

REVIEW ARTICLE

Enhanced recovery following liver surgery: a systematic review and meta-analysis

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Abstract

Background: Enhanced recovery after surgery (ERAS) programmes aim to improve postoperative outcomes. They are being utilized increasingly in hepatic surgery. This review aims to evaluate the impact of ERAS programmes on outcomes following liver surgery.

Methods: EMBASE, MEDLINE, PubMed and the Cochrane Database were searched for trials comparing outcomes in patients undergoing liver surgery utilizing ERAS principles with those in patients receiving conventional care. The primary outcome was occurrence of postoperative complications within 30 days. Secondary outcomes included length of stay (LoS), functional recovery and adherence to ERAS protocols.

Results: Nine articles were included in the review, of which two were randomized controlled trials (RCTs). Overall complication rates were 25.0% (range: 11.5–46.4%) in ERAS patients, and 31.0% (range: 11.8–46.2%) in conventional care patients. Significantly reduced overall complication rates following ERAS care were demonstrated by a meta-analysis of the data reported in the two RCTs (odds ratio: 0.49, 95% confidence interval 0.28–0.84; $P = 0.01$). The median LoS reported by the studies was 5.0 days (range: 2.5–7.0 days) in ERAS patients, and 7.5 days (range: 3.0–11.0 days) in non-ERAS patients. Recovery milestones, when reported, were improved following ERAS care.

Conclusions: The adoption of ERAS protocols improves morbidity and LoS following liver surgery. Future ERAS programmes should accommodate the unique requirements of liver surgery in order to optimize postoperative outcomes.

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Introduction

Enhanced recovery after surgery (ERAS) programmes were introduced initially in colorectal surgery, in which they have been associated with improvements in postoperative length of stay (LoS) and morbidity.¹ They have since been adopted by multiple specialties, including orthopaedic surgery,² gynaecology³ and breast surgery.⁴

The underlying principle of ERAS is a multimodal perioperative protocol to attenuate the inflammatory response and potentiate patient rehabilitation following major surgery.⁵ The intention is to prevent the problems associated with an exaggerated inflammatory reaction to surgery, such as poor healing, infective complications and organ dysfunction.⁶ This approach, incorporating intensive

optimization of mobility, gut function and analgesia,⁷ contributes to expediting recovery and minimizing morbidity.

Enhanced recovery after surgery programmes reduce postoperative morbidity rates following a variety of surgical procedures.¹ Liver resections have traditionally been associated with high mortality and morbidity rates. With current surgical and perioperative management, mortality rates of <5% can be achieved.⁸ However, morbidity rates remain high at 15–50%.⁹ Adopting ERAS protocols may facilitate further improvement in surgical outcomes in hepatic resection.

Recently, a number of publications have examined the application of ERAS programmes to hepatic surgery. This review evaluates the impacts of these programmes on morbidity and recovery rates following liver surgery.

Materials and methods

This study was conducted according to the PRISMA (*preferred reporting items for systematic reviews and meta-analyses*) guidelines for meta-analysis.¹⁰ A literature search of EMBASE, MEDLINE, PubMed and the Cochrane Database was performed independently by two researchers in May 2013.

The databases were searched for the period 1966–2013 using the key terms ‘enhanced recovery’, ‘fast track’, ‘ERAS’ and ‘liver’, ‘hepatobiliary’, ‘hpb’. All abstracts were reviewed for relevance. The full texts of relevant articles were subsequently reviewed.

All trials assessing enhanced recovery following liver surgery were included. Inclusion criteria required that the study should clearly state the ERAS protocol, which should contain at least four items of care considered to be contributory to an enhanced recovery programme.¹¹ Exclusion criteria discounted any studies involving children aged 16 years and younger, and any studies that reported the use of a non-standard care pathway or compared ERAS protocols in both arms of the study.

All studies included in the final analysis were assessed by two independent reviewers. Study quality and bias were assessed independently using the Downs and Black score.¹² Data were extracted directly from the papers according to data extraction forms.

The primary outcome was the occurrence of any complication within 30 days postoperatively. The following markers were assessed as secondary outcomes: LoS; time to the achievement of functional recovery; time to independent mobility; time to resumption of diet, and time until first bowel motion/flatulus.

