

OBSTRUCTIVE SLEEP APNEA (OSA) - AN OVER VIEW

Authors:

Sanu Tom Abraham ¹
Meenu Merry C Paul ²

¹ Professor and Head
Dept. of Orthodontics
Indira Gandhi Institute of Dental
Sciences, Kothamangalam.
Kerala 686691

² Professor and Head,
Dept. of Prosthodontics
Indira Gandhi Institute of Dental
Sciences, Kothamangalam,
Kerala 686691

Corresponding Author:
Dr. Sanu Tom Abraham
Professor and Head
Dept. of Orthodontics
Indira Gandhi Institute of Dental
Sciences, Kothamangalam.
Kerala

ABSTRACT

Sleep apnea is a condition that develops from the obstruction of the upper airway during sleep and necessitates awakening to resume breathing. This article gives an overview of the types, clinical features, etiology, various diagnostic methods and management of Obstructive sleep apnea including mandibular advancement device and surgical techniques.

Key Words: Sleep apnea syndromes; Snoring; Orthodontic appliances; Diagnosis; Therapy.

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INTRODUCTION

Obstructive sleep apnea (OSA) is a syndrome characterized by repetitive episodes of upper air way obstruction, that occurs during sleep, usually associated with a reduction in blood oxygen saturation¹(Fig 1). People with sleep apnea literally stop breathing repeatedly during their sleep, often a minute or longer and as many as hundreds of times in a single night.

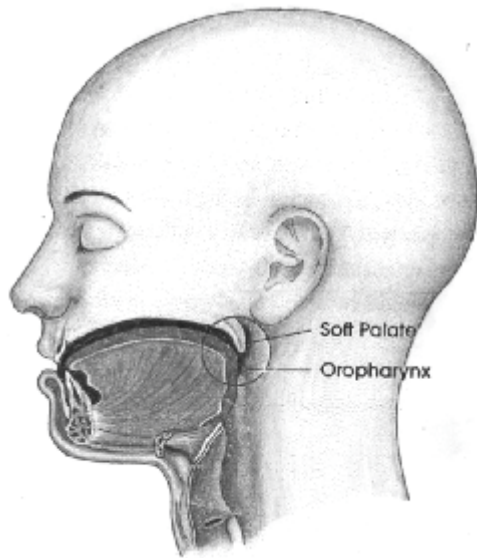


Figure 1

Types of apnea - The different types of apnea are obstructive, central and mixed .

Obstructive sleep apnea occurs due to obstruction caused by collapse of soft tissue structures in the oropharynx or hypopharynx. This includes the base of the tongue, soft palate with uvula, tonsils, epiglottis, pyriform sinuses . Central sleep apnea occurs when the brain fails to send appropriate signals to the breathing muscle to initiate respiration.

Mixed apnea starts as unobstructed apnea which is quickly followed by thoraco abdominal movements with upper air way obstruction

Causes of Obstructive sleep apnea^{1,2}

- Nose –deviated septum, enlarged turbinates, polyps

- Nasopharynx-enlarged adenoids
- Pharynx-enlarged tonsils, uvula, soft palate, base of tongue, and tongue base falling into pharyngeal airway
- Laryngopharyngeal reflex changes with severe posterior commissural swelling

The common predisposing factors^{1,2,3}

- Obesity
- Age with increase in age the muscle masses in the airway is replaced with fat leaving the airway narrow and soft
- Sex males more affected than female
- Retro positioned maxilla and mandible
- Habitual snoring
- Enlarged tonsils and adenoids (main cause of OSA in children)
- Drugs, alcohol, sedatives, anesthetics, sleeping pills, and narcotics increase the degree of relaxation of airway and interfere with brain arousability
- Smoking causes inflammation, swelling and narrowing of upper airway⁷
- Hypothyroidism, acromegaly, amyloidosis, vocal cord paralysis.

