ISSN: 0975-3583,0976-2833 VOL16, ISSUE 04, 2025

COMPARATIVE STUDY OF RIPASA AND ALVARADO SCORE IN CORELATION WITH RADIOLOGICAL AND HISTOPATHOLOGICAL FOR DIAGNOSIS OF ACUTE APPENDICITIS

[1]Dr SAIYAD JAMEER BHASHA T, [2]Dr BASAVARAJ YENAGI, [3]Dr RAKSHITH M S

[1]Associate Professor , Department of General Surgery , Chitradurga Medical College & Research Institute- CMCRI, Chitradurga, Karnataka, India.

[2]Assistant Professor, Department of General Surgery, Gadag Institute of Medical Sciences, Gadag, Karnataka, India.

[3]Post Graduate Student, Department of General Surgery, Gadag Institute of Medical Sciences, Gadag, Karnataka, India.

Corresponding Author: [1]Dr Saiyad Jameer Bhasha T

ABSTRACT

Background:

Acute appendicitis is one of the most common surgical emergencies. Timely diagnosis is essential to prevent complications. While the Alvarado score is widely used, the RIPASA score was developed for Asian populations and may offer improved diagnostic accuracy.

Aim:

To compare the diagnostic accuracy of RIPASA and Alvarado scoring systems and correlate them with radiological and histopathological findings in patients with suspected acute appendicitis.

Materials and Methods:

This prospective observational study was conducted on 100 patients presenting with clinical suspicion of acute appendicitis. RIPASA and Alvarado scores were calculated at admission. Radiological imaging (ultrasound/CECT) was done as required, and all patients underwent appendectomy. Histopathological examination (HPE) of the specimen was considered the gold standard. Sensitivity, specificity, predictive values, diagnostic accuracy, and ROC analysis were performed.

Results:

RIPASA score showed a sensitivity of 93.1%, specificity of 89.3%, and diagnostic accuracy of 92%, significantly outperforming the Alvarado score, which had a sensitivity of 70.2%, specificity of 76.9%, and accuracy of 72%. RIPASA score also demonstrated stronger

ISSN: 0975-3583,0976-2833 VOL16, ISSUE 04, 2025

correlation with radiological findings ($p < 0.001$) and a higher AUC (0.92) on ROC analysis compared to Alvarado (AUC = 0.76).

Conclusion:

The RIPASA score is a more accurate and reliable diagnostic tool for acute appendicitis in the Indian population compared to the Alvarado score. Its use can aid in early diagnosis and reduce negative appendectomy rates, particularly in resource-limited settings.

Keywords: RIPASA score, Alvarado score, Acute appendicitis, Histopathology, Radiology, Diagnostic accuracy.

INTRODUCTION

Acute appendicitis is one of the most common causes of acute abdominal pain requiring surgical intervention. The lifetime risk of developing appendicitis is approximately 7–8%, with a peak incidence in the second and third decades of life [1]. Despite its prevalence, diagnosing acute appendicitis remains challenging due to its variable clinical presentation, particularly in children, women, and elderly patients [2].Traditionally, diagnosis has been based on a combination of clinical evaluation, laboratory parameters, and imaging studies. The Alvarado score, developed in 1986, is a widely used clinical scoring system that combines symptoms, signs, and laboratory findings to stratify the risk of appendicitis [3]. However, its effectiveness has been questioned in Asian populations due to variable sensitivity and specificity, especially in female and elderly patients [4].

In response to this limitation, the RIPASA (Raja Isteri Pengiran Anak Saleha Appendicitis) score was developed in Brunei in 2008, specifically for use in Asian populations. It incorporates additional parameters such as age, gender, and urinalysis findings, which are not part of the Alvarado score [5]. Studies have shown that the RIPASA score has higher sensitivity and diagnostic accuracy in Asian and Middle Eastern populations compared to the Alvarado score [6].

Radiological imaging, including ultrasonography and computed tomography (CT), plays a crucial role in confirming appendicitis, particularly in cases where clinical scores yield inconclusive results. Histopathological examination remains the gold standard for definitive diagnosis, providing insights into the severity of inflammation and potential complications such as perforation. Comparative studies have demonstrated that integrating radiological and

ISSN: 0975-3583,0976-2833 VOL16, ISSUE 04, 2025

histopathological findings with scoring systems enhances diagnostic precision and reduces negative appendectomy rates. Furthermore, histopathological examination (HPE) remains the gold standard for definitive diagnosis [7].

