VALIDATION OF RIPASA SCORING SYSTEM FOR DIAGNOSIS OF ACUTE APPENDICITIS

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ABSTRACT**BACKGROUND**

Acute appendicitis is one of the frequently encountered surgical emergencies. Although common, due to a variety of other gynaecological and genitourinary inflammatory conditions presenting in a similar fashion, diagnosis of acute appendicitis remains a difficult task. USG and CT are good aids in confirming the diagnosis; however, their cost and inaccessibility can be a drawback in certain places. Therefore, several scoring systems have been developed to aid in the clinical diagnosis of appendicitis including Alvarado and modified Alvarado scoring system. However, several studies have shown reduced sensitivity and specificity of these scoring systems when applied to a population with a completely different ethnic origin as compared to western countries where they were initially applied. Hence, RIPASA scoring system was developed to help in the diagnosis of acute appendicitis in the Asian countries.

The aim of this study is to validate the scoring system in our set-up.

MATERIALS AND METHODS

It is a descriptive study. Clinical data from 150 patients admitted at Basaveshwar Teaching and General Hospital with RIF pain and those who have undergone appendectomy was collected to generate the parameters. P value was derived from the ROC curve. Sensitivity and specificity were calculated using the 2 * 2 table.

RESULTS

Out of the 150 patients included in our study, 111 patients were diagnosed with acute appendicitis. At the optimal cut-off threshold score of 7.5 derived from the ROC, the sensitivity, specificity, Positive Predictive Value (PPV) and Negative Predictive Value (NPV) of the RIPASA score was 95.5%, 89.7%, 95% and 89%. The sensitivity, specificity, PPV, NPV for Alvarado were 81.1%, 87.2%, 81% and 87%.

CONCLUSION

RIPASA scoring system is a good diagnostic tool in case of acute appendicitis. RIPASA score is superior to Alvarado score when used for the diagnosis of acute appendicitis.

KEY WORDS

Appendicitis, Appendectomy, Diagnostic Techniques, Scoring Systems, Symptoms and Signs.

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BACKGROUND

Acute appendicitis is one of the most frequently encountered surgical emergencies with a lifetime prevalence rate of about one in seven people.¹ The incidence is 1.5 - 1.9 per 1,000 and men are affected 1.4 times more commonly than women.²

Acute appendicitis is diagnosed purely by a thorough clinical history and examination and with laboratory investigations such as elevated leucocyte count. In spite of the large number of patients encountered, acute appendicitis remains difficult to diagnose, especially among the elderly patients and females of reproductive age group, where several other urogenital and gynaecological inflammatory conditions can present with signs and symptoms that mimic those of acute appendicitis.³ To add to this, the timing of diagnosis is also crucial. Any delay in appendectomy caused

due to further investigations in an attempt to improve its diagnostic accuracy increases the risk of appendicular perforation leading to sepsis, increasing the morbidity and mortality.⁴ Any urgency compromising the diagnostic accuracy may lead to negative or unnecessary appendectomy, which is reported to be approximately 20%-40%.⁵

Ultrasonography or computed tomography imaging have helped improve the diagnostic accuracy of this condition.⁶ But their cost and the issue of availability have been a limiting factor in many places.

Therefore, several scoring systems have now been developed and studied for the diagnosis of acute appendicitis. The Alvarado score and the modified Alvarado score are the two most popularly used scoring systems.^(5,7) However, several studies have reported reduced sensitivity and specificity of these scoring systems when applied to a population with a completely different ethnic origin and diet as compared to western countries where they were initially applied.^(8,9) As a result, a new scoring system was developed in order to aid the diagnosis of acute appendicitis in the Asian countries- the RIPASA scoring system.

The aim of this study is to validate the RIPASA scoring system in our set-up.

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Aims and Objectives

To validate the RIPASA scoring system in the diagnosis of a suspected case of acute appendicitis.

MATERIALS AND METHODS

It is a Descriptive Study-

- From Sep 2016 to Sep 2017, all the patients presenting with RIF pain were recruited in this study.
- Patients who presented with right iliac fossa pain to Basaveshwar Hospital and those who underwent appendectomy were included.
- Both Alvarado and RIPASA scores were applied to all the patients. The true positive rate, the true negative rate, the false positive rate and the false negative rate was calculated for both the scoring systems and accordingly conclusions were drawn.
- Statistical testing was conducted with the Statistical Package for the Social Science System (SPSS) version 20. The sensitivity was calculated and analysed comparatively with a Chi-square test and using histopathology as gold standard.

RESULTS

Out of the 150 patients included in our study, 111 patients were diagnosed with acute appendicitis.

