Complications of T-tube drainage of the common bile duct

D A GILLATT FRCS
Surgical Registrar
R E MAY MS FRCS
Consultant Surgeon
R KENNEDY FRCS
Surgical Registrar
A J LONGSTAFF MRCP FRCR
Consultant Radiologist
Frenchay Hospital, Bristol

Key words: COMMON BILE DUCT

Summary

The complications associated with T-tube drainage of the common bile duct following biliary surgery were studied prospectively. A high rate of complications especially associated with T-tube removal was found. Biliary leakage and bacteraemia were the two main problems though in most cases caused minimal clinical upset. Alternatives to T-tube drainage are discussed. It is suggested that if T-tubes are to be used broad spectrum antibiotic cover should be employed at the time of removal.

Introduction

T-tube drainage following choledochotomy is still the standard practice among most British surgeons (1), although controversy exists as to whether it is the best procedure (2).

Our attention was focused on the possible problems by a case of biliary peritonitis following the removal of a T-tube after an apparently satisfactorily postoperative cholangiogram. A prospective study was designed to assess the possible complications associated with T-tube drainage and more especially with its removal.

Method

All patients undergoing supraduodenal choledochotomy and T-tube drainage were entered into the study. These patients had all received a single intramuscular injection of cefuroxime (750 mg) 1 hour preoperatively with the premedication. A culture was obtained from the common bile duct at the time of operation. A 12F Maingot latex T-tube was inserted on completion of exploration and the duct was closed with continous 3/0 chromic catgut.

Approximately 1 week after operation a T-tube cholangiogram was obtained with 25% Hypaque (sodium diatrizoate BP). If there was no residual calculus and free flow into the duodenum, the tube was immediately removed. Further X-rays were then taken at 30 seconds and 15 minutes after removal and blood cultures were obtained at this time.

Correspondence to: D A Gillatt FRCS, Department of General Surgery, Frenchay Hospital, Bristol BS161LE.

TABLE I Biliary leakage after T-tube removal

Biliary peritonitis requiring reoperation Clinical peritonitis treated conservatively Radiological leakage subhepatic subphrenic	1 2 3 1
Total	7

Results

The study involved 36 patients with a total of 39 T-tubes. Thirty-six explorations were for duct stones at the time of cholecystectomy, two explorations were for residual stones left at previous cholecystectomy and one tube was re-inserted after a biliary leak. Bile duct organisms were cultured in 21 cases, the most frequent being *Escherichia coli*.

T-tubes were removed on average 9 days after operation (range 6-18 days). Two cases with residual stones requiring radiological removal were left in situ for 49 and 92 days. Although a single dose of cefuroxime had been given preoperatively, no further antibiotic prophylaxis was employed prior to T-tube removal. Biliary leakage was defined on either clinical or radiological grounds following T-tube removal and this occurred in seven cases (Table I). One case developed biliary peritonitis requiring reoperation and reinsertion of a T-tube. Two cases developed a clinical picture of peritonitis localised to the right side which were treated conservatively with success. In 4 cases radiological leaks were demonstrated, 3 into the subhepatic space (Fig. 1) and one into the subphrenic space. Three of these patients were symptomatic requiring strong analgesia for 12 hours after removal. In 6 of these patients discharge from hospital was delayed for between 2 and 10 days.

Seven patients developed bacteraemia after tube removal (Table II). Four of these had positive blood cultures and all but one were symptomatic. Three patients had no growth on blood culture but had clinical bacteraemia with rigors and high fever.

There were no cases of thromboembolism, pancreatitis or wound dehiscence. No relation was demonstrated between any complication and the patient's age, liver function or timing of T-tube removal. In all cases of bacteraemia an organism had been grown from the initial bile culture.



FIG. 1 Leakage from choledochotomy site after T-tube removal.

Discussion

T-tube drainage has been the standard method of management after supraduodenal choledochotomy for almost a century (3). The rationale for its use is that it minimises the risk of leakage in the early postoperative period if there is persistent distal duct obstruction. It also allows further radiological examination and may facilitate removal of residual calculi. However, it is associated with a higher incidence of wound sepsis (4), bacteraemia (5), postoperative pancreatitis and thromboembolism. There is also depletion of electrolytes and bile salts (6).

