APPLICATION OF ALVARADO SCORING SYSTEM IN DIAGNOSIS OF ACUTE APPENDICITIS

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Background: In conditions like acute appendicitis it is impractical to have definitive diagnosis by gold standard test (histopathology) before surgery, we would like a simple test like Alvarado scoring system which depends on the presence and absence of certain variables and which provides an accurate guide to whether or not the patient has the condition. This study was conducted to evaluate Alvarado scoring system for the diagnosis of acute appendicitis in our set up. **Methods**: 100 consecutive patients with suspected acute appendicitis admitted in Surgical B unit, Khyber Teaching Hospital Peshawar, during the period from July to December 2003 were included in the study. They were given specific scores according to the variables of Alvarado scoring system and then divided into 3 groups. Group 1 patients (score 7 or more) underwent surgery, group 2 patients (score 5-6) were admitted for observation and group 3 patients (score 4 or less) were discharged home. Patients from group 2 with increased symptom intensity (score 7 or more) in reevaluation underwent surgery. Diagnosis was confirmed by histopathological examination. Reliability of scoring system was assessed by calculating negative appendicectomy rate and positive predictive value. **Results**: Out of a total 100 patients 64 patients underwent surgery and appendicitis was confirmed in 54 cases, thus giving negative appendicectomy frequency of 15.6% (male 12%, female 17.9%). Perforation rate was 7.8%. Positive predictive value was 84.3% (males 88%, females 82.1%). **Conclusion**: This scoring system is easy, simple and cheap complementary aid for supporting the diagnosis of acute appendicitis especially for junior surgeons.

Key words: Acute appendicitis, Appendicectomy, Scoring system.

INTRODUCTION

Acute appendicitis is one of the most common surgical emergency with a life time prevalence of approximately 1 in 7.[1] Its incidence is 1.5-1.9/1000 in male and female population.[2] Surgery for acute appendicitis is the most frequent operation performed (10% of all emergency abdominal operations).[3,4]

The diagnosis of acute appendicitis is purely based on history, clinical examination and some laboratory investigations (eg. WBC count). Imaging techniques have been shown to add very little. A certain diagnosis can only be obtained at surgery and after pathological examination of surgical specimen.[5]

A negative appendicectomy rate of 20-40% has been reported in literature and many surgeons would accept rate of 30% as inevitable.[6] Removing normal appendix is an economic burden both on patients and health resources. Misdiagnosis and delay in surgery can lead to complications like perforation and finally peritonitis.[7] Difficulty in diagnosis arise in very young, elderly patients and females of reproductive age because they usually have atypical presentation and many other conditions also present like appendicitis and literature shows that 2-7% of all adults on exploration have diseases other than appendicitis.[8]

Although there is much advancement in gastroenterology but no major improvement in diagnostic accuracy of acute appendicitis, which ranges from 25-90% and optimum rate is 80% which is less in females than males. Scoring systems are valuable and valid instruments for discriminating between acute appendicitis and non specific abdominal pain[9]. At present many scoring systems for the diagnosis of acute appendicitis are available. Alvarado scoring system is one of them and is purely based on history, clinical examination and few laboratory tests and is very easy to apply[10](table 1) . This study was designed to evaluate the usefulness of this scoring system.

MATERIALS AND METHODS

We performed this study, conducted on 100 consecutive patients admitted to the surgical B unit of Khyber teaching hospital, Peshawar, from the emergency department with the clinical diagnosis of acute appendicitis during the period from July to December 2003. Patients of any age group and both genders presenting to the emergency department with pain in right lower quadrant of abdomen were included in the study. Patients with presentation of urological, gynaecological or surgical problems other than appendicitis and especially patients with mass in right iliac fossa were excluded from the study.

All included patients were admitted, initially assessed by house surgeons and base-line

investigations (full blood count urine routine examination, x-ray KUB) were done. Then a specially designed proforma was filled in for each patient by a medical officer, who was properly trained beforehand. These proformae had general information about the patients plus eight variables based on the Alvarado scoring system. Then the sum of all the scores were calculated for each patient and based on the results patients were divided into three groups.

Aggregate score 7-10 (emergency surgery group): These patients were prepared and all underwent emergency appendicectomy.

Aggregate score 5-6 (observation group): These patients were admitted and kept under observation for 24 hours with frequent re-evaluation of the clinical data and reapplication of the score. Condition of some patients improved shown by a decrease in score and therefore they were discharged with the instructions that they should come back if symptoms persist or increase in intensity.

Aggregate score 1-4 (discharge home group): These patients, after giving initial symptomatic treatment, were discharged and sent home with the instructions, to come back if symptoms persist or condition become worse.

The diagnosis of acute appendicitis was confirmed by operative findings and histopathological assessment of the appendicectomy specimen.

Finally the reliability of Alvarado scoring system was assessed by calculating Negative appendicectomy rate (the proportion of operated patients having normal appendix removed) and Positive predictive value (the proportion of patients with a positive test result who actually have the disease).

RESULTS

We conducted our study in one hundred consecutive patients with clinical features suggestive of acute appendicitis. Among these patients 59 were female (59%) and 41 were male(41%) (ratio male to female 1:1.4). Mean age was 20.2 years (range 9-56 years, standard deviation $\pm$ 8.1 years), with median age of 23 years. Most of the patients were of younger age group.

Frequency distribution of the patients according to alvarado scoring system is given in table 2. Mean scores for the emergency surgery group, observation group and discharge home group were 8.36,5.55 and 3.65 respectively (range of score 1-10) (table 3). Group wise results were as follows:

We received 17 patients (17%) with alvarado score of 1-4. Among them 10 were female (58.8%) and 7 were male (41.2%). All of them were discharged after initial assessment and symptomatic treatment. 3 of them came back with increased severity of symptoms and score of 7 or more with in 48 hours. They were admitted and all of them underwent appendicectomy. Operative findings and histopathological reports showed that all the 3 patients had inflammed appendix.

