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Open versus laparoscopic cholecystectomy in acute cholecystitis. Systematic review and meta-analysis

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HIGHLIGHTS

- Acute cholecystitis should be attempted by laparoscopy at first.
- Post-operative morbidity, mortality and hospital stay are reduced by laparoscopic cholecystectomy.
- Severe hemorrhage rate is not influenced by the operative technique.

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ABSTRACT

Introduction: Laparoscopic cholecystectomy (LC) has become a popular alternative to open cholecystectomy (OC) in the treatment of acute cholecystitis (AC). Laparoscopic cholecystectomy (LC) is now considered the gold standard of therapy for symptomatic cholelithiasis and chronic cholecystitis. However no definitive data on its use in AC has been published. CIAO and CIAOW studies demonstrated 48.7% of AC were still operated with the open technique. The aim of the present meta-analysis is to compare OC and LC in AC.
Material and methods: A systematic-review with meta-analysis and meta-regression of trials comparing open vs. laparoscopic cholecystectomy in patients with AC was performed. Electronic searches were performed using Medline, Embase, PubMed, Cochrane Central Register of Controlled Trials (CCTR), Cochrane Database of Systematic Reviews (CDSR) and CINAHL.
Results: Ten trials have been included with a total of 1248 patients: 677 in the LC and 697 into the OC groups. The post-operative morbidity rate was half with LC (OR = 0.46). The post-operative wound infection and pneumonia rates were reduced by LC (OR 0.54 and 0.51 respectively). The post-operative mortality rate was reduced by LC (OR = 0.2). The mean postoperative hospital stay was significantly shortened in the LC group (MD = −4.74 days). There were no significant differences in the bile leakage rate, intraoperative blood loss and operative times.
Conclusions: In acute cholecystitis, post-operative morbidity, mortality and hospital stay were reduced by laparoscopic cholecystectomy. Moreover pneumonia and wound infection rate were reduced by LC. Severe hemorrhage and bile leakage rates were not influenced by the technique. Cholecystectomy in acute cholecystitis should be attempted laparoscopically first.

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1. Introduction

There have been significant paradigm shifts in the treatment of AC and management of complex acute biliary problems in the past few years. These changes include earlier surgery and index admission cholecystectomy [1–3].

Actually there are considerable data favoring early surgery instead of delayed cholecystectomy [1,3]. Papi and Gurusamy published prospective studies and meta-analysis supporting respectively either open or laparoscopic surgery in the acute phase. Hospital stay was reduced when surgery was performed early and the complication rate was the same [1,3]. Moreover, approximately 15–20% of patients who underwent delayed procedures in the randomized trials had persistent or recurrent symptoms requiring intervention before their planned operation [1–12].

Accepting early surgery for AC and moving to technical aspects, laparoscopic should be compared to open surgery. While laparoscopic cholecystectomy (LC) has become the approach of choice for elective cholecystectomy, 48.7% of acute cholecystitis are nowadays still operated with the open technique. To our knowledge there are no meta-analysis comparing these techniques in AC. Some authors consider the presence of inflammation, edema, and necrosis as unfavorable conditions for safe dissection. As a consequence, the suspected increased rate of complications leads numerous surgeons, in the laparoscopic era to postpone cholecystectomy after resolution of acute inflammation.

In 2013 a new edition of the Tokyo Guidelines (TG 2013) has been produced with the aim to define the best surgical treatment for AC according to the grade of severity, the timing, and the procedure [54,55]. AC has been classified as mild, moderate and severe based principally on the grade of inflammation of the gallbladder rather than on the patients' conditions. This classification, mainly coming from committee agreement, leads to different treatment options for the three grades of AC and into each class. In general, the literature, including the TG 2013 in some aspects, shows concerns about supposedly higher morbidity rates in LC performed as an emergency procedure [14–16] and the higher conversion rate to open procedure during the acute phase [51,52].

No data of high grade evidence on hospitalization, morbidity and mortality comparison between LC and OC in AC have been produced. No systematic review or meta-analysis have been published on which is the better treatment between LC and OC for AC.

