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Investigation of Mean Platelet Volume and Platelet Count in the Blood of Patients with Migraine

Migrenli Hastaların Kanında Ortalama Trombosit Hacmi ve Trombosit Sayısının Araştırılması

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Summary

Objective: Mean platelet volume (MPV) is an indicator for platelet function and activation. Studies researching MPV and platelet level on the patients with migraine are insufficient. In this study, we aimed to find a difference in MPV and platelet count in individuals with migraine compared to healthy controls, which are indicators for platelet activation.

Material and Method: We recruited 193 patients (female/male: 128/65, average age: 31.66±9.01) who are referred to the Neurology Clinic of Dicle University, Faculty of Medicine between January 2010 and January 2012 and have been diagnosed with migraine according to 2004 diagnostic criteria of International Headache Society (IHS) and 119 healthy individuals (female/male: 73/46, averge age: 32.27±9.88) who are referred to the Family Practice Clinic and Blood Bank. We compared MPV and platelet counts between the patients with migraine and healthy controls. Both groups were similar in terms of age and gender.

Results: A statistically insignificant increase was found in MPV in patients with migraine (7.98±1.34 fL) when compared to the control group (7.85±0.96 fL) (p=0.34). Platelet levels were significantly lower in patients with migraine (367.6±74.2) than the platelet levels of the control group (286.9±68.3) (p=0.02).

Discussion: We found lower platelet levels in the patients with migraine compared to the control group. There was also statistically insignificant increase in MPV in patients with migraine, suggesting that these findings may indicate an insignificant platelet activation in patients with migraine. New prospective studies are needed on this subject. *(Turkish Journal of Neurology 2013; 19:90-2)*

Key Words: Migraine, platelet activation, mean platelet volume, platelet count

Özet

Amaç: Ortalama trombosit hacmi (OTH) trombosit fonksiyon ve aktivasyonunun bir göstergesidir. Migrenli hastalarda OTH ve trombosit düzeyinin araştıran az sayıda çalışma vardır. Bu çalışmada amacımız migrenli hastalarda sağlıklı kontrollere göre trombosit aktivasyonunun bir göstergesi olan OTH'nin ve trombosit sayısının artış gösterip göstermediğini geniş olgulu çalışmamızda araştırmaktır.

Gereç ve Yöntem: Ocak 2010 ile Ocak 2012 tarihleri arasında Dicle Üniversitesi Tıp Fakültesi Hastanesi Nöroloji Polikliniğine başvuran International Headache Society (IHS) 2004 tanı kriterlerine göre migren tanısı alan 193 hasta (kadın/erkek: 128/65, ortalama yaş: 31,66±9,01) ile Aile Hekimliği Polikliniği ve Kan Bankasına başvuran 119 sağlıklı olgu (kadın/erkek: 73/46, ortalama yaş: 32,27±9,88) çalışmaya alındı. Benzer yaş ve cinsiyette migren tanısı konmuş hastalar ile sağlıklı olan kontrol grubu arasında OTH ve trombosit sayıları karşılaştırıldı.

Bulgular: Migren hastalarında OTH (7,98±1,34 fL) kontrol grubuna göre (7,85±0,96 fL) istatistiksel olarak anlamlı olmayan artış bulundu (p=0,34). Trombosit düzeyi migrenli hastalarda (267,6±74,2) kontrollere (286,9±68,3) göre anlamlı düzeyde düşüktü (p=0,02).

Sonuç: Çalışmamızda trombosit sayısını migrenli hastalarda sağlıklı kontrol grubuna göre düşük bulurken OTH ise migrenli hastalarda kontrol grubuna göre istatistiksel olarak anlamlı olmayan artış bulduk. Bu bulgular migren hastalarında istatistiksel olarak belirgin olmayan trombosit aktivasyonunu gösterebilir. Bu konuda prospektif yeni çalışmalara ihtiyaç vardır. *(Türk Nöroloji Dergisi 2013; 19:90-2)*

Anahtar Kelimeler: Migren, trombosit aktivasyonu, ortalama trombosit hacmi, trombosit sayısı

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Introduction

There has been numerous studies investigating the relationship between migraine and cardiac anomalies, cardiovascular diseases and ischemic stroke (1). Migraine is an independent risk factor for ischemic stroke especially for women who are under 45 years of age using oral contraceptives. In addition, the incidence rate of white matter lesions for migraine patients is higher (2). The mechanisms that explain the relationship between these two diseases are not clear. It has been suggested that migraine might be related to hypercoagulopathy in young patients with ischemic strokes (3). The notion that patients with migraine have platelet disorders has been put forward (4). Numerous researchers found increased platelet activation and platelet aggregation in patients with migraine (4,5). In addition, monoamine oxidase activity in the platelets of the patients with migraine, as well as a decrease in serotonin level have been shown (6,7,8). Some studies suggested the platelet activation and aggregation due the changes that occur concurrently with the migraine attacks might be related to migraine. Further, it has been emphasized that the platelet clots can induce cortically spreading depression by blocking small vessels and produce aura-like symptoms and pulsatile headaches (9). Platelet activation plays a role in endothelial adhesion and aggregation in addition to up-regulating the inflammatory process by interacting with leucocytes (10). Platelet activation and platelet-leucocyte play important roles in aterotrombotik diseases (11). Platelets also play an important role in the pathogenesis of atherosclerotic complications and formation of thrombi. Mean platelet volume (MPV) is a good indicator of platelet activation. Structures such as platelet size, platelet aggregation, thromboxane A2, platelet factor 4 and thromboglobulin release are measured with MPV (12). There have been few studies looking at MPV in patients with migraine (13). In other studies, due to the insufficient sample size, the MPV in patients with migraine was found to be similar to healthy individuals (13, 14). This study aims to investigate whether MPV, an indicator of platelet activation, differs between patients with migraine and healthy controls in a sufficiently large patient population.

