Surgical Oncology xxx (2017) 1–9

Contents lists available at ScienceDirect

Surgical Oncology

journal homepage: www.elsevier.com/locate/suronc

Safety and efficacy for laparoscopic versus open hepatectomy: A meta-analysis

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ARTICLE INFO

Article history:
Received 11 May 2017
Received in revised form
21 June 2017
Accepted 26 June 2017

Keywords:
Liver surgery
Laparoscopy
Hospital stay
Complication
Meta-analysis

PROSPERO registration number:
CRD42017058124

ABSTRACT

Background: Laparoscopic hepatectomy (LH) is growing in popularity, but its efficacy and safety are still controversial. Few multicenter, large, population-based, prospective, randomized studies have compared LH with open hepatectomy (OH). We performed a meta-analysis to compare the treatment outcome of patients undergoing LH versus OH.

Methods: We searched PubMed, EMBASE, Cochrane Central Register, CNKI, and WanFang Med Online databases to November 30th, 2016 for randomized controlled trials (RCTs) that compared treatment outcome for LH and OH. Eligibility criteria included evaluation of operation time, blood loss, complications, and hospital stay after surgery for adult patients who underwent LH or OH. Reviewers in pairs independently screened the studies, extracted data and assessed the risk of bias of included studies. Agreement was achieved. RevMan 5.3 was used to conduct meta-analysis. Complete case analysis was used as primary analysis. Predefined subgroup analysis includes benign and malignant disease.

Results: Eight RCTs with a total of 554 patients were included in the meta-analysis, 275 types of LH and 279 types of OH. LH reduced the hospital stay after surgery (8 trials, 554 patients, MD = −3.84 days, 95% CI: −5.05 to −2.63, P < 0.0001, I^2 = 88%) and the complication rate (8 trials, 554 patients, RR = 0.29, 95% CI: 0.17−0.50, P < 0.0001, I^2 = 0%, absolute 13 to 40 fewer), shortened the time to first flatus (3 trials, 264 patients, MD = −1.41 days, 95%CI: −1.98 to −0.83, P < 0.0001, I^2 = 92%), and had less blood loss (8 trials, 554 patients, MD = −164.31 ml, 95%CI: −220.91 to −107.72, P < 0.0001, I^2 = 98%) without increasing the operation time (MD = −7.96 min, 95%CI: −24.99 to 9.07, P = 0.36, I^2 = 91%) compared with OH.

Conclusions: Laparoscopy is more effective in terms of hospital stay after surgery and time to first flatus with fewer blood loss and complication rate for hepatic resection compared with open surgery.

Contents

Abbreviations: LH, laparoscopic hepatectomy; OH, open hepatectomy; RCTs, randomized controlled trials; CNKI, China National Knowledge Infrasture; ASA, American Society of Anesthesiologist; RRs, risk ratios; MDs, mean differences; CIs, confidence intervals; RevMan, Review Manager; HCC, hepatic cell carcinoma; CRCLM, colon rectal cancer liver metastasis; FNH, focal nodular hyperplasia; Lap, laparoscopy; NR, not report.

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http://dx.doi.org/10.1016/j.suronc.2017.06.007
0960-7404/

1. Introduction

Since the first laparoscopic cholecystectomy was performed by Reynolds in 1985 [1], laparoscopy is now regularly used in the majority of surgical procedures. Laparoscopic techniques are commonly used in hernia repair [2], splenectomy [3], adrenalectomy [4], appendicectomy [5], anti-reflux surgery [6], and more recently, colorectal resection [7]. However, the use of laparoscopy in hepatic surgery is not yet widely established. Several factors may have hindered the popularity of LH. These factors include concerns regarding tumor-free margins, the possibility of uncontrolled bleeding, the section of liver lesion, and difficulty in parenchymal resection [8].

Currently, laparoscopic surgery is important for enhanced recovery after surgery for hepatectomy. To summarize the current world position on laparoscopic liver surgery, the recent International Consensus Conference on LH was held in Japan in 2014 [9]. A nine-member jury evaluated LH outcomes using GRADE [10] and graded LH by the Balliol Classification of IDEAL [11]. They concluded that minor LH had become standard practice (IDEAL 3) and that major liver resections were still innovative procedures in the exploration phase (IDEAL2b). In China, many medical centers have begun to carry out this new approach in recent years. Many patients successfully received LH, but it was limited to wedge resection or partial resection in most instances [12].

Many observational and retrospective studies [13–15] have indicated that LH can reduce blood loss and the complication rate, as well as shorten the hospital stay after surgery. However, several studies have indicated that controlling bleeding in laparoscopy is difficult. Additionally, the location of hepatic focus and surgical view affect the surgical procedure. The surgical view for LH is different from that of open surgery, and requires a high level of skill and experience. Limitations of laparoscopy include poor cranial and ventral visibility and difficulty in intrahepatic vessel dissection [16]. Several meta-analyses [8,17–19] were conducted in recent years, but most of the included studies of these meta-analyses were not randomized, controlled trials (RCTs). In the most recent two years, some RCTs that compared the outcome of LH and OH have been published [20–27]. Therefore, we aim to update the evidence by performing a systematic review and meta-analysis, to provide evidence on the efficacy and safety of LH compared with OH for a fast recovery.

2. Methods

2.1. Search strategy

PubMed, EMBASE, Cochrane Central Register of Controlled Trails, China National Knowledge Infrasture (CNKI), and WanFang Med Online were searched from their reception to November 2016 for eligible RCTs. There were no language restrictions. The search terms included hepatectomy, liver resection, laparoscopy, open resection, laparotomy, randomized, controlled trial, randomized, randomly, and clinical trial. Synonyms of each term were also used.

2.2. Study selection

Two reviewers (Bao Jin and Meiting Chen) independently reviewed the abstracts and full text of each article in duplicate. For disagreements between the two reviewers, a third reviewer (Shunda Du) was recruited for discussion until consensus was achieved. When multiple publications reported the same or overlapping data, we selected the most complete study. We selected studies that met all of the following inclusion criteria: (1) outcome and safety were evaluated for LH compared with open surgery in adult patients; (2) the outcome measures included hospital stay after surgery, complications, and recovery of bowel function; and (3) the study was a RCT. Authors of the studies which data were not available were contacted by telephone calls and emails.

2.3. Data extraction

Two reviewers (Bao Jin and Meiting Chen) independently reviewed and extracted the following information from eligible studies: name of first author, publication year, country, contact information of the author, total number of cases and controls, age, sex, comorbidities, American Society of Anesthesiologist (ASA) score, disease, operation time, blood loss, hospital stay after surgery, time to first flatus, complications, reoperation, mortality, and pre- and postoperative liver biochemical function. The primary outcomes included hospital stay after surgery. Secondary outcomes include complications, operation time, blood loss, and time to first flatus. The time for having the first diet after surgery was not our outcome of interest because it was influenced by several subjective factors, such as different instructions from surgeons.

Please cite this article in press as: B. Jin, et al., Safety and efficacy for laparoscopic versus open hepatectomy: A meta-analysis, Surgical Oncology (2017), http://dx.doi.org/10.1016/j.suronc.2017.06.007