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CASE REPORT

Abdominal wall endometriosis: comparative imaging on power Doppler ultrasound and MRI

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Introduction

Endometriosis is defined as the presence of functional endometrial glands and stroma outside the uterine cavity. It occurs in up to 15% of women of reproductive age.[1] The ovaries, pouch of Douglas, and peritoneum covering the pelvic organs are most commonly affected, followed by the bowel and urinary tract. Involvement of the abdominal wall and extra-pelvic sites (e.g. brain, lung) is uncommon.[2,3] We report a case of abdominal wall endometriosis (AWE) in a 30-year-old woman demonstrated using power Doppler ultrasound and magnetic resonance imaging (MRI). There are many reports of AWE, but this is the first case report to describe a change in appearance of AWE during the menstrual cycle.

Case report

A 30-year-old woman presented with a 3-year history of lower abdominal pain that had become worse over the preceding 6 months. On specific questioning the patient admitted that the pain was cyclical in nature, tending to get worse just before menstruation. Her menstrual cycle was regular. She had undergone a caesarean section at full term 4 years previously, from which she had recovered swiftly.

Physical examination revealed a well healed lower section caesarean section scar. There was no discoloration of the skin. There was some induration and fullness of the deep tissues but no discrete palpable mass. The scar was tender to palpation. Vaginal examination was normal.

Blood tests, including the hormonal profile, were normal. Transabdominal and transvaginal ultrasound performed elsewhere, within the previous 18 months, had also been reported as normal. A clinical diagnosis of an incisional hernia was considered and the patient referred to our institution for further imaging. An ultrasound examination using a high-frequency 12 MHz probe (ATL Philips HDI 5000, Bothwell, USA) revealed a $3.7 \times 2.3 \times 2.0$ cm well defined mass lying within the right rectus abdominis muscle (Fig. 1). The mass had a slightly heterogeneous appearance, of mildly higher attenuation than the surrounding muscle. No fluid component was demonstrated. Power Doppler interrogation revealed flow predominantly in the periphery of the mass, with only a minor flow seen within it (Fig. 1). The vessels showed simple branching with no evidence of vascular loops, trifurcations, stenoses or large feeding vessels. Analysis of Doppler waveforms revealed both arterial and venous flow. At this stage the differential diagnosis was between an abdominal wall endometrioma, a haematoma and a soft tissue sarcoma. The patient was scanned using the same ultrasound parameters (colour gain, pulse repetition frequency and flow optimization) at two different phases of her menstrual cycle—initially while menstruating and then 3 weeks after the end of menstruation—the second examination being performed for ultrasound-guided biopsy. The lesion did not change significantly in size during this time but appeared to decrease significantly in vascularity (Fig. 2).

MRI demonstrated a well defined mass lying within the rectus abdominis muscle. The mass contained areas of low signal on both T1- and T2-weighted sequences consistent with haemosiderin (Figs 3 and 4). On the T2-weighted sequence some small foci of high signal were seen around the posterior aspect of the mass and were thought to represent methaemoglobin. After intravenous gadolinium there was evidence of a minor enhancement in the periphery of the lesion corresponding to the areas of increased vascularity on power Doppler.

An ultrasound-guided biopsy was performed, which confirmed the diagnosis of endometriosis (Figs 5 and 6). Subsequently the patient underwent wide local excision of the lesion, with complete resolution of her symptoms at 3-month follow-up.

Discussion

Several theories have been suggested for the pathogenesis of AWE.[4] The most likely of these is thought to be iatrogenic implantation of endometrial tissue during surgery, particularly caesarean sections. It has also been suggested that endometrial cells may reach a surgical scar via the

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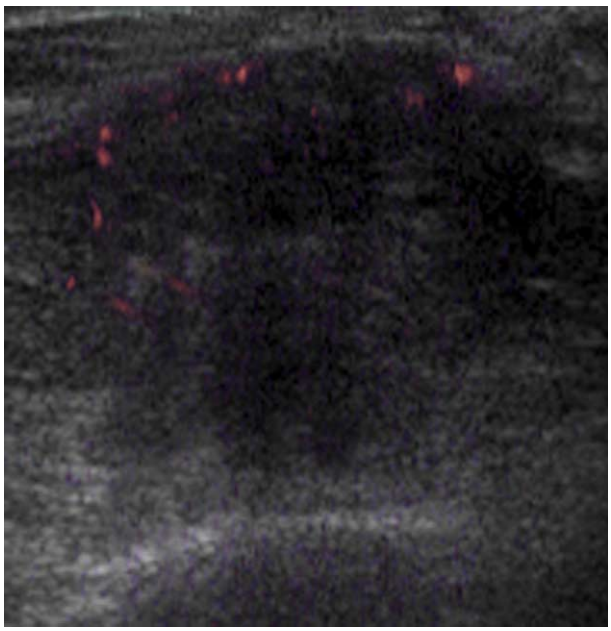

