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Evaluation of appendicitis inflammatory response score in suspected cases of acute appendicitis

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Abstract
Background: Acute appendicitis is a common surgical disease with varied clinical presentation, diagnosis of which, can be at times a clinical challenge. In order to aid in the clinical diagnosis various scoring system have been designed one of which is the appendicitis inflammatory response score (AIR score). The present study is designed to validate the diagnostic accuracy of AIR score in patient with suspected acute appendicitis.
Method: The present study included consecutive patient presenting to the emergency department of KIMS hospital Hubli, between Dec2015 to Sept 2017 with acute pain abdomen in the right iliac fossa of suspected appendicular origin. All the clinical data and laboratory investigation necessary for the evaluation of AIR score were collected. The AIR score was then compared with the histopathological report of the resected specimen.
Results: In the present study 107 patient, with 70 male and 37 female where included. The AIR score was calculated and was compared with the histopathological report of the resected specimen. AIR score had a good statistical discriminatory property for the diagnosis of acute appendicitis in patients with acute pain in the right iliac fossa, with a sensitivity of 90% and specificity of 88% when the cutoff for diagnosing acute appendicitis was placed at less than 8, with p value of <.015. It had a sensitivity of 44% and a specificity of 100% when the cut off score was taken as more than 8, with a p value of < than. 005.
Conclusion: The present study validates the diagnostic accuracy of AIR score in suspected case of acute appendicitis with a sensitivity of 78.57% and specificity of 85.71%.

Keywords: Appendicitis inflammatory response score, suspected cases, acute appendicitis

Introduction

Robert Lewson Tail in 1880 first performed appendectomy in England [1]. Now, more than 130 yr later, this most common of all surgical disease can still be a diagnostic challenge. In a country like India where approximate 75% of the population stays in rural and remote areas, with little access to medical and surgical care, diagnosing appendicitis correctly is a challenge, so as to avoid negative appendectomy. In a study performed in 2005 in Netherlands, they found that approximately 15% of patient underwent a negative appendectomy, a number similar to another Swedish study [2]. The negative appendectomy rate was 13% in another large North American study conducted by Hatle D A and *et al*. [3].

By using USG abdomen to diagnose acute appendicitis the negative appendectomy rate has dropped to 10% [4]. The sensitivity of computer tomography to diagnose acute appendicitis is greater and it has decreased the negative appendectomy rate furthers to 2-5% [4, 5]. In many European countries most surgeons still consider acute appendicitis to be a clinical diagnosis (6) Scoring system have been designed to aid in the diagnosis of acute appendicitis in patients with acute pain abdomen. In 2015 the European association of endoscopic surgeon (EAES) issued a consensus statement on the diagnosis and management of acute appendicitis. In their statement they recommended the use of diagnostic scoring to categories the patient into three classes with respect to the severity of appendicitis [7, 8]. The world society of emergency surgery in 2016 also assessed diagnostic scoring in there guidelines for the diagnoses of acute appendicitis. Alvarado score is the most well know and best performed in validating acute appendicitis, but it has some drawbacks. Its construction was based on a review of patients who had been operated with a suspicion of appendicitis, and also it does not incorporates C reactive protein level in the scoring system [9].

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The appendicitis inflammatory response score was designed to overcome these drawbacks. The score incorporates C reactive protein levels in the scoring system [10]. The objective of the present study is to validate the AIR score on a consecutive cohort of patients with clinical suspicion of acute appendicitis and compare the AIR score with histopathological report of the patient

Material and Method
The present study is a prospective study involving patients presenting to the emergency department of KIMS hospital Hubli with acute pain abdomen located in the right iliac fossa of non-traumatic in nature with clinical suspicion of acute appendicitis from Dec 2015 to Sept 2017. All the patients where thoroughly examined and necessary investigation sent. Information relating to AIR Score was collected and the score was calculated for the given patient. Further if the diagnosis of appendicitis was suspicious it was confirmed by doing USG abdomen of the

patient and before subjecting the patient to operative intervention. The gold standard for the diagnosis was taken as the histopathological report of the specimen. Appendicitis was pathologically diagnosed when infiltration of the muscularis propria by neutrophil, granulocyte was seen in the appendix specimen [11]. Histopathological report was correlated with AIR Score of the patient.

Statistical analysis was performed using SPSS statistical software [SPSS Inc, Chicago, IL]. A p value of less than 0.05 was considered statistically significant.

Results
The present study included 107 patients with clinical diagnosis of acute appendicitis. There were 70 males and 37 female patients, all were thoroughly examined and appendicitis inflammatory response score of the patient was calculated and when necessary USG abdomen was performed before subjecting the patient for appendectomy.

