

Mean Platelet Volume as a Diagnostic Marker of Acute Appendicitis in Children and Adolescents – How useful it is?

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ABSTRACT

Background: *The clinical diagnosis of acute appendicitis(AA) in children and adolescents is still problematic.*

Objectives: *To evaluate the role of Mean Platelet Volume(MPV) in acute appendicitis in children and adolescents.*

Materials and methods: *A retrospective study involving 52 test and 51 control individuals. The statistical analysis expressed as mean MPV \pm standard deviation, independent 't' test for calculating p values*

Results: *In the Group 'T' mean MPV was 7.48 and in Group 'C' was 8.02. The p value was 0.027 which is less than 0.05 indicating it was statistically significantly lower than the Group 'C'*

Conclusion: *Current study indicated that MPV decreases significantly in AA group of children and adolescents. Hence we believe taking MPV into consideration will help in the diagnosis of suspected acute appendicitis in children and adolescents.*

Keywords: *Mean platelet volume, Acute appendicitis, Children, Adolescents*

INTRODUCTION

Acute appendicitis (AA) unveils a set of confusions to the clinician as the diagnosis of the AA is still complicated and problematic. Delay in diagnosis leads to perforation even just after twenty-four hours of onset of pain followed by its complications. Furthermore the negative appendectomy rate may be as high as 50% in young children, geriatric patients and in adolescent females.^[1] Many attempts are made to find out the new tool to arrive at diagnosis. Ultrasonography and computerized tomography are used extensively with the promising results.^[2] Even then they are not sufficient.^[3]

Thus there is the need for a diagnostic tool which would be applicable everywhere, be cheap, noninvasive, and less time consuming but be able to distinguish nonspecific abdominal pain from AA. One of the laboratory parameters considered generally is leucocyte count. However the leucocyte count and blood inflammatory mediators remain nearly unaltered in early cases of AA which have not gone up to the extent of perforation.^[4]

Mean Platelet Volume (MPV) is known to be a marker of platelet function and activation. MPV

is a general laboratory parameter obtained during complete blood counts to which the clinicians do not pay the attention. It is a value in automated count which is detected along with other parameters in automatic blood count machines. Several studies have been carried out on the diagnostic value of MPV in various inflammatory and even non-inflammatory conditions. The value may decrease or increase depending on the individual variety of inflammation.^[4] In this scenario of conflicting opinions, this study aims to evaluate the diagnostic value of MPV in the case of AA in children and adolescents.

METHODOLOGY

This study was conducted after obtaining an approval from Ethics Committee with 52 patients with the age of ≤ 18 years chosen retrospectively from the case files of the patients admitted to the hospital between January 2013 to September 2013 in whom the definite diagnosis was confirmed with postoperative pathological examination. This group was called Test(T) group.

Exclusion criteria was the patients suffering from bleeding disorders, other genetic disorders, diabetes mellitus, active infections and other comorbidities.

The control(C) group of 51 patients with the age of ≤ 18 years were chosen from the children who came for the regular health checkups. The same exclusion criteria were applied here.

The blood sample collected from both Group T and Group C were anticoagulated using EDTA and processed within one hour after

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venipuncture. The Sysmex KX- 21 and ABX Micros 60 systems were used for automated counts.

Data recorded from the groups included age, gender, platelet count, MPV. (Table 1) These data of both the groups were analyzed from SPSS for

windows 13.0 software. The data of both groups were compared using mean± standard deviation. The quantitative data was analyzed by independent 't' test. The alpha values value $p < 0.05$ considered to be statistically significant.

RESULTS

In this study a total of 103 subjects were evaluated in two groups namely Group 'T' and Group 'C'.

Table 1: Shows age distribution, platelet count and mean platelet volume in test and control group

Table 1						
	Cat	N	Minimum	Maximum	Mean	Std. Deviation
CASE GROUP 'T'	AGE	52	7	18	14.96	2.751
	Platelet	52	1.7000	4.2000	2.885577	0.6468427
	MPV	52	6.1000	10.2000	7.486538	1.0352662
	Valid N (list wise)	52				
CONTROLE GROUP 'C'	AGE	51	6	18	13.57	3.145
	Platelet	51	2.1200	4.2000	3.037843	0.5409928
	MPV	51	6.5000	10.1000	8.021569	1.3587220
	Valid N (list wise)	51				

Group T consisted of 52 patients out of which 34 were males(65.4%) and 18 were females(34.6%). The mean age was 14.96 ± 2.75 years. Whereas Group C consisted of 51 patients out of which 36 were males(70.6%) and 15 were females(29.4%). The mean age was 13.57 ± 3.145 years.

