

Bull Yamaguchi Med School 53(1-2):13-17, 2006

Management of Extrahepatic Bile Duct Injury Complicating with Laparoscopic Cholecystectomy — an Experience of the Magnetic Compression Anastomosis between the Common Bile Duct and the Duodenum —

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(Received January 24, 2006, accepted May 8, 2006)

Abstract Choledochoduodenostomy was performed using magnets interventionally in a patient with complete obstruction of the common bile duct (CBD) after laparoscopic cholecystectomy (Lap-C). Choledochoduodenostomy using magnets was performed 6 months after Lap-C. A cylindrical magnet measuring 4 mm in diameter and 9 mm in length was delivered to the obstructed CBD through percutaneous transhepatic biliary drainage route that was dilated to 14 French. Then a cylindrical magnet measuring 5 mm in diameter and 5 mm in length was delivered at the bulb of the duodenum using peroral endoscopy. Anastomosis between the CBD and the duodenum was formed gradually by the force of compression between the two magnets. Two weeks later, the anastomosis was accomplished without any adverse event. Magnetic compression anastomosis is one of useful strategy for biliary complications (stenosis or obstruction) after Lap-C.

Key words: magnetic compression anastomosis, choledochoduodenostomy, laparoscopic cholecystectomy

Introduction

Biliary tract injury during laparoscopic cholecystectomy (Lap-C) is a rare complication, but one of the most severe. Especially the management of late obstruction or stenosis of the common bile duct (CBD) is very difficult because of intense inflammatory fibrosis surrounding the bile duct. Magnetic compression anastomosis is a less-invasive interventional method, reported by Yamanouchi et al.¹⁾ We performed choledochoduodenostomy

using magnets interventionally for a patient with complete obstruction of the common bile duct after Lap-C.

Case report

A 58-year-old woman was admitted to our hospital, complaining of jaundice and demonstrating a biliary fistula in the abdomen. She had undergone Lap-C for chronic cholecystitis 2 months earlier at another hospital. The CBD was injured during Lap-C, thus repair of

the CBD using a stapler was performed laparoscopically during the initial procedure, and only abdominal drainage for biliary peritonitis was performed for 16 days after Lap-C. The detail of the initial operation and the second operation was unknown. It was speculated that the injury point of CBD was closed by stapler during initial operation and the choledochojunostomy could not be performed during second operation because of severe inflammation. Bile leakage continued after the second procedure, and resulted in complete obstruction of the CBD following local inflammation. Mild hepatic dysfunction (AST:97 IU/l, ALT:142 IU/l, T-Bil:3.8 mg/dl) was demonstrated on blood examination at admission to our hospital. Three drainage tubes had been inserted into her abdomen (bilateral subphrenic spaces and infra-hepatic space), and methicillin resistance staphylococcus aureus (MRSA) was detected in the turbid discharge from all drains. On abdominal CT scan, severe fatty liver was pointed out, but

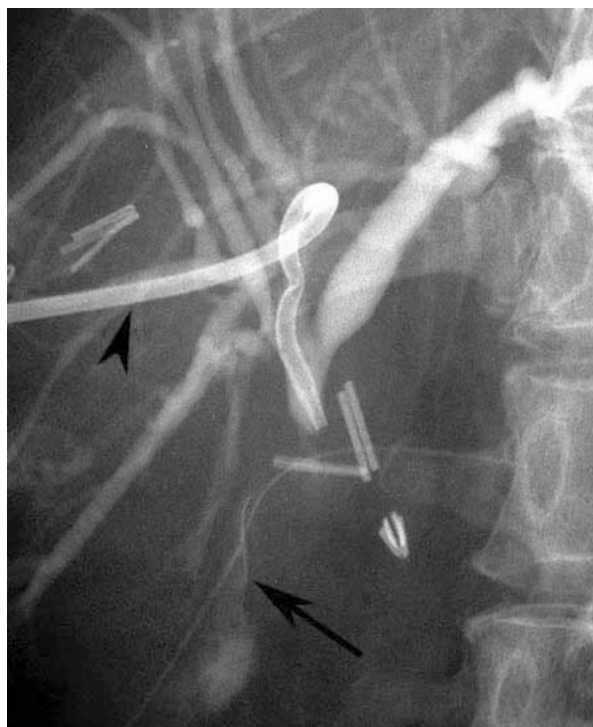


Fig. 1 A percutaneous transhepatic cholangiogram before second PTBD. A PTBD tube was inserted into the bile duct (arrow head). Common hepatic duct was obstructed completely. Bile leakage from the proximal hepatic duct was observed (arrow).

intra-abdominal abscess was not detected, and intrahepatic bile ducts were not dilated. Percutaneous transhepatic biliary drainage (PTBD) was performed through the posterior branch immediately after the admission. The extrahepatic bile duct was completely obstructed in the middle portion, and bile leakage from the proximal hepatic duct was observed on percutaneous transhepatic cholangiography (PTC) (Fig. 1). Additional PTBD tube was inserted into the left hepatic duct several days after initial PTBD because the initial PTBD tube might be escaped from bile duct accompanied with respiratory movement. The biliary fistula was closed 2 weeks after initial PTBD. After it had been hospitalized, the patient left in two months hospital with two PTBD tubes.

