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Original Research Article

A study to compare RIPASA (Raja Isteri Pengiran Anak Saleha Appendicitis) and Alvarado scores in diagnosing acute appendicitis in Indian population

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ABSTRACT

Background: Acute appendicitis is one of the most common surgical emergencies. Various clinical scoring systems have been used for early diagnosis of acute appendicitis, of which Alvarado score is the most popular but it is found to be less accurate when applied to Asian population compared to RIPASA score. Radiological modalities such as computed tomography (CT) imaging may aid in making a definite diagnosis but will inflate the cost of treatment. This study aims to compare RIPASA and Alvarado scoring system in the diagnosis of acute appendicitis in our population.
Methods: It was a comparative cross-sectional study done in 100 patients. RIPASA and Alvarado scores were applied to each patient. Our inclusion criteria were patients presenting with Right iliac fossa pain who subsequently underwent Appendicectomy in the same admission. Exclusion criteria included patients admitted under other specialties, those who underwent previous appendicectomy, elective appendicectomy and those not willing for the study.
Results: The sensitivity and specificity of RIPASA score was 95.12% and 66.67% and that of ALVARADO score was 64.63% and 77.78%. The positive predictive value (PPV) and negative predictive value (NPV) of RIPASA score was 92.86% and 75% and that of Alvarado score was 92.98% and 32.5%. The diagnostic accuracy of Alvarado and RIPASA scores were 67.0% and 90.0% respectively.
Conclusions: RIPASA scoring system is more accurate and specific scoring system for our population than Alvarado in diagnosing acute appendicitis.

Keywords: Appendicitis, Alvarado, RIPASA, Scoring system

INTRODUCTION

Acute appendicitis is one of the most common surgical emergencies encountered, with a lifetime prevalence rate of one in seven people worldwide.[1] A negative appendicectomy is taken as a surgery performed for a preoperative diagnosis of appendicitis that resulted in normal histopathology examination.

Different techniques have been formulated to assist in equivocal cases in order to decrease negative appendicectomy rates. Studies have shown a negative appendicectomy rate of 17% to 36%, when acute appendicitis is diagnosed based on clinical judgment.[2] A number of scoring systems have been used for helping in early diagnosis of acute appendicitis and in its immediate management. These scores make use of clinical history, physical examination and laboratory findings.

The Alvarado and Raja Isteri Pengiran Anak Saleha Appendicitis (RIPASA) scores are two diagnostic scoring systems developed for the diagnosis of Acute

Appendicitis and have been shown to have high sensitivity, specificity and diagnostic accuracy.

The Alvarado score have been validated in numerous patient populations and has become the gold standard in diagnostic scoring of suspected appendicitis (Table 1). The RIPASA scoring system is a new diagnostic scoring system which included more parameters than Alvarado system such as age, gender and duration of symptoms prior to presentation (Table 2). These parameters are shown to affect the sensitivity and specificity of Alvarado scoring system in the diagnosis of acute appendicitis.[3] The RIPASA Scoring system has been shown to have significantly higher sensitivity, specificity and diagnostic accuracy when compared to Alvarado Score, particularly when applied to Asian population in diagnosing Acute Appendicitis.[4,5] Depending on scoring system patients are stratified into three groups: high, intermediate, and low risk for appendicitis. Ideally, the patients in the low-risk group can be discharged, and patients in the high-risk group can be directly scheduled for surgery. The patients in the intermediate risk group benefit most from further investigations such as imaging. Computed tomography (CT) is the most accurate imaging method for the diagnosing acute appendicitis, but overuse of CT involves increased costs and increased risks of associated ionizing radiation and contrast medium, and a potential increase in delay to treatment. Abdominal organs are sensitive to ionizing radiation, and suspected appendicitis is most frequent in young patients for whom the considerations of radiation-induced risks are most important.[6] Ultrasound (USG) involves no ionizing radiation but its ability to recognize or rule out appendicitis is inferior to that of CT, and it is dependent on the skills of the radiologist. Furthermore, ultrasound is often inconclusive.[7] Not many studies have been conducted to compare RIPASA and Alvarado scoring system in the diagnosis of acute appendicitis. Hence, we prospectively compared Alvarado and RIPASA score by applying them to the patients attending our hospital with right iliac fossa (RIF) pain that could probably be acute appendicitis.

