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Validation of flow independent Dark Blood DeLayed enhancement magnetic resonance imaging technique in a canine model of myocardial infarction

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PURPOSE: To validate new magnetic resonance imaging (MRI) technique of Flow Independent Dark Blood DeLayed Enhancement (FIDDLE) technique using *ex-vivo* imaging and 2, 3, 5-triphenyltetrazolium chloride (TTC) pathologic specimen and to compare signal intensities of infarcted myocardium over both blood cavity and remote normal myocardium in comparison with the conventional delayed enhancement cardiac MRI in a canine model of myocardial infarction.

MATERIALS AND METHODS: Branches of left coronary arteries in 7 dogs were occluded by endovascular glue (N-butyl-2-cyanoacrylate) injection. Within 48 hours, contrast-enhanced MRI in a single short-axis slice was obtained at 3-T MRI scanner in all animals at 10, 20, 30, and 40 minutes after gadolinium administration using two different sequences of conventional delayed enhancement and FIDDLE. Inversion time at each temporal scan was optimized for both sequences. The location of myocardial infarction was confirmed by *ex-vivo* MRI and TTC staining of the postmortem heart in two animals. The signal intensities of the infarcted myocardium, normal myocardium and blood pool in left ventricular cavity and image noise was measured in two image datasets. Contrast-to-noise ratio (CNR) of the infarction to normal myocardium (CNR_{ItoN}) and that of infarction to blood pool (CNR_{ItoB}) for both image datasets were calculated and compared.

RESULTS: Delayed enhancement of infarcted myocardium presented in both image datasets of all 7 animals and was confirmed by *ex-vivo* MRI and TTC stained gross pathology in two animals. The mean values of CNR_{ItoN} were 1.99 times higher in conventional delayed enhancement images than in FIDDLE images with statistical significance (all, p = .018). On the other hand, mean values of CNR_{ItoB} were 2.12 times higher in FIDDLE than in conventional delayed enhancement images but statistical significance was found only at 10 minutes after contrast injection (p = .028).

CONCLUSION: *Ex-vivo* MRI and TTC staining confirmed that FIDDLE technique well depicted infarcted myocardium without false positive hyperenhancement. FIDDLE technique is expected to enable more detection of subendocardial infarction for its higher CNR of infarcted myocardium over blood cavity by nulling effectively blood cavity signal.