A SATURATION-RECOVERY INVERSION-RECOVERY “BLACK-BLOOD” GRE SEQUENCE FOR DETECTION OF DELAYED ENHANCEMENT IN THE ASSESSMENT OF MYOCARDIAL INFARCTION AT 3.0 TESLA – PRELIMINARY RESULTS

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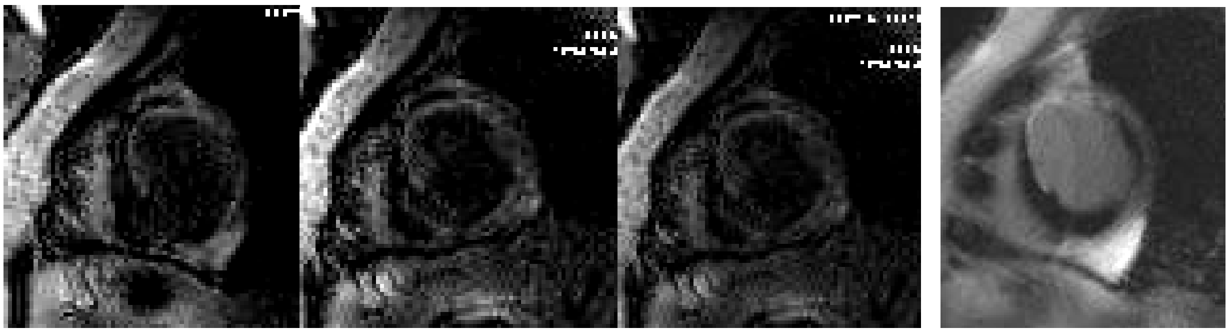
Objectives:

Identification of subtle subendocardial infarctions may be difficult using delayed enhancement MR imaging because of the high signal in the adjacent LV blood pool and therefore low infarct-blood-pool CNR. Therefore the aim of the study was to image myocardial infarction with a multislice inversion recovery (IR) GRE sequence, which is equipped with a preceding saturation pulse to null not just the signal of normal myocardium but also the signal of blood* (figure 1).



A **B** **C** **D**

Figure 1 Short axis views of a SR-IR GRE sequence (A-C) and an IR GRE sequence (D). Subendocardial late enhancement after infarction of the LAD.

Materials and Methods:

6 patients with chronic myocardial infarction were examined on a 3.0 Tesla system (Magnetom Verio, Siemens Medical Solutions, Erlangen, Germany). 15 minutes before imaging delayed enhancement contrast media (gadobenate dimeglumine, Multihance®, Bracco, Italy) was applied at a dosage of 0.1 mmol/kg/BW. Short axis slices were acquired with a multislice saturation-recovery (SR) IR-GRE sequence and a multislice IR-GRE sequence (reference method**) in random order. The saturation pulse was slice-selective while a volume selective inversion pulse has been applied. The sequence parameters were as follows: TR/TE/flip= 2.1/1.0/25°, matrix = 133 x 256, bandwidth = 790 Hz/pixel, FOV = 300 mm x 360 mm, slice = 8mm. Prior to each sequence a TI-scout was performed. While the optimal inversion time for the standard IR-GRE sequence was selected on visual basis, the optimized saturation and inversion times for maximum contrast of the SR-IR-GRE sequence were calculated with an especially written MATLAB-applet (figure 2) based on the inversion times of blood and normal myocardium, which were visualized by the TI-scout. Contrast-to-noise ratios of myocardial infarction in relation to normal myocardium (CNRinf-myo) and to the left ventricular cavity (CNRinf-LVC) were determined. Additionally overall image quality was assessed by two independent readers.

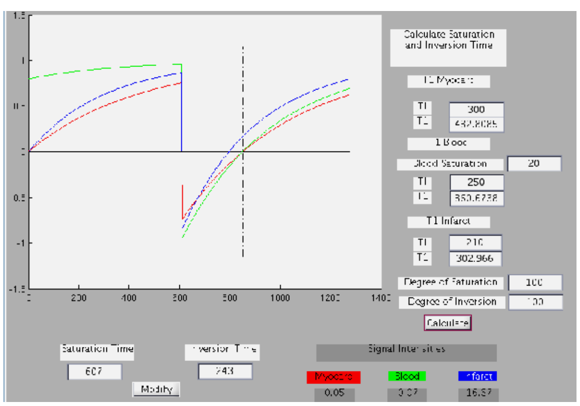


Figure 2 Screenshot of applet for calculation of saturation times and inversion times

Results:

The calculation of CNRinf-myo of the SR-IR-GRE sequence was lower, though not significantly, in comparison to the standard IR-GRE sequence. However, CNRinf-LVC was significantly higher ($p<0.001$) on the SR-IR-GRE images. The assessment of overall image quality did not result in significantly different values.

Conclusions:

A SR-IR-GRE sequence allows for imaging myocardial infarction without significant loss of CNRinf-myo and image quality compared to a standard IR-GRE sequence. Especially small subendocardial infarctions may be detected more easily due to the “black blood” technique.

* Rehwald WG et al. Dark blood delayed enhancement MRI for the assessment of subendocardial infarcts. J Cardiovasc Magn Reson 2007; 9:93

** K. Bauner et al. Inversion recovery single-shot TurboFLASH for assessment of myocardial infarction at 3 Tesla; Invest Radiol 2007 Jun;42(6):361-71