ROLE OF C REACTIVE PROTEIN AND WBC COUNT IN THE DIAGNOSIS OF ACUTE APPENDICITIS AND ITS PREDICTIVE VALUE IN ASSESSING THE SEVERITY OF THE DISEASE

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ABSTRACT

BACKGROUND

Acute appendicitis is still one of the commonest surgical emergencies. The clinical experience of the surgeon decides the accuracy of the diagnosis which is difficult in 30-40% of cases despite available diagnostic modalities. Apart from a careful history and clinical examination, blood inflammatory markers also help in the diagnosis and management of acute appendicitis. Various inflammatory markers have been estimated like white cell count, C Reactive Protein and polymorph percentage. The diagnostic accuracy of these markers varies in different reports. This study is conducted to estimate the role of sensitivity and specificity of total white cell count and C Reactive Protein in patients clinically diagnosed as suffering from acute appendicitis and their correlation with histopathology reports to assess their role in diagnosing severity of acute appendicitis.

MATERIALS AND METHODS

Patients admitted with clinical diagnosis of acute appendicitis were included in this study. Clinical examinations were made and the signs and symptoms were recorded in the proforma. Patients presenting with appendicular mass or abscess, treated conservatively and patients who refused to give consent were excluded from this study. Blood samples were collected on admission before surgery for estimation of total WBC count and CRP estimation. Then the patients underwent appendectomy and the resected appendicular specimens were sent for histopathological examination and the results were collected. Based on the histopathological report the cases were grouped under two categories complicated acute appendicitis and uncomplicated acute appendicitis depending on the presence or absence of perforation and gangrenous changes. Then the data were entered into excel 2007 and statistical analysis were made to find the significance of total white cell count and C reactive protein values in diagnosing acute appendicitis and their correlation with complication like perforation or gangrenous changes.

RESULTS

The total number of study subjects participated were 51 cases and among them 14 cases were complicated acute appendicitis and 37 cases were uncomplicated acute appendicitis. The age distribution was 26 cases (51%) were less than 25 years and 25 cases (49%) were 25 years and above. Out of the 51 cases 36 (70.6%) were males and 15 (29.4%) were females making a ratio of 2.4:1. Right iliac fossa pain and tenderness and Me Burney's tenderness were present in all 51 cases (100%) while migratory pain was noticed only in 26 cases (50.9%). Guarding and rigidity were seen in 22 cases (43%). C reactive protein was positive in 41 cases (80.4%) and negative in 10 cases (19.6%). In complicated acute appendicitis C reactive protein values were >25 mg/dl in 13 cases (92.8%) and only in 14 cases (37.8%) in uncomplicated acute appendicitis group. Total white cell count was >11150 cells/cmm in 11 cases (78.5%) in complicated acute appendicitis and in uncomplicated acute appendicitis 15 cases (40.5%) only and making a total of 26 cases (51%).

CONCLUSION

In the present study pre-operative blood inflammatory marker C reactive protein was positive in significant number of cases and was markedly raised in complicated acute appendicitis. Total white cell count was significantly raised more in complicated acute appendicitis cases and to a lesser extent in uncomplicated acute appendicitis cases. Raised C reactive protein value is a good marker of acute appendicitis and a high C reactive protein value is a better indicator of a complicated acute appendicitis. Pre-operative C reactive protein estimation in cases of acute appendicitis helps in diagnosis as well as in grading the severity of acute appendicitis.

KEYWORDS

UCC- Uncomplicated Acute Appendicitis, CC – Complicated Acute Appendicitis.

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BACKGROUND

Incidence is 42-175 in 100,000 persons. The accuracy of clinically based diagnoses depends on clinician experience and has been reported to range from 71% to 97%.[1] Thus, accurate diagnosis of acute appendicitis is still difficult.[2,3] Blood inflammatory markers such as white blood cell (WBC) counts and C-reactive protein (CRP) levels are performed in patients suspected of having acute appendicitis. Some

reports indicated that appendicitis is unlikely, when the white blood cells count and CRP value are normal.[4]

Because of its atypical symptoms and difficulties in making a definite diagnosis, only 84% of the patients who undergo an appendectomy manifest pathological findings of appendicitis. The number of negative appendectomies is high. Negative appendectomies are one of the burdens facing not only the general surgeon but also the patient her/himself and society as a whole.

AIMS AND OBJECTIVES

AIMS

To assess the role of C reactive protein and white cell count in the diagnosis of acute appendicitis and its predictive value in assessing the severity of the disease.

