

# **ERECTOR SPINAE PLANE BLOCKS IN PATIENTS WITH CHRONIC CANCER-ASSOCIATED THORACIC PAIN AND A LITERATURE REVIEW**

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**Background:** The erector spinae plane (ESP) block is a novel technique that allows for acute and chronic pain control in the cervical, thoracic, and lumbar regions. The authors seek to explore the application of the thoracic-level ESP block in treating cancer-associated thoracic pain.

**Case Reports:** All of the patient charts from a US cancer clinic were reviewed. Patients with a diagnosis of thoracic pain who received an ESP block were selected. In our case reports, 2 of the patients who underwent an ESP block had a pulmonary lobectomy and the other 2 patients had metastases to their ribs and lungs. In all of the patients, the single-level ESP block was performed under ultrasound guidance. The patients who received an ESP block for chronic thoracic pain reported effective analgesia after the procedure.

**Conclusion:** The authors conclude that ESP blocks can potentially be used to treat cancer-associated thoracic pain; however, further studies are needed.

**Key words:** Intractable pain, erector spinae block, loca anesthesia, regional anesthesia, cancer, evidence-based medicine, nerve block

## **BACKGROUND**

Since its introduction in the literature in 2016, the erector spinae plane (ESP) block has become increasingly common in clinical practice. The ESP block is an ultrasound-guided regional technique in which a local anesthetic is injected into the interfascial plane deep to the erector spinae muscle just above the transverse process of a target vertebrae (1). Nearly 90% of ESP blocks are performed in the thoracic region, with approximately 9% in the lumbar region and the remainder in the cervical region (2). During the perioperative phase of care for patients undergoing thoracic surgeries, the use of traditional neuraxial techniques, such as epidurals, are the gold standard for postoperative pain control. However, as surgical techniques become less invasive and anticoagula-

tion therapies become more prevalent, the use of neuraxial anesthetics has decreased among many clinical practitioners (3). With these changes, there is a role for the novel approach to the ESP block as described by Forero et al (4). In this case series, we discuss the use of ESP blocks in patients with chronic cancer-related thoracic pain.

## **Method**

All patients seen between January 1, 2019 and December 31, 2019 in the outpatient cancer pain clinic at a US hospital were reviewed. The list was filtered based on the ICD-10 code of M54.6, signifying pain in the thoracic region. Each chart was reviewed and the patients who underwent an ESP block were selected. Their summaries and clinical courses are outlined below.

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## **CASE REPORTS**

The first case is a 55-year-old man with a history of melanoma complicated by multisite metastases including the brain and the left lung, for which he had undergone left video-assisted thoracoscopic surgery. At the time of his initial visit, he was taking high-dose opioids for poorly controlled left-sided neuropathic pain in the thoracic region. The patient reported that his pain score was often 10 of 10. On the morning of his first clinic visit, his pain score was 4 of 10 after having taken both extended-release (ER) and immediate-release (IR) oxycodone. The physical exam showed significant left-sided allodynia in a T4-T6 distribution. Based on the patient's history and physical exam, the patient was prescribed gabapentin for neuropathic pain, and was scheduled to undergo a left-sided thoracic ESP block. On the day of the procedure, written and informed consent was obtained after the risks and benefits of the procedure were discussed with the patient, and all questions were answered. Using ultrasound guidance and an in-plane approach, a 22-gauge needle was advanced to the left T5 transverse process. It was then retracted slightly. A total of 20 mL of 0.2% ropivacaine was injected along with 10 mg of dexamethasone with negative aspiration after each 5 mL. The patient tolerated the procedure well and no complications were encountered. After the procedure, the patient had no pain. At the 2-week follow-up, the pain score had returned to a 10 of 10.

The second case is a 58-year-old man with metastatic lung cancer, for which he had undergone a muscle-sparing right thoracotomy, and a right upper lobe lobectomy with en bloc resection of ribs 3, 4, 5, and removal of the 11th rib. At the time of his initial visit, the patient reported constant chest wall pain primarily over the right midaxillary line with extension to the right middle chest. The pain was described as sharp and stabbing in quality and rated 9 of 10 on the Numeric Rating Scale for pain. Gabapentin had been previously prescribed for the patient and did not attenuate the pain. Based on the patient's history and physical exam, the patient was prescribed duloxetine, and was scheduled to undergo a right-sided thoracic ESP block. On the day of the procedure, written and informed consent was obtained after the risks and benefits of the procedure were discussed with the patient, and all questions were answered. Using ultrasound guidance and an in-plane approach, a 22-gauge needle was placed below the erector spinae muscle and a total of 15 mL of 0.25% bupivacaine was injected along with

5 mg of dexamethasone with negative aspiration. The patient tolerated the procedure well and no complications were encountered. The day after the procedure, the patient was feeling well with a 0 of 10 pain score. He reported being able to sleep well at night, which was when most of his pain normally occurred. Further follow-up showed 2 weeks of sustained relief, with a drop-off in relief but still somewhat improved since prior to the injection.

