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Proposed management of traumatic blunt gallbladder injuries: A case of a pre-emptive laparoscopic cholecystectomy for suspected gallbladder avulsion after blunt traumatic liver injury

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SUMMARY

Trauma is the leading cause of death among people aged 1–45 in the United States with the abdomen being the third most commonly injured anatomic region. The incidence of gallbladder trauma in the setting of abdominal injury ranges between 0.5 and 2.1 %. While gallbladder injuries secondary to penetrating abdominal wounds are found intra-operatively owing to the likely progression towards laparotomy, due to the paradigm shift of non-operative management of blunt liver injuries, the diagnosis of blunt gallbladder injuries are commonly delayed upwards of 1 to 6 weeks.⁴ We present a case of a pre-emptive cholecystectomy less than 36 h after sustaining a grade V liver injury status post blunt abdominal trauma in effort emphasize the importance of critical review of diagnostic images, and support the utilization of diagnostic laparoscopy to definitively diagnose and manage traumatic blunt gallbladder injuries. When operative intervention is not performed, the nonspecific findings suggestive of gallbladder injuries can lead to delayed diagnosis and subsequent increased morbidity and mortality. Due to the lack of previous guidelines we propose a diagnostic algorithm for the approach of traumatic blunt gallbladder injuries.

Introduction

Organs most commonly injured due to blunt abdominal trauma are the liver, spleen, and kidneys [1]. The gallbladder however, is usually a well-protected organ and is sheltered from external blunt trauma given its anatomy in relation to other structures. Although not entirely immune to blunt forces, the incidence of gallbladder trauma in the setting of abdominal injury ranges between 0.5 and 2.1 % [2,3]. The diagnosis of blunt gallbladder injury is commonly delayed upwards of one to six weeks [4]. We present a case of a pre-emptive cholecystectomy less than 36 h after sustaining a grade V liver injury status to emphasize critical review of diagnostic images, and support the utilization of diagnostic laparoscopy in the diagnosis and management of traumatic blunt gallbladder injuries.

Case report

A 31-year-old female presented to the emergency department following an automobile collision as a restrained driver resulting. CT

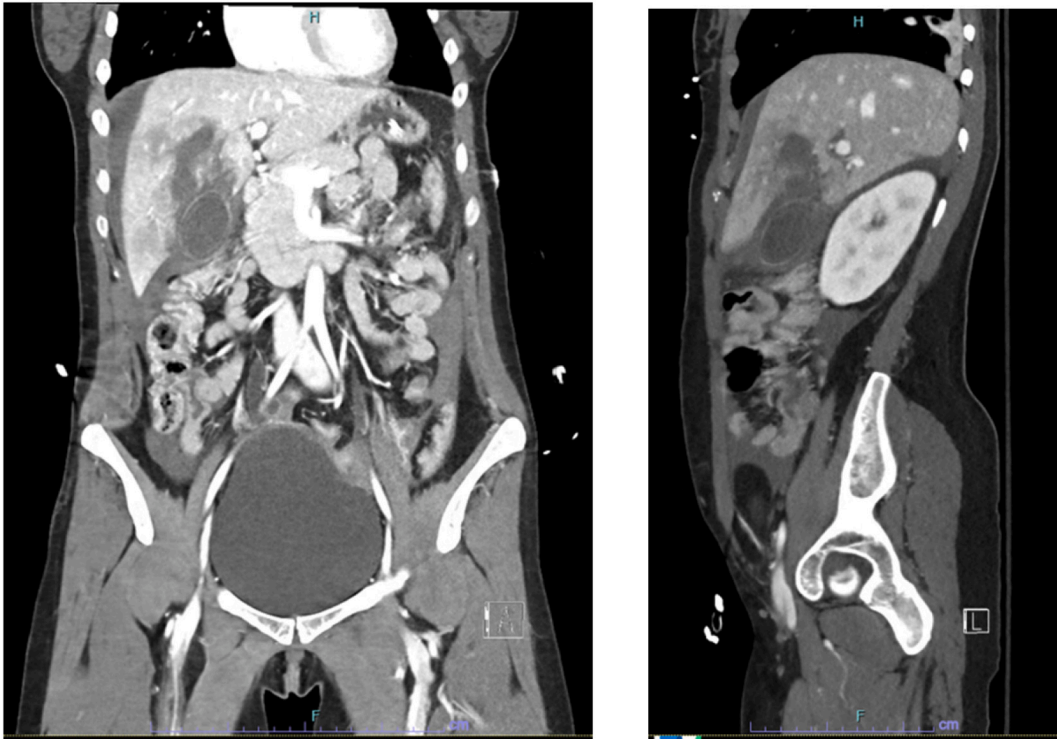
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Figs. 1 and 2. Coronal and sagittal CT scan noting significant pericholecystic fluid was noted adjacent to the gallbladder plate which was significantly fractured in segments 4 and 5. Clinical suspicion for gallbladder avulsion was high given these findings.