OBJECTIVES

1. To study the value of preoperative C- reactive protein and WBC count in diagnosing acute appendicitis.
2. To correlate its value in grading of Acute Appendicitis as compared to histopathological reports.

MATERIALS AND METHODS

Source of Data

All patients diagnosed as acute appendicitis clinically in our institution will be analysed prospectively. Data on patient's age, clinical findings, WBC count, C- reactive protein (CRP) and histopathological findings will be recorded. Statistical analysis will be carried out.

Type of Study

Eighteen months prospective study.

Numbers of Groups Studied

Patients admitted with the clinical diagnosis of acute appendicitis in the department of general surgery.

Sample Size

This study will be carried out on patients admitted with a diagnosis of acute appendicitis. This study will be carried out from December 2011 to May 2013.

Inclusion Criteria

Patients who are clinically diagnosed with acute appendicitis.

Exclusion Criteria

Patients less than 12 years of age.
Appendicular mass.
Withdrawal/Refusal of consent.

Parameters Studied

Data on patient's age, clinical findings, WBC count, C-reactive protein (CRP) and histopathological findings will be recorded. Statistical analysis will be carried out.

Method of Statistical Analysis

The continuous variables were compared by students independent 't' test. The categorical variables were associated by x^2 (Chi-square) test. The predictive values of WBC and CRP were calculated by Receiver-Operating Characteristics (ROC) curve. The above analysis and interpretations were carried out by the statistical package IBM SPSS statistics 20.

Ethical Considerations

This is an observational study. Informed consent will be obtained. In the study patients will be undergoing treatment and follow up on regular basis.

RESULTS

Statistical Analysis

The acute appendicitis study subjects were divided in to Uncomplicated acute appendicitis (UCAA) (acute suppurative appendicitis) and Complicated Acute Appendicitis (CAA) based on the presence of gangrenous changes or perforation. The two groups were compared in respect of their age, gender, WBC, Polymorph and CRP counts. The clinical symptoms of total subjects were described in terms of percentages. The continuous variables were compared by students independent 't' test.

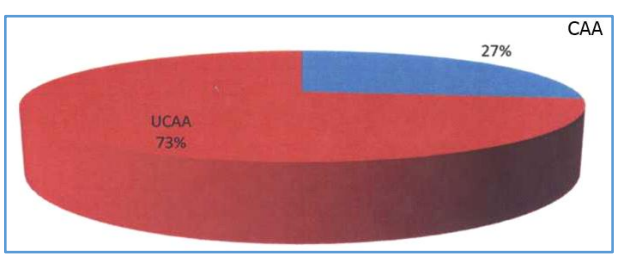

Figure 4.1. Histopathological Subgroups

Histopathology Reports and Subgroups

Among the 51 cases studied, uncomplicated acute appendicitis was present in 37 cases and complicated acute appendicitis was present in 14 cases with gangrenous changes or perforation.

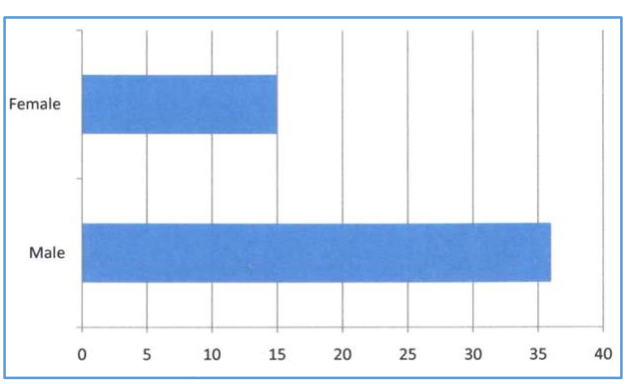

Figure 4.2. Sex Distribution

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Age Group (Years)	Male		Female		Total	
	Frequency	%	Frequency	%	Frequency	%
10-24	20	55.6	6	40.0	26	51.0
25-50	16	44.4	9	60.0	25	49.0
Total	**36**	**100.0**	**15**	**100.0**	**51**	**100.0**
Mean±SD	**24.1±8.7 years**		**29.3±10.8 years**		**25.6±9.6**	
Significance	**P>0.05**				**Gender ratio M:F= 2.4:1**	

