



Comparison of RIPASA and modified ALVARADO scoring in acute appendicitis – A tertiary care teaching centre study.

KEYWORDS

Ripasa, Alvarado, Appendicitis, South India, Lanz, Rutherford Morrison, Oschsner Sherren

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ABSTRACT *Background:* Acute appendicitis is one of the commonest infective conditions affecting young people all over the world. A number of scoring systems are used to assess the clinical condition and to plan for intervention. Alvarado score happens to be the currently accepted system. An alternative system that has been found to be effective in the Asian population is the RIPASA scoring. *Methods:* The objective was to compare Alvarado and RIPASA scoring systems in the diagnosis of acute appendicitis. This study was done as a Diagnostic test evaluation on 487 patients admitted with suspicion of acute appendicitis at Government Medical College Trivandrum. *Results:* The sensitivity of RIPASA and ALVARADO were 0.93(0.90-0.96) and 0.67(0.61-0.72) respectively. The specificities were 0.67 (0.52-0.80) and 0.65(0.50-0.78). The area under the curve for RIPASA was 0.93(0.90-0.96) whereas that for ALVARADO was 0.87(0.83-.90). *Conclusions:* RIPASA scoring system is superior to Alvarado for diagnosing acute appendicitis in the Indian population.

Introduction

Acute appendicitis continues to be one of the commonest non trauma surgical emergencies encountered by emergency staff in surgery departments (1) In addition, appendicectomy accounts for 10% of all abdominal surgeries.[excluding trauma] Moreover, appendicectomy constitutes about 32% of all emergency surgeries done in the acute-care setting (2). In the emergency setting, the decision to operate is most often taken by the junior staff. However, the diagnosis of acute appendicitis is clinical and subject to clinical experience in developing countries were advanced investigative modalities are not available. It poses a diagnostic challenge in subgroups of patients like young and elderly in addition to females of reproductive age group (3). This leads to unavoidable delays in appendicectomy in emergency settings, resulting in potential complications like perforation and sepsis(4). On the other hand, over diagnosis of appendicectomy by subjective assessment by the emergency staff results in negative appendicectomies(3).

Tools and scores to diagnose appendicitis were developed to address these issues in diagnosing appendicitis clinically. Investigations like CT or USG help in the differential diagnosis of right iliac fossa pain; these are expensive, inaccessible in developing countries at night time(5). As a result, various scoring systems were developed to help clinicians in diagnosing appendicitis without any delay. These scoring systems are Alvarado, Eskelinen and Ohhmann(6) (7-9). These scoring systems lack sensitivity and specificity compared to the histopathological gold standard (10). Moreover, there are differences with respect to the geographical locations and demography. Another issue with these scoring systems was the different cut off values in different populations. These resulted in these scoring systems not being adopted into routine clinical practice.

The RIPASA score has many advantages over the other scoring system in terms of sensitivity and specificity(3, 6). Moreover, this score

was validated in different populations and has shown consistent results. However, RIPASA scoring system was not prospectively studied in our population. Our study aims to compare the RIPASA and modified ALVARADO score in our population across all age groups.

Materials and methods

We conducted this study in the Government medical college Trivandrum. The study was designed as a comparison of diagnostic test evaluation between RIPASA and MODIFIED ALVARADO scores. We conducted the study during 2014 and 2015. Institutional ethics committee approval was obtained before starting the study. All participants in the study provided informed consent. We carried out this study conforming to the standards of the declaration of Helsinki.

Both men and women presenting with abdominal pain in the right iliac fossa and were suspected to have acute appendicitis admitted in the Government medical college Trivandrum were eligible for enrollment. Pediatric patients were also included in the study. In addition, patients presented with atypical abdominal pain but with sonological evidence of acute appendicitis were also enrolled into the study. Exclusion criteria included pregnant ladies, and those admitted with other diagnoses and subsequently diagnosed to have appendicitis from investigation alone. Those patients with recurrent appendicitis were excluded from the study. Patients with malignancies were excluded from the study. Patients with history of previous laparotomies were excluded from the study. A formal sample size calculation was done before conducting the study. We followed systematic sampling for the selection of the participants to the study.

