Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/bthdcn09

THE CORRELATION OF ALVARADO AND RIPASA SCORING SYSTEMS WITH RADIOLOGICAL, INTRAOPERATIVE AND HISTOPATHOLOGICAL FINDINGS

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Abstract:
The Alvarado score has been criticized for using the sum of the true-positive rate and true-negative rate to determine the diagnostic weight of each score item. Since Alvarado defined accuracy as the weighted average of the sensitivity and specificity using weights determined by the prevalence of appendicitis, it is problematic when the sensitivity and specificity of a score item are not equal, as the diagnostic weight is directly proportional to disease prevalence. All cases satisfying the inclusion criteria were chosen and informed consent was taken from the patients. Data was collected with the help of a proforma containing following details age, gender ,mode of presentation of illness, details of clinical examination, and results of relevant investigations. On comparison of RIPASA score with Operative finding it was found that the comparison between the two is statistically significant in diagnosing acute appendicitis. On comparison of RIPASA score with Histopathological finding it was found that the comparison between the two is statistically significant in diagnosing acute appendicitis. On comparison of Alvarado score with operative finding it was found that the comparison between the two is statistically insignificant.

Keywords: Alvarado And Ripasa Scoring Systems ,H Radiological, Intraoperative And Histopathological Findings

Introduction:

Acute appendicitis is one of the most common causes of an abdominal emergency and accounts for approximately 1% of all surgical operations. Although rare in infants, appendicitis becomes increasingly common throughout childhood and reaches its maximal incidence between the ages of 10 and 30 years. After 30 years of age, the incidence declines, but appendicitis can occur in individuals of any age.[1]

The lifetime rate of appendicectomy is 12% for men and 25% for women, with approximately

seven percent of all people undergoing appendicectomy for acute appendicitis during their lifetime. Over the 10-year period from 1987 to 1997, the overall appendicectomy rate decreased in parallel with a decrease in incidental appendicectomy.[2] However, the rate of appendicectomy for appendicitis has remained constant at 10 per 10,000 patients per year. Despite the increased use of ultrasonography, computed tomography (CT) and laparoscopy, the rate of misdiagnosis of appendicitis has remained constant (15.3%) and the rate of appendicular rupture. Thepercentage of misdiagnosed cases of appendicitis is significantly higher among womenthan among men (22.2 vs. 9.3%). The negative appendicectomy rate for women of reproductive age is 23.2%, with the highest rates in women aged 40 to 49 years. The highest negative appendicectomy rate is reported for women >80 years of age[3]

The Alvarado score has been criticized for using the sum of the true-positive rate and true-negative rate to determine the diagnostic weight of each score item. Since Alvarado defined accuracy as the weighted average of the sensitivity and specificity using weights determined by the prevalence of appendicitis, it is problematic when the sensitivity and specificity of a score item are not equal, as the diagnostic weight is directly proportional to disease prevalence. In populations with high disease prevalence, items with high sensitivity are disproportionately rewarded with high diagnostic weights while in populations with low disease prevalence, items with high specificity receive higher diagnostic weights.[4] Peter and Hedges advocate that the likelihood ratio would be a better discriminator between those with and without disease and a clinical score using this method might be more generalizable to other populations. To the best of our knowledge, this proposal for an alternative methodology did not receive any further comments by other investigators and a score based on likelihood ratios was never formally created or validated. Despite this and other methodologic criticisms and the mixed results in the validation studies, the Alvarado score is the most widely used score in clinical practice.[5]

Alvarado A et al (1986) described practical scoring system which includes localized tenderness in right lower quadrant, leukocytosis, migration of pain, shift to the left, temperature elevation, nausea, vomiting, anorexia, and direct rebound pain the score helped in interpret ting the confusing picture of acute appendicitis.
The components of original RIPASA score are patients' demographics (age and gender), symptoms (RIF pain, the migration of pain to the RIF, nausea and vomiting, anorexia, and the duration of symptoms), clinical signs (RIF tenderness, guarding, rebound tenderness, Rovsing's sign, and fever), and laboratory investigations (elevated white cell count and negative urinalysis) RIPAS Hospital.
The probability of each of the 14 parameters was calculated and scores of 0.5, 1.0, or 2.0 points were allocated to each parameter based on its probability in patients with acute appendicitis.[6]

Methodology:
Source of Data: A total of 100 patients admitted with a provisional diagnosis of acute appendicitis in the surgical department were included in the study. They were then assessed using the Alvarado and RIPASA scoring systems. Additionally, a preoperative ultrasound of the abdomen was done. The decision for surgery was made independent of the score or the ultrasound findings but was based on the surgeon’s decision. The results of the scoring system was compared with the patient’s intra operative and histopathology findings.

