Fitz-Hugh–Curtisov sindrom pri adolescentki: zapoznela diagnoza subtilne klinične slike

Fitz-Hugh–Curtis Syndrome in an Adolescent: Delayed Diagnosis due to a Subtle Presentation

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Ključne besede:
Fitz-Hugh-Curtisov sindrom, pelvična vnetna bolezen, magnetna resonanca, *Chlamydia trachomatis*, bolečina v ramenu

Key words:
Fitz-Hugh-Curtis syndrome, PID, MRI, *Chlamydia* infections, Shoulder pain

Članek prispel / Received
25. 9. 2025
Članek sprejet / Accepted
28. 11. 2025

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Izvleček

Namen: *Predstaviti diagnostični pomen magnetnoresonančnega slikanja (MRI) pri prepoznavanju Fitz-Hugh–Curtisovega sindroma (FHCS) pri mladostni bolnici s subtilno klinično sliko in poudariti pomen pravočasnega razmisleka o medenični vnetni bolezni (PID) v tej starostni skupini.*
Metode: *Sedemnajstletna športno aktivna bolnica je bila sprejeta zaradi bolečine v desnem zgornjem kvadrantu trebuha in bolečine v desni rami. Začetna obravnava z laboratorijskimi preiskavami, ultrazvokom (UZ) in računalniško tomografijo (CT) ni pojasnila etiologije težav. Zaradi vztrajajočih simptomov, je bil opravljen MRI abdomna in male medenice.*
Rezultati: *MRI je razkril obojestranski piosalpinks z restrikticijo difuzije, prosto tekočino v mali medenici in subhepatičnem prostoru ter tanke adhezije med jetrno kapsulo in peritonejem, skladne s Fitz-Hugh–Curt-*

Abstract

Purpose: *To emphasize the diagnostic role of magnetic resonance imaging (MRI) in identifying Fitz-Hugh–Curtis syndrome (FHCS) in an adolescent patient with a subtle clinical presentation.*
Methods: *A 17-year-old female presented with acute onset right upper quadrant and right shoulder pain. The initial diagnostic workup, including ultrasound (US), computed tomography (CT), and laboratory testing was inconclusive. Due to persistent symptoms and elevated inflammatory markers, MRI of the abdomen and pelvis was subsequently performed.*
Results: *MRI demonstrated a bilateral pyosalpinx with restricted diffusion, free fluid in the pelvis and subhepatic region, and linear adhesions between the hepatic capsule and peritoneum, which was consistent with pelvic inflammatory dis-*

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isovim sindromom kot zapletom PID. Mikrobiološke preiskave so potrdile okužbo s Chlamydia trachomatis*. Po ustreznem antibiotičnem zdravljenju je prišlo do popolnega kliničnega izboljšanja.*

Sklep: *Fitz-Hugh–Curtisov sindrom je redek, vendar pomemben zaplet PID, ki se lahko kaže z nespecifično bolečino v desnem zgornjem kvadrantu in preneseno bolečino v rami. MRI predstavlja metodo izbora za potrditev PID in njenih zapletov, saj omogoča visoko diagnostično natančnost brez izpostavljenosti sevanju, kar je posebej pomembno pri mladostni populaciji.*

ease (PID) complicated by FHCS. Microbiologic analysis confirmed a Chlamydia trachomatis *infection. The patient received targeted antibiotic therapy with clinical improvement.*

Conclusion: *FHCS represents a rare but important complication of PID that may present with non-specific or extra-pelvic symptoms. MRI is the modality of choice for confirming PID-related complications and perihepatic inflammation, offering high sensitivity and the advantage of radiation-free imaging, which is especially relevant in the adolescent population.*

