

Review Article

The role of stem cell therapy in multiple sclerosis: An overview of the current status of the clinical studies

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Abstract

The complexity of multiple sclerosis (MS) and the incompetence of a large number of promised treatments for MS urge us to plan new and more effective therapeutic approaches that aim to suppress ongoing autoimmune responses and induction of local endogenous regeneration. Emerging data propose that hematopoietic, mesenchymal, and neural stem cells have the potential to restore self-tolerance, provide *in situ* immunomodulation and neuroprotection, as well as promote regeneration. Thus, in this article, we will first provide an overview of the cell sources for proposed mechanisms that contribute to the beneficial effects of stem cell transplantation, the ideal route and/or timing of stem cell-based therapies for each main stem cell group, and finally, an overview of the current status of stem cell research in clinical trial stages in MS by comparable and healthy therapeutic effects of different stem cell therapies for MS patients.

Key Words: Cell therapy and transplantation, clinical trial, hematopoietic stem cells, mesenchymal stem cells, multiple sclerosis, neural stem/precursor cells, stem cells

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INTRODUCTION

Multiple Sclerosis (MS) is an autoimmune and neurodegenerative disease of the central nervous system (CNS). In autoimmune etiology, there is a prevailing theory in which oligodendrocytes are

believed to be permanently damaged by CD4+ T-cells, CD8+ T-cells, and macrophages.^[1] In MS patients, autoreactive CD4 T-cell penetration of the CNS leads to myelin injury and inflammatory responses and scarring of white matter, which can lead to severe disability and neurological defects.^[1] MS progression following demyelination typically pursues one of four courses: Relapsing-remitting MS (RRMS), secondary progressive MS (SPMS), primary progressive MS (PPMS) and progressive-relapsing MS (PRMS). To date, the effectiveness of disease-modifying drugs has been approved only in a limited number of MS patients, especially in the relapsing forms of PRMS,^[2,3] and the apparent repair-promoting activity of these drugs has not yet been reported, due to partial inhibitory effect on disease progression.

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