

Primary CBD Closure Vs T-Tube Drainage as a Treatment Option in CBD Exploration

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ABSTRACT

Backgrounds/Aims: Common bile duct (CBD) exploration is necessary to remove stones that are not removable by ERCP. T-Tube is concerned about potential bile leakage after the procedure. But T-tube itself is known to cause morbidity and, thus, prolonged discomfort and care after the operation. Also, T-tube insertion increases operative time in laparoscopy and is technically challenging.

Methods: Cases of open cholecystectomy and primary closure of CBD without T-tube insertion (n=30, Group A) were compared with cases with T-tube placement (n=30, Group B) performed at the same centre from January 2019 to December 2020. Outcomes of both the groups were followed up for one year with biochemical investigations, ultrasonography and/or computerized tomography and postoperative complications.

Results: Bile leakage was observed in one patient, recurrent stone in two patients and obstructive jaundice in one patient during the follow-up period among 30 Group A patients (n=6), when compared to T-tube placement Group B patients with 2 cases of biliary peritonitis, 1 case of residual stones and 1 case of pancreatitis (n=4), showing no significant differences between overall complication rates (p=0.08).

Conclusions: As reported in multiple recent studies, CBD exploration with primary CBD closure without T-tube is an acceptable surgical option.

Keywords: T-tube, Choledochotomy

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INTRODUCTION

Choledochotomy to remove stones in the biliary tree is mainly carried out when endoscopic retrograde cholangiopancreatography (ERCP) with endoscopic sphincterotomy (EST) either failed to remove them or was not possible. At the end of the procedure, installing a T-tube through choledochotomy is suggested to be a classical method. T-tube is a draining route of bile juice outside the body, a possible path to detect and remove any residual CBD stones and reduce the chance of CBD stricture. However, T-tube insertion and/or removal may cause biliary peritonitis with associated patient discomfort and prolonged hospitalization¹⁻⁵. Additionally, laparoscopic choledochotomy with T-tube placement is technically demanding; hence, the procedure has limitations.

More recently, one step laparoscopic cholecystectomy and choledochotomy sparing ERCP or EST,^{6,7} method using pigtail, or installing endoscopic naso-biliary drainage (ENBD) tube before the operation,⁹⁻¹³ and other methods like transcystic approach of CBD^{14,15} are attempted at various centres hoping to evade T-tube insertion. In our setup, we have been treating patients by laparoscopic cholecystectomy after removing bile duct stones by ERCP and applying open cholecystectomy and choledochotomy when endoscopic clearance couldn't be achieved.

Here we present the comparative study between clinical

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outcomes of 30 cases of open choledochotomies and primary closure of CBD without T-tube placement with 30 instances of choledochotomy closure over a T-tube from Jan 2019 to Dec 2020.

METHODS

Patient profiles

This was a prospective study. We studied patients who underwent open cholecystectomy and choledochotomy without T-tube insertion (Group A, n=30) or with T-tube (Group B, n=30) among a total of 60 operated patients. We followed them up for one year.

All operations were conducted by the same surgeon choosing choledochotomy closure methods alternatively for every 2nd case. In 60 cases of CBD stones, two cases of Group B were carried out by laparoscopic choledochotomy and others via laparotomy.

Table 1 shows the essential clinical features of the patients.

	Group A	Group B
Patient number	30	30
Median Age (years)	64.5	66.4
Hospital stay (days)	5.3±1.4	5.8±1.5
Ist Follow-up (days)	7.0±1.1	7.3±1.9
ERCP after operation	3	1

Patients were followed up with liver function tests, abdominal ultrasonography, CT or ERCP, and when needed. In addition, Post-op complications include recurrent stones, biliary peritonitis, obstructive jaundice, wound infection, pancreatitis, and CBD strictures.

Operation methods

Laparotomy was performed through the right subcostal incision, and longitudinal incision of CBD at its anterior portion made at the most easily-exposed area near the origin of the cystic duct, through which stones were removed and intraoperative choledocscopy was carried out as needed. Stones were removed using stone forceps and saline irrigation by Nelaton tubing, and the patency of CBD to duodenum was confirmed by Nelaton catheter.

Choledochotomy was closed by 5-0 Vicryl by continuous suturing in group A patients (n=30) primarily, and T-tube was inserted in group B patients (n=30) using the same suture size and material. A negative suction drain was left in the operative area to observe any bile leak and was usually removed around the 3rd postoperative day. Staples were

drawn on the postoperative 8th day.

Postoperative follow-up management

Postoperatively, monthly follow up was advised, with routine labs, USG up to 3 months, and outpatient visits once a year after that. T-tube was removed on the 12th postoperative day at the outpatient clinic after confirming stone clearance on the T-tube cholangiogram. In patients with antegrade CBD Nelaton catheter, check endoscopy ± removal was done at one month. CT scan or ERCP was needed in patients with recurrent stones or complications.

Statistical analysis

Data was analysed by chi-square test, giving statistical significance when $p < 0.05$

RESULTS

The demography of patients was comparable between the two groups. In addition, hospital stay was similar between the groups, thus, indicating no differences in recovery time at hospitals.

