

Comparison between primary closure and T-tube drainage after open choledocotomy

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Abstract

Background: Common Bile Duct (CBD) exploration for choledocolithiasis is usually closed after T-tube insertion. However, complications of T-tube insertion limit its use. In the present study, we wanted to compare outcomes between primary repair of choledocotomy and traditional T-tube insertion. **Material and methods:** Thirty patients with CBD stones disease admitted at Sina and Imam Reza hospitals of Tabriz, from April 2012 to February 2013, were included in this study. The patients were randomly divided into two groups: T-tube drainage group and primary closure group. Intraoperative findings and postoperative complications were recorded and analyzed. **Results:** There was no mortality and retained stones in both groups. Two of 15 patients in the T-tube group and four of 15 patients in primary closure group suffered from minor bile leakage. There was no major bile leakage in the T-tube group but one patient in the primary closure group had major bile leakage, which was treated conservatively without surgical or endoscopic intervention. Wound infection was seen in two patients in the T-tube group and one patient in the primary closure group. In follow up assessment, there was no intra-abdominal collection in both groups. Overall postoperative complications include biliary complications, wound infection and intra-abdominal collections, were seen in four patients in the T-tube group and six patients in primary closure group; that was not statically significant difference. **Conclusion:** primary closure of CBD after open choledocotomy is feasible and is as safe as T-tube insertion. In effect, primary closure avoids T-tube insertion and disadvantages associated with the use of T-tube. Primary closure can be recommended for selected patients with CBD stone disease.

Key words: common bile duct stones; choledocotomy; T-tube drainage; primary closure

Introduction

In patients with cholelithiasis, 6-12% may have concurrent choledocal stones. The incidence is even higher in older ages and 20 to 25% of patients older than 60 who have

gallstone disease present with concurrent choledocal stones. It may result in complete or incomplete bile duct obstruction and manifest with cholangitis or gallstone pancreatitis (1).

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Closure of choledocotomy upon T-tube is the traditional surgical technique following open choledocal drainage. The theories for this strategy are distal decompression of bile tract, availability of postoperative contrast studies and availability of extraction of retained stones. However, T-tube insertion deserves potential complications (3). The most frequent of this is bile leakage after T-tube removal (2, 4). Complications may be serious in some patients. Tract infection and bile leakage following early removal of T-tubes without tract formation may require reoperation and has potential morbidity and mortality.

Primary closure of the CBD after choledocotomy is not new. There many papers reported by different authors, which support the primary closure of the duct immediately after CBD exploration (2, 3, 6- 9). The aim of this randomized study is to find out whether primary closure without T-tube drainage after open choledocotomy is feasible and as safe as T-tube insertion.

Materials and methods

30 patients with CBD stones disease admitted at Tabriz's Sina and Emam Reza hospitals, from April 2012 to February 2013, were included in this study. The patients were randomly divided into two groups: T-tube drainage group and primary closure group. Each group will be consisted of 15 patients. Routine investigations were performed for all patients including complete blood count, liver function tests, serum amylase, blood urea nitrogen, serum creatinine and abdominal ultrasonography. Inclusion criteria was jaundice on physical examination or hyperbilirubinemia in the presence of gallstone disease, CBD stones in ultrasonography, endoscopic retrograde cholangiopancreatography (ERCP) or magnetic resonance cholangiopancreatography (MRCP), intraoperative palpation of stones in CBD. Patients with acute pancreatitis or cholangitis

at presentation, suspicious malignancy, lesser than 20 or older than 80 years old, patients with history of laparotomy, history of heart failure, renal failure, cerebrovascular accidents and myocardial infarction, obese patients with body mass index (BMI) greater than 35 were excluded. All patients were given prophylactic antibiotic and a Kocher's subcostal incision was used. A longitudinal supraduodenal choledocotomy was done. Stones were taken out and saline flushing followed to ensure patency. We confirmed the clearance of the duct with a intraoperative cholangiography (IOC). After completion of IOC, patients were randomized to two groups of primary duct closure and T-tube drainage. In the primary closure group, the choledocotomy was closed primarily with interrupted 4-0 absorbable sutures (4-0 PDS), whereas in the T-tube drainage group, a latex rubber T-tube of appropriate size (14–20 French size) was inserted into the CBD incision and CBD incision was closed using interrupted sutures (4-0 PDS). Saline was flushed through the T-tube to rule out leakage. At the end of the procedure, a single sub-hepatic closed suction drain was placed (Jackson Pratt Drain).

The day after the surgery, patients were ambulated and returned to oral intake as tolerated. If there was an insignificant output from closed suction drain, it was removed after a few days and patients were discharged. Afterward they were controlled 2 weeks, 1 month and 3month following hospital discharge.

Patient's demographics (age, gender and BMI), operative time, duration of hospital stay, comorbidities, number of CBD stones, CBD diameter, clinical presentation and postoperative complications; including minor (<200cc in 24 hours) and major (>200cc in 24 hours) bile leakage, intra-abdominal collection were recorded.



	Primary closure (n=15)	T-tube drainage (n=15)	P-value
Age(years)	52.13±15.51	50.13±20.38	0.765
Gender (M/F)	3/12	4/11	-
BMI (kg/m ²)	28.07±4.46	31.33±5.28	0.078

Table 1: Demographic characteristics

*Results are expressed as mean ± standard deviation

T-tube cholangiography or ultrasonography was used for detection of residual stones and ultrasonography was used for assessment of postoperative intra-abdominal collections. Wound infection was defined as a wound requiring partial or complete opening. Abdominal collections were defined as intra-abdominal collections requiring surgical or percutaneous drainage. Operating time was calculated in minutes. Hospital stay was defined as postoperative admission days.

