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CASE REPORT

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Trifoliate gallbladder: A rare congenital anomaly masquerading as acute cholecystitis

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Key Clinical Message

Triple gallbladder, an extremely rare congenital anomaly, can mimic more common biliary conditions. Accurate diagnosis through imaging and a multidisciplinary approach is essential for timely surgical management, preventing complications, and ensuring better patient outcomes.

Abstract

The multiplication of the gallbladder is a congenital malformation with a rare incidence of 1 in 4000 patients, among which the trifoliate gallbladder, even rarer, is included. Gallbladder anomalies are typically discovered incidentally while investigating conditions like gallstones, sedimentation, gallbladder inflammation, or malignancy. The clinical presentation of trifoliate gallbladder disease varies, and it may require a variety of imaging modalities to obtain a preoperative diagnosis. Recommended therapeutics for this anomaly are open or laparoscopic cholecystectomy, depending on the patient's condition. Early diagnosis of gallbladder multiplications is vital to improve prognosis and mitigate the risk of complications like cholelithiasis, cholecystitis, metaplasia, and adenocarcinoma. In our case, we present a 30-year-old male with the diagnosis of acute cholecystitis with triple gallbladder. A confirmatory diagnosis was made with magnetic resonance cholangiopancreatography (MRCP). The patient responded well to the therapy given and was discharged for follow-up.

KEYWORDS

acute cholecystitis, magnetic resonance cholangiopancreatography (MRCP), maximum intensity projection (MIP), open cholecystectomy, trifoliate gallbladder

1 | INTRODUCTION

Vesica fellae triplex, also known as gallbladder triplication, is a rare and frequently undiagnosed congenital abnormality of the biliary system.[1] Khadim et al.[2] reported the first case of a human cadaver in 1752. The development of the triple gallbladder happens when the rudimentary bile ducts do not retract properly during embryological development.[3] Based on the number and morphology of the cystic ducts, three distinct types of the

triple gallbladder have been identified, among which duplications and triplications are rare.[3] Clinical evaluation is often insufficient, as, despite a thorough workup, the diagnosis can be confused with choledocholithiasis, ascending cholangitis, biloma, or carcinoma.[3] Therefore, a confirmatory histopathological examination is necessary. However, radiological evaluation is thus essential to rule out the triple gallbladder and rule out type II choledochal cysts and other congenital anomalies. The use of a single imaging modality has low sensitivity for diagnosing triple gallbladder; hence, the use of multiple modalities, such as ultrasound and magnetic resonance cholangiopancreatography (MRCP), is warranted when combined with an intraoperative cholangiogram to prevent damage to the biliary tree.[4–6] For symptomatic multiple gallbladders, a cholecystectomy is advised to prevent recurrence; open surgery is preferred due to anatomical differences, and intraoperative cholangiography is recommended with laparoscopic methods.[4,7] We present a case of a 30-year-old man who experienced symptoms of acute cholecystitis and, later on, was diagnosed with trifoliate type 3 on MRCP. The patient responded well to the treatment given and was discharged for follow-up.

2 | CASE PRESENTATION

We present a case of a 30-year-old male who presented to the surgery outpatient department (OPD) with a history of intermittent, colicky abdominal pain, food intolerance, bloating, nausea, and vomiting for the past 3 days. No significant past medical history was found.

On physical examination, there was tenderness in the right hypochondrium and a positive Murphy's sign on deep palpation. No rigidity or rebound tenderness could be elicited. The rest of the systemic examination findings were unremarkable. Leukocytosis was found in the complete blood count (CBC), and the biochemistry panel showed high levels of transaminases, such as alanine transaminase, aspartate transaminase, and alkaline phosphatase. Additionally, the total bilirubin level was measured at 0.9 mg/dL, while amylase and lipase levels were recorded at 40 and 22 U/L, respectively, as shown in Table 1.

Further evaluation with abdominal ultrasound showed the presence of three anechoic, fluid-filled saccular structures in the expected location of the GB fossa, as shown in Figure 1.

