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Original Article

Neutrophil/lymphocyte ratio and mean platelet volume in branch retinal vein occlusion

Esra Turkseven Kumral; Nursal Melda Yenerel; Nimet Yesim Ercalik; Serhat Imamoglu *; Ece Turan Vural

Abstract

Purpose: To evaluate the mean platelet volume (MPV) and the neutrophil/lymphocyte ratio (NLR) in patients with branch retinal vein occlusion (BRVO).
Methods: Thirty patients with branch retinal vein occlusion (BRVO group) and 27 age and sex matched subjects (control group) were included in the study. MPV and NLR parameters obtained from peripheral blood were recorded.
Results: The mean age was 62.6 ± 12.3 years in BRVO and 63.5 ± 8.2 years in control group. The BRVO group consisted of 13 males and 17 females and the control group included 12 male and 15 female subjects. The mean MPV values were 8.64 ± 2.01 fL in BRVO group and 8.5 ± 1.26 fL in control group. NLR was 2.24 ± 0.79 and 1.89 ± 0.64 in BRVO and control groups respectively. The difference between two groups in terms of MPV and NLR was not statistically significant.
Conclusion: MPV and NLR were found to be not affected in branch retinal vein occlusion patients.

Keywords: Mean platelet volume, Neutrophil/lymphocyte ratio, Retinal vein occlusion

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Introduction

Diabetic retinopathy is the most common retinal vasculopathy. Retinal vein occlusions (RVO) make up the second most common category.[1] It is estimated that 16.4 (95% CI 13.9–18.9) million people in the world have RVO.[2] Branch retinal vein occlusions (BRVO) constitute 69.5% of the RVOs.[3] Although the pathogenesis of RVO is not clearly understood, it is believed that Principles of Virchow's triad for thrombogenesis including abnormalities of the vessel wall, alterations in the blood, and alterations in the blood flow are responsible.[4] Degenerative changes in the vessel walls seem to be the most important one[5] and primarily arteriovenous crossings are the sites of occlusion.[6] Only 4.9% of cases have an occlusion other than an arteriovenous crossing and some other factors such as inflammation (e.g., in sarcoidosis) are thought to be responsible.[7,8] Hypertension, diabetes mellitus, dyslipidemia, cigarette smoking, cardiovascular and renal disease are the risk factors for BRVO.[9]

Neutrophil/lymphocyte ratio (NLR) and mean platelet volume (MPV) as inflammatory markers recently became popular because of their simplicity, cost effectivity and their advantages to predict clinical prognosis of specific diseases.[10]

Platelets have an important role in the pathogenesis of thrombo-occlusive diseases. Alterations in the platelet function and morphology are determined primarily during or before the fragmentation of their precursor cell (megakaryocyte).[11] Megakaryocyte development has a correlation with the process of nuclear polyploidization.[12] Ploidy may change with platelet consumption and destruction. As megakaryocyte ploidy increases, larger and more active platelets are produced.[13] Larger and activated platelets produce more

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Haydarpasa Numune Training and Research Hospital, Tıbbiye Cad. No: 40 34668 Üsküdar, İstanbul, Turkey

* Corresponding author. Tel.: +90 (216)5423232/5423200; fax: +90 (216) 336 05 65.
e-mail address: ophserhat@hotmail.com (S. Imamoglu).

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thrombogenic factors. MPV is an indicator of platelet size and activation. Ozkan et al. found a relationship between myocardial İnfarction and MPV values.[14]

White blood cell (WBC) count is readily used as an inflammatory marker. However, ratios of subtypes of WBC change during an inflammatory response. NLR is more stable than any other WBC subtypes such as neutrophil, lymphocyte and total leukocyte counts. Thus NLR has become an important biomarker to determine inflammation in cardiac disorders.[15]

As branch retinal vein occlusion is a disease that goes with thrombosis and inflammatory processes, these inflammatory markers could help us to predict the risk of RVO. In this study we aimed to investigate a link between NLR and MPV parameters and BRVO.

