

TMD 2022

John Herb Matt

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Why is TMD So Confusing?

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Stomatognathic System Interrelationship

A change in any one area will affect the others

CNS/PNS

Skull

TMJ

Teeth

Mandible

Teeth

Neck

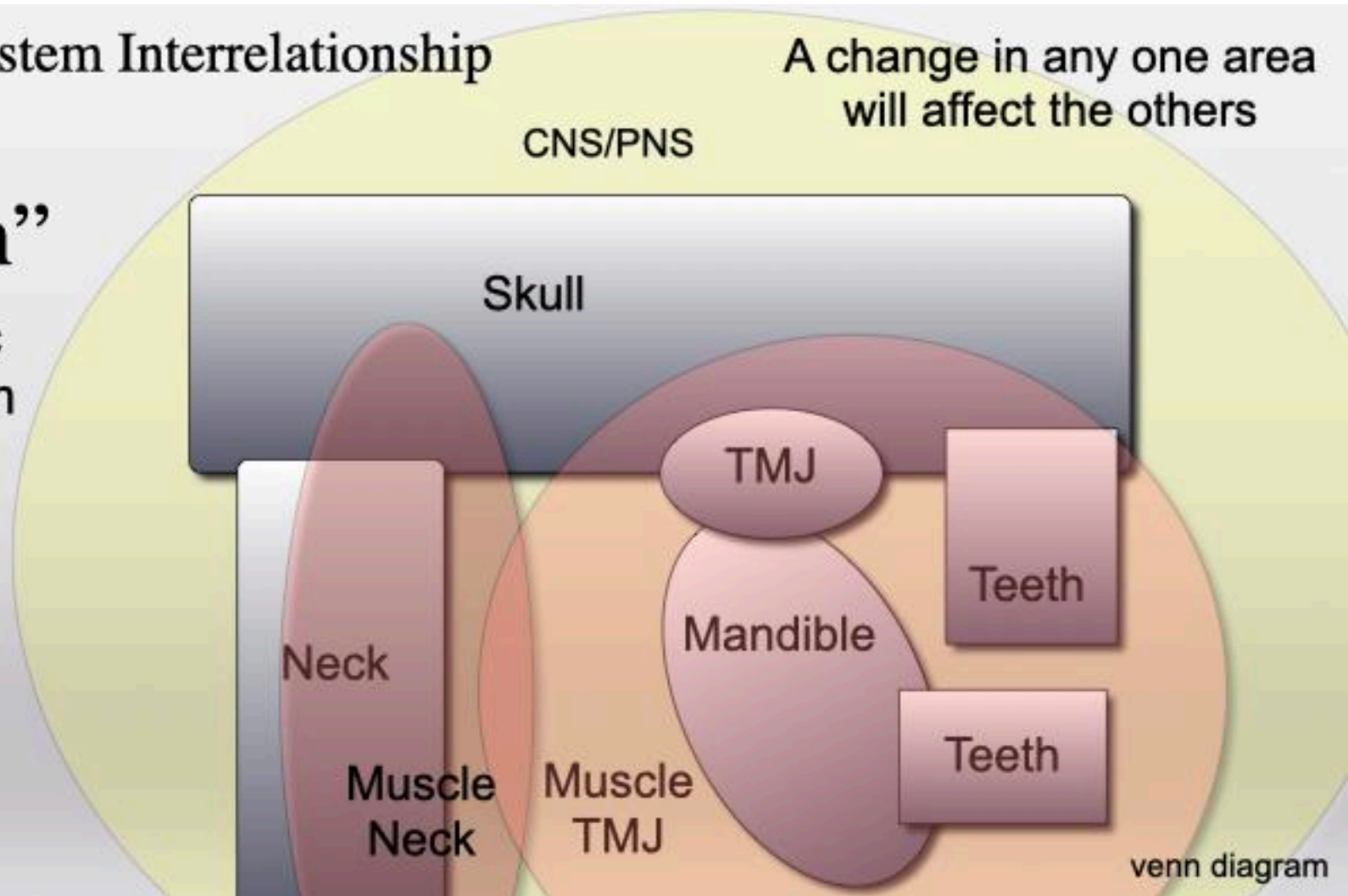
Muscle Neck

Muscle TMJ

venn diagram

“Adaptation”

This is a **dynamic** orthopedic System



Diagnosis Treatment Flow Chart

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



Symptoms

History

Signs

Doctor Exam

Differential Diagnosis

Diagnostic Tests

Specific Working Diagnosis

Treatment

No Signs

No Symptoms
Final Dx

Doctor Re-Exam

If not resolved

Symptom Dx

Tooth Pain
Arthralgia

vs
vs

Specific Dx

Irreversible Pulpitis
Osteoarthritis

Differential Diagnosis

Diagnostic Boxes: Pattern Recognition

“My Tooth Hurts”

Reversible Pulpitis secondary to caries

Irreversible Pulpitis secondary to caries

Pulpitis secondary to split tooth

Pulpal necrosis

Referred Pain from Muscle
Trigger Point

Sinus Infection

Sympathetic Mediated Pain

Neuroma

Periodontal Infection

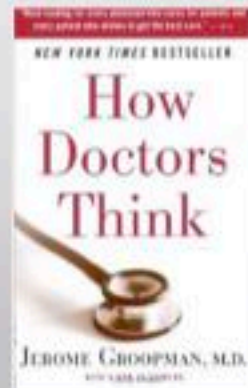
Inflamed Tissue secondary to
popcorn husk

Aphthous Ulcer

Periodontal ligament inflammation
secondary to Occlusal Trauma

Pulpitis secondary to Occlusal Trauma

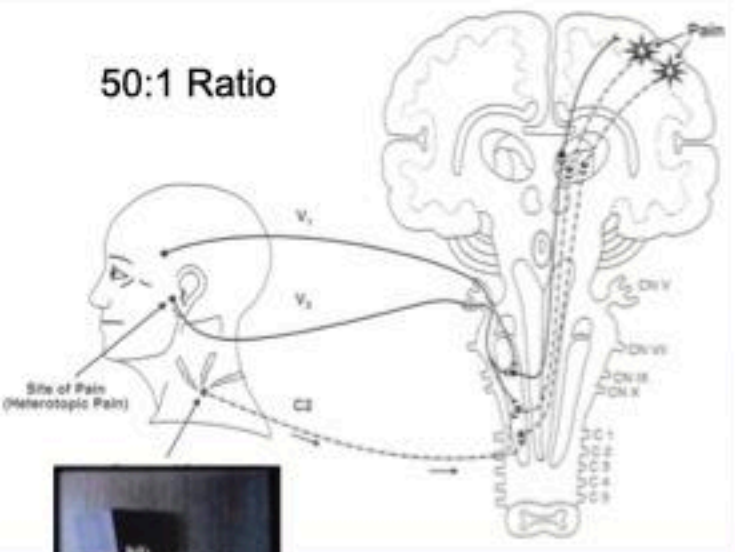
Other



Referred Pain Convergence

More primary sensory neurons than secondary neurons that travel to brain

50:1 Ratio



"Bell's Orofacial Pain"
Jeffery Okeson

Trigger Points

Contracted mass of actin, myosin and histamine

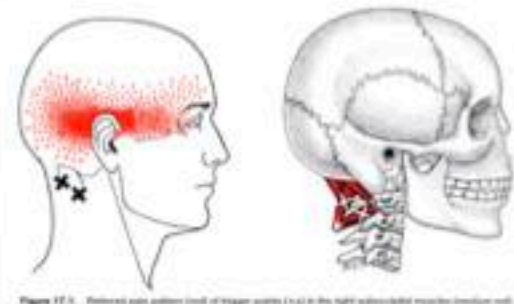
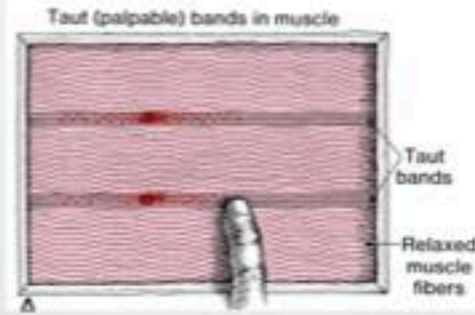
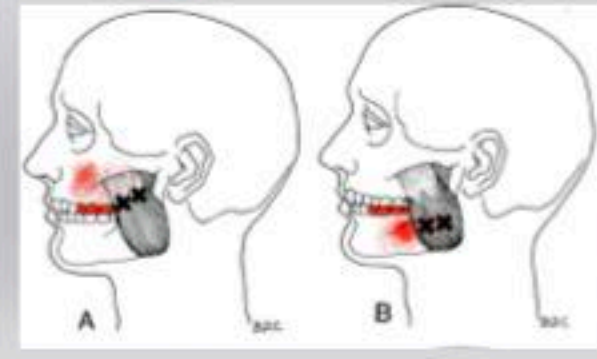
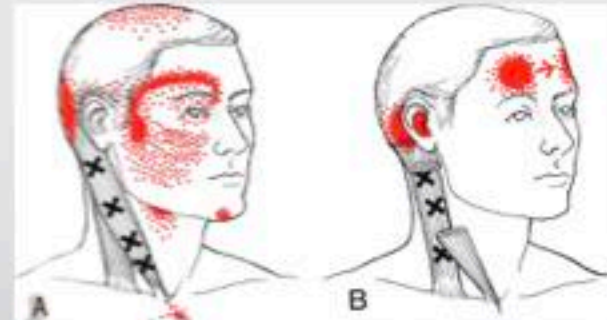
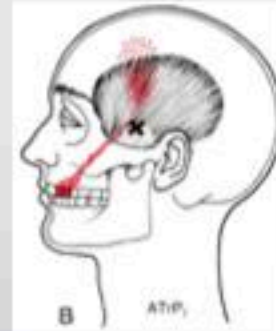


Figure 17.1. Referred pain pattern (red) of trigger points (x) in the right suboccipital muscles (American text)

"The Trigger Point Manual"
Janet Travell, MD



Differential Diagnosis

Diagnostic Boxes: Pattern Recognition

“My Tooth Hurts”

Reversible Pulpitis secondary to caries

Irreversible Pulpitis secondary to caries

Pulpitis secondary to split tooth

Referred Pain from Muscle
Trigger Point

Periodontal Infection

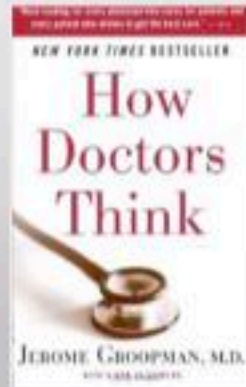
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Periodontal ligament inflammation
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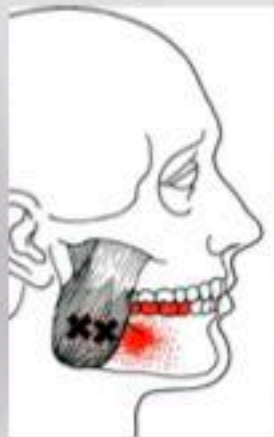
Other



“How Doctors Think”, by Jerome E. Groopman

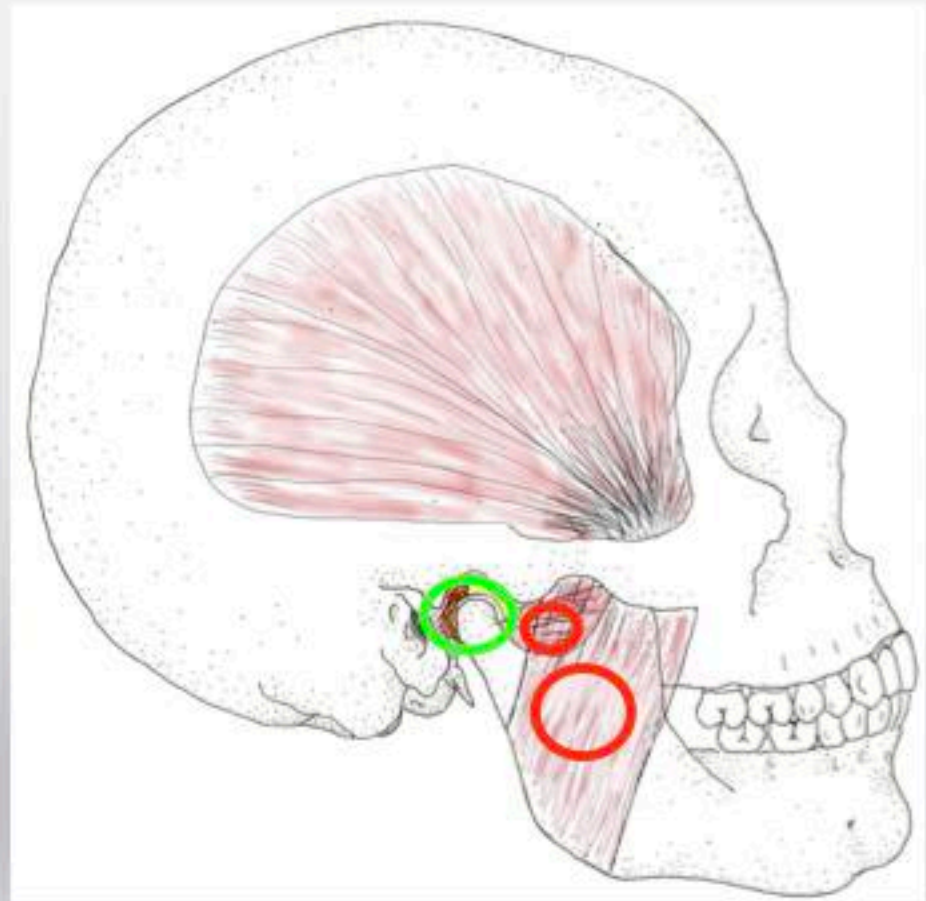
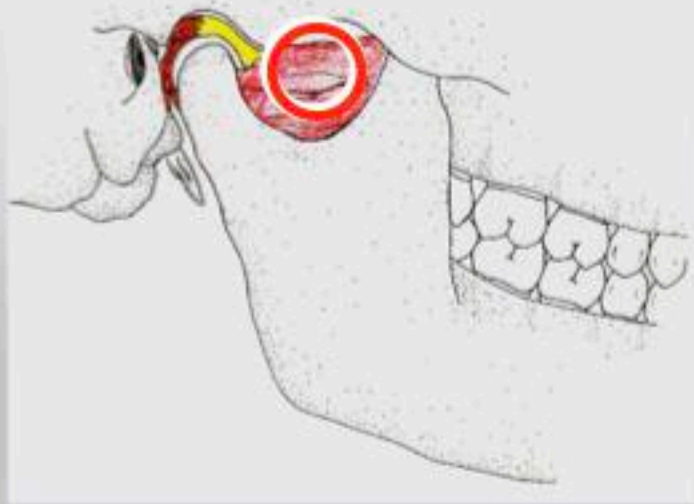
Diagnose by Pattern Recognition
Tendency to make patients fit what we know
Ignore signs and symptoms that do not fit

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



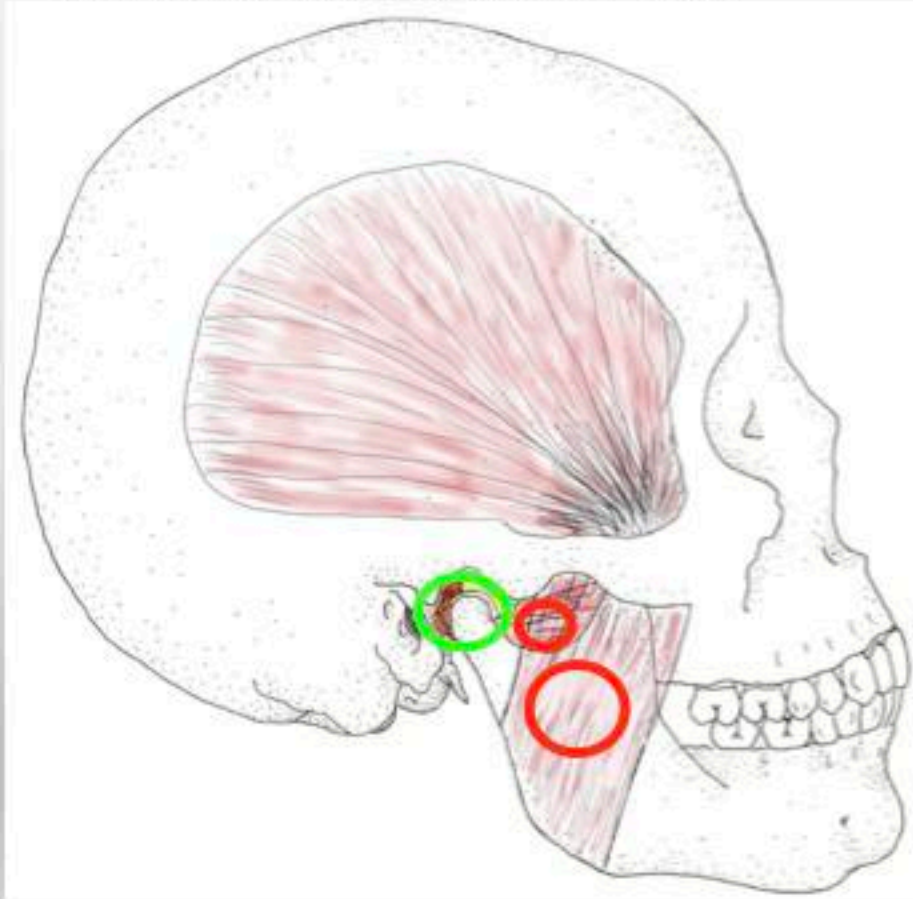
Occlusal Muscle Dysfunction Pattern

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



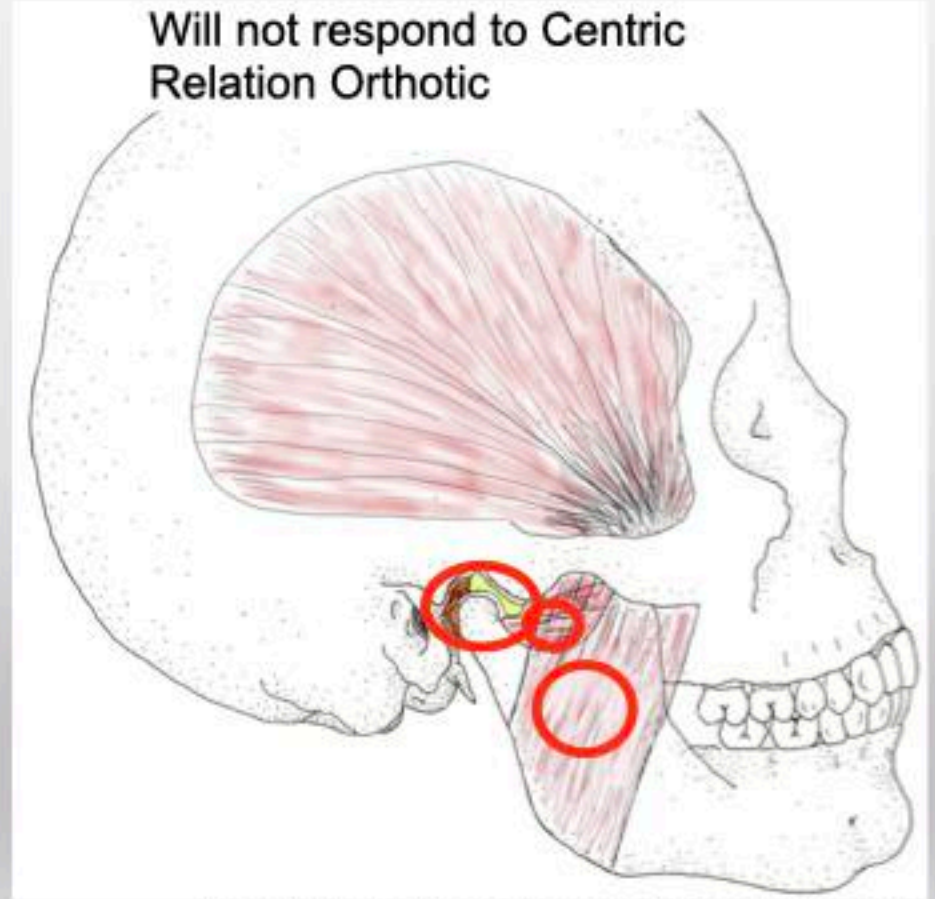
Drawings by Gretta Tomb DDS and John Droter DDS

Occlusal Muscle Dysfunction Pattern



Muscle Bracing Sore TMJ

Will not respond to Centric Relation Orthotic



Drawings by Gretta Tomb DDS and John Droter DDS

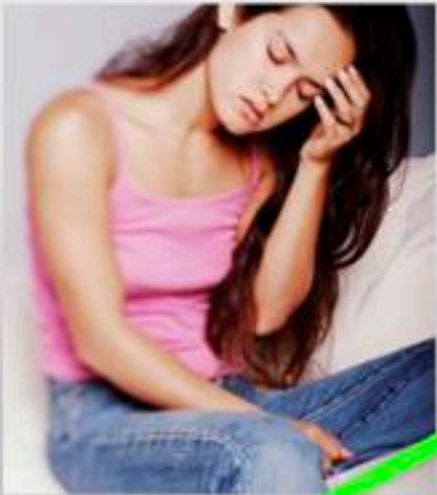
1. TMD: TMJ Damage and Diseases

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

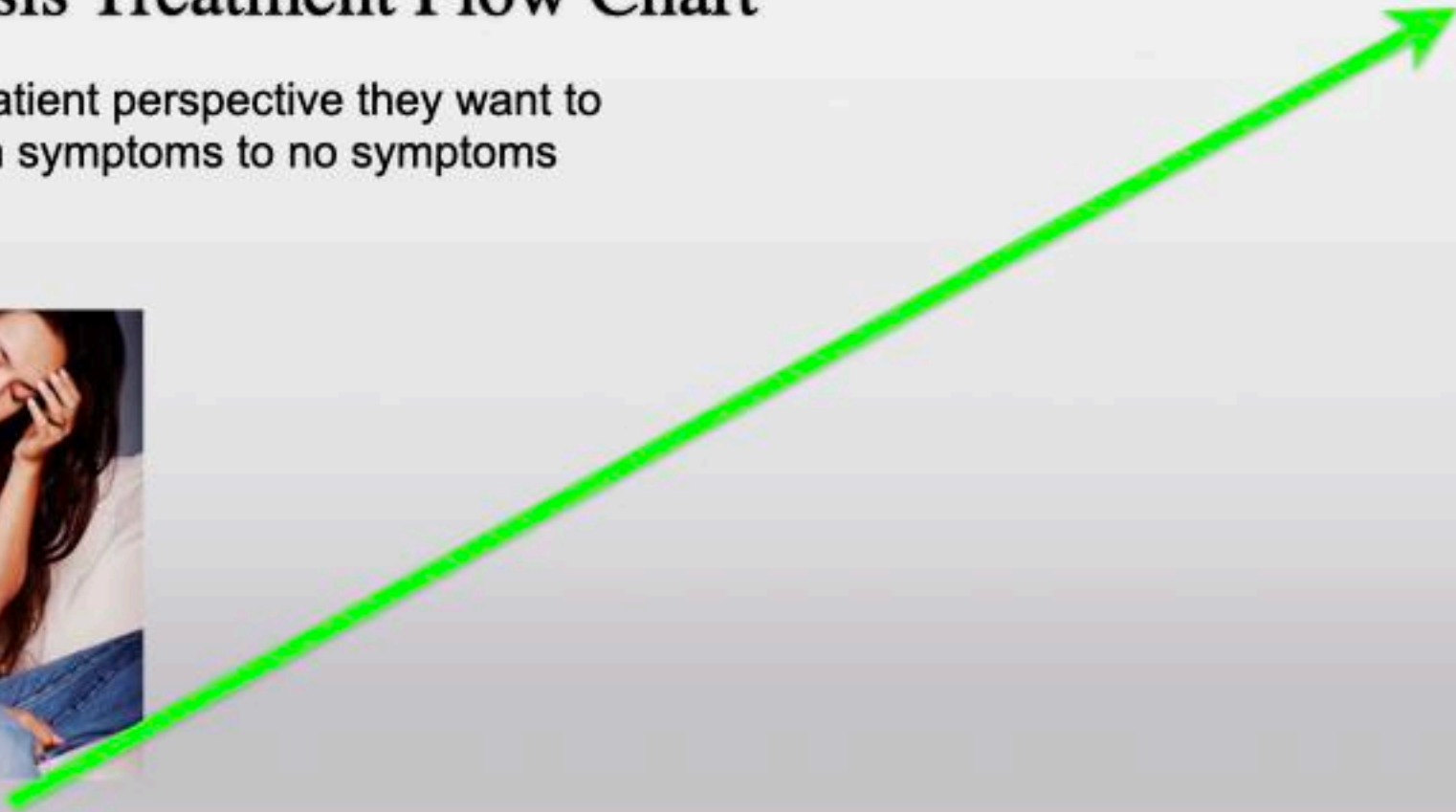
Diagnosis Treatment Flow Chart

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



Symptoms

No Symptoms



Diagnosis Treatment Flow Chart

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



Symptoms

History

Signs

Doctor Exam

Differential Diagnosis

Diagnostic Tests

Specific Working Diagnosis

Treatment

No Signs

No Symptoms
Final Dx

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If not resolved

Symptom Dx

Tooth Pain
Arthralgia

vs
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Specific Dx

Irreversible Pulpitis
Osteoarthritis

Diagnosis Treatment Flow Chart

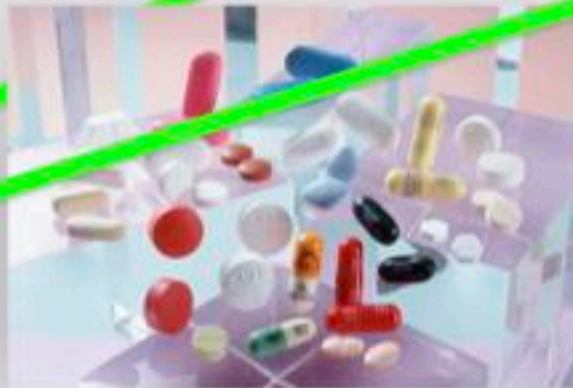
From a patient perspective they want to go from symptoms to no symptoms

No Symptoms

Less Symptoms



Symptoms



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

**TMD: If only one Diagnosis,
only need one Treatment**

**If only one Treatment,
only need one Diagnosis**



TMD is a symptom based (generalized) diagnosis

Diagnosis Treatment Flow Chart

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



Symptoms

History

Signs

Doctor Exam

Differential Diagnosis

Diagnostic Tests

Specific Working Diagnosis

Treatment

No Signs

No Symptoms
Final Dx

Doctor Re-Exam

If not resolved

Symptom Dx

Tooth Pain
Arthralgia

vs
vs

Specific Dx

Irreversible Pulpitis
Osteoarthritis



Hello. I am:

**John R Droter DDS
Annapolis, Maryland**

*Annapolis, Maryland
John R Droter DDS*

Milestones



Visiting Faculty Spear Education 2013

Visiting Faculty LD Pankey Institute 2008

Visiting Faculty Orthodontic Program
Washington Hospital Center 2000

On staff AAMC: Orthopedic Rounds
In OR for TMJ Surgery

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

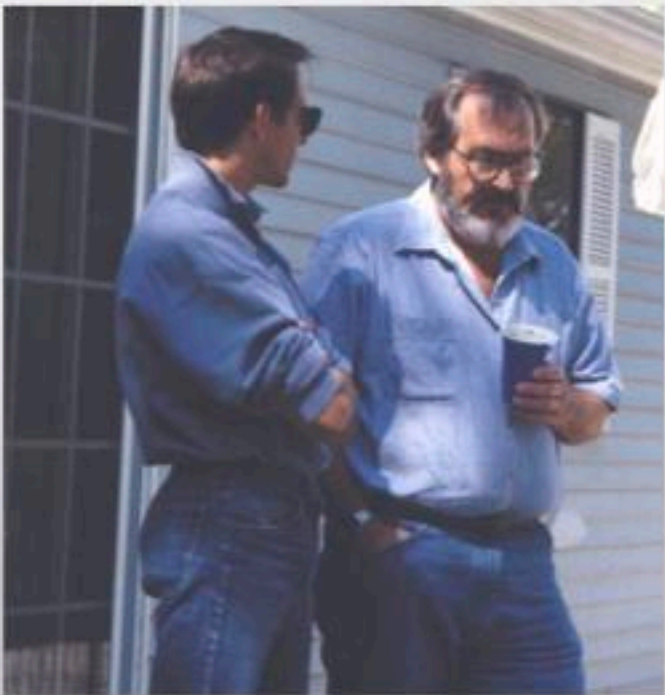
CT and MRI Imaging Joints 1992
Guy Haddix, DDS: Mentor
(3,100 images and rising)

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

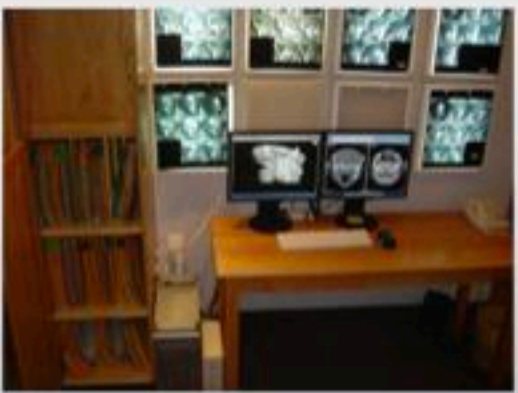


JAC 03

Dr Guy Haddix had been taking CT scans since 1990

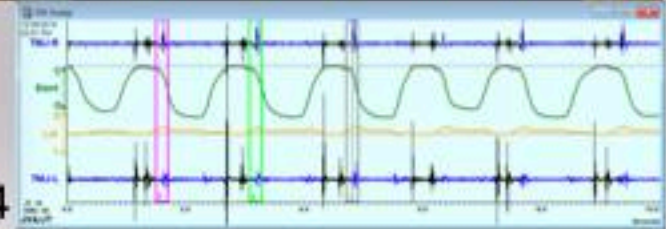
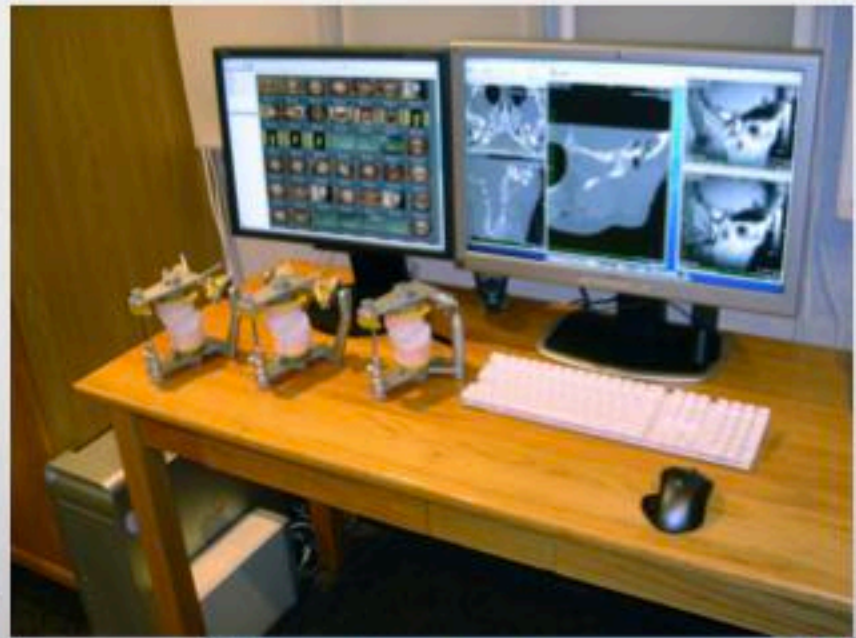


CT and MRI Scans in my practice since 1992.



