

Evaluation of Appendicitis Inflammatory Response Score in Diagnosis and Management of Acute Appendicitis

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Abstract

Background Acute appendicitis is a common surgical emergency that we have to consider when patients present with pain in right iliac fossa. Though one can come to a conclusive diagnosis of acute appendicitis with history and correlation with clinical signs, the negative appendectomies have remained considerably high (about 15-30% cases). A number of clinical and laboratory based scoring system have been devised to assist the diagnosis. Most widely used is "Alvarado Score" and equally its modifications ie, Modified Alvarado Score [MAS]. The present study aims to evaluate the usefulness of Appendicitis Inflammatory Response Score [AIRS] system in patients with a provisional diagnosis of appendicitis and to avoid negative appendectomies. **Methods** The present study selected 60 consecutive patients who presented to emergency department, Sri Adichunchanagiri Hospital and Research Centre, B.G. Nagara, with suspicion of acute appendicitis between March 2017 and August 2017. The variables necessary for evaluation are registered and diagnostic performance of two scores was compared. **Results** The present study included 60 patients with suspicion of acute appendicitis. The results analyzed shows the rate of negative appendectomy in MAS score found to be 36.66% and rate of negative appendectomy in AIR score to be 3.33%. the difference between the score to be 33.33%. Hence, proving it to be a better clinical score, when compared to Alvarado score in decreasing the rate of negative appendicitis. **Conclusions:** This study externally validates

the AIR Score for patients with acute appendicitis. The scoring system has a high discriminating power and outperforms the Alvarado score.

Keywords: Appendicitis Inflammatory Response Score; Acute Appendicitis.

Introduction

Acute appendicitis is a common surgical emergency that we have to consider when patients present with pain in right iliac fossa. Though one can come to a conclusive diagnosis of acute appendicitis with history and correlation it with clinical signs, the negative appendectomies have remained considerably high (about 15-30% cases). In 1880, Robert Lawson Tait performed the first appendectomy for appendicitis in England [1]. A study performed in 2005 in the Netherlands found that approximately 15% of the patients underwent a negative appendectomy, a number similar to another large Swedish study [2]. The negative appendectomy rate was 13% in another large North American study [3]. A number of clinical and laboratory based scoring system have been devised to assist the diagnosis. Most widely used is "Alvarado Score" and equally its modifications. The present study aims to evaluate the usefulness of Appendicitis Inflammatory Response Score [AIRS] system in patients with a provisional diagnosis of appendicitis and avoid negative appendectomies.

It is safe to assume that the negative laparotomy rate declined to approximately 10% with the routine use of ultrasonography (US) [4]. The higher sensitivity of computed tomography (CT) seems to have had an even greater effect on the negative laparotomy rate, which has decreased even further to 5-10% [4,5]. In many European countries, most surgeons still consider acute

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appendicitis to be a clinical diagnosis and do not routinely perform imaging studies [6].

Scoring systems have been designed to aid in the clinical assessment of patients with acute appendicitis. The Alvarado score is the most well known and best performing in validation studies, but it has some drawbacks [7-9]. Its construction was based on a review of patients 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 C-reactive protein as a variable, although many studies have shown the importance of C-reactive protein in the assessment of patients with appendicitis [10]. The recently introduced appendicitis inflammatory response (AIR) score was designed to overcome these drawbacks [11]. This score incorporated the C-reactive protein value in its design and was developed and validated on a prospective cohort of patients with suspicion of acute appendicitis. The objective of the present study was to externally validate the AIR score on a consecutive cohort of patients with suspicion of acute appendicitis and compare the AIR score's performance to the Alvarado score.

Methods

The present study selected 60 consecutive patients with suspicion of acute appendicitis, who presented to emergency department of Sri Adichunchanagiri Hospital and Research Centre, B.G. Nagara, between 1/03/2017 to 31/08/2017.

In this study, 60 patients were taken with suspected appendicitis with sudden-onset, non-traumatic right lower quadrant (RLQ) pain. They are categorized with 30 patients in each groups. First 30 patients are allocated with MAS score. Second half of 30 patients are allocated with AIRS score and observed over a period of 6 months. Each patients are followed upto a period of one week.

An detailed history was taken, clinical examination, basic routine investigations and ultrasound abdomen was done at the time of presentation. The diagnosis of appendicitis was confirmed by histopathological examination in all resected specimens. Appendicitis was pathologically diagnosed when infiltration of the muscularis propria by neutrophil granulocytes was seen. The suspected patients with appendicitis were taken for appendectomy.