Table 4.1. Demographic Profiles of the Study Subjects

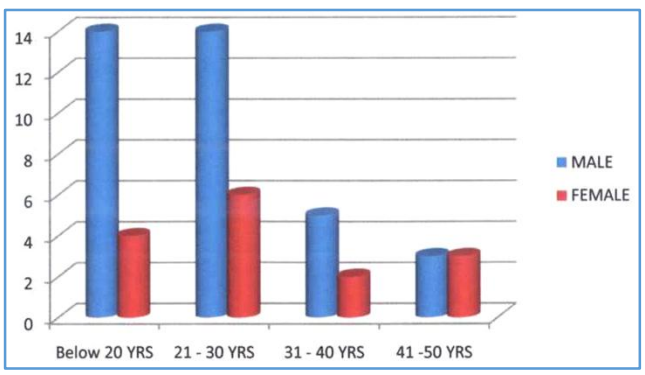

Figure 4.3. Demographic Profile

Demographic Profiles

The demographic profiles of the subjects have been described in the Table-4.1, Figure 4.1, 4.2 and Figure 4.3 The study subjects participated were 51. Out of 51, 36 (70.5%) and 15 (29.5%) were males and females respectively. The mean age of males was 24.1±8.7 years and females was 29.3±10.8 years. The difference of age between the gender 5.2 years was not statistically significant P>0.05). Among the total subjects 51% were below 25 years and 49% of them 25 and more ages.

Signs & Symptoms	Percentage		x^2	Significance	Odds Ratio	95% CI	
	UCAA n=37	CAA n=14				Lower	Upper
Pain RIF	100.0	100.0	-	-	-	-	-
Migratory pain	48.6	57.1	0.293	P>0.05	1.4	0.4	4.9
Vomiting	70.3	92.9	2.880	P>0.05	5.5	0.6	47.3
Nausea	73.0	92.9	2.374	P>0.05	4.8	0.6	41.7
Fever	51.4	85.7	5.031	P<0.05	5.7	1.1	29.0
Dysuria	5.4	7.1	0.055	P>0.05	1.3	0.1	16.1
Anorexia	81.1	85.7	0.15	P>0.05	1.4	0.2	7.7
RIF tenderness	100.0	100.0	-	-	-	-	-
Me Burney's tenderness	100.0	100.0	-	-	-	-	-
Guarding/rigidity	29.7	78.6	9.878	P<0.01	8.7	2.0	37.3
Rebound tenderness	48.6	85.7	5.761	P<0.05	6.3	1.2	32.3
Cough tenderness	59.5	92.9	5.262	P<0.05	8.9	1.0	75.1
Bowel sounds	94.6	100.0	0.788	P>0.05	1.4	1.1	1.7

Table 4.2. Association Between Uncomplicated Acute Appendicitis and Complicated Acute Appendicitis With Signs and Symptoms