Closet full of printed scans just as digital appeared!!

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



JVA since 2004



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



Disclosures:

Atomic Skis- Sponsored.
I got stuff.

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

Spear Education- Paid
honorarium for lectures

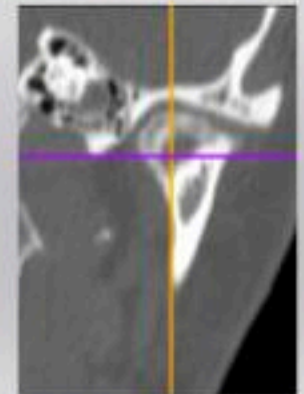
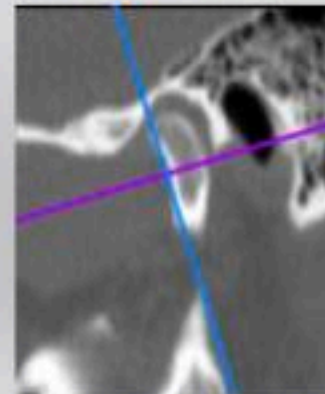
Patent on sleep device: LatBrux
Co-Owner of ArrowPath Sleep



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

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



John R Droter, DDS

To get today's lecture slides:
go to www.jrdroter.com

Seminar Download

TMD John Herb and Matt

Screenshot of the website www.jrdroter.com showing the "SEMINAR DOWNLOADS" page. The page features a navigation menu with "SEMINAR DOWNLOADS" highlighted. The main content area lists "Upcoming Seminars" and "Most Popular and Common Downloads".

Upcoming Seminars

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

Most Popular and Common Downloads

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

TMD Therapies

John R Droter DDS
Annapolis, Maryland

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John R Droter DDS

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

1. TMJ Damage

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Avascular Necrosis Mandibular Condyle
Cartilage Fibrillation, Mandibular Condyle, Fossa
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Dislocation jaw cartilage due to injury, Sequela
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Dislocation jaw cartilage without reduction, favorable adaptation, TMJ
Effusion, TMJ

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Inflammatory Tissue Bone Resorption, TMJ Condyle
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Osteolysis Mandibular Condyle, Active
Perforation Mandibular, TMJ
Perforation Pseudodic, TMJ
Psoriatic Arthritis TMJ
Rheumatoid Arthritis Sero Negative TMJ
Synovitis

2. Muscles of the TMJ

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

3. Cranial Alignment/Occlusion

Cranial Distortion / Misalignment
Hemifacial Hypoplasia
Hyper Occlusal Awareness
Idiopathic Orthotic Damage
Malocclusion Anterior Open Bite
Malocclusion Central occlusion Mx/C discrepancy
Malocclusion Deep Bite
Malocclusion due to mouth breathing
Malocclusion due to TMJ bone loss
Malocclusion due to tongue, lip or finger habits
Malocclusion insufficient anterior occlusal guidance
Malocclusion lack of posterior occlusal support
Malocclusion Posterior Openbite Bilateral
Malocclusion Posterior Openbite Unilateral
Malocclusion unspecified

Malposition/Misalignment: Maxilla, Temporal Bone, Mandible
Mandibular asymmetry
Mandibular hyperplasia
Mandibular hypoplasia
Mandibular Retrognathia
Maxillary asymmetry
Maxillary hyperplasia
Maxillary hypoplasia
Maxillary Retrognathia
Occlusal Adaptation, Favorable
Occlusal Dependency for Joint Stabilization/ Proprioception
Tooth Intrusion
Tooth Supereruption

4. Cervical Damage

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

5. Parafunction

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

6. Whole Body / Systemic

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

7. Other

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

TMD Therapies: (70 therapies)

Physical

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

Dental Orthotics

In Office Trial Anterior Stop
Temporary home use anterior stop
Myobrace
Aqualizer
Diagnostic Palatal Anterior Stop
Lower full coverage CR
Lower posterior deprogrammer
Lower TMJ Rehab flat plane
Lower Indexed

Brux Checker
Upper full coverage hard CR guard
BiArch Posterior Deprogrammer
Mandibular Advancement Device
Lateral Bruxing Device

Medicinal

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

Sleep/ Fatigue

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

Occlusal Orthopedic

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

Tongue Parafunction

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

Surgical

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

Different Diagnoses have Different Therapies

Specific Diagnosis

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

1. TMJ Damage

Abnormal relationship of temporomandibular joint articular surfaces
 Acute or chronic inflammation of TMJ
 Arthritis of TMJ
 Degenerative TMJ
 Dislocation of TMJ
 Fracture of TMJ
 Infection of TMJ
 Osteoarthritis of TMJ
 Osteoarthrosis of TMJ
 Osteomyelitis of TMJ
 Periapical abscess of TMJ
 Periapical granuloma of TMJ
 Periapical cyst of TMJ
 Periapical fibrosis of TMJ
 Periapical necrosis of TMJ
 Periapical abscess of TMJ
 Periapical granuloma of TMJ
 Periapical cyst of TMJ
 Periapical fibrosis of TMJ
 Periapical necrosis of TMJ

Arthritis of TMJ
 Dislocation of TMJ
 Fracture of TMJ
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 Osteomyelitis of TMJ
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2. Muscles of the TMJ

Acute or chronic inflammation of TMJ
 Arthritis of TMJ
 Dislocation of TMJ
 Fracture of TMJ
 Infection of TMJ
 Osteoarthritis of TMJ
 Osteoarthrosis of TMJ
 Osteomyelitis of TMJ
 Periapical abscess of TMJ
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3. Cranial Alignment/Occlusion

Abnormal relationship of temporomandibular joint articular surfaces
 Acute or chronic inflammation of TMJ
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 Periapical abscess of TMJ
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 Periapical necrosis of TMJ

4. Cervical Damage

Abnormal relationship of temporomandibular joint articular surfaces
 Acute or chronic inflammation of TMJ
 Arthritis of TMJ
 Dislocation of TMJ
 Fracture of TMJ
 Infection of TMJ
 Osteoarthritis of TMJ
 Osteoarthrosis of TMJ
 Osteomyelitis of TMJ
 Periapical abscess of TMJ
 Periapical granuloma of TMJ
 Periapical cyst of TMJ
 Periapical fibrosis of TMJ
 Periapical necrosis of TMJ

5. Parafunction

Abnormal relationship of temporomandibular joint articular surfaces
 Acute or chronic inflammation of TMJ
 Arthritis of TMJ
 Dislocation of TMJ
 Fracture of TMJ
 Infection of TMJ
 Osteoarthritis of TMJ
 Osteoarthrosis of TMJ
 Osteomyelitis of TMJ
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 Periapical cyst of TMJ
 Periapical fibrosis of TMJ
 Periapical necrosis of TMJ

6. Whole Body / Systemic

Abnormal relationship of temporomandibular joint articular surfaces
 Acute or chronic inflammation of TMJ
 Arthritis of TMJ
 Dislocation of TMJ
 Fracture of TMJ
 Infection of TMJ
 Osteoarthritis of TMJ
 Osteoarthrosis of TMJ
 Osteomyelitis of TMJ
 Periapical abscess of TMJ
 Periapical granuloma of TMJ
 Periapical cyst of TMJ
 Periapical fibrosis of TMJ
 Periapical necrosis of TMJ

7. Other

Abnormal relationship of temporomandibular joint articular surfaces
 Acute or chronic inflammation of TMJ
 Arthritis of TMJ
 Dislocation of TMJ
 Fracture of TMJ
 Infection of TMJ
 Osteoarthritis of TMJ
 Osteoarthrosis of TMJ
 Osteomyelitis of TMJ
 Periapical abscess of TMJ
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 Periapical fibrosis of TMJ
 Periapical necrosis of TMJ

TMD Therapies: (70 therapies)

Physical

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

Medicinal

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

Dental Orthotics

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

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

Sleep/ Fatigue

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

Surgical

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

Occlusal Orthopedic

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

Tongue Parafunction

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

Specific Therapy

TMD Therapies: (70 therapies)

Physical

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

Dental Orthotics

In Office Trial Anterior Stop
Temporary home use anterior stop
Myobrace
Aqualizer
Diagnostic Palatal Anterior Stop
Lower full coverage CR
Lower posterior deprogrammer
Lower TMJ Rehab flat plane
Lower Indexed

Brux Checker
Upper full coverage hard CR guard
BiArch Posterior Deprogrammer
Mandibular Advancement Device
Lateral Bruxing Device

Medicinal

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

Sleep/ Fatigue

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

Occlusal Orthopedic

Lingual Light Wire
Planas Tracks
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Restorative Dentistry
Occlusal Adjustment with DTR, TekScan
Condylar distraction
Occlusal Adaptation

Tongue Parafunction

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

Surgical

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

TMD Therapies

Physical

Ice
Hot Cold Hot
Cold Laser
TENS in office
TENS home use
Range of motion exercises
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- Breathe, Walk, Exercise

Wet Towel in Microwave
3 Min Hot
3 Min Hot



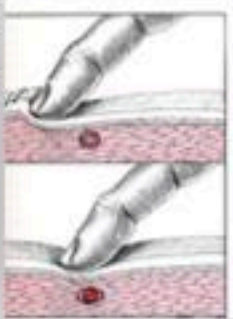
3 Min Cold

Ice Pack
 15 min 3-5x a day



ThermoSafe
 U-Tek Cold Pack
 -23° C

Triggerpoint
 in muscle



TMD Therapies

Physical

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Hot Cold Hot

Cold Laser
TENS in office
TENS home use

Range of motion exercises
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Breathe, Walk, Exercise

Cold laser for sore joints, inflammation,
muscle triggerpoints

3x week for 3 weeks



BioResearch MLS Laser 808, 905 pulsed Diode



Handheld TENS
Acupuncture Pen

Past Dry Needling and
ischemic Pressure

BioResearch
QuadraTENS



MLS Laser: BioResearch

Multiwave Locked System Laser

808 nm Continuous, 905 nm Pulsed

Diode Laser

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



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

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

TMD Therapies

Physical

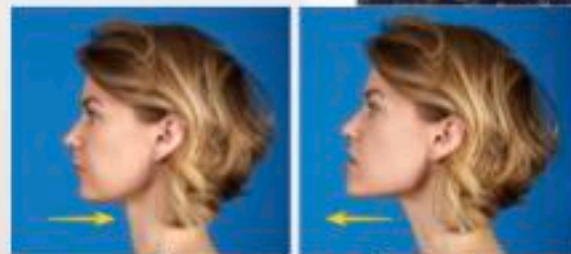
- Ice
- Hot Cold Hot
- Cold Laser
- TENS in office
- TENS home use

Range of motion exercises

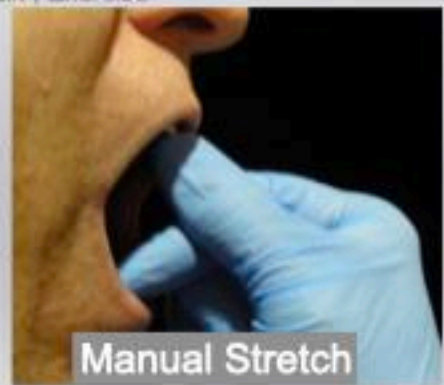
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- Breathe, Walk, Exercise

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



Danger,
Danger,
Danger.



Manual Stretch



Tongue Blade



DynaSplint

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

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Range of motion exercises
Active Stretching: Manual, Tongue Blades, Dynasplint

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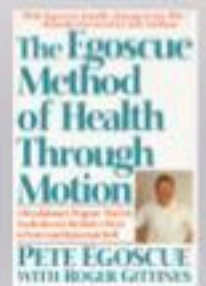
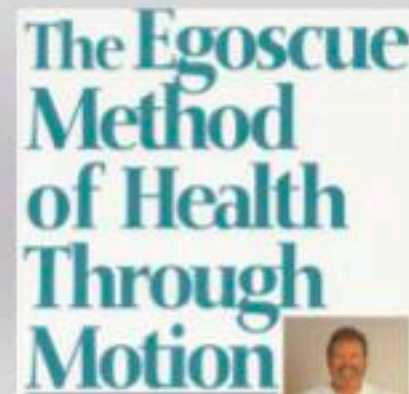
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Refer to Osteopathic MD: Body alignment
Breathe, Walk, Exercise

Postural
Restoration
Therapy



Dr Mariano Rocabado

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



TMD Therapies

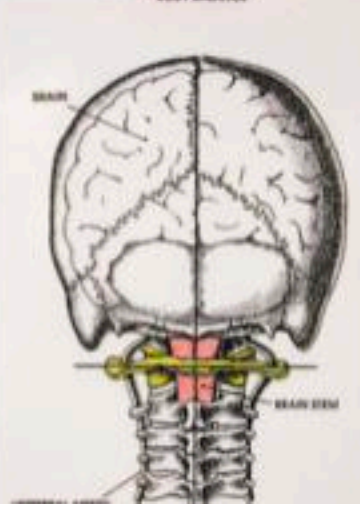
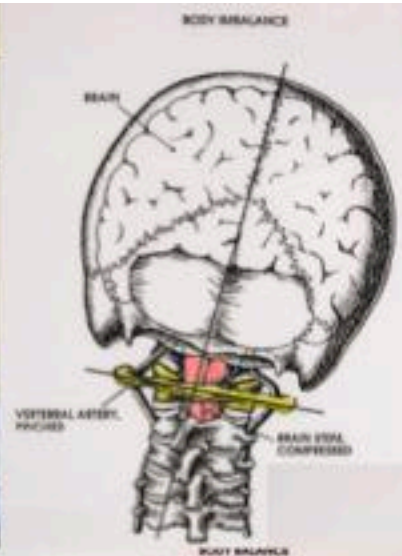
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Breathe, Walk, Exercise

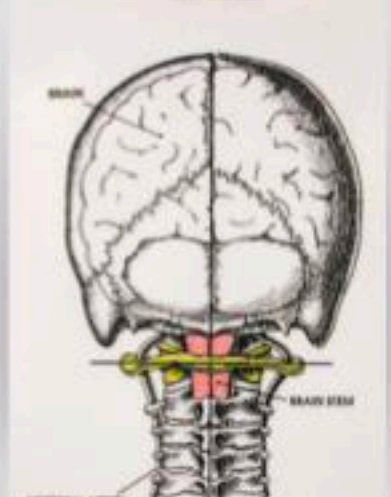
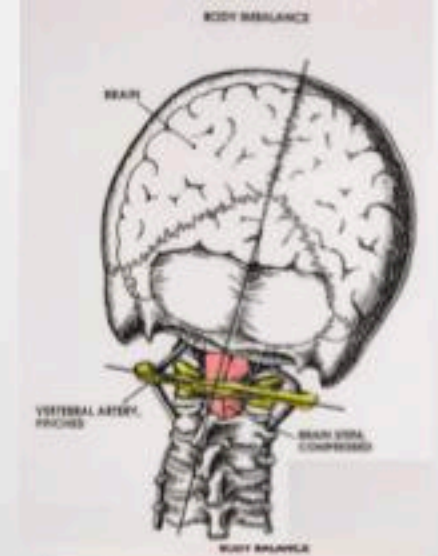
Atlas Alignment



Atlas Orthogonist
Branch of Chiropractic Medicine



Uses sound wave to move atlas,
disrupts muscle bracing



TMD Therapies

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Breathe, Walk , Exercise

Postural Restoration PT addresses these



TMD Therapies

Physical

Ice

Hot Cold Hot

Cold Laser

TENS in office

TENS home use

Range of motion exercises

Active Stretching: Manual, Tongue Blades, Dynasplint

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Breathe, Walk , Exercise

Diaphragmatic Breathing

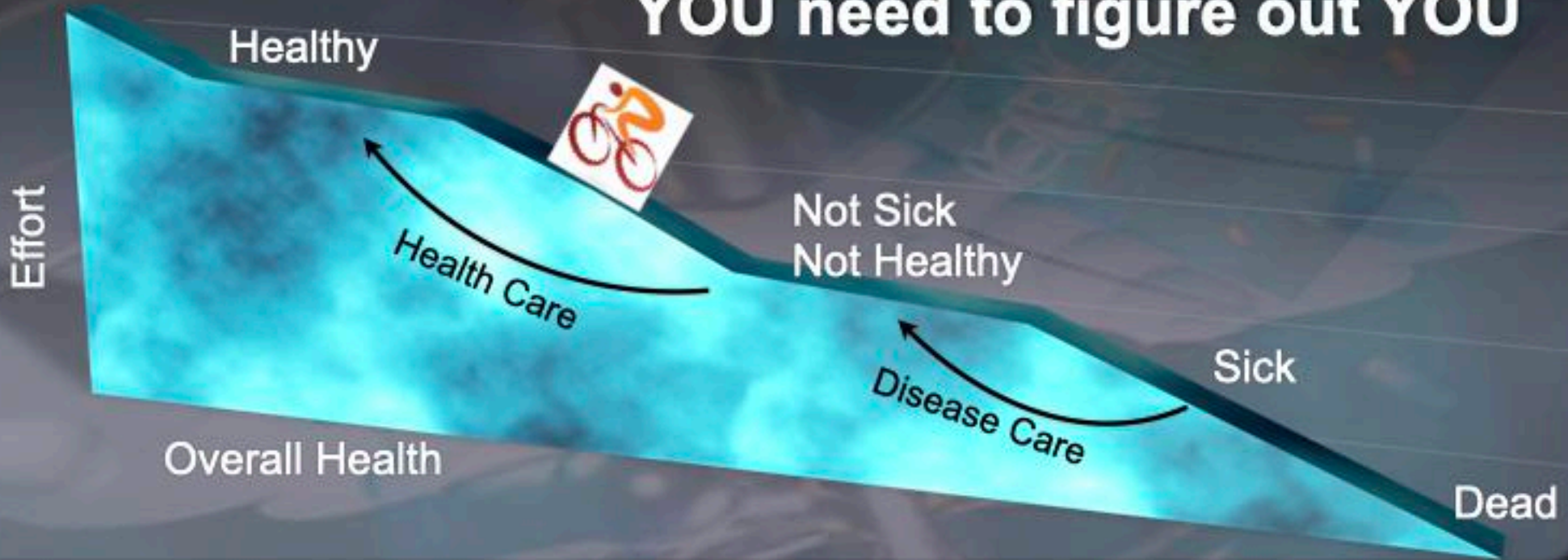
Walk

Exercise

Not Sick, Not Healthy

Concept from Bob Walker, DC
Graphics by John Droter, DDS

YOU need to figure out YOU



Which famous doctor published this?

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

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

Sir William Osler, 1891



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“Recent Advances in Medicine,” Science, March **1891**

Founding father of Johns Hopkins Medical School

Father of modern medicine

“Greatest diagnostician ever to wield a stethoscope”



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

TMD Therapies: (70 therapies)

Physical

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Temporary home use anterior stop
Myobrace
Aqualizer
Diagnostic Palatal Anterior Stop
Lower full coverage CR
Lower posterior deprogrammer
Lower TMJ Rehab flat plane
Lower Indexed

Brux Checker
Upper full coverage hard CR guard
BiArch Posterior Deprogrammer
Mandibular Advancement Device
Lateral Bruxing Device

Medicinal

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

Mouth taping
Diet Modification
Positional Therapy
Vitamins: Vitamin D, Vitamin B12, Vit C
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CPAP

Occlusal Orthopedic

Lingual Light Wire
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Lower soft sectional orthotic
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Restorative Dentistry
Occlusal Adjustment with DTR, TekScan
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Tongue Parafunction

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

Surgical

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

TMD Therapies

Medicinal

Anti Inflammatory:

- NSAIDs,

- Doxycycline low dose

- CBD Topical

- Glucosamine/Chondroitin MSM

- Vitamins: Vit C, Vit D, Vit B12

- Minerals: Magnesium, Electrolytes

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- Refer to MD for Lyme therapies

- Refer to MD Rheumatoid Arthritis therapies

- Refer Botox Masseter injections

- Refer Botox Lateral Pterygoid Injections

- Food

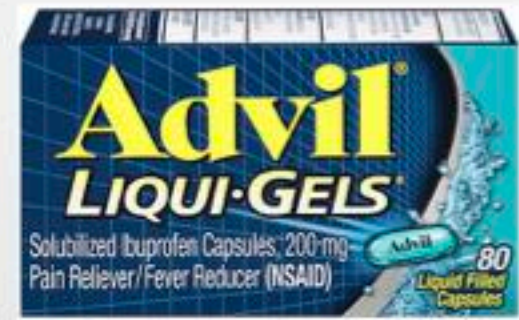
TMD Therapies

Medicinal

Anti Inflammatory: NSAIDs, Doxycycline low dose

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- Food

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



No Sulfur
Allergy



No women pre-menopause

TMD Therapies

Medicinal

Anti Inflammatory:
NSAIDs,
Doxycycline low dose

CBD Topical Glucosamine/Chondroitin MSM

Vitamins: Vit C, Vit D, Vit B12
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Food

Shea Brand CBD



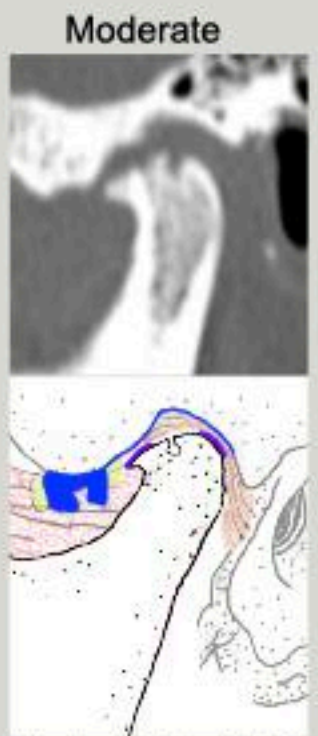
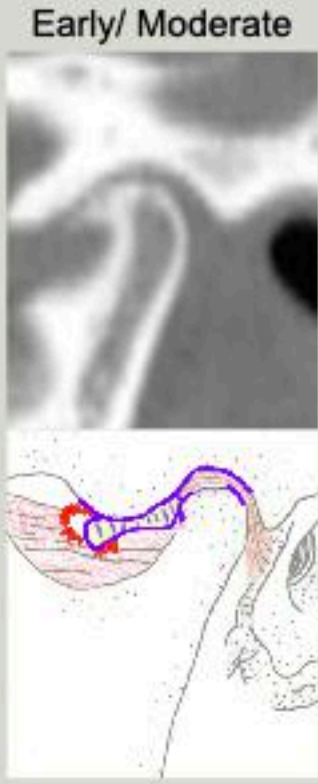
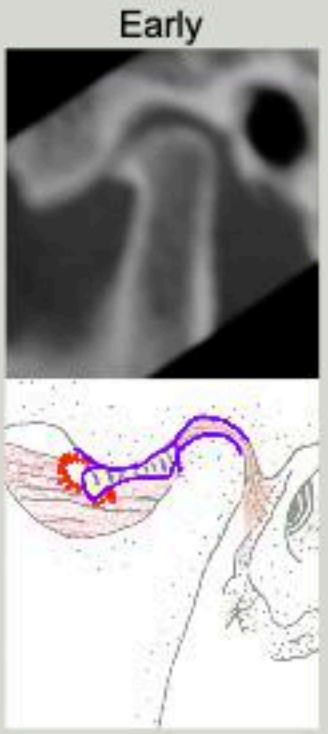
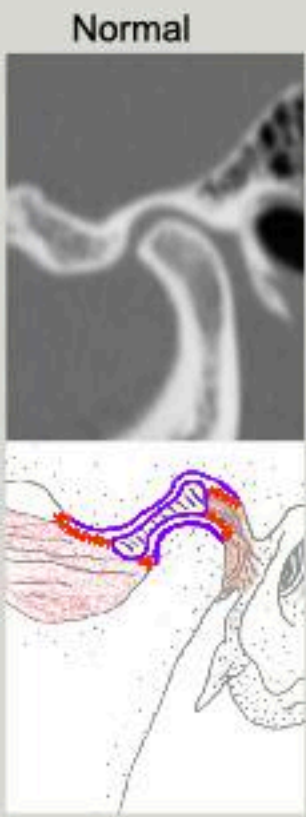
No Shellfish allergy



Vegan

Osteoarthrosis/Osteoarthritis

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



Representative examples of OA in different patients

Drawings by Gretta Tomb DDS and John Droter DDS

Treatment OA

Osteoarthritis

Minimize parafunction:

If sleep grinding due to airway:

CPAP or Dental Airway Device

Glucosamine 1500mg /Chondroitin 600 mg



Shea Brand CBD

Osteoarthritis

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

NSAIDs

Cold Laser

If still inflamed arthrocentesis with
Platelet Rich Plasma (PRP)

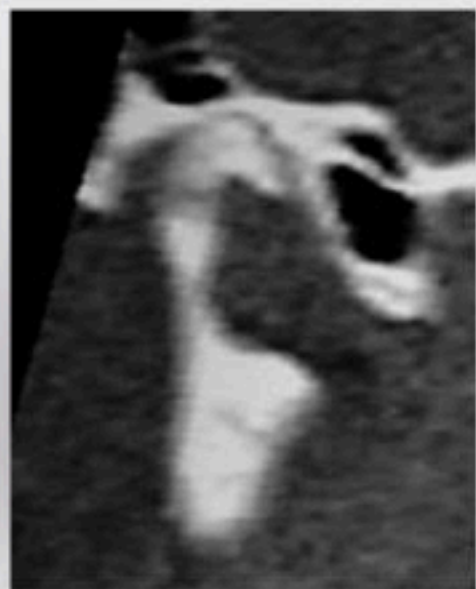


MLS Laser
3x week for 3 weeks

Adaptation Chronic Bilateral Osteoarthritis

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

OA Right and Left Bone Loss
#8 Ankylosed



TMD Therapies

Medicinal

Anti Inflammatory:
NSAIDs,
Doxycycline low dose
CBD Topical
Glucosamine/Chondroitin MSM

Vitamins: Vit C, Vit D, Vit B12

Minerals: Magnesium, Electrolytes

Minerals: Iron

Refer to MD for Lyme therapies
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Food

Vit C 1,000 mg
before exercise
or clenching



Mother Earth Ionic Angstrom
Magnesium 2 oz bottle
0.5 teaspoon sublingual



Women
add iron



TB12



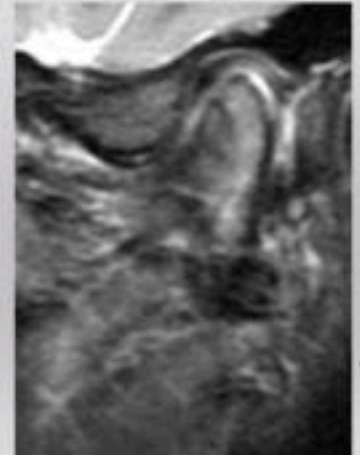
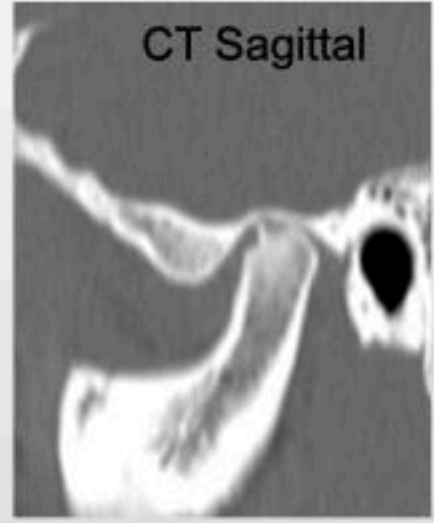
TMD Therapies

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- Food



MRI STIR
Disc Lysis
Joint infection

Spikey = Rheumatoid Arthritis

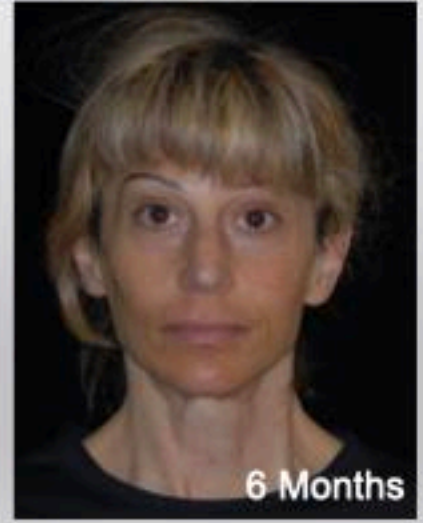
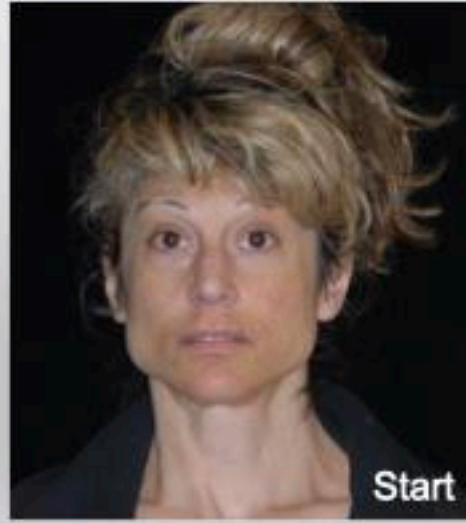
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Refer Botox Masseter injections

Botox for Hypertrophic Masseters from chronic clenching



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Food

Anti- Inflammatory Diet



TMD Therapies: (70 therapies)

Physical

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Hot Cold Hot
Cold Laser
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TENS home use
Range of motion exercises
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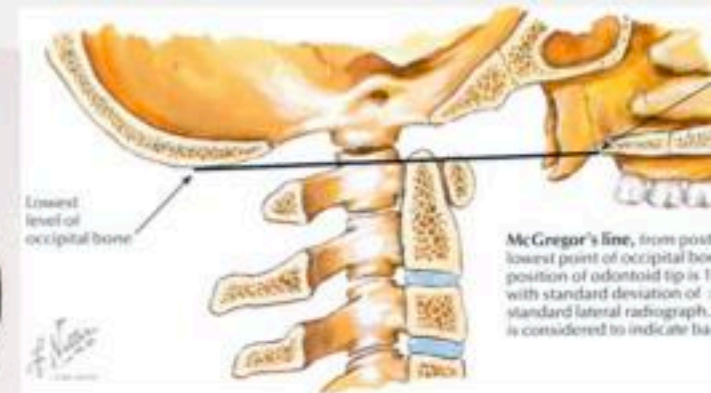
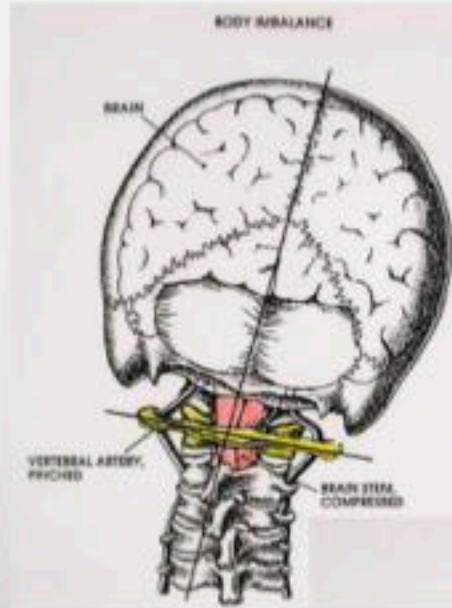
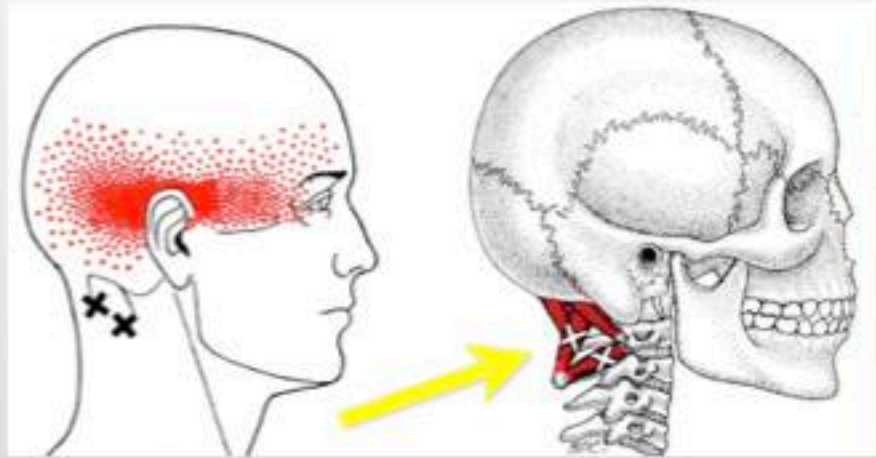
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Refer: Total Joint Replacement
Refer: Orthognathic Surgery

Atlas

John R Droter DDS
Annapolis, Maryland

Annapolis, Maryland
John R Droter DDS

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



Skull is 10 lbs supported
by occiput on atlas

My observations years ago:

Could not get rid of the suboccipital knot, no matter what tx.

