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Research Article

Use of Ripasa Score in the Diagnosis of Acute Appendicitis: A Pilot Study from West Bengal, India

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Abstract

Acute appendicitis is the most common cause of abdominal emergency in both developed and developing countries. Several scoring systems have been developed in order to aid the decision-making process to reach diagnosis of acute appendicitis in the quickest and cheapest way. Of which the Alvarado and the Modified Alvarado Scoring Systems (MASS) are the two most commonly used scoring systems worldwide. In a recent study conducted in Brunei, Darussalam from Nov 2008 to April 2009 hypothesized a new scoring system named as Raja Isteri Pengiran Anak Saleha Appendicitis (RIPASA) scoring. The study claimed that this scoring system is having much more sensitivity, specificity, positive and negative predictive value than other scoring system. Therefore, present study has tried to assess the diagnostic accuracy of RIPASA scoring system among the patients undergoing emergency appendicectomy in a rural hospital from West Bengal. A total of 88 patients including 42 males and 46 females admitted for emergency appendicectomy during 2015-2016 have been considered for present study. Before commencement of the study the purpose of the study and consent has been obtained from the studied patients. Clinical investigation and histopathological report also compared with the RIPASA score. Data revealed that RIPASA has Sensitivity of 97.14%, Specificity of 77.78%, Positive Predictive Value (PPV) of 94.44%, Negative Predictive Value (NPV) of 87.5% and Diagnostic Accuracy of 93.18%. This result corroborated with other studies from different parts of the world.

So it can be recommended from the present study that for quick and early diagnosis for acute appendicitis and to avoid the negative appendicectomy as much as possible and reduce the morbidity and mortality and economic burden related to negative appendicectomy RIPASA score can be used as a much more advanced scoring system than MASS with higher rate of diagnostic accuracy.

Keywords: *RIPASA, Acute Appendicitis, MASS, Histopathology.*

Introduction

Acute appendicitis is one of the most common surgical emergencies encountered by the surgeons with emergency appendicectomy, making up one in ten of all emergency surgeries.[1]A quick and correct diagnosis of acute appendicitis leading to

early appendicectomy and avoidance of complication arising from perforations can be difficult at times. Diagnosis of acute appendicitis is based on signs & symptoms whose interpretation is sometimes subjective (anorexia) and varied (pain perception & referral or migration) and thus the diagnosis of appendicitis has always been a challenge to emergency surgeons.

Radiological modalities like Computed Tomography (CT) imaging further aid in making a definite diagnosis and have been reported to have high sensitivity (94%) and specificity (95%) for diagnosis of acute appendicitis.[2] Thus large hospitals use CT images for the patients suspected of acute appendicitis but such practice will increase the cost of health care substantially. A recent study has suggested that such indiscriminate use of CT imaging may lead to detection of early low grade appendicitis & unnecessary appendicectomies in a condition that would otherwise have resolved spontaneously with antibiotic therapy.[3] Furthermore, the process of arranging for CT imaging may cause further delay for emergency appendicectomy.

That is the reason; the diagnosis of acute appendicitis still depends on clinical judgment. Several scoring systems are complementary aid in diagnosis of acute appendicitis. There are many scoring systems. The Alvarado score, which was developed in 1986, was a simple additive scoring system to help in the diagnosis of acute appendicitis.[4] Later in 1994, the last point of the original score was omitted.[5-7] Nowadays the Modified Alvarado Score has been widely assessed as to its accuracy in the pre-operative diagnosis of acute appendicitis.[5,8,9] Although it showed a very good sensitivity & specificity when applied in a western population but several subsequent studies have shown its limitations when applied in an Asian or Oriental population.[10] As a result a new scoring system called RIPASA (Raja Isteri Pengiran Anak Saleha Appendicitis) score which is a qualitative scoring system based on 14 fixed parameters (2 demographics, 5 clinical symptoms, 5 clinical sign and 2 clinical investigation) with one additional parameter having foreign national Identity Card.[10] All these parameters are easily obtained from history, clinical examinations & simple investigations. The optimal cut off threshold score is 7.5. The RIPASA score was introduced in the year of 2009-2010. The reported literature suggests sensitivity of 97.5%, specificity of 81.8%, PPV of 86.5%, NPV of 96.4% and a diagnostic accuracy of 91.8% in diagnosis of acute appendicitis.[10]

Objective
Therefore, in the diagnosis of acute appendicitis and to minimize the negative appendicectomy, the present study has been attempted to assess the diagnostic accuracy of RIPASA scoring system among the patients undergoing emergency appendicectomy for the provisional diagnosis of acute appendicitis from North Bengal Medical College and Hospital, Siliguri, West Bengal, India.

