International Journal of Science and Research Archive
eISSN: 2582-8185
Cross Ref DOI: 10.30574/ijsra
Journal homepage: https://ijsra.net/

(RESEARCH ARTICLE)

Check for updates

Preoperative diagnosis of gallbladder volvulus: Clinical case report and review of the literature

Hung Ngoc Dang [1], Phong An Tran [1,*], Thai Trong Le [1], Linh Ngoc Hoang Nguyen [2,3] and Thien Huu Dang [4]

[1] *Department of Abdominal Surgery, Hue Central Hospital, Hue, 530000, Vietnam.*
[2] *Faculty of Medicine, College of Medicine and Pharmacy, Duy Tan University, Da Nang, 550000, Vietnam*
[3] *Institute for Research and Training in Medicine, Biology and Pharmacy, Duy Tan University, Da Nang, 550000, Vietnam.*
[4] *College of Health Sciences, VinUniversity, Ha Noi, 124000, Vietnam.*

International Journal of Science and Research Archive, 2024, 13(02), 2028–2034

Publication history: Received on 27 October 2024; revised on 02 December 2024; accepted on 05 December 2024

Article DOI: https://doi.org/10.30574/ijsra.2024.13.2.2386

Abstract

Introduction: Gallbladder volvulus is an uncommon disorder that impedes the circulation of fluid in the gallbladder and blood vessels. Gallbladder volvulus accounts for only 1 in 365,000 cases of gallstone disease. Wendell first described gallbladder volvulus and in the early 21st century, approximately 500 cases of gallbladder volvulus were reported as of early 2020. Despite technological advances in imaging modalities, the preoperative diagnosis of gallbladder volvulus remains very difficult with only 4 cases reported in the literature.

Clinical case: We report a rare case of complete acute gallbladder volvulus diagnosed preoperatively in a woman. An elderly female patient came to the emergency room with symptoms of acute cholecystitis. Ultrasound shows signs of an enlarged gallbladder, thick walls, and fluid around the gallbladder. The gallbladder has no stones, the intrahepatic and extrahepatic bile ducts are not dilated, and there are no stones. Computed tomography also shows similar images, along with images of twisting in the neck of the gallbladder. The laparoscopic cholecystectomy was indicated as an emergency. During surgery, we found the gallbladder was twisted 180 degrees counterclockwise at the gallbladder funnel, congested and necrotic. The patient had no complications and was discharged from the hospital on the 4th day after surgery.

Conclusion: Preoperative diagnosis of gallbladder volvulus is a challenge for clinicians. The combination of signs and symptoms with imaging findings can guide physicians to accurately and promptly diagnose preoperatively gallbladder volvulus. Early intervention helps prevent complications of sepsis due to gallbladder ischemia, necrosis and perforation, reducing mortality.

Keywords: Cholecystitis; Gallbladder torsion; Cholecystectomy; Gallbladder volvulus; Acute abdomen; Laparoscopic cholecystectomy

1. Introduction

Gallbladder volvulus, also known as gallbladder torsion, is an exceedingly rare clinical condition resulting from the twisting of the gallbladder along its axis. This torsion compromises both the biliary flow and the vascular supply, leading to acute ischemia and severe abdominal pain. First described by Wendell, gallbladder volvulus represents a rare cause of acute abdomen, accounting for only 1 in 365,000 cases of gallstone-related diseases. By the early 21st century, fewer than 300 cases had been reported globally; however, by 2020, this number had risen to approximately 500, likely due to the increased life expectancy of the population (1). The condition primarily affects elderly women, with 84% of reported cases occurring in this demographic. While the exact pathogenesis remains uncertain, intraoperative findings

* Corresponding author: Phong An Tran

suggest that anatomical factors, such as a mobile gallbladder with a long mesentery, may predispose the organ to torsion, resulting in gallbladder ischemia. Clinically, gallbladder volvulus closely mimics the presentation of acute cholecystitis, making it difficult to diagnose preoperatively. Indeed, fewer than 10% of cases are identified before surgical intervention (2). Without timely treatment, complications such as sepsis, necrosis, and perforation can ensue, with potentially fatal outcomes.

