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REVIEW

Role of dentist in Mangement of Obstructive Sleep Apnea - An Overview

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ABSTRACT:

Obstructive sleep apnea is a sleep disorder of airflow at the nose and mouth during sleep. Patients with undiagnosed sleep apnea represent a major public health problem. Dental professionals have a unique doctor patient relationship that can help them in recognizing the sleep disorder and co-managing the patients along with a physician or a sleep specialist. Oral appliance therapy is an important treatment modality for sleep apnea patients.

This article discusses the etiology, clinical features, diagnosis and various treatment options with special reference to oral appliances used for obstructive sleep apnea

Key words: ***Snoring, Obstructive Sleep Apnea (OSA), Oral appliance therapy***

INTRODUCTION

Sleep Disordered Breathing (SDB) is characterized by repetitive upper airway obstruction and consequent oxyhaemoglobin desaturation during deep stages of sleep.

Sleep Disordered Breathing (SDB) includes simple snoring, upper airway resistance syndrome and Obstructive Sleep Apnea (OSA). This disorder causes significant morbidity, particularly in terms of daytime functioning and its impact on quality of life.

It is well documented by various studies that sleep disordered breathing and Obstructive Sleep Apnea (OSA) have many health related consequences which include hypertension, myocardial infarction, stroke, diabetes, depression, excessive day time fatigue and greater risk of automobile accidents.[1,2] 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]

The dental professionals have a unique opportunity to play a role in management of sleep breathing disorders and improve the quality of life for patient seen in dental practice.

Etiology and Pathogenesis :

Obstructive sleep apnea occurs in 2-4% of adult population between the ages 30-60 years[4] though evidence suggests that many more patients remain undiagnosed. OSA is characterized by a collapsing of the tongue back out the pharynx during sleep. Typically this is because of large tongue, small air pathway or abnormal throat anatomy. This blockage restricts breathing, lowering the concentration of oxygen in the blood until receptors in carotid sinus are altered to higher CO_2 levels in the body causing the patient to wake up and normal breathing is

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restored. When patient falls into deep sleep, tongue collapses again and another apneic episode takes place. The number of unintentional pauses in breathing, in a given night can be as high as 100 or more per hour. It is frequently accompanied by snoring but not everyone with sleep apnea snores. Alcohol is frequently a co-factor because of its depressant influence on upper airway muscles and on arousal response that terminates each apnea.[5].

In most patients patency of the airway is compromised structurally and therefore predisposed to malocclusion. In minority of the patients, structural compromise is due to obvious anatomic disturbances such as adenotonsillar hypertrophy, retrognathia and macroglossia. However, in majority of patients structural defect is simply a subtle reduction in airway size that can be appreciated as pharyngeal crowding and can be demonstrated by imaging techniques. Obesity frequently contributes to decrease in size of upper airway by increasing fat deposition or compressing the pharynx by superficial fat mass in the tongue[5].

Clinical Features

Some of the common signs and symptoms associated with obstructive sleep apnea are given in below (Table 1) [3]

SIGNS AND SYMPOTMS OF OBSTRUCTIVE SLEEP APNEA

Nocturnal Signs And Symptoms	Day Time Signs And Symptoms
Drooling	Excessive Sleepiness
Xerostomia	Xerostomia
Sleep restlessness	Morning headaches
Witnessed apnea	Non restorative Sleep
Choking or Gasping	Gastroesophageal reflux disease
Diaphoresis	Impaired concentration
	Depression
	Decreased libido
	Impotence
	Irritability

Examination: This should include blood pressure monitoring, neck circumference measurement (>17" in males and >15.5" in females is significant), upper airway examination to evaluate low hanging bulky soft palate, large tonsils, large tongue, low hyoid position or maxillo mandibular deficiency and dental malocclusion and wear facets(as bruxism is frequently associated with OSA).

Diagnosis:

- Polysomnography is the gold standard for diagnosing OSA and consists of detailed overnight sleep study in a laboratory.[6] Apnea is defined as cessation of airflow, a complete obstruction for 10 seconds with a consistent 2% to 4 % drop in arterial oxygen saturation. Hypopnea is reduction in airflow for at least 30 to 50 and with a drop in oxygen saturation. The Apnea hypopnea index (AHI) is average number of apneas and hypopneas per hour of sleep. OSA severity is classified on basis of patients AHI score into mild (AHI score between 5-15), moderate (AHI score between 15-30) and severe (AHI score greater than 30).[7] Not all studies adhere to numerical parameters of this classification. Other factors that also influence the severity of OSA include de-saturation, quality of life and level of daytime sleepiness.
- The multiple sleep latency test (MSLT) is used to establish how rapidly the patients falls a sleep to distinguish it from narcolepsy.
- The Epworth sleepiness scale is a questionnaire used to screen for sleep apnea.[8]
- The Mallampati score (grade 1-4) can be used as a predictor of sleep apnea particularly in cases where an enlarged tongue seems to be the cause for airway obstruction.[9]
- Lateral cephaometric radiographs reveal the diversion of airway column, position of hyoid bone and craniofacial skeleton for any maxillo-manibular deficiencies.
- Fibro optic nasopharygoscopy to examine three-dimensional structure of the airway revealing any anatomic site of obstruction.

