



## STUDY TO ASSESS THE ACCURACY OF MODIFIED ALVARADO SCORING SYSTEM IN DIAGNOSIS OF ACUTE APPENDICITIS.

### General Surgery

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### ABSTRACT

#### Back Ground

The diagnosis and treatment of acute appendicitis have changed considerably with years. In previous days the timing of surgery was under debate.. The debate on timing of the operation is nowadays settled in favour of acute operation, but the price paid for this dogma of emergency surgery for suspected appendicitis is a high rate of unnecessary appendectomies. The goal of therapy is early diagnosis and prompts operative intervention. However many patients do not seek medical attention in a timely manner and since the diagnosis of appendicitis can be difficult especially in patients at extremes of age and in those presenting with subtle and / or equivocal signs. To minimize this diagnostic dilemma, a number of scoring systems have been devised as aids to the early diagnosis of acute appendicitis. Alvarado, Teicher, Leindberg, Christian Fenyo, to name a few of these Alvarado score remains the most widely accepted one.

#### Methods:

**Aim and objectives:** To study 75 patients of suspected appendicitis using modified Alvarado scoring system, assessing the accuracy of modified Alvarado scoring system.

**Results:** The result of present study showed that a high score (>7) was a satisfactory aid in the early diagnosis of acute appendicitis, the overall sensitivity in men with scores >7 was 90%, with a negative Appendicectomy rate of 10

**Conclusions:** modified Alvarado score is accurate in assessing acute appendicitis at high scores (>7).

### KEYWORDS

modified Alvarado score, acute appendicitis, accuracy.

#### INTRODUCTION:

The diagnosis and treatment of acute appendicitis have changed considerably since the drainage of an appendicular abscess in the right lower abdominal quadrant of Prince Edward VII (1841-1910), only few days before his coronation in 1902. In those days the timing of surgery was under debate. The debate on timing of the operation is nowadays settled in favour of acute operation, but the price paid for this dogma of emergency surgery for suspected appendicitis is a high rate of unnecessary appendectomies. Appendectomy is the most commonly performed emergency operation, accounting for 6 percent of all operations. Since Reginald Fitz [1] first described Acute Appendicitis in 1886, it has been recognized as one of the most common causes of acute abdomen worldwide.

The goal of therapy is early diagnosis and prompts operative intervention. However many patients do not seek medical attention in a timely manner and since the diagnosis of appendicitis can be difficult especially in patients at extremes of age and in those presenting with subtle and / or equivocal signs. In them the diagnosis is often delayed, leading to perforation rates as high as 80%. Thus many surgeons use a fairly aggressive approach accepting a certain number of negative appendectomies (approximately 15%)<sup>[1]</sup>.

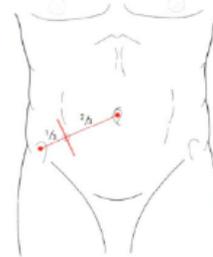
Because the early signs and symptoms of appendicitis are often subtle, patients and surgeons may downplay their importance. Early in appendicitis patients may experience dull, poorly localizable pain often described as epigastric or peri-umbilical pain which eventually localize to the right lower quadrant once inflammation involves the overlying parietal peritoneum which classically produces pain and tenderness at Mc-Burney's point. In addition, the symptoms can vary depending upon the location of the appendix.

An inflamed anterior or pelvic appendix produces marked symptoms in the lower quadrant, while a retro-caecal appendix may not cause the same degree of local signs of peritonitis because the inflammation is masked by the overlying bowel. Nausea and vomiting, if they occur, follow the onset pain. The diagnosis of appendicitis should be reconsidered in patients in whom nausea and emesis are the first signs of illness<sup>[1]</sup>.

Fever and leukocytosis usually follow later in the course of illness. A perforated appendix must be considered in a patient whose temperature exceeds 103 degree F with a leukocytosis more than

15,000<sup>[2]</sup>.

