



MEAN PLATELET VOLUME AS A PROGNOSTIC MARKER IN CEREBRAL VENOUS SINUS THROMBOSIS

Dr. Shunmuga Sundaram K

Assistant professor, Department Of Neurology, Madras medical college, Chennai

Dr. Chandra Mouleswaran V*

Professor, Department Of Neurology, Madras medical college, Chennai
*Corresponding Author

Dr. Lakshminarasimhan R

Professor and Director, Department Of Neurology, Madras medical college, Chennai

ABSTRACT The aim of our study is to investigate the role of mean platelet volume as a prognostic marker in patients with cerebral venous sinus thrombosis. Fifty patients with cerebral venous sinus thrombosis were included in the study. The mean platelet volume of all the patients were compared with the poor prognostic factors like increased age, male sex, altered mental status, presence of parenchymal lesion and deep venous system involvement. We observed a statistically significant positive correlation between increased mean platelet volume and the above mentioned poor prognostic factors except male sex. Hence, Mean platelet volume can be used a prognostic indicator in patients with cerebral venous sinus thrombosis.

KEYWORDS : Cerebral venous sinus thrombosis, Mean Platelet Volume, prognostic factors.

INTRODUCTION:

The well established role of mean platelet volume in current clinical practice is in the differential diagnosis of thrombocytopenic disorders¹. Recently, its role has been evaluated in various arterial and venous thrombotic events like acute myocardial infarction, deep vein thrombosis and pulmonary embolism^{4,6,7}. Various hypothesis have been put forward to explain the role of mean platelet volume in these disorders and they include, large platelets are functionally more active and thereby they increase the risk of thrombosis, thrombin produced in the milieu of already formed thrombus will increase the size of circulating platelets, with a high thrombus burden more young platelets will be recruited; young platelets are usually large, with high mean platelet volume and they show poor response to antiplatelet therapy. All these factors make Mean Platelet Volume as a potential prognostic marker in patients with cerebral venous sinus thrombosis^{2,5}.

AIM:

To investigate the role of mean platelet volume in the early phase prognostication of patients of patients with cerebral venous sinus thrombosis

MATERIALS AND METHODS:

In our study we have included fifty patients of cerebral venous sinus

thrombosis admitted to our hospital within 24 hours of symptom onset. Patients with diseases or drugs that are known to affect the values of mean platelet volume like those with non-venous strokes, diabetes mellitus, hypertension, systemic infection, pregnancy, peripheral vascular occlusive disease, myocardial infarction in the acute phase, antiplatelet therapy and anticoagulant therapy were excluded from the study. The diagnosis of cerebral venous sinus thrombosis was based on clinical evaluation and Magnetic Resonance Imaging of Brain with magnetic resonance venogram. Routine blood count with blood chemistry and investigation for the underlying etiology were carried out in all the patients. Patients were divided into subgroups based on the presence or absence of altered mental status at the time of admission, presence or absence of parenchymal lesions in Magnetic Resonance Imaging of brain and deep cerebral venous system involvement in Magnetic Resonance Imaging of brain. Samples for Mean platelet volume were collected within 24 hours of hospitalization in EDTA vacutainers. Mean platelet volume was measured using Beckman coulter hematology auto-analyzer. The normal value for Mean platelet volume was taken as 6-10fl. Statistical analysis was performed using the SPSS ver.24. Statistical associations and correlations between the variables in various sub-groups were tested using Mann-Whitney U test, Chi-square test and spearman rho correlation.

Table :1 ASSOCIATION BETWEEN CEREBRAL DEEP VENOUS SYSTEM INVOLVEMENT AND VARIABLES.

VARIABLES	DEEP VENOUS SYSTEM INVOLVEMENT PRESENT	NO DEEP VENOUS SYSTEM INVOLVEMENT	TOTAL	P VALUE
AGE	34.14±6.4 (26-44)	28.51±6.78 (20-49)	29.3±6.95 (20-49)	0.037^a
GENDER (M/F)	4/3	23/20	27/23	0.857 ^b
MPV	11.71±0.57 (10.5-12.2)	9.69±1.34 (6.9-12)	9.98±1.44 (6.9-12.2)	<0.001^a

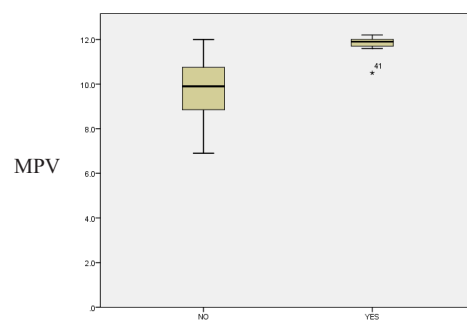
a-Mann-Whitney U test, b-Chi-square test.

