

Are Oral Appliances as Effective as CPAP?

I have recently returned from the 24th annual meeting of the American Academy of Dental Sleep Medicine. A task force commissioned by the American Academy of Sleep Medicine & AADSM consisting of 3 sleep MDs, 2 dentists of the AADSM and 2 research sleep physicians of the AASM presented findings based on thorough review of the literature.

While CPAP has long been considered the gold standard of care for sleep disordered breathing because of its superiority in reducing the AHI and oxygen desaturation, oral appliance therapy (OAT) is equal in efficacy in most other measurable parameters of success.

- 1) OAT is very effective in managing snoring
- 2) CPAP is superior to OAT in reducing AHI and improving oxygen saturation
- 3) OAT and CPAP are equal in reducing sleepiness
- 4) OAT and CPAP are equal in improvement of quality of life
- 5) OAT and CPAP are equal in reducing diastolic and systomatic blood pressure
- 6) OA's are superior to CPAP for compliance

This relative equivalency can be explained by the concept of "Mean Disease Alleviation" (MDA) which can be well illustrated by the following example:

A patient who can only use/tolerate CPAP for half the night (and we have all seen patients like that) has the same MDA as a patient wearing an oral appliance all night long with a reduction of AHI by 50%. By extrapolation, we can see many examples where patient with less than ideal CPAP compliance are better served with OAT.

Mean Disease Alleviation*
(adjusted objective compliance × therapeutic efficacy)/100

CPAP AHI=50

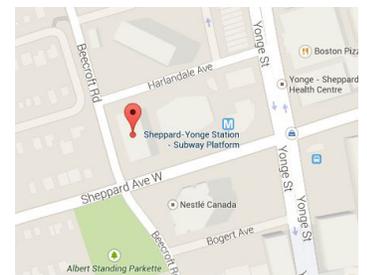
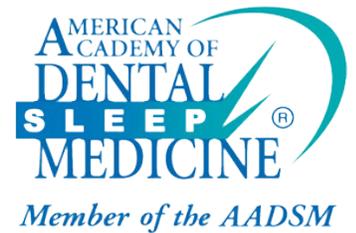
- 4/8 hour use=50% compliance
- AHI reduces to 10 (therapeutic efficacy =100%)
- MDA with CPAP = $50 \times 100\%$
= 50%

OAT AHI=50

- 8/8 hour use=100% compliance
- AHI reduced to 25 (therapeutic efficacy=50%)
- MDA with OA = $100 \times 50/100$
= 50%



Dr. Les Priemer



Oral Appliances and Their Effects on Sleep Apnea

Oral appliances have been used as early as 1902 to treat disorders of the mandible and upper airway obstruction. Since then, the technology has advanced greatly and an increasing number of oral appliances have been used to treat snoring and sleep apnea. Obstructive sleep apnea is associated with upper airway obstruction during sleep, causing snoring, apneas, and hypopneas. The pathophysiology of obstructive sleep apnea is related to the patient's upper airway anatomy, upper airway resistance, and the function of muscles in the upper airway. Oral appliances modify the upper airway by altering the position of the patient's mandible and tongue, producing consistent effects in a multitude of patients.

Researchers reviewed data from 21 different publications, which included 320 patients treated with oral appliances for either snoring or sleep apnea. Evidence showed that snoring was improved or eliminated in most of the patients treated with an oral appliance. In regards to obstructive sleep apnea, a majority of patients experienced significant progress, and the average AHI was reduced from 47 to 19 apnea events per hour. According to the researchers reviewing the previous studies, the recorded improvement in sleep quality reflects the effect that oral appliances have on the patient's breathing.

Dentists have developed a variety of devices to correct various types of occlusal disorders, and they use traditional dental techniques to modify the position of the patient's mandible and tongue. Oral appliances are designed to change the position of the upper airway structure to either enlarge it or to reduce the chances of it collapsing. Researchers used cephalometric radiographs to view the increase of upper airway dimensions in patients using mandible advancing oral appliances, as well as the effect that a downward rotation of the mandible. Their data showed

that this downward rotation increased the superior airway space, allowing for more oxygen to flow through unobstructed.

Dental devices such as oral appliances produce changes in the shape and function of the patient's upper airway. In some patients, snoring has been connected to other significant sleep disturbances, as well as higher risk of stroke or cardiovascular disease. Obstructive sleep apnea can affect a multitude of the body's other systems, and lead to diseases such as cancer, diabetes, and hypertension. The potential to positively influence the lives of those suffering from sleep disorders lies in the use of oral appliances, because many patients who use them show significant improvement.

Shmid-Nowara, W., Lowe, A., Weigand, L., Cartwright, R., Perez-Guerra, F., Menn, S. (1995) "Oral Appliances for the Treatment of Snoring and Obstructive Sleep Apnea" *Sleep*, Vol. 18, pp. 501-510.



The Relationship between Snoring and Carotid Artery Atherosclerosis

Snoring and obstructive sleep apnea may be important risk factors in the development of cardiovascular disease, as well as carotid atherosclerosis and stroke. While a connection between the two diseases has been hypothesized, there was never much evidence to prove that snoring affects the carotid artery. In 2007, a study of 110 volunteers aged 45-80 years, both snorers and on snorers with sleep apnea was conducted to find a correlation between snoring and carotid atherosclerosis. Each person was put into one of three groups: mild snorers, moderate snorers, and heavy snorers.

