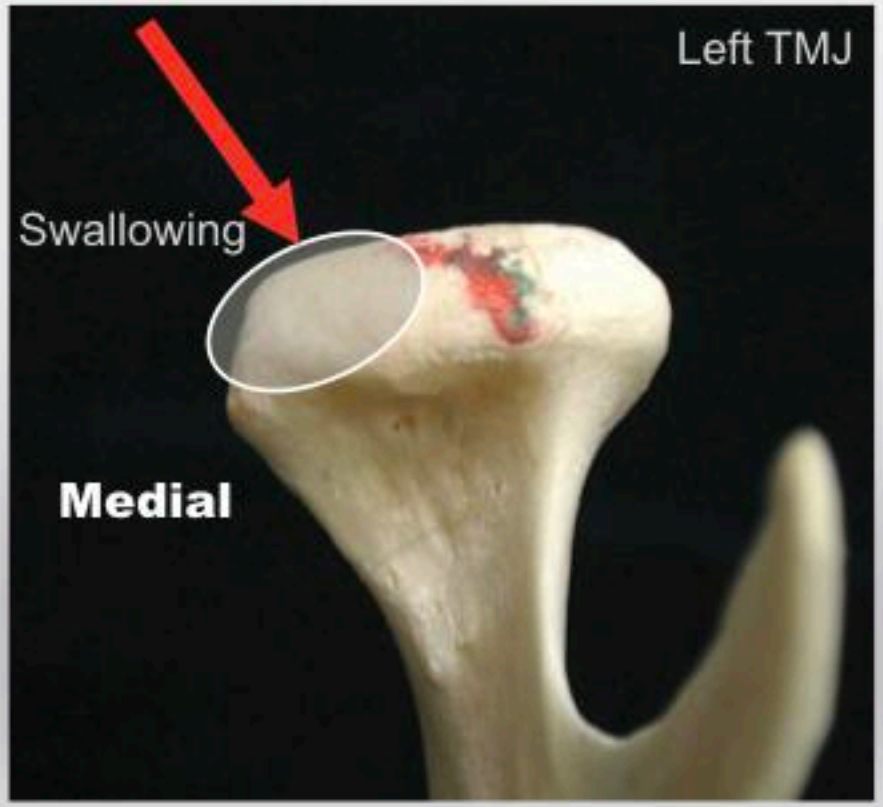


Load zones on opening

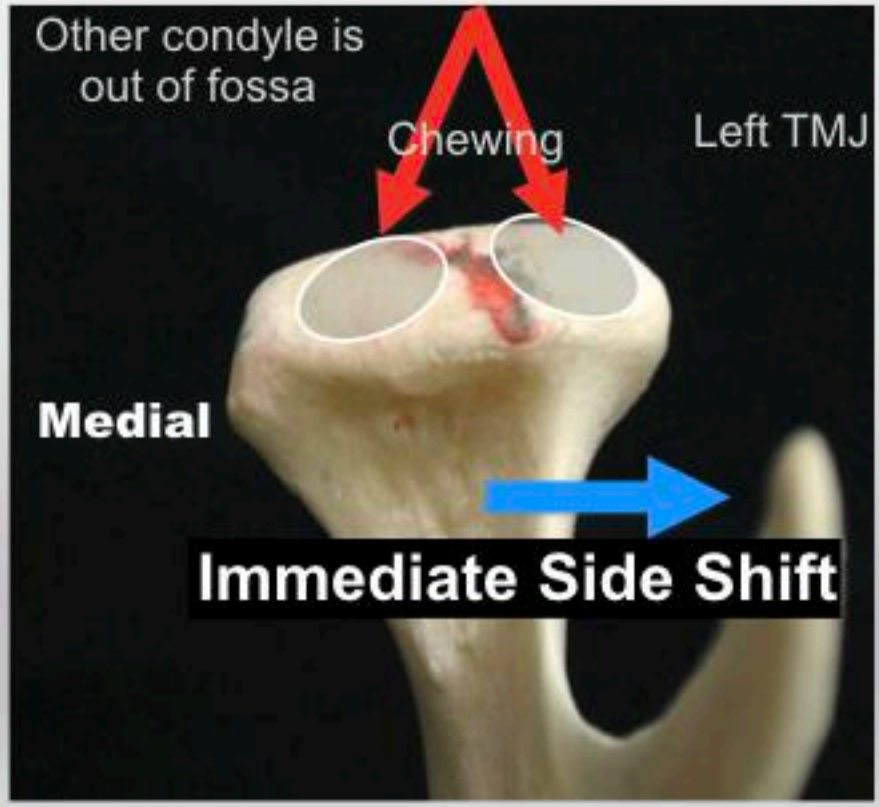


Centric Relation (CR), Translatory, and Pivot Load Zones

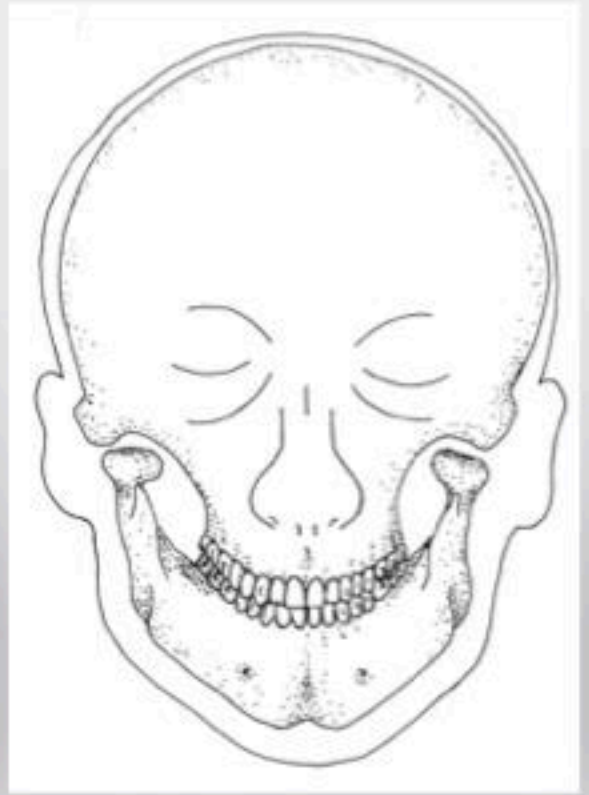
CR Rotational Load Zone



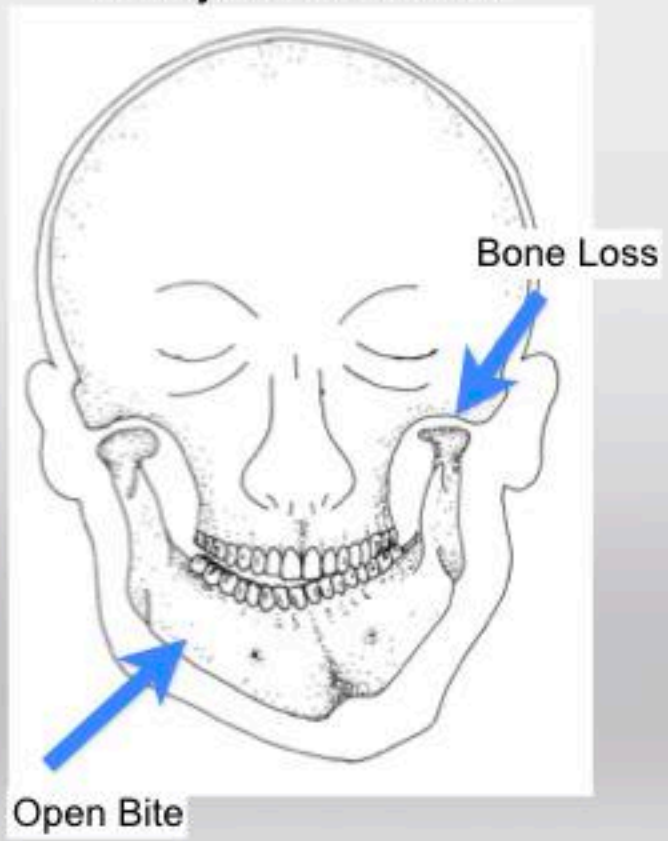
Pivotal Load Zone



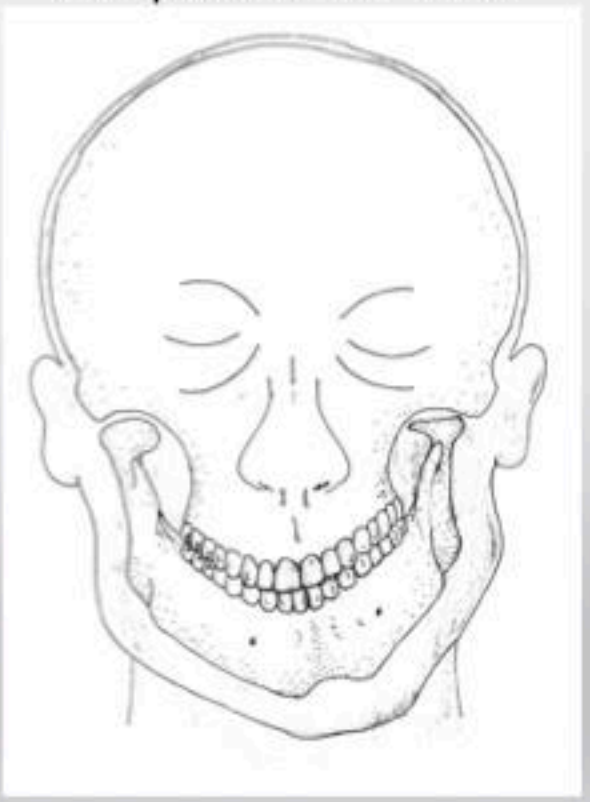
Diseases that cause bone loss in the TMJ alter the Occlusion



Condylar Bone Loss



Adaptation Over Time

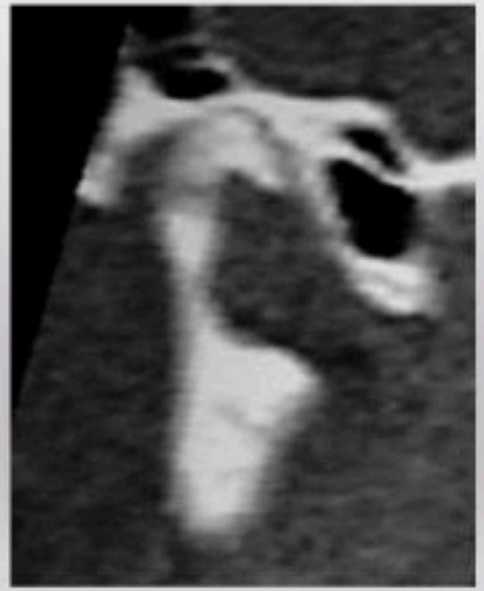


Drawings by Gretta Tomb, DDS

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



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

Why is TMD So Confusing?

John R Droter DDS
Annapolis, Maryland

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

Why Confusion?

TMD/TMJ
Symptoms based

Not One Disease

Temporomandibular Disorders (TMD) is an umbrella term covering any condition causing pain or dysfunction in the temporomandibular joint, muscles of mastication, trigeminal nerve, facial nerve, and associated head and neck musculoskeletal and neural structures.
Craniomandibular Disorders would be a better term (CMD).

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, Recaring
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

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
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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

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Cervical Vertebrae Alignment Dysfunction
Craniocranial Syndrome
Muscle Guarding due Neck Instability
Trigger Point Neck Muscle with Referred Pain
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Hypersensitive Occlusion
Parafunctional Clenching Teeth, Awake
Parafunctional Clenching Teeth, Sleep
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Parafunctional Tongue Bracing avoiding uncomfortable tooth contact
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Parafunctional Tongue Bracing to maintain Airway
Parafunctional Tongue Bracing unknown cause

6. Whole Body / Systemic

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Magnesium Deficiency
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Osteoporosis without current pathological fracture
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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

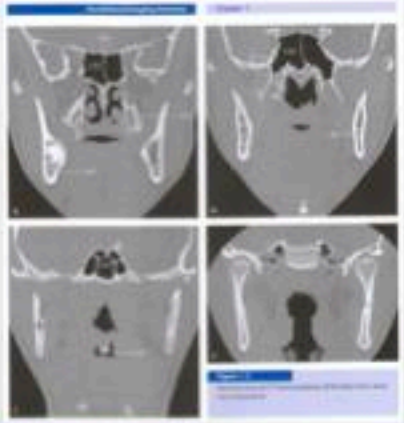
1. TMD: TMJ Damage and Diseases

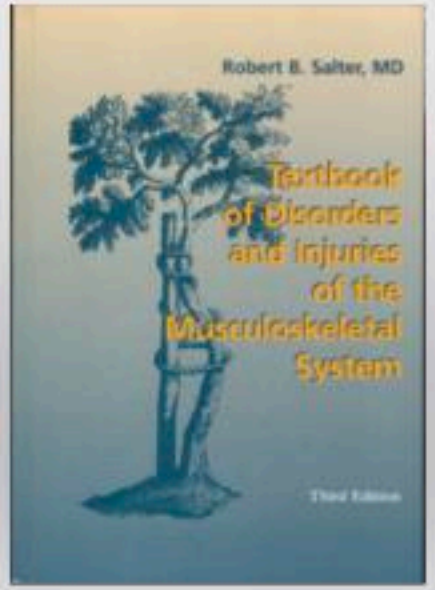
Adhesions and ankylosis of temporomandibular joint
Avascular Necrosis Mandibular Condyle
Cartilage Fibrillation, Mandibular Condyle, Fossa
Closed Lock, Jaw Cartilage, Acute
Closed Lock, Jaw Cartilage, Chronic
Closed Lock, Jaw Cartilage, Intermittent, Mechanically dysfunctional
Crush Injury Mandibular 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

My Core Belief

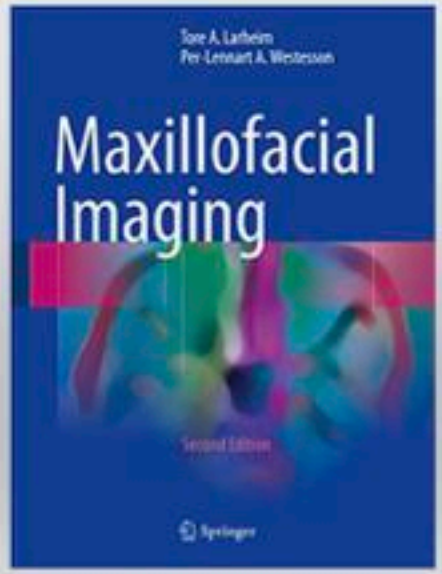
The TMJ is a synovial joint of the human body and will undergo the same disease processes as any other synovial joint

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

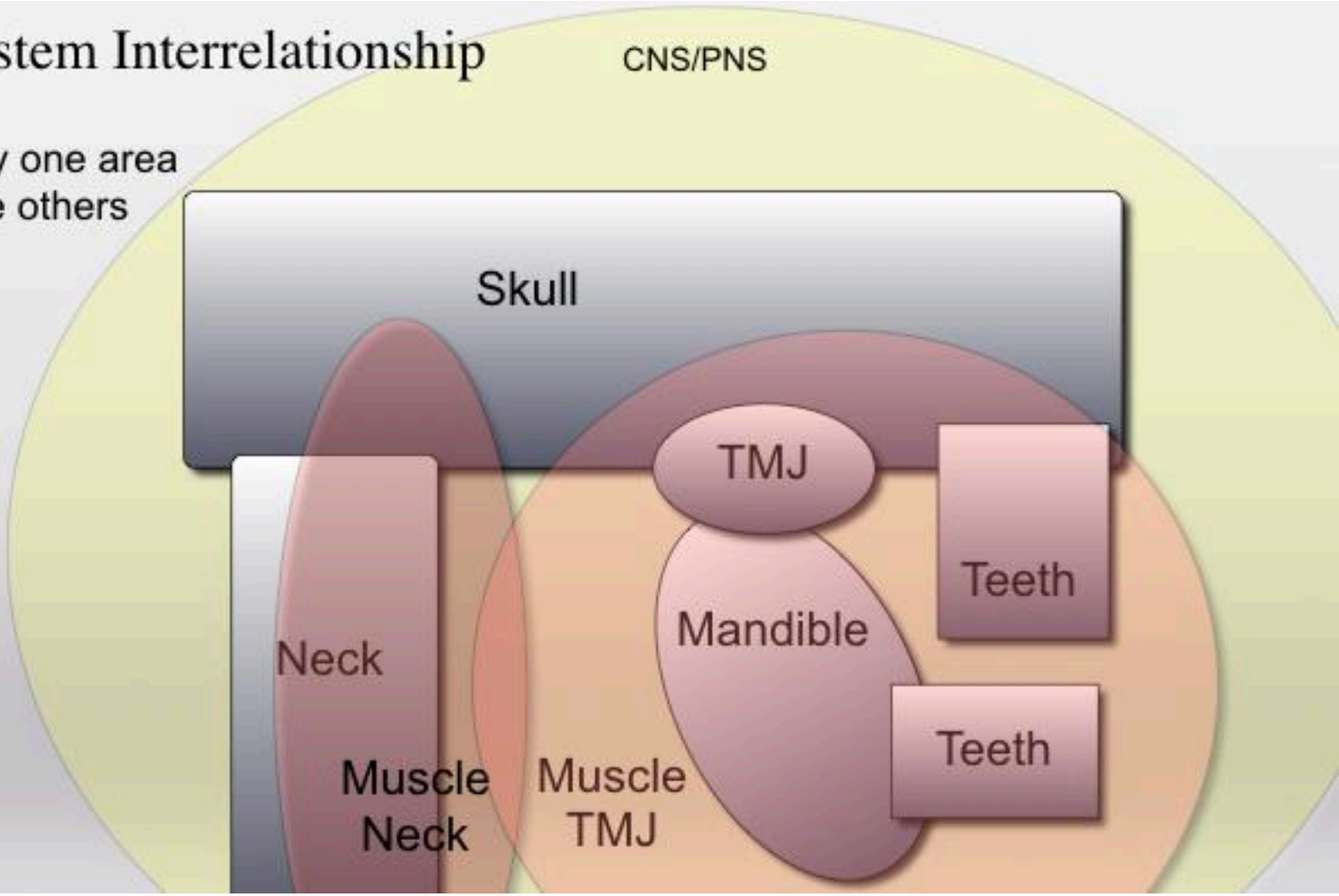
Maxillofacial Imaging
Larheim
Westesson

Stomatognathic System Interrelationship

A change in any one area will affect the others

"Adaptation"

This is a **dynamic** orthopedic System



venn diagram

Diagnosis and Treating TMDs

John R Droter DDS
Annapolis, Maryland

www.jrdroter.com

Treating Common TMDs

Diagnosis	Pattern	Treatment
Sleep Clenching with anterior tooth contact inhibition	Sore masseters on waking Morning TMJ clicking that resolves Sleep D-PAS Relieves Symptoms	D-PAS Night Guard Time Release Vitamin C hs Magnesium
Occlusal Muscle Disharmony	Sore muscles when chewing Sore Lateral Pterygoid, Headaches Day orthotic 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
Hypoxia Induced Progressive Condylar Resorption	Progressive anterior open bite Missing condylar cortex on CT	Condylar distraction for 6 months Meloxicam, Doxycycline
Sprain Discal Ligament TMJ, Acute	Sudden onset pain TMJ Pain palpation TMJ Limited opening	Cold Laser, Ice 15 min 3x a day Rest, Soft diet, NSAID 7 days Anterior Reposition Orthotic 7 days
Sleep Grinding	Worn Teeth	Depends on cause Protection vs Airway vs Occlusion

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

1. TMJ Damage

Osteoarthritis

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
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Rheumatoid Arthritis Sero Negative TMJ

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 **Patentcy** (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
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Malocclusion Anterior Open Bite
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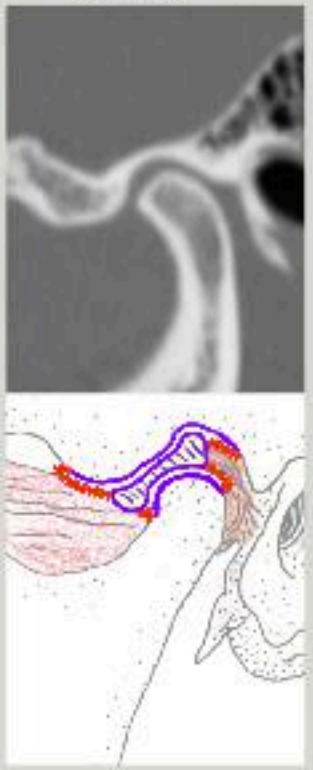
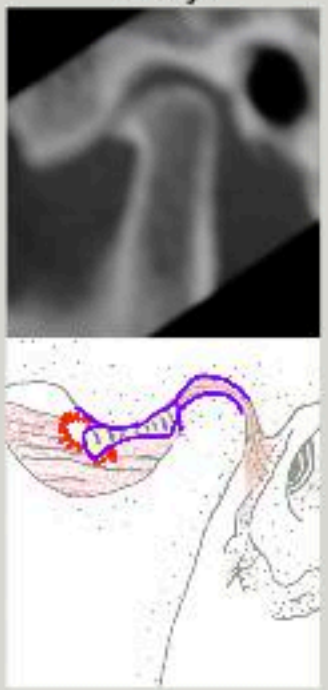
Osteoarthrosis/Osteoarthritis

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

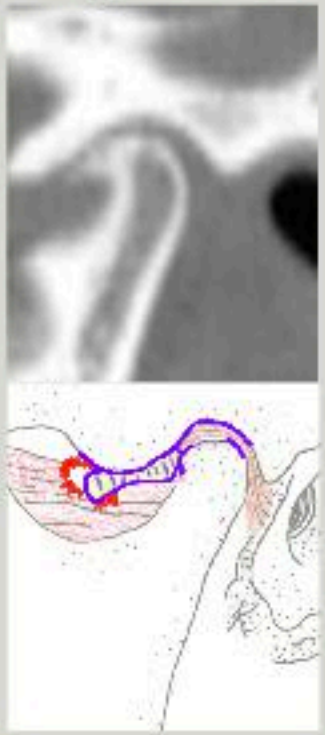
Normal



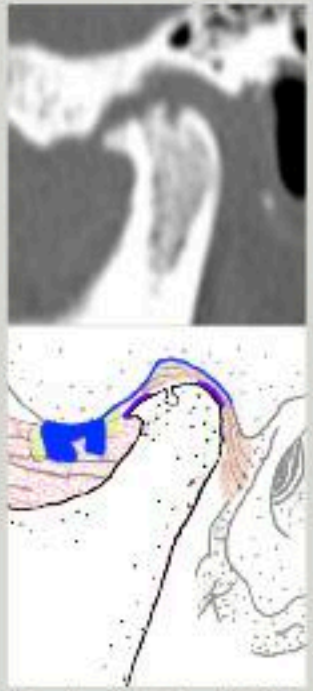
Early



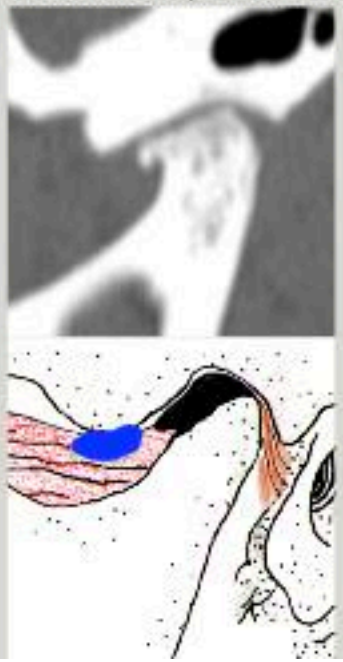
Early/ Moderate



Moderate



Severe OA, Eburnation



Representative examples of OA
in different patients

Drawings by Gretta Tomb DDS and John Droter DDS

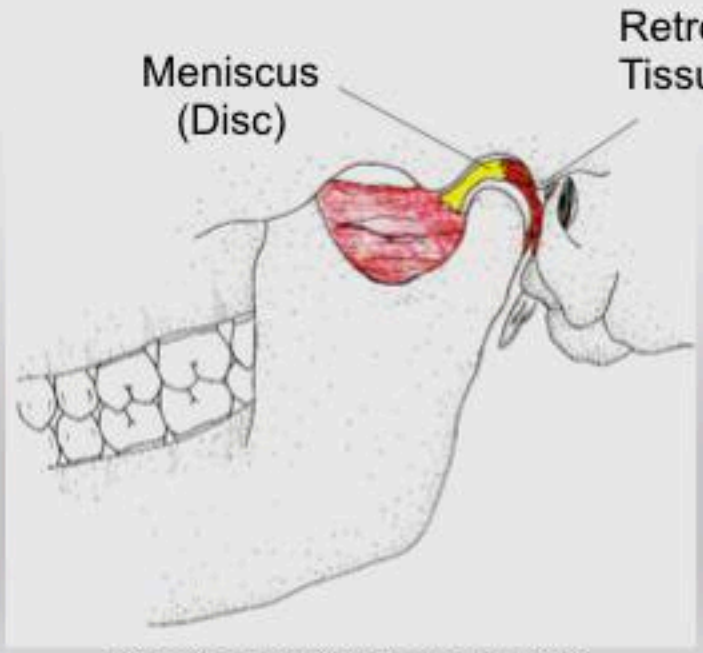
A joint joins two bones that allows movement between the two bones

TMJ has 2 Joint Compartments:

Upper- Translation
Lower- Rotation

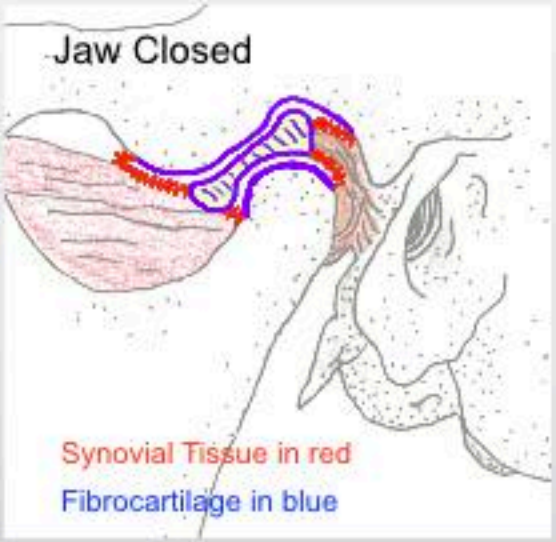
Rotate
Slide
Pivot

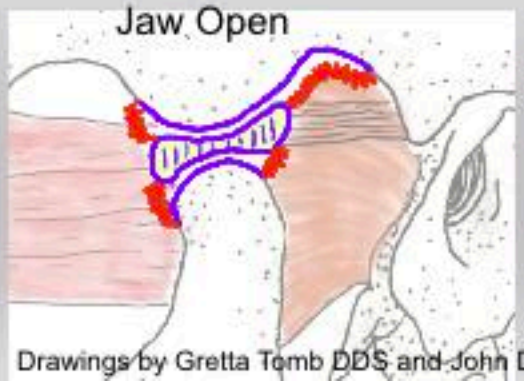
Solid end point closing
Ligamentous end point opening



Drawings by Gretta Tomb DDS

Normal TMJ- Synovium, Cartilage

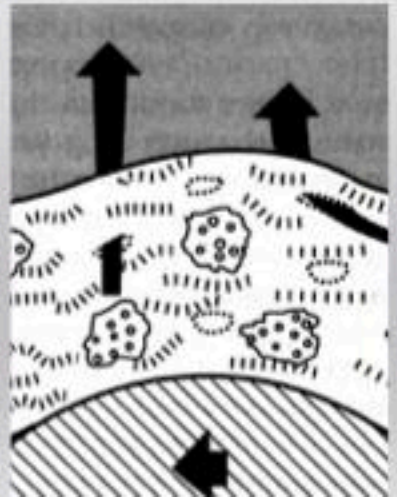




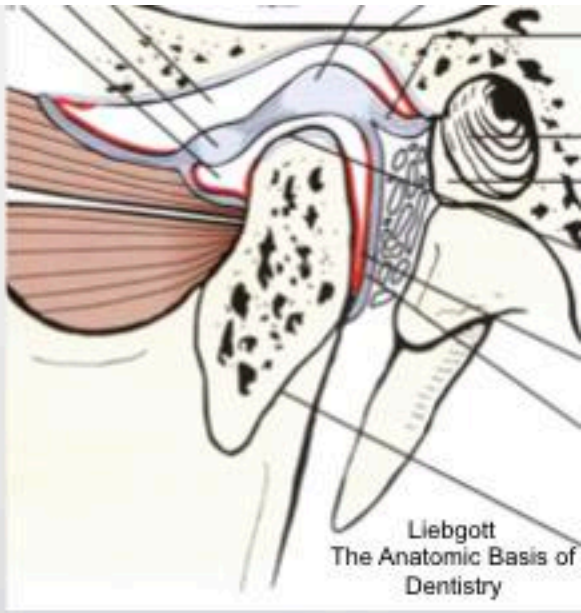
Drawings by Gretta Tomb DDS and John Droter DDS

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

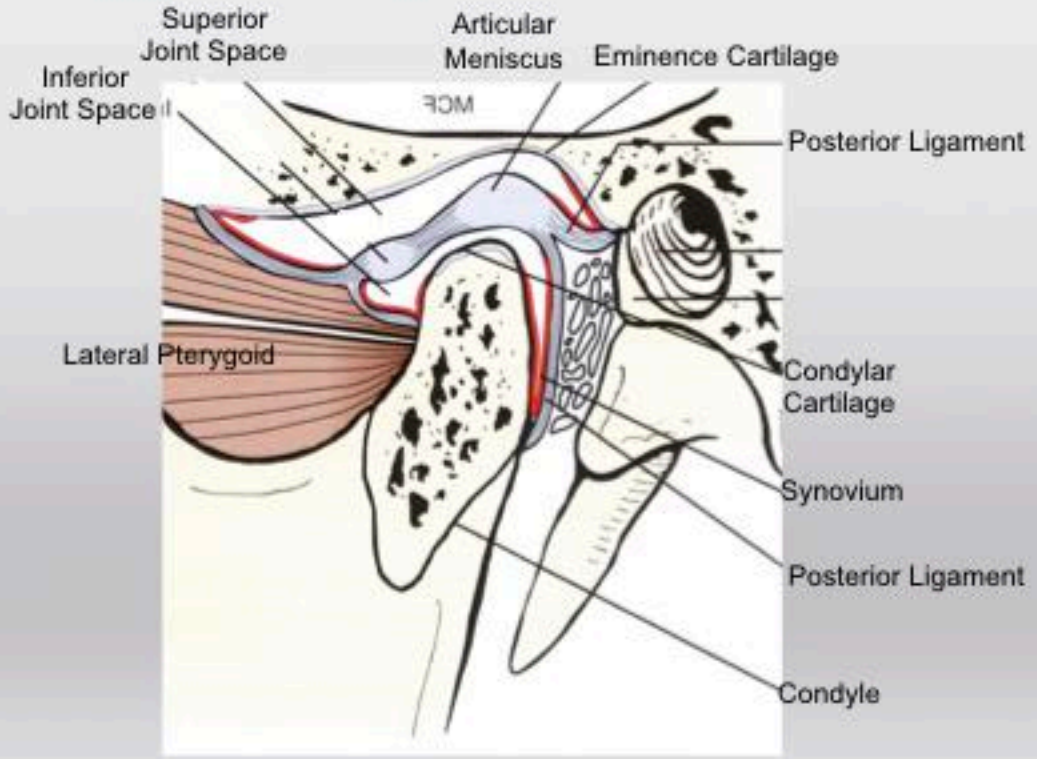
Synovial Tissue makes Synovial Fluid
- No blood vessels in a health joint
- Nutrition to the cartilage cells
- Lubrication- Hyaluronic Acid and Lubricin



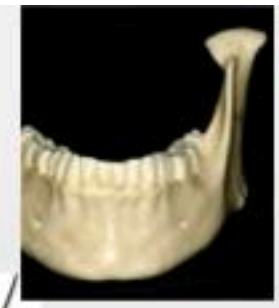
Fibrocartilage surface covered in fluid
- Cartilage is hydrophilic
- Proteoglycan negative charge
- Surface Active Phospholipids
- Fluid slides against fluid
- 5x slipperier than ice

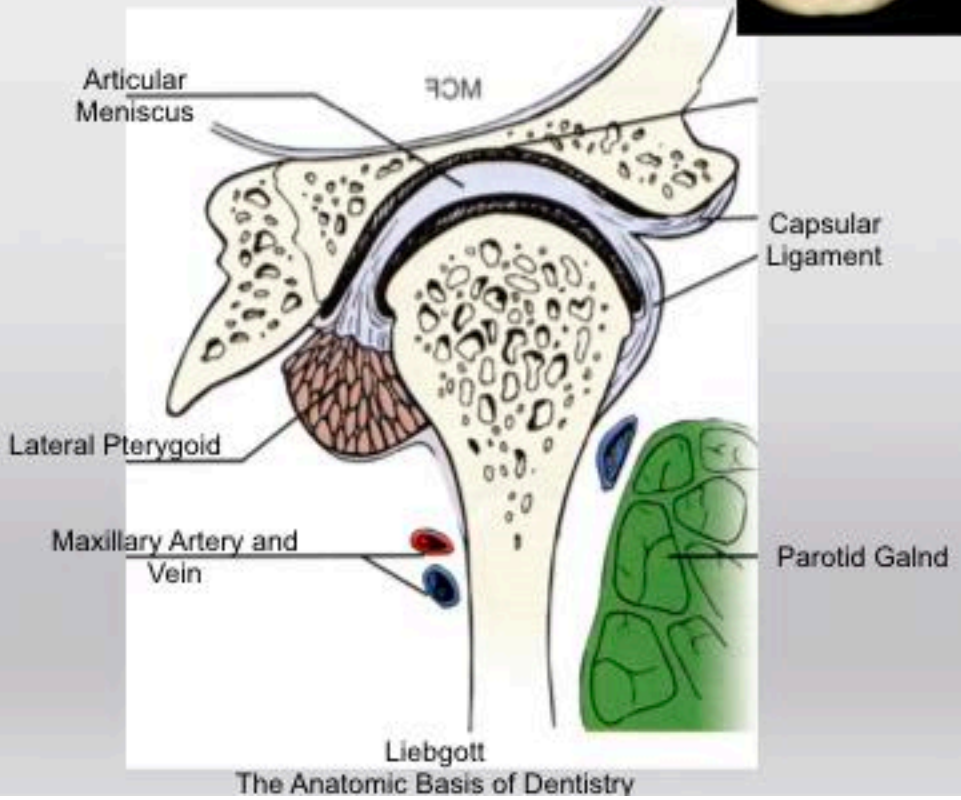


Left TMJ Sagittal View

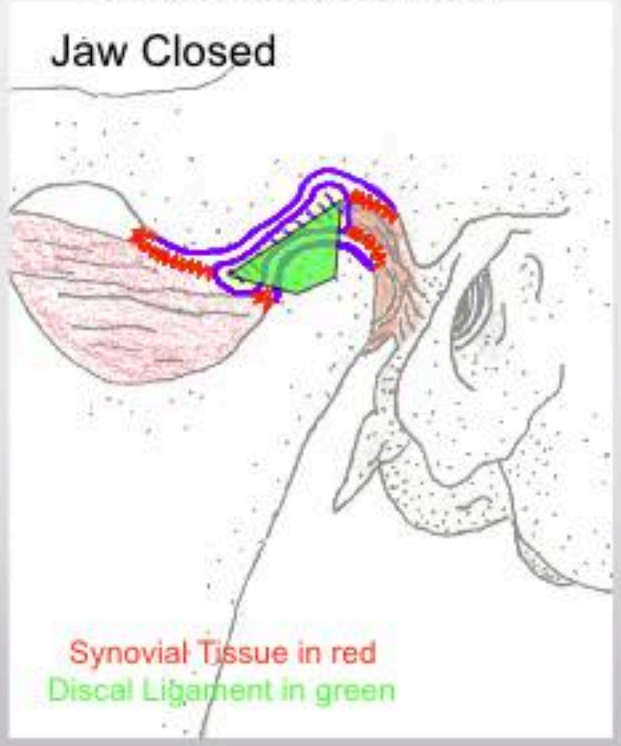


Left TMJ Coronal View





Normal TMJ



Discal Ligaments attach Disc to Condyle

Synovial Tissue
- Covers Front , Back and Sides
- Collapsed due to negative joint pressure

Disc viewed from above

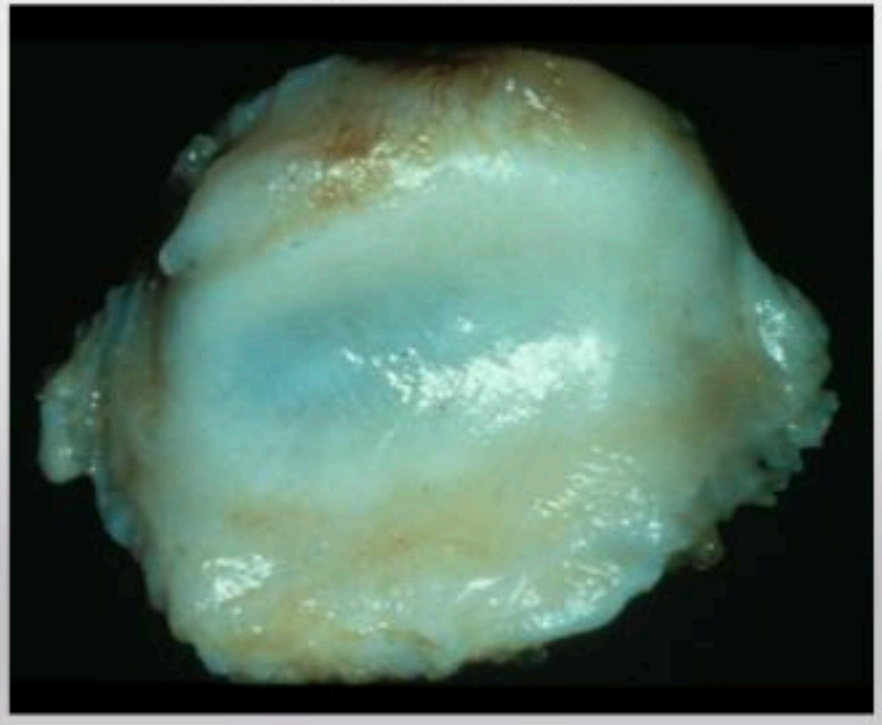
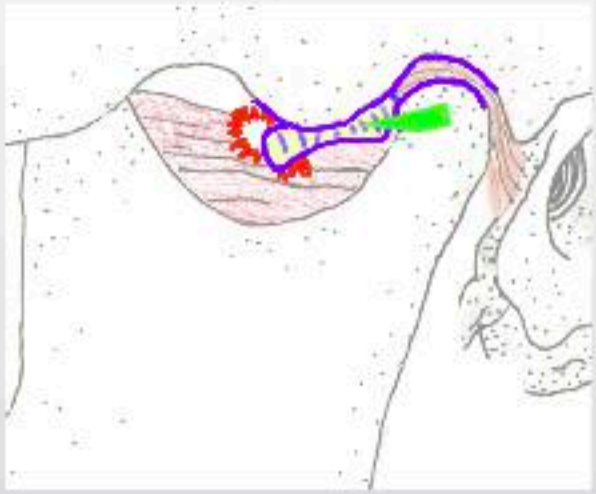


Photo Courtesy of Dr Henry Gremillion

Damaged TMJ- Anteriorly Dislocated Disc



Torn or stretched Meniscal ligaments

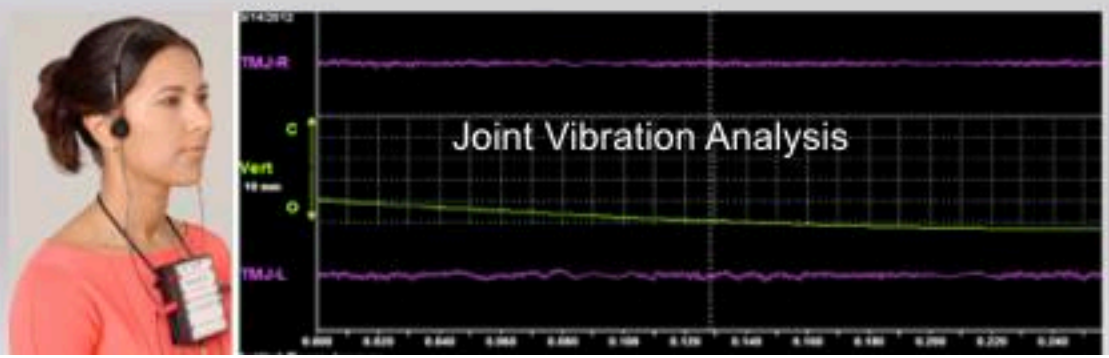
Anterior Dislocated Disc

Damaged Synovium

Retrodiscal Tissue pulled up and over the condyle
- Retrodiscal tissue in direct contact with fibrocartilage
- Major Increase in friction
- Retrodiscal tissue adapts into fibrous “pseudodisc”

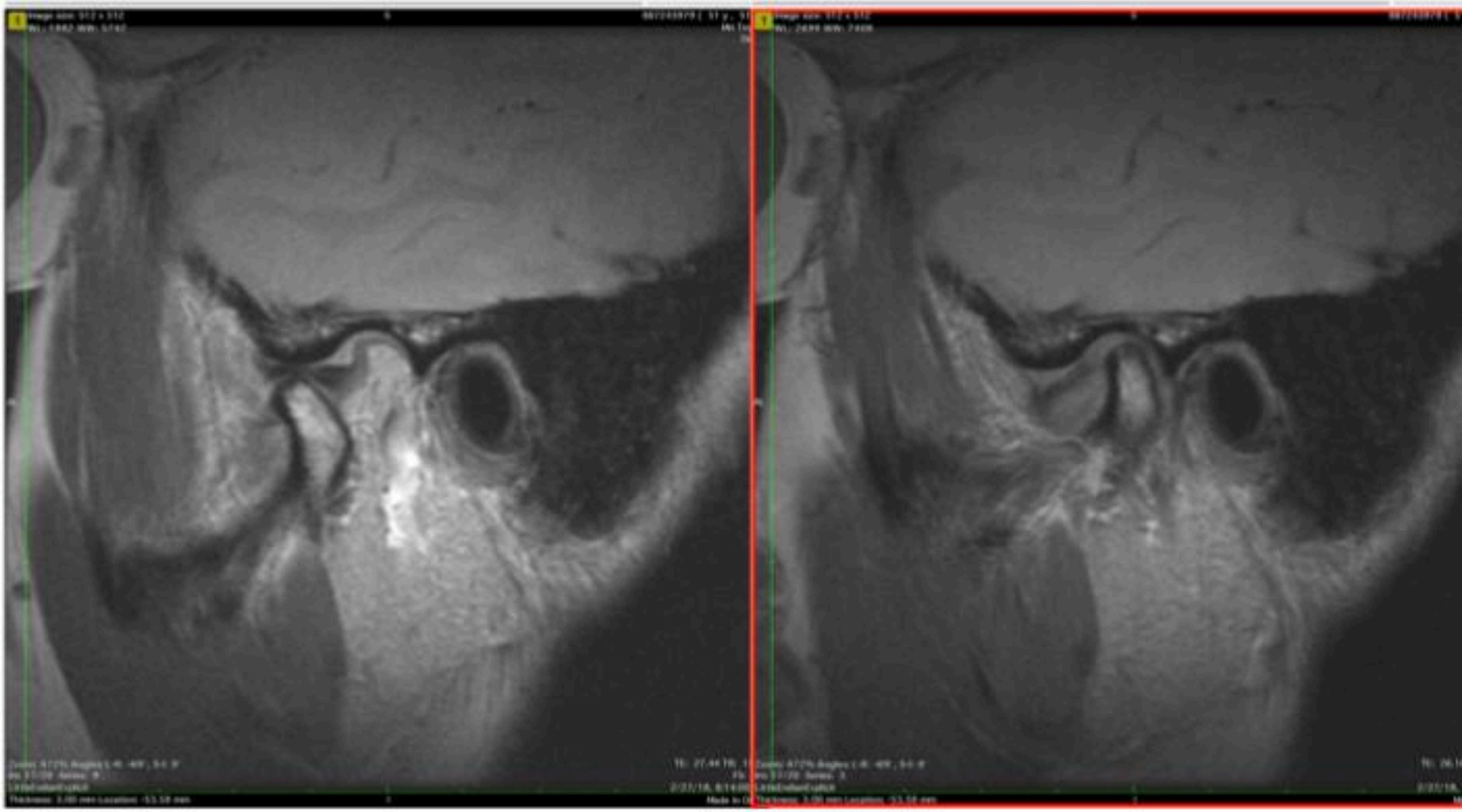
85% of all damaged joints adapt favorably without treatment

