

Original article**Usefulness of Modified Alvarado Score in Diagnosis of Acute Appendicitis in Adults**Mondal HP¹, Hadiuzzaman M², Mukhopadhyay C³, Chattopadhyay S⁴, Biswas SK⁵, Bhoj SS⁶**Abstract:**

Background: Definitive diagnosis of acute appendicitis preoperatively is sometimes difficult. Failure to make a diagnosis is the main reason for persistent rate of morbidity and mortality. Various scoring systems are devised to aid diagnosis of acute appendicitis. In some studies the modified Alvarado score was helpful, reliable and practical in minimizing unnecessary appendectomy. **Objective:** The purpose of this study was to evaluate the usefulness of modified Alvarado score for the diagnosis of acute appendicitis. **Materials and Method:** A prospective study of 89 adult patients, admitted with abdominal pain suggestive of acute appendicitis, from July 2011 to June 2012, was conducted. Data including clinical signs and symptoms and laboratory findings were recorded in modified Alvarado score record form. All 89 patients underwent appendectomy. Final diagnosis was confirmed by histopathological examination. Reliability of scoring system was assessed by negative appendectomy rate and positive predictive value. **Results:** Out of 89 patients who underwent appendectomy, 85 had acute appendicitis on histopathology. Positive predictive value was 95.5% and negative appendectomy rate was 4.5%. 52.8% had score 7 or above and 47.2% had score less than 7. From score it is difficult to predict which patient warranted appendectomy and who may be safely observed or discharged. **Conclusions:** Diagnosis of acute appendicitis remains mainly clinical evaluation and it is more helpful than modified Alvarado scoring system in adults.

Keywords: Modified Alvarado Score; acute appendicitis; adults

Bangladesh Journal of Medical Science Vol. 14 No. 04 October'15. Page: 336-338

DOI: <http://dx.doi.org/10.3329/bjms.v14i4.16257>

Introduction:

Acute appendicitis is a common cause of acute abdominal pain in emergency. Failure to make an early diagnosis is a main reason for the persistent rate of morbidity and mortality. Prompt diagnosis and surgical intervention reduce the risk of perforation and infectious complications. Emergency physicians may find it difficult to diagnose acute appendicitis based on clinical grounds alone. Various scoring system have been devised to aid diagnosis and to determine earlier and more convincingly the group of patients who will require further investigation, observation or urgent surgery¹⁻⁷. Alvarado Score

was devised in 1986⁷. Good diagnostic validity of Alvarado Score has been reported in diagnosing acute appendicitis (Chan 2001)⁸. Although some reports have found that the Alvarado Score alone is inadequate as a single diagnostic test (Ohman 1995)⁹. Classic Alvarado Score included shift to left of neutrophil maturation (score 1) yielding a total score of 10^{2,7}. Kalan et al, omitted this parameter and produced a modified score⁶. The purpose of this study is to evaluate the usefulness of Modified Alvarado Score in predicting acute appendicitis in adults in our set up.

Materials and Methods:

This is a prospective study conducted on 89 patients

1. Hari Pada Mondal, Associate Professor,
2. Md. Hadiuzzaman, PGT,
3. Chandranath Mukhopadhyay, RMO-cum-Clinical Tutor,
Dept. of Surgery, North Bengal Medical College, Sushrutanagar, Darjeeling.
4. Shibram Chattopadhyay, Assistant Professor, Dept. of G&O, Burdwan Medical College, Burdwan.
5. Sajal Kumar Biswas, Assistant Professor,
6. Sudhansu Sekhar Bhoj, Professor,
Dept. of Surgery, North Bengal Medical College, Sushrutanagar, Darjeeling.

Corresponds to: Corresponds to: Dr. Hari Pada Mondal, Associate Professor, Dept. of Surgery, North Bengal Medical College, Sushrutanagar, Darjeeling. 3/1, Rajanikanta Sarani, Hakimpura, Siliguri. Dist. Darjeeling. Pin-734001. Email: drhpmondal@gmail.com

above 12 yrs. admitted through emergency surgical dept. of North Bengal Medical college, Darjeeling with clinical diagnosis of acute appendicitis during the period from July, 2011 to June, 2012. Data including age, sex, symptoms, physical signs and laboratory findings such as white blood counts were recorded in Modified Alvarado Score form (table 1). All the patients underwent emergency appendectomy. Definite diagnosis of acute appendicitis was based on post-operative pathologic study.

