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Study finds reduced brain gray matter concentration in patients with severe obstructive sleep apnea

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A study in the Feb. 1 issue of the journal *SLEEP* found gray matter concentration deficits in multiple brain areas of people with severe obstructive sleep apnea (OSA). The study suggests that the memory impairment, cardiovascular disturbances, executive dysfunctions, and dysregulation of autonomic and respiratory control frequently observed in OSA patients may be related to morphological changes in brain structure.

Results indicate that in newly diagnosed men with severe OSA, gray matter concentrations were significantly decreased in multiple brain areas, including limbic structures, prefrontal cortices and the cerebellum. Optimized voxel-based morphometry, an automated processing technique for magnetic resonance imaging (MRI), was used to characterize structural differences in gray matter by examining the entire brain, rather than a particular region.

"Gray matter" refers to the cerebral cortex, where most information processing in the brain takes place. It is a layer of tissue that coats the surface of the cerebrum and the cerebellum and is gray in appearance, lacking the myelin insulation that makes most other parts of the brain appear to be white.

Principal investigator Seung Bong Hong, MD, PhD, professor of neurology at the Samsung Medical Center in Sungkyunkwan University

School of Medicine in Seoul, South Korea, said the study emphasizes the importance of diagnosing and effectively treating severe OSA.

"Poor sleep quality and progressive brain damage induced by OSA could be responsible for poor memory, emotional problems, decreased cognitive functioning and increased cardiovascular disturbances," said Hong. "The use of continuous positive airway pressure - CPAP - therapy could stop further progression of brain damage in patients with severe OSA."

The study involved 36 male OSA patients with an average age of 44.7 years and 31 healthy, male, age-matched controls. Sleep was evaluated by overnight polysomnography. The OSA patients had a mean apnea-hypopnea index (AHI) of 52.5 partial and complete breathing pauses per hour of sleep; an AHI of more than 30 is considered severe OSA. Patients with OSA also had more awakenings from sleep and a more fragmented sleep structure than controls.

Surprisingly, gray matter concentration was decreased in OSA patients without significant changes in gray matter volume. According to the authors, frequent episodes of nocturnal hypoxemia and hypercarbia induce vasodilation and disturbances in the autoregulation of the brains of OSA patients. Therefore, changes in the brain volume of OSA patients may be obscured by increased cerebral blood volume or whole brain water content from OSA-induced changes in autoregulation.

According to the American Academy of Sleep Medicine, OSA is a sleep-related breathing disorder that involves a decrease or complete halt in airflow despite an ongoing effort to breathe. It occurs when the muscles relax during sleep, causing soft tissue in the back of the throat to collapse and block the upper airway. This leads to partial reductions (hypopneas) and complete pauses (apneas) in breathing that can produce abrupt reductions in blood oxygen saturation. Most people with OSA snore

loudly and frequently, and they often experience excessive daytime sleepiness. The treatment of choice for OSA is CPAP therapy, which provides a steady stream of air through a mask that is worn during sleep. This airflow keeps the airway open to prevent pauses in breathing and restore normal oxygen levels.

The authors noted that more research is needed to determine if gray matter concentration loss occurs as a consequence of sleep apnea, or if preexisting abnormalities may contribute to the development of the disorder.

More information: "Reduced Brain Gray Matter Concentration in Patients with Obstructive Sleep Apnea Syndrome," journal *SLEEP*.

Provided by American Academy of Sleep Medicine