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Research Article

The platelet indices in pediatric patients with acute appendicitis

Yunus Yılmaz[1]*, Fatih Kara[2], Musa Gümüşdere[3], Hasan Arslan[4], Sefer Üstebay[1]

[1]Department of Pediatrics, Kafkas University Training and Research Hospital, Kars, Turkey
[2]Department of Biochemistry, Kars Government Hospital, Kars, Turkey
[3]Department of Biochemistry, Medical Faculty, Ataturk University, Erzurum, Turkey
[4]Department of General Surgery, Kars Government Hospital, Kars, Turkey

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***Correspondence:**
Dr. Yunus Yılmaz,
E-mail: dr_yilmaz36@hotmail.com

ABSTRACT

Background: The diagnosis of Acute Appendicitis (AA) remains a problem in pediatric population. It has been suggested that Mean Platelet Volume (MPV) is lower in the patients with AA. The purpose of this study was to investigate the diagnostic value of platelet indices in pediatric AA cases.
Methods: A retrospective case-controlled study was designed: 224 subjects were included in this study. All patients had been operated on in division of pediatric surgery at the Kars Government Hospital with the preliminary diagnosis of AA. 204 and 20 of these patients were pathologically diagnosed as AA (group 1) and normal appendix vermiformis (group 2), respectively. Platelet indices had been studied in the biochemistry laboratory of the hospital, before the surgery.
Results: In group 1, platelet count, mean platelet volume, plateletcrit and platelet distribution width were 305 ± 94x10^3/µL; 7.37 ± 0.90 fL; 0,220 ± 0.057 % and 16.3 ± 0.5%, respectively. In group 2, platelet count, mean platelet volume, plateletcrit and platelet distribution width were 283 ± 85 10^3/µL; 7.60 ± 1.24 fL; 0.208 ± 0.045 % and 16.4 ± 0.7%, respectively. There was no statistically significant difference between the groups studied with regard to platelet indices (P>0.05).
Conclusions: Our study showed that platelet indices have no diagnostic value in the diagnosis of AA at pediatric age group.

Keywords: Appendicitis, Blood platelet, Mean platelet volume

INTRODUCTION

In childhood, appendicitis is the most common surgical condition that causes acute abdominal pain, but its diagnosis can be extremely difficult due to its vague signs and symptoms and particularly in preverbal children.[1,2] Therefore, more laboratory data are needed to clarify the diagnosis of patients with suspected appendicitis.[3]

During inflammatory diseases such as appendicitis, there is a rapid recruitment of platelets to the site of inflammation where large active platelets decrease due to its consumption and sequestration.[4,5]

In recent years, it has been suggested that the mean platelet volume, a marker of platelet activation, can be helpful in diagnosis of acute appendicitis.[6,7]

The aim of this study was to research whether mean platelet volume and other platelet indices had diagnostic value in acute appendicitis for pediatric age group.

METHODS

At the Kars Government Hospital (Kars, Turkey), from March 2011 to November 2013, 224 pediatric patients operated on for a preliminary diagnosis of acute appendicitis were enrolled in the study.

Our study has been ethically approved by Kars State Hospital (02.10.2014-42288353/8213).

We retrospectively reviewed the laboratory records of these patients and divided them into two groups based on their pathological diagnosis: group 1 (204 patients with acute appendicitis) and group 2 (20 subjects with normal appendix vermiformis).

In our study, exclusion criteria were as follows: (a) older than 16 years old (b) diabetes mellitus (c) ischemic heart disease (d) hypertension. Before the surgery, the platelet indices of the patients were analyzed in whole blood with EDTA using a blood cell counter (Mindray BC-5800).

We compared the platelet indices and average age between group 1 and group 2 with Mann-Whitney U testing. The gender difference was statistically evaluated by using Chi-square test. A P value less than 0.05 was considered statistically significant.

RESULTS

According to pathological examination, about 91% of operated patients were found to have appendicitis (group 1), and the ratio of false diagnosis was about 9% (group 2). Age and gender distribution in group 1 and group 2 are summarized in Table 1.

Table 1: Demographics features in group 1 & group 2.

