

Study of Acute Phase Reactants [C- Reactive Protein, Fibrinogen And Leucocyte Count] In The Diagnosis Of Acute Appendicitis.

Dr. V.S Venkadesan¹, Dr. D.N Renganthan²

^{1,2}(Department of General Surgery , Coimbatore Medical College and Hospital , India)

Abstract:

Aim: To analyse the role of Acute Phase reactants in diagnosing Acute appendicitis in adults. Patients admitted in CMCH with features of Acute appendicitis were enrolled in the study.

Methods: Depending on the surgeon's decision based on clinical examination , patients underwent appendectomy. Total WBC counts, Serum CRP, Fibrinogen are estimated before surgery but were not taken into account for the decision of laparotomy. Final confirmation of diagnosis is by Histo pathological examination of the post op specimen. Correlation is made between laboratory investigations and clinical diagnosis depending upon post operative histo-pathological diagnosis.

Results: It was observed that CRP , Fibrinogen and WBC counts are significantly elevated in acute appendicitis. WBC counts were highly sensitive while Fibrinogen and CRP are specific in diagnosing Acute appendicitis.

Conclusion: Acute phase reactants aid in diagnosis of acute appendicitis. But, these investigations cannot be used separately for diagnosis of acute appendicitis. But when there is doubt in clinical diagnosis of acute appendicitis, these laboratory investigations can be used as corroborative evidence for diagnosing acute appendicitis.

Keywords: Appendicitis , C-Reactive Protein , Fibrinogen , Leucocyte count.

I. Introduction

Acute Appendicitis is a common surgical emergency with a lifetime prevalence rate of one in seven. Acute appendicitis is diagnosed purely depending on history and clinical examination combined with lab investigations such as complete blood count. However due to variation in clinical presentation and findings making a correct diagnosis of appendicitis is difficult. This leads on to missed diagnosis in about of 20% of the patients initially and a negative appendectomy rate of 14-40%. A delay in diagnosis and subsequent treatment leads on to appendicular perforation and a significant increase in the chances of complications. The surgeon's purpose is to evaluate patients coming with symptoms of suspected appendicitis and to manage the patients accordingly without any complications. Various scoring systems have been suggested in different parts which help to diagnose a case of acute appendicitis. Of these Alvarado and modified Alvarado scoring systems are the two most commonly used scoring systems. These scoring systems were developed for the western population. A scoring system named RIPASA scoring system has been developed which is more applicable for the south asian population.

The laboratory investigations namely leucocyte count [WBC] , C- Reactive protein and Erythrocyte sedimentation rate [ESR] are useful in diagnosing Acute Appendicitis. But for the diagnosis of perforated appendicitis there is no laboratory investigation that can be used as a marker. Recently it is stated that perforated appendicitis has been associated with hyperbilirubinemia and hyperfibrinogenemia.

Background And Purpose Of The Study:

Acute appendicitis is one of the commonly encountered surgical emergency conditions in regular clinical practice .Acute appendicitis is diagnosed generally by the clinical evaluation. Now ,the rate of negative laparotomy because of clinical diagnosis alone is still 15 to 25 percent. This study is focussed to find the accuracy of Acute phase reactants -- C-reactive protein [CRP], WBC Counts and serum fibrinogen level in diagnosing acute appendicitis and to compare it with the clinical diagnosis.

II. Acute Appendicitis Is A Continuing Diagnostic Challenge

Traditionally, the clinical diagnosis of acute appendicitis has been made by history and clinical examination. But the presenting symptoms and the clinical signs, being extremely variable due to the labile locations of the appendix, the correct diagnosis of acute appendicitis remains a challenging task for the surgeon. The condition being elusive it is not surprising to note that the diagnosis is missed initially in 20% of the patients with acute appendicitis and they become usually complicated and also in 15-40% of those undergoing emergency appendectomy for suspected acute appendicitis, the appendix is found to be non-inflamed.

The reason for negative appendectomy has been found to be due to variations in presenting signs and symptoms and also due to different differential diagnoses for a single RIF pain. There is an increase in delaying the treatment of acute appendicitis due to confusing diagnoses made in peripheral hospitals, increase in cost of medical treatment and transport. Acute appendicitis is frequently misdiagnosed and hence leading to delayed presentation after the conservative management by intravenous antibiotics and analgesics and hence the symptoms of Acute appendicitis are masked.

Delayed presentation of acute appendicitis has a higher complication rate and hence leading to an increase in mortality and morbidity due to the sequelae such as appendicular perforation and bacterial peritonitis. In developing countries, complication rates of between 6-65% have been described by various studies. High perforation rates are caused by delayed presentation, fulminating disease, misdiagnosis of acute appendicitis or lack of proper acceptance of surgical treatment in the general population. The rate of appendicular perforation following acute appendicitis is greater in young and elderly since the diagnosis is usually difficult.

