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Obstructive Sleep Apnea and Role of Orthodontist- A Review

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ABSTRACT: Obstructive sleep apnea (OSA) is a common sleep disorder characterized by episodes of complete or partial upper airway obstruction affecting the sleep quality as well health of an individual. Orthodontist plays a significant role in treatment as well as diagnosing a potential OSA patient.

KEYWORDS: Obstructive sleep apnea, orthodontist, oral appliance

I. INTRODUCTION

Sleep-related breathing disorders (SRBDs) constitute a spectrum of disease that constitute obstructive phenomena, including snoring, upper airway resistance syndrome, and obstructive sleep apnea, along with the related entities of central sleep apnea and sleep-related hypoventilation. Obstructive sleep apnea refers to occurrence of at least 5 apneas or hypopnea per sleep hour resulting in sleep fragmentation and decrease oxygen saturation[1].

Sleep disorders, particularly untreated OSA has been linked to deteriorate systemic health and known as a risk and possible causative factor in developing of systemic hypertension, depression, stroke, angina and cardiac dysrhythmias[2].

Although OSA can be definitively diagnosed only by a physician, the orthodontist may be called on to screen for OSA, contribute to the identification of underlying dentofacial components, and assist the physician in managing the disease. This review focuses on the role of orthodontist in the management of obstructive sleep apnea.

ETIOLOGY

Obstructive sleep apnea usually occurs when there is increased collapsibility of the upper airway. In order to maintain airflow the respiratory effort increases, along with relative increase in serum carbon dioxide (hypercarbia) and decrease in serum oxygen (hypoxemia). This causes arousal from sleep, leading to increased heart rate and blood pressure and a tendency for cardiac arrhythmia[3].

Table 1: Predisposing factors[4-6]
1. Increasing age causes loss of muscle mass and replacement with fat, leaving the airway narrow and soft.
2. Men have a greater risk for OSA.
3. Craniofacial features- Retropositioned maxilla and mandible, dolichocephalic facial type, narrow deep palate, midface deficiency, lower hyoid position.
4. Obesity
5. Habitual snoring
6. Familial history.
7. Individuals with Gastro esophageal reflux disease
8. Enlarged tonsils and adenoids
9. Drugs - alcohol, sedative drugs (e.g. benzodiazepines - valium, ativan), sleeping pills , anaesthetics, narcotics (codeine, morphine)
10. Smoking, which can cause swelling of the upper airway
11. Hypothyroidism, acromegaly, amyloidosis, vocal cord paralysis, Marfan's syndrome, and Down syndrome
12. Nasal congestion
13. Neuromuscular disorders

PREVALENCE

It affects 2-4% of middle aged; men are twice likely as women to have OSA. Among habitual snores between 30 and 60 years, approximately 25% of men and 10% of women have OSA.

Prevalence of pediatric OSA is 1-3% affecting children at around 2-6 years of age with no gender predilection[7].

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Table 2: SYMPTOMS OF OSA[8-10]
• Snoring, gasping respiration, witnessed pauses in breathing during sleep.
• Frequent nocturnal awakening
• Nonrestorative sleep
• Morning headaches
• Excessive day time sleepiness
• Difficulty with attention and concentration
• Mood disturbances
• Difficulty in controlling other medical co morbidities such as diabetes mellitus, hypertension, and obesity.

DIAGNOSIS:

1. Methods based on clinical data

- History: snoring or witnessed apneas
- Examination: hypertension, body mass index, neck circumference, pharyngeal volume. The presence of obesity (defined as a body mass index greater than 28 kg/m^2) and neck diameter greater than 16 inches is frequently a common feature.
- Oral examination-The upper airway should be evaluated in all patients, particularly in non obese adults with symptoms consistent with OSA.
- Malampati score is used to evaluate OSA. Scores of 3 and 4 poses increased risk of sleep apnea[10, 11].

2. Methods based on physiologic testing

- Polysomnography
- Partial-time Polysomnography
- Split-night studies
- Day nap studies
- Partial-channel Polysomnography
- Cardio respiratory sleep study
- Respiratory sleep study
- Oximetry

Polysomnography (PSG) – Gold standard test for confirmation of OSA (an in-centre sleep study). It records sleep staging which includes electroenc ephalography (EEG), electro-oculography (EOG), and electromyography (EMG). The total number of respiratory events in an hour is expressed as the apnea-hypopnea index (AHI); AHI is derived from the sum of apneas and hypopneas in an hour of sleep[11].

