Research Article

Obstructive Sleep Apnea – Do Orthodontist Have A Role?

Gejo Johns

Department of Orthodontics, Annoor Dental College and Hospital, Ernakulam, Kerala, India

ABSTRACT

Obstructive sleep apnea is one of the common sleep-related breathing disorders with several disorders associated along with it constitute along with obstructive phenomena's, which includes primarily snoring, and upper airway resistance syndrome, which profoundly affects the health and the quality of life of an individual who suffer from it, along with the related entities of hypoventilation and central sleep apnea. Like other professional health-care people, orthodontist has a major role in diagnosis and treatment planning of obstructive apnea (OSA), due to his/her knowledge related to orofacial and dentofacial structures. This article gives a brief outlook about essential role of orthodontists in the treatment of OSA.

Key words: Sleep-related breathing, obstructive apnea, continuous positive airway pressure, mandibular advancement devices

INTRODUCTION

Apnea can be defined as the cessation of airflow for at least 10 s by the American Academy of Sleep Medicine. Obstructive sleep apnea (OSA) is a condition characterized by the excessive daytime sleepiness, with complete (apnea) obstruction or reduction (hypopnea) of the upper airway during sleep with repeated episodes, often resulting in an arterial oxygen desaturation. It usually when the patient falls into sleep during this time the muscles undergo relaxation and results in collapse of the soft tissues that are present in the back of the throat leads to upper airway blockage [Figure 1]. When the air flow is completely interrupted for a period of 10 s or more called as Apnea. When there is a reduction of breathing capacity by at least 50%. Called as Hypopnea. Although OSA was generally diagnosed by a physician, the orthodontist also plays a major role in screening for OSA.[1] OSA is associated with symptoms and comorbidities which includes snoring, obesity, hypertension, type 2 diabetes mellitus, exacerbation of chronic obstructive pulmonary disease, reduced quality of life, and increased risk of industrial and traffic accidents. It is also a risk factor for ischemic stroke and cardiovascular disease. The neurocognitive problems associated with OSA include reduced performance in neuropsychological test, slower reaction times, reduced creativity, and executive function.

The prevalence of OSA is estimated to be 24% in males and 9% in females aged 30–60 years.[2] OSA affects people of all ages, most prevalent among middle-aged and elderly individual. During sleep study, monitoring the apnea-hypopnea index (AHI) is the key measure to define the severity of OSA, based on the AHI, the severity can be classified as mild (AHI or RDI ≥5 and <15), moderate (AHI or RDI ≥15 and <30), and severe (AHI or RDI ≥30). Apnea can be obstructive or central based on the presence or absence of thoracoabdominal efforts.[3] The risk factors that are associated with the development of OSA include obesity, body mass index (>30 kg/m^2), menopause, and increasing age. Craniofacial morphologies that can be predisposing to OSA include anterior open bite, midface deficiency, retrognathia, long and narrow faces, narrow and deep palate, dolichocephalic facial type, steep mandibular plane angle, and lower hyoid position.[1] Various studies pointed out that there is a relationship between OSA and

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Address for Correspondence:
Dr. Gejo Johns, Department of Orthodontics, Annoor Dental College and Hospital, Ernakulam, Kerala, India.
Mobile +91-9945608547. E-mail: gejoissacjohns@gmail.com

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increased mortality. Due to this, OSA is considered as one of the major public health issues which impose greater economic burden, which requires early recognition and treatment.

SYMPTOMS ASSOCIATED WITH OSA

Patients with OSA have a long history of snoring during sleep gasping respiration or choking, witnessed pauses in breathing (apneas), nocturnal awakenings, morning headaches, non-restorative sleep, and excessive daytime sleepiness. They also face difficulty with concentration and attention, mood disturbance, and difficulty in controlling other medical comorbidities such as hypertension, obesity, and diabetes mellitus.[1]

PATHOPHYSIOLOGY OF OSA

Pathophysiology of OSA is complex. When the patients fall asleep, the upper pharyngeal airway muscle tone get reduced leading to substantial upper airway narrowing. This results in increased inspiratory effort as an attempt to overcome the airway narrowing which then further leads to transient arousal from deep sleep to lighter sleep or a wakefulness which will allow restoring the normal airway tonicity of muscle once the normal muscle tone is attained the patient then falls deeper sleep again the cycle get repeated that leads to reduction in quality of sleep [Figure 2].