Unfortunately, most cases of acute appendicitis being missed usually have non-specific presentations. In the busy hospital environment an inexperienced physician may easily discharge these patients prematurely. Accurate diagnosis could have been made if these patients were monitored for longer periods before being discharged. From various studies it is found out that diagnostic accuracy was found to increase with the seniority of emergency physicians. Longer observation time with repeated examinations by senior doctors will help in improving the diagnostic accuracy. There is still no single diagnostic mousetrap to capture the appendiceal rodent till today.

What is the Solution to the Problem:

There is a continuing difficulty in the diagnosis of Acute appendicitis due to its variable and delayed presentation. Different methodology has been devised and advised by various organisations throughout the world but still, the sensitivity and accuracy of these techniques has been stated to be controversial. Laboratory investigations have been thought to aid in the diagnosis of acute appendicitis.

Various Laboratory investigations used in the diagnosis of acute appendicitis are Total blood count including Total White blood cell count [WBC], Differential count [mainly neutrophils and lymphocytes], Erythrocyte sedimentation rate [ESR], C-Reactive protein [CRP] and Fibrinogen levels. These investigations are thought to aid in the diagnosis of acute appendicitis but still there are many controversies regarding the use of Laboratory investigations in the diagnosis of acute appendicitis due to variability of these laboratory investigations in different individuals and in different pathological conditions mimicking acute inflammation.

C-Reactive Protein and Fibrinogen level measurement for the diagnosis of acute appendicitis has gained recent popularity in the modern world due to the convincing evidence of various studies showing the correlation between the rise of C-Reactive protein and Fibrinogen levels during the onset of Acute appendicitis.

Serum Fibrinogen levels have been shown to correlate with the disease severity of Acute appendicitis. The levels of Fibrinogen in the circulation are increased in patients who show delayed presentation of Acute appendicitis leading to complications such as Appendicular perforation and peritonitis.

III. Materials And Methods

Study Area:

Coimbatore Medical College Hospital [CMCH], Coimbatore.

Study population: Patients admitted in CMCH with symptoms suggestive of acute appendicitis and taken up for appendectomy.

Inclusion criteria:

1. Patients scheduled for appendectomies for acute appendicitis at the emergency unit of our institution.
2. Patients older than 12 years of age.

Exclusion criteria:

1. Pregnant women
2. Individuals who had undergone appendectomy
3. Patients not willing to participate in the study (who refused to consent).
4. Patients with other coexisting acute inflammatory conditions

Study Period: 12 Months. From July 2015-June 2016

Sample Size: 50. All patients eligible by inclusion and exclusion criteria are to be included in the study.

Study Design:

A Prospective study is to be conducted on patients admitted in CMCH for appendectomy. Informed consent will be taken from each respondent.

Study Tools:

1. C - reactive protein
2. Serum Fibrinogen
3. Leucocyte Count

Parameters to be studied:

Preformed Performa which includes the demographic profile of each patient and duration of symptoms like fever, vomiting, RIF pain. Laboratory investigations such as WBC total count, CRP, serum Fibrinogen are to be done.

The per-operative macroscopic appearance of the appendix specimen and subsequent histopathological study of the specimen is to be performed.

The per-operative macroscopic appearance of the appendix specimen will be noted. Laboratory investigations such as Liver function tests, CRP estimation, WBC counts are to be measured.

Methodology:

Patients admitted in Coimbatore Medical college Hospital with clinical examination suggestive of acute appendicitis were enrolled for this study after informed consent. Depending on surgeon's decision based on the clinical examination, patients underwent operation for acute appendicitis. Total WBC counts, serum CRP, Fibrinogen are estimated before surgery but were not taken into account for the decision of Laprotomy. Final confirmation of diagnosis is by Histo pathological examination of the post op specimen. Correlation is made between laboratory investigations and clinical diagnosis depending upon postoperative histo-pathological diagnosis.

Plan for analysis of data:

Data is to be analyzed using the statistical package SPSS 17. Chi-square tests, student's t tests, significance testings, and 95% confidence interval formulation are to be carried out wherever appropriate.

IV. Discussion

Of 50 patients included in the study 44 were less than 30 years of age and 6 were more than 30 years of age with the age of the oldest person being 44 years.

There were 25 males and 25 females. About 34 patients had symptoms less than 2 days duration while 16 of them had symptoms for more than 2 days.

On Classifying according to dietary habit, there were 10 vegetarians and 40 non vegetarians. The laboratory investigations show that 37 patients had elevated C-reactive protein [greater than 10 mg/L] while Fibrinogen elevated in 38 patients and leucocyte count was elevated in 41 patients included in the study. Based on Peroperative findings and microscopic examination, it shows that 39 patients had appendicitis while 11 patients had normal appendix. Of the 39 Appendicitis patients 8 had perforated appendix.

On testing statistical significance it is seen that the diagnosis of appendicitis is unlikely if patients are more than 30 years of age. Gender of the patient does not have any significance in diagnosing appendicitis. If the patient has symptoms for less than 2 days and then the diagnosis of appendicitis is more evident. The dietary habit does not have any significance in diagnosis of Appendicitis.

