Hemogram Parameters of Children with Bell's Palsy at the Time of Admission and Their Findings in the Follow-up

Bell Paralizisi Tanılı Çocukların Başvuru Anında Hemogram Parametreleri ve İzlemdeki Bulguları

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ABSTRACT

Objective: The exact cause of idiopathic facial paralysis (Bell's palsy) is not clear. The objective of our study was to investigate the relationship between certain hemogram parameters and the clinical prognosis in pediatric patients with facial paralysis.

Material and Methods: The files of patients with Bell's palsy under the age of 18 who applied to our hospital were evaluated retrospectively. Leukocyte, neutrophil, lymphocyte, platelet count, red cell distribution width, neutrophil to lymphocyte ratio, platelet to lymphocyte ratio, and monocyte to lymphocyte ratio were compared between patients with Bell's palsy and the control group. Information about their last health status recorded.

Results: A total of seventeen children with Bell's palsy and 17 control groups were included in the study. There were 7 boys (41.20%) and 10 girls (58.70%) in each group, the mean age was 11.80±4.40 (minimum 3.0-maximum 17.9) years. While the median neutrophil-lymphocyte ratio was 1.25 (0.41-7.63) in patients with Bell's palsy and 1.40 (0.42-2.52) in the control group, the median mean platelet volume level was 9.30 fL (8.20-12.30) in patients with Bell's palsy and 9.95 fL (9.30-11.70) in the control group, and the median red cell distribution width level was 12.75 % (11.50-26.30) in patients with Bell's palsy and 12.70% (12.10-26.30) in the control group. None of them were statistically significant. There were six patients with Bell's palsy with low mean platelet volume levels and no patients with low mean platelet volume levels in the control group (p=0.007). There was a positive correlation between the neutrophil-lymphocyte ratio, platelet-lymphocyte ratio, and monocyte-lymphocyte ratio and the recovery time of patients with Bell's palsy.

Conclusion: Bell's palsy may show a better prognosis in girls. High neutrophil-lymphocyte ratio, platelet-lymphocyte ratio, and monocyte-lymphocyte ratio may be indicators of delayed recovery, inflammation, and microvascular ischemia in Bell's palsy.

Key Words: Bell's palsy, Child, Blood Cell Count, Inflammation

ÖZ

Amaç: İdiopatik fasiyal paralizinin (Bell paralizisi) kesin sebebi belli değildir. Çalışmamızda fasiyal paralizi tanılı çocuk hastalarda, bazı hemogram parametreleri ile klinik prognoz arasında ilişki olup olmadığının araştırılması amaçlandı.

Gereç ve Yöntemler: Hastanemize başvuran 18 yaş altındaki Bell paralizi tanılı hasta dosyaları retrospektif değerlendirildi. Lökosit, nötrofil, lenfosit, trombosit sayısı, kırmızı hücre dağılım genişliği, nötrofil lenfosit oranı, trombosit lenfosit oranı ve monosit lenfosit oranı, Bell paralizili hastalar ile kontrol grubu arasında karşılaştırıldı. Son sağlık durumlarıyla ilgili bilgiler kaydedildi.

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Bulgular: Toplam on yedi Bell paralizi tanılı çocuk ve 17 kontrol grubu çalışmaya dahil edildi. Her bir grupta 7 erkek (%41.20), 10 kız (%58.70) vardı, yaş ortalaması 11.80±4.40 (minimum 3.00-maximum 17.90) yıldı. Bell paralizili hastalarda nötrofil lenfosit oranı medyanı 1.25 (0.41-7.63) iken kontrol grubunda nötrofil lenfosit oranı 1.40 (0.42-2.52), medyan ortalama trombosit hacim düzeyi Bell paralizili hastalarda 9.30 fL (8.20-12.30), kontrol grubunda 9.95 fL (9.30-11.70); medyan kırmızı hücre dağılım genişliği, Bell paralizili hastalarda 12.75 % (11.50-26.30) ve kontrol grubunda 12.70 % (12.10-26.30)'du. İstatistiksel olarak hiçbiri anlamlı değildi. Ortalama trombosit hacim düşüklüğü olan altı Bell paralizili hasta vardı, kontrol grubunda ortalama trombosit hacmi düşüklüğü olan kişi yoktu (p=0.007). Bell paralizili hastaların iyileşme süresi ile nötrofil lenfosit oranı, trombosit lenfosit oranı, monosit lenfosit oranı arasında pozitif korelasyon vardı.

