International Journal Dental and Medical Sciences Research
Volume 3, Issue 6, Nov-Dec 2021 pp 79-82 www.ijdmsrjournal.com ISSN: 2582-6018

Obstructive Sleep Apnea Syndrome (OSA) – A Review of the Management Protocols

Dr Ashish Pandey[1], Dr Shilpa Pandey[2]
[1] *Senior Lecturer, Department of Orthdontics & Dentofacial Orthopaedics, RRK Dental College, Akola*
[2] *Senior Lecturer, Department of Conservative Dentistry & Endodontics, RRK Dental College, Akola*

Submitted: 01-11-2021 Revised: 12-11-2021 Accepted: 15-11-2021

ABSTRACT:Obstructive Sleep Apnea (OSA) is a syndrome which occurs due to repeated incidents of decreased breathing or cessation of breathing during sleep. This review article discusses the causes of OSA. It is important to diagnose OSA at an early stage as it has far reaching consequences. The treatment options for the management of OSA are discussed in detail in this review on OSA. Non-surgical options such as CPAP, mandibular advancement, miniscrew supported rapid palatal expansion, and surgical options such as tonsillectomy and maxillomandibular surgeries can be performed for management of OSA. This review article also discusses how weight reduction can be beneficial for patients with OSA..

KEYWORDS: Obstructive Sleep Apnea, OSA, positive airway pressure, oral advancement appliance, Miniscrew supported rapid palatal expansion, surgery.

I. INTRODUCTION

Obstructive sleep apnea is chronic disorder with a high prevalence in the middle aged adult male population [1]. Patients with OSA have repeated episodes of collapse of airway while asleep. This contributes to the reduction of air passage or in some cases a complete cessation of air passage. Because of this, there is deprivation of oxygen supplied to the tissues which leads to an increased respiratory efforts often leading to a disturbed sleep [2].

The diagnosis of sleep apnea is done by evaluating the breathing patterns, along with sleep and heart patterns while the person is asleep. The specific tests performed for this are polysomnography, nocturnal cardio-respiratory polygraphy. An index which is used very commonly to diagnose OSA and classify it in different severity-grades is the apnea-hypopnea index (AHI).[3] AHI index determines the total amount of obstructive sleep apnea events per hour.

The etiology of sleep apnea is complex. It is understood to be multifactorial in the sense that there are a number of factors interplaying with each other such as the anatomic, morphologic, neurologic, muscular, as well other factors such as genetics or hereditary factors.[2,4] There are a number of identified risk factors for sleep apnea. Some of these are age, males, history of snoring, post-menopausal women, obesity, and body-mass-index (BMI).[4] Moreover, patients with a larger neck diameter, decreased mandibular size, obstruction of nose, inflamed tonsils and/or adenoids, can be at higher risk for sleep apnea.[5] It has been reported that patients with a larger tongue size and a low tonus of soft palate are more prone to developing sleep apnea. The repeated episodes of sleep apnealeads to hypoxia and in turn can damage the brain, cardiovascular activities, and also change the metabolism of the body. When these condition present clinically, it presents in a variety of symptoms called as Obstructive Sleep Apnea (OSA) syndrome.

II. WHY IS IT IMPORTANT TO DIAGNOSE SLEEP APNEA

Due to sleep apnea, there is decreased quantity of sleep and decrease quality of sleep or fragmented sleep during the night. This leads to daytime sleepiness which is chief symptom of OSA. It is present in more than 3/4thof patients with sleep apnea. As OSA progresses, the daytime sleepiness becomes highly dangerous as it can lead to decreased performance of the patient while working and potential accidents at the work place.[2,6] OSA and the daytime sleepiness can also lead to road accidents, which can at times be fatal. Therefore, the consequences of undiagnosed OSA are serious.[6]

OSA can lead to cognitive changes, affect the neural activities, and cause behavioral shifts in patients.[7] Patients with OSA feel it very difficult to concentrate and suffer from wild mood swings which can be accompanied with depression. OSA, due to all these reasons can affect the quality of life of individuals significantly.[7] OSA has been reported to be a contributory factor in some patients for cardiovascular conditions by causing a low level systemic inflammation.[6] This eventually can result

International Journal Dental and Medical Sciences Research
Volume 3, Issue 6, Nov-Dec 2021 pp 79-82 www.ijdmsrjournal.com ISSN: 2582-6018

in athreogenesis although a direct cause and effect relationship remains to be investigated. OSA has been linked to metabolic dysfunctions leading to resistance to insulin, diabetes, and alterations in the lipid profile.[8] All these factors combine can also contribute to cardiovascular health.[9] Compared with controls, OSA affects both the morbidity and mortality in patients compared to controls. This is why, it is important to diagnose and mange OSA. The diagnosis of OSA is performed by evaluation of multiple reports by the primary doctor. With the advances of artificial intelligence in radiographic evaluation,[10] it would not be too long before artificial intelligence can be utilized for the assessment of obstructive sleep apnea as well.