was significant for a grade V hepatic laceration predominantly involving segments 4B, 5, and 7 with active extravasation. The gallbladder was thickened which radiology characterized as possible contusion. Additional injuries included a left ulnar, humeral and femur fracture.

Interventional radiology was consulted, performing right hepatic artery embolization. Overnight the patient remained afebrile with stable vital signs; physical examination was unremarkable. Despite benign clinical findings, further review of the imaging by the trauma surgeons noted concern for gallbladder avulsion injury.

With this clinical suspicion we performed a diagnostic laparoscopy 36 h after presentation, revealing retained hemoperitoneum, a stable parenchymal fracture of the liver and a significant avulsion of the gallbladder from the liver bed with signs of ischemia and early necrosis of the lateral wall. In standard laparoscopic fashion the gallbladder was successfully removed. The patient recovered and was discharged to a rehabilitation facility.

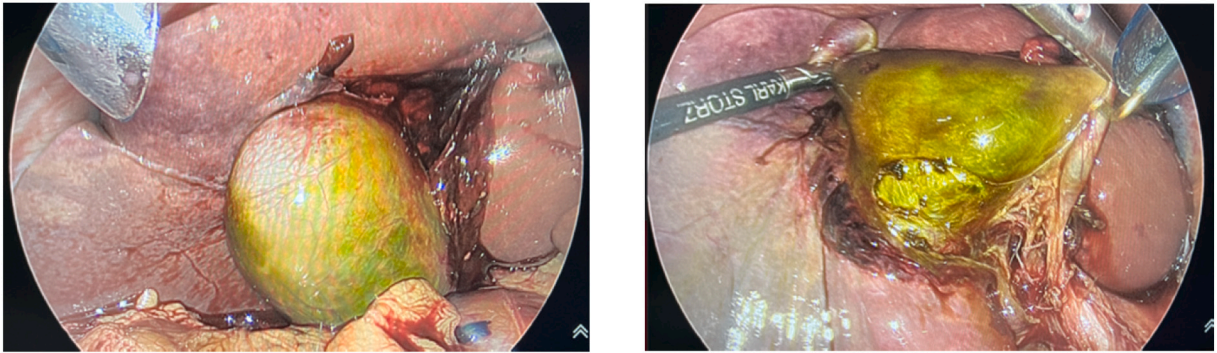
Discussion

The gallbladder given its thin wall and distensibility, as well as lack of significant stabilizing ligamentous attachments, is prone to avulsion secondary to acceleration/deceleration forces [3]. In addition, food ingestion causing a distended gallbladder, or alcohol intake leading to increased sphincter of Oddi tonicity and increased bile in the biliary tree may also predispose to injury [5]. Injury patterns of the gallbladder include contusions, rupture, and avulsions, including partial, total, and traumatic cholecystectomy [2–4].

Often, blunt gallbladder trauma is associated with a concomitant severe liver injury, which is increasingly managed non-operatively. This is because operative mortality rates are as high as 66 % for patients undergoing laparotomy for grade IV and V liver injuries [6]. Further confounding the incidence of blunt gallbladder injury, is the difficulty in diagnostication and subsequent decision of management. This is unlike penetrating gallbladder injuries, which are found soon after admission as laparotomy with penetrating abdominal injury is highly likely. In the absence an indication for exploratory laparotomy on admission, diagnostic delay of gallbladder injury can extend up to 6 weeks, secondary to non-specific clinical signs in the post-trauma period, and lack of significant peritoneal response to un-infected bile spillage intra-abdominally [2].

The consensus of the few published journals of the management of these injuries, is the benefit of immediate cholecystectomy outweighs the physiologic impact after cholecystectomy [7]. The impact of delayed diagnosis has further supported early diagnosis and treatment, as subsequent inflammation and adhesions in the gallbladder region after injury leads to difficult dissection and in some instances the need for partial cholecystectomy [8].

