

Treatment of obstructive sleep apnea and hypopnea syndrome with use of gradual mandibular advanced intraoral apparatus: A case report

Tratamento da síndrome da apnéia e hipopnéia obstrutiva do sono com uso de aparelho intraoral com avanço mandibular gradual: Relato de caso

Tratamiento del síndrome de apnea e hipopnea obstructiva del sueño con el uso de aparato intraoral avanzado mandibular gradual: Reporte de un caso

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Abstract

Obstructive Sleep Apnea and Hypopnea Syndrome (OSAHS) is a progressive disorder of the respiratory system that seriously affects the general health and, consequently, the quality of life of an individual. The aim of the present study was to report a case of moderate OSAHS treated with the supervised use of the Gradual Mandibular Advancement Intraoral Appliance (AIO). The treatment was followed up through the patient's report, evaluation of the Epworth Sleepiness Scale, and its result was confirmed by the baseline polysomnography exam. After the treatment period, there was an improvement in the symptoms reported by the patient and in the polysomnographic parameters. The patient went from a moderate OSAHS condition, with an Apnea and Hypopnea Index (AHI) of 24.7 events per hour, to a mild condition with an AHI of 10.7 events per hour. Thus, it can be concluded based on the present case that the AIO was effective for the conservative treatment of moderate OSAHS.

Keywords: Apnea; Polysomnography; Sleep apnea syndromes.

Resumo

A Síndrome da Apnéia e Hipopnéia Obstrutiva do Sono (SAHOS) é uma desordem progressiva do sistema respiratório que afeta seriamente a saúde geral e, conseqüentemente, a qualidade de vida do indivíduo. O objetivo do presente estudo foi relatar um caso de SAHOS moderada tratado com o uso supervisionado do Aparelho Intraoral de Avanço Mandibular Gradual (AIO). O tratamento foi acompanhado através do relato do paciente, avaliação da Escala de Sonolência de Epworth, e seu resultado foi confirmado pelo exame de polissonografia de base. Após o período de tratamento, houve melhora nos sintomas relatados pelo paciente e nos parâmetros polissonográficos. O paciente passou de um quadro de SAHOS moderado, com Índice de Apnéia e Hipopnéia (IAH) de 24.7 eventos por hora, para um quadro leve com IAH de 10.7 eventos por hora. Assim, pode-se concluir com base no presente caso que o AIO foi eficaz para o tratamento conservador da SAHOS moderada.

Palavras-chave: Apnéia; Polissonografia; Síndromes de apnéia do sono.

Resumen

El síndrome de apnea e hipopnea obstructiva del sueño (SAHOS) es un trastorno progresivo del sistema respiratorio que afecta gravemente la salud general y, en consecuencia, la calidad de vida de un individuo. El objetivo del presente estudio fue reportar un caso de SAHOS moderado tratado con el uso supervisado del Aparato Intraoral de Avance Mandibular Gradual (AIO). El tratamiento fue seguido a través del informe del paciente, la evaluación de la Escala de Somnolencia de Epworth y su resultado fue confirmado por el examen de polisomnografía basal. Después del período de tratamiento, hubo una mejoría en los síntomas informados por el paciente y en los parámetros polisomnográficos. El paciente pasó de un estado de SAHOS moderado, con un índice de apnea e hipopnea (IAH) de 24.7 eventos por

hora, a un estado leve con un IAH de 10.7 eventos por hora. Por lo tanto, se puede concluir con base en el presente caso que el AIO fue efectivo para el tratamiento conservador del SAHOS moderado.

Palabras clave: Apnea; Polisomnografía; Síndromes de apnea del sueño.

1. Introduction

Sleep is an essential brain function for the proper functioning of the human body, as a repairer against physical and mental wear and tear. With aging, individuals become more susceptible to sleep disorders, with snoring, Obstructive Sleep Apnea, and Hypopnea Syndrome (OSAHS) being more frequent (Ito et al. 2005; Caldas et al. 2009; Peloso et al., 2021).

