Pyogenic Liver Abscess Secondary to Acute Appendicitis: A Case Report

Sheyda Sheykhi
Multiple Sclerosis Research Center, Neuroscience Institute, Tehran University of Medical Sciences (TUMS)
Seyed Hesam Hojjat
Multiple Sclerosis Research Center, Neuroscience Institute, Tehran University of Medical Sciences (TUMS)
Mohammad Ashrafazimi
Department of General Surgery, School of Medicine, North Khorasan University of Medical Sciences
Homa Jajarmi Khayat
Department of Pediatrics , School of Medicine, North Khorasan University of Medical Sciences
Mohammad Karimi
Faculty of Medicine, North Khorasan University of Medical Sciences
Amir Rahmanian Sharifabad
Rahmanian_amir@yahoo.com

Faculty of Medicine, North Khorasan University of Medical Sciences

Case Report

Keywords: Pyogenic Liver Abscess, Appendicitis, Case Report, Drainage, Escherichia coli

Posted Date: September 8th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-9738497/v1

Additional Declarations: No competing interests reported.

Abstract

Background

Pyogenic liver abscess is uncommon in children, and acute appendicitis as an underlying cause is now exceedingly rare, having been replaced by hepatobiliary diseases as the leading etiology. When appendicitis does lead to hepatic abscess formation, the diagnosis is often delayed because children may present with nonspecific symptoms that mimic other common paediatric illnesses. This case highlights the diagnostic challenge posed by an 11-year-old boy whose appendicitis-related liver abscess initially presented with fever and altered consciousness, leading to a mistaken suspicion of meningitis. The report emphasizes the need to maintain a high index of suspicion for abdominal pathology in febrile children with unexplained neurological symptoms and underscores the continued relevance of portal pyemia from a concealed appendiceal focus.

Case Presentation

An 11-year-old Iranian male presented with a three-day history of fever, altered mental status, nausea, and vomiting. Cerebrospinal fluid analysis was normal, and empirical antibiotics were started for suspected meningitis. Abdominal examination revealed only mild diffuse tenderness without peritoneal signs. As symptoms persisted, a non-contrast computed tomography scan of the abdomen was performed on day six of hospitalization, revealing a 49 × 52 × 61 mm subcapsular liver abscess in segment VI with an air-fluid level, adjacent to a thickened appendix containing a 6 mm appendicolith, with localized fat plane obliteration. Laboratory investigations showed marked leukocytosis and elevated alkaline phosphatase, while transaminases remained normal. The patient underwent percutaneous abscess drainage and appendectomy. Abscess cultures grew Escherichia coli, and targeted antibiotic therapy was continued postoperatively. He was discharged with a liver drain, removed ten days after insertion. At one-week follow-up, complete clinical recovery was documented.

Conclusions

Pyogenic liver abscess secondary to acute appendicitis, though rare in the modern pediatric population, can still occur and may manifest with misleading extra-abdominal symptoms, such as altered consciousness mimicking central nervous system infection. This case underlines the importance of early abdominal imaging in the septic child without an obvious source. A coordinated multidisciplinary strategy combining source control, image-guided drainage, and pathogen-directed antibiotics leads to excellent outcomes.

Background

Pyogenic liver abscess (PLA) is a rare but serious suppurative infection of the hepatic parenchyma (1). Although it occurs predominantly in adults, pediatric cases are occasionally reported (2), with a median age of around 4.5 years (3). The condition is uncommon in children, yet its reported frequency varies

according to geographic setting, ranging from 2.9 per 100,000 hospital admissions in Sweden (4) to 78.9 per 100,000 in parts of South India (2), suggesting a higher burden in resource-limited regions. Without treatment, PLA carries a grave prognosis (5); however, prompt recognition and progress in imaging-guided interventions have led to a dramatic decline in mortality over recent decades (6).

