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Original Research Article

Diagnostic Efficacy of TLC &CRP in Diagnosis of Acute Appendicitis: An Observational Comparative Study

Prabhat Kumar[1], Ankit Kumar Bharti[2], Rajesh Narayan[3]

[1]Senior Resident, Department of General Surgery, Bhagwan Mahavir Institute of Medical Sciences, Pawapuri, Nalanda, Bihar, India

[2]Senior Resident, Department of General Surgery, Bhagwan Mahavir Institute of Medical Dciences, Pawapuri, Nalanda, Bihar, India

[3]Professor, Department of General Surgery, Bhagwan Mahavir Institute of Medical Sciences, Pawapuri, Nalanda, Bihar, India

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Corresponding Author: Dr. Ankit Kumar Bharti
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Abstract

Aim: The aim of the present study was to check the sensitivity and specificity of total leukocyte count in diagnosis of acute appendicitis and to check the sensitivity and specificity of CRP in diagnosis of acute appendicitis and to determine TLC and CRP efficacy in diagnosis of acute appendicitis.

Methods: The study was conducted in Department of Surgery at Bhagwan Mahavir Institute of Medical sciences, Pawapuri, Nalanda, Bihar, India from may 2022 to April 2023. A total number of 200 cases were taken diagnosed as acute appendicitis.

Results: 62 (31%) were female and 138 (69%) were male. Patient's age group ranged from 14 years to 59 years. Maximum group of patients belonged to 21-30 years (68 patients i.e., 34%). Group A had inflamed appendix (75%) and the negative appendectomy rate in this study was 25% in Group B. Distribution of cases by histopathology correlation in sex Group A 100 males and 46 females had inflamed appendix. Group B 38 males and 16 females had normal appendix. Among 150 Inflamed appendix cases, CRP was found to be raised in 120 cases and normal in 30 cases. Among 50 normal appendix cases, CRP was found to be raised in 14 cases and normal in 36 cases. Among 150 inflamed appendix cases, TLC was found to be raised in 118 cases and normal in 32 cases. Among 50 normal appendix cases, CRP was found to be raised in 20 cases and normal in 30 cases.

Conclusion: TLC and CRP are useful in diagnosis of acute appendicitis. Appendicitis is common in adult and children. In the present study association of CRP and acute appendicitis has shown to be significant, but it cannot replace surgeon's clinical acumen.

Keywords: CRP, TLC, appendicitis

Introduction

In acute appendicitis, TLC and neutrophil counts are the most frequently used laboratory tests. Most of the studies conclude that 60-90 % of all patients with acute appendicitis have total and differential leucocyte counts suggestive of the diagnosis. [1] CRP is an acute phase reactant, synthesized by liver which exhibits an exponential rise in serum concentration within eight hours in bacterial infection. [2,3] It also appears in the sera of individuals in response to a variety of inflammatory conditions and tissue necrosis. Many reports have investigated the value of CRP in improving the diagnostic accuracy of acute appendicitis with conflicting results. [4,5] CRP was identified in 1930 by Tillet and Francis and is regarded as the acute-phase protein. It has been studied as a screening device for inflammation, a marker for disease activity and as a diagnostic adjunct. Physiologically, CRP enhances cell-mediated immunity by promoting phagocytosis, accelerating chemotaxis and activating platelets. CRP is a reliable early indicator of inflammation or injury. [6,7] C-reactive protein (CRP) was first found in the serum of patients suffering from pneumonia caused by Streptococcus pneumoniae.

