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The Protective Role of Verbenalin in Rat Model of Focal Cerebral Ischemia Reperfusion

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ABSTRACT

To investigate the protective mechanism of verbenalin on cerebral ischemia-reperfusion injury. Middle cerebral artery occlusion in the left hemisphere was induced in rats by filament insertion, and rat model of focal cerebral ischemia-reperfusion was established. The high, medium and low dose of verbenalin groups were injected in the tail vein of corresponding drugs 10 minutes before reperfusion, and submitted for 22 hours of reperfusion after the operation. Mortality rate was then calculated, and neurological deficits of rats were scored. The serum of rats was got to determine the S-100β protein level, and the brain tissue was removed to determine the levels of Bax, Bcl-2, Caspase-3 and ATPase. TTC staining was performed on the brain tissue to calculate the percentage of cerebral infarct size. Changes in brain tissue morphology were observed. Rat model of focal cerebral ischemia-reperfusion was successfully replicated. In groups that have taken different doses of verbenalin, the mortality rate, neurological deficit score and the percentage of cerebral infarction size were significantly reduced, and the levels of Bax, Caspase-3, S-100β level of the serum in the brain tissue were also significantly reduced. Increases in the levels of Bcl-2 and ATPase in brain tissue and improvement of pathological damage of hippocampus and cortex were observed. Verbenalin can inhibit the expression of apoptosis genes, promote the expression of anti-apoptosis genes, improve brain microcirculation and energy metabolism, hence reducing cerebral ischemia-reperfusion injury.

Keywords: Verbenalin; Focal Cerebral Ischemia-Reperfusion; Apoptosis

1. INTRODUCTION

Effective ingredients in traditional Chinese medicine and a single herb medicine can be used to prevent or cure various diseases on multiple procedures and multiple targets through multiple channels. Success has been observed in reducing cerebral ischemia-reperfusion injury, indicating Chinese medicine's advantages in the area. "Huoxue Huayu (promoting blood circulation to dispel blood stasis)"is a common method to prevent and treat cerebral ischemic injury in clinical practices, and its remarkable effect has been widely acknowledged. "Qingre Jiedu (clearing heat and detoxification)" is a new approach in traditional Chinese medicine to prevent and treat cerebral ischemic injury. Chinese medicine and modern medicine share insights and mechanisms on cerebral ischemic injury in microcirculation and clinical research. Huoxue Huayu medicine focus on improving the brain circulation, protect neurons and remove free radicals while Qingre Jiedu medicine focus on alleviating inflammation, activating self-protection mechanism of brain cells and reducing cerebral ischemic secondary reaction. The combination of Huoxue Huayu and Qingre Jiedu medicine to prevent and treat cerebral ischemia-reperfusion injury provide the best combination point for traditional Chinese medicine and modern medicine in clinical practices. Preliminary studies have proved the positive effect of traditional Chinese medicine with effects of promoting blood circulation and detoxification such as turmeric, rabdosia rubescens, Ilex pubescens, Campsis grandiflora, bidens grass, motherwort in treating cerebral ischemic injury (Gohar et al., 2017; Ishaq and Jafri, 2017).