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A rare case presentation of isolated complete CBD transection in blunt injury abdomen

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Abstract
The prevalence of blunt and penetrating injuries to the extra hepatic biliary system is limited but seems to be on a rising trend. Bile in the sub hepatic pouch leads to suspicion of such injuries intra operatively. The significant morbidity linked to these lesions is a result of inadequate diagnostic efforts and poor treatment discretion. In addition, pre-operative investigations are not very specific and hence diagnosis of such cases becomes very challenging. Most common aetiology among all those who experience traumatic bile duct injuries include penetrating trauma from either stab injuries or gunshot wounds. Bile duct injuries due to blunt trauma are predominantly due to traffic accidents such as compression by safety belt or airbag, falls, kicks or work accidents. These injuries are commonly associated along with biliary tract including liver, gall bladder, pancreas, duodenum and mesenteric injuries. This case report demonstrates a rare instance of specific injury to common bile duct without any other solid organ injury.

Keywords: Common bile duct, blunt injury abdomen, hepaticojejunostomy

Introduction
Non-surgical trauma to the extrahepatic biliary tract is uncommon but life threatening. Drysdale published the first report on this issue in 1861 [1]. According to Mc Fadden *et al*., the true incidence may be higher than is acknowledged in the literature due to the rising frequency of vehicular accidents. Many factors, such as impacts to the abdomen, getting "run over" by a vehicle, and, lately, abdominal trauma from steering wheels and seat belt injuries, can induce blunt trauma to the abdomen that results in an isolated injury to the common duct [2]. A high index of suspicion and awareness of these lesions, thorough exploration of all hematomas surrounding the bile ducts to reduce the likelihood of overlooked injuries, meticulous repair of tangential injuries and primary biliary enteric diversion for complete transection of the ducts can all reduce the severe morbidity associated with these injuries [3]. In this article one such rare instance of isolated complete common bile duct (CBD) transection in blunt injury of the abdomen has been reported.

Case report
A 21year old male patient presented to causality on 31/5/23 at 5:30pm, with complaints of upper abdominal pain for one day, after being hit by a lorry from back on the previous day. There was no history of injury to head, spine, chest and pelvis. Physical examination revealed a blood pressure of 100/70 mmHg, heart rate of 96 beats per minute, respiratory rate of 21 cycles per minute and saturation of 95% in room air. A laceration below the chin of 1cm*1cm and abrasions over the right lumbar region measuring 2 cm*1cm and left iliac fossa measuring 1cm*1cm were noted on inspection. On Palpation, per-abdomen was soft, tenderness was present over right hypochondrium, epigastrium and right lumbar regions without guarding or rigidity. Chest and pelvic compression tests were negative and spine was found to be non-tender. Auscultation of the chest revealed clear breath sounds without any added sounds, S1 and S2 heart sounds with no murmurs and bowel sounds were heard on auscultating the abdomen.
On investigating the patient, haematological studies revealed total leucocyte count of 6000/mm^3, haemoglobin of 11g/dl, platelets count of 1,32,000/mm^3 with normal liver function tests, renal function tests and coagulation profile. Radiological examinations revealed, mild free fluid in peritoneal cavity on e-fast with ultrasound abdomen which on aspiration yielded blood,

suggesting hemoperitoneum and collection was noted in Morrisons pouch. CT (compound tomography) of abdomen showed moderate hemoperitoneum but the source of haemorrhage could not be identified. Various other investigations such as chest x-ray, x-ray of erect abdomen, plain CT of brain and 3D (dimension) face and CT of the chest revealed a normal study.

One day observation pre-operative management was performed with the help of IV (intravenous) fluids, IV antibiotics and IV analgesics. Patient was advised to be nil per oral and subsequently Ryles tube and Foleys catheter were placed. A diagnostic laparoscopy was planned under general anaesthesia with a diagnosis of doubt. Intraoperative findings revealed, bile staining over supra-duodenum and extra-hepatic biliary system on placing a 10 mm port infra-umbilically. After mobilising the duodenum, complete transection at the middle part of common bile duct was noted. There were no retroperitoneal injuries and other solid organs seemed to be normal. On identifying the site of injury, diagnostic laparoscopy was converted to an open surgery. Plan of management was to perform an open cholecystectomy, Roux-En-Y-Hepaticojejunostomy, jejuno-jejunostomy, feeding jejunostomy and placement of ADK (abdominal drainage kit) bilaterally.

In our case we followed fundus first method of cholecystectomy was planned where in gall-bladder is dissected from the liver bed, cystic artery and duct are ligated with a 2.O size silk suture and transfixed with a 2.O size vicryl suture. Procedure performed was as follows.