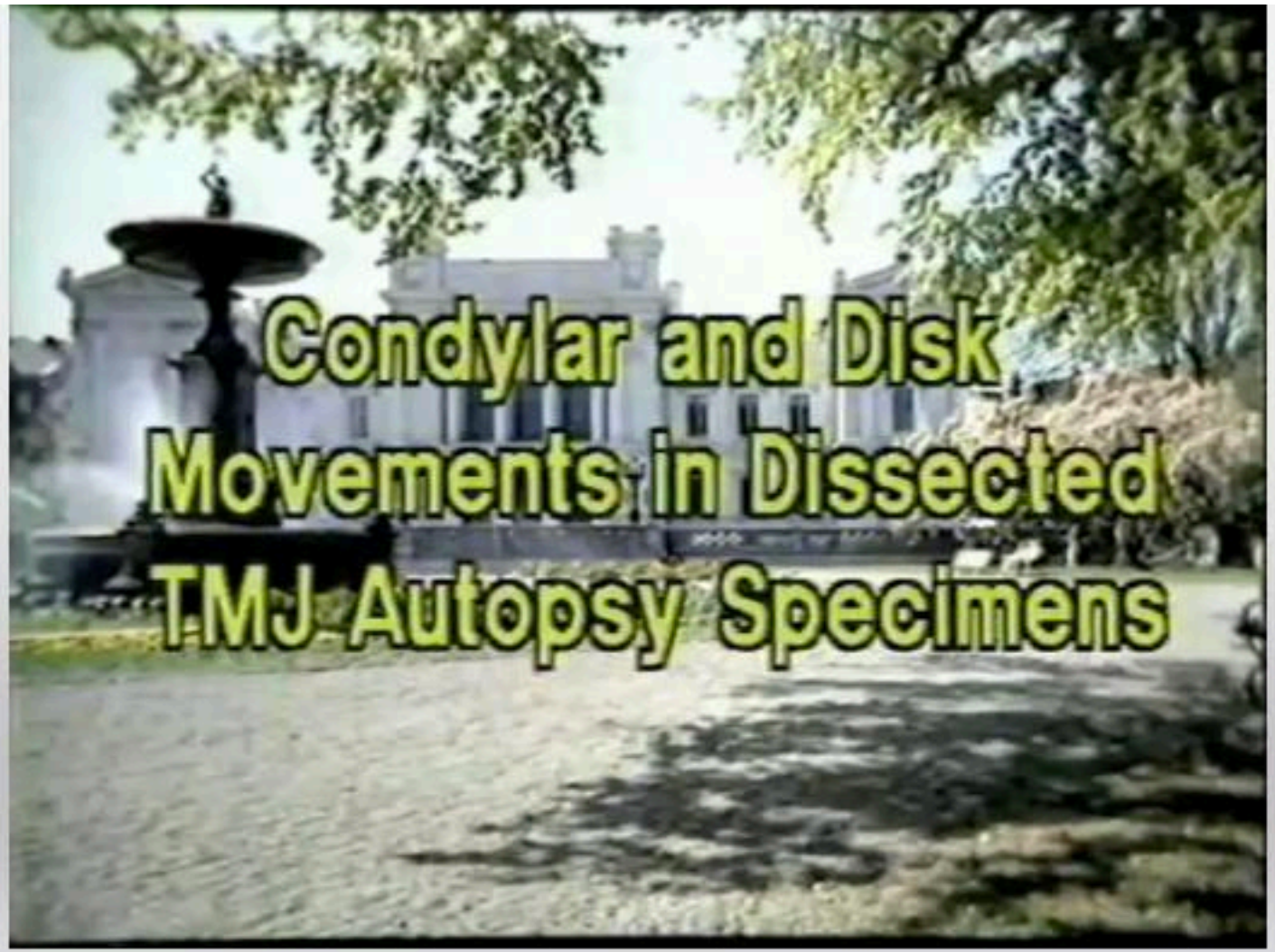
Cartilage sliding on tissue creates vibrations that can be detected



Pseudodisc

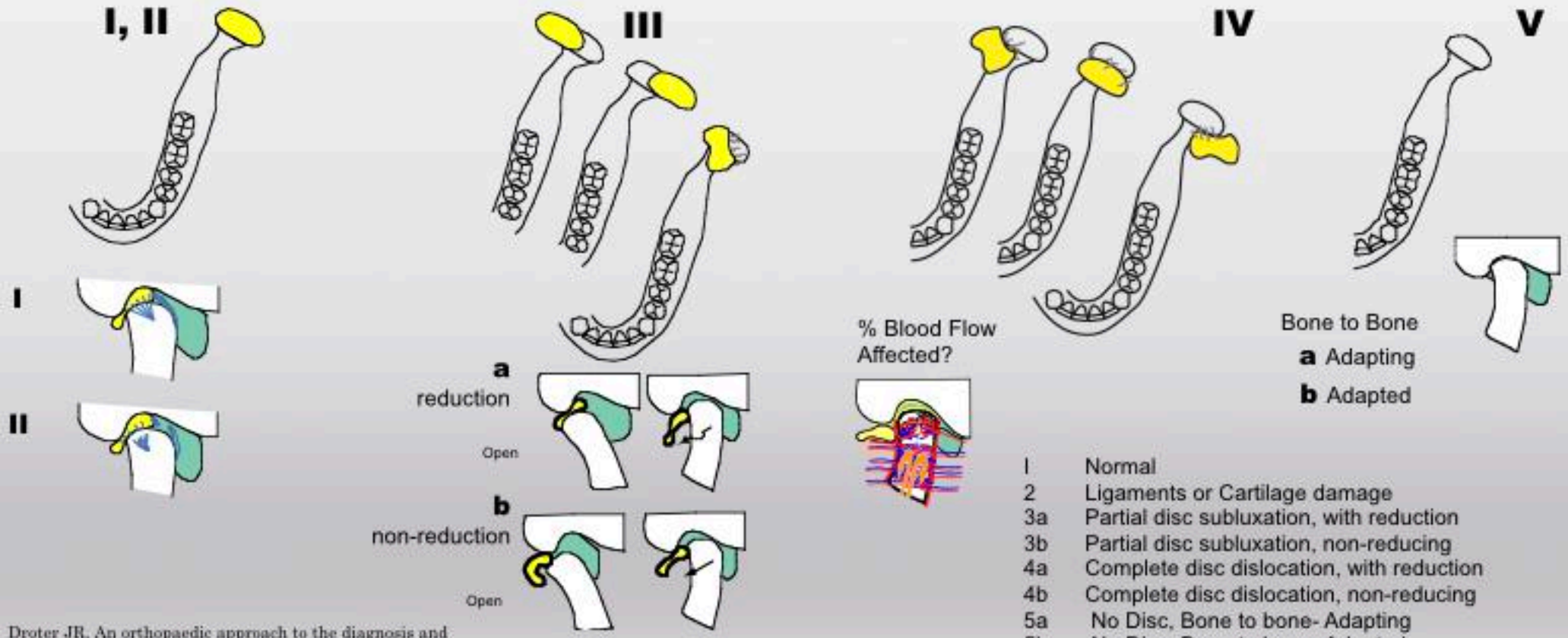
MRI
Right
PDD




Condylar and Disk
Movements in Dissected
TMJ Autopsy Specimens

Dr. Mark Piper's Classification

Left TMJ

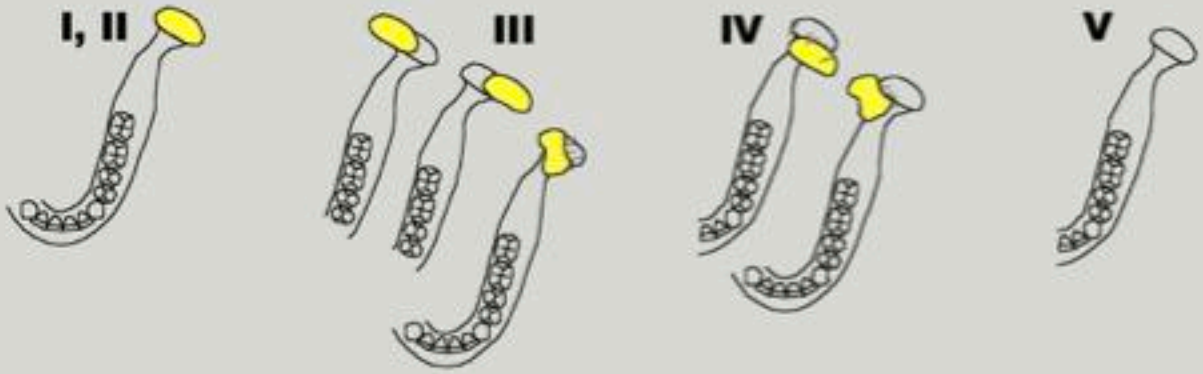


I	Normal
2	Ligaments or Cartilage damage
3a	Partial disc subluxation, with reduction
3b	Partial disc subluxation, non-reducing
4a	Complete disc dislocation, with reduction
4b	Complete disc dislocation, non-reducing
5a	No Disc, Bone to bone- Adapting
5b	No Disc, Bone to bone- Adapted

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

Distribution- 126 MRIs- 252 TMJs

- Patients presenting to my Restorative/Pain practice
- All patients with <u>any</u> indication of TMJ damage had scans



I&II-	32%
IIIa-	12%
IIIb-	3%
IVa-	18%
IVb-	30%
V-	5%

I&II- 32%

Both joints normal 14%

IIIa- 12%
IIIb- <u>3%</u>
15%

IVa- 18%
IVb- <u>30%</u>
48%

V- 5%

**III due mesial and III due lateral are new categories and not included in this study. Data thru 6/2003

Osteoarthrosis/Osteoarthritis

Healthy joints have no friction or wear.
Damaged joints have Friction. Friction causes wear.
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Parafunction increases wear.

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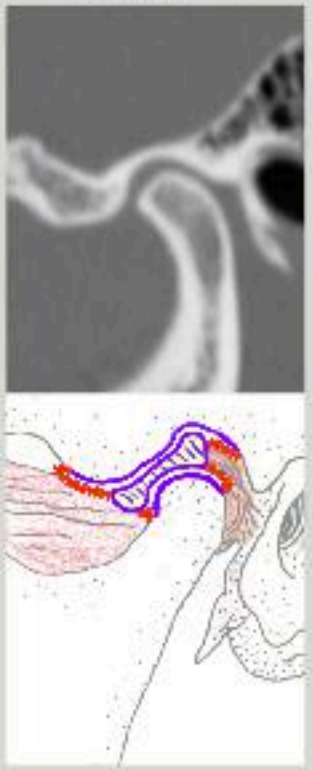
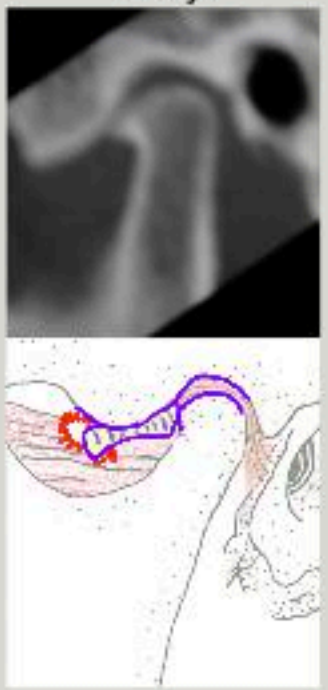
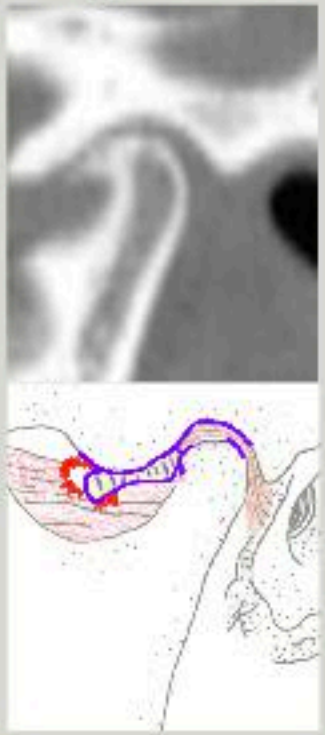


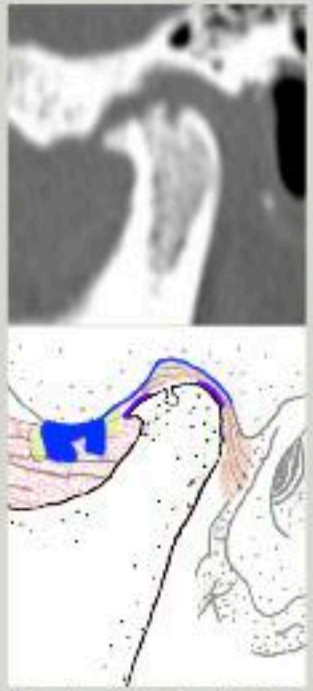
Early



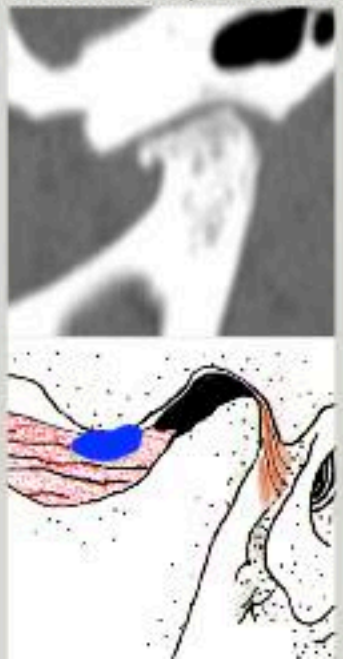
Early/ Moderate



Moderate



Severe OA, Eburnation



Representative examples of OA
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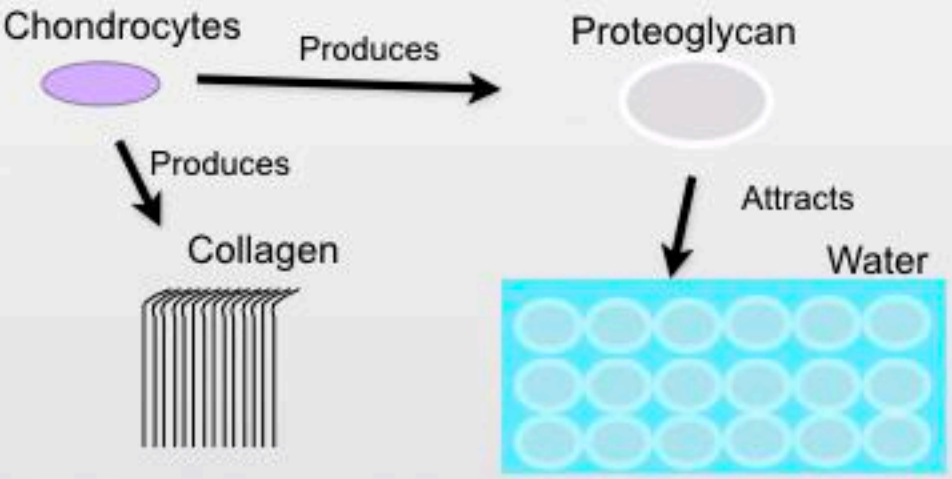
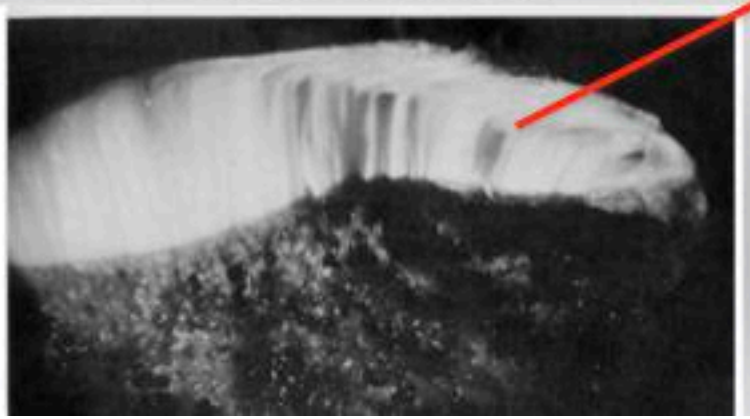
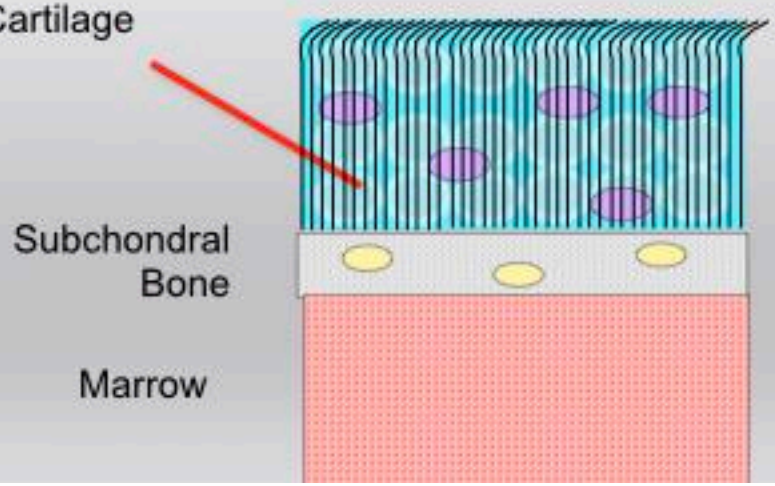
Cartilage

Chondrocytes
Collagen 10%
Proteoglycans 10%
Water 80%



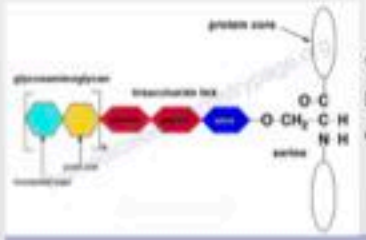
Cartilage top of femur
(Salter's orthopaedic textbook)





Cartilage Elasticity

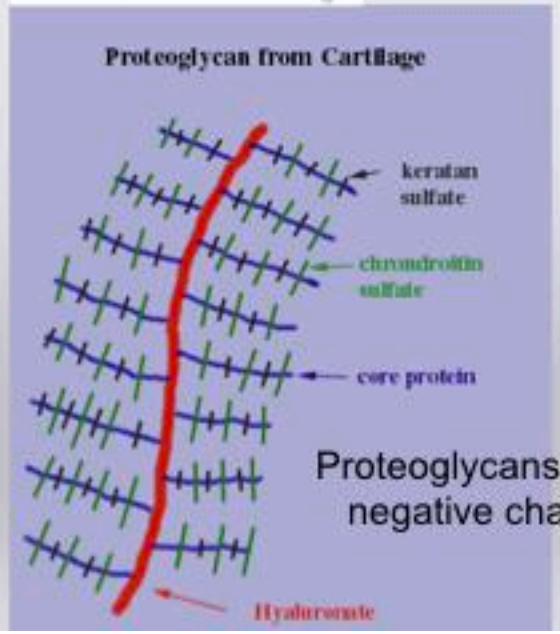
Cartilage is 80% water held in by the Proteoglycans, which are held in by the collagen



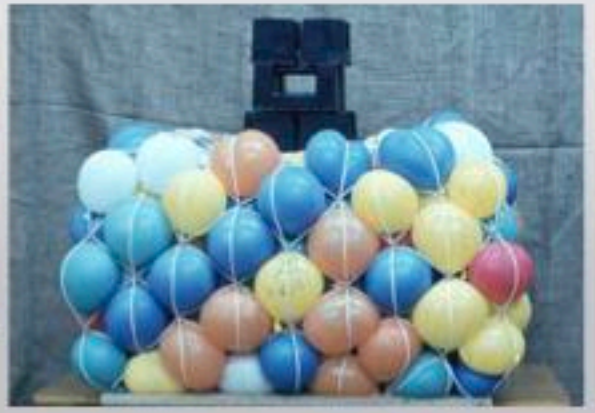
Glucosamine makes up part of core protein

Collagen fibers hold the proteoglycans in place

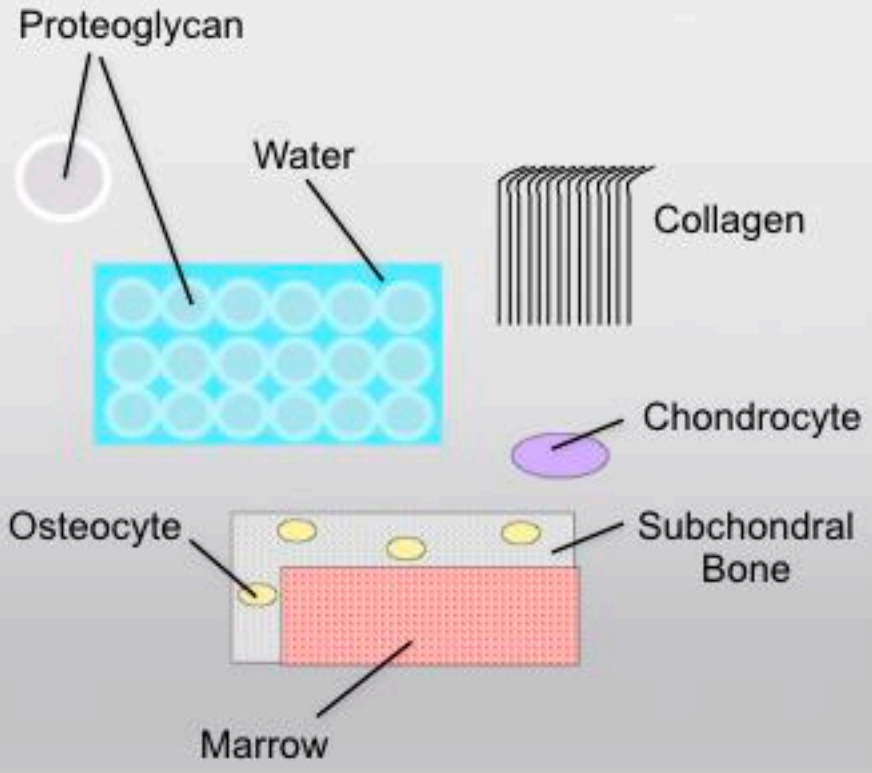
Proteoglycans attract water and form a “ballon” type structure

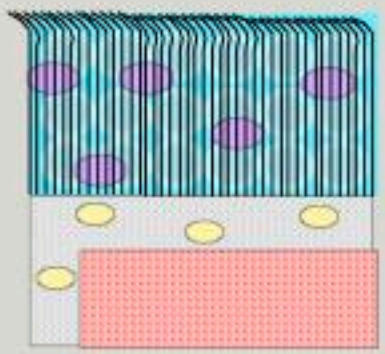


Proteoglycans have negative charge



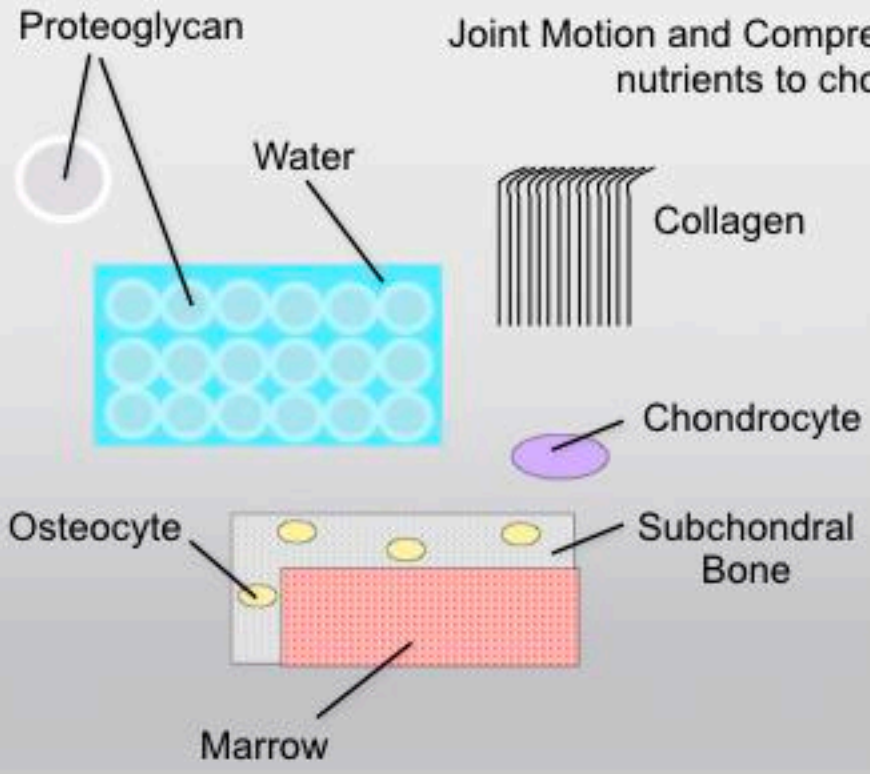
Healthy Cartilage



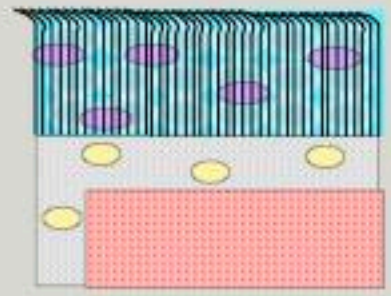


Run Back Forth 3x

Healthy Cartilage



Joint Motion and Compression needed to get nutrients to chondrocytes



Run Back Forth 3x

Osteoarthrosis/ Osteoarthritis Early

Collagen Fibrillation

Increase # Chondrocytes

Loss Cartilage in area of stress

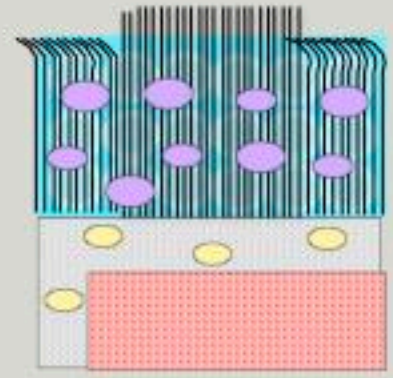
Overgrowth Cartilage on periphery

Causes:

Excessive Force

Decrease Nutrients (movement)

Decrease Synovial Fluid Perfusion



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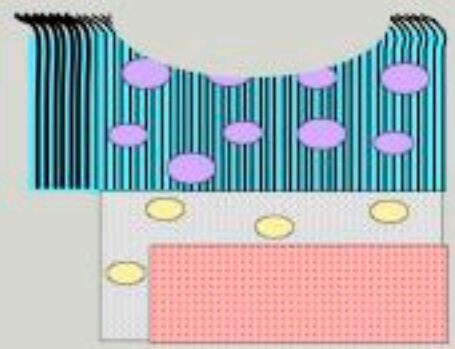


Osteoarthritis Moderate

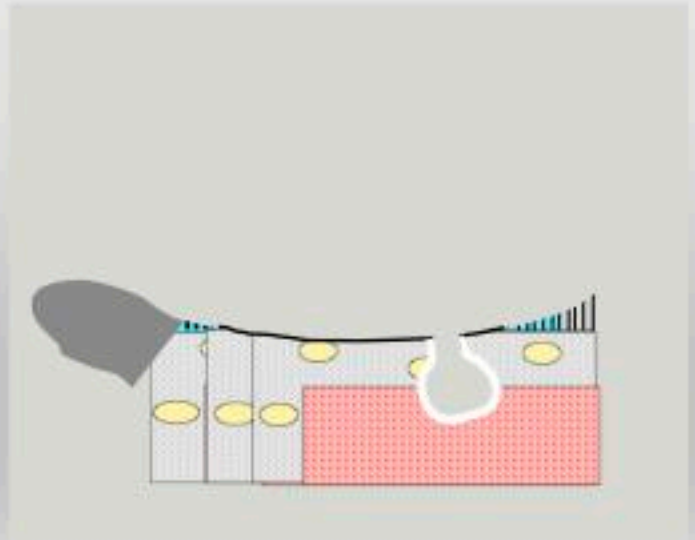
Continued loss of cartilage down to subchondral bone

Subchondral Bone Cysts

Hypercalcification

Ossification of excessive cartilage

Cystic degeneration is “ITIS”

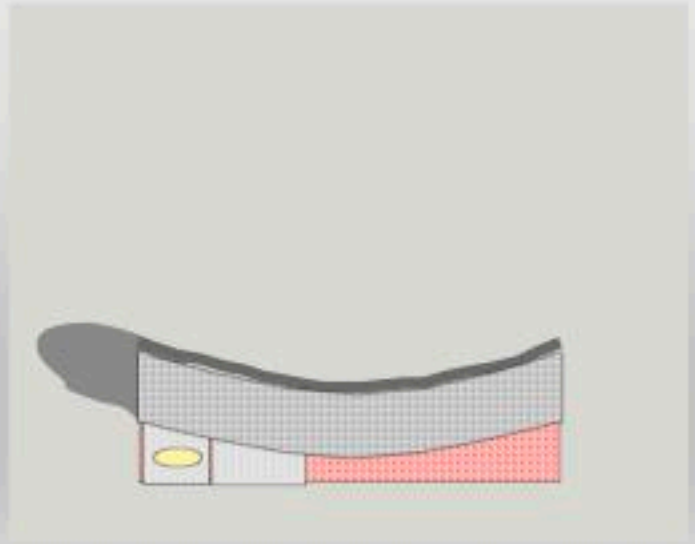


Osteoarthrosis/ Osteoarthritis Late

Sclerotic Bone

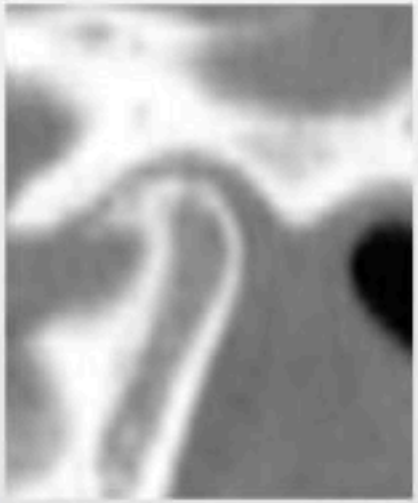
Eburnated Bone- Marble like

Calcification of surrounding structure



.....osis = disease process

.....itis = inflammation



Osteoarthr**<u>osis</u>** is a disease of cartilage, leading to progressive cartilage degeneration and changes in the bone.

Osteoarthr**<u>itis</u>** is an inflammatory phase of osteoarthrosis.

If it is not inflamed it is not **ITIS.**

Unfortunately the terms are mistakenly used interchangeably by doctors and in the literature.

If you effectively treat osteoarthritis with NSAIDs, you are now back to osteoarthrosis, which is not inflamed and will degrade at a much slower rate.

Diagnose OA

…itis is painful, …osis is not

Osteoarthr**osis**

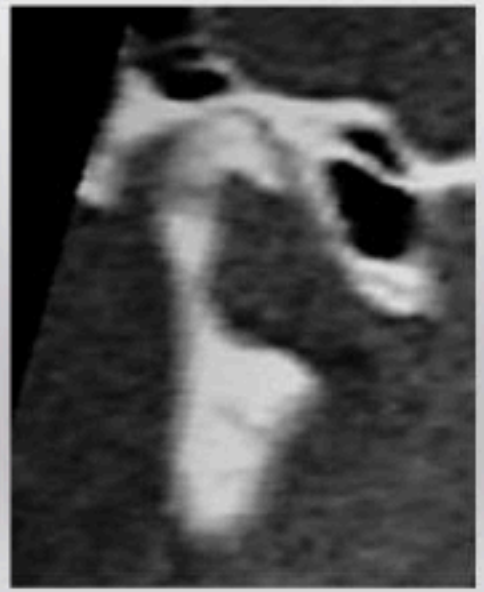
- After early phase, CT scan shows bone alteration
- Joint sounds, vibrations (roughness)- JVA is best
- Non painful to joint palpation, loading
- Friction in the joint causing wear

Osteoarthr**itis**

- CT shows bone alteration
- Inflammation present: Arthralgia
  - Need to palpate and load test the joint
- Joint sounds roughness may be diminished by joint effusion
- MRI STIR or T2 shows inflammation

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**

Minimize parafunction:

If sleep grinding due to airway:

CPAP or Dental Airway Device

Glucosamine 1500mg /Chondroitin 600 mg per day

D-LAA Device

Osteoarthr**itis**

All of the above plus eliminate inflammation……

NSAIDs

Cold Laser

If still inflamed arthrocentesis with Platelet Rich Plasma (PRP)

NOW Glucosamine and Chondroitin with MSM

Do not take if allergic to sulfur or shellfish

Treatment OA

Osteoarthr**osis**

Minimize parafunction:

If sleep grinding due to airway:

CPAP or Dental Airway Device

Glucosamine 1500mg /Chondroitin 600 mg per day

Osteoarthr**itis**

All of the above plus eliminate inflammation……

NSAIDs

Cold Laser

If still inflamed arthrocentesis with Platelet Rich Plasma (PRP)

Will be on NSAID 6-12 weeks

Best to have MD prescribe and manage

CMP- Complete Metabolic Panel

Creatinine Clearance Rate

Monitor BP- early kidney failure see rise in BP

NSAIDs I like:

Meloxicam 15mg qd

Celebrex 200mg qd

Aleve 440mg bid

Advil Liquid Gel Caps 800mg tid

Limbrel 500 bid

Can add Doxycyline 20mg bid to meloxicam 15mg qd if needed

Treatment OA

Osteoarthr**osis**

Minimize parafunction:

If sleep grinding due to airway:

CPAP or Dental Airway Device

Glucosamine 1500mg /Chondroitin 600 mg per day

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

Treatment OA

Osteoarthr**osis**

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

If still pain in 6 -12 weeks of NSAID:

- Arthrocentesis
- Platelet Rich Plasma

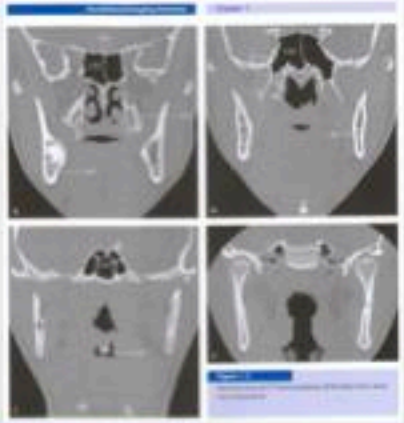
Osteoarthr**itis**

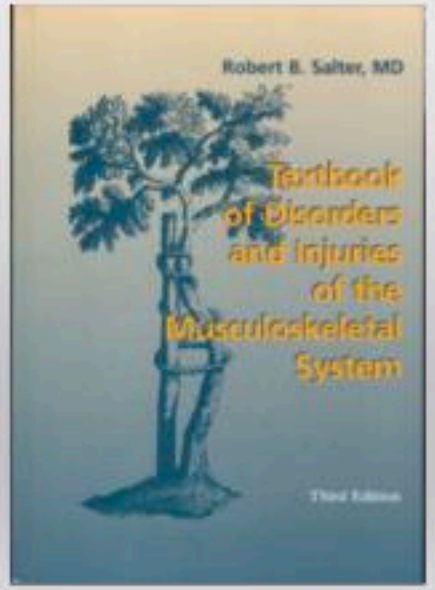
- All of the above plus eliminate inflammation……
  - NSAIDs
  - Cold Laser
- If still inflamed arthrocentesis with Platelet Rich Plasma (PRP)

My Core Belief

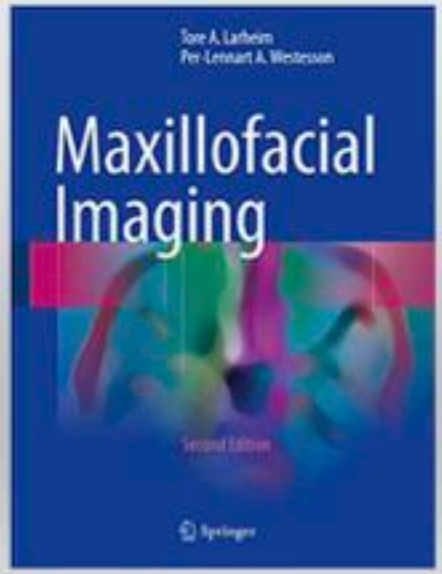
The TMJ is a synovial joint of the human body and will undergo the same disease processes as any other synovial joint

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

Exam and Diagnostic Tests

John R Droter DDS
Annapolis, Maryland

Facial Pain Diagnosis

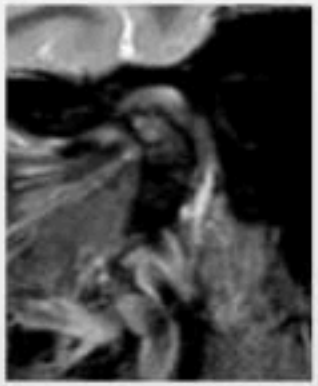
Diagnostic Tools

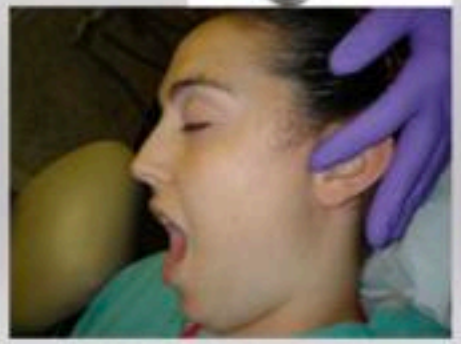
1 Written and Oral History
2 Observation
3 Physical Exam
- Muscle Palpation
- Joint Palpation
- Joint Auscultation
- Joint Motion