In the T-tube group, T-tube cholangiogram was performed on the 25-30th postoperative day and tube was removed after confirmation of free flow of contrast with no residual stone.

For comparison of the two groups, Fisher's exact test of chi-squared was used when appropriate for qualitative data, and Student's t-test for quantitative data. $P < 0.05$ was considered statistically significant. Statistical analyses were carried out using SPSS (version 18) software.

Informed consent for randomization to primary closure or T-tube drainage was requested of all patients; none refused.

Results

CBD exploration was performed in 30 patients, out of which 15 had primary closure of CBD after stone removal and T-tube drain was placed in remainder.

The mean age of patients in primary closure was 52.1 years and that of T-tube group was 50.1, ($P=0.71$). There were three males (20%) and 12 females (80%) in the primary closure group, and four males (26.7%) and 11 females (73.3%) in T-tube group (Table 1).

The median time spent in hospital after the operation for those having primary closure was 5.8 days, whereas those patients having a T-tube inserted remained in hospital from 6.3 days.

Preoperative abdominal ultrasound showed the diameter of CBD, number and size of CBD stones, which was then confirmed during the operation. Operative findings are summarized in Table 2.

Most common presentation in the primary closure group was jaundice but most of the patients in the T-tube group presented with acute cholecystitis. The clinical presentations of patients are listed in Table 3.

One patient (13.3%) in the primary closure group and two patients (6.7%) in the T-tube group had wound infection that requiring opening for drainage.

In the primary closure group, one patient experienced major bile leakage, which responded to conservative treatment and bile leak ceased spontaneously on the 7th postoperative day. Endoscopic or surgical

	Primary closure (n=15)	T-tube drainage (n=15)	P-value
Diameter of CBD (mm)	13.13±3.11	10.73±2.60	0.03
Diameter of CBD stones (mm)	10.80±4.98	6.53±3.92	0.015
Number of CBD stones	1.13±0.83	2.27±2.66	0.075
Operating time (min)	111.00±15.29	123.67±0.72	0.014

Table 2: Operative findings

*Results are expressed as mean ± standard deviation

intervention did not require. None of the patients in the T-tube group had major bile leak.

Four patients in the primary closure group and two patients in the T-tube group experienced minor bile leakage, which stopped spontaneously with extended peritoneal drainage. There was no complication following removal of T-tube.

Overall postoperative complications include biliary complications, wound infection and intra-abdominal collections were observed in four patients (40%) of the group assigned to the T-tube group and six patients (27%) assigned to primary closure group; that was not statically significant difference. There were not any residual CBD stones and intra-abdominal collections seen up to 3 months follow up and postoperative ultrasound findings were almost normal. Two patients in the primary closure group and four patients in the group T-tube group had comorbidities like hypertension, diabetes mellitus, ischemic heart disease and osteoporosis. There was a significantly lower operating time in the T-tube group compared to the primary closure group (111 versus 124 minutes, $P < 0.13$). There was no death in this study.

Discussion

Open CBD exploration has been the main treatment modality for CBD stones for many years. It is also performed frequently at the present time (10). T-tubes are usually inserted for biliary decompression and stenosis. This

strategy has been the modality of choice for many years (2, 11). Although t-tube insertion is proved to be a safe and effective method for postoperative biliary decompression, its potential complications are seen in 10% of patients and thus limit its use (3).

It is believed that insertion of T-tube allows spasm or edema of sphincter to settle after the trauma of the exploration. Moreover, postoperative T-tube drainage has been used to prevent bile stasis, decompress the biliary tree, and minimize the risk of bile leakage. A T-tube also provides an easy percutaneous access for cholangiography and extraction of retained stones (12). However, leakage of bile may be encountered after removal and patient have to carry it for several weeks before removal (13).

In our study, we had four cases (4/15) of minor bile leakage among the 15 patients in whom primary closure of the CBD was done, and two cases (2/15) among other 15 patients in whom the T-tube was used. None of the patients in the T-tube group had major bile leak but, in the primary closure group, one patient experienced major bile leakage, which was treated conservatively without endoscopic or surgical intervention.

Overall postoperative complications include biliary complications, wound infection and intra-abdominal collections, in the T-tube and primary closure group, were four and six patients; that was not statically significant difference. There were not any residual CBD stones and intra-abdominal collections, in this study. Also there were no deaths. Compared

	Primary closure (n=15)	T-tube drainage (n=15)
Acute cholecystitis	2 (13.3%)	10 (66.7%)
Biliary colic	3 (20.0%)	1 (6.7%)
Dyspepsia	4 (26.7%)	2 (13.3%)
Jaundice	6 (40.0%)	2 (13.3%)

Table 3: Clinical presentation of patients

*Results are expressed as number and percentage

with primary closure group, T-tube group had shorter operating time (111 versus 124 minutes, $P < 0.13$). The reason for this was probably that we spent more time because of intraoperative cholangiography in this group of patients. The difference between the groups was not statically significant for hospital stay (6.3 and 5.8 days). The two groups were similar in terms of demographics include age, gender and body mass index (BMI). Diameter of CBD and diameter of stones in the T-tube group were statically lower than that of primary closure group (Table 2).

Similar to the findings by others (2, 3, 5, 6, 8, 12, 13), in our study, there were no statically significant differences for postoperative

complications and residual stones. Therefore, postoperative T-tube drainage is not necessary for decompression of the biliary tree. In addition, the use of intraoperative cholangiography can also avoid missed biliary problems. Our findings showed that primary closure did not increase the risk of postoperative bile leakage.

We believe that primary closure is a safe method in patients with choledocal stones. Patients could return to work earlier, following exploration of the common bile-duct, if the duct is sutured without T-tube drainage, and primary closure of CBD is a safe and effective alternative measure and is associated with low complication rates.

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