METHODS

This study was conducted in Jubilee Mission Medical College and Research Institute, Thrissur, Kerala. This was a comparative cross section study over a duration of 1 year from May 2016 to April 2017.The sample size was set at 100 after considering a confidence interval of 95% and relative allowable error of 5% and the initial 100 cases which fulfilled the inclusion criteria during the study period were included.

The inclusion criteria were, patients presenting with RIF pain in the casuality who subsequently underwent appendicectomy in the same admission. The exclusion criteria include patients who were admitted under other specialties, elective appendicectomy, pregnant women, patient who underwent previous appendicectomy, those who were not willing for the study, and those patients who were referred/transferred to other hospitals. An informed written consent was taken from those who are willing to enroll in the study. Patients who qualified the inclusion criteria, presenting to the Department of General Surgery, JMMC & RI were recruited in this study. Relevant history including age, sex, RIF pain, migration of Right lower quadrant pain, Anorexia, nausea and vomiting and duration of symptom was taken. Relevant examination findings including RIF tenderness, RIF guarding, rebound tenderness, Rovsing's sign and fever were noted. Relevant lab investigations including Total WBC count and Urine routine also done. RIPASA and Alvarado scores were applied to each of the patients (Table 1,2).

Table 1: Various parameters included in Alvarado Score and the score allotted for each parameter.

Variables	Clinical features	Score
Symptoms	Migratory RIF pain	1
	Anorexia	1
	Nausea and vomiting	1
Signs	Tenderness (RIF)	2
	Rebound tenderness	1
	Elevated temperature	1
Laboratory	Leucocytosis	2
	Shift to left	1
Total		10

Operative notes and histopathology reports were reviewed and correlated with both the scores. All patients were given prompt care and treatment. Patients were closely followed up till the time of discharge or demise.

Table 2: Various parameters included in RIPASA Score and the score allotted for each parameter.

RIPASA score	
Male	1.0
Female	0.5
Age <39.9 years	1.0
Age >40 years	0.5
Right iliac fossa pain	0.5
Migration of right lower quadrant pain	0.5
Anorexia	1.0
Nausea and Vomiting	1.0
Duration of symptoms <48 hours	1.0
Duration of symptoms >48 hours	0.5
Right iliac fossa tenderness	1.0
Right iliac fossa guarding	1.0
Rebound tenderness	1.0
Rovsing's sign	2.0
Fever	1.0
Raised white cell count	1.0
Negative urine analysis	1.0

The statistical analysis was done by using statistical software SPSS version 20. Sociodemographic characteristics of the study subjects were described in

terms of frequencies and percentages for categorical variables. Diagnostic test validation methods like accuracy, sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) were implemented. Statistical significance was obtained using the McNemar Test. For all statistical tests, p value of <0.05 was considered significant.

RESULTS

Among the patients with RIF tenderness, who had undergone appendicectomy during the course of the study, majority were males. Data was collected at the time of admission, and patients were closely followed up until the time of discharge. Most of the patients were <40 years of Age (72%). Acute Appendicitis is relatively uncommon in old age as shown by the study data. Most of the patients were males (64%). The male: female ratio was found to be 1.7:1.

The ALVARADO score positive, that is ≥7 was obtained in 53(64.6%) patients among the 82 patients whose histopathology (HPE) report came out to be positive for acute appendicitis. The rest 29(35.4%), whose HPE were positive showed negative Alvarado score. Similarly, among the 18 HPE report negative patients, 4(22.2%) of them showed positive Alvarado score and 14(77.8%) showed negative Alvarado score. The P value of <0.001 obtained by McNemar test shows that a positive Alvarado score does not correlate directly with the positive HPE report obtained. The Kappa value came to be 0.275, which shows fair agreement between Alvarado score and HPE (Table 3).

Table 3: Comparison of Alvarado Score and Histopathology (HPE) report.

Alvarado	Histopathology				P value (Mcnemar test)
	Positive		Negative		
	N=82	%	N=18	%	
Score ≥7	53	64.6	4	22.2	<0.001
Score <7	29	35.4	14	77.8	

The RIPASA score positive, that is ≥7.5 was obtained in 78(95.1%) patients among the 82 patients whose HPE report came out to be positive for acute appendicitis. The rest 4 (4.9%), whose HPE were positive showed negative RIPASA score.

Table 4: Comparison of RIPASA Score and Histopathology (HPE) report.

