

Dental Sleep Medicine

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The sub specialty of Sleep Medicine is relatively new. The medical community is becoming more and more aware of the significant role that sleep disturbances play in our patient's general health. Physicians treating sleep disorders more clearly understand the relationship between sleep and chronic pain and appreciate the key role that sleep plays in healing from both micro trauma and macro trauma. Many have acknowledged a concern for the social problems associated with snoring. Most importantly a greater understanding of the serious co-morbidities of hypertension, myocardial infarctions, stroke, weight gain, diabetes, acid reflux (GERD), excessive daytime sleepiness leading to work and home injuries and motor vehicle accidents, and stroke associated with sleep disturbed breathing has made the treatment of these conditions a high priority.

Although there is still much about our sleep physiology that remains a mystery, the science of sleep medicine has improved dramatically in recent years. While, like any new science, there is much to be learned, the recent awareness and improvements in therapy have already led to an improved quality of life for many of our patients. Yet, ninety percent of those people with sleep disturbed breathing remain undiagnosed.

The role that dentistry can play in this critical field is extremely important. Because we as dentists tend to see our patients on a more regular basis than general physicians, it is very important that we learn to ask the right questions so that we can make the proper referrals. It is equally important that we as dentists avoid the pitfalls that can lead to improper therapy or a competitive environment with the very sleep physicians with whom we need to function in harmony in the best interest of our patients needs. Providing treatment for patients who snore without a complete and accurate diagnosis is problematic. Such therapy is no different than treating a patient's pain without understanding the underlying causes. If the snoring is resolved, the patient will then not seek further therapy. Consequently, his obstructive disorder will continue and he remains at risk for hypertension, stroke, and the other associated co-morbidities. This is an example of providing therapy without an accurate diagnosis and is akin to treating a patient for gingivitis without diagnosing the underlying bone loss. Of course the consequences of sleep disturbances are potentially more severe than tooth loss from underlying periodontitis.

This will be the first in a series of two installments to serve as an introduction to dental sleep medicine. This first article will review the basics of sleep medicine and will include an introduction to the classification of sleep disorders. The second installment will focus on treatment and dentistry's key role in providing a therapeutic option; in some cases the only viable option for the patient. In the third and final article, the physician/dentist relationship will be carefully evaluated, a brief historical review of dentistry's role in sleep medicine will be presented, and a discussion of the efficacy of oral appliance therapy as well as an important discussion of the treatment of bruxism will be included.

NORMAL SLEEP STAGES

Normal sleep is divided into two types: non-REM (NREM) and REM. REM stands for rapid eye movement. NREM sleep is divided into four distinct stages. Stages one through four each have their own characterizations based upon brain wave activity as recorded in an electroencephalogram. As one proceeds through the stages brain activity, as well as muscle tone, changes. A normal sleep pattern has four to five cycles throughout the night. NREM and REM sleep states alternate in cycles that usually last between ninety and one hundred and ten minutes. Normal NREM sleep occupies seventy five percent of the night and is characterized by a decrease in body temperature, blood pressure, breathing rate, and most physiologic functions. REM sleep is characterized by a highly active brain in an essentially paralyzed body.

As a result of this pattern, it is clear that normal sleep will present with specific relative time spent in each stage. Arousals (events that alter normal stage progression) will cause alteration of this normal architecture and are often responsible for sleep disturbances and hypersomnolence, which is defined as excessive daytime sleepiness. Arousals can be due to partial obstructions leading to snoring or difficult breathing, complete obstructions defined as apneas, or can have other non-obstructive causes such as pain, central apneas (stoppage of breathing due to lack of respiratory effort as opposed to an obstruction), involuntary body movements or some psychological causes.

NREM sleep is divided into four stages. Stage one sleep usually occupies approximately five percent of the sleep cycle and is represented by a relatively active brain wave pattern. Stage two is represented by active brain waves that include specific patterns call K complexes and sleep spindles. This stage usually occupies forty-five percent of the sleep cycle. Stages three and four combined are referred to as slow wave sleep. Earlier in sleep medicine these stages were often referred to as “Delta” sleep. These stages represent progressively deeper sleep, are identified by slow high amplitude brain waves, and usually occupy approximately twenty-five percent of the night’s pattern. These percentages do alter as the patient ages with slow wave sleep decreasing significantly in the sixth and seventh decade. Various medications have an effect on specific sleep stages as well.

REM sleep is characterized by rapid eye movement, irregular breathing, relative muscle paralysis, and a decrease in body temperature. It is when most of our dreaming occurs, and it occupies twenty to twenty five percent of the normal sleep cycle.

The gold standard for diagnosis of sleep disorders is the polysomnogram (PSG). This overnight study is done in sleep laboratories. Patients are monitored through the night. The PSG monitors brain waves (EEG’s to determine sleep stages), eye movements (EOG), muscle tone (EMG), nasal air flow, blood oxygen levels and respirations, cardiac data (EKG), respiratory effort, postural information, and the existence of snoring. From this study we can determine if there is an alteration in normal sleep architecture. The patient is monitored throughout the night and often videotaped. The sleep study is then scored and among the plethora of information received and calculated is the RDI

(respiratory disturbance index). The RDI represents the number of hypopneas (which has several definitions, the most common of which is a four percent drop in blood oxygen levels) plus apneas (universally described as total obstruction of air flow for ten seconds or longer) per hour. EMG's on leg muscles are used to evaluate the existence of periodic leg movements. Recently, placement of the surface EMG electrodes on the elevator musculature has allowed us to look more closely at parafunction.

CLASIFICATION OF SLEEP DISORDERS

Sleep disorders are classified as dysomnias and parasomnias. Dysomnias are disorders of initiating and maintaining sleep as well as disorders of excessive sleepiness. Examples of dysomnias are narcolepsy, insomnias, circadian rythm disorders (e.g. jet lag), and obstructive sleep disorders including sleep apnea. Parasomnias are undesirable physical phenomena that occur during sleep, such as sleep walking, nocturnal leg cramps, periodic leg movements, nightmares, and bruxism.

As dentists we are most involved with treatment for diagnosed obstructive disorders as well as the diagnosis and treatment of bruxism. Obstructive breathing disorders fall on a continuum beginning with snoring and including upper airway resistance syndrome, hypopnea with associated hypoxemia, and finally sleep apnea. An apnea is defined by the stoppage of breathing for ten seconds or more. If the stoppage of breathing is due to an obstruction in the airway, it is called an obstructive sleep apnea. Obstructive apneas are a result of the blockage of the airway, either at the junction of the oropharynx (soft palate and base of the tongue) or anywhere else in the pharyngeal area. When the blockage occurs in the pharynx due to muscular collapse at that site, the pharynx is said to be compliant. Most often obstructive apnea is a result of more than one site of obstruction. Central apnea refers to stoppage of breathing for ten seconds or longer not as a result of an obstruction but associated with the lack of respiratory effort. Central apneas, therefore, do not respond to oral appliance therapy.

Dentistry can play a major role in the treatment of obstructive disorders. An understanding of these disorders, the method of action of oral appliances as well as the potential dental and non-dental side effects of these oral appliances, will be the focus of next month's article.

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