Radiology Case Reports 21 (2026) 2912–2915

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journal homepage: www.elsevier.com/locate/radcr

Case Report

Acute cholecystitis in an intrahepatic duplicated gallbladder mimicking a liver abscess: The pivotal diagnostic role of percutaneous drainage ☆,☆☆

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ARTICLE INFO

Article history:
Received 26 December 2025
Revised 25 February 2026
Accepted 31 March 2026

Keywords:
Duplicated gallbladder
Intrahepatic gallbladder
Liver abscess
Percutaneous drainage

ABSTRACT

Gallbladder duplication is a rare congenital anomaly that poses significant diagnostic challenges, particularly when one moiety is intrahepatic. Herein, we report a case of acute cholecystitis in a 40-year-old man with a duplicated gallbladder that closely mimicked a liver abscess. Initial contrast-enhanced computed tomography revealed a rim-enhancing fluid collection in segment 4 of the liver, which was distinct from the normal gallbladder. Based on the intrahepatic location and signs of inflammation, a liver abscess was initially suspected. Ultrasound-guided percutaneous drainage was performed and unexpectedly yielded bile. Subsequent enhanced imaging with contrast injection through the drainage catheter revealed a communication between the cystic cavity and the common bile duct. Accordingly, the presumed lesion was determined to be an intrahepatic duplicated gallbladder. Magnetic resonance cholangiopancreatography confirmed the presence of a duplicated gallbladder of the trabecular type (Harlaftis classification). This case illustrates that intrahepatic duplicated gallbladders can closely mimic hepatic abscesses. In such diagnostic dilemmas, percutaneous drainage with contrast-enhanced imaging is a valuable tool for definitive anatomical mapping and guiding appropriate management.

☆ Acknowledgments: The authors would like to thank Editage (www.editage.jp) for English language editing.
☆☆ Competing Interests: The authors have declared that no competing interests exist.
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https://doi.org/10.1016/j.radcr.2026.03.068

Introduction

Gallbladder duplication is a rare congenital anomaly of the biliary system with an estimated incidence of approximately 1 in 4000 births [1]. It arises from aberrant division of the pars cystica during the fifth and sixth weeks of gestation [2]. Furthermore, abnormalities in the migration of the pars cystica during the fifth to eighth week of pregnancy result in ectopic positioning of the accessory gallbladder. Several classification systems have been proposed, most notably by Boyden and Harlaftis [1,3], and the "trabecular type," characterized by an accessory gallbladder embedded within the liver parenchyma, is extremely rare. Accurate preoperative diagnosis is essential to prevent bile duct injury [2,4–6], yet it remains notoriously difficult. Intrahepatic accessory gallbladders often present as cystic lesions in the liver and may be misdiagnosed as liver abscesses, hepatic cysts, or even malignancies [5,7]. A missed diagnosis can lead to incomplete surgery or inadvertent injury to the biliary tree. Herein, we present a case of acute cholecystitis in an intrahepatic duplicated gallbladder. Initial imaging strongly suggested a liver abscess; however, the correct diagnosis was established via percutaneous drainage and subsequent contrast-enhanced imaging. Additionally, we discuss the imaging pitfalls and utility of multimodal evaluations, emphasizing the role of direct cholangiography in complex biliary anomalies.

Case presentation

A 40-year-old man with no significant medical history presented to our hospital with severe epigastric and right upper quadrant pain accompanied by fever (temperature, 37.9°C). Physical examination revealed marked tenderness in the right upper quadrant. Laboratory tests showed elevated levels of inflammatory markers (white blood cell count, 11,700 /μL; C-reactive protein, 14.31 mg/dL), whereas liver function tests and biliary enzymes were within normal limits.

