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Original Article *Özgün Araştırma*

EFFECT OF DIABETES AND SYSTEMIC INFLAMMATION PARAMETERS ON THE PROGNOSIS OF BELL'S PALSY

Diyabet ve Sistemik Enflamasyon Parametrelerinin Bell Palsisinin Prognozuna Etkisi

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ABSTRACT

Objective: This study aimed to evaluate the prognostic importance of diabetes mellitus, hematologic and biochemical test findings including neutrophil-to-lymphocyte ratio, platelet-to-lymphocyte ratio, systemic inflammation response index and triglyceride-glucose index in patients with Bell's palsy and to compare these results with healthy subjects.

Material and Methods: The study included 75 patients with incomplete Bell's palsy.

and 24 healthy subjects as the control group. Patients were divided into two groups as diabetes mellitus and non- diabetes mellitus patients. Complete blood count, biochemical tests including glucose, liver and renal function tests and blood lipid profile were analyzed from all the subjects and neutrophil-to-lymphocyte ratio, platelet-to-lymphocyte ratio, systemic inflammation response index and triglyceride-glucose index values were calculated from these results.

Results: Neutrophil-to-lymphocyte ratio and systemic inflammation response index values were higher in patients with Bell's palsy when compared with the control group. Triglyceride-glucose index was positively correlated with recovery time in all patients and the diabetes mellitus group. It was also positively correlated with prognosis in non- diabetes mellitus patients. High neutrophil-to-lymphocyte ratio was predictive for delayed recovery time only in non- diabetes mellitus patients.

Conclusion: Our results indicated that diabetes mellitus didn't influence severity, recovery time and prognosis of Bell's palsy. High triglyceride levels and triglyceride-glucose index values were associated with long recovery time in patients with Bell's palsy. For both diabetes mellitus and non- diabetes mellitus patients, House-Brackmann facial nerve grading scale-initial was the best parameter to predict the prognosis. Neutrophil-to-lymphocyte ratio and systemic inflammation response index values were significantly higher in patients with Bell's palsy.

***Keywords**: Bell palsy, diabetes mellitus, inflammation, prognosis*

ÖZ

Amaç: Bell palsili hastalarda, diyabetin prognostik önemini, nötrofil-lenfosit oranı, trombosit-lenfosit oranı, sistemik inflamasyon yanıt indeksi dahil hematolojik ve biyokimyasal test bulgularını değerlendirmek, ayrıca Bell palsili hastalarda trigliserid-glikoz indeksini değerlendirmek ve bu sonuçları sağlıklı deneklerle karşılaştırmaktır.

Gereç ve Yöntemler: Çalışmaya, Bell palsisi komplet olmayan 75 hasta ve kontrol grubu olarak 24 sağlıklı birey dahil edildi. Hastalar diyabet olan ve diyabet olmayan olarak iki gruba ayrıldı. Tüm deneklerden tam kan sayımı, glikoz, karaciğer ve böbrek fonksiyon testleri gibi biyokimyasal testler ve kan lipid profili analiz edildi ve bu sonuçlardan nötrofil-lenfosit oranı, trombosit-lenfosit oranı, sistemik inflamasyon yanıt indeksi ve trigliserid-glikoz indeksi değerleri hesaplandı.

Bulgular: Nötrofil-lenfosit oranı ve sistemik inflamasyon yanıt indeksi değerleri Bell palsili hastalarda kontrol grubuna göre daha yüksekti. Trigliserid-glikoz indeksi, tüm hastalarda ve diyabet grubunda iyileşme süresi ile pozitif korelasyon gösterdi. Trigliserid-glikoz indeksi ayrıca diyabet olmayan hastalarda prognoz ile pozitif korelasyon gösterdi. Yüksek nötrofil-lenfosit oranı, sadece diyabet olmayan hastalarda gecikmiş iyileşme süresi için öngörücüydü.

