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Research Article / Araştırma Makalesi

The Effect of Initiation of Antihypertensive Medication on MPV Level in Newly Diagnosed Hypertensive Patients

Yeni Tanı Konulan Hipertansif Hastalarda Antihipertansif İlaç Başlanmasının MPV Düzeyine Etkisi

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Abstract

Platelet activation is a factor involved in the pathogenesis of hypertension. It also contributes to the development of thrombotic events and target organ damage due to hypertension. Mean platelet volume is an easily measurable parameter indicating platelet activation. To evaluate whether there is any change in MPV levels after starting antihypertensive medication in newly diagnosed hypertensive patients. 79 patients who were started on antihypertensive medication were evaluated retrospectively. 24.1% of the patients had microalbuminuria. MPV values before and after (5.8±3.6 months) the start of the antihypertensive drug were compared statistically. A statistically significant decrease in mean MPV value was found after starting antihypertenive medication (8.92±1.76 fL vs. 8.38±1.60 fL, p<0.001). The mean MPV value was higher in the microalbuminuric group than in the normoalbuminuric group (9.24±1.10 fL vs. 8.49±1.75 fL, p=0.028). A significant decrease in mean MPV level was detected in the first year following the initiation of antihypertensive medication in newly diagnosed hypertensive patients.
Keywords: Hypertension, Mean platelet volume, Microalbuminuria

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Özet

Trombosit aktivasyonu hipertansiyon patogenezinde rol oynayan bir faktördür. Ayrıca, trombotik olayların gelişimine ve hipertansiyona bağlı hedef organ hasarına katkıda bulunur. Mean platelet volume, platelet aktivasyonunu gösteren kolay ölçülebilir bir parametredir. Bu çalışmanın amacı, yeni tanı almış hipertansif hastalarda antihipertansif ilaç tedavisine başlandıktan sonra MPV düzeylerinde herhangi bir değişiklik olup olmadığını değerlendirmektir. Antihipertansif ilaç tedavisine başlanan 79 hasta retrospektif olarak değerlendirildi. Hastaların% 24.1'inde mikroalbüminüri vardı. Antihipertansif ilacın başlamasından önceki ve sonraki MPV değerleri (5.8=3.6 ay) istatistiksel olarak karşılaştırıldı. Antihipertansif ilaç tedavisine başlandıktan sonra ortalama MPV değerinde istatistiksel olarak anlamlı azalma saptandı (8.92=1.76 fl'ye karşılık 8.38=1.60 fL, p<0.001). Ortalama MPV değeri mikroalbüminürik grupta normoalbüminürik gruba göre daha yüksekti (9.24=1.10 fLvs. 8.49 = 1.75 fL, p = 0.028). Yeni tanı konulan hipertansif hastalarda antihipertansif ilaç başlanmasını takip eden ilk yıl içinde ortalama MPV düzeyinde anlamlı bir azalma tespit edildi.
Anahtar Kelimeler: Hipertansiyon, Mean platelet volüm, Mikroalbuminüri

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1. Introduction

Mean platelet volume (MPV) is known as a marker that indicates platelet activation(1-3). Large platelets contain active and dense granules with greater thrombotic potential (3). Therefore, an increased MPV level may be a marker for an increased risk of prothrombotic conditions. An increase in the risk of prothrombosis due to platelet activation is a factor involved in the pathogenesis of hypertension (4-5). Significant relationships between hypertension and MPV levels have been shown in various studies (1,5-8). In addition, it was found that MPV levels were higher in those with target organ damage due to hypertension than in those without (5,6,9).

The aim of this study is to investigate whether there is a change in MPV levels after starting antihypertensive treatment in newly diagnosed hypertensive patients without any other known cardiovascular disease.

2. Materials and Methods

Newly diagnosed hypertensive adult patients not using antihypertensive medication admitted to the nephrology outpatient clinic of the University of Health Sciences-Keçiören Educational and Research Hospital between 01/01/2017-30/06/2019 were included in this retrospective study. Diabetic patients were excluded from the study. Patients who had estimated glomerular filtration rate (eGFR) less than 60 mL/min/1.73 m², who had a history of active infection, malignancy or coronary arter disease were also excluded from the study.

The study protocol was approved by the ethics committee of the Keçiören Education and Research Hospital.

