Efficacy of postoperative epidural analgesia in adolescent scoliosis surgery: a meta-analysis

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CRD summary
This review concluded that postoperative epidural anaesthesia significantly improved pain control compared to intravenous opioids alone in the first three days after adolescent scoliosis surgery and had a beneficial effect for patient satisfaction and side effects (such as nausea, pruritus, rescue analgesics). In view of the limited evidence provided, the reliability of the authors' conclusions is unclear.

Authors' objectives
To evaluate the efficacy of postoperative epidural anaesthesia in adolescent scoliosis surgery.

Searching
MEDLINE and The Cochrane Library were searched from 1966 to October 2008 for publications in any language. Bibliographies of professional journals and proceedings of meetings were handsearched and nationally recognised experts in the field of paediatric pain management were asked for further sources of data. Limited search terms were reported and the authors also used a search strategy recommended by Robinson et al. 2002 for identifying randomised trials.

Study selection
Randomised controlled trials (RCTs) that compared use of a continuous infusion of epidural local anaesthetics plus intravenous opioids versus intravenous opioids alone for postoperative pain management in adolescent scoliosis repair were eligible for inclusion. Eligible studies had to include the primary outcome of postoperative pain score measured with a visual analogue scale. Secondary outcomes were: nausea; pruritus; rescue analgesics or total opioid usage; return of bowel function; and patient satisfaction. The intervention in two included studies was 0.3% ropivacaine; both studies used two epidural catheters. Interventions in the other two included studies were bupivacaine (0.065% or 0.1%) and bupivacaine (0.125%) plus fentanyl 2.5mcg/mL; both studies used one epidural catheter. All of the included studies allowed intravenous opioids in addition to epidural anaesthesia. The included controls all used intravenous morphine. Ages of patients in the included studies ranged from 11 to 23 years.

Two independent reviewers performed the selection; there were no disagreements.

Assessment of study quality
Methodological quality was independently assessed by two reviewers with a modified Jadad scale of randomisation, randomisation method and study withdrawal. The maximum score was 3.

Data extraction
Two reviewers independently extracted visual analogue scale scores (zero to 100) at 24, 48 and 72 hours after the operation; means and standard deviations were used to adjust a score of zero to 10. Authors were contacted for relevant data if it was provided in a graphical form; if not, data were extracted from the graphs. There were no disagreements.

Methods of synthesis
Results for continuous outcomes were pooled using weighted mean differences (WMDs) with 95% confidence intervals (CI). The intention was to pool other results to calculate relative risks, but this was not done due to incomplete data, data measured at different time points or (for return of bowel function) disparity in the relevant outcomes reported. Random-effects models were used due to expected methodological and population heterogeneity. Between-study heterogeneity was determined using the X² test and I² statistic (heterogeneity was assumed to be present if p<0.10 or I²≥50%). Publication bias was assessed visually with funnel plots. A sensitivity analysis was carried out in order to assess the effect of study quality by removal of two studies from the analysis which were believed to potentially suffer from attrition bias. Subgroup analyses were performed for one-catheter and two-catheter techniques.
Results of the review

Four relevant RCTs were identified (n=129, range 30 to 36); all had a modified Jadad score of 3. Withdrawals ranged from 0% to 14%.

Postoperative pain scores were significantly lower in the epidural group than in the intravenous morphine group after 24 hours (WMD -12.59, 95% CI -24.40 to -0.78, I²=0%; four studies), after 48 hours (WMD -10.13, 95% CI -19.11 to -1.16, I²=0%; four studies) and after 72 hours (WMD -11.53, 95% CI -20.85 to -2.21, I²=0%; three studies). Subgroup analysis for the two RCTs that used one epidural catheter after 24 hours found no significant benefit for epidural analgesia, but they also used lower anaesthetic doses. Subgroup analysis for the two RCTs that used two epidural catheters after 24 hours and higher anaesthetic doses (both studies originated from the same centre and author) found a significant benefit for epidural anaesthesia (WMD -15.02, 95% CI -28.34 to -1.70, I²=0%).

Nausea rates (three studies) were significantly lower in epidural groups (0% versus 38%) than intravenous morphine groups (0% versus 20%) in two studies after 24 hours; there was no significant difference between groups in a third study.

Pruritus rates (three studies) were significantly lower in the epidural groups (0% versus 38%) than the intravenous morphine groups (7% versus 33%) in two studies after 24 hours; there was no significant difference between groups in a third study.

Rescue analgesic use (four studies) was significantly lower in epidural groups than intravenous morphine groups in two studies (WMD -7.5mg morphine per patient, 95% CI -11.26 to -3.69); there was no significant difference between groups in the two other studies.

For return of bowel function (four studies), two studies found no significant differences between groups for resumption of liquid intake (one RCT), time to liquid or solid intake, return of bowel sounds and nasogastric tube removal (one RCT). Two studies found the epidural group had more rapid return to bowel sounds, first flatus, first tolerated meal and first bowel movement.

Two studies assessed patient satisfaction using a zero to 10 scale and found a higher satisfaction rate in the epidural group than the intravenous morphine group (WMD 1.62, 95% CI 1.26 to 1.97).

Authors' conclusions

Epidural anaesthesia was beneficial to patients in terms of improved pain control and reduced side effects. The influence on respiratory depression, length of stay in the intensive care unit and mortality was not determined.

CRD commentary

The review addressed a well-defined question in terms of participants, interventions, study design and relevant outcomes. Relevant databases were searched in any language and unpublished studies were considered. Publication bias was assessed with funnel plots. Study quality was assessed with suitable criteria. Efforts were made to reduce error and bias throughout the review process, but there were inconsistencies in the reported results. The pooled results in the text were not the same as in the figures for both postoperative pain scores after 24 hours and patient satisfaction (this abstract used the results reported in the figures). Relevant study details were reported. Statistical heterogeneity was assessed. The statistical method used for the meta-analysis of the RCTs seemed appropriate. A sensitivity analysis was carried out, but the results were not reported.

In view of the limited evidence provided, the reliability of the authors' conclusions is unclear.

Implications of the review for practice and research

Practice: The authors recommended use of dual catheters and higher concentrations of local anaesthetics for epidural analgesia in adolescent scoliosis surgery.

Research: The authors stated that the future studies should address morphine consumption in mg/kg/day and side effects related to patient drop-out (such as hypotensive episodes and paraesthesias). Patients with cerebral palsy or...
myopathies were vulnerable to respiratory depression, for which relevant outcomes would be oxygen desaturation, length of stay or re-transfer to the intensive care unit, rapid response team activations or naloxone rescue. Future studies should assess the effect of local anaesthetic concentration and whether there was a benefit from use of two catheters in epidural anaesthesia.

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