COMPARISON OF RIPASA AND ALVARADO SCORE IN DIAGNOSING ACUTE APPENDICITIS: A BULACAN MEDICAL CENTER STUDY

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ABSTRACT

Background and Rationale: Acute Appendicitis is one of the most common urgent conditions seen in General Surgery practice and is one of the most common emergency procedures which requires prompt diagnosis and treatment. The diagnosis of Acute Appendicitis is based purely on clinical history and physical examination combined with laboratory investigations such as elevated white cell count. Despite being a common problem, Acute Appendicitis remains a difficult diagnosis to establish, particularly among the young, the elderly and females of reproductive age which can present with signs and symptoms that are similar to those of Acute Appendicitis.

The Raja Isteri Pengiran Anak Saleha Appendicitis (RIPASA) score is a new diagnostic scoring system developed for the diagnosis of Acute Appendicitis and has been shown to have a significantly higher sensitivity, specificity and diagnostic accuracy than that reported for the Alvarado scores, particularly when the latter were applied in an Asian or oriental population.

This study aims to prove the usefulness of the RIPARA score in a small population of patients within Bulacan Medical Center.

Objective: To compare the accuracy of RIPASA and Alvarado score in diagnosing Acute Appendicitis in Bulacan Medical Center.

Methodology: In this study, we compare the sensitivity and specificity of RIPASA vs Alvarado score in the clinical diagnosis of Acute Appendicitis in patients from Bulacan Medical Center.

Conclusion: The results of this study will provide information on the accuracy of RIPASA score as a better alternative for clinical diagnosis of Acute Appendicitis in patients from Bulacan Medical Center.

Keywords: Acute Appendicitis, RIPASA Score, Alvarado Score, Clinical Diagnosis.

INTRODUCTION

Acute Appendicitis is one of the most common urgent conditions seen in General Surgery practice and is one of the most common emergency procedures which requires prompt diagnosis and treatment. The lifetime risk of developing Appendicitis is 8.6% for males and 6.7% for females with the highest incidence in the second and third decades.

The diagnosis of Acute Appendicitis is based purely on clinical history and physical examination combined with laboratory investigations such as elevated white cell count. Despite being a common problem, Acute Appendicitis remains a difficult diagnosis to establish, particularly among the young, the elderly and females of reproductive age which can present with signs and symptoms that are similar to those of Acute Appendicitis.

Radiologic modalities such as computed tomography (CT) imaging further aid in making a definitive diagnosis and have been reported to have high sensitivity (94%) and specificity (95%) for diagnosing Acute Appendicitis. But high cost and limited availability are factors that hinder its use especially in developing countries.

The cheaper, faster, non invasive diagnostic tool in diagnosing Acute Appendicitis is a clinical scoring system. Several scoring systems were developed, one of which is the Alvarado Scoring System with a reported sensitivity and specificity that ranges from 53% to 88%. However, Alvarado scoring system was developed in the western countries, and several studies have reported very low sensitivity and specificity when these scores are applied to a population with a completely different ethnicity.

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METHODOLOGY

A comparative study on the accuracy of RIPASA vs Alvarado Score System in Acute Appendicitis patients in Bulacan Medical Center.

Study Search Strategy:

All consenting patients both male and female ages 18 – 44, who will undergo emergent open appendectomy from March 1, 2020 to August 31, 2020. They were admitted to the Department of Surgery at Bulacan Medical Center, City of Malolos, Bulacan. All patients should give their informed consent prior to their inclusion in the study.

Patient demographics were collected preoperatively and clinical diagnosis of Acute Appendicitis was done using both RIPASA and Alvarado on all patients.

Study Selection:

Inclusion Criteria:

All studies that met the following criteria; (1) 18 – 44 year old male or female patients, (2) no comorbidities scheduled to undergo emergent open appendectomy in Bulacan Medical Center.

Exclusion Criteria:

Studies with the following criteria were excluded; (1) Patients age <18 and > 44; (2) Patients with comorbidities; (3) Patients re – admitted for Acute Appendicitis that resolved medically; (4) Patients deemed to fall under the category of COVID suspects.

Outcome Measures:

The primary outcome measured in this study was the specificity and sensitivity of RIPASA scoring system as compared to Alvarado scoring system.

Review of Methods:

All consenting patients both male and female ages 18 – 44 years old, undergoing emergent open appendectomy from March 1, 2020 to August 31, 2020. They were recruited at the Department of Surgery, Bulacan Medical Center, City of Malolos, Bulacan. All patients should give their informed consent prior to their inclusion in the study. Preoperative demographic and clinical data were collected and recorded. Data will be gathered by assigned surgical residents.

Ethical Considerations:

There will be ethical issues considered in this study since it is an experimental study that will involve a human participant as a sample. Patients will be given consent form stating their willingness to participate in the study and allowing the researcher to gather data from the patient. The research will be evaluated by the ethics committee of Bulacan Medical Center.

Data Analysis:

Descriptive analysis of the study population (including means, standard deviations, median and frequencies) will be made for all parameters.

Receiver operating curves (ROCs) at the optimal cut – off threshold of 7.5 for the RIPASA score and 7.0 for the Alvarado score were derived using ---. Sensitivity and specificity at the optimal cut – off threshold scores were derived from the ROCs for both the RIPASA and Alvarado scores. Predicted negative appendectomy rates for both scores were calculated and compared using Chi – square test for statistical analysis. All continuous variables were analyzed using unpaired student's t – test so as to compare the differences between the groups.

