

The Diagnostic Value of Total Leucocyte Count in Acute Appendicitis and Its Complications

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Abstract

Acute appendicitis is the commonest cause of "Acute abdomen". Appendicectomy is the most frequently performed emergency operation. The aim of this study is to determine the diagnostic accuracy of the above markers individually in acute and perforated appendicitis as well as their value in excluding the condition. The study is an prospective study. This study was performed on 100 patients who have been clinically diagnosed of having acute appendicitis and who were posted for emergency appendicectomy have been clinically and radiologically diagnosed of acute appendicitis. Out of 100 patients, 52 were males and 48 are females, so male predominance is seen in the present study. Appendicitis is common in the age group of 21-30 years and <20 years in this study. Appendicitis reaches its peak incidence in the teens and early 20's. Clinical diagnosis was found to be correct in 88% of cases and hence the rate of negative laprotomies for acute appendicitis in our study is 12%. Patients presenting with elevated levels of serum bilirubin in the context of right iliac fossa pain warrant early surgical intervention. The diagnosis of acute appendicitis, however remains multifactorial and such test simply help to guide the surgeon in the decision making process.

Keywords: Acute Appendicitis; Acute Abdomen; Appendicectomy; Laparotomy.

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Introduction

Appendicitis is one of the common causes of abdominal pain. Acute appendicitis with clinical manifestations may simulate almost any other acute abdominal conditions and in turn may be mimicked by a variety of conditions. So its diagnosis is established by surgeon's clinical impression depending on presenting history, clinical evaluation and laboratory tests. It is estimated that the accuracy of clinical diagnosis of acute appendicitis is lying between 76% to 92%. Therefore normal appendices unnecessarily removed remains high (15%-30%) despite several techniques. On one hand, a normal appendix at appendicectomy represents a misdiagnosis, on the other hand, a delayed diagnosis of appendicitis may lead to increased mortality and morbidity (perforation and peritonitis). Equally distressing is the fact that perforation may occur in up to 35% of Cases.

So traditionally, surgeons have accepted a higher incidence of unnecessary appendicectomies in order to decrease the incidence of perforation. This approach is being increasingly questioned in today's era of evidence based medicine. The high rate of negative explorations for appendicitis is a burden faced not only by the general surgeon, but also the patient and the society as a whole, since appendicectomy, like any other operation, results in socio-economic impacts in the form of hospital expenses, lost working days, and declined productivity. So the goal of surgical treatment is removal of an inflamed appendix before perforation with a minimal number of negative appendicectomies.

Although the overall mortality from appendicitis has dropped from about 26% to less than 1% with the advent of antibiotics and early surgical intervention,

in elderly it is approximately 5 to 15%. The morbidity due to appendiceal perforation ranges from 17% to 40%. The perforation rate is higher in elderly and children. Failure to make an early diagnosis converts acute appendicitis to perforated appendicitis, a disease with potential complications including intra abdominal abscesses, wound infection and death. The negative laparotomy rate ranges from 15% to 35% and is associated with significant morbidity. The negative laparotomy rate is significantly higher in young women (up to 45%) because of prevalence of pelvic inflammatory disease (PID) and other common obstetrical and gynecological disorders.

To conclude as acute appendicitis may simulate many other acute abdominal conditions/illnesses, and despite intensive clinical research and discussion, the diagnosis of acute appendicitis still remains a challenge. And the exact diagnosis is important for proper management. The aim of this study is to determine the diagnostic accuracy of the above markers individually in acute and perforated appendicitis as well as their value in excluding the condition

Objectives of the Study

- To study and analyze the diagnostic value of Total leucocyte count levels in cases of acute appendicitis and its complications.
- Diagnostic marker are analysed for their significance.
- To interpret how this investigation can be used effectively to improve the diagnosis and decision making of acute appendicitis and hence reduce negative appendicectomies.

Methodology

Source of Data

This study was performed on 100 patients who have been clinically diagnosed of having Acute Appendicitis and who were posted for emergency appendicectomy in General Surgery Department of M V J. Hospital and Research Center, Bangalore, during the period from 1st January 2013 to 31st July 2015.

Sample Size: 100 cases.

Study Design: The study will be prospective study.

Inclusion Criteria:

- All clinically and radiologically diagnosed cases of acute appendicitis and its complications.

Exclusion Criteria

- Patients with hepatic disorders.
- patients with a history of alcohol intake with AST/ALT >2.
- A history of hepatotoxic drug intake.
- HBsAg positive and /or those with a past history of jaundice.
- Concomitant conditions where CRP/Leukocyte count/Neutrophil count is elevated in acute appendicitis patients with associated diseases like;
 - a. Rheumatoid arthritis
 - b. SLE
 - c. Glomerular nephritis
 - d. Gout

The Method of Study Consists of

Clinical diagnosis of acute appendicitis was done by in the Department of Surgery, based on symptoms of pain, migration, nausea and 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 as per the hospital protocol. Urine microscopy was performed in all cases. Elderly patients were subjected to further investigations as part of pre-anaesthetic work up including X-ray chest, ECG etc.

