AbstractID: 14180 Title: Quantification of Cellular Response in Myocardial Infarction Using Iron Oxide Particles-Enhanced MRI

Purpose: To quantify the cellular response in myocardial infarction by using iron oxide particles cell labeling and MR imaging techniques. **Method and Materials**: Iron oxide particles can produce signal attenuation in MRI and were used to label either macrophages or mesenchymal stem cells. Macrophages were labeled via an intravenous administration of iron oxide particles, whereas mesenchymal stem cells were labeled in vitro and then transplanted into the animal bone marrow. In the macrophage study, varied doses (1.1–14.5 μg Fe/g body weight) were applied. After surgically inducing a myocardial infarction in the C57 mouse, the labeled cells would mobilize to the infarction site, attempting to repair the damaged tissue. To monitor the cellular response, T_2^*-weighted MRI was used to acquire short-axis cardiac images at 3, 7, 14 and 21 days post-infarction. Signal intensity normalized to the maximum signal from the ventricular blood was used to quantify labeled cells at infarction sites. **Results**: Cellular response during myocardial infarction was temporally and noninvasively monitored. In the macrophage study, linear regression of normalized signal intensity at each time point revealed a linear relationship between the normalized signal intensity and iron oxide dose at 7 days (r^2=0.92) and 14 days (r^2=0.98) post-infarction. An optimum dose as well as imaging time window for monitoring inflammatory cell response was also obtained. Either labeled macrophages or mesenchymal stem cells were evidenced at the infarction site in histology. **Conclusions**: A linear signal-dose relationship at 7 and 14 days post-infarction suggests that the number of labeled cells at the infarction site can be interpreted from the MR signal within this time window. This linear relationship may further apply to quantify labeled mesenchymal stem cells. Therefore the cell labeling and MR imaging technique have a potential to quantify cellular response in pathological processes, as well as during cell therapy.