Is Continuous Sciatic Nerve Block Routinely Needed in Addition to a Continuous Femoral Nerve Block Following Total Knee Arthroplasty?

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There is increasing recognition that continuous peripheral nerve blockade (CPNB) markedly reduces postoperative pain while also reducing opiate consumption and side effects, promotes early rehabilitation and hastens hospital discharge.[1-3] Blockade of the femoral nerve or lumbar plexus alone without sciatic blockade, however, will only provide partial analgesia after total knee arthroplasty (TKA). Review of the innervation of the knee reveals why sciatic blockade is necessary: The posterior femoral cutaneous nerve provides cutaneous innervation of the popliteal area. Ostial innervation of the posterior distal femur and proximal tibia derive from the sciatic nerve.

In fact the clinical data are not greatly at odds with the anatomy. The sole study to conclude that sciatic block is not needed compared three groups of only 12 patients per group and was powered only to detect very large differences in analgesic consumption between groups.[4] Moreover, in that study, patients received only single-injection femoral and sciatic blocks. Watson et al.[5] have shown the superiority of continuous infusion over single injection neural blockade for TKA. In our experience, it is not uncommon, despite preoperative injection of local anesthetic (LA) at the time of perineural catheter placement, to need an additional bolus of LA and establishment of LA infusion in the postanesthesia care unit to achieve optimal performance of the nerve block.

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Resting postoperative pain may be severe in up to 60 percent of patients and moderate in up to 30 percent of patients after conventional total knee arthroplasty (TKA), which may potentially hinder early attempts at aggressive postoperative rehabilitation. Moreover, dynamic pain is not well controlled with traditional systemic opioid-based analgesia and may be severe in up to 60 percent to 75 percent of patients for up to 48 hours after TKA.[1] Single-injection femoral nerve blocks (SFNB) have been demonstrated to significantly decrease postoperative pain and systemic opioid requirements but have only a limited duration of action.[2]

Prospective, randomized trials have demonstrated that continuous femoral nerve blocks (CFNB) further extend the analgesic benefits and opioid-sparing compared to SFNB.[3]

Despite the improvement in analgesia provided by either SFNB or CFNB, patients may still have significant pain following TKA. In the vast majority of cases, the pain is often localized to the "back of the knee." Although one study indicated that the addition of a single-injection sciatic nerve block (SSNB) did not provide additional analgesic benefits when performed in conjunction with an SFNB[2], subsequent case series and nonrandomized studies have demonstrated that blockade of the sciatic nerve after TKA provides clinically significant analgesic benefits compared to SFNB alone.[4,5] The percentage of patients with a functioning femoral nerve block that complain of clinically significant knee pain after TKA has been demonstrated to be as high as 60 percent to 80 percent.[4,6] My own clinical experience over the past five years confirms the finding. Although it is clear that extending the femoral nerve block for

Cook et al.[6] also used single-shot injections of femoral or femoral-sciatic nerves on 97 patients, a design similar to that of Allen et al.[4] In contrast to that study, Cook et al. found significantly higher pain and opiate consumption when femoral block alone was used. In the work of Pham Dang et al.[7], TKA patients received either continuous femoral block or continuous blocks of both femoral and sciatic nerves. The addition of a continuous sciatic block yielded significantly lower pain scores over the first 36 hours after surgery despite an 81-percent reduction in morphine consumption.

Weber et al.[8] placed continuous femoral blocks prior to TKA in 36 patients. Patients who failed to reach pain scores after two boluses of 20 ml of 0.2 percent ropivacaine via the femoral catheter and had posterior pain were given a single-shot sciatic block. Of the 36 patients, 24 (67 percent) required the sciatic block. Those patients' pain scores then dropped from an average of 7.3 to 0.2. Twelve hours later, pain scores remained significantly lower for this group (0.5 versus 1.9), but this relationship reversed at 24 hours once the sciatic block had dissipated. In a similar fashion, we found that more than 80 percent of TKA patients required postoperative activation of a preoperatively placed sciatic perineural catheter.[9] In those patients, the sciatic block lowered pain scores from 7.5 to 2.0, consistent with the findings of Weber et al. Although our reported data set was small, continued monitoring has shown that consistently more than 80 percent of patients require use of the continuous sciatic block. Therefore, since most patients will need the sciatic block and because postoperative placement of blocks is problematic, we continue to place preoperative perineural sciatic catheters in all TKA patients.

"It is time, though, that we stop looking for excuses why not to use continuous sciatic blockade in concert with continuous femoral blockade for TKA."

More recently Morin et al.[10] compared postoperative analgesia in three groups of patients undergoing TKA. Patients received either a continuous femoral block, continuous femoral and sciatic blocks, or a continuous lumbar plexus block. PCA pitrimide consumption over the first 48 hours was respectively 49 mg, 18 mg and 44 mg. Opioid consumption in the femoral-sciatic group was significantly less than either of the other two groups, which were not different from one another. These results

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48 to 72 hours after TKA with a CFNB[3,7,8] provides clinically relevant analgesic benefits, data from the literature do not support the routine use of continuous sciatic nerve block (CSNB) at the present time.

In the first study to prospectively evaluate the value of adding CSNB to CFNB after TKA, Pham Dang et al. evaluated VAS scores and morphine consumption for 48 hours in patients randomized to SSNB (with ropivacaine 0.2 percent) versus CSNB.[9] Their data demonstrated a statistically significant reduction in resting pain scores and morphine consumption in the CSNB for the first 24 to 36 hours. There were, however, no differences in dynamic pain scores or range of motion between the two groups, and patients in the CSNB were found to have complete sensory-motor block at 13 ± six hours. Finally, it took three times as long (30 versus 10 minutes) to place both CFNB and CSNB compared to CFNB and SSNB.

