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Case report

Extra-hepatic biliary injury secondary to blunt abdominal trauma: A successful management strategy

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ABSTRACT

Extra-hepatic bile duct injury from blunt abdominal trauma is uncommon. Complete traumatic transection of the common bile duct (CBD) with subsequent complication of a choledochoduodenal fistula is extremely rare and only a handful of reports are found in the medical literature. We describe a 20-year-old male patient who presented with a complete transection of the CBD following blunt abdominal trauma and his subsequent planned staged management.

1. Introduction

Extra-hepatic bile duct injury from blunt abdominal trauma is uncommon. The spectrum of severity ranges from severe ones such as transection or laceration, to contusion and haematoma. The incidence of bile leaks following hepatobiliary trauma ranges from 0.5 to 2.1% depending on the methods used to diagnose the bile leak [12].

Complete traumatic transection of the common bile duct (CBD) with subsequent complication of a choledochoduodenal fistula is thus extremely rare and only a handful of reports are found in the medical literature, mainly in the paediatric population [2].

Herein, we describe a patient who presented with a complete transection of the CBD following blunt abdominal trauma and his management.

2. Case report

A 20-year-old male with no past medical problems was hospitalized after a road traffic accident. The patient was the pillion rider of a motorcycle that had skidded. On arrival at the Emergency Department, he was found to have a 15 cm right flank laceration and right hip pain. He was hypotensive with a blood pressure of 86/61 mmHg and tachycardic with pulse rate of 110 per minute. The flank wound was found to be communicating with the pelvic bone. Trauma series X-rays showed multiple right lower rib fractures but no obvious pneumothorax, as well as right iliac wing and acetabular fractures. Focused abdominal sonography for trauma (FAST) showed the possibility of free intra-abdominal fluid in the Morrison's space. The patient was taken to the operating theatre from the Emergency Department for angio-embolisation of the pelvic fracture.

A right chest tube was inserted in the operating theatre for the multiple rib fractures. On-table angiography revealed no active intra-abdominal or pelvic bleeding. Prophylactic angio-embolization with gel-foam of the internal iliac arteries was performed to prevent bleeding from the pelvic fractures. The right flank wound was debrided and packed and a Steinman pin was inserted for traction of the right pelvic fractures.

From the operating theatre, the patient was sent for a computer tomography (CT) scan of the thorax, abdomen and pelvis. This revealed that the patient had grade 3 lacerations in liver segments 4, 5 and 6 with peri-hepatic haematoma and haemoperitoneum (Fig. 1), small lacerations in the right kidney and spleen and right acetabular and iliac wing fractures.

The liver, spleen and kidney lacerations were treated non-operatively. The initial serum total bilirubin was 186 μmol/L (normal range 7–31 μmol/L) and alkaline phosphatase was 123 U/L (normal range 38–126 U/L).

The right flank wound was debrided in two later operations and subsequently open reduction and internal fixation of the pelvic fractures was performed 13 days after admission.

This patient had persistent fever refractory to intravenous antibiotics and a repeat CT scan of the abdomen was performed 8 days after admission. This demonstrated increasing ascites as well as a new development of a 2.1 cm by 1.9 cm fluid collection in the right hepatic lobe (segment 6), likely a haematoma or biloma. The patient underwent CT-guided percutaneous drainage of the ascitic fluid and 1200 mL of bile-stained fluid was drained on the first day. The daily drainage amount subsequently reduced to 50–100 mL

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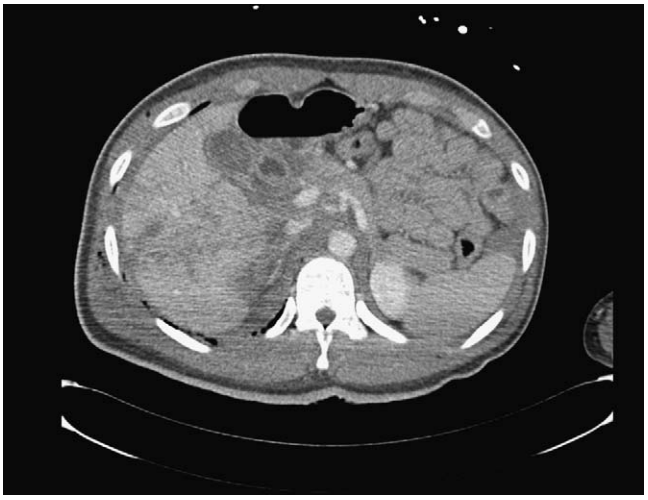

Fig. 1. CT scan showing liver lacerations and peri-hepatic haematoma.

per day. However, the patient's serum total bilirubin continued to rise to a peak of 452 μmol/L 3 days after the percutaneous drainage. Thus another CT scan of the abdomen and pelvis was performed 5 days after the initial percutaneous drainage. This showed persistent ascites and an interval increase in the size of the right hepatic lobe collection to 3.0 cm by 2.7 cm (Fig. 2).

