

The effect of the laparoscopic primary suture of the common bile duct in elderly patients: a retrospective study

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Research article

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Abstract

Background The surgery treatment strategies for elderly patients who were diagnosed as choledocholithiasis combined with cholecystolithiasis include laparoscopic choledocholithotomy with cholecystectomy and T-tube drainage or endoscopic sphincterotomy with nasobiliary drainage alone for those selected elderly patients without symptoms related to the gallbladder. However, long-term T-tube drainage will cause pain and life inconvenient. This study was designed to retrospective analysis the primary suture of the common bile duct and the T-tube drainage after laparoscopic choledochotomy to study the merits and demerits between primary suture and T-tube drainage in elderly patients. **Methods** Eighty-five patients were screened from January 2017 to January 2018. All patients were performed laparoscopic surgery, and an intraperitoneal drainage tube was left in all patients. Fifty-six cases were the primary suture group (n=56). Twenty-nine cases were the T-tube group (n=29). Preoperative baseline characteristics, intraoperative and postoperative characteristics of the two groups were compared. **Results** There were no differences in baseline characteristics in both groups ($P \geq 0.05$). Compared with the T-tube group, the postoperative total drainage volume on the first day [15(15, 58.75) vs 292(185, 360)] and patients of residual stones (0/56 vs 5/29) were fewer, and all drainage tube indwelling time [6(5,7) vs 84(82,86.5)] was shorter in the primary suture group ($P \geq 0.05$). And there were statistically significant differences in postoperative total drainage volume on the first day [15(15, 58.75) vs 292(185, 360)], all drainage tube indwelling time [6(5, 7) vs 84(82, 86.5)], postoperative total bilirubin [22.15(13.475, 33) vs 31.3(20.6,57.3)] and residual stones (0/56 vs 5/29) between the two groups ($P < 0.05$). There were no statistically significant differences in the other intraoperative and postoperative characteristics ($P \geq 0.05$). There were no pressure sores, postoperative pneumonia, deep vein thrombosis, serious complications of heart, lung and brain and even death in both groups. **Conclusions** With accurate preoperative risk assessment and strict treatment of basic diseases for elderly patients, if the stones in the common bile duct were cleared in laparoscopic surgery, the primary suture in elderly patients is feasible, safe, and valid.

Background

Cholelithiasis is a common biliary system disease in the elderly patients¹. However, most elderly patients are not diagnosed until in the acute inflammation phase^{2,3}. And the acute cholangitis or acute cholecystitis often makes their condition worse^{4,5}. Elderly patients often have many basic diseases, such as cardiovascular diseases and respiratory diseases⁶⁻⁸. Those diseases increase the risk of surgery and affect patients' prognosis, or even lead to death during perioperative period⁹. Surgery treatment strategies for elderly patients who are diagnosed with choledocholithiasis combined with cholecystolithiasis include laparoscopic choledocholithotomy with cholecystectomy and T-tube drainage, also endoscopic sphincterotomy and nasobiliary drainage alone for those selected elderly patients without symptoms related to the gallbladder, or endoscopic sphincterotomy as the first step treatment and laparoscopic cholecystectomy as the second step treatment¹⁰. Although laparoscopic surgery is a minimally invasive surgery with high safety and good efficiency, T-tube drainage can still make the elderly patients' life

inconvenient, and can also cause complications such as body fluid and electrolyte imbalance^{11, 12}. After clearing the stones, primary suture of the common bile duct could protect the patients from long-term T-tube drainage¹². The primary suture of the common bile duct had been reported in previous studies, which showed that it was feasible¹³⁻¹⁵. In this retrospect study, we analyzed the feasibility of laparoscopic primary suture of the common bile duct in elderly patients, in order to improve their postoperative living quality.

