



Mean platelet volume: Significance in patients with IBD: Ulcerative Colitis

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Abstract

Background: Mean platelet volume (MPV) and inflammatory markers are affected in chronic inflammatory diseases. In this study we aimed to investigate the correlation of MPV with disease activity in patients with IBD: Ulcerative Colitis based on the UCEIS score. The UCEIS consists of the following three descriptors and was calculated as a simple sum: vascular pattern (scored 0–2); bleeding (scored 0–3); and erosions and ulcers (scored 0–3). Therefore, the range of UCEIS scores is 0–8.

Materials and Methods: A total of 120 subjects were enrolled. The study group consisted of 40 patients with Ulcerative Colitis and the control group included 80 healthy subjects. Groups were compared regarding MPV and disease activity score - UCEIS.

Results: Groups were similar in terms of age, sex ($p=0.23, 0.43$, respectively). MPV levels were higher in patients with UC patients 9.71 ± 1.08 compared to the controls 11.27 ± 0.83 ($p= 0.02$). A significant correlation was found between MPV and UCEIS Score in patients.

Conclusion: MPV was found to be decreased in patients with IBD compared to the controls and there is a negative correlation with disease activity indices.

Introduction

Ulcerative colitis is an immune mediated chronic inflammatory disease of the bowel which pursue a protracted relapsing and remitting course, usually extending over years. UC usually involves the rectum and extends proximally to involve all or part of the colon. Some patients present with mild disease activity and do well with generally safe and mild medications, but many others exhibit more severe disease. There are numerous instruments to measure disease activity, some of which are purely clinical, endoscopic, or histologic, and others that combine clinical and endoscopic assessments.

Platelets are the smallest and yet extremely reactive blood components. They are involved first of all in the processes of fibrosis and

maintenance of haemostasis. Recent studies highlight on their multifunctional nature.¹ Platelets are the first to accumulate at the site of damage, where they change in shape and show formation of pseudopodia, local release of cytoplasmic granular content, and aggregation, when activated by classical agonists, such as ADP, TXA₂, PAF, and inflammatory cytokines, e.g., IL-1, IL-6, and TNF alpha.² Platelets promotes inflammatory processes by secretion of biologically active substances like platelet activation factor, IL-1, platelets factor 4. Platelet function correlates with their size MPV.³ The MPV has been investigated as a potential biomarker in IBD.^{4,5,6} The results of the research remain contradictory. The aim of this study is to investigate the significance of MPV in patients

with Ulcerative colitis and correlation with disease activity.

Objective

To determine the relation between the disease activity of ulcerative colitis and mean platelet volume (MPV) and to evaluate the clinical usage of a more simple and easier determinant.

Materials & Methods

A total of 120 subjects were enrolled during the study period from July 2019 to June 2020. The study group consisted of 40 patients of both sex, age ranging from 18-70 years with Ulcerative Colitis, and the control group included 80 healthy subjects. The informed consent was obtained from all participants in the study.

Patient data was collected prospectively using standardized data collection forms created specifically for this study. All patients had a definitive diagnosis of UC confirmed by clinical, radiological, endoscopic, and histological studies. None of the patients were under medication (such as oral anticoagulants, aspirin, nonsteroidal anti-inflammatory drugs, and contraceptives) that might have caused platelet or coagulation abnormalities during the last 8 weeks before blood sampling. Patients with abnormal liver or renal function tests, myeloproliferative disorders, or malignancies were not included in the study.

Laboratory Parameters

Full blood count (including MPV and white blood cells (WBC)), CRP and ESR were performed on admission (before prescribing any medications). For platelet number and MPV measurement: platelet number (per mm³) and MPV (fentoliter (fL), blood samples were taken from forehead into EDTA tubes by applying a minimal stasis from antecubital vein.

For other parameters, the measurement and process were carried out according to standard laboratory practice. To calculate the body mass index, height and weight were recorded on admission for each individual. For patients, the

disease activity was defined according to the Ulcerative colitis endoscopic index of severity.