Table 1: Modified Alvarado Score Forms

Parameters		Score
Symptoms	Migratory of pain	1
	Anorexia	1
	Nausea/vomiting	1
Signs	RLQ pain	2
	Rebound tenderness	1
	Elevation temp	1
Investigation	Leucocytosis	2
	Total score	9

Results:

We conducted our study on 89 adult patients with clinical features suggestive of acute appendicitis. Among this 30 were female (33.7%) and 59 were male (66.3%). Incidence of acute appendicitis was most frequent in 21-29 yrs. age group (39.3%) and least in age group 48-55 yrs.(1.1%). Frequency of symptoms, signs and investigation findings in accordance with Modified Alvarado Score are shown in table 2 and table 5. It showed most of the parameters are less commonly found in acute appendicitis patients.

Table 2: Frequency distribution of patients according to symptoms/signs/investigation

Parameters	Frequency	Percentage
Migration of pain	67	75.3
Anorexia	55	61.8
Nausea/ vomiting	56	62.9
RLQ pain	86	96.6
Rebound tenderness	65	73
Elevation temperatur	52	58.4
Leucocytosis	49	55.1

Modified Alvarado Score of 89 patients who had acute abdominal pain suggestive of acute appendicitis are recorded in table 3. 47 patients had score 7 and above, 42 patient had score less than 7.

Pathological stages in 89 patients who underwent appendectomy with confirmed appendicitis by histopathology are summarized in table 4. 95.5% of

appendectomy patient had appendicitis, only 4.5% had negative appendectomy rate.

Table 3: Frequency distribution of patients according to Modified Alvarado Score

Score	Frequency	Percentage
1	0	0
2	1	1.1
3	6	6.7
4	13	14.6
5	11	12.4
6	11	12.4
7	19	21.3
8	13	14.6
9	15	16.9
Total	89	100

Table 4: Pathological stage of acute appendicitis

Stage	Frequency	Percentage
Acute appendicitis	45	50.6
Gangrenous Appendicitis	9	10.1
Recurrent appendicitis	31	34.8
Normal	4	4.5
Total	89	100

Table 5: Age incidence of acute appendicitis

Age	Frequency	%
12-20	13	14.7
21-29	35	39.3
30-38	22	24.7
39-47	13	14.6
48-55	1	1.1
55-64	2	2.2
>65	3	3.4
Total	89	100

Discussion:

Accurate diagnosis is the key to decrease morbidity and mortality in any disease condition. Various scoring system are developed to aid preoperative diagnosis of acute appendicitis. Among these most famous ones are Alvarado score and its modified form^{6,7}. Modified Alvarado score is based on patient history, physical examination and blood leucocyte counts (table 1). Previous studies showed 80 percent of acute appendicitis cases may present with migratory pain. It may range from 61-92% for nausea/vomiting and 74-78% to loss of appetite. Pyrexia found in 96% case¹⁰. In our study these were 75.3%, 62.9%, 61.8% and 58.4% respectively. Negative appendectomy ranges from 8-33 percent in different studies¹¹⁻¹³. In our study 95.5% of patient had acute appendicitis

according to histopathology reports.

In our study 21.3% of patient have score 7 and 16.9% have score 9 only. 52.8% had score 7 or above and 47.2% had score less than 7. Modified Alvarado Score was neither sensitive nor specific in our study. There are studies who agree or disagree with modified Alvarado Score as its usefulness as a reliable prediction system for preoperative diagnosis of acute appendicitis^{14,6,11}.

In our study many of the parameters are not commonly found, thereby lower scoring of Modified Alvarado score. Lower scoring may be the result of inability of the patient to define the symptoms well for low socioeconomic status. Traditional system of clinical

diagnosis of acute appendicitis was highly sensitive (95.5%) in our study which was in concordance with previous studies where accuracy is between 76 and 92%¹⁵⁻¹⁷.

Conclusion:

Diagnosis of acute appendicitis depends on experience and clinical judgement. Modified Alvarado scoring system does not predict clearly which patient warrants surgical intervention and who may be safely observed or discharged. Thus less helpful than clinic based surgeons' decision to improve diagnostic accuracy and consequently reduce complication rate.

