

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

DR. SYED WARIS ALI SHAH

DR. AJMEL MUNIR TARRAR

DR. CHAUDHRY AHMED KHAN

DR. IRTIZA AHMED BHUTTA

DR. SIKANDER ALI MALIK

Department of General Surgery
Combined Military Hospital,
Rawalpindi

DR. AHMED WAQAS

ABSTRACT... objective: To compare the frequency of inflamed appendix in suspected patients of acute appendicitis having Modified Alvarado Score (MAS) of 7 or more with patients having MAS of 6 or below. **Design:** Comparative cross sectional study. **Place and duration of study:** The study was carried out at Surgical Departments of Combined Military Hospital (CMH) and Military Hospital (MH) Rawalpindi from April 2006 to 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 and the patients were divided in two groups. Group-I had MAS of 7 or more while Group-II had MAS of 6 or below. Postoperatively appendices of all the patients were sent for histopathological examination and its result regarding presence or absence of acute appendicitis was then compared with MAS of respective group. **Results:** (a) Group-I:- A total of 72 patients with 64(88.9%) positive inflamed appendices on histology. Negative appendicectomy rate 8(11.1%), (b) Group-II:- A total of 28 patients with 8(28.6%) positive inflamed appendices. Negative appendicectomy rate 20(71.4%). There is statistical significant difference of positive appendicectomy rate between two groups with (p-value<0.001). **Conclusion:** Frequency of inflamed appendix is more in patients having MAS of seven or above. The number of negative appendicectomies can be reduced by using MAS in clinical practice.

Key words: Appendix, Acute appendicitis, Appendicectomy.

INTRODUCTION

Acute appendicitis is the most common cause of acute abdomen in young adults¹. 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 appendicectomies⁵.

In 1986 Alvarado⁶ described a scoring system which has been validated in adult surgical practice^{7,8,9}. The classic Alvarado score included left shift of neutrophil maturation (score 1) yielding a total score of 10. However in 1994 Kalan¹⁰ omitted this parameter and produced a modified score. There are mixed results regarding the efficacy of Modified Alvarado Score (MAS)^{11,12,13,14,15}.

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

Aim of this study is 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.

In MAS, score is given to few important points (1 – 9) out of history, clinical examination and laboratory investigations (Table-I). 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.

PATIENTS AND METHODS

The 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 in this study. A total number of 100 patients were included in this study. 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 in the study 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.

For the purpose of statistical analysis the patients were divided in two groups. Group-I consisted of patients having MAS of 7 or more while Group-II consisted of patients having MAS of 6 and below. z-test is used to compare the proportion of group-I and group-II. P-value less than or equal to 0.05 consider significant. Sensitivity and specificity of overall MAS of all patients included in the study was calculated by using MAS of 7 or more as a screening test.

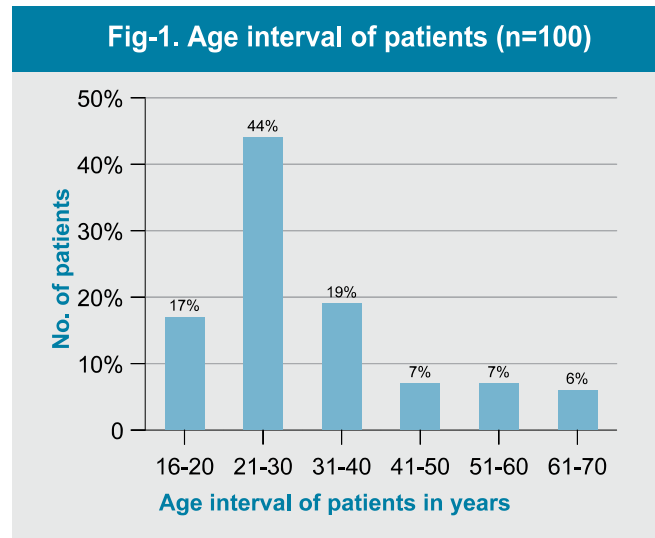
RESULTS

Out of 100 patients, 65 (65%) were males and 35 (35%) were females. A total of 72 (72%) patients had acute appendicitis on histopathological examination and 28