The mean platelet count in the case of Group T was 2.885 ± 0.646 Lakhs/ml whereas in the case of Group C was 3.037 ± 0.54 lakhs/ml. There was no statistically significant difference among the Group T & C with respect to platelet count ($p = 0.198 > 0.05$).

Table 2: Shows significance of difference in mean platelet count and mean platelet volume between test and control group

	p values
Mean Platelet Count	$0.198 > 0.05$
Mean Platelet Volume(MPV)	$0.027 < 0.05$

The MPV in the case of Group 'T' was 7.486 ± 1.035 fL whereas in the case of Group 'C' was 8.021 ± 1.358 fL. There was a statistically significant difference among the in terms of MPV ($p = 0.027 < 0.05$)

DISCUSSION

Even though the AA presents with the classical symptomatology it is still considered among one of the difficult entities to diagnose. There are many diagnostic entities which are being studied extensively in relation to AA and others. One of such parameters is MPV.

MPV, a believed marker of inflammation is an entity which is being constantly evaluated and tried to be correlated with one or the other morbidities since twenty to thirty years. In this direction there are many studies which show the relationship between the MPV values and both

inflammatory and non inflammatory conditions. The studies show that the MPV values are increased in acute pulmonary embolism, ischemic stroke patients, metabolic syndrome, myocardial infarction, sepsis, gastric cancer etc.^[5-10] Some studies show that the MPV values will decrease in some inflammatory bowel diseases such as ulcerative colitis, in children with chronic spontaneous urticaria.^[11,12] In the community acquired pneumonia in children there is biphasic alteration such as initial decrease and later increase in MPV values.^[13] MPV is readily available along with the complete blood count and is an indicator of platelet function and activation.^[14]

Usually as the platelet count decreases the platelet production increases, but the younger platelets become larger and more reactive and hence the MPV values will be higher.^[15,16]

Kisacik B et al. found the platelet volume to be low in active cases of ankylosing spondylitis and rheumatoid arthritis and that MPV values increased and normalized with treatment.^[17] In some studies it has been reported that MPV decrease in response to inflammation. For instance MPV has been reported to decrease in active period of ulcerative colitis.^[18] Makay et al. reported that MPV decreases during the attacks significantly when compared to control group in Familial Mediterranean Fever.^[19] Similarly in Akelma AZ et al. showed that a decline in MPV may be considered as an indicator of inflammation in children with chronic spontaneous urticaria.^[12] This condition is thought to have been related to the release of bioactive molecules from inflammatory active platelets at the time of inflammation. Danese S et al. speculated that the decrease in the MPV value could be because of the consumption and sequestration of large active platelets in the vascular segments of inflamed bowel.^[20]

In the present study the MPV values were found to be statistically lower in acute appendicitis group (Group 'T') when compared to control group (Group 'C'); that is p value of 0.027 (<0.05). This finding is similar to the results of the studies carried out from Albayrak Y et al. in adult patients of acute appendicitis and Bilici S et al. in children suffering from acute appendicitis.^[21,22] But the findings of Bunyamin Uyanic et al. in children with acute appendicitis differs from all the above studies including ours.^[23] In the studies of Albayrak Y et al., Bilici S et al. and Bunyamin Uyanic et al. the MPV values were respectively 77.6 fL, 7.55 fL and 7.6 fL. The first two values agree closely with the current finding that is 7.48 fL; but the last one won't agree as mentioned above because of its statistically insignificant p value. These findings of our study depict the lowered MPV values in the Group 'T'. Even though the pathogenesis of the decrease in the MPV has not been fully explained, it seems that the mechanism behind it may be the consumption and sequestration of large active platelets in the vascular segments of the inflamed intestines.^[20]

CONCLUSION

Decrease in MPV aids in the diagnosis of acute appendicitis in children and adolescents. If the clinician pays attention to the MPV (which is calculated routinely as a part of automated count) with other parameters and clinical examinations, the negative appendectomy rates in children and adolescents with suspected acute appendicitis may come down.

