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Dispositivos de avance mandibular para el tratamiento del SAOS en adultos: revisión de la literatura

Mandibular advancement mechanisms for the treatment of OSA in adults: a literature review

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Palabras claves:
apnea del sueño, mandíbula, aparatos fijos, aparatos removibles, ronquidos, adultos

Resumen

Introducción. El síndrome de apnea obstructiva del sueño (SAOS) es una alteración que se caracteriza por la obstrucción de las vías respiratorias faríngeas superiores durante el tiempo en que una persona duerme. Los dispositivos de avance mandibular (DAM) es el primer tratamiento de elección en SAOS leve y moderado en pacientes sin morbilidad cardiovascular grave y en SAOS grave se utiliza CPAP **Objetivo.** Analizar la literatura científica para describir los dispositivos de avance mandibular para el tratamiento de SAOS en Adultos. **Metodología.** La revisión literaria se realizó a través de bases de datos digitales como *ResearchGate, PubMed, Web of Science y Scopus.* Los artículos que se recopilaron fueron desde el 2020 hasta el 2024 en dos idiomas: español e inglés. **Resultados.** Se recopilo 25 artículos en los cuales se describieron los dispositivos de avance mandibular para el tratamiento del SAOS. Siendo efectivos en más del 70% de los casos. **Conclusión.** Los estudios revisados en la presente investigación demuestran que los DAM son una alternativa efectiva para el tratamiento del SAOS de leve a moderado. Para el SAOS grave existe una alternativa más efectiva como es el CPAP. La efectividad de estos dispositivos y el CPAP aumenta cuando se cuenta con un diagnóstico clínico exhaustivo. **Área de estudio general:** Odontología. **Área de estudio específica:** Ortodoncia. **Tipo de estudio:** Revisión bibliográfica.

Keywords:
sleep apnea, jaw, fixed appliances, removable appliances, snoring, adult

Abstract

Introduction. Obstructive sleep apnea syndrome (OSAS) is a disorder characterized by obstruction of the upper pharyngeal airway during sleep. Mandibular advancement devices (MAD) are the first treatment of choice in mild and moderate OSAS in patients without severe cardiovascular morbidity, and CPAP is used in severe OSAS.**Objective.**To analyze the scientific literature to describe mandibular advancement devices for treating OSA in adults.**Methodology.**The literature review was performed through digital databases such as ResearchGate, PubMed, Web of Science, and Scopus. The articles collected were published from 2020 to 2024 in Spanish and English.**Results.**Twenty-five articles were collected describing mandibular advancement devices for treating OSAS. They were effective in more than 70% of the cases.**Conclusion.**The studies reviewed in the present investigation

demonstrate that MADs are an effective alternative for the treatment of mild to moderate OSAS. For severe OSAS, there is a more effective alternative, such as CPAP. The effectiveness of these devices and CPAP increases when a thorough clinical diagnosis is available.

Introduction

Obstructive sleep apnea syndrome (OSAS) is a disorder characterized by obstruction of the upper pharyngeal airways while a person is sleeping. The soft tissues of the pharyngeal wall become blocked due to the lack of relaxation of the dilator muscles during sleep. When these collapses occur, known as apneas, which are defined as difficulty breathing, it causes the person to immediately get up in order to breathe normally again before returning to the sleep cycle.(1, 2).

The cause of OSA is multifactorial and is generally related to age, obesity and male sex, in addition to pathological and anatomical factors. This disorder can have serious consequences, as it can lead to significant problems. Nighttime symptoms of OSA include persistent snoring, sleep interruptions reported by the partner, awakenings with a feeling of suffocation or drowning, restless sleep with frequent movements and polyuria during the night. During the day, affected individuals may experience drowsiness, headache, xerostomia, a feeling of constant tiredness, weakness, memory difficulties, irritability, loss of interest in previously enjoyed activities, decreased sexual desire and changes in lifestyle habits that can affect interpersonal relationships. In addition, OSA has an impact on society, as it is recognized as a common cause of car accidents due to daytime sleepiness and so-called micro-awakenings that can lead to lapses in attention while driving.(3, 4, 5).

