Efficacy of mechanical bowel preparation with polyethylene glycol in prevention of postoperative complications in elective colorectal surgery: a meta-analysis

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CRD summary
The review found that preoperative mechanical bowel preparation with polyethylene glycol did not significantly lower postoperative complications in elective colorectal surgery. The authors’ conclusion reflected the evidence base and is appropriate, but potential bias in some aspects of the review process mean that the reliability of this conclusion should be treated with caution.

Authors' objectives
To assess the efficacy of mechanical bowel preparation with polyethylene glycol in the prevention of postoperative complications in elective colorectal surgery.

Searching
MEDLINE, EMBASE and the Cochrane Library were searched for articles in English with no date limitations; search terms were reported. Reference lists of retrieved studies were handsearched for other potentially relevant studies. The date of the search was not reported.

Study selection
Eligible studies were randomised controlled trials (RCTs) that compared the efficacy of polyethylene glycol as mechanical bowel preparation with no preparation prior to elective colorectal surgery. Major eligible outcomes were surgical site infection including incisional surgical site infection, organ/space surgical site infection, and anastomotic leak. Other outcomes included other infectious complications, main complications, mortality and hospital stay.

In the included trials, demographics of the participants were not reported, although the authors stated that the demographics of the two groups were similar including age, gender, diagnosis, type of anastomosis and procedure. One trial had only colon resections. Dosage of polyethylene glycol varied from three litres to one gallon, administered preoperatively over 24 hours, 12 to 16 hours before surgery or until clear fluid was evacuated. Some participants in the control group had dietary restrictions prior to surgery.

The authors did not state how study selection was undertaken.

Assessment of study quality
The 5-point Jadad score (which measured randomisation, blinding and treatment of withdrawals and drop-outs) was used to assess individual trials for validity. Trials were considered to be of high quality if they had a Jadad score of 3 or more.

Two reviewers independently performed the validity assessment, with inconsistencies resolved through discussion or referred to a third reviewer.

Data extraction
Data on were extracted into a standardised review form in order to calculate the weighted mean difference (WMD) and 95% confidence intervals (CIs) for length of hospital stay, and odds ratios (ORs) and 95% confidence intervals for the remaining outcomes.

Two reviewers independently extracted data, with one of the reviewers blinded to the publication source and authors' names. Inconsistencies were resolved through discussion, or referred to a third reviewer.
Methods of synthesis
Odds ratios for dichotomous data, and weighted mean differences for continuous data, with 95% confidence intervals, were combined in meta-analyses. Heterogeneity was assessed using the $X^2$ test (with $X^2$ values <0.1 being considered statistically significant) and the $I^2$ value. A fixed-effect model was used unless heterogeneity was significant.

Sensitivity analysis was used to assess the robustness of the findings after the exclusion of lower quality trials.

Results of the review
Five RCTs (n=1,147 patients) were included in the review. Four RCTs had a Jadad score of 3 points and were considered of high quality; one RCT had a Jadad score of 1 point.

Polyethylene glycol was not associated with a significant reduction in the rate of surgical site infection (OR 1.39, 95% CI 0.85 to 2.25; four RCTs), incisional surgical site infection (OR 1.44, 95% CI 0.88 to 2.33; five RCTs) or organ/space surgical site infection (OR 1.10, 95% CI 0.43 to 2.78; four RCTs).

Polyethylene glycol was also not associated with a significant reduction in anastomotic leak (OR 1.78, 95% CI 0.95 to 3.33; five RCTs), mortality (OR 1.24, 95% CI 0.37 to 4.14; four RCTs), infectious complications (OR 1.14, 95% CI 0.62 to 2.08; three RCTs; $I^2=57.6\%$) or hospital stay (WMD 2.17 days, 95% CI -2.9 to 7.25; two RCTs; $I^2=91\%$). Random-effects models were used for the analysis of infectious complications and hospital stay because of substantial heterogeneity.

Polyethylene glycol was associated with a statistically significant higher rate of main complications, which included surgical site infection and anastomotic leak (OR 1.62, 95% CI 1.06 to 2.46; four RCTs).

Sensitivity analysis, with the exclusion of the RCT that had a Jadad score of 1 point, did not markedly change the estimates.

Authors' conclusions
Preoperative mechanical bowel preparation did not significantly lower postoperative complications in elective colorectal surgery.

CRD commentary
The review included a clear research question and inclusion criteria appear appropriate. Three databases were searched and attempts were made to find other studies by searching reference lists. Eligible studies were restricted to the English language, so language bias could not be excluded. No attempts were made to identify unpublished studies, so publication bias could not be excluded. Although data extraction and validity assessment were carried out with efforts to reduce error and bias, the authors did not report whether such methods were applied to study selection.

A valid tool was used for the assessment of trial quality. The methods used for synthesizing the included trials, assessing heterogeneity and the sensitivity analyses were appropriate.

The authors' conclusion reflected the evidence base and is appropriate, although potential bias in some aspects of the review process mean that the reliability of this conclusion should be treated with caution.

Implications of the review for practice and research
Practice: The authors stated that the use of polyethylene glycol for mechanical bowel preparation was not routinely recommended.

Research: The authors stated that a high quality RCT with a sufficient sample size was required to assess the efficacy of polyethylene glycol for mechanical bowel preparation in the prevention of postoperative complications in elective colorectal surgery.
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