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Original Research Article

A prospective study of accuracy of modified Alvarado score in patients with acute appendicitis in tertiary care hospital

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ABSTRACT

Background: Acute appendicitis is the most common acute emergency of the abdomen. Clinical diagnosis of acute appendicitis is challenging in most of situation. The present study was designed to evaluate the role of modified Alvarado scoring system in diagnosis of acute appendicitis.
Methods: One hundred consecutive patients presenting in the department of surgery Geetanjali Medical College and Hospital from January 2014 to 2016 were included. Demographic characteristics, symptoms and signs, laboratory results were recorded. Data was collected using a pre-tested questionnaire and analyzed using statistical calculation.
Results: In the present study 100 patients were studied in a period of two years. Maximum percentage of patients were in age group 20-30 years and males dominated the series. The sensitivity and specificity of modified Alvarado score was 91.57% and 76.47% respectively with positive predictive value 95% and negative predictive value 65% and diagnostic accuracy of 89%.
Conclusions: This study shows that use of modified Alvarado scoring system in patients with acute appendicitis provides a high degree of diagnostic accuracy.

Keywords: Appendicitis, Appendicectomy, Modified Alvarado Scoring System (MASS)

INTRODUCTION

Acute appendicitis is the most common cause of emergency care in hospitals and it is the most frequent abdominal inflammatory disease of surgical treatment in young people.[1,2] It predominates in males in ratio of 1.4:1 and the lifelong risk of developing it is 8.6% for men and 6.7% for women.[3]

Abdominal pain is the most common and early symptom, it starts in the mesogastric region and migrates to the right iliac fossa, having a strong association with the diagnosis of acute appendicitis.[4,5]

A case of appendicitis can progress to perforation and other life-threatening complications, which is associated with higher morbidity and mortality, and the surgeons are left with no option than to operate, when diagnosed clinically rather than to wait until it is confirmed. A scoring system for early diagnosis of acute appendicitis was developed by Alvarado in 1986; based on clinical sign, symptoms and with differential leucocyte count, with a left shift of neutrophil maturation yielding a total score of 10; known as Alvarado score.[6] Kalan et al omitted the left shift to neutrophil maturation parameter and produced a modified Alvarado score.[7] It is a 9 point scoring system that helps in increasing the accuracy of preoperative diagnosis and thus reducing negative appendicectomy rate, score of 7 or more were recommended for surgery.

In recent years ultrasound (US) and computed tomography (CT) have been widely used in patients with a clinical feature of acute appendicitis to clarify the

diagnosis.[8] The ultrasound has a sensitivity of 85%, however CT has higher accuracy.[9,10]

The aim of present study is to validate the user friendly pre-operative diagnostic method based on prospectively collected data from patients admitted for suspected appendicitis incorporating the modified Alvarado score.

METHODS

Patients of all age groups varying between 7-70 years of age, both male and female, presented in casualty, outpatient department and indoor with the clinical features suggestive of acute appendicitis were selected non-randomly for the study. One hundred patients were taken for the study.

Exclusion criteria

Patients with appendicular lump were excluded in the study.

Data was collected as modified Alvarado score; ultrasonography and histopathological reports were collected. Alvarado score of more than 7 were taken as positive and less 7 as negative. Histopathology showing inflamed appendix were taken as positive, a normal appendix as negative.

Data analysis

Categorization of different parameters were performed by simple statistical methods like standard table, pie diagrams and bar charts etc.

Sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) of diagnostic investigation were calculated. An excel sheet was used for data collection and statistical analysis was done.

RESULTS

During the study period of two year 100 patients were studied. Eighty patients were having score >7, underwent emergency surgery except one patient.

Table 1: Detailed analysis of modified Alvarado scoring system.

