Case Report

Midpoint transverse process to pleura catheter placement for postoperative analgesia following video-assisted thoracoscopic surgery

D. E. Watton,¹ P. G. D. Rose,¹ F. W. Abdallah,² C. P. Thompson,² D. E. Maziak^{3,4} and I. Costache²

¹ Fellow, ² Anesthesiologist, Department of Anesthesiology and Pain Medicine, University of Ottawa, ON, Canada

³ Thoracic Surgeon, Surgical Oncology Division of Thoracic Surgery, The Ottawa Hospital, ⁴ Professor, University of Ottawa, ON, Canada

Summary

The ultrasound-guided midpoint transverse process to pleura block has been described as an alternative end-point for thoracic paravertebral blockade. Although originally described as a single-level block, midpoint transverse process to pleura blockade may cover more than one level when larger volumes of injectate are used. Moreover, a continuous catheter midpoint transverse process to pleura blockade technique was previously thought to be unfeasible. We report three cases where a midpoint transverse process to pleura continuous catheter technique was successfully used for postoperative analgesia following video-assisted thoracoscopic surgery.

Correspondence to: I. Costache

Email: icostache@toh.ca

Accepted: 13 June 2019

Keywords: catheter; regional anaesthesia; thoracic paravertebral; ultrasound

Twitter: @Faraj_RegAnesth; @calvin_calvint; @lcostacheloana

Introduction

The midpoint transverse process to pleura (MTP) block has been described as an alternative end-point for thoracic paravertebral blockade [1]. The original description used multiple level injections for breast surgery. There have been subsequent case reports of its use in breast surgery [2, 3] and video-assisted thoracoscopic surgery (VATS) [4]. A recent report describes a single-level MTP block for surgical anaesthesia during breast surgery and supports the suggestion of multiple nerve root coverage from a single injection [3]. The placement of MTP catheters for continuous local anaesthetic infusion has not been described. We report the feasibility and efficacy of MTP catheter placement and use for postoperative analgesia in patients undergoing VATS procedures.

Report

Three patients undergoing VATS procedures received postoperative analgesia through MTP catheters that were placed, with ultrasound, pre-operatively (Table 1). All patients received pre-operative multi-modal analgesia and intravenous (i.v.) midazolam before the procedure. The catheters were placed under real-time ultrasound guidance, using a parasagittal approach with an HFL-50 15–6 MHz linear transducer (Sonosite M-Turbo, Bothell, WA, USA) or 11L 3.4–10.8 MHz linear transducer (LOGIQ S7 Expert; General Electric, Chicago, IL, USA). The transverse process at the planned thoracic level was identified by ultrasound, and a 17-gauge Tuohy needle was advanced in-plane from caudad to cephalad, until the needle tip

Table 1 A description of patient baseline characteristics, MTP blockade parameters and the agents used for anaesthesia and peri-operative analgesia.

	Patient 1	Patient 2	Patient 3
Surgical procedure	Video-assisted thoracoscopic right upper lobe lobectomy for adenocarcinoma	Video-assisted thoracoscopic left upper lobe segmentectomy for carcinoid	Video-assisted thoracoscopic left upper lobe lobectomy for metastatic disease
Age (years)	65	66	57
Sex	Female	Male	Male
Weight (kg)	62	89	118
Co-morbidities	Previous left lower lobectomy	Metastatic colon cancer, diabetes mellitus and hypertension	Previous upper back melanoma resection, cerebral meningioma, benign prostatic hypertrophy.
Level of catheter placement	T5	T4	T4
Pre-operative medications	Acetaminophen 975 mg Celecoxib 400 mg Pregabalin 25 mg	Acetaminophen 975 mg Pregabalin 100 mg	Acetaminophen 975 mg Celecoxib 200 mg Pregabalin 50 mg
Induction medications	Midazolam 1.5 mg Fentanyl 150 µg Propofol 170 mg Rocuronium 50 mg	Midazolam 1.5 mg Propofol 200 mg Fentanyl 200 µg Ketamine 10 mg Rocuronium 50 mg	Midazolam 2 mg Fentanyl 250 µg Propofol 300 mg Lidocaine 60 mg Rocuronium 50 mg
Intra-operative anaesthesia and analgesia	Desflurane 0.9–1.1 MAC Dexamethasone 8 mg Fentanyl 50 µg	Desflurane 0.7–0.9 MAC Fentanyl 50 µg Hydromorphone 0.6 mg	Sevoflurane 0.9–1.1 MAC Dexamethasone 8 mg Hydromorphone 1.4 mg
MTP catheter infusion	Ropivacaine 0.2% at 10 ml.h ⁻¹ , 5 ml patient-controlled bolus with 30-min lockout	Ropivacaine 0.2% at 10 ml.h ⁻¹ , 8 ml patient-controlled bolus with 30-min lockout	Ropivacaine 0.2% at 10 ml.h ⁻¹ , 8 ml patient-controlled bolus with 30-min lockout
Postoperative analgesia	Regular acetaminophen, celecoxib and pregabalin	Regular acetaminophen, tramadol and pregabalin	Regular acetaminophen, tramadol, celecoxib, and pregabalin
MTP catheter boluses	Three on postoperative day zero Seven on postoperative day one	Two on postoperative day zero Two on postoperative day one	Seven on postoperative day zero Ten on postoperative day one
QOR-15 scores	Day 1: 125/150 Day 2: 146/150	Day 1: 144/150 Day 2: 147/150	Day 1: 115/150 Day 2: 128/150

