



Screening Adult Dental Patients for Sleep Disorders

Sleep disorders (also known as Sleep Disordered Breathing or SDB), are common medical conditions affecting more than 26 percent of Canadian adults.¹ These disorders include Obstructive Sleep Apnea Syndrome (OSAS) and Upper Airway Resistance Syndrome (UARS), and have anatomical causes that a dentist can recognize and discuss with the patient and/or the patient's medical doctor. Sleep Related Bruxism (SRB), another co-existing sleep disorder, affects at least 17 percent of the population² and is seen daily by most dentists. With the recent policy paper published in the *Canadian Respiratory Journal* and endorsed by the Royal College of Dental Surgeons of Ontario regarding sleep disordered breathing,³ dentists should screen patients for signs and symptoms of these diseases and act upon them. Fortunately, this is well within a dentist's scope of practice. With the addition of a few small steps, these patients can be identified and appropriate measures taken. The Canadian Thoracic Society (CTS)³ and the American Academy of Sleep Medicine (AASM)⁴ have published guidelines that recommend oral appliances as the first line of treatment for patients with mild to moderate OSAS and primary snoring as well as an alternative to treatment of severe OSAS where continuous positive airway pressure (CPAP) cannot be tolerated (second line treatment). This is supported by the Canadian Academy of Dental Sleep Medicine³ and other sleep organizations.

Background

Breathing is essential for life. Every cell of the body requires oxygen to generate ATP, the most basic unit of energy. ATP is produced through cellular respiration in the mitochondria of each cell and is required for every process that occurs in the human body. When oxygen saturation (SaO₂) levels fall (the oxygen measured by a pulse oximeter), such as in sleep due to transient hypoxia associated with OSAS/UARS, adverse effects occur in all parts of the body.⁵ Mitochondria resort to anaerobic metabolism and ATP pro-

duction is substituted with anaerobic respiration and the production of ethanol and lactic acid. Ethanol stimulates production of radical oxygen species (ROS) and nitrogen species (NOS)⁵ — free radicals that are damaging to surrounding tissues such as the heart, pancreas, thyroid, liver, kidneys and brain.⁶

For example, the heart, pancreas and thyroid receive their blood supply through perfusion, with oxygen entering the tissues by tiny capillaries. If the red blood cells entering the tissue are not carrying oxygen, there is reduced oxygen exchange at the cellular level and anaerobic respiration again occurs. Atrial fibrillation is common in patients with OSAS and is independently associated with cardiovascular death.⁶ OSAS patients also have a significantly higher risk of heart disease than the general population.⁶⁻¹⁰ The pancreas and thyroid are similar in structure and are also very sensitive to drops in oxygen levels. If SaO₂ levels fall, both of these organs can be damaged.¹¹ This is one of the reasons that OSAS patients have a significantly higher rate of Type 2 diabetes and insulin resistance¹¹ and close association with hypothyroidism.¹² Fatty non-alcoholic liver disease is also associated with OSAS and UARS¹³ as is chronic kidney disease.¹⁴

The brain is of particular concern here too, as it consumes more oxygen than any other organ due to its high rate of metabolism, and is thus very sensitive to drops in SaO₂ levels.¹⁵ During REM sleep, the body consumes almost as much energy as in the fully awake state, yet the body is in a state of relaxed paralysis. The energy is being used to drive repair mechanisms and solidify memories, as well as drive the immune system to combat infectious diseases.¹⁶ Recently, a system was discovered in the brain that works like the lymphatic system. It is termed the Glymphatic System (GS), as it is driven by the glial cells of the brain.¹⁷⁻²¹ During REM sleep, the GS works by flushing the brain of residual harmful proteins with cerebral spinal fluid and materials that result from neural cell metabolism. Two pro-

teins, amyloid beta and tau protein occur naturally in the brain, and can clump together if they occur in a critical mass. These make up the hallmark plaques seen on MRIs of Alzheimer patients and cause serious damage to significant regions of the brain, resulting in loss of brain function in the affected area(s). Since REM sleep is reduced in OSAS, this is a major reason that OSAS patients have significantly higher rates of dementia.²¹

Ultimately, with one in four Canadians suffering from SDB,¹ it is essential that these patients be identified and treated as early as possible. This will prevent often-permanent damage to the sensitive systems of the body. This is where dentists can contribute significantly.

