

Apoptosis, Paraptosis, Necrosis, and Cell Regeneration in Posttraumatic Cerebral Arteries

L. Danaila¹, I. Popescu², V. Pais¹, D. Riga³, S. Riga³, E. Pais⁴

¹Department of Neurosurgery, National Institute of Neurology and Neurovascular Diseases, Bucharest, Romania

²Department of General Surgery and Liver Transplantation "Dan Setlacec", Fundeni Clinical Institute, Bucharest, Romania

³Department of Stress Research and Prophylaxis, Al. Obregia Clinical Hospital of Psychiatry, Bucharest, Romania

⁴Spectral Molecular Imaging Inc., Los Angeles, CA, USA

Abstract

This study is to understand the nature and functional significance of the activated cell death programs and rehabilitation signs during late vascular changes after brain injury. We used light and transmission electron microscopy to describe changes of cells within the vascular endothelium and tunica media of the cortical arteries four weeks after craniocerebral traumatism. Within tunica media of the posttraumatic damaged artery, apoptotic and paraptotic phenotypes were identified as well as some early ultrastructural signs of smooth muscle cells regeneration, these cell highlighting a remarkable degree of plasticity. Surprisingly, some endothelial cells showed an extensive rough endoplasmic reticulum development, whereas other endothelial cells showed typical necrosis. In conclusion, two groups of suicidal cells – apoptotic and paraptotic cells – were encountered in the same lesional vascular wall after neurotrauma, showing also signs of cell regeneration. The pathophysiologic significance of the coexisting double cell death programs and cell regeneration seems to be in relation with late cell survival, after arterial damage when some cells disappear and other cells try to survive undergoing reversible injury.

Key words: posttraumatic cerebral arteries, apoptosis, paraptosis, necrosis, cell regeneration, ultrastructure

Corresponding author: L. Danaila, MD

Department of Neurosurgery

National Institute of Neurology and Neurovascular Diseases, Bucharest,
Romania

E-mail: leondanaila@neuroch.info