

Application of “Sandwiched T Tube” in Repairing Iatrogenic Right Accessory Hepatic Duct Injury

W-M Yi, C Chen, C Peng, B Jiang, J-Z Wu

ABSTRACT

Objective: To summarize and present the application of sandwiched T tube in repairing the iatrogenic right accessory hepatic duct injury.

Methods: We retrospectively analyzed the clinical data of 8 patients who were diagnosed with iatrogenic right hepatic duct injury from 2005 to 2012 in Hunan Provincial People's Hospital, Changsha, China. When patients were diagnosed with the right accessory hepatic duct injury, their right accessory hepatic duct and the residual end of ductus cysticus are anastomosed end to end, and then the sandwiched T tube was employed to provide support for the anastomotic site. Subsequently, the umbilical vein patch and medical adhesive wound closure were used to cover the anastomotic site.

Results: After surgery, patients did not suffer from postoperative complications such as bile leakage and intra-abdominal infections in the short term and such as bile duct inflammation and bile duct stenosis in the long term.

Conclusion: The application of sandwiched T tube was a simple and practical method to handle the iatrogenic right accessory hepatic duct injury.

Keywords: Anastomosis, iatrogenic right accessory hepatic duct injury, sandwiched T tube

From: Division of Hepatobiliary Pancreatic Surgery, Hunan provincial people's hospital, Changsha, 410005, P.R. China

Correspondence: Dr Wei-Min Yi, Division of Hepatobiliary Pancreatic Surgery, Hunan Provincial People's Hospital, No 61 the Liberation of West Road, Changsha, 410005, China
Email: weiminyhncs@sina.com

INTRODUCTION

The bile duct injury is the main complication of laparoscopic cholecystectomy (LC) and bile duct variation such as accessory hepatic duct is the leading cause (1, 2). With the development of surgical technique and instruments, surgery is more and more elaborate and safe. However, if LC is not appropriately treated, the extrahepatic bile duct anatomic variation can cause serious consequences and even endanger the patient lives.

Iatrogenic right accessory bile duct injury is a serious and challenging problem in LC (3), while the right accessory hepatic duct injury is very rare and difficult to repair. After surgery, patients usually suffer from many postoperative complications such as bile leakage and intra-abdominal infections in the short term and such as bile duct inflammation and bile duct stenosis in the long term (4). From 2005 to 2012, a sandwiched T tube was applied to repair iatrogenic accessory right hepatic duct injury for 8 patients in our hospital (Hunan Provincial People's Hospital). After surgery, patients did not suffer from postoperative complications such as bile leakage and intra-abdominal infections in the short term and such as bile duct inflammation and bile duct stenosis in the long term, and postoperative recovery achieved satisfactory results.

SUBJECTS AND METHODS

General data

Eight patients with average age of 55.6 ± 10.2 consist of 2 males and 6 females. The 8 patients were diagnosed with cholecystitis, and meanwhile, 3 of them were diagnosed with choledocholithiasis. LC was used to treat the 5 patients with cholecystitis. However, LC and biliary exploratory surgery were used to treat the 3 patients with cholecystitis and choledocholithiasis. After the removal of gallbladder, bile leakage from the gallbladder

triangle was observed. Inspection results revealed that the bile leakage was caused by the lacerated ends of bile duct with average diameter of 4.2 ± 0.3 mm, and then laparotomy was immediately performed. The common hepatic duct was intact, so the right accessory hepatic duct injury was highly suspected. After cutting the common bile duct, 6 patients with the bile duct injury in the right posterior lobe of liver and 2 patients with the bile duct injury in the right anterior lobe of liver were observed. The average length of defect was 1.5 ± 0.6 mm, ranging from 1 cm to 2.5 cm (Fig. 1). This study was approved by the Ethics Committee of the Hunan provincial people's hospital.