The diagnosis of OSAHS is based on data collection through clinical history, physical examination, and baseline polysomnography (PSG), which is the test of choice for diagnosis, followed by an evaluation of the efficiency of the proposed treatments (Ito et al. 2005; Silva et al. 2007; Caldas et al. 2009; Soares et al. 2010; White, Shafazand, 2013; Guimarães et al. 2014; Silva et al. 2014; Alencar et al. 2016). And it can be complemented by cephalometric analysis (Ito et al. 2005; Soares et al. 2010; Guimarães et al. 2014; Silva et al. 2014), fibroscopy, computed tomography (Ito et al. 2005; Silva et al. 2014), magnetic resonance imaging (Ito et al. 2005), evaluation of the Epworth Sleepiness Scale (Boari et al. 2004; Caldas et al. 2009), sleep hygiene (Ito et al. 2005; Almeida et al. 2006; Soares et al. 2010), and a sleep diary (Alencar et al., 2016).

Among the conducts for the treatment of OSAHS, Continuous Positive Airway Pressure (CPAP), behavioral measures, intraoral appliances, surgeries, and speech-language oral myofunctional therapy stand out (Ito et al. 2005; Almeida et al. 2006; Silva et al. 2007; Soares et al. 2010; Domingos et al. 2011; Doff et al., 2013; Alencar et al. 2016). The therapeutic measures to be chosen will depend on the severity of the diagnosed disorder (Ito et al. 2005; Soares et al. 2010). CPAP use is considered the treatment of choice due to its effectiveness (Ito et al. 2005; Soares et al. 2010; Alencar et al. 2016). However, patient cooperation in using this mechanism is still a problem. The leading causes of non-adherence to this treatment are claustrophobia and facial discomfort caused by the mask (Soares et al. 2010; Alencar et al. 2016).

Intraoral mandibular advancement appliances are devices used during sleep to control the obstructive condition, resulting in a mandibular advancement that distances the tongue from the posterior pharyngeal wall, moving the bone downwards and moving the tongue away from the soft palate, altering the position of the hyoid bone and thus modifying the airway spaces preventing the collapse between the oropharyngeal tissues and the base of the tongue, reducing obstructive events in the upper airway (Ito et al. 2005; Almeida et al. 2006; Caldas et al. 2009; Guimarães et al. 2014). Therefore, the present study aimed to report a case of moderate OSAHS treated with the supervised use of the Gradual Mandibular Advancement Intraoral Appliance (AIO).

2. Case Report

Patient data

The study was approved by the Ethics Committee on Human Research of the Hermínio Ometto University Center – FHO (CAAE 35752720.5.0000.5385). Female patient, 31 years old, Caucasian, with a Body Mass Index (BMI) of 23.6Kg/m². The initial evaluation was performed through anamnesis and the patient's clinical history, followed by extra and intraoral clinical examination. Patient reported having looked for a sleep medicine professional, after a routine consultation with the ophthalmologist. After optical coherence examination, fluorescein retino angiography and computerized perimetry, the patient received a diagnosis suggestive of serpiginous or geographic choroiditis. The patient also reported episodes of morning headache, mood swings, abnormal body movements during sleep, fatigue, neck pain, restless legs syndrome, concentration deficit and anxiety.

During the consultation with the otorhinolaryngologist to assess the upper airway, a small grade I septum deviation

was detected (deviation that does not touch the inferior turbinate); however, this abnormality in the anatomy does not generate an upper airway obstruction.

Polysomnography

When submitted to baseline polysomnography in December 2019, a sleep efficiency of 91.9% and a number of 159 obstructive respiratory events were verified, with 0 central and 0 mixed, total AHI of 24.7/hour (moderate OSAHS), AHI in REM sleep of 36.2/hour, mean oxyhemoglobin saturation of 94% and a minimum of 52%. Twelve periodic movements of lower limbs/hour were identified. During the total sleep period, she remained awake for 34 minutes, and there were 211 awakenings; periodic movements of the masticatory muscles were also recorded.