The third case is an 81-year-old man with a history of colon adenoma, for which he had undergone hemicolectomy. He was found to have pulmonary lesions, peritoneal carcinomatosis and metastasis to the left 10th rib. At the time of his initial visit, the patient reported a constant 10 of 10 pain score in the T3-T10 region, which decreased to 4 to 5 of 10 after oxycodone. The pain was described as "gnawing and digging" pain. Based on the patient's history and physical exam, the patient was scheduled to undergo a left-sided thoracic ESP block. On the day of the procedure, written and informed consent was obtained after the risks and benefits of the procedure were discussed with the patient, and all questions were answered. Using ultrasound guidance and an in-plane approach, a 22-gauge needle was advanced to the left T5 transverse process. It was then retracted slightly. A total of 13 mL of 0.25% bupivacaine was injected along with 5 mg of dexamethasone with negative aspiration after each 3 mL. The patient tolerated the procedure well and no complications were encountered. After the procedure, the patient had a pain score of 3 of 10 with pain located in the midthoracic region on his left lateral chest. Upon follow-up, pain returned back to preoperative levels within one month.

The fourth case is a 47-year-old man with a history of disseminated lung carcinoid tumor for which he had undergone a right upper lobe lobectomy. He presented to the outpatient cancer pain clinic with right-sided thoracic back pain. The patient reported that the pain originated from a scar on his back located at T8 and wrapped around on that dermatome to the front of his abdomen. The physical exam showed significant tenderness to palpation of the axial back muscles in the T7-8 area, with the right side being worse than the left. On the day of the procedure, the patient reported bilateral thoracic pain with a pain score of 9 of 10. Written and informed consent was obtained after the risks and benefits of the procedure were discussed with the patient, and all questions were answered. Using ultrasound

guidance and an in-plane approach, a 22-gauge needle was advanced to the right T5 transverse process. It was then retracted slightly. A total of 11 mL of a 22-mL mixture containing 0.2% ropivacaine and 10 mg of dexamethasone was injected along with negative aspiration after each 3 to 5 mL. A similar procedure was repeated for the left side. The patient tolerated the procedure well and no complications were encountered. After the procedure, the patient had a pain score of 6 of 10. Follow-up pain scores several weeks after the procedure were unavailable.

A tabular representation of the case reports is in Table 1.

## DISCUSSION

Pain in the thoracic region can have severe consequences. Incision of chest wall muscles and manipulation of ribs can disrupt respiratory mechanics and induce severe pain, culminating in high morbidity and mortality (3). This severe pain is currently treated with opioids, neuropathic agents, and thoracic epidurals. However, in treating chronic pain, a thoracic epidural is not a viable option due to a limited ability to provide prolonged analgesia without an external catheter. Furthermore, with the increased prevalence of anticoagulants, the risk of placing paravertebral or epidural blocks may outweigh the benefits (1). An effective alternative treatment is the ESP block. The erector spinae fascia extends cranially to the sacrum caudally (5). The ESP block is a new interfascial technique that allows for acute and chronic pain control, not only in the thoracic region, but also in the cervical and abdominal regions. The ESP block has even been associated with significant visceral pain relief as it spreads in both the dorsal and ventral rami of the spinal nerves (6).

To perform the ESP block, the local anesthetic is deposited deep into the erector spinae muscle but superficial to the transverse process. The block spreads extensively by diffusing into the paravertebral spaces and intercostal spaces at several surrounding levels (7). The efficacy of the block relies on passive distribution within the plane, thus allowing significant cranio-caudal spread. The ESP block has optimal efficacy with a high-volume, low-concentration technique (3). This is because dermatomal coverage increases with a higher volume of local anesthetic injected (8). In an analysis by Luftig et al (9), the most commonly used local anesthetics were bupivacaine and ropivacaine with concentrations between 0.25% and 0.5% and deposited volumes between 10 mL and 40 mL based on weight. The main concern with high doses of a local anesthetic is the risk of local anesthetic systemic toxicity (10). Overall, the ESP block has a lower risk of adverse events when compared to paravertebral blocks and epidurals,

Table 1. Summary of the case reports for patients with chronic cancer-related pain in thoracic region.

