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

Jinheng Liu

1Sichuan University West China Hospital;2,chengdu second people's hospital

Yanting Wang

chengdu second people's hospital

Xubao Liu

Sichuan University West China Hospital

Sineng Yin (✉ doctoryinsineng@sina.com)

Chengdu Second People's Hospital <https://orcid.org/0000-0003-2457-1361>

Research article

Keywords: Laparoscopic, primary suture, elderly patients, Choledochotomy

Posted Date: September 8th, 2019

DOI: <https://doi.org/10.21203/rs.2.14167/v1>

License: This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Abstract

Background Traditionally, Surgical treatment strategies for elderly patients diagnosed with choledocholithiasis combined with cholecystolithiasis include laparoscopic choledocholithotomy, cholecystectomy, and T-tube drainage. However, T-tube drainage in the biliary tract can still cause pain and other complications. This study was designed to compare the primary closure of choledochotomy and the use of T-tube after laparoscopic choledochotomy to determine whether primary suture can be as feasible and safe as suture with T-tube drainage in elderly patients.

Methods From January 2017 to January 2018, 85 patients were selected to undergo laparoscopic surgery. They were divided into two groups: primary suture group (n=56) and T tube group (n=29). Preoperative data, intraoperative index, postoperative complications were recorded. **Results** There were no differences in preoperative data in both groups. 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 extubation time was shorter in the primary suture group. And there were statistically significant differences in postoperative TBIL between the two groups. There were no pressure sores, hypostatic pneumonia, deep vein thrombosis, serious complications of heart, lung and brain and even death in both groups.

Conclusion Only if accurate preoperative risk assessment and strict treatment of basic diseases in elderly patients, intraoperative fine suture of the common bile duct, primary suture in elderly patients are feasible, safe, and valid after laparoscopic choledochotomy for verification of ductal clearance.

Introduction

Cholelithiasis is a common disease of the biliary system in elderly patients¹. Most of the elderly patients do not pay too much attention to their cholelithiasis which only finds in physical examination^{2,3}. But when it comes to, it is often the acute inflammation caused by choledocholithiasis⁴. Elderly patients are often accompanied by many basic diseases, such as cardiovascular diseases and respiratory diseases⁵⁻⁸. These diseases increase the risk of surgery and affect patients' prognosis, and even lead to perioperative death⁹. Surgical treatment strategies for elderly patients diagnosed with choledocholithiasis combined with cholecystolithiasis include laparoscopic choledocholithotomy, cholecystectomy and T-tube drainage¹⁰. Although laparoscopic surgery is less invasive, T-tube drainage in the biliary tract can still cause pain and other complications¹¹. Due to poor self-care ability of elderly patients, long-term T-tube drainage after discharge not only makes their life inconvenient but also causes dyspepsia, fluid, and electrolyte imbalance. After removing the stones in the common bile duct, primary suture of the common bile duct can protect the patient from T-tube drainage¹². At present, many medical centers have carried out extensive studies on the primary suture of common bile duct and reported the curative effect¹³⁻¹⁵. In order to improve the living quality of the elderly patients, after cleaning the stones

in the common bile duct during the operation, we tried to give the common bile duct primary suture, so that the patients are saved from T-tube drainage after the operation.

Patients And Methods

Inclusion and exclusion criteria

Inclusion criteria: The patient ages ≥ 60 years. Preoperative diagnosis according to imaging results (Color ultrasound of abdomen, CT of upper abdomen, MRI+MRCP of upper abdomen) for choledocholithiasis combined with gallstones. None bile of hepatolithiasis. exclusion criteria: Patients cannot undergo laparoscopic surgery.

Material

According to the inclusion criteria, 85 patients were selected from the department of hepatobiliary and pancreatic surgery of Chengdu second people's hospital from January 2017 to January 2018. All patients underwent laparoscopic surgery. 56 cases underwent laparoscopic choledocholithotomy, cholecystectomy and primary suture of the common bile duct, they were the primary suture group ($n = 56$). 29 cases laparoscopic choledocholithotomy, cholecystectomy, and T tube drainage, they were the T tube group ($n = 29$). The preoperative data of the two groups were shown in *table 1*.

Surgical Technique

Primary suture group: The operation was performed by 4-hole laparoscopic method. Establish the laparoscopic operating holes: The puncture hole under the navel was used to construct pneumoperitoneum, and a 10mm laparoscopic puncture apparatus was inserted. A 10mm laparoscopic puncture apparatus was inserted under the xiphoid process as the main operating hole. Two 5mm laparoscopic puncture apparatus had inserted the position of projection of the costal arch of the abdomen onto the underside of the gallbladder and 2cm below the costal margin of the right axillary front respectively as the auxiliary operating holes. Cholecystectomy: The calot's triangle was dissected and the gallbladder artery was separated and severed. The free gallbladder duct was closed with absorbable clip. After the gallbladder duct was severed, the gallbladder was removed successfully. Choledochotomy, stone removal by choledochoscope: The location of bile duct was determined by puncture needle. Peritoneum and adipose tissue on the surface of common bile duct were isolated. Choledochoscope was placed after the central incision of the common bile duct wall (*Figure.1*). Choledochoscope was used to remove stones and observe the condition of common bile duct (*Figure.2*). After washing the common bile duct, observed carefully whether there were residual stones in the bile duct and intrahepatic bile duct with choledochoscope. Primary bile duct suture (*Figure 3*): Primary bile duct suture with 4-0 absorbable suture what method was continuous interlocking suture. After the suture, a peritoneal drainage tube was placed through the Winslow hole.

T tube drainage group: The operation procedure of,, was the same as that of the primary suture group of the common bile duct.T tube drainage. Trimmed the T-tube and placed it into the abdominal cavity. Then the T tube was put into the common bile duct and the bile duct was sutured. After washing the T-tube and observing no bile leakage, a peritoneal drainage tube was placed through Winslow hole.

Observational index

operation 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), peritoneal drainage tube extubation time, all drainage tube extubation time (peritoneal drainage tube extubation time VS peritoneal drainage tube extubation time + T tube extubation time), length of hospital stay, postoperative glutamic-pyruvic transaminase(ALT), postoperative total bilirubin(TBIL). 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 a 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. The rank-sum test of two independent samples was adopted for measurement data, shown as M(P25, P75). $P \leq 0.05$ was statistical significance.

Results

All patients in the primary suture group and the T-tube drainage group successfully completed choledocholithotomy under the laparoscope. There were no statistically significant differences in operation time, intraoperative blood loss, postoperative peritoneal drainage volume on the first day, peritoneal drainage tube extubation time, length of hospital stay, or postoperative ALT between the two groups. But there were statistically significant differences in postoperative total drainage volume on the first day, all drainage tube extubation time, or postoperative TBIL between the two groups. 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 extubation time was shorter in the primary suture group.

There were four cases of postoperative bile leakage in the primary suture group. Because all four patients were given peritoneal drainage tubes which can drain bile. They were treated conservatively with stoppage of leakage after 1–5 days. Their peritoneal drainage tubes were removed when abdominal CT examination showed no effusion after stoppage of leakage.And no patients had postoperative bile leakage in the T-tube drainage group.

Five patients in the T-tube drainage group had retained stones diagnosed by postoperative T-tube cholangiogram and were successfully removed by choledochoscopy for stone extraction 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 and a statistically significant difference with residual stones.

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

Discussion

LC combined with LCBDE is currently the preferred treatment for choledocholithiasis combined with cholecystolithiasis¹⁶. After the stones were removed through intraoperative choledochoscope, it is feasible to implement the primary suture of the common bile duct. *Podda.M et al.* conducted a meta-analysis on relevant kinds of the 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 this study suggested that when all CBDS were removed, laparoscopic primary suture of the common bile duct could be used as the best surgical procedure.

At present, China has entered an aging society. The incidence rate of cholelithiasis in elderly patients is increasing. When cholelithiasis is asymptomatic, elderly patients do not pay enough attention to it. When small stones in the gallbladder pass through the gallbladder duct into the common bile duct, they can cause acute cholangitis or even acute pancreatitis, which is especially true in elder patients. Elderly patients with choledocholithiasis are often admitted for acute cholangitis or acute pancreatitis¹⁸. And it is safe to indwelling T tube for drainage in such patients. Due to poor cardiopulmonary function caused by cardiovascular disease and chronic obstructive pulmonary disease, elderly patients who cannot be treated surgically can choose percutaneous transhepatic catheterized drainage(PTCD)^{19,20}. However, PTCD, like T-tube drainage, can make elderly patients endure the pain of living with tubes for a long time. There are elderly patients due to excessive bile drainage caused by fluid and electrolyte imbalance or dyspepsia. There are also elderly patients accidentally removed T tubes in life, which can lead to bile leakage or hemobilia²¹.

Preoperative magnetic resonance cholangiopancreatography(MRCP) can effectively show whether there is variation in the bile duct anatomy, size, number and location of stones in the biliary tract. According to the results of MRCP, we can choose different ways of choledocholithotomy to remove stones. When stones are in the lower common bile duct, there is no expansion of common bile duct and no variation of gallbladder duct confluence into the common bile duct, we can cut open the gallbladder duct for choledochoscopy to remove the stones. The gallbladder duct is then sutured to reduce common bile duct trauma. When there are more stones in the common bile duct and common bile duct is obvious expansion, we can choose to cut open the common bile duct directly for choledochoscopy and then give the primary suture of the common bile duct. After primary suture of the common bile duct, bile entered

directly into the duodenum without drainage. If there is no bile leakage, the peritoneal drainage tube can be removed 3–5 days after the operation. Therefore, all patients in the primary suture group had their drainage tubes removed before discharge.