III. MANAGEMENT OF OBSTRUCTIVE SLEEP APNEA

The treatment for patients with OSA is to provide positive pressure airway treatment. This helps in maintain the patency of the airway by pressuring the air through the airway passage. It prevents the pressure to reach below a certain critical pressure and therefore prevents the airway collapse. This is known as positive airway pressure (PAP) therapy. It can be performed by applying a mask either on the nose or mouth and nose while sleeping. The pressure that is applied through the mask can be set at different levels according to the patients' conditions and the clinicians recommendation.

The gold standard for treatment of OSA is the continuous positive airway pressure (CPAP) appliance.[11] It is typically applied through the nose. This is a non surgical method used for the purpose of managing OSA worldwide. Using CPAP can decrease the amount of obstructive events and consequently reduce the OHI index of patients with OSA.[12] The downside of CPAP is the patient compliance. It has been reported that patient compliance with CPAP appliance is not very high. And this is because of the bulky appliance which is uncomfortable for many patients and prevents them for sleep comfortably at night. Another disadvantage of CPAP is that it is difficult for some patients to breathe out or exhale with CPAP appliance due to the application of continuous high pressure.[13] For such patients, a bilevel PAP appliance can be used.[14] With this appliance, the pressure can be adjusted so that there is higher airway pressure during inhalation and lower pressure during exhalation. It can help in the management of OSA with a lower average pressure than the CPAP.[15] Bilevel PAP are thus used for patients who are not comfortable with CPAP.

Other than positive airway pressure, there are other modes of management for OSA. Often times, the position of the body while sleeping or the sleeping posture leads to OSA due to the anatomical, morphological factors.[16] In some patients with mild OSA, changing the sleeping posture can help them with the OSA. Such changes may include therapy with tennis balls such that patient does not fall asleep in supine position. Positional beds raised at certain angles, positional pillows to direct the patient's posture at higher levels than supine are available for the management of mild OSA patients.[17]

In addition, certain oral appliance can also be used for OSA. It is mainly used in patients who are intolerant to CPAP and have mild to moderate OSA. Such appliances are known as mandibular advancement appliances.[18] These appliances advance the mandibular jaw of the patient forward and hold it in the forward position. These appliance are attached to both maxillary and mandibular teeth. The purpose of mandibular advancement appliances is that there is relocation of the pharyngeal fat pads away from the airway and movement of the tongue base forward with the mandible. This helps in increasing the upper airway dimensions laterally. Furthermore, there is improved function of the genioglossus muscle which is a dilator-muscle of the upper-airway.[19] However, these appliance do have some shortcomings such as changes in the bite of the patient over time. In the long term it can lead to negative effects on the patients' teeth and may result in proclination of mandibular incisors, negative overjet, and decreased overbite.

Expansion of the maxillary arch has also been investigated as a potential method for the management of sleep apnea. Expansion of maxilla can be performed with rapid palatal expansion (RPE) which leads to decreased nasal resistance.[20] However, it has been shown that expansion with RPE leads to dental side effects such as root resorption, and buccal gingival recession.[21] Currently an alternative method is used for the expansion of maxilla known as Miniscrew supported rapid palatal expansion (MARPE). Expansion of maxilla with MARPE has a positive effect on the naso-pharyngeal airway volume.[22] If has been shown with the help of CBCT that the airway volume of the naso-pharyngeal region could increase with MARPE as compared to expansion of maxilla with RPE and control patients.[22] Thus, there could be favorable effects with this technique on airway. For patients with OSA, orthodontic treatment options such as protraction of maxilla can also lead to positive effects on airway as it can increase the dimensions of upper airway.[23] Protraction of maxilla can be done in conjunction

with MARPE therapy with mini implants and elastics.24 Such treatment of moving the maxilla forward can be performed in patients with Class III malocclusion in which the maxilla is positioned posterior to the mandible.[24] It should be noted that such methods for orthodontic treatment can lead to changes in the bite.[25] RPE and MARPE also cause changes in the temporomandibular joint after expansion.[26] Although in the long run, such changes do not affect the oral structures including the temporomandibular joint negatively.[26] Unilateral expansion can also be performed for the maxillary arch with appliances such as U-MARPE.[27] However, the effect of such appliances on airway is not known. Therefore such orthodontic treatment should only be performed with expert supervision and after a comprehensive diagnosis of the patient's conditions.

