

A study of Accuracy of Alvarado scoring system in Acute Appendicitis

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Abstract: Acute appendicitis is a common surgical emergency with a lifetime risk of 1 in 7. Early recognition of the condition and prompt operation have been the most important factors in reducing morbidity and possible mortality, length of stay, and cost of treatment. A negative appendectomy rate of 20-40% has been reported in literature. Removing normal appendix is an economic burden on both patients and health resources. The aim of our study was to evaluate the usefulness of Alvarado scoring system in reducing the percentage of negative appendectomy in our setup.

Keywords: Acute Appendicitis, Alvarado scoring system, Appendectomy

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I. Introduction

Acute appendicitis is a common cause of abdominal pain and can be difficult to diagnose, especially during the early stages. There is still appreciable morbidity and occasionally mortality which may be related to failure of making an early diagnosis. Acute appendicitis is a common surgical emergency with a lifetime risk of 1 in 7,^[1] which means that 6% of the individuals suffer an attack during their lifetime.^[2]

It has been observed that many patients undergoing appendectomy prove to be negative on histopathology of the surgically removed appendix, which is the gold standard for diagnosis of appendicitis.^[3] Removing a normal appendix is a burden both on patients and health resources. However, early recognition of the condition and prompt operation have been the most important factors in reducing morbidity and possible mortality, length of stay, and cost of treatment.^[4]

A negative appendectomy rate of 20-40% has been reported in literature and many surgeons advocate early surgical intervention for the treatment of acute appendicitis to avoid perforation, accepting a negative appendectomy rate of about 15-20%.^[5]

Removing normal appendix is an economic burden on both patients and health resources. But misdiagnosis and delay in surgery can lead to complications like perforation and finally peritonitis.^[6]

Several scoring systems have been used to aid in early diagnosis of acute appendicitis and its prompt management. These systems are valuable and valid instruments for discriminating between acute appendicitis and nonspecific abdominal pain.^[7] An example is the modified Alvarado scoring system, which is based on physical examination, and a few laboratory investigations and is very easy to apply. Alvarado score is simple, effective and can be easily applied. It provides an accurate and consistent triage tool for ruling out appendicitis and identifying those at higher risk. In one study at Cardiff the Alvarado score reduced the unusually high false positive appendectomy rate from 44% to 14%.^[1]

Definitive diagnosis can, however, be reached at surgery and after histopathology.

The aim of our study was to evaluate the usefulness of Alvarado scoring system in reducing the percentage of negative appendectomy in our setup.

II. Methods

This was a cross sectional study to evaluate the diagnostic value of MASS in patients presenting with acute appendicitis at the surgery outpatient and ER department of Mahatma Gandhi Hospital over a period of six months from January 2018 to June 2018.

Inclusion criteria:

1. Age - all patients from age 10 years to 70 years
2. Both sexes included
3. Patients presenting with pain in the right lower quadrant or para-umbilical pain shifting to the right iliac fossa
4. Clinically diagnosed cases of acute appendicitis

Exclusion criteria:

1. Patients with a mass in the right iliac fossa
2. Patients less than 10 and greater than 70 years of age
3. Those who failed to provide necessary details and information about the illness
4. Patients without any attendants
5. Patients who had no histopathological results were also excluded from the study

All the patients were scored according to the variables of MASS (Table 1) and then divided into two groups.

Group I included patients with MASS of 7 and above (patients likely to have acute appendicitis) and Group II were patients with MASS below 7 (patients unlikely to have acute appendicitis).

The decision for admission and surgical intervention was made by the surgeon independent of the score and was based on patients' history and clinical examination. Also, abdominal ultrasound was performed prior to appendectomy to exclude other pathologies or for atypical presentation. Patients diagnosed as cases of acute appendicitis underwent open or laparoscopic appendectomy, performed by the treating surgeon. Gross operative findings were recorded and all specimens were subjected to histopathological assessment, which is considered the gold standard for final diagnosis of acute appendicitis.

Data were collected using a pretested questionnaire and analyzed using SPSS version 16 (SPSS Inc., Chicago, IL, USA). The reliability of Alvarado scoring system was assessed by calculating negative appendectomy rate which is defined as cases having no signs of inflammation on histopathology of surgically removed appendix.

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	
Leucocytosis	2
Shift to left	1
Total	10

The MASS groups were cross-tabulated against histology, the gold standard. Then, the sensitivity, specificity, accuracy, Positive Predictive Value (PPV) and Negative Predictive Value (NPV) and accuracy were determined in males and females.

