

Blood platelet activity in men with vasculogenic erectile dysfunction

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Summary *Objective: The aim of this study was to investigate the platelet activity in patients with vasculogenic erectile dysfunction (ED). Materials and methods: The total blood count, including hemoglobin (Hgb), white blood cell (WBC), red blood cell (RBC), platelet (PLT) and mean platelet volume (MPV) parameters were measured in the patient (n = 70) and control groups (n = 50). Results: The average age was 48.1 ± 11.7 and 47.6 ± 12.3 in the patient and control groups ($p = 0.8217$), respectively. MPV was higher in the patient group and there was a statistically significant difference between two groups (11.27 ± 0.56 and 9.8 ± 0.91 , $p < 0.0001$). PLT counts were lower in the patient group but there was not a statistically significant difference (196.23 ± 37.01 and 209.07 ± 36.71 , $p = 0.0626$). In terms of haemoglobin, WBC and RBC values, there was no difference in the patient and control groups. Conclusions: Finding high MPV, which reflects the platelet activity, in the patient group shows that platelets also have a role in the VED etiopathogenesis. In the case of the confirmation of this result with additional studies, the efficiency of anti-platelet therapy in the vasculogenic ED should also be researched.*

KEY WORDS: Erectile dysfunction; Platelet; Mean platelet volume.

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INTRODUCTION

Erectile dysfunction (ED) is defined as the inability to attain or maintain the penile erection required for sufficient sexual performance for at least 6 months (1, 2).

ED is a multifactorial disease in the pathophysiology of which vascular, neurogenic, hormonal, psychogenic, cavernosal, iatrogenic, and anatomic causes play a role (3). ED may affect physical and psychosocial health and may have a significant impact on the quality of life of sufferers and their partners. Additionally, ED can be an early manifestation of coronary artery and peripheral vascular disease (2).

In recent years, there have been some studies which report that mean platelet volume (MPV) increases in patients with vasculogenic ED (4-9). MPV is a marker of platelet size that is easily measured by automated blood counters and routinely available at a relatively low cost and reflects indirectly platelet activity. Increased production of large platelets could contribute to the pathogenesis of atherothrombosis, because large platelets are metabolically and enzymatically more active than small platelets and produce more thromboxane, known as the

most potent vasoconstrictor agent. Therefore increased platelet activity play an important role in the atherosclerosis formation through mechanisms such as thrombocyte gathering, tromboxan synthesis, and expression of adhesion molecules (10-13). Increased platelet activity probably plays a role in the etiopathogenesis of vasculogenic ED with such atherothrombotic process.

The relationship between vasculogenic ED and platelet activity has been investigated in some studies (4-9). But these studies contain some conflicting results. For example, while Çiftçi *et al.* (8) stated that both platelet count (PLT) and mean platelet volume (MPV) increased in vasculogenic ED, Aldemir *et al.* (9) reported that platelet count was normal. In this study, it was aimed to investigate some hematological parameters such as hemoglobin (Hgb), white blood cell (WBC), red blood cell (RBC), PLT and MPV in patients with vasculogenic ED.

MATERIALS AND METHODS

The study protocol was approved by the Institutional Ethics Committee of the School of Medicine, Istanbul Medipol University, Turkey. All of the individuals gave their informed consent. 70 patients in total who came to the Urology polyclinic between May 2015 and June 2016 with the ED complaint and were diagnosed with vasculogenic ED (arterial insufficiency) were included in this study. All the patients in this group were subjected to the detailed history (anamnesis), physical examination, erectile function examination, laboratory evaluations and penile colour Doppler ultrasonography (pDUS). The ED level was questioned by International Index of Erectile Function (IIEF) which had 6 questions consisting of the 1-5 and 15th questions of the IIEF questionnaire (14, 15). According to this, those whose IIEF-ED score was < 26 were regarded to have ED. The patients were grouped according to their erectile function area scores (Q1-5 and Q15) as mild ED (17-25), moderate ED (11-16) and severe ED (6-10).

Penile color Doppler evaluation was conducted on the basis of the criteria proposed by La Vignera *et al.* (16). The patients were classified according to the peak systolic velocity (PSV) value obtained. According to these, $PSV \geq 35$ cm/s values were assumed as normal (no arterial insufficiency). $PSV < 25$ cm/s, between 25 and 29 cm/s, and between 30-34 cm/s values were considered as severe, moderate, and mild arterial insufficiency, respectively. All patients with PSV values < 35 cm/s were con-

sidered to have vasculogenic ED and were included in the study. By contrast, patients with ED, the vasculogenic ED diagnosis of which was not confirmed with USG (with peak systolic velocity ≥ 35 cm/s), were excluded from this study, even if their IIEF-ED score was < 26 . Additionally patients who used anti-platelet and/or anticoagulant medication, patients with neurogenic or endocrinological ED, history of pelvic surgery and pelvic trauma, prostatectomy, history of other vascular risk factors for ED such as diabetes, smoking, or hypertension, patients recently diagnosed with coronary artery disease (CAD) or hematological disorder, active infectious disease, malignancy, immunological disease, or renal or hepatic failure were excluded from this study.