The Dentist's Role

There are significant signs that dentists can examine, record and act upon in regard to SDB that are seen every time a patient sits in the chair. The following is a set of questions dentists should ask themselves about adult patients:

- Are they a mouth-breather? Do they suffer from allergies?
- Do they have nasal congestion? Do they have asthma?²²
- When they breathe, is it strained?
- Is their maxilla constricted?
- Do they have a Class II facial pattern or a deep bite? A retruded mandible?
- Is their tongue proportional or large? Are the lateral borders scalloped or do they have an anterior open bite?
- Do they have a long soft palate or large tonsils?
- Do they have tori (maxillary or mandibular) or abfraction lesions?
- Do they have musculoskeletal signs and symptoms? Difficulty opening wide or for long periods? Facial or referred pain? History of headaches?
- Do their jaws shake or tremor at times?²³

These questions are important, as UARS differs from OSAS in that OSAS is characterized by an obstruction at the level of the base of the tongue and lower soft palate. There are differences in presentation between the two (Table 1) but the net result is repetitive hypoxia. With OSAS, as the patient falls deeper into sleep, the pharyngeal muscles relax and the tongue falls back obstructing the airway first with loud snoring and partial obstructions and then loud chokes or gasps as the airway is blocked. The patient is jolted awake or almost awake with adrenaline due to low SaO₂ levels. UARS is typically seen in slim patients with small necks, with restricted nasal passages and difficulty in breathing due to the upper airway rather than the base of the tongue. As the diaphragm contracts and pulls down, it increases the volume of the chest cavity creating a negative pressure that fills the lungs with air. With UARS, the air cannot enter the lungs fast enough and the trachea col-

lapses, restricting the airflow.¹⁷ This results in dropping SaO₂ levels and has similar effects on the body to OSAS. UARS is not as easy to diagnose as OSAS and specialized sensors must be used.^{24,25} These sensors measure variance in the pressure of air and are very sensitive to collapse of the trachea.

Because UARS has musculoskeletal symptoms (Table 1) as a hallmark sign, many TMD patients actually are misdiagnosed UARS patients. As SaO₂ levels fall, the pain threshold also falls. Everything starts to hurt and patients can experience symptoms of depression. Fibromyalgia patients have a significantly higher prevalence of SDB.²⁶ Forty percent or more of OSAS patients suffer from depression.²⁷ The effects on the brain and brain function of intermittent hypoxia become readily apparent. Interestingly, once the UARS is treated and oxygen restored, many TMD patients no longer experience the symptoms driving the condition and the cycle of pain is broken.

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Table 1
Differences Between OSAS and UARS

Feature	UARS	OSAS
Age	All Ages	Children, Men>40, Women after Menopause
Male:Female Ratio	1:1	2:1
Sleep Onset	Delayed, Insomnia	Fast
Snoring	Common	Almost Always
Daytime Symptoms	Tiredness, Fatigue	Sleepiness (Children can present as hyperactive)
Somatic Functional Complaints	Fibromyalgia, Chronic Pain, Chronic Myofascial Pain, Chronic Headaches	Rare
Orthostatic Symptoms	Cold Hands, Feet, Fainting Dizziness	Rare
Blood Pressure	Low to Normal	High
Neck Circumference	Normal to Small	Large (17 inches+)

The Patient History

Every dentist takes a detailed medical and dental patient history. By thinking about the questions listed above, and by adding a few more questions to a medical history form, a wealth of information can be gained. Simply asking a patient, “How well do you sleep?” can quickly identify a large percentage of patients with undiagnosed sleep disorders. “Has your spouse told you that you snore or choke in the night?” is another powerful question. If the dentist suspects there may be something here, a sleep questionnaire such as the Epworth Sleepiness Scale²⁸ should be given. A score of nine or over indicates the patient likely has an obstructive sleep disorder and a sleep study is indicated. A score over 15 strongly suggests a sleep disorder and the patient should be seen promptly for an assessment. The history is so significant in these patients that often a tentative diagnosis can be reached just from their responses.

