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RESEARCH ARTICLE

OBSTRUCTIVE SLEEP APNEA – A LITERATURE REVIEW

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ABSTRACT

Obstructive sleep apnea (OSA) is a common sleep related breathing disorder. Etiology of OSA is multifactorial with various risk predisposing factors like obesity, family history, and craniofacial abnormalities. OSA is usually present with long standing history of snoring and excessive daytime sleepiness along with accompanying obesity. The diagnosis is established with Polysomnography (PSG), which is considered the gold standard for diagnosing OSA. Several treatment modalities are available presently, of which the most successful is the application of continuous positive airway pressure (CPAP) during sleep. Oral appliance therapy is also gaining popularity in the management of OSA.

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INTRODUCTION

Obstructive sleep apnea (OSA) is a sleep related breathing disorder characterized by repetitive episodes of upper airway obstruction, usually associated with a decrease in the blood oxygen saturation, loud snoring, breathing interruptions and arousal from sleep due to gasping or choking (Epstein, 2009). The early epidemiologic studies of OSA included only men and, thus, reported higher prevalence in male population. However, recent studies have reported a male-to-female prevalence ratio of about 2:1 to 3:1 (Young, 2002). Three different types of apneas have been distinguished. Central sleep apnea,in which cessation of breathing is due to disturbance in ventilatory control at the level of the central nervous system; and there is no effort to breathe when asleep. Secondly, obstructive sleep apnea in which the respiratory control is normal, but there is physical interruption of the flow of air due to obstruction, usually at the levelof the pharynx, which requires vigorous effort to breathe on the part of patient. It isby far the most commonly reported sleep apneas. Lastly, mixed sleep apnea which is a combination of both components. Apneas are defined as complete cessation of oronasal flow that lasts more than10 seconds. In addition to apnoeas, there may be episodes of marked reduction (up to 50%) in tidal volume, without complete cessation of respiratory flow. Such eventsare termed 'hypopnoea'. The total number of apnoeas and hypopnoea per hour of sleep is called the 'apnoea / hypopnea index' (AHI) (Stradling, 2004). A respiratory effort related arousal event (RERA) is a sequence of breaths characterised by increasing effort leading to an arousal from sleep but at the same time does not fulfil criteria for apneaor hypopnea.

Respiratory Distress Index (RDI) is a parameter that includes apnea, hypopnea along with RERAs. Normal individuals generally have AHI of less than 5. Mild Sleep Apnea, AHI: 5-15 events per hour Moderate Sleep Apnea, AHI: 15-30 event per hour Severe Sleep Apnea, AHI: greater than 30 events per hour Continuous positive airway pressure (CPAP) therapy to prevent upper airwaycollapse during sleep has been considered the gold standard treatment for OSA over the years. However, adherence to CPAP is often poor, thereby limiting its efficacy.Other treatment options include various oral appliances (OA), surgeries and/or and behavioral modifications such as weight loss, changes in sleeping position, and alcohol avoidance (Lettieri, 2009). The development of oral appliances (OA) represents an interesting new approach for the management of OSA.

Diagnostic criteria for Obstructive sleep apnea

Excessive Daytime sleepiness

Two or more of the following that are not explained by other factors:

- Choking or gasping during sleep;
- Recurrent awakenings from sleep;
- Un-refreshing sleep;
- Daytime fatigue;
- Impaired concentration;

Overnight monitoring demonstrate 5 to 10 or more obstructive breathing events per hour during sleep or greater than 30 events per 6 hours of sleep. These events may include any combination of obstructive apnoea , hypopnea or respiratory effort related arousals (RERAs). The patient must fulfil criteria 1 or 2, plus criteria 3 to be diagnosed with OSAS (Hoffestein, 1993).

