

# Gallbladder Injury in a Catastrauma Patient: a Clinical Case

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## Abstract

Gallbladder trauma is a rare medical emergency in abdominal surgery because of its anatomic location. Gallbladder injury occurs in only 1.9%-2.1% of cases with abdominal traumas, with an isolated injury being ten times rarer. Despite the different mechanisms of injury, intravesical hypertension is the most important factor contributing to gallbladder rupture. A fall from a height is a rare cause of gallbladder injury, with only a few cases described in the literature. Laparoscopic cholecystectomy is the most common primary treatment. In the present case report, we present the diagnosis and management of a patient with a rare combined trauma. The patient was polytraumatized but had an isolated gallbladder injury in the absence of other abdominal injuries. Modern diagnostic methods, primarily ultrasound, can be critical in determining the best treatment strategy.

## Keywords

blunt abdominal trauma, combined trauma, catastrauma, abdominal surgery, gallbladder trauma

## INTRODUCTION

The features of a modern abdominal trauma are the multiplicity and severity of injuries, accompanied by gross disturbances of homeostasis and disorders of vital body functions.<sup>[1]</sup> Catastrauma is the second most common cause of mortality in co-injury after road traffic accidents.<sup>[2,3]</sup>

Gallbladder trauma is rare due to the anatomical features and location of the organ. It is damaged only in 1.9-2.1% of the cases, and its isolated injury is 10 times rarer.<sup>[2,3]</sup> Therefore, a case of isolated gallbladder injury in the absence of injuries of other abdominal organs is extremely rare and even casuistic in catastrauma.<sup>[4]</sup>

Despite the different mechanisms of injury, an import-

ant factor in the pathogenesis of intravesical hypertension is alcohol intoxication. The latter determines the contracted state of the sphincter of Oddi at the moment of injury.<sup>[7]</sup> Cholecystectomy is indicated as a surgical treatment for traumatic gallbladder injuries, just as it was performed in our case.<sup>[9]</sup>

We present a case of polytraumatized patient and an isolated gallbladder injury in the absence of other abdominal injuries and a review of the current literature.

## CASE REPORT

*Patient Z., 36 years old, was transported by an ambulance to*

the Intensive Care Unit of Botkin Hospital on 19.11.2021 at 10:48 a.m. after falling from a height. The patient had accidentally fallen from the fifth floor onto a canopy while in a state of alcoholic intoxication. On admission, the patient was conscious and complained of pain in the right side of the chest and abdomen (6/10 on the visual analogue scale of pain).

The patient was examined on admission by the intensive care physician on call. The patient was in a passive position (APACHE II: 20; SOFA: 12), consciousness was clear (Glasgow Coma Scale 15/15), heart rate (HR) 100 beats per minute, blood pressure (BP) 136/80 mmHg, respiratory rate (RR) 18/min, SpO<sub>2</sub> 98%, hemoglobin (Hb) 126.4 g/l. The rest of the laboratory screening study was unremarkable. Examination showed right-sided tenderness of the torso. The intensive care started with infusion (tranexamic acid 50 mg/ml, unit-dose 1000 mg), sodium chloride 0.9% - 500 ml, omeprazole 40 mg, tramadol 50 mg/ml (unit-dose 100 mg), and gelatin (500 ml), then laboratory monitoring, neurosurgeon and trauma surgeon consultations followed by an ultrasonographic evaluation (FAST protocol) and computed tomography (CT) scan of brain, thorax, spine, pelvic bones, abdominal and retroperitoneal organs with intravenous bolus contrasting.

The abdominal ultrasound examination revealed a small gallbladder, with up to an 18-mm thick layer of fluid, imbibition of the pericholecystic tissue, and a free fluid subhepatically (Figs 1A, 1B, 1C). The ultrasound examination suggested a traumatic gallbladder injury.

The CT scan showed an irregular thickening of the gallbladder walls, with hemorrhagic contents in the lumen. Pericholecystic tissue was thickened and contained fluid. CT concluded with traumatic changes of the gallbladder (Fig. 1D).

