

Clinical Study of Alvarado Scoring in Acute Appendicitis

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Abstract

Background: Acute appendicitis is a common abdominal emergency worldwide. Although there are lots of advances in the diagnostic field with the invention of sophisticated investigations, diagnosis of acute appendicitis, none of the investigations like ultrasonography, computed tomography scan can conclusively say definitely about appendicitis.

Materials and Methods: This prospective study was conducted in 128 cases of suspected appendicitis admitted in surgical unit of Mahatma Gandhi Memorial Hospital, Kakatiya Medical College, Warangal, Telangana State, India, from August 2009 to July 2011 adopting the Alvarado scoring system. Results were analyzed.

Results: A total of 128 patients were admitted who were suspected of having acute appendicitis. A total number of cases operated suspecting acute appendicitis were 113 of which 97 were found to have acutely inflamed appendix. Results of Alvarado score of operated patients are as follows: 86 patients had score 7-10, and 27 patients had score 5-6, sensitivity in males is 80.4%, and 74.07% in females. The positive predictive value in males was 93.18% and 74.07% in females. The patients with Alvarado score <5 were kept under observation. None of the patients required surgery.

Conclusion: It is simple to use and easy to apply since it relies only on history, clinical examination, and basic lab investigations. It can work effectively in routine practice as an adjunct to surgical decision-making in questionable acute appendicitis. It is effective in children and men but diagnostic laparoscopy is advised to minimize the unacceptably high false-positive rate in women. It is cost-effective and can be used in all district general hospitals with basic lab facilities. Alvarado scoring system significantly reduces the number of negative laparotomies without increasing overall rate of appendicular perforation.

Key words: Acute appendicitis, Alvarado score, Rebound tenderness

INTRODUCTION

Acute appendicitis is the acute inflammation of the appendix. It is the most common surgical cause of emergency laparotomy. Simple appendicitis can progress to perforation, which is associated with a much higher morbidity and mortality, and surgeons have, therefore, been inclined to operate when the diagnosis is probable rather than wait until it is certain.¹ Despite more than 100 years' experience, accurate diagnosis still evades the surgeon.

Owing to its myriad presentations, acute appendicitis is a common but difficult diagnostic problem. The accuracy of the clinical examination has been reported to range from 71% to 97% and varies greatly depending on the experience of the examiner.² However, because missed ruptured appendices have dire consequences, surgeons have traditionally accepted a 20% rate of negative findings at appendicectomy and the removal of a normal appendix.³ The rate of negative appendicectomy (Removal of a normal appendix in patients with other causes of abdominal pain) is reported to be between 20% and 30%.^{3,4}

The classical signs and symptoms of acute appendicitis were first reported by Fitz⁵ in 1886. Since then it has remained, the most common diagnosis for hospital admission requiring laparotomy.^{6,7} Approximately, 6% of the population will suffer from acute appendicitis during their lifetime; therefore, much effort has been directed toward early

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diagnosis and intervention.⁸ This effort has successfully lowered the mortality rate to <0.1% for non-complicated appendicitis, 0.6% where there is gangrene, and 5% for perforated cases.⁸ The diagnosis of appendicitis can be difficult, occasionally taxing the diagnostic skills of even the most experienced surgeon. Equivocal cases usually require inpatient observation. This delay in diagnosis may increase the morbidity and costs. Attempts to increase the diagnostic accuracy in acute appendicitis have included imaging by ultrasonography, computer aided diagnosis, laparoscopy, and even radioactive isotope imaging.⁹⁻¹² Various scoring systems have been devised to aid diagnosis.^{13,14}

The Alvarado Score¹⁴⁻¹⁶

Alvarado in 1986 put forward a scoring system for diagnosing acute appendicitis. The scoring system as described by Alvarado is based on three symptoms, three signs, and two lab findings.

According to the scoring system, patients with a score of 1-4 are not considered likely to have acute appendicitis. Those patients with a score of 5-6 are considered to have a possible diagnosis of appendicitis but not convincing enough to warrant immediate surgery, and they are marked for further review. Those with a score of 7-8 are considered to have a probable acute appendicitis and those with a score of 9-10 are considered to have an almost definite appendicitis and submitted to surgery. The score can increase or decrease on reassessment. The lab finding of leukocytosis is defined as a white cell count in excess of 11,000/mm³. The left shift of neutrophil maturation (% of segmented immature neutrophils with normal total white blood cell [WBC] count) (Table 1).