INTRODUCTION

Fitz-Hugh–Curtis syndrome (FHCS) or perihepatitis is a chronic inflammatory condition of the liver capsule associated with genital tract infection and represents a complication of pelvic inflammatory disease (PID), primarily affecting women of reproductive age (1,2). FHCS is characterized by perihepatic adhesions and right upper quadrant pain caused by fibrous connections between the anterior liver surface and abdominal wall (1). The pain often worsens with movement or deep breathing and may mimic acute abdominal conditions, such as cholecystitis, pyelonephritis, pneumonia, or appendicitis (3,4). Shoulder pain may also occur as referred pain due to diaphragmatic irritation and typically worsens with deep inspiration, which should raise suspicion of a subdiaphragmatic or hepatic origin (4). Importantly, FHCS can occur even in the absence of overt PID symptoms, particularly in young women, in whom delayed diagnosis can increase the risk of tubal damage and subsequent infertility (4).

FHCS represents one end of the PID spectrum. PID refers to infection and inflammation of the female upper genital tract, ranging in severity from mild pelvic inflammation to severe complications, such as tubo-ovarian abscess (TOA), pyosalpinx, or oophoritis. FHCS arises as one of these potential chronic complications. Because the presentation of FHCS is often non-specific, maintaining a high level of clinical suspicion is essential. PID primarily affects women of reproductive age and is rare in postmenopausal or prepubertal women (5).

Chlamydia trachomatis is most frequently implicated among the pathogens associated with FHCS. This bacterium is a leading cause of sexually transmitted infections worldwide and can induce persistent genital tract inflammation, contributing to infertility, chronic pelvic pain, and ectopic pregnancy if left untreated in a timely fashion (6).

IMAGING FEATURES OF PID AND FHCS

While ultrasound (US) and computed tomography (CT) are often first-line modalities in the evaluation of PID and PID complications (peritonitis, abscess formation, and infertility), magnetic resonance imaging (MRI) has substantially higher sensitivity (up to 95%) compared to contrast-enhanced CT (79%), although CT has slightly higher specificity (99% vs. 89%). MRI sensitivity is increased to nearly 98% while maintaining high specificity with incorporation of diffusion-weighted imaging (DWI) (7,8). CT imaging findings in PID range from adnexal mass formation to thickening and contrast enhancement of the fallopian tubes, loss of clear boundaries between the adnexa and uterus, pelvic fat stranding, and thickening of the uterosacral ligaments. Pathologic changes associated with PID include cervicitis, endometritis and uterine

empyema (pyometra), oophoritis, TOA, peritonitis, and salpingitis with tubal empyema (pyosalpinx). Salpingitis represents the earliest stage of PID and involves inflammation of the fallopian tubes, typically due to sexually transmitted infections. If untreated, salpingitis can progress to tubal empyema (pyosalpinx) with purulence. Imaging findings are variable and may range from mild tubal wall thickening (≥ 5 mm) and surrounding fat stranding-to-fluid-filled, thick-walled, enhancing tubes consistent with empyema. Chronic cases may lead to adhesions, tubal distortion, and infertility (8). Pelvic adhesions may appear on MRI as thin or thick linear bands or sheet-like structures connecting pelvic organs or peritoneal surfaces. These fibrous or vascularized adhesions can occasionally show mild post-contrast enhancement and may distort adjacent visceral contours (15). A dilated tubular fallopian structure exhibiting heterogeneous internal signal intensity on conventional MRI sequences with wall thickening and contrast enhancement, especially when DWI shows restricted diffusion in the walls and purulent contents, is highly suggestive of a pyosalpinx or an associated TOA (13).A TOA is a severe, complex complication of PID that is characterized by accumulation of pus in the fallopian tubes and ovaries. Imaging findings typically show septated, multilocular cystic adnexal masses with thick, enhancing walls (8). TOAs typically appear on MRI as multiloculated cystic pelvic masses with heterogeneous high signal intensity on T2-weighted images and low signal intensity on T1-weighted images, often demonstrating the penumbra sign (a hyperintense rim on T1), according to a recent review by Ferenc and Popić (2024). Post-contrast images usually show rim and septal enhancement, while DWI reveals hyperintense cystic components with restricted diffusion and low apparent diffusion coefficient values. TOAs are more frequently associated with tubal dilatation, adjacent organ involvement, and smaller overall size compared to malignant adnexal masses (12). PID can coexist with inflammation of the endometrium or ovaries, may progress to involve the peritoneum, and can occasionally extend along the paracolic gutters to the hepatic surface, resulting in FHCS (13).

