Study on suture of patients with history of abdominal surgery after laparoscopic choledocholithotomy

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Abstracts: This study was to discuss the safety, feasibility and application scope of choledocholithotomy 1st stage suture surgery under laparoscopic choledochoscope on treatment of extra hepatic bile duct stones. There were 68 patients with abdominal surgery admitted to hospital from 2009 to 2013. Among 68 patients, 3 cases had surgical laparotomy, while rest of the 65 patients were completely finished the operation of laparoscopy without complication or calculi recurrence in the next 2 year follow-up. If the surgical indications could be properly handled under the mastery of skilled laparoscopy and laparotomy, suture of the patients with the laparoscopic choledocholithotomy method still is a safe, effective and feasible treatment method and it can achieve small trauma, rapid recovery, few complication of minimally invasive purpose even though these patients have history of abdominal surgery.

Keywords: History of abdominal surgery, laparoscopic choledocholithotomy, bile duct calculi, common bile duct suture.

INTRODUCTION

Bile duct calculi is one of the commonest diseases (Yao *et al*, 2002; Zeng *et al*, 2012; Tian *et al*, 2009). Once people suffer from bile duct calculi, obstruction suppurative cholangitis may be caused, which is a more dangerous and life threatening situation. Conventional treatment of this disease is endoscopic retrograde cholangiopancreatography (ERCP) combined with Endoscopic sphincterotomy (EST) and choledocholithotomy plus T tube drainage. However, ERCP usually causes acute pancreatitis, and complications such as intestinal perforation and reflux cholangitis (Rojas-Ortega and Arizpe-Bravo, 2003), and recurrent cholangitis also increases risk of cancer (Wand *et al*, 2003). Laparoscopic technique has been used in liver and gallbladder surgery. The present investigation discussed the safety, feasibility and application scope of suture of patients with history of abdominal surgery after laparoscopic choledocholithotomy.

MATERIALS AND METHODS

From January 2009 to December, 2013, 68 cases of patients with history of abdominal operation had been performed laparoscopic choledocholithotomy pulse common bile duct suture in Henan Provincial People's Hospital. Effective curative effects with small trauma, few complications were achieved.

General Information: 68 cases of patients included 27 male and 41 female with age of 28-76 years and an average age of 56.7±2.1 years. The operations of the patients were as follows: 42 cases with cholecystectomy, 11 cases with digestive tract perforation repair, 8 cases with choledocholithotomy plus T tube drainage, 3 cases with stomach and duodenum surgery, 2 cases with spleen resection, and 2 cases with liver lobe resection. The above operations were conducted 3-10 years before this operation.

Preoperative preparation: preoperative check was based on patients' clinical symptoms, such as color ultrasound, MRCP, CT, liver function, color ultrasound of heart, pulmonary function (Wang *et al*, 2003). Before surgery, intraoperative blood should be prepared to ensure that it was ready to be transferred to laparotomy during operation, as seen in fig. 1.

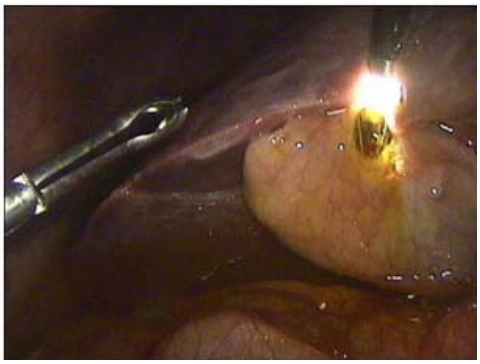

Fig. 1: Biliary lithotomy under laparoscopic combined with choledochoscope.

Surgery method: general anesthesia was employed on the patients under in supine position. The first operative place of stamp was set at umbilical region far away from the last operation place. Pneumoperitoneum was 1.3-1.8 kPa.