4 Anterior Stop Test
5 Sleep Airway Screening
6 CT Scan
7 MRI

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

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

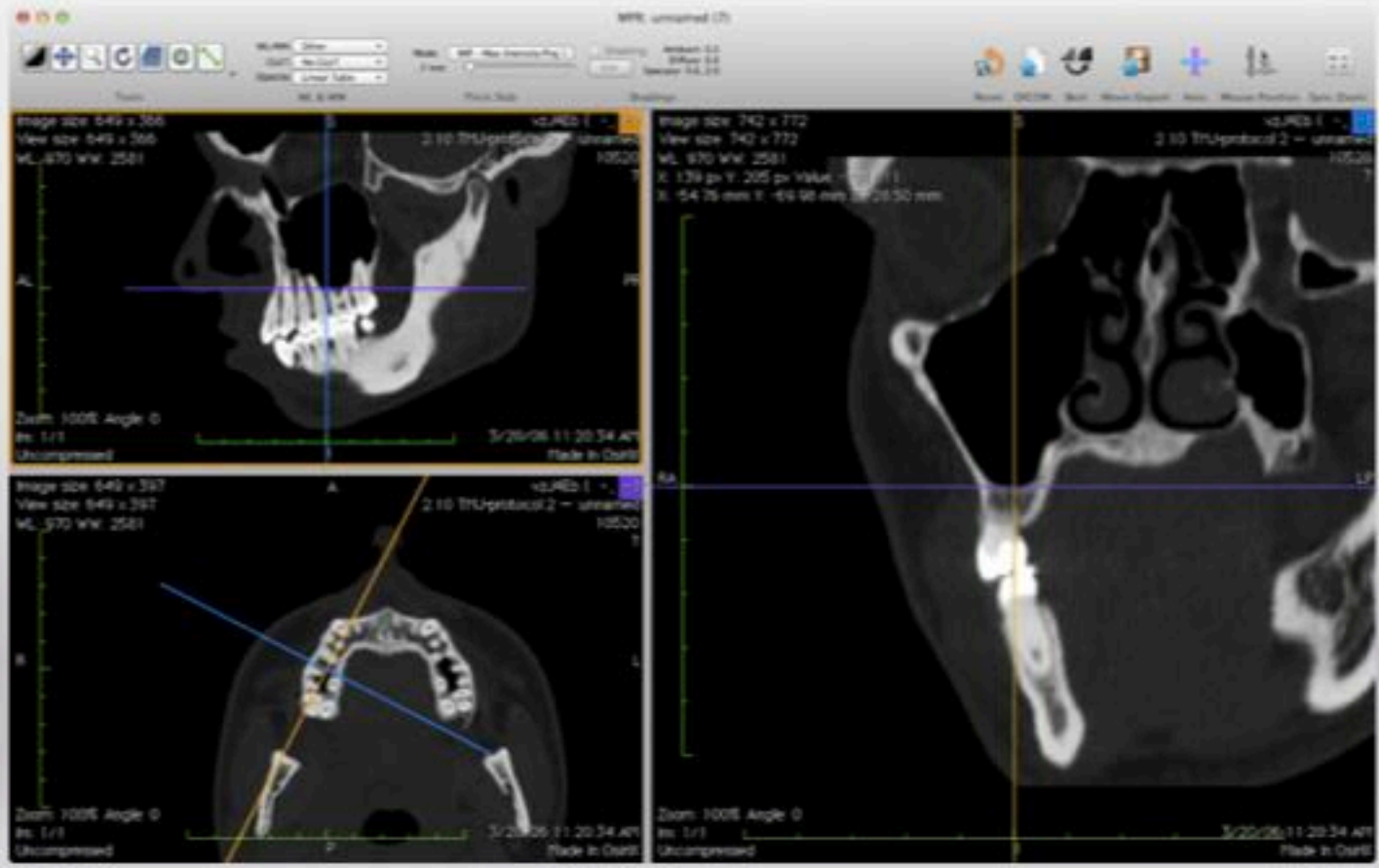




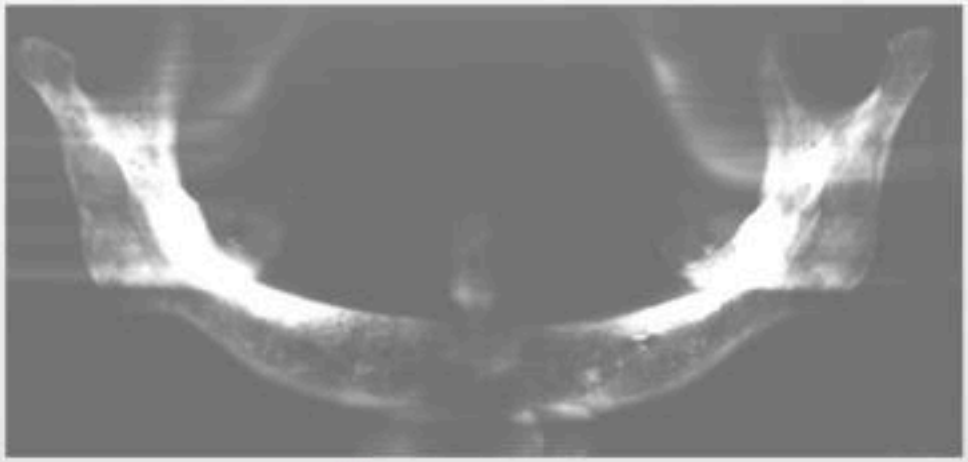
Facial Pain Diagnosis

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**
7. MRI

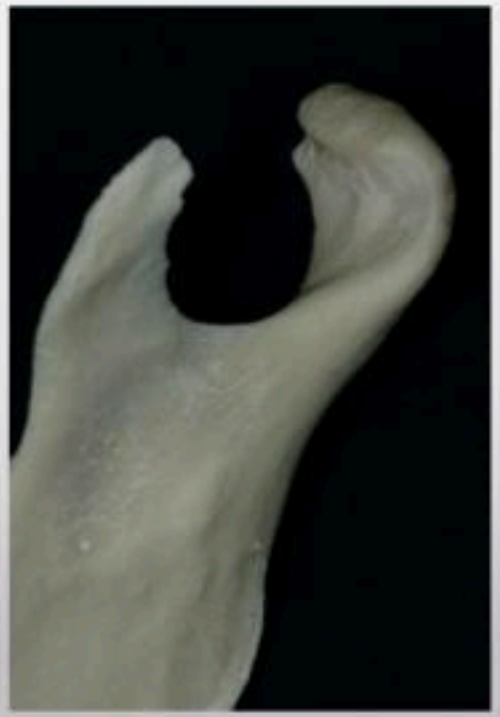


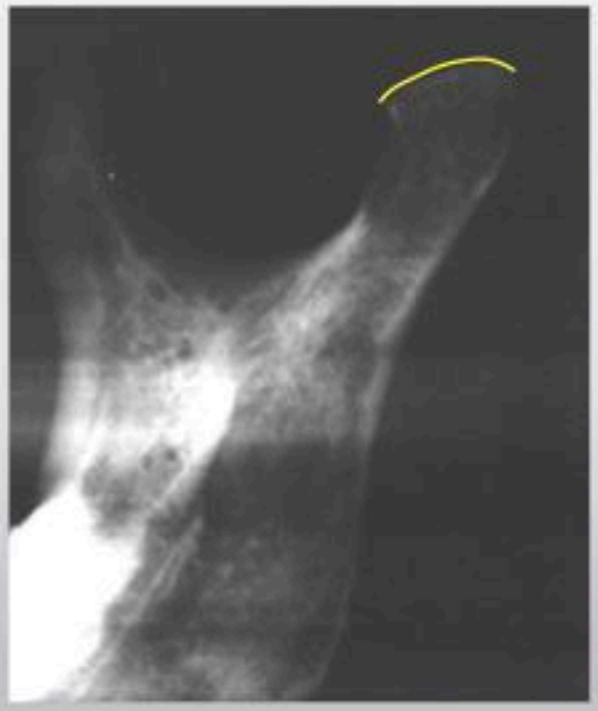
Pan-X of Skull
Mandible



Note: This Mandible had plastic teeth added

Pan-X not Accurate





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

Computerized Axial Tomography (CT, CAT)

Spiral CT Scanner
12 sec acquisition Time

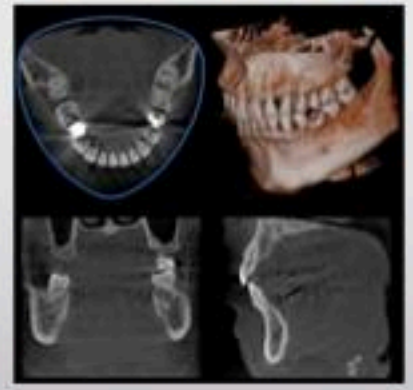
Note: prior to 2001 CT Scan took 25 min

Cone Beam CT Scanner
20 sec acquisition time

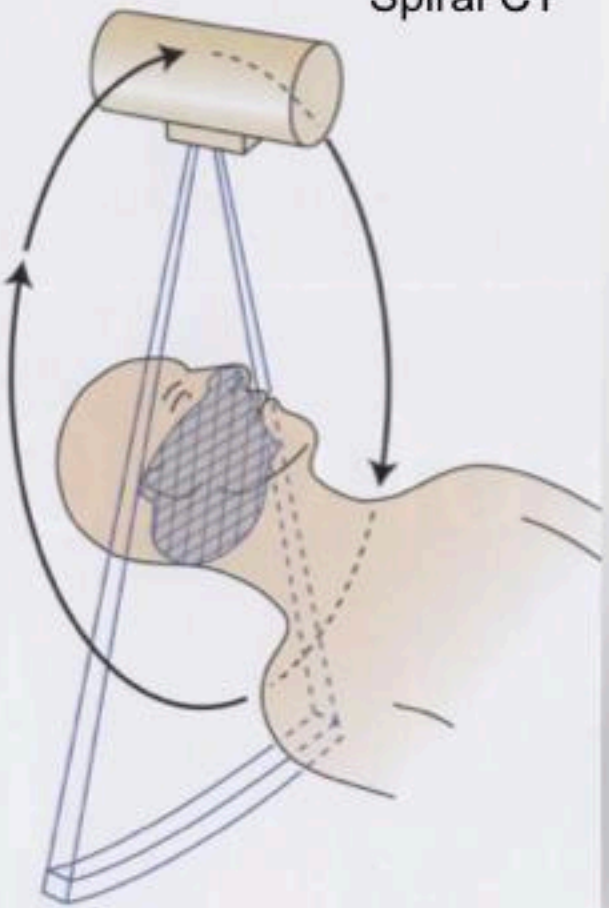
vatech

i3D Premium

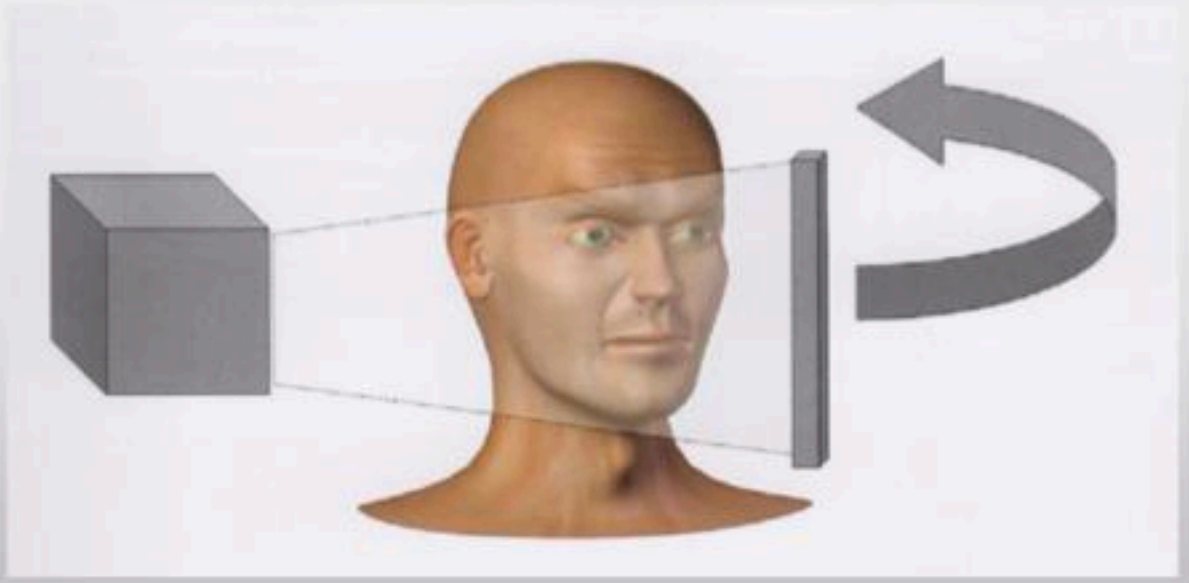
iCAT



Spiral CT



CBCT



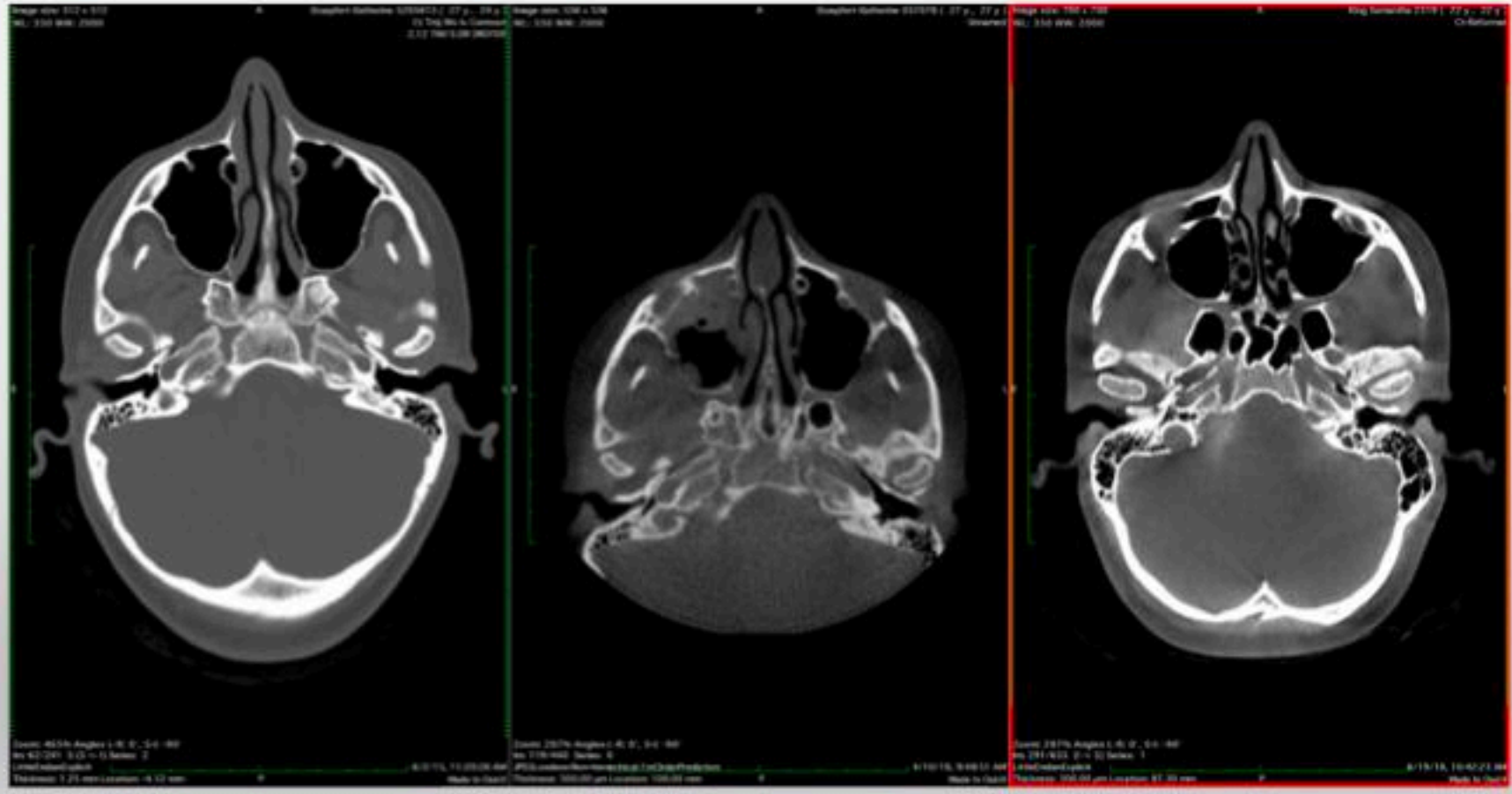
Atlas of Cone Beam Imaging
Dale Miles DDS

Compare CT scans

Spiral CT

CBCT- iCAT

CBCT- Vatech i3D Premium



Best Contrast

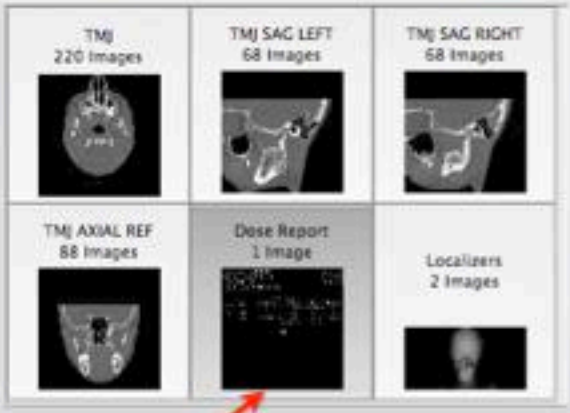
Much less Resolution

Much less Resolution

Radiation Exposure Comparison

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

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



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

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

Normal TMJ- Bone

Bone Density

- Intact Cortex
- Even pattern Trabecular bone

Normal Size/Shape Condyle/Fossa

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

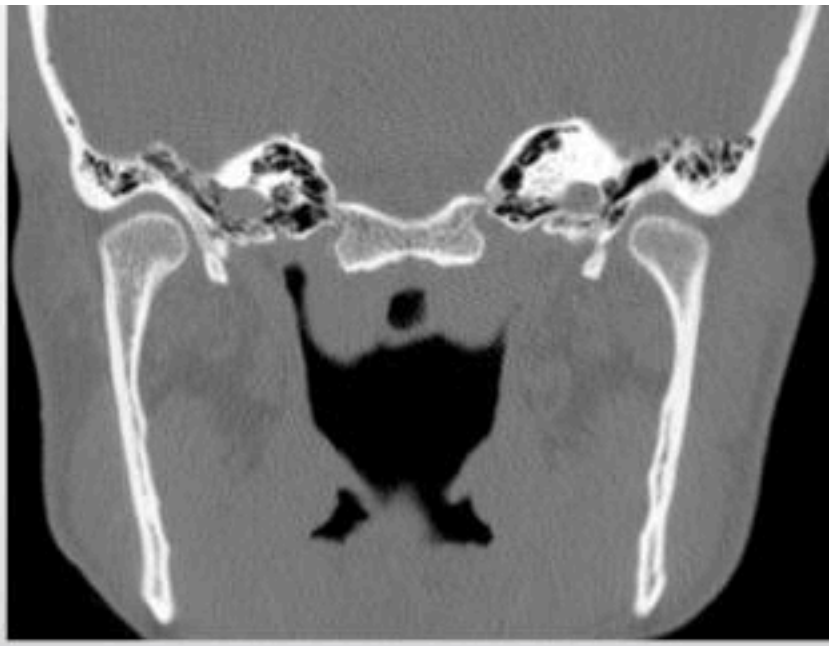
Condyle Centered in Fossa

- Coronal and Sagittal
- Room for Disc

Stable CR load Zone

- Condyle closest to fossa

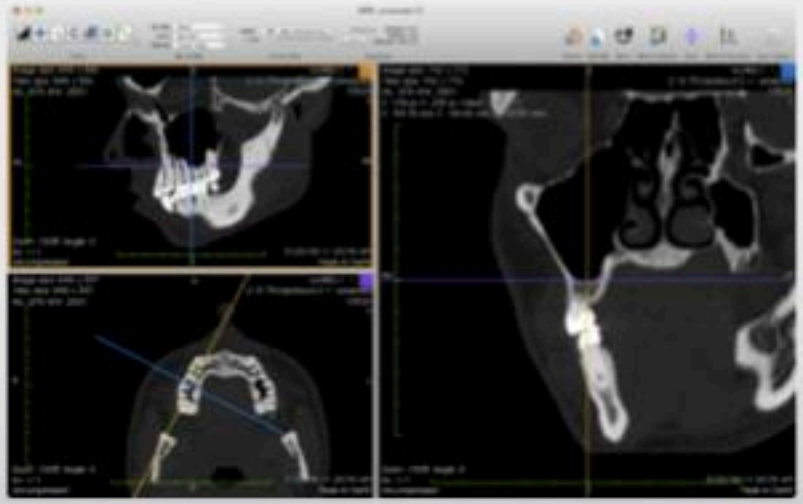
CT Scan
Coronal View



CT Scan
Sagittal View

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

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

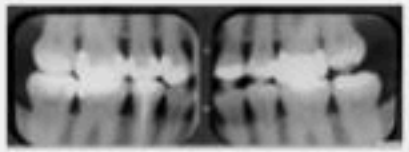


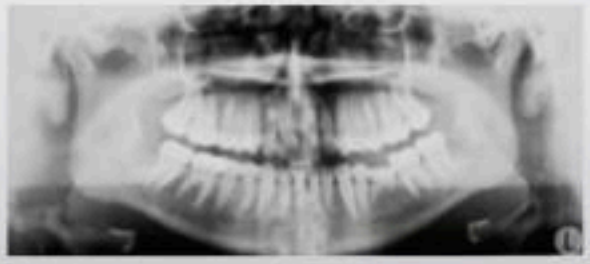
Which do you use:

FMX, PanX

FMX, CBCT

✔ CBCT, 7 vertical BW





2.5x more PAP found w/ CBCT

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

Endodontic lesion bacteria found in blood clots of Myocardial Infarctions

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

CBCT

John R Droter DDS
Annapolis, Maryland

www.jrdroter.com

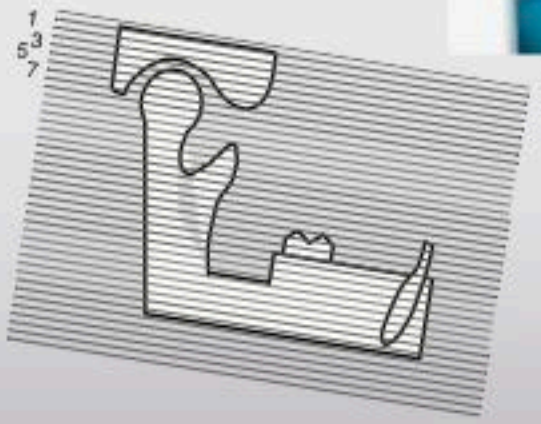
Key Features for TMJ Images

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

VaTech

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

Good Image Quality from older machine:
iCAT Classic or Next generation



J Morita

Do not recommend:
Any Sirona including Galileos: Marginal raw image quality, motion artifact
iCAT FLX- Marginal raw image quality

Green = LOW Contrast

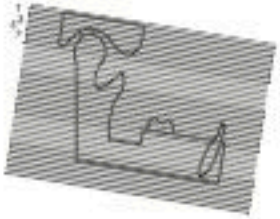
Making a Great TMJ Scan

Rx for CBCT

Can get from JRDroter.com

Adding a chair vastly improves image quality

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



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

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

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

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

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

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

Normal TMJ- Bone

Bone Density

- Intact Cortex
- Even pattern Trabecular bone

Normal Size/Shape Condyle/Fossa

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

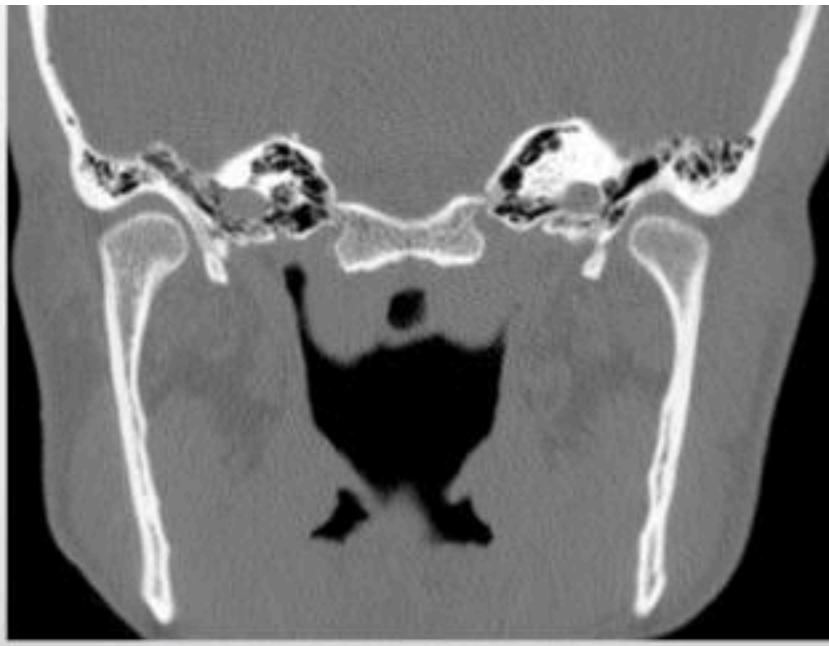
Condyle Centered in Fossa

- Coronal and Sagittal
- Room for Disc

Stable CR load Zone

- Condyle closest to fossa

CT Scan
Coronal View



CT Scan
Sagittal View

Interpreting CBCT

www.jrdroter.com

Review of Scan: CBCT

John R Droter, DDS

Name: _____ Scan Date: _____

Review Date: _____

Scan Quality: Good Fair Marginal

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

Right TMJ Scroll Coronal Sagittal and Corrected Coronal

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

Scrolling Coronal View, Sagittal View, Axial View

All Tissue	☐ Right = Left	☐ ≠ Except _____
Look for tumors: Brain, Muscle, Parotid Submand Gland, Hypertrophy		
All Bones	☐ Right = Left	☐ ≠ Except _____
Look for hyperadolfied or radiolucent areas, cysts		
Nasal (Sagittal, Cor)	☐ Open	☐ Restricted ☐ Deviated Septum
Sinuses "	☐ Clear	☐ Thickened Lining ☐ Sinus Polyps
Airway "	☐ Adequate	☐ Restricted
Teeth (Sagittal, Cor)	☐ No PAP	☐ PAP # _____
(Axial)	☐ No Gross Caries	
Perio (Thick Sagittal)	☐ No Gross Perio Bone Loss	
Arbs 3D	☐ Appears Centered	☐ Not Level with Skull Base
C2, C3, C4 3D	☐ Aligned	☐ Misaligned
Max Mand Relation	☐ Normal Sagittal	☐ Retrognathic ☐ Maxilla ☐ Mandible
Max Mand 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 hyperadolfosion 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 condyle 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 dislocations. Need to evaluate for joint mechanical stability (joint wobble) with a DJPAS. Clinically these patients may have a hypermobile "bite".

Estimate Piper

This estimation combines clinical data from the clinical history, exam, joint palpation, stethoscope auscultation, Doppler, JVA(Joint Vibration Analysis) and the CT scan. If the you see a left distalized condyle and the left TMJ clinically clicks, my estimation would be a Piper 4b. 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 fremitus on the anterior teeth.

1. Normal joint- **MRI and CT are normal** (See all above). No joint sounds, full range of motion. JVA no vibrations, quiet Doppler.
2. The TMJ is damaged but disc is still in place so **MRI and CT are normal**. Usually the cartilage is damaged, roughened from parafunctional bruxing. Doppler and JVA will both indicate slight vibrations. A well adapted 4b will also have the same vibratory signals as a Piper 2, but the 4b will show changes in condylar position on the CBCT, and the MRI will show the disc dislocation.
3. 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 concentered to a 4b. With loss of the opposing disc, the mandible shifts concordly, 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 assessing 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. Hypercalcification 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

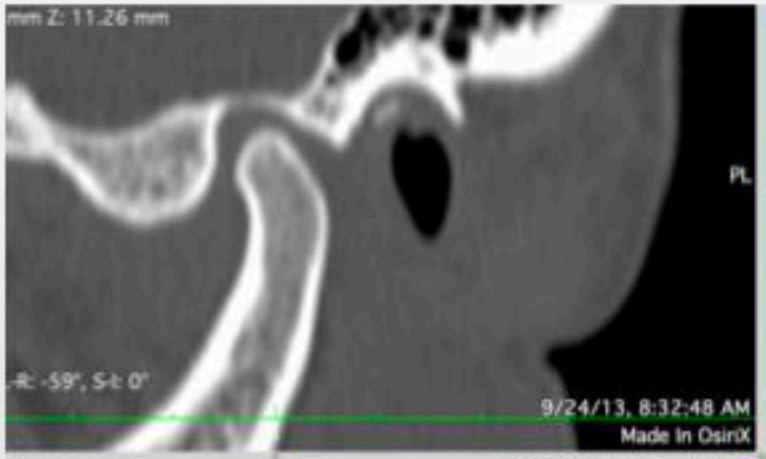
CT Left
Piper 2

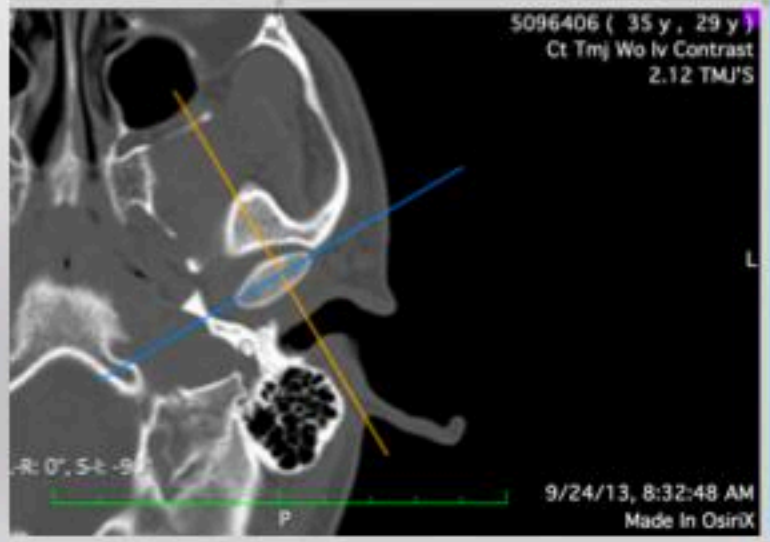
Condyle:	☑ Normal Size
	☑ Normal Shape
	☑ Cortex Intact
	☐ Cortex Even
Fossa:	☑ Normal Size
	☑ Normal Shape
	☑ Cortex Intact
Condyle Position	☐ Centered in fossa
Joint spacing	☑ Room for disc
CR Load Zone	☐ Superior medial

☑ Hypercalcification

☑ Condyle distalized

☑ Superior Lateral





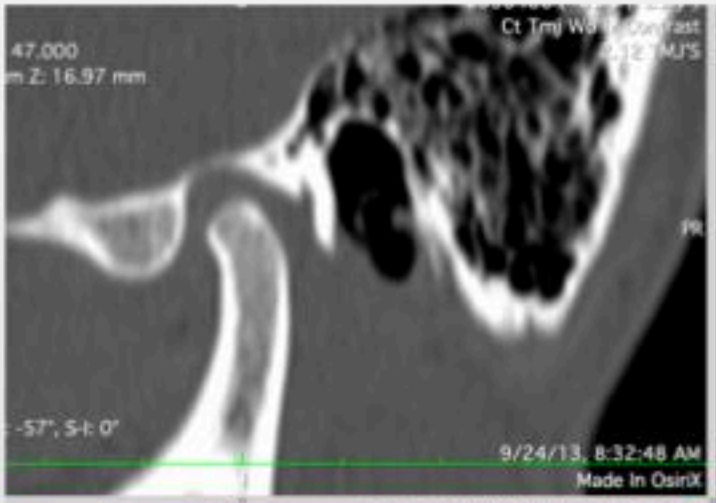
CT Right
Piper 4a-e

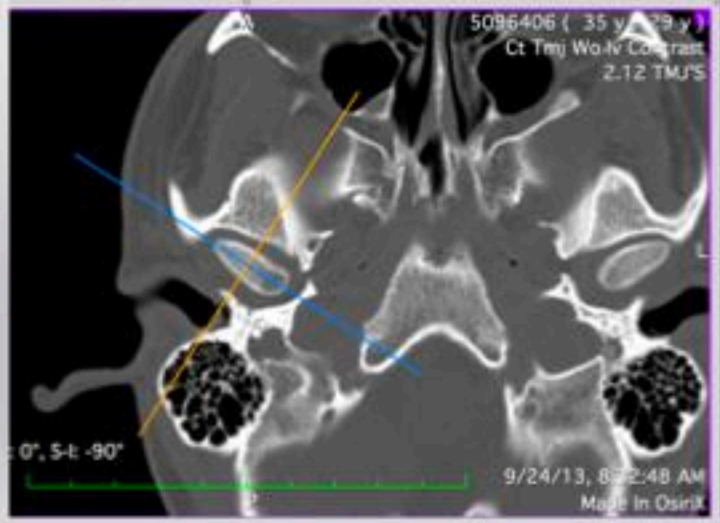
Condyle:	☑ Normal Size
	☑ Normal Shape
	☑ Cortex Intact
	☐ Cortex Even
Fossa:	☑ Normal Size
	☑ Normal Shape
	☑ Cortex Intact
Condyle Position	☑ Centered in fossa
Joint spacing	☑ Room for disc
CR Load Zone	☐ Superior medial

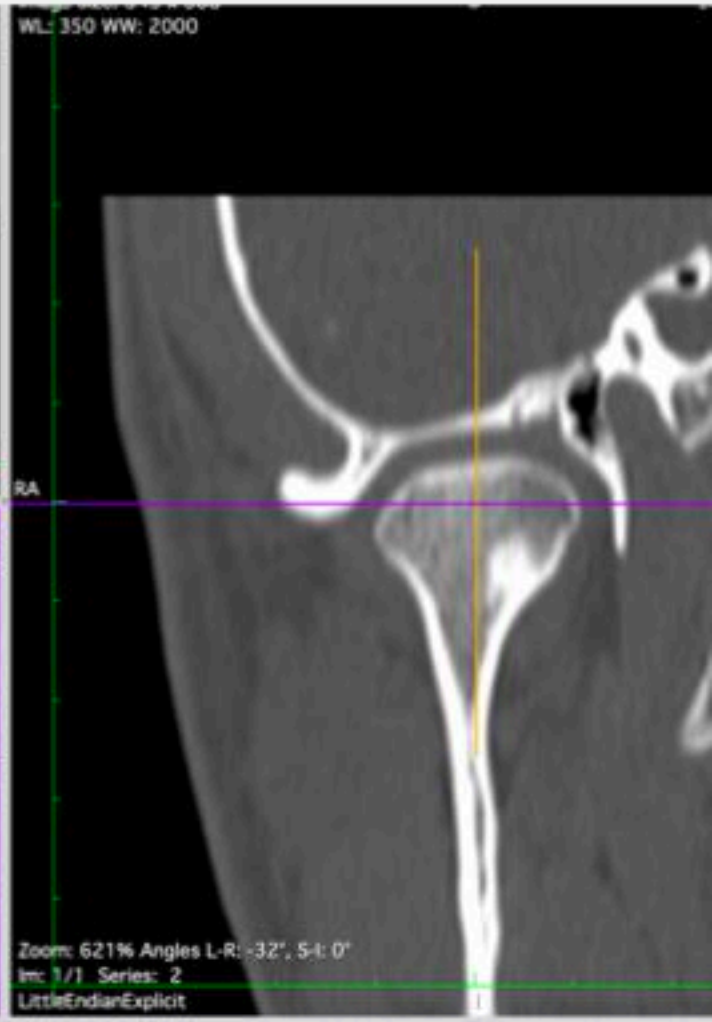
☑ Hypercalcification

☑ Superior Lateral

✔ Note: Large joint space





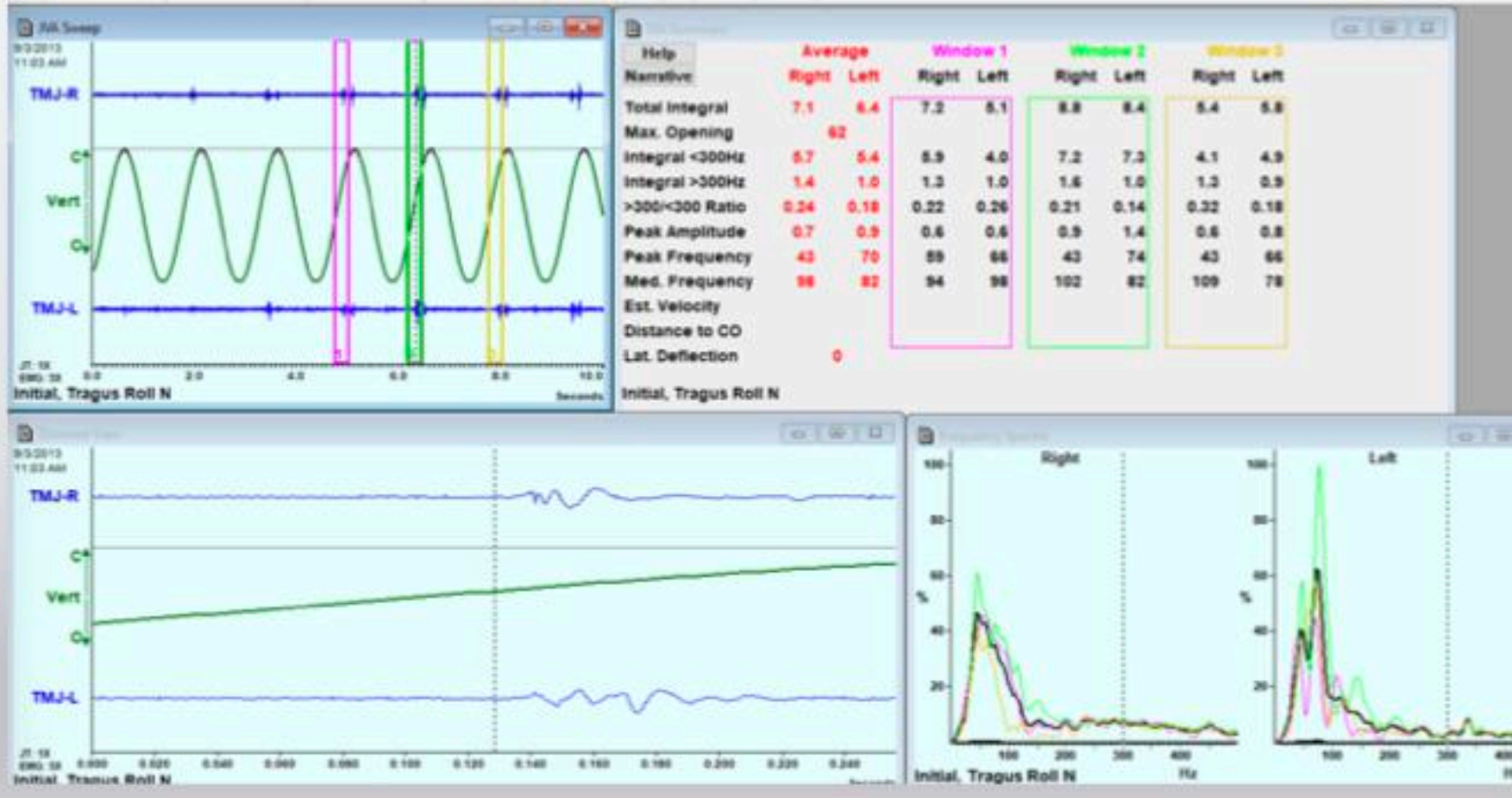


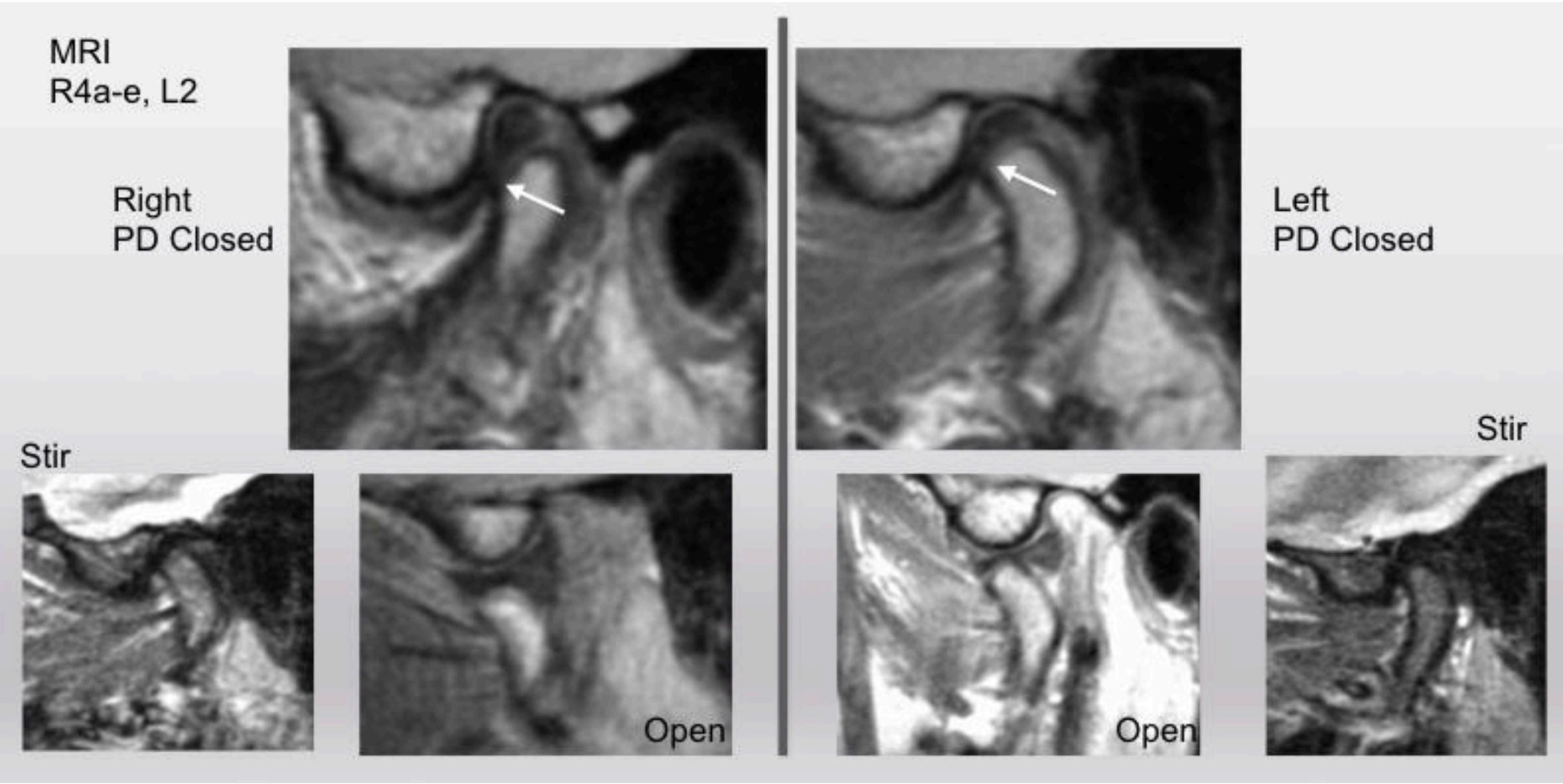
Slight Wobble before tooth contact

Joint subluxation on movement

Clinical Relevance?

Early damage from parafunction

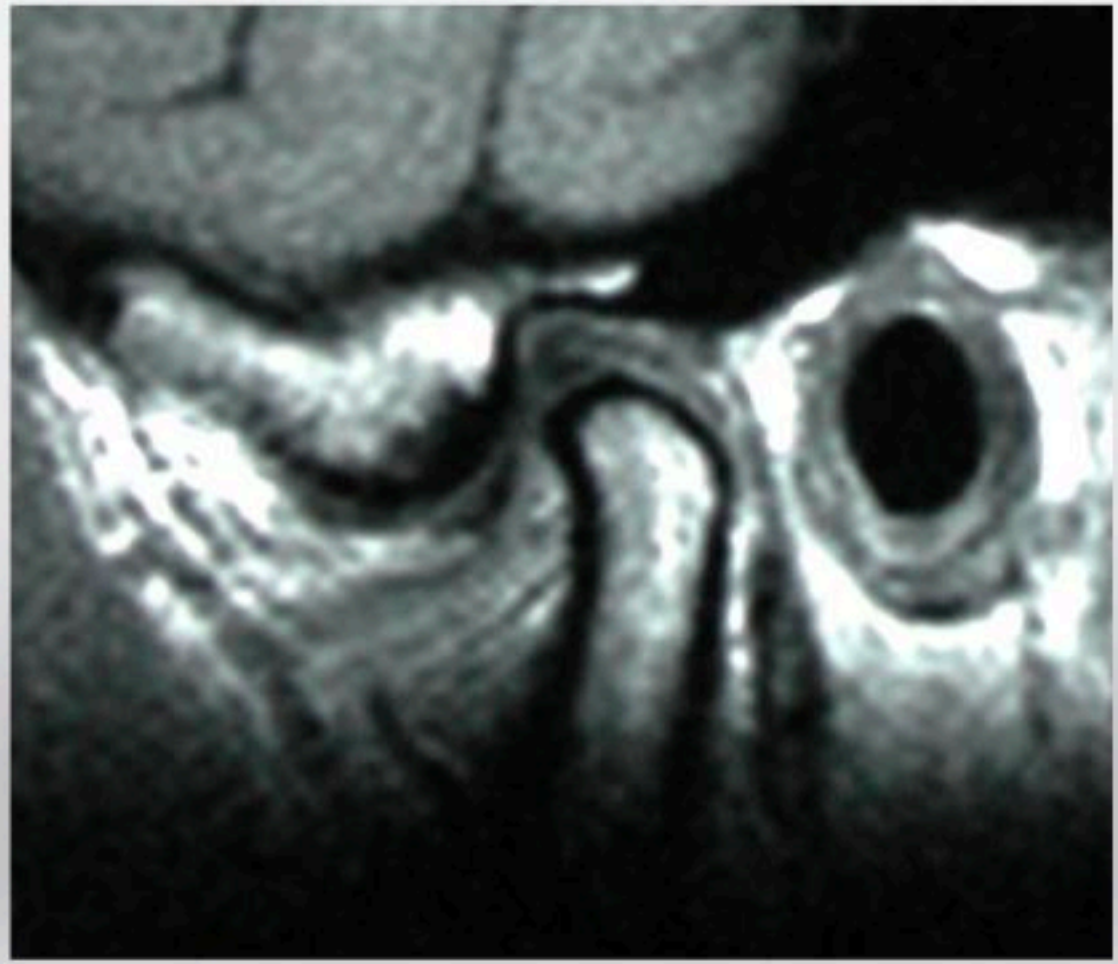



MRI
R4a-e, L2
Right
PD Closed
Left
PD Closed
Stir
Open
Open
Stir

Facial Pain Diagnosis

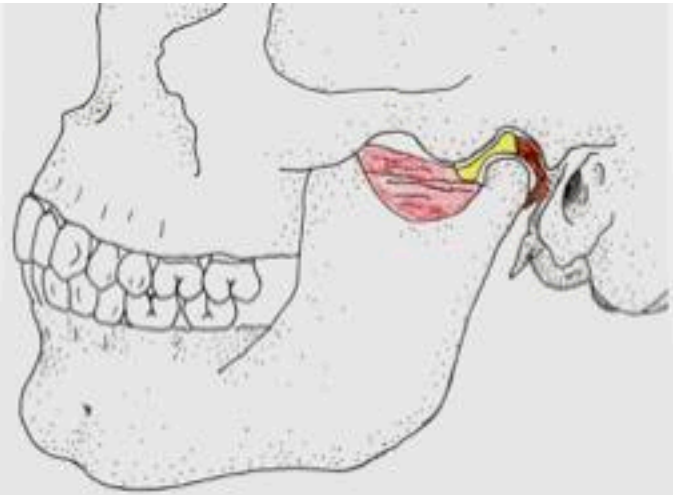
Diagnostic Tools

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



MRI- T1 Oblique Sagittal View

MRI you can see soft tissue



Find the...

