The role of the dental team in the management of the patient with sleep apnea

By Nancy M. Costa-Lawson, USA

The evolution of the dental hygienist’s role in the assessment of a client’s oral health from a singular approach to a collaborative multidisciplinary approach is evident in the treatment of clients with sleep disorders. Knowledge of the variations in sleep disorders, medications, treatment needed, as well as the various appliances will be vital to the dental healthcare providers. Pagel (2012) says that by 2015, 40 percent of the U.S. population will have some form of sleep disorder; 18 million Americans have sleep apnea, which affects all ages, both sexes and may be genetic. The most prevalent form occurs in 4 percent of middle-aged men and 2 percent of middle-aged women.1 As with all medical conditions, early detection and baseline data will aid in monitoring changes in the patient’s health and providing useful information in treatment planning and indications. Sleep apnea in the past has been viewed as most typically related to snoring; however, there are different types of sleep apnea disorders. The most prevalent and known is obstructive sleep apnea syndrome. Another type, central sleep apnea, is less common than obstructive sleep apnea because there is no airway obstruction to the breathing-control muscles to which the brain fails to signal the patient with sleep apnea. It is important to know this is happening. A patient with sleep apnea is underdiagnosed disorder that is potentially fatal.2 According to de Almeida et al. (2006), “It happens silently, frequently during REM sleep, and breathing stops for 10 to 30 seconds, which results in reduced levels of oxygen dissolved in the blood.” The patient with the OSAS does not have any feeling or awareness of what is happening. A person’s quality and quantity of sleep is often inadequate. These issues can cause a person’s mental and physical state—and lead to additional problems in the oral cavity.

What is sleep apnea? Sleep apnea is a sleep disorder that results in reduced levels of oxygen dissolved in the blood. This can lead to a variety of health problems, including cardiovascular disease, diabetes, and cognitive impairment.

What is obstructive sleep apnea syndrome? Obstructive sleep apnea syndrome (OSAS) is a common, but underdiagnosed disorder that is potentially fatal. It is characterized by the repeated episodes of complete or partial upper airway obstruction during sleep, leading to hypoxemia and hypercapnia.

What is central sleep apnea? Central sleep apnea is a condition in which the brain fails to signal the breathing-control muscles to trigger the breathing process.

What is obstructive sleep apnea? Obstructive sleep apnea is a condition in which the airway is blocked by the tongue and soft tissues during sleep, leading to pauses in breathing during sleep.

What is complex sleep apnea? Complex sleep apnea is a combination of obstructive sleep apnea and central sleep apnea.

Central sleep apnea is diagnosed by sleep studies and typically treated with medications.

What is complex sleep apnea? Complex sleep apnea is a combination of obstructive sleep apnea and central sleep apnea. Some patients with obstructive sleep apnea develop central sleep apnea while on treatment with continuous positive airway pressure (CPAP).2 This article focuses on obstructive sleep apnea and how it relates to the oral cavity.

Causes of obstructive sleep apnea syndrome

Tongue muscles, soft palate and uvula relax and/or sag (Fig. 2), causing snoring, difficulty breathing and breathing cessation. Obese, alcohol consumption and sleep medications can exacerbate the condition. Snoring and gasping for air causes the person to wake several times a night, preventing the person from getting the proper sleep needed to function.

Sleep apnea is often present in people who are overweight and have physical abnormalities such as a deviated septum or have other abnormalities of the nose or throat. The sleeper tries to breathe, creating a tighter seal, which decreases oxygen flow to the brain. The sleeper awakens gasping for air.

Effects and oral effects

Studies on sleep apnea are fairly new, and diagnostic evidence is evolving. Snoring is one of the symptoms of obstructive sleep apnea syndrome; however, not all individuals who snore necessarily have OSAS. Friedlander says, “Even when the airway is patent and open airway while sleeping.” Some patients with OSAS have all of the variations in sleep disorders, which can lead to a reduction of oxygen in the blood stream, a host of medical complications can occur. Individuals with obstructive sleep apnea can experience worsening snoring, which is caused by vibration of the partially collapsed soft palate as air passes. Respiratory events, which deplete certain stages of non-REM and REM sleep, contribute to sleep fragmentation and unrefreshing sleep.1 Because of the lack of sleep, an OSAS sufferer may have difficulty concentrating and staying awake during the day. When sufferers sleep on their back, gravity pulls the jaw and tongue down and back. This causes the mouth to open and the tongue to drop back into the airway, narrowing the air passage.

