

T-Tube Versus Biliary Stent as Decompression Procedure after Open Common Bile Duct Exploration in Patients of Choledocholithiasis

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Abstract

Background: Open biliary surgery followed by T-tube drainage is still a treatment of choice in patients of choledocholithiasis in many hospitals of developing world. The use of T-tube is not without complications. There are limited studies comparing efficacy of internal biliary stents versus T-tube in open CBD exploration to prevent T-tube complications. The present study assesses clinical short term results in patients who underwent open CBD exploration using a biliary stent versus a T-tube decompression method. **Objectives:** To compare the clinical outcomes in patients who underwent open CBD exploration using a biliary stent versus as a T-tube decompression method. **Material and Methods:** This prospective randomized controlled study was conducted on 50 consecutive patients undergoing open CBD exploration in the Department of Surgery, Government Medical College and Hospital, Chandigarh from June 2012 to October 2014. Patients were randomly allocated into two groups of 25 each to use of a biliary stent (Group A) (Indovasive, India) or a Kehr's T-tube (Group B), following open CBD exploration. **Results and Analysis:** Baseline characteristics of both the groups were comparable. Surgical site wound infection was observed in 64% of group B patients as compared to 4% in group A ($p=0.003$). There was statistical significant difference in postoperative stay in hospital for patients in Group A (6 ± 3.1 days) as compared to Group B (9.6 ± 5.3 days). Postoperative VAS was significantly low in group A

as compared to group B on 7th postoperative day ($p=0.018$). 3 patients in group B had retained CBD stone as compared to none in group A. 4 patients underwent readmission and 1 patient required reoperation in group B as compared to 1 readmission and no reoperation in group A. **Conclusion:** primary closure of CBD over biliary stent appeared safe and effective with lesser rate of surgical site wound infections, shorter postoperative hospital stay, few readmission rate and less postoperative discomfort in hospital settings where either laparoscopic CBD exploration facility or expertise are not available.

Keywords: Choledocholithiasis; Open Choledocholithotomy; Ttube; Internal Biliary Stents.

Introduction

Choledocholithiasis is a common problem encountered approximately in 10% of asymptomatic patients during cholecystectomy. 1-2% of patients following cholecystectomy will present with a retained stone in a setting where selective cholangiography is not performed [1]. There are two methods for extracting common bile duct (CBD) stones, either by endoscopic retrograde cholangiopancreatography (ERCP) or surgically, by an open or laparoscopic method [2]. Despite advancement in laparoscopic and endoscopic techniques, open biliary surgery is still a treatment of choice in many hospitals of developing world due to lack of training as well as equipment [3,4,5].

Conventionally T-tube has been used for decompression of CBD after open choledocholithotomy which also permits postoperative cholangiography and residual stones

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extraction avoiding re-exploration but it has its own share of complications. Some of these complications are serious, such as fluid and electrolyte disturbance, sepsis, premature dislodgement and bile leakage, biliary peritonitis, prolonged biliary fistula and late bile duct strictures. In addition, it causes significant discomfort and prolonged hospital stay [6,7].

A good alternative to CBD decompression is the use of internal biliary stent widely used in endoscopic procedures and laparoscopic CBD exploration. Several studies have demonstrated the usefulness of these stents leading to decreased complications, morbidity and cost as compared to T-tube in laparoscopic common bile duct exploration [8,9,10]. In our knowledge, there are limited studies comparing efficacy of internal biliary stents versus T-tube in open CBD exploration [8]. The present study aimed at comparing clinical short term outcomes in patients who underwent open CBD exploration using a biliary stent versus a T-tube decompression method.

Material and Methods

After ethical committee approval and written informed consent, a prospective randomized controlled study was conducted on 50 consecutive patients undergoing open CBD exploration in the Department of Surgery, Government Medical College and Hospital, Chandigarh from June 2012 to October 2014. Patients for the study were selected from those attending the surgical OPD or those presenting to the emergency of Government Medical College and Hospital, Chandigarh with suspicion of choledocholithiasis.