Variables recorded to evaluate the scoring systems include nausea, vomiting, anorexia, migration of pain to the RLQ, pain in the RLQ, rebound tenderness, muscular defense, body temperature, high white blood cell (WBC) count, proportion of polymorphonuclear leukocytes, and a high level of CRP. These variables are necessary to calculate both modified Alvarado score and AIR score (Table 1). The two scores are based on different variables, with different points assigned to each variable. An overview of the scoring system is given in Table 1. An cross sectional study was conducted and rate of negative appendicectomy in AIRS and MAS score was calculated and compared.

Results

The present study included 60 consecutive patients with suspicion of acute appendicitis. The age of the patients ranges from 16 to 60 years, with peak incidence in 20 to 30 years (Table 1 and Figure 1). There were 34 (56.6%) male patients and 26 female patients (43.3%), (Table 2).

Table 1: Age distribution of patients

Age	MAS	AIRS
<20	6	2
20-30	15	10
30-40	5	12
>40	4	6

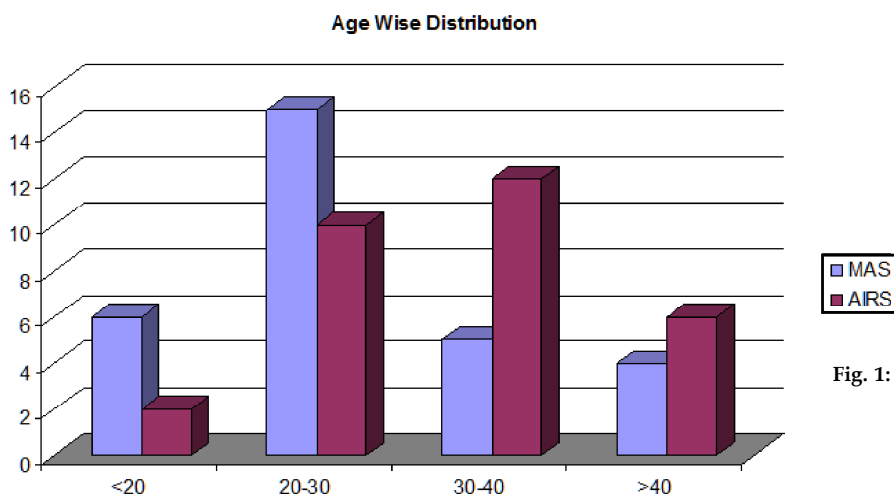


Fig. 1: Age distribution of patients

The MAS and AIR score within the study cases compared (Table 3 & Figure 2). The variables of MAS and AIR score within the study cases were also compared (Table 4- 5, Figure 3-4). Out of 30 patients in MAS score taken for appendicectomy is followed post operatively with Histopathological specimen reports

and was found to be 19 cases turned out to be positive appendicectomy with remaining 11 cases found to be negative appendicectomy. Similarly other 30 patients in AIRS score taken for appendicectomy is followed post operatively with histopathological examination reports and was found to be 29 cases turned to be positive appendicectomy with remaining 1 cases found to be negative appendicectomy (Table 6). The rate of negative appendicectomy in MAS score found to be 36.66%. The rate of appendicectomy in AIRS score found to be 3.33% (Figure 5). the difference between two score found to be $[36.66-3.33 = 33.33]$ 33.33% (Figure 6).

Table 2: Sex distribution of patients

Sex	Count	%
Female	26	43.3
Male	34	56.6

Table 3: Scoring Vs Cases

Scores	MAS	AIRS
6	3	0
7	10	0
8	5	5
9	3	6
11	0	10
12	0	9

Table 4: MAS score Vs Variables

Sl No.	MAS score Variables	Male	Female
1	Migratory Pain	18	9
2	Nausea	18	8
3	Tenderness Rif	19	11
4	Temperature	12	8
5	Leucocytosis	16	11
6	Anorexia	10	9
7	Shift to Left	16	10

Table 6: AIRS Score Vs Variables

	AIRS Score		
Vomiting-1	23	0	0
Pain RLQ-2	30	0	0
Rebound Tenderness-1	2	6	22
Temperature-4	27	0	0
PML-5	12	18	0
WBC Count-6	1	8	21
CRP-7	14	16	0