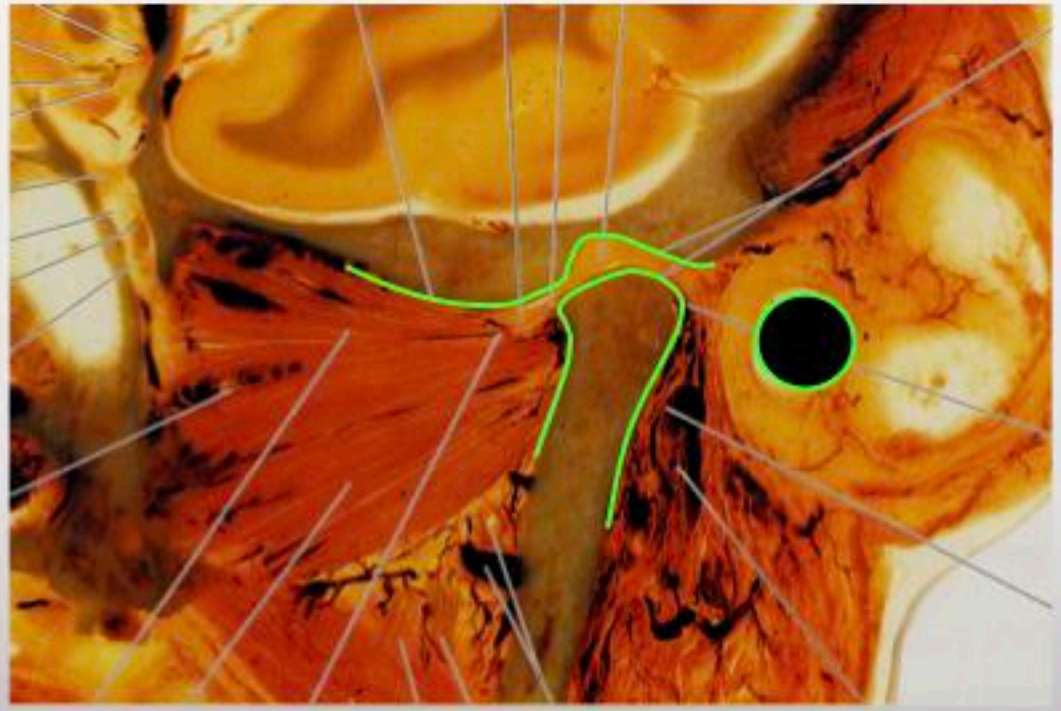
Ear

S-shaped Bone

Condyle

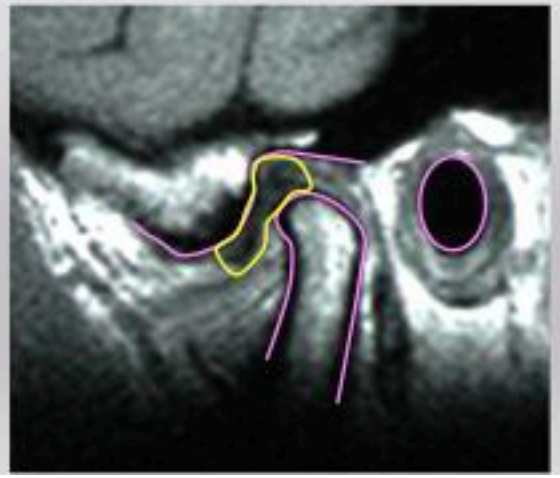
Disc

Oblique Sagittal View

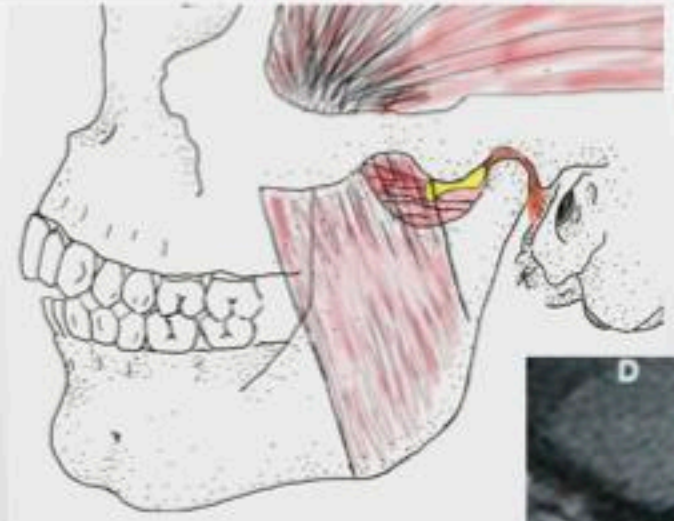


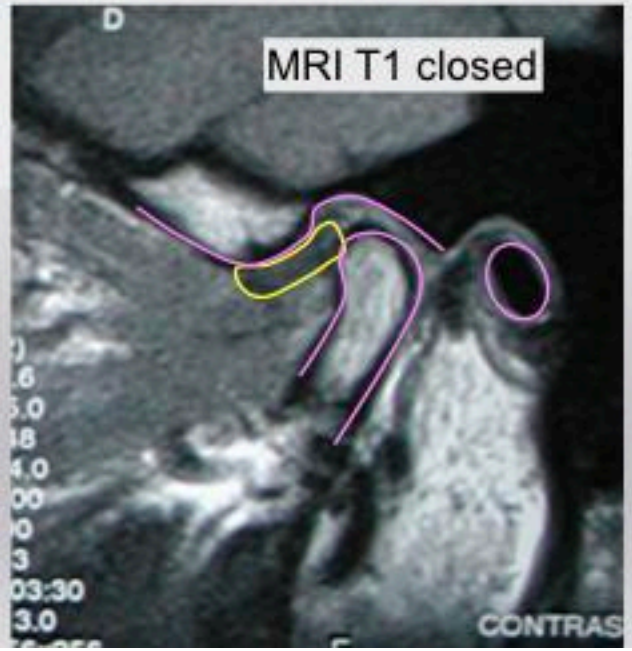
T1 Inverted

T1 Sagittal Closed



Dislocated Disc and Condyle Subluxation





MRI Scanners

MRI Scanner
1.5 Tesla
Magnet Strength

Open MRI Scanner
0.7 Tesla

Dual TMJ Coils

Shoulder Coil

How an MRI Works

Magnet lines up protons: Water and fat

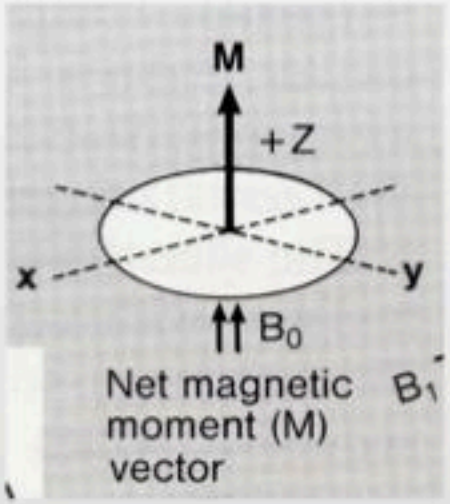
- Magnet is on the whole time

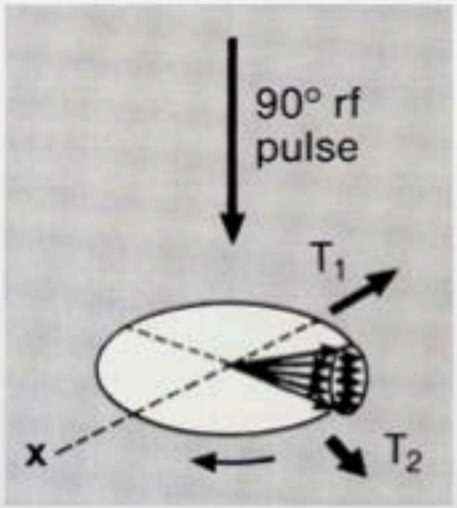
RF Pulse (Radiofrequency): 1 millisecond

- Knocks protons out of alignment

Time Constant: RF pulse off and then look

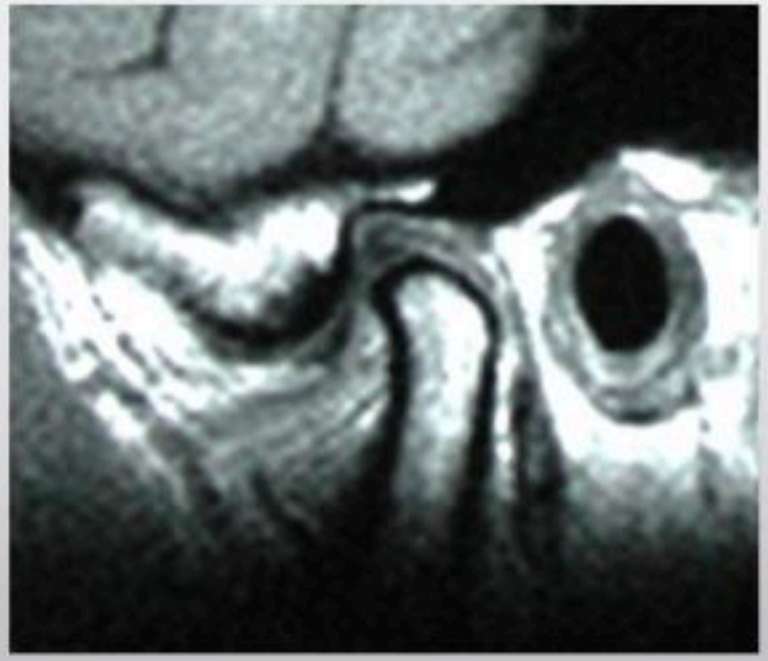
- T1 : Shows more fat
- T2 : Shows more water
- PD Proton Density- Between T1 and T2
- STIR Short T1 Inversion Recovery- Shows more water





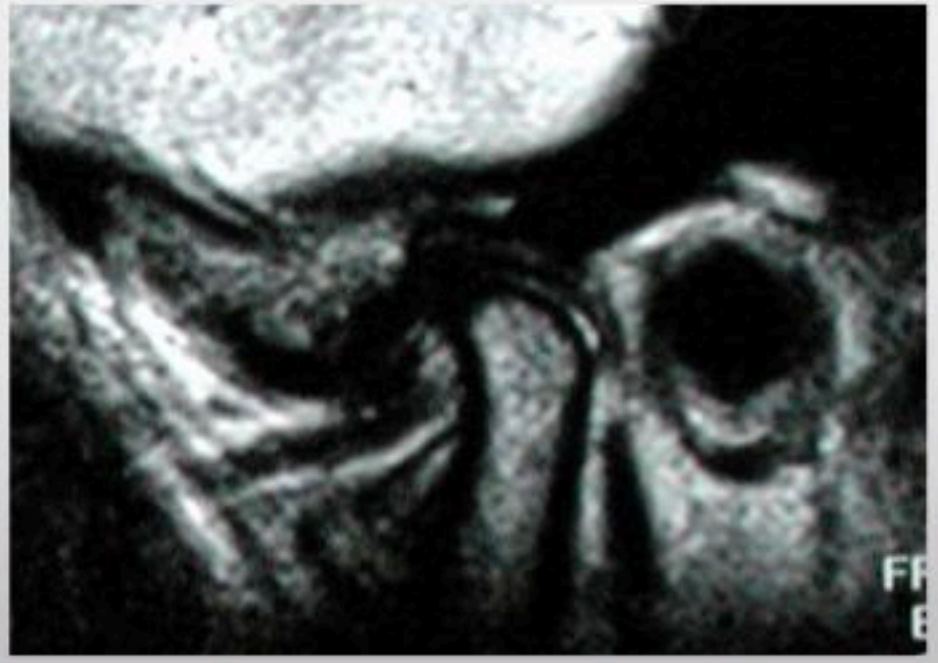
Normal MRI T1 and T2

T1 Sagittal Closed



T1 shows more fat

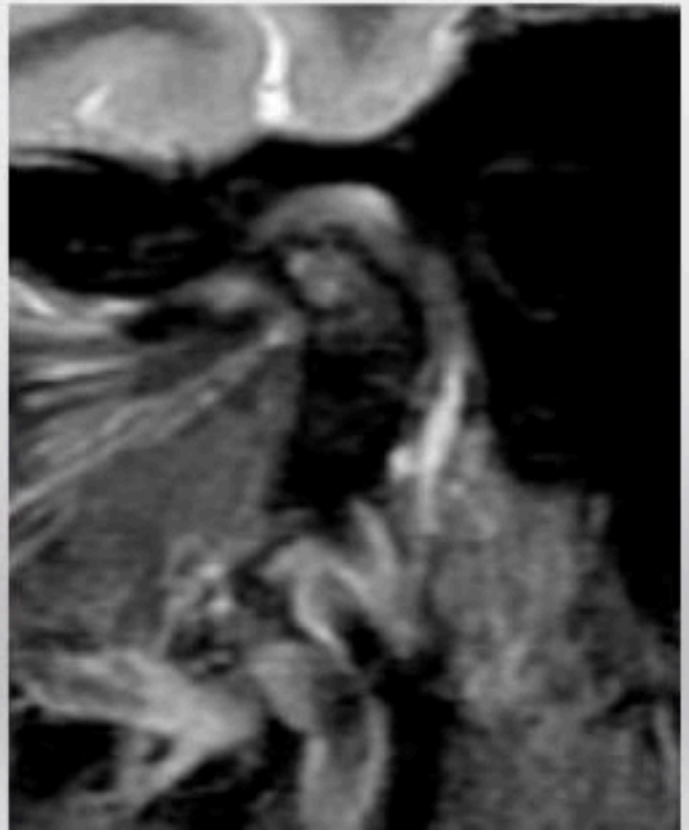
T2 Sagittal Closed



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

Facial Pain Diagnosis

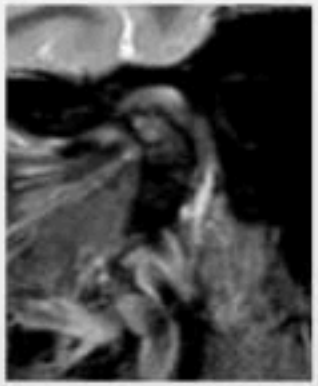
Diagnostic Tools

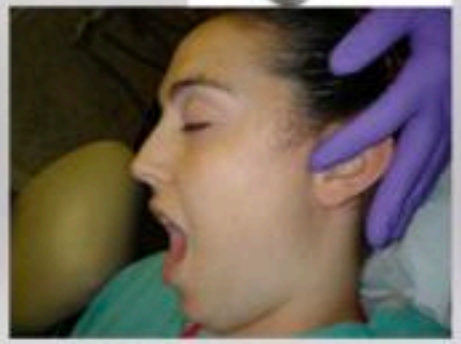
1 Written and Oral History
2 Observation
3 Physical Exam
- Muscle Palpation
- Joint Palpation
- Joint Auscultation
- Joint Motion

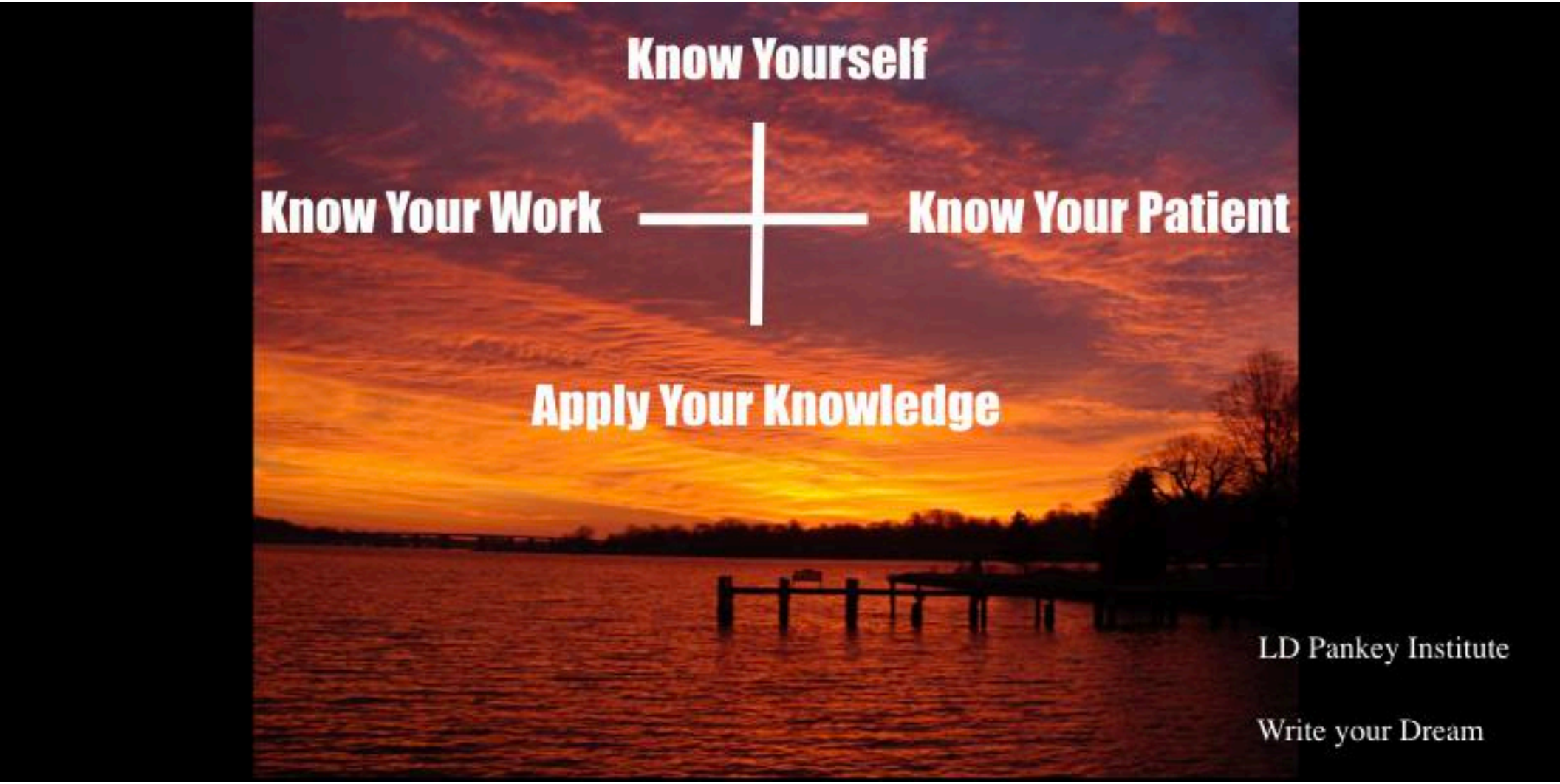
4 Anterior Stop Test
5 Sleep Airway Screening
6 CT Scan
7 MRI

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

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






Know Yourself
Know Your Work
Know Your Patient
Apply Your Knowledge
LD Pankey Institute
Write your Dream

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

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

1. TMJ Damage

Impingement Retrodiscal Tissue

Sprain Discal Ligament, Acute

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
Osteolysis Mandibular Condyle, Active
Perforation Meniscus, TMJ
Perforation Pseudodisc, TMJ
Psoriatic Arthritis TMJ
Rheumatoid Arthritis Sero Negative TMJ

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 **Patentcy** (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
Cervicocranial Syndrome
Muscle Guarding due Neck Instability
Trigger Point Neck Muscle with Referred Pain
Trigger Point Neck Muscle, Localized Pain

5. Parafunction

Excessive Tooth Wear, Damage
Hypersensitive Occlusion
Parafunction clech/grind wiggle
Parafunctional Clenching Teeth, Awake
Parafunctional Clenching Teeth, Sleep
Parafunctional Grinding Teeth, Awake
Parafunctional Grinding Teeth, Sleep
Parafunctional Tongue Bracing avoiding uncomfortable tooth contact
Parafunctional Tongue Bracing Neck stabilization
Parafunctional Tongue Bracing to maintain Airway
Parafunctional Tongue Bracing unknown cause

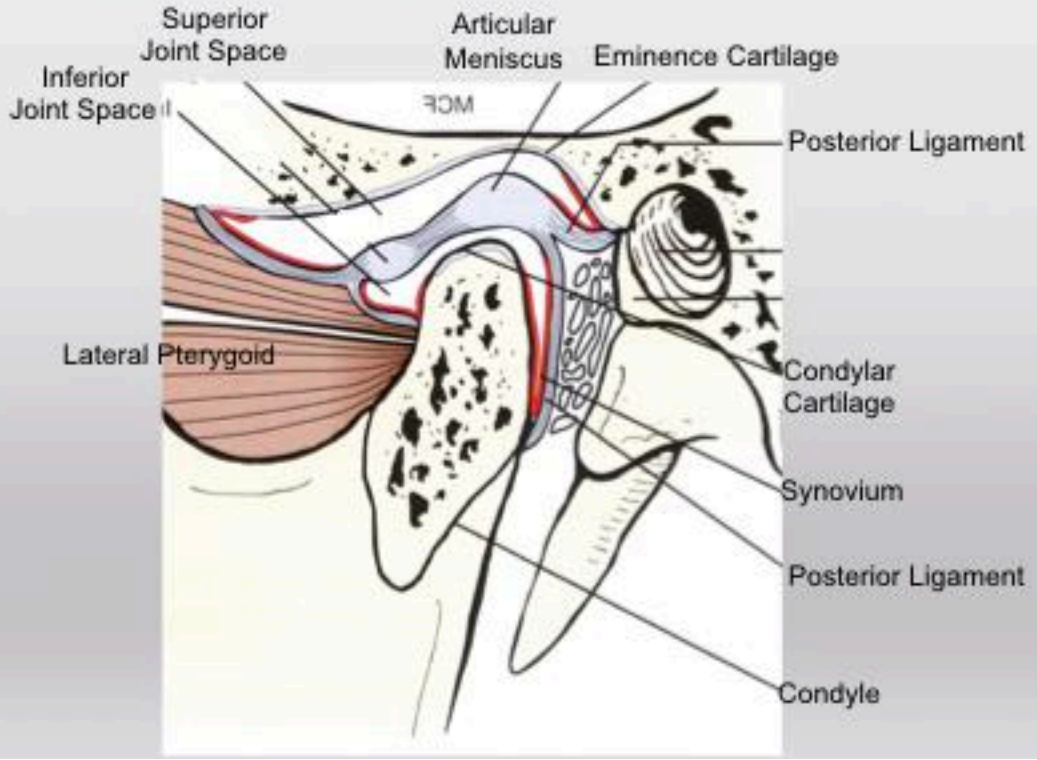
6. Whole Body / Systemic

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

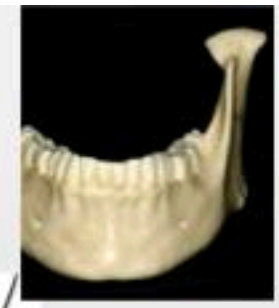
7. Other

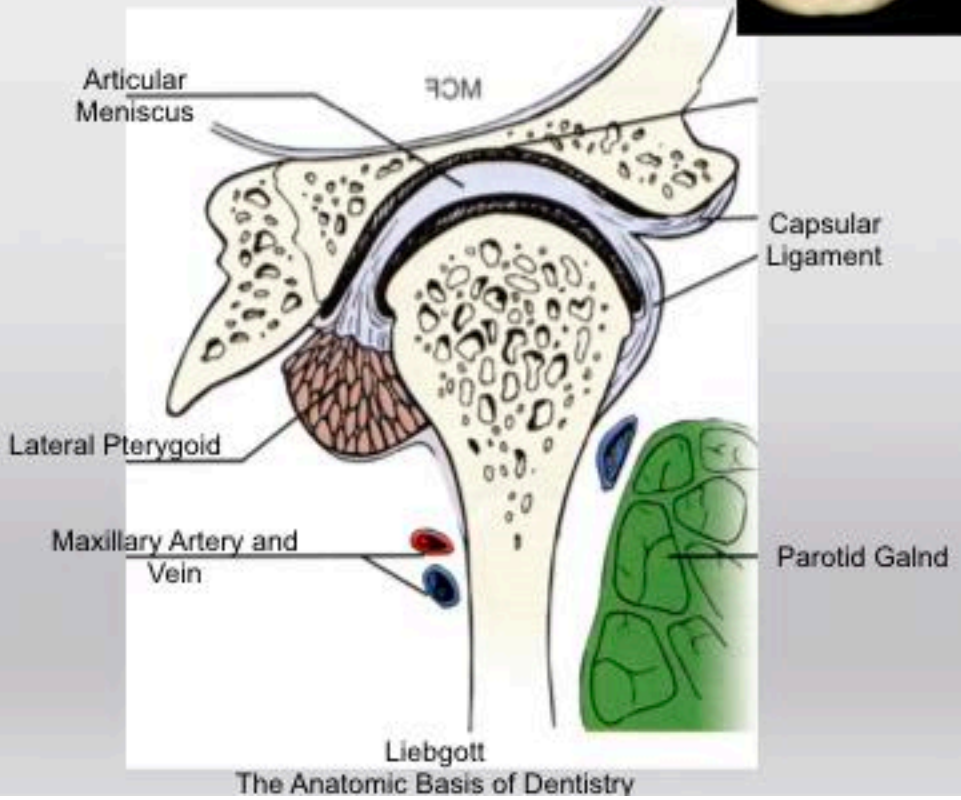
Nerve Entrapment Masseteric Nerve due to Masseteric hypertonicity
Neuroma Trigeminal Nerve
Obsessive-Compulsive Personality Disorder
Other
Otitis Ear Infection
Pain disorder exclusively related to psychological factors. Somatoform pain disorder
Pain disorder with related psychological factors

Left TMJ Sagittal View



Left TMJ Coronal View





Differential Diagnosis: Limited Joint Motion

Muscle Spasm

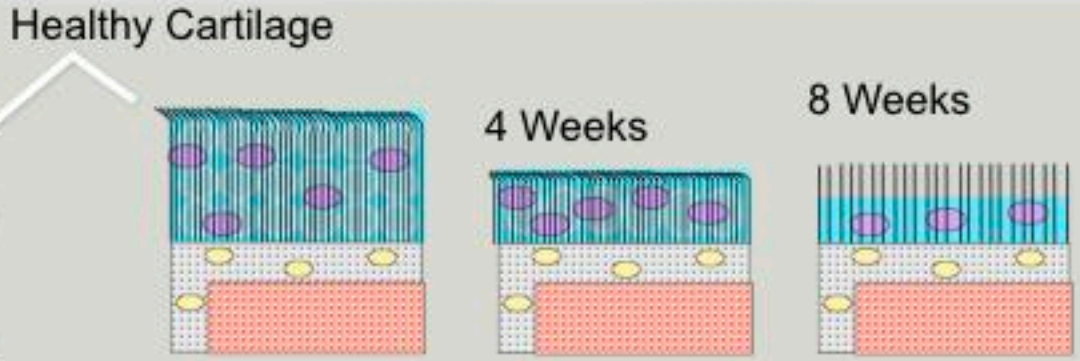
Painful to Move
- Joint Pain
- Muscle Pain

Mechanically Blocked
- 4b Acute Adhesion

Masseteric Space
- Infection
- Hematoma

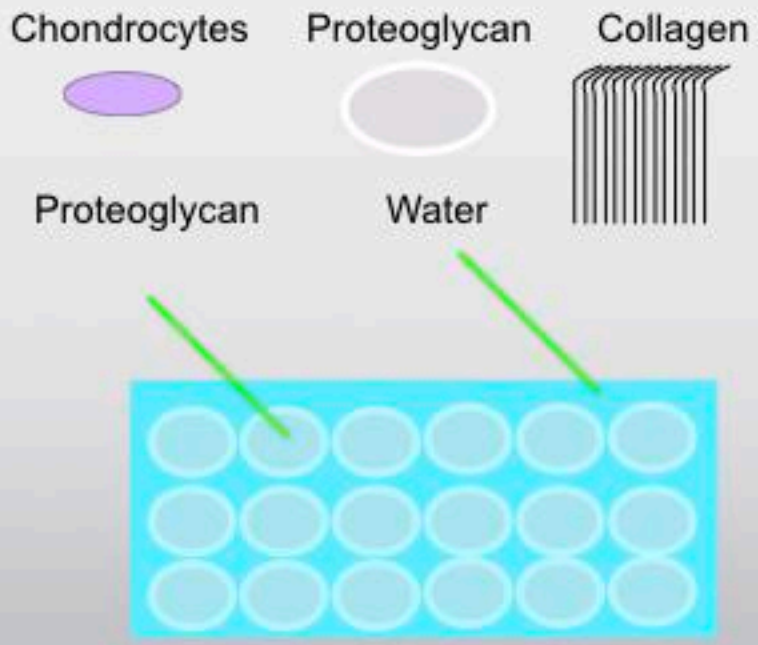
Lose 50% height of cartilage
Proteoglycans not being produced by Chondrocytes
Loss of 50% proteoglycans and water
Collagen still intact
Process is reversible
Move joint with light force/repetitive motion next 30 days

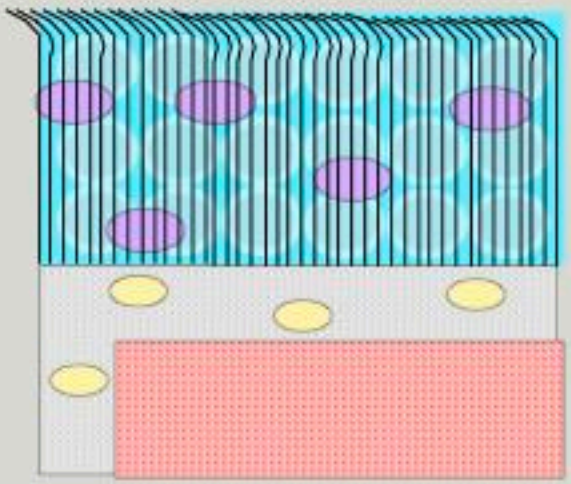
You have 6-8 weeks to get jaw moving before cartilage is irreversibly damaged, independent of the cause of the immobilization



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

Healthy Cartilage





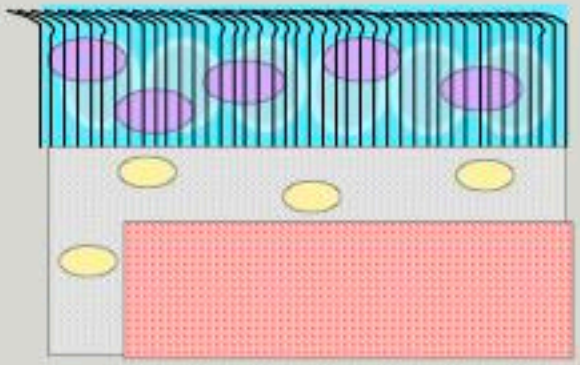
Enneking WF, Horowitz M. The intra-articular effects of immobilization on the human knee. J Bone Joint Surg Am. 1972 Jul;54(5):973-85. PMID: 5068717

Immobilization 4 weeks

Half as many "Balloons"
Still have "Ropes"

Proteoglycans not being produced by Chondrocytes
Collagen still intact
Process is reversible at 4 weeks
Move joint with light force/repetitive motion next 30 days

Half as many proteoglycans so
half as much water so
half as much cartilage height



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Immobilization 8 weeks

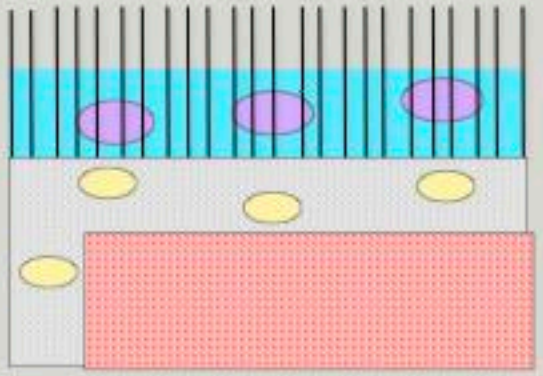
"Ropes" Degenerate

Permanent joint damage in previous healthy joints

The cartilage is irreversible damaged
- Collagen is irreversible damaged.
- The proteoglycans have no way to attach in the cartilage matrix

Adhesions form between the joint surfaces
Connective tissue proliferates into the joint
Fibrous contracture of the muscles and joint capsule

Key Point:
In a patient with limited opening, you have 4 weeks to get the jaw moving.
At 8 weeks, there is permanent damage to the TMJ, even if it was not the original cause of the limited opening



Differential Diagnosis: Limited Joint Motion

Muscle Spasm

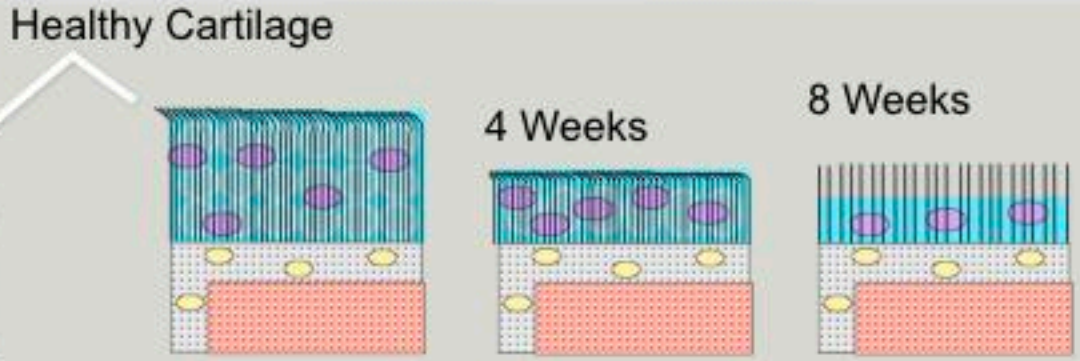
Painful to Move
- Joint Pain
- Muscle Pain

Mechanically Blocked
- 4b Acute Adhesion

Masseteric Space
- Infection
- Hematoma

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

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



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Limited Opening Algorithm

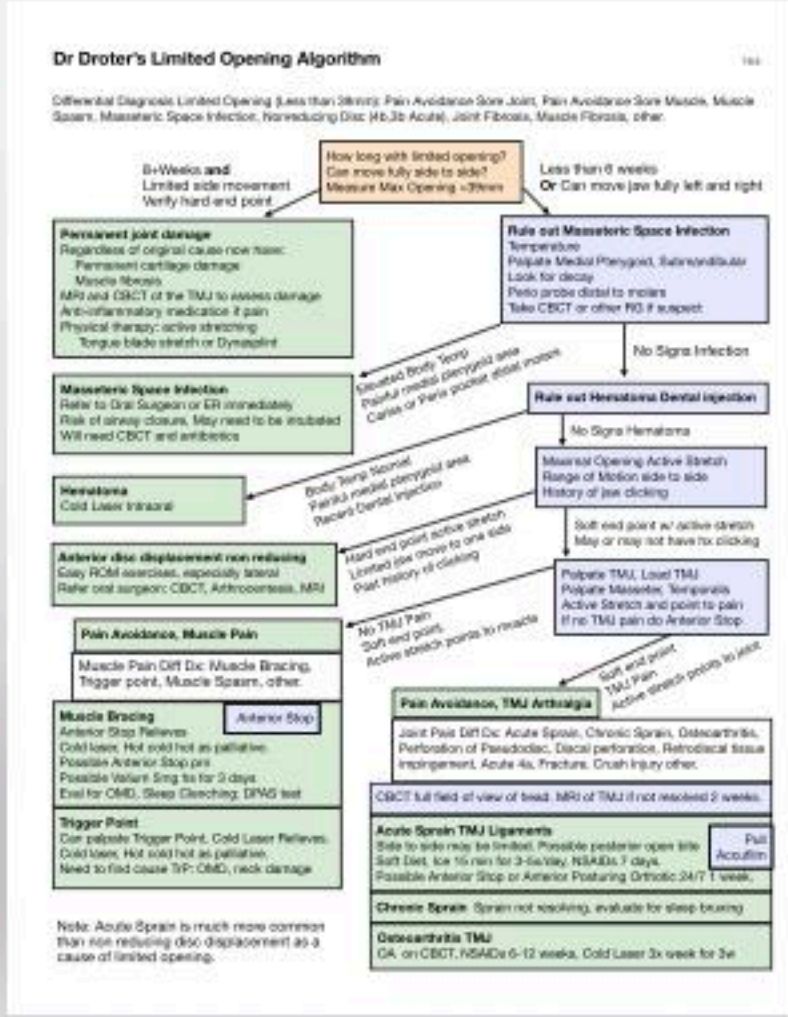
Differential Diagnosis Limited Opening:

- Pain Avoidance Sore Joint
- Pain Avoidance Sore Muscle
- 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 indicated CBCT, MRI



Subjective:

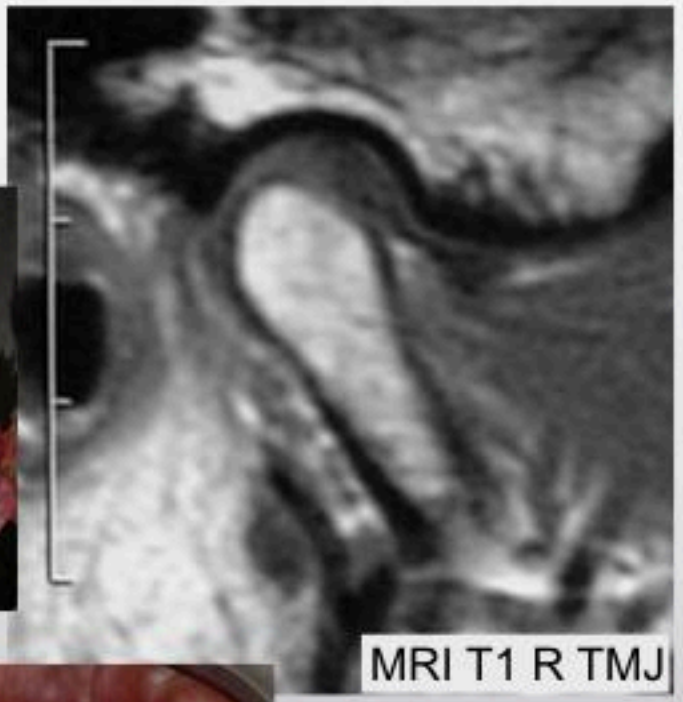
Dentist doing crown prep #30 1 week ago
Severe pain Right TMJ after moving jaw at end of appt
Constant deep pain Right TMJ
Limited opening

Objective:

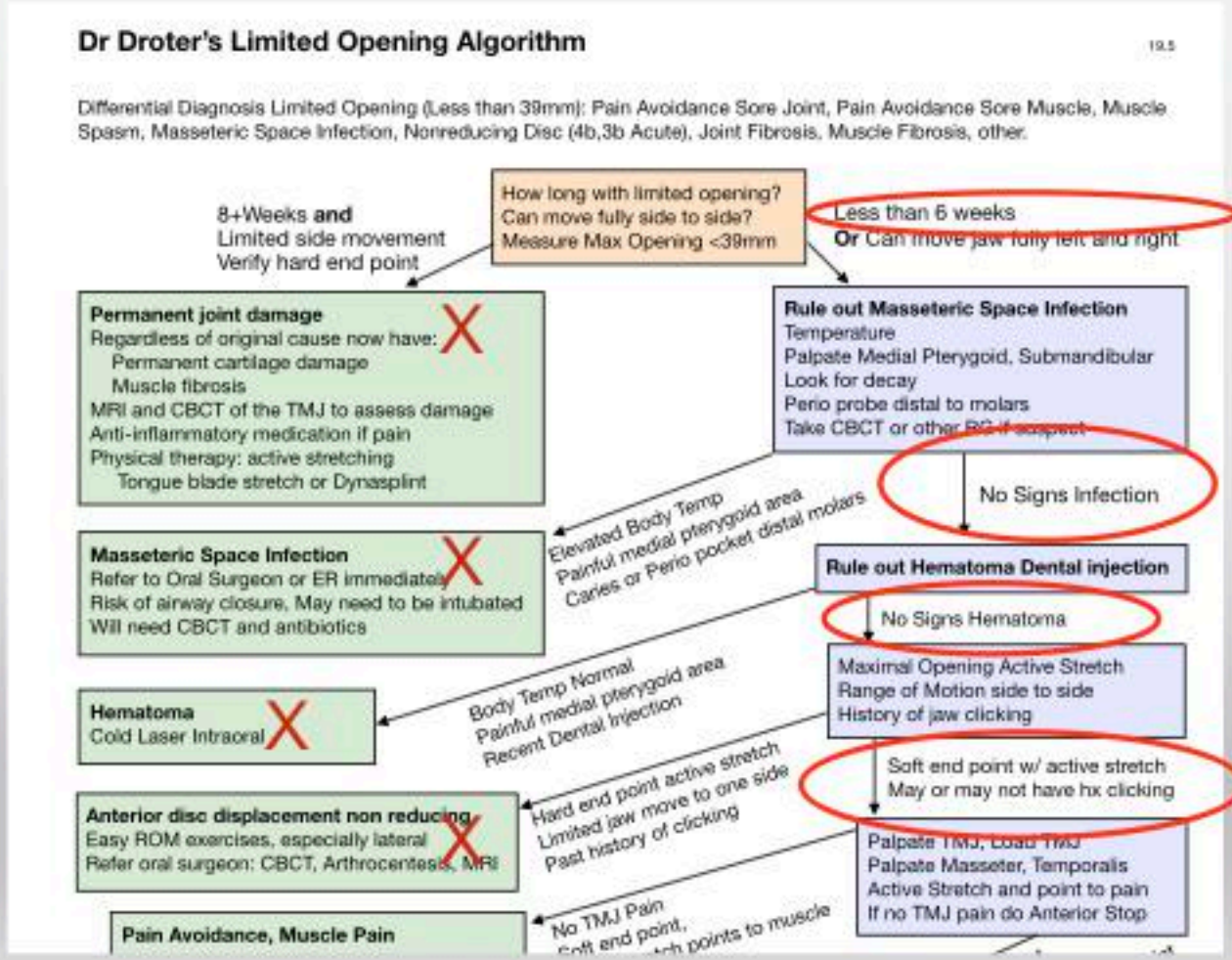
Limited opening 32mm, Mandible shifts Left
Normal side to side motion
98 temp, normal perio probe 2nd molars, no caries
No pain palpation RL Medial Pterygoid
Soft end point on active stretch, 45mm, R TMJ pain
Right TMJ pain to palpation, Left TMJ normal
Posterior openbite Right, does not hold Accufilm