ROLE OF ORTHODONTICS IN DIAGNOSIS OF OSA

Orthodontists diagnose OSA based on the signs and symptoms of OSA. Orthodontists should include an assessment of a patient's weight, height, and neck size to screen adult patients for OSA. The following questions should be asked

a) Do the patient have excessive day time sleep
b) Does he face sleepy during driving?
c) Does he face habitual or loud snoring?
d) Do you fall asleep regularly against will?

Diagnosis of OSA is performed with the use of gold standard overnight sleep study with the help of polysomnography (PSG). PSG includes seven channels of recording which includes monitoring of sleep, airflow through the nose and mouth, electroencephalography, electrocardiography, respiratory effort, pulse oximetry, and leg movement.

Clinical examination is an important part for the diagnosis of OSA which includes the following steps: (a) Ask the patient to take a seated or supine position. (b) Patient is asked to protrude their tongue forwards as far he/she can without emitting a sound. (c) The examiner should examine the relationship between the soft-tissue structures, palate, and tongue base to determine the Mallampati scale [Figure 3].

- Class I: Soft palate, uvula, fauces, pillars are visible.
- Class II: Soft palate, major part of uvula, fauces is visible.

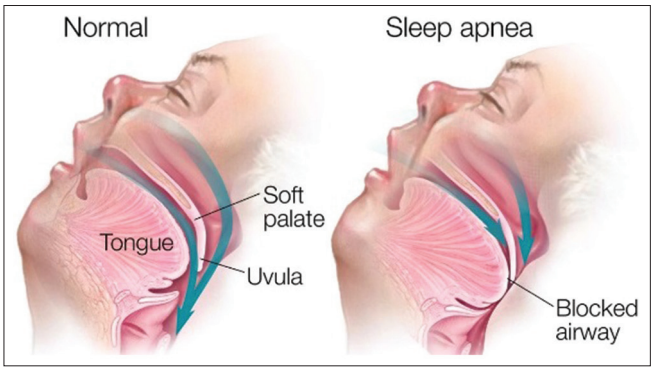

Figure 1: Obstructive airway seen in OSA

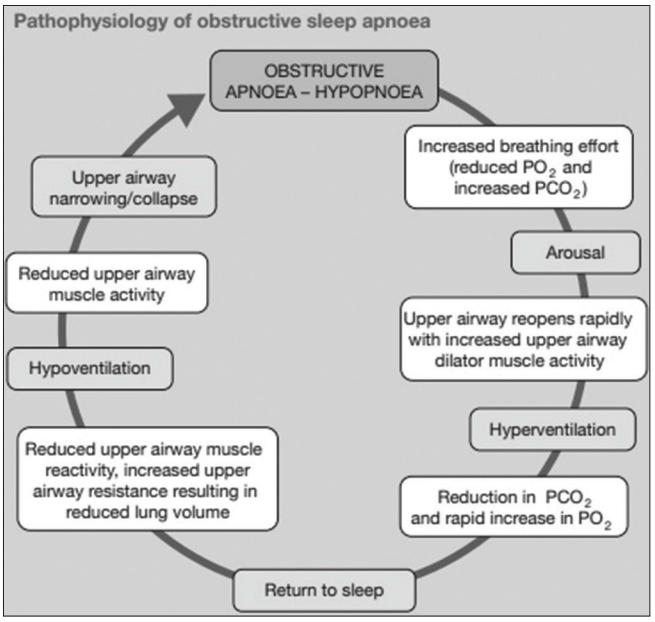

Figure 2: Flow chart of pathophysiology of OSA

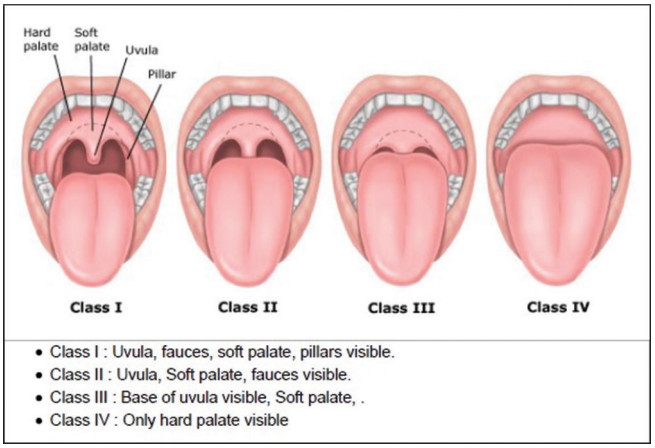

Figure 3: Mallampati scale

- Class III: Soft palate, base of uvula is visible.
- Class IV: Only hard palate is visible