In earlier eras, acute appendicitis was the leading cause of PLA (7). The pathophysiological sequence involves bacterial migration from the inflamed appendix through the portal venous circulation, producing septic thrombophlebitis (pylephlebitis) and eventually seeding the liver (8–10). Today, hepatobiliary diseases have become the dominant etiology, while appendicitis-linked PLA is encountered much less frequently. Nevertheless, it remains a well-documented complication, particularly when appendicitis is missed or when the appendix is situated in a retrocecal position (11, 12). The rarity of this association in children is confirmed by the limited number of published pediatric cases (12).

In children, the clinical manifestations of PLA are often nonspecific and overlap with those of many common pediatric illnesses, such as urinary tract infections (UTIs), viral syndromes, or even meningitis, leading to frequent delays in diagnosis (12, 13). While the textbook presentation of a hepatic abscess is described by the triad of fever, hepatomegaly, and right upper quadrant tenderness or a palpable mass, this complete picture is seldom seen in neonates and young children, which often hinders prompt diagnosis (14–16). Laboratory investigations usually demonstrate leukocytosis and elevated acute-phase reactants, whereas liver enzymes may remain within normal limits or show only subtle abnormalities (3). Because the clinical picture is often ill-defined, clinicians must maintain a high level of suspicion, turning to abdominal imaging, especially contrast-enhanced computed tomography (CT), as the key tool for diagnostic confirmation (14–16).

Current treatment is built on prompt broad-spectrum intravenous antibiotics combined with image-guided percutaneous drainage (6). The minimally invasive approach succeeds in most cases, while open surgical drainage or resection is typically kept for abscesses that are large, septated, or complex and fail to respond to percutaneous drainage (6). Once a causative organism is identified, antimicrobial therapy should be narrowed based on culture and sensitivity results (17).

The microbial profile of PLA has evolved in recent decades. Klebsiella pneumoniae has now become more prevalent, especially in Asian regions. According to a Chinese meta-analysis, Klebsiella species were responsible for 54% of liver abscess isolates, and Escherichia species for 29% (18). Compared to infections caused by other organisms, pyogenic liver abscesses due to Escherichia coli tend to follow a more severe clinical course, with considerably higher rates of septic shock and in-hospital mortality. This makes early and aggressive treatment particularly important (19).

We present the case of an 11-year-old boy whose initial presentation suggested a central nervous system infection but who was ultimately found to have a large pyogenic liver abscess arising from acute appendicitis caused by Escherichia coli. He was successfully treated with percutaneous abscess drainage, appendectomy, and targeted antibiotic therapy.

Case Presentation

Patient Information

An 11-year-old Iranian boy with an unremarkable past medical history presented to the Emergency Department of Imam Ali Hospital in Bojnurd, Iran, with a 3-day history of fever, progressive lethargy, nausea, and vomiting. His development had been normal, he had no prior hospitalizations or surgeries, and his vaccination schedule was complete. He was not taking any regular medications and had no known drug allergies. His family history was non-contributory.

Clinical Findings

On admission, the patient was lethargic but arousable. Vital signs were as follows: temperature 39.2°C (102.6°F), heart rate 118 beats per minute, respiratory rate 24 breaths per minute, blood pressure 110/70 mmHg, and oxygen saturation 96% on room air. Given the altered mental status and fever, meningitis was initially suspected; however, neurological examination revealed no nuchal rigidity and Kernig's and Brudzinski signs were negative. Abdominal examination demonstrated mild, diffuse tenderness without guarding, rigidity, or rebound tenderness. The liver was not palpable, and no right upper quadrant mass or hepatomegaly was appreciated. Bowel sounds were normoactive. There was no jaundice, scleral icterus, or cutaneous stigmata of chronic liver disease. The remainder of the physical examination, including respiratory and cardiovascular systems, was unremarkable.

Timeline

A summary of the clinical course is presented in Table 1.

