Experimental reconstruction of the injured spinal cord

A. HEJCL\textsuperscript{1,2,3}, P. JENDELOVÁ\textsuperscript{1,2}, E. SYKOVÁ\textsuperscript{1,2}

\textsuperscript{1} Institute of Experimental Medicine, Academy of Sciences of the Czech Republic, Prague, Czech Republic
\textsuperscript{2} Department of Neuroscience and Center for Cell Therapy and Tissue Repair, 2nd Faculty of Medicine, Charles University, Prague, Czech Republic
\textsuperscript{3} Department of Neurosurgery, Purkinje University, Masaryk Hospital, Usti nad Labem, Czech Republic

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Abstract

Injury to the spinal cord, with its pathological sequelae, results in a permanent neurological deficit. With currently available tools at hand, there is very little that clinicians can do to treat such a condition with the view of helping patients with spinal cord injury (SCI). On the other hand, in the last 20 years experimental research has brought new insights into the pathophysiology of spinal cord injury; we can divide the time course into 3 phases: primary injury (the time of traumatic impact and the period immediately afterwards), the secondary phase (cell death, inflammation, ischemia), and the chronic phase (scarring, demyelination, cyst formation). Increased knowledge about the pathophysiology of SCI can stimulate the development of new therapeutic modalities and approaches, which may be feasible in the future in clinical practice. Some of the most promising experimental therapies include: neurotrophic factors, enzymes and antibodies against inhibitory molecules (such as Nogo), activated macrophages, stem cells and bridging scaffolds. Their common goal is to reconstitute the damaged tissue in order to recover the lost function. In the current review, we focus on some of the recent developments in experimental SCI research.

Keywords: Spinal cord injury; neurotrophic factors; stem cells; scaffold; activated macrophages; myelin inhibitory molecules.

Introduction

Spinal cord injury (SCI) is one of the unresolved issues in today’s neurosurgery and in medicine in general. Despite enormous progress in surgical techniques since the first clinical description of this condition in the Edwin Smith Papyrus from the 16th century BC [9], including spinal cord decompression and spine