

# Study on RIPASA Scoring in Clinical Diagnosis of Acute Appendicitis

Dr. Prashant Mukadam<sup>1</sup>, Dr. Vineet Shukla<sup>2</sup>, Dr. Virinchi Dabir<sup>3</sup>, Dr. Dip Joshi<sup>4</sup>

<sup>1</sup>HoU, Department of General Surgery, Sheth LG Hospital, Ahmedabad, Gujarat, India

<sup>2,3,4</sup>Resident Doctor, Department of General Surgery, Sheth LG Hospital, Ahmedabad, Gujarat, India

**Abstract:** **Background:** The RIPASA Score is a new diagnostic scoring system developed for the diagnosis of Acute Appendicitis which showed higher sensitivity, specificity and diagnostic accuracy compared to other scoring systems, particularly when applied to Asian population<sup>[1]</sup>. Here author wants to study RIPASA score by applying them to the patients attending the hospital with right iliac fossa pain that could probably be acute appendicitis. **Methods:** A prospective analysis of 100 cases admitted with RIF pain during a 2 years period was performed. Patients between 15-60 years were scored as per Alvarado and RIPASA scoring system. Histopathological reports of the cases were collected and compared with the scores. **Results:** The sensitivity of ALVARADO score is estimated to be 73% for a cut off of 6. The specificity is 78%, positive predictive value is 92, negative predictive value is 35. The Diagnostic accuracy of ALVARADO scoring is found to be 74%. The sensitivity, specificity, positive predictive value and negative predictive values of RIPASA scoring system in our study are 95.5%, 84.9%, 92.5%, 90.3%. The diagnostic accuracy of RIPASA score is 92%. **Conclusions:** The difference in the diagnostic accuracy between ALVARADO and RIPASA scoring system is significant indicating that the RIPASA score is a much better diagnostic tool for the diagnosis of acute appendicitis.

**Keywords:** Acute appendicitis, ALVARADO score, Diagnostic accuracy, Histopathology, RIPASA score

## 1. Introduction

Acute appendicitis is one of the most common surgical emergencies, with a lifetime prevalence rate of approximately one in seven.<sup>[2]</sup>

Despite being a common problem, it remains a difficult diagnosis to establish, particularly among the young, the elderly and females of reproductive age, where a host of other genitourinary and gynecological inflammatory conditions can present with signs and symptoms that are similar to those of acute appendicitis

Delay in performing an appendectomy in order to improve its diagnostic accuracy increases the risk of appendicular perforation and sepsis, which in turn increases morbidity and mortality.

The opposite is also true, where with reduced diagnostic accuracy, the negative or unnecessary appendectomy rate is increased, and this is generally reported to be approximately 20%–40%.<sup>[3]</sup>

Diagnostic accuracy can be improved through the use of Ultrasonography (USG) or Computed Tomography Imaging (CT Scan). However, such routine practice may inflate the cost of health care substantially.<sup>[4]</sup>

A number of scoring systems have been used for aiding in early diagnosis of acute appendicitis and its prompt management. These scores make use of clinical history, physical examination and laboratory findings.

### Different Scoring System

- Alvarado Score (AS)
- Modified Alvarado Scoring System (MASS)
- Appendicitis Inflammatory Response (AIR) Score

- Izbicki Scoring System
- Christian Score
- RIPASA Scoring System

### Alvarado Score (AS)

Alvarado scoring system is the most popular one.<sup>[5]</sup> This scoring system had a very good sensitivity and specificity when applied to western population. But when this scoring was applied to Asian populations, it showed relatively less specificity and sensitivity to diagnose acute appendicitis.

Parameter	Score
Migrating Pain to RIF	1
Anorexia	1
Nausea/Vomiting	1
Tenderness in RIF	2
Rebound Tenderness	1
Fever	1
Leukocytosis	2
Shift of WBC to Left	1
Total	10

Alvarado Scoring	Possibility of Acute Appendicitis
<4	Unlikely
4-7	Moderate Possibility
>7	Highly Likely

At cut-off threshold of >7,

Sensitivity	58.9
Specificity	85.7
Positive Predictive Value	97.3
Negative Predictive Value	19.1

Modified Alvarado Scoring System (MASS): Kalan et al. modified the scoring system given by Alvarado and removed one parameter<sup>[6]</sup>- shift of WBC to left.

