Comparative Study of Alvarado and RIPASA Scoring System in Diagnosing Acute Appendicitis:

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Abstract: *Appendectomy is one of the most common surgeries conducted in any hospital. Despite modern advances, the diagnosis of appendicitis remains essentially clinical, requiring a mixture of observation clinical acumen and surgical science and as such it remains an enigmatic challenge and a reminder of the art of surgical diagnosis. A delay in performing an appendectomy runs the risk of appendicular perforation and sepsis, which in turn increases morbidity, hospital stay and mortality. A prospective comparison study was done for RIPASA and Alvarado scoring system by applying them to 150 patients who presented with right iliac fossa pain during the study period. Depending on clinical judgement and other investigations, appendectomy was done. A score of 7.5 is the optimal cut off threshold for RIPASA and 7 for Alvarado scoring system. Sensitivity and specificity of RIPASA scoring system is higher compared to Alvarado scoring system. The difference in ROC curve is 0.135 which is significant between two scoring system (p <0.001). Unnecessary and expensive radiological investigations can be avoided by using RIPASA score and thus reducing health care expenditure. This present study suggests that RIPASA score can be considered a superior score than the commonly used Alvarado score in terms of higher sensitivity and specificity in diagnosing acute appendicitis.TheRIPASA scoring system is a promising and has good sensitivity, specificity and diagnostic accuracy when compared to Alvarado scoring for Asian Population. RIPASA scoring system significantly reduces the number of negative laparotomies without increasing overall rate of appendicular perforation. It can work effectively in routine practice as an adjunct to surgical decision making in questionable acute appendicitis. It is simple to use and easy to apply since it relies only on history,clinicalexamination and basic lab investigations. It is cost-effective and can be used in all district general hospitals with basic lab facilities.*
Keywords: *Pain abdomen . Vomiting . Fever . Acute appendicitis . Alvarado scoring . RIPASA scoring . Appendicular perforation . Negativeappendectomies*

I. Introduction

The vermiform appendix is considered by most to be a vestigial organ; its importance in surgery results only from its propensity for inflammation, which results in the clinical syndrome known as 'acute appendicitis'. Appendectomy is one of the commonest surgeries conducted in any hospital. The incidence is 1.5 to 1.9 per 1000 in the population,with a male preponderance of 1.4 [1] Despite modern advances, the diagnosis of appendicitis remains essentially clinical, requiring a mixture of observation clinical acumen and surgical science and as such it remains an enigmatic challenge and a reminder of the art of surgical diagnosis. A delay in performing an appendectomy runs the risk of appendicular perforation and sepsis, which in turn increases morbidity, hospital stay and mortality. A number of scoring systems have been employed for aiding in 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) score is a new diagnostic scoring system developed for the diagnosis of appendicitis and has been shown to have significantly higher sensitivity, specificity and diagnostic accuracy compared to Alvarado scoring system, particularly when applied to the Asian population. Although RIPASA score is more extensive than the Alvarado score, the latter did not contain certain paramsymptoms prior to presentation. These parameters are shown to affect sensitivity and specificity of Alvarado scoring system in the diagnosis of acute appendicitis [2].

II. Aim and Objectives

To evaluate the accuracy of Alvarado and RIPASA scoring as an aid in surgical decision making in cases of possible appendicitis and in attenuating the 'Negative Appendectomy' rates without increasing the risk of appendicular perforation. Comparing the sensitivity, specificity, positive predictive value and negative predictive value for both scoring systems. Correlate Alvarado and RIPASA scores with intraoperative, histopathological examination findings .

III.   Patients and Methods

We compared prospectively RIPASA and Alvarado scoring systembyapplyingthem to150 patients who presented with right iliac fossa pain during the study period. Depending on clinical judgement and other investigations appendectomy was done. Intra-operative findings and post-operative histopathology report were 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, positivepredictivevalue (PPV)and negative predictive (NPV) for RIPASA and Alvarado system were calculated and compared.

RIPASA scoring system

1. Patients	score
female	0.5
male	1.0
Age <39.9	1.0
Age >40	0.5
2.symptoms	
Right iliac fossa pain	0.5
Pain migrating to right iliac fossa	0.5
anorexia	1.0
Nausea and vomiting	1.0
Duration of symptoms <48h	1.0
Duration of symptoms >48 h	0.5
3.signs	
RIF tenderness	1.0
guarding	2.0
Rebound tenderness	1.0
Rovsing sign	2.0
Fever>37 or <39 °C	1.0
4.Investigations	
Revised WBC	1.0
Negative urine analysis	1.0
Total score	15

Alvarado scoring system	
Symptoms	Score
Migratory right iliac fossa pain	1
Anorexia	1
Nausea/vomiting	1
Signs	
Tenderness in right iliac fossa	2
Rebound tenderness in right iliac fossa	1
Elevated temperature	1
Laboratory findings	
Leucocytosis	2
Shift to the left of neutrophils	1
Total	10