Clinical features:

SYMPTOMS: Snoring: It is one of the chief complaints of the patients diagnosed with sleep apnea (Duran, 2001). Most patients with OSA are reported to be heavy snorers. Patient maybe unaware that he or she is a heavy snorer. So on taking a history of snoring, bed partners are the crucial informants of nocturnal events. Bed partners or family members of patients with OSA typically describe a sequence of events that begins with the onset of quiet sleep, then transforms to progressively louder snoring, followed by a period of cessation of snoring when the patient becomes restless, makes gasping movements. The silent period is finally terminated by a characteristic loud snort, and the same sequence of events starts again. Excessive daytime sleepiness: It is a chief clinical consequence among patient with sleep apneas (Whyte, 1989). Patients with OSA fall asleep easily under the most inappropriate circumstances: for example, while talking, eating, driving short distances, etc. In general, daytime sleepiness directly relates to the severity of sleep apnoea. A standard diagnostic tool, Epworth Sleepiness Scale, is a useful tool to assess the degree of self-rated sleepiness, wherein a value above 10 is considered abnormal. Morning symptoms: Tiredness and fatigue in the morning, and lack of refreshing sleep are other associated symptoms. Rarely, patient may also complain of morning headache or nausea. Restless sleep: Agitation, restlessness, and abnormal body movements are common during episodes of obstructive apnea. Other symptoms: Other less common symptoms include intellectual deterioration, depression, impotence, sleep walking, sexual dysfunction and enuresis.

SIGNS: Over weight: Weighing more than 120% of the predicted normal, or having a body-mass index greater than 25 kg/m^2. It is one of the most common physical sign of OSA (Peppard, 2000). Neck circumference greater than 40 cm predicts OSA with a sensitivity of 61%. Overt anatomical abnormalities like enlarged adenoids, deviated nasal septum, nasal valve obstruction, tonsilar hypertrophy, macroglossia, and retro- or micrognathia, that leads to narrowing of the nasal or pharyngeal airway are rare, but should be looked for during physical examination. Systemic hypertension and other associated systemic diseases may sometimes be present.

Diagnosis: The diagnosis of OSA syndrome typically is formed by a comprehensive sleep history, presence of characteristic clinical features, together with the objective demonstration of SDB (9. American Academy of Sleep Medicine Task Force, 1999). Screening for OSA can easily be introduced in the dental practice setup. Based on medical history alone, high-risk patients for OSA can be identified. Self-reported questionnaires like Berlin Questionnaire (Yang, 2000) and the Epworth Sleepiness Score given to patients at examination appointments offer incorporation into the routine systemic health evaluation. Emerging questionnaires like the STOP-Bang questionnaire may provide greater clinical utility for identifying the probability of apneas (Chung, 2012). The diagnosis of OSA also requires objective testing and demonstration of abnormal respiratory events with polysomnography (PSG) or home apnea testing. Polysomnography, also called a sleep study, is a test used to diagnose sleep disorders. It is considered the gold-standard method to diagnose OSA. It is usually done at a sleep disorder unit within a hospital or at a sleep center. PSG monitors sleep stages and cycles to identify if or when the sleep patterns are disrupted. Various parameters electroencephalogram, electrooculogram, electromyogram, respiratory airflow, respiratory effort and oxygen saturation are evaluated continuously throughout the sleep duration.[12] It is a noninvasive, painless test. The most common side effect is skin irritation caused by the adhesive used to attach test sensors to theskin. Home portable monitoring is a potential alternative for the diagnosis of OSA.

It is less costly and more convenient for the patient. But the disadvantage of thistechnique is that the absence of direct supervision by a sleep technician increases thelikelihood of data loss or obtaining poor quality or uninterruptable sleep studies.

Treatment options for OSA: OSA is considered as a chronic disease requiring long-term, multidisciplinarymanagement.

Options for Treatment:

- Positive airway pressure (PAP)
- Upper airway surgical procedures
- Pharmacologic treatment
- Oral appliances
- Behavioral modification: weight loss, alcohol avoidance, alteration of sleepingposition.