References:

1. Tzanakis NE, Efstathiou SP, Danulidis K, Rallis GE, Tsioulos DI, Chatzivasilou A, Peros G, Nikiteas NI. A new approach to accurate diagnosis of acute appendicitis. *World J Surg.* 2005 Sep; **29** (9):1151-1156. <http://dx.doi.org/10.1007/s00268-005-7853-6>
2. Sitter H, Hoffmann S, Hassan I, Zielke A. Diagnostic score in appendicitis. Validation of a diagnostic score (Eskelinen score) in patients in whom acute appendicitis is suspected. *Langenbecks Arch Surg.* 2004 Jun; **389** (3):213-218.
3. Van den Broek WT, Bijnen BB, Rijbroek B, Gouma DJ. Scoring and diagnostic laparoscopy for suspected appendicitis. *Eur J Surg.* 2002; **168** (6):349-354. <http://dx.doi.org/10.1080/11024150260284860>
4. Nozoe T, Matsumata T, Sugimachi K. significance of SIRS score in therapeutic strategy for acute appendicitis. *Hepatogastroenterology.* 2002 Mar-Apr; **49** (44):444-446.
5. Zielke A, Sitter H, Rampp TA, Schafer E, Hasse C, Lorenze W, Rothmund M. [Validation of a diagnostic scoring system (Ohman score) in acute appendicitis]. *Chirurg.* 1999 July; **70** (7): 777-783. German. <http://dx.doi.org/10.1007/s001040050721>
6. Kalan M, Talbot D, Cunliffe WJ, Rich AJ. Evaluation of the modified Alvarado score in the diagnosis of acute appendicitis: a prospective study. *Ann R Coll Surg Engl.* 1994 Nov; **76** (6): 418-419.
7. Alvarado A. A practical score for the early diagnosis of acute appendicitis. *Ann Emerg Med* 1985; **15**:557-564. [http://dx.doi.org/10.1016/S0196-0644\(86\)80993-3](http://dx.doi.org/10.1016/S0196-0644(86)80993-3)
8. Chan MY, Teo BS, Ng BL. The Alvarado score and acute appendicitis. *Annals of the academy of Medicine Singapore* 2001; **30**(5): 510-512.
9. Ohman C, Yang Q, Franke C. Diagnostic scores for acute appendicitis. Abdominal pain study group. *The European Journal of surgery* 1995; **161**(4): 273-281.
10. Craig S. Appendicitis, Acute. In: www.emedicine.com/EMERG2005/may/26/topic41.htm.
11. Al-Hashemy AM, Seleem MI. Appraisal of the modified Alvarado score for acute appendicitis in adults. *Saudi Med J.* 2004 Sep; **25**(9): 1229-1231.
12. Denizbasi A, Unluer EE. The role of the emergency medicine resident using the Alvarado score in the diagnosis of acute appendicitis compared with the general surgery resident. *Eur J Emerg med* 2003 Dec; **10**(4): 296-301. <http://dx.doi.org/10.1097/00063110-200312000-00011>
13. Flum DR, Koepsell T. The clinical and economic correlates of misdiagnosed appendicitis: nationwide analysis. *Arch Surg* 2002 Jul; **137**(7): 799-804. <http://dx.doi.org/10.1001/archsurg.137.7.799>
14. Malik AA, Wani N A. Continuing diagnostic challenge of acute appendicitis: evaluation through modified Alvarado score. *Aust N J G Surg* 1988 Jul; **68**(7): 504-505. <http://dx.doi.org/10.1111/j.1445-2197.1998.tb04811.x>
15. Anderson RE, Hugander A, Ravn H, Offenbartl K, Ghazi SH, Nystrom PO, Olaison G. Repeated clinical and laboratory examinations in patients with an equivocal diagnosis of appendicitis. *World J Surg.* 2000 Apr; **24**(4):479-485. <http://dx.doi.org/10.1007/s002689910076>
16. Graffeo CS, Countselman FL. Appendicitis. *Emerg Med Clin North Am.* 1996 Nov; **14**(4):653-671. [http://dx.doi.org/10.1016/S0733-8627\(05\)70273-X](http://dx.doi.org/10.1016/S0733-8627(05)70273-X)
17. Guss DA, Richards C. Comparison of men and women presenting to an ED with acute appendicitis. *Am J Emerg.* 2000 July; **18**(4):372-375. <http://dx.doi.org/10.1053/ajem.2000.7323>