Case Report

Analgesic efficacy of paraspinal interfascial plane blocks performed with the use of neurophysiology monitoring for posterior cervical laminectomy surgery: a case series

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Abstract: Posterior cervical spine surgery often requires large posterior midline incision which can result in poorly controlled postoperative pain, arises from iatrogenic mechanical damage, intraoperative retraction and resection to structures such as bone, ligaments, muscles, intervertebral disks, and zygapophysial joints. Local anesthetics may be utilized for infiltration of the surgical wound; however, their analgesic efficacy has not been studied in this surgical approach. Here we report a case series. Given the potential for targeted sensory dorsal ramus nerve blocks to provide better and extended analgesia, we explored the feasibility of using cervical paraspinal interfascial plane (PIP) blocks in conjunction with neurophysiologic monitoring for postoperative analgesia after posterior cervical laminectomy. Our experience with the cervical paraspinal interfascial plane blocks has revealed that they can be used safely without affecting neurophysiologic monitoring and result in better pain control and reduced opiate use in the postoperative period. Cervical PIP blocks may be useful in controlling pain for posterior cervical laminectomy surgery without compromising neurophysiologic monitoring.

Keywords: Posterior cervical laminectomy; paraspinal interfascial plane blocks; neurophysiologic monitoring; postoperative analgesia; case report; cervical multifidus plane block (CMP block); cervical semispinalis cervicis plane block (CCeP block)

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Introduction

Decompression of the spinal cord via cervical laminectomy surgery is common in the treatment of spondylotic cervical myelopathy. Posterior cervical spine surgery often involves a deep midline incision, mobilization of paraspinal muscles and resection of bone, which can cause significant post-surgical pain and discomfort in the postoperative period (1,2). Local anesthetics infiltration of the surgical wound is often utilized, but they often have limited effect. Given the potential for targeted nerve blocks to provide better and extended analgesia, we explored their use as part of a multimodal analgesic regimen for posterior cervical spine surgery and observed their effects on neurophysiologic monitoring.

Paraspinal interfascial plane (PIP) blocks are a category of peripheral nerve blocks which are promising options for postoperative analgesia after lumbar spine surgery (3,4). In 2017, multiple cervical PIP blocks, such as cervical interfascial plane (CIP) and multifidus cervicis plane (MCP) blocks were described to target the dorsal rami nerves in the cervical region (5). We hypothesized that the cervical PIP blocks would be effective for spinal surgery of the neck

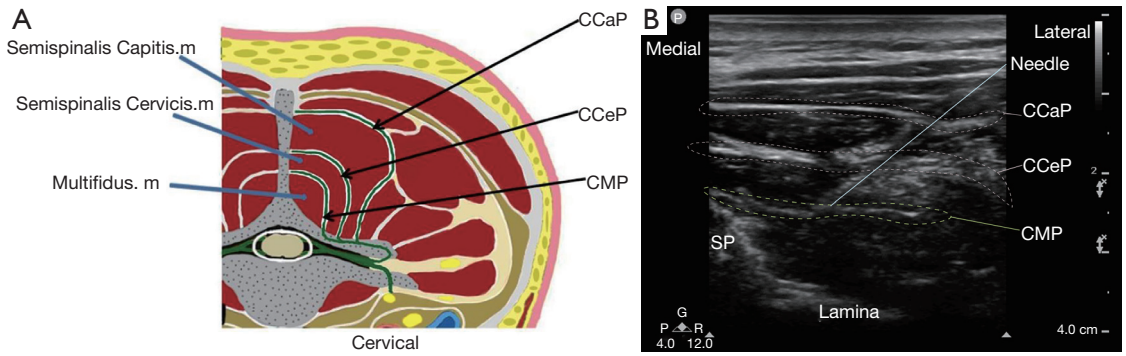

Figure 1 The cervical paraspinal interfacial planes (PIPs) (A) and ultrasound guided cervical multifidus plane (CMP) block (B). CMP, cervical multifidus plane; CCeP, cervical semispinalis cervicis plane; CCaP, cervical semispinalis capitis plane; Green line, Ventral ramus nerve, dorsal ramus nerve and its branches; m, muscle; SP, spinal process. "Figure 1A" is originally from the article (6). Permission has obtained from the original publisher.

and offered them to patients who were scheduled for neck surgery involving a posterior midline incision. For clarity, we have chosen to adopt our proposed naming scheme to differentiate between the numerous types of PIP blocks (6,7).

We present a series of cases documenting our experience with two different ultrasound- guided cervical PIP blocks: the cervical semispinalis cervicis plane (CCeP) block and the cervical multifidus plane (CMP) block (see *Figure 1*). All three patients had intraoperative neurophysiologic monitoring as part of the surgeon's routine practice. In all cases, somatosensory evoked potentials (SSEPs) were monitored by way of the median, ulnar and the posterior tibial nerves. Upper extremity motor evoked potentials (MEPs) were recorded from the trapezius, deltoid, brachioradialis, triceps and biceps brachii muscles. All three patients received total intravenous anesthesia with propofol and remifentanil infusions at the discretion of the intraoperative anesthesiologist. All cervical PIP blocks were performed intraoperatively utilizing a 10 cm, 21 G, EchoBlock needle (Havel's, Cincinnati, OH, USA) using ultrasound guidance utilizing a 4–12 MHz linear probe (Philips, Bothell, WA, USA) under sterile conditions. An in-plane, lateral to medial approach was utilized. The nerve blocks were performed by the same team of acute pain anesthesiologists consisting of an attending and a fellow. Postoperatively, hydromorphone patient-controlled analgesia (PCA) was initiated in the post anesthesia care unit (PACU) for pain control.

We present the following article in accordance with the AME Case Series reporting checklist (available at http://dx.doi.org/10.21037/jss-20-644).

Case presentation

Case 1

A 54-year-old female with past medical history of multiple cervical spine surgeries, chronic obstructive pulmonary disease, and hypothyroid underwent revision posterior decompressive laminectomy of the cervical spine with fusion from C3 to C7. At the end of the case, with the patient still anesthetized and in the prone position, an ultrasound guided CCeP block was performed bilaterally at C5 level, with injection of 10 mL 0.25% bupivacaine with 1:200,000 epinephrine (20 mL total dose). In order to confirm that the spread of local anesthetic did not affect the motor function, SSEPs and MEPs recordings were acquired every 5 min for 15 min after the block. No changes were noted in comparison to the baseline. On postoperative day 0, the patient experienced minimal pain until 8 hr postoperatively. She first requested a very small dose of opiate medication via PCA at 6 hr postoperatively (see *Table 1*).

Case 2

A 47-year-old male with past medical history of hypertension, depression, substance abuse, diagnosis of cervical spinal stenosis and cervical herniated disk, status post anterior cervical disk excision and fusion, presented for C3 to C6 posterior laminectomies. At the completion of surgery, before emergence and in the prone position, an ultrasound-guided CMP block was performed bilaterally with injection of 10 mL 0.5% bupivacaine HCL with 1:200,000 epinephrine mixed with 2 mg of dexamethasone

Table 1 Postoperative pain score and opiate consumption

	6H Postop	12H Postop	24H Postop
Pain Score (NRS)			
Case 1	6	3	10
Case 2	3	4	9
Case 3	3	3	10
Opiate use			
Case 1	4 mg	52 mg	82 mg
Case 2	2.6 mg	34 mg	51 mg
Case 3	0 mg	22 mg	34 mg

NRS scores out of a maximum of 10. Aggregate opiate use at each time point measured in oral morphine milligram equivalent (MME) converted from total opiate use (PO + IV). IV hydromorphone converted 1.5:10 MME. Oxycodone converted 1 to 1.5 MME.

on each side at the C5 level. After local anesthetic injection, SSEPs and MEPs were recorded every 5 min for 15 min. No amplitude/latency changes were observed relative to the baseline. The patient was evaluated in PACU and reported minimal pain (see *Table 1*).

Case 3

A 63-year-old female with past medical history of hypertension, HIV, GERD, status post gastric bypass, with diagnosis of cervical stenosis and cervical myelopathy at C3 to C5, was scheduled for posterior laminectomy from C3 to C4 and segmental instrumentation and fusion from C2 to C5. After he was placed in the prone position and after baseline MEPs and SSEPs were obtained, we performed bilateral CMP blocks with injection of 10 mL 0.5% bupivacaine HCL with 1:200,000 epinephrine mixed with 2 mg of dexamethasone on each side at the C4 level. No changes in MEPs or SSEPs were observed during or after the case, compared with baseline. Patient reported satisfactory pain control in PACU (see *Table 1*).

All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from the patient.

Discussion

It is difficult to draw strong conclusions as the study has limitations typical of other case series. First, our observations are limited to three patients. Second, we did not standardize the type of block or dose of local anesthetic. Third, the analgesic effect we report needs to be studied in larger populations.

However, the data garnered does suggest the cervical paraspinal interfascial plane blocks (CMP and CCeP blocks) may be considered as a part of multimodal analgesia in posterior cervical spinal surgery. Patients reported good pain control within the first several hours postoperatively. Of note, we saw that patients' numeric rating scale (NRS) scores and opioid consumption were low throughout the first 12 hr and that patients had significantly more opiate use after 12 hr postoperatively. This likely indicates expiration of nerve blocks at 12 hr as pain generally decreases with time from surgery (*Table 1*).

