

MODIFIED ALVARADO SCORING SYSTEM IN THE DIAGNOSIS OF ACUTE APPENDICITIS

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Abstract

Acute appendicitis is one of the common surgical emergencies. Different scoring systems are there in use to diagnose appendicitis. The purpose of this study was to evaluate the diagnostic accuracy of the modified Alvarado scoring system in clinical practice for acute appendicitis. A prospective study was conducted on 100 patients hospitalized with abdominal pain suggestive of acute appendicitis and were subsequently operated, from July 2005 to June 2008 at Bangladesh Rifles (BDR) hospital, Dhaka. Both male and female patients from 7 years to 55 years of age were enrolled in the study. Preoperatively, modified Alvarado score was assigned to all, and the results were compared with operative and histopathological diagnosis. Out of 100 operated patients 84 were diagnosed as a case of acute appendicitis on the basis of histopathological report. Patients with modified Alvarado score of 8-10, 5-7 and 1-4 have the accuracy of 95%, 78%, and 0% respectively. In the higher score group the accuracy is more and acceptable. Lower score group should be kept under observation. Score sensitivity is more in male than female patients. This scoring system is a reliable and practicable diagnostic modality to increase the accuracy in diagnosis of acute appendicitis and thus to minimize unnecessary appendectomy.

Key Words: Alvarado scoring system, Acute appendicitis.

Introduction

In 1886 Reginald Heber Fitts described the classical signs and symptoms of acute appendicitis as a disease entity¹. Since then acute appendicitis has remained the most common acute surgical condition of the abdomen in all ages and of course, a common disease in surgical practice². 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

"when in doubt take it out" has resulted in increased negative laparotomies³. Presentations of acute appendicitis can mimic variety of acute medical and surgical abdomino-thoracic conditions. Early diagnosis is a primary goal to prevent morbidity and mortality in acute appendicitis⁴. Another important issue is decreasing the negative appendectomy rate.

In spite of advancements in medical diagnostics, its diagnosis is mainly clinical one. 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 system⁵⁻⁸.

The aim and objective of this study is to evaluate the sensitivity of modified Alvarado scoring system in the diagnosis of acute appendicitis, to reduce the rate of negative appendectomy and to reduce the complications of acute appendicitis due to misdiagnosis and delay in surgery.

Materials And Methods

This prospective study was carried out on 100 patients hospitalized with abdominal pain suggestive of

Table-I: Modified Alvarado Score.

Clinical Features		Score
Symptoms	Migratory right iliac fossa pain	1
	Anorexia	1
	Nausea/Vomiting	1
Signs	Tenderness at right iliac fossa	2
	Rebound tenderness	1
	Elevated temperature	1
	Extra sign(s), e.g. cough test and/or Rovsing's sign and/or rectal tenderness	1
Laboratory	Leucocytosis	2
Total score		10
Interpretation of the Modified Alvarado score was summarized as follows: Score 1-4: acute appendicitis very unlikely Score 5-7: acute appendicitis probable Score 8-10: acute appendicitis definite		

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acute appendicitis during July 2005 to June 2008 in BDR Hospital, Peelkhana, Dhaka. Data including age, sex, symptoms, physical signs and laboratory findings such as white blood cell total and differential count were recorded in modified Alvarado form (Table-1)⁹.

In addition, urine for routine examination (R/E) was done for all cases. Plain X-ray Kidney-Urinary bladder (KUB) region was done in selected cases. Ultra-sonogram (USG) of abdomen was performed when diagnosis was doubtful, especially in female patients to exclude gynaecological disease. The diagnosis of acute appendicitis was made clinically and the decision for appendicectomy was taken by the qualified surgeon. Though all the patients were scored using the modified Alvarado score, it had no implications on the decision to go for surgery. Subsequently, the score of each patient was correlated with the clinical, operative and histopathological findings.

Results

Age of the patients ranged from 7 year to 55 year with the majority of the patients in the third decades (42%) followed by second decades (26%) (Table-II).

Out of 100 patients, 58 (58%) were male and 42 (42%) were female. Clinically males were more susceptible than female with a male-female ratio of 1.38:1 (Table-III). All the specimen of total 100 operated cases were sent to

Table-II: Distribution of patient as per Age group (n=100).

Age group (years)	No of patients	Percentage (%)
Upto-10	03	03
11-20	26	26
21-30	42	42
31-40	17	17
41-50	10	10
51-60	02	02
Total	100	100

Table-III: Distribution of patient as per Sex group (n=100).

Sex	No of patients	Percentage (%)	Male: Female
Male	58	58	1.38 : 1
Female	42	42	
Total	100	100	

Table-IV: Post-operative (per-operative and histopathological findings) diagnosis (n=100).

