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A Novel Association On Sleep Related Breathing Disorders And The Periodontium

ShruthiChandrasekaran, AnithaLogaranjani*, Jaideep Mahendra, Nikitha Ravi,

N Ambalavanan

Meenakshi Academy of Higher Education and Research, Faculty of Dentistry, Meenakshi Ammal Dental college and Hospital, Chennai. India.

dranitha.perio@madch.edu.in[2*]

ABSTRACT

The oral cavity has been considered as the mirror of systemic health. Almost all diseases of the body are being manifested orally and the dentist plays a pivotal role in its diagnosis and early detection. Sleep related disorders are on the rise these days mainly attributed to the improper lifestyle changes making breathing difficult. Sleep apnea can have a multitude of complications and their management is by an interdisciplinary team of doctors including the role of dentists. This review article briefly highlights the different sleep disorders, and the importance of a dental surgeon in the diagnosis and its management**.**

Keywords: sleep disordered breathing, apnea, mandibular repositioning device, positive airway pressure.

I. Introduction

Snoring and sleep apnea (i.e., cessation of breathing) are points along a spectrum that extends from benign or simple snoring with no sleep disturbance to obstructive sleep apnea (OSA) with excessive daytime sleepiness and the physiologic consequences of recurrent asphyxia.It is in the provision of oral devices for OSA that a key role for suitably trained dentists is developing.Sleep apnea can be caused by the lack of a central drive to breathe.Professor **Colin Sullivan(1982)** introduced the Positive Airway Pressure(PAP) and he advocated for dentists, as part of a multidisciplinary team, to play a critical role in four areas:[1]

Treating adults with oral devices for snoring and mild to moderate OSA to slow the progression of the disease

Treating children with rapid maxillary expansion and avoiding deleterious orthodontic treatments

Recognizing the need for bimaxillary osteotomy in young adults requiring maxillofacial correction.

II. Physiology of sleep, breathing and apnea

Sleep is classically defined as a cyclic, temporary, and physiologic loss of consciousness that is readily, promptly, and completely reversed with appropriate stimuli. Snoring is a vibratory noise

that is generated by the back of the relaxed tongue, pharynx, and soft palate. Further loss of tone or narrowing produces louder snoring and labored inspiration. This obstruction is known as an apneic episode.Increased inspiratory effort or oxygen desaturation may accompany the apneic episode which is sensed by the sleeping brain a transient arousal is provoked.This is a brief awakening to breathe before the individual returns to sleep.Decreasedduration periods and increasingly frequent interruptions in the descent into deeper, more refreshing sleep.Sleep becomes highly fragmented, and the consequent daytime sleepiness known as hypersomnolence increases the individual's risk of accidents at home, at work, and on the road.[2]OSA has a significant impact on an individual's quality of life.If left untreated,neurologic and physiologic consequences, including increased morbidity and mortalityimpaired cardiovascular[3]and metabolic function can occur.[4]

III.Types of apnea

Central apnea

Central sleep apnea (CSA) occurs without physical obstruction of the airway.It is generated by conditions that affect thetemporary loss of respiratory drive.Cheyne–Stokes respirations as a form of CSA are most often seen in patients with heart failure.

Mixed apnea is a combination of OSA and CSA.

Complex apnea - CSA events emerge in response to PAP therapy for OSA.

OSA in seclusion and also as a component of metabolic syndrome requires a multidisciplinary treatment modality. The World Health Organization states that chronic diseases are projected to be the leading cause of disability; if they are not successfully prevented and managed by 2020, they will become the most expensive problems for health care systems.

IV. Diagnosis of obstructive sleep apnea

A proper history of snoring, age,gender and thorough **examination of** BMI, hypertension, pharyngeal volume is required. A polysomnography, respiratory sleep study, cardiorespiratory sleep study and split night lab studies/ day nap lab studies are additional requirement for OSA diagnosis. A dentist must not initiate treatment with an oral device unless the patient has been assessed, medically diagnosed, and then referred to the dentist.

V. Sleep-related breathing disorders and the periodontium

The frequency of compromised breathing in patients who are also vulnerable to periodontal disease and whose periodontitis experience may be affected by a sleep-related breathing disorder is sufficient to compel dentists and their teams to develop recognition strategies. The dentist is

capable of identifying and differentiating clinical signs of possible airway issues, often before the patient becomes suspicious of the health risk.

