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The effectiveness of erector spinae plane block in patients with chronic low back pain

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Abstract. – OBJECTIVE: The erector spinae plane block (ESPB) has been widely used as a treatment strategy for a variety of acute and chronic painful conditions. The purpose of this study was to determine the analgesic efficacy of ESPB in patients with chronic low back pain and radicular symptoms who had lumbar disc herniation.

PATIENTS AND METHODS: Patients aged 18 to 80 years who had chronic low back pain with radicular symptoms associated with pain from lumbar disc herniation and had undergone ESPB were included in the study retrospectively. As part of a routine clinical procedure, the patient's age, gender, weight, height, body mass index, injection site, level of the injection, disc herniation level and visual analog scale score, Oswestry Disability Index, and five-point patient satisfaction questionnaire were recorded before and following the procedure.

RESULTS: A total of 96 patients were included in this study. The mean age was 52.28±14.12 and 55 (57.3%) of the patients were female. The mean visual analog scale value and Oswestry Disability Index score were significantly decreased consecutively after the procedure ($p<0.05$). The mean patient satisfaction questionnaire score increased gradually compared to the baseline scores ($p<0.05$).

CONCLUSIONS: Our results suggest that ESPB is an effective strategy to reduce the intensity of chronic low back pain with radicular symptoms in patients with lumbar disc herniation.

Key Words:
Disc herniation, Erector spinae block, Lower back pain, Nerve block.

Introduction

A significant proportion of people have had at least one episode of low back pain caused by intervertebral degeneration, which results in degenerative disc disease and lumbar disc herniation. Radicular pain when sitting is the most frequently reported complaint of lumbar disc herniation that is known to raise disc pressure[1]. Many clinicians contemplated using a nerve block before performing surgery for radicular pain. Additionally, recent studies[2] demonstrating the efficacy of regional anesthesia procedures for low back pain, as well as probable surgical risks such as cerebrospinal fluid leaking, hematoma, re-operation, and infection, have encouraged physicians and patients to favor conservative treatment.

The introduction of ultrasound technology into peripheric blocks increased the popularity of plane blocks, particularly the erector spinae plane block (ESPB)[3]. ESPB was first defined by Forero et al[4] in 2016 as a treatment technique for thoracic chronic pain. It has a broad range of applications over the years, including acute and chronic pain, which has been documented successively in the lumbar, cervical, and sacral areas[5-7]. Anesthesiologists frequently use the ESPB as a non-opioid analgesic approach for a variety of surgical operations. Numerous studies[8] have demonstrated that ESPB may be an effective analgesic for relieving postoperative pain and reducing postoperative opioid usage, as well as nausea and vomiting.

Nonetheless, to our knowledge, no studies have been conducted on the efficacy of ESPB in individuals with chronic low back pain. The purpose of this study was to determine the analgesic efficacy of ESPB in patients with chronic low back pain and radicular symptoms who had lumbar disc herniation. We hypothesized that ESPB is an effective modality for treating chronic low back pain associated with radicular symptoms.

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Patients and Methods

After obtaining approval from the local Ethics Committee, data on patients admitted to the Ankara Research and Training Hospital's Pain Medicine Clinic and who underwent ESPB between January 2019 and December 2020 were retrospectively obtained from the hospital database. The study recruited patients aged 18 to 80 years who had persistent low back pain (low back pain lasting at least three months) with radicular symptoms associated with lumbar disc herniation and an American Society of Anesthesiologists (ASA) score of I to III. The following criteria were used to exclude patients: bleeding diathesis, pregnancy or breastfeeding, anticoagulant medication, a history of drug allergy, particularly to local anesthetics or opioids, infection at the injection site, and refusal to participate in the procedure. As patients were transferred to the operating room, a routine ESPB procedure was conducted at the pain medicine clinic, and standard monitoring was performed using an ECG, a pulse oximeter, and non-invasive blood pressure. The injection site and injection level were determined based on the lumbar magnetic resonance imaging and radicular pain characteristics.

After taking the patient to a prone position, the curvilinear probe (1.9-6 MHz, Toshiba, Tokyo, Japan) was placed at the sagittal plane of the transverse process where the muscles were visualized superior to the transverse process. In-plane technique, a 22 G/80 mm block needle (Stimuplex A, B Braun, Melsungen, Germany) was inserted in the craniocaudal direction. A total of 1 ml of saline was injected into the interfacial area between the transverse process and the erector spinae muscle to confirm the proper injection site. After visualizing the linear spread of saline through the interfacial plane, a mixture of bupivacaine 0.5% (10 ml), triamcinolone 40 mg, and saline (9 ml) was also injected into the interfacial area for ESPB.

