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Original Article

Can inflammation parameters be determinant in upper level lumbar disc hernias?

Serap Satis[1], Alparslan Yetisgin[2], Kadri Burak Ethemoglu[3]

[1]Department of Physical Medicine and Rehabilitation, Faculty of Medicine, Harran University, Sanliurfa, Turkey
[2]Department of Physical Medicine and Rehabilitation, Faculty of Medicine, Harran University, Sanliurfa, Turkey
[3]Department of Neurosurgery, Faculty of Medicine, Harran University, Sanliurfa, Turkey

Abstract

Aim: Upper lumbar disc hernias are disc hernias located at the L1–L2, L2–L3, and L3–L4 levels. Upper lumbar disc hernias make up approximately 5% of herniated lumbar discs. The etiology of upper lumbar disc hernias is unclear. We investigated the relationship between hemogram values, sedimentation, C-reactive protein values and upper lumbar disc hernias.

Materials and Methods: Patients were divided into three groups: Group 1 (61 patients with upper lumbar disc hernias), Group 2 (96 patients with lower level lumbar disc hernias), and Group 3 (40 patients without disc hernias). Gender, age, serum hemogram parameters, including white blood cell, lymphocyte, neutrophil, monocyte, mean platelets volume, plateletss, red cell distribution width, neutrophil-to-lymphocyte ratio, platelets-to-lymphocyte ratio, sedimentation and C-reactive protein values were obtained from the system and recorded. Patients; Acute pain (<1 month); Subacute pain (1-3 months); Chronic pain (> 3 months) was evaluated.

Results: The group with upper lumbar disc hernias (Group 1) had the highest mean age; there were also statistically significant differences between Group 1 and Group 2 and between Group 2 and Group 3 in terms of age ($p < 0.05$ and $p = 0.021$, respectively). There were no significant differences between groups in terms of gender, hemogram parameters, sedimentation and C-reactive protein values, neutrophil-to-lymphocyte ratio or platelets-to-lymphocyte ratio. Groups were also evaluated for acute, subacute and chronic pain, and there were no significant differences between groups.

Conclusion: We concluded that hemogram parameters (white blood cell count, lymphocyte count, neutrophil count, monocytes, red cell distribution width, mean platelets volume and platelets count), sedimentation and C-reactive protein values, neutrophil-to-lymphocyte ratio and platelets-to-lymphocyte ratio are not indicators for diagnosis of upper lumbar disc hernias.

Keywords: Hemogram parameters; neutrophil-to-lymphocyte ratio; platelets-to-lymphocyte ratio; upper lumbar disc hernias

INTRODUCTION

Disc hernias (DHs) involve the dislocation of nucleus pulposus due to impaired integrity of annulus fibrosus. The nucleus pulposus is antigenic. Causes release of proinflammatory cytokines such as prostoglandin, leukotriene, nitric oxide, interleukin 1-alpha, interleukin 6 and TNF alpha (1,2).

Lumbar disc hernia (LDH) is the most important cause of low back pain that causes labor loss. DHs start as low back pain and hip and leg pain are added frequently. Disc hernia is not always painful. The pain occurs with the 1/3 outer fibers of the annulus fibrosis, facet snovium, anterior and posterior longitudinal ligament, nerve roots, sinuses and irritation of the muscles.

Upper lumbar disc hernias (ULDHs) are disc hernias located at the L1–L2, L2–L3, and L3–L4 levels, whereas lower level lumbar disc hernias (LLLDHs) are disc hernias located at L4–L5 and L5–S1. Approximately 90–97% of DHs are occurred at the LLLDHs, and about 5% of DHs occur at the ULDHs (3-6). The LLLDHs is common in those who require physical labor, continuous lumbar flexion, rotation posture and long-term driving (7). Knowledge about the etiology of the rarely seen ULDHs is insufficient.

In the literature, inflammatory markers for LDH have been investigated. It was all made for LLLDH (8-10).

The aim of this study is to evaluate the relationship between ULDHs and serum hemogram parameters, including white blood cell (WBC), lymphocyte, neutrophil, monocyte, mean platelets volume (MPV), red cell distribution width (RDW), neutrophil-to-lymphocyte ratio (NLR), platelets-to-lymphocyte ratio (PLR) and sedimentation and C-reactive protein (CRP) values.

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Corresponding Author: Serap Satis, Department of Physical Medicine and Rehabilitation, Faculty of Medicine, Harran University, Sanliurfa, Turkey **E-mail:** mdseraps@gmail.com

MATERIALS and METHODS

This study was performed with a retrospective study design. Approval for the study was obtained from the institutional review board at Harran University clinical research Ethics Committee (20.05.08). A total of 751 patients between the ages of 18 and 65 who were evaluated with lumbar magnetic resonance imaging (MRI) in the physical medicine and rehabilitation clinic between January 2019 and December 2019 were retrospectively screened.

