Mean Platelet Volume a Risk Indicator in Acute Coronary Syndrome

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Abstract

INTRODUCTION: Coronary artery disease is the disease manifested mainly the process of atherosclerosis and their complications. Platelets have a major part in the atherosclerosis process initiation and the formation of thrombus in the coronary vessels. Larger the size of the platelet, higher the risk of thrombosis as it is metabolically and in enzymatic way more active compared to smaller platelets. Since MPV gives the measurement of average size of the platelets, MPV measurement predicts the risk of developing Acute coronary syndrome.

METHOD: All patients who come to Emergency Department and Out patient Department of Sree Balaji Medical College and Hospital with chest pain who are not a known case of Acute Coronary Syndrome, and fulfilling the inclusion and exclusion criteria will be taken for our study. As soon as patient got admitted, informed consent was obtained from patients and attenders. Initial evaluation involves thorough clinical history and examination, Electrocardiography and Troponin I (biomarker). Venous samples for troponin I and MPV will be taken at the time of arrival and before the treatment initiation and the platelet volume indices are assessed and the correlation between ACS (STEMI, NSTEMI) and Non ACS patients with MPV values are assessed and also among STEMI and NSTEMI patients.

RESULTS: Mean platelet volume (MPV) was assessed in our study and we have found it higher in ACS patients (9.716 ± 0.829) compared to the control group (8.730 ± 0.840), which was significant, P wave of less than 0.05. It was also determined that high MPV values were there among patients who are diagnosed with STEMI as compared with NSTEMI with values of 9.98 ±0.675 and 9.412 ±0.896, significant statistically (P less than 0.05).

CONCLUSION: In our study, MPV values assessed were obtained to be high in ACS diagnosed patients than with Control group and similarly MPV values were high in the patients with STEMI patients more than in NSTEMI and also proved it to be significant. Hence it could be useful as a simple test with other biomarkers in the prediction of ACS earlier. Large platelets are usually metabolically active more, they carry the higher risk of developing coronary thrombosis leading to the Acute coronary syndrome. As this test could be done in routine analysis and could help in ACS early detection.

Keywords

ACS, Stemi, Nstemi, Platelets

INTRODUCTION

Acute coronary syndrome is a group of diseases with unstable angina till transmural infarction of myocardium. It comprises symptoms and signs due to plaque rupture and formation of thrombus in the coronary vessels which is due to rich platelets. Platelets have an important part in the acute coronary syndrome pathogenesis, in that plaque rupture is happening followed by the activation of platelets and the formation of thrombus.

The platelets those are large in size that is assessed by the mean platelet volume. Large platelets are more adhesive and gets aggregated more in view of denser granules. They are usually enzymatically, metabolically active more compared to smaller sized platelets and also increased thromboxane A2 production. And thus increases formation of thrombus in the coronary vessels in ACS patients. So inhibition of such process would play a vital part in the ACS prevention.

The diagnosis would be with clinical features, biomarkers and ECG findings. As the available biomarkers could not predict ACS earlier, there is need for such a marker. Thus Mean platelet volume could be a major part and also a reliable marker in the ACS early detection. As there were some discrepancies in the previous studies regarding this concept in methodology and samples, an attempt has been made with proper sample size and methodology.
AIM:
- To predict the risk of developing Acute coronary syndrome in association with mean platelet volume.
- Compare the significance of MPV value among the STEMI and NSTEMI patients.

METHODS
This prospective study was done in a way, all the patients who have come to the outpatient and emergency department in Sree Balaji medical college and hospital with chest pain who are not a known case of ACS and fills all the inclusion and exclusion criteria were segregated into 2 groups as groups with ACS and the Non ACS (control) group after initial evaluation and diagnostic investigations after obtaining the informed consent from patient and attenders. Initial evaluations with clinical history and examination, electrocardiography. Venous samples were drawn for both Troponin I and MPV assessment before the treatment initiation. MPV values were assessed and the correlation between ACS with MPV values are assayed.

INCLUSION CRITERIA:
Patients presented with chest pain complaints in emergency and outpatient department are put into groups:
1. Patients having clinical features, positive biomarker tests and ECG suggesting STEMI.
2. Patients having clinical features, positive biomarker tests and ECG suggesting NSTEMI.
3. Patients with normal ECG and negative biomarkers not suggestive of ACS.
4. Patients with age group more than 30 years of age with above criteria.

EXCLUSION CRITERIA:
1. Patients who are known case of CAD,
2. Patients who are on treatment with drugs aspirin, clopidogrel.
3. Patients with bleeding disorders, blood dyscrasia, pre-eclampsia and sepsis.
4. Patients with blood transfusion history recently (less than 6 weeks).
5. Patients undergone major operations and trauma history recently (< 6 weeks).
6. Patients taking drugs causing thrombocytopenia.
7. Patients having infections those are causing thrombocytopenia.

The analysis for statistics used in this study were Mean, Chi-Square test, Standard Deviation and Test of significance in difference (t-test).

RESULTS
Total 132 patients were added to this study, out of them 32 were excluded as they all met any of the exclusion criteria. After obtaining the sample size of 100 for this analysis, patients were organized in case and control groups accordingly.

