Steven Goldman Laboratory
Sarver Heart Center, University of Arizona
May 2018

3D imaging of migration and survival of iPS-derived cardiomyocyte implant

Repetti GG[1], Bradley CP[1], Lancaster JJ[2], Kellner M[1], Stansifer M[4], Daugherty S[4], Juneman E[3,4], Goldman S[3,4]

Author Information
1: Department of Medicine, University of Arizona, Tucson, AZ, USA.
2: Department of Physiology, University of Arizona, Tucson, AZ, USA.
3: Section of Cardiology, Southern Arizona Veterans Health Affairs System, Tucson, AZ, USA.
4: Sarver Heart Center, University of Arizona, Tucson, AZ, USA.

Our laboratory has shown that a cardiac patch composed of a bioabsorbable mesh embedded with human induced pluripotent stem cell-derived cardiomyocytes (hiPSC-CM) and human neonatal fibroblasts improves left ventricular (LV) systolic and diastolic function, electromechanically couples to the native myocardium and increases myocardial blood flow to the infarcted heart. To better understand the mechanisms though which the patch imparts functional benefit, we set out to assess the persistence and migration of transplanted hiPSC-CMs. We first transfected terminally differentiated hiPSC-CMs with a green fluorescent vector and implanted them into rats with infarcted and non-infarcted hearts. Rat hearts were harvested at various timepoints, and cardiac tissue was cleared using a novel method developed in the lab. The hearts were 3D imaged using multiphoton microscopy to visualize the cells within the tissue. While the cells persist to day 7 after implantation, they do not survive to day 21. The cells appear to exhibit some degree of migration within the tissue, to a greater degree in the non-infarcted samples. These data provide evidence that the hiPSC-CMs do not survive long enough to impart a functional benefit, but instead more likely provoke a paracrine or angiogenic effect on the native heart tissue.