Interventional choledochoduodenostomy using magnets was performed 6 months after Lap-C hospitalized again. A sterilized metallic wire bonded to cylindrical magnet measuring 4 mm in diameter and 9 mm in length (Fig. 2) with adhesive was delivered to the

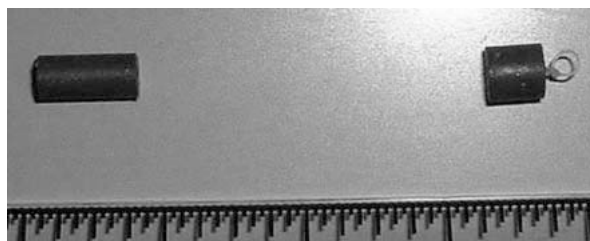


Fig. 2 Magnet in the choledocus (left) was a cylindrical magnet measuring 4 mm in diameter and 9 mm in length, 3200 Gause, and the magnet in the duodenum (right) was a cylindrical magnet measuring 5 mm in diameter and 5 mm in length, 3700 Gause.

CBD through the left PTBD route that was dilated to 14 French in two weeks under an X-ray seeing in supine position. Then an upper endoscope was inserted in left decubitus position and a cylindrical magnet measuring 5 mm in diameter and 5 mm in length (Fig. 2) was delivered to the bulb of the duodenum using peroral endoscope (Fig. 3). These magnets were provided from doctor Yamanouchi.¹⁾⁴⁾ The magnet in CBD was fixed there by fixing a metallic wire to walls of the abdomen. All treatment was perfor-



Fig. 3 The magnet was delivered to the CBD through the PTBD route after dilating to 14 French. The other magnet was delivered to the bulb of the duodenum by peroral endoscopy.



Fig. 4 The distance between the two magnets progressively shortened over two weeks.

med in about 30 minutes. Anastomosis between the CBD and the duodenum was formed gradually by the force of compression between the two magnets (Fig. 4). Two weeks later, the anastomosis was completed and there were no adverse events. The two magnets were left in the gap duodenum by pulling the metallic wire and excreted from the body with stool. A 14Fr. stent tube was placed in



Fig. 5 Passage of the anastomosis was good.

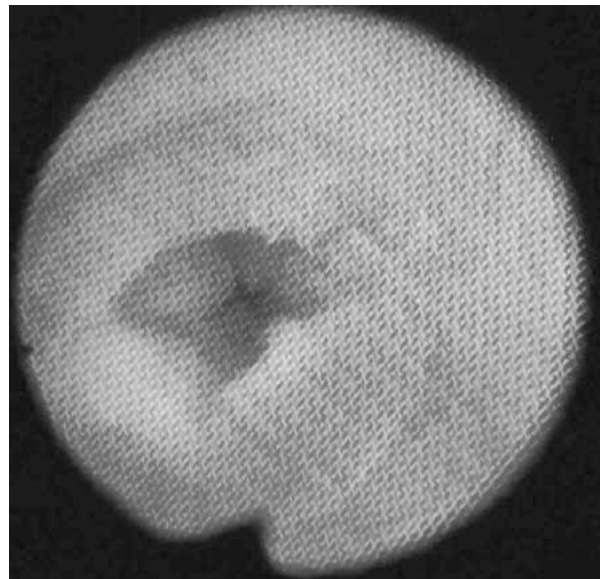


Fig. 6 Good epithelization of the stoma was observed endoscopically.

the fistula (anastomotic stoma) to prevent re-obstruction continuously after the magnets had been pulled apart from the metallic wire. The stent tube was removed 4 months after its placement. The patency of the anastomotic stoma was examined by PTC (Fig. 5). Epithelization of the stoma was observed endoscopically (Fig. 6). The patient has had no further complaints to date.

Discussion

Around 40-50 cases of Lap-C are performed every year and 522 cases of Lap-C have been performed since 1991 to July 2003 in our institution. Major intraoperative injury of the extrahepatic bile duct occurred in two cases (0.4%). One case involved complete transection of the CBD, and the procedure was converted to open surgery immediately, and choledochojunostomy (Roux-en Y) was performed. In the other case involving major injury to the CBD, sutured repair was done, but severe stenosis of CBD occurred following inflammation due to bile leakage, thus choledochojejunostomy was performed 15 months after the initial surgery (Lap-C). There have not been any major biliary complications in the recent 7 years.

Lap-C is associated with a higher rate of bile duct injuries than open cholecystectomy.²⁾ The incidence of bile duct injuries has remained almost constant and these injuries tend to be more serious; especially the management of late obstruction or stenosis of the CBD is very difficult. Management of these injuries range from therapeutic endoscopy to liver transplantation,^{2) 3)} but some surgical treatment will probably be needed in most cases. Surgery for inflammatory obstruction or stricture of the CBD is occasionally very difficult, and not only patients but also surgeons prefer to avoid surgery whenever possible. Magnetic compression anastomosis is an interventional method, reported by Yamanouchi et al recently.^{1) 4)} Using this technique, formation of an anastomosis between two ductal organs (e.g., CBD and duodenum or jejunum) becomes possible without surgical intervention. The anastomosis is formed gradually by the magnetic attraction between the two magnets. This method is extremely

lesinvasive for patients, and few major complications (e.g., anastomotic leakage or massive bleeding) were reported, although there may be mild abdominal pain after placement of the magnets and anastomotic stenosis has been reported.^{5) 6) 8)} To prevent anastomotic stenosis, a stent tube should be placed through the anastomotic fistula for three or more months for choledochoenterostomy.^{5) 7) 8)} The most important problems with this method are that re-stenosis or re-obstruction of the anastomotic stoma and recurrent cholangitis may occur. Long-term outcomes of this method have not yet been clarified, and careful observation of the patients must be continued. However, magnetic compression anastomosis is very useful for biliary complications (stenosis or obstruction) after Lap-C.

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