MATERIALS AND METHODS

Inclusion Criteria

The patients coming to hospital with pain abdomen and diagnosed provisionally as acute appendicitis and are willing for surgery are included in the study.

Table 1: Alvarado score

	Score
Symptoms	
Migrating right iliac fossa pain	1
Anorexia	1
Nausea/vomiting	1
Signs	
Tenderness in right iliac fossa	2
Rebound tenderness in right iliac fossa	1
Elevated temperature	1
Laboratory	
Leukocytosis	2
Shift to left of neutrophils	1
Total score	10

Exclusion Criteria

- Patient coming to hospital with pain abdomen along with distention of abdomen
- Pregnant females
- Any mass per abdomen (other than appendicular mass)
- Patient not willing for surgery.

Number of cases: 128.

All the patients (N = 128) selected as per criteria from August 2009 to July 2011 were admitted in surgical unit of Mahatma Gandhi Memorial Hospital, Kakatiya Medical College, Warangal, Telangana State, India, after Ethical Committee approval and patient consent.

Depending on individual presentation of signs and symptoms, a score was calculated for each case of suspected appendicitis from 8 values (based on Alvarado scoring system).

The observed value in each case was added and expressed as end-score. According to the end score:

- Those patients with scores of ≥7-10 underwent appendectomy
- Those patients with scores of 5-7 who were thought on clinical grounds to require appendectomy, it was performed
- Those patients with a score of <5 were observed and managed conservatively and reassessed
- Those patients who had mass in the right iliac fossa were observed and managed conservatively.

All the necessary investigations were done in all patients. The cases subjected to emergency surgery were adequately prepared. Whenever vomiting persisted, Ryle’s tube aspiration was done. Parenteral fluids, electrolyte supplementation broad spectrum antibiotics were administered. Hourly temperature, pulse, and respiratory charts were maintained.

Surgery was done under general anesthesia or spinal anesthesia. When diagnosis of acute appendicitis was certain, gridiron incision was used. The right paramedian incision was used when the diagnosis was uncertain or when frank peritonitis was suspected.

Before resection, the appendix was assessed. The specimen was sent for histopathological examination and the reports were analyzed.

Then, a study of the observations was done and an attempt was made to correlate the clinical presentation in each case with the pathological findings.

The results of operative measures, conservative management, and histopathological examination were

reviewed. The accuracy of diagnosis by Alvarado scoring system was assessed.

RESULTS

One hundred and twenty eight patients were preoperatively diagnosed to have acute appendicitis were admitted and operated were studied. Of the 128 cases that were admitted with suspicion of acute appendicitis, 113 cases were taken up for surgery based on the Alvarado scoring system while 10 cases with Alvarado score <5 and 5 cases with palpable mass in right iliac fossa were kept under conservative management.

Among the 113 cases that were operated 99 cases had acutely inflamed appendix.

The percentage of inflamed appendix found on operation was 87.6%.

The age group in which acute appendicitis occurred commonly is between 11 and 30 years, i.e., about 75%.

Incidence is less in younger and older age group with peak incidence in second and third decade.

In the present series, the males outnumbered females approximately in the ratio of 3:2.

Results of Alvarado score.

The patients were categorized into three groups, i.e., male; female; and children. Out of 128 cases studied 67 were male; 42 were female and 19 were children (<12 years).

Out of 67 male patients, 44 had a score of 7-10; 13 had a score of 5-6 and 7 patients had score <5. 3 patients had mass in right iliac fossa.

Out of 42 female patients - 27 had a score of 7-10; 10 had a score of 5-6 and 3 patients had score of <5. 2 female patients had mass in right iliac fossa.

About 15 children had a score between 7 and 9 while 4 had score of 5-6. All the children were operated upon.

All the 10 patients of score <5 and 5 patients with mass in right iliac fossa were observed in the hospital and did not undergo surgery. The patients with mass in right iliac fossa were advised for interval appendicectomy.

