SLEEP REPORT 1

Synopsis

Introduction

This patient is a 53-year-old male (DOB 21.09.1968) who was referred by his sleep physician following a sleep study dated 20.04.2021. His main chief complaint was a chronic cough, in the background of snoring and nocturnal bruxism. The patient initially consulted his respiratory physician for a 4-year history of persistent diurnal coughing, whereby a comprehensive lung assessment was completed, which was unremarkable. As he had signs and symptoms of sleep apnoea, including snoring and daytime fatigue, a sleep study was recommended and completed, which confirmed moderate to severe obstructive sleep apnoea. Options of a mandibular advancement device (MAD) or nasal CPAP were discussed, for which the patient elected the former. He presented to me for an initial consult on 27.05.2021.

Chief Complaint

The patient's primary complaint was a persistent cough, for which he reported consulting multiple specialists, including an allergy specialist (clinical immunology), ENT, and a respiratory and sleep physician. The latter of which recommended a sleep study, which confirmed the presence of obstructive sleep apnoea (OSA). The sleep physician advised that his persistent coughing may be related to his OSA and, as such, recommended its treatment. A secondary complaint for the patient was snoring, as it disrupted his partner's sleep. His partner also reported grinding noises when he slept.

History of Present Illness

The patient has had a long-standing history of chronic cough, initially investigated for allergies and ENT causes. Despite surgical interventions and nasal sprays, symptoms persisted. He had also completed a 6-month trial of proton pump inhibitors with no improvement. A sleep study (20/04/2021) confirmed moderate obstructive sleep apnoea with an Apnoea-Hypopnoea Index (AHI) of 18 and a minimum O_2 saturation of 86%. Snoring was also reported in the sleep study.

His snoring volume was reported as 4/10, and he experienced occasional gasping and snorting. He reported feeling mildly unrefreshed in the mornings and experienced morning headaches less than once a week. He reported mild daytime lethargy and experienced drowsiness with sedentary activities occasionally during the day and evenings. He had concerns about his memory, but was able to concentrate. He reported altered moods and generally reduced motivation. His Epworth Sleepiness score (ESS) was 2. He did not report any arthrogenous or myogenous TMD symptoms, although he noted his partner reported some grinding at night.

He did not opt for a CPAP as he did not think he could sleep with a nasal pillow or mask.

Past Medical History

The patient weighed 91kg and was 180cm tall with a BMI of 28.1. Medical history was significant for post-traumatic stress disorder, depression, and anxiety (managed with escitalopram 30mg, under psychiatric and psychological care).

Clinical and Radiographic Examination

The patient presented with a class II molar and incisor relationship, with an overjet of 4mm and an overbite of 5mm. There was a 1 mm midline shift to the left. All teeth were present, with no signs of

mobility and no periodontal pathology noted. The restorative work was in good condition. Moderate occlusal wear was noted, with shiny wear facets evident, suggesting active parafunction. Oral hygiene was good.

Maximum mouth opening was 50mm, with a right lateral excursive of 11mm and a left lateral excursive of 10mm. Maximum protrusion was recorded at 12mm. There was no deviation or deflection noted on opening or protrusion. TMJ examination revealed no joint sounds or pain on palpation, and there was no tenderness of the masticatory muscles.

The soft tissues of the oral cavity, including the tongue (Friedman tongue position grade II), palate, uvula, and tonsils (Friedman tonsil size grade 1), appeared normal in size and contour, with no soft tissue lesions identified. Salivary flow was adequate, and the oral mucosa was moist.

Diagnosis

The patient underwent a diagnostic polysomnography (level 1) on 20.04.2021, which demonstrated moderate OSA with an overall AHI of 18.0 (reported at moderate-severe OSA as Sleep WA reports AHI 25-30 as moderate to severe sleep apnoea. He had a supine AHI of 72.2 and a non-supine AHI of 5.72, which indicates supine-dominant, positional OSA. His sleep efficiency was 83.9% in the tests. His lowest oxygen level was 86%. The report highlighted his frequent snoring.

Rationale

A nylon dorsal fin mandibular advancement device (3DS Advance) was chosen as the most appropriate treatment option due to the need to manage OSA in the background of possible significant nocturnal bruxism. The patient also had a good set of dentition and restorations, and as such, was at low risk of significant dental work in the future. This is ideal for a nylon appliance, as it's less forgiving to adjustments. The appliance's initial starting position was 7 mm out of a possible 12mm (58.3%).

Results

The patient experienced significant improvements in symptoms after appliance insertion, including a reduction in coughing frequency (from 100 times per day to 10 times per day), a marked reduction in snoring, and subjective improvements in morning refreshment. Side effects included transient jaw muscle soreness, mild anterior teeth sensitivity, and occasional gag reflex, which decreased over time. Appliance titration progressed up to 10 mm of 12 mm. A treatment sleep study confirmed partial improvement of his AHI scores and snoring. His overall AHI reduced from 18 to 8, with a reduction in supine AHI from 72.2 to 30.6. There was a reduction in non-supine AHI from 5.72 to 3.59. The lowest oxygen desaturation increased from 86% to 89%. The recommendation was to continue titration of the MAD if the patient remained symptomatic, weight reduction, and avoidance of sleep in the supine posture.

Disposition

The patient had a reasonable amount of success with his MAD and was advised to continue using the MAD nightly at the titrated position. He could not titrate any further due to masseter myalgia. As such, the sleep physician recommended avoiding sleeping in the supine position and weight loss to manage the residual OSA. Regular reviews were scheduled.

Follow-Up Visits

Patient DOB: 21.09.1968
Initial consult: 27.05.2021
Appliance insert: 08.07.2021. **Starting position:** 7mm out of 12mm

DOS: 26.08. 2021 – 1st review after appliance insert

Subjective: Patient reported a 75% overall improvement. He reported his diurnal coughing has reduced dramatically, from 100x per day to 10x per day. Additionally, his wife is extremely happy with his level of snoring. He still reported moderate tiredness but advised that this may be due to his known PTSD and depression. He reported side effects such as morning muscle soreness of his masseters, which can last up to 60 minutes post-appliance removal, and maxillary tooth sensitivity (approximately 20-30 minutes after removal). He reported an increase in his tab by +2 (2mm) bilaterally. He did attempt moving up to 3mm; however, his muscles were too sore at this position. His ESS was 5.

Objective: Appliance titrated to 9 mm out of 12 mm. The maximum opening is 50 mm, with lateral excursive movements of 10mm. There was no deviation or deflection noted on opening or protrusion. TMJ examination revealed no joint sounds or pain on palpation. However, bilateral masseter and temporalis tenderness were noted. His molar occlusion remained as Class II, with contacts throughout. There were no hard or soft tissue abnormalities intraorally.

Assessment: Moderate OSA with significant subjective improvement. The appliance was well tolerated with minor side effects.

Plan: Continue nightly use. Advance appliance by +1 mm bilaterally if tolerated. Discussed jaw stretching exercises in the mornings to aid with his masticatory muscle pain. Review in 2 months.

DOS: 02.12.2021 – 2nd review after appliance insert

Subjective: Coughing remains at 5–10 times per day, indicating sustained improvements from wearing the appliance. His morning jaw soreness has reduced to approximately 5–10 minutes, and he no longer experiences maxillary tooth sensitivity. He reported an overall 50% improvement in his symptoms from his last visit. His wife remains satisfied with his level of snoring, with no gasping or snorting observed. The patient feels mildly refreshed in the mornings but still experiences moderate daytime lethargy. His ESS was 9.

Objective: Appliance titrated to 10 mm/12 mm. The maximum opening is 51 mm, with lateral excursive movements of 10mm. There was no deviation or deflection noted on opening or protrusion. TMJ examination revealed no joint sounds or pain on palpation. There was no tenderness on his masseters and temporalis. His molar occlusion remained as Class II, with contacts throughout. There were no hard or soft tissue abnormalities intraorally.

Assessment: Moderate OSA with significant subjective improvements that have been maintained. Appliance is still well tolerated, and side effects have reduced.

Plan: Maintain current position (10mm/12 mm). Proceed with the treatment sleep study. Next review in February.

DOS: 17.02.2022 – 3rd review after appliance insert

Subjective: Patient completed a treatment sleep study on 20.01.2022, which reported an overall decrease in AHI to 8.0. Supine AHI reduced to 30.6, and non-supine AHI to 3.59. (from 18.0, 72.2, and 5.72, respectively). It was reported that there was mildly persistent sleep apnoea and snoring despite use. The recommendations for the patient from the sleep physician included weight loss, avoidance of sleep in the supine posture, and further titration of the MAD.

The patient reported sustained improvement with the appliance. He still experiences coughing during the day, albeit much reduced from when it started. He reported no side effects from the treatment, including no muscle pain or maxillary tooth sensitivity. He reported mild lethargy, being mildly unrefreshed in the mornings. His ESS was 5.

Objective: Appliance titrated to 10 mm/12 mm. The maximum opening is 51 mm, with lateral excursive movements of 10mm. There was no deviation or deflection noted on opening or protrusion. TMJ examination revealed no joint sounds or pain on palpation. There was no tenderness on his masseters and temporalis. His molar occlusion remained as Class II, with contacts throughout. There were no hard or soft tissue abnormalities intraorally.

Assessment: Appliance is partially effective with residual OSA confirmed. Symptoms improved but were not resolved.

Plan: Continue current MAS (Nylon Dorsal). Titrate +1mm bilaterally if possible. Follow-up scheduled in 6 months.

SUMMARY

This is an interesting case whereby the chief complaint was not excessive daytime sleepiness, gasping or choking during sleep, snoring, or other common complaints of OSA. Rather, coughing fits were predominantly in the day and sometimes at night. This has been reported in the literature before(1-3), whereby usual reasons for chronic coughing, such as gastro-oesophageal reflux disease, cough variant asthma, and upper airway cough syndrome, have been ruled out and patients have been found to have OSA, the treatment of which partially or completely alleviates the symptoms of their cough. The suggested mechanisms for cough secondary to OSA include(4):

- increased sensitivity of the cough reflex due to airway inflammation, which is found in patients with OSA.
- Increased incidence of GORD in OSA patients
- OSA is the possible cause of tracheobronchomalacia

This highlights the importance of considering OSA in the differential diagnosis of idiopathic chronic cough, particularly in patients where conventional causes have been excluded. Recognition of this association is valuable, as timely identification and management of OSA not only addresses the

cough but also reduces the broader systemic risks associated with untreated sleep-disordered breathing. To the author's knowledge, there have been no case reports or studies published on the efficacy of MAS in treating chronic cough secondary to OSA, and as such, it is presented as a unique case.

References:

1. Birring SS, Ing AJ, Chan K, Cossa G, Matos S, Morgan MD, et al. Obstructive sleep apnoea: a cause of chronic cough. Cough. 2007;3:7.
2. Birring SS. New concepts in the management of chronic cough. Pulm Pharmacol Ther. 2011;24(3):334-8.
3. Guilleminault L, Riou J, Pontier S, Sedkaoui K, Gagnadoux F, Trzepizur W. Chronic cough in patients with obstructive sleep apnoea: A prospective cohort study. Pulmonology. 2024;30(6):659-62.
4. Chan K, Ing A, Birring SS. Cough in obstructive sleep apnoea. Pulm Pharmacol Ther. 2015;35:129-31.

PRE-TREATMENT SLEEP STUDY

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In-Centre Diagnostic PSG Sleep Study Report

PATIENT DETAILS:

Location	Bethesda Private Hospital	DOB		21/09/1968	
Name		Study Date		20/04/2021	
Patient ID Number	56106	Report Date		30/04/2021	
Usual GP / CC		Height	180cm	Weight	90kg
Referring Doctor		BMI	27.7	ESS Score	2
Reason for Study	Investigation of OSA				

CONCLUSION:

A Polysomnography Diagnostic Sleep Study was performed in hospital to monitor sleep parameters including Nasal Flow/Respiratory effort/Pulse oximetry/ECG/Limb activity/EEG/EOG and Sub mental chin EMG activity. There were intermittent problems with nasal flow trace.
The ECG demonstrated sinus rhythm. **Sleep efficiency** was reasonable. Sleep latency was short. REM latency was delayed. There was a slight reduction in the proportion of REM sleep.
There was evidence of **moderately severe sleep apnoea**. This was worse in the supine posture. The patient did not describe somnolence. **There was frequent snoring**.
Consider **the option of a mandibular advancement splint or a trial of nasal CPAP.** The patient should avoid sleep in the supine posture. A follow-up appointment has been made to discuss the results of the study with the patient.

Respiratory and sleep Physician

RESULTS:

Key Indices	Results	Normative Values	Definitions
Apnoea Hypopnoea Index (AHI)	18.0	Normal (AHI = 0-5) Mild (AHI=5-10) Mild to moderate (AHI = 10-15) Moderate (AHI = 15-25) Moderate to Severe (AHI = 25-30) Severe (AHI = 30+)	*AHI: Index of all respiratory events excluding RERA's (respiratory effort related arousals) per hour *RDI: Index of all respiratory events including RERA's per hour *TIB: Time in Bed
Respiratory Disturbance Index (RDI)	25.2		
Supine AHI	72.2		
Non Supine AHI	5.72		
REM AHI	7.7		
Oxygen Desaturation Index (ODI)	14.3		
Arousal Index (/hr)	35.9		
Periodic Limb movement Index (PLMs/Hr)	8.2		
Sleep Data	**Results**	**Normative Values**	
Total Sleep Time (TST)	386.0 min		
Sleep Efficiency (% of TIB)	83.9 %	85% and over	
Sleep Latency (Minutes)	5.0 min	5-15 minutes	
REM Latency From Sleep Onset (Minutes)	288.5 min	70-110 minutes	
REM Proportion (% of TST)	18.3 %	20-30 %	
Slow Wave Sleep Proportion (% of TST)	24.09 %	20%	
Other Data	**Results**	**Scoring Criteria**	
Average Hypopnoea/Apnoea Length	22.5 sec	*Study has been scored based on the AASM version 2.5 scoring criteria.	
Time spent with SaO2 Less than 90%	1.1 min		
Nadir SpO2 (minimum SpO2)	86		
Average Heart Rate	66.3 bpm		
Supplemental O2 (Litres per Minute)	-		
Evening Blood Pressure	138/85		
Morning Blood Pressure	121/83		

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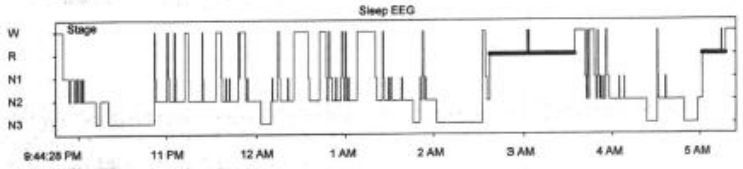
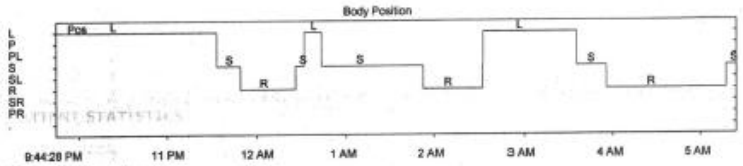
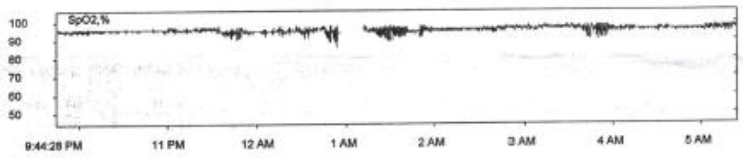
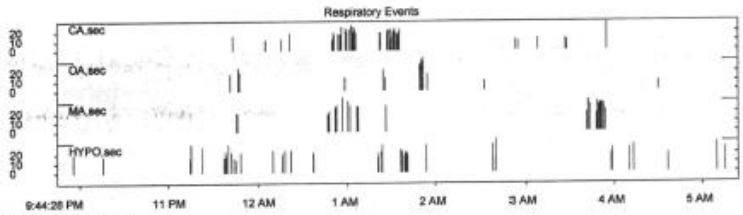
PATIENT STATISTICS:



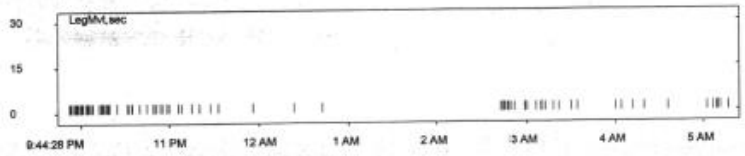


Oximetry Evolution





Leg Movements



Page **2** of **2**

POST TREATMENT SLEEP STUDY

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In-Centre MAS PSG Sleep Study Report

PATIENT DETAILS:

Location	Bethesda Private Hospital	DOB		21/09/1968	
Name		Study Date		20/01/2022	
Patient ID Number	56106	Report Date			
Usual GP / CC		Height	181cm	Weight	91kg
Referring Doctor		BMI	27.8	ESS Score	N/A
Reason for Study	Efficacy of mandibular advancement splint (MAS).				

CONCLUSION:

A Polysomnography Sleep Study was performed with a Mandibular advancement splint in situ in hospital to monitor sleep parameters including Nasal Flow/Respiratory effort/Pulse oximetry/ECG/Limb activity/EEG/EOG and Sub mental chin EMG activity. There were technical issues with both thoracic and abdominal effort belts. The ECG demonstrated sinus rhythm. Sleep efficiency was normal. REM latency was normal. There was a normal proportion of REM sleep.
There was **persistent mild sleep apnoea and mild snoring despite use of a mandibular advancement splint**. This was worse during brief periods spent in the supine posture.
The patient should be encouraged to reduce weight and avoid sleep in the supine posture. Further titration of the mandibular advancement splint is recommended if the patient remains symptomatic.

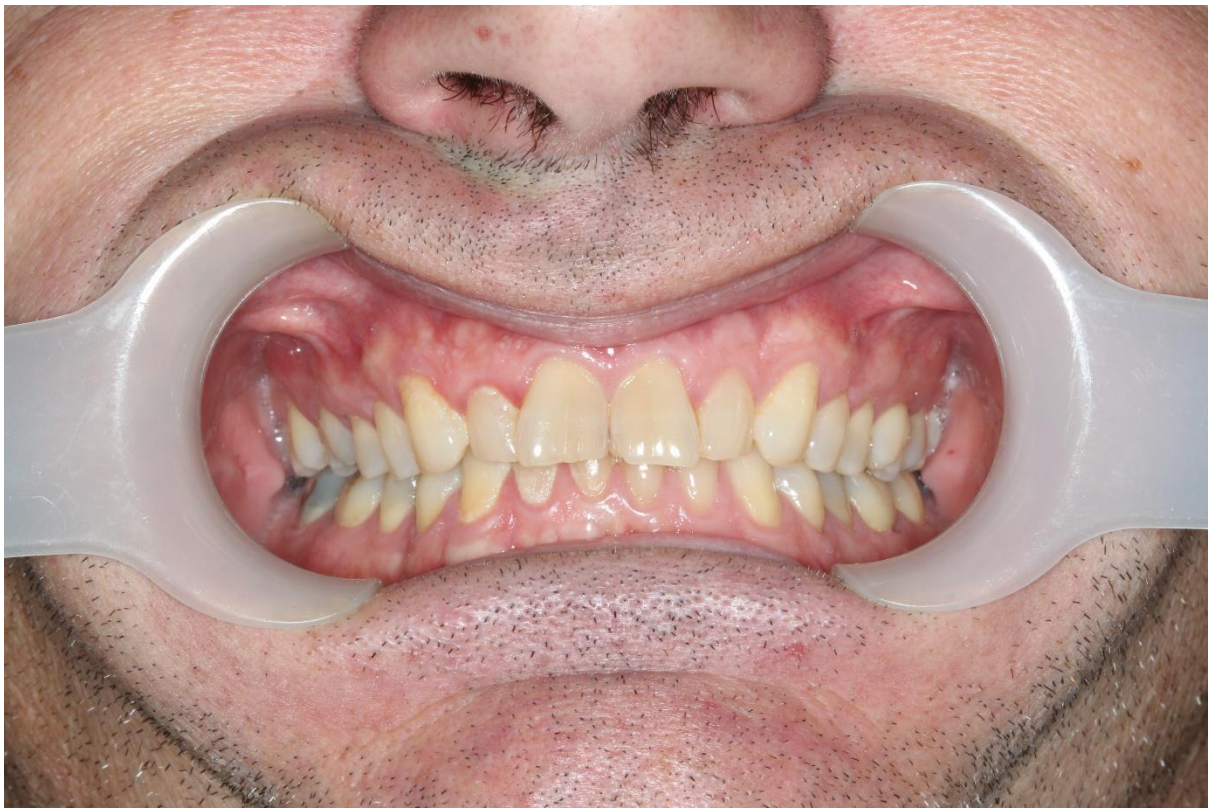
RESPIRATORY AND SLEEP PHYSICIAN

RESULTS:

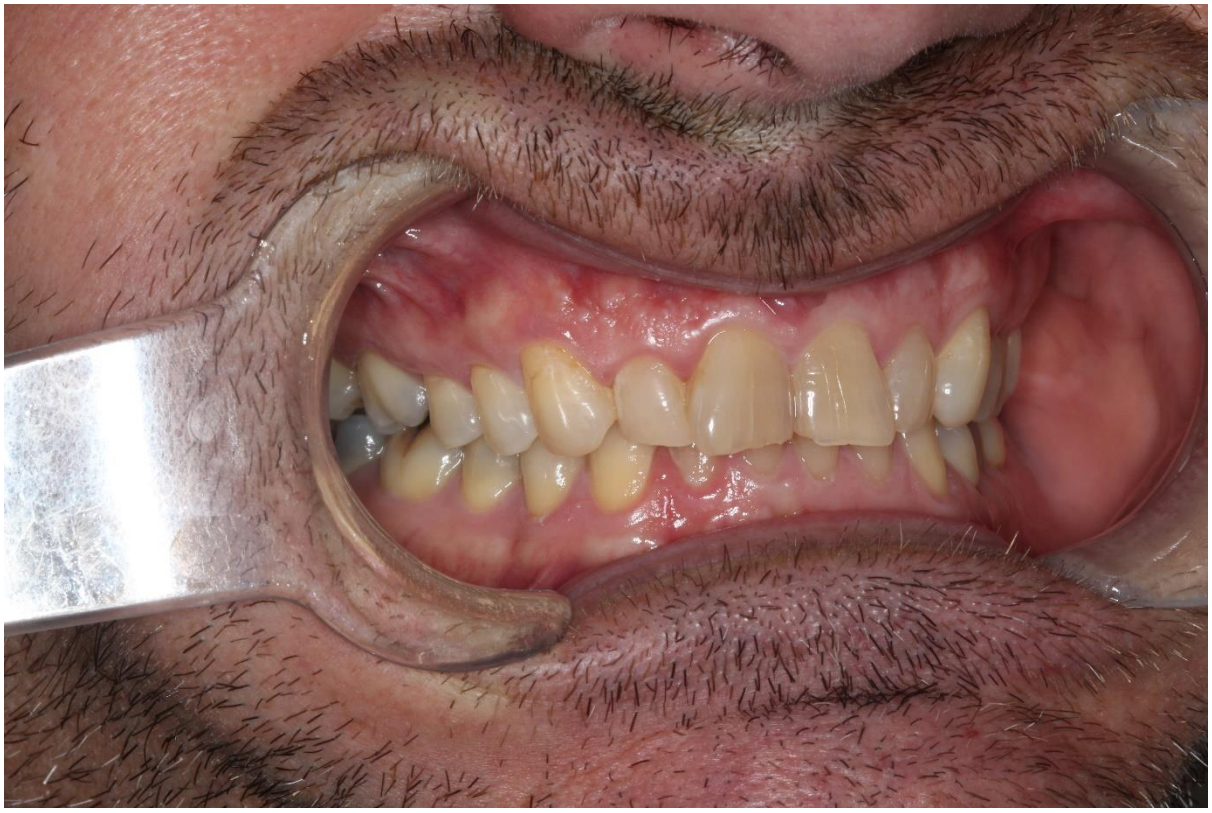
Key indices	**Results**	**Normative Values**	**Definitions**
Apnoea Hypopnoea Index (AHI)	8.0	Normal (AHI = 0-5) Mild (AHI=5-10) Mild to moderate (AHI = 10-15) Moderate (AHI = 15-25) Moderate to Severe (AHI = 25-30) Severe (AHI = 30+)	*AHI: Index of all respiratory events excluding RERA's (respiratory effort related arousals) per hour *RDI: Index of all respiratory events including RERA's per hour *TIB: Time in Bed
Respiratory Disturbance Index (RDI)	8.4		
Supine AHI	30.6		
Non Supine AHI	3.59		
REM AHI	2.0		
Oxygen Desaturation Index (ODI)	11.2		
Arousal Index (/hr)	13.2		
Periodic Limb movement Index (PLMs/Hr)	3.5		
Sleep Data	**Results**	**Normative Values**	
Total Sleep Time (TST)	440.5 min		
Sleep Efficiency (% of TIB)	90.4 %	85% and over	
Sleep Latency (Minutes)	8.5 min	5-15 minutes	
REM Latency From Sleep Onset (Minutes)	96.5 min	70-110 minutes	
REM Proportion (% of TST)	20.1 %	20-30 %	
Slow Wave Sleep Proportion (% of TST)	25.88 %	20%	
Other Data	**Results**	**Scoring Criteria**	
Average Hypopnoea/Apnoea Length	25.9 sec	*Study has been scored based on the AASM version 2.5 scoring criteria.	
Time spent with SaO2 Less than 90%	0.4 min		
Nadir SpO2 (minimum SpO2)	89		
Average Heart Rate	68.9 bpm		
Supplemental O2 (Litres per Minute)	-		
Evening Blood Pressure	169/101		
Morning Blood Pressure	129/72		

INTRA-ORAL PHOTOS – INITIAL CONSULT 27.05.2021

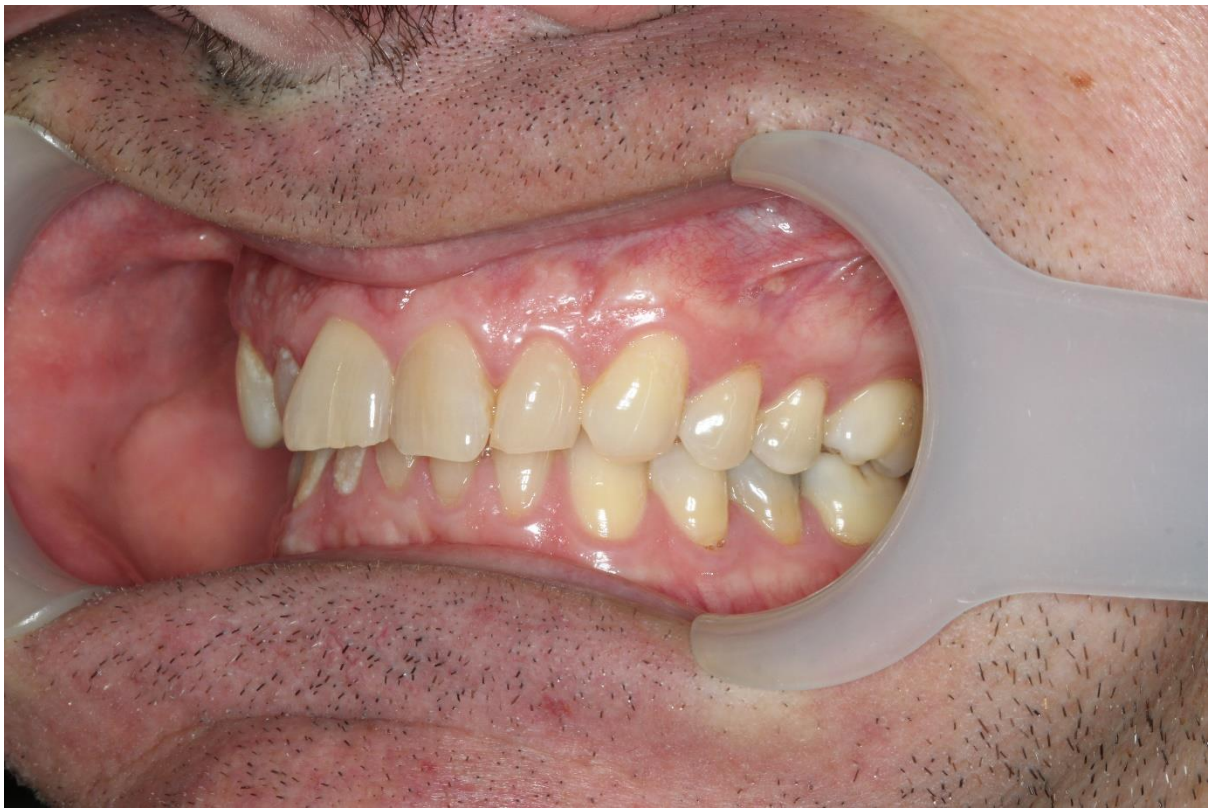
Anterior view in occlusion



Right lateral view in occlusion



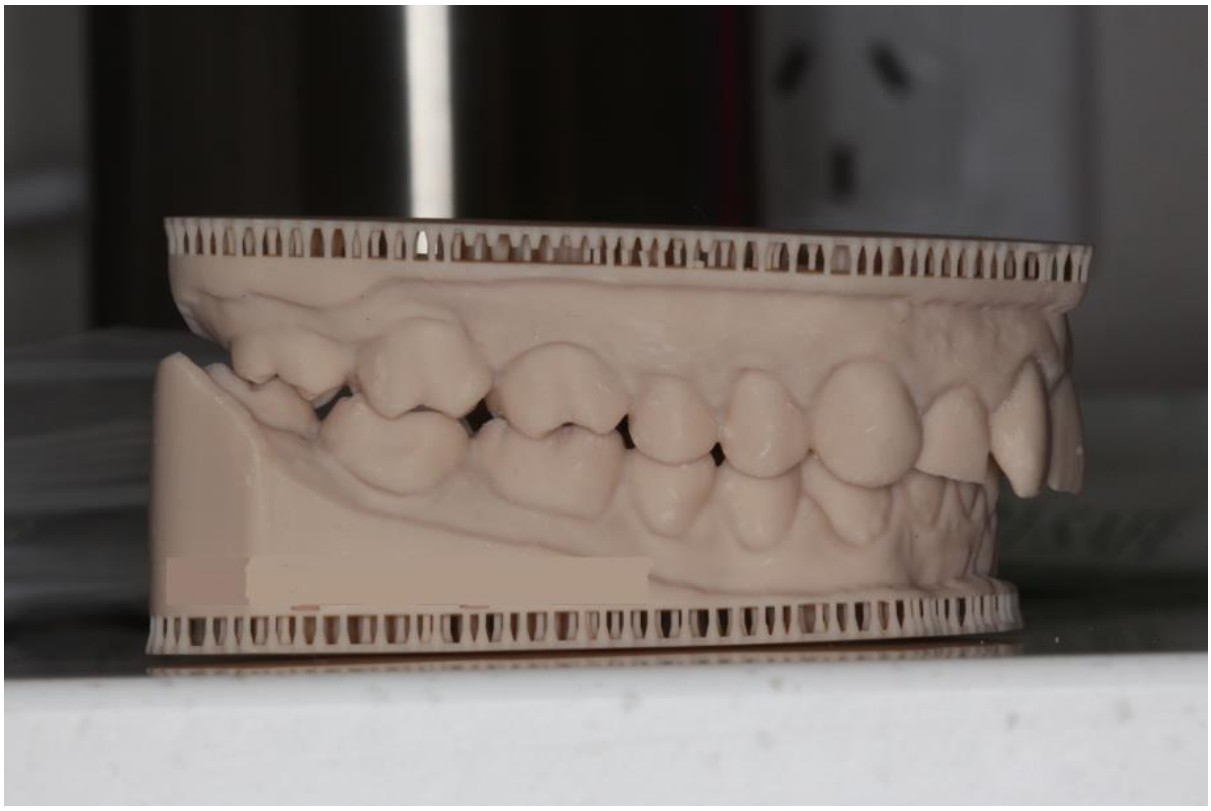
Left lateral view in occlusion



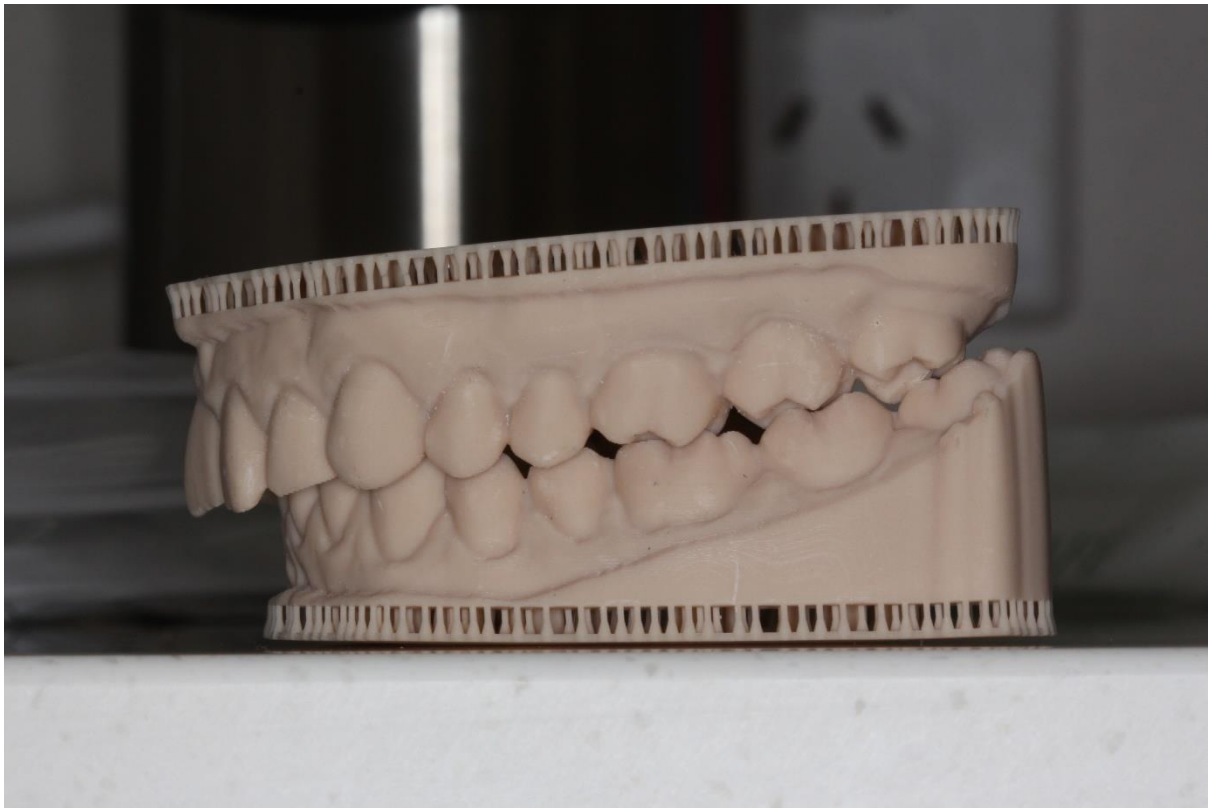
Models

Anterior view in occlusion

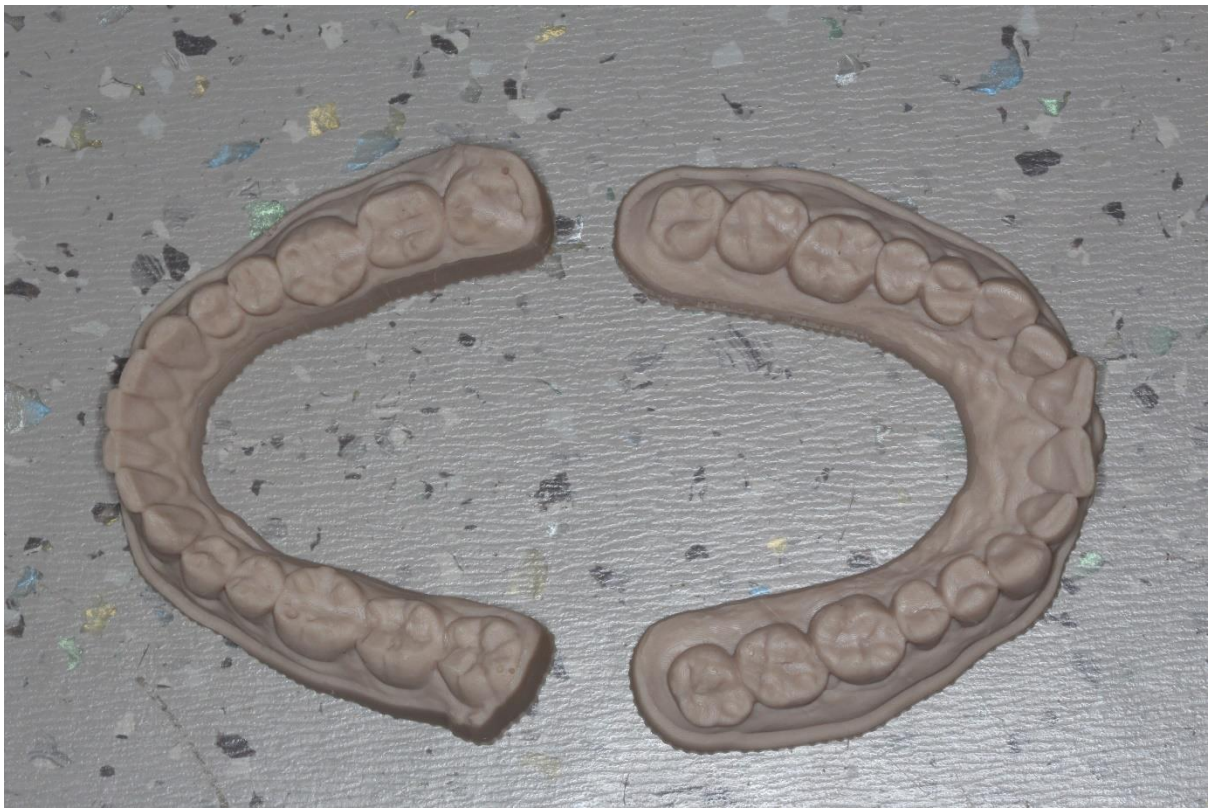
Right lateral view in occlusion



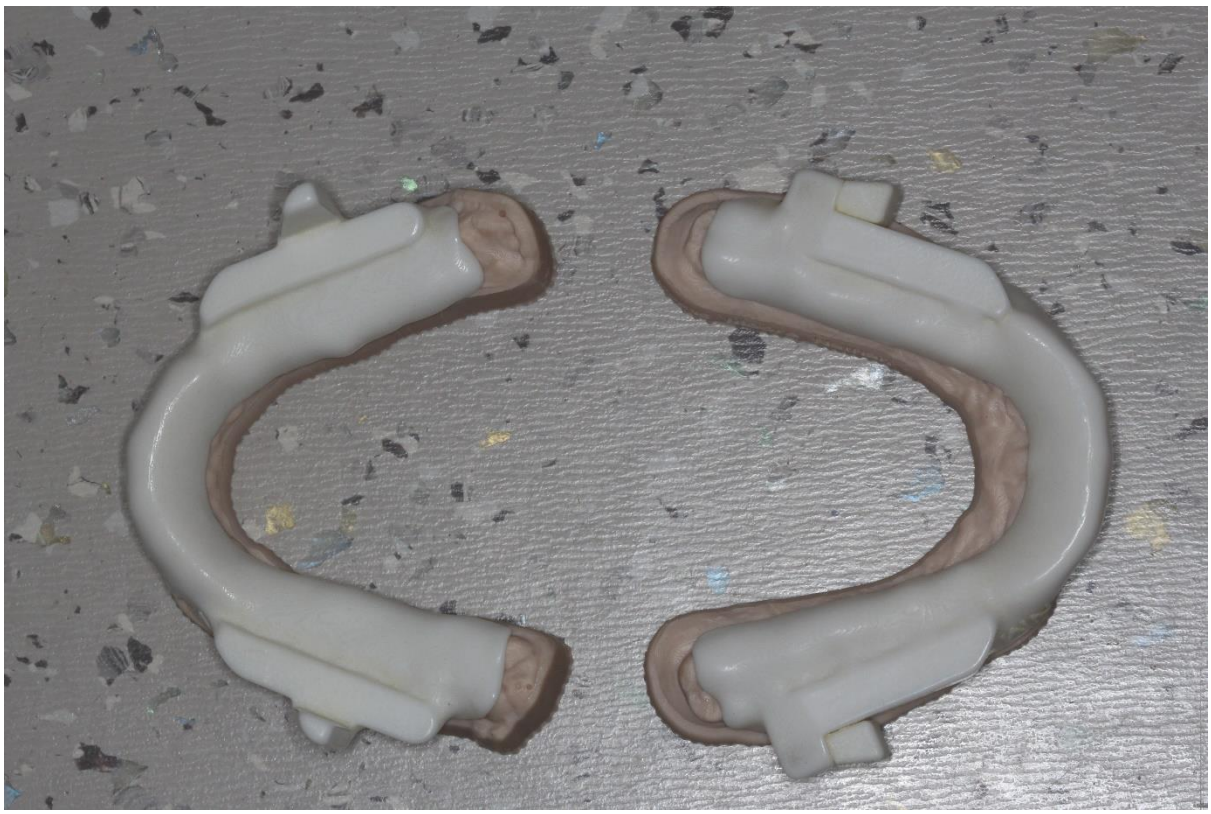
Left lateral view in occlusion



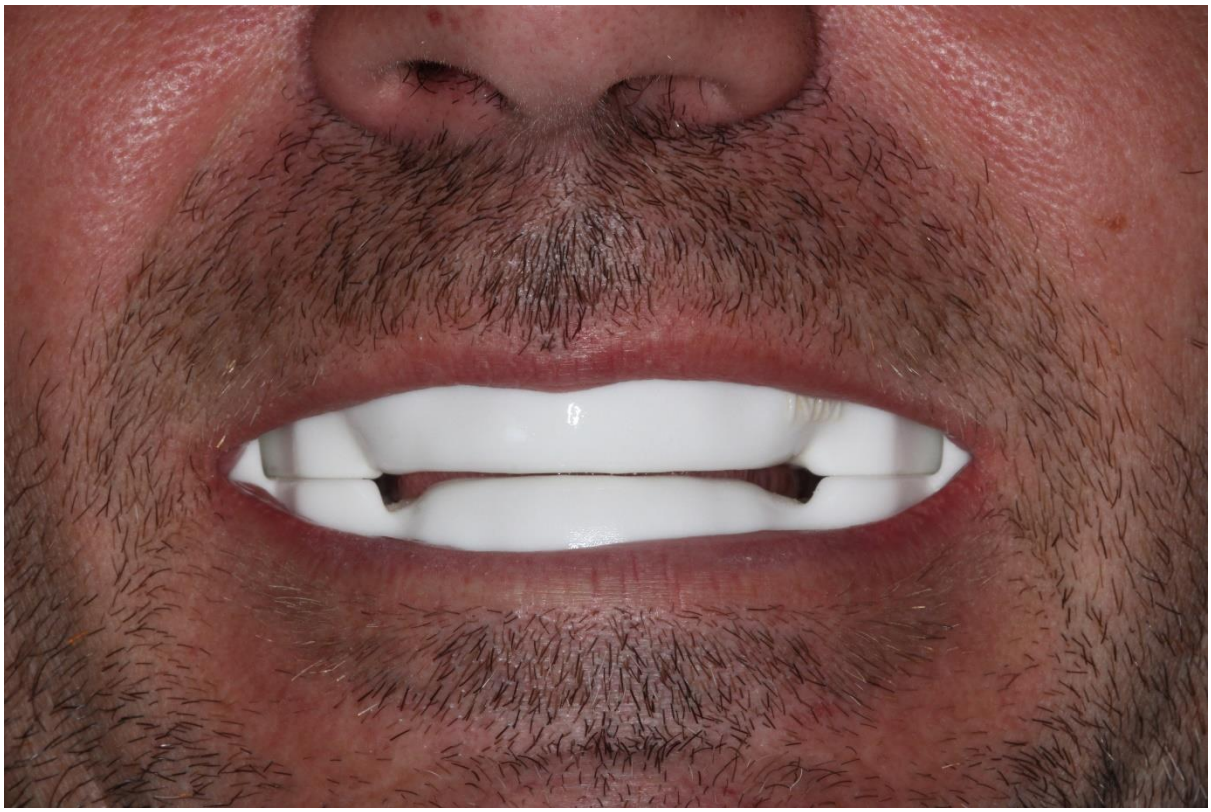
Occlusal view of models



Occlusal view with appliance in



Anterior view with MAD inserted



SLEEP REPORT 2

Synopsis

Introduction

This patient is a 50-year-old male (07.02.1969) who was referred for management of severe obstructive sleep apnoea (OSA). He initially trialled continuous positive airway pressure (CPAP) therapy for six weeks but found it uncomfortable, although his partner reported a significant benefit. Following this, he was referred for oral appliance therapy. He presented to me for an initial consult on 05.02.2020.