Materials and Methods

One hundred ninety three patients diagnosed with migraine in Dicle University Faculty of Medicine Neurology Clinic according to the international classification of headache disorders II were included retrospectively in the study. The migraine group consisted of 21 migraine cases with aura and 172 cases without aura. Patients with chronic diseases other than migraine were not included in the study. A control group (n=119) was formed from healthy volunteers who were age and sex-matched to the migraine group. Blood samples were collected from the control group like the migraine group. Individuals with chronic diseases, ischemic risk factors, and hematological disorders, those who have a history of liver and kidney disorders, acute or chronic infectious conditions and malignity were excluded from the study. In our study, vacutainers containing EDTA were used for complete automated blood count. The blood counts were done in an automatic blood count device.

Statistical analyses

The results were calculated as mean and±standard deviation. For statistical analysis SPSS 11.5 software was used. Student t-test was used to compare the MPV levels of the patient and control group. A difference between the two groups with $p<0.05$ was considered statistically significant.

Results

One hundred ninety three patients diagnosed with migraine (female/male: 128/65, mean age: 31.66±9.01) and 119 healthy subjects who consulted in Family Health Center and Blood Bank (female/male: 73/46, mean age: 32.27±9.88) were included in the study. There was no significant difference between the control and the patient groups in terms of age and sex ($p>0.05$). A statistically insignificant ($p=0.32$) increase in MPV levels between migraine patients (7.98±1.34 fL) and the control group (7.85±0.96 fL) was found. Platelet level was significantly low in migraine patients (267.60±74.20) compared to controls (286.90±68.30) ($p=0.02$). Another statistically insignificant ($p=0.27$) difference in MPV was found between patients with migraine with auras (8.29±2.11 fL, n=12) and those with migraine without auras (7.94±1.22 fL, n=117). The platelet count in patients with migraine with auras (269.70±62.1, n=21) was similar to those without auras (267.30±75.70) ($p=0.89$).

Discussion

Our study showed that platelet count was lower in the migraine group compared to healthy controls while MPV was higher in migraine patients compared to controls even though the difference was statistically insignificant. The decrease in the platelet count can be due to the increase in platelet activation. These findings may indicate platelet activation of an indeterminate significance. Mean platelet volume is an important indicated of platelet activation that also plays a role in the pathophysiology of the atherothrombotic process. Big platelets contain granules with higher densities compared to small platelets and they contain higher thrombotic potentials because they are more active enzymatically and metabolically. Prothrombotic components like thromboxane A2 are denser in large platelets (15, 16). The platelet counts tend to decrease when MPV increases (17). The reason for this could be the increase of production of platelets with high aggregability in the bone marrow or the increased platelet consumption (18).

The low platelet count in migraine patients and the insignificant increase in MPV may indicate that large platelets are more prominent in migraine patients. In a previous study done with migraine cases without auras, the platelet counts and platelet volume distribution of 30 patients between migraine attacks and 10 patients during attacks were compared to 30 healthy controls and no significant differences were found in platelet histograms, platelet counts and MPV between the groups (13). In another study, 39 migrainous patients during a period without attacks, 6 migraine patients during attack period, 9 patients with cluster headaches and 26 healthy subjects were compared in terms of their MPV and no significant differences were found. There also was no correlation between MPV and platelet monoamine oxidase

activation (14). Platelet aggregation and activation increases during and between migraine attacks in patients with migraine. It was shown that dehydrothromboxane B2, a metabolite of thromboxane A2 increases in patients with migraine between attacks (4). Disruptions in platelet functions have been argued to be involved in the pathophysiology of migraine. It has been shown that leucocyte-platelet aggregation and mean platelet activation increases significantly in patients with migraine. Leucocyte-platelet adhesion during periods without attacks was found to be similar to patients with stroke and coronary artery disorders. For this reason, a relationship on the cellular level between migraine and stroke has been suggested. Serotonin plays an important role in the pathogenesis of migraine, 90% of which is contained within platelets and it is released from the platelets depending on the demand (19). Zeller et al. evaluated the P-selectin expression on platelets in patients with migraine and found an increase in platelet activation and leucocyte-platelet aggregation formation as compared to healthy controls, especially in migraine patients without auras (20). The levels of platelet activator factor, which play an important role in numerous inflammatory and thrombotic processes and serve as the mediator in phospholipid structure, was seen to increase in patients with migraine during attacks (21). The hypothesis of migraine being primarily a platelet dysfunction has been put forward nearly 30 years ago. In a period without headaches, spontaneous platelet aggregation and platelet adhesion of the migraine patients were found to be more than the healthy controls, thus it was argues that the different platelet behavior in migraine patients may play a role in the recurrence of the attacks (19). The limitation of our study was that, since it was retrospectively conducted, we were not able to record whether the sample collection was done at a period of attacks or no attacks and therefore we could not make the comparison between the two in terms of platelet and MPV values. This possibility is open for prospective studies. We found lower platelet count in migraine patient compared to controls while statistically insignificant increase in MPV. The decline in platelet count could be due to the increase in platelet activation and aggregated platelets. In summary, MPV assessment with complete blood count and platelet count may give clues about the platelet activation in patients with migraine. The prospective investigation of this question may lead to important breakthroughs in the understanding of the pathogenesis of migraine.

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