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ORIGINAL RESEARCH

A comparative study of modified Alvarado scoring and RIPASA scoring system in making diagnosis of acute appendicitis

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ABSTRACT

Background: This was a comparative study of modified Alvarado scoring and RIPASA scoring system in making diagnosis of acute appendicitis. **Material and methods:** The present cross-sectional, comparative study comprised of 50 patients presenting to the general surgery OPD and emergency department with RIF pain. All enrolled patients were informed regarding the study and their written consent will be obtained. The study protocol was approved from institutional ethical clearance committee. RIPASA was evaluated in all patients. Subjects having score of 7.5 and above were taken for surgical management. CT scanning was done among subjects with RIPASA score of 5 to 7 for confirmation of diagnosis. Patients with score of less than 5 were assessed for other etiologic factors responsible for abdomen pain. All subjects which were managed by conservative treatment were discharged. Diagnosis among surgically treated patients was confirmed through intra-op examination and by histopathological examining. Comparison of RIPASA and MASS was done. **Results:** While assessing the patients on the basis of RIPASA score, it was seen that in 88 percent patients, RIPASA score was ≥7.5 indicating presence of acute appendicitis. While assessing the patients on the basis of MAS, it was seen that in 80 percent patients, MAS was ≥7 indicating presence of acute appendicitis. Histopathology analysis revealed presence of appendicitis in 92 percent of the patients whileit showed normal appendix findings in 8 percent of the patients. **Conclusion:** According to the current study, the RIPASA scoring system outperforms Alvarado scoring in terms of both sensitivity and specificity. Additionally, it has superior diagnostic precision, a high positive predictive value, and a high negative predictive value; as a result, the rate of negative appendicectomy is lower. It follows that the RIPASA scoring system may be used to more accurately assess cases of acute appendicitis, and that this method has the potential to be a more accurate and economical means of diagnosis.

Key words: Modified Alvarado scoring, RIPASA scoring system, Acute appendicitis.

INTRODUCTION

Appendicitis refers to inflammation of appendix. In Latin, it is formed from 2 words “appendix” & “it is”. During 1540, it was referred as long development of the organ. Metiever in the year 1759 was one who initially described this inflammation. It has several different names such as- perityphlitis, typhlitis, paratyphlitis, or extra-peritoneal swelling referring in iliac depression on body’s right portion. During the beginning of 20th century, it was known to occur because of blockage which eliminates various fluids through appendix. Increase in pressure leads to increase in volume of cell as well as that of exudates providing the evidence of inflamed appendix. 26% patients were observed to have increase chances of death. [1]

Anatomy – it is situated at the backside of cecum, and at the backside of ileum & mesenteryin right side or it is located inferior as well as towards the pelvis internally. It is about one to nine inches long. Mesentery is the part which holds it. It consists of 3 layers, i.e., named as- organ sera, submucosa, and mucous.[1]

Development starts in about 5th week of intrauterine life. The midgut gets turned towards the outer umbilical cord, followed by a comeback into abdomen as well as return towards cecum. As a result, the appendix usually ends up mainly at the back of cecum. It is commonly associated with mild clinical manifestation, but it can also manifest with additional severe symptoms. Presence of puncture within abscess might show more chronic clinical manifestations. The accurate purpose of this organ is a topic of discussion. Appendix has defensive function which functions as

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lymphoid appendage, particularly in younger individuals. Some discussions suggest that it serves as storeroom for beneficial colonic microbes. However, others dispute that it is simply a residue of development and has no significant role.[2]

Hence; we compared the efficacy of modified Alvarado scoring and RIPASA scoring system in making diagnosis of acute appendicitis.

MATERIAL AND METHODS

The present cross-sectional, comparative study comprised of 50 patients presenting to the general surgery OPD and emergency department with RIF pain. All enrolled patients were informed regarding the study and their written consent will be obtained. The study protocol was approved from institutional ethical clearance committee.

MODIFIED ALVARADO SCORING SYSTEM (MASS)

SYMPTOMS	SCORE
Migratory RIF pain	1
Nausea/Vomiting	1
Anorexia	1

SIGNS	
Tenderness in RIF	2
Rebound tenderness in RIF	1
Elevated temperature	1
LABORATORY FINDINGS	
Leukocytosis	2
TOTAL	9

In both groups after final scoring, patients were categorized into 4 groupsScore < 5 Unlikely to be appendicitis
5-6Low probability to be appendicitis
7High probability to be appendicitis
≥8Definite appendicitis

