

A Comparative Study of RIPASA Score and ALVARADO Score in the Diagnosis of Acute Appendicitis

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ABSTRACT

Background: Acute appendicitis is one of the most common surgical emergencies. Different techniques have been devised to assist in equivocal cases in attempts to decrease negative appendectomy rates. A number of scoring systems have been used for aiding in early diagnosis of acute appendicitis and its prompt management of which Alvarado score is the most popular. 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. So we prospectively applied and compared Alvarado and RIPASA score in the diagnosis of acute appendicitis in Indian population.

Materials and Methods: We compared prospectively RIPASA and Alvarado scoring system by applying them to 206 patients. Both scores were calculated for patients who presented with right iliac fossa pain during the study period. Depending on

clinical judgment appendectomy was done. Post operative histopathology report was correlated with the scores. A score of 7.5 is the optimal cut off threshold for RIPASA and 7 for Alvarado scoring system. Sensitivity, specificity, positive predictive value (PPV) and negative predictive (NPV) for RIPASA & Alvarado system was done.

Results: The sensitivity and specificity of RIPASA score were 96.2% and 90.5% respectively. The sensitivity and specificity of Alvarado score were 58.9% and 85.7% respectively. RIPASA score correctly classified 96 percent of all patients confirmed with histological acute appendicitis to the high probability group (RIPASA score greater than 7.5) compared with 58.9% with Alvarado score (Alvarado score greater than 7.0; p-value less than 0.001).

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

Keywords: Alvarado, Acute appendicitis, RIPASA

INTRODUCTION

Acute appendicitis is one of the most common surgical emergencies, with a lifetime prevalence rate of approximately one in seven [1]. A negative appendectomy is taken as a surgery performed for a preoperative diagnosis of appendicitis that results in a normal histopathology specimen. Different techniques have been devised to assist in equivocal cases in attempts to decrease negative appendectomy rates. 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. The Raja Isteri Pengiran Anak Saleha Appendicitis (RIPASA) and ALVARADO score are new diagnostic scoring systems developed for the diagnosis of Acute Appendicitis and has been shown to have significantly higher sensitivity, specificity and diagnostic accuracy. The RIPASA scoring system includes more parameters than Alvarado system and the latter did not contain certain parameters such as age, gender, duration of symptoms prior to presentation. These parameters are shown to affect the sensitivity and specificity of Alvarado scoring system in the diagnosis of acute appendicitis [2]. The RIPASA Score is a new diagnostic scoring system developed for the diagnosis of Acute Appendicitis and has been shown to have significantly higher sensitivity, specificity and diagnostic accuracy compared to Alvarado Score, particularly when applied to Asian population [3]. 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 pain that could probably be acute appendicitis during the period December 2011 to December 2012.

MATERIALS AND METHODS

The study was conducted in Kasturba Medical College and Hospital, Mangalore, Karnataka, India. Institutional ethical clearance

was obtained prior to the commencement of this study. Informed consent was obtained from all patients. The study population included all the patients attending Kasturba Medical College Hospital with right iliac fossa pain during the period December 2011 to December 2012. Children below 15 y were excluded from the study. Pregnant women, patients with right iliac fossa mass and patients with previous history of urolithiasis and pelvic inflammatory disease were also excluded from the study.

A total of 206 patients qualified for the study during the study period. Patients were within the age group 15-60 y. All the 206 patients were scored as per Alvarado and RIPASA scoring system. Alvarado score contained 8 parameters, whereas RIPASA score contained 18 parameters. The score for the parameters ranged from 0.5 to 2 for RIPASA and 1 to 2 for Alvarado as shown in [Table/Fig-1,2] respectively. Scoring charts were filled by the attending surgeon at the time of presentation. A score of 7 is taken as high probability of acute appendicitis for Alvarado scoring system and a score of 7.5 for RIPASA scoring system. The decision on appendectomy was solely based on surgeon's clinical judgment after taking into consideration all the findings of clinical, laboratory and radiological investigation. RIPASA and Alvarado score was only done for the study purpose. Patients were monitored following admission, surgery and till discharge from the Hospital. Daily follow up included monitoring of vitals thrice a day, systemic examination once a day. Histopathology findings of the operated case were collected and correlated with either score. Scores were tabulated and compared by applying Chi-square test using SPSS windows version 20. The demographics of all 206 patients are shown in [Table/Fig-3]. The distribution of patients with individual scoring systems RIPASA, ALVARADO are shown in [Table/Fig4,5]. The mean age in our study group that consisted of 61.6% male patients and 38.4% female patients were 27.82±9.262. Out of the 206 patients operated, 89.3% were positive for appendicitis in histopathological report and