Age	Percentage Distribution
<20	15%
20-29	39%
30-39	31%
40-49	8%
50-59	5%
>60	2%
Age Distribution	

The most common age group of patients in this study was between 20 - 29 with 58 patients (39%) followed by 30 - 39 years (31%).

Sex	Number	Percentage
Male	104	69%
Female	64	31%
Gender distribution of the Patients Studied		

Among the 104 males in this study, 76% (n= 79) had appendicitis. Among the 46 females, 70% (n= 32) had appendicitis.

Symptomatology

The study included all patients presenting with RIF pain. A total of 150 patients with right iliac fossa pain were included in this study.

Migration of Pain	Number	Percentage
Present	88	59%
Absent	62	41%
Migration of Pain		

Among the 88 patients with history of migration of pain to right iliac fossa, 84 patients had appendicitis (95%) which was statistically significant ($p < 0.01$).

Anorexia	Number	Percentage
Present	44	29%
Absent	106	71%
Anorexia		

36% of the patients with appendicitis gave a history of anorexia.

Nausea and Vomiting	Number	Percentage
Present	49	33%
Absent	101	71%
Nausea and Vomiting		

A total of 49 (33%) of the patients gave a positive history of nausea and vomiting.

Duration of Symptoms	Number	Percentage
< 48 hours	97	65%
> 48 hours	53	35%
Duration of Symptoms		

Among the 150 patients, 65% (n= 97) presented to us with a history lasting less than 2 days. 71% of the patients with appendicitis gave history lasting < 48 hours.

SIGNS

RIF Tenderness	Number	Percentage
Present	134	89%
Absent	16	11%
Right Iliac Fossa Tenderness		

A total of 135 (89%) patients had right iliac fossa tenderness on examination. 99% of the patients with appendicitis had RIF pain.

Rebound Tenderness	Number	Percentage
Present	91	61%
Absent	59	39%
Rebound Tenderness		

A total of 91 (61%) of the patients had rebound tenderness on examination. 79% of the patients with appendicitis had rebound tenderness

Fever	Number	Percentage
Present	19	13%
Absent	131	87%
Fever		

Only 19 (13%) of our patients had fever. 15% of the patients with appendicitis had fever.

Guarding	Number	Percentage
Present	26	17%
Absent	124	83%
Guarding		

A total of 26 patients (17%) had guarding. All the patients with guarding and RIF tenderness had appendicitis. Only 23% of the patients with appendicitis had guarding.

Rovsing's Sign	Number	Percentage
Present	45	30%
Absent	105	70%
Rovsing's Sign		

45 patients (30%) had Rovsing's sign positive on examination. 40% of the patients with appendicitis had Rovsing's sign positive.

Investigations

Raised TC	Number	Percentage
< 11000	37	25%
> 11000	113	75%
Raised Total Leucocyte Count		

113 patients (75%) had a total count of more than 11,000. 92% of the patients with appendicitis had raised TC.

Shift to Left	Number	Percentage
Present	108	72%
Absent	42	28%
Shift to Left		

	Appendicitis+	Appendicitis-
Alvarado > 7	81%	13%
Alvarado < 7	19%	87%
Predictive value of Alvarado Score		

The Alvarado Score was able to pick up 90 (81%) of the 111 cases diagnosed with Appendicitis.

The Alvarado score has-

- True positive rate of 81%
- True negative rate of 87%
- False positive rate of 19%
- False negative rate of 13%

The sensitivity of Alvarado score is 81.1% and specificity is 87.2%.

	Appendicitis+	Appendicitis-
RIPASA > 7.5	95%	11%
RIPASA < 7.5	5%	89%
Predictive value of the RIPASA Score		

The RIPASA score was able to pick up 106 (95%) of the 111 cases of appendicitis.

The RIPASA Score has-

- True positive rate of 95%.
- True negative rate of 89%.
- False positive rate of 5%.
- False negative rate of 11%.
- The sensitivity of RIPASA score is 95.5%.
- The specificity of RIPASA score is 89.7%.

Test Result Variable (s)	Area	Std. Error ^a	Asymptotic Sig. ^b	Asymptotic 95% Confidence Interval	
				Lower Bound	Upper Bound
Alvarado Score (and It; 7=1, and gt; 7=2)	.841	.038	.000	.767	.916
RIPASA Score (and It; 7.5=1, and gt; 7.5=2)	.926	.031	.000	.866	.986
Area Under the Curve					

This figure shows the ROC curve for both RIPASA and ALVARADO scoring systems.

