Laparoscopic versus open appendectomy for acute appendicitis: a metaanalysis

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CRD summary
The review concluded that although laparoscopic appendectomy had a longer operating time than open appendectomy, it resulted in less postoperative pain, faster postoperative rehabilitation, a shorter hospital stay and fewer postoperative complications in patients with acute appendicitis. Concerns about the appropriateness of meta-analysis and potential biases within the review mean that caution is warranted when interpreting the authors' conclusions.

Authors' objectives
To assess the efficacy and safety of laparoscopic appendectomy compared with open appendectomy for acute appendicitis.

Searching
PubMed, EMBASE and Current Contents were searched from January 1992 to February 2010 for articles published in English. Search terms were reported. Reference lists of retrieved studies were scanned.

Study selection
Randomised controlled trials (RCTs) that compared the effectiveness and safety of laparoscopic versus open appendectomy in patients with acute appendicitis were eligible for inclusion. Trials had to report on at least four variables of interest: operative time, hospital cost, postoperative complications, length of analgesia, bowel function recovery, the day liquid diet began, hospital stay, return to work and return to normal activities. Trials that studied variations on the standard laparoscopic technique (such as laparoscopic assisted single-trocar appendectomy) were excluded. The included trials were published between 1993 and 2009 and compared laparoscopic with open appendectomy. No further study details were provided.

The authors did not state how many reviewers performed study selection.

Assessment of study quality
Study quality was assessed using the modified Jadad scale of randomisation, blinding, allocation concealment and withdrawals and drop-outs to give a maximum score of 8.

Two reviewers independently performed validity assessment.

Data extraction
Data were extracted by two independent reviewers for outcomes of interest in order to calculate odds ratios (ORs) or mean differences, together with 95% confidence intervals (CIs). Where the measure of variance was not reported, the mean or median was halved to estimate this.

Methods of synthesis
A fixed-effect meta-analysis was used to calculate pooled odds ratios and weighted mean differences (WMDs), together with 95% CIs. Statistical heterogeneity was assessed using the $X^2$ and the $I^2$ statistics. It seems that the overall complication rate was calculated by adding the numbers of all the individual complications together. If statistic heterogeneity was detected, a random-effects model was used. Publication bias was assessed using funnel plots.

Results of the review
Twenty-five RCTs were included in the review (4,694 participants, range 40 to 583). Trial quality was variable: five trials scored 8, eight scored 7, five scored 6, four scored 5 and three scored 3 (maximum possible was 8).

Compared with open appendectomy, there was a statistically significantly longer operating time with laparoscopic appendectomy (WMD 10.71 minutes, 95% CI 6.76 to 14.66, $I^2=94.5\%$), fewer postoperative complications (OR 0.74, 95% CI 0.67 to 0.83), less postoperative pain (WMD 0.55, 95% CI 0.30 to 0.80, $I^2=95\%$), faster postoperative rehabilitation (WMD 0.84, 95% CI 0.60 to 1.10, $I^2=96.1\%$), shorter hospital stay (WMD 0.55, 95% CI 0.37 to 0.74, $I^2=97\%$) and fewer return to work (WMD 1.0, 95% CI 0.69 to 1.31, $I^2=97\%$) and return to normal activities (WMD 1.0, 95% CI 0.69 to 1.31, $I^2=97\%$). The included trials were published between 1993 and 2009 and compared laparoscopic with open appendectomy. No further study details were provided.

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95% CI 0.55 to 0.98, I²=43%), reduced duration of analgesia use (WMD -0.53 days, 95% CI -0.91 to -0.15, I²=94.7%), shorter time to commencement of a liquid diet (WMD -0.51 days, 95% CI -75 to -0.28, I²=90.3%), shorter hospital stay (WMD -0.68 days, 95% CI -1.02 to -0.35, I²=95.4%) and a more rapid return to work (WMD -3.09 days, 95% CI -5.22 to -0.97, I²=89.8%) and normal activity (WMD -4.73 days, 95% CI -6.54 to -2.92, I²=95.2%). There was no statistically significant difference in bowel function recovery.

Publication bias was deemed absent or not very serious in all analyses.

Cost information
There was no statistically significant difference in the hospital cost ratio between laparoscopic and open appendectomy (WMD 0.11, 95% CI -0.18 to 0.40, I²=99%).

Authors' conclusions
Although laparoscopic appendectomy had a longer operating time than open appendectomy, it resulted in less postoperative pain, faster postoperative rehabilitation, a shorter hospital stay and fewer postoperative complications.

CRD commentary
Inclusion criteria for the review were broadly defined. Three relevant data sources were searched. There was potential for language bias (only articles in English were included). Publication bias was assessed and deemed absent or not serious in all analyses; no further investigations were conducted even though some plots displayed a trend towards asymmetry. Attempts were made to reduce reviewer error and bias during quality assessment and data extraction; whether the same methods were used for study selection was unclear. Quality assessment was undertaken using a standard checklist.

The authors judged that 88% of the included trials were of good methodological quality. However, some trials included 100 patients or less, most trials did not adequately describe double-blinding and many did not adequately describe allocation concealment. Participant characteristics from the individual trials were not discussed, which made it difficult to judge study comparability. Trials had to report four outcomes of interest to be included and so substantial data for some outcomes may have been missed. Trials were combined using predominantly random-effects meta-analysis, but many analyses had very high levels of statistical heterogeneity (I²>90%) and this was not explored. The high level of statistical heterogeneity (even with random-effects meta-analysis) called the appropriateness of pooling into question. Another potential issue was adding the numbers for all complications to calculate an overall complication rate, which could result in double counting of patients who experienced more than one complication.

Given these concerns, caution is warranted when interpreting the authors' conclusions and recommendations.

Implications of the review for practice and research
Practice: The authors stated that laparoscopic appendectomy was worth recommending as an effective safe procedure for acute appendicitis.

Research: The authors stated that there a need for large-sample high-quality randomised trials.

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Bibliographic details

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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.