

# BioResearch 2021

John R Droter DDS  
Annapolis, Maryland

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John R Droter DDS

[www.jdroter.com](http://www.jdroter.com)

# John R Droter, DDS

To get today's lecture slides:  
go to [www.drdroter.com](http://www.drdroter.com)

Seminar Download

BioResearch 2021

Will have today's lecture  
minus patient photos

White vs Black Background

The screenshot shows a web browser window with the URL [www.drdroter.com/semnar-downloads/](http://www.drdroter.com/semnar-downloads/). The page title is "John R. Droter, DDS" and the main heading is "SEMINAR DOWNLOADS". The page content includes:

- 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
  - [SuperTMDdx13.11](#)
  - Brux supersheet Download

The left sidebar menu contains the following items: HOME, PATIENT DOWNLOADS, NEW PATIENT EXAMS, ABOUT TMD, SEMINAR DOWNLOADS (highlighted in green), and CONTACT. The top navigation bar also contains: HOME, PATIENT DOWNLOADS, NEW PATIENT EXAMS, ABOUT TMD, SEMINAR DOWNLOADS (highlighted in green), and CONTACT.

Age 14

ii: Right TMJ locking past 2 months. Has to wiggle jaw to open.

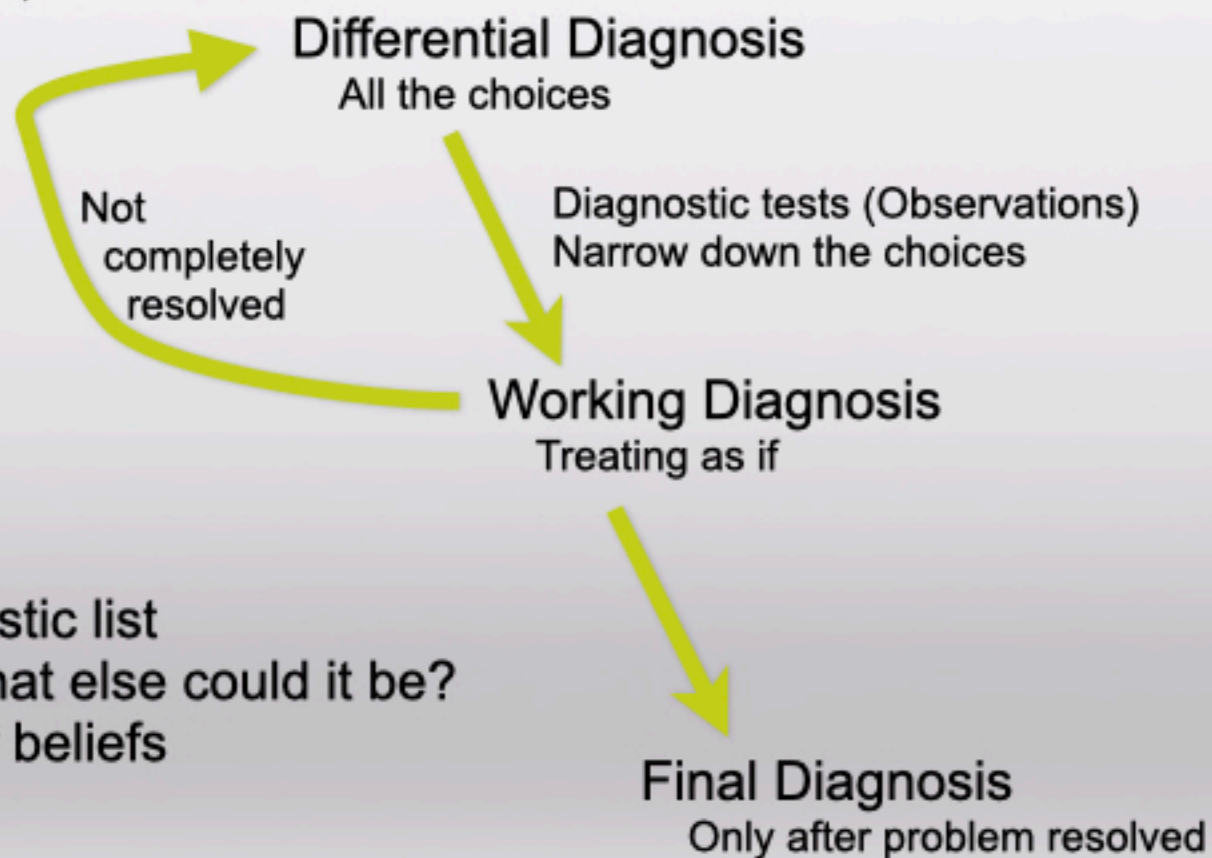
## The Diagnostic Process

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



**Think!!**

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





**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



Dr Guy Haddix  
had been taking CT  
scans since 1990

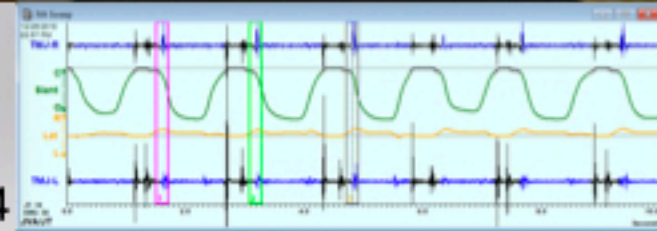


CT and MRI Scans in  
my practice since 1992.



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





# Lingual Light Wire- Crozat Arch Expansion

Age 29

Start



7 months LLW

Age 30



# Anterior Openbite with Active TMJ Bone Loss

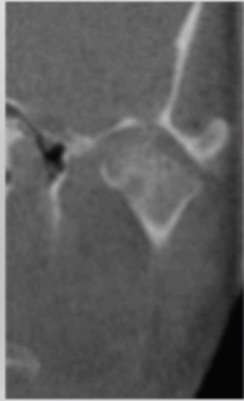
Non Surgical Therapies



Condylar Distraction



Meloxicam and Doxycycline



# Restorative Dentistry

Pathological Occlusion

??Airway Related Bruxing?



Restore Function

Composite Trial Occlusion

AHI + 26 CPAP

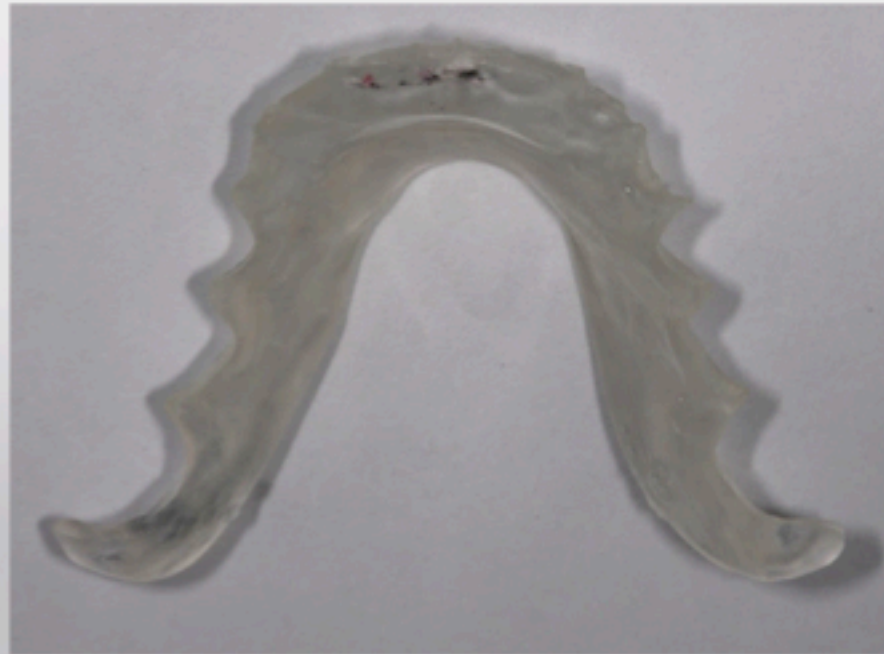


Anterior guidance  
or group function?



# The D-PAS Diagnostic Palatal Anterior Stop

Inhibits Sleep Clenching





**APS**

ArrowPath Sleep

[www.APSleep.com](http://www.APSleep.com)  
[info@apsleep.com](mailto: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**

Age 14

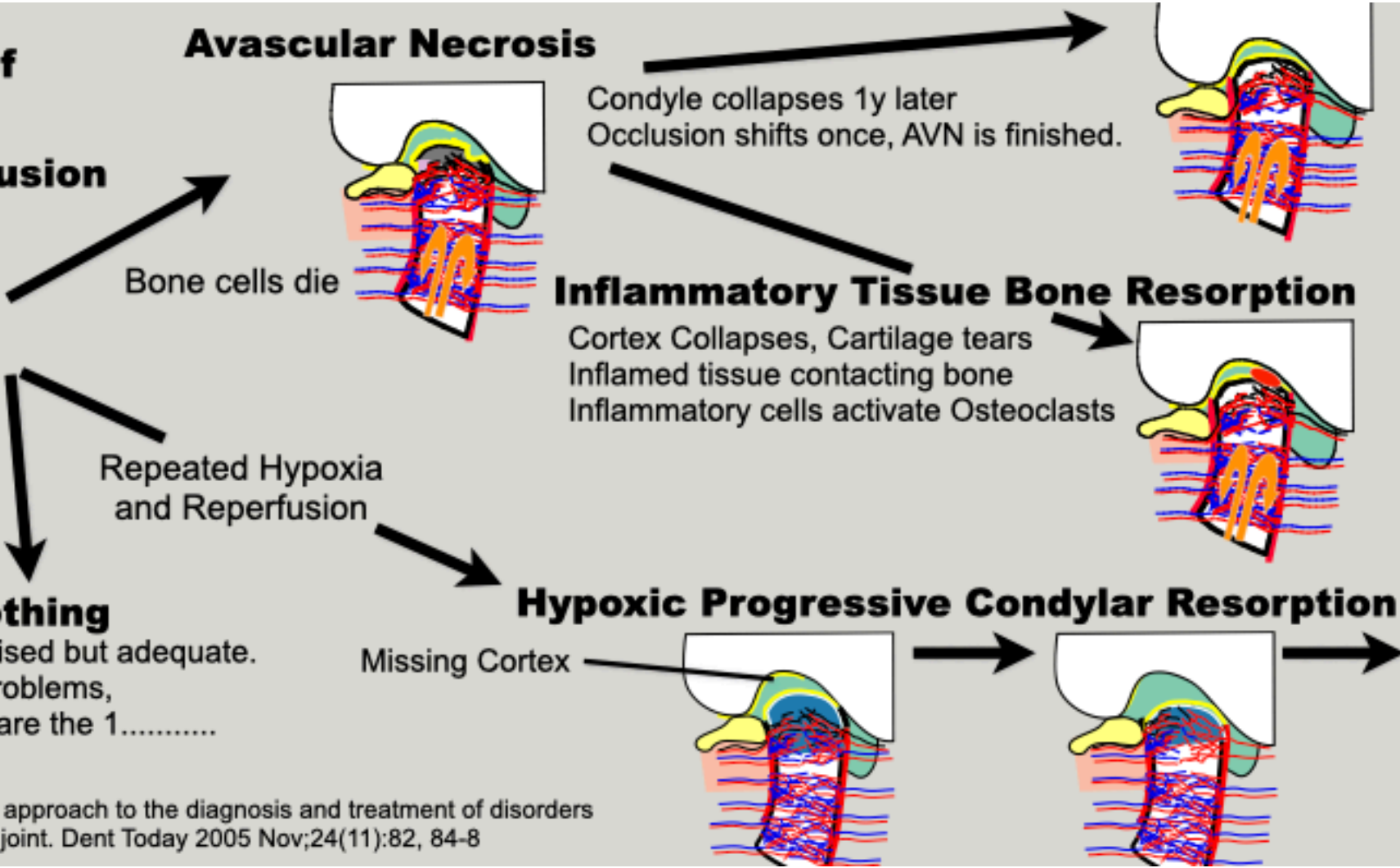
ii: Right TMJ locking past 2 months. Has to wiggle jaw to open.

ii: Right TMJ locking past 2 months. Has to wiggle jaw to open.

## My Past experiences with jaw locking

Ms KP

**4 Outcomes of Compromised Condylar Perfusion**

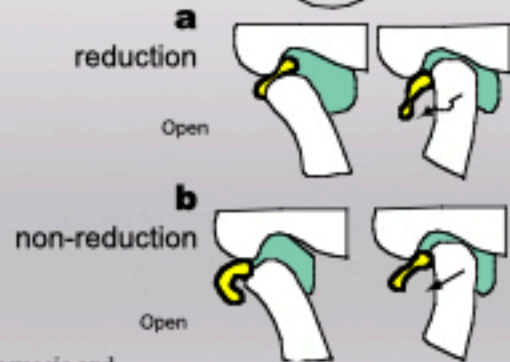
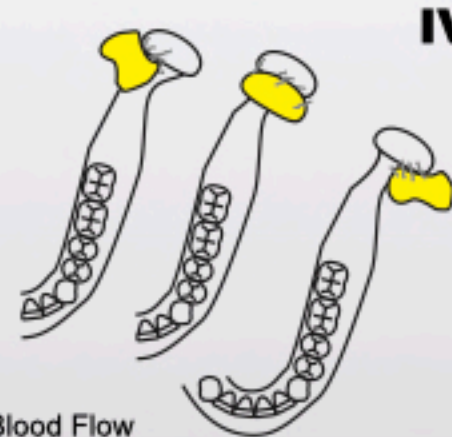
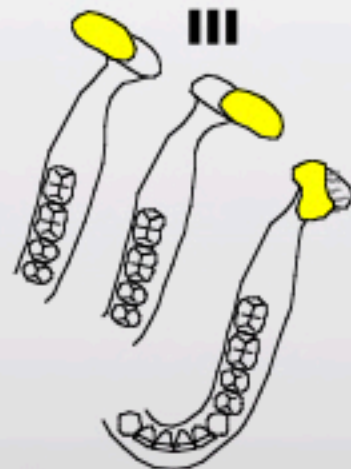


Droter JR, An orthopaedic approach to the diagnosis and treatment of disorders of the temporomandibular joint. Dent Today 2005 Nov;24(11):82, 84-8



# Dr. Mark Piper's Classification

Left TMJ



% Blood Flow Affected?



Bone to Bone  
**a** Adapting  
**b** Adapted

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

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

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

**Leeuw, Boering, Stegenga, Bont,**

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

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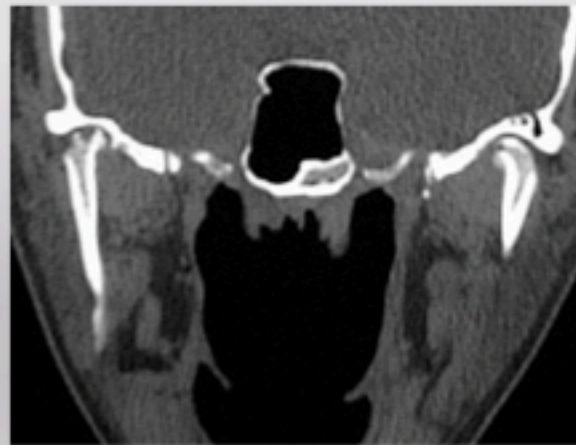
- University Hospital, Netherlands: 134 TMD patients, 30 year follow up
- Patients received good clinical work up and diagnosis 30 years ago, but basically no treatment
  - (Reassurance, PT, exercise, limited occlusal adjust)
- 70% satisfied with results
- 25% still had pain on movement
- 15% not able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

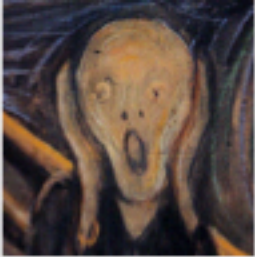
**If you have a disease that is  
one in a thousand, it is 100% for you**

---

*There is no love sincerer than the love of food.*

*G. B. Shaw*





## Damaged TMJs



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



Occlusal Muscle Dysfunction  
Osteoarthritis



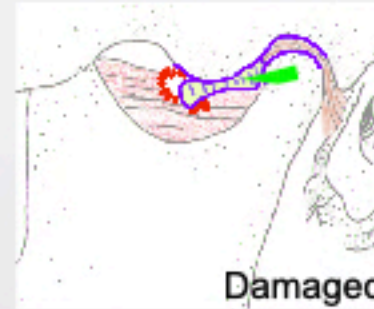
Avascular Necrosis  
Progressive Condylar Resorption

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

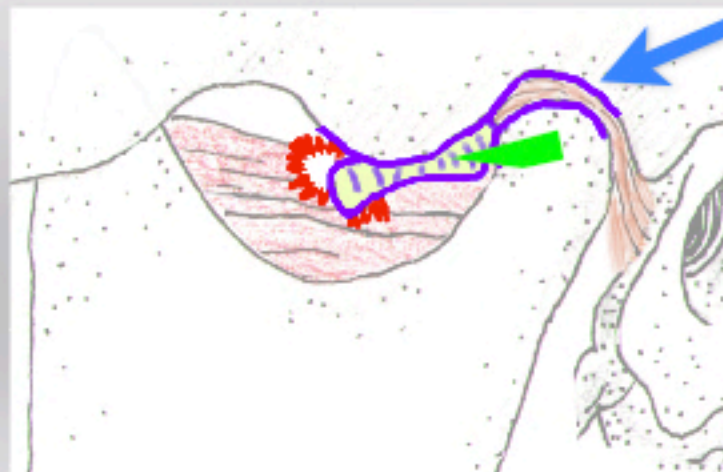
# Basic Orthopedics

Joints are either  
Healthy or  
Damaged

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



Majority of damaged  
TMJs adapt favorably



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

Tissue Fibrosis

## Problem List

TMJ Damage: Active degeneration or not adapting favorably  
Diff Dx: Piper 3a, Piper 4a, tumor, other.

ii: Jaw Locking

Goal of Therapy:

Prevent locking

Create favorable adaptation

Age 14

ii: Right TMJ locking past 2 months. Has to wiggle jaw to open.

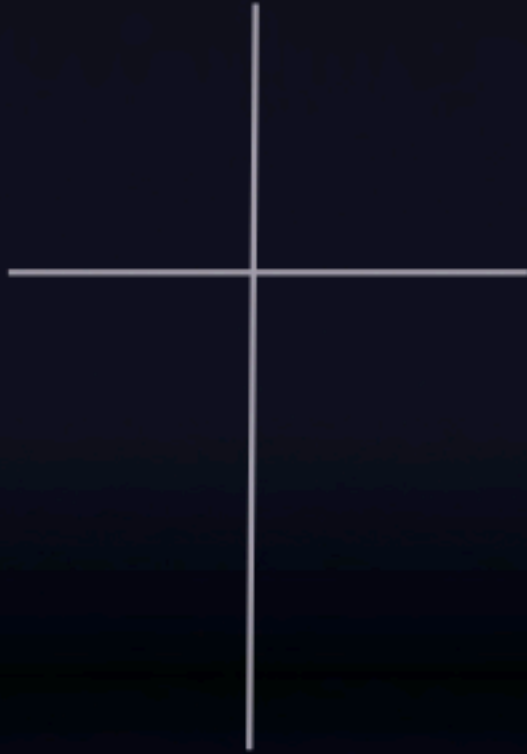
What do you observe?

Observation: Problem List

Facial Symmetry, Facial Growth, Head Posture

Age 14

Corrected View



Eyes are level

Head Tilt

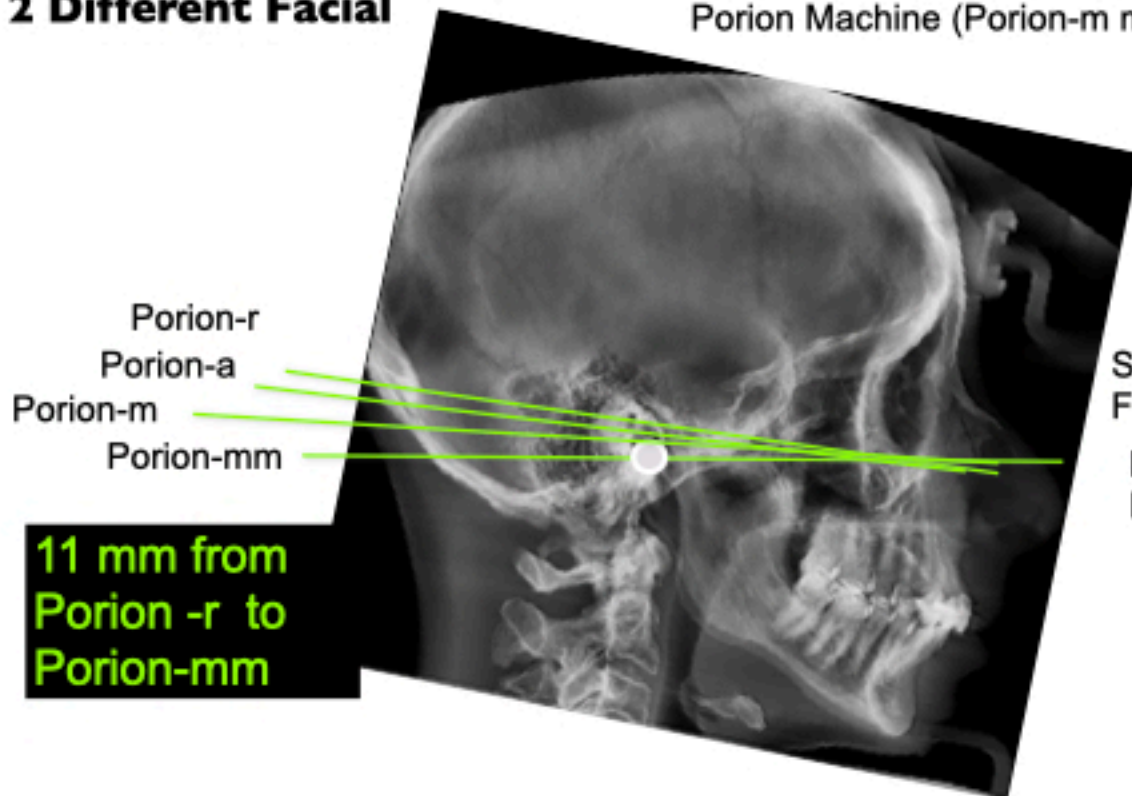
Chin Sits Left



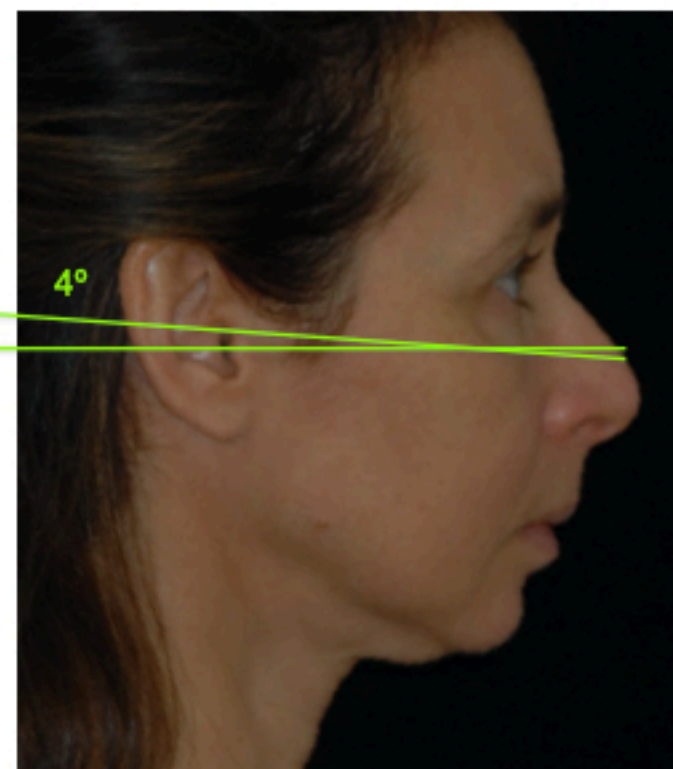
**Frankfort Horizontal (FH)**  
**4 Different Skeletal**  
**2 Different Facial**

Porion Anatomic (Porion-a) is most superior of bony auditory meatus  
Porion Radiolucency (Porion-r) is most superior of internal auditory meatus  
Porion Machine (Porion-m) superior point of ear rod  
Porion Machine (Porion-m mid) is mid point of ear rod on cephalometric machine

