Romanian Journal of Rhinology, Volume 11, No. 41, January - March 2021 DOI: 10.2478/rjr-2021-0006

SHORT SCIENTIFIC COMMUNICATION

Mandibular Advancement Device use for therapy of simple snoring: mini review

Erdem Atalay Cetinkaya

University of Health Sciences, Antalya Training and Research Hospital, Department of Otorhinolaryngology and Head & Neck Surgery, Antalya, Turkey

ABSTRACT

Oral devices that treat obstructive sleep apnea are an easy and influential option to protect the upper airways from sleep obstructions. One example is the mandibular advancement device (MAD), which is a non-invasive apparatus specified in adults with simple snoring and mild obstructive sleep apnea. Recently, due to the constraints of other therapies, like positive airway pressure treatment and surgical methods, there has been growing interest in the use of oral appliance for simple snoring patients. MAD is managed to improve the upper airway volume, minimize upper airway collapse and reduce snoring. On the other hand, it remains inferior to CPAP in the reduction of the apnea-hypopnea scores, with therapy success varying from 24% to 72%. The treatment modalities include skilled physicians and multidisciplinary strategies to treat patients with snoring and obstructive sleep apnea (OSA) effectively. Some researchers also suggest potential predictors of progress in care, but specific criteria for patient selection and predictive clinical principles for effectiveness in all treatment modalities are still needed. The aim of this brief clinical Study is to review MAD brief history, design, indications, contraindications, therapy efficiency, side effects, and current perspectives.

KEYWORDS: obstructive sleep apnea, simple snoring, oral appliances, mandibular advancement device.

INTRODUCTION

Patients' sleeping treatment compliance decreases due to the discomfort caused by the mask attached to the nose during the night and due to the pump that blows air through the mask. Some patients also do not accept surgical options. For these reasons, oral appliances (OA) are increasingly popular. Two types of OAs used in obstructive sleep apnea (OSA) can be studied according to the mechanisms and shapes – mandibular re-positioner and tongue re-positioner / fixer. Macroglossia – narrow dental arches caused by micrognathia, maxillary or mandibular retrognathias – is the cause of the disorder. To raise the upper respiratory tract quantity and especially decrease the collapse of the pharynx area, mandibular re-positioner, such as MAD, is administered[1].

DESCRIPTION OF THE CLINICAL TECHNIQUES

History and terminology

Robin was the first researcher who attempted to treat retrognathic children with breathing difficulties by using monobloc oral appliances. After quite a long time from this experiment, in 1982, a case series has been reported by Cartwright[2]. In 2002, White reported that patients generally prefer to use OA as an alternative treatment instead of nasal continuous positive airway pressure (CPAP) treatment. It is possible to come across different terminologies in the literature for the apparatus that changes the position of the mandible: mandibular advancer, mandibular advancement splint, mandibular advancement device, mandibular advancement prosthesis, these are all terms for the same

Corresponding author: Erdem Atalay Cetinkaya, Address: SBÜ Antalya Eğitim Araştırma Hastanesi, KBB Kliniği Antalya,07100, Turkey
e-mail: drerdemcetinkaya@gmail.com
Received for publication: August 25, 2020 / **Accepted:** September 29, 2020

apparatus that is positioned a little ahead and below the mandible[3,4] .

Designing

The commercialized apparatuses could be fabricated or manufactured for individual fit. They could be composed of mono or adjustable double parts. For instance, Snore Guard®, SNOAR®, Nocturnal Airway Patency Appliance®, Snorban®, Sleep Apnea Goldilocks Appliance® (SAGA), Mandibular Advancer®, Mandibular Repositioner® are monobloc fabrics and Klearway®, Herbst®, PM Positioner®, Elastic Mandibular Advancer® (EMA), Thornton Adjustable Positioner® (TAP), Silent Nite Appliance®, Silencer® consist of two adjustable parts. The two most important criteria of the device design are to determine how much vertical dimension will be applied and the amount of mandibular protrusion. Fluoroscopic studies have shown that vertical dimension should be kept to a minimum[5,6].

