A STUDY OF MEAN PLATELET VOLUME LEVELS IN PATIENTS WITH ISCHEMIC STROKE

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ABSTRACT

CONTEXT

Stroke is the most common cause of death after cardiac disease and cancer. This study attempts to identify the significance of mean platelet volume as a risk factor as well as prognostic factor for ischemic stroke patients[1]. This may help in early identification of high risk individuals who can be targeted for aggressive acute management and improved secondary prevention measures.

AIM OF THE STUDY

To assess whether mean platelet volume levels are elevated in ischemic stroke and to assess MPV as independent risk factor and to assess whether the severity and outcome of ischemic stroke correlates with elevated mean platelet volume.

SETTINGS AND DESIGN

Analytical Case Control Study.

MATERIALS AND METHODS

This study is conducted among 50 ischemic stroke patients who were admitted at Government Rajaji Hospital, Madurai from December 2014 to June 2015. After taking detailed history and physical examination and investigations, MPV was determined for Ischemic stroke patients and Modified Rankin scale (MRS) at the time of admission was calculated. After 8 weeks of onset of stroke, all the patients were again followed up. Functional outcomes were determined by use of Modified Rankin Scale (MRS)[2,3]. All patients were stratified using MRS[2,3] Scale [0-2, 3-4 and 5-6] into three groups. MPV level was correlated with MRS score at the time of admission and again at 8 weeks. Patients with MRS score of 5 and 6 were declared as very poor outcome & MRS of 3 and 4 as poor outcome. Patients with MRS 0, and 1 were considered as good outcome.

STATISTICAL ANALYSIS

One way ANOVA, Pearson correlation and Chi square test.

RESULTS

There is no statistically significant difference among the case and control groups with regard to the age or sex composition or smoking or alcoholism. MPV did not vary with diabetes or hypertension. There was a linear relation with MPV and severity of ischemic stroke i.e. as the MPV increases the severity (MRS) [2,3]of stroke increases.

CONCLUSIONS

There is significant elevation of Mean platelet volume in ischemic stroke patients[1] compared to matched control group. Mean platelet volume can be used as a significant risk factor for acute ischemic stroke and other vascular events independent of other risk factor.

KEYWORDS

Mean Platelet Volume, ISCHEMIC Stroke, Modified Rankin Scale.

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INTRODUCTION: Strokes are the most important cause of prolonged disability. About 15% to 25% of stroke survivors become disabled permanently, while 20% remain in institutional care for three months after their stroke. Stroke is the most common cause of death after cardiac disease and cancer. It plays an important cause of morbidity and mortality in the elderly and late middle age persons. Because of the rise in the number of ageing population, the burden

of stroke is likely to increase automatically in the near future. Early identification of risk factors associated with stroke and implementing prevention programs will definitely help to control the burden of this major epidemic.

Various studies demonstrate an association between mean platelet volume and ischemic stroke prognosis. Every study shows that a high mean platelet volume level at the time of stroke is associated with worse prognosis in ischemic stroke patients. This study attempts to identify the significance of Mean platelet volume as a risk factor as well as prognostic factor for ischemic stroke patients. This may help in early identification of high risk individuals who can be targeted for aggressive acute management and improved secondary prevention measures.

MATERIALS AND METHODS:

Study Population: The study is an Analytical Case Control Study conducted among 50 ischemic stroke patients who were admitted to Government Rajaji Hospital, Madurai within 48 hrs. onset of symptoms from December 2014 to June 2015.

Inclusion Criteria: All patients presented with acute stroke with definitive signs of neurological deficit and ischemic stroke was proved by CT brain.

Exclusion Criteria: Haemorrhagic stroke, thrombocytopenia, known case of hereditary disorders of large platelet, medications that can reduce the platelet count (Hydroxyurea, Anti-neoplastic agents and inhibitors of the platelet function), patients unable to communicate because of severe stroke, aphasia or dementia without a valid surrogate respondent, (A valid surrogate respondent is considered a spouse or first degree relative living in the same home or self–identified, aware of the participant's previous medical history and current therapies), patients presenting 48 hrs. after the onset of neurological symptoms, peripheral smear showing platelet aggregates.