**Facial Frankfort Horizontal**



Superior Tragus  
Facial FH  
Mid Tragus  
Facial FH



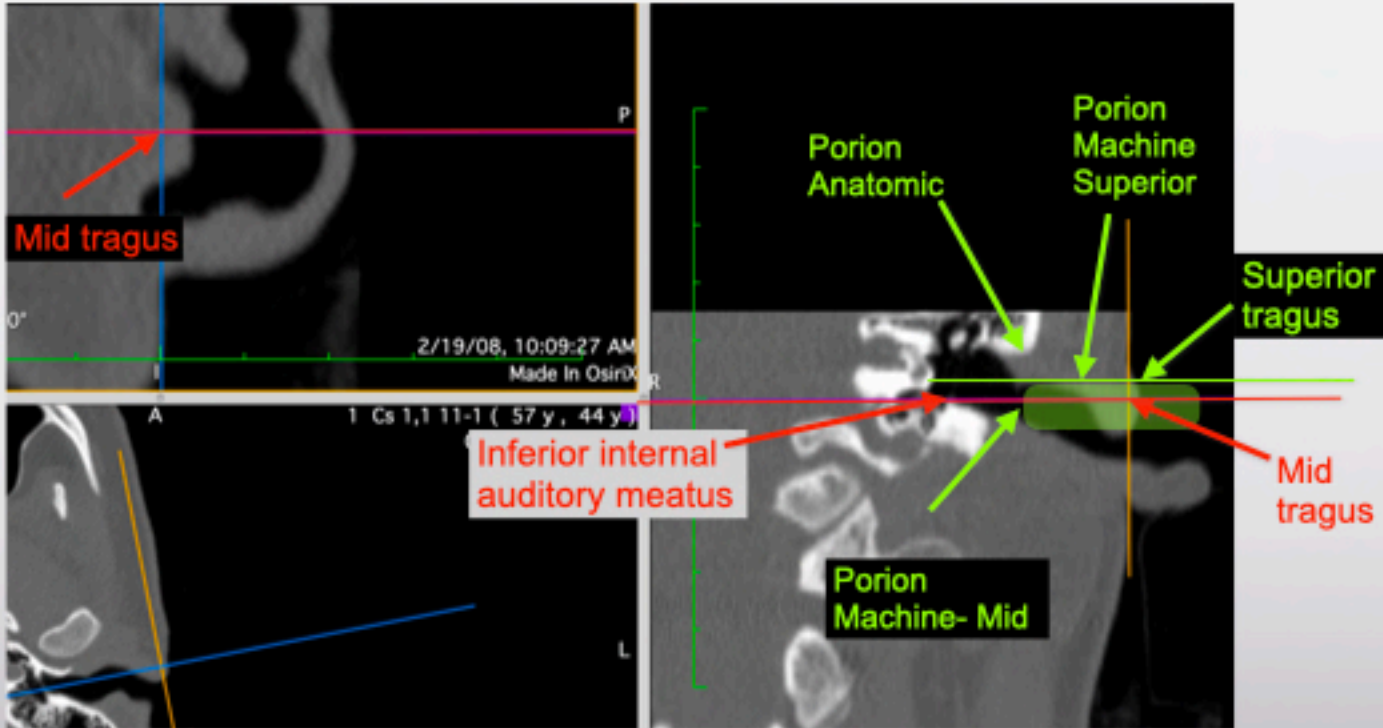
In literature need to know which Frankfort Horizontal they use

# Which Porion to Choose?

- There are 4 "Porions"
  - Porion Anatomic on dried skull
  - Porion Radiolucent
  - Porion Machine- Superior
  - Porion Machine- Mid

Inferior internal auditory meatus is a reference that lines up with mid Tragus

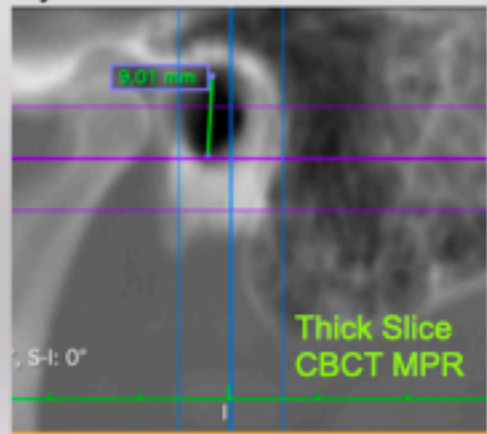
Porion anatomic is hard to see on Ceph Easy on CBCT reconstruction



CBCT MPR

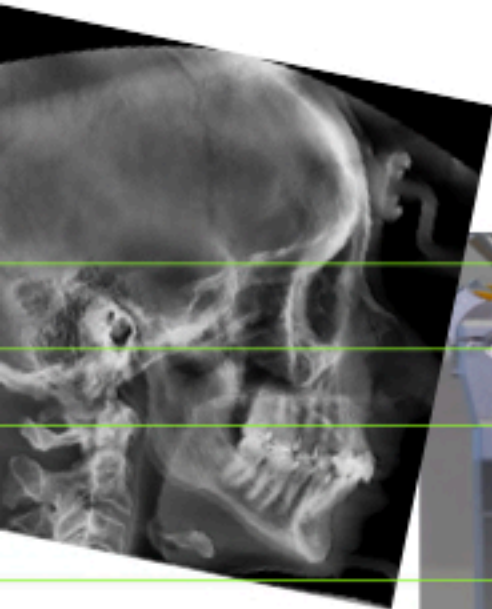
Approximate equals:  
 Inferior Internal Auditory Meatus = Mid Tragus = Porion Machine mid

None of these are true anatomic Porion



# The Annapolis Horizontal

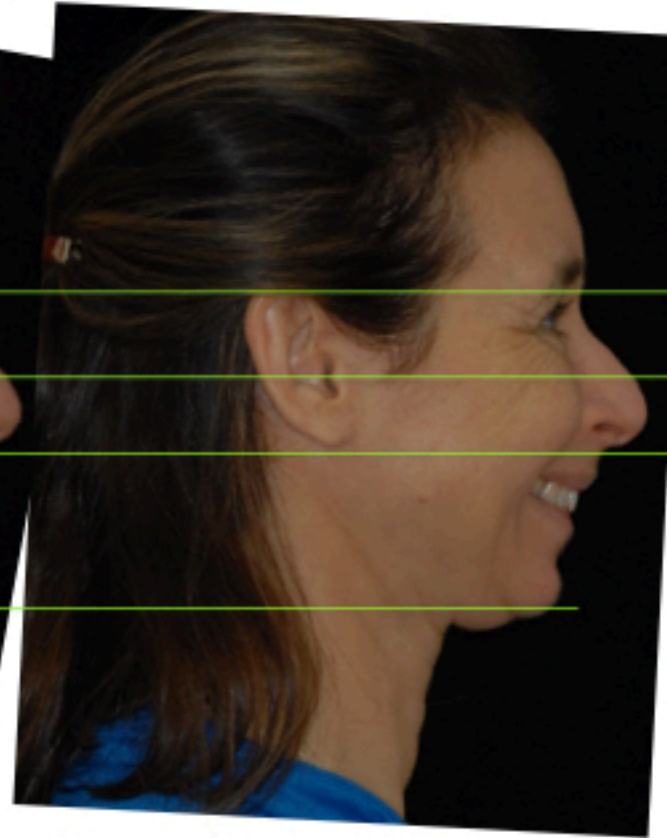
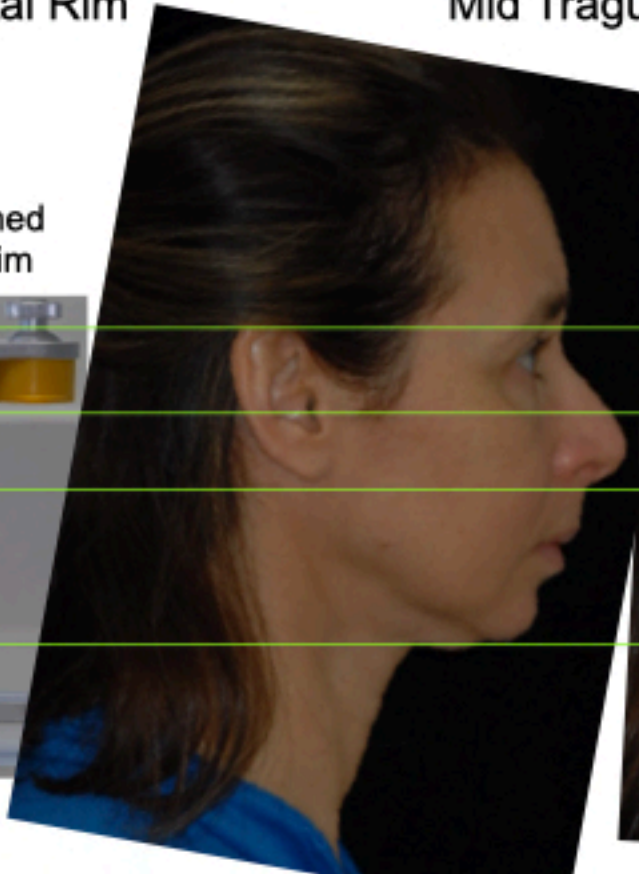
Inferior auditory meatus to Infra Orbital Rim



SAM facebow aligned  
with Infra Orbital Rim



Mid Tragus to Infraorbital Rim

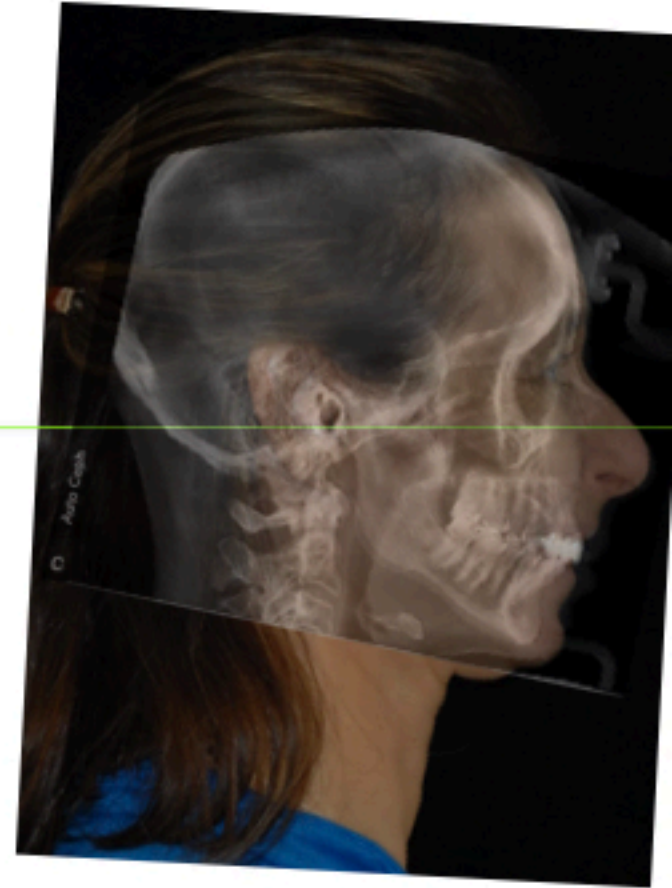
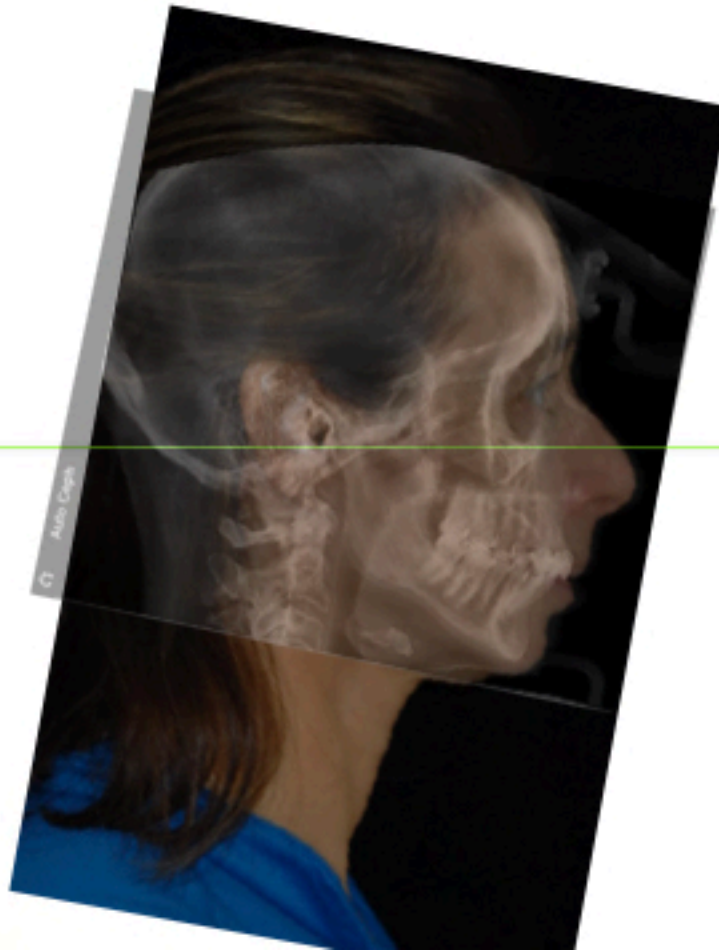


Dr Edward Zebovitz  
Dr. John Droter

# The Annapolis Horizontal



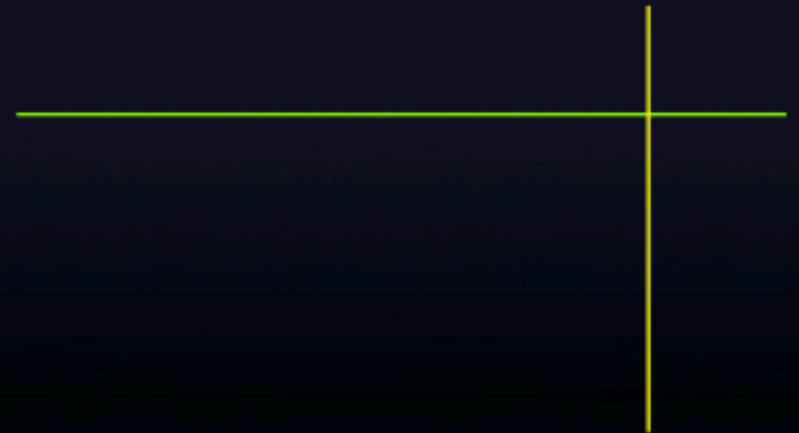
Dr Edward Zebovitz  
Dr. John Droter



Age 14

ii: Right TMJ locking past 2 months

Annapolis Horizontal



Age 14

ii: Right TMJ locking past 2 months. Wiggle jaw to open.



Smile

# Problem List

TMJ Damage: Active degeneration or adapting unfavorably. Mechanically unstable.  
Diff Dx: Piper 3a, Piper 4a, tumor, other.

Chin sits left

Diff Dx: Left TMJ damage growth disturbance , TMJ damage  
condylar bone loss (right or left), hemifacial microsomia, other.

Maxillary deficient width and AP, Mandibular slight retrognathic

Diff Dx: Mouth breathing, bottle fed as infant, tongue tie, bicuspid  
extraction retraction orthodontics, genetics, other.

ii: Jaw Locking

Goal of Therapy:

Head forward posture. Head Tilt.

Diff Dx: Cervical damage, restricted airway, other

Prevent locking

Favorable adaptation

Guarded smile

Diff Dx: Esthetics, Bells Palsy, other

Age 14

ii: Right TMJ locking past 2 months

### Significant History

Right TMJ locking started 2 months ago while eating bread

Locking is now painful

Can open wide if wiggles jaw

No prior TMJ problems

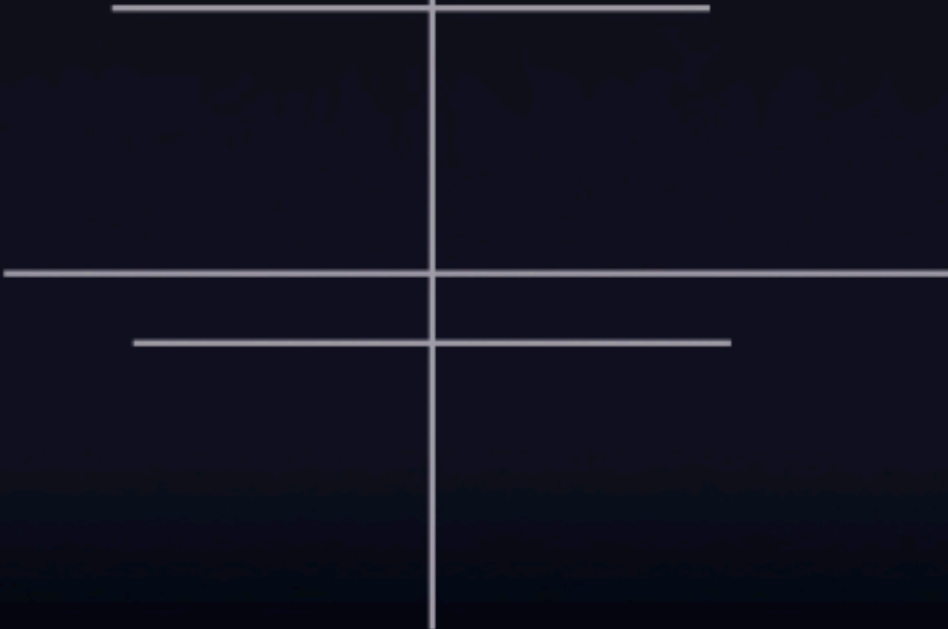
No hx trauma.

No hx ortho.

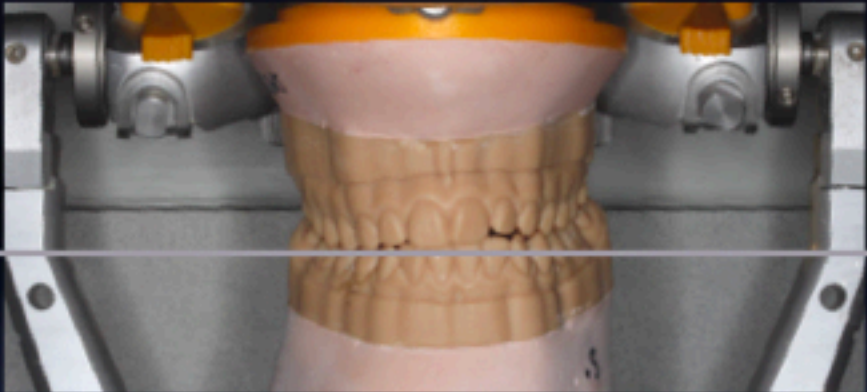
Sleeps well but is tired, Epworth 11



Age 14



Occlusal Plane High on Left



Age 14



Mottled Enamel  
Shallow anterior guidance



Age 14



## Problem List



ii: Jaw Locking

Goal of Therapy:

Prevent locking

Favorable adaptation

TMJ Damage: Active degeneration or adapting unfavorably. Mechanically unstable.  
Diff Dx: Piper 3a, Piper 4a, tumor, other.

Chin sits left

**Occlusal Plane High on left**

Diff Dx: Left TMJ damage growth disturbance , TMJ damage  
condylar bone loss (right or left), hemifacial microsomia, other.

Maxillary deficient width and AP, Mandibular slight retrognathic

**Shallow anterior guidance, end to end anterior and posterior malocclusion**

Diff Dx: Mouth breathing, bottle fed as infant, tongue tie, bicuspid  
extraction retraction orthodontics, genetics, other.

Head forward posture. Head Tilt.

Diff Dx: Cervical damage, restricted airway, other

Guarded smile **Esthetics**

~~Diff Dx: Esthetics, Bells Palsy, other~~

**Fatigue**

Diff Dx: Ineffective sleep, Iron deficiency, +60 others

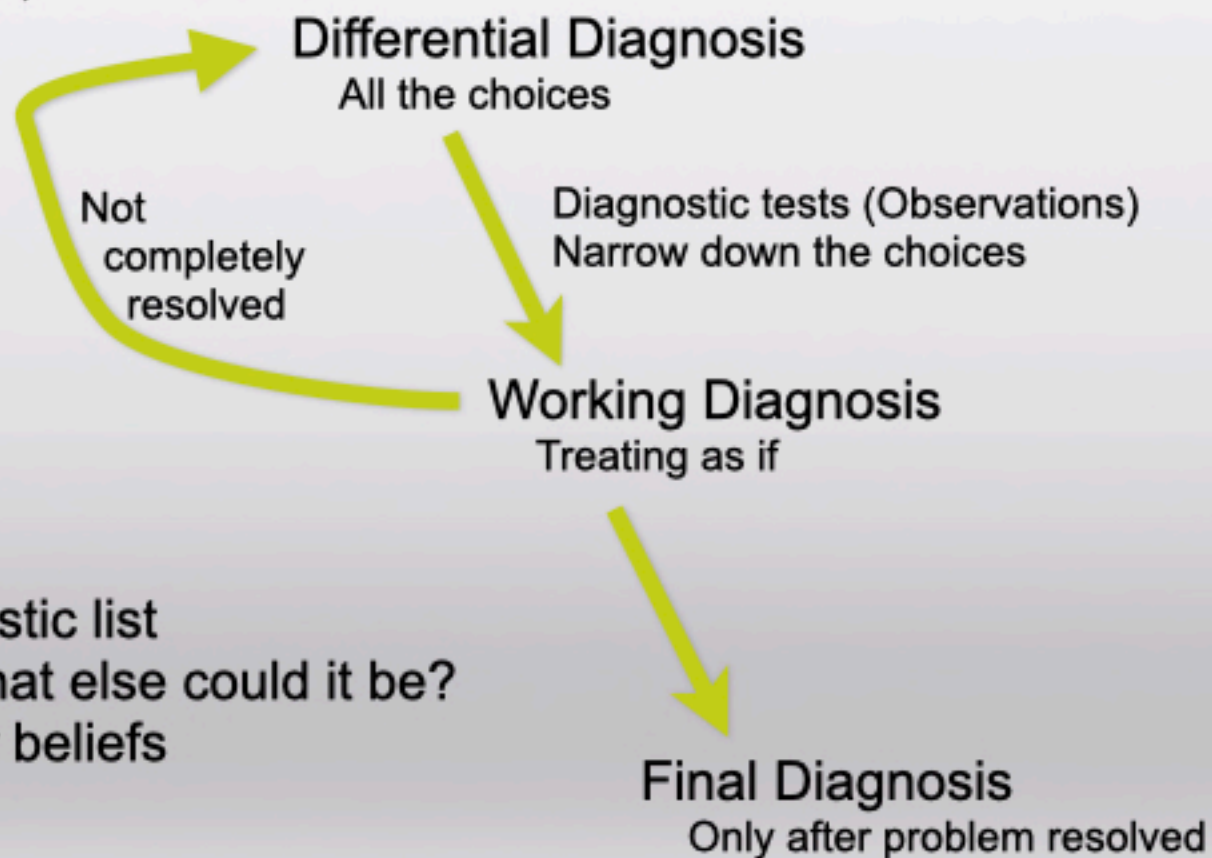
## The Diagnostic Process

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



**Think!!**

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



# Facial Pain Diagnosis

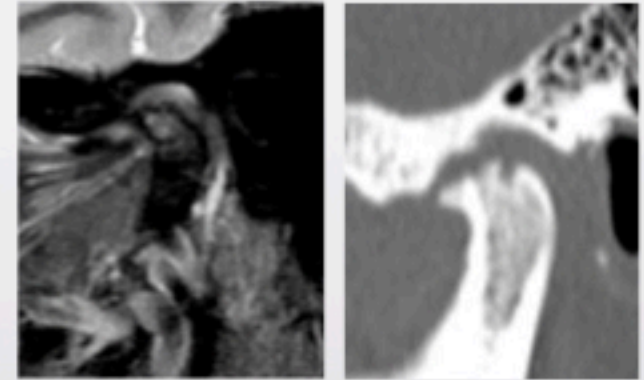
## Diagnostic Tools

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

## Biometrics

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

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



# Age 14

**Disk Stability** Unstable

Better Function Push Neither  
Worse Function Push Both

**Muscle Palpation**

	R	N	SL	MO	SV	L	N	SL	MO	SV
Temporalis post		●				●				
mid		●				●				
ant		●				●				
Masseter sup deep		●				●				
mid		●				●				
inferior		●				●				
Intermediate		●				●				
Digastric		●				●				
Medial Pterygoid		●				●				
Deep Temporalis		●				●				
Lateral Pterygoid		●				●				