INDICATION AND TREATMENT SUCCESS

For OSA, CPAP is the standard option. OSA patients with CPAP therapy intolerance must be provided with additional therapy choices to decrease the increased risk factor of mortality and morbidity. Success therapy varies due to MAD design and the criteria for patient inclusion. Treatment with MAD is stated in the following patients: patients with simple snoring, mild to moderate OSA, and severe OSA patients who cannot endure CPAP therapy or comply.

MAD is mainly given to cases with 20 teeth or more, with less than 50% bone loss and fine occlusal contact and interaction of teeth. However, the device can also be produced for cases with less than 20 teeth and even edentulous cases. The MAD should be used at least 4 hours per night (or 70 per cent of sleep)[7,8].

When the literature is reviewed, one can see that, during construction of appliances, the amount of protrusion generally varies between 5-12 mm (Figure 1, Figure 2). Some investigators suggest that the maximal amount of applied protrusion should be as high as 50-75% of the total mandibular protrusion. As the vertical mandibular protrusion size increases, temporomandibular joint problems occur more often. Also, there was no significant difference reported in treatment efficacy with an increased vertical protrusion. Individual facts such as young age, female gender, supine-dependent OSA, reduced body mass index, smaller circumference of the throat, and craniofacial variables can be anticipated for achieve-

