

## Successful Endoscopic Treatment of Hepatic Duct Confluence Injury after Blunt Abdominal Trauma: Case Report

Chan Ik Park, M.D., Sung Jin Park, M.D., Sang Bong Lee, M.D., Kwang Hee Yeo, M.D.,  
Seon Uoo Choi, M.D., Seon Hee Kim, M.D., Jae Hun Kim, M.D., Dong Hoon Baek, M.D.<sup>1</sup>

*Department of Trauma Surgery, Division of Gastroenterology,  
<sup>1</sup>Department of Internal Medicine, Pusan National University Hospital, Busan, Korea*

Hepatic duct confluence injury, which is developed by blunt abdominal trauma, is rare. Conventionally, bile duct injury was treated by surgical intervention. In recent decades, however, there had been an increase in radiologic or endoscopic intervention to treat bile duct injury. In a hemodynamically stable patient, endoscopic intervention is considered as the first-line treatment for bile duct injury.

A 40 year-old man was transferred to the emergency department of OO trauma center after multiple blunt injuries. Contrast-enhanced abdominal computed tomography performed in another hospital showed a liver laceration with active arterial bleeding, fracture of the sacrum and left inferior pubic ramus, and intraperitoneal bladder rupture. The patient presented with hemorrhagic shock because of intra-peritoneal hemorrhage. After resuscitation, angiographic intervention was performed. After angiographic embolization of the liver laceration, emergency laparotomy was performed to repair the bladder injury. However, there was no evidence of bile duct injury on initial laparotomy. On post-trauma day (PTD) 4, the color of intra-abdominal drainage of the patient changed to a greenish hue; bile leakage was revealed on magnetic resonance cholangiopancreatography and endoscopic retrograde cholangiopancreatography (ERCP). Bile leakage was detected near the hepatic duct confluence; therefore, a biliary stent was placed into the left hepatic duct. On PTD 37, contrast leakage was still detected but both hepatic ducts were delineated on the second ERCP. Stents were placed into the right and left hepatic ducts. On PTD 71, a third ERCP revealed no contrast leakage; therefore, all stents were removed after 2 weeks (PTD 85).

ERCP and biliary stenting could be effective treatment options for hemodynamically stable patients after blunt trauma. [ J Trauma Inj 2016; 29: 93-97 ]

**Key Words:** Trauma, Biliary tract, Non-penetrating, Cholangiopancreatography, Endoscopic retrograde

### I. Introduction

Bile duct injury after blunt abdominal trauma is rare, and hepatic duct confluence injury is rarer. Conventionally, these injuries were treated with primary repair with or without T-tube insertion, right or left sided hepatectomy, or hepaticojejunostomy.<sup>(1)</sup> However, non-operative management has

been largely tried and accepted in hemodynamically stable patients.<sup>(2,3)</sup> We report a case of hepatic duct confluence injury after blunt abdominal trauma successfully treated using endoscopic techniques.

### II. Case report

A 40-year-old man was transferred to the trauma

\* Address for Correspondence : **Sung Jin Park, M.D.**

Department of Trauma Surgery, Pusan National University Hospital,  
179 Gudeok-ro, Seo-gu, Busan 49241, Korea

Tel : 82-51-240-7369, Fax : 82-51-247-7719, E-mail : psj-ok@hanmail.net

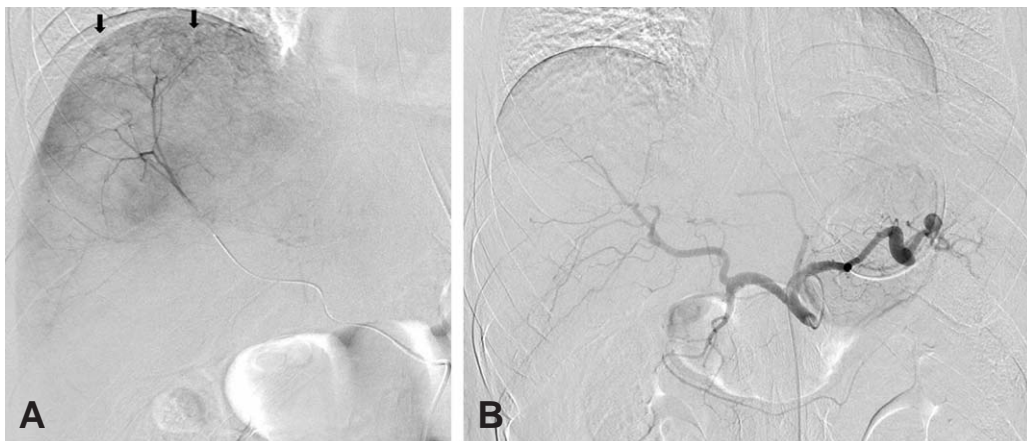
**Submitted** : July 29, 2016 **Revised** : August 2, 2016 **Accepted** : September 15, 2016

