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Research Article

Diagnostic Accuracy of RIPASA Scoring System in Acute Appendicitis

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Abstract

Background: Commonest operation done by general surgeons all over the world is appendectomy. Usually these patients were operated on the same day of admission with a view to avoid perforation of appendix and decrease the morbidity associated with this disease. Histopathology shows that percentage of removal of normal appendix is 15-40%. There are different scoring systems and diagnostic tools available like Alvarado scoring system and computerized tomography (CT) scan for the diagnosis of acute appendicitis pre operatively. Investigations like CT scan are expensive and not suitable/affordable for everybody in a third world country like Pakistan.

Objectives: The aim and objective of this study is to assess the diagnostic accuracy of a cheap, accurate and easily applicable scoring system like Raja Isteri Pengiran Anak Saleha Appendicitis (Brunei Darussalam and named after hospital name, RIPASA) in our hospitals.

Methodology: All the patients who were >12 years old and operated for appendectomy were included in this study. These patients were divided into two groups. Group 1 includes those with RIPASA score > 7.5 and those with score < 7.5 were included in group 2. History, physical examination with other routine blood and urine tests were done to fulfill the scoring system. RIPASA scoring was calculated. Ultrasound with pelvic examination was done in all female patients. SPSS 21 was used to analyze the Data.

Results: Out of 140 patients, 60% were male and 99% of total patients were below the age of 40 years. 87% of patients presented within 48 hours of initiation of pain and 88% had tenderness and rebound tenderness in right iliac fossa (RIF). 89.56% of patients had positive histopathology report for acute appendicitis with RIPASSA score of more than 7.5 while only 12% of patients with RIPASSA score of less than 7.5, histopathologist was able to identify signs of acute inflammation under the microscope.

Keywords: RIPASA Score; Acute Appendicitis; Pain Right Iliac Fossa

Introduction

Acute appendicitis is one of the commonest surgical emergency [1] encountered, with life time chances of 1 in 7 [2]. Incidence is 1.5 – 1.9 per 1000 and is approximately 1.4 times more in men than in women [3]. A quick and accurate diagnosis of acute appendicitis is desirable to reduce morbidity and mortality [4]. The goal of operative management should be aimed at removal of an inflamed appendix prior to its perforation and to minimize the rate of negative appendectomies which is calculated as around 20% by Gautam Chandra and his colleagues in his study conducted in India5 but as high as 40% mentioned is also mentioned in literature [5].

It is imperative that a preoperative diagnosis of acute appendicitis should be established with accuracy and confidence. A long list of differential diagnosis should be excluded while suspecting acute appendicitis. The diagnosis of acute appendicitis is more often clinical, however laboratory investigations like total leukocyte count and normal urinalysis may support the clinical suspicion. Ultrasonography and CT scan are one of the commonest Imaging techniques, also help in making definitive diagnosis and rule out other problems especially in females. CT scan has a high sensitivity of 91% and specificity of 83.3% for diagnosis of appendicitis [6]. Histopathology is the final and most accurate method to diagnose acute appendicitis. Hence this is the gold standard for diagnosis in our study [7,8]. However CT scan in routine practice increases the cost effectiveness in healthcare especially in poor societies [9].

Several scoring systems are used in diagnosis of acute appendicitis. For a scoring system to be effective, it must be quick, simple and easy to apply. The most common scoring system used is Alvarado Scoring System. The Alvarado is a 10 point scoring system for diagnosis of acute appendicitis based on signs, symptoms and laboratory investigations. Sensitivity is 68.3% and specificity is 87.9% respectively. Also, positive predictive value is 86.3% and negative predictive value is 71.4% respectively. While diagnostic accuracy is 86.5% [9]. being more sensitive and specific in western population, there are limitations when applied in Asian population. RIPASA scoring system developed in 2010 by Chee Fui Chong and colleagues [1], more extensive and yet simple scoring system, con-

sisting of 14 fixed parameters (five clinical symptoms, five clinical signs, two clinical investigations and two demographics) and an additional parameter i.e. National Registration Identity Card (NRIC) which is unique and specifically developed for local people. The sensitivity of RIPASA Scoring System is 98% while specificity is 81.3%. The positive predictive value is 85.3% and negative predictive value of RIPASA scoring system is 97.4% and the diagnostic accuracy is 90.5 to 91.8% [10,11]. However the supporting evidence based literature is limited on RIPASA scoring [9].