The general surgeon noted the severe condition of the patient and the changes in the laboratory results (HR 100 bpm, BP 136/80 mmHg, RR 18/min, SpO<sub>2</sub> 98%, Hb 102.2 g/l). The patient had tenderness in the right subcostal area, with muscular guarding. Based on the results of the examination, the initial diagnosis was 'a combined trauma, cranial trauma, brain contusion, hemorrhagic foci of both frontal lobes, traumatic subarachnoid hemorrhage, skull base fracture, closed fractures of the 4th through 8th ribs on the right side, lung contusion, blunt abdominal trauma, gallbladder trauma, perivesical hematoma without signs of intraabdominal bleeding.'

The absence of contrast extravasation on CT allowed proceeding with conservative hemostatic and symptomatic therapy, repeated abdominal ultrasound, and observation.

Ultrasound examination 2 hours later revealed free fluid up to 40 mm thick in the abdominal cavity under the liver (mostly along the lower edge of the right lobe). Pericholecystic heterogeneous fluid accumulation (perivesical hematoma) persisted at repeated control exam (35×85 mm), the perivesical hematoma was of the same size, with an increase in the free fluid in the abdominal cavity. A control ultrasound examination 3 hours later showed an increase in the free abdominal fluid up to 40 mm thick under the liver (predominantly along the lower edge of the right lobe) (Fig. 1E). The

patient had a pericholecystic heterogeneous fluid accumulation (perivesical hematoma 35×85 mm) (Fig. 1F). Similarly, the next ultrasound examination 6 hours after admission showed negative dynamics. Free fluid in the abdominal cavity was above the liver (up to 8 mm) and under the liver (up to 40 mm). The size of the perivesical hematoma was the same; the structure was more distinct and cord-like.

On examination by the general surgeon on call, the right subcostal area was painful with symptoms of rebound tenderness. Abdominal ultrasound showed an increase in the fluid volume and laboratory studies showed hemoglobin decrease.

Taking into account the patient's condition, increase of free abdominal fluid and hemoglobin decrease, the patient was prepared for diagnostic laparoscopy. The patient underwent diagnostic laparoscopy with subsequent laparoscopic cholecystectomy, abdominal cavity sanitation, and drainage under general anesthesia on 19.11.2021 (the day of admission). Inspection of the abdominal cavity revealed up to 150 ml of hemorrhagic content under the liver and along the right lateral canal. The gallbladder wall was black-green and thinned. Pericholecystic tissue was imbibed with hemorrhagic content and bile (Fig. 2). There was a tear of the gallbladder wall with damage to the liver parenchyma and leakage of blood in the bottom area. Postoperative diagnosis was blunt abdominal trauma, and traumatic injury to the gallbladder.