As a routine clinical procedure, age, gender, weight, height, body mass indexes, the injection site and level, level of disc herniation, and visual analog scale score, Oswestry Disability Index (ODI), five-point patient satisfaction questionnaire (PSQ) of the patients before and after the procedure 1st hour, 24th hour, 1st week, 2nd week, 3rd week, 4th week, 8th week, 12th week, and 24th week were recorded in the hospital database where all these variables were also obtained and recorded for the study. In addition, the total analgesic consumption of the patients was also found and recorded.

Oswestry Disability Index

Oswestry Disability Index is a 10-point self-reported and constructed to measure disability and quality of life impairment for patients with low back pain. It was developed and published in 1980 by Fairbank et al[9] and the Turkish validation was conducted by Yakut et al[10] in 2004.

Patient Satisfaction Questionnaire

A structured questionnaire with closed-end answers in the form of a five-point Likert scale was used to evaluate the satisfaction range after the procedure (1 strongly agree to 5 strongly disagree).

Statistical Analysis

The distribution of the data was analyzed by the Kolmogorov-Smirnov test. Quantitative variables were presented as mean and standard deviation, while qualitative variables as median [interquartile range (IQR) 25-75%] values with numbers and percentages. The analysis of the demographic characteristics was performed by Friedman's test. Intragroup comparisons were completed using the Wilcoxon signed-rank test. All analyses were performed using Statistical Package for Social Sciences version 20 program (SPSS, IBM Corp., Armonk, NY, USA). The significance level for analysis was set at $p<0.05$.

Results

This study enrolled a total of 96 patients. The mean age of the patients was 52.28±14.12 years, and 55 (57.3 %) of them were female (Table I). The demographic features of the patients were presented in Table I. 52.1 % of ESPBs were performed at the L4 level, 28.1% at the L3 level, and 19.8% at the L5 level (Table II). The specifications of the procedure are displayed in Table II and periprocedural measurements were presented in Table III. The mean visual analog scale (VAS) and ODI scores decreased significantly sequentially when compared to the mean VAS and ODI measurements before the procedure ($p<0.05$; Table III). The mean patient satisfaction questionnaire score was increased gradually compared to the baseline scores ($p<0.05$; Table

Table I. Demographic characteristics.

	Mean±SD	CI	Min-max
Age (years)	52.28±14.12	50.41-56.14	25-79
Gender (F)	55 (57.3%)		
Height (cm)	167.33±8.79	165.55-169.11	150-189
Weight (kg)	76.4±10.67	76.4-78.56	55-125
BMI (kg/m^2)	27.45±4.54	26.53-28.37	19.49-20.89

SD, standard deviation; CI, confidence interval; BMI, body mass index; min-max: minimum-maximum.

III). The analgesic consumption of the patients did not show any significant difference after ESPB application (p>0.05; Table IV).

Discussion

The present study showed that ESPB has a significant effect on chronic low back pain with radicular symptoms relief in patients with lumbar disc herniation, particularly four weeks after the procedure, where it has shown no evident alteration in analgesic consumption. It is widely preferred to perform the surgical intervention in lumbar disc herniation for patients suffering from cauda equina syndrome, intractable radicular pain, with or without neurological sensory/motor deficit. Recent randomized clinical trials[11], on the other hand, have shown that nerve blocks are more cost-effective in a large number of cases than surgical approaches. Selecting the proper treatment option for lumbar disc herniation requires a detailed analysis in all aspects to make a precise timing decision based on avoiding possible side effects and complications and cost-effectiveness as well.

As previously stated, ESPB was initially used to treat thoracic neuropathic pain, a condition for which the procedure has gained popularity in recent years. The ESPB has been applied to a variety of pain syndromes, including radiculopathy and myofascial pain, chronic cancer pain, pain relief from zona zoster infection, and chronic pain following lumbar disc herniation, according to several case reports[12-15].