Diagnosis is confirmed by an overnight polysomnography (PSG) or sleep test that assesses various parameters such as blood pressure, electrocardiographic, electroencephalographic and electromyographic activity, as well as changes in body position, respiratory function during sleep and the apnea-hypopnea index (AHI). The analysis establishes the severity of the respiratory problem. OSA affects 25% of men and 15% of women in the general population, lasts more than 10 seconds, while hypopnea refers to a respiratory episode of less than 10 seconds during which ventilation is reduced by at least 50%.(2, 3, 6). The treatment of this type of dentoskeletal alteration that presents as maxillomandibular retrusion frequently involves orthognathic surgery, associated with orthodontic treatment, with the aim of restoring the ideal dental occlusion by surgically

repositioning the maxillary bones. Non-surgical treatment of OSA involves the use of continuous positive airway pressure (CPAP).(7, 8, 9).

The American Institute of Sleep Medicine (AASM) recommends mandibular advancement devices (MAD) as the first treatment for mild and moderate OSA in patients without severe cardiovascular morbidity and CPAP is used in severe OSA and when treatment fails or is rejected. Oral appliances are an effective treatment for 60-70% of patients who suffer from it.(10, 11).

The objective of this research was to analyze the scientific literature to describe mandibular advancement devices for the treatment of OSA in adults.

Methodology

A descriptive and documentary research was carried out to collect content on mandibular advancement devices for the treatment of OSA in adults.

Search strategy

The literature review was conducted through digital databases such as ResearchGate, PubMed, Web of Science, and Scopus. The articles collected were from 2020 to 2024 in two languages: Spanish and English. For the search, the keywords obtained in the descriptors such as Medical Subject Headings (MeSH) and Health Sciences Descriptors (DeCS) were used, which were sleep apnea, jaw, fixed appliances, removable appliances, snoring, and adults, conjugated with the Boolean operators (AND, OR, NOT), to define the search equations and obtain more specific results (Table 1).

Table 1. *Search strategy*

Database	Search equation
Scopus	sleep AND apnea AND syndromes AND orthodontic AND appliances AND adults NOT Children
PubMed	((sleep apnea symptoms) AND (adult)) AND (Mandible) NOT (children)
Web of Science	((ALL= (sleep apnea syndromes)) AND ALL=(adult)) AND ALL= (orthodontic appliances)
ResearchGate	sleep apnea syndromes AND respiratory sounds AND orthodontic appliances AND adults NOT children

Inclusion and exclusion criteria for selecting articles:

Inclusion criteria

- Publications from 2020 to 2024 for up-to-date information.
- Articles that include the topic of Mandibular Advancement Devices in their content.

- Research on treatment for OSA.
- Original Articles, Case Reports and Systematic Reviews in Spanish and English.

Exclusion criteria

- Publications that exceeded 5 years of age.
- Articles unrelated to the research topic
- Texts involving pediatric patients.
- Theses, book chapters and letters to the editor.

Ethical aspects

This study was considered risk-free, since it is a compilation and update of the literature, there was no participation of human beings so informed consent was not required.

Results

Figure 1 presents the number of articles found in various databases, including*Scopus, PubMed, Web of Science and ResearchGate. After applying the inclusion and exclusion criteria and performing the corresponding screening, 25 articles were selected and are included in this review, which is detailed in Figure 1.*

