

Original Research Article

Role of C-reactive protein in enhancing the diagnosis of acute appendicitis

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ABSTRACT

Background: Acute appendicitis is one of the common surgical emergencies. This study analysed C-reactive protein as a diagnostic marker of acute appendicitis.

Objective of the current study was to investigate the efficacy of C-reactive protein in the diagnosis of acute appendicitis.

Methods: A prospective study done on patients coming to hospital with clinical diagnosis of acute appendicitis and underwent appendectomy. Operative and histopathological findings were compared and analyzed with C-reactive protein.

Results: A total of 100 patients were included in the study. CRP was more than 6mg/l in 89 patients, and out of 89 patients, 87 patients had histopathologically inflamed appendix and serum CRP estimation in diagnosis of acute appendicitis yield sensitivity of 90.6%, specificity of 50%, positive predictive value of 97.75% and negative predictive value of 18.2%.

Conclusions: CRP was raised in patients with acute appendicitis and it aids as a marker for diagnosing acute appendicitis and decreasing the rate of negative appendectomy.

Keywords: Acute appendicitis, CRP, Histopathology

INTRODUCTION

Acute appendicitis is one of the common surgical emergencies and appendectomy is the most widely performed emergency operation worldwide.¹ Simple appendicitis can progress to perforation, which is associated with a much higher morbidity and mortality, and surgeons have therefore been inclined to operate when the diagnosis is probable rather than wait until it is certain.² The surgical principle about acute appendicitis "when in doubt, take it out", is not correct in view of the number of major and minor complications following appendectomy. Despite more than 100 years experience, accurate diagnosis still evades the surgeon. Owing to its myriad presentations, acute appendicitis is a common but

difficult diagnostic problem. The accuracy of the clinical examination has been reported to range from 71% to 97% and varies greatly depending on the experience of the examiner.³ However, because missed ruptured appendixes have direct consequences, surgeons have traditionally accepted a 20% rate of negative findings at appendectomy and the removal of a normal appendix.⁴ The rate of negative appendectomy (Removal of a normal appendix in patients with other causes of abdominal pain) is reported to be between 20% and 30%.^{4,5} The classical signs and symptoms of acute appendicitis were first reported by Fitz in 1886.⁶ Since then it has remained the most common diagnosis for hospital admission requiring laparotomy.^{7,8} Approximately 6% of the population will suffer from acute appendicitis during their lifetime,

therefore much effort has been directed toward early diagnosis and intervention. This effort has successfully lowered the mortality rate to less than 0.1% for non complicated appendicitis, 0.6% where there is gangrene, and 5% for perforated cases.⁹ An adequate history and clinical examination supported by laboratory investigations and imaging is usually enough to make diagnosis of acute appendicitis. Although leucocyte count and ultrasonography of abdomen provides a valuable aid, diagnosis depends mostly upon the clinical judgement.¹⁰

C-reactive protein (CRP) is an acute phase reactant, which rises rapidly in response to inflammation and can be measured in serum 6-12 hours after the onset of the inflammatory process. It is produced in liver, controlled by interleukin-6. Its concentration is increased in infection, autoimmune disorders, neoplasia and ageing. Its normal concentration is less than 10 mg/l (9-11 mg/l).^{11,12} The evaluation of this protein is simple and its quantitative assessment aids in the diagnosis of acute appendicitis.¹³

Aim and objectives

Aim of current study was to investigate the efficacy of C-reactive protein (CRP) in acute appendicitis. Objectives of current study was to evaluate the value of clinical signs and symptoms and laboratory investigations CRP, as an aid in surgical decision making in cases of possible acute appendicitis.

METHODS

This prospective study was conducted in the department of general surgery, Government medical college, Jammu from April 2021 to October 2021. A total of 100 patients were included in the study that reported in surgical emergency from April 2021 to October 2021. The study was performed according to the guidelines set by the ethical committee of the institute. The data was tabulated and results were expressed using SPSS software.

