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Validating Contrast-Enhanced Infarct Characterization of a Novel Manganese-based Positive Contrast Agent in a Porcine Model of Myocardial Ischemia Reperfusion

Background: Late gadolinium enhancement cardiac magnetic resonance imaging (LGE-CMR) is an effective and reproducible method for characterizing myocardial infarction (MI). However, gadolinium-based contrast agents are contraindicated in patients with acute and chronic renal insufficiency. This is particularly problematic in the setting of CMR where the coincidence of heart and renal disease is approximately 30%. There is therefore a clinical need for alternative forms of MRI contrast agents that are acceptable in the setting of renal insufficiency.

Methods: We consider two positive MR contrast agents: gadoteric acid (DOTA), a clinically employed gadolinium-based agent; and RVP-001, a structurally similar manganese-based compound. Three days after 80 minutes of ischemia/ reperfusion of the left anterior descending coronary artery (LAD), CMR was performed to assess myocardial scar burden using both contrast agents. LGE CMR was examined 10 and 15-minutes after contrast injection. Contrast agents were administered in alternating fashion with a 2 – 3-hour washout period between contrast agent injections. Scar evaluation and image processing was performed using Medviso Segment CMR.

Results: Mean infarct size and transmuralty, measured using RVP-001 was not different compared with that measured using LGE images. Bland-Altman analysis demonstrated a nominal bias of +0.13 mL (<1% of average total scar volume) for RVP-001 in terms of gross infarct size measurement. Partition coefficient values showed no significant differences between the two agents.

Conclusion: The experimental manganese-based contrast agent RVP-001 appears to be an effective agent for assessment of MI location, size, and transmuralty, and may be a useful as an alternative to gadolinium-based agents.