Original Paper

Protective effect of Adenosine A1 receptor and ascorbic acid on hippocampal neuronal density and memory disorder in ischemia reperfusion induced Rats

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Abstract

Background and Objective: Brain ischemia is one of the most important factor of morbidity and mortality and leaving many people with mental and physical disabilities. Until now there are no appropriate medications to prevent and cure ischemic injury. This study was done to evaluate the protective effect of Adenosine A1 receptor and ascorbic acid on hippocampal neuronal density and memory disorder in ischemia reperfusion induced Rats.

Materials and Methods: This experimental study was performed on the hippocampus pyramidal neurons on 56 male BALB/c mice. Animals randomly allocated into 8 groups (N=7) including: 1) intact, 2) ischemic control group, 3) ischemic, plus agonist and adenosine of A1 receptor, 4) ascorbic acid (100 mg/daily), 5) ischemic plus agonist adenosine receptor (1 mg/1 kg) one week after ischemia, 6) ischemia, ascorbic acid before and after ischemia and A1 receptor (1 mg/1 kg) agonist after ischemia, 7) A1 receptor antagonist (2.25 /1 kg), one week after ischemia, 8) Ascorbic acid (100 mg/1kg) before and after ischemia plus A1 receptor antagonist (2.25 / 1 kg) after ischemia. Ischemia induced by clamping of common carotid artery and the drugs was injected subsequently into peritoneum after reduction of inflammation of ischemic zone. The Y-maze memory test performed after completing the treatment period, afterward brains fixed and prepared for microscopic nissl staining method. The counting of pyramidal cells were performed at 53500 square micrometer of CA1. Data were analyzed using SPSS-15 and ANOVA test.

Results: The Y-maze test showed extensive deficit in short-term memory in ischemic group (PA=200) but in treatment groups this deficit significantly reduced (PA=243, 248 and 265). The normal neuronal cell in ischemic group was significantly lowered (n=87) than treatment groups (n=111, 105 and 125) including ascorbic acid group (125), adenosine receptor agonist (105) and ascorbic acid plus agonist adenosine receptor (111). The number of normal neuronal cell in ischemic groups significantly is reduced compared to treatment group (P<0.05).

Conclusion: This study showed that concurrent treatment of ascorbic acid and Adenosine A1 receptor agonist can significantly reduce the complications caused by brain ischemia in CA1 area of hippocampus.

Keywords: A1 receptor, Agonist, Ascorbic acid, Ischemia, Neuroprotective

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