

COMPARISON BETWEEN RIPASA AND ALVARADO SCORING IN DIAGNOSING ACUTE APPENDICITIS

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ABSTRACT

BACKGROUND

Acute appendicitis is one of the most common cause of acute abdominal pain and emergency appendicectomy is the most common emergency surgery. The diagnosis of appendicitis is confirmed by histopathological examination that is not possible before appendicectomy. The negative exploration remains high in the rate of about 15-30%.¹ Scoring systems based on history, clinical examination and basic investigations are there in aiding the diagnosis of acute appendicitis and decreasing negative exploration. This study compares RIPASA and ALVARADO scoring systems in diagnosing acute appendicitis.²

MATERIALS AND METHODS

A comparative study was done between November 2014 to June 2015. Patients diagnosed as acute appendicitis in Department of General Surgery, Government Royapettah Hospital. 100 of them are to be selected on the basis of nonprobability (purposive) sampling method. After considering the inclusion and exclusion criteria, 96 were enrolled into the study. A full history, clinical examination and both scoring systems were done on the patients.

RESULTS

In 96 patients, 46 patients (48%) were male and 50 patients (52%) were female. 65 patients underwent emergency appendicectomy based on the clinical decision. The sensitivity and specificity of the RIPASA scoring system was 98.0% and 80.43%, respectively. The sensitivity and specificity of the ALVARADO scoring system was 80.43% and 86.95%, respectively. The PPV (positive predictive value) of RIPASA and ALVARADO was 84% and 85%, respectively. The NPP (negative predictive value) of RIPASA and ALVARADO was 97% and 71%, respectively. The diagnostic accuracy was 89% for RIPASA and 77% for ALVARADO.

CONCLUSION

The RIPASA scoring is better than ALVARADO scoring in the diagnosis of acute appendicitis.

KEYWORDS

Acute Appendicitis, ALVARADO Scoring, RIPASA Scoring.

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BACKGROUND

Appendicitis is one of the common causes of abdominal pain. Western literatures report that 6% of population have risk of suffering from appendicitis during their lifetime.^{3,4} Although, the overall mortality from appendicitis has dropped from about 26% to less than 1% with the advent of antibiotics and early surgical intervention in elderly, it is approximately 5 to 15%.⁵ The morbidity due to appendiceal perforation (rupture) and incidence of rupture ranges from 17% to 40%. The perforation rate is higher in elderly and

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children. Failure to make an early diagnosis converts acute appendicitis to perforated appendicitis, a disease with potential complications including intra-abdominal abscesses, wound infection and death.

Thus, diagnosing acute appendicitis accurately is very important in order to decrease morbidity and mortality.⁶

DEFINITION

Characteristic	Score
M=migration of pain to the RLQ	1
A=anorexia	1
N=nausea and vomiting	1
T=tenderness in RLQ	2
R=rebound pain	1
E=elevated temperature	1
L=leucocytosis	2
S=shift of WBC to the left	1
Total	10

Table 1. Interpretation of the ALVARADO Score

	SCORE
Patient demographic	
Female	0.5
Male	1.0
Age <39.9 years	1.0
Age >40 years	0.5
Symptoms	
RIF Pain	0.5
Pain migration to RIF	0.5
Anorexia	1.0
Nausea and vomiting	1.0
Duration of symptoms <48 hrs.	1.0
Duration of symptoms >48 hrs.	0.5
Signs	
RIF tenderness	1.0
Guarding	2.0
Rebound tenderness	1.0
Rovsing sign	2.0
Fever >37 C, <39 C	1.0
Investigations	
Raised WCC	1.0
Negative urinalysis	1.0
Additional scores	
Foreign NRIC	1.0
Total	
Table 2. Interpretation of RIPASA Scoring	

Aim of Study

To compare RIPASA and ALVARADO scoring in diagnosing acute appendicitis.

MATERIALS AND METHODS

Patients who presented to the Emergency/General Surgery, Department of Government Royapettah Hospital, Kilpauk Medical College for a period of 8 months from November 2014 to July 2015 with right iliac fossa pain and who were suspected of acute appendicitis were considered for the study with-

Inclusion Criteria

Patients of all age groups admitted with complaints of RIF pain with clinical suspicion of acute appendicitis.

Exclusion Criteria

1. Patients with pain >5 days suspected to have appendicular mass.
2. Features of peritonitis.
3. Previous history of urolithiasis or pelvic inflammatory disease.

100 consecutive patients with clinical suspicion of acute appendicitis were enrolled into the study. After satisfying the inclusion and exclusion criteria, 96 patients formed the study population. The detailed history, clinical examination, laboratory investigations were done, which included routine haematological investigations, urine routine, x-ray KUB and USG abdomen and pelvis in some equivocal cases. Two

specially-designed proforma was filled in for each patient. These proforma had general information about the patient plus eight variables based on the ALVARADO scoring system and another proforma had similar patient details and the fourteen variables based on RIPASA scoring system.

