Laparoscopic repair of perforated peptic ulcer: a meta-analysis

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CRD summary
This review compared open versus laparoscopic repair of perforated peptic ulcers. The author concluded that laparoscopic repair significantly reduced wound infection and reduced post-operative pain and analgesic consumption, but had a longer operating time and higher reoperation rate. Most of the included studies were non-randomised trials in which selection bias might have influenced the results. Consequently, the conclusions may not be reliable.

Authors' objectives
To compare the efficacy and safety of open and laparoscopic repair of perforated peptic ulcers.

Searching
MEDLINE and EMBASE were searched from January 1990 to December 2002 for studies published in English. The reference lists of identified studies were checked.

Study selection
Study designs of evaluations included in the review
Prospective randomised controlled trials (RCTs) and 'case-control studies' were eligible for inclusion. It was probable that the term 'case-control study' was used here in error and that the included studies were, in fact, retrospective controlled observational (cohort) studies. Studies with similar patient populations and studies from the same centre were only included once. In addition, the included studies also contained some prospective non-randomised studies.

Specific interventions included in the review
Studies that compared open and laparoscopic repair were eligible for inclusion. For laparoscopic studies only, laparoscopic suture repairs were included; sutureless repairs were excluded. The studies used different laparoscopic techniques: Graham-Steele patch repair, suture closure with and without omental patch, suture of omental patch to the perforation and simple closure. Drains were used in some studies.

Participants included in the review
Studies of patients with perforated peptic ulcers were eligible for inclusion. Some studies only included patients with perforated duodenal ulcer with or without justapyloric ulcer; a few studies included patients with perforated gastric ulcers.

Outcomes assessed in the review
The major outcomes in the review were conversion rate, operative duration, post-operative pain score, analgesic requirement, wound infection, leakage rate, intra-abdominal collection, leakage, prolonged ileus, reoperation, mortality, length of hospital stay, time taken to resume normal diet, and time to return to normal activities and work.

How were decisions on the relevance of primary studies made?
The author did not state how the papers were selected for the review, or how many reviewers performed the selection.

Assessment of study quality
The author did not formally assess validity, but did discuss study design, method of randomisation and blinding.

Data extraction
The data were extracted onto a standardised form, but the author did not state how many reviewers performed the data extraction. Where possible, odds ratios (ORs) and 95% confidence intervals (CIs) were calculated for each study.
Methods of synthesis

How were the studies combined?
Where possible and feasible, the studies were combined using a fixed-effect meta-analysis and pooled ORs and 95% CIs were calculated. Where a meta-analysis was not possible, a narrative synthesis of the studies was undertaken.

How were differences between studies investigated?
Statistical heterogeneity was assessed using the Q statistic.

Results of the review

Thirteen studies (n=658) were included: 2 RCTs (n=161), 4 prospective non-randomised studies (n=228) and 7 retrospective controlled observational studies (n=264).

One of the RCTs used an adequate method of randomisation; the other did not report the methods used. In only one of the RCTs was the outcome assessor blinded to the treatment group; the outcome assessment was not blind in the other studies. Only four of the studies assessed the baseline comparability of the treatment groups.

The rates of conversion to open repair ranged from 0 to 29.1%. Reasons for conversion were given. The most common reasons were difficulty in identifying the perforation site, large perforation and technical problems.

The results for duration of the operation were mixed. Five studies found significantly longer operating times using laparoscopic versus open surgery, while another five showed no significant difference between the methods.

All 3 studies reporting post-operative pain scores found that laparoscopic repair significantly reduced pain scores compared with open repair. Eight of the 10 studies reporting analgesic consumption found that laparoscopic repair significantly reduced analgesic requirement in comparison with open repair; 2 studies found no difference between the treatments.

In terms of post-operative complications, laparoscopic repair did not significantly reduce overall chest infection analgesia compared with open repair (10 studies; OR 0.79, 95% CI: 0.38, 1.62, P=0.51); no significant statistical heterogeneity was found (P=0.14). Compared with open repair, laparoscopic repair significantly reduced the wound infection rate (6 studies; OR 0.39, 95% CI: 0.16, 0.94, P=0.036), but did not significantly increase leakage (7 studies; OR 1.49, 95% CI: 0.53, 4.24, P=0.45); no significant statistical heterogeneity was found (P=0.50 and P=0.87, respectively). There was no statistically significant difference between open and laparoscopic repair for intra-abdominal collection (7 studies; OR 1.99, 95% CI: 0.79, 5.02, P=0.15); no significant statistical heterogeneity was found (P=0.84). Studies suggested that laparoscopic repair reduced prolonged ileus in comparison with open repair, but the result was not statistically significant (5 studies; OR 0.62, 95% CI: 0.20, 1.92, P=0.41); no significant statistical heterogeneity was found (P=0.97).

Laparoscopic repair significantly increased reoperation compared with open repair (overall rate 3.7% versus 1.9% with open). The OR (8 studies) was 2.52 (95% CI: 1.02, 6.20, P=0.045); no significant statistical heterogeneity was found (P=0.69).

Laparoscopic repair was associated with lower mortality than open repair (4.8% versus 10.2% with open), but the result was not statistically significant. The OR (11 studies) was 0.63 (95% CI: 0.34, 1.15, P=0.13); no significant statistical heterogeneity was found (P=0.86).

All 13 studies showed that hospital stay was either shorter or equal with laparoscopic surgery versus open repair; the difference reached statistical significance in 3 studies.

Five of the 6 studies reporting time to resume normal diet found similar results for both treatments; one study found in favour of laparoscopic repair. One study found that time to return to work was significantly shorter after laparoscopic repair. One study found that time to return to normal activities was significantly shorter after laparoscopic repair (10 versus 26 days with open repair).
Authors' conclusions
Laparoscopic repair of perforated peptic ulcer was associated with a significantly lower wound infection, reduced post-operative pain and analgesic consumption, but a longer operating time and higher reoperation rate.

CRD commentary
The review question was clear in terms of the participants, intervention and outcomes. The inclusion criteria were broadly defined in terms of study design. In limiting the included studies to English language publications listed in two databases, the author might have missed some relevant studies. No attempt was made to locate unpublished studies, thus raising the possibility of publication bias. The methods used to select the studies, assess validity and extract the data were not described, so it is not known whether any efforts were made to reduce errors and bias. Validity was not formally assessed, but some aspects of validity were discussed.

Data from RCTs, non-randomised studies and controlled observational studies were pooled, but study quality was not taken into consideration in either the analysis or conclusions. Poor-quality studies tended to overestimate the treatment effects. Some results were described as showing a difference between treatments when there was no statistically significant difference. The evidence relied heavily upon non-randomised trials in which selection bias might have influenced results. These concerns indicate that the conclusions may not be reliable.

Implications of the review for practice and research
Practice: The author stated that patients should be carefully selected for laparoscopic repair.

The author also stated that a Graham-Steele patch closure of a perforated duodenal or justapyloric ulcer was justified and beneficial to patients who have no Boey's risk factors. The author did not present evidence from the review to support this.

Research: The author stated that RCTs are required to assess the effects of laparoscopic surgery in patients who have one or more Boey's risk factors.

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This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.