

# A rare case of abdominal gunshot trauma: Isolated common bile duct injury within the portal triad accompanied by liver and lung injury

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## ABSTRACT

Injuries to the common bile duct (CBD) have been reported in 0.4-0.5% of penetrating trauma cases across several series. Gunshot wounds pose unique challenges due to the thermal injury caused by the projectile, combined with the close anatomical proximity of the CBD, portal vein, and hepatic artery within the hepatoduodenal ligament. This proximity often results in combined injuries to these vital structures, which are associated with high perioperative morbidity or mortality. Isolated injuries to the CBD within the hepatoduodenal ligament are exceptionally rare, given the structure's protective location and the interconnected nature of its components. The management of isolated CBD injuries remains a topic of ongoing debate. Here, we present a rare case of a gunshot wound causing an isolated CBD injury within the portal triad, accompanied by concomitant injuries to other intra-abdominal and thoracic organs. We present a 41-year-old male patient with an isolated CBD injury within the portal triad, accompanied by liver and lung injury sustained from a gunshot. Emergency computed tomography (CT) imaging revealed a bullet trajectory of 14 cm extending from liver segment 6 to segment 4B, associated with laceration and contusion. Exploration revealed thermal damage to the gallbladder wall, and the integrity of the hepatoduodenal ligament was disrupted. A cholecystectomy was performed, and dissection of the hepatoduodenal ligament revealed that approximately 70% of the CBD wall was transected. Importantly, the portal vein and hepatic artery remained intact. The proximal CBD was clamped, and complete transection of the duct was performed. Reconstruction involved a Roux-en-Y hepaticojejunostomy after preparing the jejunal segment. The patient experienced an uneventful recovery and was discharged on postoperative day 7 following drain removal. At the 6-month follow-up, the patient remained asymptomatic with no evidence of late complications. We believe that dissection of the hepatoduodenal ligament is necessary in patients with penetrating injuries near the hepatoduodenal ligament after hemostasis. Hepaticojejunostomy is an effective surgical treatment for patients with full-thickness transection of the CBD and reduces the risk of postoperative complications.

**Keywords:** Abdominal trauma; common bile duct; gunshot trauma; hepaticojejunostomy.

## INTRODUCTION

In penetrating abdominal trauma, the most commonly injured organs are the liver and small intestine; however, injuries involving the hepatoduodenal ligament are relatively rare.<sup>[1]</sup> The hepatoduodenal ligament contains three critical anatomical structures: the hepatic artery, portal vein, and common bile duct (CBD).<sup>[2]</sup> Injuries to the CBD have been reported

in 0.4-0.5% of penetrating trauma cases across several series.<sup>[3]</sup> Successful management of extrahepatic biliary tract injuries is crucial, as these injuries are associated with high morbidity rates, primarily due to the formation of biliary fistulas, strictures, and delays in diagnosis.<sup>[4]</sup>

Gunshot wounds pose unique challenges due to the thermal injury caused by the projectile, combined with the close anatomical proximity of the CBD, portal vein, and hepatic artery

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within the hepatoduodenal ligament. This proximity often results in combined injuries to these vital structures, which are associated with high perioperative morbidity or mortality.<sup>[5,6]</sup> Many patients either experience mortality before reaching the hospital or experience severe perioperative complications. Initial management strategies for these injuries typically involve damage control principles, such as abdominal packing and staged repair.<sup>[7]</sup> Immediate reconstruction is often unfeasible due to contamination and hemodynamic instability, necessitating the placement of abdominal drains and external biliary drainage. Isolated injuries to the CBD within the hepatoduodenal ligament are exceptionally rare, given the structure's protective location and the interconnected nature of its components. The management of isolated CBD injuries remains a topic of ongoing debate.<sup>[8,9]</sup>

Here, we present a rare case of a gunshot injury resulting in an isolated CBD injury without damage to other components of the hepatoduodenal ligament, accompanied by liver and lung injury. We aim to highlight our approach to managing this unique case, emphasizing the strategies employed in the treatment of extrahepatic biliary duct injuries caused by penetrating trauma.

## CASE REPORT

We present a 41-year-old male patient with an isolated CBD injury within the portal triad, accompanied by liver and lung injury sustained from a gunshot. The patient arrived at the emergency department approximately 1 hour post-injury. Upon admission, he was conscious and hemodynamically stable. Physical examination revealed a 1×1 cm bullet entry wound 1 cm below the right scapula posteriorly and a 1×2 cm exit wound 2 cm below the xiphoid process anteriorly. Abdominal examination identified findings consistent with generalized peritonitis.

Emergency computed tomography (CT) imaging revealed a bullet trajectory of 14 cm, extending from liver segment 6 to segment 4B, associated with laceration and contusion. The gallbladder and both intrahepatic and extrahepatic bile ducts appeared normal (Figure 1). Additionally, CT findings included

intra-abdominal fluid of hemorrhagic density, lacerations in the right lung, a right hemothorax, and lacerations in the right kidney. Based on these findings, the patient underwent emergency surgery 20 minutes after admission. Informed consent was obtained from the patient and his relatives prior to the surgical procedure, including permission for the use and publication of related images and videos.

## Operative Findings and Management

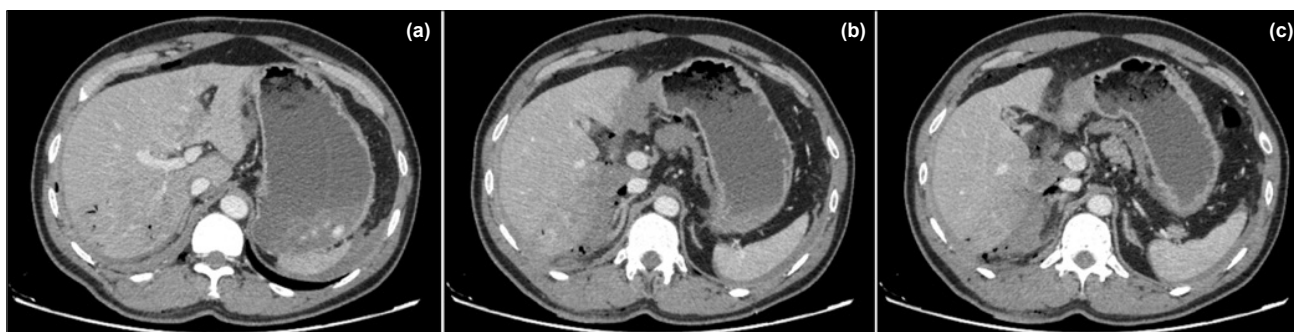
The patient was positioned supine, and a median xiphoido-pubic incision was performed. Exploration revealed 150-200 mL of hemorrhagic fluid within the abdominal cavity. A parenchymal injury was identified in the liver between segments 4 and 5, measuring approximately 1 cm in depth and 7–8 cm in length. There was no evidence of injury in the lesser sac. The bullet's trajectory caused thermal damage to the gallbladder wall, and the integrity of the hepatoduodenal ligament was disrupted.

Following a Pringle maneuver, hemostasis was achieved in the liver parenchymal injury using bipolar cautery. A cholecystectomy was performed, and dissection of the hepatoduodenal ligament revealed that approximately 70% of the CBD wall was transected. Importantly, the portal vein and hepatic artery remained intact. The proximal CBD was clamped, and complete transection of the duct was performed. Reconstruction involved a Roux-en-Y hepaticojejunostomy after preparing the jejunal segment (Figure 2).

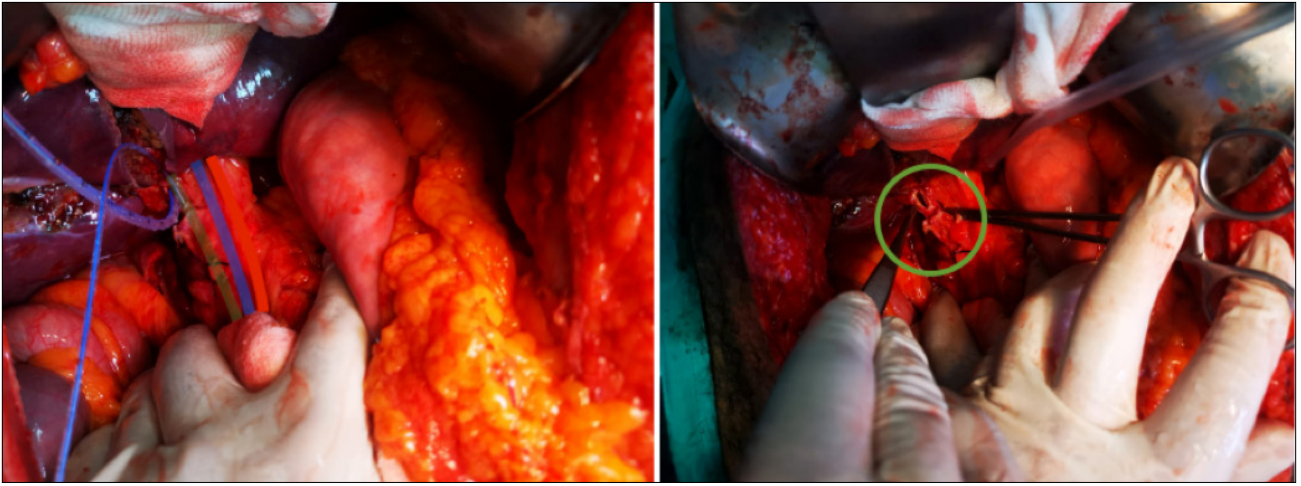
## Postoperative Course and Follow-Up

The patient experienced an uneventful recovery and was discharged on postoperative day 7 following drain removal. The follow-up blood results obtained on postoperative day 20 were as follows: SGOT 12 U/L, SGPT 37 U/L, ALP 64 U/L, GGT 83 U/L, total bilirubin 0.25 mg/dL, direct bilirubin 0.11 mg/dL. At the 6-month follow-up, the patient remained asymptomatic with no evidence of late complications.

This case highlights the challenges and surgical management strategies in treating isolated CBD injuries within the portal triad resulting from penetrating trauma.



**Figure 1.** Laceration and contusion areas in the liver parenchyma (a,b) and free fluid with hemorrhagic density around the common bile duct (c).



**Figure 2.** Identification of the common bile duct and the proximal duct after transection.

## DISCUSSION

Penetrating abdominal trauma due to gunshot is a critical and often life-threatening condition that requires prompt diagnosis and management. Among the structures affected in such injuries, the biliary system is rarely involved due to its deep location. Injury to the common bile duct is particularly uncommon and represents a difficult surgical challenge due to its anatomical position.<sup>[10,11]</sup> The limited number of patients and studies in the literature highlights that treatment modalities are often tailored specifically to the patient, and there is no established consensus.

In our case report, an exploratory laparotomy was performed on a patient with peritonitis and hemorrhagic fluid detected in the abdominal cavity on imaging, along with a liver injury. Following hemostasis, dissection of the hepatoduodenal ligament was carried out due to suspected injury in this area. The portal vein and hepatic artery were found to be intact, while an isolated CBD injury was identified.

In a meta-analysis conducted by Pereira et al.<sup>[12]</sup> in 2019, it was reported that deep liver laceration, intra-abdominal bile, hematoma of the porta hepatis, or bile-stained porta hepatis could be used as indicators for identifying bile duct injury in patients undergoing laparotomy. In the presence of these indicators, it was recommended that the surgeon suspect bile duct injury and consider diagnostic approaches such as intraoperative cholangiography, Kocher's maneuver, or extensive dissection of the porta hepatis. Due to the presence of an injury near the hepatic hilum in our patient and damage to the hepatoduodenal ligament, we deemed hepatoduodenal ligament dissection to be appropriate. This approach allowed us to identify the CBD injury effectively.

Following the identification of CBD injury, various repair approaches are available. In a case report from Taiwan presenting four cases of extrahepatic bile duct injury, it was reported

that a patient with CBD injury due to penetrating abdominal trauma underwent primary repair with T-tube choledochostomy, and no additional complications were observed during follow-up. Additionally, the same study compiled results from studies conducted between 1985 and 1996 evaluating patients with bile duct injuries caused by trauma. Among a total of 75 patients, 35 underwent primary repair with T-tube choledochostomy, 18 underwent hepaticojejunostomy, 5 underwent liver resection, and 1 underwent the Whipple procedure. Among the patients treated with primary repair and T-tube choledochostomy, 7 experienced biliary morbidity, and 6 had mortality, whereas among those who underwent hepaticojejunostomy, 5 had biliary morbidity, and 1 had mortality. The study concluded that while no significant differences were found between treatment modalities, early diagnosis and injury-specific treatment selection were emphasized as crucial factors.<sup>[4]</sup> In our patient, following hepatoduodenal ligament dissection, near-complete transection of the CBD was observed, leading to complete transection being performed. The patient subsequently underwent Roux-en-Y hepaticojejunostomy.

While reviewing the literature, studies show that it is evident that the surgical technique for CBD injuries should be selected based on the type of injury. For incomplete transections, techniques such as primary repair, primary repair with T-tube placement, or end-to-end anastomosis with T-tube placement have been described. In cases of complete transections, surgical options include end-to-end anastomosis with T-tube placement, end-to-end anastomosis, or hepaticojejunostomy. Following T-tube applications, biliocutaneous fistula formation is a common complication, while stricture formation is frequently observed after primary repair and end-to-end anastomosis of the bile duct. For this reason, hepaticojejunostomy is recommended as the preferred surgical treatment for CBD injuries.<sup>[13-15]</sup>

Non-surgical treatment approaches for extrahepatic bile duct

injuries caused by penetrating trauma have been reported in the literature. Kleiner et al.<sup>[16]</sup> described a case in which a hemodynamically stable patient with a bile duct injury from a stabbing was successfully treated with endoscopic stenting. After duodenal repair and hemostasis during laparotomy, the patient developed bile leakage in the postoperative period, confirmed by a HIDA scan. The injury was managed with ERCP and intracholedochal stenting. The patient recovered without complications, with the stent removed two months later and the biliary system found to be intact.

In patients with penetrating right upper quadrant injuries managed with selective nonoperative observation, where bile duct injuries are detected during nonoperative follow-up, or in cases where bile duct injuries are not identified during laparotomy but biliary pathology is observed in the postoperative period, some studies have shown that endoscopic treatment methods are successful in 90-95% of cases.<sup>[17-19]</sup> Therefore, in these patients, diagnostic methods such as magnetic resonance cholangiography with gadoxetic acid disodium, HIDA scan, ERCP, or even diagnostic peritoneal lavage can be used to determine the nature of intra-abdominal fluid if present.<sup>[12,20]</sup> In patients treated with endoscopic stenting, the risks of complications such as bile leakage, stent migration, and the need for a second invasive intervention should be kept in mind.<sup>[21,22]</sup>

## CONCLUSION

We believe that dissection of the hepatoduodenal ligament is necessary in patients with penetrating injuries near the hepatoduodenal ligament after hemostasis. Hepaticojejunostomy is an effective surgical treatment for patients with full-thickness transection of the CBD and reduces the risk of postoperative complications.

**Informed Consent:** Informed consent was obtained from the patient and his relatives prior to the surgical procedure, including permission for the use and publication of related images and videos.

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## REFERENCES

1. Yoganandan N, Pintar FA, Maltese MR. Biomechanics of abdominal injuries. *Crit Rev Biomed Eng* 2001;29:173-246. [\[CrossRef\]](#)
2. Nakashima J, Bordoni B. Anatomy, Abdomen and Pelvis: Hepatoduodenal Ligament. 2022 Oct 31. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-.
3. Posner MC, Moore EE. Extrahepatic biliary tract injury: operative management plan. *J Trauma* 1985;25:833-7. [\[CrossRef\]](#)
4. Ker C, Yuan T, Yuan C, Yuan C. Extrahepatic bile duct injury due to abdominal trauma. *J Hep Bil Pancr Surg* 1996;3:78-83. [\[CrossRef\]](#)
5. Chen X, Talner LB, Jurkovich GJ. Gallbladder avulsion due to blunt trauma. *AJR Am J Roentgenol* 2001;177(4):822. [\[CrossRef\]](#)
6. Jurkovich GJ, Hoyt DB, Moore FA, Ney AL, Morris JA Jr, Scalea TM, et al. Portal triad injuries. *J Trauma* 1995;39:426-34. [\[CrossRef\]](#)
7. Benz D, Balogh ZJ. Damage control surgery: current state and future directions. *Curr Opin Crit Care* 2017;23:491-7. [\[CrossRef\]](#)
8. LeBedis CA, Bates DDB, Soto JA. Iatrogenic, blunt, and penetrating trauma to the biliary tract. *Abdom Radiol [NY]*. 2017;42:28-45. [\[Cross-Ref\]](#)
9. Degiannis E, Khelif K, Leandros E, Boffard K, Saadia R. Gunshot injuries of the extrahepatic biliary ducts. *Eur J Surg* 2001;167:618-21. [\[Cross-Ref\]](#)
10. Ivatury RR, Nallathambi MN, Gaudino J. Penetrating biliary injuries. *J Trauma* 1985;25:689-93. [\[CrossRef\]](#)
11. Moore EE, Cogbill TH, Jurkovich GJ, Shackford SR, Malangoni MA, Champion HR. Organ injury scaling: spleen and liver (1994 revision). *J Trauma* 1995;38:323-4. [\[CrossRef\]](#)
12. Pereira R, Vo T, Slater K. Extrahepatic bile duct injury in blunt trauma: A systematic review. *J Trauma Acute Care Surg* 2019;86:896-901. [\[Cross-Ref\]](#)
13. Busuttill RW, Kitahama A, Cerise E, McFadden M, Lo R, Longmire WP Jr. Management of blunt and penetrating injuries to the porta hepatis. *Ann Surg* 1980 May;191:641-8. [\[CrossRef\]](#)
14. Kapoor VK. Bile duct injury repair: when? what? who? *J Hepatobiliary Pancreat Surg* 2007;14:476-9. [\[CrossRef\]](#)
15. Dawson DL, Johansen KH, Jurkovich GJ. Injuries to the portal triad. *Am J Surg* 1991;161:545-51. [\[CrossRef\]](#)
16. Kleiner O, Mordehai J, Krugliak P, Cohen Z. Penetrating Bile Duct Injury. *Eur J Trauma* 2004;30:403-5. [\[CrossRef\]](#)
17. Singh V, Narasimhan KL, Verma GR, Singh G. Endoscopic management of traumatic hepatobiliary injuries. *J Gastroenterol Hepatol* 2007;22:1205-9. [\[CrossRef\]](#)
18. Bridges A, Wilcox CM, Varadarajulu S. Endoscopic management of traumatic bile leaks. *Gastrointest Endosc* 2007;65:1081-5. [\[CrossRef\]](#)
19. Goble SR, Abdallah M, Rosenberg C, Dirweesh A, Matlock R. Endoscopic Management of Pancreaticobiliary Injuries: A Level 1 US Trauma Center Experience. *Ochsner J* 2024;24:184-91. [\[CrossRef\]](#)
20. Gupta A, Stuhlfaut JW, Fleming KW, Lucey BC, Soto JA. Blunt trauma of the pancreas and biliary tract: a multimodality imaging approach to diagnosis. *Radiographics* 2004;24:1381-95. [\[CrossRef\]](#)
21. Lubezky N, Konikoff FM, Rosin D, Sarin SK. Endoscopic sphincterotomy and temporary internal stenting for bile leaks following complex hepatic trauma. *Br J Surg* 2006;93:78-81. [\[CrossRef\]](#)
22. Sharma BC, Mishra BC, Kumar R, et al. Endoscopic management of bile leaks after blunt abdominal trauma. *J Gastroenterol Hepatol* 2009;24:757-61. [\[CrossRef\]](#)

## ORİJİNAL ÇALIŞMA - ÖZ

**Ateşli silah yaralanmasına bağlı nadir bir olgu: Akciğer ve karaciğer yaralanmasıyla birlikte portal triad içerisinde izole koledok kanalı yaralanması**

Koledok kanalı yaralanmaları, penetran batın travması vakalarının %0.4-0.5'inde görülmektedir. Ateşli silah yaralanmaları, merminin neden olduğu termal hasarın yanı sıra, koledok kanalı, portal ven ve hepatik arterin hepatoduodenal ligaman içerisindeki yakın anatomik komşuluğu nedeniyle tüm yapılarda hasar meydana getirebilir. Bu yakınlık, genellikle bu hayati yapıların bir arada yaralanmasına yol açarak yüksek perioperatif morbidite veya mortalite ile ilişkilidir. Hepatoduodenal ligaman içerisindeki izole koledok kanalı yaralanmaları son derece nadirdir. İzole koledok kanalı yaralanmalarının yönetimi halen tartışmalı bir konudur. Olgu raporumuzda, karaciğer ve akciğer yaralanmasına eşlik eden hepatoduodenal ligamanın diğer bileşenlerine zarar vermeden portal triad içerisinde yalnızca koledok kanalının yaralandığı nadir bir ateşli silah yaralanması vakasını sunmaktayız. 41 yaşında, ateşli silah yaralanmasına bağlı koledok kanalı yaralanması nedeniyle acil servise başvuran erkek hastayı sunuyoruz. Acil serviste çekilen bilgisayarlı tomografi (BT) görüntülemesinde, karaciğerin 6. segmentinden 4B segmentine kadar uzanan 14 cm'lik bir mermi yolunu ve buna bağlı laserasyon ve kontüzyonu olduğu saptandı. Eksplozasyonda safra kesesi duvarında termal hasar tespit edildi ve hepatoduodenal ligamanın bütünlüğünün bozulmuş olduğu görüldü. Hastaya kolesistektomi uygulandı ve hepatoduodenal ligamanın diseksiyonu uygulanması ardından koledok duvarının yaklaşık %70 oranında açılmış olduğu tespit edildi. Portal ven ve hepatik arter salim izlendi. Proksimal koledok kanalı kleplendi ve tam transeksiyon uygulandı. Roux-en-Y hepatikojejunostomi ile rekonstrüksiyon uygulandı. Hasta postoperatif 7. günde taburcu edildi. Altı aylık takipte hastada komplikasyon saptanmadı. Hepatoduodenal ligaman yakınında penetran yaralanması olan hastalarda, hemostaz sağlandıktan sonra hepatoduodenal ligamanın diseksiyonunun gerekli olduğuna inanıyoruz. Tam kat koledok yaralanması olan hastalar için hepatikojejunostomi etkili bir cerrahi tedavi yöntemi olup, postoperatif komplikasyon riskini azaltmaktadır.

**Anahtar sözcükler:** Ateşli silah yaralanması; hepatikojejunostomi; koledok kanalı; penetran batın travması.

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