

Obstructive Sleep apnea and Craniofacial Orthopedics: An Overview¹Dr. Tanya Arora, Consultant Orthodontist, New Delhi**Corresponding Author:** Dr. Tanya Arora, Consultant Orthodontist, New Delhi**Citation of this Article:** Dr. Tanya Arora, “Obstructive Sleep apnea and Craniofacial Orthopedics: An Overview”, IJDSIR- March - 2022, Vol. – 5, Issue - 2, P. No. 16 - 20.**Copyright:** © 2022, Dr. Tanya Arora, et al. This is an open access journal and article distributed under the terms of the creative commons attribution noncommercial License. Which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.**Type of Publication:** Review Article**Conflicts of Interest:** Nil**Abstract**

Obstructive sleep apnea is a common respiratory disorder which involves repetitive partial or complete cessation of air flow. It commonly manifests in individuals with narrow airways and individuals with craniofacial anomalies who have increased risk for obstructive sleep apnea/hypopnea syndrome. Role of orthodontist involves diagnoses of underlying dentofacial deformity which could contribute to hazardous respiratory disease in adulthood.

Keywords: obstructive sleep apnea, narrow airway, snoring, craniofacial deformities**Introduction**

Sleep apnea is defined as intermittent cessation of airflow during sleep. Obstruction of airflow results in a reduced levels of blood oxygen saturation known as hypoxemia. *Lancet* in the issue 1877 has describes OSA as “Perfect silence through two, three, or four respiratory periods in which there are ineffectual chest movements; finally, air enters with a loud snort, after which there are several compensatory deep inspirations.”¹

OSA patients have an increased incidence of cardiovascular problems and lifestyle patterns such as

obesity, hyperlipidemia, increased age, smoking history, and excessive alcohol intake. OSA can be serious and life-threatening disease where patient management and care is provided by orthodontists along with other specialties which belong to dental and medical science sector. Other consequences of sleep apnea include excessive daytime sleepiness, cognitive impairment^{18,19} impaired ability to operate a motor vehicle, and an increased automobile accident rate^{20,21}.

Physiology and Pathophysiology

Diaphragm and intercostal muscles during inhalation generate negative airway pressure. Patency of upper airway is regulated by action of oropharyngeal muscles which activates dilator and abductor muscles in rhythmic mode along with inspiration. Airway gets collapsed when negative pressure exceeds force produced by these muscles. OSA patients have constricted upper airways that cause an increase pharyngeal resistance during inspiration which increases pharyngeal dilator muscle to contract to maintain airway patency. Sustained pharyngeal contraction can cause fatigue of these muscles and airway to collapse.

Etiological Factors

Common etiological factors include obesity, adenotonsillar hypertrophy, Mandibular deficiency, Macroglossia, Loss of muscle tone, dependence on alcohol and sedatives.

Signs and Symptoms

Loud snoring, Impotence in men, Excessive day time sleepiness, Behavioral disturbances, Memory loss.

Diagnosis

It involves following

Physical examination

Examination of sleep patterns helps in diagnosing OSA probability based sleep history along with associated complicating diseases.

Clinical assessment must include;

Excessive Daytime Sleepiness

Distorted sleep patterns or a sound sleep is a subjective parameter which overlaps with tiredness and lethargy.

Obesity

Centripetal obesity which involves fat around the neck and waist is evaluated by neck circumference and hip-to-waist ratio. If BMI ≥ 30 kg/m² and a neck circumference >17 inches in men and >16 inches in women are habitually used as critical values, it indicates obesity.⁴

Craniofacial examination

Anatomy of craniofacial and oropharyngeal structures should be clinically evaluated as they can compromise patency of airway. Immediate attention should be paid to upper airway narrowing signs such as tonsillar hypertrophy especially in children, nasal obstruction, macroglossia with dental impressions, elongated uvula or soft palate inflammation.^[29, 30]

Comorbidities

Clinical examination involves thorough examination of respiratory, cardiovascular, and neurologic systems

monitoring. Proper medication and drug history should be taken into consideration.

Drugs that are used for treating OSA include sedatives, respiratory depressants, those that impair sleep onset or maintenance and appetite suppressants.

