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Case Report

Unexpected manifestations of a perforated gallbladder: a case study and imaging assessment

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ABSTRACT

Gallbladder perforation can be caused by delayed diagnosis of cholecystitis and, more rarely, trauma. Despite advancements in imaging modalities, diagnosis is often challenging, leading to further delays in diagnosis and increased morbidity and mortality. In this report, we discuss a 49-year-old Caucasian male who presented to the emergency department with severe, out-of-proportion pain and fevers following a mechanical fall. Blood tests were unremarkable, but portal venous contrast-enhanced CT of the abdomen-pelvis showed a thickened gallbladder with perihepatic fluids, and CT of the chest revealed bilateral lobar atelectasis. After a period of conservative management, the patient eventually underwent diagnostic laparoscopy, revealing a perforated gallbladder with biliary peritonitis.

Keywords: Perforated gallbladder, Trauma, Neimeier classification, Hounsfield unit, Computed tomography

INTRODUCTION

Gallbladder perforation is a rare complication of cholecystitis and blunt abdominal trauma, often preceded by delayed presentation and/or diagnosis. Due to its high morbidity and mortality, it is considered a surgical emergency. However, without clear suspicious imaging findings such as gallbladder defects, pericholecystic fluid collections, stranding of the omentum, or layering of the gallbladder wall, diagnosis can often be difficult.[1] The Niemeier classification was developed from clinical and pathological findings prior to the widespread availability of advanced imaging modalities. Type 1 (acute) describes acute free perforation, type 2 (subacute) describes subacute pericholecystic abscess, and type 3 (chronic) describes chronic cholecystoenteric fistula.[2] This classification was further modified by Anderson et al who added type 4 based on their case series describing cholecystobiliary fistula.[7]

CASE REPORT

A 49-year-old male presented to the emergency department overnight via ambulance with severe worsening right upper quadrant abdominal pain exacerbated by movement and inspiration. This pain began after a fall from standing height 2 days prior. The patient's medical history included asthma, hypertension, gastroesophageal reflux disease, and chronic lower back pain, for which he was on regular opioid analgesia. The patient presented with persistent tachycardia at 140 bpm, tachypnea at 36 breaths per minute, normal blood pressure, oxygen saturation, and temperature. On examination, there was right upper quadrant tenderness and guarding without ecchymosis. Blood tests, including liver function and lipase, were unremarkable, with a hemoglobin level of 136 g/l. A CT abdomen and pelvis were ordered to assess for intra-abdominal injuries.

Figure 1: Intraoperative photo of patient's gallbladder indicating site of perforation.

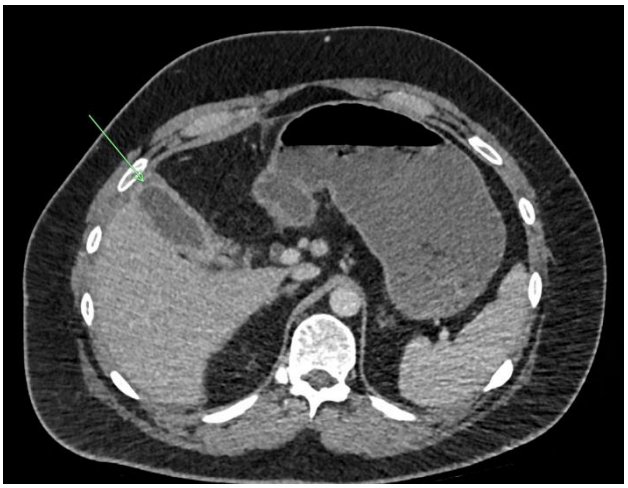

Figure 2: Axial slice of portal venous enhanced CT image across the gallbladder. On retrospective review of image, site of perforation is indicated by green arrow.

The CT abdomen pelvis with portal venous contrast revealed a small amount of fluid overlying the subdiaphragmatic surface of the right lobe of the liver without evidence of liver laceration or lower rib fractures. Radiology suggested minor liver trauma with a small amount of hemoperitoneum. The patient was subsequently treated for subacute traumatic liver injury with analgesia, fluid resuscitation, and serial abdominal examinations.

Despite initiating patient-controlled analgesia and administering 2 liters of crystalloid resuscitation, the patient remained tachycardic with severe abdominal pain overnight and developed an elevated temperature of 38.8 degrees Celsius. A non-contrast CT chest was performed to assess for rib fractures as a potential cause for liver trauma. Although no rib fractures were identified, the CT chest showed right-sided lung collapse and consolidation. These findings, along with the patient's fever, prompted empirical antibiotics for suspected pneumonia, with a differential diagnosis of cholecystitis.

An ultrasound of the abdomen during the day revealed a small amount of free fluid within Morrison's pouch, gallbladder wall thickening at 6.5 mm, biliary sludge, and a small pericholecystic collection. No cholelithiasis was observed. Sixteen hours after the initial assessment, a second CT abdomen-pelvis was performed due to minimal improvement in the patient's condition. This scan showed increased intraperitoneal free fluid and an edematous gallbladder, which led to the decision for emergency laparoscopy. During surgery, Niemeier type 1 perforation was discovered at the gallbladder fundus with four-quadrant biliary peritonitis. A standard laparoscopic cholecystectomy was performed without complications. Histology revealed perforated acute gangrenous calculus cholecystitis without evidence of dysplasia. The patient was discharged on day 5, and his 4-week post-discharge review was uneventful.

DISCUSSION

This case presented a unique instance of Niemeier type 1 gallbladder perforation, highlighting the challenges in diagnosis. The diagnosis was obscured by the patient's history of a mechanical fall onto his right abdomen, alongside CT findings suggestive of pneumonia but lacking evidence of gallbladder perforation. Upon retrospective review of the initial CT abdomen-pelvis imaging, perihepatic fluid demonstrated a Hounsfield unit of 16, indicating exudative fluid (HU >15), suggestive of infection or bile-denser than transudative fluid (HU -10 to +10), but much less dense than blood (HU ~45).[9] The consensus from the general surgical team concluded that the patient had subclinical chronic cholecystitis, with the mechanical fall potentially triggering the perforation of his gallbladder.

Perforated gallbladder is a life-threatening condition typically caused by acute cholecystitis.[2] It is associated with significantly increased morbidity and mortality, with mortality rates ranging between 12-42%.[3,4] Spontaneous perforation is more common in the elderly with compromised blood supply due to atherosclerosis, focal vasospasm, and localized vasculitis.[5]

Isolated traumatic perforation is exceedingly rare, occurring in less than 1% of all patients with blunt abdominal trauma. This rarity is largely attributed to the gallbladder's protected position within the abdominal cavity, specifically in the gallbladder fossa on the visceral surface of the right lobe of the liver, shielded by the right costal margin and adjacent alimentary tract. Patients with blunt abdominal trauma often present with other intra-abdominal injuries. Cirrhosis has been identified as a risk factor for blunt traumatic gallbladder perforation due to increased liver stiffness, which can lead to heightened shear forces in the gallbladder fossa.[6]

The definitive management of gallbladder perforation is cholecystectomy. While the laparoscopic approach is increasingly favored, an open approach is recommended

in trauma cases to thoroughly assess for other peritoneal injuries.[7]

CONCLUSION

Traumatic perforation of the gallbladder is rare and often presents with inconclusive or subtle imaging findings. The presence of increasing pericholecystic exudative fluid density, especially without signs of haemorrhage, should raise suspicion for gallbladder perforation. In cases with inconclusive diagnoses, diagnostic laparoscopy is recommended.

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