Table 1
Timeline of key clinical events and interventions in the case

Day of hospitalization	Event/Intervention	Key Findings
Baseline (Patient information)	—	11-year-old Iranian male; unremarkable past medical, family, and psychosocial history; no prior medications; complete vaccination.
Day 1 (Admission)	Initial evaluation and workup	Presented with 3-day fever, lethargy, nausea, vomiting. Vital signs: T 39.2°C, HR 118 bpm, RR 24/min, BP 110/70 mmHg, SpO_2 96%. No meningeal signs (nuchal rigidity, Kernig's, Brudzinski). Abdomen: mild diffuse tenderness, no guarding/rigidity. CSF analysis normal. Labs: WBC 22700/μL (81% neutrophils), ALP 357 U/L, AST 26 U/L, ALT 43 U/L, bilirubin normal. Empirical IV ceftriaxone and vancomycin started for suspected meningitis.
Days 2–5	Ongoing symptoms and diagnostic challenge	Persistent fever and altered mental status; mild abdominal tenderness unchanged, no peritoneal signs. CSF cultures negative. Differential expanded to include intra-abdominal infection.
Day 6	Abdominopelvic non-contrast CT scan	Liver abscess (49 × 52 × 61 mm) in segment VI with air-fluid level; thickened appendix (13 mm) with 6 mm appendicolith; loss of fat plane adjacent to ascending colon; mesenteric lymphadenopathy.
Day 6 (post-CT)	Multidisciplinary consultation	Decision made for percutaneous abscess drainage and appendectomy.
Day 6 (post-consult)	Surgical intervention	Percutaneous drainage of purulent material and appendectomy performed. Abscess culture sent.
-	Microbiology result	Culture grew Escherichia coli.
-	Discharge	Patient discharged with liver drain in situ. Antibiotics transitioned to oral cefixime and metronidazole per sensitivity; vancomycin continued for gram-positive coverage.
-	Drain removal	Liver drain removed without complication.
1 week post-drain removal	Follow-up visit	Complete clinical recovery. No residual abdominal pain, fever, or neurological deficits. No adverse events reported.

Footnotes: Abbreviations: T, temperature; HR, heart rate; RR, respiratory rate; BP, blood pressure; SpO_2, peripheral oxygen saturation; CSF, cerebrospinal fluid; WBC, white blood cell count; ALP, alkaline phosphatase; AST, aspartate aminotransferase; ALT, alanine aminotransferase; CT, computed tomography; IV, intravenous. Normal CSF analysis and negative CSF cultures ruled out meningitis. Vancomycin was continued to provide gram-positive and anaerobic coverage, as polymicrobial liver abscesses may contain organisms not recovered on culture despite the isolation of Escherichia coli.

Diagnostic Assessment

Initial laboratory tests on admission revealed marked leukocytosis (22,700/μL) with a differential count of 81% neutrophils, 8% lymphocytes, 10% monocytes, and 1% eosinophils. Liver function tests were normal (SGOT (Serum glutamic-oxaloacetic transaminase) 26 U/L, SGPT (Serum glutamic-pyruvic transaminase) 43 U/L, total bilirubin 0.6 mg/dL, direct bilirubin 0.2 mg/dL), but alkaline phosphatase (ALP) was elevated at 357 U/L. Serum calcium and phosphorus levels were 8.4 mg/dL and 3.5 mg/dL, respectively. Cerebrospinal fluid (CSF) analysis obtained on the day of admission was completely unremarkable (cell count, protein, and glucose within normal limits; negative Gram stain and culture).

On the sixth day, a non-contrast CT scan of the abdomen and pelvis was performed **(**Fig. 1**)** due to ongoing fever, altered mental status, and persistent abdominal tenderness. The scan revealed a 49 × 52 × 61 mm subcapsular abscess in liver segment VI with an air-fluid level, located adjacent to the ascending colon with loss of the fat plane between the liver and colon. The appendix was thickened to 13 mm in diameter and contained a 6 mm appendicolith, consistent with acute appendicitis. Mesenteric lymphadenopathy and thickening of the ascending colon wall were also noted.

