

Orthodontic Considerations in Obstructive Sleep Apnoea- A Review

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Abstract

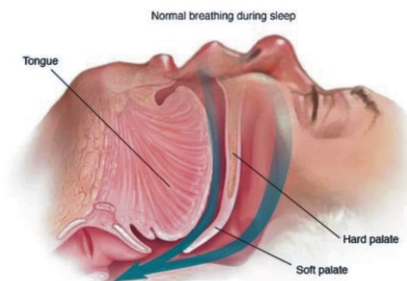
Obstructive sleep apnoea (OSA) is becoming more and more common. The same is true of the effects on health, security, and the economy. The root causes of OSA and its effects can differ greatly from patient to patient¹. This disorder is characterised by recurrent bouts of nocturnal breathing stoppage caused by upper airway collapse severe symptoms are strongly connected with cardiovascular morbidity and mortality², such as excessive daytime drowsiness. There are now numerous therapeutic choices accessible for this disease management. This article contains basic information related to Obstructive sleep apnoea (OBS), along with the basic and recent treatment modalities which are being used for orthodontic considerations.

Keywords: Obstructive Sleep Apnoea, Orthodontic appliances, Sleep disorder, Sleep management

Introduction

Obstructive Sleep Apnoea (OSA) (Figure 1) is defined as repeated incidents of total or partial upper airway collapse (mostly the oropharyngeal tract) during sleep, with a resulting blockage or decrease of the airflow³. OSA is characterised by recurring blockage and constriction of the pharyngeal airway as one sleeps^{4,5}. To detect obstructive episodes and the resulting changes in blood oxygen saturation, several parameters of night monitoring of respiratory, sleep, and cardiac (polysomnography or nocturnal cardio-respiratory polygraphy) are used to diagnose OSA (SaO₂). The apnoea/hypopnoea index (AHI), which is determined by nocturnal cardio-respiratory monitoring and is described as the number of obstructive hours of episodes of sleep⁶, is the most often used measure to determine the severity of OSA (Table 1). The underlying genetic propensity for the disease and intricate interactions between anatomical, neuromuscular, and other variables make up the multifactorial aetiology of OSA⁷. According to research, OSA is a unique cardio-

vascular disease risk factor, such as high blood pressure, cardiac arrhythmia, heart failure, ischemic heart disease, and stroke⁸. According to a number of population-based research, the OSAS prevalence ranges from 0.3 to 5.1 % 9-13. Due to rise of urban migration and economic prosperity, lifestyle-related health problems are on the rise among Indians¹⁴. When it comes to the screening and multi-disciplinary treatment of these problems, orthodontics and sleep dentistry specialists may play a vital role.



How to cite this article: Tripathi D et al.: Orthodontic Considerations in Obstructive Sleep Apnoea- A Review, *HTAJ OCD.2023; Nov-Dec(2):53-57*

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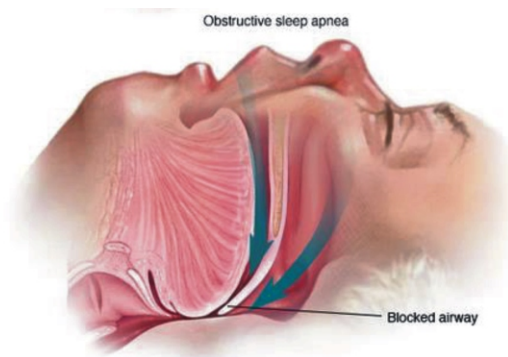
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DOI: <https://doi.org/10.5281/zenodo.10369468>

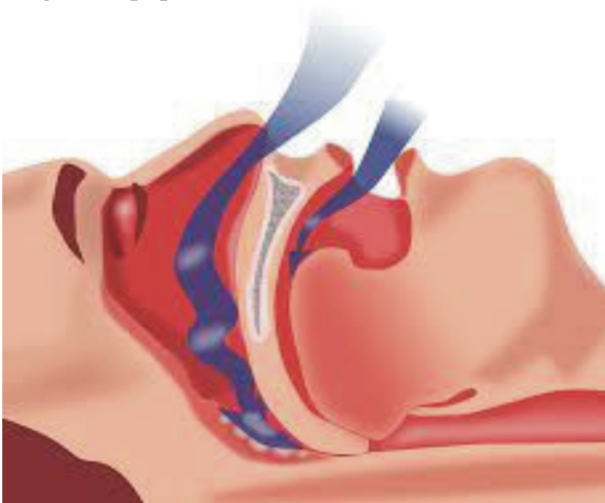
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Symptoms and signs

