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Relationship between glycosylated hemoglobin and plateletcrit of type 2 diabetes patients

Tip 2 diyabet hastalarında glikolize hemoglobin ve plateletcrit arasındaki ilişki

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ABSTRACT

Aim: Type 2 diabetes can cause serious vascular problems. Abnormal plateletcrit (PCT) levels were shown as a risk factor for coronary artery diseases by recent studies. Glycosylated hemoglonin (HbA1c) is widely used marker for assessment of glycemic control. This study aimed to evaluate relationship between HbA1c and PCT.

Material and Method: It is retrospective case control study. 63 type 2 diabetic patients' and 51 healthy control individuals' records were evaluated. Platelet indices were compared. Correlation between HbA1c and PCT, MPV was investigated in type 2 diabetes patients.

Results: Type 2 diabetes patients have difference with MPV ($p<0,001$) but no difference with PCT ($p=0.65$) by comparing healthy controls. Between HbA1c and PCT levels, statistically significant correlation was detected ($r=0,4$ $p<0,01$). Any correlation wasn't detected with MPV.

Conclusion: Plateletcrit may be guide for preventing vascular complication due to poor glycemic regulation. Therefore patients with increased plateletcrit values, should be evaluated for higher risk of vascular complications.

Keywords: HbA1c, glycemic control, plateletcrit, type 2 diabetes

ÖZ

Amaç: Tip 2 diyabet ciddi damar hastalıklarına yol açabilen bir hastalıktır. Plateletcrit (PCT) anormal düzeyleri yapılan çalışmalarda koroner arter hastalıkları için risk faktörü olarak belirlenmiştir. Glikolize hemoglobin (HbA1c), glisemik kontrolü değerlendirmek için geniş kullanıma sahip bir belirteçtir. Bu çalışmada PCT ile HbA1c arasındaki ilişkinin değerlendirilmesi amaçlanmıştır.

Gereç ve Yöntem: Çalışma, retrospektif vaka kontrol çalışmasıdır. Tip 2 diyabetli 63 hasta ve benzer özelliklerdeki 51 sağlıklı kontrol grubu bireyin geçmiş kayıtları değerlendirilmiş, iki grup arasında MPV ve PCT düzeyi karşılşatırılmıştır. Diyabetik hastalarda HbA1c ve MPV, PCT arasındaki ilişki araştırılmıştır.

Bulgular: Tip 2 diyabetli hastalarda sağlıklı kontrollerle karşılaştırıldığında MPV'de anlamlı fark saptanırken ($p<0,001$), PCT'de anlamlı fark saptanmadı ($p=0.65$). HbA1c ve PCT arasında anlamlı korelasyon saptandı ($r=0,4$ $p<0,01$). MPV ile korelasyon saptanmadı.

Sonuç: PCT, glisemik kontrolü sağlanmayan ve buna bağlı vasküler hasar gelişme olasılığı olan hastalarda yol gösterici olabilir. Bu açıdan, anormal PCT düzeyleri olan hastaların vasküler patolojiler açısından yakın takibi önemli olabilir.

Anahtar Kelimeler: HbA1c, glisemik kontrol, plateletcrit, tip 2 diyabet

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INTRODUCTION

Type 2 diabetes is serious healthcare problem worldwide and its prevalence increases day by day. Diabetes is major risk factor for cerebral, cardiac, peripheral vascular disease (like diabetic foot ulcer) and thrombotic adverse events (1). Diabetic patients have worse prognosis for vascular diseases than other patients. Glycemic control is important for prevention diabetic vascular complications. Glycosylated hemoglobin (HbA1c) is most used parameter for assessing long term glycemic control (2).

Platelet indices was researched for thrombotic events before. One of them, plateletcrit (PCT) is a marker that was thought to guide for thrombocyte dysfunctions. By recent studies, it was investigated about coronary artery diseases. Especially high PCT levels were detected as risk factor for acute coronary syndrome and poor prognostic factor for treatment of coronary syndromes. In this study, it is aimed to research relationship between HbA1c and PCT (3,4).

MATERIAL AND METHOD

To the study, 63 type 2 diabetes patients that admit Erol Olçok Training and Research hospital invasive clinic were included. Any organ failure, inavasive cardiac intervention history, hematologic disease, infectious disease or presence of inflammation were exclusion criterias. 51 healthy individuals with similar characteristics of patients were set as control group. Patient's demographic records, laboratory values, like biochemistry, total blood count parameters (like hemoglobin, white blood cell, platelet, neutrophil, lymphocyte, monocyte, eosinophil, basophil counts; PCT, mean platelet volume) and HbA1c were evaluated retrospectively. Between two groups, MPV and PCT were compared. HbA1c and plateletcrit association was assessed.

For statistical analysis, it is used SPSS version 25. For detecting distribution Shapiro-Wilk test was performed. Descriptive statistics normally distributed were reported as median and minimum-maximum, no distributed normally values were reported mean and standard deviation. Grouping variables were compared with t-test or Mann Whitney-U test. Relationship of values was assessed with Spearman's correlation and simple linear regression methods. $p<0,05$ value was accepted as significant.

Ethical Status: Authority approval has been obtained.

RESULTS

Patients' ages were mean 56.3±13.3; patients were 41 female, 24 male. Median HbA1c was 7.6 (min 5.5- max 15.2), median PCT was 0.26 (min 0.11- max 0.46). Kidney and liver function tests distributions were between normal ranges. Control group has similar characteristics. Participant characteristics was shown in Table 1.

