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

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Abstract

Background

Traditional surgery treatment strategies for elderly patients who were diagnosed as choledocholithiasis combined with cholecystolithiasis include laparoscopic choledocholithotomy, cholecystectomy, and T-tube drainage. However, long-term indwelling T-tube drainage will cause pain and other complications. This study was designed to compare 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. 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 of baseline characteristics in both groups ($P>0.05$). Compared with the T-tube group, the postoperative total drainage volume on the first day and patients of residual stones were fewer, and all drainage tube indwelling time was shorter in the primary suture group ($P\leq 0.05$). And there were statistically significant differences in postoperative total drainage volume on the first day, all drainage tube indwelling time, postoperative total bilirubin and residual stones between the two groups ($P<0.05$). There were no statistically significant differences of the other intraoperative and postoperative characteristics ($P>0.05$). There were no pressure sores, hypostatic 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 in elderly patients, and the stones were removed in laparoscopic surgery, the primary suture in elderly patients is feasible, safe, and valid.

Background

Cholelithiasis is a common disease in biliary system of elderly patients¹. Most of the elderly patients don't pay too much attention to their cholelithiasis until finding in physical examination^{2,3}. Then the acute inflammation caused by choledocholithiasis often aggravated their condition^{4,5}. Elderly patients are often accompanied by many basic diseases, such as cardiovascular diseases and respiratory diseases⁶⁻⁸. Those diseases increase the risk of surgery and affect patients' prognosis, and even lead to death during

perioperative period⁹. Surgery treatment strategies for elderly patients who are diagnosed with choledocholithiasis combined with cholecystolithiasis include laparoscopic choledocholithotomy, cholecystectomy, and T-tube drainage, or endoscopic retrograde cholangiopancreatography (ERCP) and laparoscopic cholecystectomy¹⁰. Although laparoscopic surgery is less invasive, T-tube drainage for biliary tract can still cause pain and other complications of elderly patients¹¹. Due to poor self-care ability of elderly patients, long-term T-tube drainage not only makes their life inconvenient but also causes dyspepsia, fluid, and electrolyte imbalance¹². After cleaning the stones in the common bile duct, primary suture of the common bile duct can save the patient from long-term T-tube drainage¹². Previous studies have shown that many medical centers have carried out studies on the primary suture of common bile duct and have reported the curative effect¹³⁻¹⁵. In order to improve the postoperative living quality of the elderly patients, we tried to perform primary suture of the common bile duct after cleaned the stones.

Methods

Inclusion and exclusion criteria

Inclusion criteria: The patient ages ≥ 60 years. Imaging diagnosis with choledocholithiasis combined with cholecystolithiasis: abdominal ultrasonography, epigastrium computed tomography (CT), Magnetic resonance cholangiopancreatography (MRCP). Patients have no hepatolithiasis. Exclusion criteria: 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-hole laparoscopic method was performed. Establish the laparoscopic surgery holes: The surgery hole near the navel which inserted a 10mm laparoscopic trocar was used to construct pneumoperitoneum. A 10mm laparoscopic trocar was inserted near the xiphoid as the main surgery hole. Two 5mm laparoscopic trocars were inserted along the costal margin as the auxiliary surgery holes. Cholecystectomy: The Calot's triangle was dissected, and then the gallbladder artery was separated and severed. The free gallbladder duct was closed with absorbable clips. After the gallbladder duct was severed, the gallbladder was removed successfully. Choledochotomy and stone removal: The location of

the bile duct was determined by a puncture needle. Peritoneum and adipose tissue on the surface of common bile duct were dissociated. Choledochoscope was inserted into common bile duct after it had been cut open (*Figure.1*).. The stones were removed by choledochoscope and then explored common bile duct carefully (*Figure.2*).. Primary suture of the common bile duct (*Figure 3*): If there were no residual stones in the intra-and extrahepatic bile duct, preparation for primary suture of the common bile duct. An absorbable suture line was used to suture the common bile duct, and the method was continuous interlocking suture. After the suture, a peritoneal drainage tube was placed in the Winslow hole.

T-tube drainage group: The surgery procedure of was the same as that of the primary suture group of the common bile duct. T-tube drainage: After trimmed the T-tube, and then the T tube was put into the common bile duct. The common bile duct was sutured and observing whether there was bile leakage though flushed the T-tube. A peritoneal drainage tube was placed in the Winslow hole.

Intraoperative and postoperative Characteristics

Surgery time. Intraoperative blood loss. Postoperative peritoneal drainage volume on the first day. Postoperative total drainage volume on the first day (Peritoneal drainage volume VS Peritoneal drainage volume + T-tube bile drainage volume). Peritoneal drainage tube indwelling time. All drainage tube indwelling time (peritoneal drainage tube indwelling time VS peritoneal drainage tube indwelling time + T tube indwelling time). Length of hospital stays. Postoperative glutamic-pyruvic transaminase (ALT). Postoperative total bilirubin (TBIL). Postoperative alkaline phosphatase (ALP). Postoperative-glutamyl transpeptidase(GGT). Postoperative complications: bile leakage and residual stones (*Table 2*)..

Follow-up

All patients were followed up by outpatient service and telephone for 6 months. Patients in the T-tube drainage group were followed up for 1–3 months and received an outpatient T-tube cholangiogram.

