ORIGINAL ARTICLE

EVALUATION OF MODIFIED ALVARADO SCORE FOR FREQUENCY OF NEGATIVE APPENDICECTOMIES

Haider Kamran, Danish Naveed, Shawana Asad, Muhammad Hameed, Umar Khan

Department of Surgery, Ayub Teaching Hospital Abbottabad, Pakistan

Background: Appendicitis being the commonest surgical emergency is primarily diagnosed clinically but posses diagnostic difficulty usually, especially to junior surgeons, demanding the need for tool/scoring system that can be easily applicable, accurate & reproducible in the diagnosis of appendicitis, with low negative Appendicectomy rate. This study is designed to assess one such scoring system, i.e., Modified Alvarado Score. **Methods:** A total of 100 consecutive male and female patients with age 10 year and above presenting with symptoms suggestive of acute appendicitis were included in study, assessed according to eight variables of Modified Alvarado scoring system and were accordingly placed into 3 groups. Group–I patients having score 1–4 were discharged, Group-II patients having score 5–7 were observed while Group-III patients having score 8–10 were operated. Status of appendix of operated patients was assessed histo-pathologically. **Results:** Out of 100 patients included in study, 58 patients were operated on the basis of said scoring system. Of the operated patients 52 (89.65%) had acute appendicitis, thus yielding a positive predictive value of 89.66% while negative appendectomy rate of 10.34%. Frequency of negative appendicectomy was 7.69% (3/39) amongst males and 15.79% (3/19) in females. Post-operative complication rate including wound infection, pelvic abscess, chest and urinary tract infection was 22.41% (13/58). **Conclusion:** Frequency of the negative appendicectomies can be reduced through standardization of the diagnostic procedure, by applying Modified Alvarado score in the diagnosis of suspected appendicitis cases as compared to simple clinical assessment.

Keywords: Appendicitis, Modified Alvarado Score, frequency, appendicectomy

INTRODUCTION

Acute appendicitis is one of the commonest surgical emergencies.[1] Surgery for acute appendicitis is one of the most common operations; about 10% of all abdominal surgeries.[2] The diagnosis of acute appendicitis is primarily clinical[3], including history and physical findings, with additional assistance from laboratory findings[4]. Radiological investigations do not appear to help.[5] A typical patient is one presenting with right lower abdominal pain, nausea and vomiting, having tenderness and guarding in right iliac fossa on examination. However these signs and symptoms are not very specific for acute appendicitis and can mimic other acute abdominal conditions.[6] Therefore, decision making may be difficult especially for junior surgeons.[5] A clinical decision to operate leads to removal of normal appendix in 15–30% cases.[7] From 0.5 to 1% of appendicectomised patients will later require surgery for intestinal obstruction caused by post-appendicectomy adhesions. According to some studies, the incidence of such adhesions may even be greater if the excised appendix is normal. Conversely the commonest cause of intra-abdominal adhesions in operated patients with intestinal obstruction is appendicectomy.[8]

Several diagnostic aids have been developed to improve diagnosis in suspected appendicitis cases and thus to avoid negative appendicectomy.[7] Scoring systems, based upon clinical signs, symptoms and routine laboratory assessments have been used as diagnostic aid.[9] However, variations in sensitivities and specificities were observed when scores were applied to various populations and clinical settings[9], especially they are less valid in women.

Current study is designed to assess the effectiveness of Modified Alvarado Score[8] by recording the frequency of negative appendicectomies after evaluation of patients by this scoring system. It is simple, fast, reliable, cost effective and reproducible system that can be used without expensive and complicated supportive measures. Various studies have shown variable results about sensitivity and specificity of the score. Overall this score is more specific and sensitive for males as compared to females.[10]

In our setup where most of the emergencies are dealt with by residents, such scoring if proves to be of higher diagnostic accuracy, would be a blessing. Aim of the current study is to determine the efficacy of this score by calculating negative appendicectomy rate.

