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RESEARCH ARTICLE

The Relationship Between Visual Pain Score and Neutrophil-to-Lymphocyte Ratio in Cases of Radiculopathy Treated with Transforaminal Epidural Steroid Injections

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ABSTRACT

Objective: This study aimed to evaluate whether there was a significant relationship between visual pain score and neutrophil/lymphocyte ratio values over time in patients who were treated with transforaminal epidural steroids for radicular pain.

Materials and Methods: The study included 32 cases admitted to our hospital's neurosurgery clinic with the complaint of radicular pain. Patients' age, gender, visual pain scale (VPS) and NLR values on the operation day (Day 0), 15th and 30th days of the procedure were evaluated retrospectively.

Results: The mean age of 11 male (34.4%) and 21 female (65.6%) patients was found to be 54.8±11.7 (31–81). For all cases, the mean VPS score on the day 0 was 7.13±1.60 (4–10), 4.84±1.94 (1–8) on the day 15, and 4.38±2.28 (1–10) on the day 30. the NLR value measured on the 15th day did not show a significant ($p>0.05$) change compared to the measurement made on the day of the procedure (Day 0). However, the NLR value of the 30th day showed a statistically significant decrease ($p<0.05$) compared to the 0th and 15th day measurements.

Conclusion: It is thought that the NLR value, which is used as a marker in the literature to evaluate the prognosis of many inflammatory processes, may be a marker associated with inflammatory processes in the epidural space in cases with lumbar radicular pain and that TESI is effective in pain control by suppressing the inflammatory process in the epidural space.

Keywords: Inflamation, neutrophil-to-lymphocyte ratio, transforaminal epidural steroid injections

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INTRODUCTION

It is thought that 80–85% of the population has experienced low back pain at least once in their lives. While 80–90% of acute low back pain regresses within 6–8 weeks even if no treatment is given, 20–50% of it recurs in the following year, and 5% of it becomes chronic and lasts longer than 6 months.[1] Intervertebral disc disorders are considered to be the most common cause of low back pain. In addition, 10–15% of these cases need surgical treatment.[2] In other cases, resting, exercise, lifestyle changes, medical treatments and physical therapy can be effective in pain control.

Even if radicular pain is associated with root irritation in many cases, the inability to achieve pain control by removal of the pressure through surgery in some patients and the reduction of pain without operation suggested that there were also causes of pain other than mechanical pressure. In the literature, the existence of local inflammation is discussed at this point. The emergence of inflammatory agents in the degenerated disc, facet joint or epidural distance increases the sensitivity of the root towards irritation.[3,4] The presence of t-lymphocytes, macrophages, phospholipase A-2 and pain-related neuropeptides in the epidural space and degen-

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erated disc material in the studies also supports the opinions on the relationship between radiculopathy and the inflammatory process.[5] Leukocyte, neutrophil, lymphocyte, platelet and monocyte counts are frequently used as inflammation markers. In recent years, neutrophil-to-lymphocyte ratio (NLR) has been frequently mentioned as an inflammatory marker for many pathologies. There are numerous publications recommending the use of NLR as an important marker indicating the severity of endothelial dysfunction and inflammation in the acute period in different clinical situations.[6,7]

Transforaminal epidural steroid injection (TESI) is a non-surgical minimally invasive treatment method that has been often used in recent years for patients with lumbar discopathy without progressive motor defects presenting with radicular symptoms. Studies have also revealed that transforaminal epidural steroid and local anesthetic injection is an effective and safe treatment method in radicular pain control.[8] It is known that prostaglandins, tumor necrosis factor (TNF), Interleukin 1 (IL-1) and IL-6 inflammatory markers occur in the epidural space in intervertebral disc disorders. Epidural steroid is thought to be effective in the treatment of local inflammatory processes that cause radicular pain. Transforaminal epidural injection is often preferred to transfer high concentrations of steroids to the target tissue.

In our study, it was aimed to evaluate whether there was a significant relationship between visual pain score (VPS) and NLR values over time in patients receiving TESI for radicular pain.

