

Usefulness of Contrast Enhanced CT for the Diagnosis of Gallbladder Rupture in a 12-year-old boy

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Abstract: Isolated injury of the gallbladder due to blunt trauma is rare, especially in children. The diagnosis of gallbladder rupture can be difficult, possibly delaying appropriate treatment. We report a 12-year-old boy with isolated gallbladder rupture following a direct blow from another child. We were able to confirm the diagnosis of gallbladder rupture preoperatively using contrast enhanced computed tomography (CE-CT). CE-CT demonstrated interruption of the thickened gallbladder wall with a massive pericystic fluid collection. Thus, CE-CT might provide evidence indicating isolated injury of the gallbladder in pediatrics cases of abdominal blunt trauma even in the absence of specific findings on abdominal ultrasonography.

Key Words: Blunt trauma, CE-CT, Gallbladder rupture, Children.

Introduction

Rupture of the gallbladder by blunt trauma is rare, and isolated injury of the gallbladder is extremely rare¹⁾. Most patients suffering gallbladder injuries are diagnosed incidentally during exploratory laparotomy for expected injuries of other associated organs. The diagnosis of isolated gallbladder rupture is difficult, and often delayed because of its rarity, in children. Herein, we describe a boy with isolated gallbladder rupture following blunt trauma, in which the injury could be diagnosed preoperatively using contrast enhanced computed tomography (CE-CT). We also discuss the significance of abdominal CE-CT findings in the diagnosis of gallbladder rupture in children.

Case report

While playing with a friend at school, a 12-year-old boy sustained a direct blow to the upper abdomen and thereafter complained of right upper quadrant abdominal pain, but neither nausea nor vomiting. He was transferred to our Department under a diagnosis of bleeding from the gallbladder. On physical examination, the abdomen was soft and flat with moderate tenderness in the right upper quadrant. He showed no apparent jaundice or anemia.

Laboratory studies on admission: white blood cell count 17,400/ μ l, CRP 0.00 mg/dl, hemoglobin

12.6 g/dl, Ht 37.5%, PLT 279,000/ μ l, total bilirubin 0.60 mg/dl, AST 22 IU/l, ALT 12 IU/l, ALP 424 IU/l, LDH 187 IU/l, and serum amylase 35 IU/l.

Chest and abdominal roentgenograms were unremarkable. Ultrasonography (US) of the abdomen showed atypical thickening of the gallbladder wall and fluid collection around the gallbladder. Collapse of gallbladder was not noted (Fig. 1). Contrast enhanced computed tomography (CE-CT) also demonstrated swelling of the gallbladder and an interruption of the enhanced gallbladder wall with extensive fluid collection around the gallbladder and portal vein (Fig. 2).

Because of persistent abdominal pain and the absence of any progression of anemia on laboratory data, we diagnosed biliary peritonitis due to perforation of the gallbladder. At emergency laparotomy, there was a small amount of ascites with bile and an edematous gallbladder without obvious perforation. Massive bile collection extended into the subserosa layer of the gallbladder and the retroperitoneal space. An intraoperative cholangiogram demonstrated leakage of contrast medium from the cervical subserosa space of the gallbladder and the absence of damage to the common bile duct (Fig. 3). There were no associated organ injuries. Cholecystectomy was performed, and the postoperative course was uneventful. Macroscopic examination demonstrated a perforation measuring 6 mm in diameter at the cervix, and histological examination confirmed interruption of the mucosa and muscle layer of the gallbladder cervix.

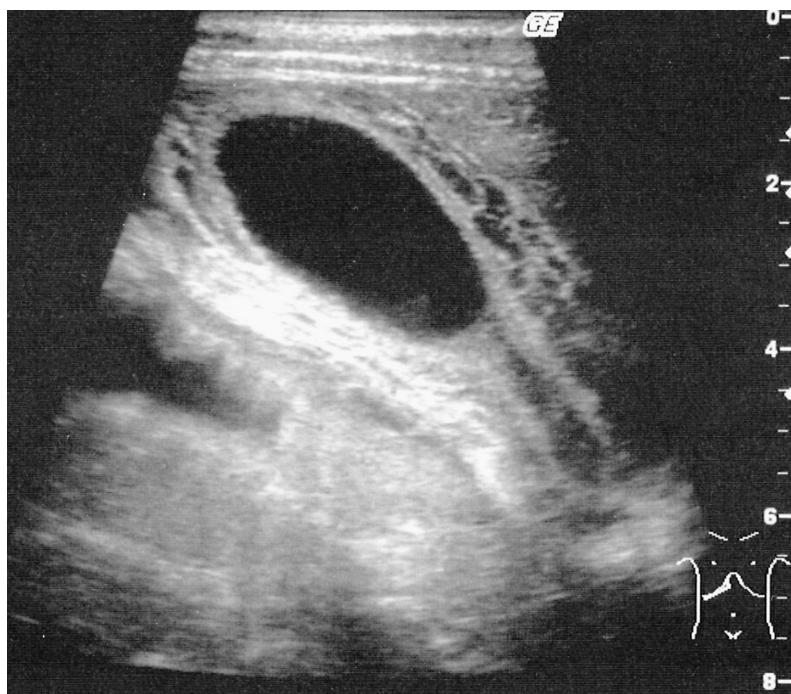


Fig. 1. Ultrasonography of the abdomen showing atypical thickening of the gallbladder wall and fluid collection around the gallbladder



