

Evaluation of Modified Alvarado Score in the Diagnosis of Acute Appendicitis at Surgery Department of AGMC and GBP Hospital, Agartala, Tripura

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Abstract:

Background: Acute appendicitis is the most common surgically treatable cause of abdominal pain; yet, it is mostly a clinical diagnosis that is still challenging to make in many cases. However, in 15–30% of cases, the normal appendix may be removed if the decision to operate was made solely on the basis of clinical suspicion. In order to decrease the likelihood of a negative appendectomy and to help in the early detection of acute appendicitis, a number of diagnostic grading systems have been developed. After Alvarado's description, Kalan et al. made modifications to one such scoring system. The purpose of the current study is to assess the effectiveness of the modified Alvarado score in the preoperative diagnosis of acute appendicitis.

Methods: For the study, 120 consecutive patients who were treated, examined, and admitted with a suspected case of acute appendicitis were included. These patients received a modified Alvarado score following a thorough evaluation and investigation. They received treatment based on the three groups to which they were assigned.

Results: According to the study's findings, high scores (7-9) in men and children had sensitivity values of 92.3% and 83.3%, respectively, whereas high scores in females had a sensitivity value of 72.7%. The sensitivity of the male and female scores (5–6) was 57% and 50%, respectively.

Conclusion: When it comes to males and children, high Modified Alvarado score scores are a reliable tool for early detection of acute appendicitis; however, this isn't the case when looking at females. Abdominal ultrasonography is a helpful tool in preventing negative appendectomy rates, especially in females.

Keywords: Acute Appendicitis, Modified Alvarado Score, Right Iliac Fossa Pain, Right Lower Quadrant Pain.

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Introduction

With a global incidence of 1.17/1000, acute appendicitis is the most prevalent reason for emergency surgery performed globally, with adolescents and young adults having the highest incidence. [1] Even though Reginald Heber Fitz first characterized appendicitis in 1886, treating surgeons still find it difficult to diagnose this condition after all these years. [2]

When applied in isolation, clinical examination might result in a negative appendectomy rate (NAR) of 15–30%; in females within the reproductive age group, this percentage is much greater, at 15–50%. [3,4] Even while preoperative examination with CECT abdomen has been shown to reduce this rate from 20% to as low as 5%, [5]

ordering CECT abdomen for each patient who is suspected of having appendicitis can place a significant financial strain on medical facilities in impoverished nations like India. Therefore, the only practical solution for the emergency scenario in our nation is a strong clinical scoring system. The Alvarado Scoring System was initially published in 1986 and is most commonly used to diagnose acute appendicitis.

Numerous alternative scoring systems, such as the Modified Alvarado Score, Fenyo, Ohmann, IRA Teicher, RIPASA, Lindberg, AIRS, and others, have since been reported on occasion. The most popular scoring systems among them are Kalan et al. 1994 adaptation of Alvarado. Modified Alvarado

Score (MAS) excludes the last criterion of Alvarado Score i.e. 'shift to left in WBC count' as it is not available in all the laboratories. Patients are thus scored out of 9 instead of 10 as in Alvarado Score. [6] Since the MAS score is the most easily reproducible, this study was conducted to assess its diagnostic accuracy and clinical relevance in the current context, where CECT abdomen is quickly becoming accepted in clinical practice, as well as its impact on the overall outcome of acute appendicitis in terms of patient morbidity and mortality. As of late, practicing surgeons have begun to place greater trust in radiological diagnoses as in their own clinical diagnoses, which are made after obtaining a thorough patient history and doing a precise clinical examination.

Material and Methods

Between 01 July 2017 and 30 June 2018, patients who were admitted to the Department of Surgery at the Agartala Government Medical College and GBP Hospital in Agartala, Tripura, with acute pain that started in the right lower quadrant of the abdomen and lasted less than seven days were included in this study. Following a clinical examination, the patients' condition was provisionally diagnosed as acute appendicitis. Most of the patients were from rural parts of Agartala. This study comprised 120 patients with appendicular perforation-related widespread peritonitis as well as appendicular mass or abscess.

Following in-depth analysis and research, each case was assigned a modified Alvarado score (Table 1). Demographics, symptoms, and presenting signs

were recorded on the proforma. According to the modified Alvarado score for appendicitis, each patient's three symptoms, three signs, and laboratory markers of appendicitis were documented. The patients were then split into three groups. Cases with a score of 1-4 [Group-I] were watched, did not undergo surgery, and were monitored for the development of acute appendicitis for the next year following discharge. For the following 24 hours, cases with scores of 5-6 [Group II] were watched in order to revise the scoring. They were scheduled for an appendectomy if their score dropped to less than 7 or if their clinical state raised strong suspicions of acute appendicitis. All patients who were considered for appendectomy underwent ultrasonography of abdomen to rule out other conditions mimicking acute appendicitis.

