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Original Research Article

Max appendicitis score: a new diagnostic score for diagnosing acute appendicitis

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ABSTRACT

Background: Scoring systems are valuable and valid for discriminating between acute appendicitis and nonspecific abdominal pain. Alvarado scoring is classical and different modifications of Alvarado score have been introduced but none is ideal and negative appendicectomy rate is still high. The aim of the study is to design a more reliable scoring system which is cost effective, simple, easy to learn, high accuracy, which can be applied by any doctor at any health care facility.
Methods: Retrospective study of 160 patients hospitalized with abdominal pain suggestive of acute appendicitis and subsequently operated over a period of 5 year from January 2012 to January 2017 at Max Super Speciality Hospital, Gurgaon.
Results: In the present study based on six clinically most significant variables, a diagnostic accuracy of 96.25% was achieved while the same was 85% for classical Alvardo Score. This significantly increased the diagnostic accuracy and lowered the negative appendicectomy rate.
Conclusions: Max Appendicitis Score is perfect scoring system for diagnosing appendicitis, it can be specially very handy in peripheral health centers where radiological facilities are sparse.

Keywords: Acute appendicitis, Alvarado scoring system, Max appendicitis score, Negative appendicectomy

INTRODUCTION

Acute appendicitis is the most common surgical emergency. Acute appendicitis is essentially a clinical diagnosis.[1] Around 6% of general population is believed to have appendicitis in their lifespan.[2] Acute appendicites is still the commonest abdominal surgical emergency with a lifetime incidence of 7%.[2] In 1886 Fits RH described classical signs and symptoms of acute appendicitis as a disease entity.[3] The diagnosis of acute appendicitis is based purely on clinical history and examination combined with laboratory investigations.[4] Absolute diagnosis of acute appendicitis is possible only after surgery and histopathological examination.[5] Early diagnosis is a primary goal to prevent morbidity and mortality in acute appendicitis.[6] Though Various scoring systems have been devised to aid diagnosis. Yet negative appendicectomy rate is still high thus arises the need of a method which can complement clinical diagnosis and make clinical decision more precise and consistent. Alvarado in 1986 introduced a criterion for diagnosis of acute appendicitis which was later modified many a times to accommodate additional parameters along with original Alvarado scoring system.[7-10]

The aim and objective of this study was to evaluate and introduce a better scoring system in the diagnosis of acute appendicitis so as to reduce the rate of negative

appendicectomy the complication of acute appendicitis arising due to misdiagnosis and delay in surgery.

METHODS

This study was carried out in Department of General Surgery, Max Super Speciality Hospital, Gurgaon for a period of 5 years from January 2012 to January 2017. Retrospective study of 160 patients hospitalized with abdominal pain suggestive of acute appendicitis and subsequently operated for appendicitis. The diagnostic accuracy of the proposed scoring system was compared with that of the other prevalent scoring system

Classical Alvardo score had a total of 8 parameters with a total of ten point. Max appendicitis score includes only six most significant clinical parameters, as shown in Table 1.

These are; pain in right iliac fossa, tenderness in right iliac fossa, tachycardia, rebound tenderness in right iliac fossa, leucocytosis and shift to left of neutrophils with a total score of 10 and excludes migratory pain in RIF, anorexia, nausea/vomiting and elevated temperature, as in the present study these parameters were found less sensitive.

Table 1: The Alvarado Score versus max appendicitis score.

	Criteria	Score	Criteria	Score
Symptoms	Migratory RIF pain	1	Pain in right iliac fossa	2
	Anorexia	1		
	Nausea/vomiting	1		
Signs	Tenderness RLQ	2	Tachycardia (pulse rate >90/minutes)	2
	Rebound tenderness in RIF	1	Tenderness in right iliac fossa	2
	Elevation of temperature	1	Rebound tenderness in right iliac fossa	1
Laboratory findings	Leucocytosis	2	Leucocytosis	2
	Shift to the left of neutrophils	1	Shift to left of neutrophils	1
Total score		10		10

Data including symptoms, physical signs and laboratory findings were recorded in Alvardo and Max Appendicitis Score (Table 1). Acute appendicitis diagnosis was made clinically and decision for appendicectomy was taken, subsequently the score of each patient was correlated with clinical, operative and histopathological findings.

RESULTS

In the present study, the youngest patient was 2-year-old male child while the oldest was 68 years old male. Majority of our patient were in age group 20-30 years (56%) followed by age group of 0-20 years (28 %). In the present study, male to female ratio was 1.62:1. Post operatively, all specimens were sent for histopathological examination. The report confirmed acute appendicitis in 150 patients (94%), remaining 10 patients (6%) did not show any evidence of appendicitis. Out of 10 patients Meckels diverticulitis and mesenteric lymphadenitis were seen in 2 patient each, 2 patients had peroperative Salpingitis and 2 had hemorrhagic endometriosis (Table 2).

Table 2: correlation of preoperative diagnosis with histopathological findings.

