



Review Article

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Obstructive Sleep Apnea- treatment methods, patient adherence, and newer techniques

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Abstract

The prevalence of OSA has been found to be high in people of different ages with males higher than 50 years of age being highly affected. The aim of this review is to cover the information regarding the prevalence of OSA and the treatment modalities for the management of OSA. In this review, we consider the pros and cons of each treatment modality for OSA. The review article also describes the patient perspective of the OSA treatment meaning the patient compliance and patient adherence with OSA treatment methods. Treatment methods for OSA such as Continuous Positive Airway Pressure, oral appliances, and relatively newer treatment modalities such as mini-screw assisted rapid palatal expansion have been reviewed in detail in this article. High quality randomized trials with different treatment options are required so that clinicians can get adequate knowledge for treatment of patients with OSA.

Keywords: Obstructive Sleep Apnea, Continuous Positive Airway Pressure (CPAP), Oral appliance therapy, Mini-screw assisted rapid palatal expansion (MARPE).

INTRODUCTION

The American academy of sleep medicine (AASM) has stated its position on obstructive sleep apnea (OSA) in 1995 and then later in 2017^[1,2]. Since then, a lot of research has been done in the field of obstructive sleep apnea. There has been an increase in the availability of clinical devices for the management of snoring while sleeping and also for obstructive sleep apnea. The research on the topic of obstructive sleep apnea has increased, and in recent times, more research is focused on the early identification of OSA and the management of OSA with options other than the traditional options used in medicine.

It has been reported that the prevalence of OSA is high in adults, ranging from 8 percentage to more than 37 percentage overall and between 12 and 32 percentage in males and between 5 and 20 percentage in females. The incidence of OSA is greater in men as their age increases^[3,4]. The alarming fact is that the percentage of moderate to severe OSA has been reported to be as high as 50% in males of European origin after the 5th decade of life. There are certain conditions that can occur due to OSA such as increased blood pressure or hypertension, cardiovascular, and cerebrovascular disorders. In addition, OSA can also lead to increased feeling of sleep during the day, impaired brain functions, and higher incidence chance of vehicular accidents^[5]. There are different treatment options for OSA which can be mainly classified as surgical and nonsurgical^[6]. Treatment of OSA with oral appliances could be used for mild to moderate types of OSA^[6]. As dentists are often consulted for the occurrence of snoring and sleep apnea, it is important for dentists to be well versed with the clinical signs and symptoms, screening and diagnosis, and treatment approach for OSA, mainly the indications for oral appliances.

The current clinical guidelines have been expanded to also include oral appliances as a potential therapy for OSA^[7]. It is indicated in cases where the patients refuse the Continuous positive airway pressure (CPAP) appliance and wish to have an alternative therapy. The patients need to be informed of all the risks associated with oral appliances before starting the treatment. Mainly the oral appliance therapy includes mandibular advancement^[8]. Recently, an increased interest has been shown in maxillomandibular surgery for advancement^[9,10]. Additionally, maxillary expansion, mainly with mini-screws has been investigated to identify its effects on airway^[11].

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MATERIALS AND METHODS

Literature review was performed for articles with the terms obstructive sleep apnea, sleep apnea, mandibular advancement, airway, expansion, mini-screw assisted rapid palatal expansion, oral appliances, continuous positive airway pressure, maxilla-mandibular surgery. AASM in 2017 published its position paper for the diagnosis of OSA in children [2]. AASM also published a guidelines paper in 2015 for dental clinical practice for OSA management. It has been showed that customizable Oral appliances in the management of OSA can be important in certain instances.

Diagnosis

The diagnosis of OSA is typically done with polysomnography (PSG). Epstein et al. have described that if patients show a high amount of apnea episodes in the PSG testing, then the patient is considered to have OSA [12]. The classification of mild, moderate, and severe OSA can be done based on the apnea episodes in the PSG. Some dental imaging modalities have been used for the screening of OSA. As orthodontists routinely record a lateral cephalogram, they have been used for analyzing the airway dimensions for patients [13]. However, lateral cephalogram is a 2-dimensional (2D) x-ray and is not able to give information about the transverse dimensions of the patient's airway [14]. 3D radiographs such as Cone beam computed tomography have been implemented for measuring airway dimensions, airway area, and airway volume [11].