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Laparoscope was set in the abdominal place for comprehensive understanding of abdominal adhesion state. The second place was selected before operation was conducted at the second place. The requirement of surgery and separated space of operating space decided the location of the other two places for operation. If it was necessary to separate or remove gallbladder, it was needed to separate gallbladder triangle and then the gallbladder was removed. The common bile duct was found through cystic ducts. If the patients did not have gallbladder, the common bile duct could be discovered through hepatoduodenal ligament and ligamentum teres hepatitis or gallbladder fossa. First, it was needed to isolate the anterior wall of the common bile duct to touch the calculi with forceps or use No. 5 infusion needle without swing to puncture for bile after common bile duct. The laparoscopic scissors was used for cut longitudinally 1.0-1.5 cm of the common bile duct front wall with choledochoscope to detect bile duct. Blue lithotomy net was employed to take out the bile duct calculi. For the calculi which had been concentrated, and incarcerated huge calculi with diameter of more than 1.5 cm, it was needed to ensure that the liquid electricity shock wave crushed calculi gravel instrument. Under the assisting of choledochoscope, the blue lithotomy net was used to take out the tine bile duct calculi (Tian *et al*, 2009). The condition was confirmed by choledochoscope, and the calculi had been checked and removed. For the patients with the lower common bile duct obstruction, the biliary detector was used to expanse the duodenal papilla to make sure that the No.8 or No.9 detector could smoothly go through the first place of the common bile duct place of first stage of suture after taking out the calculi. If the No. 8 detector could not pass, then the first stage suture was stopped. Then, T tube was set and 3-0 or 4-0 absorbable line was used to stitch the bile duct. Full-stitchness overlock stitch was employed to stitch with margin around 1.5mm-2mm. Gauze was used to dip in stitching and yellow was used for dyeing. A small retinal hole abdominal cavity drainage tube was used. The dressing equipment was used, and then the devices were removed, and the pneumoperitoneum was shut off. The skin was sutured and the surgery was finished.

Postoperative nursing and observation indexes: Routine anti-infection and parenteral nutrition support was taken after surgery. Enteral nutrition was restored after anus exhaust and defecation. The based information of the two groups was observed, such as average operative time, average intraoperative blood loss, drainage tube pull average time and postoperative hospital stay.

RESULTS

General information

The selected patients had history of abdominal surgery for more than three years; Preoperative diagnosis was confirmed through ultrasound and MRCP and ERCP examination. The diameter of common bile duct diameter in the preoperative examination was or more than 1.0 cm; liver function was in stage A and stage B, and cardiopulmonary function was normal; Elective surgery was employed. All the patients were excluded from bile duct stricture deformity requiring bile duct plasty (Yao *et al*, 2002).

In these 68 cases of patients, there were only 3 patients who had been transferred for laparotomy surgery, and the rest 65 cases successfully finished laparoscopic choledocholithotomy and suture. The average operation time was 82.4±10.2 minutes and the average intraoperative blood loss was 35±5.7ml. On the first day after operation, stomach tube, and urine tube was removed. There were 17 cases of patients who had fever of 37.5~38.8 and the temperature was recovered to normal three days after operation. Generally, the patients could take liquid diet two days after surgery. The drainage situation after eating was observed. If it was less than 20 ml, the drainage could be withdrawn. The average withdraw time of drainage tube was 3.3±1.3 days. Patients had performed abdominal color doppler ultrasound and abdominal CT before being discharged from hospital, which could assist to understand the situation of abdominal cavity effusion formation, and review biliary MRCP whether there was calculi in the bile duct. The average time duration of hospitalization was 6.8±1.8 days. Residual calculi was not detected in 68 cases of patients after examination of MRCP. Postoperative bile leakage was found in 2 cases of patients. 68 cases of patients had finished the follow-up, and the follow-up time was from 6 months to 5 years. The complications did not happen, such as remaining calculus, calculus recurrence, common bile duct stricture and cholangitis complication.

DISCUSSION

Due to the combination of choledothoscope and laparoscopic treatment of calculus of bile duct in liver and the application of choledochoscope lithotomy, it is possible to observe bile duct clearly and fully, and whether calculi has been removed clearly, and whether bile duct has stenosis can be detected. The use of the amplification of laparoscopic and non-invasive surgery line has reduced the occurrence of the bile duct wall incision bile leakage. Due to the advantages above, there is less residual calculi, bile leakage, bile duct stricture and fewer incidence of increased amylase, which prompts more and more surgeons to choose the suture after laparoscopic choledocholithotomy. The suture operation has effective therapeutic effect with shorter operation time, less postoperative transfusion volume, and shorter hospitalization time, and it is less expensive and also it reduces drainage time and pain of patient comparing with

that of the T tube method (Li, 2003). Two cases of patients had biliary leakage after surgery, and they had 200ml biliary leakage per day firstly. After promoting of defecation and reducing of gastric pressure and adequate drainage, the bile leakage of the two cases of patients have been stopped 10 days after surgery.

