



A Prospective Study of the Evaluation of Modified Alvarado Score in Diagnosis of Acute Appendicitis

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Abstract

Background- Presentations of acute appendicitis can mimic variety of acute medical and surgical abdomino-thoracic conditions. Early diagnosis is a primary goal to prevent morbidity and mortality in acute appendicitis.

Methods- After institutional ethical committee approval the present study was conducted in department of general surgery, RNT Medical College attached to M.B. Hospital, Udaipur, and Rajasthan. Patients presenting with pain in the right lower quadrant of abdomen, lasting fewer than 7 days who after clinical examination, provisionally diagnosed to have acute appendicitis will be included in the present study.

Results- 22 patients with modified Alvarado score 7-9 were managed by appendicectomy and all were reported as appendicitis on HPE. Nineteen patients with modified Alvarado score 5-6 were managed by appendicectomy and 17 of them were reported as appendicitis on HPE and 2 patient were reported normal appendix on HPE. Nine patients with score 4 or less were treated by appendicectomy, 7 out of them reported as appendicitis on HPE and 2 patients were reported as normal appendix on HPE.

Conclusion- It could well be concluded that in patients presenting with pain in right lower quadrant and with presumptive diagnosis of appendicitis modified Alvarado scoring system can be a useful aid in clinical diagnosis of appendicitis. It also helps to reduce the rate of negative appendicectomy. It is a simple user friendly method which practically involves no cost.

Keywords- Appendicitis, Modified Alvarado Score, HPE (Histopathological Examination).

Introduction

The anatomical name for the appendix, vermiform appendix, means worm-like appendage. The appendix is a closed-ended, narrow tube that attaches to the terminal end of caecum where three taeniae join, about 2 cm below the ileocaecal orifice. The appendix, ileum and ascending colon are all derived from midgut. The appendix first appears in the eighth week of gestation, as an outpouching of the caecum and gradually rotates to a more medial location as the gut rotates and the caecum becomes fixed in the right lower quadrant.

The length of the appendix varies from 2 to 20 cm, and the average length is 9 cm in adults. Diameter of the appendix is 3-8 mm and diameter of the lumen is 1-3mm. The

appendicular artery, branch of ileocolic artery, supplies the appendix. The tip of the appendix may lie in various locations. The most common location is retrocaecal (74%) but within peritoneal cavity. It is pelvic in 21% and retroperitoneal in 7% of the population. The varying location of the tip of the appendix likely explains the myriad of symptoms that are attributable to the inflamed appendix.¹

Presentations of acute appendicitis can mimic variety of acute medical and surgical abdomino-thoracic conditions. Early diagnosis is a primary goal to prevent morbidity and mortality in acute appendicitis.² Another important issue is decreasing the negative appendicectomy rate. In spite of advancements in medical diagnostics, its diagnosis is mainly clinical one. Over the last two decades different protocols have been introduced and tested by different researchers which include Lidverg, Fenyo, Christian, Ohman and Alvarado. Alvarado in 1986 introduced a criterion for the diagnosis of acute appendicitis which was later modified to accommodate additional parameters along with original Alvarado scoring system.³ Symptoms of appendicitis overlap with a number of other conditions making its diagnosis a challenge, particularly at an early stage of presentation. Simple appendicitis can progress to perforation, which is associated with a much higher morbidity and mortality, and surgeons therefore are inclined to operate when the diagnosis is probable rather than wait until it is confirmed.⁴ A clinical decision to operate leads to the removal of a normal appendix in 15% to 30% of cases. Some cases of appendicitis may resolve spontaneously. Nonetheless, if a period of observation culminates in the diagnosis of a ruptured appendix, the patient may have suffered a poor outcome that was avoidable. Reductions in the number of “unnecessary” or non-therapeutic operations should not be achieved at the expense of an increase in number of perforations. It has been claimed that diagnostic aids can dramatically reduce

the number of appendicectomies in patients without appendicitis, the number of perforations, and the time spent in hospital. The various methods advocated to assist in the diagnosis of appendicitis include laparoscopy, scoring systems, ultrasonography, computed tomography and magnetic resonance imaging. Imaging techniques have been shown to be particularly accurate.¹² Clinical prediction rules (CPRs) quantify the diagnosis of a target disorder based on findings of key symptoms, signs and available diagnostic tests, thus having an independent diagnostic or prognostic value. CPRs have the potential to reduce diagnostic error, increase quality and enhance appropriate patient care.