Figure 1 Transverse ultrasound demonstrating a fairly well circumscribed mass lying within the right rectus abdominis muscle. The mass appears slightly more echogenic than the surrounding muscle. Power Doppler ultrasound (during menses) demonstrates predominantly peripheral vascularity, with relatively little internal blood flow. The vessel architecture is simple.

lymphatic or haematogenous route.[5,6] The tissue may then proliferate under the stimulation of oestrogen or alternatively induce metaplasia of the surrounding tissue to form a mass known as an endometrioma. The incidence of AWE after caesarean sections has been reported as up to 0.4%.[7]

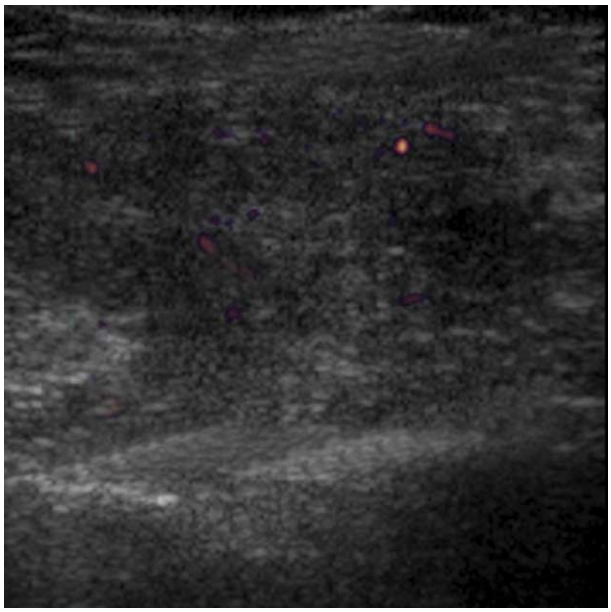

Figure 2 Power Doppler ultrasound 3 weeks after menses demonstrates scanty peripheral vascularity, which is much less pronounced than on the previous ultrasound examination (Fig. 1).

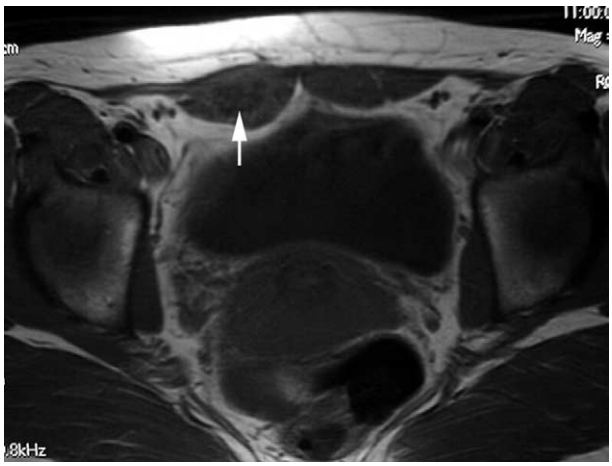

Figure 3 Axial T1-weighted MRI image demonstrates a well-circumscribed very low signal mass within the right rectus abdominis muscle (arrow).

The classical presentation of AWE is of a tender mass within or adjacent to a surgical scar. The pain is usually intermittent and associated with the patient's menstrual cycle but may be constant in nature.[2,3,8,9] The overlying skin may be hyperpigmented due to deposition of haemosiderin. The time interval between surgery and the onset of symptoms has been reported to range from less than 1 year to over 20 years.[3]

There is a wide differential for an abdominal wall mass in a woman of reproductive age, which includes a stitch granuloma, haematoma, sebaceous

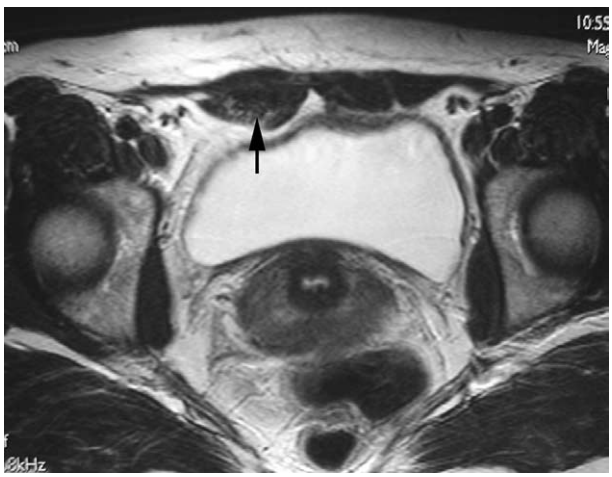

Figure 4 Axial T2-weighted MRI image also demonstrates low signal within the mass (arrow) indicating the presence of haemosiderin, consistent with chronic haemorrhage. There is minor high signal change in the periphery of the mass on its posterior aspect thought to represent small foci of methaemoglobin from subacute haemorrhage.