### RIPASA Score

The Raja Isteri Pengiran Anak Saleha Appendicitis (RIPASA) is a new diagnostic scoring system developed for

Volume 9 Issue 5, May 2020

[www.ijsr.net](http://www.ijsr.net)

Licensed Under Creative Commons Attribution CC BY

the diagnosis of Acute Appendicitis and has been shown to have significantly higher sensitivity, specificity and diagnostic accuracy.<sup>[6]</sup> Most of above mentioned scoring system were developed in western countries and have shown poor diagnostic accuracy when applied to Asian population, whereas RIPASA claimed to be better suited for Asian population.<sup>[7]</sup>

<i>Parameter</i>	<i>Score</i>
<b>Gender:</b>	
Male	1
Female	0.5
<b>Age:</b>	
<40 Years	1
>40 Years	0.5
RIF Pain	1
Pain Migrating to RIF	1
Anorexia	1
Nausea/Vomiting	1
<b>Duration of Symptoms:</b>	
<48 Hours	1
>48 Hours	0.5
<b>Parameter</b>	<b>Score</b>
RIF Tenderness	1
Guarding	2
Rebound Tenderness	1
Rovsing's Sign	2
Fever	1
Raised WBC	1
Negative Urinalysis	1
Foreign NRIC	1

Based on the RIPASA score, the management protocol is formulated as,

Total RIPASA Score	Management Protocol
< 5	Probability of acute appendicitis is unlikely, observe patient in the ward and repeat score after 2 hours, if reducing score, discharge and review in follow-up. If increasing score, treat according to score level.
5 - 7.5	Low probability of acute appendicitis, observe in ward and repeat scoring after 2 hours or perform radiological investigations (abdominal ultrasound) to rule out acute appendicitis. If reducing score, discharge and review in follow-up. If increasing score or no change, patient may need admission for observations.
7.5 - 12	Probability of acute appendicitis high, refer patient to on-call surgeon for admission and repeat score in 2 hours time. If remain high, prepare patients for appendicectomy procedure.
> 12	Definite acute appendicitis, refer to surgeon on-call for admission and appendicectomy. Keep nil by mouth. Start appropriate antibiotics.

**Objectives**

To study the superiority of RIPASA scoring system in predicting the diagnosis of acute appendicitis compared to Alvarado Scoring system.

**2. Methodology**

*Type of Study:* Cross-sectional Study

*Source of Data:* Patients presented with RLQ pain admitted under the department of General Surgery in Sheth LG General Hospital, Ahmedabad from June 2018 to May 2019

*Sample Size:* 100 patients

*Inclusion Criteria:* Patients having RLQ pain

*Exclusion Criteria:*

- Age <12 Years
- Patients with RIF mass
- Patients with Appendicular Lump
- Patients having history of Urolithiasis and Pelvic Inflammatory Disease

**Method of collection of data**

During hospitalisation relevant history, data regarding patients' admission and discharge dates, date of surgery, name of operating surgeon, Blood investigations, radiological investigations & post-operative complications were recorded. All histological confirmation of appendicular specimens were reviewed at Department of Pathology.

**Demographical Profile:-**

The mean age of the group was 29.5 years with slightly more female (male:female ratio, 1:1.3). Of the 100 patients, 78 patients had appendicectomy (Emergency/Elective) for high clinical suspicion of appendicitis. The remaining patients were managed conservatively as the clinical suspicions for acute appendicitis were low. Radiological Confirmation of the diagnosis of appendicitis was done in all cases. Of the 78 patients who had appendicectomy, 69 (88.46%) had histologically confirmed acute appendicitis, of which seven cases (8.97%) had perforated appendix. 9 cases were negative for acute appendicitis and histology specimen showed normal appendix. The mean duration of hospital stay was 4.5 days (1 to 16) days. Post-operative complications, like wound infection, respiratory complications, intestinal obstruction, fecal fistula, septicemia etc. were noted in 4%. No mortality seen in any of 100 cases.

