

Postmortem insitu mri as an adjunct to autopsy for the diagnosis of myocardial infarction

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Background and introduction

Autopsy diagnosis of myocardial infarction (MI) is still challenging because directly lethal ischemic events do not lead to visible myocardial findings. Alterations that could be seen at autopsy, such as edema or inflammatory responses within and surrounding the infarcted myocardium, require at least 1 - 2 hours of survival time. Postmortem MRI (pm-MRI), however, may support the diagnosis of MI, which was based on indirect hints such as pulmonary edema or coronary findings until today. Being extremely sensitive to water distribution alterations within myocardial tissue pm-MRI can clearly visualize areas of decreased micro-circulation without any cardiac motion related artefacts.

Objectives

The aim of this study was to validate preliminary results from a feasibility study on the suitability of non-contrast enhanced pm-MRI in the demonstration and age staging of myocardial infarction in a larger study population. Cardiac deaths represent the main natural cause of death within daily forensic and pathological routine.

Methods

In 30 human forensic corpses, with a suspected cardiac cause of death by myocardial infarction, short-axis images (T1W, T2W and PDW) were acquired insitu on a 1.5 T system. The study was approved by the ethical committee. During subsequent autopsy, the cardiac section technique was adapted to match the short-axis images. Histological investigations were performed along the entire left ventricular circumference in order to correlate signal alteration in MRI to histological appearance.

Results and discussion

Pm-MRI was extremely sensitive to ischemic myocardial alterations in the T2- and PD-weighted images. In peracute infarctions, the reduced blood supply caused a decrease in the tissue signal without any visible adjacent edematous reaction (Fig.1). Acute infarcted areas exhibited decreased signal in necrotic centres and increased signal in marginal edematous myocardial regions. Cases that demonstrated subacute infarctions showed hyperintense regions in T2- weighted images. Chronic myocardial infarction was represented by distinctively decreased signals in all applied sequences due to distinctive collagen formation. Intramyocardial fatty transformation, often occurring in chronic infarction, was seen in the T1-weighted images. Pm-MRI provided an overview and information on the entire heart, whereas histological investigations usually remains focussed on what visually attracted attention at macroscopic cardiac examination. Therefore, pm-MRI can also support collecting promising histological specimen when only moderate coronary alterations are present.

Conclusions

Pm-MRI demonstrates different stages of MI insitu. Especially in peracute infarction, still being difficult to assess at autopsy, it is of inestimable value as it provides crucial hints by visualizing the tissue water distribution. It might even serve as an alternative post-mortem investigation technique when autopsy is unwanted.

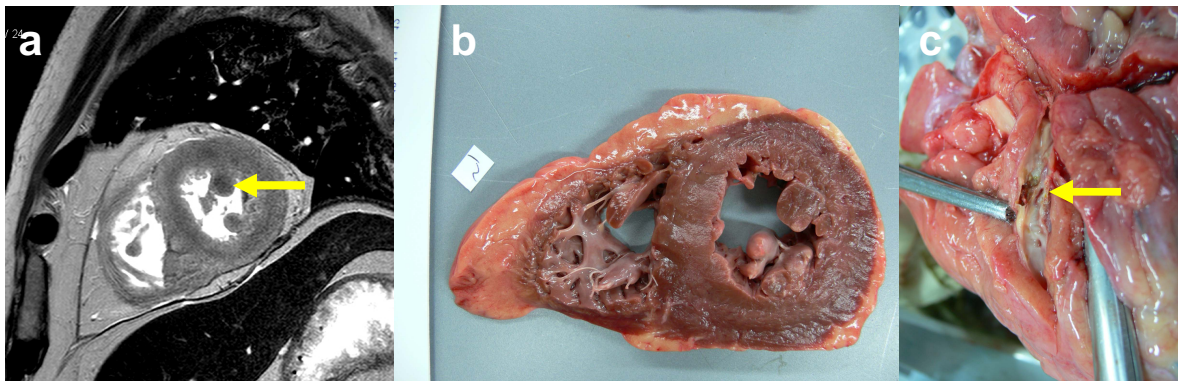


Fig. 1: Peracute infarction leading to immediate death of the patient. a) T2- weighted image shows distinctively decreased signal within the anterior papillary muscle, which is the most peripheral area supplied by the left anterior descending (LAD) coronary artery. b) No myocardial alteration is visible at autopsy. c) An acute plaque ulceration within the LAD is the only coronary finding.