ORIGINAL ARTICLE

Diagnostic Accuracy of Serum C-Reactive Protein Levels for the Diagnosis of Acute Appendicitis

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ABSTRACT

Objective: Diagnostic accuracy of serum C-reactive protein levels for the diagnosis of acute appendicitis taking histopathology as gold standard.

Patients and Methods: A total of 490 suspicious cases for acute appendicitis with the history of pain in right iliac fossa on any of the following findings nausea, vomiting direct tenderness in right iliac fossa on clinical examination were selected in this study. All pregnant women, preexisting disease, immuno-compromised status and patients suffering from other acute inflammatory conditions like enteric fever and tuberculosis were excluded.

Results: The diagnostic accuracy was calculated, it shows 82.95% for sensitivity, 86.41% for specificity, 95.82% had positive predictive value, 57.41% had negative predictive value while 83.67% had accuracy rate.

Conclusion: Ddiagnostic accuracy of serum C-reactive protein levels for the diagnosis of acute appendicitis is higher and may be used in the areas where the facility of USG and CT scan is not available.

Keywords: Acute appendicitis, Diagnosis, Serum C-reactive protein, Diagnostic accuracy

INTRODUCTION

Acute appendicitis is found to be a common surgical emergency, most of the cases are recorded during their teenage, both male and female are equally affected by this disease.[1] Approximately there is 7% prevalence of appendicitis in our population. Evaluating an elderly patient who presents with abdominal pain is a difficult challenge.[2]

Association with factors like eating habits, hygienic conditions have been suggested but are not widely accepted. Difference in the prevalence of appendicitis has been recognized recently by some researchers for different seasons.[3] The epidemiological data on appendicitis is still scarce in the Pakistani and Asian populations as most of the studies have been performed on western population.[4]

Early diagnosis of acute appendicitis is important for reducing morbidity rates. Despite many advances in diagnostic system, it is still a diagnostic dilemma at times.[5]

C reactive protein is the prototype acute phase reactant, synthesized by liver, its concentration rises within 8 hours of onset of tissue injury/inflammation, peaks 24–48 hours and remains elevated as long as continuing tissue inflammation or destruction. Regular measurement of CRP in suspected appendicitis may improve accuracy of diagnosing acute appendicitis.[6]

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Previous studies are not consistent regarding the rate of diagnostic accuracy of C reactive protein however, in this trial we tend to estimate diagnostic accuracy of CRP for diagnosis of acute appendicitis so that it may be helpful for the surgeons as well as patients also and especially when the facility of radiological diagnosis is not available.

PATIENTS AND METHODS

This study was carried out at Department of Surgery Unit-2, Punjab Employees Social Security Hospital, Multan Chungi Lahore from 1st January 2016 to 30th June 2016. A total of 154 suspicious cases for acute appendicitis with the history of pain in right iliac fossa on any of the following findings nausea, vomiting direct tenderness in right iliac fossa on clinical examination were selected in this study. All pregnant women, preexisting disease, immuno-compromised status and patients suffering from other acute inflammatory conditions like enteric fever and tuberculosis were excluded. Preoperative blood sample of all suspicious cases were sent to the hospital laboratory for C-reactive protein levels. Then, all the cases were undergoing appendectomy under supervision of a consultant and followed for histopathology from hospital laboratory. C-reactive protein was considered positive, if serum C-reactive protein levels are recorded as >6 µg/dl.

RESULTS

We recorded 35.87±7.51 years as mean age, male cases were 56.49% (n=87) and females were 43.51% (n=67). We estimated 77.27% (n=119) of the

cases positive for acute appendicitis on gold standard. The diagnostic accuracy of serum C-reactive protein was calculated as 94.12% sensitivity, 82.86% specificity, 94.92% positive predictive value, 80.55% negative predictive value and 91.56% accuracy rate (Table 1).