While most OMD patients improved with occlusal therapies, some had persisting neck symptoms

Migraines managed but not eliminated with medication and ideal occlusion

Suboccipital acupuncture helped some migraines

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

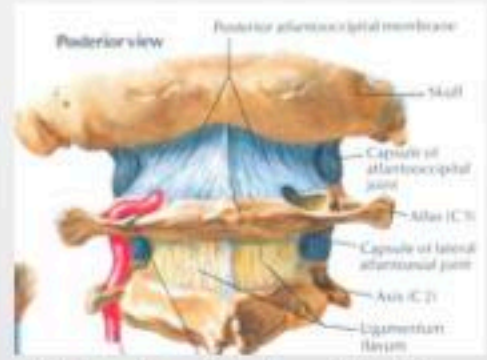
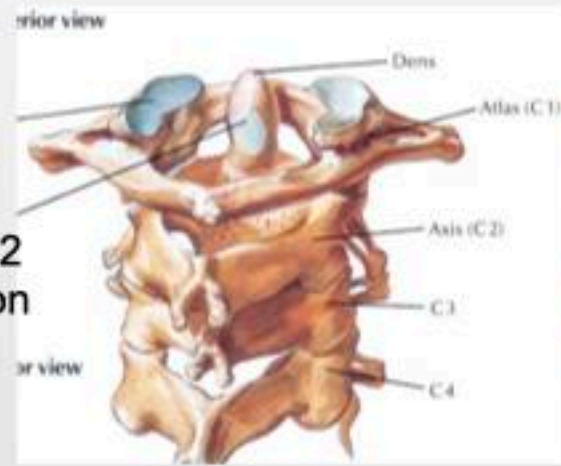
Atlas (C1)

Top bone of spinal cord supports the skull



No disc C1-C2
Allows Rotation

Discs are Hyaline Cartilage
Fibrous union: 8° rotation



Atlas is attached to the skull by ligaments



Rotation:

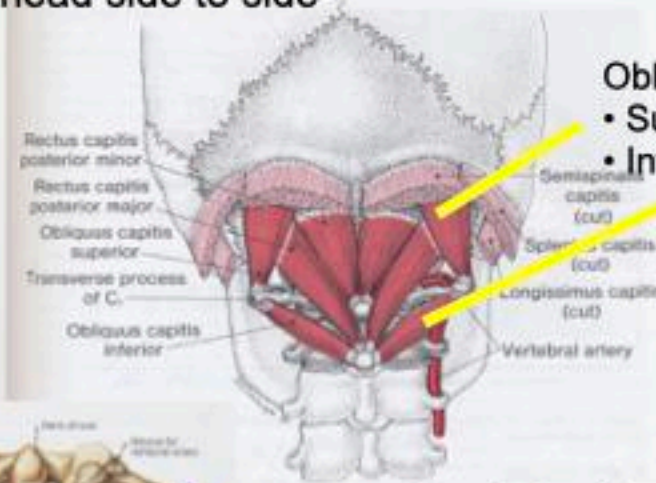
Atlas to skull	4°
C1 to C2	160°
C2 to C3	8°
all others	8°



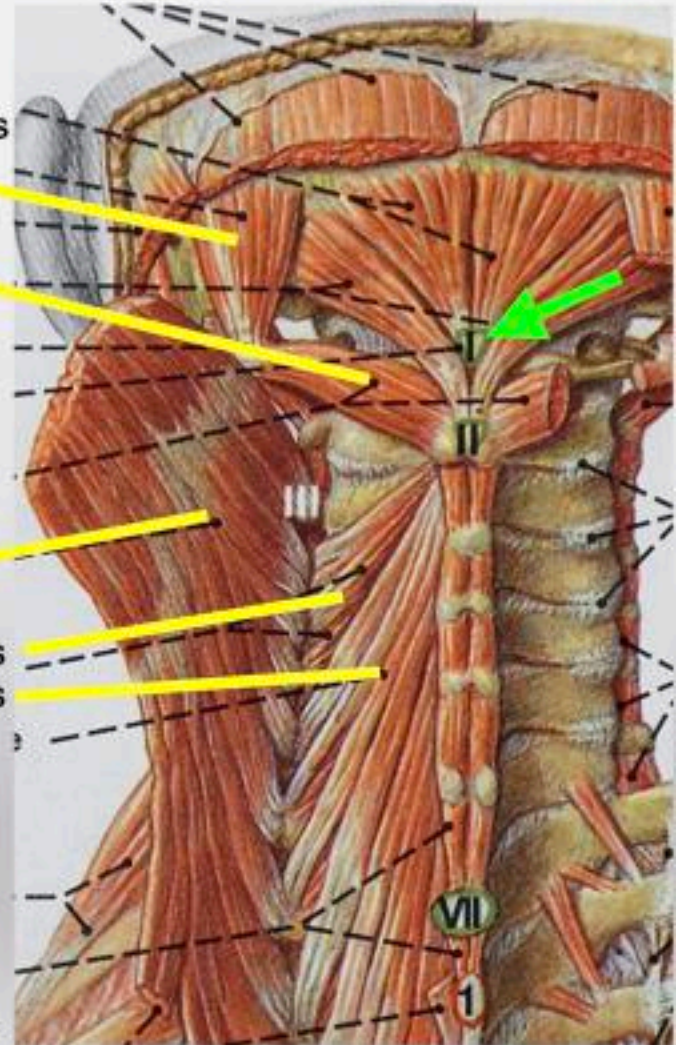
Flex-Extend:

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

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



Oblique Capitus
 • Superior
 • Inferior



Semispinalis Capitis

Multifidus
 Semispinalis Cervicis

Atlas spinal process
 not attached
 to a lower
 transverse process

From Clemente's Anatomy Book

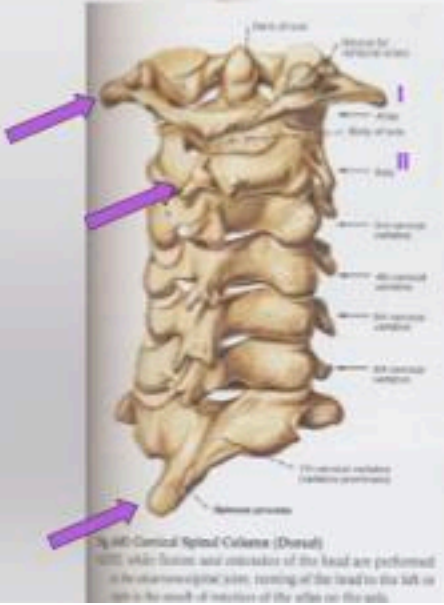


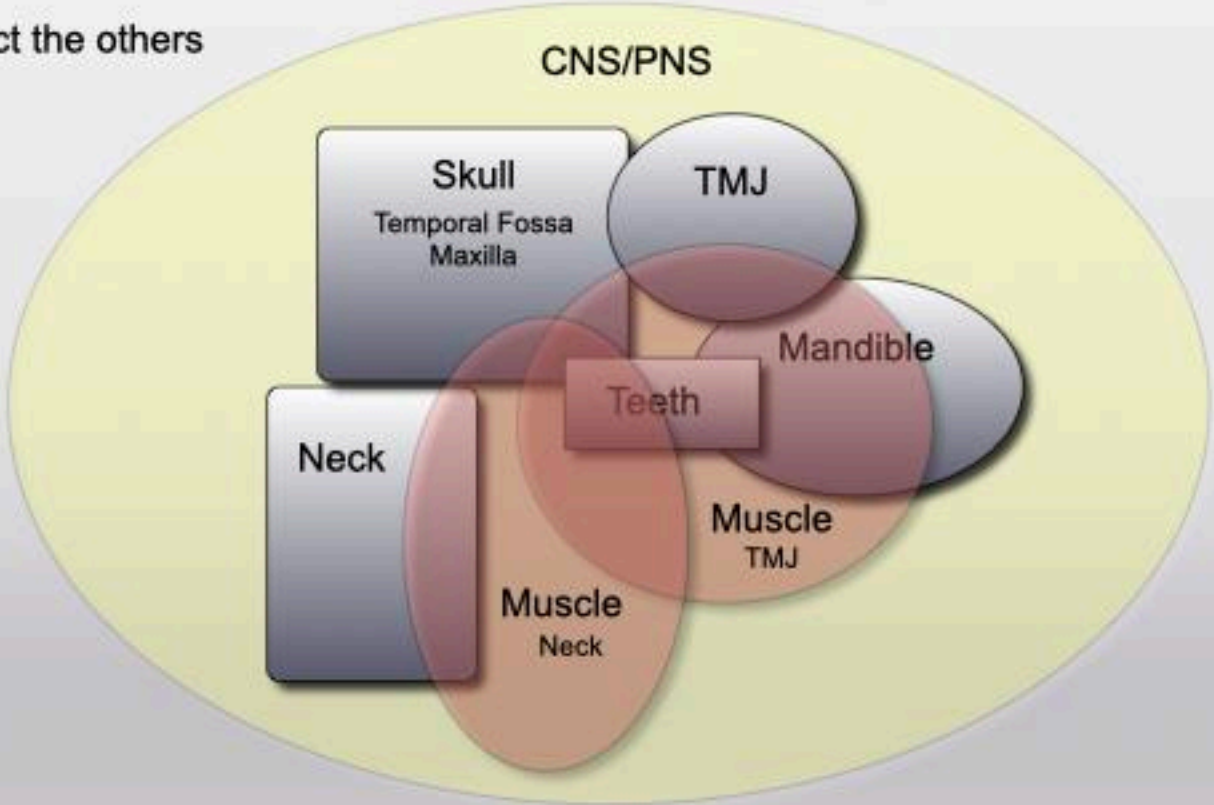
Fig. 107 Cervical Spinal Column (Dorsal)
 Note: while flexion and extension of the head are performed in the coronal plane, turning of the head to the left or right is the result of rotation of the atlas on the axis.

Stomatognathic System Interrelationship

A change in any one area will affect the others

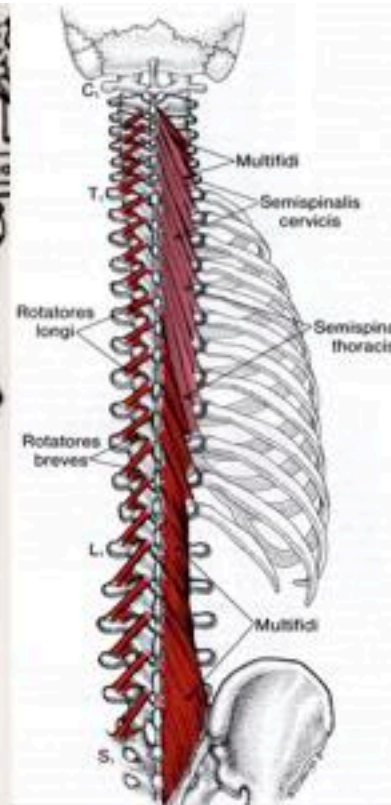
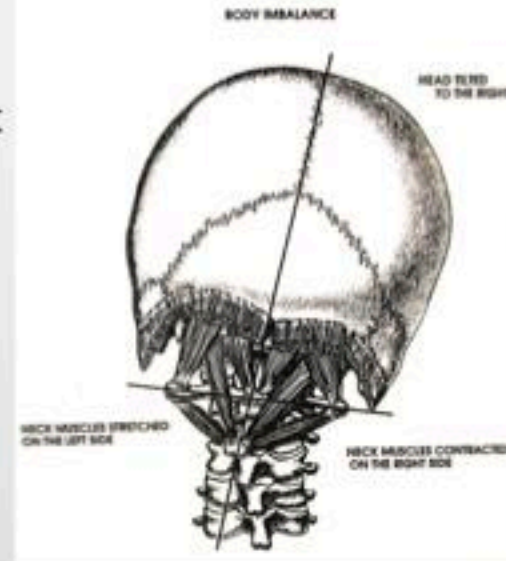
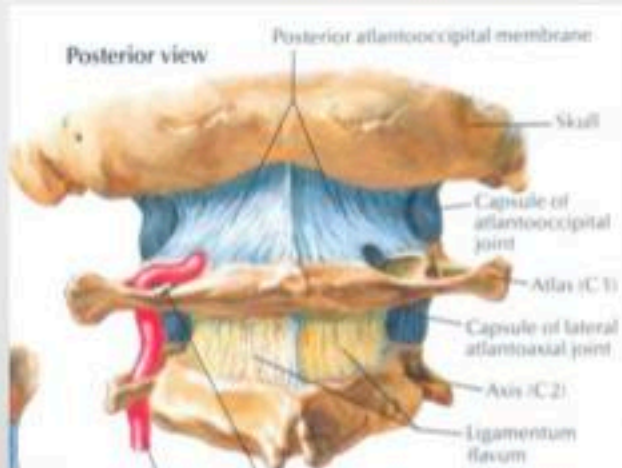
“Adaptation”

This is a dynamic orthopedic System



Atlas Subluxation

Trauma tears or stretches C1/ Skull ligament



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

A change in any one area will affect the others
This is a dynamic orthopedic System

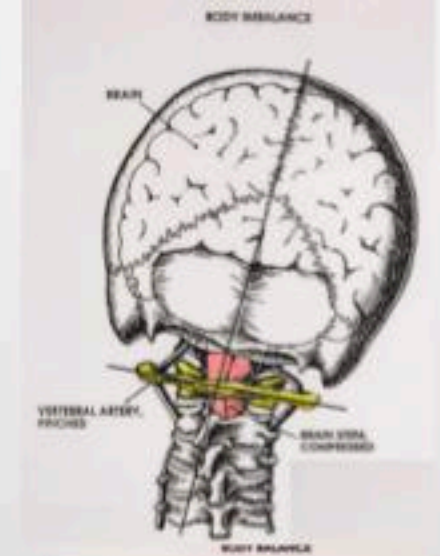
Atlas Orthogonal Adjustment

Dr. Roy Sweat

Atlas Orthogonist
Branch of Chiropractic Medicine

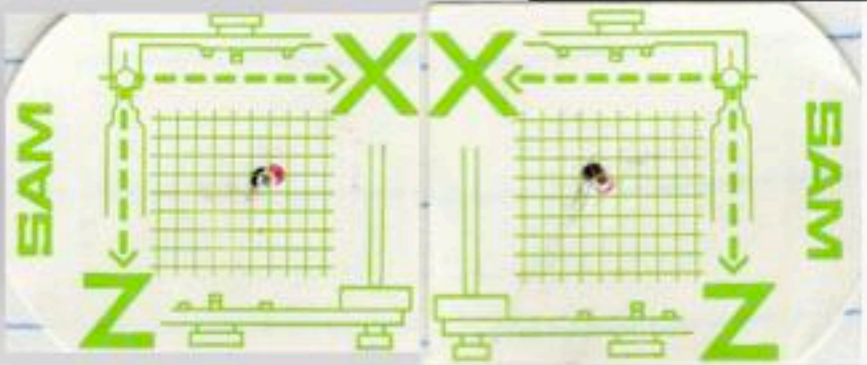


Uses sound wave to move atlas,
disrupts muscle bracing



Atlas (C1) Observations:

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



CR Changes with Atlas position

?Pressure on Occiput moves
Temporal bone?

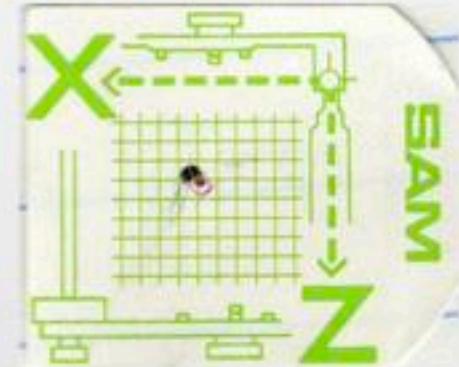
Put your teeth together and bend
neck side to side



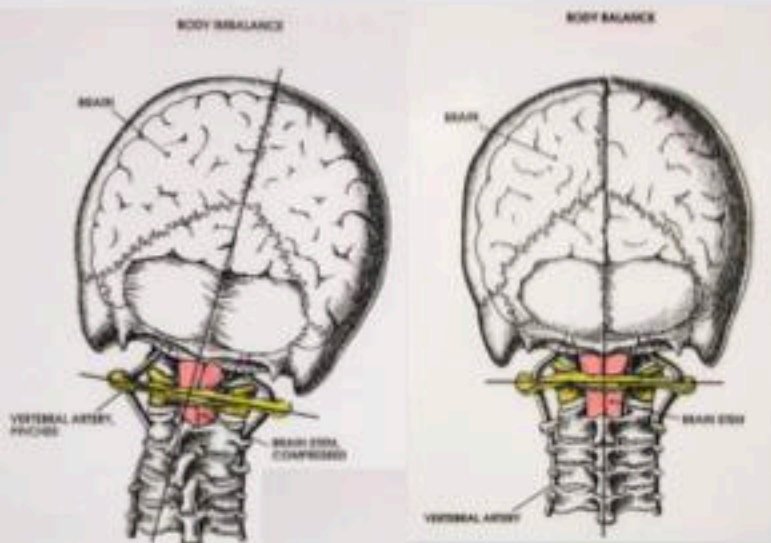
SAM Articulator Veri-check



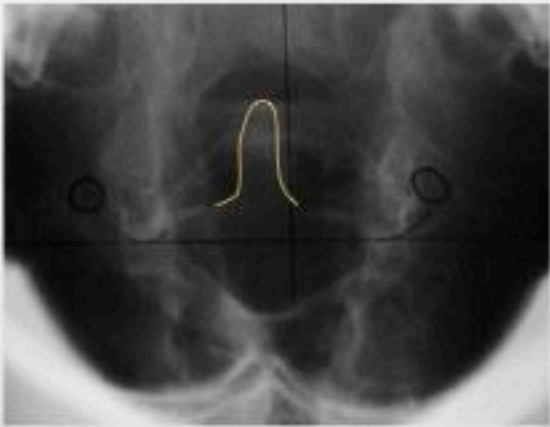
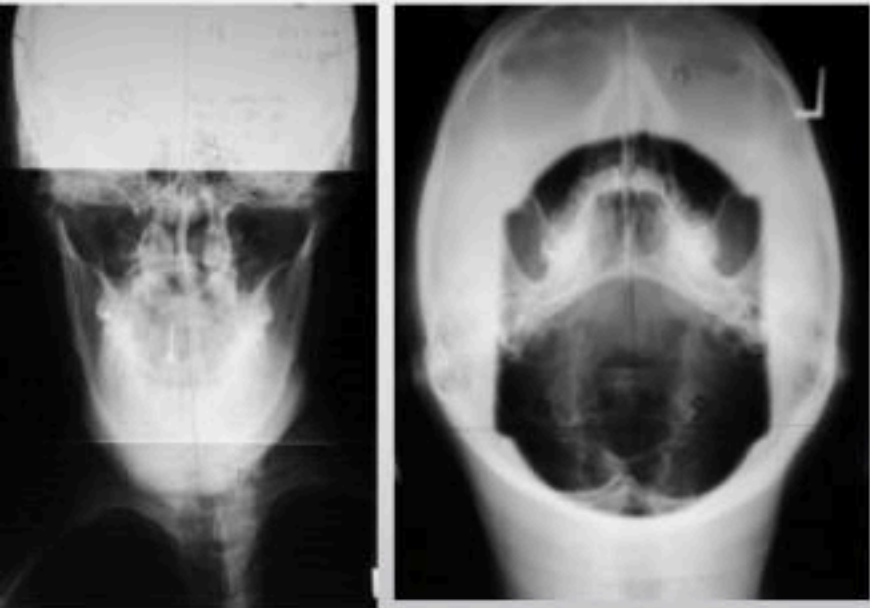
Right Condyle
Black- Atlas Out
Red- Atlas in shifts
condyle up and
forward 0.6mm



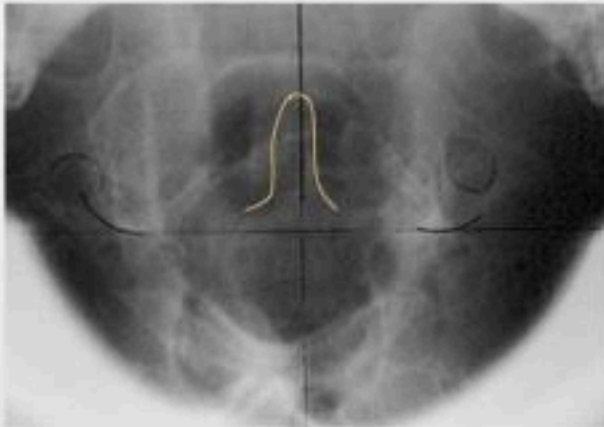
Left Condyle
Black- Atlas Out
Red- Atlas in shifts
condyle down and
back 0.5mm



My Neck



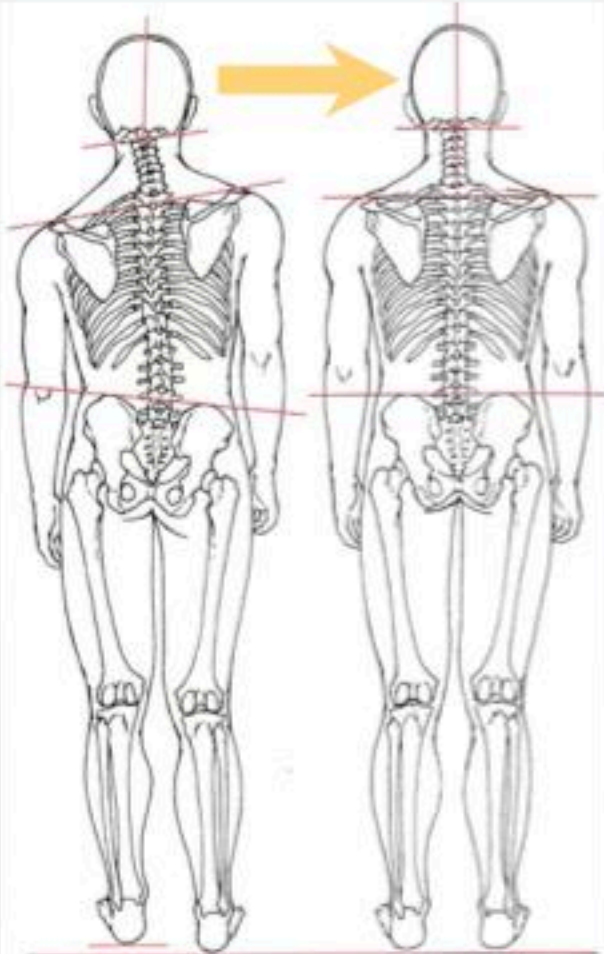
Before Atlas Adjustment



After Atlas Adjustment



Atlas Reduction



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

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

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

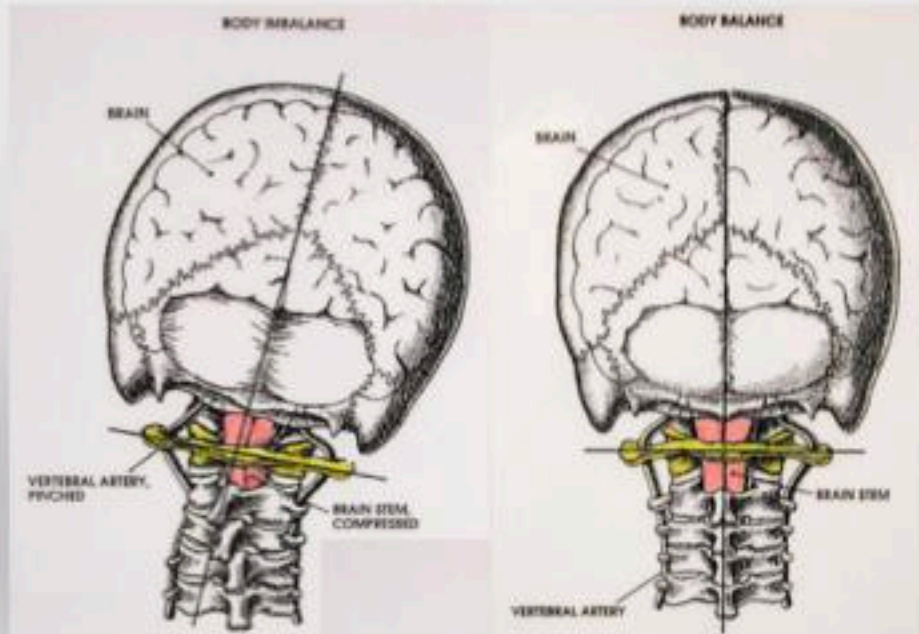
Finding An Atlas Orthogonist

www.atlasorthogonality.com

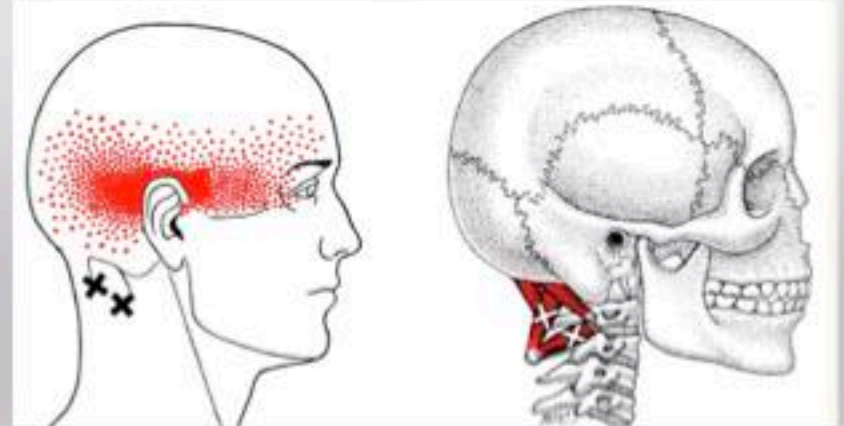
My Observations

50% of Atlas Doctors seem to be good

Most snappers and crunchers are useless or dangerous



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





LD Pankey Institute

Write your Dream

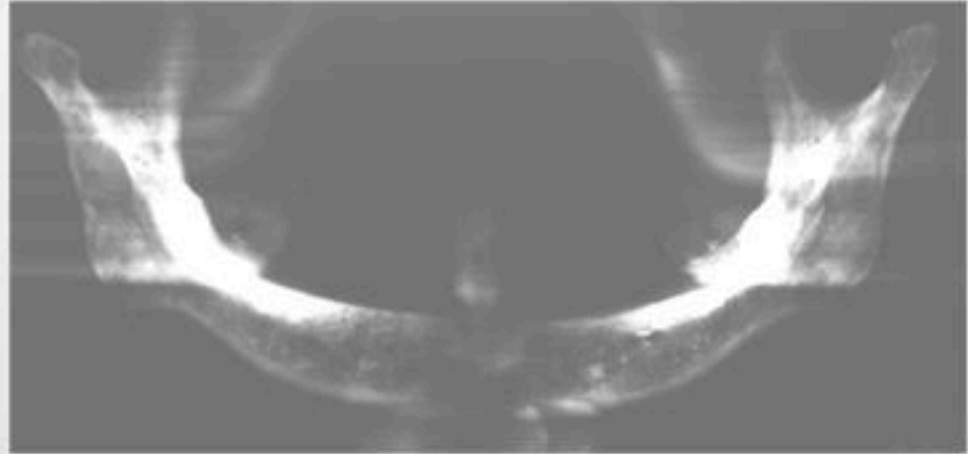
Facial Pain Diagnosis

Diagnostic Tools

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



Pan-X of Skull Mandible



Note: This Mandible had plastic teeth added



Pan-X not Accurate



Fallon S, Fritz G, Laskin D, Panoramic Imaging of the Temporomandibular Joint: 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