Given the significant diagnostic challenge posed by gallbladder volvulus, early detection and surgical management are crucial in minimizing morbidity and mortality. Although advances in imaging technology have improved diagnostic capabilities, preoperative diagnosis remains rare, with only four documented cases confirmed via imaging before surgery (3, 4). The difficulty of diagnosing gallbladder volvulus preoperatively underscores the importance of clinical vigilance. This case report aims to highlight one of the few instances where preoperative imaging successfully identified gallbladder volvulus. Through a review of the literature and discussion of the imaging findings, we hope to emphasize the critical role of early diagnosis in improving patient outcomes.

2. Case Introduction

An 80-year-old female presented to the emergency department with a 2-day history of acute right upper quadrant pain, accompanied by mild fever and nausea. The patient reported experiencing constant, dull pain the day prior to admission, which progressed to sharp, colicky pain on the day of hospitalization. The pain was associated with nausea, but there was no vomiting, jaundice, or fever at the time of presentation. The patient's medical history was notable for chronic hypertension, managed with Amlodipine (5 mg daily), and type 2 diabetes mellitus, treated with Diamicron MR (30 mg, two tablets daily).

On physical examination, the patient's vital signs were within normal limits. She was afebrile, with a non-icteric sclera and pink mucous membranes. There was tenderness in the right upper quadrant on abdominal palpation, but no guarding or rebound tenderness was observed.

Laboratory investigations revealed a white blood cell count of 4.37 x 10^9/L, hemoglobin level of 10.8 g/dL, and platelet count of 170 x 10^9/L. C-reactive protein (CRP) was elevated at 261.7 mg/dL. Other notable serum biochemistry findings included a glucose level of 3.42 mmol/L, urea at 5.01 mmol/L, and creatinine at 56.1 µmol/L. Liver enzymes showed mildly elevated aspartate aminotransferase (AST) at 31.6 U/L and alanine aminotransferase (ALT) at 20.4 U/L. Bilirubin levels were within normal limits, with a total bilirubin of 31.8 µmol/L and conjugated bilirubin of 9.0 µmol/L. Pancreatic enzymes were unremarkable, with a lipase level of 16 U/L and amylase level of 4 U/L.

Abdominal ultrasound revealed a significantly distended gallbladder with thin walls. The intrahepatic and extrahepatic bile ducts were not dilated, and no gallstones were detected.

An abdominal contrast-enhanced computed tomography (CT) scan was performed, revealing a markedly distended gallbladder measuring 45 x 66 x 92 mm, with a thin, enhancing wall. The gallbladder was located outside its usual anatomical position and exhibited a vertically reversed orientation, consistent with a "floating gallbladder." No radiopaque gallstones were present. The neck of the gallbladder was twisted, producing the classic "whirlpool" sign, while the cystic duct demonstrated an abrupt tapering, characteristic of the "bird beak" sign. Additionally, there was evidence of pericholecystic fluid and inflammatory fat stranding extending around the gallbladder and along the lesser omentum. Both the intrahepatic and extrahepatic bile ducts were of normal caliber, and no radiopaque stones were visualized.