Chief Complaint

The patient's chief complaint was loud snoring, which was mainly an issue for his wife. He reported daytime symptoms such as sleepiness and lethargy. He had an Epworth Sleepiness score (ESS) of 12. He was recommended for a sleep study by his general medical practitioner, which reported he had severe obstructive sleep apnoea.

History of Present Illness

The patient underwent a diagnostic sleep study on 14.10.2019, which revealed severe obstructive sleep apnoea with an Apnoea–Hypopnoea Index (AHI) of 39.4 and a nadir oxygen saturation of 86%.

He reported a snoring volume of 10/10, with his partner noticing gasping and snorting frequently at night. He felt moderately unrefreshed in the mornings but experienced no morning headaches. He experienced a moderate amount of lethargy and experienced drowsiness with sedentary activities frequently during the day and night. He had no concerns about his memory, mood, or motivation. His ESS was 12. He did not report any arthrogenous or myogenous TMD symptoms.

CPAP was recommended and trialled for 6 weeks. However, it was poorly tolerated due to discomfort, mainly his inability to tolerate the air pressures, stating that he felt overwhelmed by it. Moreover, he found it restrictive with movement. He reported his partner observed notable improvements with his snoring. As a consequence, a mandibular advancement device (MAD) was recommended.

Past Medical History

The patient weighed 98kg and was 181cm tall (BMI of 29.9). His medical history was significant for atrial fibrillation and hypertension. His medications included amiodarone 200mg, apixaban 5mg, amlodipine 5mg, and Olmesartan 40mg. He did not report any smoking or alcohol history. No allergies were reported.

Clinical and Radiographic Examination

The patient presented with a Class I molar and incisor relationship, with an overjet of 2 mm and an overbite of 3 mm. All teeth were present, with no signs of mobility or significant pocketing, reflecting a stable periodontal status. There was restorative work on the 46, 17, 37, and 16. No secondary caries were noted with these restorations; however, notable degradation was evident in some, with the possibility of replacement in the future. There was a gold crown on the 36 and 14 (completed endodontic treatment). Mild occlusal wear was noted, suggestive of early attrition, but no clinical signs of active bruxism were observed. Oral hygiene appeared satisfactory.

Maximum mouth opening was recorded at 47 mm, with lateral excursions of 15 mm bilaterally and mandibular protrusion of 11 mm. There was no deviation or deflection noted on opening or protrusion. TMJ examination revealed no joint sounds or pain on palpation, and there was no tenderness of the masticatory muscles.

The soft tissues of the oral cavity, including the tongue (Friedman tongue position grade II), palate, uvula, and tonsils (Friedman tonsil size grade 1), appeared normal in size and contour, with no soft tissue lesions identified. Salivary flow was adequate, and the oral mucosa was moist.

Diagnosis

The patient underwent a diagnostic polysomnography (level 1) on 14.10.2019, which demonstrated severe obstructive sleep apnoea (OSA) with an Apnoea–Hypopnoea Index (AHI) of 39.4 events per hour. The nadir oxygen saturation recorded during the study was 86%. The supine AHI was 0.0, and the non-supine AHI was 39.36, which suggests exclusively non-positional sleep apnoea. His sleep efficiency was 89.5%. The study noted moderately severe periodic limb movement activity, with an index of 16.3. The sleep physician recommended an investigation into the patient's ferritin levels and, if clinically indicated, a trial of pramipexole.

The patient also underwent a treatment sleep study with the CPAP on 18.12.2019, which demonstrated OSA was well controlled with nasal CPAP, with an overall AHI of 1.9 and a non-supine AHI of 1.9. There was reduced periodic limb movement activity.

Rationale

A Somnodent classic (Dorsal fin appliance with retention hooks) was recommended. This device was selected for its ease of adjustment should further dental work be required. Moreover, the patient demonstrated the ability to understand the titration mechanism. The initial starting position was set at 6mm out of 11mm (54.5%). He was instructed to titrate 5 turns bilaterally per week (0.5mm advancement weekly) and to maintain a diary to ensure he remembers the number of turns.

Results

The patient adapted well to the MAD device. Over subsequent months, titration was performed gradually up to 9.5 mm of 11 mm. Subjectively, the patient reported significant improvements in sleep quality and a reduction in snoring. Improvements ranged from 50% to 100% across follow-ups. Side effects were minimal, limited to occasional appliance adjustments. A treatment sleep study confirmed objective improvement in his OSA. The sleep study reported an overall AHI of 0.7, with a supine AHI of 0 and a non-supine AHI of 0.65. It also reported mild periodic limb movement activity, with an index of 11.3, which matched the index reported with CPAP. Sleep efficiency was reported at 75.4%. His nadir SpO2 was 93%, which was increased from 86%.

Disposition

The patient demonstrated excellent compliance with appliance use and achieved near-complete symptomatic resolution. At his most recent review, he reported 100% improvement with no adverse effects. The MAD was recommended to remain at 9.5 mm out of 11 mm. He was placed on an annual recall.

Follow-Up Visits

Patient DOB: 07.02.1969
Initial consult: 05.02.2020
Appliance insert: 11.03.2020. **Starting position:** 6mm out of 11mm

DOS: 08.10.2020 – 1st review after insert. The patient could not attend sooner as he was overseas.

Subjective: Patient reported a subjective overall improvement of 50%, with snoring reduced to 5/10, from a 10/10. He still reports occasionally gasping and snorting. He reports feeling refreshed in the mornings, and occasionally feeling drowsy with sedentary activities during the day and evenings. His Epworth score was 2. He reported no side effects; however, he informed us that one of the titration mechanisms on the side of his appliance appears to have malfunctioned.
Objective: The Appliance was unevenly titrated with one side at 8/11mm and the other at 7.4mm/11mm. The maximum mouth opening was 45mm, with lateral excursive movements of 15mm. There was no deviation or deflection noted on opening or protrusion. TMJ examination revealed no joint sounds or pain on palpation, and there was no tenderness of the masticatory muscles. His occlusion remained stable, with class I molar and incisor relationships and contacts throughout. There were no hard or soft tissue abnormalities intraorally.

Assessment: Severe OSA with evidence of partial subjective improvements (reduction in snoring).
Plan: Recorrected the appliance to a 6mm starting position and provided education regarding titration. Patient to titrate by 5 turns bilaterally at a maximum rate of 1x per week. A review was scheduled in 3 months.

DOS: 28.01.2021 – 2nd review

Subjective: Patient reported a subjective overall improvement of 75%, with snoring reduced to 3/10, from a 10/10. His wife has not seen him gasping and snorting. He reports feeling refreshed in the mornings, and occasionally drowsiness with sedentary activities only in the evenings now. His Epworth score was 4. He reported no side effects, and has titrated his appliance to 7mm/11mm.
Objective: The appliance was evenly titrated at 7mm/11mm. The maximum mouth opening was 46mm, with lateral excursive movements of 15mm. There was no deviation or deflection noted on opening or protrusion. TMJ examination revealed no joint sounds or pain on palpation, and there was no tenderness of the masticatory muscles. His occlusion remained stable, with class I molar and incisor relationships and contacts throughout. There were no hard or soft tissue abnormalities intraorally.

Assessment: Severe OSA with continued improvement in subjective improvements (reduction in snoring).
Plan: Patient to continue to titrate by 5 turns bilaterally at a maximum rate of 1x per week. A review was scheduled in 3 months.

DOS: 25.03.2021 – 3rd review

Subjective: Patient reported a subjective overall improvement of >75%, with snoring reduced to 1/10, from a 10/10. His wife has not seen him gasping and snorting. He reports feeling refreshed in the mornings and occasionally drowsiness with sedentary activities, but not in the evenings. His Epworth score was 3. He reported no side effects and has titrated his appliance to 9mm/11mm.
Objective: The appliance was evenly titrated at 9mm/11mm. The maximum mouth opening was 46mm, with lateral excursive movements of 15mm. There was no deviation or deflection noted on opening or protrusion. TMJ examination revealed no joint sounds or pain on palpation, and there was no tenderness of the masticatory muscles. His occlusion remained stable, with class I molar and incisor relationships and contacts throughout. There were no hard or soft tissue abnormalities intraorally.

Assessment: Severe OSA with continued improvement in subjective improvements (reduction in snoring).
Plan: Patient to continue to titrate by 5 turns bilaterally 1 more time with the aim to reduce the last component of snoring (1/10), to be in a position of 9.5mm/11mm. He is to return to the sleep physician for a treatment sleep study. A review was scheduled in 6 months.

DOS: 16.09.2021 – 4th review, treatment sleep study completed.

Subjective: Patient reported a subjective overall improvement of 100% with snoring reduced to 0/10, from a 10/10. His wife has not seen him gasping and snorting. He reports feeling refreshed in the mornings, with no lethargy or daytime sleepiness reported. His Epworth score was 3. He reported no side effects, and has titrated his appliance to 9.5mm/11mm.

The treatment sleep study was completed on 10.06.2021, which found that his OSA was well controlled using the MAD.
Objective: The appliance was evenly titrated at 9.5mm/11mm. The maximum mouth opening was 47mm, with lateral excursive movements of 15mm. There was no deviation or deflection noted on opening or protrusion. TMJ examination revealed no joint sounds or pain on palpation, and there was no tenderness of the masticatory muscles. His occlusion remained stable, with class I molar and incisor relationships and contacts throughout. There were no hard or soft tissue abnormalities intraorally.

Assessment: Severe OSA, which has been confirmed to be successfully treated with the MAD.
Plan: Patient to continue to remain at this position, 9.5mm/11mm nightly. He was scheduled for annual reviews.

Summary

This patient is a case that highlights how a MAD can still be used successfully in cases with severe sleep apnoea. It is the standard of care for patients with severe obstructive sleep apnoea (OSA) to be treated with CPAP as first line, failing which a MAD should be considered rather than no treatment

(5). CPAP is generally credited with greater AHI reductions than an MAD; however health health-related outcomes are similar despite these AHI differences (6-8), and as such, reinforces this recommendation.

Positional OSA is defined as an AHI ratio of greater than 2:1 when comparing the supine to non-supine position (9). Data has been conflicting regarding using positional or non-positional OSA as a predictor for MAD success, with historically various authors reporting conflicting data on the success of MAD in one type over the other. Recent studies have shown that both can be successfully treated with the use of an MAD (10, 11). The findings from these studies suggest that patients with positional OSA (POSA) had a higher decrease in supine AHI, and patients with non-positional OSA (non-POSA) had a greater decrease in non-supine AHI. As such, the suggestion has been that an MAD is more suitable for patients with POSA who habitually sleep in the supine predominant position and patients with non-POSA who habitually sleep in the non-supine predominant position. This patient had non-POSA, with OSA exclusively in the non-supine position. He was also a non-supine predominant sleeper. His response to treatment is in line with recent data and suggestions. This, in combination with the rare presentation of OSA exclusively in the non-supine position(12)It is presented as a unique case.

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PRE-TREATMENT SLEEP STUDY

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NATA

In-Centre Diagnostic PSG Sleep Study Report

PATIENT DETAILS:

Location	Waikiki Private Hospital	DOB		07/02/1969	
Name		Study Date		14/10/2019	
Patient ID Number	41264	Report Date		23/10/2019	
Usual GP / CC		Height	181cm	Weight	98kg
Referring Doctor		BMI	29.9	ESS Score	-
Reason for Study	Reassessment of OSA; High blood pressure, AF, Witnessed Apnoea				

CONCLUSION:

A Polysomnography Diagnostic Sleep Study was performed in hospital to monitor sleep parameters including Nasal Flow/Respiratory effort/Pulse oximetry/ECG/Limb activity/EEG/EOG and Sub mental chin EMG activity. The data was technically acceptable. Sleep efficiency was normal. REM latency was delayed. There was a normal proportion of REM sleep. **The ECG demonstrated atrial fibrillation.**
There was evidence of **severe obstructive sleep apnoea**, associated with frequent snoring. No time was spent in the supine posture. There was **moderately severe periodic limb movement activity**. Check iron levels and if clinically appropriate consider a trial of Pramipexole.
Given the severity of sleep apnoea a **trial of nasal CPAP is indicated** and a **follow-up study should be performed to assess efficacy of treatment**. Advice should be given regarding weight loss. Severe sleep apnoea can impair driving performance and suitable advice should be given regarding driving. After a suitable period of time to allow the patient to discuss the results of the sleep study with the referring physician, the patient will be contacted and offered a trial of CPAP therapy.

Respiratory and sleep Physician

RESULTS:

Key indices	**Results**	**Normative Values**	**Definitions**
Apnoea Hypopnoea Index (AHI)	39.4	Normal (AHI = 0-5) Mild (AHI=5-10) Mild to moderate (AHI = 10-15) Moderate (AHI = 15-25) Moderate to Severe (AHI = 25-30) Severe (AHI = 30+)	*AHI: Index of all respiratory events excluding RERA's (respiratory effort related arousals) per hour *RDI: Index of all respiratory events including RERA's per hour *TIB: Time in Bed
Respiratory Disturbance Index (RDI)	46.8		
Supine AHI	0.0		
Non Supine AHI	39.36		
REM AHI	45.1		
Oxygen Desaturation Index (ODI)	38.4		
Arousal Index (/hr)	49.7		
Periodic Limb movement Index (PLMs/Hr)	16.3		
Sleep Data	**Results**	**Normative Values**	
Total Sleep Time (TST)	7.42 hrs		
Sleep Efficiency (% of TIB)	89.5 %	85% and over	
Sleep Latency (Minutes)	1.0 min	5-15 minutes	
REM Latency From Sleep Onset (Minutes)	139.5 min	70-110 minutes	
REM Proportion (% of TST)	23.6 %	20-30 %	
Slow Wave Sleep Proportion (% of TST)	17.63 %	20%	
Other Data	**Results**	**Scoring Criteria**	
Average Hypopnoea/Apnoea Length	26.6 sec	*Study has been scored based on the AASM 2012 scoring criteria.	
Time spent with SaO2 Less than 90%	5.9 min		
Nadir SpO2 (minimum SpO2)	86		
Average Heart Rate	88.7 bpm		
Supplemental O2 (Litres per Minute)	-		
Evening Blood Pressure	113/82		
Morning Blood Pressure	121/83		

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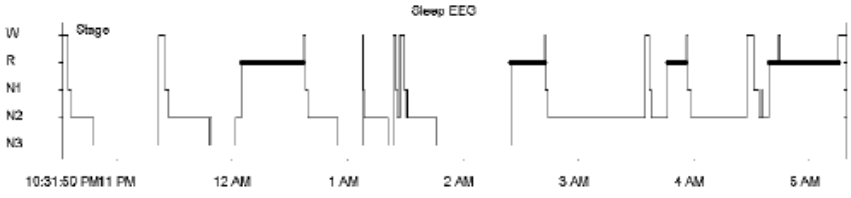
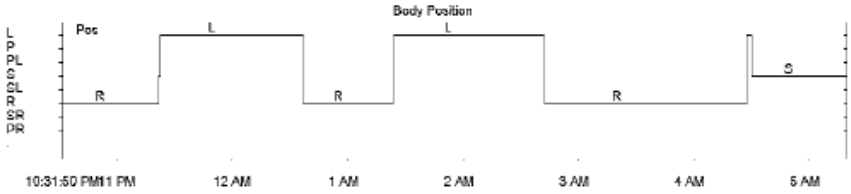
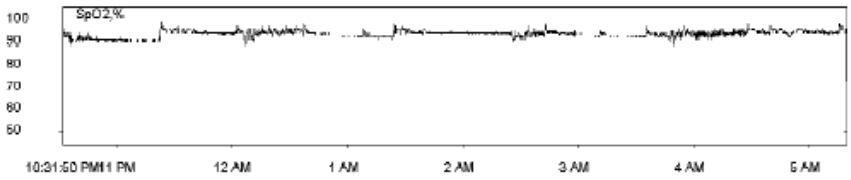
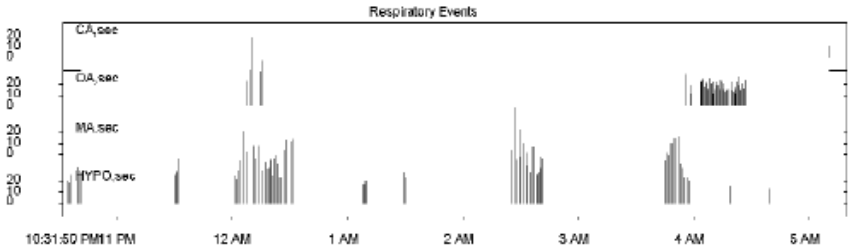
PATIENT STATISTICS:



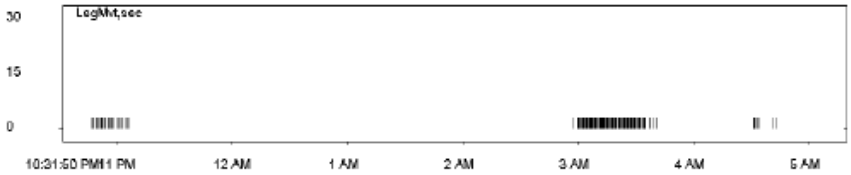


Oximetry Evolution





Leg Movements



TREATMENT SLEEP STUDY WITH CPAP

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NATA

In-Centre CPAP Titration Sleep Study Report

PATIENT DETAILS:

Location	Bethesda Private Hospital	DOB		7/02/1969	
Name		Study Date		18/12/2019	
Patient ID Number	41264	Report Date		24/12/2019	
Usual GP / CC		Height	181cm	Weight	93kg
Referring Doctor		BMI	28.4	ESS Score	7
Reason for Study	Efficacy of CPAP therapy.				

