Evaluation of Platelet Indices in Acute Coronary Syndrome: A Case Control Study

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Abstarct

Background: Platelet indices are potentially useful markers for the early detection of the thromboembolic diseases. Platelets are known to be implicated in the pathogenesis of cardiovascular disorders including atherosclerosis and myocardial infarction. Platelet hyperactivity and activation have been suggested to play a role in acute coronary syndrome. The degree of activation is indirectly measured by platelet indices viz. mean platelet volume (MPV), platelet distribution width (PDW) and platelet counts (PC). Hence the present study is undertaken to analyse these parameters in acute coronary syndrome (ACS). *Objectives:* To determine platelet indices and platelet count in cases and compare it with healthy controls. *Materials and Methods:* This was a comparative study which included 107 cases diagnosed with acute coronary syndrome and 100 age and sex matched healthy controls. The platelet indices and platelet count of both the groups were obtained by automated hematoanalyser. Plalelet counts thus obtained were confirmed by peripheral smear study. These data were entered in Microsoft excel and analysed using the EPI.INFO version 7.0. *Results:* The MPV & PDW were significantly higher in cases with ACS as compared to controls. *Conclusion:* Measurement of platelet indices and platelet count is a simple and cost effective tool that can be used as a marker of coagulation.

Keywords: Platelet Indices; Platelet Distribution Width; Mean Platelet Volume; Platelet Count; Acute Coronary Syndrome.

Introduction

Platelet activation plays a central role in the transformation of atherosclerotic cardiovascular disease (CVD) into its potentially major clinical events, such as ischemic stroke and myocardial infarction (MI) and cardiac death [1]. Acute coronary syndrome (ACS) is a set of signs and symptoms due to rupture of plaque and is a consequence of platelet rich coronary thrombus formation. Platelets have a major role in the pathogenesis of acute coronary syndrome (ACS), where plaque rupture is followed by platelet activation and thrombus formation. Activated platelets are larger in size, which can be measured by mean platelet volume (MPV)[2]. Platelet hyper-reactivity and local

platelet activation have been suggested to play a causal role in acute coronary events [3]. Platelet size has been shown to reflect platelet activity. Large platelets are metabolically and enzymatically more active than small platelets and produce more thromboxane A2 [4]. The activated platelet is the major biological risk factor for pathogenesis of ACS, so inhibition of this process could play an important role in prevention of ACS [2].

Automated cell counters have made the platelet count and the platelet indices viz. Mean platelet volume (MPV), Platelet distribution width (PDW) routinely available in most clinical laboratories. However, there is scope to make better use of the platelet parameters generated. MPV can reflect changes in either the level of platelet stimulation or the rate of platelet production. Platelet activation is indirectly measured via MPV. The present study was undertaken to compare the platelet indices and platelet count in Acute coronary syndrome (ACS) cases with healthy controls.

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Materials and Methods

A case control study was undertaken in the clinical haematology laboratory. The study was done over a period of two months which included two groups, first group consisting of clinically diagnosed cases with ACS (n=107) and second group consisting of age and sex matched healthy controls (n=100).

Criteria for Cases

Patients admitted to ICCU (intensive coronary care unit) and diagnosed with acute coronary syndrome (symptoms of ischemia, ECG changes and elevated cardiac enzymes)

Criteria for Controls

Patients who came for routine health check up to the outpatient department and who had normal ECG findings with no history of heart diseases.

After taking consent, with aseptic precautions, 2ml of blood was collected in EDTA vacutainer and MPV, platelet count and PDW were measured using automated hematoanalyser (HORIBA). Two peripheral smears were prepared and stained with leishman stain for verification of platelet count obtained from the hematoanalyser. Collected data were entered in Microsoft excel and statistically analysed using EPI INFO VERSION 7.0.The Mean and SD (standard deviation) of these values was calculated for both the groups separately. One way analysis of variance (ANOVA) was used for statistical analysis and "P" value of 0.05 or less was considered as significant. Approval was obtained for performing the study from the Institutional Ethical Review Board.