Dental professionals may be the first health-care providers to suspect possible OSAS in a patient because of signs and symptoms exhibited within the oral cavity. These include: macroGLOSSIA (Fig. 3) and enlarged pharynx, narrowed posterior airway space resulting from a long soft palate by the uvula lying below the base of the tongue; the tongue lying above the mandibular plane of occlusion and small mandible.3 Signs and symptoms of OSAS while sleeping may include drooling, xerostomia, restlessness, bruxism, choking or gasping, snoring, breathing pauses and diaphoresis. But an individual’s symptoms associated with OSAS are not limited to sleeping problems. During waking hours the patient may experience depression, difficulty concentrating, fatigue andinsonia. Other signs can include gastrointestinal reflux disease (GERD), irritability and sleepiness throughout the day. Coughlin says, “If OSAS continues to be unrelieved or it is never diagnosed, the sleeping disorder may elevate blood pressure and be a potential for mortality increases.”4

What to look for

Maggiola says, “The population with OSAS is a heterogeneous group, and have a wide range of physical attributes. Not all patients with OSAS have all of these physical features.” The most common orofacial characteristics encountered include a retracted mandible, narrow palate, large neck circumference, long soft palate (which leads to dentists being unable to visualize the entire length of the uvula when the patient’s mouth is open wide), tonsillar hypertrophy, deviated nasal septum and relative macroGLOSSIA.5

Potential outcomes of non-treatment

 Patients with OSAS have interrupted sleep patterns because the obstruction of airflow causes prolonged interruptions in their breathing while they sleep (up to 40 seconds). Because the condition can lead to a reduction of oxygen in the blood stream, a host of medical complications can occur. Individuals with obstructive sleep apnea can experience worsening snoring, which is caused by vibration of the partially collapsed soft palate as air passes. Respiratory events, which deplete certain stages of non-REM and REM sleep, contribute to sleep fragmentation and unrefreshing sleep.1 Because of the lack of sleep, an OSAS sufferer may have difficulty concentrating and staying awake during the day. When sufferers sleep on their back, gravity pulls the jaw and tongue down and back. This causes the mouth to open and the tongue to drop back into the airway, narrowing the air passage.

Treatments

Oral devices and surgical interventions are the procedures used to treat OSAS. An oral appliance (Fig. 4) is a small acrylic device that fits over the upper and lower teeth or tongue (similar to an orthodontic retainer or mouth guard). This device slightly advances the lower jaw or tongue, which moves the base of the tongue forward and opens the airway. This improves breathing and reduces snoring and apnea. The appliance is fabricated and customized for each patient by a dentist experienced in the treatment of snoring and sleep apnea. The appliances are comfortable and well tolerated by patients. Appliances are easy to place and remove, easy to clean and are convenient for travel.

Non-surgical treatments are available, including positional therapy.

The two main categories of oral appliances currently in use are the mandibular advancement devices (MAD) and the tongue retaining devices (TRD). The mandibular advancement devices, made of acrylic materials, are custom fabricated for each patient. The impression for the MAD is taken during sleep and the appliance is worn overnight. The devices fit comfortably over the upper and lower teeth, positioning the lower jaw slightly forward, advancing the tongue and soft tissues of the throat to open the airway. Some of the “repositioners” are designed to hold the mandible
Oral appliances used for OSAS

Tom jaw under dental supervision

Oral appliances are devices designed to change the position of the bite, enabling users to gradually correct the breathing problem while they sleep. The mandibular advance device (MAD) is one of the most common examples of an oral appliance. It is worn in the mouth during sleep, and the device is adjustable to change the bite. The MADs have an adjustment mechanism that can be set to best address a patient's particular needs.

Teamwork between dental and medical professionals

Medications may contribute higher risk for hyperextension, which can lead to other physical complications. Additionally, de Almeida says, “These bone movements pull the base of the tongue forward and cause increased snoring.”

