



Review Article

Exploring the world of dental sleep medicine: A review

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ABSTRACT

Dental sleep medicine is discipline concerned with the study of oral and maxillofacial causes and consequences of sleep-related problems. Obstructive sleep apnea is medical condition that can affect intensely impact an individual's quality of life and is characterized by upper airway obstruction causing apnea or hypopnea. It can lead to sleep disruptions, excessive daytime sleepiness, reduced productivity, irritability and cognitive impairment and at times can cause both physical and mental trauma to the patients. Snoring can be a regular symptom. Accurate diagnosis and effective management are crucial in such individuals to enhance their quality of life. Untreated, it may increase the risk of cardiovascular diseases, high blood pressure and other fatal conditions. The primary goal of this article is to offer an overview of obstructive sleep apnea, including its clinical characteristics, methods of diagnosis, clinical management, and in addition to outlook the role dentist in managing obstructive sleep apnea.

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1. Introduction

The worldwide incidence of obstructive sleep apnoea is approximated at 1 billion people. These patients visit dental practices across the country daily. Dental sleep medicine is a nascent and rapidly developing field that is highly interdisciplinary, requiring a broad range of specialized medical knowledge for those involved. This includes expertise in areas like ear, nose and throat, neurology, pulmonary diseases, internal medicine and psychiatry.¹ It's a comparatively new branch of dentistry that addresses sleep

apnea and other sleep-related breathing problems. Dental sleep medicine and airway focused dentistry is an emerging field within dentistry that's garnering increasing attention and interest. This demanding field is especially intriguing to oral and maxillofacial surgeons, orthodontists, specialists in oral medicine and oral pathology, orofacial pain experts and dentists specializing in dental sleep medicine. Additionally, medical doctors also require a broader understanding of dental sleep medicine to ensure optimal care in interdisciplinary environments.² Though the diagnosis and treatment of sleep-related disorders are primarily within the realm of medicine, some sleep disorders intersect

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with dentistry. Particularly in countries where people visit their dentist regularly, dentists may be in a unique position to detect risk factors or signs of specific sleep disorders within oral cavity or masticatory system. They can also conduct preliminary screenings using questionnaires, thereby contributing to the diagnostic process. Sleep apnea is a malady where there are frequent, recurring gaps in breathing during sleep.³ These pauses can last for up to a minute. They occur due to soft tissue at the back of the throat relaxing and obstructing the airway. When the brain doesn't receive sufficient oxygen, it disrupts crucial physiological process. Sleep disorders include a wide range of conditions such as hypersomnia, insomnia, sleep-disordered breathing, snoring, parasomnias, mouth breathing, xerostomia, fatigue, frequent headaches and restless leg syndrome.⁴

There are three main types of sleep apnea. They are categorized by the cause of the cessation of breathing. The most common type form is obstructive sleep apnea caused by the relaxation of throat muscles leading to airway obstruction. Second type is central sleep apnea is caused by failure of brain to send proper signals to muscles that control breathing.⁵ The final type is called complex sleep apnea syndrome is a combination of both obstructive sleep apnea and central sleep apnoea. The Mallampati classification is a system used to predict the difficulty of intubation and assess the potential risk of obstructive sleep apnoea.⁶ It is based on the visibility of structures at the back of throat. The classification is determined by asking a patient to open their mouth and stick out their tongue without phonating. The clinician then observes the structures visible in the oral cavity. The classification has four classes with class I indicating the most visible structures and class IV indicating the least.⁷

1.1. Mallampati classes

1. Class I: The soft palate, uvula, fauces and tonsillar pillars are completely visible
2. Class II: The uvula, soft palate, and fauces are visible but the tonsillar pillars are partially obscured.
3. Class III: The soft palate and base of uvula are visible; but the tonsillar pillars and fauces are obscured.
4. Class IV: Only the hard palate is visible; soft palate and uvula are not visible.

This classification is widely used in anaesthesia to estimate the difficulty of endotracheal intubation. In sleep medicine, it can be indicator of airway obstruction and a useful tool for assessing the risk of obstructive sleep apnea.

