

The Restoration Effect of Sleep Apnea After Stroke on Behaviors and Pathophysiology Using Animal Model

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Background

The intermittent hypoxia (IH) of sleep apnea (SA) increase sympathetic activity and blood pressure, and SA cause the risk of nighttime stroke onset increased. Moreover, SA in stroke patients increase the risk of recurrent stroke and the longer hospitalization. However, the lower adherence rate of continuous positive airway pressure (CPAP), which is treatment for SA, in stroke patients improve the poststroke outcome is not clear.

Aims & Objectives

This study aimed to show the importance of restoration of SA after stroke and explore the change of physiological parameters, blood pressure, sleep pattern and brain wave.

Methods

All WKYs experienced continuous IH for two weeks (8 hours/day, 30 times/hour) and then middle cerebral artery occlusion (MCAO) next day, and rats were randomly divided into one group with IH (IH-IH group) and the other group with room air (IH-RA group) for one week after MCAO. The control group experienced RA throughout the experiments. Simultaneously, physiological signals were recorded, and sensorimotor behavior was performed. After sacrifice, the infarct size was assessed by 2% triphenyl tetrazolium chloride.

Results

Compared to IH-IH group, the change of mean arterial pressure after MCAO in IH-RA group was less, and the baroreflex sensitivity in IH-RA group was lower than IH-IH group. Moreover, the high frequency power (HF) that parameter represents parasympathetic activity in IH-RA group was higher than IH-IH group. The heart sympathetic parameter, which is normalized low frequency power (LF%), in IH-RA group was lower than IH-IH group, but the vascular sympathetic parameter, which is low frequency power of blood pressure variability (BLF), was not different in three group. In sleep patterns, the accumulated time and number of active waking and interruption of sleep in IH-RA group after MCAO were lower than IH-IH group. Furthermore, the total sleep time and accumulated time of paradoxical sleep in IH-RA group after MCAO were higher than IH-IH group. The adhesive test, which is sensorimotor behavior test, showed the contact and removal time of left forelimb in IH-RA group were lower than IH-IH group after MCAO. After sacrifice, the infarct volume of brain in IH-RA group is less than IH-IH group.

Discussion & Conclusion

Combination of SA and stroke would cause severer autonomic dysfunction, brain damage and sensorimotor deficits. While recovering from SA after stroke, the parasympathetic activity, heart sympathetic activity, sleep patterns, behavior and brain damage were improved. This study indicated the importance of SA recovery after stroke that recovery regulates the autonomic dysregulation and unstable sleep, and these physiological parameters possibly relate with stroke outcome.