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Original Research Paper

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COMPARISON BETWEEN MODIFIED ALVARADO AND RIPASA SCORING SYSTEM IN DIAGNOSING ACUTE APPENDICITIS

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ABSTRACT

Background: The most frequent emergency surgery is an emergency appendectomy, which is one of the most prevalent causes of acute abdominal pain. A clinical scoring system is the less expensive, quicker, and non-invasive diagnostic technique for identifying acute appendicitis. In order to aid in the diagnosis of an acute appendicitis and reduce unnecessary exploration, scoring systems based on the history, clinical examination, and essential investigations are available. **Aim:** The aim of the present study was to compare the Modified Alvarado scoring system (MASS) and the Raja Isteri Pengiran Anak Saleha Appendicitis score (RIPASA score) and to determine their diagnostic accuracy. **Materials and Method:** A prospective observational study was conducted in the Department of General Surgery, Sree Mookambika Institute of Medical Sciences, Kulasekharam for a period of one year. A total of 80 cases were included in the study. Alvarado and RIPASA scores were calculated. Diagnosis was confirmed on histopathological evaluation. Results were analysed using SPSS 20.0 version and the association was tested using Chi square test. The scores were compared based on sensitivity, specificity, Positive Predictive Value (PPV), Negative Predictive Value (NPV) and diagnostic accuracy. **Results:** Among the 80 patients, based on the Modified Alvarado score, 61(76.25%) patients and in RIPASA score 70(87.5%) patients clinically had appendicitis. On histopathological examination it was found that 70(87.5%) of the patients were diagnosed to have acute appendicitis. The sensitivity, specificity, PPV, NPV and diagnostic accuracy for RIPASA score were 98.57%, 90%, 98.57%, 90% and 69.11% respectively. This was higher than the sensitivity, specificity, PPV, NPV and diagnostic accuracy for Modified Alvarado score which was 82.86%, 70%, 95.08%, 36.84%, 58.08% respectively. **Conclusion:** When comparing the RIPASA score to the modified Alvarado score in diagnosing acute appendicitis, the RIPASA score was better. The Fourteen parameters have been made available in a thorough clinical history as well as evaluation and can be used quickly and readily. As a result, a management choice can be taken quickly. Thus, appendicitis-related mortality and morbidity can be decreased.

KEYWORDS : Acute appendicitis, Alvarado score, Appendectomy, RIPASA score, symptoms.

INTRODUCTION

Acute appendicitis constitutes one among the most frequent surgical emergencies in surgical practise, necessitating the attending surgeon's uttermost competence and attention in addition to a thorough clinical assessment. The primary diagnostic criteria for appendicular inflammation was mainly based on the clinical history, clinical examination, and laboratory investigations, such as an elevated leukocyte count.[1]

Appendicitis, if noticed early and managed effectively, can be the most uncomplicated operation; yet, if neglected, appendicitis may develop into a condition with significant mortality and morbidity. Acute appendicitis is challenging to diagnose, especially in reproductive-age females, children, and the elderly, due to the existence of gynaecological and urinary disorders that can present with a similar clinical presentation.[2]

Ultrasonography (USG) as well as computed tomography (CT) are two techniques that have been tested to increase the rate of correct diagnosis of appendicular inflammation. Although CT is the most accurate and sensitive in diagnosing the condition, it is very expensive and cannot be performed on a regular basis. Ultrasound is primarily operator dependent and frequently misses or overdiagnoses the condition. [3,4]

When diagnosing acute appendicitis, a clinical scoring system is a less expensive, quicker, and non-invasive diagnostic tool. In order to increase diagnosis accuracy, decrease the rate of appendectomy failures, and address the problem of delayed diagnosis, numerous grading systems have been devised. Eskelinen, Lindberg, Samuel, Alvarado, Tzanakis, Ohmann, Fanyo, and others are included in this.[5] The Alvarado and Modified Alvarado scoring systems (MASS), which are practical and simple to use having greater specificity and sensitivity, especially when applied to the Western population, are the most often used scoring systems globally. Alvarado scoring, based on eight clinically predictive criteria, was published in 1986.[6] Kalan et al. devised the modified Alvarado scoring system in 1994.[7]

A new scoring system known as the Raja Isteri Pengiran Anak Saleha Appendicitis score (RIPASA score) was created in the RIPAS hospital in Brunei, Darussalam to diagnose acute appendicitis in south-east Asian patients. It is a straightforward qualitative grading system with 14 factors. In the local population, it has been demonstrated that this score has greater specificity and sensitivity than the Alvarado score.[8] There were not many studies that compare the RIPASA score to the MASS in the diagnosis of appendicitis.

