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Ultrasound Guidance May Reduce but Not Eliminate Complications of Peripheral Nerve Blocks

THE relatively recent technological advances and clinical research are continuously facilitating the metamorphosis of ultrasound-guided regional anesthesia from an experimental technique into a standard procedure in clinical care. The intense enthusiasm from its most vocal proponents led to almost religious belief that the ability to continuously monitor needle placement and administration of local anesthetic is a bulletproof technique to accomplish safe and successful regional anesthesia. However, evidence is mounting that such radical views are not only overly optimistic, but may prove counterproductive. Recent reports suggest that expert ultrasound guidance may reduce but not eliminate the most common complications of regional anesthesia, such as blood vessel puncture or inadvertent intraneural or intravascular injections.[1–5] Sites *et al.*[6] analyzed videos of some 60 ultrasound-guided blocks performed by trainees. They concluded that the most common errors are failure to recognize the maldistribution of local anesthetic, failure to recognize the needle tip before injection, and poor choice of needle-insertion site and angle, preventing needle visualization. This report alone serves as a reminder of the main limitation of ultrasound technology: dependence on the operator. The reputation of clinical excellence of the authors of the two reports in the current issue of ANESTHESIOLOGY suggests limitation in the technology, rather than a lack of expertise, as the additional obstacle in reliably detecting an intravascular injection during ultrasound-guided nerve blocks. This is of no surprise, given that multiple technical factors may also influence the ability to monitor the path of the needle, disposition of the local anesthetic, and visualization of the relevant anatomy.[7]

One of the main advantages of ultrasound guidance during peripheral nerve blocks is the ability to deliver multiple smaller aliquots of local anesthetics at different locations. It would be logical to expect that such a strategy should result in less risk of block failure and less risk of intravascular injection of a large dose of local anesthetic, particularly in a highly vascular area such as the axilla. However, despite the research suggesting that ultrasound guidance during nerve block procedures allows for reduction of total dose/volume of local anesthetic,[8] the doses and volumes used for reliable blockade by many clinicians are still capable of producing significant systemic toxicity.[4,5] Therefore, similar precautions during a nerve blockade and in the choice of local anesthetics should be adhered to, regardless of whether ultrasound guidance is used.

Results of a recent survey of practice strategies to reduce and treat local anesthetic–induced toxicity among practitioners in academic anesthesiology departments pointed out a surprising variability in safety precautions and preparedness for local anesthetic toxicity.[9] Lessons learned from reports of malignant hyperthermia unambiguously indicate that well-established treatment protocols allow for lifesaving, timely intervention.[10] Local anesthetic toxicity during peripheral nerve blockade is likely more common than malignant hyperthermia, but similar guidelines for its prevention and treatment have not been well established or widely adopted. This finding is disappointing because both laboratory evidence and clinical case reports suggest that timely treatment may be lifesaving.[11–14] Ultrasound guidance is without a doubt one of the most significant developments in regional anesthesia. It would be a collective judgment error, however, to lean on this technology as a replacement for all existing practice strategies or as a panacea for all safety considerations. An approach more likely to improve the safety of regional anesthesia is evidence-based integration of ultrasound technology into the existing and emerging monitoring and practice protocols during the administration of regional anesthesia. This task should be incumbent upon the leadership of organized anesthesia societies to secure the future of regional anesthesia.

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