Eur. Radiol. 10, 431–434 (2000)

European
Radiology

Case report

Hepatic endometrioma: a case report and review of the literature

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Received: 6 July 1998; Revision received: 4 May 1999; Accepted: 21 June 1999

Abstract. Extrapelvic endometriosis is not uncommon but hepatic endometrioma is extremely rare. Ultrasound, CT and MR features of hepatic endometrioma are discussed and the literature is reviewed in this report.

Key words: Endometriosis – Liver neoplasms, – Diagnosis

Introduction

Endometriosis is a condition characterized by the presence and proliferation of endometrial tissue outside the uterus [1]. Ectopic endometrium has been described in almost every location of the female and even in the male body [2]. It is most frequently located in pelvic organs. Unusual and remote sites of involvement include the umblicus, laparotomy or incisional scars, arms, legs, kidney, diaphragm, gastrointestinal tract, inguinal hernial sacs, bladder wall, lungs, pleura, pancreas, heart and bone [3, 4]. The only organ in the abdominal cavity that is apparently refractory to the disease is the spleen [5].

Intrahepatic location of endometrioma is unusual and imaging findings of a few cases of hepatic endometrioma, mostly with US and CT, are described in the literature [6, 7, 8, 9, 10, 11]. In this report we present correlative cross-sectional images, including MR examination, of a case and review the imaging features described in the literature.

Case report

A 25-year-old female who was known to be surgically treated twice for pelvic endometriosis previously was referred to our abdominal imaging unit for the evaluation of her pelvic pain, mass and rectal haemorrhage. Barium enema, endoscopy, US and CT examinations revealed bilateral ovarian masses which were invading rectosigmoid colon and peritoneal fat. Histopathological diagnosis of the endoscopic biopsy was endometriosis. Upper abdominal US, CT and MR for evaluation of possible intraperitoneal dissemination showed a mass of 5 cm in diameter at the right lobe of liver. This mass was round, well defined and heterogeneous including anaechoic cystic and echogenic solid components, septations and fine nodular calcifications on the US examination (Fig. 1). A CT scan showed a round, well-defined heterogeneous mass with septations. There was fine punctate/nodular calcifications at the periphery of the lesion (Fig. 2). Both on US and CT, there was a subtle wall-like peripheral zone. On MR images, a lobulated but well-demarcated subcapsular mass was seen at the posterior segment of the right lobe of liver. Postero-inferior portion of the mass was hypointense on T1-weighted images (Fig. 3 a) and slightly hyperintense on T2-weighted images (Fig. 3 b). The remaining part of the lesion was hyperintense on both sequences, and more marked on T2-weighted sequence. On T1-weighted images following intravenous Gd-DTPA injection (Fig. 3 c), low-signal areas showed inhomogeneous enhancement, but hyperintense part of the mass became less marked compared with the surrounding liver parenchyma, due to normal enhancement of the parenchyma. Those hyperintense areas on T1- and T2-weighted images were suggestive of subacute haemorrhage, whereas enhancing areas were considered to be solid. Focal punctate hypointensities on both sequences near the postero-inferior margins were due to calcifications which were also present on CT images. Percutaneous Tru-cut biopsy was done under CT control after completing all imaging studies. Histopathological result of the biopsy was "endometriosis externa". Because our patient refused operation, Danazol therapy was initiated.

