ORIGINAL RESEARCH

CORRELATION OF ULTRASOUND AND RIPASA SCORING SYSTEM IN THE DIAGNOSIS OF ACUTE APPENDICITIS

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ABSTRACT

Objective: Correlation of Ultrasound and RIPASA scoring system in the diagnosis of acute appendicitis. **Study Design:** 50 patients presenting to emergency underwent ultrasound and evaluation as per RIPASA scoring system followed by emergency appendicectomy. The sensitivity, specificity, positive and negative predictive value calculated for each goups. **Results:** The sensitivity, specificity, Positive Predictive Value and Negative Predictive Value for ultrasound were 75.51%, 100%, 100% and 7.69% respectively and that for RIPASA scoring system were 93.9%, 100% 100% and 25% respectively. The negative appendicectomy rate was 2%. **Conclusion:** RIPASA scoring system may be used for correctly diagnosing acute appendicitis but low sensitivity of ultrasound precludes its routine use and may be used as a complementary tool in diagnosing acute appendicitis. Keywards: Acute Appendictis, RIPASA, Ultrasound.

KEY WORDS: Ultrasound – RIPASA scoring – Acute appendicitis.

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INTRODUCTION

Acute appendicitis is defined as inflammation of vermiform appendix and is one of the commonest cause of abdominal pain seen in emergencies worldwide. Life time risk of acute appendicitis in general population is 8.6% for males and 6.7% for females [1]. Delay in diagnosis may lead to increase in morbidity and complications like perforation and peritonitis whereas overzealous diagnosis leads to increase in the negative appendicectomy rate.

The diagnosis of acute appendicitis is usually based on history and clinical examination with aid of laboratory investigations. Even though the diagnosis of acute appendicitis is still thought to be a clinical one, a significant number of patients have normal appendices at surgery. Wrong diagnosis of appendicitis has led to a high rate (8-30%) of inappropriate removal of the normal appendix. Although acute appendicitis has typical clinical presentation in 70% of the cases, about 30% of the patients have an uncertain pre-operative diagnosis due to which there is negative laparotomy in as high as 20-25% cases. The rate of such unnecessary surgeries is even higher (35-45%) in women of childbearing age, because of the female

pelvic organs and complications of pregnancy in this group [2]. Various diagnostic modalities are different scoring systems, ultrasonography, GIT Contrast studies, computer aided scores, computed tomography and MRI. Among these modalities ultrasonography is simple, easily available, non-invasive, convenient and cost effective.USG in the diagnosis of acute appendicitis was first popularized by Puylaert in 1986, one hundred years after the publication of first paper by Fitz. Pulayert reported the sensitivity of 89% and specificity of 100% of his technique in the diagnosis of acute appendicitis [3]. In 2010, a new appendicitis scoring system was proposed by the Department of General Surgery at the Raja IsteriPengiranAnakSaleha (RIPAS) Hospital, Brunei Darussalem comprising of 14 parameters. The scoring system showed a sensitivity and a specificity of 97.5% and 81.8%. respectively [4].

Thus, it becomes increasingly important to accurately diagnose acute appendicitis as early as possible to decrease morbidity and mortality. It is reiterated that reduction of negative appendicectomy is of utmost importance in modern day surgical practice keeping in mind that

reconstructive role of appendix in variety of situations and to reduce the economic burden on patients. The present study was therefore planned to correlate RIPASA scoring system based on purely clinical and laboratory findings vis a vis ultrasound keeping in mind to effectively reduce the negative appendicectomy rate.

METHODS

50 patients above 14 years of age presenting with features of acute appendicitis were included in the study while patients with appendicular lump and patients undergoing emergency laparotomy for any other cause with appendicectomy as part of it were excluded.

All patients presenting to the emergency room with clinical features suggestive of appendicitis were screened and thereafter subjected to RIPASA score evaluation. The score sheet did not contain the actual scores for each parameter in order to avoid the total score biasing the judgment of the admitting surgeon in his/her decision making with respect to appendicectomy. Patients with suspected appendicitis were admitted based on the surgeon's own clinical judgment and were in no way influenced by the RIPASA score. Following this, all the patients underwent ultrasonography abdomen to look for features suggestive of appendicitis. Patients were then started with intravenous antibiotics and analgesics (if required) till they underwent emergency appendicectomy. The RIPASA score and the ultrasound findings were correlated with the biopsy specimen that was sent for histopathology following surgery. At the end of the study, sensitivity, specificity and positive and negative predictive values of the RIPASA score and ultrasound were calculated.