On Analysing the laboratory investigations, C-reactive protein is significantly elevated in Appendicitis, with 35 out of 39 appendicitis patients showing a rise in C-reactive protein levels. But it is also elevated in 2 of 9 patients with normal appendix. Fibrinogen is elevated in 36 out of 39 patients with appendicitis and in 2 patients with normal appendix and has significance in diagnosis of Acute appendicitis. The leucocyte count was elevated in 37 out of 39 patients with appendicitis and also in 4 of 11 patients with normal appendix and has significance in diagnosis of Acute appendicitis. All three investigations are elevated in all cases of Perforated appendix.

On comparing the statistical parameters, it shows that the WBC count has the highest sensitivity while CRP and Fibrinogen are more specific than WBC count. Positive predictive value is highest for Fibrinogen and WBC count has highest negative predictive value. Fibrinogen has highest diagnostic accuracy.

V. Conclusion

From this study, it is understood that Acute phase reactants like C-Reactive Protein [CRP], Fibrinogen and WBC count are elevated in patients with Acute appendicitis. Leucocyte count is highly sensitive in

diagnosing acute appendicitis while C-reactive protein and fibrinogen are more specific than WBC count in diagnosing acute appendicitis. Fibrinogen has the highest positive predictive value and Diagnostic accuracy than WBC count and C-reactive Protein [CRP].

These Laboratory investigations correlate with the severity of the disease. They are not specific for diagnosis of Acute appendicitis since they are elevated in different inflammatory conditions.

Acute phase reactants cannot be used separately for the diagnosis of Acute appendicitis. But when there is doubt in the Clinical diagnosis of Acute appendicitis preoperatively, these laboratory investigations can be used as corroborative evidence for diagnosing acute appendicitis.

VI. Limitations

The study population is taken only from patients presenting to Coimbatore medical college hospital ,so to check the validity of results it should be checked in varied population. These tests are of limited use since they are also elevated in other inflammatory conditions usually presenting with similar clinical features. With the advent of imaging modalities like Ultrasonogram and Computed Tomography, these investigations play a little role in diagnosing acute appendicitis.

References

- [1]. Creese PG ; The First appendectomy; Surg gynecol Obstet. 1952;97:643.
- [2]. Herrington JL; The vermiform appendix: its surgical history. Contemp Surg. 1991 : 39:36-44.
- [3]. McBurney; Experience with early operative interference in cases of disease of the vermiform appendix. NY State Med J. 1889; 50:676.
- [4]. Semm K; Endoscopic appendectomy. Endoscopy 1983; 15:59-64.
- [5]. Schreiber JH; Early experience with laparoscopic appendectomy in women; Surg Endosc. 1987;1:211-6.
- [6]. CP Ng; Acute appendicitis a continuing diagnostic challenge to emergency physicians; editorial - Hong kong Journal of Emergency medicine.
- [7]. Bailey and Love's Short practice of surgery 25th edition; Chapter 67:2305.
- [8]. Krukowski, Z.H. O'Kelly, T.J. Appendicitis. Surgery. 1997; 15:76-81.
- [9]. Madiba. T.E.,Haffejee, A.A., Mbeti, D.L.M, Chalthram, H. and John,J. Appendicitis among African patients at King Edward VIII Hospital, Durban, South Africa: A Review, East Afr. Med. J. 1998; 75:81-84.
- [10]. Groselj-Grenc M, Repse S, Vidmar D, et al. Clinical and laboratory methods in diagnosis of acute appendicitis in children. Croat Med. J. 2007; 48:353-361.
- [11]. Turkyilmaz Z, Sonmez K, Karabulut R, et al. Sequential cytokine levels in the diagnosis of appendicitis. Scan J Clin Lab Inv. 2006; 66:723-731.
- [12]. Almagor M, Mintz A, Sirbirsky O, et al. Preoperative and postoperative levels on interleukin-6 in patients with acute appendicitis. Surg Endosc. 2005; 19:331-333.
- [13]. Philip W. Ralls, M.D; Imaging in appendicitis: CT and sonography; Diagnostic Imaging : Continuing Medical Education; March 2007; Page 1-5.
- [14]. Dachman A, Ralls P, Cohen HL, eds. Gastrointestinal disease [sixth series] text and syllabus. Reston, VA: American College of Radiology,2004.
- [15]. Schwartz principles of Surgery, 9E, Chapter 30, 2043.
- [16]. Sabiston Textbook of Surgery, 18E, Chapter 49.
- [17]. Maingot's Abdominal Operations 11E, Chapter 21.
- [18]. Xharra et al: Correlation of serum C-Reactive protein, White blood cell count and neutrophil percentage with histopathology findings in acute appendicitis. World Journal of Emergency surgery 2012 7:27.
- [19]. Mentis, Eryilmaz, Harlak, Ozturk, Tufan : The value of serum fibrinogen level in the diagnosis of acute appendicitis.
- [20]. Ulrich Sack, Birgit Biereder, Tino Elouahidi, Katrin Bauer, Thomas Keller and Ralf Bodo Trobs : Diagnostic Value of blood inflammatory markers for detection of acute appendicitis in children.
- [21]. Robbins & cotran pathologic basis of disease, 9E, chapter - 3, page :99
- [22].