Assessment:

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



MRI T1 R TMJ



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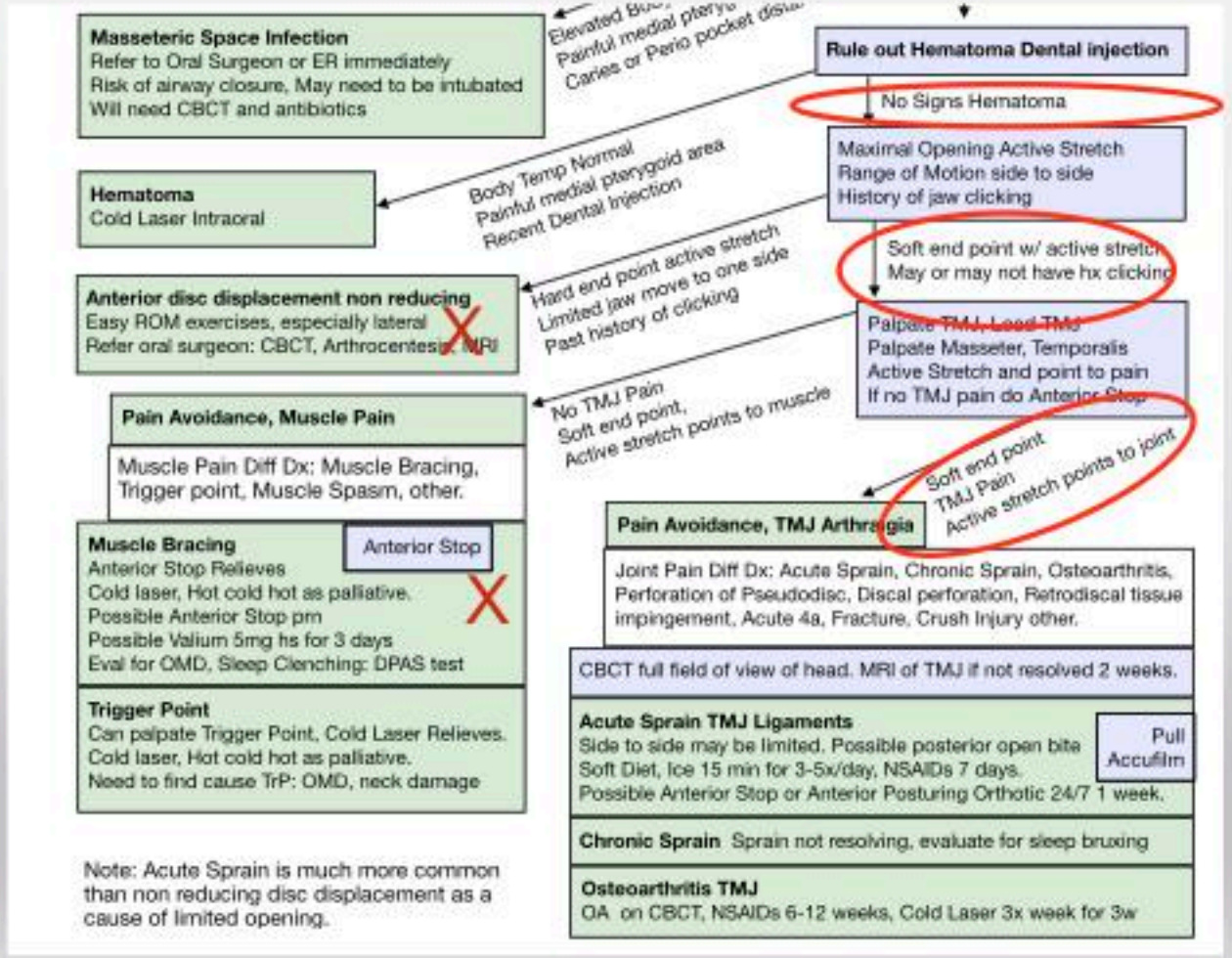

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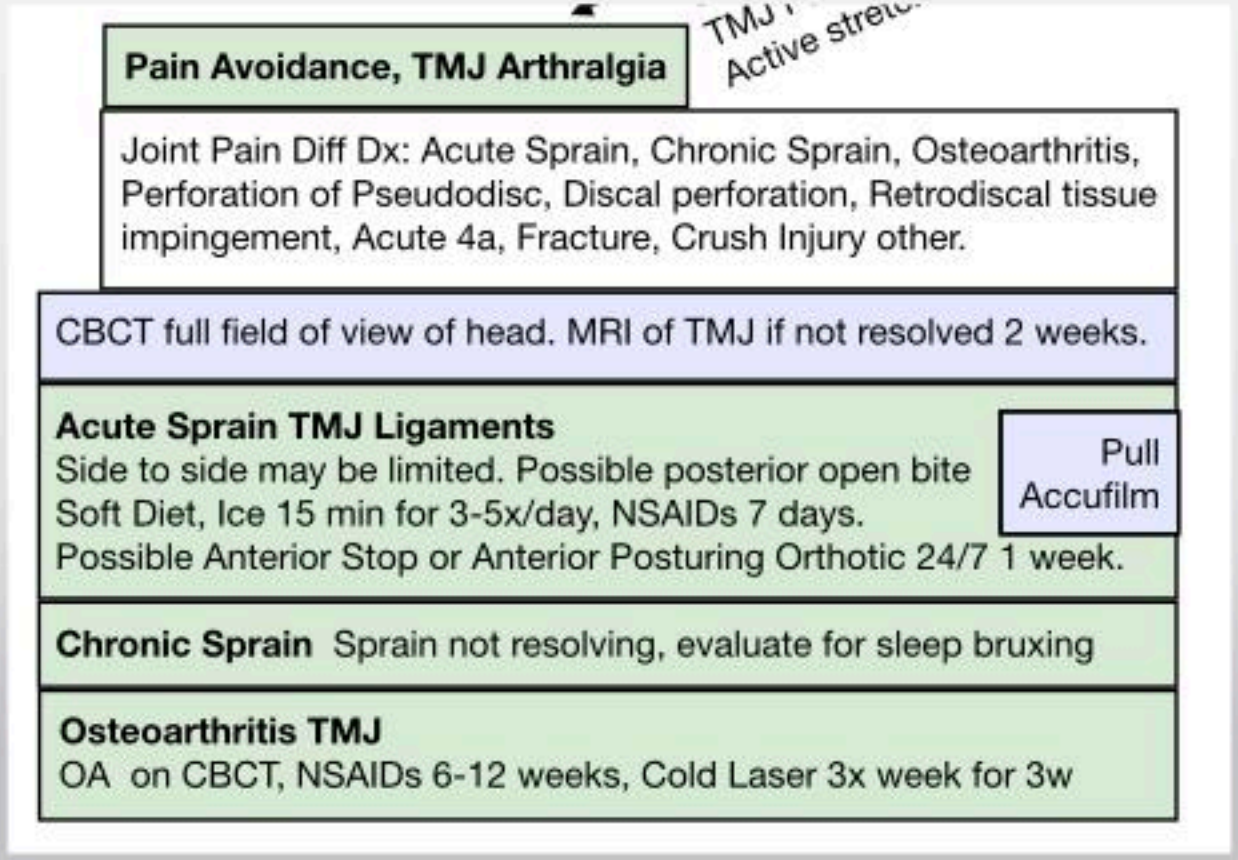

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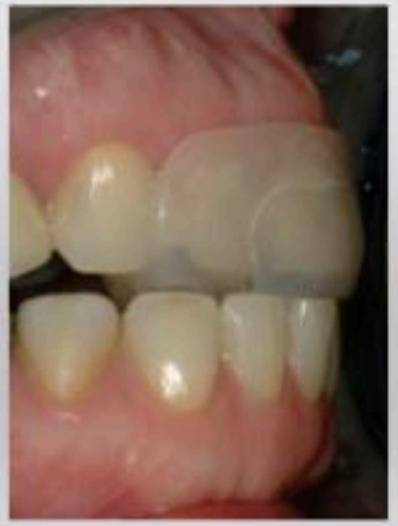
Posterior openbite Right, does not hold Accufilm

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

Verify Orthotic does not rub lingual tissue of mandible



At 4 weeks patient had full ROM
No clicking

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

MLS Laser

Multiwave Locked System Laser

808 nm Continuous, 905 nm Pulsed

Stimulates metabolic processes in cells
Decrease inflammation
Pain Reduction
Faster Healing

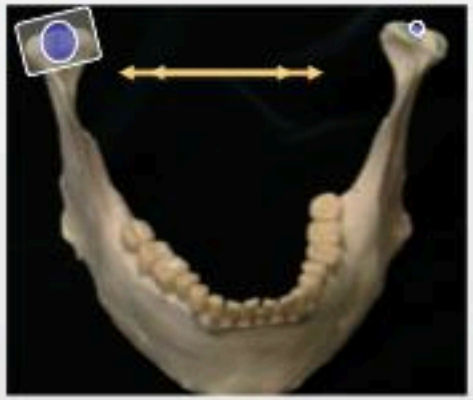
Diode Laser

What if a Centric Relation Orthotic Does Not Work?

John R Droter DDS
Annapolis, Maryland

www.jrdroter.com

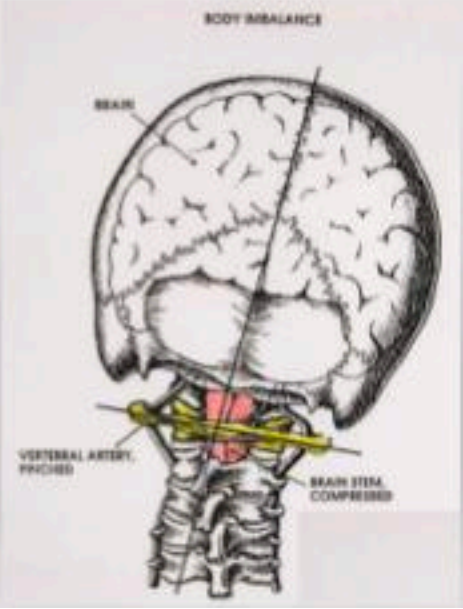
Differential Diagnosis:
CR Orthotic not working



Verify CR Orthotic well executed:

- No rocking- hard, solid fit
- No Nonworking or working interferences
- No Anterior Arc of Closure Interferences
- Harmonious Anterior guidance

Painful CR
Disharmonious Anterior Guidance- Condylar Guidance has changed
Joint Subluxation - CR joint subluxation on load
Joint Subluxation- Translatory joint subluxation
Neck Instability- Masseter and Tongue helping to stabilize
Habitual Postured Forward Maximal Intercuspation (> 2mm)
Other



Differential Diagnosis: CR Orthotic not working

Verify CR orthotic well executed:

- **No rocking- hard, solid fit**
- **No Nonworking or working interferences**
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- **Harmonious Anterior guidance**

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Neck Instability- Masseter and Tongue helping t
Habitual Postured Forward Maximal Intercuspat
Other

Haddix CR Orthotic by Dr. Droter

Anatomic Orthotic by Dr. Buzz Raymond

Differential Diagnosis: CR Orthotic not working

CNS will avoid a painful movement.
If a condyle seated in CR is painful, the body will avoid that movement

Verify CR orthotic well executed:

- No rocking- hard, solid fit
- No Nonworking or working interferences
- No Anterior Arc of Closure Interferences
- Harmonious Anterior guidance

Painful CR

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Joint Subluxation- Translatory joint subluxation
Neck Instability- Masseter and Tongue helping to stabilize
Habitual Postured Forward Maximal Intercuspation (> 2mm)
Other

Treatment: Move and support the condyle forward out of the fossa

Differential Diagnosis:
CR Orthotic not working

Verify CR Orthotic well executed:

- No rocking- hard, solid fit
- No Nonworking or working interferences
- No Anterior Arc of Closure Interferences
- Harmonious Anterior guidance

Painful CR

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Joint Subluxation - CR joint subluxation on load

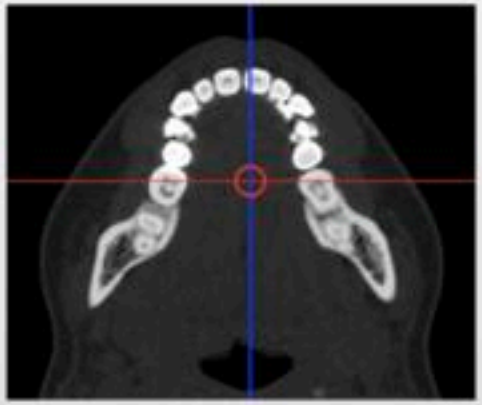
Joint Subluxation- Translatory joint subluxation

Neck Instability- Masseter and Tongue helping to stabilize

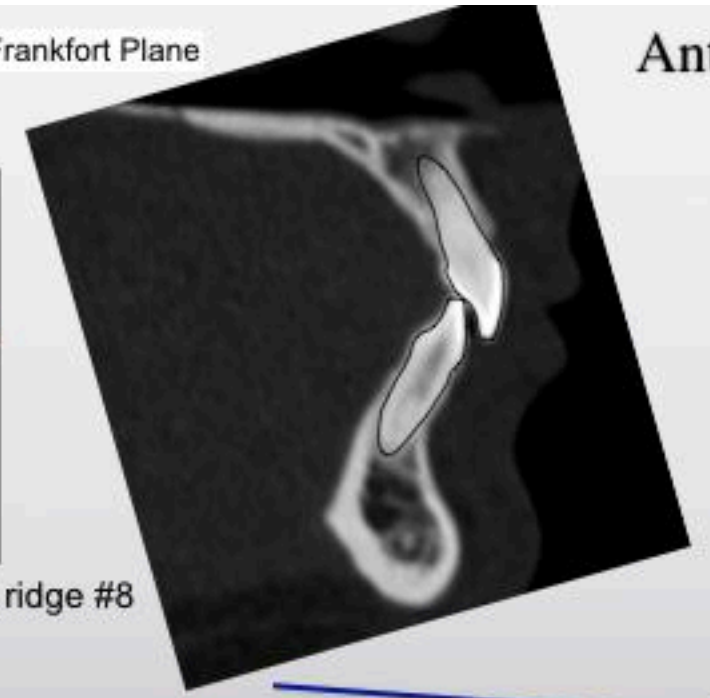
Habitual Postured Forward Maximal Intercuspation (> 2mm)

Other

Corrected for Frankfort Plane

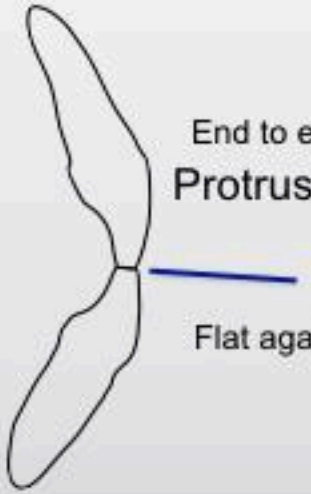


Slice through mesial marginal ridge #8



Anterior Guidance

MaxIC



End to end

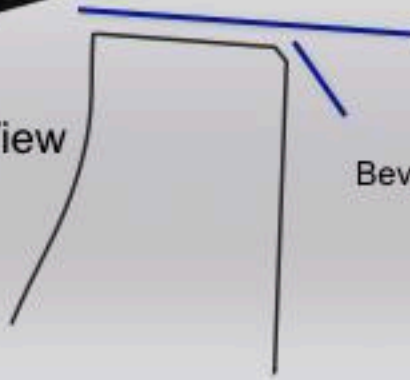
Protrusion

Flat against Flat

For muscle harmony, it is critical to have a flat against a flat with the right pitch

Pitch

Lower Zoom View



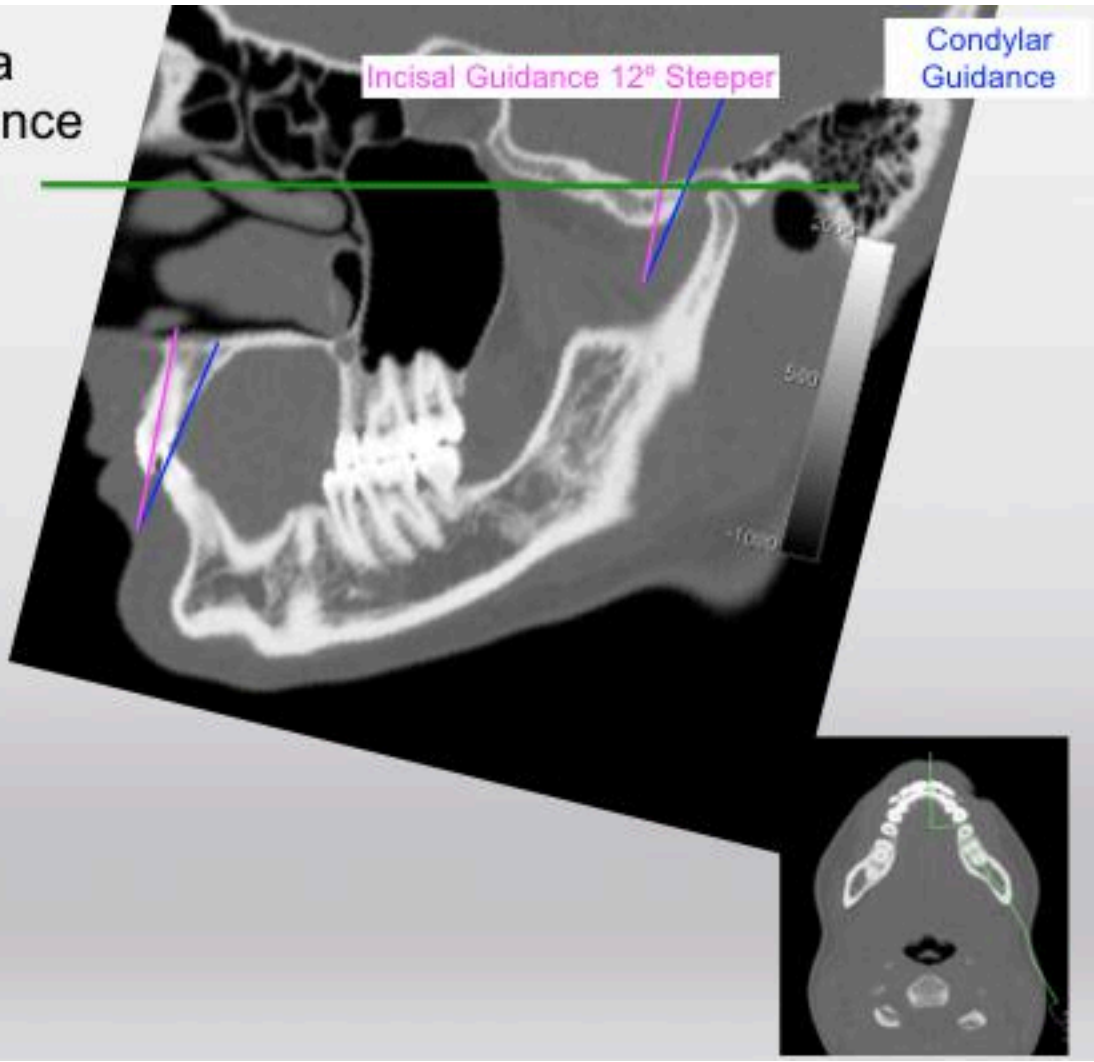
Bevel

Posterior teeth separate in excursion due a combination of Condylar and Incisal Guidance

There is no direct correlation between Condylar and Incisal Guidance.

They must be harmonious, as measured by harmonious muscles.

It is unique for each patient.



Harmonious Anterior Guidance

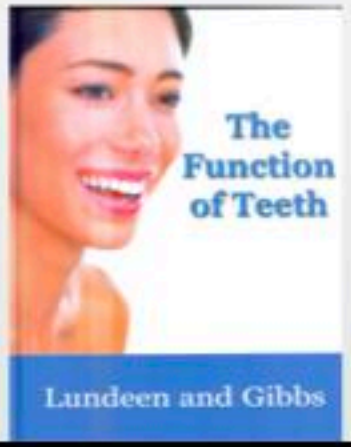
Goal- Muscles contract at a consistent rate through the whole movement.

For Muscle Harmony in Protrusion:
- Even Contact Right and Left
- Solid flat when end to end
- Pitch perpendicular to arc of closure

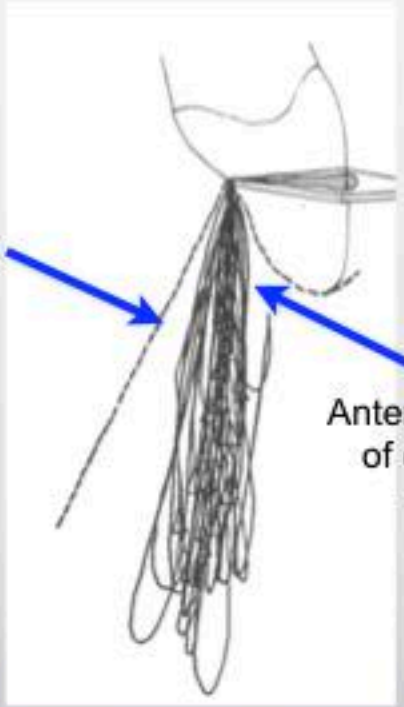
For Muscle Harmony in Lateral Excursion:
- Same Cuspid Guidance Angle Right and Left
- Solid flat when end to end
- Smooth Crossover- consistent condylar rotation

Smooth Transition

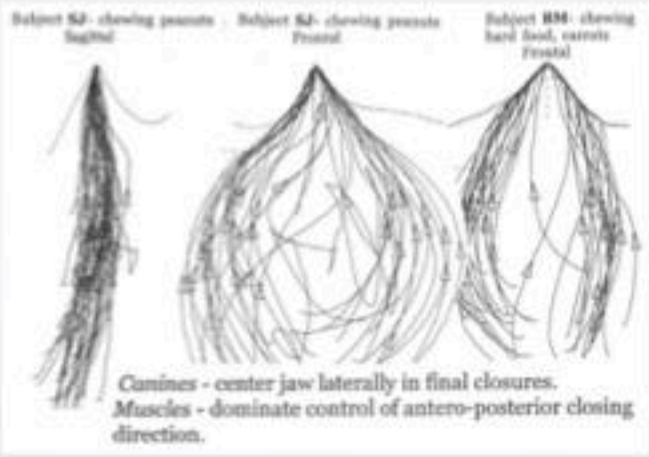
Drop off



Arc of Closure



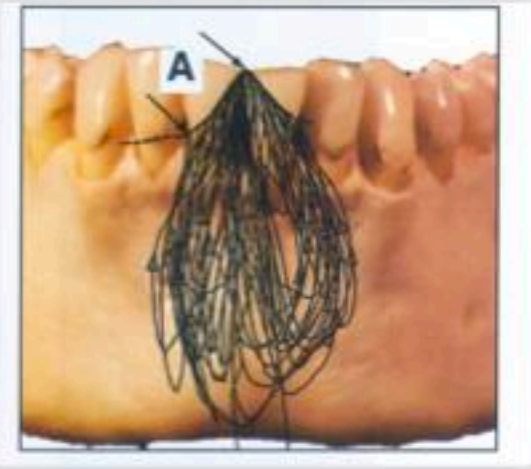
Anterior border of chewing zone

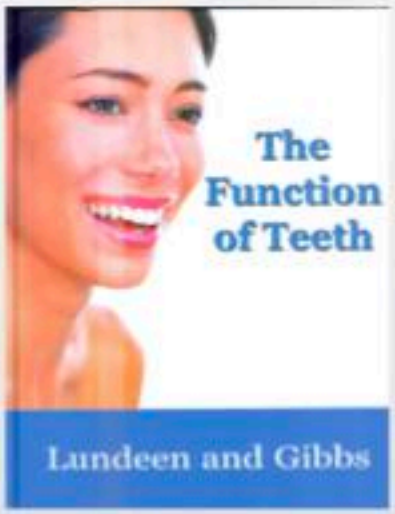


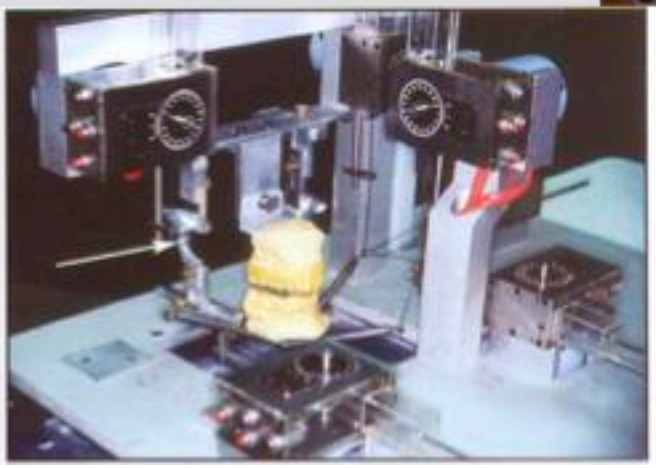
Cuspids guide the lower jaw in lateral chew stroke

Incisors need to not interfere with chewing and arc of closure

Incisors need to provide crossover







University of Florida 1982

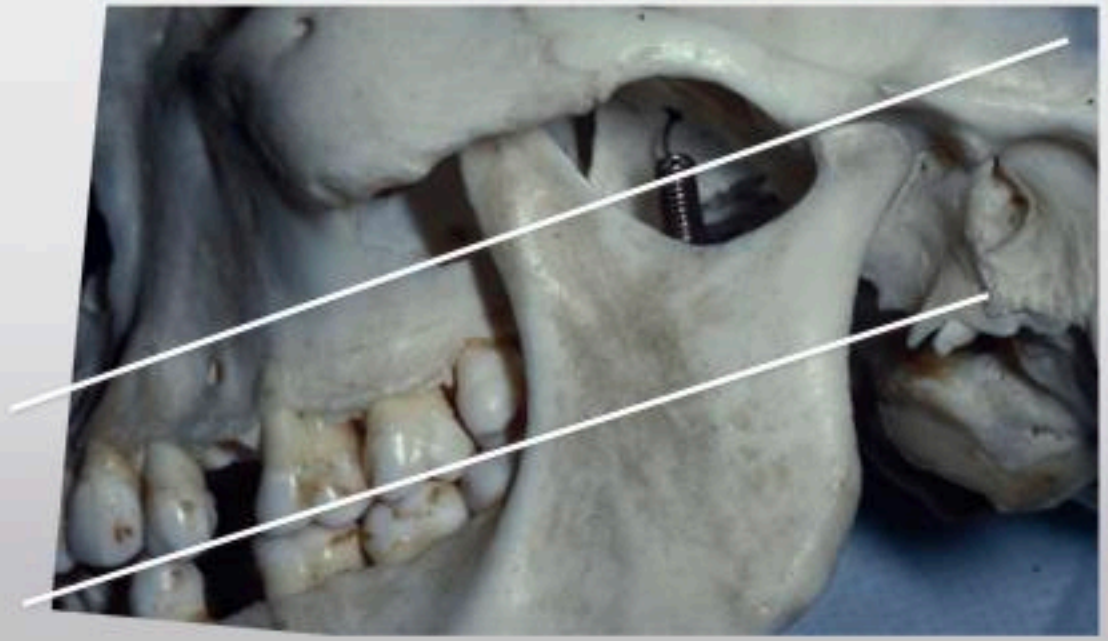
25 years later

My Office 2007

Osteoarthritis
Bone Loss

CR Load Zone is now on the zygoma

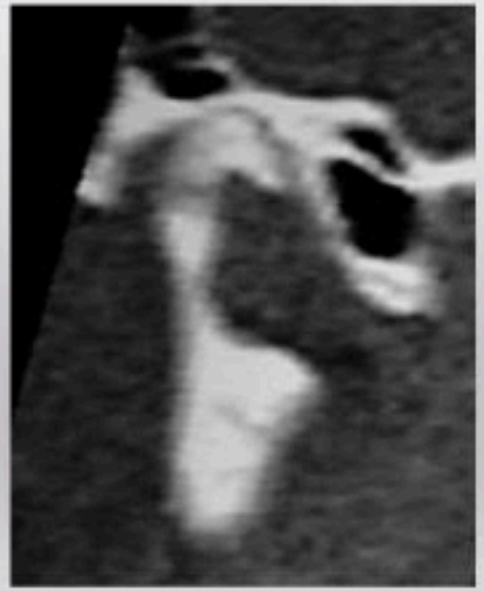
Condylar guidance has become shallower



Adaptation Chronic Bilateral OA

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

OA Right and Left Bone Loss
#8 Ankylosed



Osteoarthritis and Adaptation of Condylar Guidance and Anterior Guidance

Condylar guidance becomes shallower

Right and Left condylar guidances may now be different so in protrusion uneven anterior loading

Condylar bone loss causes heavy posterior contact and anterior open bite

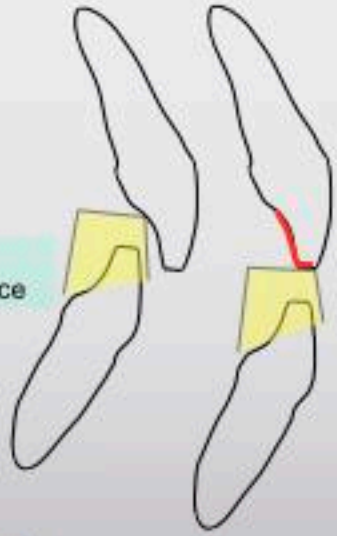
Anterior open bite corrects with anterior tooth movement resulting in steeper anterior guidance

Muscle disharmony from steeper anterior guidance and shallower condylar guidance

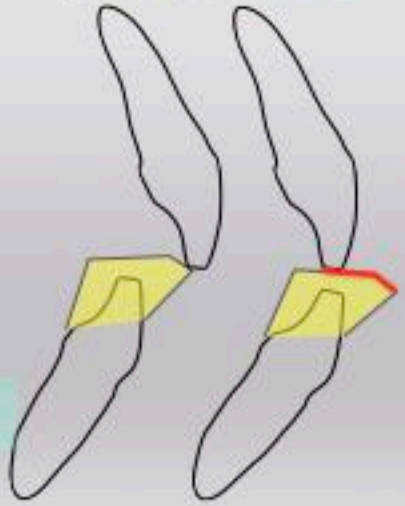
You will need to shallow out and level out the anterior guidance to reestablish muscle harmony

Which Appliance to use for OA?

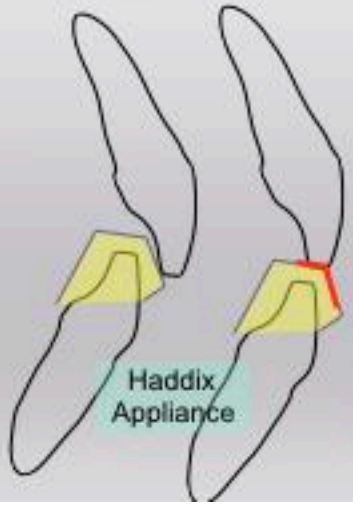
Need to discover the new anterior guidance that will work with the new condylar guidance



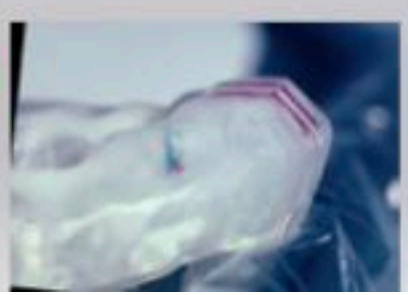
Tanner Appliance



Shallow Guidance

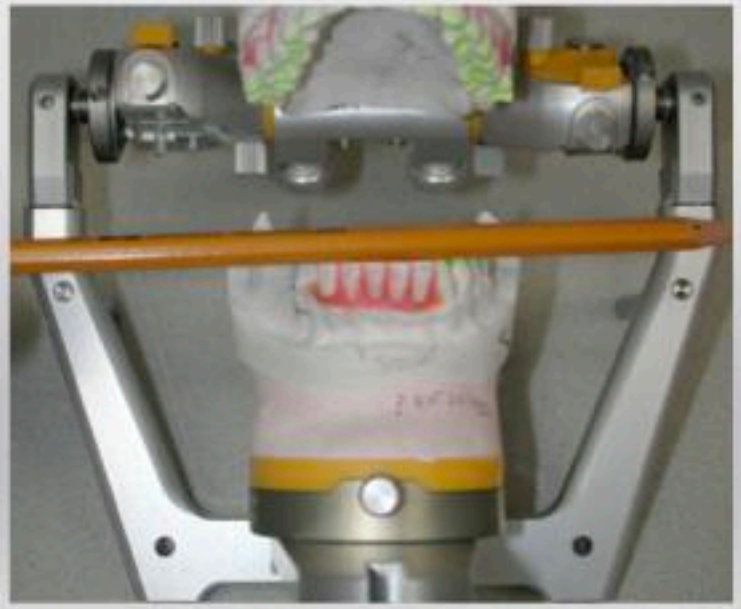


Haddix Appliance



OA Restorative Considerations

Shallow out anterior guidance
Compensate for uneven protrusive guidance
Yearly occlusal refinement lower molars

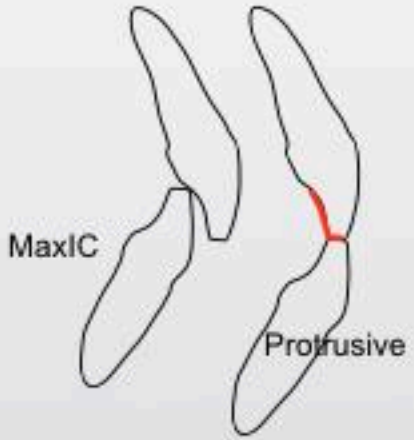


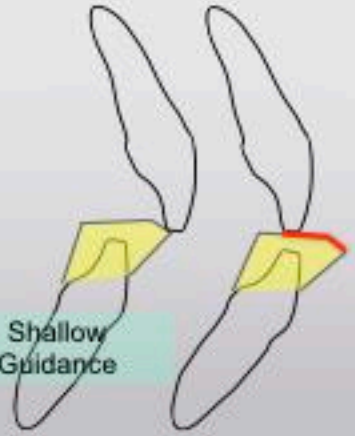
Anterior Guidance

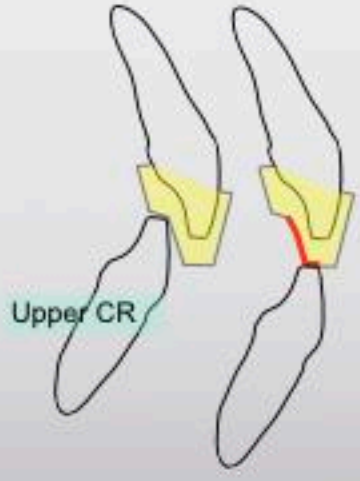
Muscle Coordination

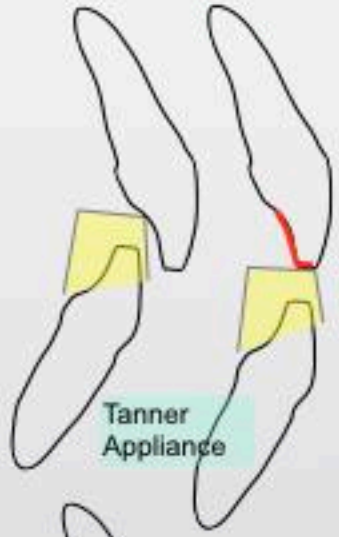
Best
Worse

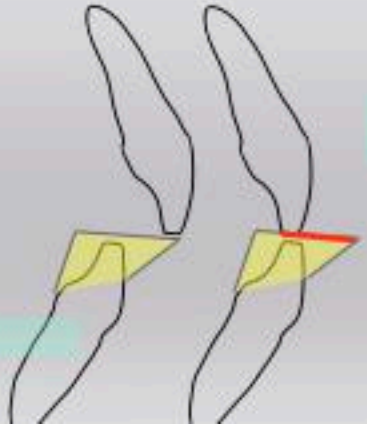
- Harmonious anterior guidance/condylar guidance
- Shallow/flat anterior guidance
- No anterior guidance
- Disharmonious anterior guidance/condylar guidance
- Too Steep anterior guidance
- Anterior teeth in the way of arc of closure

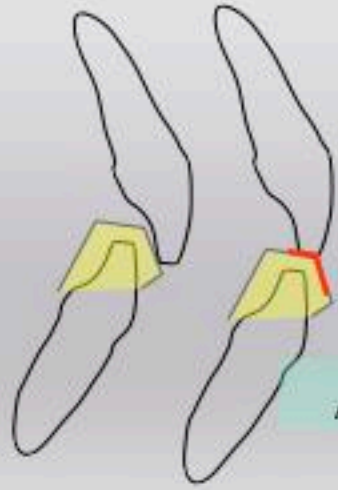


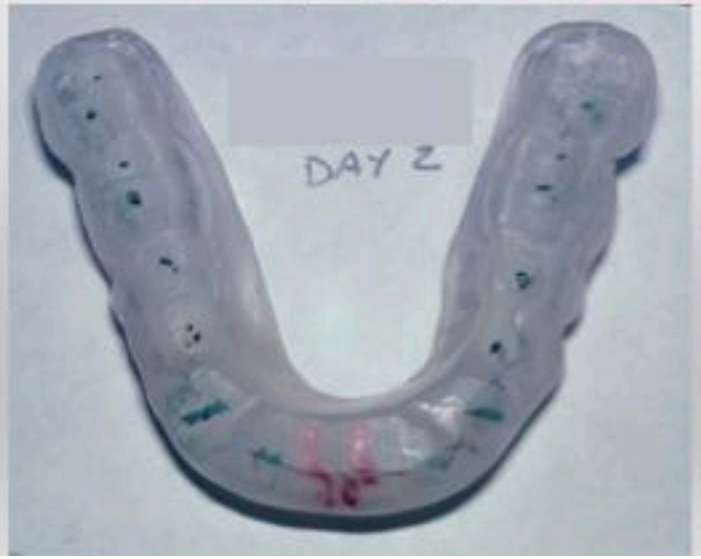




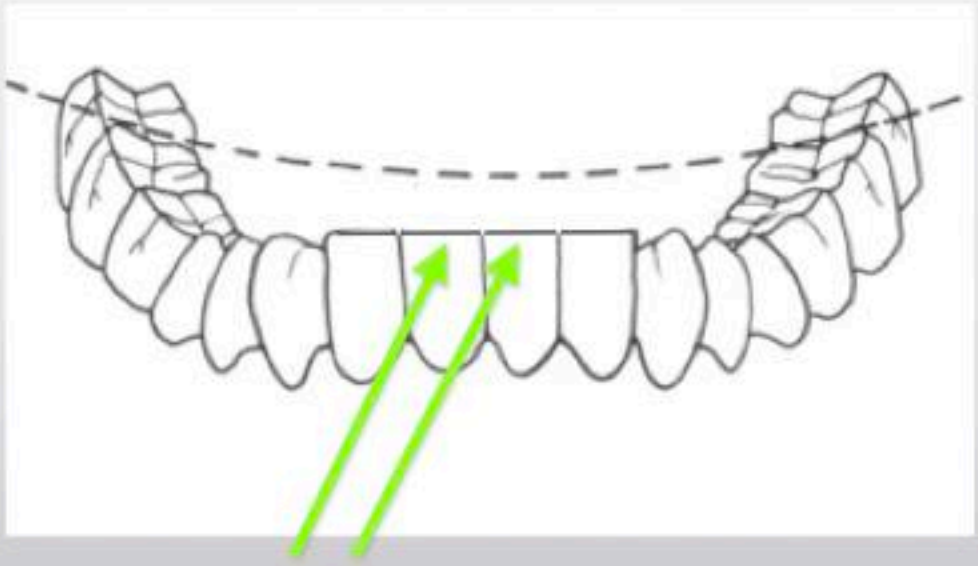




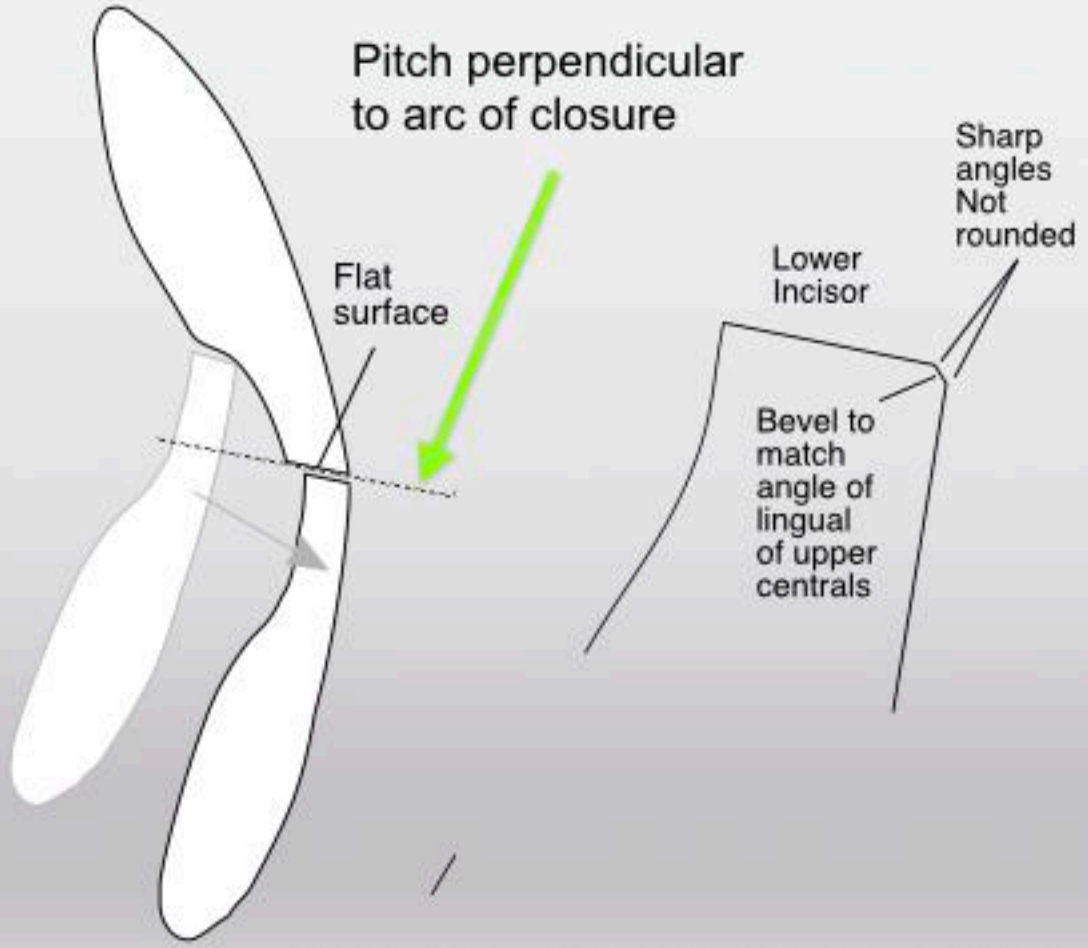



DAY 2

Pitch and Bevel of Incisors

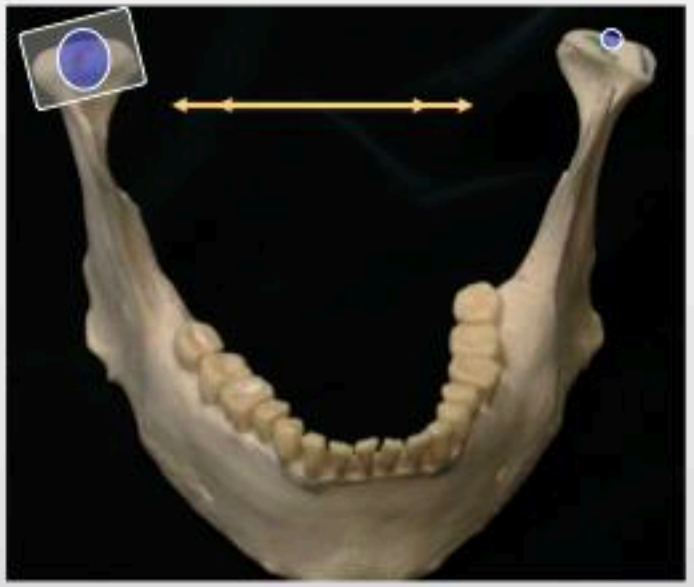


Flat Table Top Dance Floor
on Central Incisors



I learned importance of this from Guy Haddix

Differential Diagnosis: CR Orthotic not working



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Painful CR

Disharmonious Anterior Guidance- Condylar Guidance has changed

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Joint Subluxation- Translatory joint subluxation