	Group 1 (Appendicitis)	Group 2 (Normal)	P
Sex (%)			
Male	62.7	30	<0.05
Female	37.3	70	
Age (years) (mean ± SD)	10.4 ± 3.7	10.9 ± 4.2	>0.05

Platelet count, mean platelet volume, plateletcrit and platelet distribution width were 305 ± 94x10^3/µL and 283 ± 85x10^3/µL; 7.37 ± 0.90 fL and 7,60 ± 1.24 fL; 0.220 ± 0.057% and 0.208 ± 0.045%; 16.3 ± 0.5% and 16.4 ± 0.7% in group 1 and group 2, respectively (Table 2).

There was no statistically significant difference among the groups with respect to the platelet indices (P>0.05). Also, we found no significant difference in platelet indices according to gender in study groups (P>0.05).

Table 2: Laboratory findings in group 1 and group 2.

	Group 1 (Appendicitis)	Group 2 (Normal)	P
	Mean ± SD	Mean ± SD	
PLT (10^3/µL)	305 ± 94	283 ± 85	>0.05
MPV (fL)	7.37 ± 0.9	7.60 ± 1.24	>0.05
PCT (%)	0.220 ± 0.057	0.208 ± 0.045	>0.05
PDW (%)	16.3 ± 0.5	16.4 ± 0.7	>0.05
WBC (10^3/µL)	15.7 ± 5.4	11.7 ± 6.9	<0.001
NEU (10^3/µL)	12.9 ± 5.2	8.4 ± 6.8	<0.001

PLT: Platelet count; MPV: Mean platelet volume; PCT: Plateletcrit; PDW: Platelet distribution width; WBC: White blood cell; NEU: Neutrophils

DISCUSSION

Acute appendicitis is acute inflammation of the appendix vermiformis, which is the most frequent condition leading to emergent abdominal surgery in children.[2] The diagnosis of appendicitis can be difficult in children because its symptoms vary widely, and a delay in its diagnosis is associated with increased morbidity and mortality.[8] Thus, it is necessary to use more laboratory tests and imaging methods in patients with suspected acute appendicitis.[9] In our hospital, the percent of misdiagnosis was about 9%. It is possible that the utilization of new laboratory tests can reduce the number of such cases.

MPV is a measurement that describes the average size of platelets and is a marker of platelet function and activation.[10] It has been suggested that the changes of MPV in many inflammatory diseases, such as inflammatory bowel diseases,[11,12] acute pancreatitis,[13,14] acute and chronic cholecystitis,[15] ankylosing spondylitis and rheumatoid arthritis,[16] and osteoarthritis with synovitis[17] are noteworthy.

We found that there is not difference with regard to the platelet indices between the children with true appendicitis and with normal appendix among pediatric patients operated on for a preliminary diagnosis of acute appendicitis and that the mean platelet volume and other platelet indices has no diagnostic value in acute appendicitis for pediatric age group.

Bilici et al.,[6] Albayrak et al.,[7] Tanrikulu et al.,[18] and Erdem et al.[19] have suggested that the MPV was significantly lower in the acute appendicitis group compared to the control group at childhood and adult patients, respectively. Unlike these studies, Uyanik et al.[20] have reported that MPV has no diagnostic value in pediatric acute appendicitis cases and Narci et al.[21] have found that MPV were higher in adult patients with acute appendicitis than the control group. Our results agree with those by Uyanik et al. They have considered that the frequency of inflammatory events and the difficulty of their identification in pediatric ages may have caused

overlooking of the presence of other inflammatory cases in healthy control group, and this may have caused lower MPV and erroneous statistics in this group. Furthermore, they have suggested that the destruction of erythrocytes in acute inflammation may cause fragmented cells to be counted as thrombocytes and thus false MPV decrease. In our opinion, it is not likely that the presence of unidentified inflammatory diseases in control group is the cause of similar results between groups because of the very significant difference of counts of the white blood cells between groups in both their study and our study (Table 2).

It has been proposed that the measurement of MPV in whole blood with EDTA can be unreliable since MPV values may increase in a time-dependent manner due to platelet swelling10. However, the measurements of MPV and other complete blood cell count parameters are performed at the latest within 30 minutes after sampling in emergency laboratory department at our hospital as a requirement of quality standards and MPV can be measured accurately by both EDTA and citrate if analysis be early performed.[22]

We think that, whatever the reason, MPV and other platelet indices will not help to seperate true appendicitis from suspected appendicitis.

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