

Original article:

Study of values of C-reactive protein, Total Leukocyte Count and Neutrophil counts in diagnosis of acute appendicitis

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Abstract

Introduction: One of the commonest clinical presentations that require emergency surgery is acute appendicitis . It is rare in infancy and amongst the elderly, but is common in children, teenagers and young adults .

Material and methods: It was prospective clinicopathological study with 100 patient sample size conducted at Pravara Rural Hospital and Rural Medical College, PIMS , Loni . Institutional ethical committee clearance were taken before commencement of the study . Written and informed consent were taken for open appendectomy. This study included randomly all operated patients(100)suspected of acute appendicitis between June 2012 to October 2014 in the Department Of Surgery.

Results: We found sensitivity and specificity of 93.9 and 71.4 (in TLC and CRP correlation with HPE) While sensitivity and specificity of 94.2% and 62.5%.

Conclusion: In our study association of CRP and acute appendicitis has shown to be significant, but it cannot replace clinical acumen.

Introduction:

One of the commonest clinical presentations that require emergency surgery is acute appendicitis^(1,2). It is rare in infancy and amongst the elderly, but is common in children, teenagers and young adults⁽³⁾. Much effort has been directed towards early diagnosis and intervention as approximately 6% of the population will suffer from this disease during their life time⁽³⁾. Delay in diagnosis leads to increase morbidity and costs. In this study we correlated Alvarado scoring, the serum levels of C - reactive protein (CRP), Total Leukocyte Count(TLC) and raised Neutrophil Count(NC) with histopathological examination report(HPE) of the removed appendix.

Various scoring systems have been devised to aid diagnosis^(4,5). The Alvarado score was described in 1986⁽¹⁸⁾ and has been validated in adult surgical practice. The use of an objective scoring system such as the Alvarado system can reduce the negative appendectomy rate to 0-5 %^(6,7). A scoring system described by Alvarado was designed to reduce the negative appendectomy rate without increasing morbidity and mortality which was modified by M.Kalan, D.Talbat, W.J.Cunliffe and A.J.Rich⁽⁸⁾. Some observers have noted that sequential total white cell counts may be useful as the total count remains high in acute appendicitis, but falls in those without appendicitis .It is not unusual to find an inflamed

appendix or perforated appendix with normal leukocyte count^(9,10).

C - reactive protein (CRP) is an acute phase reactant, which rises rapidly in response to tissue injury and inflammation, and can be measured in serum 6-12 hours after the onset of inflammatory process. Many studies have investigated the role of CRP in improving the diagnosis of acute appendicitis, with promising results. Asfar.S.Safar H et al, have found that the specificity and sensitivity of serum CRP in the diagnosis of acute appendicitis was 86.6% and 93.6% respectively⁽¹⁰⁾.

Material and methods:

It was prospective clinicopathological study with 100 patient sample size conducted at Pravara Rural Hospital and Rural Medical College, PIMS , Loni . Institutional ethical committee clearance were taken before commencement of the study . Written and informed consent were taken for open appendectomy. This study included randomly all operated patients(100)suspected of acute appendicitis between June 2012 to October 2014 in the Department Of Surgery.

Results:

Table no1.CRPFindings:

TOTAL NO. OF CASES	100	PERCENTAGE%
CRP POSITIVE	86	86%
CRP NEGATIVE	14	14%

Table no 2. WBC findings:

WBC COUNT	TOTAL NO. OF CASES	PERCENTAGE%
>10,000 cmm	72	72%
<10,000cmm	28	28%
TOTAL	100	100%

Out of 100 patients 72% patients had increased TLC count and 28% had normal counts.

PATIENTS SELECTION:

INCLUSION CRITERIA:

- 1.All patients with right iliac fossa pain clinically suggestive of appendicitis.
- 2.All patient with right iliac fossa pain with raised total leukocyte count,neutrophil count and C-reactive protein.
- 3.All patients with right iliac fossa pain suggestive of appendicitis on ultra sonography.

EXCLUSION CRITERIA:

1. Patient in whom diagnosis of appendicitis was not clinically established
2. Patients in whom palpable mass was present in right iliac fossa due to complication of acute appendicitis(appendicular lump)
3. Patients with past history of documented appendicitis and treated conservatively.
4. Pain in RIF with pregnancy, immunocompromised status, pre existing disease and patients suffering from other acute inflammatory condition.