**Teeth** **Occl**     SL Wear

CR ≠ Max IC 0.5mm Anterior

Inadequate Anterior Guidance Shallow Anterior Guide

Surface surface posterior contacts

Dental Health Good

Perio Health Good

**Neck**

	R	SCM		L
Scalenes		●		●
Sup Oblique Capitus			●	●
Post Neck		●		●
Trapezius			●	●

**TMJ Palpation**

	R	N	SL	MO	SV	L	N	SL	MO	SV
ant lat pole		●				●				
post lat pole		●				●				
indirect				●						
Load CR		●				●				
Load Lateral			●							

**Nasal** Nasal Airway open  Breath Through Nose

**Skeletal Alignment** Eyes --- Max Plane /L  
Max Midline +  
Mand Midline +  
Mand Plane /L  
Chin +

Incisal Edge/Lip 2mm

CEJ Alignment Max Anterior Up

**Sounds** R max open 47+1 mm **Sounds** L

smooth deviate Wiggle smooth

Protrusion Normal

deviate Wiggle

Lateral Exc Normal

soft Click none

**Skin Health** Good

**Doppler Piper Classify**

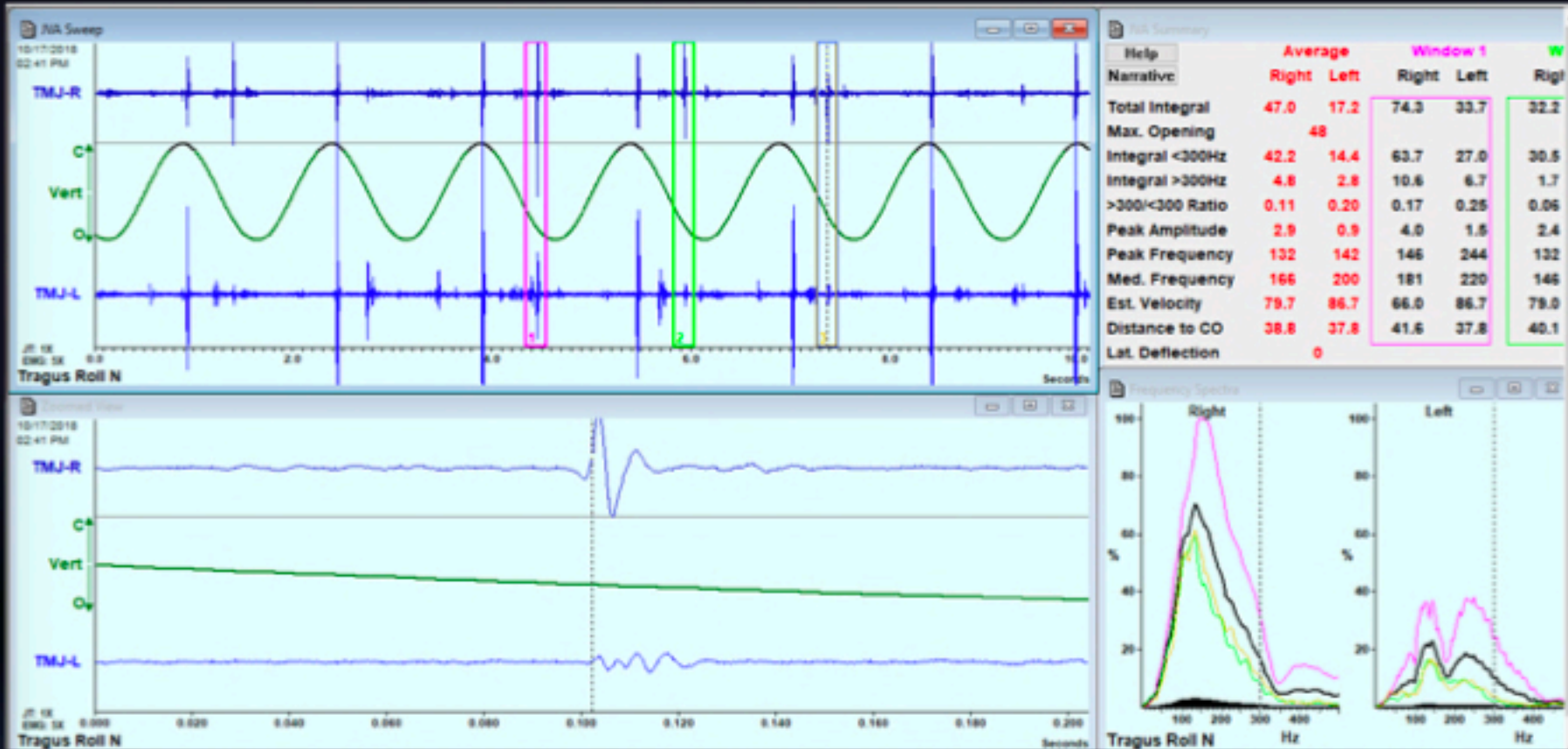
	R	rot	trans	L	rot	trans
crep	---		+	crep	+	++
Vasc	---	click	---	Vasc	+	click ++
3a				4b		

Moderate Pain Neck Muscles  
Moderate Pain TMJ intracapsular  
TMJ Muscles not sore??  
Makes no sense  
Athlete

Age 14

Right TMJ Damage Simple click Vibration, slight wobble

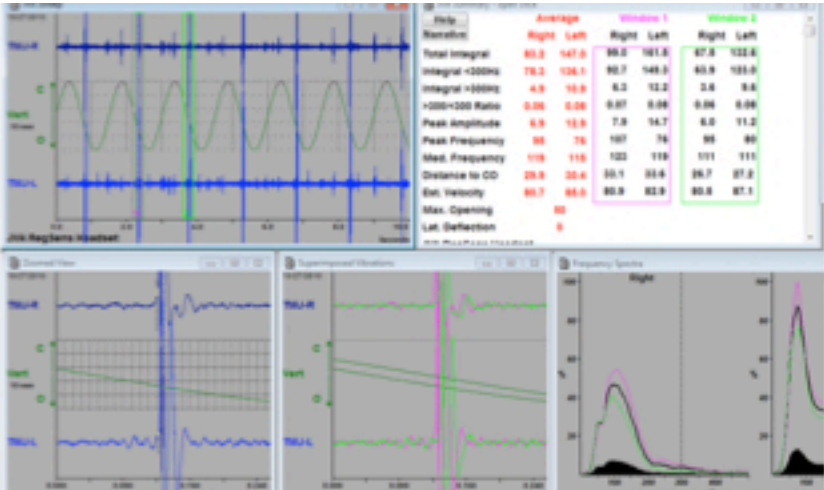
per JVA Flow Chart  
Right 3a or 4a



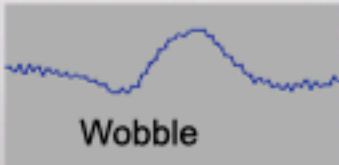
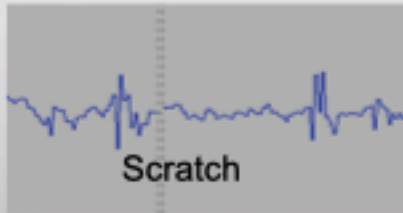
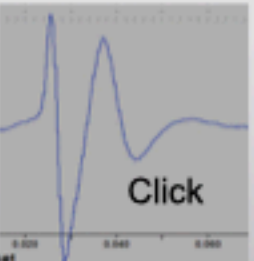


# Joint Vibration Analysis

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



## Three main types of sounds



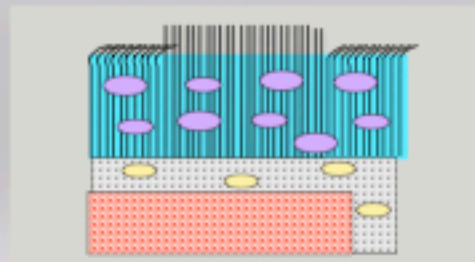
- Disc Reduction
- Disc Dislocation
- Adhesion crackle
- tooth tap

- Osteoarthritis
- Pseudo Disc
- Damaged Cartilage

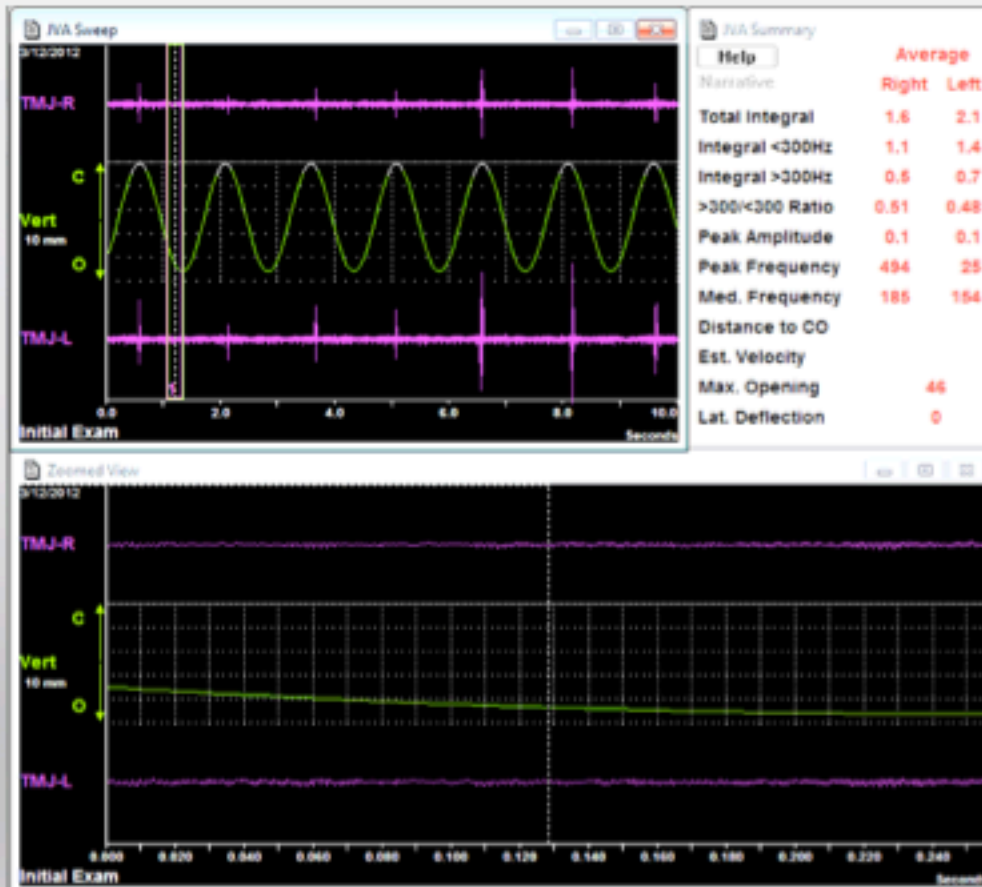
- Disc Subluxation
- Joint Subluxation
- Disc Reduction
- Disc Dislocation

Based on Sonar.  
It is not a microphone

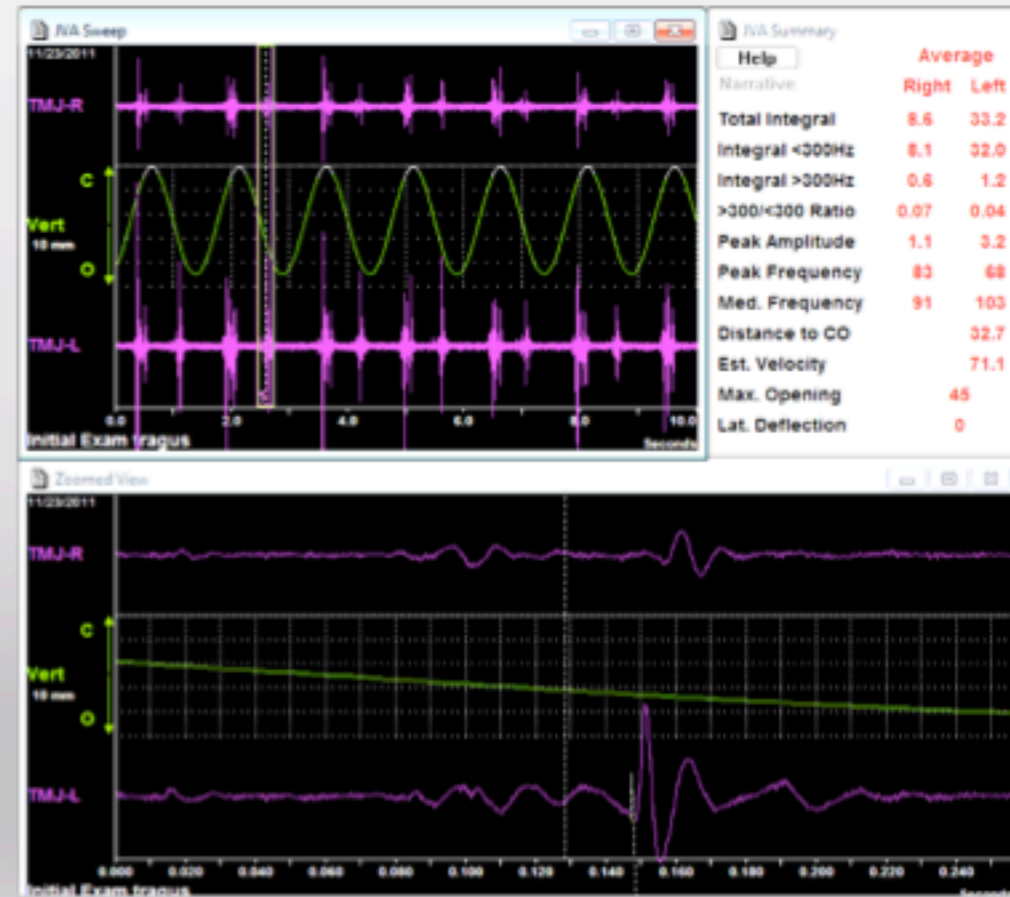
JVA measures the health of the cartilage



## Healthy or Damaged?



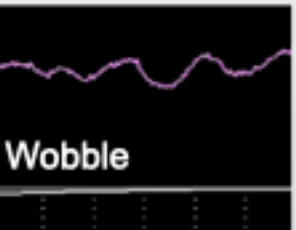
## Healthy or Damaged?



# Why is Joint making this vibration?



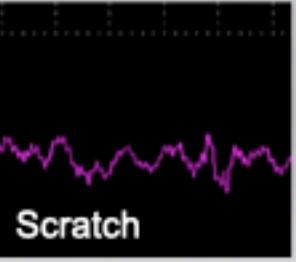
Good Vibrations  
Healthy Cartilage  
No Movement



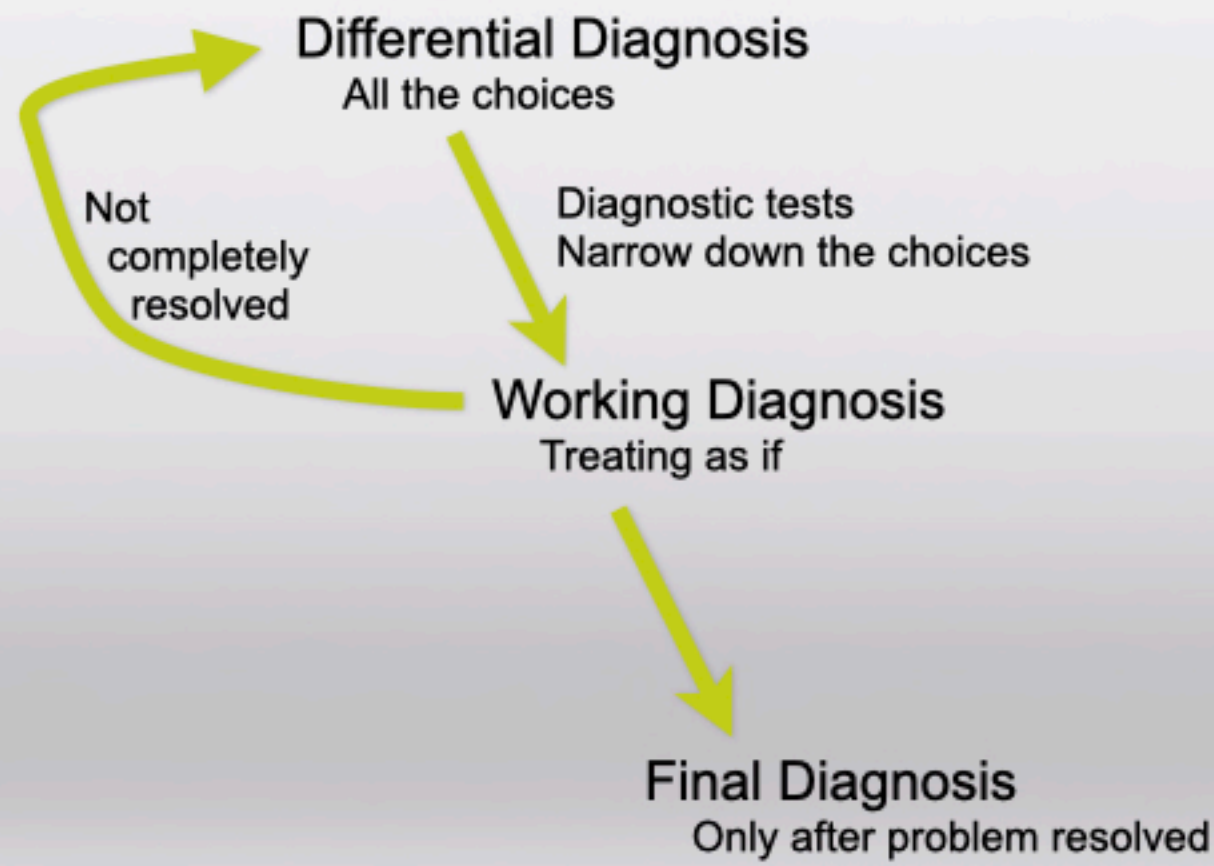
Wobble  
Disc Dislocation  
Disc Reduction  
Disc subluxation  
Joint subluxation  
Condyle bumps Disc  
Sensor roll on face



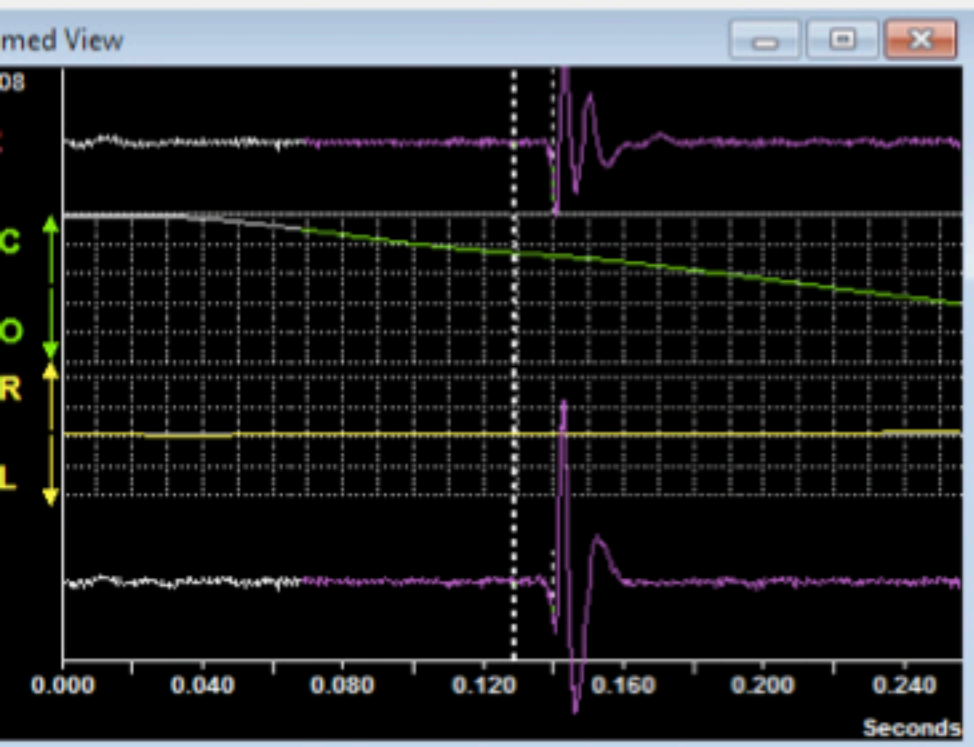
Click  
Disc Reduction  
Disc Dislocation  
Adhesion Crackle  
Tooth Tap  
Contralateral Transference



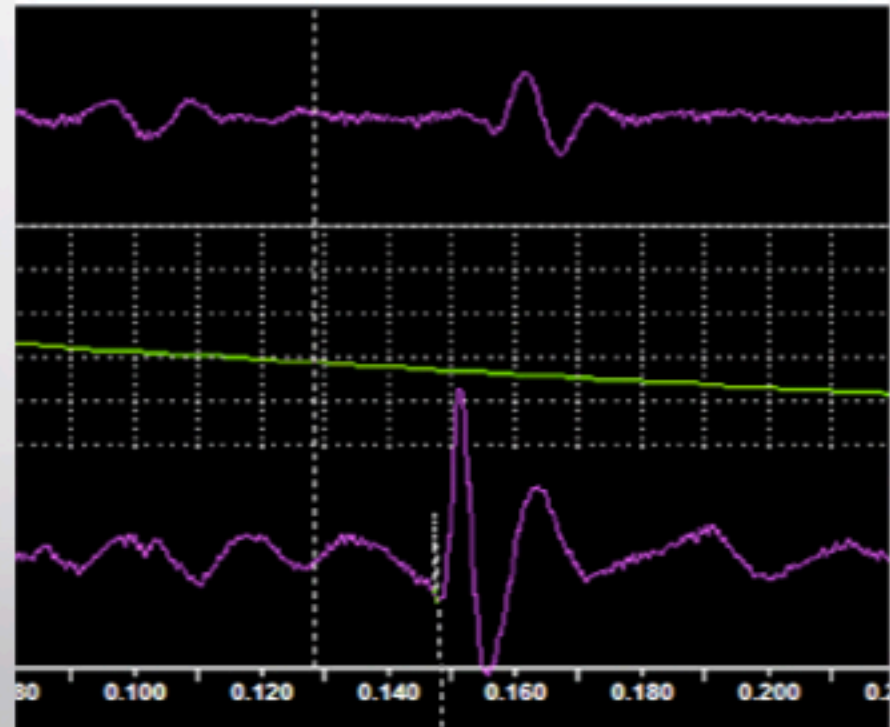
Scratch  
Cartilage Fibrillation  
Cartilage against tissue  
Bone against bone  
Velcro Noise



## Simple or Complex



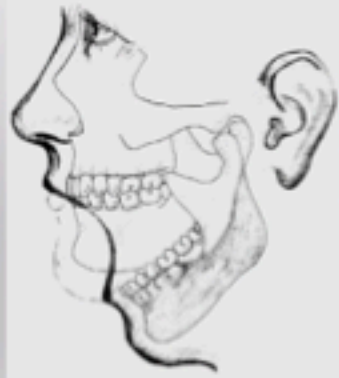
Simple left click with transference vibration to right  
L4a



