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Evaluation of Main Inflammatory Markers on Peripheral Vertigo Attack

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Abstract: The aim of this study is to evaluate the main inflammatory markers; neutrophile lymphocyte ratio (NLR), platelet lymphocyte ratio (PLR), mean platelet volume (MPV), C-reactive protein (CRP), lactate dehydrogenase (LDH) and creatine kinase (CK) in patients with acute peripheral vertigo attack. The records of patients files and laboratory results were analyzed retrospectively. The measures of complete blood count and basic biochemical test were compared in acute peripheral vertigo attack between patient and control group. The sample consists of 119 patients and 98 healthy controls are included in the control group. There is not any statistically significant change of main inflammatory measures between two groups. Peripheral vertigo can be caused by many diseases with various pathologies. There may be various mechanisms besides inflammation and atherosclerosis of microvascular structures. The results of this study states that etiology of peripheral vertigo attack may not be related with ischemia and inflammation; it may be related with viral etiology. © 2021 NTMS.
Keywords: Vertigo, Inflammation Markers, Neutrophile Lymphocyte Ratio, Platelet Lymphocyte Ratio.

1. Introduction

Vertigo is estimated to affect 20% to 30% of people at some point in their lifetime. Vertigo attack is one of the common reasons for admission to the emergency department of the hospital (1). Vertigo is the perception of movement either of the self or of the surrounding objects, and is usually refers to a feeling of rotation, swaying, or tilting of the body or surrounding environment (2). The cause of vertigo may be central due to central nervous system pathologies or peripheral due to diseases effecting the inner ear and vestibulocochlear nerve. The most common peripheral vestibular disorders in patients with vertigo include Meniere's disease, benign paroxysmal positional vertigo, vestibular neuritis, labyrinthitis, perilymphatic fistula and acoustic neuroma (3).

Complete blood cell count and routine biochemical parameters of blood provide useful information about patient's general health condition. Therefore, these laboratory tests are applied first nearly all patients who admitted to the emergency department with vertigo attack. The neutrophile to lymphocyte ratio (NLR), platelet to lymphocyte ratio (PLR) and mean platelet volume (MPV) have been suggested as an indicativemarkers of systemic inflammation and thrombotic events (4). Higher levels of NLR and PLR were detected in patients with cardiovascular,

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oncological and neurological diseases as well as some otological diseases like facial paralysis and idiopathic sensorineural hearing loss (5). Atherosclerosis and inflammation in microvascular structures of inner ear are detected in patients with higher level of NLR, PLR and MPV (6). C-reactive protein (CRP), lactate dehydrogenase (LDH) and creatine kinase (CK) are novel potential markers that can be easily calculated in routine biochemical blood test. Clinical inflammatory status may be predicted by evaluating these laboratory tests (7). These markers are useful for scanning and detecting the prognosis of diseases with inflammatory origin.

In the otolaryngology field, several authors have described potential relationships with peripheral vertigo and inflammatory parameters. Possible relationship of these parameters with vertigo provides more convenience in early diagnosis and treatment in emergency department especially for practitioners. More literatures are required for this issue to enlighten this possible inflammatory etiology and availability of these laboratory parameters in emergency department for acute peripheral vertigo attack management. Therefore; the evaluation of the changes of these laboratory results is more important for determining the significance of usage of these parameters in the management of acute peripheral vertigo attack. The aim of this study is to assess the significance of NLR, PLR, MPV, CRP, LDH and CK in patients with acute peripheral vertigo attack and to compare the levels of these parameters in patients with peripheral vertigo attack and healthy controls by scanning the patient files retrospectively.

2. Material and Methods

This retrospective study included 119 patients who had acute peripheral vertigo attack and 98 healthy controls from January 2019 to July 2020 in the second degree hospital. The control group was composed of subjects who underwent complete blood cell count and basic biochemical test as part of routine check up. The patient group was composed of subjects who admitted to emergency department of the hospital with acute peripheral vertigo complaint.

All patients underwent detailed neurological, otological and cardiovascular examinations by practitioner duty on emergency department. Complete blood cell count, basic biochemical test, electrocardiography (ECG) and cranial imaging were performed for all patients. Main inflammatory markers were evaluated to determine the general health status at the admission of the emergency department. Exclusion criteria were: abnormal neurological examination, subsequent diagnosis with central nervous system disease, abnormal cranial imaging, sudden hearing loss and abnormal ECG findings. Patients who had acute vertigo, nausea, vomiting, postural instability and absence of sudden hearing loss, otitis media and neurological signs were included in this study. Patients who developed vertigo symptoms within 3 days and patients with new onset of symptoms were included in this study to discriminate patients with chronic peripheral vertigo. These patients were considered as presented with acute peripheral vertigo attack.