Sonuç: Sonuçlarımız, diyabetin Bell palsinin şiddetini, iyileşme süresini ve prognozunu etkilemediğini gösterdi. Nötrofil-lenfosit oranı ve sistemik inflamasyon yanıt indeksi değerleri Bell palsili hastalarda anlamlı olarak yüksekti. Yüksek trigliserid seviyeleri ve trigliserid-glikoz indeksi değerleri Bell palsili hastalarda uzun iyileşme süresi ile ilişkilendirildi. Hem diyabet hem de diyabet olmayan hastalar için, the House-Brackmann facial nerve grading scale-initial prognozu tahmin etmek için en iyi parametreydi.

***Anahtar Kelimeler**: Bell palsisi, diyabet, inflamasyon, prognoz*

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INTRODUCTION

Bell's palsy (BP) is a rapid paresis or paralysis of the facial nerve. Facial nerve inflammation is suggested in the etiology which results in edema and compression of the nerve (1). Most of the patients recover within 3-5 months, but 29% of the patients face incomplete recovery or sequels (2). Many diseases and viral agents that progress with inflammation have been accused in etiology (3-6). Inflammation is presented as one of the main mechanisms of nerve damage (7) and the effect of systemic diseases progress with systemic inflammation on the prognosis of BP is under research (6,8). Diabetes mellitus (DM) is one of these diseases which is presented as a risk factor for BP (1). Studies demonstrate the presence of low-grade inflammation in patients with DM (9,10) and support the link of inflammation to the pathogenesis of DM and insulin resistance (11,12). Controversy exists on the effect of DM on the recovery time and prognosis of BP (5,13-18). DM is presented as having no effect on the healing rate of BP in most of the studies (5,13,16) whereas worse prognosis is also reported for patients with DM (18).

Triglyceride-glucose index (TyGI) is a diabetes - associated metabolic index. It is presented as an accurate diagnostic tool for insulin resistance (18-21). It can be counted up from glucose and triglyceride levels from the routine biochemical analysis and can be indicative for pre-diabetic conditions (19).

Recent literature focus on the prognostic value of parameters indicating systemic inflammation for BP (22-27). The presence of systemic inflammatory response can be indicated by leukocytes, neutrophils, lymphocytes, platelets and acute-phase proteins in blood tests (28). Studies demonstrate the correlation between pre-treatment hematologic test findings and prognosis of BP (26). Many studies are performed to search the correlation between neutrophil-to-lymphocyte ratio (NLR) and platelet-to-lymphocyte ratio (PLR) and BP (24,25,29). Systemic inflammation response index (SIRI) is a new hematologic inflammatory marker based on the counts of peripheral neutrophils, monocytes and lymphocytes (28). It is used to predict the degree of inflammation in patients with cancer.

The present study aimed to evaluate the prognostic importance of DM, hematologic and biochemical test findings including NLR, PLR SIRI and TyGI in the patients with BP and to compare these results with healthy subjects.

MATERIALS AND METHODS

The study was designed as retrospective case-control study. All procedures performed in this study were complaint with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. The study was approved by the local ethics committee (Kırıkkale University Ethics Committe of Non-interventional Research, date: 19.02.2020, issue number: 2020.02.16).

The study included 75 patients who were diagnosed as BP with incomplete paralysis between April 2016 and April 2019. The patients who had an additional symptom other than unilateral facial weakness, complete paralysis, any systemic disease other than DM, any medication within 1 month other than anti-DM drugs, recurrent paralysis, had a history that could predispose to facial paralysis, had less than 1 year follow-up were excluded.

Patients were divided into two groups as patients with DM and patients without DM (non-DM). The diagnosis of BP was based on BP Clinical Practice Guideline (1). The House-Brackmann facial nerve grading scale (HBG) was used to assess initial (IHBG) (at the time of diagnosing) and post-treatment (PHBG) facial nerve paralysis (30). PHBGs greater than I after 6 months was accepted as unsatisfactory recovery.