center of OO university hospital. He fell from a four-storey building, which was approximately 10-

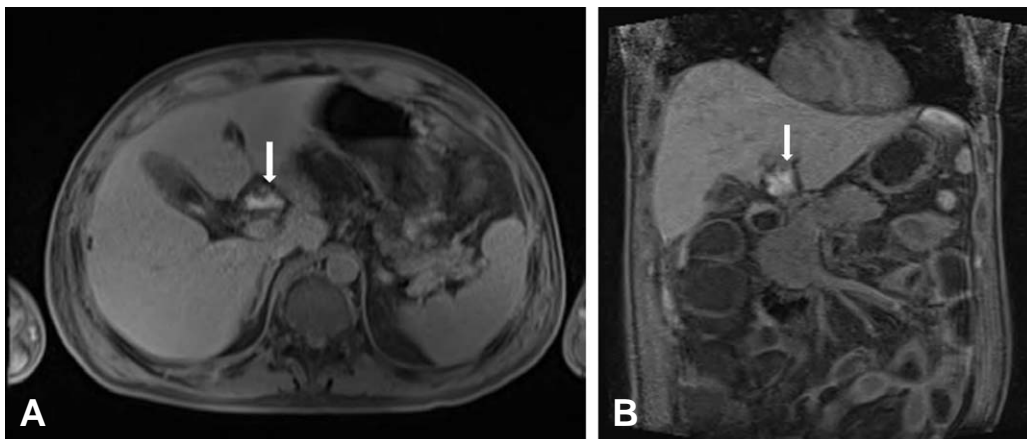


**Fig. 1.** Initial contrast-enhanced abdominal computed tomography showed a grade III liver laceration (arrow).

meter high, and arrived at our emergency room 90 min later. On admission, his blood pressure was 70/40 mmHg, heart rate was 95 beat/min, and body temperature was 36.2°C. Initial laboratory tests revealed normal hemoglobin (12.8 g/dL), but increased aspartate aminotransferase (651 IU/L) and alanine aminotransferase (412 IU/L) levels. Total bilirubin (0.89 mg/dL) and direct bilirubin (0.32 mg/dL) levels were in the normal range. Contrast-enhanced thoracic and abdominal computed tomography performed at a local medical center showed a liver laceration (grade III; >3 cm parenchymal depth) through segments IV, V, and VIII, with hemoperitoneum (Fig. 1), fracture of the sacrum and left inferior pubic ramus, intraperitoneal bladder rupture and multiple rib fractures (right 3rd-5th, 9th-12th, and left 7th). His injury severity score was 34. After fluid resuscitation, angiographic embolization was performed for

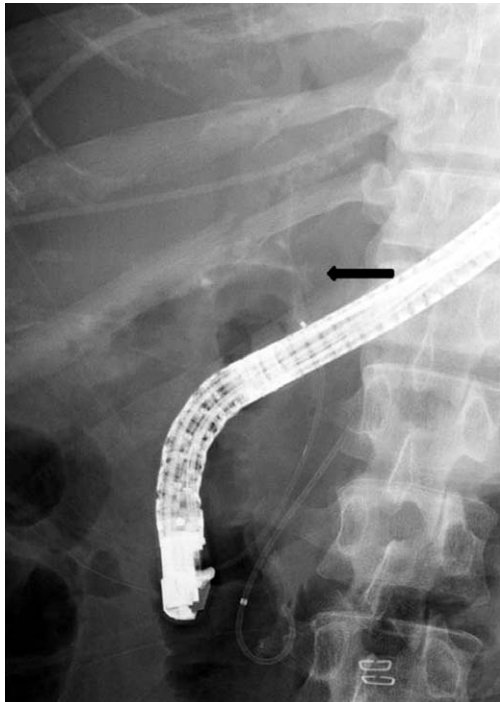


**Fig. 2.** (A) Angiography showing contrast leakage in the liver segment VIII (arrows). (B) Post-embolization showing no active contrast leakage.



