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DOES PREOPERATIVE NEUTROPHIL TO LYMPHOCYTE RATIO AFFECT PREOPERATIVE AND POSTOPERATIVE VAS LEVELS IN PATIENTS UNDERGOING CERVICAL DISC SURGERY?

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ABSTRACT

Objective: Neutrophil/lymphocyte ratio (NLR) is currently used as a marker for the diagnosis, follow-up and treatment of many diseases. It has been shown immunohistochemically that interleukins and cytokines are released in the disc herniation region. Our aim was to compare visual analog scale (VAS) and NLR values in the patients who have a cervical disc herniation, whom we frequently encounter and operate in neurosurgery practice.

Materials and Methods: This study was conducted retrospectively by scanning the files of 24 cervical disc herniation patients that we operated approximately 2018-2020. Magnetic resonance imaging was used for the diagnosis. Patients with a single level cervical disc herniation requiring surgical intervention according to the clinical and radiological findings at the level of C4-5/C5-6/C6-7 were included in the study. Preoperative and postoperative 6th month VAS values were recorded. The neutrophil and lymphocyte ratios were calculated and recorded by taking routine preoperative morning blood samples before surgery. The relationship between VAS and NLR values was examined.

Results: Preoperative neutrophil values ranged from 1.77 to 9.35, with a mean of 4.97±1.81. Preoperative lymphocyte values ranged from 1.06 to 4.86, with a mean of 2.54±0.88. NLR values ranged from 0.53 to 4.31, with a mean of 2.12±0.92. A statistically significant decrease in the VAS values was found in the postoperative 6th month compared to the preoperative values ($p=0.000$; $p<0.05$). There was a positive (47.7%) and statistically significant correlation between the NLR and preoperative VAS values ($p=0.018$; $p<0.05$).

Conclusion: The relationship between the NLR and VAS scores in the spinal surgery cases has been evaluated in many series. In our study, we found a positive and significant relationship between the preoperative VAS score and the NLR values, which is consistent with the literature.

Keywords: Neutrophil to lymphocyte ratio, cervical disc herniation, biomarker

INTRODUCTION

Cervical disc herniation (CDH) is one of the most common causes of neck and/or arm pain in the community. Axial neck pain, pain spreading to the arms depending on the side of the hernia, paresthesia, and loss of motor power can be detected in the upper extremity muscle groups. Neutrophil/lymphocyte ratio (NLR) is been used for the diagnosis of systemic inflammatory diseases. It is an inexpensive and easy-to-access examination as it is been evaluated by hemogram analysis. It is a very easy process to see the neutrophil and lymphocyte amounts and calculate the NLR with routine hemogram tests. NLR increases in some diseases such as fibromyalgia, autoimmune diseases, malignancies, infections, metabolic syndrome, renal and cardiovascular diseases. It also can be higher in those with chronic obstructive pulmonary disease, preeclampsia, eclampsia and major depression compared to the healthy population.

When we look at the literature, there have been articles about whether spinal diseases are associated with systemic inflammatory markers recently. Similar to our study, preoperative high NLR values were found in patients with surgically treated lumbar disc herniation and CDH, and the relationship between them was found to be statistically significant[1,2].

In this study, our aim is to compare visual analog scale (VAS) and NLR values in the patients who have a CDH, whom we frequently encounter and operate in neurosurgery practice.

MATERIALS AND METHODS

This study was conducted retrospectively by scanning the files of CDH patients that we operated between 2018-2020. Magnetic resonance imaging (MRI) was used for the diagnosis. Patients with a single level CDH requiring surgical intervention according to the clinical and radiological findings at the level of C4-5/C5-6/C6-7 were included in the study.

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The other causes that can increase the rate of NLR even if they have a single level CDH were excluded from the study; cancer, renal and cardiovascular disease, hypertension and diabetes, major depression, rheumatoid arthritis.

Data such as age, gender, routine neurological examination findings, level of herniation, preoperative and postoperative 6th month VAS values were recorded. The neutrophil and lymphocyte ratios were calculated and recorded by taking routine preoperative morning blood samples before surgery. The relationship between VAS values and NLR values was examined.

