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Case and Review

Fitz-Hugh-Curtis Syndrome Presenting as Perihepatic and Subcapsular Enhancement on MRI

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Keywords
Fitz-Hugh-Curtis syndrome · *Chlamydia trachomatis* · MRI

Abstract
Fitz-Hugh-Curtis syndrome (FHCS) is a rare complication of pelvic inflammatory disease and its MRI findings remain poorly described. A 34-year-old woman was raced to our hospital with slight fever and severe right upper quadrant pain. Gadoxetic acid-enhanced magnetic resonance imaging revealed high-intensity regions in the surface and subcapsule of the right liver on T2-weighted imaging and on diffusion-weighted imaging. A definitive diagnosis of FHCS was confirmed based on high titers of serum IgA and IgG antibodies to *Chlamydia trachomatis*. She was treated with oral azithromycin and discharged 6 days after admission with improvement of her symptoms. To our knowledge, this report represents a valuable addition to the FHCS literature describing MRI findings in the early stage of FHCS onset.

Introduction

Fitz-Hugh-Curtis syndrome (FHCS) is considered a rare complication of pelvic inflammatory disease (PID), mostly associated with *Chlamydia trachomatis* [1, 2] and presents as perihepatitis due to the ascending spread of microorganisms from the cervix or vagina to the peritoneum and hepatic capsule [3]. Laparoscopic confirmation of fibrous adhesions on the

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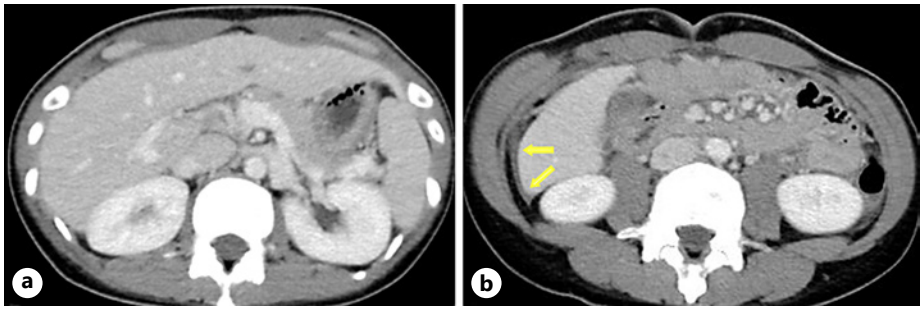

Fig. 1. CT showed no findings on the surface of the liver (**a**), but slight ascites in Morrison's pouch (**b**).

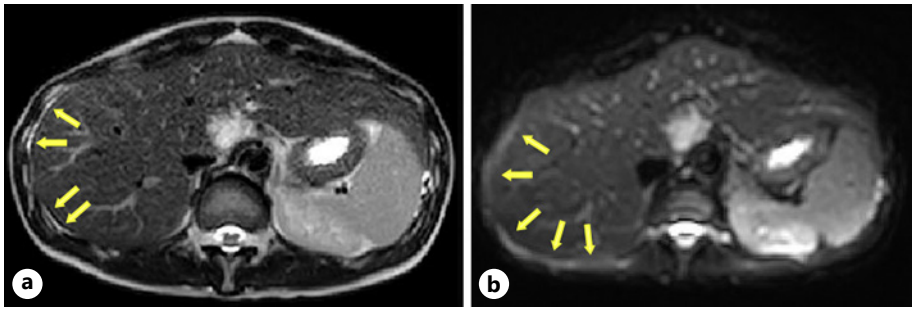

Fig. 2. Gd-EOB-MRI studies revealed high-intensity regions in the surface and subcapsule of the right liver on T2WI (**a**) and on DWI (**b**). Gd-EOB-MRI, gadoxetic acid-enhanced magnetic resonance imaging.

surface of the liver and its surroundings (violin string-like or ribbon-like adhesion) has been reported to be diagnostic of FHCS [4]. However, given its invasiveness, noninvasive diagnostic imaging is considered preferable. Recently, alongside contrast-enhanced computed tomography (CT) [5], MRI is reported to be useful for diagnosis of FHCS [6–8]. While it is rare and its radiological features remain poorly described, we, herein, report a case of FHCS in whose diagnosis MRI proved useful.

Case Report/Case Presentation

A 34-year-old woman was raced to our hospital with slight fever and severe right upper quadrant pain. She had a history of miscarriage 6 weeks ago and no previous history of PID. Physical findings included height, 153 cm; weight, 44 kg; blood pressure, 110/72 mm Hg; heart rate, 81/min; and body temperature, 37.2°C. Spontaneous pain and tenderness were remarkable in the right flank with a positive Murphy's sign. Laboratory data revealed slight inflammatory reactions (white blood cell count, 4.8×10^9/L; C reactive protein, 3.1 mg/dL). CT showed no findings on the surface of the liver (Fig. 1a), but slight ascites in Morrison's pouch (Fig. 1b). In addition, a mass was found in the caudate lobe, which was suspected to be a hemangioma. An interview conducted with her confirmed that lower abdominal pain, fever (38.4°C), and vaginal discharge were the first symptoms she had had 8 days earlier. We suspected FHCS and performed additional blood tests and gadoxetic acid-enhanced magnetic resonance imaging (Gd-EOB-MRI) studies. Gadoxetic acid-enhanced magnetic resonance imaging studies revealed high-intensity regions in the surface and subcapsule of the right liver on T2-weighted imaging (T2WI) (Fig. 2a) but more clearly on diffusion-weighted imaging

