were analyzed by special software (CMR42[R], CIRCLE, Calgary) to quantify volumes of abnormal signal, which were expressed as a percent of the total LV volume. The difference between T2 and LGE extents (T2-LGE) was then calculated as a measure of myocardial salvage. The primary end-points were the change in end-diastolic volume (delta-EDV) and end-systolic volume (delta-ESV) over time.

Results: T2-weighted abnormalities were detected only during the acute phase. T2-LGE but not LGE alone (p=0.1) correlated with the time to reperfusion (r = -0.39; p= 0.014). Both T2-LGE (r = -0.52; p=0.002) and LGE alone (r = 0.41; p= 0.018) correlated with delta EDV. T2-LGE correlated with delta-ESV (r= -0.39, p= 0.026) but LGE alone did not (p= 0.43).

The relation between T2-LGE, delta EDV and delta-ESV remained significant after correcting for the inter-study duration, time to reperfusion, ejection fraction and LGE extent.

Conclusion: We propose a myocardial salvage index based on the difference between T2-weighted abnormality and late gadolinium enhancement. This novel CMR-based parameter may have the potential to serve as a surrogate end-point in studies assessing the efficacy of infarct reperfusion strategies.

We investigated the value of a novel myocardial salvage index based on the difference between T2-abnormality and LGE (T2-LGE)extents to predict long-term LV-remodeling after AMI. T2-LGE was an independent predictor of both delta-EDV (r = -0.52) and delta-ESV(r= -0.39)

1025. MULTI-ECHO DIXON FAT AND WATER SEPARATION METHOD FOR DETECTING FIBRO-FATTY INFILTRATION IN THE MYOCARDIUM

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Introduction: The ability of MRI to discriminate between water and fat is important in tissue characterization. Conventional approaches to fat and water discrimination based on fat suppression are commonly used to characterize masses, however, have reduced ability to characterize fatty infiltration due to the poor contrast of microscopic fat and partial volume effects. Multi-echo Dixon methods [1,2] for fat and water separation provide a sensitive means of detecting small concentrations of fat with improved contrast. These methods are applied to the detection of fibro-fatty infiltration observed in chronic MI [3] as well cases of suspected ARVC/D [4]. In the present study, fat and water separation has been implemented both pre-contrast as well as applied to late enhancement using a multi-echo PSIR-GRE sequence.

Purpose: To develop a cardiac specific multi-echo fat and water separation method that is usable either pre- or post-contrast administration.

Methods: A multi-echo GRE sequence was implemented with fat and water separation using a multi-point Dixon reconstruction method. Late enhancement imaging used a multi-echo IR-GRE which additionally incorporated phase sensitive reconstruction [5]. The PSIR-GRE sequence acquires a proton density reference on alternate heartbeats which was used to jointly estimate a fieldmap and fat and water separation matrix that is applied to the inversion-recovery (IR) images. The VARPRO method [2] was used to robustly estimate the fieldmap in the presence of field inhomogeneity. The imaging sequence was ECG triggered, with 2 R-R intervals between inversions, and used an echo-train readout with 3 echoes with flyback for monopolar readout. The echo-train readout was used to increase the acquisition efficiency and thereby maintain acceptable breath-hold duration; optimum TE's [6] were not achievable using monopolar readout. Bipolar readout is being evaluated for TE optimization. Typical parameters for imaging with the Siemens ESPREE 1.5T scanner were: bandwidth=977 Hz/pixel, TE=1.8, 4.6, 7.4 ms, TR=9.5 ms, flip angle=20-25°, image matrix=256x126, views-per-segment=21, breath-hold duration=14 heartbeats including 2 discarded.

Results: Multiecho GRE fat-water imaging was performed on 26 patients, 12 of which had MI (2 acute/10 chronic). One patient had a large lipoma (Fig. 1) and another had a region with lipotamous hypertrophy of the interatrial septum. There were 3 cases with intra-myocardial fatty infiltration. A case with fatty infiltration in chronic MI is shown in Fig. 2 using water and fat separated PSIR, and a case with chronic MI without fatty infiltration is shown in Fig 3. Epicardial fat is readily distinguished from myocardium in all cases.

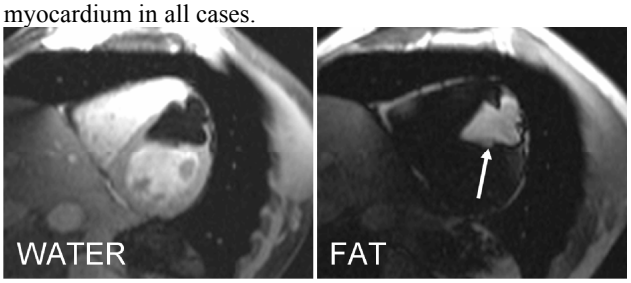

Figure 1. Water and fat separated pre-contrast images for patient with large anteroseptal lipoma.

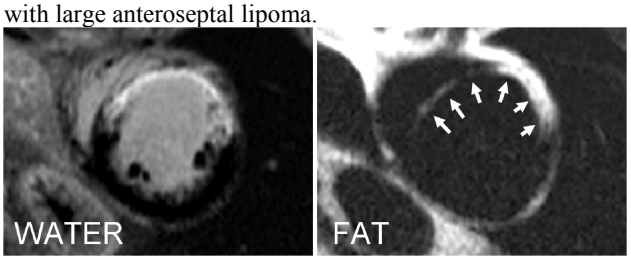

Figure 2. Water and fat separated PSIR late enhancement images for patient with chronic MI showing fatty infiltration.

