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Abstract 22

Stem Cell therapy following acute myocardial infarction. Comparative studies with Adipose Tissue-Derived Stem Cells and Bone Marrow-Derived Stem Cells

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Background The myocardium has a poor ability to regenerate after myocardial infarction. Studies have shown effect of stem cell transplantation (mainly bone marrow-derived stem cells) after myocardial infarction, with paracrine activity and neovascularisation playing an important role.
Adipose tissue-derived stem cells have been shown to be able to differentiate in an endothelial direction and have shown effect in stem cell treatments. This may depend on the fact that adipose tissue-derived stem cells, like bone marrow-derived stem cells, are of embryonal mesodermal origin. Adipose tissue-derived stem cells are easily available in large numbers and this has made adipose tissue-derived stem cells a potential alternative source of stem cells in the treatment of myocardial infarction.
Hypoxia during culture can affect stem cell proliferation, differentiation and paracrine activity.

Hypotheses Human adipose tissue-derived stem cells and bone marrow-derived stem cells are equally affected by hypoxic culture conditions, regarding proliferation, differentiation in an endothelial direction and secretion of growth factors. Hypoxic preconditioned human adipose tissue-derived stem cells and bone marrow-derived stem cells can equally improve left ventricular function after acute myocardial infarction in rats.

Materials and methods The stem cells will be cultured under different oxygen tensions and proliferation will be monitored by DNA quantification using PicoGreen. Paracrine activity will be measured using ELISA kits (VEGF, IGF-1 and HGF) and real time qPCR (VEGF, IGF-1 and Sfrp2). Endothelial differentiation will be evaluated by real time qPCR (VEGF-R2, vWF and CD31), a tube formation assay and intracellular calcium measurements by a Fura-2A based method. The functional effect of human stem cell transplantation after myocardial infarction will be studied by echocardiography, BNP measurements and histology, in a rat model of heart failure following acute myocardial infarction.

Perspectives The study will increase knowledge of hypoxic preconditioning of stem cells and the use of adipose tissue-derived stem cells in the treatment of myocardial infarction.