

Open common bile duct exploration without T-tube insertion—two decade experience from a limited resource setting in the Caribbean

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Received: 1 January 2009 / Accepted: 18 May 2009
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Abstract

Purpose Despite advancements in gallbladder surgery with the introduction of endoscopic and laparoscopic techniques, many surgeons, especially in the developing world, still perform open cholecystectomy with common bile duct (CBD) exploration for choledocholithiasis. The purpose of the study is to report the outcomes of a case series of open CBD exploration without the use of T-tubes.

Materials and methods A retrospective chart review of all consecutive open CBD exploration done by the first author over a period of 23 years was conducted. Demographic data, preoperative investigations, the surgical techniques and perioperative outcomes were recorded.

Results Of 690 open cholecystectomies performed during the study period, 108 had common bile duct exploration. In 94 cases this was done via a supraduodenal choledochotomy, in 10 cases via a transduodenal sphincteroplasty and in 4 cases via the cystic duct. In 90 cases, a simple choledochotomy and primary closure was done while in 4 cases choledocho-duodenostomy was required. Eighty-seven percent of surgeries were done on elective basis and 13% on an

emergency basis and no T-tubes were used in any patients. The mean hospital length of stay was 3.2 days and the perioperative morbidity was negligible.

Conclusions In a limited resource setting, there is still a role for open CBD exploration and primary closure without the necessity of T-tubes and stents as evidenced by a good perioperative patient outcome.

Keywords Common bile duct exploration · Open surgery · Limited resources setting · T-tubes

Introduction

Over the past two decades, the advancement in laparoscopic and endoscopic techniques has almost made open biliary surgery obsolete. Notwithstanding this, due to lack of training as well as equipment, many surgeons in the developing world are commonly required to perform open cholecystectomy and CBD exploration for choledocholithiasis. Even in the developed world, there are places where these resources may not be available. In fact, a recent survey from the rural areas of United States of America showed that surgeons had to resort to open biliary surgical procedures, due to want of equipment [1].

Irrespective of the surgical technique, the use of T-tubes for biliary drainage has been controversial to this date [2]. As early as 1965, Sawyers et al. documented the advantages of primary closure of the CBD and recommended that routine use of a T-tube following CBD exploration be abandoned [3]. In the only report from the Caribbean, Walrond

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recommended that T-tubes should not be used [4]. In two recent Cochrane reviews, one each for open and laparoscopic biliary surgery, the authors were inconclusive regarding the benefits and safety of T-tubes [5, 6]. However, in many places, routine use of a T-tube following CBD exploration remains standard practice. T-tubes are not only expensive but are also associated with prolonged hospital stay and complications such as retained stones, retained T-tube fragments, inflammatory polyps, sepsis, tube dislodgement, bile fistula, biliary stricture, bile leakage and peritonitis [7–9].

Open biliary surgery, CBD exploration and drainage with primary closure of the CBD can be safe in experienced hands and is specifically useful in a limited resource setting.

With this background, we report the two decade experience of open exploration and primary closure of the CBD at the Department of Surgery, University of the West Indies, Trinidad.

Materials and methods

A review of all the patients who had open cholecystectomy and open bile duct exploration performed during the period from July 1984 through June 2006 was conducted. All the surgical procedures were performed by the first author (Prof. Vijay Naraynsingh).

The surgeries were performed in standard operating rooms, but on-table cholangiography, choledochoscopy, laparoscopy and endoscopic retrograde cholangiopancreatography (ERCP) were not available in the hospital.

Only patients who underwent open CBD exploration were included for a detailed data collection and analysis and patients who had open cholecystectomies without CBD exploration were excluded.

Basic demographic data collected included age and gender of the patient. Clinical data recorded included preoperative investigations, comorbidities, indications for surgery, details of the surgical procedure, the utilisation of T-tubes and stents if any, intraoperative and postoperative complications, ICU admissions if any, hospital length of stay and re-admissions within a 30-day period following the surgery.

