Extended Abstract Journal of Cell and Developmental Biology 2020
Vol.4 No.3

12th World Congress and Expo on Stem Cell Research _Stem and Progenitor Cell Therapies for Cardiovascular Disease_ Christopher Sequeira _ Department of Medicine, College of Medicine, University of Florida_ Gainesville_ USA

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Adult stem and progenitor cells have shown reparative potential in pre-clinical models of ischemia and infarction. These discoveries in conjunction with increased incidence and prevalence of heart disease and few new classes of pharmacologic agents for cardiovascular disease have paved the way for numerous clinical trials of stem and progenitor cell therapy for acute myocardial infarction and congestive heart failure. Nearly all trials have demonstrated safety and feasibility of stem cell therapies for cardiovascular disease. Many have suggested that injected cells patient populations, result in improved clinical outcomes. The future of cell therapy for heart disease will involve questions pertaining to patient populations, timing of therapy, cell population utilized, imaging techniques to assess efficacy and methods of cell delivery.

A large number of clinical trials have shown that stem cell therapy is a promising therapeutic approach for the treatment of cardiovascular disease. Since the first transplantation in human patients, several types of stem cells have been applied in this field, including stem cells derived from bone marrow, cardiac progenitors as well as embryonic stem cells and their derivatives. However, the results of clinical studies are inconsistent and the improvement in cardiac performance and cardiac remodeling based on stem cells has been shown to be quite limited. In order to optimize the effectiveness of stem cells, it is essential to elucidate the underlying mechanisms mediating the beneficial effects of stem cell transplantation. Based on these mechanisms, researchers have developed different enhancement strategies to increase the potency of stem cell repair and to generate the “next generation” of stem cell therapies. In addition, since cardiovascular disease is a complex disorder comprising multiple disease patterns and pathological mechanisms, it can be difficult to provide a uniform therapeutic intervention for all patient subgroups. Therefore, future strategies should aim for more personalized SC therapies in which individual disease parameters influence the selection of the optimal cell type, dosage, and delivery approach. Recently, the uses of stem and progenitor cells for cardiac repair have been put to clinical test. The aim of this review is to summarize recent trials, discuss various stem cell types and proposed mechanisms of action, examine various methods of stem cell delivery and consider future directions for this relatively new and promising approach.

In the field of cardiac regeneration, skeletal myoblasts were the first cell type to be tested in both preclinical and clinical trials. Myoblasts are derived from satellite cells, a population of progenitor cells located below the basal lamina of skeletal muscle fibers. Following muscle injury, satellite cells mobilize, proliferate, differentiate and eventually fuse into new muscle fibers . The use of skeletal myoblasts for cardiac regeneration has been motivated due to their easy accessibility from autologous muscle biopsies, rapid in vitro expansion, resistance to ischemic conditions, myogenic capacity, and low risk of tumorigenicity. A large number of research groups have extensively evaluated the performance of these cells for the treatment of ischemic and non-ischemic cardiomyopathies in various small and large animal models, including rodent, sheep, dog and pig. These studies demonstrated that skeletal myoblasts are able to differentiate into myotubes, decreased myocardial fibrosis, attenuated ventricular remodeling, and improved myocardial performance.

This work is partly presented at 12th World Congress and Expo on Stem Cell Research July 15-16, 2020.