

Efficacy of modified Alvarado scoring system as a diagnostic tool for acute appendicitis

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Abstract

Background: Acute appendicitis is one of the common surgical emergencies. Different scoring systems have been used to diagnose appendicitis. The aim and objective of this study is to evaluate the efficacy of Modified Alvarado scoring system (MASS) in the diagnosis of acute appendicitis, to reduce the rate of negative appendicectomy. **Material and Methods:** A total of 100 hospitalized cases of suspected appendicitis were scored out of 9 according to Modified Alvarado score. All the patients underwent appendicectomy. The specimen of appendix was sent for histopathological examination to analyze efficacy of MASS in the diagnosis of acute appendicitis. **Results:** 88 cases were having Modified Alvarado Score 7 or more, out of which 80 cases reported with positive histopathology report. Rest 12 cases were having equivocal score i.e. less than 7, of which 8 cases reported with positive histopathology. The overall negative appendicectomy rate of this whole study was 12%. **Discussion:** The accuracy of diagnosis is more in patients with high MASS score. Patients with low score should be kept under observation. Score sensitivity is more in male than female patients. The diagnostic score may be used as a guide to decide whether the patients need surgery or observation. This scoring systems can be used as a cheap and inexpensive way for conclusive diagnosis of acute appendicitis.

Keywords: Acute appendicitis, Modified Alvarado scoring system, sensitivity.

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INTRODUCTION

It has been over 100 years, since Reginald Fitz presented his classic paper describing the clinical features of appendicitis¹. Since then acute appendicitis has remained the most common disease in surgical practice². Although a common surgical disease, it continues to remain a diagnostic problem and can baffle best of the clinician. Presentations of acute appendicitis can mimic variety of acute surgical pathologies. Despite extra ordinary advances in modern radiography imaging and diagnostic laboratory investigations, the accurate preoperative diagnosis of acute appendicitis remains as enigmatic

challenge. Early diagnosis is a primary goal as delay in diagnosis definitely increases the morbidity, mortality and cost of treatment. Another important issue is decreasing the negative appendicectomy rate³. Over the last two decades, different protocols have been introduced and tested by different researchers which include Lidverg, Fenyo, Christian, Ohman and Alvarado scoring system to make an early diagnosis of this sometimes very elusive disease. Alvarado in 1986 introduced a criterion for the diagnosis of acute appendicitis which was later modified to accommodate additional parameters along with original Alvarado scoring system⁴⁻⁷.

MATERIAL AND METHODS

This prospective study included 100 consecutive cases hospitalized with right lower quadrant abdominal pain suspected of acute appendicitis. Patients presenting with right iliac fossa lump/mass suggestive of appendicular lump and children aged less than 14 years were excluded from the study. All the included patients were evaluated according to the Modified Alvarado Scoring System (MASS). In this study Alvarado score was slightly modified excluding one laboratory finding, shift to left of neutrophil maturation as this investigation was not

available from our laboratory on emergency basis. Therefore, our patients were scored out of 9 rather than 10 points. Leukocytosis was defined as total leucocyte count to the excess of 10,000/ cu.mm and oral temperature >37.5°C was considered positive.

Table 1: Modified Alvarado Scoring System (MASS)

Symptoms	Score
Migratory right iliac fossa pain	1
Nausea/vomiting	1
Anorexia	1
Signs	
Tenderness in right iliac fossa	2
Rebound tenderness in right iliac fossa	1
Elevated temperature	1
Laboratory findings	
Leukocytosis	2
Total Score	9

All patients were subjected to ultrasonography of whole abdomen preoperatively. The diagnosis of acute appendicitis was made clinically and the decision for appendectomy was taken by the qualified surgeon. Patients with Modified Alvarado score of more than 7 were operated after taking written informed consent and necessary investigations if any. Findings on exploration were noted down for further reference. The specimen of appendix was sent for histopathological examination. The report of histopathology was correlated to analyze appropriateness and correctness of the use of MASS in the diagnosis of acute appendicitis and its effectiveness in decreasing negative appendectomies.

RESULTS

Majority of the patients (49%) were in the age group of 21-30 years followed by 14-20 years. Out of 100 patients, 62 were male and 38 were female. Acute appendicitis has slightly male preponderance with male to female ratio of 1.6:1. On clinical examination, tenderness in right iliac fossa was present in all the cases with migratory right iliac fossa pain and anorexia, vomiting in most of the patients. Elevated temperature was seen in 56 cases, while leukocytosis was present in 4% cases only. USG was suggestive of probe tenderness in right iliac fossa in only 18 patients. In rest of the 82 cases, USG was suggestive of acute appendicitis. All the 100 cases appendectomy was done and resected specimen of appendix was sent for histopathology examination. Intra-operatively, in 82% cases inflamed appendix was found, whereas in 4% and 2% cases congested and gangrenous appendix was found. In 12% cases appendix was found to be normal.