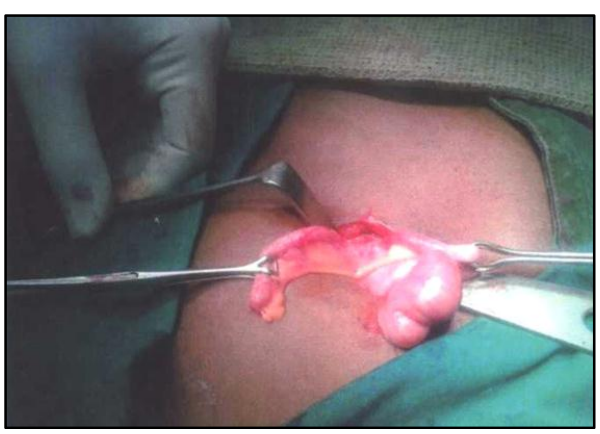

Image 1. Acute Appendicitis - UCAA

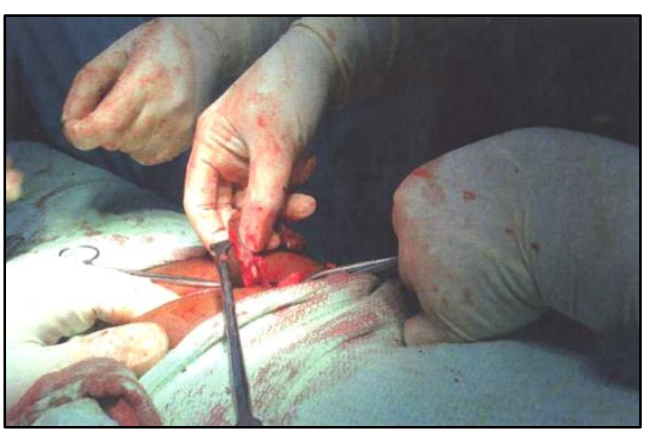

Image 2. Acute Appendicitis - CAA

Image 3. Acute Appendicitis Specimen – CAA

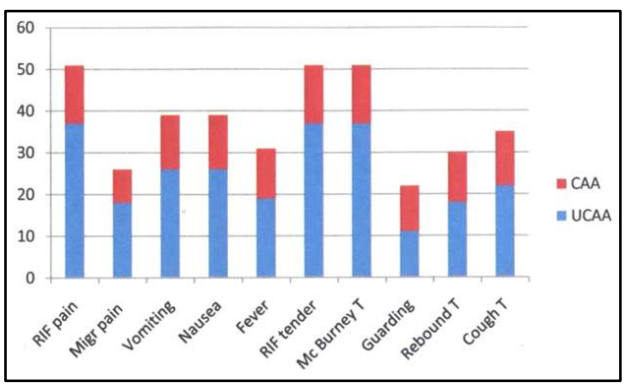

Figure 4.4. Signs and symptoms in UCAA and CAA

Signs and Symptoms

Table-4.2 and Figure 4.4 shows the association of symptoms and signs with uncomplicated acute appendicitis and complicated acute appendicitis. Signs and symptoms such as pain RIF, RIF tenderness and Mc Burney's tenderness were 100.0% in both groups. Migratory pain, vomiting, nausea, dysuria, anorexia and bowel sounds had not significantly associated with either of the group. Fever, guarding/rigidity, rebound tenderness and cough tenderness were significantly associated with complicated acute appendicitis.

Variable	Uncomplicated acute Appendicitis n=37		Complicated acute Appendicitis n=14		Difference b/w Means	't'	Signifi
	Mean	SD	Mean	SD			
Age	24.4	9.7	28.8	8.8	4.4	1.507	P>0.05
WBC	10797.3	4387.8	13107.1	2765.8	2309.8	1.830	P>0.05
Polymorph	72.2	15.6	81.6	9.3	9.4	2.090	P<0.05
CRP	27.1	30.1	71.4	34.1	44.3	4.527	P0.001

Table 4.3. Comparison of Age, WBC, Polymorph and CRP between UCAA and CAA

Inflammatory Markers

Table- 4.3 shows the Comparison of Age, WBC, Polymorph and CRP between uncomplicated acute appendicitis and complicated acute appendicitis. The mean ages of uncomplicated acute appendicitis and complicated acute appendicitis were 24.4±9.7 years and 28.8±8.8 years respectively. The difference of 4.4 years was not statistically significant (P>0.05). The WBCs were 10797.3±4387.8 and 13107.1±2765.8 with difference of 2309.8 was not statistically significant between uncomplicated acute appendicitis and complicated acute appendicitis (P>0.05). The mean polymorph of uncomplicated acute appendicitis and complicated acute appendicitis were 72.2±15.6 and 81.4±9.3 respectively. The difference 9.4 was statistically significant (P<0.05) Mean CRP 27.1±30.1 of uncomplicated acute appendicitis was significantly lesser than the mean CRP of 71.4±34.1 (p<0.001) and this is statistically significant.

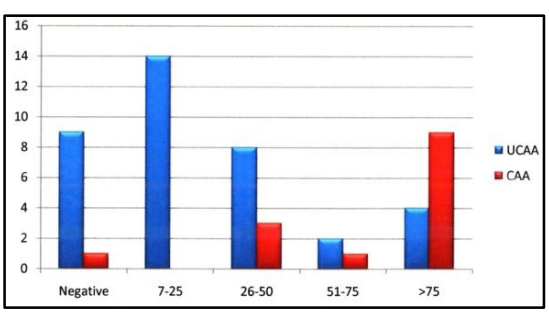

Figure 4.5. CRP values in UCAA and CAA mg/dl

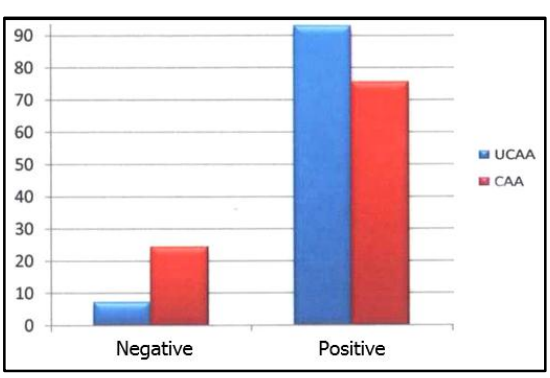

Figure 4.6. Positive and Negative CRP Values in UCAA and CAA

Appendix	CRP			x^2	Signi	Odds Ratio	95% CI	[of OR
	Negative	Positive	Total				Lower	Upper
UCAA	9	28	37	1.902	P>0.05	4.2	0.5	36.5
CAA	1	13	14					
Total	**10**	**41**	**51**					

Table 4.4. Association between CRP Level of Negative and Positive with Uncomplicated Acute Appendicitis and Complicated Acute Appendicitis

The Table-4.4 associates negative CRP with uncomplicated acute appendicitis and found that there was no significant association between them (P>0.05). The odds ratio is 4.5 and the same in the population will be 0.5 to 36.5 times.