III. Results

A total of 135 patients were enrolled in the study. Out of this 8 patients dropped out. The age ranged from 10 to 70 years (mean 29.64 ± 12.97). There were 38 (29.1%) males and 89 (70.9%) females (M: F = 1:2.4).

Sex	Males	Females
Number	38	89

All patients in this study underwent appendectomy. Of these, inflamed appendix was the most common operative findings affecting 80 patients (62.9%). Twelve patients (9.4%) had perforated appendices, six patients (4.7%) had gangrenous appendices and four patients (3.1%) had appendicular abscess.

	Frequency	Percentage
Inflamed appendix	80	62.9
Perforated appendices	12	9.4
Gangrenous appendices	6	4.7
Appendicular abscess	4	3.1
Normal appendix	11	8.7
Other	14	11
Total	127	100

Histological examination confirmed appendicitis in 85 patients (66.9%). The remaining 42 patients were found to have normal appendix giving a negative appendectomy rate of 33.1% being 26.8% and 38.3% for males and females respectively.

Histopathology	Frequency	Percentage
Normal appendix	42	33.1
Acute appendix	40	31.6
Others	45	35.3
Total	127	100

The sensitivity and specificity of MASS in this study was 94.1% (males 95.8% and females (88.3%) and 90.4% (males 92.9% and females 89.7%) respectively. The PPV was 95.2% (males 95.5% and females 90.6%) and NPV was 88.4% (males 89.3% and females 80.1%. The accuracy of MASS was 92.9% (males 91.5% and females 87.6%).

Mass score	Histology +ve	Histology -ve	Total
Group 1(>7)	80	4	84
Group 2(<7)	5	38	43
total	85	42	127

MASS showed high sensitivity (95.8%) and specificity (94.1%) in adult (16-60 years) than in children (93.3%/93.3%) and geriatric (85.7%/80.0%) age groups.

IV. Discussion

The diagnosis of acute appendicitis still represents one of the most controversial tasks in general surgery. This may be due to variable presentations of the disease and lack of a reliable diagnostic test.^[8] Surgical intervention early in the course of the disease to limit complications, leads to too many negative appendectomies being performed, with an associated mortality rate of 10%.^[9] This study was conducted to evaluate the diagnostic value of Modified Alvarado Scoring System in patients with acute appendicitis in our setting.

The female preponderance in this study is in agreement with other studies.^[10] The reason for the difference in sex distribution in these studies may be attributed to the fact that female patients with right iliac fossa pain have a wide range of differential diagnoses as a result acute appendicitis may be over-diagnosed in this gender group.

However appendicular perforations were also seen in our study due to delayed diagnosis and referral in some cases. Perforation rate was 9.4% comparable to 7.8% and 9.4% in other studies.^[11, 12] In our study, the perforation of appendices occurred mostly in patients with MASS \geq 7.

To discriminate between acute appendicitis and nonspecific abdominal pain, various diagnostic scores have been advocated to reduce the frequency of negative surgeries, one of which is the Alvarado scoring system. Alvarado devised this in 1986, and it has been validated in adult surgical practice, by giving relative weight to specific clinical manifestations often found in such patients. It is simple, easy, extremely affordable, and relatively accurate in aiding clinical diagnosis especially in interpreting the extremes of score range.^[13] Various studies have shown promising results by incorporating this system in the diagnostic process with significant reduction in false negative cases.^[14, 15]

The overall negative appendectomy rate (33.1%) in our study was found to be in concordance with reports of 33.1%^[15] and 33%,^[16] but in contrast with 14.7% and 11.49%,^[17] reported in other studies.

The reason for high negative appendectomy rate in our series may be due to appendectomies that were done to patients who presented with other conditions mimicking acute appendicitis. However appendicular perforations were also seen in our study due to delayed diagnosis and referral in some cases. Perforation rate was 9.4% comparable to 7.8% and 9.4% in other studies.^[11, 12]

The present study has shown that MASS provides high degree of sensitivity, specificity, PPV, NPV and accuracy in the diagnosis of acute appendicitis, which is in agreement with findings reported by others.^[18, 19]

V. Conclusion

The present study has shown that MASS provides high degree of sensitivity, specificity, PPV, NPV and accuracy in the diagnosis of acute appendicitis. MASS should be used to improve the diagnostic accuracy of acute appendicitis and subsequently reduce negative appendectomy and complication rates. The patients are not unduly exposed to risks of delay in intervention or significant increase in number of false negative cases. Its use is economical and can be applied easily even by junior surgeons with limited diagnostic facilities available to them.

False results are unlikely in patients with a high score (9 or 10) and no further investigation is needed; those with scores of 7 or 8 may require further investigations especially female patients or those at age extremes.

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