Appendix status	Findings	No. of patients	Percentage
	Acute appendicitis	73	
	Acute suppurative appendicitis	37	
Appendicitis	Acute gangrenous appendicitis	8	94
	Perforated appendicitis	16	
	Chronic appendicitis with lymphoid hyperplasia	12	
	Appendicitis with cholecystitis	4	
	Meckel's diverticulitis	2	
	Mesenteric lymphadenitis	2	
Normal appendix with other pathology	Ruptured ovarian cyst	2	6
	Salpingitis	2	
	Hemorrhagic endometriosis	2	

As shown in Table 3, six parameters that were included in Max Appendicitis Score had highest sensitivity at the time of presentation and 4 least sensitive parameters were excluded.

Table 3: Evaluation of clinical and laboratory finding in acute appendicitis.

	No. of Patient	Percentage
Migratory RIF pain	86	54
Pain in right iliac fossa	160	100
Nausea/vomiting	81	51
Anorexia	99	62
Tenderness in right iliac fossa	153	96
Tachycardia (pulse rate >90/minutes)	144	90
Temp >37.3°C	88	55
Rebound tenderness in right iliac fossa	118	74
Leucocytosis (>10,000 cells/micro-liter)	158	94
Shift to the left of neutrophils	129	81

As shown in Table 4, Max appendicitis score when compared with Alvarado score showed that patient with low score (score <7) had less chance of appendicitis, 17 patient had appendicitis with Alvarado score less than 7, while only 2 patient had appendicitis with MAS score less than 7. Patient having higher score (Score >7) had higher chances of having appendicitis in MAS in comparison to Alvarado score.

Table 5: Comparison of Alvarado score and Max Appendicitis score.

	Alvarado score	Max appendicitis score
Sensitivity	88.66 %	98.66 %
Specificity	30 %	60 %
Positive predictive value	95 %	97.36 %
Negative predictive value	15 %	75%
Accuracy	85 %	96.25 %

As shown in Table 5, MAS has greater sensitivity and specificity when compared with Alvarado score, MAS has sensitivity and specificity of 98.66% and 60% respectively while Alvarado score has sensitivity and specificity of 88.66% and 30% respectively. MAS also has better positive predictive value (97.36%) than Alvarado score (95%).

Negative predictive value of MAS (75%) was much higher than Alvarado score (15%). MAS (96.25%) showed better accuracy than Alvarado score (85%) which makes it a better scoring system for diagnosis of acute appendicitis.

DISCUSSION

Acute appendicitis is the most common surgical emergency. Surgeon's good clinical assessment is considered to be the most important requisite in the diagnosis of appendicitis. Ultrasound is a non-invasive, available and cost-effective, but it is operator dependent. Computed Tomography (CT) imaging also aids in making a definite diagnosis and have been reported to have high sensitivity (94%) and specificity (95) for diagnosing acute appendicitis.[7]

Various scoring systems, such as Alvarado and modified Alvarado scoring systems have been in clinical practice since 1986 to help in clinical decision-making process in achieving and accurate diagnosis of acute appendicitis in the quickest and cheapest way.[11] A study by Al-Hashemy et al, in 2004 using the modified Alvarado scoring system in Middle Eastern population reported a low sensitivity of 53.8% and a specificity of 80%.[12]

Alvarado score and its different modification have low sensitivity, specificity and even today the negative appendicectomy rate, as reported in world literature, is as high as 20 to 40% with its associated morbidities of around 10%.[13,14]

There has been a need of a scoring system that can overcome these problems with acceptable sensitivity, specificity and low negative appendectomy rate, and particularly in emergency and in peripheral health centers specially in our country and other developing countries with limited resources, availability of CT Scans in peripheral health center.

MAS has included only six parameters whereas Alvarado scoring has 8 and RIPASA has 15 parameters. Hence it is easy to remember for any health care giver. MAS scoring had sensitivity of (98.66%), specificity of (60%). positive predictive value was 97.36%, negative predictive value was 75% and Accuracy was 97.36%.

On evaluation of scoring systems in the present study, Alvarado scoring had sensitivity of (88.66%), specificity of (30%). Positive predictive value was 95%, negative predictive value was 15% and accuracy was 85% (Table 5). MAS is more sensitive (98.66) and more accurate (96.25) than Alvarado (88.66-85%) and RIPASA score (97-89%).[15] MAS is even more sensitive (98.66) than CT Scan (94) hence no need for sophisticated radiological investigation.

There is no sign/symptom or laboratory test that are 100% reliable in the diagnosis of acute appendicitis. Thus, diagnostic score may be used as a guide to decide whether patient needs surgery or observation. Patient with score 7 and above should undergo surgery and patient score less than 7 should be kept under observation and re-evaluated, if the score remains same or increases accordingly decision may be taken for/against surgery.

CONCLUSION

In the diagnosis of acute appendicitis Max Appendicitis Score is fast, simple, easy to learn and apply, reliable diagnostic modality without extra expense. This scoring system is very helpful in peripheral hospitals. It also improves diagnostic accuracy and consequently reduces negative appendicectomy rate.

Since Max Appendicitis Score includes six clinically most significant parameters with overall higher sensitivity and accuracy it can be considered as an ideal clinical scoring system for diagnosing Acute Appendicitis.

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