ORIGINAL ARTICLE

CHOLEDOCHORRAPHY (PRIMARY REPAIR) VERSUS T-TUBE DRAINAGE AFTER OPEN CHOLEDOCHOTOMY

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Background: T-tube drainage used to be standard practice after surgical choledochotomy, but there is now a tendency in some canters to close the common bile duct primarily. This study was designed to compare the clinical results of primary closure with T-tube drainage after open choledocotomy and assess the safety of primary closure for future application. **Methods:** This study was conducted at surgical Unit-3, ward 26 Jinnah Postgraduate Medical Centre Karachi, from January 2007 to January 2008. Forty patients were included in this study out of which 20 underwent primary closure and 20 T-tube placements. It was Quasi-experimental, non-probability, purposive sampling. Main outcome measures were operating time, duration of hospital stay, and postoperative complications. SPSS-10 was used for data analysis. **Results:** The age of patients in the study ranged from 29–83 years. There were 3 male while 37 female patients. Group-1 consisted of 20 patients underwent primary closure after choledocotomy, while Group-2 also consisted of 20 patients underwent T-tube drainage after duct exploration. Mean hospital stay in Group-1 patients was 7.63 days while in group 2 it was 13.6 days. Overall complication rate in group 1 was 15%, biliary leakage in 1 (5%), jaundice in 1 (5%), wound infection in 1 (5%). No re-exploration was required in Group-1. In Group-2 overall complication rate was 30%, biliary leakage in 2 (2%), jaundice in 1 (5%), dislodgement of T-tube in 1 (5%), wound infection in 1 (5%), and sepsis in 1 (5%) patients. Re-exploration was done in one patient. **Conclusion:** Primary closure of Common Bile Duct (CBD) is a safe and cost-effective alternative procedure to routine T-tube drainage after open choledocotomy.

Keywords: Open choledocotomy, Primary closure, choledocholithiasis

INTRODUCTION

Choledocholithiasis develops in about 10–15% of patients with gall-bladder stone.[1] Common Bile Duct (CBD) stones are encountered in approximately 7–15% of patients undergoing cholecystectomy.[2] There are two methods for extracting CBD stones, either by endoscopic retrograde cholangiopancreatography (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[3] and Halsted[4] described primary duct closure after CBD exploration more than a century ago. Others also have challenged the utility of a T-tube[5–12] and three randomised trials have shown benefit of primary closure over T-tube insertion.[13–15] 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.[16,17] Significant bile leak after T-tube removal can occur in 1–30% of cases.[17–19] External loss of bile leak through T-tube may lead to slow wound healing, anorexia and constipation (post-choledocotomy acidotic syndrome).[17] Complications like dislodgement, fracture of tube, encrustation, difficulty in removal, and duct stricture also have been described.[20–24] 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.[25]

The debate has continued in the laparoscopic era and an increasing number of surgeons are favouring primary closure. The widespread availability of choledochoscopy and ERCP has greatly reduced the incidence of retained stones in bile duct. However, despite its obvious advantages, primary closure is not performed routinely.

The objectives of this study were to compare the clinical outcome of the two procedures and to assess the safety of primary closure for future application.

MATERIAL AND METHODS

This study was carried out in Surgical Ward 26, Jinnah Postgraduate Medical Centre over a period of one year, from January 2007 to January 2008. Forty patients having obstructive jaundice, choledocholithiasis suggested by ultrasound, or the presence of stones in the duct palpated preoperatively were included in the study.

Patients with pancreatitis, cholangitis or malignancy were excluded from our study. All patients were evaluated with routine investigations. After taking informed consent they were allocated to two groups, Group-1 for primary closure and Group-2 for T-tube insertion. All patients were given antibiotic 1 hour before induction of anaesthesia. The CBD was opened through a supra-duodenal vertical incision between stay sutures. Stones were taken out and saline flushing followed to ensure patency. The clearance of duct was confirmed by choledochoscope after which in patients of Group-1 CBD was primarily closed with interrupted Vicryl 3/0 and in Group-2 patients T-tube were inserted. Sub-hepatic drain was placed in all patients. T-tube cholangiography was done on the 7th day in Group-2 patients. Once patency was confirmed intermittent clamping of T-tube was done and removed on 12th postoperative day. Postoperative complications were compared and hospital stay of the two groups was recorded. Ultrasound and liver function test were done. Bile leakage was defined as any yellow bile-like fluid coming out of the sub-hepatic drain or after its removal. Ultrasound was done to detect any collection in sub-hepatic peritoneal space.

Data were analysed using SPSS-10. Results were represented in tables.

RESULTS

Common Bile Duct (CBD) stones exploration was performed in 40 patients, 3 were men and 37 were women. Twenty patients underwent primary closure while other 20 had T-tube insertion. The age distribution of patients is presented in Figure-1.