The area covered under the RIPASA score of 92.6% is greater than that of the Alvarado score of 84%, which is statistically significant ($p < 0.001$).

DISCUSSION

Acute appendicitis is one of the most frequently encountered surgical emergencies, making emergency appendectomy accountable for about 10% of all emergency abdominal surgeries.^(10,11)

The word appendicitis refers to inflammation of appendix vermiformis. The literal meaning of appendix is an appendage- anything that is attached to a large or a major part as a tail or a limb. The Latin word vermiform means worm-like structure.¹²

In 1735, on December 6th, Claudius Amyand performed the first appendectomy.¹²

McBurney in New York in 1889 gave description of symptoms and signs of acute appendicitis and pioneered removal of acutely inflamed appendix before perforation occurred and also devised the muscle splitting incision (Grid iron) named after him.¹²

Acute appendicitis is one of the most frequently encountered surgical emergencies. The diagnosis of acute appendicitis is based mainly on clinical history, thorough clinical examination combined with investigations.¹²

Appendicitis is thought to be due to luminal obstruction. The appendix is vulnerable to obstruction owing to its small lumen.

The obstruction may be due to faecolith, foreign bodies, lymphoid hyperplasia, stricture, tumours etc.

Common causative organisms are *E. coli*, *Streptococcus viridans*, *Pseudomonas aeruginosa*, *Bacteroides fragilis*.¹²

Patients usually present with vague abdominal pain that is most commonly periumbilical in origin. Anorexia is often present, as is nausea with or without vomiting.

As the condition progresses and the appendiceal tip becomes inflamed, resulting in peritoneal irritation. The pain localises to its classic location in the right lower quadrant. Tachycardia and mild dehydration are often present. Fever may also be present.

Abdominal examination typically reveals a quiet abdomen with tenderness and guarding on palpation of right lower quadrant. Tenderness is classically over McBurney's point. Psoas sign, Rovsing sign and obturator sign may be positive.¹³

Leucocytosis is present in 90% of the cases. Urine analysis is typically normal. Ultrasonography of the abdomen may show inflamed appendix. Sensitivity is reported to be 78% to 83% and specificity 83% to 93%.

CT Scan

Highly effective and accurate with sensitivity of 90% to 100% and specificity of 91% to 99%, but the drawback being its high cost.¹⁴

Scoring Systems

Alvarado Score

- The Alvarado score was described in 1986 and has been validated in adult surgical practice.
- The classical Alvarado score included left shift of neutrophil maturation yielding a total score of 10.

ALVARADO (MANTRELS) SCORE		SCORE
SYMPTOMS	MIGRATORY RIF PAIN	1
	ANOREXIA	1
	NAUSEA AND VOMITING	1
SIGNS	TENDERNESS RIF	2
	REBOUND TENDERNESS	1
	ELEVATED TEMPERATURE	1
LAB INV.	LEUCOCYTOSIS	2
	SHIFT TO LEFT	1
TOTAL		10

Modified Alvarado Score

- Kalan et al removed the left shift of neutrophil maturation parameter and gave a modified score.
- The modified Alvarado score yields a total of 9. Patients having a score of 1 - 4 are unlikely to have acute appendicitis.
- Patients having a score of 5 - 6 have possible diagnosis of acute appendicitis, not convincing enough to have urgent surgery.
- Patients with a score of 7 - 9 are regarded as patients with acute appendicitis.¹⁵

RIPASA (Raja Isteri Pengiran Anak Saleha) Score

RIPASA system is a new scoring system validated by Chong et al.¹⁵

RIPASA SCORE	Score	ALVARADO	Score
MALE	1	MIGRATORY RIF PAIN	1
FEMALE	0.5	ANOREXIA	1
AGE <39	1	NAUSEA	1
>40	0.5	TENDER RIF	2
RIF PAIN	0.5	REBOUND TENDERNESS	1
MIGRATION OF RLQ	0.5	ELEVATED TEMPERATURE	1
ANOREXIA	0.5	LEUKOCYTOSIS	2
NAUSEA AND VOMITING	0.5		
DURATION <48 HRS	1		
>48 HRS	0.5		
RIF TENDERNESS	1		
RIF GUARDING	2		
ROVSING SIGN	2		
REBOUND TENDERNESS	1		
FEVER	1		
RAISED TC	1		
NEGATIVE URINE ANALYSIS	1		
FOREIGN NATIONALITY	1		

CONCLUSION

- RIPASA scoring system is an easy and reliable diagnostic tool in cases of acute appendicitis.
- RIPASA scoring system is superior to the Alvarado scoring system for the diagnosis of acute appendicitis.

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