MANDIBULAR PROTRUSION DEVICE – USERS AHI, SLEEP EFFICIENCY, REM SLEEP AND OXIGENATION

Aparelhos orais de protrusão mandibular – IAH, eficiência do sono, sono REM e oxigenação de usuários

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ABSTRACT

Purpose: to evaluate some polysomnographic parameters of patients that were referred to use mandibular protusion device (MPD). **Methods:** we studied, retrospectively, data from medical records with items that made up polysomnography of 124 patients aged between 25-77 years, that were not having any treatment for OSAHS. The study was approved by the Ethics Committee of origin institution (CAE number 0378.0.133.000-10). **Results:** 46.8% of respondents had mild apnea, snoring and most had poor sleep efficiency. Almost all of these patients had OSAHS. The lower oxygen saturation during the test ranged from 60% to 97%, with more than four fifths of the sample rates below 90%. **Conclusion:** there was no significant relationship between rates of apnea and the levels of oxyhemoglobin saturation. Sleep efficiency was directly related to the severity of OSA, with statistical evidence; oximetry can be a valuable tool for the diagnosis of OSA, but cannot be sole source to refer to the severity of the syndrome, REM sleep was poor in most investigated, and this was significantly related to sleep efficiency.

KEYWORDS: Snoring; Sleep Apnea, Obstructive; Apnea

INTRODUCTION

The Obstructive Sleep Apnea and Hypopnea Syndrome (OSAHS) is characterized by the deposition of the tongue in the side walls of the oropharynx and soft palate, which promotes a collapse of these structures and reduction or absence of airflow for at least five times per sleep hour. The first symptom observed is snoring associated with these apneic periods of ten seconds or more[1]. The obstruction of the upper airway during sleep leads to arrest of breathing, decreased blood oxygen and one arousal, restarting the same process. The repetitive motion for the air to go through the airways causes a volume increase of 30% and sagging of those structures[1, 2].

The repetition of these events leads the patient to complain of symptoms such as excessive daytime sleepiness, snoring, fatigue, exaggerated tiredness on waking, respiratory arrests observed by the room partner, changes in memory and perception. The individual may also present cardiac, psychiatric, neurological, urological or gastric changes, among others[1-3]. Moreover, oxidative stress of hypoxia/reoxygenation increases insulin resistance and raises the erythrocyte sedimentation rate (ESR) of inflammatory markers such as C-reactive protein, interleukin-6 and tumor necrosis factor. Still, the

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reduction of deep sleep (delta) decreases the secretion of growth hormone(GH)[4].

Excessive daytime limits the individual quality of life. When it originates relevant cognitive-behavioral changes, it increases morbidity and mortality of OSAHS, which becomes important risk factor for car accidents and labor. Individuals that have ten or more obstructive events per hour of sleep showed greater risk of 6.3 accidents that individuals with normal sleep, what shows a strong association between sleep apnea and the risk for motor vehicle accidents (95%)[5,6]. Mortality associated with sleep apnea significantly increases when episodes are more than 20 per sleep hour[7].

Radiographically, we can observe some anatomical features relevant to diagnosis in patients with OSAHS, such as narrow mandibular arch, maxillary and mandibular retrognathia, increased height of lower facial third, lower and anterior position of the hyoid bone; reduced pharyngeal area; increased craniocervical angle, distance decreased between the tongue base and posterior pharyngeal wall; hypertrophied tonsils and adenoids, maxillary and mandibular dentition over erupting and elongated tongue[7].

The definitive diagnosis of OSAHS is confirmed by polysomnography (PSG), which establishes the severity of the syndrome and also detect disease in asymptomatic individuals. Because of high complexity, it is only performed on high-risk groups or suspects. The PSG shows the apnea-hypopnea index (AHI), the Oxy-hemoglobin desaturation, the arousals, the percentages of sleep stages, the electrocardiogram, the record of snoring and body position. All this levels are relevant for our study as long as they allow to draw a profile of patients who underwent to the examination[3,8-10].