The present study aims to evaluate and compare the diagnostic accuracy of the Alvarado and RIPASA scores with respect to radiological findings and histopathological confirmation, thereby providing valuable insights into the most suitable clinical tool for early and accurate diagnosis in our population.

Objectives

1. To compare the diagnostic accuracy of the RIPASA and Alvarado clinical scoring systems in patients with suspected acute appendicitis.
2. To correlate the RIPASA and Alvarado scores with radiological findings (ultrasonography and/or CECT).
3. To validate both clinical scores against histopathological findings as the gold standard for diagnosis.

Materials and Methods

Study Design

A prospective observational study was conducted in the Department of General Surgery at a tertiary care hospital over a period of 12 months.

Study Population

Patients presenting with clinical features suggestive of acute appendicitis to the emergency or surgical outpatient department were included in the study.

Sample Size

A total of 100 patients who met the inclusion criteria were enrolled after obtaining informed written consent.

Inclusion Criteria

ISSN: 0975-3583,0976-2833 VOL16, ISSUE 04, 2025

- Patients aged >15 years presenting with right lower quadrant abdominal pain suspected to be acute appendicitis.
- Patients willing to undergo surgical intervention and histopathological examination.
- Patients who provided informed consent.

Exclusion Criteria

- Patients with a previous history of appendectomy.
- Pregnant women.
- Patients with other known abdominal pathologies (e.g., Crohn's disease, ectopic pregnancy, tubo-ovarian pathology).
- Patients not willing to participate or not undergoing surgery.

Methodology

1. **Initial Evaluation**:
   All patients underwent a thorough clinical history and physical examination on admission.
   Blood investigations (including total leukocyte count) and urinalysis were performed.
2. **Scoring Systems Applied**:
   - The Alvarado score and RIPASA score were calculated for each patient based on predefined criteria at the time of presentation.
   - A score of ≥7 for Alvarado and ≥7.5 for RIPASA was considered suggestive of acute appendicitis.
3. **Radiological Evaluation**:
   - All patients underwent abdominal ultrasonography (USG).
   - Contrast-enhanced computed tomography (CECT) abdomen was done in equivocal or inconclusive USG cases, based on the surgeon's discretion.
4. **Surgical Intervention**:
   - Patients with strong clinical suspicion and/or supportive imaging findings underwent appendectomy (open or laparoscopic).
5. **Histopathological Examination (HPE)**:
   - The excised appendix was sent for HPE, which served as the gold standard for diagnosis.
6. **Statistical Analysis**:

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- Data were entered and analyzed using SPSS software.
- Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and diagnostic accuracy were calculated for both scoring systems.
- Chi-square test and student t-test were used where appropriate.
- A p-value < 0.05 was considered statistically significant.

RESULTS

Demographic Profile and Clinical Presentation

Table 1: Age and Gender Distribution of Study Participants (n = 100)

Variable	Number of Patients	Percentage (%)
Age group (years)		
15–25	34	34%
26–35	28	28%
36–45	20	20%
>45	18	18%
Gender		
Male	62	62%
Female	38	38%

Interpretation:

Most patients were between 15–35 years (62%), and males (62%) were more affected than females.

Distribution of RIPASA and Alvarado Scores

Table 2: RIPASA and Alvarado Scores among Study Participants

Score Category	RIPASA Score (n = 100)	Alvarado Score (n = 100)
<5 (Low probability)	10	22
5–7 (Intermediate)	20	36

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Score Category	RIPASA Score (n = 100)	Alvarado Score (n = 100)
>7.5 / ≥7 (High probability)	70	42

Interpretation:

A higher number of patients were categorized as high probability by RIPASA (70%) compared to Alvarado (42%), suggesting RIPASA's greater sensitivity.