VI. Dental identification of signs and symptoms

The dentist should conduct an effective review and record the patient's health status.Inclusion of questions about breathing issues to look for clinical indicators of sleep-related breathing disorders.Clinical signs can reframe future discussions of the patient's overall health to prevent overlooking possible correlations with observations. For example: snoring or gasping reported to the patient by his or her bed partner may correlate with unexpected mobility of occluding anterior teeth. Important factors that may be described by a patient includes hypertension, gastroesophageal reflux disease, excessive daytime sleepiness, cardiovascular disease including arrythmias, type 2 diabetes, hypothyroidism, obesity, sudden onset of snoring and awareness of snoring SDB

VII.Dental signs and symptoms of obstructed breathing

Sleep Bruxism

Although patients commonly report SDB and sleep bruxism, there is only a suspected association because no evidence-based clinical trial has established a specific relationship. The bruxing patient's recurring mandibular movements are chiefly mediated by the central nervous system. It has been hypothesized that the advancement of the mandible opens the oropharynx, relieving some of the consequences of SDB.[5]

Clinical signs and symptoms

Wear patterns on opposing incisors are the most common to be seen as the patient positions the mandible anteriorly to maintain an open airway.The mobility of the anterior teeth may be in excess - based on the patient's health and the support available from periodontal structures.In periodontitis-susceptible populations, extensive bone loss may be localised or exaggerated in sites of unusual wear or mobility. Development of an anterior or lateral open-bite relationship of the opposing teeth may result from tongue posturing.Sleep bruxism may develop or increase. Dimpling of the cusps and lingual surfaces of the teeth can indicate related gastroesophageal reflux. The development of orofacial pain, temporomandibular joint (TMJ) dysfunction symptoms, masticatory muscle fatigue noticed on awakening, or morning headache can be related to the positioning of the mandible to open the patient's airway. The patient's age can contribute to the loss of tone of the pharyngeal muscles. Mouth breathing while sleeping can manifest as drying of the surface of the gingiva.

VIII.Treatment options for obstructive sleep apnea

Otolaryngology or oromaxillofacial Surgery, positive Airway Pressure, oral Devices for Mandibular Repositioning and effective Communication and multidisciplinary management

Surgical options

Physical obstructions to the airway (e.g., tonsils, deviated septum, nasal polyps) are present, surgical correction may improve breathing.For example, if adeno-tonsillar hypertrophy exists, childhood correction is considered advantageous.Limited evidence for adult palatal surgery, which is known as uvulopalatopharyngoplasty, exists.[6]This surgery should be considered only after PAP therapy has failed. Maxillary or bimaxillary orthognathic surgery is rarely considered, whereas tracheostomy is an effective option of last resort because it completely bypasses the affected area.

Positive airway pressure

It is the first-line treatment for OSA.It involves wearing a mask over the nose (and sometimes the mouth and nose) at night while being connected to a quiet blower.It works by minimally pressurizing the upper airway, thereby pneumatically splinting it open and preventing it from collapsing.It is particularly useful when there is a need for rapid control of OSA. Oral devices can be used to provide therapy for sleep apnea of any severity; however, effective results are considered less certain with increasing severity.[7]PAP and MRD therapies are complementary; in patients with moderate OSA, the two modalities in some circumstances can be considered equally appropriate.[8]

PAP and oral devices are fast developingwith particular focus on improving the patient's ability to tolerate their use and minimize their side effects. PAP development focuses on better mask design, the inclusion of air humidifiers, and the sensitive electronically controlled variation of air pressure in response to inspiration and expiration.

Oral devices for mandibular repositioning

Candidates for oral devices are assessed for the signs and symptoms of OSA in accordance with contemporary standards, and the assessment should be documented. If the patient exhibits signs or symptoms of OSA- referral for a medical assessment.Patients should be advised about the risks and benefits of antisnoring devices, including the potential impact on the occlusion, periodontium, and TMJs. Documentary evidence of the consent process must be retained. It has to be kept in mind that when a patient has obstructive sleep apnea, a multidisciplinary approach with an antisnoring additional device has to be planned.

Devices pertinent to the dentist

Oral devices for snoring and OSA aim to maintain the upper airway during sleep. Tongue-retaining devices and MRDs can do so by eitherby holding the tongue in a forward position, or

indirectly by repositioning the mandible anteriorly, which maintains upper airway patency.Adjustable MRDs are more likely to provide successful therapy in patients with moderate to severe OSA than nonadjustable MRDs. (**Boil and bite MRD's**)

Mandibular repositioning device therapy

Complete periodontal assessment should precede the decision to fit a patient with an MRD.Management of inflammation can be more difficult with an MRD, which the patient must use consistently when sleeping. Bacterial biofilm development and maintenance are encouraged on the tissues and on the device. Hence, supplementary instructions and motivation regarding efficient biofilm removal are often necessary. Careful and frequent monitoring of the periodontal status with ongoing use of the MRD is essential to confirm sustained health and tooth stability, to recognize negative changes, and to recommend intervention and consideration of an alternative treatment modality.