The control group consisted of 50 volunteering men who came to the Urology polyclinic during the same period with the complaints different from ED such as hydrocele, varicocele, inguinal hernia, and epididymis cyst, which were sexually active, married and whose ED domain score was ≥ 26 . Those who did not apply with the ED complaint but had an IIEF-ED score < 26 and/or had a kind of disease that may affect Hemogram parameters were not included in the control group. The patients in the control group were also subjected to the detailed sexual anamnesis, physical examination, IIEF-ED examination and laboratory evaluations as in the patient group. However, penile Doppler ultrasonography was not performed in the control group.

The total blood count, including hemoglobin (Hgb), white blood cell (WBC), red blood cell (RBC), platelet (PLT), and mean platelet volume (MPV) parameters were measured in the patient and control groups. All parameters were measured by using commercially available assay kits (Sysmex Europe GmbH, Norderstedt, Germany) with an autoanalyzer (Sysmex XT 200i, Hamburg, Germany). Blood samples were drawn from the antecubital vein and analyzed immediately (without freezing) after an overnight fasting period. The blood samples were collected in tubes containing dipotassium ethylenediaminetetraacetic acid. All the measurements were performed immediately after venipuncture to prevent in vitro platelet activation (within 1 h of sampling).

Statistical analyses were performed with MedCalc statistical software (Version 16.4.3, MedCalc Software bvba, Ostend, Belgium). Student t-test was used for comparison of two groups (vasculogenic ED and control). $P < 0.05$ was used as a threshold for statistical significance. Data were presented as mean \pm standard deviation.

RESULTS

The findings are shown in Table 1 and Table 2. The average age in the patient group was 48.1 ± 11.7 (range 29-69), the average age in the control group was 47.6 ± 12.3 (range 18-68) ($p = 0.8217$). The IIEF scores were 13.2 ± 0.5 and 27.3 ± 1.7 in the patient and control groups, respectively, and there was a significant difference between two groups ($p < 0.0001$). Total platelet count was lower in the patient group than the control group (196.23 ± 37.01 and 209.07 ± 36.71 , respectively) but there was not a statistically significant difference ($p = 0.0626$). The MPV values were higher in the patient

Table 1.

Patients' characteristics in vasculogenic ED ($n = 70$).

Age	29-69 (48.1 ± 11.7)
PSV, n (%)	Severe (< 25 cm/s), 23 (32.8%) Moderate (25-29 cm/s), 26 (37.1%) Mil (30-34 cm/s), 21 (30%)
IIEF-ED	13.2 ± 0.5
ED severity, n (%)	Severe (IIEF 17-25), 27 (38.5%) Moderat (IIEF 11-16), 27 (38.5%) Mild (IIEF 6-10), 16 (22.8%)
WBC	8.07 ± 2.77
RBC	5.16 ± 0.04
Hgb	14.89 ± 0.86
PLT	196.23 ± 37.01
MPV	11.27 ± 0.56

ED, erectile dysfunction; IIEF, international index of erectile function; PSV, peak systolic velocity.

Table 2.

Study parameters and results in vasculogenic ED and control group (t test, $p < 0.05$, statistically significant).

	Vasculogenic ED (no = 70)	Control (n = 50)	P values	Statistical result
Age	48.1 ± 11.7	47.6 ± 12.3	$p = 0.8217$	NS
IIEF	13.2 ± 0.5	27.3 ± 1.7	$p < 0.0001$	S
WBC	8.07 ± 2.77	7.67 ± 0.21	$p = 0.3109$	NS
RBC	5.16 ± 0.04	5.23 ± 0.53	$p = 0.5510$	NS
Hgb	14.89 ± 0.86	14.98 ± 0.98	$p = 0.5950$	NS
PLT	196.23 ± 37.01	209.07 ± 36.71	$p = 0.0626$	NS
MPV	11.27 ± 0.56	9.8 ± 0.91	$p < 0.0001$	S

ED, erectile dysfunction; IIEF, international index of erectile function; WBC, white blood cells; RBC, red blood cells; Hgb, hemoglobin; PLT, platelet; MPV, mean platelet volume; NS, statistically nonsignificant; S, statistically significant.

group than in the control group (11.27 ± 0.56 and 9.8 ± 0.91 , respectively) and there was a statistically significant difference ($p < 0.0001$) (Figure 1). By contrast with this, there was not a significant difference between the patient and control groups in terms of WBC, RBC and Hemoglobin values.

DISCUSSION

The findings obtained show that MPV values in the patients with vasculogenic ED were significantly increased when compared to the patients in the control group, however, any increase in the platelet count did not take place. These results are compatible with the previous similar studies in terms of MPV values (4-9), but not in terms of platelet count.

