Quad Weakness: When Does It Matter?

To the Editor:
We read the recent study by Kim et al.\(^1\) with great interest. The question that they sought to answer, namely, whether adductor canal blocks can provide noninferior analgesia to femoral nerve blocks after total knee arthroplasty while at the same time decreasing the quadriceps weakness, is an important one. We commend them in particular on their noninferiority study design regarding pain scores and opioid consumption, as well as their use of dynamometers to objectively measure quadriceps strength. Given our own practice experience, we are not surprised to see confirmation of similar analgesia.

We have some concern with the interpretation and conclusions drawn from the dynamometer data. The dynamometer readings for the adductor canal group had a much wider range (3.5–10.9) than those in the femoral nerve group (0.00–3.9) at the 6- to 8-h postoperative assessment time. Some of this could be explained by variable patient anatomy in the adductor canal. However, it could also be explained by variability in block efficacy.

Furthermore, the concomitant use of epidural local anesthetics during postoperative assessments clouds the picture. It is not clear from the data how much postoperative epidural local anesthetic was used by each group. The similar analgesia levels reported by both groups could be a consequence of the epidural infusion combined with the multimodal agents given. It is also not clear how much intraoperative epidural local anesthetic was given. Standardizing all patients to receive a spinal anesthetic without an epidural would have eliminated this concern.

Outside of the 6- to 8-h postanesthesia assessment, the authors did not find any difference in quadriceps strength. This is of particular interest in the total knee arthroplasty population because, in the case series by Atkinson et al.\(^2\) cited by the authors, the two patients who underwent knee arthroplasty sustained their falls at 20.5 and 21.5 h postoperatively. While the observed reduction in quadriceps weakness at 6–8 h is consistent with results seen in healthy volunteers,\(^3\) the clinical relevance of this finding is uncertain, especially considering the assessment performed by Kim et al.\(^1\) was in the postanesthesia care unit, where patients are not ambulating and are not, therefore, at high risk for falls.

The authors’ results are contrasted by those of Jaeger et al.\(^4\) who compared continuous adductor canal blocks to continuous femoral nerve blocks for total knee arthroplasty and found less quadriceps weakness at 24 h postoperatively in the adductor canal group with equivalent pain scores and opioid consumption. These findings could be explained by the fact that Jaeger et al.\(^4\) performed continuous blockade, while the authors performed single-injection blocks with epidural infusions. Neither study was powered adequately to study the relatively rare complication of falls, but based on the two together it is reasonable to conclude that if continuous peripheral nerve blocks are the preferred technique over epidural infusions at a given institution, quadriceps weakness may be less pronounced with adductor canal blocks at the start of ambulation. If the less conventional approach of Kim et al., in which an epidural infusion is combined with a single-injection peripheral nerve block, is preferred, the data do not yet support the idea that quadriceps strength is any better preserved with adductor canal blocks at the time of ambulation.

Competing Interests
The authors declare no competing interests.

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References

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Is an Adductor Canal Block Simply an Indirect Femoral Nerve Block?

To the Editor:
It is with interest that we read the study by Kim et al.\(^1\) and the accompanying editorial by Mariano and Perlas.\(^2\)

The patients involved in this study received effective multimodal analgesia, which included effective continuous

This letter was sent to the author of the referenced editorial, who chose not to reply.
epidural infusion, yet the title and abstract only mention the single-injection femoral nerve block (FNB) or adductor canal nerve block (ACB). The patient-controlled epidural analgesia contained 10 μg/ml hydromorphone combined with 0.06% bupivacaine set at 4 ml/h continuous infusion with 4 ml of patient-controlled boluses on demand every 10 min on the day of surgery (postoperative day 0 [POD 0]). This was reduced to 2 ml/h the next morning (POD 1), and continuous infusion was stopped at 5:00 PM that day (POD 1); however, the patient-administered boluses were not decreased, therefore the patients could still receive a total patient-controlled epidural analgesia infusion of up to 20 ml/h after the continuous infusion was stopped late on POD 1. Added to oxycodone/acetaminophen (5/325 mg) every 4 h and daily 7.5 to 15 mg meloxicam, this in and of itself represents an effective multimodal regimen. Any additional nerve block, when compared with FNB, would most probably have yielded similar results with this study design. With this level of multimodal analgesia, we agree with Mariano and Perlas that “…[the block] does not have to [provide enough analgesia for total knee arthroplasty].”

Furthermore, pain and muscle strength were assessed at 6 to 8 h postanesthesia, as well as at 24 and 48 h. As neither single-injection FNB nor ACB could be expected to last to 24 h, the later measurements are a true testament to the efficacy of the epidural and the other multimodal analgesics.

Although the local anesthetic total doses used for the single-injection nerve blocks were the same, the ACBs were performed with 15 ml of 0.5% bupivacaine, whereas the FNBs were performed with 30 ml of 0.25% bupivacaine. The question of whether volume, concentration, or total dose has a more significant effect on analgesia, motor function, and spread of local anesthetic has not been conclusively answered, but this is a confounding factor.

Finally, the finding that the FNB was responsible for the “buckling” in three patients while ambulating on POD 1 is most probably a coincidental finding after the single-injection nerve blocks have long worn off, while the patients still had continuous epidurals in place. An article by Memtsoudis et al.,3 of which Dr. Mariano, the principal author of the above-mentioned editorial,2 is a coauthor, in the same issue of Anesthesiology clearly demonstrated that peripheral nerve blockade is not a risk factor for falling after total knee arthroplasty.

The ACB may well have its effect simply by proximal spread of local anesthetic agent to the anterior and posterior divisions of the femoral nerve, as convincingly shown elsewhere.4–6 If it did not, the ACB would block only one of the seven nerves that innervate the knee joint and would most probably be ineffective. Due to this proximal spread, the lack of quadriceps muscle paralysis is not a constant characteristic of ACB.5,6 Quadriceps muscle dysfunction due to FNB, however, is only a minor issue when compared with the dysfunction caused by the original disease and the surgery itself,7–10 while effective postoperative analgesia is probably a major enabler of early ambulation.

Competing Interests

Dr. Boezaart receives royalty payments from Teleflex (Wayne, Pennsylvania). Dr. Deloach declares no competing interests.

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Is Less than 50% More Narcotics Really Noninferior?

To the Editor:

I read with great interest the study by Kim et al.1 presenting data on the superiority of an adductor canal block compared to a femoral nerve block preserving muscle strength and the noninferiority in analgesia. I believe the noninferiority “conclusion” deserves some discussion.

One of the most important aspects of designing a noninferiority study is the choice of the noninferiority margin—here a 50% increase in narcotic consumption. The validity