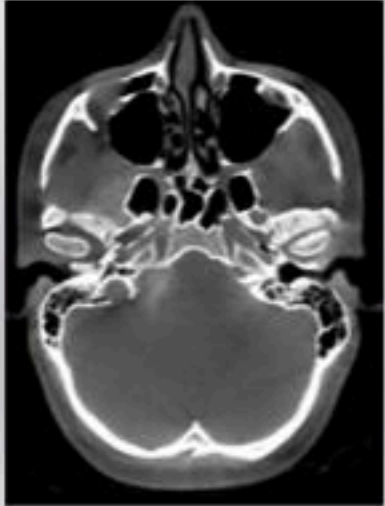


Note: prior to 2001 CT Scan took 25 min

Cone Beam CT Scanner
20 sec acquisition time



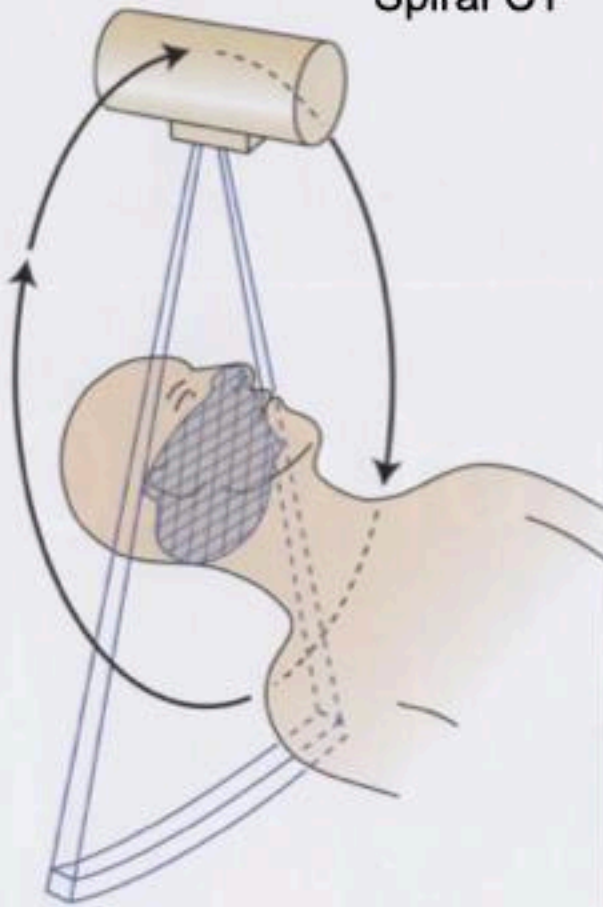
vatech
i3D Premium



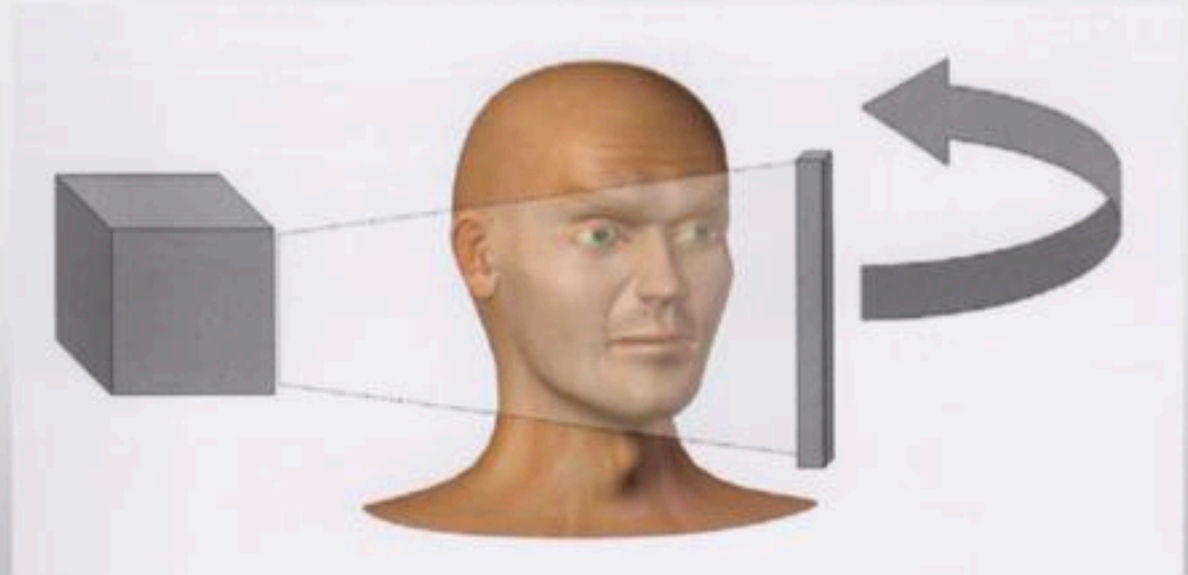
iCAT



Spiral CT



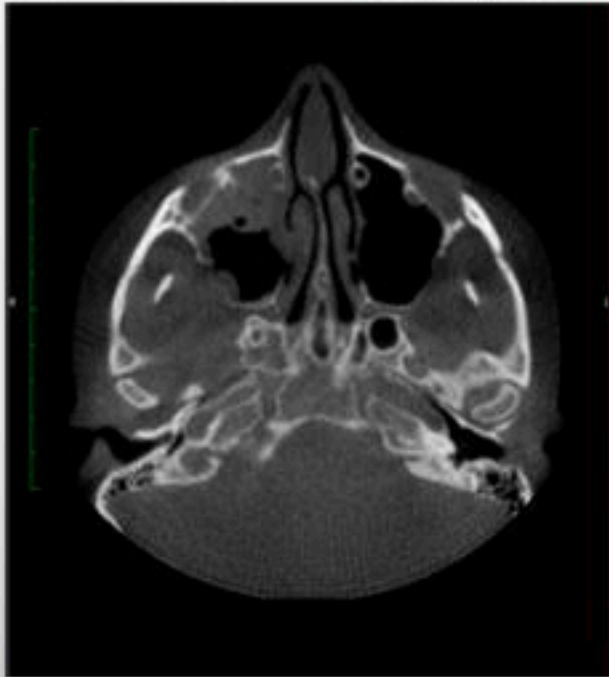
CBCT



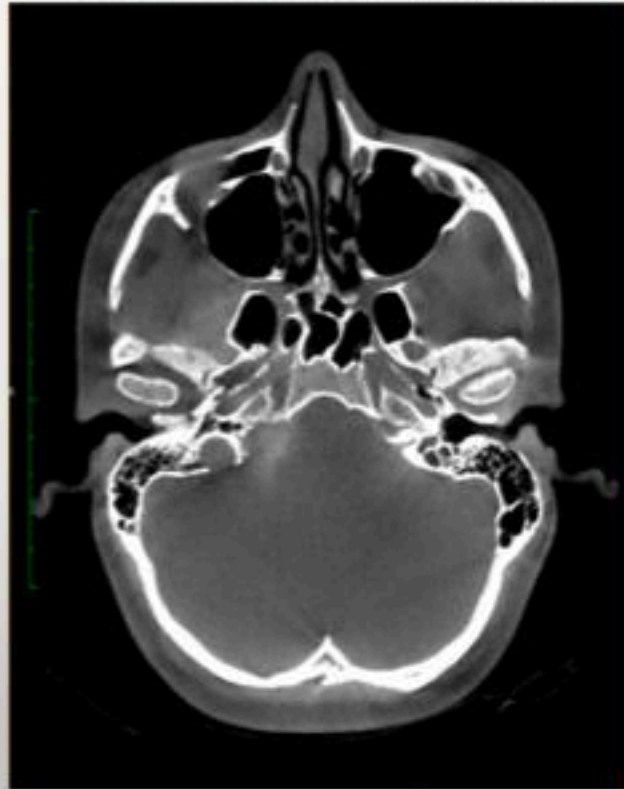
Atlas of Cone Beam Imaging
Dale Miles DDS

Compare CT scans

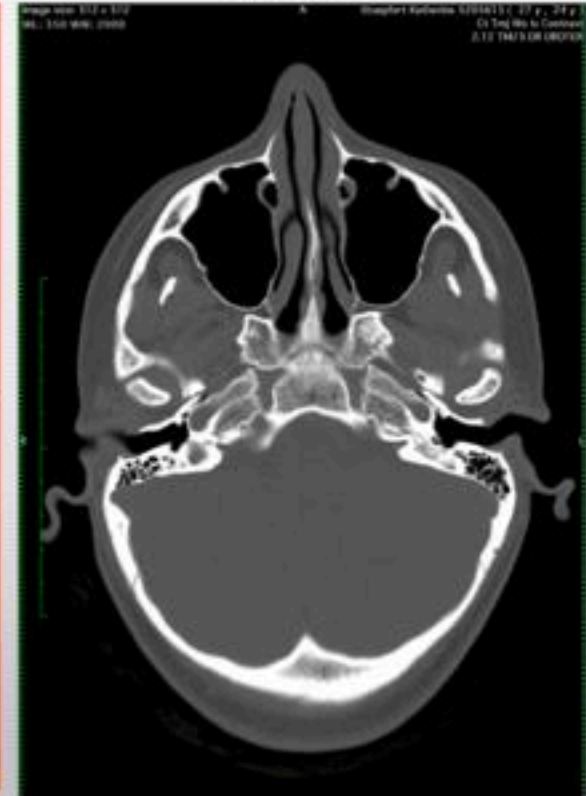
CBCT- iCAT



CBCT- Vatech i3D Premium



Spiral CT



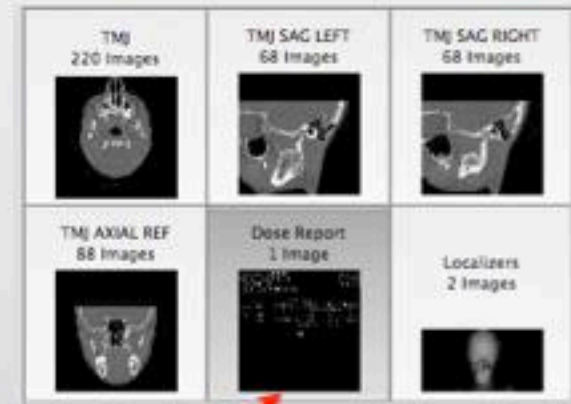
Best Contrast
Much more radiation

Radiation Exposure Comparison

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

Comparison conversions done by John R Droter DDS
Gy converted to Sv using 1mGy/cm head = .0022mSv

Gy= Gray (Joules/kg)
Sv=Sievert (Joules/kg)



Spiral CT Dose Report \rightarrow 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

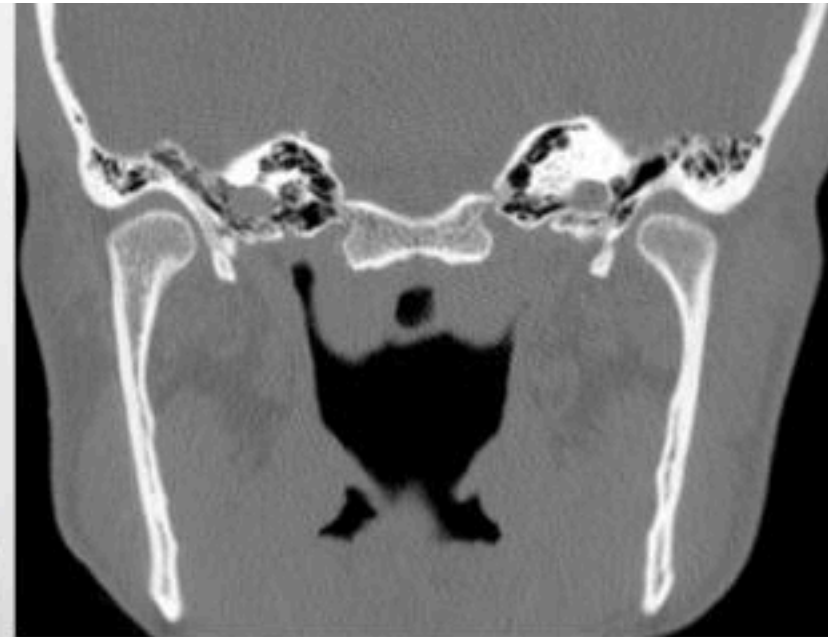
Coronal and Sagittal

Room for Disc

Stable CR load Zone

Condyle closest to fossa

CT Scan
Coronal View

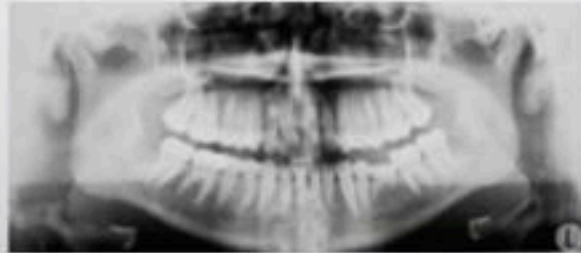
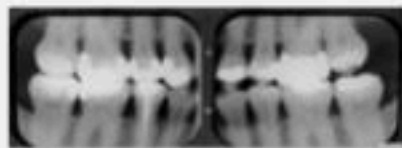
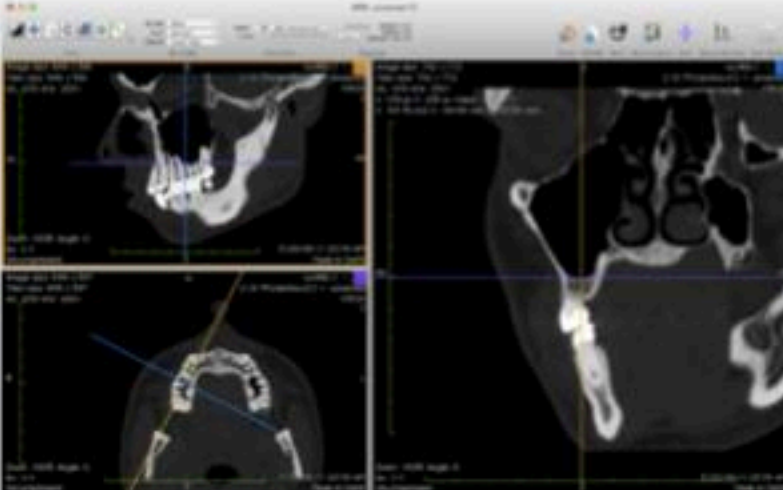


CT Scan
Sagittal View

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, 4bw, 4pa anterior



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

Annapolis, Maryland
John R Droter DDS

www.jrdroter.com

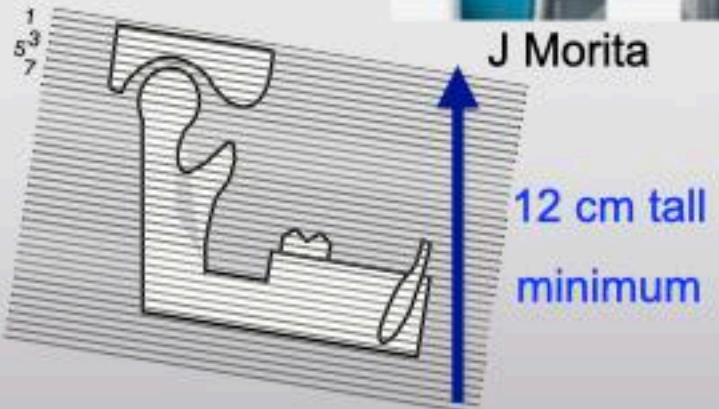
Key Features for TMJ Images

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



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

Most important is service behind the product
Benco vs others



VaTech

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

Green = LOW Contrast

Making a Great TMJ Scan

Rx for CBCT

Adding a chair vastly improves image quality



Can get from JRDroter.com

1. Large Field of View

15cm tall field of view or greater

At 12cm tall you will miss some joints. 15cm and up is better

Note: 17cm x 12 cm is 12 cm tall. The smaller # is the height, and is listed last

2. Scan Area

Scan Area to include 1 cm 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

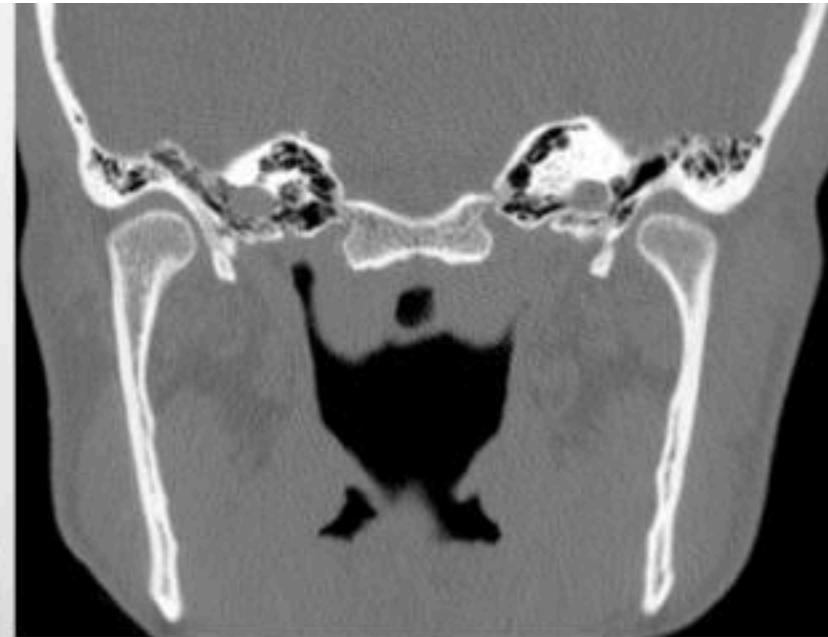
Coronal and Sagittal

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

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

Right TMJ *Small Coronal Sagittal and Coronal Coronal*

Condyle: Normal Size Small condyle size
 Normal Shape Abnormal condyle shape
 Cortex Intact Cortex not intact
 Cortex Even Hypertrophia

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

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

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

Left TMJ *Small Coronal Sagittal and Coronal Coronal*

Condyle: Normal Size Small condyle size
 Normal Shape Abnormal condyle shape
 Cortex Intact Cortex not intact
 Cortex Even Hypertrophia

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

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

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

Swelling *Coronal View, Sagittal View, Axial View*

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

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

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

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

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

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

Impression: _____

Signature: _____

Review of Scan: CT/CBCT Guide

TMJ

Condyle

Fossa

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

Condylar Position

Centered in fossa

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

Joint Spacing

Centered in fossa

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

CR Lead Zone (Centric Relation Lead Zone)

Superior medial

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

Estimate Piper

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

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

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

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

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

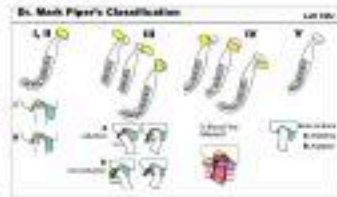
4. The disc is fully displaced off the head of the condyle and reduces on opening. There will be a shifting of the mandible which can be seen on the CBCT. Condyle not centered in fossa. Clinically there will "click or wobble" vibration as the disc returns and subluxates. While most vibrations are in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

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

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

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

John R Droter DDS



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

Right TMJ

Scroll Corrected Sagittal and Corrected Coronal

Condyle:

- Normal Size
- Normal Shape
- Cortex Intact
- Cortex Even
- Small condylar size
- Altered condylar shape
- Cortex not intact
- Hypercalcification

Fossa:

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

Condyle Position

- Centered in fossa
- Condyle distalized

Joint spacing

- Room for disc
- No room for disc

CR Load Zone

- Superior medial
- Superior Lateral

Estimate Piper:

- R1
- R2
- R3a
- R3b
- R4a
- R4b
- R5a
- R5b

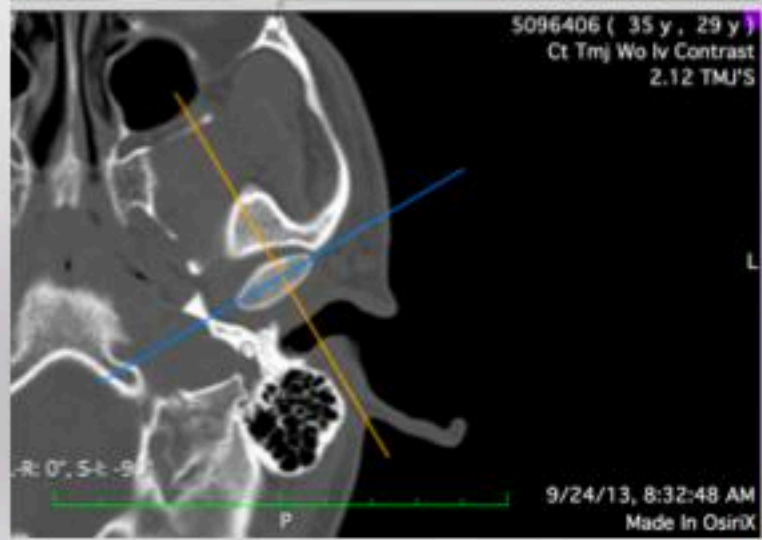
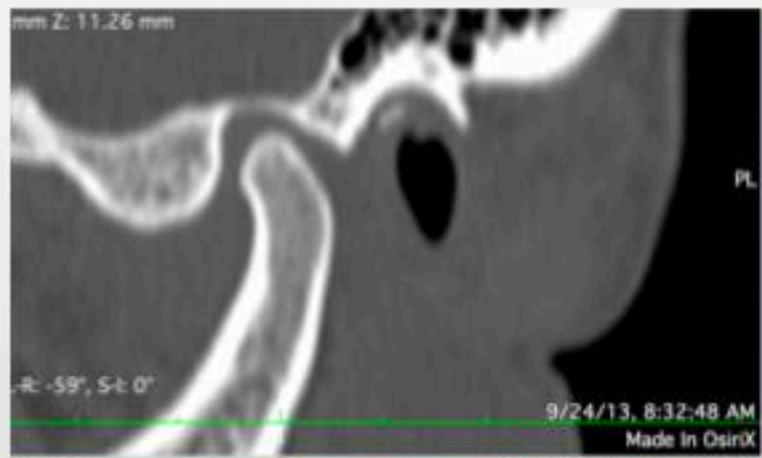
Right TMJ Health:

- Healthy
- Damaged
- Active Degeneration
- Adapting
- Adapted

CT Left Piper 2 from MRI

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

- Hypercalcification
- Condyle distalized
- Superior Lateral



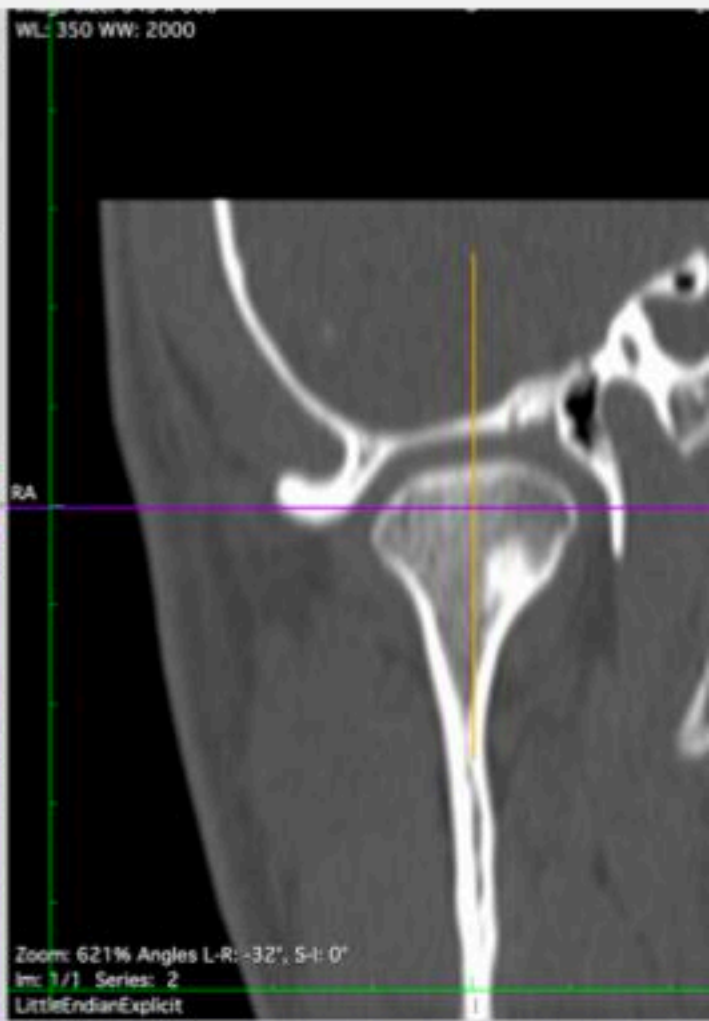
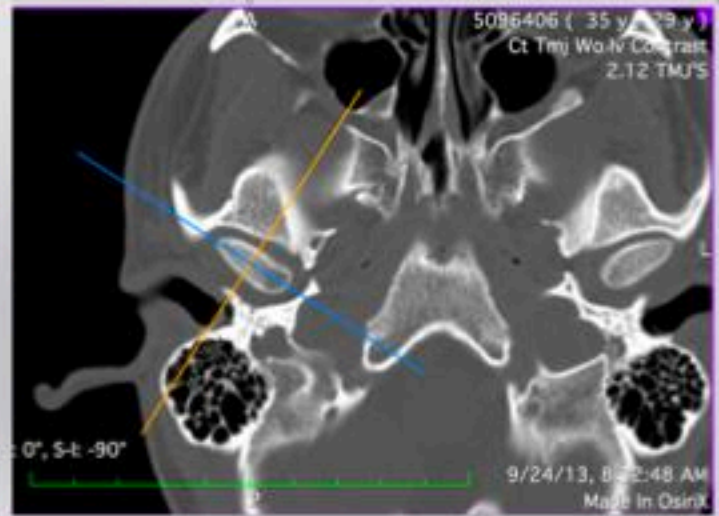
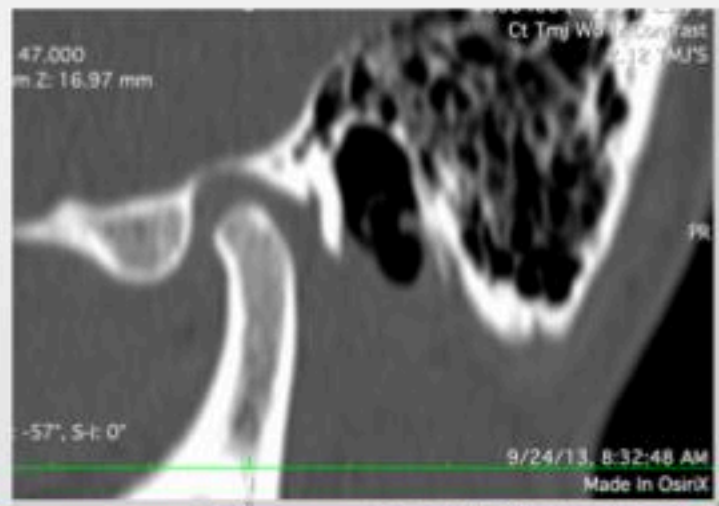
CT Right Piper 4a-e from MRI

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

Hypercalcification

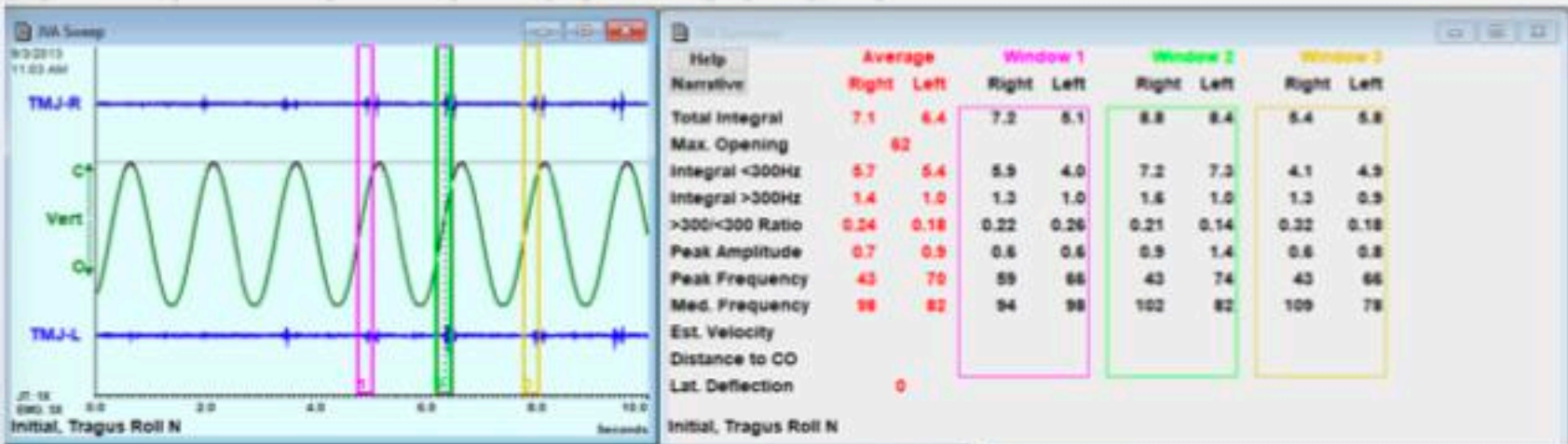
Superior Lateral

Note: Large joint space



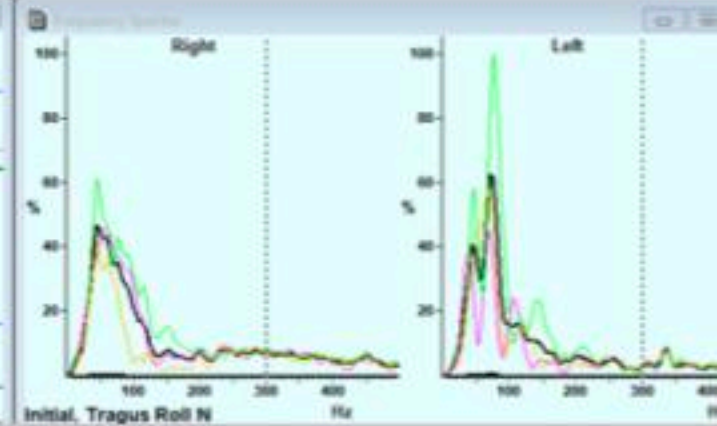
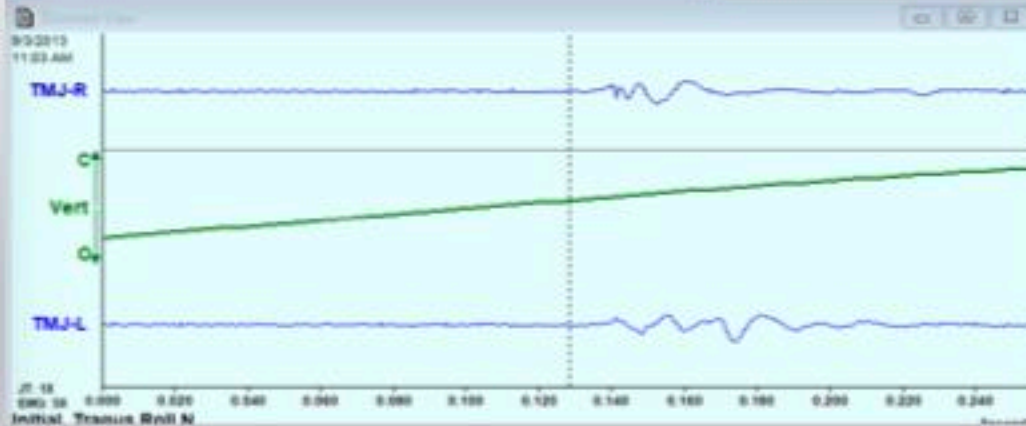
Slight Wobble
before tooth
contact

Joint
subluxation
on movement



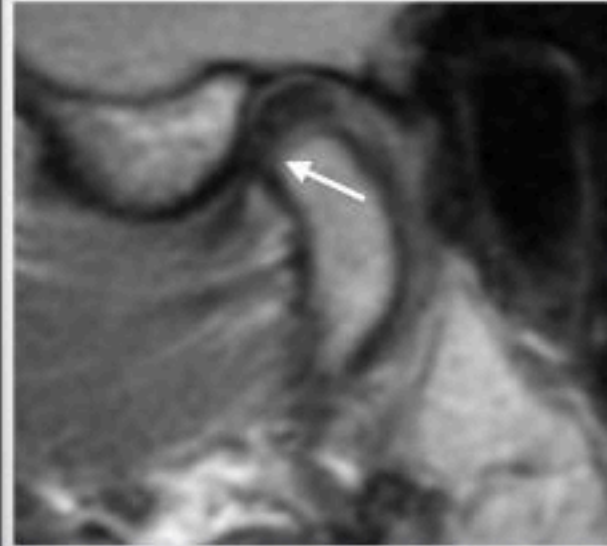
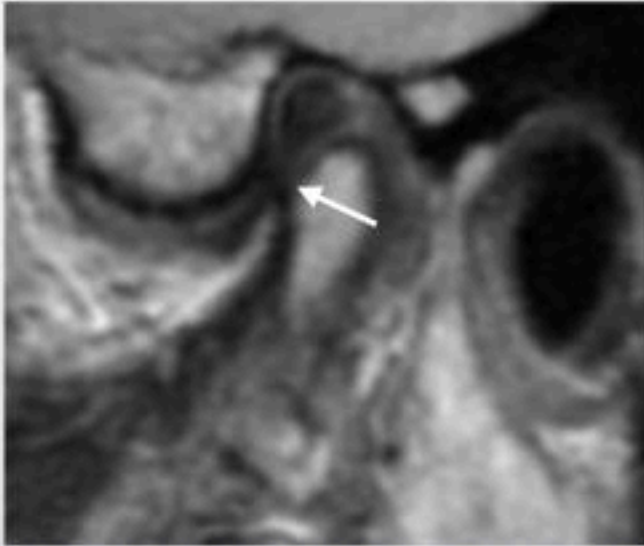
Clinical
Relevance?

