Magnet helps target transplanted iron-loaded cells to key areas of heart

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Optimal stem cell therapy delivery to damaged areas of the heart after myocardial infarction has been hampered by inefficient homing of cells to the damaged site. However, using rat models, researchers in France have used a magnet to guide cells loaded with iron oxide nanoparticles to key sites, enhancing the myocardial retention of intravascularly delivered endothelial progenitor cells.

The study is published in a recent issue of *Cell Transplantation* (21:4), now freely available online.

"Cell therapy is a promising approach to myocardial regeneration and neovascularization, but currently suffers from the inefficient homing of cells after intracavitary infusion," said Dr. Philippe Menasche of the INSERM U633 Laboratory of Surgical Research in Paris. "Our study was aimed at improving and controlling homing by loading human cord-blood-derived endothelial progenitor cells (EPCs) for transplant with iron oxide nanoparticles in order to better position and retain them in the hearts of myocardial-injured test rats by using a subcutaneously implanted magnet."

The researchers found that the cells were sufficiently magnetic to be able to be remotely manipulated by a magnet subsequent to implantation.

According to the researchers, an objective assessment of the technique to enhance the homing of circulating stem cells is the ability to track their fate in vivo. This was accomplished by visualization with MRI.

"We found a good correlation between MRI non-invasive follow-up of the injected cells and immunofluoresence or quantitative PCR data," said Dr. Menasche. The researchers concluded that further studies were needed to follow cell homing at later time points. They noted that the magnitude of homing they experienced may have been reduced by the relatively small number of cells used, owing to their large size and the subsequent risk of coronary thrombosis.

"In a rat model of myocardial infarction, this pilot study suggested homing of circulating stem cells can be improved by magnetic targeting and warrants additional benchwork to confirm the validity of concept," said Dr. Menasche. "There is also a need to optimize the parameters of targeting and assess the relevance of this approach in a clinically relevant large animal model."

"This study highlights the use of magnets to target transplanted cells to specific sites which could increase their regenerative impact. Factors to still be extensively tested include confirming the safety of the cells containing the magnetic particles and whether this process alters the cell's abilities" said Dr. Amit N. Patel, director of cardiovascular regenerative medicine at the University of Utah and section editor for Cell Transplantation.

More information: Chaudeurge, A.; Wilhelm, C.; Chen-Tournoux, A.; Farahmand, P.; Bellamy, V.; Autret, G.; Ménager, C.; Hagège, A.; Larghéro, J.; Gazeau, F.; Clément, O.; Menasché, P. Can Magnetic Targeting of Magnetically Labeled Circulating Cells Optimize Intramyocardial Cell Retention? *Cell Transplant.* 21 (4):679-691; 2012.

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