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The Role of Alvarado Score in Diagnosis of Acute Appendicitis in a Tertiary Care Hospital

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Abstract

Background: Acute appendicitis is one of the most common abdominal emergencies encountered in surgical practice. The diagnosis of acute appendicitis is an enigmatic challenge. Several studies have reported a variable diagnostic accuracy with a negative appendectomy rate varying from 3% up to 20% using combined diagnostic modalities or using the Alvarado score alone.

Aim of the study: The present study was carried out to evaluate the diagnostic efficacy of the combined use of the Alvarado score for preoperative diagnosis of acute appendicitis.

Methods: This hospital-based prospective study was conducted in the Department of Surgery at Khulna Medical College, Khulna, Bangladesh. The study was conducted from January 2022 to December 2022. A total of 67 patients were admitted to the surgical unit during the specified period with symptoms of acute appendicitis.

Result: This a prospective study; 67 patients were enrolled and analyzed. Every patient in the study had a complication of RIF tenderness. More than 70% of patients had complications like nausea/vomiting, pyrexia and leukocytosis. There were 66(98.51%) patients who had right iliac fossa pain and 40 (59.70%) patients who had anorexia.

Conclusion: Although the diagnosis of acute appendicitis remains mainly clinical evaluation, the scoring system is an easy, simple and cheap complementary aid for supporting the diagnosis of acute appendicitis.

Keywords: Alvarado score; Abdominal pain; Acute appendicitis; Appendectomy

Introduction

Acute Appendicitis (AA) is one of the most common causes of acute abdomen requiring surgical intervention. Approximately 30% of patients present with atypical clinical symptoms [1]. Anamnesis, physical examination, laboratory tests, imaging methods, and scoring systems are used to diagnose AA [2,3]. The Alvarado score (AS) is the most commonly used scoring system for diagnosing Appendicitis. The components of the Alvarado score are migration of pain, anorexia, nausea-vomiting, right lower quadrant tenderness (RLQT), rebound, temperature ≥37.3°C, leukocytosis, and increased neutrophilia. RLQT and leukocytosis score 2 points, while other parameters score 1 point [1-3]. In many studies, it has been recommended that patients with an AS ≤4 be discharged, those with an AS of 5-7 be monitored for 24 hours, and patients with an AS of 8-10 undergo surgery [3-6]. Acute Appendicitis is one of the most typical conditions responsible for the admission of patients to the hospital. The hospitalization rate for

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patients over 60 years old ranges from 18% to 42% [7]. Acute Appendicitis is the most common cause of an acute abdomen in a young adult, with a lifetime risk of about 6% [8]. Difficulty in diagnosis arises in very young, elderly patients and females of reproductive age because they usually have an atypical presentation and many other conditions also present. Appendicitis literature shows that 2-7% of all adults on exploration have diseases other than appendicitis [9]. Appendicitis may be associated with morbidity and occasionally mortality. If failure to diagnose early, the situation may become more complicated. These complications will lead to the appendix rupture, causing peritonitis and circulatory shock. Numerous studies have revealed that early diagnosis and timely operative intervention are crucial to managing acute Appendicitis. However, the picture of acute Appendicitis may not be classical, and in such situations, a policy of early surgery to avoid risk may lead to high negative appendicectomy rates". The simple scoring system developed by Alvarado in 1986 was evolved for affirmative and earlier diagnosis of acute Appendicitis. This scoring system is mainly based on history, examination and simple lab investigations, which include three symptoms (Migratory pain in the right iliac fossa, Anorexia, Nausea/Vomiting), three signs (Fever, Tenderness & Rebound tenderness in the right iliac fossa) and 2 lab investigations (Leucocytosis, shift to the left of neutrophils) [4].

Methodology and Materials

This hospital-based prospective study was conducted in the Department of Surgery at Khulna Medical College, Khulna, Bangladesh. The study was conducted from January 2022 to December 2022. A total of 67 patients were admitted to the surgical unit during the specified period with symptoms of acute appendicitis.

- Inclusion Criteria:

Patients of any age group and both sexes presenting to the surgery department with symptoms of acute appendicitis with informed consent were included.

- Exclusion Criteria:

Patients presenting with urological, gynaecological or other surgical problems including patients with mass in the right iliac fossa and those who are not willing/interested were excluded from this study

The admitted patients were subjected to thorough clinical examination, followed by other baseline investigations like, Hb, TLC, DLC, RFT, Urine examination, X-ray Chest, X-ray KUB and ECG was done. A proforma containing general information about the patient plus eight variables based on the Alvarado scoring system was filled. All the subjects included in the study remained in contact with the doctor for early post-operative complications. All data were presented in a suitable table or graph according to their affinity. A description of each table and the graph was given to understand them clearly. All statistical analysis was performed using the statistical package for social science (SPSS) program, and Windows. Continuous parameters were expressed as mean±SD and categorical parameters as frequency and percentage. The significance of the results as determined by a value of $P<0.05$ was considered to be statistically significant.

