

Susceptibility-weighted imaging for the evaluation of extra-ovarian endometriosis

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[Introduction] Susceptibility-weighted imaging (SWI) combines magnitude and phase information, and visualizes the magnetic susceptibility effects generated by local inhomogeneity of the magnetic field caused by blood products (hemosiderin or deoxyhemoglobin) as signal voids. This technique has been applied in imaging of central nervous system, and recently it can be applied in body imaging. Takeuchi et al. reported the usefulness of SWI for the diagnosis of endometriomas by detecting the hemosiderin deposition reflecting repeated cyclic hemorrhage as punctate or curved linear signal voids along the cyst wall (AJR 191; 2008). Endometriosis may also involve extra-ovarian organs such as urinary bladder, colon, abdominal wall, etc. and may mimic neoplastic lesions. Fat-saturated T1WI is sensitive for subacute hemorrhage in endometriosis-associated tumor-like masses, however, it can only detect methemoglobin as high intensity areas due to paramagnetic effect. SWI can detect both old and acute hemorrhage by hemosiderin and deoxyhemoglobin, respectively. In this study we evaluated the usefulness of SWI in diagnosing extra-ovarian endometriosis.

[Materials and Methods] Surgically proven 14 extra-ovarian endometriosis (4 colon; 2 urinary bladder; 2 ureter; 2 abdominal wall; 2 inguinal; 2 subcutaneous) were evaluated. Fast spin-echo T2WI (TR/TE = 4000ms /99.3ms) and fat saturated spin-echo T1WI (TR/TE = 600-700ms /7.9-9.6ms) were obtained in all patients on a system with a 1.5T superconducting unit (Signa Excite HD, General Electric, Milwaukee, WI) or on a system with a 3T superconducting unit (Signa HDx 3T, General Electric, Milwaukee, WI). SWI (2D-FSPGR, TR/TE = 650-700ms /30ms; Flip angle = 15-20 degrees; Matrix = 288x192; FOV = 28cm; thickness /gap = 8mm /1mm; NEX = 2; scan time = 4 min. 34 sec.; To enhance the visibility of susceptibility-induced signal voids, post-processing was applied to the magnitude images multiplied with a phase mask generated from the filtered phase data) were obtained in all patients.

[Results] 12 lesions appeared as solid tumor-like masses and 2 subcutaneous lesions appeared as endometrioma-like hemorrhagic cystic masses. Punctate or curved linear signal voids within solid tumor-like masses or along the cyst wall were observed in all extra-ovarian endometriosis (Fig. 1-4). In 7 of 12 solid tumor-like masses high intensity hemorrhagic spots were observed on fat-saturated T1WI (Fig. 1). Two cystic masses contained high intensity hemorrhagic fluid on fat-saturated T1WI, however, this finding is not specific for endometrioma and high intensity hemorrhagic foci in the cyst wall were not revealed on fat-saturated T1WI. The sensitivity for endometriosis-associated hemorrhagic change was 100% (14/14) for SWI and 7/14 (50%) for fat-saturated T1WI.

[Conclusions] SWI is more sensitive for endometriosis-associated hemorrhagic change than fat-saturated T1WI, and may contribute to the diagnosis of extra-ovarian endometriosis.

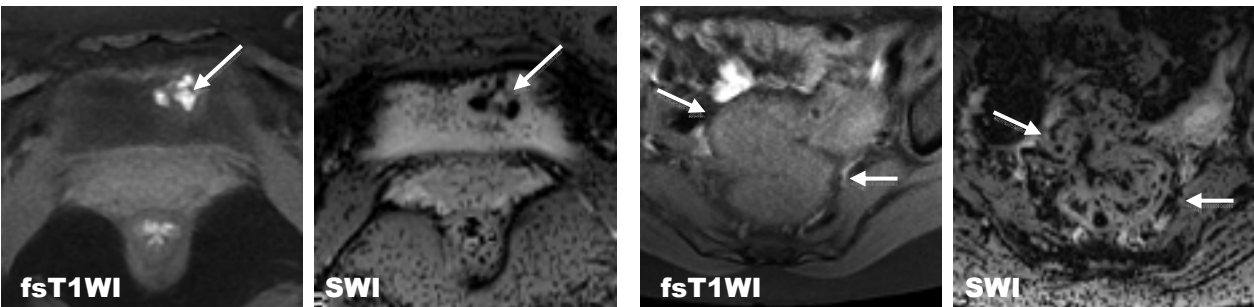


Fig. 1: Urinary bladder endometriosis: hemorrhagic spots were demonstrated as high intensity on fsT1WI and signal voids on SWI.

Fig. 2: Sigmoid colon endometriosis: hemorrhagic spots were demonstrated as signal voids on SWI but not revealed on fsT1WI.

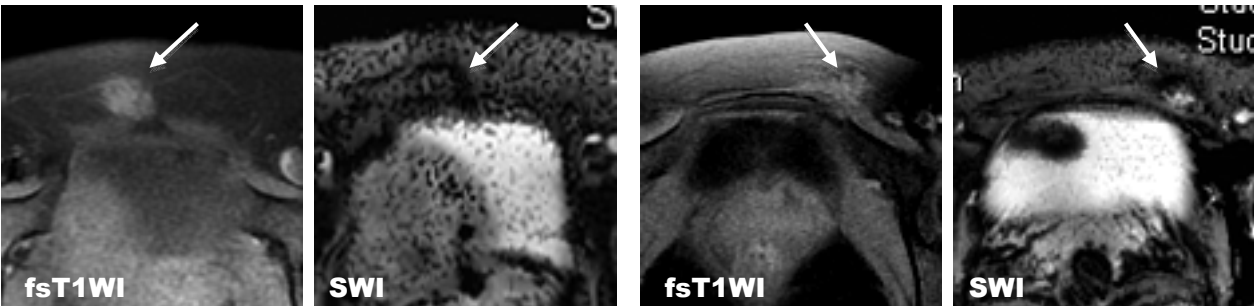


Fig. 3: Abdominal wall endometriosis: hemorrhagic area was demonstrated as peripheral signal void on SWI but not revealed on fsT1WI.

Fig. 4: Inguinal endometriosis: hemorrhagic area was demonstrated as peripheral signal void on SWI but not revealed on fsT1WI.