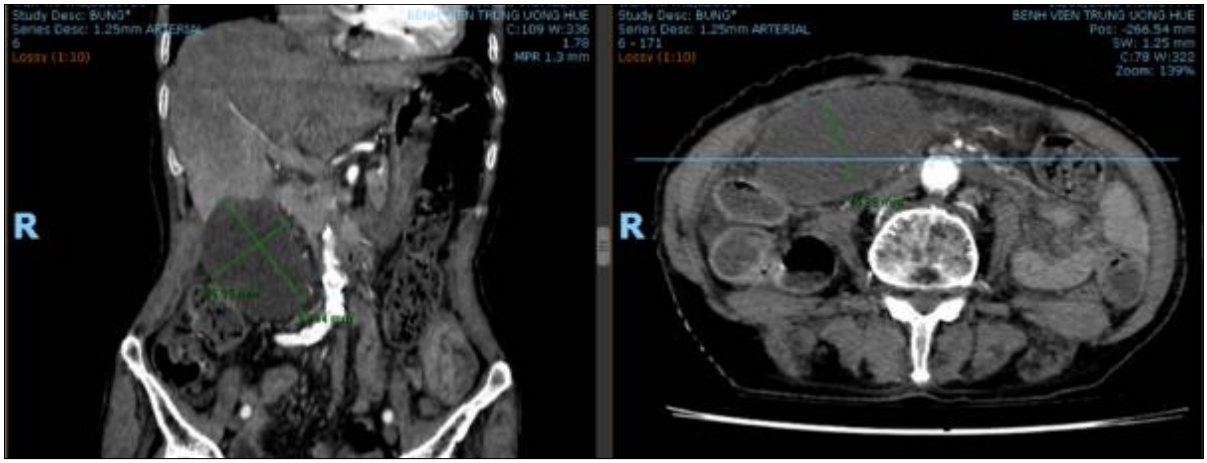

Figure 1 Coronal (left) and axial (right) CT images display the enlarged, thin-walled gallbladder in an abnormal, vertically reversed orientation

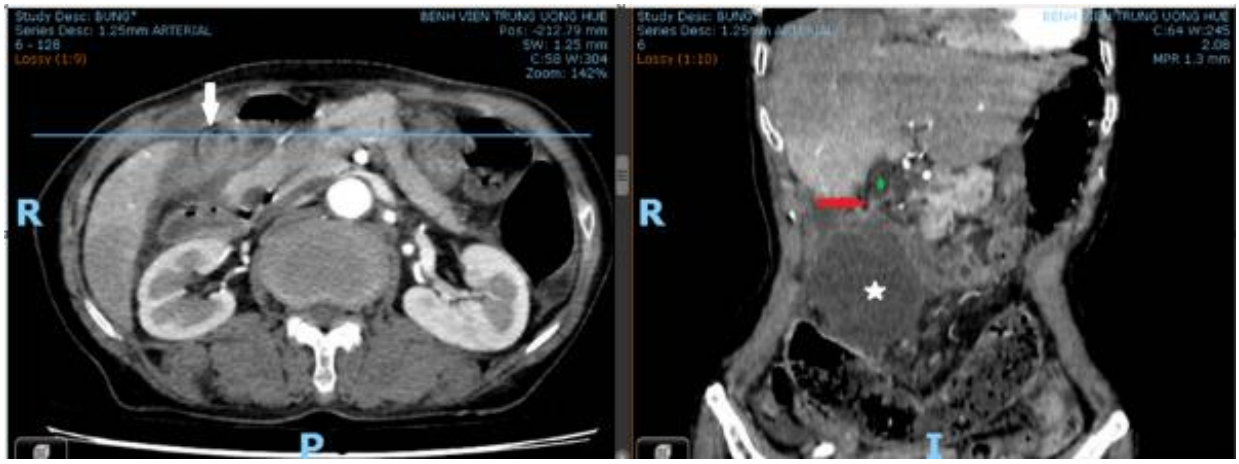

Figure 2 Axial (left) and coronal (right) CT images demonstrate the "whirlpool" sign at the neck of the gallbladder (white arrow) and the "bird beak" sign at the junction of the cystic duct (green star) and gallbladder (white star) in coronal view (red arrow).

Based on the clinical presentation and imaging findings, the patient was initially diagnosed with acute cholecystitis. However, following further review of the CT scan, a preoperative diagnosis of acute gallbladder volvulus was made, necessitating urgent surgical intervention.

The patient underwent emergency laparoscopic surgery under general anesthesia with endotracheal intubation. Pneumoperitoneum was established using an open technique, with a 10 mm Hasson trocar placed infraumbilically. A 30-degree laparoscope was used to visualize the surgical field, which revealed a 180-degree counterclockwise torsion of the gallbladder around the cystic duct axis. The gallbladder wall was thin and necrotic, with a small amount of clear, dark-yellow bile present beneath the liver. The liver parenchyma appeared rough, and the common bile duct was mildly dilated, measuring 10 mm in diameter, with no evidence of stones. Three trocars were utilized during the procedure: a 5 mm trocar in the epigastrium as the primary working port, and another 5 mm trocar in the right hypochondrium as the secondary working port for the surgeon's left hand **(Figure 3).**