Various indications of operations were the failure of CBD stone removal using ERCP and EST, previous gastric resection with Billroth II anastomosis state blocking endoscopic CBD access, or refractory cholangitis or pancreatitis antibiotics leading to a septic condition.

	GROUP A	GROUP B
Cholangitis	18	14
Acute pancreatitis	3	4
Obstructive jaundice	7	8
Acute cholecystitis	2	4

Complications rate after the operation was compared between group A and B patients, which was 7, and 6 cases, respectively ($p = 0.08$), as shown in Table 3. This was not statistically significant, indicating that complication rates between primary closure patients and T-tube inserted patients showed no differences in complication rates.

Complications	GROUP A(n)	GROUP B(n)	P VALUE
Recurrent stone	2	1	
Bile peritonitis	1	2	
Obstructive jaundice	1	1	
Wound infection	2	1	
Pancreatitis	1	1	
Total complications	7	6	0.08
Mortality	1	1	

In Group A patients, in 2 cases, immediate postoperative ERCP was performed given jaundice and suspected

remnant CBD stones. No such cases were observed in Group B patients. Another ERCP was necessary for one patient in Group A for suspected recurrent CBD stones after more than six months of operation.

Recurrent stones were detected in 2 patients of Group A and 1 case of Group B. Two cases in Group A were managed by re-exploration surgery and ERCP, respectively, and one patient in Group B was cured by re-exploration.

Biliary peritonitis after surgery occurred in one case and two cases within each Group A and B, respectively. One case in group A was leaking bile into the peritoneal cavity through the separated upper edge of closed choledochotomy. Two cases of biliary peritonitis in Group B were managed successfully by keeping USG guided drain.

Wound infection appeared in 2 cases in Group A and one patient in Group B. Dressings and antibiotics cured all the cases.

Obstructive jaundice in 1 case of Group A was caused by pancreatic oedema without apparent evidence of pancreatitis and subsided within ten days after the operation.

Each case of postoperative pancreatitis in both groups recovered uneventfully through conservative management.

Postoperative 30-day mortality was 2, with 1 case from each group.

A case of mortality in Group A had biliary peritonitis, complicating conditions to wound dehiscence and sepsis, which eventually led to death. One mortality in Group B with pneumonia and pleural effusion with resultant multiorgan failure. Thus, the mortality rates between Group A and B showed no difference.

DISCUSSION

Questions on the necessity of T-tube instillments at the end of choledochotomy, whether open or laparoscopic, are being raised given recent developments in perioperative diagnostic tools, operative instruments and surgical techniques.

The technical demanding and prolonged operation time in T-tube insertion has been replaced by primary closures, ENBD, pigtail intubations, as the laparoscopic colectomy 15 and other ways to aid decompressions of CBD postoperatively have reported good outputs.

Recently, many reports were published on successful primary closures of choledochotomy sites without T-tube during open or laparoscopic procedures^{1,2,3,16-20}

Usually, before the operation, we are all well-informed about the stone patterns in the biliary tree. Through more meticulous operative procedures focusing on CBD clearance and patency, the possibilities of retained stones are mostly negligible. That fact raises more suspicion on the necessity of T-tube insertion and makes us ask whether the T-tube bile drainage would help the healing of choledochotomy wounds. Moreover, we could expect reduced patient discomforts postoperatively through primary closures, thus, followed by financial benefits.

We traced 30 cases of primary closures without T-tube (Group A) and 30 cases of T-tube stenting (Group B) during the period of 3-year experience showing no significant difference in complication rates and fewer leakage rates of bile through closed choledochotomy when primarily closed (In 1 case of the Group A than in two instances of T-tube inserted Group B patients)

In Group A patients antegrade stenting of the ampulla of Vater using Nelton catheter, at the end of choledochotomy was practised, for suspected retained stones in CBD which was proven to be negative at the end, but contributed to good drainage of immediate bile postoperatively, which helps the healing of choledochotomy wound when the classic concept is applied.

In Group B, effects of T-tube drainage of bile for decompression to aid choledochotomy wound healing by keeping intraluminal pressures of CBD low seemed to be not the case when considering our cases of choledochotomies. Eight cases were drained by antegrade stenting, and six had EST among 30 successful primary closure patients in Group A, 8 cases were drained by antegrade stenting, and 6 had EST. In contrast, the rest had intact ampulla of Vater perioperatively, thus, maintaining normal CBD physiologic secretions and intraluminal pressures. Decompression of CBD by EST or no drains did not affect wound healing in primarily closed choledochotomy. Besides, the T-tube drained cases of Group B patients also showed uneventful recoveries of choledochotomy wound healing, demonstrating that intraluminal pressure is not an issue for healing CBD

incision wounds.

Two cases of bile peritonitis occurred unexpectedly in Group B patients at a relatively young age of 54 and 62. Still, both were managed successfully by keeping drainage and supportive care. In addition, their ampulla of Vater remained intact perioperatively.

