ORIGINAL ARTICLE

ACCURACY OF MODIFIED ALVARADO SCORE IN DIAGNOSIS OF ACUTE APPENDICITIS IN ADULTS

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ABSTRACT

Objective: To measure the accuracy of Modified Alvarado Score (MAS) in diagnosing suspected patients of acute appendicitis having MAS of 7 or above.

Design: Validation study.

Place and Duration of Study: Surgical Departments of Combined Military Hospital (CMH) and Military Hospital (MH) Rawalpindi from April 2006 April 2007.

Material and Methods: This study involved 100 patients who were operated with provisional diagnosis of acute appendicitis. Preoperatively MAS of each patient was calculated. Postoperatively appendices of all the patients were sent for histopathological examination and their results regarding presence or absence of acute appendicitis were then compared with MAS of there patients. The data was analyzed by using SPSS version 10.0.

Results: Staistical analysis showed that MAS of 7 or more has sensitivity of 88.88%, specificity of 71.42%, Positive Predictive Value 88.88% and Negative Predictive Value 71.4%. Accuracy of MAS was 84%.

Conclusion: MAS 7 or above is a reliable indicator of acute appendicitis clinically in adults. The number of negative appendicectomies can be reduced by using MAS in clinical practice.

Keywords: Acute appendicitis, Appendicectomy, Modified Alvarado Score.

INTRODUCTION

Acute appendicitis is the most common cause of acute abdomen in young adults[1]. Appendicitis is sufficiently common that appendicectomy is the most frequently performed urgent abdominal operation. In usual clinical practice a surgeon on the basis of clinical skills makes the diagnosis of acute appendicitis and the treatment of choice is surgery.

Diagnosis of acute appendicitis is at times difficult. Decision making in case of acute appendicitis may be especially difficult for junior doctors who might get confused by a long list of conditions mimicking this clinical scenario. Equivocal cases usually require in-patient observation. This delay in diagnosis may increase the morbidity and costs.

To avoid complications related to delayed diagnosis or treatment, there is a tendency of over diagnosis of the condition and different studies have found a very high negative appendicectomy rate (11-30%).[2,3] In another study the proportion of negative appendicectomy rate was 32.66%[4].

Recently a number of scoring systems have been advocated to minimize the number of negative appendectomies. In daily clinical practice the use of a scoring system has been found to be associated with a reduced rate of negative appendicectomies.[5]

In 1986 Alvarado[6] described a scoring system which has been validated in adult surgical practice[7-9]. The classic Alvarado score included left shift of neutrophil maturation (score 1) yielding a total score of 10. However in 1994 Kalan[10] omitted this parameter and produced a modified score. There are mixed results regarding the efficacy of Modified Alvarado Score (MAS)[11-15].

This study was undertaken to evaluate the accuracy of MAS. It is based on the hypothesis that the frequency of inflammed appendix is more in patients having MAS 7 or more, than patients having MAS 6 or below.

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The aim of this study was that a simple and structured scoring system like MAS will aid junior doctors. This will help in deciding upon a course of action in suspected cases of acute appendicitis and thus help in reducing the incidence of negative appendicectomies.

PATIENTS AND METHODS

This validation study was carried out in surgical departments of CMH and MH Rawalpindi which are tertiary care military hospitals. Patients of age 16 years or above who were admitted and operated with provisional clinical diagnosis of acute appendicitis were included. A total number of 100 patients were studied. All those patients who were treated conservatively were not included and five patients were dropped out because they had appendicular mass at the time of admission. Another two female patients were not included because they had developed florid signs of pelvic inflammatory diseases.

Patients were initially evaluated by history, physical examination, Total leucocyte count, and MAS of each patient was calculated. The decision to operate was made independently by the surgeon on call / surgical team. All operated appendices were sent for histopathological examination. In MAS, score is given to few important points (1-9) out of history, clinical examination and laboratory investigations. Diagnosis of acute appendicitis is then established based upon the score attained by the patient i-e., 1 - 4 Appendicitis unlikely, 5-6 Probably appendicitis, 7-9 most likely acute appendicitis. Score given to different points had been described in Table.

Data was analyzed using statistical package for social sciences (SPSS) version 10.0. Descriptive statistics were used to describe the data. Sensitivity, specificity, positive predictive value, negative predictive value and accuracy of MAS of all patients, included in the study was calculated by using histopathology as gold standard.

RESULTS

Out of 100 patients, 65 (65%) were males and 35 (35%) were females. Minimum age was 16 years and maximum was 70 years. Mean age of all patients was 32.17 years (SD=13.07). A total of 72 (72%) patients had acute appendicitis on histopathological examination and 28 (28%) had normal appendix (Fig.1). Most common MAS was seven (40%) (Fig.2)

A total of 72 patients had MAS of 7 or more, among them 46(63.9%) were males and 26 (36.1%) were females. Out of these 72 patients, 64 (88.8%) had histologically proven acute appendicitis, while 8 patients (11.1 %) had normal appendix.

Table: Modified Alvarado Score.