Type 2 diabetes patients have similar PCT (p=0.65) but higher levels of MPV ($p<0,01$). Between HbA1c and PCT, significant correlation was detected ($r=0.40$ $p<0.01$) (Figure 1).

Simple linear regression showed significant relationship between HbA1c and PCT (Table 2).

Table 2. Simple linear regression analysis between HbA1c and PCT

	R^2	F	β	t	Signficance
PCT	0.15	7.22	0.32	2.68	p<0.01

PCT didn't have correlation with age (p=0,95). MPV didn't have any correlation with HbA1c (p=0.59).

Table 1. Patients' demographic and laboratory characteristics.

		Patients n=63	Control group n=51	Significance
Age, year		56.3±13.3	51.4±9.6	p=0.11
Female/Male n		41/24	28/23	-
Serum creatinine, mg/dl	*M±SD*	0.7±0.16	0.73±0.12	p=0,10
Serum alanin aminotransferase, IU/L	*M±SD*	26.6±5.1	22.5±4.8	p=0,56
HbA1c %	*Median (min-max)*	7.6 (5.5-15.2)	NA	-
White blood cell count, $x10^3/\mu l$	*M±SD*	7.7±2.0	8,1±2.0	p=0.29
Hemoglobin, g/dl	*M±SD*	13.6±1.4	13.2±1.1	p=0.20
Platelet count, $x10^3/\mu l$	*M±SD*	266.3±73.0	244.5±46.9	p=0.59
Plateletcrit	*Median (min-max)*	0.26 (0.11- 0.46)	0.23 (0.17-0.29)	p=0.65
Mean platelet volume	*M±SD*	10.40±0.83	9.90±0.91	p<0.001

NA: Not applicable

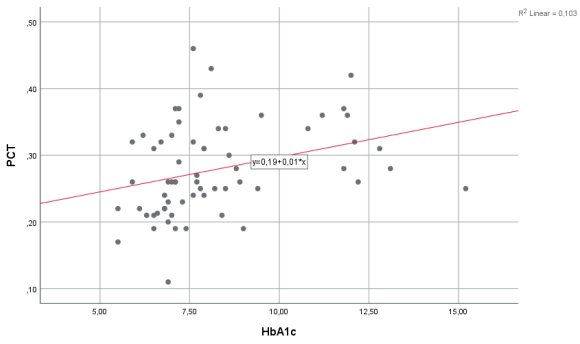

Figure 1. HbA1c and plateletcrit correlation

DISCUSSION

Type 2 diabetes is the important reason for major vascular complications. Microvascular complications like nephropathy, retinopathy, neuropathy; and macrovascular complications like coronary artery diseases, stroke were serious burden for healthcare providers (5) .

Hematologic parameters are cost-effective and easy to reach tests. Therefore, many studies were made with hematologic parameters like neutrophile/lymphocyte ratio, platalet/lymphocyte ratio, platelet distribution width, mean platalet volume, etc (6).

Platelet indices as prognostic factors were studied for diabetic patients. Higher PDW values were found in patients developing neuropathy and nephropathy complications than diabetics without any complication. Elevated PDW values have been shown relation with increased mortality in patients with acute coranry syndromes that treated with primary percutaneous coronary intervention (7). Jaman et al (8) studied association between HbA1c; MPV and PDW. They showed that glycemic control markers correlated with MPV and PDW. Increased MPV levels were interpreted as microvascular or macrovascular risk factors.

PCT, defined as the percentage of platelet mass in the blood. PCT = platelet count x MPV / 10000 is calculated by the formula, thrombocyte count in the studies and is thought to be a guide for dysfunctions (3). Platelets play a role in the inflammatory process. Plateletcrit was found superior to platelet count about assessing platelet status (9). High PCT was thought as inflammatory marker with several studies (10).

In this respect, it has been the subject of many researches on coronary artery diseases. In particular, PCT high values; were identified as the risk factors for acute coronary syndromes and predictors of poor prognosis in patients treated for coronary syndromes. In addition, there are studies showing that platelets may be problematic in low PCT levels and may be a risk factor for coronary artery disease (3,4).

Our study showed there were correlation between PCT and HbA1c. This relationship can be clue of poor glycemic control's harm on macrovascular, especially coronary damage.

Alhadas et al (11) too showed relationship between fasting glucose, Hba1c, and PCT, PDW, MPV. PCT results of this study supports our findings. Differently we didn't find any relationship about MPV. In literature, different results were reported about MPV-HbA1c association (12,13).

Glycemic control of diabetes patients is cornerstone for coronary artery disease prevention, treatment, and defining prognosis. High HbA1c levels can be reason for worse outcomes. Therefore glycemic control but individualized should be one of the major treatment targets (14,15).

Our study has several limitations. By retrospective design, patients' informations like body mass index and other platelet indices couldn't be obtained totally. It was one centre experience and the other prothrombotic and atherogenic markers couldn't be evaluated. Limited data prevented subgroup analysis. Furthermore, detailed investigations are needed to clarification of this issue.

CONCLUSION

Plateletcrit may be guide for preventing vascular complication due to poor glycemic regulation. Therefore patients with increased plateletcrit values, should be evaluated for higher risk of vascular complications.

DECLARATION OF CONFLICTING INTERESTS

The author declared no conflicts of interest with respect to the authorship and/or publication of this article.

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