Engineered stem cells may limit heart attack damage, improve function

July 20 2010

Implanting tiny plastic scaffolds seeded with genetically engineered stem cells reduced organ damage and led to better cardiac function after a heart attack, according to an animal study presented at the American Heart Association's Basic Cardiovascular Sciences 2010 Scientific Sessions - Technological and Conceptual Advances in Cardiovascular Disease.

The study was designed to help determine what role cytokines - substances secreted by cells that have an effect on other cells - might play following a heart attack, said lead Matthias Siepe, M.D., lead author, assistant professor and staff surgeon at the Department of Cardiovascular Surgery, Medical University Center in Freiburg, Germany.

The researchers implanted five groups of 10 rats each with tiny polyurethane scaffolds seeded with different genetically engineered stem cells. Three groups received cells that overproduced one of three cytokines: hepatocyte growth-factor (HGF), stromal cell-derived factor 1 (SDF-1) or vascular endothelial growth factor (VEGF); one group received a gene called Akt1 associated with several cytokine pathways, and the fifth group received scaffolds seeded with unmodified stem cells, Siepe said. Five more groups were injected with the same types of modified and unmodified stem cells without the plastic scaffolding. An 11th group, the control group, received a sham operation, he said. A sham procedure is similar but omits a key therapeutic element of the treatment or procedure under investigation.

During six weeks of follow-up, the researchers observed significant improvements in blood pressure function in the rats implanted with scaffolds seeded with stem cells modified to overproduce Akt1, SDF-1 and HGF. There was no functional change in the group that received scaffolds containing VEGF-modified stem cells, he said.

In comparison, there was a decrease in blood pressure function in the control group that got the sham procedures. And, blood dynamics were stable in rats that received scaffolds with unmodified stem cells. In addition, two therapies - SDF-1 and Akt1 overproduction - seemed to limit cardiac damage from the heart attack, Siepe said.

Provided by American Heart Association