What is the connection between sleep apnea, stroke and death?

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Summary:

Obstructive sleep apnea decreases blood flow to the brain, elevates blood pressure within the brain and eventually harms the brain's ability to modulate these changes and prevent damage to itself. The findings may help explain why people with sleep apnea are more likely to suffer strokes and to die in their sleep.

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Obstructive sleep apnea decreases blood flow to the brain, elevates blood pressure within the brain and eventually harms the brain's ability to modulate these changes and prevent damage to itself, according to a new study published by The American Physiological Society. The findings may help explain why people with sleep apnea are more likely to suffer strokes and to die in their sleep.

Sleep apnea is the most commonly diagnosed condition amongst sleep-related breathing disorders and can lead to debilitating and sometimes fatal consequences for the 18 million Americans who have been diagnosed with the disorder. This study identifies a mechanism behind stroke in these patients.

The study, "Impaired cerebral autoregulation in obstructive sleep apnea" was carried out by Fred Urbano, Francoise Roux, Joseph Schindler and Vahid Mohsenin, all of the Yale University School of Medicine in New Haven, Connecticut. It appears in the current issue of the Journal of Applied Physiology.

During sleep apnea episodes, the upper airway becomes blocked, hindering or stopping breathing and causing blood oxygen levels to drop and blood pressure to rise. The person

eventually awakens and begins breathing, restoring normal blood oxygen and blood flow to the brain.

Ordinarily, the brain regulates its blood flow to meet its own metabolic needs, even in the face of changes in blood pressure -- a process known as cerebral autoregulation. This study found that the repeated surges and drops in blood pressure and blood flow during numerous apnea episodes each night reduces the brain's ability to regulate these functions.

Condition a health risk

Up to 4% of the population suffers from obstructive sleep apnea. In a previous study, Dr. Mohsenin and his colleagues showed that people with sleep apnea are three times more likely to suffer a stroke or die, compared to people in a similar state of health but without sleep apnea.

"After we found that sleep apnea is a risk factor for stroke and death, independent of other risk factors, we hypothesized that there must be something wrong with the regulation of blood flow to the brain," Dr. Mohsenin said. Participants included people with severe sleep apnea who experienced more than 30 apneas an hour during sleep time. The participants were about 47 years old, were free of cardiac disease and had not experienced any strokes. The study also included a control group which did not have sleep apnea but was similar in most other ways.

The researchers monitored the participants' blood pressure while standing and squatting. Standing from a squatting position lowers blood pressure as can be experienced during normal daily activity. They also monitored the participants as they slept. The study found that the sleep apnea group:

- had lower cerebral blood flow velocity
- had significantly lower blood oxygen levels during sleep
- took longer to recover from a drop in blood pressure
- took longer to normalize blood flow to the brain

Identification is key

Overall, the findings indicate that repeated surges and drops in blood pressure and low oxygen levels eventually impair the body's ability to regulate blood flow to the brain. Sleep apnea may occur over a long period of time before the person becomes aware of it and seeks medical treatment. Here are the symptoms Dr. Mohsenin says to watch out for:

- After eight hours of sleep, you don't feel rested. During the day, you feel more and more tired, and by afternoon, you want to nap.
- You experience loud, habitual snoring that disturbs others.

- Your bed partner observes pauses in your breathing.

The treatment of obstructive sleep apnea with an airway pressurization mask has been shown to normalize cerebral autoregulation, although there are not yet any studies to show that it reduces the rate of stroke. Those who are being treated for sleep apnea should remain compliant with treatments, according to Dr. Mohsenin, including use of

- air pressurization mask or CPAP
- nasal inserts
- dental appliances
- weight reduction for the obese

In some cases, surgery may be advised.

https://www.sciencedaily.com/releases/2009/01/090106100009.htm

Stroke and Sleep Apnea

Stroke is a cardiovascular disease and is the brain equivalent of a heart attack. For your brain to function, it needs a constant blood supply bringing oxygen and nutrients to the brain cells. If the blood vessels burst, if they are narrowed by disease or blocked by a blood clot then the blood flow is obstructed and the brain cells don't receive the required oxygen or nutrients. Without oxygen and nutrients, the brain cells are damaged or die.

Stroke carries a high risk of death, depending on the type of stroke. A 'mini stroke' or Transient ischemic attack, where symptoms resolve in less than 24 hours, has the best outcome. Survivors of stroke can experience loss of vision and/or speech, paralysis and confusion depending on the part of the brain that is affected, how widespread the damage is and how healthy the person was before the stroke. Having had one stroke significantly increases risk of having another.

People with sleep apnea experience a number of symptoms that may predispose them to stroke, like repetitive drops in oxygen levels during the night which places stress on the heart

and brain, and an increase in sympathetic nervous system activity leading to the narrowing of blood vessels, increased heart rate and hypertension. Hypopneas and apneas are known to cause death of brain cells from lack of oxygen[5] and hypertension is a major risk factor for stroke. Treating hypertension can reduce the risk of stroke by 40%.[1]

Stroke has the potential to cause sleep apnea, depending on the part of the brain affected by stroke. Some types of stroke affect the control of breathing while other types of stroke can compromise the function of muscles that control the tongue and soft palate.

Since these muscles hold the upper airway open, this loss of muscle function can result in obstructive sleep apnea.

Stroke patients with untreated sleep apnea have a significant disadvantage in the struggle to recover from stroke. Daytime sleepiness, fatigue and impaired memory and concentration associated with sleep apnea, combined with the effects of stroke are likely to make stroke rehabilitation more difficult. Untreated sleep apnea in stroke patients is associated with higher death rates at one year and poor functional outcomes in survivors.[6]

Treating sleep apnea with CPAP will reduce the apneas and hypopneas associated with the drops in oxygen that can place stress on the heart and brain. It will reduce blood pressure, the main risk factor for stroke, significantly reducing the chances of suffering a stroke[7]. Treating sleep apnea has also been shown to reduce the risk of new problems occurring with the blood vessels[8] and is known to improve quality of life[6] and reduce the stroke mortality rate.[9]

References:

1. World Health Organisation, The Atlas of Heart Disease and Stroke
http://www.who.int/cardiovascular_diseases/resources/atlas/en/

2. Yaggi et al. 2005, N Engl J Med 2005;353:2034-41.

3. Shahar E et al. Am J Respir Crit Care Med 2001;163:19-25

4. Bassetti et al. Sleep. 1999

5. Bassetti C, Aldrich MS. Sleep Apnoea in Acute Cerebrovascular Diseases: Final Report on 128 Patients. Sleep 1999;22(2):217-23

6. Good DC, Henkle JQ, Gelber D, Welsh J, Verhulst S. Sleep-Disordered Breathing and Poor Functional Outcome After Stroke. Stroke 1996:27(2):252-9.

7. Parr O, Arboiz A, Bechich S, Garcia-Eroles L, Montserrat JM, Lopez JA, Bassester E, Guerra JM, Sopena JJ. Time Course of Sleep Related Breathing Disorders. Am J Respir Crit Care Med 2000;161:375-380.

8. Martinez-Garcia MA et al. *Chest* 2005;128 :2123-9