RESEARCH ARTICLE

A STUDY TO EVALUATE THE LONG TERM EFFECT OF TITRABLE MANDIBULAR ADVANCEMENT DEVICE (MAD) ON APNEA HYPOPNEA INDEX(AHI) AND SLEEP BRUXISM

Ashutosh Gupta[1],K. Sujan[2],Piyush Sharma[3],Avinash Mishra[4],Abhishek Singh[5],R. Haribabu[6]
1.Sr. Lecturer, Department of Prosthodontics, Dental College, Azamgarh.
2.Head, Department of Prosthodontics, Dental College, Azamgarh.
3.Sr. Lecturer, Department of Orthodontics, Dental College, Azamgarh.
4.Sr. Lecturer, Department of Conservative dentistry and Endodontics, Dental College, Azamgarh.
5.Head, Department of Prosthodontics, Sathyabama university

ABSTRACT

Objective: The present aimed at evaluating the effect of oral appliance on sleep bruxism and sleep disorder breathing.

Methods: Eighteen patients who fulfilled the study criteria , underwent polysomnography before treatment with oral appliance,and then at 6 months and at 17 months after insertion of the oral appliance. Both rhythmic masticatory muscle activity (RMMA) episodes per hour and audible tooth grinding events per night were recorded before treatment, at 6 months and then 17 months after insertion of oral appliance.

Result:A significant reduction in AHI and sleep bruxism (Mean±SD) was observed after 3 months of wearing oral appliance ($p< 0.001$). No sleep bruxism episodes with tooth grinding noises were observed following the use of an oral appliance.

At 17 months following oral appliance use a significant reduction in AHI and RMMA was observed at 1 year treatment interval as compared to pre-treatment values ($p=0.001$). Few sleep bruxism episodes with tooth grinding noises were observed following the use of an oral appliance.

Conclusion: Within the limitations of the present study it can be concluded that oral appliances are effective in reducing the frequency of sleep bruxism on short term basis.

Keywords: Mandibular advancement device, sleep bruxism, obstructive sleep apnea

INTRODUCTION

Sleep bruxism (SB) is defined as a stereotyped movement disorder characterized by rhythmic masticatory muscle activity (RMMA) associated with tooth grinding (TG) and occasional tooth clenching.[1] SB awareness in the general population is reported at 8% and tooth grinding noises are usually noted by the patient's bed partner or a family member. The prevalence of primary SB (based on grinding sounds reported from family members or sleep partners) declines linearly from childhood (12% to 20%) to adult life (5% to 8%) and even more over 60 years of age (3%) without any gender differences.[2-5] The consequences of SB

Corresponding Author: Dr Ashutosh Gupta Email: drashutosh.gupta@yahoo.co.in

include excessive tooth wear, tooth fractures, sensitivity, orofacial pain and sleep related headaches. [6-10]

During the last two decades there has been an increased interest in oral appliance (OA) as a treatment modality for OSA. The OA is used during night and it protrudes the mandible and thereby opens the airway. The oral appliance is easy to use as it does not require electrical power, does not make any noise and cross-over studies have shown that patients prefer OA therapy to CPAP, which leads to good compliance. The effect of SB treatment and its influence on sleep disorder breathing has been noted in a few studies. It is common dental practice to utilize oral appliance therapy when treating SB; however, its effect remains an enigma. [11-13]

Hence the present study was planned to evaluate the effect of oral appliance on sleep bruxism and sleep disorder breathing.

MATERIALS AND METHOD

The present study was conducted in the Department of Prosthodontics, Azamgarh Dental College & Hospital. Prior approval of the Institutional ethical committee had been obtained.

The inclusion criteria were: OSA verified by somnographic evaluation (defined as apnea/hypopnea index (AHI) >5 < 15per hr) and at least 2 of the following symptoms—daytime sleepiness, snoring, witnessed apneas, fragmented sleep, at least 7mm of sustainable protrusive jaw movement from the position of maximum intercuspation.

