Patient-controlled epidural analgesia versus continuous infusion for labour analgesia: a meta-analysis

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Authors' objectives
To compare the efficacy and safety of patient-controlled epidural analgesia (PCEA) with continuous epidural infusion (CEI) for labour analgesia.

Searching
MEDLINE and EMBASE (both from January 1980 to September 2001), the Science Citation Index (from 1993 to 2002) and the Cochrane Library (Issue 3, 2000) were searched. The search terms included 'patient-controlled', 'labour analgesia', 'anaesthesia' (excluding anaesthesia for Caesarean section) and 'pregnancy'. Alternative spellings were also applied and no language restrictions were imposed. The reference lists of retrieved reports and reviews were also examined.

Study selection
Study designs of evaluations included in the review
Published randomised controlled trials (RCTs) were eligible for inclusion in the review. Abstracts of scientific meetings, unpublished observations and correspondence were excluded.

Specific interventions included in the review
Comparisons of PCEA without continuous background infusion with CEI were eligible for inclusion if they used the same local anaesthetic and additives in both intervention groups. Most of the patients received bupivacaine (0.1 to 0.25%) as either a bolus (2 to 10 mL) for PCEA or as CEI (8 to 14 mL/hour); the rest received ropivacaine (0.1% to 0.2%) as either a bolus (5 mL) for PCEA or as CEI (8 mL/hour). For some patients the infusion also contained fentanyl (2 to 2.5 microg/mL) or sufentanil (0.5 microg/mL) with or without epinephrine (1:400,000).

Participants included in the review
Studies of healthy parturients were eligible. The included studies were of nulliparous and mixed parity women.

Outcomes assessed in the review
The primary outcome in the review was the number of patients who received anaesthetic interventions during the maintenance of labour analgesia. The secondary outcomes included the dose of local anaesthetic, incidence of motor block, the quality of analgesia and maternal satisfaction. Additional outcomes included the duration of labour, rate of Caesarean section, rate of instrumental deliveries, the incidence of low Apgar scores at 1 and 5 minutes, hypotension, high block, nausea, pruritus and shivering.

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

Assessment of study quality
Validity was assessed using the 5-point scale of Jadad et al. (see Other Publications of Related Interest), which evaluates adequacy of randomisation, degree of blinding and the treatment of withdrawals and drop-outs. The three authors independently assessed and scored study validity. The final validity score was reached by consensus.

Data extraction
Two authors independently extracted the data and any discrepancies were resolved by reinspection of the original
The data were entered into a statistical program and checked by a second reviewer. The tabulated information included the year of publication, the number of patients in each treatment group, parity of the population, outcomes assessed and significant results.

**Methods of synthesis**

How were the studies combined?
Where feasible, the data were combined in meta-analyses using a random-effects model. For dichotomous data, the risk difference (RD) and 95% confidence intervals (CIs) were calculated. For continuous data, the weighted mean difference and 95% CIs were calculated. Where a meta-analysis was not appropriate, the results from the individual studies were reported.

How were differences between studies investigated?
Statistical heterogeneity was tested with the chi-squared statistic, using a statistical threshold of p less than 0.05. A sensitivity analysis was conducted on the primary outcome using the quality score (0 to 2 versus 3 or more).

**Results of the review**

Nine RCTs (641 patients) were included in the review.

The median quality score was 3. Five of the 9 RCTs scored 3 or more.

Unscheduled anaesthetic interventions (6 RCTs): significantly fewer patients required clinician top-ups with PCEA compared with CEI. The RD was 27% (95% CI: 18, 36, p<0.00001). Similar findings were obtained when only studies with a quality score of 3 or more were analysed (RD 35%, 95% CI: 19, 51, p<0.0001). No heterogeneity was detected (p=0.36).

Amount of local anaesthetic (8 RCTs): different regimens were used and significant heterogeneity was detected (p<0.0001). All studies found that higher local anaesthetic doses were used with CEI than with PCEA.

Motor block (4 RCTs): significantly fewer patients had 'no motor weakness' with PCEA than with CEI; the RD was 18% (95% CI: 6, 31, p=0.003).

Analgesia: there was no difference in the visual analogue scores between the treatments in the 7 RCTs that used them.

There was no significant difference between PCEA and CEI for: patient satisfaction (5 RCTs); total duration of first and second stage of labour (3 RCTs); incidence of Caesarean section or instrumental delivery (9 RCTs); incidence of low Apgar scores at 1 and 5 minutes after birth (6 RCTs); hypotension (6 RCTs); high block (3 RCTs); pruritus (2 RCTs); shivering (1 RCT) or nausea (1 RCT). The results for all of these outcomes were reported in the review.

**Authors’ conclusions**

Both PCEA and CEI appear to be safe for the mother and the neonate. Patients who receive PCEA are less likely to require anaesthetic intervention, require lower doses of local anaesthetic and have less motor block than those who receive CEI.

**CRD commentary**

The aims of the review were stated and the inclusion criteria were defined in terms of the participants, study design, intervention and outcomes. Several relevant sources were searched and no language restrictions were applied. However, excluding unpublished material may have led to publication bias. The methods used to select the studies were not described. The authors reported that they were unable to obtain two publications, but the reasons for this were not stated. Only RCTs were eligible. Validity was formally assessed using validated criteria, and the methods used to assess validity were described. Relevant data were extracted and tabulated, and the methods used to extract the data were described. Statistical heterogeneity was tested and a meta-analysis was conducted when appropriate. The influence of study quality on the results was also explored. The evidence presented appears to support the authors’ conclusions.
Implications of the review for practice and research

Practice: The authors state that PCEA for labour pain has several advantages when compared with CEI. These include a reduction in the number of unscheduled clinician top-ups, a reduction in the amount of drug used, and a reduction in the amount of motor block of the lower extremities. Both methods are safe for the mother and newborn.

Research: The authors state that more information is needed to determine which method of analgesia maintenance leads to a reduced need for obstetric intervention and improves patient satisfaction. They also state that there is a need for a large study with standardised obstetric management to detect differences between interventions for some outcomes.

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