INCREASED MYOCARDIAL VIABILITY AND FUNCTION MEASURED BY MANGANESE-ENHANCED MRI (MEMRI) DEMONSTRATE MYOCARDIAL REGENERATION BY HUMAN PLURIPOTENT STEM CELL DERIVED CARDIOMYOCYTES (HPCMS)

Oral Contributions
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Background: Human pluripotent stem cell derived cardiomyocytes (hPCMs) hold the potential to regenerate the myocardium and enable restoration. Manganese-enhanced MRI (MEMRI) allows direct evaluation of myocardial viability. Persistent engraftment of the hPCMs associated with viability and LVEF increase suggests regenerative changes. This study evaluates whether the hPCMs generate regenerative changes in the murine model of myocardial injury.

Methods: 0.5 million reporter-gene transduced human pluripotent stem cells and their cardiomyocyte derivatives were delivered into the injured SCID murine myocardium: iPSCs (n=3), hESCs (n=3), hCMs (n=3), iCMs (n=2), and PBS (n=1). MEMRI and cardiac MRI evaluated viability and function (3T HDx, GEHC, WI) using SeeMore (Eagle Vision, PA) on days 14 and 28 days post-MI.

Results: The longitudinal LVEF % difference from day 14 to 28 days were the following: iPSCs: -8.4±8.2%, hESCs: 1.4±4.2%, hCMs: 7.9±3.9%, iCMs: 2.0±4.0%, and PBS: -8.7% and MEMRI % difference: iPSCs: -6.6±5.8%, hESCs: 3.5±6.9%, hCMs: 6.1±5.5%, iCMs: -2.3±0.3% and PBS: -17.4%. MEMRI and LVEF measurements demonstrated significant difference between the undifferentiated vs. cardiac differentiated hPCMs. Significant correlation between LVEF and MEMRI was seen in the hPCM groups (r=0.81, p=0.001).

Conclusion: MEMRI and cardiac MRI allow reliable in vivo detection of myocardial regeneration. The findings suggest that the hPCMs regenerate and permanently restores the injured myocardium.

Correlation between LVEF and MEMRI

![Graph showing correlation between LVEF and MEMRI](image)

r=0.81 (p=0.001)