MATERIALS and METHODS

This study was discussed and approved at Training Planning Board (TPB) meeting of our hospital on 26.03.2024. Study consent for retrospective studies is evaluated by the Training Planning Board (TPB) in our hospital.

Thirty-two cases who received TESI in the Neurosurgery Clinic of our hospital between 2023 and 2024 were evaluated retrospectively based on the hospital information system data.

The study included patients, who were admitted to the neurosurgery outpatient clinic of our hospital with the complaint of radicular pain, whose examinations revealed degenerative findings such as disc herniation and spinal stenosis, who did not have motor defects and progressive neurological deficits, and who received transforaminal epidural steroid injection for pain treatment. Cases with extruded, sequestered disc herniation and motor deficits or progressive neurological deficits underwent surgical intervention and were excluded from the study. In addition, cases with spinal tumor, spinal fracture, uncontrolled diabetes, uncontrolled hypertension, heart diseases, malignancy and bleeding diathesis, infection, clotting disorder, and the presence of a history of TESI in the last 3 months were accepted as the exclusion criteria of the study. Patients' other comorbidities were not used as exclusion or inclusion criteria.

Scopy-controlled TESI was applied to the distance determined by the radiological imaging and neurological examination findings of the patients evaluated during the brain and nerve surgery polyclinic admissions of our hospital. All cases were evaluated with a standard VPS scale on the day of the procedure and during follow-up examinations.

Patients' age, gender, visual pain scale (VPS) and NLR values on the operation day (Day 0), 15th and 30th days of the procedure were evaluated retrospectively. NLR values were obtained by our hospital laboratory complete blood count examination, and the normal NLR range in our hospital laboratory was accepted to be 0.00–3.13.

All patients were verbally informed in detail regarding the procedure during their admissions to the outpatient clinic, and any questions they had before the procedure were answered, and their written consent was obtained. The detailed surgical technique of the TESI procedure was described in another article.[9] Briefly, the patients were not sedated during the procedure, all procedures were performed under local anesthesia. The procedure was transforaminally performed in all patients. TESI procedure was performed in the operating room with C-arm fluoroscopy. After sterile draping, 5 mg of 0.5% bupivacaine (1 ml) and 40 mg methylprednisolone acetate (1 ml) (2 ml in total) were mixed for each level and injected into the target distance stained with contrast material with fluoroscopy control. Following the procedure, the patients were monitored in the clinic for 1 hour. Their medications, except for anticoagulant-antiaggregant treatments, were continued including the day of the procedure. Anticoagulant and antiplatelet treatments were recommended to be initiated the next day. Patients were called for control on the 15th and 30th days, which we also use in routine clinical follow-up, and their VAS and NLR values were checked.

Statistical Analysis

In the descriptive statistics of the data, mean, standard deviation, median, lowest, highest, frequency and ratio values were used. The distribution of the variables was measured with Kolmogorov Smirnov and Shapiro-Wilk tests. Wilcoxon test was used to analyze the dependent quantitative data of the study. Spearman correlation analysis was used for the correlation analysis. In the analyses, IBM SPSS 27.0 software based in USA was used.

Table 1. Demographics of cases

	Min-max	Median	Mean±SD	n	%
Age	31.0–81.0	52.5	54.8±11.7		
Gender					
Male				11	34.4
Female				21	65.6

SD: Standard deviation

RESULTS

The study included 32 patients (11 males, 21 females) who received TESI for the treatment of radicular pain in our clinic between 2023–2024 and whose VPS and NLR values could be reached on days 0, 15 and 30. The mean age of the patients was found to be 54.8±11.7 (Table 1).

For all cases, the mean VPS score on the day 0 was 7.13±1.60 (4–10), 4.84±1.94 (1–8) on the day 15, and 4.38±2.28 (1–10) on the day 30. The reference NLR range used in the laboratory tests of our hospital was determined as 0.00–3.13. The mean NLR values for all cases were calculated to be 2.70±1.83 on the day 0, 2.46±1.09 on day the 15, and 1.99±0.53 on the day 30.

The VPS score values of the patients on the 15th and 30th days decreased statistically and significantly ($p<0.05$) compared to the values on the day of the procedure (Day 0). The VPS score of the 30th day did not show a significant ($p>0.05$) change compared to the 15th day evaluation.

