COMPARATIVE STUDY ON THE DIAGNOSTIC ACCURACY OF THE RIPASA SCORE OVER ALVARADO SCORE IN THE DIAGNOSIS OF ACUTE APPENDICITIS

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ABSTRACT

BACKGROUND

Comparing the diagnostic accuracy of RIPASA score over Alvarado score in diagnosing acute appendicitis. The accuracy of Alvarado score in the diagnosis of acute appendicitis is disappointingly low in Asian population and RIPASA scoring has been designed for the diagnosis of acute appendicitis in the Asian population.

MATERIALS AND METHODS

A cross-sectional study of 109 patients diagnosed to have acute appendicitis with the aim of comparing RIPASA and Alvarado scoring. A score of 7.5 is the optimal cut off threshold for RIPASA and 7 for Alvarado scoring system. Sensitivity, specificity, positive predictive value and negative predictive for RIPASA and Alvarado system were done.

RESULTS

The sensitivity and specificity of RIPASA score were 95.5% and 65%, respectively. The sensitivity and specificity of Alvarado score were 65.16% and 90%, respectively. The positive predictive value of RIPASA was 92.39% and negative predictive value 76.47%. The positive predictive value for Alvarado was 96.6% and negative predictive value was 36.73%. RIPASA score correctly classified 89.9% of all patients confirmed with histological acute appendicitis to the high probability group (RIPASA score greater than 7.5) compared with 69.73% with Alvarado score (Alvarado score greater than 7.0; p-value is 0.002).

CONCLUSION

RIPASA scoring system is more convenient, accurate and specific scoring system for Indian population than Alvarado scoring system.

KEYWORDS

Alvarado, Acute Appendicitis, RIPASA.

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INTRODUCTION: Appendicitis is one of the commonest cause for abdominal pain. Diagnosing appendicitis purely based on the clinical acumen, i.e. 'clinical judgment' leads to a negative appendicectomy rate of 17-36%.[1,2] In addition to the clinical judgment, when the Alvarado scoring system is used, the negative appendicectomy rate has fallen to <8%.[3,4] Several scoring systems have been developed to increase the diagnostic accuracy of the appendicitis, of these, the Alvarado scoring system has been the most popular. This popular system has been developed for the western population and several studies had pointed out its inadequacy in the South East Asian scenario.[5]

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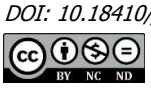


A new scoring system, Raja Isteri Pengiran Anak Saleha Appendicitis (RIPASA) score has been developed to aid in the diagnosis of acute appendicitis in the Asian countries. The study has been found to be having more sensitivity, specificity and predictive value compared to that of Alvarado scoring system. This study aims to validate and to compare the diagnostic accuracy of this particular scoring system to an accepted scoring system in our setup.

MATERIAL AND METHODS: The study is conducted at Dr. SMCSI Medical College, Karakonam, Kerala, as a part of the PG curriculum. Ethical clearance was obtained as per the institutional norms. A cross-sectional study design was employed. The study population included all the patients attending SMCSI Medical College with right iliac fossa pain, vomiting and fever was clinically examined those with a suspected clinical diagnosis of appendicitis and posted for appendicectomy between August 2013 to 31st July, 2016. Patients of age below 12 years and with complications of

appendicitis [perforated appendix, appendicular mass and malignancy, elective appendicectomy were excluded.

Decision to operate was usually made by general surgical teams who are not members of the research team and their decision is based on clinical judgment. Once appendicectomy is decided, history taken, physical examination performed and the laboratory results reviewed, both RIPASA and Alvarado scoring performed.

Preoperative and histopathological findings were followed from the records. Preoperative findings considered positive for appendicitis were limited to the terms: normal, early appendicitis, inflamed appendix, suppurative appendicitis, perforated appendix, gangrenous appendix and appendicular mass. Histopathological finding consistent with diagnosis of appendicitis is inflamed appendix.

A total of 109 patients qualified for the study during the study period. Patients were within the age group 13-65 years. All the 109 patients were scored as per Alvarado and RIPASA scoring system. Alvarado score contained 8 parameters whereas RIPASA score contained 14 parameters {Table 1/Table 2}.