A latex T-tube is the most suitable type for short term biliary drainage (7). It is said to produce a rapid intraperitoneal reaction with good track formation, thus biliary leakage should be unlikely. However, in 7 cases in this study there was leakage into the peritoneal cavity from the choledochotomy site after removal of the T-tube. The reasons for leakage are unclear, though poor intraperitoneal reaction and duct trauma on removal are possible factors. Nevertheless, biliary leakage is a potentially life threatening complication and at the very least will delay discharge from

Bacteraemia associated with T-tube drainage is well documented. The 18% incidence in this series is only slightly higher than previous studies (8). Trauma to the ducts may

TABLE II Bacteraemia following T-tube removal

Positive blood culture	
Escherichia coli	2*
Klebsiella	1*
Staphylococcus	1
Negative blood culture but clinical bacteraemia	
with rigors and fever	3
Total	_
1 Otal	7

^{*} Rigors and fever.

be implicated in the development of bacteraemia and it has been suggested that the increase in biliary pressure during Ttube cholangiography in an infected system may allow bacteria to enter the blood stream via the liver sinusoids (8). In all cases in this series bacteraemia has occured only when infected bile has been present at the time of exploration.

Alternatives to T-tube drainage include transduodenal exploration, choledochoduodenostomy and primary closure of the choledochotomy. Transduodenal exploration removes the need for supraduodenal choledochotomy, but it has a high morbidity and mortality especially from postoperative pancreatitis (9). Choledochoduodenostomy is useful for multiple or recurrent calculi, but should only be used when the duct is dilated (10). Primary closure results in a low incidence of sepsis with a shorter hospital stay (2), but bile leakage may occur if distal obstruction due to residual stones persists. Despite combining completion cholangiography with choledochoscopy it is not possible to fully guarantee that all stones have been cleared at exploration (11)

In conclusion this study has demonstrated a high incidence of bacteraemia and bile leakage following T-tube removal. As most surgeons still favour T-tube drainage it is probable that this practice should be re-assessed. If T-tubes continue to be used antibiotic prophylaxis should be employed at the time of their removal. This can be determined by bile culture obtained at operation or in the early postoperative period.

References

- 1 Glenn F. The physiological basis for surgical treatment of nonmalignant disease of the biliary tract. Surg Clin North Am 1958;38:471-85.
- 2 Keighley MRB, Burdon DW, Baddeley RM et al. Complications of supraduodenal choledochotomy: comparison methods of management. Br J Surg 1976;63:754-8.

3 Thornton JK. Observations on additional cases illustrating hepatic surgery. Lancet 1891;i:763-4.

- 4 Rundle FF, Cass MH, Robson B. Bile drainage after choledochotomy in man with some observations on biliary fistula. Surgery 1955;37:903-10.
- 5 Keighley MRB. Micro-organism in the bile: a preventable cause of sepsis after biliary surgery. Ann R Coll Surg 1977;59:328-34.
- Cass MH, Robson B, Rundle FF. Electrolyte losses with biliary fistula: the post choledochotomy acidotic syndrome. Med J Aust 1955;1:165-9.
- 7 Apalakis A. An experimental evaluation of the types of material used for bile duct drainage tubes. Br J Surg 1976;63:440-5. Pitt HA, Postier RG, Cameron JL. Postoperative T-Tube cholangiography. Ann Surg 1980;191:30-4. Cave-Bigley DJ, Aukland P, Kane JF, Hardy EG. Transduodenal carlos of the care bill the state of the care bill the

- denal exploration of the common bile duct in a district general hospital. Ann R Coll Surg 1984;66:187-9.
 Johnson AG, Rains AJH. Choledochoduodenostomy. A re-
- appraisal of its indications based on a study of 64 patients. Br J Surg 1972;59:377–80.
- 11 May RE, Corfield A. An assessment of operative choldochoscopy—a worthwhile procedure or not? Ann R Coll Surg 1985;67:96-8.