Due to non-specific symptoms, such as pleuritic right upper quadrant pain and referred shoulder pain, diagnosis of FHCS can be challenging (pelvic pain, cervical motion tenderness, and vaginal discharge are often absent). Referred shoulder pain is a common clinical feature of FHCS, representing pain perceived in the shoulder region due to irritation of the diaphragm and phrenic nerve by hepatic capsular inflammation (16). CT findings include increased hepatic capsular enhancement during the arterial phase, capsular thickening of the liver, fluid and fat stranding extending from the pelvis to the right upper quadrant through the paracolic gutter, gallbladder wall thickening, and loculated perihepatic fluid. Capsular enhancement of the liver (Glisson's capsule) is the hallmark finding of perihepatitis. The enhancement is most evident on early post-contrast images using a biphasic protocol with acquisitions at 35–40 s (arterial phase) and ~70 s (portal phase). Review of images with narrow window settings improves capsule–parenchyma contrast and helps detect subtle capsular thickening or enhancement. US findings are non-specific and mainly include a thickened hepatic capsule and ascites, although the US findings may be interpreted as normal. These findings can also be present in perihepatitis due to other causes, such as perforated cholecystitis or hepatic abscess, tuberculous peritonitis, and peritoneal carcinomatosis (8,9,14). MRI findings in perihepatitis are infrequently described in the literature. Specifically, MRI revealed linear perihepatic and subcapsular contrast enhancement corresponding to capsular inflammation, mild perihepatic fluid in Morrison's pouch, and increased T2 signal along the hepatic surface and subcapsular regions in two reported cases (a 34-year-old woman and a 17-year-old girl), consistent with edema and early inflammatory changes. In the younger patient, the subcapsular T2 hyperintensity was interpreted as a small area of combined ascites and edema (10,11).

CASE PRESENTATION

A 17-year-old otherwise physically active girl presented to the Pediatric Emergency Department in November 2024 due to pain below the right costal margin, which intensified with inspiration. She reported that the symptoms had started with right shoulder pain 10 days earlier. She had no history of chronic diseases. The epidemiologic history included travel to Asia 1 month before presentation.

On physical examination, tenderness was noted in the right lower quadrant with positive McBurney's and Rovsing's signs. Laboratory test findings showed an elevated C-reactive protein (CRP) (50 mg/L) and a significantly elevated D-dimer (1246 µg/L). A chest X-ray excluded pneumonia and an abdominal US excluded acute appendicitis (the appendix had normal diameter (< 6 mm)) without visible structural changes in the surrounding fat tissue but free fluid was noted in the pouch of Douglas. The patient was admitted for further diagnostics and observation due to a suspected intra-abdominal inflammatory process (pain, elevated D-dimer, and moderately increased CRP; Figure 1). During the 3-week hospitalization, an abdominal US was repeated twice, again showing free fluid in the true pelvis, the appendix without signs of inflammation, and B-lines noted along the liver surface under the right hemidiaphragm. Doppler US of the veins was performed due to an elevated D-dimer, excluding a deep vein thrombosis. Because of pain in the right shoulder, US and MRI of the right shoulder were performed, showing no significant abnormalities except for mild supraspinatus tendinosis.