CONCLUSION:

An In-Hospital Polysomnography Sleep Study was performed on CPAP to determine the efficacy of CPAP in controlling obstructive sleep apnoea. Sleep parameters recorded include Flow/Respiratory effort/Pulse oximetry/ECG/Limb activity/EEG/EOG and Sub mental chin EMG activity.
The data was technically acceptable. Sleep efficiency was slightly reduced due to the difficulty establishing sleep at the beginning of the study. The patient was offered but declined sedation. Sleep architecture was normal. The ECG demonstrated normal sinus rhythm.
Obstructive sleep apnoea was well controlled with nasal CPAP at an optimal pressure of 9 cmH2O. No mask leak was observed. Recommend continue CPAP at 9 cmH2O.
There was evidence of **mild to moderate periodic limb movement activity.**

Respiratory and sleep Physician

RESULTS:

PAP Information	**Results**		**Definitions**
Original Mask used	**DreamWear (M)**		*PAP: Positive Airway Pressure *AHI: Index of all respiratory events excluding RERA's (respiratory effort related arousals) per hour *RDI: Index of all respiratory events including RERA's per hour *TIB: Time in Bed
Best/Recommended Mask	**DreamWear (M)**		
Pressure Range (cm H2O)	**6.0-9.6cmH2O**		
Optimum Pressure (cm H2O)	**9cmH2O**		
Key Indices	**Results**	**Normative Values**	
Apnoea Hypopnoea Index (AHI)	1.9	Normal (AHI = 0-5) Mild (AHI=5-10) Mild to moderate (AHI = 10-15) Moderate (AHI = 15-25) Moderate to Severe (AHI = 25-30) Severe (AHI = 30+)	
Respiratory Disturbance Index (RDI)	2.6		
Supine AHI	n/a		
Non Supine AHI	1.9		
REM AHI	1.7		
Oxygen Desaturation Index (ODI)	1.8		
Arousal Index (/hr)	7.3		
Periodic Limb movement Index (PLMs/Hr)	11.3		
Sleep Data	**Results**	**Normative Values**	
Total Sleep Time (TST)	6.20 hrs		
Sleep Efficiency (% of TIB)	81.6 %	85% and over	
Sleep Latency (Minutes)	10.0 min	5-15 minutes	
REM Latency From Sleep Onset (Minutes)	108.0 min	70-110 minutes	
REM Proportion (% of TST)	28.1 %	20-30 %	
Slow Wave Sleep Proportion (% of TST)	31.05 %	20%	
Other Data	**Results**	**Scoring Criteria**	
Average Hypopnoea/Apnoea Length	17.0 sec	*Study has been scored based on the AASM 2012 scoring criteria.	
Time spent with SaO2 Less than 90%	0.0 min		
Nadir SpO2 (minimum SpO2)	90		
Average Heart Rate	60.4 bpm		
Supplemental O2 (Litres per Minute)	-		
Evening Blood Pressure	119/76		
Morning Blood Pressure	116/78		

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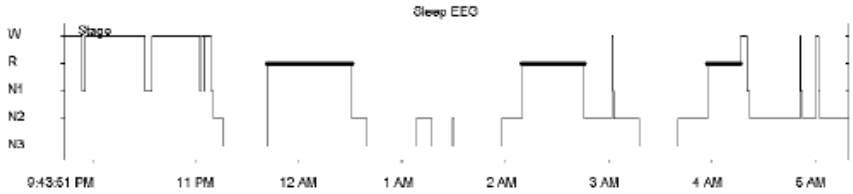
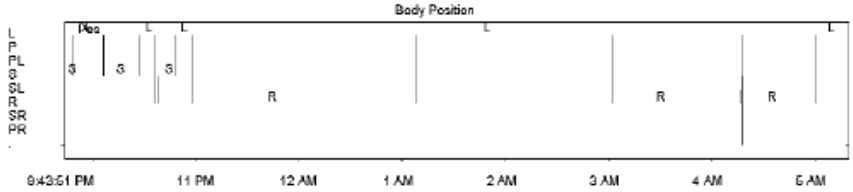
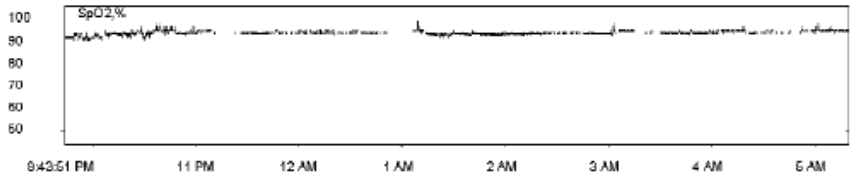
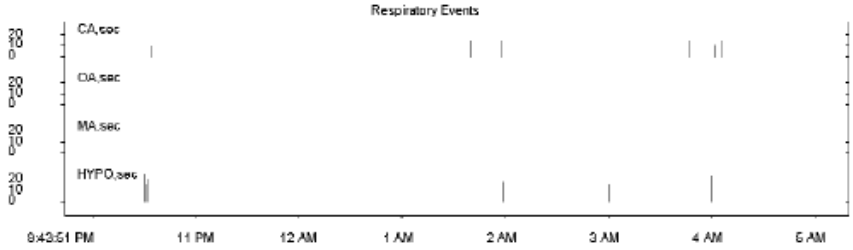
PATIENT STATISTICS:



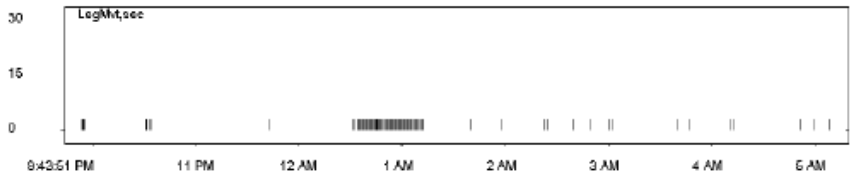


Oximetry Evolution





Leg Movements



TREATMENT SLEEP STUDY WITH MAD

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In-Centre MAS PSG Sleep Study Report

PATIENT DETAILS:

Location	Bethesda Private Hospital	DOB		7/02/1969	
Name		Study Date		10/06/2021	
Patient ID Number	41264	Report Date			
Usual GP / CC		Height	178	Weight	88
Referring Doctor		BMI	27.8	ESS Score	4
Reason for Study	MAS efficacy study				

CONCLUSION:

A Polysomnography Sleep Study was performed with a Mandibular advancement splint in situ in hospital to monitor sleep parameters including Nasal Flow/Respiratory effort/Pulse oximetry/ECG/Limb activity/EEG/EOG and Sub mental chin EMG activity. The data was technically acceptable. Sleep efficiency was poor. There was sleep onset and sleep maintenance insomnia with early morning wakening. No time was spent in the supine posture.
There was **mild periodic limb movement activity**.
Obstructive sleep apnoea and snoring were well controlled using a mandibular advancement splint. The patient did not describe somnolence. No further titration of the mandibular advancement splint is required.

Respiratory and sleep Physician

RESULTS:

Key indices	**Results**	**Normative Values**	**Definitions**
Apnoea Hypopnoea Index (AHI)	0.7	Normal (AHI = 0-5) Mild (AHI=5-10) Mild to moderate (AHI = 10-15) Moderate (AHI = 15-25) Moderate to Severe (AHI = 25-30) Severe (AHI = 30+)	*AHI: Index of all respiratory events excluding RERA's (respiratory effort related arousals) per hour *RDI: Index of all respiratory events including RERA's per hour *TIB: Time in Bed
Respiratory Disturbance Index (RDI)	2.6		
Supine AHI			
Non Supine AHI	0.65		
REM AHI	1.3		
Oxygen Desaturation Index (ODI)	0.2		
Arousal Index (/hr)	24.3		
Periodic Limb movement Index (PLMs/Hr)	11.3		
Sleep Data	**Results**	**Normative Values**	
Total Sleep Time (TST)	276.0 min		
Sleep Efficiency (% of TIB)	75.4 %	85% and over	
Sleep Latency (Minutes)	36.5 min	5-15 minutes	
REM Latency From Sleep Onset (Minutes)	90.5 min	70-110 minutes	
REM Proportion (% of TST)	17.4 %	20-30 %	
Slow Wave Sleep Proportion (% of TST)	19.93 %	20%	
Other Data	**Results**	**Scoring Criteria**	
Average Hypopnoea/Apnoea Length	12.2 sec	*Study has been scored based on the AASM version 2.5 scoring criteria.	
Time spent with SaO2 Less than 90%	0.0 min		
Nadir SpO2 (minimum SpO2)	93		
Average Heart Rate	59.9 bpm		
Supplemental O2 (Litres per Minute)	-		
Evening Blood Pressure	118/70		
Morning Blood Pressure	111/60		

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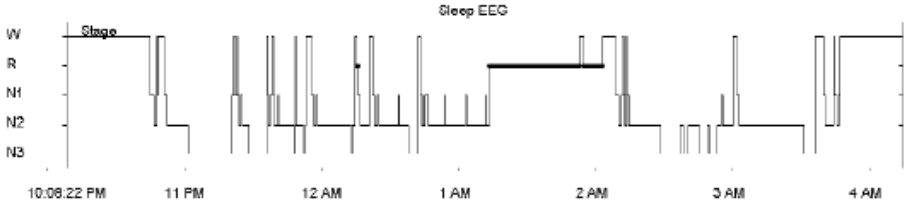
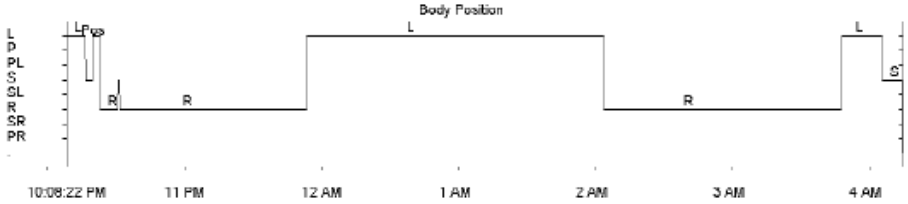
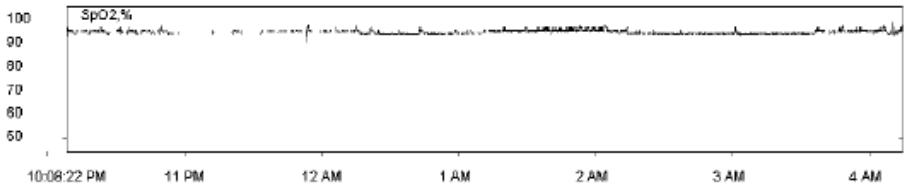
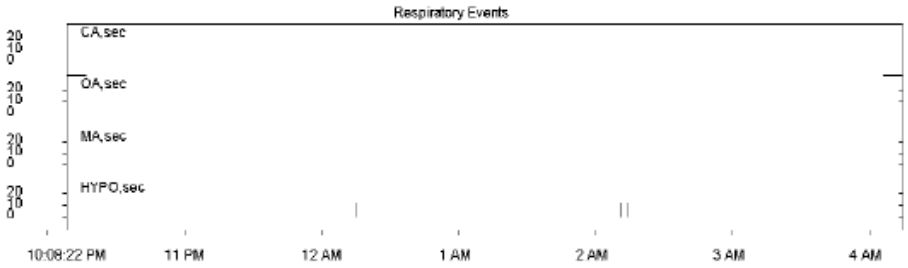


