ORIGINAL ARTICLE

Reliability of Diagnosis of Acute Appendicitis by Clinical Assessment Through Modified ALVARADO Vs RIPASA Scoring System at Combined Military Hospital, Rawalpindi

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ABSTRACT

Objective: To determine the diagnostic accuracy of RIPASA (Raja Isteri Pengiran Anak Saleha Appendicitis) and Modified ALVARADO score in the diagnosis of acute appendicitis by using histopathology as a gold standard.

Study Design: A comparative cross-sectional study.

Place and Duration of Study: The study was carried out at the Department of Surgery, Combined Military Hospital (CMH) Rawalpindi, Pakistan from January 2020 to August 2020.

Methods: A total of 126 patients suspected of having acute appendicitis were included. All patients who had met the inclusion criteria were chosen via the process of consecutive sampling. Patients who had presented with right iliac fossa pain, migration of pain, anorexia, nausea, and vomiting and were admitted to the hospital were assessed prospectively using RIPASA and Modified ALVARADO scores. RIPASA (Raja Isteri Pengiran Anak Saleha Appendicitis) score $\geq$ 7.5 and Modified ALVARADO score > 7 were used to diagnose acute appendicitis. The diagnosis was confirmed postoperatively using a histopathological report. Every scoring system was assessed for validity by calculating sensitivity, specificity, diagnostic accuracy, negative predictive value, and positive predictive value.

Result: The results obtained from individuals recruited in the study showthat out of 126 patients, 70(55.6%) were male and 56(44.4%) were female. The mean age was 33.25±8.19 years. 83.3% of patients having RIPASA (Raja Isteri Pengiran Anak Saleha Appendicitis) score (≥7.5) and 68.3% of patients having Modified ALVARADO score (≥7) have met the criteria for acute appendicitis. The sensitivity and specificity of the RIPASA (Raja Isteri Pengiran Anak Saleha Appendicitis) score were 90.9% and 73.3% compared with 73.8% and 73.3% of the Modified Alvarado score.

Conclusion: The RIPASA (Raja Isteri Pengiran Anak Saleha Appendicitis) scoring system is a more convenient, accurate, and specific scoring system for our population than the Modified ALVARADO scoring system.

Keywords: *Appendicitis, Acute Abdomen, Diagnostic Techniques and Procedures, Emergency Treatment, Surgical Procedures.*

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Introduction

The emergency department of a tertiary care hospital receives many patients with acute abdomen in whom acute appendicitis is an important differential to rule out. The overall chance of acquiring this serious pathology in life is approximately 9% in males and 7% in females.[1,2] There are several causes for this sickness, which typically makes it difficult for surgeons to diagnose.[3,4] A comprehensive physical and medical history are

vital for the diagnosis, however delaying too long can increase morbidity and death. Both normal and aberrant presentations might be seen in patients.[5] Clinical intuition and credible laboratory inflammatory indicators and rating systems are often employed in the diagnosis process.[6] The importance of non-clinical diagnostic markers becomes more significant in patients presenting with atypical presentation.[7] Moreover, gender and extremes of age confound the clinical picture making the diagnosis a challenge.[8]

Appendectomy is the treatment of choice with a negative appendectomy rate in the range of 10-15% and the final diagnosis requires histopathologic examination of the specimen.[9] Over the past few decades' multiple criteria have been devised and were inquired for their usefulness in the detection of this illness.[10] Modified ALVARADO system is a convenient and practical tool for the diagnosis.[11] Modified ALVARADO scoring involves clinical and laboratory parameters and is effective in minimizing unnecessary appendicectomies.[12] Modified ALVARADO score has a sensitivity of 88% and specificity of 80% in comparison with Alvarado which is around 53.3% sensitive and 75.3% specific.[13,14] The RIPASA system of scoring is found to be more satisfactory and has high precision in diagnosing acutely inflamed appendicesdeveloped for our population.[15] A little while back, clinicians developed a novel clinical scoring system named the Raja Isteri Pengiran Anak Saleha appendicitis (RIPASA) score which had been put together in the year 2008. Noor Shehryar et al. in their study in 2020 revealed 98% sensitivity and 81.3% specificity for RIPASA score at $\geq$ 7.5 compared to 68.3% and 87.9% for Modified Alvarado score at >7 respectively.[16] Limited studies are available on the new score. A recent systemic review published on the global incidence of appendicitis identified peculiar risk factors in the development of appendicitis including recent industrialization, low dietary fiber, and tobacco use, which differ in our society from the rest of the population.[17]

Appendicitis with its protean manifestations makes it a diagnostic challenge requiring diagnostic tools like scoring systems that can accurately & timely diagnose this pathology and significantly decrease the rates of falsely diagnosed cases. In the busy routine of surgical emergency, it is of utmost importance that patients presenting with pain in the right iliac fossa may be timely identified for an acutely inflamed appendix. This study would provide us with the data that will help in comparing the effectiveness of both scoring systems. This study will also help us in devising the local SOPs for effective management of patients along with decreasing the mortality and expenses of the health care system.