Methods

Inclusion and exclusion criteria

Inclusion criteria: jThe patient ages \geq 60 years. k Choledocholithiasis combined with cholecystolithiasis was diagnosed by Clinical imaging: abdominal ultrasonography, epigastrium computed tomography (CT), magnetic resonance cholangiopancreatography (MRCP). l The diameter of the common bile duct \geq 8mm. mThe patients have no hepatolithiasis. Exclusion criteria: The patients cannot be performed laparoscopic surgery.

Material

According to the inclusion criteria, eighty-five patients were screened from the Department of hepatobiliary and pancreatic surgery, Chengdu second people's hospital from January 2017 to January 2018. All patients were performed laparoscopic surgery. Fifty-six cases were performed laparoscopic choledocholithotomy, cholecystectomy and primary suture of the common bile duct, they were the primary suture group (n=56). Twenty-nine cases were performed laparoscopic choledocholithotomy, cholecystectomy, and T-tube drainage, they were the T-tube group (n=29). The baseline characteristics of screened patients were shown in **Table 1**.

Surgery Technique

Primary suture group: Four-port laparoscopic method was performed. jLaparoscopic surgery ports: two five millimeter subcostal ports, one five millimeters subxiphoid port and one ten millimeters subumbilical port were used. kCholecystectomy: laparoscopic surgery to remove the gallbladder and the tissue around the common bile duct. lCholedochotomy and stones cleared: Choledochoscope which was used to clear the stones, was inserted into common bile duct after it had been cut open. m Primary suture of the common bile duct: the choice of primary suture or T-tube drainage depended on the clearance of the stones. If it was sure to clear the stones in surgery, the primary suture is performed. An absorbable suture line (4/0 Vicryl; Ethicon) was used to suture the common bile duct, and the method was continuous interlocking suture. A peritoneal drainage tube was placed in the Winslow hole.

T-tube drainage group: The surgery procedure ofjkl was the same as that of the primary suture group. mT-tube drainage: If it was not sure to clear the stones, the T-tube was placed. The 22F-24F T-tube could be

used if the common bile duct dilated significantly (≥ 1 cm), and the 18-20F T-tube could be used if the bile duct did not dilate (≥ 1 cm). A peritoneal drainage tube was placed in the Winslow hole.

Intraoperative and postoperative Characteristics

We recorded all these variables of intraoperative and postoperative characteristics which showed in **Table 2**.

Follow-up

All patients were followed up by outpatient service and telephone for 6 months. Patients in the T-tube drainage group which received a T-tube cholangiogram 2 weeks post-operation were required to return for choledochoscopy and extubation in 1-3 months post-operation.

Statistical analysis

All data were analyzed by SPSS20.0 software (SPSS 12.0.1 for Windows; SPSS, Chicago, IL). A Chi-Square Test was adopted for the enumeration data, and Fisher's Exact Test was used when the frequency was less than 5. The Rank-Sum Test was adopted for two independent samples, shown as M (P25, P75) (M=Median, P=Percentiles). $P < 0.05$ was of statistical significance.

Results

All patients in the primary suture group and the T-tube drainage group were successfully performed laparoscopic choledocholithotomy. There were no statistically significant differences in surgery time, intraoperative blood loss, postoperative peritoneal drainage volume on the first day, peritoneal drainage tube indwelling time, length of hospital stays, and postoperative ALT, postoperative ALP, postoperative GGT between the two groups ($P > 0.05$). But there were statistically significant differences in postoperative total drainage volume on the first day [15(15,58.75) vs 292(185,360)], all drainage tube indwelling time [6(5,7) vs 84(82,86.5)], and postoperative TBIL [22.15(13.475,33.00) vs 31.3(20.6,57.3)] between the two groups ($P < 0.05$). Compared with the T-tube group, the postoperative total drainage volume on the first day [15(15, 58.75) vs 292(185,360)] and patients of residual stones (0/56 vs 5/29) were fewer, and all drainage tube indwelling time [6(5,7) vs 84(82,86.5)] was shorter in the primary suture group ($P < 0.05$).