Methods
Study participants consist of 88 patients (42 males and 46 females) within the age group of 13years to 60 years admitted in surgical ward and casualty ward of North Bengal Medical College and Hospital and undergoing emergency appendicectomy for the provisional diagnosis of acute appendicitis during the period from April, 2015 to March, 2016. Patients presenting with RIF pain, suggestive of acute appendicitis and are undergoing appendicectomy were included in the study and the exclusion criterion includes patients with gynecological & urological diseases on clinical ground, Appendicular lump, dementia, septic shock and evidence of generalized peritonitis. This study is approved by Institutional Ethics Committee and prior consent has been obtained from the patients explaining the purpose of this study.

In patient records, Laboratory investigation report, USG reports and Histopathology reports of appendix specimen have been examined. The

RIPASA Score chart has been applied and score was corroborated with the findings of other clinical examinations.

The RIPASA scoring system is described below: [10-11]

Patients	Score
Sex:-	
Male	1.0
Female	0.5
Age:-	
Age <40 years	1.0
Age >40 years	0.5
Symptoms:-	
Right Iliac Fossa (RIF) pain	0.5
Migration of pain to RIF	1.0
Anorexia	1.0
Nausea and vomiting	1.0
Duration of symptoms <48 hours	1.0
Duration of symptoms >48 hours	0.5
Signs:-	
RIF tenderness	1.0
Guarding	2.0
Rebound tenderness	1.0
Rovsing's sign	2.0
Fever	1.0
Laboratory Investigations:-	
Raised WBC count	1.0
Negative urinalysis	1.0
TOTAL	**17.5**

True positive, true negative, false positive and false negative cases were obtained by considering the following cut offs:

True Positive (TP): No of patients having RIPASA score ≥ 7.5 & Histopathologically acute appendicitis.

False Positive (FP): No of patients having RIPASA score ≥ 7.5 but Histopathologically normal appendix.

True Negative (TN): No of patients having RIPASA score < 7.5 but Histopathologically normal appendix.

False Negative (FN): No of patient having RIPASA SCORE < 7.5 but histopathologically acute appendicitis.

Sensitivity, specificity, positive predictive value (PPV), negative predictive values (NPV) and Diagnostic Accuracy (DA) were calculated by using the following formulas:

$$\text{Sensitivity} = \frac{TP}{TP+FN} \times 100$$

$$\text{Specificity} = \frac{TN}{TN+FP} \times 100$$

$$\text{Positive Predictive Value (PPV)} = \frac{TP}{TP+FP} \times 100$$

Negative Predicative Value (NPV) $=TN/TN+FN$

$$\text{Diagnostic Accuracy (DA)} = \frac{TP+TN}{TP+TN+FP+FN} \times 100$$

Statistical analysis was done using Statistical Package for Social Sciences version 22 for windows [IBM SPSS Statistics for Windows, Version 22.0 Armonk, NY: IBM Corp]. P <0.05 was considered to be statistically significant.

Results

Table 1: Age group and Sex wise distribution of studied participants

Age Group (Yrs)	Male		Female		Total
	No	%	No	%	
11-20	10	11.3	12	13.6	22 (24.9%)
21-30	16	18.1	16	18.1	32 (36.2%)
31-40	8	9.0	14	15.9	22 (24.9%)
41-50	6	6.8	2	2.2	8 (9.0%)
51-60	2	2.2	2	2.2	4 (4.4%)
Total	42	47.4	46	52.0	88 (99.4%)

From table-1, it is documented that the acute appendicitis is a predominant disease of younger age group. The incidence is more common in second decade in males and females. 61% of total appendicitis patients are in the age group of 11-30 yrs. It is observed that there is steep rise of incidence of appendicitis in second & third decade. There is no case below 10 yrs and above 60 yrs.