Total leucocyte count was done in all cases. TLC count of more than 11,000 cells/mm³ was considered positive. Ultrasonography of abdomen was done in most of the cases to confirm diagnosis and rule out other causes of pain abdomen. No special preparation of the patient was required prior to sample collection by approved techniques. When there was delay, the sample was stored at 2-8°C. Maximum period of storage was 72 hours. Patients with strong suspicion of acute appendicitis were advised emergency appendicectomy. After obtaining consent, patient was operated, and the appendicectomy specimen was sent for histopathological examination.

The histopathology report was considered as the final diagnosis. The histopathologically positive cases among TLC positive group were considered true positives. The histopathologically negative cases in the same group were considered as false positives.

The histopathologically negative cases in the same group were considered as true negatives. The evaluation of TLC in the diagnosis of acute appendicitis is done as follows.

Test	HPE	
	Positive	Negative
Positive	a	b
Negative	c	d

The patients were meticulously monitored in the post-operative period for any complications. All patients were followed up in the outpatient department for a period of two months. The case study was done as per a detailed proforma which is shown in the annexure. The hospital ethical committee clearance was obtained prior to undertaking the study.

Results

Table 1: Age distribution of patients studied

Age in Years	No. of Patients	%
10-20	37	37.0
21-30	40	40.0
31-40	14	14.0
41-50	6	6.0
>50	3	3.0
Total	100	100.0

Mean ± SD: 25.68±10.39

Table 2: Gender distribution of patients studied

Gender	No. of Patients	%
Female	48	48.0
Male	52	52.0
Total	100	100.0

Table 3: Histopathology correlation

Histopathology	Gender		Total
	Female	Male	
Normal appendix	8(16.7%)	4(7.7%)	12(12%)
Inflamed appendix	32(66.7%)	38(73.1%)	70(70%)
Gangrenous appendix	4(8.3%)	5(9.6%)	9(9%)
Perforated appendix	4(8.3%)	5(9.6%)	9(9%)
Total	48(100%)	52(100%)	100(100%)

P=0.597, Not significant, Chi-Square test

Evaluation of the Role of TLC count in Diagnosis of Acute Appendicitis by Correlation with HPE Reports

Out of 100 cases of acute appendicitis 56 had

elevated TLC count, rest 44 patients had normal TLC count.

Table 4: Role of TLC

TLC	HPE	
	Positive	Negative
Positive	55	1
Negative	3	11
Sensitivity		62.5%
Specificity		91.6%
Positive Predictive Value		98.2%
Negative Predictive Value		25%

Discussion

The present study was performed in Department of General Surgery of MVJ. Hospital from period of November 2013 to October 2015, on 100 patients who have been clinically and radiologically diagnosed of acute appendicitis.

Out of 100 patients, 52 were males and 48 are females, so male predominance is seen in the present study. Appendicitis is common in the age group of 21

- 30 years and <20 years in this study. Appendicitis reaches its peak incidence in the teens and early 20's.

Clinical diagnosis was found to be correct in 88% of cases and hence the rate of negative laprotomies for acute appendicitis in our study is 12%. According to literature, accuracy of clinical examination ranges from 75 to 97%, depending on experience of surgeon the reported rate of negative appendicectomy is 20-30%.

Our results when compared with other studies are as follows.

Table 5: Comparison of accuracy of clinical diagnosis in acute appendicitis with other studies

Study Group	HPV Positive	HPV Negative	Negative Appendectomy %	
Gurleyiketal ¹	108	90(83.3%)	18(16.6%)	16.6%
ShakhatrehHSetal ²	98	89(91%)	9(9%)	9%
AfsarSetal ³	78	63(80%)	15(20%)	20%
Oosterhiusetal ⁴	125	101(80.8%)	24(19.2%)	19.2%
Khan M Netal ⁵	259	222(85.7%)	37(14.3%)	14.3%
SvendDueholmeta ¹	100	59	41(41%)	41%
Presentstudy	100	82	12(12%)	12%

Out of 12 patients who were HPE negative 8 (60%) were females and 4 (40%) were males. This observation is supported in study by Goonroos and Goonroos*. In their study 62% female and 38% male patients had Negative appendicectomies.

The diagnostic accuracy of acute appendicitis in women of child bearing age group was low because of so many conditions mimicking appendicitis.