As the patient remained septic, he eventually underwent a laparotomy 17 days after admission. Intra-operatively, a large amount of bilious-purulent peritoneal fluid was found mainly in the left sub-diaphragmatic area, right sub-diaphragmatic area, root of the transverse mesocolon, inter-loop and pelvis. A total of approximately 2500 mL of bilious-purulent fluid was drained. Two Jackson–Pratt (JP) drains were inserted. The liver lacerations and biliary tree were not explored because the omentum was plastered over them and the intra-abdominal collection was presumed to be secondary to the liver lacerations.

Our patient was noted to have persistent large amounts of bile leakage through the abdominal drains (between 400 and 600 mL of bile-stained fluid from each drain per day). Coupled with the persistently raised total bilirubin (ranging between 51 and 140 μmol/L), the clinical impression was that of a possible major bile duct injury with bile leakage. A decision was made to treat the bile leak non-operatively as the patient's clinical condition had improved. Both JP drains were left to passive drainage 2 weeks post-laparotomy.

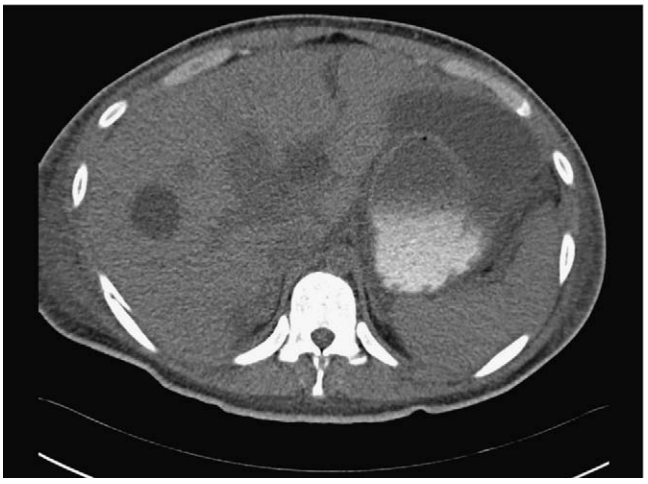

Fig. 2. CT scan showing right hepatic lobe collection.

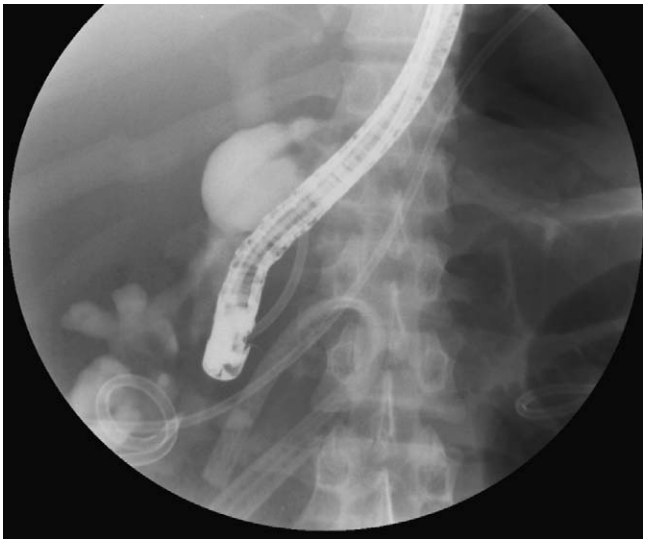

Fig. 3. ERCP showing slender distal CBD with contrast leak about 4.5 cm from the duodenal papilla. The CBD was completely disrupted with contrast accumulating in the retroperitoneum.

A magnetic resonance cholangio-pancreatogram (MRCP) was done 45 days after the laparotomy which revealed that the mid to distal CBD was not visualized.

An endoscopic retrograde cholangiopancreatogram (ERCP) was performed 8 days after the MRCP to further delineate the biliary tree. This showed complete transection of the CBD 4.5 cm from the duodenal papilla (Fig. 3). The endoscopist attempted to use a guidewire to traverse the bile duct up to the biliary system but failed, with the guidewire persistently entering the free retroperitoneal space. Thus a decision was made to stent the distal CBD to