This clinical assessment framework helps the orthodontists to identify the patients who are at the risk for upper airway obstruction during sleeping. Epworth Sleepiness Scale helps the patient to self-rate their level of sleepiness based on eight different sedentary situations.[4,5] The ESS scale is as follows:

- Normal range ESS <11
- Mild subjective daytime sleepiness ESS = 11
- Moderate subjective daytime sleepiness ESS = 16
- Severe subjective daytime sleepiness ESS >18

Based on the International Classification of Sleep Disorders, OSA can be diagnosed by either of two sets of criteria. In first set of diagnostic criteria, the patient can be diagnosed as OSA in the presence of at least one of the following: (1) A bed partner or other observer reports habitual snoring, breathing interruptions, or both during the patient's sleep, (2) the patient wakes with breath holding, gasping, or choking, and (3) the patient has sleepiness, non-restorative sleep, fatigue, or insomnia symptoms.

In the second criteria, OSA can be diagnosed if PSG shows 15 or more predominantly obstructive events (obstructive or mixed apneas, hypopnea).

ORTHODONTIC MANAGEMENT OF OSA

Management of OSA can be broadly divided into:

a) Behavioral modifications
b) Non-surgical methods
c) Surgical methods

BEHAVIORAL MODIFICATIONS

As most of the patients suffering from OSA are generally obese, they are asked to reduce their weight by undergoing weight looing methods, asked to quit smoking and consumption of alcohol, patients are asked to avoid sleeping tablets as they may worsen and decrease airway dilator function.[6]

NON-SURGICAL METHODS

One of the effective methods for the treatment of OSA is continuous positive airway pressure (CPAP). CPAP that is usually administrated through the nose of the patient is considered as more effective gold standard treatment for OSA. CPAP was introduced by Dr. Sullivan *et al*. in 1983.[7] Various other devices are also employed for the treatment of OSA which includes oral appliances that displace the tongue forward that generally prevents the tongue from falling backwards during sleep known as the tongue retaining devices. Mandibular advancement devices, these appliances move the mandible in an anterior and forward direction so as to improve the airway patency, some of those appliances are Thornton adjustable positioner, Herbst appliances, SomnoDent, an Silent Nite® sl.[8] The main side effects of these appliances are hypersalivation, dislodgement of appliances during sleep, and TMJ discomfort. The mode of action of these oral appliances is they move the tongue forward with the jaw as it is connected to the lower jaw at the genial tubercle so when the patient moves the jaw forwards it moves the tongue forward along with it.[9]

SURGICAL METHODS

Surgical interventions are generally considered when the patient shows less response to CPAP and oral appliances and those cases with deformity of anatomic structures are seen. Some method of surgical intervention includes reduction of tissue from the uvula, adenoids, soft palate, or tongue, tonsils. Tonsillectomy is carried out in cases of chronic inflammation of tonsils.[11] Uvulopalatopharyngoplasty is a surgical procedure in which the uvula and a portion of soft palate is resected so as to widen the oropharyngeal airway.[10] Laser-assisted uvulopalatoplasty includes excision of a part of uvula and soft palate. Other surgical interventions include maxillomandibular advancement and surgically assisted rapid maxillary expansion (SARME). By the advent of mini-implants and temporary anchorage devices, a mini-screw supported rapid maxillary expansion (MARPE) can be a possible alternative for SARME

COMPLICATIONS ASSOCIATED WITH UNTREATED OSA

Complications associated with untreated OSA include cardiac problems including heart attack, reduced neurocognitive function, increased risk of high blood pressure, decreased libido and sex drive, irritability, and stroke.[12]

CONCLUSION

OSA is a serious medical disorder that can affect adults and children that may lead to serious consequences if they are left untreated. The effects of untreated OSA compromise many of daily activities lead to excessive daytime sleepiness, mood fluctuations, impaired cognitive function, and personality changes. Orthodontist as a health-care professional he/she should be familiar with the signs and symptoms associated with OSA. Orthodontists should screen the patients with regard to the signs and symptoms. Based on training and skills and the amount of experience and the standards of care,

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DECLARATION SECTION

Ethical Approval and Consent to Participants

Not applicable.

Consent of Publication

This manuscript has all the consent to publish in progress in orthodontics.

Authors' Contributions

The corresponding author has done all the works including data collections, write up, and all the related data to the manuscript.

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