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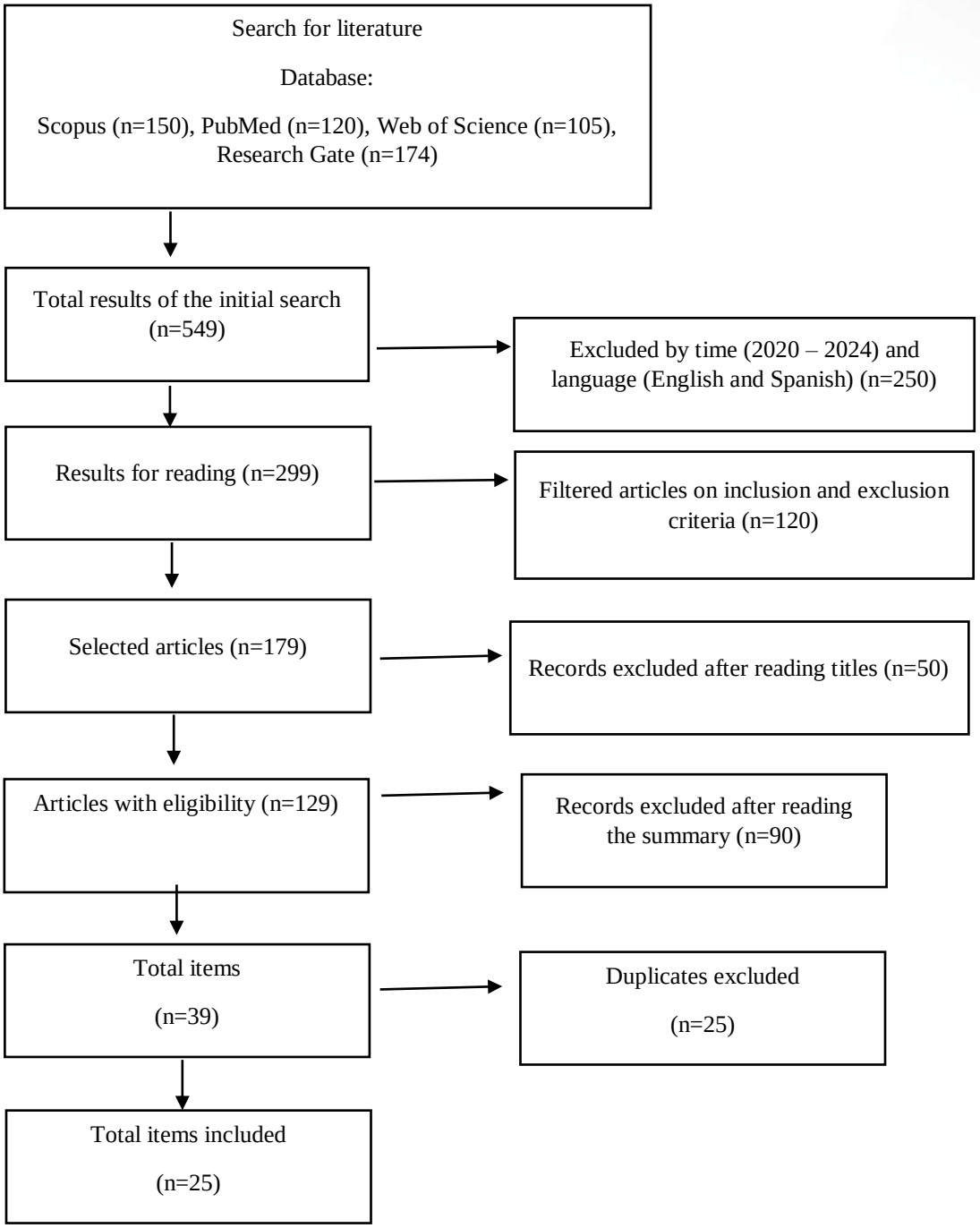

Figure 1. Flowchart Selection of articles

In Figure 2, the information obtained was from different types of studies, systematic reviews were 27%, systematic reviews and meta-analysis 20%, literature reviews 25% and clinical cases 28%.

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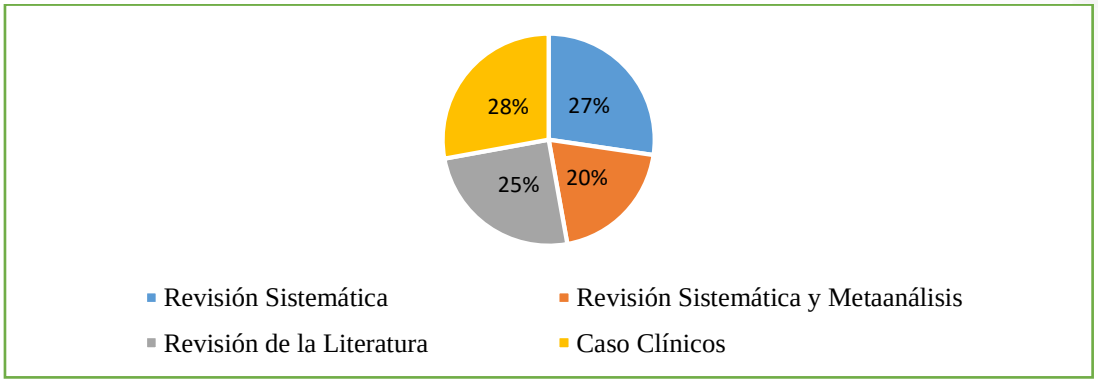

Figure 2.*Types of Studies Collected*

The results chosen at the end of the search were systematic reviews, systematic reviews and meta-analyses, literature reviews and clinical cases.