Criteria for acute appendicitis by ultra sound
Sonographically, appendicitis is suggested by the presence of pain on graded compression of the area in which abnormal appendix was seen as a tubular, blind ending, aperistalitic bowel loop which is non compressible with a diameter of 6 mm or greater in antero posterior direction. The presence of a fecolith or prominence of peri appendicular fat was an indirect sign. Ultra sonography was

considered negative when the appendix could not be found or was normal, or if no appendicular pathology was discovered.

Criteria for diagnosis of acute appendicitis by histopathology:
The histological criterion for the diagnosis of acute appendicitis is the presence of polymorphous leucocytic infiltration in to the muscularis mucosa.

Study design **:**Prospective
Sample size **:**100

Sample design **:**purposive sampling

Study place **:** Department of General Surgery
Method of collection of Data
All cases satisfying the inclusion criteria were chosen and informed consent was taken from the patients.
Data was collected with the help of a proforma containing following details age, gender ,mode of presentation of illness, details of clinical examination, and results of relevant investigations.

Inclusion criteria
All patient presenting with acute right iliac fossa pain

Exclusion criteria
Patient managed conservatively
patient who underwent interval appendicectomy
patient with right iliac fossa mass
Patients presenting with urological, gynecological and surgical problems other than appendicitis

Results:

Table: 1 Comparison of ALVARADO score and Radiological findings

	RADIOLOGICAL FINDING			
	Normal		Appendicitis	
	N	%	N	%
Alvarado score Unlikely (<5)	1	8.3%	23	26.1%
Possible Ac Appendicitis (5- 6)	8	66.7%	28	31.8%
Probably Ac Appendicitis (>7)	3	25.0%	37	42.0%
The chi square statistic is 5.724 and p value is 0.057				

On comparison of Alvarado score with radiological finding it was found that the comparison between the two is statistically insignificant

Table: 2 Comparison of ALVARADO score and operative findings

	OPERATIVE FINDING			
	Normal		Appendicitis	
	N	%	N	%
Alvarado score Unlikely (<5)	1	10.0%	23	25.6%
Possible Ac Appendicitis (5- 6)				

Probably Ac Appendicitis (>7)	6	60.0%	30	33.3%
	3	30.0%	37	41.1%
The chisquare statistic is 2.963 and p value is 0.227				

On comparison of Alvarado score with operative finding it was found that the comparison between the two is statistically insignificant

Table: 3 Comparison of ALVARADO score and Histopathology findings

	HPE FINDING			
	Normal		Appendicitis	
	N	%	N	%
Alvarado scoreUnlikely (<5)	2	15.4%	22	25.3%
Possible Ac Appendicitis (5- 6)	7	53.8%	29	33.3%
Probably Ac Appendicitis (>7)	4	30.8%	36	41.4%
The chisquare statistic is 2.102 and p value is 0.350				

On comparison of Alvarado score with Histopathological finding it was found that the comparison between the two is statistically insignificant

Table: 4 Comparison of RIPASA score and Radiological findings

	RADIOLOGICAL FINDING			
	Normal		Appendicitis	
	N	%	N	%
RIPASA score Low Probability (5-7)	7	58.3%	12	13.6%
High probability (7.5-11)	4	33.3%	42	47.7%
Definite (>12)	1	8.3%	34	38.6%
The chisquare statistic is 14.350 and p value is 0.001				

On comparison of RIPASA score with radiological finding it was found that the comparison between the two is statistically significant in diagnosing acute appendicitis.

Table 5 Comparison of RIPASA score and operative findings

	OPERATIVE FINDING			
	Normal		Appendicitis	
	N	%	N	%
RIPASA score Low Probability (5-7)	6	60.0%	13	14.4%
High probability (7.5-11)	4	40.0%	42	46.7%
Definite (>12)	0	0.0%	35	38.9%
The chisquare statistic is 13.806 and p value is 0.001				

On comparison of RIPASA score with Operative finding it was found that the comparison between the two is statistically significant in diagnosing acute appendicitis.

Table; 6 Comparison of RIPASA score andHistopathology findings

	HPE FINDING			
	Normal		Appendicitis	
	N	%	N	%
RIPASA score Low Probability (5-7)	9	69.2%	10	11.5%
High probability (7.5-11)	4	30.8%	42	48.3%
Definite (>12)	0	0.0%	35	40.2%
The chisquare statistic is 25.857 and p value is <0.001				

On comparison of RIPASA score with Histopathological finding it was found that the comparison between the two is statistically significant in diagnosing acute appendicitis.