Management of patient with OSA

Life style modification :

- This includes positional therapy i.e placing the patient in non supine position (for example having patients sew a tennis ball into back of their pyjama tops) to prevent patients from sleeping in a supine position. In mild cases non supine position may relieve the obstruction. However, most patients with sleep disordered breathing (SDB) show apnea in all position thus this technique is only useful for simple snoring.
- Alcohol consumption should be avoided in the evening as alcohol may relax the airway making the airway more prone to obstruction at susceptible sites.
- Weight loss is recommended for all over weight patients to control sleep apnea.

Continuous Positive Airway Pressure(CPAP):

Sullivan and colleagues reported the use of nasal continuous positive airway pressure (CPAP) for treatment of OSA.[10] Nasal CPAP maintains the upper airway patency during sleep by way of a pneumatic stent. The treatment is administered via nasal or oral mask. It is most prescribed treatment for OSA for moderate to severe cases[11] and is almost always effective, but its success is limited by patient's level of compliance is poor which is estimated to be 30-40 %. The CPAP machine is large and cumbersome and its use can have irritating side effects such as nasal congestion and throat dryness.

Although CPAP is the treatment of choice in patients with moderate to severe OSA, it has poor patient compliance because of problems with portability, cost, pump noise, dryness of the airway passage, claustrophobia and nasal leaks with mask discomfort

Oral Appliance Therapy in Management of OSA :

Oral appliances find their greatest success when utilized for simple snoring, upper airway resistance syndrome and mild to moderate obstructive sleep apnea. Improvement of snoring occurs in high proportion of patient with complete resolution in smaller subset. A large literature review by Lowe showed that, as groups oral appliances were effective in mild to moderate OSA with 75 % compliance rate.[12] Oral appliance therapy has been accepted by the American Sleep Disorder Association as an appropriate treatment modality for OSA patient.

Oral appliances can lift the soft palate or advance tongue or mandible thus opening the airway. A combination of oral appliances and CPAP is also used in a few cases.

Soft palate lift appliances: Those that lift the soft palate are rarely used because of gag, discomfort and success of laser and radio frequency soft palate procedures.

Tongue Retention –Tongue Retaining Devices (TRD) have an anterior hollow bulb, which creates a negative pressure vacuum when tongue is inserted. Tongue is held forward away from post pharyngeal wall, opening the airway. This appliance simultaneously modifies the position of the mandible

Mandibular Repositioning or Advancement Devices (MRD / MAD) function by engaging one or both of dental arches to modify mandibular protrusion and improve the velopharyngeal airway patency.[13] The most common mandibular repositioning dimension quoted is 50-75 % of maximal protrusion (Approximately 5-7mm).[14] As these appliances hold the mandible in antero-inferior position, these indirectly bring the tongue forward as a consequence of muscle attachment and open up the posterior airway. The repositioning may also stretch and reduce the collapsibility of soft palate via its connection to the base of tongue and increase the superior airway space.

Although tongue repositioning devices and mandibular advancement devices have been standard appliances for treatment of OSA, a recent study be Venket R et al describes the use, four new prosthodontics appliances for managing sleep apnea namely uvula lift appliance, uvula and velopharynx lift appliances, nasopharyngeal aperture guard and soft palate lift appliance and a conventional mandibular advancement appliance. He concluded that nasopharyngeal aperture guard appliances was the best among the five type of appliances.[14] Futhur studies would be required in this direction.

Design consideration of OA : Till date, more than 40 different OAs have been patented. Design variations depend upon

- Method of retention
- Flexibility of material
- Adjustability
- Vertical opening
- Freedom of jaw movement

According to the material used these can be either polyvinyl vacuum formed thermoplastic appliances or those made of hard acrylic. According to adjustability these may be fixed or adjustable. Fixed oral appliances are usually one piece design that can be adjusted in the antero posterior plane.