The demographic findings and laboratory data were screened from the database of our hospital and recorded. Date were analyzed and compared between patient and control groups. The NLR and PLR were calculated as a simple ratio between absolute neutrophile to lymphocyte counts and platelets to lymphocyte counts. MPV, CRP, LDH and CK levels were recorded and analyzed between groups.

2.1. Statistical Analyses

The collected data were exported to SPSS version 19.0 for Windows (IBM, Armonk, NY) for statistical analyses. Descriptive data were expressed as mean ± standard deviation. The independent samples t test was used for comparison of two groups. Statistical significance was defined as $p<0,05$.

Sample size of the study was planned due to the time interval (Jan 2019-July 2020) independent from power analysis. The power analysis of the study was calculated after data collection. G Power version 3.1.9.7 for Windows (HH Düsseldorf University, Germany) were used for power analysis. Actual power of the study was calculated as 0,9506.

3. Results

The sample group consists of 119 patients; the mean of age was 48,1±16,68 years and 64,72% was female and 36,28% was male. The control group consists of 98 patients; the mean of age was 38,03±13,85 years and 54,08% was female and 45,92% was male.

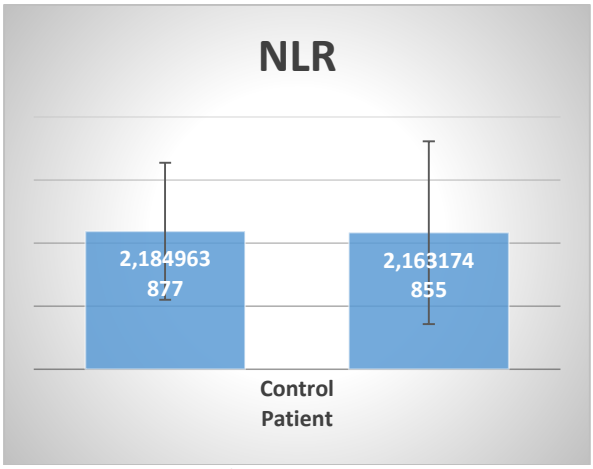

Figure 1: Comparison of neutrophile to lymphocyte ratio (NLR) between the patient group and the control group.

The mean of NLR value of patient group was 2.16±1.44 and the mean of NLR value of control group was 2.18±1.08 (Table 1). There is not statistically significant change between two groups in this ratio (Figure 1).

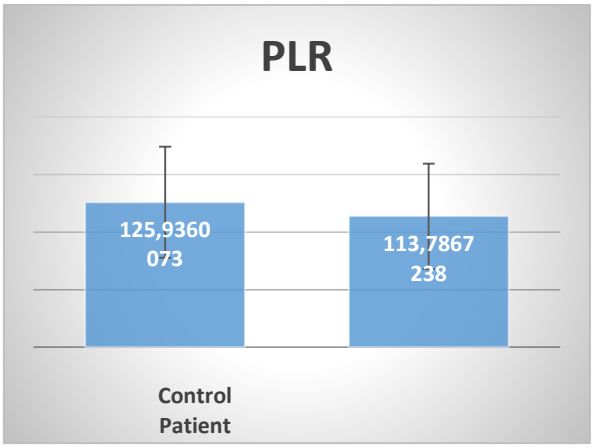

Figure 2: Comparison of platelet to lymphocyte ratio (PLR) between the patient group and the control group.

The mean of PLR value of patient group was 113.78±45.73 and the mean of PLR value of control group was 125.93±48.22 (Table 1). There is not statistically significant change in PLR between two groups (Figure 2).

The mean of MPV value of patient group was 9.99±0.98 and the mean of MPV value of control group was 10.19±0.97. There is not any significant change observed between two groups. The mean of CRP, LDH and CK were 5.86±5.58, 190.86±49.47 and 80.63±63.49 in the patient group. The mean of CRP, LDH and CK were 4.16±3.21, 180.88±40.74 and 97.25±49.45 in the control group (Table 1). There is not any statistically significant relation observed also (Figure 3).