- CBD (common bile duct) was skeletonised till proximal part and a lumen of 5-6mm CBD diameter was achieved.
- Distal CBD was retracted up to the duodenum.
- A loop of Jejunum was divided and proximal end was lifted through rent created in transverse mesocolon.
- A rent was created 10cm from proximal end of divided jejunum similar to size of lumen of CBD.
- Anastomoses was performed with the help of PDS 3.O and Vicryl 3.O sutures both anteriorly and posteriorly (End to Side Anastomosis).
- Proximal jejunal stump was closed with Silk 2.O suture.

Following this, Roux-En-Y-Hepaticojejunostomy was done to prevent postoperative leak as shown in Figure 1. Jejunojejunostomy was performed where distal loop of jejunum was anastomosed with other segment of jejunum with Silk 2.O suture (End to Side Anastomosis). This was followed by feeding jejunostomy with 18F Ryles tube 30cms from the site of Jejunojejunostomy. Subsequently serosal breaks were repaired with the help of Silk 2.O suture. In the end, two ADK were placed, one each in the HJ (Hepato-jejunostomy) site and pelvis respectively. Post procedure, patient was extubated and shifted to post-operative ward. He was started on antibiotics, analgesics and nutritional supplements along with regular monitored. Liquid diet was started on 2nd POD (post-operative day). Patient was given injection Octreotide at a dose of100 mcg subcutaneously on POD-2. General condition and haematological parameters were found to be normal for 5 days following the procedure. The drain volume collections were regularly noted as shown in Table 1.

In view of increasing drain fluid, HJ anastomotic leak and proximal jejunal stump blow out were suspected and patient was re-explored after 4 days of surgery under general anaesthesia. Intra-operatively, biliary leak was present over posterior anastomotic site of Roux-En-Y-Hepaticojejunostomy, whereas rest of the abdomen seemed to be normal. In order to correct the leak, Kehrs T-Tube Placement over HJ anastomotic site with tension suturing closure of abdomen was planned. Kehrs T-Tube of size 10 was placed with one limb in CBD and the other in jejunum with Vicryl 4.O suture. Third limb was secured to skin and brought outside as shown in Figure 2. Proximal jejunal stump was fixed to left lobe of liver and one jejunal loop distal to anastomosis was fixed to right lobe of liver. Patient was extubated and shifted to post-operative ward in stable condition. Patient was transfused with two packets of whole blood and fresh frozen plasma following the procedure. Simultaneously, he was started on higher antibiotics, analgesics, nutritional supplements and anticoagulants as a part of DVT (Deep vein thrombosis) prophylaxis. Liquid diet started on POD-2. He developed hypokalaemia on POD 3 for which he was started on syrup containing potassium chloride, 5ml thrice a day. He also had hypoglycaemic attacks which was corrected with 25% dextrose. The drain volume collections post first re-exploration surgery were as shown in Table 2.

Monitoring the drain volume led to confirmation of anastomotic leak is confirmed and a repeat re-Exploration was planned under general anaesthesia. In the second re-exploration, on opening the peritoneal cavity 500ml of bilious fluid was noted, CBD was not found, Kehrs T tube was displaced, H.J anastomotic leak and sloughed off bowel proximal jejunal stump were noted. In view of correcting these changes, a surgery for re-establishment of HJ Anastomosis and repositioning Kehrs T-Tube was planned. Sloughed off bowel was resected at HJ anastomotic leak site and the remaining part of proximal jejunal loop was closed with purse string sutures using silk 2.O suture inverting the lumen. CBD not being found, Common Hepatic duct localized, Kehr T tube was placed in the common hepatic duct and in the new rent created in the jejunum and HJ anastomosis was revised as shown in Figure 3 with Vicryl 4.0 and Vicryl 5.0. Jejunal loop was fixed to right and left lobes of liver. Tension Suturing was done to close the abdomen.

Patient was extubated and shifted to ward in stable condition following the procedure. Patient was transfused with one packet of whole blood and fresh frozen plasma post operatively. Patient was continued with IV antibiotics, IV analgesics and nutritional supplementation such as amino acids and albumin in infusion form, anticoagulants were given as a part of DVT prophylaxis and injection octreotide was also given to decrease the bilious output. Patient was given total parental nutrition till oral feeds were started. Feeding jejunostomy (FJ) feeds were started on POD-3 when bowel sounds were heard. Oral liquid diet was started on POD-4, oral solid diet was started on POD-5. The bilious output from the sub hepatic drain was filtered and again it was given through FJ tube. High protein diet was given both orally and through FJ tube as per calorie requirement. Patient was advised airbed, positional changes to avoid pressure sores. Electrolyte imbalance such as hypokalaemia which occurred on POD-8 was corrected with potassium chloride syrup. The drain output after 2nd Re-Exploration were as shown in Table 3.