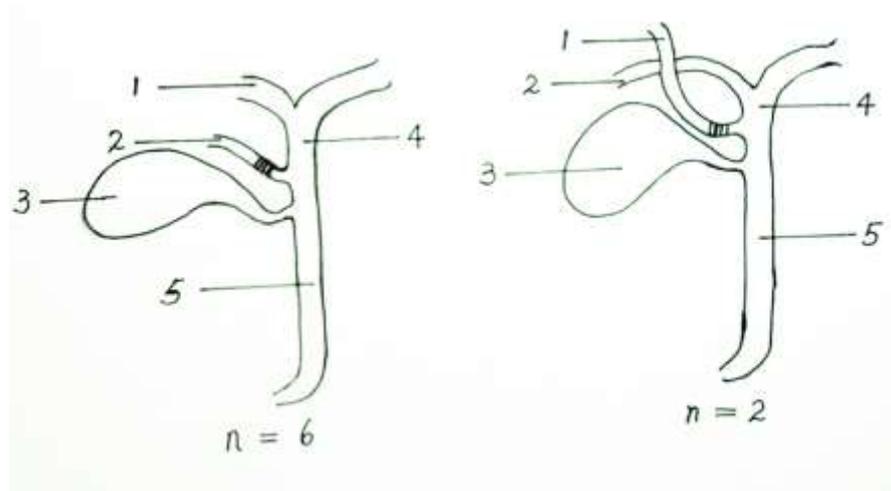


Fig. 1: The right accessory hepatic duct injury. 1: bile duct in right anterior lobe, 2: bile duct in right posterior lobe, 3: gallbladder, 4: common hepatic duct, 5: common bile duct. n = 6: 6 patients with the bile duct injury in the right posterior lobe; n = 2: 2 patients with the bile duct injury in the right anterior lobe.

Surgical procedure

After thoroughly inspecting bile duct and the injury was diagnosed with the right accessory hepatic duct injury, the titanium clip or knot was removed from the residual end of bile duct. The necrotic tissues were eliminated from the rupture location of right accessory hepatic duct and bile duct followed by end to end anastomosis. Three or four 1 mm holes were created at

the proximal region of a 2.5 mm silicon tube, and then the silicon tube was inserted into the liver about 5 cm through common bile duct and the anastomotic site. A #16 T tube was implanted into the common bile duct after trim. The distal end of the silicon tube was embedded into the long arm of T tube and #1 suture was used to fix T tube and silicon tube. Then the sandwiched T tube was established (Fig. 2). The 4-0 monofilament absorbable sutures were used to close the common bile duct. The leakage in common bile duct anastomosis was investigated after water was infused into T tube. The umbilical vein in round ligament of liver was found after removing adipose tissue and was gradually expanded with biliary stents, and thereafter, 2 × 2 cm umbilical vein patch was prepared. Medical adhesive wound closure was spread onto the anastomotic site followed by applying umbilical vein patch to avoid bile leakage after surgery (Fig. 3). Three months after surgery, if cholangiogram indicated that stenosis in right accessory hepatic duct or bile leakage was not observed in patients, the sandwiched T tube was removed.

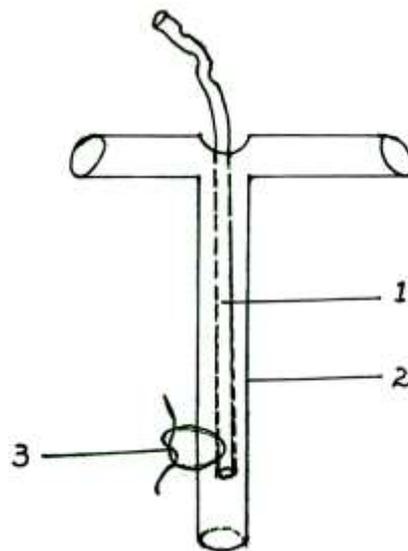


Fig. 2: The sandwiched T tube. 1: silicon tube with 2.5 mm diameter; 2: #16 T tube; 3: fixation of T tube and silicon tube with #1 suture.