MTP, Midpoint transverse process to pleura; MAC, minimum alveolar concentration; QOR, quality of recovery.

was located midway between the posterior border of the transverse process and pleura. Needle tip position was also confirmed with injection of 2 ml dextrose 5%. For patient 1, a 17-gauge Tuohy needle (Smiths Medical ASD, Keene, NH) with a 20-gauge catheter was used. For patients 2 and 3, a 17-gauge Tuohy needle (Arrow StimuCath®, Teleflex, Reading, PA, USA), with a 19-gauge catheter was used.

The MTP block end-point was located at 5 cm in patient 1, and the catheter was inserted to 5.5 cm at the skin. A 20-ml volume of 0.5% ropivacaine with adrenaline (1:400,000) was injected via the catheter. Dynamic scanning confirmed local anaesthetic spread and the catheter tip position posterior to the superior costotransverse ligament (Fig. 1). In patient 2, the MTP end-point was at 4 cm, and the catheter was inserted to 6 cm at the skin. A 5 ml volume of 0.25% ropivacaine with adrenaline (1:400,000) was injected via the needle, followed by an additional 25 ml via the catheter. In patient 3, the MTP depth was identified at 4 cm, and the catheter was inserted to 5.5 cm at skin. A 20-ml volume of 0.5% ropivacaine with adrenaline (1:400,000) was injected via the needle, followed by an additional 10 ml via the catheter. Anterior pleural displacement was observed with catheter injection in all three patients [5].

Figure 1 Ultrasound image of local anesthetic spread and catheter tip position posterior to the superior costotransverse ligament (SCTL). PVS, paravertebral space.

Postoperatively, a continuous catheter infusion with additional patient-controlled boluses was used. All three patients reported high satisfaction with their pain control and had minimal opioid consumption. Patient 1 reported a numeric rating scale (NRS) pain score of 2–3/10 and a sensory block in the T1–5 dermatomes in the recovery area. Pain on postoperative day 1 was reported as 5/10 at rest and with movement and sensory blockade was confirmed over the T3–8 dermatomes. Patient 2 reported pain NRS ranging from 0–2/10 in the recovery area and averaged 1/10 on postoperative days one and two. Patient 3 reported pain NRS between 3–4/10 in the recovery area and on postoperative day 1. Sensory blockade was confirmed over the T3–T9 dermatomes on postoperative day one. Patients 1 and 2 were discharged home on postoperative day two and Patient 3 on postoperative day one. Assessment of postoperative quality of recovery on postoperative day two using the QoR-15 scale indicated that Patients 1 and 2 achieved excellent quality of recovery (146/150 and 147/150), while Patient 3 had good recovery (128/150) by postoperative day two [6,7]. There were no block-related complications, such as infection, pneumothorax, catheter leak, catheter failure or catheter dislodgement. There were no opioid-related side-effects such as excessive sedation, pruritis, postoperative nausea and vomiting.

Discussion

Despite its minimally invasive nature, VATS procedures are still associated with moderate to severe postoperative pain that may compromise pulmonary function and increase the risk of chronic pain [8]. Guidelines for enhanced recovery after lung surgery, which are based on strong evidence, recommend the use of regional anaesthesia techniques [9]. Comparisons between thoracic epidurals and paravertebral blockade suggest the latter may provide analgesia that is as good as a thoracic epidural, while at the same time reducing the incidence of pulmonary complications and hypotension in patients undergoing thoracic surgery [10, 11]. There has been a move towards minimally invasive approaches to thoracic surgery favouring the use of paravertebral blockade as part of multi-modal analgesia [11]. Clinicians are now seeking less invasive nerve block techniques that better safeguard the pleura, nerves and vasculature, and the MTP block satisfies these criteria.

