RESEARCH ARTICLE

RECRUITMENT OF ALVARADO AND MODIFIED RIPASA SCORES IN DIAGNOSIS OF ACUTE APPENDICITIS.

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Manuscript Info	*Abstract*
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Background: Diagnosis of acute appendicitis depends mainly on the surgeon's skills, as there is no single test that can confirm or rule out diagnosis, most of cases are first met by young surgeons in the emergency departments, so a diagnostic score which is easy applicable with good diagnostic accuracy was needed, ALVARADO and modified RIPASA scores are known but none of them proved to be better than the other.

Patients and method: ALVARADO and modified RIPASA scores were applied simultaneously on 224 patients with right lower quadrant pain, results of the scores were compared to the results of histopathological examination of the appendectomy specimen.

Results: ALVARADO score has positive predictive value (PPV) 100%, negative predictive value 36.5%, (NPV), sensitivity 66.3%, specificity 100%, and diagnostic accuracy 71.8%. Modified RIPASA score has positive predictive value (PPV) 90.4%, negative predictive value (NPV) 92.3%, sensitivity98.9%, specificity 55.8%, and diagnostic accuracy 90.6%.

Conclusion: ALVARADO score is more specific, but modified RIPASA score is more sensitive, in diagnosis of acute appendicitis, if both scores were applied together to all patients presented with acute right lower quadrant pain a better accuracy could be obtained, that can decreases negative appendectomy rate.

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Introduction:-

Acute appendicitis is a common surgical emergency, it accounts for 15-20% of acute abdominal pain.[1, 2]. Appendectomy found to be the most common emergency operation performed by general surgeons as it doesn't require wide experience and for fear of complications of unresolved appendicitis. [3, 4].

Diagnosis of appendicitis depends largely on the clinical experience of the practicing surgeon, till now no laboratory test that can hundred percent exclude or confirm diagnosis of acute appendicitis, ultrasound has sensitivity about 85% and specificity about 90% for the diagnosis of acute appendicitis. [5].

Computerized tomography (CT) was implicated in diagnosis of suspected appendicitis with high specificity and sensitivity; it helps decreasing the rate of negative appendectomy and reduced the number of complicated cases due

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to neglected treatment. But CT is not in the hands of every surgeon especially in the developing and poor countries. [6].

Negative appendectomy rate ranged between 10 - 15 %, may be greater in some high-risk populations. Consideration of negative appendectomy or not depend on histopathological examination. Negative appendectomy not only costs the health service authorities a high percentage of the healthcare budget, but it also exposes the patients to the hazards of unnecessary surgery [7, 8].

With the aim of a better clinical prediction of acute appendicitis, and as trials of decreasing negative appendectomy rate several diagnostic scores was emerged. [9, 10].

The Criteria of the scoring system for reducing the negative appendectomy rate is clinically based, non-invasive, requires no special equipment and has been used successfully by house surgeons and junior registrars [11].

Alvarado scoring system is one of the most commonly used scoring tool which incorporates symptoms, signs and laboratory investigations to reach the diagnosis. RIPASA scoring system was claimed to have better outcomes in Asian populations, we don't have much studies to test the reliability of RIPASA or ALVARADO scoring systems in the Egyptian population.

Patient and Methods
This study is a cross sectional observational study which was conducted in Zagazig University Hospitals in the emergency unit, over a period of 12 months from august 2018 to August 2019. Over 224 patients presented with right lower quadrant pain.

All patients were informed and consented; the study was approved by the institutional research board and ethical committee of Zagazig University.

All patients underwent a thorough history taking, clinical examination, lab tests in the form of CBC and urine analysis of selected patient, and ultrasound examination of the abdomen and pelvis,

ALVARADO and RIPASA scoring systems were applied simultaneously for all patients away from the practicing surgical team. Decision for surgery or not was taken by the attending surgeon, surgery performed as usual and post-operative histopathological examination of the appendix specimen was done.

Demographic data of patients, preoperative diagnostic criteria, data of ALVARADO and RIPASA scoring systems, and result of histopathology were collected and analyzed using the proper statistical tests.
Inclusion criteria:

Patients suspected acute appendicitis in emergency department. Age above 14 years old.
Exclusion criteria:
Patients with right loin pain referred to groin as renal pain, history of urolithiasis, history of pelvic inflammatory disease, pregnant females, patients with generalized peritonitis, complicated appendicitis (appendicular mass, appendicular abscess), diabetic and Immunocompromized patients, neurological deficits interfere with the ability to localize abdominal pain.

The patients who were treated conservatively in hospital then discharged home were contacted and followed up. And those who relieved within one week on medical treatment were considered negative cases.

Alvarado Scoring System:

Mnemonic (MANTRELS)	Value
Symptom	
Migration of pain to Right iliac fossa.	1
Anorexia	1
Nausea-vomiting	1
Signs	
Tenderness in right lower quadrant.	2

Rebound pain	1
Elevation of temperature >37.3°C	1
Laboratory	
Leukocytosis	2
Shift to the left (neutrophilia)	1
Total score	10

Interpretation of ALVRADO score
- < 5   not appendicitis
- 5 - 6   likely appendicitis
- 7 - 10   most likely appendicitis

Modified RIPASA scoring system:

		score
1.Patient.		
	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	0.5
	Anorexia	1.0
	Nausea & Vomiting	1.0
	Duration of symptoms ≤48hrs	1.0
	Duration of symptoms ≥48hrs	0.5
3.signs		
	RIF tenderness	1.0
	Guarding	2.0
	Rebound tenderness	1.0
	Rovsing's sign	2.0
	Fever ≥ 37ºC ≤ 39ºC	1.0
4.Investigation		
	Raised WBC	1.0
	Negative urine analysis	1.0
	Total score	16.5

Interpretation of modified RIPASA score
- < 5   Probability of acute appendicitis   is unlikely.
- 5–7.0   Low probability of acute appendicitis.
- 7.5–11.0   Probability of acute appendicitis   is high.
- > 12   Definite acute   appendicitis.