Table: 7 Comparison of Alvarado and Histopathological findings

	HPE FINDING			
	Normal		Appendicitis	
	N	%	N	%
Alvarado score (>7) <7	9	69.2%	51	58.6%
>7	4	30.8%	36	41.4%

Table: 8 Comparison of RIPASA and Histopathological findings

	HPE FINDING			
	Normal		Appendicitis	
	N	%	N	%
RIPASA score (>7.5) <7.5	9	69.2%	10	11.5%
>7.5	4	30.8%	77	88.5%

Discussion:

In a prospective study by Chong CF et al, the sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of the RIPASA score were 98%, 81.3%, 85.3%, 97.4% and 91.8% respectively when compared to Alvarado score with sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of 68.3%, 87.9%, 86.3%, 71.4% and 86.5% respectively.[7]

The authors of the RIPASA scoring system have claimed in this comparative prospective study that RIPASA score is better than Alvarado score in Asian settings. There is paucity of published studies, by other authors, comparing these scoring systems.[8]

In a study by Regar MK et al., Intraoperative findings such as length of appendix, presence of free fluid, presence of gangrene, presence of fecolith and base of appendix were assessed in all patients of acute appendicitis. Increase in length of appendix was found statistically significant for the groups with Alvarado score ≥7 and RIPASA score ≥7.5 (p-value < 0.05). Other findings were statistically not significant when analyzed with both the systems at their respective cut off score.[9]

In the various studies, diagnostic parameters for RIPASA and Alvarado scores were calculated according to different cut-offs. Most of the studies used 7.0 and 7.5 as conventional cut-offs for Alvarado and RIPASA scores, respectively. Accordingly, patients were considered as affected by AA if their scores exceeded these cut-off values. However, Korkut et al. and Ozdemir et al. used the value of 8 for the Alvarado, and the values of 10 or 12 for the RIPASA, respectively. Reasons of

using different cut-offs may be explained by the aim to improve the diagnostic parameters of the scores. For all the studies considered, the gold standard is given by thehistopathological exam performed post-surgery.[10,11]

Bond et al prospectively studied 187 patients with suspected appendicitis and found Alvarado score to have a sensitivity and specificity of 90% and 72% respectively.[12]
Hsiao et al conducted a retrospective study and found sensitivity and specificity for an Alvarado Score ≥7 were 60% and 61% respectively.[13]

Owen et al prospectively evaluated 215 patients and found the sensitivity and specificity of Alvarado scoring were 93% and 81%.[14] Shreef et al recently in 2010, performed a dual-centre prospective study, reviewing 350 patients and found the sensitivity and specificity of Alvarado scoring were 86% and 83% respectively.[15]
During development of RIPASA by Chong et al, was found to have a sensitivity and specificity of 88% and 67% respectively. But few studies have been done consecutively, showing better results.[7]
Butt MQ et al conducted a cross sectional study on 267 patients and found RIPASA score to have a sensitivity and specificity of 96.7% and 93% respectively. Its Positive predictive value was 98% and negative predictive value was 95%. Hence, they concluded that RIPASA was a useful tool in diagnosis of appendicitis.[16]
., Mohammed et al compared RIPASA and Alvarado and found RIPASA to be a more convenient,accurate and specific score with the resulting comparative values of RIPASA and Alvarado as follows- Sensitivity – 96% and 58% respectively, Specificity – 90% and 85% respectively.[17]
Erdem et al studied 113 patients in a tertiary care centre and compared four clinical scoring systems- Alvarado, Eskelinen, Ohmann and RIPASA. They found a sensitivity level of 81%, 80.5%, 83.1% and 83% for each respectively. They concluded that Ohmann and RIPASA scores were the most specific in diagnosis of acute appendicitis.[18]
Although studies show that CT scanning has maximum sensitivity and specificity in diagnosis of acute appendicitis, this has not been very widely in use, at least in a developing country like India. This is due to multiple factorsnot only universal factors like risk of radiation exposure, but also other economic and practical causes like cost and availability.
Hence some studies were done to try and find out which group of patients benefitted from CT scan, to try and filter the available resources. Tan WJ et al prospectively compared Alvarado and CT scan, and found that CT scan was mainly beneficial in patients with Alvarado score
The RIPASA score is a useful tool for diagnosis of acute appendicitis, as it contains simple parameters that include Clinical history, examination and two simple blood investigations. Thus, the operating surgeon can make a quick decision upon seeing patients with right iliac fossa pain, by RIPASA scoring system with a score > 7.5 to be operated, while patients with a RIPASA score < 7.0 can either be observed in the unit's day ward or discharged with an early clinic review appointment. Unnecessary and expensive radiological investigations can be avoided by using RIPASA score and thus reducing health care expenditure.

Conclusion:
The RIPASA score is currently a better diagnostic scoring system for acute appendicitis compared to the Alvarado score, with the former achieving significantly higher sensitivity and diagnostic accuracy, particularly in Indian population. We can get information of 17 fixed parameters of the RIPASA score by taking a complete history, and conducting clinical examination and investigations. Unwanted admissions and expensive imaging studies can also be avoided by using RIPASA score.

There is paucity of studies that compare intraoperative and histopathological findings with both scoring systems and needs to be evaluated further by prospective studies.

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