Therapeutic Interventions

The patient was initially started on intravenous ceftriaxone and vancomycin as empirical treatment for suspected meningitis. Following the CT findings and surgical consultation, he underwent percutaneous drainage of the liver abscess and an appendectomy on the same day. The drained purulent fluid was sent for culture. Vancomycin was continued for coverage of gram-positive organisms, while ceftriaxone was maintained. Abscess culture subsequently grew Escherichia coli sensitive to cefixime and metronidazole. Based on the antibiogram results, the antibiotic regimen was transitioned to oral cefixime and metronidazole to complete a targeted course; vancomycin was continued for complete gram-positive coverage as deemed necessary by the infectious disease team. Exact dosages, strengths, and the total duration of antibiotic therapy were not specified in the available clinical records.

Follow-up and Outcomes

The patient’s postoperative course was uneventful. He showed gradual improvement in mental status and fever defervescence. He was discharged with a liver drain in place. Ten days later, the drain was removed without complication. At a follow-up visit one week after drain removal, the patient was completely asymptomatic, and physical examination was normal, confirming full clinical recovery. No follow-up laboratory or imaging studies were documented at that visit; clinical recovery was assessed by symptom resolution and physical examination. The prescribed oral antibiotic regimen was completed without reported adverse effects.

Discussion and Conclusions

Following the SCARE 2020 reporting framework (8), we present the case of an 11-year-old boy whose initial symptoms of fever and an altered mental state raised concern for meningitis, yet who was

ultimately diagnosed with a large PLA originating from acute Escherichia coli-associated appendicitis. The misleading neurological presentation, the appendiceal source of the abscess, and the patient's full recovery after percutaneous drainage, appendectomy, and tailored antimicrobial therapy yield several meaningful clinical lessons.

In the early decades of the twentieth century, acute appendicitis was the predominant cause of PLA (7). Although hepatobiliary diseases now account for the majority of cases, the appendix remains a well-recognized but significantly rarer trigger, especially among children (11, 12). The very small number of published pediatric cases of appendicitis-related PLA confirms how infrequently this classic causal chain is observed in current practice (12). Reported frequencies of childhood PLA differ markedly by region, varying from 2.9 per 100,000 hospital admissions in Sweden to as many as 78.9 per 100,000 in parts of South India; such disparities likely reflect differences in healthcare access and the availability of diagnostic tools (2, 4, 13). The current report from Iran adds to the modest pediatric literature and underscores that a disease mechanism described nearly a century ago still merits attention.

The pathological link between appendicitis and hepatic abscess formation rests on portal pyemia. Microorganisms arising from the inflamed appendix gain access to the portal venous system, trigger septic thrombophlebitis (pylephlebitis), and subsequently establish infection within the liver parenchyma (9, 10). An anatomically concealed appendix, such as one lying in a retrocecal position, a configuration supported in this patient by the abscess's close relationship to the ascending colon and the obliteration of the surrounding fat plane, facilitates this process by masking appendicitis, thereby prolonging intraluminal pressure elevation and promoting bacterial translocation (11, 12). The CT finding of an air-fluid level within the abscess is characteristic of a gas-forming pathogen, a feature most commonly linked to E. coli and indicative of a highly virulent infection.

The clinical picture displayed by our patient is particularly instructive. He did not demonstrate the classic triad of fever, hepatomegaly, and right upper quadrant tenderness; instead, his altered consciousness, nausea, and vomiting steered the initial diagnostic evaluation toward a central nervous system infection. This deceptive presentation is well documented in pediatric PLA, where neonates and young children frequently lack classic signs and where vague symptoms may imitate viral syndromes, UTIs, or meningitis (14–16). In resource-limited environments, the absence of typical abdominal findings often contributes to a delayed diagnosis (13). In the present case, a normal cerebrospinal fluid examination prompted a non-contrast abdominal CT on the sixth day of hospitalization, which simultaneously disclosed the liver abscess and the underlying appendiceal pathology. This sequence highlights the value of keeping a low threshold for abdominal imaging in febrile children who present with unexplained encephalopathy, even when overt abdominal signs are absent.

