The RDH Detective: Discovering Sleep Disordered Breathing in Adults

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This is an exciting time to be a dental health professional. As our understanding of the multiple links between the mouth and the body has increased, our roles have expanded to include comprehensive care of the patient's whole health. One aspect of whole health care that can have an enormous life-changing and lifesaving effect is to screen for sleep-disordered breathing.

Breathing is the most essential function of our bodies. Without oxygen, we cannot survive. Yet until recently, breathing was not considered a part of dentistry's scope of practice. With the advent of integrative dental medicine, the focus on the central role of airway and breathing disorders represents a shift in dentistry's approach to patient care.[1]

The American Dental Association adopted a policy addressing discovering and treating sleep-breathing disorders, including obstructive sleep apnea, in 2017. Obstructive sleep apnea is a condition in which a physical obstruction, such as the tongue or the pharyngeal muscles, block the airway, which interferes with breathing while the person is asleep. People with obstructive sleep apnea will have multiple episodes of difficulty breathing, with too little oxygen (hypopnea), or a complete lack of breathing (apnea), every night, which can severely impact their health. The ADA policy encourages all dental professionals to screen their patients for sleep-disordered breathing and to collaborate with medical physicians to manage patients with obstructive sleep apnea.[2]

The focus on the airway, which was never part of the traditional dental school curriculum, is now a part of mainstream dentistry. Dental professionals have easy access to examine their patient's airway at every appointment and are in the perfect position to be the first to discover possible airway restrictions and sleep-disordered breathing.[3] The diagnosis of sleep-disordered breathing must be made by a sleep specialist. However, many people will not seek a sleep evaluation without the recommendation of another health-care professional, and this is where the dental professional can make an impact.

The American Dental Association states that approximately 60% of Americans see a dentist annually.[8] It's estimated that 22 million Americans suffer from obstructive sleep apnea, with 80% of moderate to severe cases undiagnosed.[1] This means it's most likely that several people who enter our practices every single day will suffer from undiagnosed airway restrictions and sleep-disordered breathing.

Airway Screening Made a Difference for My Patient

The compounded effect of poor sleep quality and quantity, and the resulting detrimental physical effects, led to a reduced quality of life for my patient, Alan* (*name changed to protect the patient's right to privacy), a 50-year-old engineer.

"I can hardly remember the last time I didn't feel exhausted. I've been tired for so long, it's my normal state. Every day, I drag myself out of bed. Even if I go to bed at a decent time, even if I sleep eight hours, I never feel rested. I make coffee

and drink it on my way to work. I refill my cup when I get to my office. Most days, I drink another cup or two just to feel like I'm able to function at my job. I've fallen asleep at my computer more than once. I've fallen asleep at stoplights. It's pretty scary to be this tired, actually. I often call my wife on the way home and talk to keep myself awake. I don't have the energy to work out. I don't have the energy to do much of anything. And my snoring frustrates my wife. She sleeps in the guest room most nights. It's really become a big problem. But I've heard the stories of those C-pap machines, and the way I travel, I just can't imagine having to lug one of those around with me. I just don't see an answer."

I showed Alan the anatomic indicators that made me suspect that he suffered from obstructive sleep apnea, which included a scalloped tongue, narrow maxillary and mandibular arches (with a history of extracted premolars for orthodontic treatment), a low soft palate and the inability to visualize the posterior wall of the pharynx. I classified Alan's airway as a Class IV Mallampati score.

I recommended a sleep study. The dentist agreed with this plan, and Alan agreed to have the test. The polysomnogram showed that Alan experienced 30 arousals an hour, for periods of 10 seconds or longer, which is considered severe sleep apnea. That means that every other minute of every hour, Alan was experiencing fragmented sleep due to partial arousals. There were also occasional full awakenings, when Alan would feel the need to use the bathroom or have a drink of water, or when he simply woke up and looked at the clock. All of these arousals are attempts by the brain to stimulate Alan to breathe and to keep him alive.

Alan was relieved to find that although his severe obstructive sleep apnea required that he use a continuous positive

airway pressure (CPAP) machine as opposed to an oral appliance, the newer models are not as bulky and difficult to tolerate as the stories he had heard. After several months of CPAP use, Alan reports that he feels rested and energetic. He drinks less coffee and even has the energy to work out several days a week. Alan's wife reports that nights are more peaceful, and she worries less about Alan's health now that he's being proactive and using the CPAP.