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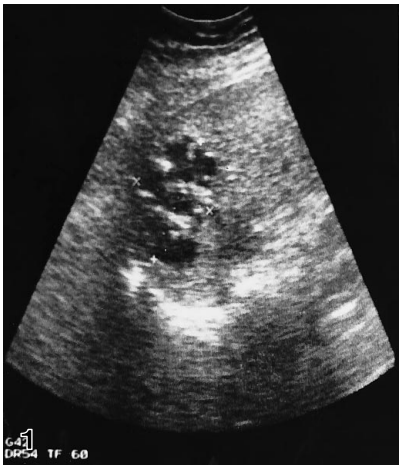
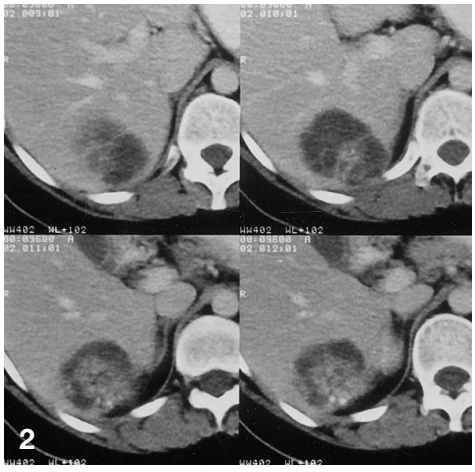
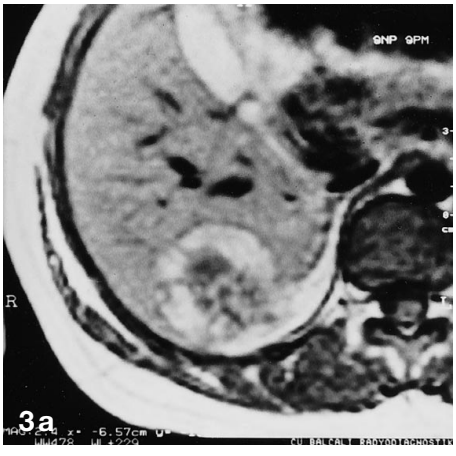
Fig. 1. Ultrasound of hepatic endometrioma showing both cystic and solid components with septations

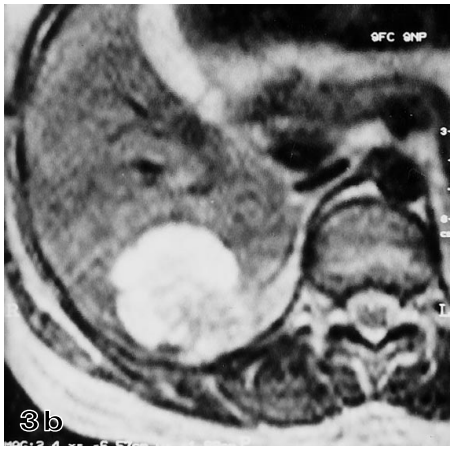
Fig. 2. Contrast-enhanced CT images of hepatic endometrioma showing a heterogeneous mass with septations and punctate calcifications on the wall

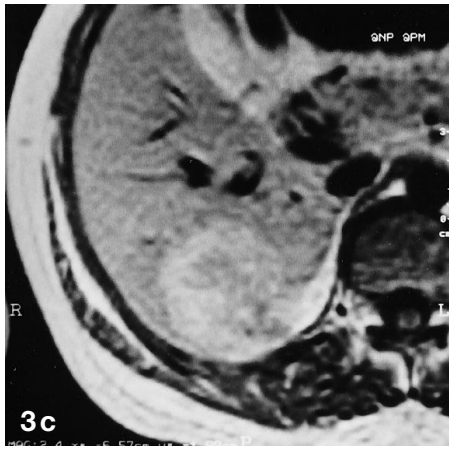
Fig. 3 a–c. Magnetic resonance imaging. **a** T1-weighted images show a well-demarcated mass with haemorrhage of high signal and solid parts of low signal intensity inside. **b** The mass is predominantly of high signal intensity on T2-weighted images. **c** Solid parts of the lesion enhance with IV gadolinium injection











Discussion

Endometrioma of the liver is extremely rare and it is difficult to explain the pathogenesis of this lesion [6, 7]. The pathogenesis of endometriosis is explained by the implantation or the coelomic metaplasia theory [1, 10, 11, 12, 13]. For our case, together with the previously reported cases of extrapelvic endometriosis, we believe that the aetiology is still uncertain and either of these mechanisms may be responsible. But we also believe that vascular spread would provide a plausible explanation for the increasing numbers of reported cases of endometriosis of the parenchyma of the lung and liver.

