

Effective Diagnosis of Acute Appendicitis – Comparison of RIPASA and Alvarado Scoring Systems

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ABSTRACT

Objective To compare the diagnostic usefulness of RIPASA and Alvarado score in identifying patients with acute appendicitis presenting with right iliac fossa pain.

Study design Cross sectional analytical.

Place & Duration of study Department of Surgery Unit III, Jinnah Postgraduate Medical Centre (JPMC) Karachi, from December 2013 to December 2015.

Methodology All patients above 15 year age of either sex with right iliac fossa pain, were included in the study. All patients were clinically assessed and scored as per Alvarado and RIPASA scoring systems. Decision for appendectomy was based on the surgeon's clinical judgment. The scoring systems were used for the study purpose. The histopathological findings were compared with the scores of the two systems.

Results Using RIPASA scoring criterion, 172 (86%) patients were suspected to have acute appendicitis. Out of these 164 patients had acute appendicitis on histopathology report (true positive - TP) where as 8 were false positive (FP), 16 false negative (FN) and 12 true negative (TN) for acute appendicitis. Using Alvarado score, only 22 (11%) were suspected to have acute appendicitis. A total 21 patients were confirmed true positive (TP) based on histopathology, only one false positive (FP), 159 false negative (FN) and 19 true negative (TN). The sensitivity of RIPASA score was 91.11%, specificity 60%, PPV 95.34%, NPV 42.85%, diagnostic accuracy 88% and rate of negative appendicectomy was 10.25%. Sensitivity of Alvarado score was 11.67%, specificity 95%, PPV 95.45%, NPV 10.67%, diagnostic accuracy 20% and negative appendicectomy rate was 0.132%.

Conclusion The RIPASA score was reliable and sensitive diagnostic tool to make diagnosis of acute appendicitis

Key words Acute appendicitis, RIPASA score, Alvarado score.

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INTRODUCTION:

The acute appendicitis is one of the most common acute abdominal conditions dealt with in emergencies.^{1,2} The global life time risk of acute appendicitis is 8.6% and 6.7% in men and women respectively.^{3,4} There are number of scoring systems designed to accurately diagnose the acute appendicitis and the most commonly used is Alvarado scoring system. Another diagnostic scoring system, the Raja Isteri Pengiran Anak Saleh (RIPASA)

consists of 17 fixed parameters (age, sex, symptoms like right iliac fossa pain, migratory pain, nausea and vomiting, duration of symptoms, signs as rebound tenderness, guarding, fever, Rovsing sign, wbc count, negative urine analysis) and an additional parameter (NRIC) that is unique to the Asian population.

The purpose of this study was to compare the diagnostic usefulness of RIPASA and Alvarado scores in identifying patients with acute appendicitis by applying them to all the patients attending our hospital emergency room with right iliac fossa pain.

METHODOLOGY:

This study was conducted in Surgical Unit III, Jinnah Postgraduate Medical Centre Karachi, from December 2013 to December 2015. Patients above 15 year age of either sex with right iliac fossa pain were included in the study. Pregnant women, patients with right iliac fossa mass, previous history of pelvic inflammatory disease and urolithiasis were excluded. All patients were scored as per Alvarado and RIPASA scoring systems. Alvarado system contains eight whereas RIPASA contains seventeen plus one parameter. The scores for high probability of having acute appendicitis for Alvarado system is 7.0 while the cut-off value for RIPASA is 7.5. The decision for appendectomy was based on the surgeon's clinical judgment and the scoring systems were used for the study purpose. The biopsy reports were compared with the scores obtained from the two systems.

Data was entered into SPSS-20.0 version. Results were categorized on the basis of test marker score > 7.5 for RIPASA and >7.0 for Alvarado test, as positive. The histopathology report of acute appendicitis was considered as final criterion for the acute appendicitis. Results were presented in

frequency and percentages. Chi-square test was applied to compare the proportion of similar and variant diagnostic results against histopathology report. Sensitivity, specificity, positive predictive value, negative predictive value, diagnostic accuracy and rate of negative appendectomy of RIPASA and Alvarado scores were calculated.

Using the actual scores of positive cells for each group following different diagnostic markers, receiver operating curve (ROC) was established to find the diagnostic yield of markers used in this study. Area under the ROC=0.70 was considered acceptable diagnostic yield for a marker. The p value =0.05 was considered statistically significant result.

RESULTS:

Appendectomy was performed in all 200 cases who met the inclusion criteria. On histopathology report 180 (90%) patients were reported as having acute appendicitis and 20 (10%) were negative for acute appendicitis. Out of 200 patients, 129 (64.5%) were males and 71 (35.5%) females (Male: Female = 1.8: 1). The mean age of the patients was 24.7 ± 10.2 year (ranging from 14 to 65 year).