In addition, the NLR value measured on the 15th day did not show a significant ($p>0.05$) change compared to the measurement made on the day of the procedure (Day 0). However, the NLR value of the 30th day showed a statistically significant decrease ($p<0.05$) compared to the 0th and 15th day measurements (Table 2) (Fig. 1).

Table 2. VPS and NLR values by days

	Min-max	Median	Mean±SD	p*	p**	
VPS						
0th day	4.00–10.00	7.00	7.13±1.60			
15th day	1.00–8.00	5.00	4.84±1.94	0.000		w
30th day	1.00–10.00	4.00	4.38±2.28	0.000	0.115	w
NLR						
0th day	0.60–9.40	2.21	2.70±1.83			
15th day	1.25–6.86	2.14	2.46±1.09	0.568		w
30th day	0.91–3.45	2.02	1.99±0.53	0.044	0.001	w

w: Wilcoxon test. *: Change according to day 0; **: Change according to day 15. VPS: Visual pain score; NLR: Neutrophil-to-lymphocyte ratio; SD: Standard deviation

No significant ($p>0.05$) correlation was observed between the VPS score and NLR value evaluated on days 0, 15 and 30. No significant ($p>0.05$) correlation was observed between the 1st and 2nd measurements, 1st and 3rd measurements, 2nd and 3rd measurements regarding VPS scores and NLR changes (Table 3).

DISCUSSION

Radicular pain is a commonly observed complaint in the daily life of individuals, disrupting the quality of life and causing serious labor loss. The estimated one-year prevalence of lumbosacral radicular pain varies from 3% to 14%.[10] Causes such as mechanical root compression, infection and instability due to intervertebral disc protrusion are the main pathologies that are associated with radicular pain.

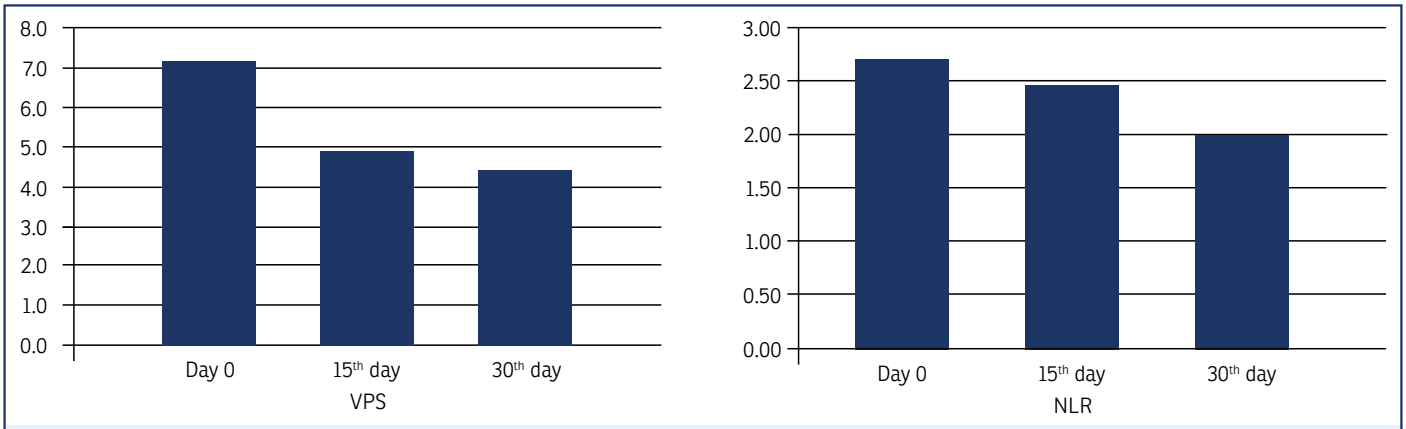

Figure 1. Graph showing VPS and NLR changes by days

VPS: Visual pain score; NLR: Neutrophil-to-lymphocyte ratio

Table 3. VPS scores and NLR changes

	NLR					
	Day 0	**Day 15**	**Day 30**	**0/15 day change**	**0/30 day change**	**15/30 day change**
VPS						
r	-0.310	-0.028	-0.095	-0.166	-0.343	-0.293
p	0.085	0.880	0.606	0.363	0.055	0.103

