

Case History #3
Neuromuscular Orthotic Care

Case History #3 Kay B.S.

1. Chief Complaints

- a. Patient presented to our office with numerous cranialmandibular problems and a long complex history. Initial questionnaire provided a filter to arrive at her top four complaints; all of which scored a 10 of 10 in severity and a frequency of 4 of 4:
 - i. Jaw Pain bilateral
 - ii. Neck Pain lateral to midline and bilateral in position
 - iii. Shoulder pain bilaterally in scapula regions
 - iv. Back pain
- b. Additional significant issues reported to at least a 8 of ten in intensity and a 4 of 4 in frequency included:
 - i. Jaw joint noises
 - ii. Pain with chewing

2. Past Medical History

- a. Patient is 42 years old and weights 130lbs and is 5' 7" tall.
- b. Allergies include sulfa and methocarbonol
- c. Patient takes NSAIDs as needed
- d. Patient reports cold hands and feet, chronic fatigue, depression, vertigo, and difficulty concentrating, some hearing impairment, heart palpitations, and has frequent stressful situations in work and personally. Patient suffers from insomnia, muscles aches constantly with crampings, nervousness, ovarian cysts, poor circulation, prior orthodontics, sinus problems, skin problems, swollen and stiff joints, gets multiple sore throats, tired muscles.
- e. Patient reported significant headaches as a child.
- f. Patient reports recurrent angular cheilitis and has several teeth sensitive to hot and cold.

3. History of Illness / Trauma

- a. Patient has a long and complex history of events and treatment that have led to our office. Main causative events were car accidents. Most damaging for overall body damage was in 1986 with patient losing consciousness from a limousine crash where the vehicle hit a tree head-on with patient thrown around in the car and hit back of head, broke mandible in anterior area, dislocated hip. Teeth and face/chin were involved. Second accident several years later provided substantial whiplash and others were minor in patient opinion.

- b. Dental and related treatment prior to auto accidents was minor with minor fillings, 18month orthodontic care and extraction of wisdom teeth. Post accident the patient saw several TMJ specialists, had two years of orthodontics to try to help with the pain, several chiropractors, and a number of medical providers to try numerous treatment modalities to help with the dysfunction. Several dental splints were worn during the post accident timelines.
- c. Pain has been increasing since the orthodontics was completed last year.
- d. Patient reports clenching and that teeth hit in front first. Wakes up with tired jaws in morning.

4. Clinical Examination

- a. Patient presented with a history of regular dental care. Noted several endodontic treatments along with crowns on several teeth. Teeth numbers 5,12,20,28,26 and 31 are missing and is to have an implant provided for 26 (fig. 4,5,6). Periodontal screening is within normal limits with only noted marginal gingivitis around crown margins locally. Oral cancer and soft tissue exam was within normal limits plus a noted scalloped border of tongue. Patient has a basic orthodontically created Engle's Class I. Noted significant Occlusal wear and a flat plane of occlusion especially on right side and a Occlusal cant toward the left is noted (fig. 7,8). CEJ to CEJ was 18.4 and gave a modest vertical discrepancy of 2mm. Overbite of 2mm and no overjet. Patient had a history of periodontal surgery, and has had occlusal equilibration. The jaw fracture was in two places in the Mental Protuberance area. This is noted perhaps by asymmetry upon smiling by patient with lower lip (fig.3).
- b. Muscle exams were somewhat similar to past ones done in prior offices during the last several years. Patient had tenderness with:
 - i. Opening against pressure on left TMJ
 - ii. Protruding against pressure on right/left TMJ
 - iii. Closing against pressure right/left but especially left TMJ
 - iv. TMJ extrameatally at rest on left and intrameatally also on left.
 - v. Masseter at mid-body on left side
 - vi. Occipital region on left
 - vii. Trapezius upper on left
 - viii. Trapezius middle on left
 - ix. SCM left and right but especially the left
 - x. Medial pterygoid left / right but especially left

- c. Patient has shoulder and hip tip down to left with reverse tip of head. Facial profile is flat and patient exhibits a short lower third of face (fig 1,2).
- d. Range of motion was interesting to have normal ranges on head flexion, rotation, and side to side.
- e. Range of motion of mandible had limitations.
 - i. Maximum interincisal opening without pain 28mm
 - 1. Max with pain 50mm
 - ii. Maximum left lateral excursions 7mm left and 8mm right, max protrusion 10mm and deviation on opening was 5mm to the right.

5. Diagnostic Procedures

- a. Computerized Electrosonography
- b. Computerized Mandibular Scanning
- c. Computerized Electromyography
- d. Imaging
 - i. Photo's
 - ii. Lateral Cephalogram
 - iii. Panoramic
 - iv. CBVT with TMJ's
 - v. Magnetic Resonance Imaging
- e. Study Model Occlusal Analysis

6. Analysis of diagnostic Data

- a. Computerized Electrosonography
 - i. Patient showed limitations in both range and velocity. Especially on closure speed is limited (fig. 13). May indicate sensitive teeth, lack of a balanced centric occlusion, or pain in musculature. Right joint shows "noise through the midpoint and beyond. The left shows a midpoint click on opening and "noise " on both open and close at midpoint and beyond. Patient condition has been present for a long time and thus accurate reading of scan is not valid. More conclusion can be noted with the scan 2 analysis and imaging. Certainly more anterior parts of the disc have degenerated in both shape and function allowing uneven movement down the slope of the eminence.
- b. Computerized Mandibular scanning
 - i. Pre ULF - TENS

1. Scan 2 reflects some of what was seen in the ESG's in regard to a very slow velocity on closure (fig. 17). Additionally there is a pronounced deviation to the left, which was noted, in the visual exam. Possible non-reducing disk status. Putting the ESG and the frontal on scan 2 together gives one the impression of a partial reducing disk during the last half of the open/close cycle. Patient signs of wanting to please and noted that it hurt some to open as she did, which confirms state as she did during the range of motion during the clinical examination.
2. Scan 3 shows a minimal freeway space of about 1mm and little AP (less than 1mm) and almost no lateral movement (fig. 18).
3. Scan 6 indicates a tongue thrust and would concur with the "trapped" tongue as indicated by the scalloped tongue border (fig. 19).
4. Chewing cycle of scan 8 shows a CO point of contact that is repeatable and focused (fig. 20). However it also shows lack of symmetry in the chew cycle with most of Mandibular movement taking place to the left of center.
5. Scan 13 shows a dramatic image of the deviation of the mandible to patient's left of 10.5mm (fig. 21). There is also limited lateral movement to patients right and cross over in the sagittal showing possible patient desire to come more anterior.

ii. Post ULF- TENS

1. Scan 4/5 showed additional freeway space development (fig. 27). AP trajectory showed minor changes to a more anterior position. The lateral was hard to analyze but based on prior scans it is felt patient has potential to develop a small left correction. This would concur with model analysis that follows here. The Golden Vertical is calculated at 20.5 however due to condyle degeneration possible a bite was marked to be about .5mm beyond so as to open the bite .5mm more than GV shows (fig. 28). To help insure muscle physiological neutrality another scan was done with selected points to evaluate EMG's of muscle action at various locations within the likely

cylinder of physiological homeostasis (fig. 29). The three points arrived at had the best *region* before muscle groups started to activate at *outer* points of rest position that muscle spindles demonstrated.

c. Computerized Electromyography

i. Pre ULF-TENS

1. Scan 9 shows an elevated Anterior Temporalis bilaterally (fig. 22). Otherwise readings are low, in fact perhaps a bit too low considering patient knows she clenches and bruxes. One would expect higher readings under such conditions.
2. Scan 12 shows new information with a lag of the masseters relative to the anterior temporalis (fig. 23). This may indicate a “posturing” of the mandible prior to major activation of chewing muscles. This would add support to jaw posture being unbalanced versus tooth sensitivity.
3. Scan 11 shows modest improvement with cotton under load (fig. 24). Also shows worse action by masseters than the anterior temporalis. Masseters improved with cotton suggesting that increased vertical may be at fault.
4. Scan 18 shows fatigue pretens (25). Given the long-term condition possible conditions will be withheld till more data is acquired.

ii. Post ULF – TENS

1. Scan 10 shows a marked improvement in all muscle group values. Again there is question on overall numbers due to active parafunctional habits of clenching/bruxing (fig. 26).
2. Scan 18 continues to indicate possible fatigue. Noted that again the numbers do not form trends and will be evaluated later in the treatment phase. Given the past history, the patient was informed that this would likely have an ascending component (fig. 30)

d. Imaging

- i. Photographic images show asymmetry in lower lip. Upper lip is smaller in proportion to lower lip. Possible mouth breathing. Gingival attachment is adequate and oral hygiene appears good.

