DOI: 10.5350/SEMB.20160127121008

Role of Susceptibility Weighted Imaging (SWI) in the Diagnosis of Abdominal Wall Endometriosis

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ABSTRACT:

Role of susceptibility weighted imaging (SWI) in the diagnosis of abdominal wall endometriosis

Objective: Abdominal wall endometriosis is a rare subtype of extra-pelvic endometriosis; and the patients present with a painful abdominal mass that is particularly aggravated by menstruation. Ultrasound and MRI are the recommended diagnostic tools for the evaluation of the mass lesions. Biopsy is performed when calcifications in the granulation tissue cannot be differentiated from chronic blood products. Susceptibility weighted imaging (SWI) is a relatively new MR technique where the image contrast is mainly based on magnetic susceptibility differences. SWI has higher sensitivity to blood products compared to conventional MRI sequences. Although it has been mostly used in neuroimaging studies, recent studies have shown that it provides additional diagnostic information abdominal imaging. In this article, we aim to demonstrate the diagnostic utility of SWI for lesions of abdominal wall endometriosis.

Case: A 29-year-old woman with a history of Caesarean-section delivery five years ago presented with a cyclic pain and slowly growing abdominal mass located superior to the Caesarean incision scar on the left side of the midline. A heterogeneous hypoechoic solid mass was detected ultrasonographically underneath the fascia of rectus muscle. On MRI, a solid heterogeneous enhancing lesion located anterior to the rectus muscle was seen in which blood products and calcifications could not be differentiated by their signal intensities. On SWI sequence, signal voids within the lesion on magnitude images were hyperintense on phase images and this excluded calcifications endorsing endometriosis as diagnosis.

Conclusion: SWI imaging with its high sensitivity to blood products, contributes to the diagnosis of abdominal wall endometriosis by depicting different phases of hemorrhage during menstruation and non-menstruating days. Another advantage of SWI is the ability to differentiate between blood products and calcification which provides additional value to improve diagnostic ability of pelvic MRI.

Key words: Abdominal wall endometriosis, Magnetic resonance imaging, Susceptibiliy weighted imaging, scar, endometriosis

ÖZET:

Suseptibilite ağırlıklı manyetik rezonans görüntüleme sekansının abdominal duvar endometriozisi tanısına katkısı

Amaç: Pelvis dışı endometriozisin bir alt tipi olan abdominal duvar endometriozisi nadir görülmekte olup olgular özellikle menstrüasyonla şiddetlenen ağrılı kitle ile başvururlar. Kitlenin de¬ğerlendirilmesinde ultrasonografi ve MRG önerilen tanı yöntemleridir. Granülasyon zemininde kalsifikasyonun kronik kan ürünlerinden ayırdedilemediği durumlarda tanı biyopsi ile konulur. Suseptibilite ağırlıklı görüntüleme (SAG), komşu dokular arasındaki manyetik duyarlılık farklarını imaj oluşturmakta kullanan göreceli yeni bir tekniktir. Kan ürünlerine duyarlılığı konvansiyonel MRG'ye göre daha yüksek olan SAG sekansı esas olarak nöroradyoloji alanında kullanılmakta ancak son çalışmalarda batın görüntülemede ek tanısal bilgi sağladığı gösterilmektedir. Bu yazıda SAG'nin abdominal duvar endometriozisi lezyonlarında tanısal yararlılığını göstermeyi amaçlıyoruz.

Olgu: Beş yıl önce sezaryen ile doğum öyküsü olan 29 yaşındaki kadın hasta sezaryen skarı süperior kesiminde, orta hattın solunda ağrılı ve zamanla büyüyen kitle şikayeti ile başvurdu. Yapılan ultrasonografide rektus fasyası altında heterojen hipoekoik solid lezyon tespit edildi. MRG de rektus abdominis kasına bitişik yerleşimli düzensiz şekilli lezyon içerisinde kronik kan ürünleri ile kalsifikasyon ayırımının net yapılamadığı kontrast tutan heterojen kitle görüldü. SAG sekansta sinyal void olarak izlenen odakların faz imajlarda hiperintens görülmesi kalsifikasyon olasılığını ekarte etmiş, endometriozis tanısını desteklemiştir.

Sonuç: Abdominal duvar endometriozisi şüpheli olgularda MR tetkikine eklenen SAG sekansı menstürasyon ve menstürasyon dışı dönemlerde değişik fazlardaki kan ürünlerini gösterebilmesinin yanında, faz imajların katkısıyla kalsifikasyon olasılığının ortadan kaldırılmasında önemli bir rol oynayarak tanıyı kolaylaştırmaktadır.

