Human mesenchymal stem cells improve myocardial performance in a splenectomized rat model of chronic myocardial infarction

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摘要

Abstract

Background/Purpose: Cellular therapy has been applied to animal studies and clinical trials for acute or subacute myocardial infarction. Little is known about the effect of cell therapy on chronic myocardial infarction. The goal of this study was to investigate myocardial performance after human bone marrow-derived mesenchymal stem cell (hMSCs) transplantation in rats with chronic myocardial infarction. Methods: The hMSCs were obtained from adult human bone marrow and expanded in vitro. The purity and characteristics of hMSCs were identified by flow cytometry and immunophenotyping. Splenectomy in male rats was performed to prevent immune reaction. One week after splenectomy, ligation of the left anterior descending coronary artery was performed to induce myocardial infarction. Four weeks after ligation of the coronary artery, culture-expanded hMSCs were injected intramyocardially at the left anterior free wall. Left ventricular function measured by echocardiography, infarct size and immunohistochemical stain were performed to evaluate the effect of the therapy. Results: The engrafted hMSCs were positive for the cardiac marker troponin T. Infarct size (35.4 ± 3.4% vs. 53.3 ± 3.0%, $p < 0.001$) and fibrotic area (2.6 ± 0.1% vs. 5.9 ± 0.2%, $p < 0.001$) were significantly smaller in the hMSC-treated group than in the control group at 28 days after therapy. hMSC transplantation resulted in smaller left ventricular end-diastolic dimension (6.5 ± 0.1mm vs. 7.9 ± 0.7 mm, $p < 0.001$) and better left ventricular ejection fraction (88.7 ± 1.2% vs. 65.8 ± 2.5%, $p < 0.001$) than in the control group. Capillary density was markedly increased after hMSC transplantation compared with the control

group. Conclusion: This study demonstrates that intramyocardial transplantation of hMSCs improves cardiac function after chronic myocardial infarction through enhancement of angiogenesis and myogenesis in the ischemic myocardium. Transplantation of hMSCs for myocardial regeneration may become the future therapy for chronic myocardial infarction. [J Formos Med Assoc 2008;107(2):165–174]