Side effects

The following side effects can be seen with MRD's

Hypersalivation or Xerostomia

Immediate short-term side effects of wearing MRDs include hypersalivation or xerostomia (i.e., dry mouth) if lip seal is impossible as a result of vertical opening or bulk, or both.

Undesired orthodontic effects

Tooth movement may complicate MRD therapy and "may be predictable on the basis of initial characteristics in dental occlusion and the design."Some degree of retroclination of the upper incisors and proclination of the lower incisors is thought to occur with most MRDs. It may manifest during long-term use as a mild reduction in overjet or overbite, and it may be undetectable by the patient. Occasionally, dental changes occur that require remedial dentistry to restore the occlusion. After wearing an MRD, some patients may experience a temporary sensation of bite change. Empiric reporting has led to the creation of morning-wear devices that can lessen this effect. The morning-wear device can be designed to reverse the lateral load applied to the teeth by the MRD and the potential overbite and overjet changes.

Change in occlusal relationship

Obtaining valid informed consent and retaining pre-MRD therapy study casts are highly recommended because a change in the occlusal relationship may be observed in rare instances. Careful and frequent dental follow-up appointments are suggested. Communication with the patient regarding detected changes that he or she may be unaware of is recommended, and these should be discussed in the context of a risk–benefit assessment and consideration of alternative

treatment modalities.A posterior open bite may develop due to:The device frees the bite. The MRD can eliminate interdigitation with opposing teeth and the influence of physiologic TMJ function on tooth position, either or both of which can destabilize the occlusion.The condylar head is moved anteriorly and off of the meniscus.Premature incisal contact results from inclination that appears as a posterior open bite.

IX. OSA AND PERIODONTAL DISEASE

Tremblay C et al (2017)[9]- performed a literature review to investigate the possible association between periodontitis and obstructive sleep apnea (OSA) by assessing 11 studies. They found a causal relationship between periodontitis and OSA which was still debatable due to the heterogeneity of studies and divergence of results.

Latorre C et al (2018)[10]- identified association between periodontitis and mild OSA and this association was more frequent in women with hypertension or hypertensive cardiomyopathy. Periodontitis was associated with severe OSA in men who showed any of two comorbidities such as hypertension or hypertensive cardiomyopathy.

Seo WH et al(2013)[11]- a cross sectional study to evaluate the association between and periodontitis and obstructive sleep apnea and found that periodontitis was more prevalent in patients with OSA than in non-OSA subjects and among the OSA patients, those who reported excessive mouth breathing were at a higher risk of developing periodontal disease compared with those who did not.

Ahmed NE at al(2015)[12]- investigated the strength of association between periodontitis and risk for OSA and found that patients with periodontitis were 4.1 times more likely to be at high risk for OSA than healthy controls.

Keller JJ et al (2013)[13] - performed a population based epidemiological study and found OSA patients to be 1.75 **times** more likely than healthy controls to have had a previous diagnosis of chronic periodontitis.

Loke W at al (2015)[14]- analyzed the relationship between OSA and periodontal disease prevalence and severity using a variety of clinical parameters and found no meaningful association between OSA and the prevalence of moderate/severe periodontitis.

Patients with OSA often present with oral breathing and dryness of the oral cavity and the pharynx.[15]

Nizam M et al(2014)[16] - evaluated the salivary interleukin (IL)-1β, IL-6, IL-21, IL-33, and pentraxin-3 (PTX3) concentrations in patients with and without OSAS and found OSAS may have an increasing effect on salivary IL-6 and IL-33 concentrations regardless of OSAS severity.

Nizam M et al(2016)[17] - found a significant change in the composition of microbes to gram negative in plaque, particularly in severe OSAS samples and significantly higher salivary IL-6 levels in OSAS patients. Salivary apelin levels were significantly higher in the severe OSAS group compared to the control group

X. Conclusion

In 1997, Loube and Straussconcluded that future efforts at enhancing cooperation between dentists and sleep disorders physicians in the treatment of OSA with oral appliances should be promoted as a means of standardizing treatment.[19]The role of dentistry in sleep medicine is developing to include increased emphasis on screening, and it may include patient evaluation (e.g., monitoring MRD compliance and objective efficacy). It may also include weight monitoring and hypertension assessments to recognize the best time to transition from an oral device to PAP.Perspective is essential and can be gained through working as part of a multidisciplinary team.

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