The mean age group of patients with deep cerebral venous system involvement was 34.14±6.4(range 26-44) and, 28.51±6.78(range 20-49) in patients without deep cerebral venous system involvement. The gender ratio respectively in patient groups with and without deep cerebral venous system involvement are 4/3 and 23/20. The mean platelet volume values are 11.71±0.57(range 10.5-12.2) and 9.69±1.34(range 6.9-12) respectively in patient group with and without deep cerebral venous system involvement(table 1, graph 1&2). Spearman rho correlation showed a positive correlation between increased mean platelet and presence of deep cerebral venous system involvement with a significant p value of <0.001 (table 2).n

Table : 2 CORRELATION BETWEEN DEEP VENOUS SYSTEM INVOLVEMENT AND VARIABLES

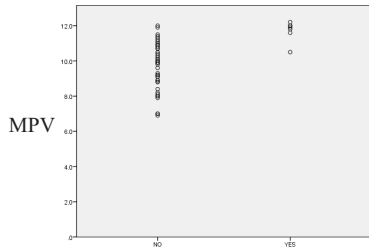
VARIABLES	SPEARMAN RHO CORREALTION	TYPE OF CORREALTION	P VALUE
AGE	0.284	POSITIVE	0.046
MPV	0.492	POSITIVE	<0.001

Graph:1 ASSOCIATION BETWEEN CEREBRAL DEEP VENOUS SYSTEM INVOLVEMENT AND MEAN PALTELET VOLUME



INVOLVEMENT OF CEREBRAL DEEP VENOUS SYSTEM

Graph: 2 CORRELATION BETWEEN DEEP VENOUS SYSTEM INVOLVEMENT AND MEAN PLATELET VOLUME



INVOLVEMENT OF CEREBRAL DEEP VENOUS SYTEM

Table:3 ASSOCIATION BETWEEN PARENCHYMAL LESIONS AND VARIABLES

VARIABLES	PARENCHYMAL LESIONS PRESENT	NO PARENCHYMAL LESIONS	TOTAL	P VALUE
AGE	31.69+7.2 (20-49)	25.06+3.8 (21-32)	29.3+6.95 (20-49)	0.001a
GENDER (M/F)	19/13	8/10	27/23	0.309b
MPV	10.88+0.79 (9.6-12.2)	8.38+0.8 (6.9-9.3)	9.98+1.44 (6.9-12.2)	<0.001a

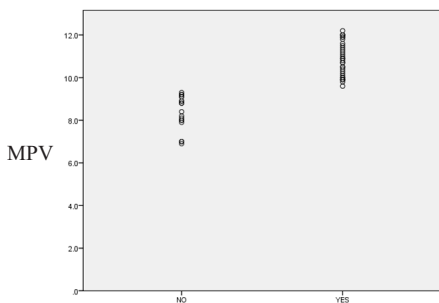
a-Mann-Whitney U test, b-Chi-square test.

The mean age group of patients with parenchymal involvement was 31.69+/- 7.2(range 20-49) and 28.51+/-6.78(range20-49) in patients without parenchymal involvement. The gender ratios in patient group with and without parenchymal lesions respectively are 19/13 and 8/10. The mean platelet volume was 10.88+/-0.79(range9.6-12.2) and 8.38+/-0.8(range 6.9-9.3) respectively in patient group with and without parenchymal lesions(table 3 and graph3). Spearman rho correlation was done, which showed that a significant positive correlation exists between increased mean platelet volume and presence of parenchymal lesions with a p value of <0.001(table 4)

Table: 4 CORRELATION BETWEEN PARENCHYMAL LESIONSAND VARIABLES

VARIABLES	SPEARMAN RHO CORREALTION	TYPE OF CORREALTION	P VALUE
AGE	0.463	POSITIVE	0.001
MPV	0.840	POSITIVE	<0.001

Graph :3 CORRELATION BETWEEN PARENCHYMAL LESIONSAND MEAN PALTELET VOLUME



PARENCHYMAL INVOLVEMENT

Table: 5 ASSOCIATION BETWEEN ALTERED MENTAL STATUSAND VARIABLES

VARIABLES	ALTERED MENTAL STATUS PRESENT	NO ALTERED MENTAL STATUS	TOTAL	P VALUE
AGE	32.83+6.7 (23-49)	26.3+5.7 (20-42)	29.3+6.95 (20-49)	<0.001a
GENDER (M/F)	14/9	13/14	27/23	0.368b
MPV	11.21+0.65 (10-12.2)	8.93+1.03 (6.9-10.5)	9.98+1.44 (6.9-12.2)	<0.001a

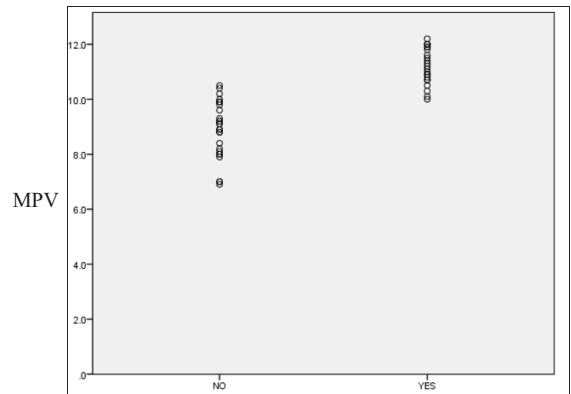
a-Mann-Whitney U test, b-Chi-square test.

