Immunohistochemical and Electron Microscopic Investigation of the Effect of Brain Injury Tissue Extract to Injured Cerebral Cortical Neurons of Adult Rats

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The fundamental cause of regeneration failure after brain injury is that the injury causes death of large amount of neurons and that the capability of regeneration of neurons are low. Neurotrophic factors (NTFS) have the effect of maintaining survival of injured neurons and facilitating growth of the processes. In the injured brain tissue extract there is NTF activity. We used light microscope combining immunohistochemical and electron microscopic quantitative methods to observe the effect of the injured brain tissue extract (BWTE) on the injury of adult rat cerebral cortical neurons.

In this experiment 38 adult SD rats were chosen, 20 for Nissl stain light microscopic observation, 10 for electron microscopic observations and 8 for neurofilament immunohistochemical experiment. Within 2 months after injury of the adult rat parietal cortex, experiment group was given brain injured tissue extract fluid repeatedly into the injured cavity, control group animals were added equivalent amount of Hanki fluid. The results found were: (1) In the experiment group, the number of neurons that survived in the injured parietal cortex was higher than that of the control group (1198.1±83.76 and 1038.9±103.45 cells/mm², P<0.001). (2) The experimental group had an marked increase of neurons with enlarged cell body than that of the control group (25.8±12.9 and 9.9±4.4 cells / mm², P<0.02). The neurons with enlarged cell body had thick and large apical dendrites, in its cytoplasm and dendrites there were full of neurofilaments. (3) Electron microscopic quantitative observation found that the experimental group had an increased density of mitochondria when compared with control group (0.3521±0.0378 and 0.2671±0.0717μm⁻³, P<0.005), soma density increased (0.0671±0.0099 and 0.0502±0.001μm⁻³, P<0.005), surface density increased (0.4415±0.0351 and 0.3671±0.0445μm⁻¹, P<0.02). It was also found that there was an increase of the density of rough endoplasmic reticulum in the injured parietal cortex in the experimental group when compared with control (0.7063±0.1112 and 0.5310±0.0846μm⁻¹, P<0.05). Also it could be seen that the experimental group had more isolated nucleoprotein than the control.

The experimental results indicate that injured brain tissue extract fluid could raise the number of mitochondria of the injured parietal cortical neuron, increase mitochondria membrane surface area and volume, and also increase surface area of rough endoplasmic reticulum membrane. It indicates that the brain injured tissue extract strengthens the metabolic activities of the injured neurons. From the above results it suggests BWTE maintains and facilitates the survival and growth of injured cortical neurons in parietal lobe of adult rat.