REFERENCES:

1. Andersson RE, Hugander A, Thulin AJ: Diagnostic accuracy and perforation rate in appendicitis: association with age and sex of the patient and with appendectomy rates. *Eur J Surg.* 1992; 158:37-41.
2. Lessin MS, Chan M, Catalozzi M et al. Selective use of ultrasonography for acute appendicitis in children. *An J Surg.* 1999;177:193-196.
3. Anderson M, Anderson RE. The appendicitis inflammatory response score: a tool for the diagnosis of acute appendicitis that outperforms the Alvarado score. *World J Surg.* 2008; 32: 1843-9.
4. Sack Ulrich, Biereder Birgit Elouahidi et al. Diagnostic value of blood inflammatory markers for detection of acute appendicitis in children. *BMC Surg.* 2006; 6:15 PMID: PMC 1712352.
5. Hilal E, Neslihan Y Gazi G et al. Does the mean platelet volume have any importance in patients with acute pulmonary embolism?. *Wien Klin Wochenschr.* 2013 Jul; 125(13-14):381-5.
6. Arikangolu A, Yucel Y Acar A et al. Relationship of the mean platelet and C reactive protein levels with mortality in ischemic stroke patients. *Eur Rev Med Pharmacol Sci.* 2013 Jul; 17(13): 1774-7.
7. Nechita A, Delcea C, Enache V et al. Metabolic syndrome and mean platelet volume variation in patients with chest pain and negative cardiac enzymes. *J Med Life.* 2013 Jun 15; 6(2): 156-60.
8. Endler G, Klimesh A, Sunder Plassmann H et al. Mean platelet volume is an independent risk factor for myocardial infarction but not for coronary artery disease. *Br J Haematol.* 2002; 117:399-404.
9. Oncel MY, Ozdemir R, Yurttutan S et al. Mean platelet volume in neonatal sepsis *J Clin Lab Anal.* 2012;26: 493-96.
10. Kilinlap S, Ekiz F, Basar O et al. Mean platelet volume could be a possible biomarker in early diagnosis and monitoring of gastric cancer. PMID: 23537073.
11. Yuksel O, Helvaci K et al. An overlooked indicator of disease activity in ulcerative colitis: Mean platelet volume. *Platelets.* 2009;20:277-81.
12. Akelma AZ, Mete E, Cizmici MN et al. The role of mean platelet volume as an inflammatory marker in children with chronic spontaneous urticaria. *Allerg Immunopathol (Madr)* 2013 Aug pii:S0301-054613(00187)-0.
13. Karadag-Oncel et al. The value of mean platelet volume in determination of community acquired pneumonia in children. *Italian Journal of Pediatrics.* 2013;39:16.
14. Bath PM, Butterworth RJ. Platelet size: measurement, physiology, and vascular disease. *Blood Coagul Fibrinolysis.* 1996;7:157-61.
15. Thompson CB, Eaton KA et al. Size dependent platelet sub populations: relationship of platelet volume to ultrastructure, enzyme activity and function. *Br J Haematol.* 1982;50:509-19.
16. Martin J. The relationship between megakaryocyte ploidy and platelet volume. *Blood cells.* 1989; 15:108-21.
17. Kisacik B, Tufan A, Kalyoncu. et al. Mean Platelet Volume (MPV) as an inflammatory marker in ankylosing spondylitis and rheumatoid arthritis. *Joint Bone Spine* 2008; 75930: 291-94.
18. Kayahan H, Akarsu M, Ozcan MA et al: reticulated platelet levels in patients with ulcerative colitis. *Int J Colorectal Dis.* 2007;22:1429-35.

19. MakayB,Turkyilmaz Z, Unsal E. Mean Platelet Volume in children suffering with Familial Mediterranean fevere. *Clin Rheumatoid*. 2009;28:975-8.
20. Danse S, Motte cd CdeL,Fiocchi C. Platelets in inflammatory bowel disease: clinical, pathogenic and therapeutic implications. *Am J Gastroenterol*. 2004;99:938-45.
21. Albayrak Y, Albayrak A, AlbayrakF et al. Mean platelet volume: A new predictor in conferringAcute appendicitis diagnosis. *ClinApplThrombHemost*. doi : 10.1177/1076029610364520.
22. Bilici S, Sekmenli T, Goksu M et al. Mean platelet volume in diagnosis of acute appendicitis in children. *Afr Health Sci*. 2011;11:427-32.
23. BunyaminUyanic, CemilKavalic, EnginDenizArslan et al. Role of mean platelet volume in diagnosis of childhood Acute appendicitis. *Emergency Medicine International*. Volume 2012, Article ID- 823095. doi : 1155/2012/823095.