Clinics and Research in Hepatology and Gastroenterology (2015) 39, 584–593

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ORIGINAL ARTICLE

A meta-analysis of single-stage versus two-stage management for concomitant gallstones and common bile duct stones

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Available online 27 April 2015

Summary

Objective: To conduct a randomized controlled trial (RCT) meta-analysis to evaluate the safety and effectiveness of single-stage [laparoscopic cholecystectomy (LC) + laparoscopic common bile duct exploration (LCBDE)] vs. two-stage management [preoperative endoscopic retrograde cholangiopancreatography (ERCP) + LC] for concomitant gallstones and common bile duct stones.

Methods: RCTs that met the inclusion criteria for data extraction were identified from electronic databases (PubMed, Embase, Science Citation Index, and the Cochrane Library) up to August 2014. The relevant congressional proceedings were also searched. The primary outcomes were stone clearance from the common bile duct, postoperative morbidity and mortality. The secondary outcomes were conversion to other procedures, length of hospital stay, total operative time, and hospitalization charges. The outcomes were calculated as odds ratios (ORs) with 95% confidence intervals (CIs) using RevMan 5.2.

Results: Eight RCTs, which included 1130 patients, were identified for analysis in our study. The meta-analysis revealed that the common bile duct stone clearance rate in the single-stage group was higher (OR = 1.56, 95% CI: 1.05 to 2.33, $P = 0.03$). The lengths of hospital stay (MD = −1.02, 95% CI: −1.99 to −0.04, $P = 0.04$) and total operative times (MD = −16.78, 95% CI: −27.55 to −6.01, $P = 0.002$) were also shorter in the single-stage group. There was no statistically significant difference between the two groups regarding postoperative morbidity (OR = 1.12, 95% CI: 0.79 to 1.59, $P = 0.52$), mortality (OR = 0.29, 95% CI: 0.06 to 1.41, $P = 0.13$) and conversion to other procedures (OR = 0.82, 95% CI: 0.37 to 1.82, $P = 0.62$).

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http://dx.doi.org/10.1016/j.clinre.2015.02.002

Conclusion: Single- and two-stage management for cholecysto-choledocholithiasis had similar mortality and complication rates; however, the single-stage strategy was better in terms of stone clearance, hospital stay and total operative time.

Introduction

Common bile duct stones (CBDS) occur in approximately 8%—20% [1—3] of cholelithiasis patients. There are two broad options for management of patients with concomitant gallstones and choledocholithiasis, which include a single-stage strategy that comprises laparoscopic cholecystectomy (LC) and laparoscopic common bile duct exploration (LCBDE) or a two-stage approach consisting of LC and pre- or postoperative ERCP [4]. Surgeons tend to clear the common bile duct (CBD) of stones preoperatively by ERCP because further surgery is needed if postoperative ERCP fails [5]. ERCP followed by LC has been the treatment of choice for concomitant gallstones and CBDS for decades. However, the major shortcoming of ERCP is that it requires the two-stage approach (laparoscopic cholecystectomy and preoperative/postoperative ERCP), which can not only cause life-threatening complications, including bleeding, perforation and pancreatitis [6,7], but also can lead to disruption of the intact sphincter of Oddi [8]. Meanwhile, single-stage concomitant CBD and gallbladder stone management is gaining popularity as the laparoscopic technique matures and surgeons attain experience with the technique. It avoids the morbidity and mortality associated with ERCP as well as the need for multiple procedures; however, the main drawback of single-stage management is that the common bile duct is traditionally closed with T-tube drainage after LCBDE and patients may have to carry the drain for several weeks before removal. This increases the psychological pressure and difficulty in postoperative nursing of patients [9,10]. Currently, it is still uncertain whether the two-stage management approach is better than or at least equivalent to the single-stage surgical strategy for cholecysto-choledocholithiasis [11,12]. A previous meta-analysis conducted in 2012 [13] that compared the single-stage and two-stage approaches for the management of concomitant gallstones and CBDS concluded that the two groups were equally effective but that the two-stage approach contained both preoperative and postoperative ERCP. Since then, three randomized trials have been published; therefore, we conducted this meta-analysis of all of the randomized controlled trials (RCTs) to evaluate the clinical safety and effectiveness of the two-stage (ERCP + LC) versus the single-stage (LC + LCBDE) management approaches for concomitant gallstones and CBDS.

Materials and methods

Searching strategy

We searched databases, including PubMed, Embase, the Science Citation Index, and the Cochrane Library, up to August 2014 to identify all of the related published RCTs. The keywords used in the searches were as follows: LC, LCBDE, ERCP, EST, gallbladder stones, and common bile duct stones. The language was restricted to English only. The citations within the reference lists of the articles were searched manually to identify any additional eligible studies.

Inclusion and exclusion criteria

The studies that were published up to and including August 2014 were considered eligible if they met the following inclusion criteria:

- study design: RCTs;
- population: patients with proven or suspected CBDS before LC or those with gallstones that were found to have CBDS at LC by intraoperative cholangiography;
- intervention: preoperative ERCP/EST + LC vs. LC + LCBDE.

Abstracts from conferences and full texts without raw data that was available for retrieval, duplicate publications, letters, non-randomized trials, retrospective analyses and reviews were excluded. If publications reported on the same study population, then the most informative article was included.

Study quality assessment

The literature quality was independently assessed by two authors (Hong-Yi Zhu and Ming Xu) by utilizing the modified Jadad Scale. Scores of 0 to 7 were allocated to each study. Studies with a score of 4 or more were defined as high-quality studies. Those with a score of 3 or less were defined as low quality.

Outcomes of interest and definitions

The primary outcomes were stone clearance from the CBD, postoperative morbidity, and mortality, while the secondary outcomes were conversion to other procedures, overall hospital stay, and total operative time. Successful stone clearance was defined as the CBDS removal with the intended treatment modality via the planned procedure, only once. The overall postoperative morbidity consisted of surgical and nonsurgical complications, such as bleeding, perforation, cholangitis, ileus, bile leak, fistulas, surgical-site infections, myocardial infarctions and pulmonary embolisms, all of which had nothing to do with the operation. Mortality was defined as postoperative death before discharge or within 30 postoperative days. Conversion to other procedures was defined as any case in which stones from the CBD were not successfully extracted or other