Obstructive sleep apnea leads to upper airway collapsibility.

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Introduction

Obstructive Sleep Apnea (OSA) is a chronic respiratory disease that affects sleep. The pharyngeal airway narrows and becomes blocked periodically while you're sleeping, which is a symptom of obstructive sleep apnea. Long-term health effects of untreated obstructive sleep apnea include cardiovascular disease, metabolic disorders, cognitive decline, and depression. Excessive daytime drowsiness, weariness, restless sleep, nocturia, morning headache, irritability, and memory loss are typical symptoms. Untreated obstructive sleep apnea is also linked to decreased productivity, work-related mishaps, and fatal and seriously injured auto accidents. Untreated obstructive sleep apnea and sleep loss have high financial repercussions. The recommended treatment can ease symptoms and lessen some of the resulting side effects. Continuous positive airway pressure (CPAP), the first-line treatment for obstructive sleep apnea, is difficult for many patients, and adherence rates are still too low. Although upper airway surgery and oral appliance therapy are non-continuous positive airway pressure therapies, their effectiveness is variable and unexpected. New methods of treating obstructive sleep apnea are thus needed [1].

Yes, the majority of obstructive sleep apnea sufferers go undetected and untreated. In other circumstances, this can be a result of, at least in part, a lack of knowledge about the illness. Access to polysomnography (PSG) and diagnostic services, perceived lack of enthusiasm with regard to available treatment options, and, in some cases, worry that driving privileges will be suspended are additional potential barriers to seeking treatment. These factors are particularly prevalent in remote communities and the developing world. Additionally, general practitioners might not be encouraged to consider an early diagnosis of obstructive sleep apnea. This is particularly true for people who do not initially exhibit subjective drowsiness or the usual signs of a high body mass index. The presence of a comorbid illness, which is common in those with obstructive sleep apnea, may also be the cause of symptoms like exhaustion or sleepiness [2].

Upper airway collapsibility

The measurement of upper airway collapsibility while sleeping is done using the well-established Pharyngeal Critical Closing Pressure (Pcrit) technique. When describing variations in upper airway collapsibility across the range of sleep disturbed breathing, pharyngeal critical closing pressure has been used (from snoring to obstructive sleep apnea 80). It is regarded as the gold standard method for measuring "functional anatomy" while you are asleep. The pharyngeal airway can be inspected while having less neuromuscular input than when awake thanks to the Pharyngeal Critical Closing Pressure approach. Following the establishment of a therapeutic continuous positive airway pressure level that avoids airway obstruction or narrowing, stable sleep is achieved by applying brief (5 breaths) reductions in the holding pressure. This process is continued at various mask pressure settings until airflow is limited and the mask closes. Peak inspiratory flow for breaths with flow limitations and the related mask pressure have a similar pressure-flow relationship. To calculate the "Pharyngeal critical closing pressure," or the mask pressure at no airflow, these numbers are extrapolated. Pharyngeal critical closure pressure measurements within an individual are consistent across time (days to months). However, it would be expected that conditions like prolonged weight growth would make airways more susceptible to collapsing [3].

Pharyngeal critical closure pressure readings for individuals with obstructive sleep apnea typically fall close to ambient pressure. This suggests that during sleep, their airway closes at or close to 0 cmH2O. However, pharyngeal critical closure pressure varies greatly in people with obstructive sleep apnea, making them more prone to pharyngeal collapse anatomically. In fact, in cases of obstructive sleep apnea, the pharyngeal critical closure pressure can range from roughly -5 to more than +5 cmH2O. Since suction pressure is needed to seal the upper airway while you sleep, a Pharyngeal critical closing pressure at or around +5 cmH2O implies a very collapsible airway, whereas a sub-atmospheric value indicates a moderately stable upper airway. In patients with Pharyngeal Critical Closing Pressure values less than 5 cmH2O, obstructive sleep apnea is extremely uncommon. However, there is a significant overlap in Pharyngeal Critical Closing Pressure between individuals with and without obstructive sleep apnea within the sub-atmospheric range (0 to 5 cmH2O). In fact, compared to persons without obstructive sleep apnea, 20% of obstructive sleep apnea patients experience similar pharyngeal collapsibility during sleep. In this group, obstructive sleep apnea pathogenesis is greatly influenced by the combination between mild anatomical susceptibility and impairment in one or more of the non-anatomical causes of obstructive sleep apnea. When compared to individuals with extremely high Pharyngeal Critical Closing Pressure, these patients are more likely to benefit from tailored non-continuous positive airway pressure therapy [4].

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Therefore, a straightforward measurement of airway collapsibility would be invaluable to guide targeted treatment decisions given the critical role that upper airway anatomy/ collapsibility plays in obstructive sleep apnea pathogenesis. The Pharyngeal Critical Closing Pressure Technique is technically difficult, somewhat invasive (requires continuous positive airway pressure and ideally a pharyngeal pressure catheter), time-consuming, and requires skilled personnel to gather and analyse the data. This poses a problem because the technique is not clinically viable [5].

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