

REVIEW ARTICLE

Orthodontic view in the Diagnoses and Management of Obstructive Sleep Apnea - A Review

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ABSTRACT

Obstructive sleep apnea (OSA) is a sleep-associated disorder of breathing with a reduction or complete airflow obstruction. Orthodontics is well trained for treatment of OSA patients due to their expertise and knowledge regarding growth and development of oro-facial and dento-facial structures as well as orthopedic, orthodontic and surgical correction of the jaws and other supporting tissues. The present review article highlights diagnoses and management of obstructive sleep apnea with orthodontic appliances.

Key words: Obstructive sleep apnea, Orthodontics, Breathing.

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INTRODUCTION

Sleep apnea is defined as an intermittent cessation of airflow at the nose and mouth during sleep. By convention, apneas of at least 10 seconds duration have been considered important, but in most patients, they are 15–20 s in length and may last as long as 1–3 min. It can be classified as follows- Central sleep apnea – Nerve impulse to all respiratory muscles is absent. Obstructive sleep apnea (OSA) – occlusion of oropharyngeal airway is seen. OSA affects 2–4% of middle-aged adults. Mixed apnea – Central apnea followed by obstructive component.¹

Obstructive sleep apnea (OSA) is a sleep-associated disorder of breathing with a reduction or complete airflow obstruction despite an ongoing effort by patient for breathing. It usually occurs during sleep, muscles undergoes relaxation and causes collapse of the soft tissues present in the back of the throat which leads to upper airway blockage.²

Prevalence

OSA can occur in any age group, but prevalence increases between middle and older age. OSA with resulting daytime sleepiness occurs in at least 4% of men and 2% of women. About 24% of men and 9% of women have the breathing symptoms of OSA with or without daytime sleepiness. About 80% to 90% of adults with OSA remain undiagnosed. OSA occurs in about 2% of children and is most common at preschool ages.³

Pathophysiology

It has been considered that individuals with OSA have impairment in function of genioglossus muscle, which is a muscle of tongue. This causes the prolapse of the tongue against the posterior pharyngeal wall when there is inspiratory effort during sleep. Pharyngeal wall invaginates and airway occludes during sleep. Obstruction in nasal air flow increases air flow resistance, which in turn increases effort for inspiration and increases negative pressure in the pharyngeal wall

airway. This suction increases the chances of pharyngeal airway collapse.⁴

Predisposing factors of OSAHS⁵

S. No	Predisposing factors
1	Obesity
2	Increasing age
3	Presence of structural abnormalities that causes upper airway obstruction
4	Male gender
5	Sedatives
6	Smoking and alcohol consumption
7	Adenoids
8	Retrognathic mandible
9	Enlarged tongue
10	Enlarged tonsils
11	Micrognathia

Pathogenesis of Obstructive Sleep Apnea

The definitive event in OSA is occlusion of the upper airway space, usually at the level of the oropharynx. The resulting apnea leads to progressive asphyxia until there is a brief arousal from sleep, whereupon airway patency is restored and airflow resumes. The patient then returns to normal sleep, and this cycle of events is repeated. The immediate factor leading to collapse of the upper airway in OSA is the production of critical sub-atmospheric pressure during inspiration that exceeds the potential of the airway dilator and abductor muscles to maintain airway stability.⁶

Obesity frequently contributes to the reduction in the size of upper airway, either by increasing fat deposition in the soft tissues around the pharyngeal airway or by compressing the pharynx by superficial fat masses in the neck. Snoring, a high-frequency vibration of the palatal and pharyngeal soft tissues that results from the decrease in size of the upper airway lumen, may aggravate the narrowing by producing edema of the soft tissues.⁷

Symptoms of OSAHS⁸

S. No	Predisposing factors
1	Snoring
2	Neck hyper extension
3	Mouth breathing, due to dryness in mouth
4	Growth failure restriction
5	Chronic nasal congestion
6	Bruxism (nocturnal tooth grinding)
7	Walking during sleep
8	Obesity
9	Fatigue
10	Mouth breathing, due to dryness in mouth
11	Mood changes; irritability, frustration, impatience,

	depression, anxiety
12	Aggression and hyperactivity
13	Poor concentration, and distraction
14	Poor school performance
15	Infraorbital venous congestion
16	Restless sleep and increased body movements
17	Apneic pauses i.e., choking, gasping, snoring during the night
18	Nocturnal and daytime enuresis

Objective assessment of sleepiness

The Multiple Sleep Latency Test (MSLT) is used to measure the time to fall asleep (using EEG criteria). This is performed in a dark room on at least four separate occasions across the day. This period of time is called as sleep latency.⁹

Physical examination¹⁰

- Weight and height are noted at the first clinic visit. Changes in height and weight are observed at all subsequent visits as approx 50% of patients with OSAHS are obese (BMI >30 kg/m²).
- Circumference of neck are measured as patients with OSAHS often have increased neck circumference >17 (43 cm).
- Visually inspect for retrognathic mandible.
- Assess patency of nasal airway.
- Upper airway obstruction is assessed using indirect laryngoscopy if possible.
- Inspect the tongue for macroglossia.
- Assess dentition for the presence or absence of teeth.
- Assess pharynx for size of tonsil, appearance of uvula and size of lumen.
- Measure blood pressure.
- Perform respiratory, cardiovascular and neurological examination for detection of any disease such as cor pulmonale, deformity in chest wall and myopathies.
- Observe the possibility of hypothyroidism, acromegaly and thyroid function tests should be indicated.