When we searched previous reports for hepatic endometriosis in the literature, we found five reports of hepatic endometriomas [6, 7, 8, 9, 11] and one report describing two cases of hepatic lesion together with one case of pancreatic lesion [10]. Because Finkel et al. [6] and Grabb et al. [8] reported a single case separately in two different journals, the correct number of total cases of reported liver endometriomas is six including our case. Our case is most unusual as there are only few reported instances of hepatic location. Most of the previously reported cases describe US and CT findings, whereas this report presents MR findings additional to US and CT.

The gross and microscopic pathological appearances of endometriosis vary widely depending on the location, extent, age and endocrine response of the lesion [14]. The appearance of endometriotic tissue depends on the degree of its response to the normal hormonal fluctuations of the menstrual cycle. Endometriotic foci may enlarge to produce nodules, cysts or both. Most authors have described intrapelvic masses that can be cystic, solid or of mixed appearance [8]. Because of this wide range of morphological features of endometriomas, there are no characteristic findings with which to distinguish either pelvic or extrapelvic endometriosis from other processes; therefore, clinical history is important for proper diagnosis.

Table 1 summarizes the previously reported cases and ours, comparing the morphological features of hepatic endometriomas. Imaging features of our case and previously reported cases are reviewed in Table 2.

Endometriomas typically have a fibrotic wall of variable thickness and are commonly covered by dense fibrous adhesions that may result in fixation to adjacent structures [14, 15]. Most of the previously reported cases described a wall structure either smooth [6, 7, 8], membranous [10], ragged [10] or undulating [11] at imaging or gross morphological examination. Our case had a wall-like structure at the periphery of the lesion which was not obvious at imaging. Whereas most of the reported cases were pure cystic either at imaging or gross examination, our case was heteroge-

Table 1. Comparison of morphologic features of hepatic endometriomas. *APE* associated pelvic endometriosis; *LL* left lobe; *RL* right lobe; *P* peripheral; *C* central

Reference	[17]	[7]	[9‘]	[10] Case 1	[10] Case 2	[11]	This paper
Age (years)	21	37	34	34	62	40	25
APE	?	+	–	–	–	+	+
Location	LL-C	LL-P	RL-P	RL-P	LL-P	LL-P	RL-P
Size (cm)	13.5	10	6	12	12	6.4	5
Wall	+	+	?	+	+	+	+
Septation	+	+	+	–	–	+	+
Calcification	–	+	–	–	–	–	+

Table 2. Comparison of imaging features of hepatic endometriomas

Reference	US findings	CT findings	MR findings
[17]	Cystic with low-level echoes and septation	Smooth-walled cystic lesion with no septation or calcification	–
[7]	Cystic with low-level echoes and septation	Multilocular cyst with fine calcification on the wall	–
[9]	Heterogeneous nodule	A low-density formation with septation	Peripheral areas of high intensity on T1, enhancement after Gd injection and on T2
[10] Case 1	–	A cystic tumour	A cystic tumour
[10] Case 2	A cyst	A cyst	–
[11]	Multiseptated cyst	Low-density cyst with undulating wall, septation was not obvious	–
This paper	Cystic and solid components with septation	Heterogeneous mass with septation and calcification	Heterogeneous mass with heterogeneous enhancement after Gd injection

neous including both cystic and solid components. Whether cystic or heterogeneous, most of the lesions included septations, a wall structure and two had punctate calcifications on the wall. Whether at the right or left lobe of the liver, most of the reported cases were located peripherally. Although peripheral location of these lesions raises suspicion about the precise location (whether extra- or intracapsular) preoperatively, two of the previously reported cases were completely intrahepatic and intraparenchymal [6, 8, 11], whereas two were not completely intraparenchymal [7, 9] at surgery.