Material and Methods

After institutional ethical committee approval the present study was conducted in department of general surgery, RNT Medical College attached to M.B. Hospital, Udaipur, and Rajasthan.

Source of Data

Patients with Acute appendicitis admitted at Maharana Bhupal Government Hospital (MBGH) attached to R.N.T. Medical College, Udaipur and undergoing appendicectomy.

Type of study

This is a prospective study of patients admitted and positively diagnosed as acute appendicitis.

Methods of data collections

Patients presenting with pain in the right lower quadrant of abdomen, lasting fewer than 7 days who after clinical examination, provisionally diagnosed to have acute appendicitis will be included in the present study.

“Modified Alvarado score” will be applied on these patients which consists of three symptoms, three signs and a laboratory finding as described by Alvarado and later modified by Kalan (Table 1).

Table 1: Modified Alvarado Score

Symptoms/ Sign/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
Investigations		
Leucocytosis > 10 X10 ⁹ /L	2	0

Scoring system

Score :

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

The patients will be scored out of a total of 9 points. Patients with score of 1-4 are not considered likely to have acute appendicitis will be observed and not operated unless for compelling reasons to do so. Those with scores between 5-6 will be considered to have possible diagnosis of acute appendicitis but not convincing enough to warrant immediate surgery and these patients will be monitored at 4 hourly intervals and if within 24 hours of observation these score become ≥ 7 or their clinical features are convincing enough to warrant surgery than irrespective of their scores appendectomy will be performed. All patients with scores 7 to 9 will be considered to have either probable or definite diagnosis of acute appendicitis and will be considered for appendectomy in first instance.

All patients will undergo ultrasonography of the abdomen primarily to rule out other conditions mimicking acute appendicitis.

Patients with score of 7-9 who are considered candidates for appendectomy will be assessed again after ultrasonography. If any other conditions mimicking acute appendicitis is found in them, they are not operated and will be considered as false positive cases.

All specimens of appendix will be sent for histopathological confirmation of acute appendicitis. Finally correlation between the scoring system and final diagnosis is made.

Inclusion Criteria

- Patients with provisional clinical diagnosis of acute appendicitis.

Exclusion criteria:

- Patients of age ≤ 12 years.
- Patients with appendicular mass or abscess.
- Patients with generalized peritonitis due to appendicular perforation.

Observations

Thirty five patients out of 50 patients, 35 patients (70%) were male and 15 patients (30%) were female. Eleven patients (64.7%) were male and 6 patients (35.3%) were female out of 17 elective cases. Most cases were aged between 21-30 years of age (44%) followed by 12-20 years (30%).Sixteen percent of cases were between 31-40 years and 10% above 40 years of age.Youngest patient in the study group was 13 years and eldest was 52 years.

Table No.2. Presenting Signs and Symptoms

Symptoms	No. of patients	% of cases
Migration of pain to RIF	40	80
Anorexia	26	52
Nausea/vomiting	38	76
Tenderness in RIF	50	100

Rebound tenderness	13	26
Elevated temperature	36	72

Right iliac fossa tenderness was present in 100% cases. History of Migration of pain from umbilicus to right iliac fossa and nausea/vomiting both were present in 80% and 76% cases respectively. Fever was present in 72% cases. Anorexia was present in 52% cases. Rebound tenderness was present in 26% cases.

Table No.3. Blood Test (Total Leucocyte Count)

Total leucocyte count (counts/dl)	No. of patients	% of patients
<10500	25	50
>10500	25	50

Fifty percent patients had total leucocyte count more than 10500/dl. Remaining 50% patients had total leucocyte count less than 10500/dl.

