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Isolated Rupture of the Gallbladder Secondary to Blunt Abdominal Trauma

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Abstract

Blunt traumatic gallbladder rupture is rare and generally associated with other intra-abdominal injuries. In isolation, a lack of specific signs and symptoms often results in diagnostic and therapeutic delays. In this case report, we present the laparoscopic management of a patient with isolated traumatic gallbladder rupture following blunt abdominal trauma. Clinicians should consider gallbladder rupture in cases of biliary ascites of unclear etiology. We advocate for early surgical exploration in this circumstance to avoid the morbidity of a delayed or missed diagnosis.

Keywords: Blunt Trauma; Isolated Injury; Gallbladder Rupture

Introduction

Traumatic gallbladder injury secondary to blunt trauma is rare and associated with severe hepatic injury in many cases [1]. The diagnosis of an isolated gallbladder injury is challenging given the lack of specific signs and symptoms. The detection of a defect in the gallbladder wall using conventional imaging studies poses a significant diagnostic challenge. The initial Focused Assessment Sonography in Trauma (FAST) exam may show free intraperitoneal fluid (i.e. simple or bloody bile), although the initial volume is likely to be inadequate in this early period for detection. Concern on physical exam or a positive FAST would prompt a Computed Tomography (CT) scan which would depict fluid but may not identify the source. In this instance, laparoscopic evaluation would represent the gold standard diagnostic and therapeutic modality.

Traumatic Gallbladder Rupture (TGR) in blunt trauma is generally diagnosed intra-operatively in the setting of other organ injuries. We present a rare case of isolated gallbladder rupture secondary to blunt abdominal trauma.

Case Report

A 48-year-old man with history of chronic alcohol use was brought to the emergency department at an outside hospital secondary to a mechanical fall onto a floor fan. On arrival, the patient was intoxicated but reported abdominal pain. His vital signs included a heart rate of 92/min, a blood pressure of 90/60mmHg, an oxygen saturation of 98% on room air, and a normal temperature. On physical exam, he was found to have pronounced right upper quadrant tenderness and abdominal distention. His labs demonstrated significant elevation of aspartate aminotransferase (1524 U/L), mild elevation of alanine aminotransferase (101 U/L), a total bilirubin of 1.58 mg/dL with a direct bilirubin of 0.57 mg/dL. Lactate on arrival was elevated to 7.1 mmol/l (Table 1). Subsequent CT of the abdomen revealed significant low-density (15 Hounsfield units) intra-abdominal fluid consistent with ascites of unclear origin and no direct evidence for intra-abdominal hollow or solid organ injury (Figure 1). The surgical team at the outside hospital elected to pursue conservative management the setting of a relatively benign abdominal exam and lack of radiological evidence of intra-abdominal injury. The patient was admitted and, on the following day, required endotracheal intubation secondary to deteriorating mental status, which was attributed to alcohol withdrawal versus sepsis. A diagnostic paracentesis was performed and revealed bilious ascites (white blood cells count 173 cell/mm3; bilirubin 24.8 mg/dL). The patient's hemodynamic status subsequently deteriorated with increasing pressor requirements and worsening acute kidney injury despite resuscitation.

	Outside Hospital Admission	Day of Transfer	Day of Surgery
White Blood Cell (/nL)	10	8.59	5.51
Hemoglobin (g/dL)	12.1	6.8	6.8
Platelet (/nL)	121	104	111
Bicarbonate (mmol/L)	20	21	20
Creatinine (mg/dL)	1.6	8.7	9.6
Total Bilirubin (mg/dL)	1.58	2.3	2.4
Direct Bilirubin (mg/dL)	0.57	1.9	1.8
Aspartate Aminotransferase (U/L)	1524	82	65
Alanine Aminotransferase (U/L)	101	27	22
Alkaline Phosphatase (U/L)	235	157	152
Lactate (mmol/L)	7.1	0.9	0.8

Table 1: Preoperative trend of serum values.

Figure 1: Admission CT of the abdomen demonstrating gallbladder wall thickening with new ascites without evidence of overt intra-abdominal injury.

The outside treating team had a high suspicion for bile leak in the setting of bilious ascites, and on post–injury day four the patient was transferred to the medical intensive care unit at our tertiary care hospital for further evaluation and therapy. Upon arrival and prior to surgical consultation, an Endoscopic Retrograde Cholangiopancreatography (ERCP) was performed to localize the source of the presumed biliary injury. A contrast leak in proximity to the gallbladder was revealed. (Figure 2).

