Abstract

Rationale and Objectives:
Diffusion-weighted EPI-sequences for liver-MRI have been widely investigated for characterization of focal liver lesions with help of ADC-calculations [1]. However, their role as morphologic sequences for detection of lesions due to the black-blood-effect, the good lesion-to-liver contrast and the fast acquisition has not been elucidated properly. The aim of the present study is to evaluate the feasibility of a diffusion-weighted black-blood (BB)-EPI sequence with parallel imaging (iPAT) for detection of focal liver lesions in comparison to an un-enhanced standard T2-weighted sequence in patients with known or suspected liver lesions.

Methods:
20 patients with known or suspected focal liver lesions underwent a diffusion-weighted fat-saturated single-shot BB-EPI sequence with complete suppression of intrahepatic venous signal (TR 2200 ms, TE 50 ms, b-value = 50 s/mm², 2 averages, 18 seconds breath-hold, Matrix 192x162) and a standard fat-saturated T2-w sequence (TR = 2800; TE = 107, 1 average, 3 x 17 seconds breath-hold, Matrix 320x320) with 6mm slices thickness on a 1.5 T MRI-system (Magnetom Avanto, Siemens Medical Solutions). Both sequences used parallel imaging (iPAT) with an acceleration factor of 2. Overall image quality and degree of artifacts were compared with help of a five-point scale with 5 being the most desirable score. The detection rate and the level of confidence with regard to lesion detection were evaluated for both sequences in comparison to a contrast-enhanced (gadolinium and /or SPIO) MR examination, which was used as the standard-of-reference.

Results:
The diffusion-weighted BB-EPI sequence showed significantly (p<0.05) improved overall image quality and fewer artifacts in comparison to the T2-w sequence. Sensitivity for lesion detection was superior in the BB-EPI-sequence. The level of confidence for the detection of focal liver lesion was also superior for the BB-EPI sequence in comparison to the T2-w sequence. The results are summarized in table 1.

Conclusion:
Diffusion-weighted BB-EPI sequences within a single breath-hold for liver-imaging are feasible with parallel imaging and show excellent image quality. They might contribute to easy and confident lesion detection in comparison to T2-w sequences. Especially the black-blood effect with dark signal in the vessels helps to distinguish small lesions in the periphery from tiny lesions; however, the number of false positive findings is slightly increased, so that detected lesions should be verified in the contrast-enhanced sequences.

Table 1

<table>
<thead>
<tr>
<th></th>
<th>Image quality</th>
<th>Respiratory artifacts</th>
<th>Detected lesions</th>
<th>Level of confidence</th>
<th>True-positives</th>
<th>False-positives</th>
<th>Sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>BB-EPI</td>
<td>4,10</td>
<td>4,15</td>
<td>39</td>
<td>3,9</td>
<td>34</td>
<td>5</td>
<td>83%</td>
</tr>
<tr>
<td>Standard-T2-w</td>
<td>3,50</td>
<td>3,30</td>
<td>27</td>
<td>3,2</td>
<td>25</td>
<td>2</td>
<td>61%</td>
</tr>
</tbody>
</table>

Literature: