



COMPARISON OF T-TUBE DRAINAGE VERSUS PRIMARY CLOSURE OF CBD AFTER OPEN CHOLEDOCOLITHOTOMY

Hepatobiliary Surgery

Dr. Dharmendra Dugar	Associate Professor, Department of General Surgery, All India Institute of Medical Science, Raipur (CG), India.
Dr. Debajyoti Mohanty	Additional Professor, Department of General Surgery, All India Institute of Medical Science, Raipur (CG), India.
Dr. Hari S. Mahobia*	Senior Resident, Department of General Surgery, All India Institute of Medical Science, Raipur (CG), India. *Corresponding Author
Dr. Arijit Saha	Assistant Professor, Department of General Surgery, All India Institute of Medical Science, Raipur (CG), India.

ABSTRACT

Background: In a developing country like India where 65% of the population lives in rural area with limited access to modern surgical setup, open bile duct exploration is still a treatment of choice in many hospitals for obstructed CBD stone. Although T-Tube has been used as a safe and effective method of biliary decompression, it is not exempt from complications, which is present in up to 10% of patients. This study was designed to access the outcome of primary repair of CBD in terms of operating time, duration of hospital stay and postoperative complications.

Aim: To compare the complications, operative time and duration of hospital stay in patients with T-Tube drainage versus primary closure after open bile duct exploration.

Methodology: This is a prospective study conducted in Department of General Surgery over a period of 2 years. Fifty patients were enrolled in study. In all these patients ERCP was attempted but failed. Patients were evaluated with routine investigations. They were further allocated alternately to two groups, Group I for T-Tube drainage and Group II for primary closure. Patients were underwent for open CBD exploration Bile leakage and other parameter was studied.

Results: Overall complication rate was higher in group I (n = 7; 28%) compared to group II (n = 3; 12%). In group I, biliary leak was seen in four (16%) patients and group II bile leak was seen in two patients (8%).

Conclusion: T-Tube drainage results in significantly longer operative time and hospital stay without any evidence of benefit as compared to primary closure. Alternate modalities should be explored to reduce T-Tube related complication. Primary closure in selected patients gives equally good results as compared to standard T-Tube drainage.

KEYWORDS

CBD stone(Cholelithiasis), CBD exploration(choledocolithotomy), T- Tube

INTRODUCTION

Gall stone is a common problem of biliary system and is associated with common bile duct (CBD) stone in about 5-11 % of the patients [1]. In the era of minimal invasive surgery, the standard protocol of treatment is to drain the CBD by ERCP followed by laparoscopic cholecystectomy. Another option is to do laparoscopic CBD clearance along with laparoscopic cholecystectomy. However, open exploration is indicated in failed ERCP and places where expertise is not available for ERCP or laparoscopic surgery. In a developing country like India where 65% of the population lives in rural area with limited access to modern surgical setup, open surgery is still a treatment of choice in many hospitals. Hypothesis for placement of T-Tube is (a) Prevention of extravasation of bile from common bile duct. (b) Allows postoperative visualization of CBD and (c) Potential route for extraction of any retained stones.

Although T-Tube has been used as a safe and effective method of biliary decompression, it is not exempt from complications, which is present in up to 10% of patients [2]. The most frequent of these is bile leak after removal of T-Tube, which is seen in 1-19% of cases [3]. Patients may present with electrolyte imbalance, dehydration, tract infection, T-Tube dislodgement and sepsis. All these complications lead to prolonged hospital stay and increase the cost of treatment. This study was designed to access the outcome of primary repair of CBD in terms of operating time, duration of hospital stay and postoperative complications.

Aim

To compare the complications, operative time and duration of hospital stay in patients with T-Tube drainage versus primary closure after open bile duct exploration.

METHODS

This is a prospective study conducted in Department of General Surgery over a period of 2 years. Fifty patients admitted in the Department of General Surgery were included in the study. In all these patients ERCP was attempted but failed. Patients with co-existing

pancreatitis and malignancy were excluded from the study. All the admitted patients were evaluated with routine investigations including complete blood counts, liver function tests, renal function test and coagulation profile. An abdominal ultrasound was repeated following admission to confirm biliary stone and evaluate intrahepatic and extrahepatic biliary radicles. All patients were scheduled for open CBD exploration. They were further allocated alternately to two groups, Group I for T-Tube drainage and Group II for primary closure. All patients received antibiotic (I.V Ceftriaxone) prior to induction of anesthesia. In both groups, CBD was opened using supraduodenal vertical incision. Common bile duct was cleared and normal saline flushing was done to confirm the patency of CBD. In Group I, appropriate size T-Tube was placed and in Group II, CBD was closed primarily using 4-0 PDS, interrupted sutures. Subhepatic drain was placed in all patients. T-Tube Cholangiography was done on 7th postoperative day in Group I patients. Once patency was confirmed, intermittent clamping of T-Tube was done followed by removal on 10th postoperative day. Bile leakage is defined as any green bile like fluid coming out of subhepatic drain or aspiration of bile under ultrasound guidance after removal of drain. All patients having clinical jaundice were given 3 doses of Vitamin- K prior to surgery.