Limited studies[16-18] have been conducted on the use of ESPB in postoperative analgesia. Yayik et al[16] conducted a randomized clinical trial in which patients underwent lumbar ESPB and discovered that the procedure significantly decreased opioid consumption and was effective for postoperative pain relief. Another study by Tulgar et al[17] demonstrated that ESPB may improve the quality of analgesia following hip and proximal femur surgery. A recent study by Abdelnasser et al[18] on patients who applied hip replacement revealed that ESPB could decrease the postoperative analgesic consumption and pain scores in the first 24 hours. Similarly to these studies, the present study was conducted on patients with chronic low back pain with radicular symptoms. ESPB was performed in the lumbar region unilaterally using a total vol-

Table II. Specifications of the procedure.

		n	%	Total
PL (L3/L4/L5)		27/50/19	28.1/52.1/19.8	96
Side (Left)		44	45.8	
Herniation level	L3-L4	2	2.1	
	L4-L5	8	8.3	
	L5-S1	19	19.8	96
	L3-L4+L4-L5	10	10.4	
	L4-L5+L5-S1	42	43.8	
	L3-L4+L4-L5+L5-S1	15	15.6	

Table III. Periprocedural pain measurements.

	n	%	Total
	Mean±SD	CI	Min-max
VAS-BP	8.4±0.77	8.24-8.56	7-10
VAS-1st h	2.29±1.58	1.97-2.61	0-6
VAS-24th h	1.57±1.45	1.27-1.86	0-6
VAS-1st w	1.81±1.57	1.49-2.13	0-6
VAS-2nd w	3.15±2.56	2.63-3.67	0-9
VAS-3rd w	6.23±2.69	5.64-6.82	0-9
VAS-4th w	5.56±2.94	4.34-6.77	0-10
VAS-8th w	4.75±3.33	2.63-6.86	0-9
VAS-12th w	4.28±3.63	0.92-7.65	1-9
VAS-24th w	5.25±4.42	-1.79-12.29	1-10
ODI-BP	76.75±9.91	74.74-78.75	44-94
ODI-1st w	33.93±12.45	31.41-36.46	12-62
ODI-2nd w	39.37±20.03	35.31-43.43	12-88
ODI-3rd w	60.19±21	55.6-64.77	12-90
ODI-4th w	55.12±20.96	46.46-63.77	12-88
ODI-8th w	54.16±25.11	38.2-70.12	12-88
ODI-12th w	52.25±29.16	27.86-76.63	12-90
ODI-24th w	44.4±32.29	4.3-84.49	12-82
PSQ-BP	1.13±0.37	1.05-1.21	1-3
PSQ-1st h	3.98±0.82	3.82-4.15	1-5
PSQ-24th h	4.27±0.73	4.12-4.42	3-5
PSQ-1st w	4.27±0.73	4.27-4.41	3-5
PSQ-2nd w	3.62±1.24	3.37-3.87	1-5
PSQ-3rd w	2.18±1.34	1.88-2.47	1-5
PSQ-4th w	2.48±1.63	1.8-3.15	1-5
PSQ-8th w	3.08±1.62	2.05-4.11	1-5
PSQ-12th w	3±1.77	1.51-4.48	1-5
PSQ-24th w	3.2±2.04	0.65-5.74	1-5

p<0.05. Wilcoxon signed-rank test. BP, before procedure; min, minute; h, hour; w, week; VAS, visual analog scale; ODI, Oswestry disability index; PSQ, patient satisfaction questionnaire; SD, standard deviation; CI, confidence interval; min-max: minimum-maximum. Intragroup comparison of VAS; VAS-1st h - VAS-BP: p<0.05; VAS-24th h - VAS-BP: p<0.05*; VAS-1st w - VAS-BP: p<0.05*; VAS-2nd w - VAS-BP: p<0.05*; VAS-3rd w - VAS-BP: p<0.05*; VAS-4th w - VAS-BP: <0.05*; VAS-8th w - VAS-BP: p=0.006*; VAS-12th w - VAS-BP: p=0.042*; VAS-24th w - VAS-BP: p=0.197. Intragroup comparison of ODI; ODI-1st w - ODI-BP: p<0.05*; ODI-2nd w - ODI-BP: p<0.05*; ODI-3rd w - ODI-BP: p<0.05*; ODI-4th w - ODI-BP: p<0.05*; ODI-8th w - ODI-BP: p=0.003*; ODI-12th w - ODI-BP: p=0.028*; ODI-24th w - ODI-BP: p=0.068. Intragroup comparison of PSQ; PSQ-1st h - PSQ-BP: p<0.05*; PSQ-24th h - PSQ-BP: p<0.05*; PSQ-1st w - PSQ-BP: p<0.05*; PSQ-2nd w - PSQ-BP: p<0.05*; PSQ-3rd w - PSQ-BP: p<0.05*; PSQ-4th w - PSQ-BP: p=0.003*; PSQ-8th w- PSQ-BP: p=0.012*; PSQ-12th w - PSQ-BP: p=0.041*; PSQ-24th w - PSQ-BP: p=0.102.

ume of 20 ml. Patients experienced a significant (approximately 50%) reduction in pain following the procedure, with VAS scores increasing in the third week and remaining elevated throughout the study period.