Number	Age, Gender	Preoperative Diagnosis	Type of Pain	Preoperative Pain Score	Intervention	Medication Given	Preoperative Pain Score	Duration of Analgesia
1	55, Male	Melanoma with metastasis to the lung	Thoracic neuropathic pain	10/10	Left-sided T5 ESP Block	20 mL of 0.2% ropivacaine and 10 mg of dexamethasone	0/10	2 wks
2	58, Male	Metastatic lung cancer status post thoracotomy & lobectomy	Intercostal neuropathy/thoracic back pain	9/10	Right-sided ESP Block	15 mL of 0.25% bupivacaine and 5 mg of dexamethasone	0/10	2 wks
3	81, Male	Peritoneal carcinomatosis with metastasis to the 10th rib	Thoracic back pain in T3-T10 region	10/10	Left-sided T5 ESP Block	13 mL of 0.25% bupivacaine and 5 mg of dexamethasone	3/10	1 mo
4	47, Male	Disseminated lung carcinoma status post lobectomy	Thoracic back pain at T8. Right side worse than left	9/10	Bilateral T5 ESP Block	11 mL of a 22 mL 0.2% ropivacaine and 10 mg of dexamethasone on each side	6/10	No follow-up

Abbreviations: ESP, erector spinae plane

as the site of injection is distant from the pleura, spinal cord, and major blood vessels. Thus, it can potentially be placed in patients with thrombocytopenia, coagulopathy, antiplatelet medications, or anticoagulant treatments (1). Furthermore, using an ultrasound machine, the transverse process is reliably identified and serves as a backstop for needle advancement, and thus the risk of pneumothorax is minimal (11). As such, an ultrasound-guided approach was used in all of the cases in this report. The ESP block, even though having a limited duration, can be immensely helpful in terminally ill patients. To increase the duration of the blockade, as is necessary in the chronic pain setting, dexamethasone can be added. There is evidence of this practice in ESP blocks for patients with neuropathic pain, myofascial pain, or low-back pain (8). In our cases, between 5 mg and 10 mg of dexamethasone was used. Two of the patients had adequate pain control for 2 weeks before the pain returned to baseline levels. In one patient, the pain control lasted for a month before returning to baseline levels.

The ESP block can be utilized in an assortment of clinical settings as an effective analgesic. It has been used to treat chronic thoracic pain, acute postthoracotomy pain, and pain after breast surgery (12). There is not much literature on the use of ESP block for chronic thoracic cancer pain. However, it has been successfully used for palliative pain control in a patient with pleural mesothelioma (13). In the report, the authors describe an attempt to switch to continuous infusion using an elastomeric pump, but it failed to produce the same analgesic effect.

There is also a case report of successfully using continuous ESP block in a patient with primary adenocarcinoma requiring lobectomy of the lung (14). Pain management in patients with lung malignancies are particularly challenging due to involvement of deeper structures and the extensive distribution of pain. Furthermore, metastases to the viscera are observed in patients with lung and breast cancer, and an ESP block can provide relief in this setting. Forero et al (4) noted that a patient with neuropathic pain from metastasis to the ribs had complete resolution of pain after an ESP block. Another case report mentions the use of an ESP block in the management of pain from metastatic cancer of the face (15). The authors described an ultrasound-guided ESP block that was performed at T2 with 15 mL of 0.25% bupivacaine and 4 mg of dexamethasone. Subsequently, the patient displayed significant pain relief, from an initial pain score of 10 of 10 to a postprocedure pain score of 4 of 10. Another interesting case report noted

effective pain relief with a high-thoracic ESP block for a patient having intractable pain in the neck, upper extremity, and chest wall from a Pancoast tumor (11).

The ESP block has also been described in breast cancer surgeries. Persistent pain after breast cancer treatment has a prevalence of up to 50% of patients and lasts at least 5 years after treatment (16). In several randomized controlled trials in patients undergoing breast surgery, the ESP block exhibited significant analgesic effect by reducing pain scores and opioid consumption postoperatively (17,18). Thus, it is possible that ESP blocks can be used to manage persistent pain after breast cancer in a chronic setting. Malawat et al (19) performed a single-shot ESP block at T4 for breast surgeries and observed complete surgical anesthesia. Another interesting technique being employed in thoracotomy patients is the performance of 2-level ESP blocks. Tulgar et al (20) demonstrated lower postoperative pain scores and opioid use with bilevel ESP blocks as compared to single-level blocks. This study warrants further investigation of the use of single versus bilevel ESP blocks for adequate analgesia.

In our case reports, 2 of the patients who underwent an ESP block had a pulmonary lobectomy and the other 2 patients had metastases to their ribs and lungs. In all of the patients, the single-level ESP block was performed under ultrasound guidance with the transverse process acting as a backstop landmark. All of the patients tolerated the procedure well and no complications were noticed. The ESP block decreased the pain scores from preoperative levels of 9 to 10 out of 10 to postoperative levels of 0 to 3 out of 10. In one patient, the postprocedure pain score was 6 of 10. Two of the patients reported returning to baseline quality-of-life functions after the ESP block. Between 5 mg and 10 mg of dexamethasone was given in all 4 patients to prolong the block. Two of the patients had adequate pain control for 2 weeks before pain returning to baseline levels. In one patient, the pain control lasted for a month before returning to baseline level. The pain scores at follow-up were unavailable for the last patient because he had an emergent hernia repair.

## **CONCLUSION**

In conclusion, ESP blocks can potentially be used as a treatment for cancer-associated thoracic pain. However, further studies are needed. There could also be further investigation into single versus bilevel blocks, as well as the efficacy of catheters for a continuous infusion.

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