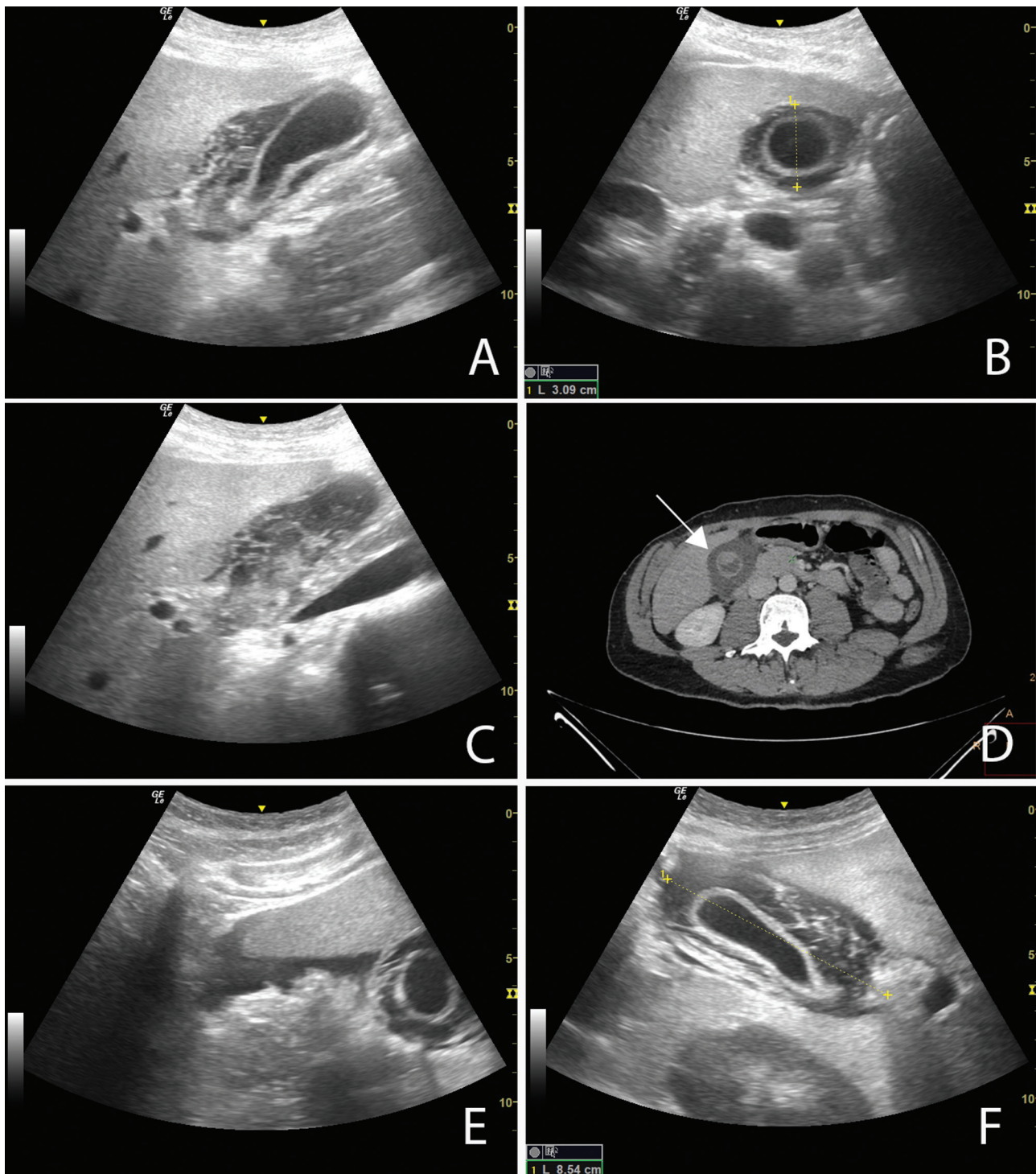
The postsurgical period was uneventful. Considering the concomitant pathology, we continued complex conservative management in the intensive care unit. Four days after the admission and operation (23.11.2021), the patient was transferred to the surgical department and at 6 days, (25.11.2021) he was discharged from the hospital in a good general condition.

## DISCUSSION

Gallbladder injuries are seen in only 1.9-2.1% of cases, with 2-10% of them as isolated injury.<sup>[2,3]</sup> The literature on gallbladder injury is predominantly represented by clinical case reports. The major causes of rupture are due to intravesical hypertension (hydrostatic shock), complications of cholelithiasis, or direct trauma.<sup>[5,6]</sup> There are currently no guidelines or recommendations regarding the management of isolated gallbladder injuries, therefore the management of these patients usually falls within the trauma protocols based on the severity of the injury.

The incidence of concomitant internal injuries in gallbladder trauma is over 90%, which emphasizes the rarity of the isolated gallbladder trauma. Gallbladder perforation is more likely when the gallbladder is overstretched at the time of injury. Therefore, gallbladder perforation is more likely in patients who have consumed alcohol or eaten shortly before injury.<sup>[2,3]</sup>

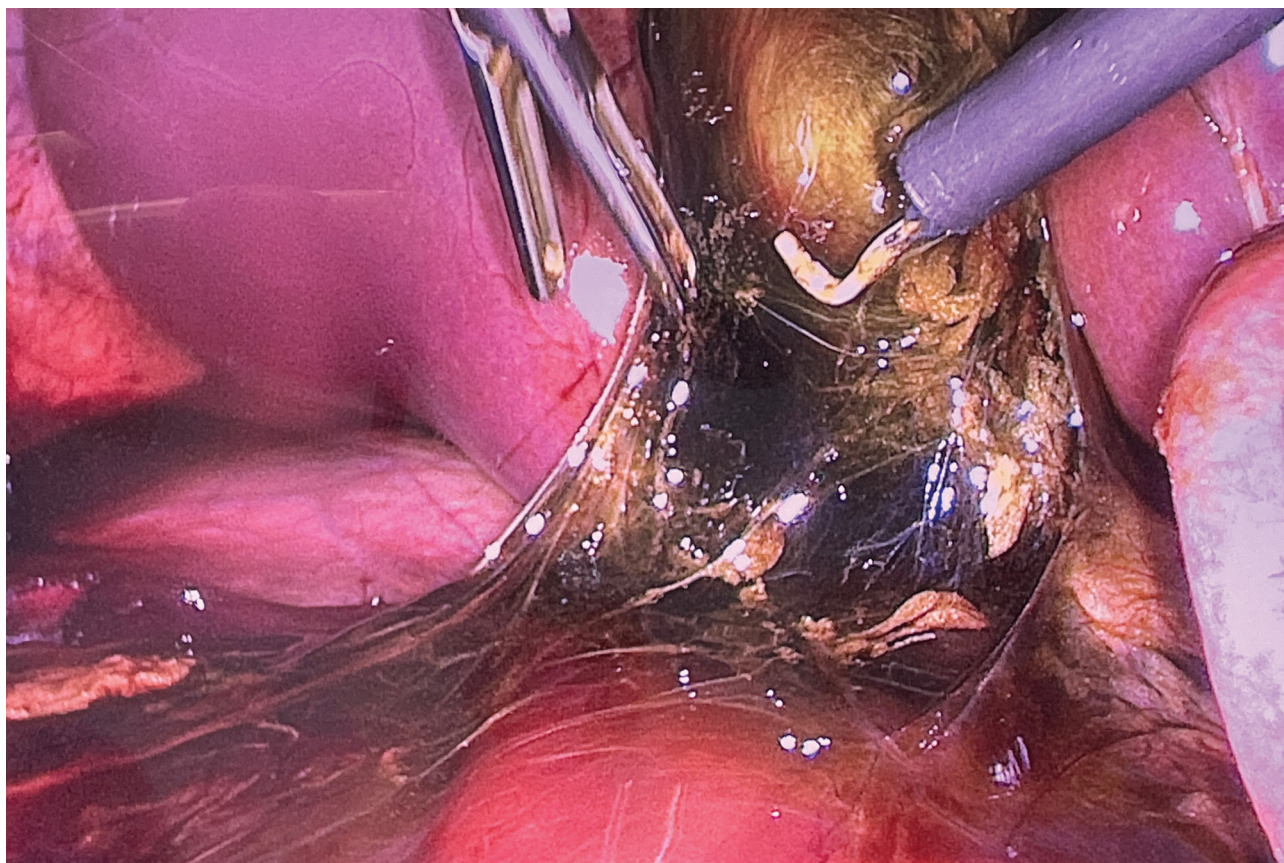
In our case, given the relative stability of hemodynamics on admission, we decided to abstain from urgent surgical intervention, carrying out a correction of vital functions with monitoring.



**Figure 1.** A. Ultrasound image, longitudinal section of the gallbladder; B. Ultrasound image, cross-section of the gallbladder; C. Ultrasound image, imbibition of the pericholecystic tissue; D. CT scan of abdomen, (gallbladder and pericholecystic fat tissue marked with an arrow); E. Ultrasound image, free fluid under the liver; F. Ultrasound image, perivesical hematoma.

Gallbladder injury in closed abdominal trauma is difficult to diagnose. In the first hours after injury, echographic signs of gallbladder damage are minimal.<sup>[5]</sup> As with any other pathology, the following indices should be evaluated: size, condition and structure of the gallbladder wall, paravesical tissue, and presence of fluid inclusions.<sup>[7]</sup> For this reason, a dynamic examination is indicated in such patients.

Despite the advances in CT and ultrasound diagnostics, it is difficult to detect gallbladder perforation largely because of the rarity of the disease. Ultrasound diagnosis plays an important role in the evaluation of abdominal trauma, with a sensitivity of 86%, specificity of 98%, and accuracy of 97%.<sup>[8]</sup> However, the diagnostic accuracy for gallbladder injuries is 88% largely because of the rarity of



**Figure 2.** Intraoperative picture of the gallbladder's bed.

this injury and the lack of knowledge and training among specialists.<sup>[9]</sup>

Losanoff and Kjossev described 5 types of gallbladder injury in 1999.<sup>[10]</sup> Our case represents the second type, with a rupture of the bladder wall with bile leakage into the surrounding tissues (**Table 1**).

Laparoscopic cholecystectomy is performed in the vast majority of gallbladder trauma cases (93%), although gallbladder drainage may be sufficient in rare situations (7%).<sup>[9]</sup> In this type of injuries, the mortality rate can

reach 24%. The most frequent causes are bleeding, concomitant trauma, multiple organ failure, and craniocerebral injuries.<sup>[9]</sup>

## CONCLUSIONS

The gallbladder injury in the absence of injury to other abdominal organs is an extremely rare, difficult to diagnose condition that often has unfortunate consequences. How-

**Table 1.** Types of gallbladder injury (adopted from Losanoff and Kjossev, 1999<sup>[10]</sup>)

Types of injury	Description
I	A Gallbladder contusion with intramural hematoma
	B Large intramural haematoma, which may lead to necrosis and subsequent perforation of the gallbladder wall
II	Immediate rupture of the gallbladder during trauma
III	A Partial detachment of the gallbladder from the liver
	B Complete detachment from the liver but kept by the hepato-duodenal ligament
	C Complete detachment from the bed with free positioning in the abdominal cavity
IV	A Secondary traumatic cholecystitis because of haemobilia caused by liver injury
	B Acute acalculous cholecystitis complicating the trauma
V	Mucosal rupture, leading to bile leakage into the developed cavity

ever, modern diagnostic methods, primarily ultrasound, can be of great value in determining the best treatment strategy.

## Acknowledgements

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## Statement of Ethics

The patient gave his written informed consent to publish the case and the images.

## Conflict of Interest

The authors have no conflicts of interest to declare.

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## Author contributions

Conception: A.S., D.D., N.P., and S.C.; design: A.S., D.D., N.P., and S.C.; analysis and interpretation of data: A.S., D.D., N.P., T.S., N.I., Yu.M., and S.C.; drafting and revision of the manuscript: A.S., D.D., N.P., T.S., N.I., Yu.M., and S.C.; and

final approval: A.S., D.D., N.P., T.S., N.I., Yu.M., and S.C.

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# Травма жёлчного пузыря у больного с кататравмой: клинический случай

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## Резюме

Травма жёлчного пузыря является редкой неотложной медицинской помощью в абдоминальной хирургии из-за её анатомического расположения. Повреждения жёлчного пузыря встречаются лишь в 1.9-2.1% случаев при травмах живота, при этом изолированное повреждение встречается в 10 раз реже. Несмотря на разные механизмы повреждения, внутрипузырная гипертензия является наиболее важным фактором, способствующим разрыву жёлчного пузыря. Падение с высоты является редкой причиной повреждения жёлчного пузыря, и в литературе описано всего несколько случаев. Лапароскопическая холецистэктомия является наиболее распространённым первичным лечением. В настоящем клиническом случае мы представляем диагностику и лечение пациента с редкой сочетанной травмой. Больной получил политравму, но имел изолированное повреждение жёлчного пузыря при отсутствии других повреждений живота. Современные методы диагностики, в первую очередь УЗИ, могут иметь решающее значение для определения наилучшей тактики лечения.

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## Ключевые слова

тупая травма живота, сочетанная травма, кататравма, абдоминальная хирургия, травма жёлчного пузыря

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