Table No.4 Comparison of Appendicular Histopathology with Pre-Operative Modified Alvarado Score

Appendix HPE	No. of patients	Average Modified Alvarado score
Acute appendicitis	46	6.26
Normal appendix	4	4.25

Average modified Alvarado score was 6.26 in patients with HPE report of acute appendicitis and 4.25 in patients with normal appendix.

Table No.5 Pre-Operative Modified Alvarado Score And Hpe Report.

Score	Course of action	HPE report	
	Appendicectomy	Appendicitis	Normal appendix
7-9	22	22	-
5-6	19	17	2
<4	9	7	2

Twenty two out of 22 patients with modified Alvarado score 7-9 were managed by appendicectomy and all were reported as appendicitis on HPE.

Nineteen patients with modified Alvarado score 5-6 were managed by appendicectomy and 17 of them were reported as appendicitis on HPE and 2 patient were reported normal appendix on HPE.

Nine patients with score 4 or less were treated by appendicectomy, 7 out of them reported as appendicitis on HPE and 2 patients were reported as normal appendix on HPE.

Discussion

The diagnostic accuracy in cases of acute appendicitis should be high because negative appendicectomy carries significant morbidity as there is a greater risk for abdominal adhesions after appendicectomy, other equally important point to note is, delay in treatment due to diagnostic uncertainty, which leads to higher complication rate, which further translates into higher morbidity and mortality. The symptoms of appendicitis may not be classical and in such situation; a policy of early intervention to avoid perforation may lead to high negative appendicectomy rate. And on other hand minimization of negative appendicectomy carries the risk of complications. Difficulties in diagnosis arise in very young, elderly patients and females of reproductive age because they are more likely to have an atypical presentation, and many other conditions may mimic acute appendicitis in these patients. In such cases, clinical examinations should be complemented with various

investigations to exclude other diseases and helpful to achieve a more accurate diagnosis.

Many scoring system for the diagnosis of acute appendicitis have been tried; but most of these are complex and not feasible in emergency setting. Therefore, a scoring system used for the diagnosis of acute appendicitis should be simple enough to be used as an emergency department setting. Modified Alvarado Score is just a simple mathematical tabulation of common clinical signs and symptoms found in patients of acute appendicitis. It has been reported to be a cheap and quick diagnostic tool in patients with acute appendicitis. However, differences in diagnostic accuracy have been observed if the score were applied to various populations and clinical settings.

In our study the total number of male patients was 35 (70%) and number of female patients was 15 (30%) and M: F Ratio was 2.33:1. This finding was greater than what Kailash Singh et al (2008) ⁵ found in their study, incidence of male and female was 55% and 45% respectively. At the end of the study, it was found that age group of patients in which maximum number of cases presented was from 21-30 years. Male patients outnumbered female patients. Similar study has been done by Harsha et al(2011)⁶.

In patients with histopathological report of acute appendicitis, average Modified Alvarado score was 6.26. Four appendix were reported histopathologically as normal and average modified Alvarado score in this was 4.25.

Twenty two patients with HPE report of acute appendicitis out of 22 had modified Alvarado score in the range of 7-9. 17 patients reported appendicitis on HPE out of 19 patients had modified Alvarado score of in the range of 5-6. 7 patients reported appendicitis on HPE out of 9 patients who had modified Alvarado score 4 or less.

patients reported normal appendix on HPE, had modified Alvarado score of 5, 5, 3 and 2.

Hence sensitivity and specificity of this score in our study was found 100% and 14.28% respectively.

Kurane et al (2008) found In their study, modified Alvarado score had sensitivity of 78.26% and specificity was 83.78%.⁷

Conclusion

It could well be concluded that in patients presenting with pain in right lower quadrant and with presumptive diagnosis of appendicitis, modified Alvarado scoring system can be a useful aid in clinical diagnosis of appendicitis. It also helps to reduce the rate of negative appendicectomy. It is a simple user friendly method which practically involves no cost.

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