Blood Pool Gadolinium-Chelate (Vistarem) Discriminates Acute From Chronic Myocardial Infarcts

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Introduction: The delayed enhancement of myocardial infarcts after administration of extracellular MR contrast media is independent of infarct age, despite the differences in cellular and microvascular structures. The potential of the blood pool MR contrast medium (Vistarem, Guerbet Group, France) in differentiating acute from chronic infarcts was investigated.

Methods: Reperfused myocardial infarcts (2h LAD occlusion/reperfusion) were produced in eight pigs. Infarcts were studied at 3 days and 8 weeks using the same protocol. MR images were acquired at baseline and for 1h after administration of Vistarem (0.026mmol/kg) followed by the extracellular agent (Dotarem 0.1mmol/kg). Inversion recovery gradient echo (IR-GRE; TE/TR=2.1/4.4ms) and T1-weighted (T1-WT; TE/TR=20ms/1 R-R interval) turbo-spin echo images were acquired to monitor changes in myocardial signal intensity (SI) using a 1.5T Intera scanner (Philips Medical Systems, The Netherlands). Myocardial infarction was defined by TTC.

Results: Vistarem enhanced acute infarcts on both sequences. Peak enhancement occurred 40min after Vistarem and 20min after Dotarem, suggesting that accumulation of Vistarem in reperfused infarcts is relatively slow. At 40min, SI ratio was 4.6±0.5 on IR-GRE and 1.5±0.1 on T1-WT spin echo. Dotarem provided greater enhancement (SI ratio 7.7±1.4, p=0.001) than Vistarem. MR images obtained 40min after Vistarem and 20min after Dotarem are shown in Fig. I & 2. Vistarem did not enhance chronic infarcts (SI ratio= 1.6±0.4) on IR-GRE or on T1-WT spin echo (1.1±0.1). On the other hand, Dotarem provided distinct enhancement of the scar tissue on IR-GRE (7.5±0.9) and moderate enhancement on T1-WT spin echo (1.5±0.1). Factors attributing to the lack of enhancement of chronic infarcts on Vistarem-enhanced MRI include poor vascularization and intact residual microvessels in the scar. In acute infarction, the size of Vistarem- and Dotarem enhanced regions were 16.0±1.3% and 17.1±1.7% (p=ns), respectively. After 8 week, the size of Dotarem-enhanced region was significantly reduced (13.2±1.4%, p=0.01), but it was comparable to TTC (12.0±1.5%).

Conclusion: 1) Blood pool contrast media discriminate acute from chronic myocardial infarcts, 2) The combination of blood pool and extracellular Gd-contrast media can be used to characterize the age as well as the extent of infarcts and 3) This dual imaging strategy can be used for directing delivery of multi-potential stem cell into both acute and chronic infarcts.

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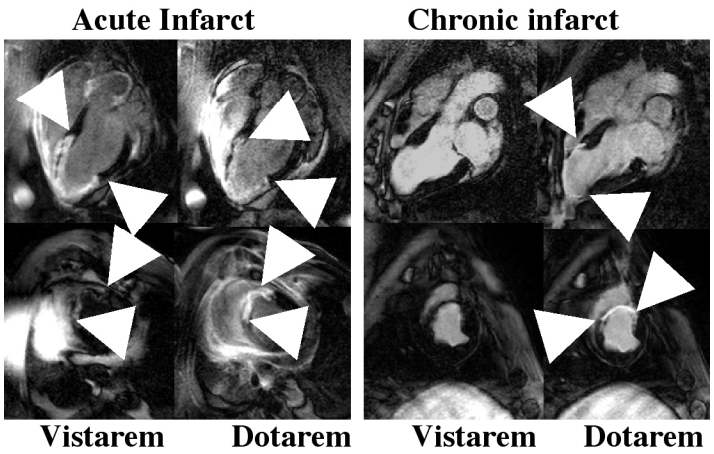

Fig. 1: Contrast enhanced IR-GRE images showing the differential enhancement of acutely infarcted myocardium after Vistarem and Dotarem. Chronic infarct was not enhanced by Vistarem, but by Dotarem.

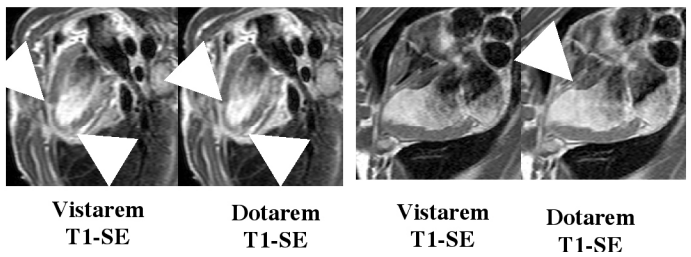

Fig. 2: Contrast enhanced turbo-spin echo images showing the differential enhancement of acutely infarcted myocardium after Vistarem and Dotarem. The scar tissue was not enhanced by Vistarem, but by Dotarem, allowing discrimination of scar tissue.