The rationale of this study is to observe the accuracy of RIPASA score in diagnosis of acute appendicitis which will be used for surgical management and accurate diagnosis of acute appendicitis.

Materials and Methods

This prospective study was conducted at Pakistan Institute of Medical Sciences Islamabad from 1st January 2018 till 31st December 2018. Both male and female patients who presented with pain Right Iliac Fossa (RIF) suspected to be acute appendicitis and operated for appendectomy were included in the study. History, physical examination and RIPASA scoring system were calculated. Ultrasound with pelvic examination was done in all female patients. These patients were divided into two groups, group 1 includes those with RIPASA score > 7.5 and those with score < 7.5 were included in group 2. Histopathology with other routine blood and urine tests were done to fulfil the scoring system. Informed consent was taken from all the patients. Complete record of all Patients included in the study was kept separately for retrieval of data. SPSS 21 was used to analyze the Data.

Inclusion and exclusion criteria

Only patients who are above the age of 12 years were included in this study. All the patients who refused to give consent or managed conservatively and discharged without operation were excluded from the study.

RIPASA scoring system

RIPASA Score is a 17.5 score with cut-off of 7.5 for diagnosing acute appendicitis. If the score is < 5.0, probability of acute appendicitis is unlikely. Between 5 - 7 score, probability of acute appendicitis is low. With 7.5-11.5 score on RIPASA scale, probability of acute appendicitis is high. With > 12 score, it is definitely acute appendicitis.

Foreign national record of identity card (NRIC) which is specific to the local population where the system was developed. For this study, all the patients will be given score 0 since the parameter is for local population of the country where score was developed.

Results

Our study comprise of 140 patients. Minimum age of patients was 12 years. Out of these 140 patients, 61.42% were males while rest i.e. 38.57% was belong to female gender. Mean age was 23.6 ± 8.2 years. Also majority of the patients were below the age of 40. None of the female patients more than 40 years of age was operated for appendectomy in our study.

Parameter	Score
Sex: Male Female	1.0 0.5
Age: <39.9 years >40.0 years	1.0 0.5
RIF pain	0.5
Migration of RLQ pain	0.5
Anorexia	1.0
Nausea and vomiting	1.0
Duration of symptoms: <48 hours >48 hours	1.0 0.5
RIF tenderness	1.0
RIF guarding	2.0
Rebound tenderness	1.0
Rovsing's sign	2.0
Fever	1.0
Raised WBC	1.0
Negative urinalysis	1.0
Foreign NRIC	1.0

Table

Total	140	Age > 40
Males	86	>2
Females	54	>0

Table 1: Showing demographic distribution.

Only 20% of the patients had the history of migration of pain from periumbilical region to RIF. Duration of pain was < 48 hours in 88.6%. The tenderness in right iliac fossa was present in 87.86% and 85.71% patients had rebound tenderness. The leukocyte count was raised in 71% patients. Detail was given in figure 1 with number of different sign and symptoms.

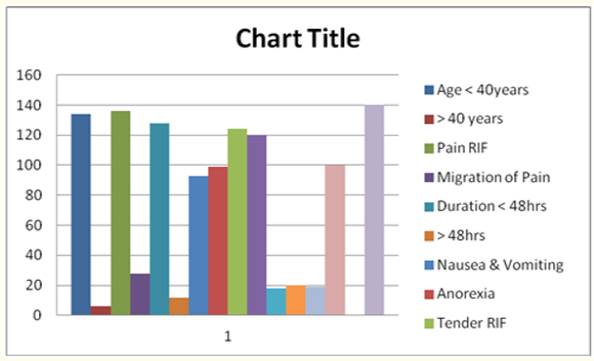

Figure 1: Showing number of patients with signs and symptoms.

All the 140 patients were divided into two groups. Patients with score more than 7.5 were kept in group 1 while score of less than 7.5 on RIPASA scoring system were named as group 2. Than all these patients were taken to operation theatre after resuscita-

tion and investigations. Appendectomy was done and specimen was sent to laboratory for histopathology. 89.56% of patients had positive histopathology report for acute appendicitis with RIPASA score of more than 7.5 while in only 12% of patients with RIPASA score of less than 7.5, histopathologist was able to identify signs of acute inflammation under the microscope. Number of patients with positive histopathology for acute appendicitis and those with normal appendix were shown in table 1.

In table 2 and 3, we calculated the sensitivity and specificity of RIPASA scoring system in patients with positive histopathology. Our calculations showed that RIPASA scoring system had very high value for sensitivity in the diagnosis of acute appendicitis pre operatively with diagnostic accuracy of around 90%.