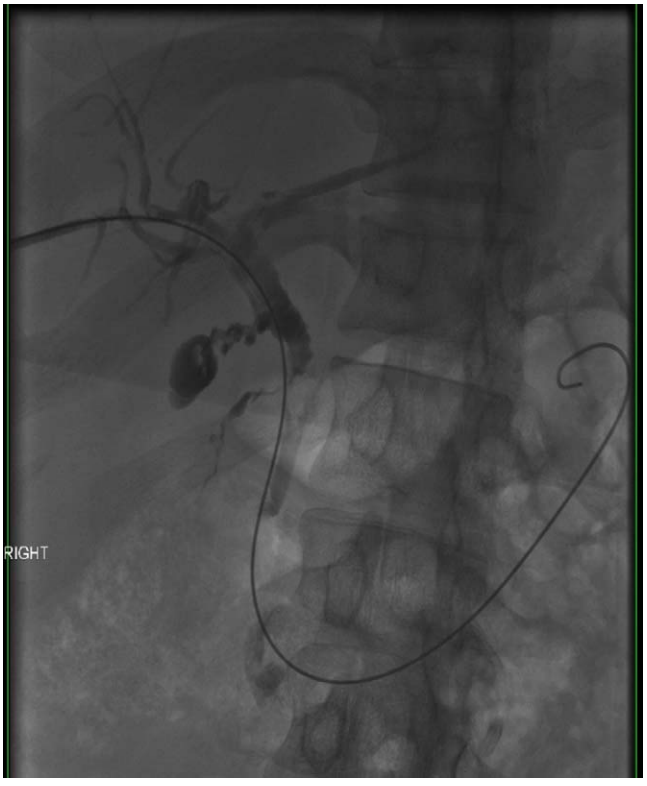

Fig. 4. Cholangiogram showing CBD stricture.

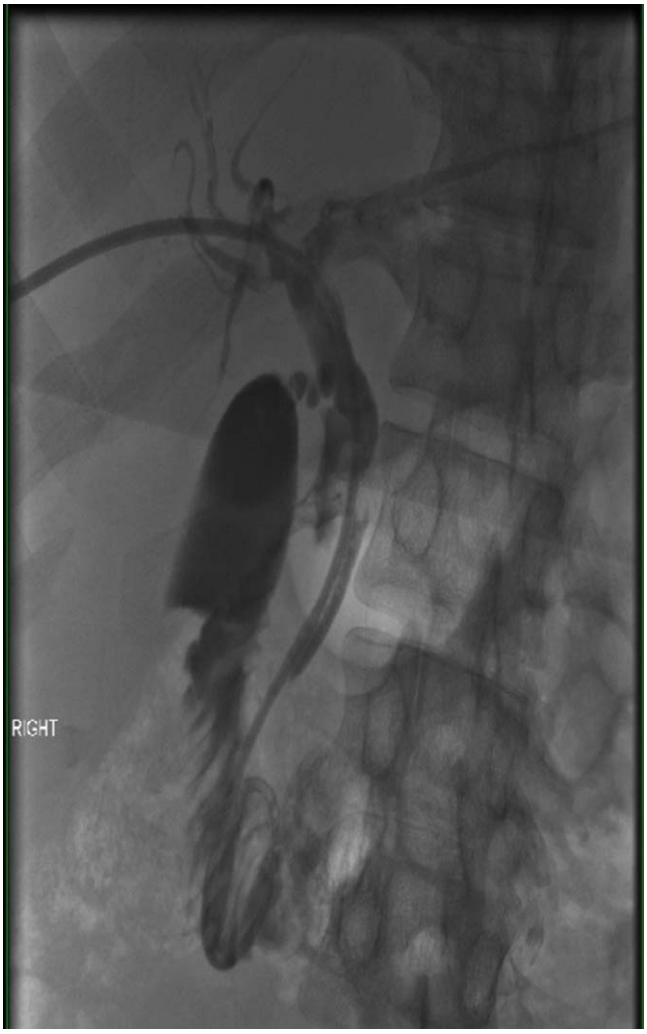

Fig. 5. Cholangiogram showing choledocho-duodenal fistula.

allow easier bile drainage. A stent was successfully deployed across the distal CBD with good bile drainage.

Percutaneous transhepatic cholangiogram (PTC) was done the following day where a percutaneous external–internal biliary drain was successfully placed across the injured segment. The indwelling CBD stent was pushed into the duodenum. This procedure enabled both external biliary diversion as well as internal biliary drainage.

The patient improved clinically after this and bile drainage via the abdominal drains subsequently reduced. His serum total bilirubin also progressively normalized. The abdominal drains were thus removed prior to discharge. The patient was discharged well almost 4 months after initial presentation.

An outpatient cholangiogram 3 months after discharge showed a CBD stricture (Bismuth Type 1) and a choledocho-duodenal fistula at the level of the stricture (Figs. 4 and 5).

The patient was counselled for elective surgical repair of the common bile duct stricture and choledocho-duodenal fistula.

