Cell therapy using patient's own bone marrow may present option for heart disease

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Cell therapy may present an option for patients with ischemic heart disease to use their own bone marrow cells to repair the damaged areas of their hearts, and may pave the way for future treatment options, according to the FOCUS trial, which will be presented as a late-breaking clinical trial March 24 at the 61st annual American College of Cardiology (ACC) scientific session.

This is the largest study to date to look at stem cell therapy, using a patient's own stem cells, to repair damaged areas of the heart in patients with chronic ischemic heart disease and left ventricular dysfunction. Researchers found that left ventricular ejection fraction (the percentage of blood leaving the heart's main pumping chamber) increased by a small but significant amount (2.7 percent) in patients who received stem cell therapy. The study also revealed that the improvement in ejection fraction correlated with the number of progenitor cells (CD34+ and CD133+) in the bone marrow; and this information will help in evaluating and designing future therapies and trials.

"FOCUS is an incredibly important trial, as it has informed the cell therapy community how to better treat this high-risk patient population, and allows us to enter into an exciting, next generation of stem cell therapy armed with more data," said study investigator Timothy D. Henry, MD, an interventional cardiologist at the Minneapolis Heart Institute® (MHI) at Abbott Northwestern Hospital in Minneapolis and director of research with the Minneapolis Heart Institute Foundation.

This multicenter study was conducted by the Cardiovascular Cell Therapy Research Network (CCTRN), which is supported through a research grant from the National Institutes of Health's National, Heart, Lung and Blood Institute (NHLBI), with the goal to evaluate novel stem cell-based treatment strategies for individuals with cardiovascular disease.

FOCUS will be presented at ACC.12 by its lead investigator Emerson C. Perin, MD, PhD, director of clinical research for cardiovascular medicine at the Texas Heart Institute, one of the five sites in the CCTRN. The Minneapolis Heart Institute is another site of the five in the network, and a large number of CCTRN patients were enrolled in Minnesota.

For this study, which took place between April 2009 and April 2011, the five sites randomly selected 92 patients to receive stem cell treatment or placebo. The symptomatic patients, with an average age 63, all had chronic ischemic heart disease and an ejection fraction of less than 45 percent (baseline 34 percent) along with heart failure and/or angina and were no longer candidates for revascularization. "These patients had no other options, as medical management failed to improve their symptoms," explained the study's co-investigator Jay Traverse, MD, an interventionalist cardiologist at the Minneapolis Heart Institute at Abbott Northwestern Hospital and physician researcher with the Minneapolis Heart Institute Foundation.

Bone marrow was aspirated from the patients and processed to obtain just the mononuclear fraction of the marrow. In patients randomly selected to receive stem cell therapy, physicians inserted a catheter into the heart's left ventricle to inject 100 million stem cells in more than 15 sites that showed damage on the electromechanical mapping image of the heart.

"Studies such as these are able to be completed much faster because of the team approach of the network" said Sonia I. Skarlatos, PhD, NHBLI's deputy director of the division of cardiovascular sciences and program director of CCTRN.

The FOCUS trial was designed to determine whether left ventricular end systolic volume and myocardial oxygen consumption improved in patients who received stem cell treatment. Researchers also wanted to see if nuclear scans of the heart showed a reversible change in perfusion defects in patients who had received the treatment.

While the study did not achieve its primary endpoint, the researchers found that those patients with more progenitor cell types had much better improvement with ejection fraction, explained Henry, and demonstrated a linear relationship between the number of CD34+ cells and the improvement in ejection fraction.

"As a result, these findings are revealing the importance of certain cell types that are delivered and that modifying the cells may create more robust cells capable of achieving better results in future studies," concluded Traverse.

The study will be simultaneously published in the *Journal of the American Medical Association.*

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