Laboratory values in this patient align with the recognized pediatric profile of PLA. Marked leukocytosis and a substantially elevated ALP were observed, whereas transaminases and bilirubin remained within the normal range, a configuration frequently reported in children because hepatic involvement can be highly localized (3). The isolation of E. coli from abscess fluid is notable in light of the evolving

microbiological landscape of liver abscesses. A meta-analysis from China indicated that although Klebsiella pneumoniae now dominates (isolated in 54% of cases), Escherichia species continue to represent a substantial minority (29%) of cultured organisms (18). Importantly, E. coli PLA has been independently associated with significantly higher rates of septic shock and in-hospital mortality when compared with infections caused by other pathogens, a finding that underscores the aggressive clinical course such infections can take (19). The patient's profound initial presentation, characterized by altered mental status, may indeed mirror this heightened virulence, making early escalation of care and timely source control especially critical.

Contemporary management of PLA hinges on the combined use of broad-spectrum intravenous antibiotics and image-guided percutaneous drainage, an approach that has dramatically reduced the once-extremely high fatality of this condition (5, 6). Our patient underwent successful percutaneous aspiration and catheter drainage of the 49 × 52 × 61 mm abscess, thereby avoiding open surgical drainage, which is generally reserved for multiloculated, septated, or otherwise refractory collections (6). Surgical removal of the inciting source, the acutely inflamed appendix, was equally essential to halt ongoing bacteremia and to forestall recurrence (12). After culture and susceptibility data became available, antimicrobial therapy was de-escalated in accordance with established stewardship principles (17). The patient's complete recovery and the uneventful removal of the drain ten days after discharge affirm the effectiveness of this combined interventional and operative strategy.

This report is limited by its single-case design, and the abdominal CT was performed without intravenous contrast, which may have precluded detailed evaluation of potential portal vein thrombosis. Nonetheless, the case clearly documents the now rarely encountered classical sequence of pylephlebitis and hepatic abscess formation originating from a concealed appendicitis, and it illustrates the effectiveness of a coordinated multidisciplinary management strategy.

In conclusion, this case demonstrates that PLA secondary to acute appendicitis, though rare in the modern pediatric population, continues to occur and can manifest with misleading extra-abdominal symptoms. A high index of suspicion, early abdominal imaging in the septic child without an obvious focus, and a coordinated multidisciplinary plan that incorporates source control, percutaneous drainage, and pathogen-directed antibiotics are the cornerstones of a favorable outcome.

- Patient perspective

Informed consent for publication was obtained from the patient's legal guardian; however, a separate narrative account of the family's experience was not formally recorded during the clinical encounter and is therefore not available for inclusion in this report.

Abbreviations

CT

Computed Tomography
CSF
Cerebrospinal fluid
PLA
Pyogenic Liver Abscess
SGOT
Serum Glutamic-Oxaloacetic Transaminase
SGPT
Serum Glutamic-Pyruvic Transaminase
UTI
Urinary Tract Infection

Declarations

Ethics approval and consent to participate:

Not Applicable.

Consent for publication:

Written informed consent was obtained from the patient's legal guardian for publication of this case report and any accompanying images, as the patient was under 18 years of age. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

Competing interests:

The authors declare that they have no competing interests.

Funding:

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Author Contribution

S.S. wrote the entire manuscript. S.H.H. contributed to conceptualization and ideation of the case report. M.A., H.J.K., M.K., and A.R.S. collected the clinical data. All authors (S.S., S.H.H., M.A., H.J.K., M.K., A.R.S.) reviewed and approved the final manuscript.

Acknowledgements:

Not Applicable.

Availability of data and materials:

Not Applicable.