One of the structures showed a shadowing echogenic focus measuring approximately 4 mm in maximum dimension, consistent with cholelithiasis, as shown in Figure 2. Mild wall thickening was seen in all three structures. The possibility of either a Todani type II choledochal cyst or a duplicated gallbladder was postulated based on sonographic findings, and magnetic resonance cholangiopancreatography (MRCP) was advised.

TABLE 1 Patients laboratory values.

Parameter	Result	Normal range
Complete blood count (CBC)		
Leukocytes (WBC)	13,000/mL	4000–11,000/mL
Biochemistries		
Alanine transaminase (ALT)	222 U/L	5–40 U/L
Aspartate transaminase (AST)	104 U/L	5–35 U/L
Alkaline phosphatase (ALP)	200 U/L	35–115 U/L
Total bilirubin	0.6 mg/dL	0.2–1.2 mg/dL
Amylase	50 U/L	30–110 U/L
Lipase	22 U/L	10–140 U/L

MRCP showed the presence of three incompletely separated tubular cystic structures in the region of the gallbladder fossa with incomplete septations, as shown in Figure 3.

The structures were seen to confluence at the region of the neck of the gallbladder with a solitary cystic duct, which was further confirmed through a maximum intensity projection (MIP) image displayed in Figure 4. The findings were consistent with trifoliate gallbladder type 3.

Following appropriate informed consent, the patient was taken for laparoscopic cholecystectomy to treat the calculous cholecystitis. Laparoscopic examination showed that the gallbladder lumen was split into three parts, with a single cystic duct and an accompanying artery. The surgical specimen was sent for histopathological examination, which revealed slightly edematous mucosa in two of the three gallbladders and slightly edematous, inflammatory changes in the mucosa of the third with accompanying calculus. No signs of chronic inflammation, metaplasia, or carcinomatous changes were noted in any of the three gallbladders, as shown in Figure 5. Post-operative recovery was uneventful. The patient continues to be pain-free and in good health.

3 | DISCUSSION

Congenital anomalous biliary multiplications, such as triple gallbladder (vesical fellae triplex), are exceedingly rare occurrences, with an incidence of approximately 1 in 4000 patients.[4] These anomalies result from the incomplete regression of embryological rudimentary bile ducts and can manifest in various configurations, leading to different types of triple gallbladders.[8] The classification of these anomalies is primarily based on the size, location, and number of accessory gallbladders. Types 1, 2, and 3

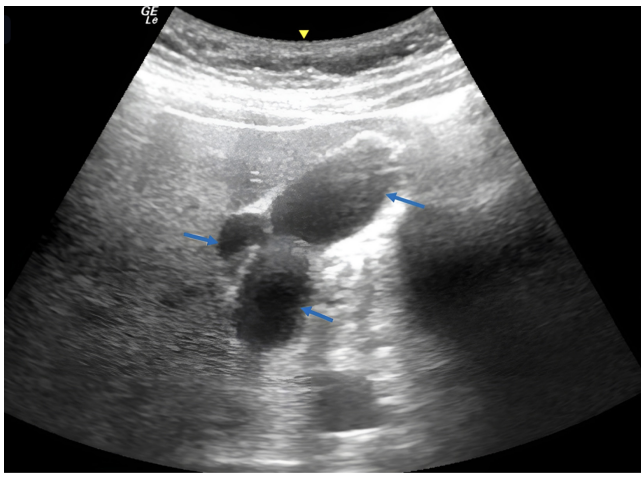


FIGURE 1 Oblique sagittal sonography image showing three anechoic, cystic, and saccular structures in the GB fossa (blue arrows).

