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ROLE OF PLATELET INDICES IN DIFFERENTIATING HYPO PRODUCTIVE THROMBOCYTOPENIA FROM HYPER DESTRUCTIVE THROMBOCYTOPENIA

Haematology

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ABSTRACT

Thrombocytopenia defined as low platelets is attributed to variety of hematological and pathological disorders. During the evaluation of thrombocytopenic patients, it is very important to identify the cause of thrombocytopenia, whether it is due to hyper destruction or hypo production of platelets as it will ultimately have an impact on the management of the patient. A prospective study was conducted for a period of one and a half years on patients with thrombocytopenia. Platelet count (PC) Mean platelet volume (MPV), Plateletcrit (PCT), Platelet distribution width (PDW) and relevant clinical details of the patients were collected and analyzed for statistical significance. A total of 80 thrombocytopenic patients were considered for the study, of which 48 belongs to hyper destructive group and 32 belong to hypo productive group. The analysis showed that the mean values of platelet indices like MPV, PDW were found to be higher in the hyper destructive group when compared with hypo productive group (p value-0.000). On comparison with the controls, both groups of thrombocytopenia showed a statistically significant difference with p value of 0.000 in all the four indices. It was concluded that MPV and PDW can be used as screening test for differentiating both types of thrombocytopenia and may help in avoiding or delaying the irrelevant invasive procedures like BMA.

KEYWORDS

Thrombocytopenia, Platelet indices, Hyperdestruction, Hypoproduction, Bone Marrow Aspiration, CBC

INTRODUCTION

Thrombocytopenia is defined as platelet counts below 1,50,000 cells/mm3, but the knowledge of low platelet counts does not reveal the underlying cause of thrombocytopenia.[9] During evaluation of these patients with thrombocytopenia, it is important to identify the etiology of thrombocytopenia, whether it is due to hypoproduction or hyper destruction of platelets as this has an impact over the proper management of these patients.

The two main causes of thrombocytopenia are:

1) Increased destruction or peripheral consumption (hyper-destructive thrombocytopenia)
2) Decreased platelet production (hypo productive thrombocytopenia)

Bone marrow aspiration remained the gold standard method for evaluating the cause for thrombocytopenia for a long time as it provides the information about the platelet production and number of megakaryocytes. But this procedure is invasive, time consuming and carries an overt risk of bleeding in some thrombocytopenic patients. Previously for the evaluation of thrombocytopenia, platelet count by peripheral blood film was the only vital information available. But recently automated blood cell analysers have made it possible to measure various platelet indices such as Plateletcrit (PCT), Platelet distribution width (PDW), Mean Platelet Volume (MPV) and Platelet large cell ratio (P-LCR). Measurement of platelet indices in automated analysers has many advantages over the manual estimation as it is simple, quick, and inexpensive test which also eliminates the inter observer bias.[1] Platelet indices could be used as markers for the interpretation of mechanisms of thrombocytopenia in these patients. With such higher prevalence of thrombocytopenia, characterization of thrombocytopenia as per etiology and pathophysiological mechanisms becomes important. Hence, we are conducting this study in an attempt to find the usefulness of these platelet indices in the initial evaluation of patients with thrombocytopenia by assessing their variation in different clinical scenarios and to assess their sensitivity and specificity.

AIM

1. To evaluate the variation in platelet indices in establishing clinical correlation in patients presenting with thrombocytopenia.
2. To evaluate the efficiency of platelet indices to differentiate hypo productive thrombocytopenia from hyper destructive thrombocytopenia.

MATERIALS AND METHODS

This study was conducted in Department of pathology, Guru Nanak Dev Medical College, Amritsar, Punjab.

STUDY PERIOD: 1.5 years

SAMPLE SIZE: 80 cases and 80 controls

STUDY DESIGN: It was hospital based prospective comparative study

INCLUSION CRITERIA

1. All patients with platelet count lower than 1,50000 /mm3
2. All patients with confirmed diagnosis of thrombocytopenia by peripheral blood smear or bone marrow aspiration.

EXCLUSION CRITERIA

1. Patients on antiplatelet drugs and other medications causing thrombocytopenia.
2. Diagnosed cases with secondary causes of ITP such as systemic lupus erythematosus.

RESULTS

A total of 80 patients with thrombocytopenia were included in the study out of which, 46 (57.5%) were males and 34 (42.5 %) were females. Sex matched 80 controls were also taken into the study with normal platelet count (>150 x 10^9/L). Patients with thrombocytopenia were grouped into 2 groups according to the mechanism causing low platelet count i.e group A with low platelet count due to impaired production by the bone marrow and group B with low platelet count due to hyper destructive causes. Table 1 shows the age wise distribution of the cases with thrombocytopenia. Our age group ranged from <15 years to >60 years with maximum number of cases belonging to age group 31-45 years both in cases and control groups.

Group A (Hypo productive thrombocytopenia) included 32 patients who were diagnosed as one of the following: Acute leukemia, Alcoholism, Aplastic anaemia, Megaloblastic anaemia, Pancytopenia and Sepsis. Group B (Hyper destructive thrombocytopenia) included 48 patients who were diagnosed as one of the following: Idiopathic thrombocytopenic Purpura, Dengue, Malaria and Viral fever.