- ii. Lateral Cephalogram was not to evaluate possible orthodontic issues at this time. More it was to evaluate possible cervical damage that might affect our portion of care. Portions shown note cervical damage in both the lack of consistent arc of curve as well as spacing. Indications of Spondylitis between C2,C3,C4 is noted.
- iii. Panoramic image shows relationships of teeth to jaws. Additionally airway may be an issue as “shadow” shows minimal passage ways (fig. 15 arrows). Though not diagnostic it does go along with clinical exam findings. Dental midline shift can be seen as it displays in the mouth as well.
- iv. Cone Beam Volume Tomography provides additional information to include the TMJ. Corrected tomographic views show pathological condition of both joints. Cortical erosion and arthritic processes are suspected. Substantial beaking of the left joint is noted. Eminence on left shows pathological remodeling. The right TMJ appears to be in a distalized position relative to the anterior space. The left TMJ reveals minimal disk space superior to condyle. Frontal view shows a pronounced beaking of left joint and may indicate remodeling due to forces beyond physiological homeostasis.
- v. MRI study was repeated from an earlier one. The first study stated a right TMJ disk displacement into a lock position. The current study was reviewed by a radiologist who stated that right was within normal limits, however the left had anterior displacement with recapture. This study was reevaluated at University of the Pacific and it was felt the left did not have recapture. For purposes of this report I could not include all images of the scan. Such review is needed to see the progression of the disk upon translation to fully appreciate the movements. I would like to state here that it would be beneficial if reporting providers would state the cut number(s) they judged their conclusions on. This was not done with either study. The K7 data tended to confirm disk displacement with no recapture. Certainly the condition of the condylar/emminence bone could lead to a number of hybrid situations of partial disks or connective tissue replacement or portions there of the disk complex (Figs. 11,12)

- e. Occlusal Analysis with study models showed a dental midline shift of 2mm to the patients left. Dental Classification of occlusion is noted under the examination of patient in this report. Width of central incisor was 9.8mm and the vertical index was 18.4mm. Calculated golden vertical was 20.4mm. Dental occlusion had been *created* by orthodontic history (fig. 4,5,6). HIP mounting indicates a cant superiorly to patients left. Reduced Curve of Spee on patients left and with no curve on right is observed (fig. 7,8). Teeth #26 and 31 as well as third molars are noted to be missing. Maxillary anterior teeth show to be out of balance to ideal proportions as revealed by calculated vertical indexes listed above.

7. Diagnosis

- a. Patient's diagnosis included Temporal Joint Disorders Articular Disk Disorder (ICD 524,63)
- b. Headache with Facial Pain (ICD 784)

8. Treatment Objectives were to avoid surgery or additional orthodontics. Re-posturing of the mandible into a physiological location, reducing cranial and cervical pain, improve head/cervical posture, promote improved coordinated muscle function, and reduce TMJ compression in all three dimensions.

9. Treatment Provided included creation of a fully anatomical neuromuscular orthotic (fig 31,32,33,34). Space of tooth #26 and #31 was to be included in the appliance. Patient was referred to cervical chiropractic specialist for evaluation and treatment of the cervical complex. Literature and resources were reviewed and provided to help patient with lifestyles issues that seem to be contributing to her conditions instability.

10. Treatment Outcome Data (provided 3 months post insertion)

- a. Photos: Body posture seemed to be influenced in that preop full frontal photo (fig. 1) shows possible left shoulder dropoff. This appears improved in photo with orthotic in place (fig. 35)
- b. Computerized Mandibular scanning (Pre & Post ULF-TENS)
 - i. K7 usage shows in scan 2 that in the sagittal display good trajectory with open/close cycle (fig. 36). Minimal crossover is noted as tracing almost runs over each other showing mandible consistent path with travel from open to close. The frontal tracing continues to show strong left deviation and appears to confirm other data suggesting a non-reduced disk on left side. There could be adhesions and bony impediments that would provide similar movements in translations. This

could be anticipated as accidents have happened over several decades. Velocity also is affected particularly under the “wide and fast” cycle. The closure path shows a marked slowdown indicates jaw having to reposition in its travel back to CO from such a marked lateral shift.

- ii. Scan 4/5 displays freeway space of approximately 2mm. Trajectory is good over the close cycle even as patient over opens in the effort to tap together. This behavior also gave a noted right shift in the frontal display. This should be noted however behavior is out of sync with other controlled data and images and is only noted and not given weight (fig. 39)
- iii. Several EMG points were taken and marked (fig. 40). These were then displayed to see range of muscle activity over a greater range of mandible positions (fig. 41).
- c. Computerized Electromyography (Pre & Post ULF-TENS)
 - i. Scan 9 shows a much-improved muscle rest position with orthotic in place (fig 38).
 - ii. Scan 11 show much improved muscle recruitment (fig. 37). It is noted that clench with cotton was done on third clench and it did not decrease. This might indicate additional room of adaptability with additional vertical latitude in which to position arches if any phase II treatment is contemplated.
 - iii. Scan 12 also shows better coordination of interactions with arches their respective dentition and elevator muscles groups (fig. 42)
 - iv. Scan 18 (post TENS) continues to show possible ascending issues. This data is taken after a number of cervical *adjustments*. Some degree of chronic dysfunction is to be expected due to cervical tissue damage during multiple auto accidents and numerous dental interventions.

11. Analysis of Outcome Data: Patients improved movement/function (scan 2,11) were welcomed, especially in the presence of a history of multiple auto accidents and jaw fracture. Good attainment of a symmetrical myotrajectory was also good results to see (scan 4/5). EMG normal values attained were consistent with a decrease in symptoms reported by patient (scan 9). Patient reported a significant decrease in frequency and intensity of headaches and no longer had jaw pain. Cervical issues continued with various symptoms waxing and waning with periods of higher job stresses. Patient feels she clenches more during these periods.

12. Narrative Abstract of Case

- a. Patient presented to my office with a multitude of pain and function related problems. Pathology involved long periods of decades and a number of major dental interventions to try to help. Her four most severe complaints (being a 10 of 10 in intensity and 4 of 4 in frequency) were: jaw pain, neck pain, shoulder pain, and back pain. Persistent headaches were also reported medications seemed to help these prior to our treatment and so patient had a harder time quantifying these. Comprehensive exams with imaging studies were completed. K7 data also was collected to create a diagnosis on which treatment was accomplished. After three months with a neuromuscular orthotic patient reported much lower numbers. All went down to a 1 or two in frequency and intensity was in the 2-4 range. The only exception to this was her shoulder pain, which only improved modestly.
- b. Co-treatment with cervical chiropractor seemed not to help as much as hoped for. Patient selected this provider. Patient was very cooperative with care. I do not feel she is ready for a Phase II at this time.

13. **Future Treatment Recommendations** include patient to get her work schedule under better control. I feel this adds considerable stress to the body, as does the constant travel. To this the patient needs to become more involved in an exercise and nutrition program, which she still does not have ownership of. I want to evaluate her selection of chiropractor for data of treatment of her cervical and other spinal issues. It is understood that one needs 85% resolution of deviations of Atlas/axis complex deviations to get dependable decrease of symptoms and signs. Completion of the implant on 26 is to be accomplished with adjustment to the orthotic. Certainly if we can have a long-term stability of reduced symptoms the patient could contemplate another course of orthodontics or a restorative approach with comprehensive crown and bridge. Before this Phase two I would have patient go to a 24/7 usage of orthotic or go to fixed orthotics for 12 months. After which new images would be taken to evaluate possible early changes in joint position and remodeling.