Table 1: Appendicitis inflammatory response score

Sl No	Variables	Score	Observation in patients	Percentage
1	Vomiting	1	58	54
2	Pain in right iliac fossa	1	107	100
3	**Rebound tenderness**			
	a) absent	0	06	05.6
	b) mild	1	33	30.8
	c) moderate	2	45	42.2
	d) severe	3	23	21.4
4	**Body temperature**			
	a) <38.5 c	0	99	92.5
	b) >38.5 c	1	08	07.5
5	**Polymorph nuclear**			
	a) <70% Leucocytes	0	25	23
	b) 70-84%	1	47	44
	c) >85%	2	35	33
6	White blood cell			
	a) <10000 Count	0	41	38
	b) 10000-14999	1	31	29
	c) >15000	2	35	33
7	**C reactive protein**			
	a) <10 mg/dl	0	23	21
	b) 10-49 mg/dl	1	49	46
	c) >50 mg/dl	2	32	30
8	Total score	2-12		

A score of less than or equal to 4 was considered as low risk for appendicitis, score of 5 to 8 intermediate risk and score of more than or equal to 8 high risk [12].

Table 2: Distribution of cases according to appendicitis inflammatory response score

Sl no	AIR Score Risk stratification	AIR Score in patients(107)	
		No of patients	percentage
1	Low risk(0-4)	18	17
2	Intermediate risk(5-8)	45	42
3	High risk(9-12)	44	41

In our study 18 cases (17%) had a low risk score hence they has a low risk of having acute appendicitis, 45 cases had an intermediate risk score who required further investigation like USG abdomen and 44 cases had a high risk score which was diagnostic of acute appendicitis

Table 3: Distribution of cases as per ultrasound finding

S N	Ultrasound finding	No of patient	Percentage
1	Not done	7	6
2	Normal appendix	4	4
3	Acute appendicitis	69	65
4	Advance appendicitis	27	25
5	Total	107	

In our study 7 patients USG abdomen was not done and in 4 cases USG abdomen was reported as normal. Ultrasound abdomen showed feature of acute appendicitis in 69 patients and in 27 patients it showed feature of advance appendicitis like peri appendicular fluid, pus, abscess and peritonitis

After thorough evaluation of the patients they were subjected to operative intervention that is open appendectomy using Right iliac fossa incision and the appendicular specimen was sent for histopathological analysis which was statistically analyzed

Table 4: Distribution of patients according to histopathological report

S no	Histopathological report	No of patients	Percentage
1	Normal appendix	7	7
2	Acute appendicitis	69	64
4	Acute supparative appendicitis	13	12
5	Acute perforative appendicitis	9	8.5
6	Chronic appendicitis	9	8.5
7	Total	107	100

On analyzing the histopathological report there was no evidence of acute appendicitis in 7 patients and in 69 patient histopathology was reported as acute appendicitis. In 13 patient histopathology showed feature of acute supparative appendicitis and in 9 patient each it showed feature of acute perforative

appendicitis and chronic appendicitis features.

For the purpose of statistical analysis the AIR score of patients was divided into two groups, those with score less than 8 and those with score more than 8, which was compared with the histopathological report of the patient

Table 5: Distribution of patients according to their risk score group

S no	AIR risk group	No of patients	Percentage
1	Group 1 AIR score less than 8	63	59
2	GROUP 2 AIR score more than 8	44	41
3	Total	107	100

Patients were statistically analyzed according to their AIR risk group with their histopathological report

Table 6: Statistical analysis of patients in AIR risk group 1

S No	AIR risk score group 1	Histopathological report			McNessan test
		Inflamed appendix	Normal appendicitis	Total	
1	Low risk score < 4	12	06	18	
2	Intermediate risk score 4-8	44	01	45	P < 0.016
3	Total	56	07	63	

In the AIR risk group 1, 18 patients had score less than 4 of them 12 patients had histopathological evidence of acute appendicitis and 6 patients had no evidence of appendicitis, in the intermediate risk group there were 89 patients and of them 88 patients had evidence of acute appendicitis and only one

patient had a normal appendix. When the cut off for diagnosing acute appendicitis by AIR score was kept at less than 8 it had a sensitivity and specificity of 78.57% and 85% with a positive predictive value of 97.77% and a positive predictive value of 33%, and a p value of <0.016

Table 7: statistical analysis of patients in AIR risk group 2

S no	AIR risk score group 2	Histopathological report			Mc Nessan test
		Inflamed appendix	Normal appendicitis	Total	
1	Low AIR Score <8	56	07	63	
2	High AIR score > 8	44	00	44	<0.005
3	Total	100	07+	107	

