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RESEARCH ARTICLE

CLINICAL STUDY OF ALVARADO VERSES RIPASA SCORE IN DIAGNOSING ACUTE APPENDICITIS

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ABSTRACT

Introduction: Acute Appendicitis is one of the most common surgical emergency encountered in hospitals making up 10% of all emergency abdominal surgeries. Early diagnosis and timely intervention is essential in preventing complications associated with Acute Appendicitis.

Methods: 100 patients of Acute Appendicitis were included in our study. A complete pre-operative workup was done in all patients. ALVARADO and RIPASA scoring was calculated and compared in terms of Intraoperative findings ,Sensitivity, specificity, Positive predictive value (PPV), Negative predictive value(NPV), diagnostic accuracy and negative appendectomy rates with respect to histopathology, as gold standard for diagnostic confirmation.

Results: 88 patients were having ALVARADO score>7 and 96 patients with RIPASA score >7.5, While as 12 patients had Alvarado score< 7 and 4 patients with RIPASA SCORE <7.5. Out of the100 patients operated, 93 patients were reported as having AA whereas 7 patients were reported as having normal Appendix. Among 88 patients who were having ALVARADO score of >7, 86 were having Appendicitis on Histopathological report and the remaining 2 were reported having normal APPENDIX. 12 patients who were having ALVARADO score <7, 7 were having. Appendicitis and 5 were having no appendicitis. out of 96 patients who were having RIPASA score>7.5, 92 were having Appendicitis where as other 4 patients didn't have AA. Patients with RIPASA score of<7, 1 patient had AA whereas 3 patients had no appendicitis on histipathological examination. On comparing both the scoring system in all the100patients, we found that sensitivity of RIPASA scoring is greater than ALVARADO scoring system 98.92 and 92.47 respectively, specificity of RIPASA scoring system is less than ALVARADO scoring system 42.85and71.42respectively.Positive predictive value of RIPASA scoring system is less than ALVARADO scoring system 95.83and 97.72 respectively. Negative predictive value of RIPASA scoring system greater than ALVARADO scoring system 75 and 41.66 respectively. Accuracy of RIPASA scoring system is greater than ALVARADO scoring system 95 and 91 respectively.

Conclusion: RIPASA scoring system is more sensitive(98.92%) as compared to Alvarado scoring system (92.47%). However Alvarado scoring system is more specific (71.72%) as compared to RIPASA scoring system (42.85%)

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INTRODUCTION

Acute Appendicitis (AA) is one of the most common surgical emergency in clinical practice with an estimated life time prevalenceof 1in7 approximately (Chong *et al*., 2010). It is a common cause of abdominal pain for which a prompt diagnosis and treatment is rewarded by a marked decrease in morbidity and mortality. Diagnosis of AA is based purely on clinical history and examination combined with few laboratory investigations. Based on clinical history, physical examination and laboratory findings, a number of scoring systems have been devised to aid in early diagnosis of AA and its prompt management including the Alvarado, Fenyo, Teicher, Ramirez and Christian scores (Ohman *et al*., 1995; Gallego *et al*., 1998). While the Alvarado score and the modified Alvarado score are the two most commonly used scoring systems. The reported sensitivity and specificity for the Alvarado and the modified Alvarado scores range from 53%–88%and75%–80%respectively (Alvarado, 1986). Several studies claim that these scoring systems were developed in western countries and have reported very low sensitivity and specificity of these scores in populations with a completely different ethnic origin and diet (Al-Hashemy and Saleem, 2004). Recently, the Raja Isteri Pengiran Anak Saleha Appendicitis (RIPASA) scoring system which includes more parameters than Alvarado system has been introduced to aid in the diagnosis of AA The RIPASA Score is a new diagnostic

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scoring system developed for the diagnosis of AA and has been shown to have significantly higher sensitivity, specificity and diagnostic accuracy compared to Alvarado Score, particularly when applied to Asian population (Chong *et al*., 2010).

MATERIAL AND METHODS

This study was conducted in postgraduate department of surgery, Government Medical College Srinagar from December 2014 to June 2016 on 100 patients with diagnosis of AA. Patients of either sex below 60 years, coming to the hospital casualty, clinically diagnosed as Acute Appendicitis who fulfilled the inclusion criteria of our study were included. All patients were evaluated on the basis of predetermined proforma and a written informed consent was obtained. A complete pre-operative workup was done in all patients which included a thorough Clinical history and physical examination. All patients were advised the investigations; Hemoglobin, Total Leukocyte Count, Shift of White Blood Cells to left on Peripheral Blood Film, Blood urea, serum creatinine, Serum electrolytes, Liver function test, Urine pregnancy test for females of reproductive age group, Ultrasound abdomen, X-Ray Abdomen erect and supine films and Urine-analysis. Parameters evaluated were ALVARADO and RIPASA scoring in every clinically diagnosed case of appendicitis. Intraoperative findings , Histopathological confirmation, Sensitivity, specificity, Positive predictive value (PPV), Negative predictive value(NPV), diagnostic accuracy and negative appendectomy rates in both the scoring systems were compared with respect to histopathology, as gold standard for diagnostic confirmation.

