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Analysis of the curative effect of laparoscopic primary suture of common bile duct with two choledocholithotomy routes

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Abstract

Objective: To investigate the clinical efficacy of laparoscopic choledocholithotomy through cystic duct and common bile duct in the treatment of choledocholithiasis combined with cholecystolithiasis.
Methods: 58 patients with choledocholithiasis complicated with cholecystolithiasis were selected. 26 cases were treated with choledocholithotomy through cystic duct approach and 32 cases were treated with direct choledocholithotomy. Laparoscopic combined choledochoscope or laparoscopic combined choledochoscope and duodenoscopy were performed with one-stage suture at the same time. The intraoperative diameter of common bile duct, duration of surgery, intraoperative blood loss, and length of hospital stay, drainage volume of abdominal drainage tube on the first day after surgery, extraction time of abdominal drainage tube, postoperative alanine transaminase, postoperative total bilirubin and incidence of postoperative complications were compared between the two groups.
Results: Comparing the two groups of patients, the diameter of common bile duct $P < 0.05$ was statistically significant. The surgical time, intraoperative blood loss, hospitalization time, abdominal drainage volume on the first day after surgery, drainage tube extubation time, postoperative alanine transaminase, postoperative total bilirubin, and complication rate were not statistically significant compared with $P > 0.05$.
Conclusion: According to the different diameter of choledocholithiasis, it is feasible to choose the appropriate path for laparoscopic primary suture of choledocholithiasis, which is worthy of further study.

Keywords: Choledocholithiasis; choledocholithotomy; duodenoscopy; endoscopy; cholecystectomy.

Introduction

At present, laparoscopic surgery combined with endoscopy is the first choice for the treatment of biliary calculi [1]. In the treatment of extrahepatic bile duct stones, the common bile duct can be sutured at the same time of cholecystectomy [2]. Laparoscopic cholecystectomy is rapidly replacing traditional cholecystectomy as the treatment of choice for patients with cholelithiasis, in this study author's team has accumulated a large number of cases and rich surgical experiences since carrying out laparoscopic common bile duct primary suture in the treatment of extrahepatic bile duct stones [3-5]. In laparoscopic primary suture of common bile duct, different primary suture methods of common bile duct can be selected according to different lithotomy paths [6]. In this study the author selected 58 patients with choledocholithiasis combined with cholecystolithiasis, respectively, through cholecystolithotomy or direct choledocholithotomy, laparoscopy combined with choledochoscopy or laparoscopy combined with choledochoscopy, duodenoscopy in the same period of one-stage suture, compared the curative effect between the two, now reported as follows.

Materials and Methods

All 58 patients were diagnosed as choledocholithiasis combined with cholecystolithiasis. 26 patients with choledocholithotomy and choledochoscopy underwent primary suture of the common bile duct under laparoscope. Among them, 23 patients underwent multiple endoscopies (laparoscopy, choledochoscopy, duodenoscopy) combined with intraoperative nasobiliary drainage and primary suture, and 3 patients underwent two endoscopies (laparoscopy, choledochoscopy) combined with primary suture of the common bile duct. 32

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patients with choledocholithotomy and laparoscopic primary suture of common bile duct were selected as the common bile duct pathway group. Among them, 22 patients were treated with multiple endoscopes combined with intraoperative nasobiliary drainage and primary suture, 10 patients were treated with two endoscopes combined with primary suture of common bile duct, and 2 patients were treated with PTCD before operation. Inclusion criteria: Patients with preoperative imaging examination (abdominal color Doppler ultrasound, upper abdominal CT, upper abdominal MRI + MRCP) confirmed common bile duct stones with gallstones were included in this study. Exclusion criteria: the patients who were not suitable for laparoscopic surgery; the patients suspected that the stones could not be removed or the obstructive jaundice was serious and changed to T-tube drainage.