The information from 3D x-rays has been considered to be more accurate than 2D x-rays for not only the airway but also in terms of linear measurements of maxilla, mandibular and cervical vertebrae.¹⁵ The reason that the 3D x-rays such as cone beam computed tomography are more popular than 2D x-rays is that there is no overlap of different tissues in 3D x-rays as in 2D xrays [15]. Also, in 3D x-rays there is no error due to the magnification of the tissues which is commonly observed in 3D x-rays. It has been reported that the deviation of the head position during the recording of 2D x-rays can lead to higher errors in the measurement of structures [15]. Moreover, higher amount of deviation in head position leads to higher amount of errors. For these reasons, 3D x-rays are more appropriate in recording the airway measurements than 2D x-rays.

RESULTS

The outcome for any intervention for OSA is judged mainly by polysomnographic (PSG) testing. The assessment of PSG before and after an intervention can help in determining its effect on sleep apnea. The decrease in PSG and the number of apnea events during sleep is considered to be positive effect of the intervention in patients with sleep apnea [16]. In fact, the amount of decrease in the apnea events also acts as a positive reinforce for patients to comply with the intervention such as CPAP appliances.

DISCUSSION

As OSA has a high global prevalence, it is important to identify the trends of patients with OSA with the different treatment modalities. The compliance of patient with the treatment approach plays an important role in the treatment success [17]. No matter how good the treatment is, but if the patient is not complaint with the treatment therapy, it is not going to be effective. Thus, several studies have investigated not only the effectiveness but also the compliance of patients with the treatment methods used for OSA.

Salepci et al. investigated the adherence of CPAP in patients with OSA [18]. In this study, they studied over 600 patients with OSA. About 70% of the patients in the study by Salepci et al. were males. The patients were followed up and asked about their adherence and the use of CPAP appliances. The objective adherence was found to be about 60%

whereas subjective adherence was about 85%. Thus, a large percentage of patients were not compliant with the CPAP appliance. This is an important consideration while providing treatment to patients with OSA.

The oral appliances such as mandibular advancement appliances have bene shown to lead to similar improvements to sleep apnea as CPAP in a study by Aarab et al [19]. The respiratory arousal index parameter (RAI) has been reported to improve with both CPAP and Mandibular advancement appliances in comparison with controls. This indicates that there were no significant differences between the two groups in terms of effectiveness. However, the body mass index in the two groups was different at base-line and this is an important limitation in this study. The body mass index plays an important role in sleep apnea.

Another dental treatment modality that has been investigated recently for OSA is maxillary expansion [20]. Maxillary expansion can be achieved with an expansion screw cemented to the maxillary molar teeth and is known as conventional rapid palatal expander (RPE). When the expansion screw is opened, it leads to increase in the maxillary arch width, nasal cavity width, and thus, leading to decrease in nasal resistance. With the recent advancements of mini-implants in orthodontics, mini-implant supported rapid palatal expanders (MARPE) can be used for maxillary expansion leading to higher skeletal expansion and decreased incidence of dental expansion effects. RPE has shown to increase the airway dimensions in the short term following expansion. MARPE has not been investigated as much as RPE as it is a new treatment modality. Lee et al. has showed that MARPE leads to increase in airway volume following expansion [21].

Mehta et al. recently showed that MARPE leads to an increase in the airway volume in the long term [11]. In this study, the authors evaluated the effects of MARPE as compared to RPE and controls. The authors showed that the increase in airway volume with MARPE is due to the higher nasopharyngeal volume with MARPE appliance in the long term as compared to RPE and controls. Of all the best qualitative and quantitative studies comparing the effects of MARPE and RPE with controls, Mehta et al. has the longest follow-up period of 2.5 years [11]. They analyzed the effects of the expansion appliances on a sample from a randomized controlled clinical trial. Based on the study from Mehta et al., important conclusions can be drawn regarding the effect of MARPE appliance which would be helpful to researchers for conducting future studies and finding an answer to non-surgically improve the OSA condition of the patients [11].

The new treatment modalities such as MARPE is a non-compliant therapy as it does not need to be inserted by the patient. The oral appliances are relatively more tolerant by the patients as compared to CPAP therapy. The newer innovative expansion techniques such as Unilateral MARPE have been shown to be effective in treating the patient's malocclusion [22]. It remains to be seen if such therapies can lead to improvement in airway. The comparisons of CPAP and oral appliances have met with contrasting findings [23,24]. Some studies showing no difference between the two therapies and some studies showing higher effectiveness of CPAP therapy. However, the effectiveness of a therapy should also be considered in terms of the patient acceptability in the clinical situations. The patient's acceptability of CPAP therapy has been shown to be lower than that with oral appliances [18].

