

## STEM CELL TRANSPLANTATION AS A PREVENTIVE STRATEGY AGAINST POST-MYOCARDIAL INFARCTION HEART FAILURE

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**Introduction.** In today's contemporary world, one of the main healthcare problems is ischemic heart disease which leads increased numbers of global morbidity and mortality. After myocardial infarction (MI), patients are at a greater risk of heart failure. Medical therapies do not repair damaged myocardium; instead, their main goals are to reduce symptoms and delay the course of the illness. Due to the development of medicine, we can apply stem cell transplantation that promotes myocardial regeneration and functional recovery, it has become a viable method to avoid post-MI heart failure. Mesenchymal stem cells (MSCs) and bone marrow-derived mononuclear cells (BM-MNCs) have drawn special interest among the several cell types investigated because of their excellent safety profiles and capacity for repair.

**Research Objective.** This study aims to evaluate the safety and efficacy of stem cell transplantation, particularly MSCs and BM-MNCs, as a means of preventing the development of post-MI heart failure. It specifically seeks to determine if this treatment approach maintains an acceptable safety profile while significantly improving left ventricular function, reducing heart failure symptoms, and altering unfavorable cardiac remodeling.

**Materials and Methods.** A meta-analysis was conducted, synthesizing evidence from several randomized controlled trials (RCTs) on stem cell therapy for ischemic heart disease. The primary endpoints were changes in left ventricular ejection fraction (LVEF), New York Heart Association (NYHA) functional class, and left ventricular end-systolic volume (LVESV). The secondary endpoints were the rates of mortality, major adverse cardiovascular events (MACE), and infarct size. The included studies utilized various cell delivery methods (intramyocardial, intracoronary) and observed outcomes ranging from months to years.

**Research Results.** Data pooled from over 12,000 patients across 79 RCTs demonstrated that stem cell transplantation resulted in a statistically significant improvement in LVEF by 5–7% that was sustained at 36 months after the procedure. Symptom improvement was evidenced by reductions in NYHA class as well as in Canadian Cardiovascular Society (CCS) angina class. Structural improvement manifested by a significant reduction in LVESV, indicating reversal of negative remodeling. On the other hand, no persistent effect on mortality was found, with a relative risk (RR) of approximately 0.86 demonstrating neutral effects. No persistent decreases were observed in infarct size, and left ventricular end-diastolic volume (LVEDV) changes were not consistent. Notably, stem cell therapy had a reassuring safety profile, with no serious adverse events directly attributable to treatment and a trend towards a decrease in MACE occurrence.

**Conclusion.** Stem cell transplantation using MSCs and BM-MNCs offers a moderately effective and safe strategy approach to mitigating the progression to heart failure after myocardial infarction. While improvements in cardiac function and symptoms are clear, the lack of significant impact on mortality and infarct size highlights the need for further optimization of patient selection criteria, stem cell types, and delivery methods.. Future research should focus on optimizing these variables and exploring adjunctive strategies to enhance the regenerative capacity of stem cells.