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Original Research Article: "Application of Alvarado Scoring System in Diagnosis of Acute Appendicitis"- A retrospective Study

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ABSTRACT: Background: Acute appendicitis is one of the most common surgical emergency around the world and Appendicectomy being the most frequent operation performed accounting for about 10% of all emergency abdominal operation. Removal of normal appendix causes not only economical burden to patients and health resources but also physical and mental burden to the patients. Wrong diagnosis and delay in surgery can lead to complications like perforation and finally peritonitis.The Alvarado score can be used to diagnose patients with symptoms of suspected appendicitis.This is a retrospective study to assess the diagnostic accuracy of the Alvarado Scoring System in predicting acute appendicitis in our set up.

Materials & Methods: A retrospective study of 50 patients having pain in right lower quadrant of abdomen with a clinical diagnosis of acute appendicitis was conducted in department of Surgery, Nalanda Medical College and Hospital, Patna. The aim of this study was to evaluate accuracy of Alvarado score in suspected cases of acute appendicitis.

Result: Out of 50 patients selected for this study, 29 were male and 21 female operated for acute appendicitis on the application of Alvarado score.Pain in right iliac fossa was the main symptom in all patient along with nausea, vomiting and anorexia in many. Tenderness was observed in right iliac fossa in almost all patients.

Conclusion: Application of Alvarado scoring system increases the sensitivity and specificity for diagnosis of acute appendicitis with the added advantage of being simple and easy to use.

Keywords: Acute appendicitis. Alvarado score. Appendicectomy

I. INTRODUCTION

The appendix was first described in 1521 and inflammation of the appendix has been known to be a clinical problem since 1759.[1] However, the term 'appendicitis' was not used until Reginald Fitz described this condition in 1886.[2]Acute Appendicitis is the most common abdominal emergency in both developed and developing countries[3]. Approximately 6% of the population suffers from acute appendicitis during their life time [4]. It is more common in the younger population with a slight male preponderance. Its incidence rises slowly from birth and peaks in the late teen years, while gradually declining in the elderly age group. [5]

The clinical presentation of acute appendicitis may vary from non-specific vague abdominal pain to the classic presentation of right iliac fossa pain, tenderness and rebound tenderness. In atypical presentation of acute appendicitis the exact identification of patients who require immediate surgery as opposed to those who will be benefited from active observation is not always easy. Many times age and gender confounds the clinical picture, for example in premenopausal female, diagnostic considerations are broader, even in elderly patient diagnosis is a challenge[6]. Delay in diagnosis and treatment of appendicitis are associated with increased rate of morbidity and mortality. So to avoid this problem surgeons have a traditional approach for early intervention even in the absence of definitive diagnosis.[7] Negative appendicectomy rate of 15-40% has been reported in literature. [8]

Lots of efforts have been directed toward early diagnosis and treatment of acute appendicitis. A number of scoring systems have been used for aiding in early diagnosis of acute appendicitis and its prompt management. Scoring systems are valuable and valid instruments for discriminating between acute appendicitis and non specific abdominal pain [9]. One of the scoring is the Alvarado Scoring System which is purely based on history, clinical examination and few laboratory tests which helps to reduce negative appendicectomy rate and improved patient quality

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of care[10]. Alvarado score in this context is a simple, easy to apply, a cheap tool and an effective mean of stratifying patients according to the risk of acute appendicitis. However, this system is not a substitute for clinical judgment and just an aid in diagnosing acute appendicitis and assist in arriving at a conclusion whether a particular case should be operated or not, so that the number of negative laparotomies can be reduced. Our study is to evaluate the role of Alvarado Scoring System (MANTRELS Scoring) in diagnosis of acute appendicitis.

II. MATERIAL & METHODS:

A retrospective study of 50 patients who were suspected enough to warrant surgery for acute appendicitis admitted at Nalanda Medical College & Hospital, Patna under various surgical units was conducted during a period from July 2017 to December 2019.

INCLUSION CRITERIA- Patients of all age groups and both genders presenting with pain in right lower quadrant of abdomen and diagnosed provisionally as acute appendicitis and were willing for surgery were included in the study.

EXCLUSION CRITERIA- Patients presenting with palpable lump in right iliac fossa, urological, gynaecological or surgical problems other than acute appendicitis & Pregnant females were excluded from this study.

All patients were admitted , detailed history was taken which included symptoms and duration of the disease; general and systemic examination was done. Baseline investigations - CBC, RFT, LFT, Viral markers, Routine urine examination, X-ray Chest, X-ray KUB and ECG were done. A proforma containing general information about the patient plus eight variables based on the Alvarado scoring system (Table-1) was filled, their Alvarado score were calculated. A score of >7 was indicating acute appendicitis and a score below this level meant normal appendix but the decision to undergo surgery was purely on clinical grounds. Patients were operated by conventional method of appendicectomy. Diagnosis was confirmed by histopathological examination. The Alvarado score was correlated with the histopathological findings (Table-II). All data was analysed by SPSS version 10.