Patients without sedimentation and CRP values, patients describing inflammatory pain and patients with positive brucella test results, diabetes mellitus or history of previous lumbar surgery were excluded from the study. This left 197 patients to be included in the study. Patients were divided into three groups: Group 1 (61 patients with ULDHs), Group 2 (96 patients with LLLDHs), Group 3 (40 patients without DH).

Gender, age, WBC (n:3.7-10.1 103/ul), lymphocyte (n:1.09-2.99 103/ul), neutrophil (n:1.63-6.96 103/ul), monocyte (n:0.24-0.79 103/ul), MPV (n:6.8-10.8 fL), platelets (n:142-424 103/ul), RDW (n:11.8-15.8 %) and sedimentation and CRP (n<0.8 mg/dl) values were obtained from the system and recorded. NLR was calculated by dividing the number of neutrophils by the number of lymphocytes, whereas PLR was calculated by dividing the number of platelets by the number of lymphocytes.

Patients; Acute pain (<1 month); Subacute pain (1-3 months); Chronic pain (> 3 months) was evaluated.

Statistical Analysis

The SPSS 20.0 (SPSS® for Windows, Chicago, IL, USA) software program was used for statistical analysis. Numeric data were presented as means ± standard deviations. The Kolmogorov–Smirnov test was performed for evaluating distribution of numeric data. The independent samples t-test was used when the distribution of the numeric data was normal, whereas the Mann-Whitney U test was used when it was abnormal. The one-way analysis of variance (ANOVA) test was used for inter-group comparisons when the distribution of numeric data was normal. The Bonferroni test was used as a post hoc test. In addition, the Kruskal–Wallis H test was used for comparison when the distribution was abnormal, whereas the Mann–Whitney U test was used for paired comparison if the results were significant. The Chi-square test was used for the comparison of non-numeric data. Results with a p-value < 0.05 were considered statistically significant.

RESULTS

Group 1 consisted of 61 patients whose mean age was 47.27 ± 11.27, Group 2 included 96 patients whose mean age was 37.90 ± 12.00, and Group 3 included 40 patients whose mean age was 31.80 ± 10.62. The ULDH group had the highest mean age; there were also statistically significant differences between Group 1 and Group 2 and between Group 2 and Group 3 in terms of age (p < .05 and p = .021, respectively). Comparisons in terms of gender are summarized in Table 1, and there were no significant differences between groups (p = .549).

Table 1. Gender distribution in groups

	Group 1	Group 2	Group 3
Female	40(65.5%)	59(61.4%)	24(60%)
Male	21(34.5%)	37(38.6%)	16(40%)

The statistical analysis performed for hemogram parameters is summarized in Table 2. There were no significant differences between groups in terms of WBC, lymphocyte, neutrophil, monocyte, MPV, platelets, RDW, NLR, PLR or sedimentation and CRP. The groups were also evaluated for acute, subacute and chronic pain. The results are presented in Table 3, and there were no statistically significant differences between groups (p = .607).

Table 2. Analysis of hemogram parameters between groups

	Group 1	Group 2	Group 3	p
Age	47.27 ± 11.27	37.90 ± 12.00	31.80 ± 10.62	**0.000**
WBC	8.09 ± 2.05	8.17 ± 1.82	8.44 ± 1.89	0.654
Lymphocyte	2.44 ± 0.69	2.58 ± 0.68	2.41 ± 0.61	0.346
Neutrophil	2.05 ± 0.83	1.98 ± 0.98	2.29 ± 1.03	0.243
Monocyte	0.57 ± 0.17	0.56 ± 0.17	0.57 ± 0.17	0.988
MPV	8.09 ±1.59	7.70 ±1.40	7.92 ± 1.64	0.344
Platelets	296.75 ± 68.92	323.24 ± 83.57	316.34 ± 78.05	0.135
RDW	11.85 ±1.05	11.91±1.32	12.14 ± 2.67	0.664
NLO	2.05 ± 0.83	1.99 ± 0.97	2.29 ± 1.03	0.249
TLO	129.01 ± 42.84	133.95 ± 55.98	139.73 ± 54.56	0.756
CRP	1.06 ± 0.50	0.42 ± 0.31	0.46 ± 0.37	0.941
Sedimentation	15.24 ± 11.87	12.68 ± 9.62	10.15 ± 10.99	0.12

WBC: White Blood Cell, MPV: Mean Platelet Volume, RDW: Red Blood Cell Distribution Width, NLR: Neutrophil/Lymphocyte Ratio, PLR: Platelet/Lymphocyte Ratio, CRP: C-Reactive Protein

Table 3. Acute pain, subacute pain and chronic pain distribution in groups

	Group 1	Group 2	Group 3
Acute pain	24(39.3%)	31(32.2%)	19(47.5%)
Subacute pain	7(11.4%)	8(8.3%)	4(10%)
Chronic pain	30(49.1%)	57(59.3%)	17(42.5%)

DISCUSSION

In our study, we did not find any statistical difference between the groups except for age. ULDH group were in the older age group.

