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REVIEW ARTICLE

The outcomes of central hepatectomy versus extended hepatectomy: a systematic review and meta-analysis

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Abstract

Background: Central hepatectomy (CH) is a relatively uncommon liver resection technique. It is generally perceived as a more complex operation than extended hepatectomies (EH), with potentially higher associated morbidity. The outcomes of CH compared with EH is not well defined and there is a need to reassess.

Methods: A systematic literature search was conducted in PubMed, MEDLINE, EMBASE and Web of Science according to PRISMA guidelines for studies on the treatment of liver tumours with CH published from 1972 until February 2017. Outcomes of patients undergoing CH were assessed and compared to those undergoing EH.

Results: 18 publications including 1380 CH were included for analysis. Mortality rates after CH ranged from 0 to 9%. There were 20 (1.4%) deaths after CH and the most common cause of death was post-hepatectomy liver failure (PHLF). Morbidity rates varied between 12 and 61% and 316 (23%) post-operative events were reported. Analysis of five comparative studies showed similar mortality between CH and EH groups (OR: 0.64, 95% CI = 0.24–1.70, p = 0.37). There were significantly fewer overall post-operative complications in the CH group (OR: 0.38, 95% CI = 0.28–0.51, p < 0.001) and reduced PHLF was found in the CH group compared to EH (OR: 0.53, 95% CI = 0.29–0.98, p = 0.04). The rates of post-hepatectomy biliary complications were similar between groups (OR: 0.98, 95% CI = 0.51–1.88, p = 0.96). Mean length of stay (days) was shorter in the CH group (MD: –2.67, 95% CI = –4.93 to –0.41, p = 0.02).

Conclusion: CH appears to have similar post-operative mortality rates compared to EH but is associated with fewer post-operative complications, including PHLF and shorter overall length of stay.

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Introduction

Liver resection remains the curative treatment for various liver malignancies. There are different approaches to liver resection in terms of major and minor resections.[1] Major resection for removal of some tumours requires consideration of the volume and function of the remaining future liver remnant (FLR). Traditionally, patients with centrally located liver tumours (CLLT) are treated with extended hepatectomies (EH), with the removal of more than four contiguous liver segments. The main limitation of EH has been the high rate of post-hepatectomy liver failure (PHLF) related to extensive resection (60–85%) of liver parenchyma.[2–5]

As compared to extended hepatectomy, central hepatectomy (CH) may achieve oncologically equivalent results and preserve FLR in certain patients.[6–12] CH is a parenchyma-sparing procedure defined as *en bloc* resection of Couinaud segments 4a, 4b, 5 and 8 (i.e. right anterior and left medial sections) with or without resection of segment 1 (caudate lobe). It is also known in the literature as mesohepatectomy,[5,6,8,9,13–16] central bisectionectomy,[17,18] central bisegmentectomy[19,20] and central hepatic resection,[21,22] however there is currently no definition of this procedure in the Brisbane 2000 Nomenclature of Hepatic Anatomy and Liver Resections by the International Hepato-pancreaticobiliary Association (IHPBA).[23,24]

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CH has been performed for CLLT including hepatocellular carcinoma (HCC), colorectal liver metastases (CLM) and cholangiocarcinoma (CCA).[8,11,15,16] It is not a commonly performed procedure, having been considered by many surgeons in the past as a higher risk and more technically demanding procedure compared to EH, related to the need to operate in proximity to hilar structures and creation of two major transection planes.[6,9,16] In this current era of liver surgery, whether these risks pose major obstacles is somewhat controversial.[25]

The purpose of this review is to investigate and provide an update on the outcomes in patients with CLLT following CH compared to EH in terms of mortality, morbidity, early and long-term complications and operative outcomes.

Methods

Search strategy

This review was prepared according to Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) recommendations.[26] An electronic search of the literature was conducted in PubMed, MEDLINE, EMBASE and Web of Science for articles published from 1972 until February 2017, using Medical Subject Headings (MeSH) terms and Boolean operators. Key terms used were 'central hepatectomy (MeSH)', 'mesohepatectomy', 'central bisectionectomy', central bisegmentectomy'. References of relevant literature were reviewed to identify additional studies.

Inclusion and exclusion criteria

All titles and abstracts retrieved from the search strategy were screened. Duplicate studies were identified and excluded. Comparative studies and publications that reported on any clinical outcome of patients with CLLT who underwent CH, regardless of operative technique, were included in this review. For studies that included non-anatomical wedge resections of central segments, right anterior sectionectomy (Sg 5, 8) and left medial sectionectomy (Sg 4a, 4b) in their study population of CH, only those that reported a significant proportion of true CH were included. In studies published from the same institution with overlapping study periods and patient populations, the most recent and relevant study was included. Articles published in languages other than English, case reports, editorials, commentaries, letter to the editor and studies of non-adult patients were excluded.

Outcomes of interest

Primary end points after CH examined were peri-operative mortality and overall post-operative complications, including 30- and 90-day morbidity and mortality. Secondary end points evaluated included post-hepatectomy liver failure (PHLF), post-hepatectomy biliary complications, operating time, intra-operative blood loss and transfusion requirements and length of hospital stay.

Statistics

The computer software Review manager (RevMan) version 5.3 was used for statistical analysis and the generation of forest plots. Data of interest was extracted from studies for analysis. Dichotomous data was evaluated using Mantel-Hansel method with fixed-effect model and 95% confidence interval (CI). Continuous data was determined using inverse variance with a 95% CI. $p < 0.05$ was considered statistically significant. When there was insufficient data available for statistical analysis, results were reported in descriptive terms.

Results

Study selection

Eighteen series met selection criteria and were evaluated in detail for this review (Fig. 1).

Study characteristics

Patients in the 18 included publications underwent liver resection between 1973 and 2013. Overall 20,795 patients were included, varying between eight and 4985 patients per study. 1380 (7%) patients had CH. Most papers were retrospective, single centre studies except two prospective single centre studies.[14,27] Nine papers reported only outcomes of CH.[8,14,15,17–19,27–29] The remaining nine were comparative studies comparing CH to either EH and/or hemihepatectomy.[6,11–13,16,22,25,30,31] Of these, one compared CH with hemihepatectomies, four compared CH to combined EH and hemihepatectomies and five evaluated CH versus EH. The five comparative studies comparing CH with EH included 432 patients who underwent CH and 598 who underwent EH (left/right).[6,11–13,16]

Patient characteristics

Study and patient characteristics are shown in Table 1.

The indication for CH was available in all studies. Eight papers studied HCC patients only, all of which were from East Asia.[6,15,17,18,22,25,30,31] One study only specified the number of patients with primary or secondary liver tumours with no description of malignancy type.[27] The overall main indication was HCC comprising 85% (n = 1147) of patients, followed by CLM (n = 118 (8.8%)). Other diagnoses include intrahepatic cholangiocarcinoma (CCA) (n = 16 (1.2%)), gallbladder carcinoma (n = 9 (0.7%)), hepatosarcoma (n = 2), other liver metastases (n = 30 (2.2%)), benign lesions (n = 16 (1.2%)) including focal nodular hyperplasia (n = 9) and haemangioma (n = 2).

Three of the five comparative series noted significantly fewer CH patients required portal vein embolization (PVE) compared with EH.[11,12,16] Seven (2%) patients before CH compared with 122 (23%) EH patients had pre-operative PVE (OR: 0.09, 95% CI = 0.04–0.22, $p < 0.001$) (Fig. 2).

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