

Evaluation of the Alvarado Score and Serum C-reactive protein in patients with acute Appendicitis: A Prospective Observational Clinical study

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ABSTRACT

Background and Aim: Acute appendicitis (AA) is a common surgical condition and a frequently suspected differential diagnosis in patients presenting with acute right lower abdominal pain. The aim of study was to assess the alvarado score and serum C-reactive protein as a predictor of severity in patients with acute appendicitis.

Materials and Methods: Total 200 patients were included in this study. Patients with acute appendicitis admitted to the Department of General Surgery, Chalmeda Anand Rao Institute of Medical Sciences, Karimnagar. Alvarado score which takes into account symptoms, signs and the laboratory parameters were ascertained to each of the patient in this group. The total score was not calculated until after the appendicectomy.

Results: Age of patients varies from 13 to 65 years and it is observed that maximum number of patients were in the age group of 13 to 25 years which accounted for 46% of total cases. It is evident that the appendicitis is more common in young adults.

Conclusion: The majority of appendicitis cases were seen in young adults of age 13 to 25 years. There was a positive correlation between the alvarado score and CRP elevation in cases of acute appendicitis.

Keywords: Alvarado score, Serum C - reactive protein

INTRODUCTION

Acute appendicitis (AA) is a common surgical condition and a frequently suspected differential diagnosis in patients presenting with acute right lower abdominal pain. [1] Simple appendicitis can progress to perforation which is associated with a much higher morbidity and mortality and surgeons have therefore been inclined to operate when diagnosis is probable rather than wait until it is certain.[2]

It has been claimed that diagnostic aids can dramatically reduce the number of appendicectomies in patients without appendicitis, the number of perforations and time

spent in hospital. Various scoring systems are used to aid in diagnosing acute appendicitis. The Alvarado score is a 10 point scoring system for the diagnosis of appendicitis, based on clinical signs and symptoms and a differential leucocyte count (8 parameters). [3]

The life time rate of appendectomy is 12% for men and 25% for women, with 7% of all people would undergo appendectomy for acute appendicitis during their lifetime.[4]

In 1986, Alvarado described a scoring system, which has been validated in adult surgical practice. This scoring system includes eight variables: three symptoms

(migrating pain from the umbilicus to the right iliac fossa, anorexia, and vomiting), three signs (tenderness, rebound tenderness, and pyrexia) and two laboratory data (leukocytosis and shifting to the left of neutrophil maturation index) yielding a total score of 10.^[5]

C-reactive protein (CRP) is an acute phase protein that is often relied-on by many surgeons as a diagnostic marker of acute appendicitis.^[6] Actually, there is no strong evidence supporting its use in the diagnosis of acute appendicitis and related clinical data are controversial.^[7,8]

The purpose of study was to evaluate the Alvarado score and serum C-reactive protein in predicting the severity of acute appendicitis. The severity is determined by preoperative findings and the histopathological diagnosis, which is taken into account as the final diagnosis.

MATERIALS AND METHODS

Study Design

The study was a prospective observational clinical study

Samplings

Total 200 patients were included in this study.

Study center

Department of General Surgery, Chalmeda Anand Rao Institute of Medical Sciences, Karimnagar

Study Duration

Study period from July 2017 to October 2019.

Inclusion Criteria:

1. Patients of age group 16 years or older with acute appendicitis who underwent surgery

Exclusion Criteria:

1. Patients who were not operated
2. Patients with any major co-morbid illness
3. Patients below 15 years old

Alvarado score which takes into account of symptoms, signs and the laboratory, parameters will be ascertained to each of the patient in this group. The total score was not calculated until after the appendicectomy.

The Study population was divided into subgroups based on Alvarado score as

- 1). Those with Alvarado score of <7
- 2). Those with Alvarado score of =7

The histopathological report was categorized into

1. Histologically unremarkable

2. Simple appendicitis

3. Complicated appendicitis (gangrene/perforation)

Alvarado Scoring system

Feature	Score
Migration of Pain	1
Anorexia	1
Nausea	1
Tenderness in right lower quadrant	2
Elevated temperature	1
Leucocytosis	2
Shift of WBC count to the left	1
Total	10

Finally accuracy of CRP and Alvarado score in predicting severity of acute appendicitis was evaluated.

Ethics Approval

Ethical clearance was obtained from the Ethics Committee of the Institute Ethics Committee, Chalmeda Anand Rao Institute of Medical Sciences, Karimnagar.

All patients gave their written informed consent to participate in the study.