Result

This a prospective study; 67 patients were enrolled and analyzed. Table 1 describes the scoring pattern in Alvarado's score. It has ten scoring points according to symptoms, signs and laboratory findings. More than 35% of participants were from the age group 21-30 years, 20(29.85%) patients were from the age group 11-20, and 13 (19.40%) patients were from the age group 31-40 years (Table 2). In this study, male patients were more affected than females; male patients were 52.24%, and female patients were 47.76% (Figure 1). According to Alvarado's score, 45 (67.16%) patients were from the score group 7-10, 15 (22.39%) patients were from the score group 5-6, and 7 (10.45%) patients were from the score group 1-4 (Table 3). Every patient in the study had a complication of RIF tenderness. More than 70% of patients had complications like nausea/vomiting, pyrexia and leukocytosis. There were 66 (98.51%) patients who had right iliac fossa pain and 40 (59.70%) patients who had anorexia (Table 4). We used three procedures for treatments; open appendicectomy was used to treat 19 (28.36%) patients, lap. Appendicectomy was used to treat 37 (55.55%) patients, and the conservative technique was used to treat 11 (16.42%) patients (Table 4). Table 5 shows the correlation of Alvarado's score with histopathology revealing; 10 patients were biopsy positive and 46 patients were biopsy negative.

Table 1: Determination of scoring pattern in Alvarado score.

S. No	Symptoms	Score
1	Migratory right iliac fossa pain	1
2	Nausea/ Vomiting	1
3	Anorexia	1
Signs		
1	Tenderness in right iliac fossa	2
2	Rebound tenderness in right iliac fossa	1
3	Elevated temperature	1
Laboratory findings		
1	Leucocytosis	2
2	Shift to the left of neutrophils	1
Total		10

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Table 2: Age distribution of the study population (N=67).

Age (years)	Frequency	Percentage
05-10	2	2.99
11-20	20	29.85
21-30	24	35.82
31-40	13	19.4
41-50	3	4.48
51-60	2	2.99
61-70	3	4.48

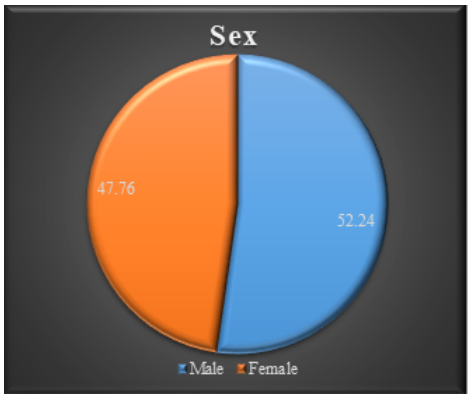

Figure 1: Sex distribution of the study population (N=67).

Table 3: Distribution in the different grades of Alvarado score.

Distribution in the Different Grades of Alvarado Score	No. of Cases	Percentage
1-4	7	10.45
5-6	15	22.39
7-10	45	67.16
Total	67	100

Table 4: Clinical presentation according to Alvarado's components demonstrating the Alvarado score.

Variables	No. of Cases	Percentage
Alvarado's Components		
Right Iliac Fossa Pain	66	98.51
Anorexia	40	59.70
Nausea / Vomiting	50	74.63
RIF Tenderness	67	100.00
Rebound Tenderness	48	71.64
Pyrexia	51	76.12
Leucocytosis	47	70.15
Arneth count	17	25.37
Treatment modalities		
Open appendicectomy	19	28.36
Lap appendicectomy	37	55.22
Conservative	11	16.42

Table 5: Correlation of Alvarado score with histopathology reveal.

Clinical score	Biopsy positive (N=10)		Biopsy negative (N=46)	
	N	%	N	%
5-7	8	80.00	42	91.30
8-10	2	20.00	4	8.70
Total (N=56)	10	100.00	46	100.00

Interpretations of Alvarado's score indicate with a score of 1-3 will be unlikely acute appendicitis, but to be kept on observation for 24-48 hours for any raise in Alvarado's score. Score more than 4-6 probable (equivocal) acute appendicitis, and score 7-10 definitely (high probable) acute appendicitis.