Statistical analysis

All data were analyzed by SPSS20.0 software (SPSS 12.0.1for 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). $P \leq 0.05$ was 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, all drainage tube indwelling time, and postoperative TBIL between the two groups ($P<0.05$). Compared with the T-tube group, the postoperative total drainage volume on the first day and patients of residual stones were fewer, and all drainage tube indwelling time was shorter in the primary suture group ($P<0.05$).

There were four cases of postoperative bile leakage in the primary suture group. The four patients were given peritoneal drainage tubes which could drain bile. When abdominal CT examination showed no effusion, their peritoneal drainage tubes were removed after bile leakage stopped. And no patients had postoperative bile leakage in the T-tube drainage group.

Five patients in the T-tube drainage group had residual stones diagnosed by postoperative T-tube cholangiogram and were successfully removed by choledochoscope in the outpatient department. No other residual stones were detected at 6 months follow-up in both groups. Compared to the T-tube group, the primary suture group demonstrated no statistically significant difference with bile leakage ($P>0.05$), yet a statistically significant difference with residual stones ($P<0.05$).

There were no pressure sores, hypostatic 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. After the stones were removed through an intraoperative choledochoscope, it was feasible to perform the primary suture of the common bile duct. *Podda.M et al.* conducted a meta-analysis of the relevant literature of laparoscopic primary suture of the common bile duct and confirmed that it was feasible, and its complications were less than T tube drainage¹⁷. The results of the study suggested that when all stones were removed, laparoscopic primary suture of the common bile duct could be used as the best surgery procedure.

China has entered an aging society nowadays. The incidence rate of cholelithiasis in elderly patients is increasing¹⁸. When small stones in the gallbladder passed through the gallbladder duct into the common bile duct, they could cause acute cholangitis or acute pancreatitis which was particularly obvious in elderly patients and was also the main reason to hospitalize¹⁸. It was safe for indwelling T tube drainage in such patients. Due to poor cardiovascular and respiratory function, such as cardiovascular disease or chronic obstructive pulmonary disease, elderly patients who couldn't be treated surgically would choose percutaneous transhepatic catheterized drainage (PTCD)^{19,20}. However, PTCD, the same as T-tube drainage, might make elderly patients miserable with tubes for a long time. Some elderly patients could

be fluid and electrolyte imbalance or dyspepsia due to excessive bile drainage. And some elderly patients accidentally pulled out T tubes, which will lead to bile leakage or hemobilia²¹.

According to the preoperative magnetic resonance cholangiopancreatography (MRCP), which could effectively show the bile duct anatomy and the location of stones, we could choose different methods of choledocholithotomy to remove stones. When stones are in the lower common bile duct, endoscopic retrograde cholangiopancreatography (ERCP) could be chosen, but ERCP would damage the function of the duodenal nipple. If we committed the ERCP as the first step to treat choledocholithiasis and then laparoscopic cholecystectomy as the second step to treat cholecystolithiasis, the elderly patients would be required two surgeries over a short period. We tried to commit once surgery strategy for elderly patient. To reduce common bile duct injury in laparoscopic surgery, we performed cysticotomy for choledochoscopy to remove the stone which was only one or two in the lower common bile duct. This method only needed to suture the cystic duct. When there were more stones in the common bile duct, we cut open the common bile duct directly for choledochoscopy and then gave the primary suture of the common bile duct. After primary suture of the common bile duct, if there was no bile leakage, the peritoneal drainage tube could be removed 3–5 days postoperation. Therefore, all patients in the primary suture group had no drainage tubes residual after discharge.

In this study, laparoscopic primary choledochal suture could improve postoperative quality of life and avoid complications caused by long-time T tube drainage indwelling. Minimally invasive surgery could not only relieve the psychological pressure of elderly patients but also could accelerate their postoperative recovery. In laparoscopic choledocholithotomy, the special surgery position 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. Early oral feeding could be encouraged to promote gastrointestinal function recovery²³. Postoperative pulmonary function training could help elderly patients to recover lung function and to accelerate the elimination of carbon dioxide used in laparoscopy. Effective postoperative analgesia might help further elderly patients to get out of bed early and to conduct early oral feeding²⁴.

Conclusions

According to this study, the results showed that primary suture did not increase the risk of postoperative bile leakage. The primary suture of the common bile duct could prevent patients from living with the long-term T-tube drainage indwelling. The elderly patients could also avoid T-tube-related complications with primary suture. Only with accurate preoperative risk assessment and strict treatment of basic diseases in elderly patients, and the stones were removed in laparoscopic surgery, primary suture in elderly patients is feasible, safe, and valid. And the deficiencies of this study were small sample size and retrospective. Therefore, 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.

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Declarations

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

Ethics approval and consent to participate

This study was approved by the ethics committees of Chengdu second people's hospital. All patients signed a 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, cm	M (P25, P75)	1.2(1.0,1.4)	1.2 (1,1.3)	1.20[1.05,1.60]	0.105
CBD 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
Surgery time, min	M (P25, P75)	176(158,211)	174(156.5,190.75)	181(160,262)	0.321
Blood 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 indwelling time, d	M (P25, P75)	6(5,7)	6(5,7)	5(5,7)	0.451
All drainage tube indwelling 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
Hospital 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)	
Residual 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