



Comparison of Efficacy of Ripasa Scoring System with Modified Alvarado Scoring System in Diagnosing Acute Appendicitis

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Abstract

Background: Acute appendicitis is one of the commonest surgical emergencies. Different scoring systems are postulated to arrive at a diagnosis. A new scoring system named RIPASA scoring system was developed to aid in the diagnosis of acute appendicitis in the Asian countries. We have prospectively compared diagnostic accuracy of RIPASA scoring and modified Alvarado scoring system.

Materials & Methods: This observational study was done in Rajah Muthiah Medical College and Research Institute between June 2015 and August 2016 in patients with clinical diagnosis of acute appendicitis and undergoing appendectomy were included in the study. After obtaining their consent study were conducted. Both Alvarado score and RIPASA score were calculated for all the patients. The operative findings and postoperative histopathology report were compared with the two scoring systems. Receiver operating curve (ROC), sensitivity, specificity & diagnostic accuracy were calculated.

Results: One hundred and fifty patients satisfying inclusion and exclusion criteria were analysed. At optimal cut-off point of 7.5 derived from ROC curve for RIPASA, the sensitivity & specificity was 99.25% and 55 % respectively. At the cut-off threshold of 7.0 derived from ROC curve for modified Alvarado score the sensitivity and specificity is 78.46% and 59.09% respectively. The diagnostic accuracy of RIPASA was 5.4% better than Modified Alvarado score.

Keywords: Acute Appendicitis, Ripasa Score, Histopathology. ROC Curve, Specificity and Alvarado Scoring System.

Introduction

Acute appendicitis is a common cause of abdominal pain for which a prompt diagnosis and treatment is rewarded by a marked decrease in morbidity and mortality. Routine history and examination both remain the most effective and practical diagnostic modalities. Acute appendicitis is associated with raised TLC. Ultrasound is operator dependent and often misses or over-diagnose the condition. CECT scan is

investigation of choice with high sensitivity and specificity for diagnosis.^{5,6}

Materials and Methods

Study was conducted in RMMCH between 2015 and 2016. Study was conducted in the study period. Patients with clinical diagnosis of acute appendicitis and undergoing appendectomy were included in the study. Patients were briefed about the study. After obtaining their consent study were

conducted. Both Alvarado score and RIPASA score were calculated for all the patients. The decision for appendectomy will be purely based on operating surgeon's decision and strictly not based on these two scoring systems. Operating surgeon will be unaware of the two scores.

The operating findings and postoperative histopathology report were compared with the two scoring systems. Histopathology report was considered as the confirmation of appendicitis and the two scores were compared with the histopathology report and final result was analysed using ROC analyser.

Inclusion Criteria

Patients aged between 12- 80 years of age of both gender admitted with the provisional diagnosis of acute appendicitis and getting operated.

Exclusion Criteria

- Patients managed conservatively.
- Patients with Appendicular mass.
- Patients with presentation of urological, gynaecological or surgical problems other than appendicitis.

Methodology

Written informed consent was obtained from all patients.

Preoperative work up:

- Clinical History and Physical Examination.
- All patient had the following preoperative investigations:

Hemoglobin, TLC, Shift of WBC's to the left, Blood urea with serum creatinine, serum electrolytes, Ultrasound abdomen, abdomen X-ray-Erect and Supine films, Urine-analysis, Application of RIPASA scoring in every clinically diagnosed cases.^{2,3,4}

Operation: Emergency appendectomy by grid iron or lanz incision.

Parameters Evaluated

- RIPASA scoring and Modified ALVARDO Scoring in every clinically diagnosed case of appendicitis.
- Histopathological confirmation and assessment under following headings- Acute appendicitis, acute suppurative appendicitis,

acute gangrenous appendicitis, periappendicitis and normal.

- Sensitivity, specificity, PPV, NPV, diagnostic accuracy and negative appendectomy rates of scoring system with respect to histopathology, as gold standard for diagnostic confirmation.