Initial consultation

During the initial consultation, the patient was submitted to an assessment protocol that consisted of the application of a sleepiness assessment questionnaire. The Epworth Sleepiness Scale considers values above 10 points as abnormal, for the patient in question, a score of 16 was verified. During the orthodontic evaluation with morphological analysis of the face according to the mesofacial facial pattern and with the presence of facial asymmetry, with left subdivision class II dental malocclusion (Figure 1).

Figure 1. Orthodontic evaluation through photographs of the face and occlusion.



Source: Authors.

The patient was classified as class II in the Mallampati classification, that is, she had visibility of the soft palate, upper part of the palatine tonsils and uvula (Figure 2) and did not report painful symptoms related to the temporomandibular joint. Measurements of maximum mandibular advancement were performed, allowing the choice of the gradual mandibular advancement device (AIO) for the treatment. In addition, the patient received verbal and written instructions on sleep hygiene to change her inappropriate sleep habits (Mallampati et al., 1995; Oliveira et al., 2021).

Figure 2. Mallampati Classification – Class II.

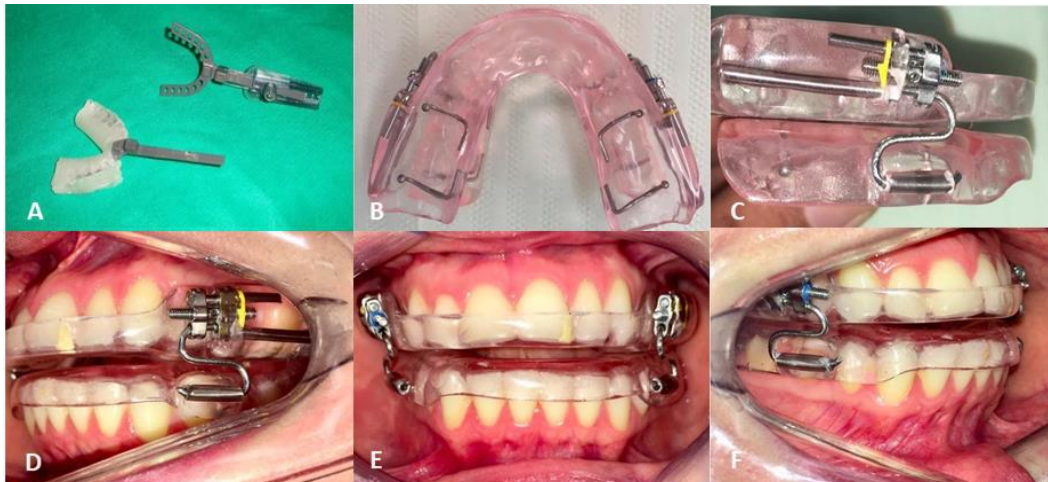


Source: Authors.

Mandibular advancement device

The construction and installation of the AIO were performed with 50% of the patient's maximum mandibular protrusion using the George Gauge ruler. As the characteristics of the conjugated mandibular advancement intraoral appliance, two occlusal covering plates, with a buccal slider on both sides located in a telescope tube, thus allowing the gradual advancement of the appliance and laterality movements that generate more comfort for the patient (Figure 3).

Figure 3. (A) George Gauge ruler. (B) Occlusal view of the conjugated AIO. (C) Side view of the conjugated AIO. (D) Right profile view of the conjugated mandibular advancement AIO on the patient. (E) Frontal view of the patient's gradual mandibular advancement AIO. (F) Left profile view of the patient's AIO of gradual mandibular advancement.



Source: Authors.

After installing the AIO, the patient reported comfort in using the device, increased salivation, and increased airflow. The patient was reassessed weekly in the first month of use and monthly in the subsequent months for adjustments to be made, and a 0.5mm advance was performed until the maximum comfortable mandibular advancement was reached.