When the cut off for diagnosing acute appendicitis by AIR score was kept at more than 8, then 56 patients out of 63 patients with AIR score of less than 8 had inflamed appendix and 7 patients had normal appendix. All the 44 patients with AIR score of more than 8 had inflamed appendix. This shows that when the cut for AIR score to diagnose acute appendicitis was kept at or more than 8 it has a sensitivity of 44% and specificity of 100% to diagnose appendicitis. The positive predictive value was 100% and negative predictive value was 11% with a p value of <0.005

Discussion

In this prospective cohort study an attempt is made to evaluate the diagnostic accuracy of appendicitis inflammatory response score in patient with suspected diagnosis of acute appendicitis. The AIR Score was first reported in 2008, it was based on data collected prospectively from 545 patients admitted for suspected appendicitis in 4 hospitals. The score was developed on 316 randomly selected patients and evaluated on remaining 229 patients. The AIR Score was based on similar values as Alvarado score, but it also included C reactive proteins as a variable. A recent met analysis showed that when both WBC count and C reactive protein levels are elevated in a patient of suspected acute appendicitis, there is a fourfold increased risk [12].

In our study 35% of patient had WBC count more than 15000 cell, and 35% of patient had polymorph nuclear leukocytosis of >85%. Majority of the patients in our study had increased serum C reactive protein levels (76%). Serum c reactive protein is a

marker of inflammatory response and is included in AIR Score [13].

In our study 17% of the patients had a low AIR Score and hence acute appendicitis was suspicious in them. 42% patients (45) had intermediate risk score and required further investigations. 41% patients (44) had high AIR Score which was strongly suspicious of appendicitis.

The present study shows that AIR Score has a good statistical discriminating property for diagnosing acute appendicitis with a high sensitivity (78.57%) and specificity (85.71%) when the cut off for diagnosing acute appendicitis was kept at or less than 8 which was similar to other studies done by Frank c, Yang Q etal [14].

When the cut off for diagnosing acute appendicitis by AIR Score was kept at or more than 8 it had a sensitivity of 44% and a high specificity 100% and at this cut off score AIR Scoring cannot be used as a modality to screen patients with acute pain abdomen in Rt Iliac fossa as it is diagnostic of acute appendicitis at a score of 8 and above [15].

References

1. 27Th Edition of Baily and Love short practice of surgery chapter 72, 1201-1317
2. Seal A Appendicitis: a historical review. Can J Surg. 1981; 24:427-433.
3. Andersson RE, Hugander A *et al*. diagnostic accuracy and preformation rate in appendicitis: association with age and sex of the patient and with appendectomy rate. Eur J Surg. 1992; 158:37-41.

4. Douglas CD, Davidson PM *et al*. Randomized controlled trail of ultrasound in diagnosis of acute appendicitis incorporating the Alvarado score. BJM321. 2000; 7266:919-922.
5. Wagner PL, Eachempati SR *et al*. defining the current negative appendectomy rate: for whom is pre-operative computer tomography making an impact? Surgery. 2008; 144:276-282
6. Kim K, Kim YH *et al*. low dose abdominal CT for evaluating suspected appendicitis. N Engl J Med. 2012; 366:1596-05.
7. Pootman P, Oostvogel HJ *et al*. the use of imaging in case of suspected acute appendicitis: opinion of Dutch surgeons. Ned Tijdschr Geneeskd, 2009, 153:B376 (in Dutch)
8. Andersson M, Andersson RE. the appendicitis inflammatory response score: a tool for the diagnosis of acute appendicitis that out performs the Alvarado score. World J Surg. 2008; 32:1843-1849
9. Ohmann C, Franke C *et al.* diagnostic score for acute appendicitis. Chirurg. 1995; 66:135-141.
10. Andersson RE. Meta-analysis of the clinical and laboratory diagnosis of appendicitis. Br J Surg. 2004; 91:28-37.
11. Franke C, Yang Q *et al*. clinical benefit of a diagnostic score for appendicitis: results of a prospective intervention study. Arch Surg. 1999; 134:993-996.
12. Test book of pathology by Robbins Willems 12 edition chapter 18 pade 1106-11
13. Van Rossem CC, Bolmers MD *et al*. prospective nationa wide outcome auidit of surgery for suspected acute appendicitis. Br J Surg. 2016; 103:144-51.
14. Cuschieri J, Florence M. Negative appendectomy and imaging accuracy in the Washington state surgical care and outcomes assessment program. Ann surge. 2008; 248:557-563.
15. Kim BS, Ryu DH *et al.* diagnosis of acute appendicitis using scoring system: compared with the Alvarado score Koran Surg sco. 2010; 79:207-14.
16. Berry J, Malt RA. Appendicitis near its centenary. Ann J Surg. 1984; 2000:567-75.