More attention on glial cells to have better recovery after spinal cord injury

Sajad Hassanzadeh [a,b,*], Maryam Jalessi [a], Seyed Behnamedin Jameie [b,c], Mehdi Khanmohammadi [a], Zohre Bagher [d], Zeinab Namjoo [e], Seyed Mohammad Davachi [f]

[a] *Skull Base Research Center, Hazrat Rasoul Hospital, The Five Senses Health Institute, Iran University of Medical Sciences, Tehran, Iran*
[b] *Neuroscience Research Center (NRC), Iran University of Medical Sciences, Tehran, Iran*
[c] *Department of Medical Basic Sciences, Faculty of Allied Medicine, Iran University of Medical Sciences, Tehran, Iran*
[d] *ENT and Head & Neck Research Center and Department, The Five Senses Health Institute, Hazrat Rasoul Akram Hospital, Iran University of Medical Sciences, Tehran, Iran*
[e] *Department of Anatomical Sciences, School of Medicine, Ardabil University of Medical Sciences, Ardabil, Iran*
[f] *Department of Food Science, College of Agriculture and Life Sciences, Cornell University, Ithaca, NY, USA*

Abstract:

Functional improvement after spinal cord injury remains an unsolved diffculty. Glial scars, a major component of SCI lesions, are very effective in improving the rate of this recovery. Such scars are a result of complex interaction mechanisms involving three major cells, namely, astrocytes, oligodendrocytes, and microglia. In recent years, scientists have identifed two subtypes of reactive astrocytes, namely, A1 astrocytes that induce the rapid death of neurons and oligodendrocytes, and A2 astrocytes that promote neuronal survival. Moreover, recent studies have suggested that the macrophage polarization state is more of a continuum between M1 and M2 macrophages. M1 macrophages that encourage the inflammation process kill their surrounding cells and inhibit cellular proliferation. In contrast, M2 macrophages promote cell proliferation, tissue growth, and regeneration. Furthermore, the ability of oligodendrocyte precursor cells to differentiate into adult oligodendrocytes or even neurons has been reviewed. Here, we frst scrutinize recent fndings on glial cell subtypes and their benefcial or detrimental effects after spinal cord injury. Second, we discuss how we may be able to help the functional recovery process after injury.

Keywords:
Spinal cord injury, A1 astrocyte, A2 astrocyte, OPCs, M1 and M2 macrophages