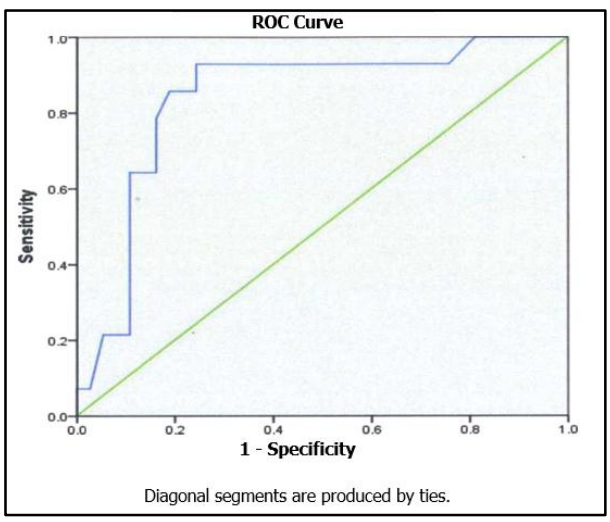

Figure 4.7. ROC Curve of CRP

Test Result Variable(s): Predicted probability

Aea	Std. Error	Asymptotic Sig.	Asymptotic 95% Confidence Interval	
			Lower Bound	Upper Bound
.839	.064	.000	.713	.965

Table 4.5. Area Under the Curve for CRP

CRP level	CAA	UCAA	Sensitivity	Specificity	PPV	NPV	Youden Index
>26.5	13	23	92.8%	75.8%	59.1	96.6	0.686
<2 6.5	1	14					
Total	**14**	**37**					

Table 4.6. Specificity and Sensitivity of CRP 26.5 mg/dl in CAA

Table- 4.6 states the cut off value is 26.5 of CRP. At this point the sensitivity is 92.8% and specificity is 75.8% and the Youden index is highest (0.686).

CRP Level	Sensitivity	Specificity	Youedn Index
>6	92.8	24.3	0.172
>26.5	92.8	75.8	0.686
>27.5	85.7	75.7	0.614

Table 4.7. Youden Index for different Values of CRP

Test Result Variable (s): WBC

Area	Std. Error[3]	Asymptotic Sig.[b]	Asymptotic 95% Confidence Interval	
			Lower Bound	Upper Bound
.700	.071	.029	.560	.839

Table 4.8. Area Under the Curve for White Cell Count

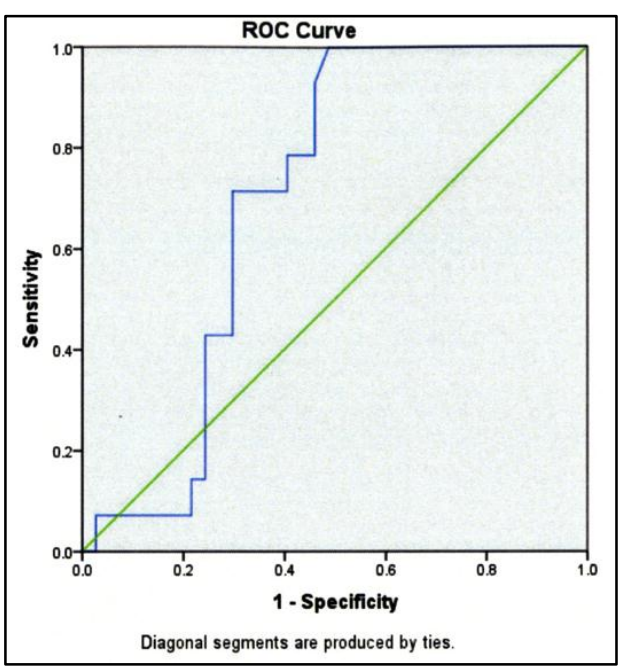

Figure 4.8. Prediction of White Cell Count Cut off Value by ROC Curve

Test Result Variable (s): WBC

WBC Level	CAA	UCAA	Sensitivity	Specificity	PPV	NPV	Youeden Index
>11150	11	15	78.6%	59.5%	42.3%	88.0%	0.381
<11150	3	22					
Total	**14**	**37**					

Table 4.9. Specificity and Sensitivity white cell count at 11150 & above

Table- 4.9 states the cut off value is 11150 of WBC. At this point the sensitivity is 78.6% and specificity is 59.5% and the Youden index is highest (0.381).

