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Original research article

Study of accuracy and predictability of ripasa (raja isteripengirananaksaleha appendicitis) score in acute appendicitis

[1]Dr.Karunakar GK, [2]Dr.Sathish V Shivamallaiah, [3]Dr.Greeshma S, [4]Dr.Chandrashekar S

[1,3]Assistant Professor, Department of General Surgery, Kodagu Institute of Medical sciences, Madikeri, Karnataka, India

[2]Associate Professor, Department of General Surgery, Kodagu Institute of Medical sciences, Madikeri, Karnataka, India

[4]Assistant Professor, Department of General Surgery, KVG Medical College, Sulliya, Dakshina Kannada, Karnataka, India

Corresponding Author:
Dr.Chandrashekar S

Abstract

Acute appendicitis is one of the most common surgical emergencies with a life time prevalence of approximately one in 7.Despite being a common problem, it difficult to establish diagnosis particularly among the elderly and females of reproductive age, where host genitourinary and gynecological inflammatory conditions can mimic the signs and symptoms to those of acute appendicitis. A total of 202 patients were included in this study. RIPASA score was assessed. The diagnosis of appendicitis was made clinically aided by routine sonography of abdomen. After appendectomies, resected appendices were sent for histopathological examination. Out of 202 patients, 128 were male while remaining 74 patients were female with mean age of 28.88±12.24 years. Sensitivity of RIPASA score was 89.2%, specificity 57.4%, diagnostic accuracy was 88.11%, positive predictive value was 98.3%, and negative predictive value was 16%.RIPASA scoring system can be used as effective modality to establish the accurate diagnosis of acute appendicitis.

Keywords: Acute appendicitis, RIPASA score, histopathological examination

Introduction

The vermiform appendix is considered by most to be a vestigial organ, its inflammation which results in the clinical syndrome known as acute appendicitis[1].AA is the most common surgical emergency with a life time prevalence of approximately 1in 7. AA is a frequent reason for emergency hospital admission, and appendectomy is one of the most common emergency procedure performed in contemporary medicine. The risk of developing appendicitis is 8.6% for males and 6.7% for females in their life, with the highest incidence in the second and third decades[2-5].The diagnosis of AA is purely based on history and clinical examination. However sometimes, the clinical evaluation of patients with suspected AA become difficult. Accurate and Prompt diagnosis is imperative to decrease the frequency of complications, such as appendicular abscess, appendicular perforation and phlegmon formation which are associated with increase morbidity and mortality. Complication are more common in children and old age patients who have greater perforation rate with more chances of intraperitoneal spread of infection due to their poor localizing capability[6-7].

Acute appendicitis is one of the most common surgical emergency encountered in causality and reasons for emergency laparotomy. The lifetime risk of undergoing appendectomy is 12% for men and 25% for women[3, 5].One side there is a high negative appendectomy rate of 10% to 20% for the total population and as high as 26% in females of reproductive age, on the other side there a is fear of perforation due to delay in diagnosis leading to prolonged hospital stay and increased morbidity and mortality[3].This is also a cause for concern with significantly longer hospital stay, unnecessary hospital expenses, higher rate ofinfectious complications and high fatality rate[3].Byincreasingdiagnosticaccuracysurgeonscandecreasetherateofnegativeappendectomy and rate of perforation.

The diagnosis of AA most accurately is still a source of debate. It has historically been a clinical diagnosis combination of history, physical signs and laboratory analysis is used to balance the risk of delay in operative intervention against the removal of normal appendix. The clinical examination in diagnosing AA has been reported to have accuracy 70% to 87% (54% to 70% in children and 50% to70% in women of childbearing age)[8, 9].

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The classical history of AA is a vague periumbilical pain that localizes to the right lower quadrant, followed by anorexia, nausea, vomiting, which evolves over 12 to 24 hours. The symptom most consistently present are abdominal pain and anorexia[1].Other symptoms are more variable, physical findings include tachycardia, low grade fever, and the laboratory values of leucocytosis with a left shift. Tenderness to palpation, Obturator sign, and Rovsing's sign is less common. Approximately 20% to 30% of patients with suspected acute appendicitis are with atypical findings[9].

Routine laboratory blood examination is mandatory in all but not always very helpful with normal finding in some patients. Both leucocytosis and raised C- reactive protein (CRP) levels are non-specific and only indicate that the patient may have inflammatory pathology in the body. However, a rise of repeated leukocyte count is more specific in diagnosing AA[10, 11].

Radiological investigation like X-ray of the abdomen has an abnormal finding in only 8% of patients. These include presence of fecolith, dilated sentinel loop of bowel and blurring of psoas shadows[11].