The meta-analysis was performed using RevMan Version 5.2 (Nordic Cochrane Centre, Copenhagen, Denmark). Dichotomous data were analysed using the fixed-effects odds ratio. Heterogeneity was assessed using I^2 and chi-squared tests and judged to be significant if the I^2 -value was >50% and according to a P -value of <0.05. The cut-off for statistical significance was set at $P < 0.05$. When continuous quantitative data were not distributed normally, meta-analysis was not performed and a qualitative assessment was utilized.

Results

Study characteristics

A total of 257 papers were identified. The PRISMA diagram is shown in Fig. 1. Nine studies were included for review.^{13–21}

Studies investigating outcomes in open hepatic surgery included two randomized controlled trials (RCTs),^{16,17} two prospective cohort studies^{18,19} and one retrospective cohort study²¹ and two case–control studies.^{13,20} Two case–control trials compared outcomes of ERAS protocols with those of conventional care after laparoscopic surgery.^{14,15}

The trials included spanned the period from 2008 to 2013. A total of 522 patients underwent liver resection according to an ERAS protocol and 316 were managed on a conventional care

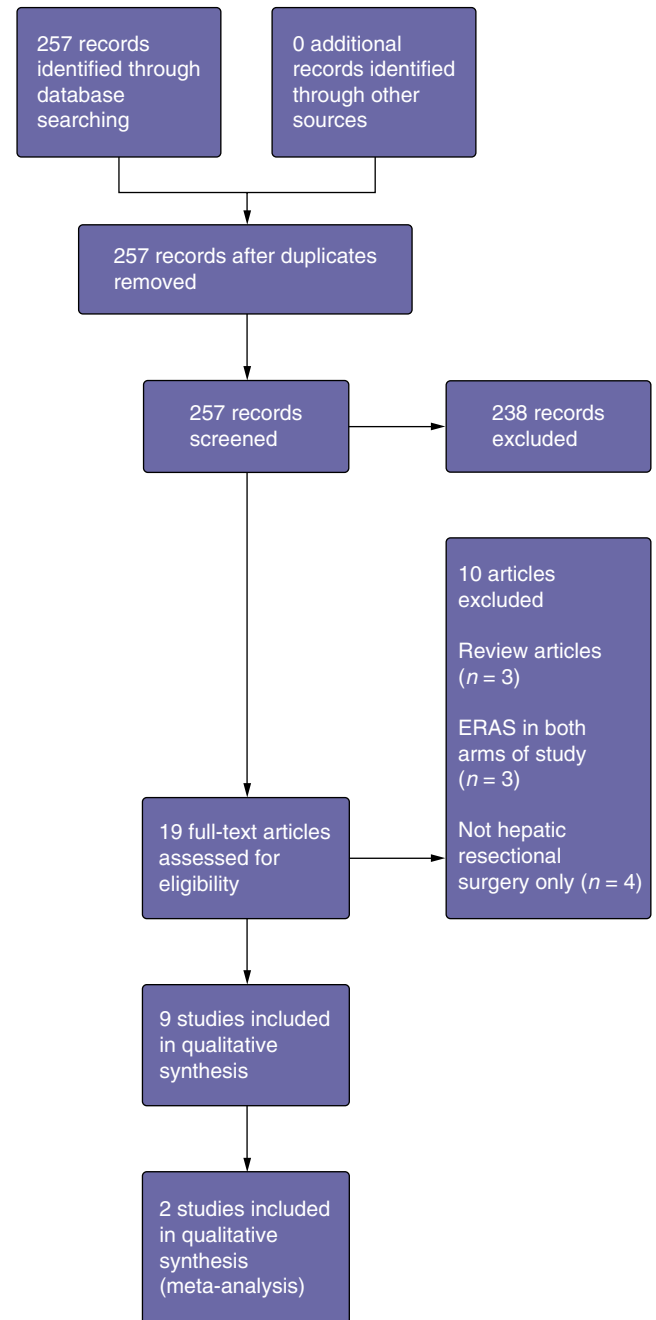


Figure 1 PRISMA diagram illustrating the identification and selection of studies for review

pathway following liver resection. The median patient age was 60.0 years (range: 48.4–64.0 years) in the ERAS group and 52.5 years (range: 45.0–67.0 years) in the conventional care group. The majority of the operations were for colorectal liver metastases or hepatocellular carcinoma. Details of participant characteristics are shown in Table 1. All studies explicitly described an ERAS protocol. A median of 11 (range: 8–19) ERAS items were utilized. The

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