11 months after the blunt abdominal trauma, the patient underwent a repair of the CBD injury. Intra-operatively, a choledocho-duodenal fistula was found over the middle CBD region to the second part of the duodenum. A CBD stricture was seen just proximal to fistula. A hepato-jejunostomy was constructed, and the choledocho-duodenal fistula closed. The external–internal biliary stent was also internalised using a jejunostomy catheter and brought into the efferent limb of the jejunum.

He recovered well from the operation and a cholangiogram on the eighth post-operative day showed no bile leak. The biliary drain was subsequently removed and he was discharged well on the ninth post-operative day.

3. Discussion

Injury to the extra-hepatic biliary tree secondary to blunt abdominal trauma is uncommon; complete transection of the common bile duct is especially rare. Despite its rarity, the unusual features associated with this entity have attracted attention in surgical literature from early times. *Battle* [1] and *Spencer* [15] each reported a case in the 19th century and a careful review of the literature from 1890 to 1970 by *Rydell* uncovered 91 cases of extra-hepatic bile duct lacerations [14]. Of these, 25 were CBD transections similar to our case report.

The exact pathophysiology necessary to cause injury to the extra-hepatic bile ducts is unknown, although the following have been described:

1) Impingement and compression of the ductal system on the vertebral column [10].
2) External compression of the gallbladder with transmitted rise in intra-ductal pressures causing "blow-out" of the duct [11].
3) Laceration of the ductal system at the junction of its fixed and mobile portions [6].

Despite the various theories, it is most likely that a combination of the mechanisms proposed above is responsible for extra-hepatic bile duct injuries.

The clinical picture of bile duct transection is characteristic. The typical case starts off with a history of crushing abdominal trauma. The patient then remains remarkably stable until jaundice and abdominal distension due to bile ascites occurs after 3–4 days. Peritoneal findings, such as severe abdominal pain and guarding, are usually absent. In addition, laboratory investigations are frequently misleading because of the multiple other causes of jaundice following major abdominal trauma, including haemolysis from multiple blood transfusions, resolving haematomas, bilomas from liver lacerations and drug toxicity. This accounts for the frequent delay of several days and sometimes weeks or months before a diagnosis is made and treatment instituted. This was illustrated in our case report, in whom diagnosis was only suspected 1 month after admission.

We propose that a MRCP should be the initial investigation of choice in patients suspected of an extra-hepatic biliary injury. Such patients would classically have had a prior laparotomy or intra-abdominal sepsis. This potentially would make an ERCP technically more challenging and prone to complications. We further propose that an ERCP should be the technique of choice for intervention, rather than a diagnostic tool, in patients with suspected extra-hepatic biliary injury.

In our case, we attempted the initial ERCP in an attempt to achieve biliary continuity via stenting of the injured CBD. We proceeded to stent the CBD distal to the injury in an attempt to aid the drainage of the bilioma. The original intent of the follow-up PTC was to achieve external biliary drainage; however, we were fortunate to be able to traverse the complete biliary disruption using this technique.

From this experience, we propose that should there be similar cases, we should be open to the various methods of achieving internal biliary drainage.

We believe that the key to achieving surgical success in blunt extra-hepatic bile duct injury is to intentionally delay the

definitive surgery. The reason is that the majority of cases of this rare injury present late and as such, with sepsis and local inflammation on board, any attempts at surgical intervention would be fraught with a high incidence of difficult dissection, anastomotic leak and poor surgical outcome.

We propose that any initial surgery should be targeted at draining the area and controlling contamination. We should curtail the urge of attempting definitive surgical intervention at this stage.

Instead, after achieving control of sepsis and optimizing the patient, we should allow for a length of time (we propose a time interval of at least 6 months) before attempting definitive surgical intervention. In our case, after 11 months, despite having had a prior trauma laparotomy, the surgical dissection and mobilization was uncomplicated, resulting in a successful definitive surgical cure.

Complete transection of the CBD, such as in our case, has been managed by a wide variety of surgical procedures, including simple drainage [1,15], cholecystostomy and ligation of the CBD [9], choledocho-duodenostomy [5,14,17], choledocho-jejunostomy [8], cholecysto-jejunostomy [16,19] and reconstruction over a T-tube [3,4,7,18]. Irrespective of the type of repair, the majority of reported cases appear to have done well. Our patient was managed with a combination of initial bile drainage via a biliary stent followed by a definitive hepatico-jejunostomy at an elective setting.

Biliary-enteric anastomosis is the current preferred management of CBD transections because they offer the best long-term drainage with less risk of stricture formation than end-to-end anastomoses. This was demonstrated by Rodriguez-Montes et al. in their recent case series of seven patients [13].

4. Conclusion

Extra-hepatic bile duct injuries are uncommon after blunt abdominal trauma. A high index of suspicion of such injuries would ensure early diagnosis and appropriate management. Biliary drainage and control of sepsis should be the initial goals of treatment. Definitive surgical reconstruction should be delayed for several months.

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