All the patients were treated with either oral or intravenous corticosteroids (methyl prednisolone

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therapy 1mg/kg for 3 days and reduced across 10 days) within 3 days of symptom onset. The antivirus agent was not included in the treatment regimen. The patients were followed-up regularly at least 1 year from the onset of facial paralysis. Magnetic Resonance Imaging and electrodiagnostic testing were performed only in patients in whom the paralysis failed to recover in 3 months.

Since the changes depending on ethnic origin could be seen in hematological and biochemical data and normative values of SIRI and TyGI had not been established, 24 healthy subjects who had normal facial functions with no history of systemic disease and medication were included in the study to present the normative values. Informed consent was obtained from subjects who participated in the study.

Complete blood count, biochemical tests including glucose, liver and renal function tests and blood lipid profile were analyzed from all subjects and NLR, PLR, SIRI and TyGI values were calculated from these results. The data were compared between healthy subjects and patients, and DM and non-DM patients. The effect of these parameters on the severity, recovery time and prognosis of BP were explored.

Statistical Analysis

Non-parametric data were analyzed using the *Kruskal-Wallis* test ($p<0.05$). The *Mann-Whitney U* test and *Bonferroni Correction* test were applied in binary comparisons of groups ($p<0.0167$).

Parametric data were analyzed with *One-Way Analysis of Variance (ANOVA)* to evaluate the differences between groups ($p<0.05$). *Tukey Multiple Comparisons* test and *Independent Samples t* test were applied in binary comparisons of groups ($p<0.016$).

Spearman's rho Correlation test was used to determine the correlation between disease parameters specially to predict the improvement and/or prognosis ($p<0.05$).

ROC-Curve analysis was applied to determine the sensitivity and specificity of the study parameters to predict the prognosis ($p<0.05$).

The *Likelihood-Ratio* test and *Logistic Regression* test were applied to the variables for prediction of the "best" variable or parameter of the improvement time and prognosis ($p<0.05$).

RESULTS

Thirty-six patients (48%) were non-DM and 39 patients (52%) had DM. The competence of the sample size was supported by G power analysis (G*Power, version 3.1.9.2, minimum sample size of groups=33, alpha=0.05, actual power=0.80)

The average recovery time was 32.3±19.4 days (range 7-90 days) in the non-DM group and 59.3±56.4 days (range 14-180 days) in the DM group. Total recovery occurred in 76% (57 patients) of the patients, 81% (29 patients) in the non-DM group and 72% (28 patients) in the DM group. Among the 18 patients who presented with unsatisfactory recovery, the PHBG was grade II in 11 patients and grade III in 7 patients in 6 months follow up. No additional pathology was detected in their radiologic evaluation. None of the patients had any sequel. Results of comparison between patients and the control group are presented in Table 1.

Analysis of Patients with BP

The correlation analysis revealed positive correlations between recovery time and triglyceride level ($r=0.294$, $p=0.010$), TyGI value ($r=0.312$, $p=0.007$), IHBG ($r=0.388$, $p=0.001$), red cell distribution width (RDW) level ($r=0.252$, $p=0.029$) and prognosis ($r=0.242$, $p=0.036$). Positive correlations existed between prognosis and IHBG level ($r=0.392$, $p<0.001$) and triglyceride level ($r=0.238$, $p=0.040$). IHBG level was positively correlated with alanine aminotransferase (ALT) level ($r=0.291$, $p=0.011$) and insulin use ($r=0.265$, $p=0.022$). Positive correlation existed between SIRI value and NLR ($r=0.746$, $p<0.001$). Triglyceride

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and IHBG levels and TyGI and RDW values could be used as the best parameters in predicting the recovery time. Besides, although they did not have a direct correlation with recovery time; age, mean platelet volume (MPV) and ALT levels were also predictive for recovery time (Table 2). Triglyceride level >174 mg/dL (61% sensitive and 70% specific, area=0.661, *p*=0.041) and IHBG >III-IV (3.5) (61% sensitive and 79% specific, area=0.759, *p*=0.001) were predictive for poor prognosis (Figure 1). IHBG and RDW level were the best parameters to predict the prognosis (Table 2).

