



OBSTRUCTIVE SLEEP APNEA: POTENTIAL ROLE OF DENTIST

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ABSTRACT

The review article sheds light upon obstructive sleep apnea and the potential role of a dentist in its diagnosis and treatment. Obstructive Sleep Apnea affects children and adults due to factors ranging from obesity to several conditions that leads to the narrowing of upper airway. The disease is often left undiagnosed and the long-term effects could be harmful. Polysomnography, which is a sleep study, is a standard for establishing a diagnosis. If the condition is not diagnosed and treated, it would lead to a poor quality of life and life-threatening conditions. CPAP (continuous positive airway pressure) is one of the most widely accepted treatment. Dentists could play a vital role in early diagnosis and treatment of sleep apnea with oral appliances and significantly contribute to improve the quality of life of patients suffering from this disorder.

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INTRODUCTION

Obstructive Sleep Apnea (OSA) is defined as brief pauses between breathing during a sleep cycle. According to National Heart, Lung, and Blood Institute, US Department of Health & Human Services, in sleep apnea, patients have one or more pauses in breathing or shallow breaths while they are asleep. The duration of pauses ranges from few seconds to minutes while the frequency of occurrence could be as high as 30 times or even more. This typically is followed by a normal breathing cycle but sleep often shift to light from a deep cycle. This chronic condition is one of the leading causes of daytime sleepiness and poor quality of sleep. In US alone about 24% men & 9 % middle-aged adult females are affected by OSA (Narindrangkura, 2016). The Centres for Disease Control and Prevention considers it a public epidemic, and National Healthy Sleep Awareness Project estimates that OSA affected at least 25 million American adults in the year 2014. Despite the huge number, majority of the times the disease goes undiagnosed and this results in increased morbidity for the patient, so this makes it extremely important to diagnose and treat the disease at an early stage (Jagannathan, 2017).

Pathophysiology & Symptoms

OSA affects about 2% of children between the age of 2- 7 years and about 2.5 to 6% in adolescent. It has a slightly more likelihood in boys than in girls. Adenotonsillar hypertrophy, a condition in which adenotonsillar tissue enlarges and occupies greater area in the nasopharynx is commonly associated with OSA in children, it leads to narrowing of airway. Major risk factors include obesity family history of snoring or OSA, physical abnormalities, cerebral palsy, muscular dystrophy, Down's syndrome, sickle cell anemia, mouth breathing and any condition that leads to narrowing of upper airway (Maya Capua, 2009). As the patient falls asleep the nasopharynx muscles begin to relax, collapsing the surrounding tissues and this compromises the airway. The narrowing is further increased due to the sympathetic tone, triggered by a drop in oxygen and an increase in carbon dioxide levels. The repeated episodes decreases the rapid eye movement (REM) phase of sleep hence the overall quality of sleep is comprised. Repeated episodes of hypoxia reduce the synthesis of vasodilator, nitrous oxide and this directly effects the vascular beds. Further hypoxia activates the inflammatory cells, which can damage the endothelial developing atherosclerotic lesions.

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Some other risk factors include diabetes pregnancy, menopause, hypothyroidism, alcohol and tobacco. An apnea-hypopnea index of > 5 is diagnostic of sleep apnea as this means the patient experiences lower breathing of more than 5 times during per hour of sleep cycle (Motamedi, 2009). Sleep study called polysomnography is the standard for diagnosing OSA. This is recommended for anyone who shows the signs and symptoms of OSA. In adults the airway obstruction is 10 seconds or more while in children desaturation of oxygen is caused in 3-4 seconds, thus diagnostic guidelines are different for children (Goraya, 2017). A psychometric based questionnaire can assess the individual level of risk for example low or high (Jagannathan, 2017). Typical features include disturbed night sleep, snoring, restlessness and interrupted regular breathing pattern. The person finds it difficult to concentrate in the day and feels fatigued (Motamedi, 2009). Waking from sleep with a sense of choking, morning headaches, decreased libido, a history of cerebrovascular disease, renal disease or gastroesophageal reflux disease. OSA is associated with a low -grade systemic inflammation and there would be high serum levels of mediators of the systemic and vascular inflammatory response, including inflammatory cytokines, adhesion molecules, coagulation factors and C-reactive protein (CRP). The inflammatory response contributes to atherosclerosis, which in turn increases cardiovascular and cerebrovascular morbidity (Narindrarangkura, 2016).

OSA induces severe resistance to insulin, resulting in compensatory hyperinsulinemia and this increase the requirement for higher doses of exogenous insulin. The hyperglycemia in OSA appears to be due to hypoxia and sleep fragmentation. The hypoxia causes an elevation in epinephrine resulting in increased hepatic gluconeogenesis and decreased skeletal muscle reuptake of glucose. The fragmentation of sleep decreases the insulin sensitivity and impair glucose metabolism (Nannapaneni, 2013).

Risks for Untreated Patients

Untreated OSA is a major established determining factor of cardiovascular morbidity and mortality. More than half of the patients develop drug-resistant systemic hypertension and others may develop stroke, cardiac arrhythmia and ischemic heart disease. OSA has been associated with a low-grade systemic inflammation and this in turn is associated with initiating or accelerating the process of atherogenesis. It is observed in patients suffering from OSA that regardless of weight, there is metabolic impairment, insulin resistance, type II diabetes altered serum lipid profile leading to the cardiovascular morbidity (Narindrarangkura, 2016).

