

# Evaluation of endometrial lesion on synthetic FOCUS diffusion weighted imaging

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## Target audience:

The scientists, physicians, and technologists who are interested in MR angiography for endometrial lesion in uterus.

## Introduction:

MR imaging has played an important role in evaluating the urinary bladder cancer. Now, diffusion weighted imaging (DWI) with single-shot echo planar imaging (ss-EPI) is a useful tool for detection of the endometrial tumor. However, DWI with ss-EPI is susceptible to inhomogeneity of the main 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, and can acquire high spatial resolution images with less distortion. (Figure 1). On the other hand, synthetic DW Imaging (S-DWI) is a new method that can calculate DWIs for any b-value from at least two DWIs using different b-values. The purpose of this study is to compare delineation of endometrial lesion in FOCUS-DWI and synthetic FOCUS-DWI (S-FOCUS-DWI) with those on conventional FOV DWI.

## Materials and Methods:

21 patients with endometrial lesion (endometrial cancer: 12, endometrial hyperplasia: 7, endometrial polyp: 2, pyometra: 1, respectively) were included in this study, who underwent MRI on a 3T unit (MR750, 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. S-FOCUS-DWI with b-value of 1500 calculated from FOCUS with that of 800. In 13 patients, apparent diffusion coefficient (ADC) of the tumor in each imaging was calculated with FUNCTOOL (GE Healthcare).

Qualitative evaluations (overall image quality, image undistortion, blur, motion artifact, conspicuity of tumor, and tumor structural visualization in same magnification, respectively) were performed with five-point scale.

## Results:

Correlation Coefficient (R) of calculated ADC of tumor between in FOCUS imaging and in Conventional imaging was 0.86 (Figure 2). Figure 4 shows the images of FOCUS, S-FOCUS-DWI and conventional DWI. Figure 3 is the qualitative analysis of each image. Overall image quality in FOCUS DWI was superior to that in conventional FOV DWI (FOCUS-DWI/conventional FOV DWI/ s-FOCUS-DWI: 4.9/4.3/5.0, respectively). The distortion in FOCUS DWI was superior to that in conventional FOV DWI (5.0/ 4.4/5.0, respectively). The conspicuity and structural visualization of tumor in FOCUS DWI and S-FOCUS-DWI was also superior to that in conventional FOV DWI (4.6/4.4/5.0, respectively).

## Conclusion:

FOCUS DWI is useful for evaluation of endometrial lesion with high spatial resolution and less distortion. S-FOCUS-DWI enables to enhance diagnostic ability of FOCUS without image degradation, and might be one of the best combinations.

## Reference:

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

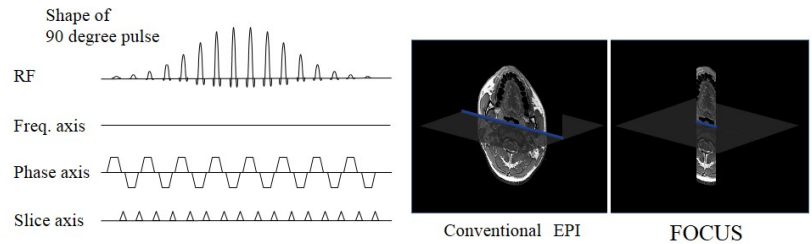


Figure 1. Sequence chart of FOCUS EPI DWI

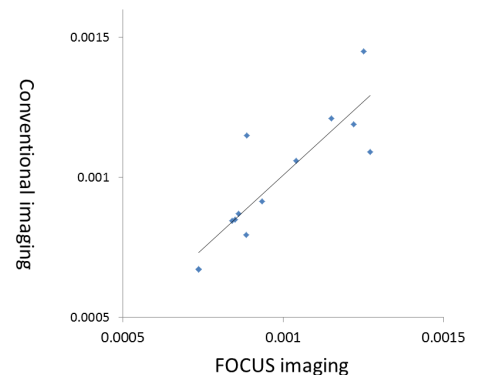


Figure 2. ADC of tumor in each imaging

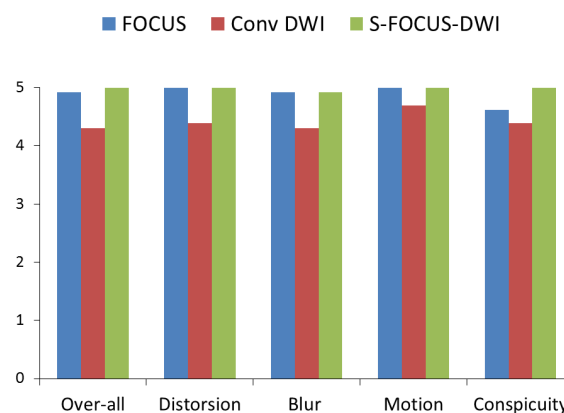


Figure3. Qualitative analysis

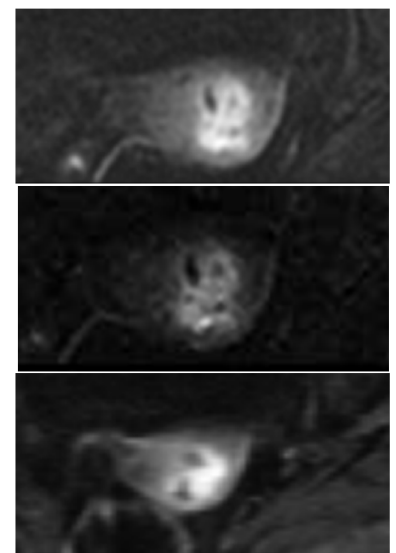


Figure 4. 84-year old woman with T1b-stage endometrial carcinoma  
FOCUS DWI (top image) and S-FOCUS-DWI (center image) show tumor in higher spatial resolution than conventional DWI (bottom image)