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Original Research Paper

General Surgery

ROLE OF C-REACTIVE PROTEIN AND WHITE BLOOD CELL COUNT IN THE DIAGNOSIS OF ACUTE APPENDICITIS AND PREDICTION OF DISEASE SEVERITY – A PROSPECTIVE STUDY

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ABSTRACT

Background: Acute appendicitis is one of the most common surgical emergencies, yet its diagnosis remains challenging due to variable clinical presentation. Delay in diagnosis can result in complications such as gangrene and perforation, while inaccurate diagnosis leads to negative appendectomy. Simple, inexpensive inflammatory markers such as C-reactive protein (CRP) and white blood cell (WBC) count may aid in early diagnosis and in predicting disease severity. **Objectives:** To evaluate the role of preoperative C-reactive protein and white blood cell count in the diagnosis of acute appendicitis and to assess their predictive value in determining the severity of the disease. **Methods:** This prospective observational study was conducted on 150 patients clinically diagnosed with acute appendicitis. Patients were categorized into uncomplicated acute appendicitis (UCAA) and complicated acute appendicitis (CAA) based on histopathological findings. Preoperative CRP levels, total leukocyte count, and polymorph percentage were recorded and compared between the two groups. Statistical analysis was performed using Student's *t*-test and Chi-square test. Diagnostic accuracy was assessed using Receiver Operating Characteristic (ROC) curve analysis. **Results:** Among 150 patients, 107 (71.33%) had uncomplicated acute appendicitis and 43 (28.67%) had complicated appendicitis. Mean CRP levels, total leukocyte count, and polymorph percentage were significantly higher in patients with complicated appendicitis compared to uncomplicated cases ($p < 0.05$). ROC curve analysis demonstrated that CRP had a higher diagnostic accuracy than WBC count in predicting complicated appendicitis, with superior sensitivity and specificity. **Conclusion:** C-reactive protein and white blood cell count are useful, readily available inflammatory markers in the diagnosis of acute appendicitis. Elevated CRP levels, in particular, are reliable predictors of disease severity and can aid in early identification of complicated appendicitis, thereby helping to reduce morbidity and negative appendectomy rates.

KEYWORDS : Acute appendicitis; C-reactive protein; White blood cell count; Complicated appendicitis; Inflammatory markers.

INTRODUCTION

Acute appendicitis is one of the most frequent causes of acute abdomen requiring emergency surgical intervention. Despite advances in imaging and laboratory investigations, accurate diagnosis remains challenging because of atypical clinical presentations, especially in children, elderly patients, and pregnant women. Delay in diagnosis increases the risk of complications such as gangrene, perforation, peritonitis, and postoperative morbidity, whereas overdiagnosis results in unnecessary appendectomies with associated economic and healthcare burdens.

Clinical diagnosis alone has a variable accuracy ranging from 70–95%, depending largely on the experience of the surgeon. Hence, there is a continued need for reliable, inexpensive, and readily available investigations that can complement clinical judgment. Among laboratory investigations, white blood cell (WBC) count and C-reactive protein (CRP) are commonly used inflammatory markers in suspected appendicitis.

CRP is an acute-phase protein synthesized by the liver in response to inflammation and tissue injury, mediated primarily by interleukin-6. Elevated CRP levels have been associated not only with the presence of acute appendicitis but also with disease severity. WBC count, though widely used, lacks specificity when used alone. Combining these markers may improve diagnostic accuracy and help differentiate uncomplicated from complicated appendicitis.

This study was undertaken to evaluate the diagnostic value of CRP and WBC count in acute appendicitis and to assess their predictive role in determining disease severity as confirmed by histopathological examination.

MATERIALS AND METHODS

Study Design And Setting

This was a prospective observational study conducted in the Department of General Surgery over a one-year period.

Study Population

A total of 150 patients clinically diagnosed with acute appendicitis and undergoing appendectomy were included in the study.

Inclusion Criteria

Patients clinically diagnosed with acute appendicitis

Exclusion Criteria

- Patients below 12 years of age
- Patients with appendicular mass
- Patients unwilling to give informed consent

Data Collection

Detailed clinical history, physical examination findings, and laboratory investigations were recorded. Preoperative blood samples were collected for estimation of total leukocyte count, differential count, and serum CRP levels. All patients underwent appendectomy, and the diagnosis was confirmed by histopathological examination.

Grouping

Based on histopathological findings, patients were classified into:

- **Uncomplicated Acute Appendicitis (UCAA)**
- **Complicated Acute Appendicitis (CAA)** – gangrenous or perforated appendix

Statistical Analysis

Continuous variables were expressed as mean ± standard deviation and compared using Student's *t*-test. Categorical variables were analyzed using Chi-square test. Diagnostic

accuracy of CRP and WBC count was evaluated using Receiver Operating Characteristic (ROC) curve analysis. A p value < 0.05 was considered statistically significant. Statistical analysis was performed using IBM SPSS Statistics version 20.

Ethical Considerations

The study was observational in nature. Informed consent was obtained from all participants, and confidentiality was maintained.

RESULTS

Out of 150 patients studied, 107 (71.33%) had uncomplicated acute appendicitis and 43 (28.67%) had complicated acute appendicitis based on histopathological findings.

Male patients constituted the majority of cases. Complicated appendicitis was significantly more common among males compared to females ($p < 0.05$). The mean age of patients was 28.65 years, with no statistically significant difference between the uncomplicated and complicated groups.

Mean CRP levels were significantly higher in patients with complicated appendicitis (mean 68.4 ± 18.2 mg/L) compared to those with uncomplicated appendicitis (mean 24.6 ± 11.8 mg/L), and this difference was statistically significant ($p < 0.001$). Similarly, total leukocyte count (14,820 ± 2,160 cells/mm^3 vs 10,460 ± 1,980 cells/mm^3) and polymorph percentage (82.3% ± 6.1 vs 71.4% ± 5.8) were significantly elevated in the complicated group ($p < 0.001$).

ROC curve analysis demonstrated that CRP had a higher area under the curve (AUC = 0.86) compared to total leukocyte count (AUC = 0.79) and polymorph percentage (AUC = 0.76), indicating superior diagnostic accuracy in predicting complicated appendicitis.

DISCUSSION

Early and accurate diagnosis of acute appendicitis remains a clinical challenge. While clinical evaluation is paramount, laboratory markers provide valuable adjunctive information. In this study, both CRP and WBC count were significantly higher in patients with complicated appendicitis, highlighting their role in assessing disease severity.

CRP, being an acute-phase reactant, rises proportionally with the extent of inflammation. Our findings are consistent with previous studies that have demonstrated higher CRP levels in gangrenous and perforated appendicitis. WBC count, although sensitive, lacks specificity when used alone; however, when combined with CRP, diagnostic accuracy improves.

ROC curve analysis in this study showed that CRP had superior predictive value compared to WBC count. This supports the use of CRP as a reliable marker in differentiating uncomplicated from complicated appendicitis, particularly in equivocal cases where clinical findings are inconclusive.

Early identification of complicated appendicitis allows timely surgical intervention and appropriate antibiotic therapy, thereby reducing postoperative complications, hospital stay, and overall morbidity.

CONCLUSION

C-reactive protein and white blood cell count are simple, cost-effective, and readily available inflammatory markers in the evaluation of acute appendicitis. Elevated CRP levels, in particular, serve as a reliable predictor of disease severity. Incorporation of these markers into routine assessment can aid in early diagnosis, reduce negative appendectomy rates, and improve patient outcomes.

LIMITATIONS

- Single-center study
- Pediatric population excluded
- Serial CRP measurements were not analyzed

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