There were four bile leakage patients in the primary suture group. The four patients were given peritoneal drainage tubes which could drain bile. When abdominal CT examination showed no encapsulated effusion, their peritoneal drainage tubes were extubated after bile leakage stopped. And no patient had bile leakage in the T-tube drainage group. And there is no patient with septic and prolonged hospital stay in two groups.

In the primary suture group, all the fifty-six patients have cleared stones during the surgery, and no residual stones were found in postoperative MRCP. Five patients in the T-tube drainage group had residual stones that were found by postoperative T-tube cholangiogram and were successfully removed by

choledochoscope. No other residual stones were detected at 6 months follow-up in both groups. Compared to both groups, there was no statistically significant difference with bile leakage ($P>0.05$).

There were no pressure sores, postoperative pneumonia, deep vein thrombosis, serious complications of heart, lung and brain and even death in both groups.

Discussion

Laparoscopic cholecystectomy (LC) combined with Laparoscopic common bile duct exploration (LCBDE) has been the preferred treatment for choledocholithiasis combined with cholecystolithiasis¹⁶. With the improvement of laparoscopic surgery and choledochoscopy technology, stones the common bile duct can be entirely cleared. In that case, it was feasible to perform the primary suture of the common bile duct. *Podda.M et al.* who conducted a meta-analysis of the relevant literature of laparoscopic primary suture of the common bile duct, confirmed that the primary suture was feasible and its complications were less than T tube drainage¹⁷. The results of the study also indicated that laparoscopic primary suture of the common bile duct could be the best surgery procedure choice if all stones were cleared.

In China, the number of elderly people is increasing year by year. Therefore, the incidence rate of cholelithiasis in elderly patients is increasing¹⁸. The stones in the common bile duct could cause acute cholangitis or acute pancreatitis, which could be treated by surgery¹⁸. It was safe for placing T tube drainage through laparoscopic surgery in such patients. However, some elderly patients had cardiovascular disease or chronic obstructive pulmonary disease. And their cardiovascular and respiratory function was so poor that they could not tolerate the laparoscopic surgery or endoscopic sphincterotomy. If they had acute cholangitis or acute pancreatitis, the percutaneous transhepatic catheterized drainage (PTCD) was an alternative safe drainage treatment^{19,20}. However, PTCD, the same as T-tube drainage, might make elderly patients miserable for placing a long time. If they suffer an excessive bile drainage loss, this would lead to fluid and electrolyte imbalance. And some elderly patients would accidentally pull out T tubes, and then this would lead to bile leakage or even hemobilia²¹.

The preoperative magnetic resonance cholangiopancreatography (MRCP) could effectively show the anatomical structure of the biliary system with the number and location of stones. According to MRCP images, if the definite numbers of stones were cleared and so that there were no residual stones in the common bile duct, therefore the primary suture could be performed. When stones are in the lower common bile duct, the endoscopic sphincterotomy could be chosen, but endoscopic sphincterotomy would damage the function of the duodenal nipple. Some patients' diameter of the common bile duct was less than 8mm, which placing the T-tube difficultly. And primary suture might also lead to choledochal stenosis. Therefore, we committed the endoscopic sphincterotomy as the first step to treat choledocholithiasis and then laparoscopic cholecystectomy as the second step to treat cholecystolithiasis. But in that case the elderly patients would be performed two surgeries over a short period. If performed the endoscopic sphincterotomy alone for the patients with asymptomatic cholecystolithiasis and subsequent observation thereafter, the patients might still need surgery in the

attack of acute cholecystitis. The elderly patients got older, and the cardiovascular and respiratory function would be worse. Also the surgery risk would grow. In this study, all the elderly patients had acute cholecystitis and the MRCP imaging showed there were stones in their common bile duct and the diameter of the common bile duct was more than 8mm. We tried to perform once surgery for elderly patients. In laparoscopic surgery, if the common bile duct expanded sufficiently and the stones in the lower common bile duct, we performed choledochoscopy via the cystic duct without a choledocotomy to clear the stone for reducing trauma to the common bile duct. This approach only needed to suture the cystic duct. If there were many stones in the common bile duct, we cut open the common bile duct directly for choledochoscopy and then performed the primary suture of the common bile duct. If there was no bile leakage, the peritoneal drainage tube could be extubated 3-5 days post-operation. And all patients in the primary suture group had no indwelling drainage tubes at discharge.