All patients belonging to ASA grade I and II undergoing elective open choledocholithotomy as well as failed ERCP were included. Those aged more than 80 years, previous history of choledocholithotomy and deranged coagulation profile were excluded. Patients were assessed preoperatively with relevant clinical history, physical examination and routine biochemical tests including liver function tests. Diagnosis of choledocholithiasis was established preoperatively by abdominal ultrasonography (US), ERCP or magnetic cholangiopancreatography (MRCP).

Patients were randomly allocated into two groups of 25 each to use of a biliary stent (Group A) (Indovasive, India) or a Kehr's T-tube (Group B), following CBD exploration. All the patients underwent standard CBD exploration through choledochotomy in supraduodenal part of CBD. After stone retrieval and completion cholangiogram, patient

underwent either biliary stent or T-tube placement as per group allocation. A 7 Fr 10cm biliary stent was placed in CBD by the technique described by Perez et al [11] and Kim et al [12]. For patients in T-tube group, a No.12 F/14 F gauge T-tube was placed with the "T" lying along the length of the duct, shortening the limbs to 2.5cm in either direction and splitting the horizontal limb along its length opposite the vertical tube. The CBD was closed with interrupted 000 polygalactin 910 in both groups. Intraoperative drain in Morrison's pouch was employed in all patients and removed before discharge from hospital.

Patients were assessed postoperatively periodically until discharge. After ensuring no residual stones in T-tube cholangiogram done on 10th postoperative day, T-tube was removed on 14th postoperative day. Patients underwent upper gastrointestinal endoscopy for biliary stent removal after 4 to 6 weeks.

Quantitative data was presented as mean and range as appropriate. Normality of quantitative data was checked by measures of Kolmogorov Smirnov tests of normality. For normally distributed data, mean was compared using T-test. For skewed data or scores, Mann-Whitney U-test was used. For discrete categorical data, number and percentages were calculated. Chi-Square test or Fisher's Exact test were applied for categorical data. All statistical tests were two sided. A p value of <0.05 was considered to indicate statistical significance. Analysis was conducted using SPSS for windows (version 17.0; SPSS Inc., Chicago, IL, USA).

Result and Analysis

Baseline characteristics of both the groups with respect to age, sex, BMI, preoperative total serum bilirubin, serum alkaline phosphatase (ALP), duration of CBD stones were comparable (Table 1).

The postoperative morbidity in terms of number of patients developing wound infection was observed in 6 patients (24%) of Group B at T-tube site. 4 patients (16%) of Group A had surgical site wound infection while in Group B 14 patients (64%) developed surgical site wound infection. One patient in Group B (4%) had biliary peritonitis post T-tube removal which was managed conservatively (Table 2).

Postoperative stay in hospital for patients in Group A was 6±3.1 days as compared to Group B with 9.6±5.3 days. One patient (4%) in Group A and 4 patients (16%) in Group B were readmitted. 3 patients (12%) had retained CBD stones in Group B as

compared to none in Group A, one of whom was readmitted and reoperated as ERCP was not feasible in that patient because of previous Roux-En-Y gastrojejunostomy while other two patients underwent ERCP as OPD procedure for stone retrieval (Table 3).

No other serious postoperative procedure related complications such as postoperative acute pancreatitis, severe dehydration, biliary stent

retention and bowel perforation occurred during the course of study.

Postoperative Visual analogue score (VAS) score was less than 5 in 92% of patients of Group A on 1st postoperative day and 100% of patients on 7th postoperative day. While in Group B, VAS score was more than 5 in 100% of patients on 1st postoperative day and 20% of patients on 7th postoperative day (p=0.018).