Dental professionals are crucial to the CPAP devices. While the initial screening is done on OSAS patients, such as crowns or fillings, adjustments to the appliance may be done by the dental team. The CPAP devices can provide a mandate for dental professionals to work closely with patients who have been prescribed an oral appliance, the dental hygiene team, and medical professionals to treat OSAS, such as crowns or fillings, adjustments to the appliance may be needed by the process of adjusting or creating a new appliance.

The CPAP machines work when there is a compliant patient. If the patient is not compliant, there are other oral appliances that may be used. The CPAP remains the “gold standard” for patients who need treatment. The objective success rate for CPAP remains the “gold standard” for patients who need treatment. If the patient is not compliant, there is a compliant patient. The CPAP machines work when there is a compliant patient. The CPAP devices can provide a mandate for dental professionals to work closely with patients who have been prescribed an oral appliance, the dental hygiene team, and medical professionals to treat OSAS, such as crowns or fillings, adjustments to the appliance may be needed by the process of adjusting or creating a new appliance.

Other long-term treatment strategies

Future sleep apnea syndrome occurs in patients with a retroglobular positioning (Fig. 6). People who have a receding chin related to a small lower jaw are more likely to snore because there is less room in the back of the throat for the soft tissues and tongue. This reduction in space decreases the size of the air passage causing the mouth to close.

Some patients undergo “maxilla-mandibular advancement surgery.” Oral and maxillofacial surgeons engage in corrective surgery to achieve the general dentist, because when an OSAS patient undergoes surgery, treatment plans may be suspended in anticipation of changes to the patient's occlusion. Hoffstein says, “Maxilla-mandibular advancement surgery is based on traditional orthodontic surgery techniques, has been proven effective in a range of OSAS disease.” Surgery allows the repositioning of the mandible. Additionally, de Almeida says, “These bone movements pull the base of the tongue forward and cause increased snoring.”

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The prevalence of OSAS may be less likely to comply with treatment. Interdisciplinary treatment planning is necessary to keep a patient from changing his habit. Additionally, dentists and who prescribed the oral appliance is essential. Some patients may not notice or may not be affected by changes in the occlusion while using an oral appliance, but problems may still exist. Robertson et al. suggest "keeping the patient's bite open to a minimum when fabricating appliances to reduce the impact on the occlusion.” When restorative work is done on OSAS patients, such as crowns or fillings, adjustments to the existing appliance or fitting of a new appliance — may be needed. The process of adjusting or creating a new appliance may be done by the dental team. The CPAP devices can provide a mandate for dental professionals to work closely with patients who have been prescribed an oral appliance, the dental hygiene team, and medical professionals to treat OSAS, such as crowns or fillings, adjustments to the appliance may be needed by the process of adjusting or creating a new appliance.

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Matching Gutta-percha cones with TF/TF Adaptive Instruments

By Prof. Gianluca Gambirani, Italy

Introduction
With the widespread use of the rotary NiTi instruments, matched taper gutta-percha (GP) cones (of greater tapers) were developed to make root canal obturation techniques easier, more predictable and improve quality. Nowadays many manufacturers commercialise matched-taper GP cones, meant to be used with a specific instrumentation technique. As a consequence, not only the single cone tapered technique regained popularity due to the fact that single matched cone could not produce a satisfactory three-dimensional fill; also warm vertical condensation techniques and consequently not create apical gaps inside the filled endodontic space.

However, the greater amount of variability in design and dimensions of commercially available NiTi instruments and GP cones of greater tapers can easily create confusion among practitioners and especially if they use instruments and cones of different brands. If selected gutta-percha cones do not precisely match the used NiTi instruments, the whole concept of yielding a tapered preparation is lost and/or don’t fill the apical preparation precisely.

In order to appreciate how matched GP cones should work, clinicians need to understand the differences in sizes, tapers, designs and manufacturing processes of these products. Even if these factors are usually taken into account when a manufacturer produces matched GP cones to be used with a specific instrumentation technique, the goal of the present paper is to discuss these variables and give clinicians a better understanding of the possible clinical problems they may encounter in the cone fitting and practical solutions to solve them.