Discussion

Since appendicitis is a surgical emergency of the inflamed appendix and most cases require immediate removal through surgery, either open or laparoscopic appendicectomy, necessary treatment modalities are required quickly to reduce mortality rates [10]. Therefore, a timely clinical decision is essential for better diagnosis with the evidence of history and clinical examination. Several studies demonstrated that a surgeon's timely decision is mandatory because unnecessary surgical intervention carries the risk of morbidity and mortality [11]. The diagnosis of acute appendicitis is mainly clinical, though ultrasound and laparoscopy can be helpful. Sometimes the correct diagnosis could hardly be made [12]. Diagnostic accuracy regarding appendicitis also depends on the surgeon's experience, yet the need for supportive measures is always there [4]. C.T. Scan may resolve the issue supported by ultrasonography and assessment of C-reactive protein levels [13]. However, various scoring systems have been considered for a better outcome [14]. Numerous studies have revealed various scoring systems to diagnose appendicitis better [15]. Few studies highlighted the importance of the Alvarado score, but studies on the Bangladeshi population are rare. Therefore, the present investigation assesses the clinical diagnosis of acute appendicitis based on the Alvarado score. The Alvarado scoring system, first described in 1986, is a simple scoring system that can be instituted easily in the outpatient section. Alvarado scoring system (Table 1) works mainly based on the history, physical examination and few laboratory investigations, which remains the mainstay of correct diagnosis of acute appendicitis [11,16]. Out of 63 subjects, 83% were suspected of acute appendicitis and underwent appendicectomy. Of those operated on, eight subjects were found to have a normal appendix, and others were associated with pathology-related symptoms. The negative appendicectomy rate was found to be very less, representing a percentage of 9.6% (Table 5) [17-20]. Similarly, various studies also presented comparable data and represented the same incidence rates related to positive and negative appendicectomy [21]. Thus, our study is correlated

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to other studies demonstrating the sensitivity of the Alvarado scoring system [22]. In the present study, none of the patients with an Alvarado score below 4 had appendicitis. Hence, we admitted the patients with a score of 3 and above and assessed the impact of the Alvarado scoring system among these people. Therefore, ten patients with a score of 3 and 4 were admitted and kept under critical observation. After a thorough examination, none of them had appendicitis, and our findings strongly support the basis of the Alvarado scoring system. Another study has demonstrated similar observations [23]. Further, 22 patients exhibited a score between the range of 5 and 6 and were admitted into the hospital, out of which 15 were subjected to appendicectomy. In contrast, the remaining seven subjects were discharged on conservative treatment. Thus, the present study strongly supports that patients with an Alvarado Score of 4 or less have no appendicitis; thus, no surgical intervention is required. Our findings are correlated with other studies which demonstrated similar results [23]. However, patients with a score of 5 or above may require surgical intervention. Moreover, it is also important to note that the scoring may not be an objective criterion in patients who fails to give proper histories, such as those very young or those with a communication problem [21]. Several studies also support our findings [24]. 50 patients have exhibited Alvarado scores between the range of 5 and 7, underwent emergency surgery and were found to have acute appendicitis associated with various complications related to pathology, which also further supports the high sensitivity and specificity of the Alvarado scoring system. In contrast, the Positive predictive value was maximum up to a percentage of 91.30% among these subjects (Table 5). Thus, the Alvarado score showed a good correlation with the histopathological results, "higher the score, greater the incidence of histologically proven acute appendicitis". Moreover, applying Alvarado's clinical scoring among the patients presenting with clinical manifestations of acute appendicitis in the emergency setup prevents false-negative operations. Various diagnostic aids have been administered to increase the diagnostic accuracy of acute appendicitis, but the clinical diagnosis is still superior. In the present study, diagnostic tools like ultrasonography have been employed to predict and confirm the diagnosis of acute appendicitis. However, patients exhibiting typical clinical presentations of acute appendicitis based on the Alvarado score do not need modern diagnostic tools like ultrasonography. In addition, the information given by ultrasonography did not improve the diagnostic accuracy in cases of negative or equivocal Alvarado Score.

Limitations of the study

Every hospital-based study has some limitations and the present study undertaken is no exception to this fact. The limitations of the present study are mentioned. Therefore, the results of the present study may not be representative of the whole of the country or the world at large. The number of patients included in the present study was less in comparison to other studies. Because the trial was short, it was difficult to remark on complications and mortality.

Conclusion and Recommendations

The above study concludes that the Alvarado score may be an excellent clinical diagnostic system for excluding acute appendicitis with a score below 4. Patients whose clinical scoring falls between 5 and 7 require critical observation and appropriate investigations like ultrasound and CT scan before the surgical intervention. The present study strongly recommends immediate appendectomy in all patients whose clinical score is more than 7.