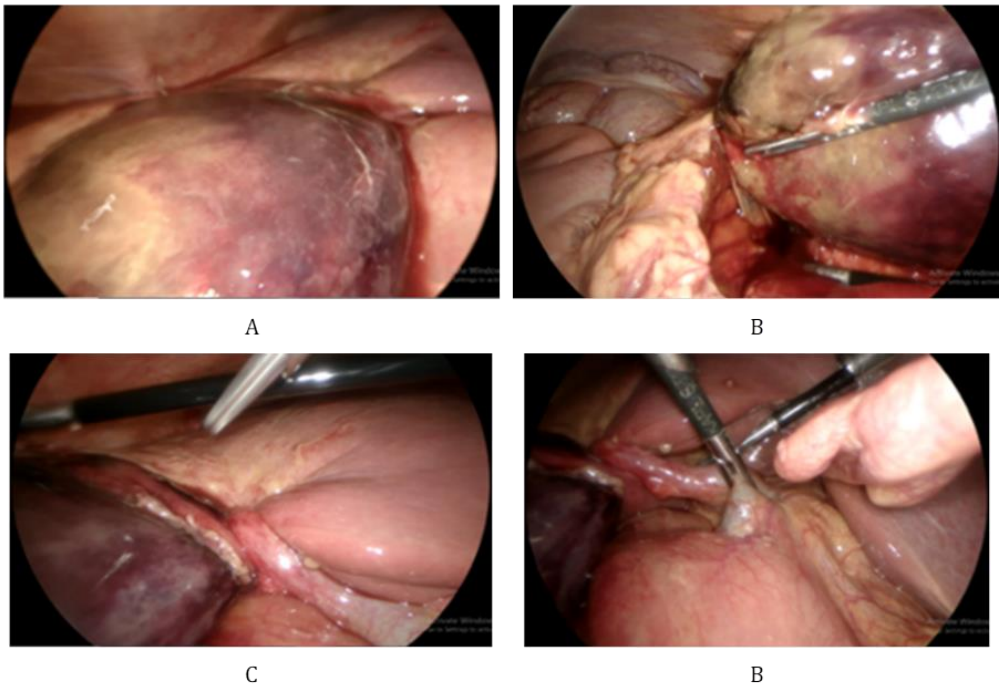

Figure 3 Intraoperative images of laparoscopic cholecystectomy (a)(b) Gallbladder necrosis, inflammatory fluid with pseudomembranous membrane (c) Twisting gallbladder neck 180° (d) The common bile duct is dilated to a diameter of 10 mm; and there are no stones

A retrograde laparoscopic cholecystectomy was performed using two Hem-o-lok clips to secure the cystic duct and cystic artery. The procedure was completed without any intraoperative complications or significant blood loss, and the total operative time was approximately 30 minutes **(Figure 4)**.

Figure 4 The gallbladder has been removed. Clamp the gallbladder's cervical duct with Hem-o-lok

Postoperatively, the patient had an uneventful recovery. She experienced the return of bowel function and resumed oral intake by the second day post-surgery. The patient was discharged on postoperative day 4, with no complications noted during her hospital stay.

3. Discussion

Gallbladder volvulus is an uncommon surgical emergency, with cases reported in a wide age range from 3 to 96 years. The condition primarily affects elderly patients, with 84% of cases occurring in individuals over 70 years old, while 16% of cases involve pediatric patients under 18 years old. There is a gender disparity, with females outnumbering males in the elderly group by a ratio of 5:1, whereas males are more commonly affected in the pediatric group (2, 5, 6). Gallbladder volvulus can be categorized as complete (>180° torsion) or incomplete (<180°). A complete volvulus of a mobile gallbladder obstructs its blood supply, which, if left untreated, leads to ischemia and necrosis. In pediatric cases,

congenital anatomical abnormalities are typically the cause, while in adults, it is thought that age-related physiological changes play a central role.

Although the exact etiology remains unclear, one prevailing theory suggests that gallbladder volvulus may result from congenital defects, loss of supportive structures, or anatomic variations that predispose the gallbladder to torsion. Embryological abnormalities in the development of the gallbladder mesentery may result in the suspension of the gallbladder from birth (7). Anatomical variations can be classified into two types: Type A, where a long and wide mesentery provides support to the gallbladder and bile duct, and Type B, where the mesentery is incomplete or absent, attaching only the bile duct to the liver (8).