Newer techniques such as aligner therapy have been undertaken by many adult patients to treat their teeth [25]. As the prevalence of sleep apnea is higher in adults, a treatment modality of advancing the mandible with aligners or expansion of maxilla with aligners may help such patients with their apnea symptoms. Future research should be directed in these areas. It will be interesting to see in the future if a combination of appliance therapy such as expansion, mandibular advancement would lead to better results than CPAP therapy. Artificial

intelligence has been implemented for interpretation of the dental radiographic imaging in recent research. As more research is performed on the applications of artificial intelligence in healthcare, it would serve as a valuable aid for the diagnosis of patients with obstructive sleep apnea.

CONCLUSION

OSA is a highly prevalent disorder and has serious consequences if left untreated. CPAP is considered to be the common treatment for OSA. However, the adherence of patients with CPAP is found to be low. Other treatment modalities for OSA such as mandibular advancement appliances can have higher patient adherence. Newer treatment modalities such as MARPE have been investigated for its effectiveness in OSA. A combination approach with different interventions can be helpful in the future for the management of OSA.

REFERENCES

1. Nieto FJ, Young TB, Lind BK, Shahar E, Samet JM, Redline S, D'Agostino RB, Newman AB, Lebowitz MD, Pickering TG. Association of sleep-disordered breathing, sleep apnea, and hypertension in a large community-based study. Sleep Heart Health Study. *JAMA*. 2000 Apr 12;283(14):1829-36.
2. Kirk V, Baughn J, D'Andrea L, Friedman N, Galion A, Garets S, Hassan F, Wrede J, Harrod CG, Malhotra RK. American Academy of Sleep Medicine Position Paper for the Use of a Home Sleep Apnea Test for the Diagnosis of OSA in Children. *J Clin Sleep Med*. 2017 Oct 15;13(10):1199-1203.
3. Senaratna CV, Perret JL, Lodge CJ, Lowe AJ, Campbell BE, Matheson MC, Hamilton GS, Dharmage SC. Prevalence of obstructive sleep apnea in the general population: A systematic review. *Sleep Med Rev*. 2017 Aug;34:70-81.
4. Heinzer R, Vat S, Marques-Vidal P, Marti-Soler H, Andries D, Tobback N, Mooser V, Preisig M, Malhotra A, Waeber G, Vollenweider P, Tafti M, Habab-Rubio J. Prevalence of sleep-disordered breathing in the general population: the HypnoLaus study. *Lancet Respir Med*. 2015 Apr;3(4):310-8.
5. Amra B, Rahmati B, Soltaninejad F, Feizi A. Screening Questionnaires for Obstructive Sleep Apnea: An Updated Systematic Review. *Oman Med J*. 2018 May;33(3):184-192.
6. Lévy P, Kohler M, McNicholas WT, Barbé F, McEvoy RD, Somers VK, Lavie L, Pépin JL. Obstructive sleep apnoea syndrome. *Nat Rev Dis Primers*. 2015 Jun 25;1:15015.
7. Rogers RR. Past, present, and future use of oral appliance therapies in sleep-related breathing disorders. *J Calif Dent Assoc*. 2012 Feb;40(2):151-7.
8. Scherr SC DL, Almeida FR, Bennett KM, et al. Definition of an effective oral appliance for the treatment of obstructive sleep apnea and snoring: a report of the American Academy of Dental Sleep Medicine. *J Dent Sleep Med* 2014;1:39-50.
9. Gauthier L, Laberge L, Beaudry M, Laforte M, Rompré PH, Lavigne GJ. Efficacy of two mandibular advancement appliances in the management of snoring and mild-moderate sleep apnea: a cross-over randomized study. *Sleep Med*. 2009;10(3):329-36.
10. Zaghi S, Holty JE, Certal V, Abdullatif J, Guilleminault C, Powell NB, Riley RW, Camacho M. Maxillomandibular Advancement for Treatment of Obstructive Sleep Apnea: A Meta-analysis. *JAMA Otolaryngol Head Neck Surg*. 2016 Jan;142(1):58-66.
