No Clinical or Electrophysiologic Evidence Proving Intraneural Injection Is Safe

To the Editor:
The article by Sala-Blanch et al. paints regional anesthesia into an interesting corner. On one hand, the authors demonstrate that intraneural injection happens frequently during nerve stimulator-guided blocks. On the other hand, the article does not provide convincing evidence that intraneural injection is safe. Neuropathy after peripheral nerve block is uncommon and therefore difficult to study from an epidemiologic perspective. For this study, the unbiased estimate of the true event rate for nerve injury after intraneural injection is 0 percent. However, because of the small sample size (n = 16), the upper bound of the 95% CI on this event rate is only 20% (Clopper–Pearson method).

The title of the article, “No Clinical or Electrophysiologic Evidence of Nerve Injury After Intraneural Injection During Sciatic Popliteal Block,” is misleading when reported in such a limited number of patients. It provides tacit approval of a practice that may be the cause (albeit rarely) of complications that are devastating to the patient. A large prospective trial of intraneural injections in humans is needed to quantify the risk of this practice. However, such a study is difficult to justify because animal studies already demonstrate that needle trauma alone can cause nerve injury. Even animal studies showing no histologic or electrophysiologic evidence of injury after intraneural injection do not address the most common symptoms of injury, which are paresthesia, dyesthesia, and pain. The majority of these symptoms occur without electrophysiologic abnormalities.

There is a striking paradox in this study. The investigators unknowingly performed intraneural injection in 94% of patients with the nerve stimulator. Meanwhile, their colleagues (in the same study) used ultrasound to assess local anesthetic distribution with such precision as to “identify hypoechoic aliquots of fluid between nerve fascicles.” Few reports have illustrated the gap in capability between these two technologies so well.

The truth is we do not know how often intraneural injection leads to nerve injury. However, it is reasonable to assume that piercing and injecting nerves is not therapeutic in any way. Instead of trying to convince ourselves that nerve injection and needle trauma are not so bad, why not just stop doing it? After all, we have the technology.

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References


Incidence of Subclinical Neuropathy after Intraneural Injection

To the Editor:

We read with interest the recent article by Sala-Blanch et al., in which the authors prospectively evaluated the frequency of subclinical neurologic injury following nerve-stimulator-guided low-pressure intraneural injection of local anesthetic and radio-opaque contrast for a single-shot sciatic popliteal block in 16 patients undergoing hallux valgus repair. Intraneural injection was confirmed by ultrasound and computed tomography scan imaging. Patients underwent physical examination and conventional electrophysiologic studies both preoperatively and postoperatively at weeks 1 and 4 to detect clinical and subclinical nerve injury, respectively. None of the 16 patients demonstrated evidence of clinical or subclinical nerve injury. Based on these results, the authors cautiously concluded that low-pressure intraneural injection within the sciatic nerve at the popliteal level may not result in clinical or subclinical nerve injury. Despite material differences in methodology, Sala-Blanch et al.’s findings are in stark contrast to a recent publication that reported the frequency of subclinical nerve injury after nerve-stimulator-guided continuous femoral nerve block in young adults undergoing anterior cruciate ligament repair to be 24% at 4 weeks, based on clinical examination and conventional electrophysiologic study; all patients recovered at 6 months.

Therefore, we believe that some additional information is necessary in order for the readership, ourselves included, to meaningfully interpret the clinical relevance of the present results. First, the authors defined electrophysiologic nerve injury as “a change in latency (more than 120%) or in amplitude and
Conduction velocity (less than 80%) compared with baseline data obtained in the same individual.

However, their Table 3 summarizes the mean electrophysiologic records for all the patients at the three time-points. Averaging these values may mask potential electrophysiologic variations, which may occur following nerve injury. We believe the raw electrophysiologic data for each patient both at baseline and at 4 weeks postoperatively should also be reported, as the evolution over time may further inform our understanding of nerve injury. Indeed, the value of electrodiagnostic data at 1 week postoperatively may be questionable, as motor and sensory axons can remain excitable for a period of 7 and 11 days, respectively, following an insult. Nonetheless, the results of Sala-Blanch et al.'s study do seem to lend support to the growing body of important literature suggesting that intraneural injection may not always lead to nerve injury, and for this, we are sincerely grateful.

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In Reply:
We thank Swenson, Davis, Albrecht, Riazi, and Brull for their comments on our study, which have given us an opportunity to contribute additional thoughts on this subject.

Swenson and Davis point out that our article does not provide convincing evidence that intraneural injection is safe, specifically citing the small sample size. We agree and also advise against the practice of intraneural injections as unnecessary and potentially hazardous. Several recent studies reported that as little as 1 ml, or 0.1 ml/mm of square surface of the nerve of local anesthetic injected perineurally, is sufficient for timely onset of successful nerve block. If so, what can be gained by a targeted intraneural injection, except an unnecessary risk? However, an injection within the epineurium during popliteal sciatic block has been a norm before ultrasound, and should probably continue with ultrasound-guided blocks as well, provided adequate monitoring, as discussed below.

We share the concerns of Swenson and Davis that there is a possibility that the title of the article may be misinterpreted by some as a “tacit approval of a practice which may result in disabling complications.” The fundamental problem is in the lack of the standardized nomenclature of what constitutes an intraneural versus perineural injection. Importantly, for the purpose of our study, “intraneural” was defined as injections that occurred within the epineurium and not within the perineurium. However, the predicated reports on the subject used the term “intraneural” for injections that took place within any connective tissue of the nerves or plexuses. As a result, the peer-review process favored “intraneural” in our title, although a more appropriate title would have been “intraepineural” or “subepineural.” In our recent review, however, we attempted to standardize nomenclature of the sites of nerve injection to help reduce the future confusion in the literature. We also agree with Swenson and Davis that technology is now available to decrease the risk of intraneural injection and needle trauma. There is sufficient evidence suggesting that combination of ultrasound guidance, electrophysiologic monitoring (avoidance of evoked motor response at less than 0.3 mA), and avoidance of resistance to injection (more than 15 psi) may decrease the risk of an intrafascicular injection altogether.

Albrecht et al. question whether additional electrophysiologic testing or data analysis would have an impact on the incidence of neurologic outcome of the subepineural injections reported in our study. We do not have a reason to doubt the sensitivity and the timing of the electromyography testing to detect significant subclinical nerve injury in our study. Electromyography is simply the most suitable method currently available to assess postblock nerve injury. The choice of electrophysiologic data presented in our article was collaboratively made with reviewers through the peer-review process. Reporting more data would have unnecessarily cluttered the article since analysis of pre- and postinjection electrophysiologic data at all three data points (baseline, 1 week, and 4 weeks postblock) did not yield a signal prompting further exploration. As opposed to the report by Albrecht et al., none of our patients had symptoms or signs of nerve injury.

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