Comparison of PROPELLER fast spin echo, respiratory-triggered fast spin echo and single-shot fast spin echo sequences for transverse T2-weighted magnetic resonance imaging of the female pelvis.

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Introduction:

PROPELLER (Periodically Rotated Overlapping ParallEL Lines with Enhanced Reconstruction) sequence has been applied to T2-weighted image of the brain. With this technique, motion artifacts can be suppressed. In the area of abdomen and pelvis, motion artifacts are generated by respiratory movement and peristalsis of the bowels. Theoretically, motion corrections with PROPELLER may be insufficient. However, different appearances of motion artifacts on the PROPELLER imaging are expected and this technique may be useful. Thus, the purpose of the current study was to evaluate the usefulness of the PROPELLER-FSE technique in comparison with respiratory-triggered fast spin echo (without an antiperistaltic drug) (RT-FSE(-)), respiratory-triggered fast spin echo (with an antiperistaltic drug) (RT-FSE(+)) and half-Fourier single-shot fast spin echo (SS-FSE) for transverse T2-weighted magnetic resonance imaging of the female pelvis.

Material and methods:

Thirty-five patients (mean age 35.1 years ± 8.2 [SD]; range 24 - 54 years) were included, who were suspected of pelvic abnormalities after abdominal or tranvaginal ultrasonography. On a 1.5-T system (SIGNA EXCITE ; GE Medical Systems, Milwaukee, Wis) with an 8ch body array coil, before administering an antiperistaltic drug 3 types of T2-weighted images were obtained with the following sequences : PROPELLER-FSE ; (TR of 6000 msec, eTE of 85 msec, slice thickness 7 mm, with a 2 mm intersection gap, matrix size of 288 x 288 correspond to 256 x 256 in conventional FSE scan , field of view of 35 x 35 cm, acquisition time of 1 min 42 sec), RT-FSE ; (4500-6000, 85 msec, 7 mm, 2 mm, 256 x 256, 35 x 35 cm, 1 min 54 sec, with ASSET reduction factor 2) and SS-FSE ; (∞, eTE of 85msec, 36 sec, reduction factor 2, half fourier acquisition). And after administration of antiperistaltic drug RT-FSE was repeated.

Evaluations:

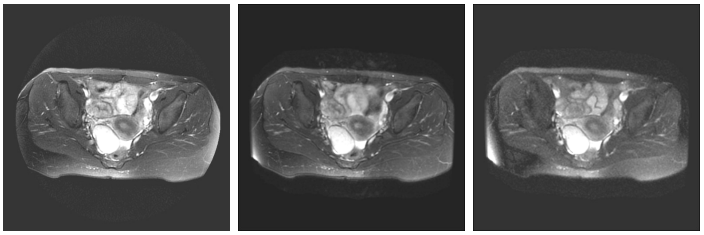
For qualitative evaluation, on 4 types of T2-weighted images overall quality, artifact and sharpness were ranked with a five-point scale (1, bad - 5, good). For quantitative evaluation, signal intensity (SI) of region of intensity in each area (myometrium, junctinal zone and endometrium) and the contrast ratio (CR) ([SI of each area(myometrium, endometrium) - SI of junctional zone] / SI of junctional zone) was calculated.

Results:

Motion artifacts on RT-FSE (-) were recognized blurring or noise on the phase encoding direction. With antiperistaltic drug, motion artifacts were less and image quality was improved. On SS-FSE images, motion artifacts were not recognized (Fig. 1). Unique artifacts for PROPELLER-FSE images were recognized such as semicircular lines (Fig. 2). CR on PROPELLER image were competitive or slightly better than those on RT-FSE (TABLE 1).

Conclusion:

Motion artifacts on PROPELLER-FSE T2-weighted image of the pelvis are less prominent. Image contrast on PROPELLER is competitive to that on the RT-FSE (+). Thus, PROPELLER-FSE T2-weighted image can be used for the evaluation of the pelvis without obvious penalty.



a. b. c.

Figure 1. T2-weighted transverse images in a 28-years-old woman with suspected right ovarian dermoid cyst.
(a) On a PROPELLER-FSE image, motion artifacts are not recognized. (b) On a RT-FSE (+) image, mild blurring artifacts are recognized regardless of antiperistaltic medication. (c) SS-FSE image shows no motion artifact, however blurring effects are noticed.

TABLE 1 (mean ± SD)	PROPELLER	RT-FSE(-)	RT-FSE(+)	SS-FSE
Overall quality	4.2 ± 0.7	3.5 ± 0.6	3.7 ± 0.5	3.0 ± 0.2
Artifact	3.8 ± 0.7	3.2 ± 0.4	3.6 ± 0.5	5.0 ± 0.2
Sharpness	4.8 ± 0.5	3.7 ± 0.5	3.8 ± 0.4	2.0 ± 0.2
CR (myometirum and junctional zone)	0.64 ± 0.42	0.55 ± 0.37	0.52 ± 0.37	0.41 ± 0.31
CR (endometirum and junctional zone)	1.32 ± 0.66	1.19 ± 0.70	1.15 ± 0.88	0.90 ± 0.46

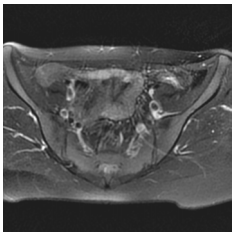


Figure 2. On a PROPELLER-FSE image, semicircular line is recognized as an artifact.