Complex Click  
L3a, R4b

## Magnetic Resonance Imaging

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



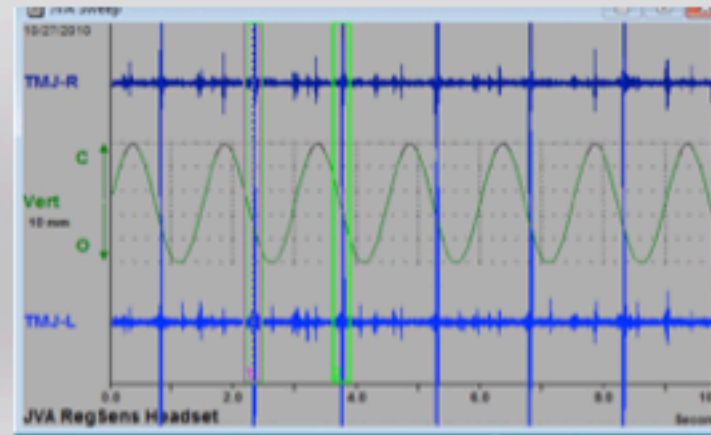
## Joint Vibration Analysis

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

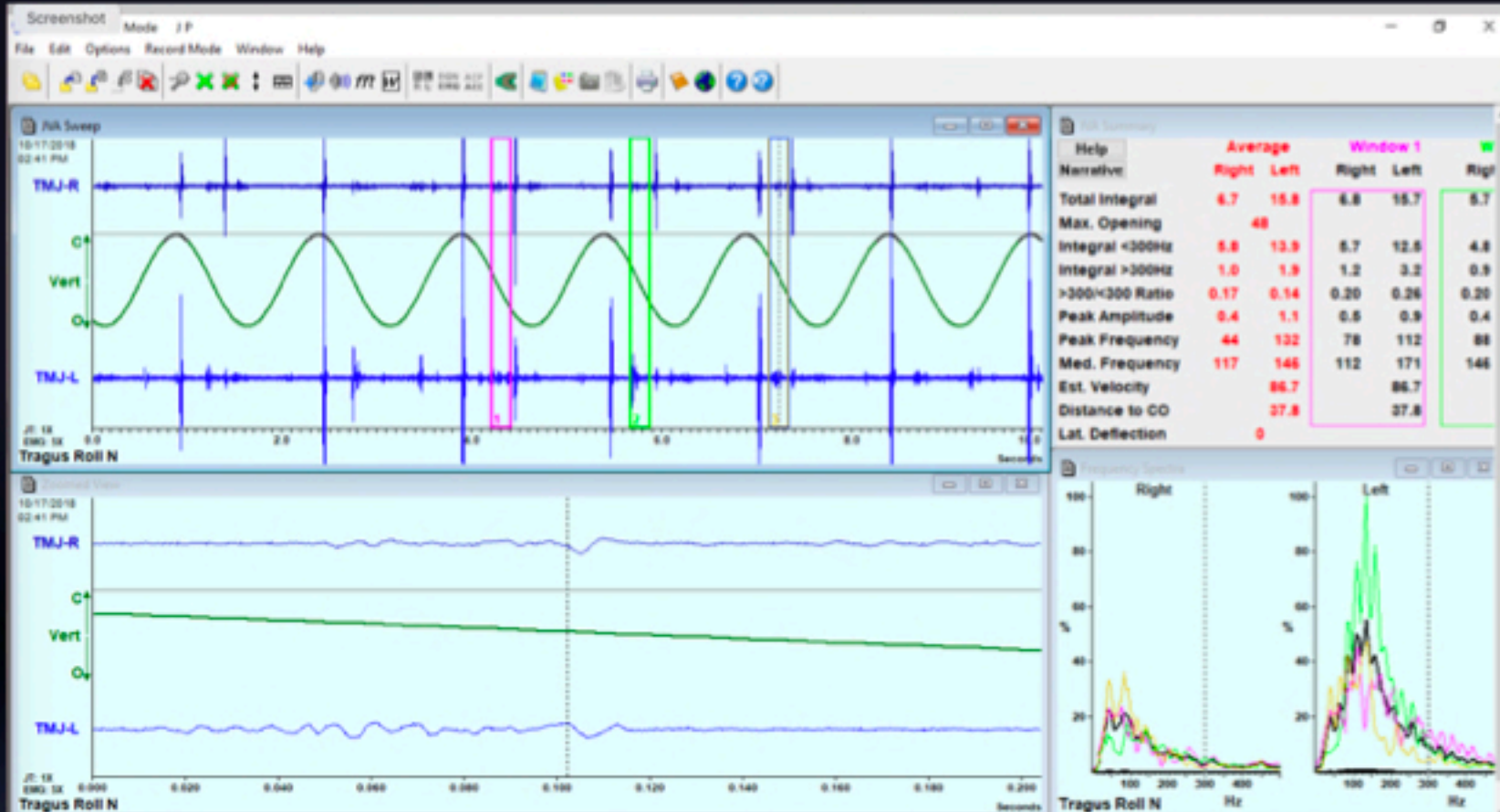


Age 14

Vibration before the click

per JVA Flow Chart

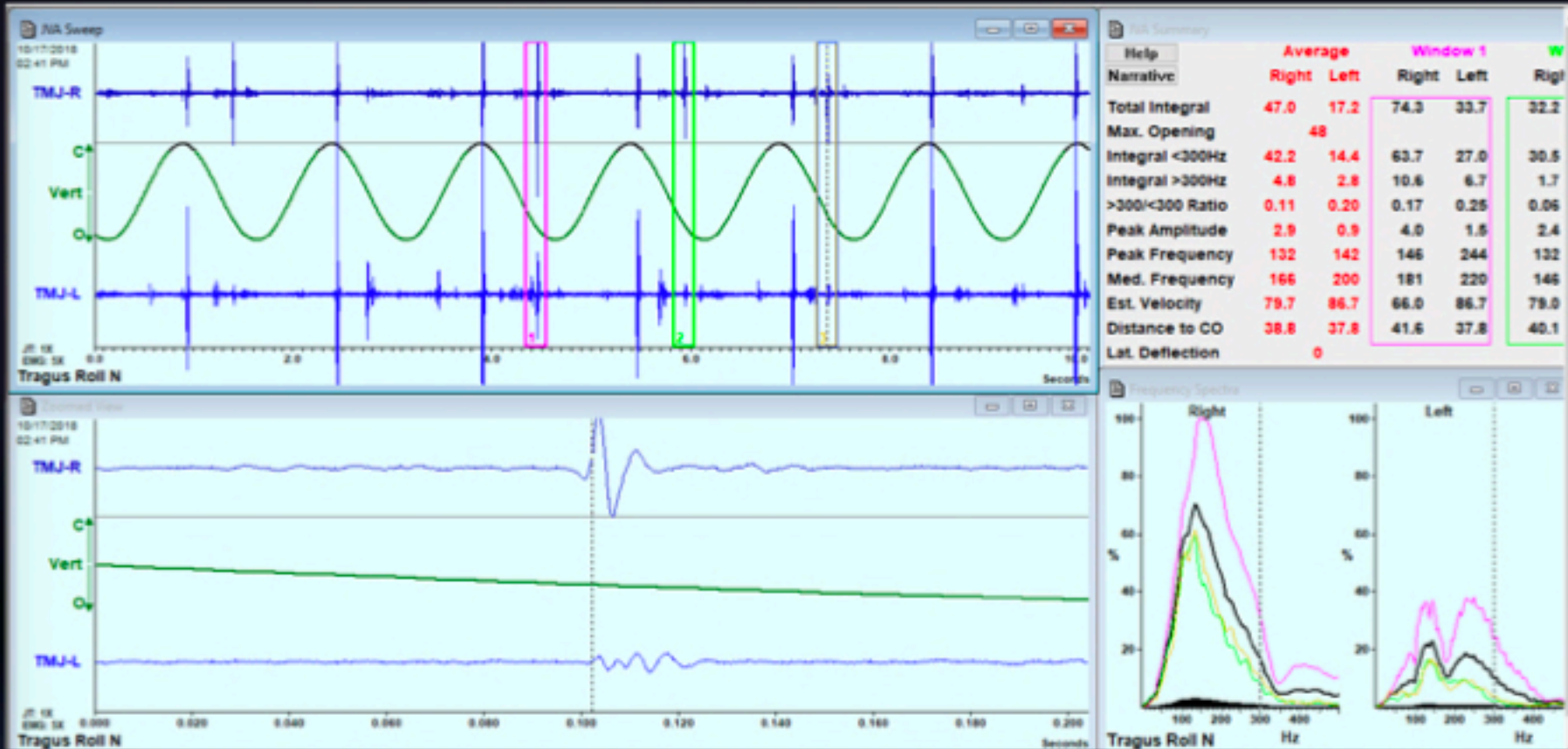
Left 4b  
1, 2, 4b



Age 14

Right TMJ Damage Simple click Vibration, slight wobble

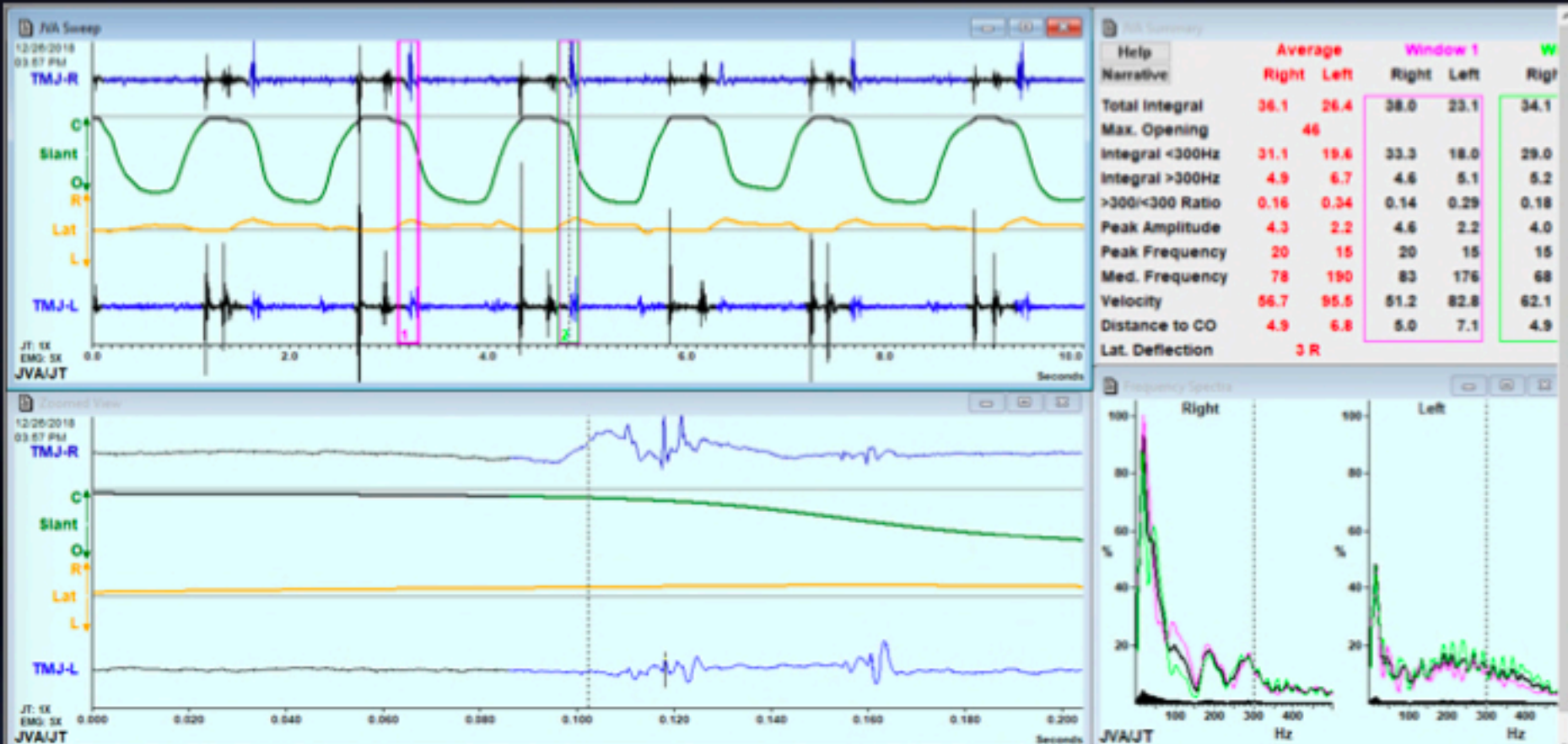
per JVA Flow Chart  
Right 3a or 4a



2 months later Right TMJ vibration has changed

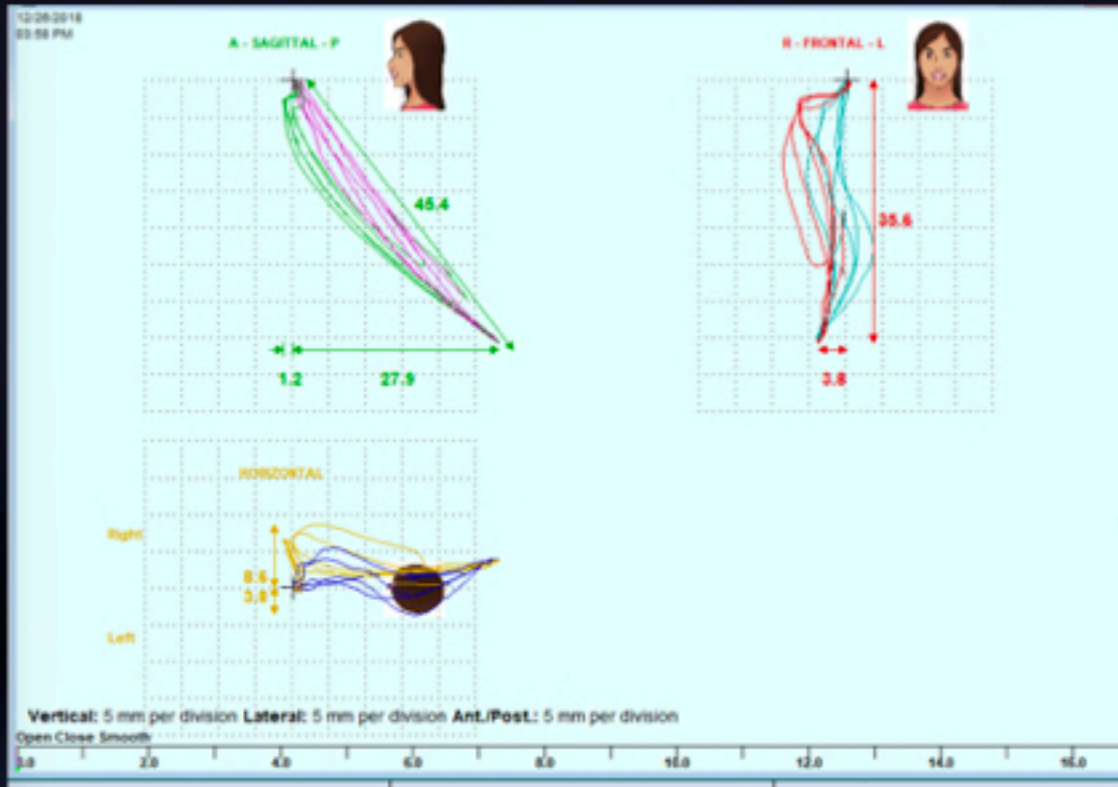
Right TMJ Damage Wobble, scratch

per JVA Flow Chart  
Right 3a or 4a





Age 14



Moves jaw right lateral to open

# CBCT

John R Droter DDS  
Annapolis, Maryland

Annapolis, Maryland  
John R Droter DDS

[www.jrdroter.com](http://www.jrdroter.com)

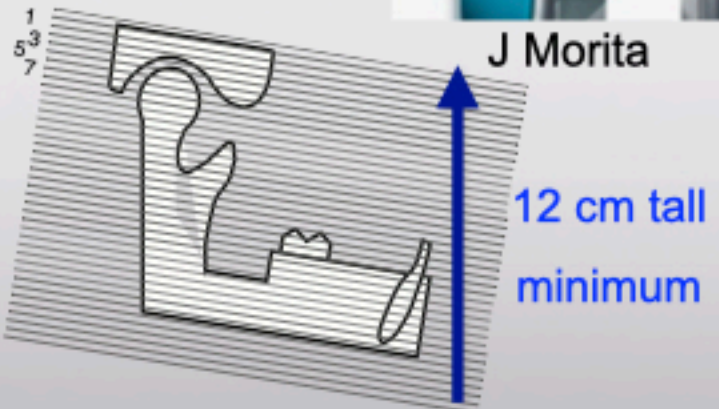
# Key Features for TMJ Images

**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**

# 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

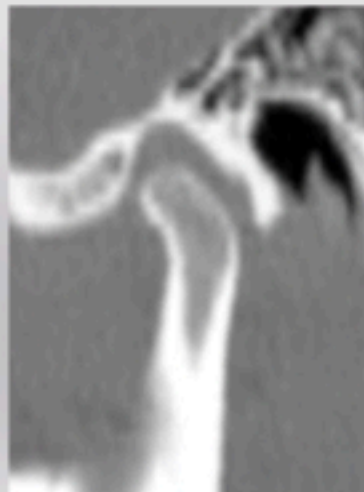
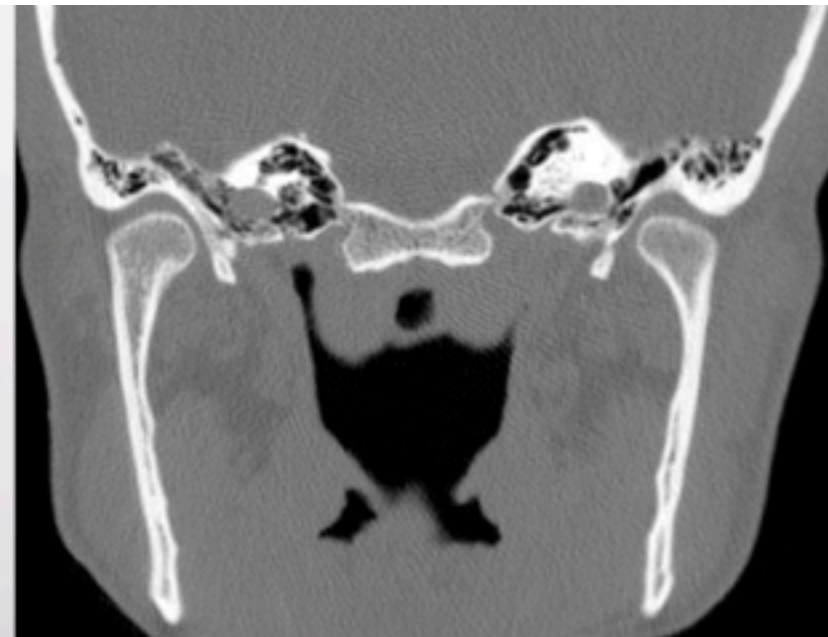
Coronal and Sagittal

Room for Disc

## Stable CR load Zone

Condyle closest to fossa

CT Scan  
Coronal View



CT Scan  
Sagittal View

# Interpreting CBCT

[www.drdroter.com](http://www.drdroter.com)

20+ Various Handouts  
in one folder

**Review of Scan: CBCT**  
**John R Droter, DDS**

Name \_\_\_\_\_ Scan Date \_\_\_\_\_

Review Date: \_\_\_\_\_  
Scan Quality: Good Fair Marginal

*Print or quick scroll through axial, coronal, and sagittal for global impressions.*

**Right TMJ** *Small Coronal Sagittal and Coronal Coronal*

Condyle:  Normal Size  Small condylar size   
 Normal Shape  Altered condylar shape   
 Cortex Intact  Cortex not intact   
 Cortex Even  Hypertroplification

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

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

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

---

**Left TMJ** *Small Coronal Sagittal and Coronal Coronal*

Condyle:  Normal Size  Small condylar size   
 Normal Shape  Altered condylar shape   
 Cortex Intact  Cortex not intact   
 Cortex Even  Hypertroplification

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 tumors Brain, Muscle, Parotid Submand Gland, Hypertrophy

All Bones  Right = Left  = Except \_\_\_\_\_  
 Look for hyperplastic or radiolucent areas, cysts

Nasal *(Sagittal, Cor)*  Open  Restricted  Deviated Septum   
 Sinuses  Clear  Thickened Lining  Muc Polyps   
 Airway  Adequate  Restricted   
 Teeth *(Sagittal, Cor)*  No PAP  PAP # \_\_\_\_\_  
*(Axial)*  No Gross Caries

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

Axial  3D  Appears Centered  Not Level with Skull Base   
 C2, C3, C4  3D  Aligned  Misaligned

Max Head Relation  Normal Sagittal  Retrognathic  Maxilla  Mandible  
 Max Head 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 hypertroplification which are indicative of excess load in that area or damage and repair. The right and left TMJs should be the same size.

#### Condylar Position

Centered in fossa

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

#### Joint Spacing

Centered in fossa

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

#### CR 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 is to have both condyles load on the superior lateral surfaces. 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 hypertroplastic "bite".

#### Estimate Piper

This estimation combines clinical data from the clinical history, exam, joint palpation, arthroscopic visualization, Doppler (VA) [Joint Vibration Analysis] and the CT scan. If you see a left distalized condyle and the left TMJ clinically clicks, my estimation would be a Piper 4b. A left distalized condyle and no clicking is either a Piper 4b or a healthy joint distalized due to heavy anterior contact (usually isotropic). In the case of the 4b, VA would show some slight "scratch vibrations", whereas a healthy TMJ distalized due to occlusion would show "smooth vibrations", and clinically have fremitus on the anterior teeth.

1 Normal joint- MRI and CT are normal (See all above). No joint sounds, full range of motion, VA 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 JNA will both indicate slight vibrations. A well adapted 4b will also have the same vibratory signals as a Piper 2, but the 4b will show changes in condylar position on the CBCT, and the MRI will show the disc dislocation.

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

3b Same as above except non-reducing and therefore no clicking vibration. CT is normal.

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

4b The disc is fully displaced off the head of the condyle and does not reduce on opening. This will look the same on CBCT as a 4a. Condyle not centered in fossa. While limited opening may occur, many can have a full range of motion. Range of motion should not be a sole determine factor on 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. Hypertroplification will be seen having reinforced the damaged area. There is a loss of congruency as the condyle and fossa wear down and become flattened. Parafunctional tooth grinding increases CA bone wear.

John R Droter DDS



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

**Right TMJ**

Scroll Corrected Sagittal and Corrected Coronal

Condyle:

- |  |   |                          |
|--|---|--------------------------|
| <input type="checkbox"/> Normal Size   | <input type="checkbox"/> Small condylar size    | <input type="checkbox"/> |
| <input type="checkbox"/> Normal Shape  | <input type="checkbox"/> Altered condylar shape | <input type="checkbox"/> |
| <input type="checkbox"/> Cortex Intact | <input type="checkbox"/> Cortex not intact      | <input type="checkbox"/> |
| <input type="checkbox"/> Cortex Even   | <input type="checkbox"/> Hypercalcification     | <input type="checkbox"/> |

Fossa:

- |  |  |                          |
|--|--|--------------------------|
| <input type="checkbox"/> Normal Size   | <input type="checkbox"/> Small fossa size      | <input type="checkbox"/> |
| <input type="checkbox"/> Normal Shape  | <input type="checkbox"/> Flattened fossa shape | <input type="checkbox"/> |
| <input type="checkbox"/> Cortex Intact | <input type="checkbox"/> Cortex not intact     | <input type="checkbox"/> |

Condyle Position

- |  |   |                          |
|--|---|--------------------------|
| <input type="checkbox"/> Centered in fossa | <input type="checkbox"/> Condyle distalized | <input type="checkbox"/> |
|--|---|--------------------------|

Joint spacing

- |  |   |                          |
|--|---|--------------------------|
| <input type="checkbox"/> Room for disc | <input type="checkbox"/> No room for disc | <input type="checkbox"/> |
|--|---|--------------------------|

CR Load Zone

- |  |   |                          |
|--|---|--------------------------|
| <input type="checkbox"/> Superior medial | <input type="checkbox"/> Superior Lateral | <input type="checkbox"/> |
|--|---|--------------------------|

Estimate Piper:

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

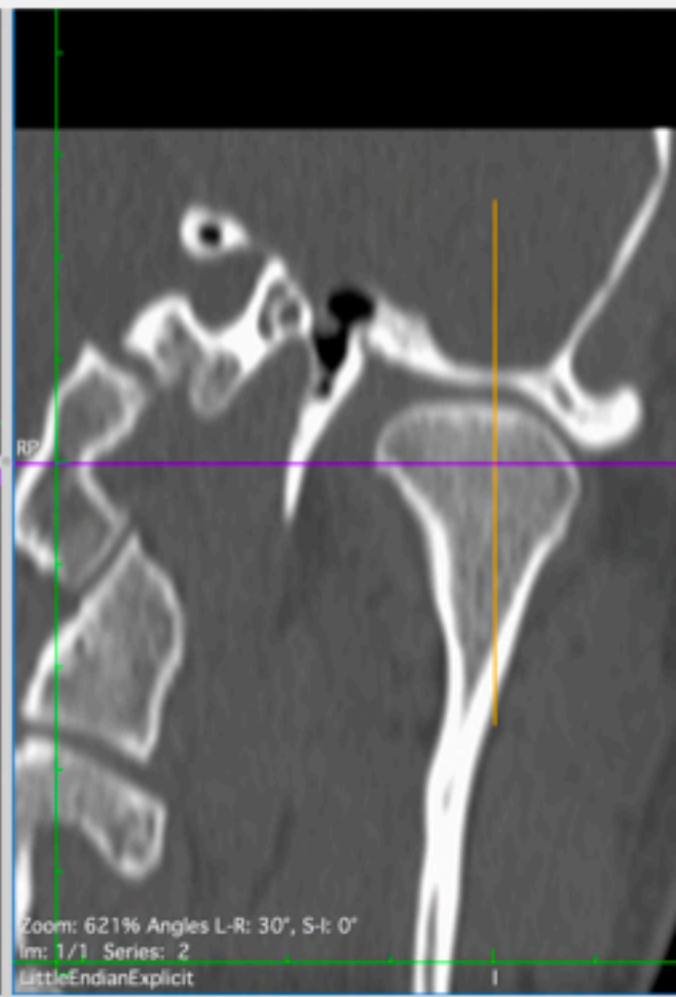
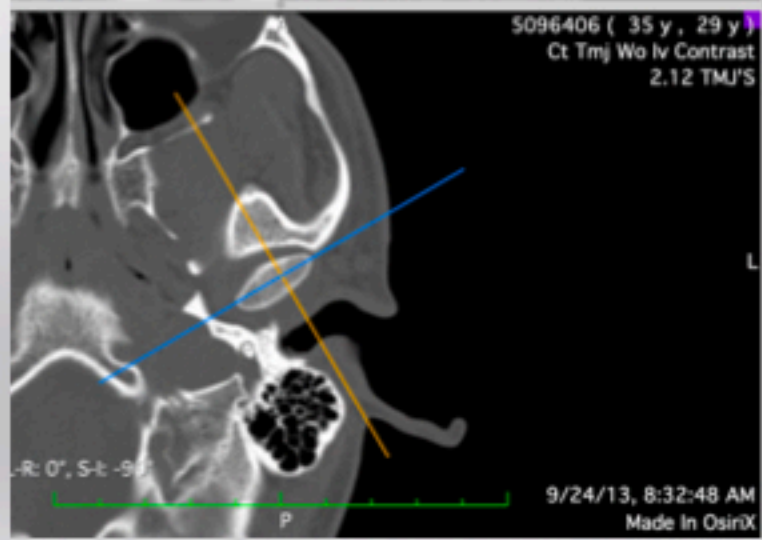
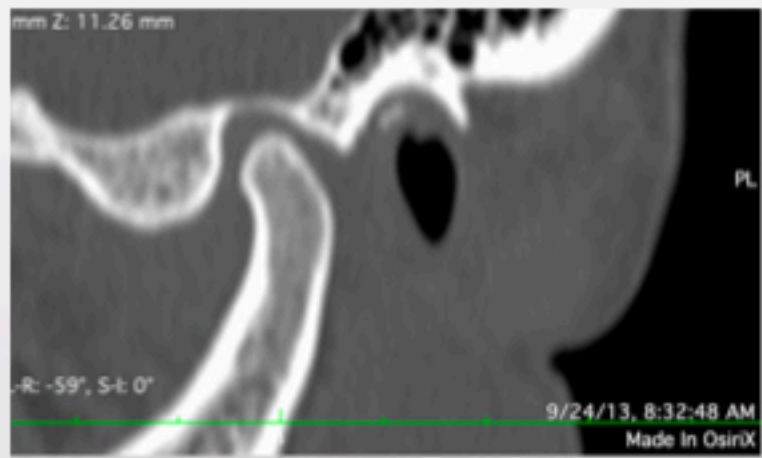
Right TMJ Health:

- |                                  |                                   |  |
|----------------------------------|-----------------------------------|--|
| <input type="checkbox"/> Healthy | <input type="checkbox"/> Damaged  | <input type="checkbox"/> Active Degeneration |
|                                  | <input type="checkbox"/> Adapting | <input type="checkbox"/> Adapted             |

# CT Left Piper 2 from MRI

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

- Hypercalcification
- Condyle distalized
- Superior Lateral



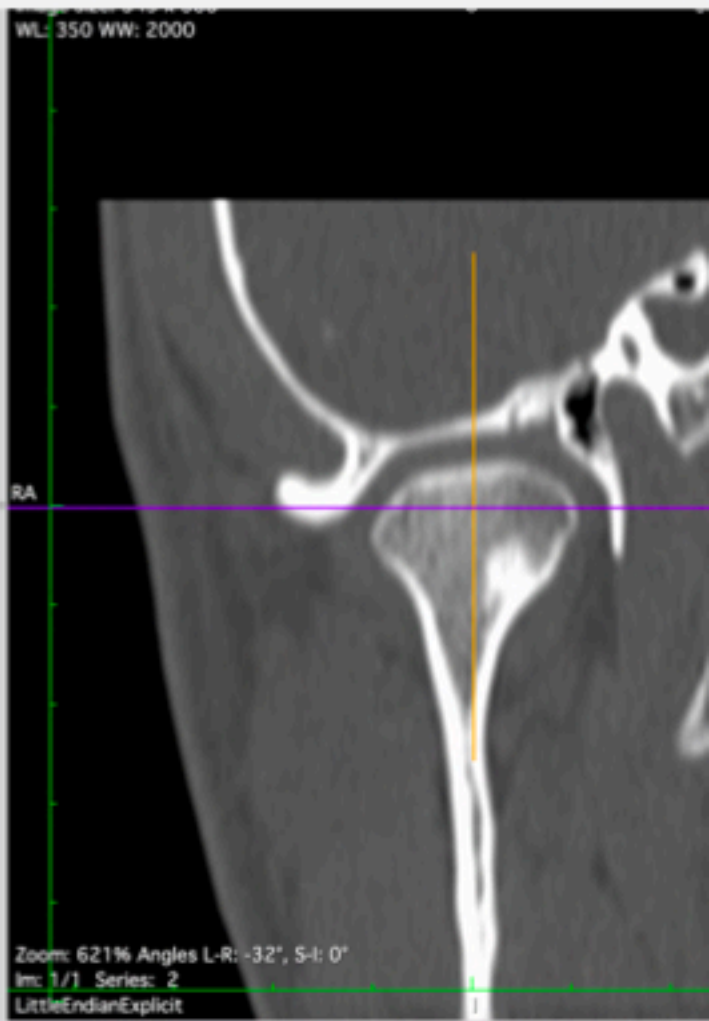
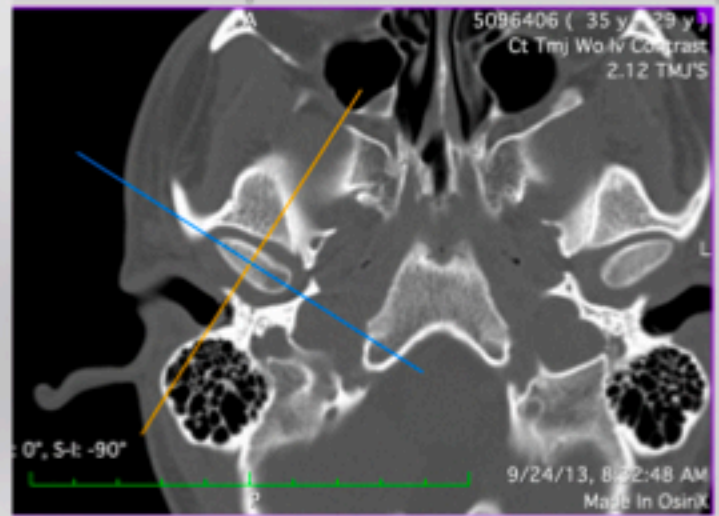
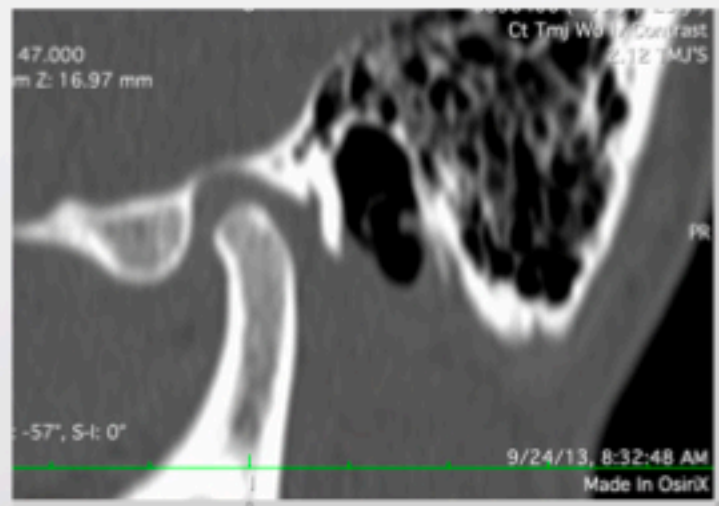
# CT Right Piper 4a-e from MRI

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

Hypercalcification

Superior Lateral

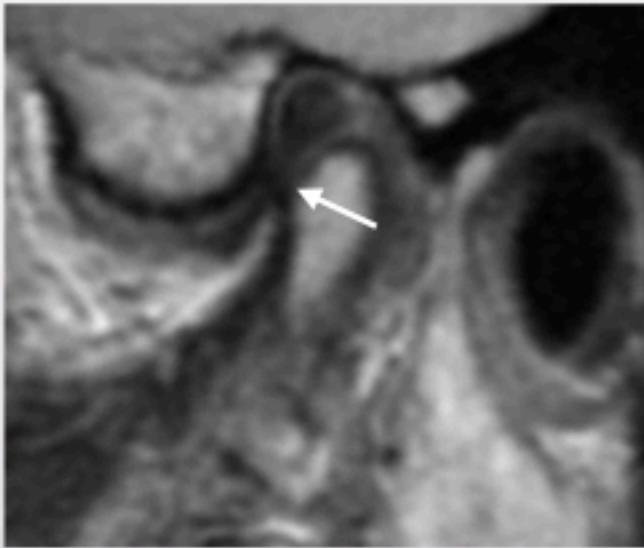
Note: Large joint space



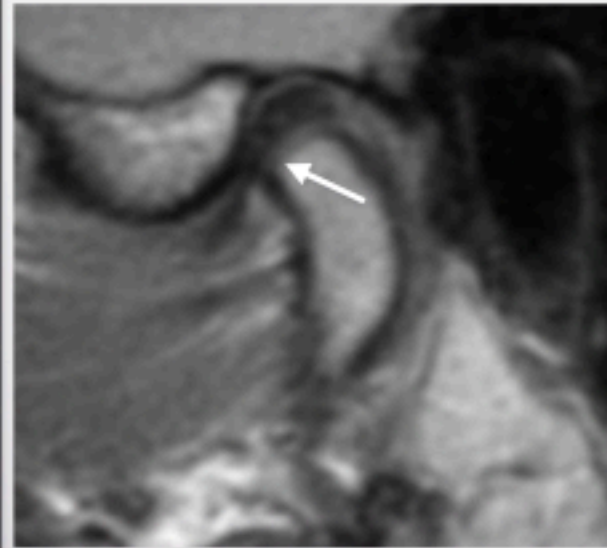


MRI  
R4a-e, L2

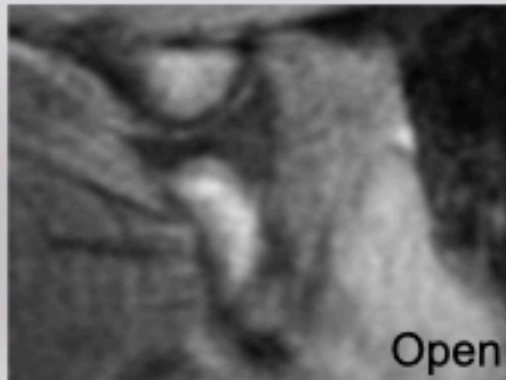
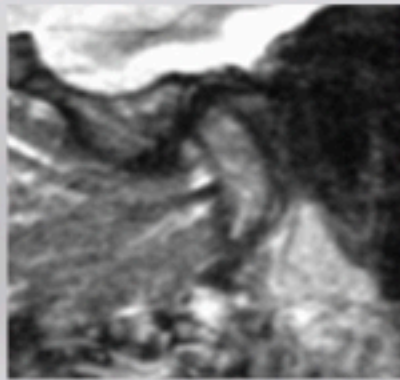
Right  
PD Closed



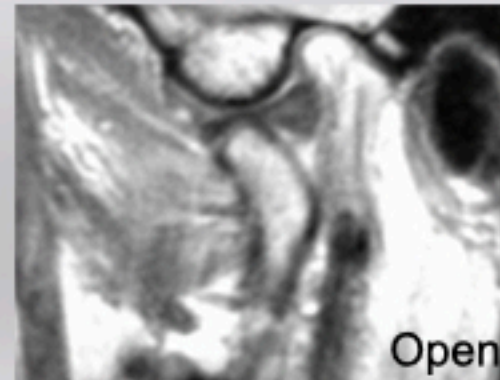
Left  
PD Closed



Stir

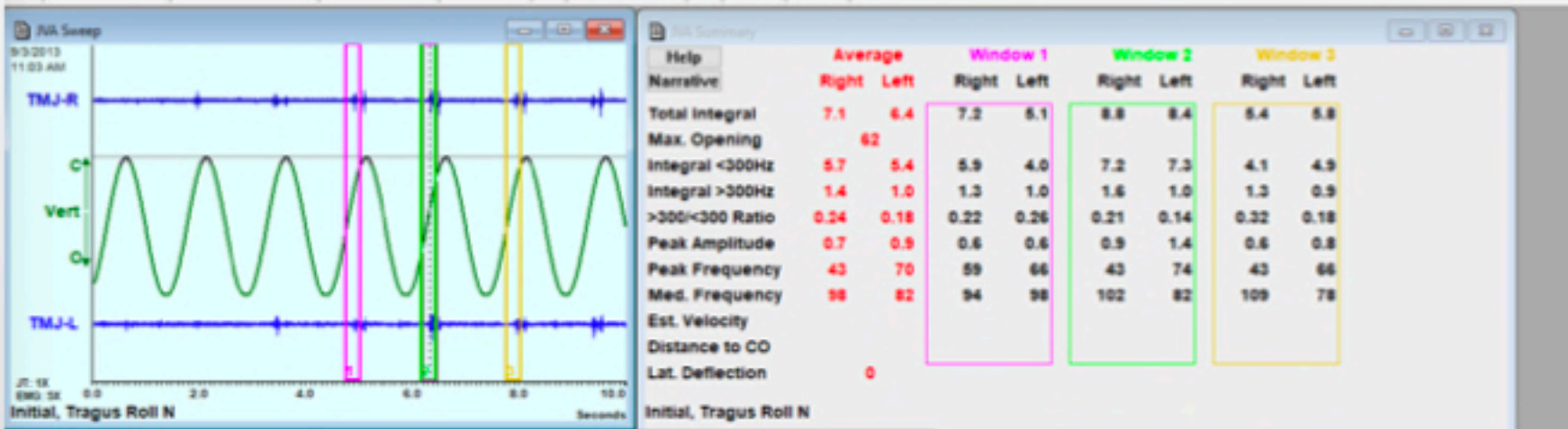


Stir



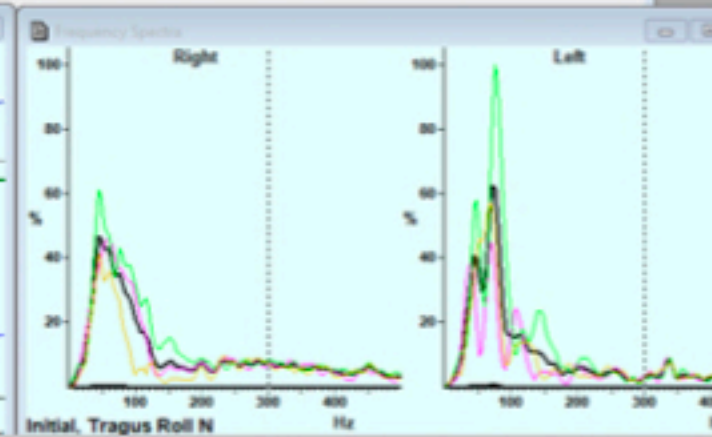
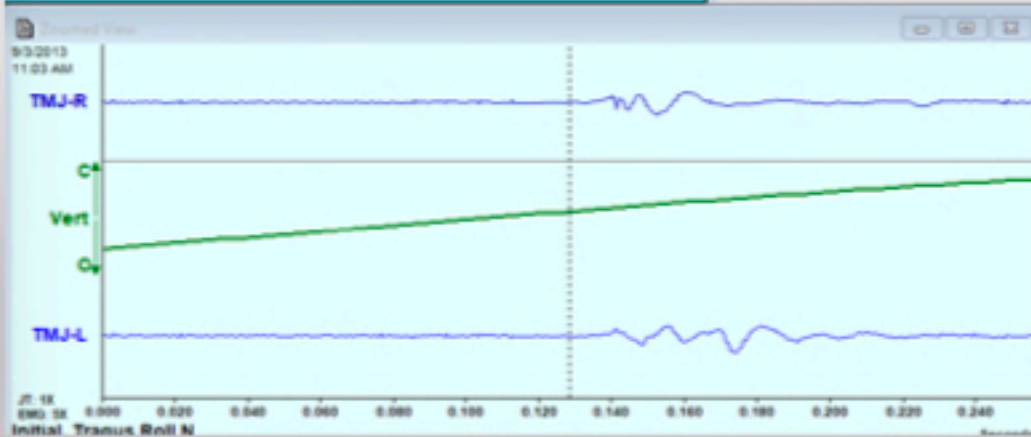
Slight Wobble  
before tooth  
contact

Joint  
subluxation  
on movement



Clinical  
Relevance?

Early damage  
from  
parafunction



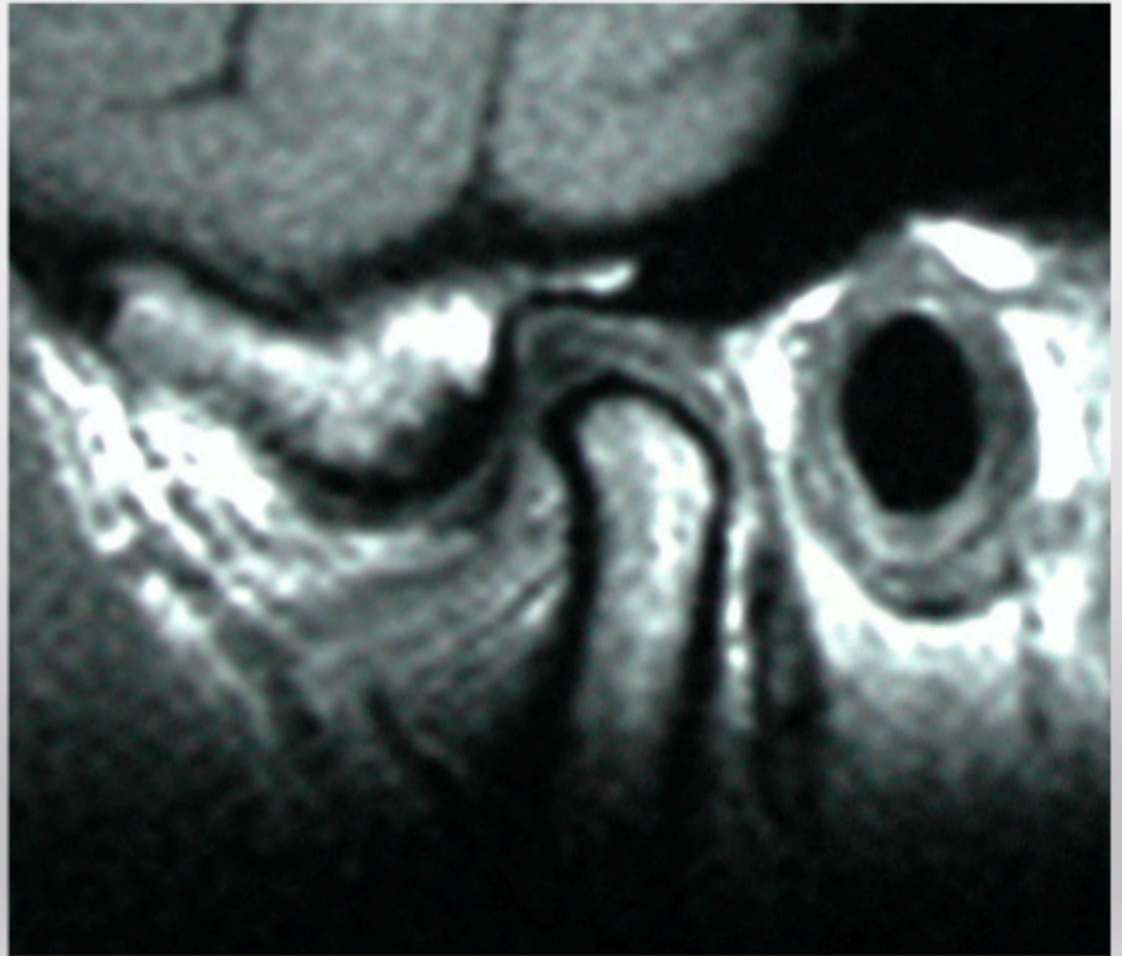
# Facial Pain Diagnosis

## Diagnostic Tools

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

## MRI

Blood Tests

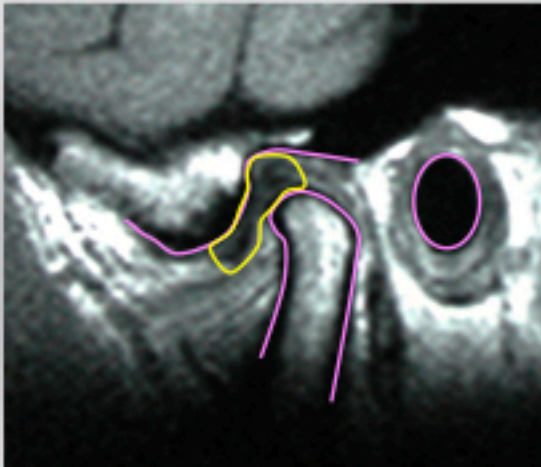


Short

T1 Inverted

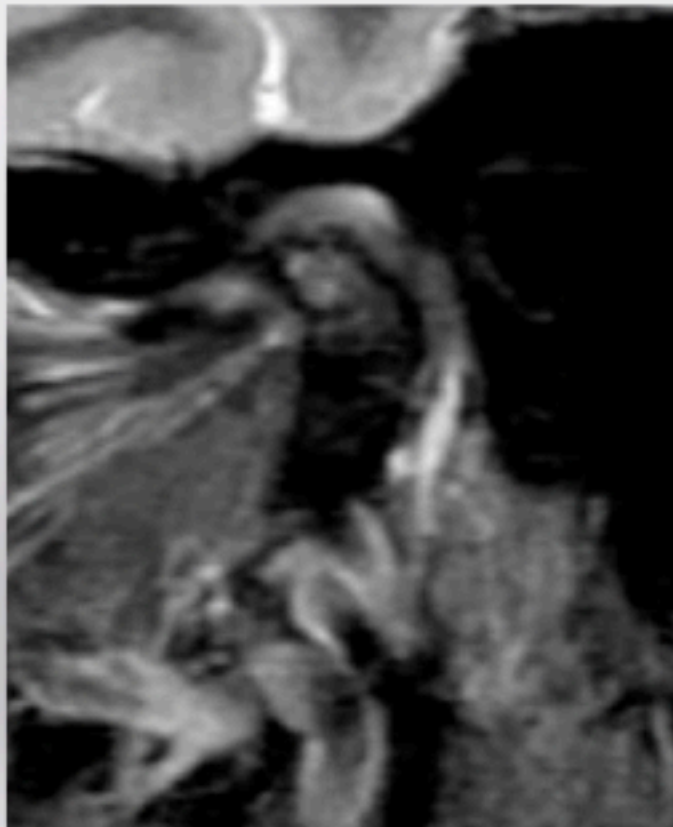


T1 Sagittal Closed



# MRI STIR Image

STIR- Short T1 Inversion Recovery



STIR- "Supercharged" T2

Retrodiscal Inflammation

Marrow Edema

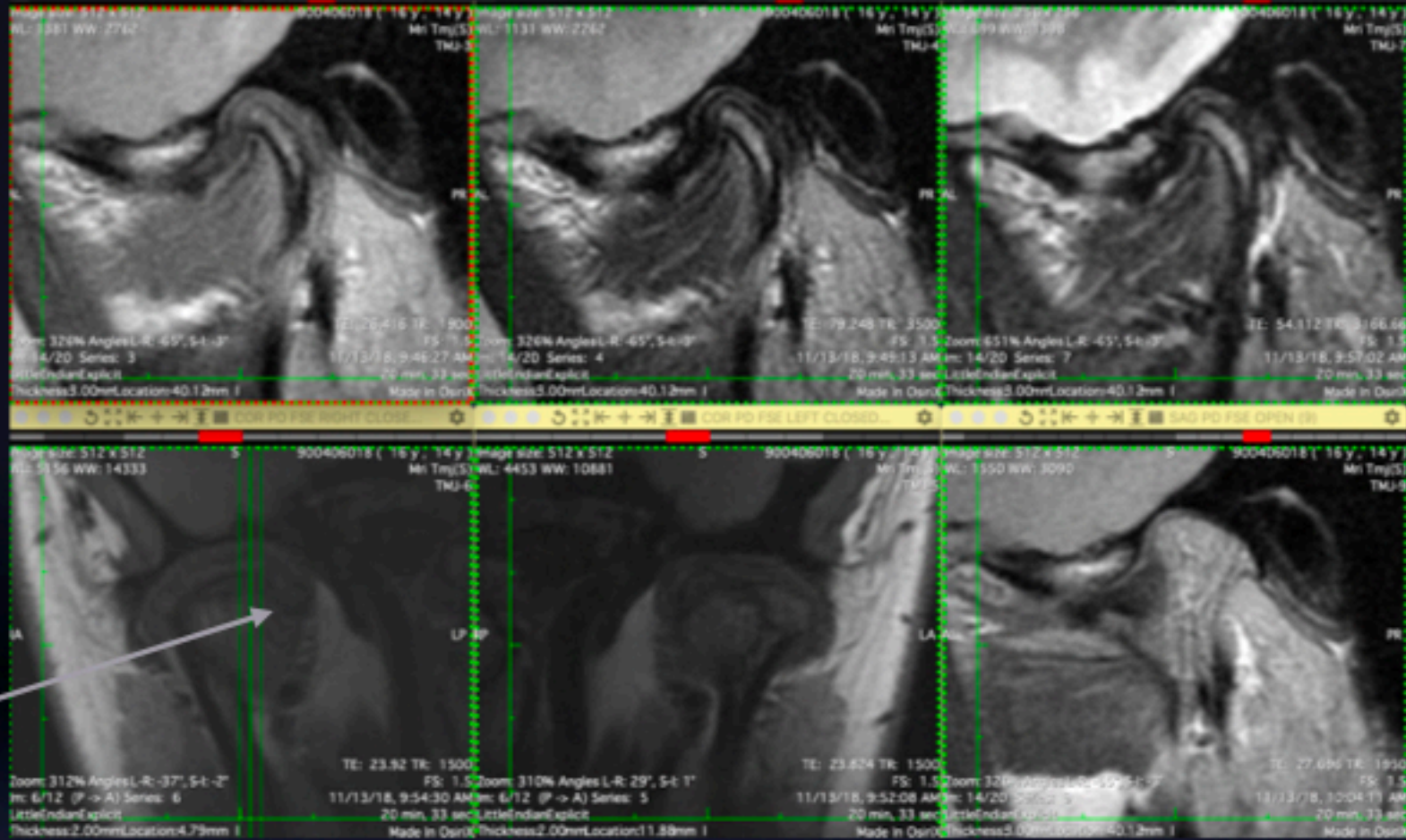
Diff Dx is active AVN, Osteoarthritis, Lyme Ds, RhA, Hypoxic Progressive Condylar Resorption, Other.