Surgical procedures

Cystic duct path: Four hole method was used for puncture hole selection, with 10 mm puncture device under umbilicus as observation hole, 10 mm puncture device under xiphoid process as main operation hole, 5 mm puncture device at the intersection of right clavicle midline and 2 cm below costal margin, and 5 mm puncture device at the intersection of right axillary front line and 2 cm below costal margin as secondary operation hole [2,4]. After the gallbladder artery is separated from the gallbladder; the gallbladder artery can be clipped and cut off to free the gallbladder from the gallbladder bed [3]. After the assistant of cholecystolithotomy suspended the gallbladder; the main scalpel cut the cystic duct in the center of the cystic duct with an electric hook, inserted a 4f urethral catheter into the duct, and went down into the common bile duct. Along the urethral catheter, the main scalpel continued to cut the cystic duct to the junction of the common bile duct, and cut the junction of the common bile duct if necessary. The common bile duct was flushed after choledochoscopy [4]. The primary suture of common bile duct was performed with 4-0 absorbable suture along the incision at the opening of common bile duct and cystic duct, and then the cystic duct was clamped with absorbable clamp. If the duodenal papilla stenosis was detected by choledochoscopy during the operation, the dilated catheter was inserted into the common bile duct under the guidance of urethral catheter in the combination of two endoscopes; in the combination of three endoscopes at the same time, the duodenal papilla was dilated or the duodenal papilla was micro dissected during the operation, and the indwelling nasobiliary drainage was given at the same time, the primary suture was performed. After suturing, a drainage tube was placed in the foramen venneri (Figure 1).

Common bile duct path: The choice of puncture hole is the same as above [1,2]. The gallbladder was cut off by the same method [3]. Choledocholithotomy was performed by electric knife, choledochoscopy was used to remove the stones, and the intrahepatic and extrahepatic bile ducts were observed. After the stones were removed, the common bile duct was flushed [4]. The common bile duct was sutured with 4-0 absorbable suture. During choledochoscopy exploration, duodenal papilla stenosis was found. In the combination of two endoscopes, a dilating catheter was inserted into the common bile duct under the guidance of urethral catheter to dilate the duodenal papilla. In the combination of three endoscopes at the same time, the duodenal papilla was dilated during the operation, and the indwelling nasobiliary drainage was performed at the same time. After suturing, a drainage tube was placed in the foramen venneri (Figure 2).

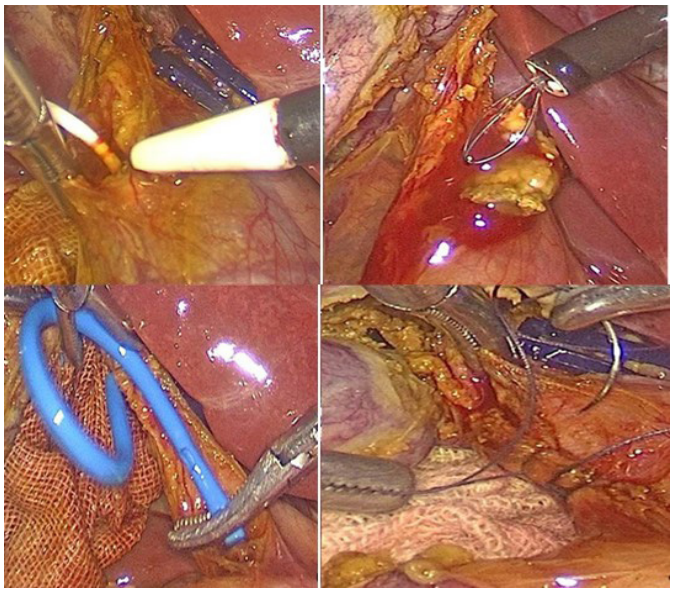

Figure -1a, 1b, 1c, 1d

Figure 1: *After the cystic duct was inserted into the ureteral duct, the electric knife cut the cystic duct along the ureteral duct to the junction of the common bile duct, choledochoscope was inserted into the common bile duct through the cystic duct to remove the stones, the nasobiliary duct was inserted through abdominal and gallbladder duct by three endoscopes at the same time, and the nasobiliary duct was indwelling for drainage, continuous suture from the incision at the junction of cystic duct and common bile duct to the upper part of cystic duct.*

