Psoas compartment block for lower extremity surgery: a meta-analysis

Touray S T, de Leeuw M A, Zuurmond W W, Perez R S

CRD summary
This review concluded that psoas compartment block was effective following hip and knee surgery and, that combined with sciatic nerve block and sedation, was also effective for minor knee surgery. There was insufficient data for hip and knee surgery. Overall, given the limitations of the review and the poor quality of the data, these conclusions may not be reliable.

Authors' objectives
To evaluate the efficacy and safety of psoas compartment block compared with conventional anaesthetic techniques for hip and knee surgery.

Searching
Studies were identified through a bibliographic search of PubMed, EMBASE and the Cochrane Library up to December 2007. Search terms were reported. References of retrieved articles were searched for additional studies.

Study selection
Randomised controlled trials, case-control studies and case-series comparing psoas compartment block with conventional anaesthetic techniques, in adult patients undergoing hip or knee surgery, were eligible for inclusion. Eligible studies included intraoperative anaesthesia, comparing psoas compartment block with general anaesthesia or neuraxial anaesthesia, and postoperative anaesthesia, comparing psoas compartment block with opiates, femoral nerve block or neuraxial block.

For intraoperative studies, the main outcome was anaesthetic success, defined as the ability to successfully complete surgery using psoas compartment block alone, psoas compartment block plus sciatic nerve block, or psoas compartment block plus sciatic nerve block plus sedation. For postoperative studies, outcomes were pain (quantified using a visual analogue scale) or postoperative analgesic consumption. The degree of sensory block or motor block and plasma levels were also reported.

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

Assessment of study quality
Methodological quality was assessed using the Jadad scale, a 5-point scale evaluating randomisation, blinding and withdrawals. Studies were considered high quality if they scored 3 points or more.

The authors did not state how many reviewers performed the validity assessment.

Data extraction
For dichotomous outcomes, the numbers of events in each group were extracted to derive risk ratios (RR) and 95% confidence intervals (CI). Continuous variables were reported as means and standard deviations.

The authors did not state how many reviewers performed the data extraction.

Methods of synthesis
For qualitative analyses, studies were assigned a level of evidence and were synthesised narratively according to the level of evidence (A1 for systematic reviews to C for non-analytic studies). For quantitative analyses, pooled risk ratios and corresponding 95% confidence intervals were calculated for dichotomous outcomes using a fixed-effect model where statistical heterogeneity was not present. For continuous outcomes, weighted mean differences (WMD) were calculated. Statistical heterogeneity was assessed using $\chi^2$ and $I^2$ tests.
Results of the review
Thirty studies (n=1,426) were included in the review, of which 20 were RCTs, one was a case-control study, three were case-series and six were pharmacokinetic studies. Methodological quality was generally low; one study scored 5, one study scored 4, five studies scored 3, and eight studies each scored 2 and 1. Seven studies were not RCTs and were not appraised for quality.

Psoas compartment block for anaesthesia for hip surgery: One RCT showed that spinal anaesthesia resulted in the sensory block to a mean level of the eighth thoracic dermatome with no block failures, but anaesthesia was judged inadequate in four of the 15 patients.

Psoas compartment block for analgesia after hip surgery: Two RCTs compared psoas compartment block with neuraxial block, with conflicting results. One RCT compared psoas compartment block with femoral nerve block and found that pain scores at rest and morphine consumption were lower during the first four hours post-surgery in the psoas compartment block group; no significant differences were noted during mobilisation. Three RCTs compared single injection psoas compartment block with intravenous opioids for pain after total hip arthroplasty. Psoas compartment block significantly reduced pain scores both up to four hours post-surgery (WMD -1.20, 95% CI: -1.82 to -0.58; two studies) and four to eight hours post surgery (WMD -1.07, 95% CI: -1.72 to -0.41; two studies). However, after eight hours there were no differences between the groups. Three RCTs compared continuous psoas compartment block with opiates and found that pain scores were significantly lower in the psoas compartment block group four to eight hours after surgery (WMD -2.71, 95% CI: -3.25 to -2.17), and remained significantly lower at 20 to 24 hours post surgery (WMD -1.05, 95% CI: -1.38 to -0.72). Significant heterogeneity was observed at four to eight hours.

