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CAN PLATELET INDICES PREDICT BLEEDING RISK IN THROMBOCYTOPENIC PATIENTS- A SINGLE INSTITUTIONAL STUDY.

Pathology

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ABSTRACT

OBJECTIVES/PURPOSE OF THE STUDY: To study platelet indices in patients with thrombocytopenia and find their independent relationship with bleeding tendency.

MATERIALS AND METHODS: Patients with platelet count < 1.5 lakhs/mm^3 with Immune Thrombocytopenic purpura (ITP) who presented at our centre was taken up for this study. They were divided into two groups: bleeding present or absent. Platelet indices-mean platelet volume (MPV), plateletcrit, platelet distribution width (PDW) and platelet large cell ratio (PLCR) were compared in both groups.

RESULTS: A total of 190 patients were enrolled in this study. Lower the platelet count, higher the risk of bleeding was seen. Mean MPV, PDW and PLCR were significantly lower in patients with bleeding. But when platelet count was also taken into picture, significant difference was seen in mean MPV between cases with and without bleeding at all platelet counts. However significant difference in mean PDW was seen only when platelet count was <20000/mm^3.

CONCLUSION: In thrombocytopenic patients, MPV has high predictive value for risk of bleeding independent of platelet count, while PDW indicates high risk of bleeding only when platelet count is<20000/mm^3.

KEYWORDS

Platelet indices, MPV, PDW, Plateletcrit, PLCR

INTRODUCTION:

Thrombocytopenia is defined as platelet count <1.5 lakh/mm^3. The clinical significance of platelet counts between 1–1.5lakh/mm^3 is not clear. Platelet counts < 1 lakh/mm^3 may be associated with clinical complications and counts <50,000/mm^3 can be associated with petechiae, menorrhagia and spontaneous bruising. The possibility of severe and spontaneous bleeding in otherwise healthy individuals usually does not occur until the platelet count is <10,000/mm^3. Thrombocytopenia may be due to reduced platelet production, increased platelet destruction, dilutional thrombocytopenia and/or splenic sequestration of platelets. Any abnormal report should be confirmed with repeat testing before labelling it as thrombocytopenia.[1]

Platelet indices include- mean platelet volume (MPV), platelet distribution width (PDW), plateletcrit and platelet large cell ratio (PLCR). These indices are calculated from the platelet distribution curve.

Mean platelet volume (8-12fL) is measurement of average size of platelets, calculated by sum of volumes of platelets divided by platelet count and gives an idea of platelet function.[2] MPV is useful in the detection of platelet production states. A raised MPV indicates an increase in the megakaryocyte activity due to increased platelet consumption and activation. A reduced MPV indicates bone marrow suppression and a heightened risk of bleeding.[3,4]

Larger platelets have greater prothrombotic potential and are enzymatically more active than smaller platelets as the number of granules are more in larger platelets. The chance of bleeding is decreased in larger platelets as compared to smaller platelets.[3]

Platelet distribution width (9-15fL) determines the variation in platelet size in peripheral blood smear. Increased PDW suggests large range of platelet size due to swelling, immaturity and/or increased platelet destruction. An increased PDW without any change in the MPV may indicate increased platelet destruction.[4]

Plateletcrit (20-36%) is measure of total platelet mass.[4] It is volume occupied by platelets in the blood as a percentage and calculated according to the formula PCT= platelet count x MPV/10000. Under physiological conditions, the amount of platelets in blood is maintained in an equilibrium state by regeneration and elimination. [5]

Platelet large cell ratio is the percentage of platelets with a size of >12fL and indicator of circulating large platelets.

Vinholt P J et al studied platelet indices and methods for evaluating platelet function in thrombocytopenic patients, and concluded that low MPV is usually associated with bleeding when platelet <20,000/mm^3, however PDW gives no information in relation to bleeding risk in thrombocytopenia.[6]

This study was conducted to find relationship between different platelet indices with risk of bleeding independent of platelet count.

MATERIALS AND METHOD:

This cross sectional observational study was done at a tertiary care centre between December 2014 to July 2016. Patients with platelet count < 1.5 lakhs/mm^3 with Immune Thrombocytopenic purpura (ITP) who presented at our centre was taken up for this study. The patients with abnormal coagulation profile and age <18 years were excluded. Then cases were grouped into two categories:

Group: 1 Platelet count<1.5lakh/mm^3 with bleeding.
Group: 2 Platelet count<1.5lakh/mm^3 without bleeding.

In these groups, platelet indices were compared in three subgroups depending on platelet counts (<20,000/mm^3, 20,000-50,000/mm^3 and >50,000/mm^3)

Statistical analysis was done using SPSS 22 version software.

RESULTS:

A total of 190 patients with thrombocytopenia (95 with bleeding and 95 without bleeding) were studied. Mean and median age of patients was 36.7 years and 34 years respectively. Among total of 190 cases, there were 110(57.9%) females and 80(42.1%) males. Mean platelet count was 54,482/mm^3, mean MPV was 6.67fL, mean PDW was 18.36fL, mean plateletcrit was 25.66%, mean PLCR was 25.17.

There was significant difference in value of mean platelet count between two groups. Mean platelet count in patients with and without bleeding was 44526/mm^3 and 66042/mm^3 respectively (p<0.001).

