



EVALUATION OF THE PERTINENCE OF MODIFIED ALVARADO SCORE IN THE DIAGNOSIS OF SUSPECTED ACUTE APPENDICITIS

General Surgery

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ABSTRACT

INTRODUCTION: Appendicitis remains one of the most common surgical emergencies faced by surgeons during his surgical practice. The first formal description of Acute Appendicitis as a disease entity and its natural process, along with common clinical features and recommendation for its prompt surgical removal was done by Reginald Heber Fitz in 1886 in Harvard University¹. **AIMS AND OBJECTIVES:** This study is aimed to evaluate the pertinence of modified Alvarado score in the diagnosis of suspected acute appendicitis. To look for the effectiveness of Modified Alvarado Score in clinical practice for diagnosis of acute appendicitis by correlating the score with operative and histopathological findings. **MATERIALS AND METHODS:** Patients admitted in the inpatient department with pain right lower abdomen especially right iliac fossa tenderness, suspected appendicitis in the department of General Surgery, College of Medicine & JNM Hospital, Kalyani. 6 MONTHS from the period of institutional ethical committee clearance. **RESULTS:** A MODIFIED ALVARADO SCORE of 6 has been obtained in most of the participants (26.87%), followed by higher Modified Alvarado Score scores of 7, 8 and 9 in 25%, 18.75% and 17.5% respectively. Only about 11.88% participants have a score less than 6. Most of the participants, a little less than two-third of them had a MODIFIED ALVARADO SCORE grade 3, almost one-third had a grade 2 and only 5.6% belonged to grade 1 group.

KEYWORDS

Modified Alvarado, Acute Appendicitis, Clinical Practice, Histopathological Findings

INTRODUCTION

Appendicitis remains one of the most common surgical emergencies faced by surgeons during his surgical practice. The first formal description of Acute Appendicitis as a disease entity and its natural process, along with common clinical features and recommendation for its prompt surgical removal was done by Reginald Heber Fitz in 1886 in Harvard University¹. It is associated with high morbidity and occasionally morbidity related to failure of making an early diagnosis². Even after elapse of more than 120 years since its first description this common surgical disease continues to remain a diagnostic problem and can baffle best of the clinician. Delay in diagnosis definitely increases the morbidity, mortality and cost of treatment. In equivocal cases, however, aggressive surgical approach as "when in doubt take it out" has resulted in increased white appendectomies. The premise that it is better to take out normal appendix than to delay diagnosis does not stand up to close scrutiny.³

Removing Normal Appendix is an economic burden on both patients and health resources, also misdiagnosis on delay may lead to the complications like Perforation and Peritonitis.⁴ According to the literature negative appendectomy of 20-40% has been reported and many surgeons accept the same of 15-20% in their practice. Therefore, the diagnosis of Appendicitis⁵ should be as accurate as possible with limited time interval.

The purpose of this study was to evaluate the diagnostic pertinence of Modified Alvarado Score in clinical practice for diagnosis of acute appendicitis by correlating the score with operative and histopathological findings.

MATERIALS AND METHODS

Study population:- In prospective study patients admitted in the inpatient department with pain right lower abdomen especially right iliac fossa tenderness, suspected appendicitis in the department of General Surgery, College of Medicine & JNM Hospital, Kalyani.

Sample size:- UNIVERSAL SAMPLING . All the cases of suspected acute appendicitis who were operated after prior admission, clinical examination and investigation and coming under inclusion criteria in College of Medicine and JNM Hospital, Kalyani, weekly twice (As my admission day is twice a week) for a period of 6 months after INSTITUTIONAL ETHICAL COMMITTEE CLEARANCE were

included for the study sample . (i.e., UNIVERSAL SAMPLING TECHNIQUE WAS USED)

Inclusion criteria:

- All patients with right iliac fossa (RIF) pain clinically suspected to be acute appendicitis.
- Age >12 years
- fit for surgery
- no co-morbidities like cardiac abnormalities, renal disease, liver diseases etc. present.

Exclusion criteria:

- Patients with palpable mass in RIF.
- Unfit for surgery due to any medical conditions.
- Evidence of Generalized peritonitis.
- Age <12 Yrs.
- Evidence of acute confusional state, Dementia, septic shock.
- Patients who did not give consent for surgery.

RESULTS

Our study showed that it is evident from result that majority of the participants (45%) were aged between 11 to 20 years, followed by young adults (31.88%) aged between 21 to 30 years. We found that majority of the participants (54.37%) were females. In our study the majority of the participants (50.57%) were females aged between 11 years to 20 years, followed by males of the same age group (38.35%). Result shows that migratory pain was the most consistent symptom that was seen with 81.25% of the participants followed by nausea and/or vomiting that was seen in 80%. Among the clinical signs, the most consistent finding was tenderness that was seen in 93.75% of the participants, followed by rebound tenderness seen in 73.12% and elevated tenderness was seen in 66.25%. Leukocytosis was observed in 70% of the participants.