If these symptoms are untreated, adults may present with neurobehavioral impairments, which include sleepiness, fatigue, depressed mood, poor memory and concentration (Dempsey, 2010). Untreated sleep apnea in children can result in hypertension, cardiac arrhythmia, reduced growth, attention deficit disorder and lower IQ level (Maya Capua, 2009). There is risk of developing systemic hypertension, coronary artery disease, stroke, atrial fibrillation, congestive heart disease. Poor sleep quality may decrease quality of life and increase morbidity (Ramar, 2015). OSA disturbs the sleep increasing the sympathetic nerve activity, blood pressure, produces intrathoracic pressure oscillations, hypercapnia and arterial oxygen desaturation.

There is reduction in heart rate, stroke volume and cardiac output but post apnea is marked by a transient period of increased systemic arterial pressure. OSA alters mechanism of neural and vascular resistance causing vascular constriction in forearm. Cerebral circulation increases during apnea but falls post apnea. This oscillation influences CO₂ washout and may cause breathing instability (Dempsey, 2010). Untreated OSA is a major established determining factor of cardiovascular morbidity and mortality.

Treatment Options

CPAP

Once diagnosed the treatment options available include the gold standard of continuous positive airway pressure (CPAP). It's a non-invasive method that reduces the number of nocturnal obstructive events and improve the sleep parameters. After a continuous treatment of 3-6 months, an improvement is observed in the memory and attention. The side effects include nasal congestion and pressure related discomfort thus affecting patient compliance. Auto-CPAP continuously titrates accordingly so that the patient's upper respiratory tract remains patent following the changes in the airflow resistance (Spicuzza, 2015).

Adenotonsillectomy

Adenotonsillar hypertrophy is a major contributing factor of OSA in children and adenotonsillectomy is effective in about 80% of children diagnosed with OSA (Maya Capua, 2009). It also significantly decreases snoring, weight and behavioral problems.

Positional Therapy

Sleeping in supine position, the gravity effects the position of the tongue and soft palate thereby increasing the number of apnea/hypopnea. Postural OSA occurs in about 30% of patients who are typically young and less obese. The obstruction takes place mainly in supine position and it is at least double than in nonsupine position (Narindrarangkura, 2016). Positional therapy is helpful in cases where supine position causes mild apnea. The "tennis ball technique", supine alarm & positional pillows prevent supine position hence apnea (Spicuzza, 2015).

Oral Appliances

Oral appliances help to reduce snoring in the following ways. Some devices bring the jaw forward, others elevate the soft palate and other devices retain the tongue from falling back in the airway. Mandibular Advance Splints (MAS) are frequently used oral appliance and It advances mandible in a forward position and this moves the pharyngeal fat laterally and moves the tongue base forward. This reduces the possibility of snoring and apnea. Its side effects include excessive salivation, arthralgia and occlusion changes (Spicuzza, 2015). A new orthodontic appliance like a modified monobloc reduces sleep apnea and improves sleep quality and day time performance in both children and adults (Maya Capua, 2009).

Diet and Medicine

Obesity in children can be controlled by encouraging a healthy diet and promoting weight loss. ISHORT term use of

antibiotics is helpful in treating snoring and obstruction, especially if the problem is not persistent (Maya Capua, 2009).

Potential role of dentists

The dentist may include a questionnaire to get information about any symptoms of sleep apnea and snoring (Goraya, 2017). With the help of a clinical exam, dentist may diagnose adenotonsillar hypertrophy (Maya Capua, 2009 and Goraya, 2017) and refer to ENT specialist for possible surgery (Maya Capua, 2009). Any patient with signs and symptoms of sleep apnea or snoring may be referred out for a sleep study to sleep medicine specialists. Upon the recommendation of sleep specialist, dentist may treat patients diagnosed with mild to moderate sleep apnea with oral appliances (Luc Gauthier, 2012). A dentist can recognize the symptoms of OSA and assess the oral health, effects of concomitant bruxism, gastroesophageal reflux disease (GERD), orofacial pain, temporal headaches and manage these symptoms appropriately. The patient can be referred to an orthodontist, oral and maxillofacial surgeon or an otolaryngologist as necessary. Depending on the patient's oral health and craniofacial morphology, such patients may be treated with occlusal splint, mandibular advancement appliance, tongue retaining device etc (Luc Gauthier, 2012) It is recommended that the patients without OSA, who require a treatment for only snoring be prescribed oral appliances which are custom titrated by the dentist and followed through till symptoms are resolved (Ramar, 2015).

Conclusion

Obstructive Sleep apnea is a silent disease, which usually goes undiagnosed. The pathological factors are diverse. The repeated cycles of obstruction invariably disturb the sleep cycle and this has both immediate and long-term effects on the health of an individual. The duration of the obstruction varies from few seconds to minutes and the airway becomes narrow. Sleep apnea can pose serious health challenges for adults and children alike. Dentist plays a key role in early diagnosis and treatment of sleep apnea thus preventing serious consequences of untreated obstructive sleep apnea. Continuous positive airway pressure (CPAP) is the gold standard for treatment but in cases where CPAP compliance is not optimum or in cases of mild to moderate apnea, dentist may very well treat such patients with oral appliances to significantly improve their quality of life.

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