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ORIGINAL ARTICLE

Diagnostic Accuracy of Increased Mean Platelet Volume as Inflammatory Marker in Diagnosis of Acute Appendicitis Taking Histopathology as Gold Standard

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ABSTRACT

Objective: To determine diagnostic accuracy of increased mean platelet volume as inflammatory marker in diagnosis of acute appendicitis taking histopathology as gold standard.
Study Design: Cross Sectional Study.
Setting: Department of Surgery, Abbasi Shaheed Hospital, Karachi.
Duration: From 28th October 2016 To 27thApril 2017.
Material and Methods: Total 229patients suffered from acute appendicitis were included. Venous blood (<20 ml) for complete blood count was sent to lab before surgery. MPV >11fl was taken as increased value. Post-appendicectomy appendix was sent for histopathology. Sensitivity, specificity, positive and negative predictive values were calculated. Stratification was done. Chi-square test was applied post stratification and p-value ≤0.05 was considered as significant.
Results: There were 128 male and 101 female. Mean age was 34.09±6.63 years. Mean duration of symptoms was 28.97±11.89 hours. 107 patients were observed with total leukocyte count >10X10^{3}µL. Mean platelets volume was more than 11 fl in 47.2% patients. Sensitivity, Specificity, PPV, NPV and accuracy were 74.6%, 91.6%, 92.5%, 71.9%, and 81.6% respectively.
Conclusion: In conclusion in patients with temporary diagnosis of acute appendicitis, high MPV "≥ 11fl" can assist in the identification of acute appendicitis hence negative rate of appendectomy can be decreased..
Keywords: Diagnostic Accuracy, Increased Mean Platelet Volume, Acute Appendicitis, Histopathology

INTRODUCTION

Worldwide acute appendicitis is one of the most commonly encountered abdominal emergencies. Despite recent advances in imaging and laboratory parameters, the diagnosis still remains clinical. About acute appendicitis the surgical principal "when in doubt, take it out", is not right because often this procedure shows some complications. Although it's a very common problem but still diagnosis of acute appendicitis is a challenge for medical practioners.[1]

One of the common reasons of emergency laparotomy is acute appendicitis (AA). The accurate diagnosis of this common problem still problematic as sensitivity of clinical examination range from 71% to 97%.[2] In support of clinical history and examination, laboratory studies provide help in its diagnosis. So distinguishing general pain of abdominal from acute appendicitis is of much importance. The sensitivity of different parameters like WBC (white blood cell), CRP (C-reactive protein), leucocyte/lymphocyte ratio, ESR (erythrocyte sedimentation rate), alpha tumor necrosis factor (α TNF), fibrinogen, D-lactate and α 2-macroglobulin have been studied.[3]

Overall where diagnostic outcomes support the laparoscopic procedure there are also some diagnostic inaccuracies reported which comes in median incidence of accuracy of 20% and rate of negative laparotomy to be 30%.[4] Because there is a direct consequence of missed rupture appendixes, traditionally surgeons accepted rate of negative findings of appendectomy up to 20% and surgical removal of normal appendix.[5]

Negative appendectomy (in which surgeon remove appendix which is normal in patients other than reason of abdominal pain) rate is observed 20 percent to 30 percent.[5,6] The diagnosis which become late may enhance the chances of morbidity and also increase the cost. Average size of thrombocyte is measured by means of Mean platelet volume (MPV) which is provided by CBC analyzers as per routine part of complete blood count. Also there are a lot of researches which proved that mean platelet volume is disturbed by inflammation.[3,7]

For platelet function mean platelet volume is most accepted substitute marker and had been proved to intimate inflammatory burden in general inflammation like Crohn's disease and ulcerative colitis[8] and activity of disease in many diseases like myocardial infarction and acute pancreatitis. In acute inflammatory situation of gastrointestinal tract mean platelet volume (MPV) reduced; the given reason is sequestration and consumption of platelets vascular sections of inflammatory bowl.[8]

The aim of treatment by means of surgery is the removal of swollen appendix before perforation with a slight number of negative appendectomies. Limited study have been conducted in our local population hence this study is planned to use MPV level as an inflammatory marker in acute appendicitis cases as the postponement in diagnosis of appendix may possibly increase the morbidity and costs to the patient. If it is proven than it will be helpful for surgeons to diagnose acute appendicitis and distinguish nonspecific abdominal pain from acute appendicitis.