Neck Instability- Masseter and Tongue helping to stabilize

Habitual Postured Forward Maximal Intercuspation (> 2mm)

Other

The TMJ:What You need to Know

Mechanical Stability

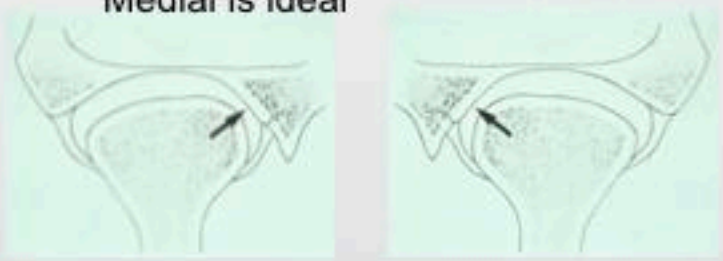
Mechanical Joint Stability

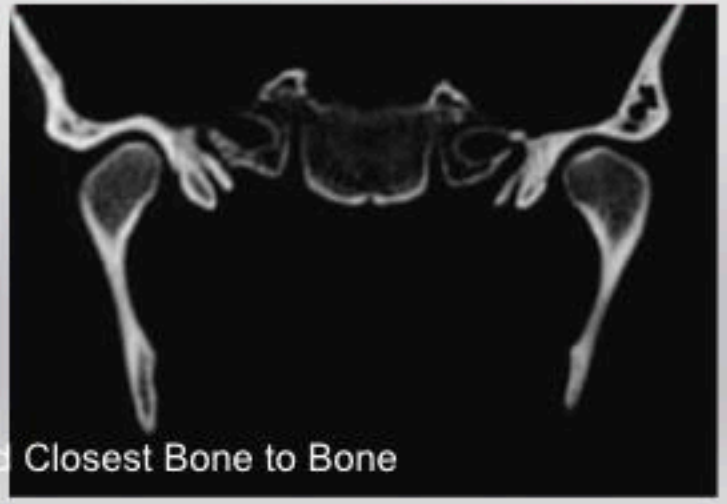
- Shape condyle/disc/fossa provides stability when loaded
- Capsular Ligaments provide stability when not loaded so pieces will be aligned and ready for loading.
  - Capsular Ligaments other roles are to provide end point of joint movement and proprioception

CR Load Zone

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

Medial is ideal

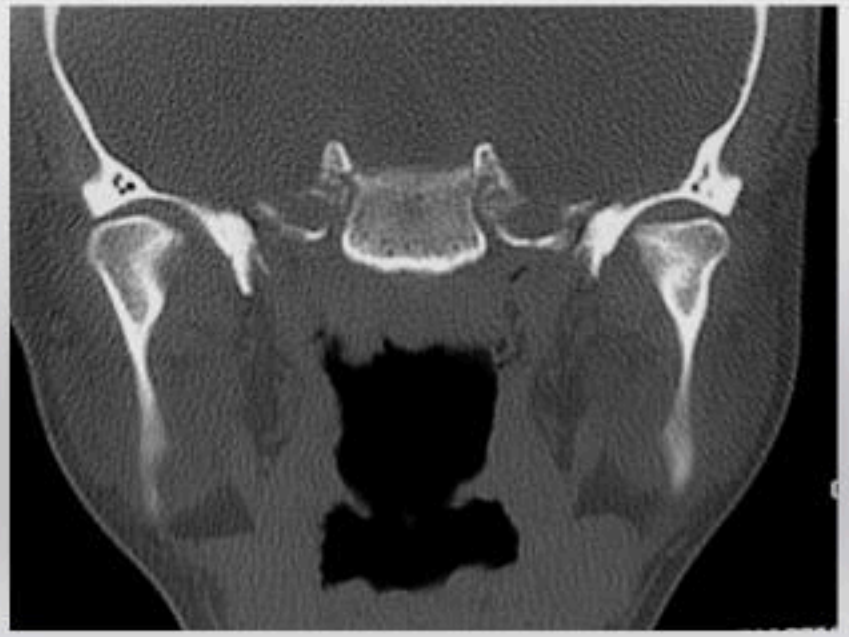




Find Closest Bone to Bone

Unstable Mechanically

Hypersensitive Occlusion



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

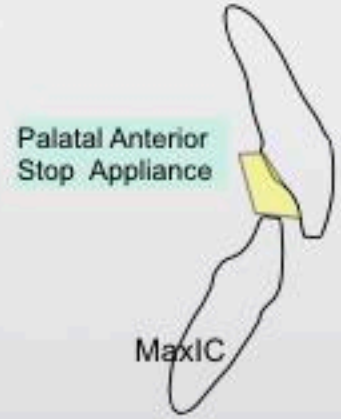
TM Joint subluxates under load
  Adapted CR "wobbles"

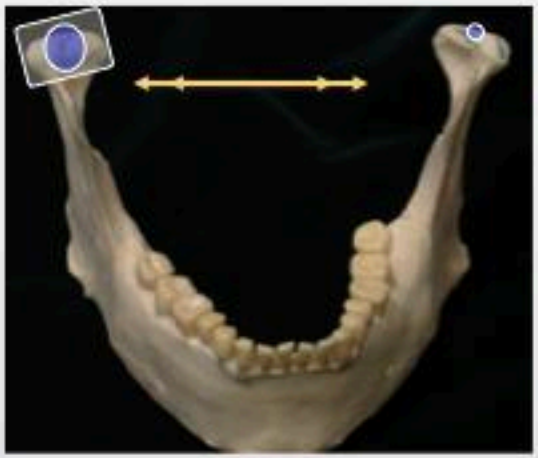
TMJ Muscle hyperactivity
  Looks similar to OMD
  Muscles must stabilize the joint
  Deep temporalis especially sore

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

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

Treatment: Lock-in Appliance 6 months, the CR appliance, then D-PAS.





Hate Love

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Other

With condyle moving in translation:
- Muscle Harmony with mechanically stable joints or if disc reduction is predictable.

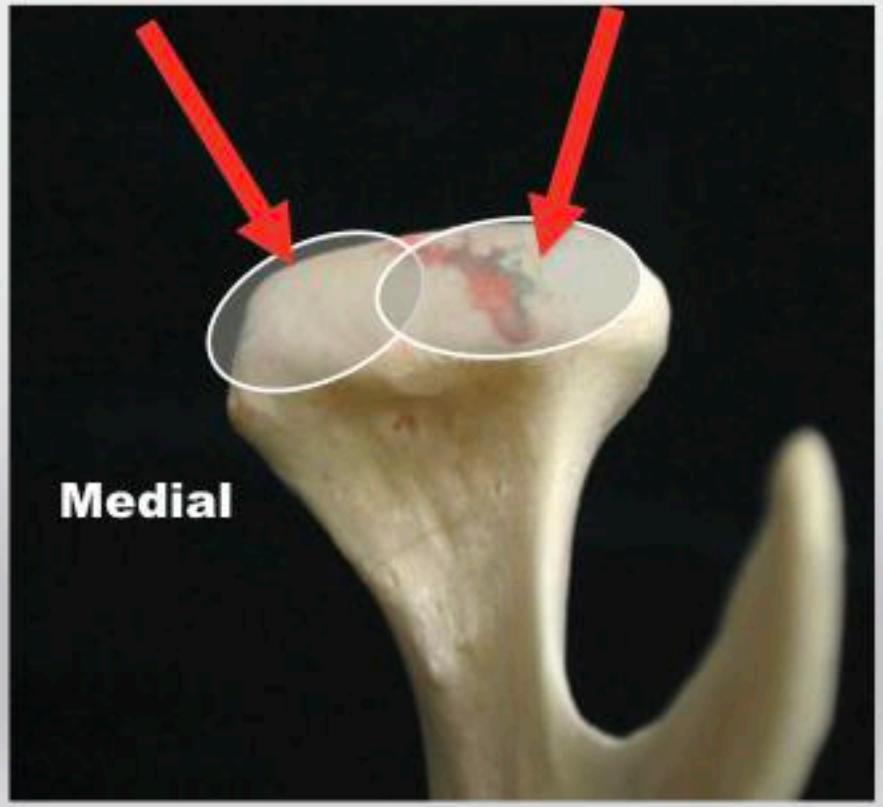
Muscle splinting if unpredictable disc reduction, disc wobbles, joint wobbles, or lateral CR load zone.

Muscles providing lateral stabilization
Deep Temporalis
Deep Masseter

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

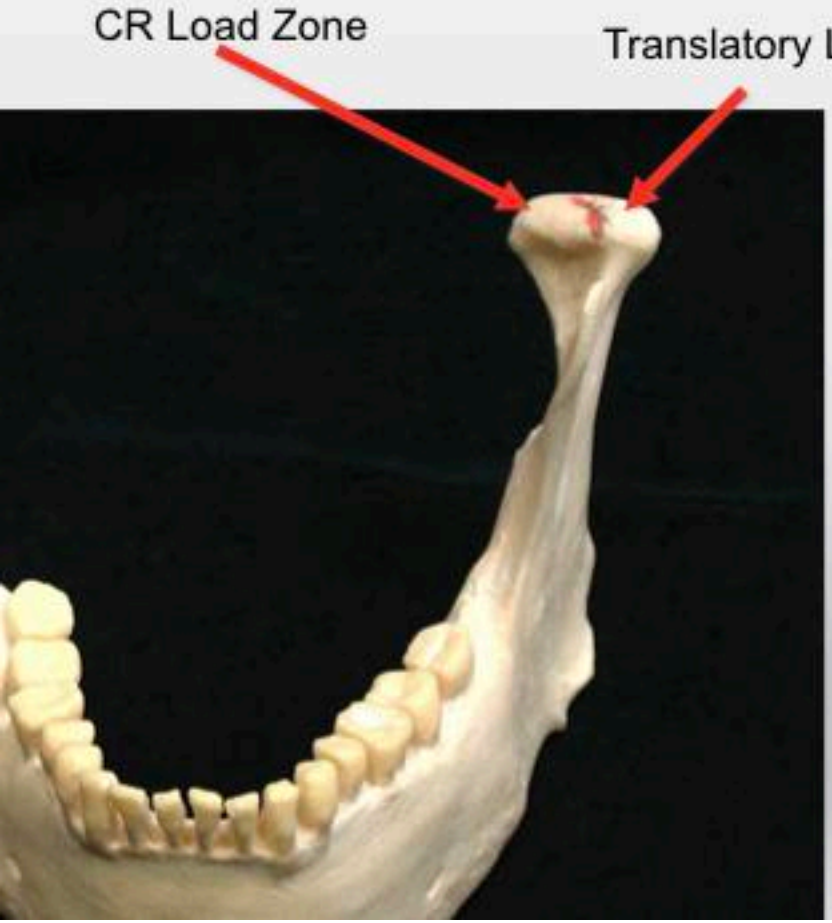
CR Rotational Load Zone

Translatory Load Zone

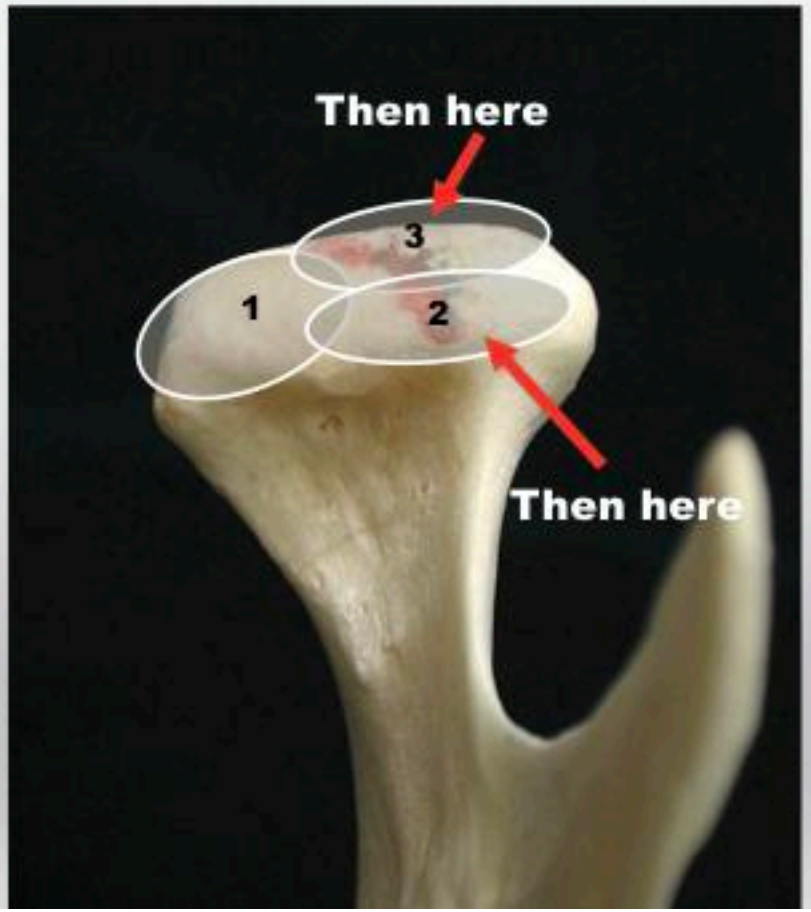


Left Condyle

CR and Translatory Load Zones

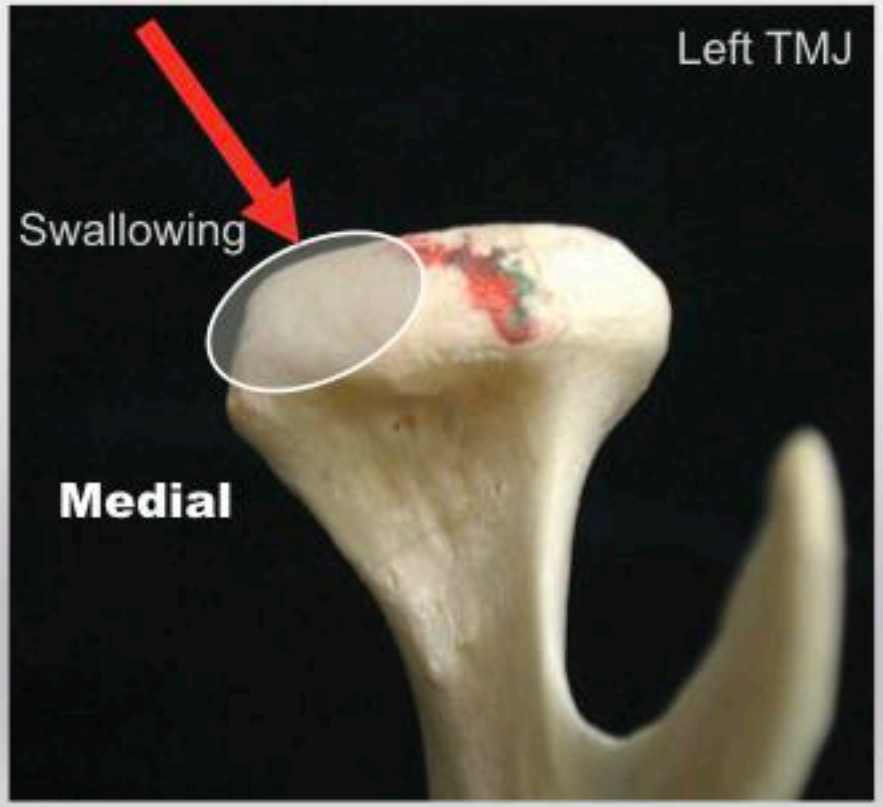


Load zones on opening

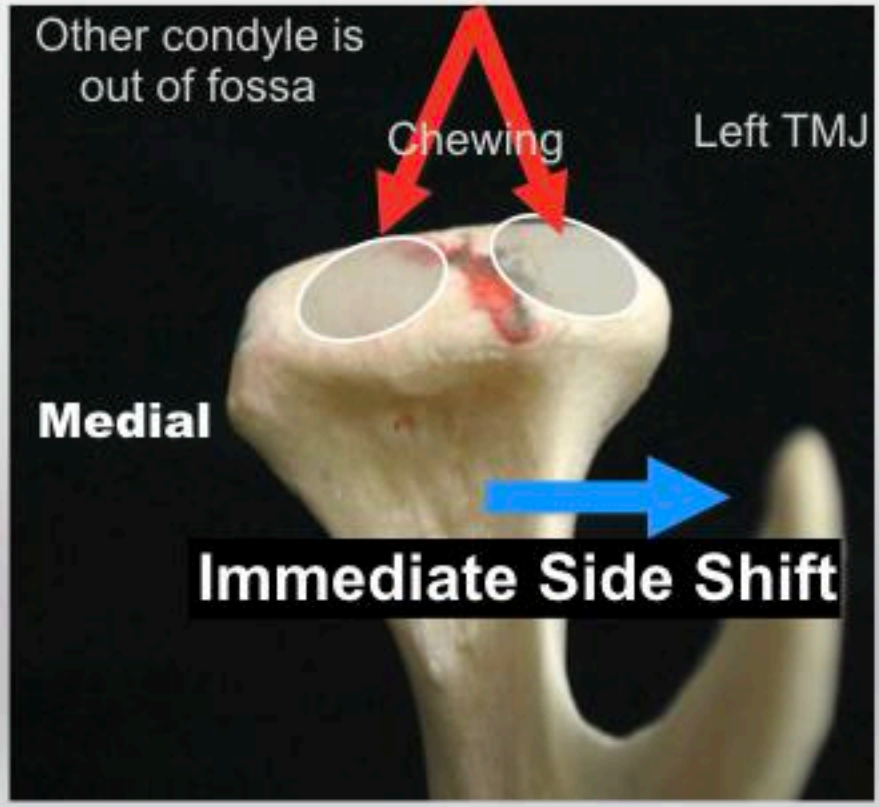


Centric Relation (CR), Translatory, and Pivot Load Zones

CR Rotational Load Zone



Pivotal Load Zone



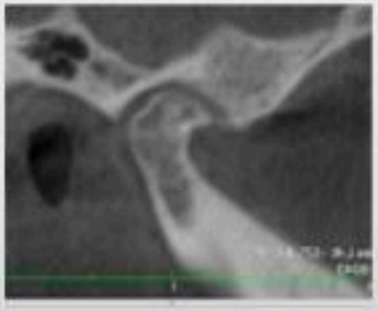
Which condyle has stable **Pivot Zone** for chewing?

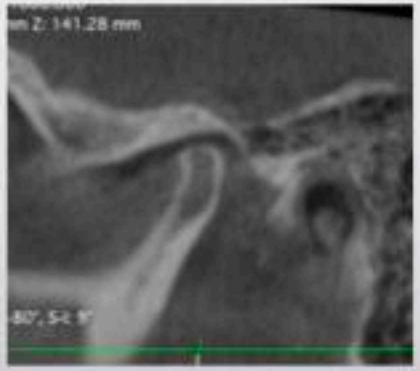
Left lacks stable pivot zone

64yo F
R5b, L5b

Right TMJ
Corrected Coronal View

Left TMJ
Corrected Coronal View





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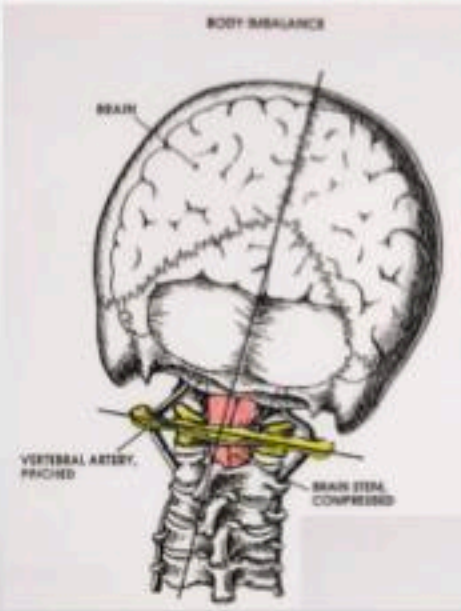
CR Orthotic not working



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Neck Instability- Masseter and Tongue helping to stabilize
Habitual Postured Forward Maximal Intercuspation (> 2mm)
Other

Neck Therapy

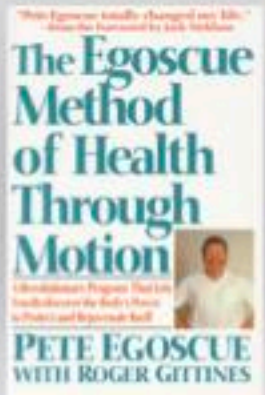
Masseters may be used to stabilize the neck, and will therefore not respond to occlusal therapy.

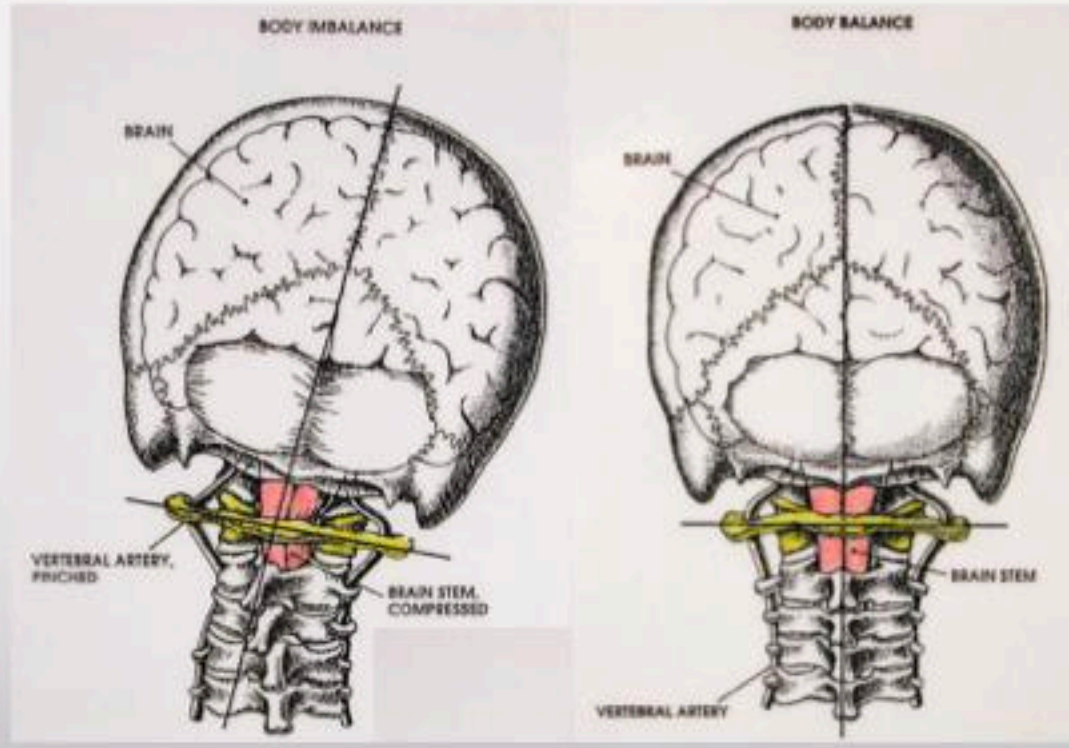
Neck Physical Therapy
- Remove TrP
- Strengthen weak muscle groups

Atlas Orthogonist
- Align Cervical vertebrae

Egoscue Home Exercises

Foundation Exercise





Atlas Orthogonist

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Habitual Postured Forward Maximal Intercuspation (> 2mm)
Other

Condyles Seating from a Postured Forward Position

Maximal Intercuspation

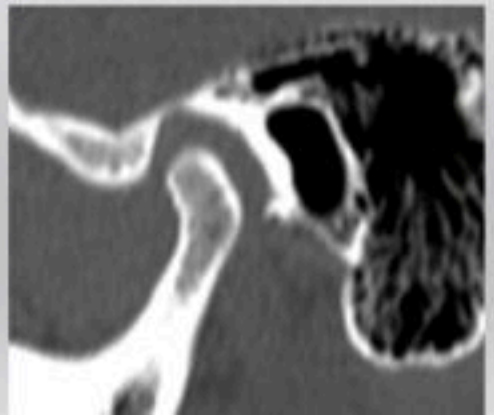
NOT an Anterior open bite

Can still return to postured forward position and get anterior tooth contact

Centric Relation

3mm Centric Relation to Maximal Intercuspation slide

Habitual Postured Forward Maximal Intercuspation (> 2mm)



Key points:

- Do not treat to CR
- Change occlusion as little as possible
- Working and non Working contacts are reference points
- Do not have have seated condyles as reference
- Change to a single cusp can lose their bite

Dark Room Analogy

Differential Diagnosis: CR Orthotic not working

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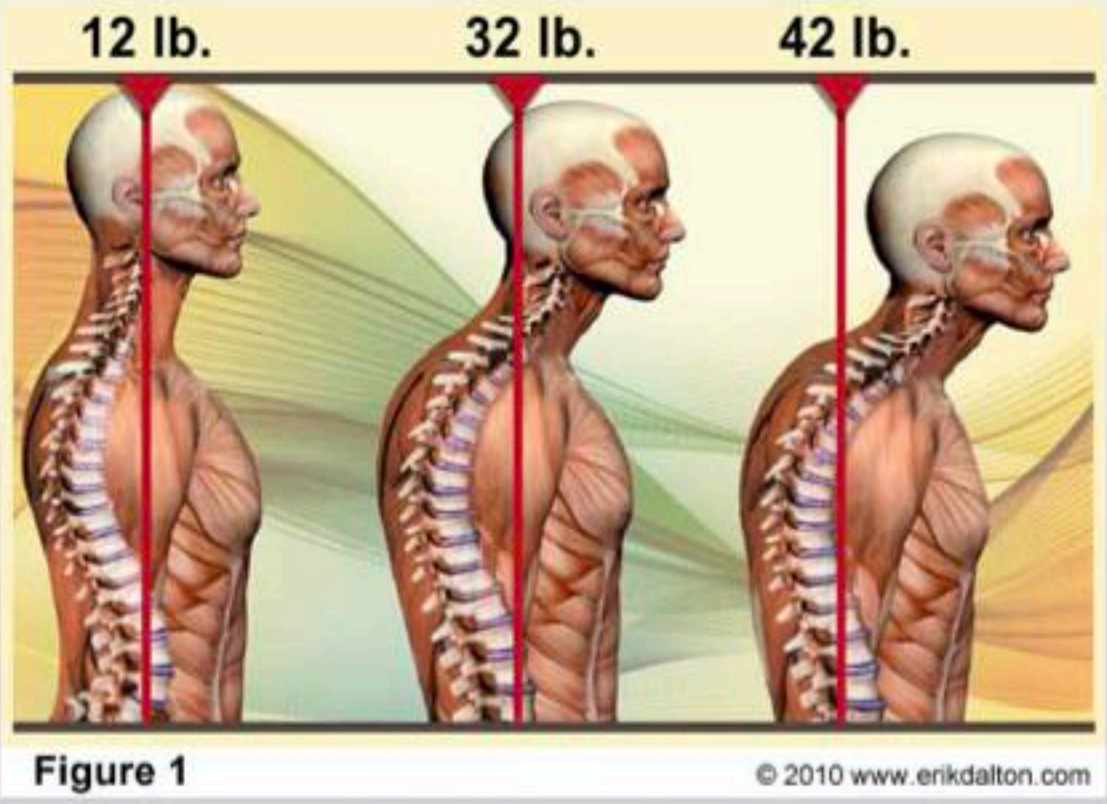
Habitual Postured Forward Maximal Intercuspation (> 2mm)
Other

TMD Arthralgia as primary source of pain
Physical Damage to Disc & Ligaments
Osteoarthritis
Avascular Necrosis
Inflammatory Tissue Bone Resorption
Rheumatoid Arthritis
Lyme Disease
Joint Infection- Staph, Strep, Syphilis
Compromised Condylar Perfusion
Osteochondritis Dissecans
Fracture/Crush condylar head and fossa
Psoriatic Arthritis
Crystalline Deposition Diseases
Cancer TM Joint/ TM Bones
Scleroderma
Synovial Cyst

Non TMD Facial Pain
Cancer; Head, Neck, Central
Coronary Artery Disease
Centrally Mediated Pain
Migraine Headaches histamine mediated
Infection: Sinuses, Ear, Teeth, Periodontal
Pulpitis
Fibromyalgia
Temporal Arteritis
Other

Head forward posture due to airway



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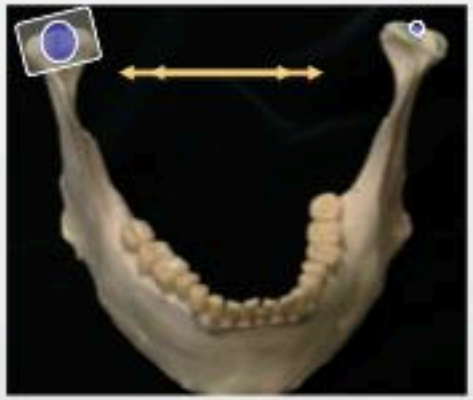

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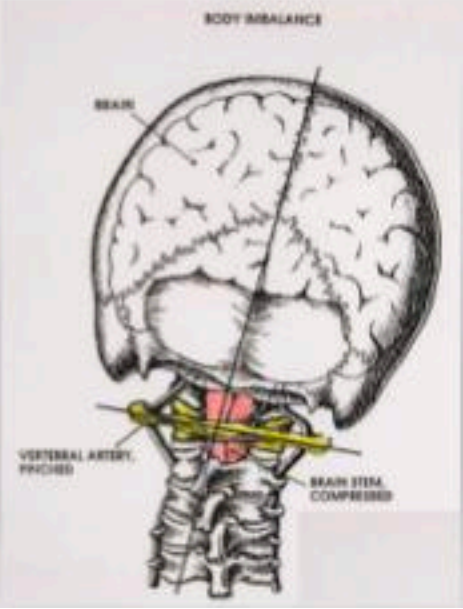
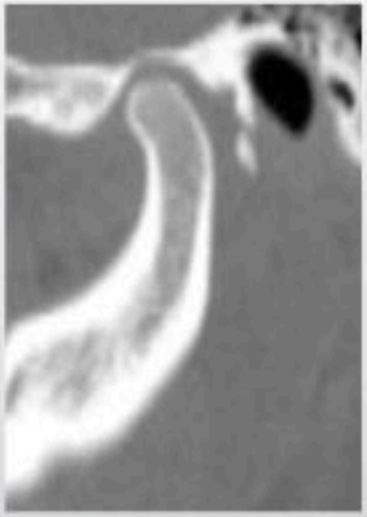


I use both Centric Relation and Non-Centric Relation Orthotics



Treatment Position vs Final Position: Do Not Confuse the Two

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

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

When not to use a CR appliance

When there is not a stable comfortable CR load zone

When you want to create change of the joint structures

Treatment Position vs Final Position

Treatment Position Creates Change

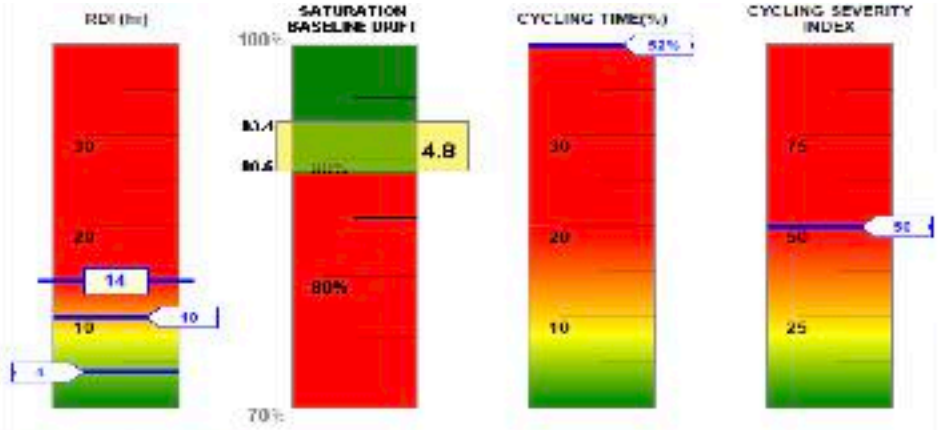
Final Position you want Stability

Do Not Confuse the Two

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
7. MRI



PATTERN BASED REPORT

OXYGEN SATURATION BASELINE ANALYSIS

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

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

SPO2 CYCLING

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

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

TRADITIONAL REPORT

ODI4:	11
Total ODI4 Events:	58
Time in ODI4 Events:	00:29:26
Avg ODI4 Event Duration:	00:00:28
<=88% ODI4 Events:	23
<=88% Longest Duration:	00:01:21
Minimum SpO2:	84
Avg Low 10% SpO2:	86
Avg Low SpO2:	89
Avg Low SpO2 <=88%:	87

Definition of ODI4 Event: a fall in oxygen saturation of at least 4% and persisting greater than 3 seconds.

%SpO2	DURATION	%TOTAL
94-100	00:16:37	5%
88-94	04:57:26	91%
80-88	00:13:39	4%
70-80	00:00:00	0%
<= 70	00:00:00	0%
Total	05:27:42	100%
Motion Artifact	00:00:07	0.04%
Error Signal	00:00:05	0.03%

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

"Sleep Airway Screening"

High Resolution
Pulse Oximetry

Data every 1
second average
over 3 seconds

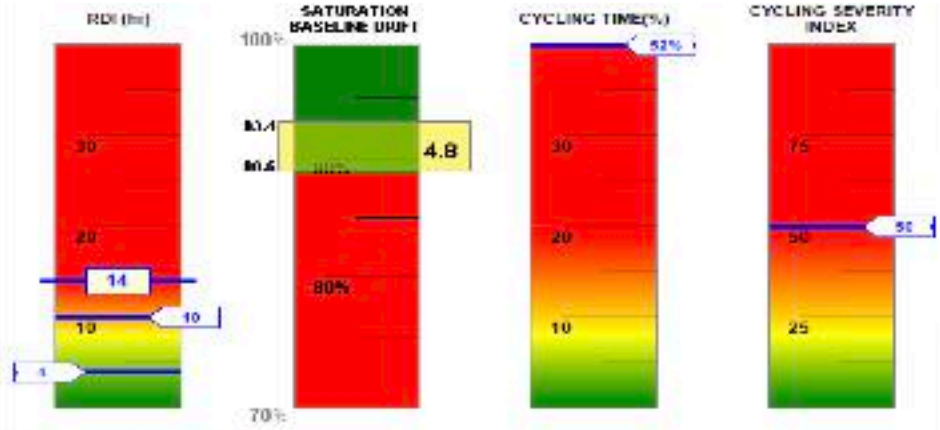
Patient Safety Inc.

SLEEPSAT

SATSCREEN

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

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



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Lowest Saturation Baseline	89
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SPO2 CYCLING		
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Cycling Frequency	45	
96% - Lowest Sat	12	
Cycling Severity Index	50	

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

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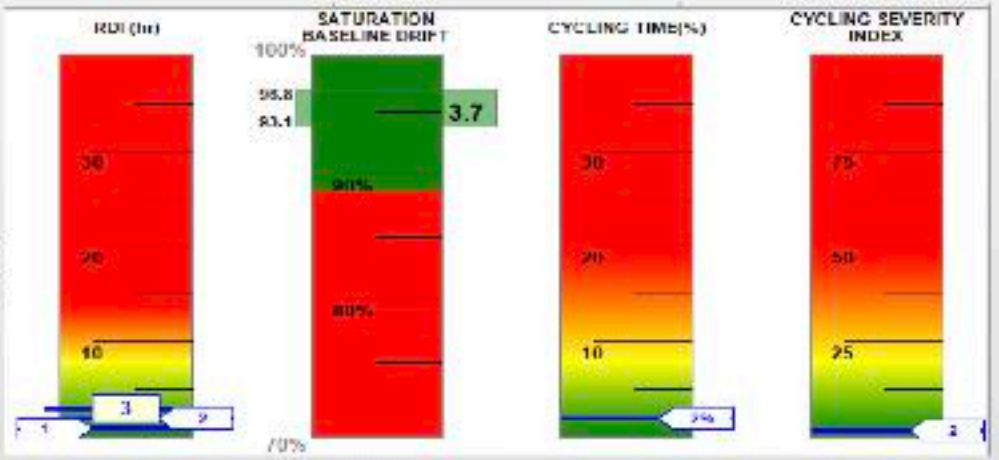
Total	05:27:42	100%
Motion Artifact	00:00:07	0.04%
Error Signal	00:00:05	0.03%

Does the dental orthotic make the airway better or worse?

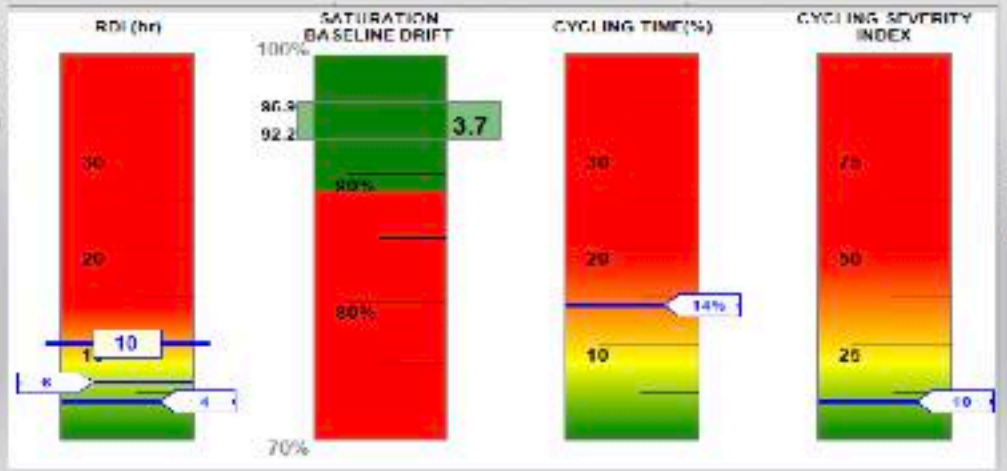
RDI= Respiratory Distress Index

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.

