

To compare the use of Alvarado score with appendicitis inflammatory response score in the diagnosis of acute appendicitis in a tertiary hospital in Maharashtra

Dr. Pooja Agarwal, Dr. Shaunak Saha, Dr Akshaya Parthiban, Prof Sameer Kadam

3rd year junior resident, senior resident, 2nd year junior resident, HOD Department of General Surgery, MGM medical college and Hospital, Navi Mumbai

***Corresponding Author:**

Dr Pooja Agarwal

3rd year junior resident, Department of General Surgery, MGM medical college and Hospital, Navi Mumbai

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Abstract

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INTRODUCTION

Acute appendicitis is one of the most common cause of acute abdomen in the emergency room. Diagnosis of Appendicitis has always been a diagnostic dilemma for the treating surgeon with the management including complex decision making regarding the need for surgical exploration. The diagnosis of this said condition has undergone wholesome changes in the past decades. Traditionally, the diagnosis of appendicitis was based solely on clinical symptoms and signs which later started including results of inflammatory laboratory variables such as leucocytes, neutrophils and CRP [1]. The rate of appendectomy is 12% for men and 25% for females. Early and urgent assessment and management of acute appendicitis is important as it is known to cause complications like obstruction, perforation, ischemia or peritonitis. Negative appendectomy remains a major concern in surgical practice and leads to prolonged hospital stay, higher cost and increased mortality and morbidity. The burden of negative appendectomy in India is 17.2% (12.4% in males; 33.3% in females [8,9,10].

Hence, various scoring systems are used to aid in clinical assessment of patients with acute appendicitis. The Best-known scores include the Alvarado score, the modified Alvarado score, the Pediatric appendicitis score, the appendicitis inflammatory response score, and the RIPASA score. [4,6,15] Out of

which the Alvarado score is the most well-known and best performing in validation studies, but it has some drawbacks. Its construction was based on a review of patient who had been operated with suspicion of appendicitis, whereas the score is supposed to be used on all patients with suspicion of appendicitis. Also, the score does not incorporate CRP as a variable, which has been found to be important in many patients with appendicitis.[5] In the wake of limited number of comparative studies of these new scores, with the existing scores, the current study compares the validity and reliability of Alvarado score with AIR score in the diagnosis of appendicitis in a tertiary hospital in Maharashtra.

AIMS AND OBJECTIVES

AIMS

To study the sensitivity, specificity, false positive rate, false negative rate, positive predictive value, negative predictive value, diagnostic accuracy and reliability of Alvarado score with AIR score in diagnosing acute appendicitis against the reference standard of histopathology in patients undergoing emergency appendectomy in a tertiary care hospital in Maharashtra.

OBJECTIVES

a) To compare the validity, predictive values and reliability of Alvarado score with appendicitis inflammatory response (AIR) score in the diagnosis of acute appendicitis in a tertiary hospital in Maharashtra.

b) To compare the association between the risk score and HPE findings in study population

c) To compare reliability of the two risk score in study population

MATERIALS AND METHODS

1. Type of study: Prospective study
2. Place of study: Mahatma Gandhi Mission's Medical college and hospital, Kamothe, Navi Mumbai
3. Duration of study: 6 months
4. Sample size: minimum 50
5. Inclusion criteria:
 - a) All patients who present to emergency room with complain of right iliac fossa with suspected appendicitis: clinically or proven by radiological imaging
 - b) Age >18 yrs
6. Exclusion criteria:

a) Previous history of appendicectomy

b) Lump in right iliac fossa

c) All pregnant patients

d) Elective appendicectomy

7. Plan of study:

All eligible patients admitted in surgery ward will be evaluated by senior surgery consultant and after Clinical examination, appropriate laboratory investigations and ultrasonography, the patients who are diagnosed as definitive case of acute appendicitis- both Alvarado and AIR scoring [16,17] will be done. Patient will be taken up for open or laparoscopic surgery. Intraoperatively, the condition of the appendix will be noted. The excised specimen will be sent for histopathological examination. Patients will be categorized as high or low risk as per the suggested cut off values of the two risk scoring systems. The sensitivity, specificity, predictive values and diagnostic accuracy of both the risk stratifications scores against HPE findings (Gold standard) will be calculated and compared. IBM SPSS statistical software version 22 will be used for statistical analysis.

Following parameters are included in the study.

