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Research Article

PLATELET DISTRIBUTION WIDTH AS A RELIABLE MARKER IN ACUTE APPENDICITIS PATIENTS

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ABSTRACT

Background: Acute appendicitis (AA) is the most common emergency surgical condition. MPV and PDW has been reported to be a laboratory marker in inflammatory conditions.

Aim: To analyze the diagnostic value of platelet distribution width in acute appendicitis patients

Methods: This is a prospective study, conducted in department of surgery, Victoria Hospital between January 2014 and December 2015. 150 patients of acute appendicitis (Group I) and 50 patients of normal healthy individuals (Group II) were enrolled in the study. The age, gender, white blood cell count, mean platelet volume, and platelet distribution width values from blood samples were recorded. PDW values were compared among the groups. Statistical analyses were performed using SPSS 17 software. Independent T test was used to compare means between two groups. P value <0.05 is considered significant.

Results: In group 1, WBC count, Mean platelet volume and Platelet distribution width were $16 \pm 2.1 \times 10^3/\mu\text{L}$; 8.8 ± 0.51 fl; 16.79 ± 0.79 %, respectively. In group 2, WBC count, Mean platelet volume, Platelet distribution width were $8.67 \pm 1.64 \times 10^3/\mu\text{L}$; 8.97 ± 1.25 fl; 17.18 ± 0.59 %, respectively. There were stastically significant difference in WBC count and PDW with ($P < 0.05$). MPV showed P value > 0.05 .

Conclusion: Our present study showed PDW is increased in acute appendicitis patients. Platelet distribution width analysis can be used as a reliable marker in diagnosis of acute appendicitis without requiring additional tests, thus reducing the cost and better patient management.

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INTRODUCTION

Acute appendicitis (AA) is the most common emergency surgical condition in the abdomen, which requires urgent surgery [1, 2]. The prompt diagnosis of which is necessary so that we can decrease the morbidity and mortality [3]. The clinical diagnosis of acute appendicitis is often based on medical history, physical examination, blood tests and sonographic examination [4]. Clinically, the symptoms and findings may not be always typical, in that cases, the establishment of diagnosis becomes difficult [5, 6]. Rapid and accurate diagnosis is very important in each case because extension of the period between the initiation of the symptoms and start of the surgical procedure increases the risk for appendiceal perforation, thereby potentially resulting in sepsis and even death [7].

Platelets have effects on haemostasis and regulate inflammatory events. These platelets are highly activated when inflammatory mediators are released [8]. Mean platelet volume (MPV) and platelet distribution width (PDW) are two platelet parameters of the complete blood count which is routinely used

in emergency departments [9]. They are the indicators of platelet activation. The size of the platelet is correlated with the activity and the function of the platelet. Platelet distribution width is an indicator of variation in platelet size, which can be a sign of active platelet release [10, 11]. Thus, these parameters has been shown to reflect inflammatory burden and disease activity in several diseases including acute pancreatitis, unstable angina, pre-eclampsia, myocardial infarction, and systemic inflammation such as ulcerative colitis and Crohn's disease [9]. There are very few studies investigating the diagnostic accuracy of platelet function parameters in cases of acute appendicitis. So we want to investigate the diagnostic significance of platelet parameters, including MPV and PDW in acute appendicitis patients.

MATERIALS AND METHODS

The study was a prospective study, conducted in department of surgery, Victoria Hospital, Bangalore Medical College and Research Institute, Bangalore between January 2014 and December 2015. The data were classified into two groups. Group I comprised of 150 patients with acute appendicitis and Group II comprised of 50 patients with normal healthy

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individuals were enrolled in the study. 150 patients of acute appendicitis were taken based histopathological diagnosis and normal healthy individuals were taken based on medical history.

Inclusion criteria involved that all patients were adults, and their pathology reports confirmed the diagnosis of acute appendicitis. The exclusion criteria were the following: less than 15 years of age, history of previous abdominal operation, having acute or chronic infectious disease, history of medications (analgesics, anticoagulant, iron supplements, oral contraceptives, antimetabolites, etc.) and history of blood transfusion within last 1 year.

Complete blood counts were performed from the venous blood samples. All blood samples were collected in EDTA tube and assayed using Beckman coulter LH 780 analyzer. All the results were available in the coulter and were recorded. White cell (WBC $\times 10^3/\mu\text{l}$) count, MPV fl (Mean platelet value) and Platelet distribution width % (PDW) were collected from acute appendicitis and control groups and were recorded. The standard reference values were $4-11 \times 10^9/\text{L}$ for WBC, 7.6–13.2 fl for MPV, 12%–16.5% for PDW. We compared the platelet indices, WBC Count mainly MPV and PDW between groups.