Due to persistent inspiratory pain in the right upper quadrant and an elevated D-dimer (which increased during hospitalization to 3529 µg/L), CT angiography of the pulmonary arteries was performed, which excluded a pulmonary embolism. Because the pain persisted, a pelvic US and MRI were performed. The pelvic US was unremarkable but the MRI of the pelvis revealed free fluid in the true pelvis that was greater than physiologically expected. MRI diagnostics

Figure 1. *The first ultrasound performed in November 2024. The transverse view of the pelvis posterior to the uterus (anterior to the urinary bladder is visualized, filled with hypoechoic urine) shows a collection of free fluid in the pelvic cavity, the amount of which is greater than physiologically expected.*

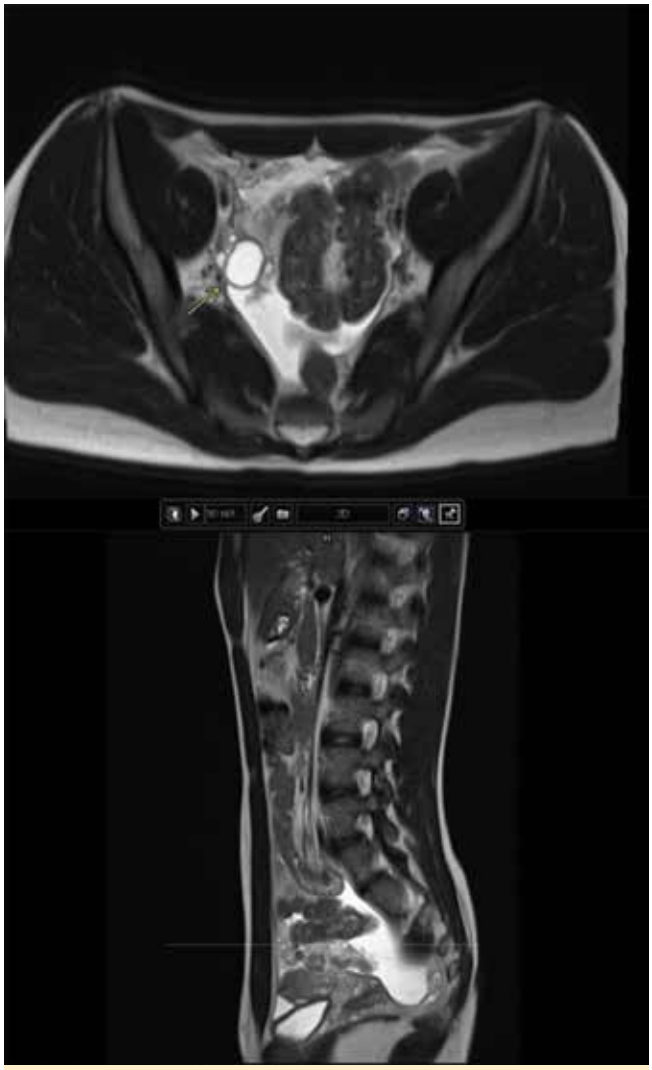

Figure 2. *The first MRI of the abdomen and pelvis performed in November during the initial hospitalization (T2-weighted axial and coronal planes) demonstrates T2-hyperintense free fluid in the pelvic cavity, greater in amount than physiologically expected. The arrow on the axial image indicates a hyperintense lesion on the right, corresponding to an ovarian cyst.*

were performed according to the protocol shown in Table 1. A positron emission tomography-CT did not show scintigraphic evidence of acute inflammation or malignancy. The patient was discharged to home after the inflammatory marker and D-dimer levels decreased althoughthe cause of the symptoms remained unclear during the hospitalization. She was referred for follow-up care in the Pediatric Gastroenterology Clinic (Figure 2).

No abnormalities were present on clinical examination at the follow-up appointment in January 2025(the white blood cell count, CRP level, and renal and liver function tests were normal), but the D-dimer level remained elevated (3626 µg/L). Consultations with a hematologist and pediatric rheumatologist were scheduled.

During the hematology consultation in early February 2025 the patient reported a weight loss of 3 kg since the previous hospitalization. She did not describe any pain or loss of appetite. The physical examination was unremarkable. Laboratory test findings again showed a significantly elevated D-dimer (15924 µg/L), therefore she was hospitalized for further diagnostic evaluation.