A beautiful bouquet of flowers was delivered to my practice with the following message: "Thank you for recognizing what I couldn't see for myself. My nights are now restful, and my days are more joyful. Who would have thought my dental hygienist would be the one to give me back my life? With heartfelt gratitude, Alan."

This is the kind of patient experience that makes my career so rewarding.

Prevalence of Obstructive Sleep Apnea

Fifty to seventy million U.S. adults have some sort of sleep disorder, and obstructive sleep apnea (OSA) is the most common. Approximately 22 million Americans (3-7% of men and 2-5% of women) have obstructive sleep apnea.[9] Worldwide, over 100 million people suffer from obstructive sleep apnea.[3]

Obstructive sleep apnea can strike people of any age, including infants and children, but it is most frequently seen in men over 40, especially those who are overweight or obese. The increasing obesity rate in the United States is believed to be related to the increase in sleep apnea.[3] Too

little good quality, restful sleep can contribute to obesity, so it may be a situation where one wonders which came first: the obesity or the obstructive sleep apnea?

In no way is obstructive sleep apnea limited to overweight men. Many women, even slim women, have been diagnosed with obstructive sleep apnea or other types of sleep-disordered breathing, so clinicians must be vigilant to screen every patient, regardless of age or gender, for airway disorders.[8]

This article will focus on sleep-disordered breathing in adults. For information on screening for sleep-disordered breathing in children, refer to this article in last month's Today's RDH.

Obstructive Sleep Apnea

Obstructive sleep apnea is the most common form of sleep-disordered breathing. Obstructive sleep apnea is a condition in which a person stops breathing during sleep, and as a result, the brain experiences repeated episodes of suffocating.[3]

In an attempt to get critical oxygen, the brain signals the person to gasp for air, which is often heard as a loud snort. In our society, people often view snoring, or these snorting sounds as humorous. There are numerous videos posted online that show people laughing while their friends or family members gasp for air in their sleep.

Snoring is viewed as embarrassing, and people are often hesitant to admit that they snore or that they have sleep apnea. Therefore, many people go untreated and at risk of

serious health consequences. Additionally, many people believe that simple snoring is not a significant concern, but *all* snoring is abnormal and should be considered a serious symptom and possible sign of obstructive sleep apnea.[9]

The central characteristic of obstructive sleep apnea is the increased collapsibility of the upper airway during sleep. The restriction or blockage of the airway occurs during sleep, usually when the tongue collapses against the soft palate and the soft palate collapses against the back of the throat. The result is markedly reduced or absent airflow from the nose or mouth. This is usually accompanied by desaturation of oxyhemoglobin (oxygenated blood) and is typically terminated by a brief micro-arousal in which the brain rouses the sleeper, usually only partially, to signal breathing to resume.[3]

In those with severe sleep apnea, this can happen hundreds of times a night, leading to a sustained reduction in oxyhemoglobin saturation stressing the sleeper's body and leading to sleep fragmentation often most intensely late in the sleep cycle during slow-wave and rapid-eye-movement (REM) sleep. As a result, the patient's sleep is extremely fragmented and of poor quality.[3]

Symptoms may include snoring, pauses in breathing, and disturbed sleep. This sleep disturbance stimulates the parasympathetic /sympathetic dysregulation that is very stressful to the body and increases systemic inflammation.[10] Systemic inflammation is the number one factor in atherosclerosis and accelerated aging.[11]