The mean age group of patients with and without altered mental status respectively are 32.83+/- 6.7(range23-49)and 26.3 +/-5.7(20-42).the gender ratios were 14/9 and 13/14 respectively in the group with and without altered mental status at the time of presentation. The mean platelet volume was 11.21+/-0.65(raneg10-12.2) and 8.93+/-1.03 (range6.9-10.5) in patients with and without altered mental status respectively (table 5 and graph 4). There was significant positive correlation between patients with increased mean platelet volume and altered mental status at the time of presentation with a significant p value of <0.001 with spearman rho correlation (table 6).

Table :6 CORRELATION BETWEEN ALTERED MENTAL STATUSAND VARIABLES

VARIABLES	SPEARMAN RHO CORREALTION	TYPE OF CORREALTION	P VALUE
AGE	0.473	POSITIVE	0.001
MPV	0.797	POSITIVE	<0.001

Graph:4 CORRELATION BETWEEN ALTERED MENTAL STATUS AND MEAN PLATELET VOLUME



ALTERED MENTAL STATUS

CONCLUSION:

The Mean platelet volume was increased in Cerebral venous sinus thrombosis patients with parenchymal lesions, altered mental status at the time of initial presentation and presence of deep cerebral venous system involvement, which are all poor prognostic factors according to various studies including ISCVT and hence they can be used as a hematological marker for predicting the severity of Cerebral venous sinus thrombosis

DISCUSSION:

Platelet activation leads changes in morphology of platelets as spherical shape and pseudopodia formation. These changes possibly reflect the changes in mean platelet volume. We found increased Mean platelet volume value with brain lesions and severe neurological abnormalities in patients with Cerebral venous sinus thrombosis. This may be related in response to the production of cytokines and other factors in parenchymal lesion with Cerebral venous sinus thrombosis. Our findings suggest that the increased Mean platelet volume contribute to the prothrombotic situation in the acute phase of Cerebral venous sinus thrombosis and larger platelets may play an important role in infarction. Increased Mean platelet volume may be a predictive factor for poor prognosis as age, coma, cortical and deep cerebral venous system involvement, increased intracranial pressure, and parenchymal involvement(poor prognostic factors according to ISCVT study include age > 37, involvement of deep venous system, hemorrhage at presentation, coma, central nervous system infection, cancer, male sex^{1,2}.

REFERENCES :

1. Ferro JM, Canhão P, Stam J, Bousser MG, Barinagarrementeria F. Prognosis of cerebral vein and dural sinus thrombosis: results of the International Study on Cerebral Vein and Dural Sinus Thrombosis (ISCVT). Stroke. 2004 Mar 1;35(3):664-70.
2. Kamisli O, Kamisli S, Kablan Y, Gonullu S, Ozcan C. The prognostic value of an increased mean platelet volume and platelet distribution width in the early phase of cerebral venous sinus thrombosis. Clinical and Applied Thrombosis/Hemostasis. 2013 Jan;19(1):29-32.
3. Noris P, Melazzini F, Balduini CL. New roles for mean platelet volume measurement in the clinical practice?. Platelets. 2016 Oct 2;27(7):607-12.
4. Yuri Gasparyan A, Ayyavazyan L, P Mikhailidis D, D Kitas G. Mean platelet volume: a link

- between thrombosis and inflammation?. *Current pharmaceutical design*. 2011 Jan 1;17(1):47-58.
5. Jindal S, Gupta S, Gupta R, Kakkar A, Singh HV, Gupta K, Singh S. Platelet indices in diabetes mellitus: indicators of diabetic microvascular complications. *Hematology*. 2011 Mar 1;16(2):86-9.
 6. Gulcan M, Varol E, Etili M, Aksoy F, Kayan M. Mean platelet volume is increased in patients with deep vein thrombosis. *Clinical and Applied Thrombosis/Hemostasis*. 2012 Jul;18(4):427-30.
 7. Khandekar MM, Khurana AS, Deshmukh SD, Kakrani AL, Katdare AD, Inamdar AK. Platelet volume indices in patients with coronary artery disease and acute myocardial infarction: an Indian scenario. *Journal of clinical pathology*. 2006 Feb 1;59(2):146-9.