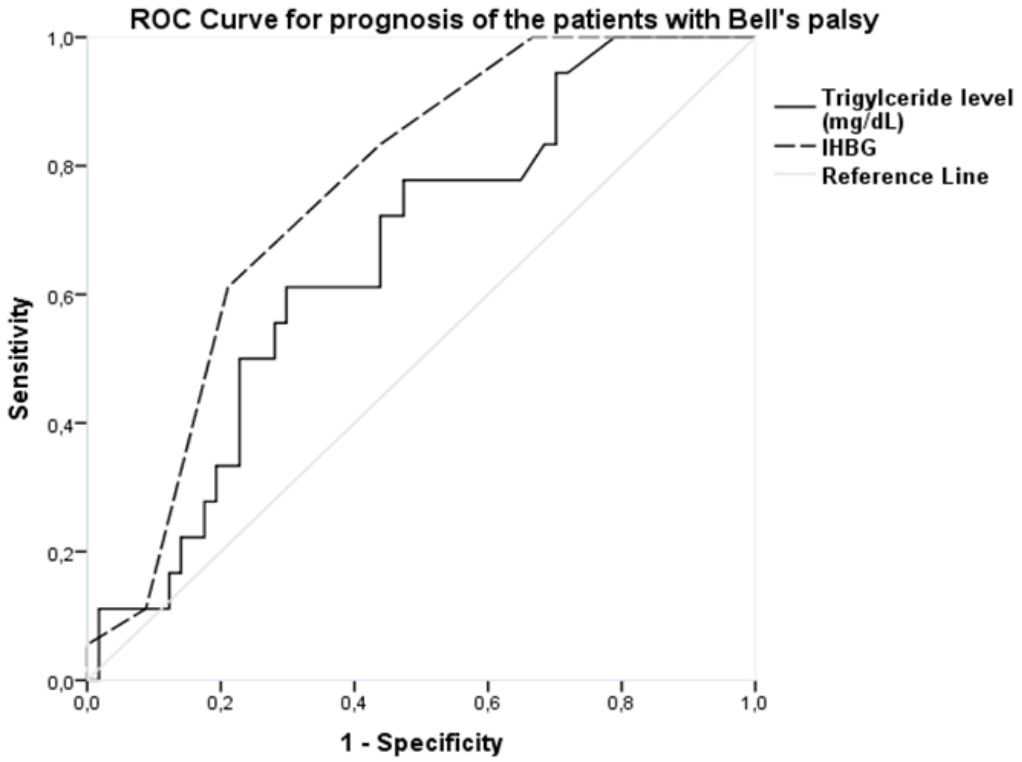

Figure 1: The ROC Curve analysis graphic demonstrating the sensitivity and specificity of the variables for prognosis of Bell's palsy. IHBG: initial House-Brackmann grade

Results of the analysis between DM and Non-DM patients are presented in Table 3.

Analysis of patients with DM

The correlation analysis revealed positive correlations between recovery time and triglyceride level (r=0.327, *p*=0.042) and TyGI value (r=0.356, *p*=0.026). Positive correlations were detected between prognosis and IHBG (r=0.430, *p*=0.06), AST (r=0.381, *p*=0.017) and ALT levels (r=0.370, *p*=0.02). In addition, a positive correlation existed between IHBG and ALT level (r=0.452, *p*=0.004). Triglyceride and glucose levels, TyGI value and the use of insulin were presented as the best parameters in predicting the recovery time (Table 4). IHBG >III–IV (3.5) (81% sensitive and 71% specific, area = 0.768, *p*=0.010) was predictive of poor prognosis (Figure 2.b). IHBG was the best parameter to predict the prognosis (Table 4).