Ethical Committee Approval: Obtained.

Study Protocol: Patients with acute ischemic stroke admitted in the medicine department within 48 hrs. of onset of symptoms were enquired about presenting complaints, mode of onset of neurological deficit, past history of TIA, hypertension, diabetes mellitus in detail. Special enquiry about alcoholism, smoking, pregnancy or recent delivery and use of anticoagulants or oral contraceptives was made. Any similar illness in the family was asked. Complete general examination and neurological examination was done. Optic fundus was seen in all cases to identify papilloedema, diabetic retinopathy and hypertensive retinopathy. Other systems were examined in detail. Basic investigations such as Haemoglobin, blood cell count, urine for albumin, sugar deposit, blood sugar, urea, serum creatinine, and serum electrolytes, total cholesterol were estimated. Electrocardiography, echocardiography and CT scan of brain were done. Serum samples for MPV estimation were taken after confirming ischemic stroke & sent to the laboratory. MRI brain was also taken if the CT brain was normal and if the patient was affordable. Other risk factors such as history of TIA, MI, SHT, DM and BMI & serum cholesterol were taken into account. Modified Rankin scale (MRS) at the time of admission were calculated. Standard treatment was given to all patients with ischemic stroke. After 8 weeks of onset of stroke, all the patients were again followed up. Functional outcomes were determined by use of Modified Rankin scale (MRS). All patients were stratified using MRS Scale [0-2, 3-4 and 5-6] into three groups. MPV level was correlated with MRS score at the time of admission and again at 8 weeks. Patients with MRS score of 5 and 6 were declared as very poor outcome & MRS of 3 and 4 as poor outcome. Patients with MRS 0, and 1 were considered as good outcome.

STATISTICAL ANALYSIS: The information collected regarding all the selected cases were recorded in a master chart. Data analysis was done with the help of computer by using SPSS software and Sigma Stat 3.5 version (2012). Using this software, percentage, mean, standard deviation and 'p' value were calculated through one way ANOVA, Pearson correlation and Chi square test and P value of < 0.05 was taken as significant.

RESULTS: In this study, mean age of case group was 56.2, and the mean age of control group was 58.28. There were 39 male cases and 11 female cases in study group in contrast to 38 male patients and 12 female cases in control group. In this study, there were 28 smokers and 22 non-smokers in case group in contrast to 21 smokers and 29 non-smokers in control group. There is no statistically significant difference among the two groups with regard to the age or sex composition or smoking or alcoholism (p= 0.194). (p=0.947)(p=0.519)(p=0.810). There were 23 diabetics and 27 nondiabetics in case group in contrast to 22 diabetics and 28 nondiabetics in control group. P value was 0.956, which means diabetic and nondiabetic are equally distributed in both cases and control group. There were 22 hypertensive cases and 28 non-hypertensive cases in case group whereas in control group, there were 17 hypertensive and 33 non-hypertensive cases. P value was 0.624, means hypertensives and non-hypertensives are equally distributed in both groups. In study group, mean for MPV found to be 10.33 and standard deviation 1.74. But the control group had mean of 9.2 and standard deviation of 1.14. P value was <0.001 which is statistically very significant.

In case group, 36 patients had MPV within normal limit (7.5 to 11.5), 14 patients had elevated MPV (>11.5). In control group, 47 had normal MPV value (7.5 to 11.5) and 3 persons had elevated MPV (>11.5) (P value = 0.027)**.** 28% of ischemic stroke patients had abnormal elevated MPV. In study group, 5 patients were with MRS (Modified Rankin Scale) Gr 0, 2 patients were with MRS Gr 5, maximum cluster was seen between MRS Gr 1 to 4; total 43 patients. Maximum 14 patients were with MRS Gr 1. 19 patients with MRS Gr 0 to 1 had MPV with mean 9.79 and SD 1.5. 20 patients with MRS Gr 2 to 3 had MPV with mean 10.09 and

SD 1.73. 11 patients with MRS Gr 4 to 5 had MPV with mean 11.72 and SD 1.53**.** There was a linear relation with MPV and severity of ischemic stroke (p =0.008) i.e. as the MPV increases the severity (MRS) of stroke increases.