AIMS AND OBJECTIVES

The present study was conducted to compare Modified Alvarado and RIPASA scoring system in diagnosing acute appendicitis and to determine the diagnostic accuracy of both scores.

MATERIALS AND METHODS

The present study was a prospective study was conducted in

the Department of General Surgery, Sree Mookambika Institute of Medical Sciences, Kulasekharam for a period of one year. All patients irrespective of gender with classical signs and symptoms of acute appendicitis including fever, anorexia, nausea, peri-umbilical colic, localized tenderness in right iliac fossa (RIF), pain shifting to RIF and muscle guarding were included in the study. Pregnancy, patients with abdominal distension, previous history of pelvic inflammatory disease, patient not willing for surgery were excluded from the study. A total 80 patients were included in the present study.

The detailed history, clinical examination, laboratory investigations were done which included routine haematological investigations, Urine routine and USG Abdomen and Pelvis. The patients were evaluated based on the parameters of Modified Alvarado score (Table1,2) and RIPASA score (Table 3,4).

Table 1: Modified Alvarado Scoring Systems (MASS)

Features		Score
Symptoms	Anorexia	1
	Nausea/ vomiting	1
	Migratory RIF pain	1
Signs	Elevated temperature	1
	Tenderness in RIF	2
	Rebound tenderness in RIF	1
Laboratory investigation	Leukocytosis	2
	Shift of WBC to left	1
	Total	10

Table 2: Interpretation Of Modified Alvarado Scoring Systems (MASS)

Score	Interpretation
<5	Not sure, keep under observation
5-6	Compatible, may be for regular observation
7-9	Probable, operate
>9	Confirmed, operate

Table 3: RIPASA Score

	Features	Score
Demographic Features	Female	0.5
	Male	1
	Age< 39.9 years	1
	Age> 40 years	0.5
Symptoms	Anorexia	1
	Nausea/ vomiting	1
	RIF pain	0.5
	Migratory RIF pain	0.5
	Duration of symptoms < 48 hrs	1
	Duration of symptoms > 48 hrs	0.5
Signs	Tenderness in RIF	1
	Guarding	2
	Rebound tenderness in RIF	1
	Rovsing sign	2
	Fever >37°C, <39°C	1
Laboratory investigation	Leukocytosis	1
	Negative urinalysis	1
Additional scores	Foreign NRIC (National Registration Identity Card)	1

Table 4: Interpretation Of RIPASA Score

Score	Interpretation
<5	Unlikely acute appendicitis
5-7	Probably acute appendicitis
7.5-11.5	High probability acute appendicitis
>12	Definite acute appendicitis

According to the scores, each patient was assigned as definite/clinically confirmed, high probability/clinically equivocal, or neither. Intraoperative observations were recorded, and the specimen in 10% formalin was sent for histopathological analysis. Data entered in excel sheet. Statistical Analysis was carried out using SPSS 20.0 version. Sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) for both scoring systems were calculated. Chi square test was done to assess statistical significance. A p value less than 0.05 was considered significant.

OBSERVATION AND RESULTS

Among the study population, the age group of patients ranged from 15 to 53 years with a mean age of 26.38 ± 8.56 years. Most of the patients were in the younger age group and the most common age group affected in the study was 21 to 30 years seen in 38(47.5%) patients. Males 44(55%) were predominantly affected than females 36(45%) in the present study.

Most common presentation was pain in RIF was seen in 78(97.5%) patients followed by nausea and vomiting in 75(93.75%) patients. Fever was noted in 40(50%) patients. Rebound tenderness was present in 35(43.75%) patients whereas guarding was seen in 22 (27.5%) patients. Rovsing sign was elicited in 18 (22.5%) patients. Increased leucocyte count was seen in 63 (78.75%) cases with shift to left noted in 60(75%) cases.