Generally, higher Mallampati scores (Class III and IV) suggest a higher likelihood of airway obstruction, which could be indicative of obstructive sleep apnea.⁸

2. Discussion

Obstructive sleep apnea is among the most common sleep disorders and can lead to serious health risks if not treated. It is characterized by interrupted breathing, disturbed sleep patterns and reduced oxygen levels in the body. Not everyone who snores has sleep apnea, and not everyone with sleep apnea snores.⁹ If someone is gasping, choking, or making other unusual noises while sleeping, sleep apnea might be concern. The biggest telltale sign is how one feel throughout the day. Obstructive sleep apnea occurs when tissue at the back of the throat collapses, blocking the airway while sleeping, reducing the amount of oxygen delivered throughout the body.¹⁰ When blood oxygen levels fall low enough, individual for an instant gets awoken, though sometimes so brief that he or she might not even realize it. Snorers might also suffer from sleep loss, sometimes because their own loud snoring startles them awake, not to mention their bed partner, who might be equally disrupted by the noise. Inadequate sleep is associated with numerous contemporary illnesses an impacts overall health.¹¹ It also affects family life. Inadequate sleep can lead to increased inflammation, blood pressure, stroke, cardiomyopathy, heart failure, impaired insulin resistance & blood sugar regulation, diabetes, increased cortisol & weight gain.¹²

Sleep deprivation due to dental diseases is associated with impaired cognition and memory and is strongly linked with road traffic accidents, job impairment, work-related accidents as well as poor academic performance in children and teenagers.¹³ Dentists or medical professionals, through patient history and examination, identify which individuals might be at risk. The sleep specialists at the centre will organize an evaluation for the patient, either through an overnight sleep study at an hospital or providing them with equipment, such as a breathing sensor, heart rate monitors, and an oxygen sensor, to track their sleep at home. This will be useful in reaching a definitive diagnosis.¹³ Neck circumference can be used to estimate the likelihood and severity of obstructive sleep apnea in patients who snore. Body mass index and male gender are independent predictors.¹⁴

2.1. Treatment for obstructive sleep apnea

Sleep dentistry involves dental treatments aimed at addressing snoring and related sleep issues. The most suitable treatment for obstructive sleep apnea relies on various factors, including the severity of the condition, the anatomical structure of upper airway, other existing medical issues as well as personal preference.¹⁵ An early part of treatment for obstructive sleep apnea involves educating the patient about the condition and how it can be improved with specific lifestyle changes like weight loss through exercise and diet control, reducing sedative consumption, cessation

of alcohol & smoking and changing sleeping positions.¹⁶

The benchmark treatment for Sleep Disordered Breathing is Continuous Positive Airway Pressure which involves face or nasal mask connected to a pump that generates stream of air to maintain open airways.¹⁷ Patients who move around a lot during sleep can get tangled in the Continuous positive airway pressure tubing. And a small, portable device is easier to take along when traveling. A significant proportion of patients find it difficult to tolerate or comply with this therapy, so custom-made oral devices are an alternative treatment option for them. These oral devices are the treatment of choice for snorers and mild apnoeic in any case.¹⁸ Dentists employ oral appliance therapy to treat obstructive sleep apnea. Patients wear a custom-fitted removable oral appliance at night. The device is designed to fit similarly to a sports mouth guard or orthodontic retainer and prevents airway from collapsing. It keeps either the tongue or jaw in a forward position and potentially opens the airway, cutting down on snoring and the tissue collapse that causes obstructive sleep apnea. It depends on the severity of the condition and other factors unique to the patient. Numerous patients with mild to moderate obstructive sleep apnea find relief with oral appliance therapy. Some people find the device more comfortable. It is more compact and simpler to clean compared to a continuous positive airway pressure system. Patients who experience claustrophobia often prefer oral appliance therapy.¹⁹ Oral devices, like Mandibular Advancement or Mandibular Repositioning Devices and tongue-retaining mouthpiece, can benefit those with mild sleep apnea. The Mandibular Advancement Device snap over the upper and lower dental arches and have metal hinges that enable the lower jaw to be pushed slightly forward. It pulls the lower jaw forward to provide extra space at the back of the throat for the tongue and relaxed soft tissue, which often causes airway blockages and prevent normal breathing. Other devices like the Thornton Adjustable Positioner, allow for controlling the degree of jaw advancement. Tongue retaining devices are used less frequently than former device.

This device is a splint that secures the tongue to maintain an open airway.²⁰ A 2013 study demonstrated that oral appliances can effectively treat sleep apnea cases across all levels of severity and can be a preferable option to continuous positive airway pressure machines.²¹ At the initial appointment, the patient's dental impressions and bite records are taken and sent to the appliance manufacturer. At the follow up visit, the appliance is given to the patient after adjustments are made to ensure a comfortable fit. A single might not be inevitably suitable for every patient. Certain mandibular repositioning devices hold the mandible in fixed position while others permit lateral and vertical mandibular movement.²² Augmented Reality and Virtual Reality are emerging as potential tools in the