When patients have upper abdominal surgery with complication of biliary calculi, doctors in China often directly open abdomen and perform choledocholithotomy plus T tube drainage. However, there were very few of laparoscopic surgery doctors who could try to treat calculi through choledocholithotomy plus T tube drainage. Few surgeons thought that these patients could be treated with suture at site of laparoscopic choledocholithotomy. At present, performing laparoscopic biliary tract surgery is no longer forbidden in abdominal surgery (Zheng and Xu, 2012). Since 2009, we have performed the suture after laparoscopic choledocholithotomy for the patients with history of abdominal surgery. These surgeries were accompanied with mild trauma, rapid recovery, fewer complications and satisfactory treatment effect, which have overcome the disadvantages of large trauma and severe pain after laparotomy and T tube drainage. The experience is summarized as below:

Surgery indications: (1) When diagnosis is clear, preoperative check should be performed to definite diagnosis and understand distribution of stones; (2) the history of abdominal surgery is generally no more than three times; Abdominal surgery should be 3 years before this surgery. When the surgery membrane adhesion is reduced, it is easy to separate (Zhu, 2003); (3) The upper abdomen is not malignant tumor, and it is not abdominal postoperative infection; and it is acute cholecystitis or cholangitis attacked 1 week before surgery; (4) There is no serious diseases such as diseases of heart and lung. The patients with low proteins should ensure that low proteins are more than 80g/L. Liver function is at stage A or stage B. The patients with liver function of stage C should have internal medicine for conservative treatment to protect liver and reach stage B; (5) the diameter of the common bile duct expansion is more than 1.0 cm; (6) During the operation, it should be confirmed that there is no residual calculi and bile duct stricture, normal duodenal papilla mucosal morphology and diastolic function through the choledochoscope detection; (7) If the patient has intrahepatic bile duct calculi, intraoperative operation should be confirmed that there is no intrahepatic bile duct stricture and intraoperative calculi; If it cannot be fully removed, then the suture should be given up .

The placement of Trocar: If the last operation is below rib, then pneumoperitoneum is established at the bellybutton place; if it is upper abdominal or lower abdominal incision, then the pneumoperitoneum is set up through the gallbladder fossa and xiphoid process or 2.0cm of small incision is conducted which could straightly detect abdominal cavity. The rest three positions should be used according to the situation of intra-abdominal adhesion and operation requirement and the fifth incision could be used when necessary. Xiao-chu ZHOU *et al*. have reported that placing of incision should follow the following principles (Zhou *et al*, 2004): the first incision place is below the bellybutton without surgery scar. The second incision place should be 10mm to facilitate in electric coagulation knife or ultrasonic knife for the separation of adhesion. The third 10mm poke incision should be under the xiphoid process to facilitate the application of biliary lithotomy forceps and choledochoscope and then T tube drainage could be applied after surgery. The fourth poke incision should be established at the right upper quadrant to facilitate assistant operation;

Separation of abdominal cavity adhesion: We have tried to use ultrasonic scalpel and scissors to separate patiently and meticulously, and we have paid attention not to damage the bowel loops. The separation between the intestinal canal and abdominal wall adhesion was as far as possible to the abdominal wall and adhesion of the association in the case of no intestinal obstruction and separation. Separation range should not be too large, and stopping bleeding was also needed; In intraoperative separation of adhesion, it should be careful and patient, from osteoporosis gradually to the dense adhesion separation, from light to heavy, from shallow to deep. For the abdominal adhesion between liver edge and abdomen, the adhesion could have the function of suspension during the process of operation, and it was conducive to the exposure of the surgical field, and it could be separated after surgery.

Searching for common bile duct: searching for common bile duct is one of the most important steps and the most difficulty in operation. We should pay attention to the gallbladder, hepaoduodenal ligament and liver toughening or gall bladder fossa and took these as the markers, and then it is found that the duodenal bulb (Chen *et al*, 2003), which has important meaning for finding the common bile duct; if possible, one could use the CSL to probe (Bezzi *et al*, 1998) and find the common bile duct. It should not pierce too deep puncture of common bile duct, in case of piercing the blood vessels at the back of bile duct. The laparoscopy provided a large and bright vision, which is also longer than that of the other instruments. During the separation of adhesion, operative field should be exposed, which had more advantages than those of the laparotomy surgery; the common bile duct exposure range should be more than 2 cm.

Opening the common bile duct: When exposing of hepatic bile duct, it should not to separate the hepatic duct, and part of front wall of hepatic bile duct should be closed to

the cystic duct. The avasuclar area should be chosen and it was also close to the three tubes. At the same time, it was needed to pay attention to protect the good axial blood vessels to preserve the integrity of the bile duct microcirculation system and avoid injury of ischemia biliary strictures (Huang, 2005).

