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Estimation of ESR, CRP, TLC and DLC in 200 Suspected Cases of Acute Appendicitis.

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ABSTRACT

The most common cause of acute abdomen even today is acute appendicitis. An inflammatory disorder, several laboratory factors contributing to its inflammatory responses are used for diagnosis. To estimate the value of ESR, CRP, TLC and DLC in 200 suspected patients of acute appendicitis in both sex of different age groups. The present study were performed on 200 patients who have been clinically diagnosed as a case of acute appendicitis and were taken up for emergency appendectomy. Apart from the routine investigations all the 200 cases were subjected specifically to the following four investigations i.e. ESR, CRP, TLC and DLC. All cases were subjected for histopathological examinations, which is considered as gold standard for the final diagnosis. Age wise maximum number of patients were in third decade (35%), followed by second decade. Male predominance (60%) was seen in study. Negative appendectomy was done in 20% cases. In present study association of ESR, CRP, TLC and DLC and acute appendicitis was shown to be significant with value. Acute appendicitis remains a diagnosis based primarily on history and clinical examination. Clinical examination is indispensable in diagnosing acute appendicitis and all the above investigations complement clinical skills and cannot replace it.

Keywords: Appendicitis, histopathological, appendectomy

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INTRODUCTION

Appendicitis is caused by obstruction of appendicular lumen from variety of causes. Obstruction is believed to cause an increase in pressure within the lumen. Such an increase is related to continuous secretion of fluids and mucus from the mucosa and stagnation of this material. At the same time intestinal bacteria within the appendix multiply leading to the recruitment of white blood cells and formation of pus and subsequent higher intraluminal pressure. As a result, the appendix swells and become infected [1].

Within a few hours, this localized condition may worsen because of thrombosis of the appendicular artery and vein, leading to perforation of the appendix which is the most common and most serious complication of acute appendicitis, leading to generalized peritonitis [2].

Appendicitis is an inflammatory disorder, several laboratory factors contributing to inflammatory responses are used for diagnosis. ESR is a simple and inexpensive laboratory test for assessing the inflammatory or acute response. The White blood count is elevated in 80% of all cases of acute appendicitis [3]. 95% of patients have neutrophilia and in the elderly, an elevated band count greater than 6% has been shown to have a high predictive value for appendicitis [4].

CRP is an abnormal serum glycoprotein produced by the liver during acute inflammation. Because it disappears rapidly when inflammation subsides, its detection signifies the presence of a current inflammatory process. Further, by serial measurements important information can be obtained on the resolution or continuation of the inflammatory process.

Therefore, if all three of these findings are absent, the chances of acute appendicitis is low [5].

In patient with appendicitis, urinalysis may demonstrate mild pyuria, proteinuria, hematuria. Ultrasonography and Computed Tomography (CT) scans are helpful in evaluating suspected cases of appendicitis [6].

The standard for management of non perforated appendicitis remains appendectomy. Because prompt treatment of appendicitis is important in preventing further morbidity and mortality [7].

MATERIALS AND METHODS

The present study was performed on 200 patients who have been clinically diagnosed as a case of acute appendicitis and were taken up for emergency appendectomy in Department of General Surgery of Rajindra Hospital in the period from December 2011 to October 2013. Apart from the routine investigations all the 200 cases were subjected specifically to the following four investigations i.e. ESR, CRP, TLC and DLC in the department of pathology to evaluate their role in accurately diagnosing a case of acute appendicitis. ESR test , CRP Test, TLC and DLC was done by Westergren's method, latex agglutination slide method, manual counting and routine Leishman stained smears by manual methods respectively.^[8] All the 200 cases were subjected for histopathological examinations which was considered as gold standard for the final diagnosis. The data was analyzed statistically.

RESULTS

Out of 200 cases, only 80 (40%) cases occurred in females, and the remaining 120 (60%) cases occurred in males. The male to female ratio in the present study was 1.5:1. In both males and females most common age group of presentation of acute appendicitis was between (21-30) (35%) followed by the age group (11-20 years) (29%).

Out of the 200 cases, 40 (20%) cases were reported histopathologically negative (normal appendix) and 160(80%) cases were reported positive (acute appendicitis).

