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Assessment of platelet indices and their interpretation in thrombocytopenia

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ABSTRACT

Background: If platelet parameters are not regularly assessed, thrombocytopenia, a serious condition in hospitalized patients, may go unnoticed. The present study was conducted to assess platelet indices and their interpretation in thrombocytopenia.
Materials & Methods: 58 patients of thrombocytopenia of both genders were put in group I and controls in group II. Group I was further divided into group A – as accelerated destruction and b- as impaired production. The laboratory used a 5-part automated hematology analyzer to process all patient blood samples that were received in K3-EDTA anticoagulated vacutainers within an hour of collection. (Horiba Medical, Pentra ES 60) Platelet count and platelet parameters, such as mean platelet volume (MPV), platelet distribution width (PDW), platelet large cell ratio (P-LCR), and platelet crit (PCT), were recorded from the analyzer-generated reports.
Results: Group I had 38 males and 20 females and group II had 29 each male and female. In group A, B and II, mean platelets count (x 109/L) was 106.2, 75.2 and 254.8, PDW (fL) was 19.5, 17.1 and 16.3, MPV (fL) was 13.7, 13.2 and 12.3, P- LCR (%) was 54.2, 42.7 and 40.9 and PCT (%) was 0.09, 0.03 and 0.21 respectively. The difference was significant ($P<0.05$).

Conclusion: PCT and platelet count are directly correlated, and platelet crit can be used to evaluate both quantitative and qualitative platelet problems. The mechanism underlying the low platelet count can be deciphered using additional parameters such as PDW, PLCR, and MPV in addition to PCT. High index values suggest a greater breakdown of platelets in the bloodstream, while low values may be the result of impaired production brought on by primary or secondary bone marrow disease.

Keywords: platelet, platelet distribution width, thrombocytopenia

Introduction

If platelet parameters are not regularly assessed, thrombocytopenia, a serious condition in hospitalized patients, may go unnoticed. Thrombocytopenia is defined by a platelet count of less than 150 x 109/L, although this does not indicate the underlying pathophysiology.[1] Determining the etiology—whether hypoproduction or hyper destruction—is crucial during the evaluation of these individuals since it will affect how the patients are managed. The gold standard technique for determining the source of thrombocytopenia for a long time was bone marrow aspiration. However, this operation is time-consuming, invasive, and has a clear danger of bleeding diathesis in cases of serious thrombocytopenia.[2]

Thrombocytopenic patients are evaluated using serology (for infectious disorders), platelet-associated immunoglobulin G (PAIgG), and molecular markers for disseminated intravascular coagulation (DIC), all of which are somewhat expensive. In the past, the only important data on this little blood component was the platelet count.[3] However, new indices pertaining to platelet count are also being evaluated in light of the recent availability of automated blood cell analyzers. The three most crucial metrics are platelet distribution

width (PDW), mean platelet volume (MPV), and platelet crit (PCT).[4] Platelet activation causes alterations in platelet shape, and when platelet size increases, MPV and PDW rise as well. Traditionally, platelet size is determined by microscopic measurements of platelet diameters, a technique that is not easily accessible in day-to-day routine.[5] The present study was conducted to assess platelet indices and their interpretation in thrombocytopenia.

Materials & Methods

The study was carried out on 58 patients of thrombocytopenia of both genders. All gave their written consent to participate in the study.

Data such as name, age, gender etc. was recorded. Patients were put in group I and controls in group II. Group I was further divided into group A – as accelerated destruction and b- as impaired production. The laboratory used a 5-part automated hematology analyzer to process all patient blood samples that were received in K3-EDTA anticoagulated vacutainers within an hour of collection. (Horiba Medical, Pentra ES 60) Platelet count and platelet parameters, such as mean platelet volume (MPV), platelet distribution width (PDW), platelet large cell ratio (P-LCR), and plateletcrit (PCT), were recorded from the analyzer-generated reports. In every instance, the platelet count was reassessed by peripheral blood smear examination on Leishman stained slides. Results thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

Results

Table I Distribution of subjects

Groups	Male	Female
Group I	38	29
Group II	20	29

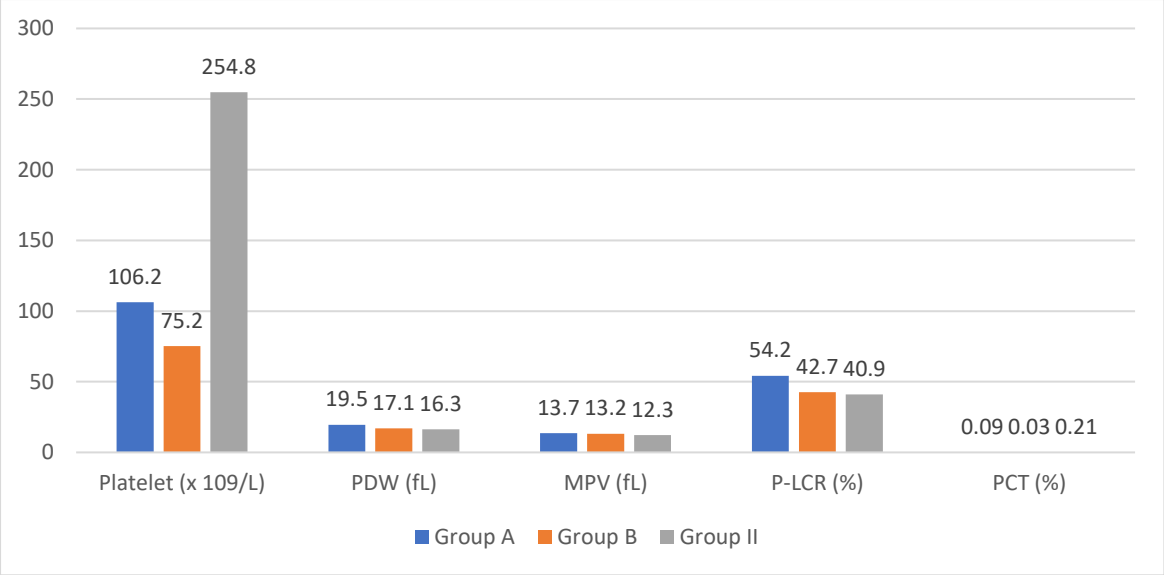
Table I shows that group I had 38 males and 20 females and group II had 29 each male and female.

