

OBSTRUCTIVE SLEEP APNEA- A REVIEW

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ABSTRACT

Obstructive sleep apnea can be characterised as repeated partial or complete airway collapse during sleep. It is a medical condition with increasing frequency, which may be associated with marked increase in morbidity. Individuals with obstructive sleep apnea are generally obese and present with the history of snoring and daytime drowsiness. Obesity and narrow pharyngeal airway are the most important risk factors along with the male gender. Polysomnography is considered as the gold standard for the diagnosis of OSA, which is carried out in Sleep Clinic. First line of treatment of OSA includes weight loss. Severe cases of OSA should be advised to use continuous positive airway pressure appliance (CPAP) during sleep. Various mandibular advancement splints can also be used as the treatment options.

KEY WORDS

Obstructive Sleep Apnoea, Polysomnography, Continuous Positive Airway Pressure, Mandibular Advancement Splints, Maxillomandibular Advancement, Uvulopalatopharyngoplasty.

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BACKGROUND

Obstructive sleep apnea (OSA) is a medical condition with increasing frequency, affecting majority of the general population since long. Reports show 2% of adult women and 4% of adult men are diagnosed with moderate-to-severe OSA.¹ Obstructive sleep apnea may also be associated with an increased association of hypertension, cardiovascular disease and thereby diminishing quality of life. Apnoeas² are defined as complete airway obstruction during sleep, which results in obstruction of oronasal airflow which lasts more than 10 seconds. The patient feels choked and experiences transient awakening, which is a result of reduced oxygen saturation. The partial cessation of airflow due to partial obstruction in the upper pharynx or nasal cavity results in snoring, which is known as 'hypopnoea.' The obstructive sleep apnea can be categorised based on the total number of apnoeas and hypopnoeas occurring per hour of sleep, which is called the 'apnoea/ hypopnoea index' (AHI).

AHI of less than 5 is considered as normal.³ When the AHI is 5 - 15 events per hour, it is called mild sleep apnoea. AHI of 15 - 30 events per hour is considered as moderate obstructive sleep apnea and AHI of more than 30 is considered as severe obstructive sleep apnoea.

Sleep apnea can be categorised into three categories. In case of central sleep apnoea, there is cessation of breathing due to various disturbances in the ventilatory control in the respiratory center of the brain as a result of which the individual is not able to put any effort to breathe during sleep. In case of obstructive sleep apnoea, no disturbance is found in the respiratory center of the brain. The cessation of the airflow is due to any obstruction at the level of the pharynx, which interrupts the airflow despite the individual's effort to breathe. The mixed sleep apnea is a combination of both central and obstructive components.

Various risk factors of obstructive sleep apnea include obesity, snoring, male gender, postmenopausal women and various craniofacial and oropharyngeal features, which may result in the obstruction of the oronasal airflow. The craniofacial feature such as neck circumference more than 40cm, retrognathic mandible, nasal obstruction, enlarged adenoids and tonsils, macroglossia increases the risk of having obstructive sleep apnoea. The main causative factor of OSA is the decrease in the tidal volume due to genioglossus muscle dysfunction or discoordination between the inspiratory and expiratory muscles, which results in decreased respiratory effort.⁴ The length of the pharynx and the fat deposition around also makes the individual more prone to obstructive sleep apnoea. According to various cephalometric studies, the individuals with obstructive sleep apnea exhibit a longer upper part of pharynx when compared to normal individuals. The longer upper airway increases the chances of airway collapse during sleep.

In case of individuals with obstructive sleep apnoea, the distance from the soft palate to the posterior pharyngeal wall reduces, which results in posteriorly positioned maxilla. A thicker soft palate and an enlarged uvula are observed in these individuals. In the OSA individuals, pharynx is generally narrow and more susceptible to collapse due to larger fat deposition around it. The lower positioning of the tongue and

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the fat deposition in the submandibular and submental region reduces the diameter of the upper airway lumen, which may result in complete or partial airway obstruction during sleep.

Individuals with obstructive sleep apnea generally present with excessive daytime sleepiness, choking or gasping for air during sleep, recurrent transient awakening, fatigue and headache. A typical OSA individual is diagnosed with 30 or more apnoeas per hour of sleep, which lasts for 10 seconds or more along with reduction in the oxygen saturation.

Epidemiological survey shows the prevalence of OSA is two to three times more in case of males when compared to females. The post-menopausal women are also susceptible to obstructive sleep apnea due to the increased collapsibility of upper airway. The difference in the prevalence of OSA between the male and female gender may be due to the difference in the body fat distribution and hormones.