Choledochoscope lithotomy: The common bile duct calculi could be removed by saline pressure flush, indirect extrusion and choledochoscope net lithotripsy and plasma shock wave lithotripsy. Because the calculi could not be removed, it was needed to use the choledochoscope biopsy forceps or plasma shock wave lithotripsy to crash the calculi and then the reoccupy lithotomy operation was used to clean. During the operation, it was needed to avoid causing duodenal papilla edema and oddi sphincter muscle spasm; For the intraoperative choledochoscopy, doctors should make endeavor to expose the choledochoscopy corner which was not easy to be detected; After removing the calculi, images should be taken before the surgery to avoid residual calculi. For the patients without obvious congestion, edema, or narrow biliary Oddi sphincter, the suture could be used on them (Cai *et al*, 2005); otherwise, T tube should be placed.

The suture under choledochoscope: during the common bile duct suture, the noninvasive small circular needles were needed. The absorbable surgery line was used, and the suture was done, as seen in fig. 2.

Fig. 2: Non-invasion surgery incision

Otherwise, continuous full-thickness overlock stitch on the front side of the common bile duct wall. When sewing, 1.5mm of margin should be made, and the common bile duct diameter should be reduced within 3mm and diameter reduction was less than 1mm, which would not lead to bile duct stricture. Conventionally, the abdominal cavity drainage tube was placed in the venturi hole, which could effectively prevent the adverse effects of biliary fistula after surgery. After surgery, it was needed to observe the nature and amount of drainage liquid and ensure the drainage tube smoothly. Generally 5 days to 7 days after surgery, it was needed to remove drainage pipe for several times. The best solution was checking on abdominal CT before the removal of tubes and checking if there is any fluid within the abdominal cavity.

The following cases should be transferred to do laparotomy surgery: (1) Abdominal cavity is adhesion when it is difficult to identify during operation; (2) in operation, it is difficult to identify which is the common bile duct; (3) In the surgery, the main vessel or bowel loops is misidentified or got injured. In this study, there were a total of 3 cases of patients who had been transferred for laparotomy surgery all due to the serious adhesion of abdominal cavity and the common bile duct could not be exposed under the promise of ensuring security.

In conclusion, if the surgical indications could be properly handled under the mastery of skilled laparoscopy and laparotomy, suture of the patients, the laparoscopic choledocholithotomy method still is a safe, effective and feasible treatment method and it can achieve small trauma, rapid recovery, few complications of minimally invasive purpose even though these patients had history of abdominal surgery.

REFERENCES

Bezzi M, Slecchia G and De Leo A (1998). Laparoscopic and intraoperative Ultrasound. *Eur. J. Radiol.*, **27**: 207-214.

Cai Q, Chen X and Zhang D (2005). Laparoscopic common bile duct exploration with built-in tube drainage treatment of extra hepatic bile duct stones. *Yun. Y. J.*, **24**(5): 293-294.

Chen D, Dong J and Zhao S (2003). Laparoscopic clinical research for the treatment of recurrent bile duct stomes. *Chin. J. Hep. Surg.*, **9**(9): 537-538.

Huang Z (2005). The problems of the hepatic bile duct portal vein expose in biliary tract reoperation. *J. Hep. Surg.*, **13**(5): 321-322.

Li J (2013). Clinical comparative analysis of stitching after laparoscopic common bile duct examination and T tube drainage set. *Chin. J. Gen. Surg.*, **28**(11): 836-838.

Rojas-Ortega S and Arizpe-Bravo D (2003). Transcystic common bile duct exploration in the management of patients with choledocholithiasis. *Gast. Surg.*, **7**(4): 492-496.

Tian G, Yin S and Long F (2009). Application of the body shock wave lithotripsy in laparoscopic bile duct exploration biliary stone removal. *Chin. J. Gen. Surg.*, **24**(7): 601-602.

Wand B, Zhang X and Li L (2003). Reflux cholangitis and biliary intestinal anastomosis. *Chin. J. Hepat. Surg.*, **9**(7): 393-395.

Yao H, Shao J and Fang HX *et al* (2002). Discussion on removal of gall-stone under laparoscope,

choledochoscope and common bile duct. *Chin. J. General Surg.*, **11**(10): 805-807.

Zeng X, Yang P and Luo H (2012). Application of laparoscopic bile duct research on the patients with history of abdominal surgery. *Biom. Eng. Cli. Med.*, **1**(1): 37-41.

Zheng J and Xu L (2012). Clinical analysis of patients patients with history of abdominal surgery for haparoscopic cholecystectomy. *Chin. J. Lap. Surg.*, **8**(4): 326-327.

Zhou X, Yin Y and Lu X (2004). Laparoscopic surgery treatment on recurrent biliary calculi. *Chin. J. Prim. Med. Phar.*, **11**(6): 659-660.

Zhu Z (2003). Application of laparoscope in abdominal surgery history of 256 cases report. *Chin. Jl. Endos.*, **9**(6): 11-12.