The exclusion criteria were: More than one missing tooth per quadrant (excluding the third molar) that could minimize retention for the mandibular protruding device, substantial evidence of TMJ disorders including pain, significant joint crepitation, restricted mouth opening or sites of muscle tenderness in the Masseter or Temporalis region, severe caries and/ or compromised periodontal status, which would not allow prolonged use of mandibular protruding device.

Eighteen dentulous OSA patients (25 males; 12 females; age 41±4 years; BMI 22±5; AHI 5-30), who volunteered and provided written informed consent were included in the study. A provisional selection of the patients was based on subjective evaluation of the symptoms according the Epworth Sleepiness scale and Berlin questionnaire. Such patients were subjected to overnight polysomnography to confirm their actual status before being included as study subjects.

For sleep bruxism patients having more than four rhythmic masticatory muscle activity (RMMA) episodes per hour of sleep consisting of three or more phasic or mixed contractions of the masseter at a frequency of 1 Hz and at least two audible tooth grinding events per night[14,15] were selected.

AHI , RMMA and sleep bruxism episodes with tooth grinding noises were assessed preoperative and at 6 months and 17 months after wearing mandibular advancement device.

Overnight polysomnography sleep study (S-7000, Cogent technologies, EMBLA System Inc) included Electroencephalograms (EEG); (C3-A2,C4-A1,O2-A1,O3-A2), Bilateral

Electro-oculogram (ROC,LOC), Chin and Leg Electromyogram (EMG), Nasal airflow, thoracic and abdominal movements, Electrocardiogram (ECG) and body position recorders. Apnea Hypopnea Index (AHI) was calculated with the help of Somnologica Studio software. The apnea episodes were defined as complete cessation of airflow for ≥10 s, and hypopnea was defined as a ≥50% reduction in oronasal airflow accompanied by a reduction of at least 4% oxygen saturation calculated by pulse oximetry. AHI was determined by the frequency of these events per hour during sleep time based on the results of the overnight polysomnography. Recorded polysomnographic data was cross checked manually for scoring of sleep stages, apneas and Hypopnea events.

As the sample size was small, hence non-parametric assessment plan was adopted. Data was analyzed using Statistical Package for Social Sciences Version 15.0. Wilcoxon signed rank test was used to evaluate before-after changes.

RESULTS

A significant reduction in AHI and sleep bruxism (Mean±SD) was observed after 3 months of wearing oral appliance ($p< 0.001$). No sleep bruxism episodes with tooth grinding noises were observed following the use of an oral appliance (table1).

At 17 months following oral appliance use a significant reduction in AHI and RMMA was observed at 1 year treatment interval as compared to pre-treatment values ($p=0.001$). Few sleep bruxism episodes with tooth grinding noises were observed following the use of an oral appliance (table 2).

DISCUSSION

The present study was aimed at estimating the effect of oral appliance treatment on sleep bruxism of a cohort of OSA patients on a short (6 months) and long (17 months) term basis and also to evaluate changes in the AHI index. There was 51.8% reduction in RMMA episodes per hr following the use of an oral appliance after 6 months which continued to improve even after 17 months (59.4%). AHI followed the same pattern with 79.3% change in 6 months and 81.9% change after 17 months of oral appliance use. Another interesting finding was no audible tooth grinding events following oral appliance use for 6 months .

In a study by Clark et al[16], it was shown that OA treatment resulted in a decrease in EMG activity during sleep in approximately 50% of patients. Hiyama et al[17] suggested that masticatory muscle activity during sleep is significantly reduced by wearing an OA.

Yap et al[18] in their study on nocturnal parafunction showed that the stabilization appliances do not stop nocturnal parafunctional activities on short term basis. This is contrary with the present study that showed almost 100% improvement in audible tooth grinding events. However tooth grinding noises were observed after 17 months of wearing MAD. Several studies[19-27] have reported that OAs do not stop SB permanently; rhythmic masticatory muscle activity and tooth grinding seem to diminish for short periods (1 to 2 weeks) after initial OA usage but resume over time.