The DAM developed for the treatment of sleep-related respiratory changes are used in the oral cavity to prevent collapse between the oropharyngeal tissues and the base of the tongue. This device helps us to generate mandibular advancement and stabilization during sleep, promoting anterior traction displacement of the mandible to increase the tension of the genioglossus muscle and the supra and infrahyoid muscles, expanding the air space of the pharyngeal region.(12).

MADs are indicated for patients with mild to moderate OSA and snoring. However, they are also an accepted therapeutic option for patients with severe OSA who do not respond to or do not tolerate positive airway pressure therapies. There are contraindications or side effects that should be considered such as periodontal damage, caries or poor oral hygiene. This dental professional should be responsible for any necessary dental treatments prior to MAD placement; in addition, it is important to consider and discuss with the patient the risk of possible occlusal changes or exacerbation of temporomandibular joint disorders.(11, 13, 14).

Table 2.*Types of mandibular advancement devices*

Author	Year	Treatment or Equipment	Results
Manetta et al.(13)	2022	DAM Precast	Prefabricated oral MADs are a useful option for the treatment of mild to moderate OSA, but are less effective than custom-made ones.
Manetta et al.(13)	2022	DAM custom made	Custom mandibular advancement devices are an aid mechanism for the treatment of mild to moderate snoring and OSA with a percentage greater than 75% of effectiveness.

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Table 2.*Types of Mandibular Advancement Devices (continued)*

Author	Year	Treatment or Equipment	Results
Okuno et al.(15)	2024	Implant-supported DAM	The treatment was effective in 71%, achieving a decrease (AHI <5/h with DAM),

As indicated in Table 2, MADs can be made of different materials and can have different designs, some of them with the capacity for progressive mandibular advancement and lateral movements. MADs can be prefabricated, customized and implant-supported; MAD customization also involves the choice of material, which must be adapted to the oral structure and physical needs of each patient. Although MADs are generally used as a sole therapy, they can also be combined with CPAP and other therapeutic modalities for better control of OSA.(13).

Prefabricated MADs tend to be bulky and present some challenges related to their ability to retain a stable mandibular protrusive position during sleep. Therefore, this type of MAD is more likely to lose efficacy and cause patient discomfort. However, a study by Manetta et al. (13) (Table 2) demonstrated the efficacy of a prefabricated MAD in reducing OSA and related symptoms in patients with mild to severe disease.(13).

Custom-made MAD has been associated with increased patient-reported comfort, increased protrusive range of motion, and increased therapeutic effectiveness. choice, which should be tailored to the oral structure and physical needs of each patient. MADs are accepted by the U.S. Food and Drug Administration (FDA) for use in the treatment of OSA in adults. The appliance design is bimaxillary connected in the posterior region of the dental arches and full coverage of all tooth surfaces to increase anchorage(12, 13).

Implant-supported MAD is presented as an innovative treatment for edentulous patients. The treatment protocol involves the placement of four dental implants in the jaw and the creation of a new denture for both the mandible and the maxilla. The MAD is fabricated and held in place by suction force, using a clip-on bar structure that is attached to a replica of the upper and lower overdenture.(15).

Long-term side effects occurring after 6 months may include occlusal changes, reduction of overbite and overjet, lingual inclination of the upper incisors, vestibular inclination of the lower incisors, mesialization of the lower molars and distalization of the upper molars, alterations in dental arch crowding, appearance of posterior open bite and decreased occlusal contacts. These dental changes develop due to the forces that the MAD exerts on the upper and lower dental arches to maintain protrusion, and the resistance forces of the mandible to maintain its initial position.(13,16).

Studies conducted in recent years show that advancement treatments for OSA have a positive effect on airway dimensions and respiratory function. MADs allow us to hold the

lower jaw in a forward and downward position to expand the upper airway space and significantly reduce AHI.(17,18).

Discussion

OSA has evolved with the help of various devices that allow reducing the apnea-hypopnea index (AHI) and improving the quality of life of patients. According to Ghosh et al. (19) they indicate that OSA is more prevalent in older men who are obese and have craniofacial abnormalities that are considerable risk factors for the development and progression of OSA. While in women there is a low percentage for this disorder(19). Similarly, for Selene et al. in their study, they determined that the prevalence of OSA has increased by 23 to 26% in women and 40.6 to 49.7% in men, and there is also a higher prevalence in men that increases with obesity.(19).