Table 1: Histopathology of acute appendicitis in serum C-reactive protein levels

Serum C-reactive protein levels	Histopathology for Acute Appendicitis	
	Appendicitis Present	Appendicitis absent
Appendicitis Present	True positive(a) 112	False positive(b) 6
Appendicitis Absent	False negative(c) 7	True negative(d) 29

Sensitivity = 94.12%, Specificity = 82.86%, Positive predictive value =94.92%, Negative predictive value = 80.55%, Accuracy rate = 91.56%

DISCUSSION

This study was planned with the view that due to controversy between the results in national and international studies, this study may aid in establishing the diagnostic accuracy of serum C-reactive protein levels in acute appendicitis. If it proves to be statistically significant, CRP may be used along with clinical examination for the diagnosis of acute appendicitis and it can reduce morbidity and mortality by early diagnosis and treatment in patients.

In this study mean age was calculated as 36.14±9.71 years, 50.61% (n=248) were male and 49.39% (n=242) were females, frequency of acute appendicitis on histopathology was recorded as 78.98% (n=387). The diagnostic accuracy of serum C-reactive protein levels for the diagnosis of acute appendicitis taking histopathology as gold standard was calculated, it shows 82.95% for sensitivity, 86.41% for specificity, 95.82% had positive predictive value, 57.41% had negative predictive value while 83.67% had accuracy rate.

We compared our results with a previously study recorded 85.1% sensitivity, 72% specificity, 94.7% positive predictive value and diagnostic accuracy 83.2%.[9] Our findings are in agreement regarding sensitivity, specificity, positive predictive value while negative predictive value in our study was not as higher as recorded in the above study, the reason behind this difference is not known.

However another study conducted in Pakistan has shown sensitivity, specificity and positive predictive value of 93.6%, 86.6% and 96.7%.[7] Our findings are slightly contrast with this study.

Various studies recorded the sensitivity of CRP level alone while diagnosing appendicitis in those cases who were selected for appendectomy.

Gurleyik et al[7] recorded 96.6 sensitivity of CRP, another study by Shakhetrah[8] recorded as 95.5%. Asfar et al[9] in a study revealed that CRP is sensitive in 93.6% in cases selected for appendectomy, similarly, another study by Erkasap et al[10] recorded 96% sensitivity in a group of 102 adult cases with RLQ pain, out of which 55 cases were selected for appendectomy.

The researchers also reviewed the ability of combinations of CRP and WBC count to rule out appendicitis reliably. Gronroos and Gronroos[13] revealed that CRP level and WBC count were abnormal in all cases presented with appendicitis while in a study on 300 cases were operated for suspected appendicitis.[13] Another study by Ortega-Deballon et al[12] revealed that normal range of CRP and WBC count had 92.3% negative predictive value while diagnosing for appendicitis.

Some other trials examined the sensitivity of a combined CRP levels and WBC count population over the age of 60 years. Gronroos et al[13] investigated 83 cases older than 60 years and underwent appendectomy out of which 73 were positive for appendicitis and recorded that no case with appendicitis had normal CRP level and WBC count. Yang and others[14] studies retrospectively in cases who were proven positive appendicitis on histology and found only 2 cases were having a normal "triple screen".

Multiple studies also estimated that the accuracy of CRP level and WBC count in subpopulation of pediatric cases who were suspected appendicitis. Gronroos et al[11] investigated 100 children with pathology-proven appendicitis and recorded that both CRP and WBC count were normal in 7 of 100 cases. Stefanutti and others[15] studied prospectively where more than 100 children were undergoing appendectomy for suspected appendicitis and recorded that either CRP levels and WBC count elevated in 98% of patients who were pathology-proven appendicitis.

However, our findings clarified the role of CRP for detection of acute appendicitis, which shows that sensitivity and specificity of this biomarker is higher and may be reliable, this modality can be used especially in those areas where ultrasound and CT are not available in our country.

CONCLUSION

Diagnostic accuracy of serum C-reactive protein levels for the diagnosis of acute appendicitis is higher and may be used in the areas where the facility of USG and CT scan is not available.

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