Study design

Current investigation was a prospective study.

Inclusion criteria

Patients coming to hospital with clinical diagnosis of acute appendicitis and patients who undergo appendectomy were included in the study.

Exclusion criteria

Pregnant females, patients on steroids, immune-compromised patients, patients with liver disease, patients on chemotherapy for malignancy and appendicular lump were excluded from the study.

Clinical diagnosis of acute appendicitis was, based on symptoms of pain in right iliac fossa, migration of pain to RIF, nausea/vomiting, anorexia, fever and signs of peritoneal inflammation like right iliac fossa tenderness, rebound tenderness and guarding. Once acute appendicitis was suspected, patient was subjected to routine investigations like total leucocyte count (TLC), differential leucocyte count (DLC), C-reactive protein (CRP). Ultrasonography of abdomen was done in all of the cases to rule out alternative diagnoses. Elderly patients were subjected to further investigations as part of pre-anaesthetic work up including X-ray chest, ECG etc. Serum C-reactive protein estimation was done in all these cases. The serum or whole blood specimen was collected under standard laboratory conditions. The specimen was tested within one hour of collection. CRP was estimated by using latex agglutination slide test method using a Humatex CRP test kit. The test is based on immunological reaction between CRP in patient's serum and anti-CRP antibodies bound to latex particle. A positive reaction indicates a CRP content of more than 6mg/l in the serum, and is denoted by a distinctly visible agglutination of the latex particles in the test cell of the slide.

RESULTS

A total of 100 patients were included in our study, out of which 74 were male and 26 were female (Table 1).

Table 1: Gender distribution.

Gender	N	%
Male	74	74
Female	26	26
Total	100	100

In current study, young adults are most commonly affected. Maximum patients were in age group of 21-30 years about 29% followed by 20% of the patients in both 11-20 and 31-40 age groups (Table 2).

Table 2: Age distribution of patients.

Gender	N	%
0-10	07	07
11-20	20	20
21-30	29	29
31-40	20	20
41-50	16	16
51-60	05	05
>60	03	03
Total	100	100

In current study, CRP was raised in 89 patients with 87 patients showing inflamed appendix on histopathology. While in 11 patients CRP was normal, out of which 9 having inflamed appendix on histopathology (Table 3). Serum CRP estimation in diagnosis of acute appendicitis

yield sensitivity of 90.6% and specificity of 50%. Positive predictive value for the test was 97.75% while negative predictive value was 18.2%.

Table 3: Distribution of patients according to C-reactive protein.

CRP (≥6mg/l)	N	%	Histopathologically inflamed appendix	Histopathologically not inflamed appendix
Yes	89	89	87	2
No	11	11	09	2

Table 4: Comparison of present study with previous studies.

Study group	Sample size	Sensitivity (%)	Specificity (%)
Gurleyik et al ¹⁰	108	93.5	80
Asfar et al ¹⁶	78	93.6	86.6
Shakhatreh et al ¹⁷	98	95.5	88.9
Present study	100	90.6	50

DISCUSSION

Acute appendicitis remains a common abdominal emergency throughout the world. Despite the advances in the diagnostic field, the diagnosis of acute appendicitis remains an enigma for the surgeon.¹⁴ In the present study, total 100 patients were studied. Out of which 74 were male and 26 were female. The male:female ratio in the present study was 2.85:1. In the study by Ghimire et al 62.96% of patients were male while 37.04% were female.¹⁵ Most common age group was between 21-30 years. In the present study CRP was more than 6mg/l in 89 patients, and out of 89 patients, 87 patients had histopathologically inflamed appendix and serum CRP estimation in diagnosis of acute appendicitis yield sensitivity of 90.6% and specificity of 50%. Al-Abed et al conducted a study on 447 patients with suspected acute appendicitis had found that a CRP concentration of ≥6 mg/l alone had a sensitivity of 76.4% and a specificity of 55.7% which is comparable with the present study.¹³ The sensitivity and specificity of CRP in acute appendicitis in present study are weighed against other studies (Table 4). The sensitivity of CRP in present study is comparable with that of other studies done in past but specificity of CRP in present study is less in comparison with other studies done in past except one study by Al-Abed et al. In the study, the predictive value for positive test was 97.75% and predictive value for negative test was 18.2% which is consistent with the study by Ghimire et al.¹⁵

Limitations

This study was conducted over short period of time with limited sample size.