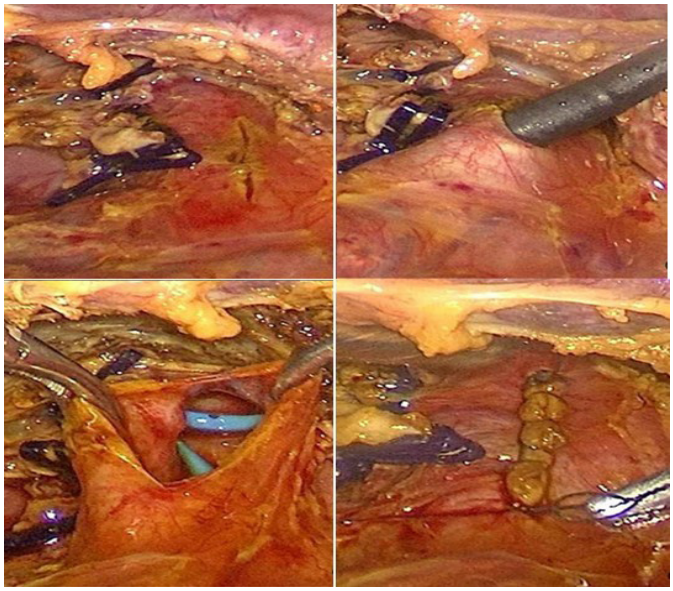

Figure -2a, 2b, 2c, 2d

Figure 2: *Direct choledochotomy, common bile duct exploration and lithotomy with choledochoscope, three endoscopes combined with indwelling nasobiliary drainage during operation, primary suture of common bile duct.*

Statistics: All data were analyzed by SPSS 20.0 software. Chi square test was used for comparison between counting data groups, and independent sample t test was used for comparison between measurement data groups, expressed by x±s. The difference was statistically significant (P < 0.05).

Results: The diameter of common bile duct, operation time, intraoperative blood loss, and hospitalization time, drainage volume of abdominal drainage tube on the first day after operation, extubation time of abdominal drainage tube, alanine amino transferase, total bilirubin and incidence of postoperative complications were compared between the two groups. There was no significant difference in the general information between the two groups, as shown in (Table 1).

While comparing the two groups of patients, the common bile duct diameter P < 0.05, was statistical significance. The operation time, intraoperative blood loss, hospitalization time, abdominal drainage volume on the first day after operation, extubation time of abdominal drainage tube, alanine aminotransferase and total bilirubin after operation were compared between the two groups (P > 0.05). Other indicators are shown in (Table 2).

Comparison of complications: There were 2 cases of postoperative acute pancreatitis in each group, and they were cured after treatment according to the diagnosis and treatment plan of acute pancreatitis. There was 1 case of bile leakage in the cystic duct route group and 2 cases in the common bile duct route group. On the first day of operation, bile was seen in the abdominal drainage tube, and the indwelling abdominal drainage tube was unobstructed. No bile was found in the drainage tube. CT scan showed no encapsulated effusion and extubation. There was no significant difference in complications between the two groups. There were no serious complications such as bleeding, reoperation and death in the two groups.

Discharge and follow-up: All patients were followed up by telephone one week after discharge without special discomfort. Three months after discharge, the outpatient follow-up, color Doppler ultrasound and blood biochemistry, no recurrence of common bile duct stones and abnormal liver function, good quality of life, no adverse prognosis.

Discussion

Laparoscopic surgery for choledocholithiasis with cholecystolithiasis has been widely reported in many literatures [7, 8]. Our study has conducted a lot of in-depth research in minimally invasive biliary surgery and accumulated experience in the treatment of biliary tract stones [9, 10]. Through the combination of laparoscopy, choledochoscopy and duodenoscopy, the stones in the common bile duct were removed, the problem of duodenal papilla stenosis was resolved during laparoscopy, and the common bile duct was sutured in one stage, so that the patients could not live with T-tube for a long time and get benefited from the operation [11]. Our study found that some patients with choledocholithiasis for gallstones, through the cystic duct into the common bile duct. Most of patients had a stone in the lower part of the common bile duct causing obstruction or static stones and these static stones will not cause obstructive dilatation of the common bile duct, a small number of patients with common bile duct stones can be discharged into the intestinal tract through the duodenal papilla. At the time of examination, because of duodenal pneumatosis, color Doppler ultrasound cannot find these stones, MRCP

Table1: *Comparison of general data between cystic duct pathway group and common bile duct pathway group (±s).*

