ALVARADO SCORE IN THE DIAGNOSIS OF ACUTE APPENDICITIES

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ABSTRACT
Objective: *To evaluate the efficacy of Alvarado score in diagnosing acute appendicitis and to correlate it with operative and histopathological findings.*
Study Design: *Prospective, cross-sectional study .*
Setting & Duration: *Surgical D Ward, Khyber Teaching Hospital, Peshawar from Dec 2006 to Dec 2007.*
Methodology: *A total of 100 patients who were admitted with a diagnosis of acute appendicitis during the study period were included in the study. After collecting the basic and clinical data, the patients were divided into three groups according to the Alvarado score. Group-I (Score1-4) patients were put on conservative treatment and sent home, while Group-II (Score5-6)patients were admitted put on conservative treatment reassessed and rescored after few hours. Those settling down were discharged, while those deteriorating with increase in their Alvarado score were operated. Group III patients were operated after necessary preparations. Modified Alvarado Score was then correlated with the operative and histopathological findings.*
Results: *A total of 100 patints, 62 males and 38 females were included in the study. Majority (67%) of them were teenagers or in their twenties. Amongst them 89 patients, 9 of group II and 80 of group III, underwent appendicectomy. Out of these 16 cases had a normal appendix.*
Conclusion: *The Alvarado score is an easy,cheap.simple and effective aid for diagnosing acute appendicitis.*

KEY WORDS: *Acute Appendicitis, Appendicectomy, Scoring System, Alvarado Score*

INTRODUCTION

The classical signs and symptoms of acute appendicitis were first reported by Fitz[1] in 1886. Since then it has remained the most common diagnosis for hospital admission requiring laparotomy.[2,3] Since then acute appendicitis has remained the commonest clinical presentation that requires emergency surgery. Approxiamately 6% of the population will suffer from acute appendicitis during their lifetime.[4,5] Despite being so common its diagnosis still remains a challenge[6,7] leading to a negative appendicectomy rate of 20-40%.[8]

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Misdiagnosis and delay in surgery can lead to complications like perforation and finally peritonitis. Different diadnostic aids have been used in attempts to reduce negative appendicectomies which all have variable usefulness like laproscopy[9], scoring systems[10], computer programs[11], ultrasonography[12], computed tomography[13] and magnetic resonance imaging.[14] These efforts have successfully lowered the mortality rate to less than 0.1% for non complicated appendicitis, 0.6% where there is gangrene, and 5% for perforated cases.[15]

In 1986 Alvarado proposed a Scoring system to diagnose acute appendicitis.[16] His system is purely based on history, clinical examination and few laboratory tests and is very easy to apply Table I. Alvarado suggested operation for patients having a score of 7 or above out out of 10. This study was carried out to evaluate the practicality of Alvarado`s scoring system in our setup.

METHODOLOGY

We performed this study, conducted on 100 consecutive

patients admitted to the surgical D unit of Khyber teaching hospital, Peshawar, from the emergency department with the clinical diagnosis of acute appendicitis during the period from December 2006 to December 2007. 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 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).

Table I. 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 fingings	
Leucocytosis	2
Shift to the left of neutrophils	1
Total	10

RESULTS

A total of 100 cases were included in this study, out of these 62% (n=62) patients were male and 38% (n=38) were female with a male to female ratio of 6:4 as shown in figure No 1.Their ages ranged from 13 to 50 years with the maximum patients (43) in the 2nd and 3rd decade of life (figure no 2).

Most of the patients presented with pain around the umbilicus shifting to right iliac fossa (n=100) followed by fever (n=93) 93%,anorexia (n=82) 82%, nausea (n=68) 68% and vomiting (n=44) 44% as shown in figure 2.

Among these 100 patients 7% patients had Alvarado score of 1-4, 13% had a score of 5-6 and 80% were

Table II. Alvarado Score (n=100)

Alvarado Score	No.	Appendicitis	No Appendicitis
1 - 4	7	0	0
5 - 6	13	5	5
7 - 10	80	68	68
Total	100	73	73

Table III. Frequency of Appendicities in patients and Alvarado Score Cutoff point 7 (n=100)

Alvarado Score Cutoff Point	Appendicitis	No Appendicitis
> 7	68	12
< 7	5	15
Total	73	27

Sensivity = 0.93 (93%)
Specificity = 0.55 (55%)
PPV = 0.85 (85%)

Alvarado Score Cutoff Point	Sensitivity	Specificity	1-Specificity	PPV
7	0.93	0.55	0.45	0.85
5	1.00	0.26	0.74	0.78

Table IV. Comparison of Sensitivity, Specificity, 1-Specificity and PPV values of Cutoff 5 and Cutoff 7

found to have a score of 7-10.

All patients with Alvarado score 1-4 were managed conservatively and were send home. While patients having score 5-6 were first put on conservative treatment and then reassessed. Four patients having Alvarado score 5-6 improved with conservative management and were sent home and followed for one month to have no recurrence of symptoms. These patients were labeled to have no appendicitis with out histopathology (n=11) 11% .

All patients in score range 0-4 were labeled to have no appendicitis. Out of 13 patients in 5-6 score range the 4 managed conservatively were labeled to have no appendicitis. Of the remaining 9 patients 5 were proven case of appendicitis (Acute appendicitis, gangrenous, perforated). The remaining 4 patients had no appendicitis on HP. In the score range 7-10, all the 80 patients were operated and specimens subjected to HP. 68 patients (n=68) 85% showed changes of appendicitis while 12 patients (n=12) 15% had no appendicitis on HP as shown in Table II.

At the cut off point 7 and above of Alvarado score, the sensitivity was 93% while the specificity was 55% and positive predictive valve was 85%. as shown in Table III. For Alvarado score cut off point 5 and above, the sensitivity of the score increased to 100% but the specificity decreased to 26%. Thus increasing the chance of picking false negative cases. The positive predictive value at this cut point was 78%. as shown in Table IV.

DISCUSSION

The diagnosis of acute appendicitis continues to be difficult due to the variable presentation of the disease and the lack of reliable diagnostic tests. Although there has been some improvement in the diagnosis of acute appendicitis over the past several decades, the percentage of normal appendices reported in various series varies from 8 to 33%.[17-19]

In the management of number of surgical conditions, clinical scoring systems have proved useful. Similarly, many scoring systems have been developed to help improve the diagnosis of acute appendicitis[20] like the Ramirez[7], Teicher[10] and Ohmann.[20] However Alvarado scoring system is in common usage.[21,22]

The results of our study are comparable with that of other studies. The negative appendicectomy rate of our study was 16%. It is comparable with the figures shown in literature as 14.3%[20], 16.1%[23], 17.5%[24], 14%[25], 11%[26] and 20%[16] in various studies respectively. Similarly, in a prospective study of 215 adults and children in Cardiff, use of the Alvarado score decreased an unusually high false-positive appendicectomy rate of 44% to14%.[27] 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.[20] Some centers have even reduced negative appendicectomy rates to less than 10% by having regular audit of appendicectomies.

To be useful, a scoring system must be both sensitive and specific.The sensitivity of Alvarado as found by our study was and the specificity was Fenyo[28] also, reported in one study a sensitivity of 90.2% and specificity of 91.4% and others reported a sensitivity of 73%, specificity of 87%.[29]

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 (82%) is comparable with the literature which reports 83.5%,87.5%,85.3%87.4%.[22,30,31]

CONCLUSION

Alvarado scoring system is simple to use, requires no expensive equipments or expertise. It can be applied any where in the world ,assessment is easy to carry out and it helps in reducing the negative appendicectomy rate.

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