The data was analyzed in statistical program SPSS. Chi square test was applied for categorical variable to calculate frequencies and percentage and Student's t-test was applied to compare the means among the groups. Value of $p \leq 0.05$ was considered statistically significant.

RESULTS:

Open CBD exploration was performed in 50 patients out of which T-Tube was placed in 25 patients. Primary closure was done in another 25 patients. The mean age of patients who had T-Tube drainage was 42.3 ± 12.8 years (median- 40years; range, 18–72 years) and that of primary closure was 45.8 ± 17 years (median- 44 years; range, 20–68 years). There were 6 males (24%) and 19 females (76%) in the T-Tube drainage group, and 4 males (16%) and 21 females (84%) in primary closure group (Table 1). The clinical presentation of patients with CBD

stone is listed in Table 1. Most common presentation in both groups is biliary colic (72% and 64%). Other clinical presentations were jaundice and fever with chills and rigor. Table-1 shows that the demographic characteristics were well matched in both groups.

Table 1- Demographic Characteristics Of Patients

	T-Tube drainage (n=25)			Primary Closure (n=25)			P - Value
	Mean \pm SD	Media n	Range	Mean \pm SD	Media n	Range	
Age	42.3 \pm 12.8	40	18-72	45.8 \pm 17	44	20-68	0.13
Gender	male	6 (24%)			4 (16%)		0.48
	female	19 (76%)			21 (84%)		
Symptoms							
Biliary colic	18 (72%)			16 (64%)			0.54
Jaundice	12 (42%)			8 (32%)			0.25
Fever with chills	7(28%)			8(32%)			0.76
Silent stones	0 (0%)			2(8%)			0.09

The average operative time in T-Tube drainage group was 156 ± 6.4 minutes (range 130-170 minutes) and in primary closure group was 123.5 ± 4.8 minutes (range 110-135 minutes). The mean postoperative hospital stay in the T-Tube drainage group was 15.2 ± 2.3 days (range 10-22 days), compared to the primary closure group which was 8.6 ± 1.73 (range, 7-15 days) (Table 2).

Table 2–Hospital Stay, Operative Time

	T-Tube drainage Mean \pm SD	Range	Primary Closure Mean \pm SD	Range	p-value
Hospital stay in days	15.2 ± 2.3	10-22 days	8.6 ± 1.73	7-15 days	<0.01
Operative time in minutes	156 ± 6.4	130-170 mins	123.5 ± 4.8	110-135 mins	<0.01

In the T-tube drain patients, biliary leak was seen in four (16%) patients. All patients had bile leakage after removal of the T-tube and were managed conservatively. One patient required ultrasound guided aspiration. No patients in Group- I had post-operative retained stone or jaundice. Twenty two patients in the primary closure group did not suffer any complication. Bile leak was seen in two patients (8%) and both required USG guided drainage. All patients of bile leak were managed conservatively and none of the patient required re-exploration. Three patients (12%) had superficial surgical site infection which settled with antibiotics given as per swab culture report. One patient in T-Tube drain group developed septicemia after removal of T-Tube. USG showed collection in right hypochondrium which was aspirated and antibiotics were escalated. The patient recovered and was discharged on postoperative day-22.

Table 3- Postoperative Complications

	T-Tube drain (n=25)	Primary Closure (n=25)	p-value
Bile leak	4	2	0.27
Jaundice	0	0	1
Wound infection	2	1	0.48
Septicemia	1	0	0.31
Retained stone	0	0	1
Mortality	0	0	1
Total	7	3	0.16

DISCUSSION

Before the era of Minimal Invasive Surgery, cholecystectomy and choledocholithotomy was done as a single open procedure. In 1890, Ludwig Courvoisier performed first successful CBD exploration and

the procedure was considered as gold standard [4]. Halsted in 1919 recommended drainage of CBD by a small tube through cystic duct [5]. ERCP was introduced in 1968 by Mc Cune which revolutionized the diagnosis and management of diseases of hepatobiliary tract [6]. Although ERCP is considered as the method of choice in removal of CBD stones, but it has its own limitations. Situations like large stone, multiple impacted stones make ERCP difficult and surgical exploration is the only option left. Present study was thus performed to compare the morbidity of T- Tube placement over primary closure in patients with failed ERCP.

There were 40(80%) female and 10(20%) male patients ranging from age group 18-72 years (Table- 1). The most common presenting symptom was biliary colic present in 34(68%) of patients, followed by jaundice in 20(40%) patients. Two patients (4%) were asymptomatic and CBD stone was detected incidentally in screening USG (Table – 1). In all these cases, endoscopic extraction failed. Multiple impacted stones (n= 30; 60%) and large stone (n = 11; 22%) were the main cause of the failure. In (n = 9; 18%) of the cases the procedure was abandoned because of bleeding or difficulty in cannulation.

