

PARAPARESIS AFTER ULTRASOUND-GUIDED LUMBAR ERECTOR SPINAE PLANE BLOCK: A CASE REPORT AND REVIEW

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- Background:** Erector spinae plane block (ESPB) is an interfascial block used to manage perioperative acute and chronic pain. Local anesthetics administered during the procedure may occasionally cause temporary motor block.
- Case Report:** A 39-year-old woman presented with low back and right leg pain due to lumbar disc herniation. Her neurological examination was normal. Under ultrasound guidance, ESPB was performed at the right L4 level using 20 mL of a solution containing bupivacaine, saline, and dexamethasone. Fifteen minutes later, she had decreased motor strength in the right lower extremity and mild weakness on the left. Muscle strength and sensation returned to normal within 18 hours.
- Conclusions:** Evidence concerning ESPB complications and the optimal volume and concentration of local anesthetic remains limited. Further research is needed to evaluate its safety.
- Keywords:** Paraparesis, low back pain, erector spinae plane block, local anesthetics

BACKGROUND

ESPB was first described by Forero et al. in 2016 for the treatment of thoracic neuropathic pain (1). It is an interfascial plane block used in the treatment of both perioperative and chronic pain (2). ESPB is performed by injecting a local anesthetic solution into the fascial plane located between the erector spinae muscle and the transverse process under ultrasound guidance. It is applied to a region away from the pleura and neuraxial structures, minimizing the risk of tissue damage and complications. Since it can be applied to the cervical, thoracic, lumbar, and sacral spinal levels, its scope of indication is quite broad, and low back pain due to lumbar discopathy is among these indications (3,4).

Low back pain is one of the leading causes of health-care visits and disability. In patients who do not benefit from conservative treatment, interventional treatments

are an alternative. Epidural steroid injections (ESIs) are commonly preferred interventional treatments for low back pain due to lumbar radiculopathy. Although ESIs are effective in the palliation of pain, they carry a risk of catastrophic complications. Additionally, radiation exposure is another concern. ESPB, on the other hand, may serve as a safe alternative to epidural injections in selected cases of low back pain with lower complication rates, since it is a less invasive method compared with ESIs (3-5).

There are different approaches in the literature regarding the concentration and volume of local anesthetics used in ESPB. Increasing the injectate volume may produce wider spread and greater efficacy (4). Nonetheless, the likelihood of motor block following an ESPB is believed to escalate with the increased volume and/or concentration of the injectate administered.

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In this article, we present our case and review reported cases of paresis after ESPB to examine the relationship between the volume of the injectate and the development of paresis.

Patient Consent: Written informed consent for the procedure and publication of this case was obtained from the patient.

CASE PRESENTATION

A 39-year-old woman (height: 173 cm, weight: 78 kg, numeric rating scale [NRS] score: 8) presented with severe low back and right leg pain. Magnetic resonance imaging (MRI) revealed a protrusion at the L4-L5 level. The patient had no known comorbidities or drug allergies. Her symptoms had been ongoing for approximately 2 years, and she had not previously undergone any invasive treatments.

Physical examination revealed radicular pain radiating from the lower back to the right leg, restricted lumbar flexion and paravertebral muscle spasm, and the straight leg raising test was positive on the right side. The neurological examination was normal.

The patient was informed about the injection procedure, and written informed consent was obtained. A pain medicine specialist performed the block in a procedure room. Standard monitoring included electrocardiography, noninvasive blood pressure, and peripheral oxygen saturation. An intravenous catheter was inserted before the block.

The ultrasound probe was enclosed in a sterile cover, and the patient's skin was prepared with povidone-iodine. The patient was placed prone, and the transducer was positioned parasagittally over the L4 transverse process, which was identified by counting cephalad from the sacrum. Once the L4 transverse process and erector spinae muscles were visualized, a 22-gauge, 80-mm needle (Stimuplex A; B. Braun, Melsungen, Germany) was advanced in-plane from caudal to cranial under ultrasound guidance (HM70 EVO, Samsung Healthcare, Seoul, South Korea; 2–6-MHz curvilinear transducer) to position the tip in the fascial plane. After hydrodissection with 1–2 mL of 0.9% sodium chloride at the anterior fascia of the erector spinae muscle, 20 mL of solution (10 mL of 0.5% bupivacaine, 9 mL of saline, and 1 mL of methylprednisolone) was injected (Fig. 1).

After the procedure, the patient was placed supine. At 15 minutes, right hip flexion and knee extension strength was 3/5; right ankle and great toe dorsiflexion strength was 2/5. Left knee extension strength was 4/5;

left ankle and great toe dorsiflexion strength was 3/5. Pinprick testing showed hypoesthesia in the right L1–S1 and left L4–L5 distributions. At 30 minutes, the patient reported complete pain relief.

The patient was informed that the weakness was expected to be temporary. She remained under observation, and motor strength and sensation returned to normal after approximately 18 hours. She was discharged with an NRS score of 0 and follow-up recommendations. At the follow-up examination 3 months later, the patient had no motor function issues and the NRS score was also zero.