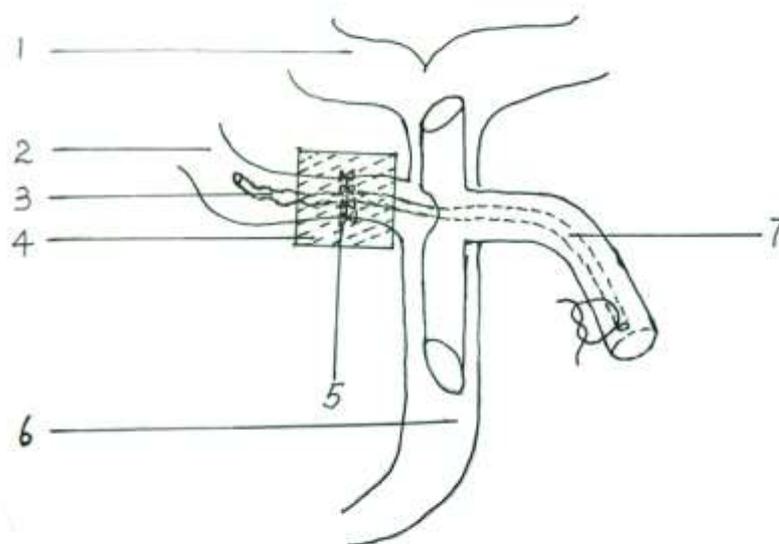


Fig. 3: Placement of the sandwiched T tube and overlap of the anastomotic site with umbilical vein patch and medical adhesive wound closure. 1: bile duct in right anterior lobe; 2: bile duct in right posterior lobe; 3: silicon tube; 4: umbilical vein patch; 5: anastomosis; 6: common bile duct; 7: sandwiched T tube.

RESULTS

After receiving treatment as described above, all the 8 patients were satisfied with the postoperative recovery. During the three months to seven years follow-up, patients did not suffer from postoperative complications such as bile leakage and intra-abdominal infections in the short term and such as bile duct inflammation and bile duct stenosis in the long term.

DISCUSSION

Generally, there are four commonly used methods to cope with iatrogenic right accessory

hepatic duct injury. Closure with suture is often used to treat less than 2 mm diameter of right accessory hepatic duct injury (5). However, this method is very risky because it can cause severe complications such as abscess and bile leakage due to bile accumulation. It is generally believed that this method is not applicable for higher than 3 mm diameter of right accessory hepatic duct injury, but the fluent bile duct drainage is considered as a good method to solve higher than 3 mm diameter of right accessory hepatic duct injury (6). Roux-en-Y anastomosis can solve the problem of biliary drainage. However, a skillful surgeon in anastomosis is mandatory because the diameter of right accessory hepatic duct is only 3 - 5 mm (7). Moreover, postoperative complications such as bile leakage, stenosis and reflux cholangitis may happen to patients due to the alteration of patients' physiological channel. If the length of the right accessory hepatic duct injury is short, end-to-side anastomosis can be conducted to join the right accessory hepatic duct end with the right side of common hepatic duct (8). However, after surgery, the infections may affect the common hepatic duct and even cause extensive inflammation and high bile duct stenosis, which will make the postoperative care much more challenging. In our long term clinical experiences, we found that end-to-end anastomosis could be applied to join the right accessory hepatic duct with the residual end of ductus cysticus. The key parameter of success is the choice of support material. If the cross arm of T tube was used to support the anastomotic site, the excessive tension of anastomotic site and bile leakage were easily induced (9), and the length of cross arm of T tube might not meet with the requirement. Applying ureteral catheter or silicon tube to support the anastomotic site cannot guarantee the common bile duct drainage and the ureteral catheter or silicon tube easily fall off. Here we established the right accessory hepatic duct and common bile duct drainage with the sandwiched T tube, which could be firmly fixed and minimized the possibility of fall-off. Combination with the umbilical vein patch and medical adhesive wound closure prevented bile leakage. This method retained the physiological channel and

minimized the incidence of bile duct inflammation and stenosis. Although the anastomotic site might progress into stenosis in the long term, the right accessory hepatic duct would gradually atrophy due to the biliary obstruction and chronic inflammation. However, its function will be compensated with the rest hepatic duct and patients' normal life would be not significantly affected. In the present study, the 8 patients were satisfied with the postoperative recovery. During the three months to seven years follow-up, patients did not suffer from postoperative complications such as bile leakage, intra-abdominal infections, bile duct inflammation and bile duct stenosis.