The second hospitalization in February 2025 occurred 58 days after discharge from the first hospitalization. The patient was hospitalized for 1 week, during which magnetic resonance angiography of the thoracic and abdominal aorta was performed due to suspicion of vasculitis. The arterial origins were normal but only a short segment of the celiac trunk was visualized on T2 sequences and the distal course was not seen, raising suspicion for median arcuate ligament syndrome. A follow-up abdominal US and Doppler assessment of the arteries showed a slightly narrowed origin of the celiac trunk with velocity variation during inspiration and expiration, which were consistent with median arcuate ligament syndrome.

Free fluid was again noted on US in the pelvis and subhepatic and perisplenic regions. Both ovaries were enlarged with tubular, hypoechoic, peripherally vascularized structures (i.e., the fallopian tubes), for which a gynecologic evaluation was recommended. A gynecologic US showed enlarged ovaries with areas of denser content, raising suspicion for TOAs. Free fluid in the pouch of Douglas and adhesions were also noted. During the gynecologic consultation cervical swabs and serologic testing for *C. trachomatis* antibodies were obtained, and an MRI of the abdomen and pelvis was repeated (Figure 3).

On abdominal MRI the liver was at the upper limit of normal size with a T2-hyperintense line

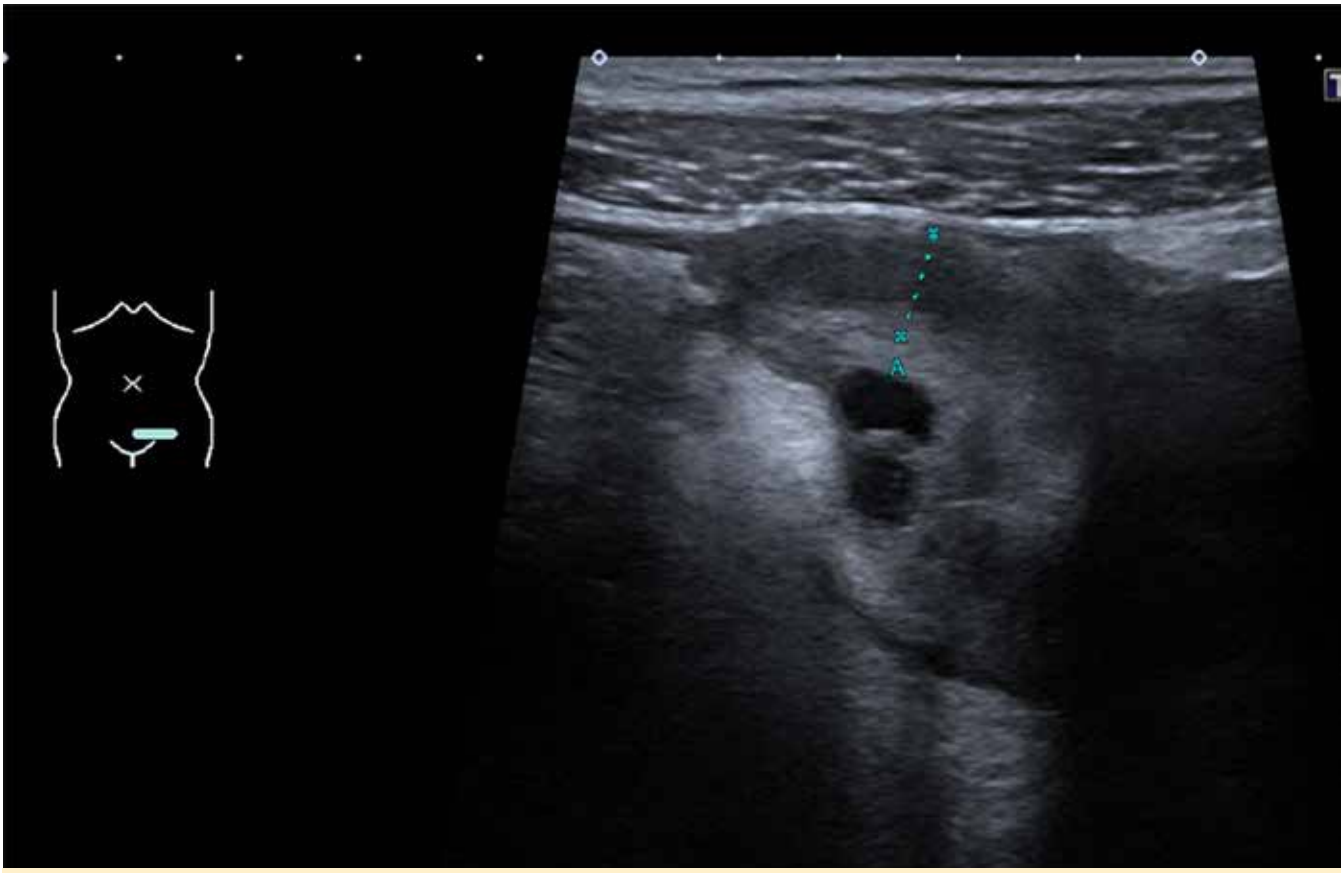

Figure 3. *During the second hospitalization, a tubular structure was visualized adjacent to both ovaries on ultrasound (the image above shows the left side). The structure was filled with hypoechoic content, a thickened wall, and peripheral vascularization. This finding most likely represented a fallopian tube distended with fluid, suspicious for salpingitis or pyosalpinx.*

representing subhepatic free fluid. Several thin linear bands connecting the liver to the peritoneal surface were visualized in this area, representing adhesions. Both fallopian tubes were dilated and filled with T2-hyperintense content, which was slightly lower in intensity compared to the T2 signal of ovarian cysts. Restricted diffusion (hyperintense signal on DWI and hypointense signal on the apparent diffusion