Laparoscopic vs open resection for rectal cancer: a meta-analysis of randomized clinical trials

CRD summary
Compared with open resection, laparoscopic resection for rectal cancer led to a shorter hospital stay, earlier return to bowel function, reduced blood loss, and fewer episodes of postoperative blood transfusion, abdominal postoperative bleeding, late intestinal obstruction by adhesion and late morbidity. Despite some concerns about trial variation, quality and reporting, these conclusions are likely to be reliable.

Authors' objectives
To compare laparoscopic versus open resection for the treatment of rectal cancer.

Searching
PubMed, Cochrane Database of Systematic Reviews, EBM Reviews, CINAHL and EMBASE were searched for articles from 1960 to January 2011. There were no language or publication restrictions and the search terms were reported.

Study selection
Randomised controlled trials (RCTs) comparing laparoscopic and open rectal cancer resection were eligible for inclusion if they reported at least one of the following outcomes: operative, recovery, early and late postoperative, histopathological and long-term oncological. Trials had to clearly document rectal cancer resection as either anterior or abdominoperineal, and describe the technique as laparoscopic or open. Trials of rectal surgery for benign lesions and inflammatory bowel disease and those that did not include a distinct group of patients with rectal cancer, or included a patient group undergoing transanal endoscopic microsurgery, transanal excision or palliative treatment were excluded. Surgical procedures performed by trainees or by surgeons during the learning curve for laparoscopic or conventional rectal surgery were excluded.

In included trials, anterior or abdominoperineal resection methods were used. Most patients had total mesorectal excision. All trials were published between 2003 and 2010.

Titles and abstracts were screened by two reviewers, and the full texts of potentially relevant studies were assessed independently by two authors. Disagreements were resolved by discussion, with a third reviewer if needed.

Assessment of study quality
Trial quality was assessed using the Cochrane risk of bias tool, which covered methods of randomisation, concealment of allocation, blinding, incomplete outcome data, selective outcome reporting and other bias. The Jadad scale was used to rank trials by quality; scores could range from zero to five, with higher scores indicating higher quality.

Trial quality was assessed by two authors.

Data extraction
Data were extracted, to calculate weighted mean differences and odds ratios, by one author and checked by a second. A third author was consulted as needed.

Methods of synthesis
Odds ratios were pooled with 95% confidence intervals, using Mantel-Haenszel fixed-effect and random-effects models. Heterogeneity was assessed using $X^2$ and $I^2$. For continuous outcomes data, reported as median and range, the mean and standard deviation were estimated using Hozo's method. Analyses were performed on an intention-to-treat basis.

Subgroup analyses were performed to compare laparoscopic versus open surgery for abdominoperineal excision,
anterior resection and total mesorectal excision. Sensitivity analyses that included only high-quality trials, with a Jadad score of three or more, were performed.

Results of the review
Nine RCTs were included, with 1,544 patients. Most trials reported appropriate methods of randomisation. Blinding of outcome assessor and allocation concealment methods were rarely reported. The rates of conversion to the open approach ranged from zero to 34% (two trials had more than 30%). Only one trial was conducted in several centres. Seven trials had a Jadad score of three, and two scored two out of five. Follow-up ranged from three months to nine years.

Compared with open resection, laparoscopic surgery was associated with a statistically significant reduction in intraoperative blood loss (WMD -98.17mL, 95% CI -137.26 to -59.07; five trials; I²=55%), lower chance of requiring a blood transfusion (OR 0.21, 95% CI 0.09 to 0.47; three trials; I²=0), and longer operating time (WMD 39.69 minutes, 95% CI 22.40 to 56.99; six trials; I²=89%). Earlier resumption of oral intake was observed with laparoscopic surgery (WMD -0.71 days, 95% CI -1.28 to -0.15; five trials; I²=66%), as well as a faster return of bowel function (WMD -1.03 days, 95% CI -1.61 to -0.46; three trials; I²=56%) and a shorter duration of hospital stay (WMD -2.69 days, 95% CI -4.65 to -0.74; five trials; I²=83%).

Analysis of early postoperative outcomes showed that laparoscopic resection had a significantly lower bleeding rate, compared with open surgery (OR 0.28, 95% CI 0.08 to 0.90; six trials; I²=0). There were no other significant differences in early postoperative outcomes between the groups. Laparoscopic resection patients had a significantly lower late morbidity (OR 0.31, 95% CI 0.14 to 0.67; two trials; I²=0) and late intestinal adhesion obstruction (OR 0.14, 95% CI 0.04 to 0.56; two trials; I²=0). No significant differences were found for other late complications.

No significant differences were found in other intraoperative outcomes and in long-term oncological outcomes, including when lower quality trials were excluded. The results of the subgroup and sensitivity analyses were reported.

Authors’ conclusions
Compared with open resection, laparoscopic resection for rectal cancer led to a shorter hospital stay; earlier return to bowel function; reduced blood loss; fewer episodes of postoperative blood transfusion, abdominal postoperative bleeding, and late intestinal obstruction by adhesion; and a lower late morbidity. The intraoperative and long-term oncological outcomes were comparable between the two surgical methods.

CRD commentary
The review question and selection criteria were clearly stated. Several databases were searched and no publication and language restrictions were imposed. Appropriate steps were taken to minimise error and bias in trial selection, data extraction and quality assessment. Trial details were reported, but few patient characteristics were given. The results of the quality assessment were reported. There were several gaps in the trials' reporting, making the reliability of the evidence partly unclear. Two trials had significant rates of conversion to open resection and it is unclear whether this had an effect on the pooled estimates. The methods of analysis appear to have been appropriate, and there were attempts to explore heterogeneity; there was evidence of heterogeneity for several outcomes.

Despite these limitations, the conclusions of the review reflected the results and are likely to 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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