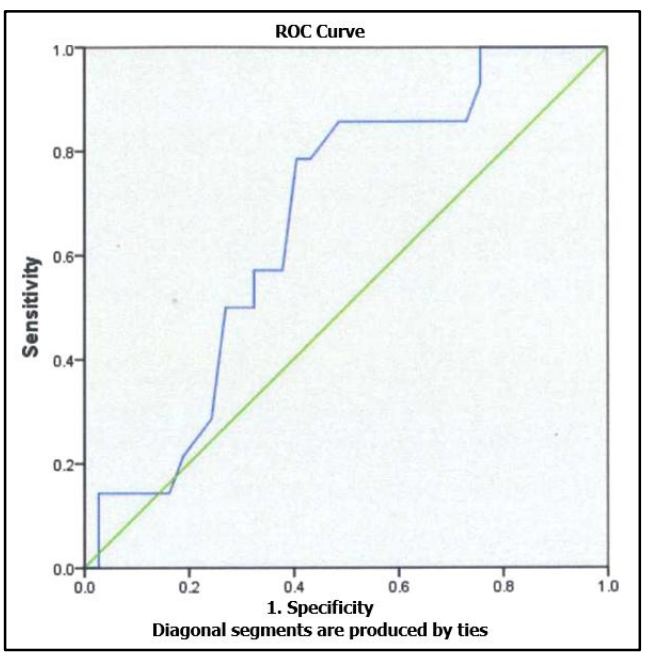

Figure 4.9. ROC Curve of Polymorph Percentage

WBC Level	Sensitivity	Specificity	Youeden Index
> 10800	78.6	56.8	0.354
>11150	78.6	59.5	0.381
>11550	71.4	59.5	0.309

Table 4.10. Youden Index for different Values of White Cell Count

Area	Std. Error[3]	Asymptotic Sig.b	Asymptotic 95% Confidence Interval	
			Lower Bound	Upper Bound
.666	.079	.069	.512	.821

Table 4.11. Area Under the Curve for Polymorph Percentage Test Result Variable (s): Polymorph

Polymorph Level	CAA	UCAA	Sensitivity	Specificity	PPV	NPV	Y ouden Index
>78.0	11	15	78.6%	59.5%	42.3	88.0	0.381
<78.0	**3**	**22**					
Total	**14**	**37**					

Table 4.12. Specificity and Sensitivity of Polymorph Percentage

Table- 4.12 states the cut off value is 78.0 of Polymorph level. At this point the sensitivity is78.6% and specificity is 59.5% and the Youden index is highest (0.381).

Polymorph level	Sensitivity	Specificity	Youden Index
>75.5	85.7	51.4	0.371
>78.0	78.6	59.5	0.381
>79.5	57.1	67.6	0.247

Table 4.13. Youden Index for different Values of Polymorph percentage

DISCUSSION

The definite diagnosis of appendicitis still remains a clinical decision augmented by appropriate tests. Total white cell count has remained an important factor in the definite diagnosis of appendicitis but this can be very non-specific at times. Recently interest has grown in other inflammatory markers which could be helpful in diagnosing appendicitis and C-Reactive Protein is one of them. A high degree of diagnostic accuracy is required to reduce the incidence of negative appendectomies which still remains around 20%.

In our study, for statistical analysis, the continuous variables were compared by students independent 't' test, the categorical variables were associated by % (Chi-square) test and the predictive values of total white cell count and CRP were calculated by Receiver Operating Characteristics (ROC) curve. The above analysis and interpretations were carried out by the statistical package IBM SPSS statistics 20.

The p-values less than 0.05 ($p<0.05$) were considered as significant in two test. The cut-off value of C-reactive protein was defined by drawing the receiver operating characteristic (ROC) curve with the relationship of sensitivity and specificity and obtaining the highest Youden index.