11. Mehta S, Wang D, Kuo CL, Mu J, Vich ML, Allareddy V, Tadinada A, Yadav S. Long-term effects of mini-screw-assisted rapid palatal expansion on airway. *Angle Orthod*. 2021 Mar 1;91(2):195-205.
12. Epstein LJ, Kristo D, Strollo PJ Jr, Friedman N, Malhotra A, Patil SP, Ramar K, Rogers R, Schwab RJ, Weaver EM, Weinstein MD; Adult Obstructive Sleep Apnea Task Force of the American Academy of Sleep Medicine. Clinical guideline for the evaluation, management and long-term care of obstructive sleep apnea in adults. *J Clin Sleep Med*. 2009 Jun 15;5(3):263-76.
13. Neelapu BC, Kharbanda OP, Sardana HK, Balachandran R, Sardana V, Kapoor P, Gupta A, Vasamsetti S. Craniofacial and upper airway morphology in adult obstructive sleep apnea patients: A systematic review and meta-analysis of cephalometric studies. *Sleep Med Rev*. 2017 Feb;31:79-90.
14. Slaats MA, Van Hoorenbeeck K, Van Eyck A, Vos WG, De Backer JW, Boudewyns A, De Backer W, Verhulst SL. Upper airway imaging in pediatric obstructive sleep apnea syndrome. *Sleep Med Rev*. 2015 Jun;21:59-71.
15. Mehta S, Dresner R, Gandhi V, Chen PJ, Allareddy V, Kuo CL, Mu J, Yadav S. Effect of positional errors on the accuracy of cervical vertebrae maturation assessment using CBCT and lateral cephalograms. *J World Fed Orthod*. 2020 Dec;9(4):146-154.
16. Phillips CL, Grunstein RR, Darendeliler MA, Mihailidou AS, Srinivasan VK, Yee BJ, Marks GB, Cistulli PA. Health outcomes of continuous positive airway pressure versus oral appliance treatment for obstructive sleep apnea: a randomized controlled trial. *Am J Respir Crit Care Med*. 2013 Apr 15;187(8):879-87.
17. Barnes M, McEvoy RD, Banks S, Tarquinio N, Murray CG, Vowles N, Pierce RJ. Efficacy of positive airway pressure and oral appliance in mild to moderate obstructive sleep apnea. *Am J Respir Crit Care Med*. 2004 Sep 15;170(6):656-64.
18. Salepci B, Caglayan B, Kiral N, Parmaksiz ET, Comert SS, Sarac G, Fidan A, Gungor GA. CPAP adherence of patients with obstructive sleep apnea. *Respir Care*. 2013 Sep;58(9):1467-73.
19. Aarab G, Lobbezoo F, Hamburger HL, Naeije M. Oral appliance therapy versus nasal continuous positive airway pressure in obstructive sleep apnea: a randomized, placebo-controlled trial. *Respiration*. 2011;81(5):411-9.
20. Abu Arqub S, Mehta S, Iverson MG, Yadav S, Upadhyay M, Almuzian M. Does Mini Screw Assisted Rapid Palatal Expansion (MARPE) have an influence on airway and breathing in middle-aged children and adolescents? A systematic review. *Int Orthod*. 2021 Mar;19(1):37-50.
21. Lee KJ, Park YC, Park JY, Hwang WS. Miniscrew-assisted nonsurgical palatal expansion before orthognathic surgery for a patient with severe mandibular prognathism. *Am J Orthod Dentofacial Orthop*. 2010 Jun;137(6):830-9
22. Dzingile J, Mehta S, Chen PJ, Yadav S. Correction of Unilateral Posterior Crossbite with U-MARPE. *Turk J Orthod*. 2020 Jul 20;33(3):192-196. doi: 10.5152/TurkJOrthod.2020.20034
23. Nikolopoulou M, Byraki A, Ahlberg J, Heymans MW, Hamburger HL, De Lange J, Lobbezoo F, Aarab G. Oral appliance therapy versus nasal continuous positive airway pressure in obstructive sleep apnoea syndrome: a randomised, placebo-controlled trial on self-reported symptoms of common sleep disorders and sleep-related problems. *J Oral Rehabil*. 2017 Jun;44(6):452-460.
24. Gagnadoux F, Fleury B, Vielle B, Pételle B, Meslier N, N'Guyen XL, Trzepizur W, Racineux JL. Titrated mandibular advancement versus positive airway pressure for sleep apnoea. *Eur Respir J*. 2009 Oct;34(4):914-20.
25. Mehta F, Mehta S. Aligners: The Rapidly Growing Trend in Orthodontics Around the World. *Indian J Basic Appl Med Res*. 2014;3(4):402-409.

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