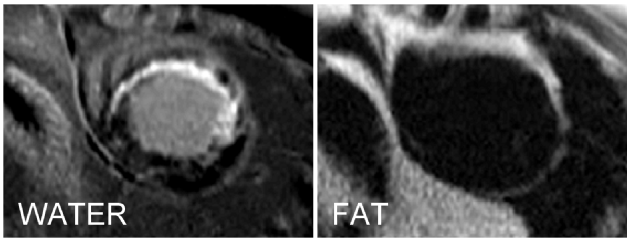

Figure 3. Water and fat separated PSIR late enhancement images for another patient with chronic MI without fatty infiltration.

Discussion/Conclusions: The proposed approach can characterize myocardial fibro-fatty infiltration as demonstrated with late enhancement imaging. The method can also separate fat and water pre-contrast as illustrated by the case of lipoma. Initial experience indicates a much higher contrast and sensitivity than conventional fat suppression, or T1 measurement methods. The phase sensitive reconstruction is insensitive to inversion time (TI) which is particularly important when assessing diffuse fibrosis with a patchy appearance. The proposed method has the additional benefit of using a single breath-hold to produce fat and water images, thereby improving the workflow and ensuring spatial registration. The VARPRO method provided robust fieldmap estimates.

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A Multi-echo Dixon fat and water separation method for detecting fibro-fatty infiltration in the myocardium can be used before or after contrast administration. The method is easy to use and provides improved contrast compared with conventional fat suppression.

1026. INFARCT SIZE DETERMINES INFARCT HEALING AND VENTRICULAR REMODELING IN PATIENTS WITH SUCCESSFULLY REPERFUSED ST-ELEVATION MYOCARDIAL INFARCTION

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Background and Purpose: We sought to evaluate the influence of infarct size on infarct healing and left ventricular (LV) remodeling in patients with a first, successfully reperfused ST-elevation myocardial infarction (STEMI) using MRI.

Methods and Results: Fifty-eight patients were studied in the first week (1W) and 4 months (4M) after the acute event. At 1W, infarct size was related to infarct transmurality ($r=0.62$, $p<0.001$), infarct surface ($r=0.78$, $p<0.001$), circumferential and longitudinal infarct length ($r=0.67$, $p<0.001$ and $r=0.69$, $p<0.001$, respectively), concomitant microvascular obstruction ($r=0.74$, $p<0.001$), area at risk ($r=0.78$, $p<0.001$) as well as the ratio of infarct size to area at risk ($r=0.68$, $p<0.001$), and inversely related to systolic wall thickening in the infarct ($r= 0.45$, $p<0.001$) and peri-infarct area ($r= 0.37$, $p=0.004$), and LV EF ($r= 0.59$, $p<0.001$). The median of normalized infarct size at 1W, ie, 17.1% of LV mass, was used to create a small and large size infarct group. Large infarcts presented with higher maximum serum troponin I levels than small infarcts (115±68 μg/L versus 60±28 μg/L, $p=0.003$. While shrinkage in infarct size at 4M was similar between groups (43±18% in small versus 42±16% in large infarcts, $p=0.99$), the infarct surface did shrink significantly more in small (15.7±15.9%) than large infarcts (4.0±11.9%), $p=0.005$ with most pronounced differences in longitudinal direction, i.e. 14.5±12.5% in small versus 5.0±8.6% in large infarcts, $p=0.003$. On the other hand, thinning of the infarcted wall was more pronounced in large (29.8±18.8%) than in small infarcts (13.5±22%), $p=0.004$. Functionally, small infarcts recovered systolic wall thickening in the infarct ($p=0.01$) and peri-infarct area ($p=0.004$), matching with improvement in LV EF (52.7±7.0% at 1W tot 55.7±7.3% at 4M, $p=0.003$), while large infarcts showed a lack of recovery in regional or global LV function. At 1W, large infarcts showed more pronounced flattening of the infarcted myocardium as expressed by a larger circumferential radius of curvature ($p=0.019$). At 4M infarct size was related to expansion of the remote myocardium (circumferential radius of curvature at end diastole: $r=0.45$, $p=0.001$, end systole: $r=0.54$, $p=0.001$), and global adverse remodeling (LV EDV $r=0.39$, $p=0.003$; LV ESV $r=0.58$, $p<0.001$, LV EF $r=-0.61$, $p<0.001$).

Conclusion: The amount of necrotic myocardium strongly determines the pattern of infarct healing, and regional and global LV remodeling. Small infarcts show favorable infarct healing (less thinning, more surface shrinkage) and remodeling with a beneficial impact on regional and global function. Large infarcts, in contrast, show more extensive infarct thinning, lack of infarct surface shrinkage leading to adverse remodeling, and lack of functional recovery.

Infarct size determines infarct healing, LV remodeling and functional recovery. Small infarcts show favorable infarct healing and remodeling with improved function while large infarcts show extensive infarct thinning without infarct surface shrinkage, adverse remodeling, and lack of functional recovery.

1027. RAPID AND ACCURATE FREE-BREATHING 3D DELAYED ENHANCEMENT IMAGING FOR MYOCARDIAL VIABILITY ASSESSMENT: COMPARISON WITH BREATH-HOLD 2D IMAGING

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Introduction: Delayed enhancement MRI (DE-MRI) has been established as a diagnostic imaging standard for myocardial