

Meeting abstract

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## **I035 Value of a 2D phase-sensitive inversion recovery (PSIR) sequence in comparison to a 3D inversion recovery gradient echo sequence (IR-GRE) for the detection of myocardial scar by MRI in different myocardial diseases**

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### **Purpose**

MRI is a well established technique to assess myocardial viability. Nevertheless, it is sometimes difficult to distinguish viable from non-viable myocardium in patients with a less circumscribed occurrence of myocardial scars or fibrosis like in myocarditis patients. Therefore, the aim of the current study was to compare the efficiency of two different techniques, on the one hand a standard 3D inversion recovery gradient echo (IR-GRE) sequence on the other hand a 2D phase-sensitive inversion recovery (PSIR) sequence for the detection of myocardial scar in patients with different types of myocardial disease.

### **Material and methods**

33 patients were examined on a 1.5 T magnetic resonance (MR) scanner (Intera, Philips, Best, Netherlands). The mean age of the patients (21 men, 12 woman) was 58.3 years (age range 30.5 – 83.0 years). 8/33 of the patients had an acute myocardial infarction 2–4 days before MRI examination, in 11/33 patients there was a clinical suspicion for acute myocarditis, 9/33 had chronic ischemic heart disease, in the remaining 6 patients we looked for cardiomyopathy.

The 3D inversion recovery gradient echo (IR-GRE) sequence (TE = 4.3 ms, TR = 1.3 ms, flip angle 15°, matrix 204 × 138, spatial resolution 1.29 × 1.29 × 5 mm) was acquired in breath hold approximately 15 minutes after the administration of 0.15 mmol/kg body weight Gadobutrol (Gadovist, Schering, Germany) in the short axis from base to apex and also a 2D phase-sensitive inversion recovery (PSIR) sequence (TR = 3.6 ms, TE = 1.2 ms, flip angle 15°, matrix 256 × 150, spatial resolution 1.88 × 1.88 × 10 mm) in the same orientation. Before the IR-GRE sequence was started the optimal inversion time was determined by a look-locker sequence. The PSIR sequence allows imaging without adaptation of the inversion time. The different techniques were analyzed regarding the detection of myocardial scar and fibrosis.

### **Results**

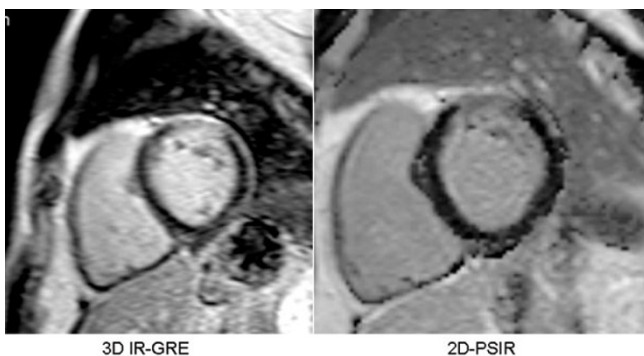
In 11/33 patients (33.3%) both techniques did not detect any myocardial scar or fibrosis. In 22/33 patients (66.7%) myocardial scar could be detected at the same localization with both sequences. We noticed that PSIR images had a superior contrast between the hypointense myocardium and the hyperintense myocardial scar than IR-GRE images. In 16/22 cases (72.7%) myocardial scar was found in the same extension but in PSIR images it was eas-

ier to detect it. In IR-GRE imaging especially diffuse and subendocardial myocardial scar was difficult to detect neighbouring the bright blood signal of the left ventricular cavity (Fig. 1). PSIR imaging clearly depicted the myocardial enhancement even in those patients, but it showed a tendency to overestimate the extension of late enhancement as compared to the IR-GRE sequence (in 5 of 22 cases (22.7%)) probably due to the lesser spatial resolution and partial volume effects.

Furthermore, in 10 of 22 patients (45.5%) PSIR images showed an inverse intramyocardial signal intensity especially in the midventricular and basal myocardial segments as if the inversion time (TI) would have been too short. Nevertheless, in all of these cases we could detect the myocardial scar clearly.

### Conclusion

The used 2D PSIR sequence is a reliable technique to detect myocardial scar and fibrosis and seems to be more sensitive for non-viable tissue even if used with a lower spatial resolution compared to a standard 3D IR-GRE sequence. Myocardial scar and fibrosis seems to be easier to select from healthy myocardium due to the better contrast of the PSIR sequence in comparison to the IR-GRE sequence especially in the detection of small, diffuse or subendocardial myocardial necrosis.



**Figure 1**  
The 2D-PSIR-sequence is a reliable technique and seems to be more sensitive compared to a 3D-IR-GRE-sequence. Myocardial scar seems to be easier to depict due to the better contrast especially in the detection of small, diffuse or subendocardial lesions.

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