This report demonstrates the novel and effective use of continuous MTP blockade. All three patients maintained effective postoperative analgesia lasting several days, confirming the benefits of a continuous catheter infusion. The MTP block offers two technical advantages. First, compared with the classical ultrasound-guided paravertebral block, MTP blockade does not require visualisation of the superior costotransverse ligament. Second, the MTP injection target is shallower which might potentially reduce the risk of accidental pleural or neurovascular injury.

A perceived limitation of the MTP block is that a continuous catheter technique is not feasible [2]. This perception may be due to the absence of a discrete defined plane posterior to the superior costotransverse ligament where a catheter can be

threaded. Challenging this assumption, we were able to easily thread the catheters 0.5 cm, 2.0 cm and 1.5 cm for Patients 1, 2 and 3, respectively, beyond the needle tip. Furthermore, our clinical observation, that all patients report immediate improvement of analgesia when boluses are administered, indicates that catheters were maintained in the desired anatomical site. Finally, the measurable sensory block suggests that local anaesthetic solutions reached the paravertebral space. Importantly, we have demonstrated multiple dermatome spread using the MTP block, a spread we had thought required multiple injections [1].

In summary, continuous MTP blockade appears to be a safe and effective technique to provide postoperative analgesia and sensory blockade to multiple thoracic dermatomes. Future research should compare this technique with continuous paravertebral blockade.

Acknowledgements

Published with the written consent of the three patients. No external funding or competing interests to declare.

References

1. Costache I, de Neumann L, Ramnanan CJ, Goodwin SL, Pawa A, Abdallah FW, McCartney CJL. The mid-point transverse process to pleura (MTP) block: a new end-point for thoracic paravertebral block. *Anaesthesia* 2017; **72**: 1230–6.
2. Bhoi D, Narasimhan P, Nethaji R, Talawar P. Ultrasound-guided midpoint transverse process to pleura block in breast cancer surgery: a case report. *Anesthesia and Analgesia: Practice* 2019; **12**: 73–6.
3. Costache I. Mid-point transverse process to pleura block for surgical anaesthesia. *Anaesthesia Reports* 2019; **7**: 1–3.
4. Scimia P, Fusco P, Droghetti A, Harizaj F, Basso Ricci E. The ultrasound-guided mid-point transverse process to pleura block for postoperative analgesia in video-assisted thoracoscopic surgery. *Minerva Anestesiologica* 2018; **84**: 767–8.
5. Watton DR, Rose PGD, Abdallah FW, Thompson CP, Maziak DE, Costache I. Midpoint transverse process to pleura catheter placement for postoperative analgesia following video-assisted thoracoscopic surgery, 2019. <https://youtu.be/6q1OVYoLZJ4> (accessed 02/07/2019).
6. Stark PA, Myles PS, Burke JA. Development and Psychometric Evaluation of a Postoperative Quality of Recovery Score. *Anesthesiology* 2013; **118**: 1332–40.
7. Kleif J, Ismail G. Severity classification of the quality of recovery-15 score An observational study. *Journal of Surgical Research* 2018; **225**: 101–7.
8. Richardson J, Sabanathan S. Pain management in video assisted thoracic surgery: evaluation of localised partial rib resection. A new technique. *Journal of Cardiovascular Surgery* 1995; **36**: 505–9.
9. Batchelor T, Rasburn N, Abdelnour-Berchtold E, et al. Guidelines for enhanced recovery after lung surgery: recommendations of the Enhanced Recovery After Surgery (ERASVR) Society and the European Society of Thoracic Surgeons (ESTS). *European Journal of Cardio-Thoracic Surgery* 2019; **55**: 91–115.
10. Scarci M, Joshi A, Attia R. In patients undergoing thoracic surgery is paravertebral block as effective as epidural analgesia for pain management? *Interactive Cardiovascular and Thoracic Surgery* 2010; **10**: 92–6.
11. Short HL, Kamalanathan K. Has analgesia changed for lung resection surgery? *Anaesthesia* 2018; **73**: 412–16.