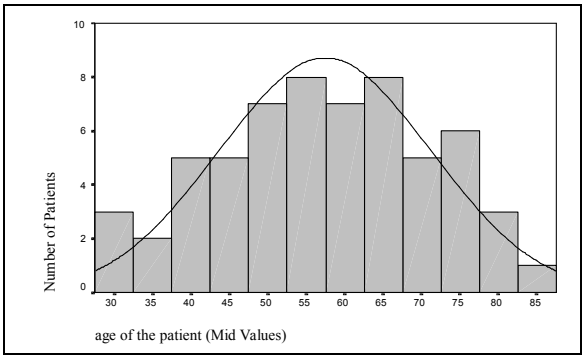

Figure-1: Age distribution of patients (n=40)

Thirty-five patients presented with biliary colic, other presentations were obstructive jaundice in 3 patients and acute cholecystitis in 2 patients. The mean postoperative hospital stay in Group-1 patient was 7.63±1.63 days while in Group-2 it was 13.6±2.3 days. Complications in Group-1 were biliary leak in 1 (5%) patient, postoperative jaundice in 1 (5%) patient, wound infection in 1 (5%) patient with overall complication rate of (15%). In Group-2, 2 (10%) patients had biliary leak, postoperative jaundice developed in 1 (5%), sepsis in 1 (5%), dislodgement of tube in 1 (5%), and wound infection in 1 (5%) patient. Over all complication rate was 30%. All patients with biliary leakage conservatively managed with closed external biliary suction while patient with dislodgement required re-operation. Patients with sepsis and infection were treated with antibiotics. Drains were removed between 3 to 6 days and follow-up was done of all patients till 6 months. Hospital stay and postoperative complications are given in Table-1.

Table-1: Hospital stay and postoperative complications in the 2 groups

	Group-1 (n=20)	Group-2 (n=20)
Hospital stay (Days)	7.63 ±1.63	13.6±2.3)
Biliary leakage	1 (5%)	2 (10%)
Jaundice	1 (5%)	1 (5%)
Sepsis	0	1 (5%)
Wound infection	1 (5%)	1 (5%)
Dislodgement of tube	0	1 (5%)

DISCUSSION

Symptomatic gallstone disease is a very common indication for abdominal surgery. Choledocholithiasis is a complex procedure with appreciable morbidity and mortality.[26] The mean hospital stay in our study for T-Tube insertion group was much longer (13.6 days) while for primary repair it was only 7.63 days which is in agreement with studies conducted by Ahmad *et al*[26] Ambreen *et al*[27], Zhang *et al*[28]. Another study conducted by Makinen[29] showed shorter hospital stay in T-tube group (not statistically important). The use of a T-tube allows spasm or oedema of sphincter of Oddi to settle after the trauma of exploration. Failure to drain the duct may result in build up of pressure in the extra hepatic ductal system, leading to leakage or disruption of duct closure with biliary peritonitis. Also it is used for detection and removal of retained stones through tube tract.

Despite these potential advantages, morbidity rates are high as depicted in our study. Accidental displacement of T-tube is reported in 1 case in our study. Irfan *et al*[26] required re-exploration in 2 of their cases. Biliary leakage, persistent biliary fistula, excoriation of skin and cholangitis caused by migration of micro-organisms may prolong the hospital stay and delay recovery. Indwelling T-tubes are uncomfortable, require continuous management and restrict the patient's activity because of the risk of dislodgment. Patients on free drainage with T-tubes are at risk of dehydration and electrolyte imbalance. Postoperative complication rates are higher in patients in Group-1 while patients who underwent primary closure had fewer and minor complications which did not require re-operation. There was no mortality in either group during study and follow-up period. Postoperative complications reported

in other literature and Ahmad *et al*[26] showed that 6 patients had bile leak who underwent primary closure, 2 of them required re-exploration. However in our study 3 out of 20 patients who underwent primary closure, and 4 patients with T-tube had minor biliary leak, but none of these patients required operative measures. Ambreen *et al*[27] reported biliay leak in 10.5% in T-tube group while 6.3% in primary closure group, all managed conservatively. Haider *et al*[30] reported 10.5% complication in primary group, bile leak was found in 7.89% cases, small sub-phrenic collections in 2.63%, all were managed conservatively. Kieghley[9] reported a high incidence of infective complications related directly to infected bile. The complications outweigh the benefits of a T-tube, especially because the short- and long-term results in patients having primary closure of a choleochotomy are favourable. A T-tube may be necessary in selected cases such as in those who fail preoperative ERCP and in those patients in whom ductal clearance is not confirmed intra-operatively.

CONCLUSION

Primary closure of Common Bile Duct is a safe and cost effective alternative procedure to routine T-tube drainage after open choledocotomy.