Surgical technique

A Kocher's subcostal incision was used. A longitudinal supraduodenal choledochotomy was done. Any obvious stones appearing were removed. A 5 Fr infant feeding tube was then passed distally and generous irrigation of the CBD was done with normal saline. Use of this small tube allowed stones to float up alongside to be extruded at the choledochotomy. It also facilitated passage of the tube through the ampulla (if no obstruction was present) signaled by free

flow of irrigant with no return through the choledochotomy. In most cases the CBD was cleared using this technique. This was followed by dilating the Sphincter of Oddi using Bake's dilator to 8 or 9 Fr calibre. If however, a stone at the distal end could not be disimpacted, other options were as follows:

- Irrigation using an 8 Fr infant feeding tube to facilitate a higher volume of irrigant at greater pressure which was more likely to dislodge the stone. This was followed by dilating the ampulla.
- If the stone was still impacted despite the aforementioned procedures, a transduodenal sphincterotomy/sphincteroplasty or choledochoduodenostomy (although not the preferred procedure) was done.

Since free drainage of the bile into the duodenum is ensured by any of these options, no T-tube or stents were used. However, a 20 Fr subhepatic drain was placed *in situ* for 48 hours postoperatively.

Results

One hundred and eight patients had CBD exploration during the study period. Demographic and clinical data were recorded and analysed for these patients. During the same period, an additional 582 open cholecystectomies were performed for cholelithiasis confined to the gallbladder (not involving the CBD), and were excluded.

Of 108 patients, 90 (80%) were females. The age of patients ranged from 16 to 82 with a median age of 47 years. Eighty-seven percent of surgeries were done on elective basis and 13% on an emergency basis. 80.6% of the patients had elevated bilirubin and hepatic enzymes in the preoperative period. 10.2% of the patients had cholangitis and 2.8% of patients had gallstone associated pancreatitis in the preoperative period.

All 108 patients were diagnosed with preoperative ultrasound and prepared in the conventional manner for open biliary surgery. Computed tomography (CT) scans and magnetic resonance cholangiopancreatography (MRCP) were performed preoperatively in 14 and 3 cases, respectively.

The indications for CBD exploration included the following: preoperative jaundice in 87 patients, cholangitis in 11 patients, incidental (during routine cholecystectomy but with a dilated CBD or stones palpable in CBD found at surgery) in 7 patients and pancreatitis with jaundice in 3 cases.

In 104 cases, the cystic duct was isolated and ligated prior to CBD exploration; in the other 4, the cystic duct was so wide that the CBD was explored through it. In 94 cases, CBD exploration was done via a supraduodenal choledochotomy; in 4 of these, free passage into the duodenum could not be achieved using catheters, irrigation and dilators. These were completed by a choledochoduodenostomy. In 10 cases, a transduodenal sphincteroplasty was done

since a stone was, on palpation, impacted at the ampulla and could not be dislodged. No CBD stones were found in 5 cases, but CBD irrigation followed by ampullary dilatation and passage of catheter into the duodenum were also done in these cases.

T-tubes were not used in any patient. However, all patients had a 20 Fr subhepatic drain *in situ* for 2 days postoperatively with the exception of 2 cases in which bile drainage persisted until the fourth postoperative day.

The hospital length of stay ranged from 2 to 9 days with a mean of 3.2 days. There were no complications such as postoperative biliary obstruction, cholangitis, and pancreatitis or biliary peritonitis. However, wound sepsis occurred in 7 (6.5%) cases which responded to antibiotic therapy. No patient required ICU admission, there were no re-admissions within the first 30-day period and there was no perioperative mortality. No long-term complications were encountered; the hospital practice ensures that complications are returned to the original unit.

Discussion

The major finding of this case series is the good perioperative outcome for open biliary surgery without the usage of T-tubes and stents in a setting with minimal resources, when ERCP, choledochoscopy and laparoscopy are unavailable.