Sonuç: Bell paralizisi kızlarda daha iyi prognoz gösterebilir. Nötrofil lenfosit oranı, trombosit lenfosit oranı ve monosit lenfosit oranı yüksekliği Bell paralizisinde iyileşmede gecikme, inflamasyon ve mikrovasküler iskeminin bir göstergesi olabilir.

Anahtar Sözcükler: Bell Paralizisi, Çocuk, Tam Kan Sayımı, İnflamasyon

INTRODUCTION

The facial nerve consists of motor and sensory fibers and runs through a long and narrow bony canal. For this reason, it is the cranial nerve whose function is most frequently impaired compared to other nerves. Central facial paralysis occurs with injuries to the facial nerve nucleus. Peripheral facial paralysis occurs after injuries to the facial nerve nucleus (1).

Facial nerve palsy can have many causes, such as congenital, idiopathic (Bell's palsy), infectious, trauma, metabolic causes, malignant diseases, neurological and autoimmune syndromes, and toxic conditions (1,2). Idiopathic facial paralysis (Bell's palsy) is the most common acute mononeuropathy (3). Bell's palsy (BP) is thought to develop as a result of vascular ischemia, autoimmunity, or viral inflammation of the neural sheath, a sudden temperature change after prolonged exposure to extreme cold or heat of the face, or reactivation of the Herpes virus. However, the exact cause is still unclear (1,3,4). BP is the most common cause of acute onset and unilateral facial paralysis in children (65-70%) (1,4,5). Bell's palsy is the most common cause of facial paralysis in our country (78-80%) (6). BP may be seen at any age. BP often resolves completely, but moderate-to-severe facial asymmetry may persist in approximately one-quarter of patients (4).

The diagnosis of facial paralysis is primarily made by anamnesis and physical examination. Laboratory tests and imaging methods are not routinely required in all cases (1). Systemic steroid use in treatment can reduce the risk of late sequelae such as autonomic disorders and contractures (5,7). Methods such as eye ointment, artificial tears, eye closure (corneal protection with a moisture-retaining eye shield at night), antiviral therapy in severe cases (intense pain, Herpes, or Zoster suspicion), and microsurgery in cases of residual facial weakness and incomplete healing can be used (5). A good physical examination and evaluation for etiology are important. It has been reported that when corticosteroid is started in the first three days, it is significant in terms of complete recovery and that hemogram parameters should be checked before starting the steroid (1).

Neutrophil-lymphocyte ratio (NLR) can give an idea about inflammation. The high neutrophil-to-lymphocyte ratio is associated with different malignancies, infectious diseases, metabolic syndrome, cardiovascular diseases, and other inflammatory diseases (8,9). It has been suggested in some studies that the neutrophil-lymphocyte ratio in peripheral blood may be a marker in determining the prognosis of facial paralysis (10, 11). Mean platelet volume (MPV) and red cell distribution width (RDW), platelet-lymphocyte ratio (PLR), and monocyte-lymphocyte ratio (MLR) are among the markers that can be used in general inflammatory and peripheral thrombotic diseases in the literature. Its relationship with BP has been investigated in some studies (2,3,12).

In our study, it was aimed to retrospectively examine the pediatric patients with Bell's paralysis who applied to our hospital within five years, to evaluate the results of the examination (hemogram parameters, imaging findings, if any), and to determine the relationship between the recovery time and the test results.

MATERIALS and METHODS

The study was approved by Erzincan Binali Yıldırım University Clinical Research Ethics Committee (decision no. 32/11 taken at session no. 32 on 16 October 2018). This study was conducted in accordance with the Declaration of Helsinki. The records of patients diagnosed with facial paralysis and Bell's palsy in our hospital between 2013 and 2018 were evaluated retrospectively and cross-sectionally.