Clinical Features

Snoring is most commonly associated with OSA.⁵ Most of the individuals with OSA are heavy snorers. Patients are generally unaware of the snoring. The history of the night time snoring can be collected from the bed partners. They generally describe a sequential event of snoring, which starts with a normal silent sleep and is followed by louder snoring which ends in a complete cessation of breathing when the patient feels choked and wakes up from the sleep.

Excessive daytime sleepiness is also an important indicator of obstructive sleep apnoea.⁶ Numerous validated questionnaires are available to diagnose the daytime sleepiness among which the Epworth Sleepiness Scale is considered as the standard tool to assess the degree of day time sleepiness. Morning headache, fatigue, drowsiness and irritability are other associated symptoms of the obstructive sleep apnoea. Reduced concentration, depression, loss of libido and enuresis are also associated with obstructive apnoea.

Individuals with excess weight more than 120% of the predicted weight or body mass index more than 25 kg/m² should be evaluated for having obstructive sleep apnoea. Individuals with neck circumference more than 40 cm, narrow nasal or pharyngeal airway, enlarged adenoids and tonsils, deviated nasal septum, macroglossia and micrognathia are susceptible to obstructive sleep apnoea.

Diagnosis

The obstructive sleep can be diagnosed with polysomnography.⁷ It is an overnight sleep study carried out in a sleep laboratory. The various parameters of polysomnography recorded during sleep include Electroencephalogram (EEG), Electro-oculogram (EOG), Electromyogram (EMG), Respiratory airflow by nasal probes, Respiratory effort by the chest and abdomen, Arterial oxygen saturation and EMG of anterior tibialis muscle. Home sleep studies may also replace the polysomnographic study, as it is more convenient for the patients and can be carried out at home.

Assessment of structure and function of upper airway is useful for the diagnosis of obstructive sleep apnoea. Various imaging techniques such as CT scan and radiographic views of the laryngeal and pharyngeal airway, nasal airflow

resistance, maximum expiratory/ inspiratory flow volume loops can be used to diagnose the upper airway obstruction.

Treatment

The Treatment of OSA can be divided into different Modalities-

1. Weight loss,
2. Continuous positive airway pressure (CPAP) and
3. Surgery.

Weight loss is the most effective treatment for individuals with obstructive sleep apnoea. According to the Wisconsin Sleep Cohort, a 10% decrease in weight is associated with 26% reduction in Apnoea-Hypopnoea Index.⁸

Nocturnal continuous positive airway pressure (CPAP)⁹ therapy is considered as the gold standard for the treatment of obstructive sleep apnoea. This therapy provides continuous positive airway pressure during sleep, which prevents the collapse of upper airway sleep.¹⁰ The pressure required to prevent apnea depend on the severity of the disease and is determined by a personalised overnight titration procedure. The major disadvantage of CPAP therapy is the bulkiness of the appliance and difficulty to use.¹¹ Patients find the mask uncomfortable and difficult to use and some patients also experience claustrophobia.¹² CPAP therapy is not indicated in treating the patients with mild OSA. Medications such as nasal decongestants, respiratory stimulants and antidepressants are used as an adjunct in the treatment of obstructive sleep apnoea.

The mandibular advancement splint (MAS) is also used for the treatment of OSA. This increases the area and volume of the upper airway.¹³ It is recommended to patients with mild-to-moderate OSA and in severe OSA where the patient is not comfortable with CPAP therapy.¹⁴ Side effects associated with MAS-migration of the lower dentition¹⁵ and dry mouth.¹⁶

Maxillomandibular Advancement (MMA) and Uvulopalatopharyngoplasty (UPPP) are common surgical procedures,¹⁷ which involves surgical-repositioning of upper and lower jaws to increase the width of the upper airway space. It is the most effective surgical treatment for OSA. Uvulopalatopharyngoplasty¹⁸ involves removal of excess tissue at the posterior wall of pharynx and uvula to create a wider airway. Other common adjunctive procedures to correct OSA are the septoplasty, sinus surgery, tonsillectomy, adenoidectomy, laser-assisted uvulopalatoplasty (LAUP), radiofrequency volumetric tissue reduction and sliding genioplasty.

CONCLUSION

The aetiology of OSA is multifactorial, which comprises of complex interactions between anatomical and neuromuscular factors leading to upper airway collapsibility. The increasing prevalence of obstructive sleep apnea is negatively affecting the quality of life of the individuals. The field of sleep medicine is relatively new, but has undergone numerous changes in few recent years. Future research should investigate about the aetiology of the obstructive sleep apnea patients, which will enable the doctors for better patient care.

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