Objective testing

Polysomnography is one of an essential tool in diagnosis for sleep-disordered patients and in understanding of normal sleep and disordered sleep. It is a complex procedure and should be performed by trained technologist which involves use of electrodes and sensors. Routine clinical polysomnographic procedure includes monitoring of brain electrical activity, electro-oculography, electromyography along with airflow, oxygen saturation, electrocardiography, and body position.

Anatomic factors in OSA

Typical abnormalities which are posteriorly positioned mandible and maxilla, shorter mandibular body length, longer anterior facial height, steeper and shorter anterior cranial base.

Non-anatomic factors

Inflammation of upper airway and trauma caused by snoring, hypoxia caused by intermittent upper airway collapse may impair sensory pathways along with activation of neuromuscular reflexes which can cause upper airway to collapse.

Mechanics of upper airway are affected by flexion and extension of neck because airway lies behind axis of rotation for extension and flexion. Thus an altered sleep position for example a supine position may increase upper airway collapsibility and predispose OSA in adults

Treatment Modalities

Healthcare professionals require an interdisciplinary communication amongst them and long-term management schedule with a regular follow-ups.

Treatment modality is broadly categorized as general measures, specific measures, surgical measures.

General measures include weight control, avoidance of alcohol and sedatives and maintenance of a healthy lifestyle.

Specific measures involves supplying positive airway pressure, mandibular advancement devices

Surgical measures include; Uvuloplasty, glossectomy, maxillomandibular osteotomy and advancement.

Oral appliances used to treat OSA

Mandibular advancing appliances which brings retrognathic mandible forwards, displaces tongue more anteriorly helps to increase airway but this approach is successful in growing children. Oral appliances are recommended as an alternative therapy to CPAP for mild to moderate OSA patients.

Adjunctive treatment Modalities

Pharmacological therapy

Topical nasal corticosteroids should be given in patients with OSA. Modafinil is a commonly used psychostimulant used for treatment of residual excessive daytime sleepiness.

Bariatric surgery

They consists of numerous operative techniques used for weight reduction such reducing gastric banding, gastric and jejunoileal bypass or gastroplasty. It is often recommended for treatment of morbid obesity where $BMI \geq 35 \text{ kg/m}^2$ or those with a $BMI \geq 35 \text{ kg/m}^2$.

Conclusion

OSA is a respiratory disorder that is common in all age groups. Few problems encountered with it include alteration in quality of life, decreased economic potential and increased morbidity and mortality. Its diagnosis involves a proper clinical examination, overnight testing using polysomnography to degree of its severity. CPAP

is main treatment modality for moderate to severe OSA. Modalities such as mandibular advancing devices help in increasing airway and improve respiration. Severe grades of OSA are treated by surgical interventions.

References

1. Broadbent WH. On Cheyne-Stokes' respiration in cerebral haemorrhage. *Lancet* 1877;1:307-309.
2. Bickelmann AG, Burwell CS, Robin ED, Whaley RD. Extreme obesity associated with alveolar hypoventilation- a Pickwickian syndrome. *Am J Med* 1956; 21(5): 811-18.
3. Guilleminault C, Dement WC. 235 cases of excessive daytime sleepiness. Diagnosis and tentative classification. *J Neurol Sci* 1977; 31(1): 13-27
4. Lavigne GJ, Cistulli PA, Smitn MT. Sleep medicine for dentists. A practical overview. *Quitessence Publishing Co, Inc* 2009
5. International classification of sleep disorders. 3rd ed, American academy of sleep medicine, Darien IL 2014
6. American Academy of Sleep Medicine Task Force. Sleep-related breathing disorders in adults: recommendations for syndrome definition and measurement techniques in clinical research. *Sleep* 1999; 22:667-89.
7. Giannasi LC, Magini M, Costa MS and al. Oral appliance treatment for obstructive sleep apnea in a partly edentulous patient. *Am J Orthod Dentofacial Orthop* 2010; 137: 548-51
8. Mason M, Welsh EJ, Smith I. Drug therapy for obstructive sleep apnoea in adults. *Cochrane Database of Systematic Reviews* 2013, Issue 5. Art. No.: CD003002. DOI: 10.1002/14651858.CD003002.pub3.