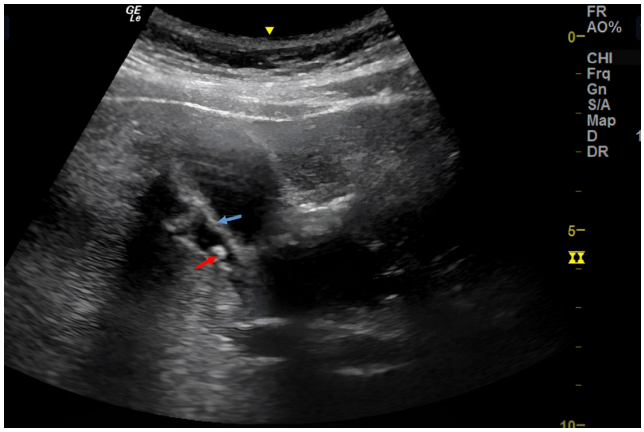


FIGURE 2 Oblique sagittal sonography image showing calculus at the neck of the GB (red arrow) and mild wall thickening (blue arrow).

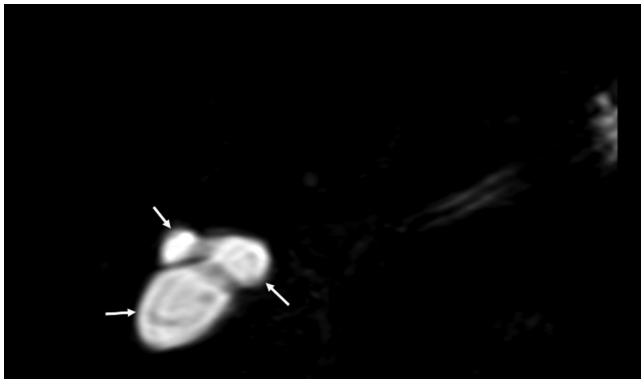


FIGURE 3 Coronal multi-planar reformat showing three gallbladders with incomplete septations (white arrows).

have been described, each characterized by distinct biliary drainage configurations, as shown in Table 2.[8]

Type 1 triple gallbladder is characterized by three separate gallbladders, each with its own cystic duct, while in

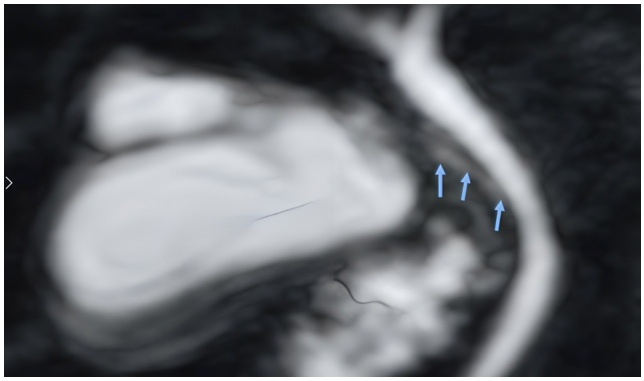


FIGURE 4 Coronal MIP image showing a single cystic duct (blue arrows) joining the CBD.

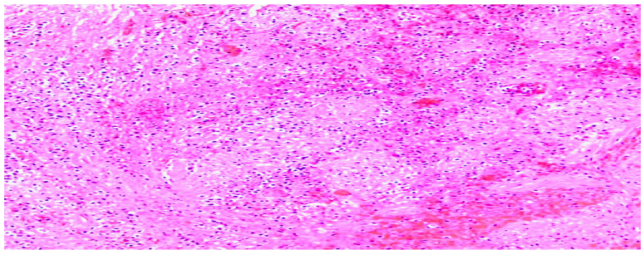


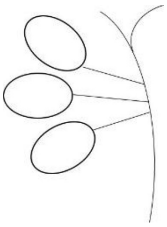
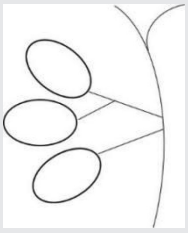
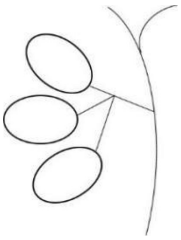
FIGURE 5 HPE image with hematoxylin–eosin stain showing fibrinous, inflammatory exudates, and neutrophil infiltration into the gallbladder mucosa, consistent with acute cholecystitis.

