



Obstructive sleep apnea

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Obstructive Sleep Apnea (OSA) is a clinical subtype of Upper Airway Sleep Disorders (UASD). Sleep apnea is a serious and potentially life threatening disorder. Clinical features of the disorder include excessive daytime sleepiness, insomnia, headaches, snoring, abnormal motor activity during sleep, intellect and personality changes, hypertension, cor pulmonale, heart failure, and polycythemia. Snoring is the mild form of UASD; OSA is the severe form. According to the National Commission on Sleep Disorders research report, it has been estimated that snoring affects up to 25% of males, OSA occurs in approximately 2-4% of the American population (1).

UASD's are generally the result of a condition that causes partial or complete obstruction of the airway when the patient assumes a supine position and goes to sleep. Treatment of UASD is a multidisciplinary team approach. Increased numbers of patients are now being referred to dentists for treatment using removable oral devices. This clinical update presents an overview of the anatomical, diagnostic and current treatment aspects of OSA.

Anatomy

In the normal anatomy, the activities of the tensor veli palatini, levator veli palatini, genioglossus, and geniohyoid muscles maintain the position of the tongue, soft palate, uvula, and hyoid bone in a position away from the posterior wall of the pharynx. The activity of these muscles diminishes greatly during rapid eye movement (REM) sleep. The airway of snoring patients remains patent but partially obstructed. The obstruction results from the tongue or hyoid bone dropping back to the posterior pharyngeal wall when the patient sleeps in a supine position. The efforts to get sufficient oxygen to the lungs cause an increased velocity of air passing through the reduced airway space. This often causes the soft palate and/or uvula to vibrate. The vibration is the sound of snoring (2).

OSA patients have an almost completely or completely obstructed upper airway. These patients can

suffer from hundreds of apneic events per night. Apneic events are by definition blockages of the airway lasting more than 10 seconds (1) resulting in multiple arousals, causing loss of both quality and quantity of sleep. Posterior positioning of the tongue and hyoid; inflammation of the tonsils, adenoids, epiglottis; tumors; obesity; and structural compromise may cause obstruction. The use of sedatives and ethanol has also been associated with exacerbation of UASD (1).

Diagnosis

The dentist should be responsible for recognizing potential upper airway sleep disorder patients. UASDs, and OSA in particular, are medical problems that are potentially life threatening. These patients should be referred to a physician for diagnosis and treatment. The dentist should support the physician in the treatment phase when requested by proper referral. The dentist must not assume the role of primary care provider for any UASD/OSA patient (3).

Diagnostic tests

Serum laboratory tests on suspected OSA patients during waking hours are within normal limits. Patient or spouse reports are subjective. The definitive diagnostic test for sleep apnea patients is the all-night polysomnogram. The polysomnogram measures oxygen saturation levels, number and length of apneic episodes, sleep stages, airflow, respiratory effort and heart rate. This test allows the calculation of the Respiratory Disturbance Index (RDI) which indicates the apneic events per hour. An RDI of greater than 5 is abnormal, 5-20 is mild, 20-50 is moderate and greater than 50 indicates a severe OSA patient (2).

Treatment

Once a diagnosis of OSA is made, the physician has five treatment options: behavioral modification, surgery, continuous positive air pressure (CPAP), oral devices and medication. Medications have been proven to be of minimal benefit and are not often used. Behavior modifications include weight loss,

change of sleep position, and reducing the intake of alcohol or sedatives. These modifications have not been shown to have long-term success; however, patients are sometimes successfully treated using these simple procedures and they should not be overlooked.

Surgery is often in the form of uvulopalatopharyngoplasty (UPPP), laser-assisted UPPP (LAUP), tonsillectomy, adenoidectomy, tracheotomy, mandibular advancement, or hyoid bone lift. UPPP is successful in 55% of the OSA patients and LAUP is now indicated primarily in snoring patients. Tonsil and adenoid surgery is often of benefit in children. Because of esthetic and social compromises, tracheotomy is reserved for life-threatening situations. Mandibular advancement and hyoid bone procedures have been shown to be successful in treating OSA and snoring.

CPAP is considered the gold standard for treating moderate to severe OSA patients but is considered excessive for snoring patients. CPAP is a treatment modality that utilizes a pump forcing room air through the patient's nasal cavity and upper airway. It suffers from poor compliance due to lack of portability, noise, discomfort of wearing a mask and limitation of patient movement.

Oral Devices

The patient is often referred to a dentist for treatment with an oral device. There are two types of oral appliances for treatment of OSA, the Tongue Retaining Device (TRD) and the Mandibular Advancement Device (MAD). The TRDs work through the use of a hollow bulb and sufficient vacuum to hold the tongue forward. The MADs work indirectly by holding the mandible and therefore the tongue forward. These devices also aid in preventing the hyoid bone from dropping posteriorly and its overlying tissues from impinging on the upper airway (4).

Oral devices and UPPP have similar success rates treating OSA, and oral devices are also successful in approximately 50% of surgical (UPPP) failure patients. Patient compliance with oral devices is often better than with CPAP. Oral devices are extremely successful in treating snoring-only patients (1).

MADs may be single position stock devices, adjustable stock devices, or custom made in the laboratory. The MAD is usually fabricated to hold the mandible forward in a position approximately 70% of the patient's maximum protrusive range and with between 5 to 7 mm of oral opening (5). The adjustable models are generally prefabricated devices that allow a range of adjustment in controlling the protrusion of

the mandible. An example of a prefabricated adjustable device is the TheraSnore (Distar, Inc., Albuquerque, NM). Single position appliances are fixed in a selected position. Stock thermoplastic devices require heating and intraoral adaptation to restrain the mandible in the selected position.

For fabrication of the laboratory processed MADs, casts of the maxillary and mandibular teeth are articulated at the selected protrusive and increased vertical dimension of occlusion. Determination of the proper protrusive position is made chairside. The patient's range of protrusive motion is measured. This process is simplified with the use of a George Gauge (Great Lakes Orthodontics, Tonawanda, NY), which has a scale to measure the patient's protrusive motion and setscrews to hold the mandible at a given position. With the gauge at this position, a maxillo-mandibular recording medium is used on the bite fork of the gauge to record the amount of opening and the protrusive position desired.

Success rates are similar with either prefabricated or lab processed appliances. Complications associated with these oral devices are generally minor, consisting primarily of transient occlusal changes and muscular discomfort.

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