For their part, according to Cossio & Letelier(20), determined that oral appliances are successful for mild to moderate OSA in 40 to 50% of patients and manage to reduce the AHI, treatment should be started after a medical evaluation based on clinical, physical and polysomnographic parameters. According to Manohar et al. (21) and Osorio & Blake (22), they point out that side effects are common, provided that the appliances are manufactured by qualified Dentists, between 50% and 70% of patients continue using them for several years. Its effectiveness is lower than that of CPAP.(21, 22). In turn, Manetta et al. indicate that there is solid evidence that adjustable and personalized devices are highly effective for the treatment of mild to moderate OSA.(13). Trindade et al.(23), for its part, indicates that DAMs are safe in the treatment of OSA and achieve an average reduction of 79.5% in the AHI in the 83 individuals in the sample.

However, for Okuno et al. (15), in their article, it indicates that the MAD did not present any type of side effect and was beneficial in decreasing the AHI. Regarding the implant-supported device, it indicates that patients required implants in the maxilla because the pressure on the alveolar crest was painful and in other patients the implants failed. More information is needed to establish whether the implants tolerate the lateral forces applied by MAD instead of the occlusion forces.(15). Pramudita et al.(24)In his study, the patient with OSA who is being treated with custom-made oral appliances to move his jaw slightly forward and down showed an improvement in his sleep cycle during the night while wearing oral appliances during the day he felt less fatigue and drowsiness because he slept better.

Dieltjens & Vanderveken(25), state that the treatment of older patients with DAM is not as effective and becomes complicated due to possible changes in oral health. Since the use of CPAP is a more comfortable option, it achieves a good prognosis and well-being in the patient's life.

Conclusion

- The studies reviewed in this research demonstrate that MADs are an effective alternative for the treatment of mild to moderate OSA. The effectiveness of these devices increases when there is a thorough clinical diagnosis, performed by a multidisciplinary team of specialists, together with adequate complementary examinations, which is evidenced by the significant improvement in polysomnographic results and the reduction of the AHI. In addition, for severe OSA there is an alternative that is more effective, namely CPAP. In both cases, patients treated with MADs or CPAP have experienced notable improvements in reducing daytime and nighttime symptoms, which has resulted in a better quality of life. Even so, it is crucial to inform patients about possible side effects, variability in treatment efficacy, and the need for careful monitoring.

Conflict of interest

The authors declare that there is no conflict of interest.

Authors' contribution statement

Author 1 (Crosby Valarezo): Contributed with a comprehensive literature review, compiling the most relevant studies in the field of this research, as well as the organization and structure of the document.

Author 2 (Isabel Cabrera): Provided key insights, drafted and reviewed the final manuscript of this literature review.

Together, Crosby Valarezo and Isabel Cabrera played essential roles in the development and improvement of this scientific article, which has been crucial in expanding knowledge on the topic and offering new points of view in this field.

Bibliographic References

1. CamañesG, Bellot S, Marco C, Montiel R, García JM, Panadero A, Paredes R, Puertas V. Comparison of the phenotypic characteristics between responders and non-responders to obstructive sleep apnea treatment using mandibular advancement mechanisms in adult patients: Systematic review and meta-analysis. Sleep Medicine Reviews [Internet]. 2022 [cited 2024-03-22]; 64: 101644. Available at: https://pubmed.ncbi.nlm.nih.gov/35653952/

2. Kim YJ, Shin HK, Lee DY, Ryu JJ, Kim TH. Decreased maxillary sinus volume is a potential predictor of obstructive sleep apnea. Angle Orthodontist [Internet].

2020 [cited March 18, 2024];90(4): 556-63. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8028452/#:~:text=Decreased maxillary sinus volume was, as indicated by the AHI.

3. Brunetto DP, Moschik CE, Dominguez-Mompell R, Jaria E, Sant'Anna EF, Moon W. Mini-implant assisted rapid palatal expansion (MARPE) effects on adult obstructive sleep apnea (OSA) and quality of life: a multi-center prospective controlled trial.Progress in Orthodontics [Internet]. 2022 [cited 22 March 2024]; 23(1). Available at: https://pubmed.ncbi.nlm.nih.gov/35102477/

4. Banari AS, Datana S, Agarwal SS, Chopra SS, Roy ID. Comparison of upper airway post oral appliance therapy in patients with obstructive sleep apnea using 3 different modalities (lateral cephalogram, acoustic pharyngometry and CBCT)-A prospective clinical study.Journal of Contemporary Orthodontics [Internet]. 2023 [cited 23 March 2024]; 7(3): 219-26. Available at: https://pubmed.ncbi.nlm.nih.gov/31205607/