Out of the total patients with pain in right iliac fossa 172 (86%) were suspected to have acute appendicitis according to RIPASA scoring criterion. Of these 164 patients were later confirmed as having acute appendicitis based on histopathology (true positive-TP), 8 were false positive (FP), 16 were false negative (FN) and 12 were true negative for acute appendicitis. Using Alvarado score, only 22 (11%) were suspected to have acute appendicitis. Of these 21 were confirmed true positive (TP) based on histopathology (table I). The sensitivity of RIPASA and Alvarado scores is given in table II. Distribution of patients according to RIPASA and Alvarado scores is presented in table III. Receiver operating curve

Table I: Diagnostic Findings of Acute Appendicitis

Variables	Histopathology(Gold-standard)		
	Positive (n = 180)	Negative (n = 20)	p-value
RIPASA Score			
Positive (RIPASA > 7.5)	164 (91.1%)*	8 (40.0%)	<0.001
Negative (RIPASA = 7.5)	16 (8.9%)	12 (60.0%)	
Alvarado > 7.0			
Positive (Alvarado > 7.0)	21 (11.7%)	1 (5.0%)	<0.001
Negative (Alvarado = 7.0)	159 (88.3%)*	19 (95.0%)	

*Shows statistically significant results at 5% level of significance.

Table II: Sensitivity Analysis

Variables	Score in percentage (95% CI)		
	RIPASA > 7.5	Alvarado > 7.0	p-value
Sensitivity	91.11 (85.72-94.67)*	11.67 (7.53-17.49)	<0.001
Specificity	60.00 (36.41-80.02)	95.0 (73.06-99.74)*	<0.001
Positive predictive value (PPV)	95.34 (90.72-97.82)	95.45 (75.12-99.76)	0.999
Negative predictive value (NPV)	42.85 (25.02-62.57)*	10.67 (6.72-16.39)	<0.001
Diagnostic accuracy	88.0*	20.0	<0.001
Negative appendectomy rate	10.25*	0.132	<0.001

*Shows statistically significant results at 5% level of significance.

Table III: Distribution of Patients According To RIPASA Versus Alvarado Scores

Variables	True Positive		False Positive		True Negative		False Negative	
	RIPASA > 7.5	Alvarado > 7.0	RIPASA > 7.5	Alvarado > 7.0	RIPASA > 7.5	Alvarado > 7.0	RIPASA > 7.5	Alvarado > 7.0
Number	164	21	8	1	12	19	16	159
Total Score ± (S.D)	10.87± (2.56)	8.62± (0.74)	8.38± (0.52)	9.0 ± (0)	5.58± (0.67)	6.58± (1.47)	6.0± (0.97)	5.00± (1.95)
Gender (M:F)	107:57	15:6	3:5	0:1	8: 4	11: 8	11: 5	103: 56
Age in years Mean ± (S.D)	24.57± (9.76)	22.67± (9.12)	28.38± (9.87)	16.0±(0)	21.58± (8.04)	24.74± (9.26)	26.56± (15.3)	25.02± (10.47)

(ROC) yielded a high diagnostic value of RIPASA score as compared to Alvarado score. The area under the curve of RIPASA score was 0.889 and of Alvarado score was 0.633.

DISCUSSION:

The diagnosis of acute appendicitis is a great challenge for the surgeons.^{5, 6} Delay in diagnosis can lead to morbidity and mortality.^{7, 8} The negative appendectomy reported rate is about 10% - 15%.^{9,10,11} The clinical judgment can be supplemented by the radiological imaging like ultrasound and C.T scan though in a recent study this claim is challenged.¹² Number of scoring systems have been developed to aid the diagnosis of the acute appendicitis amongst them the Alvarado is the most popular. Alvarado proposed this scoring system in 1986 and its highly sensitive and specific when applied to the western population.^{13,14} This scoring system has limitations when applied to the Asian population.

RIPASA is an other scoring system with better sensitivity and specificity than Alvarado system in the diagnosis of acute appendicitis as reported in

other series.^{15,16,17} The diagnostic accuracy of RIPASA in our study was 88% as compared to Alvarado scores (p<0.001). Thus RIPASA is the better diagnostic tool for the diagnosis of acute appendicitis. The results of this study are comparable with study other study.¹⁸ RIPASA scoring system can omit the need for expensive radiological investigations thus reducing the healthcare cost and therefore is highly recommended.

CONCLUSION:

RIPASA score at cut off of total >7.5 was more sensitive with higher positive predictive value and diagnostic accuracy but less specific with higher rate of negative appendectomy as compared to Alvarado score. The findings of this study revealed that RIPASA score is reliable and sensitive diagnostic tool for diagnosing acute appendicitis.

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Author's Contributions:

Shireen A.A Ramzanali Damani: Manuscript writing and statistic analysis.

Syed Sagheer Hussain Shah: Proof reading.

Afshan Hashami: Data collection.

Mohsina Siddiq Mansoori: Data Collection.

Conflict of Interest:

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