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Case Study

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T tube drainage for spontaneous perforation of the extrahepatic bile duct

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A Study Design
B Data Collection
C Statistical Analysis
D Data Interpretation
E Manuscript Preparation
F Literature Search
G Funds Collection

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Summary

Background: Spontaneous perforation of the extrahepatic bile duct is very rare. We report a patient with a spontaneous perforation of the left hepatic bile duct who was diagnosed preoperatively.

Case Report: A 65-year-old woman was admitted to our hospital complaining of a right upper quadrant pain lasting for two days. She was diagnosed as having a perforated bile duct and peritonitis and underwent a laparotomy. After a cholecystectomy, T-tube drainage of the left hepatic duct was performed. The postoperative course was uneventful. The T tube was removed 25 days after the surgery.

Conclusions: A more noninvasive procedure, such as endoscopic treatment, should play a central role in the management of extra bile duct perforation. For this case, however, we chose to perform a laparotomy based on the patient's general condition and the presence of peritonitis. T tube decompression is effective and a safe and reliable method. The goal of treatment is to stop the bile leakage, resolve the choledocholithiasis and cholangitis, and reconstruct the bile duct.

key words: spontaneous perforation of the bile duct • preoperative diagnosis • T tube drainage

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Background

Spontaneous perforation of the bile duct is very rare in adults. Such events are classified into perforations of the intrahepatic bile duct and perforations of the extrahepatic bile duct. Intrahepatic bile duct perforations are located at the surface of the liver, while extrahepatic bile duct perforations can be located in four areas (right hepatic duct, left hepatic duct, common hepatic duct, and common bile duct). Spontaneous perforations are difficult to diagnose preoperatively. Many patients are diagnosed as having cholecystitis or choledochocystitis preoperatively. Because of the prolonged duration of symptoms, prognoses were wrong. Here, we report a patient with a spontaneous perforation of the left hepatic bile duct who was diagnosed preoperatively and survived the operation. Although the development of endoscopic instrumentation and techniques has enabled endoscopic treatment to replace laparotomy in many cases, a laparotomy was performed in the present case because of the patient's general condition and the presence of peritonitis. When selecting an operative procedure, if the site of perforation can be detected, T tube decompression is an effective procedure that is safe and reliable. Several other patients have reportedly undergone the same procedure.

Case Report

A 65-year-old woman was admitted to our hospital with a complaint of right upper quadrant pain lasting for two days. She had a past medical history of hypertension. A physical examination revealed a blood pressure of 76/-mmHg, a pulse of 144/minute, and a temperature of 38.8°C. She had developed jaundice. An abdominal examination revealed rebound tenderness in the entire abdomen and the presence of Murphy's sign. Her WBC was 21400/mm^2 (4000–9000/mm^2), PLT was 238×10^3/mm^2 (130–400×10^3/mm^2),CRP was 19.01 mg/dL (<0.1mg/dL), T-bil was 5.41 mg/dL (<1.2 mg/dL), AST was 123 IU/L (<35 IU/L), ALT was 222 IU/L (<40 IU/L), ALP was 1633 IU/L (<338 IU/L), LDH was 258 IU/L (<211 IU/L), α-GTP was 668 IU/L (<50 IU/L), UN was 14.1 mg/dL (<20 mg/dL), Cre was 0.49 mg/dL (<0.8 mg/dL), and Alb was 2.4 g/dL (3.9 g/dL<). She presented with Charcot's triad. Although we performed an abdominal ultrasound examination, the right upper quadrant was nearly impossible to visualize because of the presence of a large amount of intestinal gas. An abdominal computed tomography (CT) examination showed choledocholithiasis and a dilatation of the common bile duct (15 mm). Although the wall of the gallbladder was thickened and slightly swollen, cholecystolithiasis was absent. Of note, a calculus deviated from the biliary duct and an abscess located ventral to the hepatoduodenal ligament were observed (Figure 1A). Calculi with a density approximately equal to that of the deviated calculus were also detected in the common bile duct (Figure 1B). The patient was diagnosed as having a perforated bile duct and pan-peritonitis. Noninvasive procedures, such as endoscopic or percutaneous treatments should play a central role in the management of extra bile duct perforation. In the present case, however, the patient's general condition and the need to drain the abdominal cavity because of the presence of peritonitis as well as the relatively thick nature of the bile duct defect led us to select a laparotomy. During