5. Saldías P. F, Cahmi B. D, Guzmán Z. A, Leiva RI Clinical characteristics of obstructive sleep apnea syndrome in the elderly. JournalChilean Journal of Respiratory Diseases [Internet]. 2023 [cited April 20, 2024]; 39(4): 279-289. Available at: https://www.scielo.cl/scielo.php?script=sci_arttext&pid=S0717-73482023000400279&lng=n&nrm=iso&tlng=n

6. MarmolejoTorres ME, Torres-Fraga MG, Rodríguez-Reyes YG, Guerrero-Zúñiga S, Vargas-Ramírez LK, Carrillo-Alduenda JL. How to grade a respiratory polygraph? Rules of the American Academy of Sleep Medicine. Pulmonology and Thoracic Surgery [Internet]. 2020 [cited May 12, 2024]; 79(2): 110-115. Available at: https://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S0028-37462020000200110

7. Fichera G, Ronsivalle V, Zappalà G, Campagna P, Quinzi V, Lo Giudice A. Mandibular Advancement Devices (MAD) as a Treatment Alternative for Obstructive Sleep Apnea Syndrome (OSAS).The Open Dentistry Journal [Internet]. 2021 [cited 25 March 2024]; 15(1): 120-126. Available at: https://pubmed.ncbi.nlm.nih.gov/33170490/

8. De Lourdes Rabelo Guimarães M, Hermont AP, Guimarães TM, Dal-Fabbro C, Bittencourt L, Junior CMC.Severe obstructive sleep apnea treatment with mandibular advancement device: a case report. Sleep Science [Internet]. 2020 [cited March 26, 2024]; 11(2): 118-22. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6056071/

9. Menendez Garcia M, Olivera Ducasse P, Gálvez Hernández Y, Jauregui Abull J, Galvez Ruiz OI, Bravo LA, Cuspineda E. Orthognathic surgery in the treatment of obstructive sleep apnea syndrome. Cuban Journal of Stomatology [Internet]. 2020 [cited May 20, 2024]; 57(1): 1644. Available at: http://www.revestomatologia.sld.cu/index.php/est/article/view/1644http://www.revestomatologia.sld.cu/index.php/est/article/view/1644

10. Tanaka M, Seto Y, Kobayashi S. Changes in pharyngeal airway space and hyoid bone position after Bionator treatment of skeletal Class II malocclusions.Australasian Orthodontic Journal [Internet]. 2023 [cited 27 March 2024]; 39(2): 71-81. Available at: https://pubmed.ncbi.nlm.nih.gov/21130322/

11. Belkhode V, Godbole S, Nimonkar S, Nimonkar P, Pisulkar S. Comparative evaluation of the efficacy of customized maxillary oral appliance with mandibular advancement appliance as a treatment modality for moderate obstructive sleep apnea patients-protocol for a randomized controlled trial. Trials [Internet]; 2022 [cited April 29, 2024], 23(1), 159. https://doi.org/10.1186/s13063-022-06070-w. https://pubmed.ncbi.nlm.nih.gov/35172870/

12. Yu M, Hao Z, Xu L, Wen Y, Han F, Gao X. Mandibular advancement device as treatment trial for catathrenia (nocturnal groaning).Journal of Clinical Sleep Medicine [Internet]. 2021 [cited 11 April 2024]; 17(9): 1767-1776. Available at: https://doi.org/10.5664/jcsm.9290

13. Manetta IP, Ettlin D, Sanz PM, Rocha I, Meira e Cruz M. Mandibular advancement mechanisms in obstructive sleep apnea: an updated review.Sleep Science [Internet]. 2022 [cited 4 April 2024]; 15(2): 398-405. Available at: https://pubmed.ncbi.nlm.nih.gov/35371398/

14. Ciavarella D, Campobasso A, Conte E, Burlon G, Guida L, Montaruli G,Cassano M, Laurenziello M, Illuzzi G, Tepedino M. Correlation between dental arch form and OSA severity in adult patients: an observational study. Progress in Orthodontics [Internet]. 2023 [cited April 4, 2024]; 24(1). Available at: https://pubmed.ncbi.nlm.nih.gov/37246168/