As the Subhepatic drain and pelvic drain outputs slowly decreased to minimal values, both the drains were removed and patient was planned for discharge on POD22 after 2nd re-exploration surgery in account to his nutritional and psychological improvement. Following all the advices and proper counselling patient was discharged after 35days of hospital stay from the time of admission. Patient was asked to revisit after a week to follow up with T-tube cholangiogram and MRI abdomen with MRCP. T-tube cholangiogram showed contrast free flow filling the entire intrahepatic and extra-hepatic biliary system and passing to the bowels indicating the potency

of anastomosis as shown in Figure 4. MRI Abdomen with MRCP turned out to be of normal study with no dilation of CBD and Intrahepatic Biliary system. T tube was removed and patient was sent home with all the necessary precautions.

Table 1: Increasing output in both subhepatic and pelvic drains following initial surgery

Post op day	Subhepatic drain	Pelvic drain
Day 1	150 ML/24 Hour Bilious	160 ML/24 Hours Bilious
Day 2	200 ml/24 hour Bilious	120 ml/24 hours Bilious
Day 3	250 ML/24 hours Bilious	100 ml/24 hours Bilious
Day 4	300 ML/24 Hours Bilious	100 ml/24 hours Bilious

Table 2: Increasing output in both subhepatic and pelvic drains following first re-exploration surgery

Post op day	T tube	Right subhepatic drain	Pelvic drain
Day 1	100 ML (Bilious)	50 ml (Bilious)	40 ml (Serosanguinous)
Day 2	60 ml (Bilious)	Nil	60 ml (Serosanguinous)
Day 3	30 ml (Bilious)	150 ml (Bilious)	20 ml (Serosanguinous)
Day 4	20 ml (Bilious)	450 ml (Bilious)	20 ml(Serosanguinous)
Day 5	30 ml (Bilious)	300 ml (Bilious)	30 ml(Serosanguinous)
Day 6	40 ml (Bilious)	300 ml (Bilious)	5 ml(Serosanguinous)

Table 3: Initial increase followed by a drop in the outputs of subhepatic and pelvic drains

Post op day	T tube	Subhepatic drain
Day 1	140ml (Bilious)	140 ml (bilious)
Day 2	220 ml (bilious)	120 ml (bilious)
Day 3	5 ml (bilious)	400 ml (bilious)
Day 4	10 ml (bilious)	350 ml (bilious)
Day 5	30 ml (bilious)	300 ml (bilious)
Day 6	5 ml (bilious)	350 ml (bilious)
Day 7	40 ml (bilious)	400 ml (bilious)
Day 8	30 ml (bilious)	500 ml (bilious)
Day 9	20 ml (bilious)	700 ml (bilious)
Day 10	30 ml (bilious)	1000 ml (bilious)
Day 11	50 ml (bilious)	500 ml (bilious)
Day 12	40 ml (bilious)	400 ml (bilious)
Day 13	80 ml (bilious)	80 ml (bilious)
Day 14	70 ml (bilious)	50 ml (bilious)
Day 15	80 ml (bilious)	40 ml (bilious)
Day 16	40 ml (bilious)	100 ml (bilious)
Day 17	100 ml (bilious)	80 ml (bilious)
Day 18	200 ml (bilious)	50 ml (bilious)
Day 19	300 ml (bilious)	30 ml (bilious)
Day 20	200 ml (bilious)	20 ml (bilious)
Day 21	200 ml (bilious)	15 ml (bilious)
Day 22	100 ml (bilious)	15 ml (bilious)

Fig 1a: Laparoscopic picture showing bile staining noted at the supra duodenal region and extra hepatic biliary system

Fig 1b: Laparoscopic picture showing complete transaction at the middle part of the common bile duct

Fig 2a: Proximal jejunal stump with anastomosis of common bile duct and jejunum

Fig 2b: Posterior anastomosis of hepaticojejunostomy

Fig 3a: Biliary leak present over posterior anastomotic site of Roux-En-Y-Hepaticojejunostomy