In a more recent study by Morin et al., patients undergoing TKA were prospectively randomized to CFNB with CSNB versus either CFNB or continuous psoas compartment blocks (CPCB) alone.[10] The primary outcome of this trial was 48-hour opioid consumption among the three groups. The patients randomized to the CSNB + CFNB demonstrated a significant decrease (60 percent) in 48-hour opioid consumption compared to the CFNB or

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CPCB groups. Upon closer inspection of the data, the vast majority of the difference in opioid consumption occurred during the first 24 hours, and there was no significant difference in opioid consumption between 24 to 48 hours. There was no difference in either resting or dynamic pain scores or achievement of rehabilitation goals between the three groups, although patients with a combined CSNB + CFNB had more difficulty with active

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indicate a significant contribution to pain following TKA from the sciatic nerve and a relatively minor contribution from the obturator, findings mirrored by Kolouf et al.[11]

One of the arguments raised against the use of sciatic blockade in TKA is the potential for obscuring sciatic nerve injury either from the tourniquet[12] or from the surgery itself.[13] The clinical incidence of peroneal palsy following TKA ranges from 0.3 percent to 1.3 percent.[13] Early diagnosis is desirable as it is recommended to remove any constrictive dressing and to place the knee in flexion in order to relieve tension on the nerve.[14] Use of a single-shot sciatic block preoperatively would make early postoperative diagnosis impossible. Our approach to continuous sciatic blockade in TKA is mindful of this concern. We place the sciatic perineural catheter preoperatively, injecting only saline. No LA is administered except to anesthetize the overlying skin. The sciatic infusion is begun postoperatively only after the patient demonstrates full plantar flexion and dorsiflexion. Infusion of 0.05 percent ropivacaine at 5 mL/h has proven to be an effective analgesic dose with only rare instances of motor blockade, something that was distressingly common with a 0.2 percent ropivacaine infusion. Should nursing staff observe foot weakness, standard operating procedure dictates stopping the LA infusion and notifying the physician. The LA infusion is not restarted until complete resolution of any foot weakness. Thus the advantages of continuous as opposed to single-shot sciatic block are twofold: A continuous block overcomes the inadequate duration of a single injection,[7] and the continuous block provides a means to address the need for prompt diagnosis of peroneal injury.

Unfortunately the data as to analgesia point clearly to the conclusion that sciatic nerve blockade is an important, even necessary, element of neural blockade for TKA. Indeed it would have been convenient for it not to be so. The need for an additional block places further demands on our time and resources. Even worse it appears preferable to place a sciatic perineural catheter rather than perform the simpler single-injection block. It is time, though, that we stop looking for excuses why not to use continuous sciatic blockade in concert with continuous femoral blockade for TKA. It is time we accept the obvious and focus instead on how we can do this safely, efficiently and organizationally.

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exercise and ambulation because of more pronounced motor weakness of the operative extremity. Catheter placement took three to four times longer in the CSNB + CFNB group compared to the CFNB or CPCB alone groups, similar to the results of Pham Dang's study.

Taken together, these two studies demonstrate that a CSNB may provide improved analgesia compared to an SSNB, but it appears that the benefit may not extend beyond a 24-hour duration. In contrast, a CSNB in conjunction with a CFNB clearly takes significantly more time (even in experienced hands) to perform compared to a CFNB alone. Although the increased time to successfully place both catheters may be offset by a dedicated preoperative block area and an acute interventional pain service, not many clinicians in private practice can as yet afford these two invaluable aids in conducting a continuous peripheral catheter program. Both of these studies demonstrate that a CSNB also extends the duration of motor block. In addition to adding to the weakness provided by the CFNB, a CSNB increases the time for the potential risk of developing heel ulcers.[11] Thus the benefit provided by a CSNB versus an SSNB must be weighed against the increased time and cost to place (and manage) two continuous catheters as well as the potential complications associated with extending the duration of a sciatic nerve block beyond 16 to 20 hours.

Based on my experience and the available data, I routinely perform a CFNB with an SSNB. If the plan is for a general anesthetic, I inject 20-25 ml of mepivacaine 1.5 percent for rapid onset of operative anesthesia (the "primary anesthetic block") and then begin an infusion of ropivacaine 0.2 percent at 4-6 ml/hr (the "secondary analgesic block") in the operating room. If the plan is for a spinal anesthetic, I simply administer a 20 ml "loading dose" of the analgesic solution of ropivacaine 0.2 percent, followed by the same infusion regimen.

After placement of the continuous femoral catheter, I place the patient in the lateral decubitis position and perform a SSNB via the infragluteal parabiceps approach with 20 ml of ropivacaine 0.25 percent.[12] Since my goal is to provide analgesia with the sciatic nerve block, I use ropivacaine because its lower lipid solubility provides more predictable resolution of its extended duration of action as compared to the more lipid-soluble bupivacaine. The volume of 20 ml at a lower concentration will reliably provide sensory analgesia of 16-20 hours with the goal of predictable resolution of sciatic motor block by the morning of postoperative day one.[13]

In addition to the CFNB and SSNB, I routinely use a multimodal analgesic regime, including gabapentin and COX-2 inhibitors. COX-2 inhibitors have already been

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demonstrated to add benefit to continuous regional analgesic regimens after TKA[14], and I suspect that the data also will show gabapentin to be of benefit. This approach is well accepted by our surgical colleagues because it allows patients to benefit from continuous regional analgesia while at the same time addressing their concerns about operating room efficiency and excessive motor weakness potentially impairing early active ambulation.

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