**Fig. 3.** (A, B) Magnetic resonance cholangiopancreatography showing bile leak at the liver hilum, on the 4th postoperative day (arrow).

the liver laceration. We found active bleeding in liver segment VIII and embolized this with gelatin sponge particles (Fig. 2). After embolization, his

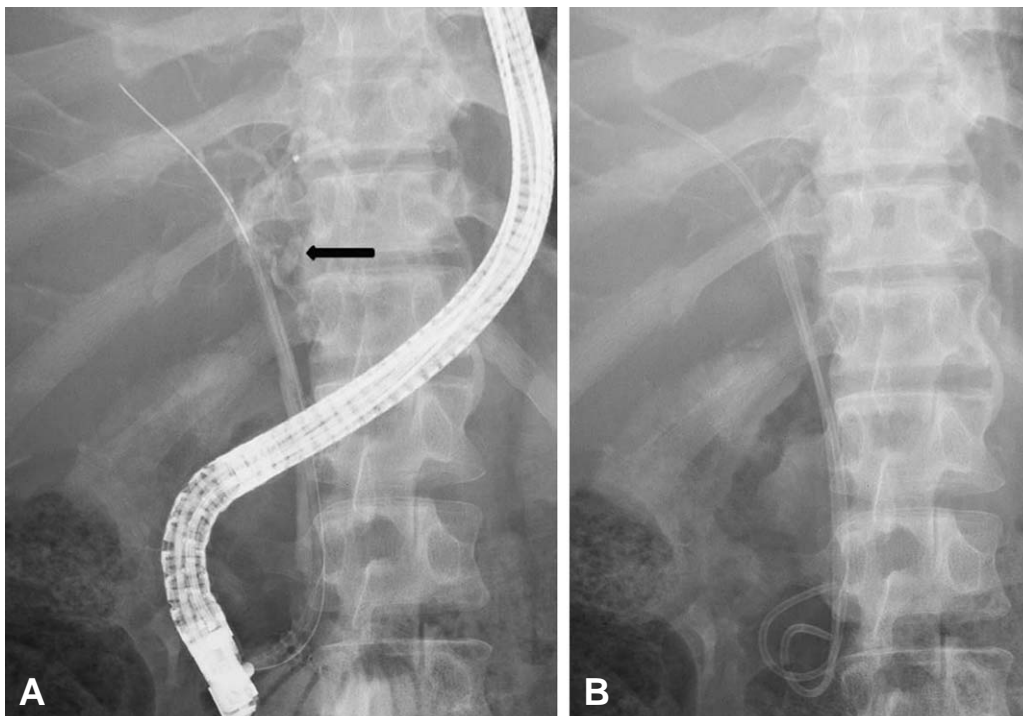


**Fig. 4.** The first ERCP showing bile leak at the confluence of the left and right hepatic ducts (arrow).

vital signs stabilized. An exploratory laparotomy was subsequently performed, and we repaired the ruptured bladder. There was no evidence of intraperitoneal bile leakage at this point. After the surgery, the patient was transported to the intensive care unit.

On the post-trauma day (PTD) 4, the patient's vital signs remained stable, but the color of intra-abdominal drainage of the patient changed from serous to bilious. Suspecting a bile duct injury, a magnetic resonance cholangiopancreatography (MRCP) was performed first to determine the focus of bile leakage. It showed contrast leakage from the bile duct at the liver hilum (Fig. 3). The patient then underwent endoscopic retrograde cholangiopancreatography (ERCP) with sphincterotomy. Contrast leakage was detected near the hepatic duct confluence; therefore, biliary stents were placed into the left hepatic and pancreatic ducts (Fig. 4). On the 8<sup>th</sup> day after ERCP, the patient's abdominal drainage became serous and decreased in amount.