RAJA ISTERI PENGIRAN ANAK SALEHA APPENDICITIS (RIPASA) SCORE

PATIENT'S DEMOGRAPHIC	SCORE
Female	0.5
Male	1.0
Age< 39.9 years	1.0
Age> 40 years	0.5
SYMPTOMS	
RIF pain	0.5
Pain migration to RIF	0.5
Anorexia	1.0
Nausea & vomiting	1.0
Duration of symptoms < 48 hrs	1.0
Duration of symptoms > 48 hrs	0.5
SIGNS	
RIF tenderness	1.0
Guarding	2.0
Rebound tenderness	1.0
Rovsing's sign	2.0
Fever>37^{0}C, <39^{0}C	1.0
INVESTIGATIONS	
Raised WBC count	1.0
Negative urinalysis	1.0
ADDITIONAL SCORES	
Foreign NRIC	1.0

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Total 17.5

RIPASA was evaluated in all patients. Subjects having score of 7.5 and above were taken for surgical management. CT scanning was done among subjects with RIPASA score of 5 to 7 for confirmation of diagnosis. Patients with score of less than 5 were assessed for other etiologic factors responsible for abdomen pain. All subjects which were managed by conservative treatment were discharged. Diagnosis among surgically treated patients was confirmed through intra-op examination and by histopathological examining. Comparison of RIPASA and MASS was done.

STATISTICAL ANALYSIS

Data was entered in Microsoft Excel and analysed. Categorical data was expressed in number and percentage. Continuous data of normal distribution was expressed as mean andstandard deviation. Skewed data was expressed using the median and interquartile range. P- value of <0.05 was taken as statistical significance.

RESULTS

Table 1: Distribution of patients according to RIPASA score

RIPASA Score	Number	Percentage
≥7.5	44	88
<7.5	6	12
Total	50	100

While assessing the patients on the basis of RIPASA score, it was seen that in 88 percentpatients, RIPASA score was ≥7.5 indicating presence of acute appendicitis.

Table 2: Distribution of patients according to Modified Alvarado score (MAS)

MAS	Number	Percentage
≥7	40	80
<7	10	20
Total	50	100

While assessing the patients on the basis of MAS, it was seen that in 80 percent patients, MAS was ≥7 indicating presence of acute appendicitis.

Table 3: Distribution of patients according to histopathological findings

Histopathological findings	Number	Percentage
Acute appendicitis	46	92
Normal appendix	4	8
Total	50	100

Histopathology analysis revealed presence of appendicitis in 92 percent of the patients while it showed normal appendix findings in 8 percent of the patients.

Table 4: Diagnostic accuracy of RIPASA Score for identifying acute appendicitis

Variables	Value	95% C.I.
Sensitivity	93.48%	82.10% to 98.63%
Specificity	75%	19.41% to 99.37%
Diagnostic accuracy	92%	80.77% to 97.78%
Positive predictive value	97.73%	88.72% to 99.58%
Negative predictive value	50%	22.59% to 77.41%

Table 5: Diagnostic accuracy of Modified Alvarado score for identifying acuteappendicitis

Variables	Value	95% C.I.
Sensitivity	82.61%	68.58% to 92.18%
Specificity	50%	6.76% to 93.24%
Diagnostic accuracy	80%	66.28% to 89.97%
Positive predictive value	95%	87.60% to 98.08%
Negative predictive value	20%	7.23% to 44.49%

Sensitivity and specificity of Modified Alvarado score for identifying acute appendicitis was 82.61% and 50% respectively. Diagnostic accuracy of Modified Alvarado score for identifying acute appendicitis was 80%.

Table 6: Test Result Variable(s) for RIPASA score

Area under ROC curve forRIPASA score	ic 95% ConfidenceInterval		Asymptotic Sig[b] (p-value)
	Lower Bound	Upper Bound	
0.81	0.612	0.839	0.000