In this study, after the removal of stones in elderly patients, a laparoscopic primary choledochal suture can improve postoperative quality of life and avoid complications caused by long-time T tube drainage. Minimally invasive surgery can not only relieve the psychological pressure of elderly patients but also accelerate their postoperative recovery. We implemented the strategies of enhanced recovery after surgery for all elderly patients. In laparoscopic choledocholithotomy, the special surgical position can aggravate stasis of blood stream²². Patients are encouraged to get out of bed early to prevent deep venous thrombosis and pressure sores. Early oral feeding is encouraged to promote gastrointestinal function recovery²³. Postoperative pulmonary function training can help elderly patients recover lung function and accelerate the elimination of carbon dioxide used in laparoscopy. Effective postoperative analgesia can help further elderly patients to get out of bed early and 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 can prevent patients from living with the tube for a long time. And with primary suture, the elderly patients could also avoid T-tube-related complications. Only if accurate preoperative risk assessment and strict treatment of basic diseases in elderly patients, intraoperative fine suture of common bile duct, primary suture in elderly patients are feasible, safe, and valid after laparoscopic choledochotomy for verification of ductal clearance. Therefore, randomized controlled trial on a larger scale of patients and with a longer follow-up are needed to verify the merits and demerits of primary suture.

References

- 1.Sutor DJ, Wooley SE. The nature and incidence of gallstones containing calcium. *Gut*. 1973;14(3):215–220.
- 2.Korkmaz H, Araz M, Alkan S, Akarsu E. Liraglutide-related cholelithiasis. *Aging clinical and experimental research*. 2015;27(5):751–753.
- 3.Loozen CS, van Ramshorst B, van Santvoort HC, Boerma D. Acute cholecystitis in elderly patients: A case for early cholecystectomy. *Journal of visceral surgery*. 2018;155(2):99–103.
- 4.Zhao HQ, Liu HR, Xiao L, Zheng F, Li WM. Laparoscopic cholecystectomy in elderly patients: an evaluation of immunity. *Aging clinical and experimental research*. 2015;27(6):927–933.
- 5.Sapey E, Patel JM, Greenwood HL, et al. Pulmonary Infections in the Elderly Lead to Impaired Neutrophil Targeting, Which Is Improved by Simvastatin. *American journal of respiratory and critical care medicine*.

2017;196(10):1325–1336.

6.Solini A, Grossman E. What Should Be the Target Blood Pressure in Elderly Patients With Diabetes? *Diabetes care*. 2016;39 Suppl 2:S234–243.

7.Zilberszac R, Gabriel H, Schemper M, Laufer G, Maurer G, Rosenhek R. Asymptomatic Severe Aortic Stenosis in the Elderly. *JACC Cardiovascular imaging*. 2017;10(1):43–50.

8.Bauduceau B, Le Floch JP, Halimi S, Verny C, Doucet J. Cardiovascular Complications Over 5 Years and Their Association With Survival in the GERODIAB Cohort of Elderly French Patients With Type 2 Diabetes. *Diabetes care*. 2018;41(1):156–162.

9.Jha GG, Anand V, Soubra A, Konety BR. Challenges of managing elderly men with prostate cancer. *Nature reviews Clinical oncology*. 2014;11(6):354–364.

10.Eustace PW, Hailey DM, Cox AG, Baird ES. Biliary excretion of diazepam in man. *British journal of anaesthesia*. 1975;47(9):983–985.

11.Bourgeois N, Deviere J, Yeaton P, et al. Diagnostic and therapeutic endoscopic retrograde cholangiography after liver transplantation. *Gastrointestinal endoscopy*. 1995;42(6):527–534.

12.Trojanowski A, Dziackowski I. [Primary suture of the common bile duct following surgical opening]. *Polski przegląd chirurgiczny*. 1958;30(5):595–598.

13.Chen D, Zhu A, Zhang Z. Laparoscopic transcystic choledochotomy with primary suture for choledocholith. *JSLS: Journal of the Society of Laparoendoscopic Surgeons*. 2015;19(1):e2014.00057.

14.Jie Z, Hong L, Shaocheng Z, Bin Z, Haibiao W. A study of primary single and layered suture technique by using two-port laparoscopic choledocholithotomy. *Journal of minimal access surgery*. 2018.

15.Zhan Z, Han H, Zhao D, et al. Primary closure after laparoscopic common bile duct exploration is feasible for elderly patients: 5-Year experience at a single institution. *Asian journal of surgery*. 2019.

16.Zhang Z, Liu Z, Liu L, et al. Strategies of minimally invasive treatment for intrahepatic and extrahepatic bile duct stones. *Frontiers of medicine*. 2017;11(4):576–589.

