Colorado Children's Ear Nose and Throat, P.C.

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Sleep Apnea

WHAT IS SLEEP APNEA?

General Description of Sleep Apnea and Snoring

Sleep apnea is a disorder in which a person stops breathing during the night, perhaps hundreds of times, usually for periods of 10 seconds or longer and sometimes for as long as a minute. In most cases the person is unaware of it, although sometimes they awaken and gasp for breath. It is usually accompanied by snoring. People who have sleep apnea may not even be aware of the condition, but it inevitably causes daytime sleepiness.

Sleep apnea is generally categorized as obstructive, central, or mixed. A less severe form of obstructed breathing called upper airway resistance syndrome (UARS) is also worth mentioning.

Obstructive Sleep Apnea

Obstructive sleep apnea (OSA), the most common form of apnea, occurs when tissues in the upper throat (or airway) collapse at intervals during sleep, thereby blocking the passage of air. In general, OSA occurs as follows:

- On its way to the lungs, air passes through the nose, mouth, and throat (known as the upper airway).
- Under normal conditions, the back of the throat is soft and pliant and tends to collapse inward as a person breathes.
- Certain muscles, called dilator muscles, work against this to keep the airway open. Interference or abnormalities in this process causes air turbulence.
- In some cases, the interference is incomplete (called obstructive *hypopnea*) and causes continuous but slow and shallow breathing. In response the throat vibrates and makes the sound of snoring. Snoring can occur whether a person breathes through the mouth or the nose. (It should be noted that snoring also occurs without sleep apnea.)
- If the tissues at the back of the throat collapse and become momentarily blocked, *apnea* occurs. (Apnea literally meaning absence of breath.)
- Apnea decreases the amount of oxygen in the blood, and eventually this lack of oxygen triggers the lungs to suck in air.

- At this point, the patient may make a gasping or snorting sound but does not usually fully wake up.

Central Sleep Apnea

Central sleep apnea is much less common. It is caused by some problem in the central nervous system, most likely a failure of the brain to signal the airway muscles to breathe. In such cases, oxygen levels drop abruptly and usually the sleeper wakes with a start. Often people with central sleep apnea recall waking up. They generally experience less sleepiness during the day than people with obstructive sleep apnea.

Mixed Apnea

Mixed apnea is the term used when the two apneas occur together.

Upper Airway Resistance Syndrome (UARS)

Upper airway resistance syndrome (UARS) is a condition in which patients complain about excessive daytime sleepiness and they may snore and wake frequently during the night. However, UARS patients do not have the breathing abnormalities that characterize sleep apnea and they do not show reduction in oxygen levels in the blood. Unlike apnea, UARS is more likely to occur in women than in men. Treatments are similar to those of sleep apnea. It is not known if UARS has any serious health complications.

HEALTHY SLEEP

Circadian Rhythm

In sleep studies, subjects spend about one-third of their time asleep, suggesting that most people need about eight hours of sleep each day. Individual adults differ in the amount of sleep they need to feel well rested, however. (Infants may sleep as many as 16 hours a day.)

The daily cycle of life, which includes sleeping and waking, is called a *circadian* (meaning "about a day") rhythm, commonly referred to as the biologic clock. Hundreds of bodily functions follow biologic clocks, but sleeping and waking comprise the most prominent circadian rhythm. The sleeping and waking cycle is approximately 24 hours. (If confined to windowless apartments, with no clocks or other time cues, sleeping and waking as their bodies dictate, humans typically live on slightly longer than 24-hour cycles.) It usually takes the following daily patterns:

- Humans are designed for daytime activity and nighttime rest.
- Additionally, there is a natural peak in sleepiness at mid-day, the traditional siesta time.

In addition, daily rhythms intermesh with other factors that may interfere or change individual patterns:

- The fraction-of-a-second-firing of nerve cells in the brain may be faster or slower in different individuals.

- The monthly menstrual cycle in women can shift the pattern.
- Light signals coming through the eyes reset the circadian cycles each day, so changes in season or various exposures to light and dark may unsettle the pattern. The importance of sunlight as a cue for circadian rhythms is dramatized by the problems experienced by people who are totally blind: they commonly have trouble sleeping and other rhythm disruptions.

The Response in the Brain to Light Signals

The response to light signals in the brain is an important key factor in sleep:

- Light signals travel to a tiny cluster of nerves in the hypothalamus in the center of the brain, the body's master clock, which is called the *supra chiasmatic nucleus* or SCN.
- This nerve cluster takes its name from its location, which is just above (*supra*) the optic chiasm. The optic chiasm is a major junction for nerves transmitting information about light from the eyes.
- The approach of dusk each day prompts the SCN to signal the nearby *pineal gland* (named so because it resembles a pine-cone) to produce the hormone melatonin.
- *Melatonin* is thought to act as the body's time-setting hormone. The longer a person is in darkness the longer the duration of melatonin secretion. Secretion can be diminished by staying in bright light. Melatonin also appears to serve as a trigger for the need to sleep.

Sleep Cycles

Sleep consists of two distinct states that alternate in cycles and reflects differing levels of brain nerve cell activity. During a normal night's sleep, one progresses through these stages about five or six times:

Non-Rapid Eye Movement Sleep (NonREM). NonREM sleep is also termed quiet sleep. NonREM is further subdivided into three stages of progression:

- Stage 1 (light sleep).
- Stage 2 (so-called true sleep).
- Stage 3 to 4 (deep "slow-wave" or delta sleep).

With each descending stage, awakening becomes more difficult. It is not known what governs NonREM sleep in the brain. A balance between certain hormones, particularly growth and stress hormones, may be important for deep sleep.

Rapid Eye Movement Sleep (REM). REM sleep is termed active sleep and is believed by some experts to be regulated by the circadian clock in the hypothalamus. Most vivid dreams occur in REM sleep. REM-sleep brain activity is comparable to that in waking, but the muscles are virtually paralyzed, possibly preventing people from acting out their dreams. In fact, except for vital organs like the lungs and heart, the only muscles not paralyzed during REM are the eye muscles. REM sleep may be critical for learning and for day-to-day mood regulation. When people are sleep-deprived, their brains must work harder than when they are well rested.

The REM/NonREM Cycle. The cycle between quiet (NonREM) and active (REM) sleep generally follows this pattern: