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Efficacy of Erector Spinae Plane Block for Back Pain Referred from Visceral Pain in the Palliative Care Setting

Kayo Takimoto, MD
Mayu Ono, MD

Background: Erector spinae plane (ESP) block, an easy and safe interfascial plane block under ultrasound guidance, has an analgesic effect in various surgeries for chronic pain. However, no study has described the possible clinical efficacy of ESP block in palliative patients suffering from back pain referred from visceral pain.

Case Report: Here we report three cases of successful ESP block at the middle to lower thoracic vertebras with 5–10 mL local anesthetic to relieve back pain referred from thoracic or abdominal visceral cancer pain. Back pain in these cases was derived from spinal extensor muscles supplied by the dorsal rami of the spinal nerve. Thoracic or abdominal visceral pain was suggested to stimulate the middle to lower thoracic dorsal rami of the spinal nerve.

Conclusion: Despite the effect of ESP block on the ventral rami of the spinal nerve being uncertain, back pain accompanied by the lateral and medial branches of the dorsal rami of the spinal nerve, similar to that in these cases, can be relieved via ESP block. Therefore, ESP block can be easily and safely performed for relieving back pain referred from visceral pain in the palliative care setting. Further, to establish optimal volume, concentration of local anesthetic, and clinical efficacy, randomized control trials will be essential in the future.

Key words: Erector spinae plane block, fascial plane block, referred pain, palliative care setting, dorsal rami of the spinal nerve, ventral rami of the spinal nerve, visceral pain, chronic pain

From: Department of Anesthesiology, Ikeda City Hospital, Osaka, Japan
Corresponding Author: Kayo Takimoto, MD, Department of Anesthesiology, Ikeda City Hospital, 3-1-18, Ikeda City, Osaka, Japan, 563-8610
E-mail: onomayu@gmail.com
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BACKGROUND

Erector spinae plane (ESP) block, an easy and safe interfascial plane block under ultrasound guidance, is effective as part of a multimodal analgesia in various surgeries with few side effects (1-6). Some studies have reported that the ESP block is used for the management of chronic pain (1,2,6,7). However, no study has described the possible clinical efficacy of the ESP block in palliative care settings.

Herein, we report 3 cases of ESP block to relieve back pain referred from thoracic or abdominal visceral cancer pain.

CASE REPORTS

Case 1

A 53-year-old man weighing 49 kg with tumor, node, metastasis (TNM) stage 4 esophageal cancer suffering from epigastric pain due to lymph node metastasis around the celiac artery received high-dose opioid and adjuvant therapy, which were partially effective. After the neurolytic retrocrural celiac plexus block was performed, pain scores using the Numeric Rating Scale (NRS-11; ranging from 0 to 10) were reduced from 10 (preblock) to 2 (postblock). Five days after the procedure, he complained of quite severe back pain and moderate right flank pain, for which immediate-release opioid treatment and other adjuvant therapies did not offer adequate analgesia. Back pain was located in the cranio-to-caudal direction at 1 to 2 cm right lateral of the T10 and T11 spinous processes. Right flank pain was located on a slightly rear side of the midaxillary line along the 10th and 11th ribs. At these sites, tenderness was present and hyperalgesia and allodynia were absent. Further, spinal extension worsened his back pain. We decided to perform a unilateral ESP block and obtained written informed consent.

He was placed in the prone position, and an ESP block was performed at the right T10 transverse process from the caudal to cranial side in an in-plane direction using a high-frequency linear ultrasound transducer and a 38-mm 25-gauge long-bevel needle. A total of 10 mL of 0.4% levobupivacaine was administered, creating a hydrodissectional space on the ventral fascial plane of the erector spine muscle. Then, 15 minutes after the ESP block, he was completely pain-free as indicated by an NRS-11 score of 0. Four days later, moderate pain recurred on the same location, and the second ESP block was performed with 10 mL of 0.25% levobupivacaine. The same effect as that in the first ESP block was observed.

He was transferred to hospice without the recurrence of back pain after 16 days and died 38 days after the first ESP block.