Scoring Chart

Modified Alvarado score¹⁰

ALVARADO (MANTRELS) SCORE		SCORE
SYMPTOMS	MIGRATORY RIF	1
	PAIN ANOREXIA	1
	NAUSEA AND VOMITING	1
SIGNS	TENDERNESS RIF	5
	REBOUND	
	TENDERNESS	1
	ELEVATED TEMPERATURE	1
LAB INV	LEUCOCYTOSIS	2
	SHIFT TO LEFT	1
TOTAL		10

Ripasa (Raja Isteri Penigiran Anak Saleha)

RIPASA SCORE	
MALE	1
FEMALE	0.5
AGE <39	1
>40	0.5
RIF PAIN	0.5
MIGRATION OF RLQ	0.5
ANOREXIA	0.5
NAUSEA AND VOMITING	0.5
DURATION <48 HRS	1
>48 HRS	0.5
RIF TENDERNESS	1
RIF GUARDING	2
ROVSING SIGN	2
REBOUND	1
FEVER	1
RAISED TC	1
NEGATIVE URINE ANALYSIS	1
FOREIGN NATIONALITY	1
SCORE	>OR<7.5/15

Results

Predictive Value of RIPASA

At optimal cut-off threshold of >7.5, RIPASA was able to identify 138 appendicitis in which 129 were positive of appendicitis in histopathology report.¹

The RIPASA score has

Positive predictive value of 93.48 % (CL 89.36%- 97.60%)

Negative predictive value of 91.67 % (CL 76.03%- 107.30%)

The Sensitivity of RIPASA score is 99.23%

The Specificity of RIPASA score is 55 %

Predictive Value of Alvarado

At optimal cut-off threshold of >7, Modified Alvarado was able to identify 109 cases in which 102 were positive of appendicitis in histopathology report.

The Modified Alvarado score has

Positive predictive value of 91.89 % (CL 86.81.36%- 96.97%)

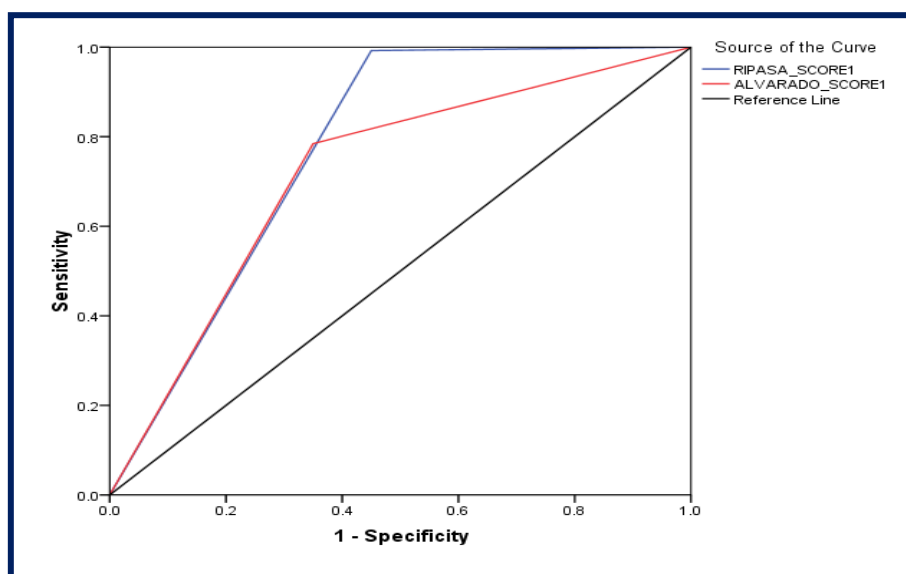
Negative predictive value of 31.71 % (CL 17.46%- 45.95%)

The Sensitivity of Modified Alvarado score is 78.46%

The Specificity of Modified Alvarado score is 59.09 %

ROC Curve

Case Processing Summary	
HPE_Appendicitis	Valid N (listwise)
Positive ^a	130
Negative	20
Larger values of the test result variable(s) indicate stronger evidence for a positive actual state.	
a. The positive actual state is 1.	



Area Under the Curve					
Test Result Variable(s)	Area	Std. Error ^a	Asymptotic Sig. ^b	Asymptotic 95% Confidence Interval	
				Lower Bound	Upper Bound
RIPASA_SCORE1	.771	.071	.000	.631	.911
ALVARADO_SCORE1	.717	.066	.002	.588	.846
The test result variable(s): RIPASA_SCORE1, ALVARADO_SCORE1 has at least one tie between the positive actual state group and the negative actual state group. Statistics may be biased.					
a. Under the nonparametric assumption					
b. Null hypothesis: true area = 0.5					

Crosstabs

Count		HPE_appendicitis		Total
		1	0	
RIPASA_SCORE1	2	129	9	138
	1	1	11	12
Total		130	20	150