Clinical risk score		
	Alvarado score	AIR score
Symptoms		
Nausea or vomiting	1	
Vomiting		1
Anorexia	1	
Migration of pain to the right lower quadrant	1	
Signs		
Pain in right lower quadrant	2	1
Rebound tenderness or muscular defence	1	
Light		1
Medium		2
Strong		3
Body temperature $\geq 37.3^{\circ}\text{C}$	1	
Body temperature $\geq 38.5^{\circ}\text{C}$		1
Laboratory tests		
Leucocytosis shift	1	
Polymorphonuclear leucocytes		
70-84%		1
$\geq 85\%$		2
White blood cell count		
$>10.0 \times 10^9/\text{L}$	2	
$10.0-14.9 \times 10^9/\text{L}$		1
$\geq 15.0 \times 10^9/\text{L}$		2
C-reactive protein concentration		
10-49 mg/L		1
$\geq 50 \text{ mg/L}$		2
Total score	10	12

DISCUSSION

Considering the non-availability of advanced investigations like CT, risk stratification scores are valuable tools in reducing diagnostic dilemma and the rate of negative appendectomies in resource poor settings and developing countries like India. The widely applied scoring system was Alvarado scoring system which was used in many studies globally with few limitations and drawbacks. Appendicitis inflammatory response score (AIR) which was developed in Sweden in 2008 is found to be better than Alvarado score in diagnosing acute appendicitis and hence decreasing the rate of negative appendectomies.[2] There are a number of reasons to use scoring systems in managing cases of acute appendicitis. The intent of scoring system is not to establish a primary diagnosis of acute appendicitis but simply to discriminate objectively when there is uncertainty. [3,7]

The present study shows that the AIR score has better statistical discrimination for patients of acute

appendicitis as compared to Alvarado score. Clinical score may be suitable as an instrument for selecting patients for immediate surgery, further examination with imaging techniques or observation.[4] In current study, the reliability, sensitivity, specificity and diagnostic accuracy of the AIR score was better than Alvarado score in diagnosing acute appendicitis against histopathology (HPE) reports which is considered as the gold standard.[20]

RESULTS

A total of 50 patients were included in the study with suspicion of acute appendicitis. Out of which 32 (64%) were males and 18 (36%) were females. The number of subjects stratified as high risk by Alvarado score was 78% and by AIR score was 86%. Overall 41 patients had pathologically proven appendicitis. [10,19] 09 patients had no pathologically proven appendicitis. 27 patients had phlegmonous appendicitis, 12 had advanced appendicitis while 2 had chronic appendicitis. [11,14]

PARAMETERS	FREQUENCY	PERCENT
1.SEX		
Female	18	36%
Male	32	64%
2.ALVARADO SCORE		
Low score>4 <8	11	22%
high score >8	39	78%
3.AIR SCORE		
Low score>4 <8	07	14%
High score>8	43	86%
4.HPE		
positive	41	82%
negative	09	18%

Fig 1: gender distribution and test results in the study group

Statistically significant association was seen between HPE reports, Alvarado score and AIR score. (Fig 2)-[12]

PARAMETERS	HISTOPATHOLOGY (POSITIVE)	HISTOPATHOLOGY (NEGATIVE)	CHI SQUARE VALUE	P VALUE
ALVARADO SCORE				
high	35(85.36%)	04 (44.44%)	7.2018	<0.001
low	06(14.63%)	05 (55.56%)		
AIR SCORE				
high	39(95.12%)	02(22.22%)	26.5719	<0.001
low	02(4.87%)	07(77.77%)		

Fig 2: association between the risk scores and HPE reports

Sensitivity of Alvarado score in diagnosing acute appendicitis was 85.37%, whereas AIR score was 95.12%. The specificity, positive predictive value of AIR score was better than Alvarado score as shown in the fig 3. Overall the diagnostic accuracy of AIR score was 92% as compared to Alvarado score which was 80%. [13,14]

PARAMETER	ALVARADO SCORE	AIR SCORE
1.SENSITIVITY	85.37%	95.12%
2.SPECIFICITY	55.56%	77.78%
3.POSITIVE LIKELIHOOD RATIO	1.92	4.28
4. NEGATIVE LIKELIHOOD RATIO	0.26	0.06
5.POSITIVE PREDICTIVE VALUE	89.74%	95.12%
6.NEGATIVE PREDICTIVE VALUE	45.45%	77.78%
7.DIAGNOSTIC ACCURACY	80.00%	92%
8.DISEASE PREVALENCE	82%	82%

Fig 3: comparison of validity, reliability, predictive values of the two risk scores

The reliability of two score as measured by kappa statistics [16] and p value was found to be better for AIR score as compared to Alvarado score in our study population as shown in fig 4.

RISK SCORE	KAPPA STATISTICS	P VALUE
ALVARADO SCORE	0.377	<0.001
AIR SCORE	0.729	<0.001

Fig 4: comparison of reliability of the two risk scores in the study population

CONCLUSION:

1. The new appendicitis inflammatory response score has displayed a better validity and reliability, as compared to Alvarado score. [18]
2. Both negative appendectomy rates and missing cases of appendicitis will be reduced, if AIR score is used for treatment decisions, in place of Alvarado score.

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