

Sleep Apnoea and Its Management: A Review

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Abstract: We spend approximately 1/3rd of our life asleep. Sleep probably has a recovery function, especially for the brain. Upper airway sleep disorder (USAD) is becoming commonly recognized by medical and dental communities. Snoring is a mild form of this disorders, Obstructive Sleep Apnoea (OSA) is the severe form and upper airway resistance syndrome falls somewhere between the two. Obstructive Sleep Apnea (OSA) is a disorder in which a person stops breathing during the night. The prevalence of OSA in middle age is 2% for women and 4% for men¹. In practice, OSA seems undiagnosed in an estimated 80% of patients. Patients with OSA are particularly vulnerable during many medical procedures. These patients are at a high risk of developing complications like pulmonary hypertension, heart failure, nocturnal cardiac dysrhythmias, myocardial infarction and ischemic stroke. CPAP (Continuous Positive Air Pressure) is the gold standard for treating OSA Patients are now being referred to dentist for treatment of these conditions using removable oral devices. The American Academy of Sleep Medicine recommends dental devices for patients with mild-to-moderate obstructive sleep apnea who are not appropriate candidates for CPAP Oral devices are of two basic configurations, the Tongue Retaining Device (TRD) and the Mandibular Advancement Device (MAD) and oral devices are successful in approximately 50% of surgical (UPPP) failure patients (Mi'llman et al, 1998). Patient compliance with oral devices is better than with CPAP

Keywords: Obstructive sleep apnea , Continuous Positive Air Pressure, Mandibular advancement device, Tongue retraining device.

Introduction

We spend approximately 1/3rd of our lives asleep. In sleep the body is at most relaxed state and a three dimensional collapse of muscles and fatty tissue around the airway may cause obstruction. Obstructive sleep apnea (OSA) is a disorder in which a person stops breathing during the night. These gaps in breathing are called apneas. It is estimated that as many as 26% of adults are at high risk for OSA ²The word apnea means absence of breath. An obstructive apnea episode is defined as the absence of airflow for at least 10 seconds. Apnea decreases the amount of oxygen in the blood, and eventually this lack of oxygen triggers the lungs to suck in air. At this point, the patient may make a gasping or snorting sound but does not usually fully wake up. Obstructive sleep apnea is defined as five or more episodes of apnea or hypopnea per hour of sleep (called apnea-hypopnea index or AHI) in individuals who have excessive daytime sleepiness. Central sleep apnea is much less common. It is caused by some problem in the central nervous system, most likely a failure of the brain to signal the airway muscles to breathe. apnea is the term used when central and obstructive sleep apneas occur together.

Upper airway resistance syndrome (UARS) is a condition in which patients snore, wake frequently during the night, and have excessive daytime sleepiness. However, UARS patients do not have the breathing abnormalities that characterize sleep apnea and they do not show a reduction in blood oxygen levels.

General Causes of Obstructive Sleep Apnea

Structural abnormalities in the face, skull, or airways that cause some obstruction or collapse in the upper airways and reduce air pressure can produce sleep apnea syndrome. People with micrognathia, retrognathia, enlarged tonsils, tongue enlargement, and acromegaly are especially predisposed to obstructive sleep apnea. Abnormalities or weakness in the muscles that surround the airway can also contribute to obstructive sleep apnea. Several studies have been made to study the efficacy of oral appliance for OSA patients. Some studies stated that oral appliances with magnets are more effective in management of mild and moderate obstructive sleep apnea in comparison to appliances with increased vertical dimension.

Dental profession has a unique doctor and patient relationship that affords them a role in recognizing sleep disorder by exploring the history of patients who are sleepy.

Clinical sign and symptoms

OSA is a disturbance in the normal sleep pattern. When combined with day time symptoms, this condition is termed as OSA syndrome. This syndrome is characterized by periodic collapse of upper airway during sleep which results in an absence or diminished airflow into the lungs despite persistent inspiratory efforts^{3,4}. The muscles like geniohyoid, genioglossus and tensor veli palatine muscles which usually cause dilation of the upper airway lose their tone during these episodes.