Anahtar kelimeler: Abdominal duvar endometriozisi, Manyetik rezonans görüntüleme, Suseptibilite ağırlıklı görüntüleme, skar, endometriozis

Ş.E.E.A.H. Tıp Bülteni 2016;50(4):325-9

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Date of receipt / Geliş tarihi:
December 11, 2015 / 11 Aralık 2015

Date of acceptance / Kabul tarihi:
January 27, 2016 / 27 Ocak 2016

INTRODUCTION

Endometriosis is the location of a functional endometrial tissue outside of uterine cavity. Non-pelvic endometriosis occurs rarely, and it may locate in many tissues and organs of the body causing symptoms according to the organ it's located. Abdominal wall endometriosis (AWE) accounts for 4% of the non-pelvic endometriosis cases, seen mainly in the incision scar and umbilicus, rarely in the inguinal canal and rectus abdominis muscle (1,2). AWE may develop Caeserean cases with a rate of 0.003-0.4%. The cases present with a painful mass that is aggravated with menstruation and hernia, benign- malignant mass, and abscess distinction cannot be made by physical examination. Ultrasonography, ultrasound-guided fine needle aspiration and MRI are the recommended diagnostic methods in the evaluation of the mass (3). USG findings are nonspecific. It has been shown that ultrasound-guided fine-needle aspiration does not give result in 75% due to the fibrosis basis (4). MR imaging is diagnostic in cases where the hemorhragic foci in the mass can be demonstrated by multiplanar imaging and high-contrast resolution features. Diffusion MRI studies have shown that the ADC values of endometrial cysts are lower than the ADC values of other cysts, band similarly, the ADC values are lower in AWE cases (3-5). SWI has been used in recent years to evaluate liver, spleen, prostate in abdominal evaluations, other than neuroradiology (6-8).

Susceptibility weighted imaging (SWI) is a technique based on a gradient echo sequence that uses magnetic susceptibility differences between neighboring tissues to form an image. Because diamagnetic materials such as calcium, paramagnetic materials such as blood products and gadolinium and ferromagnetic materials such as iron have different and high magnetic susceptibility, they result in different phase accumulations. This difference in phase forms the basis for distinguishing between bleeding and calcification (9,10). Due to the susceptibility of the SWI sequence to different term blood products, this sequence has recently been found in several pelvic MRI studies such as endometrioma, extraovarian endometriosis, deep infiltrative endometriosis and AWE (9,11,12). We aim to present the contribution of SWI sequence to the MRI in a rare case of rectus muscle endometriosis in the light of the literature.

CASE REPORT

A 29-year-old woman with a history of Caesarean-section delivery five years ago presented to the