The age, gender, name and number of the newly started antihypertensive drugs of the patients were obtained from the records. Patients' laboratory data as serum creatinine, eGFR, lipid profile, uric acid and spot urine albumin-to-creatinin ratio levels evaluated before antihypertensive medication initiation were also obtained from the medical records. Platelet count and MPV values evaluated before and within the first 1 year (1-12 months) after starting to take antihypertensive medication were found from the medical records.

Blood samples were taken from the antecubital vein into dipotassium ethylenediaminetetraacetic (EDTA) tubes and were analyzed in the same analyzer (BC-6800-Mindray North America Hematology Analyzer) in the same laboratory within one hour. Mean platelet volume measurement was performed based on platelet histogram.

The eGFR was calculated by 4-variable MDRD equation described by the National Kidney Foundation as follows: eGFR (mL/min/1.73 m²) = 175× (Scr)$^{-}$ -1.154 × (Age)$^{-}$-0.203 × (0.742 if female) × (1.212 if African American) (10).

The definition of normoalbuminuria and microalbuminuria is that the daily excretion of albumin should be below 30 mg and 30-300 mg, respectively (11).

Data analysis was performed using SPSS version 15.0 (SPSS Inc., Chicago, IL, USA). Results were expressed as mean±SD for continous variables and as numbers and percent for categorical variables. Mean platelet volume values before and after the antihypertensive drug began were compared by Paired Samples T-test. Spearman correlation test was used to evaluate correlations between variables. A p-value <0.05 was considered statistically significant.

3. Results

Seventy-nine newly diagnosed hypertensive patients were included in the study. The most commonly started antihypertensives were renin angiotensin system (RAS) blockers (58.2%). Combined antihypertensive medication was started in 49.4% of patients. Demographic and labarotory properties of the patients were given in Table 1.

Table 1. Demographic and laboratory characteristics of patients

Number	**79**
Gender (F/M) (%)	68.4/31.6
Age (years)	53.4±10.8
Number of antihypertensive drug	
1 drug (%)	50.6
2 or more drug (%)	49.4
Antihypertensive drug	
RASi (%)	58.2
CCB (%)	44.3
Beta blocker (%)	1.3
Alpha blocker (%)	1.3
Diuretic (%)	40.5
Follow-up period (months)	5.8±3.6
Serum creatinine (mg/dl)	0.80 ±0.14
eGFR (mL/min/1.73 m²)	94±15
Uric acid (mg/dl)	5.2±1.3
Total cholesterol (mg/dl)	217±37
Triglyceride (mg/dl)	163±104
LDL-cholesterol (mg/dl)	137±35
HDL-cholesterol (mg/dl)	48±9
Albuminuria (mg/day)	50±96
Microalbuminuria (%)	24.1

RASi: renin angiotensin system inhibitors, CCB: calcium channel blocker
eGFR: estimated glomerular filtration rate, LDL: low density lipoprotein HDL: high density lipoprotein

Although the mean MPV value was higher in women, this difference was not statistically significant (9.15±1.89 fL vs. 8.42±1.36 fL, p=0.088). There was no correlation between MPV value and age, lipid profile, uric acid, eGFR and albuminuria amount.

The mean MPV value was found to be higher in the microalbuminuric group than in the normoalbuminuric group (9.24±1.10 fL vs. 8.49±1.75 fL, p=0.028).

The number of platelet and MPV values were evaluated on average 5.8±3.6 months after starting to take the antihypertensive drug. The initial mean MPV value of patients before the drug was started was 8.92±1.76 fL. A statistically significant decrease in mean MPV value was found after starting antihypertensives (8.38±1.60 fL, p<0.001). The mean number of platelets before and after the start of the drug was similar (274±55*10³/µL vs. 277±62*10³/µL, p=0.565) (Table 2).

Table 2. MPV and platelet values before and after the start of antihypertensive medication

	Before	**After**	**p**
MPV (fL)	8.92±1.76	8.38±1.60	<0.001
Platelet (*10³/µL)	274±55	277±62	0.565

MPV: mean platelet volume

4. Discussion

In this study, a significant decrease in the mean MPV value was observed within the first year after starting to take antihypertensive medication in newly diagnosed hypertensive patients. In addition MPV value was higher in microalbuminuric hypertensives than in normoalbuminuric hypertensive patients.