Patients under the age of 18 with a diagnosis of Bell's palsy were included in the study. Patients who don't want to be examined, patients with a diagnosis of congenital facial paralysis, patients with an underlying neurological disease, patients with previous drug use, heart disease, kidney disease, etc., those with a diagnosis of acute or chronic disease, or those with a known history of systemic disease were not included in the study. Biochemistry, PT/APTT, hemograms, and other parameters, as well as the brain imaging reports of the patients included in the study, were recorded. Those with abnormal biochemistry, PT/APTT parameters, and abnormal brain imaging (bleeding, stroke, tumor, etc.) were excluded from the study. The phone number of the family of the patients who did not come for control recently was reached, and it was learned whether they had facial paralysis again, whether there were sequelae, and

in how many days the face shape improved. Brain imaging techniques and the results of the patients were recorded.

Examination values obtained for routine control purposes from pediatric patients of the same age and gender who did not have any disease in the records and who came to the general polyclinic for a healthy child examination were recorded in the system.

Laboratory reference ranges; WBC (leukocytes): 4-11x10^3 /L; Monocyte (%): 2-9; Neutrophil (%): 41-76; Lymphocyte (%): 25-50; Plt (platelet count): 150-450x10^3; MPV (mean platelet volume): 9-12 fL, Hb (Hemoglobin): 11.5-15 g/dL; Hematocrit (%): 34-45 RBC (erythrocyte): 4-5.3x1012/L: RDW (red cell distribution width): 11-14%; MCV (mean erythrocyte volume): 76-91 fL. The leukocyte, Hb, Htc, RBC, MCV, neutrophil, lymphocyte, and platelet counts, and RDW levels of the patients and control group were recorded. The lymphocyte-monocyte ratio (LMR) was calculated in the BP and control groups. It was statistically investigated whether there was a relationship between hemogram parameters and the clinical recovery process. According to MPV and RDW reference ranges, the mean or median value of NLR (1.40), MLR (0.19), LMO (5.80), and PLR (112.13) of the control group was considered normal and evaluated as high or normal.

Statistical analysis

While summarizing the data, categorical variables were presented as frequency and percentage and continuous variables as mean and standard deviation or median, minimum and maximum. The analysis of categorical variables was done by using the Fisher exact test. The conformity of the data to the normal distribution was tested with the Kolmogorov-Smirnov test. The Mann-Whitney U test was used in the analysis of variables that did not fit the normal distribution. The independent samples t-test was used when testing the variables with a normal distribution. While determining the relationship between clinical recovery time and other variables, the Spearman correlation coefficient was used. For all statistical tests, a value of $p<0.050$ was considered statistically significant. IBM SPSS 20 (Armonk, NY: IBM Corp.) was used in the analysis of the data.

RESULTS

Seven males (41.20%) and 10 females (58.80%) totaled seventeen patients with BP, and 17 control groups of the same age and gender were included in the study. The mean age of the patients was 11.82±4.40 (minimum 3.0-maximum 17.9) years. The median clinical recovery time was 10 (3-90) days. The median clinical recovery time was 30 (10-90) days in boys and 7 (3-21) days in girls, and the clinical recovery time was longer in boys (p=0.032). The hemogram parameters (leukocyte count, platelet count, neutrophil-lymphocyte-monocyte percentage, RBC, Htc, Hb, MCV, RDW, MPV, NLR, MLR and PLR) of patients with Bell's palsy were similar to

Table I: Comparison of hemogram values of patients with Bell's palsy paralysis and the control group

	Control group	Patients with Bell's palsy	p
Leukocyte (10^9/L)*	7.10±1.47	8.47±3.16	0.125‡
RBC (10^{12}/L)*	5.14±0.52	5.06±0.40	0.606‡
Htc (%)*	41.80±4.30	41.86±3.63	0.961‡
Hb (gr/dl)*	13.90±1.46	14.15±1.34	0.610‡
MCV (fL)*	81.21±2.91	82.75±3.43	0.182‡
Plt (10^3/µl)*	296.18±59.46	304.81±85.92	0.744‡
Monocyte (%)*	7.74±1.85	7.22±1.55	0.719‡
Lymphocyte (%)*	39.41±9.29	40.46±11.54	0.778‡
Neutrophil (%)*	50.32±8.78	52.13±15.44	0.684‡
RDW (%)†	12.70 (12.1-26.3)	12.75 (11.5-26.3)	0.867§
MPV (fL)†	9.95 (9.3-11.7)	9.30 (8.2-12.3)	0.073§
MLR†	0.19 (0.07-0.31)	0.17 (0.10-0.66)	0.468§
LMR*	5.80±2.85	5.88±2.22	0.931‡
NLR†	1.40 (0.42-2.52)	1.25 (0.41-7.63)	0.669§
PLR*	112.13±37.22	128.23±86.03	0.484‡