Abdominal ultrasonography (US) demonstrated a hypoechoic cystic lesion with internal debris in segment 4 (S4) of the liver. A normal gallbladder was separately identified in the standard gallbladder fossa. Contrast-enhanced computed tomography (CT) revealed fluid collection with thick rim enhancement in S4 (Fig. 1). The lesion was adjacent to the left portal vein, but appeared separate from the biliary tree on standard images. Based on the imaging appearance and apparent separation from the "normal" gallbladder (Fig. 1A, arrowhead), a primary radiological diagnosis of pyogenic liver abscess or an infected hepatic cyst was made (Fig. 1, arrows). Accordingly, US-guided percutaneous drainage was performed. The aspirated fluid was bile-like, which was unexpected for a typical abscess, raising suspicion of a biliary communication. Bacterial culture results were negative. To clarify the anatomy, contrast medium was injected through the drainage catheter on day 17 of hospitalization. This demonstrated a communication between cystic cavity and the common bile duct via a separate cystic duct (Fig. 2, arrow). The contrast medium also flowed into the common bile duct and retrogradely opacified the caudal portion of the normal gallbladder (Fig. 2, arrowhead), confirming the presence of 2 independent gallbladders. T2-weighted fat-suppressed magnetic resonance images revealed that the lesion in S4 had decreased in size. In addition, internal hypointense areas suggestive of gallstones or debris were observed (Fig. 3A, arrow). Magnetic resonance cholangiopancreatography demonstrated 2 separate cystic structures draining into the common bile duct (Fig. 3B). Based on these findings, the lesion was diagnosed as a duplicated gallbladder and classified as the Harlaftis trabecular type, corresponding to the Boyden H-shaped.

The patient was diagnosed with acute cholecystitis of the intrahepatic duplicated gallbladder. Although cholecystectomy is generally recommended for duplicated gallbladders to prevent recurrent cholecystitis, the intrahepatic location of the inflamed gallbladder posed a high risk of hepatic injury that could necessitate partial hepatectomy. Therefore, conservative management with drainage and antibiotics was selected. The patient's symptoms resolved and he was discharged without any complications.

Discussion

A duplicated gallbladder is a morphological anomaly resulting from splitting of the cystic primordium or development of an accessory bud from the biliary tree [1,3]. Boyden classified these anomalies into 2 main groups: the "vesica fellea divisa" (bilobed gallbladder) and "vesica fellea duplex" (true duplication) [1]. True duplications were further categorized based on cystic-duct junctions. The gallbladder morphology in our patient corresponded to the Harlaftis Type II (accessory gallbladder), specifically the "trabecular type" [3], in which the duplicated gallbladder is embedded within the liver parenchyma. This intrahepatic location is distinct from the more common Y-shaped (vesica fellea duplex) or H-shaped (ductular type) duplications, in which the cystic duct drains into the common bile duct [6,8], resulting in a significantly higher likelihood of diagnostic confusion and an increased risk of iatrogenic injury.

The primary challenge in this case was the mimicry of a liver abscess. In our patient, the lesion was located in S4 (quadrate lobe), which was distinct from the standard gallbladder fossa. This anatomical separation strongly favored an initial diagnosis of an intrahepatic abscess rather than a gallbladder anomaly. Furthermore, normal biliary enzyme levels, which are atypical in severe biliary infection but common in isolated liver abscesses, misled the clinical team. On CT and US, an inflamed intrahepatic gallbladder presents as a fluid-filled cystic lesion with wall thickening. This appearance is nearly indistinguishable from the "double target sign" or rim enhancement observed in pyogenic liver abscesses or bilomas. However, differentiation from a biloma was clearly established by catheter-based cholangiography. The imaging revealed multiple filling defects (stones) within the cavity and a connection to the common bile duct via a distinct cystic duct, findings that are incompatible with a simple biloma caused by bile leakage.