Initially, we utilized 0.25% bupivacaine with epinephrine for the nerve blocks. On postoperative day 1, Patient 1 described satisfactory analgesia until about 8 hr after surgery. Thus, for subsequent blocks, we used 0.5% bupivacaine HCL with 1:200,000 epinephrine mixed with 4 mg of dexamethasone in an attempt to prolong the analgesic effects.

A published meta-analysis has suggested neurophysiologic monitoring may be a useful diagnostic tool for detection of intraoperative neural damage (8). Cervical PIP blocks provide the opportunity to evaluate if local anesthetics injected in the proximity of the dorsal ramus is isolated from the ventral ramus and neuraxial space (9). In all three cases reported herein, we were able to assess the effect of cervical

PIP blocks on neurophysiologic monitoring; no changes resulting from local anesthetic spread were observed. This is consistent with our expectations given that the MEPs and SSEPs monitoring utilized at our institution test innervation originating from the ventral rami of cervical spinal nerves (other than the trapezius which receives motor function from cranial nerve XI), and the expected effect of the PIP blocks should be limited to the dorsal rami of the spinal nerves. Nevertheless, we considered there was a possibility that neurophysiologic monitoring could be affected due to previous reports (9). We anticipated that the CMP block could parallel the Lumbar multifidus plane (or thoracolumbar interfascial plane) block in its attenuation of SSEPs while the CCeP block could mirror the Lumbar longissimus plane (or modified thoracolumbar interfascial plane) block in producing no effect on neurophysiologic monitoring. It seems, however, that both the CMP and CCeP blocks may be safe to use without impacting neurophysiologic monitoring regardless whether the block is administered pre- or postoperatively. We caution, however, that larger volumes of local anesthetic injection may result in more significant spread of local anesthetic. Further study is required in order to determine the ideal volume for injection. Similarly, the possibility of intrathecal spread should be considered if the dura is breached during cervical spinal surgery.

Conclusions

We observed an impressive clinical effect, albeit of limited duration, for this small cohort of patients who traditionally have experienced debilitating pain postoperatively (10). Our observations suggest that cervical PIP blocks may be useful in controlling pain without compromising intraoperative neurophysiologic monitoring or producing motor or sensory deficits which could interfere with extubation and assessment of postoperative neurological function. While more research will be required to compare the CMP to the CCeP blocks and placebo, our experience implies that both are a promising modality for pain control in posterior cervical spinal surgery and could be considered as part of a multimodal analgesic regimen.

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Footnote

Reporting Checklist: The authors have completed the AME Case Series reporting checklist. Available at http://dx.doi.org/10.21037/jss-20-644

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at http://dx.doi.org/10.21037/jss-20-644). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from the patient.

References

1. Datta G, Gnanalingham KK, Peterson D, et al. Back pain and disability after lumbar laminectomy: is there a relationship to muscle retraction? Neurosurgery 2004;54:1413-20.
2. Gerbershagen HJ, Aduckathil S, van Wijck AJ, et al. Pain intensity on the first day after surgery: a prospective cohort study comparing 179 surgical procedures. Anesthesiology 2013;118:934-44.
3. Ueshima H, Hara E, Otake H. Thoracolumbar interfascial plane block provides effective perioperative pain relief for patients undergoing lumbar spinal surgery; a prospective, randomized and double blinded trial. J Clin Anesth 2019;58:12-7.
4. Spivak A, Xu Jeff L. Ultrasound-guided paraspinal intrefascial plane blocks for postoperative analgesia on

spine surgery. J Spine Surg 2019;5:601-2.
5. Ohgoshi Y, Kurahashi K. Cervical interfascial plane (CIP) block and multifidus cervicis plane (MCP) block: Similarities and tips. J Clin Anesth 2017;41:55.
6. Xu JL, Tseng V. A proposal to standardize the nomenclature for paraspinal interfascial plane blocks. Reg Anesth Pain Med 2019;44:1106-7.
7. Xu JL, Tseng V, Shabsigh M. Paraspinal interfascial plane blocks: a well-defined novel terminology becomes clinically essential. Reg Anesth Pain Med 2020;45:750-1.
8. Di Martino A, Papalia R, Caldaria A, et al. Should evoked potential monitoring be used in degenerative cervical spine surgery? A systematic review. J Orthop Traumatol 2019;20:19.
9. Xu JL, Doherty T, Patel R, et al. Analgesic efficacy of ultrasound-guided modified thoracolumbar interfascial plane block performed with the use of neurophysiology monitoring for postoperative lumbar surgery. J Clin Anesth 2019;52:21-3.
10. Sharma S, Balireddy RK, Vorenkamp KE, et al. Beyond opioid patient-controlled analgesia: a systematic review of analgesia after major spine surgery. Reg Anesth Pain Med 2012;37:79-98.

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