Surgical treatment options are also available for patients with OSA. Tonsillectomy and adenoidectomy are used for the management of enlarged lymph nodes.[28] Also uvulopalatopharyngoplasty is performed for selective patients in which a part of the uvula, soft palate, and excess tissue in oro-pharyngeal area is resected.[29] A more invasive surgery is the maxillomandibular advancement of the jaws. In this surgery, both the maxilla and mandible are advanced to produce an anterior displacement of the tongue and increase the transverse width of the pharyngeal area. Even though this is an invasive surgery, the success rates with this surgical technique are very high.

Obesity is considered as a risk factor for OSA and thus, weight reduction has been suggested as potential treatment option. A correlation has been reported between the BMI body mass index and AHI index for OSA. Weight reduction is an effective technique for patients with OSA to decrease the symptoms and severity of OSA.[30] In certain situations, bariatric surgery has also been advocated for weight reduction. Both surgical and non surgical means of weight reduction have shown to decrease the severity of OSA.

IV. CONCLUSION

OSA has a multifactorial etiology and occurs due to a combination of several factors. Diagnosis of OSA in early stages can help in providing effective treatment to the patients. The management of OSA can be performed by CPAP which is the gold standard. Other therapies such as bilevel PAP are also available for patients with OSA. Oral appliance such as mandibular advancement devices lead to improved upper airway dimensions in patients with mild to moderate OSA. Transverse expansion of maxilla with MARPE can be utilized to increase the naso-pharyngeal airway volume as an orthodontic option. Surgical options such as tonsillectomy, adenoidectomy, uvulopalatopharyngoplasty, as well as maxillomandibular advancement can be performed for OSA. Patients with OSA and high BMI index should be encouraged to reduce their weight as that can help to reduce the symptoms with OSA.

REFERENCES

[1]. Young, T., Palta, M., Dempsey, J., Skatrud, J., Weber, S. and Badr, S. (1993) The occurrence of sleep-disordered breathing among middle-aged adults. N Engl J Med 32: 1230–1235.

[2]. Guilleminault, C. and Quo, S. (2001) Sleep disordered breathing. A view at the beginning of the new Millennium. Dent Clin North Am 45: 643–656.

[3]. Berry, R., Budhiraja, R., Gottlieb, D., Gozal, D., Iber, C., Kapur, V. et al. (2012) Rules for scoring respiratory events in sleep: update of the 2007 AASM Manual for the Scoring of Sleep and Associated Events. J Clin Sleep Med 8: 597–619

[4]. Dempsey, J., Veasey, S., Morgan, B. and O'Donnel, C. (2010) Pathophysiology of sleep apnea. Physiol Rev 90: 47–112.

[5]. Bradley, T. and Floras, J. (2009) Obstructive sleep apnoea and its cardiovascular consequences. Lancet 373: 82–93

[6]. Jordan, A., McSharry, D. and Malhotra, A. (2014) Adult obstructive sleep apnoea. Lancet 22: 736–747.

[7]. Vaessen, T., Overeem, S. and Sitskoorn, M. (2014) Cognitive complaints in obstructive sleep apnea. Sleep Med Rev 19: 51–58.

[8]. Sharma, S., Agrawal, S., Damodaran, D., Sreenivas, V., Kadhiravan, T., Lakshmy, R. et al. (2011) CPAP for the metabolic syndrome in patients with obstructive sleep apnea. N Engl J Med 365: 2277–2286.

[9]. Young, T., Finn, L., Peppard, P., Szklo-Coxe, M., Austn, D., Nieto, F. et al. (2008) Sleep disordered breathing and mortality: eighteen-year follow-up of the Wisconsin sleep cohort. Sleep 31: 1071–1078

[10]. Mehta, S., Suhail, Y., Nelson, J., and Upadhyay, M. (2021) Artificial Intelligence for radiographic image analysis. Semin Orthod. 27(2):109-120 https://doi.org/10.1053/j.sodo.2021.05.007.

[11]. Stasche, N. (2006) Selective indication for positive airway pressure (PAP) in sleep-related breathing disorders with obstruction. GMS Curr Top Otorhinolaryngol Head Neck Surg 5: Doc06

[12]. Patel, S., White, D., Malhotra, A., Stanchina, M. and Ayas, N. (2003) Continuous positive airway pressure therapy for treating sleepiness in a diverse population with obstructive sleep apnea: results of a metaanalysis. Arch Intern Med 163: 565–571

[13]. Chen, L., Pei, J. and Chen, H. (2014) Effects of continuous positive airway pressure treatment on glycaemic control and insulin sensitivity in patients with obstructive sleep apnoea and type 2 diabetes: a meta-analysis. Arch Med Sci 10: 637–642.

