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Platelet Volume Indices and Platelet Count in Patients with Acute Coronary Syndrome – Case control study

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ABSTRACT
Background: *Myocardial infarction is major cause of morbidity and mortality. Platelets play causal role in acute coronary syndrome. An increase in mean platelet volume (MPV) and platelet distribution width (PDW) due to platelet activation is hypothesized in acute coronary syndromes.*
Aim: *1. To study platelet volume indices and platelet count in acute coronary syndrome. 2. To compare platelet volume indices and platelet count in acute coronary syndrome with age and sex matched controls.*
Materials: *Present study is prospective case control study consisting of 200 subjects. Platelet count and platelet indices (MPV and PDW) are evaluated in two groups by automated cell analyser. First group consisted of patient with acute coronary syndrome and second group was age and sex matched controls.*
Statistical analysis: *Data were analysed using SPSS software. Results were presented as mean, standard deviation. For the comparison of two groups, t test was applied. A p value of less than 0.05 was considered statistically significant.*
Results: *There was a significant increase in MPV (p<0.01) and PDW (p<0.01) in patients with acute coronary syndrome compared to healthy control subjects. There was no statistical difference in platelet count among cases and controls (p=0.4).*
Conclusion: *Platelet volume indices increase during platelet activation, as depicted by automated haematology analysers. Thus these are simple, reliable parameters, which can be used in routine practice to predict the impending adverse cardiac events.*
Keywords- *Acute coronary syndromes, Mean platelet volume, Platelet distribution width, Platelet count.*

Introduction

Acute coronary syndromes are the major cause for morbidity and mortality. The spectrum of presentation is wide from unstable angina to acute myocardial infarction.[1] Early diagnosis of progressive activation of coagulation system can help to manage disease successfully.[2] Platelets play a causal role in the development and progression of atherosclerotic plaque with increased aggregation and activation.[3] Platelet size has been shown to reflect platelet activity. Large platelets are enzymatically and metabolically more active than small platelets and produce more Thromboxane A2.[4], [5] It's been shown that platelet size, when measured as mean platelet volume and platelet size variability, when measured as platelet distribution width, are markers of platelet function and positively associated with platelet activation.

Increased MPV and PDW are indicators of reactive platelets, have been associated with myocardial damage in acute coronary syndrome. [6], [7] It's also been proposed that low platelet count is associated with acute coronary syndromes.[8] A significant list of reliable marker of coagulation have been investigated which are laborious and expensive.[2]

In present study, an effort was made in finding whether simple platelet volume indices and platelet count are helpful markers of platelet activation in acute coronary syndrome and compare them with age and sex matched controls.

Materials and methods

Present study is prospective case control study undertaken in clinical haematology laboratory. Total 200 hundred subjects were studied in two groups. Cases –A total of 100 patients admitted to ICU and diagnosed with acute coronary syndrome (symptoms of ischemia, ECG changes, elevated cardiac enzymes). Controls- Age and sex matched 100 healthy controls with normal ECG. In cases, blood samples were collected by ICU staffs as a standard care before administration of anticoagulants or antiplatelet drugs. In controls, samples were collected as routine check-ups. All blood samples were collected in vacutainers containing EDTA. Samples with microthrombi were excluded. Samples were analysed with Sysmex KX21 automated haematology analyser. Quality control was strictly followed. Platelet count and indices are collected and analysed.

Statistical analysis

Data collected were entered in MS excel sheet. An expert statistical advice was sought for Statistical analyses were computer assisted using SPSS (Statistical Package for Social Sciences) software. The outcome quantitative variables were normally distributed and summarised in the form of mean and Standard Deviation (SD). The difference in means among cases and controls were analysed by using t test. A P value less than 0.05 was considered statistically significant.

Results

A total of 200 subjects were analysed, 100 each of cases and age and sex matched controls. In present study age range was 43 to 82 years. Mean age of 100 cases were $58.53+9.15$ years and of control was $57.59+9.55$ years. There were 19 females and 81 males in both case and control groups.

Table 1: Comparison of platelet count, MPV and PDW in cases and controls

Groups	Platelet count (lakh/cmm) Mean $+$SD	MPV(fl) Mean $+$SD	PDW (%) Mean $+$SD
Cases (N=100)	$2.65+0.10$	$8.46+0.78$	$15.54+0.9$
Controls (N=100)	$2.5+0.98$	$7.79+0.89$	$14.87+0.34$
P value	0.41	<0.001	<0.001

Mean platelet volume and platelet distribution width are significantly raised in cases than control group. There was no significant difference in platelet count among cases and controls.

Discussion

One of the principal factors in determining the development of acute coronary syndromes is conversion of stable atherosclerotic plaque into unstable one. Activated platelets play a significant role in this event. [9] During activation platelets change from discoid to spherical shape and develop pseudopods in order to obtain larger surface. Also increase in consumption of platelets during thrombotic events cause release of hyperactive large platelets from the bone marrow. [10] Thus degree of platelet activation is indirectly measured by platelet volume, which is determined by MPV and PDW. Platelet volume indices are simple and reliable marker for acute coronary syndrome. [11]

In present study, there is no significant difference in platelet count among acute coronary syndrome patients and healthy controls. This is in accordance with most of the studies. [11], [12] However; few studies have shown significant difference in platelet count in ACS patients and controls. [13], [14], [15] Comparison of MPV and PDW with previous studies is illustrated in table 2 and 3. Most of the studies are in accordance with present study.

Table 2: Comparison of MPV in previous and present studies

Previous studies	AMI/ACS MPV (fl)	Controls MPV (fl)	P value
Smyth et al [16] (1993)	8.54	8.1	>0.05
Khandekar MM et al [12] (2006)	8.10	7.01	<0.001
Bhayana A et al [9] (2009)	8.04	8.04	>0.05
Khode V et al [17] (2012)	9.07	8.32	<0.001
Bharihoke et al [6] (2014)	9.30	7.7	<0.001
Jasani et al [8] (2014)	11.02	7.98	<0.05
Pipliwali et al [1] (2015)	11.97	10.7	<0.05
Subbarayan et al [1] (2015)	8.69	7.89	<0.001
Present study (2016)	8.46	7.79	<0.001

Table 3: Comparison of PDW among previous and present studies

Previous studies	AMI/ACS PDW (%)	Controls PDW (%)	P value
Khandekar MM et al [12] (2006)	13.1	10.75	<0.001
Bhayana A et al [9] (2009)	17.06	16.81	>0.05
Bharihoke et al [6] (2014)	16.45	15.63	<0.001
Pipliwali et al [1] (2015)	15.23	13.25	<0.001
Subbarayan et al [1] (2015)	16.70	11.97	<0.001
Present study (2016)	15.54	14.87	<0.001

However it remains uncertain whether increased platelets indices are the result or cause of coronary artery disease. There are potential confounding factors for MPV. Few studies have shown that platelet volume indices vary between different ethnicities. [17], [18] Few medications, obesity, diabetes influence platelet indices. There is temporal increase in MPV values in EDTA anticoagulated sample. Previous studies have not mentioned about time between onset of chest pain and collection and analysis of sample. [6] The cut off values for MPV among Indian population is not established; hence large cohort studies are necessary. [11]

Conclusion

Platelet volume indices increase during platelet activation, as depicted by automated haematology analysers. We found no significant change in platelet count among acute coronary syndrome patients. Thus MPV and PDW are simple, reliable parameters, which can be used in routine practice to predict the impending adverse cardiac events.

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