OSAHS is classified according to the apnea index + hypopneas per hour of sleep (AHI), which is also called RDI (respiratory disturbance index), and its quantification is in episodes per sleep hour. The disease is mild if the AHI is between 5 and 15, the status is said moderated when the index presents between 15 and 30, and severe when this ratio is greater than 30[11].

Oximetry during the PSG characterizes the frequency and severity of desaturation Oxy-hemoglobin. It detects the rapid fluctuations in arterial oxygen saturation during sleep, allowing earlier detection of respiratory disorders. It has been discussed not only the utility of pulse oximetry screening in patients with sleep disorders, but the possibility to it replace the PSG in some circumstances. However, there is no validation of the isolated use of oximetry in detecting sleep breathing disorders. It was believed that the patients with decreased oxygenation would have an increased prevalence of nightmares, but respiratory parameters in patients with OSAHS showed that they did not correlate significantly with the frequency of nightmares [12].

The mandibular protusion devices (MPDs) are a good alternative for the treatment of snoring and OSAHS due to reduced cost and comfort of use, and greater acceptance by patients. They are being increasingly recognized as an alternative treatment to CPAP, achieving reduction in apnea-hypopnea index, snoring reduction and improvement in daily activities. Comparisons between CPAP and MPD revealed that, although oral appliances are less efficient in reducing the AHI, they are used more often and are more readily accepted than the CPAP, which might extrapolate his nomination to moderate or severe cases of sleep apnea[8]. Based on these data, this study aimed to evaluate polysomnographic parameters of patients with an indication for use of MPDs.

METHODS

We studied retrospectively the clinical records data of 150 patients aged between 25 to 77 years of age referred to the use of the Mandibular Protrusion Device (MPD) as the only treatment for OSAHS after polysomnographic diagnosis of sleep disturbance. It was necessary that the first clinical care to the performance of MPD were conducted between the years 2000 to 2009. Inclusion criteria for the study were patients with prior referral to use mandibular protrusion device, aged above, featuring regular or good general health, making full use of his mental faculties, who were not using another treatment for OSAHS. Were excluded from the sample those who underwent polysomnographic exam with CPAP devices (Continuous Positive Airway Pressure) or with MPD and also who were treated before the year 2000. After the adoption of these criteria, the sample consisted of 124 patients aged 25-77 years. All patients had undergone to clinical evaluation, and in its medical files were found data from history and physical examination. The research was based on pre-structured form of the items that made up polysomnography, among them: Sex, Age, Body Mass Index (BMI), apnea-hypopnea index (AHI), snoring during the exam, Sleep Efficiency, percentage of REM sleep, lower saturation and oxygen saturation average.

The analysis of patient files was authorized by the Surgeon Dentist and even by physicians responsible for polysomnographic through terms of Agreement. The term is in accordance with Resolution 196/96 of the National Health Council,

following the current guidelines for human research. The study was approved by the Ethics Committee of the Universidade Estadual da Paraíba – UEPB (CAE 0378.0.133.000-10).

The AHI, which ranks OSAHS, was categorized as normal (till 5 events / h), mild (more than 5 till 15 events / h), moderate (15 till 30 events / h), and severe (above 30 events / h). Sleep efficiency was satisfactory when reached greater than or equal to 70% of the night's sleep, while the REM sleep were considered satisfactory when it between 20 and 25% of the sleep [10].

Data were organized and submitted to statistical tests using SPSS Statistics 17.0, these being submitted to descriptive analysis using frequency, and submit them to the nonparametric Kruskal Wallis as the Chi-square test and U Mann Whitney, adopting a significance level of 95% (p = 0.05). The results are shown in tables.

RESULTS

It was found that the individuals surveyed were aged between 25 and 77 years of age, where 32.8% of patients in the study were aged between 50 to 59 years, with a mean of 52.2 ± 12.51 years old. Male patients were more prevalent, totaling 83 (64.8%) of the 124 surveyed. About the obesity and BMI, 48.7% were overweight and 27.4% had normal weight.

