

Obstructive Sleep Apnea and Stroke

By Monica Roselli, assistant editor of A₂Zzz

Ischemic stroke (or acute stroke) is the second leading cause of long-term disability. Many who suffer from ischemic stroke also have obstructive sleep apnea (OSA). Currently, ischemic stroke treatment therapies have a very limited therapeutic window and aren't widely applicable to most patients. The treatment of OSA in patients with acute ischemic stroke is now being looked to as a novel, therapeutic approach to preventing stroke.

Pathogenesis of Sleep Apnea

According to a paper published in the *American Journal of Respiratory and Critical Care Medicine*, "Central sleep apnea is generally the product of an unstable ventilatory control system (high loop gain) with increased controller gain (high hypercapnic responsiveness) generally being the cause." OSA is generally caused by physiologic characteristics, primarily those that impact the airway.

Linking Sleep Apnea to Stroke

As mentioned in the 2019 AAST Annual Course presentation, "Obstructive Sleep Apnea and Stroke: Evidence, Mechanisms, and Treatment Strategies," due to sleep inconstancies during the night, patients with OSA appear to be at a greater risk for developing diurnal (daytime) hypertension. Those with an increased severity of sleep apnea have an increased risk of developing hypertension. Patients with moderate to severe sleep apnea are at a greater risk (two to three times more likely) for developing hypertension over time. Hypertension is the most prevalent risk factor for stroke.

Consequences of Sleep Apnea

In addition to an increased risk of developing hypertension, patients with sleep apnea are susceptible to:

- Neuro-cognitive dysfunction
- Drowsiness-related accidents
- Cardiovascular and metabolic morbidity and mortality

The question at hand is does sleep apnea cause stroke or does a stroke lead to obstructive sleep apnea?

Stroke Epidemiology

According to the American Heart Association's [2017 statistics report](#) on heart disease and stroke, stroke is the second leading cause of death worldwide and the third leading cause of death in the United States. In the United States alone, strokes cost an estimated \$34

billion each year, which includes the cost of acute and chronic health care services, medicines and missed days of productivity.

Sleep Apnea and Stroke Patients

As mentioned by Dr. Henry Klar Yaggi during the "Obstructive Sleep Apnea and Stroke: Evidence, Mechanisms, and Treatment Strategies" presentation, there are not many studies available directly related to sleep apnea and stroke. Most studies are smaller and cross-sectional, however, the studies available show that there is a 60-80% prevalence of sleep apnea among patients who have had a previous stroke.

The question at hand is does sleep apnea cause stroke or does a stroke lead to obstructive sleep apnea? There are biologic mechanisms, such as bulbar dysfunction, where a stroke can cause sleep apnea. However, there are biologic pathways that support the idea that sleep apnea causes strokes, as it is associated with transient ischemic attack (TIA).

Other confounding contributing issues are obesity and weight gain, which carry a triad of other cardiovascular and cerebral vascular issues.

Mechanisms by Which Sleep Apnea May Confer Stroke Risk

As referenced in "Obstructive Sleep Apnea and Stroke: Evidence, Mechanisms, and Treatment Strategies," some of the key influences where sleep apnea can cause cardiovascular and/or cerebral vascular risk are:

- Intermittent hypoxia in OSA
- Nocturnal sympathetic activation
- Mechanical load
- Sleep loss and metabolic dysregulation

Mechanisms that can specifically increase stroke risk:

- Association of OSA and atrial fibrillation
- Patent Foramen Ovale (PFO)
- Individual obstructive respiratory events that can reduce cerebral blood flow
- Snoring and carotid artery atherosclerosis

Treatment Need

There is a need for acute stroke treatments. Current therapies are not widely applicable to most patients. Patients who have had a TIA or minor stroke are ideal candidates for preventive treatment of recurrent vascular events. With the high prevalence of OSA patients having strokes, these patients may be an ideal target for new treatments. 🌙

Research Studies on Sleep Apnea and Stroke

1. Chronic Observational Studies
2. Marin, J, Carrizo, S, Vicente, E, Agusti, A. Long-term cardiovascular outcomes in men with obstructive sleep apnoea-hypopnoea with or without treatment with continuous positive airway pressure: An observational study. *Lancet*. 2005. [https://doi.org/10.1016/S0140-6736\(05\)71141-7](https://doi.org/10.1016/S0140-6736(05)71141-7)
3. Martinez-Garcia, M et al. Continuous Positive Airway Pressure Treatment Reduces Mortality in Patients with Ischemic Stroke and Obstructive Sleep Apnea. *AJRCCM*. 2009. <https://doi.org/10.1164/rccm.200808-1341OC>
4. Long-term Randomized Controlled Trials
5. Barbé, F et al. Effect of Continuous Positive Airway Pressure on the Incidence of Hypertension and Cardiovascular Events in Nonsleepy Patients With Obstructive Sleep Apnea: A Randomized Controlled Trial. *JAMA*. 2012;307(20):2161-2168. doi:10.1001/jama.2012.4366
6. Emin, M et al. Increased internalization of complement inhibitor CD59 may contribute to endothelial inflammation in obstructive sleep apnea. *STM*. 2016. DOI: 10.1126/scitranslmed.aad0634
7. McEvoy, RD et al. CPAP for Prevention of Cardiovascular Events in Obstructive Sleep Apnea. *NEMJ*. 2016;375:919-31. DOI: 10.1056/NEJMoa1606599.
8. Mokhlesi, B et al. Obstructive sleep apnoea during REM sleep and incident non-dipping of nocturnal blood pressure: A longitudinal analysis of the Wisconsin Sleep Cohort. *Thorax*. 2015. doi:10.1136/thoraxjnl-2015-207231
9. Peker, Y et al. Effect of Positive Airway Pressure on Cardiovascular Outcomes in Coronary Artery Disease Patients with Nonsleepy Obstructive Sleep Apnea: The RICCADSA Randomized

Controlled Trial. *AJRCCM*. 2016. <https://doi.org/10.1164/rccm.201601-00880C>



MONICA ROSELLI is the assistant editor of *A₂Zzz*

Purchase AAST's Recording Bundles for Additional Education

Interested in hearing more from previous AAST speakers? You can earn up to 12.5 CECs with our 2019 Annual Meeting Recording Bundle. These recordings including topics on women's sleep needs, parasomnias, the impact of telemedicine on sleep, and more. To learn about this offer, visit aastweb.org.