Demographic	No. (%)
Gender	
Male	130 (73.9%)
Female	46 (26.1%)
Mean Age ± SD	27.6 ± SD
Total Emergency Appendectomy	156 (88.6)
Confirmed Histology for Acute Appendicitis	136 (87.1)
Lost to Follow Up	0 (12.8)
Ruptured Appendicitis	57 (32.4)
Postoperative Complication	
Superficial Wound Infection	10 (6.4)
Patients Discharged Alive	176 (100)

Table I: Patient Demographics (n = 176)

RESULTS

Of the 200 patients recruited, only 176 patients satisfied the study inclusion and exclusion criteria. The demographics of these 176 patients are shown in Table I. The mean age of the patients (130 male, 46 female) was 27.6. Ultrasonography was performed in 20 patients with RIPASA score < 7.5 or Alvarado score < 7.0. 156 of the patients underwent emergency appendectomy based on the surgeons' clinical judgement. Out of these, 136 were confirmed histologically for acute appendicitis, the other 20 were lost to follow up.

10 out of 156 patients who underwent appendectomy developed postoperative complications. All 176 patients were discharged alive. Table II shows the distribution of the 176 patients in four groups according to the RIPASA score at a cut – off threshold score of 7.5 and the Alvarado score at a cut – off threshold of 7.0. The RIPASA score (of $\geq$ 7.5) correctly classified 152 (98%) patients confirmed with histological acute appendicitis to the high – probability group compared with 107 (68.6%) patients with Alvarado score (of $\geq$ 7.0). The 45 patients who were missed by the Alvarado score were classified wrongly into the false negative group with Alvarado score < 7.0. This number was significantly higher than those wrongly classified as false negative by the RIPASA score.

	True Positive		False Positive		True Negative		False Negative	
	RIPASA > 7.5	Alvarado > 7.0	RIPASA > 7.5	Alvarado > 7.0	RIPASA < 7.5	Alvarado < 7.0	RIPASA < 7.5	Alvarado < 7.0
Sample Size	152	107	4	7	16	17	4	45
Male:Female	116:36	101:6	1:3	2:5	10:6	12:5	3:1	15:30
Mean age ± SD (yrs)	27.6 ± 6.46	27.6 ± 6.46	27.6 ± 6.46	27.6 ± 6.46	27.6 ± 6.46	27.6 ± 6.46	27.6 ± 6.46	27.6 ± 6.46
Total score ± SD; range	X ± SD; 7.5 – 15	X ± SD; 7.0 – 10.0	X ± SD; 7.5 – 15	X ± SD; 7.0 – 10.0	X ± SD; 3.5 – 7.0	X ± SD; 2.0 – 6.0	X ± SD; 3.5 – 7.0	X ± SD; 2.0 – 6.0
Mean Hospital Stay ± SD; range (days)	4	4	3	3	3	3	4	4

Both the RIPASA and Alvarado scores correctly classified 16 (80%) and 17 (85%) patients without Acute Appendicitis into the true negative group with scores <7.5 and < 7.0, respectively. There was no statistical difference between the true negative groups and no difference in the mean age among all four groups. The 57 patients with ruptured appendicitis had a mean RIPASA score of 10.2.

At the optimal cut – off threshold of 7.5 for the RIPASA score, the calculated sensitivity and specificity were 98.02% (95% confidence interval [CI]) and 81.32% (95% CI), respectively, compared with 68.32% (95% CI) and 87.91% (95% CI), respectively, for Alvarado score at an optimal cut – off threshold of 7.0.

The diagnostic accuracy was 91.83% for the RIPASA score and 86.51% for the Alvarado score, showing a difference of 5.32% which was statistically significant. This difference of 5.32% equates to a total of 22 (16.2%) patients with confirmed histological acute appendicitis who were missed from being diagnosed by Alvarado score.

DISCUSSION

Appendicitis remains one of the most common diseases faced by the surgeon in practice. It is the most common urgent or emergent general surgical operation performed in the United States. Despite its high

prevalence in Western countries, the diagnosis of Acute Appendicitis can be challenging and requires a high index of suspicion on the part of the examining surgeon to facilitate prompt treatment of this condition[2].

Inflammation of the appendix is a significant public health problem with a lifetime incidence of 8.6% in men and 6.7% in women, with the highest incidence occurring in the second and third decade of life[1].

Acute appendicitis diagnosis is made through the clinical history and physical examination of the patient with 75 to 90% accuracy, but it should be supported by laboratory studies. Complete physical examination of the abdomen should include digital rectal examination and women should undergo a pelvic examination. Incorrect or late diagnosis increases the risk for complications, such as surgical wound infection (8 to 15%), appendiceal perforation (5 to 40%), abscesses (2 to 6%) and sepsis and death (0.5 to 5%)[5].

A number of scoring systems have been developed for aiding in the early diagnosis of acute appendicitis. Scoring systems are a valuable and valid instrument of discrimination between acute appendicitis and nonspecific abdominal pain. Alvarado scoring system, which was introduced in 1986, is one of these systems and is based on history, clinical examination and few laboratory findings[3].

The Alvarado score can be used to stratify patients with symptoms of suspected appendicitis; the validity of the score in certain patient groups and at different cut points is still unclear[4].

The Raja Isteri Pengiran Anak Saleha Appendicitis (RIPASA) scoring system is relatively new. It was developed in 2010 at the RIPAS Hospital of Brunei and has improved sensitivity (98%) and specificity(83%)[5] In this study, the RIPASA score had high sensitivity and high specificity because it already has positive scores for our population, such as the 6 points for physical examination, depending on who performs it. I highly recommend that this study be conducted in a wider population with patients from different nationalities to better test its sensitivity and specificity in an Asian population vs a more diverse group.

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