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STUDY OF EFFICACY OF ALVARADO SCORE AND RIPASA SCORE IN DIAGNOSIS OF ACUTE APPENDICITIS

Surgery

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ABSTRACT

Introduction: Acute appendicitis is a common cause of acute abdomen for which a prompt diagnosis and treatment is rewarded by a marked decrease in morbidity and mortality. The present study has been planned to compare Alvarado and RIPASA scoring systems in diagnosis of acute appendicitis and correlating both scoring systems with histopathological findings.
Methods: 70 cases of appendicitis were admitted. RIPASA and Alvarado scores were correlated with histopathological findings.
Results: The sensitivity and specificity of Alvarado scoring system in our study were 82.09% and 66.67% respectively and PPV and NPV were as 98.21% and 14.29% respectively. The sensitivity and specificity of RIPASA scoring system in our study came out to be 79.10% and 100% respectively. PPV and NPV were as 100% and 17.65% respectively. The diagnostic accuracy was 80%.
Conclusion: We found that RIPASA scoring has more diagnostic value in diagnosis of acute appendicitis.

KEYWORDS

Alvarado scoring, RIPASA scoring, acute appendicitis

Acute appendicitis (AA) is one of the most common surgical emergency in clinical practice with an estimated life time prevalence of 7 percent[1]. It is a common cause of acute abdomen for which a prompt diagnosis and treatment is rewarded by a marked decrease in morbidity and mortality. AA is traditionally understood to be a clinical diagnosis but the clinical features of appendicitis overlap with a number of other conditions making diagnosis a challenge, particularly at an early stage of presentation[2].

AA refers to a distinct entity, pathologically characterized by acute transmural inflammation of appendix. Clinically it is characterized by acute onset of pain, which is initially in periumbilical region but later shifts to the right iliac fossa accompanied by rebound tenderness. Traditionally, the diagnosis of appendicitis was made solely based on clinical symptoms and signs, and later diagnosis included results of inflammatory laboratory variables. This practice in diagnostics led to a false positive diagnosis (negative appendectomy) rates in the range of 15-30%.[3,4,5]

Imaging techniques such as ultrasound (USG) and computed tomography (CT) offer to improve clinical outcome by increasing the accuracy of early diagnosis. USG has the great advantage of being radiation free, however it is operator dependent. USG may be difficult in patients with a retrocaecal appendix and has limited sensitivity, in comparison to CT. CT scan overcame these limitations and has greater sensitivity in the diagnosis of acute appendicitis, with reported accuracies of 93-98% but it is expensive and not available at all centers.[6,7]

Making wise, educated decisions is the cornerstone of good medical practice and often involves estimating the probability of an event. Clinical prediction rules (CPRs) quantify the diagnosis of a target disorder based on findings of key symptoms, signs and available diagnostic tests, thus having an independent diagnostic or prognostic value[8] . They can also extend into clinical decision-making if probability estimates are linked to management recommendations, and are subsequently referred to as clinical decision rules. CPRs have the potential to reduce diagnostic error, increase quality and enhance appropriate patient care.[8]

In this context in order to reduce the negative appendectomy rates various scoring systems, based on clinical history, physical examination and laboratory findings have been developed for supporting the early diagnosis of AA[9] , Alvarado and the RIPASA scoring systems are the most commonly used scoring systems in diagnosis of AA.

Alvarado score showed very good sensitivity and specificity when applied in a Western population, however several subsequent studies have shown its limitations when applied in Asian population.[10,11,12]RIPASA score was developed in the year 2010 with the intent to be applicable in Asian population in the early diagnosis of acute appendicitis.[13]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.[13]The present study has been planned to compare both scoring systems in diagnosis of acute appendicitis and correlating both scoring systems with the intraoperative and histopathological findings.

MATERIAL AND METHODS

The proposed study was conducted in tertiary centre in north India,after due permission from the Institute Ethical Committee from October 2017 to January 2019. It was a hospital based observational study done on 70 patients.

The following inclusion criteria were adopted: All patients above the age of 15 years undergoing emergency appendectomy and the patients who had given consent to be included in part of the study.

Patient exclusion criteria were: Patients with appendicular lump and pregnant females with acute appendicitis.

All patients fulfilling the inclusion and exclusion criteria underwent clinical and investigative evaluation including laboratory and imaging modalities. The study population underwent Alvarado and RIPASA scoring , the cut off for Alvarado Score taken was 7 where as it was 7.5 in RIPASA score, so patient having Alvarado score more than 7 and RIPASA score more than 7.5 were considered to have acute appendicitis. The decision to operate was solely based on surgeon's clinical judgment after taking into consideration all the findings of clinical, laboratory and radiological investigation.