Table 1: Baseline Characteristics of patients

Characteristics of patients	T-tube (n=25)	Biliary Stent (n=25)	P
Age(years)mean ± SD	45.4±15.4	50.2±13.9	0.262
Sex			
Male	6(24%)	5(20%)	0.733
Female	19(76%)	20(80%)	
Total Bilirubin(mg/dl)	1.76	1.90	0.210
Alkaline phosphatase(IU/dl)	436.84	384.64	0.930
Duration of CBD stones (weeks)	5.2	2.3	0.195

n: number of patients. Gender is shown as the absolute number and percent. Total bilirubin, alkaline phosphatase and duration of CBD stones shown as the mean.

Table 2: Postoperative complications

Complication	T-tube	Biliary Stent	P
Total	26	4	<0.001
Wound infection	14	4	0.003
Wound haematoma	1	0	0.312
Intraabdominal abscess	1	0	0.312
Retained CBD stones	3	0	0.235
T-tube wound infection	6	0	
Biliary peritonitis after T-tube removal	1	0	
Severe dehydration/pain	0	0	NS*
Biliary stent retention	0	0	NS*
Acute pancreatitis	0	0	NS*

*Not Significant

Table 3: Surgical results

Surgical Result	T-tube	Biliary Stent	P
Reoperation	1	0	0.312
Readmission	4	1	0.157
Postoperative stay(days) Mean ± SD	6±3.1	9.6±5.3	0.002

Discussion

Since its inception, T-tube has been the method of choice for CBD decompression following choledochotomy. This method has its share of complications [6,7]. Biliary internal drainage with the use of stent can be an alternative to t-tube.

In our study the method of stent removal was upper

gastrointestinal endoscopy. Therefore, complications of ERCP were not reported. With T-tube group, higher percentage of complications were associated that can be attributed to good follow up as it was a prospective study. The use of t-tube requires postoperative cholangiogram for its removal which is economically equivalent to upper gastrointestinal endoscopy for stent removal.

In T-tube group, postoperative morbidity in terms of T-tube site infection, wound hematoma, wound

infection and intra-abdominal abscesses were more common. Perez et al in his study reported the complication rate of 30% in T-tube group as compared to 11% in biliary stent group [11]. It appears reasonable that introduction of a foreign body in T-tube drainage, leads to exogenous acquisition of environmental microorganisms. Apparently ascending cholangitis leads to bacteremia and distant infective complications. In evaluating the relative morbidity between the two groups, the postoperative complications were significant and this did constitute the primary cause of increased morbidity among cases undergoing T-tube drainage.

Postoperative hospital stay in our study was 6 days in biliary stent group that was significantly shorter than T-tube drainage group which was 9.5 days while Perez et al in his study showed shorter hospital for biliary stent group which was not statistically significant compared to T-tube group [11]. In another study by Saeed N et al, mean postoperative hospital stay in T-tube group after open CBD exploration was 13.6 days [13]. T-tube drainage thus places an increased demand on the nursing personnel. This becomes an important consideration with the problems of hospital bed shortage and increasing costs. The benefits of a shorter postoperative stay to the patient as well as the hospital are well documented by Kim et al [12] and Isla et al [14] in their laparoscopic biliary stent placement after CBD exploration (2 to 5 days; mean 3 days), (4.81.5 days).

Three patients in the T-tube group had retained CBD stone on T-tube cholangiogram which attributed to one reoperation and ERCP for stone extraction in other two patients. Four patients in the T-tube group and one in biliary stent were readmitted. One patient had localized biliary peritonitis which was managed conservatively. Other two patients in T-tube group and one patient in the biliary stent group had minor complaints of pain abdomen and vomiting. In this study there was statistically significant difference in the postoperative pain in patients of CBD exploration with biliary stent group and in the patients of CBD exploration with T-tube group. Patients in biliary stent group experienced much less pain as compared to the patients with T-tube drainage, since these patients had the added discomfort of an extra tube in the abdomen and can be attributed to T-tube site and surgical site wound infections.

Conclusion

Complications in the primary group were significantly lower than the T-tube group so during open surgery for CBD stones primary closure of CBD

over biliary stent appeared safe and effective with shorter postoperative hospital stay, few readmission rate and less postoperative discomfort in hospital settings where laparoscopic CBD exploration facility are not available.

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