The physical examination is often unrevealing in the early stages of appendicitis, again varies depending on the location of the appendix. In retrocaecal appendix localized tenderness may be less impressive; a pelvic appendix can cause tenderness below Mc Burrey's point-such patients often complaint of urinary frequency, dysuria or rectal symptoms such as tensesmus and diarrhea. Several manoeuvres during physical examination like the Rovsing's sign, obturator sign, iliopsoas sign have been described to facilitate diagnosis although their accuracy has not been well defined<sup>[1]</sup>



The patients of acute appendicitis due to their subtle early signs and symptoms often pose a diagnosis challenge and can test the accuracy of an astute clinician especially if presented early and/or with equivocal signs. Even with the aid of some special investigations like ultrasound and CT false positive diagnosis ranges between 20 and 44%. [4]

To minimize this diagnostic dilemma, a number of scoring systems have been devised as aids to the early diagnosis of acute appendicitis. Alvarado, Teicher, Leindberg, Christian Fenyo, to name a few of these Alvarado score remains the most widely accepted one.

The Alvarado scoring system described by Alvarado in 1986 was designed to facilitate early diagnosis, and to reduce negative appendectomy rate without increasing morbidity and mortality. This scoring system is based on three symptoms, three signs and two laboratory findings. Each is scored 1 or 2 making the total score 10. [5] The Alvarado score was modified later by Kalan in 1988 which considered only one laboratory finding and a total score of 9 instead of 10.

In many previous studies it was found that the Alvarado score is a simple and practical method in the preoperative clinical diagnosis of acute appendicitis. Sensitivity was especially at the extremes of the score spectrum in males.<sup>[6]</sup>

**AIM AND OBJECTIVES:** To study 75 patients of suspected appendicitis using modified Alvarado scoring system, assessing the accuracy of modified Alvarado scoring system by using sensitivity, specificity, positive and negative predictive values and percentage of positive and false negative.

#### MATERIAL AND METHODS

This is a study conducted in a Government General Hospital, Kakinada. 75 patients who were suspected to have appendicitis on clinical presentation among 94 patients were evaluated initially only the admitted cases were included in the study.

**PERIOD OF STUDY:** 2 year { july 2016 – june 2018}.

#### INCLUSION CRITERIA:

1. Age between 15 & 50 years.
2. Acute abdominal pain clinically presumed to be of appendicular origin who subsequently underwent appendicectomy.

#### EXCLUSION CRITERIA:

1. Age less than 15 years or more than 50 years.
2. Palpable mass on abdominal examination.
3. Signs of generalized peritonitis
4. Patients who were not taken up for appendicectomy.

The clinical presentation of all these patients was studied with reference to the modified Alvarado scoring system<sup>[11]</sup>.

#### MODIFIED ALVARADO SCORING SYSTEM:[7]

Kalan and Talbot<sup>[7]</sup> undertook a study of 49 patients using a Modified version of the Alvarado system. In this only 7 parameters out of the total 8 parameters were considered. One of the laboratory investigations i.e. Neutrophilic left shift was not considered.

Symptoms / Signs / Investigation	Score	
	Yes	No
Symptoms		
Migration of pain to right iliac fossa	1	0
Anorexia	1	0
Nausea / Vomiting.	1	0
Signs		
Tenderness over right iliac fossa	2	0
Rebound tenderness over right iliac fossa	1	0
Temperature > 37.3°C	1	0
Investigation:		
Leucocytosis > 10 x 10 <sup>9</sup> /L	2	0
Total Score	9	0

#### SCORING SYSTEM

- 1-4 - Appendicitis unlikely
- 5-6 - Appendicitis possible
- 7-8 - Appendicitis probable
- 9 - Appendicitis definitive

Thus, all the 75 patients were admitted evaluated and scored on the basis of the modified Alvarado scoring system and subsequently underwent Appendicectomy. Operated patients had their appendix evaluated by histo-pathological examination (HPE). The HPE results were subsequently collected and compared with the respective scores. Negative Appendicectomy was defined when an appendix removed at surgery did not show evidence of appendicitis on HPE.

**DATA ANALYSIS:** In the present study the following statistical methods were employed for the score analysis from the collected data:

1. Simple frequency distribution
2. cross tabulations
3. Sensitivity, specificity, positive predictive value, negative predictive value, false Positive and false Negative.