Takahashi and Suzuki[19] recently reported that when ESPB was used on chronic low back pain following lumbar surgery, pain relief lasted for 10 hours, necessitating the procedure to be repeated three times a month. Additionally, Fusco et al[20] performed ESPB on a patient with chronic chest pain, and Piraccini et al[21] performed ESPB on the sacrum, with pain relief lasting 10 and 7 days, respectively, following the procedure. Goncalves Morais et al[22] demonstrated that when ESPB was used in patients with chronic low back pain, pain relief lasted an average of 20.8 days following the intervention. The duration of the block suggested that the spinal nerves' anatomical location and variation in the anatomy of the vertebral column could be a significant factor in the disparate outcomes following ESPB. In contrast to the elevated VAS scores, patients were very satisfied with the technique during the follow-up period.

Furthermore, a significant finding is that the ODI scores increased in lockstep with the VAS scores after the third week of the procedure and remained stable in lockstep with the VAS scores as well. It can be suggested that an additional ESPB intervention or continuous catheter placement is required after 20 days to relieve of radicular pain in patients with lumbar disc herniation. Nevertheless, an interesting outcome of the current study is the analgesic consumption of the patients who did not show any significant difference after ESPB.

Despite the safety of using easily identifiable ultrasound landmarks and clear visualization of local anesthetic distribution, some potential risks including pneumothorax, hematoma, and tissue damage could be faced during or after the procedure[23]. However, based on the literature and the findings of the present study it can be speculated that ultrasound-guided ESPB has several advantages in chronic low back pain as follows: easy to apply with minimum complications, short discharge period after the intervention, and effective in pain relief at short-term and medium-term (three weeks).

Limitations

This study has some limitations. First, the retrospective design of the study could limit the generalizability of the results. Second, few randomized controlled trials have existed on the use of ESPB in patients with low back pain limiting the comparison of the findings. Third, additional questionnaires to evaluate the quality of life could be more useful for the effectiveness of ESPB in which the retrospective design of the study restricted this requirement.

Table IV. The comparison of analgesic consumption.

	AC-1st d			
	No change (n/%)	Decreased (n/%)	No analgesics (n/%)	*p*-value*
AC-1st w	56	5	34	0.317
AC-2nd w	57	4	34	0.317
AC-3rd w	45	3	34	0.317
AC-4th w	13	2	6	0.223
AC-8th w	3	1	4	0.261
AC-12th w	1	1	2	0.261
AC-24th w	-	1	2	-

*$p<0.05$. Friedman test. AC, analgesic consumption; w, week.

Conclusions

In individuals with lumbar disc herniation, the erector spinae plane block is a successful method for reducing the intensity of chronic low back pain with radicular symptoms.

Conflict of Interest

The Authors declare that they have no conflict of interests.

Informed Consent

Not applicable.

Ethics Approval

The study was approved by the Ankara Research and Training Hospital Ethics Committee (IRB No. 503/2020).