		Proportion	Confidence Interval	
		Estimate	Lower	Upper
Sensitivity	$a/(a+c)$	0.9923	0.9773	1.0073
Specificity	$d/(b+d)$	0.5500	0.3320	0.7680
Pred value positive	$a/(a+b)$	0.9348	0.8936	0.9760
Pred value negative	$d/(c+d)$	0.9167	0.7603	1.0730
Likelihood Ratio	$a/(a+c)/(b/b+d)$	2.2051	1.3580	3.5807
False positive rate	$b/(b+d)$	0.4500	0.2320	0.6680
False negative rate	$c/(a+c)$	0.0077	-0.0073	0.0571
Accuracy		0.9333	0.8934	0.9733

Count		HPE_appendicitis		Total
		1	0	
ALVARADO_SCORE1	2	102	7	109
	1	28	13	41
Total		130	20	150

		Proportion	Confidence Interval	
		Estimate	Lower	Upper
Sensitivity	$a/(a+c)$	0.7846	0.7139	0.8553
Specificity	$d/(b+d)$	0.5909	0.3855	0.7964
Pred value positive	$a/(a+b)$	0.9189	0.8681	0.9697
Pred value negative	$d/(c+d)$	0.3171	0.1746	0.4595
Likelihood Ratio	$a/(a+c)/(b/b+d)$	1.9179	1.1515	3.1947
False positive rate	$b/(b+d)$	0.4091	0.2036	0.6145
False negative rate	$c/(a+c)$	0.2154	0.1447	0.3412
Accuracy		0.7667	0.6990	0.8344

Discussion

Appendicectomy is the most commonly done emergency surgery making it 10% of all emergency abdominal surgery. The diagnosis of appendicitis is still one of commonly encountered difficulty in clinical practice. There are several attempts which aid to help in finding the accuracy of diagnosis of acute appendicitis. Computed tomography imaging has been reported to have

higher sensitivity and specificity for diagnosing acute appendicitis. Several scoring system have been introduced to help in making clinical diagnosis of acute appendicitis. This study was made over a period of 18 months in patients undergoing emergency appendicectomy. It is a prospective study with 150 patients as study subjects. The principle aim of the study was to compare the accuracy of RIPASA and modified

Alvarado scoring system in the diagnosis of acute appendicitis.