*:mean±SD, †:*median (minimum-maximum)*, ‡: *Independent Samples T-test*, §:*Mann Whitney U Test*, ***RBC :*** *Red Blood Cell*, ***Htc:*** *Hematocrit;* ***Hb:*** *Hemoglobin*, ***MCV :*** *Mean Red Cell Volume*, ***Plt:*** *Platelet*, ***RDW:*** *Red Cell Distribution Width*, ***MPV:*** *Mean Platelet Volume*, ***MLR:*** *Monocyte to lymphocyte ratio*, ***LMR:*** *Lymphocyte-monocyte Ratio*, ***NLR:*** *Neutrophil-lymphocyte Ratio*, ***PLR:*** *Platelet-lymphocyte Ratio*

Table II. Comparison of inflammatory parameters of patients with Bell's palsy and control group

	Control group	Patients with Bell's palsy	p*	Correlation with clinical recovery time †
RDW				
Normal	15 (88.20)	13 (76.50)	0.656	r=0.204
High	2 (11.80)	4 (23.50)		p=0.598
MPV				
Normal	17 (100.00)	10 (58.80)	0.007	r= 0.140
Low	0 (0.00)	6 (41.20)		p=0.720
PLR				
Normal (<112.13)	9 (52.90)	8 (47.10)	1.000	r=0.897
High (>112.13)	8 (47.10)	9 (52.90)		p=0.001
MLR				
Normal (<0.19)	9 (52.90)	9 (52.90)	1.000	r=0.709
High (>0.19)	8 (47.10)	8 (47.10)		p=0.032
LMR				
Normal (>5.80)	6 (35.30)	6 (35.30)	1.000	r=-0.709
Low (<5.80)	11 (64.70)	11 (64.70)		p=0.032
NLR				
Normal (<1.40)	8 (47.10)	10 (58.80)	0.732	r=0.785
High (>1.40)	9 (52.90)	7 (41.20)		p=0.012

:** *Fisher's exact test*, **†:Spearman correlation*, ***RDW:*** *Red Cell Distribution Width;* ***MPV:*** *Mean Platelet Volume*, ***PLR:*** *Platelet-lymphocyte Ratio*, ***MLR:*** *Monocyte to lymphocyte ratio*, ***LMR:*** *Lymphocyte-monocyte Ratio,****NLR:*** *Neutrophil-lymphocyte Ratio*

those of the control group (Table I). There was a strong positive correlation between the number of days in which the face shape improved clinically and NLR (r=0.785, p=0.012), MLR (r=0.709, p=0.032), and PLR (r=0.897, p=0.001). In patients diagnosed with BP, the percentage of low MPV levels was higher than the percentage in the control group (p=0.007). The number of patients with elevated PLR and MLR in the patient and control groups was similar (Table II). Brain MRI alone was performed in 8 patients; only computerized brain tomography was performed in 4 patients, and both computerized brain tomography and brain MRI were performed in three patients, and imaging was not performed in two patients. Brain imaging was normal in all patients who underwent imaging. Oral steroid therapy, eye medications, and eye closure during sleep were initiated in all patients when they were applied.

DISCUSSION

Bell's palsy is idiopathic. The estimated incidence of Bell's palsy is 20-30:100.000 (13). Bell's palsy occurs with similar incidence in men and women. It has been reported that the prognosis of male patients with Bell's palsy is worse than that of female patients, and that progesterone in women accelerates peripheral nerve repair; therefore, peripheral nerve damage in women recovers faster than in men (5,11). Our number of male and female patients was similar. Our female patients healed in a shorter time, while the boys generally recovered later.