Symptoms	Score
Migratory right iliac fossa pain	1
Anorexia	1
Vomiting / Nausea	1
Signs	
Tenderness right lower quadrant	2
Rebound tenderness right lower quadrant	1
Pyrexia≥37.50C	1
Investigations	
Leucocytosis	2

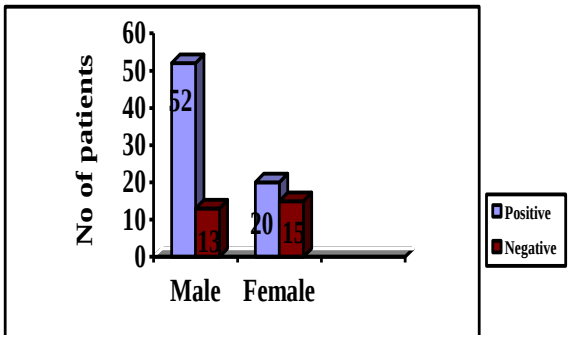

Fig. 1: Histopathological results of appendix in comparison with gender (n=100)

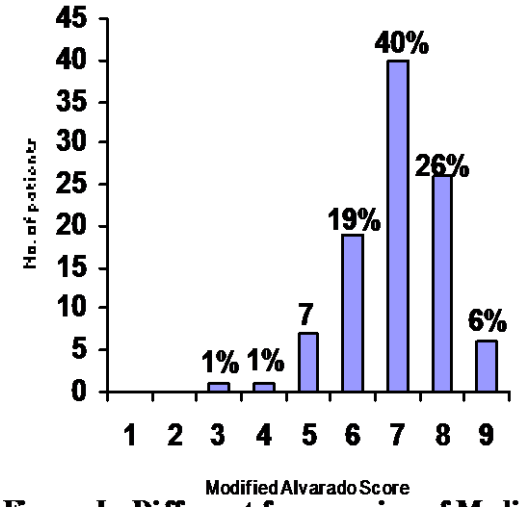

Fig.2: Different frequencies of Modified Alvarado score (n=100).

A total of 28 patients had MAS of 6 and below, among them 19(67.9%) were males and 9 (32.1%) were females. Out of these 28 patients, 8 (28.57%) had histologically proven acute appendicitis, while 20 patients (71.42%) had normal appendix.

Statistical analysis showed that 64 patients had true positive results, 20 patients had true negative results, and 8 patients had false positive results while 8 patients had false negative results. Overall sensitivity of MAS 7 or more was 88.89%, specificity was 71.42%, positive predictive value 88.89% and negative predictive value was 71.42%. Thus the overall accuracy of MAS was 84%.

DISCUSSION

Diagnostic accuracy in case of acute appendicitis should be high because negative appendicectomy carries significant morbidity. There is greater risk for abdominal adhesions after appendicectomy for healthy appendix as compared with that of acute appendicitis. History, clinical examination, TLC and abdominal ultrasonography are helpful to achieve a more accurate diagnosis.

In developed countries advanced diagnostic facilities like ultrasonography, CT scan and diagnostic laparoscopy are routinely available and are helpful in making a treatment plan, but in our setup such investigations are not available in most hospitals and are also costly. Moreover one cannot rely on any single investigation, but a combination of thorough physical examination along with investigations is essential for accurate diagnosis of acute appendicitis[16].

In this study there were 65 males and 35 females. This gender ratio is almost similar to Muzafaruddin[13] and AI-Hshemy[12]. The most common age group is 21 - 25 years which is comparable to published literature[1,17]. The negative appendicectomy rate in patients with MAS 7 or more was 11.11 % which is less than the similar studies carried out by AI-Hashemy[12] and Saidi HS[3]. When the data is statistically analyzed it is seen that negative appendicectomy rate decreases with the rise in score, which supports the hypothesis of this study. In this study the overall sensitivity was 88.88%. Similar results have been found by Muzaffaruddin[13] and Amer[14] in their respective studies. As a highly sensitive test is required for the diagnosis of a condition where the consequences of a false negative test are serious, therefore, this sensitivity of 88.88% suggests MAS to be an effective tool in the diagnosis of acute appendicitis in adults.

One limitation observed in this study was of leucocytosis. There are always chances of laboratory error and it is also known that the presence or absence of leucocytosis is not confirmatory for including or excluding the diagnosis of acute appendicitis in cases of right lower quadrant abdominal pain.[18,19] Moreover, the raised leucocyte count can also occur because of some other pathology[20].

In the study 8 patients (28.57%) with MAS 6 and below had acute appendicitis which is a significant number and this could be missed if totally relied upon the scoring system, so it should be kept in mind that no scoring system is 100% effective but modifications may increase the accuracy in future.

When the results of this study were statistically analyzed the accuracy of MAS 7 or above was found to be 84% which means that chances of having acute appendicitis are more with MAS of 7 or above.

CONCLUSION

It is concluded that MAS is a simple aid for the diagnosis of acute appendicitis and patients with MAS 7 or above will have more chances of having acute appendicitis than patients having MAS of 6 or below.

It is recommended that MAS should be introduced and practiced in emergency departments as this simple scoring system will be of great help to junior doctors.

Modifications in MAS are also recommended, e.g. assigning more points to pain and tenderness in right lower abdominal quadrant for which further studies should be carried out.

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