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Table 1. Cases reported to date of MRI findings of FHCS

No	Reference	Year	Age	Sex	CT findings	MRI findings
1	[6]	2017	37	F	(–)	T2WI: small amount of perihepatic fluid T1WI (post-contrast): perihepatic/subcapsular enhancement
2	[7]	2019	56	F	(–)	T1WI (arterial phase): mild capsular perihepatic enhancement
3	[8]	2021	17	F	Nonenhanced CT: no specific findings	T2WI: high-intensity regions in the surface and subcapsule of the liver
4	Our case	2021	42	F	Slight ascites in Morrison's pouch	T2WI: high-intensity regions in the surface and subcapsule of the right liver DWI: high-intensity regions in the surface and subcapsule of the right liver

CT, computed tomography; MRI, magnetic resonance imaging; T2WI, T2-weighted imaging; T1WI, T1-weighted imaging; DWI, diffusion-weighted imaging.

(DWI) (Fig. 2b). The mass identified in the caudate lobe was visualized with high-intensity and as showing increasingly darker staining from the tumor margin outward on T2WI, and thus was diagnosed as hemangioma. A definitive diagnosis of FHCS was confirmed by high titers of serum IgA and IgG antibodies to *Chlamydia trachomatis*. She was treated with oral azithromycin (1,000 mg/day) and discharged 6 days after admission with improvement of her symptoms. After discharge, she was referred to obstetrics and gynecology department for further scrutiny and treatment.

Discussion/Conclusion

Our case has two important clinical implications. First, MRI may prove useful for the diagnosis of FHCS, while FHCS is a rare complication of PID, and its MRI findings remain poorly described in the literature.

To date, MRI findings of FHCS have been reported in 3 cases (Table 1) [6–8], whose MRI findings were characterized by the presence of a small amount of perihepatic fluid on T2WI, perihepatic/subcapsular enhancement on T1WI [6], mild capsular perihepatic enhancement on T1WI [7], and high-intensity regions in the surface and subcapsule of the liver on T2WI [8].

In our case, high-intensity regions in the surface and subcapsule of the right liver were observed on T2WI but more clearly on DWI. Thus, this represents the first report to show that DWI-MRI proved useful in the diagnostic imaging of FHCS.

It has been reported that perihepatic enhancement at the arterial phase on contrast-enhanced CT reflects increased blood flow in the hepatic capsule due to exudative inflammation of the peritoneum and is useful for the early diagnosis of FHCS, as it is seen, on average, 6.5 days after the onset of its symptoms [9], and the MRI findings in our case were thought to reflect the same mechanism.

For accurate diagnosis of FHCS, it is reported that (1) dropped stones-related perihepatic abscess, (2) echinococcosis, (3) tuberculosis, (4) perihepatic peritoneal metastases/pseudomyxoma peritonei, (5) diffuse peritoneal leiomyomatosis and fibromatosis, (6) splenosis, (7) endometriosis, and (8) intraperitoneal focal fat infarction need to be ruled out based on MRI findings, symptoms and clinical examinations [8].

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Table 2. Diagnostic criteria for FHCS by Murao et al. [11]

Major criteria	
1	Spontaneous pain or tenderness in the right flank
2	Body movements deep breathing pain or Murphy's sign
Minor criteria	
1	Chlamydia- or gonococci-positive
2	Exclusion by physicians and surgeons of other potential causes
3	Fever of over 37°C
4	Symptoms or signs of acute pelvic peritonitis
5	Positive inflammatory reaction (CRP, high value, or increase)
Definitive criteria	
1	Diagnosis by laparoscopic findings

When the condition meets all major criteria and satisfies 3 or more minor criteria, it is clinically diagnosed as FHCS. Otherwise, it is definitively diagnosed as such based on laparoscopic findings (definitive criteria).

The other implication was that FHCS could cause acute abdominal pain, especially spontaneous pain or tenderness in the right flank. FHCS is difficult to diagnose in the early stage of its onset because it needs to be differentiated from many other diseases. It is most often mistaken for acute cholecystitis, especially when right upper abdominal pain is more pronounced than pelvic symptoms [10]. We suspected FHCS based on the patient's clinical symptoms and radiological findings, and confirmed its diagnosis based on serum IgA and IgG antibodies to *Chlamydia trachomatis*. Murao et al. [11] proposed a diagnostic criterion for FHCS (Table 2), and, indeed, our case met all of the major and minor criteria listed, suggesting that these criteria may prove useful in the future. In conclusion, MRI may prove useful in diagnosis of FHCS. Gastroenterologists need to recognize FHCS as a disease requiring differential diagnosis in women with acute abdominal pain.

Statement of Ethics

Written informed consent was obtained from the patient for publication of this case report and any accompanying images. The study protocol was reviewed and approved by the institutional review board of the National Hospital Organization Hakodate National Hospital (Approval No. R3-0927001).

Conflict of Interest Statement

The authors have no conflicts of interest to disclose in association with this study.

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Author Contributions

Kimitoshi Kubo, Masanori Ohara, Ryosuke Watanabe, Masayuki Higashino, Momoko Tsuda, and Motosugu Kato contributed equally to the study as well as to the preparation of the manuscript for publication.

Data Availability Statement

All data generated and/or analyzed during the course of this study are included in the article. Any further query may be addressed to the corresponding author.

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