Risks of Untreated Obstructive Sleep Apnea

1. **Hypertension**: If one already has high blood pressure, sleep apnea can make it worse. When one wakes up multiple times at night, the body becomes stressed, making the hormone systems go into overdrive, which results in increased blood pressure. Additionally, the level of oxygen in the blood drops when one doesn't breathe well, which adds to the problem. People who get treated for sleep apnea often see their blood pressure improve.[12]
2. **Cardiovascular disease**: People who suffer from obstructive sleep apnea have a higher risk for strokes, heart attacks, and atrial fibrillation (a too rapid, fluttering heartbeat). Sleep apnea disrupts the way the body receives oxygen, and that makes it difficult for the brain to control the blood flow to the brain and the arteries.[13]
3. **Type 2 Diabetes**: Sleep apnea is common in people with type 2 diabetes. In fact, 80% or more people with type 2 diabetes suffer from sleep apnea. Sleep apnea alters glucose metabolism and promotes insulin resistance. Obesity increases the risk for both disorders.[14]
4. **Obesity**: Excess weight increases the risk of developing sleep apnea, and the condition makes it difficult to lose weight. When one is overweight, there can be more fatty deposits in the neck that can result in blocking breathing passages. Additionally, sleep apnea is related to insulin resistance and causes the release of the hormone ghrelin, which makes one crave sweets. Nocturnal awakenings and micro-arousals are connected to chronic cortisol release. When one is tired all the

time, one may not turn food into energy efficiently, which leads to weight gain. Further research must be done to determine if treatment for sleep apnea may improve the situation by helping one feel rested and more energetic to exercise and able to resist the temptation of sweets.[15]

5. **Acid reflux**: Up to 60% of patients who suffer from sleep apnea also suffer from gastroesophageal reflux. Some researchers believe that the acid from the reflux may result in spasms of the vocal cords that can result in sleep disruption. Other researchers believe that sleep apnea results in airway pressure changes that cause reflux to occur. More research is needed to determine the exact relationship, but studies have shown that treatment with a CPAP can improve acid reflux symptoms.[16]

6. **Asthma:** Studies confirm that obstructive sleep apnea is an independent risk factor for exacerbation of asthma. Bronchoconstriction and gastroesophageal reflux have been suggested as mechanisms that can lead to worsening asthma in patients with obstructive sleep apnea. Several studies have revealed that asthmatic patients are more prone to develop obstructive sleep apnea than members of the general population.[17]

7. **Cancer:** The intermittent hypoxia that is a feature of sleep-disordered breathing has been implicated in the increased incidence and more adverse prognosis of cancer.This may be a result of the development of new blood vessels which may encourage tumor growth and metastasis.[18]

8. **Auto and other accidents**: Insufficient quantity and quality of sleep leaves one tired and groggy, increasing the risk of falling asleep at the wheel. People with sleep

apnea are up to five times more likely to have traffic accidents than people who do not have sleep apnea.[1]

9. **Depression**: Depression, anxiety, and other mood disorders have been found to be common in those who experience excessive daytime sleepiness. Some researchers express concern that those with psychiatric disorders may not be compliant with CPAP or other treatment for obstructive sleep apnea.[10]

Dental Screenings

The goal of dental screenings is to assess the patient for both sleep and awake symptoms. Certain criteria should automatically trigger a referral to a sleep physician for evaluation and diagnosis[9], including snoring, witnessed apneas, excessive daytime sleepiness, and the presence of medical comorbidities such as hypertension, obesity, depression, gastroesophageal reflux, diabetes and asthma.[12]

Sleep Apnea Signs and Symptoms

- **Mouth breathing.** Most studies show that nasal breathing is ideal breathing, especially since the nose and the paranasal sinuses are the primary sites in which our bodies produce nitric oxide, which is critical for whole-body health.[2] Mouth breathing bypasses the nose and paranasal sinuses and does not contribute to the production of nitric oxide.[13]
- **Bruxism**. Studies show that nearly one in four people with obstructive sleep apnea exhibit nighttime bruxism. It's unclear why the two are linked. Some researchers believe that upper airway resistance causes an arousal,

which leads to a stress response throughout the body. The heart rate and respiration increase, and stress hormones are released. This leads to an increase in the activity of the muscles of mastication, resulting in bruxing. The movement of the jaw forward opens the airway, and the person is able to take a breath. This process repeats multiple times each night. Another theory is that when the tissues of the upper airway collapse during episodes of snoring, partial or complete apnea, the brain signals the jaw muscles to tighten, which will stiffen the sides of the throat, preventing the collapse of the airway tissues.[13]