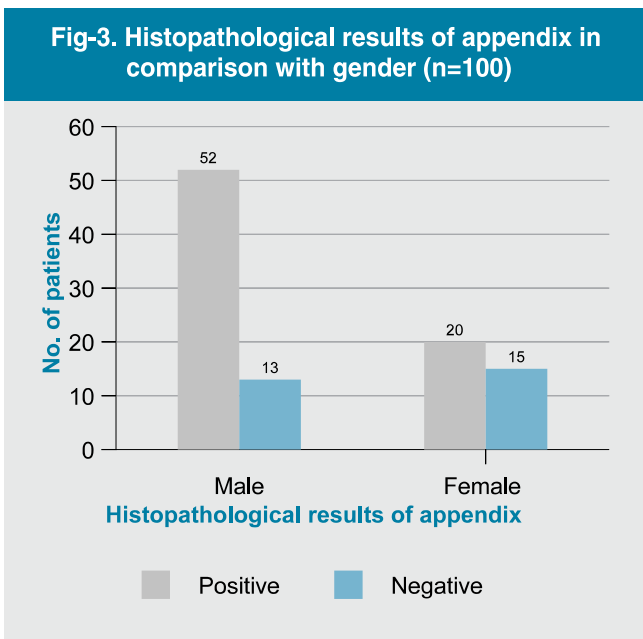
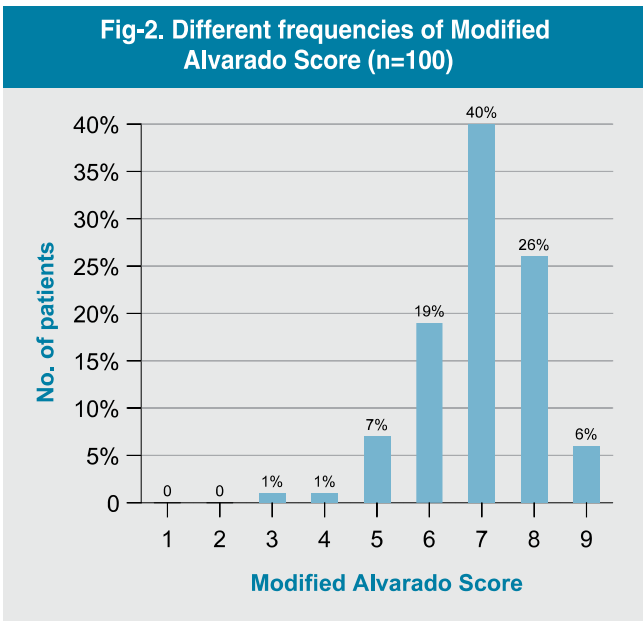
(28%) had normal appendix. Most common age group was 21 – 30 years (Figure I), and most common MAS was seven (40%) (Figure II).

Table-I. 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 $\geq 37.5^{\circ}\text{C}$	1
Investigation	
Leucocytosis	2

Out of total 65 male patients, 52 (80%) had acute appendicitis on histopathological examination, while 13 patients (20%) had normal appendix. Out of total 35 female patients 20 (57.14%) had acute appendicitis on histopathological examination, while 15 (42.85%) patients had normal appendix (Figure III).



Group-I:- 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. In patients having positive histopathology, 44 (68.75%) were males while 20 (31.25%) were females. Negative appendicectomy rate in this group was 11.1% and positive appendicectomy rate in this group was 88.9%.

Group-II:- 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 (28.6%) had histologically proven acute appendicitis, while 20 patients (71.4%) had normal appendix. All eight patients with positive histopathology were males while in patients with normal appendix, 11 (55%) were males and nine (45%) were females. Negative appendicectomy rate in this group was 71.4% and positive appendicectomy rate in this group was 28.6%.

Patients of both the groups were analyzed for frequency of positive histopathological appendicitis by applying z-test which shows statistically significant difference between two groups of patients (p-value<0.001). Overall sensitivity was 88.9% and specificity was 71.4%.

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.

It has been observed that use of a scoring system helps in reaching a decision and making a treatment plan¹¹. As junior doctors are the first ones to encounter patients of acute appendicitis in emergency departments, therefore, a scoring system used for the diagnosis of acute appendicitis should be simple enough to be used in an emergency department setting.

Modified Alvarado Score is just a simple mathematical tabulation of the common clinical signs and symptoms found in patients of acute appendicitis. Another scoring system is Ramirez and Deus¹⁶ scoring system, designed

in Spain. As compared to MAS, Ramirez and Deus system is complicated¹⁷, and junior doctors may get confused during the calculation. Other scoring systems like Ohmann, Eskelinen and SIRS score are also under trial at different centres^{18,19,20}.

In this study there were 65 males and 35 females. This gender ratio is almost similar to Muzafaruddin¹³ and Al-Hashemy¹². The most common age group is 21 – 25 years which is comparable to published literature¹.

The negative appendectomy rate in group-I was 11.11% which is less than the similar studies carried out by Al-Hashemy¹² and Saidi HS³.

When the results of group-I are compared with group-II, it is seen that negative appendectomy rate decreases with the rise in score, which supports the hypothesis of this study.

In this study the overall sensitivity was 88.9%. Similar results have been found by Muzaffaruddin¹³ and Saeed Amer¹⁴ in their respective studies. As a highly sensitive test is required for the diagnosis of a condition where the consequences of a false positive test are serious, therefore, this sensitivity of 88.9% suggests MAS to be an effective tool in the diagnosis of acute appendicitis in adults.

Right lower quadrant abdominal pain with or without shifting, and tenderness right iliac fossa with or without rebound tenderness were the most common symptoms and signs in this study and almost every patient had them.

In the study 8 patients (28.6%) out of group-II 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, by z-test which is statistically significant (p-value < 0.001) and the chances of having acute appendicitis are more with MAS of 7 or above.

CONCLUSION

It is thus concluded that MAS is a simple aid for the diagnosis of acute appendicitis and patients with MAS of 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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Correspondence Address:

Dr. Syed Waris Ali Shah
Surgical Specialist,
HIT Hospital, Taxila Cantt
drwarisali@yahoo.com

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*A speech is like a love affair.
Any fool can start one,
but to end it requires
considerable skill.*

Lord Mancroft