9. Peppard PE, Young T, Barnet JH et al. Increased Prevalence of Sleep-Disordered Breathing in Adults. *Am J Epidemiol.* 2013; 177(9): 1006-1
10. Laraqui O, Laraqui S, Manar N, et al. Screening and prevalence of obstructive sleep apnea syndrome among health professionals in Morocco. *Archives des maladies professionnelles et de l'environnement.* 2013; 74(2): 178-85
11. De Backer W. Obstructive sleep apnea/hypopnea syndrome. *Panminerva Med.* 2013; 55(2): 191-5.
12. Lurie A. Obstructive sleep apnea in adults: epidemiology, clinical presentation, and treatment options. *Adv Cardiol.* 2011; 46:1-42
13. Johnson JT, Gluckman JL, Sanders MM. *Management of Obstructive Sleep Apnea.* Martin Dunitz Ltd, 2002
14. Ip MS, Lam B, Lauder IJ, et al. A community study of sleep-disordered breathing in middle-aged Chinese men in Hong Kong. *Chest* 2001; 119(1): 62–69.
15. Scharf SM, Seiden L, DeMore J, et al. Racial differences in clinical presentation of patients with sleep-disordered breathing. *Sleep & breathing = Schlaf & Atmung* 2004; 8(4): 173–183.
16. Lam B, Ip MS, Tench E, et al. Craniofacial profile in Asian and white subjects with obstructive sleep apnoea. *Thorax* 2005; 60(6): 504–510.
17. Liu Y, Lowe AA, Zeng X et al. Cephalometric comparisons between Chinese and Caucasian patients with obstructive sleep apnea. *Am J Orthod Dentofacial Orthop* 2000; 117: 479-85
18. eary A, Rouleau I, Montplaisir J. Cognitive deficits associated with sleep apnoea syndrome: A proposed neuropsychological test battery. *Sleep* 2000;23:369-381.
19. Lojander J, Kajaste S, Maasilta P, et al. Cognitive function and treatment of obstructive sleep apnoea syndrome. *J Sleep Res* 1999;8:71-76
20. per M, Hack MA, George CF, et al. Steering simulation performance in patients with obstructive sleep apnoea and matched control subjects. *Eur Respir J* 2000;1(suppl):590-595
21. Young T, Blustein J, Finn L, et al. Sleep-disordered breathing and motor vehicle accidents in a populationbased sample of employed adults. *Sleep* 1997;20:608- 613
22. Yang EH, Hla KM, McHorney CA, et al. Sleep apnoea and quality of life. *Sleep* 2000;23:535-541.
23. Hui DS, Chan JK, Choy DK, et al. Effects of augmented continuous positive airway pressure education and support on compliance and outcome in a Chinese population. *Chest* 2000;117:1410-1416
24. Hoy CJ, Vennelle M, Kingshott RN, et al. Can intensive support improve continuous positive airway pressure use in patients with the sleep apnoea/hypopnea syndrome? *Am J Respir Crit Care Med* 1999;159:1096- 1100.
25. D'Ambrosio C, Bowman T, Mohsenin V. Quality of life in patients with obstructive sleep apnoea: Effect of nasal continuous positive airway pressure—a prospective study. *Chest* 1999;115:123-129
26. Meslier N, Lebrun T, Grillier Lanoir V, et al. A French survey of 3, 225 patients treated with CPAP for obstructive sleep apnoea: Benefits, tolerance, compliance and quality of life. *Eur Respir J* 1998;12:185-192
27. Bolitschek J, Schmeiser Rieder A, Schobersberger R, et al. Impact of nasal continuous positive airway pressure treatment on quality of life in patients with obstructive sleep apnoea. *Eur Respir J* 1998;II:890-894

28. Jennum P, Jensen R. Sleep and headache. *Sleep Med Rev* 2002;6:471-47
29. Liu Y, Lowe AA, Fleetham JA, Park YC. Cephalometric and physiologic predictors of the efficacy of an adjustable oral appliance for treating obstructive sleep apnea. *Am J Orthod Dentofacial Orthop.* 2001; 120:639-47
30. Schmidt-Nowara W, Lowe A, Wiegand L, Cartwright R, Perez-Guerra F, Menn S. Oral appliances for the treatment of snoring and obstructive sleep apnea: a review. *Sleep.* 1995; 18:501-10.
31. American Sleep Disorders Association (ASDA). Practice parameters for the treatment of snoring and obstructive sleep apnea with oral appliances. *Sleep.* 1995; 18:511-3.