

Obstructive Sleep Apnea - Dentistry's Role

Abstract

Sleep is essential to life and overall health. Human beings spend approximately one third of their lives sleeping and a restful sleep is important for maintaining the quality of life. Obstructive sleep apnea (OSA) is a disorder of upper airway function during sleep involving critical narrowing of the airway resulting in occlusion and apnea when inspiratory pressure exceeds the forces that maintain airway patency. OSA is a potentially life threatening condition. Patients with undiagnosed sleep apnea represent a major public health problem. Common symptoms of OSA include loud snoring, restless sleep, excessive daytime sleepiness, however associated health issues range from depression and anxiety to cardiovascular problems such as hypertension, irregular heart rate, coronary artery disease and even stroke. Investigations done for diagnosis are polysomnography, acoustic reflection, fluoroscopy, cephalometry and MR and CT imaging. Multidisciplinary effort is required for its management and treatment is more successful and efficient if dentists and sleep specialists collaborate closely. Treatment modalities include behaviour modification, surgical procedures, continuous positive airway pressure (CPAP) and oral appliances. Dentist can play a key role in management as oral appliances are the treatment of choice in mild to moderate OSA in patients intolerant to CPAP.

Key Words

Obstructive sleep apnea, Continuous positive airway pressure, mandibular repositioning appliances.

Introduction

Sleep is essential to life and overall health. Human beings spend approximately one third of their lives sleeping and a restful sleep is important for maintaining the quality of life^[1]. Sleep apnea, or sleep-disordered breathing, is a condition in which breathing is briefly interrupted or even stops episodically during sleep.

Definition Of Obstructive Sleep Apnea

Obstructive sleep apnea (OSA) is a disorder of upper airway function during sleep involving critical narrowing of the airway resulting in occlusion and apnea when inspiratory pressure exceeds the forces that maintain airway patency. Apnea is defined as cessation of airflow which lasts for at least 10 seconds with oxygen desaturation of more than 3%. Hypoapnea is defined as reduction in amplitude of airflow of greater than 50% of baseline measurement for at least 10 seconds with accompanying oxygen desaturation of at least 3%. A distinctive form of obstructive sleep apnea is known as the Pickwickian syndrome, in which individuals are overweight, with large necks, fat build up around the soft tissues of the neck, and loss of muscle tone with

aging.

Patho-physiologic Aspect Of Obstructive Sleep Apnea

Although Sleep Apnea might be central, obstructive or mixed in origin; the Obstructive type is the most common form. It is characterized by cessation of airflow because of upper airway obstruction despite simultaneous respiratory effort. Once the airway is obstructed, resulting fall in blood oxygen level signals the brain to awaken the person enough to activate the upper airway muscles and reopen the airway. Repeated arousal or even full awakening when breathing stops causes sleep fragmentation. Individuals suffering from sleep apnea are often drowsy during the day. Complications from an insufficient amount of oxygen reaching the brain are serious and even potentially life threatening^[2]. Untreated OSA is associated with poor work performance and reduced quality of life and may affect the patient on personal, social and professional levels^[3].

Epidemiology

Sleep apnea appears to be far more common than was initially realized when

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it was first described in 1965. Estimates of prevalence of Obstructive Sleep Apnea vary widely, largely because of different cutoff point for diagnosis. Battagel (1996)^[4] stated that incidence for middle-aged adults range from 1.3 to 24%. Almost all studies report higher incidence in males than in females, and agree that the prevalence of condition is greater in obese. The prevalence increases with age.

Predisposing Factors

Obesity - airway is compromised because of more fat deposits in soft palate, tongue and surrounding pharynx.

Alcohol ingestion - decrease in hypoglossal nerve output.

REM sleep - muscles of airway are most hypotonic in this stage of sleep.

Etiological Factors

Etiological factors for obstructive sleep apnea include tonsillar and adenoid hypertrophy, deviated nasal septum, choanal atresia, nasal and pharyngeal tumors, infections, macroglossia, velopharyngeal flap surgery, goiter, craniofacial maladjustments^[5].

Clinical Features Of Obstructive Sleep Apnea

Nocturnal symptoms include snoring, frequent arousal during sleep, insomnia. Daytime symptoms include excessive sleepiness, morning headaches, gastroesophageal reflux disease, impaired concentration, depression, decreased libido, irritability, personality changes, school and learning problems.

Diagnosis

Experts estimate that at least 90-95% of cases remain undiagnosed, because of vague, slowly developing symptoms that largely occur when the patient is sleeping; limited knowledge of the disease by physicians; and expensive, specialized testing needed for definitive diagnosis.

History: Talking to the patient and the spouse or parent is an important first step, but it may not be sufficient. Helpful diagnostic aids may include a questionnaire asking about typical symptoms and sleep habits. Patients can be evaluated on Epworth Sleepiness Scale.

Clinical Examination: General physical conditions like the BMI of the patient can be recorded. Neck size is an important aspect of evaluation, more than 40cm increases predisposition. Clinical examination should also include airway evaluation, size of the tongue, position of the tongue, tonsillar size, and assessment of effect of mandibular position^[6].

