CRD summary
This review assessed regional analgesic techniques for the management of post-thoracotomy pain. The authors concluded that thoracic paravertebral block was an effective alternative to thoracic epidural local anaesthetic alone and was associated with reduced complications. In light of uncertainty over parts of the review process and the strength of evidence the findings should be treated with caution.

Authors' objectives
To assess regional analgesic techniques for the management of post-thoracotomy pain.

Searching
MEDLINE and EMBASE were searched for English-language studies to May 2004; search terms were reported.

Study selection
Randomised controlled trials (RCTs) of regional analgesic or anaesthetic interventions in adult thoracotomy were eligible for inclusion. Included studies compared the following interventions with each other or with systemic analgesia: thoracic epidural local anaesthetic plus opioid; thoracic epidural local anaesthetic or opioid alone; intrathecal opioid; thoracic paravertebral block using local anaesthetic with or without opioid; intercostal nerve block with local anaesthetic; interpleural local anaesthetic and/or opioid. The age of study participants was not reported. The primary outcome was postoperative pain scores. Secondary outcomes were supplementary analgesic requirements and a number of adverse effects, including nausea, vomiting and pulmonary complications.

The authors stated neither how the papers were selected for review nor how many reviewers performed the selection.

Assessment of study quality
Methodological quality was assessed by grading of allocation concealment: A adequate; B unclear; C inadequate; and D not used. Quality was also assessed using the Jadad scale 5-point scale evaluating randomisation, blinding and withdrawals; a score of 5 was classed as high quality.

The authors did not state how the validity assessment was performed.

Data extraction
Means and standard deviations of pain scores were extracted to calculate weighted mean differences; pain scores on a verbal rating scale or numerical rating scale were converted to visual analogue scale. Numbers of patients and events were extracted to calculate odds ratios (OR) for adverse events.

The authors stated neither how the data were extracted nor how many reviewers performed the data extraction.

Methods of synthesis
Studies that reported similar outcomes were pooled by meta-analysis. The pooled weighted mean difference (WMD) and corresponding 95% confidence intervals (CI) were calculated. The reviewers used $X^2$ and $I^2$ statistics to calculate heterogeneity ($p \leq 0.10$ was considered significant) in the meta-analysis. Where heterogeneity was detected among the included studies, a random-effects model was used. When heterogeneity was absent a fixed-effects model was used. Studies were excluded from the meta-analyses if they did not report mean, standard deviation or standard error of the mean or the proportion of patients. Qualitative and quantitative analyses were stratified according to mode of delivery and type of analgesic in each comparison group, with the effectiveness of each technique assessed through the number
of studies that reported a significant difference between groups.

**Results of the review**

Seventy four studies were included (number of participants not reported), most of which had a quality score of at least 3; nine studies described appropriate allocation concealment.

Thoracic epidural analgesia using local anaesthetic plus opioid, local anaesthetic alone or lipophilic opioid alone was associated with significant reductions in pain scores compared with systemic opioid analgesia (12 of 14 studies). Comparison of thoracic epidural combining local anaesthetic plus opioid with systemic opioid analgesia showed a significant reduction in pain scores for three days (WMD -14.50, 95% CI -21.74 to -7.26; five studies) and an increase in the incidence of hypotension (OR 3.80, 95% CI 1.57 to 9.23; four studies). Paravertebral block was superior to control in reducing pain scores on day one (WMD -8.68, 95% CI -14.79 to -2.57; four studies) and significantly reduced the incidence of pulmonary complications (OR 0.17, 95% CI 0.09 to 0.33; seven studies). A number of additional comparisons were reported with mixed results or non-significant findings.

**Authors’ conclusions**

Thoracic paravertebral block was an effective alternative to thoracic epidural local anaesthetic alone and was associated with reduced incidence of postoperative pulmonary complications compared with systemic analgesia.

**CRD commentary**

The review question and inclusion criteria were stated clearly. The literature search was restricted to publications in English and it was unclear whether unpublished studies were sought, so language and/or publication bias could have been present and some studies may have been missed. Limited details of the included studies were reported in the review, although online details were available as supplementary material. It was unclear how all stages of the review process were undertaken, therefore, it was not possible to assess whether appropriate steps were taken to reduce reviewer error and bias. Appropriate criteria were used to assess the quality of the included studies, but most achieved only a Jadad score of 3 and as the results of the assessment were not reported for each study it was unclear on which criteria most studies failed. For some of the quantitative comparisons the number of studies and participants were small and there were wide confidence intervals for the estimates of effect. In light of these uncertainties the authors’ conclusions may be overstated and should be treated with caution.

**Implications of the review for practice and research**

**Practice**: The authors stated that the efficacy of thoracic epidural combining local anaesthetic plus opioid, as well as thoracic epidural alone and thoracic epidural lipophilic opioid alone for thoracotomy were supported by the review. Thoracic paravertebral block with local anaesthetic, as a bolus and continuous infusion for two to three days was recommended. Where thoracic epidural or paravertebral techniques were not possible, or contraindicated, then intercostal nerve block or preoperative intrathecal opioid was recommended.

**Research**: The authors stated that further studies are required to assess whether thoracic paravertebral block is equivalent to thoracic epidural combining local anaesthetic plus opioid with respect to pain relief and morbidity.

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