		Score
1.	Patients :	
	Female	0.5
	Male	1.0
	Age < 39.9 years	1.0
	Age > 40 years	0.5
2.	Symptoms	
	RIF Pain	0.5
	Pain Migration to RIF	0.5
	Anorexia	1.0
	Nausea & Vomiting	1.0
	Duration of Symptoms < 48 hrs.	1.0
	Duration of Symptoms > 48 hrs.	0.5
3.	Signs	
	RIF Tenderness	1.0
	Guarding	2.0
	Rebound Tenderness	1.0
	Rovsing Sign	2.0
	Fever > 37° C < 39° C	1.0
4.	Investigation	
	Raised WBC	1.0
	Negative Urine Analysis	1.0
5.	Additional Score	
	Foreign NRIC	1.0
	Total score	17.5

[Table/Fig-1]: RIPASA appendicitis (RIPASA) score

		Score
1.	Symptoms	
	Pain Migration to RIF	01
	Anorexia	01
	Nausea – Vomiting	01
2.	Signs	
	RIF tenderness	02
	Rebound Tenderness	01
	Fever	01
3.	Investigation	
	Raised WBC	02
	Shift of WBC to Left	01
	Total score	10

[Table/Fig-2]: Alvarado appendicitis scoring system

10.6% were negative. The histological report was collected from all the study patients. 4 out of 206 patients who developed post operative complications were discharged alive. All 4 complications were minor that included 2 cases simple wound infection and 2 cases of wound gaping requiring secondary suturing.

RESULTS

At optimal cutoff threshold of >7.5, the sensitivity and specificity of the RIPASA scoring system were 96.2% and 90.5% respectively. Similarly, at optimal cutoff threshold of >7 the sensitivity and specificity of the Alvarado scoring system were 58.9% and 85.7% respectively. The positive predictive value and negative predictive value of RIPASA score is 98.9% and 73.1% respectively. The positive predictive value and negative predictive value of Alvarado score is 97.3% and 19.1% respectively. Using ROC the area under the curve is 0.982 which is greater than that for ALVARADO score, which is 0.849. The difference in the area under the curves of 13.4% is significant between two scoring systems ($p < 0.001$), which

Demography	No. of patients(%)
Gender	
Male	127(61.6)
Female	79(38.4)
Total Emergency Appendicectomy	145(70)
Confirmed Histology for Acute Appendicitis	184(89.3)
Negative Histology for Acute Appendicitis	22(10.6)
Mean Hospital stay	4.2 days
Perforated Appendix	4(2)
wound infection	4(2)

[Table/Fig-3]: Demographics of 206 patients

RIPASA score	No of patients	%
<5	0	0
5-7	26	12.6%
>7	180	87.4%
Total	206	100%

[Table/Fig-4]: Showing the distribution of patients in RIPASA scoring system

ALVARADO score	No of patient	%
<5	50	24.3%
5-7	133	64.6%
>7	23	11.1%
Total	206	100%

[Table/Fig-5]: Showing the distribution of patients in ALVARADO scoring system

equates to 30 (13.4 %) patients with acute appendicitis who were misdiagnosed using the Alvarado score compared to the RIPASA score.

DISCUSSION

Acute appendicitis is one of the most common surgical emergencies, with a lifetime prevalence rate of approximately one in seven [1]. 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 [4]. A delay in performing an appendicectomy 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 appendicectomy rate is increased, and this is generally reported to be approximately 20%–40% [5]. Several authors considered higher negative appendicectomy rates acceptable in order to minimize the incidence of perforation [6]. Diagnostic accuracy can be further improved through the use of ultrasonography or computed tomography imaging. However, such routine practice may inflate the cost of health care substantially. A recent study has suggested that such indiscriminate use of CT imaging may lead to early low-grade appendicitis and unnecessary appendicectomies which would otherwise be resolved spontaneously by antibiotics therapy [7].

Hence, hosts of scoring system were derived in order to diagnose acute appendicitis. Alvarado scoring system is the most popular one. This scoring system had a very good sensitivity and specificity when applied to western population [8,9]. Subsequently, when this scoring was applied to oriental populations, it showed relatively less specificity and sensitivity to diagnose acute appendicitis [10,11]. So, a new scoring system was devised called the RIPASA scoring system which was more extensive yet simple scoring system consisting of 17 fixed parameters and an additional parameter (NRIC) that is unique to Asian population.

Our study compared sensitivity and specificity between Alvarado scoring system with that of RIPASA. Sensitivity or true positive rate is the proportion of actual positives which is correctly identified that is the percentage of sick people who are correctly identified as having the condition. Specificity or true negative rate is the proportion of negatives which are correctly identified that is the percentage of healthy people who are correctly identified as not having the condition [12]. The RIPASA score was considerably better than Alvarado score in correctly diagnosing acute appendicitis. Using the RIPASA score, 96.2% of patients who actually had acute appendicitis were correctly diagnosed and placed in the high probability group (RIPASA score > 7.5), compared to only 58.9% when using the Alvarado score on the same population sample. The difference in diagnostic accuracy of 33.93% between the RIPASA score and Alvarado score was statistically significant ($p < 0.0001$), indicating that the RIPASA score is a much better diagnostic tool for the diagnosis of acute appendicitis. Our study is comparable with the study done by Chong [3].

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

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