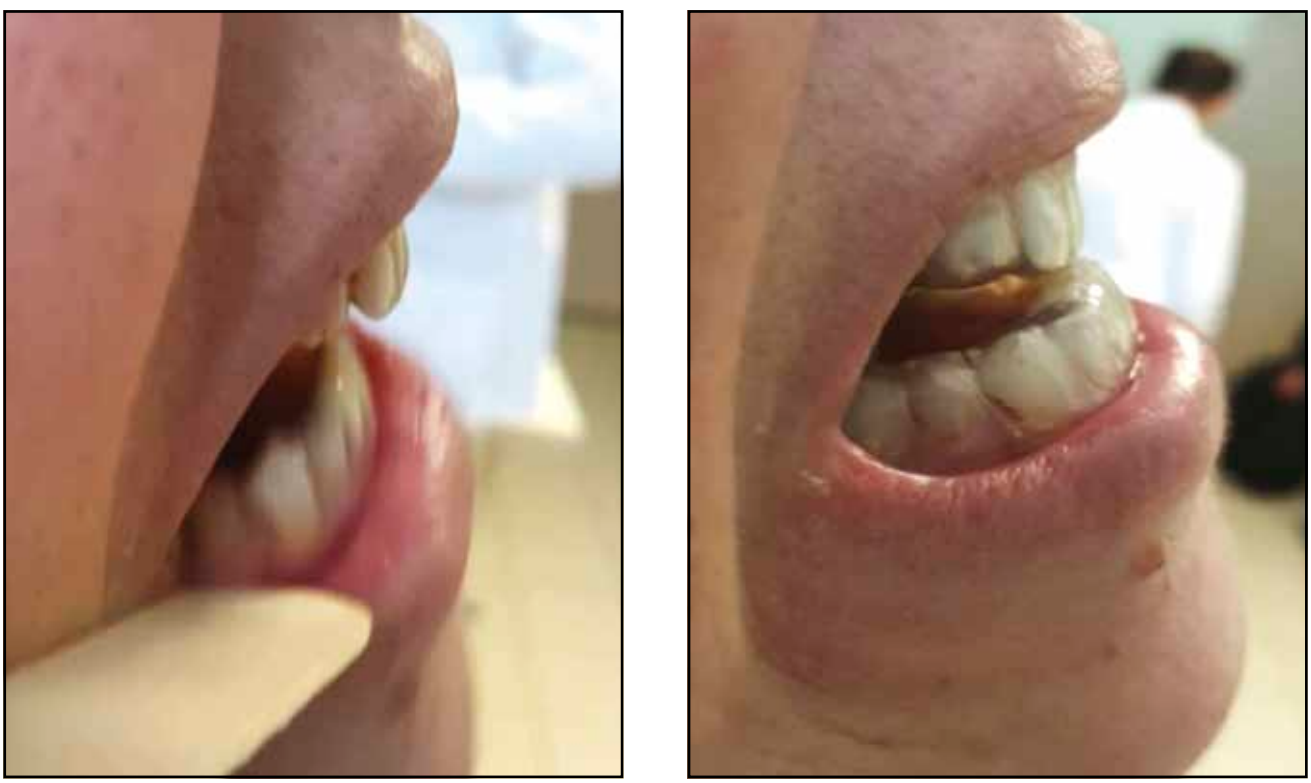

Figure 1. Lateral view of patient: (left) without MAD and (right) with MAD.

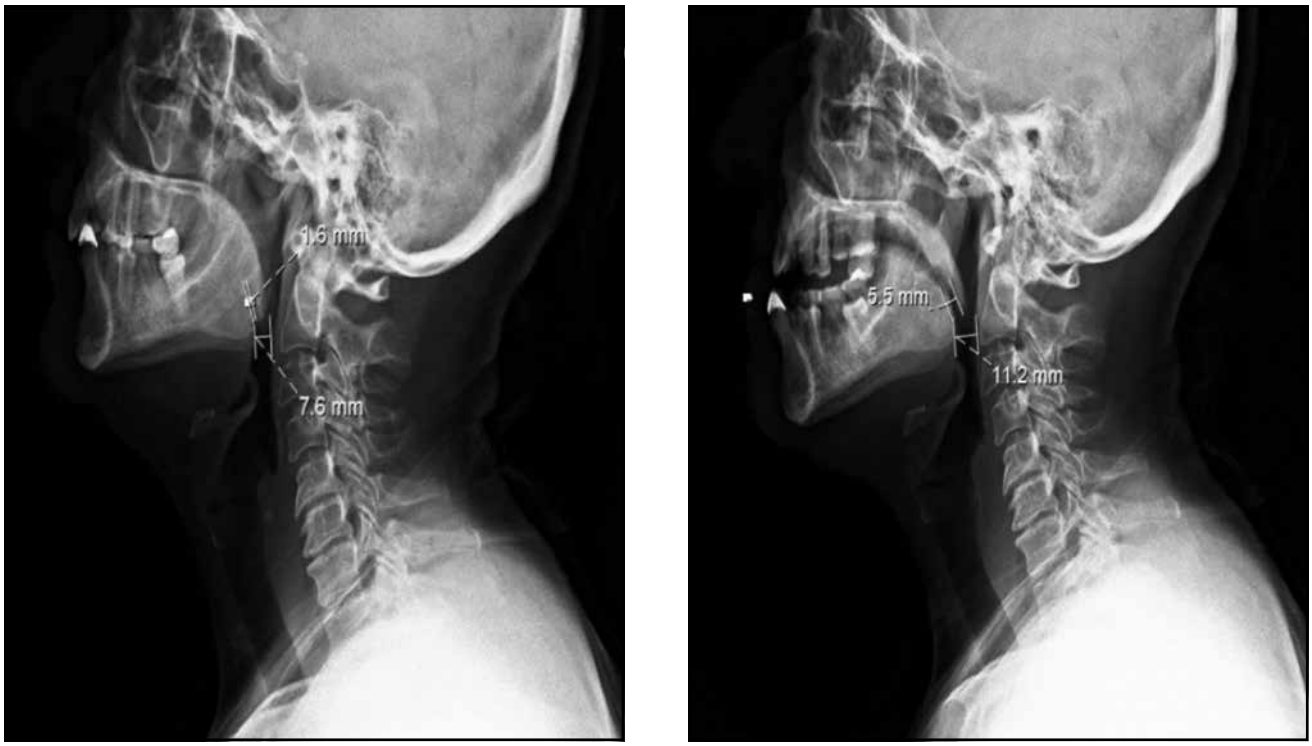

Figure 2. View of the airway at lateral radiography: (left) without MAD and (right) with MAD.

ment with MAD treatment. Cephalometric pilot research discovered that jaw retrognathia is a favourable predictive variable for achievement with MAD therapy[6-11].

