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PROSPECTIVE STUDY OF C-REACTIVE PROTEIN LEVELS IN DIAGNOSIS OF ACUTE APPENDICITIS IN SOUTH INDIANS

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ABSTRACT

Acute appendicitis is one of the most common surgical emergencies. Approximately 7.0% of the population will have appendicitis in their lifetime with the peak incidence occurring between the age of 10 and 30 years. The classical history of peri umbilical pain at beginning and later shifting to right iliac fossa is present in only 50% cases. Clinical assessment outweighs the use of investigations in the diagnosis of acute appendicitis. Nevertheless, white cell count (WCC) and C-reactive protein (CRP) are regularly measured in patients with suspected appendicitis. C-reactive protein (CRP) is used routinely in many hospitals to evaluate patients with an acute abdomen. C-reactive protein is an acute phase reactant synthesized by liver in response to tissue injury. Serial measurement of CRP can improve the accuracy of diagnosing acute appendicitis. Data The source of data was from pretested proforma which takes into account clinical history, general physical examination, relevant investigations, imaging modalities. They were included after explaining them about the study and taking their written consent. In our study CRP test sensitivity was 92.00%, specificity was 84.00 %, positive predictive value was 96.00%, negative predictive value was 66.00% and diagnostic accuracy was 92.00%.

INTRODUCTION

Acute appendicitis is the most common surgical emergency and the most common source of community-acquired intra-abdominal infections [1]. Clinical diagnosis of acute appendicitis is still difficult. It has been estimated that the diagnostic accuracy of acute appendicitis is between 70 and 85% [2], and that up to 50% of patients hospitalized for possible appendicitis have normal appendices [3]. Misdiagnosing acute appendicitis is responsible of two types of outcomes: in one hand, a delay to surgical treatment can that lead to perforation and peritonitis in up to 15% of the cases [4]

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and, in the other hand, negative appendectomy which is associated with post-operative complications such as wound infection and adhesions [3]. Several approaches have been introduced to improve the diagnostic accuracy of acute appendicitis and therefore to reduce complications. Imaging techniques, especially abdominal ultrasonography [5] and CT scans [6], have been shown to be particularly accurate with a sensitivity and specificity overcoming 90% [7].

Abdominal pain is the most common clinical presentation. Anorexia, nausea and vomiting with tenderness or guarding rigidity in right iliac fossa on examination. However, these are not very specific for appendicitis. [8] In 70.0% of the cases the clinical presentation is typical and there is no difficulty in making a diagnosis. The remaining 30.0% have atypical clinical

presentation and present a diagnostic dilemma for the surgeons especially in the extreme of age, in women of reproductive age and with abnormal position of the appendix and thus have an uncertain preoperative diagnosis leading to unnecessary laparotomy and appendectomy.[9] A negative appendectomy ranging from 10.0 to 44.0% has been considered acceptable by various authors with view to minimize the incidence of perforation and associated morbidity and mortality. Various diagnostic modalities have been reported to influence the negative appendectomy. This includes radiological, laparoscopy and laboratory methods of investigation. Leucocyte has long been known to be a useful adjunct to the diagnosis of appendicitis; however, the utility of this test has been poorly characterized as it can be very non-specific at times. [10] A more recently suggested laboratory evaluation is determination of C-reactive protein level. C-reactive protein (CRP) is an acute phase reactant synthesized by liver in response to tissue injury. A multivariate analysis showed that the serial measurement of CRP can improve the accuracy of diagnosing acute appendicitis. [11] Fortunately, it's easy and economical as well. Negative appendectomy, as any other operation, results in socioeconomic impact in the form of lost working days and declined productivity. CRP is a non-specific inflammatory marker that is used routinely in many hospitals as an aid in the diagnosis of patients with an acute abdomen. An acute phase protein is produced in the liver. Normal serum concentration is less than 10 mg/dl 8-12 hours after infection or trauma; the increase of acute phase protein in liver CRP is more important in clinical practice. Production of CRP is controlled by Interleukin-6 and in a few minutes increase from 10 to 1000 times. The vermiform appendix is present only in humans, certain anthropoid apes and the wombat. It is a blind muscular tube with mucosal, submucosal and serosal layers. The appendix varies considerably in length and circumference. The average length is between 7.5 and 10cm and diameter generally does not exceed 6mm maximal outer diameter.The appendicular artery, a branch of ileocolic artery, passes behind the terminal ileum to enter the mesoappendix and supply the appendix. Four to six or more lymphatic channels traverse the mesoappendix to empty into the ileocaecal lymph nodes. In this study we correlate the quantitative serum levels of CRP with the diameter of appendix in acute appendicitis. This study emphasizes the impact of normal rather than raised serum C-reactive protein in reducing the rate of negative explorations.

Material and Methods:

In our study 100 patients of appendicitis admitted in surgery ward and subjected to CRP, hematological and radiological investigations. The present was conducted in SLIMS,Pondicherry. The Study was approved by the Institutional ethical Clearance of SLIMS. Data The source of data was from pretested proforma which takes into account clinical history, general physical examination, relevant investigations, imaging modalities. They were included after explaining them about the study and taking their written consent.

Inclusion criteria:

1. Patients in the age group 12 to 50 Yrs.

Exclusion Criteria: T

he exclusion criteria are following: 1. Children below 12 years and elderly above 50 years was excluded as the CRP response is not optimal. 2. Patients who were managed conservatively or Individuals who had undergone appendicectomy for pain abdomen was excluded from this study. 3. Patients with past history of jaundice, signs and symptoms of liver disease, chronic alcoholic and with other coexisting acute inflammatory conditions were excluded, as CRP is exclusively produced in liver and raised in acute inflammatory condition. 4. Females taking oral contraceptive pills or pregnant were excluded as CRP is elevated in these individuals. 5. Patients with appendicular lumb / appendicular abscess were exclude. 6 Patients, not willing to participate in the study (who refused to give consent).