5–6 = Possible 7–8 = Probable > 9 = Very probable

IV.   Results and Observations

In our study, 150 patients attending the hospital were applied RIPASA and Alvarado score. The data collected have been statistically analysed and discussed (Table 1). Of the 150 patients who underwent appendectomy, 143 patients showed RIPASA score > 7.5 suggesting probability of acute appendicitis. Two patients whose RIPASA < 7.5 showed positive histopathology report. Hence according to the above table sensitivity of RIPASA score =98.61%, specificity =83.33%, positive predictive value =99.3%, negative predictive value = 71.42%. One hundred twelve patients showed Alvarado score > 7 suggesting probability of acute appendicitis out of HPE negative for 2 patients, 34 patients whose Alvarado <7 showed positive histopathology report. Hence, according to the above table sensitivity = 76.39%, specificity = 66.66%, positive predictive value =89%, negative predictive value =10.52% (Table 2). Sensitivity, specificity, positive predictive value, negative predictive value of RIPASA and Alvarado scoring when applied to 150 patients in our study were 98.61, 83.33, 93.33, and 71.42% and 76.39, 66.66, 89, and 10.52%, respectively.

4. Investigation Revised WBC 1.0 Negative urine analysis 1.0 Total score 15eters such as age, gender and duROC Curve

Area under the curve (ROC) for the RIPASA score is 0.892 which is greater than that for the Alvarado score, which is 0.757. The difference in the area under the curve is 0.135 which is significant between two scoring systems (p < 0.001),whichequatesto23(15.4%)patientswithappendicitis who are misdiagnosed using the Alvarado score compared to the RIPASA score. Both the variables are statistically significant but RIPASAwas a better estimator when compared with Alvarado as per the area under the curve.

V. Discussion

Acute appendicitis is one of the most common surgical emergencies, with a life time prevalence rate of approximately one in seven[3].Despite being a common problem, acute appendicitis remains a difficult diagnosis   to establish, particularly among the young, the elderly and females of reproductive age, where a host of other genitourinary and gynaecological inflammatory conditions. The diagnosis of acute appendicitis is based purely on clinical history and examination combined with laboratory investigations such as elevated white cell count. We prospectively compared the two scoring systems for diagnosing acute appendicitis in 150 patients presenting with right iliac fossa pain. The RIPASA score correctly classified 142 patients with histologically confirmed acute appendicitis compared to 110 patients with Alvarado score with total 144 HPE positive cases, indicating that RIPASA score is more superior to Alvarado score in our clinical settings. This prospective evaluation of RIPASA score in our study had a positive predictive value of 93.33% (score >7.5) and a negative predictive value of 71.42% (score <7.5), prospective evaluation of Alvarado score in our study had a positive predictive value of 89% (score >7) and a negative predictive value of 10.52% (score < 7). Thus RIPASA scores clearly outperformed the Alvarado scores. The sensitivity and specificity of the RIPASA score in our study were 98.61% and 83.33%, respectively, whereas in a retrospective study done by other investigators, the sensitivity and specificity of Alvarado and modified Alvarado score was less and similar to the sensitivity and specificity of that of a CT scan. By application of the RIPASA score, the number of costly CT scans that are to be performed to exclude acute appendicitis could be reduced.In our study RIPASA score 'ssensitivity and specificity are 98.61 and 83.33%, respectively, when cut off level is at 7.5. This finding is supported by Chong et al. [4] (2010) where sensitivity was 97.5%, specificity 81.8% when the cut off level was at 7.5. Overall, our study suggests that RIPASA score is a much better diagnostic tool for the diagnosis of acute appendicitis in Indian continent. Our study were on par with the study done by Chong C. F. et al. in 2010 and 2011.

Comparison between Alvarado vs RIPASA scoring with HPE report

	RIPASA	ALVARA DO
Sensitivity	98.61%	76.39%
Specificity	83.33%	66.66%
Positive predictive value	93.33%	89%
Negative predictive value	71.42%	10.52%

VI. Conclusion

The RIPASA scoring system is a promising and has good sensitivity, specificity and diagnostic accuracy when compared to Alvarado scoring for Asian Population. RIPASA Scoring system is a reliable indicator for diagnosing acute appendicitis with attenuating the BNegative Appendectomy^ rates. RIPASA scoring system significantly reduces the numberofnegativelaparotomieswithoutincreasingoverallrateof appendicular perforation. It can work effectively in routine practice as an adjunct to surgical decision making in questionable acute appendicitis. It is simple to use and easy to apply since it relies only on history, clinical examination and basic lab investigations. It is cost-effective and can be used in all district general hospitals with basic lab facilities.

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