Early damage
from
parafunction



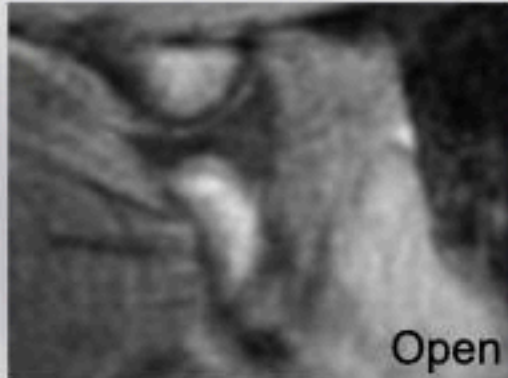
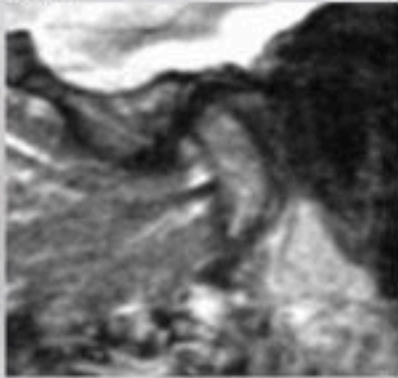
MRI
R4a-e, L2

Right
PD Closed

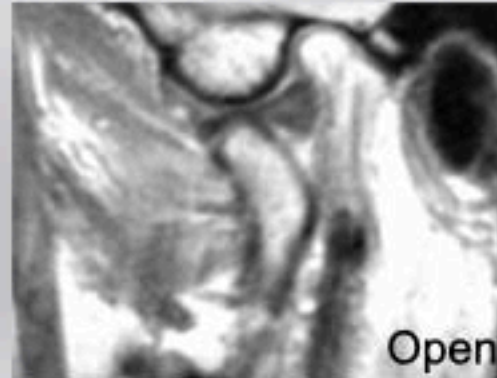


Left
PD Closed

Stir



Stir





LD Pankey Institute

Write your Dream



Hello. I am:

**John R Droter DDS
Annapolis, Maryland**

*Annapolis, Maryland
John R Droter DDS*

Lingual Light Wire- Crozat Arch Expansion

Age 29

Start



7 months LLW

Age 30



Anterior Openbite Non Surgical Treatment: Moving the Maxilla



Anterior Openbite with Active TMJ Bone Loss

Non Surgical Therapies



Condylar Distraction



Anti Inflammatory Therapies



Restorative Dentistry

Pathological Occlusion

??Airway Related Bruxing?



Restore Function

Composite Trial Occlusion

AHI + 26 CPAP



Anterior guidance
or group function?



Treat what is in my area of expertise

Appliance Therapy/
Occlusal Adjust



Appl



CR Before Adjust

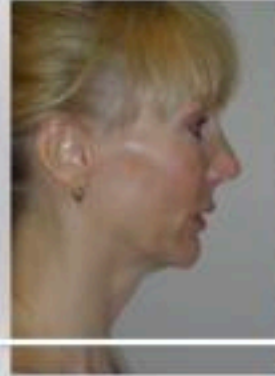


CR After

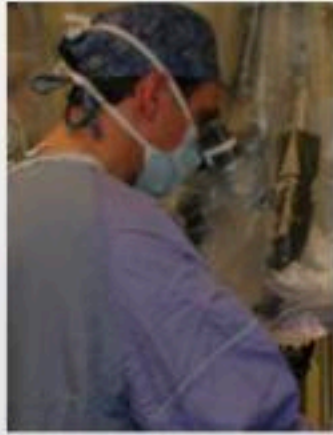
Complex
Restorative



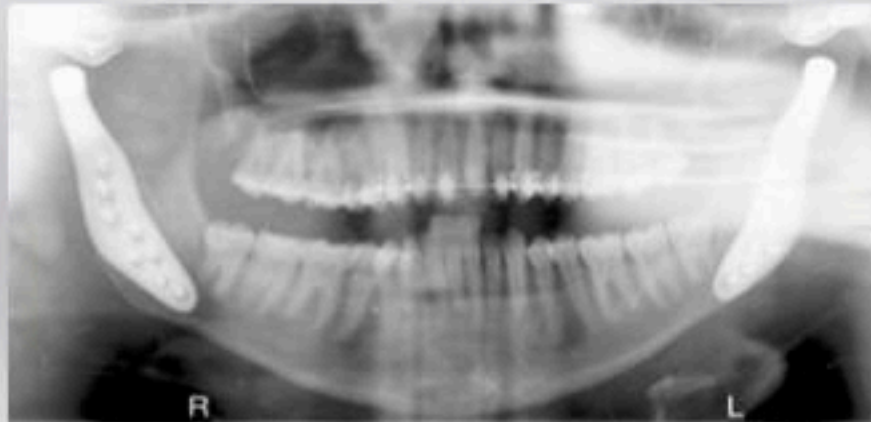
Occlusal Management-
Orthodontics/
Orthognathic Surgery



Occlusal Planning- Discectomy/ Fat graft



Occlusal Planning- Total Joint Replacement



The D-PAS Diagnostic Palatal Anterior Stop

Inhibits Sleep Clenching





APS

ArrowPath Sleep

www.APSleep.com
info@apsleep.com



APS In Office Anterior Stop 2.5mm



APS Airway Bite 4mm



APS Home Trial Anterior Stop



APS D-PAS



APS Lat-BruX

Sounds/ Vibrations Stethoscope



Use Bell side, not Diaphragm side,
over the TMJ

3M Littmann Classic II S.E. Stethoscope

My Subjective Description of Joint Sounds

smooth
paper
sand
pebbles
rocks
glass

fine
med
coarse

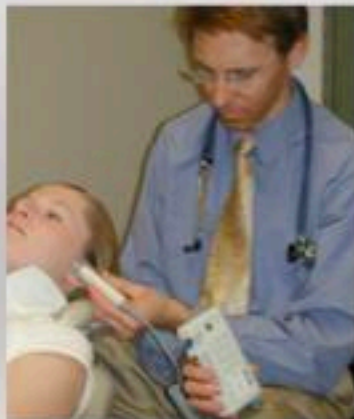
crackle
crunchy
squeaky
scratch

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

negative joint movement
minimal joint movement

Sounds/ Vibrations Doppler

Doppler measures motion toward or away from the source



A Health Joint is Quiet



Find Superficial Temporal Artery
Listen for Retrodiscal Expansion
Cavernous Vein Expansion
Pin back Tragus, Aim for eye
Rapid velocity to find best location
Diagnostic velocity jaw movement



Skin Movement causes errors

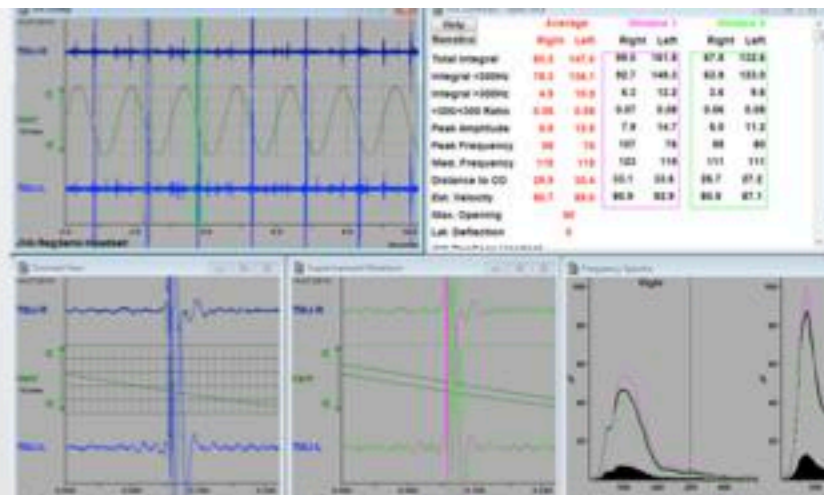
Doppler only hears what occurs at lateral portion of condyle.
Small degenerated condyles are quiet.

All dopplers generate different sounds for different motions

Landmark Medical, Inc. 800-334-5618
Huntleigh Mini Dopplex 5hz
Great Lakes Orthodontics 800-828-7626

Joint Vibration Analysis

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



Based on Sonar.
It is not a microphone

Three main types of sounds

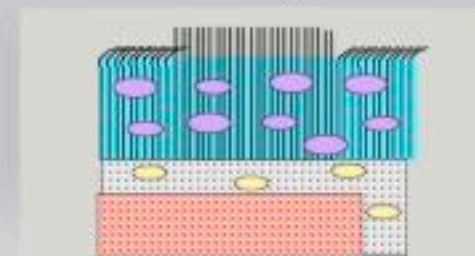


Disc Reduction
Disc Dislocation
Adhesion crackle
tooth tap

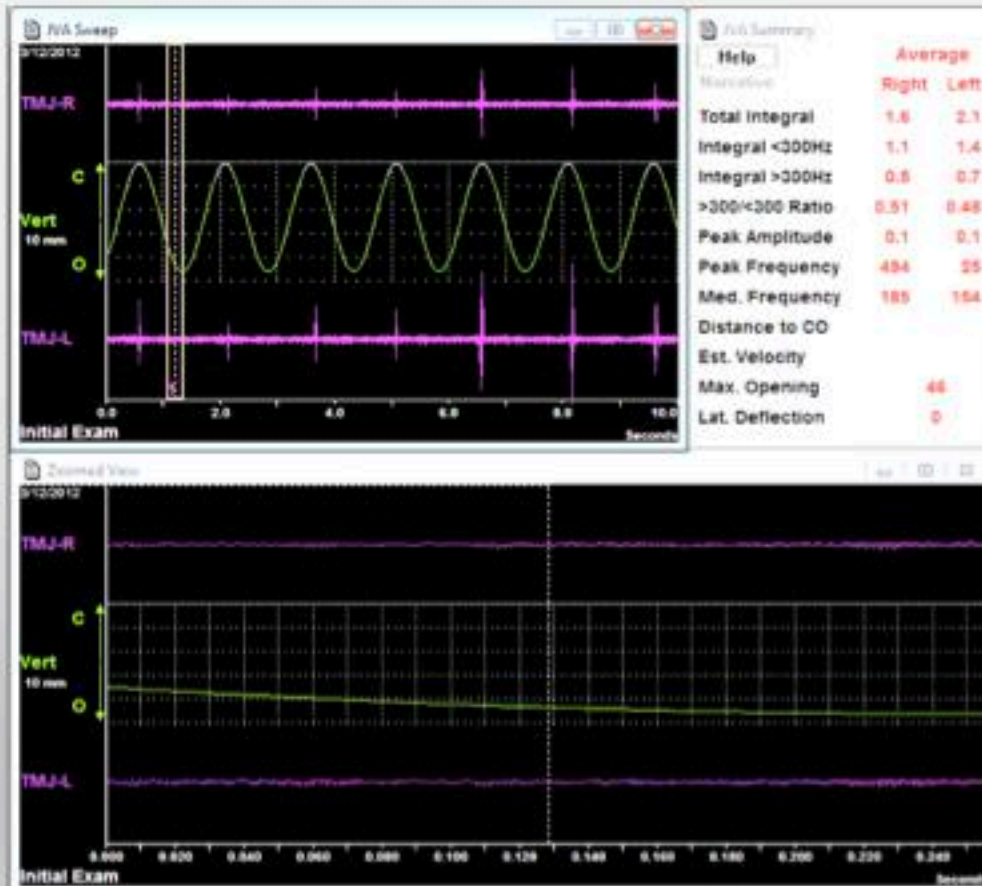
Osteoarthritis
Pseudo Disc
Damaged Cartilage

Disc Subluxation
Joint Subluxation
Disc Reduction
Disc Dislocation

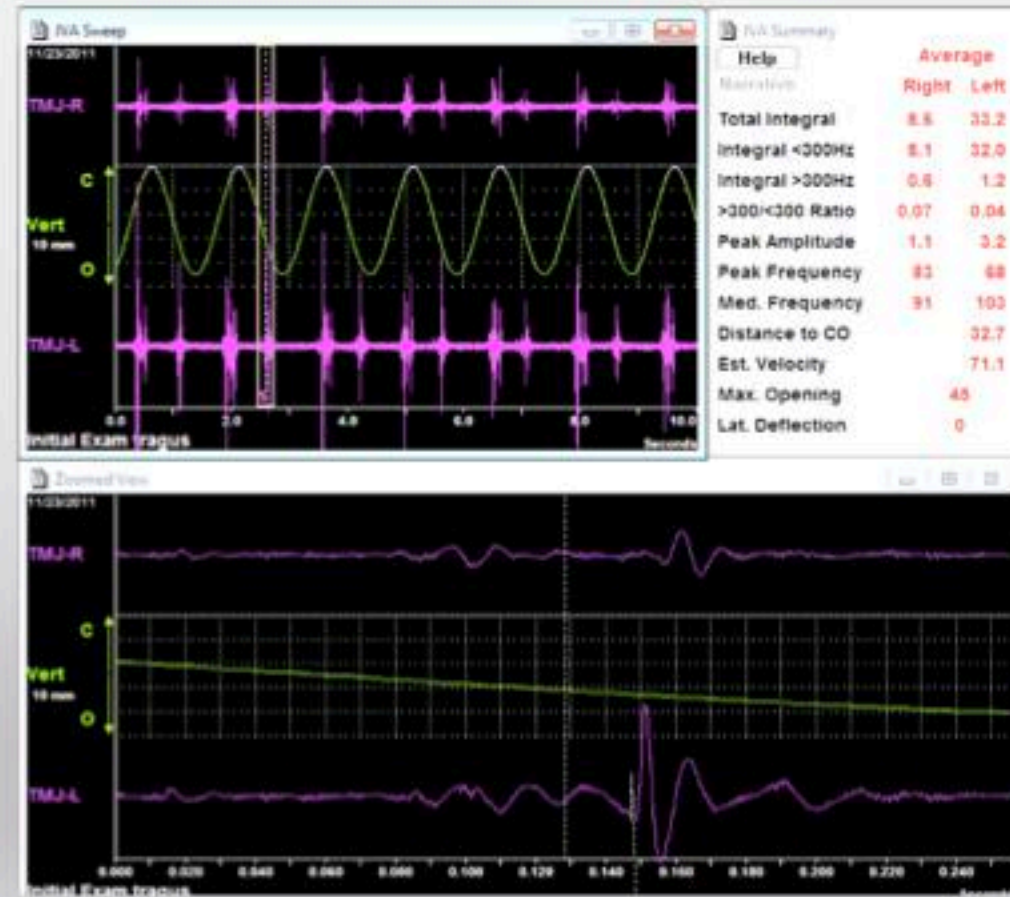
JVA measures the health of the cartilage



Healthy or Damaged?



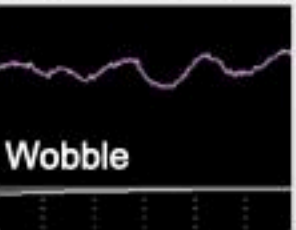
Healthy or Damaged?



Why is Joint making this vibration?



Good Vibrations
Healthy Cartilage
No Movement



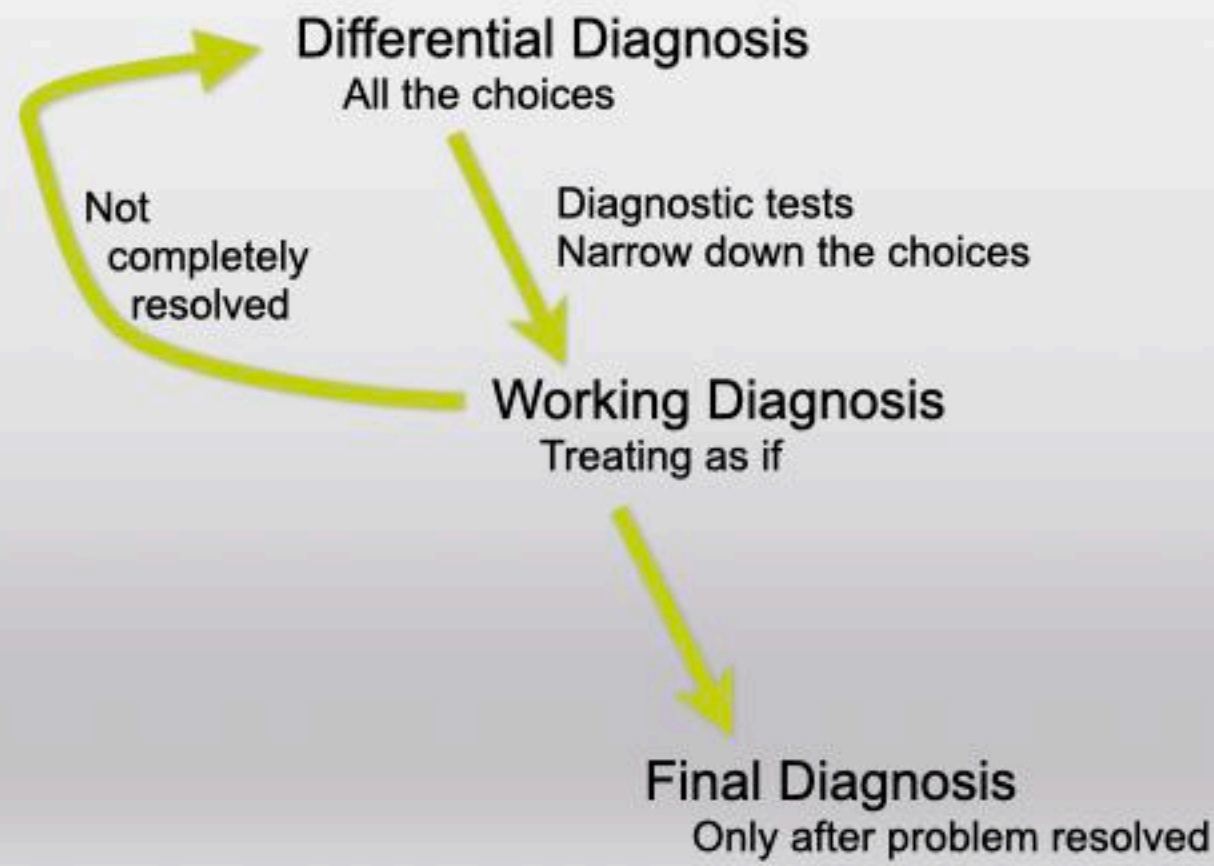
Wobble
Disc Dislocation
Disc Reduction
Disc subluxation
Joint subluxation
Condyle bumps Disc
Sensor roll on face



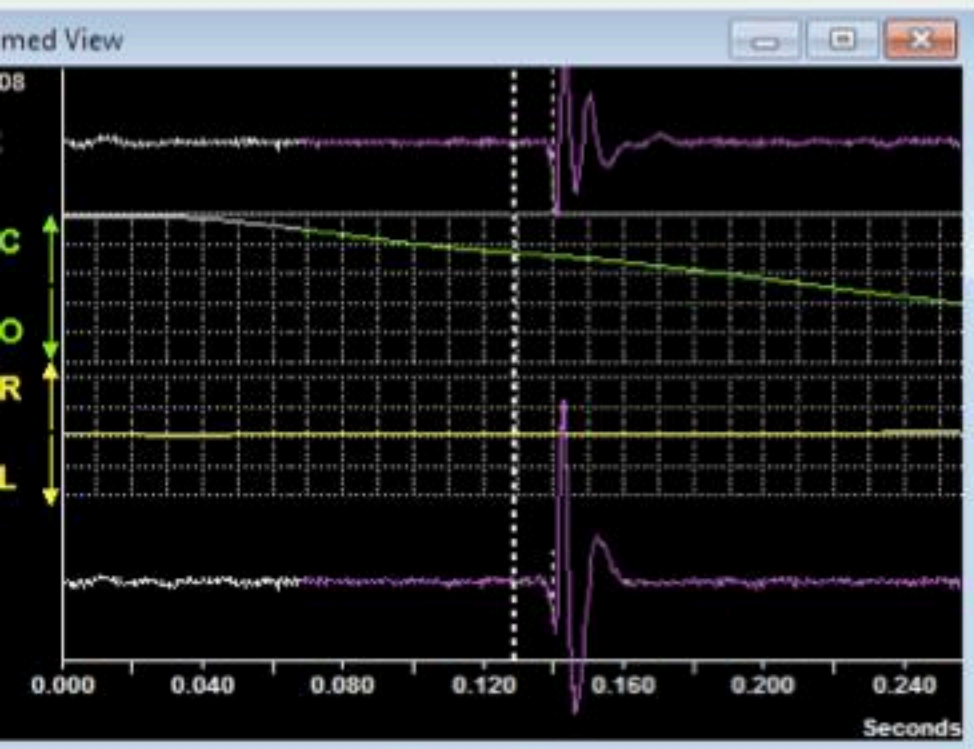
Click
Disc Reduction
Disc Dislocation
Adhesion Crackle
Tooth Tap
Contralateral Transference



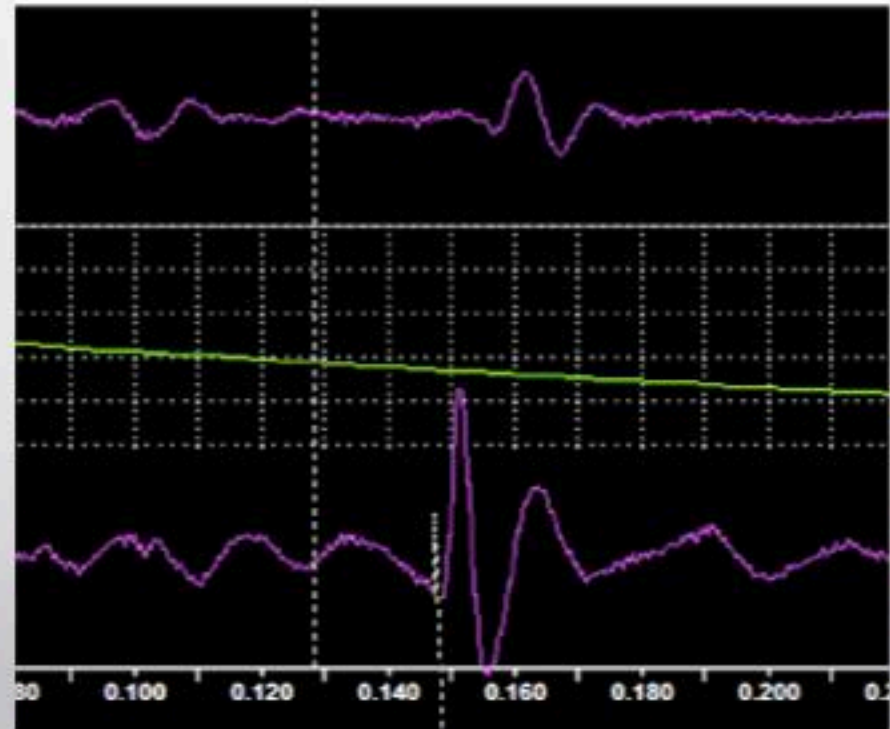
Scratch
Cartilage Fibrillation
Cartilage against tissue
Bone against bone
Velcro Noise



Simple or Complex



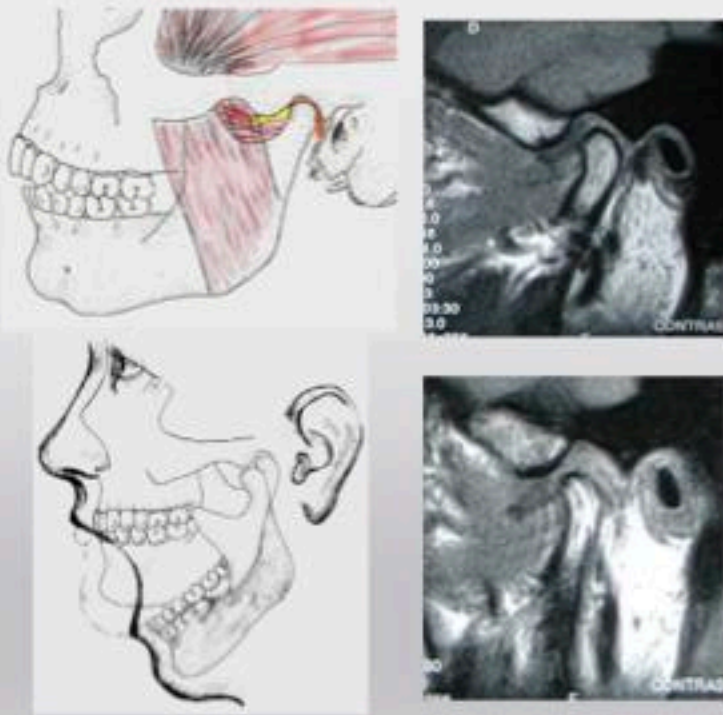
Simple left click with transference vibration to right
L4a



Complex Click
L3a, R4b

Magnetic Resonance Imaging

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



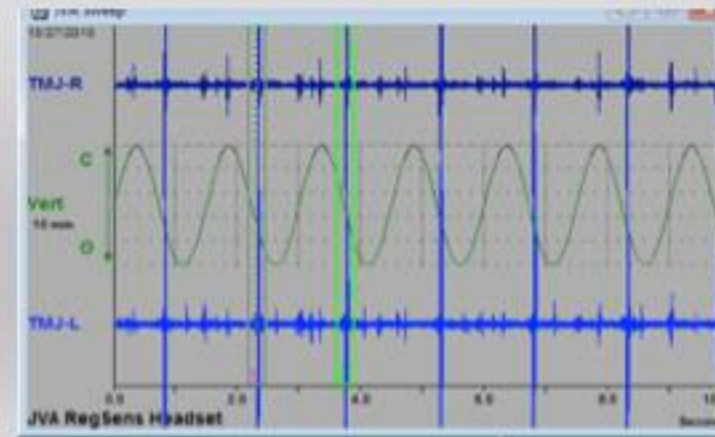
Joint Vibration Analysis

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



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

JVA allows you to view
the joint in function



TMD Symptoms

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



TMD Symptoms

Sore TMJ

= CBCT

Diseases to consider and rule out:

- Acute Sprain
- Chronic Sprain
- Osteoarthritis
- Perforation of Pseudodisc or Disc
- Retrodiscal tissue impingement
- Osteolysis
- Other