Such structural abnormalities, along with a lack of supportive tissues around the gallbladder, increase the risk of volvulus, especially in young children. In adults, factors such as age-related atrophy of the liver, rapid weight loss, and diminished parenchymal volume of the liver contribute to the condition. Additional cofactors, including spinal deformities, a long cystic duct, and variations in the cystic artery, may also predispose to gallbladder torsion. Increased gastrointestinal peristalsis has been linked to the rotation of the gallbladder, with clockwise rotation associated with the stomach or duodenum and counterclockwise rotation with the transverse colon. Hormonal factors, such as increased cholecystokinin levels, may further stimulate gallbladder contraction and precipitate volvulus (7). Although gallstones are often considered a contributing factor by increasing gallbladder weight, between 50% and 80% of patients with gallbladder volvulus do not present with gallstones, and no direct correlation has been established (2, 9).

The most frequent preoperative diagnosis in gallbladder volvulus cases is acute cholecystitis, as the symptoms are nonspecific and can mimic other biliary pathologies. Patients commonly present with abdominal pain (100%), nausea and vomiting (52.7%), fever (31.8%), and jaundice (31.8%) (2). Incomplete volvulus can also present with biliary colic, while gallbladder necrosis is observed in approximately 50% of patients after 48 hours of pain onset. Laboratory findings often show elevated inflammatory markers, with increased CRP and white blood cell counts in 55% of cases, though liver function tests remain within normal limits in about 85% of patients (5).

Despite advances in imaging technologies, preoperative diagnosis of gallbladder volvulus remains challenging, with only four cases documented in the literature where the condition was diagnosed preoperatively using imaging modalities (3, 5). Ultrasound and computed tomography (CT) are valuable tools for the preoperative evaluation of gallbladder volvulus. Ultrasound, often the first imaging modality used, can reveal findings such as an enlarged, abnormally positioned gallbladder, a thickened wall, or the displacement of the gallbladder from its usual anatomical fossa. Doppler ultrasound may provide additional diagnostic value by detecting disrupted blood flow in the gallbladder pedicle. One study reported the absence of blood flow in cases of gallbladder volvulus, in contrast to acute cholecystitis, where the cystic artery can still be visualized (10).

CT imaging can demonstrate the abnormal positioning of the gallbladder, wall thickening, and pericholecystic fluid. Although CT is a useful diagnostic tool, magnetic resonance imaging (MRI) has been suggested to be more specific in identifying gallbladder volvulus. According to Usui and colleagues, MRI can reveal key features such as bile duct deformity, bile duct disruption, and a distended gallbladder deviating toward the midline. Characteristic MRI findings include V-shaped deformation of the main bile duct, gallbladder torsion, distension, and differences in wall thickness between the body and neck of the gallbladder (11).

The standard treatment for gallbladder volvulus is urgent surgical intervention, typically in the form of an emergency cholecystectomy. If surgical treatment is delayed, the risk of gallbladder infarction and perforation increases, leading to biliary peritonitis and a mortality rate of up to 5%. Both laparotomy and laparoscopy can be employed, although laparoscopy offers advantages such as reduced postoperative pain, fewer complications, and a shorter hospital stay (12, 13). Laparoscopic cholecystectomy should be the preferred approach for gallbladder volvulus, as it is minimally invasive. Percutaneous gallbladder drainage is generally unnecessary, as gallbladder volvulus is not an infectious disease. However, drainage may be used for decompression in cases where immediate cholecystectomy is not feasible (10). The removal of the gallbladder is typically straightforward because the organ is loosely attached due to torsion (2). Key steps in the surgical management of gallbladder volvulus include decompression, detorsion, and cholecystectomy, though detorsion may increase the risk of introducing bacteria into the bile duct (7).

In our case, an 80-year-old woman presented with right upper quadrant pain and mild fever, and her clinical and laboratory findings were consistent with previously reported cases of gallbladder volvulus. Preoperative imaging, including ultrasound and CT, confirmed the diagnosis of acute gallbladder volvulus. Intraoperatively, the gallbladder was found to be twisted more than 180 degrees, classifying it as a complete volvulus according to Carter's classification. The early detection and prompt surgical intervention resulted in a favorable outcome, despite signs of infarction and

necrosis at the gallbladder base. We performed a laparoscopic cholecystectomy without first untwisting the gallbladder, as this minimized the risk of bile duct infection. The hepatic pedicle's structure was intact, and the surgery proceeded without complications.

