The Egyptian Journal of Radiology and Nuclear Medicine (2015) **46**, 159–165

Egyptian Society of Radiology and Nuclear Medicine

The Egyptian Journal of Radiology and Nuclear Medicine

www.elsevier.com/locate/ejrnm
www.sciencedirect.com

ORIGINAL ARTICLE

Accuracy of magnetic resonance imaging in diagnosis of deeply infiltrating endometriosis

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Received 16 August 2014; accepted 16 November 2014
Available online 13 December 2014

KEYWORDS

Magnetic resonance imaging;
Deeply infiltrating endometriosis;
Female infertility

Abstract *Objective:* To determine the accuracy of MRI and diffusion weighted images in the diagnosis of deep infiltrating endometriosis (DIE).
Patients and methods: This study included 72 patients (mean age, 28 years; range, 17–41 years). Inclusion criteria were patients who: (a) had a history of symptoms consistent with endometriosis, such as pelvic pain, dysmenorrhea, deep dyspareunia, dyschezia, and infertility; (b) had a pelvic examination revealing thickening of the posterior cul-de-sac and/or nodules; (c) had transvaginal ultrasound showing ovarian cysts with thickened low amplitude echoes. Exclusion criteria were the common contraindications to MRI (pacemaker, metallic foreign bodies, and claustrophobia). MRI was performed using a GE Signa 1.5 T MRI system and no contrast medium was used for imaging.
Results: In 70/72 patients, DIE was confirmed at surgery and histopathologic examination. 36/72 (50%) patients had endometriotic nodules infiltrating the rectouterine pouch and rectum, 24/72 (33%) the vesicouterine pouch, 6/72 (8.3%) the urinary bladder and 6/72 (8.3%) the anterior abdominal wall. 20/72 patients (27%) had endometrioma correlating with DIE and another 8/72 (11%) had also adenomyosis.
Conclusion: In conclusion, preoperative MRI is an excellent tool to provide a reasonably accurate mapping of multiple sites of pelvic endometriosis with high accuracy.

1. Introduction

Endometriosis is defined as the presence of endometrial tissue outside the uterus. In particular, deep pelvic endometriosis, also called deep infiltrating endometriosis (DIE), is defined as infiltration of the implant of endometriosis under the surface of the peritoneum (5 mm in depth) (1). Although

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Peer review under responsibility of Egyptian Society of Radiology and Nuclear Medicine.

http://dx.doi.org/10.1016/j.ejrnm.2014.11.009

Table 1 Clinical presentation of 72 patients with endometriosis.

Clinical presentation	No. of patients	%
Dysmenorrhea	66	91.6
Dyspareunia	44	61
Infertility	18	25
Dysuria	6	8.3
Dyschezia	34	47.2

Table 2 Infiltration sites of 72 patients with endometriosis.

Infiltration site	No. of patients	%
Recto-uterine pouch & rectum	36	50
Vesico-uterine pouch	24	33.3
Urinary bladder	6	8.3
Anterior abdominal wall	6	8.3
Endometrioma with DIE	20	27
Adenomyosis with DIE	8	11

peritoneal endometriosis can be asymptomatic, DIE is a cause of pelvic pain, dysmenorrhea, dyspareunia, dyschezia, and urinary symptoms and is frequently associated with infertility (2).

Diagnosis of DIE remains a major challenge in the clinical context and has become an area of focus for pelvic radiologists in the last two decades. Precise preoperative diagnosis of DIE requires radiologists to have meticulous knowledge of pelvic anatomy and the natural history of DIE, as well as expertise in the imaging technique employed prior to surgical and pathologic confirmation. Transvaginal, transrectal, and rectal endoscopic ultrasound used to diagnose DIE have shown variable accuracy depending on the anatomical sites affected and the experience of the investigators (3–6). Despite noted limitations, magnetic resonance imaging (MRI) remains the best non-invasive method to evaluate the locations affected by pelvic endometriosis (7,8).

Diffusion weighted magnetic resonance (MR) imaging has been established as a useful functional imaging tool in neurologic applications for a number of years, but recent technical advances now allow its use in abdominal and pelvic applications. Diffusion-weighted MR imaging studies of female pelvic tumors have shown reduced apparent diffusion coefficient (ADC) values within cervical and endometrial tumors. In addition, this unique noninvasive modality has demonstrated the capacity to help discriminate between benign and malignant uterine lesions and to help assess the extent of peritoneal spread from gynecologic malignancies (9).

The aim of this study was to determine the accuracy of MRI and diffusion weighted images in the diagnosis of deep infiltrating endometriosis (DIE).

2. Patients and methods

2.1. Population

Between February 2011 and May 2014, 103 consecutive patients referred for pelvic MRI because of a clinical suspicion of endometriosis were prospectively enrolled. Among these, 72 patients with symptomatic disease who underwent laparoscopic surgery were included in our study (mean age, 28 years; range, 17–41 years). Inclusion criteria were patients who: (a) had a history of symptoms consistent with endometriosis, such as pelvic pain, dysmenorrhea, deep dyspareunia, acyclic pelvic pain, dyschezia, and infertility; (b) had a pelvic examination revealing thickening of the posterior cul-de-sac and/or nodules; (c) had transvaginal ultrasound results showing ovarian cysts with thickened low amplitude echoes; and (d) had no previous pelvic surgery for endometriosis. Exclusion criteria were the common contraindications to MRI (pacemaker, metallic foreign bodies, and claustrophobia) and post-menopausal status. This study was approved by the ethics committee of our institution; an informed consent was obtained from all patients after full explanation of the benefits and risks of the procedure.

Table 3 Pattern of MRI signals of endometriotic lesions.

Pathology	T2-weighted image	Fat suppressed T1-weighted images	Diffusion weighted image	ADC map	ADC value
Endometrial cysts	Endometrial cysts of low signal intensity	High intensity of the cysts, indicating their hemorrhagic content	Hypointense cyst	Two endometrial cysts of high signal intensity	$0.85–1.16 \times 10^{-3}$ mm^2/s
Abdominal wall endometriosis	Heterogeneous lesion located dorsally to the aponeurosis of the rectus oblique muscle	Isointense signal of the lesion to muscle	Hypointense mass of the bladder	Heterogeneous mass located dorsally to the aponeurosis of the rectus oblique muscle	0.93×10^{-3} mm^2/s
Bladder endometriosis	Mass of hypointensity of bladder	Low signal intensity mass	Hypointense mass of the bladder	Heterogeneous mass at the posterior aspect of urinary bladder	0.88×10^{-3} mm^2/s
Cul-de sac	Nodule of hypointensity of Cul-de-sac	Low signal intensity nodule	Hypointense nodule of the Cul-de-sac	Heterogeneous nodule in the Cul-de-sac	0.86×10^{-3} mm^2/s