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Conflict of interest

None declared

References

1. Behzatoğlu B, Hatipoğlu E, Bayramoğlu S, et al. Comparison of ultrasonographic and computed tomographic findings in the diagnosis of acute appendicitis. Bakırköy Tıp Dergisi 2 (2006): 22-24.
2. Doğan S, Bulut AS, Karamürsel BS. A rare differential diagnosis of acute appendicitis: Appendiceal endometriosis. Turkish Journal of Surgery (2012)
3. Lowry SF, Davidov T, Shiroff AM. Appendicitis and appendiceal abscess. In Fischer's Mastery of Surgery: Sixth Edition 2012 Feb 20. Wolters Kluwer Health Adis (ESP).
4. Alvarado A. A practical score for the early diagnosis of acute appendicitis. Annals of emergency medicine 15 (1986): 557-564.
5. Yildirim E, Karagülle E, Kirbas I, et al. Alvarado scores and pain onset about multislice CT findings in acute appendicitis. Diagnostic and Interventional Radiology 14 (2008): 14.
6. Yüksel Y, Dinç B, Yüksel D, et al. How reliable is the Alvarado score in acute appendicitis? Ulus Travma Acil Cerrahi Derg 20 (2014): 12-18.
7. Marx J, Hockberger R, Walls R. Rosen's Emergency Medicine-Concepts and Clinical Practice E-Book. Elsevier Health Sciences 2 (2013).
8. Ohle R, O'Reilly F, O'Brien KK, et al. The Alvarado score for predicting acute appendicitis: a systematic review. BMC medicine 9 (2011): 1-3.

Sardar A, et al., J Surg Res 2023
DOI:10.26502/jsr.10020294

9. Gilmore OJ, Browett JP, Griffin PH, et al. Appendicitis and mimicking conditions: a prospective study. The Lancet 306 (1975): 421-424.

10. Stephens PL, Mazzucco JJ. Comparison of ultrasound and the Alvarado score for the diagnosis of acute appendicitis. Connecticut medicine 63 (1999): 137-140.

11. Ohmann C, Yang Q, Franke C. The abdominal pain study group: Diagnostic scores for acute appendicitis. Eur J Surg 161 (1995): 273.

12. Soomro AG, Siddiqui FG, Abro AH, et al. Diagnostic accuracy of Alvarado Scoring System in acute appendicitis. J Liaquat Univ Med Health Sci 7 (2008): 93-96.

13. Terasawa T, Blackmore CC, Bent S, et al. Systematic review: computed tomography and ultrasonography to detect acute appendicitis in adults and adolescents. Annals of internal medicine 141 (2004): 537-546.

14. Abdeldaim Y, Mahmood S, Mc Avinchey D. The Alvarado score as a tool for diagnosis of acute appendicitis. Irish medical journal 100 (2007): 342

15. Brigand C, Steinmetz JP, Rohr S. The usefulness of scores in the diagnosis of appendicitis. Journal de Chirurgie 146 (2009): 2-7.

16. Khan I, Rehman A. Application of Alvarado scoring system in diagnosis of acute appendicitis. Journal of Ayub Medical College Abbottabad 17 (2005).

17. Chan MY, Teo BS, Ng BL. The Alvarado score and acute appendicitis. Annals of the Academy of Medicine Singapore 30 (2001): 510-512.

18. Crnogorac S, Lovrenski J, Cvijanović R, et al. Evaluation of the Alvarado score in the diagnosis of acute appendicitis. Medicinski pregled 54 (2001): 557-561.

19. Gwynn LK. The diagnosis of acute appendicitis: clinical assessment versus computed tomography evaluation. The Journal of emergency medicine 21 (2001): 119-123.

20. 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. European Journal of Emergency Medicine 10 (2003): 296-301.

21. Kalan M, Talbot D, Cunliffe WJ, et al. Evaluation of the modified Alvarado score in the diagnosis of acute appendicitis: a prospective study. Annals of the Royal College of Surgeons of England 76 (1994): 418.

22. Fente BG, Echem RC. Prospective evaluation of the Bengezi and Al-Fallouji modified Alvarado score for presumptive accurate diagnosis of acute appendicitis in the University of Port Harcourt Teaching Hospital, Port Harcourt. Nigerian Journal of Medicine 18 (2009): 589.

23. Von Titte SN, McCabe CJ, Ottinger LW. Delayed appendectomy for appendicitis: causes and consequences. The American journal of emergency medicine 14 (1996): 620-622.

24. Shrivastava UK, Gupta A, Sharma D. Evaluation of the Alvarado score in the diagnosis of acute appendicitis. Tropical gastroenterology: official journal of the Digestive Diseases Foundation 25 (2004): 184-6.