17.Podda M, Polignano FM, Luhmann A, Wilson MS, Kulli C, Tait IS. Systematic review with meta-analysis of studies comparing primary duct closure and T-tube drainage after laparoscopic common bile duct exploration for choledocholithiasis. *Surgical endoscopy*. 2016;30(3):845–861.

18.James PD, Kaplan GG, Myers RP, et al. Decreasing mortality from acute biliary diseases that require endoscopic retrograde cholangiopancreatography: a nationwide cohort study. *Clinical gastroenterology and hepatology: the official clinical practice journal of the American Gastroenterological Association*. 2014;12(7):1151–1159.e1156.

- 19.Huang SM, Yao CC, Cheng YW, et al. Laparoscopic primary closure of common bile duct combined with percutaneous cholangiographic drainage for treating choledocholithiasis. *The American surgeon*. 2010;76(5):517–521.
- 20.Sun Y, Li W, Sun D, et al. Percutaneous transhepatic cholangial drainage combined with percutaneous endoscopic jejunostomy for maintaining nutrition state in patients with advanced ampullary neoplasms. *Journal of cancer research and therapeutics*. 2018;14(Supplement):S1158-s1162.
- 21.Cao H, Liu J, Li T, et al. Interventional therapy for the treatment of severe hemobilia after percutaneous transhepatic cholangial drainage: a case series. *International surgery*. 2013;98(3):223–228.
- 22.Rondelli F, Manina G, Agnelli G, Becattini C. Venous thromboembolism after laparoscopic cholecystectomy: clinical burden and prevention. *Surgical endoscopy*. 2013;27(6):1860–1864.
- 23.Hendry PO, van Dam RM, Bukkems SF, et al. Randomized clinical trial of laxatives and oral nutritional supplements within an enhanced recovery after surgery protocol following liver resection. *The British journal of surgery*. 2010;97(8):1198–1206.
- 24.Day A, Smith R, Jourdan I, Fawcett W, Scott M, Rockall T. Retrospective analysis of the effect of postoperative analgesia on survival in patients after laparoscopic resection of colorectal cancer. *British Journal of anaesthesia*. 2012;109(2):185–190.

Declarations

Ethics approval and consent to participate: This study was approved by the ethics committees of West China Hospital, Sichuan University, and Chengdu second people's hospital. All patients signed to 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.

Funding: 1, National Natural Science Foundation of China (81602133).

2, 1. 3. 5 projects for disciplines of excellence, West China Hospital, Sichuan University(ZY2017302 1-3-5).

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.

Acknowledgments: Thanks to professor Gang Zhang for his support of this research.

Tables

Table 1. Preoperative data of the study M50P25, P75)

Parameter	Primary suture(n=56)	T tube (n=29)	P value
Age(year)	68 (64.257,7)	68 (63,77.5)	0.849
CBD diameter(cm)	1.2 (1,1.3)	1.201.05,1.60	0.105
CBD stones	11,2	11,3	0.546
ALT(U/L)	8928.5,194.25	121.060.5,193.5	0.266
TBIL(umol/L)	21.115.25,39.075	43.215.3,113.6	0.066
Previous LC (Y/N)	12/44	9/20	0.330
ASA(II/III)	51/5	28/1	0.659
Gender(Male/Female)	26/30	15/14	0.643
CVD(Y/N)	19/37	11/18	0.714
Diabetes (Y/N)	11/45	3/26	0.273

CBD common bile duct, LC laparoscopic cholecystectomy, ASA American Society of Anesthesiologists, CVD cardiovascular disease

Table 2. Intraoperative index and postoperative complications

Parameter	Primary suture(n=56)	T tube (n=29)	P value
Operation time (min)	174(156.5,190.75)	181(160,262)	0.321
Intraoperative blood loss (ml)	20(20,30)	30(20,35)	0.081
Postoperative peritoneal drainage volume on the first day(ml)	15(15,58.75)	30(10,71)	0.451
Postoperative total drainage volume on the first day (ml)	15(15,58.75)	292(185,360)	0.000
Peritoneal drainage tube extubation time (d)	6(5,7)	5(5,7)	0.451
All drainage tube extubation time (d)	6(5,7)	84(82,86.5)	0.000
Postoperative ALT(U/L)	97(47,146.75)	105(67.5,175.5)	0.559
Postoperative TBIL(umol/L)	22.15(13.475,33.00)	31.3(20.6,57.3)	0.008
Hospital stay(d)	11(10,17)	14(11.5,17)	0.127
Bile leakage (Y/N)	4/52	0/29	0.294
Residual stones (Y/N)	0/56	5/24	0.004

Figures

Figure 1

Choledochotomy

Figure 2

Choledochoscopy for stone removal

Figure 3

Primary suture of the common bile duct