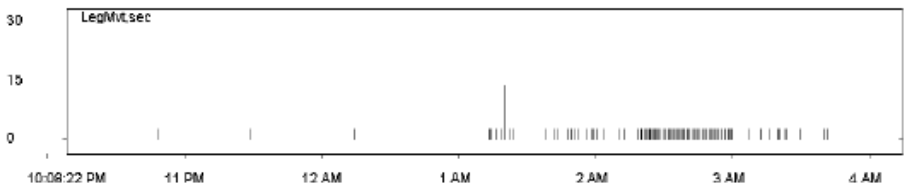


Oximetry Evolution



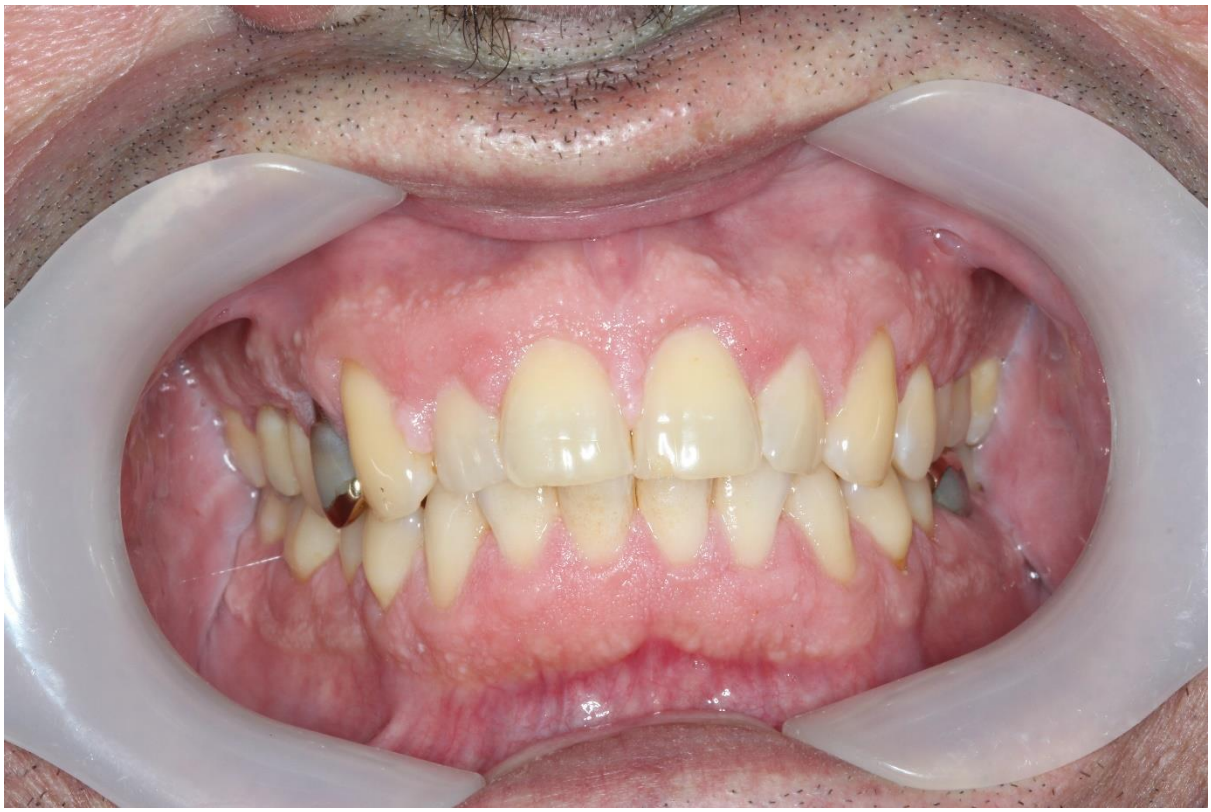


Leg Movements

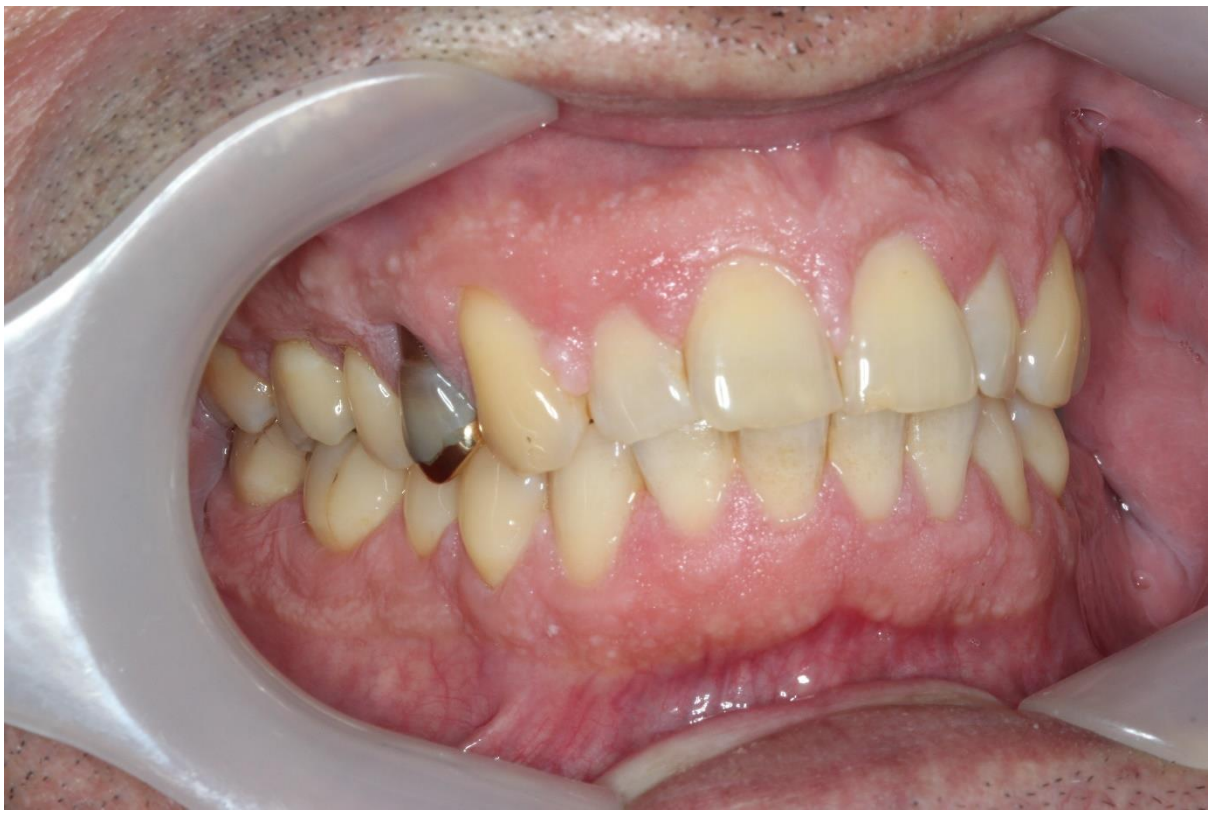


INTRA ORAL PHOTOS – INITIAL CONSULT 05.02.2020

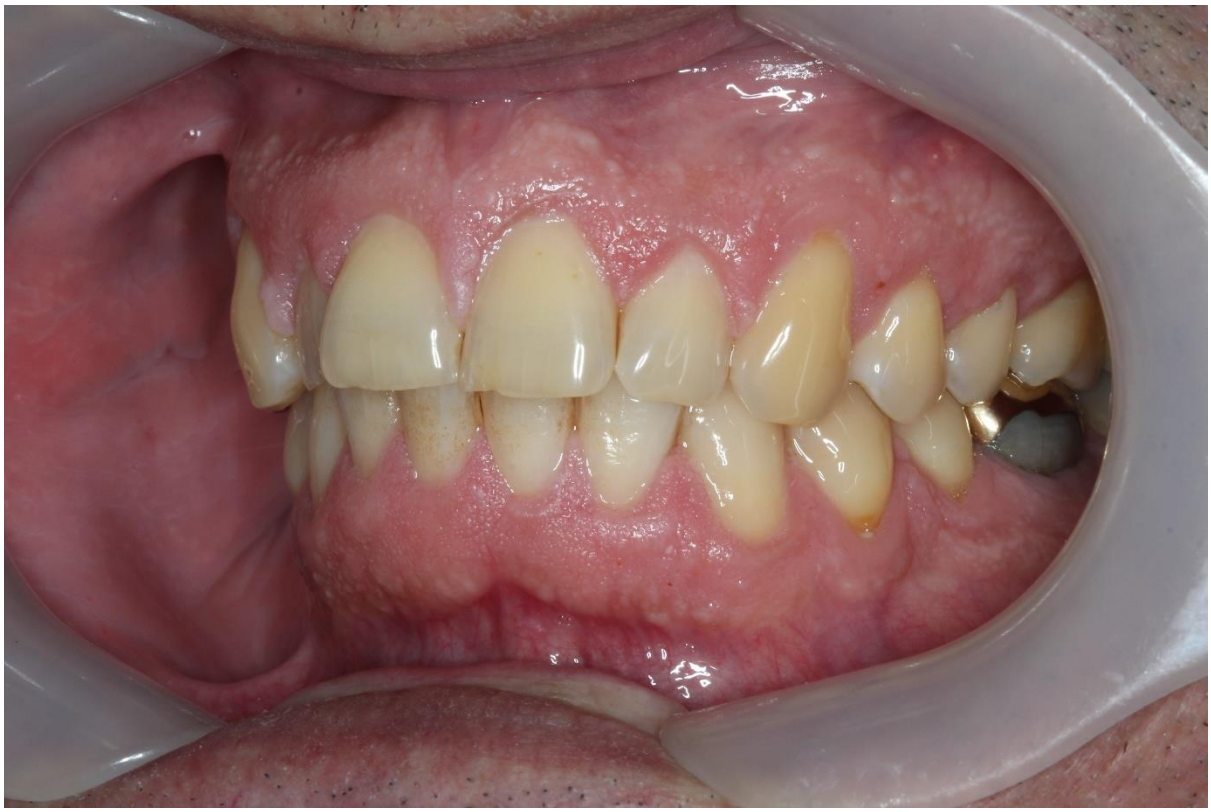
Anterior view in occlusion



Right lateral view in occlusion

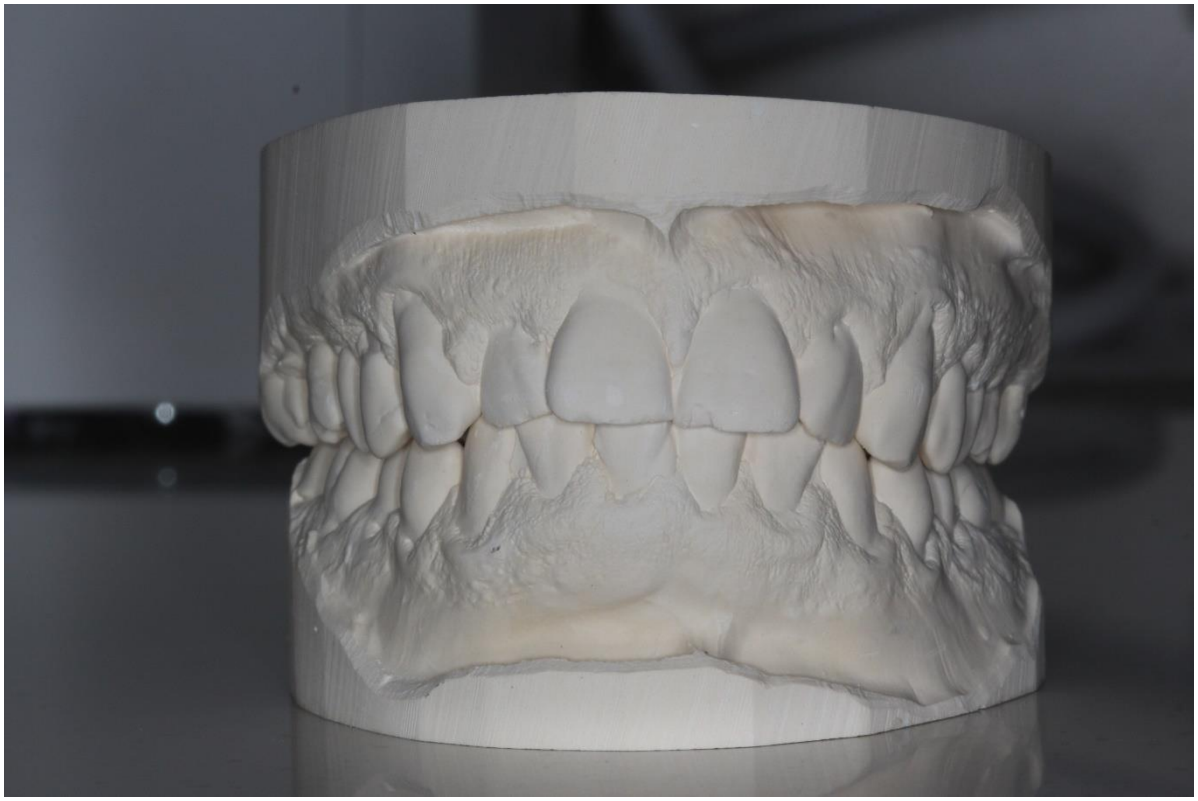


Left lateral view in occlusion

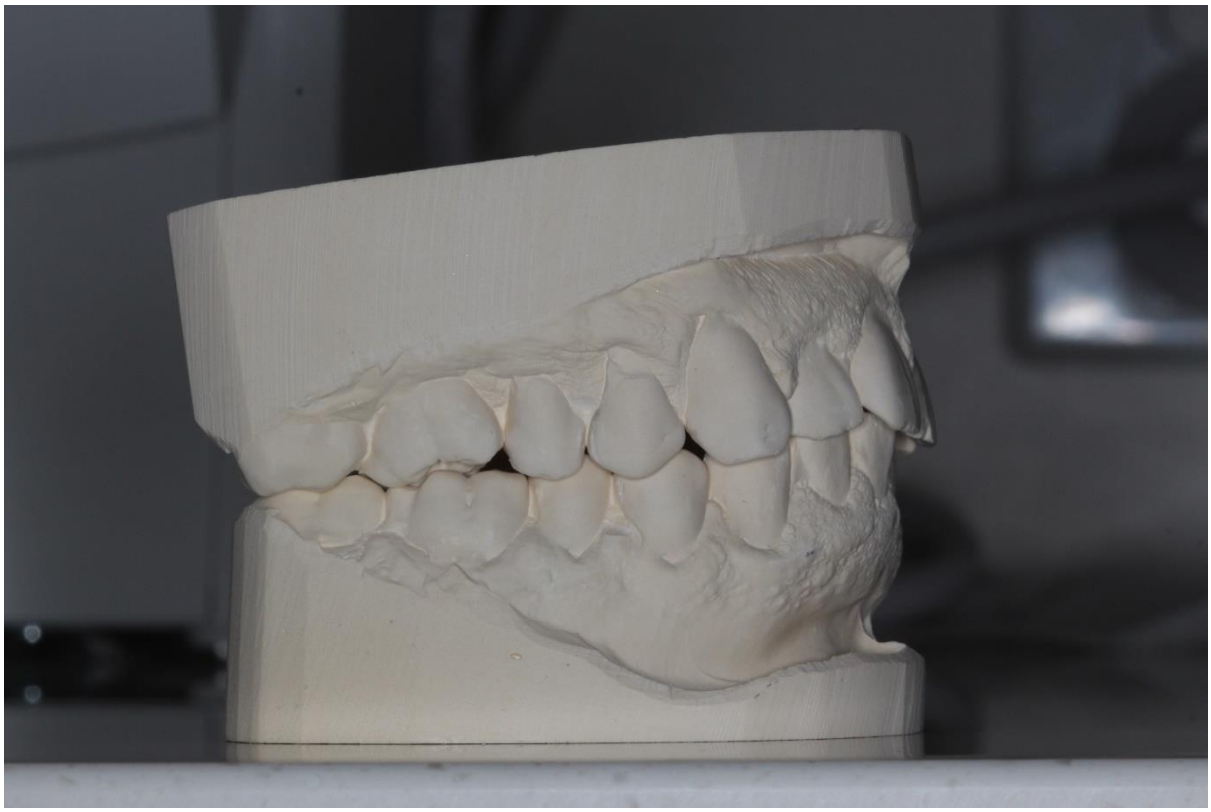


Models

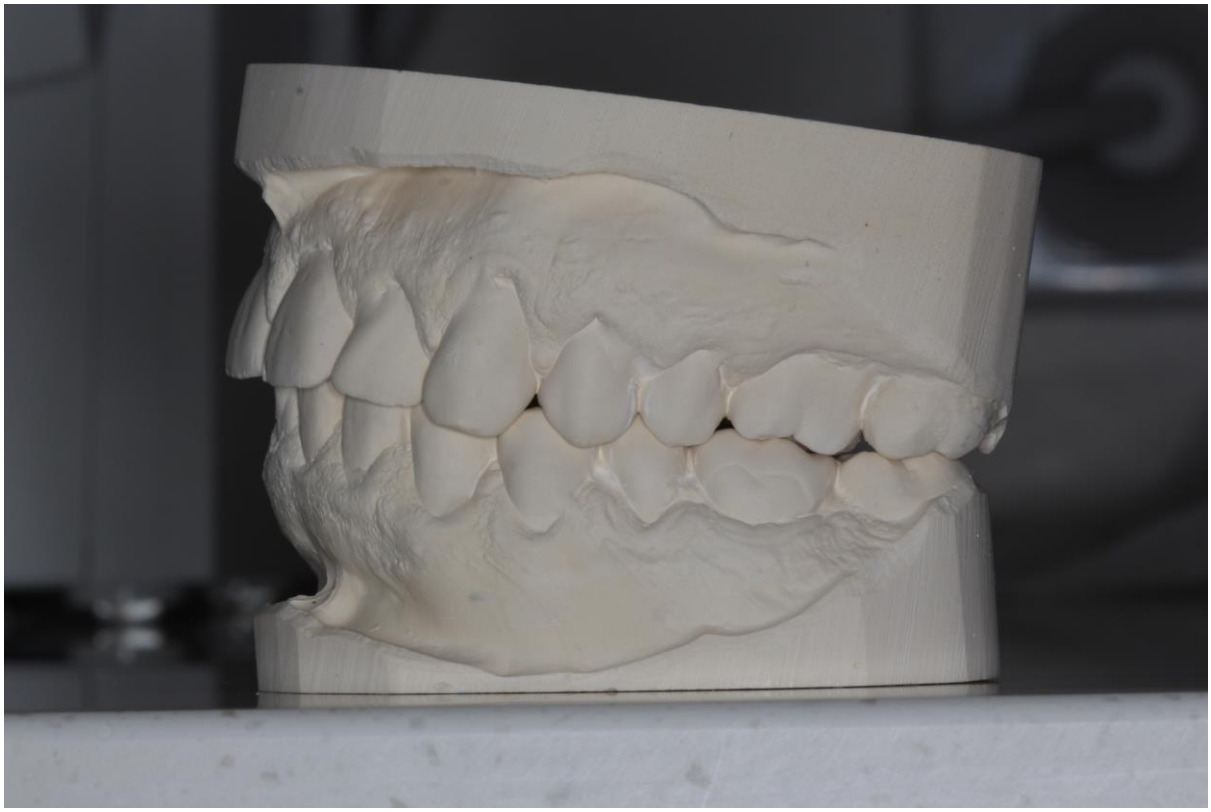
Anterior view in occlusion



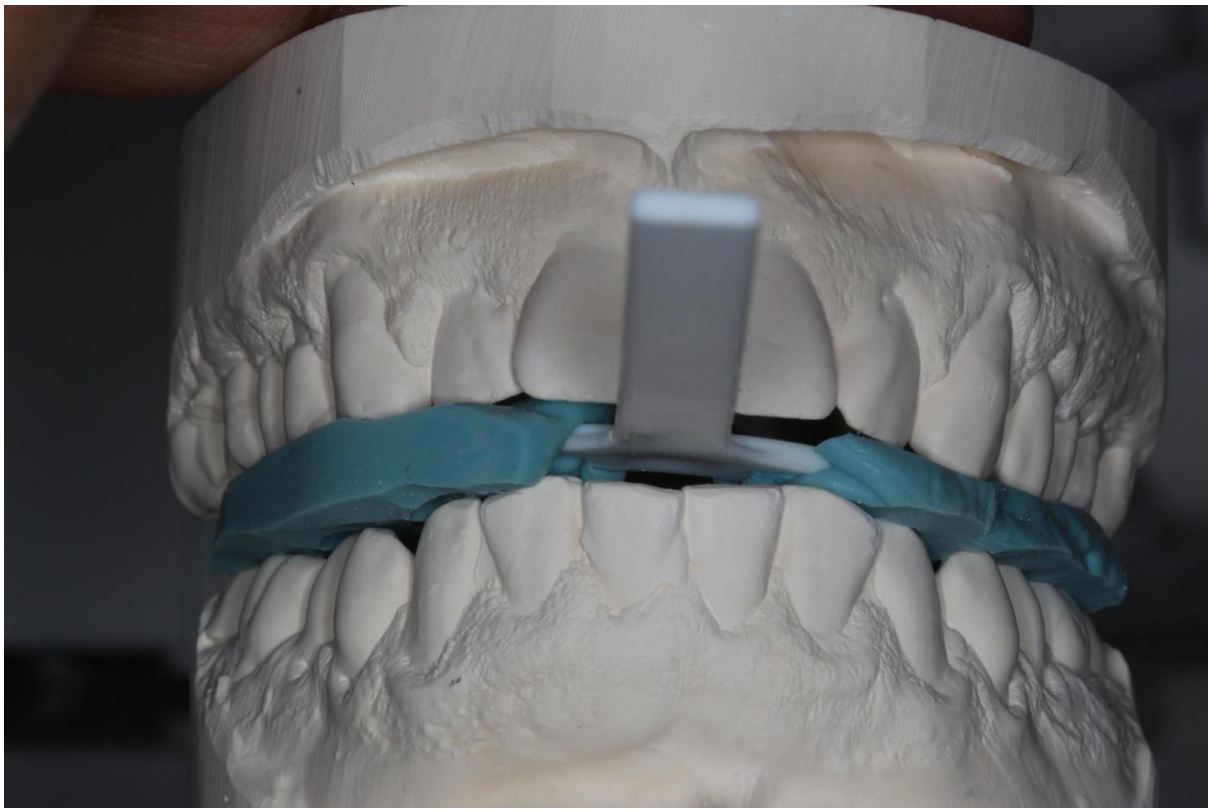
Right lateral view in occlusion



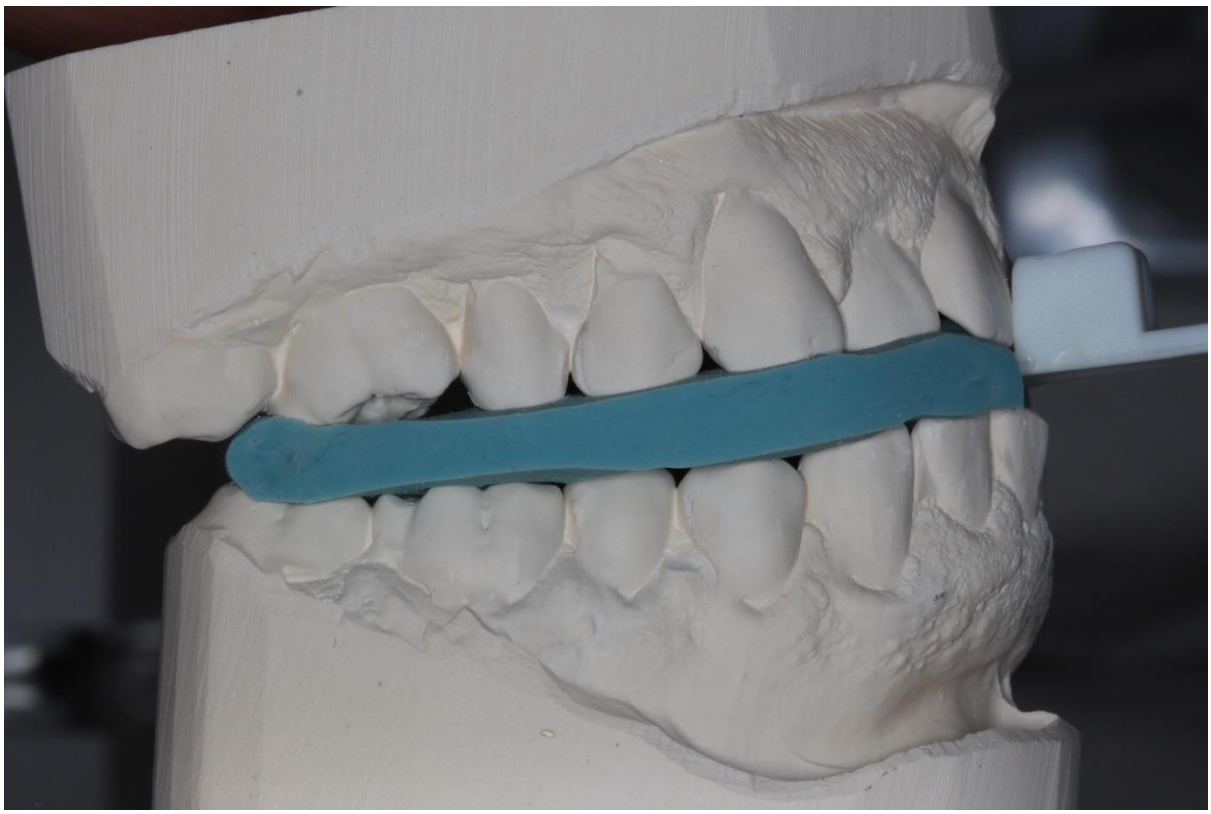
Left lateral view in occlusion



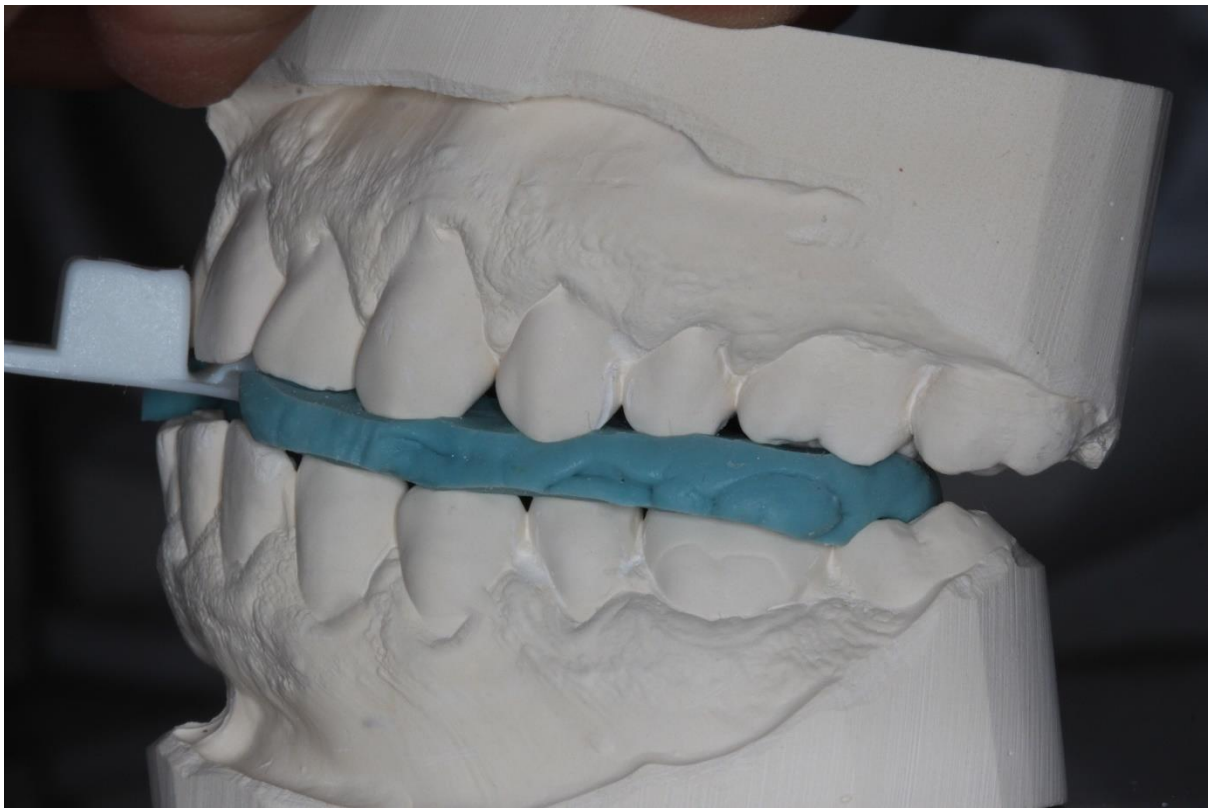
Frontal view with bite



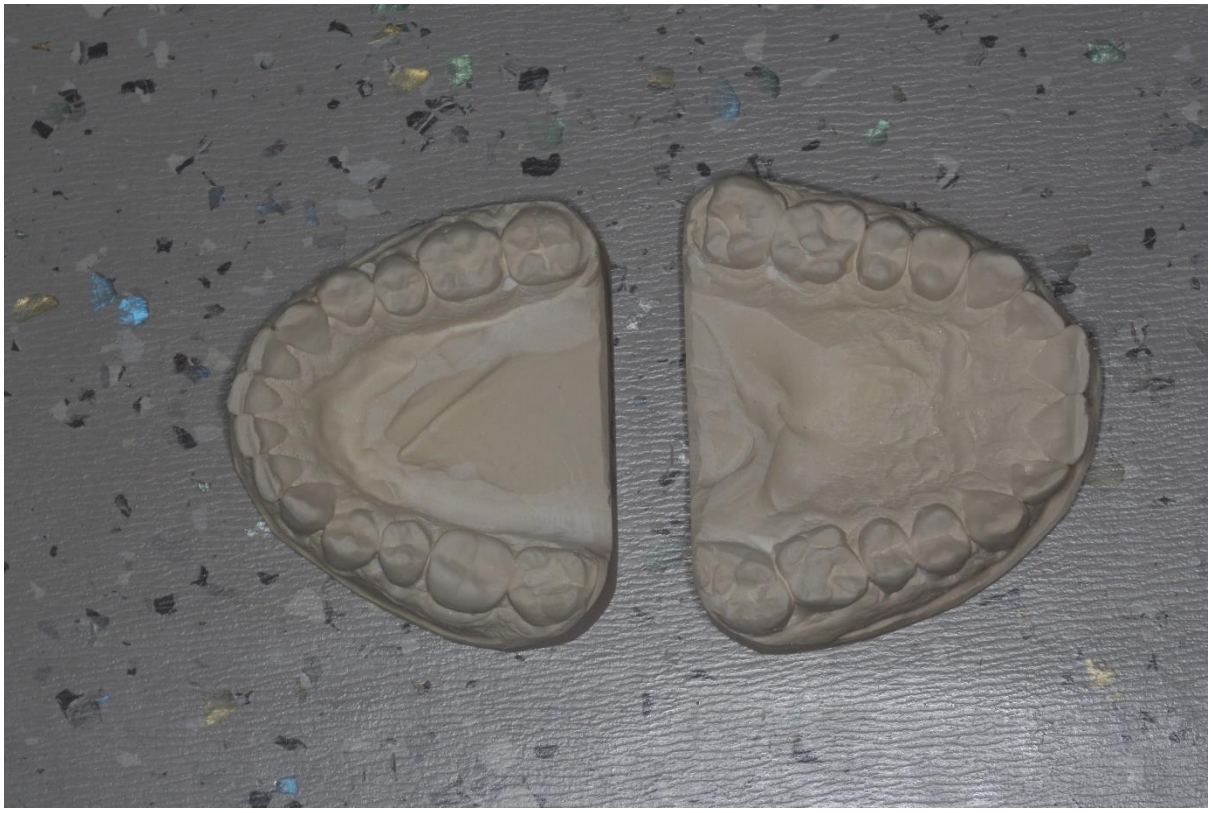
Right lateral view with bite



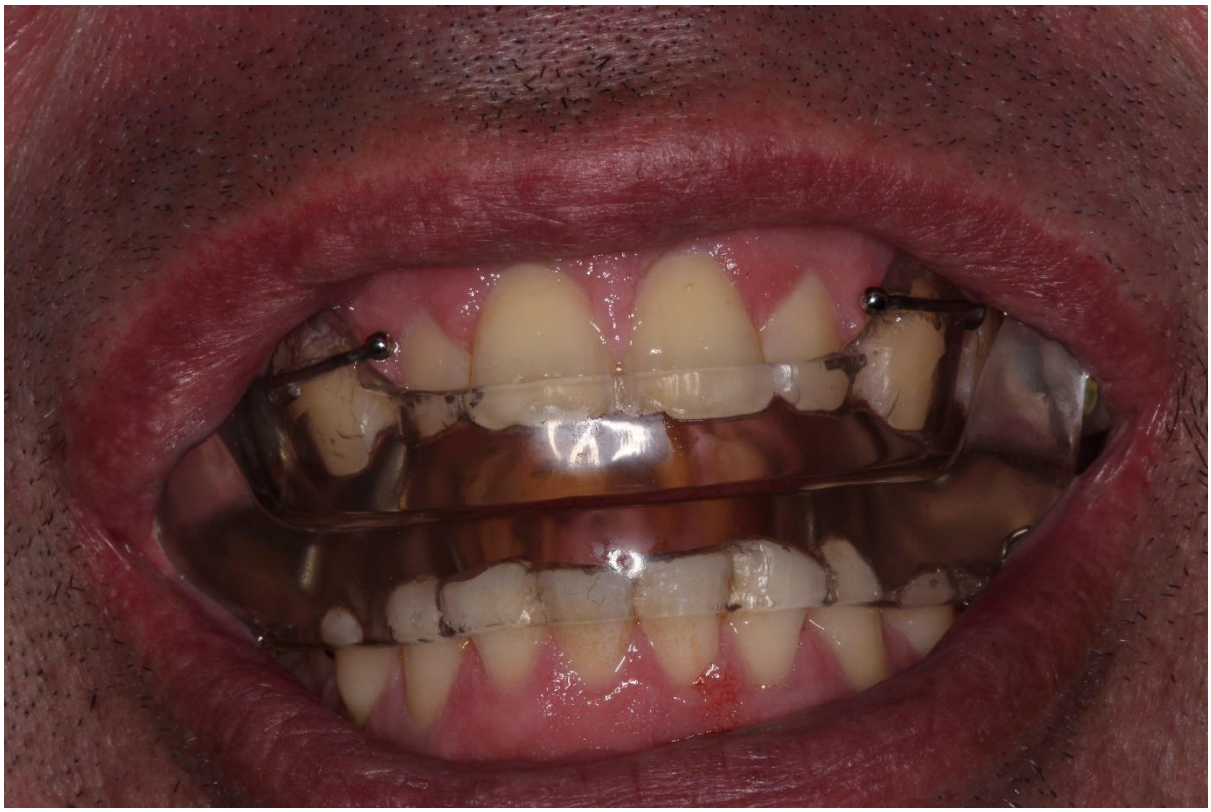
Left lateral view with bite



Occlusal view of models



Anterior view with MAD inserted



SLEEP REPORT 3

Synopsis

Introduction

This patient is a 42-year-old male (05.01.1979) who presented for management of moderate obstructive sleep apnoea (OSA). He reported loud snoring, reduced mood and motivation, alongside a history of right temporomandibular joint (TMJ) dysfunction. He presented to me for an initial consult on 01.04.2021.