This study is adhered to the tenets of the Declaration of Helsinki and was approved by the Institutional Review Board of the Department of Ophthalmology, Haydarpaşa Numune Training and Research Hospital, Turkey, and informed consent was obtained to participate in the study.

Materials and methods

Thirty patients with recently diagnosed branch retinal vein occlusion (BRVO group) and 27 age and sex matched subjects (control group) were included in the study. All patients underwent full ophthalmologic evaluation including best corrected visual acuity, pupillary reactions, intraocular pressure measurement, biomicroscopic and fundoscopic examination. Hemorrhages, cotton wool-spots, edema, and venous dilatation and tortuosity arise from arteriovenous crossing seen in a localized retinal area was diagnosed as branch retinal vein occlusion. Patients with signs of an acute stage of BRVO within a week and no history of previous treatment were included in the study.

All patients with BRVO had systemic hypertension that was under control by medication. Patients with glaucoma, diabetes, systemic inflammatory diseases, cardiovascular, hepatic and renal disorders, blood dyscrasias, and malignancy were excluded from the study. History of routine anti-inflammatory drug usage, oral contraceptives and anticoagulants, smoking and alcohol consumption was also included in exclusion criteria as they might affect thrombosis.

Blood samples for complete blood count (CBC) were obtained between 08:00 and 9:00 a.m. after overnight fasting from the antecubital vein. Venous blood (1.8 ml) was collected and mixed with 0.2 ml 3.8% sodium citrate solution and analyzed within 2 h after sampling with Cell-Dyn 3700 Hematology Analyzer (Cell-Dyn 3700, Abbott Diagnostics, Abbott Park, IL, USA). It performs simultaneous laser and impedance measurements. The NLR was calculated by dividing the neutrophil count by the lymphocyte count and MPV by dividing platelet crit (PCT) by the total number of platelets.

Statistical analysis

Statistical analysis was done by SSPS statistical software (SPSS for windows 17.0, Inc., Chicago, IL, USA). Parametric Student's *t*-test and nonparametric Mann-Whitney's *U* test were used for comparison of independent groups. Data were reported as mean ± standard deviation (±SD). A level of $P < 0.05$ was considered significant.

Results

The BRVO group consisted of 13 male and 17 female patients and the control group included 12 male and 15 female subjects. The mean age of the BRVO group was 62.60 ± 12.3 years and the control group was 63.50 ± 8.20 years. There was not a statistically significant difference between groups with regard to age and sex. The mean MPV values were 8.64 ± 2.01 fL in BRVO group and 8.5 ± 1.26 fL in control group. The difference between two groups was not statistically significant ($p = 0.10$, $p > 0.05$). NLR was 2.24 ± 0.79 and 1.89 ± 0.64 in BRVO and control groups respectively. Statistically significant difference was not found between two groups ($p = 0.30$, $p > 0.05$). There was no statistically significant difference in platelet count and PCT between groups (Table 1). There was also no statistically significant difference between groups in terms of MPV categories (Table 2).

Discussion

We investigated the importance of MPV and NLR values in branch retinal vein occlusion and did not find any difference in MPV and NLR values between BRVO and control group.

Retinal vein occlusion is the most common retinal vascular pathology after diabetic retinopathy.[16] BRVO is more common than CRVO. It is estimated that 5.6 times as many persons are affected by BRVO compared to CRVO.2. It is believed that cascades of thrombosis and inflammation play role in the pathogenesis of BRVO.[17]

Some studies reported the relation between retinal vein occlusion and thrombotic diseases such as hyperhomocystinemia, factor V Leiden mutation, deficiency in protein C or S, and anticardiolipin antibodies.[18–20] Systemic inflammatory diseases are also involved in the pathogenesis of retinal vein occlusion such as sarcoidosis and Behçet's disease.[21,22] MPV and NLR are inflammatory markers for the diseases related to thrombosis and inflammation. Etfal et al. found that NLR as an inflammatory marker increases in venous thromboembolism (VTE) and as the extent of VTE increases, NLR increases too. They claimed that inflammatory processes have an important role in prothrombotic state in patients with VTE.[10]

MPV is thought to be a marker of platelet activation. It increases with active and large platelets and is used as laboratory test to predict some occlusive diseases. Elevated MPV was found in silent cerebral infarction that may be an indicator of transient ischemic attack or clinically undetectable stroke.[23] Also, increased MPV is linked with diseases

Table 1. Comparison of laboratory data between BRVO and control group.

