Stem cell therapy in ischemic heart disease

Julia N. E. Sunkomat and Mohamed A. Gaballa

The University of Arizona Sarver Heart Center, Section of Cardiology, Tucson, Arizona, USA

Keywords: Angiogenesis — Cardiac therapy — Coronary heart disease — Heart failure — Myoblasts — Myocardial ischemia — Myocardial regeneration — Stem cells.

ABSTRACT

Coronary artery disease (CAD) remains the leading cause of death in the Western world. The high impact of its main sequelae, acute myocardial infarction and congestive heart failure (CHF), on the quality of life of patients and the cost of health care drives the search for new therapies. The recent finding that stem cells contribute to neovascularization and possibly improve cardiac function after myocardial infarction makes stem cell therapy the most highly active research area in cardiology. Although the concept of stem cell therapy may revolutionize heart failure treatment, several obstacles need to be addressed. To name a few: 1) Which patient population should be considered for stem cell therapy? 2) What type of stem cell should be used? 3) What is the best route for cell delivery? 4) What is the optimum number of cells that should be used to achieve functional effects? 5) Is stem cell therapy safer and more effective than conventional therapies? The published studies vary significantly in design, making it difficult to draw conclusions on the efficacy of this treatment. For example, different models of ischemia, species of donors and recipients, techniques of cell delivery, cell types, cell numbers and timing of the experiments have been used. However, these studies highlight the landmark concept that stem cell therapy may play a major role in treating cardiovascular diseases in the near future. It should be noted that stem cell therapy is not limited to the treatment of ischemic cardiac disease. Non-ischemic cardiomyopathy, peripheral vascular disease, and aging may be treated by stem cells. Stem cells could be used as vehicle for gene therapy and eliminate the use of viral vectors. Finally, stem cell therapy may be combined with pharmacological, surgical, and interventional therapy to improve outcome. Here we attempt a systematic overview of the science of stem cells and their effects when transplanted into ischemic myocardium.