The decision to operate on the patient (vs. conservative line of management) was based solely on the clinical suspicion of an experienced surgeon who was not part of/involved in the study. Scoring was performed at every review until a decision was made from either appendectomy or continued conservative line of management. The diagnosis of acute appendicitis was confirmed by operative findings and histopathological assessment of the appendectomy specimen with the ultimate criterion for the final diagnosis of acute appendicitis being the histological demonstration of polymorphonuclear leucocytes throughout the thickness of the appendix wall. Those patients who were treated conservatively and subsequently discharged were reviewed in the surgical outpatient within a week.

Sensitivity, specificity, positive predictive value and negative predictive value for both these scorings were calculated and analysed comparatively with a Chi-square test (SPSS Software).

RESULTS

The results are as follows-

Out of the 100 patients recruited, only 96 satisfied the inclusion and exclusion criteria. In the present study, the minimum age was 14 yrs. and the maximum age was 74 yrs. The number of patients was highest in the age group of 20 to 30 years followed by 30 to 40 years. The least was in the age group of 70 to 80 years. Mean age was 30.58. Standard deviation- 12.3 (age range 14-74 yrs.). Median age was 28 years. Out of the 96 patients, 46 were male and 50 were female. The male-to-female ratio was 1:1.08.

Age (Years)	Total
<20	16
20-30	41
30-40	23
40-50	8
50-60	6
60-70	1
>70	1
Table 3. Age Distribution	

The operative details of the study group were as follows-

Demographic	Value
Gender	
1.Male	46
2.Female	50
Mean age ±SD	30.58±12.3
Total Emergency Appendectomy	
1. Confirmed histology of acute appendicitis	50

2. Negative histology for acute appendicitis	15
Mean Hospital stay±SD	4.6±2.0
Perforated Appendicitis	3
Postoperative wound infection	5
Patients discharged alive	96

Table 4. Patient's Demographics (n=96)

65 patients underwent emergency appendectomy. This was based on the surgeon's clinical judgment. Out of these, 50 cases were confirmed histologically as having acute appendicitis or its complications. This included, four cases of gangrenous appendicitis and four cases of perforated appendicitis. 15 of the operated patients had a normal histology of the appendix. This indicated a negative appendectomy rate of 23% when based only on clinical decision. The mean hospital stay duration was 4.6±2.0 days. Five out of the 65 patients operated, developed postoperative complications, mainly superficial wound infection. All 65 patients were discharged alive.

	Positive Histology	Negative Histology
RIPASA >7.5	49	9
RIPASA <7.5	1	37

Table 5. Distribution of Patients According to RIPASA

	Estimated Value	95% Confidence Interval Lower Limit	95% Confidence Interval Higher Limit
Prevalence	0.520833	0.416994	0.622987
sensitivity	0.98	0.879892	0.998955
Specificity	0.804348		
For any particular test, the probability that it will be:			
Positive	0.604167	0.49894	0.70096
Negative	0.395833	0.29904	0.50106
For any particular positive test result, the probability that it will be:			
True Positive (Positive Predictive Value)	0.844828	0.720749	0.92233
False positive	0.155172	0.07767	0.279251
For any particular negative test result, the probability that it will be:			
True negative (Negative Predictive Value)	0.973684	0.84566	0.998625
False negative	0.026316	0.001375	0.15434

Table 7. Test Characteristics for RIPASA Scoring Applied on the study Population

Variable	RIPASA>7.5	ALVARADO>7.0	p-Value
Sensitivity	98.0% (87.98-99.89)	68% (53.16-80.0)	<0.0001
Specificity	80.43% (65.62-90.13)	86.95% (73.04-94.58)	
Positive predictive value	84.44% (72.07-92.23)	85% (60.47-93.75)	
Negative predictive value	97.36% (84.56-99.86)	71.42% (57.59-82.3)	<0.0001
Diagnostic accuracy	89.58%	77.08%	<0.0001
Negative appendectomy rate	15.51%	15%	

Table 8. Comparison between the RIPASA and ALVARADO Scoring Systems with Respect to Different Variables

Score in % (95% confidence interval).

According to RIPASA score, 58 patients were diagnosed to have appendicitis. Out of these 58, 49 patients had evidence of appendicitis histopathologically. Nine patients were falsely diagnosed to have appendicitis by RIPASA scoring system. Out of the 38 patients diagnosed by RIPASA as not having appendicitis, only one was missed.