SIDE EFFECTS AND CONTRAINDICATIONS

OSA patients usually tolerate MAD therapy well; however, in both the short and long term, side effects can occur. Short-term side effects may occur as follows: teeth tenderness and discomfort, irritation of gingiva, dry mouth, excessive salivation, drooling, temporomandibular joint pain, and myofascial pain. Long-term side effects can occur as: modifications in dental occlusion associated with declines in overbite, overjet, minor skeletal modifications associated with increased face height, and lower mandible rotation. Because of the reciprocal forces distributed by in situ MAD through the dentoalveolar and skeletal structures, these side effects may increase[11,12].

MADs are said to be contraindicated in severe OSA. In addition, the following are contraindicated: epilepsy patients, morbidly obese patients, patients with a large number of teeth deficiencies, insufficient number of supporting teeth, severe periodontal disease, widespread caries and excessive crown damage, and poor oral hygiene. MAD use has been reported to be contraindicated in cases of temporomandibular joint discomfort, severe nocturnal bruxism, limitation of mouth opening and limitation of the amount of protrusion of the mandible. Cases with upper cervical spine skeleton variations, such as the fusion of two or more cervical vertebrae, were found to be less likely to respond to MAD therapy. Some trials discovered less impact of MAD inconclusive cephalometric parameters and supine-dependent OSA, leading to the conclusion that remote cephalometric parameters could be detected as contraindicators or "red flags" instead of predictive criteria[12-14].

CONCLUSIONS

The efficacy of MAD continues to be below CPAP in lowering the apnea-hypopnea index, with therapy success varying from 24% to 72%. It works directly by enlarging the pharyngeal functional soft tissues attached to the mandible, mainly in the oro- and/or velopharyngeal regions. This decreases the collapse of the upper airway by changing the morphology, structure, and function of the upper airway. While patient compliance with MAD is higher than CPAP, MAD have been shown to be as efficient with respect to subjective sleepiness and health results. There is currently no clinically accurate and valid technique for predicting the achievement of MAD therapy. Further interdisciplinary studies in this area are therefore needed[14-18].

Financial Disclosure: The author has no competing financial interests in relation to the work described.

Conflict of Interest: The author has no conflict of interest to declare.