The Examination

The dentist’s examination should include the Mallampati score²⁹ for the patient as well as a tonsil scoring (especially in children).³⁰ The width of the maxilla, skeletal (not dental) facial form, breathing pattern (mouth or nasal) and lip posture at rest should always be recorded. The more positives the patient has, the more likely he or she may have a sleep disorder.

Examining the patient’s musculature by palpation of the masseter, medial pterygoid and lateral pterygoid muscles is essential. This examination can alert the dentist to another sleep disorder related to both UARS and OSAS: Sleep Related Bruxism (SRB). SRB is centrally mediated in the brain stem and occurs at a subconscious level.

SRB directly affects the patient’s dentition and every dentist is familiar with the signs: unusual wear to the teeth, abfraction lesions, premature failure of restorations, mandibular or maxillary tori, accelerated local or generalized periodontal disease. SRB is different than clenching and grinding during waking hours. When clenching/bruxing while awake, the patient generates a conscious force. During SRB, which occurs usually in levels 2 and 3 of sleep, it is an unconscious force that can exceed 10 times what can be generated while awake. It begins with an increase in heart rate, then an increase in blood pressure and then aggressive clenching and/or grinding lasting 20 to 30 seconds. It is usually associated with an arousal from sleep and can prevent reaching deep sleep.⁴ This can be repeated well over 100 times per sleep period, and places considerable force on the patient’s dentition, musculature, TMJ and periodontium, often exceeding the strength of the structure and causing damage.

Many dentists daily face patients with SRB, such as the one who presents with a broken filling you placed only two weeks prior, or the patient who requires an endodontic procedure on a tooth that never was restored or has a toothache that shifts from one tooth to another. In the

mildest form, a night guard (a lower is preferred to allow normal tongue posture while sleeping) can be used to protect the structures. In patients with severe stages of SRB, however, a night guard can actually worsen the condition and mandibular advancement appliances are preferred. These are the patients who grind through their night guards quickly or return again and again for adjustments, upset that the night guard is not working. Good questions to be asking at the exam stage for suspected SRB patients are:

- Have you been told or are you aware of clenching or grinding your teeth while sleeping?
- Do you experience jaw pain? TMJ pain?
- Do you awaken with a headache in the morning? Where? (Temporal headaches are the most common and also occur with OSAS and UARS.)
- Do you have difficulty opening your mouth wide in the morning or difficulty chewing breakfast? (Results from lactic acid accumulation due to anaerobic metabolism during sleep.)
- Are your teeth sensitive to hot and cold? All or one in particular?
- Does your jaw feel weak at times, do you have difficulty or fatigue when chewing?
- Do you ever awaken with an awareness of clenching/grinding or just an awareness of your teeth in the night?
- Does your jaw tremor or shake at times?
- Do you dream? (This identifies patients that are not reaching deep REM sleep as can occur in OSAS, UARS and SRB)

By adding this simple but informative series of questions and recording a few more findings, every dentist can identify many OSAS, UARS and SRB patients in their practice. Now what?

