Is laparoscopic right colectomy more effective than open resection? A meta-analysis of randomized and nonrandomized studies

CRD summary
Laparoscopic right colectomy resulted in less blood loss, a shorter hospital stay, and less postoperative short-term morbidity, compared with open right colectomy, with a comparable oncological outcome. The conclusions reflected the evidence and key limitations were acknowledged; a high risk of bias and high heterogeneity mean that they are unlikely to be sufficiently cautious and may not be reliable.

Authors' objectives
To compare laparoscopic or laparoscopy-assisted right colectomy with open right colectomy.

Searching
MEDLINE, EMBASE, CINAHL and The Cochrane Library were searched, up to March 2011. Eight specialist journals were searched online. Both published and unpublished studies were sought. The search terms were reported. Only studies in English, French, German, Spanish, or Italian were included. The bibliographies of full-text articles were scanned for additional studies.

Study selection
Randomised or non-randomised studies, comparing elective laparoscopic or laparoscopy-assisted resection with open resection of the right colon, for benign disease or malignant neoplasms, were eligible. Studies of emergency colectomy were excluded.

The outcomes of interest included intra-operative end-points, postoperative recovery, early postoperative outcomes, and short and long-term oncological outcomes. Most of the included studies were of patients with right colon cancer, and nearly all the intervention procedures were laparoscopic, rather than laparoscopy assisted. Where reported, the rates of conversion from laparoscopic to open surgery ranged from zero to 21%. Two studies were conducted in the UK.

Two reviewers selected the studies for inclusion.

Assessment of study quality
Randomised controlled trials (RCTs) were assessed using a modified 15-point Jadad scale. Non-randomised studies were assessed using a revised and modified 21-point grading system from the Scottish Intercollegiate Guidelines Network. Higher scores indicated higher quality.

The authors did not state how many reviewers assessed the quality of the studies.

Data extraction
The data were extracted to calculate odds ratios and mean differences, for up to 21 different outcomes. These data were extracted by one reviewer and checked by a second. Disagreements were resolved through discussion or by consulting a third reviewer.

Methods of synthesis
Pooled odds ratios and weighted mean differences were calculated using the Mantel-Haenszel method. Heterogeneity was assessed using $X^2$ and $I^2$. If $I^2$ was over 50%, a random-effects model was employed, otherwise a fixed-effect meta-analysis was conducted. For continuous outcomes, if necessary, the mean and standard deviation were imputed.

Subgroup analyses were conducted to evaluate the outcomes for patients with malignant tumours. Sensitivity analyses explored the effects of study quality and design. Publication bias was assessed in a funnel plot.

Results of the review
Seventeen studies, with 1,489 patients, were included. Two were randomised trials, which scored five and 11, out of 15, for quality. Ten of the 15 non-randomised studies were retrospective. Among non-randomised studies, for quality, four had a score of less than eight (considered poor), 10 scored between eight and 14 (fair), and one scored 15 (good). The duration of follow-up ranged from one month to nearly nine years.

Compared with open surgery, the mean operative time was longer for patients undergoing laparoscopic surgery (MD 37.94 minutes, 95% CI 25.01 to 50.88; 13 studies; I²=86%). Laparoscopic surgery performed better in terms of intra-operative blood loss (MD -96.61 mL, 95% CI -150.68 to -42.54; eight studies; I²=92%), length of hospital stay (MD -2.29 days, 95% CI -3.96 to -0.63; 10 studies; I²=82%), and short-term postoperative morbidity (OR 0.64, 95% CI 0.49 to 0.83; 15 studies; I²=37%).

There were no differences between the two methods of surgery in their operative oncologic outcomes, mortality, other morbidity outcomes, other recovery end-points, and short- and long-term outcomes. The results of the subgroup and sensitivity analyses were reported. No evidence of publication bias was found.

**Authors' conclusions**
Laparoscopic right colectomy resulted in less blood loss, a shorter hospital stay, and less postoperative short-term morbidity, compared with open right colectomy, with a comparable oncological outcome.

**CRD commentary**
The review question was clear and used broad, but replicable selection criteria. Several bibliographic sources were searched to identify published and unpublished studies, but language restrictions were applied and these excluded several studies. Attempts were made to minimise error and bias in study selection and data extraction, but it was unclear whether similar steps were taken in the quality assessment of the studies.

Detailed results of the quality assessment were provided. Only two studies were randomised and most were subject to several sources of bias. The non-randomised studies had a high risk of bias in favour of the treatment group, as acknowledged by the authors, and none of them reported blinding of the outcome assessor, suggesting a risk of bias. Heterogeneity was very high for most outcomes, as acknowledged by the authors, making the applicability of the results of the analyses unclear.

The conclusions reflected the evidence and the authors acknowledged some key limitations. The high risk of bias in most studies and high levels of heterogeneity, mean that the conclusions are unlikely to be sufficiently cautious and may not be reliable.

**Implications of the review for practice and research**
The authors did not state any implications for practice and research.

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