One of the accepted design is one-piece non adjustable soft vinyl vacuum formed mandibluar repositioning appliance consisting of thermoplastic material covering the maxillary and mandibular arches in the desired antero inferior position. The occlusal position is established and recorded by either a wax bite, silicon bite or anterior jig with inter occlusal registration[15]. (Fig 1)

Figure 1: Mandibular Repositioning appliance non adjustable

In the two part Herbst – style appliance, the arches are connected by pivoting bars that can be altered in length to titrate the protrusive mandibular position for effectiveness and comfort. The occlusal registration for these two part appliances is not as important because mandibular reposition can be titrated from the intercuspal position. (Fig 2)[15]

Figure 2: Mandibular Repositioning Appliance, Herbst Type

TAP (Thornton Adjustable Positioner) appliance uses a hook on the maxilla to attach to the mandible in order to bring it forward.(Fig3)

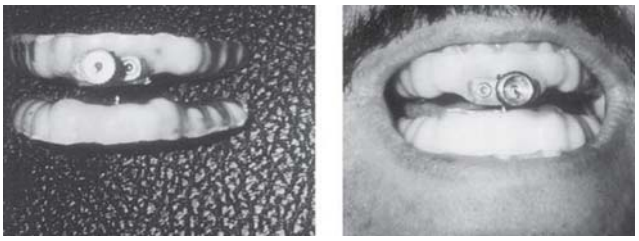

Figure 3: TAP appliance (Left) inserted into the mouth (Right).

For edentulous patients with OSA, a Tongue Stabilizing Device (TSD) can be used which does not attach to teeth and acts as a pacifier. It is made of soft silicon and holds the tongue forward by gentle suction preventing it from falling back (Fig 4). Implant retained mandibular repositioning device in the mandible is a viable treatment modality for Edentulous OSA patients[16].

Figure 4 : Tongue stabilizing device for edentulous patients

Advantages of Oral appliances : The advantages of oral appliances over other sleep apnea treatment options include relatively low cost, good success rates (efficacy comparble to uvulopalatopharyngoplasty but less efficacious than CPAP), good compliances a more benign adverse-effect profile, rapid effect and easy termination without sequalae.[17] OA insertion can be performed as a single stage procedure is an out patient setting. These can be used effectively for simple snoring and mild to moderate OSA as recommended by American Academy of Sleep Medicine,[18] but a study by Jeffery Pancer concluded that oral appliances appear to be effective treatment alternative for selected patients of snoring and varying degrees of sleep apnea including those with severe OSA.[19]

OAs improve the blood oxygen saturation levels as they relieve the apnea in 20 -75 % of patients. They reduce the AHI to < 10 events per hr or bring about 50 % reductions in AHI. They also reduce AHI to normal in 50-60 % of the patients.

A recent study by Kazvya Yoshida[20] reported that appliance therapy in selected population resulted in a significant fall of about 3.7mmHg in mean arterial pressure. The blood pressure response was significantly associated with AHI reduction thus proving efficacy of oral appliance therapy. The reduction in blood pressure in turn would reduce the risk of coronary heart disease and stroke.

Side effects with oral appliances are generally minor and include excessive salivation, muscle and tooth discomfort and occasionally temporomandibluar joint discomfort. But symptoms usually improve over time.[21]

SURGERY AS TREATMENT OPTION : Surgery should be considered as last treatment of option of OSA. A widely accepted procedure to treat snoring and sleep apnea is uvulopalato pharyngo plasty (UPPP)[21] which has a success in less than half of all cases. Repositioning of hyoid bone is another treatment modality. Maxillo Mandibular Advancement (MMA) surgery is another effective surgical procedure. Nasal surgery such as turbinectomy and septoplasty may reduce AHI but normally nasal surgery is used in combination with other surgical procedures.

Pillar palatal implant system is a newer treatment option. This system involves the placement of three mesh polyethylene tetraphthalate implants within the soft palate muscles under local anaesthesia. These permanent implants improve snoring by stiffening the palate and decreasing its vibratory movement during inspiration.[23]

DISCUSSION AND CONCULSION:

The recognition and treatment of snoring and obstructive sleep apnea are two medical areas where dentistry can play a valuable role. Due to relative lack of public and professional attention given to sleep apnea, it is important that when indicated the patients be asked about snoring, daytime sleepiness and other signs and symptoms of OSA. Oral appliance therapy has been accepted as an appropriate treatment modality for some patients by American Sleep Disorders Association. However it is necessary that a dentist works as a part of the treatment team which includes a physician and a sleep specialist and not assume responsibility for diagnosis and treatment himself.

Considering that obstructive sleep apnea greatly increases patients chances of heart attack, stroke and early death, dentist might be in a critical position to screen patients, refer patients and treat patients and assume a primary role in saving lives.

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