Fig. 2. Contrast enhanced CT scan showed an interruption of the enhanced wall of the gallbladder (arrow head) and fluid collection around the gallbladder (arrows)

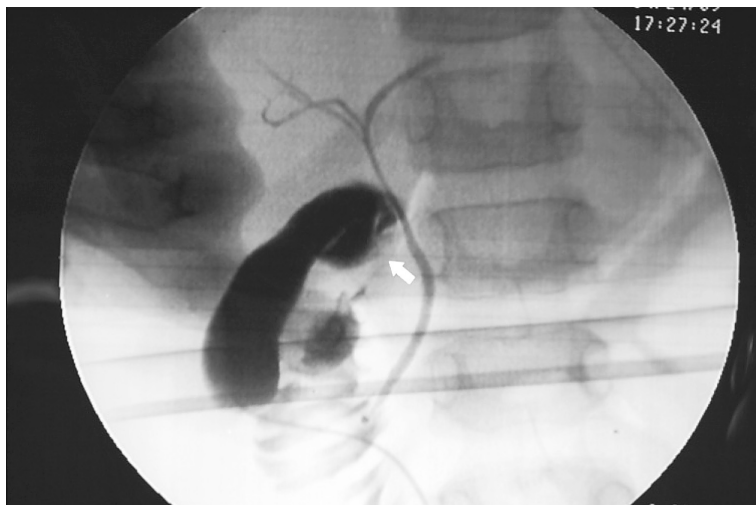


Fig. 3. Intraoperative cholangiography demonstrated leakage of contrast medium from the region of the gallbladder cervix (arrow) and an absence of damage to the common bile duct

Discussion

Blunt traumatic injury of the gallbladder is rare, occurring in only 1%~2% of patients with blunt abdominal trauma¹⁻³. Isolated injury of the gallbladder is even more rare. The gallbladder, surrounded

by the liver and costal arch, is generally well sheltered from trauma under normal anatomical conditions. Therefore, traumatic injury of the gallbladder is frequently associated with trauma to other organs, such as liver, or common bile duct injuries.

The diagnosis of ruptured gallbladder is difficult, often leading to a delay in treatment and increased morbidity. For patients who have sustained blunt abdominal trauma, the first choice among diagnostic examinations is US, especially in an emergency. Some investigators have reported that findings suggesting gallbladder rupture include an ill-defined or thickened gallbladder wall, collapsed gallbladder, mass effect on the duodenal wall, fluid collection around the gallbladder, or a defect in the gallbladder wall⁴⁻⁶. However, we detected no specific findings of gallbladder rupture by US, except for a thickened gallbladder wall and fluid collection around the gallbladder. Therefore, we performed CE-CT after US. CE-CT provides sensitive imaging for the diagnosis of abdominal trauma including gallbladder rupture^{7,8}. We detected an interruption of the thickened gallbladder wall with massive pericystic fluid collection. Even if there are no specific findings of gallbladder rupture on US, CE-CT might be effective for diagnosing this condition, as in the present case. Therefore, we emphasize that both US and CE-CT are mandatory in patients with blunt abdominal trauma, especially when biliary system injury is suspected.

Furthermore, when the site of gallbladder perforation is not identified during surgery as in the present case, intraoperative cholangiography might play an important role in detecting the perforation and confirming the absence of other injuries to the biliary system. Though there are several potential treatment strategies for gallbladder injuries³, we recommend cholecystectomy for children with gallbladder rupture^{1,9}. Only drainage for blood and bile through cholecystostomy or drainage tube may be allowed in limited cases with severe conditions. Moreover, laparoscopy may be useful for the diagnosis and treatment of isolated injury of the gallbladder in some patients in stable condition^{10,11}.

In conclusion, early diagnosis and early exploratory laparotomy might decrease mortality due to traumatic rupture of the gallbladder. For the diagnosis of blunt abdominal trauma, we advocate performing CE-CT in addition to US.

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〈和文抄録〉

術前診断に造影 CT が有用であった 鈍的外傷による胆嚢穿孔の 1 学童児例

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小児において鈍的外傷による胆嚢の単独損傷は稀であり、診断・治療が遅れることが多い。我々は外傷性胆嚢穿孔の診断に造影 CT が有用であった 12 歳男児の一例を経験した。患児は友人に右季肋部を殴られた後、腹痛を訴えて来院した。腹部超音波検査にて確定診断がつかなかったが、造影 CT 検査にて胆嚢周囲の液体貯留に加え、胆嚢壁の途絶を認めたため、緊急開腹術を施行した。術中所見では、胆嚢周囲に多量の胆汁性腹水の貯留及び嚢頸部に径 10 mm の穿孔部を認めた。胆嚢摘出術施行後、術後経過は良好で、術後 3 日目より食事開始、7 日目に退院となった。小児の腹部外傷症例において、腹部超音波検査が第 1 選択検査であるが、非典型例では造影 CT 検査も有用である。

キーワード：小児鈍的外傷、外傷性胆嚢穿孔、造影 CT (CE-CT)。