Figure 1



Figure 2



Figure 3



Figure 4



Figure 5



Figure 6

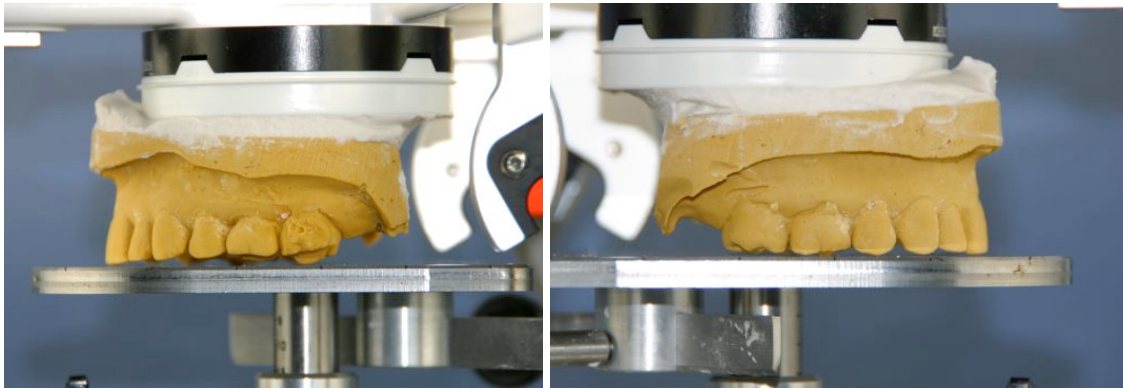
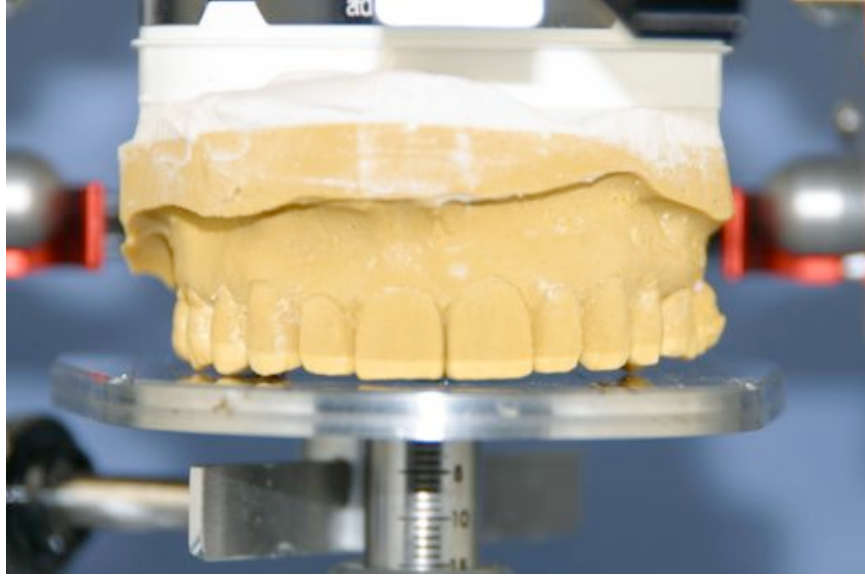