After six months of starting treatment, new baseline polysomnography using the AIO was requested. Performed in October 2020, polysomnography showed a sleep efficiency of 74.6%, a number of 56 obstructive respiratory events, 0 central and 0 mixed, total AHI of 10.7/hour (mild OSAHS), AHI in REM sleep of 9.2/ hour, mean oxyhemoglobin saturation of 95%

and a minimum of 77%. Seven periodic movements of the lower limbs were identified per hour; in the total period of sleep, the patient remained awake for 107 minutes, and there were 120 awakenings, a slightly shortened latency with a reduction to REM sleep, and many episodes of periodic movements of the masticatory muscles with EEG intrusion, simulating periods of peak wave and double brain wave peak. Due to the test results, the patient was referred to the neurologist for evaluation (Table 1).

Table 1. Results of baseline polysomnography exams.

Evaluated parameters	Basal Polysomnography December/2019	Basal Polysomnography October/2020
AHI	24.7/hr	10.7/hr
AHI in REM sleep	36.2/h	9.2/hr
Obstructive Respiratory Events	159	56
Mean/Minimum Oxyhemoglobin Saturation (%)	94/52	95/77
BMI (Kg/m ²)	23,6	24, 1
Awakenings	211	12 0
Sleep Efficiency (%)	91,9	74, 6

Source: Authors.

After six months of treatment, with a body mass index (BMI) of 24.1Kg/m², the patient reported having a more restful sleep and consequently improved quality of life; she reported more willingness to perform her activities, and on the Sleepiness Scale of Epworth, we had an improvement, presenting a score of 8.

Based on the comparison of the results of the initial polysomnography exam and after six months of the proposed treatment using the AIO, an improvement was observed in the analyzed parameters, mainly in the AHI, which changed from a moderate to a mild condition.

3. Discussion

The baseline polysomnography (PSG) test consists of monitoring the physiological parameters during sleep so that the severity of the condition, the type of apnea present, as well as cardiac, respiratory, and brain changes are diagnosed (Boari et al. 2004; Ito et al. 2005; Almeida et al. 2006; Alencar et al. 2016; Dekon et al. 2018). The factors observed in the polysomnographic examination are sleep efficiency, a predominance of snoring, severity of apnea and hypopnea by the AHI per hour of sleep, oxyhemoglobin saturation (Caldas et al. 2009; Alencar et al. 2016).

In the case of the patient under study, there was no report of snoring, overweight, or obesity, but she had mood swings, morning headaches, anxiety, and a change in ophthalmological examination with a diagnosis suggestive of the serpiginous or geographic choroid.

When comparing the polysomnographic exams with an interval of six months, it was possible to observe that the mean oxyhemoglobin saturation was above the index considered normal, indicating a reduction in systemic and cardiovascular risks, according to the work of Alencar et al. (2016). The total AHI and REM sleep showed a reduction; according to these results, the patient initially presented a condition of moderate OSAHS, which after six months changed to a mild condition.

The Epworth Sleepiness Scale is a subjective method that allows assessing the improvement of the clinical condition through scores; thus, an initial score of 16 could be verified, which configured an out-of-normal condition, while, after six months, it was verified if a score of 8 which configured a normal condition (Bertolazzi et al., 2009; Morais et al., 2020).

Adherence to non-invasive treatment with OA does not depend on isolated factors but on a set of them that can make patients accept or not the proposed therapy (Almeida et al. 2009; Prescinotto et al. 2015; Alencar et al. 2016). In the present study, patient acceptance was observed with the OA, allowing movements of mandibular laterality and a slower progression of advancement that generate more comfort for the patient and optimize the results seen in the polysomnography exam.

The goal of AIO treatment is to reduce obstructive respiratory events, restore sleep patterns, and adequate arterial oxygenation. They were trying to normalize systemic changes (Alencar et al. 2016). It was found in the present study that the patient went from 159 obstructive respiratory events to a picture of 56 obstructive respiratory events. In other words, AIO can be considered as an alternative for the treatment of OSAHS (Modesti-Vedolin et al., 2018).

4. Conclusion

With the results of this clinical case, we can consider the supervised use of AIO as a non-invasive treatment method, which is a safe and efficient approach in the treatment of mild or moderate OSAHS.

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