Table -1 : Alvarado Scoring System

Symptoms :	Score
Migratory right iliac fossa pain	1
Nausea/Vomiting	1
A norexia	1
Signs :	
Tenderness in right iliac fossa	2
Rebound Tenderness in right iliac fossa	1
Elevated temperature	1
Laboratory Findings :	
Lecucocytosis	2
Shift to the left of neutrophils	1
Total	10

Table-II: Alvarado Score *Histopathology Cross tabulation Count (n=50)

Alvarado Score ↓	Histopathology		
	Inflamed	Noninflamed	Total
3	0	2	3
4	0	1	2
5	7	1	8
6	12	0	13
7	5	1	6
8	9	0	9
9	8	0	8
10	4	0	4
	45	5	50

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III. RESULTS:

Maximum number of patients was between the age group of 12-30 years, out of which 21 patients were within the age group of 20- 30 years and 15 were between 12-20 years. The male: female ratio was 1.6:1. Pain was the most common symptom followed by nausea, vomiting and anorexia. Tenderness was the most common physical finding (47 patients) followed by rebound tenderness (27 patients) and raised temperature (29 patients). Leucocyte count was raised > 11000 in 28 patients and between 6000-11000 in 16 patients and 6 patients had counts less than 6000.

There were 27 patients with Alvarado score ≥7, and 23 patients with score <7, Peroperative observation revealed that 90% of patients had acutely inflamed appendix. On histopathological confirmation 96.3% of patients had acutely inflamed appendix with Alvarado score ≥7, while 82.6% with score <7. The sensitivity, specificity, positive predictive value, negative predictive value and accuracy were 57.8%, 80.0%, 96.3%, 17.4% and 60% respectively. (Table-III)

Table III: Representing the values of test and disease positive (n=50)

	Histopathology Positive	Histopathology Negative	
Alvarado ≥7	**26**	**1**	**27**
Alvarado < 7	**19**	**4**	**23**
	45	**5**	**50**

Sensitivity: 26/45 x 100 = 57.8%, Specificity: 4/5 x 100 = 80.0%, PPV: 26/27 x 100 = 96.3% NPV: 7/23 x 100 = 17.4% Accuracy: 30/50 x 100 = 60%

IV. DISCUSSION:

Appendicitis is a disease that spares no age and it may occur at any period of life from cradle to the grave. Majority of the studies have also reported and concluded that no age is exempt from acute appendicitis. The increase of incidence during the second and third decade of life is thought to be due to the increase of lymphoid tissue of the appendix at this age. It is presumed that the lymphoid hyperplasia can very easily give rise to obstruction and thus greater chances for inflammatory changes during adolescence and early adult life. The low incidence in old age can be explained by the fact that at this age the lymphoid tissue gradually disappears and is replaced by fibrous tissue and appendix tends to become atrophic. In our study, tenderness at McBurney's point and rebound tenderness was present in 47 and 27 patients respectively. John H. et al 1991 has emphasized that clinical examination and surgeons' experience remains the most important tool in diagnosis of acute appendicitis. Alvarado A. 1986, in his original paper has given two points to leucocytosis and one point to raised polymorphs and stated that if Alvarado score is less than 5, the chances of acute appendicitis is less likely and if Alvarado score is 7 or more, the chances of acute appendicitis are more. Alvarado Scoring System is one of the many scoring systems available today. It is based on history, physical examination and few laboratory tests. Alvarado score is a simple non-invasive diagnostic procedure, which is reliable, safe, repeatable and economical, easy and can be used in emergency setting without expensive and complicated supportive diagnostic tools.

Several studies have validated the Alvarado score but on the other hand many studies recommend taking cut-off point at 4 or 6.[11,12] In our study, 96% of patients with Alvarado score >7 have evidence of acute appendicitis on histopathology with positive predictive value of 96.3% and sensitivity of 57.8% which is comparable to study conducted by Ahmed et al[13] giving sensitivity of 53.8%. It clearly indicates that high score may be used as an aid in deciding the need for immediate appendicectomy.

Matija et al[14] in their study documented 100% positive predictive value of score >7 in the diagnosis of acute appendicitis in females. Hizbullah et al[15] study documented positive predictive value of 85% at score >7. But in another study conducted by Ikramullah et al [16] positive predictive value was found to be 83.5% in adults. Another study conducted by Pruekprasert et al[17] reported sensitivity of >7 score of 79% while those who were operated upon based on surgeons clinical experience the sensitivity was found to be 96% while in our study 91% sensitivity was seen on the basis of clinical experience irrespective of score.

In our study negative appendicectomy at score >7 was 3.7% which is comparable to study conducted by Matija et al[14] who revealed no case of removal of normal appendix at score >7.

In another study conducted by Khalid et al[18] negative appendicectomy rate was 11%. However, Malik AA & Wani NA[19] reported the use of Alvarado score with positive predictive value at

score of >7 of 80% as it had a very high negative appendicectomy rate in female giving sensitivity of 61%. Most of these patients had score >5 while all those at score 3 or 4 had normal appendix. Malik AA & Wani NA[19] reported the positive predictive value 66.6% in case of score <7.Thus our study shows that application of Alvarado scoring system provides high degree of positive predictive value and therefore high diagnostic accuracy.

V. CONCLUSION:

This study showed that Alvarado Scoring System has a high diagnostic value in diagnosis of acute appendicitis. Hence, although clinical findings and experience have major importance, Alvarado score is a useful tool in the diagnosis of acute appendicitis.Alvarado scoring System is a non-invasive, safe diagnostic procedure which is simple, fast, reliable and repeatable.

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