- Nasal paralysis

Systemic Complications

- Systemic Hypertension
- Type 2 Diabetes Mellitus
- Myocardial Infarction
- Cerebrovascular accident(Stroke)
- Pulmonary Hypertension
- Arrhythmia

Clinical symptoms of OSA^{1,2}

- Excessive day time sleepness
- Loud snoring
- Morning headache
- Unrefreshing sleep

- Dry mouth upon awakening
- High Blood pressure
- Over weight
- Irritability and depression
- Difficulty in concentrating
- Frequent nocturnal urination
- Rapid weight gain

The radiographic characteristics of OSA⁵

- Mandibular retrognathia
- Retropositioned tongue
- High mandibular plane angle
- Short chin neck angle
- Class II skeletal relation
- Nasal airway obstruction
- Oropharyngeal abnormalities .
- Children with apnea are found to have longer hyoid mandibular plane distance.

Diagnostic techniques

The upper airway should be evaluated in in all patients, particularly in non obese adults, for features associated with the presence of OSA such as narrowing of the lateral airway walls, enlarged tonsils, retrognathia, micrognathia, soft palate edema ,high arched palate ,enlarged uvula or tonsillar hypertrophy. An elongated soft palate that rest on the base of tongue is other case of air way obstruction some times seen in patients with OSA.⁵

• **Polysomnography**⁶

Overnight Polysomnography (PSG)is considered the gold standard of sleep apnea. Sleep polysomnography features electro cardiography, brainwave, electroencephalography (EEG) measurements, motor activity extremity measurements, diaphragmatic, chest movements, eye movements, pulse oximetry for oxygen desaturation measurements and inhalation exhalation oronasal flow characteristics. However PSG does not provide data for patients who have mild OSA .

• Oxymetry

Overnight oximetry which measures a patients oxygen saturation throughout the night.

• Multiple sleep latency test (MSLT)⁶

Measure the speed of falling asleep. MSLT is also be performed to assess the level of day time sleep. A mean sleep latency of less than five minutes is considered abnormal(the average adult require 10 or more minutes to fall asleep during the day).The MSLT may be useful to measure the degree of excessive day time sleepiness and to rule out other type of sleep disorders.

Investigations

1. Radiographs like lateral neck films can better demonstrate adenotonsillar hypertrophy and other air way lesion.⁷

2. Computed Tomography (CT) scans provide tomographic images often used to diagnose pharyngeal obstruction. The drawback include the radiation exposure, expense and that is a non dynamic study .

3. MRI non invasive with high contrast resolution and allow scanning in multiple planes , allowing whole air way to visualize at one time. Reduction in the air space up to 50% considered as normal. MRI is the best non- invasive modality for evaluation and follow up of patients with OSA.⁷

4. Flexible fibro optics provides a dynamic examination of the upper air way.¹¹ Rigid bronchoscopy and laryngoscopy under general anesthesia which spontaneous respiration may be necessary in children where the site of obstruction cannot be discriminated by physical examination or radiographic studies.

Treatment

Treatment of snoring and OSA are directed at the upper air way and include nasal Continuous Positive Air way Pressure(CPAP) ie, sleeping with oxygen mask and the tank besides, various oral appliances and surgical management.

Oral Devices

- Mandibular advancing devices^{4,5,7,8,9} -advances the mandible and increase the air way by creating space between soft palate and the posterior nasopharynx.



Mandibular advancement device

- Tongue retraction device - the tongue is kept in an anterior position, the airway remains patent during sleep.^{1,2,4,5,6}

The adverse effects of wearing an oral appliance includes TMD and tooth discomfort, pain, increased salivation, periodontal problem etc.

Stimulants

If the patient is sleepy, he can be treated with stimulants and he becomes more active.

Surgical Correction

1. Tracheotomy 1:- Surgical hole in the neck that opened during night and plugged for normal breathing during day.

Problem : raw unconditioned air inhalation⁸

2. Uvulopalatopharyngoplasty or UPPP^{10,11}, is the oldest and most invasive surgical treatment for snoring⁹. It was first performed in 1982 by a Japanese surgeon named S. Fujita¹⁰. The reconstruction of the throat by resecting the posterior margins of soft palate and redundant mucosa on lateral pharyngeal wall. In this procedure, the surgeon resects (removes) the patient's tonsils, part of the soft palate, and the uvula. The procedure works by enlarging the airway and removing some of the soft tissue that vibrates when the patient snores. It is not effective in

treating snoring caused by obstructions at the base of the tongue.

Drawbacks of UPPP

Lengthy recovery period.

Result in major complications, including severe bleeding due to removal of the tonsils as well as airway obstruction.

The results may not be permanent; between 50% and 70% of patients who have been treated with UPPP report that short-term improvements in snoring do not last longer than a year.