Patients was monitored from the time of admission to till discharged from the Hospital. Daily follow up included monitoring of vitals thrice

a day, systemic examination once a day. The following tests was carried out and the record maintained as per Performa and records of operative interventions and the findings as well as histopathology reports, Alvarado and RIPASA score was also maintained:

- Complete blood count.
- Liver function test.
- Renal function test.
- Urine routine examination.
- Chest X ray (PA VIEW)
- X ray abdomen (ERECT)
- Ultrasonography of abdomen
- ECG

Categorical variables were presented in number and percentage (%) and continuous variables were presented as mean ± SD and median. Normality of data was tested by Kolmogorov Smirnov test. If the normality was rejected, then non parametric test was used.

Statistical tests were applied as follows-

1. Quantitative variables were compared using Independent t test/Mann-Whitney Test (when the data sets were not normally distributed) between the two groups.
2. Qualitative variables were correlated using Chi-Square test/Fisher's Exact test.
3. Receiver operating characteristic curve (ROC) was used to find out cut off point of Alvarado score and RIPASA score for predicting appendicitis. Comparison of AUC of Alvarado score and RIPASA score was performed to assess any significant difference in their predictability. A p value of <0.05 was considered statistically significant.

RESULTS

Present study was conducted on 70 patients, who underwent emergency appendectomy, with age ranging from 15-58 year, with mean age of 31.23 ±12.89 years. Out of the 70 patients operated, 67 patients were reported as having AA whereas 3 patients were having normal appendix on histopathology report.

On correlating histopathological results with Alvarado score of each subjects, we found that out of 56 patients who were having score of >7, 55 were having appendicitis on histopathological examination. 14 patients who were having Alvarado score <7, 12 were having appendicitis on histopathological report and the remaining 2 were having normal appendix(table -1) and the P value was 0.0086 which is being less than 0.05 is statistically significant. The sensitivity and specificity of Alvarado scoring system were 82.09% and 66.67% respectively. The PPV and NPV were 98.2% and 14.3% respectively. The diagnostic accuracy was 81.43 percent.

Table 01: Correlation Of Alvarado Score With Histopathological Results

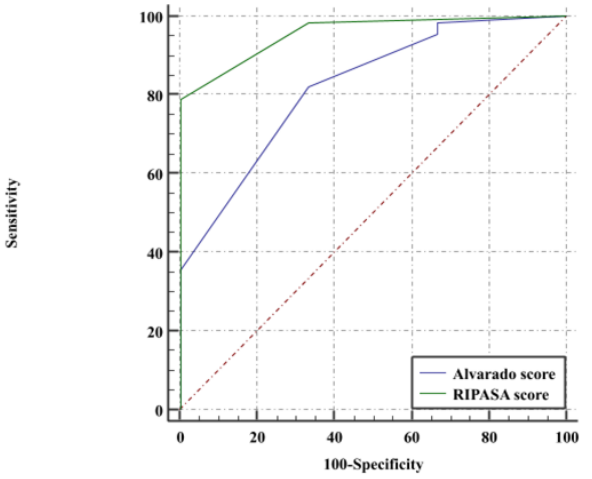
Scoring System	Histopathological Results		Total
	Appendicitis	No appendicitis	
Alvarado Score >7	55	1	56
Alvarado Score <7	12	2	14
Total	67	3	70

On correlating histopathological results with RIPASA score in each subject we found that out of 53 patients who were having score >7.5, 53 were having appendicitis. In the other group of patients with RIPASA score of < 7.5, 14 patient had AA on histopathology whereas 3 had normal appendix(table-2) and the P value was 0.0001 which is statistically significant. The sensitivity and specificity of RIPASA scoring system were 79.1% and 100 % respectively. The PPV and NPV were 100% and 17.6 % respectively. The diagnostic accuracy was 80 percent.

Table 02: Correlation Of Ripasa Score With Histopathological Results

Scoring System	Histopathological Results		Total
	Appendicitis	No appendicitis	
RIPASA SCORE >7.5	53	0	53
RIPASA SCORE <7.5	14	3	17
Total	67	3	70

On correlating the Alvarado scoring and RIPASA scoring with histopathological findings, the area under the ROC curve for Alvarado and RIPASA score were 0.823 and 0. 958. So RIPASA score has more diagnostic value in diagnosis of acute appendicitis when compared to Alvarado score in our study(graph-01).