coefficient map) and thickened tubal walls were noted, consistent with salpingitis or a pyosalpinx. Free fluid in the true pelvis was noted again, along with thin linear bands corresponding to fibrin strands and fibrosis (iso- to mildly hypo-intense signal on T1 and low signal on T2 compared with normal myometrium) in theposterior vaginal fornix and retrocervical portion of the uterus. A vaginal polymerase chain reaction confirmed C. trachomatis. *Ureaplasma parvum* was also detected, likely representing colonization (Figures 4–6).

The patient was treated by the gynecology team with ceftriaxone (500 mg intramuscularly once) and dual oral antibiotic therapy (doxycycline (100 mg 1 tablet every 12 h for 10 d) and metronidazole (400 mg 1 tablet every 12 d for 14 d)). Follow-up care was arranged in the Gynecology Clinic.

Hematologic testing showed that the patient is a carrier of the Factor V Leiden mutation, which increases the risk of thromboembolic events. She received counseling regarding lifestyle modifications to include maintaining adequate hydration, avoiding prolonged sitting, avoiding caffeine, alcohol, and smoking, maintaining normal body weight, and being cautious with the use of oral contraceptives. She was

advised to use prophylactic low-molecular-weight heparin in case of fractures or prolonged flights and to have regular follow-up in the Anticoagulation Clinic.

Figure 4. *MRI of the pelvis during the second hospitalization in February (T2-weighted axial, sagittal, and coronal planes) revealed bilateral tubular adnexal formations filled with T2-hyperintense content, slightly less intense than that of the adjacent ovarian cysts. These findings correspond to dilated fallopian tubes with thickened walls, consistent with a pyosalpinx. Additional T2-hyperintense free fluid was present in the pouch of Douglas, greater in amount than physiologically expected.*

An abdominal US in late February 2025 showed partial regression of ascites in the true pelvis with persistent heterogeneous changes in the left fallopian tube.

At the end of June 2025 (approximately 6 months after the diagnosis of PID), follow-up in the Pediatric Clinic revealed no abnormalities with normal clinical findings and laboratory parameters.