Obstructive Sleep Apnea

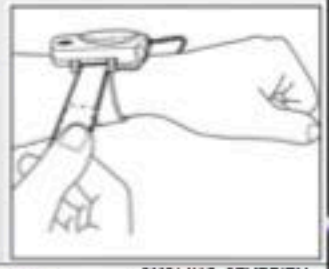
Normal Airway

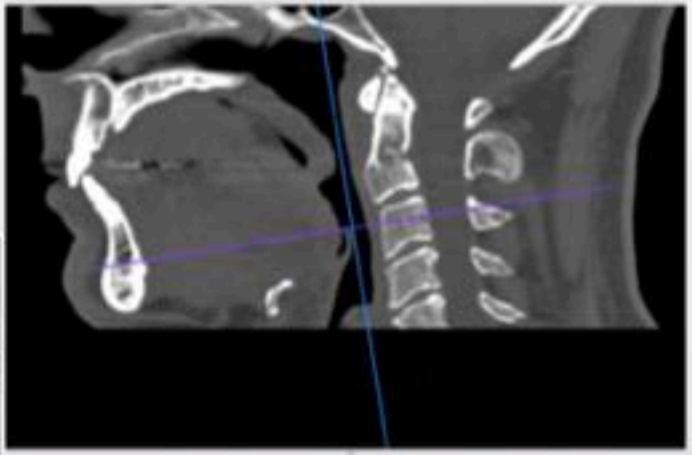
Upper Airway Resistance
Snoring in men, purring in women

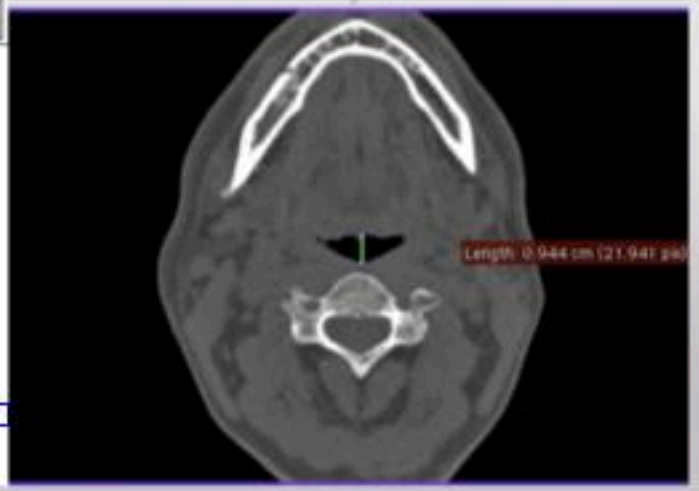
Obstructed Apnea

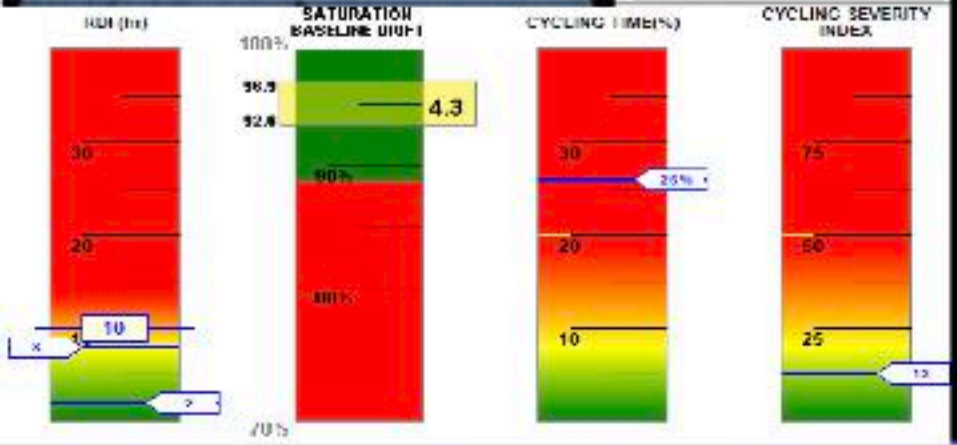
Images from Somnodent. https://somnomed.com/us

Mild Obstructive Sleep Apnea









Referred to pulmonologist
Medical Sleep Study
PSG- Polysomnogram
RDI 10

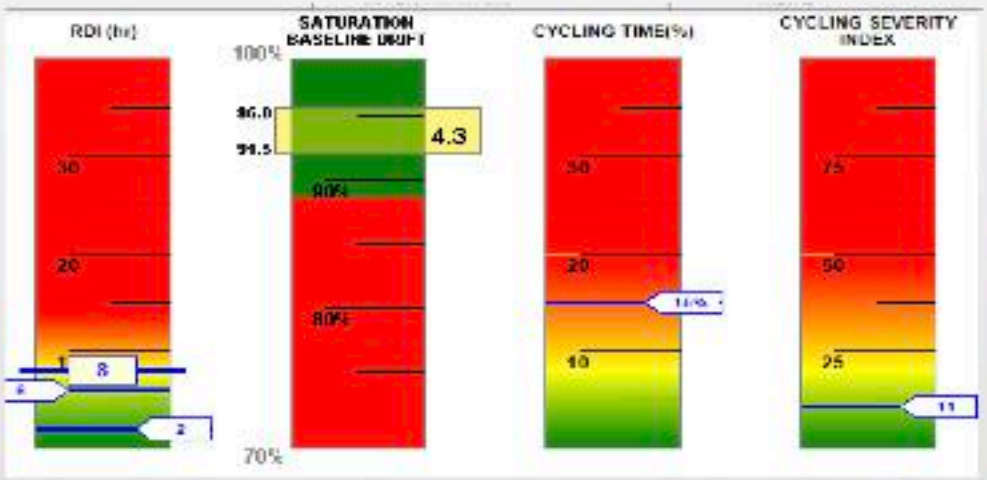
Home Sleep Airway Screening- RDI 10

RDI= Respiratory Distress Index

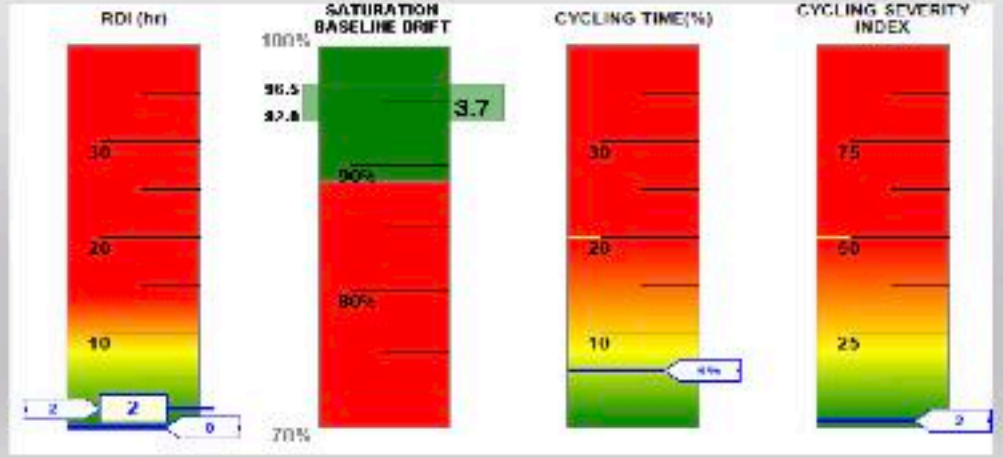
Mild OSA = 5-15 Apnea/hr

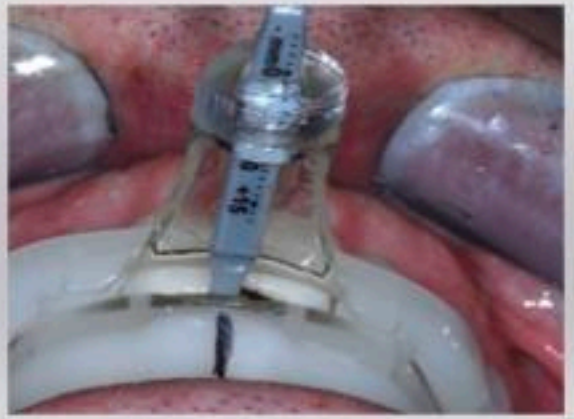
RDI= Respiratory Distress Index

MyTAP
Mandible
Advanced 4mm
RDI 8



MyTAP
Mandible
Advanced 5mm
RDI 2





Disordered Breathing Disease Progression

Disease Stage 1

Predisposing Factors

Small Airway

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

Disease Stage 2

Compensation:
Airway Maintained

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

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

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
- ⬇ Growth Hormone

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

Disease Stage 4

Sleep
Airway Full collapse

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

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

John R. Droter DDS

Disordered Breathing Disease Stage 4

OSA- Obstructive Sleep Apnea

AHI- Apnea Hypopnea Index

Apnea and Hypopnea events per hour

Apnea- Stop airflow for 10 seconds

Hypopnea- <50% airflow or 3+% O_2 Desaturation

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

Signs

- Apnea
- 4% drop O_2 Saturation
- Cardiovascular Damage
- Elevated BP
- GERD

Irreversible Damage

Symptoms

- Not Waking Rested, Daily Fatigue
- Cognitive Impairment

John R. Droter DDS

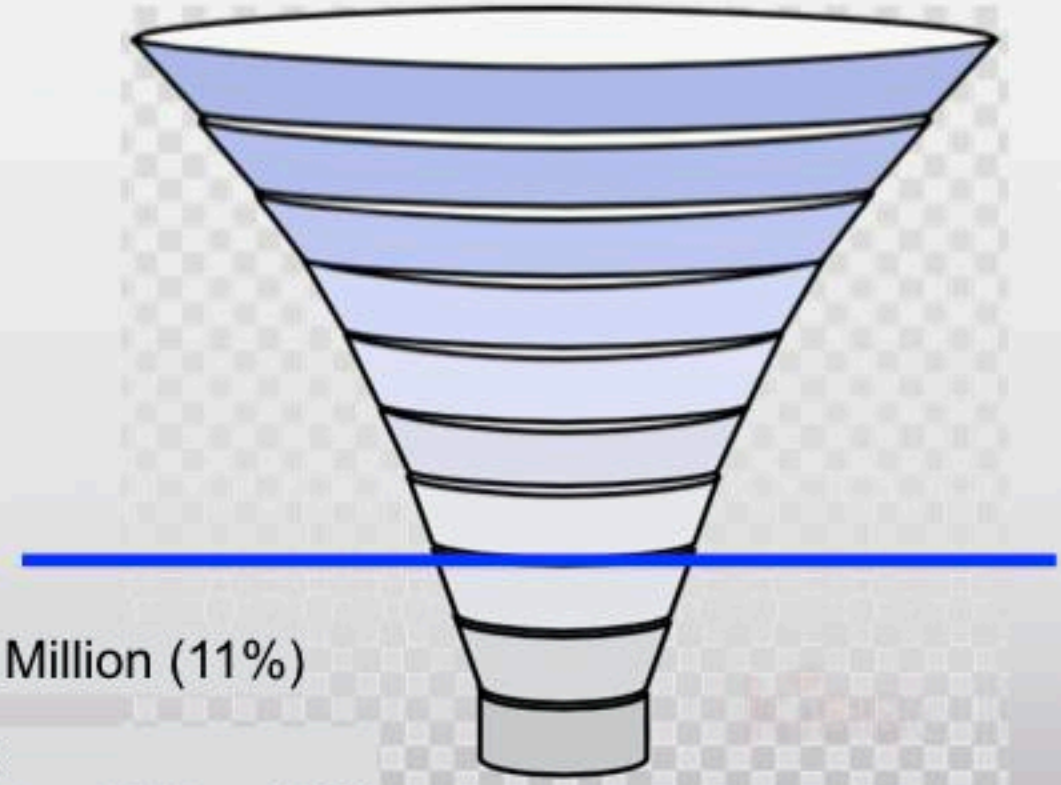
Disordered Breathing USA 2008

Stage 1

Stage 2

Stage 3

Stage 4



Mild OSA- 35 Million (11%)

Moderate and
Severe OSA 19.5 Million (6%)

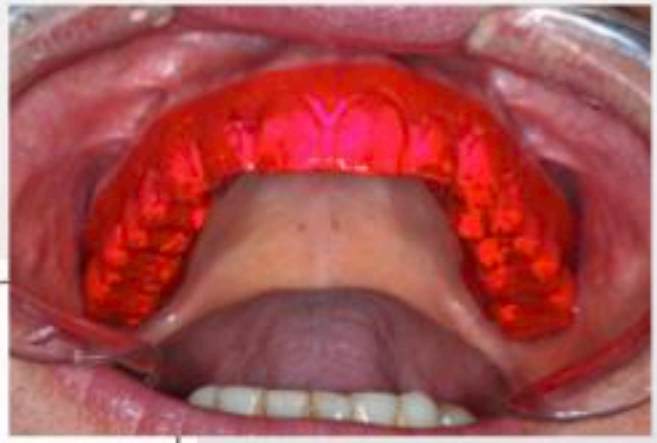
Young, T., Finn, L., Peppard, P. E., Szklo-Coxe, M., Austin, D., Nieto, F. J., et al. (2008). Sleep disordered breathing and mortality: eighteen-year follow-up of the Wisconsin sleep cohort. *Sleep*

US Pop 325 Million

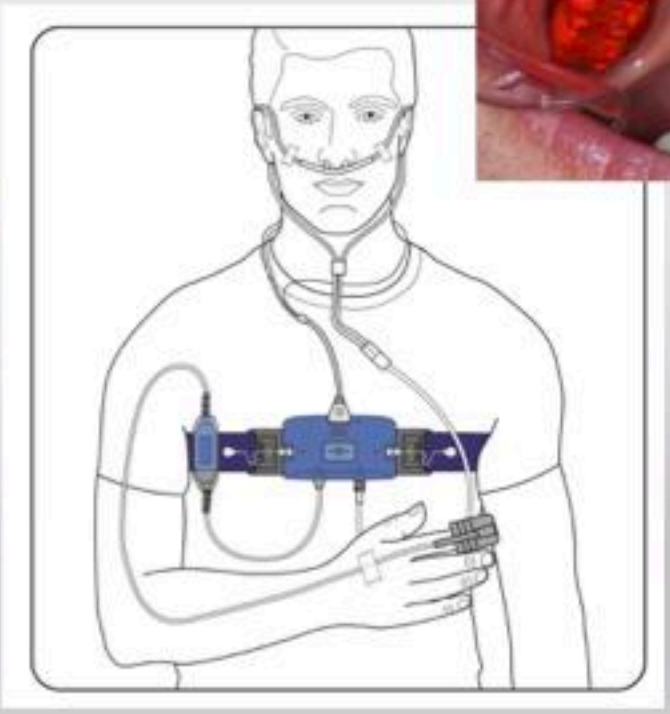
Dr German Ramirez-Yanez

zMachine

zMachine + Brux Checker
+ Snore Lab

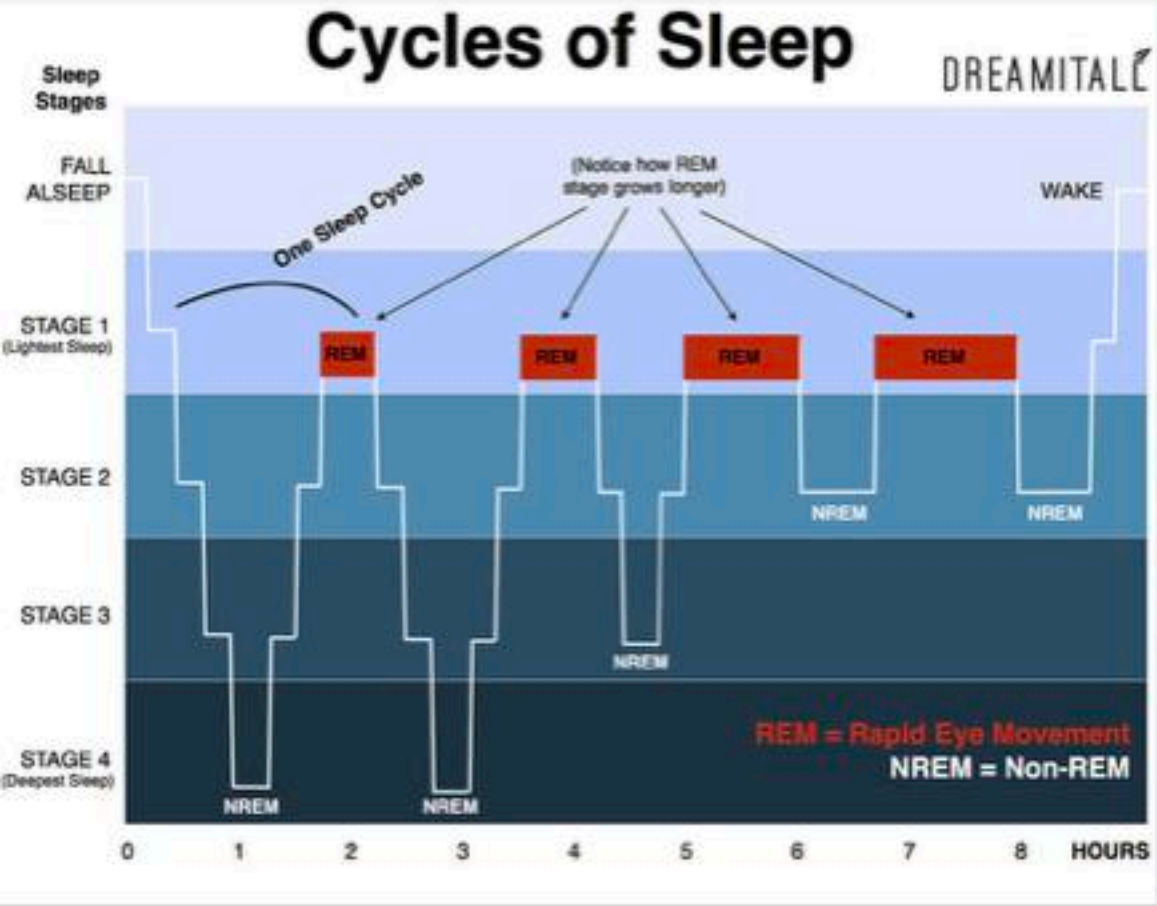


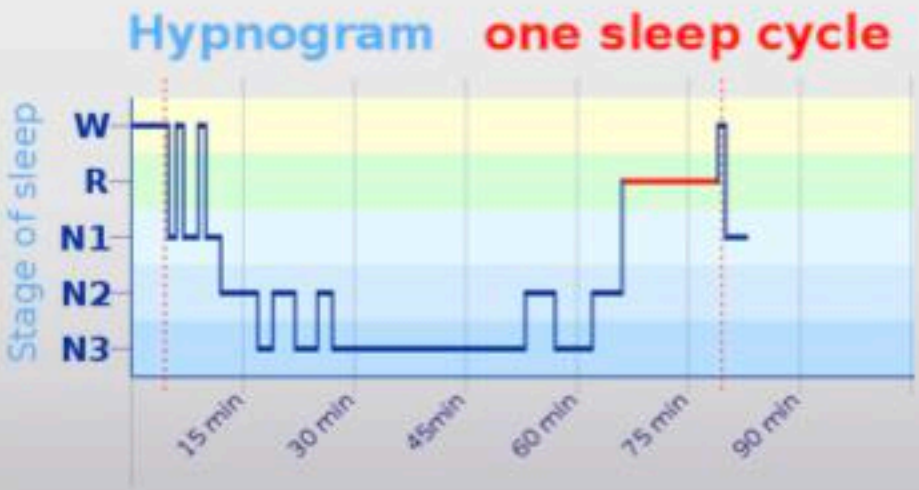
GENERAL sleep



Call (888) 330-4424

Use Code: DROTER to receive special offer


Cycles of Sleep
DREAMITALC
Sleep Stages
FALL ALSEEP
STAGE 1 (Lightest Sleep)
STAGE 2
STAGE 3
STAGE 4 (Deepest Sleep)
One Sleep Cycle
(Notice how REM stage grows longer)
WAKE
REM
REM
REM
REM
NREM
NREM
NREM
NREM
NREM
REM = Rapid Eye Movement
NREM = Non-REM
0
1
2
3
4
5
6
7
8
HOURS


Hypnogram
one sleep cycle
Stage of sleep
W
R
N1
N2
N3
15 min
30 min
45min
60 min
75 min
90 min

Patient: M Y
Study Date: 2018-09-27 Study ID: 1124990976
3% Threshold

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

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

Date of Birth: 1998
Age: 20
Sex: F

Height: 63 Inches
Weight: 105 Pounds
BMI: 18.60

Note:

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

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

Times and Durations	
Lights off	2018-09-27 01:47:32
Lights on	2018-09-27 08:42:54
Total Recording Time (TRT)	936.8 min.
Time in Bed (TIB)	414.0 min. (81.7% of TRT) [6 hours 54 minutes
Total Sleep Time (TST)	396.8 min. (95.9% of TIB)
Sleep Efficiency (SE)	95.9 % of TIB
Latency to Persistent Sleep (LPS)	8 min
Latency to Deep Sleep (LDEEP)	19 min
Latency to REM Sleep (LREM)	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. (24.1% 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

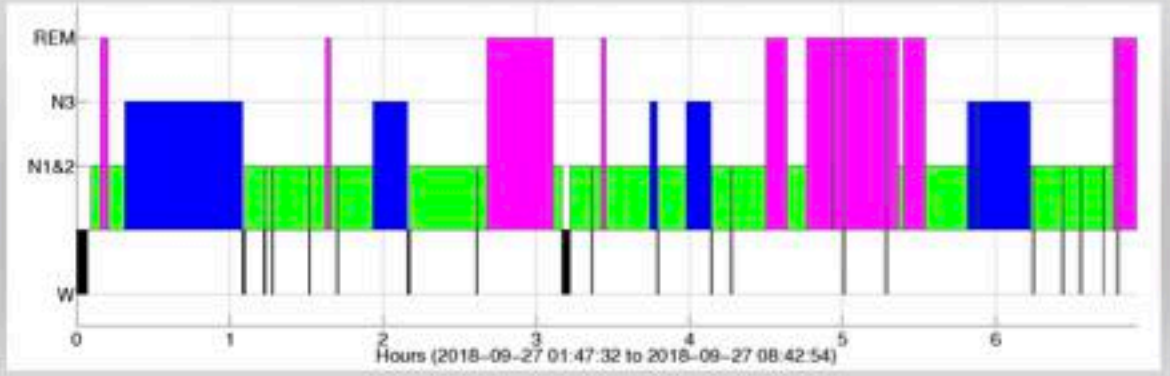
TRT is the total duration of the recording, TIB is the elapsed time from lights off to lights on; TST is the cumulative time scored as any stage of sleep; SE is 100×(TST÷TIB) expressed as a percentage; AHI is apneas + hypopneas per hour of sleep time; RDI is apneas + hypopneas + RERAs per hour of sleep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

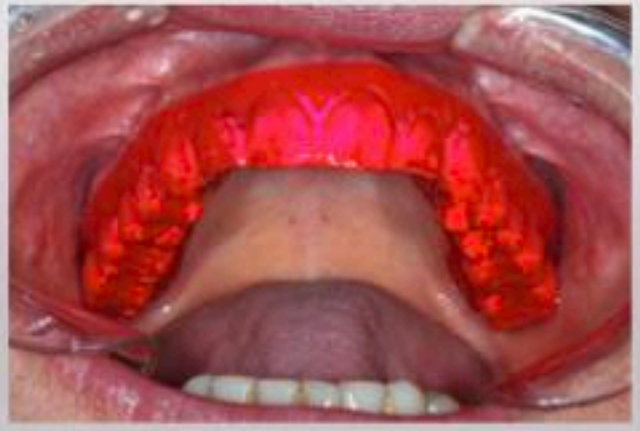
Sleep Stages



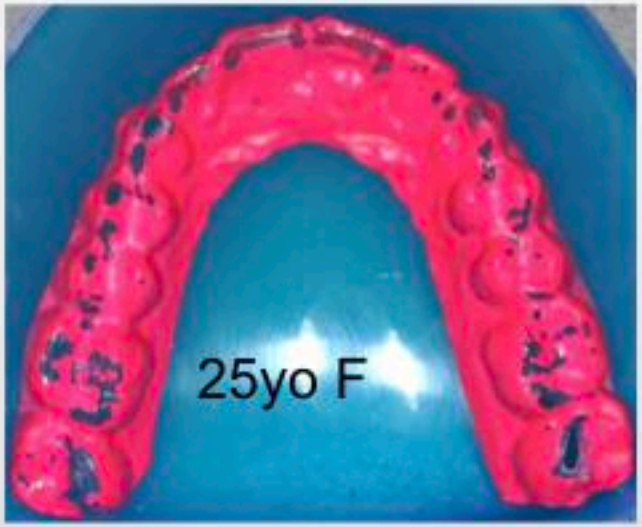
Does grinding occur awake or asleep?

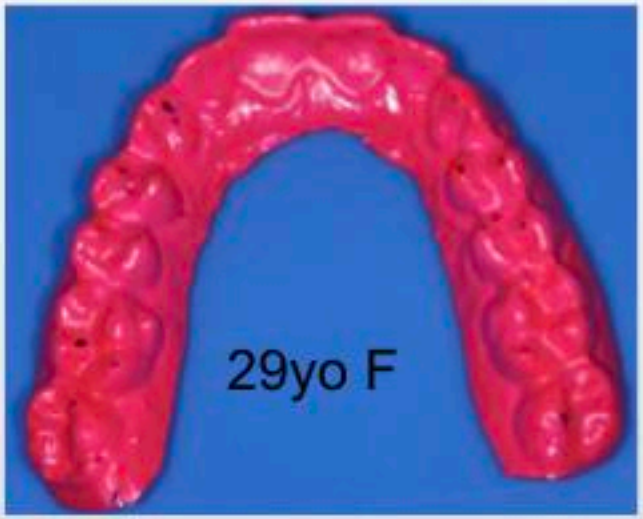
Brux Checker
Great Lakes Orthodontics

0.1mm Mylar



Made on Biostar Machine



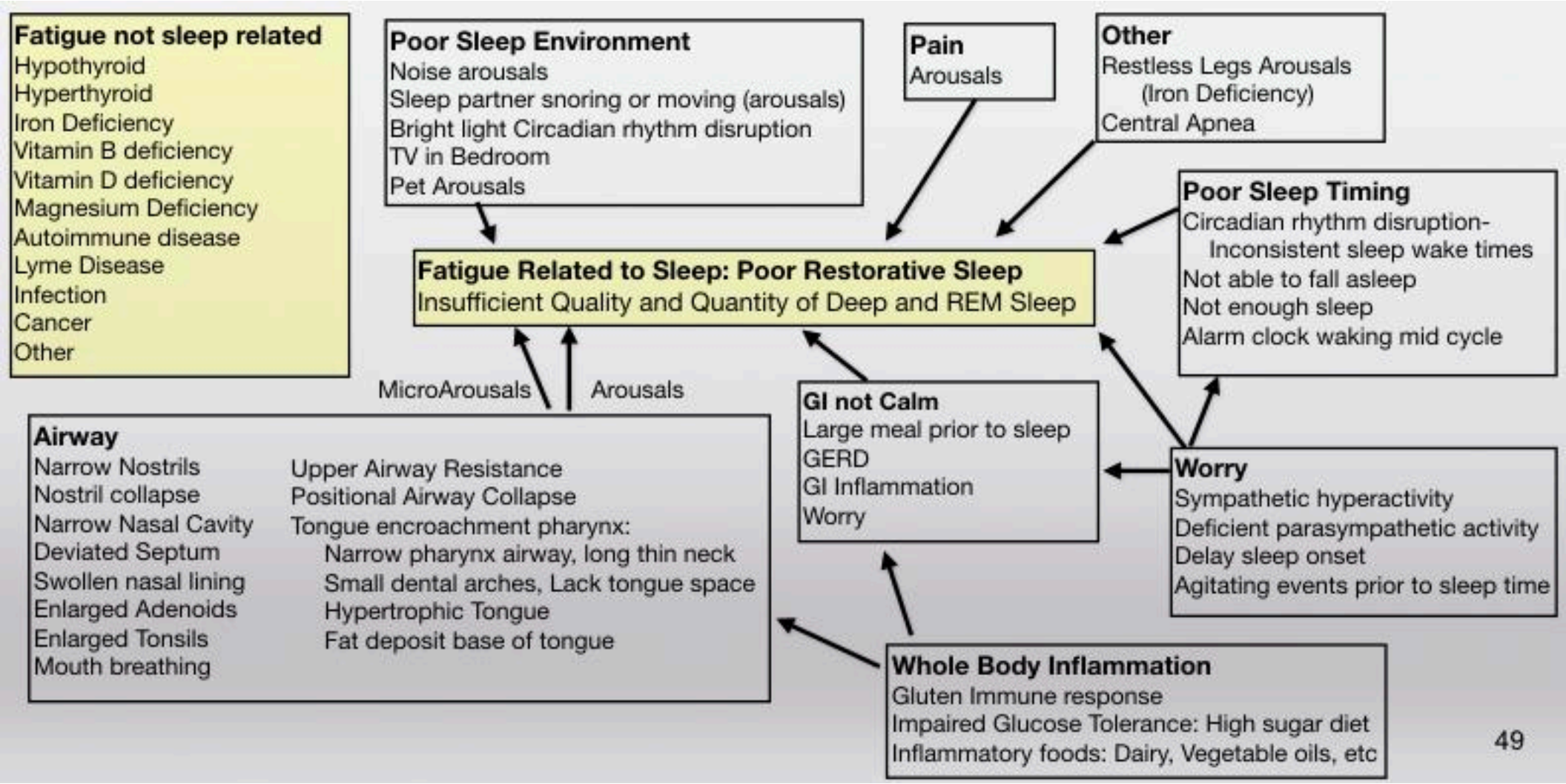


Daytime Clenching- Clear Brux Checker

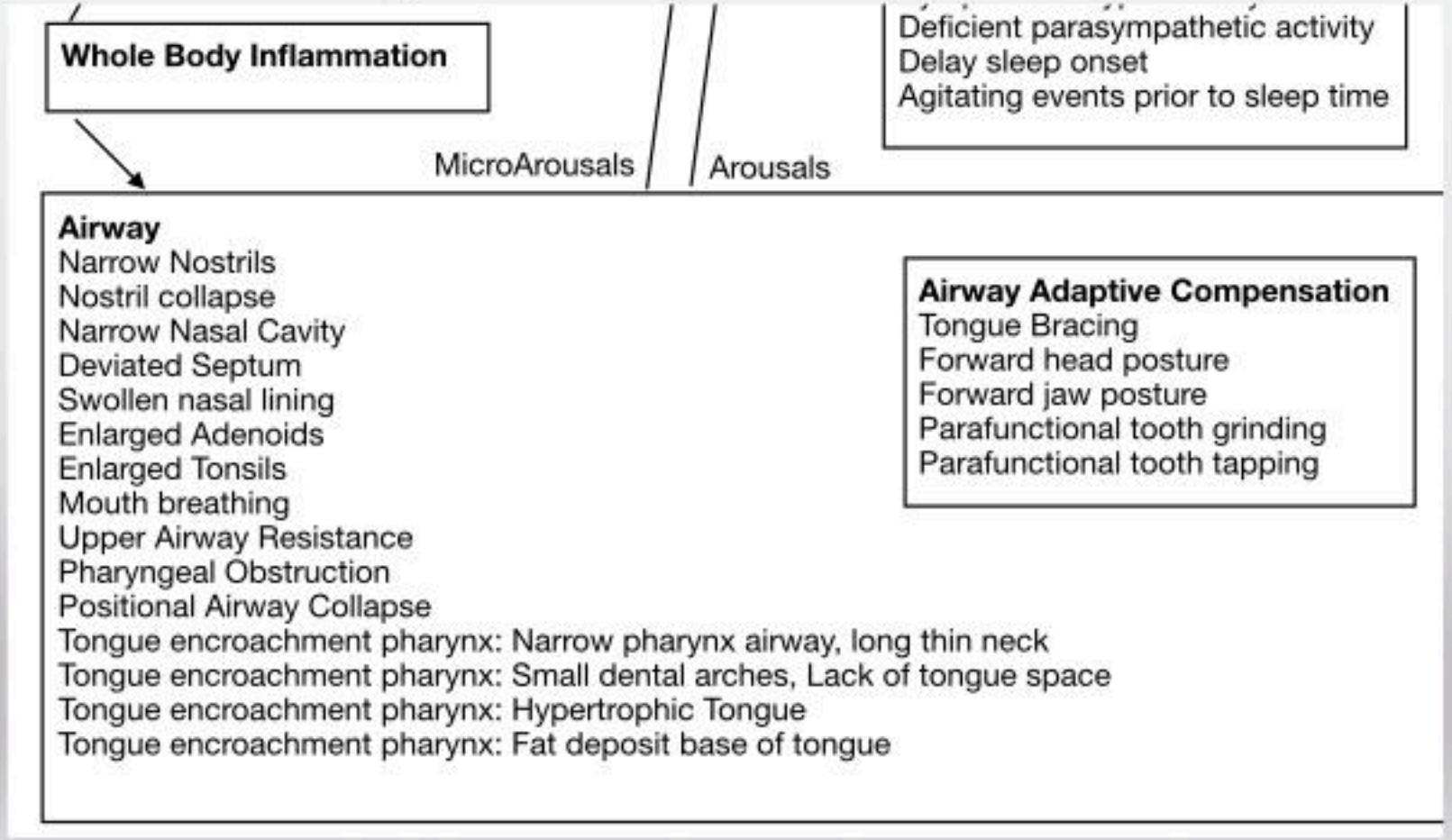
Increase awareness to break habit

Very thin: Similar to mylar used for composites

Great Lakes Orthodontics
Biostar Platzhalterfolie
Item Ref 3202.1


Fatigue not sleep related
Hypothyroid
Hyperthyroid
Iron Deficiency
Vitamin B deficiency
Vitamin D deficiency
Magnesium Deficiency
Autoimmune disease
Lyme Disease
Infection
Cancer
Other
Poor Sleep Environment
Noise arousals
Sleep partner snoring or moving (arousals)
Bright light Circadian rhythm disruption
TV in Bedroom
Pet Arousals
Pain
Arousals
Other
Restless Legs Arousals
(Iron Deficiency)
Central Apnea
Poor Sleep Timing
Circadian rhythm disruption-
Inconsistent sleep wake times
Not able to fall asleep
Not enough sleep
Alarm clock waking mid cycle
Fatigue Related to Sleep: Poor Restorative Sleep
Insufficient Quality and Quantity of Deep and REM Sleep
MicroArousals
Arousals
Airway
Narrow Nostrils
Nostril collapse
Narrow Nasal Cavity
Deviated Septum
Swollen nasal lining
Enlarged Adenoids
Enlarged Tonsils
Mouth breathing
Upper Airway Resistance
Positional Airway Collapse
Tongue encroachment pharynx:
Narrow pharynx airway, long thin neck
Small dental arches, Lack tongue space
Hypertrophic Tongue
Fat deposit base of tongue
GI not Calm
Large meal prior to sleep
GERD
GI Inflammation
Worry
Worry
Sympathetic hyperactivity
Deficient parasympathetic activity
Delay sleep onset
Agitating events prior to sleep time
Whole Body Inflammation
Gluten Immune response
Impaired Glucose Tolerance: High sugar diet
Inflammatory foods: Dairy, Vegetable oils, etc

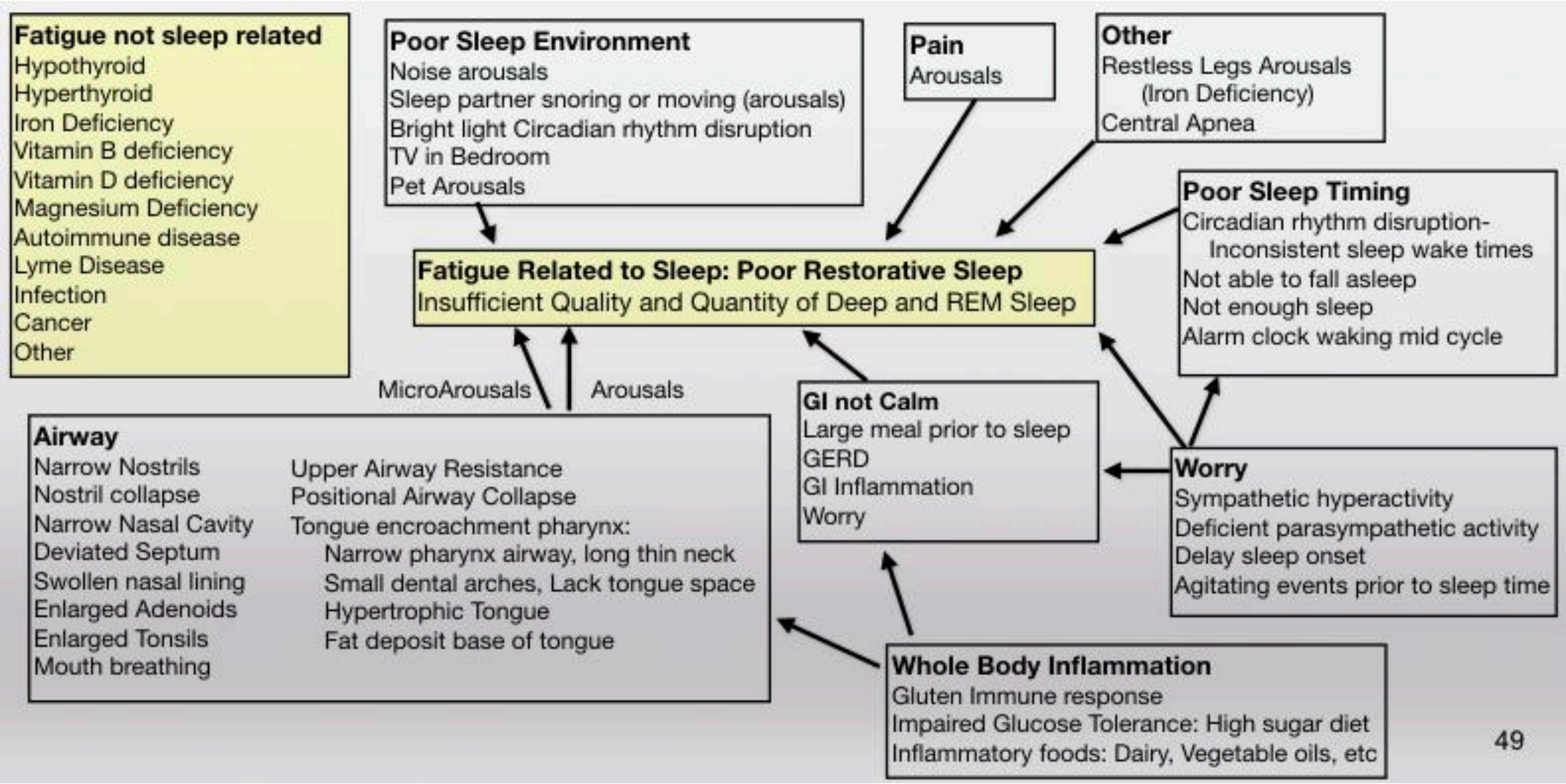
Many different problems of airway cause fatigue



Fatigue

John R Droter DDS
Annapolis, Maryland

www.jrdroter.com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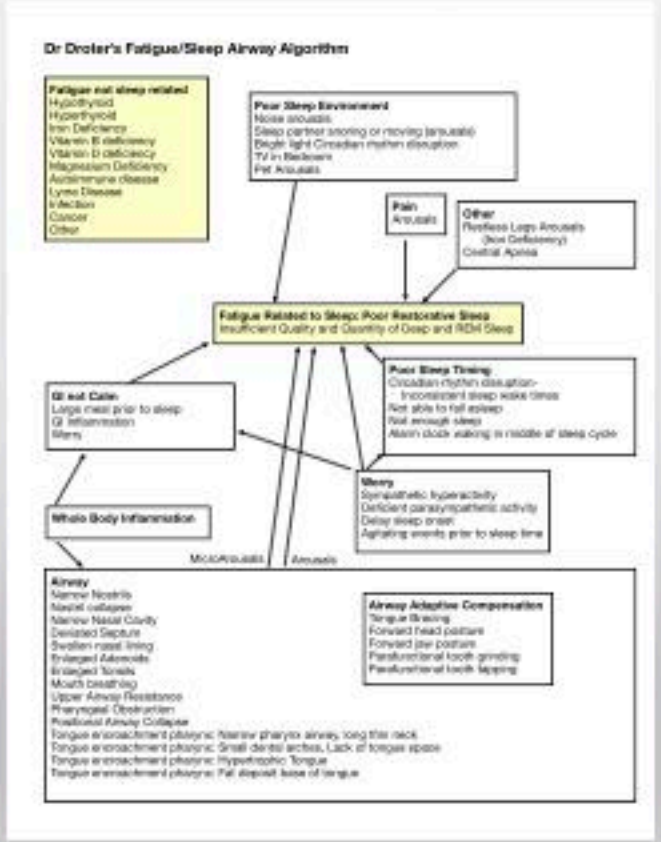
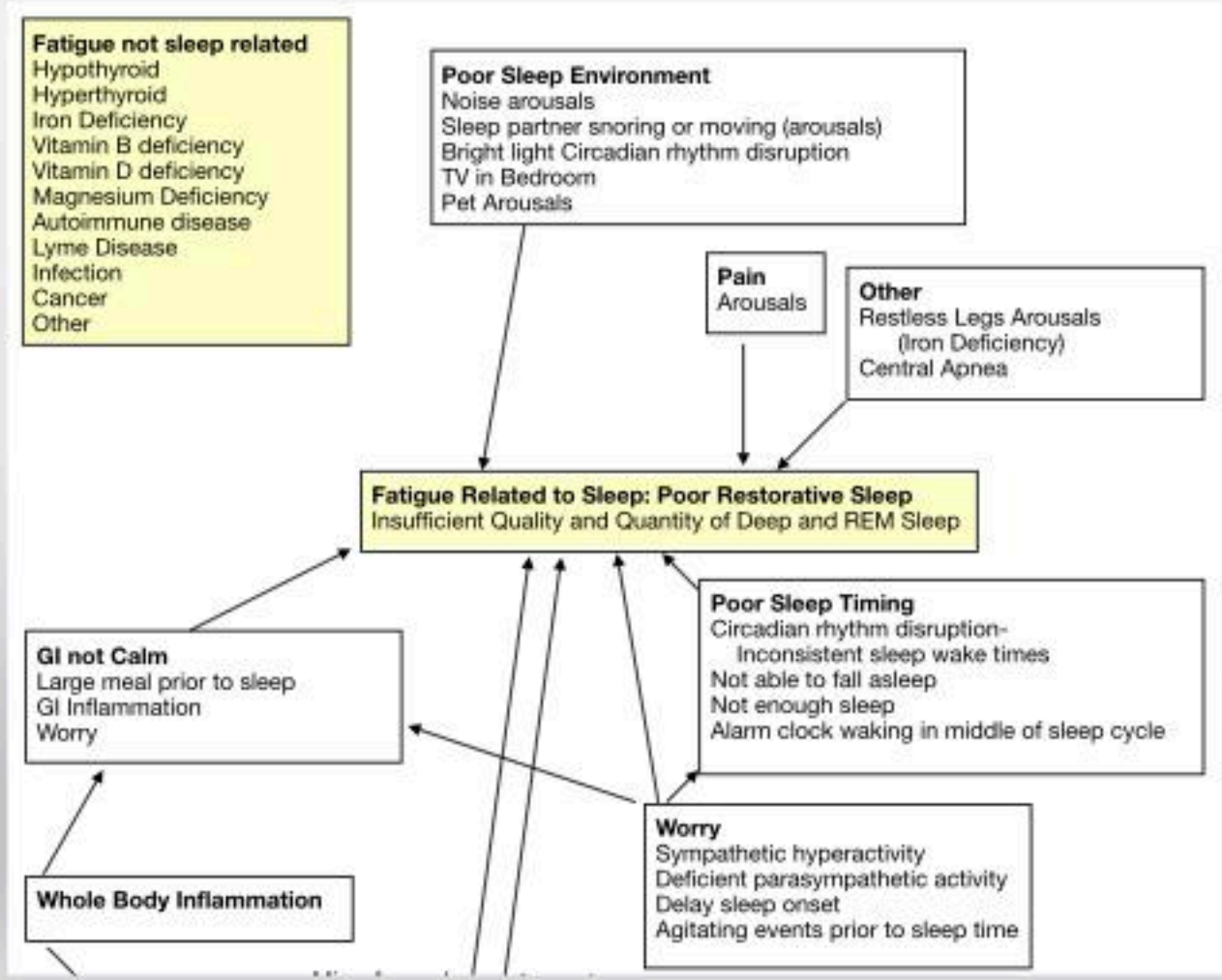
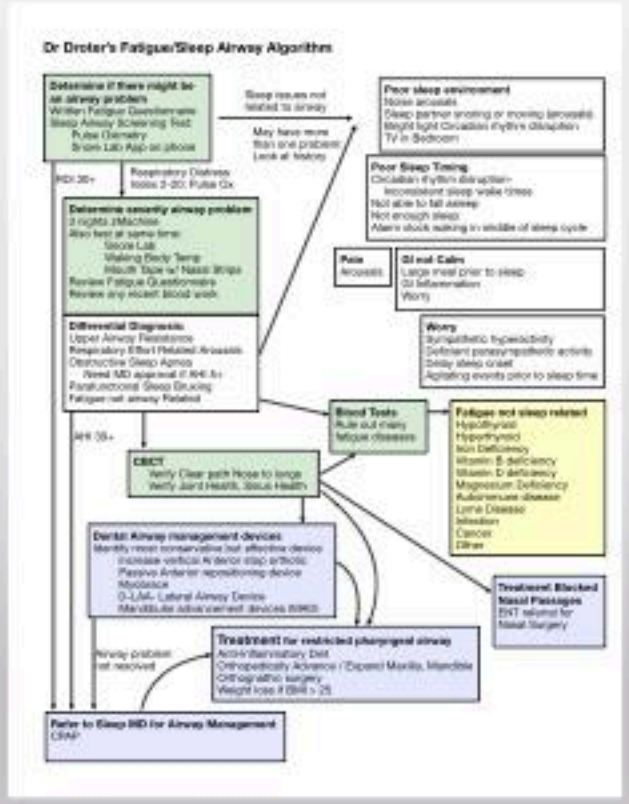
The many causes of Fatigue





The many causes of Fatigue



Determine if there might be an airway problem
Written Fatigue Questionnaire
Sleep Airway Screening Test:
Pulse Oximetry
Snore Lab App on phone

Sleep issues not related to airway

May have more than one problem: Look at history

Poor sleep environment
Noise arousals
Sleep partner snoring or moving (arousals)
Bright light Circadian rhythm disruption
TV in Bedroom

RDI 30+

Respiratory Distress Index 2-20: Pulse Ox

Poor Sleep Timing
Circadian rhythm disruption-
Inconsistent sleep wake times
Not able to fall asleep
Not enough sleep
Alarm clock waking in middle of sleep cycle

Determine severity airway problem
3 nights zMachine
Also test at same time:
Snore Lab
Waking Body Temp
Mouth Tape w/ Nasal Strips
Review Fatigue Questionnaire
Review any recent blood work

Pain
Arousals

GI not Calm
Large meal prior to sleep
GI Inflammation
Worry

Differential Diagnosis:
Upper Airway Resistance
Respiratory Effort Related Arousals
Obstructive Sleep Apnea
Need MD approval if AHI 5+
Parafunctional Sleep Bruxing
Fatigue not airway Related

Worry
Sympathetic hyperactivity
Deficient parasympathetic activity
Delay sleep onset
Agitating events prior to sleep time

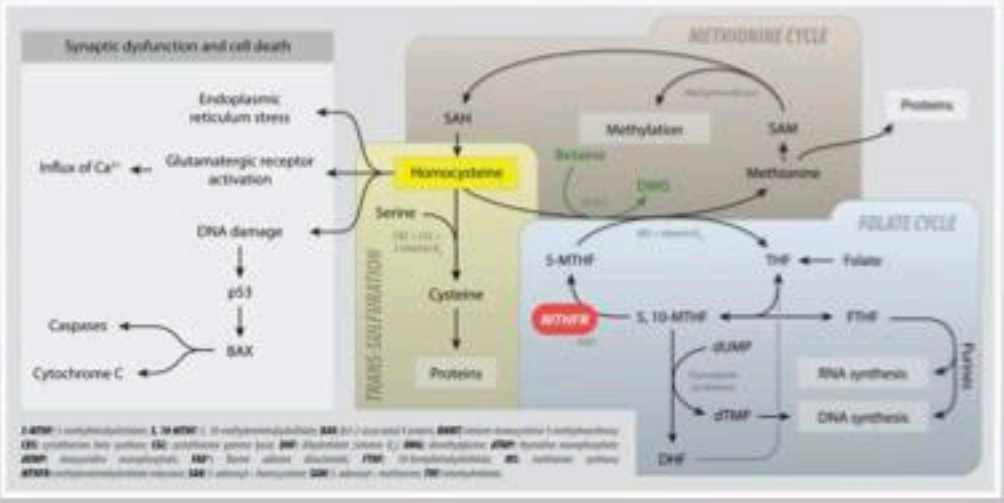
Blood Tests
Rule out many fatigue diseases

Fatigue not sleep related
Hypothyroid
Hyperthyroid
Iron Deficiency
Vitamin B deficiency
Vitamin D deficiency
Magnesium Deficiency
Autoimmune disease

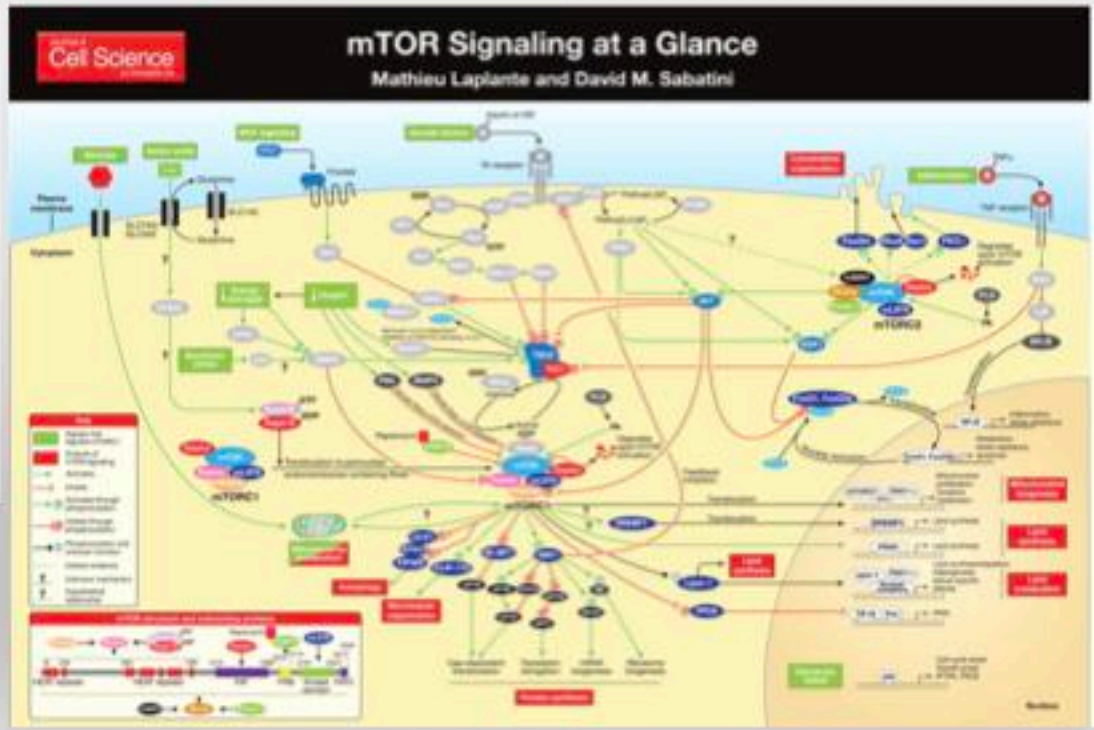
AHI 30+

CBCT
Verify Clear path Nose to lungs
Verify Joint Health, Sinus Health

Vitamin D deficiency
leads to Vitamin B deficiency
leads to high Homocysteine
leads to Inflammation (damages arteries)



Homocysteine activates mTORC1



Vit D needed to Absorb Vit B12 made in gut
Low Vit B = poor sleep, fatigue

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

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.