	BRVO ($n = 30$) Mean ± SD	Control ($n = 27$) Mean ± SD	p
Hb (g/dL)	13.35 ± 1.22	12.78 ± 1.15	0.10
Htc (%)	39.56 ± 3.21	38.57 ± 3.48	0.31
Plt (K/μL)	268.27 ± 57.13	247.69 ± 54.85	0.21
Ptc	0.23 ± 0.06	0.21 ± 0.06	0.13
MPV (fL)	8.64 ± 2.01	8.5 ± 1.26	0.10
NLR	2.24 ± 0.79	1.89 ± 0.64	0.30

Hb, hemoglobin; Htc, hematocrit; Plt, platelet count; Pct, platelet crit; SD, standard deviation; $p > 0.05$.

Table 2. Comparison of BRVO and control group by categories of mean platelet volume.

Categories of MPV (fL)	Groups	Mean ± SD	*p*
MPV < 9.5	BRVO (*n* = 18)	7.84 ± 0.77	***0.57***
	Control (*n* = 22)	7.89 ± 0.71	
MPV > 9.5	BRVO (*n* = 12)	10.63 ± 0.71	***0.80***
	Control (*n* = 5)	10.45 ± 0.17	

BRVO, branch retinal vein occlusion; MPV, mean platelet volume; SD, standard deviation; $p > 0.05$.

associated with chronic inflammation such as hypertension and diabetes mellitus.[24,25] In recent studies, a link between MPV values and retinal vein occlusion was reported. Sahin et al. showed higher levels of MPV in patients with RVO.[26] Önder et al. found higher MPV levels in hypertensive BRVO patients.[27]

The present study showed no relation between BRVO and NLR and MPV values. When the pathogenesis of BRVO is took into consideration the most important predisposing factor is the sclerosis of the vessel wall and basement membrane thickening, as it may occur with aging, hypertension, and diabetes.[28] Arteriosclerotic hypertrophy of the neighboring arterial wall causes compression of the involved vein where the artery and vein share a common sheath.[29] Compression of the vein causes increased retinal venous blood flow velocity, turbulence of blood flow, endothelial injury, and secondary thrombosis.[30] Thrombosis and inflammation have less effect on pathogenesis of retinal vein occlusion. Ingerslev stated that there is no need for a complete hematologic investigation in RVO patients.[31] Ornek et al. did not find increased MPV values in patients with RVO compared to controls.[32] These inflammatory markers might be useful to predict predisposition for venous thromboembolism in some certain inflammatory and hematologic diseases other than BRVO.

Elevated MPV was noted in diseases associated with arterial and venous thrombosis, such as mitral stenosis and dilated cardiomyopathy.[33,34] Braekkan et al. investigated the impact of MPV on the incidence of VTE and stated that an increasing MPV is a predictor for VTE. They also found age and sex adjusted higher risk of VTE in subjects with MPV > 9.5 fL as compared to the subjects with PMV < 8.5 fL.[35] As our study population was small MPV variables categorized into >9.5 and <9.5 fL, no statistically significant difference was found between groups in regard to MPV categories (Table 2).

There are some limitations in the study. The small cohort of patients included might have influenced the statistical significance. BMI of patients was not recorded and taken into consideration as it has an effect on MPV values.

In conclusion, our study showed that MPV and NLR could not be used as predictory markers for BRVO. Further studies should be done to understand the efficiency of these markers in the prediction and prognosis of BRVO.

Conflict of interest

The authors declared that there is no conflict of interest.

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