Four weeks after the first ERCP (PTD 37), a follow-up ERCP revealed a healing bile duct, but small contrast leakage was still detected. The biliary stents in the left hepatic and pancreatic ducts were



**Fig. 5.** The second ERCP 5 weeks after the injury. (A) Bile leak (arrow) still remained. (B) Biliary stents inserted into the right and left hepatic ducts.



**Fig. 6.** ERCP at 9 weeks after injury demonstrating no bile leak.

removed, and the same kinds of stents were placed into the left and right hepatic ducts (Fig. 5). After the procedure, the patient's general condition improved and he was transferred to the department of rehabilitation medicine. A third ERCP performed 5 weeks after the second one (PTD 71) revealed no contrast leakage (Fig. 6). After 2 weeks (PTD 85), the stents were finally removed. The patient was discharged without other complications on PTD 89.

### III. Discussion

Hepatic duct confluence injury, which is developed by blunt abdominal trauma, is rare. There have been few reports about traumatic bile duct injury. Dawson et al(4) reported one case of bile duct injury from blunt abdominal trauma in 10,500 consecutive trauma admissions. Jurkovich et al(5) reported one case of hepatic duct confluence injury in their multicenter study of eight academic level I trauma centers over a combined 62 years. Recently, Nathan et al(6) reported one case of hepatic duct confluence injury after a head-on motor vehicle collision and was endoscopically treated. Garge et al(7) reported two cases that had hepatic confluence injury after

blunt trauma and underwent operative management.

Bile duct injury can be missed at initial evaluation and during surgery unless a rigorous search is made in any suspicious injury. Michelassi and Ranson(8) reported that the incidence of missed ductal injuries on initial laparotomy was 12%. Several studies reported that the median time to diagnosis ranged from 5 days to 3 weeks.(7,9,10) In our case, there was no bile staining and no obvious injury on initial laparotomy. We could identify the bile duct injury after the color of the patient's intra-abdominal drainage changed on the 4th post-operative day.

A hepatobiliary scintigraphy scan, known as hepatobiliary iminodiacetic acid or diisopropyl iminodiacetic acid scan, or MRCP can be used for evaluation of a suspected bile duct injury. Main limitation of hepatobiliary scintigraphy is that it lacks the spatial resolution needed for the accurate identification of the exact site of bile leaks. But MRCP provides exquisite anatomic detail and functional information. In addition, it had advantage of potentially revealing the exact site of bile leak, and can guide subsequent management, whether endoscopic, percutaneous, or surgical.(11) In the present case, MRCP revealed biliary leakage at the liver hilum. ERCP was performed to identify the location and extent of bile duct injury and for diversion of the biliary stream.

Patients with portal triad and extrahepatic bile duct injuries are usually hemodynamically unstable.(1) In such patients, bile duct injury should be managed after acute bleeding has been controlled. There are some surgical technique to repair bile duct injury. It depends on the severity of the injury. Avulsion and small lacerations of the bile duct can be primarily repaired with or without insertion of a T-tube. Massive tissue loss requires biliary-enteric anastomosis such as Roux-en-Y hepaticojejunostomy with cholecystectomy and T-tube drainage.(1)

Otherwise, non-operative management can be preemptively considered in hemodynamically stable patients.(12) Some investigators recently reported that traumatic bile duct injury can be safely and effectively managed by endoscopic and radiologic intervention.(2,13,14) Currently, endoscopic and

radiologic techniques have been the main methods of treatment in hemodynamically stable patients with bile duct injury. However, a report about bile duct confluence injury is rare and its treatment is challenging.

In our case, contrast leakage was detected near the liver hilum on initial ERCP. The endoscopist tried to insert biliary stents into both hepatic ducts. However, the guidewire could not be inserted into the right hepatic duct easily. Endoscopic retrograde biliary drainage and endoscopic retrograde pancreatic drainage were placed into the left hepatic and pancreatic ducts, respectively, and a follow-up study was planned. The second ERCP showed improvement of the bile duct injury compared to the previous study. At this time, we were able to detect both hepatic ducts, which enabled the insertion of biliary stents.