Table 1: The demographic data, clinical findings and laboratory results of the control and Bell's palsy groups. *Independent Samples t* test, *Mann Whitney U* test and *Chi-S-square* test (p<0.05).

		Control	**Bell's palsy**		
Variable		Mean±SD/ Median (min-max)/ n (%)	Mean±SD/ Median (min-max)/ n (%)	t / Z/ X^2	*p*
Age, year		51.17±13.59	53.28±17.64	-0.549*	0.584
Gender	Male	10 (10.1%)	34 (34.3%)	0.099***	0.753
	Female	14 (14.1%)	41 (41.4%)		
MPV (fL)		9.83±0.96	9.82±1.21	0.044*	0.965
RDW (%)		13.40 (12.10-16.90)	13.60 (12.10-20.90)	-1.447**	0.148
Leukocyte (uL)		7270 (5070-15800)	9810 (4830-26130)	-2.858**	0.004
Neutrophil (uL)		4205 (2630-10330)	6200 (2300-23900)	-3.748**	<0.001
Lymphocyte (uL)		2225 (1360-3640)	2360 (430-7490)	-0.747**	0.455
Monocyte (uL)		400 (270-770)	500 (10-1050)	-1.650**	0.099
Platelet (uL)		266500 (189000-398000)	255000 (72000-706000)	-0.861**	0.389
NLR		1.93 (1.17-6.42)	2.83 (0.81-32.13)	-2.629**	0.009
PLR		111.97 (85.52-232.75)	108.07 (43.21-496.819	-1.208**	0.227
SIRI		727.61 (361.09-4940.43)	1320 (64.19-17696.49)	-3.344**	0.001
Glucose (mg/dl)		96 (80-110)	119 (71-429)	-4.713**	<0.001
Triglyceride (mg/dl)		91 (50-231)	132 (31-554)	-3.005**	0.003
TyGI		4.53±0.21	4.91±0.39	-4.571*	<0.001
LDL (mg/dl)		108.66±30.89	116.00±40.63	-0.812*	0.419
HDL (mg/dl)		51 (36-71)	51 (10-96)	-0.098**	0.922
AST (U/L)		17 (11-67)	18 (6-52)	-1.438**	0.151
ALT (U/L)		16 (7-56)	18 (6-110)	-1.558**	0.119
BUN (mg/dl)		27 (15-47)	30 (4-88)	-1.778**	0.075
Creatinine (mg/dl)		0.79 (0.59-1.25)	0.75 (0.45-5.18)	-1.095**	0.274

(*) t value (Independent Samples t test); (**) Z value (Mann Whitney U test); (***) X^2 Pearson Chi-square value (Chi-square test)

SD: standard deviation; MPV: mean platelet volume; RDW: red cell distribution width; NLR: neutrophil to lymphocyte ratio; PLR: platelet to lymphocyte ratio; SIRI: systemic inflammation response index; TyGI: triglyceride-glucose index; LDL: low density lipoprotein; HDL: high density lipoprotein; AST: aspartate aminotransferase; ALT: alanine aminotransferase; BUN: blood urine nitrogen

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Table 2: Results of *Likelihood Ratio* test and *Logistic Regression* test for recovery time and prognosis of Bell's palsy (p<0.05).

***Likelihood Ratio* tests for recovery time of Bell's palsy**			
Effect	X^2		*p*
Age	25.807		0.027
MPV (fL)	27.124		0.019
RDW (%)	27.141		0.018
Triglyceride (mg/dl)	26.266		0.009
TyGI	32.203		0.004
ALT (U/L)	24.508		0.040
IHBG	33.007		0.003
***Logistic Regression* test for prognosis of Bell's palsy**			
	B	Wald	*p*
RDW (%)	-1.011	6.477	0.011
IHBG	1.008	10.504	0.001