Methods

This comparative cross-sectional study was carried out at the Department of Surgery, Combined Military Hospital (CMH) Rawalpindi, Pakistan for 6 months from January 2020 to August 2020. In this cross-sectional study, 126 patients suspected of acutely inflamed appendix were included. Patients of both genders were included, aged between 20 to 50 years. All patients who had met the inclusion criteria were chosen via the process of consecutive sampling. The Ethical Review Board of hospital was taken on board and their permission was sorted to collect data that will be used in our research vide letter no: 133/12/2020, dated: 6th March 2020. The patients were counseled, and their informed consent was taken before inclusion in the study. Patients with chronic diseases like chronic lung disease, diabetes, chronic renal disorder, hypothyroidism, CCF, gynecological causes like a cystic disease of ovaries, abscess of tubo-ovarian origin, torsion of ovaries, ectopic pregnancy, pelvic inflammatory disease and urological causes like urinary calculi, urinary tract infections were excluded.

All patients with pain in the right lower abdomen with positive migration towards RIF along with complaints of anorexia, nausea, and vomiting were included**.** Upon admission, relevant history, clinical examination, and investigations were performed. Both scores were quantified. Fourteen standard parameters constitute the RIPASA scoring system. There were eight standard parameters given in the Modified ALVARADO Scoring System. A value greater than 7.5 for the RIPASA and greater than 7 for Modified Alvarado suggested the diagnosis of an acutely inflamed appendix. All the evaluation score sheets thatwere used during this research study did not contain the actual guidelines and scores to

prevent bias. The surgical procedure for this acute presentation was entirely dependent upon the senior surgeon's discernment for this prospective comparative study. All patients underwent appendectomy performed by a surgeon with over 10 years of experience. Second-generation Cephalosporin (Cefuroxime Sodium) will be given preoperatively. The patients were operated on. The dissected tissue was preserved and was sent for the review and reporting of the histopathology team.

Postoperatively the patient was kept pain-free by Inj. Tramadol 30mg IV twice daily and Injection Paracetamol 1 gm IV thrice daily for the first 24 hours followed by Tab. Diclofenac 50mg PO thrice daily for the next 24 hours and SOS later. Postoperatively Injection of Ceftriaxone 1gm IV 12 hourly and Injection Flagyl 500mm IV for the first 24 hours followed by oral antibiotics. At the time of discharge, all the data collection forms that had been filled in were kept in a separate study folder with a lock and key. Variables were recoded to maintain confidentiality. Variables such as admission and discharge date, date of appendectomy procedure, surgeon's identifying information such as the signature and name, radiological investigations used, and postoperative complications experienced by the patients, if any, were also recorded in the score sheet. Histology reports confirming appendicular specimens, which were obtained from the emergency appendectomy were reviewed by one senior pathologist.

SPSS software version 20 was used to examine data. Parameters of variance for both the RIPASA and Modified ALVARADO were calculated. For diagnostic confirmation, a histopathology report is taken as the gold standard.

Results

The results obtained from individuals recruited in the study shows that out of 126 patients with a presumption of having acutely inflamed appendix who fulfill the inclusion criteria were taken up for the study having a mean age of 33.25±8.19 years. Out of 126, 82(65.1%) patients were classified among the age group 20-35 years and 44(34.9%) in the age group 36-50 years. Out of these patients, 70(55.6%) were male and 56(44.4%) were female. Diagnostic confirmation was done with a histopathology report. Histopathological examination demonstrated that 88.1% had and 11.9% did not have acute appendicitis. Moreover, 83.3% and 68.3% met the criteria for acute appendicitis on RIPASA and Modified Alvarado scoring system respectively. (Table-1).

Statistical results using both scoring systems are shown in Table-2 and Table-3 respectively.