We found that as is evident from result, a MODIFIED ALVARADO SCORE of 6 has been obtained in most of the participants (26.87%), followed by higher Modified Alvarado Score scores of 7, 8 and 9 in 25%, 18.75% and 17.5% respectively. Only about 11.88% participants have a score less than 6. Most of the participants, a little less than two-third of them had a MODIFIED ALVARADO SCORE grade 3, almost one-third had a grade 2 and only 5.6% belonged to grade 1 group.

Result denotes that most of the participants i.e. 42.5% were found to have a grossly inflamed appendix, 5% had perforation, and 6.25% had a gangrenous appendix. Base inflammation was noted in 28.13%, tip was inflamed in 6.87%. Negative appendicectomy rate was 11.25%.

We showed that the result tabulates histopathology findings and states that nearly 47% participants had acute appendicitis, 32.5% had chronic inflammation and gangrenous appendicitis was observed in 2.5%. A total of 16 out of 160 participants had features of recurrent appendicitis on histopathology. A non-inflamed appendix was seen in about 8%. In our study, there is significant correlation between MODIFIED ALVARADO SCORE grade and histopathology. Higher MODIFIED ALVARADO SCORE grade is associated with increased incidence of acute appendicitis & gangrenous appendicitis, whereas most of the recurrent appendicitis and non-inflamed appendix has been reported from MODIFIED ALVARADO SCORE grade 1 & 2. Result mentions that all forms of appendicitis obtained on histopathology were most commonly seen in participants aged between 11 to 20 years. The incidence declined with increase in age from teenagers to young adults to elderly.

We found result shows that acute and gangrenous appendicitis were more commonly found in males while females had higher incidence of chronic and recurrent appendicitis. Negative appendicectomy was higher in females. It is evident from our study that Modified Alvarado Score is a reliable clinical indicator in the diagnosis of acute appendicitis. Higher Modified Alvarado Score grades have a sensitivity of 74% and a still higher specificity of 96.55%. The positive predictive value of 98.98% reflects high reliability. The negative predictive value is 45.16%. The diagnostic accuracy is as high as 78.12%.

DISCUSSION AND CONCLUSION

Acute appendicitis is one of the most common causes of abdominal pain that is surgically correctable. The incidence has been increasing with the modification of lifestyle and the food habits of the youth. However, the timely and correct diagnosis of acute appendicitis which subsequently helps in the decision for management is indeed a challenge with different case scenarios. Subtle clinical features might not be detected clearly obscuring the diagnosis or diverting it in another direction. Correct diagnosis in time is crucial in order to prevent the subsequent complications like perforation which heralds significant morbidity and mortality. At the same time, incorrect diagnosis of appendicitis often leads to the patient undergoing an unwanted operation, thereby increasing morbidity.⁶

Though the diagnosis of acute appendicitis is primarily based on clinical evaluation, the decision to operate based on clinical suspicion alone can lead to removal of a normal appendix in 15-30% cases. This rate is still higher in women of reproductive age. Negative appendicectomy not only increases preventable morbidity in a patient but also creates a burden on the manpower and resources of the health facilities in a developing country like India. Moreover, post-operative complications like wound infections, ileus, abscess formation and adhesions in the long term can occur for any surgery.

Several studies have been conducted by researchers all over the world to study the evolving trends of acute appendicitis in different populations in order to modify and improvise the approach for correct timely diagnosis and decision making. With repeated and improved studies, diagnostic tools have been time and again modified for convenience and reliability.

The Modified Alvarado Score is an important tool in the evaluation of patients who are clinically suspected to have acute appendicitis, and efficiently helps in taking the decision for management. Review of existing literature suggests that the Modified Alvarado Score has been effective in decreasing the rate of negative appendectomies and hence this study was carried out to further evaluate its pertinence among the patients of College of Medicine and JNM Hospital.

During the course of this study, it was found that the majority of the participants belonged to the age group of 11-20 years, followed by young adults in the age group 21-30 years. A total of 76.88% cases were from these 2 age groups. Drinkovic had conducted a similar study in 1991 where the author had concluded that appendicitis was most common in the age group from 11 to 20 years.⁷ Another similar study showed that the highest occurrence was in the age group from 20-29

years, followed by the 10- 19 years age group, with a consequent 66.7% cases aging between 10-29 years.

It was observed in this study that the majority of the participants who presented with symptoms suggestive of acute appendicitis and fulfilled other inclusion criteria were females. However, Nshuti et al. included 146 patients to study the presentation of acute appendicitis in adults and opined that the male to female ratio was 1.6:1.⁸

It was observed that migratory abdominal pain was the most consistent symptom in acute appendicitis, having been found in 81.25% of participants, followed by nausea and vomiting in 80%.

This study found that migratory abdominal pain and tenderness were the most consistent features in acute appendicitis. This corroborated the findings of Sartelli et al. in the study conducted in 2018.⁹

Rebound tenderness was the second most common sign in our study and was present in nearly 73% of the participants. This is in agreement with the finding of Hirsch who found that rebound tenderness is the most reliable finding in children with acute appendicitis.

