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Neutrophil to Lymphocyte Ratio and Platelet to Lymphocyte Ratio in Bell's Palsy: A Comparison of Diabetic and Nondiabetic Patients

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Abstract

Aim: The study aimed to investigate the relationship between hematological parameters, including the Neutrophil to Lymphocyte Ratio (NLR) and Platelet to Lymphocyte Ratio (PLR), and Bell's Palsy (BP) in diabetic or non-diabetic patients.

Material and Methods: The electronic records of 57 diabetic (Type 2) and 56 non-diabetic patients with BP and 57 healthy subjects who were admitted to tertiary clinical center were retrospectively reviewed.

Results: The NLR levels were significantly higher in the diabetic BP group compared to control subjects (p: 0.005; p<0.05). The other groups were not statistically different in terms of NLR (p>0.05). The NLR were statistically reverse relationship with initial House Brackman grade values (p: 0.040; p<0.05). The relationship between NLR and 1st and 6th-month House Brackman grades were not significantly different (p>0.05). The groups of this investigation were not statistically different in terms of PLR (p>0.05).

Conclusion: PLR values were not different in diabetic and non-diabetic patients with Bell's palsy. NLR values were significantly higher in diabetic Bell's palsy group. NLR can be used as auxiliary parameters in the diagnosis of Bell's palsy in diabetic patients.

Keywords: Bell's palsy; Diabetes mellitus; NLR; PLR

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Introduction

Bell's Palsy (BP) is a sudden onset idiopathic paralysis of the peripheral facial nerve, affecting approximately 25 people in every 100,000 [1-3]. BP has no identified cause, but viral inflammation and/or microvascular problems have been accused as possible causes. The diabetic BP patients generally have a very good prognosis, but microangiopathy due to diabetes can be a potential etiological and poor prognostic factor in BP [2]. On the other hand, there are very few clinical studies in the literature regarding the relationship between prognosis and diabetes in BP patients [4,5]. Currently, it is advocated that hematologic prognostic markers such as neutrophil-lymphocyte ratio and thrombocyte-lymphocyte ratio can be used as indicators of inflammatory conditions [6-8]. Hematological prognostic markers indicating the degree of inflammation have only been described in the literature for non-diabetic patients. However, it is clear that prognostic markers are also necessary to predict the prognosis in diabetic BP patients. In this study, diabetic and non-diabetic BP patients were evaluated comparatively in terms of hematological parameters, and the effect of diabetes on prognosis was examined.

Material and Methods

This study was conducted in a single tertiary clinical center. The electronic records of 57 diabetic (Type 2) and 56 non-diabetic patients who were admitted to tertiary clinical center with facial paralysis between January 2017 to December 2020 and were treated with the diagnosis of BP and 57 healthy subjects were retrospectively reviewed. At the beginning of the study institutional review board approval was obtained (Protocol no: E-17073117-050.06). Venous blood samples were taken from all patients at admission. A Complete Blood Count (CBC) data was obtained. The PLR and NLR were simply calculated using CBC data. HbA1c levels were also obtained. Oral prednisolone treatment was initiated in all patients (starting 1 mg/kg per day, maximum starting dose 60 mg). The

treatment was terminated by reducing the prednisolone dose by 10 mg every 3 days. In all diabetic patients, prednisolone administered intravenously in inpatient clinic and subcutaneous insulin injections were used instead of oral antidiabetics during the treatment period to control blood glucose levels. The facial movements and appearance of each patient were evaluated by two specialist otolaryngologists using the House-Brackmann (HB) scores [9]. This six-degree scoring is used widely as a method to evaluate facial nerve function. Mean values of HB scores and recovery rates were evaluated at four different periods in BP groups: at the time of admission and 1, 6 months follow up visits. The statistical analyses were performed by IBM SPSS Statistics 22 (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.). Descriptive statistical methods (mean, standard deviation, frequency) were used while evaluating the study data. The reliability of the parameters to the normal distribution was evaluated with the Shapiro Wilks test. One Way ANOVA test was used to compare parameters with normal distribution between two groups. Tamhane's T2 test was used in determining the group that caused the difference. Kruskal Wallis test was used for intergroup comparisons of parameters having non-normal distribution, and Dunn test was used to determine the group that caused the difference. The Mann-Whitney U test was used to compare the parameters of the two groups that were not normally distributed. Wilcoxon Signed Ranks Test was used for intragroup comparisons of parameters that did not show normal distribution. A Chi-square test was used for qualitative data comparison. Pearson correlation and Spearman's rho were used to examining the relationships between parameters compatible and not compatible for normal distribution respectively. Significance was evaluated at the $p<0.05$ level.