REFERENCES

1. Perez G, Escalona A, Jarufe N, Ibáñez L, Viviani P, García C, *et al*. Prospective randomized study of T-tube versus biliary stent for common bile duct decompression after open choledochotomy. World J Surg 2005;29:869–72.
2. Ahrendt SA, Pitt HA, Biliary tract. In: Townsend M, Ed. Sabiston Textbook of Surgery. Philadelphia: WB Saunders; 2004.p. 486–92.
3. Thornton JK. Observation on additional cases illustrating hepatic Surgery. Lancet 1891;137:763–4.
4. Halstead WS. Contributions to surgery of the bile passages, especially of the common bile duct. Bull John Hopkins Hosp 1900;106:1–11.
5. Mirrizi PL. Primary suture of the common bile duct in choledocholithiasis. Arch Surg 1942;44(1):44–54.
6. Collin PG, Redwood C, Wynne-Jones J. Common bile duct without intraductal drainage following choledochotomy. Br J Surg 196;47:661–7.
7. Sawyer JL, Herrington JL, Edward WH. Primary closure of the CBD. Am J Surg 1965;109:107–12.
8. Collin PG. Further experience with common bile duct suture without intraductal drainage following choledochotomy. Br J Surg 1967;54:854–6.
9. Keighley MBR, Burdon DW, Baddeley RM, Dorricott NJ, Oates GD, Watts GT, *et al*. Complication of supraduodenal choledochotomy: a comparison of three methods of management. Br J Surg 1976;63:754–58.
10. Vassilakis JS, chattopadhyay DK, Irvin TT, Duthie Hl. Primary closure of common bile duct after elective choledochotomy. J R Coll Surg Edinb 1979;24(3):156–8.
11. Sorensen VJ, Buck JR, Chung SK, Fath JJ, Horst HM, Obeid FN. Primary common bile duct closure following exploration of the common bile duct: an effective alternative to routine biliary drainage. Am J Surg 1994;60:451–4.
12. Seale Ak, Ledet WP. Primary common bile duct closure. Arch Surg 1999;134:22–4.
13. Sheen-chen SM, Chou FF. Choledochotomy for biliary lithiasis: is routine T-tube drainage necessary? A prospective controlled trial. Acta Chir Scand 1990;156:387–90.
14. De Roover D, Vanderveken M, Gerard Y. Choledochotomy: primary closure versus T-tube. A prospective trial. Acta Chir Belg 1989;89:320–24.
15. William JA, Treacy PJ, Sidey P, Worthley CS, Townsend NC, Russell EA. Primary duct closure versus T-tube drainage following exploration of the common bile duct. Aust NZ J Surg 1994;64:823–6.
16. Lygidakis NJ. Choledochotomy for biliary lithiasis: T-tube drainage or primary closure. Effects on prospective bacteremia and T-tube bile infection. Am J Surg 1983;46:254–6.
17. Gillat DA, May RE, Kennedy R, Longstaff AJ. Complication of T-tube drainage of the common bile duct. Ann R Coll Surg 1985;67:370–1.
18. Gharaibeh KI, Heiss HA, Biliary leakage following T-tube removal. Int surg 2000;85:57–63.
19. Rovere J. Bile leakage following T-tube removal. Radiology 1982;144:267–70.
20. Kacker LK, Mittal BR, Sikora SS, Ali W, Kapoor VK, Saxena R, *et al*. Bile leak after T-tube removal: a scintigraphy study. Hepatogastroenterology 1995;42:975–8.
21. JelasoDV, Hirschfield JS. Jaundice from impacted sediment in a T-tube: recognition and treatment. Am J Roentgenol 1976;127;413–5.
22. Haq A, Morris J, Goddard C, Mahmud S, Nassar AH. Delayed cholangitis resulting from a retained T-tube fragments encased within a stone: a rare complication. Surg Endosc 2002;16:714.
23. Rozario A, Thomas PG, Pais A, Ravindra KV, Rao V Asymptomatic T-tube remnant in common bile duct. Indian J Gastroenterol 1999;18:180–1.
24. Chaudry A, Salunkhe S, Anand BS, Aranya RC. Post cholecystectomy syndrome due to broken T-tube. Indian J Gastroenterol 1991;10:18–9.
25. Lygidakis NJ. Hazards following T-tube removal after choledochotomy. Surg Gynecol Obstet 1986;163:153–5.
26. Ahmad I, Pradhan C, Beckingham I, brooks J, Rowlands BJ, Lobo DN. Is a T-tube necessary after common bile duct exploration? World J Surg 2008;32:1485–8.
27. Ambreen M, Shaikh AR, Jamal A, Qureshi JN, Dalwani AG, Memon MM. Primary closure versus T-tube drainage after open choledochotomy. Asian J Surg 2009;321:21–5.
28. Zhang LD, Bie P, Wang SG, Ma KS, Dong JH. Primary duct closure versus T-tube drainage following laparoscopic choledochotomy. Zhonghua Wai Ke Za Zhi 2004;42:520–3.
29. Makinen AM, Matikainen M, Nordback I. T-tube drainage is needed after routine common bile duct: results of a randomized trial. Surg Res Commun 1989:6(4):299–302.
30. Haidar J, Aziz A, Khan l, Alam SN. Primary closure of common bile duct after open choledochotomy. J Surg Pak 2009;14(4):173–5.

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