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Poster presentation

In vivo mri of the left coronary artery branching patterns in mice and the myocardial area-at-risk during coronary ligation: towards improved understanding of an important model

Guangping Dai*, Jose-Luiz Figueiredo, Natalia Berry, Ritika Uppal, Cory Siegel, Peter Caravan and David E Sosnovik

Address: Massachusetts General Hospital, Charlestown, MA, USA
* Corresponding author

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Introduction

Ligation of the left coronary artery (LCA) is frequently used to study ischemia in mice. However, the branching pattern of the LCA in mice and the impact of this has not been characterized. MRI of LCA branching patterns was thus performed in mice in vivo and correlated with fluorescence reflectance imaging (FRI) of the percent myocardial area at risk (AAR) during coronary ligation.

Methods

MRI was performed on a 9.4 T horizontal bore small animal scanner. A 1500 mT/m gradient insert (Resonance Research Inc) was used to minimize the TE without sacrificing spatial resolution. FLASH cines were acquired in the plane of the lateral wall of the left ventricle with the following parameters: FOV 25 mm, slice 1 mm, MTX 256 × 256 (in-plane resolution 97 um), flip angle 60°, TE 1 ms, 16 frames per RR interval, Nex 8. Images were acquired in 6 mice after injection of an albumin-bound gadolinium chelate and in 5 without the contrast agent. The percent AAR was calculated in 10 mice in 1) The surgeon's view looking down onto the anterior wall of the whole heart and 2) in 1 mm thick short axis slices.

Results

The LCA and its branches were well visualized in all mice. An average of 3.9 +/- 0.4 branches arose from the LCA at regular increments along the vessel and coursed toward the posteeral apex (Fig 1A-B). In one mouse early branching with two co-dominant vessels in the lateral wall was seen (Fig 1C), and in one very late branching was seen. No significant difference in image quality/CNR was seen between the contrast and non-contrast enhanced images (CNR 12.1 vs 15.2). The percent AAR in the anterior/surgeons view (Fig 1D) was significantly larger than that in the summed short axis slices (Fig 1E). More apical segments in particular, frequently showed ischemia in the anterior wall but not in the lateral and posterolateral walls (Fig 1D-E)

Conclusion

In most mice numerous branches arise from the LCA in the anterolateral wall and course towards the posterolateral apex. The extent of ischemia in the anterior wall is quite consistent. However, due to the branching pattern of the LCA, minor differences in the placement of the ligation can result in either extensive or virtually no ischemia in the lateral and posterolateral walls. Intra-operative inspection by the surgeon of blanching in the anterior wall thus usually overestimates the global extent of ischemia (Fig 1F).

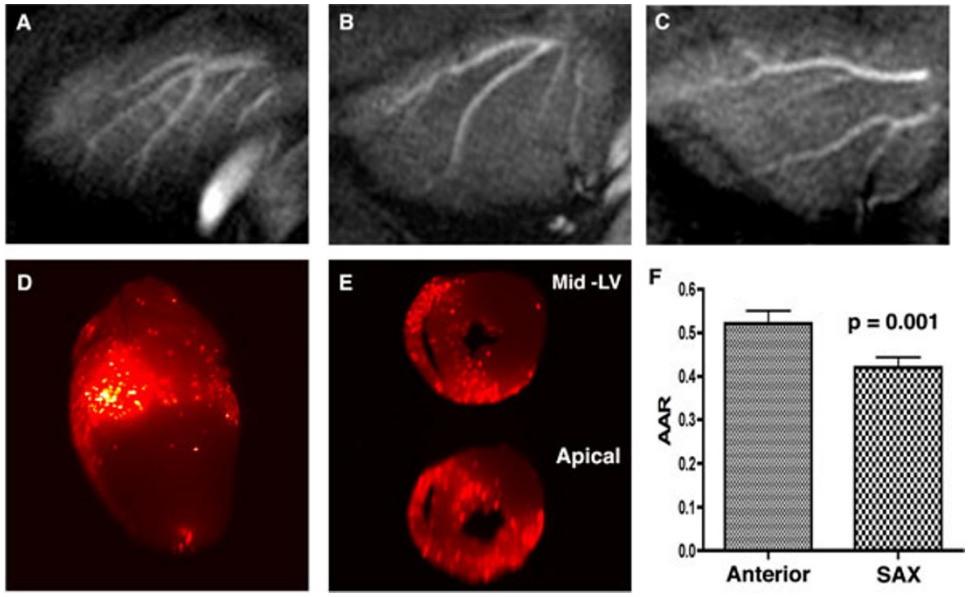

Figure 1