Among the 80 patients reported positive on HPE examination, 70 cases were reported to have inflamed appendix, rest 18 cases were reported to

have complication of acute appendicitis (i.e. 9 Gangrenous appendicitis and 9 perforated appendicitis).

WBC Count and Acute Appendicitis

The sensitivity, specificity, predictive value of positive test and predictive value of negative test of WBC in our study is 62.5%, 91.6%, 98.2% and 25% respectively. Our results are in accordance with other studies as shown in the table.

Table 6: Comparison of role of WBC count in diagnosis of acute appendicitis with other studies

	Sensitivity	Specificity	Predictive Value Positive Test	Predictive Value of Negative Test
Yahya et al ⁶	73.8	5.7	91.3	25.2
Dueholmetal ⁷	83	-	-	88
MNkhanetal	83	62.1	92	-
Marchandetal ⁸	81-84	-	-	-
Hoffmanetal ⁹	81-84	-	-	-
Peltolaetal ¹⁰	76	-	-	-
Piperetal ¹¹	66.7	-	-	-
Presentstudy	62.5	91.6	98.2	25

According to study done by JM Goonroos et al WBC was the test of choice in diagnosing uncomplicated acute appendicitis, however its a poor predictor of protracted inflammation. This is supported in study by David and Berchley et al.

The WBC count when done individually distinguishes normal appendix from uncomplicated acute appendicitis. But does not distinguish uncomplicated from complicated appendicitis.

Coleman C et al reported that WBC is a poor

predictor of severity of disease. Vermenum et al after evaluating 221 patients concluded that WBC could did not significantly influence the surgical decision making.

Dueholm et al in his study demonstrated that WBC had best sensitivity (83%) and predictive value of negative test (88%) and combining these tests with CRP increases the sensitivity to 100%.

This is supported by study done by Khan MN et al, which reported that when WBC and CRP are measured together it increases the positive predictive value.

In our study association of WBC count and acute appendicitis has shown to be significant with P value (0.025).

Appendicitis And WBC count has been variously reported as either being reliable or unreliable, and hence where WBC count is in variance with clinical features the latter should take precedence.

Conclusion

This study highlights the value of blood markers in the diagnosis of Acute Appendicitis and its complications. This is particularly important in the patients with equivocal symptoms or in female patients with a differential diagnosis of gynecological pathology.

The diagnosis of Acute Appendicitis, however remains multifactorial and such test simply help to guide the surgeon in the decision making process.

References

1. Gurleyik E, Gurleyik G, Unalmiser S. Accuracy of serum c reactive protein measurements in diagnosis

of acute appendicitis compared with surgeons clinical impression. *Dis colon rectum* 1995; 38(12):1270-4.

2. Shakhathresh 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.

3. Afsar S, Safar H, Khoursheed M, Dashti H, Al-Bader A. Would measurement of c reactive protein reduces the negative exploration for acute appendicitis? *J R Coll Surg Edinb* 2000 Feb; 45:21-4.

4. Oosterhuis WP, Zwinderman AH, TeeuwenM, Van Andel G, Oldenziel H, Kerkhoff JF et al, C reactive protein in the diagnosis of acute appendicitis, *Eur J Surg* 1993 Feb; 1599(2):115-9.

5. Khan MN, Davie E, Irshad K. The role of white cell count and c reactive protein in the diagnosis of acute appendicitis. *Journal of Clinical and Diagnostic Research*. 2009 August; 3:1647-1652.

6. Yahay A, Al -Abed Naseer Alobaida. Diagnostic markers in acute appendicitis. *The American journal of surgery* 2014.p.64-67.

7. Dueholm S, Bagi P, Bud M. Labrotary aid in the diagnosis of acute appendicitis. A blinded, prospective trial concerning diagnosis value of leucocyte count, neutrophil differential count and c reactive protein. *Dis colon rectum* 1989.

8. Marchand A, Van lente F, Galen RS. The assessment of labrotary tests in the diagnosis of acute appendicitis. *Am J Clin Pathol* 1983 Sep; 80(3):369-74.

9. Hoffmann J, Rasmussen O. Aids in the diagnosis of acute appendicitis *Br.J.Surg* 1989 August; 76:774-9.

10. Peltola H, Ahlquist J, Rapola J, Rasanen J, Louhimo I, Saarinen m et al. C reactive protein compared with white blood cell count and erythrocyte sedimentation rate in the diagnosis of acute appendicitis in children. *Acta Chir Scand*. 1986 Jan; 152:55-8.

11. Pieper R, Kager L et al. Obstruction of the appendix vermiformis causing acute appendicitis an experimental study in the rabbit. *Acta Chir Scand*. 1982; 148:63.