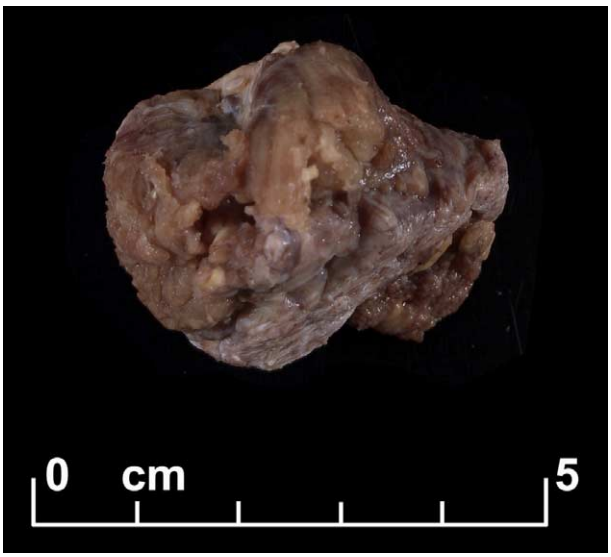

Figure 5 Gross specimen photograph demonstrating a well-circumscribed mass surrounded by fibrous tissue.

cyst, hernia, haemangioma, lymphoma, metastasis, sarcoma and endometrioma.[3] Imaging, in conjunction with the clinical history and examination, has an important role to play in the diagnosis of AWE. Nevertheless, there are only a few reports in the literature describing the ultrasound features of this clinical entity.[10–12] On ultrasound the lesion is usually well defined and hypoechoic. Heterogeneity due to repeated haemorrhage may also be a feature. The abdominal wall musculature is usually involved, with the lesion lying either partly or completely within the muscle. To our knowledge there has only been one previous case report describing the Doppler appearances of AWE.[11] This showed a subcutaneous mass within a caesarean scar with scanty peripheral blood flow, similar to the pattern encountered in our case. Power Doppler is an important part of the ultrasound investigation as it may reliably differentiate benign from malignant soft-tissue masses.[13] Simple branching vessel architecture, with no evidence of vascular loops, trifurcations or stenoses, suggests a benign lesion.

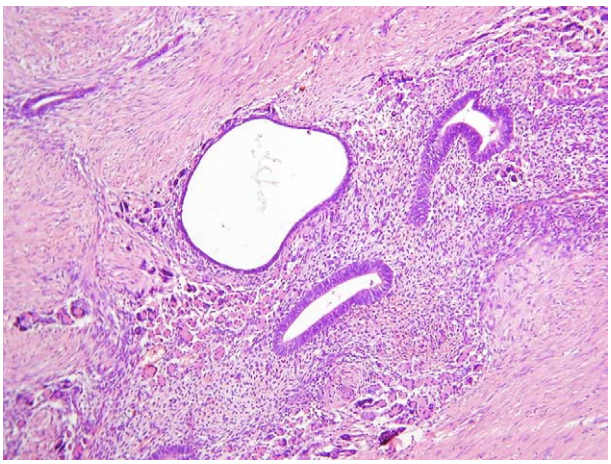

Figure 6 Medium-power photomicrograph (haematoxylin and eosin stain) shows endometriotic glands and stroma. The endometriotic tissue is surrounded by fibrosis.

This is the first report describing a change in appearance of AWE during the menstrual cycle. It is recognized that intra-pelvic endometriomas may change in appearance during the menstrual cycle, becoming more swollen and congested during menses, reflecting the increased proportion of glandular elements.[4] The authors suggest that if a change in vascularity is demonstrated within an abdominal wall mass over the menstrual cycle, it is highly likely to represent AWE.