Ripasa	Histopathology				P value (Mcnemar test)
	Positive		Negative		
	N=82	%	N=18	%	
Score ≥7.5	78	95.1	6	33.3	0.754
Score <7.5	4	4.9	12	66.7	

Similarly, among the 18 HPE report negative patients, 6 (33.3%) of them showed positive RIPASA score and 12 (66.7%) showed negative RIPASA score. The P value of 0.754 obtained by McNemar test shows that a positive RIPASA score correlate directly with the positive HPE report obtained. The Kappa value came to be 0.646, which shows fair agreement between RIPASA score and HPE (Table 4).

The present study showed a sensitivity of 64.6% and 95.1% for Alvarado score and RIPASA score respectively. The specificity obtained was 77.7% and 66.6% for Alvarado score and RIPASA score respectively. The PPV of Alvarado score and RIPASA score in the present study were 92.9% and 92.8% and the NPV of Alvarado score and RIPASA score were 32.5% and 75.0%. The diagnostic accuracy of Alvarado score was 67.0% and that of RIPASA score was 90.0% in the present study (Table 5).

Table 5: Comparison of Sensitivity, Specificity, PPV, NPV and Diagnostic accuracy of Alvarado score and RIPASA score.

	Alvarado	RIPASA
Sensitivity	64.6%	95.1%
Specificity	77.7%	66.6%
Positive predictive value	92.9%	92.8%
Negative predictive value	32.5%	75.0%
Diagnostic accuracy	67%	90%

DISCUSSION

Acute appendicitis is one of the most common surgical emergencies encountered especially by junior doctors during on call duties with emergency appendicectomy making up 10% of all emergency abdominal surgeries.[8] Acute appendicitis can lead to complications such as perforation, peri-appendicial abscess, peritonitis, and rarely death.[9,10] Most of newer tests have cost implications, require expertise, and may not be available in majority of institutions.[11]

Complications such as wound infection, ileus, urinary retention ,abscess formation and readmission are not any lower when removing a normal as opposed to an inflamed appendix.[12] CT scans are contraindicated in certain conditions like pregnancy, renal failure and contrast allergy. Routine practice of CT imaging may lead to early diagnosis of low-grade appendicitis and unnecessary surgical approaches (appendectomy), which would otherwise be resolved spontaneously by non-operative techniques, that is antibiotic therapy.[13]

Following our study in the population of patients with appendicitis in and around Thrissur, it follows that RIPASA score can better diagnose patients with acute appendicitis compared to Alvarado score. The sensitivity of RIPASA score was 95.1% compared to 64.6% of Alvarado score. The NPV of RIPASA score was 75.0% compared to 32.5% of Alvarado score. The PPV was almost equal for both the scoring systems, 92.8% for

RIPASA and 92.9% for Alvarado. The Diagnostic accuracy of RIPASA was 90% when compared to 67% of Alvarado.

In case of specificity, that is the ability to identify cases without appendicitis, Alvarado score [77.7%] was better than RIPASA score [66.6%] in our setup. Similarly, negative appendicectomy rate was lower when Alvarado score was used. Alvarado score has a negative appendectomy rate of 7.02 while it is 7.14 for RIPASA score. Alvarado score has a low sensitivity in diagnosing acute appendicitis. But, it is more accurate in determining whether the patient has no appendicitis due to its high specificity. The accuracy is higher with RIPASA when compared with Alvarado scoring system.

This confirms that RIPASA score is better than Alvarado score for the diagnosis of acute appendicitis in our particular setting. With a RIPASA score more than 7.5, the surgeon can make a quick decision whether to operate or not. This report is in concordance with similar studies conducted by Chong et al, Ismail et al., and Nanjundaiah et al.[13-15]

The limitation of our study includes factors such as a low sample size of 100. The reference values of inflammatory laboratory variables and possible differential diagnoses depend on the patient's age, sex and the delay in presentation to hospital and this discrepancy can possibly impair the diagnostic accuracy of such scoring systems. Those patients who presented with RIF pain and suspected acute appendicitis but were later managed conservatively were not studied to validate the scoring systems.

CONCLUSION

The study showed that both Alvarado and RIPASA scores are good scoring systems for diagnosing acute appendicitis. On comparing both, RIPASA score is a better diagnostic scoring system for diagnosing acute appendicitis than Alvarado, with the former achieving significantly higher sensitivity and diagnostic accuracy, particularly in Indian population. Since the RIPASA score obtained a very good sensitivity and diagnostic accuracy for diagnosing acute appendicitis, its use in patients with suspected appendicitis may avoid unwanted admissions and imaging studies.

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