

Evaluation of mean platelet volume in patients with symptomatic and asymptomatic peripheral arterial occlusive disease

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Objective: To measure and evaluate the mean platelet volume in symptomatic and asymptomatic patients with peripheral arterial vascular occlusive disease.

Methodology: In this retrospective study, 70 patients with peripheral arterial occlusive disease at King Abdullah University Hospital were studied. 40 patients were symptomatic and 30 patients were asymptomatic. The mean platelet volume was reviewed for each patient.

Results: The mean platelet volume values in patients with symptomatic peripheral arterial occlusive disease were significantly higher than

asymptomatic group (10.71fL and 9.72fL, respectively) ($p < 0.05$). There was a positive correlation between mean platelet volume values and symptomatic peripheral vascular occlusive disease.

Conclusion: There is a significant elevation of mean platelet volume in symptomatic peripheral arterial occlusive disease compared to asymptomatic group. There was higher mean platelet volume in patients with atherosclerosis. (Rawal Med J 201;43:231-234).

Key words: Mean Platelet Volume, peripheral arterial disease, atherosclerosis, platelets.

INTRODUCTION

Peripheral Arterial Occlusive Disease (PAOD) is a chronic obstruction of the arteries supplying the lower extremities.¹ It is a potential threat to functional independence particularly in the elderly and is associated with hospitalization, surgery, and death.² Depending on the study population and the diagnostic methods used, the prevalence for symptomatic PAOD varies from 0.414.4%, whereas the prevalence for asymptomatic PAOD ranges from 0.9% to 22%.³ Diagnosis is made using the ankle-brachial blood pressure index (>0.90)⁴ and confirmed by imaging studies. The majority of patients are asymptomatic. However, symptomatic PAOD can manifest as pain in the lower extremities only with exertion (claudication) or critical ischemia as rest pain, ulceration, and/or gangrene.⁵ Atherosclerosis plays an essential role in the development of PAOD.⁶ Risk factors for PAOD are smoking, diabetes, advanced age, hyperlipidemia, and hypertension.⁵

Platelets are small, a-nucleate cytoplasmic cells that lack genomic DNA.⁷ They contain numerous cytokines, chemokines and growth factors in their granules and through interaction with leukocytes and endothelial cells, can promote inflammation

and atherosclerosis. It has been described that inflamed endothelial cells have the ability to bind platelets and red blood cells, despite that the endothelial cell layer is intact.⁸ Therefore, they have been implicated in the pathogenesis of cardiovascular disorders, including atherosclerosis and its complications, such as acute myocardial infarction, unstable angina, and sudden cardiac death.⁹

The mean platelet volume (MPV) includes the mean value of the volumes of platelets in the blood.¹⁰ Platelet size has been shown to reflect platelet activity. Large platelets are metabolically and enzymatically more active than small platelets and produce more thromboxane A2.⁹ Increased MPV is one of the early markers of atherosclerosis.¹⁰ Increased MPV also reflects increased platelet activation which is involved in development of atherosclerosis.¹¹ through 'response-to-injury' hypothesis which suggests that platelets contribute to atherogenesis, partly through their release of the potent smooth muscle cell mitogen and chemoattractant; platelet-derived growth factor.¹²

Various studies have reported an association between MPV and ischemic stroke prognosis,¹³ acute coronary events,⁹ renal artery stenosis,¹² acute

mesenteric ischemia,¹⁴ patients with fibromyalgia syndrome¹⁰ and patients with Bell's Palsy.¹⁵ However, there were no studies in the literature that have sufficiently investigated the relationship between MPV and patients with symptomatic and asymptomatic PAOD. In this study, the aim was to evaluate this relationship, based on the fact that MPV increase in cases of vascular ischemia involving other vascular bed like coronaries, cerebrovascular, reno-vascular and mesenteric vessels.