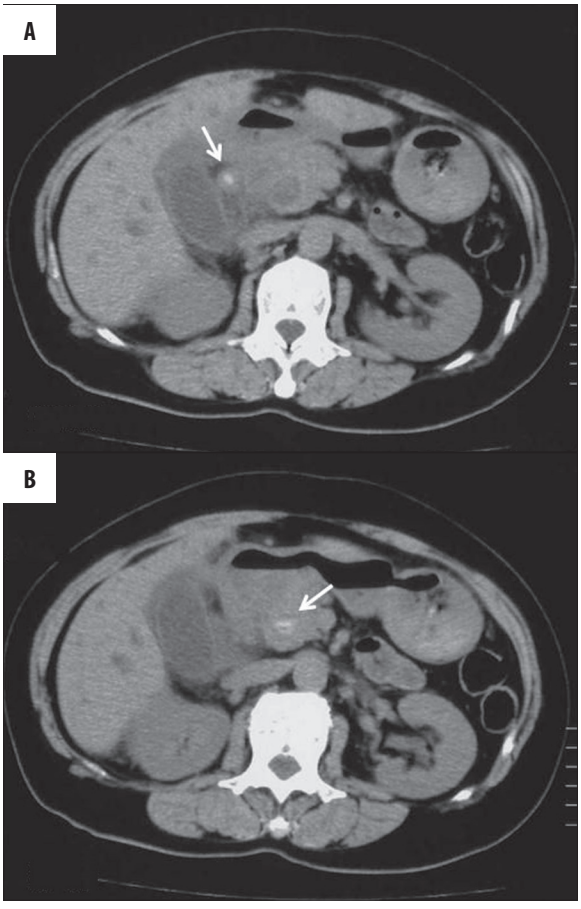

Figure 1. (**A**) A calculus deviated from the hepatoduodenal ligament was recognized in the right upper peritoneal space (arrow). The wall of the gallbladder (GB) shows evidence of thickening. No GB stones are visible. (**B**) A small amount of ascites has accumulated in Morison' pouch. Several calculi similar to the deviated calculus are visible in the common bile duct (arrow).

the median incisional laparotomy, 500 mL of bile was collected ventral to the hepatoduodenal ligament. A green viscous abscess adhered to Calot's triangle was observed, and the calculus observed on the CT image was also identified. The bile source was a perforated hole with a diameter of 10 mm in the anterior wall of the bile duct (Figure 2A). The wall of the gallbladder was edematous but did not even develop into catarrh. After the extirpation of the gallbladder, several common duct stones were removed (Figure 2B). A T tube was placed into the hole of the perforation and secured using sutures (Figure 2C). An intraoperative cholangiogram demonstrated that the site of the peroration was the left hepatic duct. No calculi were remaining in the bile duct, and other perforated site observed using intraoperative cholangiography (Figure 3A). The interior of the bile duct was not inspected through an endoscope because of the fragility of the bile duct. The postoperative course was uneventful. The T tube was removed 25 days after the surgery. At a 1-year follow-up examination (using magnetic resonance cholangiopancreatography), the patient was in good health and her liver function tests were normal (Figure 3B).