In our study we performed open CBD exploration and ensured ductal clearance by flushing with normal saline in all the cases. In group I (n = 25) appropriate size T- Tube was inserted after clearance of the CBD. Primary closure group II (n = 25) was done in patients where wall of the duct was healthy, dilated to permit sutures without obstruction, and allowed for passage of normal saline on irrigation. The purpose of T-Tube insertion was to decompress the bile duct, but Table – 3 shows that the purpose was not well served as expected. There were 4(16%) bile duct leak in group I and 2(8%) in group II. Bile leak in group I was after removal of T- Tube on 10th postoperative day. Yamazaki et al reported bile leak as 11.7% and 5.7% respectively with overall incidence of 14.3-38% [3, 7]. Many authors have reported no bile leak after primary closure [8]. All our patients with biliary leak were managed conservatively with USG guided drainage (n = 3) and antibiotics. All our patients of bile leak in Group- I was after removal of T-Tube. The cause may be due to post-operative distal spasm, diseased bile duct wall, and early removal of T-Tube. None of our patients had retained stone as the cause of distal obstruction and bile leak. To avoid such complication we recommend the use of intra-operative biliary stent in selected cases where there is bile duct edema, fibrosis, difficult dissection and redo surgery.

Incidence of complications is listed in Table – 3. Most common complication was post- operative bile leak (12%), followed by wound infection (6%) and septicemia (2%). One patient developed septicemia in group I, which was managed conservatively with antibiotics and bowel rest. Overall complication rate was higher in group I (n = 7; 28%) compared to group II (n = 3; 12%). Although not statistically significant, but this contributed to significantly higher post-operative hospital stay in patients with T-Tube drain. Other complications which are mentioned in the literature are bile duct trauma during removal, biliary peritonitis, retention of fragment of tube, stricture formation, fluid and electrolyte imbalance and prolonged biliary fistulae [9].

This study has shown that T-Tube drainage appeared to increase the operative time. The difference was statistically significant (Table – 2). The difference in time maybe due to an additional time required for T-Tube placement and fixation. Longer time for completion of procedure may be associated with complication like wound infection as seen in our study (Table – 3).

Our study shows that there is significant difference in post-operative hospital stay. In group I the average stay was 15.2 days (range 10-22 days) and in group II it was 8.6 days (range 7-15 days). The cause may be due to discharge in group I after T-tube removal which was done on post-operative day 10. Another cause of prolonged hospital stay was increased complication rate in group I as compared to primary closure patients. Other studies also had similar observation with prolonged hospital stay in T- Tube drainage patients [10].

CONCLUSION

T- Tube drainage results in significantly longer operative time and hospital stay without any evidence of benefit as compared to primary closure. Alternate modalities should be explored to reduce T-Tube related complication. Primary closure in selected patients gives equally good results as compared to standard T-Tube drainage. Based on our study and various other literatures there is no justification to routinely use T- Tube drainage after open CBD exploration.

REFERENCES:

1. Hemli JM, Arnot RS, Ashworth JJ, Curtin AM, Simon RA, Townend DM. Feasibility of laparoscopic common bile duct exploration in a rural centre. *Australian and New Zealand Journal of Surgery* 2004;74(11):979–82. Tapia A, Llanos O, Guzman S, et al. Resultados de la coledocotomia clasica por coledocolitiasis: un punto de comparacion para tecnicas alternativas. *Rev Chil Cir* 1995;47:563–8.
2. Gharaibeh KIA, Heiss HA. Biliary leakage following T-tube removal. *Int Surg* 2000;85:57–63.
3. Courvoisier L. Statistical contributions to the pathology and surgery of the biliary system. Leipzig: Vogel. 1890;387:57-8.
4. Halstead WS. The omission of drainage of common duct surgery. *J Am Med Assoc*. 1919;73:1896-7.
5. McCune WS, Snorb PE, Moskovitz H. Endoscopic cannulation of the ampulla of Vater: A preliminary report. *Ann Surg*. 1968;167:752-6.
6. Yamazaki M, Yasuda H, Koide Y, et al. Primary closure of the common bile duct in open laparotomy for common bile duct stones. *J Hepatobiliary Pancreat Surg* 2006;13:398–402.
7. Sorenson VJ, Buck JR, Chung SK, et al. Primary bile duct closure following exploration: an effective alternative to routine biliary drainage. *Am J Surg* 1994;60:451–5.
8. Will VL, Gibson K, Karihaloot C, Jorgensen JO. Complication of biliary T-tube after choledochotomy. *ANZ J Surg*. 2002;72(3):177-80.