One of the most typical OSA symptoms are loud, chronic snoring¹⁵ however the main symptom is recurrent blockage of the upper airway when sleeping which results in apneas and/or hypopneas¹⁶. Nocturia, (Figure 2) nocturnal sweating, and waking up gasping for breath are some other night time symptoms of OSA¹⁷. Bruxism has a strong correlation with OSA respiratory episodes¹⁸. Children with OSA frequently have night-time enuresis.¹⁹ Patients with OSA may awaken with a headache and a dry mouth. But the primary daily Excessive daytime sleepiness is a sign of OSA, which affects functioning, degrades quality of life, and increases the risk of accidents on the road¹⁷. On the other hand, OSA in children may infrequently coexist with Attention Deficit Hyperactivity Disorder, according to **Tan et al. (2013)** (ADHD). Low cognitive functioning that affects memory, learning, and focus, among other cognitive manifestations, may be another daytime symptom¹⁷. Gastroesophageal Reflux Disease (GERD) coexists heavily with OSA in these individuals. In individuals with OSA, as much as 65 percent of cases of GERD have been documented, compared to 25 percent in the general population.²⁰



Clinical assessment for Obstructive Sleep Apnoea

For instance, the primary risk factor for adult obstructive sleep apnoea is overweight. Weight fluctuation has been consistently linked to varying degrees of OSA severity. BMI more than or equal to 35 kg/m² and an increased size of the neck (>1600 for women and >1700 for men) are risk factors for spectrum of obstructive sleep apnoea. Weight fluctuations have been consistently linked to varying degrees of OSA severity²¹. The patient's height, weight, and neck circumference must thus be noted by the dentist²².

Another OSA risk factor is an enlarged tongue (macroglossia), enlarged tonsils, enlarged adenoids, or an enlarged uvula. By examining the existence of scalloping, the tongue's size in relation to the oral cavity is determined. Brodsky Grading Scale may be used to measure tonsillar size²³. The primary risk factor for OSA in children is adenoid hypertrophy. However, adenoids are not visible while peering inside the mouth. Asking about recurrent otitis media, snoring, sleep apnoea, and/or difficulty breathing through the nose, all can help dentists to better comprehend a patient's medical history. Testing hyponasality and watching mouth breathing are part of clinical examinations, however neither test is sensitive enough²⁴.

The number one cause of adenoid enlargement. Patients with "adenoid face," can be seen with chronic adenoid enlargement and abnormalities such as a narrow and increased palatal height, increased facial height, an anterior open bite, and incompetence of lip may be present²⁵. It is also possible to employ lateral cephalometric radiographs, however it has been shown that it overestimates the size of adenoids. When Cone Beam Computed Tomography (CBCT) is used, sensitivity is increased, when the results are analysed by a qualified person then only²⁶. When measured physically or radiographically, the uvula is termed overgrown if it's broader is more than 10 mm or longer than 15 mm.²⁷

Micrognathia, or small jaws, and retruded jaw position (retrognathia) are two additional anatomic risk factors that may exist²⁸. The hyoid bone's inferior placement in relation to the mandible has been associated with OSA and has been found to be a sign of weak muscle tone. This can be assessed coronally with CBCT or sagittally with lateral cephalometric radiographs²⁹. Oral signs of OSA are possible and can result from a variety of causes. For instance, mouth breathers may develop halitosis, gingivitis, periodontitis, dry mouth, and throat infections³⁰. While OSA patients who grind their teeth may have bone loss, tooth mobility, and attrition³¹. Patients with OSA and GERD may experience dental erosion, especially in the palatal and lingual cusps with dental caries, halitosis, red and enlarged uvula and palatal region³².

Investigation

Dentists are really recommended for screening potential patients for SDB risk and preferring those who are identified. On the other hand, professional sleep doctors should make the diagnosis. Depending on the patient's condition, doctors may recommend either a nocturnal home sleep apnea test (HSAT) or an overnight polysomnography (PSG), an in-lab sleep test³³. The patient is classified depending on the number of respiratory episodes calculating each hour while sleeping, or the Apnea-hypopnea Index (AHI), they had mild, moderate, or severe OSA if a verified OSA diagnosis is made. The physicians will then choose the best course of action for each patient, and if required, they may formally refer the patient to an orthodontist or sleep dentist.³⁴

Orthodontic Treatment

• Adult patient management

Positive Airway Pressure (PAP) treatment is an effective method to treat OSP. It is particularly effective for preventing breathing obstructions and enhancing night time oxygen saturation. Despite this, inadequate PAP conformity and toleration have received extensive documentation in the literature³⁵. Therefore, not providing patients with alternatives to PAP devices would be a disservice.