Chief Complaint

The patient's primary concern was his loud snoring, which was affecting the sleep of his wife. He also reported having to sleep in a different room as his wife could not tolerate the snoring. Other concerns included reduced mood and generally reduced motivation. Interestingly, although his sleep study stated borderline somnolence, daytime sleepiness was not a feature of his main complaint.

History of Present Illness

A diagnostic sleep study performed on 15.03.2021 demonstrated an AHI of 27.9, for which he was diagnosed with moderate OSA. Minimum oxygen saturation was noted at 90%. His supine AHI score was 20.8 and his non-supine score was 29.77, suggestive of non-positional sleep apnoea. He had a sleep efficiency of 89.2% in the test. The sleep study also reported moderately severe periodic limb movement activity.

His snoring volume was reported at 7–8/10. There was no associated gasping or snorting. He reported feeling refreshed when he woke up, with no symptoms of headaches. His Epworth Sleepiness Scale score was 2, but he did report a moderate amount of lethargy during the day. He reported no history of daytime naps and advised drowsiness or the need to fall asleep in sedentary circumstances 25% of the time during the day and 50% of the time during the evenings. He has no concerns regarding his memory and ability to concentrate. However, he considered his mood to be depressed and noted a reduction in general motivation. The patient reported nocturnal bruxism and a history of intermittent, sporadic right TMJ pain related to an injury in 1998. He reported completing an arthrocentesis in 2019, which improved his right TMJ symptoms. He rated his current pain experience as 1-2/10, which occurs for 1 hour once every 2-4 weeks, mainly in the mornings. He also reported occasional clicking on the right TMJ.

He has tried weight loss, changing sleeping position, changing pillows, and a reduction in caffeine and alcohol intake in the past to manage his sleep apnoea. The sleep physician recommended a mandibular advancement device (MAD) over a CPAP due to the patient's frequent movements at night (tossing and turning).

Past Medical History

The patient weighed 80kg and was 180cm tall (BMI 24.7). His medical history was significant for gastro-oesophageal reflux disease, depression, and chronic lower back pain. His medications included esomeprazole 20mg, venlafaxine 150mg, and pregabalin 75mg. He did not report any smoking or alcohol history. No allergies were reported.

Clinical and Radiographic Examination

The patient presented with a class I molar and incisor relationship, with a 1mm midline shift to the left. He had an overbite and overjet of 1mm, and a cross bite involving teeth 22-25, most

pronounced on the 23. All teeth were present, with no signs of mobility. 4mm pocketing was noted in the interproximal region of 41-31, and was the only site of bleeding on probing, a reflection of accumulated lower lingual calculi. Aside from this region, the rest of his oral cavity was periodontally stable. There were small occlusal restorations on the 46 and 47, which were well maintained, with no marginal leakage noted. There was mild occlusal wear, with shiny wear facets evident, particularly on his anterior teeth, suggestive of active parafunction. There was a small 31 disto-incisal chip, which had a history of failed restorative work. The patient decided to leave it as he was not significantly concerned by this. His oral hygiene was fair, with a mild to moderate amount of calculus in the lower anterior region.

Maximum mouth opening was 42mm, with a right excursive movement of 8mm and a left excursive movement of 6mm. The patient was able to protrude 8mm. There was no deviation or deflection noted on opening or protrusion. TMJ examination revealed no joint sounds or pain on palpation, and there was no tenderness of the masticatory muscles.

The soft tissues of the oral cavity, including the tongue (Friedman tongue position grade III), palate, uvula and tonsils (Friedman tonsil size grade I), appeared normal in size and contour, with no soft tissue lesions identified. Salivary flow was adequate, and the oral mucosa was moist.

Diagnosis

The patient underwent a diagnostic polysomnography (level 1) on 15.03.2021, which demonstrated moderate OSA with an apnoea-hypopnea index of 27.9. It is reported as moderately severe OSA as WA Sleep categorizes AHI 25-30 as such. The nadir oxygen saturation recorded during the study was 90%. His supine AHI score was 20.8, and his non-supine score was 29.77, suggestive of non-positional sleep apnoea. He had a sleep efficiency of 89.2% in the test. He was also diagnosed with moderately severe periodic limb movement activity.

Aside from this, there was a query of right TMJ disc displacement with reduction, and a patient-reported history of intermittent arthralgia. Both of which were reported, but not evident on clinical examination. Given the history of right TMJ arthralgia and arthrocentesis, an MRI of his TMJs was organised.

Rationale

Given the patient's moderate OSA with unsuccessful conservative measures, his history of bruxism, and low restorative need, a Nylon dorsal fin appliance was recommended (3DS Advance). The initial starting position was 4mm out of 8mm (50%). A conservative starting position of 4mm was decided, given his reports of intermittent right TMJ arthralgia. He was instructed to titrate it 1mm bilaterally 2 weeks after the initial insert, at a maximum rate of +1mm per week.

Results

The patient adapted well to his MAD. He reported a >75% subjective improvement, with reduction of snoring from 7–8/10 to 1–2/10. A treatment sleep study (08.06.2021) confirmed an overall AHI reduction from 27.9 to 3.7. His supine AHI reduced from 20.8 to 4.0, and his non-supine AHI reduced from 29.77 to 3.3. Interestingly, his periodic limb movement index increased (from 17.2 to 24.9). His overall arousal index decreased from 55.2 to 24.9. The sleep physician recommended further investigation regarding the possibility of restless leg syndrome and the patient's ferritin levels. A trial of pramipexole or pregabalin was also recommended to his medical GP if clinically indicated. Side effects included transient jaw pain and bite changes, which were managed.

Disposition

The patient displayed a good response to the MAD, with confirmed reduction in AHI and sustained symptomatic relief. TMJ arthralgia was mild and well-managed with conservative measures. His bite changes were also managed with conservative measures. He was recommended to remain at 6mm out of 8mm and was placed on an annual recall.

Follow-Up Visits

Patient DOB: 05.01.1979
Initial consult: 01.04.2021
Appliance insert: 29.04.2021
Starting position: 4mm out of 8mm

DOS: 03.06.2021 - 1st review after insert.

Subjective: The patient reported a 75% improvement in his symptoms overall. He reported a reduction of snoring volume from 7-8/10 to 1-2/10. He reported feeling mildly unrefreshed in the mornings, with mild lethargy and occasional drowsiness with sedentary activities during the day. He did not report this for the evenings. His Epworth score was 3. He was able to titrate the appliance bilaterally by +2mm, however, he could not tolerate the +3 tab due to pain in his right TMJ. The main side effect reported was his bite change, whereby he noted his teeth were now in an edge-to-edge position and he cannot feel his molars contacting anymore.
Objective: The appliance was titrated to 6mm out of 8mm. The maximum mouth opening was 43mm, with lateral excursive movements of 7 mm bilaterally. There was no deviation or deflection noted on opening or protrusion. TMJ examination revealed no joint sounds or pain on palpation, and there was no tenderness of the masticatory muscles. His occlusion was changed, with a current occlusal classification of Class III for both molar and incisor, with no contacts on his posterior teeth. There were no hard or soft tissue abnormalities intraorally.
Assessment: Moderate OSA with evidence of subjective improvements. However, a major side effect of the bite change was noted. The MRI of the TMJ reported no internal derangements and was unremarkable. As such, his acute change in occlusion is likely muscular in origin.

Treatment today: adjustment and return of occlusion to the original Class I occlusion using a leaf gauge to reset the muscle engram (see photos). Discussed correcting his bite with a paddle pop stick (with the same technique and principles as a leaf gauge) at home if required. However, I recommended the patient to have breakfast consistently in the morning first, as the chewing action should return his occlusion to the original position in the mornings if he feels his bite is off.
Plan: To continue at this position for several more weeks before attempting to titrate +1mm bilaterally, and to review symptoms. A review was scheduled in 3 months

DOS: 23.09.2021

Subjective: The patient reported a greater than 75% improvement in his overall symptoms. He noted a maintenance of reduced snoring volumes. He reported feeling refreshed in the mornings, with mild lethargy and occasional drowsiness with sedentary activities during the day and evenings. His Epworth score was 4. He remains at +2mm bilaterally (current position 6mm out of 8mm), as titration to 7mm still elicited pain on his right TMJ. No side effects noted apart from minor bite changes in the morning, which are largely corrected by chewing in the mornings and, on the rare occasion, the paddle pop technique. The patient reported that he completed a treatment sleep study at the recommendation of his medical GP, who deemed it necessary due to his occupational needs, which confirmed the success of the titrated MAD.
Objective: The appliance was titrated to 6mm out of 8mm. The maximum mouth opening was 48mm, with lateral excursive movements of 15mm bilaterally. There was no deviation or deflection noted on opening or protrusion. TMJ examination revealed no joint sounds or pain on palpation, and there was no tenderness of the masticatory muscles. He had a Class I occlusion (molar and incisor), with contacts throughout. There were no hard or soft tissue abnormalities intraorally.
Assessment: Moderate OSA, which has been confirmed to be successfully treated with the MAD.
Plan: Patient to continue to remain at this position, 6mm out of 8mm nightly. He was scheduled for a review in 6 months.

SUMMARY

The case had several unique points of discussion. First, it highlights that OSA is not always about sleepiness, which is seen in this case with an ESS of 2. It is important to consider other risk factors, such as difficulty in concentration and mood disturbances, in the context of his snoring, and it is a good example of why a sleep study is warranted even in the absence of classic daytime somnolence. It also highlights that a history of TMD is not an absolute contraindication to MAD, and with conservative planning, such as a more conservative start position and slower titration rates, success can be found in these patients (13). Another interesting point in this case is the slight increase in the periodic limb movement index even after a reduction in his total AHI, which suggested a possible underlying disorder, as reported by the sleep physician, who recommended further investigation and management. Interestingly, a recent meta-analysis by Lin in 2022, however, suggested that baseline PLMI usually persists even after CPAP management. In their discussion, they mentioned possible mechanisms by which there is an increase in PLMI, include CPAP-triggered sleep fragmentation and bodily discomfort. However, these are just hypotheses and suggest further investigation into this issue. As far as I'm aware, there are no papers investigating the reduction or persistence in PMLI in MAD therapy. Given the persistence of his mild symptoms and their association with other diseases (such as RLS), the sleep physicians' recommendations were still warranted.

Perhaps the most unique portion of the management case was his acute bite change early in the treatment. Occlusal changes are a well-known long-term side effect of oral appliance therapy, usually attributed to dental changes (labial tipping of lower central incisors, lingual tipping of upper central incisors, and more) with minor implications for skeletal influences (14, 15). Early side effects, including an uncomfortable bite in the mornings, are well recognised and are thought to be more muscular in origin. These are usually managed by the action of chewing in the morning or using a morning aligner. Given the persistence and severity of his changed occlusion, I used a leaf gauge,

which is traditionally used for locating centric relation in prosthodontic circles, as a neuromuscular deprogrammer in hopes of resettling his condyles posteriorly, which was successful.

References

1. Langaliya A, Alam MK, Hegde U, Panakaje MS, Cervino G, Minervini G. Occurrence of Temporomandibular Disorders among patients undergoing treatment for Obstructive Sleep Apnoea Syndrome (OSAS) using Mandibular Advancement Device (MAD): A Systematic Review conducted according to PRISMA guidelines and the Cochrane handbook for systematic reviews of interventions. J Oral Rehabil. 2023;50(12):1554-63.
2. Rana A, Raut A, Mathur A. The Occlusal Side Effects of Mandibular Advancement Device Therapy in Adult Sleep Apnea Patients: A Systematic Review. Cureus. 2023;15.
3. Gandedkar NH. Long-term mandibular advancement devices for obstructive sleep apnea may result in progressive dental changes with minimal skeletal effects. Journal of Evidence-Based Dental Practice. 2025.

PRE-TREATMENT SLEEP STUDY

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NATA

In-Centre Diagnostic PSG Sleep Study Report

PATIENT DETAILS:

Location	Bethesda Private Hospital	DOB		5/01/1979	
Name		Study Date		15/03/2021	
Patient ID Number	56031	Report Date		17/03/2021	
Usual GP / CC		Height	180cm	Weight	80kg
Referring Doctor		BMI	24.7	ESS Score	8
Reason for Study	Investigation of OSA, Snoring, Leg movements				

CONCLUSION:

A Polysomnography Diagnostic Sleep Study was performed in hospital to monitor sleep parameters including Nasal Flow/Respiratory effort/Pulse oximetry/ECG/Limb activity/EEG/EOG and Sub mental chin EMG activity. The data was technically acceptable. Sleep efficiency was good. REM latency was delayed and there was a reduction in the proportion of REM sleep. The ECG demonstrated sinus rhythm.
There was evidence of **moderately severe obstructive sleep apnoea, associated with borderline somnolence**. There was intermittent snoring. There was moderately severe periodic limb movement activity.
Recommend a trial of nasal cpap. Obstructive sleep apnoea can impair driving performance and suitable advice should be given if relevant. If the patient fails to tolerate or accept cpap consider **the alternative of a mandibular advancement splint (MAS)** or upper airway surgery. After suitable adjustment of the MAS, a follow up sleep study is required to ensure the efficacy of the MAS. The patient has been advised to contact the referring medical practitioner to discuss results the study and after a suitable time the patient will be contacted and offered a trial of therapy.

Respiratory and sleep Physician

RESULTS:

Key indices	**Results**	**Normative Values**	**Definitions**
Apnoea Hypopnoea Index (AHI)	27.9	Normal (AHI = 0-5) Mild (AHI=5-10) Mild to moderate (AHI = 10-15) Moderate (AHI = 15-25) Moderate to Severe (AHI = 25-30) Severe (AHI = 30+)	*AHI: Index of all respiratory events excluding RERA's (respiratory effort related arousals) per hour *RDI: Index of all respiratory events including RERA's per hour *TIB: Time in Bed
Respiratory Disturbance Index (RDI)	34.7		
Supine AHI	20.8		
Non Supine AHI	29.77		
REM AHI	33.0		
Oxygen Desaturation Index (ODI)	27.4		
Arousal Index (/hr)	55.2		
Periodic Limb movement Index (PLMs/Hr)	17.2		
Sleep Data	**Results**	**Normative Values**	
Total Sleep Time (TST)	5.47 hrs		
Sleep Efficiency (% of TIB)	89.2 %	85% and over	
Sleep Latency (Minutes)	3.5 min	5-15 minutes	
REM Latency From Sleep Onset (Minutes)	246.5 min	70-110 minutes	
REM Proportion (% of TST)	10.5 %	20-30 %	
Slow Wave Sleep Proportion (% of TST)	28.61 %	20%	
Other Data	**Results**	**Scoring Criteria**	
Average Hypopnoea/Apnoea Length	30.7 sec	*Study has been scored based on the AASM version 2.5 scoring criteria.	
Time spent with SaO2 Less than 90%	0.0 min		
Nadir SpO2 (minimum SpO2)	90		
Average Heart Rate	70.8 bpm		
Supplemental O2 (Litres per Minute)	-		
Evening Blood Pressure	115/75		
Morning Blood Pressure	119/77		

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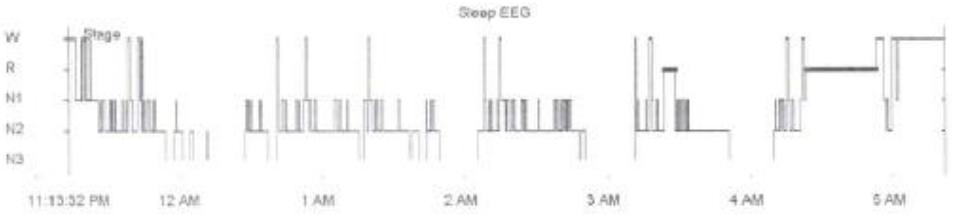
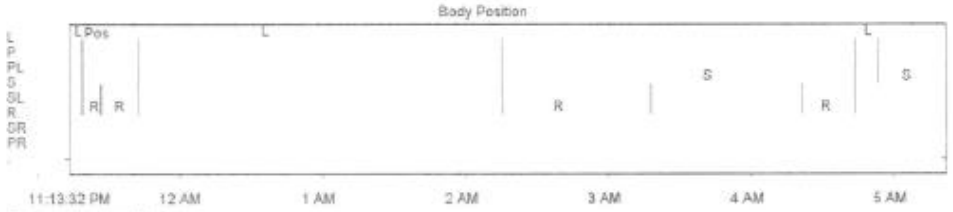
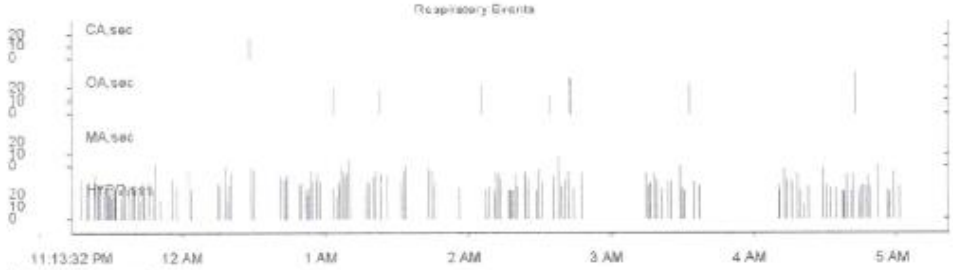
PATIENT STATISTICS:





Oximetry Evolution



Leg Movements

POST-TREATMENT SLEEP STUDY

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NATA

In-Centre MAS PSG Sleep Study Report

PATIENT DETAILS:

Location	Bethesda Private Hospital	DOB		5/01/1979	
Name		Study Date		8/06/2021	
Patient ID Number	56031	Report Date		10/06/2021	
Usual GP / CC		Height	180cm	Weight	85kg
Referring Doctor		BMI	26.2	ESS Score	4
Reason for Study	Evaluation of effectiveness of mandibular advancement splint (MAS) for treatment of patient's sleep apnoea.				

CONCLUSION:

A Polysomnography Sleep Study was performed with a Mandibular advancement splint (MAS) in situ in hospital to monitor sleep parameters including Nasal Flow/Respiratory effort/Pulse oximetry/ECG/Limb activity/EEG/EOG and Sub mental chin EMG activity.
The data was technically acceptable. Sleep efficiency and sleep architecture were normal.
The ECG demonstrated sinus rhythm.
There was evidence of **moderately severe periodic limb movement activity**. Specific enquiry should be made for any history of restless legs syndrome. Recommend check iron levels and consider trial of Pramipexole or Pregabalin if clinically relevant.
Obstructive sleep apnoea was well controlled using a mandibular advancement splint (MAS). There was minimal snoring. No further adjustment of the mandibular advancement splint is required.

