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A Hospital Based Prospective Study to Assess the Clinical and Laboratory Parameters in Diagnosing Patients with Acute Appendicitis Admitted in Surgical Ward

Pradeep Kumar Garg[1], Rambilas Singh[2*]

[1]*Principal Specialist, Department of Surgery, District Hospital, Dholpur, Rajasthan, India*
[2]*Principal Specialist, Department of Surgery, District Hospital, Dholpur, Rajasthan, India*

Abstract

Background: Acute appendicitis is one of the most common general surgical emergency that has a lifetime risk of about 7%. The laboratory investigations namely white blood cell count (WBC), C-reactive protein (CRP) and erythrocyte blood sedimentation rate (ESR) are useful in diagnosing acute appendicitis. This study proposes to compare the various scoring systems in diagnosing a case of acute appendicitis and to suggest a scoring system which is suitable for our population. **Materials & Methods:** A hospital based prospective study is to be conducted on 50 patients admitted in department of general surgery at district hospital for appendicectomy during one year period. Informed consent will be taken from each respondent. The per-operative macroscopic appearance of the appendix specimen and subsequent histo-pathological study of the specimen is to be performed. Chi-square tests, Student's t tests, significance testing, and 95% Confidence Interval formulation are to be carried out wherever appropriate. **Results:** Acute appendicitis was more common in age group less than with more than 90.62% of patients with appendicitis being less than 40 years of age and is statistically significant (p value $< 0.05*$). The occurrence of acute appendicitis was significantly higher when the duration of symptoms was less than 2 days. This p value is statistically significant (p value $< 0.05*$). When the C reactive protein levels were higher than 10 mg/dl, the occurrence of acute appendicitis was significantly higher than in the patients with levels less than 10 mg /dl. The occurrence of acute appendicitis did not have any significant correlation with the serum bilirubin levels when the cut off was placed at 2 mg/dl in this study (p value $= 0.243$). When the ESR levels were higher than 15 mm/hr, the occurrence of acute appendicitis was significantly higher than in the patients with levels less than 10 mg /dl. The p value is $< 0.05*$. The various scoring systems analyzed were compared among themselves and along with the combined predictor score formulated. **Conclusion:** We concluded that there must be early and prompt diagnosis, adequate resuscitation as well as early surgery in patients with acute appendicitis to keep the morbidity and mortality low. In patients with equivocal findings, imaging studies and laboratory tests should be ordered to help confirm the diagnosis.

Keywords: Acute Appendicitis, Scores, CRP Level, Clinical Parameters.

Introduction

Acute appendicitis is one of the more common surgical emergencies with a lifetime prevalence rate of one in seven. The diagnosis of acute appendicitis is purely based on history and clinical examination combined with laboratory investigations such as white blood cell count. However due to variation in clinical presentation and findings making a correct diagnosis of appendicitis is challenging. This leads on to missed diagnosis in about of 20% of patients initially and a negative appendicectomy rate of 14 – 40%. A delay in diagnosis and subsequent treatment leads on to appendicular perforation and a significant increase in morbidity and mortality. The surgeon's goals are to evaluate patients referred for suspected appendicitis and to minimize the negative appendectomy rate without increasing the incidence of perforation[1].

Acute appendicitis is one of the most common general surgical emergency that has a lifetime risk of about 7%[2]. The peak age of incidence is from 10 years to 30 years[2]. The diagnosis of acute appendicitis has been made by history and physical examination for more than a century now. The incidence of acute appendicitis has fallen dramatically nowadays and the individual lifetime risk of appendicectomy is 8.6% and 6.7% among males and females respectively[1].

The disease is commonest in the second and third decades of life and rare in the under twos and the elderly although in the latter age groups the complication rates are higher[1]. Males are more affected than females and the disease is commoner in individuals of higher social status.

The laboratory investigations namely white blood cell count (WBC), C-reactive protein (CRP) and erythrocyte blood 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. Until recently it is stated that perforated appendicitis has been associated with hyperbilirubinaemia[3]. This study proposes to compare the various scoring systems in diagnosing a case of acute appendicitis and to suggest a scoring system which is suitable for our population.

Materials & Methods

A hospital based prospective study is to be conducted on 50 patients admitted in department of general surgery at district hospital for appendicectomy during one year period. Informed consent will be taken from each respondent.

Inclusion Criteria

1. Patients scheduled for appendectomies for acute appendicitis.
2. Patients older than 12 years of age.

Exclusion Criteria

1. Patients younger than 12 years of age
2. A documented history of viral hepatitis, chronic liver disease and haemolytic diseases.
3. Patients preoperatively diagnosed as appendicular abscess.
4. Pregnant women.