At MRI, endometrial implants usually demonstrate signal intensity similar to that of normal endometrium on T1- and T2-weighted images. However, because endometrial implants can exhibit various degrees of haemorrhage due to hormonal stimulation, implants may demonstrate a spectrum of appearances depending on the age of the haemorrhage [14]. Specifically, during the hyperacute stage of haemorrhage, oxyhaemoglobin produces iso- or hypointensity on T1- and hyperintensity on T2-weighted images. In the following hours and first several days, T2 hyperintensity converts to hypointensity due to deoxyhaemoglobin. In the late subacute–early chronic stage, as in our case, high signal intensity on both sequences is seen due to extracellular methemoglobin. We did not repeat MR examination at a different stage of hormonal cycle to check if this observation is true or not.

Hepatic endometriosis can be added to the differential diagnosis list of a peripherally located cystic or heterogeneous liver mass with septations and a wall structure in women, with or without pelvic endometriosis. Radiologists must be aware that the appearance of endometriotic tissue can vary depending on hormonal response, especially on MR.

References

1. Sampson JA (1940) Development of the implantation theory for origin of peritoneal endometriosis. Am J Obstet Gynecol 40: 549–557
2. Martin JD, Hauck AE (1985) Endometriosis in the male. Am Surg 51: 426–430
3. Saleh N, Daw E (1980) Endometriosis in non-gynecological sites. Practitioner 244: 1189–1195
4. Sataloff DM, La Vorgna KA, McFarland MM (1989) Extrapelvic endometriosis presenting as a hernia: clinical reports and review of the literature. Surgery 105: 109–112
5. Markham SM, Carpenter SE, Rock JA (1989) Extrapelvic endometriosis. Obstet Gynecol Clin North Am 16: 193–219
6. Finkel L, Marchevsky A, Cohen B (1986) Endometrial cyst of the liver. Am J Gastroenterol 81: 576–578
7. Rovati V, Faleschini E, Vercellini P et al. (1990) Endometrioma of the liver. Am J Obstet Gynecol 163: 1490–1492
8. Grabb A, Carr L, Goodman JD, Mendelson DS, Cohen B, Finkel L (1986) Hepatic endometrioma. J Clin Ultrasound 14: 478–480
9. Cravello L, D'Ercole C, Le Treut YP, Blanc B (1996) Hepatic endometriosis: a case report. Fertil Steril 66: 657–659
10. Verbeke C, Harle M, Sturm J (1996) Cystic endometriosis of the upper abdominal organs: report on three cases and review of the literature. Pathol Res Pract 192: 300–304

11. Chung CC, Liew CT, Hewitt PM, Leung KL, Lau WY (1998) Endometriosis of the liver. Surgery 123: 106–108
12. Sampson JA (1927) Metastatic or embolic endometriosis due to menstrual dissemination of endometrial tissue into the venous circulation. Am J Pathol 3: 93–110
13. Ingram JM (1984) Endometriosis. In: Benson RC (ed) Current obstetric and gynecologic diagnosis and treatment. Lange Medical Publications, California, pp 376–388
14. Stevens SK (1992) The adnexa. In: Higgins CB, Hricak H, Helms CA (eds) Magnetic resonance imaging of the body. Raven Press, New York, pp 865–889
15. Zawin M, McCarthy S, Scout L, Comite F (1989) Endometriosis: appearance and detection at MR imaging. Radiology 171: 693–696

Book review

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Moonen C. T. W., Bandettini P. A.: Medical radiology – Diagnostic imaging – Functional MRI. Berlin Heidelberg New York: Springer, 1999, 575 pages, 250 figures in 398 separate illustrations, 110 in color, DM 349.00, ISBN 3-540-64263-3

This book, edited by two leading specialists in neurofunctional magnetic resonance imaging (fMRI), is the first major contribution to provide a detailed and comprehensive overview of fMRI basic mechanisms, experimental and processing methods, and both basic and clinical applications, written by world experts. The reasons for the explosive growth of fMRI are its noninvasiveness, high spatial and temporal resolution, the almost one-to-one correspondence with anatomical images and the ability to implement the method on any recent MR scanner.