In this study, laparoscopic primary choledochal suture could improve postoperative quality of life. Minimally invasive surgery could not only relieve the psychological pressure of elderly patients but also could accelerate their postoperative recovery. The special surgery position in laparoscopic surgery could aggravate the stasis of blood stream²². We executed the strategies of enhanced recovery after surgery for all elderly patients. Patients were encouraged early ambulation to prevent deep venous thrombosis and pressure sores. And early oral feeding was encouraged to promote gastrointestinal function recovery²³. Postoperative respiratory rehabilitation training helped elderly patients to improve respiratory function and to accelerate the elimination of carbon dioxide used in laparoscopy. Effective postoperative analgesia could efficiently restrain the stress response of surgery²⁴.

Conclusions

According to this study, the primary suture of the common bile duct could protect patients from long-term T-tube drainage. And the results showed that primary suture did not increase the risk of postoperative bile leakage. Only if accurately assessed the surgical risk and treated the basic diseases, primary suture the common bile duct is feasible, safe, and valid in elderly patients.

And the deficiencies of this study were small sample size, single institution, and a retrospective study. Because of non-randomization, there might be the possibility of bias in patient selection for primary suture. Therefore, multicenter-clinical randomized controlled trials on a larger scale of patients and with a longer follow-up are needed to verify the merits and demerits of primary suture.

List Of Abbreviations

ERCP endoscopic retrograde cholangiopancreatography

CT computerized tomography

MRI magnetic resonance imaging

MRCP magnetic resonance cholangiopancreatography

ALT glutamic-pyruvic transaminase

TBIL total bilirubin

ALP Alkaline phosphatase

GGT γ -glutamyl transpeptidase,

LCBDE laparoscopic common bile duct exploration

PTCD percutaneous transhepatic cholangial drainage

CBD common bile duct

LC laparoscopic cholecystectomy

ASA American Society of Anesthesiologists

CVD cardiovascular disease

Declarations

Ethics approval and consent to participate

This study was approved by the ethics committees of Chengdu second people's hospital. All patients signed the consent to participate in this study.

Consent for publication

Not applicable.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors have stated explicitly that there are no conflicts of interest in connection with this article.

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Authors' contributions

JHL designed the research and wrote this manuscript. YTW reviewed existing publications, extracted the materials, and collected the data. XBL and SLY edited the manuscript. All authors read and approved the final manuscript.

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Tables

TABLE 1. Baseline Characteristics of Screened Patients

		All patients (85)	Primary suture(56)	T tube (29)	P Value
Age, years	M (P25, P75)	68(64,77)	68 (64.25,77)	68 (63,77.5)	0.849
Sex					0.643
Male	n (%)	41(48)	26(46)	15(52)	
Female	n (%)	44(52)	30(54)	14(48)	
CBD diameter, mm	M (P25, P75)	12(10,14)	12 (10,13)	12[10.5,16]	0.105
BD stones	M (P25, P75)	1(1,2)	1[1,2]	1[1,3]	0.546
ALT, U/L	M (P25,P75)	99.0(34.5,213.0)	89[28.5,194.25]	121.0[60.5,193.5]	0.266
TBIL, mmol/L	M(P25,P75)	25.3(15.3,63.6)	21.1[15.25,39.075]	43.2[15.3,113.6]	0.066
GGT, U/L	M(P25,P75)	279.0(57.5,555.0)	282.5(54.75,555.0)	277.0(53.5,584.0)	1.000
ALP, U/L	M(P25,P75)	189.0(120.5,357.5)	187.0(117.0,353.25)	189.0(120.5,388.5)	0.982
Previous LC					0.330
Yes	n (%)	21(25)	12(21)	9(31)	
No	n (%)	64(75)	44(79)	20(69)	
ASA					0.659
II	n (%)	79(93)	51(91)	28(97)	
III	n (%)	6(7)	5(9)	1(3)	
CVD					0.714
Yes	n (%)	30(35)	19(34)	11(38)	
No	n (%)	55(65)	37(66)	18(62)	
Diabetes					0.273
Yes	n (%)	14(16)	11(20)	3(10)	
No	n (%)	71(84)	45(80)	26(90)	