DISCUSSION

In the current case of chronic, conservative treatment-resistant lumbar radiculopathy, following ESPB, we observed a temporary motor weakness and sensory loss.

Currently, transforaminal epidural injections are frequently preferred in the interventional treatment of spinal pain. However, ESPB may be used as an alternative, less invasive treatment method with lower complication rates in patients who cannot tolerate or undergo epidural injections in some cases. When ESPB is performed with high-volume local anesthetic, the injectate can spread over a wide area in the cranio-caudal and horizontal directions, and it can extend to the epidural space and neural foramina, potentially producing effects similar to epidural steroid injections (3,5). In the literature, it has been found that an ESP block performed at the L4 level using a volume of 40 mL covers the T10-S2 dermatomes. In another ESPB case performed at the L4 level with a 40 mL volume, magnetic resonance imaging (MRI) showed that the injectate spread horizontally between the lateral side of the erector spinae muscle and the facet joints, from L1 to S4, while craniocaudally, it spread to the neural foramina of L1 and L4 and the anterior and posterior epidural spaces at these levels (3,4). A recent cadaver study reported that in an ESPB performed at the T5 level with a 20 mL volume, the injectate spread approximately five levels in the craniocaudal direction (5). Schwartzmann et al. examined the spread of the injectate using MRI after ESPB and stated that with volumes under 35 mL, the injectate would not spread into the epidural space (6). There are also studies reporting much wider spread areas with lower volumes; however, these studies do not provide evidence that can be generalized (7). Notably, in our case, despite the administration of only 20 mL of injectate, the development of bilateral motor weakness

suggests that clinically significant spread beyond the intended erector spinae plane may still occur even with relatively low injectate volumes.

In the ESP block we performed from the right L4 level, we found that the block affected a large area, covering the right L1-S1 and left L4-L5 dermatomes, although we used a volume of 20 mL and we think that this may be due to individual anatomical differences. A reason for the differences between studies regarding injectate volume and spread area is the physiological and mechanical changes between cadaveric and living human specimens. In living humans, it has been reported that the negative intrathoracic pressure generated during inspiration and the movement of the erector spinae muscles can increase the spread of the injectate to the paravertebral and intercostal regions (6).

ESPB is a less invasive and safer method compared to epidural injections, but some complications may still occur. The most commonly observed complications following ESPB in the literature include block failure, pneumothorax, local anesthetic systemic toxicity, and temporary motor block. Although local anesthetic systemic toxicity appears to be uncommon following ESPB, the relatively large volumes of local anesthetic often required for interfascial spread and the potential for rapid systemic absorption from the erector spinae plane should be considered. Local anesthetic systemic toxicity may result from inadvertent intravascular injection or systemic absorption of an excessive total dose of local anesthetic and can manifest with neurological symptoms, including tinnitus, altered mental status, and seizures, as well as cardiovascular toxicity, such as hypotension, arrhythmias, and, in severe cases, cardiovascular collapse. Therefore, careful calculation of the total local anesthetic dose, incremental injection with repeated aspiration, and appropriate clinical monitoring are important when performing ESPB. Motor block has been associated with the local anesthetic solution affecting the ventral ramus of the spinal nerve or the lumbar plexus. It is known that the use of local anesthetics in high concentrations can increase the risk of motor block. Additionally, it is thought that motor block may occur if the needle slips over the transverse process during the injection and progresses deeper into the thoracolumbar fascia, causing the local anesthetic solution to spread more deeply and affect the ventral ramus of the spinal nerve (7-9).

In the study by Tulgar et al., ESPB was performed with a volume ranging between 20–30 mL in thoracic

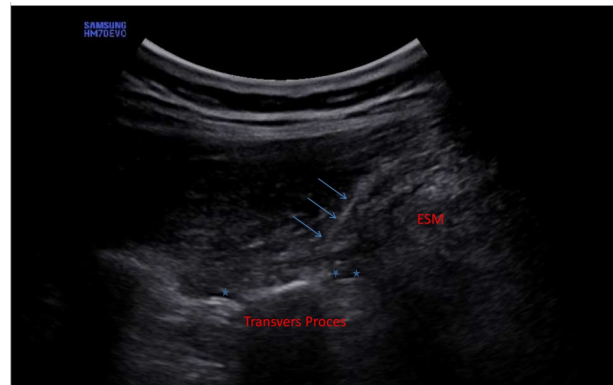


Fig. 1. Ultrasound image showing local anesthetic spread beneath the erector spinae muscles (ESM). The blue arrow indicates the needle, and blue stars indicate local anesthetic solution.

regions and 30–40 mL in lumbar regions. However, no statistically significant relationship was found between the local anesthetic volume and block success. Based on their clinical experience, the authors stated that high volume and concentration of local anesthetic might increase the success rate of ESPB. Factors such as the technique used, the application level, the concentration and volume of the local anesthetic, and the physical and anatomical characteristics of the patients affect the success rate of ESPB and the extent of the block (7).

The first case report regarding motor block after ESPB was published in 2018, involving a patient who underwent cesarean section and intrauterine myomectomy. In this case, a 29-year-old woman received an ESPB at the right T9 level, and a temporary bilateral motor block developed from T9 to L3. The patient fully recovered after 13 hours (9).