Table 7: Negative Appendicectomy Rate Vs Scores

	MAS	AIRS
POS Appen	19	29
NEG Appen	11	1

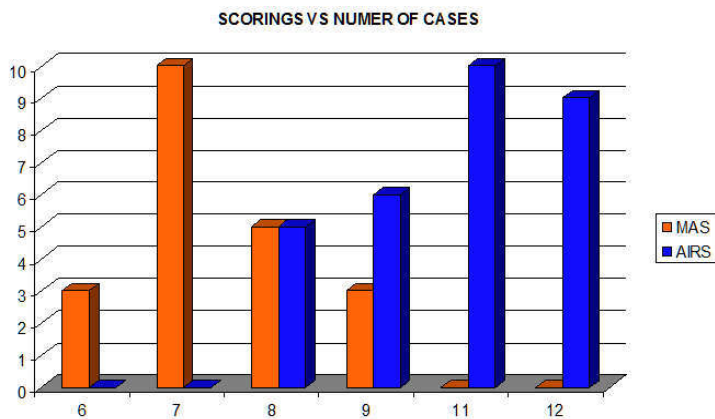


Fig. 2: Scoring Vs Cases

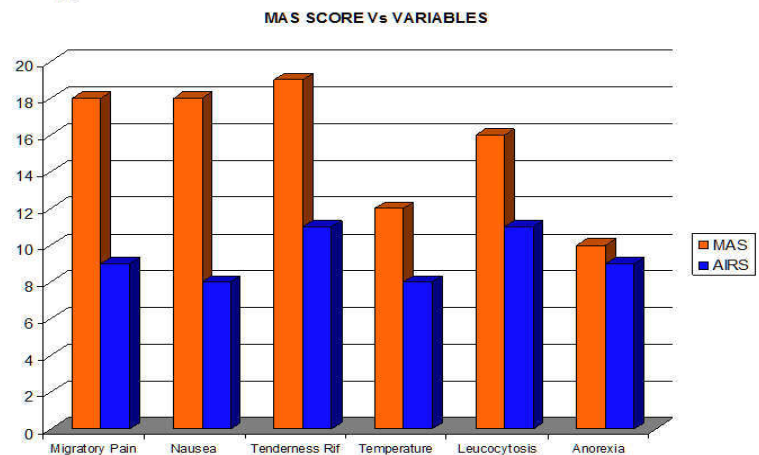


Fig. 3: MAS score Vs variables

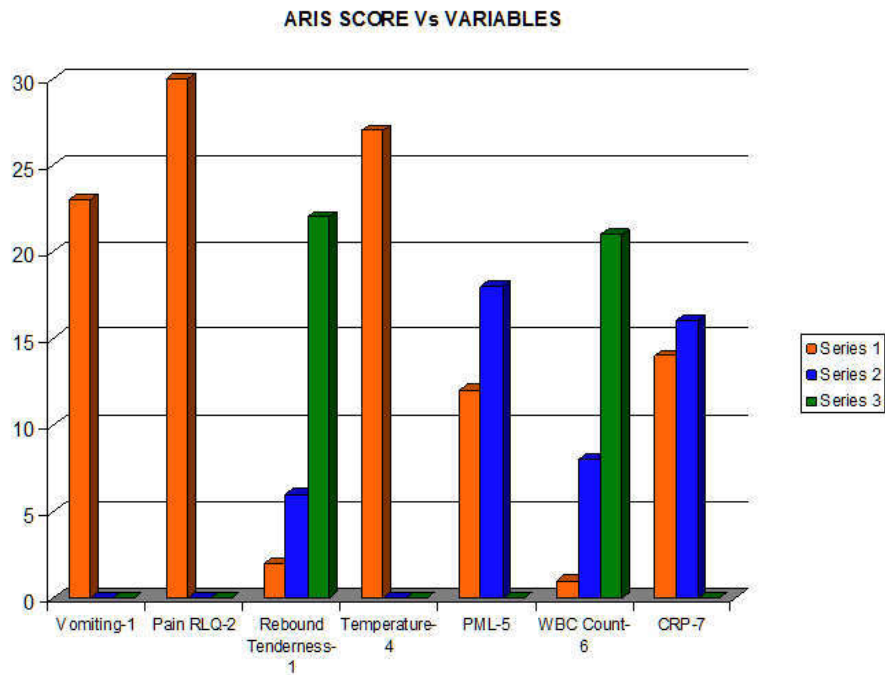


Fig. 4: ARIS score and variables

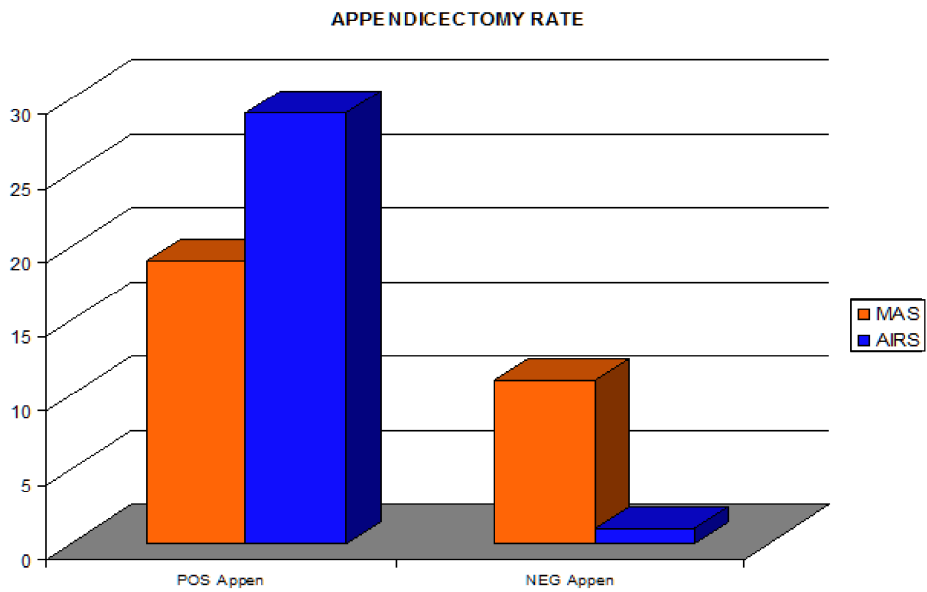


Fig. 5: Appendicectomy Rate

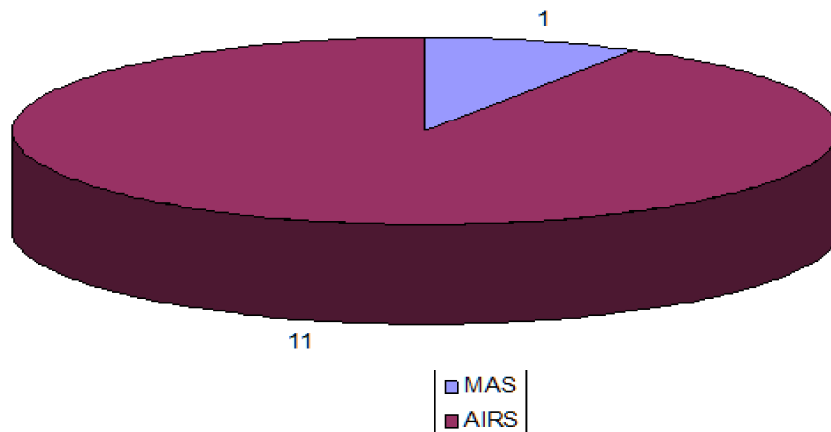


Fig. 6: Negative appendicectomy rate

1. Negative appendicectomy rate in AIRS score
2. Negative appendicectomy rate in MAS score

Discussion

The diagnosis of acute appendicitis finds to be difficult due to lack of reliable diagnostic test and different presentation of the disease. In spite of improved diagnostic tools over few years, percentage of negative appendicectomy reported to be between 8 to 33%.

In past few years, many clinical system have been devised and currently MAS was used in all centres. But AIRS score outrated MAS score, as it's a simple scoring system that can be used normally. Development of AIRS score contributes to diagnosis because through associating very easy applicable clinical criteria and two sample laboratory test, attribute the score, which classifies patients regarding the probability of diagnosis.

Anderson [2008] collected prospectively from 545 patients admitted in four hospital for suspected appendicitis. Score devised from 8 variables in 316 randomly selected patients and evaluated in remaining 279 patients. Receiver Operating Characteristic area of new score was 0.97 for advanced appendicitis and 0.93 for all appendicitis, which was compared with 0.92 [p=0.0027] and 0.88 [p=0.0007] respectively for Alvarado Score. 63% patients are classified into low or high probability group with an accuracy of 97.2%, leaving 37% of remaining patients for further investigations. 73% of non-appendicitis patients, 67% of advanced appendicitis and 37% of all appendicitis are classified into low or high probability zone respectively [11].

