Systematic sonographic and evoked motor identification of the nerve to vastus medialis during adductor canal block

To the editor,

Adductor canal block (ACB) is commonly used for analgesia following total knee arthroplasty.[1] The goal of this technique is to anesthetize the saphenous nerve and nerve to vastus medialis (NVM). Most technical descriptions of the block have described a midthigh approach with the endpoint for needle advancement immediately anterolateral to the femoral artery.[2] We have recognized some relevant anatomical issues:

1. The NVM is probably far more important than the saphenous nerve with respect to analgesia following knee arthroplasty.[3] The NVM innervates most of the medial joint capsule, whereas the saphenous nerve is primarily a cutaneous nerve.
2. At the midthigh, the NVM lies between the vastus medialis and sartorius muscles and is frequently 1–2 cm more lateral in this fascial plane than the saphenous nerve, which remains adjacent to the femoral artery.[4 5]
3. These two nerves are frequently separated by the vastoadductor membrane.[4] This firm fascial membrane subdivides the adductor canal and isolates the more lateral NVM from the perivascular saphenous nerve.
4. Lastly, the NVM is not always easily identified on ultrasound.

We have become concerned that ignoring the NVM may lead to decreased block efficacy and, more importantly, a safety hazard. The most common approach to the ACB involves a lateral-to-medial needle path.[2] This can put the NVM directly in the trajectory of the needle, predisposing it to needle injury.

We have changed our technique and now perform the following sequence of steps. The transducer is placed on the anteromedial thigh, and the femoral artery, saphenous nerve, and sartorius and vastus medialis muscles are identified (figure 1). We then direct our attention to the fascial plane between the sartorius and vastus medialis and attempt to identify the NVM. A 21-gage 10 cm block needle is attached to a nerve stimulator and advanced in-plane from the lateral aspect, immediately deep to and parallel with the sartorius muscle. The current intensity is set between 0.5 and 1.0 mA. The assistant has a hand placed on the medial knee so that an evoked motor response of the medial vastus head can be appreciated. When this occurs, we assume that NVM is in close proximity, and careful hydrodissection with normal saline is performed. Following this, the nerve can routinely be observed as a hyperechoic structure contrasted against the background of local anesthetic. A total of 10 mL of local anesthetic is deposited at this location. The needle is then advanced toward the femoral artery, and following passage through the vastoadductor membrane, an additional 10 mL of local anesthetic is deposited. Continuous catheter techniques are performed in a similar manner, and the multiorifice catheter is positioned in a way that permits local anesthetic spread to both the saphenous nerve and NVM.

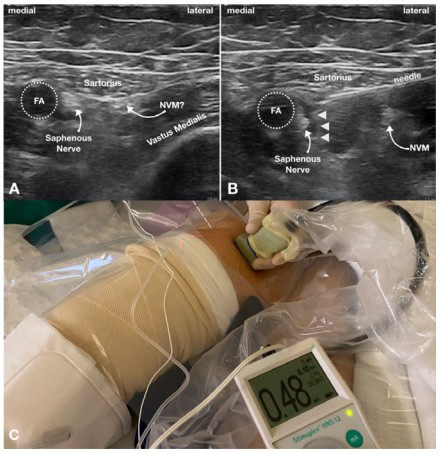

Figure 1 Ultrasound image showing adductor canal anatomy. (A) Preblock. The saphenous nerve is easily identified, but the NVM is less so. (B) Postinjection. Both the saphenous and NVM can be identified easily with local anesthetic surrounding each nerve. The vastoadductor membrane can be visualized also (arrowheads). (C) Ultrasound probe position. FA, femoral artery; NVM, nerve to vastus medialis.

While this technique is slightly more involved than simply placing local anesthetic next to the artery, we believe this has led to improved efficacy for these cases since local anesthetic is not sequestered in the adductor canal by the vastoadductor membrane, resulting in a blockade of just the saphenous nerve. More importantly, we strongly believe that the NVM is at risk of mechanical injury from a lateral needle trajectory. We are unaware of any published cases of NVM injury associated with ACB,

but we do feel that it is reassuring to be able to carefully identify and hydrodissect this important motor nerve, much in the same way that identifying and avoiding the dorsal scapular and long thoracic nerves during interscalene brachial plexus block may help reduce inadvertent injury to those structures.[6]

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REFERENCES

1 Bauer MCR, Pogatzki-Zahn EM, Zahn PK. Regional analgesia techniques for total knee replacement. *Curr Opin Anaesthesiol* 2014;27:501–6.
2 Jæger P, Zaric D, Fomsgaard JS, *et al*. Adductor canal block versus femoral nerve block for analgesia after total knee arthroplasty: a randomized, double-blind study. *Reg Anesth Pain Med* 2013;38:526–32.
3 Burckett-St Laurant D, Peng P, Girón Arango L, *et al*. The nerves of the adductor canal and the innervation of the knee: an anatomic study. *Reg Anesth Pain Med* 2016;41:321–7.
4 Tubbs RS, Loukas M, Shoja MM, *et al*. Anatomy and potential clinical significance of the vastoadductor membrane. *Surg Radiol Anat* 2007;29:569–73.
5 Andersen HL, Andersen SL, Tranum-Jensen J. The spread of injectate during saphenous nerve block at the adductor canal: a cadaver study. *Acta Anaesthesiol Scand* 2015;59:238–45.
6 Hanson NA, Auyong DB. Systematic ultrasound identification of the dorsal scapular and long thoracic nerves during interscalene block. *Reg Anesth Pain Med* 2013;38:54–7.