

4. Salinas FV, Liu SS, Mulroy MF: The effect of single-injection femoral nerve block *versus* continuous femoral nerve block after total knee arthroplasty on hospital length of stay and long-term functional recovery within an established clinical pathway. *Anesth Analg* 2006; 102:1234-9
5. Ilfeld BM, Mariano ER, Girard PJ, Loland VJ, Meyer RS, Donovan JF, Pugh GA, Le LT, Sessler DI, Shuster JJ, Theriaque DW, Ball ST: A multicenter, randomized, triple-masked, placebo-controlled trial of the effect of ambulatory continuous femoral nerve blocks on discharge-readiness following total knee arthroplasty in patients on general orthopaedic wards. *Pain* 2010; 150:477-84

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In Reply:

We thank Drs. Barrington, Olive, and Kluger for their interest in our recent meta-analysis of femoral nerve block for total knee arthroplasty and for the opportunity to respond to their concerns.¹ The concern raised is that the key message in the highlighted box on the first page of the article, "that these studies did not demonstrate further improvement with continuous compared with single-shot femoral nerve block alone," was unsupported by the data.

Of the 23 randomized controlled trials that were included in our meta-analysis, only 2 trials (with a total of 69 patients) directly compared single shot femoral nerve block to continuous femoral nerve block, the trials by Hirst *et al.* and Salinas *et al.*^{2,3} The trial by Salinas *et al.* located the nerve with a nerve stimulator and used 30 ml ropivacaine, 0.375%, with epinephrine for the single shot femoral nerve block, and the continuous femoral nerve block group also received a continuous infusion of ropivacaine, 0.2%, at 10 ml/h. The trial by Hirst *et al.* also located the nerve using a nerve stimulator but used 20 ml bupivacaine, 0.5%, with epinephrine for the single shot block, and the continuous nerve block group received an infusion of bupivacaine, 0.125%, at 6 ml/h. The trial by Salinas *et al.* showed that a continuous femoral nerve block (in comparison with a single shot femoral nerve block alone) resulted in lower pain scores (during the first and second postoperative day and during physical therapy) and opioid consumption was also reduced; by contrast, the study by Hirst *et al.* found that there were no differences in pain scores or opioid consumption. We disagree with Barrington *et al.* that the trial by Hirst *et al.* was not clinically appropriate and the results do apply to current practice. Thus, the direct evidence is equivocal, with conflicting evidence for a continuous femoral nerve block.

In addition to the direct evidence, our Bayesian meta-analysis combined the indirect results from the 7 trials (with 136 patients) that investigated single shot femoral nerve block and the 13 trials (with 352 patients) that investigated continuous femoral nerve block. These results showed that there was no difference in analgesia outcome for these groups in terms of opioid consumption, pain scores, nausea, range of motion, or length of stay.¹ The weakness of this approach,

that these were not randomized comparisons and subject to the same biases as observational studies, was described in the original paper. We defend our inclusion of trials that used either bupivacaine or ropivacaine for their femoral nerve blocks because one local anesthetic has not been proven superior to the other in terms of block effectiveness.⁴ Thus, the evidence from the indirect comparisons does not support the use of continuous femoral nerve blocks.

Overall there is equivocal evidence for a continuous femoral nerve block from the direct evidence and no evidence from the additional indirect comparisons from the Bayesian analysis. Although these indirect comparisons were nonrandomized, the treatment groups were quite similar between studies. Given these results, we feel that the conclusion "that these studies did not demonstrate further improvement with continuous compared with single-shot femoral nerve block alone" was justified.

The fact that some of the evidence described in the studies does not come from randomized comparisons is a fair criticism and clearly stated in the article. This is a weakness of the literature, as opposed to the methods used in the meta-analysis. More authors need to study the head-to-head comparisons for single shot *versus* continuous femoral nerve block for total knee arthroplasty, and this was in fact the final conclusion of our study, as stated in the last sentence. Although the idea of a continuous femoral nerve block makes intuitive sense because it prolongs the duration of the nerve block while patients are still having significant pain, its advantages have not been proven in the literature to date. This message is important for investigators because most of the trials published (11 of the 13 trials of continuous femoral nerve block) ignore the comparison with a single shot nerve block group as if it can be taken for granted that continuous femoral nerve block is the superior approach.

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References

1. Paul JE, Arya A, Hurlburt L, Cheng J, Thabane L, Tidy A, Murthy Y: Femoral nerve block improves analgesia outcomes after total knee arthroplasty: A meta-analysis of randomized controlled trials. *ANESTHESIOLOGY* 2010; 113:1144-62
2. Hirst GC, Lang SA, Dust WN, Cassidy JD, Yip RW: Femoral nerve block: Single injection *versus* continuous infusion for total knee arthroplasty. *Reg Anesth* 1996; 21:292-7
3. Salinas FV, Liu SS, Mulroy MF: The effect of single-injection femoral nerve block *versus* continuous femoral nerve block after total knee arthroplasty on hospital length of stay and long-term functional recovery within an established clinical pathway. *Anesth Analg* 2006; 102:1234-9
4. Wulf H, Löwe J, Gnutzmann KH, Steinfeldt T: Femoral nerve block with ropivacaine or bupivacaine in day case anterior crucial ligament reconstruction. *Acta Anaesthesiol Scand* 2010; 54:414-20

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