SUB GROUPS:
Table. 1 The above tabular column shows the percentage division of the general factors assessed.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>STEMI</th>
<th>NSTEMI</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Count</td>
<td>Percentage</td>
<td>Count</td>
</tr>
<tr>
<td>Total Number of Patients</td>
<td>25</td>
<td>50</td>
<td>25</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>14</td>
<td>56%</td>
<td>13</td>
</tr>
<tr>
<td>Female</td>
<td>11</td>
<td>44%</td>
<td>12</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 30</td>
<td>0</td>
<td>0%</td>
<td>0</td>
</tr>
<tr>
<td>31-60</td>
<td>15</td>
<td>60%</td>
<td>15</td>
</tr>
<tr>
<td>61-90</td>
<td>10</td>
<td>40%</td>
<td>10</td>
</tr>
<tr>
<td>Diabetic status</td>
<td>10</td>
<td>40%</td>
<td>12</td>
</tr>
<tr>
<td>Known Hypertensive</td>
<td>13</td>
<td>52%</td>
<td>10</td>
</tr>
</tbody>
</table>

Fig. 1 The above diagram showing the number of patients among the control and case group among the total.
<table>
<thead>
<tr>
<th>Characteristics</th>
<th>STEMI</th>
<th></th>
<th>NSTEMI</th>
<th></th>
<th>Control</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Count</td>
<td>Percentage</td>
<td>Count</td>
<td>Percentage</td>
<td>Count</td>
<td>Percentage</td>
</tr>
<tr>
<td>Tobacco, Smoking History</td>
<td>2</td>
<td>8%</td>
<td>3</td>
<td>12%</td>
<td>15</td>
<td>30%</td>
</tr>
<tr>
<td>Alcohol History</td>
<td>6</td>
<td>24%</td>
<td>3</td>
<td>12%</td>
<td>11</td>
<td>22%</td>
</tr>
<tr>
<td>Dyslipidaemia</td>
<td>9</td>
<td>36%</td>
<td>4</td>
<td>16%</td>
<td>15</td>
<td>30%</td>
</tr>
</tbody>
</table>

Fig. 2 The above pie chart shows the factors assessed among the CASE group (STEMI) patients.

Fig. 3 The above pie chart shows the factors assessed among the CASE group (NSTEMI) patients.
Fig. 4 The above pie chart shows the factors assessed among the CONTROL group patients.

Table 2
The above tabular column shows the MPV values – mean, Std Dev- Standard deviation, T- T test, Chi Sq - Chi square test values.

<table>
<thead>
<tr>
<th>MPV</th>
<th>Group</th>
<th>n</th>
<th>Mean</th>
<th>Std Dev</th>
<th>T</th>
<th>Chi Sq</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Case</td>
<td>50</td>
<td>9.7160</td>
<td>0.82964</td>
<td>5.90</td>
<td>0.0253</td>
</tr>
<tr>
<td></td>
<td>Control</td>
<td>50</td>
<td>8.7300</td>
<td>0.84037</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fig. 5 The above Bar diagram shows the comparison of MPV value analysis among the CASE and CONTROL group patients.

Table 3
The above tabular column shows the comparison of the MPV values analysis among the CASE- STEMI and NSTEMI patients.

<table>
<thead>
<tr>
<th>MPV</th>
<th>Group</th>
<th>n</th>
<th>Mean</th>
<th>Std Dev</th>
<th>T</th>
<th>Chi Sq</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>STEMI</td>
<td>25</td>
<td>9.98</td>
<td>0.67515</td>
<td>2.35</td>
<td>0.0308</td>
</tr>
<tr>
<td></td>
<td>NSTEMI</td>
<td>25</td>
<td>9.4520</td>
<td>0.89681</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The main aim of this study is to see the correlation of MPV with ACS. The results showed us there was significant.

**DISCUSSION**

As found in the previous studies, conducted by Pal R et al., Pervin et al and Mathur et al. showed MPV values obtained was high in patients with ACS with comparison to non ACS groups, which is also in the favour of our study.\(^5\)\(^6\)\(^7\) Our study has also compared the values of MPV among the ACS and non ACS patients which is our secondary objective of the study. Assessing the values obtained, MPV values were high in ACS patients \((9.716 \pm 0.829)\) when comparison to control group \((8.730 \pm 0.840)\) and also MPV was high among patients who are diagnosed with STEMI when compared to NSTEMI with values of \(9.98 \pm 0.675\) and \(9.412 \pm 0.896\) and proved to be statistically significant.

**LIMITATIONS:**

The limitations of the study was selection bias would have creeped in patients who have a typical chest pain symptoms having unstable angina without changes in ECG and biomarker positivity.

**CONCLUSION**

In the study, MPV values assessed were high in patients diagnosed with ACS in comparison to the control group and similarly MPV values were higher in the patients with STEMI than those with NSTEMI and also proved it to be significant. Hence it could be useful as a simple test with other biomarkers in the prediction of ACS earlier. Large platelets are usually metabolically active more, they carry the higher risk of developing coronary thrombosis leading to the Acute coronary syndrome. As this test could be done in routine analysis and could help in ACS early detection.

**Funding**

self

**Conflict of interest**

No

**Ethical approval**

Institutional Ethics Committee approved.

**REFERENCES**


3. Hasdai D, Behar S, Wallentin L, Danchin N, Gitt AK, Boersma E, et al. A prospective survey of the characteristics, treatments and outcomes of patients with acute coronary syndromes in Europe and the