Whole blood analysis is an inexpensive assay that reflects the clinical condition of the patient. High neutrophil counts may be associated with inflammation, and a low lymphocyte count may be associated with increased stress (14). It has been reported that mean NLR and neutrophil values in adult and pediatric patients with BP are significantly higher than in healthy controls (2,3,10,11,15-17). Bucak et al. (10), in their study of 54 people in which they examined the relationship between NLR and progression in Bell's palsy, stated that NLR increased with the severity of inflammation and that NLR was higher in adult patients who did not respond to treatment. In the study of Wasano et al. (11) in 468 people, it was stated that NLR was higher in adult patients who did not respond to treatment. The severity of inflammation caused by viral infection has been associated with the prognosis of facial paralysis. In the study of Kum et al. (17), in which 656 patients were included, NLR was found to be higher in the Bell palsy group. Özler et al. (16) reported that NLR measurements in patients with BP correlated with the prognosis of the disease. There is no consensus in the literature about the correlation between NLR and the degree of disease (14). Some studies have reported that NLR is higher in BP, but NLR does not correlate with the severity of the disease (15,18). In our study, NLR was similar in the patient and control groups. There was a strong positive correlation between clinical recovery time and NLR.

Lymphocytes direct immune system activity. Some of the monocytes inhibit inflammation and immune reactions and promote damage repair (3). Yamamoto et al. (3) reported in their study that a low lymphocyte-monocyte ratio (LMR) is a negative prognostic marker in BP. In our study, MLR and LMR were similar in the patient and control groups. There was a strong positive correlation between clinical recovery time and MLR and a strong negative correlation between clinical recovery time and LMR. This may give an idea about tissue damage repair, inflammation severity, and recovery time.

Platelets play a major role in hemostasis and have important functions in inflammatory functions (19). In acute inflammatory conditions, platelet count increases due to some vasoactive peptides secreted in the vascular area (2). PLR has been reported as a poor prognosis marker in coronal vascular diseases, and hepatobiliary and gynecological malignancies (20). It has been suggested that circulatory disorders of the facial nerve resulting from inflammation, microcirculatory thromboembolism, and microvascular ischemia may play a role in the etiology of BP (2, 20). Therefore, the PLR level was measured to analyze the risk of thromboembolism in the microcirculation. It has been shown that there is a correlation between high PLR and BP, and it has been suggested that microvascular ischemia plays a role in BP (18, 20). Contrary to this view, many studies have reported that PLR does not increase BP (2,14,21). In our study, PLR was not found to be higher than the control group in our patients with BP. However, there was a positive correlation between clinical recovery time and PLR. This may be a finding that supports microvascular ischemia.

MPV is a parameter that shows the circulating platelet volume (14). It has been suggested that young platelets are larger in volume, but also more granular and have more adhesion molecules, which may predispose them to prothrombic events (2,22). Biochemical agents and cytokines emerging in inflammation may trigger the release of more young platelets into the circulation. Therefore, MPV may be elevated in microvascular thrombotic events (2,22). It has also been reported that MPV can be used as a negative acute phase reactant in chronic diseases (such as rheumatoid arthritis, and FMF) (23). MPV levels and BP has been investigated, but no correlation has been found (2,14, 17,21). It has been theorized that BP may be an inflammatory condition rather than a microvascular event (17). In our study, similar to the literature, MPV levels were similar in the BP and control groups. However, the number of patients with low MPV levels was high. Supporting the literature, it can be thought that MPV in BP may be a negative acute phase reactant and may be an indicator of inflammation.

Red blood cell distribution width (RDW) represents heterogeneity in the size and volume of circulating erythrocytes (24). RDW is an inflammatory biomarker increased in anemia, oxidative stress, microvascular thrombotic events, and inflammation (2,24). It has been suggested that RDW levels may also increase as a result of increased erythropoiesis due to inflammatory changes

(2,25,26). It has been reported that high RDW is associated with poor clinical outcomes in some diseases (2). Horibe et al. (26) showed that RDW was higher in Bell palsy patients who did not recover than in those who did. They suggested that RDW could be a useful prognostic biomarker for BP. However, in different studies, it has been reported that there is no significant increase in RDW levels in patients with BP (2,14,21). In our study, there was no significant increase in RDW levels in our patients diagnosed with BP compared to the control group. There was no correlation between recovery time and RDW.

The limitations of our study are that it is retrospective and the number of cases is small.

The strengths of our study are long-term follow-up and investigation of the relationship between admission hemogram parameters and recovery time.

CONCLUSION

In this study, there is a positive correlation between NLR, PLR, MLR, and clinical recovery day in pediatric patients with Bell's palsy. This supports the involvement of inflammation and microvascular ischemia in the etiology of Bell's palsy. Bell's palsy has a better prognosis in girls. Prospective studies with a high number of cases are needed.

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