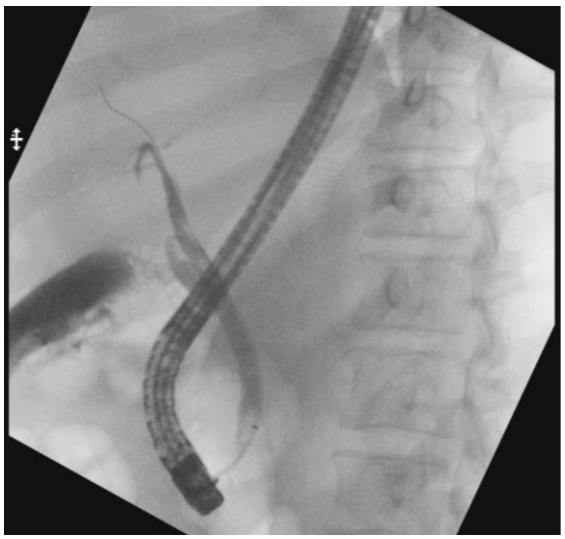

Figure 2: ERCP demonstrating extravasation of contrast from the region of the cystic duct.

Surgery was immediately consulted, and the patient was brought urgently to the operating room for laparoscopic exploration. Three liters of frank bile were aspirated, and extensive irrigation of the abdominal cavity was performed. The single identified injury was a five-centimeter, longitudinal perforation on the anterior wall of the gallbladder (Figure 3). The patient underwent laparoscopic cholecystectomy and shortly after his clinical condition improved with reduced pressor requirements. The ascitic fluid cultures grew *Candida albicans* requiring an anti-fungal treatment course. The patient's postoperative course was complicated by STEMI

with unremarkable subsequent cardiac catheterization, right lower extremity deep venous thrombosis requiring anticoagulation, loculated left pleural effusion requiring IR pigtail drainage, acute renal failure requiring temporary hemodialysis, and cardiac tamponade requiring pericardiocentesis. Despite a long and complicated 98-day hospital course, he survived to discharge.

Figure 3: Five-centimeter longitudinal perforation of the gallbladder wall

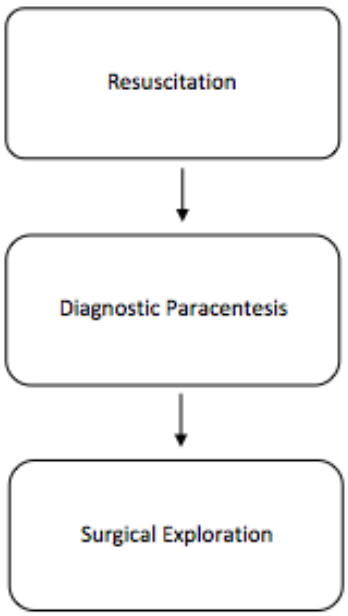

Figure 4: Recommended treatment algorithm on presentation.

Title	Authors	Journal	Date
Laparoscopic cholecystectomy for traumatic gallbladder perforation	C Hamilton, SP Carmichael, AC Bernard	J Surg Case Rep	2012
Traumatic gallbladder rupture: a patient with multiple risk factors	AC Philipoff, W Lumsdaine, DG Weber	BMJ Case Rep	2016
Isolated traumatic rupture of the gallbladder	BYM Kwan, P Plantinga, I Ross	Radiol Case Rep	2015
Isolated gallbladder rupture following blunt abdominal injury	HY Su, MC Wu, SC Chuang	Nigerian Journal of Clinical Practice	2016
Pediatric traumatic gallbladder rupture	WL Jackson, PC Bonasso, RT Maxson	J Surg Case Rep	2016
Traumatic gallbladder rupture treated by laparoscopic choleycstectomy	N Egawa, J Ueda, M Hiraki, S Inoue, Y Sakamoto, H Noshiro	Case Rep Gastroenterol	2016
Laparoscopic treatment of an isolated gallbladder rupture following blunt abdominal trauma in a schoolboy rugby player	R Kohler, R Millin, B Bonner, A Louw, P Bornman	Br J Sports Med	2002
Blunt gallbladder injuries: presentation of twenty-two cases with review of the literature	O Sharma	Journal of Trauma: Injury, Infection and Critical Care	1995
A decade of experience with injuries to the gallbladder	CG Ball, E Dixon, AW Kirkpatrick, FR Sutherland, KB Laupland, DV Feliciano	J Trauma Manag Outcomes	2010
Gallbladder injuries resulting from blunt abdominal trauma: an experience and review	CA Soderstrom, K Maekawa, RW DuPriest Jr, RA Cowley	Ann Surg	1981
Diagnosis of blunt trauma to the gallbladder and bile ducts	K Sondenaa, A Horn, T Nedrebo	Eur J Surg	2003
Traumatic Rupture of the Gallbladder	S Salzman, R Lufti, D Fishman, J Doherty, G Merlotti	Journal of Trauma: Injury, Infection and Critical Care	2006
Isolated perforation of gallbladder following blunt abdominal trauma	DA Laffey, DJ Hay	Postgrad Med J	1979

