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Research Article

Platelet and Acute Coronary Syndrome

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Abstract

Acute coronary syndrome (ACS) is a set of signs and symptoms due to rupture of a plaque and is a consequence of platelet rich coronary thrombus formation. Platelet parameters especially MPV could be an important and reliable markers in early detection of ACS when other markers are not available. This study was conducted in Department of medicine, in collaboration with Department of Cardiology, King George's Medical University. Total 296 adult (18 years above) patients with clinically suspected acute coronary syndrome who attended in cardiac emergency and admitted in coronary care unit (CCU) in the department of Cardiology were enrolled in this study.

Comparing the mean of two groups (cases vs control), t test showed significantly ($p<0.001$) different and higher (MPV and PDW) while significantly ($p<0.001$) different in ACS case group compared to control group. Comparing the mean of two groups (cases vs control), t test showed significantly ($p<0.001$or $p<0.05$) different and higher (Hb and MCH) while significantly ($p<0.001$ or $p<0.05$) different in Control group compared to ACS cases group.

In this research author reported that MPV had higher sensitivity and specificity in contrast to platelet count. MPV may used as predictor for early detection of ACS and risk stratification when other cardiac biomarkers are negative.

Keywords: Acute coronary syndrome; Platelet count; Mean platelet volume; Hemoglobin

Introduction

Acute coronary syndrome (ACS) refers to a group of conditions due to decreased blood flow in the coronary arteries such that part of the heart muscle is unable to function properly or dies and that is a consequence of platelet rich coronary thrombus formation [1]. Platelets have a major role in the pathogenesis of acute coronary syndrome (ACS) [2]. Activated platelets are larger in size, which can be measured by mean platelet volume (MPV) [3].

Larger platelets are more adhesive and tend to aggregate more as they more dense granules. They are metabolically and enzymatically more active than small platelets and produce more thromboxane A2 [4-6]. Increased platelet volume will increase the tendency for coronary thrombus formation in ACS patients [7]. 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 [8].

The diagnostic criteria of ACS are clinical presentation, biochemical markers of acute ischemic injury, and electrocardiographic findings [9-10]. The present cardiac markers are not sufficiently sensitive at an early stage of ACS. That's why an early and reliable marker is needed for accurate diagnosis of ACS when patients will attend in cardiac emergency department. Platelet parameters especially MPV will be an important marker in early detection of ACS when other markers are not available.

Methodology

This study was conducted in Department of medicine, in collaboration with Department of Cardiology, King George's Medical University.

Total 296 adult (18 years above) patients with clinically suspected acute coronary syndrome who attended in cardiac emergency and admitted in coronary care unit in the department of Cardiology, King George's Medical University, India were enrolled in this study. Among them 204 patients had ECG changes (ST-elevation, ST-depression, T-inversion, appearance of Q-wave) with or without elevated troponin I and treated with anti-platelet drugs. They were considered as cases (group I). The rest 92 Patients had normal ECG findings, normal cardiac troponin I and did not receive anti-platelet therapy. They were considered as controls (group II). Clinical history, medical reports, findings and information were documented in a pre-designed data sheet with informed and written consent. Blood was collected aseptically for CBC and MPV with EDTA tube and determined by automated analyzer.

Statistical Analysis

Descriptive statistical analyses were performed using SPSS

Table 1: Mean and standard deviation (Mean ± SD) values of platelets count and platelet indices in the ACS (acute coronary syndrome) cases and control groups.

Parameters	Case Group (N=248)	Control Group (N=104)	P value
Platelet count (in thousands)	298.94 ± 148.18	296.15 ± 130.6	0.868
MPV (Mean Platelet volume)	8.55 ± 1.22	7.88 ± .46	<0.001*
PCT (Platelet crit)	0 .36 ± 0.28	0 .37 ± 0.33	0.79
PDW (Platelet distribution width)	9.49 ± 3.25	8.26 ± 2.60	0.001*

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Table 2: Mean and standard deviation (Mean ± SD) values of the biochemical parameters analyzed in the ACS (acute coronary syndrome) and control groups.

Parameters	Case Group (N=248)	Control Group (N=104)	P value
Hb (Hemoglobin)	11.97 ± 2.36	12.56 ± 2.42	0.033*
MCH (Mean Hemoglobin concentration)	27.50 ± 3.39	29.00 ± 4.03	<0.001*
MCHC (Mean corpuscular Hemoglobin concentration)	31.25 ± 2.94	31.05 ± 4.18	0.606
RBC (Red Blood cells)	4.50 ± 1.1	4.45 ± .79	0.707
WBC (White Blood cells)	8.09 ± 3.42	7.51 ± 2.68	0.126

software (version 20, 2008). Data were summarized as Mean±SD. Groups (cases vs controls) were compared by unpaired or independent Student's t test. Pearson correlation coefficients were used to determine the relationship of all parameters. While correlation was defined as a measure of the strength and direction of a linear relationship between two scale variables. The statistical measure of linear association is known as the correlation coefficient, denoted by the symbol r, and measures how close the points lie to a straight line. Its value always lies between −1 and +1. The value +1 indicates a perfect positive relationship between the two variables and the value −1 indicates a perfect negative relationship. A two-tailed p<0.05 was considered statistically significant.

