Title

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Single-injection and Continuous Femoral Nerve Blocks Are Associated with Different Risks of Falling

To the Editor:

I read with interest the superb retrospective database study of Memtsoudis et al. titled, "Inpatients falls after total knee arthroplasty: The role of anesthesia type and peripheral nerve blocks."[1] Of more than 190,000 patients who underwent total knee arthroplasty (TKA), there was a fall incidence of 1.6%. Twelve percent of all patients had a "peripheral nerve block" (PNB), yet, as stated in the abstract, "Contrary to common concerns, no association was found between PNB and IF [inpatient falls]." However, within the limitations section, the authors explain that, "The database used contains limited clinical information and thus some important factors cannot be taken into account… With regard to information concerning PNB, specific details on the exact type of block, if it was a continuous or single-shot application… are not readily discernible." In other words, it remains unknown how many—or even if any—of the nearly 23,000 patients with "PNB" had a *continuous* PNB.

This is a critical piece of (missing) information because the available data from previous studies that *were* able to differentiate between single-injection and continuous PNBs suggest a strong association of the latter with an increased risk of falls. In a retrospective database study, Wasserstein et al. found that—like Memtsoudis et al.—patients who underwent TKA with a *single*-injection femoral nerve block had the same risk of falling as patients without any type of PNB.[2] However, the presence of a *continuous* femoral nerve block increased the odds ratio of falling to 4.4 ($p = 0.04$). In a meta-analysis of three randomized, placebo-controlled trials involving femoral and posterior lumbar plexus catheters for TKA and total hip arthroplasty, respectively, Ilfeld et al. found that no subjects receiving perineural saline (n = 86) fell (0%) while there were seven falls (7%) in patients receiving perineural ropivacaine (n = 85; $p = 0.01$), strongly suggesting a causal relationship between the continuous blocks and falling.[3] Since there were no falls in the placebo group, an odds ratio cannot be calculated; but, if even just a single fall occurred in this group, the odds ratio would be 5.5 (therefore, the actual odds ratio is *at least* 5.5, but possibly higher). Finally, an additional meta-analysis including 4 randomized, controlled trials and one retrospective cohort study, Johnson et al. calculated an odds ratio of 3.9 ($p < 0.01$) of falling for subjects with a continuous femoral or posterior lumbar plexus block of greater than 12 h (incidence = 2.2%) compared with subjects with either no block, a single-injection block, or a perineural infusion of less than 12 h (incidence = 0.5%).[4] To my knowledge, there are no data contradicting these findings when single-injection and continuous PNBs are differentiated.

Why this apparent difference in the risk of falling exists between single-injection and continuous PNB remains unknown. Nevertheless, one may speculate that the reason single-injection blocks do not increase the risk of falling is simply because patients with flaccid quadriceps are not permitted out of bed—and do not attempt ambulation—without a good deal of caution and assistance. In contrast, patients with continuous PNB are not only permitted to get out of bed, but ambulate repeatedly in the early hours/days following surgery. Given that falls with 4-day continuous PNB occur not only in the two days following surgery, but postoperative days 3 and 4 as well—after patients have successfully ambulated multiple times during physical therapy—there is a high probability that patients become more confident and do not continue to take the same precautions as during early ambulation attempts.[3] To support this supposition, the majority of falls in patients with continuous PNB occur when patients are unaccompanied/unassisted and going to the restroom, often in the middle of the night.[5]

Therefore, while I agree with the authors' statement that their, "data should provide encouragement to not shy away from the use of PNB;" it should also not lull healthcare providers into a false sense of security regarding the risks of continuous PNB. Research involving the etiology of patient falls and their association with various regional analgesic interventions must not decrease due to the important findings reported in the recent study by Memtsoudis et al. In addition, this letter should not be construed as criticizing the study by Memtsoudis et al.—the authors accurately and responsibly identified the limitation of their analysis within their discussion section—but, rather, a caution to readers of their article. Practitioners should at least be aware of the data specific to *continuous* PNB, as decreased cognizance or even denial of the issue may only increase the potential risk to our patients.

Competing Interests

The author declares no competing interests.

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In Reply:

We thank Dr. Ilfeld for his very thoughtful and important commentary. His letter not only inserts relevant clinical detail and consideration into the discussion, but also rightfully highlights once more the limitations of information gained from the analyses of large administrative databases.

Despite the advantage associated with the ability to study low incidence outcomes in a real-world setting, the lack of information on causation and paucity of clinical detail cannot be overemphasized. This is a particular salient point now during a time when the number of studies utilizing administrative data sources, while arguably important and valuable, is surging in our specialty journals. Dr. Ilfeld should be commended for his constructive feedback on how to supplement our knowledge gained from big data analyses through more detailed investigations in clinical settings and *vice versa*. At a time when large database investigations are searching for their legitimate place within anesthesiology research, accepting limitations while acknowledging strengths is not only necessary but also a major determinant of our willingness as a community to utilize this important resource of information.

With respect to the data presented in our recent study,[1] we support the conclusion that, while we were not able to identify an association between peripheral nerve block (PNB) and in-patient fall risk in total knee arthroplasty patients, this does not mean that there is no potential mechanism linking the two. However, what our data do suggest is the notion that, in real-world practice, outcomes are influenced by many factors that may sometimes be corrective but are often unmeasured in randomized clinical trials.

In real-world clinical practice, PNB are not performed in isolation and without regard for patient safety, including fall-risk reduction.[2–4] It is a limitation of studies using administrative databases that important information, such as practice management strategies, is often lacking. The lack of association between PNB and in-patients falls in our study may very well relate to systems issues and perhaps selection bias: those hospitals that have had previous problems with falls or lack training in the safe use of PNB may be less likely to use PNB for arthroplasty patients; and those hospitals that use PNBs regularly for arthroplasty may have systems in place to make them work while keeping patients safe, including multidisciplinary fall prevention programs. For every hospital that provides care for arthroplasty patients, all sources of risk should be acknowledged and minimized. The "right" analgesic protocol (*e.g.*, PNB *vs.* no PNB, single-injection *vs.* continuous catheter) will vary by practice but should openly address the risk of inpatient falls that is almost certainly affected by any motor weakness and work toward decreasing the incidence of all complications.

In conclusion, we wholeheartedly agree with Dr. Ilfeld's comments and echo his call for more research in this area of medicine, including targeted clinical and mechanistic studies. As we have previously stated on a number of occasions, database studies cannot provide the ultimate answer on any topic but can help gauge the extent of a problem, formulate testable hypotheses, and perhaps guide future research efforts into directions where it is most needed.

Competing Interests

The authors declare no competing interests.

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