Mechanical bowel preparation for elective colorectal surgery: updated systematic review and meta-analysis
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CRD summary
Authors concluded that mechanical bowel preparation for elective colorectal surgery did not lower the incidence of postoperative complications. These conclusions appeared to reflect the presented evidence. Despite limited trial, participant, quality and heterogeneity details these conclusions are likely to be reliable.

Authors’ objectives
To assess the efficacy of mechanical bowel preparation in the prevention of postoperative complications following elective colorectal surgery.

Searching
The Cochrane Library, EMBASE and MEDLINE were searched in May 2011 for eligible studies. Search terms were reported. The last 12 issues of nine major surgical journals were checked, as well as reference lists of selected articles. The search was limited to English language studies but no restriction was made regarding date. No attempts to identify unpublished material were reported.

Study selection
Prospective randomised controlled trials (RCTs) that compared mechanical bowel preparation versus no mechanical bowel preparation prior to elective colorectal surgery were eligible for inclusion. Studies that did not report any major postoperative outcomes were excluded.

Demographics of patients between the two groups across trials were reported as "similar". Further participant characteristics were not reported. Studies were published between 1992 and 2010. Most trials used a combination of hand sewn and stapled anastomosis (data not available for all trials). A range of oral laxatives were used, including polyethylene glycol, senna, sodium phosphate and mannitol.

Two reviewers independently assessed studies for inclusion by reading the abstracts.

Assessment of study quality
The methodological quality of the included trials appeared to have been evaluated by means of the Jadad scale which assessed randomisation, double blinding, and withdrawals/drop-outs. Overall scores range from 0 to 5; higher scores indicated better quality. Up to two scores each were awarded for randomisation and blinding, with one score for drop-out/withdrawals. Authors judged single blinding to be appropriate as they assumed patients to know their treatment regimen. Further details of how scores were awarded were not reported. Trials that scored 2 or less were considered of "poor" quality.

Two reviewers independently assessed trial quality. Final scores were awarded by consensus.

Data extraction
Data on the surgical procedure and a range of outcomes were extracted. Anastomotic leakage was the primary outcome. Secondary outcomes included surgical site infections, extra-abdominal septic complications, wound infections, reoperation, and death. Data were extracted to calculate odds ratios with 95% confidence intervals.

Data extraction was conducted by two reviewers and cross-checked.

Methods of synthesis
Trials were synthesised by means of a fixed-effect meta-analysis to calculate odds ratios with 95% confidence intervals. \( \chi^2 \) and I² were used to assess heterogeneity; \( \chi^2 \) less than 0.1 was considered to indicate the presence of heterogeneity. In this this case a random-effects meta-analysis was used. Sensitivity analysis to assess the robustness of the results and
several subgroup analyses were pre-specified. A funnel plot was used to assess publication bias for the primary outcome.

**Results of the review**
Fourteen RCTs (5,373 participants) were included. Sample sizes ranged from 129 to 1,354. Eleven trials scored 4 on the quality assessment tool, one scored 3 and two scored 2. No details of what scores were awarded for were reported. The funnel plot for the primary outcome anastomotic leakage was considered to be symmetrical which authors considered to indicate absence of obvious publication bias.

There was no statistically significant difference in the incidence of anastomotic leaks between the groups (14 trials).

There were no statistically significant differences between the groups for any of the secondary outcomes: surgical site infections (14 trials), extra-abdominal septic complications (eight trials), wound infections (14 trials), reoperation (seven trials) or death (10 trials).

Removal of the two "poor" quality trials or of 12 "small" trials (129 to 380 participants) in sensitivity analyses did not alter the results.

Use of polyethylene glycol and sodium phosphates was investigated in subgroup analyses. Patients using polyethylene glycol for mechanical bowel preparation had more anastomotic leaks (OR 1.72, 95% CI 1.02 to 2.87; number of trials unclear) and more overall surgical site infections (OR 1.39, 95% CI 1.05 to 1.86; number of trials unclear) than those who did not receive mechanical bowel preparation. Use of sodium phosphates with mechanical bowel preparation was also associated with increased surgical site infection rates (OR 2.16, 95% CI 1.38 to 3.40; number of trials unclear) compared to patients not receiving mechanical bowel preparation. There were no statistically significant differences between the groups on other outcomes.

Colon versus rectal surgery was also investigated in subgroup analysis. There were no significant findings apart from a reduction in overall surgical site infection rates for rectal surgery in the mechanical bowel preparation group (OR 0.33, 95% CI 0.16 to 0.66; number of trials unclear) compared to patients not receiving mechanical bowel preparation. X² values were not reported for sensitivity and subgroup analyses.

**Authors' conclusions**
Mechanical bowel preparation for elective colorectal surgery did not lower the incidence of postoperative complications.

**CRD commentary**
The review question and inclusion criteria were clear. Several relevant sources were searched. As non-English language studies were excluded there was a potential that relevant information was missed. It was unclear if unpublished material was sought leading to an unclear risk of potentially relevant studies having been overlooked. However, a funnel plot of the primary outcome did not indicate presence of publication bias. The use of independent and duplicate processes for study selection, data extraction and quality assessment reduced the risk of reviewer error and bias in these areas. Limited trial details were reported hindering an assessment of the generalisability of the included patient groups and the surgical settings and procedures.

The methods of synthesis were appropriate and suitable measures were used to assess heterogeneity between studies. However, information on heterogeneity was reported inconsistently. Therefore, it was difficult to assess the amount of variability between studies. The use of a scoring system for quality assessment was of limited use as no details of how scores were awarded were reported. Therefore, the actual quality of the included trials was difficult to determine. Quality assessment results were taken into consideration in sensitivity analyses illustrating the impact of trial quality on results.

The authors' conclusions appear to reflect the presented evidence. Despite limited trial, participant, quality, and heterogeneity details these conclusions are likely to be reliable.

**Implications of the review for practice and research**
**Practice:** The authors recommend that mechanical bowel preparation no longer be considered clinical routine in elective
Research: The authors recommend further evaluation of the role of mechanical bowel preparation in laparoscopic colorectal surgery.

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