Based on the Modified Alvarado and RIPASA scoring systems a score >7 and >7.5 respectively was indicative of appendicitis. According to Modified Alvarado score 61(76.25%) patients and in RIPASA score 70(87.5%) patients had appendicitis. (Table 5)

Table 5: Distribution Of Patients Based On Modified Alvarado And RIPASA Score

Modified Alvarado score		RIPASA score	
Score	Frequency	Score	Frequency
<5	8(10%)	<5	3(3.75%)
5-6	11(13.75%)	5-7	7(8.75%)
7-9	52(65%)	7.5-11.5	54(67.5%)
>9	9(11.25%)	>12	16(20%)

On histopathological examination it was found that 70(87.5%) of the patients were diagnosed to have acute appendicitis and the remaining had appendix with lymphoid hyperplasia and normal histology. Comparison between Modified Alvarado and RIPASA scoring systems with histopathology diagnosis showed statistically significant difference when compared with histopathology diagnosis with a p value <0.001. (Table 6 and 7)

Table 6: Comparison Between Modified Alvarado Score And Histopathology Report

Histopathology diagnosis vs Modified Alvarado scoring		Histopathology diagnosis	
		Appendicitis	No appendicitis
Modified Alvarado scoring	Appendicitis	58(72.5%)	3(3.75%)
	No appendicitis	12(15%)	7(8.75%)

Table 7: Comparison Between RIPASA Scoring And Histopathology Report

Histopathology diagnosis vs RIPASA scoring		Histopathology diagnosis	
		Appendicitis	No appendicitis
RIPASA scoring	Appendicitis	69(86.25%)	1(1.25%)
	No appendicitis	1(1.25%)	9(11.25%)

Sensitivity, specificity, PPV, NPV and Diagnostic Accuracy of RIPASA score was high when compared to Modified Alvarado score. (Table 8) So RIPASA score can be a better diagnostic scoring system for acute appendicitis. Difference in the scoring systems showed statistically significance (p = 0.001).

Table 8: Sensitivity, Specificity, PPV, NPV And Diagnostic Accuracy Of Modified Alvarado Score And Ripasa Score

	Modified Alvarado score	RIPASA score

DISCUSSION

Acute appendicitis is one of the most frequent surgical emergencies worldwide, especially among people under 30 years old. In their study, Wani MM et al.[9] found that men made up majority of appendicitis cases and that adolescents and young adults are the typical age at which appendicitis appears for the first time. Similar findings were made by Sabir et al.[10] who recognised appendicitis as a condition affecting children and noticed that there were 126(78.75%) males as well as 34(21.25%) females. This was comparable to the current study. In the current study, 70(87.5%) patients were diagnosed with acute appendicitis, which was comparable to the study done by Sabir et al.[10] where majority of patients (91%) had histological evidence suggesting acute appendicitis. According to the study, the best method for diagnosing appendicitis is still histopathological analysis.

The most typical symptom of acute appendicitis is pain. Acute appendicitis patients experience pain that initially begins in the umbilical area before moving to RIF. A 0.5 ml increase in secretions will result in an intraluminal pressure rise of up to 60 cm of water. Vomiting and nausea were brought on by this luminal blockage and distension. Then, an inflammatory process involving the serosal layer and parietal peritoneum results in a migration of discomfort from the umbilical region to the right iliac fossa. Typically, the discomfort begins as diffuse, with its focal point at epigastrium or umbilical region. Pain migrates to the right lower quadrant during a time frame of 4 to 6 hours.[11]

Chana RS et al.[12] in their study found abdominal pain in 88.6% of cases. This was similar to the present study where pain in RIF was seen in 78(97.5%) which was the most common symptom. The second most frequent symptom in the present study was nausea or vomiting. A total of 75 (93.75%) patients had it. A study conducted by Chana RS et al.[12] revealed that 56% of patients experienced nausea, and 50.67% experienced vomiting.

Low grade fever was one of the typical symptoms of acute appendicitis. The release of pyrogens causes an increase in body temperature. Particularly in situations of perforation and gangrenous appendicitis, fever can occasionally be high degree and persistent. In the current investigation, 40 patients (or 50%) had low-grade fever. According to the study done by Singhal P et al.[13], 25 patients (50%) had fever, 22 (44%) had rebound tenderness, 12 (24%) had guarding and 12 (24%) patients exhibited the roving indication. This was comparable to the present study.