Table 1: Evaluation of the Role of CRP in Diagnosis of Acute Appendicitis by Correlation with HPE Reports

CRP	HPE Positive Cases (%age)	HPE Negative Cases (%age)	Total
Raised	144 (90%) True Positive	8 (20%) False Positive	152
Normal	16 (10%) False Negative	32 (80%) True Negative	48
Total	160 (100%) Total Positive	40 (100%) Total Negative	200

Statistical Analysis

Chi-square	Df	p value
8.858	1	0.000

Out of 160 cases of acute appendicitis 144 (90%) had raised CRP value, rest 16 (10%) patients had normal CRP. Out of 40 HPE negative cases, 32 (80%) had normal CRP while rest 8 (20%) had elevated CRP value. (Table 1)

DISCUSSION

Male predominance was seen in present study (60%) which was comparable with study done by Kim-Choy and Shih-Wei (54.30%), Mohammed et al (64.34%), Agrawal et al (51.72%), Kaya et al (69.20%) and 59.90% by Dahmardehei et al [9-13]. Negative appendectomy in present study (20%) was comparable with the study done by Oosterhius et al [14] (19.20%), Gurleyik et al [15] (16.50%) Asfar et al (20%) [16].

ESR And Acute Appendicitis

Berenji et al [18] found that sensitivity and positive predictive value of ESR, CRP and TLC can strengthen the clinical diagnosis of acute appendicitis, but lowered value of negative (NPV) tests showed that negativity of each of the test and all together cannot verify acute appendicitis.

Dahmardehei et al [13] studied that ESR, CRP and TLC had significant statistical correlation with pathological diagnosis of acute appendicitis. In present study association of ESR value and acute appendicitis was found to be significant with p value (0.00) while association of ESR value and acute appendicitis in different age groups and both sex was found to be insignificant with p value 0.146 and 0.953 respectively.

CRP And Acute Appendicitis

In present study, the sensitivity, specificity, predictive value of positive, predictive value of negative test was 90% 80%, 94%, and 66% respectively. The results of this study when compared with other studies were as follows.

Table 2: Comparison of Role of CRP in Diagnosis of Acute Appendicitis with Other Studies

Study	Sensitivity	Specificity	Predictive value positive test	Predictive value negative test
Al-Saigh [19] (1992)	39.70%	76.30%	-	-
Oosterhius et al[14] (1993)	87%	50%	-	-
Erikson et al[20] (1994)	-	-	96.70%	76.50%
Gurleyik et al[15] (1995)	93.50%	80%	-	-
Afsar et al[16] (2000)	93.60%	86.60%	96.70%	76.50%
Shakhatreh[21] (2000)	95.50%	86.90%	-	-
Khanet al[10] (2004)	75.60%	83.70%	96%	-
Yanget al[22] (2005)	76.50%	28.10%	-	-
Agrawalet al[11] (2008)	74.80%	66.70%	-	-
Berenjiet al[18] (2010)	75.30%	28%	91.40%	11%
Dahmardeheiet al[13] (2013)	85%	57%	89%	48%
Present Study (2013)	90%	80%	94%	66%

Sensitivity of present study (90%) was comparable with the study done by Oosterhuis et al[14] (87%), Gurleyik et al[15] (93.50%), Afsar et al[16] (93.60%) Shakhathreh[21] (95.50%), Dahmardehei et al[13] (85%). While specificity of present study (80%) was comparable with the study done by Gurleyik et al[15] (80%), Afsar et al[16] (86.90%) Khan et al[10](83.70%).

Predictive value positive test of present study (94%) was comparable with study done by Afsar et al[16](96.70%), Khan et al[10](96%), Berenji et al[18] (91.40%), Dahmardehei et al[13] (89%).

False negative reactions usually occur early in the infective episode, the reasons were due to technical pitfalls in laboratory testing. Because CRP levels can increase so rapidly and dramatically, the latex agglutination assay was subject to false-negative reactions due to a prozone-type phenomenon in which all of the antibody combining sites on the latex particles were bound to an excess of CRP, so no cross-linking (agglutination) could occur.

This could be avoided by performing qualitative tests on several dilutions. Thus, at the end, it should be stressed that serum CRP estimation did not replace clinical diagnosis, but was useful adjunct in diagnosis of acute appendicitis. Clinical diagnosis was crucial in ruling out alternate diagnoses and other conditions which might give a false positive value on CRP estimation. Serum CRP value should be interpreted in combination with clinical findings and leucocyte count.

Serum CRP estimation did not undermine the importance of clinical diagnosis of a skilled surgeon, but complements it. In present study, CRP and acute appendicitis were highly associated (p value 0.00).and association of CRP and acute appendicitis in different age groups and both sex was found to be insignificant with p value 0.357 and 0.05 respectively.