Results

The Diabetic Bell Palsy (DBP), non-diabetic Bell Palsy (BP), and Healthy Control (HC) groups included 57, 56, and 57 subjects respectively. Mean age was higher in DBP compared to other groups ($p<0.05$), there is no significant age difference between BP and HC ($p>0.05$). Gender distribution did not show a statistically significant difference between the groups ($p>0.05$) (Table 1). When such parameters PLT (platelet count), lymphocyte count, monocyte count were examined no difference was observed between groups. However, neutrophile count in DBP and BP groups were found to be significantly higher compared to control group ($p<0.05$) while NLR value was observed remarkably higher in only diabetic Bell's palsy group (p: 0.005; $p<0.05$) (Table 2). PLR of the groups did not differ statistically ($p>0.05$). Though pre-treatment HB-grades were not significantly different between BP groups ($p>0.05$), 1 and 6 months HB -grades in between BP and DBP had widespread difference as HB grades were higher in diabetic BP group (1st month comparison p: 0.000 and 6th month comparison p: 0.004) (Mann Whitney U Test). In the DBP group, significant improvement in facial function were observed in 6th month visit ($p<0.05$). In the BP group, HB grade decline was found significant from 1st month visit and also significant decline detected in the 6th month follow up (Table 3). There was no statistically significant relationship between HBA1C levels and baseline, 1st and 6th month House Brackman grade values ($p>0.05$). There was no statistically significant relationship between HBA1C and NLR values (p: 0.591; $p>0.05$) (Table 4). There was no statistically significant relationship between NLR and 1st and 6th month House Brackmann grade values ($p>0.05$).

Discussion

In studies conducted so far, the relationship between diabetes and Bell's palsy severity has not been demonstrated [10,11]. Kudoh et al. [12] reported that non-insulin dependent diabetes mellitus had no effect on Bell palsy scores, but slowed recovery. Riga et al. [13] reported that there was a relationship between abnormal HbA1c values and the severity of Bell's palsy, but contrary to what was expected, these patients had a better prognosis than non-diabetic patients. They attributed this to effective glycemic control during treatment. Karagöz et al. [14] showed that insulin resistance negatively affected the severity and healing of palsy in their study on patients with non diabetic Bell's palsy. They stated that insulin resistance in non-diabetic patients may be a misleading factor when comparing the prognosis of diabetic Bell's palsy patients, and also reported that there was no correlation between HbA1c levels and the course of the Bell's palsy. According to the results of our study, type 2 diabetes mellitus does not affect the severity of Bell's palsy. However, the healing rate was slower in diabetic BP, especially in the early period. On the other hand, there is no relationship between HbA1c levels and Bell's palsy severity. Although the effect of diabetes on BP is controversial, a hematological marker that will reflect the degree of edema and inflammation can provide information about the prognosis, since the basic pathophysiology is edema and inflammation-related vascular congestion. As a matter of fact, some of the hematological parameters have been shown to be related to the severity and prognosis of the disease in nondiabetic BP patients. In a published meta-analysis, it was reported that NLR values were correlated with the BP and prognosis of BP [8]. The results of our study indicated a significant increase in NLR levels in only diabetic BP group compared to control group. However, there was no correlation with NLR values and prognosis. In our study unexpectedly there was a negative correlation between NLR values and severity of the symptoms in initial visit. Hematological parameters were examined in the literature for only nondiabetic patients. As far as we know, the effects of hematological parameters on diabetic Bell's palsy patients were evaluated for the first time in this study. On the other hand, DM alone causes an increase in NLR values [15-17]. In this study, although the NLR was higher in diabetic patients than non-diabetics, this elevation was not statistically significant. Two things can cause this situation. One of them is the increase in NLR values in BP patients, and the other is the low number of patients. In our

Tablo 1: Evaluation of age and gender between groups.

	The group of Bell's Palsy with Diabetes	The group of Bell's Palsy without Diabetes	Control Group	p
	Average ± SD	Average ± SD	Average ± SD	
Age	58.93 ± 10.68	43.59 ± 17.39	44.4 ± 13.45	0.000[1*]
Gender *n (%)*				
Men	31 (54.4%)	28 (50%)	23 (40.4%)	0.308[2]
Women	26 (45.6%)	28 (50%)	34 (59.6%)	

[1]Oneway ANOVA Test; [2]Ki-Square Test; *p<0.05

Table 2: Evaluation of the NLR and the hematological parameters between the groups.