Alvarado (MANTRELS) Score		**Score**
Symptoms	Migratory RIF pain	1
	Anorexia	1
	Nausea and Vomiting	1
Signs	Tenderness RIF	2
	Rebound	1
	Tenderness Elevated Temperature	1
Laboratory Investigations	Leucocytosis	2
	Shift to left	1
	Total	10

Table 1: Alvarado Score

RIPASA Score		
1	Male	1.0
	Female	0.5
2	Age <39.9 years	1.0
	Age >40 years	0.5
3	Right iliac fossa pain	0.5
4	Migration of right lower quadrant pain	0.5
5	Anorexia	1.0
6	Nausea and vomiting	1.0
7	Duration of symptoms <48 hours	1.0
	Duration of symptoms >48 hours	0.5
8	Right iliac fossa tenderness	1.0
9	Right iliac fossa guarding	2.0
10	Rebound tenderness	1.0
11	Rovsing's sign	2.0
12	Fever	1.0
13	Raised white cell count	1.0
14	Negative urine analysis	1.0

Table 2: RIPASA Scoring System

RESULTS: The study is a cross-sectional study done to find the diagnostic accuracy of RIPASA scoring and Alvarado scoring for appendicitis in the population in and around Dr. SMCSI Medical College, Karakonam. The study was done in 109 patients diagnosed by surgeons as acute appendicitis and was planned for surgery.

Appendicitis is more common in less than 40 years of age. The mean age group of the study population was 28 years. In the age group more than 40 years, there is high chance of negative appendectomy. The majority of the patients are females [62.9%] and false negative results are also high among the female patients [75%].

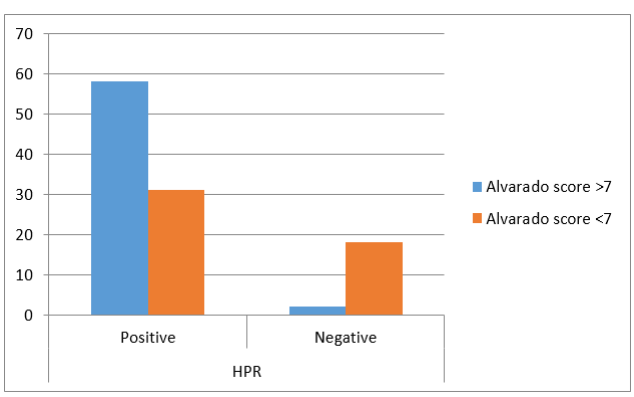
Histopathologically negative appendicitis was seen more among patients [95%] who had symptoms lasting more than 48 hours. While among the 39 patients with symptoms less than 48 hours, 38 of them had a histologically confirmed appendicitis.

Of the total 109 patients, 89 were histopathologically positive for appendicitis. On Alvarado scoring for 109 patients, 60 patients had score more than 7 and above, 30 had score between 5 and 6, 19 had a score of 4 and below. Of the 60 with score above 7, 58 had histopathologically proven appendicitis.

According to RIPASA scoring only 28 patients was definitive of acute appendicitis [score >12], 64 came under the high probability group, i.e. high probability of acute appendicitis [score 7.5-11.5], rest 17 had a score below 7.5 and below. Of the 92 patients with RIPASA score above 7.5, 85 (92.39%) were histopathologically confirmed to have acute appendicitis while only 4 out of the total 17 patients with score <7.5 had appendicitis.

		HPR		**Total**
		Positive	**Negative**	
Alvarado score	>7	58	2	60
	<7	31	18	49
Total		**89**	**20**	**109**

Table 3: Association between Alvarado Score and HPR



Alvarado Score Results

		Appendicitis (HPR)		**Total**
		Positive	**Negative**	
RIPASA score	>7.5	85	7	92
	<7.5	4	13	17
Total		**89**	**20**	**109**

Table 4: Association between RIPASA Score and HPR

	RIPASA		Alvarado		P value
Sensitivity	85/89	95.51	58/89	65.16	<.001
Specificity	13/20	65	18/20	90	0.059
PPV	85/92	92.39	58/60	96.67	0.28
NPV	13/17	76.47	18/49	36.73	0.0046
Diagnostic accuracy	98/109	89.9	76/109	69.73	0.002
Negative appendicectomy rate	7/92	7.61	2/60	3.33	0.276
Diagnostic odds ratio	85*13/ (7* 4)	39.46	58*18/ (2* 31)	16.84	

Table 5: Comparison between RIPASA and Alvarado Score

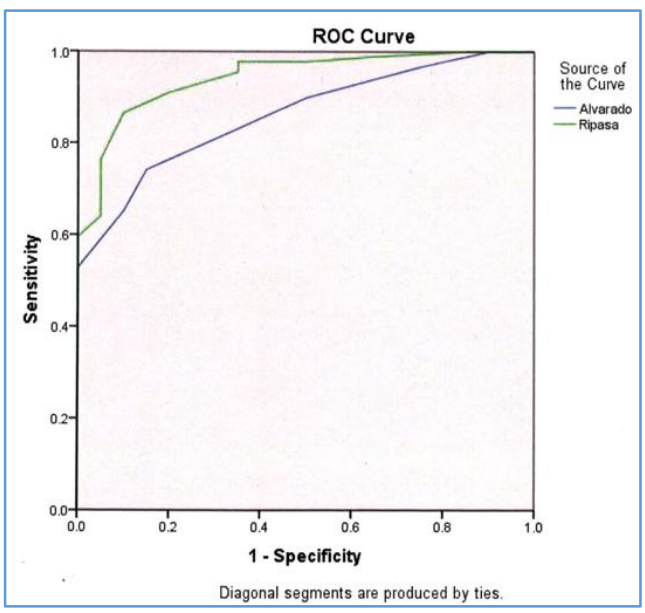


Figure 1: ROC Curve

Test Result Variable(s)	Area	Std. Error 3	P	Asymptotic 95% Confidence Interval	
				Lower Bound	Upper Bound
Alvarado	0.862	0.037	<0.001	0.789	0.934
RIPASA	0.943	0.024	<0.001	0.896	0.991