MATERIAL & METHODS

Overall 229 cases which fulfilled the criteria of inclusion/exclusion were registered from the outpatient Department of General Surgery, Abbasi Shaheed Hospital, Karachi from 28thOctober 2016 to 27th April 2017. First, the approval of research/ethical committee of the hospital was acquired and then the study was conducted. An informed consent of the patients was obtained to include their data in the study and their confidentiality was ensured. Sample size was calculated of 229 cases while taking P= 82.6% [8] margin of error for sensitivity =15%, margin of error for specificity =13%, sensitivity = 66%[5] and specificity = 51%.[5] Non-probability consecutive sampling method was adopted. Study design was cross sectional. Patients of 16 to 60 years of either gender suffered from right lower abdomen pain and fever with clinical and lab diagnosis of acute appendicitis were included in the study. Patients having signs and symptoms of urinary tract infection, patients who were unable to give informed consent, pregnant woman, morbid obesity >35 BMI were also excluded from the study.

Brief history was taken for duration of symptoms and co-morbids and examination was done for collection for relevant data on annexed pro-forma. Venous blood for complete blood count was sent to lab (< 20ml) before going for surgery. MPV >11fl was taken as increased value, surgery was performed and postappendicectomy appendix was sent for histopathology, of which histopathology report followed, this information alongwith age, gender, duration of symptoms, co-morbids conditions like diabetes, hypertension were included in proforma. The biasness and confounding variables were controlled through exclusion and inclusion criteria.

The data were entered and analyzed using SPSS V-19. For continuous variables like age, duration of symptoms mean and standard deviation were calculated. For categorical variables like increased mean platelet volume and acute appendicitis on histopathology, co-morbids condition like diabetes mellitus and hypertension frequencies and percentages were calculated. 2x2 table was used to calculate sensitivity, specificity, PPV, NPV, and diagnostic accuracy for increased mean platelet volume as inflammatory marker taken histopathology as gold standard. Stratification was done with age, gender, duration of symptoms, DM, and hypertension to check its effect on outcome. Post stratification, Sensitivity and specificity positive and negative predictive values and diagnostic accuracy were calculated.

RESULTS

There were 128 male and 101 female patients in the study. The overall mean age of patients was 34.09±6.63 years. Further age is stratified in 2 groups, 126 patients of ≤35 years and 103 patients of age >35 years. The overall mean duration of symptoms was 28.97±11.89 hours. The duration of symptoms is further stratified in two groups, 91 patients had symptoms from ≤24 hours and 138 patients had symptoms since >24 hours.

Out of 229 study subjects, 12.2% patients were found with diabetes while 17% patients were found with hypertension.

Among 229 study subjects, 107 patients were observed with total leukocyte count >$10X10^3$µL.

Among total study subjects, it was observed that with mean platelets volume was more than 11 fl in 47.2% study subjects. As far as Histopathology is concerned, the results showed that appendix was found positive in 58.5% study subjects.

Positive Predictive values, diagnostic accuracy, specificity and sensitivity of MPV for the detection of appendix taking histopathology as gold standard were calculated. The results showed that there were 100 patients were true positive, correctly diagnosed and 87 patients were true negative, correctly diagnosed. Sensitivity, Specificity, PPV, NPV and accuracy were 74.6%, 91.6%, 92.5%, 71.9%, and 81.6% respectively as shown in Table 1.

The stratification of obtained results was done according to gender, age groups, duration of symptoms, diabetes mellitus and hypertension and post stratification sensitivity, specificity, and diagnostic accuracy were also calculated with these effect modifiers by applying chi square=X^2 test taking p value less than 0.05 as significant.

Table 1: Diagnostic accuracy of mean platelets volume (MPV) ≥ 11fl with histopathology as gold standard to diagnose appendix

MPV ≥ 11fl	Histopathology			P-Value
	Yes (n=134)	No (n=95)	TOTAL	0.000*
Yes (n=108)	100	8	108	
No (n=121)	34	87	121	
TOTAL	134	95	229	
Sensitivity	Specificity	PPV	NPV	Accuracy
74.6%	91.6%	92.5%	71.9%	81.6%

* Significant at 0.05

CONCLUSION

In conclusion in patients with temporary diagnosis of acute appendicitis, high MPV "≥ 11fl" can assist in the identification of acute appendicitis hence negative rate of appendectomy can be decreased. As value of MPV is counted in analysis of CBC, the value of MPV might be considered with TLC in patients with suspected acute appendicitis.

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