Excessive daytime sleepiness

Generally, patients risk falling asleep during the day while performing routine activities such as reading, watching TV etc³. This obstruction in airway draws the tongue, epiglottis and soft palate posteriorly against the pharyngeal wall which ultimately leads to difficulty in inspiration. These episodes last for a few seconds and lead to reduced oxygen levels in the blood which in turn causes vasoconstriction and a rise in systemic blood pressure and pulmonary hypertension occurs. Eventually the patients respiratory efforts increase which cause them to awaken but it is very unlikely of them to remember this.

Morning headaches, Irritability and impaired mental or emotional functioning

These types of symptoms are directly related to interrupted sleep.

Snoring: Bed partners may report very loud and interrupted snoring. Patients experience snoring associated with choking or gasps. This often occurs in a crescendo pattern with the loudest noises occurring at the very end.

Some of the classic clinical findings include obesity, thick neck and excessive fat deposition in the palate, enlarged tongue and pharynx, long soft palate, retrognathic mandible, calcified carotid artery atheroma's on panoramic and lateral cephalometric radiographs. Family physicians commonly recognize obesity and male sex as risk factors for sleep apnoea.

Diagnosis:

The symptoms of obstructive sleep apnea are not very specific. This means that many people who snore at night or who feel tired during the day probably do not have sleep apnea. Other medical reasons for daytime sleepiness should be considered by your doctor before referral to a sleep center for diagnostic sleep tests.

Symptoms or findings that make the need for evaluation by a sleep specialist include⁶:

Sleepiness is affecting patient's quality of life

Sleepiness on-the-job places the patient or others in danger

Others have observed apnea or breath holding spells while asleep

Other medical illnesses that may be worsened by obstructive sleep apnea are present.

Children who are snoring a lot and are irritable, not thriving or growing well, or having behavioral issues

If symptoms suggest obstructive sleep apnea or other sleep disorders, further diagnostic testing will be performed. A sleep specialist or sleep disorders center will perform an in-depth medical and sleep history and physical exam. Centers should be accredited by the American Academy of Sleep Medicine.

Investigations

The following investigations can also be recorded to check the severity of the disorder:-

- A polysomnography record
- Grading severity using an Epworth sleepiness scale
- Assessment can be done by the bed partner
- Patient can assess the severity by the side effects they have developed
- Radiographic examination like panoramic and left cephalometric radiograph.

Management

CPAP (Continuous Positive Air Pressure) is the gold standard for treating OSA. it was given by Hoffstein et al 1992. The device itself is a machine weighing about 5 pounds that fits on a bedside table. A mask containing a tube connects to the device and fits over just the nose. The machine supplies a steady stream of air through a tube and applies sufficient air pressure to prevent the tissues from collapsing during sleep. Effects on Sleep and Wakefulness CPAP improves both objective and subjective measures of sleep. After using CPAP regularly many patients report the following benefits:

- a) Restoration of normal sleep patterns.
- b) Greater alertness and less daytime sleepiness.
- c) Less anxiety and depression and better mood.
- d) Improvements in work productivity.
- e) Better concentration and memory.

The fabrication of the devices requires a cast and an intra occlusal record (maximum protrusive movement) to be sent to the laboratory for device fabrication and the instruction are to be given by the professional to the lab technician for the fabrication device.

The fabricated device is then checked in the patient's mouth and instructions and home care measurements are explained and the patient is recalled after 24 hours for evaluation.

Patient instruction and home care

Device is worn for minimum of 6 hours during the night.

1. The Device is removed daily.
2. Clean the device with the soap and warm water preferably with soft tooth brush
3. The Device is stored in a container (as per the manufactures instruction)
4. Use mouth wash 2 to 3 times daily for dryness of mouth.
5. The patient may complain of pain in TMJ and discomfort of device (Titration procedure is followed to bring a mandible to desired position.)
6. The procedure might take days, weeks months to achieve desired result and patient should be informed of the same.