RIPASA Score	Positive Histopathology	Negative Histopathology	Total
>7.5 (group 1)	a. 103	b. 12	a+b=115
<7.5 (group 2)	c. 03	d. 22	C+d=25
Total	a+c= 106	b+d=34	a+b+c+d=140

Table 2: Showing patients with positive histopathology.

Sensitivity = a/a+cX100 = 97.16%
Specificity = d/b+d x 100 = 64.7%
Positive predictive value = a/ a+b x 100 = 89.5%
Negative predictive value = d/ c+d x 100 = 88%
Diagnostic accuracy = a+d/ a+b+c+d = 89.2%

Table 3: Showing sensitivity and specificity of scoring system.

Discussion

Acute appendicitis is the commonest surgical emergency all over the world. There is a wide range of diagnostic accuracy of clinical assessment of acute appendicitis and varies from 50%-80%. The clinical diagnosis is especially difficult in females of reproductive age group as well as very old and very young people. This acute surgical condition still poses a diagnostic challenge to the young clinicians. Many methods have been investigated with a view to reduce the removal of normal appendix without increasing the perforation rate. Common radiological tools such as ultrasonography and CT as well as diagnostic laparoscopy are all methods that have been investigated previously. Many diagnostic scores have been advocated, with a problem that most are complex and difficult to implement in a clinical situation.

In our study, 62% of the patients were male with mean age was 23.6 years. This shows that acute appendicitis is more common in male of twenties. Recently a study conducted in Department of General Surgery at Sri Siddhartha Medical College and Research Institute by Hafsa Salim Daber and her colleague showed the similar results. According to them, mean age of study population was 27.25 years and majority were males (72.50%) which is very near to our results [12]. Another study conducted by Naz N., et al. showed male to female ratio as 62.1% male and 37.9% female patients which is again showing that acute appendicitis is slightly more common in males [13]. Aman T., *et al.* calculated the ratio of males is 63.2% [14]. So according to literature, it is reasonably proved that acute appendicitis is more common in young males [15,16].

In our study, 98.57% of patients presented with pain and on examination, tenderness was present in more than 88% of participants. These results are comparable with the study by Chong., *et al.* [9] which was the study carried out to formulate RIPASA score and with most of the other studies. We have found out in his study that RIF pain was present in all the patients while other symptoms as nausea vomiting in 89%, anorexia in 63% and fever in 65% patients. Study by Abdullah., *et al.* [15] showed comparable results. In their study 99.3% patients had acute RIF pain, 81% patients had nausea and vomiting, 79% patients had anorexia and 53% patients had fever. In this study, majority of the patients (99%) were found to have RIF tenderness, guarding in 77%, rebound tenderness in 84% and rovsing sign in 11% of patients. Only difference we have in our study is incidence of nausea and vomiting is less as compare to above mentioned studies.

In our study, 71% of participants had raised white cell count. Recently a study conducted by Vamsavardhan Pasumarthi and his colleague C. P. Madhu in Karnatka, India showed very much similar results as far as the white cell count and age group is concerned. Though, in their study, ratio of males was much higher as compare to any other study [17].

The sensitivity and specificity of RIPASA score was 97.17% and 64.71% respectively in our study and it was also reported by Chung C F., *et al.* [9] sensitivity and specificity is 97.4% and 81.82% respectively. Naz A., *et al*. [13] shows 100% sensitivity and 96.23% specificity. Aman T., *et al.* has reported Sensitivity and specificity of 86.96% and 51.14% respectively [14].

The Alvarado score has less sensitivity and specificity 66% and 814% respectively as reported by Jalil A, S A Shah., *et al.* [4] and Dey S., *et al* [6]. The positive predictive value and negative predictive value were 89.5% and 88% respectively. Same results were obtained by Chong C F, Thien A., *et al* [1,7]. Alvarado score has less PPV and NPV [1,4,7].

The diagnostic accuracy of RIPASA scoring system was 89.2% and same was reported by other studies.1,4 The sensitivity and specificity is further reinforced by Balakrishnan Subramani from Channai. Surprisingly this is one of the very few studies which showed slightly more females (52%) than males suffering from acute appendicitis. They also 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 ($p < 0.0001$) [18,19].

Conclusion

RIPASA scoring system is reasonable accurate and easy to apply for pre-operative diagnosis of acute appendicitis in a third world country like Pakistan.

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