4. Conclusion

The preoperative diagnosis of acute gallbladder volvulus remains challenging due to its rare occurrence and nonspecific clinical presentation. A thorough medical history and detailed physical examination, combined with appropriate imaging studies, are critical in aiding the diagnosis before surgical intervention. Early identification of gallbladder volvulus is crucial to prevent life-threatening complications such as ischemia, necrosis, or perforation. Prompt cholecystectomy is the definitive treatment, and timely surgical intervention significantly reduces the risk of morbidity and mortality associated with this condition.

Compliance with ethical standards

Disclosure of conflict of interest

The authors declare that they have no conflicts of interests.

Statement of ethical approval

The study was approved by the Research Ethics Committee of Hue Central Hospital. The procedures used in this study adhere to the tenets of the Declarations of Helsinki.

Statement of informed consent

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

Sources of funding

The authors declare no funding for this study.

Availability of data and material

Data is available upon reasonable request and with permission of Hue Central Hospital.

Guarantor

Hung N. Dang, MD. PhD.

Authorship contribution statement

- Hung Ngoc Dang and Thai Trong Le: conceived, performed the operation.
- Linh Ngoc Hoang Nguyen wrote the manuscript.
- Phong An Tran and Thien Huu Dang: edited the manuscript.

All authors contributed to the interpretation of the results, discussed the results. All authors read and approved the final manuscript to submit

References

[1] Chai JS, Wang X, Li XZ, Yao P, Yan ZZ, Zhang HJ, et al. Presentation of gallbladder torsion at an abnormal position: A case report. World J Clin Cases. 2020;8(12):2667-73.

[2] Nakao A, Matsuda T, Funabiki S, Mori T, Koguchi K, Iwado T, et al. Gallbladder torsion: case report and review of 245 cases reported in the Japanese literature. Journal of Hepato-Biliary-Pancreatic Surgery. 1999;6(4):418-21.

[3] Dayananda P, Praba RD, Balal MR. Gallbladder volvulus: an uncommon phenomenon: a case report and review of the literature. Clin Med Rev Case Rep. 2018;5(5):213.

[4] Mouawad NJ, Crofts B, Streu R, Desrochers R, Kimball BC. Acute gallbladder torsion-a continued pre-operative diagnostic dilemma. World Journal of Emergency Surgery. 2011;6:1-5.

[5] Moser L, Joliat G-R, Tabrizian P, Di Mare L, Petermann D, Halkic N, et al. Gallbladder volvulus. Hepatobiliary Surgery and Nutrition. 2021;10(2):249.

[6] Reilly DJ, Kalogeropoulos G, Thiruchelvam D. Torsion of the gallbladder: a systematic review. HPB. 2012;14(10):669-72.

[7] Keeratibharat N, Chansangrat J. Gallbladder volvulus: a review. Cureus. 2022;14(3).

[8] Gross RE. Congenital anomalies of the gallbladder: a review of one. hundred and forty-eight cases, with report of a double gallbladder. Archives of Surgery. 1936;32(1):131-62.

[9] Bustos R, Mashbari H, Gangemi A. First report of gallbladder volvulus managed with a robotic approach. Case Reports in Surgery. 2019;2019(1):2189890.

[10] Hung MT, Son QT, Hoc HT. Gallbladder torsion: Case report and Review of the literature. Vietnam Medical Journal. 2022;512(2).

[11] Usui M, Matsuda S, Suzuki H, Ogura Y. Preoperative diagnosis of gallbladder torsion by magnetic resonance cholangiopancreatography. Scandinavian journal of gastroenterology. 2000;35(2):218-22.

[12] Keus F, Gooszen H, Van Laarhoven C. Systematic review: open, small-incision or laparoscopic cholecystectomy for symptomatic cholecystolithiasis. Alimentary pharmacology & therapeutics. 2009;29(4):359-78.

[13] Tan X, Wang G, Tang Y, Bai J, Tao K, Ye L. Minilaparoscopic versus single incision cholecystectomy for the treatment of cholecystolithiasis: a meta-analysis and systematic review. BMC surgery. 2017;17:1-9.