Results:-
Out of the 224 patients of the study 144 (64.3%) were female and 80 (35.7%) were male with mean age 27.3± 8.1, the most frequent complaint was pain shift to right iliac fossa followed by fever the least complain was anorexia and the most frequent clinical sign was tender Mc Burney's point followed by rebound tenderness and positive Rovsing's sign. Demographic criteria and the presenting manifestations presented in table 1.

Table (1) demographic criteria and presenting manifestations.

		Number	Percentage
gender	Male	80	35.7%
	Female	144	64.3%
Age		27.3 ± 8.1	
RIF pain		56	100%
Pain migration to RIF		56	100%
Fever		30	53.6%
Anorexia		25	44.6%
Nausea & vomiting		26	46.4%
RIF tenderness		56	100%
Guarding		18	32.1%
Rebound tenderness		50	89.3%
Rovsing's sign		40	71.4%

Out of the 224 patients, 216 underwent appendectomy and 8 patients relieved with conservative measures, histopathological examination of the operated cases confirmed diagnosis of appendicitis in 181 cases, and revealed negative results in 35 cases (negative appendectomy rate 16.2%. total number of proved non appendicitis was 43 cases.(operated and non-operated).

ALVARADO score diagnosed appendicitis in 120 patients all of them confirmed by histopathological examination, (true positive), It ruled out appendicitis in 104 cases, 61 of them were positive after histopathological examination. As shown in table 2.

In comparison to histopathological results ALVARADO score has positive predictive value (PPV) 100%, negative predictive value 36.5%, (NPV), sensitivity 66.3%, specificity 100%, and diagnostic accuracy 71.8%.

Table 2 ALVARADO score findings.

Alvarado score	Total no of patients	No appendicitis	appendicitis
<7	104	35	61
≥7	120	0	120
total	224	35	181

Modified RIPASA score diagnosed appendicitis in 198 patients 179 of them confirmed by histopathological examination (true positive) and 19 cases were negative (false positive), modified RIPASA score also ruled out appendicitis in 26, two of them were positive (false negative) after histopathological examination as shown in table 3. In comparison to histopathological results modified RIPASA score has positive predictive value (PPV) 90.4%, negative predictive value (NPV) 92.3%, sensitivity98.9%, specificity 55.8%, and diagnostic accuracy 90.6%.

Table 3 modified RIPAS score findings

Modified RIPASA score	Total no of patients	No appendicitis	appendicitis
<7.5	26	24	2
≥7.5	198	19	179
total	224	35	181

Diagnostic criteria of ALVARADO and modified RIPASA scores are presented in table 4, throughout these findings ALVARADO score is superior in diagnosing acute appendicitis without negative appendectomy rate while modified RIPASA score is superior in excluding acute appendicitis and overall diagnostic accuracy.

Table 4 diagnostic criteria of ALVARADO and modified RIPASA scores

	sensitivity	specificity	PPV	NPV	Accuracy	Negative appendectomy
ALVARADO	66.3%	100%	100%	36.5%	71.8%	0 %
Modified RIPASA	98.9%	55.8%	90.4	92.3%	90.6%	9.6%

Discussion:-

Up to date there was no single investigation that exclusively confirms or rule out the diagnosis of acute appendicitis. CT has a high level of sensitivity and specificity in diagnosis of acute appendicitis, but unfortunately it can't be available in every place or for every patient especially in areas with limited resources, thus many clinical and laboratory scores emerged aiming at decreasing the rate of negative appendectomy.

In the present study we found that female to male ratio is 1.8 to 1 that is different from some studies this difference had no impact on the results of the study, the mean age was 27.3±8.1 years , most patients were in their 3rd decade as we excluded patients of pediatric age.

In the present study the most common symptoms was right iliac pain, fever and pain shift, with nausea being the least presenting symptom. Tender Mc Burney's point is the commonest sign these findings coincides with most of the studies.

Regarding ALVARADO score, it has positive predictive value (PPV) 100%, negative predictive value 36.5%, (NPV), sensitivity 66.3%, specificity 100%, and diagnostic accuracy 71.8%.other studies has a varying results, the study of Konan [11], has similar results but studies of Verma [12], and Chong [13],reported a better accuracy.
MODIFIED RIPASA score has positive predictive value (PPV) 90.4%, negative predictive value (NPV) 92.3%, sensitivity98.9%, specificity 55.8%, and diagnostic accuracy 90.6%. These findings are similar to the results of Chong [13] and Alanjadat [14], and higher than in the studies of Erdem [15].

Negative appendectomy rate of this study is 16.2% which is higher than the study of Verma [12] and similar to the study of Alanjadat [14].

Conclusion:-

ALVARADO score is more specific for diagnosis of acute appendicitis but modified RIPASA score is more sensitive for exclusion of acute appendicitis; if both scores were applied together to all patients presented with acute right lower quadrant pain we will get better accuracy that can decreases negative appendectomy rate.

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