General information	Cystic duct pathway group n=26	Common bile duct pathway group n=32	$x^{2\ Value}$/t Value	P Value
Gender(male/female)	13/13	14/18	0.225	0.635
Age(year)	53.19±15.52	53.72±20.42	-0.111	0.912
Alanine aminotransferase (U / L)	256.35±243.12	201.66±204.84	0.930	0.356
Total bilirubin (ummol / L)	46.42±39.64	44.28±53.27	0.170	0.866

Table 2: *Comparison of related indexes between cystic duct pathway group and common bile duct pathway group.*

Observation index	Cystic duct pathway group n=26	Common bile duct pathway group n=32	t Value/ x^2Value	P Value
Diameter of common bile duct (cm)	0.90±0.31	1.13±0.37	-2.461	0.017
Operation time(min)	191.54±61.23	193.13±88.52	-0.078	0.938
Intraoperative blood loss(ml)	22.12±8.96	22.96±11.49	-0.310	0.758
Hospitalization days(d)	12.58±5.05	13.47±6.46	-0.576	0.567
Drainage volume on the first postoperative day(ml)	29.04±25.30	46.09±50.08	-1.681	0.099
Extubation time of abdominal drainage tube(d)	6.73±3.76	5.63±1.39	1.543	0.128
Postoperative alanine aminotransferase(U/L)	182.56±178.198	158.66±122.35	0.604	0.548
Postoperative total bilirubin(ummol/L)	46.42±36.77	49.41±44.34	0.783	0.473
Complications	3/26(11.5%)	4/32(12.5%)	0.012	0.911

