Continuous peripheral nerve block compared with single-injection peripheral nerve block: a systematic review and meta-analysis of randomized controlled trials

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CRD summary
The review concluded that compared with single-injection, continuous peripheral nerve block was associated with improved pain control and satisfaction, reduced opioid use, and less nausea in patients undergoing surgery. The authors’ conclusions were based on the evidence and seem reasonable, although the high levels of variation and quality issues should be considered when interpreting the evidence.

Authors’ objectives
To compare continuous peripheral nerve block with single-injection peripheral nerve block in patients undergoing surgery.

Searching
PubMed and SCOPUS were searched for articles in any language. Search terms were reported. Google Scholar and the reference lists of eligible studies were also searched.

Study selection
Randomised controlled trials (RCTs) of continuous peripheral nerve block versus single-injection peripheral nerve block were eligible for inclusion. Trials were excluded if they compared perineural techniques with different analgesic modalities, or compared different blocks, or were performed to evaluate different dosing regimens. Articles in languages that could not be translated (Lithuanian) were also excluded.

The included trials studied continuous peripheral nerve block versus single-injection peripheral nerve block in adult patients undergoing various types of surgery including surgery of the shoulder, knee, ankle and breast. The anaesthetic block was performed using a range of drugs, including ropivacaine, bupivacaine, levobupivacaine, and mepivacaine. Included trials were published from 1996 to 2010.

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

Assessment of study quality
Trial quality was assessed using a modified Jadad tool, which appraised nine quality factors including randomisation, allocation concealment, blinding, and intention-to-treat. Each trial was scored out of a maximum of 13 points, with trials scoring 11 or more deemed as high quality, 6 to 10 deemed as fair quality, and 5 or less deemed as poor quality. Trials that scored below 5 were excluded from the meta-analysis.

Two reviewers independently assessed quality.

Data extraction
Data were extracted on pain scores, opioid use, satisfaction and adverse effects. Binary data were used to calculate relative risks and continuous data were used to calculate mean differences, with 95% confidence intervals. Trial authors were contacted for missing data.

The authors did not state how many reviewers extracted the data.

Methods of synthesis
Mantel-Haenszel fixed-effect meta-analysis was used to calculate pooled relative risks and 95% confidence intervals in the absence of statistical heterogeneity; where there was evidence of statistical heterogeneity, a DerSimonian and Laird random-effects meta-analysis was used. DerSimonian and Laird random-effects meta-analysis was also used to calculate mean differences and 95% confidence intervals. Cochran Q and I² were used to assess statistical heterogeneity. Publication bias was assessed using funnel plots and Egger's test.
Results of the review
Twenty-one RCTs were included in the review (702 patients). Trial sample size ranged from 16 to 155 patients. Eight trials were considered high quality and 13 were deemed fair quality. There was no evidence of publication bias.

Pain: Compared with single-injection peripheral nerve block, continuous peripheral nerve block was associated with statistically significant lower visual analogue worst pain scores on postoperative day zero (mean difference -1.29, 95% CI -2.19 to -0.40; I²=82%; nine RCTs). This significant result was maintained at postoperative day one and two, but it was no longer significant at day three. Visual analogue pain at rest scores showed similar results (full results were presented in the paper).

Satisfaction: Continuous peripheral nerve block was associated with statistically significant greater satisfaction (mean difference 2.04, 95% CI 1.23 to 2.85; I²=86%; 11 RCTs) compared with single-injection peripheral nerve block.

Opioid use: Compared with single-injection peripheral nerve block, continuous peripheral nerve block was associated with statistically significant lower opioid use on postoperative day one (mean difference -29.14, 95% CI -43.25 to -15.02; I²=95%; eight RCTs). This significant result was maintained at post-operative day two, and over the entire study period. However, the results were not significant at day three.

Complications: Continuous peripheral nerve block was associated with statistically significant lower rates of nausea (RR 0.35, 95% CI 0.17 to 0.70; I²=11%; six RCTs) compared with single-injection peripheral nerve block.

Authors’ conclusions
Compared with single-injection peripheral nerve block, continuous peripheral nerve block was associated with improved pain control, decreased need for opioid analgesics, less nausea, and greater patient satisfaction in patients undergoing surgery.

CRD commentary
Inclusion criteria for the review were clearly defined. Two relevant databases were searched. Publication bias was not detected. Attempts were made to reduce reviewer error and bias during quality assessment, but it was not clear if the same attempts were made for study selection and data extraction.

Quality assessment was undertaken using a standard checklist, which indicated that the quality of the evidence base was fair to good. Some of the trials had small sample sizes. Data were combined using meta-analysis and statistical heterogeneity was assessed, which was appropriate. However, there was evidence of high statistical heterogeneity in some analyses, which may indicate that the trials were too dissimilar for pooling.

The authors’ conclusions were based on the evidence and seem reasonable, although the high levels of statistical heterogeneity in some analyses and quality issues with some trials should be considered when interpreting the evidence.

Implications of the review for practice and research
Practice: The authors stated that there was additional evidence in favour of continuous peripheral nerve block when indicated for postoperative pain control. However, it could not be endorsed for universal use as many questions remained unanswered.

Research: The authors stated that further studies were needed in different settings, patient groups and using different surgical techniques. The effects of complications, longer-term outcomes and costs also needed exploring.

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Bibliographic details

PubMedID
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.