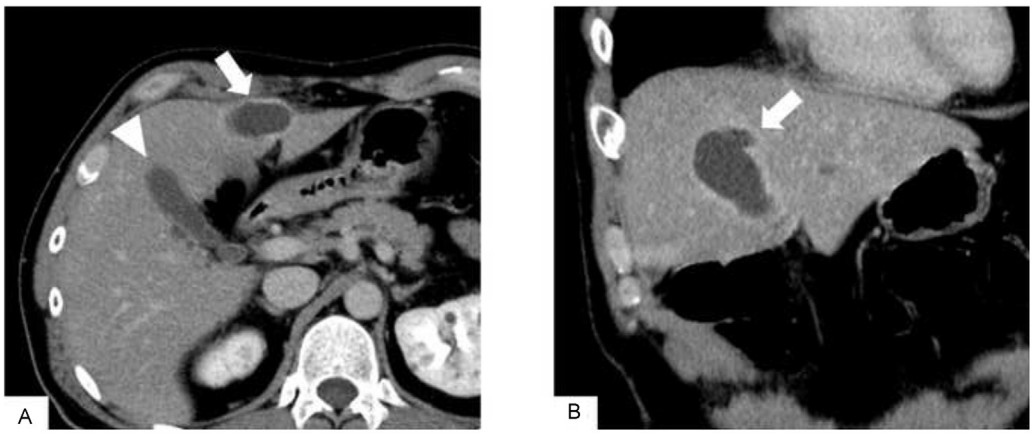

Fig. 1 – Contrast-enhanced computed tomography findings. (A) Axial image shows a cystic mass with rim enhancement on the surface of hepatic segment 4 (arrow). The normal gallbladder is separately identified (arrowhead). (B) Coronal image shows the cystic mass with a slightly irregular shape on its craniomedial aspect (arrow).

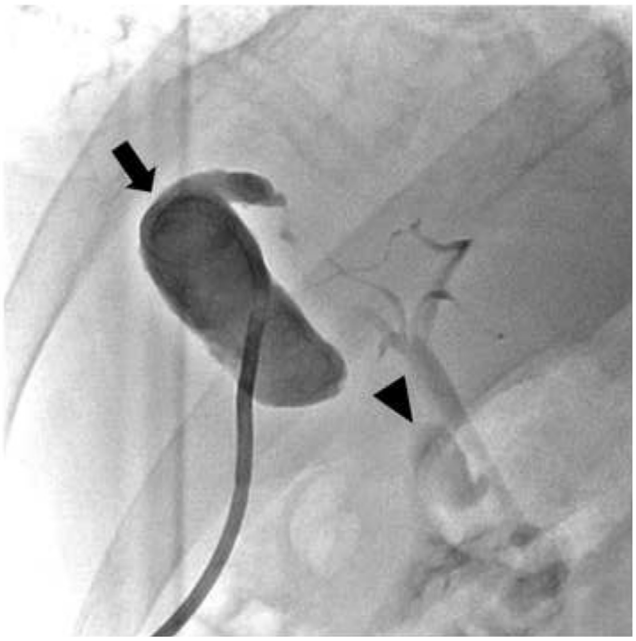

Fig. 2 – Tubography via the drainage catheter. Contrast-enhanced imaging demonstrates the biliary tree from the intrahepatic ducts to the common bile duct (arrow). The normal gallbladder is faintly opacified at the level of the middle bile duct (arrowhead). Multiple round filling defects suggestive of gallstones or debris are observed within the duplicated gallbladder.

Regarding the diagnosis of acute cholecystitis, although the bile culture obtained from drainage was negative—likely due to prior antibiotic administration—the diagnosis was clinically robust. Anatomically, the lesion was confirmed as a duplicated gallbladder. Clinically, it exhibited distinct signs of inflammation, including wall thickening and pericholecystic fluid, accompanied by right upper quadrant tenderness and systemic inflammatory markers. These findings fulfill the diagnostic criteria for acute cholecystitis according to the Tokyo Guidelines 2018 (TG18) [9], confirming that the pathology was indeed inflammation of the duplicated organ.

Although magnetic resonance cholangiopancreatography is widely considered the gold standard for noninvasive evaluation of biliary anatomy [2,4,6,8,10,11], it has limitations in the acute setting. Severe inflammation, pericholecystic fluid, and sludge can obscure the thin cystic duct or suppress the fluid signal, making it difficult to trace the connection to the biliary tree [4,5]. In such situations, percutaneous drainage followed by contrast-enhanced imaging has proven to be the decisive modality. Unlike static cross-sectional imaging, contrast-enhanced imaging via the drainage catheter provided dynamic visualization of the biliary flow in our patient. It demonstrated not only the patency of the cystic duct of the duplicated gallbladder, but also retrograde filling of the normal gallbladder, conclusively proving duplication. This highlights the fact that in diagnostic dilemmas where noninvasive imaging is equivocal, direct cholangiography via percutaneous access remains an invaluable tool for anatomical mapping [4,5].