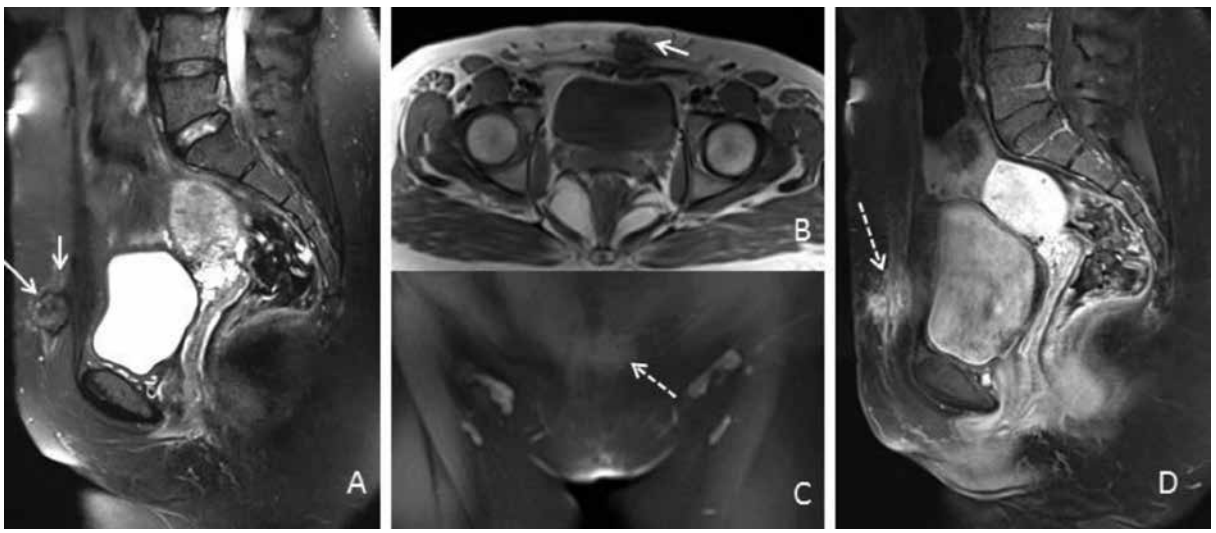

Figure-1: Irregular shaped abdominal wall endometriosis in the anterior vicinity of the left rectus abdominis muscle. (A) T2A sagittal examination showing heterogeneous hypointense mass lesion with hypointense foci in and around. (B) Axial T1A examination shows heterogeneous intense contrast enhancement in the mass lesion that is isointense with the rectus muscle in coronal (C) and sagittal (D) fat-suppressed T1A examinations following contrast-enhancement.

Department of Obstetrics and Gynecology with a cyclic pain and slowly growing abdominal mass located superior to the Caesarean incision scar on the left side of the midline. A mass was palpated at the described localization in the physical examination. The vaginal examination and pelvic USG showed normal uterus and ovaries. Superficial tissue ultrasonography showed an irregular heterogeneous hypoechoic solid lesion under the rectus fascia. In the MRI performed with the diagnosis of a mass on the abdominal wall, an irregular mass lesion of 3x3 cm placed adjacent to the rectus abdominis muscle, with hypointense foci in T1A- weighted scans and heterogeneous in T2A-weighted scans, including hypointense foci inside, and showing intense heterogeneous contrast enhancement, was seen (Figure-1). In SWI sequence magnitude (amplitude) images, curvilinear areas around the lesion and punctate signal void areas in its central, supporting hemorrhage or calcification, were observed. The hyperintense imaging of the signal-free foci in SWI phase images suggested that these belong to blood products and strengthened our AWE diagnosis (Figure-2). Histopathological examination of the surgically excised mass was reported as endometriosis.

DISCUSSION

Non-pelvic endometriosis accounts for 9% of all endometriosis cases and AWE, for 4% of non-pelvic endometriosis (3). AWE occurs iatrogenically, with the placement of endometrial tissue to the incision line after surgery. In cases with no surgical anamnesis, majority of the lesions located in umbilical region are of congenital origin (12). In the studies, the incidence of pelvic endometriosis in AWE cases varies between 13-40% (3). AWE sites include Caesarean scar, episiotomy scar, vaginal cuff following hysterectomy, trocar scar, umbilical region, inguinal canal and rectus abdominis muscle (1,12).

The differential diagnosis of AWE should include diagnosis such as abscess, lipoma, hematoma, desmoid tumor, primary and metastatic cancer (1). MRI has high accuracy in showing deep infiltrative endometriosis foci. Fat-suppressed T1A sequence provides convenience in showing millimetric

