

Outcome of Alvarado scoring system in the diagnosis of acute appendicitis at a tertiary care teaching hospital

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ABSTRACT

Background: Diagnosis of acute appendicitis is usually made on the basis of clinical judgment and experience of the surgeon. It may sometimes become a challenge due to variability in presentation. It is not unusual for surgical residents & consultants to miss the diagnosis.

Aim: To evaluate the effectiveness of Alvarado score in making an accurate diagnosis of acute appendicitis and assessing its sensitivity at a tertiary care hospital, in Lahore, Pakistan.

Methods: A Prospective observational study was conducted at the department of Surgery, Ghurki Trust Teaching Hospital (GTTH). The data was collected from 117 patients on a self-designed proforma over a one-year period i.e., from 1st January 2018 to 31st December 2018 with the suspected diagnosis of acute appendicitis and who underwent surgery. The variables were evaluated with Alvarado scoring system to assess its effectiveness and sensitivity. The data was analyzed using SPSS v13.

Results: Demographic results showed 73(62.4%) males and 44(37.6%) female. The mean age was 23 years and most of the patient were in age group 11-20years 55(47%). Abdominal pain was the commonest feature found in all the patients followed by Nausea in 72% and migration of pain to Right Iliac fossa 60%. Complicated appendicitis was found as gangrenous (7.5%) and perforated (6%). 53% of the cases were performed by on-call team consisted of SRs and surgical residents.

Conclusion: Alvarado score is an effective scoring system in making an accurate diagnosis of acute appendicitis. It can be very useful in the prompt management of patients with equivocal features and in extreme of ages.

Keywords: Acute appendicitis, Clinical scoring, Alvarado score

INTRODUCTION

Acute appendicitis is the commonest surgical emergency in tertiary care hospitals and takes most of the share amongst the differential diagnosis of acute abdomen¹. Acute appendicitis is commonly caused by the obstruction of appendiceal lumen by a fecolith, lymphoid hyperplasia or a stricture^{2,25}. The diagnosis of acute appendicitis, due to its variability in presentation, sometimes becomes a challenge. It is not unusual for the surgical residents and even consultants to sometimes miss the diagnosis⁶. Although the most common presentation of acute appendicitis is lower abdominal pain, yet the patients can also present with some atypical symptoms²⁵. Accurate diagnosis of acute appendicitis is difficult in extremes of ages and women of reproductive age³. The clinical presentation varies with age, severity of inflammation and variable position of appendix. Acute appendicitis can occur in all age groups but it is most commonly seen in childhood and young adults with a peak incidence in the teens and early twenties^{4, 25}. Common complications of acute appendicitis include perforation of appendix, gangrene, intra-abdominal abscess formation, wound infection and paralytic ileus³. Early diagnosis and treatment can effectively reduce these complications. Delay in making an accurate diagnosis of acute appendicitis can result in increased morbidity while a wrong diagnosis may lead to negative appendectomies. Clinical judgment is the mainstay in the diagnosis of acute appendicitis but total leucocyte count, ultrasound and computed tomography scan aid in confirming the diagnosis. The diagnostic accuracy can best be achieved with ultrasound and CT imaging⁴. CT scan is useful in confirming the diagnosis of acute appendicitis in patients with equivocal symptoms, thus reducing the rate of complications and unnecessary appendectomies on one hand while establishing an alternative diagnosis on the other⁵. Since CT scan is not easily accessible and as it increases the management cost in developing countries different scoring systems have been used in making early diagnosis of acute appendicitis. Alvarado scoring system is the most popular and

commonly used criteria for diagnosing acute appendicitis^{6,7}. This scoring system has a very good sensitivity and specificity when applied to the western population⁸. The objective of this study was to evaluate the effectiveness and also to assess the sensitivity of the Alvarado score in the diagnosis of acute appendicitis in a tertiary care hospital setting in Lahore, Pakistan.

MATERIAL & METHODS

This was a cross sectional validation study in which prospective data was analyzed. It was conducted in the department of surgery, Ghurki Trust Teaching Hospital (GTTH). The ethical approval of this study was taken from the institutional ethical review board.

Data collection: The data was collected prospectively on a self-designed proforma from 117 patient's hospital record, admitted during a one-year period i.e., from 1st January 2018 to 31st December 2018 with suspected diagnosis of acute appendicitis and underwent surgery. Patients from all age groups and of both genders were included in the study with the exception for previously diagnosed and suspected cases of chronic inflammatory bowel disease and pregnant females. Patient's age, gender, clinical features, ultrasound findings, total leucocytes count, type of incision and procedure, level of surgeon, pre-operative findings and early postoperative complications were recorded. The diagnosis of acute appendicitis was made based on the findings on history and clinical examination. Symptoms recorded were lower abdominal pain, migratory pain, anorexia, nausea, vomiting and fever. Clinical signs included tenderness in right iliac fossa, rebound tenderness, Rovsing's sign and Psoas sign. Total leukocyte count and neutrophil left shift was recorded in findings as well. Diagnosis was confirmed on per-operative findings. Different surgical procedures were performed depending on the clinical criteria. The procedures included open appendectomy, laparoscopic appendectomy and laparotomy. The procedures were performed by senior registrars, surgical residents and only few by consultants. Patient's individual variables were evaluated and compared with Alvarado score.