M Median, P Percentiles, CBD common bile duct, ALT glutamic-pyruvic transaminase, TBIL Total bilirubin, ALP Alkaline phosphatase, GGT γ -glutamyl transpeptidase, LC laparoscopic cholecystectomy, ASA American Society of Anesthesiologists, CVD cardiovascular disease.

TABLE 2. Intraoperative and Postoperative Characteristics of Screened Patients

		All patients (85)	Primary suture(56)	T tube (n=29)	P Value
urgery time, min	M (P25, P75)	176(158,211)	174(156.5,190.75)	181(160,262)	0.321
lood loss , ml	M (P25, P75)	30(20,30)	20(20,30)	30(20,35)	0.081
Peritoneal drainage volume on the first day, ml	M (P25, P75)	30(10,60)	15(15,58.75)	30(10,71)	0.451
total drainage volume on the first day, ml	M (P25, P75)	55(27.5,245)	15(15,58.75)	292(185,360)	0.000
Peritoneal drainage tube dwelling time, d	M (P25, P75)	6(5,7)	6(5,7)	5(5,7)	0.451
drainage tube dwelling time, d	M (P25, P75)	7(5,82.5)	6(5,7)	84(82,86.5)	0.000
ALT, U/L	M (P25, P75)	104(55.5,152)	97(47,146.75)	105(67.5,175.5)	0.559
TBIL, mmol/L	M(P25,P75)	25.6(16.45,39.3)	22.15(13.475,33.00)	31.3(20.6,57.3)	0.008
GGT, U/L	M(P25,P75)	191(62.5,357)	179(63,360.75)	237(46.5,349.5)	0.777
ALP, U/L	M(P25,P75)	147(108.5,285.5)	139(103.25,293)	166(122.5,270.5)	0.630
ospital stays, d	M(P25,P75)	12(10,17)	11(10,17)	14(11.5,17)	0.127
Bile leakage					0.294
Yes	n (%)	4(5)	4(7)	0(0)	
No	n (%)	81(95)	52(93)	29(100)	
esidual stones					0.004
Yes	n (%)	5(6)	0(0)	5(17)	
No	n (%)	80(94)	56(100)	24(73)	

ALT glutamic-pyruvic transaminase, TBIL Total bilirubin, ALP Alkaline phosphatase, GGT γ -glutamyl transpeptidase,