Leucocytosis was a consistent finding in 70% of the participants, showing that it could be a reliable indicator in correct diagnosis. This was consistent with the findings of Kamran et al. in their study where the authors concluded that the sensitivity and specificity of TLC in diagnosing acute appendicitis is 76.5% and 73.7% respectively while positive predictive value is 92.5%.¹⁰ This study showed that almost 27% of the participants had a Modified Alvarado Score score of 6, followed by Modified Alvarado Score scores of 7, 8 and 9 in 25%, 18.75% and 17.5% respectively. Thus, the overall proportion of participants having a Modified Alvarado Score score 6 and above was 88.13%. This is comparable to the study of Kanumba and associates which calculated the median Modified Alvarado Score score to be 7.²

Most of the participants (98 out of 160) had a Modified Alvarado Score score of 6 and above with a Modified Alvarado Score grade 3 which showed that appendicitis was very probable and hence these participants underwent surgery. This is comparable with the findings of included a total of 120 cases in their study and found 60 of them belonged to grade 3, favouring the decision to operate.

Intra-operative findings during the course of the study showed that there was appendiceal perforation in 5% cases. Most of the cases had a grossly inflamed appendix (42.5%) followed by a base-inflamed appendix in 28.13%, and a tip-inflamed appendix in almost 7%. Gangrenous appendix was found in 6.25% and appendix was apparently normal in 11% of cases. These intra- operative findings are comparable to those in the study conducted by Afuwape et al.¹¹ where the researchers found an inflamed appendix in 52%, appendiceal perforation in 20%, gangrenous appendix in 3.3% and a normal appendix in 10%.

According to the histopathological examination reports, out of 160, 75 cases (47%) had acute appendicitis, followed by 52 cases showing features of chronic inflammation. Recurrent appendicitis was found in 16 cases and 4 cases had gangrene formation. Only 8.13% cases had a non-inflamed appendix. This can be compared to the findings of Charfi et al.¹² who retrospectively analysed 24,697 appendectomies and concluded that acute appendicitis was present in 19,637 (79.5 %) patients. The perforation rate was 6.3 % and was significantly higher in adult patients. The negative appendicectomy rate was 15 % and was significantly higher in female and adult patients.

This study concluded that a higher Modified Alvarado Score grade is associated with an increased incidence of acute appendicitis and gangrenous appendix, whereas most of the recurrent and not inflamed appendicitis has been reported from Modified Alvarado Score grade 1 and 2. All the cases of acute and gangrenous appendicitis belonged to the Modified Alvarado Score grade 3 group. This agrees with Sulo³⁰ who opined that Modified Alvarado Score scores of, 7-8 and 9-10 could correctly diagnose appendicitis in 74%, 78% and 96% cases respectively.

From histopathology, it was clear that acute and gangrenous appendicitis were more common in males, whereas chronic appendicitis, recurrent appendicitis had a female preponderance. Thus almost 70% females with Modified Alvarado Score score more than 7

had a negative appendicectomy. This agrees with the findings of stating that a high Modified Alvarado Score score of 7 or more in men was reliable in diagnosing acute appendicitis, with a small negative appendicectomy rate. However, in females the negative appendicectomy rates were high even with Modified Alvarado Score scores of 7 to 9.

As calculated by this study, higher Modified Alvarado Score grade (grade 3) is concluded to be a reliable indicator with a sensitivity and specificity of 74.05% and 96.55% respectively. The positive predictive value (PPV) and negative predictive value (NPV) has been shown to be 98.98% and 45.16% respectively. Hence, the diagnostic accuracy is calculated to be 78.12%.

This agrees with Nasiri et al.¹³ who found that using the cut-off point of 6 for the Modified Alvarado Score, a sensitivity of 85.1%, specificity of 25%, PPV of 90.5%, NPV of 16.7% and accuracy of 78.7% were obtained. Taking a cut-off point of 7 for the Modified Alvarado Score score, the values get modified to a sensitivity of 65.7%, specificity of 37.5%, PPV of 89.8%, NPV of 11.5% and accuracy of 62.7% respectively.

Table : Distribution according to MODIFIED ALVARADO SCORE

MODIFIED ALVARADO SCORE FEATURES		Score	Frequency	Percent
SYMPTOMS	Migratory pain	0	30	18.75
		1	130	81.25
	Anorexia	0	50	31.25
		1	110	68.75
	Nausea/Vomiting	0	32	20
		1	128	80
SIGNS	Tenderness	0	10	6.25
		2	150	93.75
	Rebound tenderness	0	43	26.88
		1	117	73.12
	Elevated temperature (>37.3 °C)	0	54	33.75
		1	106	66.25
INVESTIGATIONS	Leukocytosis (>10 X 10 ⁹)	0	48	30
		2	112	70

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