In the modern ‘minimally invasive approach’ era, the current standard protocol for the treatment of CBD stones is to clear and drain the CBD by ERCP, followed by laparoscopic cholecystectomy. However, these minimally invasive approaches are not widely practised in many developing countries due to the lack of equipment and trained endoscopists. As mentioned earlier, even in the developed world, in rural settings, there is lack of equipment for these techniques [1]. In Trinidad, the few endoscopists trained in ERCP are not available in the public healthcare system; hence surgeons are often left with no option other than to continue the practice of open CBD exploration. Furthermore, a Cochrane database review published in 2006 has suggested that ERCP was less successful than open surgery in CBD stone clearance and was associated with a higher mortality [10]. There is also an increased recurrence rate of CBD stones following endoscopic removal [8]. Many experienced surgeons traditionally choose open biliary surgery and perform this technique with excellent results.

Regardless of the technique, the practice of using T-tubes versus primary closure of the bile duct is a subject of dispute, although the trend is towards primary closure [2].

Many authors have advocated primary closure of the CBD following stone removal [3, 4, 9–12]. Primary closure without a T-tube is safe and associated with a lower complication rate [13–16]. However insertion of T-tubes is still routinely practiced in some centres. In a previously reported randomised controlled trial, the hospital length of stay

was significantly prolonged in patients who had a T-tube insertion compared to those with primary closure [12]. The mean hospital length of stay for patients who had a primary closure in that report was 8 days. In comparison, the mean length of hospital stay in the present series was further low, with a mean of 3.2 days.

There are many possible complications associated with the use of T-tubes such as biliary leakage, retained stones, increased biliary complications, retained T-tube fragment, inflammatory polyps, sepsis, tube dislodgement, biliary fistula, bile peritonitis, bile duct stricture and a overall higher mortality [7–9, 17–19]. Despite this, T-tubes are still in vogue largely due to the theoretical advantages of providing temporary drainage during a period of ampullary oedema and the possibility of retrieving a residual stone via the T-tube tract [20]. Again, the equipment used for retrieval of residual stones either by percutaneous transhepatic removal [21] or via T-tube tracts is seldom available in most Third-World countries.

Primary closure during emergency CBD exploration is furthermore controversial. In a recent study reporting primary closure of CBD in emergency surgery, the authors have mentioned that this was the first report of its kind in the literature [22]. In the present case series, 13% of the CBD exploration was done on emergency basis and still no T-tubes were inserted.

To ensure a free, unfettered drainage of bile into the duodenum, dilatation of the ampulla is a recommended technique which was practiced in the present series. Although dilatation of the ampulla has been suggested as a cause of ampullary stenosis, the objective evidence is unconvincing. In fact, a recent ‘12-year follow-up’ study found that the diameter of the dilated CBD returns to preoperative normal or near normal values in 75% of the patients after surgical exploration of the CBD and extraction of the stones [23]. We believe that if the ampulla is dilated to 8–9 Fr, even residual stones will pass freely into the duodenum without producing symptoms and, therefore, the risk of residual CBD calculi is minimised. In the uncommon circumstance when free passage (of a probe, dilator or catheter) via the choledochotomy into the duodenum is not possible, a choledochoduodenostomy or transduodenal sphincteroplasty may be done, which was also practiced in the present series.

The question is whether open biliary surgery has still a role in this modern ‘minimally invasive techniques’ era. A recent Cochrane review to compare primary closure versus T-tube usage following open CBD exploration found only five methodologically sound trials of open biliary surgery [5]. This, undoubtedly, indicates that in current practice, open biliary surgery is not commonly performed. However, the fact remains that much of the equipment and training available to the developed world are still not available in the Third-World setting. Many surgeons in limited resource settings are very well experienced with the open techniques; hence in our opinion, open biliary surgery has its specific

role to play in these settings. Interestingly, there are reports that the confidence level of surgical residents in the modern ‘laparoscopic’ era are low due to minimal exposure to open techniques and are not able to perform better in critical situations requiring an open approach [24].

In conclusion, the good perioperative outcome of patients undergoing open CBD exploration will positively reinforce the value of such surgery in the limited resource setting.

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