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Statistical analysis: The collected data was analysed using SPSS version 23. The observations were analysed using descriptive Statistical methods.

RESULTS

One hundred and seventeen patients were admitted through the emergency department of GTTH with the diagnosis of acute appendicitis and they underwent various surgical procedures depending upon the clinical criteria. Demographic results showed 73(62.4%) males and 44(37.6%) females. The mean age of these patient was 23 years (table. 1). In this study, most of the patients were in the age group of 11-20 years 55(47%) followed by 28(24%) in the age group of 21-30 years (Fig.. 1). In the presenting symptoms, history of lower abdominal pain was the commonest feature found in all the patients followed by nausea 85(72%) and migration of pain to right iliac fossa 71(60%). Lower abdominal tenderness was elicited in 100% of the patients and guarding in the right iliac fossa was appreciated in 102(88%) patients. There was raised total leukocyte count ($>9 \times 10^9 /L$) in 79(68%) of patients and it was found to be higher ($> 18 \times 10^9/liter$) in complicated patients like perforated and gangrenous appendix. Neutrophil left shift ($\geq 75\%$) was recorded in 90(76%) patients (Table.1). In perioperative data, the most commonly used incision was the Grid iron incision in 73(67%) of pts. Lap. appendectomy was performed in only five patients. Per-operative findings revealed acutely inflamed appendix in 100(85%) cases. Complicated appendicitis was found as gangrenous (7.5%) and perforated (6%). Laparotomy with midline incision was performed in 4 patients with developed peritonitis in delayed presentation and found to have perforated appendix (Table 2). The length of hospital stay ranged between 2-9 days with mean 3.2 days. 60% patients had length of stay ≤ 3 days. In early postop complications, paralytic ileus developed in 16(13.5%) patients. 6 patients developed fever in early postoperative period and these patients had complicated appendicitis. Wound sepsis occurred in 9(7.5%) patients. No mortality was recorded in patients presenting with clinical features of acute appendicitis and who underwent surgery in this study period. Alvarado scoring system (AS) was applied to all these diagnosed patients of acute appendicitis. On evaluation four cases were found to have score equal to 4 according to Alvarado scoring criteria. 37 cases out of a total of 117 pts had a AS of 5-6, while 4 cases were negative for acute appendicitis confirmed at operative findings (Fig. 2), and the remaining 85(72%) pts had a AS ≥ 7 (Table. 3). Keeping a cutoff point at 7 for accurate diagnosis of acute appendicitis with data collected diagnostic Sensitivity of Alvarado score (i.e., correct diagnoses/ total cases) was calculated at 75.22% (Table. 4).

Figure.1: Demographic Distribution

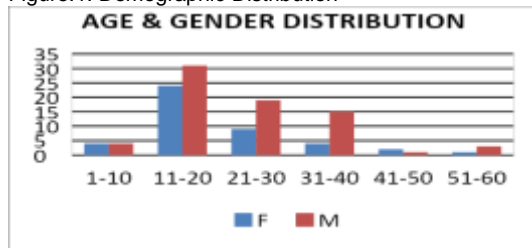


Table 1: Demographics and Clinical findings (n=117)

Demographics	
Mean Age	23
Gender ratio M:F	73:44
Clinical features	
Abdominal pain	117(100%)
Migratory Pain	71(60%)
Nausea	85(72%)
Anorexia	63(54%)
Vomiting	57(48%)
Fever	44(38%)
Guarding	102(87%)
RIF tenderness	117(100%)
Rebound Tenderness	109(93%)
Psoas sign	26(22%)

Table 2: Peri-operative Data (n=117)

Intraoperative Findings	
Acutely Inflamed	98(83%)
Gangrenous	8(7.5%)
Perforated	7(6%)
Normal	4(3.5%)
Incision	
Grid iron incision	73(67%)
Lanz incision	3(2.5%)
Transverse skin crease incision	27(23%)
Lower Midline incision	2(1.5%)
Midline umbilical saving incision	2(1.5%)
Laparoscopic appendectomy	5(4%)
Surgeon level	
Postgraduate trainee	62(53%)
Senior Registrar	39(33%)
Assistant Professor	14(12%)
Professor	2(1.5%)
Procedures	
Laparoscopic Appendectomy	5(4%)
Open Appendectomy	108(92%)
Laparotomy	4(3%)
Early postoperative complications	
Ileus	16(13.5%)
Post-op Fever	6(5%)
Wound sepsis	9(7.5%)