<b>Mean Age:</b>	29.5 y
• Male	30.3 y
• Female	28.7 y
<b>Male: Female Ratio</b>	1:1.3
<b>Diagnosis at the time of Admission:</b>	78
• Appendicitis	22
• Other than Appendicitis	
<b>Number of patients underwent Appendicectomy:</b>	78
• Emergency Open Appendicectomy	67
• Elective Open Appendicectomy	2
• Elective Laparoscopic Appendicectomy	9
<b>Histological Findings:</b>	
• Acute Appendicitis	69
• Normal Appendix	9
<b>Post-Operative Complication:</b>	4%
• Wound Infection	2
• Respiratory Complication	1
• Intestinal Obstruction	1
• Feecal Fistula	0
• Others	0
• <b>Mean Hospital Stay:</b>	4.5 days

### 3. Results

Following table shows the distribution of the 100 patients in 4 groups, according to the RIPASA score at cut-off threshold score of 7.5. Of the 69 positive cases of acute appendicitis, 64 were in patients with RIPASA scores >7.5 (True Positive). Only 5 cases with positive appendicitis had RIPASA score <7.5 (False Negative). Of the 9 patients who had negative appendicectomy, 3 patients were with RIPASA

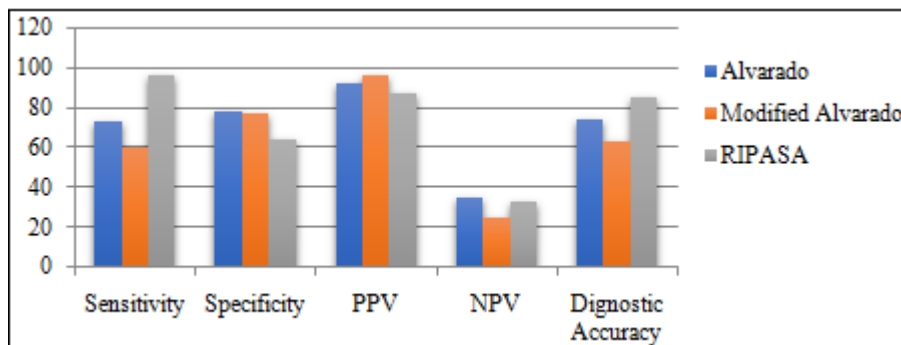
scores >7.5 (False Positive) and 6 patients were with RIPASA score <7.5 (True Negative). Remaining 22 patients, who were managed conservatively because of low clinical suspicion, were confirmed as non-appendicitis patients by abdominal ultrasound later on (True Negative). The true positive cases had a higher mean RIPASA scores of 10.4 (7.5 to 15) compared to the true negative cases 5.8 (3.0 to 7.0). The patients with perforated appendicitis had a mean RIPASA score of 12.

Parameters	RIPASA Score > 7.5 (Total=69)		RIPASA Score < 7.5 (Total=31)	
	True Positive	False Positive	False Negative	True Negative
Number of Patients	64	5	3	28
% of Total Sample Size	92.75%	7.25%	9.68%	90.32%
Mean RIPASA Score	10.4	8.3	6.6	5.3

Based on optimal cut-off threshold score of 7.5,

Parameter	Value
Sensitivity	95.52%
Specificity	84.85%
Positive Predictive Value (PPV)	92.75%
Negative Predictive Value (NPV)	90.32%
Diagnostic Accuracy	92.00%

Scoring System	Sensitivity	Specificity	PPV	NPV	Diagnostic Accuracy
Alvarado	73.7%	78.6%	92.0%	34.8%	74.3%
Modified Alvarado	59.6%	77.5%	96.9%	25.0%	63.3%
RIPASA (In Literature)	96.2%	64.3%	87.5%	33.3%	85.0%
RIPASA (In our Study)	95.5%	84.9%	92.5%	90.32%	92.0%