Graph 01: Comparison Of Roc Curve Of Alvarado And Ripasa Scoring

On applying pearson chi square test there is no relationship between two scoring systems on the basis of presence or absence of faecolith. For Alvarado scoring system, the p value is 0.6 and for RIPASA scoring system, the P value is 1.

DISCUSSION

Acute appendicitis is one of the most common surgical emergencies encountered in hospitals making up to 10% of all emergency abdominal surgeries[13]. Surgeon's good clinical assessment is considered to be most important requisite in diagnosis of AA. Several other conditions can mimic this clinical condition. While CT scan can diagnose AA with very high sensitivity and specificity, it is not feasible to have this investigation done for each and every patient suspected to be having appendicitis. Several scoring systems have been developed to aid in the diagnosis of AA. In our study we compare Alvarado and RIPASA scoring system for the diagnosis of AA.

In our study, males comprised of 61.43% percent of subjects while females comprised of 38.57% percent of subjects. The mean age was 31.23 ± 12.89 years, ranging from 15-58 year. In the study of Bhabatosh et al[14], mean age was 28.28±12.34years, and in the study of Manish et al[16,15] mean age of patients was 28.10±10.88 years and in the study of Ismail Alnjadat et al mean age was 26.52 years In all these studies majority of the patient were male. On comparison, the mean age of our study population was slightly more than the study done by Bhabatosh et al,Manish et al and Ismail Alnjadat et al. In our study, the patients who were clinically suspected of having appendicitis, 80% had Alvarado score >7 while as 75.71% had RIPASA score more than 7.5, which is almost similar to the finding of Manish et al[15] in their study .

In our study, out of 70 patients, 67 patients (95.71%) were documented of having appendicitis on histopathology but three(3) patients had no evidence of appendicitis on histopathology(table -1). After comparing the histopathology findings with Alvarado scoring, we noted that the sensitivity and specificity of Alvarado scoring system in our study were 82.09% and 66.67% respectively and PPV and NPV were as 98.21% and 14.29% respectively which is almost similar to the study done by Ismail Alnjadat et al[16] in which the reported sensitivity and specificity of Alvarado score were 73% and 68.6% respectively, and PPV and NPV of Alvarado score were 92% and 34.8%. In study of Bhabatosh et al[14] sensitivity and specificity of Alvarado score was 96.2% and 62.5% respectively, PPVand NPV was 94.3% and 71.4% respectively.

On correlating the RIPASA scoring system with histopathology, we observed in our study a statistically significant association between the histopathological diagnosis of appendicitis and RIPASA score of more than 7.5. The sensitivity and specificity of RIPASA scoring system in our study came out to be 79.10% and 100% respectively. PPV and NPV were as 100% and 17.65% respectively. The diagnostic accuracy was as 80%.

These findings are comparable with Bhabatosh et al[14] who also had a

statistically significant association between RIPASA score and histopathological diagnosis of appendicitis. The sensitivity, specificity PPV and NPV of RIPASA score in their study was as 98.1%; 87.5%; 98.1% and 87.5% respectively. Accuracy of RIPASA score were 96.6% Comparing the RIPASA and Alvarado scoring systems, we found that RIPASA is better than Alvarado score in diagnosis of acute appendicitis. Similar findings were noted in study of Bhabatosh et al,Manish et al and Ismail Alnjadat et al.

Intraoperative findings such as, presence of free fluid and presence of Fecolith were assessed in all patients of AA. The presence of free fluid and Fecolith were all found statistically insignificant when analysed with both the scoring systems with their respective cut-off scores i.e. Alvarado score group >7 and RIPASA score >7.5. There is however lack of any published studies which correlate intraoperative findings with scoring systems, therefore further analysis through multicentric prospective studies is needed.

CONCLUSION

From this study we found that Alvarado scoring system is more sensitive as compared to RIPASA scoring system. However, Alvarado scoring system is less specific as compared to RIPASA scoring system. PPV and NPV of both the scoring systems is comparable. The diagnostic accuracy of Alvarado scoring system is greater 81.43% as compared with 80% in RIPASA scoring system. But the area under the ROC curve is more in RIPASA scoring system, so the diagnostic value of RIPASA scoring is more than Alvarado scoring. So it can be concluded that RIPASA scoring system offers a better diagnosis of Acute Appendicitis in Indian population. However, because of paucity of studies available on the relation of the two scoring systems with intraoperative and histopathological report, further prospective studies are required in this perspective.

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