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Lentivirus carrying the NeuroD1 gene promotes the conversion from glial cells into neurons in a spinal cord injury model

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Highlights

- An endogenous method of treating spinal cord injury is proposed.
- This method relies on reprogramming reactive glial cells into neural stem cells and neurons in vivo, by up-regulating NeuroD1.
- The recovery of the spinal cord injury is reviewed from both kinesiological and morphological aspects.

Abstract

In this study, we aimed to reprogram reactive glial cells into neural stem cells and neurons in vivo, by up-regulating NeuroD1. 60 rats were randomly divided into three groups with equal numbers. All rats received a spinal cord injury. Group A received only normal saline injection. Group B received unloaded lentivirus injection. Group C received NeuroD1 recombinant lentivirus injection. The BBB scores of the animals were documented at 3, 7, 14, 21 days after SCI. 5 random rats of each group were removed at those timings after SCI and sacrificed. In the spinal cord slices, the numbers and morphology of neural stem cells, immature neurons and mature neurons were examined after immunohistochemical staining. Except day 3 after SCI, the BBB scores of group C on days 7, 14 and 21 were significantly higher than the other two groups ($P<0.05$). Compared with the group A and B, a remarkable increase was noticed in the number of positive cells in the group C ($P<0.05$). These findings suggest that NeuroD1 up-regulated cells can be reprogrammed into neural stem cells, immature and functional neurons. It may be possible to replace neurons after injury by endogenous means, as a first step toward spinal cord repair.

Keywords NeuroD1, conversion, glial cell, neuron, spinal cord injury