Results

Total 296 patients were included in this study. The mean age was found 59.29±11.93 years in group I (case) and 40.53±18.86 years in group II (control).

The clinical lab values of Platelet count, MPV, PCT and PWD of two groups (ACS cases vs Controls) at presentation is summarized in Table 1. Comparing the mean of two groups (cases vs control), t test showed significantly (p<0.001) different and higher (MPV and PDW) while significantly (p<0.001) different in ACS case group compared to control group. However, mean of rest parameters not differed (p>0.05) between the two groups (case vs control) i.e. found to be statistically not significant.

The biochemical lab values of Hb, MCH, MCHC, RBC and WBC of two groups (ACS cases vs Controls) at presentation is summarized in Table 2. Comparing the mean of two groups (cases vs control), t test showed significantly (p<0.001or p<0.05) different and higher (Hb and MCH) while significantly (p<0.001 or p<0.05) different in Control group compared to ACS cases group. However, mean of rest parameters not differed (p>0.05) between the two groups (case vs control) i.e. found to be statistically not significant.

MPV were directly associated with Hb and demonstrate a highly significant strong negative relation (r= -0.237, p <0.001) (Table 3).

Hb were directly associated with MCH, MCHC, RBC and WBC and demonstrate a highly significant strong positive relation (MCH r=0.385, p<0.001), (MCHC r=0.249, p<0.001) (RBC r=0.567, p<0.001) and moderate positive relation (WBC r=112, p=0.035).

Table 3: Correlation between different biochemical parameters.

Correlations							
		MPV	Hb	MCH	MCHC	RBC	WBC
MPV	r	1	-.237**	0.081	0.072	-0.019	0.092
	P value	---	<0.001	0.129	0.176	0.726	0.085
Hb	r	-.237**	1	.385**	.249**	.567**	.112*
	P value	<0.001	---	<0.001	<0.001	<0.001	0.035
MCH	r	0.081	.385**	1	.450**	-0.016	-.171**
	P value	0.129	<0.001	---	<0.001	0.77	0.001
MCHC	r	0.072	.249**	.450**	1	-0.009	-.133*
	P value	0.176	<0.001	<0.001	---	0.872	0.012
RBC	r	-0.019	.567**	-0.016	-0.009	1	0.082
	P value	0.726	<0.001	0.77	0.872	---	0.127
WBC	r	0.092	.112*	-.171**	-.133*	0.082	1
	P value	0.085	0.035	0.001	0.012	0.127	---

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).
r=Pearson Correlation coefficient.

Discussion

Acute coronary syndrome occurs at any adult age, but it is the disease of middle & old age. The disease process usually starts in young age. In our study there was significant differences found between cases and controls in respect of age. The mean age of the patients with ACS was 59.29±11.93 years as compared to 56.59±13.63 years in a study done by AS Assiriet et al. [10]. Gender variations in ACS are also significant. There was clear male predominance in this study, 82.3% and 88.5% in group I (case) and group II (control) respectively.

In our study, we found that ACS was associated with abnormal platelet parameters. The study reveals that the mean (±SD) value of total platelet count was lower in cases than controls where as MPV was significantly higher in group I than group II.

In our study, platelet count was 298.94 ±148.18 /L in ACS and 296.15 ± 130.6 /L in control groups. Similarly MPV was 8.55 ± 1.22 fl and 7.88 ± .46 fl respectively. MPV was significantly higher in patients with ACS compared to non-ACS. Our results are consistent with the results of A Mathur et al. [11] and AS Assiri et al. [10].

They found mean (±SD) value of total platelet count was slightly higher in ACS group than control subjects. MPV were significantly higher in ACS groups in compared to control groups. They described platelets parameters mainly MPV was raised in ACS compared to controls. Nandwani et al [12] noted that platelet volume indices were raised in patients with ACS compared with controls. MPV was 10.78 μm^3 in acute myocardial infarction and 11.73 μm^3 in unstable angina. In an another study carried out by Khandekar et al. [13] observed that all platelet volume indices were increased significantly in patients with acute myocardial infarction and unstable angina compared to subjects of stable coronary artery disease. Authors also noted platelet volume indices especially, MPV are consistent with these studies. The findings of this study especially platelet count and MPV also similar with a number of studies carried out by various other authors [14-16].

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