Following ultrasonography, patients with scores of 7-9 [Group-III] who were scheduled for appendectomy underwent further evaluation. They were not operated on and were categorized as false positive cases if any other conditions that resembled acute appendicitis were discovered in them. Acute appendicitis was confirmed histopathologically on the whole appendix specimen. The final diagnosis and the scoring method were shown to be correlated. Using the statistical package for social science software, an appropriate follow-up statistical analysis was carried out (SPSS). Calculations were made for accuracy, sensitivity, specificity, negative predictive value, and positive predictive value.

Table 1: Modified alvarado score

Symptoms/Signs/Investigation	Score	
	Yes	No
Symptoms		
Migration of pain to right iliac fossa	1	0
Anorexia	1	0
Nausea/Vomiting	1	0
Signs		
Tenderness over right iliac fossa	2	0
Rebound tenderness over right iliac fossa	1	0
Temperature >37.3°C	1	0
Investigations		
Leucocytosis >10×10 ⁹ /L	2	0
Total Score	9	0

Scoring system; Modified alvarado score;

Group-I - 1-4 appendicitis unlikely.

Group-II - 5-6 appendicitis possible.

Group-III - 7-9 appendicitis definitive.

Results

The age range of the patients in our study was 10-59 years old, with a mean age of 26.23 years. The age group between 20 -29 years old had the highest occurrence rate (42.5%). The next age group impacted was 10-19 years old (24.2%). In total, 66.7 percent of the cases involved people between the ages of 10 - 29. Table 2.

Table 2: Age distribution

Age in years	No. of cases with score (1-4)	No. of cases with score (5-6)	No. of cases with score (7-9)	Total	Percentage
10-19	8	7	14	29	24.2%
20-29	8	17	26	51	42.5%
30-39	6	5	13	24	20.0%
40-49	4	4	5	13	10.8%
50-59	1	-	2	3	2.5%
Total	27	33	60	120	

Age distribution of one hundred twenty cases according to groups of modified alvarado score. In our study there were 68 (56.7%) male patients, 40 (33.3%) female and 12 (10%) children Table 3.

Table 3: Sex distribution

Sex	No. of cases with score (1-4)	No. of cases with score (5-6)	No. of cases with score (7-9)	Total	Percentage
Male	17	25	26	68	56.7%
Female	10	8	22	40	33.3%
Children	-	-	12	12	10.0%

Sex distribution of one hundred twenty cases according to groups of modified alvarado score. Group I: Of the 27 patients in the first group (1-4), none were thought to be at risk for appendicitis. They were watched over and given cautious treatment. Released after two to three days, followed up with each month for a year, and none of them needed surgery. Group II: Of the 33 patients in this group (5-6), 9 underwent surgery due to a clinical suspicion of a high likelihood of acute appendicitis (Table 4).

Table 4: Distribution of cases according to Modified Alvarado Score (5-6)

Category of cases	No. of cases operated	No. of cases with histopathological confirmed appendicitis	No. of cases without histopathological confirmed appendicitis	Proportion of true positive
Male (n=25)	7	4	3	57%
Female (n=8)	2	1	1	50%
Child (n=0)	0	0	0	0%
Total (n=33)	9	5	4	55.6%

Histopathological reports of patients undergoing appendectomy in group – II.

The remaining twenty-four instances received conservative treatment, were monitored, and were released from the hospital after three to four days. They were followed up with each month for a year, and during that time, none of the cases needed surgery. Of the nine patients who underwent

surgery and had a score of 5-6, two were female and seven were male.

Acute appendicitis affected one of every two females and four of every seven males. Patients with a score of less than 6 had an overall negative appendectomy rate of 44.4%. Group III: Of the 60 patients in this group, 54 had appendectomies (Table 5).

Table 5: Distribution of cases according to modified Alvarado score (7-9)

Category of cases	No. of cases operated	No. of cases with histopathological confirmed appendicitis	No. of cases without histopathological confirmed appendicitis	Proportion of true positive
Male (n=26)	26	24	2	92.3%
Female (n=22)*	22	16	-	72.7%
Child (n=12)	12	10	2	83.3%
Total (n=60)	60	50	4	83.3%

Histopathological reports of patients undergoing appendectomy in group – III. Six female patients undergoing abdominal ultrasonography did not have an appendectomy because they had additional pathologies that mimicked acute appendicitis. Two patients had twisted ovarian cysts, three patients

had pelvic inflammatory disorders, and one patient had an ectopic pregnancy that burst. In fifty of the sixty cases, appendicitis was acute. The proportion of true positives with a modified Alvarado score of ≥ 7 was 83.3%, indicating its sensitivity. Males had the highest level of sensitivity (92.3%), while

females and children had the lowest levels (72.7% and 83.3%, respectively).

