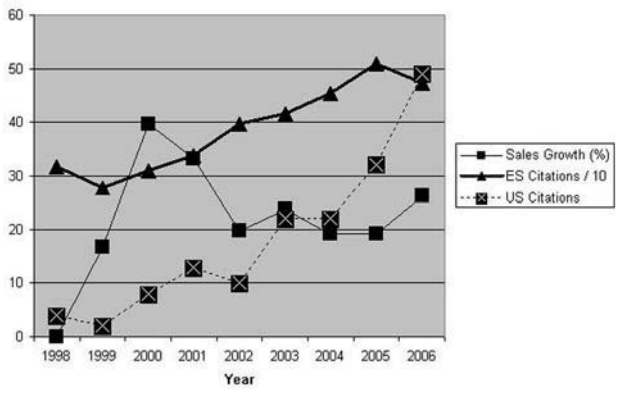

FIGURE Annual sales growth (%) increases when compared with the prior year (with 1998 as baseline) for one vendor's nerve stimulation-related products and supplies are tracked over time. Also tracked are the number (*n*) of indexed citations of nerve block-related manuscripts describing electrical stimulation (ES) and ultrasound (US). Note that the graphic for ES citations is an order of magnitude greater than for US citations.

of citations meeting the OVID Medline search criteria of "'nerve block' and 'nerve stimulator or nerve stimulation or electrical stimulation,'" and "'nerve block' and 'ultrasound or ultrasonography.'" The search is meant to be illustrative, but not comprehensive, and is not designed to over- or under-represent manuscript indexing of either neurolocation technique. The numerical increase in the number of indexed manuscripts per year is also presented in the Figure. The reader should be able to conclude that product sales enjoyed annual growth ranging from 17% to 40% in the period 1999-2006, while the number of manuscripts addressing neurostimulation for nerve blocks were indexed at least an order of magnitude more frequently than were ultrasound-related nerve block manuscripts. We believe this refutes Dr. Tsui's statement that electrical stimulation failed to result in a renewed interest in regional anesthesia.

That said, we do agree with the overall theme that the practice of regional anesthesia is not yet where placing central catheters is for anesthesiologists today: there is a subset of anesthesiologists who are comfortable routinely performing regional techniques, but certainly not all anesthesiologists.

Based on these impressions, we suggest that any new studies of block success rates comparing neurolocation techniques should be discouraged in future research, with the exception of manuscripts addressing "learning curves" of trainees on regional anesthesia services.[2] Future neurolocation research should be focused primarily and specifically on long-term safety outcomes. Such studies will indeed require thousands upon thousands of patients. Because of the relatively low occurrence of nerve injury, these events will be especially difficult to study without first developing consensus-based outcome parameters, and appropriate vendor-sponsored and foundation-sponsored underwriting. The time has come to reconsider traditional seamless publication addressing "my technique *vs* your technique," reminiscent of the needle-induced-paresthesia era. Instead, our subspecialty should reallocate scarce research resources to show: (i) whether ultrasonographic imaging effectively excludes anesthesiologist-attributed nerve injury, and (ii) that the surgically-induced or previously-undiagnosed patient-specific neurodeficits are appropriately attributed as such, when such deficits are manifest after surgery performed under peripheral nerve block.

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References

1 *Tsui B.* Ultrasound-guidance and nerve stimulation: implications for the future practice of regional anesthesia. Can J Anesth 2007; 54: 165–70.
2 *Sites BD, Spence BC, Gallagher JD, Wiley CW, Bertrand ML, Blike GT.* Characterizing novice behavior associated with learning ultrasound-guided peripheral regional anesthesia. Reg Anesth Pain Med 2007; 32: 107–15.

Reply:

I sincerely thank Dr. Williams and his colleagues for their interest and comments regarding my recently published editorial.[1] Contextually, I would like to emphasize that the opinions expressed in the editorial were not intended to undermine the important role and merits of nerve stimulation related to the growth of regional anesthesia. Clearly, the introduction of nerve stimulation some 30 years ago was the first step towards trans-

forming regional anesthesia into a "science". Nerve stimulation provided a considerable boost to those who were already drawn to regional techniques. Despite the advances, however, the fact remains that nerve stimulation-guided regional anesthesia has limitations. The technique relies on physiological responses of neural structures to electrical impulses which are subject to considerable inter-individual variation. Other factors, including the local anesthetic, its excipients, and various neurological diseases also may influence the response to electrical nerve stimulation. The ongoing search for improved methodologies to enhance the success rates of regional techniques is clinically justified.