About the AHI, which is the main classifier of OSAHS, it was found that 58 – almost half of respondents (46.8%) were between the 5 and 15, featuring a mild apnea; 12.1% had index between 15 and 30 and subsequent framework of severe apnea and 11.3% had AHI less than 5, then being considered subjects without OSAHS (Table 1).

Table 1 – Distribution of OSAHS according to the Classification of apnea and hypopnea index (AHI) in patients referred for treatment MPD

OSAHS	N	%
Normal (less than 5 e/h)	14	11,3
Mild (from 5 to 15 e/h)	58	46,8
Moderate (from 15,1 to 30 e/h)	37	29,8
Severe (more than 30 e/h)	15	12,1
Total	124	100,0

About sleep efficiency, it was observed that the majority (52.4%) of the subjects just slept a percentage of up to 79% of the time during the night of analysis, and therefore had a poor sleep efficiency. From the patients with poor sleep efficiency, the majority, 92.3%, had an apnea-hypopnea index (AHI) greater than 5 events per hour, or had some degree of OSAHS.

Applied the Kruskal-Wallis test (p = 0.016) it follows that there statistical evidence that sleep efficiency statistically different between patients with different severity of OSA (mild, moderate or severe) at 5% significance, characterizing patients with OSAHS Grave (67.21%) sleep less (Table 2).

Table 2 – Average percentage of Sleep efficiency according to the classification of OSAHS

OSAHS	n	Mean	Standard deviation	Interval for the mean with 95% of confidence		*p* Value
				Lower limit	Upper limit	
Normal	14	84,14	10,925	77,83	90,45	0,016
Mild	58	77,84	14,374	74,07	81,62	
Moderate	37	79,22	11,617	75,34	83,09	
Severe	14	67,21	16,168	57,88	76,55	
Total	123	77,76	13,965	75,27	80,26	

[a] p value for the test of Kruskal Wallis,
Source: Study conducted in the city of Recife – PE

In relation to snoring, 117 (91.4%) patients snored while sleeping. Among patients who had OSAHS, most 92.9% snored during the night, and almost all 91.8% of the patients with OSAHS also showed snoring. From this patients, those with mild, moderate and severe snoring presented in 86.2%, 97.3% and 100%, respectively. By means of the Mann Whitney U test (p = 0.066) concludes that there is statistical evidence that the mean AHI between individuals who snore during sleep and those who do not snore, show a statistically significant difference, with the level of 5% of significance. That is, the fact that individual snore imply a greater probability that he has a syndrome more severe than those who do not snore.

Table 3 – Mean AHI according to snoring overnight

Snores during the night?	n	Mean	Standard deviation	Interval for the mean with 95% of confidence		*p* Value
				Lower limit	Upper limit	
No	10	9,23	5,054	5,62	12,85	
Yes	114	17,43	15,764	14,50	20,35	0,066[a]
Total	124	16,77	15,336	14,04	19,49	

[a] p value for the Mann Whitney test U,
Source: Study conducted in the city of Recife – PE

In relation to sleep stages, only 12.6% of respondents showed up in range satisfactory percentage (between 20 to 25% of sleep) REM sleep, and this item in the majority of patients (73.1%) were not satisfied. In 17 subjects (14.3%) the phase of REM sleep was nonexistent. It is important to note that this data was faulty in 9 of the records search.

It was found in research that individuals with poor sleep efficiency, most (79.4%) showed dissatisfaction of REM sleep, besides observing a greater lack this phase of sleep (15.9%) compared to patients with satisfactory efficiency (12.5%). Applied the chi-square test, p = 0.024, we conclude that there statistical evidence that REM sleep is statistically associated with sleep efficiency at 5% significance. That is, the less efficient is your sleep, the less likely that having a satisfactory percentage of REM sleep.