Table II Platelet parameters in all groups

Parameters	Group A	Group B	Group II	P value
Platelet (x 10^9/L)	106.2	75.2	254.8	0.01
PDW (fL)	19.5	17.1	16.3	0.05
MPV (fL)	13.7	13.2	12.3	0.18
P-LCR (%)	54.2	42.7	40.9	0.36
PCT (%)	0.09	0.03	0.21	0.04

Table II, graph I shows that in group A, B and II, mean platelets count (x 109/L) was 106.2, 75.2 and 254.8, PDW (fL) was 19.5, 17.1 and 16.3, MPV (fL) was 13.7, 13.2 and 12.3, P-LCR (%) was 54.2, 42.7 and 40.9 and PCT (%) was 0.09, 0.03 and 0.21 respectively. The difference was significant ($P<0.05$).

Graph I Platelet parameters in all groups



Discussion

A common medical problem linked to a wide range of illnesses is thrombocytopenia (TCP). A circulating blood platelet count that is below normal is known as TCP.[6] TCP is defined by platelet counts less than 1,50,000 per microliter, although the underlying pathophysiology is not disclosed by these numbers.[7] Knowing if thrombocytopenic patients are experiencing hypoproduction, hyperdestruction, or aberrant platelet pooling is crucial for targeted patient therapy, preventing needless tests, and reducing the number of possible causes.[8] Labor-intensive and time-consuming techniques have now mostly been replaced by automated haematology analyzers in labs and medical facilities across the globe. These analyzers frequently produce platelet indices including MPV, PDW, and PCT in minutes in addition to platelet counts.[9] The present study was conducted to assess platelet indices and their interpretation in thrombocytopenia.

We found that group I had 38 males and 20 females and group II had 29 each male and female. Bowles KM et al[10] studied 473 unselected patients with thrombocytopenia. The mean platelet volume (MPV) was 8.1 fl in patients with marrow disease and 9.8 fl in patients without marrow disease ($P < 0.001$). A total of 5% of patients with an MPV >or=10.5 fl have marrow disease (odds ratio 0.05, 95% CI 0.02-0.13). Conversely over three quarters of patients with an MPV of <8.0 fl have marrow disease (odds ratio 8.1, 95% CI 5.0-13.0). Therefore, the MPV can strongly guide the clinician as to the likely presence or absence of bone marrow disease in thrombocytopenic patients.

We found that in group A, B and II, mean platelets count (x 109/L) was 106.2, 75.2 and 254.8, PDW (fL) was 19.5, 17.1 and 16.3, MPV (fL) was 13.7, 13.2 and 12.3, P- LCR (%) was 54.2, 42.7 and 40.9 and PCT (%) was 0.09, 0.03 and 0.21 respectively. Kaito K et al[11] investigated the significance of the platelet indices, mean platelet volume (MPV), platelet size deviation width (PDW), and platelet-large cell ratio (P-LCR), in the diagnosis of thrombocytopenia by comparing these levels in 40 patients with hypo-productive thrombocytopenia (aplastic anaemia; AA) and 39 patients with hyper-destructive thrombocytopenia (immune thrombo-cytopenia; ITP). The sensitivity and specificity of platelet indices to make a diagnosis of ITP were also compared. All platelet indices were significantly higher in ITP than in AA, and platelet indices showed sufficient sensitivity and specificity. The area under the curve (AUC) of the receiver operating characteristics curve of platelet indices was large enough to enable the diagnosis of ITP. P-LCR and PDW had the

largest AUCs, which indicated that these values were very reliable for immune thrombocytopenia. Our results suggest that these indices provide clinical information about the underlying conditions of thrombocytopenia. More attention should be paid to these indices in the diagnosis of thrombocytopenia.

The shortcoming of the study is small sample size.

Conclusion

Authors found that PCT and platelet count are directly correlated, and platelet crit can be used to evaluate both quantitative and qualitative platelet problems. The mechanism underlying the low platelet count can be deciphered using additional parameters such as PDW, PLCR, and MPV in addition to PCT. High index values suggest a greater breakdown of platelets in the bloodstream, while low values may be the result of impaired production brought on by primary or secondary bone marrow disease.

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