Ultrasonography (USG) has significantly improved the diagnostic accuracy in suspected appendicitis with an overall accuracy of 85 -96%. The main limitation is that it is operator dependent with lower diagnostic rates with inexperienced radiologist[12, 13].

Computed tomography (CT) scan has also been widely studied for the diagnosis of inflamed appendix with high accuracy of 89 -98%. Limited availability and high costs limit it use in daily practice[14].

Diagnostic laparoscopy is useful in evaluating patients with right lower abdominal pain, especially in those with equivocal signs of AA. It has the additional benefit of being therapeutic. Premenopausal women benefit the most from this procedure. In one study selective laparoscopy has reduced the rate of negative appendectomy rate from 37% to 31%; by contrast, routine laparoscopy has reduced the negative appendectomy rate to 5%. Its unavailability, invasiveness and the need for expertise are its limitations in our context[15].

Early and accurate diagnosis is essential to reduce the morbidity and mortality as a consequence of delayed appendectomy and to reduce the number negative appendectomies. The RIPASA scoring system[16]was formulated in attempt to develop a simple and reliable scoring system with high diagnostic accuracy.

Methodology

After complete history, clinical examination and laboratory investigations RIPASA score was calculated and Patients with score 7.5 or >7.5 will undergo Appendectomy and Histopathological results were analyzed.

Initial evaluation of patients was in the Emergency Department and Surgery department. Ultrasound of abdomen and pelvis, total and differential leucocyte count, routine microscopic examination of the urine and other necessary investigation were sent. Detailed history, physical examination findings and investigation report were recorded on a preformed Performa. The diagnosis of acute appendicitis was done on the basis of clinical judgment. Subsequently RIPASA Scoringwas done and recorded. Even when the new score was less than 7.5, if clinical suspension was high patient were subjected for appendectomy.

The intraoperative findings were recorded and the removed appendix was sent in a 10% formalin containing jar for histological examination. Haematoxylin and eosin stain was used for the staining purpose. When there was focal collection of neutrophil within the lumen and lamina propria, appearance of Neutrophils at the base of the crypts adjacent to small defect in the epithelium along with focal erosion, ulceration, cryptitis and crypt abscess extending up to submucosa diagnosis of acute appendicitis was made. When there was extensive neutrophilic infiltrate extending deep in to or through the appendical wall along the fibrinous purulent coating of the serosa, histological diagnosis of acute suppurative appendicitis was made. If the mucosa was absent, the wall was necrotic and thrombosed vessels were present it was diagnosed as gangrenous appendicitis.

Histological reports were followed up and recorded in the preformed Performa sheet. The final diagnosis of acute appendicitis was based on histological diagnosis.

Statistical analysis

1. Frequencies, percentages, mean with standard deviation and p values were calculated.
2. Finding presented as tables, bar diagrams, pie chart.
3. Significance of the results was tested by using the independent T- test, chi- square test and Fisher's Exact Test.
4. The 'p' value of less than 0.05 was regarded as significant.

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Results

Table 1: RIPASA Score-wise Distribution of Patients

RIPASA Score	Frequency	Percentage
2-4.5	0	0
5-7.5	20	9.9%
8-10.5	21	10.3%
11-13.5	115	56.9%
14-16	46	22.77%
Total	202	100%

In this study of 202, none had RIPASAscore less than 4.5, in score between 5- 7.5, 8-10.5, 11-13.5 and 14-16 patients had histological evidence of acute appendicitis were20, 21, 115, and 46 respectively.
Out of 202 patients none had score less than 4.5, while 9.9% (20) had score between 5 and 7.5, 10.3%(21) had score between 8 and 10.5, majority 56.9% (115) were between score 11 to 13.5 and 22.77%had score more than 14.
RIPASA scores in acute appendicitis, acute on chronic appendicitis and chronic appendicitis group. The minimum RIPASA score in acute appendicitis group was 5 and maximum was 15 with a mean score of 10.24, while the mean score for acute gangrenous appendicitis group was 12.58,mean score for acute suppurative appendicitis group was 13.03,for chronic appendicitis it was 8.95 and for normal histopathological group it was 6.43 with a significant p value.