Missed gallbladder duplications can have serious surgical consequences, and cases in which re-operation was performed owing to misdiagnosis of duplicated gallbladders as "residual gallbladders" after cholecystectomy have been reported [5,6,8]. In other scenarios, the surgeon may remove the visible (normal) gallbladder and leave the inflamed intrahepatic gallbladder, leading to persistent symptoms and potential progression to gangrene or perforation. Surgical removal of both gallbladders is typically recommended to prevent recurrence and complications such as malignancy [4,6,7,12]. However, the intrahepatic location of the duplicated gallbladder in our patient presented a substantial surgical challenge. Unlike standard cholecystectomy, curative excision would have necessitated partial hepatectomy (S4 resection), which is associated with significant risks of morbidity, such as hemorrhage and bile leakage. Given the complete resolution of the acute infection after percutaneous drainage, a conservative strategy was prioritized to maximize patient safety [5].

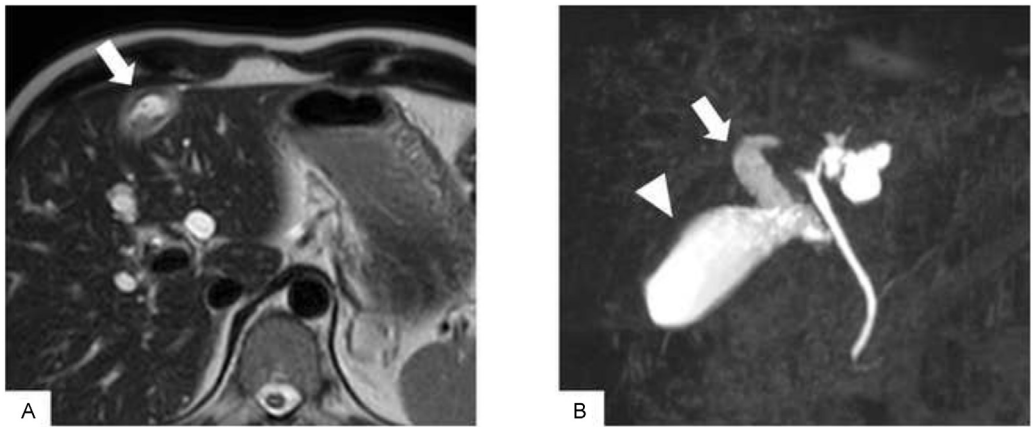

Fig. 3 – Magnetic resonance cholangiopancreatography findings. (A) Axial T2-weighted fat-suppressed image shows hypointense areas within the duplicated gallbladder, suggestive of stones or debris. (B) A maximum intensity projection magnetic resonance cholangiopancreatography image shows the normal gallbladder (arrowhead) and the duplicated gallbladder (arrow). Simple hepatic cysts are visualized near the left intrahepatic bile duct.

In conclusion, acute cholecystitis in an intrahepatic duplicated gallbladder is rare and can closely mimic a liver abscess. Radiologists should maintain a high index of suspicion of this anomaly when observing a cystic lesion with rim enhancement in S4, particularly in the presence of a normal gallbladder. In cases where non-invasive imaging is inconclusive, percutaneous drainage serves a dual purpose: it provides therapeutic relief, and combined with contrast-enhanced imaging, it establishes a definitive anatomical diagnosis. Moreover, this approach prevents unnecessary high-risk surgical interventions or inadvertent bile duct injuries.

Declaration of generative AI and AI-assisted technologies in the manuscript preparation process

During the preparation of this work, the authors used Gemini (Google) to improve the language, readability, and structure of the manuscript. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the published article.

Patient consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

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