To investigate reported motor block after ESPB, we reviewed case reports published between 2016 and 2024 (7,9-17). Search terms included “erector spinae plane block and motor block,” “erector spinae plane block and motor weakness,” “ESPB and motor block,” and “ESPB and motor weakness.” Cases with significant motor block are summarized in Table 1, including patient characteristics, block level, injectate, indication, and duration of motor block.

In our case, transient motor blockade developed in both lower extremities and resolved completely after 18 hours. Unlike other cases with bilateral motor block, bilateral motor and sensory deficits developed following unilateral ESPB using a lower local anesthetic

Table 1. Demographic and clinical characteristics of patients with motor block after ESPB.

Case	Case's Publication Date	Gender	Age	ESPB spinal level and the administered drugs and their volumes	Reason for ESPB application	Localization of the motor block	Duration of the motor block	Reference
1.	December 2018	W	29	Right T9 Total volume 25 mL: 15 mL 0.5% bupivacaine + 5 mL 2% lidocaine + 5 mL saline	Intrauterine myomectomy with cesarean incision	Bilateral hip flexion and knee extension loss	Total recover in 13 hours	9
2.	April 2023	W	67	Right L4 Total 40 mL: 20 mL 0.5% bupivacaine + 10 mL 2% lidocaine + 1 mL methylprednisolone + 9 mL saline	Right-sided back and leg pain	Bilateral hip and knee flexion loss	Total recover in 14 hours	11
3.	August 2019	W	50	Bilateral L4 20 mL ropivacaine 0.35% bilateral	Pain after L5-S1 laminectomy	Bilateral lower extremity motor block	Total recover in 10 hours	12
4.	December 2021	M	44	Bilateral T5 – T6 40 mL 10 mL 0.5% ropivacaine bilateral	For pain control after CVS surgery	Left lower extremity motor block	Total recover on the 2nd day	13
5.	May 2022	W	62	Right T4 20 mL 0.5% ropivacaine	Right Lung Lobectomy surgery	Bilateral hip flexor weakness	Total recover in 3 hours	14
6.	June 2023	4 W	69 +/- 12	Total Hip Arthroplasty side L4 Total volume 40 mL ropivacaine 0.5%	Post-Total Hip Arthroplasty analgesia	Unilateral hip adduction and knee extension loss	Recovery in the first 24 hours	15
7.	April 2021	3 cases Gender unknown	-	2 cases left L3, 1 case right L3 30 mL 0.2% ropivacaine, 12.5 µg dexmedetomidine	Hip surgery	Hip weakness in 2 cases, foot drop in 1 case	Recovery in ≥ 24 hours	16
8.	December 2021	2 cases W M	62 66	Bilateral L4 20 mL = bupivacaine 0,25% + dexamethasone 8mg	Lumbar spine surgery	Bilateral lower extremity complete motor block	W- in 2 hours. M – in 1 hours. Total recovery	17
9.	January 2019	W	76	Bilateral T9 Lidocaine + bupivacaine 0.25%	Laparoscopic umbilical hernia surgery	General muscle weakness	Total recover in 15 hours	7
10.	2023	M	66	Bilateral L3 15 mL 0.5% ropivacaine	Low back pain due to lumbar stenosis; L2-L5 laminectomy, L2-L3 discectomy	Unilateral lower extremity motor block appropriate L3	Total recovery in 16 hours	10
11.	Present case	W	39	Right L4 20 mL = 10 mL 0.5% bupivacaine + 9 mL saline + 1 mL methylprednisolone	Low back pain due to L4-L5 protrusion	Bilateral lower extremity motor block	Total recovery in 18 hours	Present Case

W, woman; M, man; ESPB, erector spinae plane block.

volume (20 mL). Furthermore, a more widespread deficit was observed in the right lower extremity compared to the left. We believe that the different clinical outcomes following ESPB in different cases may be due to individual variations in anatomical structure and local anesthetic sensitivity, as well as the method of block application. Furthermore, the complete recovery of muscle strength, the absence of additional neurological deficits, and the complete resolution of pain in our patient after procedure and at the follow-up examination 3 months later, indicate that the ESPB procedure was successful.

According to the table, all reported motor blocks developed after thoracic and lumbar ESPB. The types, concentrations and injectate volumes of local anesthetics used in patients who developed block were quite variable. Studies have shown that bupivacaine or ropivacaine were generally used for ESPB at concentrations ranging from 0.25%–0.5% and volumes of 20 mL

or more. Although it is estimated that the use of low concentration local anesthetics will decrease the risk of motor block, it has been reported that the effect area will be widened with the use of high volume (10). However, there is no consensus on the type, volume and concentration of local anesthetics to be used.

When preparing the local anesthetic solution, sufficient volume of solution should be prepared considering the area of pain spread. In addition, it should be kept in mind that unexpected complications may develop when the injection is not performed optimally, the needle and related tissues cannot be visualized by ultrasonography or the needle is directed to a non-target area.

CONCLUSIONS

Published evidence remains limited regarding the complications of ESPB and the optimal volume and concentration of local anesthetic. Further studies are needed to assess its safety.

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