TLC and Acute Appendicitis

The sensitivity, specificity, predictive value of positive test and predictive value of negative test of TLC in present study was 78.75%, 80%, 94% and 48.48% respectively. The results of this study when compared with other studies were as follows.

Table 3: Comparison of Role of TLC in Diagnosis of Acute Appendicitis with Other Studies

Study	Sensitivity	Specificity	Predictive value Positive test	Predictive value of Negative test
Doraiswamy et al[24] (1979)	42%	-	-	-
Piper et al[25] (1982)	66.70%	-	-	-
Marchand et al[26] (1983)	83%	-	-	-
Peltola et al[17] (1986)	76%	-	-	-
Dueholm et al[27] (1989)	83%	-	-	88%
Khan et al[10] (2004)	83%	62.10%	92%	-
Wang et al[28] (2007)	79%	94%	-	-
Kamran et al[29] (2008)	76.50%	73.70%	92.50%	-
Agrawal et al[11] (2008)	78.60%	54.80%	-	-
Berenji et al[18] (2010)	84.50%	34%	92%	16.70%
Present Study(2013)	78.75%	80%	94%	48.48%

Sensitivity of present study (78.75%) was comparable with the study done by Marchand et al[26] (83%), Peltola et al[17] (76%), Dueholm et al[27] (83%), Khan et al[10] (83%), Wang et al[28] (79%), Kamran et al[29] (76.50), Agrawal et al[11] (78.50%), Berenji et al[18] (84.50%).While specificity of present study (80%) was comparable with Wang et al[28] (94%) and Kamran et al[29] (73.50%).

Positive value of predictive test of present study (94%) was comparable with the study done by Khan et al[10] (92%), Kamran et al[29] (92.50%) and Berenji et al[18] (92%).

Present study showed high association between raised TLC and acute appendicitis. (p value 0.00). Association of TLC and acute appendicitis in different age groups was found to be insignificant with p value 0.259 while association of TLC and acute appendicitis in both sex was found to be significant (p value 0.02).

When WBC count is combined with other tests like CRP / NC the sensitivity, specificity, predictive value of positive test and predictive value of negative test increases significantly.

With appendicitis the WBC count had been variously reported as either being reliable or unreliable, and hence where WBC count was in variance with clinical features the latter should take precedence. Only value of WBC count was to prompt observation rather than operation in patients who had equivocal features of appendicitis with normal counts.

Neutrophil Percentage and Acute Appendicitis

The sensitivity, specificity, predictive value of positive, predictive value of negative test of present study was 77.5%, 80%, 93.9%, and 47.05% respectively. The results of this study when compared with other studies were as follows.

Table 4: Comparison of Role of Neutrophil Percentage in Diagnosis of Acute Appendicitis with Other Studies

Study	Sensitivity	Specificity	Predictive value ± test	Predictive value of negative test
Doraiswamy[24] (1979)	42%	-	-	-
Marchand et al[26] (1983)	81%	-	-	-
Vermeulen et al[31] (1995)	75%	-	-	-
Yang et al[22] (2005)	87.20%	33%	-	-
Present Study (2013)	77.50%	80%	93.90%	47.05%

Sensitivity of present study (77.50%) was comparable with the study done by Marchand et al[26] (81%), Vermeulen et al[31] (75%) and Yang et al[22] (87.50%).

Present study showed high association between raised neutrophil percentage and acute appendicitis. (p value 0.00). Association of neutrophil percentage and acute appendicitis in different age groups was found to be insignificant with p value 0.370. While association of neutrophil percentage and acute appendicitis in both sex was found to be significant (p value 0.038).

Most studies conclude that Neutrophilia > 75% will occur in 78% of cases. The TLC and neutrophil count taken together, less than 4% cases with acute appendicitis would have normal value. According to Marchand et al [26] Neutrophil count >75% was single best test, for diagnosis of acute appendicitis with sensitivity (81-84%). According to Doraiswamy et al[24] NC was particularly useful in diagnosis of acute appendicitis in children.

Combining ESR, CRP, TLC and DLC increase the sensitivity, predictive value of positive test.

CONCLUSION

Acute appendicitis remains a diagnosis based primarily on history and clinical examination. Clinical examination is indispensable in diagnosing acute appendicitis and all the above investigations complement clinical skills and cannot replace it.

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