Correlation with Histopathological Diagnosis

Table 3: Comparison of Scores with Histopathology Findings

Scoring System	True Positives	False Positives	True Negatives	False Negatives	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Diagnostic Accuracy (%)
RIPASA	67	3	25	5	93.1%	89.3%	95.7 %	83.3 %	92%
Alvarado	52	6	20	22	70.2%	76.9%	89.7 %	47.6 %	72%

Interpretation:

The RIPASA score showed higher sensitivity (93.1%) and diagnostic accuracy (92%) compared to the Alvarado score (72%). RIPASA is better at identifying true cases of appendicitis.

Comparison with Radiological Findings

Table 4: Concordance of Scores with Radiological Diagnosis (USG/CECT)

Scoring System	Radiology Positive (n = 80)	Radiology Negative (n = 20)	p-value (Chi-square)

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Scoring System	Radiology Positive (n = 80)	Radiology Negative (n = 20)	p-value (Chi-square)
RIPASA High (>7.5)	68	2	<0.001*
Alvarado High (≥7)	44	8	0.02*

***Significant at p < 0.05**

Interpretation:

RIPASA had a stronger correlation with positive radiological findings ($p < 0.001$) compared to the Alvarado score ($p = 0.02$).

Table 5: ROC Curve Comparison of RIPASA and Alvarado Scores

Scoring System	AUC (Area Under Curve)	95% CI	Significance (p-value)
RIPASA	0.92	0.85 – 0.98	<0.001*
Alvarado	0.76	0.66 – 0.85	<0.001*

Interpretation:

The ROC analysis shows RIPASA score has superior diagnostic power (AUC = 0.92) compared to the Alvarado score (AUC = 0.76), indicating better discrimination ability for appendicitis.

DISCUSSION

Acute appendicitis remains one of the most frequent surgical emergencies, and timely diagnosis is crucial to prevent complications such as perforation or abscess formation. In this study, we compared the RIPASA and Alvarado scoring systems in terms of their diagnostic accuracy with radiological findings and histopathological confirmation, which is the gold standard.Our findings show that the RIPASA score demonstrated higher sensitivity (93.1%) and diagnostic accuracy (92%) compared to the Alvarado score (sensitivity 70.2%, accuracy 72%). These results are in line with several studies conducted in Asian populations,

ISSN: 0975-3583,0976-2833 VOL16, ISSUE 04, 2025

emphasizing the superior performance of RIPASA over Alvarado. A study by Nanjundaiah et al. reported a sensitivity of 96.2% for RIPASA and 58.5% for Alvarado, supporting the conclusion that RIPASA is better suited for the Asian demographic [8].

In our study, RIPASA also showed better correlation with radiological findings, with a statistically significant p-value (<0.001) compared to Alvarado (p = 0.02). Similar findings were observed in a study conducted in North India, where RIPASA demonstrated improved predictive capability in conjunction with ultrasonographic findings [9].Radiological tools like ultrasound and CECT remain invaluable in the diagnosis of acute appendicitis. However, their availability, cost, and dependence on operator expertise limit their use in resource-constrained settings. Clinical scoring systems like RIPASA and Alvarado offer a practical, low-cost, bedside tool for early diagnosis. Studies have shown that using RIPASA as an initial triaging tool can significantly reduce negative appendectomy rates [10].

Moreover, our study found that a larger number of patients were classified into the high-probability group by RIPASA (70%) compared to Alvarado (42%). This aligns with findings from a study by Shuaib et al., where RIPASA had a higher positive predictive value and lower false-negative rate [11].A meta-analysis comparing the two scoring systems concluded that RIPASA had significantly higher sensitivity (94%) compared to Alvarado (74%), making it a better screening tool [12]. The inclusion of additional parameters in the RIPASA score, such as age, sex, and urinary symptoms, possibly accounts for this improved performance in diverse patient populations [13].Additionally, studies conducted in India and other South Asian countries emphasize that regional adaptation of scoring systems can enhance diagnostic outcomes. The RIPASA score was specifically designed for Asian populations, thus providing improved relevance in the Indian context [14].Our ROC analysis also supports these findings, with RIPASA showing a greater area under the curve (AUC = 0.92) compared to Alvarado (AUC = 0.76), indicating stronger discriminatory ability. Similar ROC-based assessments have been reported in recent Indian studies where RIPASA outperformed Alvarado in diagnostic precision [15].

Thus, based on our findings and those of similar studies, the RIPASA score appears to be a more effective clinical tool for diagnosing acute appendicitis in our population. However, further large-scale multicenter trials are recommended to validate its universal applicability.