In diagnosing gallbladder injuries, ultrasound is often used, noting non-visualization as a sign to suggest gallbladder rupture, although sonographer variability and concomitant intra-abdominal injuries may cause inaccuracy. CT scans are common in the work



Figs. 3 and 4. Intra-operative findings of a partial avulsion during diagnostic laparoscopy. Cystic duct and cystic artery were intact.

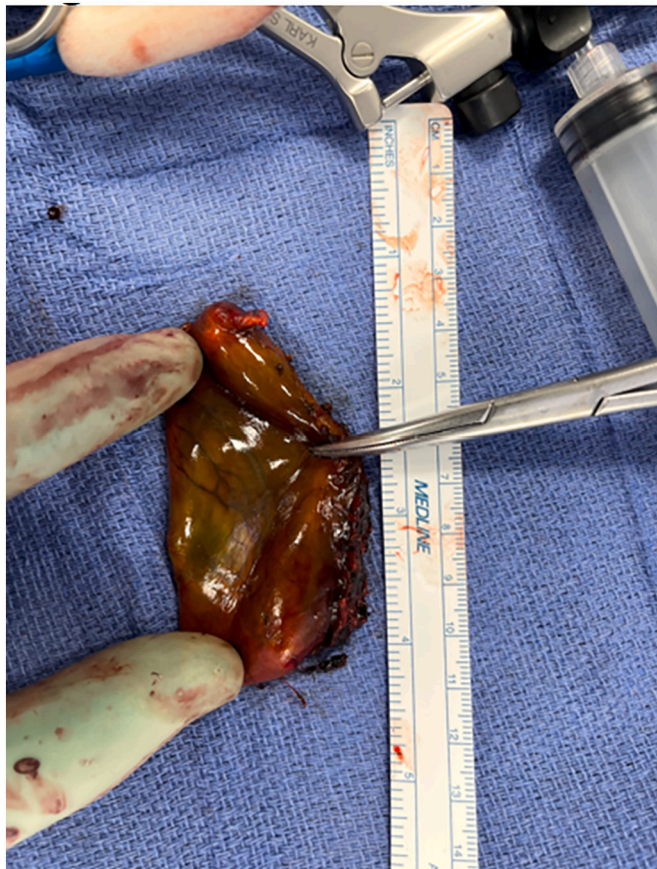


Fig. 5. Operative specimen; lateral gallbladder wall with necrosis and a visible thrombosed sub-serosal vessel. Consistent with pathology results of transmural ischemic changes and necrosis of the gall bladder wall.

up of significant blunt trauma mechanisms, although may be non-specific. CT findings suggestive of injury include pericholecystic fluid, abnormal gallbladder wall contour or discontinuity, collapsed lumen, intra-luminal extravasation, and mesenteric standing. Of note, intravenous contrast should enhance the gallbladder wall if the arterial supply is intact, and delays should be performed to differentiate true gallbladder hemorrhage from other nontraumatic gallbladder findings [9].

MRCP would be an additional option, noting significantly improved resolution of biliary ductal anatomy when compared to CT, although the study is limited in trauma settings as it requires the patient to be hemodynamically stable and able to lay flat for a sustained amount of time, as well as institutional availability [10].

In the case of our patient, the decision to perform a diagnostic laparoscopy procedure was made in the absence of worsening vital signs, physical examination or laboratory values, and was based solely on a the surgical team's interpretation of the patient's CT

