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Article *in* Neural Regeneration Research · December 2013

DOI: 10.3969/j.issn.1673-5374.2013.36.001 · Source: PubMed

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NEURAL REGENERATION RESEARCH
Volume 8, Issue 36, December 2013

www.nrronline.org

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Najafzadeh N, Nobakht M, Pourheydar B, Golmohammadi MG. Rat hair follicle stem cells differentiate and promote recovery following spinal cord injury. Neural Regen Res. 2013;8(36):3365-3372.

Rat hair follicle stem cells differentiate and promote recovery following spinal cord injury*

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Abstract

Emerging studies of treating spinal cord injury (SCI) with adult stem cells led us to evaluate the effects of transplantation of hair follicle stem cells in rats with a compression-induced spinal cord lesion. Here, we proposed a hypothesis that rat hair follicle stem cell transplantation can promote the recovery of injured spinal cord. Compression-induced spinal cord injury was induced in Wistar rats in this study. The bulge area of the rat vibrissa follicles was isolated, cultivated and characterized with nestin as a stem cell marker. 5-Bromo-2′-deoxyuridine (BrdU) labeled bulge stem cells were transplanted into rats with spinal cord injury. Immunohistochemical staining results showed that some of the grafted cells could survive and differentiate into oligodendrocytes (receptor-interacting protein positive cells) and neuronal-like cells (βIII-tubulin positive cells) at 3 weeks after transplantation. In addition, recovery of hind limb locomotor function in spinal cord injury rats at 8 weeks following cell transplantation was assessed using the Basso, Beattie and Bresnahan (BBB) locomotor rating scale. The results demonstrate that the grafted hair follicle stem cells can survive for a long time period *in vivo* and differentiate into neuronal- and glial-like cells. These results suggest that hair follicle stem cells can promote the recovery of spinal cord injury.

Key Words

neural regeneration; spinal cord injury; cell transplantation; cell therapy; hair follicle stem cells; oligodendrocytes; nerve cells; glial cells; receptor-interacting protein; grants-supported paper; neuroregeneration

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Received: 2013-09-25
Accepted: 2013-11-09
(NY20120914001)

Acknowledgments: We would like to thank Mahmoudian M, Sharifi M and Rahbar Roushandel N (Department of Pharmacology, Iran University of Medical Sciences, Tehran, Iran) for providing useful equipments.

Funding: This study was financially supported by a grant from Iran University of Medical Sciences (Tehran–Iran), No. 531.

Author contributions: Najafzadeh N was responsible for study conception and design, data collection, assembly, analysis and interpretation and paper writing. Nobakht M was in charge of study conception and design, data collection, assembly and interpretation. Pourheydar B participated in study conception and design, and data collection and assembly. Ghasem MG was also responsible for data collection and analysis and revised the paper. All authors

INTRODUCTION

About 2.5 million people all over the world suffer from spinal cord injury, with more than 130 000 cases added each year[1]. Contusive injury with subsequent compression is the most common type of spinal cord injury, resulting in neuronal and glial cell death and the demyelination of surviving axons[2]. Unfortunately, there has been no comprehensive approach for the treatment of spinal cord injury[3]. Studies are underway to develop strategies to restore structure and function of the damaged spinal cord[2, 4]. Cell therapy plays a major role in the promotion of axonal growth and neuronal replacement in spinal cord injury[5], Alzheimer's disease[6], Parkinson's disease[7] and other central nervous system-related degenerative diseases[8-9]. Transplantation of peripheral nerve[10-11], fetal tissue[12], olfactory ensheathing glia[13],