STUDY OF A DIFFUSION-WEIGHTED SINGLE-SHOT SPIN ECHO ECHO PLANAR IMAGING SEQUENCE USING PARALLEL IMAGING OF FOCAL LIVER LESIONS: COMPARISON WITH A T2-WEIGHTED TURBO SPIN ECHO TECHNIQUE

K. Coenegrachts[1], J. Delanote[1], L. ter Beek[2], M. Haspeslagh[3], S. Bipat[4], J. Stoker[4], L. Steyaert[1], H. Rigauts[1], J. W. Casselman[1]

[1]Radiology, AZ St.-Jan AV, Bruges, West-Flandres, Belgium, [2]Philips Medical Systems, Best, Best, Netherlands, [3]Hospital administration and statistics, AZ St.-Jan AV, Bruges, West-Flandres, Belgium, [4]Radiology, Academic Medical Center, Amsterdam, Amsterdam, Netherlands

PURPOSE:

To compare diffusion-weighted Single-Shot Spin Echo Echo Planar Imaging (SS SE-EPI DWI) with T_2-weighted Turbo Spin Echo (T2w TSE) in detecting focal liver lesions, with focus on small (< 10mm) lesions.

MATERIALS AND METHODS:

Twenty-four consecutive patients suspected for malignant liver lesions underwent routine MRI examinations. A respiratory-triggered T2w TSE sequence and a respiratory-triggered SS SE-EPI sequence with diffusion weighting (b-values of 0, 20, 300 and 800 s/mm^2) were compared. Lesion identification was obtained by two abdominal radiologists in consensus and analyzed by means of Rank order analysis (RIDIT-analysis; "relative to an identified distribution" analysis). Lesion-to-liver Contrast-to-Noise Ratio (CNR) for each sequence was obtained by the radiologists independently and means were compared by Kruskal-Wallis test. All sequences were also analyzed qualitatively by grading image quality, lesion conspicuity, and artifacts and compared by RIDIT-analysis.

RESULTS:

Biliary cysts were best detected with T2w TSE and hemangiomas and metastases were best ($p < 0.05$) detected with SS SE-EPI DWI with b=20 s/mm^2. The coinciding black-blood effect on diffusion-weighted SS SE-EPI DWI is useful in detecting (especially) small (<10mm) focal liver lesions (figure 1) lying against the intrahepatic vasculature. Lesion-to-liver CNRs were highest on T2w TSE for biliary cysts and on SS SE-EPI DWI with b=20 s/mm^2 for hemangiomas and metastatic lesions ($p < 0.05$). Best ($p < 0.05$) image quality was achieved with T2w TSE and best ($p < 0.05$) lesion conspicuity was achieved with T2w TSE for biliary cysts and with SS SE-EPI DWI using b=20 s/mm^2 for hemangiomas and metastases (figure 2). Image artifacts were lowest ($p < 0.05$) with T2w TSE.

CONCLUSION:

SS SE-EPI DWI with low b-values seems useful in detecting focal liver lesions in general and small (<10mm) lesions in particular when compared with T2w TSE.

Fig.1a Fig.1b

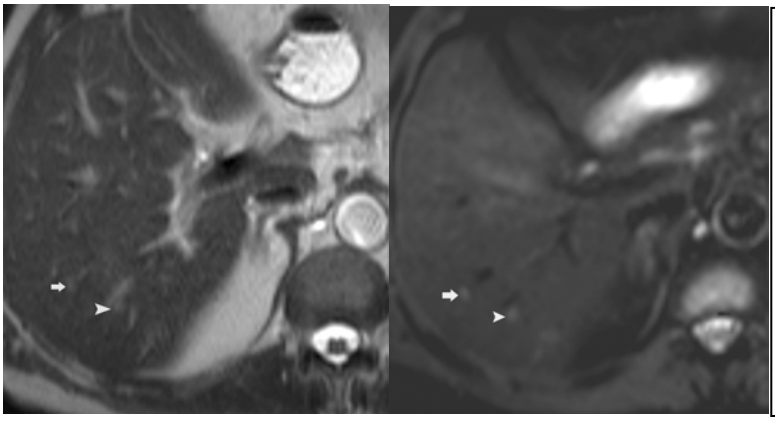

Figure 1:
On T2w TSE (axial plane; fig.1a) the attention is drawn on two small (< 10mm) hyperintense nodules (white arrow and white arrowhead). These hyperintensities are hard to differentiate from the surrounding intrahepatic vessels. When evaluating the SS SE-EPI DWI images (mainly b=20s/mm^2 (axial plane; fig.1b)) these nodules are clearly displayed as hyperintense nodules, contrasting with the surrounding intrahepatic vessels which show a strong signal intensity decrease.

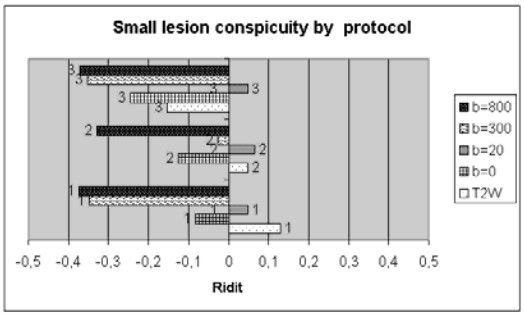

Figure 2:
Comparison of the lesion conspicuity for each type of lesions (biliary cysts (1), hemangiomas (2) and metastases (3)) smaller than 10mm using RIDIT-analysis. When calculating RIDIT scores, the null hypothesis is an a priori RIDIT of 0.5, which implies a fifty-fifty distribution. The RIDIT scores were all subtracted by 0.5 to have the mean at zero and multiplied by (-1). A zero score must be interpreted as an imaging protocol which is not different from the overall mean result for all lesions when using all five imaging protocols. The more positive the RIDIT score, the better the overall result is for one type of imaging protocol and vice versa.