The diagnosis of acute appendicitis was based on clinical judgement supported by investigation. Those cases satisfying the diagnostic criteria for acute appendicitis were scored for both RIPASA and modified ALVARADO scores. The decision to treat the patients

surgically or conservatively was mainly based on the treating surgeon's decision. The surgical option was open appendicectomy with Lanz incision, Rutherford morrison incision or grid iron incision. In some cases, laparotomies were also done (11). Patients treated by conservative measures were put on Oschsner Sherren regimen. Only those patients who underwent appendicectomy were considered for comparison of the score with ROC curves. However exploratory analysis was done with whole sample set as well. Baseline demographic details, mode of treatment, and those individual components in the scores were collected. A well-designed case report form was used for collection of the variables, and the data were entered into an excel database for analysis.

Relevant demographic variables, treatment given, histopathology, components of ALVARADO and RIPASA scores were recorded in a pretested case report form by junior resident given training for data collection. All data were collected using pretested data collection form by junior resident duly trained in the data collection procedures. The data entered by the junior resident was cross checked by the investigator. The data collected was then entered into an excel sheet, taking special attention to avoid data entry errors.

Statistical analysis: From the variables collected, RIPASA and ALVARADO scores were calculated for all patients. Correlations between these scores were calculated. We assessed the RIPASA and ALVARADO score for all patients who underwent appendicectomy. Sensitivities and specificities across all possible scores were calculated, and ROC curves were plotted. Then we calculated the AUC for each of the scores. The optimum cut of points for each score in the ROC curves was determined. For plotting the ROC curves, only cases with complete histopathological results were considered. Those lost to follow up and with no histopathological, results were not included in the analysis. Baseline demographics were assessed. Continuous variables were summarized as median and IQR. Categorical variables were summarized as proportions. Groupwise differences were assessed using Wilcoxon rank sum test and chi-square test for continuous variables and categorical variables respectively.

Results

From 2014 to 2015, 500 patients diagnosed with acute appendicitis were treated with either appendicectomy or conservative management. Thirteen patients lost to follow up (2.6%) were excluded from the analysis. As a result, 487 patients were evaluated. Histopathology proven cases of appendicectomy were 315 (64.7%). Following the clinical diagnosis, 367(75.4%) patients underwent emergency appendicectomy. Histopathology results could not be traced in 4 patients. These 4 patients were dropped from further analysis. The characteristics of these patients are shown in table 1.

Table 1. Table showing baseline characteristics

	Overall
N	487
AGE (median [IQR])	21.00 [16.00, 29.50]
GENDER = Male/Female (%)	306/181 (62.8/37.2)
RIPASA (median [IQR])	9.00 [6.50, 10.00]
ALVARADO (median [IQR])	6.00 [5.00, 8.00]
TREATMENT = EMERGENCY APPENDICECTOMY/CONSERVATIVE MANAGEMENT (%)	367/120 (75.4/24.6)
HISTOPATH (%)	
positive	315 (64.7)
negative	52 (10.68)
not done	120 (24.64)

Of the 487 patients analysed, 306(63%) were males and 181(37%) were females. In these patients, emergency appendicectomy was done in 367(75%) and conservative management were given to

120(25%) patients. Of all the patients, 315 (65%) were histopathologically proven to have appendicitis.

In the histopathology proven cases, the median RIPASA score was 9 and that of ALVARADO score 8. There were more males in the histopathology positive group which was not statistically significant. There was a significant difference in the RIPASA score between the histopathologically positive cases compared to the negative cases (p. value<0.001). Similarly, there was a statistically significance difference between the ALVARADO scores between these groups (p. value <0.001). As shown in table 2 and figure 1, RIPASA and ALVARADO scores were significantly higher in the histopathologically proven appendectomy patients. Spearman correlation coefficient between these groups was 0.88 and was statistically significant(<0.001).

Table 2: characteristics of patients according to histopathology

	positive	negative	p
n	314	49	
AGE (median [IQR])	20.00 [16.00, 28.00]	22.00 [17.00, 32.00]	0.140
GENDER = Male/Female (%)	206/108 (65.6/34.4)	28/21 (57.1/42.9)	0.322
RIPASA (median [IQR])	9.50 [8.50, 10.00]	7.00 [6.00, 9.00]	<0.001
ALVARADO (median [IQR])	8.00 [6.00, 9.00]	6.00 [6.00, 7.00]	<0.001

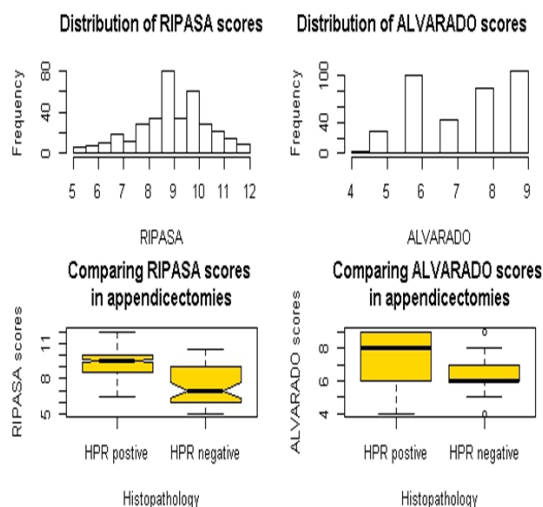


Figure 1. Comparison of ALVARADO and RIPASA scores

ROC curves for various sensitivities and specificities were calculated and plotted. The best cut off value for each was calculated. In addition, the area under the curve for both RIPASA and ALVARADO were calculated and compared as given in figure2.. The sensitivity of RIPASA and ALVARADO were 0.93 (0.90-0.96) and 0.67(0.61-0.72) respectively. The specificities were 0.67 (0.52-0.80) and 0.65(0.50-0.78). The area under the curve for RIPASA was 0.93(0.90-0.96) whereas that for ALVARADO was 0.87(0.83-.90)

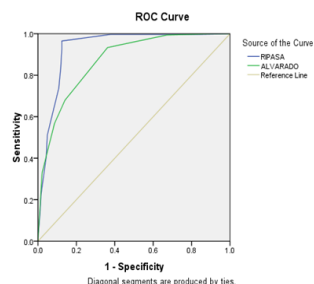


Figure 2. ROC curve

Discussion

The RIPASA scoring compared to ALVARADO score proved to be better at diagnosing the acute appendicitis as evidenced by the higher area under the curve in the ROC curves for the scores. This proves the hypothesis of the study. The sensitivity and specificity are also higher for the RIPASA scores compared to the MODIFIED ALVARADO score.

The strength of the study is in the formal sample size calculations and in the inclusion of the all categories of patients. In addition, we selected patients using a systematic sampling technique. This results in better generalization of the results. Strength of the study lies in its simplicity in the components of the score. Moreover, our study included all age groups in the study including children. As a result, this study is more generalizable.

Our study has shown that age is an important factor to be considered. RIPASA score takes into account the age, whereas the ALVARADO score does not take this into account. There was good correlation between RIPASA and alvarado scores. When the cut off for the ripasa was fixed at 7.5 as suggested by the ROC curve analysis, the sensitivity was 93 percent and specificity 69 percent. These results are higher compared to other studies(3), and lower compared to Nanjundaiah, N et al (12). The difference in the sensitivity and specificity from other studies may be due to difference in the population and as result of all types of patients in the study. The best cut off for the alvarado scale was found to be at 6. This is consistent with a few studies. However the studies by Chong et al observed the best cut off to be at 7. One of the potential causes for the different cut off value in our studies may be due to the use of modified alvarado score.

Comparison of ripasa scoring with alvarado scoring in ROC curve analysis demonstrated ripasa as a better scoring system. The difference in the area under the curve was statistically significant. This results compares to other studies.

Conclusion

In this study, we have concluded that RIPASA scoring is a better diagnostic scoring system for acute appendicitis compared to Alvarado score. We can get adequate information on the parameters included in the RIPASA scoring by taking complete history and thorough clinical examination and relevant investigations. This can avoid unwanted admissions as well as unwarranted investigations, to a large extent.

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