In July 2013 to July 2014, Sao Paulo evaluated the "value of C-Reactive proteins and percentage of leukocytes segmented blood count showed a direct relationship with the phase of acute appendicitis". This study also stated that AIRS was important to diagnose and disease stratification. This study finally stratified as mild [65.3%] and high [34.3%]. Pain in right iliac fossa present in 95.2% of the patients. C-Reactive protein < 50 in patients with stage 1 and segmental neutrophils between 85% in 95% of cases and in stage 4. C-Reactive protein > 50 and segmental neutrophils > 85% in 60% of patients. It is safe to assume negative laparotomy rate decreases to 10% with use of ultrasound. CT scan decreases to 5-10%. In this study, age variable comparison in both scores with mean age between 20-30 years. In MAS score all variables predominates male patients. In AIRS score, maximum cases are covered in vomiting, pain right lower quadrant, temperature, severe rebound tenderness, white blood cell count $>15 \times 10^9/L$ [12].

Conclusion

In this study, negative appendicectomy rate of MAS and AIRS score is 36.66% and 3.33% and difference between two score found to be 33.33%. Negative appendicectomy rate decreases to 3.33% in AIRS score compared to 36.66% proved that the incidence of negative appendicectomy rate found to be decrease in number. Similarly the score of AIRS scoring system was simple and accurate in diagnosing the appendicitis in early stages. This score is also useful in the management of acute appendicitis proving the decrease incidence of negative appendicectomy rate.

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