Mean platelet volume is a parameter that indicates the platelet size. Large platelets contain dense granules with greater thrombotic activity (3). Therefore, the

increase in MPV is also a predictor of increased platelet activation (1-3). The presence of a prothrombotic state is a mechanism involved in the pathogenesis of hypertension (4-5). The relationship between MPV and hypertension has been shown in various studies (1,5-8,12,13). Gang et al.(7) followed normotensive individuals for about 9 years and reported that high MPV level was associated with an increased incidence of hypertension independent of other risk factors such as age, sex, serum creatinine, waist circumference. Mean platelet volume values were found to be higher in hypertensive patients than in normotensives (5,6,13). Patients with masked hypertension have higher MPV values than normotensives too (12). It has been also reported that prehypertensive individuals have a higher MPV value than normotensives (13). In addition, a significant relationship between MPV and the severity of hypertension has been detected. The mean MPV value is lower in hypertensives whose blood pressure is under control than in resistant hypertensive individuals (14).

Increased platelet activity plays an important role in the development of atherosclerosis. It has been reported that platelet activation may be associated with cardiovascular morbidity and mortality in hypertensive patients, and increased MPV may be an indicator of this condition (15,16,17). Microalbuminuria is a marker of endothelial damage that develops as a result of atherosclerosis and is associated with an increased risk of cardiovascular disease (18-20). Also, microalbuminuria is an early marker of kidney damage, which is the target organ in hypertensive patients (21,22). In various studies, it has been shown that there is an association between increased platelet activity and the risk of target organ damage in hypertensive patients (5,6,9). Significant positive correlations were found between MPV and subclinical target organ damage, such as microalbuminuria, left ventricular hypertrophy and carotis intima-media thickness in hypertensive patients (5). Ates et al.(9) reported that MPV levels were higher in hypertensive patients with proteinuria than in those without proteinuria. We also found a higher mean MPV value in microalbuminuric hypertensive patients than in normoalbuminuric ones. In this study, we did not detect any correlation between MPV and albuminuria levels that before the initiaition of antihypertensive medication, but we were unable to evaluate the relationship between MPV and albuminuria after medication because there were no control albuminuria values after antihypertensive therapy was started.

It has been shown in various clinical studies that MPV levels increase in hypertensive patients and in various clinical conditions associated with hypertension. However, there are no clinical studies showing the effect of antihypertensive therapy on MPV. In the study involving prehypertensive patients, it was found that 20 week-lifestyle changes provided a significant reduction in MPV levels (23). We found a significant decrease in mean MPV level of newly diagnosed hypertensive patients within one year (mean 5.8±3.6 months) after antihypertensive treatment was started.

Assessment of platelet activity requires difficult, time-consuming and expensive methods (24). However, MPV value measured during routine blood count is an easier and cheaper method of assessing platelet activity. A high MPV level can easily indicate the presence of platelets that are larger and have high thrombogenic activity. Many preanalytical and analytical factors, such as the method of blood collection, the anticoagulant used, the temperature of the blood being analyzed, can affect the mpv value (25,26). In addition, no standard cut off value is known for MPV and there is no standardization in comparing intercenter MPV values. However, in this study, all blood samples were obtained in a similar way and were studied with the same analyzer in the same laboratory within an hour after they were taken.

The most important limitation of this study is the small number of patients included in the study. In addition, due to the retrospective nature of the study, it was not possible to investigate whether there was a relationship between the mpv levels and the initial blood pressure values and the rate of decrease in blood pressure after treatment. However, it is known from the records that all patients enrolled in the study had their blood pressure

under control after starting to take antihypertensive medication. Another limitation of this study is the patients did not have control albuminuria values within one year after starting to take antihypertensive medication, so the relationship between the decrease in mpv and albuminuria levels could not be evaluated.

In conclusion, in this study, a significant decrease was detected in the MPV levels measured in the first year following the initiation of antihypertensive drug in the newly diagnosed hypertensive patients without other diseases. In newly diagnosed hypertensive patients, controlling blood pressure independently of antihypertensive agent may lead to a decrease in MPV level, thus reducing the risk of prothrombotic states, and may be associated with a reduction in endothelial damage and early atherosclerosis. In future studies, it may be useful to investigate whether the decrease in MPV level is accompanied by improvement in endothelial dysfunction after blood pressure control.

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