Psoas compartment block for anaesthesia for knee surgery: One RCT, comparing psoas compartment block with general anaesthesia and spinal anaesthesia in patients undergoing knee arthroscopy, reported no block failures in patients receiving psoas compartment block. Another RCT found that patients randomised to psoas compartment sciatic nerve block with propofol sedation successfully underwent arthroscopy without conversion to general anaesthesia.

Psoas compartment block for analgesia after knee surgery: Two RCTs compared psoas compartment block with epidural analgesia and found pain scores were comparable between groups. Four RCTs compared psoas compartment block with femoral nerve block. Two RCTs found that postoperative pain scores were comparable between groups. One RCT, comparing continuous psoas compartment block with continuous femoral nerve block and continuous sciatic block, found no differences in supplemental piritramide consumption between groups. One RCT found lower pain scores at 10, 15 and 20 minutes after block injection (p<0.05) and lower meperidine consumption post-surgery in the psoas compartment sciatic nerve block group. Three RCTs compared psoas compartment block with intravenous opioids and found lower pain scores and reduction in morphine consumption post-surgery.

Other outcomes (seven studies): Four RCTs compared psoas compartment block with ‘3-in-1’ block. There were no significant differences between psoas compartment block and femoral nerve block or between psoas compartment block and lateral femoral cutaneous nerve block. However, psoas compartment block was significantly more effective than obturator nerve block (RR 4.02, 95% CI: 1.47 to 11.04; three studies) p=0.007). Significant heterogeneity was present. Three studies measured plasma concentrations which remained below toxic threshold in all three studies. Of all 30 included studies, one case of systemic toxicity was described. Epidural diffusion was the main complication and was described in 10 studies with incidence ranging from 3 to 27%.

Authors’ conclusions
Although psoas compartment block combined with sciatic nerve block and sedation was an effective technique for minor knee surgery, there was insufficient data available to recommend the use of this approach for hip and major knee surgery. Psoas compartment block was a safe and effective alternative for analgesic after hip and knee surgery.

CRD commentary
This review addressed a clear question in terms of study design, interventions and outcomes of interest. Relevant databases were searched, but it was unclear whether language restrictions were applied. The potential influence of publication bias was not considered in the report, and there did not appear to have been any efforts to locate unpublished material, so there is the possibility that important data was missed. In terms of both the clinical
heterogeneity and the generalisability of this review to different clinical situations, it would have been useful to see more details of included studies reported, particularly patient characteristics. Methods to minimise bias and errors in making decision about the relevance of primary studies, in performing data extraction, and in undertaking quality assessments were not reported.

The authors reported that they categorised studies into high and low quality based on the strength of evidence, but the narrative syntheses did not appear to be reported in hierarchical order, also the included studies were not ordered by strength of evidence in the tables. It might have been more appropriate to report RCT data before case-series data. The quality of included studies, even those study designs generally considered to be more robust (i.e. RCTs), was often poor. A number of the studies also had small sample sizes. The authors reported that heterogeneity was investigated, but this did not appear to be the case for all outcomes where significant heterogeneity was observed. Where subgroup analyses were performed, the number of studies was small, suggesting that the results may not be reliable. Overall, given the limitations of the review and the poor quality of the data, the authors’ conclusions may not be reliable.

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

**Practice:** The authors made recommendations for all comparisons investigated. These are reported in the text.

**Research:** The authors stated that more research is required to define the role of psoas compartment block in the intraoperative setting and to confirm potentially beneficial effects on variables, such as perioperative haemodynamics and blood loss; to determine if the sciatic nerve block should be continuous or single injection; and to evaluate the efficacy of psoas compartment block combined with sciatic nerve block and sedation for hip and major knee surgery. The authors also stated that further studies are needed on factors contributing to systemic toxicity and epidural extension, and the role of ultrasound in improving the safety profile of psoas compartment block.

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