Together with other acute phase-proteins, the serum level of CRP (C - reactive protein) rises in response to any tissue injury. [8] It also increases in response to infections (bacterial and viral) and in non-infectious conditions like myocardial infarction, malignancies and rheumatic disorders. The levels of CRP (C-reactive protein) usually increase around 8

hours after the onset of injury and usually reach their peak levels around 2-4 days and are found to be elevated as long as there is persisting infection or injury. [9] Due to its short half-life (4-7 hours) serum CRP (C-reactive protein) concentration rapidly declines as the acute inflammatory process subsides. There have been many studies which have evaluated the association of raised CRP (C-reactive protein) levels in acute appendicitis, but with conflicting results. [10]

Various diagnostic modalities such as radiological, laparoscopy and laboratory methods have been reported to reduce the incidence of negative exploration. Leukocyte count has been useful adjunct for diagnosis; however, the utility of this test has been poorly characterized. A more recently suggested laboratory evaluation is determination of C-reactive protein level. CRP is an acute phase reactant synthesized by the liver in response to tissue injury. The measurement of CRP is available, easy to perform and economical. As CRP is an inflammatory marker, it is expected to rise in case of acute appendicitis. Many workers have investigated the value of CRP in improving the diagnostic accuracy of acute appendicitis. A multivariate analysis showed that serial CRP measurement can improve the accuracy of diagnosing acute appendicitis. [11]

The aim of the present study was to check the sensitivity and specificity of total leukocyte count in diagnosis of acute appendicitis and to check the sensitivity and specificity of CRP in diagnosis of acute appendicitis and to determine TLC and CRP efficacy in diagnosis of acute appendicitis.

Materials and Methods

The study was conducted in Department of Surgery at Bhagwan Mahavir Institute of Medical sciences, Pawapuri, Nalanda, Bihar, India. The data was studied form may 2022 to April 2023. A total number of 200 cases were taken diagnosed as acute appendicitis. Patients above 12 years of age who were diagnosed as acute appendicitis on the basis of presenting symptoms and signs were enrolled. Those cases like patients with RIF pain treated conservatively. Patients with extreme age, Pain in RIF with pregnancy, immunocompromised status, pre-existing disease and patients suffering from other acute inflammatory condition were excluded from the study.

All patients were subjected to routine blood investigations in addition to pre-operative imaging like ultrasonography. Informed consent was obtained from all registered cases. TLC and CRP were evaluated in all patients who planned for appendectomy. Appendectomies were performed independent of results of TLC and CRP levels. The laboratory staff was blinded. Appendix specimen sent to histopathological examination.

The records of all patients were accessed from pathology department with histopathological results. This was used to get the incidence of negative appendectomy and then on these features patients were divided into two groups as.

- Group A: Inflamed/perforated/gangrenous appendix
- Group B: Normal appendix

For statistical purpose this 2 groups were used. The normal TLC and CRP values, raised TLC, raised CRP, and raised both TLC and CRP values calculated in each of these groups. The sensitivity and specificity of these tests were calculated according to following formulas.

Sensitivity = true positive/true positives = false positives

Specificity= true negative/true negatives = false positives

The Cut off value for TLC 11X106/L. This value was selected arbitrarily as it corresponds to elevated TLC. The CRP levels were calculated and cut off value was taken1.7mg/dl.[15]

Results

Table 1: Age and sex distribution

Age	Male	Female	Total
12-20	34	18	52
21-30	50	18	68
31-40	30	20	50
41-50	20	4	24
51-60	4	2	6
Total	138	62	200

62 (31%) were female and 138 (69%) were male. Patient's age group ranged from 14 years to 59 years. Maximum group of patients belonged to 21-30 years (68 patients i.e., 34%).

Table 2: Distribution of cases

Histopathology ofappendix	No. of patients	Percentage
Group A	150	75
Group B	50	25
Total	200	100

Group A had inflamed appendix (75%) and the negative appendectomy rate in this study was 25% in Group B.

Table 3: Distribution of cases by histopathology correlation in sex

HPE type	Number	Male	Female
Group A	146	100	46
Group B	54	38	16
Total	200	138	62

Distribution of cases by histopathology correlation in sex Group A 100 males and 46 females had inflamed appendix. Group B 38 males and 16 females had normal appendix.