They account for 5% of all LDHs (4-6). Nerves arising from the upper lumbar spine do not innervate specific muscle groups. Therefore, predicting localization of DHs with muscle tests and deep tendon reflexes in examination is difficult.

LDHs account for approximately 9% of all lumbar pains (11). Only 30–40% of all LDHs are symptomatic (12). Trauma and/or inflammation have been blamed for DHs; however, most of the studies that reached this conclusion only included LLLDHs. There has been limited research on the etiology of ULDHs. One study concluded that DHs tend to be located closer to the cranium as age increases (13,14). In our study, the mean age for the ULDH group was significantly higher than the LLLDH and control groups like other study. In another study, it was found that success of surgery was lower in ULDH cases compared to LLLDH cases (15). These unsuccessful surgeries may be due to the patients' ages.

In a research the sub-parameters of T lymphocyte in peripheral blood with radicular pain in LDH; T lymphocytes have been observed to be important in symptom development (8). In an animal study investigating the role of leukocytes in radicular pain secondary to herniated nucleus pulposus, it was concluded that radicular pain was due to inflammatory infiltration (9).

The relationship between the NLR and PLR, which have both been used as indicators of systemic inflammation in single-level LDHs and multi-level spinal stenosis, was investigated in a study. It was highlighted that the NLR may be used for compressed nerve tissue (10). In research comparing sedimentation and CRP values of patients with chronic lumbar pain, it was concluded that patients with chronic lumbar pain do not have a systemic inflammatory response (16). Likewise, NLR was compared with visual analogue scale (VAS) scores in preoperative and postoperative LDH patients, and the results were statistically significant (17). In another study, it was suggested that RDW and MPV may be determinants for planning further imaging in patients with lumbar pain (18). NLR and PLR have been highlighted many times as inexpensive and effective inflammation indicators of many types of locomotor system pain (19-20). In our study, we did not find a result indicating use of inflammation markers in diagnosis of ULDHs.

It has been hypothesized that DHs cause pain through the impaired integrity of annulus fibrosus, dislocated nucleus pulposus and irritated nerve fibers; however, this has not been fully explained. Pointing only to anatomic alterations as the causes of pain is not appropriate because there are usually no correlations between complaints, examination findings and obtained imaging. This condition indicates inflammation. LDH-related pain is associated with compression of the nerve root and inflammatory response against herniated disc material. Many studies have been conducted at the molecular level. For example, elevated phospholipase A2 levels have been found in examinations of herniated disc materials (21-22). A study evaluating macrophage-related cytokines concluded that there are positive associations between VAS scores and TNF alfa, TNFR1, IL6, IL8 and interferon gamma levels, whereas there are negative associations between IL4, IL10, TNFR2 and macrophage (23). In a similar study, results supported that IL6, IL8, IL15 and type I interferon initiate pathological processes in DHs (24). It was demonstrated that macrophages play an active role in DH resolution and that the tendency of hernias to diminish is greater for this type of hernia due to the presence of a larger adhesion surface area on the extruding disc for macrophage (25).

Patients with LDHs have been found to have low serum metalloproteinase levels and high IL-6 levels (26). Similarly, high levels of serum ceruloplasmin were observed in a study investigating chronic inflammation in LDHs (27). In our study, we did not observe a difference when we compared inflammation markers, such as WBC, lymphocyte, neutrophil, monocyte, MPV, platelets, RDW, NLR, PLR and sedimentation and CRP values of ULDHs with LLLDHs and the control group. In a study investigating the roles of inflammation and fibrinolysis after LDH operation, it was found that plasminogen activator inhibitor 1 was associated with a poor prognosis, whereas it was not associated with CRP values, fibrinogen and D-dimer (28). Similarly, we did not find an association between CRP values and DH.

Clinical features and examination findings of patients with ULDHs are not completely understood. LLLDHs usually present with pain radiating toward the back of the leg, whereas pain at the groin and thighs is present in ULDHs (29-30). Significant associations between hip pain and L1–L2 and L2–L3 DHs were observed in a study (31). In our work, 24 patients (39.3%) with ULDHs had hip pain. It was highlighted that examination using the straight leg raise test and the femoral stretch test is not specific for ULDHs; however, pain and/or numbness proximal to the knee joint are present in L2 nerve root involvement, whereas medial knee pain and/or numbness are present in L3 nerve root involvement (32). In total, 11 of our patients with ULDH had knee pain. While an increased rate of cauda equina in patients with DHs at L3–L4 has been reported (33,34), we did not observe any cases in our patients.

CONCLUSION

In conclusion, the most important limitations of our study were its retrospective design, the small sample, lack of body mass index and not knowing the severity of pain. Future studies with larger sample groups are needed. Nevertheless, our findings suggest that WBC, lymphocyte, neutrophil, monocyte, MPV, platelets, RDW, NLR, PLR and sedimentation and CRP values are not indicators for diagnosis of ULDHs.

Competing interests: The authors declare that they have no competing interest.

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