Type 2, two gallbladders connect to a common cystic duct, and the third drains into a separate duct. Type 3 involves three gallbladders sharing a single cystic duct.[8] These variations in anatomy are essential to understand when diagnosing and managing congenital biliary multiplications, as they influence clinical presentation and treatment approaches.

The clinical presentation of the triple gallbladder can vary widely, and it often mimics more common biliary pathologies, such as calculous or acalculous cholecystitis, ascending cholangitis, choledocholithiasis, or even biloma and biliary hematoma.[4] Therefore, clinicians must consider this rare anomaly in the differential diagnosis, especially when patients present with atypical symptoms or complications related to the biliary system.

Radiological imaging plays a vital role in the diagnosis of triple gallbladder and other congenital biliary anomalies. Multiple imaging modalities, including ultrasound, endoscopic retrograde cholangiopancreatography (ERCP), and magnetic resonance cholangiopancreatography (MRCP), are often required to accurately delineate the anatomy and confirm the diagnosis.[9] However, it is important to note that even with meticulous imaging protocols, the detection of the triple gallbladder can be challenging due to the rarity of the condition and the potential for radiologists to focus on more common differentials.[9]

TABLE 2 Types of trifoliate gallbladder.[8]

Types	Description	Figures
Type 1	Three gallbladders with three separate cystic ducts. *Triple Ductular*	
Type 2	Three gallbladders where two connect to a common cystic duct and the third drains into a separate duct. *Triple Combined*	
Type 3	Three gallbladders share a single cystic duct. *Triple Primordial*	

Early diagnosis is crucial for a better prognosis and to reduce the risk of intraoperative and pathological complications associated with gallbladder multiplications, such as cholelithiasis, cholecystitis, metaplasia, and adenocarcinoma.[2] Surgical management is the primary treatment approach, typically involving laparoscopic cholecystectomy with careful dissection of Calot's triangle. An intraoperative cholangiogram is recommended to avoid damage to the biliary tree during the procedure.[7] Furthermore, a thorough histopathological examination of the resected specimen is essential to assess for underlying pathologies, including chronic cholecystitis and metaplasia, which may impact clinical outcomes.[8]

In conclusion, triple gallbladder and other congenital biliary multiplications are rare anomalies that can present with variable clinical symptoms and often mimic more common biliary pathologies. Radiological imaging is instrumental in their diagnosis, although the rarity of these anomalies and the presence of other differential diagnoses can pose challenges to detection. Early diagnosis and appropriate surgical management are crucial for improving patient outcomes and reducing complications associated with these anomalies. A multidisciplinary approach involving clinicians, radiologists, and pathologists is essential for a comprehensive evaluation and treatment of these rare biliary anomalies.[3]

4 | CONCLUSION

We present a novel case of triple gallbladder, an exceedingly rare anatomical variation within the biliary system. In the context of abdominal imaging, where more common radiological differential diagnoses like biloma or a type II choledochal cyst often take precedence, a high index of clinical suspicion and heightened awareness on the part of the radiologist become paramount. These factors are instrumental in ensuring the accurate diagnosis of this exceptionally rare anomaly, allowing for timely and appropriate medical management.

AUTHOR CONTRIBUTIONS

Akbar Hussain: Formal analysis; writing – original draft; writing – review and editing. **Pugazhendi Inban:** Investigation; methodology; writing – original draft; writing – review and editing. **Chinaza Mercy Akuma:** Writing – original draft; writing – review and editing. **Rohan Raj:** Data curation; formal analysis; funding acquisition; software; supervision. **Ogbonnaya Akuma:** Investigation; methodology. **Nnamdi Lionel Nwoke:** Conceptualization; formal analysis. **Anasonye Emmanuel Kelechi:** Supervision; validation.

CONFLICT OF INTEREST STATEMENT

None.

FUNDING INFORMATION

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

DATA AVAILABILITY STATEMENT

The datasets analyzed during the current study are available from the corresponding author upon reasonable request. Additionally, comprehensive literature sources used for the literature review are cited appropriately within the manuscript.

CONSENT

Written informed consent was obtained from the patient to publish this report in accordance with the journal's patient consent policy.

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