Serum CRP Level :

Quantitative assessment of serum CRP was done using human CRP kit based on the principle of solid -phase enzyme-linked immunosorbent assay.

Ultrasonography:

Diameter of appendix in acute appendicitis was measured by ultrasonography and was correlated with CRP levels .

Statistical Analysis :

Datas were analysed in terms of demographic , clinical features,blood tests -white blood cells, serum CRP levels and diameter of appendix in acute appendicitis as per ultrasonography reports preoperatively. Statistical analysis done in SPSS 11.0

Table 1. Mean CRP level was 3.61±2.28mg/dl

CRP level	
Mean	3.60
SD	2.67

Table 2. Diagnostic Accuracy Of CRP Level

Sensitivity	92.00%
Specificity	84.00%
Positive predictive value	96.00%
Negative predictive value	66.00%
Diagnostic accuracy	92.00%

Table 3.Negative Appendectomy

Appendectomy	**No. of patients**	**Percentage**
Negative appendectomy	28	14.00

Table 4: Rate of negative appendicectomy was compared with other studies

Khan MN et al, 2004[21]	14.3%
Vinoth Kumar et al, 2011[22]	10.00%
Shozoyokoyama et al, 2007[23]	8.00%
Asfar et al, 2000[24]	19.2%
Our study	14.00%

Discussion:

Obviously, the assessment of patients with acute abdominal pain, and particularly suspected appendicitis, remains multifactorial, and still relies to a large extent on clinical judgement. In some patients, further investigations such as ultrasound, CT and even laparoscopy may be indicated, whereas in others a short period of observation is all that is required, before the diagnosis becomes clearer. On the basis of the results from this study, we suggest an algorithm for the assessment of patients with lower abdominal pain and possible acute appendicitis: If the history and examination findings are typical, clinical assessment should outweigh the use of investigations [1-8].

Mean CRP level was 3.61±2.28mg/dl. In our study CRP test sensitivity was 92.00%, specificity was 84.00 %, positive predictive value was 96.00%, negative predictive value was 66.00% and diagnostic accuracy was 92.00%. In our study out of 100 cases,14.00% negative appendectomy was occurred.

The acute abdomen remains a diagnostic challenge for even the most experienced surgeon. A whole range of different techniques including the use of structured data sheets, computer diagnosis, ultrasound, CT scanning and diagnostic laparoscopy have been used to improve the diagnostic accuracy. CRP as a marker of inflammation is now routinely used in many hospitals in patients with an acute abdomen. However, most studies were conducted on patients presenting with suspected appendicitis with very few studies assessing the diagnostic role of CRP in acute abdomen especially those admitted to a surgical ward with a difficult clinical dIagnosis [10-11].

However, where the diagnosis of appendicitis is considered unlikely, and no other obvious diagnosis of concern is being considered, the presence of a normal WCC and CRP can reassure the clinician and allow the patient to be discharged home. If either or both markers are raised, it would be prudent to admit the patient for further investigations, observations and treatment as required. In these patients, other investigations (e.g. ultrasound, CT and diagnostic laparoscopy) will be dictated by local guidelines.

Non-traumatic acute abdominal or flank pain is the common reason for emergency department (ED) visits and accounts for approximately 5% - 10% of all ED visits .[12] Nowadays,WBC and CRP are the most frequently used supportive diagnostic markers. These markers are easily accessible, cost-effective, and routinely analysed parameters in most of the centers.Still, they have limited specificity and sensitivity. Diagnostic sensitivity and specificity of WBC are 85% and 25%, respectively [13] . Lower specificity of WBC values remains a serious problem. In AA, many markers of inflammation including phospholipase A2, serum amyloid A, interleukins, and cytokines have been investigated.[14-15] Procalcitonin and Ddimer have been investigated for diagnostic purposes, and the authors indicated their lower diagnostic sensitivity and specificity [16-17] Bilirubin has been also investigated, and in one study it has been asserted that bilirubin could not specify AA and its complications. While in another study, higher bilirubin levels were found in PA when compared with AA patients [18].

Good clinical approach with detailed physical examination is keystone in the diagnosis of appendicitis. However, atypical clinical presentations and nonspecific findings are frequent which could delay the diagnosis leading to complications, more often perforation; or carry misdiagnosis and lead to unnecessary surgical interventions. To overcome these difficulties, many diagnostic strategies were developed including short period admission for observation, serial laboratory tests and imaging investigations . Although the utility of repeated laboratory examinations may seem helpful, diagnostic

yield of serial tests has not been studied thoroughly enough to be validated in this condition. Also, it is unclear which serum inflammatory markers should be used and how well the early levels changes can function as a discriminator factor in patients with a suspected diagnosis of acute appendicitis.

Although, higher CRP levels were found to be significantly higher in AA (acute appendicitis) patients relative to PA patients, it has a limited diagnostic value for AA [19-20] ($p < 0.0001$). Emergency appendicectomy was done on patients with acute appendicitis based on clinical impression of the surgeon. After the study it is noted that negative appendicectomy rate was 14%.This rate of negative appendicectomy was compared with other studies [21-24].

Conclusion:

In our study CRP test sensitivity was 92.00%, specificity was 84.00 %, positive predictive value was 96.00%, negative predictive value was 66.00% and diagnostic accuracy was 92.00%. In our study out of 100 cases, 14.00% negative appendectomy was occurred. Raised serum C-reactive protein and appendix diameter reducing the rate of negative explorations.

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