The rate of negative appendectomy was highest in females (27.3%), lower in males (7.7%) and higher in children (16.7%). Meckel's diverticulitis affected two male patients who had normal

appendices. Two kids with healthy appendices had threadworms in them.

Anorexia (71.7%) was the most common symptom in the current investigation, followed by nausea/vomiting (63.3%) and pain migration to the right iliac fossa (53.3%), as shown in Table 6.

Table 6: Symptoms distribution

Sex	No. of cases with score (1-4)	No. of cases with score (5-6)	No. of cases with score (7-9)	Total	Percentage
Migration of pain to RIF	3	7	54	64	53.3%
Anorexia	23	17	46	86	71.7%
Nausea/Vomiting	11	28	47	76	63.3%

The three symptoms of modified Alvarado score and their distribution in each group. Tenderness over RIF was the most common symptom observed in this study (75.8%). Table 7 indicates that rebound discomfort over RIF (46.7%) and raised temperature >37.3°C (68.3%) were the following common signs. Of the 120 patients in our study, 81 (seven in group I, twenty-one in group II, and fifty-three in group III) had leucocytosis. The current study's leucocytosis rate was 67.5%.

Table 7: Signs distribution

Sex	No. of cases with score (1-4)	No. of cases with score (5-6)	No. of cases with score (7-9)	Total	Percentage
Tenderness over RIF	4	27	60	91	75.8%
Rebound tenderness over RIF	0	9	47	56	46.7%
Elevated temperature >37.3°C	19	25	46	90	75.0%

The three signs of modified Alvarado score and their distribution in each group.

Discussion

Even though acute appendicitis is the most common surgical abdominal emergency with a lifetime frequency of roughly 1 in 7. [7] It can occasionally be challenging to diagnose. One strategy to try and avoid appendectomies that go wrong is to utilize a modified Alvarado score. The current study's findings demonstrated that a high score (≥ 7) in men was a useful tool for diagnosing acute appendicitis early on; in these men, the total sensitivity was 92.3%, and the rate of appendectomy that resulted in a negative result was 7.7%.

However, among females, the rates of negative appendectomy were rather high in both the 7–9 and 5–6 score groups. In the aforementioned groups, the negative appendectomy rate is 50% and 27.3%, respectively. In children, it was dependable in the diagnosis of acute appendicitis when the score was ≥ 7 , the sensitivity in the present study being 83.3%.

Sensitivity of acute appendicitis 92.3% for males in the present study with the score of 7 to 9 correlates well with the figures of studies by Kalan M, Rich AJ, Talbot D, Cunliffe WJ (who have reported 93%),⁹ Bhattacharjee PK, Chowdhary T, Roy D (who have reported 94.1%). [8] Sensitivity of acute

appendicitis 72.7% for females in the present study with the score of 7 to 9 correlates well with the figures of studies by Kalan M, Rich AJ, Talbot D, Cunliffe WJ (who have reported 67%) and Bhattacharjee PK, Chowdhary T, Roy D (who have reported 71.9%). [9,10,11] Sensitivity of acute appendicitis 83.3% for children in the present study with the score of 7 to 9 correlates well with the figures of studies by P. K. Bhattacharjee, T. Chowdhary, D. Roy (who have reported 80%), but is less sensitive compared to study conducted by Kalan M, Rich AJ, Talbot D, Cunliffe WJ (who have reported 100%). [8,9]

The overall sensitivity of acute appendicitis being 83.3% in the present study with score 7 to 9 correlates well with the figures of studies by Kalan M, Rich AJ, Talbot D, Cunliffe WJ (who have reported 83.7 %) and Bhattacharjee PK, Chowdhary T, Roy D (who have reported 82.7%). Sensitivity of acute appendicitis 57% for males in the present study with score of 5 to 6 is lesser than the figures of studies by Kalan M, Rich AJ , Talbot D, Cunliff WJ (who haverepoerted 67% in men) and Bhattacharjee PK, Chowdhary T, Roy D (who have reported 83.3%). Sensitivity of acute appendicitis 50% for females in the present study with score of 5 to 6 correlates well with the figures of studies by Kalan M, Rich AJ, Talbot D, Cunliffe WJ (who have reported 50%) and lesser compared

to Bhattacharjee PK, Chowdhary T, Roy D (who have reported 66.7%). [8,9,10,11,12]

Conclusion

According to the results of this study, males and children with high scores (7-9) on the modified Alvarado score are more likely to receive an early diagnosis of acute appendicitis; however, this is not the case for women. Abdominal ultrasonography is a helpful tool in preventing negative appendectomy rates, especially in women.

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