On MRI the signal characteristics of AWE reflect the varying degrees of haemorrhage, fibrosis and inflammation. An important distinguishing feature of an endometrioma is "shading" (i.e. loss of signal within the lesion) which can be seen on both T1- and T2-weighted images,[14] reflecting the presence of haemosiderin due to chronic recurrent haemorrhage. In patients with subacute haemorrhage, the presence of methaemoglobin may result in foci of increased signal on both T1- and T2-weighted sequences.[15] Intravenous gadolinium administration may show only scanty peripheral uptake in the mass, corresponding to areas of increased vascularity on power Doppler. MRI is more specific than CT in the diagnosis of AWE because of its ability to detect haemosiderin.[15]

On computed tomography (CT), the lesion usually appears iso- or hyperdense to adjacent muscle, with a heterogeneous enhancement pattern after intravenous contrast medium administration. Surrounding inflammatory change may result in blurring of adjacent fat planes.[4,16,17]

The treatment of choice for AWE is wide-margin excision.[2] Medical treatment with hormonal agents has variable success and may produce only temporary relief of symptoms.[18]

The increasing rate of caesarean sections may result in a corresponding rise in the incidence of AWE.[19] Raising awareness of the specific imaging features of AWE should help to minimize the risks of incomplete excision and recurrence. If the vascularity of an abdominal wall mass alters with the patient's menstrual cycle on power Doppler ultrasound, AWE should be considered in the differential. MRI may demonstrate the presence of haemosiderin within the mass and therefore help confirm the diagnosis.

References

1. Ranney B. Endometriosis. *Obstet Gynecol* 1978;**7**:219—44.
2. Blanco RG, Parithivel VS, Shah AK, Gumbs MA, Schein M, Gerst PH. Abdominal wall endometriomas. *Am J Surg* 2003; **185**:596—8.
3. Patterson GK, Winburn GB. Abdominal wall endometriomas: report of eight cases. *Am Surg* 1999;**65**:36—9.
4. Woodward PJ, Sohaey R, Mezzetti Jr TP. Endometriosis: radiologic—pathologic correlation. *RadioGraphics* 2001;**21**: 193—216 questionnaire 288—94.
5. Steck WD, Helwig EB. Cutaneous endometriosis. *JAMA* 1965; **191**:167—70.
6. Kaunitz A, Di Sant'Agnese PA. Needle tract endometriosis: an unusual complication of amniocentesis. *Obstet Gynecol* 1979;**54**:753—5.
7. Singh KK, Lessells AM, Adam DJ, et al. Presentation of endometriosis to general surgeons: a 10-year experience. *Br J Surg* 1995;**82**:1349—51.
8. Dwivedi AJ, Agrawal SN, Silva YJ. Abdominal wall endometriomas. *Dig Dis Sci* 2002;**47**:456—61.
9. Chatterjee SK. Scar endometriosis: a clinicopathologic study of 17 cases. *Obstet Gynecol* 1980;**56**:81—4.
10. Alexiadis G, Lambropoulou M, Deftereos S, et al. Abdominal wall endometriosis—ultrasound research: a diagnostic problem. *Clin Exp Obstet Gynecol* 2001;**28**:121—2.
11. Wu YC, Tsui KH, Hung JH, Yuan CC, Ng HT. High-frequency power Doppler angiographic appearance and microvascular flow velocity in recurrent scar endometriosis. *Ultrasound Obstet Gynecol* 2003;**21**:96—7.
12. Khaleghian R. Abdominal wall endometriosis: sonographic diagnosis. *Australas Radiol* 1995;**39**:166—7.
13. Bodner G, Schocke MF, Rachbauer F, et al. Differentiation of malignant and benign musculoskeletal tumors: combined color and power Doppler US and spectral wave analysis. *Radiology* 2002;**223**:410—16.
14. Arrive L, Hricak H, Martin MC. Pelvic endometriosis: MR imaging. *Radiology* 1989;**171**:687—92.
15. Balleyguier C, Chapron C, Chopin N, Helenon O, Menu Y. Abdominal wall and surgical scar endometriosis: results of magnetic resonance imaging. *Gynecol Obstet Invest* 2003; **55**:220—4.
16. Fishman EK, Scatarige JC, Saksouk FA, Rosenshein NB, Siegelman SS. Computed tomography of endometriosis. *J Comput Assist Tomogr* 1983;**7**:257—64.
17. Amato M, Levitt R. Abdominal wall endometrioma: CT findings. *J Comput Assist Tomogr* 1984;**8**:1213—14.
18. Rani PR, Soundararaghavan S, Rajaram P. Endometriosis in abdominal scars—review of 27 cases. *Int J Gynaecol Obstet* 1991;**36**:215—18.
19. Olufowobi O, Sorinola O, Miller SJ, Condie RG. Scar endometrioma: a cause for concern in the light of the rising caesarean section rate. *J Obstet Gynaecol* 2003;**23**:86.