X^2 chi-square value

MPV: mean platelet volume; RDW: red cell distribution width; TyGI: triglyceride-glucose index; ALT: alanine aminotransferase; IHBG: initial House-Brackmann grade

Analysis of Non-DM patients

Correlation analysis revealed positive correlation between recovery time and IHBG (r=0.484, p=0.003). Positive correlations existed between prognosis and IHBG (r=0.369, p=0.027), triglyceride level (r=0.352, p=0.035) and TyGI value (r=0.335, p=0.046). IHBG was positively correlated with triglyceride level (r=0.338, p=0.044). Triglyceride level, TyGI value, NLR and HDL level were presented as the best parameters in predicting the recovery time (Table 4). Triglyceride level>159 mg/dL, (with 71% sensitivity and 76% specificity, area=0.756, p=0.038), IHBG>II-III (2.5) (with 71% sensitivity and 73% specificity, area=0.759, p=0.036) and TyGI value >4.78 (71% sensitivity and 65% specificity, area=0.744, p=0.048) were predictive of poor prognosis (Figure 2.a). Triglyceride level was the best parameter to predict the prognosis (Table 4).

Table 3. The demographic data, clinical findings and laboratory results of patients with DM and non-DM. *Independent Samples t* test, *Mann Whitney U* test and *Chi-S-square* test ($p<0.05$).

Variable		**Diabetes** Mean±SD/ Median (min-max)/ n (%)	**Nondiabetes** Mean±SD/ Median (min-max)/ n (%)	t / Z/X^2	*p*
Age		59.64±13.12	46.39±19.41	3.487*	0.001
Gender	Male	16 (16.2%)	18 (18.2%)	0.608***	0.435
	Female	23 (23.2%)	18 (18.2%)		
MPV (fL)		9.86±1.12	9.77±1.31	0.327*	0.744
RDW (%)		13.60 (12.10-18.30)	13.60 (12.10-20.90)	-0.058**	0.953
Leukocyte (uL)		9730 (4860-26130)	10160 (4830-18660)	-0.726**	0.468
Neutrophil (uL)		7100 (2300-23900)	5880 (2410-16700)	-1.235**	0.217
Lymphocyte (uL)		2120 (430-7490)	2540 (1140-5080)	-1.031**	0.306
Monocyte (uL)		468.74±195.66	537.08±234.65	-1.374*	0.174
Platelet (uL)		252000 (144000-573000)	261000(72000-706000)	-0.154**	0.878
NLR		3.43 (0.81-32.13)	2.42 (1.15-9.07)	-2.116**	0.034
PLR		116.11 (56-496.81)	101.77 (43.21-283.33)	-1.792**	0.073
SIRI		2000.00 (314.14-17696.49)	1093.19 (64.19-11234.67)	-1.384**	0.166
Glucose (mg/dl)		132 (90-429)	103 (71-239)	-3.543**	<0.001
Triglyceride (mg/dl)		153 (48-554)	115 (31-310)	-1.549**	0.121
TyG1		5.04±0.38	4.78±0.35	3.125*	0.003
LDL (mg/dl)		116.23±38.41	115.75±43.46	0.051*	0.960
HDL (mg/dl)		47 (10-90)	53 (22-96)	-1.427**	0.154
AST (U/L)		18 (6-37)	18.50 (10-52)	-0.335**	0.738
ALT (U/L)		18 (10-57)	18 (6-110)	-0.574**	0.566
BUN (mg/dl)		30 (4-88)	31 (11-59)	-1.163**	0.245
Creatinine (mg/dl)		0.78 (0.51-5.18)	0.71 (0.45-1.21)	-1.146**	0.252
Insulin use	No	23 (30.7%)	36 (48.0%)	18.774***	<0.001
	Yes	16 (21.3%)	0 (0.0%)		
IHBG	1	7 (9.3%)	12 (16.0%)	9.657***	0.086
	2	5 (6.7%)	11 (14.7%)		
	3	10 (13.3%)	7 (9.3%)		
	4	12 (16.0%)	4 (5.3%)		
	5	4 (5.3%)	2 (2.7%)		
	6	1 (1.3%)	0 (0.0%)		
Prognosis	Best	28 (37.3%)	29 (38.7%)	2.372***	0.305
	Worse	11 (14.7%)	7 (9.3%)		
Improvement		30 (10-180)	30 (7-180)	-0.851**	0.395

