

Comparison of FOCUS and Conventional DWI for Evaluation of Intra-pelvic Tumor

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Target audience:

The scientists, physicians, and technologists who are interested in MR angiography for intra-pelvic tumor.

Introduction:

MR imaging has played an important role in evaluating the intra-pelvic tumor such as uterine, prostatic, and rectal cancer. Now, diffusion weighted imaging (DWI) with single-shot echo planar imaging (ss-EPI) is a useful tool for detection of the intra-pelvic tumor. However, DWI with ss-EPI is susceptible to inhomogeneity of magnetic field and may result in distortion of imaging. Field-of-view (FOV) optimized and constrained undistorted single-shot (FOCUS) is one of the new methods. With this method, we can decrease the required readout duration for single shot EPI by using a 2D spatially selective echo-planar RF excitation pulse and a 180 degrees refocusing pulse, consequently, acquire high spatial resolution images with less distortion. The purpose of this study was to compare the performance of FOCUS DWI for evaluation of intra-pelvic tumor with that of conventional DWI.

Materials and Methods:

14 patients with pelvic tumor (rectum: 4, uterus and vulva: 2, urinary bladder: 6, prostate: 2, respectively) were included in this study, who underwent MRI on a 3T unit (MR750W, GE Healthcare). The spatial resolution of FOCUS DWI was as follows; FOV: 24*12cm, Matrix: 128*64, section thickness: 4-5 mm, and that of conventional DWI was as follows; FOV: 40*28 cm, Matrix 128*160, section thickness: 4-5 mm, respectively. The b-value of all imaging was 800. Apparent

diffusion coefficient (ADC) of the tumor in each imaging was calculated with FUNCTOOL (GE Healthcare). Qualitative evaluations (overall image quality, image undistorsion, blur, motion artifact, conspicuity of tumor, and tumor structural visualization in same magnification, respectively) were performed with five-point scale. Statistical analyses were performed with Wilcoxon signed rank test.

Results:

Correlation Coefficient (R) of calculated ADC of tumor between in FOCUS imaging and in Conventional imaging was 0.79 (Figure 2). Figure 4 shows the images of FOCUS and conventional DWI. Figure 3 is the quantitative analysis of each image. Overall image quality in FOCUS DWI was superior to that in conventional FOV DWI (FOCUS/conventional: 4.7/3.5, respectively, p<0.01). The undistortion in FOCUS DWI was superior to that in conventional FOV DWI (FOCUS/conventional: 4.7/3.7, respectively, p<0.01). The conspicuity and structural visualization of tumor in FOCUS DWI was also superior to that in conventional FOV DWI (Conspicuity: 4.6/3.9, Structural visualization: 4.9/3.4, respectively, p<0.01).

Conclusion:

FOCUS DWI is useful for evaluation of intra-pelvic tumor with high spatial resolution and less distortion.

Reference:

Saritas EU, Cunn ingham CH, et al. Magn Reson Med. 200 8 Aug;60(2):468-73

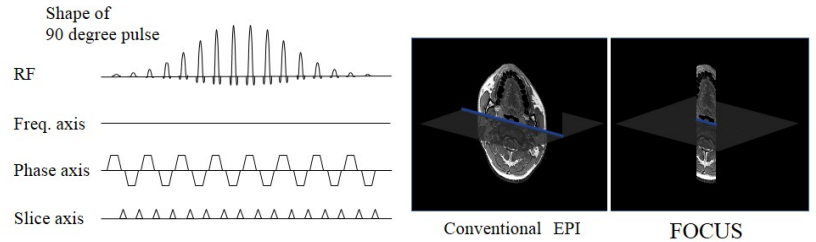


Figure 1. Sequence chart of FOCUS EPI DWI

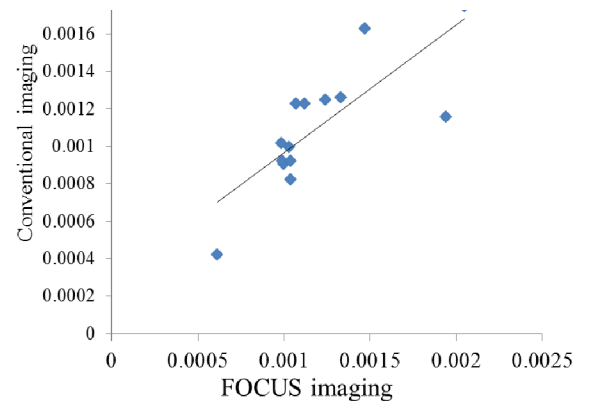


Figure 2. ADC of tumor in each imaging

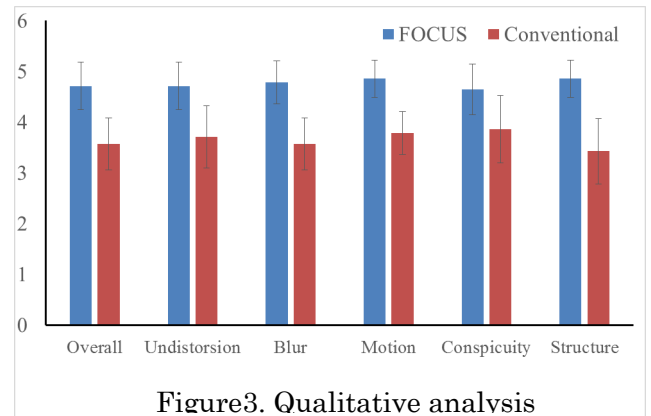


Figure3. Qualitative analysis

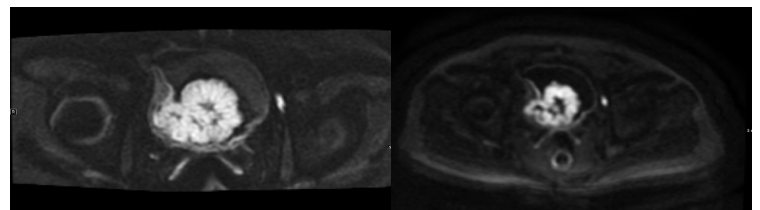


Figure 4. 70-year old man with T1-stage bladder tumor FOCUS DWI (left image) shows tumor in higher spatial resolution than conventional DWI (right image)