The optimal duration for stenting has not been established. In one case series, the authors removed the stents after an interval of 4–16 weeks.(3) In another study, median time to resolution of traumatic bile leakage was 13 days.(9) In our case, the amount of abdominal drainage decreased and its color became serous on the 8th day after the first ERCP. We were able to remove the biliary stent 10 weeks after the initial ERCP without complication. A follow up ERCP after the initial procedure was performed every 4 weeks according to the endoscopist's decision.

#### IV. Conclusion

Hepatic duct confluence injury after blunt abdominal trauma is rare and its diagnosis can be missed or delayed. Treatment should be selected according to the patient's hemodynamic status, and the type and extent of their injuries. Non-operative management, such as ERCP and biliary stenting, can be an effective treatment option in selected patients.

#### V. Acknowledgement

This study was supported by clinical research grant (2016), Pusan National University Hospital.

#### REFERENCES

- 1) Fabian TC, Bee TK. Liver and biliary tract. In: Mattox KL, Moore EE, Feliciano DV, eds. Trauma. 7th ed. New York:McGraw Hill; 2013: 539-61.
- 2) Anand RJ, Ferrada PA, Darwin PE, Bochicchio GV, Scalea TM. Endoscopic retrograde cholangiopancreatography is an effective treatment for bile leak after severe liver trauma. *J Trauma* 2011; 71: 480-5.
- 3) Spinn MP, Patel MK, Cotton BA, Lukens FJ, Successful endoscopic therapy of traumatic bile leaks. *Case Rep Gastroenterol* 2013; 7: 56-62.
- 4) Dawson DL, Johnsen KH, Jurkovich GJ. Injuries to the portal triad. *Am J Surg* 1991; 161: 545-51.
- 5) Jurkovich GJ, Hoyt DB, Moore FA, Ney AL, Morris JA Jr, Scalea TM et al. Portal triad injuries. *J Trauma* 1995; 39: 425-34.
- 6) Nathan M, Gates J, Ferzoco SJ. Hepatic duct confluence injury in blunt abdominal trauma: case report and synopsis on management. *Surg Laparosc Endosc Percutan Tech.* 2003; 13: 350-2.
- 7) Garge S, Narasimhan KL, Verma S, Kechon V. Hepatic duct confluence injury in blunt abdominal trauma-a diagnostic dilemma. *Ulus Travma Acil Cerrahi Derg* 2013; 19: 480-4.
- 8) Michelassi F, Ranson JH. Bile duct disruption by blunt trauma. *J Trauma* 1985; 25: 454-7.
- 9) Kulaylat AN, Stokes AL, Engbrecht BW, McIntyre JS, Rzucidlo SE, Cilley RE. Traumatic bile leaks from blunt liver injury in children: a multidisciplinary and minimally invasive approach to management. *J Pediatr Surg* 2014; 49: 424-7.
- 10) Zollinger RM, Jr., Keller RT, Hubay CA. Traumatic rupture of the right and left hepatic ducts. *J Trauma* 1972; 12: 563-9.
- 11) LeBedis CA, Bates DD, Soto JA. Iatrogenic, blunt, and penetrating trauma to the biliary tract. *Abdom Radiol* 2016. DOI: 10.1007/s00261-016-0856-y.
- 12) Croce MA, Fabian TC, Menke PG, Waddle-Smith L, Minard G, Kudsk KA, et al. Nonoperative management of blunt hepatic trauma is the treatment of choice for hemodynamically stable patients. Results of a prospective trial. *Ann Surg* 1995; 221: 744-53.
- 13) Lubezky N, Konikoff FM, Rosin D, Carmon E, Kluger Y, Ben-Haim M. Endoscopic sphincterotomy and temporary internal stenting for bile leaks following complex hepatic trauma. *Br J Surg* 2006; 93: 78-81. DOI: 10.1002/bjs.5195.
- 14) Singh V, Narasimhan KL, Verma GR, Singh G. Endoscopic management of traumatic hepatobiliary injuries. *J Gastroenterol Hepatol* 2007; 22: 1205-9. DOI: 10.1111/j.1440-1746.2006.04780.x