Table 2: Frequency Distribution of RIPASA Score with Histopathology (HPE).

RIPASA Score	HPE		Total
	Normal Appendix	Acute Appendicitis	
RIPASA ≥ 7.5	4 (4.4%)	68 (77.2%)	72 (81.8%)
RIPASA< 7.5	14 (15.9%)	2 (2.2%)	16 (18.1%)
Total	18 (20.4%)	70 (79.5%)	88 (99.9%)

Table- 2 shows the RIPASA scores of the study population in respect of histopathological report of specimens of appendices. It was found that out of total 88 patients, 14 patients were histologically negative (normal) for acute appendicitis. The RIPASA score of those14 patients were <7.5. In 68 histologically proved acute appendicitis patients found RIPASA score ≥7.5. There were 2 cases with score <7.5 but their specimens proved positive for acute appendicitis histologically. There were 4 patients with score ≥7.5, found negative histopathologically.

Table 3: Distribution of studied participants according to RIPASA Score

Variables	RIPASA ≥7.5		RIPASA<7.5	
	True Positive (TP)	False Positive (FP)	True Negative (TN)	False Negative (FN)
Sample	68	4	14	2
Male : Female	33:35	2:2	6:8	1:1
Mean Age(yrs)	28.34±11.2	20±11.5	34±11.5	40±11.3
Total Score ± S.D	11.045±1.438	10.75±2.143	6.714±1.133	6.75±1.53
Range of Score	8.5-13	9.5-13.5	5.5-7	6.5-7

Table-3 shows that there are 68 true positive cases, of which 33 are males and 35 are females. There are 4 false positive cases, of which 2 are males and 2 are females. True negative cases are 14, of which 6 are males and 8 are females. There are only 2 cases those who are false negative, 1 male and 1 female. Mean age of true positive cases is 28.34 yrs±11.2 and mean age of true negative cases is 34 yrs±11.5. Mean age of false positive cases and false negative cases are 20 yrs±11.5 & 40 yrs±11.3 respectively. Analysis shows false negative cases are found in more advance age groups whether, false positive cases are found in younger age groups.

Table 4: Sensitivity, Specificity, PPV, NPV and DA among studied participants

Diagnosis Efficacy	Male	Female	Combined
Sensitivity	97.05%	97.2%	97.14%
Specificity	75%	80%	77.78%
Positive Predictive Value (PPV)	94.28%	94.59%	94.4%
Negative Predictive Value (NPV)	85.7%	88.89%	87.5%
Diagnostic Accuracy (DA)	92.85%	93.47%	93.18%

In table-4 the Sensitivity, Specificity, PPV, NPV and Diagnostic Accuracy of RIPASA score is 97.14%, 77.78%, 94.44%, 87.5% & 93.18% respectively for both the sexes. Interestingly all the variables have shown comparatively higher value in case of females patients.

Conclusion

The Alvarado Score, later Modified Alvarado Scoring System (MASS) has been used as popular scoring system for last three decades all over the world. The reported literature suggests sensitivity, specificity and diagnostic accuracy of MASS in the range of 53 to 94%, 37 to 90% and 74 to 86% respectively.[8, 12-16] But much newer scoring system RIPASA has more accurate predictive scores reported from different studies ranging sensitivity, specificity and diagnostic accuracy as of 93 to 100%, 28 to 85% and 77 to 92%.[15-18] The result of present study showing sensitivity of 97.14%, specificity of 77.78% and diagnostic accuracy of 93.18% which corroborated with

other studies and inferred that it is a much better diagnostic tool for the diagnosis of acute appendicitis.

In an emergency setting, the on duty medical officer can make a quick decision upon the patients with RIF pain by referring those with RIPASA score ≥7.5 to the on call surgical team for admission, while patients with RIPASA score <7.0 can either be observed in the ward or sending home with advice to patient party for observation. Thus RIPASA Score is currently a much better diagnostic scoring system for acute appendicitis compared to Alvarado score, with former achieving significantly higher sensitivity, specificity, NPV and diagnostic accuracy, particularly Indian population setting, which is reflecting in this study also.

Further studies need to be done with larger patient population to validate the results in this study. The importance of RIPASA score in Indian context with other contemporary scores (Alvarado, modified Alvarado) needs to be evaluated in future.

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