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Rifampicin attenuates spatial memory deficits induced by transient global ischemia/reperfusion in male Wistar rats

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Background: Stroke remains the leading cause of death and disability worldwide. This fact highlights the need to search for potential drug agents that can reduce stroke-related brain damage. Rifampicin is an antibacterial agent that is widely used in tuberculosis and leprosy therapy. Recent studies have found that rifampicin has neuroprotective properties in neurodegenerative diseases. In this study, we investigate the effect of rifampicin on spatial memory deficits, neuronal damage and also evaluate mitochondrial changes caused by ischemia/reperfusion (I/R) in rats.

Materials & Methods: In this experimental study, 32 male Wistar rats were randomly assigned to four groups that included control, I/R, experimental and vehicle groups. We used the rat common carotid artery occlusion model for 20 minutes to mimic global transient cerebral I/R. The Morris water maze (MWM) test was performed for neurobehavioral testing, and histological changes of hippocampal pyramidal cells in CA1 region were investigated by using Nissl staining. Mitochondrial toxicity parameters such as ROS formation, mitochondrial membrane potential (MMP) collapse, mitochondrial swelling, ATP level and cytochrome C release, antioxidant defense system such as parmalondialdehyde (MDA) content and activities of SOD and GSH-Px, were determined in brain.

Finding: The MWM results showed significant differences between control and I/R groups either in the distance (P=0.027) or in time (P=0.049) while these differences were not significant between control and experimental groups (P=1/000, P=0/673 respectively). There was a significant difference in the number of viable pyramidal neurons in CA1 region of hippocampus between control and experimental groups compared with I/R group. Our results also showed that mitochondrial damages, impairment of antioxidant defense system in IR group were significantly higher than in the Control and vehicle groups. Rifampicine decreased mitochondrial damage through reducing oxidative stress, lipid peroxidation and augmented the activities of antioxidant enzymes studied in the brain of IR

Conclusion: Our study indicated that rifampicin administration significantly improved spatial learning ability and may reduce cognitive impairment .These results also confirm the role of mitochondrial dysfunction and oxidative stress in the development of ischemia and reperfusion so it may be a candidate for the treatment of brain damage following I/R.

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