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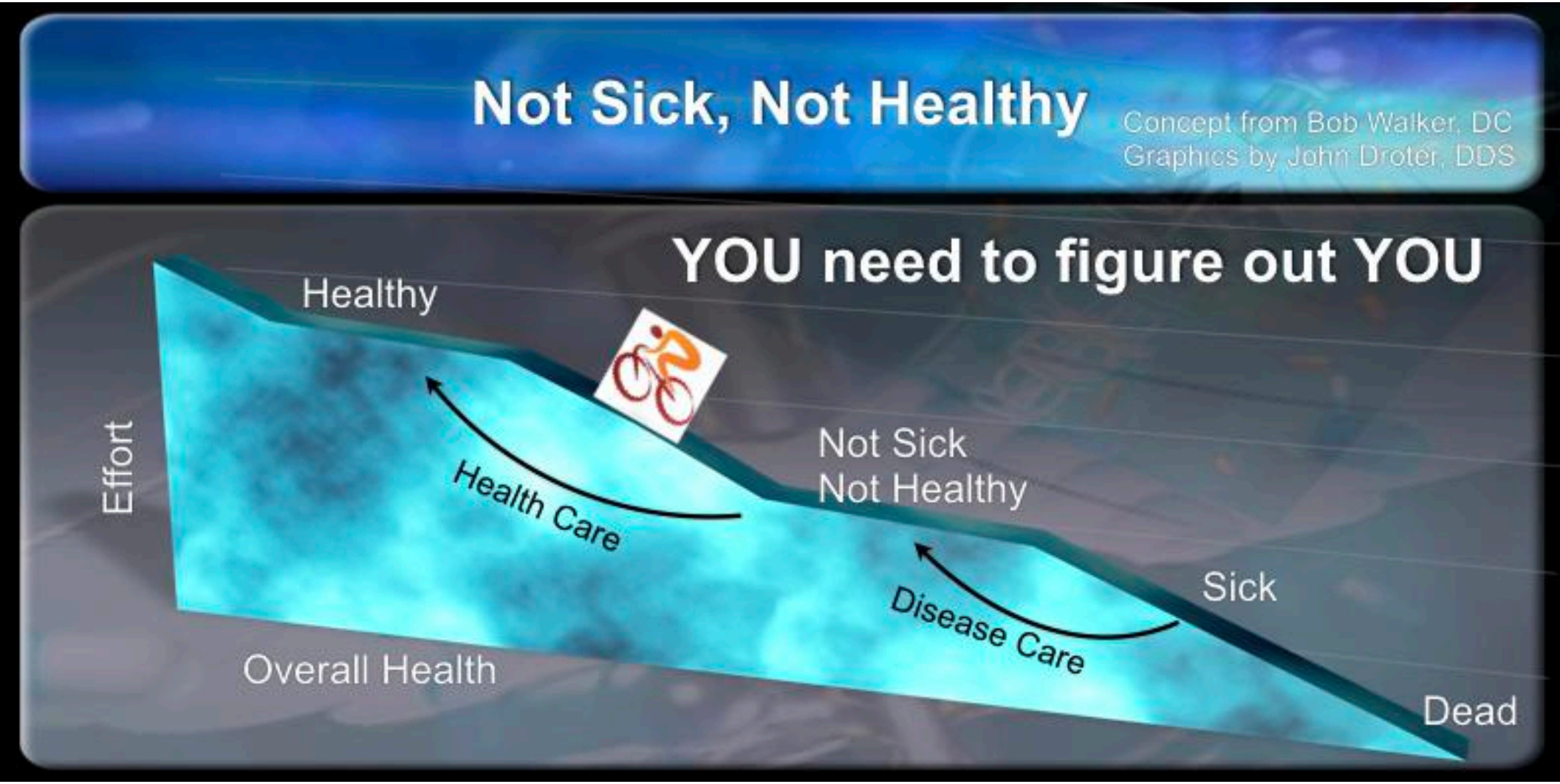
"Recent Advances in Medicine," Science, March **1891**

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

TOXIC PILLS
AND SURGERY
LIFESTYLE
CHANGE


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

Handout for Patients

www.jrdroter.com

Disordered Breathing Disease Progression

Disease Stage 1	Disease Stage 2	Disease Stage 3	Disease Stage 4
Predisposing Factors	Compensation: Airway Maintained	Sleep: Airway Partial Collapse	Sleep: Airway Full collapse
Tongue Tie, Lip Tie Bottle Fed as Infant Dysfunctional Swallow Allergies Nasal Obstruction Large Tonsil Large Adenoids Large Tongue Mid-face Deficient Mandibular Deficient Small Airway	Signs Tongue Bracing Indents in Tongue Head Postured Forward Jaw Postured Forward Sore Masseters Sore Neck Muscles Mouth Breathing Symptoms Facial Ache Not Waking Rested Daily Fatigue Neck Soreness	Signs All of stage 1 and 2 plus.... Upper Airway Resistance 2% Drop O_2 Saturation RERA- Respiratory Arousals ⬇ Growth Hormone Symptoms Heart Rate Fluctuation Snoring or "Purring" Weight Gain Cognitive Impairment, ADD Hyperactivity	Signs All of stage 1, 2, 3 plus.... 3+% drop O_2 Saturation Apnea Cardiovascular Damage Elevated BP GERD Sleep Teeth Grinding Symptoms All of stage 2, 3 plus.... Worn Teeth

John R. Droter DDS

Disordered Breathing Disease Stage 4

OSA- Obstructive Sleep Apnea

AHI- Apnea Hypopnea Index

Apnea and Hypopnea events per hour

Apnea- Stop airflow for 10 seconds

Hypopnea- <50% airflow or 3+% O_2 Desaturation

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

Signs
Apnea
3+% drop O_2 Saturation
Cardiovascular Damage
Elevated BP
GERD
Sleep Teeth Grinding

Symptoms
Not Waking Rested, Daily Fatigue
Cognitive Impairment
Worn Teeth

Irreversible Damage

John R. Droter DDS

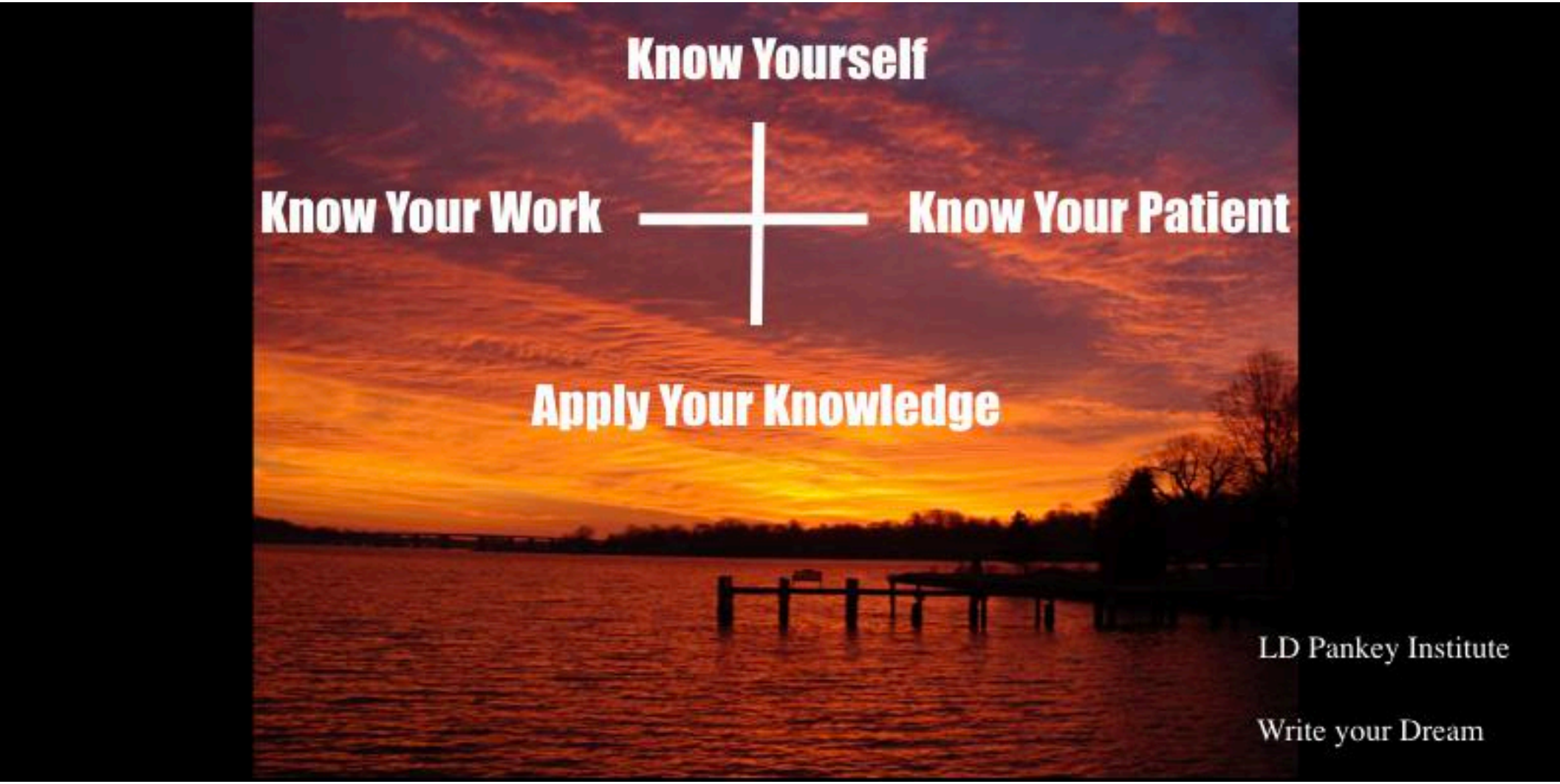
John R. Droter, D.D.S.
8000 Michelville Rd., Suite B
Bowie, Maryland, 20716
301-805-9400
www.drdroter.com

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

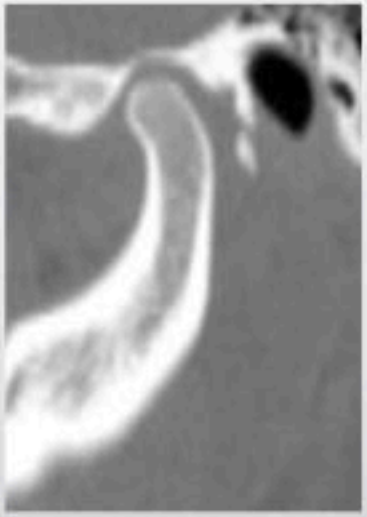
Young patients can be treated, older patients can only be managed.

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

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


Know Yourself
Know Your Work
Know Your Patient
Apply Your Knowledge
LD Pankey Institute
Write your Dream

I use both Centric Relation and Non-Centric Relation Orthotics



Treatment Position vs Final Position: Do Not Confuse the Two

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

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

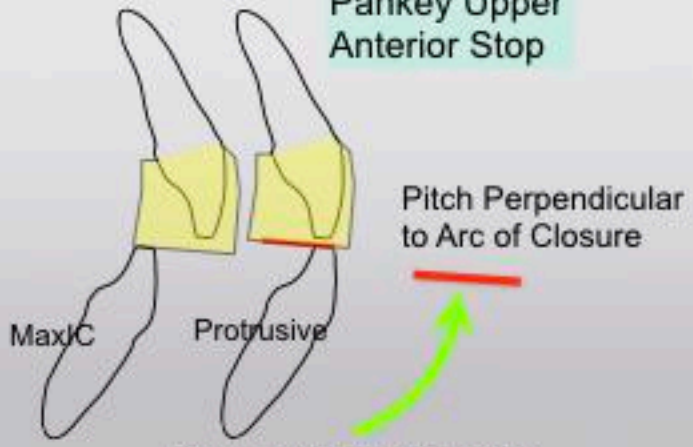
Anterior Stop Orthotics

Pankey Upper
Anterior Stop

Modified Quick Splint
w/ Triad Trans Sheet

Temporary trial night guard

D-PAS
Diagnostic Palatal
Anterior Stop

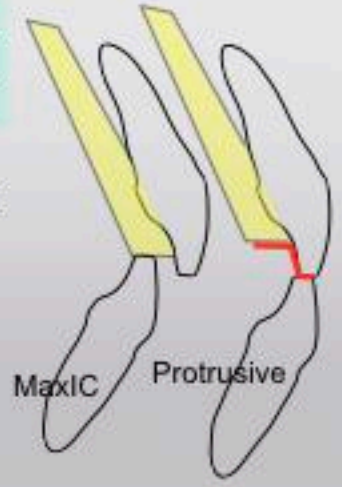


Pitch Perpendicular
to Arc of Closure

Diagnostic test in office

D-PAS is most effective
Most solid contact
Most # helped

Dx test nighttime 3 nights
Dx test daytime 2 days

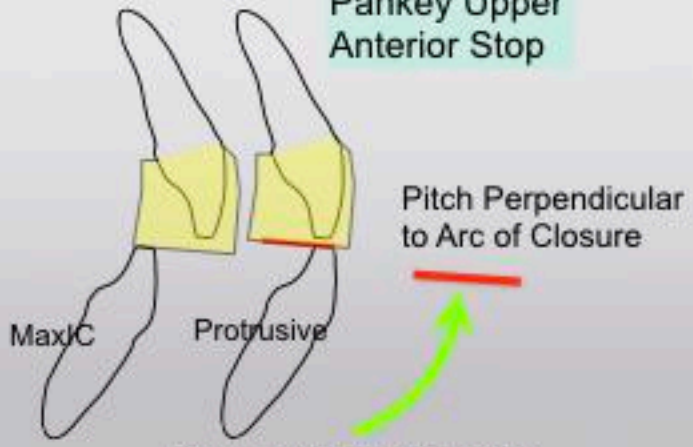


Create undercuts in plastic
Reline 2x with Futar D- Kettenbach

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

Pankey Anterior Stop Orthotic

Pankey Upper Anterior Stop



Diagnostic test in office

Create undercuts in plastic
Reline 2x with Futar D- Kettenbach

Office USE ONLY

Do not send home with patient

Need to Deprogram Muscle Engrams

With anterior stop in place:
Patient solid taps CR 10x, Solid taps far left, solid taps far right

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

3rd round
Patient solid taps CR 10x, Solid taps far left, solid taps far right
Solid taps CR 10x, re-Examine muscle

Modified Quick Splint

Emergency Temporary Trial Nightguard

Triad Trans Sheet

Reverse bevel slot

Slight over fill

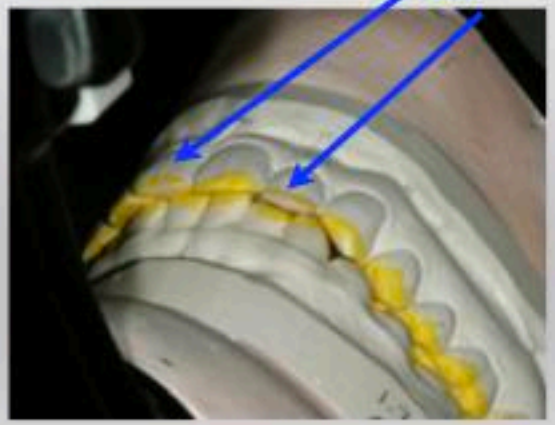
Reline Blue Mousse

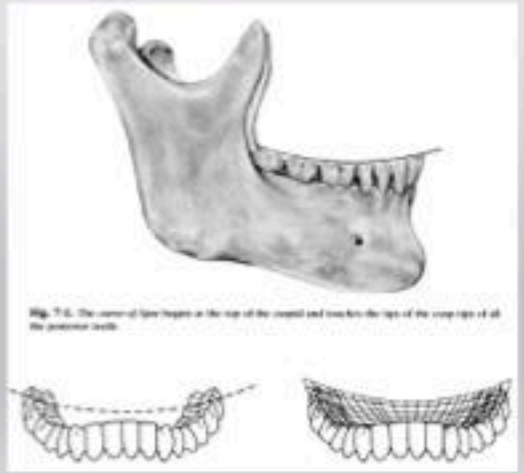
Left Lateral Excursion

Right Lateral Excursion

Occlusal Adjusting is an Esthetic Procedure
Form Follows Function

Before





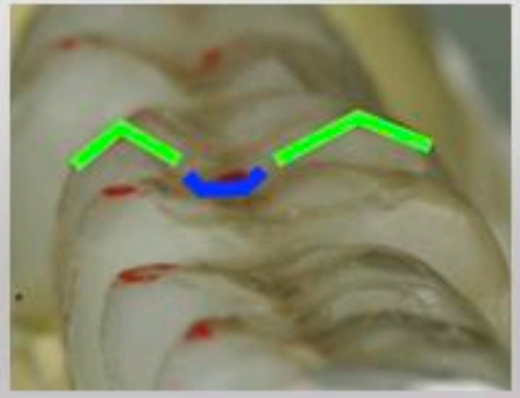
After

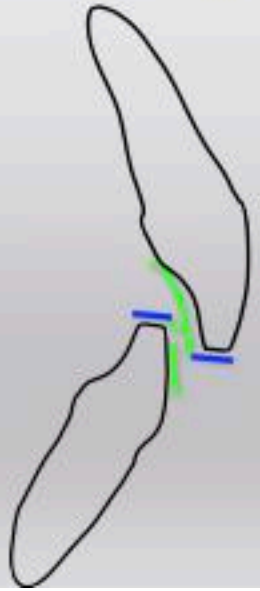
Occlusal Sculpting Tools, including Zirconia

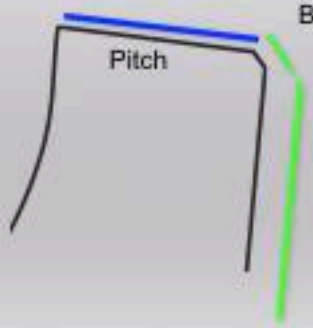
Wheel
- Create Cusp Landing Zone
- Flatten Incisal edges
- Bulk reduction of inclines

Move and Shape Cusps, Inclines, Facial Surfaces

Brassler Brio Shine
FLBCER-1
FLBF-2







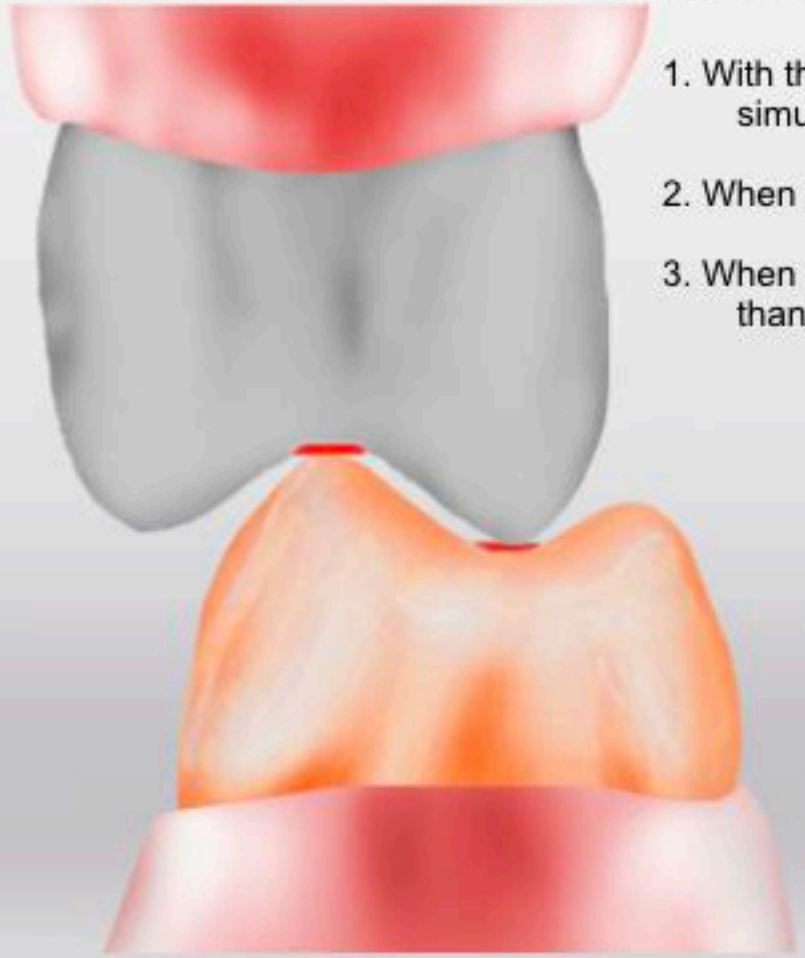
Premier 860.9 F Wheel Diamond
Premier 230 F Barrel Diamond
Neodiamond 1118.7F Roundend taper
Dedco Green Stone
White Arkansas stone

Start Age 50

Lingual Light Wire w/ Sectional Ortho

Post Occlusal Reshaping

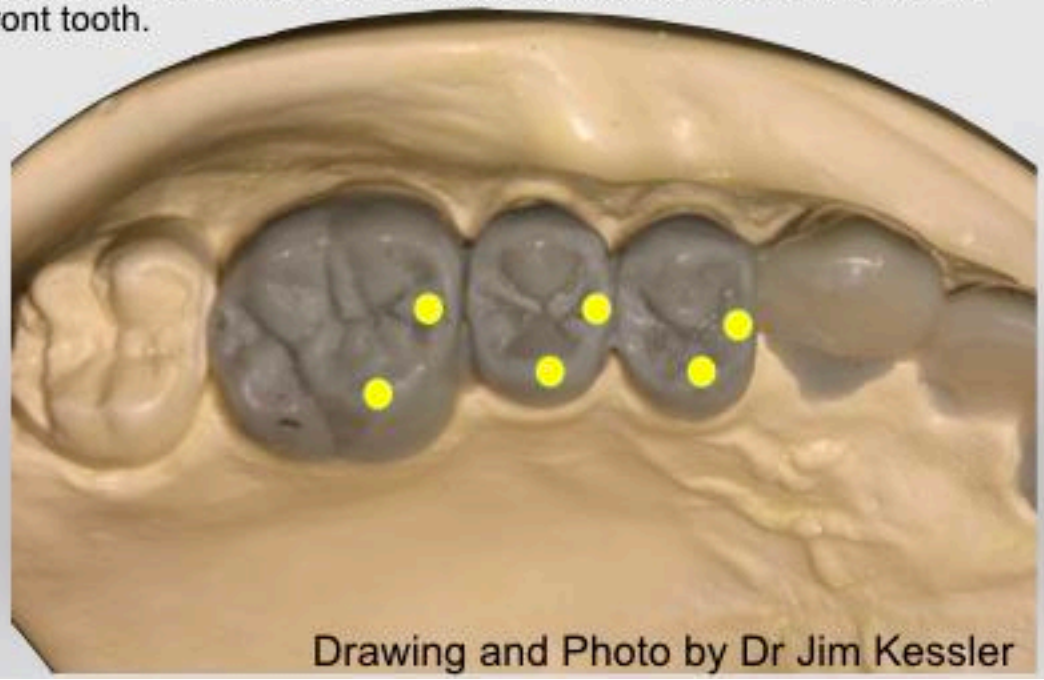
LD Pankey's 3 Rules of Occlusion (Clyde Schuyler)



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.

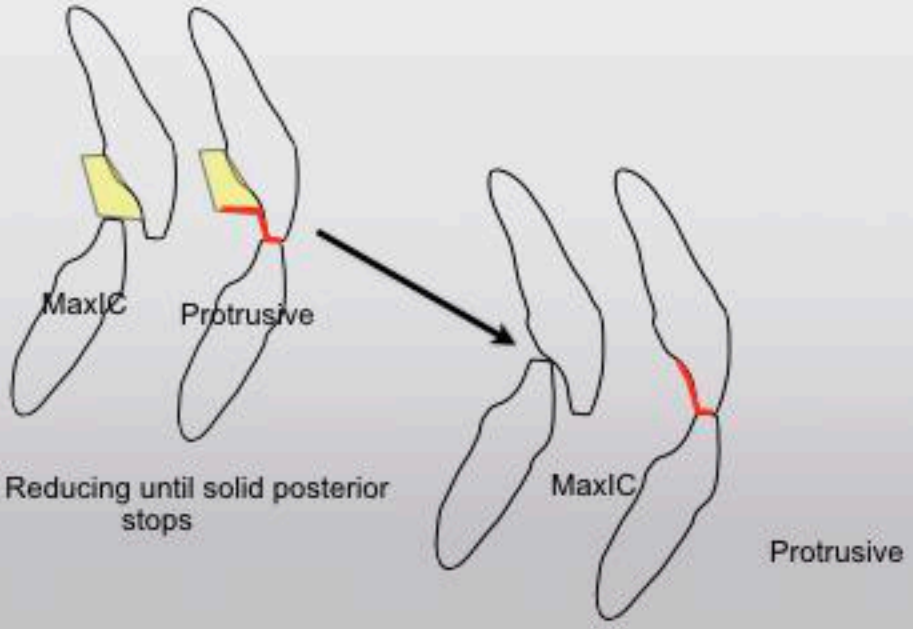


Drawing and Photo by Dr Jim Kessler

Occlusal Adjustment Treatment Assist Orthotic Deprograms throughout the occlusal adjustment

Triad Light Shade
Remove and refine
Solid flat anterior stop
Glue in with Triad clear gel
Adjust in with teeth
Remove once solid posterior stops

Learning the skill of occlusal adjusting to treat occlusal pathology is the doorway into a world of dentistry most do not even imagine. Creating a more harmonious occlusion is a wonderful service to provide for your patients.

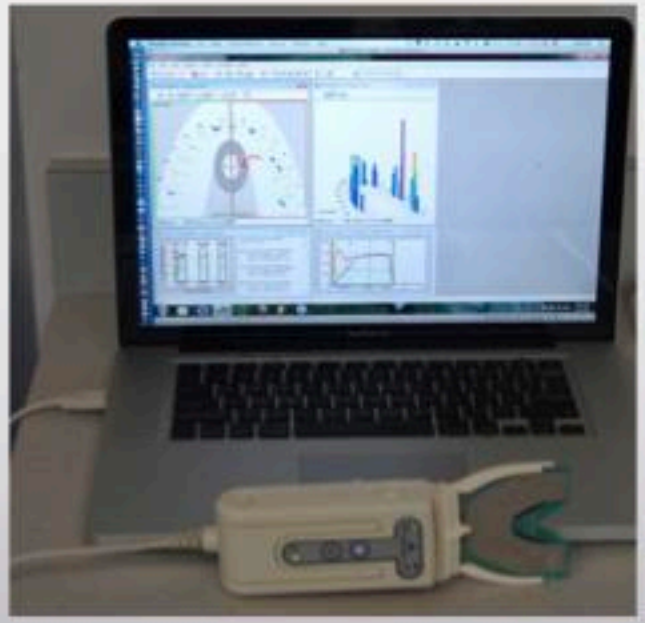


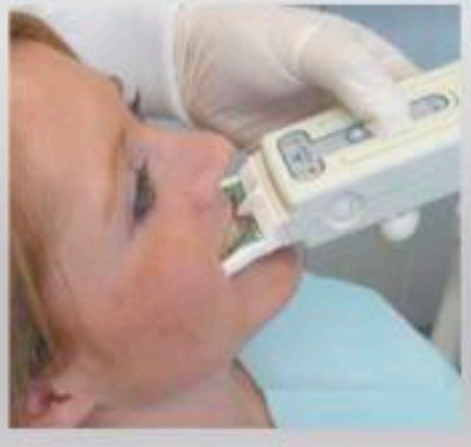
Keep Reducing until solid posterior stops

More Harmonious Occlusion ≠ Perfect

T-Scan Computerized Occlusion

Occlusion Live and in Slow Motion





Articulating Paper leaves evidence after the events

Not Live

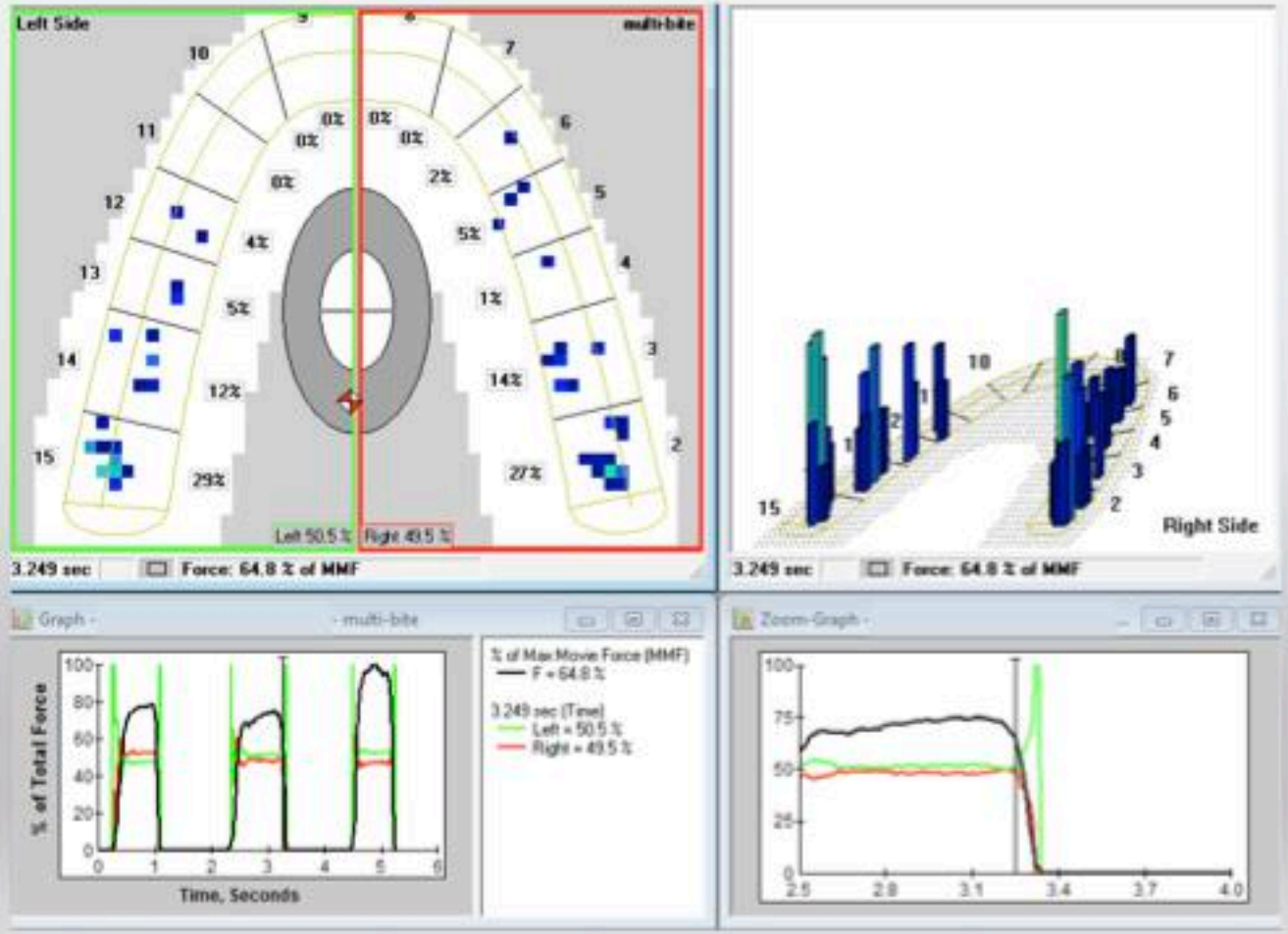
All events lumped together

Using Since1999

Time Force Graphic Representation of the Occlusion

T-Scan Gives you:
Timing
Intensity
Location
Distribution

"Occlusion in Slow Motion"
Regular 10 msec intervals
Turbo 2.5 msec



D-PAS Test Interpretation

Wear 3 nights, then 2 days

Decrease Muscle Pain Sleep Wear
Sleep Clenching: Wear D-PAS as night guard

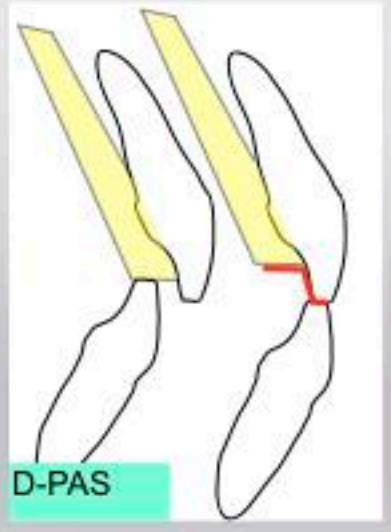
Decrease Muscle Pain Day Wear
Occlusal Muscle Disharmony: Occlusal Adjust

No Change in Pain
Damaged TMJ are mechanically stable
Pain not related to occlusion

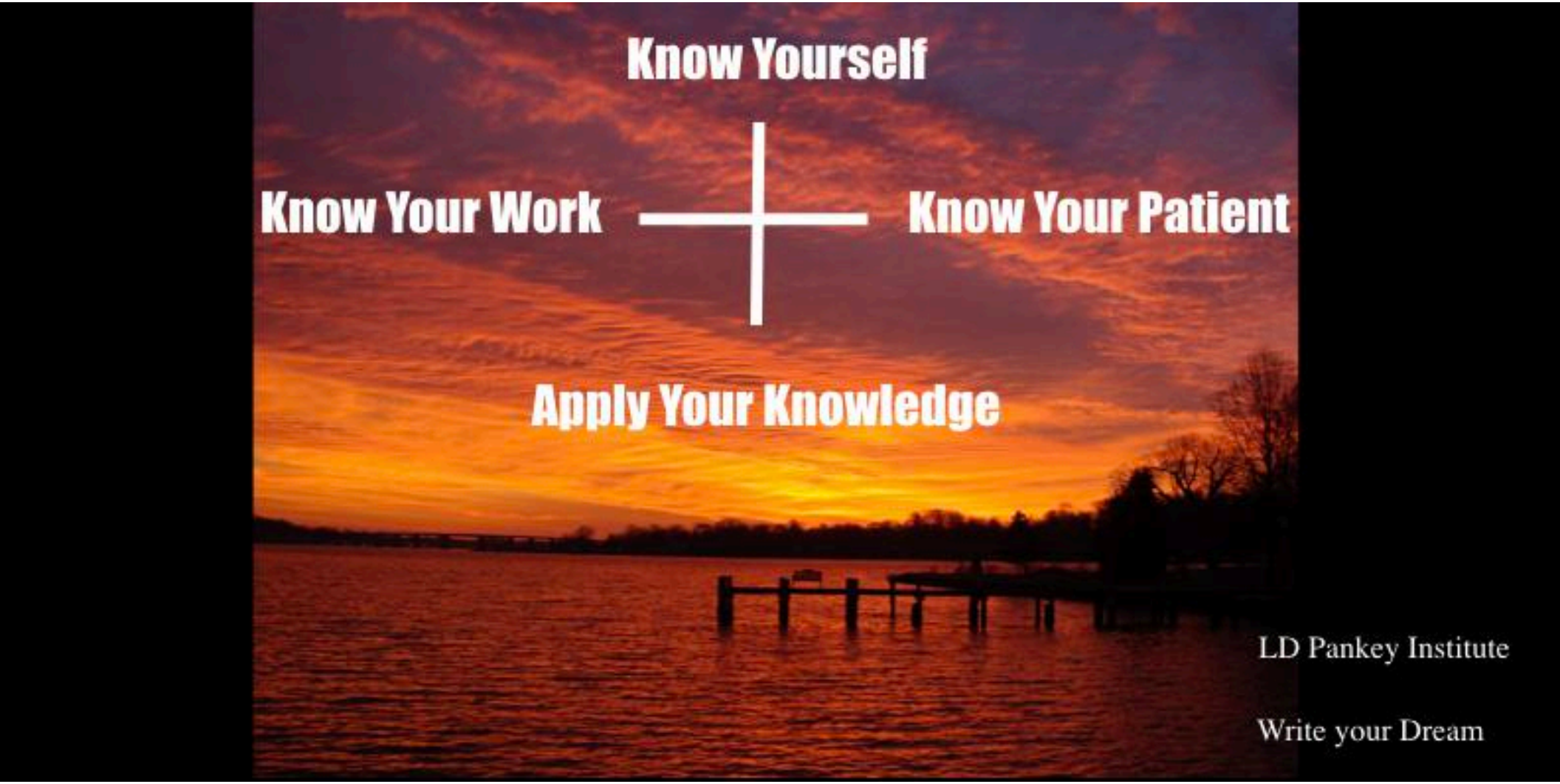
Increase Muscle Pain
Mechanically Unstable TMJ, joint subluxation

Increase Joint Pain
Intracapsular Problem TMJ

Masseter Muscle/ tooth contact Inhibition:
Has Inhibition: Can use anterior disclusion
Lacks Inhibition:Full power on clenching



If grinding or airway issue need to address those problems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