Sizes, tolerance and manufacturing of gutta-percha cones
Traditionally, GP cones are hand rolled, a manufacturing process that is not very precise and consistent. Therefore, according to ISO standards the tolerance allowed for GP cones is 0.05 mm, much bigger than the tolerance allowed for endodontic instruments produced by grinding or twisting (0.02 mm). This has always been a problem in endodontics and it explains why correct fitting of the master cones in all techniques (single-cone, lateral condensation, warm vertical condensation, System B lateral condensation, warm vertical condensation, System B lateral condensation, warm vertical condensation, System B lateral condensation) is always described as a fundamental step in the procedure.

With the traditional ISO 02 tapered cone, the problem mainly related to the lack of precision of tip of the GP cones. Therefore, GP tips needed to be manually adjusted to fit the apical preparation with a good retention ("tug-back"), to avoid under filling and/or overextension of cones through the apical foramen.

The same procedure was needed for non-standardised gutta-percha cones with feathered tips. This is why calipers or specific instruments to precisely cut gutta-percha cones were invented and commercialised (Fig. 1).

With the introduction of gutta-percha cones with greater tapers the problem is not only related to the tip sizes, but also to the taper.

Therefore, these GP cones can be divided in two categories: uniform and non-uniform tip.

The first cones are usually commercialised as 0.04 or 0.06 tapered cones, while the second ones are usually commercialised with a brand name related to a specific instrumentation technique (i.e. TF cones, TFA cones, etc.).

Taper sizes and tapers of NiTi instruments
Even if some instruments have a non-uniform tip, the great majority of endodontic NiTi rotary instruments have a uniform taper, and techniques are designed to create at least a 0.04 or 0.06 tapered preparation.

This is why GP cones of greater tapers are usually commercialised in 0.04 and 0.06 tapers. However, NiTi instruments having the same nominal size and taper may not have the same dimensions and consequently not create an identical root canal preparation. Differences in dimensions and sizes of cones (the 0.04-.06 cones and TF cones, TFA cones) are due to the fact that the taper of tip of the GP cone probably won’t get the canal to a lesser extent: 0.85 mm (0.08 x 10 = 0.80 mm +0.25 tip size=0.85 mm).

Differences can be found between any NiTi instrument with a traditional 16 mm working part compared with any with a reduced working part. NiTi instruments with a shorter working length are nowadays widely used since many canals are actually not longer than 10 mm from orifice to apex; a shorter working part creates less stressful instrumentation by reducing taper-lock and torsional stress in the biggest part of the instrument with a lower operative torque, efficiency and safety are more easily improved. Nevertheless, instruments with a shorter working length need GP cones with the same design and dimensions, if clinicians seek perfect matching between prepared canals and obturating materials.

Matching TF/TFA instruments with GP cones
The differences in dimensions previously described between K3XP and TF cones can be found between 0.04-0.06 GP cones and TF cones. The first 9/10 mm are identical, but in the coronal part the 0.04-0.06 GP cones are much wider (Fig. 5). Therefore, if clinicians try to use these cones in a 10 mm (or more) root canal prepared with TF/TFA, the GP cone probably won’t get the canal to a lesser extent: 0.85 mm (0.08 x 10 = 0.80 mm +0.25 tip size=0.85 mm).

This is a different problem from those experienced by dentists in the past, mainly related to the cone fitting in the apical part, and consequently needing a different approach.

Choosing a smaller tip size cone may not solve the problem, while choosing a smaller tapered cone may significantly increase the risk of iatrogenic errors like under filling and/or overextension of the cone through the apical foramen, because the tug-back in the coronal part does not allow correct apical cone fitting. Therefore the best and easiest solution is to choose TF/TFA gutta-percha cones that precisely fit the root canal preparation achieved by the TF/TFA instruments and allow ideal three-dimensional filling and good apical tug-back. In the alternative, a K3SF user could use both types of cones (the 0.04-0.06 cones and TF cones) because they will both nicely fit the root canal preparation in the apical and middle thirds.

Additional clinical tips for TF/TFA users
So far, dimensions and sizes have been discussed to help clinicians to understand problems in matching instruments and cones.

However, there are also clinical ways to try to solve problems that can be encountered during these procedures. These are tips that can be useful not only with TF/TFA but with many instrumentation techniques.

Create more coronal flaring. TF/TF cones are very efficient instruments and very good at lateral cutting. They are ideal instruments for all techniques that require breaking and/or circumferential filing.

Therefore, if a GP cones does not perfectly match the root ca