CONCLUSION

So the conclusion drawn from the present study is that the patients with right iliac fossa pain with provisional

diagnosis of acute appendicitis and CRP more than 6mg/l, help in the diagnosis of acute appendicitis and the negative appendectomy rate can be decreased if appendectomies are avoided in cases where CRP <6mg/l. Diagnostic laparoscopy may detect other abnormality especially in females with suspected acute appendicitis.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Cusheiri A, Grace PA, Darzi A. Disorders of small intestine and vermiform appendix. Clinical Surgery. 2nd ed. UK: Blackwell Publishing Ltd; 2010:405.
2. Hoffmann J, Rasmussen OO. Aids in the diagnosis of acute appendicitis. Br J Surg. 1989;76:774-9.
3. John H, Neff U, Kelemen M. Appendicitis diagnosis today: clinical and ultrasonic deductions. World J Surg. 1993;17:243-9.
4. Jones PF. Suspected acute appendicitis: trends in management over 30 years. Br J Surg. 2001;88: 1570-7.
5. Lee SL, Walsh AJ, Ho HS. Computed tomography and ultrasonography do not improve and may delay the diagnosis and treatment of acute appendicitis. Arch Surg. 2001;136:556-1.
6. Fitz RH. Perforating inflammation of the vermiform appendix: with special reference to its early diagnosis and treatment. Am J Med Sci. 1886; 92:321-46.
7. Puylaert JB. Acute appendicitis: US evaluation using graded compression. Radiol. 1986;158:355-60.
8. Pearson RH. Ultrasonography for diagnosing appendicitis. Br Med J. 1988;297:309-10.
9. Walsh AJ. A sound approach to the diagnosis of acute appendicitis. Lancet. 1987;1:198-200.
10. Gurleyik E, Gurleyik G, Unalmiser S. Accuracy of serum C-reactive protein measurements in diagnosis of acute appendicitis compared with surgeon’s clinical impression. Dis Colon Rectum. 1995; 38(12):1270-4.
11. Mohammed AA, Daghman NA, Aboud SM, Oshibi HO: The diagnostic value of C-reactive protein, white blood cell count and neutrophil percentage in childhood appendicitis. Saudi Med J. 2004;25(9): 1212-5.
12. Davies AH, Bernau F, Salisbury A, Souter RG. C-reactive protein in right iliac fossa pain. J R Coll Surg Edinb. 1991;36:242-4.

13. Al-Abed YA, Alobaid N, Myint F. Diagnostic markers in acute appendicitis. *American Journal of Surgery.* 2015;209(6):1043-7.
14. Jones K, Peña AA, Dunn EL, Nadalo L, Mangram AJ. Are negative appendectomies still acceptable? *Am J surg.* 2004;188(6):748-54.
15. Ghimire R, Sharma A, Bohara S. Role of C-reactive protein in acute appendicitis. *Kathmandu Univ Med J.* 2016;54(2):130-3.
16. Asfar S, Safar H, Khoursheed M, Dashti H, Al-Bader A. Would measurement of C reactive protein reduces the rate of negative exploration for acute appendicitis?. *J R Coll Surg Edinb.* 2000;45:21-4.
17. Shakhatreh HS. The accuracy of C- reactive protein in the diagnosis of acute appendicitis compared with that of clinical diagnosis. *Med Arh.* 2000;54(2): 109-10.

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