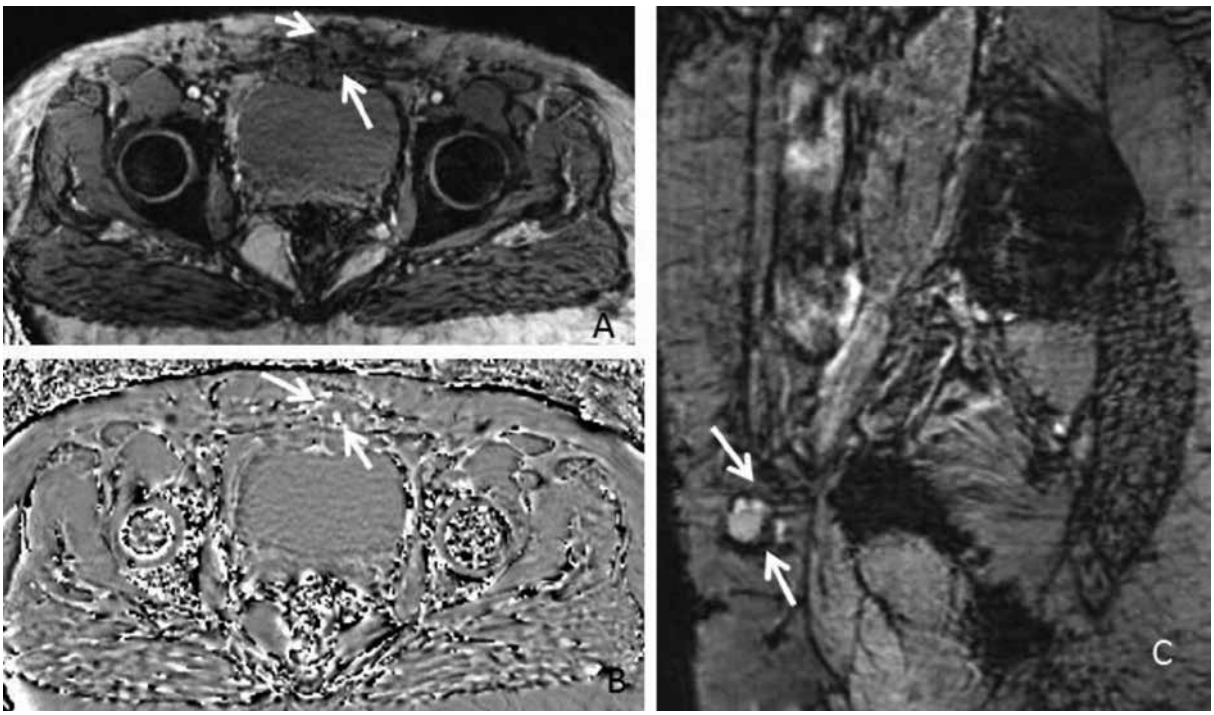

Figure-2: Lesion with punctate signal void foci in the center and peripheral curvilinear foci in SWI sequence magnitude images (A,C). Lesion with hyperintense foci of blood products in SWI phase images (B).

endometriotic foci. However, in cases of superficial peritoneal endometriosis, in T2A images with fibrotic unclear borders, it is not easy to recognize the foci with hypointense features (9).

SWI is a newly developed advanced MRI method. SWI is a 3D gradient-echo sequence, and the magnetic susceptibility differences of the tissues are utilized to create contrast. Iron, blood products, MRI contrast agents and calcium have strong magnetic susceptibility and can be detected more easily by SWI sequence. With magnitude and phase postprocessing features, it is a very sensitive sequence in detection of deoxyhemoglobin, methemoglobin and hemosiderin. Another advantage of this method is that it can distinguish the blood products from calcification. While blood products which are paramagnetic increase the local magnetic field, calcium which is dimagnetic increases the magnetic field, thereby, creating a diminished image in the phase images (9). With these properties, the practical practices of SWI beginning with the demonstration of hemorrhage foci in neuroradiology began to take part in the abdominal studies in the course of time. Iron accumulation in liver and spleen in different diseases, differential diagnosis of tumor-thrombus in the portal vein, differential diagnosis of cancer-hyperplasia in prostate and detection of calcification focus, detection of lesions of endometrioma and deep endometriosis can be considered as abdominopelvic applications (6-9).

In our case with a history of Caesarean delivery with absence of accompanying pelvic endometriotic lesion, due to the absence of blood products of acute-subacute period in the mass lesion that shows continuance with rectus abdominis muscle, no hyperintensity in the lesion was observed in the fat-suppressed T1A sequences and T2A sequences. Hypointense foci in T2A sequence suggest primarily dystrophic calcification, but the differentiation of calcification and hemorrhage is inadequate with the conventional sequences. Because of the cyclic pain of the patients, endometriosis is included in the differential diagnosis, signal void foci that support hemorrhage or calcifications in SWI sequence magnitude images were observed. AWE diagnosis has been strengthened by hyperintense appearance of the signal void foci in phase images, suggesting that the source is blood products.

Solak and Takeuchi, in their studies, have shown that the addition of SWI sequence to MRI increases the rate of AWE diagnosis (11,12). Takeuchi et al. in their ovarian and extraovarian endometriosis cases, reported that SWI sequence increased the diagnostic yield by 50% (11). Solak et al. evaluated the MRI examinations at different periods of menstrual cycle of AWE cases and swowed the presence of old and new blood products in menstrual and non-menstrual periods with SWI sequence (12). The addition of SWI sequence to MRI has been described to enhace the success of MRI in the diagnosis of deep infiltrative endometriosis by laparoscoic correlation (9).

In summary, in the presented case, SWI sequence showed the old blood products in the lesion and allowed us to distinguish the calcification with the help of phase images. Endometriosis should be considered as a differential diagnois in the evaluation of abdominal anterior wall masses and it should be kept in mind that SWI sequence of MRI may play a reinforcing role in the diagnostic ability in AWE cases.

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