- **Snoring.** Chronic snoring is a sign of structural or functional pathology in the airway. Patients may not want to admit to snoring, or they may be unaware that they snore, or they may believe it's normal. Ask if any family members, roommates, or bedpartners have mentioned that they snore or have witnessed unusual breathing patterns such as pauses in breathing or gasping for breath.[13]
- **Daytime sleepiness and poor sleep quality.** Multiple arousals and sleep fragmentation result in daytime sleepiness, ADHD and bedwetting in children, morning headaches, joint pain, frequent trips to the bathroom, foggy thinking, temporomandibular joint dysfunction, muscle pain and achy joints, among other conditions. This may be easily observed in a patient who falls asleep in the reception room or the dental chair.[13]
- **Nasal congestion.** Undiagnosed and untreated allergy-related and nasal airway-related problems, such as sinus infections and deviated septum, can lead to sleep-disordered breathing.[13]

- **Forward head posture.** Forward head posture is associated with mouth breathing and with TMD and cervical neck pain.[13]
- **Tongue-tie.** A short lingual frenum can decrease the size of upper airway support by the tongue and contribute to upper airway collapse.[13]
- **Chronic cough.** Chronic cough due to gastric reflux is closely associated with sleep apnea.[13]
- **Deviated septum.** A deviation in the septum which separates the two nostrils can alter airflow through the nostrils, reducing the effectiveness of breathing through the nose.[13]
- **Mallampati Score >2.** The Mallampati Score involves a visual assessment of the distance between the tongue and the roof of the mouth, which determines the amount of space for the airway. The patient is seated upright, and the oral structures are evaluated. A higher score predicts the risk for obstructive sleep apnea.[13]
- **Scalloped tongue.** When the dental arches are narrow, the tongue space is restricted, and the tongue overlaps the teeth, resulting in indentations, or scallops, along the lateral borders of the tongue.[13]
- **Skeletal profile.** Maxillary and/or mandibular skeletal underdevelopment, or narrow jaws, can compromise the airway space.[13]
- **Hypertension**. A sudden or unexplained increase in blood pressure may be evidence of untreated sleep apnea. Monitoring of vital signs, including blood pressure, is done at every dental visit, so for patients of record, the dental records will show a change from the patients' normal.[13]

Assessment Tools

1. **Epworth sleepiness scale (ESS).** This is a simple questionnaire that can reveal how sleepy a patient feels during waking hours and can reliably identify those who may be at risk for sleep apnea.
2. **STOP-Bang questionnaire.** This reliable instrument helps to identify patients by asking about fatigue, snoring, and blood pressure, as well as measurements of body mass, neck size, age, and gender.
3. **Berlin questionnaire.** This questionnaire asks similar questions as the STOP-Bang and is a reliable indicator of obstructive sleep apnea.
4. **Apps.** There are now computer applications that can be used on smartphones and other smart devices that can track snoring and sleep.
5. **Professional screening using high-resolution pulse oximetry, heart rate variability, or a home sleep test.** These tools collect overnight data to be analyzed by the dentist or physician.

Gathering all of this data will inform the examining dentist and dental hygienist of any need to refer the patient to a sleep physician. The sleep physician will order a polysomnogram, or sleep study, to be able to confirm a diagnosis of obstructive sleep apnea. Then treatment will be recommended.

Sleep Apnea Treatment

Continuous Positive Airway Pressure

The standard treatment for obstructive sleep apnea is continuous positive airway pressure (CPAP), which involves using a device which delivers pressurized air through the nose, or nose and mouth, to the throat by way of a mask. That pressure keeps the throat from collapsing during sleep and enables normal breathing.[23]

Many people have a negative reaction to the CPAP. The mask that covers the mouth and nose can feel restrictive. Some people report feeling claustrophobic and can't relax enough to sleep. The big rush of air in the throat can feel too intense. The air pressure from the CPAP can lead to nasal congestion, runny nose, and dry mouth. For those people who don't tolerate a CPAP well, there are alternative treatments.

CPAP Alternatives

Positive airway pressure devices[23]:

- **Nasal expiratory positive airway pressure (nEAP):** This device prevents upper airway collapse by creating an airtight seal of the nostrils.
- **Bi-level positive airway pressure (BiPAP):** This device applies a lower expiratory positive airway pressure during expiration and a higher inspiratory positive pressure during inhalation.
- **Auto-titrating device (APAP):** This device monitors the patient's respiratory activity in order to provide the

lowest level of positive air pressure necessary to eliminate respiratory disturbances.

