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-weigthed 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-weigthed 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).

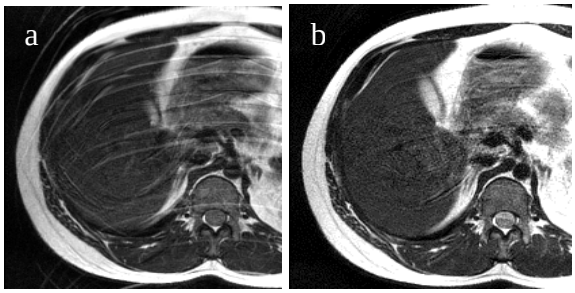

Figure 1: T2-w liver images of a volunteer: Breath-hold sequence without (a) and with iPAT (b). Note the markedly reduced artifacts in the sequence with iPAT (b) of this volunteer, who had problems holding his breath.

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).

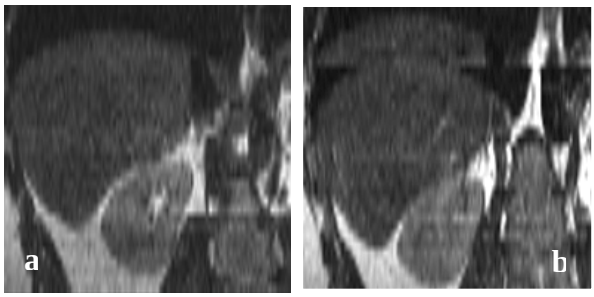

Figure 2: Coronal reformats of a study performed in a volunteer (a, b). The alignment of the liver shows only a minimal edge between the image stacks in the breath-hold sequence with PACE (a). The corresponding sequence without PACE, however, shows a substantial edge (b).

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.

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