management of obstructive sleep apnea. These technologies can be utilized in various ways to aid in the diagnosis, treatment, and education of patients. These can assist healthcare professionals in visualizing and understanding the anatomical structures involved in obstructive sleep apnoea. By overlaying digital information onto the real world or creating immersive virtual environments, clinicians can better assess airway anatomy and identify areas of obstruction. These can also be used to simulate the effects of different treatment modalities for obstructive sleep apnoea, such as oral appliances or surgical procedures.²³ This allows clinicians to personalize treatment plans based on individual patient anatomy and preferences. It can provide patients with immersive experiences that help them understand their condition and treatment options more effectively. Interactive simulations can demonstrate the consequences of untreated OSA and the potential benefits of adhering to treatment. Virtual Reality can be employed as a distraction technique during procedures such as continuous positive airway pressure mask fitting or titration studies, helping patients feel more comfortable and relaxed during these sessions.

Augmented Reality and Virtual Reality applications can be integrated into Continuous Positive Airway Pressure devices to provide real-time feedback and guidance to users, promoting better adherence to therapy. By leveraging Augmented Reality and Virtual Reality technologies in the management of this pathological entity, healthcare providers can enhance diagnostic accuracy, optimize treatment outcomes, and improve patient engagement and adherence. However, further research is needed to fully understand the potential benefits and limitations of these technologies in the field of sleep medicine.²⁴

Uvulopalatopharyngoplasty stands as the most frequently suggested surgical intervention for the treatment of obstructive sleep apnea.²⁵

3. Follow up Care for Oral devices in Obstructive sleep apnea Treatment

If patient have a dental device fitted, he/she should have an initial checkup to ensure its working, along with regular follow- up appointments for potential adjustments or replacement. If patient experience discomfort or bite misalignment, the dentist who provided the device can adjust to resolve the issue.²⁶

4. Future Research Prospects

As sleep apnea gains attention, researchers are exploring various avenues to improve its diagnosis and treatment:

Innovative Diagnostic Tools: Efforts are underway to develop less invasive, at home sleep study devices to make diagnosis more accessible.

Personalized Treatment: Research focuses on customizing treatment plans based on individual patient needs, including dental appliances, Continuous positive airway pressure machines or surgical options.

Genetic Studies: Understanding the genetic factors involved in sleep apnea may lead to targeted therapies and earlier identification of at risk individuals.

Neurobiological Research: Examining the brain's role in central sleep apnoea could unveil new treatment approaches that focus on neural pathways.

Lifestyle interventions: Studies into the effects of diet, exercise and weight management on sleep apnea could offer non invasive methods for reducing symptoms.²⁷

5. Conclusion

Sleep is viewed as a fundamental aspect of health and dentists are in prime position to manage sleep breathing disorders. Sleep disorders and inadequate sleep are regarded as components of contemporary ailments. Dentists should have a thorough understanding of this disorder and skilled enough to recognize its signs and symptoms. Dentists are ideally positioned to screen patients, guide them to toward appropriate care and in many cases offer treatment to enhance their health and extend their lifespan. The future of sleep apnea research holds promise for more effective, personalized and patient friendly treatments, along with improved awareness and early detection.

6. Source of Funding

None.

7. Conflict of Interest

None.