Table 4: CRP, TLC and histopathology correlation

	CRP		Total
	Raised	Normal	
Group A	120	30	150
Group B	14	36	50
Total	134	66	200
	TLC		Total
	Raised	Normal	
Group A	118	32	150
Group B	20	30	50
Total	138	62	200

Among 150 Inflamed appendix cases, CRP was found to be raised in 120 cases and normal in 30 cases. Among 50 normal appendix cases, CRP was found to be raised in 14 cases and normal in 36 cases. Among 150 inflamed appendix cases, TLC was found to be raised in 118 cases and normal in 32 cases. Among 50 normal appendix cases, CRP was found to be raised in 20 cases and normal in 30 cases.

Discussion

Acute appendicitis is still one of the most-commonest surgical emergencies. [12] The diagnosis is primarily clinical. A typical patient presents with right lower abdominal pain, nausea and vomiting with tenderness or guarding rigidity in right iliac fossa on examination. However, these signs and symptoms are not very specific for appendicitis. [13] The picture is more confusing due to variable positions of appendix. Despite of advances in diagnostic modalities the diagnosis still doubtful in 30- 40% of cases. [14] The definite diagnosis of appendicitis still remains a clinical decision, augmented by appropriate tests. TLC has remained an important factor in definite diagnosis of appendicitis. Various studies have shown that this can be very nonspecific at times. [15] Recently interest has grown in other inflammatory markers which could be helpful in diagnosing appendicitis. CRP is one of them.

62 (31%) were female and 138 (68%) were male. Patient's age group ranged from 14 years to 59 years. Maximum group of patients belonged to 21-30 years (68 patients i.e., 34%). Appendicitis is mainly a disease of adolescents and young adult. [16] Group A had inflamed appendix (75%) and the negative appendicectomy rate in this study is 25% Group B. Distribution of cases by histopathology correlation in sex Group A 100 males and 46 females had inflamed appendix. Group B 38 males and 16 females had normal appendix. Among 150 Inflamed appendix cases, CRP was found to be raised in 120 cases and normal in 30 cases. Among 50 normal appendix cases, CRP was found to be raised in 14 cases and normal in 36 cases. Among 150 inflamed appendix cases, TLC was found to be raised in 118 cases and normal in 32 cases. Among 50 normal appendix cases, CRP was found to be raised in 20 cases and normal in 30 cases. In the present study, leucocyte count was a better laboratory test than CRP value in diagnosing uncomplicated acute appendicitis, whereas CRP value was superior to leucocyte count in resecting appendiceal perforation or abscess formation. These results are in accordance with earlier reports. [17-20] Previous

and present results suggest that increased leucocyte count is usually the earliest laboratory test to indicate appendiceal inflammation. Only during protracted inflammation are levels of acute–phase reactants such as CRP increased. The leucocyte count does not, however, increase any more during protracted inflammation such as in the case of appendiceal perforation or abscess formation, as reported earlier [17,18] and confirmed in the present study.

False negative reactions usually occur early in the infective episode, the reasons are due to technical pitfalls in laboratory testing. Because CRP levels can increase very rapidly and dramatically, the latex agglutination assay is subject to false negative reactions due to a prozone-type phenomenon in which all of the antibody combining sites on the latex particles are bound to as excess of CRP, so no crosslinking (agglutination) can occur. Thus, at the end it should be stressed that serum CRP estimation does not replace clinical diagnosis but is useful adjunct in diagnosis of acute appendicitis. Serum CRP value should be interpreted in combination with clinical findings and leukocyte count. According to study done by Goonroos JM et al TLC was the test of choice in diagnosing uncomplicated acute appendicitis, however it's a poor predictor of protracted inflammation. [21] This supported in study by David and Berchley et al. [22] The TLC count when done individually distinguishes normal appendix from uncomplicated acute appendicitis but it does not distinguish uncomplicated from complicated appendicitis. Colemen C et al reported that TLC is a poor predictor of severity of disease. [23] Vermenum et al after evaluating 221 patients concluded that TLC count did not significantly influence the surgical decision making. [24]

Conclusion

TLC and CRP are useful in diagnosis of acute appendicitis. Appendicitis is common in adult and children. In the present study association of CRP and acute appendicitis has shown to be significant, but it cannot replace surgeon's clinical acumen.

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