A follow-up US in August 2025 showed a small amount of free fluid in the small pelvis (up to 15 mL), which was within physiologic expected limits (14 d after the last menstruation in the periovulatory period). No records of gynecologic follow-up examinations were received and no gynecology records were found in the electronic medical record system or from other institutions.

DISCUSSION

This case illustrates the diagnostic value of cross-sectional imaging (especially MRI) in identifying FHCS in an adolescent patient with an subtle presentation. FHCS is a rare complication of PID that is most often caused by *C. trachomatis* and characterized by perihepatic inflammation and adhesions. While FHCS typically presents with right upper quadrant pain, referred shoulder pain due to diaphragmatic irritation, as occurred in this case, can delay diagnosis.

Because of her athletic background, early evaluation was directed toward musculoskeletal etiologies, a focus that contributed to the diagnostic delay. US, while useful for excluding appendicitis and identifying free pelvic fluid, lacked specificity for the extent of pelvic and perihepatic involvement. As described and suggested by Moon et al., US findings (thickened hepatic capsule and ascites in women and adolescent girls of reproductive age) should raise suspicion for PID and the possibility of FHCS when supported by clinical findings (9). A CT scan may demonstrate hepatic capsular enhancement and fluid tracking along the paracolic gutters but in this adolescent patient MRI was advantageous in terms of tissue characterization without ionizing radiation. MRI was crucial in establishing the diagnosis and has been shown to be more effective than both US and CT (7,8). Findings, including bilateral pyosalpinx

with diffusion restriction, fallopian tube distention with T2-hypointense content, pelvic ascites, and subhepatic adhesions, were critical in confirming