MRS	No. of Cases
Gr 0	5
Gr 1	14
Gr 2	9
Gr 3	11
Gr 4	9
Gr 5	2

Table 1: Severity of Ischemic Stroke

MRS vs. MPV	Mean	SD	p value
Gr 0, 1(19)	9.79	1.5	
Gr 2, 3(20)	10.09	1.73	
Gr 4, 5(11)	11.72	1.53	0.008 Sig

Table 2: MPV vs. severity of stroke (MRS)

DISCUSSION: The measurement of MPV[1] may add useful prognostic patients marker at the time of admission in patients presenting with ischemic cerebrovascular disease. Martin JF et al conducted a case control study with 482 stroke patients and concluded that mean platelet volume was significantly elevated in stroke patients than in matched control group. We also found a strong positive correlation with mean platelet volume and ischemic stroke. T. O'Malley et al studied mean platelet volume and platelet count in stroke patients. His study conclusion was that elevated MPV and decrease in platelet counts are found both in acute and non-acute phases of ischemic stroke. Shah PA et al[4] studied 22 ischemic stroke patients in study group and matched 27 subjects in control group. He found that MPV is an independent predictor of ischemic stroke[1] and transient ischemic attack. His conclusion was MPV may be a useful prognostic information for clinicians in managing ischemic stroke patients. Pabón Osuna et al studied that mean platelet volume >9 fl was associated with a significant increase of risk for morbidity and mortality (OR = 1.37; p =0.026). By univariate analysis, an elevated mean platelet volume was seen associated with higher risk of cardiac failure (OR = 1.46; p = 0.01) and a significant increase in the incidence of recurrent ischemic stroke events (OR = 1.35; p = 0.07). In addition, he found that elevated mean platelet volume was also associated with a higher prevalence of ischemic vascular events, arterial hypertension and diabetes mellitus. Smyth et al study showed that increased platelet size is associated with increased platelet activity.

Bath PM et al[5] studied platelet volume in citrated blood in two groups of patients at risk of having atherosclerotic renal artery stenosis, namely (i) 30 patients with severe hypertension and (ii) 44 patients with peripheral vascular disease. Platelet volume was increased in patients with hypertension who had atherosclerotic renal artery stenosis diagnosed by angiography.[5] Platelet volume correlated with severity of renal artery stenosis (rs= 0.391, 2p = 0.033, n = 30). Similarly, platelet volume correlated with severity of renal artery stenosis in patients with peripheral vascular disease (rs = 0.319, 2p =0.035, n = 44). Serum immunoreactive platelet-derived growth factor (predominantly released from platelets) and plasma immunoreactive interleukin-6 (a cytokine which has been postulated to regulate platelet volume) concentrations were not different between hypertensive patients with and without renal artery stenosis. Since large platelets are hyperactive, increased platelet volume may contribute to the development of atherosclerotic renal artery stenosis. This study also supports our study that large platelets are hyperactive, and increased platelet volume as measured by MPV directly relates to prothrombotic state. Vizoli et al stated that volume of platelet is determined by thrombopoietin in bone marrow. Thrombopoietin is a cytokine and growth factor for volume of platelet size which explains elevated mean platelet volume in inflammatory and vascular events. MPV[1] is considered as an independent predictor of large infarct volume in ischemic stroke patients, coronary artery disease and severity of coronary artery disease. In our study, there is a linear relation with MPV and severity of ischemic stroke. As the MPV increases the severity (MRS)[2,3] of stroke increases.

CONCLUSION: There is significant elevation of mean platelet volume in ischemic stroke patients[1] compared to matched control group. Mean platelet volume can be used as a significant risk factor for acute ischemic stroke and other vascular events independent of other risk factor. Mean platelet volume can be used as a prognostic indicator and high mean platelet volume is well correlated with severity and outcome of acute ischemic stroke at the time of admission itself. The primary goal of biomarker MPV in ischemic stroke patients should be early identification of high risk individuals who can be targeted for aggressive acute management and improved secondary preventive measures.

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