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CARDIAC COMPUTED TOMOGRAPHY FOR EFFICACY ASSESSMENT OF STEM CELL TRANSPLANTATION IN HEART FAILURE

ACC Poster Contributions
Ernest N. Morial Convention Center, Hall F
Tuesday, April 05, 2011, 9:30 a.m.-10:45 a.m.

Session Title: Advances in Noncoronary Applications of Cardiac CT
Abstract Category: 37. CT Coronary Calcium and Noncoronary CT Applications
Session-Poster Board Number: 1170-194

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Background: Noninvasive imaging techniques are frequently used to explore therapeutic effects of stem cell therapy in preclinical and clinical investigations. Cardiac computed tomography (CT) can accurately characterize and quantify myocardial scar tissue and assess left ventricular ejection fraction (LVEF). It is not known, however, if cardiac CT can be used to assess cell therapy efficacy in serial follow-up studies. Accordingly, we assessed the hypothesis that cardiac CT is able to quantify therapeutic effects of cellular regenerative therapies.

Methods: Twenty-two adult Göttingen minipigs underwent LAD occlusion followed by reperfusion; resulting in LVEF of 33.0±1.4% 12 weeks after myocardial infarction (MI).Pigs were randomised to intramyocardial injection of culture medium (placebo, n=9), or 200 million mesenchymal stem cells (MSCs, n=13). Cardiac CT and MRI were performed prior to randomization and 12 weeks after MSC delivery to characterize the myocardial scar tissue and evaluate LVEF. Animals did not receive medication to control the intrinsic heart rate. Two blinded observers analyzed CT acquisitions.

Results: MSC therapy resulted in a reduction infarct size from 14.7±1.5% to 10.3±1.5% of the LV-mass ($p=0.01$), whereas infarct size increased in non-treated animals (13.8±1.3% to 16.3±1.4%; $p=0.02$) 12 weeks after delivery intervention (Placebo vs MSC; $p=0.02$). Both observers had excellent agreement for infarct size ($r=0.96$; $p<0.001$). LVEF increased from 32.6±2.2% to 36.9±2.7% in MSC treated animals ($p=0.03$) and decreased in placebo animals (29.1±1.5% at 6 months; $p=0.02$ vs MSC). Infarct size and LVEF by CT compared favorably with MRI assessment (14.1±0.9% and 21.4±1.2% of LV-mass; $r=0.63$; $p<0.01$, and 35.2±1.3% and 36.4±1.6% LVEF;$r=0.81$; $p<0.01$, respectively).

Conclusions: Cardiac CT can evaluate change in infarct size and LVEF after intramyocardial delivered MSC therapy. These findings support the use of cardiac CT in preclinical and clinical studies as a noninvasive imaging technique for assessment of novel myocardial therapies.