MATERIAL AND METHODS

The study was carried out at the surgical units of Ayub Teaching Hospital Abbottabad. A total of 100 consecutive patients presenting with signs and symptoms suggestive of acute appendicitis were included in study. Children under 10 year of age, patients unwilling for surgery, mentally retarded and non-cooperative patients were excluded of the study. Similarly patients presenting with signs and symptoms

suggestive of mass right iliac fossa, generalised peritonitis, gynaecological and urinary tract problems were also excluded.

All patients included in study were admitted to the ward, history with emphasis over complaints related to scoring parameters was taken, followed by detailed clinical examination. Routine investigations were carried out including total and differential leucocyte count. Chest X-Ray and ECG of the patients with suspected history or age over 40 years were also advised to rule out any underlying unknown respiratory or cardiac etc; pathology.

After initial assessment findings were recorded on a proforma designed according to eight variables (Table-I) of scoring system.[8]

Table-1: Modified Alvarado Score

Variables	Value
Migratory pain right iliac fossa	1
Anorexia	1
Nausea/vomiting	1
Tenderness right lower quadrant	2
Rigidity and/or rebound tenderness	1
Elevated temperature	1
Extra signs (cough sign/Rovsing's sign/rectal tenderness)	1
Leucocytosis	2
Total Score	10

Based upon their scores patients were placed into following 3 groups:

Group-I (aggregate score 1–4): These patients were discharged after initial assessment, with the strict advice to come back to the same unit and hospital if symptoms persist or recur.

Group-II (aggregate score 5–7): These patients after initial assessment were kept under observation and reassessed at 4–6 hourly interval till next 24–48 hours, to know whether the score rises or drops. If score dropped to $\leq$ 4, patients were discharged with the advice to come back if symptoms persist or recur. Otherwise if score rose up to 8 or more they were operated.

Group III (aggregate score 8–10): These patients as per scoring system were having acute appendicitis and frequency of negative appendicectomies had to be determined amongst this group.

Antibiotics were used for a maximum of 3 doses in patients with un-complicated appendicitis while in those with perforated or gangrenous appendix these were used for 5–7 days. Uncomplicated patients were discharged on 2nd postoperative day while those with complications were kept admitted till full recovery.

All appendices were then submitted for histopathology examination.

Proformas were finalised after getting the histopathology report. Frequency of negative appendicectomies was calculated as percentage of the negative cases.

RESULTS

Of the 100 patients included in the study 68 (68%) were male and 32 (32%) were female patients. Male to female ratio was 2.1**:**1. Age range was 10–47 years. Mean age was 22.7 years. Most patients presented between 16-30 years (n=69). 26 (26%) presented with a score $\leq$4 (Group–I) and were discharged after evaluation. This group included 18 (69.23%) male and 8 (30.76%) females. None of them came back with persistence or recurrence of the symptoms.

Twenty-eight (28%) patients had a score 5 to 7 (Group-II). They were kept under observation and assessed repeatedly at 4–6 hourly intervals till next 24–48 hours, to record a rise or drop in their initial score. This group included 19 (67.85%) male and 9 (32.14%) female patients. Score of 12 (42.85%) patients including 8 males and 4 females increased to 8 or above, (i.e., Group-III range), so were operated and thus entered the final part of the study. Score of 16 (57.14%) patients including 11 males and 5 females dropped to $\leq$4, (i.e., Group–I range), and were discharged. Amongst the operated 12 patients in this group, histopathology revealed 10 (83.33%) patients to be having acutely inflamed appendix while 2 (16.66%) including one male child and a female patient turned out to be having a normal appendix on histopathology.

Forty-six percent patients initially fell into Group–III so were operated. 31 (67.39%) were male patients and 15 (32.60%) were female patients. Amongst this group histopathology revealed 42 (91.30%) to be positive cases, while rest of the 4 (8.60%) were having normal appendix on histopathology. 2 were female while 2 were male patients.

Mean hospital stay of the patients was 3.4 days (ranging from 1–10 days). Total 74 (74%) patients were admitted after excluding the Group– I patients. 58 (58%) patients got operated, out of which 6 turned out to be negative appendicectomies. Positive predictive value was 89.66%. Frequency of negative appendicectomies therefore was 6 out of 58 (10.34%), it was 7.69% (3/39) amongst males while in females it was 15.79% (3/19).