Case 2

A 66-year-old woman weighing 40 kg with TNM stage 4 lung cancer suffering from precordial pain due to mediastinal lymph node metastasis received a high-dose opioid and achieved a satisfying analgesia (NRS-11 score of 2). However, back pain remained significant, and immediate-release opioid treatment did not offer adequate analgesia. Oral ingestion, including drinking water, was impossible because of the midesophageal obstruction due to mediastinal lymph node metastasis; therefore, adjuvant pain therapy was limited, and effective analgesia was not obtained. Back pain was located in the cranio-to-caudal direction at 1 to 2 cm bilateral to the T6 and T7 spinous processes. Tenderness was present and hyperalgesia and allodynia were absent at the bilateral paraspinal area. When she was referred to our department, she had been sleeping in a sitting position at night for a few months because spinal extension worsened her back pain. Salvage radiation therapy was planned for mediastinal lymph node metastasis, but she could not be in a supine position even for 10 minutes during the radiation therapy due to her back pain. We decided to perform a bilateral ESP block and obtained written informed consent.

She was placed in a sitting position, and an ESP block was performed at the bilateral T7 transverse process using the same procedure as that used in Case 1. Then, 5 mL of 0.4% levobupivacaine was bilaterally administered with hydrodissection, and 15 minutes after the ESP block, she was completely pain-free as indicated by an NRS-11 score of 0. Further, the ESP block elicited sensory loss, as measured by the cold test using ice, 9 cm laterally from the spinous process and 6 cm craniocaudally from the insertion point. We performed a bilateral ESP block with 5 mL of 0.25% levobupivacaine 6 times within the next 2 weeks. The same effect as that in the first ESP block was observed every time, and 37.5 Gy in 15 fractions of salvage radiation therapy was completed, as scheduled. Thereafter, her back pain remained at NRS-11 scores of 1 to 2, and she did not need another ESP block and received small-molecule therapy.

Case 3

A 44-year-old woman weighing 41 kg with TNM stage 4 urachal carcinoma suffering from lower abdominal pain due to a 5 × 10-cm abdominal wall invasion just below the umbilicus received a small-dose opioid and achieved a satisfying analgesia (NRS-11 score of 2) for her abdominal pain. However, she complained of severe back pain and could not sleep in a supine position. Immediate-release opioid treatment did not offer adequate analgesia. Back pain was located in the cranio-to-caudal direction at 1 to 2 cm bilateral to the T10 and T11 spinous processes. Tenderness was present and hyperalgesia and allodynia were absent at the bilateral paraspinal area. Spinal extension worsened her back pain. Therefore, we decided to perform a bilateral ESP block and obtained written informed consent.

She was placed in the sitting position, and an ESP block was performed at the bilateral Th10 transverse process using the same procedure as that used in Case 1. Then, 5 mL of 0.4% levobupivacaine was bilaterally administered with hydrodissection, and 15 minutes after the ESP block, she was completely pain-free, down from an NRS-11 score of 10. Ten days later, her abdominal pain had increased and moderate back pain recurred at the same location. The second ESP block was performed with 10 mL of 0.25% levobupivacaine. The same effect as that in the first ESP block was observed.