References

1. Ytzhak N, Zur D, Goldstein C, Almozni G. Obstructive Sleep Apnea, Metabolic Dysfunction, and Periodontitis-Machine Learning and Statistical Analyses of the Dental, Oral, Medical Epidemiological (DOME) Big Data Study. *Metabolites*. 2023;13(5):595. doi:10.3390/metabo13050595.
2. Vlăduțu DE, Ionescu M, Noveri L, Manolea HO, Scrieci M, Popescu SM, et al. Aspects of Dental Occlusion Assessed with the T-Scan System among a Group of Romanian Dental Students in a Cross-Sectional Study. *Int J Environ Res Public Health*. 2023;20(6):4877.
3. Huang Z, Zhou N, Chattratrat T, Selms MV, De Vries R, Hilgevoord A, et al. Associations between snoring and dental sleep conditions: A systematic review. *J Oral Rehabil*. 2023;50(5):416-28.
4. Lobbezoo F, Aarab G. Dental sleep medicine: A further introduction to an emerging dental discipline. *Ned Tijdschr Tandheelkd*. 2020;127(4):222-30.
5. Lavigne GJ, Goulet JP, Zuconni M, Morrison F, Lobbezoo F. Sleep disorders and the dental patient: an overview. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 1999;88(3):257-72.
6. Nuckton TJ, Glidden DV, Browner WS, Claman DM. Physical examination: Mallampati score as an independent predictor of obstructive sleep apnea. *Sleep*. 2006;29(7):903-11.
7. leary AM, Sandison MR, Roberts KW. History of anesthesia; Mallampati revisited: 20 years on. *Can J Anaesth*. 2008;55(4):250-1.
8. Mallampati SR, Gatt SP, Gugino LD, Desai SP, Waraksa B, Freiburger D, et al. A clinical sign to predict difficult tracheal intubation: a prospective study. *Can Anaesth Soc J*. 1985;32(4):429-63.
9. Benjafield AV, Ayas NT, Eastwood P. Estimation of the global prevalence and burden of obstructive sleep apnoea: a literature-based analysis. *Lancet Respir Med*. 2019;7:687-98.
10. Young T, Evans L, Finn L, Palta M. Estimation of the clinically diagnosed proportion of sleep apnea syndrome in middle-aged men and women. *Sleep*. 1997;20:705-6.
11. Dopp JM, Reichmuth KJ, Morgan BJ. Obstructive sleep apnea and hypertension: mechanisms, evaluation, and management. *Curr Hypertens Rep*. 2007;9:529-34.
12. Keppinger J, Barlinn K, Albright KC, Schrempf W, Boehme AK, Pallesen LP, et al. Early sleep apnea screening on a stroke unit is feasible in patients with acute cerebral ischemia. *J Neurol*. 2013;260(5):1343-50.
13. Kuang B, Li D, Lobbezoo F. Associations between sleep bruxism and other sleep related disorders in adults: a systematic review. *Sleep Med*. 2022;89:31-47.
14. Gagnon Y, Mayer P, Morisson F, Rompré PH, Lavigne GJ. Aggravation of respiratory disturbances by the use of an occlusal splint in apneic patients: a pilot study. *Int J Prosthodont*. 2004;17:447-53.
15. Gauthier L, Almeida F, Arcache J. Position paper by Canadian dental sleep medicine professionals on the role of different healthcare professionals in managing obstructive sleep apnea and snoring with oral appliances. *Can Respir J*. 2012;19:307-9.
16. Vignesh S, Nm B, Balakrishnan A, Ssp R. Efficacy of coblation assisted surgery in obstructive sleep apnea with obstruction at the retropalatal level. *Panacea J Med Sci*. 2023;13(1):165-70.
17. Chhapane A, Wadde K, Sachdev SS, Landge J, Wadewale M, Rathod S. Surgical modalities of obstructive sleep apnea in adults: A systematic review and meta-analysis. *J Dent Panacea*. 2022;4(4):154-61.
18. Agarwal L, Gupta A. Role of Orthodontist in obstructive sleep apnea - An orthodontic review. *Int J Oral Health Dent*. 2016;2(3):137-42.
19. Wetselaar P, Manfredini D, Ahlberg J, Johansson A, Aarab G, Papagianni CE. Associations between tooth wear and dental sleep disorders: A narrative overview. *J Oral Rehabil*. 2019;46(8):765-75.
20. Lobbezoo F, Lavigne GJ, Kato T, De Almeida F, Aarab G. The face of Dental Sleep Medicine in the 21st century. *J Oral Rehabil*. 2020;47(12):1579-89.
21. Lobbezoo F, De Vries N, De Lange J, Aarab G. A further introduction to dental sleep medicine. *Nat Sci Sleep*. 2020;12:1173-9.
22. Chernyshev OE, Mccarty DE, Moul DE, Liendo C, Caldito GC, Munjampalli SK, et al. A pilot study: Portable out-of-center sleep testing as an early sleep apnea screening tool in acute ischemic stroke. *Nat Sci Sleep*. 2015;7:127-38.
23. Kashwani R, Kulkarni V, Salam S, Sharma S, Rathi P, Gupta S, et al. A, Virtual vs Augmented Reality in the field of Dentistry. Community practitioner: . *The J Commun Practitioners' & Health Visitors' Assoc*. 2024;21:597-603.
24. Huang TK, Yang CH, Hsieh YH, Wang JC, Hung CC. Augmented reality (AR) and virtual reality (VR) applied in dentistry. *Kaohsiung Med Sci*. 2018;34:243-8.
25. Alhassani AZMS, Zawawi AA. Tooth loss as a potential risk factor for deficient sleep: an analysis of a nationally representative sample of adults in the USA. *Sleep Breath*. 2021;25:1101-7.
26. Aboussouan LS. Sleep-disordered Breathing in Neuromuscular Disease. *Am J Respir Crit Care Med*. 2015;191:979-89.
27. Aboussouan LS, Cabodevila EM. Sleep-Disordered Breathing in Neuromuscular Disease: Diagnostic and Therapeutic Challenges. *Chest*. 2017;152:880-92.

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