Blood inflammatory markers such as white blood cell counts and C-reactive protein levels are performed in patients clinically diagnosed as suffering from acute appendicitis. The importance of these investigations on decision making regarding further management has been studied widely.[5,6] There are reports which have investigated the value of the raised serum CRP values in improving the diagnosis of acute appendicitis.[7] Studies have shown that elevated levels of inflammatory markers increase the probability of acute appendicitis.[8] whereas others have concluded that patients with right lower quadrant pain with a normal WBC count and CRP level are unlikely to have acute appendicitis.[8,] To assess the role of C Reactive Protein in grading the severity of acute appendicitis by correlation with histopathological reports.

H.C. Kim et al. (2011) in their study on evaluation of relationships between blood inflammatory markers and CT findings concluded that total white cell count better detects early appendiceal inflammation and an elevated CRP level better detects perforated appendicitis.[9] In a double blind study Asfar et al. (2000) reported a sensitivity and specificity of CRP as 86.6% and 93.6%, respectively. They concluded that a normal CRP value probably indicates a normal non-inflamed appendix.[10] Erkassap (2000) in a positive study on 102 patients reported that sensitivity and specificity of the CRP were 96% and 78%, respectively; the positive predictive value was 100%J.[11] In a retrospective study, Wu and coworkers (2005) concluded that the combined usage of the WBC, neutrophil count, and the CRP monitoring increased the positive predictive value.[12]

Shefki Xharra [2012], Comments that their results and other studies as well clearly suggested that CRP leads to precise prediction of the severity of acute appendicitis. The positive predictive value of the CRP was 94.7%, specificity 72%, sensitivity 85.1%. WBC count was assessed, sensitivity of 85.1% and a specificity of 68%,; the positive predictive value was 94%. The neutrophil percentage with a sensitivity of 79.1% and the specificity 68%; the positive predictive value was 93.6%.[13] In his study Shozo Yokoyama (2009) concludes that only the CRP level is consistent with the severity of appendicitis, and considered to be a surgical indication marker for acute appendicitis with sensitivity =84.3%, specificity =75.8%, false positive rate =24.2%, false negative rate =15.7%, positive predictive value =64.2%, negative predictive value = 90.4%.[14]

The study by Hyoung-Min Moon by multivariate analysis demonstrated that C- reactive protein was an independent predictor for complicated appendicitis (odds ratio, 1.371; 95% confidence interval, 1.155 to 1.628; $P<0.001$) The cut-off value of C-reactive protein was set at 7.05 mg/dL by using receiver operating characteristic curve (0.805; sensitivity, 57.6%; specificity, 98.3%). In conclusion, in patients who have already been diagnosed as having appendicitis and for whom surgery has already been scheduled, if the value of C- reactive protein is higher than 7.05 mg/dL, to the surgeon should anticipate complicated appendicitis, decide on an appropriate operation time, select antibiotics, and explain the prognosis to the patient.[15] The observation by Sheikh MuzamilShafi (2009) stated that TLC had a sensitivity, specificity and positive predictive value of 97.82%, 55.55% and 91.8%, respectively. CRP had a sensitivity, specificity and positive predictive value of 95.6%, 77.77% and 95.6% respectively. Percentage of neutrophil count had a sensitivity, specificity and positive predictive value of 98.9%, 38.88% and 89.21%, respectively.[16]

Present study (2013) includes a total of 51 cases, who were all admitted with the clinical diagnosis of acute appendicitis, investigated and had undergone appendectomy. Based on the histopathology report they were grouped as complicated acute appendicitis and uncomplicated acute appendicitis depending on the presence of gangrenous changes or perforation. We had 14 cases (27.5%) in CAA and 37 cases (72.5%) in UCAA. The mean ages of uncomplicated acute appendicitis and complicated acute appendicitis were 24.4±9.7 years and 28.8±8.8 years respectively. The difference of 4.4 years was not statistically significant ($P>0.05$). This when compared with other studies has a low incidence of complicated cases which may be due to exclusion of paediatric cases and no elderly patients in the series or because the sample had only 51 cases while other studies had more than 100 cases.[13,15] Out of 51 cases studied 36 cases (70.5%) and 15 cases (29.5%) were males and females respectively making a ratio of 2.4:1. This value is higher than the values of 1.2 to 1.3:1 as seen in other studies.

Signs and symptoms such as pain RIF, RIF tenderness and Mc Burney's tenderness were 100.0% in both groups. Migratory pain history was present in 28 cases (54.9%), nausea and vomiting in 38 cases (74.5%), anorexia in 42 cases (82.3%) dysuria in 5 cases (9.8%) and bowel sounds were present in 45 cases (88.2%). These incidence had not been significantly associated with either CAA or UCAA. Fever in 28 cases (54.9%), guarding/rigidity in 28 cases (54.9%), rebound tenderness in 30 cases (58.8%) and cough tenderness in 35 cases (68.6%) were significantly associated with complicated acute appendicitis.