Rupture of the gall bladder after blunt abdominal trauma	PC Breen	Southern Medical Journal	1975
Jaundice as a sign of delayed gallbladder perforation following blunt abdominal trauma	JWL Fielding, CJL Strachan	Injury	1975
Rupture of the gallbladder due to non-penetrating injury to the abdomen	S Gayen	Journal of the Royal College of Surgeons of Edinburgh	1973
Solitary wounding of the gallbladder from blunt abdominal trauma	DC Schecter	NY State Medical Journal	1969
Gallbladder rupture, an isolated seat belt injury	JE Wright	Medical Journal of Australia	1972
Traumatic rupture of the gallbladder, case reports, and notes on choleperitoneum	M Norgore	Ann Surg	1946
Traumatic Rupture of the Gallbladder	SW Smith, TN Hastings	Ann Surg	1954
Perforation of the gallbladder due to blunt abdominal trauma	I Wiener, LC Watson, FJ Wolma	Arch Surg	1982
Traumatic rupture of the gallbladder due to nonpenetrating injury	B Sinna, BB Welcher	NY State Medical Journal	1961
Traumatic rupture of the gallbladder without penetrating wound of the abdominal wall	PA Knepper, RV Riddell, JR McDaniel	Arch Surg	1956

Table 2: Literature review of previously reported cases of traumatic gallbladder perforations

Discussion

Traumatic extrahepatic biliary and portal triad injuries are rare, constituting only 0.07-0.21% of trauma presentations at level I centers, of which up to 66% of these are gallbladder injuries from either penetrating or blunt mechanisms [1]. In the setting of blunt abdominal trauma, gallbladder rupture is found in approximately 2% of laparotomies [2]. This is the first report to date of isolated gallbladder rupture following blunt abdominal trauma with subsequent development of biliary peritonitis and septic shock (Table 2).

The most commonly published mechanisms for blunt gallbladder injury are motor vehicle collision, fall from height, or direct blow to the abdomen [3]. The resultant gallbladder injuries have been stratified by the American Association for the Surgery of Trauma (AAST)

Extrahepatic Biliary Tree Injury Scoring Scale, with gallbladder contusions classified as Grade I, partial gallbladder avulsions or laceration/perforations classified as Grade II, and complete gallbladder avulsion classified as Grade III [4]. The most common type, Grade II, are treated with cholecystectomy, which corresponds to the injury and management described in our clinical vignette. However, most blunt gallbladder injuries are identified in association with other abdominal organ injuries, which are more likely to define the primary management strategy and to lead to early intraoperative diagnosis [5].

Risk factors that have been associated with gallbladder rupture in blunt trauma include absent history of chronic inflammation secondary to cholecystitis resulting in a thin-walled viscus, prolonged fasting leading to marked gallbladder dilation, and acute alcohol intoxication causing increased sphincter of Oddi tonicity [6,7]. Our patient seemingly possessed all three risk factors.

A definitive diagnosis of gallbladder injury is difficult to make preoperatively on imaging studies alone. While hemorrhage around the gallbladder fossa may be visualized on CT, a defect in the wall of the gallbladder is difficult to detect. (8). Instead, as in this patient, imaging is generally only able to demonstrate ascites and diagnostic paracentesis may be helpful to prove a bilious etiology. Prior reports document the confirmation of bilious ascites leading to surgical exploration in patients subsequently found to have blunt traumatic gallbladder rupture [9,10]. While ERCP can also demonstrate biliary tract disruption at the level of the gallbladder, it is not a standard element of diagnostic or therapeutic protocols in biliary trauma. Its use in this case may have been attributable to anchoring on medical disease in the setting of largely nonspecific trauma workup. In hindsight, the initial CT findings in a septic patient with new onset ascites of unclear etiology would prompt a diagnostic paracentesis, revealing bilious ascites with subsequent surgical exploration following initial resuscitation (Figure 4).

While open cholecystectomy in the setting of acute trauma with suspected extrahepatic biliary injury is the recommended approach [1], laparoscopic cholecystectomy represents a less invasive alternative in selected cases with low suspicion for multifocal intra-abdominal pathology.

Previous case reports demonstrated rapid clinical improvement following cholecystectomy in patients with blunt traumatic gallbladder rupture [11,12]. However, for patients in whom diagnosis was delayed, abdominal sepsis secondary to biliary peritonitis can complicate the postoperative course. For this reason, ascitic cultures should be obtained at the time of diagnostic paracentesis or surgical intervention to direct antimicrobial therapy. Biliary candidiasis has been increasingly reported in the literature, with a recent study demonstrating 44% of 123 consecutive patients undergoing ERCP to have positive biliary fungal cultures [13]. Significant associated risk factors include immunosuppression and prolonged antibiotic administration. These findings suggest that antifungal therapy should be considered in the perioperative management of patients with traumatic gallbladder rupture.

In this case report we present the successful laparoscopic management of a patient with isolated gallbladder rupture following blunt abdominal trauma. Clinicians should include gallbladder rupture in their differential of post-traumatic ascites without overt hollow or solid organ injury on imaging studies. Early surgical exploration is indicated to avoid morbidity and potential mortality.

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