### 4. Discussion

Acute appendicitis is one of the most common surgical emergencies encountered, making up 10% of all emergency abdominal surgeries. Despite this, making a quick and accurate diagnosis of acute appendicitis can be difficult many a times. Particularly in the young, elderly and female patients of reproductive age where a host of other genitourinary and gynecological inflammatory conditions can also present with similar signs and symptoms of acute appendicitis.<sup>[8]</sup> It is now common practice in major centers to perform a CT scan in all patients suspected of having acute appendicitis. However, such practice can be very costly and stretch an already overburdened national healthcare system. Furthermore, arrangement for CT scan may delay emergency appendicectomy. Recent reports have suggested that the indiscriminate use of CT scan may lead to the detection of early low-grade appendicitis and these patients may then be subjected to unnecessary appendicectomy, in a condition that would otherwise have resolved with antibiotics therapy.<sup>[9]</sup> Several scoring system such as the

Alvarado and the Modified Alvarado scoring system had been introduced since 1986 to help with clinical decision making process in achieving an accurate diagnosis of acute appendicitis in the fastest and cheapest way. Despite good sensitivity and specificity when applied to a western population, both these scoring systems have been shown to achieve low sensitivity and specificity, ranging from 50 to 59% and 23 to 94% respectively, when applied to Middle Eastern, Asian or oriental populations.

The RIPASA score is a simple and easy to use quantitative scoring system and most of these 14 clinical parameters are easily obtained from a good clinical history and examination<sup>[10]</sup>. Therefore, a decision on the management can be made early.

### 5. 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.

## References

- [1] Singla, A., Singla, S., Singh, M. *et al.* A comparison between modified Alvarado score and RIPASA score in the diagnosis of acute appendicitis. *Updates Surg* **68**, 351–355 (2016). <https://doi.org/10.1007/s13304-016-0381-0>
- [2] van Randen A, Bipat S, Zwinderman AH, et al. Acute appendicitis: meta-analysis of diagnostic performance of CT and graded compression US related to prevalence of disease. 2008. In: Database of Abstracts of Reviews of Effects (DARE): Quality-assessed Reviews [Internet]. York (UK): Centre for Reviews and Dissemination (UK); 1995-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK75712/>
- [3] Seetahal SA, Bolorunduro OB, Sookdeo TC, Oyetunji TA, Greene WR, Frederick W, Cornwell EE, Chang DC, Siram SM. Negative appendectomy: a 10-year review of a nationally representative sample. *Am J Surg*. 2011;201:433–437.
- [4] Mostbeck G, Adam EJ, Nielsen MB, et al. How to diagnose acute appendicitis: ultrasound first. *Insights Imaging*. 2016;7(2):255-263. doi:10.1007/s13244-016-0469-6
- [5] Alvarado A. A practical score for the early diagnosis of acute appendicitis. *Ann Emerg Med*. 1986;15:557–564
- [6] Kanumba ES, Mabula JB, Rambau P, Chalya PL. Modified Alvarado Scoring System as a diagnostic tool for acute appendicitis at Bugando Medical Centre, Mwanza, Tanzania. *BMC Surg*. 2011;11:4. Published 2011 Feb 17. doi:10.1186/1471-2482-11-4
- [7] Chong CF, Adi MI, Thien A, et al. Development of the RIPASA score: a new appendicitis scoring system for the diagnosis of acute appendicitis. *Singapore Med J*. 2010;51:220–25.
- [8] Gilmore OJ, Browett JP, Griffin PH, et al. Appendicitis and mimicking conditions. A prospective study. *Lancet*. 1975;2:421–24.
- [9] Styrud J, Eriksson S, Nilsson I, et al. Appendectomy versus antibiotic treatment in acute appendicitis. a prospective multicenter randomized controlled trial. *World J Surg*. 2006;30:1033–1037. doi: 10.1007/s00268-005-0304-6.
- [10] ABDELRHMAN, Tamer M. et al. Validity of RIPASA scoring system as a diagnostic tool of acute appendicitis in comparison with Alvarado scoring system in the Arab population. *International Surgery Journal*, [S.l.], v. 5, n. 6, p. 2011-2017, may 2018. ISSN 2349-2902.