Findings		No of patients	Percentage
Acute appendicitis	Inflammation	45	45
	Suppurative	33	33
	Gangrenous	04	04
	Perforation	02	02
	Total	84	84
Normal appendix with other diagnosis	Ruptured ovarian cyst	02	02
	Salpingitis	01	01
	Pelvic inflammatory disease	01	01
	Meckel's diverticulitis	01	01
	No pathology found	11	11
Total	16	16	
Total	100	100	

laboratory for histopathological examination. The reports showed features of acute appendicitis in 84 (84%) cases and 16 (16%) patients did not have acute appendicitis. Out of 16 cases, 2 had ruptured ovarian cyst, one had salpingitis, one had pelvic inflammatory disease, one had Meckel's diverticulitis and 11 had no pathology. In this series the negative appendicectomy rate was 16% (Table-IV).

Table-V: Sensitivity of different score range groups (n=100).

Score	No of patients	Acute appendicitis	Normal appendix	Sensitivity
8-10	55	52	03	95%
5-7	41	32	09	78%
1-4	04	00	04	00%

Table-VI: Sensitivity of modified Alvarado score 7 and above (n=75).

Sex	No of patients with score ≥ 7	Acute appendicitis	Normal appendix	Sensitivity
Male	43	40	3	93%
Female	32	27	5	84%
Total	75	67	8	89%

Table-VII: Sensitivity of modified Alvarado score < 7 (n=25).

Sex	No of patients with score < 7	Acute appendicitis	Normal appendix	Sensitivity
Male	15	11	4	73%
Female	10	06	4	60%
Total	25	17	8	68%

In this series, patients with score of 8-10, 5-7 and 1-4 had 95%, 78% and 0% sensitivity respectively (Table-V). Patients with the score 7 and above, the sensitivity is 93% in male and 84% in female and overall sensitivity was 89% (Table-VI). Patients with the score less than 7, the sensitivity was 73% in male and 60% in female and the overall sensitivity was 68%(Table-VII).

Discussion

Result of this study shows that acute appendicitis was most common in the 21-30 years age group (42%). Next common group was 11-20 years (26%). Epidemiological studies have shown that appendicitis is more common in the 10-29 years of age group¹⁰. Male is more susceptible than female¹¹.

The diagnosis of acute appendicitis still remains a challenging task for surgeons. A negative rate of appendicectomy of 20%-40% is not an unusual finding in surgical literature¹². Negative appendicectomy rate in this study was 16% (male 12%, female 21%). The percentage of normal appendicectomies in various series varies from 8 to 33%¹³⁻¹⁵. In a study, Lone et al¹⁶ observed negative appendicectomy rate as 17%. In a prospective study of 215 adults and children, use of the Alvarado score decreased an unusually high false positive appendicectomy rate of 44% to 14%⁶. For the entire

modern era of surgery many surgeons opined that maximum 15-20% negative appendectomy is acceptable¹⁷. Removal of normal appendices is inevitable to lower the rate of perforation and consequent mortality. On the other hand unnecessary appendectomy carries long term risks to the patients¹⁸.

From this study it was found that higher the score, more of its sensitivity. Patients with the Alvarado score ranges 8-10, 5-7 and 1-4 have the accuracy 95%, 78%, and 0% respectively (Table-V). Fengo et al¹⁹ reported a sensitivity of 90.2% and others reported a sensitivity of 73% with negative laparotomy rate of 17.5%. In this series the sensitivity of the patients with the score 7 and above was 93% in male and 84% in female and the combined sensitivity was 89%. Whereas it was 73% and 60% in male and female respectively and the combined sensitivity is 68% in the patients with score less than 7. In a study of Lone et al¹⁶ has shown the sensitivity of the patients with the score 7 and above was 94% in male and 81% in female and the combined sensitivity was 88%. Whereas it was 69% in male and 63% in female and the combined sensitivity was 67% in the patients with score less than 7. Similar sensitivity was found in another study²⁰.

This study also reveals that this scoring system was more helpful in male patients by showing high accuracy rate as compared to female patients (Table-VIII). Lone et al¹⁶ 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^{7,21,22}. In females additional investigations may be required to confirm the diagnosis. Different literatures also support this observation^{23,24}.

However, there are no signs, symptoms or laboratory tests that are 100% reliable in the diagnosis of acute appendicitis. 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. Patients with score of 8 to 10 are almost certain to have appendicitis and they should undergo operation immediately. Patients with a score of 5 to 7 indicate probable appendicitis. They should be observed and evaluated every four to six hours, if the score remains the same or increases after this, re-evaluation is required and the patients may need operation. Patients with the score of 4 or less are very unlikely but not impossible to have appendicitis and they can be discharged from hospital after giving initial conservative treatment and with the advice to report again if symptoms persist or condition becomes worse.

Conclusion

In the diagnosis of acute appendicitis, the modified Alvarado score is a fast, simple, reliable, noninvasive,

repeatable and safe diagnostic modality without extra expense and complications. It is very handy in peripheral hospitals where back up facilities are sparse. It can be very helpful for junior doctors provided it is applied purposefully and objectively in patients of abdominal emergencies. The application of this scoring system improves diagnostic accuracy and consequently reduces negative appendectomy and thus reduces complication rates.

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