Spearman corelation. VPS: Visual pain score; NLR: Neutrophil-to-lymphocyte ratio

However, it may not always be accurate to associate radicular pain with root compression. In McRae's study,[11] a postmortem case with roughly 40% disc protrusion but no history of sciatalgia is mentioned. In MRI imaging, up to 60% of radiological root compression findings that do not reveal clinical findings are mentioned.[12] Even if mechanical compression is not surgically decompressed in the majority of cases without neurological deficits with complaints of sciatalgia, the findings may regress within 4–6 weeks through conservative methods.[3] Apart from medical treatments, physical therapy applications, and conservative methods such as rest, TESI is a common non-surgical intervention in cases with radicular pain. In our clinic, we frequently perform the TESI procedure for radicular pain control in patients with radicular pain for various reasons and without accompanying progressive motor deficit.

The mechanism of radicular pain is thought to be increased vascular permeability due to inflammation in the facet joint, intervertebral disc and epidural space, and secondary root edema emergence. The increased amount of neutrophils in this inflammatory environment causes the production of large amounts of nitric oxide, which has been revealed to be associated with pain and worsens the clinical situation.[13] The steroid applied in TESI directly and/or indirectly reduces the synthesis of inflammatory agents such as arachidonic acid, phospholipases, prostaglandins, leukotrienes and prevents their accumulation in the epidural space. The steroids used improve both early inflammation (edema, fibrin accumulation, capillary dilatation, leukocyte aggregation and phagocytosis) and late effects (capillary and fibroblast proliferation, collagen accumulation and cicatrization).[3] In this way, acute inflammation is limited, and pain control is enabled.[14] Steroids also modulate inflammatory responses by suppressing pro-inflammatory genes, reducing leukocyte migration into the environment, and preventing the accumulation of macrophages in the environment. These effects can prevent local inflammation by using TESE.

Neutrophil-to-lymphocyte ratio (NLR) is a practical and inexpensive inflammatory marker that can be reached by a simple laboratory examination such as a complete blood count. NLR value is also used as a prognostic marker for cardiac events, ischemic stroke, chronic diseases, cancers and infectious diseases in many studies.[15–17] There are also studies focusing on the presence of inflammation in intervertebral disc pathologies and changes reflected in inflammatory markers. Bozkurt et al.[18] also reported a significant positive correlation between VPS score, NLR value and pain severity evaluated in the preoperative and postoperative period in patients with lumbar disc hernia.[13]

In our study, after TESI procedure, a significant regression and correlation was found in NLR and VPS values in the 1st month compared to the evaluation made on the day of the procedure. In the evaluation made on the 15th day, although the VPS scores decreased arithmetically compared to the evaluation made on the 30th day, it did not show a statistically significant decrease. However, NLR values decreased statistically significantly on the 30th day compared to the values measured on the operation day and 15th day. It was thought that the VPS values that regressed in the early period after the procedure may be related to the early effect of lidocaine, which is a short-acting local anesthetic used in the procedure, and the long-term effect of the steroid used in TESI led to a decrease in NLR and VPS values on the 30th day.

Not excluding the other pathologies that may affect NLR, lack of a control group and limited number of cases stand out as the limitations of our study. It is thought that more significant results can be obtained in a larger patient series in which all pathologies that will affect the NLR value are excluded.

CONCLUSION

As a result, it can be put forward that the NLR value, which is used as a marker in evaluating the prognosis of many inflammatory processes in the literature, can also be considered as a marker in lumbar radicular pain cases associated with inflammatory processes in the epidural distance, and that TESI is an effective application in pain control by suppressing this inflammatory process. In cases where high NLR values were reported before the procedure, inflammation suppressed by TESE may provide better pain control, which can be evaluated through larger series of studies.

Disclosures

Ethics Committee Approval: The study was approved by the Haydarpaşa Numune Training and Research Hospital Ethics Committee (No: E-62977267-771-240825582, Date: 26/03/2024).

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