## RESULTS

**Group – I :** Eighteen patients were in first group (1-4 score) who were not considered likely to have appendicitis. They were observed and were treated conservatively. Discharged after 2-3 days and were followed up every month for 6 months and none of them required surgery.

**Group – II :** Twenty three patients were in second group (5-6 score) , 7 were operated upon clinical suspicion of high probability of acute appendicitis. Rest of the 16 cases were not operated, were observed and discharged after 3 to 4 days of stay in hospital and followed up every month for 6 months and none of them required surgery during the period of observation. Of the 7 patients, whose score was 5-6 who were operated, 5 were males and 2 were females.

#### Distribution of cases according to modified Alvarado Score (5-6)

Category of cases	No. of cases operated	No. of cases with HP Appendicitis	No. of cases without HP Appendicitis	Proportion of true positive
Male (n=22)	22	20	2	90%
Female (n=14)	14	10	0	71.4%
Total (n=36)	36	30	2	83.3%

4 female patients on subjecting for ultrasonography of abdomen had other pathology mimicking acute appendicitis and they didn't undergo Appendicectomy.

Two patients had pelvic inflammatory diseases, and two patients had ruptured ectopic pregnancy.

30 cases out of 36 cases had acute appendicitis. The sensitivity of modified Alvarado score of > 7 was 83.3% (proportion of true positive).

The sensitivity was highest among males i.e., 90% while in females, it was 71.4%. Negative appendicectomy rates were highest among females (28.6%), where as in case of males it was 10%. 2 males patients with normal appendix had Meckel's diverticulitis.

#### DISCUSSION

The result of present study showed that a high score (>7) in men<sup>[10]</sup> was a satisfactory aid in the early diagnosis of acute appendicitis, the overall sensitivity in men with scores >7 was 90% , with a negative Appendicectomy<sup>[9]</sup> rate of 10%.

But in females the negative Appendicectomy rates were quite high<sup>[11,12]</sup> in groups with score of 5 to 6 as well as 7 to 9. The negative Appendicectomy rate in the above groups being 50% and 28.6% respectively.

Sensitivity of acute appendicitis 90% for males in the present study with score of 7 to 9 correlates well with the figures of studies by Kalan M, Rich AJ, Talbot D, Cunliffe WJ (who have reported 93%) and P.K. Bhattacharjee, T. Chowdhary, D.Roy (who have reported 94.1%).

Sensitivity of acute appendicitis 71.4% for females in the present study with score of 7 to 9 correlates well with the figures of studies by Kalan M, Rich AJ, Talbot D, Cunliffe WJ (who have reported 67%) and P.K. Bhattacharjee, T. Chowdhary, D.Roy (who have reported 71.9%).

The overall sensitivity of acute appendicitis being 83.3% in the present study with score of 7 to 9 correlates well with the figures of studies by Kalan M, Rich AJ, Talbot D, Cunliffe WJ (who have reported 83.7%) and P.K. Bhattacharjee, T. Chowdhary, D.Roy (who have reported 82.7%)<sup>[14]</sup>.

#### Comparison of Modified Alvarado score (5-6)

Category	Present study	Kalan M, Rich AJ, Talbot D, Cunliffe WJ	P.K. Bhattacharjee, T. Chowdhary, D.Roy
Male	60%	67%	83.3%
Female	50%	50%	66.7%
Total	57%	62.5%	73.7%

**Comparison of Modified Alvarado score (7-9)**

Category	Present study	Kalan M, Rich AJ, Talbot D, Cunliffe WJ	P.K. Bhattacharjee, T. Chowdhury, D.Roy[14]
Male	90%	93%	94.1%
Female	71.4%	67%	71.9%
Total	83.3%	83.7%	82.7%

**CONCLUSION:**

From the present study it may be concluded that high scores (7-9) in modified Alvarado score is dependable aid in early diagnosis of acute appendicitis in men but the same is not true as far as women are concerned, because of other conditions mimicking appendicitis like pelvic inflammatory disease, ruptured ectopic pregnancy. Ultrasonography of abdomen is a useful tool in avoiding negative Appendicectomy rates particularly in females.

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