



## Motor-sparing high-thoracic erector spinae plane block for proximal humerus surgery and total shoulder arthroplasty surgery: clinical evidence for differential peripheral nerve block?

Wen Ma, MD · Lisa Sun, MD · Lynn Ngai, MD · John G. Costouros, MD · Robert Steffner, MD · Jan Boublik, MD, PhD · Ban C. H. Tsui, MD, MSc, FRCPC 

Received: 9 June 2019/Revised: 20 June 2019/Accepted: 20 June 2019/Published online: 9 July 2019  
© Canadian Anesthesiologists' Society 2019

### To the Editor,

There is growing literature suggesting the successful use of a high-thoracic erector spinae plane block (ESPB) for upper extremity analgesia.<sup>1–3</sup> We present two novel observations (with patient consent) in which an ESPB was used as a motor-sparing alternative to the interscalene block for proximal humerus surgery and total shoulder replacement, respectively.

The first observation was a 21-yr-old woman with type-I diabetes and recurrent chondroblastoma in her proximal humerus, who presented for intralesional proximal humerus surgery through a posterior approach. To facilitate a postoperative motor examination, the avoidance of motor blockade was requested by the surgeon. An ultrasound-guided ESPB catheter (Flexblock, Teleflex, Morrisville, NC, USA) was placed using an in-plane approach at the T5 level. After the fascial plane was hydro-dissected using 25 mL of saline, the catheter was smoothly threaded 10 cm in the cephalad direction (estimated to reach T2 via surface landmark) and then injected with 20 mL 0.5% ropivacaine.

Intraoperatively, the patient received ketamine 30 mg, methadone 5 mg, fentanyl 100 µg, acetaminophen 1000 mg, and ketorolac 30 mg. The ESPB catheter was programmed with a 10 mL 0.2% ropivacaine autobolus every 60 min plus a patient-demand bolus of 5 mL every 30

min. Postoperatively, she had intact motor function and sensation. Ultrasound confirmed no phrenic nerve blockade. Postoperatively, the only opioid the patient received was oxycodone 5 mg on postoperative day (POD) 0 and 10 mg on POD 1 in addition to her multimodal analgesic regimen. Her pain score was 0 in the postanesthesia care unit (PACU), with a subsequent median score of 2. She was discharged home with the ESPB catheter on POD 1. She remained comfortable and removed the catheter on POD 3.

Our second patient was a 70-yr-old man with a high-thoracic ESPB catheter placed (using a similar technique as described above) for postoperative analgesia after total shoulder arthroplasty. The patient had declined an interscalene block because of his dislike for the motor weakness after a spinal anesthetic for prior prostate surgery. Under ultrasound guidance, an ESPB catheter was inserted preoperatively at the T4 level and advanced to the T1–2 level. The catheter was bolused with 20 mL 0.5% ropivacaine and programmed with a 5 mL 0.2% ropivacaine autobolus every 60 min plus a patient-demand bolus of 5 mL every 30 min. The patient received fentanyl 175 µg intraoperatively and fentanyl 100 µg in the PACU. During the remainder of his hospital stay, he received no further opioid on POD 0 and oxycodone 10 mg on POD 1. On POD 2, the ESPB catheter was removed and the patient was discharged home. His median postoperative pain score was 3, and he had no motor or sensory deficits.

These unique observations show that a cephalad-directed high-thoracic ESPB catheter can provide motor-sparing analgesia for upper extremity and shoulder surgery. These observations are comparable with abundant cases describing adequate analgesia without demonstrable sensory or motor changes from ESPB.<sup>4</sup> While the actual

W. Ma, MD · L. Sun, MD · L. Ngai, MD · J. Boublik, MD, PhD · B. C. H. Tsui, MD, MSc, FRCPC (✉)  
Department of Anesthesiology, Perioperative and Pain Medicine, Stanford University School of Medicine, Stanford, CA, USA  
e-mail: bantsui@stanford.edu

J. G. Costouros, MD · R. Steffner, MD  
Department of Orthopaedic Surgery, Stanford University School of Medicine, Stanford, CA, USA

mechanism of ESPB is still not conclusively established, the motor-sparing characteristic may be due to the differential effect of a small volume and low concentration of local anesthetic with a high pKa (e.g., ropivacaine) reaching the brachial plexus and preferentially blocking C fibres more than A nerve fibres, which affect nociception and motor conduction, respectively.<sup>5</sup> The prospect of providing analgesia in a wide cervicothoracic dermatomal distribution without brachial plexus motor or phrenic nerve blockade makes the cervical or high-thoracic ESPB an enticing alternative to an interscalene block in selected clinical scenarios. These cases raise the possibility of the “holy grail” in regional anesthesia—a *differential peripheral nerve block*.

**Conflicts of interest** None declared.

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

## References

1. Forero M, Rajarathinam M, Adhikary SD, Chin KJ. Erector spinae plane block for the management of chronic shoulder pain: a case report. *Can J Anesth* 2018; 65: 288-93.
2. Tsui BC, Mohler D, Caruso TJ, Horn JL. Cervical erector spinae plane block catheter using a thoracic approach: an alternative to brachial plexus blockade for forequarter amputation. *Can J Anesth* 2019; 66: 119-20.
3. Hamadnalla H, Elsharkawy H, Shimada T, Maheswari K, Esa WA, Tsui BC. Cervical erector spinae plane block catheter for shoulder disarticulation surgery. *Can J Anesth* 2019; DOI: 10.1007/s12630-019-01421-9.
4. Tsui BC, Fonseca A, Munshey F, McFadyen G, Caruso TJ. The erector spinae plane (ESP) block: a pooled review of 242 cases. *J Clin Anesth* 2019; 53: 29-34.
5. Kii N, Yamauchi M, Takahashi K, Yamakage M, Wada T. Differential axillary nerve block for hand or forearm soft-tissue surgery. *J Anesth* 2014; 28: 549-53.

**Publisher's Note** Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.