Table 2: HPE-wise RIPASA Mean Score Distribution of Patients-1

HPE	N	Minimum	Maximum	Mean	Std. Deviation
A ON C	8	4	12	9.71	2.690
AA	100	4	15	10.24	2.308
AGA	28	9	15	12.58	2.194
ASA	30	9	15	13.03	1.663
CA	23	4	13	8.95	3.429
N	7	4	12	6.43	3.359
RA	5	6	13	9.86	2.854
SAA	1	10.00	10.00	10.00	.
Total	202			10.67	2.853

Table 3: Comparison of HPE-wise RIPASA Mean Score of Patients-2

HPE	N	Minimum	Maximum	Mean	Std. Deviation	F-value (p-value)
N	7	4	12	6.43	3.359	10.18(.000)
SAA	1	10	10	10.00	-	
CA	20	4	13	8.95	3.429	
AA	174	4	15	11.07	2.536	
Total	202	0	15	10.67	2.853	

Table 4: Comparison of RIPASA Score according to Subtype of HPE

RIPASA Score	HPE								Total
	A ON C	AA	AGA	ASA	CA	N	RA	SAA	
2-4.5	0	0	0	0	0	0	0	0	0
5-7.5	1	6	0	0	7	4	2	0	20
8-10.5	1	11	4	2	2	1	0	0	21
11-13.5	6	79	5	7	11	2	4	1	115
14-16	0	4	17	22	2	0	1	0	46
Total	8	100	28	30	23	7	5	1	202

Table 5: Association of HPE with RIPASA Score

New Score	HPE				Total	p-value
	N	SAA	CA	AA		
2-4.5	0	0	0	0	0	0.005
5-7.5	4	0	7	9	20	
8-10.5	1	0	2	18	21	
11-13.5	2	1	11	101	115	
14-16	0	0	0	46	46	
Total	7	1	20	174	202	

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Above table shows definite association between RIPASA score and histopathological outcome with significant p value.

Table 6: Agreement between HPE and RIPASA Score Diagnosis with Cut off 7.5

New Score Diagnosis	HPE Diagnosis		Total	Kappa Value (p-value)
	Positive	Negative		
Positive	174	3	177	0.068.
Negative	21	4	25	
Total	195	7	202	

Kappa value is significant which shows there is agreement between the two variables that is preoperative RIPASA score with actual histopathological report.
The sensitivity and specificity of RIPASA ≥ in diagnosis of AA was 89.2% and 57.4% respectively. The overall diagnostic accuracy was 88.11% with positive predictive value of 98.30% and negative value of 16%.

Table 7: Diagnostic indices for RIPASA score

Index	New score	95% CI
Sensitivity	89.2%	79.72%-90.14%
Specificity	57.4%	29.04%-96.33%
Positive predictive value	98.3%	95.74%-99.85%
Negative predictive value	16%	5.11%-31.90%
Diagnostic accuracy	88.11%	80.05%-89.95%

Discussion

Numerous scoring systems have been developed to aid in preoperative diagnosis of AA, like Alvarado, Modified Alvarado score is being used worldwide[16].The new RIPASA scoring system found to be superior to the previously formulated scoring systems. This scoring system has the sensitivity, specificity and diagnostic accuracy was 95.4%, 97.4% and 96.5% respectively[16].
The sensitivity and specificity of RIPASA score7.5 ≥ in diagnosis of AA in our study was 89.2% and 57.4% respectively. The overall diagnostic accuracy was 88.11% with positive predictive value of 98.30% and negative value of 16%.
Negative appendectomy rate was low in our institute and the current study has also supported this fact. Previously the negative appendectomy rate was ten percent whereas this study has shown a negative appendectomy rate of six percent. Majority of our patients have delayed presentation which increases rate of positive clinical findings as well as laboratory parameters for AA. This has probably led to more accurate preoperative diagnosis and hence the lower rate of negative appendectomy in our setup.
This study had some limitations. Clinical evaluations were done by different residents, allowing place for interobserver differences in findings. Similarly the histological examination of the appendix was also done by different pathologist, in which opinion might differ, especially with regard to grading of severity of inflammation of the appendix.
Present study has a sensitivity and positive predictive value and diagnostic accuracy which is comparable with the original RIPASA scoring system with specificity at a lesser side. But sensitivity and specificity is better than many existing scoring systems as shown in the table.

Table 8: Comparison of present study with other scoring systems

No.	Scoring system	SN	SP	PPV	NPV
1	Alvarado	73-90	87-92	-	-
2	RIPASA	97.5	81.8	91.8	-
3	Present study	89.2	57.4	98.3	16

Conclusion

Acute appendicitis is a common surgical emergency. The diagnosis of acute appendicitis is mainly clinical judgment based on signs and symptoms added by investigations.in an attempt to increase the diagnostic accuracy and to reduce the negative appendectomy rate several scoring systems were developed. The newly introduced RIPASA SCORING SYSTEM formulated, based on clinical and laboratory parameters is simple and reliable with high diagnostic accuracy. RIPASA scoring system can be used as effective modality to aid in the accurate diagnosis of acute appendicitis along with clinical diagnosis.

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