Ethical approval for the study was obtained from the University of Health Sciences Turkey, İstanbul Haydarpaşa Numune Training and Research Hospital Ethics Committee (reference number: E-62977267-903.99)

Statistical Analysis

Statistical analysis was performed using Microsoft Excell and the SPSS 22.0 statistical package software. Results were compared with Kolmogorov-Smirnov and Wilcoxon tests. Correlation coefficients were calculated using Spearman's analysis and were accepted as 0.05. P<0.05 was considered statistically significant.

RESULTS

The study was conducted with 24 patients aged between 30-66. Sixteen (66.7%) of the patients were male and 8 (33.3%) of them were female. The mean age of the patients is 41.38±8.98.

Preoperative neutrophil values ranged from 1.77 to 9.35, with a mean of 4.97±1.81. Preoperative lymphocyte values ranged from 1.06 to 4.86, with a mean of 2.54±0.88. NLR values ranged from 0.53 to 4.31, with a mean of 2.12±0.92. The number of patients with disc herniation according to the level is shown in Table 1. A statistically significant decrease of the VAS values was found in the postoperative 6th month compared to the preoperative values (p=0.000; p<0.05) (Table 2). There was a positive (47.7%) and statistically significant correlation between the NLR and preoperative VAS values (p=0.018; p<0.05) (Table 3 and Figure 1).

DISCUSSION

Nerve root pain caused by disc herniation is attributed to both chemical and mechanical factors[3-5]. As a chemical effect, it has been shown to induce an inflammatory-like reaction experimentally in the nerve root after the rupture of the nucleus pulposus (annulus fibrosus) which is located inside the disc [6]. It has been shown immunohistochemically that interleukins and cytokines such as pro-inflammatory tumor necrosis factor-a are released in the disc herniation region[7]. These cytokines increase the release of the chemokines from the degenerated disc, and increase the infiltration and activation of T and B cells, macrophages and mast cells[8].

Table 1. Distribution of operating parameters

	Min.-Max.	Average ± SD
NEU	1.77-9.35	4.97±1.81
LYM	1.06-4.86	2.54±0.88
NLR (Preop)	0.53-4.31	2.12±0.92
	n	**%**
Level		
C4-5	1	4.2
C5-6	8	33.3
C6-7	14	58.3
C7-T1	1	4.2

NEU: Neutrophil, LYM: Lymphocyte, NLR: Neutrophil/lymphocyte ratio, SD: Standard deviation, Min.: Minimum, Max: Maximum

Table 2. Evaluation of postoperative 6th month VAS change according to preoperative

VAS	Min.-Max.	Average ± SD
Preop	3-10	5.92±2.24 (5)
Postop 6.m	0-3	0.96±0.95 (1)
p		0.000*

Wilcoxon sign test *p<0.05
VAS: Visual analog scale, SD: Standard deviation, Min.: Minimum, Max: Maximum

Table 3. Evaluation of the correlation between NLR and preoperative and postoperative 6th month VAS levels

VAS		NLR
Preop	**r**	0.477
	p	0.018*
Postop 6.m	**r**	0.288
	p	0.172

Pearson correlation analysis *p<0.05
NLR: Neutrophil/lymphocyte ratio, VAS: Visual analog scale

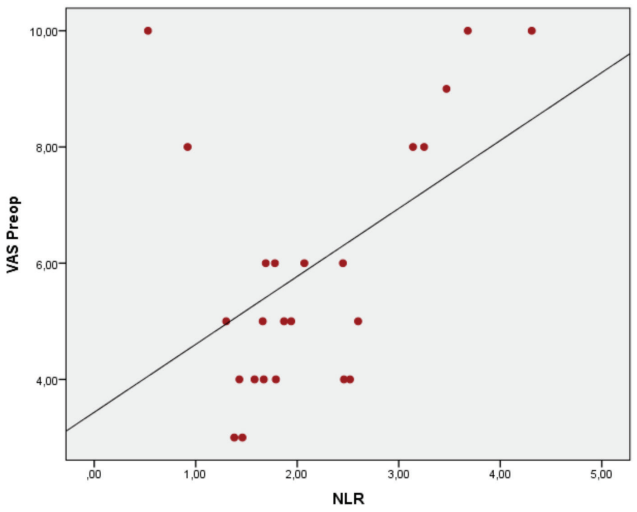

Figure 1. Positive correlation between NLR and preop VAS values
NLR: Neutrophil/lymphocyte ratio, VAS: Visual analog scale