Cephalometry: Cephalometry is considered useful for evaluating and quantifying craniofacial (mandibular and hyoid position) and soft tissue structures (tongue and soft palate) in patients with retrognathia or micrognathia. Widespread availability of cephalometric metrics make it useful for sleep apnea patients being treated with oral appliances and undergoing craniofacial surgery^[7]. Anatomic alterations associated with reduced airway may include (Ivanhoe) posteriorly positioned maxilla and mandible, steep occlusal

plane, overerupted anterior teeth, large gonial angle, anterior openbite associated with large tongue, posteriorly placed pharyngeal walls^[8].

Acoustic Reflexion (Philipson 1992):

This procedure uses a device that emits a sound wave that is projected into the airway, comes into contact with various portions of the airway and is reflected back through the tube to a computer which creates an image that determines the size or area of the airway.

Polysomnography (PSG): First proposed by Holland et al (1974) requires an overnight testing at a specialized sleep center. During this test, breathing, brain waves, heartbeat, muscle tension, and eye movement are monitored through wires attached to the skin while the patient sleeps. Oxygen levels can be monitored through a device applied to a fingertip, and audio and/or video recordings may provide additional diagnostic information. PSG will provide Apnea Index (AI), Hypoapnea Index (HAI). An index of 5 episodes per sleep hour is considered normal.

Classification: Obstructive sleep apnea can be classified as^[9]

Mild : 10 to 20 episodes per hour

Moderate : 20 to 40 episodes per hour

Severe: more than 40 episodes per hour

Pulse Oximetry: Arterial oxygen saturation can be monitored continuously by pulse oximetry. Pulse oximetry is relatively simple and reliable. Oximetry may be useful to evaluate response to treatment after surgery or airway dilator placement in patients with known Obstructive Sleep Apnea.

Treatment Modalities

Behaviour modifications: It is possible to correct OSA by modifications in behavior such as alcohol use, sedative use, smoking and patient's weight.

Sleep position: Many patients have apnea only when they sleep on their back. They can be trained to sleep on the side to reduce the episodes of apnea.

Elimination of Alcohol and Sedative use:

These have depressing effect on CNS. They act as muscle relaxants contributing to the loss of muscle activity maintaining airway patency.

Patient's weight: Increase in the weight leads to loss in the diameter of the upper airway. As the BMI of a patient becomes 10% above ideal, loss of airway space becomes significant.

Surgical Procedures: Surgical procedures like lingualplasty, mandibular surgery, nasal septal surgery can be undertaken for OSA patients.

Continuous positive airway pressure

CPAP: To keep the airway open during sleep, some individuals with obstructive sleep apnea need a device called nasal CPAP, which delivers air through a mask over the nose or over both the nose and mouth. This is considered to be the most effective and widely used therapy but the process is still cumbersome. Approximately 10-50% of subjects finds the continuous positive airway pressure (CPAP) intolerably uncomfortable and discontinues its use within a short period of time.

Oral appliances^{[10],[11],[12]}: Oral appliances are a viable option for patients who are intolerant to or refuse treatment with CPAP. Dental appliances in the treatment of Obstructive Sleep Apnea can be divided into two categories:

Tongue Retaining Devices

This type of appliance is designed to reposition the tongue in a more forward position. Tongue retaining devices consist of a hollow bulb supported by trays that fit over the maxillary and mandibular teeth or edentulous ridges. To prevent tongue from approaching the posterior wall of the pharynx, the patient projects the tip of the tongue into a hollow bulb, thereby creating a suction which retains the tongue in an anterior position. It does not depend on teeth for retention. Rather, the tongue is held forward by the negative pressure created in the vacuum bulb on the front of the appliance.

Mandibular Repositioning Appliances

The rationale for this appliance is that the tongue is attached to the genial tubercles of the mandible and positioning the mandible forward moves the tongue forward. These mandibular repositioning appliances also change hyoid bone position and modify the lower airway space below the level of the base of the tongue. These appliances are custom-fitted to help the patient sleep soundly and minimize the effects of sleep apnea,

such as snoring. These devices treat Obstructive Sleep Apnea by preventing airway obstruction and allowing the patient to breathe easily and continuously. Worn in the mouth like an orthodontic appliance during sleep, oral appliances keep the soft tissue from collapsing and interrupting normal breathing patterns.

Conclusion

In rapidly industrializing country like India, with soaring rates of obesity, it is quite likely that prevalence of Obstructive Sleep Apnea is far higher than detected and rising rapidly. Dental specialist, in concert with trained medical personnel can render valuable service in diagnosis and treatment of OSA. It is important however for these patients to undergo regular medical referrals to monitor their condition and switch to an alternative treatment plan if required. Thus, there can be no doubt that dentist has a vital role to play in identifying as well as treating OSA patients. It would thus be important for dentist to make themselves aware of the procedures and responsibilities involved in multi-disciplinary management of OSA.

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