https://doi.org/10.1016/j.hpb.2018.02.379 HPB

ORIGINAL ARTICLE

Laparoscopy-assisted versus open and pure laparoscopic approach for liver resection and living donor hepatectomy: a systematic review and meta-analysis

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Abstract

Background: Laparoscopy-assisted (hybrid) liver surgery is considered a minimally invasive technique, however there are doubts regarding loss of the benefits of laparoscopy due to the use of an auxiliary incision. The aim of this study was to compare perioperative results of hybrid vs. open and hybrid vs. pure laparoscopic approach to liver resection for focal lesions and living donation.

Methods: A systematic review was performed in Medline, EMBASE, Cochrane Library Central and LILACS databases. Perioperative outcomes were analyzed.

Results: 21 studies were included. Hybrid vs. open: operative time was lower in open group (mean difference [MD] = 34 min; 95%CI: 22–47; P < 0.001; N = 669). Hybrid technique was associated with a reduction in operative blood loss [MD = –43 ml; 95%CI: –74–(–13); P = 0.005, N = 1738]; shorter hospital stay [MD = –1.9 days; 95%CI: –3.2–(–0.5); P = 0.008; N = 833] and lower morbidity [risk difference (RD) = –0.05; 95%CI: –0.10–(–0.01); P = 0.010; N = 1359]. Hybrid vs. pure laparoscopic: There was no difference regarding blood loss, transfusion rate, hospital stay and morbimortality.

Discussion: Hybrid technique had perioperative outcomes that were more in keeping with pure laparoscopic outcomes than open surgery. Hybrid liver surgery should be considered a minimally invasive approach.

Received 21 June 2017; accepted 4 February 2018

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Introduction

The first consensus on laparoscopic liver surgery in 2008 standardized the technical aspects as well as nomenclature related to the 3 preferred methods of minimally invasive liver surgery (MILS), dividing them into pure laparoscopic liver resections (PLLR), hand-assisted liver resections (HALR) and hybrid (laparoscopy-assisted) liver resections.[1]

To be defined as a pure laparoscopic approach the entire procedure is performed laparoscopically and an auxiliary incision (mostly a Pfannenstiel incision) is made at the end of surgery for specimen retrieval. Despite being the preferred method in most centers, it has mostly been confined to minor and non complex resections.[2–4] Barriers to widespread adoption of PLLR have included factors such as high costs and long learning curves.[5,6]

HALR and the hybrid technique have emerged to overcome some of the limitations faced by PLLR with the aim of expanding indications and safety of laparoscopic liver resections (LLR).[7–9] These modalities allow surgical manipulation in a similar way to open liver resection (OLR), recovering tactile sensation.[9,10]

Please cite this article in press as: Coelho FF, et al., Laparoscopy-assisted versus open and pure laparoscopic approach for liver resection and living donor hepatectomy: a systematic review and meta-analysis, HPB (2018), https://doi.org/10.1016/j.hpb.2018.02.379

In HALR the operation is performed with the elective placement of a hand port through an 8–10 cm laparotomy on the upper abdomen for the purpose of facilitating the procedure and retrieving the specimen. The definition of a hybrid approach is a procedure that is initiated totally laparoscopic or in hand-assisted manner, with the aim of achieving full liver mobilization. Subsequently planned (up to 15 cm) mini-laparotomy on upper abdominal wall is performed to approach vascular pedicles (if necessary) and perform the parenchymal transection.[1,4,11] If the hybrid procedure is initiated by the hand-assisted method the hand port incision can be used for the mini-laparotomy part (sometimes with a small extension). Advantages of this modality should be highlighted, such as manual search for deep lesions, technical assistance during liver transection or vascular control and even for direct compression in case of bleeding. A procedure that resembles conventional surgery may also reduce the learning curve.[12–14] A remarkable feature of hybrid operation is its universal applicability, suitable for any type of resection and best indicated for difficult resections, especially for posterosuperior segments (segments 1, 4a, 7, 8) and major hepatectomies, especially in living donation.[15–18]

Although considered as a modality of MILS, currently there is scarce evidence that demonstrates the benefits of hybrid surgery over OLR or compares the results of hybrid technique with other MILS techniques. The aim of this study was to determine if hybrid resections are as safe as OLR and if the benefits of laparoscopy are maintained in patients undergoing hybrid technique, in patients submitted to liver resection for focal lesions and living donation.

Methods

The Institutional Ethics Committee approved this study protocol. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement guidelines for conducting and reporting meta-analyses were followed. The research protocol was registered at the International Prospective Register of Systematic Reviews (http://www.crd.york.ac.uk/PROSPERO) with the number CRD42016037380.

Literature search

A systematic review was performed in Medline, EMBASE, Cochrane Library Central and LILACS (Latin American and Caribbean Health Sciences Literature) independently by 2 authors (FFC and GMF). All databases search was performed to identify comparative studies evaluating perioperative results between hybrid vs. open and/or hybrid vs. pure laparoscopic approach. Studies comparing patients undergoing hepatectomy for focal lesions (benign or malignant) or living donation were included. The search was restricted to comparative studies (prospective or retrospective). No restrictions were set for language, date or publication status. References of retrieved articles were also crosschecked manually for further studies. The last search was conducted on 31 January 2016.

Search strategy was based on different combinations of keywords for each database. For Medline database, the following combination was used: (hepatectomy OR liver resection OR sectionectomy OR segmentectomy) AND (laparoscop* OR minimally invasive OR Hand Assisted OR Hand-Assisted OR video OR hybrid OR laparoscopic-assisted OR (laparoscopy-assisted) AND (therapy/broad [filter] OR comparative study OR epidemiologic methods). The same keywords were inserted into manager fields of EMBASE using filters for comparative clinical studies. For Cochrane and LILACS search, only keywords without additional filters were used.

Study selection

The same 2 reviewers independently performed eligibility assessment and selection of screened records identified in the primary search. Inclusion criteria were: (i) Randomized or comparative studies, regardless of the number of patients in each arm, that compared perioperative results of hybrid vs. open and/or hybrid vs. pure laparoscopic technique; (ii) Studies that compared these techniques in 2 subgroups: patients undergoing liver resection for focal hepatic lesions and for living donation; (iii) If the same institution reported more than one study, only the most recent or highest quality study was included.

Exclusion criteria were: (i) Non-comparative studies, review articles, letters, comments, and case reports; (ii) Studies comparing robotic surgery or single port resections; (iii) Studies comparing hybrid vs. mini-laparotomy; (iv) Studies comparing OLR vs. mini-laparotomy (without laparoscopic assistance); (v) Studies in which the whole operation was conducted through hand-assistance; (vi) Studies where it was not possible to retrieve or calculate mean and standard deviation (SD).

If reviewers disagreed about inclusion or exclusion of a given study, a consensus meeting was held to decide eligibility.

Data extraction

The same 2 independent researchers reviewed relevant texts, tables, and figures to extract data from the included articles. The following information was collected: (i) First author name, year of publication and study type; (ii) Type of comparison: hybrid vs. OLR or hybrid vs. PLLR; (iii) Number of patients included in each arm; (iv) Perioperative outcomes: conversion rate (defined as unplanned or an extended incision greater than 15 cm), operative time, estimated blood loss, perioperative transfusion rate, hospital stay, morbidity according to Clavien-Dindo classification (25) (up to 90th postoperative day). Whenever possible a separate analysis in subgroups (resection and living donation) was performed.

Level of evidence and quality assessment

Evidence level of selected studies was assessed by 2011 Oxford Scale.[19] To evaluate the quality of observational studies the Newcastle–Ottawa Scale (NOS) was used.[20] The minimum

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