Table-1: Age Wise Distribution Of Cases With Thrombocytopenia

Age	Group A	Group B	Controls	Total
<15	3	2	4	9
16-30	9	5	14	28
31-45	13	24	40	77
46-60	6	15	20	41
>60	1	2	2	5
Total	32	48	80	160

The comparison and statistical analysis of the mean platelet parameters including PC (Platelet count), MPV (Mean Platelet volume), PDW (Platelet distribution width) and PCT (Plateletcrit) were done among both cases and control group and it is depicted in Table 2.

Statistically significant correlation was noted when means of platelet parameters like platelet count, mean platelet volume, platelet

distribution width and plateletcrit of study groups i.e Group A (Hypo productive) and Group B (Hyper destructive) were compared with the control group.

However, platelet parameters of hypo productive and hyper destructive thrombocytopenia show statistically significant correlation in mean values of MPV and PDW. (p-value - 0.000).

Table-2: Mean Values Of Platelet Parameters

	No of cases	PC (Mean±SD) (x 109/L)	MPV (Mean±SD)	PDW (Mean± SD)	PCT (Mean± SD)
Group A	32	60.64±29.4	8.78±1.29	15.16±3.32	0.034±0.040
Group B	48	60.64±29.4	12.34±0.78	18.33±1.66	0.096±0.035
Controls	80	254.55±60.9	9.96±0.71	15.3±1.28	0.24±0.26

DISCUSSION

Thrombocytopenia in seen in numerous conditions. With the advent of automated platelet indices like MPV, PDW and PCT, it has become easier for the clinician to identify the underlying cause of thrombocytopenia. The frequency of consultation with haematologists for thrombocytopenia cases continues to increase after the advent of automated analysers.

In our study, out of total 80 cases, 57.5 % were males and 42.5% were Female. Males outnumbered the females in our study with Male to Female ratio of 1.3:1. Similar findings were noted by various other authors like Borkataky et al (2009)[1], Chandra H (2010) [2] who reported male predominance in their studies. However, on the contrary, Kaito et al (2005) [3] in his study reported more females than males.

In the present study, it was analysed that thrombocytopenia due to hyper destruction was mainly seen in the higher age group (i.e. 31-45 years to >60 years) whereas cases due to hypoproduction was mainly seen in the lower age group (i.e. <15 years to 31-45years). This analysis was similar to the study done by Borkataky S et al [1] where cases of thrombocytopenia due to hyper destruction mainly fell into the third decade of life.

The mean platelet count of group A and B when compared with control group were found to be statistically significant. (p-value-0.000), similar to studies conducted by Elsewefy et al (2014).

The MPV (mean platelet volume) was significantly higher in hyper destructive group i.e Group B when compared with hypo productive group i.e Group A (p value- 0.000). Similar results were obtained in the studies conducted by Ntaios et al,[4] Numbenjapon et al,[5] Kaito et al, [3] Parveen et al,[6] Khairkar et al [7] and Elsewefy et al [8] where MPV was higher in hyper destructive group when compared with hypo productive group. However, Tomita et al [11] found a low MPV in hyper destructive thrombocytopenia and Nakadate H et al [10] and Baynes RD et al [11] found no significant difference in the MPV between both the groups.

PDW (Platelet distribution width) was significantly higher in the hyper destructive group (Group B) when compared with hypo productive group (Group A) (p-value-0.000). Shah et al [11] and Borkataky et al [1] also found higher PDW in hyper destructive group than hypo productive group. However, Xu et al [16] found a contrasting result of higher PDW values in hypo productive thrombocytopenia and attributed this as a result of significant dysplasia of haematopoiesis in the bone marrow.

The analysis of PCT (Plateletcrit) among two study groups i.e Group A and B did not show any significance with a p value of 0.34 similar to the studies conducted by Parveen et al [6] and Khaleel et al [12] where no statistical difference was founf in the value of PCT between the two study groups.

In our study, we also performed bone marrow aspiration studies wherever required. It was carried out in 19 cases from which 11 belonged to hypo productive group and 8 belonged to hyper destructive group. Analysis showed that megakaryocytes were increased in number in hyperdestructive group (Group B) and were decreased in number in hypo productive group (Group A). On comparing the platelet indices such as MPV and PDW with the bone marrow analysis, it was found to be equally helpful in differentiating between the two groups of thrombocytopenia. Similar study was done by Numbenjapon et al 2008 where all his patients underwent BMA study and used it to validate the utility of MPV. Based on his study, upon comparison of mean MPV with the bone marrow defined diagnosis, the MPV of 7.9fl as a cut off value could predict the hyperdestructive thrombocytopenia.[5]

We also found that almost all the cases of Immune thrombocytopenic purpura(ITP) showed increased number of megakaryocytes in the BMA studies, the average being 66/10 LPF. This corresponds to the study done by Choudhary et al (2013) [13], Shi et al (2004) [14] and Jubelirer et al (2002) [15] where they found an increase in megakaryocytes in 91%, 98% and 95% cases of ITP respectively.

CONCLUSION

It was concluded that platelet indices like MPV and PDW shows prominent increase in hyper destructive type of thrombocytopenia and are accompanied by markedly low levels of platelet counts. Whereas, hypoproductive thrombocytopenia does not show marked increase in MPV or PDW and usually does not lead to severe thrombocytopenia. Plateletcrit does not show any variation in the either type of thrombocytopenias. Platelet indices provide a useful preliminary information about the type of thrombocytopenia even before the bone marrow reports are analysed. Also they neither need additional blood sample, additional time and no extra expenses as they can be performed during routine blood cell counting.

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