Recurrence rates of video-assisted thoracoscopic versus open surgery in the prevention of recurrent pneumothoraces: a systematic review of randomised and non-randomised trials

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CRD summary
This review compared the efficacy of video-assisted and open surgery for the prevention of recurrent pneumothorax. The authors concluded that the video-assisted approach was associated with a four-fold higher rate of recurrent pneumothorax. This review was well-conducted and the conclusions appear reliable.

Authors' objectives
To compare the efficacy of video-assisted and open surgery for the prevention of recurrent pneumothorax.

Searching
MEDLINE (1950 to October 2006), EMBASE (1974 to October 2006), and the Cochrane Library (Issue 4, 2006) were searched; the search terms were reported. No language restrictions were applied. To identify additional studies, trial registers on the Internet and abstracts from major cardiothoracic surgery scientific meetings were searched (2004 to 2006) and reference lists of all relevant studies were screened.

Study selection
Study designs of evaluations included in the review
Randomised and non-randomised studies were eligible for inclusion.

Specific interventions included in the review
Studies that compared video-assisted thoracoscopic surgery with open surgery were eligible for inclusion. Where reported, the surgical procedure consisted of (limited) pleurectomy and/or pleural abrasion in all but one of the included studies; this study compared the video-assisted approach with bilobectomy.

Participants included in the review
Studies of patients undergoing surgery for pneumothorax were eligible for inclusion. When reported, the patients' mean age ranged from 20 to 45 years and the proportion of males from 58 to 97%.

Outcomes assessed in the review
Studies that provided data on recurrence rates were eligible for inclusion. Where reported, follow-up ranged from 24 days to 4,961 days. The outcomes assessed by the review were recurrence rates, post-operative pain and duration of hospital stay.

How were decisions on the relevance of primary studies made?
At least two independent reviewers selected the studies, with any disagreements resolved by consensus. If the same population was evaluated in more than one article, the report with the most complete follow-up was selected.

Assessment of study quality
Study quality was assessed using the Downs and Black quality scale, which assigns one point for each of 27 criteria. The authors did not state how many reviewers performed the validity assessment.

Data extraction
The authors did not state how many reviewers performed the data extraction. For studies in which there was more than one open surgery group, the data were extracted as a single comparison group by pooling data from each of the groups. Results data were extracted as whole numbers rather than percentages. Relative risks (RRs) of recurrence in patients undergoing thorascopic surgery compared with those having open surgery were calculated.

Methods of synthesis
How were the studies combined?
RRs and 95% confidence intervals (CIs) were calculated using the Mantel-Haenszel fixed-effect model. Sensitivity analyses using a random-effects model and the Peto fixed-effect method were also conducted. The primary comparison was between two or more different forms of surgical access using the same pleurodesis procedure.

How were differences between studies investigated?
The chi-squared test and I-squared statistic were used to assess statistical heterogeneity. An I-squared value of 25% or less was regarded as low heterogeneity. Sensitivity analyses were performed by including only good-quality studies scoring at least 15 points, and by a hypothetical model biased against open surgery in which a single recurrence was assigned to the open surgery group where no events had been reported.

Results of the review
Twenty-nine studies (3,609 patients), of which four were randomised and 25 non-randomised, were included in the review.

The mean score on the Downs and Black quality scale was 14. Most studies were judged to be of a poor quality because of no adjustment for confounders (25 out of 29 studies), unblinded assessment of the outcomes (none of 29), failure to do appropriate statistical analysis (25 out of 29), and insufficient power (all 29).

Four randomised controlled trials and 13 non-randomised trials assessed pleurodesis. Video-assisted surgery carried a significantly higher risk of recurrence compared with open surgery (RR 4.73, 95% CI: 2.70, 8.29, p<0.0001); there was no evidence of statistical heterogeneity (p=0.88; I-squared 0%). This effect was consistent in non-randomised and randomised studies. Sensitivity analyses reported similar results.

The authors stated that the results for hospital stay were not reported since significant statistical heterogeneity was found (p<0.0001; I-squared 92.2%).

There were insufficient data to assess post-operative pain.

Authors' conclusions
There was roughly a four-fold higher risk of pneumothorax recurrence with a video-assisted thoracoscopic approach compared with open surgery.

CRD commentary
This review had clearly stated inclusion criteria with respect to the study participants, interventions, study outcomes and study design. The authors searched two relevant databases and one trial register and efforts were made to identify additional studies. No language restrictions were applied, thus limiting the potential for language bias. Publication bias was not assessed in the report. The authors attempted to minimise error and bias by carrying out the study selection process in duplicate; it is not clear whether the data extraction and quality assessment were also conducted independently by two reviewers. Statistical heterogeneity was assessed and the authors stated that there was no significant heterogeneity for the main outcomes, which supports their decision to pool the studies in a meta-analysis. The review was generally well-conducted and the authors' conclusions are likely to be reliable.

Implications of the review for practice and research
Practice: The authors did not state any implications for practice.
Research: The authors stated that an adequately powered randomised trial with long follow-up is needed.

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