References

1) Amin RM, Andrade NS, Neuman BJ. Lumbar Disc Herniation. Curr Rev Musculoskelet Med 2017, 10: 507-516.
2) Kim J, Hur JW, Lee JB, Park JY. Surgery versus Nerve Blocks for Lumbar Disc Herniation: Quantitative Analysis of Radiological Factors as a Predictor for Successful Outcomes. J Korean Neurosurg Soc 2016, 59: 478-484.
3) Huang W, Wang W, Xie W, Chen Z, Liu Y. Erector spinae plane block for postoperative analgesia in breast and thoracic surgery: A systematic review and meta-analysis. J Clin Anesth 2020, 66: 109900.
4) Forero M, Adhikary SD, Lopez H, Tsui C, Chin KJ. The Erector Spinae Plane Block: A Novel Analgesic Technique in Thoracic Neuropathic Pain. Reg Anesth Pain Med 2016, 41: 621-627.
5) Tulgar S, Senturk O. Ultrasound guided Erector Spinae Plane block at L-4 transverse process level provides effective postoperative analgesia for total hip arthroplasty. J Clin Anesth 2018, 44: 68.
6) Hamadnalla H, Elsharkawy H, Shimada T, Maheshwari K, Esa WAS, Tsui BCH. Cervical erector spinae plane block catheter for shoulder disarticulation surgery. Can J Anaesth 2019, 66: 1129-1131.
7) Tulgar S, Senturk O, Thomas DT, Deveci U, Ozer Z. A new technique for sensory blockage of posterior branches of sacral nerves: Ultrasound guided sacral erector spinae plane block. J Clin Anesth 2019, 57: 129-130.
8) Kendall MC, Alves L, Traill LL, De Oliveira GS. The effect of ultrasound-guided erector spinae plane block on postsurgical pain: a meta-analysis of randomized controlled trials. BMC Anesthesiol 2020, 20: 99.
9) Fairbank JC, Couper J, Davies JB, O'Brien JP. The Oswestry low back pain disability questionnaire. Physiotherapy 1980, 66: 271-273.
10) Yakut E, Düger T, Oksüz C, Yörükan S, Ureten K, Turan D, Frat T, Kiraz S, Krd N, Kayhan H, Yakut Y, Güler C. Validation of the Turkish version of the Oswestry Disability Index for patients with low back pain. Spine (Phila Pa 1976) 2004, 29: 581-585.
11) Overdevest GM, Vleggeert-Lankamp CL, Jacobs WC, Brand R, Koes BW, Peul WC; Leiden-The Hague Spine Intervention Prognostic Study Group. Recovery of motor deficit accompanying sciatica--subgroup analysis of a randomized controlled trial. Spine J 2014, 14: 1817-1824.
12) Alici HA, Ahiskalioglu A, Aydin ME, Ahiskalioglu EO, Celik M. High volume single injection lumbar erector spinae plane block provides effective analgesia for lower extremity herpes zoster. J Clin Anesth 2019, 54: 136-137.
13) Chung K, Kim ED. Continuous erector spinae plane block at the lower lumbar level in a lower ex-

tremity complex regional pain syndrome patient. J Clin Anesth 2018, 48: 30-31.

14) Celik M, Tulgar S, Ahiskalioglu A, Alper F. Is high volume lumbar erector spinae plane block an alternative to transforaminal epidural injection? Evaluation with MRI. Reg Anesth Pain Med 2019; doi: 10.1136/rapm-2019-100514. Epub ahead of print.
15) Sirohiya P, Yadav P, Bharati SJ, Sushma B. Unfolding Role of Erector Spinae Plane Block for the Management of Chronic Cancer Pain in the Palliative Care Unit. Indian J Palliat Care 2020, 26: 142-144.
16) Yayik AM, Cesur S, Ozturk F, Ahiskalioglu A, Ay AN, Celik EC, Karaavci NC. Postoperative Analgesic Efficacy of the Ultrasound-Guided Erector Spinae Plane Block in Patients Undergoing Lumbar Spinal Decompression Surgery: A Randomized Controlled Study. World Neurosurg 2019, 126: e779-e785.
17) Tulgar S, Kose HC, Selvi O, Senturk O, Thomas DT, Ermis MN, Ozer Z. Comparison of Ultrasound-Guided Lumbar Erector Spinae Plane Block and Transmuscular Quadratus Lumborum Block for Postoperative Analgesia in Hip and Proximal Femur Surgery: A Prospective Randomized Feasibility Study. Anesth Essays Res 2018, 12: 825-831.
18) Abdelnasser A, Zoheir H, Rady A, Ramzy M, Abdelhamid BM. Effectiveness of ultrasound-guided erector spinae plane block for postoperative pain control in hip replacement surgeries; A pilot study. J Clin Anesth 2020, 62: 109732.
19) Takahashi H, Suzuki T. Erector spinae plane block for low back pain in failed back surgery syndrome: a case report. JA Clin Rep 2018, 4: 60.
20) Fusco P, DI Carlo S, Scimia P, Luciani A, Petrucci E, Marinangeli F. Could the new ultrasound-guided erector spinae plane block be a valid alternative to paravertebral block in chronic chest pain syndromes? Minerva Anestesiol 2017, 83: 1112-1113.
21) Piraccini E, Antioco M, Maitan S. Ultrasound guided sacral erector spinae plane block: A useful tool for radicular pain treatment. J Clin Anesth 2020, 59: 11-12.
22) Goncalves Morais I, Barreira Martins A. Erector spinae plane block for chronic low back pain analgesia: A case series. Rev Esp Anestesiol Reanim (Engl Ed) 2021, 68: 414-419.
23) Canturk M. Ultrasound-guided bilateral lumbar erector spinae plane block for postoperative analgesia after spondylolisthesis correction surgery. J Clin Anesth 2019, 57: 77-78.