Statistical Analysis

All tests were performed using SPSS Windows 17 software. The parameters with normal distribution were expressed as mean and standard deviation. Comparisons of means were performed with Student’s t test. A p value of <0.05 was accepted as statistical significance.

RESULTS

One hundred patients who underwent appendectomy with acute appendicitis (Group I) and fifty normal healthy patients were taken as control (Group II) between January 2014 and December 2015 at Victoria Hospital, Bangalore Medical College and Research Hospital were included in the study. The mean ages of the patients were 33 ± 12.2 years (range, 16–62 years). In our study 133 were males and 67 were females. The mean WBC counts in the AA and control groups were $16 \pm 2.1 \times 10^3/\mu\text{L}$ and $8.67 \pm 1.64 \times 10^3/\mu\text{L}$ with $P < 0.05$. The mean MPV in the AA and control groups were 8.8 ± 0.51 fl and 8.97 ± 1.25 fl with $P > 0.05$. The mean PDW in the AA and control were 16.79 ± 0.79 % and 17.18 ± 0.59 % with $P < 0.05$. (Table1)

Table I Laboratory results for patients with AA and control groups

Group Statistics					
	Study group	N	Mean	Std. Deviation	P value
WBC COUNT 10(3) μl	1	150	16.01	2.138	0.001
	2	50	8.67	1.645	
MPV (FL)	1	150	8.80	0.517	0.156
	2	50	8.97	1.254	
PDW (%)	1	150	16.79	0.797	0.002
	2	50	17.18	0.593	

MPV: Mean platelet volume; PDW: Platelet distribution width; WBC: White blood cell

The comparisons of the laboratory values among the groups are given in Table 1. For all parameters, MPV was lower in Group I when compared to Control group, whereas PDW, WBC was

higher compared to the control group. PDW and WBC Count was the most important diagnostic parameter. In contrast, MPV has the lowest diagnostic accuracy, with a significant difference between Group I and Group II.

DISCUSSION

Acute appendicitis is acute inflammation of the appendix vermiformis, which is the most frequent condition in all age groups. Although the classical symptoms and the examination findings of AA are well known, the diagnosis remains quite difficult among the causes of abdominal pain. It is important to make a rapid and accurate diagnosis before the complications develop [12, 1]. Thus, it is very important to use more laboratory tests and imaging methods in patients with suspected acute appendicitis patients [13].

Acute appendicitis is an inflammatory process, many authors in their studies, considers using biomarkers for diagnosis. Among these, WBC is the one most commonly used. Many studies support that WBC is the first indicator to be elevated in appendix inflammation [14]. Platelet activation is related to pathophysiology of disorders with a tendency for inflammation and thrombosis. MPV, a marker of platelet activation, is being investigated for its correlation with both inflammation and thrombosis in many studies. PDW is a function of standard deviation of log volume and is also known as the volume change coefficient. PDW is an index of thrombocyte volume heterogeneity, similar to erythrocyte distribution [10]. Both MPV and PDW are markers of platelet immaturity.

In various studies, the range of sensitivity and specificity of WBC in the diagnosis of acute appendicitis have been reported 67 - 97.8% and 31.9 -80% [15]. In a study done by Albayrak et al [15] on 226-patients, found a significantly lower MPV level in patients with acute appendicitis compared to the control group. Bilici et al. [16] found that the MPV level significantly decreased in acute appendicitis compared with the control group. Uyanik et al. [12] on the other hand, reported that the MPV level was not predictive in the diagnosis of acute appendicitis. In a study done by Bulent Dinc et al, found that PDW increased in acute appendicitis and concluded that PDW was considered as a marker that could be used in early detection of the perforation risk in acute appendicitis patients [17].

There are a small number of studies that evaluate PDW. In a trial by Liang et al investigating vascular dementia and Alzheimer’s disease, PDW was significantly lower in the patient group compared to the control group [18]. In contrast, Mete Ural et al detected high PDW values in patients with recurrent miscarriages [19].

There are many studies going on regarding correlation between platelet indices in acute appendicitis, but there are a small number of studies that evaluate PDW in acute appendicitis patients. So we undertook this study to analyze the diagnostic utility of PDW in acute appendicitis patients. In our study PDW values were significantly higher in acute appendicitis patients when compared to control groups.

CONCLUSION

In current study, PDW level was higher in patients with acute appendicitis when compared to the control group, suggest that

it could help in early diagnosis of acute appendicitis patients. This may provide an opportunity for making a diagnosis of AA without requiring additional analysis, increased cost, or loss of time, and is practically applicable in the emergency department. Nevertheless, diagnosis of AA should always be combined with clinical, laboratory and radiologic evaluations.

Abbreviations

1. AA – Acute Appendicitis
2. WBC – White Blood cell
3. MPV – Mean Platelet Volume
4. PDW – Platelet distribution Width
5. EDTA – Ethylene Di amine Tetra Acetic Acid.

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