Expensive procedure.

3. Laser-assisted uvulopalatoplasty (LAUP)¹²

LAUP was developed in the late 1980s by Dr. Yves-Victor Kamami, a French surgeon. Laser-assisted uvulopalatoplasty, or LAUP, is an out-patient surgical treatment for snoring in which a carbon dioxide laser is used to vaporize part of the uvula, a small triangular piece of tissue that hangs from the soft palate above the back of the tongue. LAUP is typically performed as a series of three to five separate treatments. Additional treatment sessions, if needed, are spaced four to eight weeks apart.

4. Somnoplasty¹³

Somnoplasty, or radio frequency volumetric tissue reduction (RFVTR) is a newer technique. The surgeon uses a thin needle connected to a source of radio frequency signals to shrink the tissues in the soft palate, throat, or tongue. The needle is inserted beneath the surface layer of cells and heated to a temperature between 158°F (70°C) and 176°F (80°C). The upper layer of cells is unaffected, but the heated tissue is destroyed and gradually reabsorbed by the body over the next four to six weeks. Somnoplasty stiffens the remaining layers of tissue as well as reducing the total volume of tissue. Some patients require a second treatment, but most find that their snoring is significantly improved after only one. The procedure takes about 30 minutes and is performed under local anesthesia.

Somnoplasty appears to have a higher success rate (about 85%) than LAUP and is considerably less

painful. Most patients report two to three days of mild swelling after somnoplasty compared to two weeks of considerable discomfort for LAUP.

Conclusion

Obstructive sleep apnea is a syndrome characterized by repeated episodes of airway obstruction during sleep. Among the various treatment modalities, surgery is indicated only if there is no response to drugs or CPAP (Continuous Positive Airway Pressure).

REFERENCES

- Bernstein AK, Reidy RM. The effects of mandibular repositioning on obstructive sleep apnea. *J Craniomandibular Prac* 1988;6:179-81.
- Bonham PE, Currier GF, Orr WC, Othman J, Nanda RS. The effect of a modified functional appliance on obstructive sleep apnea. *Am J Orthod Dentofacial Orthop* 1988;94:384-92.
- Calderelli DD, Cartwright RD, Lilie JK. Obstructive sleep apnea: variations in surgical management. *Laryngoscope* 1985;95:1070-3.
- Clark GT, Arand D, Chung E, Tong D. Effect of anterior mandibular positioning on obstructive sleep apnea. *Am Rev Respir Dis* 1993;147:624-9.
- Eveloff SE, Rosenberg CL, Carlisle CC, Millman RP. Efficacy of a Herbst mandibular advancement device in obstructive sleep apnea. *Am J Respir Crit Care Med* 1994;149:905-9.
- George PT. A modified functional appliance for treatment of obstructive sleep apnea. *J Clin Orthod* 1987;21:171-5.
- Importance of cigarette smoking and obesity. *Chest* 1988;93:678-83.
- Guilleminault C, Simmons FB, Motta J, et al. Obstructive sleep apnea syndrome and tracheostomy: long-term follow-up experience. *Arch InternMed* 1981;141:985-8.
- Keenan SP, Burt H, Ryan CF, Cleetham JA. Long-term survival of patients with obstructive sleep apnea treated with uvulopalatopharyngoplasty or nasal CPAP. *Chest* 1994;105(1):155-9.
- Fujita S, Conway W, Zorick F, Roth T. Surgical correction of anatomic abnormalities in obstructive sleep apnea syndrome: uvulopalatopharyngoplasty. *Otolaryngol Head Neck Surg* 1981;89:923-34.
- Remmers JE, deGroot WJ, Sauerland EK, Anch AM. Pathogenesis of upper airway occlusion during sleep. *J Appl Physiol* 1978;44:931-8.
- Walker RP, Gopaldaswami C, Totten MC, Grigg-Damberger M. Laser assisted uvulopalatoplasty for snoring and obstructive sleep apnea: Results in 170 patients. *The Laryngoscope*. 1995;105(9):938-43.
- Sandhu GS, Vatts A, Bhinney D, Kotecha B, Croft PB. Somnoplasty for simple snoring - a pilot study. *Clinical Otolaryngology & Allied Sciences*. 2003;28(5):425-29.