Table 4 – Analysis of the correlation between satisfaction Sleep efficiency and satisfaction of REM sleep in patients referred for treatment MPD

Sleep efficiency		REM Sleep			Total	*p* Value
		Satisfactory (20 to 25%)	Not satisfactory (<20 and >25 %)	Absence		
Not Satisfactory (till 79%)	n	3	50	10	63	0,024[a]
	%	4,8%	79,4%	15,9%	100,0%	
Satisfactory (80 to 100%)	n	12	37	7	56	
	%	21,4%	66,1%	12,5%	100,0%	
Total	n	15	87	17	119	
	%	12,6%	73,1%	14,3%	100,0%	

[a] p value by chi-square test,
Source: Study conducted in the city of Recife – PE

The patients analyzed showed during polysomnography a percentage of lower oxygen saturation between 60% and 97%, averaging 82.24% saturation of oxyhemoglobin between these individuals. 111 (86.7%) of the participants had saturation at or below 90% during sleep, while 13.3% had lower oxyhemoglobin saturation above 90%. The greater the severity of the study group, the lower the level of oxygen saturation, with the lowest average (77.2%) of the severe patients, as noted in Table 5. Analyzing the relationship between the various degrees of apnea (normal, mild, moderate and severe) and considering the lowest oxyhemoglobin saturation satisfactory patients above 90% was applied Kruskal Wallis test with significance set at 95%, thus giving a p-value: 0.224, allowing us to infer that there is no statistically significant relationship between the apnea index and levels of oxyhemoglobin saturation during sleep in these patients.

Table 5 – Average percentage of low oxyhemoglobin saturation during polysomnography, the second classification of OSAHS

OSAHS	n	Mean	Standard deviation	Interval for the mean with 95% of confidence		*p* Value
				Lower limit	Upper limit	
Normal	14	85,36%	8,034	80,718	89,996	0,224
Mild	58	82,87%	6,752	81,086	84,637	
Moderate	37	81,95%	7,291	79,514	84,377	
Severe	15	77,2%	5,906	73,929	80,470	
Total	124	82,24%	7,124	80,996	83,488	

[a] p value for the test of Kruskal Wallis,
Source: Study conducted in the city of Recife – PE

DISCUSSION

When the prevalence of OSAHS compared between sexes, the results obtained in the studies reviewed showed always a higher prevalence in males[1,5,9,13]. This higher prevalence in males is probably due to disposal adipose central type of fat in the body of men, in addition to anatomical differences upper airway (UA) and hormonal profile of male[13].

With respect to age more prevalent presented by the studies, which had described the disease is more prevalent among individuals with age ranging between 40 and 60 years. The literature also relates to the severity of the syndrome patient age, where it was observed that older patients have more severe disease, emphasizing the progressive nature of the disease[1,13].

The majority of respondents had a sleep efficiency unsatisfactory, and almost all of these had some degree of OSAHS, with an apnea-hypopnea index (AHI) greater than 5 events per hour. There is statistical evidence that sleep efficiency differ statistically between those patients with different severity of OSAHS. In other studies[3], including individuals with OSAHS had worse sleep efficiency than those affected by the syndrome, as it is represented by the ratio between the time an individual slept and the total time the patient spent in bed.

Only a small proportion of respondents had satisfactory percentage of REM sleep, verifying although that most individuals with poor sleep efficiency showed dissatisfaction or lack of REM sleep or absence of this sleep phase, which indicates that REM sleep is statistically associated with sleep efficiency. It is during REM sleep that occurs essentially complete inhibition of skeletal muscle tone (atony) to give relaxation, with EEG patterns similar to those obtained during wakefulness. It is important at this stage of the rest that most dreams are thought to occur, eg[14]. A detailed study of the relationship between arousals and REM sleep parameter was not performed, and the automatic analysis of routine diagnostic procedures are not valid. In addition, the AHI and oxygen saturation are a rough measure for the number of relevant desaturations per night[12].

Oximetry characterizes the frequency and depth of Oxy-hemoglobin desaturation, allowing detection of rapid fluctuations in arterial oxygen saturation during sleep disordered breathing as well. Its use in the screening of patients with sleep disorders as a substitute for PSG is not valid, however it can serve as a guide in the diagnosis of respiratory sleep disorders[3]. Although there was no statistically significant relationship between the apnea index and levels of oxyhemoglobin saturation of patients in the study, this index proves to be an important indicator of the severity of apnea.