STATISTICAL ANALYSIS

Data were fed to the computer using SPSS software package version 20.0. Qualitative data were described using number and percentage.

RESULTS

During the study period, 200 patients were admitted in the Department of General Surgery, with symptoms and signs suggestive of acute appendicitis, and underwent emergency open appendicectomy during the period from April 2018 to March 2019 were included in the study.

Table 1: Gender distribution

Gender	Frequency	Percentage
Male	135	67.5
Female	65	32.5
Total	200	100

Table 1 shows the above observations show that appendicitis is relatively common in male patients (67.5%) when compared with female patients (32.5%).

Table 2: Age distribution

Age group	Frequency	Percentage
13-25	92	46.0
26-35	36	18
>35	72	36
Total	200	100

Table 2 shows Age of patients vary from 13 to 65 years and is observed that maximum number of patients were in the age group of 13 to 25 years which accounted for 46 %. It is evident that appendicitis is more common in young adults.

Table 3: Operative findings

Operative findings	Frequency	Percentage
initially inflamed appendix	99	49.5
Grossly inflamed appendix	55	27.5
Gangrenous appendix	4	2
Perforated appendix	42	21
Total	200	100

It was observed that 49.5 % of the cases had minimally inflamed appendix, 27.5 % had grossly inflamed appendix, 2 % had gangrenous appendix and 21% had perforated appendix. Most of the operated cases were minimally inflamed and where as gangrenous appendix was least encountered (Table 3).

Table 4: Post Operative histo-pathological report

HPR	Frequency	Percentage
Histologically unremarkable	41	20.5
Simple Appendicitis	105	52.5
Complicated Appendicitis	54	27
Total	200	100

Table 4 shows based on histopathological diagnosis, 52.5 % had simple appendicitis whereas 27% had complicated appendicitis. On the other hand, rate of negative appendectomy was around 20.5%.

Table 5: Mean of Age and Total Alvarado Score

	N	Mean	Std. deviation	Std. Error Mean
Mean Age	200	29.9	15.107	1.068
Total Alvarado Score	200	6.42	2.06	0.146

DISCUSSION

Appendicitis is the most common abdominal surgical emergency and appendectomy is one of the most frequently performed abdominal operations. This is a burden faced not only by the General Surgeons but also by the patient and the society as a whole, since appendectomy, like any other operation, results in socio-economic impacts in the form of hospital expenses, loss of working days, and declined productivity.

The present study showed, the most of appendicitis patients were young adults, age group (13-25) that is 46%, followed by older age group above 35 years that is 36%. It is more common in males (67.5%). In this study mean CRP in each histo-pathological category was calculated. Mean CRP in histologically unremarkable category is only 1.8317mg/dl where as it is 7.743 mg/dl in simple appendicitis. The mean CRP is significantly high in complicated appendicitis which is 23.313mg/dl. These results are comparable to similar studies.

The Alvarado score is simple to use and easy to apply, since it relies only on history, clinical examination and a basic laboratory investigation. Mean Alvarado score in each histopathological group were calculated. Mean Alvarado score in histologically unremarkable group is 4.78. It is significantly high in simple appendicitis and complicated appendicitis which are 6.52 and 7.33 respectively. Results obtained are similar to study done by Md. Omar Afsal et al.^[9]

These results indicate that both Alvarado score and CRP can predict the severity of appendicitis. Both were compared using ROC curve and it is found that CRP is better in predicting the severity of appendicitis than the Alvarado score.

The Alvarado score is a 10-point scoring system based on clinical signs and symptoms and a differential count. Alvarado recommended an operation for all patients with a score of 7 or more and observation for the patients with scores 5 or 6. A high score was found to be an easy and satisfactory aid to early diagnosis of acute appendicitis in children and men, but had a high false - positive rate in women. In present study, patients were grouped into two groups based on the Alvarado score, < 7 group and most of the complicated appendicitis were in Alvarado score = 7 group that is 51 %.

CONCLUSION

In conclusion, the majority of appendicitis cases were seen in young adults of age 13 to 25 years. Complicated appendicitis is also more common in young adults. Alvarado score and CRP estimation are useful aids in diagnosing appendicitis. Alvarado score can be used for

assessing the severity of appendicitis. In the presence of a normal CRP and normal Alvarado score diagnosis of appendicitis is unlikely and needs further study to determine other possible causes of right iliac fossa (RIF) pain and tenderness.

CONFLICT OF INTEREST:

The authors declared no conflict of interest.

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