RESULTS

Out of the total of 100 subjects in our study Acute Appendicitis was found most common in the age group of 20-29 years and the least common in the age group of 0-9years.The mean age was 31.8 with the Standard deviation of ± 18.13 years, ranging from 0-59 year. Males Comprised of 73% percent of subjects while females comprised of 27% percent of subjects By performing ALVARADO and RIPASA scoring on patients in our study, we had 88 patients with ALVARADO score>7 and 96 patients with RIPASA score >7.5.While as 12 patients had Alvarado score< 7 and 4 patients with RIPASA SCORE <7.5.

Table 1. Distribution of patients as per ALVARADO and RIPASA scoring system

Scoring system	No. of patients	Percentage
ALVARADO SCORE>7	88	88
ALVARADO SCORE<7	12	12
RIPASA SCORE>7.5	96	96
RIPASA SCORE<7.5	4	4

Out of the100 patients operated, 93 patients were reported as having AA whereas seven patients were reported as normal Appendix. On correlating Histopathological results with the ALVARADO score of each subjects, we found that out of 88 patients who were having score of >7, 86 were having Appendicitis on Histopathological report and the remaining 2 were reported having normal APPENDIX. 12 patients who were having ALVARADO score <7, 7 were having Appendicitis and 5 were having no appendicitis. On correlating Histopathological results with the RIPASA score in each subject we found that out of 96 patients who were having score>7.5,92 were having Appendicitis where as other 4 patients didn't have AA.

Table 2. Correlation of alvarado score with histopathological results

Scoring system	Histopathological Results		Total
	Appendicitis	No appendicitis	
ALVARADO score>7	86	2	88
ALVARADO score<7	7	5	12
Total	93	7	100

In the other group of patients with RIPASA score of<7, 1 patient had AA whereas 3 patients had no appendicitis on histipathological examination. Fischer's exact test has been applied and RIPASA scoring system diagnosis correlates well with the histopathological diagnosis. P value (representing the probability of the occurrence of a given event)equal to 0.00084 which is statistically significant. The sensitivity and specificity of RIPASA scoring system in our study came out to be 98.92%and 42.85% respectively. The PPV and NPV were as 95.83% and 75% respectively. The diagnostic accuracy was 95%.

Scoring System	Histopathological Results		Total
	Appendicitis	No Appendicitis	
RIPASA score<7.5	92	4	96
RIPASA score>7.5	1	3	4
Total	93	7	100

Comparison between Alvarado and RIPASA scoring system in the diagnosis of AA. On comparing both the scoring system in all the100patients, we found that sensitivity of RIPASA scoring is greater than ALVARADO scoring system 98.92 and 92.47 respectively, specificity of RIPASA scoring system is less than ALVARADO scoring system 42.85and71.42respectively.PPV of RIPASA scoring system is less than ALVARADO scoring system 95.83and 97.72 respectively. NPV of RIPASA scoring system greater than ALVARADO scoring system 75 and 41.66 respectively. Accuracy of RIPASA scoring system is greater than ALVARADO scoring system 95 and 91 respectively.

Correlation between the ALVARADO scoring system and histopathologic severity of appendicitis

Analysing the severity of Appendicitis with the ALVARADO score,the severity of Appendicitis has been seen to increase with increase in the ALVARADO score. The mean score for acute, acute suppurative, acute gangrenous Appendicitis was as 7.1, 8.0 and 9.4 respectively.

Table 3. Correlation between the alvarado scoring system and histopathologic severity of appendicitis

Histopathological Finding	No. of patients	Mean alvarado score in each category
No Appendicitis	7	4.742
Acute Appendicitis	10	7.142
Acute Suppurative Appendicitis	41	8.012
Acute Gangrenous Appendicitis	42	9.412

Correlation between the RIPASA scoring system and histopathologic severity of appendicitis: Analysing the severity of Appendicitis with the RIPASA score, There is an increase in RIPASA Score with increase in Histopathologic severity of Appendicitis.The mean score for acute, acute suppurative, acute gangrenous Appendicitis was as 9.012, 10.891 and 12.012 respectively.

