To Determine Validation of RIPASA Score in Diagnosis of Suspected Acute Appendicitis and Histopathological Correlation with Applicability to Indian Population: a Single Institute Study

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Abstract

Although acute appendicitis is one of the most common surgical emergencies worldwide, timely accurate diagnosis is always difficult for a surgeon even after availability of recent diagnostic tools. Our study is to determine validation of RIPASA score in diagnosis of acute appendicitis and histopathological correlation. A prospective study of 200 patients presented to emergency or surgical opd with right iliac fossa pain and suspected to have acute appendicitis were included in our study. RIPASA score calculated but appendectomy done on the basis of clinical assessment and hospital protocol and histopathological correlation done with a score. A score of 7.5 is cut off threshold, results compared with previous studies. In our study of 200 patients, M:F ratio of 1.56:1. Sensitivity of the RIPASA score was 95.89% with specificity 75.92% and diagnostic accuracy of 90.5%, expected and observed rate of negative appendectomy were 8.5 and 12.35%, respectively. So there is net reduction in negative appendectomy rate by 3.85%. Data analysis done with Statistical Package for Social Science (SPSS) version 21.0. RIPASA score at a cutoff value of 7.5 is easier, cheap, and better diagnostic tool in equivocal case of right iliac fossa pain in Indian scenario of limited availability of recent diagnostic tool in remote areas and affordability of these tool in the available set up, simultaneously, it also helps to reduce negative appendectomy rates.

Keywords RIPASA score · Acute appendicitis · Histopathological correlation · FNRIC (Foreign National Registration Identity Card)

Introduction

Acute appendicitis is one of the most common surgical emergencies encountered in every surgeon's life with a life-time prevalence approximately 8% [1]. Even in the present

scenario of recently developed new diagnostic techniques accurate diagnosis of acute appendicitis and decreasing the burden of negative appendectomy rate remains a challenge for surgeons. Various scoring systems have been developed to assist diagnosis of acute appendicitis. These scores combine clinical history and physical examination with few laboratory parameters. Alvarado and modified Alvarado scores are one of the most popular and most common used scores but validity of these scores are low in Asian population. Recently, Raja Isteri Pengiran Anak Saleha Appendicitis (RIPASA) score has been developed for the diagnosis of acute appendicitis in Asian population by Chee Fui Chong, Department of Surgery RIPAS Hospital Brunei, Darussalam [2]. Raja Isteri Pengiran Anak Saleha Appendicitis (RIPASA) score is a simple qualitative scoring system based on 14 fixed parameters (two demographic, five clinical symptoms, five clinical signs, and two clinical investigations, and one additional parameter FNRIC) (Table 1).

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Table 1 Shows the RIPASA score sheet

		Score
1	Patients	
	Female	0.5
	Male	1.0
	Age < 39.9 years	1.0
	Age > 40 years	0.5
2	Symptoms	
	RIF pain	0.5
	Pain migration to RIF	1.0
	Anorexia	1.0
	Nausea and vomiting	1.0
	Duration of symptoms < 48 h	1.0
	Duration of symptoms > 48 h	0.5
3	Signs	
	RIF tenderness	1.0
	Guarding	2.0
	Rebound tenderness	1.0
	Rovsing sign	2.0
	Fever > 37 °C	1.0
4	Investigations	
	Raised TLC	1.0
	Negative urine analysis	1.0
5	Additional score	
	Foreign national registration identity card	1.0
	Total maximum score	17.5

Our study conducted to determine validation of RIPASA score in Indian population and diagnosis of acute appendicitis with histopathological correlation during the period December 2014 to January 2017.

Materials and Methods

We conducted our study in tertiary care center government hospital Ajmer in central Rajasthan (India) after ethical clearance and included 200 patients presented to emergency or surgical opd with right iliac fossa pain and suspected to have acute appendicitis during the period of December 2014 to January 2017. From our study, we have excluded children < 15 years of age, patients with lump in the right iliac fossa, patients with history of trauma, pregnant female, and patients already on treatment for pelvic inflammatory disease or urolithiasis.

After initial assessment of patients presenting to the outpatient department or emergency department in JLN medical college hospital, Ajmer with symptoms and signs suggestive of acute appendicitis, who met the inclusion criteria admitted and are initially subjected for detailed history taking, clinical examination, and investigations like hematological

investigations, urine routine, X-ray abdomen/chest, USG abdomen, and CT scan as required.

