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**Dr. Swapnil A Pattanshetti**

Assistant Professor, Department of  
Pediatric Surgery, Jawaharlal  
Nehru Medical College, KAHER,  
Belagavi, Karnataka, India

**Dr. Vidya M Mahalmani**

Assistant Professor, Department of  
Pharmacology, Jawaharlal Nehru  
Medical College, KAHER,  
Belagavi, Karnataka, India

**Dr. Kannikanti Nageswara Rao**

Assistant Professor, Department of  
Pediatric Surgery, Jawaharlal  
Nehru Medical College, KAHER,  
Belagavi, Karnataka, India

**Corresponding Author:**

**Dr. Swapnil A Pattanshetti**

Assistant Professor, Department of  
Pediatric Surgery, Jawaharlal  
Nehru Medical College, KAHER,  
Belagavi, Karnataka, India

## Comparison of primary closure and T-tube drainage of the common bile duct after choledochotomy

**Dr. Swapnil A Pattanshetti, Dr. Vidya M Mahalmani and Dr. Kannikanti  
Nageswara Rao**

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### Abstract

The closure of common bile duct (CBD) after choledocholithotomy can be done over T-tube or primarily. The method of T-tube drainage comes with many complications and hence, nowadays, there is tendency to close CBD primarily which leads to less complications and shorter duration of stay at hospital. We conducted this study comparing primary closure of CBD with T-tube drainage following choledocholithotomy over a period of one year in 40 patients divided in two groups each of 20 i.e. Group A– primary closure and Group B- T-tube drainage. The results were compared in terms of operating time, duration of stay at hospital and complications such as leakage and wound infection. It was observed that primary closure group had less operating time, less duration of hospital stay and less complication rates as compared to T-tube group. Hence, we concluded in our study that primary closure can be recommended as safe alternative procedure after choledocholithotomy in selected patients of choledocholithiasis.

**Keywords:** common bile duct, choledocholithotomy, choledochotomy, T-tube, choledocholithiasis

### Introduction

Choledocholithiasis develops in about 10–15% of patients with gall-bladder stone<sup>[1]</sup>. Common Bile Duct (CBD) stones are encountered in approximately 7–15% of patients undergoing cholecystectomy<sup>[2]</sup>. There are two methods for extracting CBD stones, either by endoscopic retrograde cholangio pancreatography (ERCP), or surgically, by an open or laparoscopic method. The traditional surgical management of CBD stones consists of a supra-duodenal choledocotomy and insertion of a T-tube. The recommendation for T-tube drainage is based on the premise that it provides postoperative decompression of the CBD should outflow obstruction occur, it allows for radiological visualisation of the CBD, and it provides a potential route for extraction of any retained stones. The duration of T-tube drainage is variable and can range from 7–45 days depending on individual preference. A T-tube cholangiogram is usually performed postoperatively to look for residual stones or biliary leakage. The role of T-tube has been challenged since Thornton<sup>[3]</sup> and Halsted<sup>[4]</sup> described primary duct closure after CBD exploration more than a century ago. Others also have challenged the utility of a T-tube<sup>[5, 6]</sup>, and three randomised trials have shown benefit of primary closure over T-tube insertion<sup>[7, 8]</sup>. Continuous external drainage of bile can lead to fluid and electrolytes imbalance and nutritional disturbances. T-tube drainage is associated with an increased incidence of cholangitis and wound sepsis<sup>[9, 10]</sup>. Significant bile leak after T-tube removal can occur in 1–30% of cases. External loss of bile leak through T-tube may lead to slow wound healing, anorexia and constipation (post-choledocotomy acidotic syndrome)<sup>[10]</sup>. Complications like dislodgement, fracture of tube, encrustation, difficulty in removal, and duct stricture also have been described<sup>[11]</sup>. The incidence of recurrent stones may be greater than T-tube drainage because the tube acts as a foreign body around which bile pigments and salts may precipitate<sup>[12]</sup>.

However, primary closure of common bile duct leads to shorter operating time, less duration of stay at hospital, and devoid of complications like tube dislodgement, fracture of tube, encrustation etc. there is less incidence of bile leak, and wound infections with primary closure as compared to T-tube drainage. Also, less incidence of recurrent stones have been reported in primary closure of CBD as compared to T-tube drainage as T-tube acts as foreign body around which bile pigments and salts may precipitate. Hence, we conducted a prospective study to compare the postoperative course and final outcome of primary closure and T-tube drainage of the CBD after choledochotomy.

