

3.0 T Breast Diffusion Weighted MRI Using Readout Segmented EPI: Comparison With Single Shot EPI

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INTRODUCTION:

Diffusion weighted imaging (DWI) is expected to increase diagnostic accuracy of detecting breast cancer. But compared to dynamic MRI, the imaging quality of DWI is poor because of distortion, poor fat suppression, low spatial resolution and so on. Recently DWI using readout segmented echo planner imaging (RS-EPI) is introduced to our institution as work-in-progress sequence by Siemens Healthcare Inc. and expected to improve image quality. The purpose of our study is to evaluate the image quality of 3.0 T diffusion weighted breast MRI using RS-EPI compared to single shot EPI (SS-EPI).

MATERIALS and METHODS:

With IRB approval, thirty-two patients of clinically suspected breast cancer were prospectively enrolled between September 2010 and November 2010. Breast MRI was performed at 3.0 T scanner (MAGNETOM Trio, A Tim System, Siemens Healthcare, Erlangen, Germany) with 16ch breast coil. Sequences were as follows: axial T1WI, T2WI with fat saturation (FS), 3D dynamic contrast enhanced (DCE) series and DWIs. Axial DWIs of b values 0 and 1000 sec/mm² were performed using the following parameters: 1) SS-EPI, TR 7000 ms, TE 62 ms, FOV 330x160 mm, matrix 166x80, slice thickness 3 mm (gapless), NEX 3, 48 slices, 1 min 59 sec, 2) RS-EPI, TR 7000 ms, TE 53 ms, FOV 330x165 mm, matrix 166x83, slice thickness 3 mm (gapless), NEX 1, 48 slices, 3 min 11 sec, five shots. All images were reviewed on a dedicated work station (Aquarius Net, Terarecon Inc.). We evaluated the AP and right-to-left (RL) distance of mammary gland, visualization of nipple and quality of fat suppression at DWIs (b=0) and T2WI. We also compare the AP and RL diameter of mass and ghost artifacts at DWIs (b=1000) and the early phase of dynamic MRI.

RESULTS:

We could complete all the sequences of each patient and picked up seventeen masses. The average difference measuring AP distance of mammary gland between T2WI and SS-EPI and that between T2WI and RS-EPI, were 8.63±0.76 and 4.16±0.51 mm, respectively. No significant difference was observed between the RL distances of mammary gland. Visualization of nipple was better at RS-EPI than SS-EPI. Fat suppression of RS-EPI and SS-EPI were better than T2WI. The average difference measuring AP distance of tumor

between T2WI and SS-EPI and that between T2WI and RS-EPI, were 3.29±0.64 and 2.06±0.33 mm, respectively. No significant difference was observed between the RL distances of mass. But ghost artifacts were occurred at RS-EPI frequently.

CONCLUSION:

3.0 T breast diffusion weighted MRI using RS-EPI can reduce imaging distortion and provide better visualization around the nipple.

Reference: 1) Porter DA, Heidemann RM. High resolution diffusion-weighted imaging using readout-segmented echo-planar imaging, parallel imaging and a two-dimensional navigator-based reacquisition. Magn Reson Med. 2009 62(2):468-75.

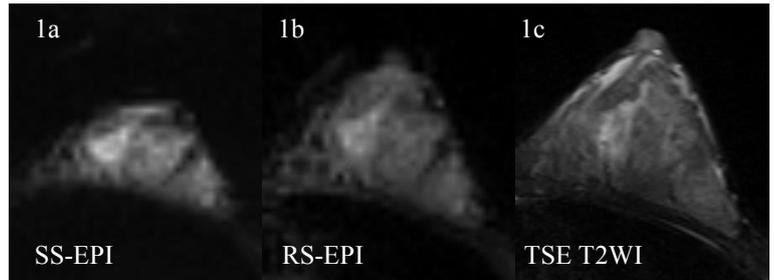


Figure 1. 36-year-old female with no apparent abnormal findings. Axial SS-EPI (1a), RS-EPI (1b) and TSE T2WI of the same position. The AP distance of mammary gland is markedly reduced at SS-EPI. Visualization of the nipple is better at RS-EPI than SS-EPI.

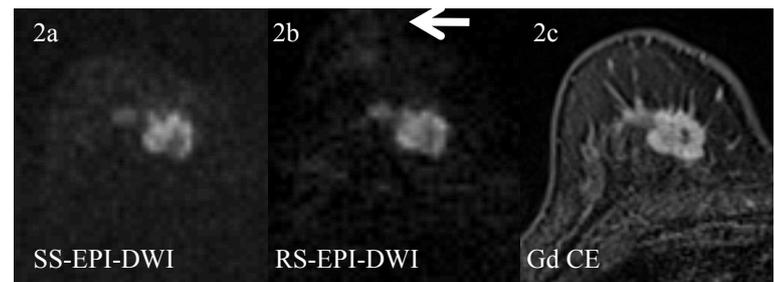


Figure 2. 52-year-old female with right breast cancer. Axial DWI (b=1,000) using SS-EPI (2a) and RS-EPI (2b) and axial image at early phase of dynamic series. (2c). The tumor was visualized clearly at both SS-EPI-DWI and RS-EPI-DWI. Note the ghost artifact (arrow) at RS-EPI-DWI.

Figure 3. Difference of Antero-Posterior Distance of Mammary Gland