Table 6: Area Under the Curve

Using ROC, the area under the curve for RIPASA score is 0.943, which is greater than that for Alvarado score, which is 0.862. The difference in the area under the curves is 0.13, which is significant between two scoring systems.

DISCUSSION: The presentation of acute appendicitis is not always classical and when there is some degree of doubt, an early intervention will prevent inadvertent complications, but will drive up the negative appendectomy rate. While newer investigative test, although helpful, will have cost implication, require expertise and may not be available round the clock in a healthcare facility other than the tertiary centre. Routine practice of CT imaging may lead to early diagnosis of low-grade appendicitis and unnecessary appendicectomies, which would otherwise be resolved spontaneously by antibiotic therapy.[6]

For this purpose, many scoring system has been brought up. These include Alvarado, Samuel, Ohmann, Eskelinen, Fanyo, Lindberg, Logistic score of Kharbanda et al. Of these, Alvarado score is the most commonly used and accepted because of high sensitivity and specificity in the western population.[7]

In 2010, RIP AS developed the RIPASA scoring system by adding few other demographic variables, symptoms, signs and laboratory results.[8]

There was a preponderance of patients in the age group less than 40 years (76.1%). Most of the patients [65.1%] in this study were females.

In this study, Alvarado scoring system had a sensitivity and specificity of 65.17% and 90.0% for the diagnosis of acute appendicitis [p=0.059].

The Alvarado score has a better specificity in this study when compared to that of Chong et al[9] and Ismail et al.[10] The sensitivity is low compared to that of Ismail et al,[10] but similar to that of Chong et al and Nanjundaiah et al.[11]

The positive predictive value of Alvarado score for the diagnosis of appendicitis was 96.67% and negative predictive value was 36.73%, which was comparable to the results in the study by Ismail et al.[10]

RIPASA score in this study had a sensitivity of 95.51% and a specificity of 65.0%. The sensitivity obtained in our study is comparable to the results obtained by Chong et al,[9] Nanjundaiah et al[11] and Ismail et al.[10] While the specificity is similar to that of Ismail et al,[10] while it is lower than that of Chong et al[9] and Nanjundaiah et al.[11]

The diagnostic accuracy for the Alvarado score is 69.73% whereas the diagnostic accuracy for RIPASA score is 89.9%, while in other studies conducted elsewhere, the accuracy was higher.[9,10]

Following our study in the population of patients with appendicitis in and around Karakonam, it follows that RIPASA score can better diagnose patients with acute appendicitis compared to Alvarado score. The sensitivity of RIPASA score was 95.51% compared to 65.16% of Alvarado score. That means RIPASA identified 27 more people with acute appendicitis than Alvarado score.

Positive predictive value was higher for Alvarado score [96.67%] compared to that of RIPASA score [92.39%]. While the negative predictive value was higher for RIPASA score [76.47%] compared to that of Alvarado score [36.73%].

In case of specificity, i.e. ability to identify cases without appendicitis, Alvarado score [90.0%] was better than RIPASA score [65.0%] in our setup.

Similarly, negative appendicectomy rate was lower when Alvarado score was used. Alvarado score has a negative appendectomy rate of 3.33 while it is 7.61 for RIPASA score.

Overall, the diagnostic accuracy was more with RIPASA score [89.9%] rather than with Alvarado score [69.73%].

So, it follows that Alvarado score has a low sensitivity in diagnosing appendicitis. But, it's better able to say that the patient has no appendicitis considering its high specificity. While the accuracy is higher with RIPASA scoring rather than with Alvarado scoring.

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 to operate while those with a score less than 7.5 can be managed conservatively. Unnecessary and expensive investigations can be avoided by using RIPASA score.

CONCLUSION: After doing study on 109 patients who are provisionally diagnosed with acute appendicitis, the RIPASA score can be considered as a diagnostic scoring system for acute appendicitis in the Indian population. RIPASA scoring system achieved a significantly higher sensitivity and diagnostic accuracy compared to that of the Alvarado score in this study. The new scoring system utilises demographic factors, clinical symptoms, signs and a few laboratory values. The 14 clinical parameters can be derived from a good clinical history and simple laboratory tests without any delay. The scoring can be quickly done and a decision to operate or not can be taken up based on this score.

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