Figure 2: AS relationship to preoperative findings

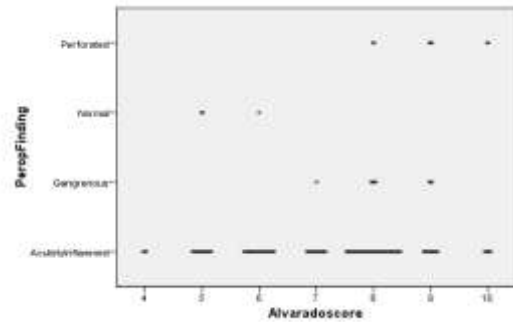


Table 3: Evaluation of Alvarado Score to individual variables in Diagnosis of Acute Appendicitis

Clinical Features	Alvarado Score	Distribution of Data for individual variables n=117
Migratory Pain	1	71 (60%)
Anorexia	1	63(54%)
Nausea -Vomiting	1	57(48%)
Tenderness in RIF	2	117(100%)
Rebound Tenderness	1	109(93%)
Elevated Temperature	1	44(37%)
TLC $\geq 10 \times 10^9/L$	2	79(68%)
Neutrophil Shift $\geq 75\%$	1	90(76%)
		≤ 4 not likely 5-6 likely 7-8 probable ≥ 9 definite

Figure 3: AS relationship to Neutrophil left Shift

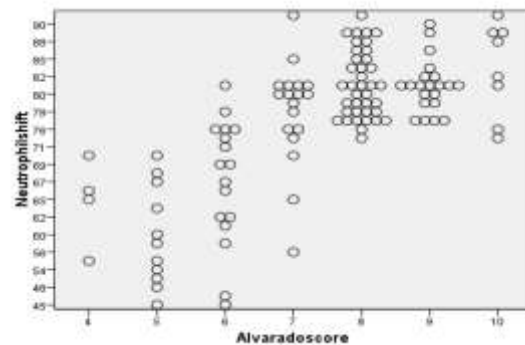


Table 4: Interpretation of Alvarado score with number of Diagnosis

Alvarado Score	No. of Diagnosis n=117
≤ 4 not likely	4(3.5%)
5-6 likely	28(23%)
7-8 probable	56(47%)
≥ 9 definite	29(24%)

DISCUSSION

Acute appendicitis is a common surgical condition which is diagnosed mostly by clinical examination and supported by the laboratory findings. Different diagnostic methods are used to improve accuracy like ultrasound, CT scan, but all these methods have some drawbacks. These methods are operator dependent and increase the cost of treatment or even delay the management⁵. In developing countries like Pakistan, where there is limitation of resources these methods are not cost effective¹³. CT scan is the gold standard investigation to diagnose acute appendicitis. Most of the patients are operated without a CT scan due to its high cost, non-affordability and non-availability in most of the hospitals in Pakistan. This practice may lead to some unnecessary operations and therefore high morbidity⁹. In this study, there was no major morbidity recorded and the negative appendectomy rate was 3.4%. This negative appendectomy rate is well within range of different studies in literature^{10,11}.

In the recent years, development of different scoring systems has eased evaluation of patients presenting with pain in the right iliac fossa. The Alvarado Score is the most commonly used scoring system. Its validity and sensitivity has been determined in many studies^{12,13,14}. It is easy to apply Alvarado scoring system as clinical findings are already in practice. In this study, the Alvarado scoring system was applied to the clinically diagnosed cases of acute appendicitis. The diagnostic sensitivity of this score was found to be 75.22% in this study which is comparable to other studies in the literature^{15,18}. Kariman et al.¹⁹ reported that the patients presenting with acute abdominal pain and evaluated for Alvarado score >7 are 93% more likely to be diagnosed as acute appendicitis than patients with Alvarado score <7 have 26% chances to be diagnosed as acute appendicitis. Therefore, patients making lesser scores than 7 should be cautiously worked up not to miss a diagnosis. In this study, 85 (72%) patients were evaluated as Alvarado score more than 7. 4 patients had an Alvarado score < 4 and out of these 4 only one patient was found to have normal appendix in operative findings and the other three were acutely inflamed appendixes. Three patients who were found to have normal appendix were at Alvarado score-5 when evaluated. A significant Neutrophilic left shift ≥75% observed in our study (Figure 3) is in true comparison with study by Wang et al^{20,21}. In literature, different scoring system have been evaluated but the Alvarado scoring system is easy to apply and more practical^{6,23,24}.

CONCLUSION

Alvarado score is an effective scoring system in making an accurate diagnosis of acute appendicitis. It can be useful in the prompt management of patients with equivocal features and in extreme of ages. Clinical scoring systems may enhance the accuracy in diagnosis, but still good clinical acumen will keep primary importance in making diagnosis of acute appendicitis. Application of clinical scoring systems like AS can benefit young trainees to develop their skills in diagnostic accuracy and prompt management for this common surgical emergency minimizing morbidity due to missed or delay in diagnosis

Limitation: The study is prospective and has been conducted at a single hospital on a small group of patients. A multicentric study

with a large sample size is suggested for a more accurate evaluation of the efficacy of the Alvarado scoring system.

Conflict of Interest: No conflict of interest was declared

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