CONCLUSION

Within the limitations of the present study it can be concluded that oral appliances are effective in reducing the frequency of sleep bruxism on short term basis however its long term effect is still controversial

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TABLE:

Table 1: Comparison of pre treatment and 6 month after treatment with mandibular advancement device.

Parameters	Before treatment (n=18)		6 months after wearing oral appliance		% change		Significance of difference (Wilcoxon signed rank test)	
	Mean	SD	Mean	SD	Mean	SD	Z	P
AHI	22.7	6.6	4.7	2.5	-79.29	6.80	3.415	0.001
Episodes/hr	7.9	1.3	3.8	1.4	-51.8	2.2	2.172	<0.001
Episodes with noise	8.5	1.0	0	0	100	0	0.449	<0.001

Graph 1: Comparison of pre treatment and 6 month after treatment with mandibular advancement device

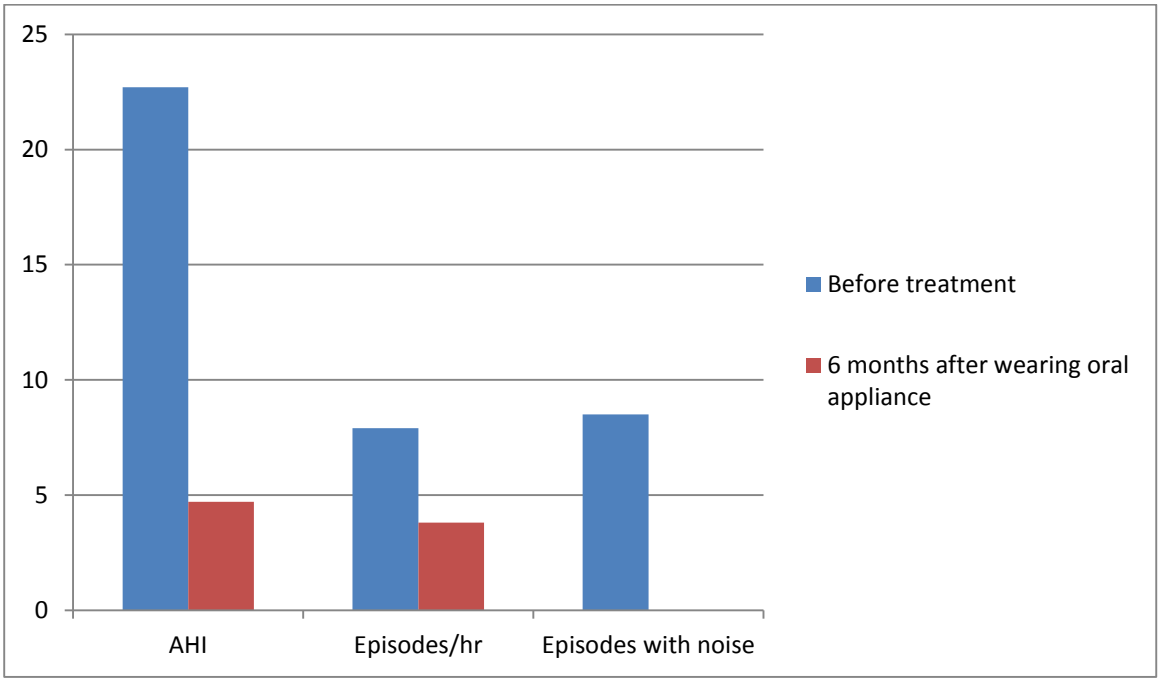

Table 2: Comparison of pretreatment and 17 months after treatment with mandibular advancement device.

Parameters	Pre-operative (n=18)	17 months after wearing oral	% change	Significance of difference

			appliance				(Wilcoxon signed rank test)	
	Mean	SD	Mean	SD	Mean	SD	Z	P
AHI	22.7	6.6	4.1	1.9	-81.9	4.73	3.413	0.001
Episodes/hr	7.9	1.3	3.2	0.9	-59.4	2.8	2.554	0.001
Episodes with noise	8.5	1.0	5.4	1.8	36.4	1.5	0.4	<0.001

Graph 2: Comparison of pretreatment and 17 months after treatment with mandibular advancement device.