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*Correspondence

Dr. Rambilas Singh
Principal Specialist, Department of Surgery, District Hospital, Dholpur, Rajasthan, India.
E-mail: rambilassingh@yahoo.com

Methods

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

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Preformed Performa which includes the demographic profile of each patient, history pain, fever, nausea, vomiting, dysuria and anorexia, clinical examination findings such as RIF tenderness, guarding, rigidity, rebound tenderness, Rousing sign and elevated temperature. Laboratory investigations such as WBC total count & differential count, CRP, Urine analysis are to be done.

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

Statistical Analysis

Data is to be analyzed using the statistical package SPSS 21. Chi-square tests, Student's t tests, significance testing, and 95% Confidence Interval formulation are to be carried out wherever appropriate.

Results

Acute appendicitis was more common in age group less than with more than 90.62% of patients with appendicitis being less than 40 years of age and is statistically significant (p value < 0.05*). There was no statistical significant correlation noted in the incidence of acute appendicitis based on the patient's sex (p>0.05) (table 1).

The occurrence of acute appendicitis was significantly higher when the duration of symptoms was less than 2 days. This p value is statistically significant (p value < 0.05*) (table 1).

When the C reactive protein levels were higher than 10 mg/dl, the occurrence of acute appendicitis was significantly higher than in the patients with levels less than 10 mg /dl. The p value is < 0.05* (table 1).

The occurrence of acute appendicitis did not have any significant correlation with the serum bilirubin levels when the cut off was placed at 2 mg/dl in this study (p value = 0.243).

When the ESR levels were higher than 15 mm/hr, the occurrence of acute appendicitis was significantly higher than in the patients with levels less than 10 mg /dl. The p value is < 0.05* (table 1).

The various scoring systems analysed were compared among themselves and along with the combined predictor score formulated. The results are tabulated below in table no. 2.

Table 1: Clinical and Laboratory Parameters in Diagnosing Patients with Acute Appendicitis

Clinical and Laboratory Parameters	Acute appendicitis (N=32)	Normal appendix (N=18)	P-value
Age (yrs)			
<40 yrs	29	13	<0.05*
>40 yrs	3	5	
Sex			
Male	21	9	>0.05
Female	11	9	
Duration of symptoms			
<2 days	27	2	<0.05*
>2 days	5	16	
CRP levels (mg/dl)			
<10 mg/dl	5	12	<0.05*
>10 mg/dl	27	6	
Serum bilirubin levels (mg/dl)			
<2 mg/dl	28	17	>0.05
>2 mg/dl	4	1	
ESR (mm/hr)			
<15 mm/hr	5	12	<0.05*
>15 mm/hr	27	6	

Table 2: Comparison of results by various score

Parameter	Alvarado	MASS	Teicher	Fenyo	Ohmann	RIPASA	Combined Predictor Score
Sensitivity	86.59%	80.49%	97.56%	60.98%	96.34%	97.56%	95.12%
Specificity	88.89%	82.22%	82.22%	97.78%	88.89%	82.22%	95.56%
PPV	93.42%	89.19%	90.91%	98.04%	94.05%	90.91%	97.50%
NPV	78.43%	69.81%	94.87%	57.89%	93.02%	94.87%	91.49%
Diagnostic accuracy	87.40%	81.10%	92.13%	74.02%	93.70%	92.13%	95.28%

Discussion

Physical examination and medical history remain the cornerstones of good clinical practice in patients presenting with acute abdominal pain localized in the right lower abdominal quadrant. White blood cell (WBC) count, erythrocyte sedimentation rate, and sometimes serum C-reactive protein (CRP) may be helpful[4-6]". However, a recent report on the diagnostic value of medical history, clinical presentation, and indices of inflammation, including CRP in a group of 496 patients with suspected AA showed that none of the individual variables had sufficiently high discriminating power to be used as a diagnostic test[7]. "The presence of anorexia, nausea, and right-sided rectal tenderness had no diagnostic value. In one study, leukocyte and WBC counts, CRP, rebound tenderness, guarding, and gender were independent predictors of AA; the combined area under the receiver operating characteristic (ROC) curve was 0.93 for AA, showing the value of combining several parameters. A normal serum CRP level was recently shown to correlate strongly with a normal appendix in patients with suspected appendicitis[8]. "A meta-analysis of studies addressing these issues has shown an increased likelihood of AA when a positive psoas sign, fever, or pain migrating to the right lower abdominal quadrant was present; vomiting before the onset of pain made appendicitis less likely[9]. A study by Bohner showed a maximum positive predictive value of 85 percent when a combination of three out of five clinical parameters were present[10]. Rectal examination was not shown to contribute to a definite diagnosis of AA[11].

We found that RIPASA scoring system and Teicher's score have got the best sensitivity and negative predictive value while Fenyo's scoring system is more specific and has the highest positive predictive value. Ohmann's scoring system has the best diagnostic accuracy among other scoring systems[12-18].

Conclusion

We concluded that there must be early and prompt diagnosis, adequate resuscitation as well as early surgery in patients with acute

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appendicitis to keep the morbidity and mortality low. In patients with equivocal findings, imaging studies and laboratory tests should be ordered to help confirm the diagnosis.

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