Pattern Recognition

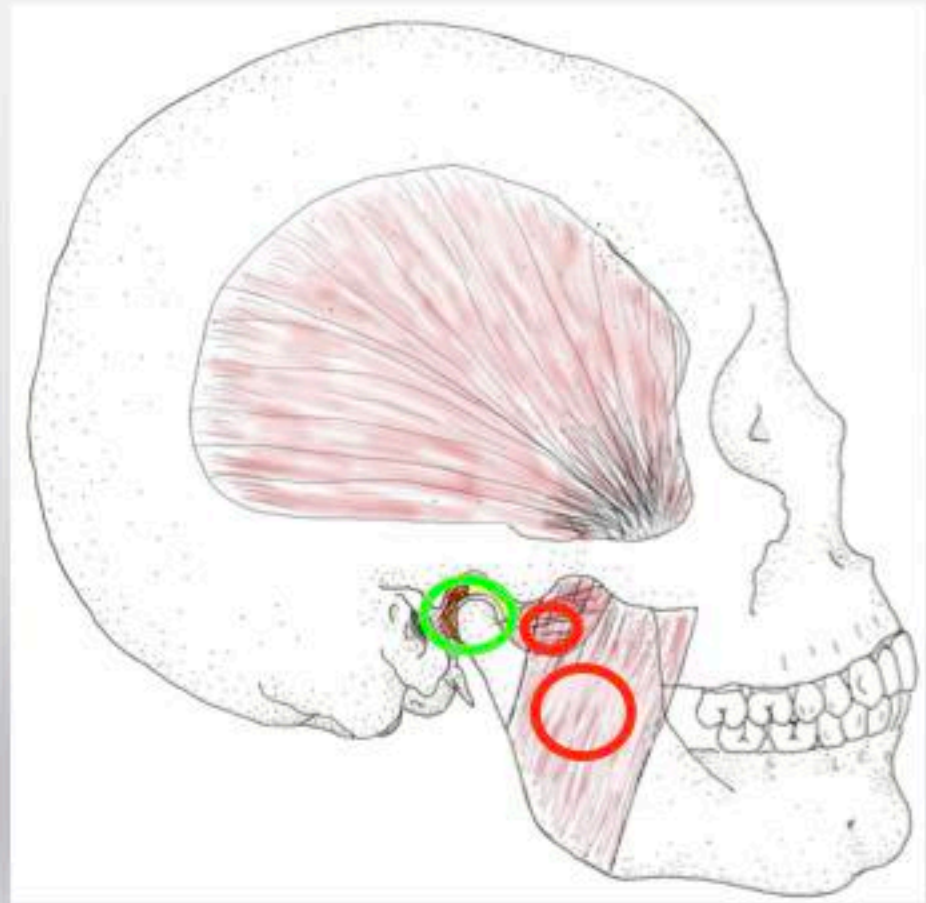
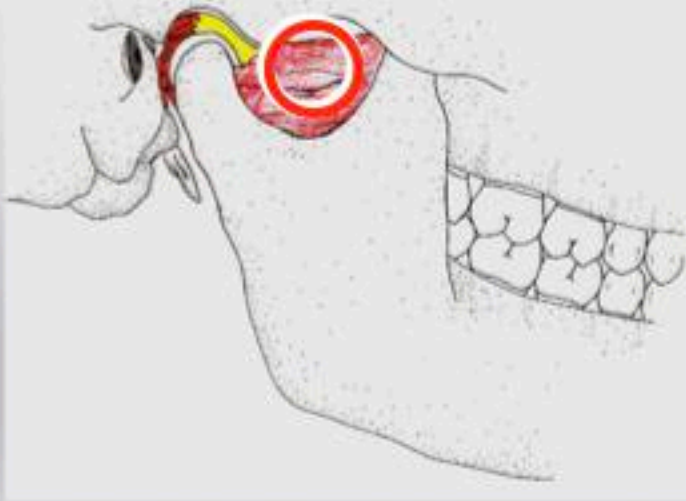
Occlusal Muscle Dysfunction Pattern

Sore muscles when chewing

Sore Lateral Pterygoid

TMJ is not sore

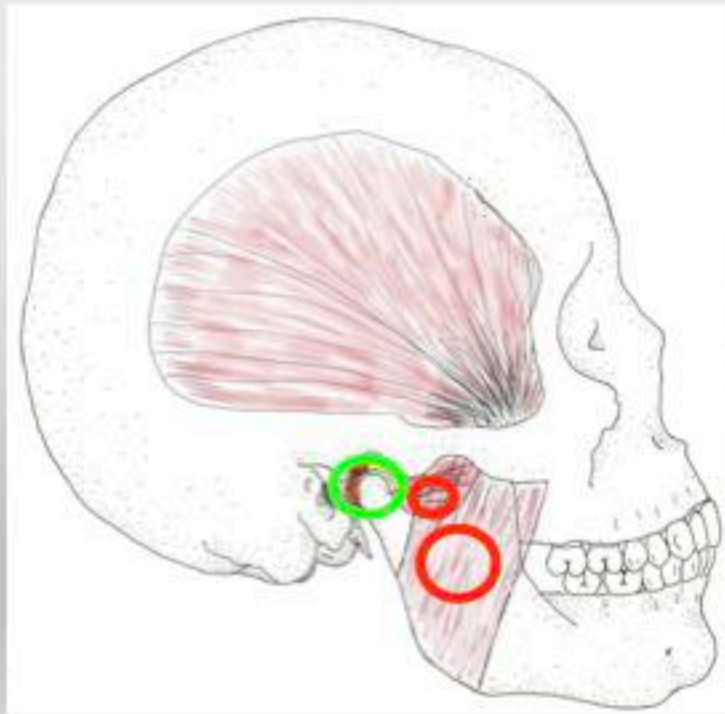
Day orthotic relieves symptoms



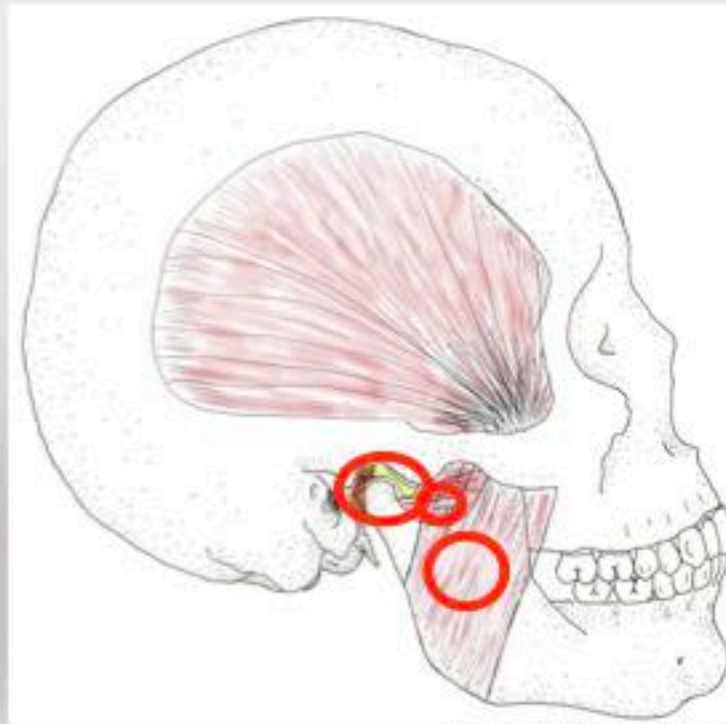
Drawings by Gretta Tomb DDS and John Droter DDS

Pattern Recognition

Occlusal Muscle Dysfunction Pattern



Muscle Bracing Sore TMJ



Treat Sore Joints First

If joint is sore, the muscles will be sore

Sore joints will not resolve with a Centric Relation Orthotic

Drawings by Gretta Tomb DDS and John Droter DDS

1. TMD: TMJ Damage and Diseases

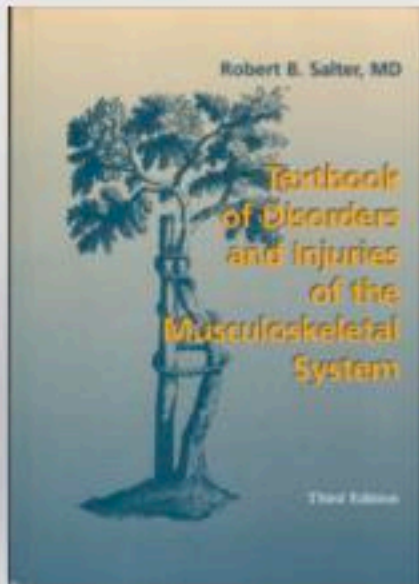
Adhesions and ankylosis of temporomandibular joint
Avascular Necrosis Mandibular Condyle
Cartilage Fibrillation, Mandibular Condyle, Fossa
Closed Lock, Jaw Cartilage, Acute
Closed Lock, Jaw Cartilage, Chronic
Closed Lock, Jaw Cartilage, Intermittent, Mechanically dysfunctional
Crush Injury Mandibular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

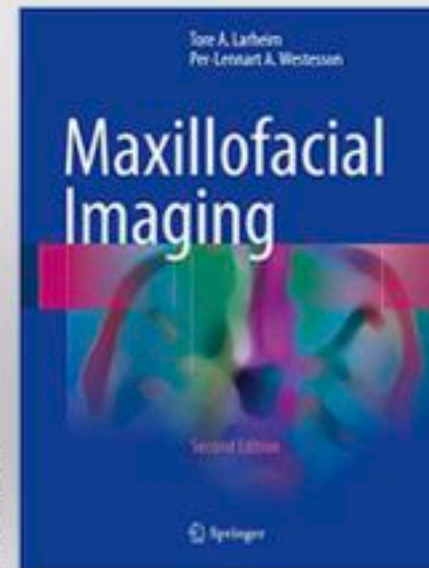
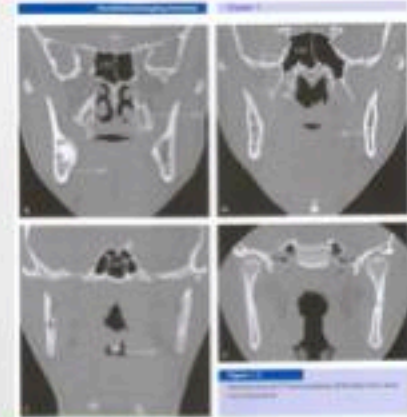
Understanding orthopedic medicine is the key to understanding joints, including the TMJ



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

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

Maxillofacial Imaging
Larheim
Westesson



Sore TMJ Differential Dx:

Most Common:

- Osteoarthritis
- Sprain Discal Ligament (Acute or Chronic)
- Perforation Pseudodisc or Meniscus
- Impingement (Inflammation) Retrodiscal Tissue
 - Acute 4a
 - Distalizing Occlusion
- Osteolysis Mandibular Condyle
 - Hypoxic Progressive Condylar Resorption
 - Inflammatory Tissue Bone Resorption
 - Avascular Necrosis Mandibular Condyle
- Hypoxia Reperfusion Injury, TMJ Cartilage Damage
 - Cartilage Fibrillation
 - Adhesions of Cartilage
- Open Lock TMJ
- Fibrous Ankylosis

Other:

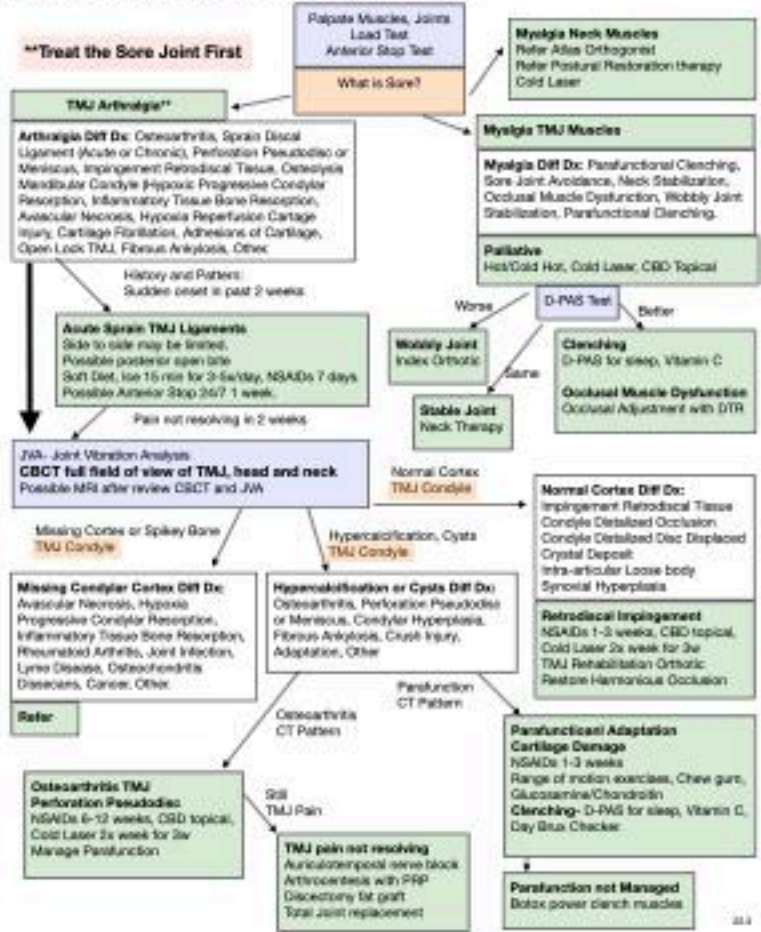
- Crush Injury Mandibular Condyle
- Crystal arthropathy, unspecified, TMJ
- Ear Inflammation
- Gout
- Hemarthrosis TMJ, Traumatic
- Hyperplasia Mandibular Condyle
- Infection
- Fracture of subcondylar process of mandible
- Intra-articular Loose Body (Joint Mice), TMJ
- Malignant neoplasm of bones of skull and face
- Osteochondritis Dissecans TMJ
- Psoriatic Arthritis TMJ
- Rheumatoid Arthritis Sero Negative TMJ
- Rheumatoid Arthritis TMJ
- Synovial Cyst (Ganglion Cyst)
- Synovial Hyperplasia

Synovitis and Effusions are signs of active cartilage breakdown:

- Osteoarthritis (most common)
- Cartilage Fibrillation, Adhesions

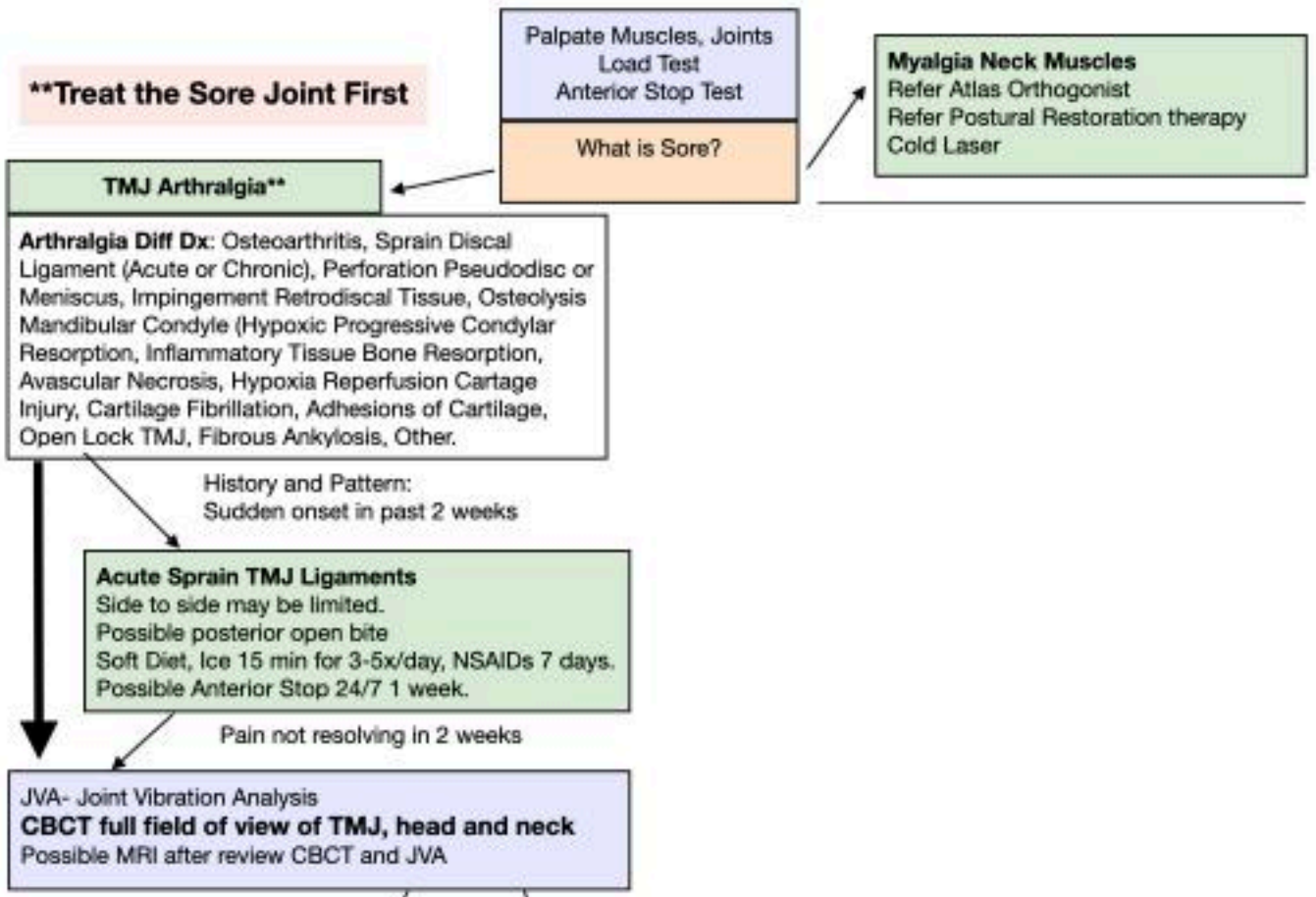
Arthralgia Algorithm :

Dr Droter's Algorithm for Arthralgia Myalgia the TMJ



Arthralgia Algorithm :

Dr Droter's Algorithm for Arthralgia Myalgia the TMJ

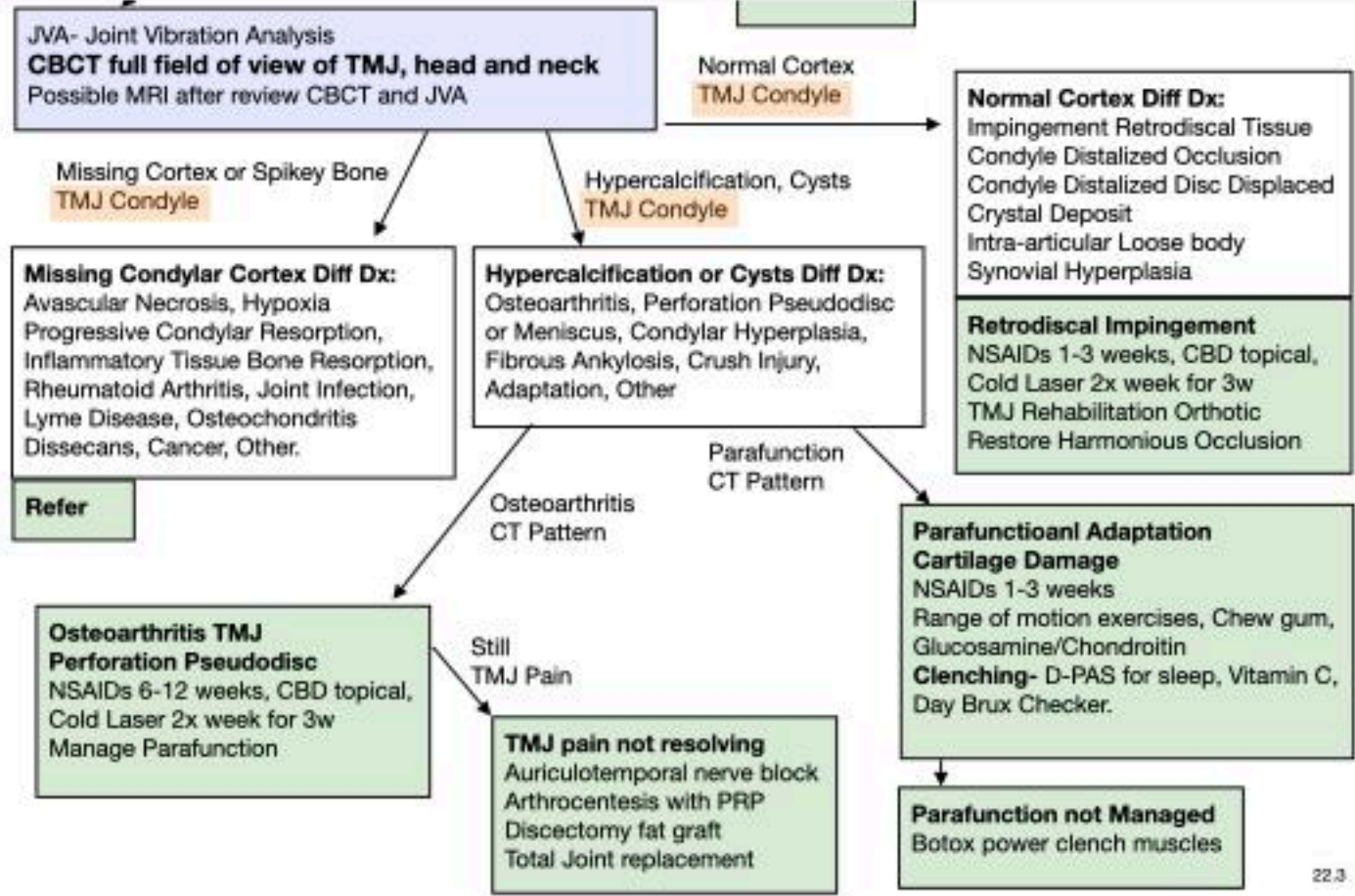


Arthralgia Algorithm :

Sore Joint = Imaging

TMJ Condyle

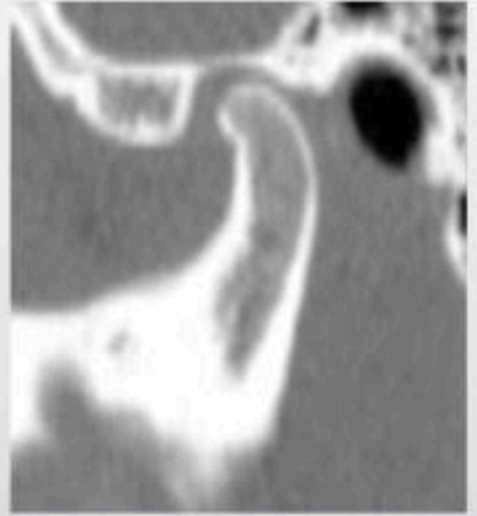
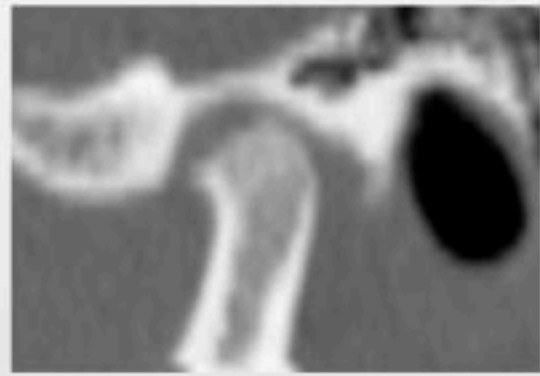
CBCT:
 Missing Cortex
 Hypercalcification, Cysts
 Normal Cortex



Arthralgia Algorithm :

Sore Joint = Imaging

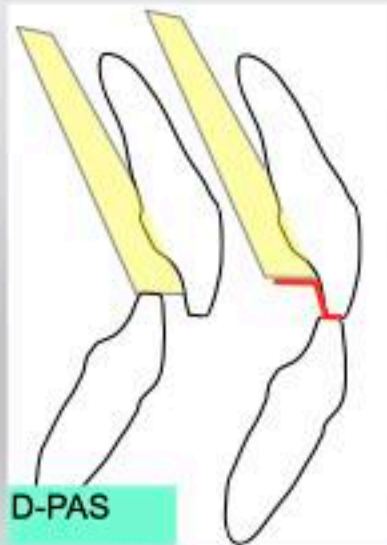
- CBCT
- Condyle:
 - Missing Cortex
 - Hypercalcification, Cysts
 - Normal Cortex



Facial Pain Diagnosis

Diagnostic Tools

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



Anterior Stop Orthotics Utilization

Diagnostic Test
Patient Awareness
Disease Management
Bite Recording Tool

Palatal Anterior Stop



APS In Office Anterior Stop



***Do not send patient home with small anterior stops that can be aspirated.

APS Home Trial
Temporary Anterior Stop

Anterior Stop Orthotics

Diagnostic Test

Patient Awareness

Disease Management

Bite Recording Tool



APS In Office
Anterior Stop
2.5 mm



Pankey In Office
Anterior Stop

***Do not send patient home with small anterior stops that can be aspirated.

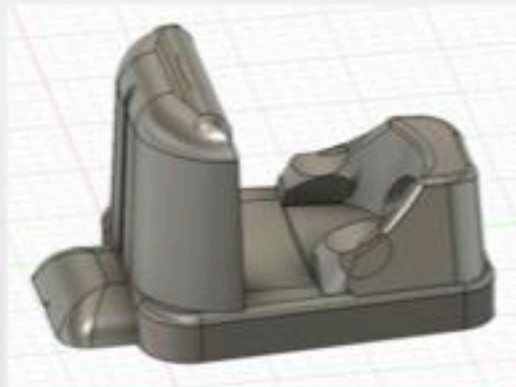
Anterior Stop Orthotic In Office Diagnostic Test



Reline with Parkell Blu-Mousse Super Fast

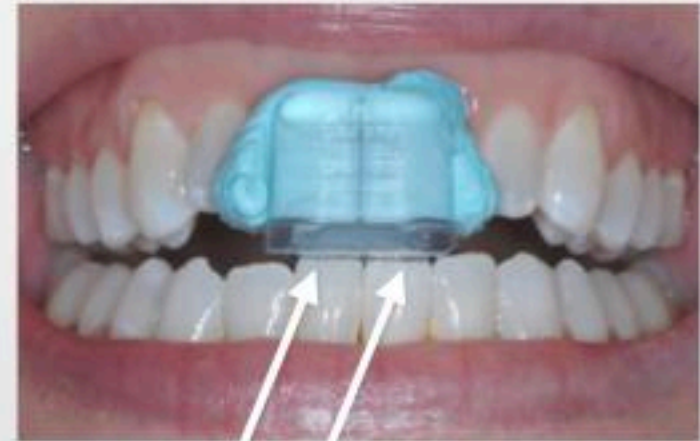


Can do 2nd reline over top of the first if needed

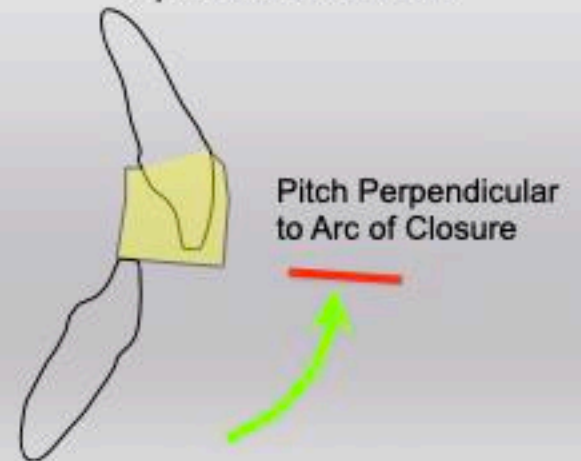


APS Anterior Stop 2.5mm

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



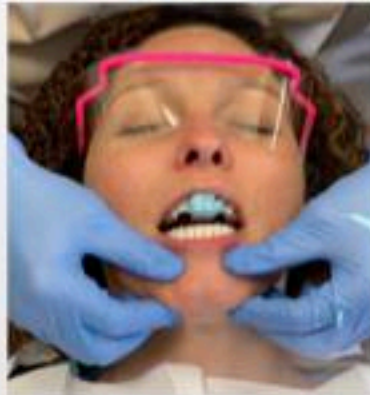
2 points of contact



Anterior Stop Orthotic In Office Diagnostic Test



ArrowPath Sleep
Anterior Stop



Deprogram Muscle Engrams

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

With anterior stop in place:

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

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

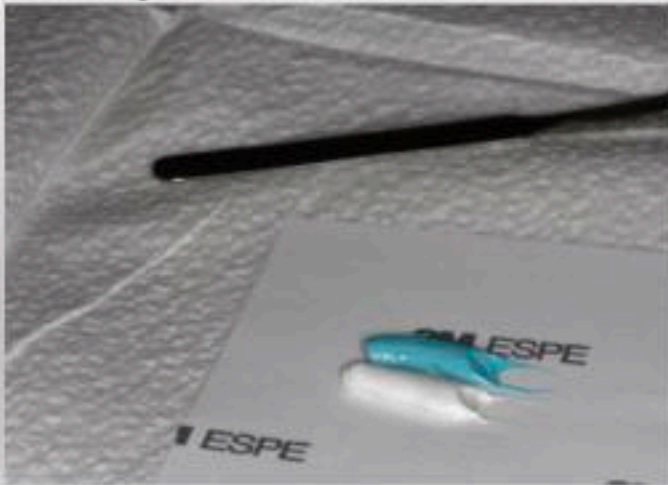
Occipital Lift with 3 deep breaths. Posterior neck opening muscle massage.

3rd round same as first except less taps each position

Office USE ONLY Do not send home with patient

Anterior Stop Orthotic In Office Diagnostic Test

Can do 2nd mix to
overlay 1st if needed



Anterior Stop Orthotic In Office Diagnostic Test

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

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



ArrowPath Sleep
Anterior stop 2.5 mm

>30% of headaches have an occlusal component

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

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

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

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



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



Pankey Anterior Stop
relined with bis-gma resin

Working Diagnosis:
Protective Muscle Bracing
Occlusal Muscle Dysfunction
Anterior Openbite

Anterior Stops

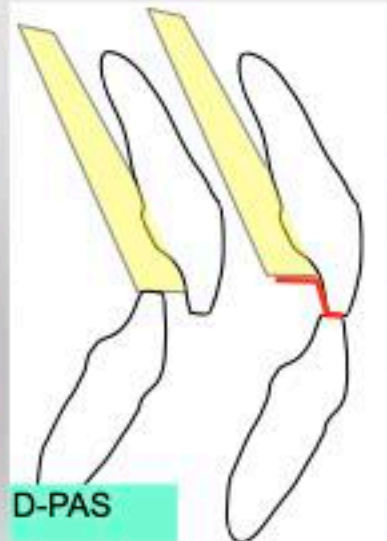
John R Droter DDS
Annapolis, Maryland

Annapolis, Maryland
John R Droter DDS

Facial Pain Diagnosis

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Blood Tests



Anterior Stop Orthotics



Anterior Stop Orthotics

Diagnostic Test
Patient Awareness
Disease Management
Bite Recording Tool



Lucia Jig
Great Lakes Orthodontics

CR Bite Registration



Brown Stick Compound
Futar D- Kettenbach



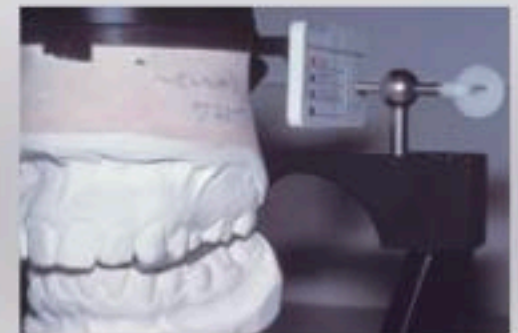
Leaf Gauge Great Lakes Orthodontics

I now use Aluwax and bimanual manipulation.