Postoperative complication rate including wound infection, pelvic abscess, chest and urinary tract infection was 22.41% (13/58). Morbidity was 13 cases including those with gangrenous and perforated appendix who stayed for 5–10 days as against the routine 2–3 day stay of simple appendicitis cases. Mortality was none in this study.

DISCUSSION

Acute appendicitis being a common abdominal emergency is diagnosed on clinical findings.[3] Classically the patient is young, predominantly male in

their 1st and 2nd decade of life but can occur at any age. It is rare below the age of two year and in old people, i.e., at both extremes of life.

The principal objective of the clinical decision process is to make, with maximal economy of resources and as soon possible, a correct diagnosis. History and examination sometimes provide information to make the diagnosis, but often the process involves different possibilities and the doctor must decide, based on cost-benefit consideration, which is the best management plan for the patient.[11]

When the decision is whether or not a patient has acute appendicitis the importance of this choice is heightened, both by the urgency of the situation and because a diagnosis of appendicitis signifies a surgical intervention and carries a definitive risk of morbidity and mortality.[12] Nowadays, the indication for operative treatment remains based on clinical examintaiton[13] and the accuracy of diagnosis has improved little in decades, with a negative appendicectomy rate as high as 30%[14]. The need for complementary aid in questionable acute appendicitis is self-evident. Of all the different diagnostic aids that have appeared recently, only laparoscopy, ultrasonography and computer-aided diagnosis have demonstrated good clinical results, but all have their drawbacks.[12]

Clinical scoring systems have proved useful in the management of many surgical conditions. In recent years various scores have been developed to aid the diagnosis of acute appendicitis.

Junior staff, in particular, may get benefit from the use of structured data forms by adopting a more systematic approach to patient assessment. Also the structured date collection may lead to improved history taking and decision-making behaviour among hospital staff.

Modified Alvarado Score works with data collected routinely on suspected cases of appendicitis in general surgical units and its application takes less than 5 minutes. In this study total number of patients was 100, male were 68 while 32 were female patients, which is comparable to similar studies conducted by Wazir *et al*[15], Arain *et al*[16] and Ijaz *et al*[10]. The mean age of the patients was 22.7 years (median age was 24 years) with the range of 10–47 years. The study done by Walker *et al*[17] showed the median age of the patient 18 years with range of 6–81 years. Similarly the study conducted by Arain *et al*[16] recorded a mean age of 19.9 years with the median age of 22 years, so the values obtained in our study are comparable to these studies conducted earlier.

Ijaz *et al*[10] recorded sensitivity of 96%, specificity of 85%, positive predictive value of 85% and diagnostic accuracy of 84% while evaluating a similar other scoring system for appendicitis, which is closely comparable to positive predictive value (89.66%) observed in current study. Arain *et al*[16] recorded sensitivity of 97.2%, specificity of 84.6% and positive predictive value of 85.5% while evaluating Alvarado Score.

The frequency of negative appendicectomies was 10.34% which is comparable to the results shown by various authors in their studies, e.g., Arain *et al*[16] (14.3%), Ijaz *et al*[10] (16%). In males the frequency of negative appendicectomies was 7.69% (3/39) while in females it was 15.78% (3/19) which can be compared to published results of 25%, 21%, 17.5%, 14.8% documented by Ijaz *et al*[10], Ohmann *et al*[18], Fenyo *et al*[19] and Alvarez *et al*[20] respectively. Fenyo *et al* recorded sensitivity, specificity and positive predictive value of 73%, 87% and 72% respectively while assessing scoring system in their study.[19] Therefore our recorded statistical values are closely comparable to their values.

CONCLUSION

Modified Alvarado Score thus proved quite helpful in the diagnosis of acute appendicitis. Frequency of Negative appendicectomies decreased after evaluation of the patients by this scoring system, i.e., as compared to simple clinical assessment. Therefore this scoring system may routinely be adopted to get help in the diagnosis of acute appendicitis.

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Address for Correspondence:

Dr. Haider Kamran, Assistant Professor Surgery, Room SR: 03, Doctors Hostel, Ayub Teaching Hospital Abbottabad, Pakistan. **Cell:** +92-300-9110605
Email: dhkamran@hotmail.com