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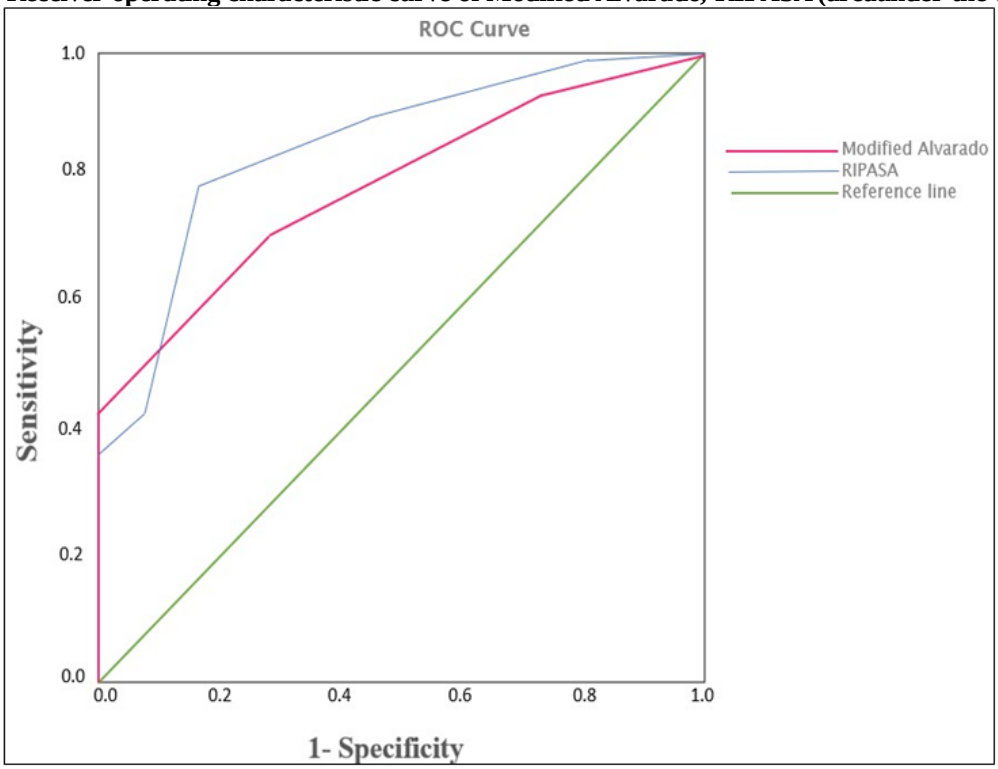
Cut-off variables			
Cut-off for RIPASA Score	7.5		
Sensitivity	93.48%		
Specificity	75%		

Table 7: Test Result Variable(s) for Modified Alvarado score

Area under ROC curve for Modified Alvarado score	Asymptotic 95% Confidence Interval		Asymptotic Sig[b] (p-value)
	Lower Bound	UpperBound	
0.59	0.612	0.749	0.000
Cut-off variables			
Cut-off for MASS Score	7		
Sensitivity	82.61%		
Specificity	50%		

Graph 1: Receiver operating characteristic curve of Modified Alvarado, RIPASA (areaunder the curve)



DISCUSSION

Appendicitis is the most common causes of acute abdominal discomfort in adults and children, with a lifetime risk of around 7% for women and 9% for men. Among common surgical emergencies, occurring around one in seven times over a lifetime. Diverticulitis, intestinal obstruction, colonic carcinoma, renal colic, ulcerative colitis, perforated peptic ulcer, pancreatitis, rectus sheath hematoma, dysmenorrhea, pelvic inflammatory disease, endometriosis in women, and testicular torsion in men are among the differential diagnoses for acute appendicitis in addition to Crohn's disease. A negative appendicectomy is the surgery performed when appendicitis is identified preoperatively and a normal histology specimen is obtained. For unclear cases, several techniques have been devised to assist lower the rate of negative appendicectomy. Several grading schemes have been put in placeto help in the prompt diagnosis and management of acute appendicitis. These evaluations are derived from the clinical history, physical examination, and test outcomes.[3,4]

In 1994, Kalan, Talbot, and Cunliffe evaluated Alvarado score's accuracy in the diagnosis of acute appendicitis before surgery. In males and children, a high score facilitates the early identification of acute appendicitis; in women, however, there was a significant proportion of false positives for the condition. In 2010, Chong et al. conducted prospective research on patients with pain in right iliac fossa who came to the surgical wards or Accident & Emergency department at RIPAS Hospital, Brunei Darussalam's national hospital. They came to the conclusion that RIPASA score, which has excellent sensitivity, specificity, and diagnostic accuracy, is the better appropriate choice for scoring for local contexts in

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southeast Asia.[5,6]

It has been observed that RIPASA Score, a novel diagnostic scoring system designed for thediagnosis of acute appendicitis, has far more sensitivity, specificity, and diagnostic accuracy than the Modified Alvarado Score, especially when used with Asian populations. The lack of data comparing the diagnostic accuracies of the Modified Alvarado and RIPASA scoringsystems in the diagnosis of acute appendicitis is mentioned in the literature.[7,8]

Histopathology analysis revealed presence of appendicitis in 92 percent of the patients while it showed normal appendix findings in 8 percent of the patients. Our results were in concordance with other authors who also reported similar findings. In the studies conductedby Heiranizadeh N et al[9], N N et al[10] and Zeb et al[11], acute appendicitis was the finding on histopathology in 82 percent, 89.3 percent and 93.08 percent of the patients respectively. In another similar study conducted by Sanjive JG et al[12], acute appendicitis was seen in 93.3 percent of the patients.

CONCLUSION

According to the current study, the RIPASA scoring system outperforms Alvarado scoring in terms of both sensitivity and specificity. Additionally, it has superior diagnostic precision, a high positive predictive value, and a high negative predictive value; as a result, the rate of negative appendicectomy is lower. It follows that the RIPASA scoring system may be used to more accurately assess cases of acute appendicitis, and that this method has the potential to be a more accurate and economical means of diagnosis.

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