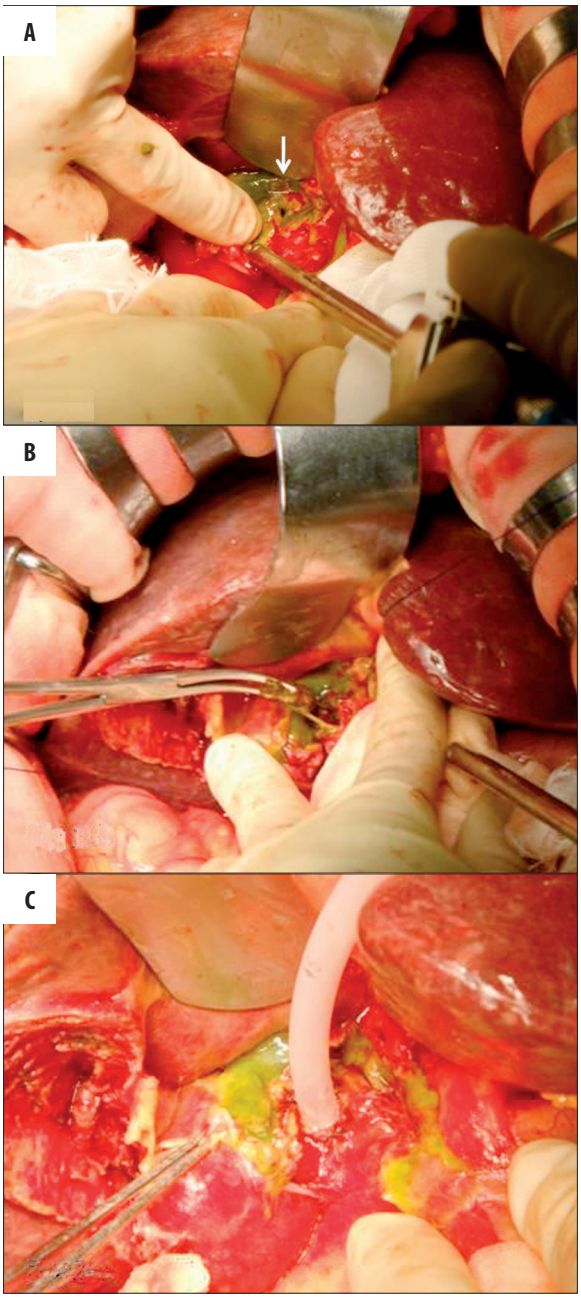

Figure 2. (**A**) The arrow indicates the hole in the anterior wall of the bile duct. The hepatoduodenal ligament became friable because of an infection. (**B**) The calculi were grasped with forceps and removed carefully. (**C**) A T tube was inserted from the perforated site, and a cholangiography was performed using a low pressure.

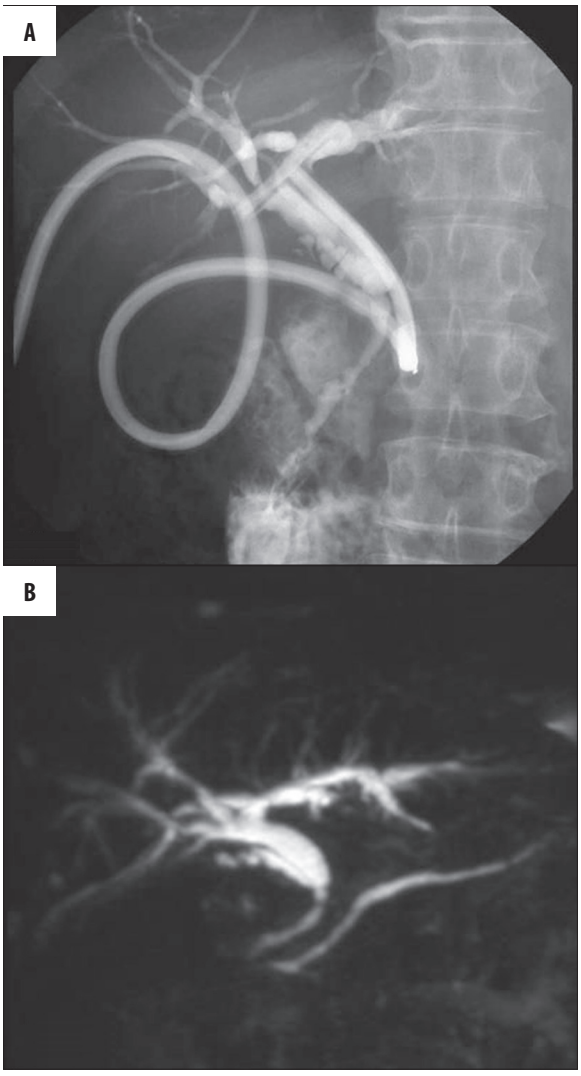

Figure 3. (**A**) Intraoperative cholangiography shows the perforation in the left hepatic duct; no calculi remain in the bile duct. No other perforations or stenosis in Calot' triangle were observed. (**B**) Magnetic resonance cholangiopancreatography examination performed 1 year after surgery shows a healthy bile duct with no signs of stenosis or dilatation.