The technical essentials for restoring the right accessory hepatic duct injury with sandwiched T tube include the following ten considerations. (a) Laparotomy should be conducted immediately once the right accessory hepatic duct injury was reported; (b) A larger incision was necessary and the surgical procedure should be conducted with the help of auto abdominal retractor under bright vision and thoroughly anesthesia; (c) the necrotic tissues residing around the residual hepatic duct and bile duct should be removed appropriately to protect the blood circulation and biliary duct tissues; (d) The right accessory hepatic duct and the residual end of biliary duct are anastomosed end to end with interrupted everted sutures, leaving the knots outside the anastomotic lumen (10); (e) For completely inducing bile drainage, the silicon tube with holes on its side was inserted into the right accessory hepatic duct about 5 cm; (f) The sandwiched T tube should be fixed firmly and the common bile duct should be closed carefully; (g) The umbilical vein patch should be as thin as possible and the medical wound closure should be applied onto the wound evenly and swiftly, covering the anastomotic site completely; (h) The sandwiched T tube and drainage tube under hepatic clearance should be pull out from the right side of the abdomen and fixed properly to avoid the fold of drainage tube; (i) Patients should be closely monitored to handle the postoperative complications such as bile leakage, bleeding and intra-abdominal infections; (j) A long-term

follow-up should be conducted.

In conclusion, the application of sandwiched T tube was a simple and practical method to handle the iatrogenic right accessory hepatic duct injury.

CONFLICTS OF INTEREST

The author declares that there are no conflicts of interest.

REFERENCES

1. Pekolj J, Alvarez FA, Palavecino M, Claria RS, Mazza O, de Santibanes E. Intraoperative management and repair of bile duct injuries sustained during 10123 laparoscopic cholecystectomies in a high-volume referral center. *J Am Coll Surg* 2013; 216: 894-901.
2. Huang Q, Yao HH, Shao F, Wang C, Hu YG, Hu S et al. Analysis of risk factors for postoperative complication of repair of bile duct injury after laparoscopic cholecystectomy. *Dig Dis Sci* 2014; 59: 3085-91.
3. Stewart L. Iatrogenic biliary injuries: identification, classification, and management. *Surg Clin North Am* 2014; 94: 297-310.
4. Savassi-Rocha PR, Almeida SR, Sanches MD, Andrade MA, Frerreira JT, Diniz MT et al. Iatrogenic bile duct injuries. *Surg Endosc* 2003; 17: 1356-61.
5. Gagner M, Garcia-Ruiz A. Technical aspects of minimally invasive abdominal surgery performed with needlescopic instruments. *Surg Laparosc Endosc* 1998; 8: 171-9.

6. Catalano OA, Sahani DV, Forcione DG, Czermak B, Liu CH, Soricelli A et al. Biliary infections: spectrum of imaging findings and management . Radiographics 2009; 29: 2059-80.
7. Karamanakos SN, Vagenas K, Kalfarentzos F, Alexandrides TK. Weight loss, appetite suppression, and changes in fasting and postprandial ghrelin and peptide-YY levels after roux-en-Y gastric bypass and sleeve gastrectomy: a prospective, double blind study. Ann Surg 2008; 247: 401-7.
8. Scanga AE, Kowdley KV. Management of biliary complications following orthotopic liver transplantation. Curr Gastroenterol Rep 2007; 9: 31-38.
9. Wu YV, Linehan DC. Bile duct injuries in the era of laparoscopic cholecystectomies. Surg Clin North Am 2010; 90: 787-802.
10. Bie P and He Y: Indications and evaluation of different surgical treatment for iatrogenic bile duct injury and stricture. Chin J Practi Surg 2011; 31: 566-8.