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Translational Medicine

Commentary

An Therapeutic Approch towards Cellular Cardiomyoplasty by Using Progenitor Cell Lines

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DESCRIPTION

The cardiac regenerative medicine fields have focused on cellular cardiomyoplasty, myocardial tissue engineering, and myocardial regeneration as alternative approaches to produce whole organ transplantation, which involves direct injection of stem cells. The progenitor cells are used to restore sections of damaged or necrotic myocardium is known as cellular cardiomyoplasty, also known as cell-based cardiac repair, and it is a novel therapeutic approach. The transplanted progenitor cells can improve function within the failing heart. The Left Ventricular Ejection Fraction (LVEF) and other markers do not have significant difference between groups of patients who underwent cellular cardiomyoplasty in of patients. Mostly the patients undergo Percutaneous Coronary Intervention (PCI) after having a myocardial infraction, and progenitor cell infusion took place 2-3 weeks after the intervention. However, more positive results were being produced. The treated people with autologous cardiac stem cells post myocardial infraction have been reported to be showing statistically significant increases in Left Ventricular Ejection Fraction (LVEF) and reduction in infarct size after four months of implantation. Positive results are appeared after one-year. Efficacy of using these particular cells is high although they have a limited capacity to produce new cardiomyocytes. Therefore now raise concerns to continue. The ideal progenitor cells have not been found or created. With the goal of recreating human tissue, the use of Embryonic Stem Cells (ESC) was the initial logical choice but these pluripotent cells can conceptually give rise to any somatic cell line in the human like restoration of cardiac function, immunologic rejection issues and teratoma formation have rendered ESC's a high risk.

Human-induced Pluripotent Stem Cells (iPSCs) are a cell line derived from somatic cells which have been induced through a combination of transcription factors. The induced pluripotent stem cells line is very similar or identical to ESCs in many regards and also shows great promise in cardiac potential. This cell line, however, it is also less than ideal in that cell type, where it has been unable to mature into a homogeneous cell culture, making it immunogenic and teratogenic. A third cell line that shows great promise and has no known safety concerns is the adult stem cell derived from bone marrow or from cardiac tissue explants. This finally concludes that adult stem cells do have cardiogenic potential. Presently, the success of adult stem cells in regenerating human myocardium is just a fraction of what it could be. Three major challenges have been observed during cardiomyoplasty. Adult stem cells exhibit a minimal commitment to engraft into the damaged myocardium, they have low survival rates and they have limited proliferation. The positive effects observed in clinical trials today are a result of the work of donated stem cells that persist in the damaged myocardium for just days to weeks after delivery. Clearly, if the cell survival is prolonged, these effects could be greatly enhanced. This is where a majority of research is being done today and several methodologies hold great promise in celluar cardiomyoplasty.

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