4. Discussion

Symptoms such as nausea, vomiting, sweating, nystagmus and bradycardia are commonly seen in patients with peripheral vertigo. Attacks of vertigo can seem frightening to patients; anxiety and worsening of emotional status of patient are commonly observed. This instable condition may cause serious events like increasing the levels of stress related hormones and cytokines (8). These events cause stress and inflammation therefore changes of inflammatory markers may be observed. The inflammatory process induces some changes in peripheral blood cells and changes of the biochemical parameters in the blood serum (9).

Compete blood cell counts are widely used to evaluate patients' general condition so it is the first and basic test in peripheral vertigo attack with basic biochemical test in the emergency department. NLR and PLR have been proposed as inflammatory markers. These ratios have been used in otolaryngology, cardiovascular medicine and oncology to evaluate the inflammatory status and to assess the prognosis of the disease. MPV, CRP, LDH and CK indicates the inflammatory status as well, can easily calculated from basic blood test (10). These markers are highly repeatable, inexpensive and available predictors for detecting systemic inflammation moreover they are frequently used and evaluated quickly in emergency department.

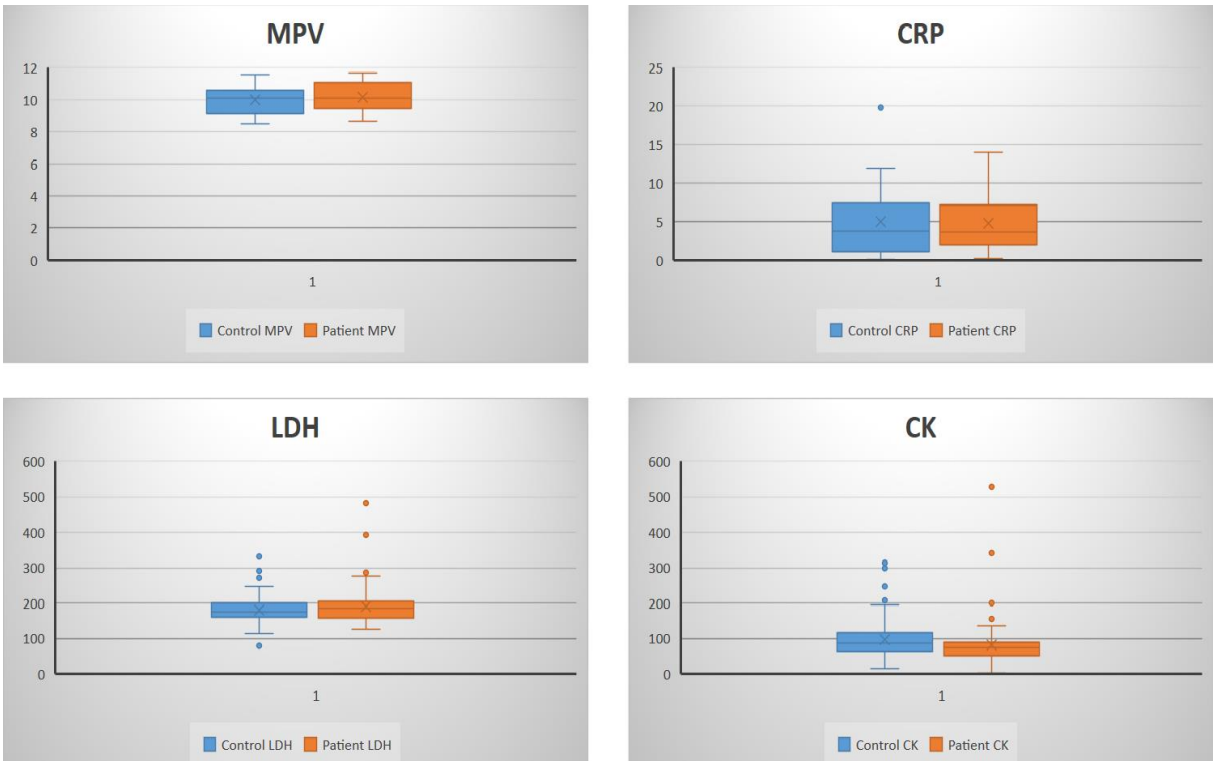

Figure 3: Comparisons of mean platelet volume (MPV), C reactive protein (CRP), lactate dehydrogenase (LDH), creatine kinase (CK) between the patient group and the control group.

