

DETECTION OF CORONARY ARTERY WALL INFLAMMATION IN A PORCINE MODEL USING NON-CONTRAST ENHANCED MRI

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Introduction: Arterial wall inflammation is considered to play an essential role for destabilization and rupture of atherosclerotic plaques (1). Therefore, detection of inflammatory activity within atherosclerotic plaques has the potential to distinguish between unstable (vulnerable) and stable plaques. We examined whether inflammatory edema in a balloon injured porcine coronary artery could be detected by MRI using a T2-weighted short-tau inversion recovery sequence (T2-STIR).

Methods: Overstretched balloon damage was performed on the proximal left anterior descending artery (LAD) of seven pigs to induce inflammatory edema in the vessel wall. Before and 2-4 days after balloon injury, T2-STIR (known to detect edema) and multi-contrast weighted sequences (T1, T2, PDW) were performed on a cross section of the LAD using a clinical 1.5 T MRI scanner. The MR images were matched with corresponding histological sections and correlated to inflammation (macrophages) and leaky endothelium (leakage of fibrinogen).

Results: After injury, the T2-STIR images showed a significant increase in signal intensity of the coronary artery wall of 143% (CI95 = [39.6 - 142.5]; Figure 1). The multi-contrast coronary images did not show significant changes in signal intensity after injury. Areas of the coronary vessel wall with MRI signal enhancement correlated well to areas with leakage of fibrinogen and inflammation as confirmed by histopathology (Figure 2).

Conclusion: T2-STIR MRI could discriminate between the normal and the injured porcine coronary artery walls. MRI has a potential for non-invasive detection of edema as a marker of inflammation in coronary artery disease.

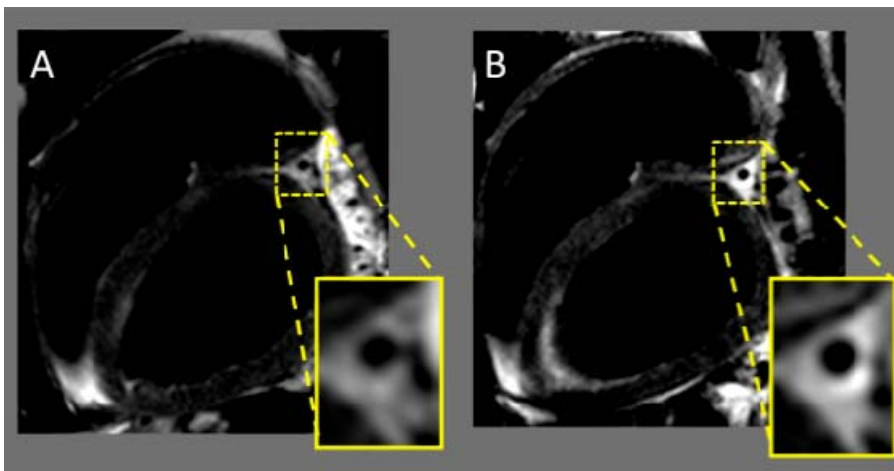


Figure 1. T2-STIR cross-sectional images of the LAD prior to balloon injury (A) and three days after injury (B). Note the strong MR signal located to the arterial wall after the balloon injury

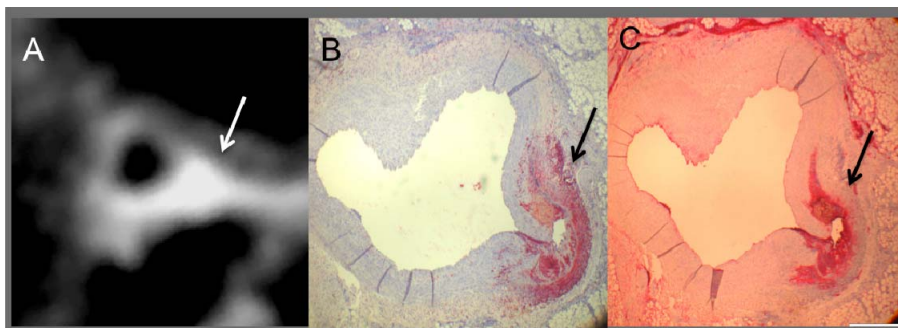


Figure 2. T2-STIR cross-sectional images of the LAD three days after injury (A) and histological identification of inflammatory cells (B) and fibrinogen (C). Note that the strong MR signal corresponds to the area with inflammatory cells and fibrinogen (edema) in the histological section.

(1) Naghavi M, Libby P, Falk E et al. From vulnerable plaque to vulnerable patient: a call for new definitions and risk assessment strategies: Part I. *Circulation* 2003;7;108(14):1664-72 (2)