	The group of Bell's Palsy with Diabetes	The group of Bell's Palsy without Diabetes	Control Group	p
	Average ± SD (median)	Average ± SD (median)	Average ± SD (median)	
Neutrophil	6.35 ± 2.72 (5.6)	5.33 ± 2.12 (4.7)	4.45 ± 1.66 (4.2)	0.000*
Lymphocyte	2.38 ± 1.04 (2.2)	2.61 ± 0.96 (2.5)	2.39 ± 0.71 (2.2)	0.223
Monocytes	0.71 ± 1.06 (0.5)	0.49 ± 0.19 (0.5)	0.46 ± 0.16 (0.4)	0.384
Platelet	248.4 ± 78.35 (241)	257.57 ± 68.05 (251.5)	266.07 ± 58 (266)	0.069
NLR	3.32 ± 2.47 (2.3)	2.32 ± 1.51 (2)	1.93 ± 0.66 (1.8)	0.007*

Kruskal Wallis Test; *p<0.05

Table 3: Evaluation of the House Brackmann grades of Bell's Palsy groups with and without Diabetes (from the beginning to the 1st and 6th months).

House Brackman Grade	The group of Bell's Palsy with Diabetes	The group of Bell's Palsy without Diabetes	Control Group	p[1]
	Average ± SD (median)	Average ± SD (median)	Average ± SD (median)	
Beginning	3 ± 0.93 (3)	2.82 ± 0.97 (3)	2.91 ± 0.95 (3)	0.180
1st Month	2.81 ± 1.16 (3)	2.14 ± 1.05 (2)	2.48 ± 1.15 (2)	0.000*
6th Month	1.54 ± 0.66 (1)	1.23 ± 0.5 (1)	1.39 ± 0.6 (1)	0.004*
Beginning-1st Month *p*[2]	0.120	0.000*		
Beginning-6th Month *p*[2]	0.000*	0.000*		
1st Month - 6th Month *p*[2]	0.000*	0.000*		

[1]Mann Whitney U Test; [2]Wilcoxon Sign Test; *p<0.05

Table 4: Evaluation of the correlation between HBA1C and NLR with House Brackmann grades (Beginning, 1st Month, 6th month parameters).

		HBA1C	NLR
House Brackman Grade			
Beginning	**r**	-0.039	*-0.194*[+]
	p	0.775	*0.040**
1st Month	**r**	-0.032	-0.012[+]
	p	0.811	0.901
6th Month	**r**	-0.112	-0.036[+]
	p	0.407	0.709

Pearson Correlation Analysis; [+]Spearman Rho Correlation Analysis; *p<0.05

study NLR values were significantly higher only in diabetic Bell's palsy group compared to control group. The diagnosis of diabetes in patients with Bell palsy is made by Fasting Blood Glucose (FBG) and oral glucose tolerance test. Glucose tolerance test for insulin resistance is costly, time-consuming, and not reproducible, so it is not used for patients with completely normal Fasting Blood Glucose (FBG) levels. The significance of HbA1c levels is that patients report a history of glycemic control over the past 2 to 3 months, as the average lifetime of an erythrocyte is 120 days. FBG alone may not be sufficient for the diagnosis of diabetes due to the possibility of false results. HbA1c levels are not affected by instant blood sugar changes. It correlates with FBG and oral glucose tolerance test [17,18]. Sefil et al. [19] found that increasing NLR values were associated with increasing HbA1c values. In our study, no correlation was found between HbA1c levels and NLR values. PLR reflects the degree of systemic inflammation. Atan et al. [7] reported that PLR values were significantly higher in BP patients compared to the control group. Kim reported a significant increase in PLR values in pediatric BP patients [20]. However, some studies did not detect an increase in PLR values [8]. In the data of this study, there was no relationship between PLR values and BP. DM also causes changes in PLR values. Mertoğlu reported that PLR values decreased in the early period of diabetes but increased in the late period [21]. In our study, there was no difference between diabetic and non-diabetic patients in terms of PLR values. This may be due to the patients having different stages of DM. The current study had some limitations. It was a retrospective study and consisted of a small number of patients with BP. Another limitation was that it could not evaluate other parameters such as body mass index, blood pressures, because it was a retrospective study. Prospective studies are needed to evaluate the changes of NLR and PLR values in diabetic BP.

Conclusion

NLR values were not different in diabetic and non-diabetic patients with Bell's palsy. But NLR was higher in diabetic BP compared to control group. While NLR values reversely correlated with the severity of Bell's palsy, it was not associated with prognosis. PLR values did not correlate with any parameters of the Bell's palsy clinic. The NLR can serve as an auxiliary parameter in the diagnosis of Bell's palsy in diabetic patients.

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