9 bite records 3 different ways



Denar
VeriCheck



Anterior Stop Orthotics

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

APS Airway Bite Anterior Stop 4mm



George Gauge



Airway Metrics



ArrowPath Sleep Airway Bite

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

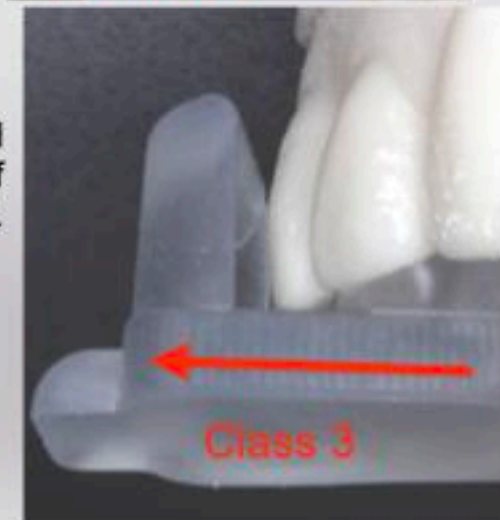
APS Airway Bite Anterior Stop 4mm



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



Device shifted back so
flush with buccal surface
of front teeth



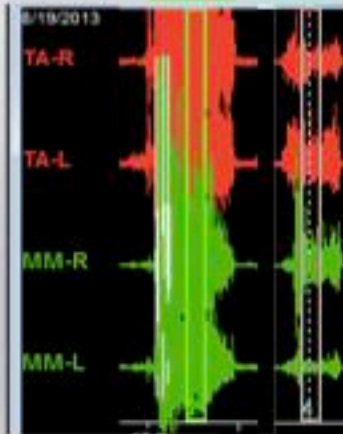
Device shifted forward
so lingual surface of
front teeth touch device.

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

Patient with muscles inhibited by anterior only contact



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



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

ArrowPath Sleep Airway Bite



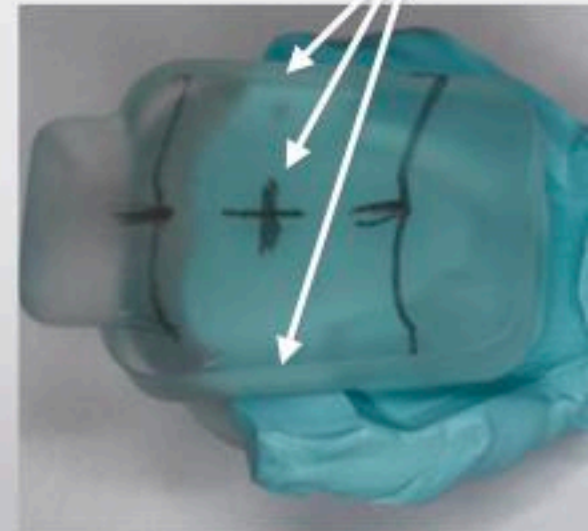
Mark furthest forward and back jaw position and midline with sterile disposable pencil



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

50% is typically a good place to start

Place bonding agent



ArrowPath Sleep Airway Bite



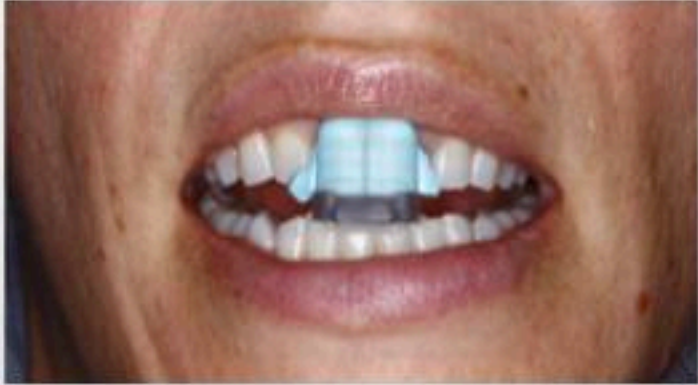
Move jaw into position, verify with tap tap, then flow flowable composite in front of lower incisors, cure.



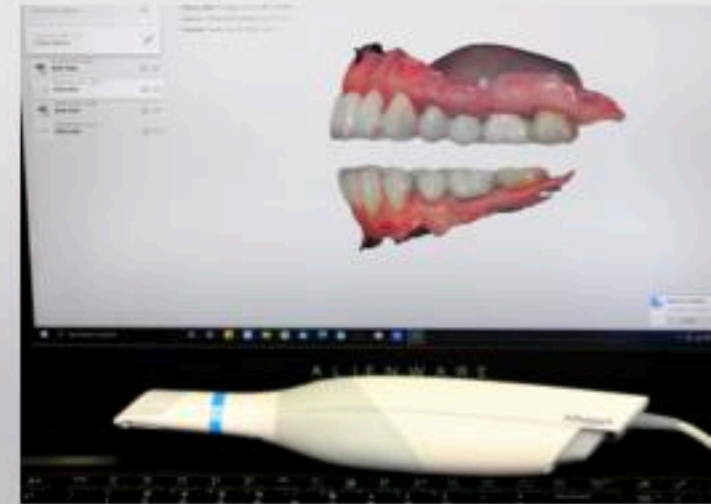
At edge of anterior stop flow some composite behind teeth and cure.

Jaw is now held stable in forward position.

ArrowPath Sleep Airway Bite

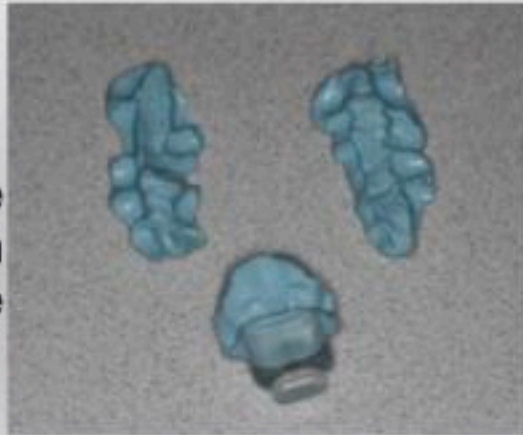


or take digital scan with anterior stop in place and jaw positioned forward



Jaw is held stable in forward position.

Silicone bite registration of airway bite



Anterior Stop Orthotics

Diagnostic Test

Patient Awareness

Disease Management

Bite Recording Tool



The D-PAS
Diagnostic Palatal Anterior Stop



Kois Deprogrammer

or Upper Hawley
with Anterior stop

Anterior Stop Orthotics

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

The D-PAS Diagnostic Palatal Anterior Stop

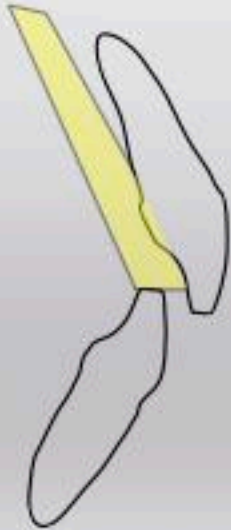


Basically a relined upper Hawley retainer with anterior stop, no wire, no buccal restrictions.



Anterior Stop Orthotics

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



The D-PAS Diagnostic Palatal Anterior Stop



Diagnostic Palatal Anterior Stop

D-PAS Test: Wear 3 nights, then 2 days

Better- Decrease Symptoms

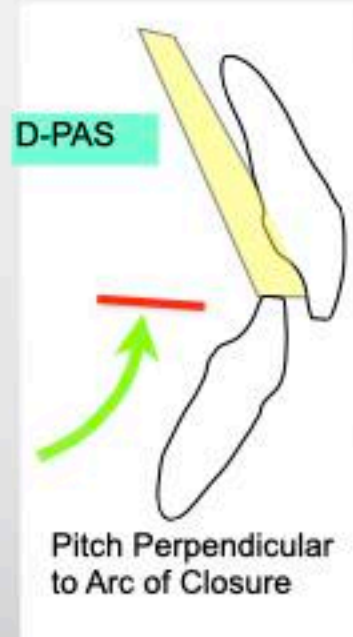
Sleep Clenching: Wear D-PAS as night guard
Occlusal Muscle Disharmony: Occlusal Adjust

Worse- Increase Symptoms

Mechanically Unstable TMJ, joint subluxation
Intracapsular Problem TMJ

Stays the Same- No Change in Symptoms

Damaged TMJ are mechanically stable
Pain not related to occlusion

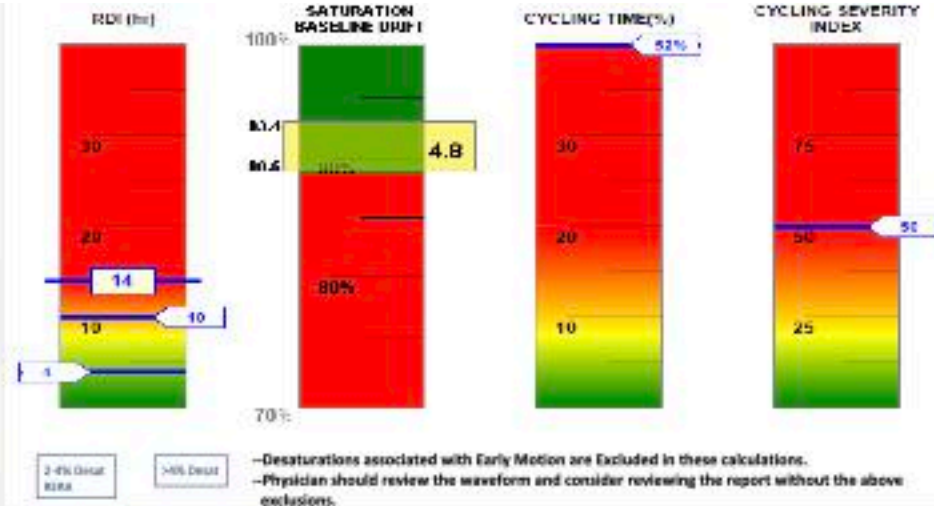
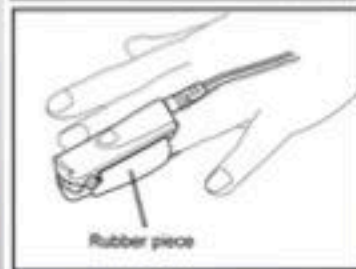
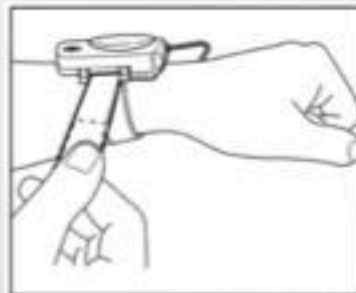


Stapelmann H, Türp JC. The NTI-tss device for the therapy of bruxism, temporomandibular disorders, and headache.....BMC Oral Health. 2008 Jul PMID: 18662411

Facial Pain Diagnosis

Diagnostic Tools

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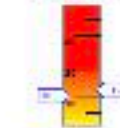
OXYGEN SATURATION BASELINE ANALYSIS

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

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

PATTERN BASED REPORT

0.45 / 3.1-9.7
 3.0 / 1.0-1.0



Legend: 2-4% Desat (Blue), 4-6% Desat (Green).

SPO2 CYCLING

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

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

TRADITIONAL REPORT

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

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

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

Obstructive Sleep Apnea

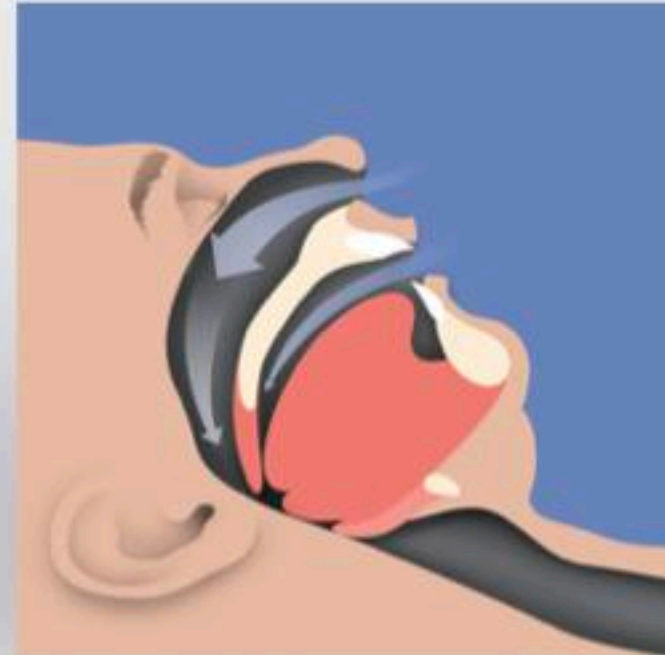
Normal Airway



Upper Airway Resistance
Snoring in men, purring in women



Obstructed Apnea



Images from Somnodent. <https://sommomed.com/us>

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

"Sleep Airway Screening"



High Resolution
Pulse Oximetry

Data every 1
second average
over 3 seconds

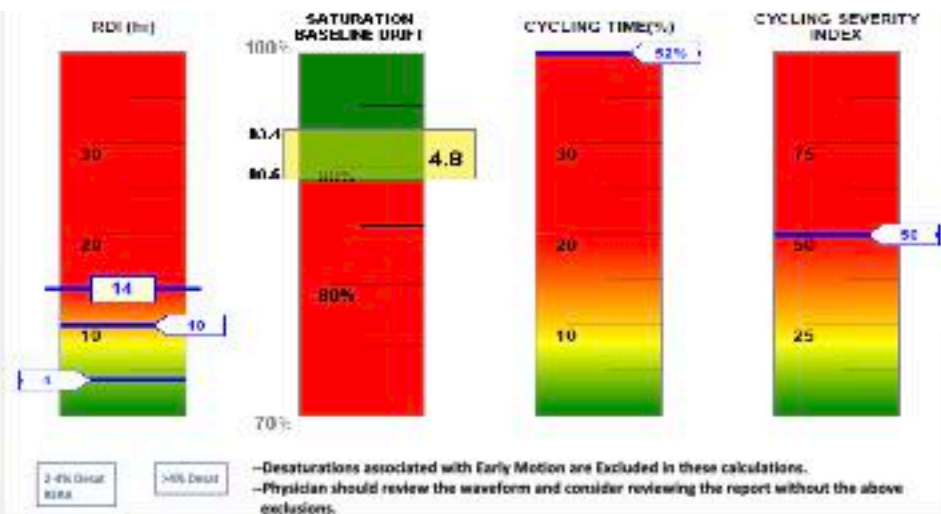


Patient Safety Inc.



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

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



OXYGEN SATURATION BASELINE ANALYSIS

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

PATTERN BASED REPORT

SPO2 CYCLING

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

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

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

TRADITIONAL REPORT

ODI4:		%SpO2	DURATION	%TOTAL
Total ODI4 Events:	11	94-100	00:16:37	5%
Time in ODI4 Events:	58	88-94	04:57:26	91%
Avg ODI4 Event Duration:	06:29:26	80-88	00:13:39	4%
<=88% ODI4 Events:	00:00:28	70-80	00:00:00	0%
<=88% Longest Duration:	23	<= 70	00:00:00	0%
Minimum SpO2:	00:01:21	Total	05:27:42	99%
Avg Low 10% SpO2:	84	Motion Artifact	00:00:07	0.04%
Avg Low SpO2:	96	Error Signal	00:00:05	0.03%
Avg Low SpO2 <=88%:	89			
	87			

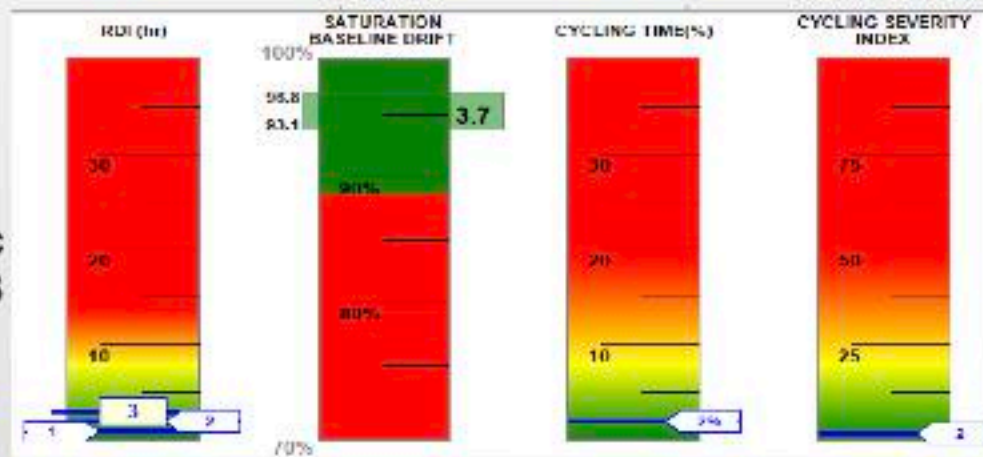
Definition of ODI4 Event: a fall in oxygen saturation of at least 4% and persisting greater than 4 seconds.

Does the dental orthotic make the airway better or worse?

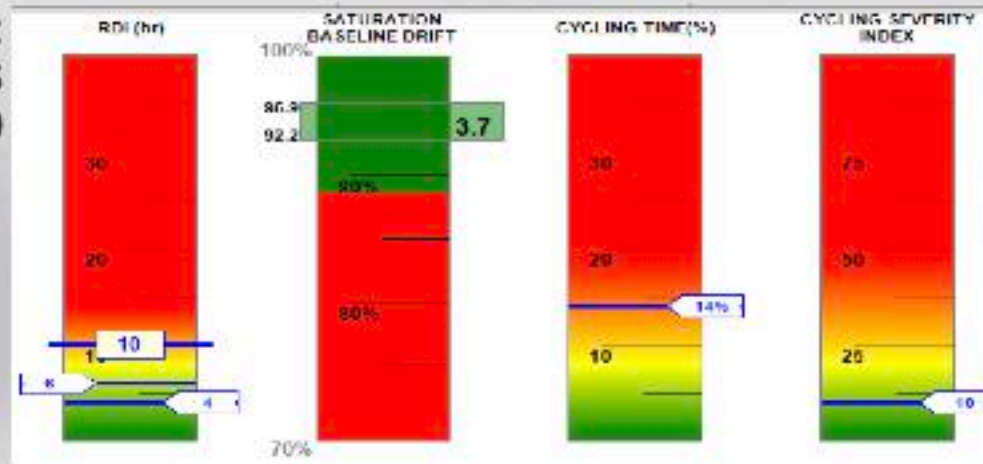
RDI= Respiratory Distress Index

Sometimes D-PAS makes airway better, sometimes worse

No dental orthotic
RDI = 3



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



High Resolution
Pulse Oximetry

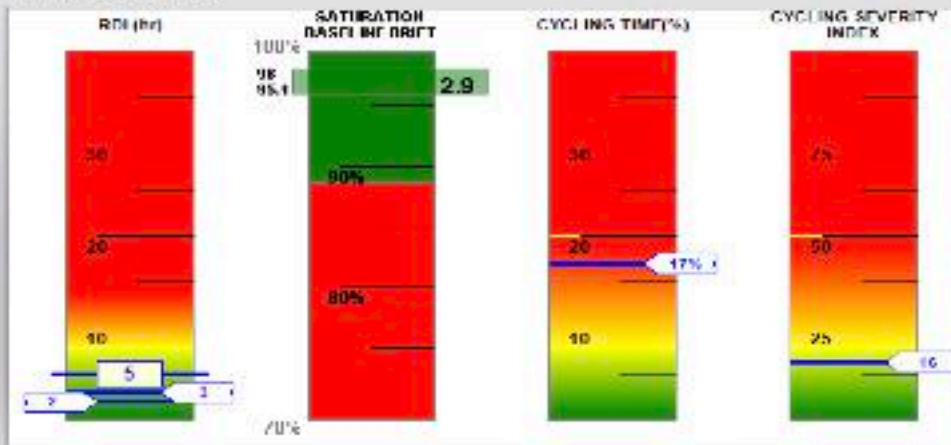
PULSOX 300i,
Konica Minolta
with data analysis
Patient Safety, Inc.

Anterior Repositioning Orthotic

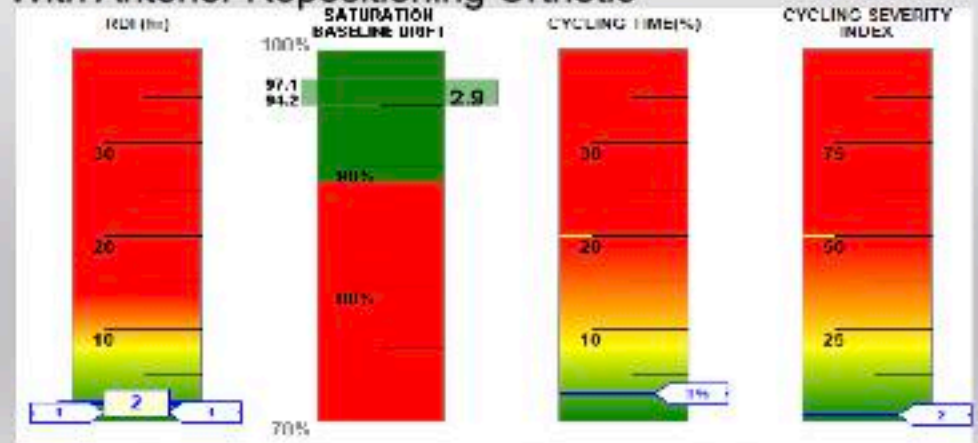


Minolta Pulse Ox

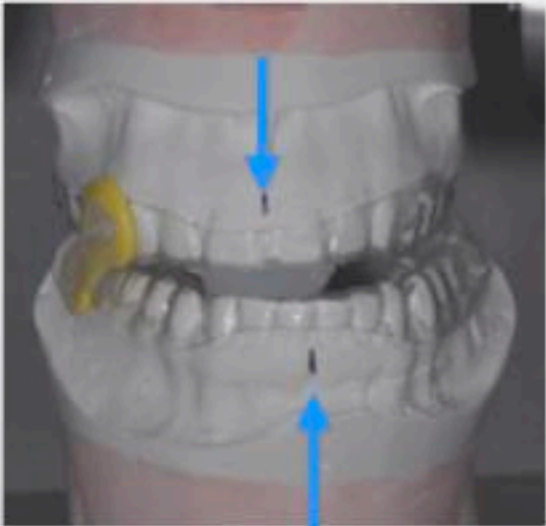
No Orthotic



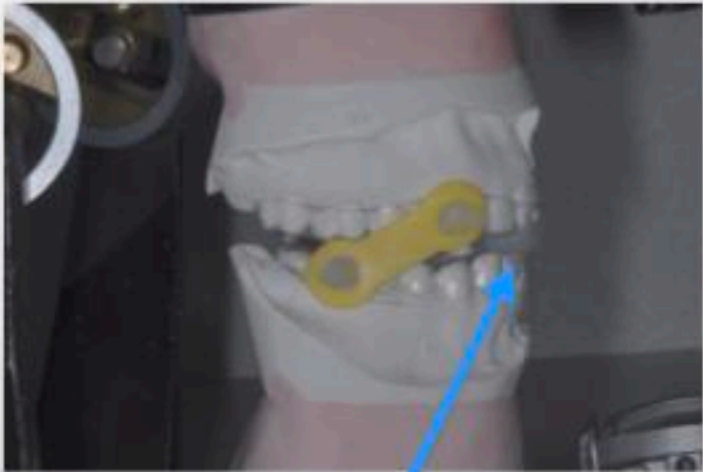
With Anterior Repositioning Orthotic



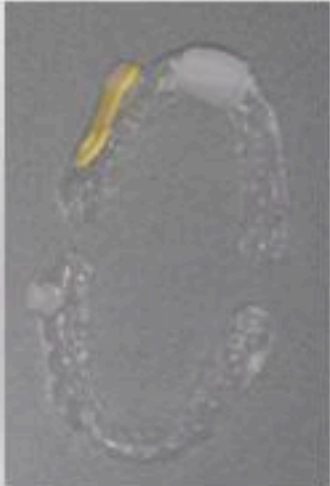
D-LatBrux Lateral Bruxing Orthotic



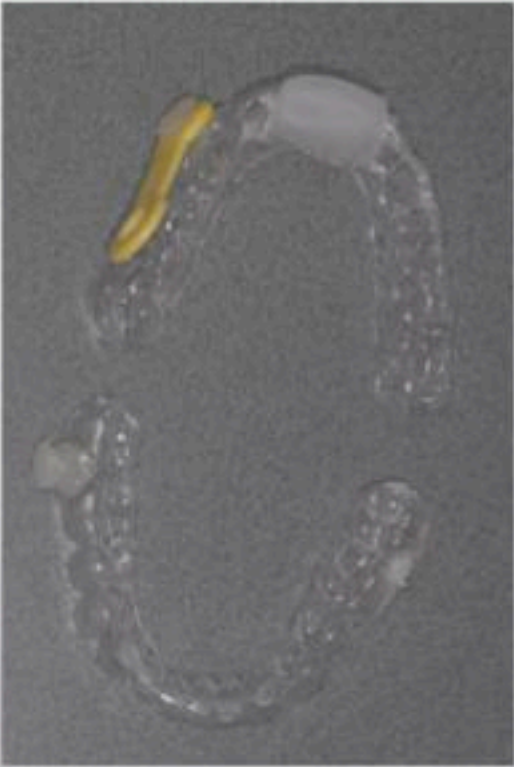
Elastomer Pulls Right condyle forward out of fossa. Moves the jaw to the **Left**.



Anterior Occlusal Stop opens the bite and provides vertical support.



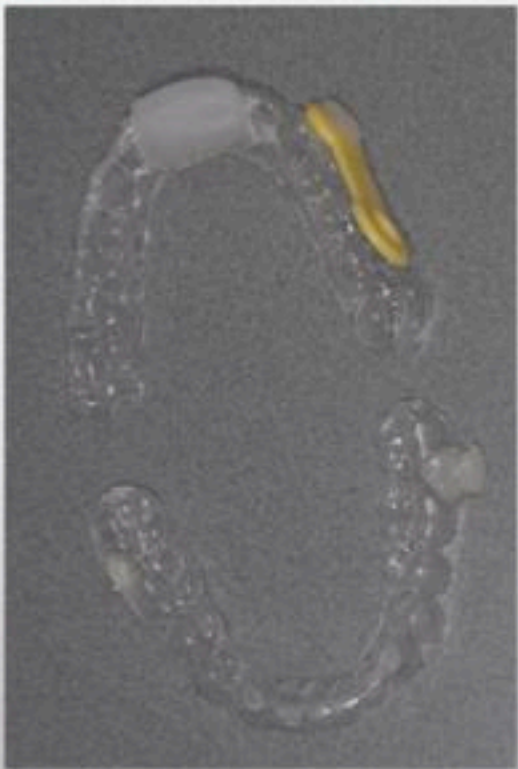
D-LatBrux Lateral Bruxing Orthotic



Pull Left



Pull Right



Only one joint is strained at night. Alternating nights wearing Right then Left gives an extra 24 hours of adaptation time to the system, minimizing permanent bite changes.

Note- simulated Left image reverse of Right

Management

Diagnosis

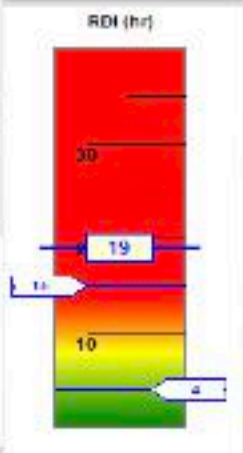
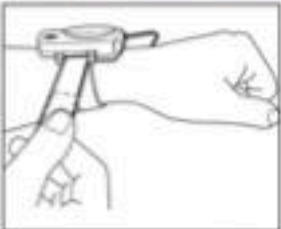
Obstructive Sleep Apnea

Pattern

Variable.....

Treatment

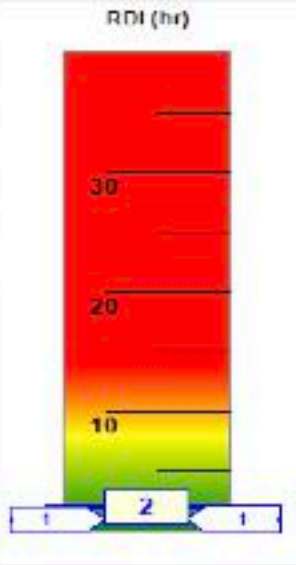
Mandibular Advancement Appliance (after MD approves)



2-4% Desat
PFAA

>4% Desat

Pulse Ox Screening
Refer to Medical Sleep Doctor
Get approval for Mandibular Advancement Appliance
Verify Airway Improves
19 events/hr before
2 events/hr with Orthotic



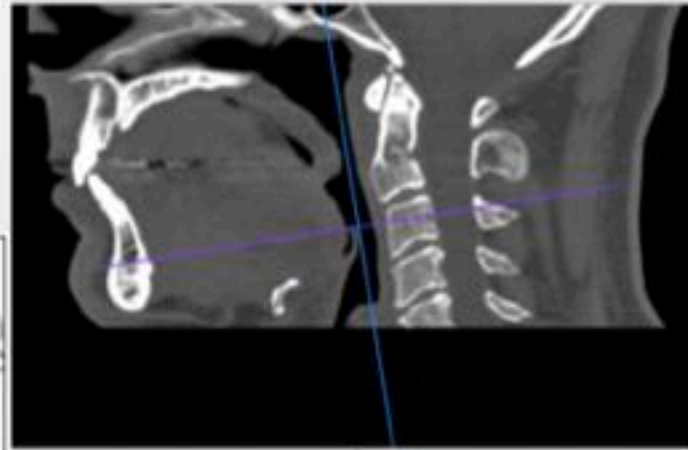
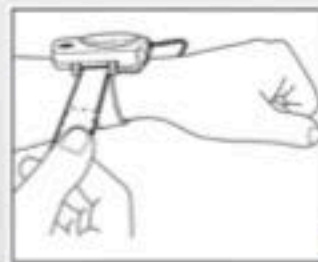
2-4% Desat
RERA

>4% Desat

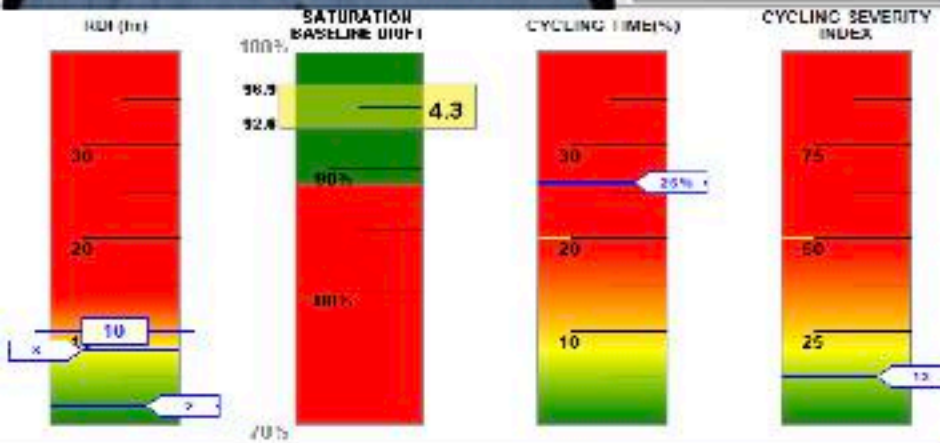
PULSOX 300i, Konica Minolta
with data analysis Patient Safety, Inc.