Discussion

Spontaneous perforation of the bile duct is unrelated to trauma and surgical complications and is an extremely rare condition that is more often seen in infants and children [1]. Such events are classified into perforations of the intrahepatic bile duct and perforations of the extrahepatic bile duct. Freeland reported the first case of spontaneous hepatic duct perforation in 1882 in a case that was diagnosed during an autopsy [2]. To date, only about 20 cases of intrahepatic bile duct perforations [3] and 50 cases of extrahepatic bile duct perforations [4–7] have been reported. The etiologic factors of spontaneous perforation of the extrahepatic bile duct have been reported as follows: 1) erosion by biliary stones directly through the duct wall; 2) obstruction of the distal bile duct and increased intraductal pressure; 3) vascular thrombosis supplying the duct wall; 4) intramural infection of the duct as a result of cholangitis; 5) regurgitation of pancreatic secretions into the bile duct; 6) diverticulitis of the bile duct; and 7) carcinomas arising in the hepato-biliary-pancreatic organs. Combinations of these factors are probably responsible for most bile duct perforations [2]. One of the most frequent of all causes of spontaneous perforations are biliary stones [2,8], especially after choledocholithiasis [4,8]. Combined with calculi, infection also plays an important role in the etiology of spontaneous perforation of the bile duct. The most common site

of perforation is the common bile duct (32 cases), followed by the common hepatic duct (19 cases). The perforation in the present case occurred in the left hepatic duct. The etiology for the localization of the perforation has not been discussed. The present report is, to our knowledge, the first time that a definitive diagnosis of spontaneous perforation of the extrahepatic bile duct has been obtained preoperatively in an adult [9–11]. The CT findings for cholecystitis and/or cholangitis are very distinctive, and perforation of the bile duct is often associated with cholecystitis and/or cholangitis, with the perforation findings recognized as an accompanying lesion. Furthermore, very few previous cases have described the presence of ascites and fluid collection on the right side if the anterior parenteral space and the perirenal space [9]. In the present case, the presence of a deviated calculus from the bile duct was the prime reason why a definitive diagnosis could be obtained preoperatively. A previous report has stated that a hepatic iminodiacetic acid scan is a reliable test for showing the extravasation of bile and confirming a perforation [11]. Endoscopic instrumentation and techniques have evolved rapidly over the last few decades and have replaced laparotomy because of noninvasive technique and prognoisis after treatment [12–15]. Endoscopic treatment should have been performed if the patient had not developed shock and pan peritonitis.

The goal of treatment, which should be tailored to individual patients, is to stop bile leakages, cure choledocholithiasis and cholangitis, and reconstruct the bile duct. In particular, an optimal operation should consist of a cholecystectomy, intraoperative cholangiography, bile duct exploration, repair of the perforated site and T tube insertion. Bile duct injury can be avoided using a cautious approach during the dissection of Calot's triangle and the early recognition of its presence. The site of T tube insertion depends on the accessibility of the perforation. T tube insertion is crucial for the successful treatment of spontaneous perforations of the bile duct. Most such perforations occur on the anterior wall of the bile duct [16,17]. Bile duct stones can be easily removed and the T tube inserted during the treatment of such perforations. Surgical management is more difficult when the perforation occurs on the other side of the wall. If a large ductal defect is present, a more invasive operation should be considered, such as a choledochojejunostomy, hepaticojejunostomy, hepatoduodenostomy or gallbladder wall flap [11,18–20]. Although biliary endoscopy is useful for the removal of bile duct stones and intraoperative diagnosis, intraoperative cholangiography is a more noninvasive approach despite the friability around the perforation. Needless to say, adequate drainage of the right upper abdomen is very important.

Until the 1960s, the mortality rate for bile duct perforations was estimated to be 50%. The introduction of current examination techniques, progress in endoscopic treatment, interventional radiology, surgical techniques and antibiotics, however, have contributed to a significant decline in the mortality rate since the 1970s [7,11–20].

Conclusions

An emergent operation for a spontaneous perforation of the left hepatic duct was performed. Although spontaneous perforations are difficult to diagnose based only on diagnostic imaging, the adequate drainage of bile can improve this potentially fatal condition.

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