METHODOLOGY

This retrospective study enrolled 70 patients with PAOD who were admitted or visited King Abdullah University Hospital (KAUH), Jordan from January 2014 and February 2016. 40 patients were symptomatic and 30 were asymptomatic. Patients were considered symptomatic if they had Ankle-Brachial Index (ABI) less than 0.9 and lower limbs pain on exertion IC Intermittent Claudication (IC) or Critical Limb Ischemia (CLI) with symptoms of rest pain, ulcers and/or gangrene. Any patient with ABI less than 0.9 in one or both lower limbs with absence of the above symptoms was considered asymptomatic. Any patient with recent (less than 2 weeks) myocardial infarction, stroke, deep vein thrombosis, thrombo-embolic vascular events and atypical symptoms like (night cramps, neuropathic and musculoskeletal) symptoms, which could be related to other cause rather than vascular arterial disease was excluded from the study.

MPV was reviewed for each patient as it is part of routine complete blood counts from the computerized clinical data. The normal MPV value in our laboratory is 8-10 fL. Any value above 10fL was considered as increased MPV. $P < 0.05$ were taken as significant.

RESULTS

Out of 70 patients, 40(57%) were symptomatic. Mean age was 63 years. 29(73%) patients were males and 11(27%) were females. 9 (22.5%) of them had IC and 31 (77.5%) had CLI. Of patients with CLI, 20(64.5%) had trophic changes and ulceration and 11(35.5%) had rest pain. Thirty patients (43%) having asymptomatic PAOD with a mean age of 59

years. 23 (77%) were males and 7 (23%) were females.

Table. Baseline Characteristics of the Study Population (n=70).

	Asymptomatic (n=30)	Symptomatic (n=40)	P Value
Males	23	29	NS
Females	7	11	NS
Mean Age (years)	59	63	NS
MPV (fL)	10.71	9.72	$p < 0.05$
Anti-Platelets	10	15	NS
Diabetes	30	38	NS
Hypertension	15	21	NS
Smoking	27	36	NS

MPV values were 10.71fL and 9.72fL for symptomatic and asymptomatic patients, respectively. MPV was significantly associated with symptomatic PAOD ($p < 0.05$) in comparison to asymptomatic PAOD (Table).

DISCUSSION

Although, regularly assessed in a complete blood count, little attention is usually paid by health care givers to MPV values, which measure the average size of platelets present in the blood.¹⁶ It is a simple and reliable index of platelet size that correlates with the functional status of platelets.¹⁷ MPV, which is a marker for platelet activation is a new risk indicator for atherothrombosis since increased platelet activity has been shown to contribute to the rise in the risk of cardiovascular disease.¹⁰

Previous studies have also reported that high MPV levels were related with cardiovascular risk factors and that these levels increase in patients with cardiac conditions who have a poor prognosis.¹⁰ A study by Fatih et al showed that MPV was of prognostic significance in mesenteric ischemia.¹⁴ In another study concluded that MPV was increased in the stroke patients.¹⁸ Another study found that increased MPV and platelet mass in patients with atherosclerotic renal artery stenosis.¹² Therefore, the pathophysiological involvement of platelets in the atherosclerotic process has already been established¹⁵ and the role of high MPV levels in vascular events, like atherosclerosis is well documented.¹⁴

In this study, MPV was significantly higher in patients with symptomatic in comparison to asymptomatic patients with PAOD. A likely explanation is that the symptomatic patients have more atherosclerotic burden than asymptomatic patients. Moreover, risk factors were evenly distributed among symptomatic and asymptomatic patient, however, smoking was more prevalent among symptomatic patients. High MPV is not only a marker for early atherosclerosis¹⁰, but also have more prothrombotic activity,¹¹ which could predict the future complications in patients with high MPV. Further studies are required to assess whether MPV provides added value in being able to identify patients with symptomatic PAOD who are at increased clinical risk.

There are several study limitations. First, MPV values increase in Type II diabetes mellitus.¹¹ The majority of symptomatic and all asymptomatic patients in this study were diabetics. Furthermore, we could not exclude patients with history of other vascular events from the study. Second, it is a retrospective study with lack of standardization of both blood sampling and MPV measurements. Third, number of patients was small. Lastly, the effects of some chronic medications, which patients may be taking could act as confounding factors that may have affected platelet volumes.

CONCLUSION

There is a significant elevation of MPV in symptomatic PAOD compared to asymptomatic PAOD. Higher MPV was seen in patients with atherosclerosis.

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