Laboratory studies can be helpful in the diagnosis of acute appendicitis but no single test is definitive. Blood inflammatory markers such as total white cell counts and C-reactive protein levels are performed in patients suspected of having acute appendicitis. A total white cell count is perhaps the most useful laboratory test and the count is slightly elevated in UCAA, but may be quite elevated in CAA. Mild increase in total white cell count ranging from 10000 to 18000 cells per cmm. is usually present in patients with UCAA and is often accompanied by a moderate polymorphonuclear predominance. Total white cell counts are variable and white cell count above this level increases the possibility of a perforated appendix with or without an abscess. In the present study the total white cell count was

more than 11000 cells/cmm in 11 cases (78.5%) in CAA and 16 cases (43.25%) in UCAA. The total white cell count has a mean value of 10797 cell/cmm in UCAA and 13107 cells/cmm with a difference of 2310 cells/cmm. The receiver-operating characteristic (ROC) curve indicated that the cut off value of total white cell count is 11150 cells/cmm. At this point the sensitivity is 78.6% and specificity is 59.5% and the Youden index is highest (0.381).

This was not statistically significant between UCAA and CAA ($p>0.05$). The polymorph percentage was more than 75% in 12 cases (85.7%) in CAA and 19 cases (51.3%) in UCAA. The mean polymorph of UCAA and CAA were 72 and 81.4 respectively. The difference 9.4 was statistically significant ($P<0.05$). The receiver-operating characteristic (ROC) curve indicated that the cut off value of polymorph is 78 and at this point the sensitivity is 78.6% and specificity is 59.5% and the Youden index is highest (0.381).

Tillet and Francis (1930) identified CRP as an acute-phase protein and this has been studied as a screening device for inflammation, a marker for disease activity and as a diagnostic adjunct. Physiologically, CRP enhances cell-mediated immunity by promoting phagocytosis, accelerating chemotaxis and activating platelets. Mustard et al. documented that serial postoperative CRP levels could predict septic complications before their clinical manifestations.[17] In many studies the accuracy of CRP in diagnosing acute appendicitis and the increase in CRP in acute appendicitis with perforation or gangrenous changes, which is related to the severity of appendiceal inflammation is well documented.[18] In the present study out of 14 cases in complicated acute appendicitis group 1 case (7.2%) was CRP negative and 13 cases (92.8%) were CRP positive. The CRP values ranged from 27 to 140 mg/dl with a mean value of 71.4 mg/dl. In the other uncomplicated acute appendicitis group of 37 cases CRP was positive in 28 cases (75.6%) and negative in 9 cases(24.4%) and the CRP values varied from 7 to 110 mg/dl with a mean value of 27.1 mg/dl. Mean CRP of 27.1 mg/dl in UCAA was significantly lesser than the mean CRP of 71.4 mg/dl in CAA and this is statistically significant ($p<0.001$) The receiver operating characteristic (ROC) curve indicated that the cut off value of CRP is 26.5 mg/dl and at this point the sensitivity is 92.8% and specificity is 75.8% and the Youden index is highest (0.686).

In our study of 51 cases the preoperative estimation of CRP is helpful in diagnosing acute appendicitis and is indicative of complications if the values are high. Even though the total white cell count did not show a statistically significant good correlation in diagnosis of acute appendicitis the increase in total white cell count in CAA cases were very significant. The receiver-operating characteristic (ROC) curve indicated that the cut off value of CRP is 26.5 mg/dl and at this point the sensitivity is 92.8% and specificity is 75.8% and Youden index is highest (0.686).

Rothrock SG (2000) in his study concludes that "Our study highlights the diagnostic predictability of WCC and CRP for simple acute appendicitis and a perforated appendix. A higher sensitivity of CRP than the WCC in the diagnosis of simple acute appendicitis has been reported in a few studies.[19] This study results are almost the same as our study.

CONCLUSION

Pre operative C reactive protein value and total white cell count in clinically diagnosed cases of acute appendicitis contribute to the diagnosis and grading of severity of the disease. Positive C reactive protein value (more than 6 mg/dl) is a good marker of acute appendicitis and a high C reactive protein value (more than 26.5mg/dl) is an indicator of complicated acute appendicitis.

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