What To Do Once You Identify These Conditions

It is one thing to identify these patients, and another to get them treated. Snoring, OSAS and UARS must be diagnosed and treatment ordered by a medical doctor trained in sleep medicine. SRB, however, does not require a sleep study and may be initiated by a dentist trained in its treatment. For OSAS and UARS, the dentist is required to notify the patient’s medical doctor or tell the patient to contact his or her medical doctor about the suspicion of a sleep disorder and request a referral for a sleep study. Currently, only a doctor with an OHIP billing number may refer a patient for a sleep study in Ontario. Most medical doctors will gladly make this referral to prevent the associated diseases. As indicated, early forms of SRB are effectively treated with mandibular bruxism appliances. These preserve the tongue space and allow the tongue to assume its normal position of the anterior one-third resting in the pre-maxilla position. Upper appliances can force the tongue down due to bulk of material.

Many dentists are training in the use of mandibular advancement appliances in the treatment of these disorders. The American Academy of Dental Sleep Medicine, the largest dental sleep group in the U.S., recommends oral appliances as the first line in the treatment of mild to moderate OSAS (and UARS), primary snoring, as well as the second line in people with severe cases who cannot or will not tolerate CPAP forced air devices.⁴ Approximately half (46 percent to 83 percent) of CPAP wearers fail in the treatment.³¹ This failure rate is very high, and oral appliances, while not completely effective in severe cases, have a much higher compliance rate (84 percent or more)³² and offer at least some treatment for these patients. It has been estimated that 26 percent of the Canadian population, or 9.2 million people, suffer from SDB.¹ If the severe group comprises approximately one-third of these, this is still more than 1.5 million severe cases that dentists may be able to help. Along with the remaining six million people who have mild to moderate OSAS/UARS that dentists can cure, this is more than 7.5 million people that can benefit significantly from dentists' involvement in treatment.

As an added benefit, when OSAS/UARS are adequately treated, the patient no longer snores. Snoring is a serious social problem. At least 26 percent of couples sleep in separate rooms due to snoring.³³ Snoring alone may reduce SaO₂ levels by up to 10 percent from the turbulence in the pharynx.³⁴ Oral appliance therapy for snoring is exceptionally effective and can allow couples to sleep in the same room again. Extended medical insurance covers these appliances fully for most patients. Preauthorization is always required and the patient must have been diagnosed by a certified sleep specialist and referred to the dentist for this treatment for an appliance to be eligible.

These numbers may appear unusually high but are well researched. Since dentists are in a position to treat the vast majority of these patients, it is important that all dentists consider incorporating this into their practice. Mandibular advancement appliances are not difficult to learn to construct or adjust and provide a rewarding aspect to a practice. Patients (and spouses) are usually very grateful for this type of treatment, as it can take sluggish, forgetful, unwell people and turn them into alert, active, healthy persons within a few days or a few weeks. The dentist has the benefit of gaining the respect of medical doctors and eventually sleep specialists, since they are identifying patients who would otherwise have been missed.

Summary

By adding a few key questions to a re-care or initial examination, a dentist can identify patients with OSAS, UARS and SRB. Treatment can be very rewarding for both the patients and the dentist as this type of treatment can completely change the life of an affected person and the person's spouse. With the guidelines of the CTS and the AASM, dentistry is in the unique position of offering the most effective treatment for a very common and potentially life-threatening group of medical disorders affecting millions of Canadians. 

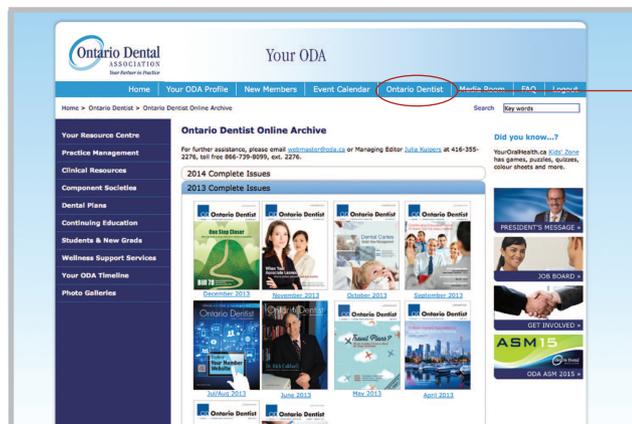
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