examination will find stones in the lower part of the common bile duct, and the diameter of the common bile duct is also smaller [12]. For such patients with continuous choledocholithiasis and cholecystolithiasis, it has been reported that laparoscopic cholecystectomy was performed after duodenoscopic papillotomy. Surgeons chose to give patients choledocholithiasis and primary suture of common bile duct through celiac cystic duct path [10]. In this study, the surgeons selected 58 patients, divided into cystic duct path and common bile duct path, through the observation of the operation period and related data were compared; strive to find out the similarities and differences of the two methods in laparoscopic common bile duct primary suture, to provide the basis for further research. In this study, all patients underwent laparoscopic primary suture of common bile duct, and the stones were removed during the operation. The diameter of common bile duct in two groups was different, $P < 0.05$. Most of the cases were secondary stones which entered into the common bile duct through the cystic duct. Our study find that since the gallstone can pass through the cystic duct, the cystic duct can be cut and put into choledochoscope to remove the gallstone. After the cystic duct was cut, the urethral catheter was inserted into the bile duct through the incision of the cystic duct. Due to the spiral valve of the cystic duct, some cases need to cut a small part of the common bile duct along the cystic duct, such as the common bile duct. The incision is suitable for choledochoscopy. The urethral guided electrotome can not only guide the incision smoothly through the urethral catheter also avoided the incision deviation. According to our experience, preoperative MRCP film can show the relationship between cystic duct and common bile duct, the number of common bile duct stones, the number of intraoperative stones and preoperative MRCP diagnosis can be basically consistent. If anatomic variation or abnormal location of cystic duct were found, laparoscopic cholecystectomy should be performed in different stages after choledocholithotomy or endoscopy. After removing the stones by choledochoscopy, the stone extraction net can pass through the duodenal papilla under choledochoscopy. If the stone extraction net can pass through the duodenal papilla, it means that the lower part of the common bile duct is unobstructed. If the stone extraction net cannot pass through the duodenal papilla, the author chose the same period of multiple endoscopies combined with small incision of duodenal papilla and nasobiliary drainage. In the cholecystectomy group, 23 patients underwent primary suture after indwelling nasobiliary drainage through duodenoscopy. In primary suture, it is important to choose the appropriate suture method according to the characteristics of incision. If the nasobiliary duct drainage is retained in the common bile duct, it can be sutured from the incision of the common bile duct to the incision of the cystic duct. After suturing the cystic duct and tying a knot around the cystic duct with suture, it can be clipped with absorbable clamp, and then the gallbladder can be cut off. The suture method should be selected according to the thickness of the common bile duct. When the common bile duct is thick, 4-0 absorbable suture can be used for continuous locking suture. The needle spacing should be adjusted according to the suture time, and it is appropriate to close the bile duct incision. When the common bile duct is thin, intermittent suture should be selected as far as possible, especially when suturing at the incision of the common bile duct. When inserting the needle, it is appropriate to avoid too large and too deep, and stick into the edge of the incision. Avoid direct closure of the common bile duct during suture, or suture ligation of the nasobiliary duct in the common bile duct, leading to iatrogenic biliary complications. When choledochoscopy is used to explore the bile duct, it is easy to cause duodenal papilla edema when the stone mesh is used to pass through the duodenal papilla. After direct primary suture, duodenal papilla edema changes bile duct pressure, which is easy to lead to bile leakage, acute pancreatitis and other complications [13]. In this kind of operation, the surgeons chose indwelling nasobiliary drainage. It can not only relieve the bile leakage caused by the pressure change of primary suture in the case of thin common bile duct, but also smooth the drainage of bile, relieve the bile reflux caused by duodenal papilla edema, and prevent the occurrence of acute pancreatitis. In this group, 2 cases of acute pancreatitis occurred without indwelling nasobiliary drainage. Amylase was normal in 4 days after treatment according to the standard scheme of acute pancreatitis. Abdominal CT showed that peripancreatic exudation decreased significantly. One patient with bile leakage was treated by laparoscopic drainage tube on the first day after operation. The patient was discharged with a tube. After 20 days of abdominal drainage without bile, he went back to the hospital for reexamination, and the abdominal drainage tube was removed after color Doppler ultrasound showed no bile duct stones or ascites. In the choledocholithotomy groups, 32 patients with common bile duct diameter of 1.13 ± 0.37cm were treated with direct choledochotomy and choledochoscopy. At present, most of the laparoscopic common bile duct primary sutures reported in clinical studies choose this path of lithotomy and at present, the operation process of this path is standardized [14]. The advantages of this method are that it is convenient to remove the stones, can observe the situation of intrahepatic bile duct, and can avoid the residual stones; if it is suspected that the stones have not been removed completely or the duodenal papilla stenosis is found after the stones have been removed completely, T-tube can be indwelling to ensure the safety of the operation. Among the 32 patients studied in this group, 2 patients had severe obstructive jaundice before operation, poor physical condition at admission, and high risk of emergency operation. They were given PTCD puncture drainage to reduce jaundice, improve the safety assessment of preoperative examinations, and then given elective laparoscopic choledocholithotomy and primary suture after operation. In terms of complications, bile leakage occurred in 2 patients after operation. After unobstructed drainage, there was no drainage from the abdominal drainage tube 5-7 days later, and the tube was removed after reexamination. At present, there are many studies on this kind of suture method in China, and most of them use 4-0 absorbable suture to do contact lock suture or intermittent suture. The suture is accurate, even if there is bile leakage, it will be cured quickly. Because the overall operation process is one-stage suture of common bile duct after three or two laparoscopic lithotomy. In this study, there is no difference in other indicators between the two groups, which is consistent with other similar studies at home and abroad. According to the different diameter of the common bile duct and the specific anatomy during the operation, choosing the appropriate path for choledocholithotomy is conducive to the postoperative recovery of patients. A good preoperative MRCP is also helpful to judge whether the stone is removed during the operation and to carry out primary suture, so as to avoid the pain of t-banding for a long time. Through this study, the author believes that it is feasible to

remove stones through cystic duct incision for patients with secondary choledocholithiasis and cholecystolithiasis with smaller diameter of common bile duct [15]. When the diameter of the common bile duct is larger, the stones in the common bile duct are more accurate. It can also enter the common bile duct through the cystic duct and be sutured at the same time.

Conclusion

Laparoscopic cholecystectomy is rapidly replacing traditional cholecystectomy as the treatment of choice for patients with cholelithiasis. According to the different diameter of choledocholithiasis, it is feasible to choose the appropriate path for laparoscopic primary suture of choledocholithiasis, which is worthy of further study.

Declarations

Ethics approval and consent to participate: The protocol was approved by the Chengdu Second People's Hospital, Clinical Research Ethics Committee, and parents of all subjects provided informed consent.
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