Efficacy of continuous wound catheters delivering local anesthetic for postoperative analgesia: a quantitative and qualitative systematic review of randomized controlled trials

Liu S S, Richman J M, Thirlby R C, Wu C L

CRD summary
This review evaluated the efficacy of continuous wound catheters in delivering local anaesthetic in postoperative analgesia. Continuous wound catheters were found to improve analgesia, reduce opioid use and side-effects, increase patient satisfaction and reduce hospital stay. However, these conclusions should be viewed with some degree of caution due to the heterogeneity of the included studies.

Authors' objectives
To evaluate the efficacy of continuous wound catheters in delivering local anaesthetic in postoperative analgesia.

Searching
MEDLINE and the Cochrane Central Register of Controlled Trials were searched from 1 January 1966 to 19 February 2006. Search terms were reported. There were no language restrictions.

Study selection
Randomised controlled trials (RCTs) of adults (older than 18 years) who had undergone surgery in which continuous wound catheters were placed into the operative field by a surgeon were eligible for inclusion. Included trials had to report pain scores or opioid consumption. Trials that used continuous peripheral nerve block and central neuraxial (epidural or spinal) catheter techniques were excluded. Additionally, trials that did not specify that a placebo solution of saline or water was delivered through the wound catheter or non-functional pump, and trials without a no-catheter control group, were excluded. The participants in the included trials had undergone a variety of operations and catheters were placed at a variety of sites.

Trials that reported outcomes only as the mean or median value were eligible for inclusion in the qualitative but not the quantitative review. In the included studies the definition of outcomes was as defined by the primary study. The outcomes pain score (using the visual analogue score) with and without activity, opioid rescue during infusion period, opioid use, post-operative nausea and vomiting (PONV), patients rating satisfaction as excellent and length of hospital stay were reported.

The authors do not state how the papers were selected for review, or how many reviewers performed the selection.

Assessment of study quality
The methodological quality of each study was assessed in terms of randomisation, blinding and drop-outs using the Jadad scale to obtain a quality score out of a maximum of 5.

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

Data extraction
Pain scores were extracted at rest and with activity. For each group the mean visual analogue score for pain for the duration of anaesthetic infusion was calculated. The incidence of need for opioid rescue was extracted and the amount of opioid spared was expressed as equivalents of IV morphine (mg) per day. Frequency of post-operative nausea and vomiting, patient satisfaction, duration of hospital stay, catheter-related complications (wound infections and clinical systemic toxicity from local anaesthetics) and catheter or pump failure were extracted.

Data was extracted independently by two reviewers and disagreements resolved by discussion.
Methods of synthesis
For the quantitative systematic review outcomes were pooled in a Mantel-Haenszel meta-analysis and odds ratios with 95% confidence intervals (CIs) or weighted mean differences with 95% CIs with the inverse variance method were calculated. A random-effects or fixed-effect model was used depending on whether statistical heterogeneity was found. Subgroup analysis was performed in the following groups: cardiothoracic surgery, general surgery, gynaecology-urology surgery and orthopaedic surgery. $\chi^2$ tests and Q statistics were used to assess statistical heterogeneity. Publication bias was assessed using a funnel plot.

For the qualitative systematic review study characteristics and outcomes were tabulated. The results were also reported in the text in the following categories: cardiothoracic surgery, general surgery, gynaecology-urology surgery and orthopaedic surgery.

Results of the review
Quantitative systematic review (44 RCTs, $n=2,141$ participants).

The median Jadad score of the RCTs was 4 out of 5. The funnel plot did not indicate the presence of publication bias.

Results for all surgical groups combined:

Pain scores: The use of continuous wound catheters was associated with a significant decrease in visual analogue scores for pain at rest (weighted mean difference -10mm, 95% CI: -13, -7, $p<0.001$, $n=1,814$ patients) and in visual analogue score for pain with activity (weighted mean difference -22mm, 95% CI: -32, -13, $p<0.001$, $n=794$ patients) compared to control. Substantial statistical heterogeneity was found ($I^2=85.3\%$).

Opioid use: The percentage of patients with need for opioid rescue during the infusion period was significantly reduced in the continuous wound catheter group compared to control (odds ratio 0.15, 95% CI: 0.08, 0.29, $p<0.001$, $n=411$ patients). Opioid use per day was also significantly reduced in the continuous wound catheter group compared to control (weighted mean difference -11mg, 95% CI: -14, -7, $p<0.001$, $n=1,637$ patients) Substantial statistical heterogeneity was found ($I^2=99.1\%$).

Post-operative nausea and vomiting: The percentage of patients that experienced post-operative nausea and vomiting was significantly reduced in the continuous wound catheter group compared to control (odds ratio 0.45, 95% CI: 0.3, 0.68, $p<0.001$, $n=614$ patients).

Satisfaction rating: The percentage of patients rating as excellent was significantly greater in the continuous wound catheter group compared to control (odds ratio 7.7, 95% CI: 1.8, 34, $p=0.007$, $n=209$ patients).

Length of hospital stay: The number of days of hospital stay was significantly reduced in the continuous wound catheter group compared to control (odds ratio -1 (95% CI: -2, -0.3, $p=0.04$, $n=753$ patients).

Further subgroup analyses were reported for the quantitative review.

Qualitative systematic review (51 RCTs, $n=2,407$ participants).

Cardiothoracic group: In the cardiothoracic group 12 of 14 RCTs reported analgesic efficacy for either pain scores or opioid use which was statistically significant ($p<0.05$).

General surgery group: In the general surgery group 10 of 12 RCTs reported statistically significant analgesic efficacy as either reduced opioid use or reduced pain scores ($p<0.05$).

Orthopaedic surgery group: In the orthopaedic surgery group 13 of 16 trials reported a statistically significant reduction in pain or opioid use ($p<0.05$). Twelve of 16 trials reported a statistically significant reduction in pain scores in the immediate post-operative period ($p<0.05$). Eleven RCTs reported a reduction in pain scores two to five days postoperatively.
Post-operative nausea and vomiting: Four of six RCTs reported a reduction in post-operative nausea and vomiting but these were not statistically significant.

Satisfaction rating: Three RCTs reported increased patient satisfaction.

Authors' conclusions
Continuous wound catheters can confer several benefits, including improved analgesia, reduced opioid use and side-effects, increased patient satisfaction and reduced hospital stay.

CRD commentary
The review addressed a focused question and the inclusion criteria were clear with regard to participants, intervention, study design and outcome. Two appropriate databases were searched in all languages, minimising the risk of language bias. The authors did not report attempts to locate unpublished studies which increased the risk of publication bias, although this was not indicated by the funnel plot. The quality of the included trials was assessed using an appropriate scale and statistical heterogeneity was also assessed. The studies were found to be statistically and clinically heterogeneous, so pooling these studies in a meta-analysis may not have been appropriate. However, the results of the qualitative review generally supported the results of the quantitative review, where data was available. The authors’ conclusions should be viewed with some degree of caution due to the heterogeneity of the included studies.

Implications of the review for practice and research
Practice: The authors stated that the efficacy and technical simplicity of the continuous wound catheter should encourage its widespread clinical use.

Research: The authors stated that large homogenous RCTs would be valuable and that additional study is required to identify ways to optimise outcomes. It would also be useful to examine whether continuous wound catheters could accelerate patient discharge or reduce hospital admission in an ambulatory environment.

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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.