Continuous positive airway pressure (CPAP) was introduced by Sullivan and was considered as the most important advances in the medical treatment of OSA (Hirshkowitz, 2005). CPAP can be applied through nasal mask, nasal inserts, or a full face mask (in patients who breathe through their mouth during sleep) (Douglas, 1998). CPAP is a non-invasive procedure and decreases the number of apneic and hypoxic episodes during sleep. CPAP treatment has no major side-effects other than occasional conjunctival irritation, resulting from air leaks around the mask, and some irritation of the nasal mucosa, due to the flow of dry air (Wright, 1997). Surgical treatment of obstructive sleep apnea is carried out primarily for the correction of anatomical deformities which obstruct the upper airway, such as deviated nasal septum, obstruction of the nasal valve, or enlarged adenoids or tonsils (Li, 2005). Various surgerical options that can be offered to patients with OSA include nasal surgeries (septoplasty, sinus surgery and others), tonsillectomy with/without adenoidectomy, uvulopalatopharyngoplasty (UPPP), laser assisted uvuloplasty (LAUP), radiofrequency volumetric tissue reduction, sliding genioplasty and maxillo-mandibular advancement osteotomy. Oral appliance therapy has emerged as an alternative to CPAP for snoring, and mild to moderate OSA in patients who refuse or fail to adhere to the use of the CPAP device (Ferguson, 1996). Although mandibular repositioning appliances (MRAs) seem to be less effective than CPAP, patients usually prefer oral appliances over CPAP in instances where both treatments are effective.

Rationale for oral appliance therapy: Rationale for OA therapy is to advance the mandible and tongue to positively impact upper airway caliber and function. The upper airway behind the base of the tongue and the soft palate is vulnerable due to a lack of rigid skeletal support. By decreasing upper airway collapsibility and improving upper airway muscle tone OAs may improve upper airway patency during sleep by decreasing the upper airway collapsibility and improving the muscle tone of the upper airway (Ferguson, 2003).

Mechanism of action: Oral appliances aids in the treatment of OSA by increasing upper airway dimension, augmenting the activity of pharyngeal muscles, or a combination of both. Most oral appliances act by advancing the mandible or tongue forwards or downwards. This maybe accomplished with the use of a suction bulb that retains the tongue forward (e.g.; Tongue retaining device) or by a variety of mechanisms that lock protruded mandible to maxilla (E.g Herbst Appliance) Some appliances also work by lifting the soft palate backwards (E.g Soft palatal lifter) (Ayas and Epstein, 1998).

Types of oral appliances: There are two main appliance groups: tongue repositioning devices and mandibularrepositioning appliances, or MRAs. Mandibular Repositioning appliances are made primarily of clear acrylic and are snapped onto the teeth. The acrylic appliance pieces are connected with adjustable rods and screws or with plastic extension arms. Most appliances allow for mouth opening and lateral movement of the mandible. Initially the oral appliance is adjusted to 75 percent of the protrusive range of the mandible. Several fine adjustments may be necessary to optimize the advancement and to reduce the discomfort.

MRAs advance the mandible in relation to the maxilla, creating more space behind the tongue and stabilizing the pharyngeal lumen during sleep. MRAs are subdivided into titratable (2-piece appliance), nontitratable (1-piece appliance), custom-made appliances and pre-fabricated appliances.

Requirements of a mandibular repositioning appliance (Barewal, 2014):

- Good retention form to 1 or 2 arches
- Sufficient protrusion of the mandible at an increased vertical dimension
- Appliances that do not restrict jaw movement laterally or vertically are optimal for temporomandibular joint (TMJ) comfort.

The Tongue retaining device is an excellent device for edentulous patients or those who suffer from TMJ sensitivity. TRD works on vacuum that retains tongue protruded. It is a one-piece device and is made of non-rigid vinyl material without thermoplastic material to adapt to the teeth.

CONCLUSION

The field of sleep medicine is a relatively new arena that has undergone numerous changes in few recent years. There have been a number of significant advances as far as the diagnosis, consequences and management of sleep apnea is concerned. Despite of improvement in infrastructure to diagnose OSA, as it comes to the management part, a treatment modality that can assure compliance along with cure is still lacking. So, high quality research and practice will be required for understanding and treatment of patients with OSA.

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