STIR and T2 shows water as white

MRI  
Age 14

Right TMJ

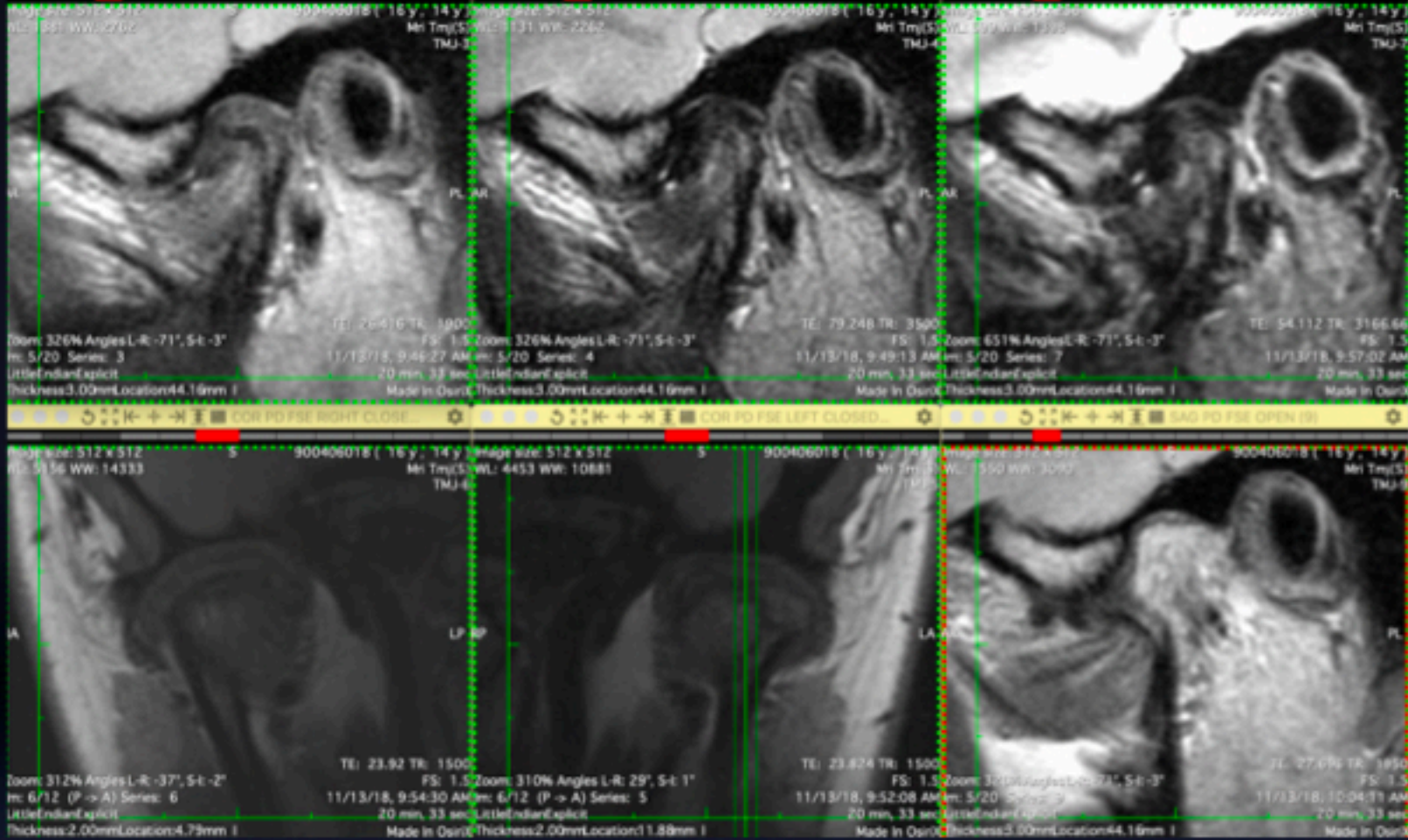
R4a medial anterior



MRI  
Age 14

Left TMJ

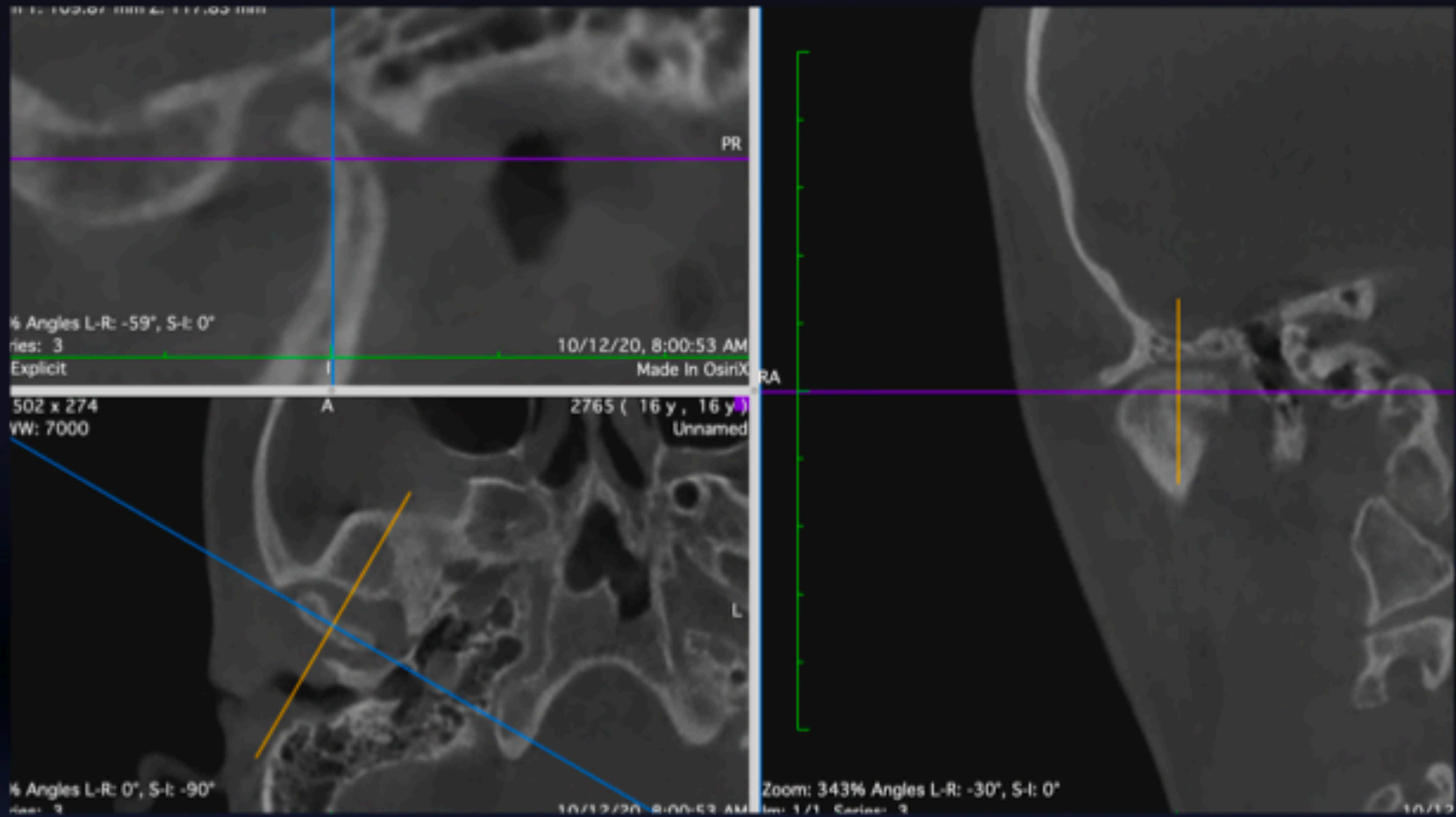
L4b medial anterior



CBCT  
Age 14

Right TMJ

Narrow Condyle  
Large Fossa  
Distalized

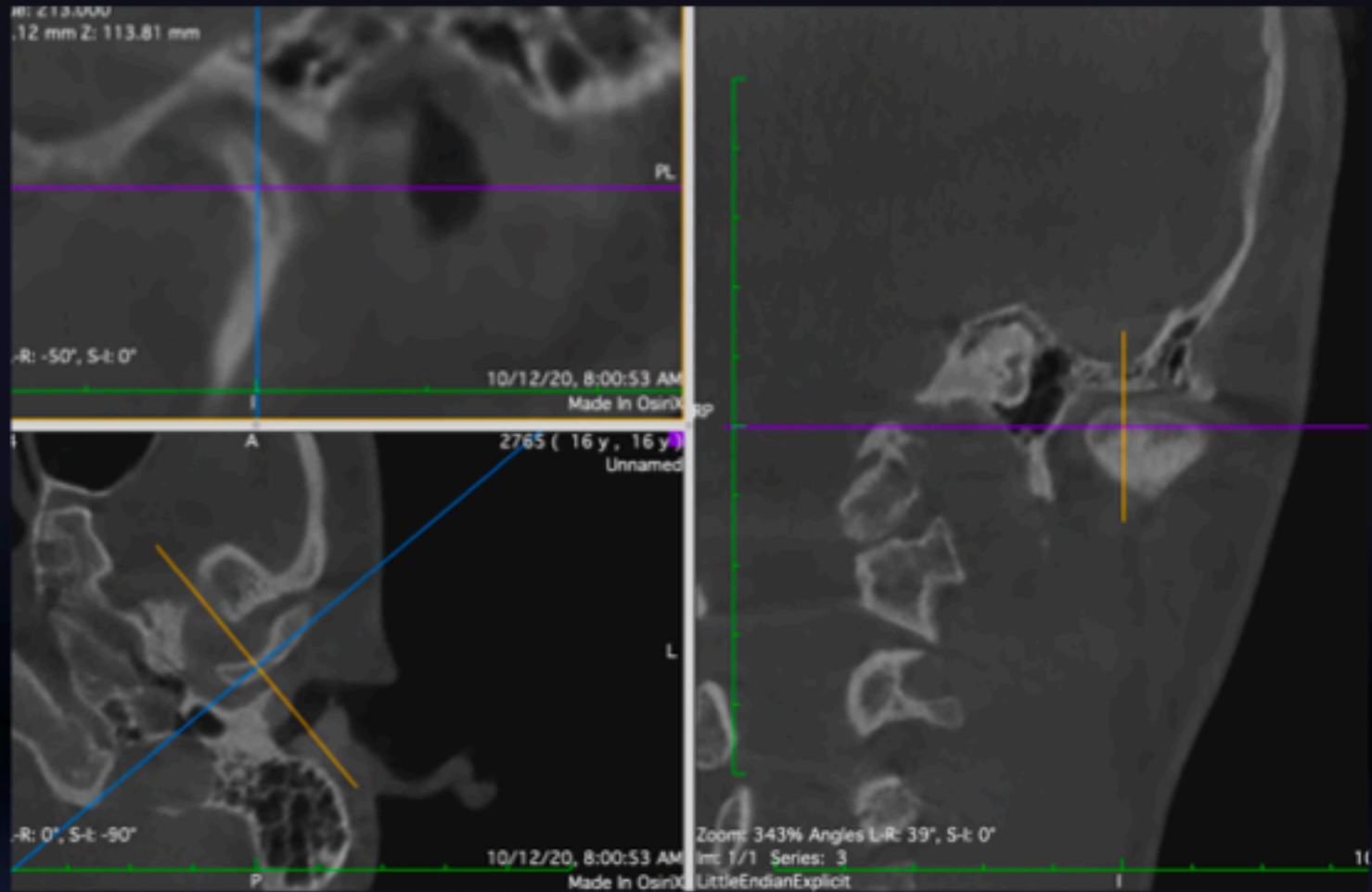




CBCT  
Age 14

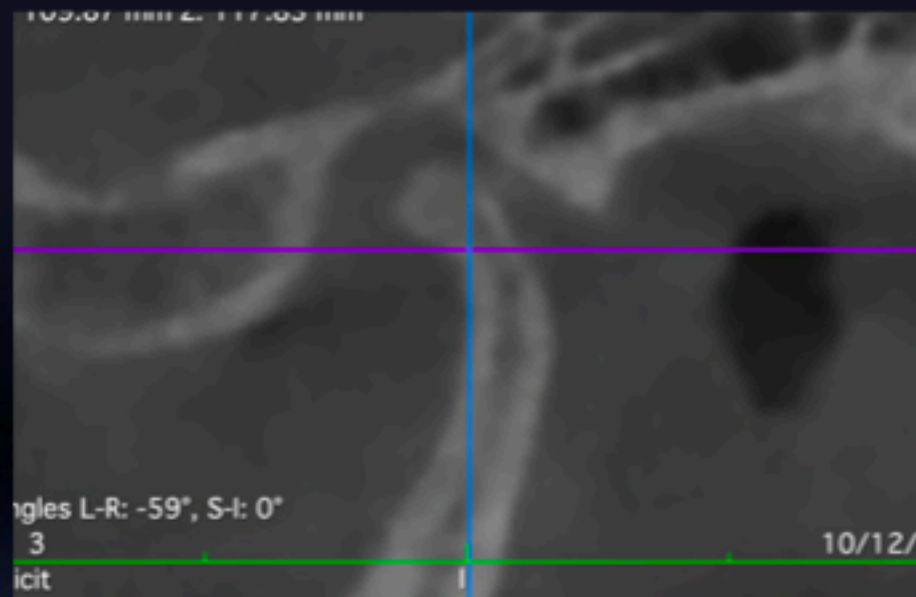
Left TMJ

Narrow Condyle  
Large Fossa  
Left Smaller than Right  
Distalized

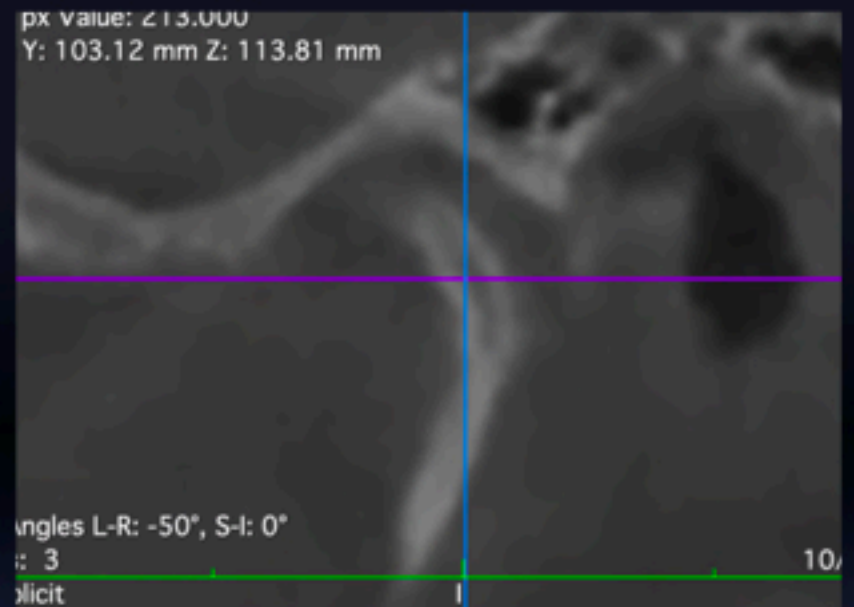


Best Guess R4a, L4b during puberty growth  
Left Condylar growth inhibited

### Right CBCT



### Left CBCT

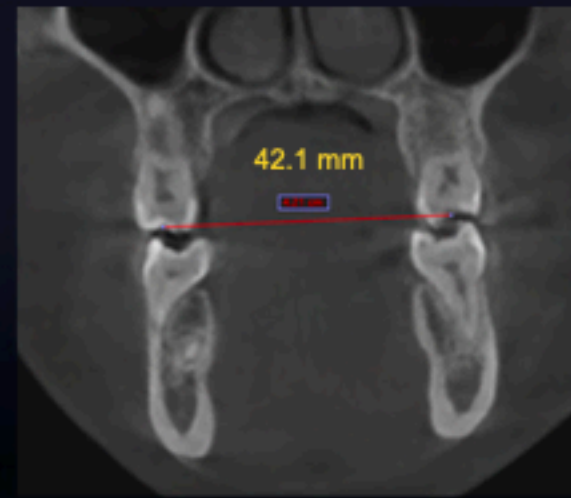
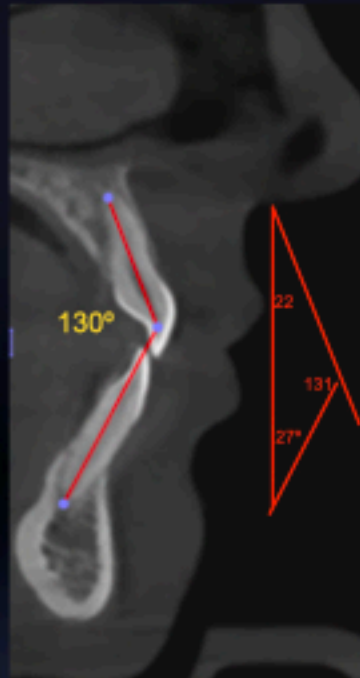
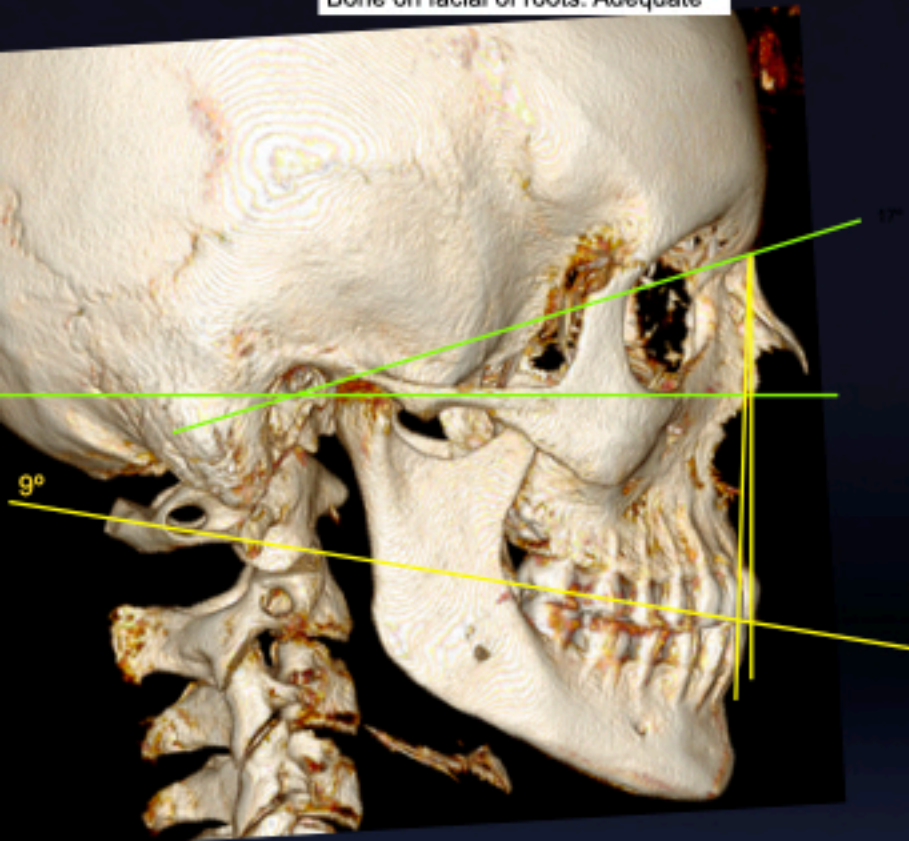


# My Experiences in “Recapturing the disc”

Ms NB

JP  
11-2018

Maxilla: Slight Retrognathic  
Mandible: Slight Retrognathic  
Upper Incisors: Normal Inclination  
Lower Incisors: Normal Inclination  
Nperp B 87°  
Maxillary 1st molar width 42.1 mm  
Bone on facial of roots: Adequate



## Problem List

TMJ Damage: Active degeneration or adapting unfavorably. Mechanically unstable.  
Diff Dx: Piper 3a, Piper 4a, tumor, other.

Chin sits left

Occlusal Plane High on left. Left TMJ damage growth disturbance

Diff Dx: ~~TMJ damage condylar bone loss (right or left), hemifacial microsomia.~~

Maxillary deficient width and AP, Mandibular slight retrognathic

Shallow anterior guidance, end to end anterior and posterior malocclusion

Tongue Tie

Diff Dx: Mouth breathing, bottle fed as infant, tongue tie, bicuspid extraction retraction orthodontics, genetics, other.

ii: Jaw Locking

Goal of Therapy:

Prevent locking

Favorable adaptation

Head forward posture. Head Tilt. Atlas Subluxation.

Diff Dx: Cervical damage, restricted airway, other

Guarded smile Esthetics

Diff Dx: ~~Esthetics, Bells Palsy, other~~

Fatigue

Diff Dx: Ineffective sleep, Iron deficiency, +60 others

# Problem List

# Working Diagnosis

ii: Jaw Locking

Goal of Therapy:  
Prevent locking  
Favorable adaptation

TMJ Damage: Mechanically unstable. Adapting unfavorably.  
R 4a Locking, L4b old

Left TMJ damage growth disturbance Chin sits left. Occlusal Plane High on left.

Maxillary deficient width and AP, Mandibular slight retrognathic  
Shallow anterior guidance, end to end anterior and posterior malocclusion  
Tongue Tie.