Narval CC
Great Lakes Ortho

Mild Obstructive Sleep Apnea



Referred to pulmonologist
 Medical Sleep Study
 PSG- Polysomnogram
 RDI 10

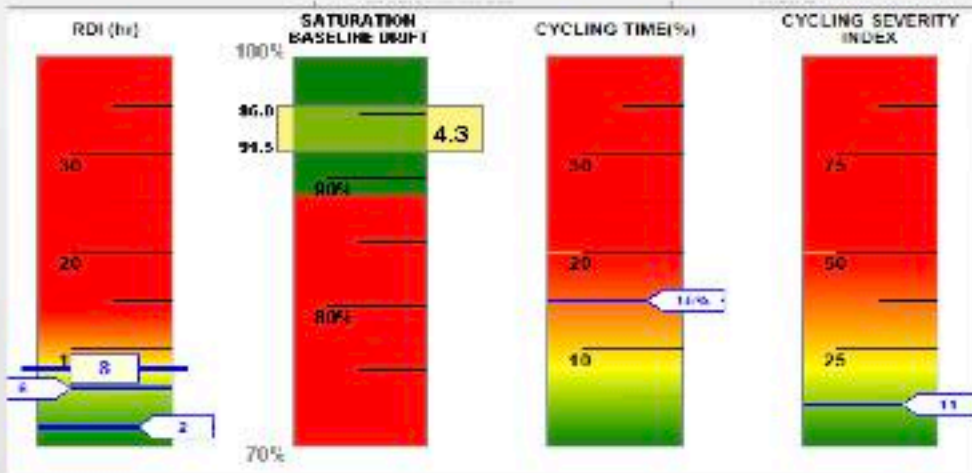


Home Sleep Airway Screening- RDI 10

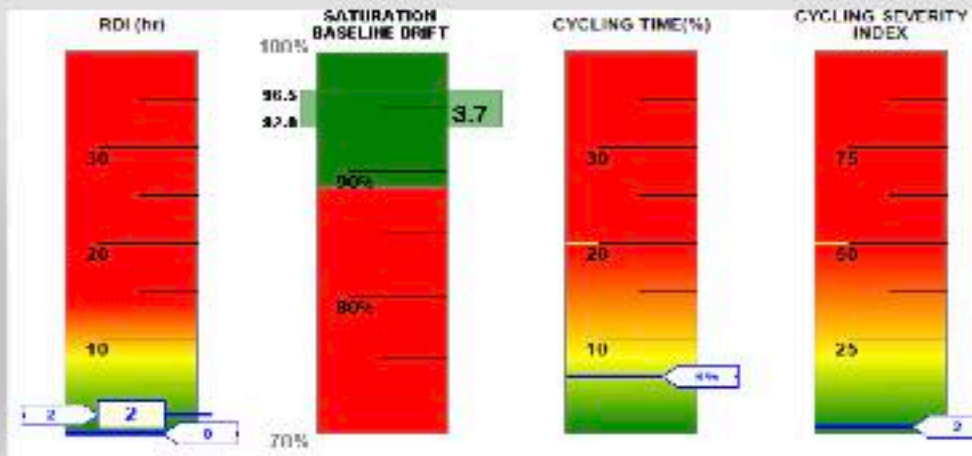
RDI= Respiratory Distress Index

Mild OSA = 5-15 Apnea/hr

MyTAP
Mandible
Advanced 4mm
RDI 8



MyTAP
Mandible
Advanced 5mm
RDI 2



RDI= Respiratory Distress Index



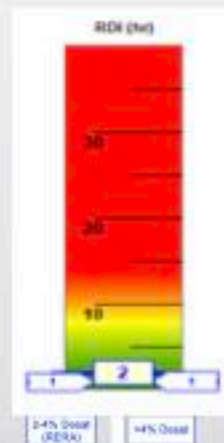
Age 16F
cc: Facial Pain, Excessive Daytime Fatigue



Age 16F
cc: Facial Pain, Excessive Daytime Fatigue



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



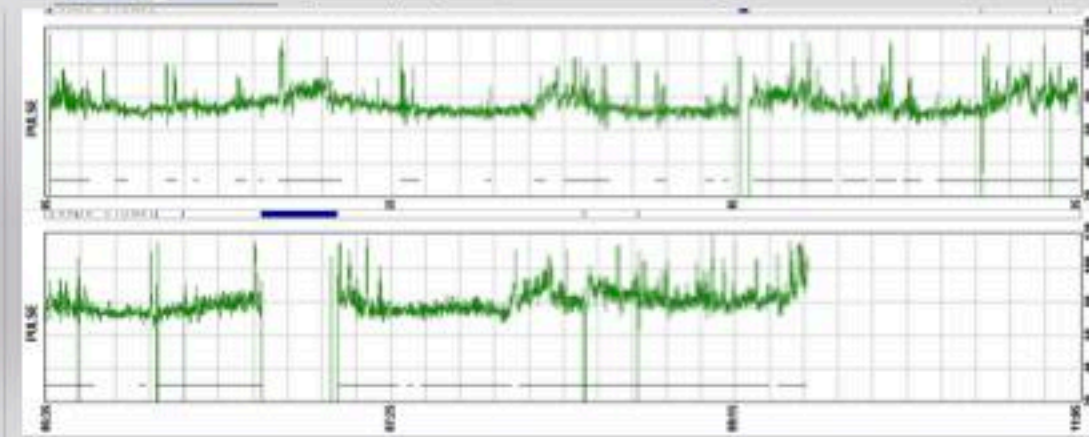
PULSE RATE DATA	
Autonomic Arousal	
Index (#/hr):	31
Pulse Rate Range	
Mean:	78
Min:	34
Max:	122
Tachycardia - Sleep (>90 bpm)	
Duration:	00:34:56
% (VRT):	6%
Bradycardia - Sleep (<50 bpm)	
Duration:	00:00:35
% (VRT):	0%



Heart Rate
>90 bpm
for 35 min

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

Sleep Latency Test
Dx: Narcolepsy
Recommend daytime medication



Disordered Breathing Disease Progression

Disease Stage 1

Predisposing Factors

Small Airway

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

Disease Stage 2

Compensation: Airway Maintained

Signs

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

Symptoms

Facial Ache
Not Waking Rested
Daily Fatigue
Neck Soreness

Disease Stage 3

Sleep Airway Partial Collapse

Signs

All of stage 1 and 2 plus.....
Upper Airway Resistance
2-4% Drop O₂ Saturation
RERA- Respiratory Arousals
Sleep Teeth Grinding
↓ Growth Hormone

Symptoms

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

Disease Stage 4

Sleep Airway Full collapse

Signs

All of stage 1, 2, 3 plus....
4%+ drop O₂ Saturation
Apnea
Cardiovascular Damage
Elevated BP
GERD

Symptoms

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

Disordered Breathing Disease Stage 4

OSA- Obstructive Sleep Apnea

AHI- Apnea Hypopnea Index

Apnea and Hypopnea events per hour

Apnea- Stop airflow for 10 seconds

Hypopnea- <50% airflow or 4+% O₂ Desaturation

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

John R. Droter DDS

AHI 1-4
"Normal" ??

AHI 5-15
Mild OSA

AHI 15-30
Moderate OSA

AHI 30+
Severe

Signs

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

Symptoms

- Not Waking Rested, Daily Fatigue
- Cognitive Impairment

Irreversible Damage

John R. Droter DDS

Disordered Breathing USA 2008



Stage 1

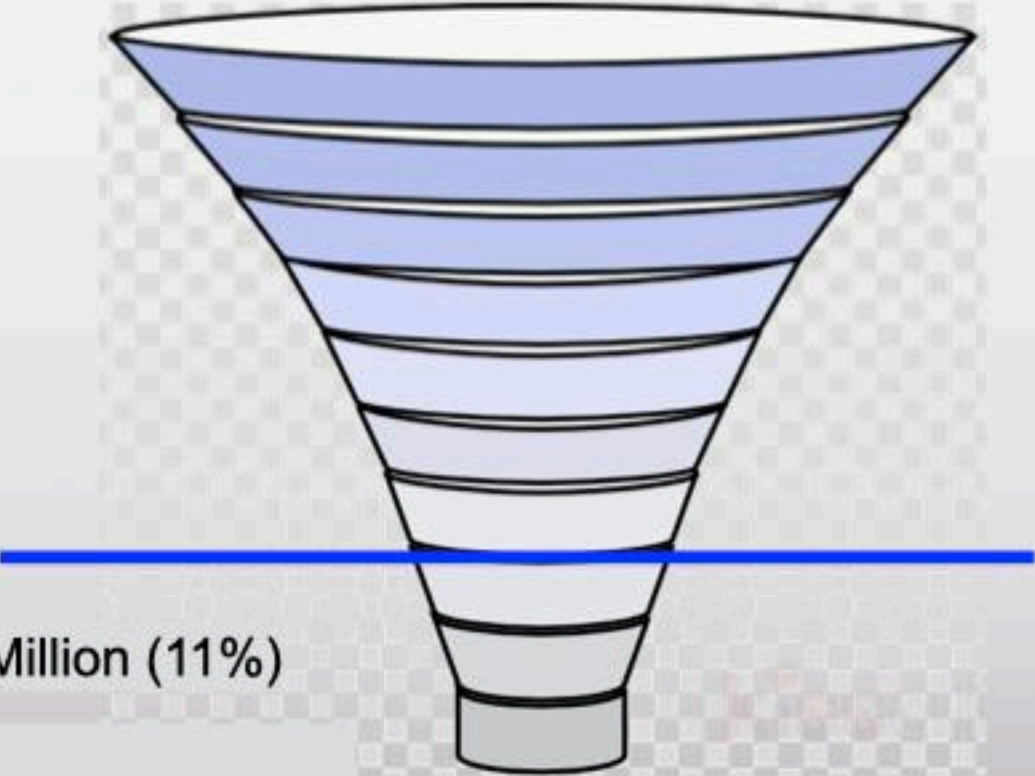
Stage 2

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

Get his **Free** Textbook on how to do this
kidsmalocclusions.com



The earliest a craniofacial growth and development deviation/disturbance is corrected, the better and the simpler treatment is

kidsmalocclusions.com

German Ramirez-Yanez
Early Treatment of Malocclusions
Prevention and Management of Primary Malocclusions

Start Age 7

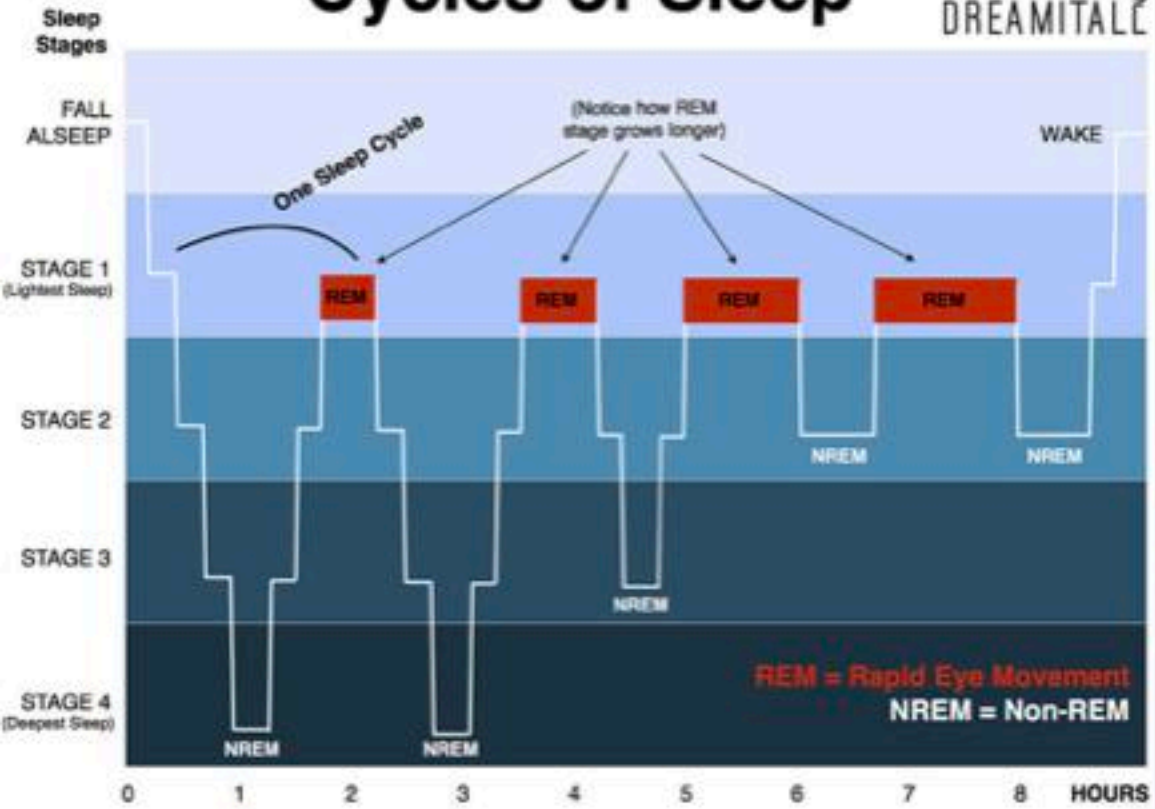
Planas Tracks
Lingual Light Wire

Age 8
9 Months from start

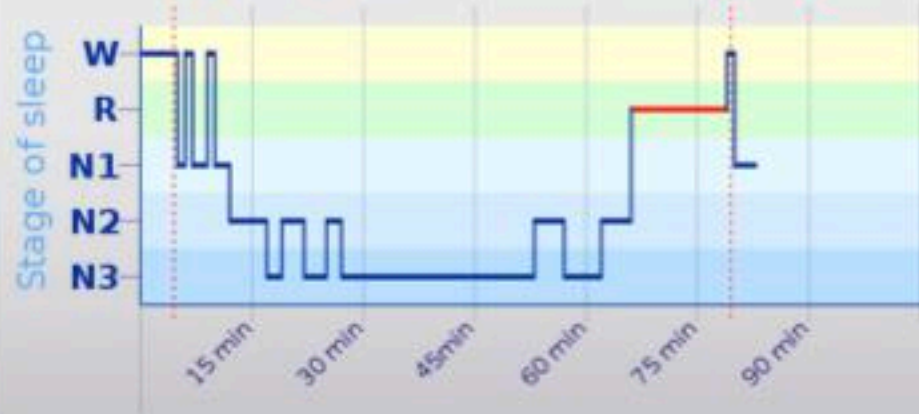


Cycles of Sleep

DREAMITALC



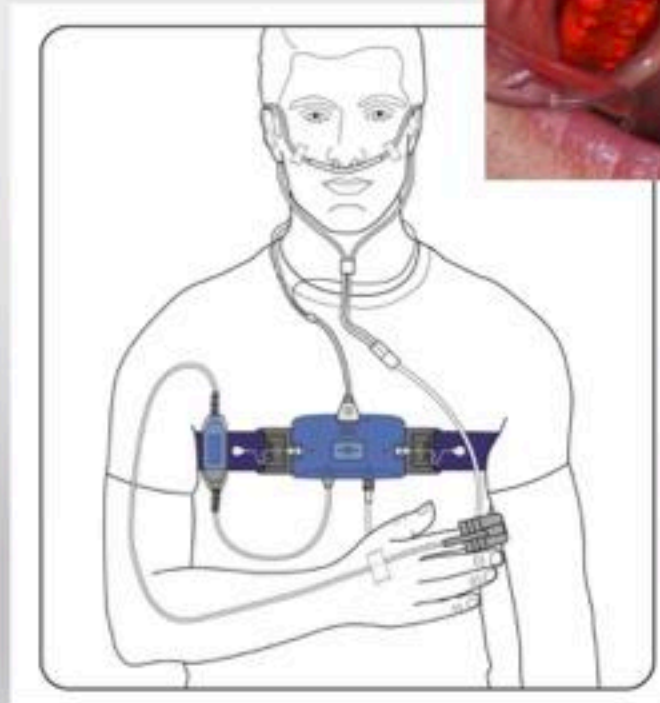
Hypnogram one sleep cycle



zMachine

zMachine + Brux Checker
+ Snore Lab

GENERAL
sleep



Call (888) 330-4424

Use Code: DROTER to receive special offer

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

3% Threshold

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

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

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

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

Study Details: Computer Generated Scoring

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

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

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

N1 2% - 5%
 N2 40% - 50%
 N3 Deep Sleep: 10% - 20%
 REM Sleep: 10-20%
 REM Latency: 10-20 min
 REM Latency: 10-20 min

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

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

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

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

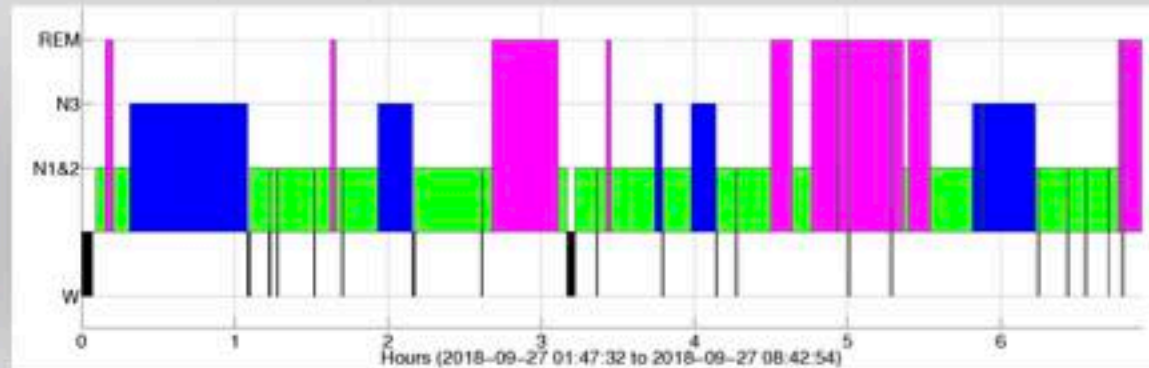
Awakenings During Sleep	
Wake After Sleep Onset (WASO)	13 min
≥ 1-Epoch Awakenings	18 (2.7 per sleep hour)
≥ 3-Epoch Awakenings	0 (0 per sleep hour)

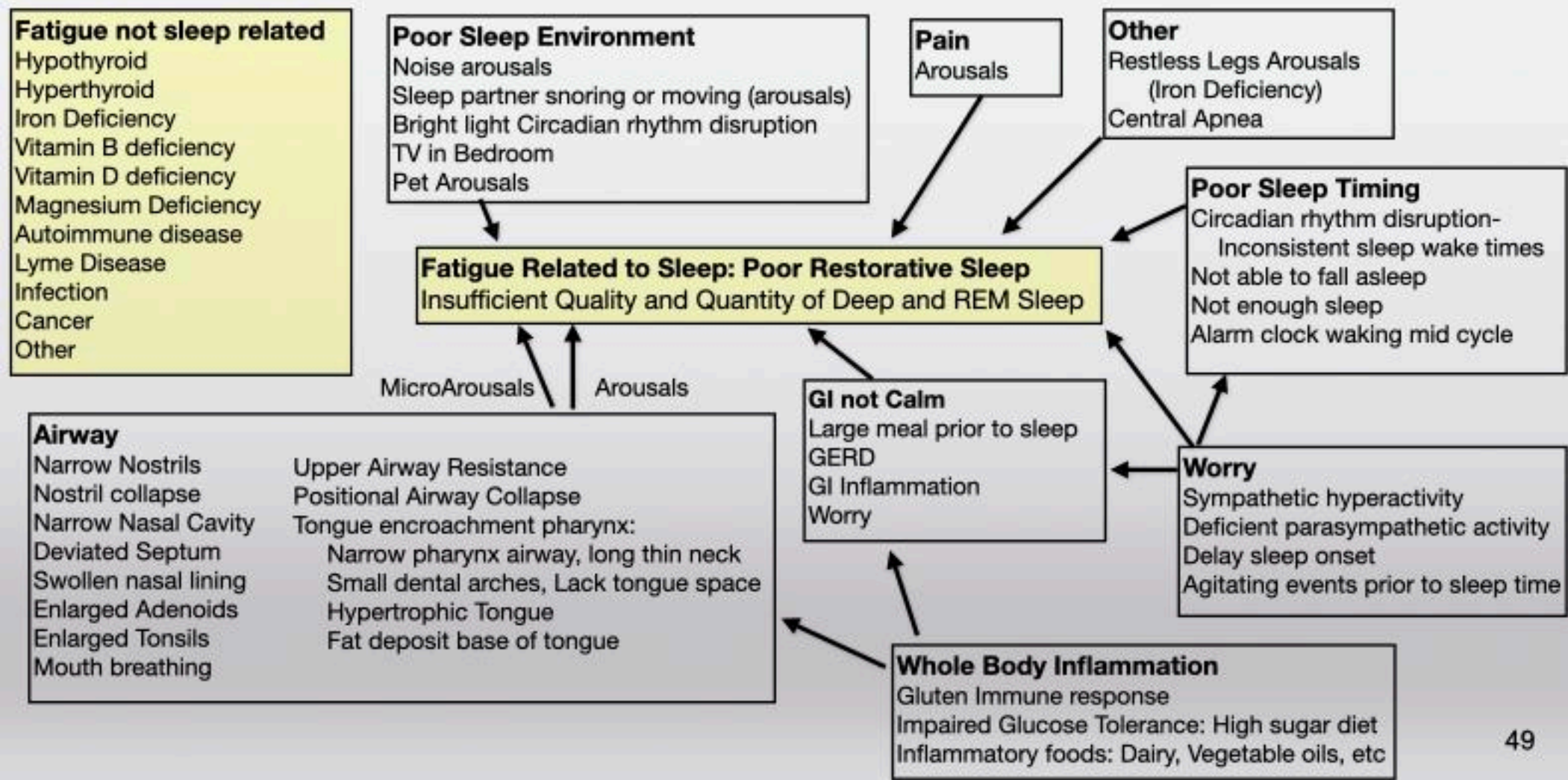
WASO is the cumulative wake time following LPS. ≥ 1-Epoch Awakenings is the number of times the patient wakes for one epoch (i.e. 30 seconds) or more after LPS, and ≥ 3-Epoch Awakenings is the number of times the patient wakes for three epochs or more after LPS. This is a subset of a ≥ 1-Epoch

Respiratory Events

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

Sleep Stages





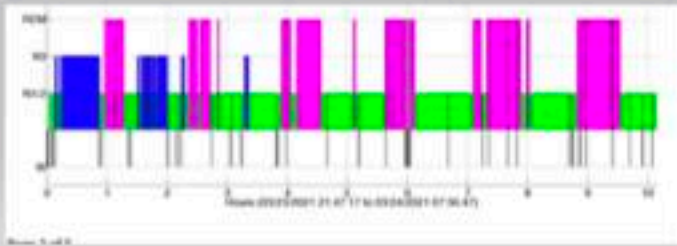
Sleep Simplified

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

Sleep Complexity:

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

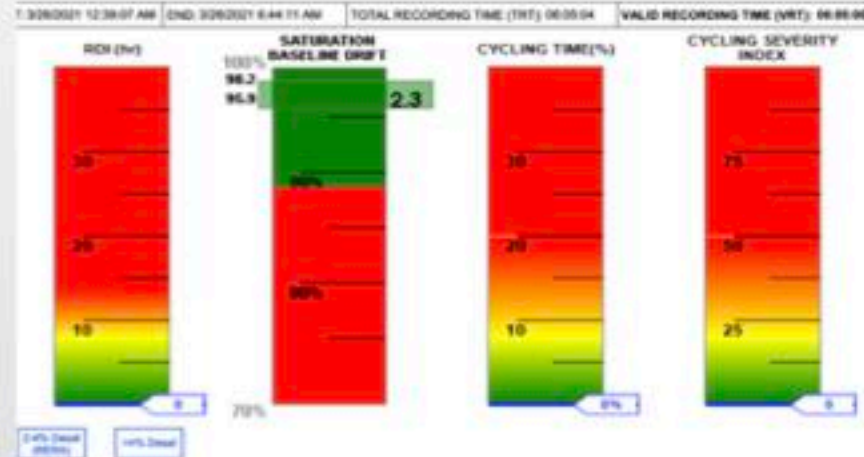
Always go to the back to basics:
 60+min Deep and 90+min REM
 Air from Nose to Lungs
 Large periods of calm, steady heart rate



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

zMachine: Interrupted Deep and REM

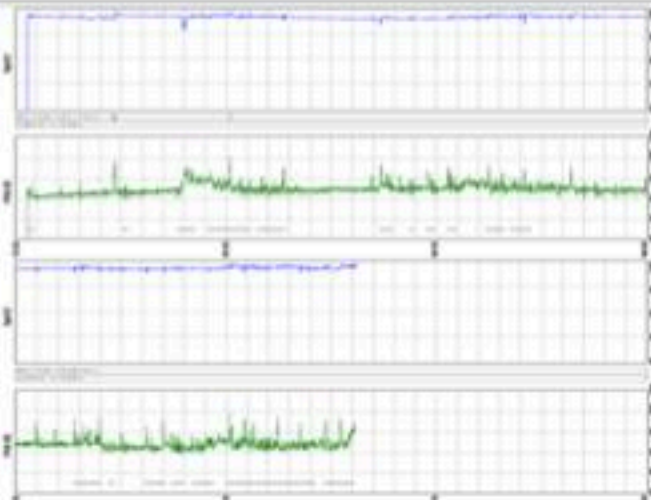
Sat Screen by Patient Safety Inc



PULSE RATE DATA

Autonomic Arousal
 Index (#/hr): 23

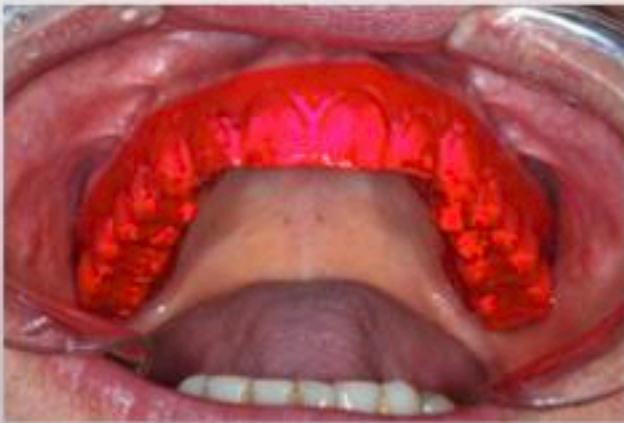
Pulse Rate Range
 Mean: 69
 Min: 58
 Max: 102



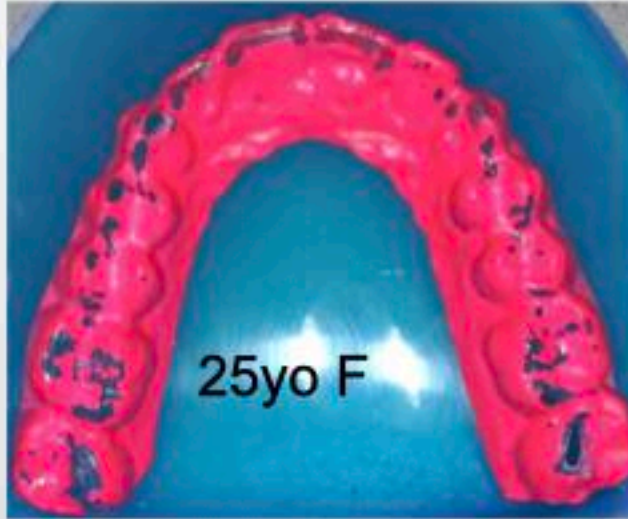
Does grinding occur awake or asleep?

Brux Checker
Great Lakes Orthodontics

0.1mm Mylar



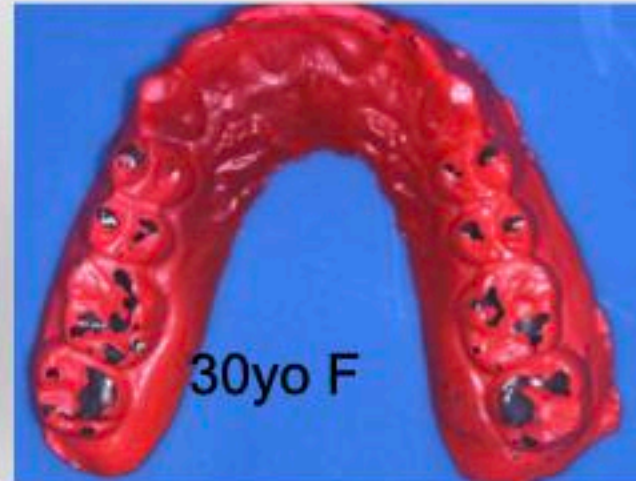
Made on Biostar Machine



25yo F



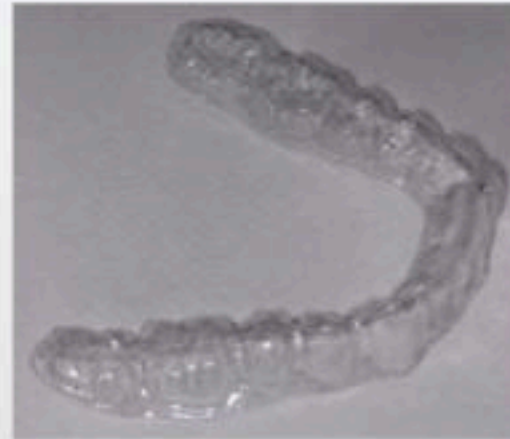
29yo F



30yo F

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





LD Pankey Institute

Write your Dream