Figure 7



Figure 8

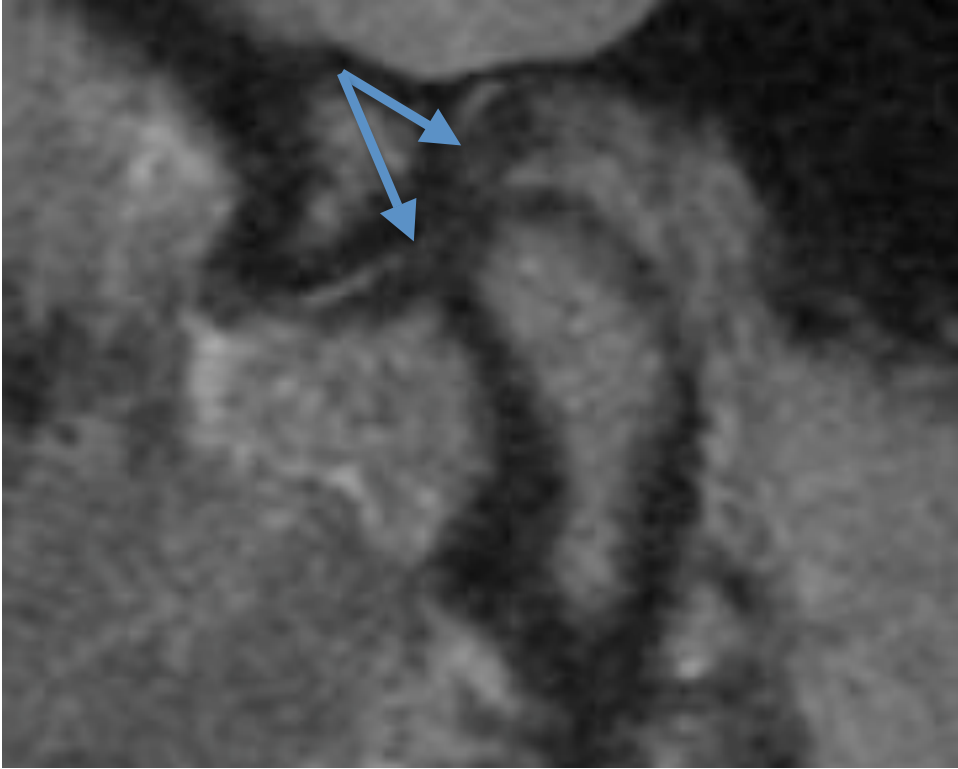


Figure 9

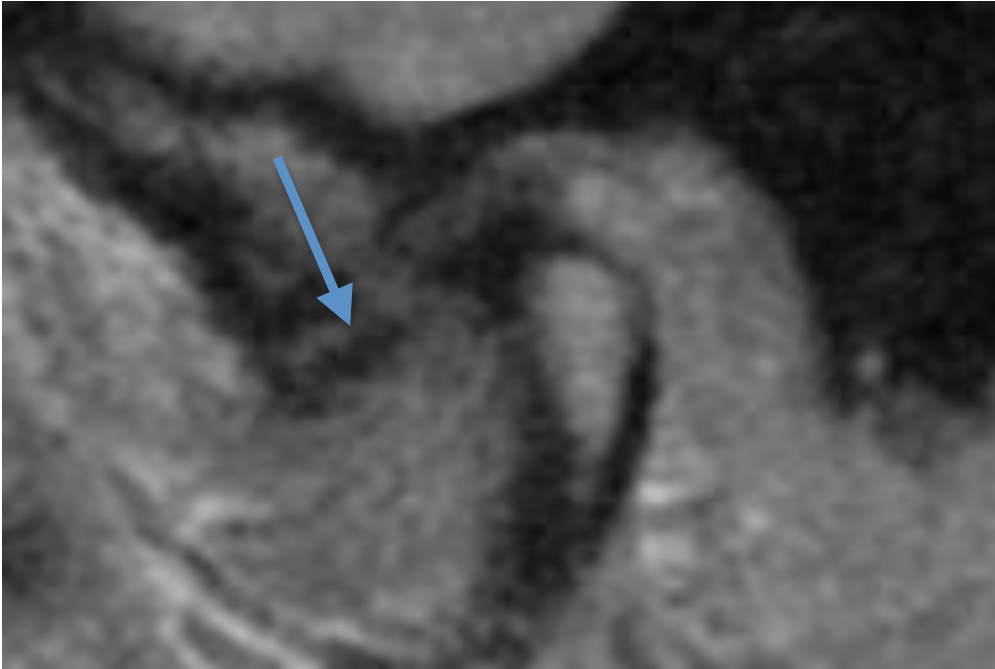


Figure 10

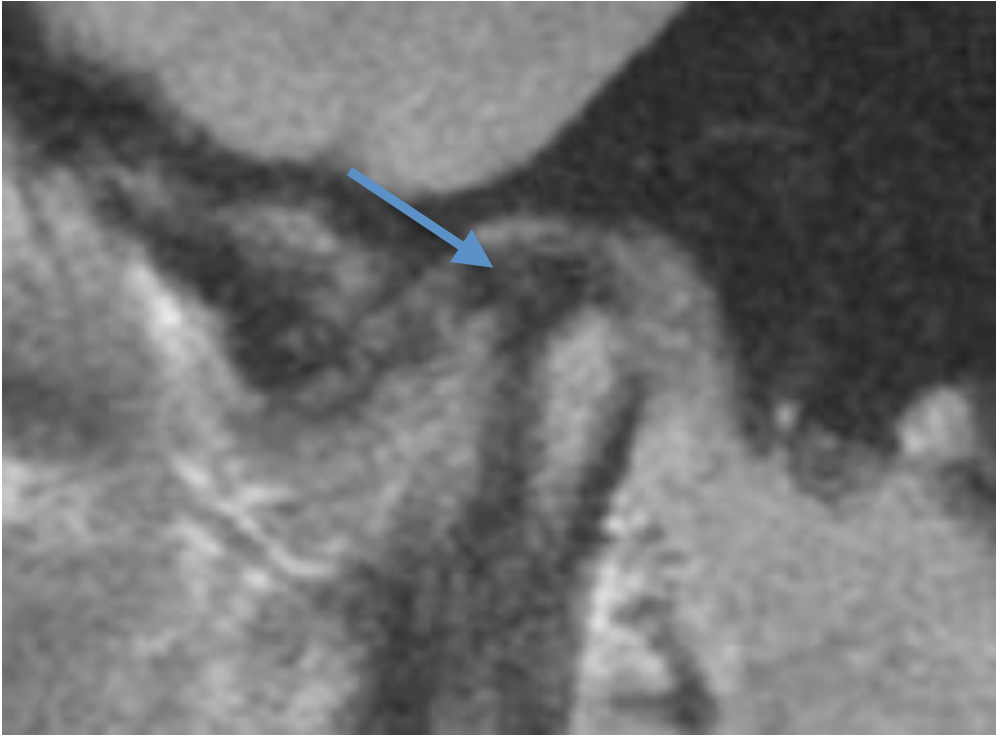


Figure 11

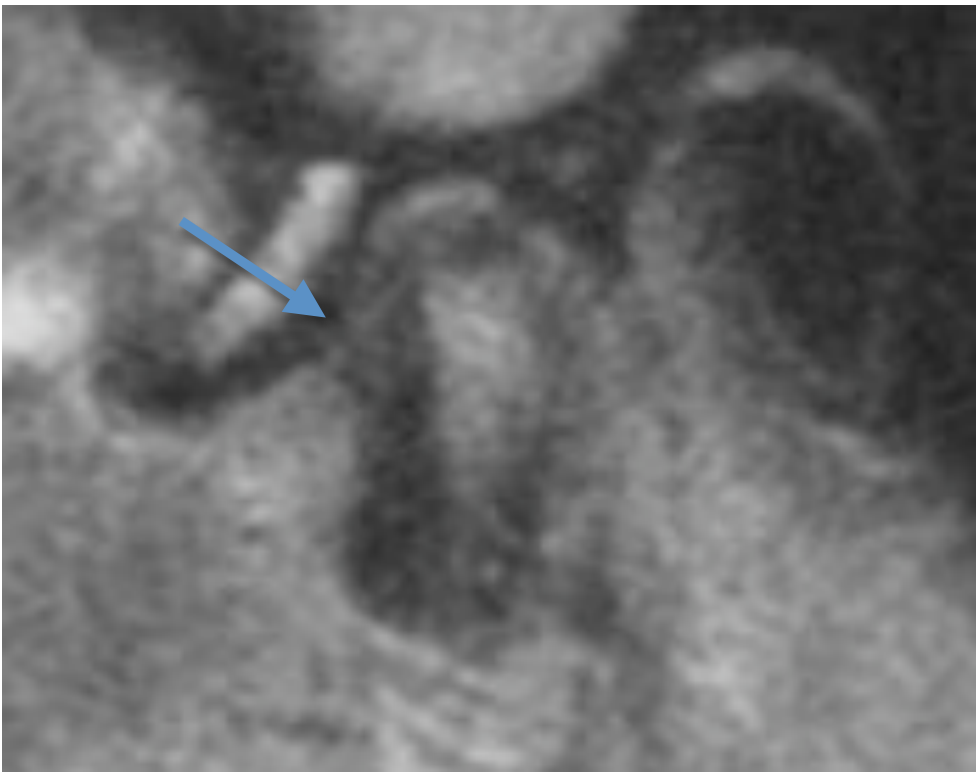


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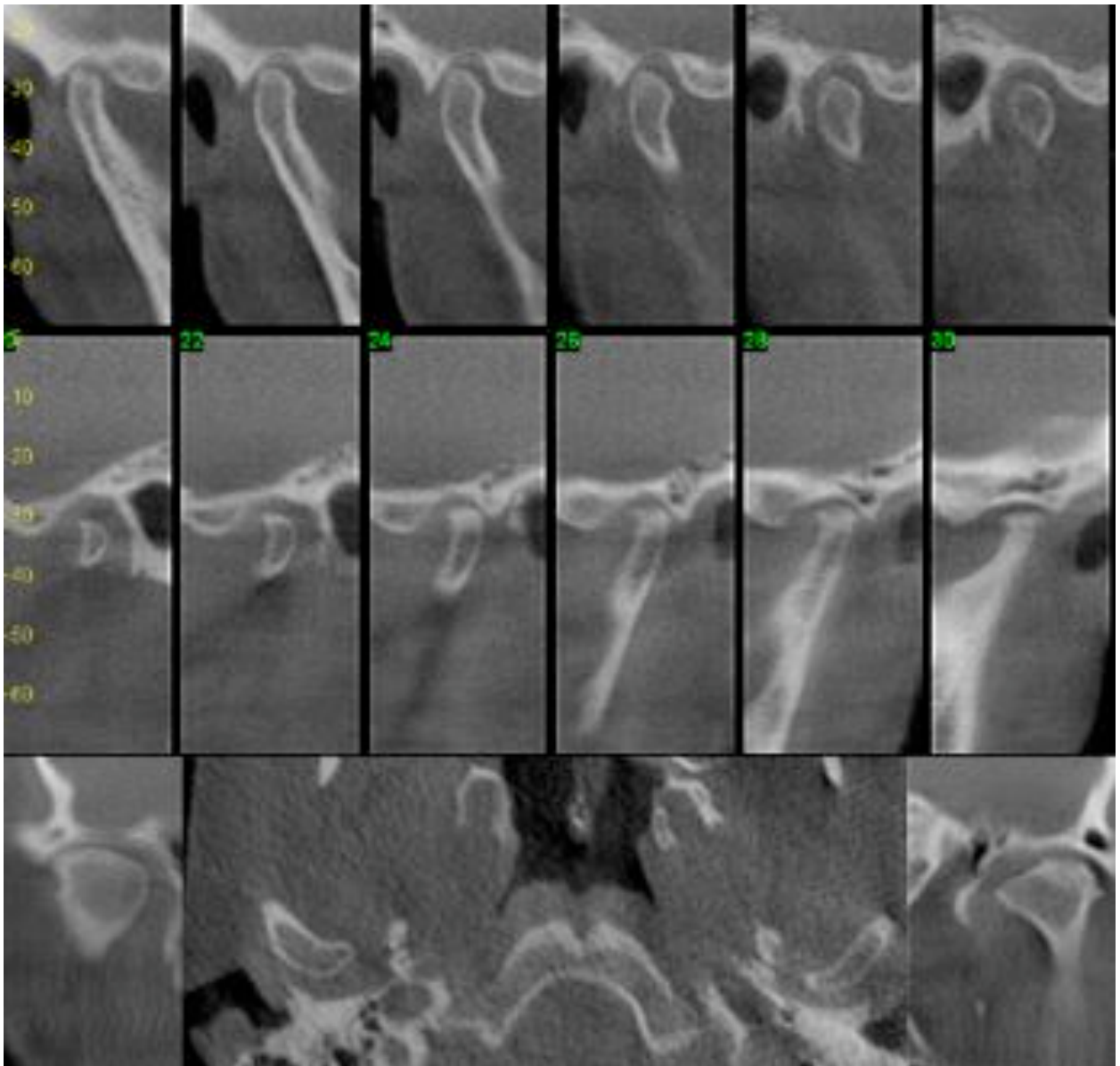