An elevated total leukocyte count was thought to be an accurate indicator for acute appendicitis, but due to its relatively low specificity, it cannot be used as a diagnostic tool and offers little to improve the care of patients with uncertain clinical findings. Other illnesses including enteric fever and pelvic inflammatory disease also cause an increase in the total leukocyte count. As a result, it was an unfocused investigation. The clinical judgement needs to be regarded as more trustworthy because even an appendix that got perforated may have normal total leucocyte count.[14] In the current study, 63 (78.75%) participants had raised total leucocyte count.

In the present study shift to left was seen in 15(18.75%) cases. Wang et al.[15] did a study to assess the significance of leukocytosis and shift to the left in acute appendicitis. In their study, 53.5% of the patients with a shift to left of neutrophils had appendicitis, compared to 6.1% of adolescents with no left shift.

The most crucial requirement for making an accurate appendicitis diagnosis is regarded to be a good clinical examination. A scoring method was required to address these issues with adequate sensitivity, specificity, and a low appendectomy rate. One of the most often used is the MASS, which combines symptoms, indicators, and laboratory tests to arrive at the diagnosis. Another scoring system, the RIPASA score, was developed and promoted as having better results in Asian contexts.

Both scores can be calculated quickly by interns and residents. According to the current study, the RIPASA has a sensitivity and specificity of 98.57% and 90%, respectively. Similarly, other studies have shown that RIPASA is more effective than modified Alvarado in the diagnosis of acute appendicitis (Table 9). Similarly, Shuaib A et al.[16] and Damburaci N et al.[17] found statistically significant difference on comparing both scores. The fact that RIPASA employs more parameters than Alvarado, such as age, gender, and the length of symptoms previous to presentation, may further explain why RIPASA has higher sensitivity. These additional parameters are not included in Alvarado scoring.

Table 9: Comparison Of Sensitivity, Specificity, PPV, NPV And Diagnostic Accuracy Of Both Score With Other Studies

Studies	Modified Alvarado score					RIPASA score				
	sensitivity	Specificity	PPV	NPV	Diagnostic accuracy	sensitivity	Specificity	PPV	NPV	Diagnostic accuracy
Shuaib A et al.16	83.8%	56%	89.4%	42.4%	77.94%	94.5%	88%	97.2%	78.5%	93.38%
Damburaci N et al.17	88.09%	68.7%	93.6%	31.2%	73.4%	94.04%	87.5%	97.5%	12.5%	85.25%
Barman MK et al.18	76.82%	88.23%	96.92%	45.45%	81.25%	96.29%	76.4%	95.1%	81.25%	92.85%
Dezfuli SAT et al.19	53.95%	70.18%	70.69%	53.33%	-	93.42%	45.61%	69.61%	83.87%	-
Rao KR et al.20	85.07%	57.14%	95%	28.57%	82.44%	91.04%	71.42%	96.82%	45.45%	89.14%
Pachya U et al.21	52.56%	70%	93.18%	15.91%	54.54%	98.71%	80%	97.46%	88.89%	96.6%
Parmeshwar T et al.22	67.36%	80%	98.45%	11.42%	68%	94.73%	60%	97.82%	37.4%	93%
Khan HA et al.23	97.6%	12.5%	65.6%	75%	66.15%	100%	80%	98.3%	100%	98.46%
Gupta S et al.24	80.95%	75%	94.44%	42.86%	80.95%	92.86%	87.5%	97.5%	70%	92%
Present study	82.86%	70%	95.08%	36.84%	58.08%	98.57%	90%	98.57%	90%	69.11%

CONCLUSION

The RIPASA score is a straightforward quantitative scoring system that is simple to apply. The results of the present study found that the RIPASA score was superior to the widely used Alvarado score based on sensitivity, specificity, PPV, NPV, and diagnostic accuracy. This scoring system can be completed quickly, and the choice to operate might be based on a thorough clinical examination and a few straightforward laboratory tests. This would increase diagnostic accuracy and lower the likelihood of complications. As a result, a rapid diagnosis can be made without waiting for the whole set of examinations as well as in terms of medical expenses, they can help to reduce unnecessary radiological investigation.

LIMITATIONS

The limitation of study is the small study population. Further studies with larger sample sizes can be conducted to support the findings in the present study.

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