Out of those who were mild snorers, 20% experienced carotid atherosclerosis, while 32% of the moderate group and 64% of the heavy group had the same diagnosis. The data shows that snoring is significantly associated with carotid atherosclerosis, and that plaque buildup in the arteries is more common in people who snore heavily. Other research groups have hypothesized that oscillatory pressure waves from the upper airway may be transmitted to the surrounding tissues in the cardiovascular system. These vibrations are considered to be pathophysiological factors for development of carotid atherosclerotic plaque that clog arteries and may cause strokes. This constant exposure to heavy vibrations causes fundamental damage to the endothelial cells of the carotid artery walls.

The risk of developing carotid atherosclerosis affects those with obstructive sleep apnea as well as those who are heavy snorers. Snoring is often a common side effect of obstructive sleep apnea; therefore the patients are also experiencing the effects of the vibrations to the cardiovascular artery walls. Snoring is usually regarded as more of a social and marital issue than a health issue, but the evidence shows that it can have a detrimental effect on one's health. The severity of which snoring can affect the body as a whole has often been overlooked by patients, as they do not see it as more than a nuisance. The truth is that heavy snoring is an independent risk factor for carotid atherosclerosis, which could eventually develop to be associated with fatal strokes.

Lee, S.A., Amis, T.C., Byth, K., Larcos, G., Kairaitis, K., Robinson, T.D., Wheatley, J.R. (2007) "Heavy Snoring as a Cause of Carotid Artery Atherosclerosis" *Sleep*, Vol. 31, pp. 1207-13.



*** In my practice, I see many sleep patients suffering from OSA who can't/won't use CPAP at all. For those patients, especially, OAT is generally an excellent alternative. ***

What does this mean to me:

When I see patients who are CPAP compliant, I encourage them to continue with CPAP and utilize OAT for travel, camping, etc.

For patients who can tolerate CPAP only part time OAT is a useful adjunct; (e.g. to be used in the second half of the night or alternating nights, with CPAP, to decrease CPAP pressure etc.)

For patients who can't/won't use CPAP, OAT can offer great benefits and with appropriate titration protocol can have an excellent success rate and be very beneficial to our patients.

Patients referred from their sleep physicians are generally very grateful to be offered a second treatment modality. I stress to them, the need for proper follow up by their referring physician and the usefulness of a follow up oral titration polysomnogram

Good communication is the key to success.

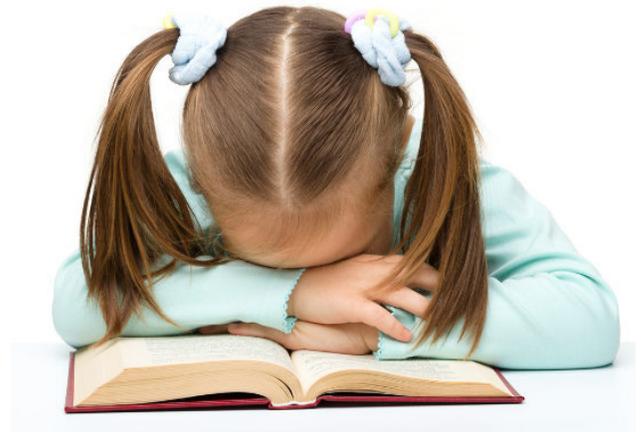
Sleep Disordered Breathing in Children: A Retrospective Review

A retrospective review of pediatric experimental sleep data sought to summarize the most important and recent scientific developments of pediatric sleep medicine, specifically as it relates to sleep disorders and sleep in special pediatric populations. The review is based on a Medline search with the following terms: pediatric, infant, child, sleep, insomnia, sleep disorders, and includes articles referencing people under the age of 18. The most important articles were in the AASM, which were evidence-based reviews on respiratory indications for nocturnal polysomnography in children. A study of adolescents aged 13-18 examined the important clinical issues of whether adult or pediatric scoring should be applied in adolescents. Use of adult standards for meeting criteria for sleep apnea classification resulted in less teens being diagnosed, emphasizing the importance of standardized parameters.

Another study provided data-driven analyses of conventional polysomnography information for the diagnosis of obstructive sleep apnea in children, streamlining the parameters for diagnoses. A different study assessed risk factors for developing sleep apnea, such as maternal smoking, age, weight gain during pregnancy, as well as pre or perinatal complications. Most risk factors were insignificant, but delayed motor milestones were a great indicator of sleep-disordered breathing. It was also noted that obese children were more likely to develop obstructive sleep apnea due to a higher consumption rate of fast foods, and less exercise.

The impact of sleep disordered breathing on metabolic and cardiovascular function of a young body put the child at risk for insulin resistance. Children with sleep disordered breathing were also observed to have neurocognitive impairments, lower IQ, and ADHD. The review highlights much clinical research focused on sleep disorders in children and in high-risk pediatric populations. Improved diagnostic tools and methods, better understanding of individual risk factors for adverse consequences of sleep continue to be worthy goals for future research for pedia-

Owens, J.A., "Update in Pediatric Sleep Medicine" *Curr Opin Pulm Med.* 2011;17 (6):425430.



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