The first section, on general physiology, describes the local changes triggered by neuronal activation in brain physiology (A. Villringer), cerebral blood flow (W. Kuschinsky) and energy metabolism (P. Magistretti). These changes can be detected by appropriate fMRI methods which are the subject of the next three major sections. Perfusion-based functional MRI comprises contributions on tracer methods (A. C. McLaughlin) and on arterial spin-labeling (J. A. Detre and E. C. Wong). Flow-based functional MRI contains chapters on time-of-flight (J. H. Duyn) and on inflow and phase-contrast angiography (C. Segebarth). Finally, susceptibility contrast-based functional MRI introduces the basic principles of BOLD (blood oxygen level dependent) functional imaging (W. Chen), and the related theoretical models (R. Weisskoff), and devotes attention to the negative-going response of the BOLD MRI signal (C. S. Springer).

Since the BOLD effect has been the major impetus for the enormous development of fMRI, a series of chapters are devoted to the acquisition techniques for BOLD fMRI, such as gradient-echo and spin-echo methods (R. P. Kennan), EPI (M. S. Cohen), spiral scanning (D. C. Noll), 3D (C. T. W. Moonen), physiological noise (P. Jezzard) and multiple-contrast acquisition (E. C. Wong). Key issues of spatial resolution, intimately related to the micro- and macrovascular effects (S. G. Kim), in particular to the signals of the large draining veins (S. Lai) are discussed in depth along with issues of temporal resolution, such as the hemodynamic response characteristics and the single-event fMRI method (P. A. Bandettini). The potential of functional MR BOLD spectroscopy for time-course analysis of signal changes after activation is highlighted in a separate section (J. Hennig). The editors have not evaded some of the controversial or incompletely understood BOLD observations such as the signal decrease at the onset of stimulation (X. Hu), the post-stimulus signal undershoot (R. R. Buxton), the functional connectivity (J. S. Hyde) and the field dependence of the fMRI signal (J. S. Gati).

Since fMRI signal changes are small, motion artifacts in the images have to be corrected for using appropriate registration procedures (J. Ashburner), and proper data processing and statistical treatment are crucial for the reliable retrieval of the induced neuronal activity (N. Lange). Finally, the success of fMRI acquisition relies on adequate experimental procedures and quality assurance (K. R. Thulborn) and the availability of proven peripheral hardware for stimulus delivery and response recording (R. L. Savoy).

The remainder of the book covers the ever-expanding field of the applications of fMRI, under two separate headings: the research and the clinical applications. The first chapter on the research applications concerns the experimental design of fMRI experiments, which should be capable of rejecting a hypothesis and should maximize sensitivity for a predicted effect (G. K. Aguirre). The subsequent chapters cover the major fields of basic neurophysiology: the sensorimotor (M. Hallett), auditory (J. R. Melcher) and language systems (J. R. Binder). Further sections cover the comparison with PET and related technical issues (N. F. Ramsey), hypercapnia (A. Kastrup), and the very recent technique of event-related fMRI based on the transient neuronal changes associated with individual cognitive and sensory events (R. L. Buckner). The chapters on the clinical applications describe some of the most promising avenues of fMRI in the clinical environment, such as in neurology (T. A. Hammeke), psychiatry (J. H. Callicott), pediatrics (K. M. Thomas), pharmacology (E. A. Stein), surgery planning (C. R. Jack), developmental dyslexia (G. F. Eden) and study of the emotions (R. J. Davidson).

To conclude, this outstanding book provides both an in-depth and a broad source of information on fMRI and should be of interest to a large audience of disciplines including physics, statistics, neuroscience, physiology, radiology, neurology, neurosurgery, pharmacology, psychology and psychiatry. It is highly recommended to anoyone interested or active in the field of fMRI, either at the beginner or the expert level. The book is richly illustrated with numerous color activation and anatomical maps, graphs and figures, and each of its chapters ends with an extensive list of references. Needless to say the book is well worth its price for its excellent layout, content and coverage.

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