	Positive Histology	Negative Histology
ALVARADO score >7	34	6
ALVARADO score <7	16	40

Table 6. Distribution of Patients According to ALVARADO Scoring

According to ALVARADO score, 40 patients were diagnosed to have appendicitis. Out of these 40 patients, 34 patients had evidence of appendicitis histopathologically. Six patients were falsely diagnosed to have appendicitis by ALVARADO scoring system. Out of 56 patients diagnosed by ALVARADO as not having appendicitis, 16 patients were missed by this scoring system.

COMPARISON

At the optimal cut-off threshold score of 7.5 for the RIPASA score, the calculated sensitivity and specificity were 98% (95% confidence interval (CI) 87.98%-99.89%) and 80.43% (95% CI 65.62%-90.13%), respectively compared with 68% (95% CI 53.16%-80.0%) and 86.95% (95% CI 73.04%-94.58%), respectively for ALVARADO score at an optimal cut-off threshold of 7.0.

- The PPV and NPV for the RIPASA score were 84.44% and 97.36%, respectively compared with 85% and 71.42%, respectively for the ALVARADO score.
- This shows that the negative predictive value was significantly higher for the RIPASA score compared to that of the ALVARADO score (p<0.0001).

DISCUSSION

Acute appendicitis is the most common acute surgical condition in emergency. The diagnostic accuracy of clinical assessment of acute appendicitis varies from 50%-80%. The clinical diagnosis is especially difficult in the very young, the elderly and in the women of reproductive age group. Appendicitis still poses a diagnostic challenge and many methods have been investigated to try to reduce the removal of a normal appendix without increasing the perforation rate. Radiological methods such as ultrasonography and computed tomography as well as laparoscopy are all methods that have been investigated previous. Many diagnostic scores have been advocated, but most are complex and difficult to implement in a clinical situation.

The ALVARADO score, first described in 1986, is a simple scoring system. The ALVARADO criterion for the diagnosis of acute appendicitis, which was later modified to accommodate additional parameters along with original ALVARADO scoring system.² Since then, the modified ALVARADO has been the most widely used clinical scoring for acute appendicitis. Recent studies have indicated that the accuracy of diagnosing acute appendicitis in Asian populations using the ALVARADO scoring gave much poorer results when compared to western literature. This led to the development of a newer scoring system in 2010 by Chong et al that included 14 fixed parameters.⁷ Data showed significantly increased the accuracy of diagnosing acute appendicitis in the Asian populations.

Our study compared the widely used ALVARADO scoring with the newer RIPASA scoring in our population group.^{7,8} When the RIPASA score was applied, 98.0% of patients who actually had acute appendicitis were correctly diagnosed and placed in the high-probability group (RIPASA score >7.5) and managed appropriately, compared to only 68% when using the ALVARADO score on the same population sample.

Thus, the ALVARADO score failed to diagnose 28.5% of patients (n=16) with acute appendicitis and wrongly classified them in the low-probability group (ALVARADO score <7.0). The difference in diagnostic accuracy of 12.5% between the RIPASA score and ALVARADO score was statistically significant (Table 8. $p < 0.0001$) indicating that the RIPASA score is a much better diagnostic tool for the diagnosis of acute appendicitis in our patient population. Similarly, for patients who were classified in the low-probability group, i.e. true negative group with RIPASA score <7.5 and ALVARADO score <7.0, the RIPASA score again outperformed the ALVARADO score by correctly diagnosing 97.3% of patients who did not have acute appendicitis compared with the ALVARADO score, which only managed to correctly diagnose 71.42%.

The RIPASA score is a useful, rapid diagnostic tool for acute appendicitis, especially in the settings of the emergency as it requires only the patient's demographics (age, gender), a good clinical history (RIF pain, migration to RIF, anorexia, nausea and vomiting), clinical examination (RIF tenderness, localised guarding, rebound tenderness, Rovsing's sign and fever) and two simple investigations (raised white cell count and negative urinalysis performed at

triage, which is defined as an absence of red and white blood cells, bacteria and nitrates). Thus, in the emergency setting, a quick decision can be made upon seeing patients with RIF pain. Those with a RIPASA score >7.5 need admission and further management, while patients with a RIPASA score <7.0 can either be observed. With its high sensitivity (98%) and NPV (97.3%), the RIPASA score can also help to reduce unnecessary and expensive radiological investigations such as routine CT imaging.^{9,10,11}

CONCLUSION

In conclusion, the RIPASA score is currently a much better diagnostic scoring system for acute appendicitis compared to the ALVARADO score. RIPASA had significantly higher sensitivity, NPV and diagnostic accuracy in our study group. The 14 fixed parameters can be easily and rapidly obtained in any population setting by taking a complete history and conducting a clinical examination and two simple investigations. In remote settings or emergency, a quick decision can be made with regards to referral to an operating surgeon or observation. The use of RIPASA scoring would help in decreasing the unwarranted patient admissions and also expensive radiological investigations.

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