The aim of the present study is to systematically review and analyze the published data comparing LC and OC in AC in terms of morbidity, mortality, length of hospital stay, operative times and severe intraoperative hemorrhage.

2. Material and method

2.1. Literature search strategy

Electronic searches were performed using Medline, Embase (1988–May 2014), PubMed (January 1980–May 2014), Cochrane Central Register of Controlled Trials (CCTR), Cochrane Database of Systematic Reviews (CDSR) and CINAHL from (1966–2014). The search terms were: “acute cholecystitis”, “laparoscopy”, “open” combined with AND/OR. Research included also all the MeshTerms. No search restrictions were imposed. The reference lists of all retrieved articles were reviewed for further identification of potentially relevant studies. Review articles were also obtained to determine other possible studies. Duplicate published trials with accumulating numbers of patients or increased lengths of follow-up, were considered only in the last or at least in the more complete version.

2.2. Selection criteria

Studies which have been judged eligible for this systematic review and consequent meta-analysis were those in which patients with AC were included (Table 1). The diagnosis of AC was based on the finding of acute right upper quadrant tenderness and ultrasonographic evidence of acute cholecystitis (presence of gallstones with thickened and edematous gallbladder wall, positive Murphy's sign and peri-cholecystic fluid collections); or acute right quadrant tenderness, ultra-sonographic confirmation of gallstones, and one or more of the following: temperature above 38 °C and/or leukocytosis greater than 10 × 10/l and/or C-reactive protein level greater than 10 mg/l) No language restrictions were applied. Eligibility for study inclusion into the meta-analysis and study quality assessment were performed independently by two authors (FeCo, MP). The study data were extracted onto standard forms independently by two authors (FeCo, MP). Discrepancies between the two investigators were resolved by discussion. The final results were reviewed by other investigators (LA, FaCa, GL).

The primary outcome measures for the meta-analysis were morbidity and mortality. Secondary outcomes were: operative times, intraoperative blood loss of more than 500 ml and hospitalization length. Also conversion rate and bile duct injuries were evaluated and results on these two issues were reviewed although it was impossible to perform a meta-analysis on these data.

2.3. Assessment of risk of bias

There is a potential risk of overestimating the beneficial treatment effects of RCT with a resultant risk of bias. The risk of bias was assessed comprehensively according to the guidelines of The Cochrane Collaboration [17] and six items were considered relevant (Table 2): 1) whether the method of allocation was truly random; 2) whether there was proper allocation concealment; 3) whether the groups were similar at baseline; 4) whether the eligibility criteria were documented; 5) whether loss to follow-up in each treatment arm was specified; 6) whether intention-to-treat analysis was conducted. Therefore the evaluation of the quality level of the study was conducted as follows: positive answer to at least six questions was required for a trial to be rated as high quality. With a positive answer to five or four questions the study was considered to be of fair quality. With a positive answer to three or fewer questions the study was registered as low quality. When studies did not report adequate information to determine the above-mentioned assessment criteria, an attempt to obtain direct additional data from the investigators was made.

Data quality of non-randomized studies was assessed using the Methodological index for non-randomized studies (MINORS) [18] (Table 3). By considering 12 items (8 for non-comparative + 4 for comparative studies) the total score was calculated by summing the values attributed as follows: 0 (not reported), 1 (reported but inadequate), 2 (reported and adequate). Global ideal score for non-comparative studies was 16 and for comparative ones was 24.

2.4. Statistical analysis

Data from the individual eligible studies were entered into a spread-sheet for further analysis. Review Manager (RevMan) (Version 5.1. Copenhagen: The Nordic Cochrane Centre, The Cochrane Collaboration, 2011) [50] was used to perform the statistical analysis. Pooled odds ratios (OR) were calculated for discrete variables. Mean Difference (MD) were calculated for continuous variables. The fixed-effects and random-effects models were used to calculate the outcomes [19,20]. Heterogeneity amongst the trials was determined by means of the Cochran Q value and quantified