31 patients (31%) had score of 5-6, all were admitted for observation and regular reevaluation. This group comprised of 17 female (54.8%) and 14 male (45.2%) patients. 22 patients ended up in a score of 6 or less after 24 hours and therefore were discharged. Only 9 patients had increased severity of symptoms with score 7 or more on reevaluation with in first 24 hours. These 9 patients underwent appendicectomy. Operative findings and histopathological reports showed that 6 patients had inflammed appendix and the remaining 3 patients had normal appendix.

In 52 patients (52%) the score was found to be 7 or more. All were admitted and underwent appendicectomy. Among them 32 were female (61.5%) and 20 males (38.5%). Operative findings and histopathological reports showed that 45 patients had inflammed appendix and 7 patients had normal appendix.

Table-1: Alvarado scoring system

Symptoms	Score
Migratory right iliac fossa pain	1
Nausea / Vomiting	1
Anorexia	1
Signs	
Tenderness in right iliac fossa	2
Rebound tenderness in right iliac fossa	1
Elevated temperature	1
Laboratory findings	
Leucocytosis	2
Shift to the left of neutrophils	1
Total	**10**

Negative appendicectomy rate in our study was 15.62%. Total number of surgeries performed in our study was 64 (64%). Among these patients 39 were female and 25 were male. Operative findings and histopathological reports showed that 54 patients (84.4%) had inflammed appendix including 32 female patients and 22 male patients. The negative appendicectomy rates for males and females were 12% and 17.9% respectively.

Positive predictive value of Alvarado score was 84.3% (males 88% and females 82.1%)

Among all surgeries performed 5 patients (7.8%) had perforated appendices, 7 patients (10.9%) had gangrenous appendices and none of them was missed by alvarado score and all were operated. Results of our operative exploration are shown in table 4.

Table-2: Frequency distribution of patients according to Alvarado scoring system

Score	No. of patients (%age)
1	---
2	---
3	6(6%)
4	11(11%)
5	14(14%)
6	17(17%)
7	13(13%)
8	18(18%)
9	10(10%)
10	11(11%)

Table-3: Results of application of Alvarado scoring system

Suggested management	Results (%age)	Mean score
Surgery	52(52%)	8.63
Observation	31(31%)	5.55
Discharge	17(17%)	3.65

Table-4: Results of explorations (Operative findings and Histopathological examination)

Findings	No. of patients	%age
Inflammed appendix		
Acute appendicitis	42	65.6%
Perforated appendix	5	7.8%
Gangrenous appendix	7	10.9%
Normal appendix		
Ruptured ovarian cyst	2	3.1%
Meckel's Diverticulitis	1	1.6%
Salpingitis	1	1.6%
No pathology found	6	9.4%
Total operated patients	**64**	

DISCUSSION

The main aim of the clinical decision making process is to reach an accurate diagnosis in the fastest and cheapest way[5]. History and clinical examination provide useful information regarding diagnosis but even then different possibilities are there. The surgeon is the person who decides the best management in cost effective manner. The choice that whether to operate or not is very important because surgical intervention for acute appendicitis carries definitive risk of mortality and morbidity[11]. These days the diagnosis of acute appendicitis is mainly clinical. Different diagnostic aids have appeared recently and among these laparoscopy and ultrasonography have shown good results but they also have limitations and drawbacks[12]. Of course the more experienced the surgeon is, more will be the diagnostic accuracy, but the junior surgeon have to make the initial assessment and decision to operate or not. Thus there is need of a complementary aid in difficult decisions.[10,13]

At present many clinical scoring systems are available and have proved useful in the management of acute appendicitis. Initial assessment can be improved by clinical scoring system e.g. alvarado scoring system which is based on history, physical examination and few laboratory investigations and is very easy to apply.[13,14] A structured form for recording patient's data provide a more consistent and complete pre-operative patient assessment and it can be a cheap and quick tool to apply in emergency room.

Results of our study are comparable with the literature. Negative appendicectomy rate in our study was 15.6% (male 12%, female 17.9%). It is comparable with the figures shown in literature as 14.3%, 16.1%.[7,14] Removal of some normal appendices is bound to lower the rate of perforation and consequently mortality. Literature shows that if negative appendicectomy rate is less than 10-15%, then the surgeon is operating on too few patients thus increasing the risk of complications [7]. Some centers have even reduced negative appendicectomy rates to less than 10% by having regular audit of appendicectomies .

Our study shows that application of Alvarado scoring system in diagnosis of acute appendicitis can provide high degree of Positive predictive value and thus diagnostic accuracy. Positive predictive value shown by our study (83.5%) is comparable with the literature which reports 87.5%,85.3%87.4%.[6,13,15]

Our study also revealed that Alvarado scoring system is more helpful in male patients by showing lower negative appendicectomy rate and high positive predictive value for male patients as compared to females. In females additional investigations may be required to confirm the diagnosis. Literature also support this observation.[16,17]

Studies evaluating usefulness of Alvarado scoring system in paediatric age group shows that it

is equally accurate in children with positive predictive values of upto 85.7%.[18]

CONCLUSION

This study showed that clinical scoring systems like the one used in this study can be a cheap and quick tool to apply in emergency departments to rule in acute appendicitis. This scoring system is a dynamic one, allowing observation and critical reevaluation of the evolution of the clinical picture. Its application improves diagnostic accuracy and consequently reduces negative exploration and complication rates (e.g. perforation).

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