Respiratory and sleep Physician

RESULTS:

Key indices	Results	Normative Values	Definitions
Apnoea Hypopnoea Index (AHI)	3.7	Normal (AHI = 0-5) Mild (AHI=5-10) Mild to moderate (AHI = 10-15) Moderate (AHI = 15-25) Moderate to Severe (AHI = 25-30) Severe (AHI = 30+)	*AHI: Index of all respiratory events excluding RERA's (respiratory effort related arousals) per hour *RDI: Index of all respiratory events including RERA's per hour *TIB: Time in Bed
Respiratory Disturbance Index (RDI)	4.1		
Supine AHI	4.0		
Non Supine AHI	3.3		
REM AHI	6.1		
Oxygen Desaturation Index (ODI)	5.6		
Arousal Index (/hr)	21.0		
Periodic Limb movement Index (PLMs/Hr)	24.9		
Sleep Data	**Results**	**Normative Values**	
Total Sleep Time (TST)	419.5 min		
Sleep Efficiency (% of TIB)	97.8 %	85% and over	
Sleep Latency (Minutes)	7.5 min	5-15 minutes	
REM Latency From Sleep Onset (Minutes)	83.0 min	70-110 minutes	
REM Proportion (% of TST)	37.3 %	20-30 %	
Slow Wave Sleep Proportion (% of TST)	20.26 %	20%	
Other Data	**Results**	**Scoring Criteria**	
Average Hypopnoea/Apnoea Length	22.8 sec	*Study has been scored based on the AASM version 2.5 scoring criteria.	
Time spent with SaO2 Less than 90%	0.1 min		
Nadir SpO2 (minimum SpO2)	88		
Average Heart Rate	70.7 bpm		
Supplemental O2 (Litres per Minute)	-		
Evening Blood Pressure	121/80		
Morning Blood Pressure	108/76		

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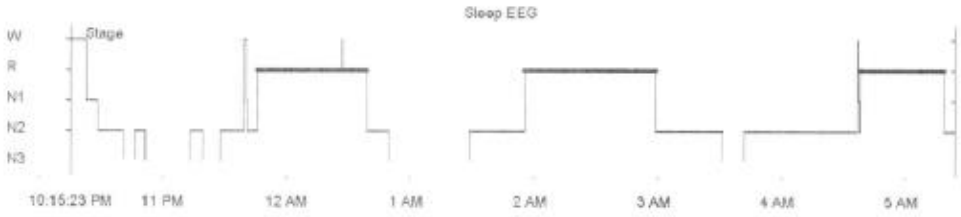
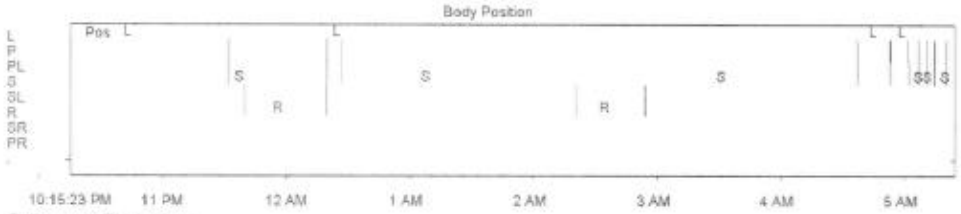
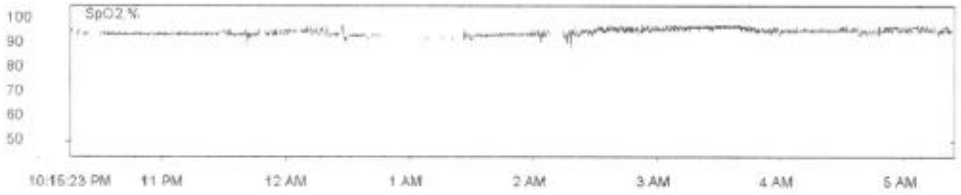
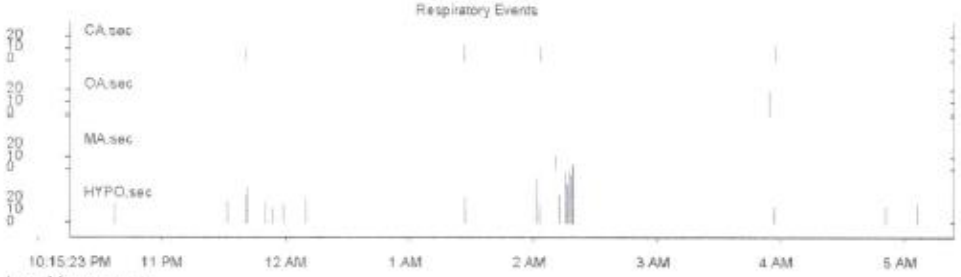
PATIENT STATISTICS:





Oximetry Evolution

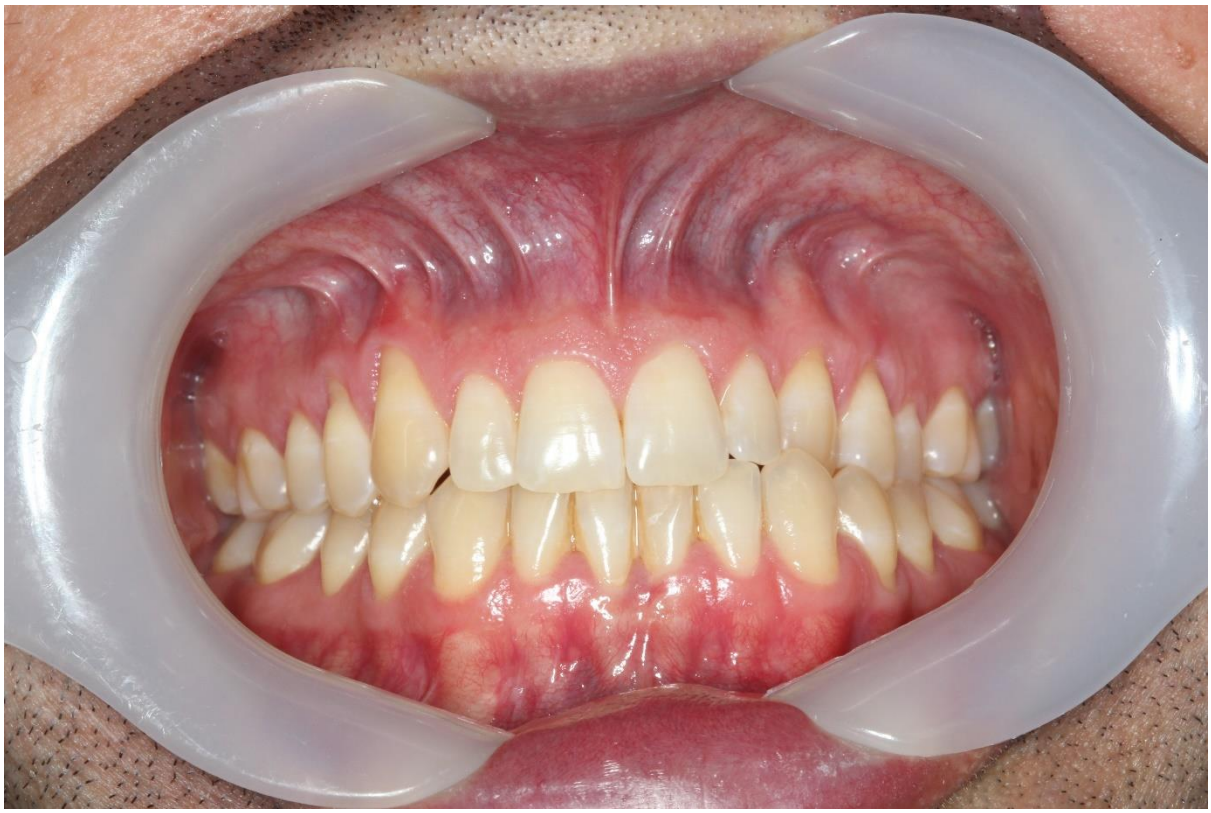




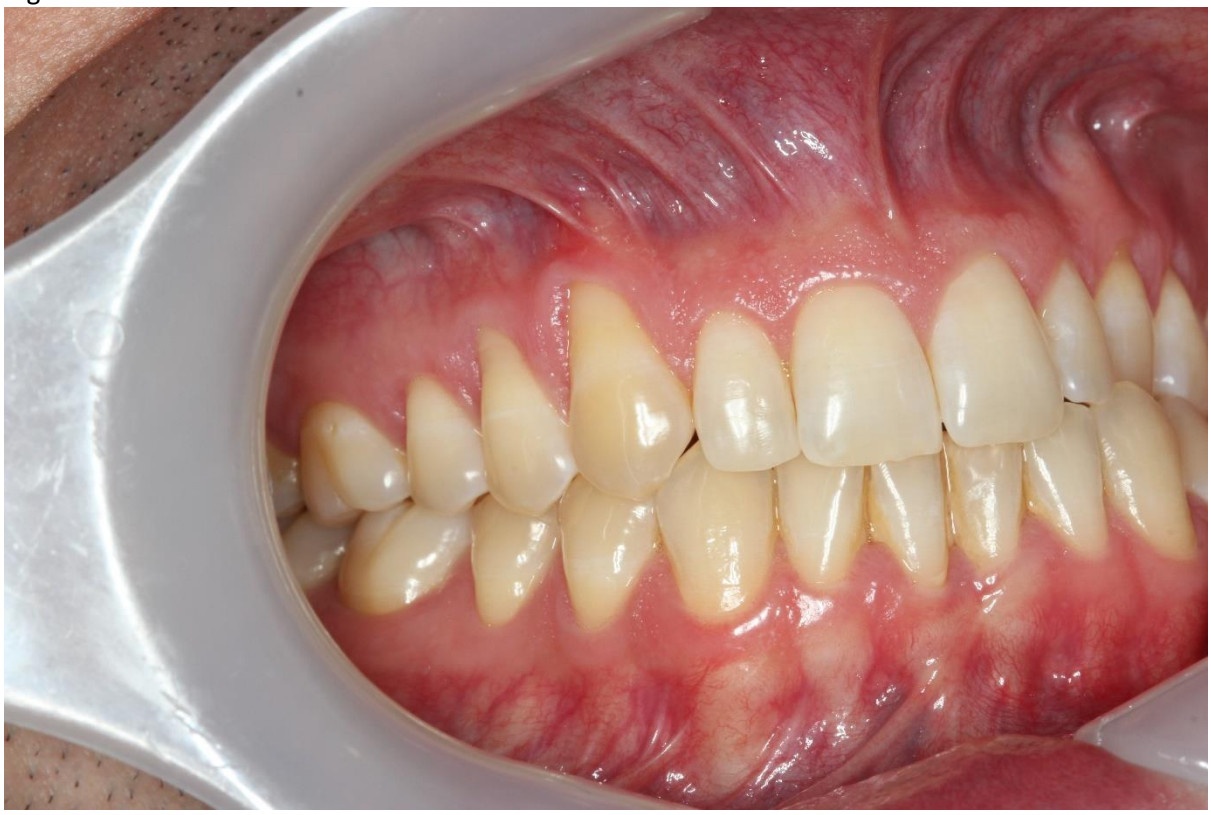
Leg Movements

INTRA ORAL PHOTOS – INITIAL CONSULT 01.04.2021

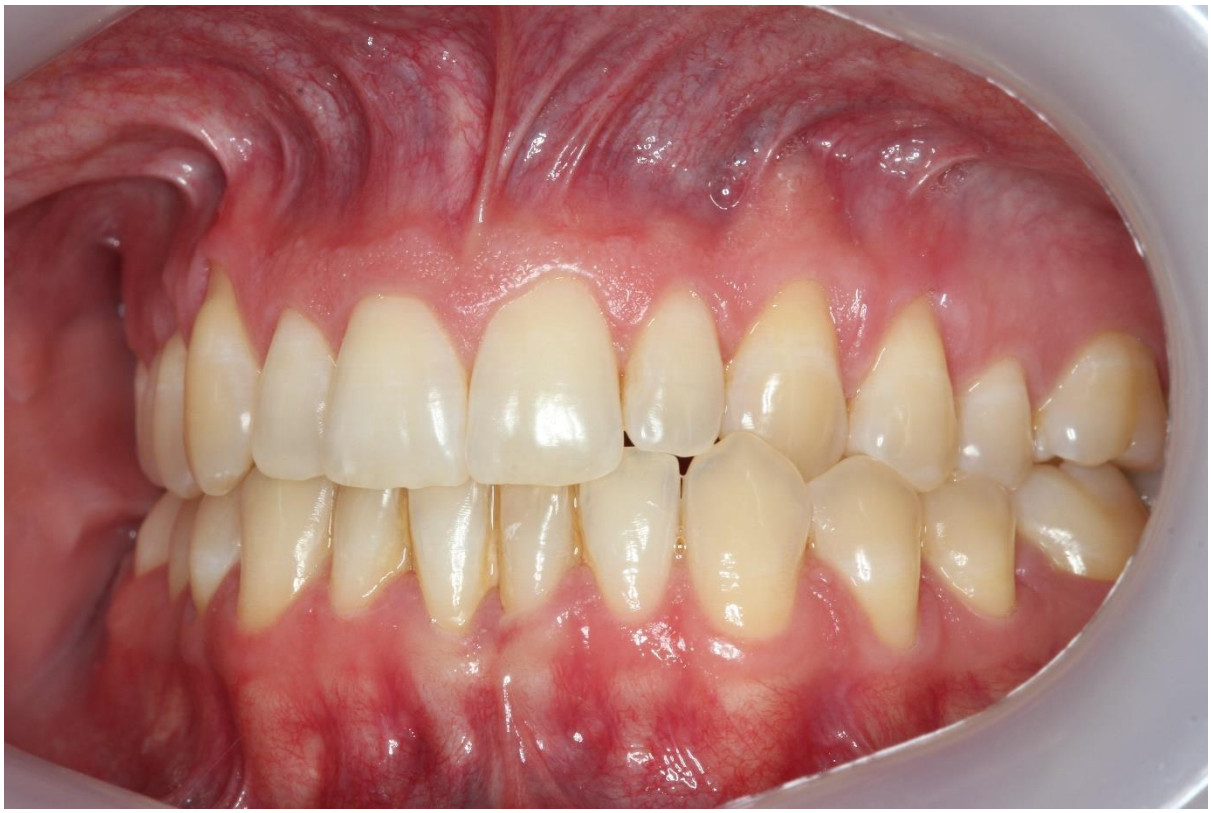
Anterior view in occlusion



Right lateral view in occlusion

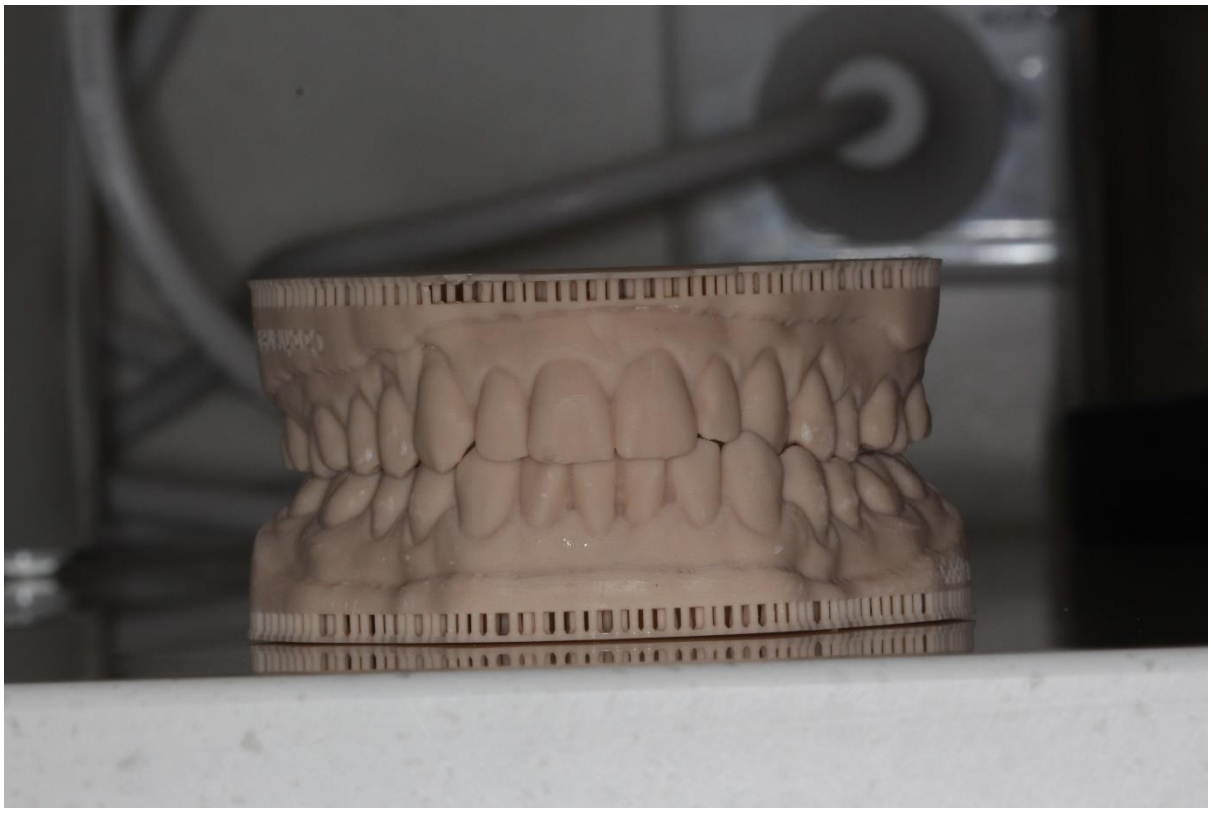


Left lateral view in occlusion

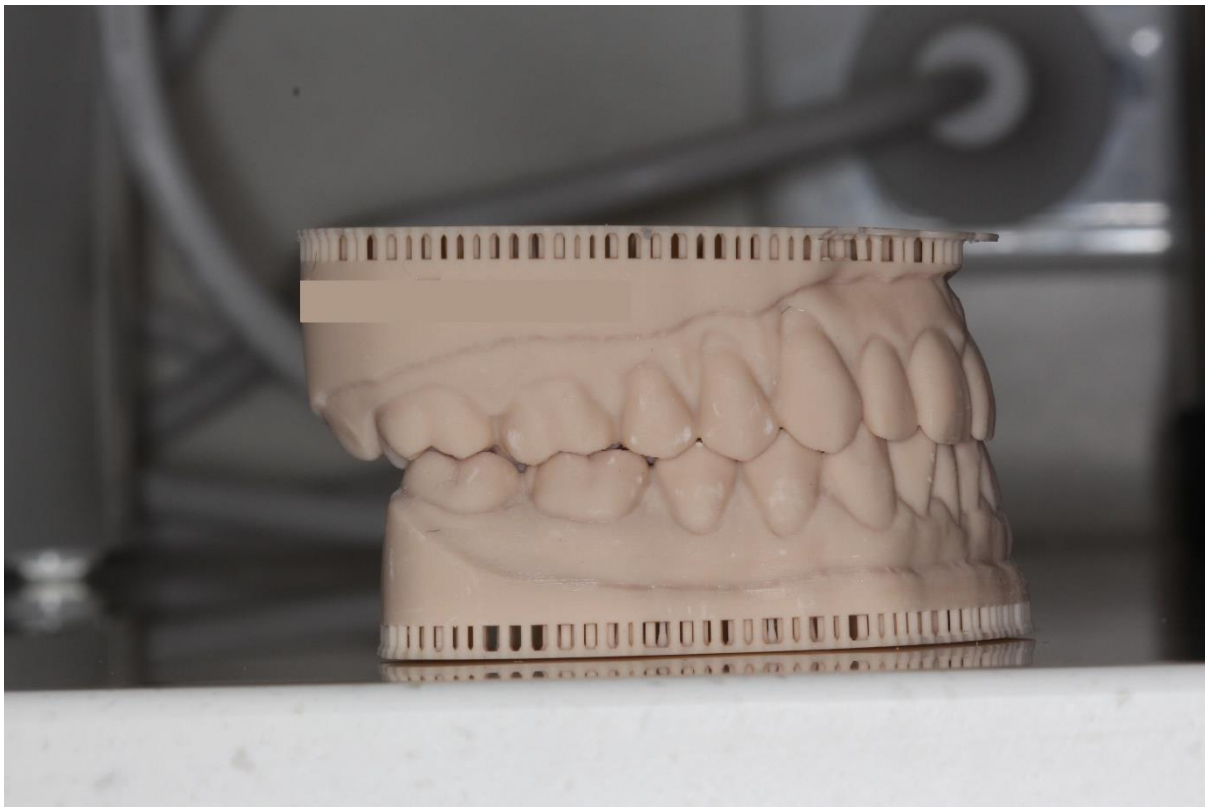


Models

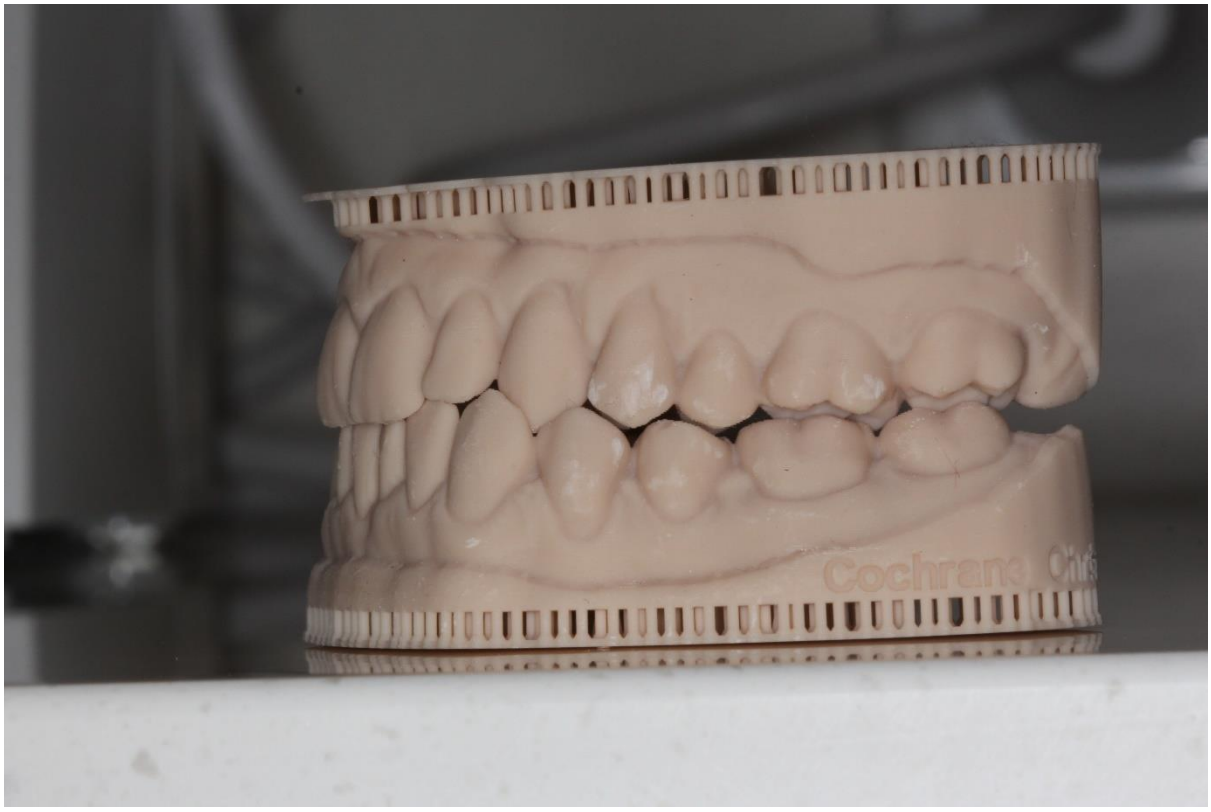
Anterior view in occlusion



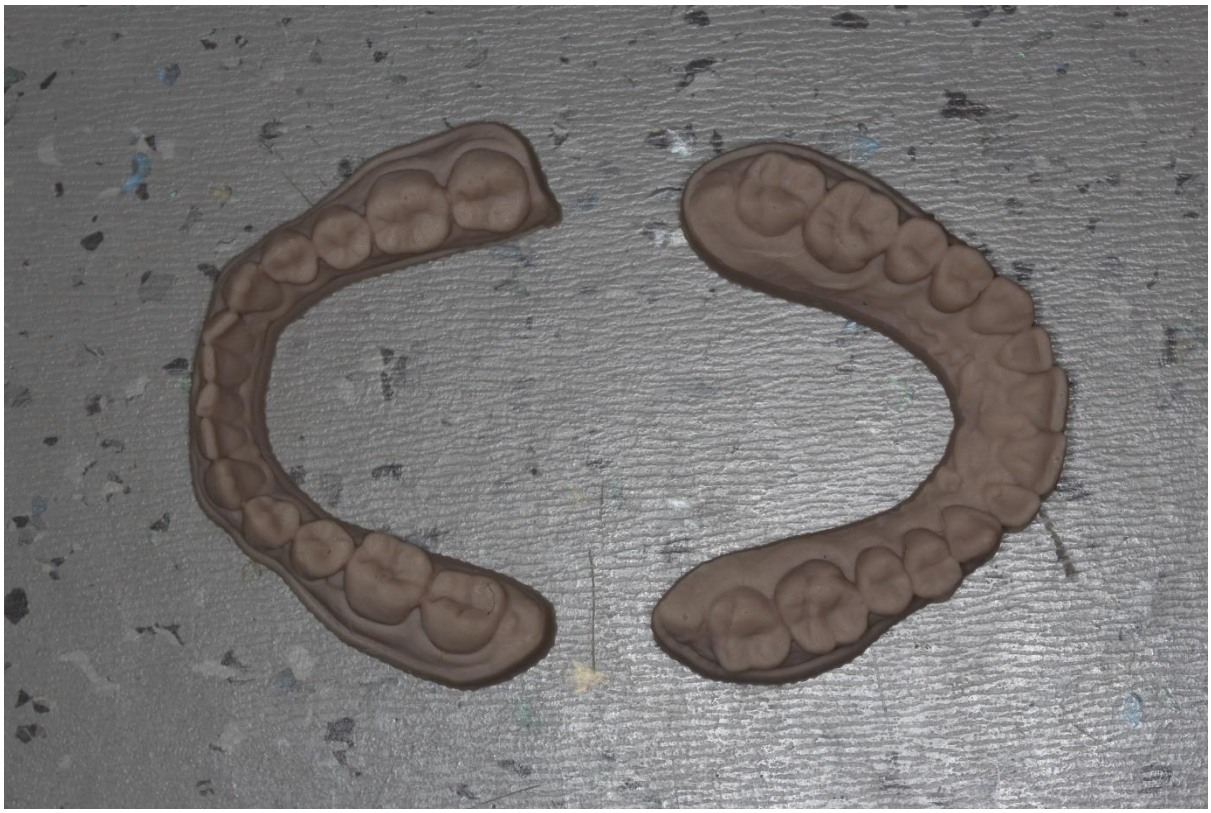
Right lateral view in occlusion



Left lateral view in occlusion

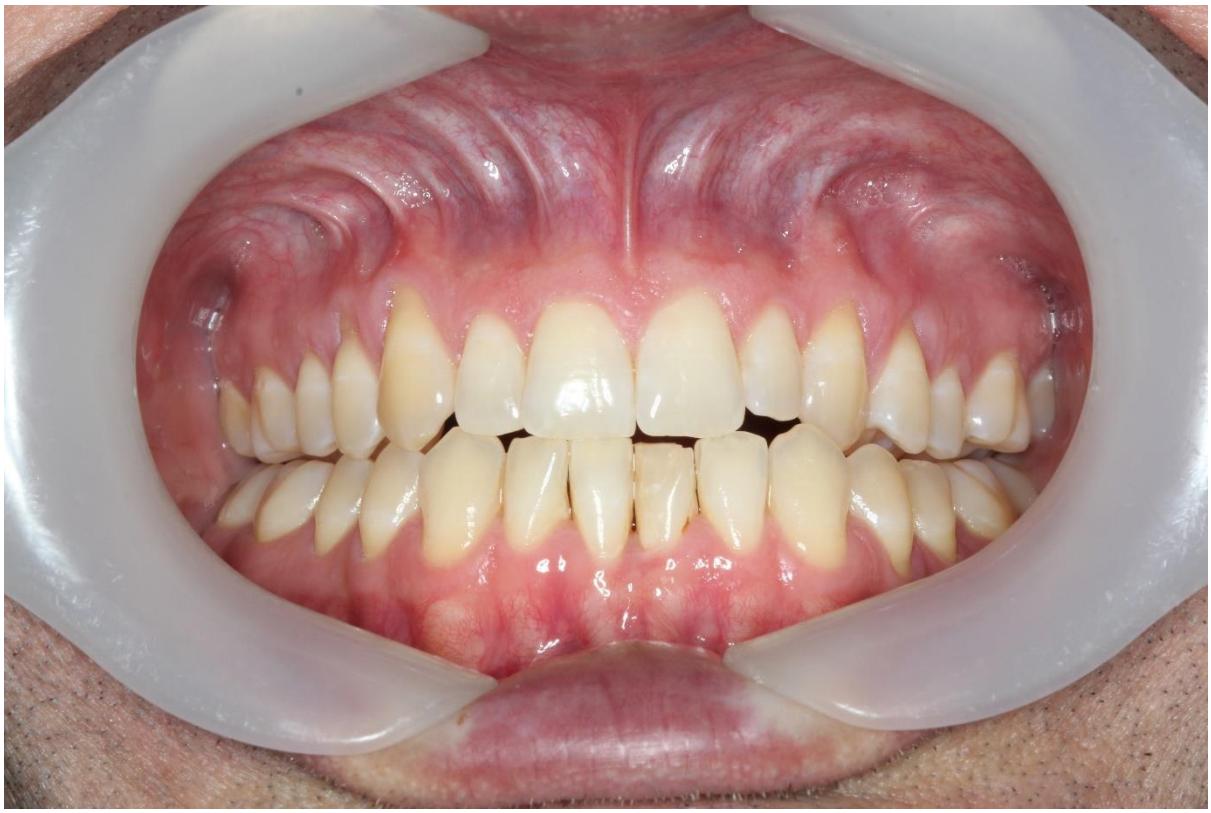


Occlusal view

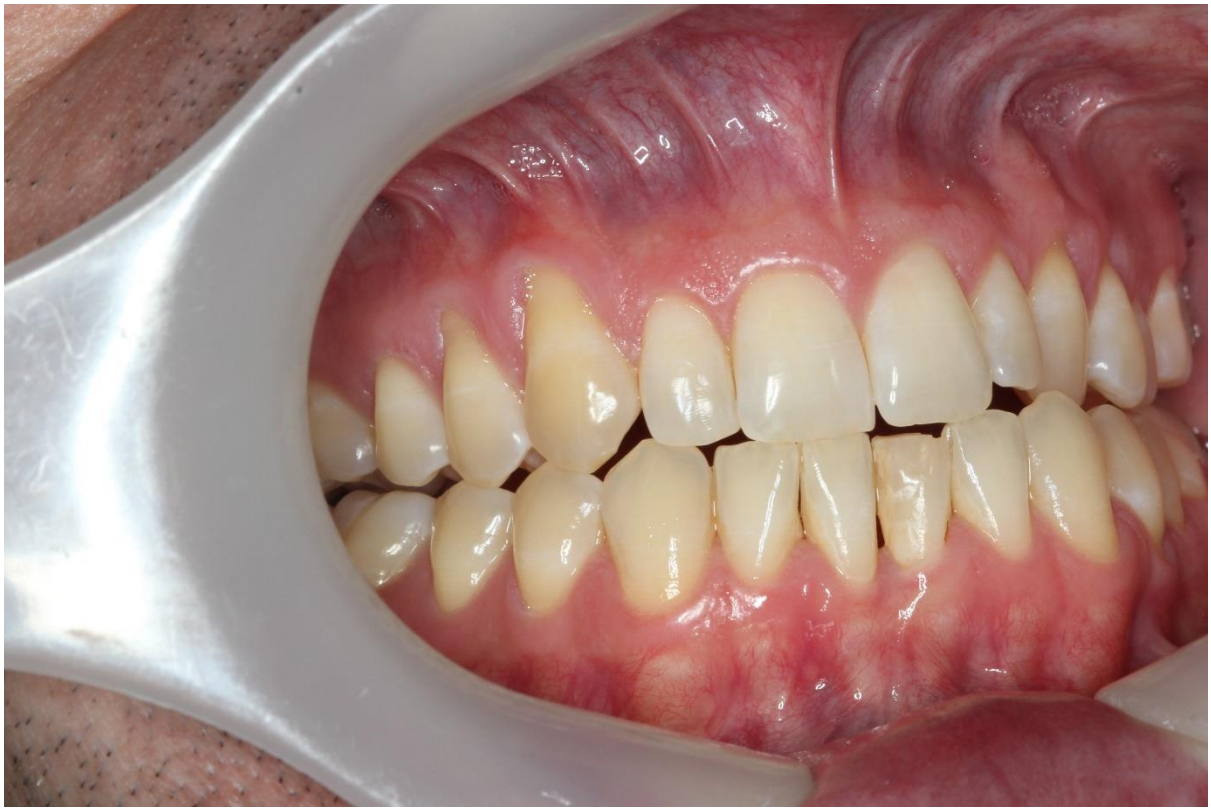


REVIEW 03.06.2021 WITH CHANGE IN OCCLUSION

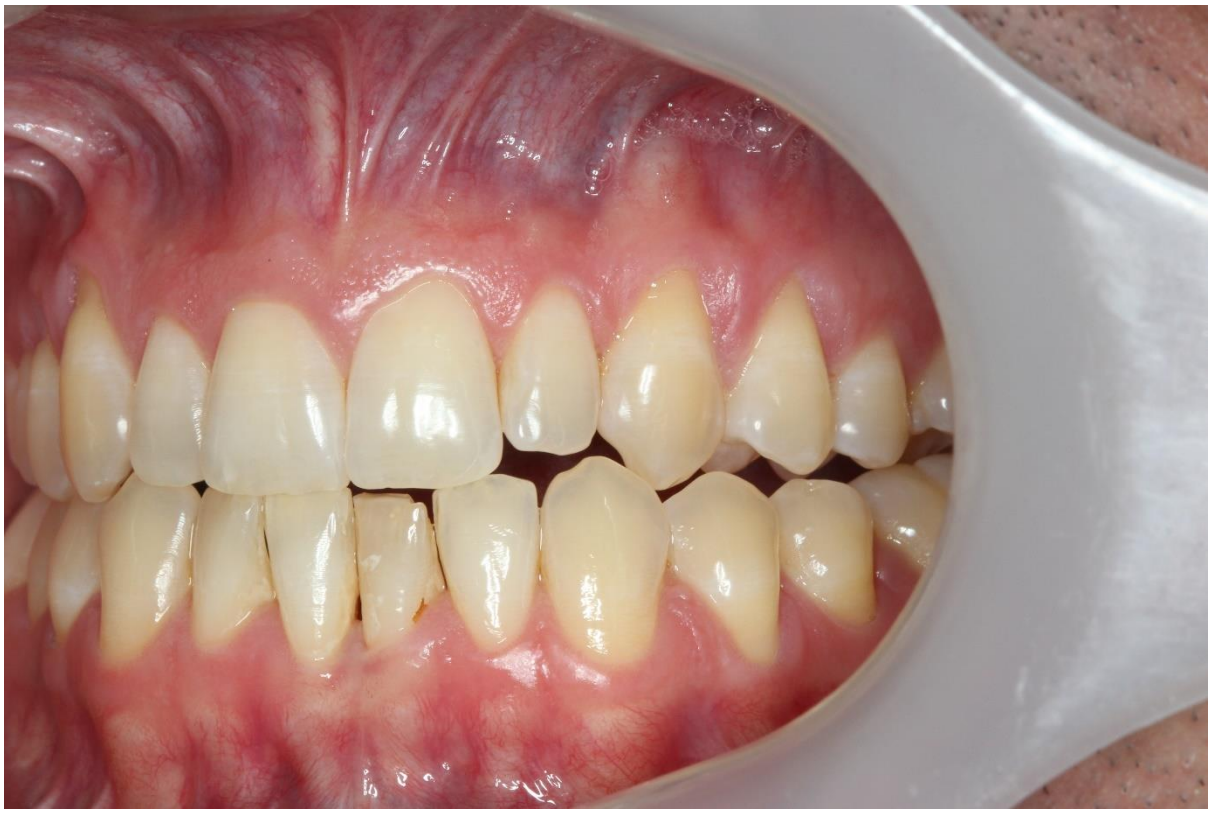
Anterior view in occlusion



Right lateral view in occlusion

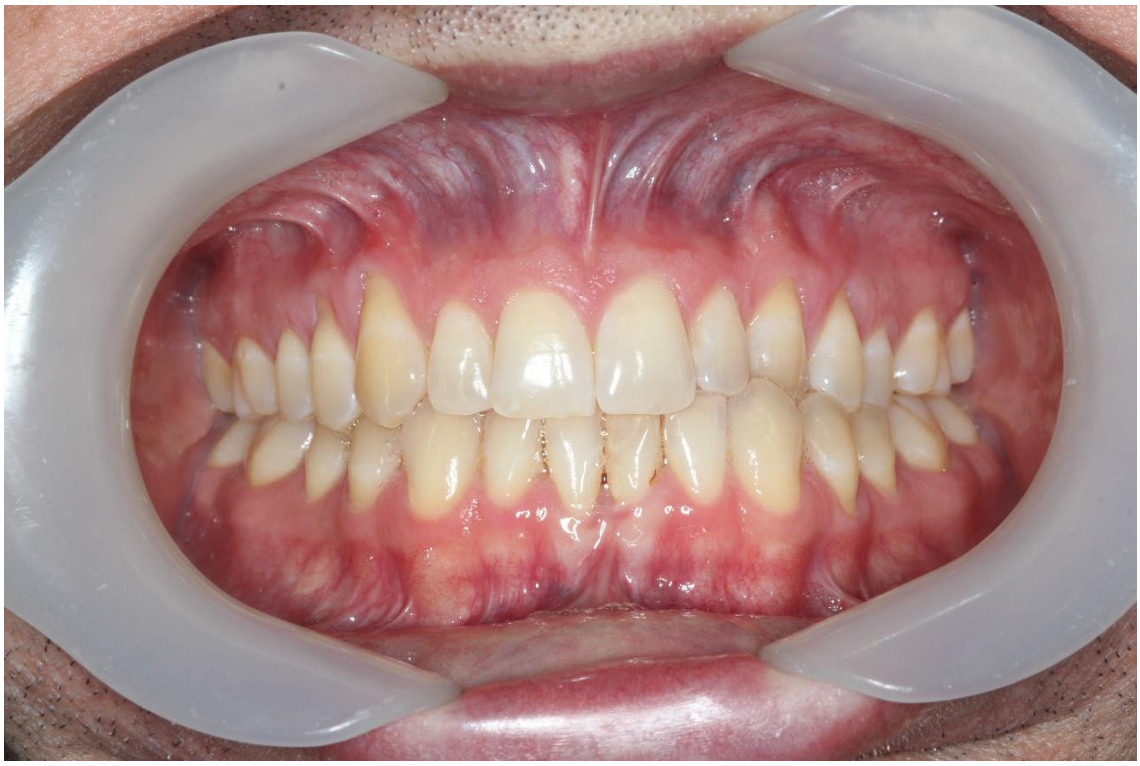


Left lateral view in occlusion

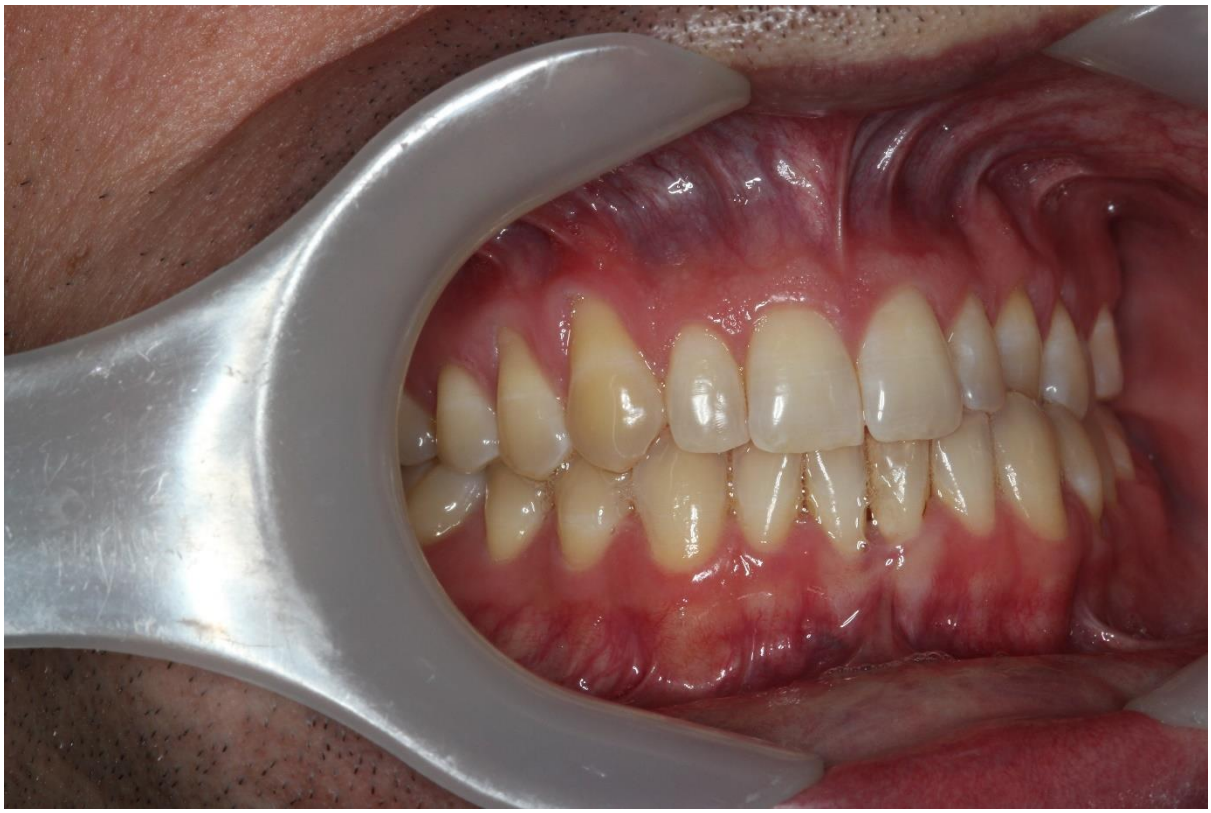


REVIEW 03.06.2021 POST LEAF GAUGE

Anterior view in occlusion



Right lateral view in occlusion



Left lateral view in occlusion