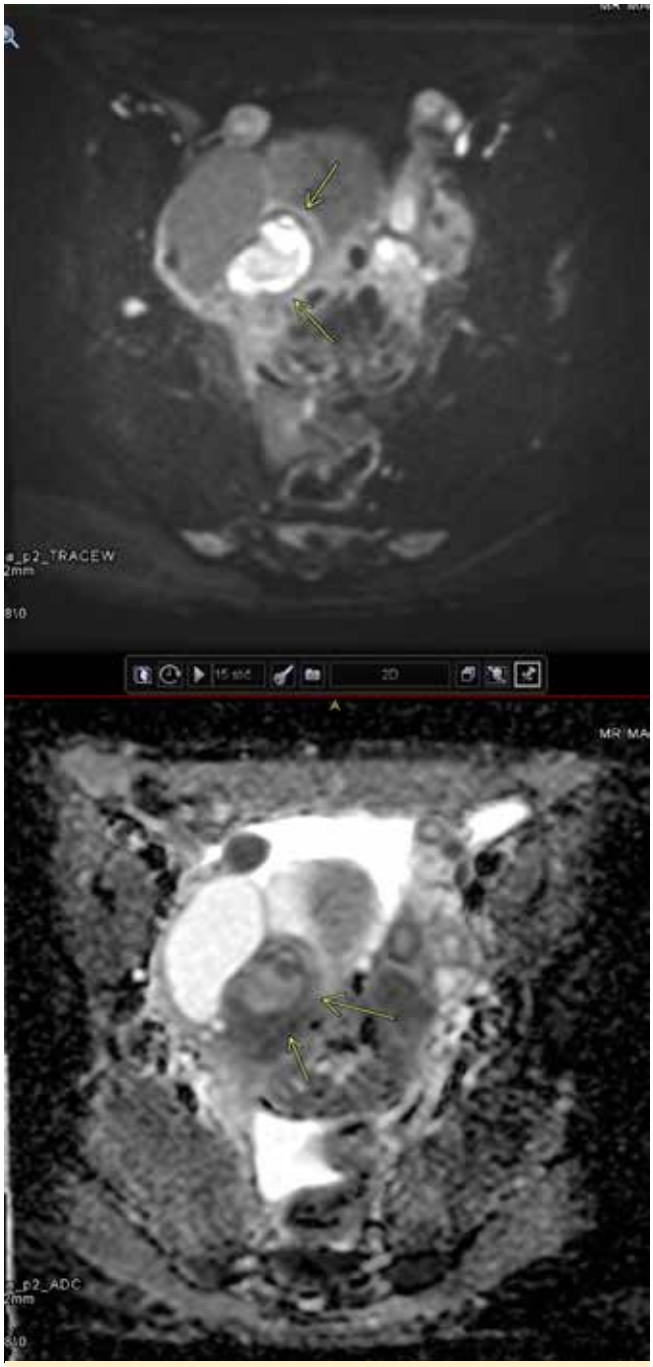

Figure 5. *Diffusion-weighted MRI of the pelvis (axial views) and the corresponding ADC map show marked hyperintensity on DWI and low signal on ADC within the fallopian tube regions (arrows), consistent with restricted diffusion, supporting the diagnosis of an active inflammatory or purulent process.*

Figure 6. *MRI of the upper abdomen (T2-weighted axial and coronal planes) demonstrates a layer of T2 hyperintense fluid adjacent to the liver, consistent with free intraperitoneal fluid (a thin layer is also visible along the spleen). Within the perihepatic fluid, thin T2 hypointense linear bands are observed, representing adhesions.*

FHCS. As described in a case report by Shibuya et al. and in a multi-case study by Kubo et al., MRI following US (which may be normal) is the imaging modality of choice when FHCS is suspected because MRI avoids ionizing radiation and provides better soft-tissue characterization than CT, especially in the adolescent population (10,11). MRI is particularly valuable in this population due to high sensitivity for PID-related complications and the ability to

Table 1: *MRI Protocol Summary: Upper Abdomen and Pelvis*

Parameter	Description
Scanner	1.5 Tesla
Coil Used	Phased-array body/pelvic coil
Purpose	Optimize signal-to-noise ratio
T1-Weighted Sequences	VIBE (opposed-phase, in-phase, water-only, and fat-only) sequences
T2-Weighted Sequences	HASTE sequences in axial and coronal planes with and without fat suppression
Diffusion-Weighted Imaging (DWI)	b-values: 0, 500, 800 s/mm²; ADC maps for quantitative diffusion assessment
Post-Contrast Imaging	T1-weighted VIBE sequences in axial and coronal planes after intravenous gadolinium administration
Dynamic Contrast Phases	25 s (late arterial/early venous), 60 s (portal venous, with/without subtraction), 2 min (delayed), 3 min (coronal delayed)
Slice Thickness	Upper abdomen: 4 mm (2.6 mm for contrast-enhanced sequences); Pelvis: 3 mm (2.6 mm for contrast-enhanced sequences)
Interslice Gap	Minimal
Special Notes	Protocol applies to both upper abdomen and pelvis; includes ADC maps for diffusion assessment

depict subtle perihepatic changes. Individuals with sexually transmitted infections are advised to receive medical counseling, which emphasizes the importance of promoting sexual health and preventing sexually transmitted diseases through awareness, risk-reduction strategies, empathic and non-judgmental counseling, and high-intensity behavioral interventions tailored to patient risk (17).

CONCLUSION

FHCS should be considered in adolescent and young adult women presenting with right upper quadrant or referred shoulder pain, especially when US demonstrates free pelvic fluid or hepatic capsular thickening despite minimal pelvic symptoms. MRI can further characterize PID (e.g., pyosalpinx) and perihepatic involvement without ionizing radiation, thereby supporting diagnostic clarification and timely clinical management.

CONFLICT OF INTEREST

No conflict of interest to declare.

FUNDING

Our research did not receive any specific grant from funding agencies in the commercial or public sectors.

ETHIC APPROVAL SENTENCE

Since the patient turned 18 during the course of medical management, a consent form was obtained from her authorizing the use of anonymized medical data for presentation purposes.

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