RESULTS

The percentage of population above age of 40 was 14 and below the age of 40 was 86. Of the total 50 patients involved in the study, 36 were male i.e. 72% and 14 were female i.e. 28%. All the patients underwent ultrasonography (USG) out of which 37 patients revealed a non-compressible, blind ended, tubular, aperistaltic structure indicative of inflamed appendix while 13 patients were labelled as normal appendix i.e. there were no ultrasonographic finding/evidence of an inflamed appendix. The sensitivity of ultrasound was 75.51% while specificity was 100%. The positive Predictive Value was 100% while the Negative Predictive Value was 7.69%. The most common of the RIPASA variables were right iliac fossa tenderness (98%), right iliac fossa pain (96%) and rebound tenderness (90%). Out of the total 50 patients, 32 (64%) had presented to the hospital within 48 hours of onset of symptoms, while 18 (36%) presented after 48 hours. A total score as per RIPASA scoring system of less than 7.5 indicated that the chances of inflamed appendix are highly unlikely while a score of more than 7.5 indicated that the chances of inflamed appendix are more likely. After applying the RIPASA score, 4(8%) had a score of < 7.5 while 46(92%) had score of 7.5 or more which has been shown in Table –I.

Table I : Severity of appendicitis based on RIPASA score

Severity of appendicitis	Number	Percentage
Less likely of acute appendicitis (<7.5)	4	8
More likely of acute appendicitis (7.5 or more)	46	92

All the patients had undergone operative intervention. The total number of patients which proved to be having appendicitis as per histopathological report were 49 (98%). Only one patient was reported to have normal appendix (2%). The sensitivity and specificity of RIPASA score was calculated to be 93.9% and 100% at a cut off value of 7.5. The positive predictive value was 100% while the negative predictive value was 25% at the same cut-off value.

DISCUSSION

Although acute appendicitis is one of the most common surgical emergencies encountered worldwide, it is still one of the most misdiagnosed of all abdominal pathologies [5]. The diagnosis mainly based on history and clinical findings. Also many scoring systems are in use to hasten the diagnosis of acute appendicitis. Scoring system reflects an inexpensive, non-invasive and easy to use diagnostic aid. Alvarado score is the most commonly used scoring system worldwide but it has a low sensitivity in comparison to western population when applied to the oriental population [5]. To overcome these limitations, RIPASA scoring system has been developed in 2010, consisting of easily obtainable clinical, laboratory parameters like age, sex, duration of symptoms, anorexia , fever, vomiting, pain in right iliac fossa or migration of pain to right iliac fossa, tenderness, rebound tenderness, guarding, Rovsing sign, raised TLC, negative urinalysis and foreign national. Hence a score can be obtained quickly, and a rapid diagnosis can be made without having to wait for full investigations. In a retrospective study, the RIPASA scoring system has been shown to achieve better sensitivity (88%) and specificity (67%) than Alvarado scoring system (sensitivity 59%, specificity 23%) in Asian population [6]. But still many radiological investigations have been used for the diagnosis of acute appendicitis like ultrasonography, computed tomography (CT), MRI. According to some studies ultrasound has a sensitivity ranging from 49 to 90%, a specificity ranging from 47 to 100% [7].

The sensitivity and specificity achieved for a cut-off value of 7.5 was higher (93.9% and 100% respectively) as compared to other systems, and with respect to a similar study by Chong et al in 2010 at RIPAS Hospital, Brunei (88.46% and 66.67% respectively) [4] and another by Muhmmad Usman Malik et al [8] in 2017 was 85.39% and 69.86% respectively in St. Luke's Hospital, Kilkenny, Ireland and it was 94% and 95% respectively for Sandeep Khadda et al. [9] The positive predictive value obtained at a cut-off score of 7.5 was 100% while the negative predictive value was found to be 25%. The positive

predictive value obtained was consistent with the studies conducted by Chong et al (93%), Muhmmad Usman Malik et al (84.06%) and Sandeep Khadda et al (86%). The negative predictive value was found to be 25% at a cut-off score of 7.5 which was low in comparison to the studies conducted by Chong et al (53%), Muhmmad Usman Malik et al (72.86%) and Sandeep Khadda et al (96%). The low negative predictive value obtained may be attributed to less number of patients and high prevalence of the disease in the studied population.