TREATMENT

The management of the patient's obstructive sleep apnea is based on the diagnosis, along with consultation and the recommendations of the treating physician, and on the desires of the patient. Adjunctive measures that may be undertaken include weight loss, nutritional counseling, exercise, the use of a special cervical pillow, smoking cessation, alcohol counseling, or the alteration of the patient's sleep position[12].

In most instances the orthodontist involved in the management of the sleep-disordered patient focuses on the management of a breathing-related disorder. The use of an appliance to advance the mandible or some form of a surgical procedure comprises the most significant component of the treatment.

Steps in treatment plan[13]

1. Behavior modifications
2. Continuous Positive airway pressure therapy (CPAP)
3. Oral Appliances
4. Surgical treatment

Behavioral management includes (eliminating risk factors):

- Reducing obesity
- Limiting alcohol consumption
- Smoking cessation
- Central nervous system depressant drugs must be avoided as this decreases the airway dilator function.
- Positional therapy- change in body position during sleep

TREATMENT OF OSA IN CHILDREN:

INTRAORAL APPLIANCES

➢ Treatment involving the maxilla

These appliances aims at increasing the transverse width of maxilla thereby enlarge the palatal and retropalatal area. Rapid maxillary expansion (RME) or slow maxillary expansion (SME) along with maxillary protraction is used for this purpose. Anteroposter and transverse enlargement of the dental arches increases the intraoral space for accommodating the sublingual tissues and tongue by removing the constraints of narrow maxillary and mandibular arches. In growing individuals RME plays a favorable orthopedic role by modifying the facial bony structures and conditions further development positively [14].

➢ Treatment by stimulating maxillary and mandibular growth

The correction of anteroposterior maxillomandibular deficiencies in children may improve OSA. Forward positioning of mandible

with functional appliances enlarges the upper airway, improves respiratory function and reduces AHI in more than 60% of patients.

E.g.: Mandibular advancement splint-made of polyvinyl acetate polyethylene with an interarch relationship which was approximately 10mm open and at 75% of maximal protrusion[15].

- Tongue-retaining device (TRD)

A device was designed by Cartwright and Samelson in 1982 to overcome airway obstruction by keeping tongue in an advanced position. TRD secure the tongue in forward position by means of negative pressure in the anterior part of the device. These devices also modify the mandibular posture, resulting in downward rotation[16, 17]

- Oral pressure appliance

Combination of oral appliance and CPAP therapy, this helps in reducing pressure requirements and preventing issues of mouth opening, leaks and chin retrusion which results from different CPAP masks[18].

TREATMENT OF OSA IN ADULTS

Interdisciplinary team management of the patient with OSA involving different specialists and coordination of treatment is essential. This includes behavioral management as well as medical management.

Medical management

- Non-surgical approach
- Surgical approach

- Non surgical approach

Continuous positive airway pressure (CPAP)

CPAP is the "gold standard" treatment for OSA. CPAP is able to abolish obstructive respiratory events, reduce excessive daytime sleepiness, improve cognitive function and quality of life, and reduce arterial blood pressure in those with hypertension[13].

- Surgical approach

Maxillomandibular advancement (MMA) is the most effective and definitive surgical procedure in treating patients with moderate to severe OSA. Advancement of maxillofacial skeletal structures increases the oropharyngeal airway. Schendel et al indicated that MMA resulted in an increase in the oropharyngeal airway and is also an effective treatment option with a high degree of success for patients with OSA who cannot tolerate CPAP[19].

Side effects of oral appliances

Minor side effects from oral appliances used for treatment of snoring and sleep apnea are common.

Side effects include [20, 21]

- Sore teeth, sore jaw muscles, and excessive salivation
- Reduction in overjet
- Increased facial height
- Increased mouth opening
- Change in incisor inclination

II. CONCLUSION

Obstructive sleep apnea is sleep related breathing disorder having serious implication on health if untreated. As a part of the multidisciplinary approach to diagnosing and treatment planning of OSA, orthodontist plays an important role in the management of OSA by planning appropriate oral appliance or orthognathic surgery.

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