Background: Standard extracellular MRI (Magnetic Resonance Imaging) contrast agents do not provide differentiation between acute and older myocardial infarcts (MI), which is of great importance in clinical decision-making. Gd(ABE-DTTA), a novel low molecular weight MRI contrast agent which differentiates between acute and older MIs is presented.

Methods: Dogs (n=6) were studied in closed-chest, reperfused, double MI model. MIs were generated by occluding the Left Anterior Descending coronary artery with an angioplasty balloon for 180 min, and four weeks later occluding the Left Circumflex coronary artery. Inversion-recovery gradient-echo (IR-GRE) delayed enhancement (DE) images were obtained on day 3 and day 4 after second MI, using Gd(DTPA) and Gd(ABE-DTTA), respectively. Triphenyltetrazolium chloride (TTC) histomorphometry validated existence and location of infarcts. Hematoxylin-eosin and Masson’s trichrome staining provided histologic evaluation of infarcts.

Results: Gd(ABE-DTTA) or Gd(DTPA) highlighted the acute infarct, whereas the four-week old infarct was visualized by Gd(DTPA), but not by Gd(ABE-DTTA). With Gd(ABE-DTTA), the mean ± SD signal intensity enhancement (SIE) was 366 ± 166% and 24 ± 59 % in the acute infarct and the four-week old infarct, respectively (P<0.05). The latter did not differ significantly from SIE in healthy myocardium (P=NS). Gd(DTPA) produced SIEs which were similar in acute (431 ± 124%) and four-week old infarcts (400 ± 124%, P=NS), and not statistically different from Gd(ABE-DTTA)-induced SIE in acute infarct. The existence and localization of both infarcts were confirmed by TTC. Histologic evaluation demonstrated coagulation necrosis, inflammation, and multiple foci of calcification in the four day old infarct, while the late subacute (four-week-old) infarct showed granulation tissue and early collagen deposition.

Conclusions: DE MRI with separate administrations of Gd(DTPA) and Gd(ABE-DTTA) differentiates between acute and four-week old MIs in a reperfused, double infarct, canine model. This feature of Gd(ABE-DTTA) may become a reliable tool in several clinical situations.