IL-21 plays an important role in the persistence and differentiation of both T and B cells[9]. Xue et al.[10] compared the serum IL-21 and serum IL-17 levels in the healthy control group and patients with lumbar disc herniation (LDH) and showed that they were significantly higher in LDH patients. VAS scores were positively correlated with serum IL-21 levels, and inflammation was responsible for the LDH-related pain[10]. In another study, a relationship was reported between high-sensitivity C-reactive protein (CRP) levels and severe pain[11].

A few studies in the literature have examined the relationship between CDH and serum inflammatory markers. Yılmaz et al.[12] reported 394 patients with lumbar disc hernia and low back pain that shows the NLR was an independent predictor in the patients, recently. On the contrary, Dagistan et al.[13] found no significant difference between serum NLR levels of the LDH patients and the healthy controls.

Another study showed that preoperative and postoperative pain was more severe among the patients with lumbar disc hernia and a higher NLR level, as an indicator of inflammation. The NLR is the ratio of cells that mediate two distinct immune pathways. The initial line of immunological defense is comprised of neutrophils, which secrete a variety of inflammatory mediators, mainly cytokines, which cause phagocytic and apoptotic effects. Due to cell dysfunction and oxidative stress, inflammation brought on by cytokines might bring on further inflammation. While lymphocytes provide a regulatory or protective function, they are particular inflammatory mediators. A low lymphocyte count indicates poor overall health and physiological stress. A few research have looked at the connection between CDH and serum inflammatory markers in the literature. NLR was recently found to be an independent predictor in patients with disc hernia and discomfort by Yılmaz et al.[12].

Similarly, a study showed that patients with extruded disc hernia had significantly higher mean serum hs-CRP levels than patients with bulging disc hernia and significantly higher mean serum IL-21 levels than patients with protruded disc hernia, which the authors speculated may be caused by inflammation near the nerve roots[14].

In short, an inflammatory-like reaction occurs and many interleukins and cytokines are released due to disc herniation. It is possible to detect these parameters with routine blood tests. These values and ratios change can guide in the disease in diagnosis and treatment. Studies have shown that the change of the NLR is significant. According to the literature, we found that similar studies on the spinal degenerative diseases were reported for the patients with lumbar disc herniation. We wanted to examine what kind of change occurred in the patients who were operated for CDH. Although the number of our patients was not enough due to the pandemic process, we obtained statistically significant results. With the VAS scores increasing, the NLR value is also increased.

Study Limitations

The limitation of our study was the small number of patients and the organization of our study was retrospective. Because of that, in the new future prospective multicenter studies with larger patient groups should be planned.

CONCLUSION

NLR is currently used as a marker for the diagnosis, follow-up and treatment of many diseases. The relationship between the NLR and VAS score in the spinal surgery cases has been evaluated in many series. In our study, we found a positive and significant relationship between the preoperative VAS score and the NLR values, which is consistent with the literature. When we associate normal NLR values with the normal cervical MRI imaging, we think that this may help us in the follow-up and treatment of the patients in the clinic.

Ethics

Ethics Committee Approval: Ethical approval for the study was obtained from the University of Health Sciences Turkey, İstanbul Haydarpaşa Numune Training and Research Hospital Ethics Committee (reference number: E-62977267-903.99).
Informed Consent: Retrospective study.
Peer-review: Externally and internally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: A.E.K., Concept: A.E.K., H.G., Design: H.G., Data Collection or Processing: H.G., Analysis or Interpretation: A.E.K., Literature Search: A.E.K., H.G., Writing: A.E.K., H.G.

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