Figure 13



Figure 14



Figure 15 Panorex

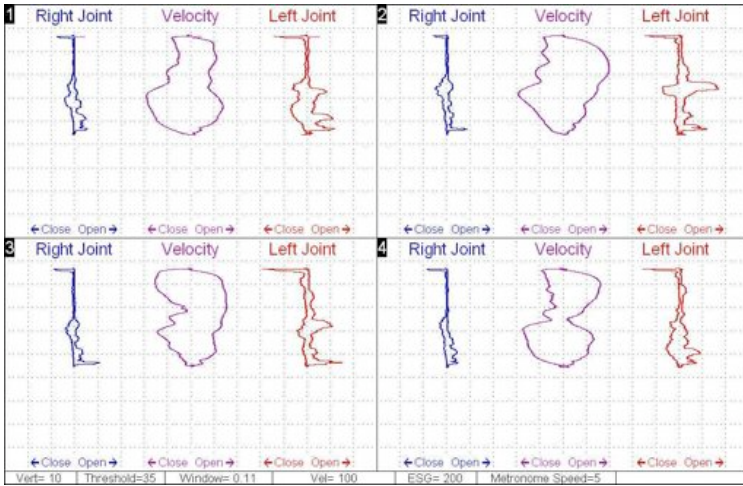


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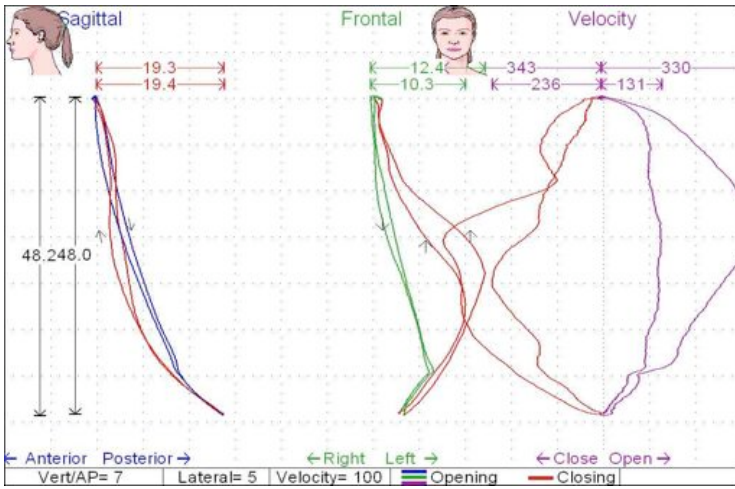


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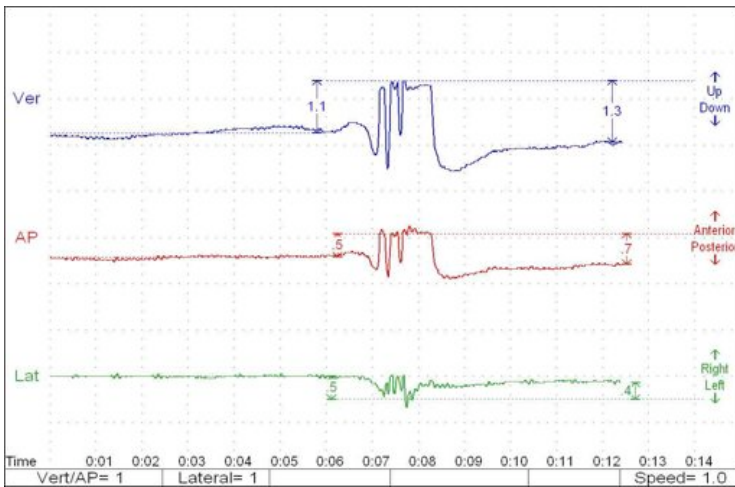


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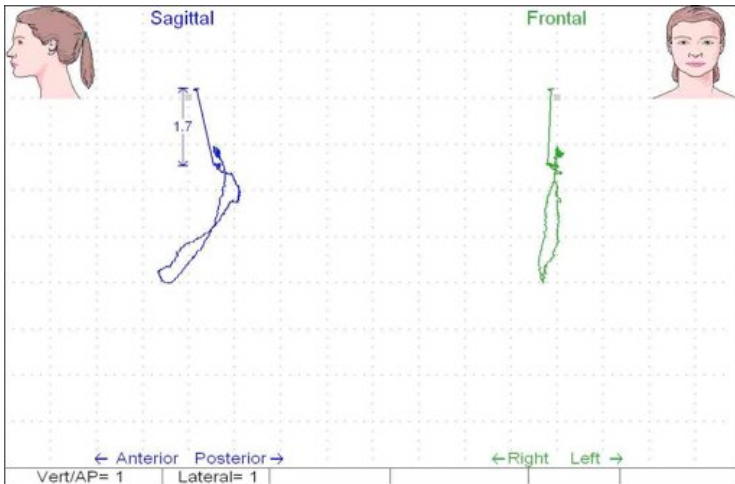


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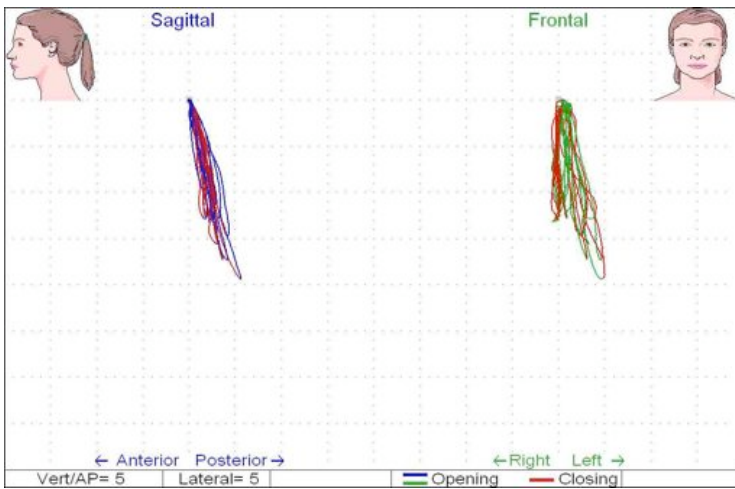


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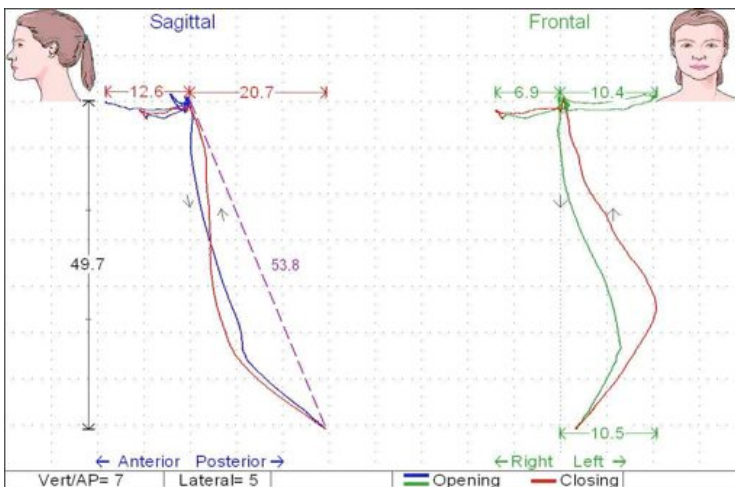


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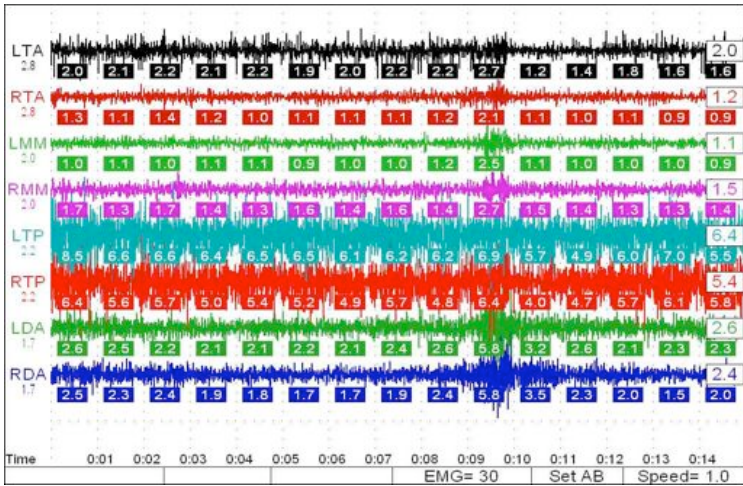


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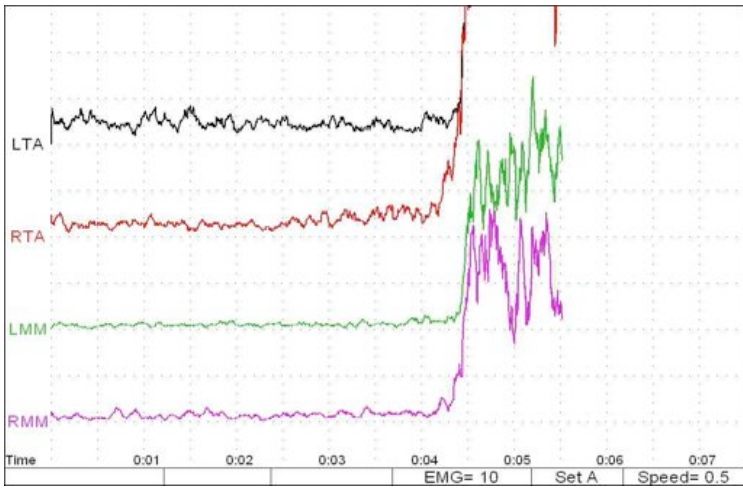