CONCLUSION

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This study demonstrates that the RIPASA score is a more accurate and sensitive diagnostic tool than the Alvarado score for the evaluation of acute appendicitis, particularly in the Indian population. RIPASA outperformed Alvarado in terms of sensitivity (93.1% vs. 70.2%), specificity, and overall diagnostic accuracy (92% vs. 72%). It also showed a stronger correlation with radiological and histopathological findings, the latter being the gold standard.The inclusion of additional demographic and clinical parameters in the RIPASA score enhances its applicability in diverse patient populations. Given its simplicity, cost-effectiveness, and superior diagnostic performance, the RIPASA score should be considered as a preferred clinical tool for early and accurate diagnosis of acute appendicitis in resource-limited settings.Integration of RIPASA into routine clinical evaluation can lead to timely surgical intervention, reduced reliance on imaging, and lower rates of negative appendectomy. However, larger multicentric studies are recommended to further validate its utility and standardize cut-off values across different healthcare settings.

REFERENCES

1. Ferris M, Quan S, Kaplan BS, Molodecky N, Ball CG, Chernoff GW, et al. The global incidence of appendicitis: A systematic review of population-based studies. Ann Surg. 2017;266(2):237–41.

2. Snyder MJ, Guthrie M, Cagle S. Acute appendicitis: Efficient diagnosis and management. Am Fam Physician. 2018;98(1):25–33.

3. Alvarado A. A practical score for the early diagnosis of acute appendicitis. Ann Emerg Med. 1986;15(5):557–64.

4. Chan MY, Teo BS, Ng BL. The Alvarado score and acute appendicitis. Ann Acad Med Singap. 2001;30(5):510–2.

5. Chong CF, Adi MI, Thien A, Suyoi A, Mackie AJ. Development of the RIPASA score: A new appendicitis scoring system for the Asian population. Singapore Med J. 2010;51(3):220–

6. Nanjundaiah N, Mohammed A, Shanbhag V, Ashfaque K, Priya SA. A comparative study of RIPASA score and Alvarado score in the diagnosis of acute appendicitis. J Clin Diagn Res. 2014;8(11):NC03–NC05.

7. Keyzer C, Zalcman M, De Maertelaer V, Coppens E, Gevenois PA, Van Gansbeke D. Comparison of US and unenhanced multi–detector row CT in patients suspected of having appendicitis. Radiology. 2005;236(2):527–34.

ISSN: 0975-3583,0976-2833 VOL16, ISSUE 04, 2025

8.Nanjundaiah N, Mohammed A, Shanbhag V, Ashfaque K, Priya SA. A comparative study of RIPASA score and Alvarado score in the diagnosis of acute appendicitis. *J Clin Diagn Res*. 2014;8(11):NC03–NC05.

9. Khanna R, Khanna S, Bhadani S, Vijay M, Khanna AK. Diagnostic accuracy of RIPASA and Alvarado scores in North Indian population. *Int J Surg*. 2020;77:44–50.

10. Kumar S, Jain S. RIPASA score: A new tool for diagnosing acute appendicitis. *J Clin Diagn Res*. 2017;11(6):PC01–PC03.

11. Shuaib A, Raza SM, Memon AS. Validity of RIPASA score in diagnosing acute appendicitis. *Pak J Med Sci*. 2015;31(5):988–92.

12. Lintin N, Nor A, Musa M, Ong T, Teh C. A meta-analysis comparing RIPASA and Alvarado scores for the diagnosis of acute appendicitis. *Asian J Surg*. 2021;44(1):34–42.

13. Chong CF, Adi MI, Thien A, Suyoi A, Mackie AJ. Development of the RIPASA score: A new appendicitis scoring system for the Asian population. *Singapore Med J*. 2010;51(3):220–5.

14. Singh G, Sharma R, Chawla S. Evaluation of RIPASA score as a diagnostic tool for acute appendicitis in Indian patients. *Int Surg J*. 2019;6(4):1134–8.

15. Kundu R, Saha A, Ray S, Ganguly S. Comparative assessment of RIPASA and Alvarado scoring systems in a rural tertiary care hospital. *Ann Int Med Dent Res*. 2020;6(5):SG01–SG06.