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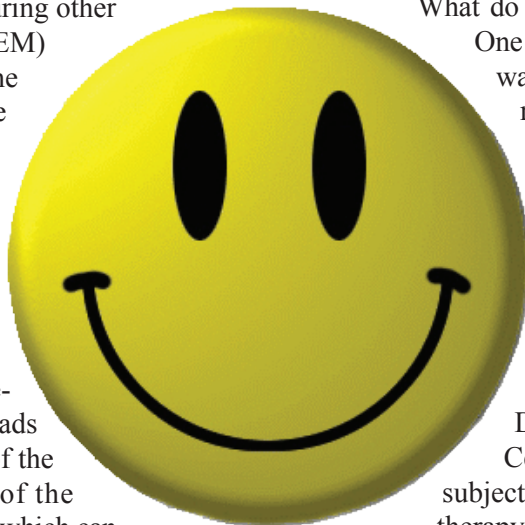


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REM Rebound with CPAP Therapy

Although dream imagery can occur during other stages of sleep, Rapid Eye Movement (REM) sleep is loosely known as dream sleep. The hallmarks of REM sleep are a low voltage mixed frequency EEG, low muscle tone, and bursts of rapid eye movements punctuated by periods when the eyes remain relatively motionless. Obstructive Sleep Apnea (OSA), typically characterized by snoring and stopping breathing during sleep, may often be quite pronounced during REM sleep. This is because the paralysis of REM sleep often leads to paralysis of the oropharyngeal aspect of the airway. This may lead to a worsening of the respiratory disturbance during REM sleep which can then lead to poor REM sleep quality. Over time this leads to the equivalent of chronic REM sleep deprivation. Once a patient is diagnosed with OSA and treatment is initiated with continuous positive airway (CPAP) therapy, normal sleep may then suddenly resume which may result in a temporary yet dramatic increase in the total amount of REM sleep. An impressive increase in the speed and density of eye movements may also occur, which is known as an increase in REM sleep phasic density. The initial use of CPAP therapy in a patient with OSA may result in the combination of a decreased time to enter REM sleep, an increase in the total duration of REM sleep, and an increase in the phasic density of REM sleep. This is known as REM sleep rebound.

Human sleep cycles are about ninety minutes in duration. REM sleep comes at the end of each sleep cycle. The duration of REM sleep during the first cycle is quite short, but the duration of REM sleep during subsequent cycles gradually increases, so that the last sleep cycle usually has the greatest amount of REM sleep. The density of rapid eye movements also tends to increase with each subsequent sleep cycle. As apneas and hypopneas during REM sleep tend to occur during the bursts of eye movements, during the time when both dream imagery and real body paralysis are most intense, the respiratory disturbance during late REM sleep tends to be more significant than in earlier sleep cycles.¹



What do we really know about REM sleep rebound? One study of twenty six patients with OSA was performed to determine the degree of REM rebound that would occur with the initial treatment with CPAP therapy. For these patients REM sleep time increased by 69% and REM density increased by 73%. The improvement in the respiratory disturbance index with CPAP therapy significantly correlated with increased minutes of REM sleep.² A study of 44 patients with OSA performed at the Sleep Disorders Center at Duke University Medical Center demonstrated that patients who noted a subjective improvement in sleep quality with CPAP therapy also showed a significant increase in the percentage of REM sleep ($P < 0.008$).³

What about REM sleep rebound in normal people who do not have OSA? A study of eight healthy young men was performed where REM sleep was deprived for three consecutive nights. This was done by monitoring the brainwaves of the sleeping subjects, and repeatedly awakening them as they entered REM sleep. During subsequent nights the number of sleep interruptions required to prevent REM sleep increased. Over all, REM sleep was reduced to 9.2% of baseline amounts and then rose to 140.1% of normal in the first recovery night. The authors concluded that the rising REM sleep propensity, as reflected by the increase of interventions within and across REM sleep deprivation nights, and the REM sleep rebound during recovery can be accounted for by a compensatory response that serves REM sleep homeostasis.⁴

In one more way CPAP therapy proves to be beneficial. Sweet dreams...

¹ [J Appl Physiol](#). 1991 Oct;71(4):1201-15

² [Sleep](#). 1989 Oct;12(5):413-9

³ [1389-9457](#). 2001 May;2(3):215-223

⁴ [Am J Physiol](#). 1998 Apr;274(4 Pt 2):R1186-94