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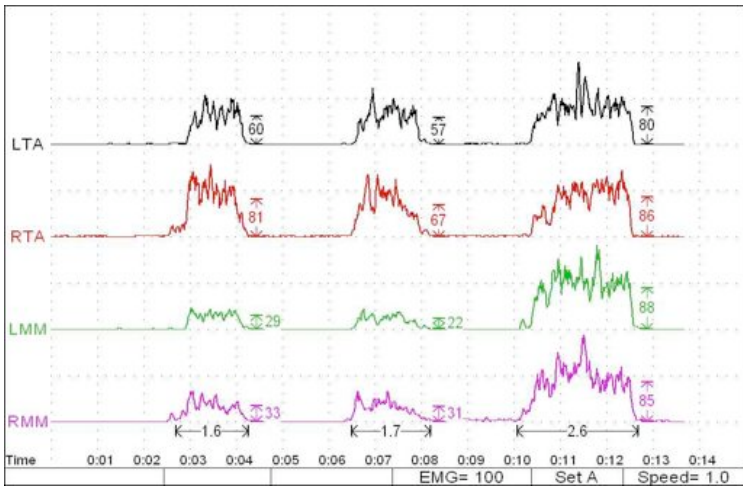


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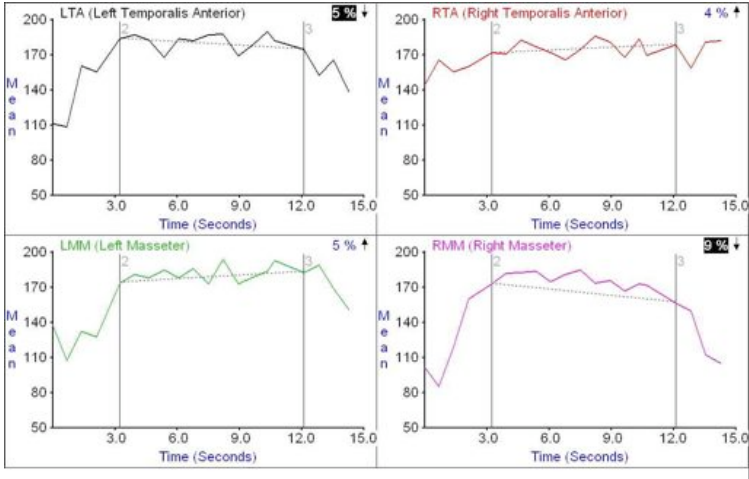


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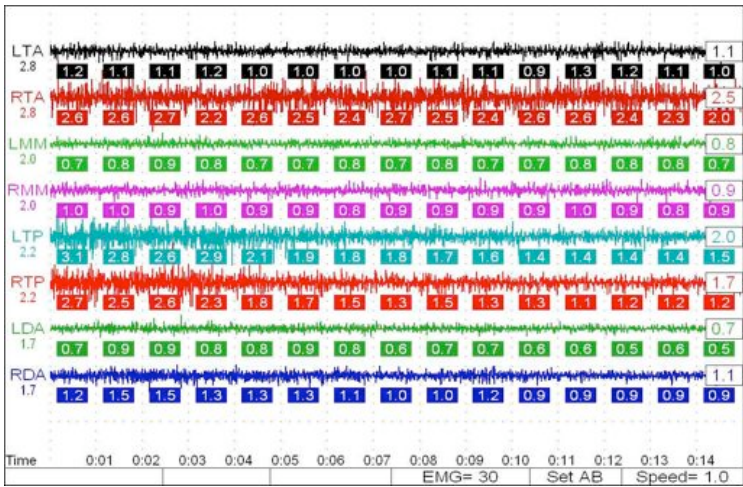


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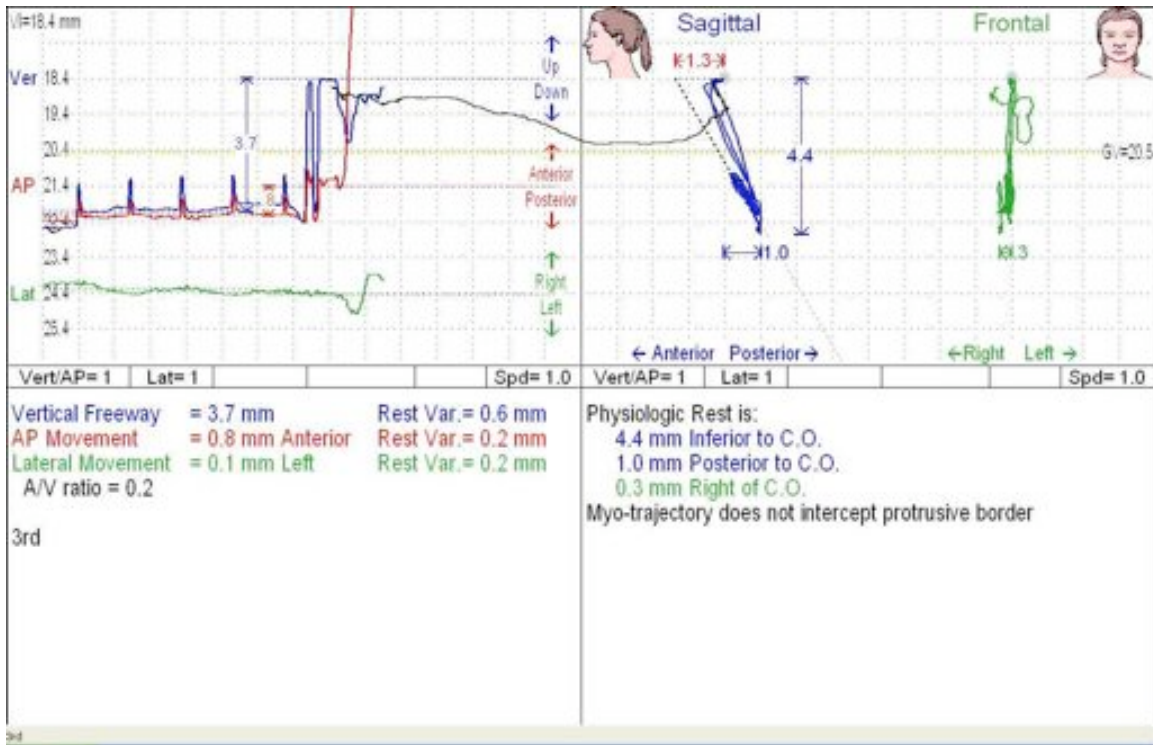


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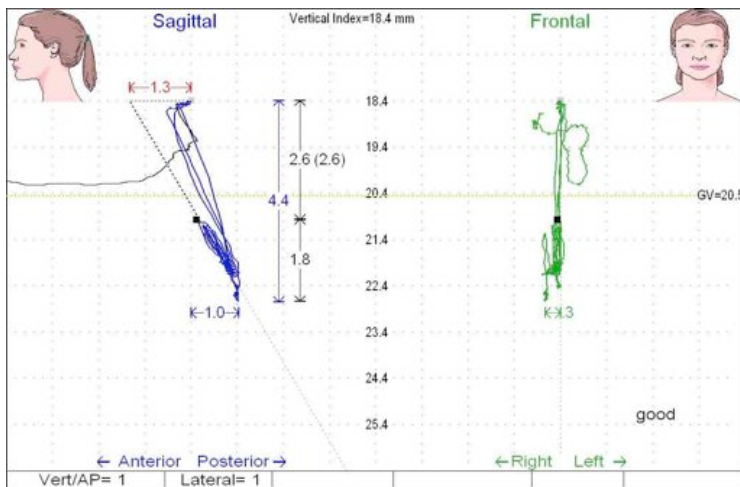


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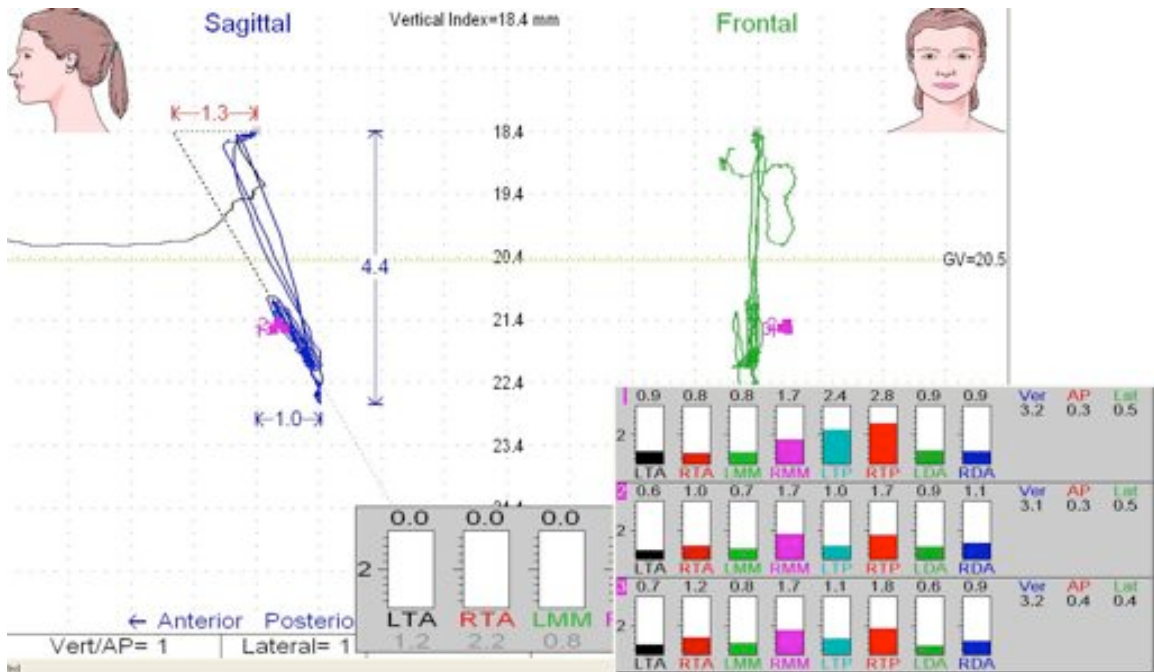


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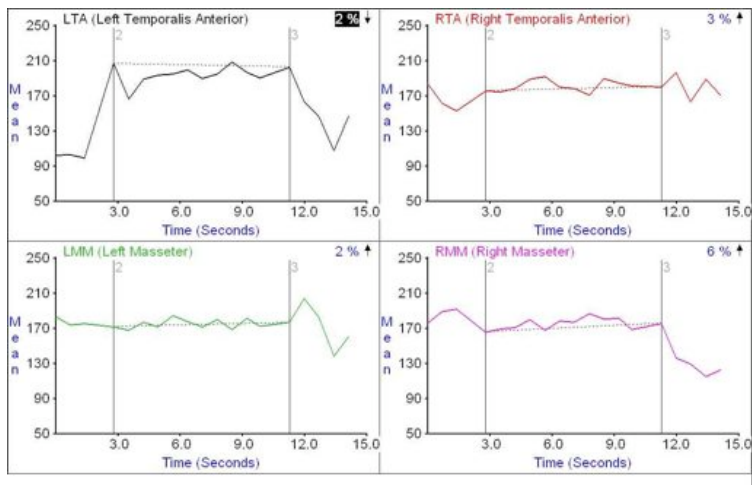


Figure 30



Figure 31



Figure 32



Figure 33

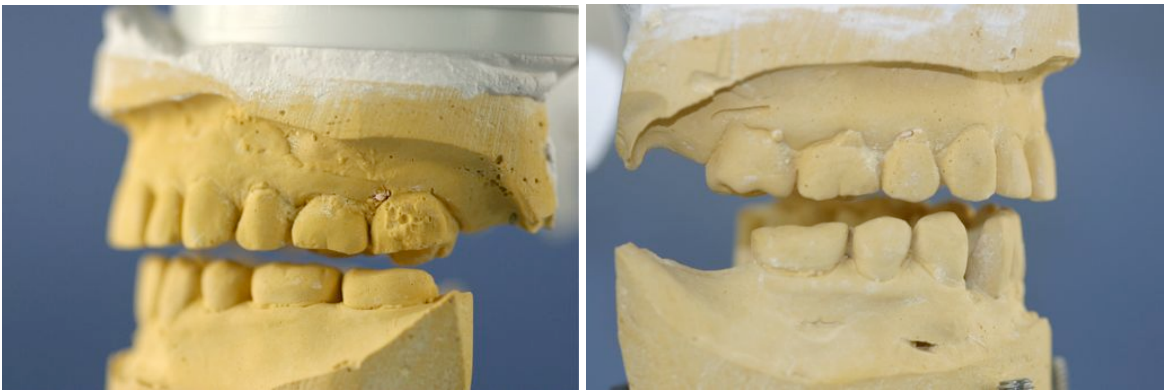


Figure 34



Figure 35

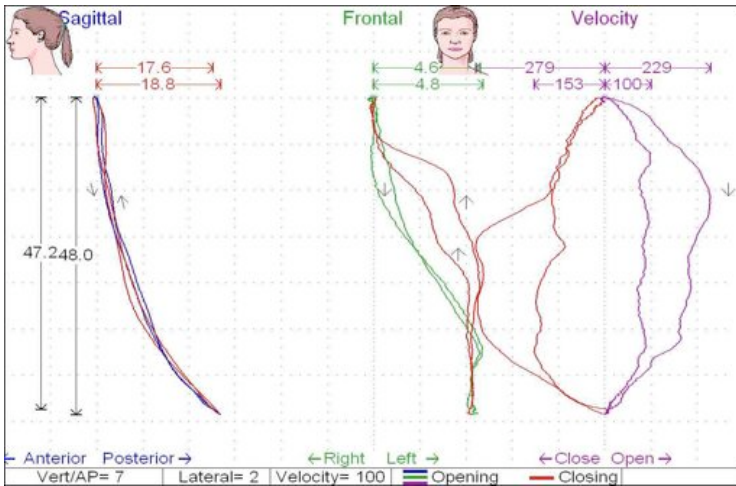


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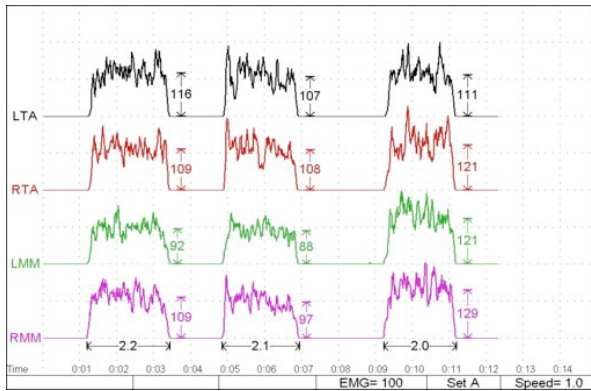