Table 1: Results of Age, Sex, NLR, PLR, MPV, CRP, LDH and CK between two groups.

	Control Group n=98	Patient Group n=119	Statistical Significance
Age	38.03±13.85	48,1±16,68	
Sex (Female)	54.08%	64,72%	
NLR	2.18±1,08	2.16±1.44	t value: 10.689 p value : 0.136
PLR	125.93±48.22	113.78±45.73	t value: 6.504 p value : 0.122
MPV	10.19±0.97	9.99±0.98	t value: - 0.211 p value : 0.832
CRP	4.16±3.21	5.86±5.58	t value: - 0.196 p value : 0.844
LDH	180.88±40.74	190.86±49	t value: - 1.599 p value : 0.111
CK	97.25±49.45	80.63±63.49	t value: 2.454 p value : 0.114

NLR is a potential marker of inflammatory state and a predictor of prognosis in many diseases like coronary artery disease, renal, thyroid disease and solid tumors. Ozler et al. investigated the relationship between NLR and facial paralysis and there was a correlation between NLR values and prognosis of facial palsy (11). PLR and MPV have been proposed as a marker indicating platelet activation and inflammation associated with cardiovascular and cerebrovascular diseases. Gary et al. have concluded that a higher levels MPV and increase in platelet counts may lead to inflammation and ischemic events (12). Sagit et al. and Ulu et al. have found increased level of MPV in idiopathic sensorineural hearing loss (13, 14). Sea et al. demonstrated that NLR and PLR value were significantly higher in the patients with idiopathic sensorineural hearing loss (6). While the etiologies are uncertain, the proposed mechanisms are similar for sudden hearing loss and vertigo. The results of these studies may support the role of inflammation and thrombosis in peripheral vertigo attack. Recently, Ozbay et al. investigated NLR in peripheral vertigo patients. In that study, higher NLR in patients group was interpreted and they concluded that the potential inflammation and thrombotic mechanisms in the formation of vertigo (15). According to these literatures; the inflammatory response may contribute to thrombosis, then results to microvascular occlusion and labyrinthine ischemia and vertigo attack may be formed due to this process. However, it is difficult to suggest that this mechanism is accurate.

Peripheral vertigo can be caused by many diseases with various pathologies. Therefore, there may be various mechanisms besides inflammation and atherosclerosis. However, there was not any correlation found in these markers between two groups in this study. Temirbekov et al. also investigated NLR, PLR and MPV in peripheral vertigo and found no difference in the patient's group like our study (1). The authors who found that some relationships with these markers with vertigo, think that ischemic and inflammatory etiology could be a basis of vertigo. The results of this study states that etiology of peripheral vertigo attack may not be related with ischemia and inflammation it may be related with viral etiology. In this study, patient's group consists of acute peripheral vertigo attack, this group is very heterogenous with many different etiologies. Insignificant result of this study may be related to this heterogeneity.

The main limitations of this study are small sample size and type of method. Retrospective patient file evaluation is the important disadvantage of this study. Power analysis were calculated after data collection so sample size could not be planned at the beginning of the study. Detailed neuro-otological examination and vestibular tests could not applied for differential diagnosis of peripheral vertigo therefore various types of peripheral disorders were evaluated at the same time in this study. The insignificant result can be related with evaluating the various types of peripheral disease.

5. Conclusions

NLR, PLR, MPV, CRP, LDH and CK can reflect the inflammatory status of body. When evaluating the inflammatory diseases or diseases with inflammatory etiology, these markers should be taken into consideration. Acute peripheral vertigo attack can be caused by many diseases with various pathologies. Diagnosis or predicting the prognosis of peripheral vertigo may not be managed with evaluation of these markers. In this study, there is not any statistically significant relation with these markers in peripheral vertigo. Detailed neuro-otological examination and vestibular tests are still good and useful methods for

peripheral vertigo. More comprehensive, detailed prospective studies with large groups can be useful for detection of the importance of these markers in peripheral vertigo.

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Conflict of Interests
The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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Author Contributions
Dilci A and Cevizci R contributed to the conception and design of the study. Dilci A contributed to the collection of the data and statistical analysis and evaluation of the results. Dilci A contributed to the creating and writing of manuscript. Cevizci R contributed to revising the work and final approval of the version.

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