Following which they were evaluated using the RIPASA scoring system but appendectomy done on the basis of clinical assessment and hospital protocol, histopathological correlation done with a score. A score of 7.5 was considered a cutoff value for high probability of acute appendicitis.

A specially designed Performa was filled in for each patient. These Performa had general information about the patient plus eight variables based on RIPASA scoring system. Then, the total score was calculated for each patient and based on the results, patients were divided into four groups (Table 2).

Diagnosis of acute appendicitis was confirmed by intra-op findings and histopathological assessment of the appendicectomy specimen. Finally, the reliability of RIPASA scoring system is assessed by calculating sensitivity, specificity, negative appendicectomy rate (the proportion of operated patients having normal appendix removed), and positive predictive value (the proportion of patients with a positive test result who actually have the disease). Data analysis done with chi-square test.

Results

In our study of 200 (122 males and 78 females) patients with M:F ratio of 1.56:1, the highest number of patients (49.5%) were observed in the age group of 15 to 24 and the least number of patients (6%) were observed in the age group of 45 years and above (Fig. 1). The mean age of patients in our study was 27.55 years (males 27.45 years and female 27.70 years). Right iliac fossa pain was most common observed symptom (92%) cases and tenderness to right iliac fossa was most common sign (84%) cases. The RIPASA score of < 5 is observed in 11 patients (M, 5; F, 6), 5–7 in 36 patients (M, 19; F, 17), 7.5–11.5 in 137 (M, 95; F, 42), > 12 in 16 (M, 9; F, 7) (Fig. 2). We operated 178 patients on the basis of clinical assessment out of their histopathology report of 146 showed changes consistent with acute appendicitis and among these are the following: 140 had a RIPASA score of > 7.5 (true positive); six patients had a score of < 7.5 but histopathology was suggestive of acute appendicitis; 32 patients had normal appendix on histopathological examination and out of them, 13 had score of > 7.5 (false positive) and 19 had a score of < 7.5 (true negative); observed rate of negative appendectomy was 12.35% (22 total cases); four patients have appendicular perforation; and six patients had wound sepsis. So if a cutoff value of 7.5 was used, sensitivity of the RIPASA score was 95.89%, specificity 75.92%, positive predictive value 91.50%, and negative predictive value 87.23% with diagnostic accuracy of 90.5% and the expected rate of negative appendectomy was 8.5% [3] (Table 3).

Table 2 The table shows the total RIPASA score management guidelines

Score	Management
< 5.0	Chances of acute appendicitis are almost nil, advice observation of the patient in the ward and recalculate score after 1 to 2 h if the score is decreasing, discharge and review in opd. If increasing score, treat according to score level.
5.0–7.0	Very low probability of acute appendicitis, advice observation of the patient in the ward and repeat scoring after 1 to 2 h or perform radiological investigations (abdominal ultrasound) to rule out acute appendicitis. If decreasing score, discharge and review in opd. If increasing score or no change, patient may need admission for observations, discussed with the operating surgeon on duty.
7.5–11.5	High probability of acute appendicitis, refer patient to on-duty surgeon for admission and repeat score after 1 to 2 h. If remain high, prepare patients for appendicectomy. In female patients, get radiological investigations such as an abdominal ultrasound to rule out gynecological causes of RIF pain.
> 12	Appendectomy

Discussion

Acute appendicitis is one of the most common and oldest surgical emergencies with an approximate estimated life time prevalence of approximately 8% with peak incidence in age group 10–30 years [1, 4]. In our study, the highest incidence was observed in 15–24 years. Even after being a common clinical problem, acute appendicitis is diagnosed with difficulty in some cases particularly among the young and females of reproductive age, in whom various gynecological conditions can mimic signs and symptoms of acute appendicitis [5]. In our study of 200 (122 males and 78 females) patients with M:F ratio of 1.56:1, which is higher in contrast to other studies [2, 6].

For achievement of diagnostic accuracy, if appendectomy is delayed, there are high chances of complications like appendicular perforation and sepsis with high mortality [7], and in contrast with reduced diagnostic accuracy rate of negative appendectomy increases which is generally reported to be approximately 20–40% [8].

In the present era of recent diagnostic tool like ultrasonography, CT scan diagnostic accuracy can be improved but availability and cost of these diagnostic tools are major hurdle to reach the poor Indian population which is rural and belongs to middle economic class, so diagnosis and surgery are delayed and morbidity is increased, and on other hand frequent use of CECT in urban high class population for the diagnosis acute appendicitis may lead to early detection of low grade appendicitis and appendectomy that can be managed conservatively with antibiotics [9].