Table no 3. Neutrophils Count:

NEUTROPHIL COUNT	TOTAL NO. OF CASES	PERCENTAGE %
>75%	76	76%
<75%	24	24%
TOTAL	100	100%

Out 100 patients 76% patients had neutrophilia while 24% patients had normal neutrophil count.

Table no. 4. Correlation of CRP Levels With HPE Positive and Negative Cases:

CRP	HPE		TOTAL
	POSITIVE	NEGATIVE	
RAISED	80	6	86
NORMAL	4	10	14
TOTAL	84	16	100

Sensitivity:95.2%Specificity: 62.5%

PPV: 93.0%NPV: 71.4%

Value of $\chi^2 = 4.03$, $p < 0.05$, significant

By applying Chi-Square test there is a significant association between CRP levels and HPE positive /negative cases ($p < 0.05$)

Table no 5. Correlation OF Total Leukocyte Count With HPEPositive And Negative Cases:

TLC	HPE		TOTAL
	POSITIVE	NEGATIVE	
TLC-RAISED	68	4	72
TLC-NORMAL	16	12	28
TOTAL	84	16	100

Sensitivity: 80.9%Specificity: 78%

PPV: 94%NPV: 42.8%

Value of $\chi^2 = 18.188$, $p < 0.05$, significant

By applying Chi-Square test there is a significant association between Total leucocyte count and HPE positive /negative cases ($p < 0.05$)

Discussion:

In our study , out of 100 patient 35 were female and 65 were male. Maximum group of people belong to 21 to 30 years (33 patients) i.e. 33%. Appendicitis is mainly a disease of adolescents and young adults⁽¹¹⁾ . Clinical diagnosis was found to be correct in 84% of cases and negative appendectomy rate was 16% in this study. This is comparable with the study done by Erikson⁽¹²⁾ (14%) and Gurleyik (16%)⁽¹³⁾. A high degree of accuracy is required to reduce the incidence of negative appendectomies which still remain around 20%⁽²²⁾. This was comparable with study done by Khan MN et al⁽¹⁴⁾ and Asfar S et al⁽¹⁵⁾ .

C reactive protein and acute appendicitis:

In this study , the CRP has a sensitivity of 95.2% .This is comparable to the result of study done by Asfar¹⁴ where sensitivity was 86.6% .

TLC and Acute appendicitis

The sensitivity, specificity, predictive value of positive test and predictive value of negative test of TLC in our study is 80.9%, 75%, 94%, and 42.85 respectively. These results were in accordance with study by Yang et al⁽¹²⁾ including high association between TLC and acute appendicitis (Chi-square= 12.80, P< 0.0001)

NEUTROPHIL AND ACUTE APPENDICITIS:

In this study, Neutrophilia of more than 75% was seen in 76% of cases. Sensitivity and specificity of neutrophil count in present study was 83% and 62.5%, which shows it has better sensitivity than TLC and is less specific than TLC.

References:

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Correlation of TLC and CRP, TLC and NC and TLC, NC, and CRP with HPE:

In our study we correlated the Total leukocyte count and CRP, Neutrophil count with CRP, TLC, Neutrophil count and CRP in combination with histopathologically positive and negative cases.

We found sensitivity and specificity of 93.9 and 71.4 (in TLC and CRP correlation with HPE) While sensitivity and specificity of 94.2% and 62.5%.

When combined value of CRP, TLC and raised Neutrophil count is taken into consideration sensitivity was 100% and specificity was 83.3 predictive positive value was 96.7 while negative value was 100%. Showing combination of these test will be effective in early diagnosis of appendicitis while avoiding surgery in these cases can reduce negative appendectomy rate considerably. (p= 24.92 p<0.0001).

Marchand et al⁽¹⁶⁾ in their study that combination of this test has 100% sensitivity and 100% specificity in the diagnosis of acute appendicitis which is comparable with present study. Yang et al⁽¹⁷⁾ in their study concluded that patients with normal results in all these tests were highly unlikely to have acute appendicitis and to be operated with extra caution before surgery.

Conclusion:

In our study association of CRP and acute appendicitis has shown to be significant, but it cannot replace clinical acumen.

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