Head forward posture. Head Tilt. Atlas Subluxation. Cervical damage,  
In addition most likely restricted airway affecting sleep

Fatigue  
Diff Dx: Ineffective sleep, Iron deficiency, +60 others

Guarded smile due to esthetics

Where to start, \$\$

Not 8 veneers

# Problem List

# Working Diagnosis

TMJ Damage: Mechanically unstable. Adapting unfavorably.  
R 4a Locking, L4b old



ii: Jaw Locking

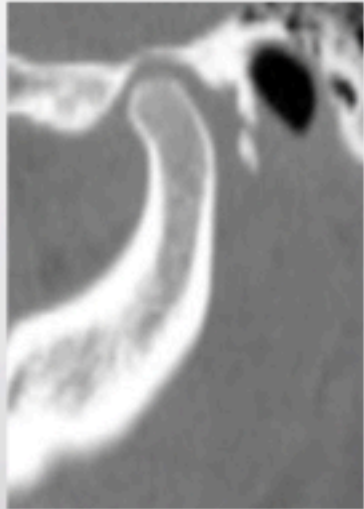
Goal of Therapy:  
Prevent locking  
Favorable adaptation

## Treatment Options:

1. Leave as is. Allow to lock. Stretch after locks. Turn into a functional 4b.  
Slight Risk Avascular Necrosis
2. TMJ Surgery: Discectomy with fat graft.
3. Non Surgical TMJ rehabilitation

Where to start, \$\$

## I use both Centric Relation and Non-Centric Relation Orthotics



Treatment Position vs Final Position: Do Not Confuse the Two

Treatment Position Creates Change (Adaptation)

Treat: Painful CR Load Zone

Mechanically Unstable Centric Relation Loading  
Cranial bones misaligned

Final Position Creates Stability (Centric Relation)

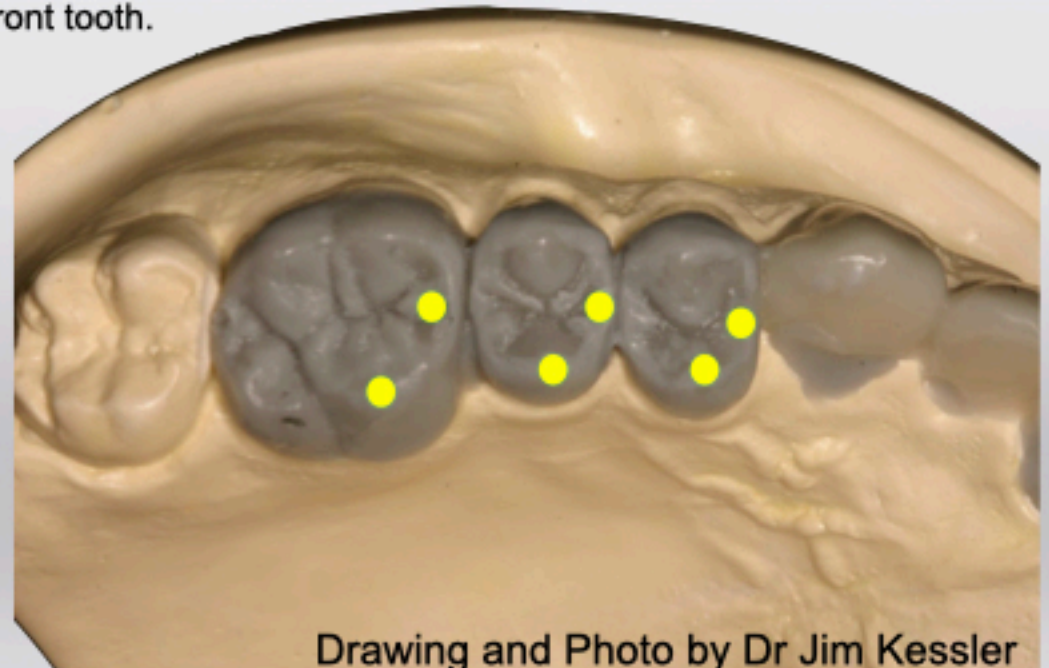
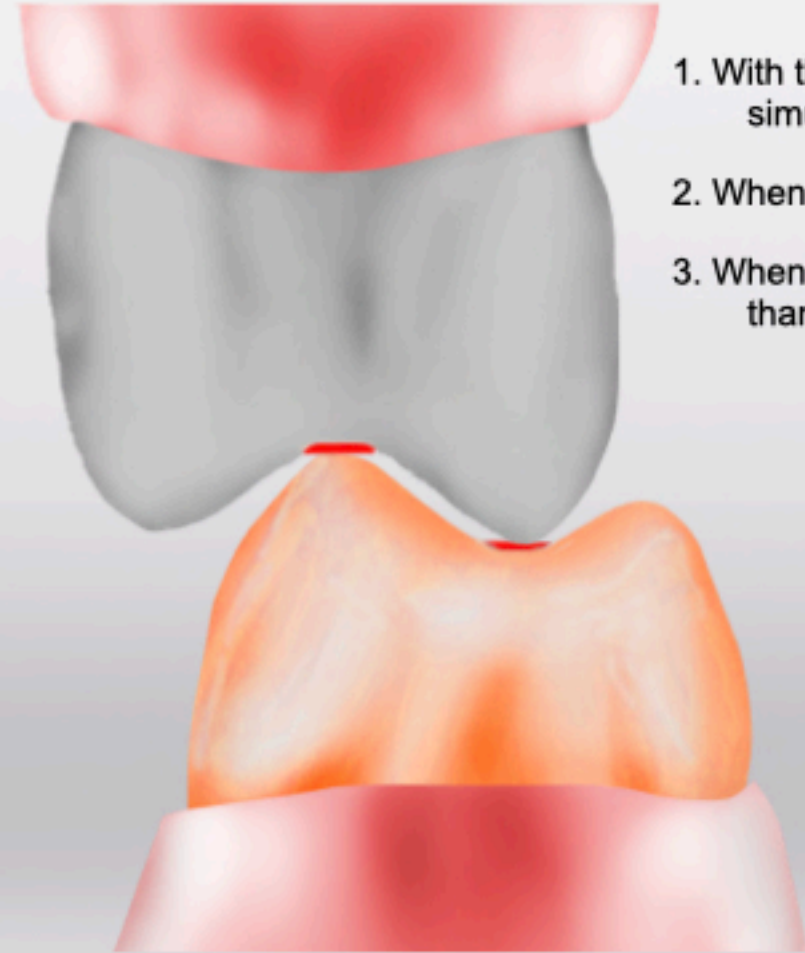
When the forces are balanced, Adaptation Stops





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

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



Drawing and Photo by Dr Jim Kessler



# LD Pankey's 3 Rules of Occlusion Literature

(Clyde Schuyler)

Schuyler CH. J Florida Dent Soc, 1938.

Occlusal disharmony and its relation to oral discomfort.

Schuyler CH. J Am Dent Assoc. 1958 Aug;57(2):221-31.

Factors of occlusion to be observed in everyday practice.

Schuyler CH. J Pros Dent. 1963 Nov: 13(6): 1011-29.

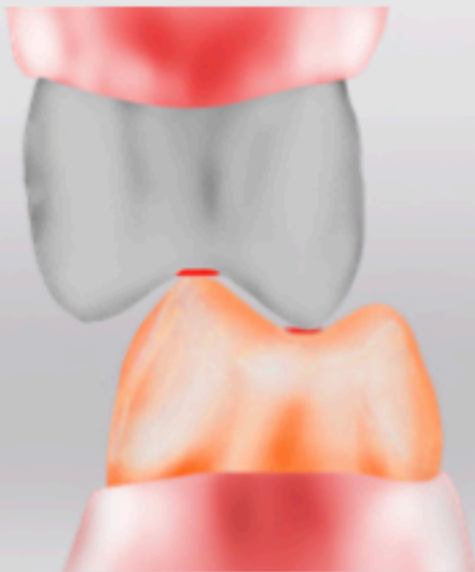
The function and importance of incisal guidance in oral rehabilitation.

Kerstein, R. B., & Radke, J. (2012). Cranio 30(4), 243–254.

Masseter and temporalis excursive hyperactivity decreased by measured anterior guidance development.

Kerstein, R. B., & Radke, J. (2016). Cranio pp1–17.

Average chewing pattern improvements following Disclusion Time reduction.



## 2nd Bicuspid Orthotic



Set up heavy right, cranial manipulations, then even

Takes about 1 hour  
Goes home with even contact



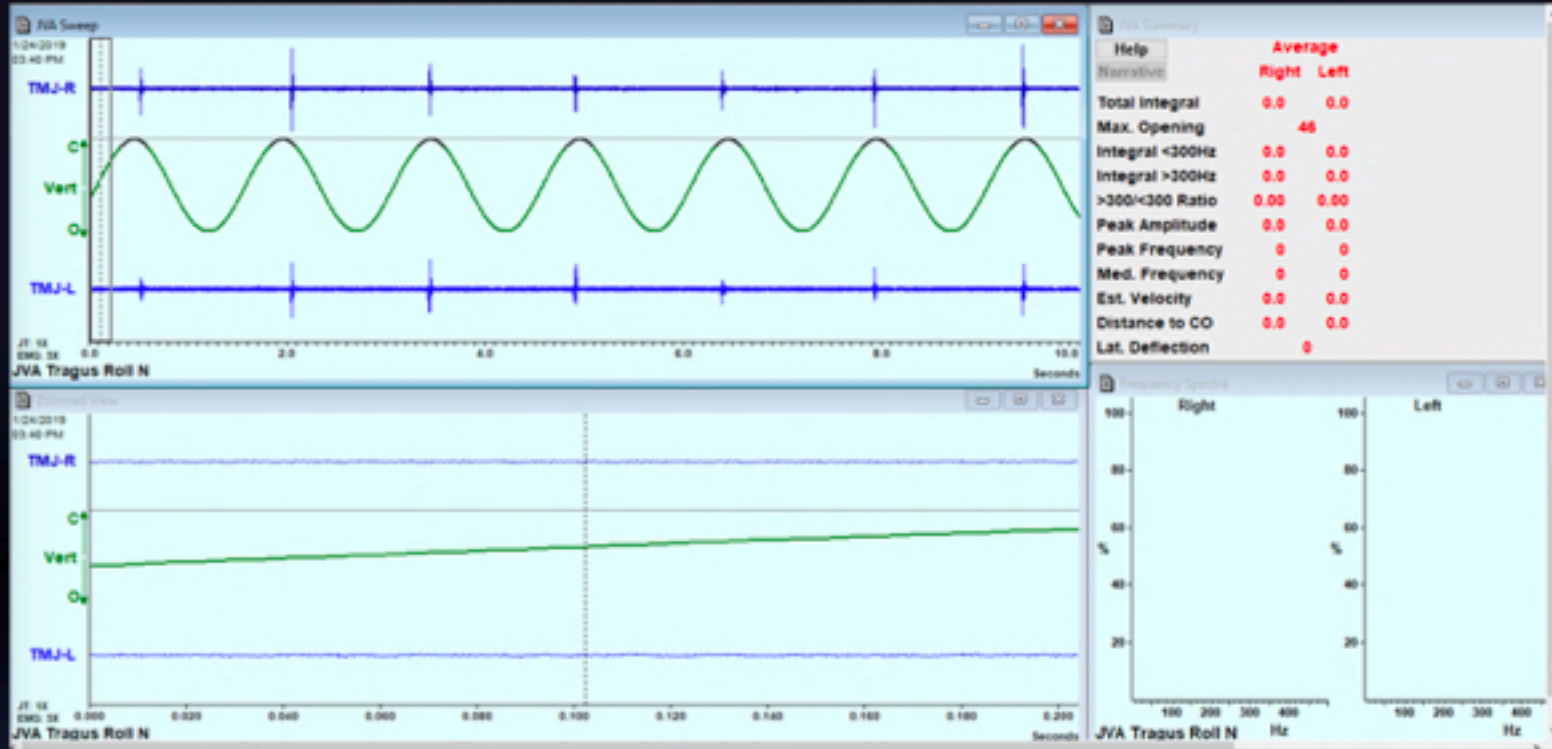
Freedom in anterior to allow  
jaw to move forward

Neck Therapy:  
Atlas Therapy over next 2 weeks

# JVA with 2nd Bicuspid Orthotic and Cranial Manipulation



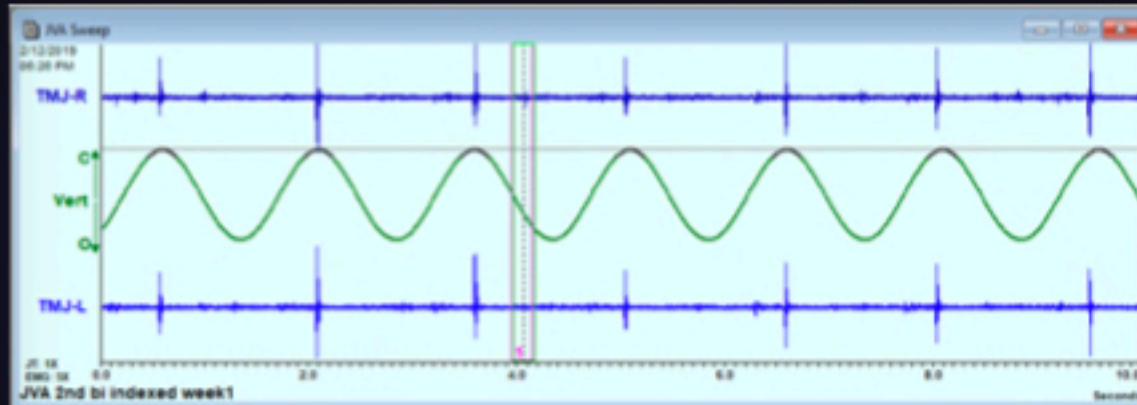
Smooth open close 46 mm



2nd Bi orthotic turned into Indexed orthotic after 2 weeks

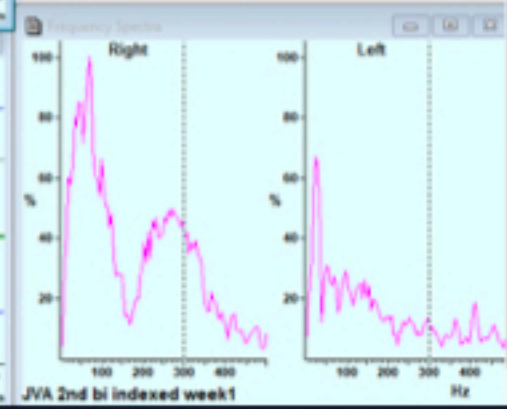
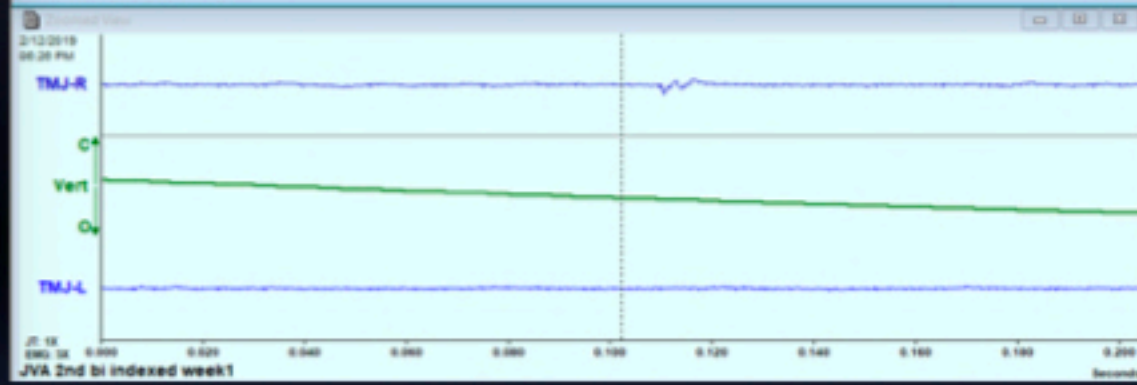


# JVA with Indexed Orthotic 1 week

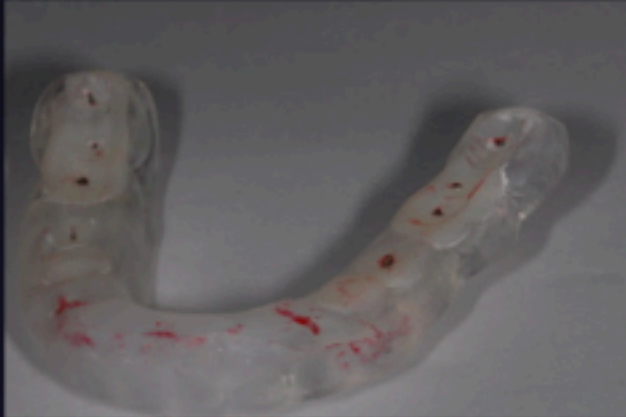


JVA Summary

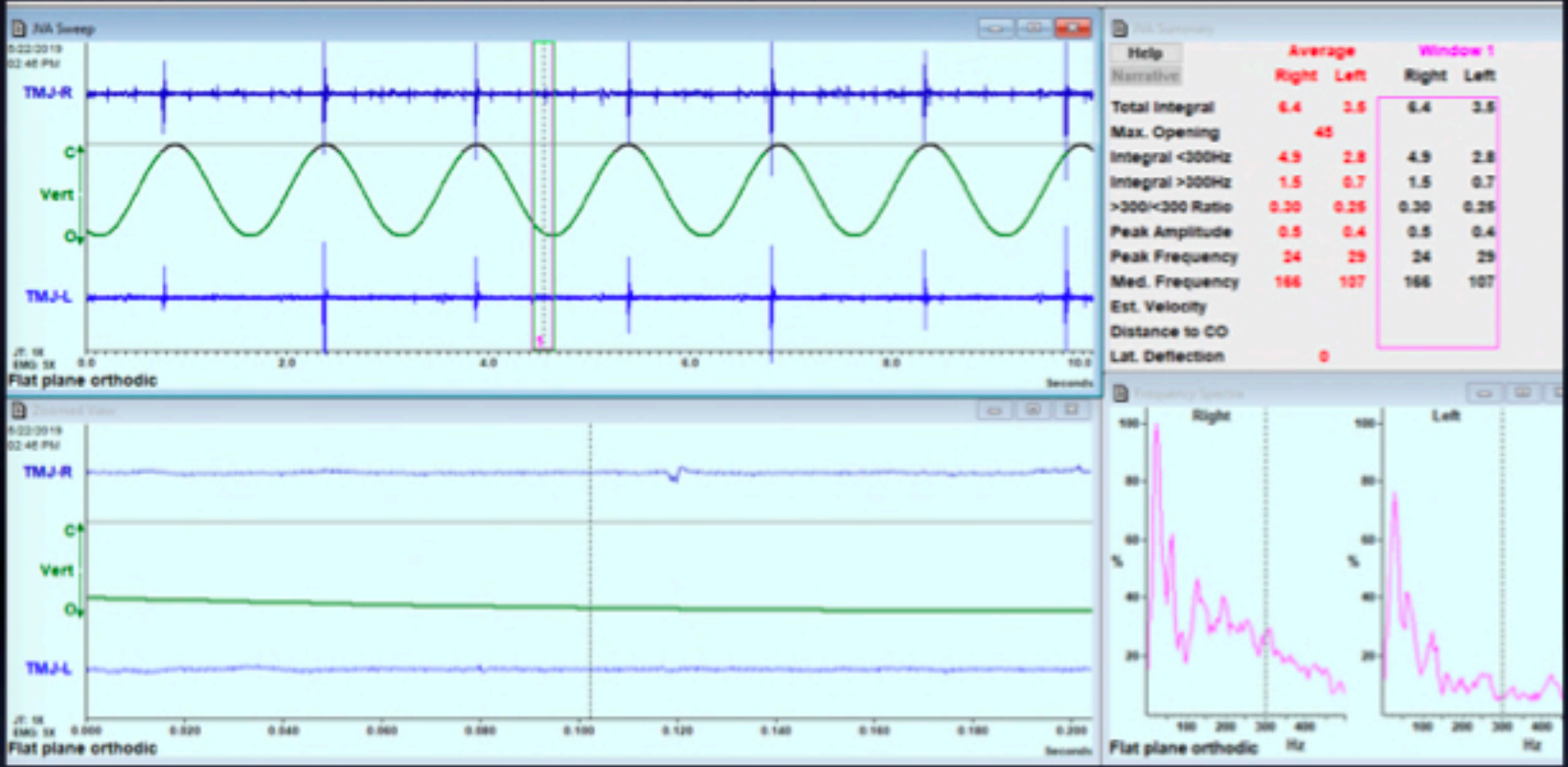
Help	Average		Window 1	
	Right	Left	Right	Left
Negative				
Total Integral	4.3	1.9	4.3	1.9
Max. Opening	43			
Integral <300Hz	3.4	1.5	3.4	1.5
Integral >300Hz	0.9	0.4	0.9	0.4
>300<300 Ratio	0.25	0.28	0.25	0.28
Peak Amplitude	0.3	0.2	0.3	0.2
Peak Frequency	68	24	68	24
Med. Frequency	151	137	151	137
Est. Velocity				
Distance to CO				
Lat. Deflection	0			



After 3 month indexed orthotic, adjust so now Centric Relation orthtic  
Start CR guard



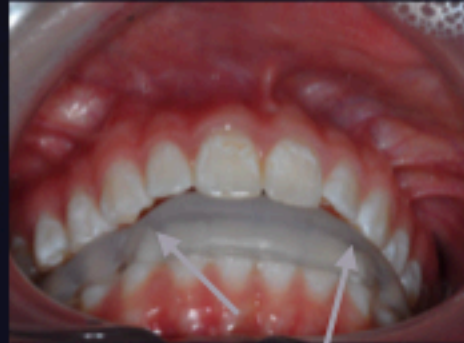
After 3 month indexed orthotic  
 Start CR guard





1 Month CR orthotic

Anterior teeth lightly touch



LD Pankey Rules of Occlusion:

1. Condyles seated all teeth hit even.
2. Squeeze nothing moves.
3. Left, right, forward, back teeth come apart

Left



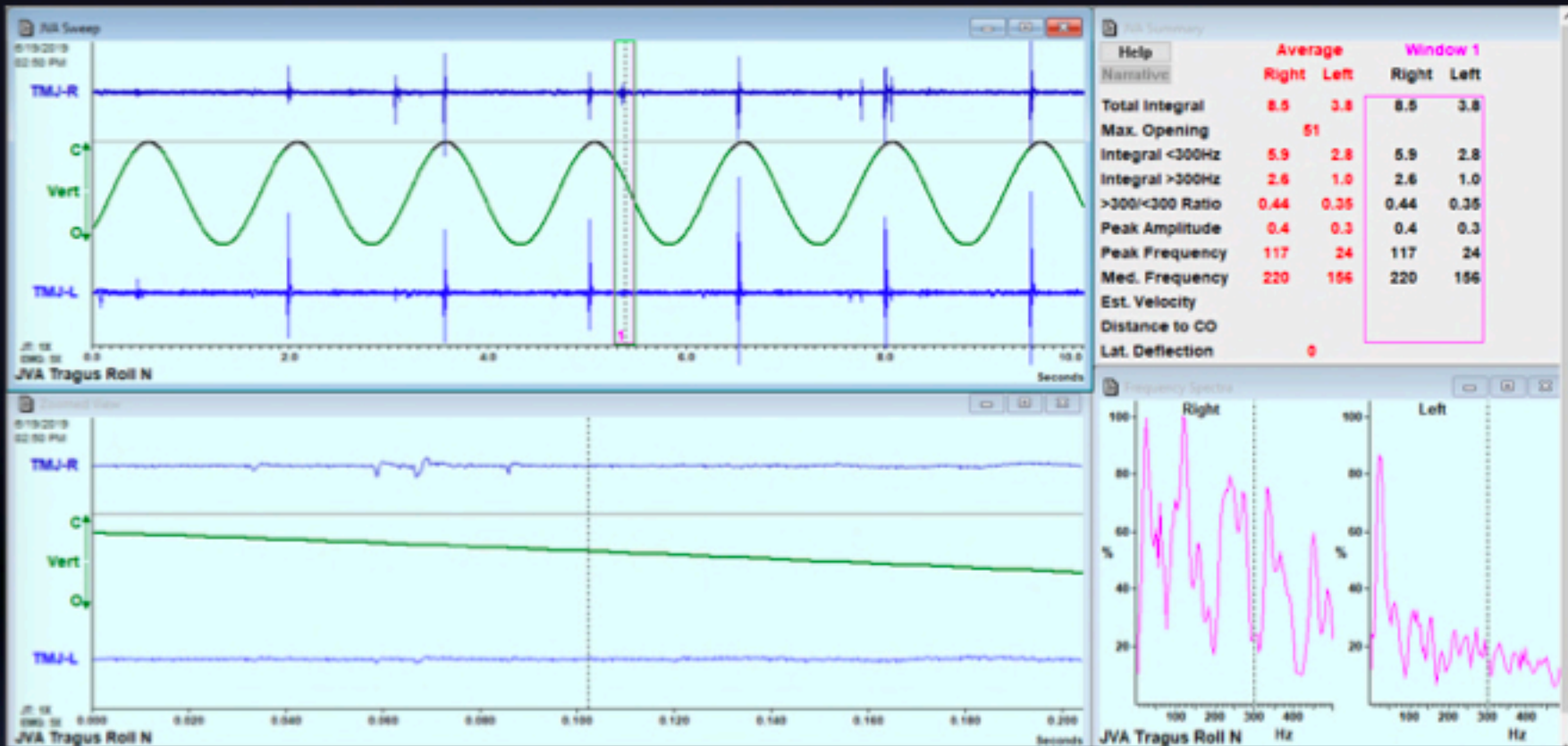
Right



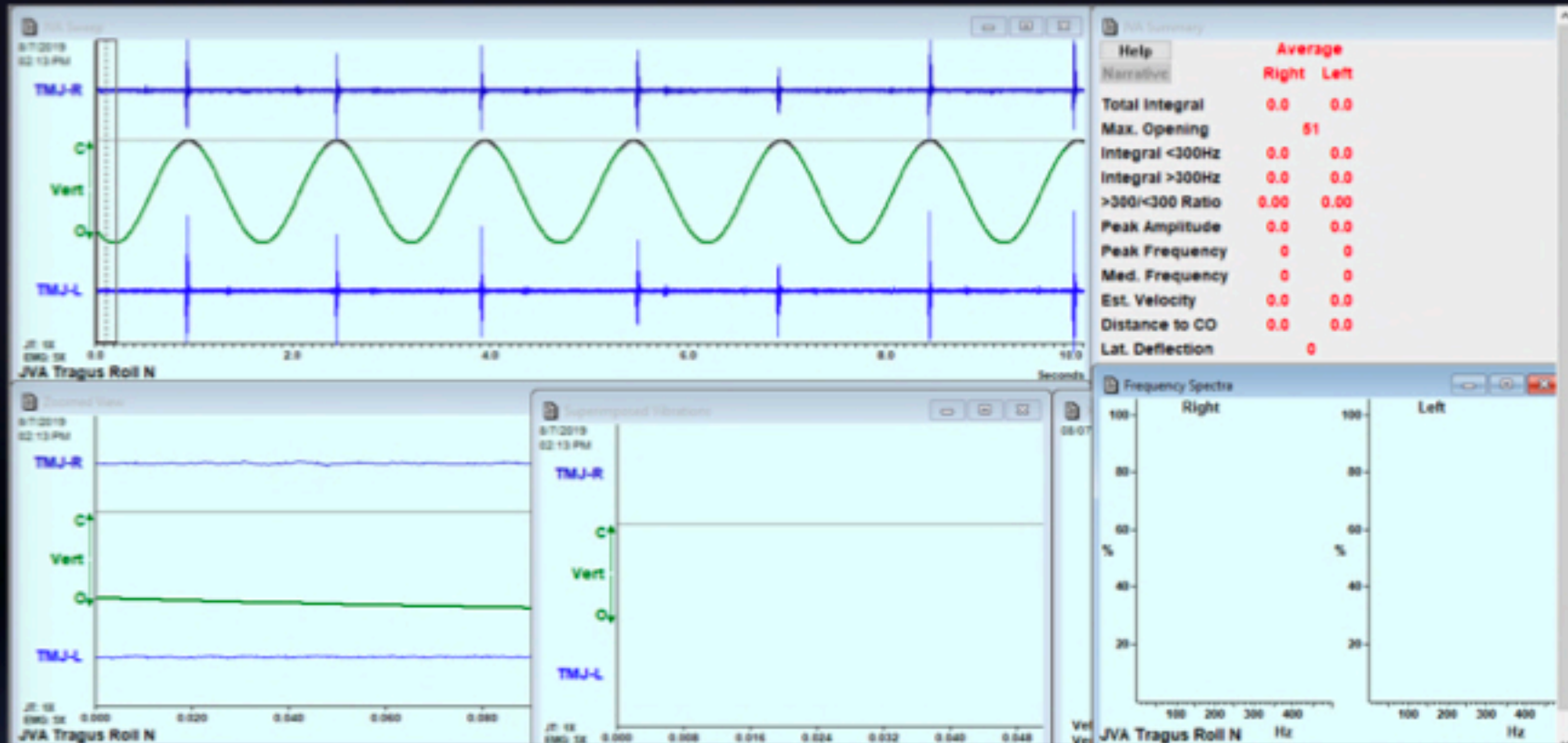
Protrusive



5.5 months from start  
 10 weeks CR orthotic  
 Smooth opening, full range of motion 51mm, no jaw locking



7.5 months from start  
 3 months CR orthotic  
 Smooth opening, full range of motion 51mm, no jaw locking  
 Start Phase 2



End TMJ Rehabilitation  
Start Phase 2  
Age 14



Goal on Natural teeth  
LD Pankey Rules of Occlusion:

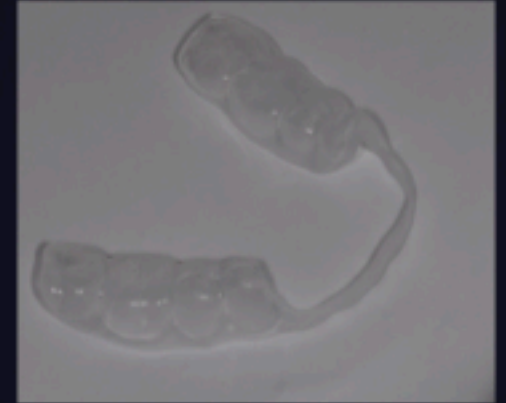
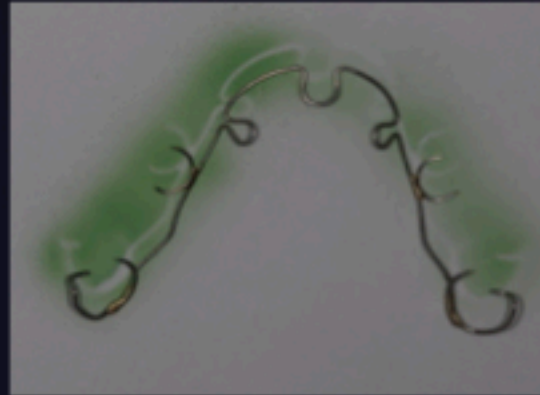
1. Condyles seated all teeth hit even.
2. Squeeze nothing moves.
3. Left, right, forward, back teeth come apart



Start Phase 2  
Age 14

Upper Lingual Light Wire Crozat

Daytime Lower Soft Sectional



TMJ Myobrace for sleep



10 months LLW, LSS  
Age 15



Cuspids are in contact



Age 14



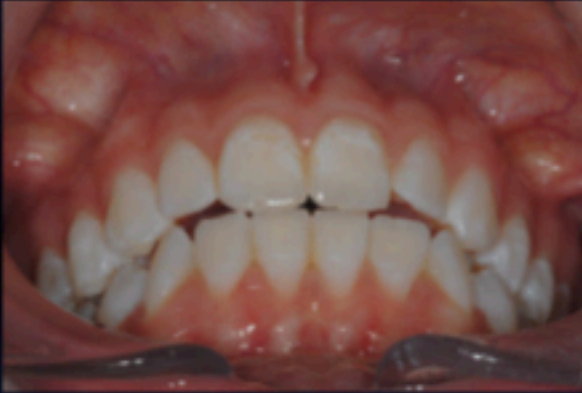
Age 16



**Crest White Strips  
cost vs 8 veneers**



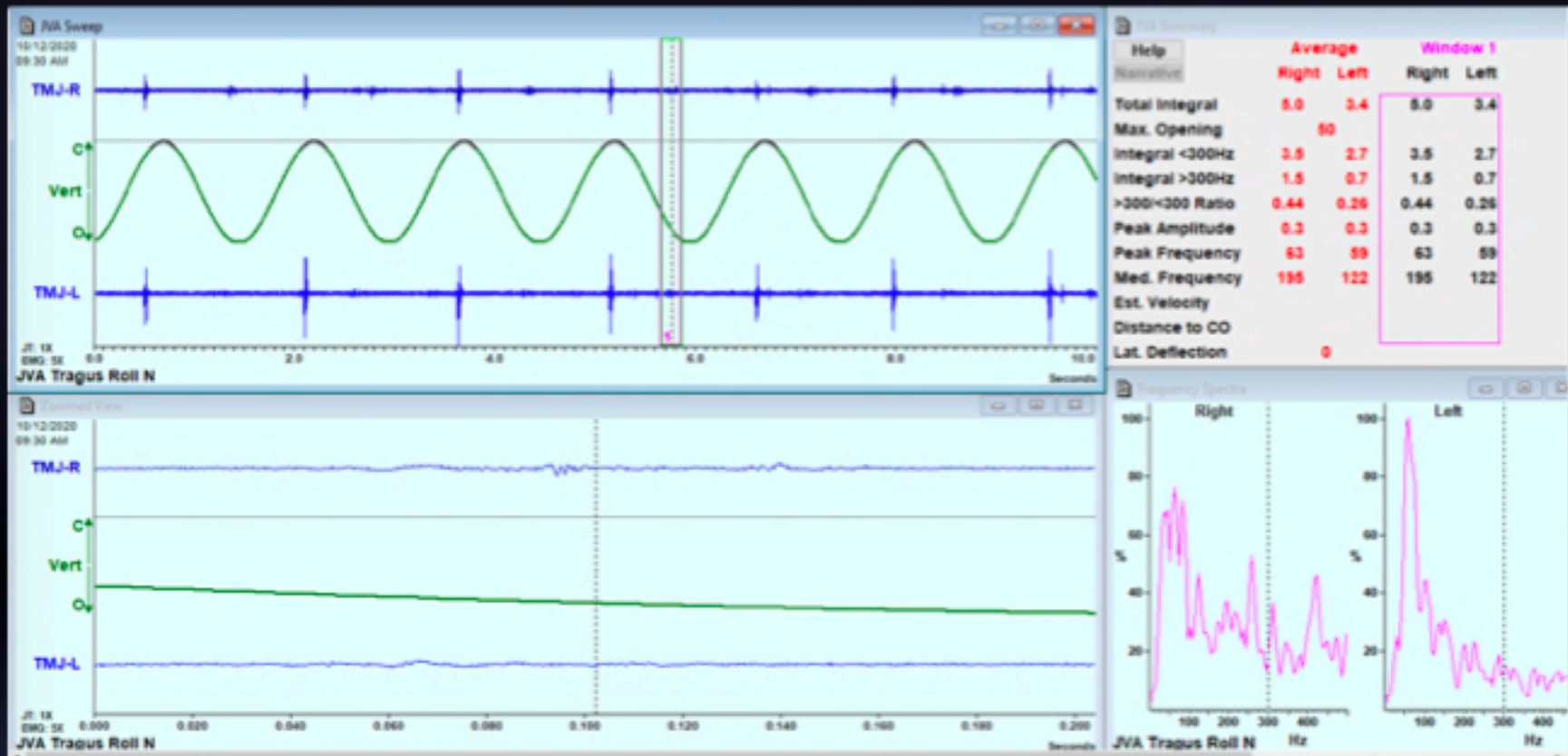
4 months post LLW, LSS



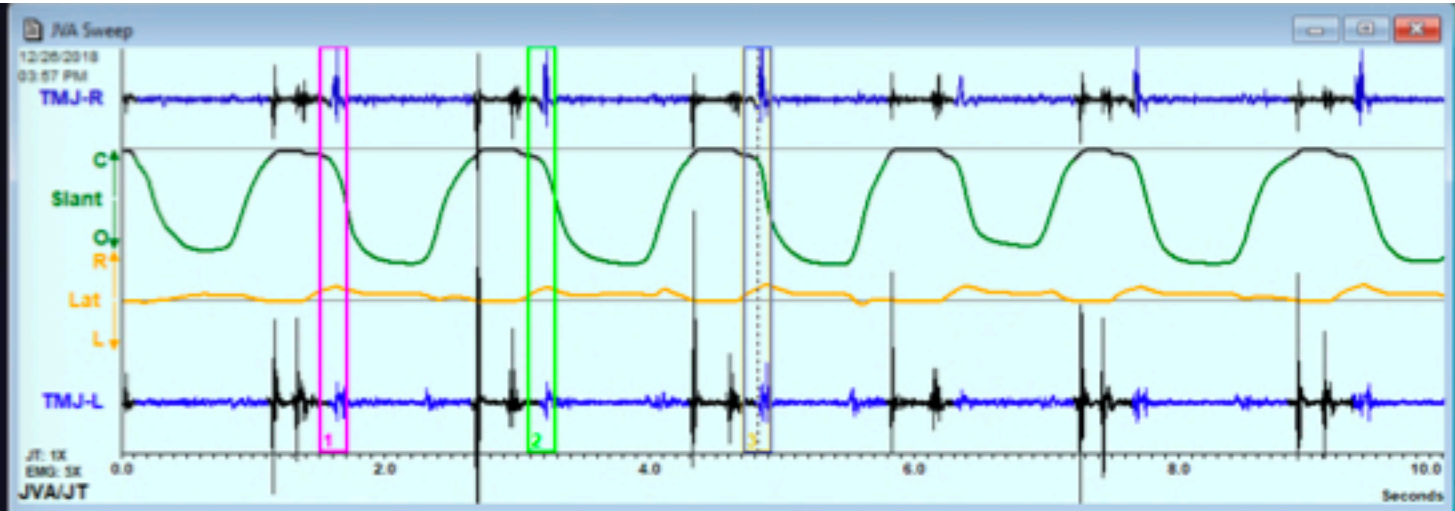


Age 16

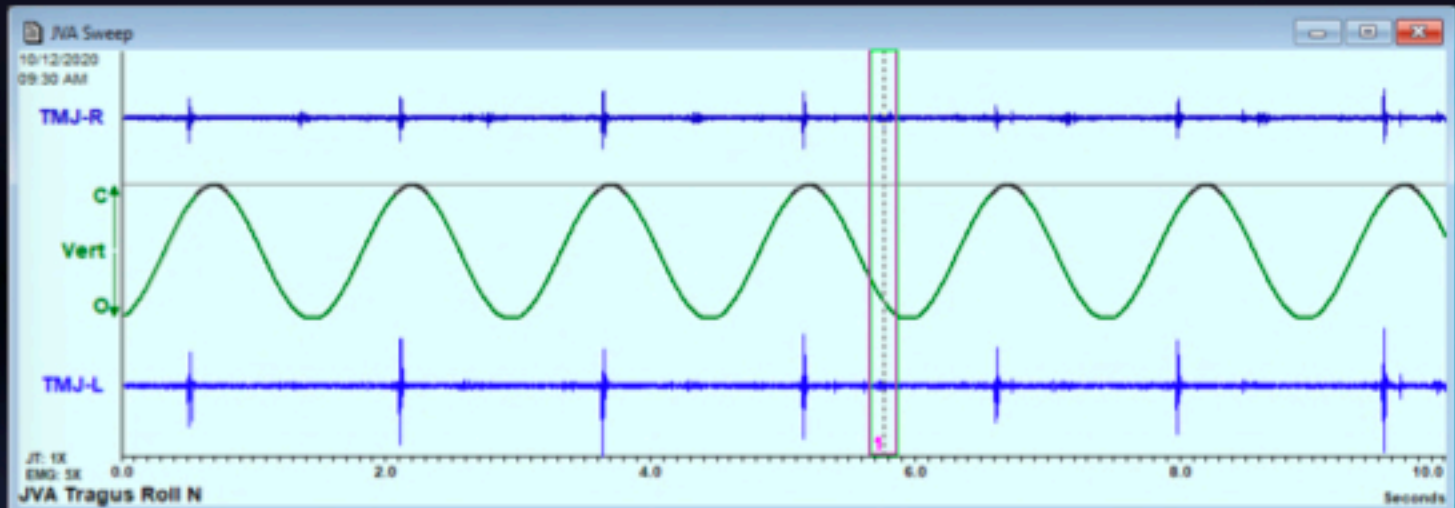
Natural Teeth after LLW, LSS



Age 14



Age 16



Up Next:

Extract 3rd molars, tongue tie release with myofunctional therapy

Sleep airway test, Evaluate Sympathetic Arousals

Further expand upper with LLW

Occlusal Adjustment

Esthetic comp or veneers 8,9

Retrospect: Tongue tie limited maxillary expansion. Still would do the same.

# Stomatognathic System Interrelationship

A change in any one area will affect the others

CNS/PNS

Skull

TMJ

Teeth

Mandible

Teeth

Neck

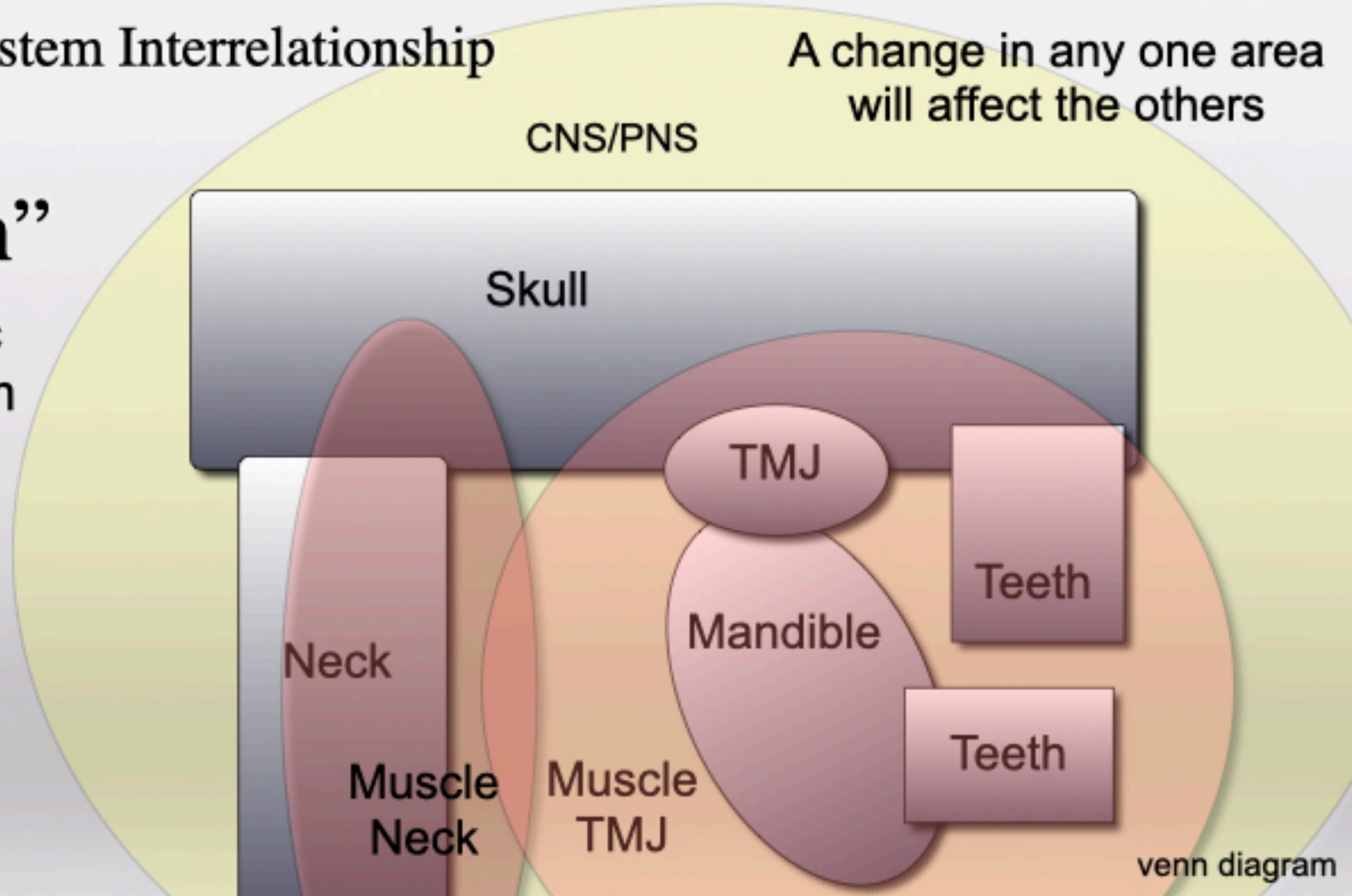
Muscle Neck

Muscle TMJ

venn diagram

## “Adaptation”

This is a **dynamic** orthopedic System



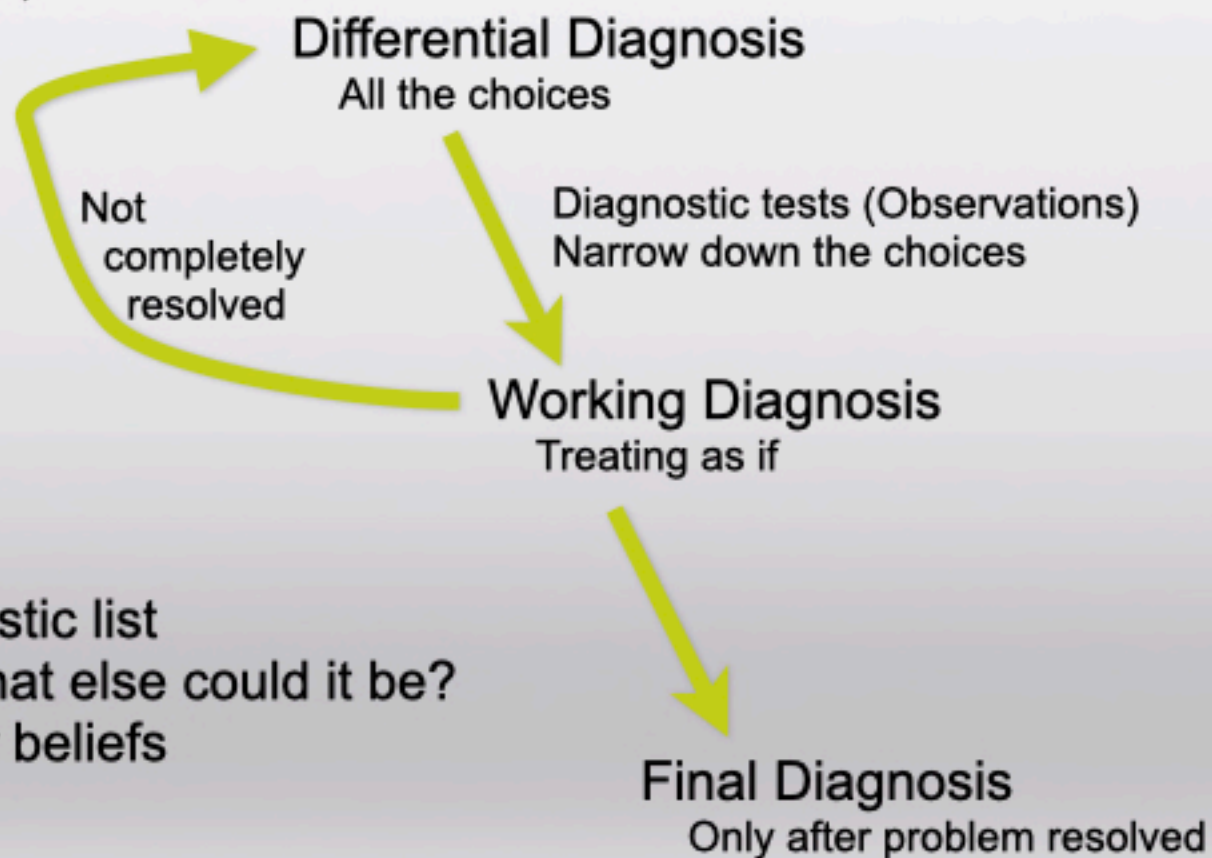
## The Diagnostic Process

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



**Think!!**

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





LD Pankey Institute

Write your Dream