References

1. Kirtisudha M, Srikanta B, Subhasis R. Liver abscess in children: an overview. World J Clin Pediatr. 2010;6(3):210–6.
2. Kumar A, Srinivasan S, Sharma AK. Pyogenic liver abscess in children–South Indian experiences. J Pediatr Surg. 1998;33(3):417–21.
3. Xie Y, Guo L-y, Liu B, Hu H-l, Hu B, Chen T-m, et al. Pyogenic liver abscess in pediatric populations in Beijing (2008–2023). BMC Infectious Diseases. 2024;24(1):745.
4. Svensson E, Jonsson A, Blackberg A. Increasing incidence of pyogenic liver abscess in Southern Sweden: a population-based study from 2011 to 2020. Infect Dis (Lond). 2023;55(6):375–83.
5. Huang CJ, Pitt HA, Lipsett PA, Osterman FA, Lillemoe KD, Cameron JL, et al. Pyogenic hepatic abscess. Changing trends over 42 years. Ann Surg. 1996;223(5):600–7.
6. Heneghan HM, Healy NA, Martin ST, Ryan RS, Nolan N, Traynor O, et al. Modern management of pyogenic hepatic abscess: a case series and review of the literature. BMC Research Notes. 2011;4(1):80.
7. Ochsner A, DeBakey M, Murray S. Pyogenic Abscess of the Liver II. An Analysis of Forty-Seven Cases with Review of the Literature. Am J Surg. 1938;40:292–319.
8. Agha RA, Franchi T, Sohrabi C, Mathew G, Kerwan A. The SCARE 2020 guideline: updating consensus surgical CAse REport (SCARE) guidelines. Int J Surg. 2020;84:226–30.
9. Kim C, Torres V, Urayeneza O, Hinika G. Pylephlebitis: a rare complication of acute appendicitis. Cureus. 2022;14:e31377.
10. Singh P, Yadav N, Visvalingam V, Indaram A, Bank S. Pylephlebitis—diagnosis and management. Am J Gastroenterol. 2001;96:1312–3.
11. Diana M, Paroz A, Demartines N, Schäfer M. Retroperitoneal abscess with concomitant hepatic portal venous gas and rectal perforation: a rare triad of complications of acute appendicitis. A case report. World Journal of Emergency Surgery. 2010;5(1):3.
12. Taylor GM, Saffer ER, McDowell EL, Warpinski MA. A 2-year-old with a hepatic abscess secondary to an ascending retrocecal appendicitis: case report and review of the literature. International Journal of Emergency Medicine. 2019;12(1):41.
13. Adeniyi OF, Daniel N, Ashefor O, Akintan P. Cryptogenic hepatic abscess in an infant and management challenges in a resource limited setting: a case report. Egyptian Pediatric Association Gazette. 2023;71(1):40.

14. Kliegman RM, Geme JWS. Nelson Textbook of Pediatrics. 21st ed: Elsevier Health Sciences; 2019.
15. Sharma S, Mohta A, Sharma P. Hepatic abscess in a preterm neonate. Indian Pediatr. 2007;44:226–8.
16. Simeunovic E, Arnold M, Sidler D, Moore SW. Liver abscess in neonates. Pediatr Surg Int. 2009;25:153–6.
17. Gui Y-g, Shou S-t, Jiang Y, Wang Q-l. Treatment of liver abscess caused by Klebsiella pneumoniae with multi-site infection: a case report. Journal of Medical Case Reports. 2025;19(1):428.
18. Luo M, Yang XX, Tan B, Zhou XP, Xia HM, Xue J, et al. Distribution of common pathogens in patients with pyogenic liver abscess in China: a meta-analysis. European Journal of Clinical Microbiology & Infectious Diseases. 2016;35(10):1557–65.
19. Ruiz-Hernández JJ, Conde-Martel A, Serrano-Fuentes M, Hernández-Meneses M, Merlán-Hermida A, Rodríguez-Pérez A, et al. Pyogenic liver abscesses due to Escherichia coli are still related to worse outcomes. Irish Journal of Medical Science (1971 -). 2020;189(1):155–61.