[14]. Kolla, B., Olson, E., Ramar, K. and Morgenthaler, T. (2014) Bilevel positive airway pressure for obstructive sleep apnea. Expert Rev Med Devices 11: 283–294

[15]. Schäfer, H., Ewig, S., Hasper, E. and Lüderitz, B. (1998) Failure of CPAP therapy in obstructive sleep apnoea syndrome: predictive factors and treatment with bilevel-positive airway pressure. Respir Med 92: 208–215.

[16]. Frank, M., Ravesloot, M., van Maanen, J., Verhagen, E., de Lange, J. and de Vries, N. (2015) Positional OSA part 1: towards a clinical classification system for position-dependent obstructive sleep apnoea. Sleep Breath 19: 473–480.

[17]. Oksenberg, A. (2005) Positional and non positional obstructive sleep apnea patients. Sleep Med 6: 377–378.

[18]. Ngiam, J., Balasubramaniam, R., Darendeliler, M., Cheng, A., Waters, K. and Sullivan, C. (2013) Clinical guidelines for oral appliance therapy in the treatment of snoring and obstructive sleep apnoea. Aust Dent J 58: 408–419.

[19]. Chan, A., Sutherland, K., Schwab, R., Zeng, B., Petocz, P., Lee, R. et al. (2010) The effect of mandibular advancement on upper airway structure in obstructive sleep apnoea. Thorax 65: 726–732

[20]. Hershey HG, Stewart BL, Warren DW. Changes in nasal airway resistance associated with rapid maxillary expansion. Am J Orthod. 1976;69(3):274-284. doi:10.1016/0002-9416(76)90076-2

[21]. Agarwal A, Mathur R. Maxillary Expansion. Int J Clin Pediatr Dent. 2010;3(3):139-146. doi:10.5005/jp-journals-10005-1069

[22]. Mehta, S., Wang, D., Kuo, C. L., Mu, J., Vich, M. L., Allareddy, V., Tadinada, A., & Yadav, S. (2021). Long-term effects of mini-screw-assisted rapid palatal expansion on airway. The Angle orthodontist, 91(2), 195–205. https://doi.org/10.2319/062520-586.1

[23]. Danaei, S. M., Ajami, S., Etemadi, H., &Azadeh, N. (2018). Assessment of the effect of maxillary protraction appliance on pharyngeal airway dimensions in relation to changes in tongue posture. Dental research journal, 15(3), 208–214.

[24]. Mehta, S., Chen, P. J., Upadhyay, M., & Yadav, S. (2021). Intermaxillary elastics on skeletal anchorage and MARPE to treat a class III maxillary retrognathic open bite adolescent: A case report. International orthodontics, S1761-7227(21)00107-8. Advance online publication. https://doi.org/10.1016/j.ortho.2021.08.001

[25]. Melgaço, C. A., Columbano Neto, J., Jurach, E. M., Nojima, M., Sant'Anna, E. F., &Nojima, L. I. (2014). Rapid maxillary expansion effects: an alternative assessment method by means of cone-beam tomography. Dental press journal of orthodontics, 19(5), 88–96. https://doi.org/10.1590/2176-9451.19.5.088-096.oar

[26]. Mehta, S., Chen, P. J., Vich, M. L., Upadhyay, M., Tadinada, A., & Yadav, S. (2021). Bone-anchored versus tooth-anchored expansion appliances: Long-term effects on the condyle-fossa relationship. Journal of the World federation of orthodontists, S2212-4438(21)00031-X. Advance online publication. https://doi.org/10.1016/j.ejwf.2021.07.001

[27]. Dzingle, J., Mehta, S., Chen, P. J., & Yadav, S. (2020). Correction of Unilateral Posterior Crossbite with U-MARPE. Turkish journal of orthodontics, 33(3), 192–196. https://doi.org/10.5152/TurkJOrthod.2020.20034

[28]. Spicuzza, L., Leonardi, S., & La Rosa, M. (2009). Pediatric sleep apnea: early onset of the 'syndrome'?. Sleep medicine reviews, 13(2), 111–122. https://doi.org/10.1016/j.smrv.2008.07.001

[29]. Aurora, R. N., Casey, K. R., Kristo, D., Auerbach, S., Bista, S. R., Chowdhuri, S., Karippot, A., Lamm, C., Ramar, K., Zak, R., Morgenthaler, T. I., & American Academy of Sleep Medicine (2010). Practice parameters for the surgical modifications of the upper airway for obstructive sleep apnea in adults. Sleep, 33(10), 1408–1413. https://doi.org/10.1093/sleep/33.10.1408.

[30]. Tuomilehto, H., Seppä, J., &Uusitupa, M. (2013). Obesity and obstructive sleep apnea--clinical significance of weight loss. Sleep medicine reviews, 17(5), 321–329. https://doi.org/10.1016/j.smrv.2012.08.002.