Table 4. Correlation between the ripasa scoring system and histopathologic severity of appendicitis

Histopathological Finding	No. of patients	Mean RIPASA score in each category
NoAppendicitis	7	7.512
AcuteAppendicitis	10	9.012
AcuteSuppurative Appendicitis	41	10.891
AcuteGangrenous Appendicitis	42	12.012

DISCUSSION

Acute Appendicitis is one of the most common surgical emergency encountered in hospitals making up 10% of all emergency abdominal surgeries. Surgeon's good clinical assessment is considered to be most important requisite in diagnosis of Acute Appendicitis. Several other condition can mimic this clinical condition. While CT scan can diagnose Acute Appendicitis 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; particularly in our state with limited resources (Muhammad Qasim Butt *et al*., 2014). Several scoring systems have been developed to aid in the diagnosis of AA. While Alvarado score and the modified Alvarado score are the two widely applied scoring systems. The accuracy of these scores in the diagnosis of AA is disappointingly low in Asian population and hence RIPASA scoring system has been designed for the diagnosis of acute appendicitis in the South Asian population (Murali Mohan and Rahul Inganal, 2014). So we applied and assessed Alvarado and RIPASA score in the diagnosis of Acute Appendicitis in our study, which comprised of 100 clinically suspected cases of Acute Appendicitis. RIPASA scoring system has the following parameters; Sex: Male (score1.0), Female(score 0.5), Age:<39.9 years (score1.0) and >40.0 years (score 0.5), RIF pain:(Score 0.5), Migration of RLQ pain (Score 0.5), Anorexia: (Scoreof1.0), Nausea and vomiting: (Scoreof1.0), Duration of symptoms: (score of 1for duration 48 hrs),RIF tenderness: (Score of1.0),RIF guarding: (Scoreof 2.0), Rebound tenderness: (Score of 1.0), Rovsing's sign(Scoreof 2.0), Fever: (Score of 1.0), Raised TLC (Score of 1.0), Negative urinalysis: (Score of 1.0), Foreign NRIC:(Score of 1.0).

In our study 93 patients (93%) were documented of having Appendicitis by histopathology while as 7 patients had no evidence of Appendicitis on histopathology. Comparing the histopathology findings with ALVARADO scoring, we noted that the sensitivity and specificity of ALVARADO scoring system in our study was 92.47% and 71.42% respectively. PPV and NPV were as 97.72% and 41.66% respectively. The diagnostic accuracy was as 91%. Comparing 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 98.92% and 42.85% respectively.PPV and NPV were as 95.83% and 75% respectively. The diagnostic accuracy was as 95%. These findings are in agreement with Bhabatosh *et al*. (2016), who also had a statistically significant association between RIPASA score more than7.5 and appendicitis. Comparing the RIPASA and ALVARADO scoring systems, we found that RIPASA score has a better sensitivity (98.92% vs 92.47%); NPV (75% vs 41.66%) and Diagnostic accuracy (95% vs 91%) than ALVARADOs core. In a study by Chong *et al*. (2011) the sensitivity, specificity, PPV, NPV and diagnostic accuracy of the RIPASA score were 98.0%,81.3%,85.3%,97.4% and 91.8% respectively when compared to Alvarado score with sensitivity, specificity, PPV, NPV and diagnostic accuracy of 68.3 %, 87.9 %,86.3 %,71.4 % and 86.5 % respectively. The authors of the RIPASA scoring system have claimed in this comparative prospective study that RIPASA score is better than Alvarado score in Asian settings (Srivastava *et al*., 2004). There is paucity of published studies, by other authors, comparing these scoring system. Comparing the two scoring systems, histopathologica land intraoperative findings, there are very few studies that correlate these scoring systems with the intraoperative and histopathological findings. In studies by Lewis FR and Althoubaity FK (Lewis *et al*., 1975; Althoubaity, 2006), they observed that all the gangrenous appendicitis were associated with Alvarado score more than 8.In our study we also noted the mean ALVARADO score of gangrenous appendicitis to be 9.4.The mean scores for acute appendicitis and acute suppurative appendicitis in our study were as7.14 and 8.01 respectively. In RIPASA scoring system, mean scores for AA, suppurative and gangrenous appendicitis were as 9.01, 10.89 and 12.01 respectively. There has been an increase in the score, in both the scoring systems, with increase in the histopathological severity.

Conclusion

From this study we found that RIPASA scoring system is more sensitive (98.92%) as compared to Alvarado scoring system (92.47%). However Alvarado scoring system is more specific (71.72%) as compared to RIPASA scoring system (42.85%). PPV of both the scoring systems is comparable, 97.72% for ALVARADO and 95.83% for RIPASA system. NPV of RIPASA scoring system is 75% as compared to 41.66% in Alvarado scoring system. The diagnostic accuracy of RIPASA scoring system is greater 95% as compared with 91% in Alvarado scoring system. There has also been an increase in scores in both the scoring systems with increase in severity of AA on histopathological report.

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