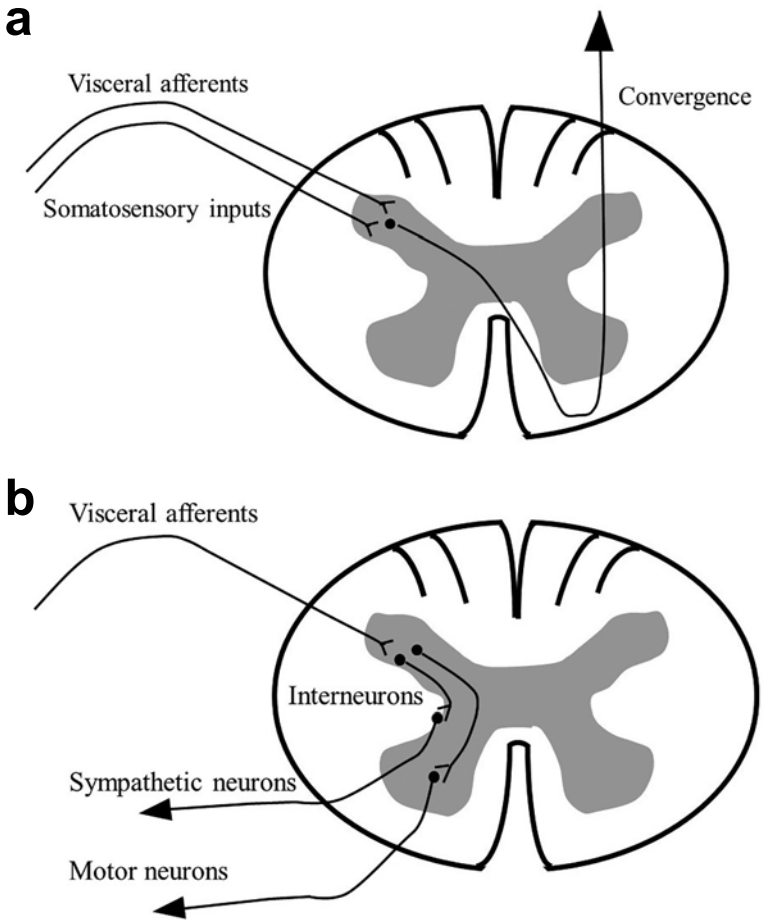

Fig. 1. Neural pathway diagrams of viscerosomatic convergence (a) and reflex (b).

DISCUSSION

We diagnosed back pain in these cases as referred pain because it occurred as the visceral pain worsened. The precise neural substrate of referred pain is unknown; however, the convergence of visceral and somatic afferents onto interneurons in the dorsal horn of the spinal cord is one of the most widely accepted theories (8-10). Furthermore, severe ongoing visceral input can activate motor neurons and sympathetic efferents and then produce increased muscle tone and spasm at the same spinal segment (9,10). The former and latter are known as viscerosomatic convergence and viscerosomatic reflex, respectively (Fig. 1).

Back pain in these cases was derived from spinal extensor muscles, which were erector spinae muscles (iliocostalis, longissimus, and spinalis) and deeper muscles (transversospinalis and levatores costorum). Thoracic or abdominal visceral pain input was considered to develop viscerosomatic convergence and viscerosomatic reflex in the middle to low thoracic spinal segments. Consequently, pain was felt at the spinal extensor muscles. Erector spinae and levatores costorum muscles are supplied by the lateral branch of the dorsal rami of the spinal nerve, and transversospinalis muscles are supplied by the medial branch of the dorsal rami of the spinal nerve (11). In the present study, ESP blocks relieved

skeletal muscle pain because they were effective for the dorsal rami of the spinal nerve.

The injectate distribution patterns and clinical efficacy of the ESP block remain unclear. Some studies have reported that a local anesthetic spreads ventrally through the costotransverse foramen into the paravertebral space and generates an extensive blockade of the ventral and dorsal rami of the spinal nerves and white and gray rami communicantes (4-6,12). Other studies have demonstrated restricted distribution that involves only the posterior to the costotransverse foramen (13-15). One cadaveric study described the spread of 20 mL of dye on the dorsal rami and its innervating muscles, erector spinae, and levatores costorum (13).

At least, the blockade of the dorsal rami of the spinal nerve can be definitely obtained via ESP block, despite the effect of the ESP block on the ventral rami being uncertain.

The efficacy of the ESP block at the middle to lower thoracic transverse processes for both branches of the dorsal rami was observed in all cases. We could not confirm the blockade of the ventral rami of the spinal nerve in any case.

In Case 1, right flank pain was also relieved by the ESP block. This effect may be because local anesthetic spreads laterally within the plane of the deep to the serratus anterior muscles, and within the superficial plane to the intercostal muscles, which are contiguous with the ESP. Local anesthetic spreading on this plane can potentially reach the intercostal nerve or lateral cutaneous branches of the intercostal nerves (4,5).

In these 3 cases, bone metastasis, facet joint pain, and posterior cutaneous nerve entrapment syndrome (POCNES) were considered as differential diagnoses of back pain (16). Imaging studies did not indicate bone metastasis or facet joint abnormalities in any case. Facet joint pain was not indicated because patients did not report the pain, such as pain radiating into a somewhat larger area; furthermore, a specific point of maximum pain was absent or concerned multiple overlapping dermatomes (16). POCNES was not indicated because no skin somatosensory abnormalities were reported in any case.

The exact relationship among local anesthetic volume, concentration, spread, and effectiveness is still under investigation. In these cases, the analgesic effect was obtained in 2 to 3 vertebral levels centered on the level of injection of 5 to 10 mL of local anesthetic. The results of our study are consistent with those of previous reports (2,4,5).

CONCLUSION

The ESP block is an effective, easy, and safe analgesic technique for the treatment of spinal extensor pain referred from visceral pain in the palliative care setting. To establish optimal volume, concentration of local anesthetic, and clinical efficacy, randomized controlled trials will be essential in the future.

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