All variables were stated as mean \pm standard deviation. For statistical analysis, the relation between MPV and variables was examined through Pearson and Spearman correlation. P<0.05 value was accepted as statistically significant

Results

9 of 40 ulcerative colitis patients were having ulcerative proctitis (E1) (22.5%), 18(45%) patients were having Left sided colitis (E2), and 13 pancolitis (32.5 %) 9 were in remission (22.5 %) and 31 of them had active disease (77.5%)

Details of the clinical characteristics of the study patients are shown in Table 1. Disease activity in patients with UC was assessed by the Ulcerative Colitis Endoscopic Index of Severity (UCEIS), which incorporates three scores (Vascular, Haemorrhage, Erosions and Ulcers). Demographic data including age, sex, year of diagnosis, age at diagnosis, smoking status, and a family history of inflammatory bowel disease (IBD) as well as annual measurements of disease severity and course of disease were recorded. Groups were compared regarding MPV, platelet count, CRP, ESR.

The demographic features of UC patients and healthy controls are shown in Table 1. The distributions of age, gender, smoking habit and body mass index were not statistically significant between groups

Table 2 demonstrates comparisons of all inflammatory markers, including MPV, CRP and ESR. A significant reduction in MPV was noted in patients with ulcerative colitis compared with healthy controls (9.71 ± 1.08 fl vs. 11.27 ± 0.83 fl, $P = 0.02$). Meanwhile, CRP (15.6 ± 2.8 mg/dl vs. 1.9 ± 0.96 mg/dl, $P < 0.003$) and ESR (25.67 ± 1.87 mm/hour vs. 8.83 ± 1.72 mm/hour, $P < 0.009$) were statistically higher in the ulcerative colitis group than those in the control group.

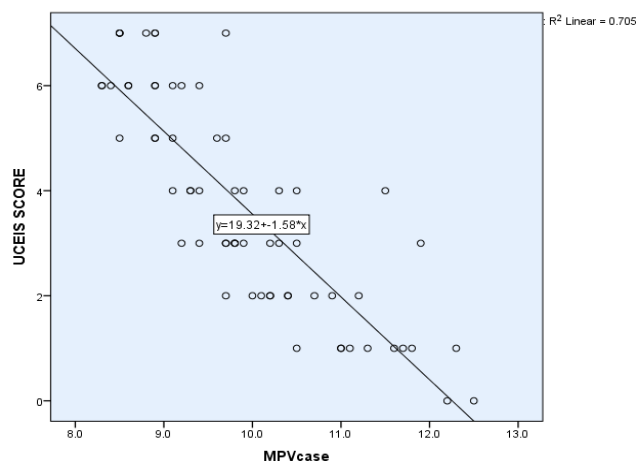
Table 1 Demographics of ulcerative colitis patients and control group

Characteristics	Ulcerative Colitis (n=40)	Control (n=80)	P value
Age	46.6 ± 1.36	49.5 ± 1.84	0.23
Sex: Male	22 (55%)	41(51.25%)	0.43
Smoking	11(27.5%)	23(28.75%)	0.73
BMI	20.3 ± 0.982	21.32 ± 0.527	0.13
Socioeconomic status	8.93 ± 1.06	9.8 ± 1.63	0.39
Hypertension	5 (12.5%)	9(11.25%)	0.10
Diabetes Mellitus	4(10%)	9(11.25%)	0.49

Table 2 Comparison of MPV and other inflammatory markers between Ulcerativecolitis and control group

	Cases	Control	P- value
MPV	9.71 ± 1.08	11.27 ± 0.83	0.02
CRP	15.6 ± 2.8	1.9 ±0 .96	0.003
ESR	25.67 ± 1.87	8.83 ± 1.72	0.009

We further investigated the ability of MPV and other markers in differentiating UC patients from healthy controls. A significant correlation was found between MPV and IBD disease activity, which was measured with UCEIS score in UC.⁷ Using the Spearman coefficient we analysed the co-relation between Mean Platelet Volume and disease severity using the Ulcerative Colitis Endoscopic Index of Severity (UCEIS) and found that there is a significant negative correlation between MPV and disease severity ($r = -0.7$ $P = 0.004$)