15. Okuno K, Wang L, Almeida FR.Focus of dental sleep medicine on obstructive sleep apnea in older adults: A narrative review. Journal of Prosthodontic Research [Internet]. 2024 [cited May 1, 2024]; 68(2): 227-236. Available at: https://pubmed.ncbi.nlm.nih.gov/37648523/

16. Labarca G, Horta G. Metabolic associations of the obstructive sleep apnea (AOS) and hypoventilation obesity syndrome (HOS).Revista Medica Clínica Las

Condes [Internet]. 2021 [cited June 1, 2024]; 32(5): 570-576. Available at: https://www.sciencedirect.com/science/article/pii/S0716864021000869

17. Cheung GC, Dalci O, Mustac S, Papageorgiou SN, Hammond S, Ali Darendeliler M,Papadopoulou AK. The upper airway volume effects produced by Hyrax, Hybrid-Hyrax, and Keles keyless expanders: A single-center randomized controlled trial. European Journal of Orthodontics [Internet]. 2021 [cited April 5, 2024]; 43(3): 254-64. Available at: https://pubmed.ncbi.nlm.nih.gov/32377675/

18. Mirhashemi A, Arab S, Bahrami R. Orthodontics as atherapeutic tool for managing sleep apnea: a systematic review. Journal of Craniomaxillofacial Research [Internet]. 2020 [cited April 3, 2024]; 7(2). Available at: https://www.researchgate.net/publication/346456692_Orthodontics_as_a_Therapeutic_Tool_for_Managing_Sleep_Apnea_A_Systematic_Review

19. Ghosh P, Janakiram C, Kovilakam SVN, Velath AV, Kadekuzhi S. Oral appliance therapy for the management of obstructive sleep apnea in adults: an umbrella review protocol.JBI Evidence Synthesis [Internet]. 2023 [cited 4 May 2024]; 21(8): 1624-1631. Available at: https://www.researchgate.net/publication/369495236_Oral_appliance_therapy_for_the_management_of_obstructive_sleep_apnea_in_adults_an_umbrella_review_protocol

20. Cossio CS, Letelier MF. Practical tools for OSA: from suspicion to follow-up. Revista Médica Clínica Las Condes [Internet]. 2021 [cited May 29, 2024];32(5): 577-83. Available at: https://www.elsevier.es/es-revista-revista-medica-clinica-las-condes-202-articulo-herramientas-practicas-saos-sospecha-al-S0716864021000870#:~:text=The prevalence of hypertension in hypertensive patients is 40%253.

21. Manohar J, Ganapathy D, Kumar Pandurangan K, Velayudhan A, Student G. Oralappliances used for obstructive sleep apnea: a review. Test Engineering and Management [Internet]. 2020 [cited May 20, 2024]; 83: 26002-26015. Available at: https://www.researchgate.net/publication/346966848

22. Osorio N, Blake M. Orofacial myofunctional therapy as an alternative to CPAP for treatment of OSA: a systematic review(Alternative CPAP therapies to treat OSAS: a systematic review) Revista Fonoaudiológica [Internet]. 2023 [cited May 30, 2024]; 70(1): 38-48. Available at: https://fonoaudiologica.asalfa.org.ar/index.php/revista/article/view/132

23. Trindade PAK, Nogueira V dos SN, Weber SAT.Is maxillomandibular advancement an effective treatment for obstructive sleep apnea? Systematic

literature review and meta-analysis. Brazilian Journal of Otorhinolaryngology [Internet]. 2023 [cited 2024-03-20]; 89(3): 503-510. Available at: https://pubmed.ncbi.nlm.nih.gov/37167845/

24. Pramudita S, Rikmasari R. Treatment of mild obstructive sleep apnea using twin block oral appliance.Journal of Dentomaxillofacial Science [Internet]. 2023 [cited 25 May 2024]; 8(3): 200-203. Available at: https://www.researchgate.net/publication/377438864_Treatment_of_mild_obstructive_sleep_apnea_using_twin_block_oral_appliance?enrichId=rgreq-4e00bf4c651dbac3b7ad75f3b1673e07-XXX&enrichSource=Y292ZXJQYWdlOzM3NzQzODg2NDtBUzoxMTQzMTI4MTIxNzk4NDc3N0AxNzA1NDQ0N

25. Dieltjens M, Vanderveken OM. Oral appliances in obstructive sleep apnea. Healthcare [Internet]. 2020 [cited May 22, 2024];7(4): 1-12. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6956298/#:~:text=The recommended type of oral appliance is the custom-made,CPAP in reducing OSA severity.

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