Fortunately, ultrasound imaging (although in itself limited by subjective interpretation) adds the dimension of accurately visualizing local anesthetic spread and related anatomic structures to be avoided; thereby providing a new measure of clinical efficacy and safety. These may be factors to explain why nerve stimulation did not achieve a similar rate of growth in the practice of regional anesthesia that seems to be occurring with the introduction of high resolution ultrasound. Clinicians who have renewed their interest in regional anesthesia because of familiarity with ultrasound techniques, also may have utilized nerve stimulation as a 'tried and true' confirmation of their visual test. In this context, the related editorial would preferably have stated that: "Not surprisingly, the introduction of ES (electrical stimulation) failed to result in a renewed interest in regional anesthesia to the extent, and especially with such a rapid pace, as we are witnessing with ultrasound-guided techniques".

Finally, with respect to Dr. Williams' important points related to the strength and complexity of research related to patient safety, I concur that a consensus-based approach related to the study outcomes of safety and success rates would be important to help determine best clinical practices related to regional anesthesia. Adding to the research repertoire a focus of patient satisfaction with reliable and reproducible outcomes will ultimately determine improvements in overall patient care, and future advances in the practice of regional anesthesia.

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Reference

1 *Tsui B.* Ultrasound-guidance and nerve stimulation: implications for the future practice of regional anesthesia. Can J Anesth 2007; 54: 165–70.

Spinal myoclonus associated with intrathecal bupivacaine and fentanyl in an infant

To the Editor:

Spinal myoclonus is most commonly caused by drugs. Other causes include spinal tumours, infections, vascular lesions, acquired immunodeficiency syndrome and demyelinating diseases, but in a few cases the etiology remains unknown.[1] There are very few reports of myoclonus following spinal anesthesia in adults,[2,3] and none involving an infant. Parental consent was obtained for publication of the following report.

A 45-day-old healthy male infant (5.1 kg) presented for bilateral inguinal hernia repair. His medical history and neurological examination were unremarkable. The hemoglobin was 128 $g \cdot L^{-1}$. Following application of routine monitors, a subarachnoid block was performed under sterile conditions at the L5–S1 interspace using a 25-G, 25-mm spinal needle (Beckton Dickinson, Madrid, Spain), in the left lateral position. Clear cerebrospinal fluid was seen at needle hub. A 2-mg dose of 0.5% bupivacaine with fentanyl 2.5 μg was prepared in a tuberculin syringe to a volume of 0.46 mL. Injection took place after aspiration of a very small volume of cerebrospinal fluid, with no resistance. As the child was turned supine, he developed abnormal, asymmetrical rhythmic flexion and adduction movements of the left thigh and arm at an approximate frequency of 20–30 $\cdot min^{-1}$. There was no facial movement or any change in heart rate, and the child was alert during the episode while receiving oxygen by face mask. The level of sensory block was T8 bilaterally. After four minutes, the myoclonus resolved spontaneously without further intervention. Surgery was allowed to begin once the myoclonus had resolved, and was completed uneventfully within 45 min. Serum electrolytes, glucose and calcium were within normal limits. Postoperatively, a neurology consultation was obtained, and in the light of an absent history of seizures, and absent focal neurological signs, it was concluded that the myoclonus was not of epileptic origin. There was no recurrence and the child was discharged the following day. Magnetic resonance imaging studies of the spinal cord performed one week later did not reveal any abnormality.

Spinal myoclonus appears as stimulus-sensitive, repetitive jerks in a group of muscles supplied by one or several contiguous segments of the brainstem or spinal cord, and unlike other forms of myoclonus, is unaffected by sleep, anesthesia, or coma. The contractions are nearly rhythmic, and may be synchronous