Parameters	Manifestations	Score
Symptoms	Migratory pain	1
	Anorexia	1
	Nausea/vomiting	1
Signs	RIF tenderness	2
	Rebound tenderness	1
	Elevated temperature	1
Laboratory test	Leucocytosis (>10,000/m^3)	2
Total score		9

RIF-Right iliac fossa

Twenty patients were having MASS of <7 were treated conservatively and observed and re-evaluated after twenty-four hours. Patients with increased score underwent surgery and those with decreased score were discharged home (Table 5). The male female ratio was 3.5:1 and the maximum incidence was in age group of 21 to 30 years (Figure 1) (Table 2). Common presenting symptom was pain in right iliac fossa (97%), nausea (87%), fever (86%) (Figure 2).

Table 2: Age distribution.

Age in years	No. of patients	Percentage
0-20	20	20%
21-30	32	32%
31-40	18	18%
41-50	18	18%
>50	12	12%

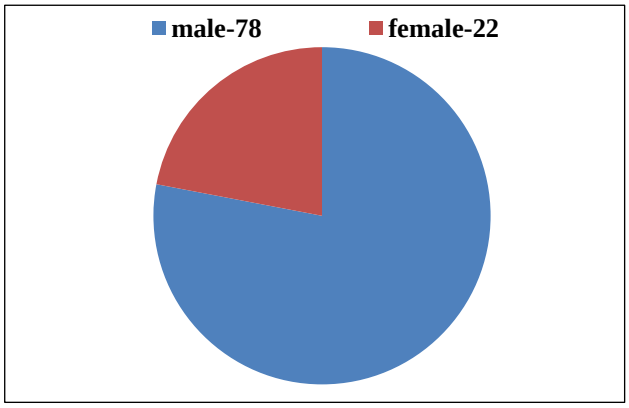

Figure 1: Sex distribution (total cases 100).

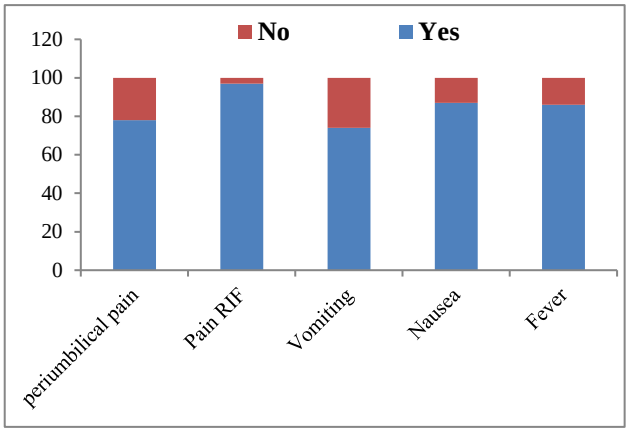

Figure 2: Signs and symptoms.

All the patients underwent appendicectomy, their appendices were subjected to histopathological examination and 71(88.75%) were confirmed having acute appendicitis (Figure 3).

The sensitivity of system was calculated as 91.57%and specificity 76.47%, with a positive predictive value of 95% and negative predictive value of 65% (Table 7).

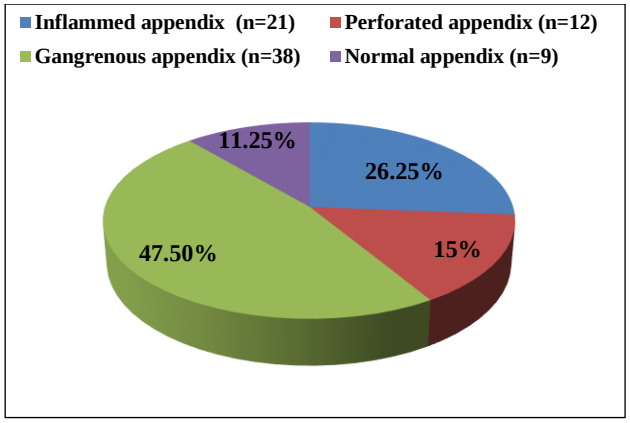

Figure 3: Histopathological finding (total cases n=80).