The most frequent bleeding manifestation was bleeding gums (29.47%) followed by petechiae oral cavity (21.05%) and third common were epistaxis (17.89%).

Distribution of cases in three subgroups is shown in Table 1. It can be seen that bleeding was significantly (p=0.017) more common in patients with platelet count <20000/mm^3.

Table 1: Distribution of cases with and without bleeding

PLATELET COUNT (/mm^3)	BLEEDING		TOTAL
	PRESENT	ABSENT	

<20000	20(66.7%)	10(33.3%)	30(100%)
20000-50000	44(55%)	36(45%)	80(100%)
>50000	31(38.8%)	49(61.2%)	80(100%)
TOTAL	95(50%)	95(50%)	190

On comparing platelet indices with bleeding tendency, MPV, PDW and PLCR were significantly lower in patients with bleeding. No such significance was observed with plateletcrit (Table 2)

Table 2: Comparison of bleeding manifestation with platelet indices

	Bleeding				P value
	Present		Absent		
	Mean	SD	Mean	SD	
MPV	5.7	1.3	7.5	1.6	<0.001*
PDW	15.1	7.9	19.0	6.2	<0.001*
PLCR	24.7	5.9	27.1	9.2	0.035*
Plateletcrit	24.9	5.9	25.7	8.5	0.444

In all subgroups (i.e. platelet count<20000, 20000-50000 or >50000) there was significant difference in mean MPV between cases with and without bleeding. Lower MPV was observed among those with bleeding at all the levels of platelet count*. In platelet count of <20000, significant difference in mean PDW was observed between cases with and without bleeding*. However in other subgroups no such significant difference was seen in mean PDW. Also there was no significant difference in plateletcrit and PLCR between cases with and without bleeding. (Table 3)

Table 3: Mean MPV, PDW and Plateletcrit comparison among subjects with bleeding and without bleeding with respect to platelet count.

				MPV			PDW			PLCR			PLATELETCRIT		
				Mean	SD	P	Mean	SD	p	Mean	SD	p	Mean	SD	P
Platelet	< 20000	Bleeding	Present	5.1	1.0	<0.001*	12.1	1.34	<0.001*	21.1	6.7	0.780	21.1	6.7	0.723
			Absent	8.3	2.0		14.9	9.3		21.9	8.4		20.1	8.4	
	20000 to 50000	Bleeding	Present	5.5	1.3	<0.001*	18.5	3.6	0.433	24.7	5.1	0.102	24.7	5.1	0.985
			Absent	7.0	1.6		19.4	6.0		27.1	8.0		24.6	8.8	
	> 50000	Bleeding	Present	6.5	1.1	<0.001*	18.7	3.1	0.374	27.1	5.5	0.592	27.5	5.3	0.963
			Absent	7.8	1.4		19.6	5.3		28.1	9.9		27.6	7.8	

DISCUSSION:

Out of 190 cases in our study 95 cases (50%) had bleeding and 95 cases (50%) without bleeding, similar to a study done by Srinivas et al[7], which had 49% cases with bleeding and 51% cases without bleeding.

Out of 95 patients with bleeding, the most common bleeding manifestation was gum bleed followed by petechiae. However, most studies had presence of petechiae as the most common bleeding manifestation in study done by Kumar et al [8], P S Nair et al [9], Gandhi et al[10], Puttu Suresh et al[11] and Modi et al[12], Usha rani et al [13], Basir et al[14]

Out of 95 cases of thrombocytopenia with bleeding, 20 cases (21.1%) had platelet count <20000/mm^3, 44 cases (46.3%) had platelet count between 20,000-50,000/mm^3 and 31 cases (32.6%) had platelet count >50,000/mm^3. Maximum cases with bleeding in our study had platelet count in range between 20000-50000/mm^3 similar to another study done by Basir et al.[14] However in a study conducted by Usha Rani et al[13], 78.7% of bleeding patients had platelet count<20000/mm^3.

In thrombocytopenic cases without bleeding (95 cases), 10 cases (10.5%) had platelet count<20,000/mm^3, 36 cases (38%) had platelet count between 20,000- 50,000/mm^3 and 49 cases (51.5%) had platelet count >50000/mm^3. Maximum cases without bleeding in our study had platelet count >50,000/mm^3 similar to study done by Basir et al[14]. However, in a study conducted by Usha Rani et al[13] where, maximum (41.3%) non-bleeders had platelet count 20000-50000/mm^3.

MPV count in our study was significantly lower (5.7fL) in patients with bleeding as compared to patients without bleeding(7.5fL), similar to the finding seen in a study conducted by Kennet et al[15].

In patients with bleeding, platelet indices including MPV, PDW, PLCR and plateletcrit were lower compared to patients without bleeding and it was statistically significant for MPV, PDW, and PLCR.

CONCLUSION:

Alterations in platelet indices help predict the bleeding risk. With decrease in platelet count, platelet indices also decrease. These indices are even lower in thrombocytopenic patients with bleeding. Finally from our study this can be concluded that in thrombocytopenic patients, MPV has high predictive value for risk of bleeding independent of platelet count, while PDW indicates high risk of bleeding only when platelet count is<20000/mm^3.

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