Side Effects and Getting Used to the Device

All patients should be warned that the first few nights of CPAP therapy are unnerving. The mask may cause some patients to feel anxious. Starting out with low pressure to get used to the mask may help. Patients may actually sleep less, or have different sleep quality, at the start of treatment. Nearly all patients complain of at least one side effect. Nearly half of complaints are related to the mask. Many of these problems can be minimized with a well-chosen mask that is comfortable and reduces leakage as much as possible.

Other Related Devices

Bilevel Positive Airway Pressure: Bilevel positive airway pressure (BPAP) systems may be particularly helpful for patients with coexisting lung disease and those with excessive levels of carbon dioxide. These devices have a sensing feature that helps determine and vary the appropriate pressure depending on whether a person is breathing in or out. Greater pressure is needed on inhalation and less on exhalation. These machines are more expensive than the CPAP and may not be covered by insurance.

Autotitrating Positive Airway Pressure Devices: Traditional CPAP devices provide a set pressure based on findings from polysomnography. This pressure does not fluctuate during the night or between nights unless it is reset. Autotitrating positive airway pressure (APAP) devices are also available. These devices automatically customize air pressure for the individual patient. For some patients, APAP devices can be used to begin therapy at home without any supervision.

Medications that treat accompanying disorders associated with sleep apnea may be helpful. The following drugs may be helpful for certain patients:

Modafinil (Provigil), which is also used to treat narcolepsy, was approved by the FDA in 2004 as the first drug to treat the sleepiness associated with obstructive sleep apnea.

Dental Devices

Oral appliances, also called dental appliances or devices, may be an option for patients who cannot tolerate CPAP. The American Academy of Sleep Medicine recommends dental devices for patients with mild-to-moderate obstructive sleep apnea who are not appropriate candidates for CPAP or who have not been helped by it. Oral devices are of two basic configurations, the tongue retaining device (TRD) and the mandibular advancement device (MAD). Oral devices generally work by directly or indirectly preventing the tongue from approaching the posterior wall of the pharynx and hence compromising the airway space⁷.

Mandibular Advancement Device (MAD): This is the most widely used dental device for sleep apnea³. It is similar in appearance to a sports mouth guard. MAD forces the lower jaw forward and down slightly, which keeps the airway open. The MADs work indirectly by holding the mandible and hence the tongue forward.

Tongue Retraining Device (TRD): The TRD (Professional Positioners, Racine, WI) is an excellent device for edentulous patients or those who suffer from TMJ sensitivity. This is a splint that holds the tongue in place to keep the airway as open as possible. The TRDs work through the use of a hollow bulb and sufficient vacuum to hold the tongue forward. This is a one-piece device made of a nonrigid vinyl material without thermoplastic material to adapt to the teeth. Retention to the teeth or residual ridges is not a requirement with this device, and therefore rigidity of the device is unnecessary.

Patients fitted with one of these devices should have a check-up early on to see if it is working; short-term success usually predicts long-term benefits. It may need to be adjusted or replaced periodically. These devices also aid in preventing the hyoid bone from dropping posteriorly and its overlying tissues from impinging on the upper airway.

Both oral devices and UPPP have similar success rates when treating OSA, and oral devices are successful in approximately 50% of surgical (UPPP) failure patients (Mi'llman et al, 1998). Patient compliance with oral devices is better than with CPAP.

Fabricating Different Oral Device Types

Single-Position Stock Devices:

These devices are generally fabricated from two rigid-plastic shells in the shape of impression trays joined into a single unit. The trays fit over both the maxillary and mandibular teeth simultaneously and receive retention from a thermoplastic fill material. They are generally inexpensive, are used to diagnose the success potential of oral devices, and are often temporary. The particular device (TheraSnore, Distar, Albuquerque, NM) is somewhat unusual in that it is retentive only on the maxillary arch. The mandibular side of the device has a lingual projection or flange of the hard-resin tray material extending lingually below the plane of occlusion and behind the mandibular anterior teeth. Retention is not required on the mandibular arch because the lingual surfaces of the mandibular anterior teeth are in direct contact with this lingual projection, which prevents the mandible from dropping posteriorly. Because there is no retention of the mandibular arch, the mandible may drop open several millimeters during sleep. For most patients, this opening is insignificant; however, on some patients the mandible may drop a sufficient distance that the lingual projection cannot prevent the mandible from falling posteriorly, causing the patient to snore and/or become obstructed.

