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Possible therapeutic use of stem cells in wide spectrum of pathologies

Context: The promising field of regenerative medicine is working to restore structure and function of damaged tissues and organs. The adult heart represents an attractive candidate for cell-based technologies. While there is a wealth of preclinical and clinical data showing the safety, feasibility, and efficacy of stem cells in adults with acute myocardial infarction and heart failure, less is known about possible implementation of stem cell therapy in infants and children with heart failure due to dilated cardiomyopathy and pulmonary arterial hypertension. The challenges facing cardiac stem cell therapy are multiple. There are uncertainties around the destiny of stem cells after their injection into the blood stream. In particular, it regards migration and homing of implanted cells in the target tissues. As yet unclear is the possible role of sympathetic nervous system in the context of osteoreflexotherapy. There is still no definitive answer to the question on which is the preferred type of stem cells to be used for transplantation in different settings. Since 2008, when we first used autologous bone marrow-derived mononuclear cells (BM-MNCs) in patient with acute myocardial infarction, we have investigated the use of stem cells not only for myocardial regeneration in adults and pediatric patients, but also in adult patients with diabetes mellitus and osteoarthritis.

Aim: Aim of this study is to determine the role of BM-MNCs in management of wide spectrum of pathologies, including critically ill pediatric patients, adult patients with acute myocardial infarction & heart failure and adult patients with osteoarthritis.

Design, Settings & Participants: Two patients (9 and 15 years old) with trisomy 21 and severe pulmonary arterial hypertension due to uncorrected large ventricular septal defects received intrapulmonary BM-MNCs implantation. Radionuclide scintigraphy showed improvement of lungs vascularization during 36 months follow-up. Seven patients (four months–17 years) with dilated idiopathic cardiomyopathy received intra myocardial BM-MNCs injections. During follow-up (up to seven year), we observed improvement of left ventricular ejection fraction (LVEF), decrease of left ventricular end diastolic dimension by echocardiography and cardio-thoracic index at chest X-ray exams, reduction of serum brain-natriuretic peptide serum levels and decrease of the stage of heart failure from stage IV to stage I, by NYHA classification. No peri-procedural harmful side effects were observed. We performed BM-MNCs intracoronary infusion in 101 adult patients with acute myocardial infarction with reduced LVEF and in 14 patients with chronic heart failure. Our results showed statistically significant improvement in LVEF at 12 months. We also infused BM-MNCs to the pancreas directly via branches of splenic artery or superior pancreaticoduodenal artery; we have performed single intra-articular BM-MNCs injections in 70 patients with knee or hip joint osteoarthritis (stage II–III). No adverse effects after the BM-MNC injection were observed. Preliminary analysis showed decrease in pain and other symptoms and statistically significant improvement by clinical scoring system using different questionnaires.

Conclusions: The results are promising and we suggest that BM-MNCs might be used for the stabilization of the adult and pediatric patients to improve symptoms and outcomes or serve as a bridge for heart or lung transplantation or delay joint replacement surgery. It also could be recommended in cases if other more traditional treatment options fail or contraindicated.

Biography

Aris Lacis is a Cardiac Surgeon and Professor. He completed his MD, PhD and Graduation at Riga Medical Institute. He was a General and Thoracic Surgeon at P. Stradina University Hospital in Riga (1964-1969); Thoracic and Cardiac Surgeon at Latvian Centre for Cardiovascular Surgery (1969-1994). From 1994-2012, he was the Head of Pediatric Cardiology and Cardiac Surgery Clinic at University Children's Hospital, Riga and; since 2012, he has been a Consulting Professor of this Clinic. He is a Vice President of Latvian Society for Cardiovascular Surgery and; President of Latvian Association for Pediatric Cardiologists. He is an Author of 395 scientific publications, three monographs and 13 patents. He is an Investigator in more than 10 clinical trials including cardio surgical procedures performed under deep hypothermia and hybrid procedures etc.

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