HIGH-RESOLUTION MR-IMAGING OF THE LIVER WITH T2-WEIGHTED SEQUENCES USING INTEGRATED PARALLEL IMAGING, PROSPECTIVE MOTION CORRECTION AND RESPIRATORY TRIGGERING

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INTRODUCTION:
The aim of this study was to obtain high-resolution T2-weighted images of the liver with integrated parallel acquisition techniques (iPAT) to reduce acquisition time and breathing artifacts. iPAT was used in combination with breath-hold sequences and a navigator-based prospective acquisition motion correction (PACE) as well as in combination with respiratory triggering via respiratory belt [1].

METHODS:
Ten volunteers and ten patients underwent imaging on a 1.5 T MR System (Siemens Sonata, Siemens Medical Solutions, Erlangen) with the same high-resolution fast spin echo (FSE) T2-weighted sequences with a full 320 matrix and a slice thickness of 5 mm: a multi-breath-hold FSE sequence without iPAT and PACE respective with iPAT and PACE and a respiratory triggered FSE sequence without and with iPAT. To cover the whole liver 36 slices were needed. For parallel imaging the GRAPPA-algorithm was used with an acceleration factor of 2 and 27 additional reference lines [2, 3]. Overall image quality and the presence of respiratory artifacts was rated with a five-point scale by two independent readers.

RESULTS:
The sequences with iPAT required a substantially shorter acquisition time without loss of image quality. Overall image quality was rated equal for all sequences by both readers. Both readers found fewer breathing artifacts in the iPAT-breath-hold sequence in comparison to the corresponding non-iPAT sequence (Figure 1). Image time for 9 slices with iPAT was 13 seconds (19 seconds without iPAT) with multi-breath-hold and on average 4:00 minutes (7:02 minutes without iPAT) with respiratory triggering. Imaging with the PACE technique resulted in a more correct positioning of the image stacks (Figure 2).

DISCUSSION:
T2-weighted fast imaging with parallel imaging strategies is feasible and results in high-quality images within a short acquisition time. Overall image quality is not negatively affected by the use of iPAT and time of acquisition is reduced clearly. This resulted in fewer breathing artifacts for breath-hold sequences and enables the acquisition of respiratory triggered sequences within a reasonable time. Therefore, parallel imaging strategies should be used routinely in liver imaging.

REFERENCES:

Figure 1: T2-w liver images of a volunteer: Breath-hold sequence without (a) and with iPAT (b). Note the markedly reduced artifacts in the sequence with iPAT (b) of this volunteer, who had problems holding his breath.

Figure 2: Coronal reformats of a study performed in a volunteer (a, b). The alignment of the liver shows only a minimal edge between the image stacks in the breath-hold sequence with PACE (a). The corresponding sequence without PACE, however, shows a substantial edge (b).