Results

A total of 207 blood samples were studied. 107 were from cases and 100 were from controls. The age of cases and controls ranged from 50-80 years with a mean age of 63years. Majority of cases (44%) and controls (42%) were in the age group of 50-60years.

Among cases 66(62%) were males and 41(38%) were females. Controls included 53(53%) males and 47(47%) females. Mean and standard deviation of the platelet indices of cases (ACS) were slightly higher when compared with controls.

MPV, PDW and PC were significantly raised among cases when compared with that of control group and yielded a statistically significant p value of 0.002, 0.014 and 0.004 respectively(Table 1).

Table 1: Comparison of platelet indices and platelet count in ACS (cases) and controls

Platelet Indices	Cases	Controls	Mean ±Deviation	Mean Square	F* Score	Significance	P** Value
Platelet count	2.78±0.982	2.75±0.859	2.760±0.922	0.025	0.029	0.864	0.004
Mean platelet volume	8.26±0.560	7.93±0.869	7.91±0.810	5.759	10.942	0.001	0.002
Platelet distribution width	15.35±1.446	14.23±1.306	14.43±1.684	65.476	34.371	0.000	0.014

Table 2: Comparison of MPV in cases and controls in different studies

Publication	MPV(fl)		P value
	Cases(IHD)	Controls	
O Brien et al(1973)[9]	8.10	7.01	<0.001
Cameron et al(1983)[10]	9.07	8.32	<0.001
Martin et al(1983)[11]	7.30	6.32	0.05
Martin et al(1991)[12]	10.09	9.72	<0.001
Pizulli et al(1998)[13]	9.40	8.20	<0.001
Vitthal khode et al(2010)[14]	9.65	9.21	<0.025
Present study	8.26	7.93	<0.002

Table 3: Comparison of PDW in cases and controls in different studies

Publication	PDW(fl)		P value
	Cases (IHD)	Controls	
M M Khandekar et al(2006)[8]	8.10	7.01	<0.001
Vitthal khode et al(2012)[14]	9.07	8.32	<0.001
Present study	15.35	14.23	<0.014

Discussion

Platelets play a vital role in the development of atherothrombosis [4]. Platelet activity and function can be best assessed by platelet volume indicators like MPV and PDW [5,6]. MPV reflects changes in level of platelet stimulation or the rate of platelet production [7]. Platelet volume reflects platelet activity [7].

The increase of PDW was ascribed to platelet anisocytosis and platelet heterogenecity [7,8]. We observed increased platelet indices among ACS group compared to controls. Specifically, MPV levels were significantly higher among patients with ACS compared to controls. The MPV comparison between these groups showed high significance.

Our data suggest that the increased mean platelet volume contributes to the prethrombotic state in acute coronary syndromes and that larger platelets may play a specific role in infarction. Because larger platelets are hemostatically more active, presence of larger platelets is probably a risk factor for developing acute coronary syndromes [8]. These findings were in concordance with other several studies with respect to MPV, PDW and PC [Table 2 and 3].

Platelet function and size correlate because larger platelets, produced from activated megakaryocytes in the bone marrow, are likely to be more reactive than normal platelets because large platelets contain more secretary granules and mitochondria and are known to be more active than small platelets [15]. Consequently, larger and hyperactive platelets play a vital role in accelerating the formation and propagation of intracoronary thrombus, leading to the occurrence of acute thrombotic events [16].

Conclusion

Platelet indices are useful markers of identifying large platelets which are hemostatically active and are a risk factor for developing coronary thrombosis, leading to acute coronary syndromes. Patients with larger platelets can be easily identified during routine haematological analysis. Hence, measurement of platelet indices and platelet count is a simple and cost effective additional tool that can be useful for predicting an impending acute coronary event. Future research with a larger sample size is needed to bring more light on this issue.

Abbreviations

- PDW-Platelet distribution width
- MPV-Mean platelet volume
- PC-Platelet count
- ACS-Acute coronary syndromes
- CVD- Coronary vascular disease
- ICCU-Intensive coronary care unit

Financial Disclosure Statement: No

Conflict of Interest: Nil

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