Table 3: Alvarado score.

Alvarado score	No. of patients	Percentage
<7	20	20
>7	80	80

DISCUSSION

In the present series author have divided modified Alvarado score system in two groups. First group with score >7 termed as MAS positive and second with a score <7 termed as MAS negative. Present study observed maximum incidences of acute appendicitis in age group 21-30years (32%) most of them were male patients 78% and 22% were female patients. Similar incidence of age in second and third decade was also documented in literature by Talukder et al and Singh K et al.[11,12] Out of 100 patients 78 (78%) were male and 22 (22%) were female patients. Right iliac fossa tenderness was present 97% of patients which is comparable to study of Kumar R.[13]

Nausea was noted in 87% of patient and vomiting was noted in 74% patients more than the study of Bon TD.[14] Periumbilical pain was noted in 78% patients which is same as in other studies.[15,16] The role of MAS system in the diagnosis of acute appendicitis was assessed .The study shows that use of scoring system in patients suspected of acute appendicitis provided a high degree of sensitivity and specificity as 91.57% and 76.47% respectively and a positive predictive value of 95%and negative predictive value of 65%. Schirzad N et al documented low result with a sensitivity of 71.2% and specificity of 83.3% and positive predictive value of 89.9% and negative predictive value of 11.5%.[17]

Table 4: Result of the treatment plan of score >7.

Sex	No. of cases	Treatment plan		Confirmed appendicitis	
		Conservative	Appendicectomy	No. of cases	%
Male	56	1*	55	54	98.1%
Female	24		24	22	91.6%
Total	80		79	76	96.2%

*1 case was treated conservatively because patient refused for surgery and underwent interval appendicectomy

Table 5: Result of the treatment plan of score <7.

Sex	No. of cases	Treatment plan		Confirmed appendicitis	
		Conservative	Appendicectomy	No. of cases	%
Male	12	3	9	4	44%
Female	8	2	6	3	50%
Total	20	5	15	7	47%

Table 6: Sensitivity and specificity of modified Alvarado score.

Diagnostic test result	Appendicitis	Non-appendicitis	Total
Score >7 (positive)	True positive- 76	False positive- 4	80
Score <7 (negative)	False negative-7	True negative-13	20
Total	83	17	100

Table 7: Alvarado score of different diagnostic test.

Diagnostic test	Percentage
Sensitivity	76/83x100=91.57%
Specificity	13/17x100=76.47%
Positive predictive value	76/80x100= 95%
Negative predictive value	13/20x100 = 65%
Diagnostic accuracy	76+13/100x100=89%

Authors documented similar result with a sensitivity and specificity of 88.08% and 75% respectively.[18]

In the present study the positive predictive value and negative predictive value for Modified Alvarado score is 95% and 65% respectively. Wade DS et al showed their findings of study with a positive predictive value and negative predictive value of 82% and 62% respectively.[19]

Sarasom P reported 95% positive predictive value.[20] Almagir et al had documented 83% positive predictive value.[21] Low positive and negative predictive value of about 77% and 52%.[22] In the present study Diagnostic accuracy was 89% and Schirzad N et al documented it about 78.7%.

Overall, in the present study, the sensitivity, specificity, positive predictive value and negative predictive value are 91.57%, 76.47%, 95% and 65% respectively. The diagnostic accuracy was 89%. The obtained values in the study of Tekeli MT et al, was 75.2%, 76.1%, 90.2%, 50.9% and 75.4% respectively.[23]

CONCLUSION

From the present study it was concluded use of Modified Alvarado Scoring system is a simple and effective system in Diagnosis of acute appendicitis. A cut off point of 7 for mass score will yield more sensitivity and a better diagnosis of Acute Appendicitis and it can be used to improve diagnostic accuracy of acute appendicitis and subsequently reduce the negative appendicectomy.

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