Figure 37 with orthotic 3mo later

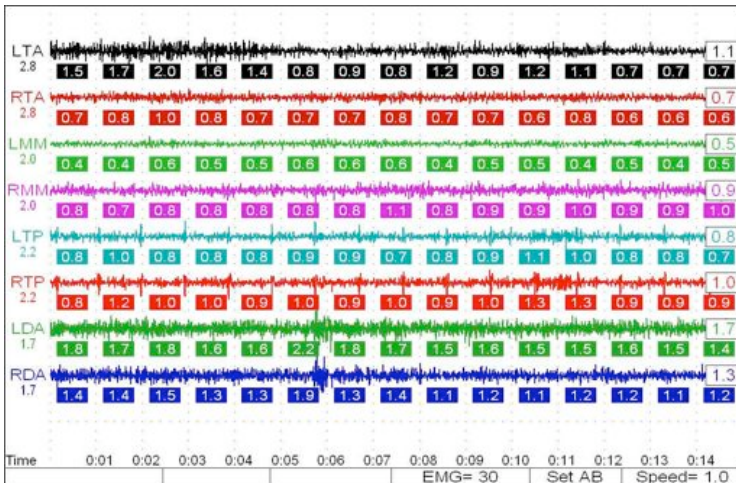


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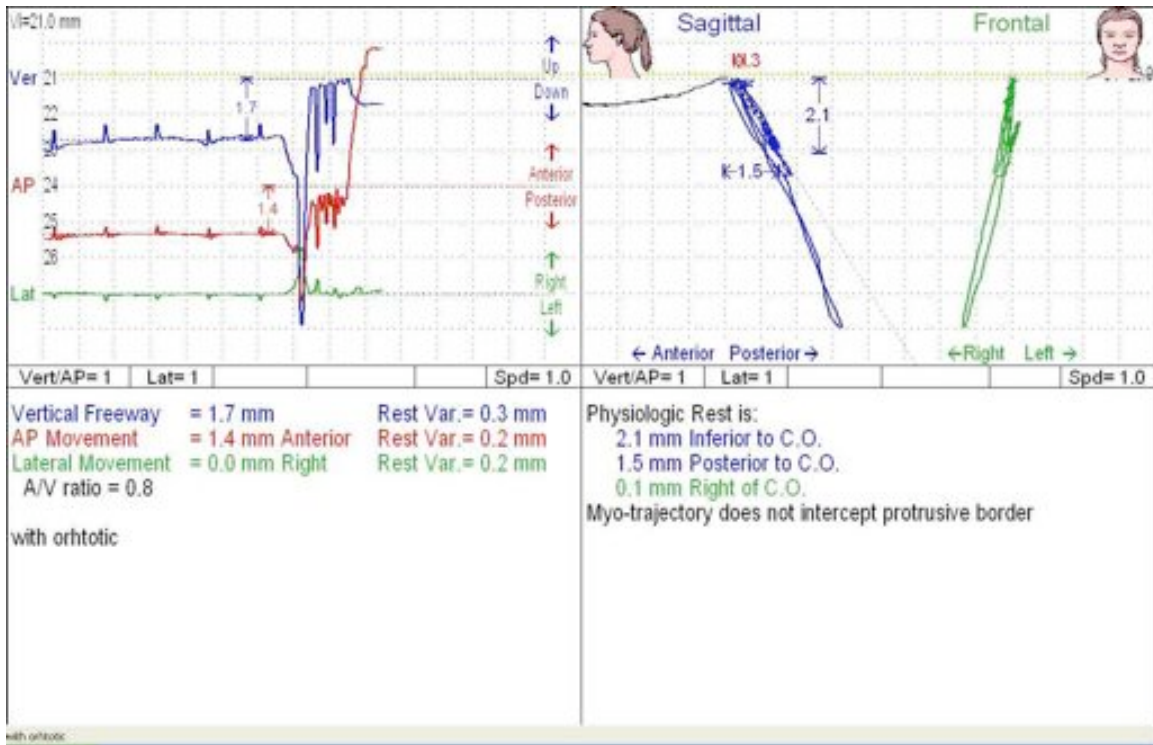


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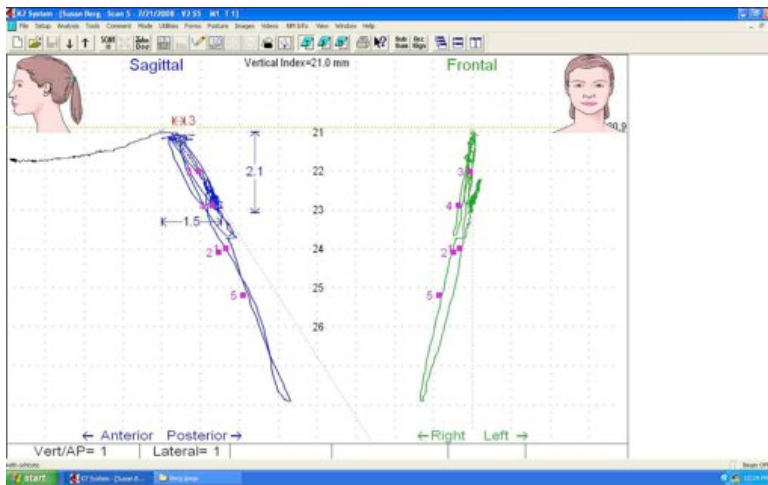


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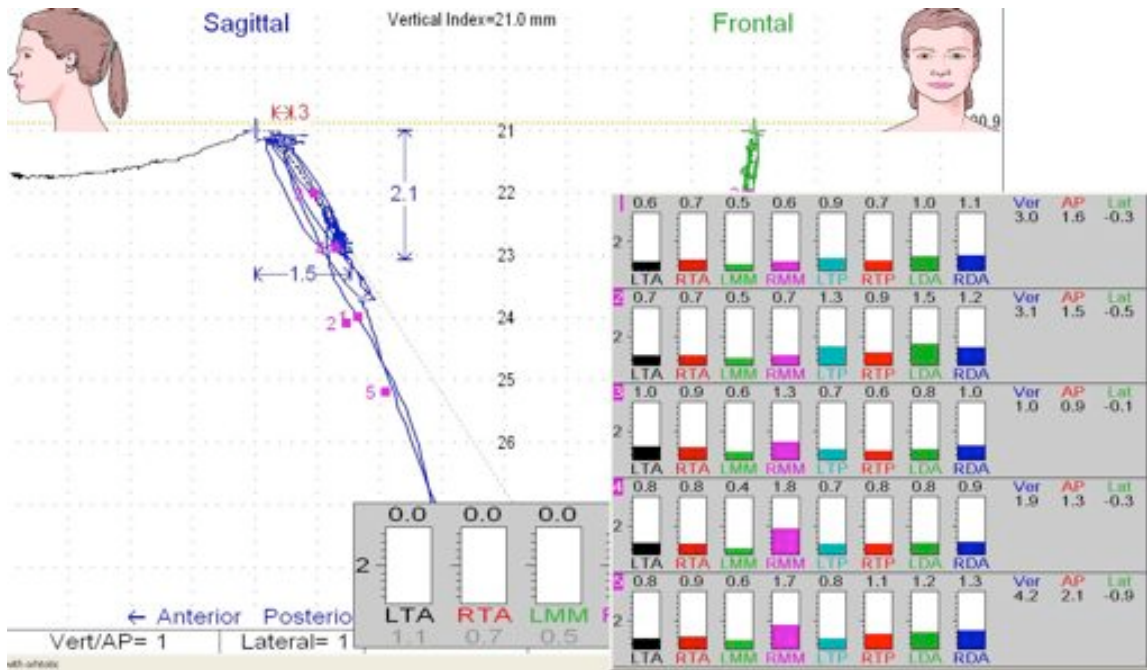


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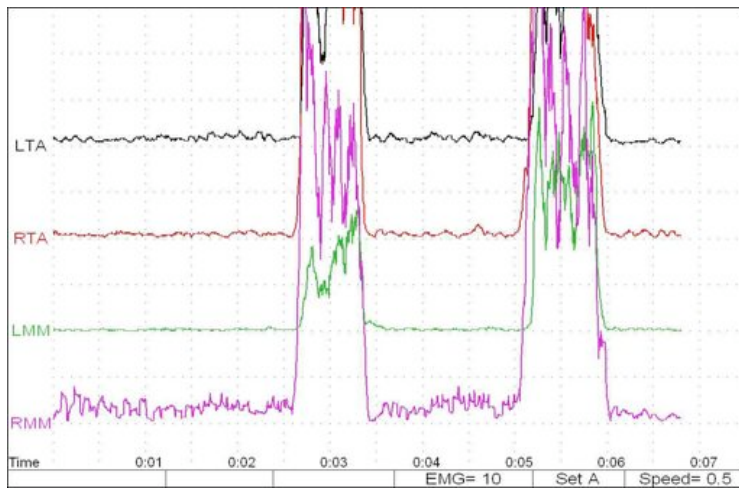


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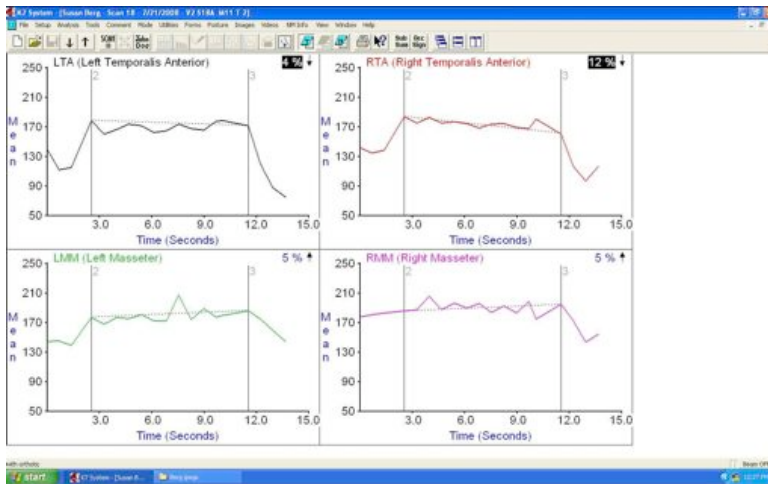


Figure 43