Table 2: Histopathological findings in all cases

Histopathological findings	No. of patients
Acute appendicitis (Total=88)	
Acute inflammation	18
Acute suppurative appendicitis	14
Acute appendicitis with periappendicitis	26
Acute on chronic appendicitis	22
Acute on chronic appendicitis with periappendicitis	06
Acute gangrenous appendicitis with periappendicitis	02
Normal appendix (Total =12)	12

Table 3: Correlation of Modified Alvarado Score with Histopathology Reports

Modified Alvarado score	Total	Positive Histopathology report	Percentage
Score > 7	88	80	90.9
Positive			
Equivocal	12	8	66.6
Total	100	88	88.0

In this study out of 100 cases, 88 cases were having Modified Alvarado Score 7 or more, out of which 80 cases reported with positive histopathology report. Rest 12 cases were having equivocal Modified Alvarado Score i.e. less than 7, of which 8 cases reported with positive histopathology.

DISCUSSION

In present study, acute appendicitis was more common in the age group of 14-30 years. Epidemiological studies have shown that appendicitis is more common in the 10-29 years of age group⁸. It has slightly male preponderance. Male is more susceptible than female⁹. Lewis *et al*¹⁰ and Ronan ‘O’ Connell¹¹ also found similar observations. The diagnosis of acute appendicitis still remains a challenge for surgeons. A negative rate of appendectomy of 20% is common in surgical literatures¹². Pain in the right iliac fossa was present in all 100 patients (100%) in this study which is similar to Gallego *et al*(96.4%)¹³ and Schwartz SI(100%)². Right iliac fossa tenderness was present in all the 100 (100%) cases at the time of presentation which is similar to Gallego *et al*(94%)¹³, Kalan M *et al*(95%)¹⁴, Mathews *et al*(99.1%)¹⁵ and dissimilar to Bhattacharjee *et al*(92%)¹⁶. Anorexia, nausea and vomiting nearly always accompanies appendicitis. Anorexia was present in 76% of patients in present series which is similar to Kalan M *et al*(85%)¹⁴, nausea was present in 73% and vomiting was present in 60% of cases which is dissimilar to Owen TD *et al*(Nausea in 84% and vomiting in 78%)⁵, Mathews *et al*(Nausea in 92% and vomiting in 70.9%)¹⁵, Schwartz SI(Nausea in 90% and vomiting in 75%)². In 40% of cases, rebound tenderness was present which is similar to Schwartz SI(50%)¹⁶. Fever was present in 56 cases out of 100 cases (56 which is similar to Wilcox *et al*(60%)¹⁷.

White blood cell count more than 10,000 cells/cumm was found in 96% of cases which is similar to Elongovan S(90%)¹⁸ and dissimilar to Gallego *et al*(65%)¹³. The present study shows negative Appendectomy rate of 12.90% in males and 10.52% in females which is dissimilar to Bhattacharjee *et al*(6.9% in males and 19.1% in females)¹⁶ and dissimilar to Mohanty *et al*(4.8% in males and 6.7% in females)¹⁹. In males negative appendectomy rate is high as compared to females. Lone *et al*¹⁶ has shown in their study that sensitivity in the same score was more in male than female patients. Lower values in female patients were due to presence of diseases in genital system i.e. ovaries, salpinges etc. Therefore, additional investigations may be required to confirm the diagnosis in females. Out of the 100 patients studied in this series, 12 patients were having negative histopathology reports hence the overall negative appendectomy rate of this whole study was 12% which is similar to Gyomber *et al*(15%)²⁰, Mohammad *et al*(12%)²¹ and Chairrok Limpawattanasiri(14.7%)²². Many surgeons opined that maximum 15-20% negative appendectomy is acceptable²³. Negative appendectomy rate was 12% in the present study of 100 cases which is comparable to the standard rate which is considered to be approximately 20%. Removal of normal appendices is inevitable to lower the rate of perforation and consequent morbidity and mortality. Whereas, unnecessary appendectomy carries long term risks to the patients²⁴. From this study it was found that higher the Modified Alvarado score, more of its sensitivity. In this study modified Alvarado scoring system showed that the accuracy of the diagnosis was very dependable and acceptable in higher scores but patients with lower scores should be under observation. The diagnostic score may be used as a guide to decide whether the patients need surgery or observation. The scoring systems like Modified Alvarado Scoring System can be used as a cheap and inexpensive way for conclusive diagnosis of acute appendicitis.

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