(*) t value (Independent Samples t test); (**) Z value (Mann Whitney U test); (***) X^2 value (Chi- square test)
SD: standard deviation; MPV: mean platelet volume; RDW: red cell distribution width; NLR: neutrophil to lymphocyte ratio; PLR: platelet to lymphocyte ratio; SIRI: systemic inflammation response index; TyGI: triglyceride-glucose index; LDL: low density lipoprotein; HDL: high density lipoprotein; AST: aspartate aminotransferase; ALT: alanine aminotransferase; BUN: blood urine nitrogen; IHBG: initial House-Brackmann grade

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Table 4: Results of *Likelihood Ratio* test and *Logistic Regression* test for recovery time and prognosis of patients with DM and non-DM (p<0.05).

	***Likelihood Ratio* test for recovery time**			
	Effect	***X²***		***p***
DM	Triglyceride	51.396		<0.001
	TyGI	52.617		<0.001
	Glucose	37.557		<0.001
	Insuline use	26.531		0.005
Non-DM	Triglyceride	31.021		0.001
	TyGI	49.875		0.037
	NLR	28.767		0.002
	HDL	36.279		<0.001
	***Logistic Regression* test for prognosis**			
	Variable	**B**	**Wald**	***p***
DM	IHBG	0.883	5.188	0.023
Non-DM	Triglyceride	0.012	4.128	0.042

X^2 chi-square value

DM: diabetes mellitus; non-DM: non-diabetic; TyGI: triglyceride-glucose index; NLR: neutrophil to lymphocyte ratio; HDL: high density lipoprotein; IHBG: initial House-Brackmann grade

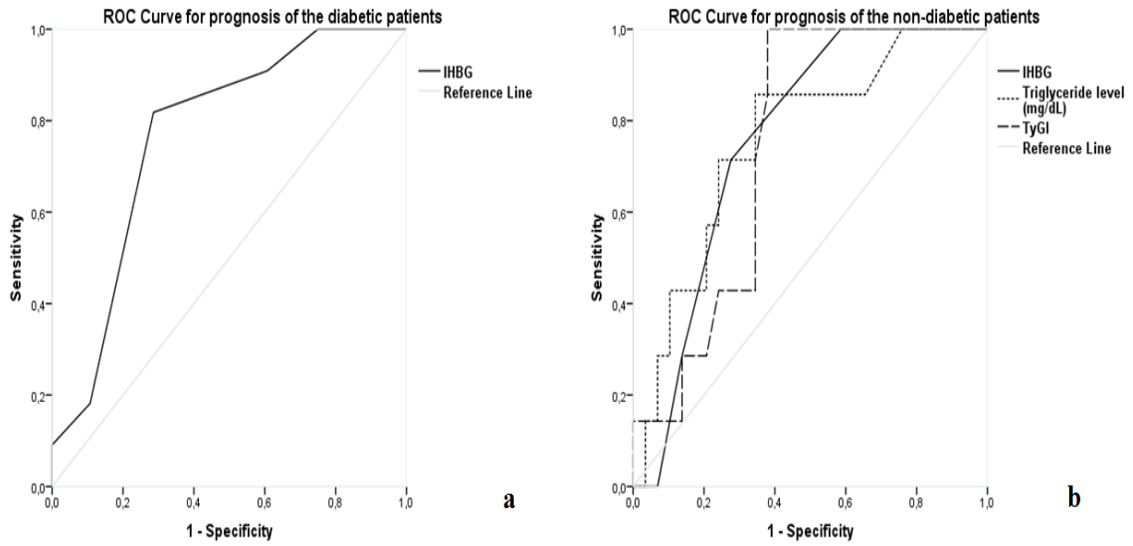

Figure 2: The ROC Curve analysis graphic demonstrating the sensitivity and specificity of the variables for prognosis of diabetic patients (2.a); and the sensitivity and specificity of the variables for prognosis of non-diabetic patients (2.b). IHBG: initial House-Brackmann grade; TyGI: triglyceride glucose index.