## Aims and objective

To study the comparison between primary closure of common bile duct and T-tube drainage after choledocholithotomy in choledocholithiasis in terms of operating time, biochemical level of liver function test postoperatively, post-operative complications and duration of hospital stay.

## Materials and Methods

Prospective study was conducted in the Department of General Surgery, Jawaharlal Nehru Medical college, KAHER, Belagavi from January 2013 to December 2016. Minimum 40 patients of choledocholithiasis half of which 20 patients were undergoing open choledocholithotomy followed by primary closure [Group-A] and another half undergoing open choledocholithotomy followed by T-tube drainage [Group-B] were studied and their outcomes were compared in accordance with the aims and objectives of the study. All the patients of cholelithiasis with choledocholithiasis were included in this study. Patients with cholangitis, pancreatitis or evidence of ampullary obstruction and those undergoing emergency surgery were excluded from this study.

## Results

The average age of patients undergoing CBD exploration was 50.05 years. The number of female patients undergoing CBD

exploration was more as compared to male, female to male ratio being 1.5:1. All patients were accessed through right subcostal incision. After cholecystectomy, longitudinal incision was made over supra duodenal portion of bile duct. Stones were extracted with the help of Desjardin forceps and patency of distal passage was confirmed by negotiation of Bakes dilators into second part of duodenum and palpating retro duodenal portion of CBD after Kocherisation of duodenum. This was followed by irrigation of bile duct with normal saline via feeding tube. Then primary repair of CBD was done with placement of continuous polyglycolic 3/0 suture in primary closure group [GROUP A] and closure was performed over T-tube in T-tube drainage group [GROUP B]. In all cases, subhepatic drain was placed. It was observed that the mean operating time in group A i.e primary closure group was 65.00 +/- 14.05 minutes whereas it was 95.25 +/- 9.66 minutes in group B i.e T-tube group with a p value of 0.0001 which is statistically significant. The fall in serum total bilirubin level post operatively was more in group A as compared to group B with a p value of 0.004. The mean duration of stay at hospital in group A i.e primary closure group was 7 +/- 1.75 days which was much less than that in group B i.e T-tube group (13.40 +/- 3.10 days) with a p value of 0.0001 (Table 1). However, there was no statistically significant difference in terms of complications such as leakage and wound infection when both groups were compared.

**Table 1:** Comparison of Primary Closure and T-tube Drainage after cbd Exploration.

Parameters	Group A (primary closure)	Group B (T-tube drainage)	P value
Mean operating time (minutes)	65 +/- 14.05	95.25 +/- 9.66	0.0001
Mean duration of stay at hospital (days)	7 +/- 1.75	13.40 +/- 3.10	0.0001
Wound infection (%)	15	35	0.435
Post-operative serum total bilirubin (mg/dl)	0.82 +/- 0.22	1.47 +/- 0.93	0.004

## Discussion

Common bile duct [CBD] exploration is still an important procedure for removal of CBD stone. After the CBD exploration is performed and stones have been removed, the choice lies between primary closure of duct and T-tube drainage. T tube placement after CBD exploration has long been a standard surgical practice for choledocholithiasis. The main advantages of this modality were provision of external biliary drainage till edema of sphincter of Oddi subsided and percutaneous removal of retained bile duct stones. However, this technique is associated with significant complications; therefore, primary repair of CBD has been advocated in literature. In our study, wound infection was present in only 15% cases in group A whereas, it was 35% in group B. This result is nearly comparable to the study performed by Zhang *et al.* [13] who noticed 28.6% of complications rate associated with T-tube in contrast to 11.1% in whom primary repair was performed. The mean duration of hospital stay in group A was 7 +/- 1.75 days whereas it was 13.4 +/- 3.10 days in group B with p value of 0.0001 which indicates that primary closure of CBD is associated with significantly less stay at hospital as compared to T - tube drainage. This observation is comparable to study performed by Xu *et al.* [14], Gurusamy *et al.* [15] and Ambreen *et al.* [16]. The mean operating time in primary closure group was 65 +/- 14.05 minutes whereas; it was 95.25 +/- 9.66 minutes in T-tube group with p value of 0.0001. This observation is comparable to study performed by Zhu *et al.*, [17] who found p value of < 0.0001 in case of operating time in their study.

## Conclusion

Primary closure of CBD and T-tube drainage after CBD

exploration are equally good procedures for the treatment of uncomplicated choledocholithiasis. However, primary closure of CBD is having significantly lower operating time and less duration of stay at hospital. Therefore, it can be recommended for treatment in selective patients of choledocholithiasis.

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