The patient is instructed to protrude the mandible approximately 70% of maximum protrusive movement and then close into the tray and warmed thermoplastic fill material. Before actually attempting to fit the device, the patient should practice this maneuver several times, remembering to protrude in a forward direction with minimal lateral deviation. This particular device is placed in a hot-water bath set to 150°F until the thermoplastic material loses all opaqueness, indicating that the material is thoroughly softened. The tray is centered and completely seated on the maxillary arch until the occlusal and incisal edges of the teeth seat firmly against the hardplastic tray material. While the thermoplastic material is still very soft, the patient is instructed to project the mandible to the predetermined distance and close the mandibular teeth into thermoplastic material, once again closing until the teeth touch the hard-plastic tray.

The thermoplastic material is adapted to the teeth, removed, chilled, and the maxillary trimmed as described below. Retention is absolutely necessary on the maxillary arch, but if lost, it may be re-established by adding small pieces of the trimmed material. As stated above, the device is designed not to be retentive on the mandibular teeth but to provide vertical stops on as many teeth as possible and yet allow several millimeters of freedom of movement to the mandible in protrusive and lateral movements.

Single-Position Laboratory-Fabricated MADs

There are several single-position laboratory-fabricated devices available; however, their fabrication is often a combination of techniques described for the other devices. Therefore, they should be fabricated using these techniques and the manufacturer's instructions.

Adjustable Stock MADs

These devices are generally shaped like plastic impression trays. The trays are filled with thermoplastic material for fitting to the patient with some mechanism for adjusting the mandible in a protrusive and retrusive direction. QuietKnight (Nellcor Puritan Bennett, Pleasanton, CA) is such a device with a screw mechanism for positioning the mandible.

Fabricated MADs

All laboratory-fabricated devices require maxillary and mandibular casts and many require an interocclusal record. Some of the devices are two pieces that can be inserted singly onto the maxillary arches, and some are single units in which the entire device is inserted onto both arches simultaneously. These devices often require 30 to 40 mm of vertical opening to fit over both arches at the same time.

MAD Insertion, Adjustment, Titration, and Follow-up: Fabricating and inserting oral devices is reasonably simple and straightforward in most patients, but titration of MADs, adjustment, and follow-up care are often frustrating for both the clinician and the patient since they may be quite prolonged.

Titration: Titration of these devices is the process of slowly moving the mandible into a more protruded or retruded position until the minimum possible advancement of the mandible is achieved, snoring is eliminated or at an acceptable level, and there is no prolonged TMJ or tooth sensitivity upon awakening. Titration should be delayed for the first several nights until the patient is able to sleep comfortably with the mandible in its initial advanced position.

Benefits of Dental Devices

Dental devices seem to offer the following benefits:

Significant reduction in apneas for those with mild-to-moderate apnea, particularly if patients sleep either on their backs or stomachs. They do not work as well if patients lie on their side. The devices may also improve airflow for some patients with severe apnea.

Improvement in sleep in many patients.

Improvement and reduction in the frequency of snoring and loudness of snoring in most (but not all) patients.

Higher compliance rates than with CPAP.

Dental devices have shown better long-term control of sleep apnea when compared to uvulopalatopharyngoplasty (UPPP), the standard surgical treatment⁷. There are also few complications with a dental device.

Disadvantages of Dental Devices

Dental devices are not as effective as CPAP therapy. The cost of these devices tends to be high. Side effects associated with dental devices include:

Nighttime pain, dry lips, tooth discomfort, and excessive salivation.

Conclusion

Patients should understand that dentistry has a role in the management of OSA. It must be emphasized that dentistry in concrete with medicine has much to afford patient with OSAS. Dental devices have shown better long-term control of sleep apnea when compared to uvulopalatopharyngoplasty (UPPP), the standard surgical treatment. There are also few complications with a dental device. We conclude that adjustable oral appliances appear to be an effective treatment alternative for selected patients with snoring and varying degree of sleep apnea, including those with severe obstructive sleep apnea.

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