Of the 50 patients, who had undergone appendicectomy, 49 of them were histopathologically confirmed appendicitis. Thus, the observed negative appendicectomy rate was 2%. This was a much lower rate when compared to studies by Chong et al which was 6.9% and by Sandeep Khadda et al which was 13.7 in 2015. The high negative appendicectomy rate in the study conducted by Sandeep Khadda et al was attributed to the assessment of the patients coming to accident and emergency department by the junior residents on duty.

When Pulayert first introduced his graded compression method in 1986, he reported sensitivity of 89% and specificity of 100%. In the present study, the sensitivity of Ultrasound was 75.51% which was comparable to the studies conducted by Subash KC et al in 2015 where the sensitivity was 95.12%, while it was 85% for study conducted by Kassim Amir HadiTaj-Adean in 2008 and 89% for the study conducted by Pulayert in 1986 [10]. The present study had sensitivity comparable to the study conducted by ParisaJavidiParsijani et al. [7] The specificity of ultrasound was 100% which was high compared to the study conducted by Kassim Amir HadiTaj-Adean (53%) [11], but comparable to the studies conducted by various authors like Vanja Giljaca et al (81%) [12], Subash KC et al (88.88%) [13], Parisa Javdi Parsijani et al (69.2%) and Pulayert (100%) in 1986. The low specificity of the study conducted by Kassim Amir HadiTaj-Adean may be due to the cross-sectional nature of the study and exclusion of some additional criteria like thickness of the appendiceal wall, the presence of air within the appendiceal lumen, and the non-compressibility of peri-appendiceal fat. The negative predictive value was 7.69% while the positive predictive value was 100%. Many other studies also showed varied results which as per Table –II.

Table II : Comparison showing predictive values of ultrasound

Studies	Positive Predictive Value	Negative Predictive Value
Shirzad Nasiri et al[15]	97.4%	25%
Rodrigo de Oliveira Peixoto et al[16]	92.4%	28.1%
Present study	100%	7.69%

The positive predictive value of this study is comparable to the above mentioned studies, but the negative predictive value was not found to be in conformity with most of the studies except of the study by Shirzad Nasiri et al where the negative predictive value was 25% and another by Rodrigo de Oliveira Peixoto et al which assessed the negative predictive value as 28.1%. The wide variation in the results of negative predictive value for appendicitis confirmed by ultrasonography has been quoted amongst the literature to be because of various factors like the experience of the radiologist and the technique used and also the patient factor like obesity and the position of the appendix particularly retrocaecal [14 ; 15]. Adding to it mostly the ultrasonography in our hospital setting is performed by the junior resident staff on duty during the emergency hours explaining the high rate of false negative cases, therefore reducing the negative predictive value. As is in the study, there is a significant difference between the positive and negative predictive value for diagnosing appendicitis by ultrasonography, which strongly emphasizes the already proven fact that a positive ultrasonography for appendicitis strongly favors an inflamed appendix while a negative ultrasonography is not sufficient to rule out the diagnosis of acute appendicitis [7]. The present study correctly classified 98% of all patients with proven histological appendicitis as per RIPASA score evaluation while only one patient (2%) was in the negative group. This study showed a sensitivity and specificity of RIAPSA scoring system as of 93.9% and 100% respectively while ultrasonography had a sensitivity of 75.51% and specificity of 100%.

RIPASA scoring system is a simple scoring system, based on simple, easily obtainable parameters for rapid and accurate diagnosis of acute appendicitis while reducing the rate of negative appendicectomy and cost of radiological investigations and thereby reducing unnecessary morbidity and economic burden of the patients. Although ultrasound has a good specificity, the low sensitivity rules out its routine use in clinical cases and it can never replace a surgeon's clinical judgment. It may be used as a complimentary tool for diagnosing acute appendicitis to rule out other causes of pain abdomen. However, to consolidate the routine efficacy of RIPASA scoring system in clinical practice for diagnosing acute appendicitis, a larger study involving more number of patients should be considered.

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