Oral pressure therapy. Retro-palatal collapse can be prevented by applying negative pressure to the upper airway using this suction device to reposition the tongue and soft palate.[23]

Positional therapy. There are special pillows made to help people remain on their sides during sleep, which reduces airway obstruction in some cases.[23]

Mandibular advancement appliance. This is an oral appliance that works by moving the jaw forward to increase the opening of the upper airway and reduces air resistance. It is considered appropriate across the range of severity of obstructive sleep apnea.[23]

Tonsillectomy and adenoidectomy. Removal of tonsils and adenoids may be recommended for a patient whose tonsils and adenoids are enlarged and contributing to airway restriction.[23]

Uvulopalatopharyngoplasty (UP3). This is a procedure that is used to remove excess tissue in the soft palate to widen the airway and allow easier flow of air to the throat. This treatment can reduce snoring and may be effective in cases of mild to moderate obstructive sleep apnea.[23]

Genioglossus advancement (GGA). This treatment may be recommended when the airway collapses behind the tongue. In this surgical procedure, the chin bone is moved

forward, pulling the base of the tongue muscles forward to open the airway.[23]

Inspire hypoglossal nerve stimulator. This procedure is used for people who experience a backward collapse of the tongue. In this case, a device is implanted to monitor the recipient's breathing while he or she sleeps. It delivers mild stimulation to airway muscles and moves the tongue and other soft tissues away from the upper airway to enable improved breathing.[23]

Maxillomandibular advancement (MMA) surgery. This procedure is performed for patients with shortened maxillary or mandibular jawbones. Those bones are lengthened and positioned forward to enhance the airway. This treatment is recommended only for patients with moderate to severe obstructive sleep apnea.[23]

Maxillomandibular expansion (MME). This combination of orthodontic appliances and surgical intervention is used to widen the jawbones in cases when a patient's jawbones are narrow. The goal of this treatment is to enlarge the airway space and increase the intraoral space for the tongue.[23]

Weight loss, medical weight loss, or bariatric surgery. As mentioned before, obesity may be a contributor to obstructive sleep apnea by causing fatty tissue to build up around the throat and at the base of the tongue, impeding the airway space. Weight loss may reduce the fatty tissue and result in a more open airway.[23]

Tongue reduction surgery. When a person has macroglossia or an abnormally enlarged tongue, reducing the size of the tongue may improve airflow and breathing.[23]

Buteyko Breathing Technique training and mouth taping. The premise of this method is to retrain the body to nasal breathing instead of mouth breathing. Mouth taping is a tool used to encourage nasal breathing. Many medical professionals consider these techniques to be controversial.[23]

Patient Education

Effective management of sleep-disordered breathing requires that the patient become an active partner in his or her own treatment. This requires a high level of understanding, and it is our responsibility to help that patient acquire that understanding. We must make the patient aware that sleep-disordered breathing, and obstructive sleep apnea, in particular, present a very grave health risk and must be taken seriously.

Other Factors to Consider

It's imperative to inform patients that treatment success may be negatively influenced by the use of tobacco, alcohol, caffeine, or recreational drugs. Weight gain and weight loss should also be discussed with the patient.

Sleep hygiene is an important topic and should be discussed with the patient. The impact of ambient room lighting, temperature, regular sleep schedules, the use of electronics, and animals in the bed should all be discussed. These considerations may not directly affect the use of a CPAP or

oral appliance, but they can cause sleep fragmentation and aggravate daytime sleepiness, reducing the patient's perception of the benefits of therapy in terms of sleep quality and daytime functioning.[30]

A Final Thought

As dentistry grows as a medical specialty, dentists and dental hygienists are tasked with ever-expanding roles. We must study areas of health that we never learned in dental and dental hygiene school.

New research is being published, and the standard of care is constantly evolving. This is what keeps dentistry fresh, exciting, and challenging. We have ever-increasing opportunities to help our patients achieve higher levels of overall health and to save lives. That's why I believe this is the best time to be in dentistry.

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