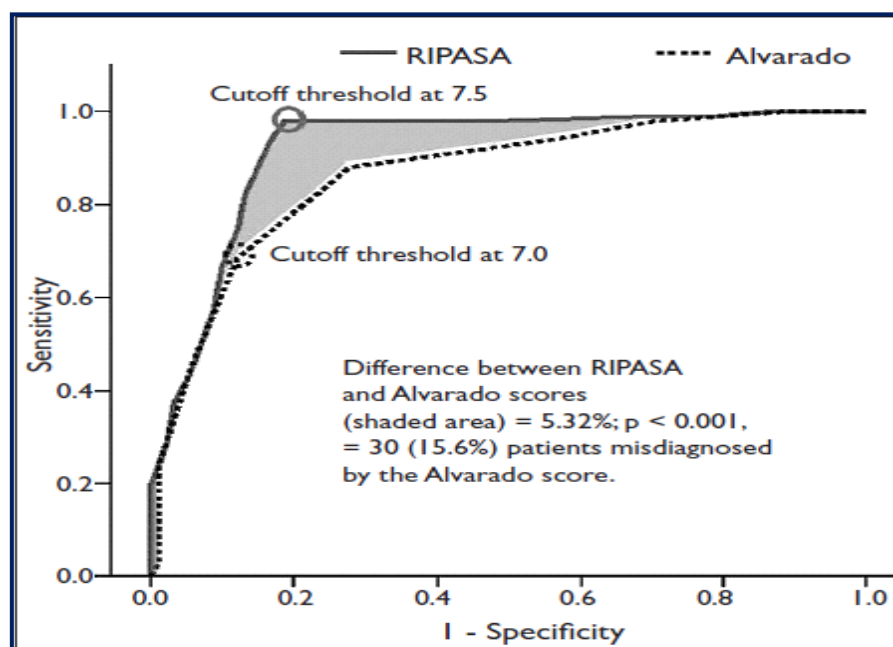
RIPASA vs Modified Alvarado

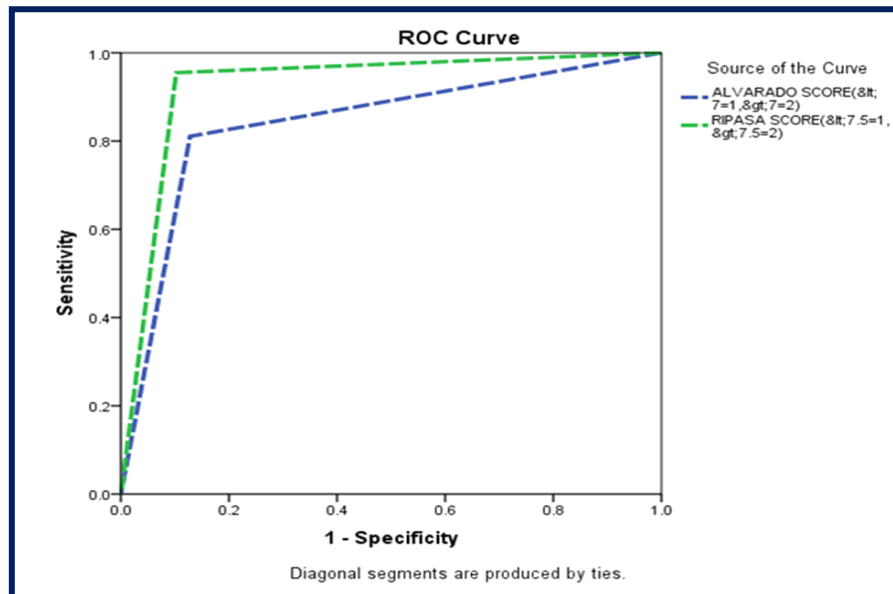
Using RIPASA score, 93% of patients who actually had appendicitis were correctly diagnosed & were placed in high probability group (RIPASA>7.5) & were treated appropriately. Using Modified Alvarado score, 93% of patients were correctly diagnosed in high probability group (>7) when used on the same population group. But, Alvarado score failed to identify 68.2% of patients who had appendicitis and were wrongly classified in to low probability group (<7).¹ The Chong et al study showed RIPASA score identified 98% of patients with acute appendicitis in high probability group and Alvarado showed only 68.3%. The diagnostic accuracy of 5.4% between the RIPASA score (CL0.631-0.911) and Alvarado score (CL0.588-0.846) was statistically significant showing that RIPASA score is a much better diagnostic tool. The diagnostic accuracy between these two scores was compared with the study conducted by Chong et al and showed a diagnostic accuracy of 5.32%.

Similarly for patients who were classified in low probability group, (true negative group) with RIPASA score <7.5 and Alvarado <7, RIPASA had 8% of patients positive for appendicitis and 92% of patients negative for appendicitis whereas Alvarado identified 31.7% of patients positive for appendicitis. The true negative results compared with Chong et al showed that RIPASA correctly diagnosed 97.4% who did not have appendicitis where as Alvarado managed to identify only 71.4% in that study.^{7,8}

The sensitivity of RIPASA score is 99.23% with a confidence interval between 97.73% - 100.73% and the specificity is 55% with a confidence interval of 33.20%-89.36% which was statistically significant. The study conducted by Chong et al showed 88% sensitivity and 67% specificity of RIPASA score.¹¹

The sensitivity of Alvarado score is 78.46% with a confidence interval of 71.39%- 85.53% and the specificity is 59.09% with a confidence interval of 38.55% to 79.64%. The study conducted by Chong et al showed sensitivity of 59% and specificity of 23%.¹²





The ROC curve was compared with the study by Chong et al

Other parameters were analysed in this study. The most common age group was between 20-29(33%) second most common being <20(28%) followed by 30-39(19%). This study had 57% male and 43% female patients. 90.5% of all males were found to have appendicitis and 81% of females were found to have appendicitis. All the patients were presented with RIF pain. Among 150 patients 67% of patients presented in less than 48 hours 33% of patients presented after 48 hours. In patients who had presented before 48 hours 89% were histologically proven appendicitis. Eighty seven percent of patients had nausea and vomiting in which 86% were proven to have appendicitis. Fifty two percent of patients had complaints of anorexia in which 90% of them had appendicitis. Ninety eight percent of patients had RIF tenderness the rest had right lumbar tenderness which was taken for surgery as they were USG proven appendicitis. Among the patients with RIF pain 86% were proven to have appendicitis. Rebound tenderness was present in 63% of patients among which 87% had appendicitis. Thirty seven percent of patient presented with fever in which 89% were proven to have appendicitis. Rovsing sign was present in 19% of patient in which 85% had appendicitis. Eighty three percent of patients had increased total

counts, in which 88% were proven to have appendicitis. 81 % had negative urine analysis while the rest had some amount of UTI.

Conclusion

RIPASA scoring is an easy and reliable scoring system and has better diagnostic accuracy compared to Modified Alvarado scoring. Due to the advancement of imaging modalities these scoring system has less significant values in tertiary care centres. However it can be used in areas where there is a lack of imaging modalities like rural areas or in primary care centre where these scoring systems can be used to plan the management of the patients.

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