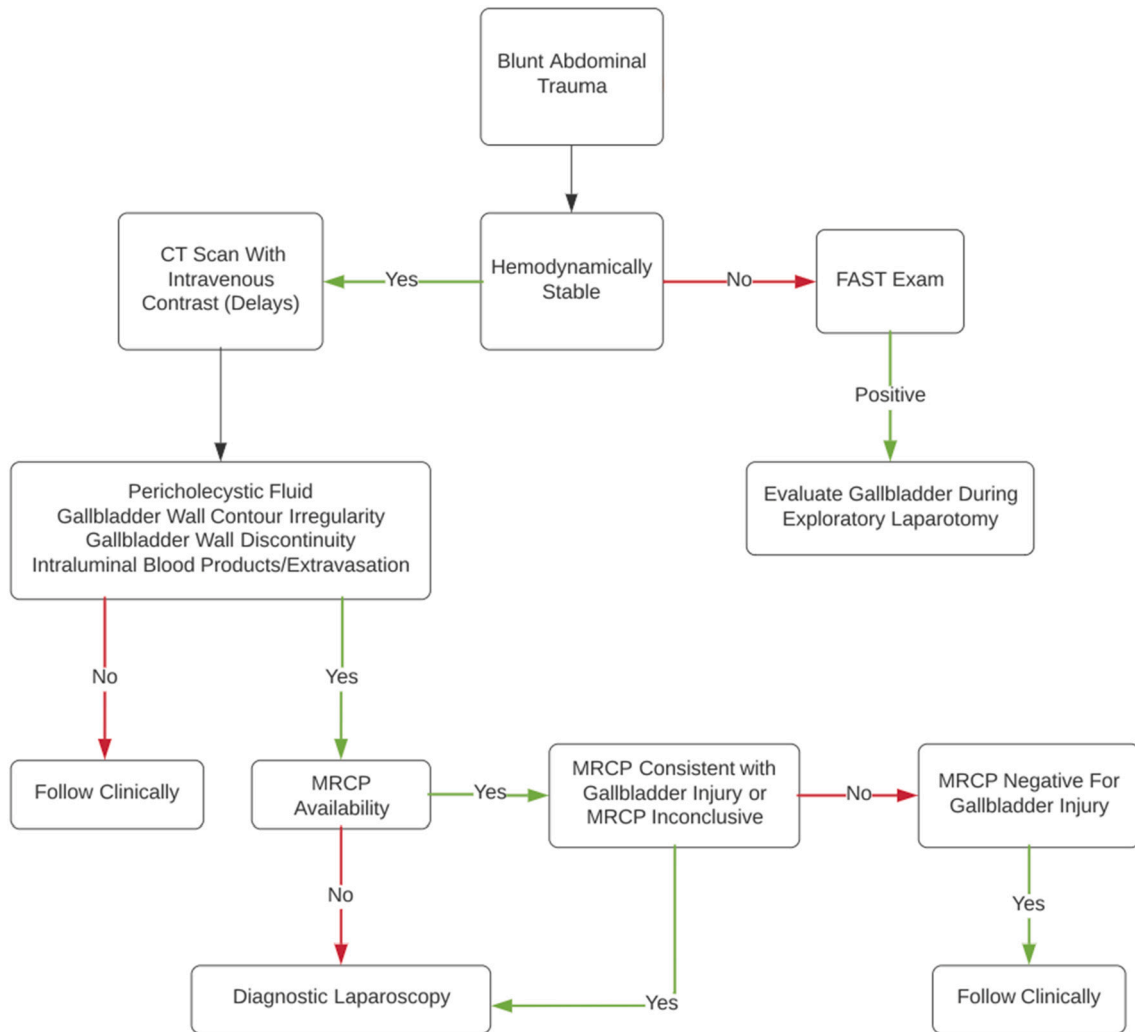


Fig. 6. Proposed algorithmic approach to diagnosis and management of traumatic blunt gall bladder injury.

imaging. As seen in Figs. 1 and 2, in the coronal and sagittal views respectively, significant circumferential pericholecystic fluid was noted adjacent to the cystic plate which was significantly fractured in segments 4 and 5. Clinical suspicion for gallbladder avulsion was high given our review of the imaging, despite any pathognomonic radiographic findings to suggest obvious gall bladder injury. Figs. 3 and 4 note the intra-operative findings of a partial avulsion, and Fig. 5 shows the lateral gallbladder wall with necrosis and a visible thrombosed sub-serosal vessel. Fortunately, timely surgical intervention was provided and further complications from her gallbladder injury were avoided with the additional benefit of having undergone a successful laparoscopic approach as opposed to a more invasive laparotomy. As such, given the paucity of guidance in the diagnosis of this elusive injury, we propose the following algorithm as noted in Fig. 6, in effort to avoid delayed diagnosis of blunt traumatic gallbladder injuries.

Conclusions

Traumatic blunt gallbladder injury is a rare entity that may be missed given the nonspecific clinical findings. This can lead to delayed diagnosis and subsequent increased morbidity and mortality. Due to the lack of previous guidelines we propose a diagnostic algorithm for the approach of traumatic blunt gallbladder injuries.

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