According to Aldemir *et al.* (9), MPV values in the patients with vasculogenic ED increased significantly when compared to the control group but there was no change in the platelet count. By contrast, according to Çiftçi *et al.* (8), both MPV value and platelet count increased significantly in the patients with vasculogenic ED. In this study as well, MPV values were significantly higher in the patients with vasculogenic ED compared to the control group. This result (in terms of MPV) is compatible with other

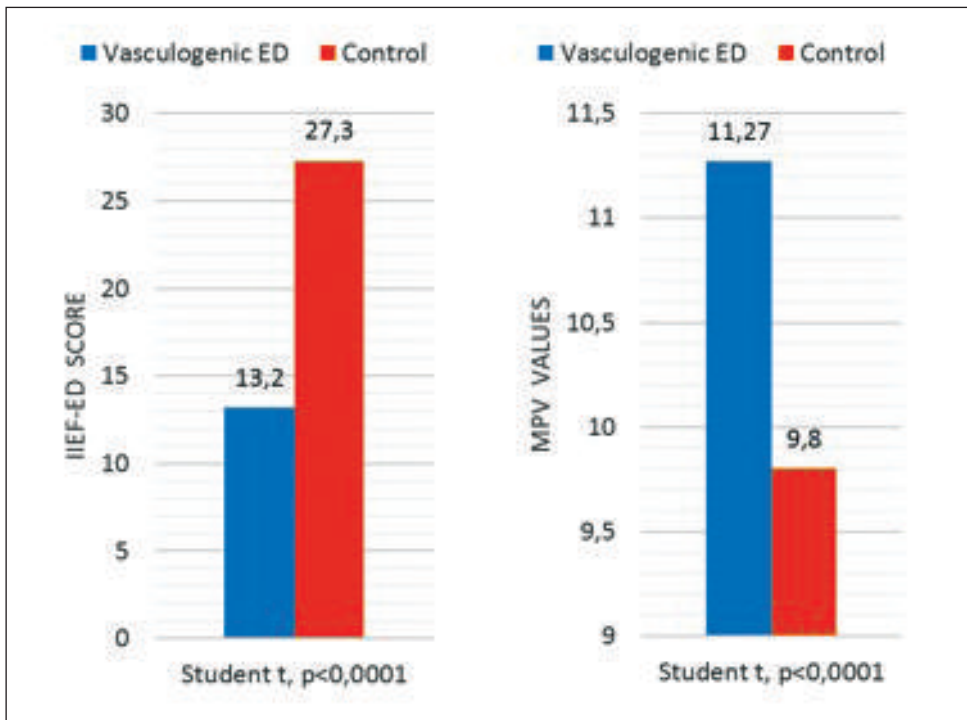


Figure 1.
Comparison of IIEF-ED and MPV values between vasculogenic ED and control group.

similar studies. However, platelet counts in this study were lower in the patient group. Even though this difference is not statistically significant, this result is partially compatible with the study carried out by *Aldemir et al.* (9) (in terms of platelet count) and contradictory with the study carried out by *Çiftçi et al.* (8). This contradiction may have resulted from the number of patients and/or the age difference of the patients since the average age of the patients in this study was 48.1 ± 11.7 years, and it was 53.70 ± 12.39 years in the study carried out by *Çiftçi et al.* (8). Nevertheless, the MPV level was found to be high in all studies including the present study.

What does the high MPV value indicate? Platelet size has been shown to reflect platelet activity. MPV is a parameter which states platelet size and indirectly proves its activity. Large platelets are metabolically and enzymatically more active than small platelets and produce more thromboxane. They show greater aggregability in response to ADP and decreased inhibition of aggregation by prostacyclin in vitro. Larger platelets are denser and contain more α -granules, which can release prothrombotic substances, including platelet factor 4, P-selectin, and platelet-derived growth factor, a chemotactic and mitogenic factor contributing to vascular neointimal proliferation. Finally, larger platelets are more often reticulated, and this is an independent predictor of poor response to dual antiplatelet therapy (10, 11).

There is evidence showing an association between MPV and cardiovascular disease, peripheral artery disease (PAD) and stroke (11, 16). *Berger et al.* reported that platelets play a pivotal role in the pathogenesis of atherosclerosis and PAD. MPV, a measure of platelet size available in every blood count, is increasingly recognized as an important marker of platelet activity. Large platelet size is an independent predictor of increased risk for

peripheral artery disease (17). Increased production of large platelets can contribute to the pathogenesis of atherothrombosis (18). Additionally, platelet aggregation plays an important role in the pathogenesis of acute myocardial infarction. MPV, an indicator of platelet activation, has been reported to be higher in patients with coronary artery disease compared to healthy individuals, and as a possible independent risk factor for myocardial infarction (19).

MPV can be examined in patient with erectile dysfunction because large platelets may be an indicator of the peripheral artery disease and vascular ED. Because MPV is a marker of platelet size that is easily measured by automated blood counters and routinely available at a relatively low cost (4-9, 17-19).

CONCLUSIONS

Consequently, MPV values which demonstrate the Thrombocyte activity were found to be high in the patients with vasculogenic ED. However, these data found in the limited number of patient groups with ED should be confirmed with additional studies.

Furthermore, the efficiency of the anti-platelet therapy to be performed individually or combined in the patients with vasculogenic ED who have high MPV values can also be investigated.

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