Among the treatment options for OSAHS already established in the literature, we have the main therapeutic measures of sleep hygiene, uvulopalatopharyngoplasty surgery, surgery of mandibular and maxillary advancement, the use of CPAP devices and the use of oral appliances protrusion (AOPM) [2,15-19].

The mandibular protrusion appliances have been consolidated as an alternative treatment to CPAP, with no consensus yet on its indication, but its statement is mainly in cases of low and medium gravity[7,20]. In patients with OSAHS, reduced the apnea-hypopnea index to less than 10 in 54% of those surveyed, reducing snoring in 45%[18]. Although they are less effective in reducing AHI when compared to the CPAP, they are more frequently used and they are preferred by most patients and more readily accepted, both because of the low cost and the relative comfort of use. In 30 months, 56-68% of patients continue to use oral appliance. There are still doubts about the effectiveness of oral appliances, but its use in the treatment of apnea of medium severity has received great attention and acceptability[7,18,21].

Evaluating the discomfort and noise measurements of snoring patients after use of the device protrusion for two years, 90% of patients reported a reduction in snoring and sleep apnea, 76% had a reduction in daytime tiredness, and 84% reported an improvement in quality of nocturnal sleep, the latter index showing an improvement of 50% of the initial patients[19].

The role of the dentist is becoming increasingly significant in the treatment of sleep disorders with oral appliances. One example is that comparisons between the CPAP and AOPM revealed that, although the intraoral appliance demonstrated to be less effective in reducing the rate of respiratory disorders, they are, on average, more frequently used, being preferred by more patients and more readily accepted the CPAP, whether for comfort, whether at cost[7,21].

Many patients suffer from upper airway disorders that affect the quality of patients' sleep, and despite the professional are able to act successfully in the treatment of these disorders, few do. This lack of participation occurs in reflection of the very poor emphasis of the colleges of education to this area of study as part of their curriculum[22]. The Surgeon Dentist need to change your design and make it wider, going to play an active role in the treatment of these disorders are under diagnosed in clinical reality and that when the applicability of its symptomatology epidemiologically will perform

through important numbers in automobile accidents and labor.

CONCLUSION

With the following work, we conclude that: the efficiency Sleep in subjects with an indication for use of MPD was directly related to the severity of OSAHS in patients; oximetry can be a valuable tool for the diagnosis of OSAHS, but it cannot be taken as a single source reference for the severity of the syndrome, REM sleep was unsatisfactory in most of respondents, and this was significantly related to sleep efficiency.

RESUMO

Objetivo: avaliar parâmetros polissonográficos de pacientes com indicação para uso de AOPMs. **Métodos:** estudaram-se, retrospectivamente, os dados de prontuários com base em itens que compunham a polissonografia de 124 pacientes com idade entre 25 e 77 anos, que não estavam fazendo nenhum tratamento para distúrbios do sono. O estudo foi aprovado pelo Comitê de Ética em Pesquisa da instituição de origem (CAE nº 0378.0.133.000-10). **Resultados:** 46,8% dos pesquisados tinham diagnóstico de apnéia leve, 91,8% roncavam e tinha uma eficiência do sono insatisfatória. Dos pacientes que roncavam, a quase totalidade apresentava SAHOS. A menor saturação de oxigênio durante o exame variou entre 60% e 97%, com mais de quatro quintos da amostra com índices abaixo de 90%. **Conclusão:** não houve relação significante entre os índices de apnéia e os níveis de saturação de oxi-hemoglobina. A eficiência do sono esteve diretamente relacionada à severidade da SAHOS, com evidências estatísticas; a oximetria pode ser um valioso instrumento para o diagnóstico da SAHOS, mas não pode ser única fonte para referenciar a gravidade da síndrome; o sono REM foi insatisfatório na maioria dos pesquisados, e este esteve significantemente relacionado à eficiência do sono.

DESCRITORES: Ronco; Apnéia do Sono Tipo Obstrutiva; Apnéia

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