Sources of support: None

REFERENCES

1. Mhlaba JM, Chen ML, Bandla HP, Baroody FM, Reid RR. Predictive soft tissue airway volume analysis in mandibular distraction: pushing the envelope in surgical planning for obstructive sleep apnea. J Craniofac Surg. 2016;27(1):181-4. DOI: 10.1097/SCS.0000000000002342.
2. Cartwright RD, Samelson C. The effects of a nonsurgical treatment for obstructive sleep apnea. The tongue-retaining device. JAMA. 1982;248(6):705-9.
3. Serra-Torres S, Bellot-Arcis C, Montiel-Company JM, Marco-Algarra J, Almerich-Silla JM. Effectiveness of mandibular advancement appliances in treating obstructive sleep apnea syndrome: A systematic review. Laryngoscope. 2016;126(2):507-14. DOI: 10.1002/lary.25505.
4. White J, Cates C, Wright J. Continuous positive airways pressure for obstructive sleep apnoea. Cochrane 275 Database Syst Rev 2002;(2):CD001106.
5. Piskin B, Akin H, Sentut F. Usage of oral appliances in obstructive sleep apnea. Cumhuriyet Dent J. 2012;15(3):264-78. DOI:10.7126/cdj.2012.1047.
6. Ramar K, Dort LC, Katz SG, Lettieri CJ, Harrod CG, Thomas SM, et al. Clinical practice guideline for the treatment of obstructive sleep apnea and snoring with oral appliance therapy: an update for 2015. J Clin Sleep Med. 2015;11(7):773-827. DOI: 10.5664/jcsm.4858.
7. Heidsieck DSP, de Ruiter MHT, de Lange J. Management of obstructive sleep apnea in edentulous patients: an overview of the literature. Sleep Breath. 2016;20(1):395-404. DOI: 10.1007/s11325-015-1285-9.
8. De Corso E, Fiorita A, Rizzotto G, Mennuni GF, Meucci D, Giuliani M, et al. The role of drug-induced sleep endoscopy in the diagnosis and management of obstructive sleep apnoea syndrome: our personal experience. Acta Otorhinolaryngol Ital.2013;33(6):405-13. DOI: 10.14639/0392-100X-959.
9. Sutherland K, Cistulli P. Mandibular advancement splints for the treatment of sleep apnea syndrome. Swiss Med Wkly. 2011;141:w13276. DOI: 10.4414/smw.2011.13276.
10. Svanholt P, Petri N, Wildschiodtz G, Sonnesen L. Influence of craniofacial and upper spine morphology on mandibular advancement device treatment outcome in patients with obstructive sleep apnoea: a pilot study. Eur J Orthod. 2015;37(4):391-7. DOI: 10.1093/ejo/cju064.
11. Practice parameters for the treatment of snoring and obstructive sleep apnea with oral appliances. American Sleep Disorders Association. Sleep. 1995;18(6):511-3. DOI: 10.1093/sleep/18.6.511.
12. Knappe SW, Bakke M, Svanholt P, Petersson A, Lonnesen L. Long-term side effects on the temporomandibular joints and oro-facial function in patients with obstructive sleep apnoea treated with a mandibular advancement device. J Oral Rehabil. 2017;44(5):354-62. DOI: 10.1111/joor.12485.
13. Denolf PL, Vanderveken OM, Marklund ME, Braem MJ. The status of cephalometry in the prediction of non-CPAP treatment outcome in obstructive sleep apnea patients. Sleep Med Rev. 2016;27:56-73. DOI: 10.1016/j.smrv.2015.05.009.
14. Doff MH, Finnema KJ, Hoekema A, Wijkstra PJ, de Bont LGM, Stegenga B. Long-term oral appliance therapy in obstructive sleep apnea syndrome: a controlled study on dental side effects. Clin Oral Investig. 2013;17(2):475-82. DOI: 10.1007/s00784-012-0737-x.
15. Marklund M, Verbraecken J, Randerath W. Non-CPAP therapies in obstructive sleep apnoea: mandibular advancement device therapy. Eur Respir J. 2012;39(5):1241-7. DOI: 10.1183/09031936.00144711.
16. Petri N, Svanholt P, Solow B, Wildschiodtz G, Winkel P. Mandibular advancement appliance for obstructive sleep apnoea: results of a randomized placebo controlled trial using parallel group design. J Sleep Res. 2008;17(2):221-9. DOI: 10.1111/j.1365-2869.2008.00645.x.
17. Knappe SW, Sonnesen L. Mandibular positioning techniques to improve sleep quality in patients with obstructive sleep apnea: current perspectives. Nat Sci Sleep. 2018;10:65-72. DOI: 10.2147/NSS.S135760.
18. Gjerde K, Lehmann S, Berge ME, Johansson AK, Johansson A. Oral appliance treatment in moderate and severe obstructive sleep apnoea patients non-adherent to CPAP. J Oral Rehabil. 2016;43(4):249-58. DOI: 10.1111/joor.12376.