Failures of choledochotomy wound healing, leading to bile peritonitis and multiorgan septic failure and death, occurred in 1 case of Group A, an 86-year-old male patient under imminent septic condition by large CBD stones, which hastened operation, and efforts to save operation time included omitting the T-tube instilment.

Although the T-tubes help detects residual stones postoperatively, it has not played many roles in healing choledochotomy wounds by decompression. When the operation is confronted with suspicious retained stones in CBD at the end, leaving the internal antegrade stent in position could be an option for additional endoscopic stone removal procedures. Recent laparoscopic choledochotomy and primary closure trials can be accepted as a feasible and acceptable treatment option.^{21,22}

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REFERENCES

1. Zhu QD, Tao CL, Zhou MT, et al. Primary closure versus T-tube drainage after common bile duct exploration for choledocholithiasis. *Langenbecks Arch Surg* 2011; 396:5362.
2. L. Carvalho, J. Antunes, et al. Primary Closure versus T Tube Drainage in Laparoscopic Common Bile Duct Exploration: Has the Paradigm Already Changed?, *HPB* 2021, 23:982.
3. Ambreen M, Shaikh AR, Jamal A, et al. Primary closure versus T-tube drainage after open choledochotomy. *Asian J Surg* 2009; 32:2125.
4. Leida Z, Ping B, Shuguang W, et al. A randomized comparison of primary closure and T-tube drainage of the common bile duct after laparoscopic choledochotomy. *SurgEndosc* 2008; 22:15951600.
5. Wills VL, Gibson K, Karihaloot C, et al. Complications of biliary T-tubes after choledochotomy. *ANZ J Surg* 2002; 72:177180.
6. Memon MA, Hassaballa H, Memon MI. Laparoscopic common bile duct exploration: the past, the present, and the future. *Am J Surg* 2000; 179:309315.
7. Campbell-Lloyd AJ, Martin DJ, Martin IJ. Long-term outcomes after laparoscopic bile duct exploration: a 5-year follow up of 150 consecutive patients. *ANZ J Surg* 2008; 78:492494.
8. Kanamaru T, Sakata K, Nakamura Y, et al. Laparoscopic choledochotomy in management of choledocholithiasis. *SurgLaparoscEndoscPercutan Tech* 2007; 17:262266.
9. Martínez Cecilia D, Valentí Azcárate V, Qurashi K, et al. Advantages of laparoscopic stented choledochorrhaphy. Six years experience. *Cir Esp* 2008; 84:7882.
10. Tang CN, Tai CK, Ha JP, et al. Antegrade biliary stenting versus T-tube drainage after laparoscopic choledochotomy--a comparative cohort study. *Hepatogastroenterology* 2006; 53:330334.
11. Pérez G, Escalona A, Jarufe N, et al. Prospective randomized study of T-tube versus biliary stent for common bile duct decompression after open choledocotomy. *World J Surg* 2005; 29:869872.
12. Wani MA, Chowdri NA, Naqash SH, et al. Primary closure of the common duct over endonasobiliary drainage tubes. *World J Surg* 2005; 29:865868.
13. Wei Q, Hu HJ, Cai XY, et al. Biliary drainage after laparoscopic choledochotomy. *World J Gastroenterol* 2004; 10:31753178.
14. Wu JS, Soper NJ. Comparison of laparoscopic choledochotomy closure techniques. *SurgEndosc* 2002; 16:13091313.
15. Chen CC, Wu SD, Tian Y, et al. The fading role of T-tube in laparoscopic choledochotomy: primary choledochorrhaphy and over pigtail J and endonasobiliary drainage tubes. *J LaparoendoscAdvSurg TechA* 2010; 20:807811.
16. Naraynsingh V, Hariharan S, Ramdass MJ, et al. Open common bile duct exploration without T-tube insertion--two decade experience from a limited resource setting in the Caribbean. *Indian J Surg* 2010; 72:185188.

17. Yin Z, Xu K, Sun J, et al. Is the end of the T-tube drainage era in laparoscopic choledochotomy for common bile duct stones is coming? A systematic review and meta-analysis. *Ann Surg* 2013; 257:5466.
18. Cai H, Sun D, Sun Y, et al. Primary closure following laparoscopic common bile duct exploration combined with intraoperative cholangiography and choledochoscopy. *World J Surg* 2012; 36:164170.
19. Savita KS, Bhartia VK. Laparoscopic CBD exploration. *Indian J Surg* 2010; 72:395399.
20. Jameel M, Darmas B, Baker AL. Trend towards primary closure following laparoscopic exploration of the common bile duct. *Ann R CollSurgEngl* 2008; 90:2935.
21. Zhang LD, Bie P, Chen P, et al. Primary duct closure versus T-tube drainage following laparoscopic choledochotomy. *Zhonghua Wai KeZaZhi* 2004; 42:520523.
22. Wan Zhen, MD1*, Wang Xu-Zhen et al. Primary Closure Versus T-Tube Drainage Following Laparoscopic Common Bile Duct Exploration in Patients With Previous Biliary Surgery 2020; 87:50-55.