At present various scoring system are available to improve diagnostic accuracy. Alvarado and modified Alvarado are most popular for western population with reported sensitivity and specificity of both are 53 to 88% and 75 to 80%, respectively [8, 10].

But these score have shown low sensitivity and specificity when applied to Asian population. Recently, Raja Isteri Pengiran Anak Saleha Appendicitis (RIPASA) score has been developed for the diagnosis of acute appendicitis in the Asian population by Chee Fui Chong, Department of Surgery in

Fig. 1 Graph shows age and sex distribution of patients

Fig. 2 Graph shows the RIPASA score distribution of patients

RIPAS Hospital Brunei, Darussalam [2]. Raja Isteri Pengiran Anak Saleha Appendicitis (RIPASA) score is a simple qualitative scoring system based on 14 fixed parameters [two demographic, five clinical symptoms, five clinical signs, and two clinical investigations and one additional parameter FNRIC (Foreign National Registration Identity Card)] each parameter is scored individually with a maximum total score of 17.5 (Table 1).

In addition to history and physical examination, only two simple laboratory investigations (urinary analysis, total leucocytes count) are included in RIPASA score, so patient can easily be assigned in high or low probability group on the basis of score and quick decision can be taken for surgery.

If the score is < 5, then chances of acute appendicitis are almost nil and patient just need observation and repeat scoring. If the score is between 5 and 7, then there is low probability of acute appendicitis and after observation of patient in ward for 1 to 2 h, repeat scoring is done and simultaneously

support of radiological investigation is needed to take decision for surgery. If the score is 7.5 to 11.5, then there are high chances of acute appendicitis and radiological investigations are needed in females to exclude gynecological problems but if the score is > 12 then there is very high probability of acute appendicitis and appendectomy is needed without any radiological investigations (Table 2).

In our study, sensitivity of the RIPASA score was 95.89%, specificity 75.92%, positive predictive value 91.50%, and negative predictive value 87.23% with diagnostic accuracy of 90.5%. Observed rate of negative appendectomy was 12.35% (22 total cases) and if applying RIPASA scoring system expected rate of negative appendectomy was 8.5%, so there is reduction of negative appendectomy rate by 3.85% and mean duration of hospital stay was 4.7 days (Table 3). Our results are comparable with previous studied on RIPASA score like Chee Fui Chong et al. [2, 6] (sensitivity of 97.5%, specificity of 81.8%, PPV of 86.5%, NPV of 96.4%, and a

Table 3 Shows results of present study

Patients particulars	No. of patients
Gender	
Male	122
Female	78
Emergency appendectomy performed	178
Positive HPE reports for appendectomy	146
Negative HPE for appendectomy	32
Perforated appendix	4
Wound sepsis	6
RIPASA score of < 7.5	47
RIPASA score of > 7.5	153
True positive cases (patients with a score of > 7.5 and positive histology)	140
false positive (patients with a score of > 7.5 but negative histology)	13
True negative (patients with a score of < 7.5 and negative for histology)	19
False negative (patients with a score of < 7.5 but positive for histology)	6

diagnostic accuracy of 91.8%). The predicted negative appendectomy rate was 13.5%, which is a 5.9% reduction from the observed rate of 19.4%, Muhammad Qasim Butt et al. [11] and Dr. Nanjundaiah N et al. [3].

In our study, observed rate of negative appendectomy was lower compared to other studies, it may be because of higher M:F ratio in our study compared to others and females always have more negative appendectomy than males because of gynecological conditions mimicking appendicitis [2, 3, 6, 11].

Some limitations exist in our study which are necessary to discuss, first sample size of this study is small to validate this scoring system and secondly, our study was conducted within a single governmental tertiary care center in central Rajasthan and it is not clear whether these results can be replicated in other health care setting in India, hence, multi-centric trials with including geographic variable population of India should be appropriate for validation.

Conclusion

We have concluded that RIPASA score is a better, easy, safe, and non-invasive diagnostic tool for diagnosis of acute appendicitis especially in the Indian scenario where most of population is rural where radiological diagnostic tools are not easily available and even in the area of availability, affordability becomes the issue for middle class patient, so significant reduction in health care cost can be done.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

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