CORRESPONDENCE

Can electrical nerve stimulation guidance assist in cervical erector spinae plane block catheter placement for total shoulder arthroplasty?

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To the Editor,

Although the erector spinae plane block (ESPB) is rapidly being adopted for a multitude of clinical applications, it can be challenging to perform in the cervical region because of the neck's unique curvature and vertebral anatomy. Nonetheless, cervical ESPB to control perioperative pain in the upper extremity has been described using catheter advancement from the thoracic level.^{1,2} In adults, electrical stimulation has aided catheter advancement in the epidural space.³ Herein, we report a novel application using the same principle to advance a stimulating catheter in the erector spinae plane space from the thoracic up to the cervical region.

A 77-yr-old diabetic male (who provided written consent for this report) was scheduled for a right total shoulder arthroplasty. As this patient preferred a nerve block that would not weaken his arm, a continuous ESPB was offered. An ultrasound-guided ESPB was performed in the sitting position. An 18G 100-mm Tuohy needle (Stimulong Sono Tsui, epidural/peripheral stimulating catheter, Pajunk, Germany) was inserted at T3 level using an in-plane approach from caudad-to-cephalad direction. After 20 mL of saline was used to

hydrodissect the interfascial plane, a stimulating catheter with an electric current of 10 mA (0.2 msec pulse width at 2 Hz) was inserted with cephalad advancement. A right deltoid muscle twitch was observed (with a threshold of 4.5 mA) when the catheter was inserted approximately 7 cm into the ESP space, and 20 mL of local anesthetic (0.5% ropivacaine and 0.125% bupivacaine) was injected through the catheter. The entire right upper limb elicited sensory loss to cold (ice) over the C5 distribution 20 min after the injection and the patient was subsequently transported to the operating room for a general anesthetic. Intraoperatively, fentanyl 150 µg, hydromorphone 1 mg, and ketamine 20 mg were used as part of the multimodal analgesic regimen. An intermittent bolus of 10 mL 0.2% ropivacaine every two hours was commenced via an infusion pump in the postanesthetic care unit (PACU). The patient received a total of hydromorphone 0.8 mg *iv* and ketorolac 15 mg *iv* in the PACU, and thereafter reported a pain score of 5/10 on the numeric rating scale for pain (NRS). On postoperative day (POD) 1, the patient's pain was well managed using a combination of acetaminophen, ketorolac, gabapentin, and oral hydromorphone, together with the continuous nerve block. His subsequent daily opioid requirement varied between 0 and 3 mg of oral hydromorphone. The patient remained comfortable and the ESPB catheter was removed on POD 2 without any complications apparent. Throughout the postoperative period, the patient did not complain of any respiratory distress and both normal diaphragmatic movement (on ultrasound) and spirometry were present.

This is the first case report describing the feasibility of electrical nerve stimulation-guided catheter advancement from thoracic to cervical level within the ESP. This technique may be particularly helpful in situations where

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Table Electrical stimulation criteria used for regional anesthesia

Neurostructural localization	Threshold (0.1–0.2 msec)	Comments
Peripheral nerve		
• Close proximity to or on the nerve	0.5 mA < 0.2 mA	Risk of intrafascicular needle placement.
• Intraneural		
Transcutaneous nerve mapping		Up to a maximum of approximately 3 cm deep.
• Interscalene	1–5 mA	Deltoid, biceps or triceps response.
Epidural stimulation test		Segmental spinal level response
• Intrathecal	< 1 mA	Bilateral
• Against spinal nerve root	< 1 mA	Unilateral
	2–15 mA	Stimulating spinal nerve root at few cm distance (mostly unilateral; but can be bilateral).
• Epidural space		
Erector spinae plane		
• Cervical	4.5 mA	Nerve stimulation of the brachial plexus resulting in deltoid muscle twitch was shown in a single case report at the cervical ESP region. No stimulation was elicited at the thoracic ESP region for the intercostal nerve at up to 10 mA. Further study is necessary to determine the range
• Thoracic	Unknown	
• Lumbar	Unknown	

ESP = erector spinae plane

the catheter tip was poorly visualized using ultrasound during advancement. As the cervical erector spinae plane is posterior to the transverse process (i.e., the catheter tip is relatively far away from the brachial plexus), a relatively high current threshold was necessary to stimulate the superior trunk of the brachial plexus to produce a deltoid twitch. While electricity can readily transmit through different muscles and tissue layers (Table) as seen in transcutaneous nerve mapping,⁴ the volume of local anesthetic that leaks through the tissue planes may only be sufficient to cause differential block affecting primarily sensory rather than motor function. This technique provides for alternative opioid-sparing analgesia² and benefits those who dislike the dense motor component of the nerve block.⁵ Further studies are warranted to evaluate the merits of this electrical stimulation-guided cervical ESP technique.

Conflict of interest Ban Tsui is the inventor of the catheter used in this case.

Editorial responsibility This submission was handled by Dr. Hilary P. Grocott, Editor-in-Chief, *Canadian Journal of Anesthesia*.

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