DISCUSSION

About 25% of the patients with BP have an associated systemic disease that can potentiate this inflammation (31). DM is one of the systemic diseases which has been suggested as a contributor to the healing process of BP (1,13). According to our results, DM patients had higher NLR and TyGI values than non-DM patients supporting

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that DM patients had a greater degree of inflammation and insulin resistance. It is generally accepted that DM does not affect prognosis of BP negatively (5,13,15,16). Compatible with most of the studies in the literature, our study revealed no difference in prognosis, severity and recovery time between DM and non-DM patients.

We also investigated the effect of lipid profile and TyGI on the severity, recovery time and prognosis of BP. Previous studies detected no correlation between hypercholesterolemia and the severity of BP whereas recovery rate was reported as negatively affected by high triglyceride levels (5,32). According to our results, both the triglyceride level and TyGI value had some influence on the healing of BP in both DM and non-DM patients. Patients with BP tended to have higher triglyceride levels when compared with healthy individuals, although this difference might be a result of high incidence of DM in patients' group. High triglyceride levels and TyGI values were directly associated with prolonged recovery time and triglyceride level>174 mg / dL was predictive for poor prognosis in patients with BP. High triglyceride levels and TyGI values were associated with long recovery time in both DM and non-DM patients whereas their significance on prognosis were different. In DM patients, high triglyceride levels and TyGI values did not have any influence on prognosis but in non-DM patients, triglyceride level was associated with poor prognosis. Additionally, our results revealed that a high HDL level could be predictive of short recovery time in non-DM patients.

Many inflammatory factors play role in coordinating the inflammation of the facial nerve in BP (33). Studies searched the relation of peripheral blood inflammatory markers to the prognosis and severity of BP, based on the idea that the degree of inflammation determines the severity of damage to facial nerve (23,24). A recent meta-analysis reveals that not all parameters showing inflammation are significant in demonstrating the prognosis of BP (24).

Systemic inflammation is associated with poor prognosis for many inflammatory diseases (28,29). SIRI was first applied to predict the survival of patients with pancreatic cancer (34). Different from NLR, the monocyte ratio is a component of SIRI, which is already presented as a prognostic parameter for Ramsey Hunt syndrome (29).

Our study revealed that the number of leukocytes and neutrophils were significantly higher in patients with BP although the values were within the normal range. NLR and SIRI values were significantly higher in patients with BP. High NLR was predictive for delayed recovery time. No association was determined between SIRI and healing in BP.

IHBG was the most constant parameter that was associated with both recovery time and prognosis in all patients with BP. IHBGs greater that III-IV and II-III were predictive of poor prognosis in DM and non-DM patients respectively. Compatible with the literature, a high RDW level was predictive for poor prognosis (22).

The main drawback of our study is the relatively small sample size of our patient group. Patient selection was based on certain criteria to exclude the effect of other factors, diseases and medication to the inflammation rather than BP and DM. The competence of the sample size was supported by statistics.

Our results indicated that DM did not influence severity, recovery time and prognosis of BP. High triglyceride levels and TyGI values were associated with long recovery time in patients with BP. For both DM and non-DM patients, IHBG was the best parameter to predict the prognosis. NLR and SIRI values were significantly higher in patients with BP and high NLR was predictive for delayed recovery time in non-DM patients. However, no association was detected between peripheral blood inflammatory markers and prognosis.

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