Figures

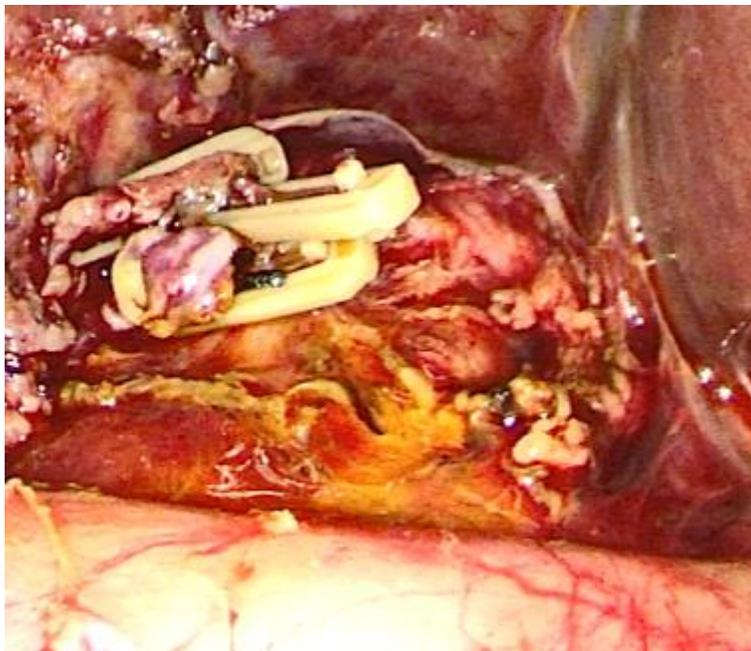


Figure 1

Choledochotomy

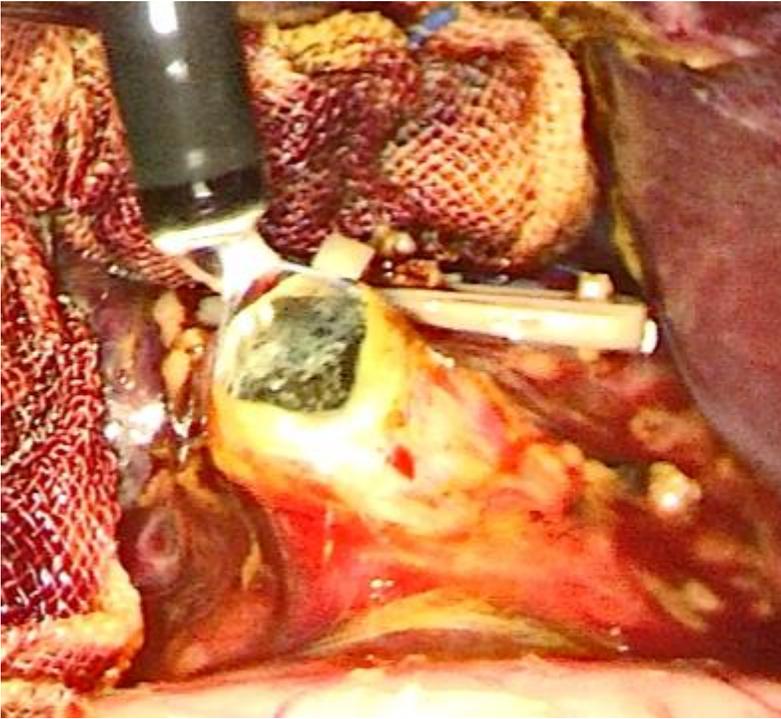


Figure 2

Choledochoscopy for stone removal

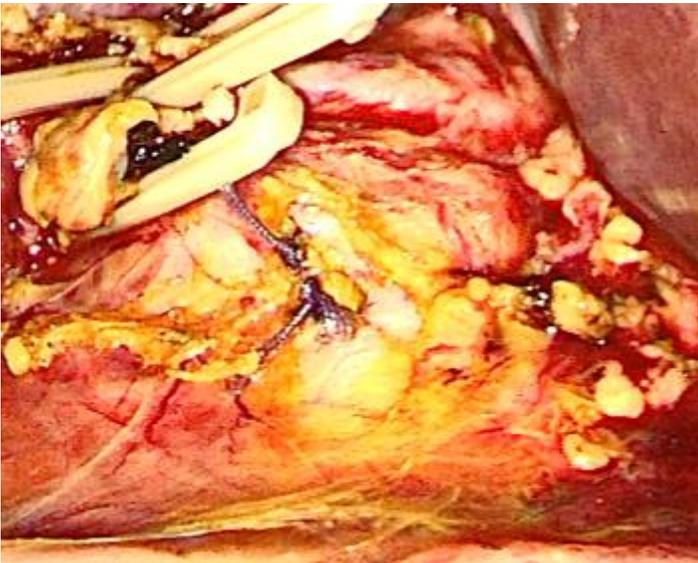


Figure 3

The primary suture of the common bile duct