Single- versus two-layer intestinal anastomosis: a meta-analysis of randomized controlled trials

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CRD summary
This review assessed the use of a single layer versus a double layer of sutures for intestinal anastomosis. The authors concluded that there was no significant difference in leakage rates between single- and double-layer techniques. Therefore, the quicker and cheaper single-layer technique might be preferable for most surgery. The authors' conservative conclusions are likely to be reliable.

Authors' objectives
To compare the efficacy and safety of one versus two layers of sutures for intestinal anastomosis after resection.

Searching
MEDLINE (1966 to April 2004), EMBASE (1986 to August 2004) and the Cochrane Controlled Trials Register (Issue 2, 2004) were searched; the search terms were reported. There were no language restrictions. The bibliographies of included articles and reviews were searched.

Study selection
Study designs of evaluations included in the review
Randomised controlled trials (RCTs) were eligible for inclusion.

Specific interventions included in the review
Comparisons of single-layer versus double-layer anastomosis after intestinal resection were eligible for inclusion. The included studies used a range of suture materials. A range of techniques was used for the single-layer approach; for the double-layer approach, a continuous suture was most commonly used for the inner suture and interrupted Lambert technique for the outer layer.

Participants included in the review
Studies of patients undergoing intestinal resection were eligible for inclusion. The mean age of the participants ranged from 3.7 to 64.6 years and the proportion of males from 37.9 to 64.6%.

Outcomes assessed in the review
The studies had to report on leakage to be included. Other outcomes in the included studies were mortality, duration of anastomosis procedure, duration of total parenteral nutrition (TPN), length of hospital stay, risk of wound infection and cost of sutures.

How were decisions on the relevance of primary studies made?
Authors selected articles independently, with any differences resolved by consensus between all authors.

Assessment of study quality
Study quality was assessed using the Jadad scale, which evaluates randomisation, allocation concealment, blinding and withdrawals, giving a score between 0 and 5. Since blinding is difficult in surgical studies, the authors considered studies with a Jadad score of 2 or 3 to be of a high quality. The authors did not state how many reviewers performed the validity assessment.

Data extraction
Two reviewers independently extracted the data, with any differences resolved by a third reviewer. The number of leaks and deaths were extracted from each study, from which risk ratios (RRs) and 95% confidence intervals (CIs) were calculated.

**Methods of synthesis**

How were the studies combined?
Pooled RRs and 95% CIs were calculated using a Mantel-Haenszel fixed-effect model when no heterogeneity was observed between studies (p<0.1), and a DerSimonian and Laird random-effects model when heterogeneity was present. Publication bias was investigated using a funnel plot, Egger's regression method and a Begg-Mazumdar correlation test.

How were differences between studies investigated?
A chi-squared test was used to evaluate heterogeneity. Sources of heterogeneity were investigated via a l'Abbe plot and sensitivity analyses. Meta-regression analyses were undertaken to examine publication year, study participant age and gender as sources of heterogeneity.

**Results of the review**

Six RCTs (n=670) were included.

The Jadad scores ranged from 1 to 3 (mean 1.7). There was no evidence of publication bias.

There was no significant difference in the incidence of leaks between single-layer and double-layer anastomosis, (RR 0.91, 95% CI: 0.49, 1.69). There was significant heterogeneity between the studies (p=0.06).

Heterogeneity was thought to be due to one study in which the single-layer techniques used were uncommon in current practice. A sensitivity analysis that included only the three high-quality studies (Jadad score of 2 or 3; this included the 1977 trial) favoured the double-layer technique (RR 1.65, CI: 1.04, 2.61).

Other outcomes.

TPN duration was shorter in the single-layer group (1 RCT). There was no difference in mortality (1 RCT). The mean duration of the anastomosis procedure was shorter for the single-layer approach (2 RCTs). The mean length of hospital stay was shorter for patients undergoing single-layer intestinal anastomosis (3 RCTs).

**Cost information**

One study reported suture costs, with single-layer anastomosis sutures costing $4.50 and double-layer anastomosis sutures costing $35.40.

**Authors' conclusions**

Current evidence does not indicate that two-layer anastomosis has less leakage than single-layer anastomosis.

**CRD commentary**

The review addressed a clearly defined question in terms of the participants, interventions, outcomes and study design. The authors searched several relevant sources without language restrictions in an attempt to reduce the potential for publication and language bias. The study selection and data extraction processes were conducted in duplicate, hereby minimising the potential for error and bias; it was unclear whether the same steps were taken during the validity assessment. Validity was assessed using established criteria. The pooling of data from such clinically heterogeneous studies might not have been appropriate. The authors acknowledged that statistical heterogeneity between the studies, small trial sizes, and the poor quality of some studies limits the generalisability of the results. However, the authors' conservative conclusion is likely to be reliable.
Implications of the review for practice and research
Practice: The authors stated that single-layer anastomosis might prove preferable to two-layer anastomosis given the shorter procedural length and lower costs.

Research: The authors did not state any implications for research.

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