Fig 3b: Placement of Kehr's T tube

Fig 4a: New proximal jejunal loop closed with purse string sutures

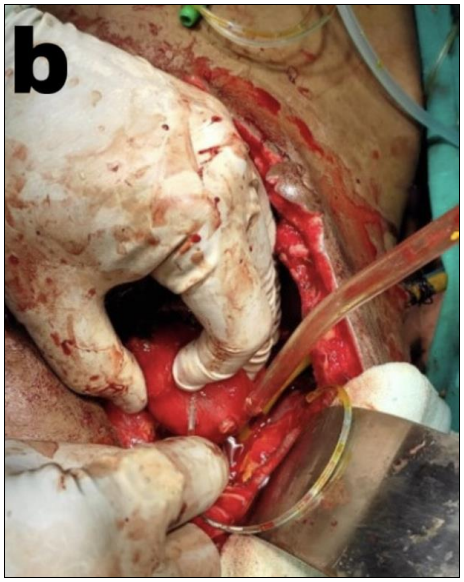

Fig 4b: Kehr's T tube placement in the high end of common bile duct and new rent created in jejunum

Fig 5: T tube cholangiogram showing complete filling of biliary system and free flow to the bowels

Discussion

Battle and Spencer first described the first two cases of isolated common bile duct transection caused by blunt nonpenetrating trauma at the end of the 20th century [4]. Three sites of the biliary tract's relative fixation where CBD damage usually occurs are the pancreaticoduodenal junction, the bifurcation of the hepatic ducts, and the beginning of the left hepatic duct. Proximally and distally, where the biliary tree is relatively stable, disruption is more likely to occur [5, 6]. Some possibilities on how CBD injuries are caused include: a) compression of the biliary system over the vertebral column [7] b) external compression of the gallbladder with a subsequent increase in intraductal pressure that disrupts the bile duct [8] c) A tear in the duct where its fixed and mobile sections meet [9]. The fact that two cases of common bile duct injury after cholecystectomy [10] have been reported somewhat diminishes the importance of compression of the gallbladder as a major causative factor.

According to Bourque *et al*., the average time between the clinical presentation of an isolated bile duct damage and surgical intervention was 18 days, with a range of several hours to 60 days. Post-injury symptoms in these circumstances may include nausea, vomiting, jaundice, and abdominal pain [11]. Rarely, patients with isolated biliary tract injuries may show up with an acute abdomen. The more frequent symptoms are vague pain in the abdomen, a low-grade fever, and a mild leucocytosis. Peritonitis may take days or weeks to manifest [12]. The patient may then remain remarkably stable until jaundice and abdominal distension due to bile ascites occur around the third day. Due to relatively little symptoms, those whose presentation was delayed may not have sought medical attention at the time of abdominal trauma, or the biliary injury may have gone unnoticed during first clinical evaluation or surgery [13].

Due to the lack of released bile in the free peritoneal cavity when the damage is recent, taps may be mistakenly negative early in the clinical course. Laboratory tests are not helpful but elevated bilirubin is detectable if there is delay in diagnosis [14]. When bile is seen in the abdominal cavity or haemorrhage and/or hematoma are present in the portal pedicle, the diagnosis is typically made during an emergency laparotomy for concomitant abdominal injuries. If a laparotomy is not performed right away, the diagnosis is frequently significantly delayed. In fact, the prevalence of nonsurgical techniques to the early management of abdominal injuries has led to an increase in the proportion of late diagnosis. In some situations, abdominal computed tomography or ultrasonography reveal an intra-abdominal liquid that is thought to be blood rather than bile [15]. The majority of cases can be treated by choledochorrhaphy and Kehr tube insertion through a separate orifice where the biliary duct tissue is healthy when the lesion includes at least 50% of the main bile duct circumference. This is the quickest and most effective approach available without bile duct dilation. Hepaticojejunostomy is the procedure of choice if the patient is hemodynamically stable when the bile duct is completely severed. Choledochoduodenostomy is another option if the distal end cannot be located out of risk of postoperative stricture. If the distal bile ducts that were cut couldn't be located, they might be located through a duodenostomy using retrograde ampulla of water probing and direct duct to duct anastomosis. About 10% of patients with a main bile duct lesion experience morbidity, including the possibility of biliary fistulas, haemobilia, biliomas, intrahepatic abscesses, and ascending cholangitis. The majority of patients die from electrolyte imbalances, biliary sepsis, and other problems unrelated to biliary lesions.

Conclusion

In this case study, we describe an instance of extrahepatic bile duct rupture caused by blunt abdominal trauma. The difficulty in diagnosing these issues is a result of the use of suboptimal imaging techniques, the existence of confusing injuries, and the rarity of blunt traumatic CBD injuries. There are even fatal consequences as a result of inadequate treatment and delayed identification of these injuries. Although managing such situations is tough, in our case we were able to achieve the intended repair after three re-exploration surgeries. We have reported this case to emphasise the rarity of occurrence of such cases as well as the challenges involved in its identification and treatment.

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