Discussion

Previous studies have demonstrated that appropriate and effective therapy can control symptoms, maintain remission, prevent relapse, improve quality of life and reduce mortality in patients with Ulcerative Colitis. Therefore, early diagnosis and assessment of disease activity is

essential for tailoring therapy.⁸ As invasive techniques, including endoscopic, radiological and histopathologic methods, are routinely used for diagnostic decision and disease activity monitoring, an ideal non-invasive test is increasingly expected for initial diagnosis and identification of disease activity.⁹ The mean platelet volume (MPV) reflects the size of platelets. It can be measured during a routine automatic whole blood count. The MPV has been shown to correlate with the function and activation of platelets.³ The importance of MPV has been emphasized as an inflammation marker in some chronic inflammatory disorders, such as inflammatory intestinal diseases, rheumatoid arthritis, and ankylosing spondylitis.¹⁰ An inverse correlation between disease activity and MPV has been demonstrated. Several stool tests, such as faecal lactoferrin, calprotectin and elastase, were investigated as novel inflammatory markers for IBD.¹¹ Even though they are superior to CRP or ESR with higher sensitivity and specificity in detecting gastrointestinal inflammation, they are not specific markers for IBD. Small platelets have lower functional capabilities.¹² This may in part explain the bleeding frequently seen in IBD patients with active disease. According to one of the hypotheses, the decrease of platelet volume observed in CD and UC could occur due to the presence of a disorder in the regulation of thrombopoiesis often associated with systemic inflammation.¹³

The correlation between MPV and inflammation has been well investigated in the literature. Previous series of case-control and cohort studies have documented several essential confounders of MPV. Smoking and exposure to nicotine were key factors that would significantly influence platelet morphology and size, and could be confounded by sex, age and duration of smoking. In our study, the age, sex and smoking histories were statistically similar between healthy controls and patients with UC.¹⁴

Mustafa Güçlü et al showed that there is negative significant co-relations between MPV and clinical, pathological and colonoscopic activity indices.¹⁵

However, there was no relation between the extent of the disease involvement and MPV. Kapsoritakis et al collected data for 66 patients with Crohns Disease and 38 healthy volunteers, and found a negative correlation of MPV with CRP, ESR and WBC. Ya Levin et al study demonstrates that there is increase in platelet and erythrocyte aggregation, accompanied by the decrease in their volume and increase in erythrocyte anisocytosis.¹⁷ The results of our study are not in concordance with the case control study done by Tayyibe Saler et al who recruited 200 subjects (100 patients with IBD (UC: 50 and CD:50) and the control group which included 100 healthy Subjects) could not find any significant association between MPV and inflammatory bowel disease.¹⁸ Song Liu et al demonstrated that MPV was low in Crohns disease patients compared with healthy subjects, but MPV did not show a discriminative value in disease activity.¹⁹

Platelets play a crucial role in the pathogenesis of IBD. The statistically significant reduction in MPV in patients with Ulcerative Colitis observed in our study is in accordance with findings of most of the prior studies, suggesting that MPV may be helpful in clinical practice, especially to the primary care physicians in differentiating inflammatory diarrhoea from functional aetiologies and also predicting the severity of the disease. According to one of the hypotheses, the reduction of platelet volume seen in patients with

UC could be due to the presence of a disorder in the regulation of thrombopoiesis often associated with systemic inflammation. Another hypothesis is that it could occur due to quicker consumption of the large activated platelets. Another factor that can explain the decrease in MPV could be enhanced blood cells microvesiculation.²⁰ According to literature, a substantial amount of Microvesicles (MV) in blood is derived from the platelet. The release of micro vesicles results in decrease of the MPV. MVs are known to play a part in pathogenesis of multiple conditions, especially associated with the risk of thrombosis²¹

Conclusion

MPV was found to be decreased in patients with IBD compared to the controls and there is a negative correlation with disease activity indices. Our study uncovered a preliminary but inspiring finding that Mean Platelet Volume could be used as a good biomarker in distinguishing Ulcerative colitis from healthy controls. Nevertheless, we are also aware that our finding is not sufficient for employing MPV solely in this differential diagnosis but our finding could provide a suggestion for physicians to seek attention to the value of MPV and take it into account while making decisions of differential diagnosis. Our study is limited by small study sample so further studies with large sample size are needed to validate the above findings

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