Figures

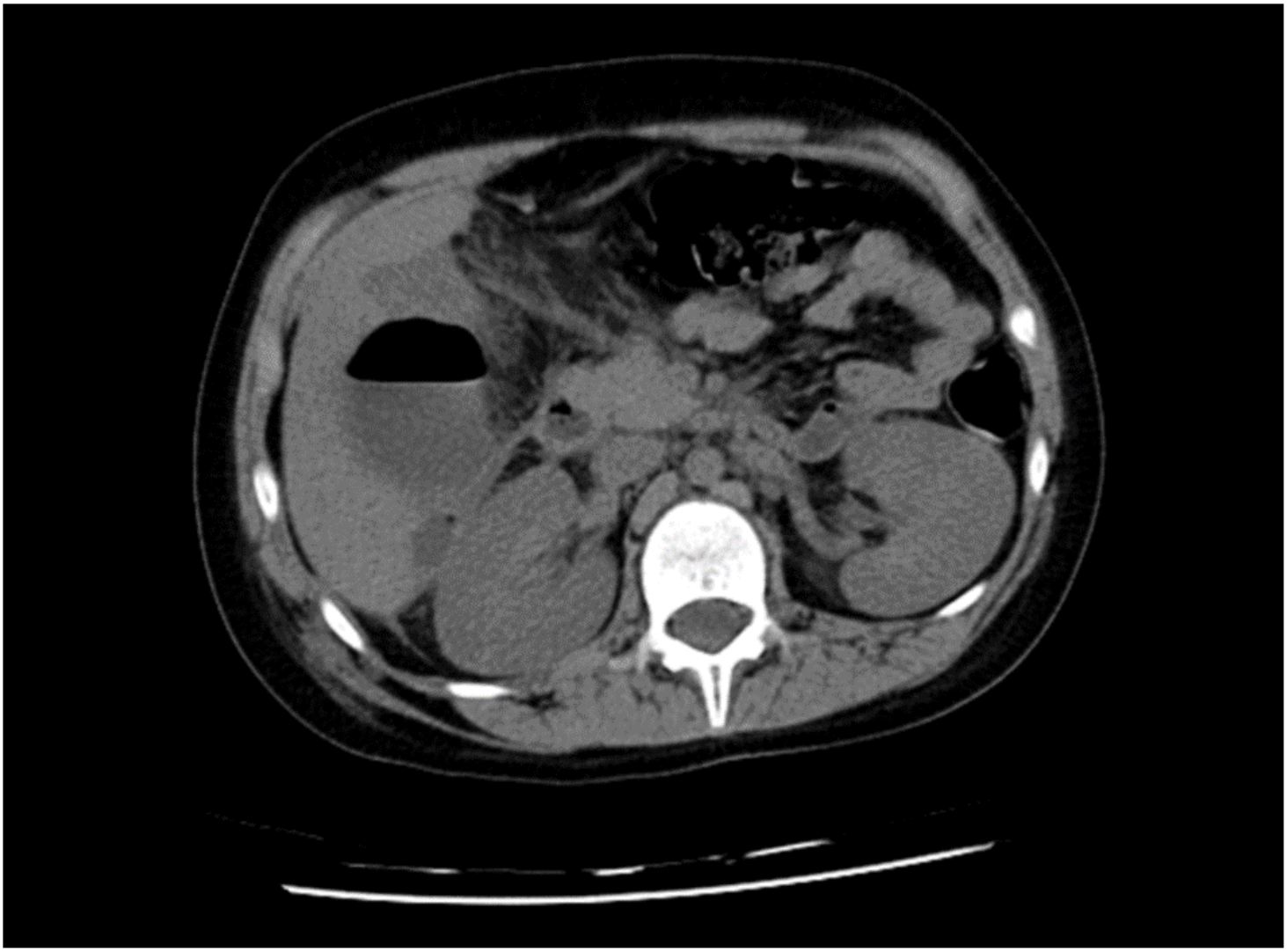

Figure 1

Non-contrast CT scan showing a subcapsular liver abscess in segment VI and acute appendicitis with a 6 mm appendicolith.