• Oral appliances

Oral appliances are the most well-liked alternatives to PAP machines. There have been reports of great acceptance and adherence to oral sleep appliances³⁶. Self-reports made unreasonable claims of high adherence, which adherence monitoring using microsensors objectively confirmed³⁷. The American Academy of Dental Sleep Medicine (AADSM) created an annotation of an efficient mouthpiece based on research in 2013 for the therapy of snoring and OSA.³⁸ This definition gives information on the purpose, layout, and design of sleep equipment. In this description, mandibular advancement devices are referred to as sleep appliances. Verification is required in cases with mandibular advancement and protrusive positioning in the mandible. Along with being retentive, the appliance should be easy for the patient or caregiver to put on and take off, and should be able to maintain structural integrity for a least three years of period³⁸. The patient's eligibility must be assessed once the doctor has issued a referral for OAT. For the appliance to be retained, the patient's teeth and undercuts must be sufficient. Additionally, the periodontium and teeth must be in good enough condition to survive the pressure the device will apply to them while holding the jaw forward. Based on the mechanism that pushes and keeps the jaw anteriorly placed, the majority of sleep devices on the market fall into four categories: push-type, pull-type, interlocking type, and forward stop type.

Depending on a variety of criteria, each appliance has pros and cons. These appliances may include the amount of accessible oral space, the number of teeth present or absent, the quality of the patient's teeth and periodontium, their physical dexterity, and behaviours like bruxism and mouth breathing, among others. Initial records must be taken before the appliance is built, including intraoral and extraoral photos, radiographs, and information on the state of the interproximal and occlusal contacts. Thus, choosing how much to forward the mandible is the first stage in creating the appliance. The best therapeutic mandibular position during PSG titration may be chosen based on the highest improvement in respiratory events, blood oxygenation saturation, and airflow, among other metrics. In order to physically change the oral sleep appliance during PSG, the patient must be awakened. Alternatively, a remotely operated device may be used³⁹. The patient is referred back to the treating physician when the orthodontist/sleep dentist has reached the final titration in order to receive objective verification of results. Additionally, it was studied that negative effects become worse when an appliance protruded more than 50% of its maximum⁴⁰.

The mandibular advancement with its holding and the soft tissue components related to this helps oral sleep appliances to regulate OSA rather than treating it by keeping the airway open. As a result, prolonged usage of oral sleep appliances is anticipated. This raises the possibility of adverse effects⁴¹

• Maxillomandibular advancement (MMA)

To lessen upper airway collapsibility, surgical intervention may be required in some circumstances. Together, an orthodontist and an oral surgeon perform MMA. MMA tries to raise the UA by strengthening the muscles in the suprahyoid, soft palate, and base of the tongue. There have been reports of MMA's strong efficacy in lowering respiratory events, increasing wakefulness, and raising quality of life^{42,43}. Patients for MMA include those with severe OSA and high PAP intolerance. Additionally, candidates typically have retrognathia, skeletal hypoplasia, and/or narrowing of nasopharyngeal wall, and/or base of the throat. Having stated that, individuals without retrognathia or skeletal hypoplasia have had effective MMA documented 44. Additionally, drug-induced sleep endoscopy before surgery is used to identify OSA patients who may or may not respond to MMA (DISE). The velum, oropharynx, tongue, and epiglottis are the four locations assessed and scored for collapse during DISE. Complete anteroposterior epiglottic collapse patients might not be good MMA candidates (2015).⁴⁵

• Surgically assisted rapid palatal expansion (SARPE)

Surgery called SARPE is being performed on patients who have palatal constriction and suffering from OSA^{46,47}. As an alternative, orthodontists can help adult patients with palatal expansion by employing a miniscrew-assisted fast palatal expansion (MARPE). To apply orthopaedic stress directly to the palatal shelves and split the fused midpalatal suture, a palatal expander supported by a miniscrew is introduced during MARPE.⁴⁵

• Treatment of paediatric patients

A. Rapid palatal expander (RPE)

An orthodontist can give quick expansion to the palate with the help of expander to separate the palatal shelves before the midpalatal suture fuses. Studies have shown that this intervention improved PSG and anatomical measurements over the long term.^{48,49} Age-related differences in sutural maturation timing are most noticeable in adolescents and young adults. Chronologic age cannot be utilised to accurately forecast the suture developmental stage. The most reliable diagnostic method for evaluating sutural maturation in teenagers and young adults and making a treatment decision between conventional RPE and SARPE may be computed tomography (CBCT).⁵⁰

B. Functional orthodontic appliances

A retrognathic mandible is advanced to treat Class II skeletal disharmony with orthodontic functional appliances. Improvements in PSG and anatomical parameters have been observed in studies^{7,51,52}. Protraction of the upper jaw has been proven in studies to enhance clinical features in Class III skeletal disharmony. The effect of maxillary protraction on PSG levels has not been studied.⁵³

Conclusion

This review's objective is to present information on the relation between orthodontists and sleep dentists in the therapy of OSA which is necessary for achieving correction of both orthodontics and sleeping disorder. The majority of the time, OSA is a chronic disorder. Because OSA is a complicated multifactorial disorder, the best treatment regimens are all-inclusive and multidisciplinary. The trial-and-error aspect of OSA care must not frighten the sleep team, especially the orthodontist/sleep dentist. If we make an effort to use evidence-based procedures, we definitely can assist lots of sufferers.

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