In our study, data were stratified for the gender of patients. In males, the sensitivity of RIPASA was 95%, specificity was 75%, Positive predictive value was 96.6%, Negative predictive value was 54.5% and diagnostic accuracy was 90%. Whereas in males, the sensitivity of the Modified ALVARADO was 70.9%, specificity was 75%, Positive predictive value was

Table-1: Attributes of individuals with Acutely Inflamed Appendix

Variables	Categories	Number	Percentage
Age	20-35 years	82	65.1%
	36-50 years	44	34.9%
Gender	Male	70	55.6%
	Female	56	44.4%
Duration of Symptoms	<48 hours	84	66.7%
	>48 hours	42	33.3%
Acute Appendicitis on Modified ALVARADO score (≥7)	Positive	86	68.3%
	Negative	40	31.7%
Acute Appendicitis on RIPASA score (≥7.5)	Positive	105	83.3%
	Negative	21	16.7%
Acute Appendicitis on Histopathology	Positive	111	88.1%
	Negative	15	11.9%

Table-2: Results of RIPASA scoring system taking histopathology as gold standard

Variable		Histopathology		Total
		Positive	Negative	
RIPASA score	Positive	101 True positive	04 False positive	105
	Negative	10 False negative	11 True negative	21
Total		111	15	126

Table-3: Results of Modified Alvarado scoring system taking histopathology as the gold standard

Variable		Histopathology		Total
		Positive	Negative	
Alvardo score	Positive	82 True positive	04 False positive	86
	Negative	29 False negative	11 True negative	40
Total		111	15	126

95.6%, Negative predictive value was 25% and diagnostic accuracy was 71.4%. In females, the sensitivity of RIPASA was 90%, specificity was 71.4%, Positive predictive value was 95.8%, and Negative predictive value was 62.5% and has the diagnostic accuracy of 87.5%. Whereas in females, the sensitivity of Modified ALVARADO was 77.5%, specificity was 71.4%, Positive predictive value was 95%, Negative predictive value was 25% and diagnostic accuracy was 76.7% for prediction of an inflamed appendix taking histopathological report as the gold standard.

Discussion

An acutely inflamed appendix is among the common diagnoses in a surgical emergency, requiring urgent management and surgical intervention. A delay in diagnosis followed by surgical repair puts the patients at enhanced risk of perforation, infection, morbidity, and mortality. Different laboratory parameters, imaging, and scoring systems were developed over time to prevent these adverse outcomes and reduce negative appendicectomy rates. In pursuit of these goals RIPASA and Modified ALVARADO scoring system were designed which make use of patients' clinical data, physical exams, and lab results for the accurate detection of this illness.

Our research results are in coherence with many other studies. Nanjundaiah et al. compared scores with histopathology and found that the RIPASA has sensitivity and specificity of 96.2% and 90.5% and Modified ALVARADO score has 58.9% and 85.7% respectively.[18] Rodrigues et al found that 75% of patients were of less than forty years of age and there was a slight majority of females with 57(54.29%) patients being females. Histopathologically, about 81.8% of cases were identified as having acutely inflamed appendix. The Modified ALVARADO score had an increased positive predictive value, increased specificity and positive likelihood ratio than the RIPASA Scoring system.[19] Karami et al evaluated the RIPASA and Modified ALVARADO score and found the sensitivities for the same population to be 93.18% with a RIPASA score of > 8, 78.41% and Modified ALVARADO score of > 7.[20] Moreover, Butt found the sensitivity and specificity of 96.7% and 93.0% and Singh et al found it to be 90% and 92.22% respectively for the RIPASA.[21,22]

RIPASA Scoring System has proven to be a worth using a tool for the identification of cases of acute appendicitis, as it contains variables about the basic patient information and 2 routinely used laboratory parameters. Thus rendering the operating surgeon able, to make an urgent decision when it came to

patients presenting with pain in RIF. While using the RIPASA Scoring System, patients having greater than 7.5 score need operative intervention, while patients with a score < 7.0 were managed conservatively in the department's inpatient ward or were discharged and followed up at the hospital's outpatient clinic in case the symptoms reoccur. Delaysfor radiological investigation and patient burden can also be kept away by using the RIPASA Scoring System, thereby, decreasing states wellness program costs.[23-27]

Conclusion

In our part of the world, the RIPASA Scoring System has proven to be an effective method of identification of acutely inflamed appendix in comparison to the Modified ALVARADO score. Our results show that the RIPASA Scoring System achieves significantly higher diagnostic accuracy and sensitivity. Our results are in coherence with the international studies carried out in the past. Moreover, our research helps in directing efforts to prevent unnecessary patient admissions to hospitals and in averting costly imaging studies that were previously conducted on admitted patients with the discussed complaint. This, in turn, helps alleviate the burden on hospital administration. It's important to note that this study does not applyto patients at both ends of the age spectrum.

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RQ: Idea conception, study designing, data collection, data analysis, results and interpretation, manuscript writing, and proofreading

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IT: Data collection, manuscript writing, and proofreading