Operative Findings

A total of 113 patients were operated, out of which 57 were males; 37 were females; 19 were children.

In male patients having score of >7-10; 41 patients had acute appendicitis; 3 patients had normal appendix and 2 patients had diseases in the form of ileal perforation and Meckel's diverticulitis. Male patients having score of 5-6 were 13; out of which 10 patients had acute appendicitis; 3 patients had normal appendix and 1 patient had mesenteric lymphadenitis.

In female patients having score of >7-10; 20 had acute appendicitis; 7 patients had normal appendix and 2 patients had other diseases, out of which 1 had pelvic inflammatory disease; 1 had twisted right ovarian cyst. In females with score of 5-6; 7 had acute appendicitis; and 3 patients had pelvic inflammatory disease.

All the 19 children (15 with score 7-10 and 4 with score 5-6) subjected to operation had acute appendicitis.

DISCUSSION

A study of 128 cases of suspected appendicitis admitted to surgical unit Mahatma Gandhi Memorial Hospital, Kakatiya Medical College, Warangal, Telangana, India, was made from August 2009 to July 2011 adopting the Alvarado scoring system.

Acute appendicitis remains a common abdominal emergency worldwide. Although there are lots of advances in the diagnostic field with the invention of sophisticated investigations, diagnosis of acute appendicitis remains an enigma for the attendant surgeon. None of the investigations like ultrasonography, computed tomography scan can conclusively say definitely about appendicitis.

Some of the investigations already discussed are costly, time-consuming, require more specialized and expert services, while some are non-feasible and not available every while.

So even today a thorough clinical examination with a basic investigation like WBC count remains cornerstone in the diagnosis of acute appendicitis. With this background, many eminent surgeons and physicians have been adopting different scoring systems to decrease negative appendicectomy.

We find the value of Alvarado score for its routine use in clinical practice. The Alvarado score is simple to use and easy to apply, since it relies only on history, clinical examination and a basic laboratory investigation. In this study, the usefulness of the scoring system was demonstrated beyond doubt by reducing number of negative laparotomies especially in men and children.

However, in women the negative laparotomy was high, and this can be avoided by laparoscopy.

The sensitivity of Alvarado scoring system in our series was as high as 80%. This indicates that by particularly adopting the Alvarado scoring system many negative appendicectomy can be reduced. Patients in whom the Alvarado score was <5 did not need subsequent appendicectomy indicating the usefulness of modified Alvarado scoring system.

In our series when the scores were more than 7 indicating strong possibility of intra-abdominal infection localized to the right iliac fossa surgery were performed within 6 h of the patient getting admitted to the hospital. The observation was that these patients had badly inflamed appendix with impending perforation once again indicating the sensitivity and specificity of the scoring system.

In our series, we had 19 cases of patients in pediatric age group. 15 of them had score more than 7 while 4 children had score 5-6. All of them were operated within 6 h. Per-operative finding was of highly inflamed appendix indicating a sensitivity of 100% in children. This is important keeping in mind the shortness of omentum in children which can cause early perforation and peritonitis with its attendant morbidity and mortality.

In our series, we had 37 cases of female patients. Out of 37 cases 27 had score of >7 and appendicitis in 20 cases the other being gynecological causes.

Since intra-abdominal infection in females, particularly in lower abdomen, can be quite confusing, as it is difficult to differentiate appendicitis from gynecological condition like twisted ovarian cyst and pelvic inflammatory disease, laparoscopy and abdominopelvic ultrasound scan can be advised as a diagnostic tool to minimize negative appendicectomy.

CONCLUSION

Alvarado scoring system significantly reduces the number of negative laparotomies without increasing overall rate of appendicular perforation.

It can work effectively in routine practice as an adjunct to surgical decision-making in questionable acute appendicitis.

- It is effective in children and men but diagnostic laparoscopy is advised to minimize the unacceptably high false-positive rate in women
- It is simple to use and easy to apply since it relies only on history, clinical examination and basic lab investigations
- It is cost-effective and can be used in all district general hospitals with basic lab facilities.

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