Diagnosis

The diagnosis is made by the following ways:

- Sleep history
- Epworth sleepiness scale questionnaire
- Apnea hypopnea index (AHI)
- Polysomnography (PSG).

Polysomnography records patterns of sleeping and breathing together. PSG is performed overnight at a sleep centre with the help of a technician and a standard PSG typically consists of EEG, electromyogram, electro-oculogram, respiratory airflow, thoraco-

abdominal movement and oxygen saturation tracings (oximetry).¹¹

Polysomnography requires about 30-60 min set up time before sleep and about 30 minutes detachment time in the morning. Staff should be present for at least ten hours overnight to perform and monitor this test.

Oximetry

Cheap recording pulse oximeters are readily available; therefore oximetry is used as the first screening tool for OSAHS. These are spectrophometric devices that are used for the detection and calculation of the differential absorption of light by presence of oxygenated and deoxygenated hemoglobin in blood. This is a method for detection of the blood oxygen saturation.

Epworth sleepiness scale¹²

S. No	Types of Sleepiness ESS Score	ESS score
1	Normal range	ESS <11
2	mild subjective daytime sleepiness	ESS =11
3	moderate subjective daytime sleepiness	ESS =16
4	Severe subjective daytime sleepiness	ESS >18

Treatment of Obstructive Sleep APNEA

Treatment options can be broadly divided into

1. Behavioral interventions
2. Non-surgical options
3. Surgical options

Behavioral interventions

Since patients with obstructive sleep apnea are obese, therefore patients should be advised to undergo weight reduction therapy as it improves symptoms of OSAHS and other related disorders. Smokers should be advised to stop smoking for general health.¹³

Non-surgical interventions

Continuous positive airway pressure (CPAP): CPAP is the treatment option for moderate to severe cases of OSA. A continuous positive airway pressure machine is a new device with a mask that fits snugly over the nose of patient. It transmits a continuous flow of air and keeps the throat open throughout the night.

Oral appliance therapy

Orthodontic appliances should be fabricated in a way that it can be worn by the patient either in a permanent or removable manner depending upon the condition of the patient. These appliances bring the mandible and tongue forward, opens up the lower pharynx and allows continuous breathing during sleep.

Examples are tongue retaining devices (TRD) and mandibular advancement appliances (MAA).¹⁴

Mandibular Advancement Appliances

The ideal properties of removable appliances include simplicity of delivery, low bulk, lip seal maintenance, sufficient tongue space, non-interference with sleep, low cost, and lateral freedom. The patients selected for these types of appliances need to have certain features for the appliance to exhibit the best possible results. These include reduced lower anterior facial proportions, normal relation between maxilla and mandible, high position of hyoid, normal soft palate area and tongue proportion, and relatively normal postpalatal and postlingual airway. Advancement appliances are manufactured in different materials and sold under different trade names. Their main purpose is to place the mandible in a forward position so that the size of the airway passage is increased.

Advantage of Oral appliances

- Reduction in the snoring and
- High compliance level as compared to CPAP
- Significant reduction in breathing pauses
- Improvement of airflow for some patient with apnea

Disadvantages of oral appliances

Reciprocal forces are generated on the teeth and jaw by mandibular advancement splints which results in dry mouth, gum soreness, salivation, tooth pain, headaches, and TMJ problems.

Surgical interventions¹⁵

Surgery is considered when noninvasive therapy such as CPAP and oral appliances has been not successful. It is done in a situation when there is any deformity in anatomic structure that can be later on corrected to eliminate the breathing problems. It addresses the problem by reduction of tissue from the soft palate, uvula, tonsils, adenoids or tongue.

Adenotonsillectomy

It is the surgical removal of the tonsils and adenoids and it is the most common treatment option for children with OSA.

Uvulopalatopharyngoplasty (UPPP)

It is the reconstruction of the throat by resection of posterior margins of the soft palate and unwanted mucosa present on the pharyngeal walls.

Tracheostomy

Tracheostomy was the first surgical treatment for OSAHS and bypasses the obstruction completely.

Conclusion

The effects of untreated sleep apnea on daily activities are multiple and Orthodontists should play an active role in screening of patients for this disease and advise oral appliance therapy, if required.

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