

THE IMPACT OF APPLYING ALVARADO SCORE IN REDUCING NEGATIVE APPENDECTOMIES. OUR EXPERIENCE AT PRINCE HASHEM BIN ABDULLAH II HOSPITAL

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Abstract

Background: Acute appendicitis is considered one of the most frequent emergent laparotomies. The precise confirmation of acute appendicitis is a challenge. Alvarado score is used to stratify patients with clinical features of suspected acute appendicitis.

Aim: To assess the effect of implementation of Alvarado score in decreasing the incidence of negative appendectomies in a Jordanian group of patients.

Methods: Our prospective, randomized and double blind investigation enrolled 174 patients, of both sexes, aged 22-64 years and presented to the emergency surgical clinic complaining of lower quadrant and right iliac fossa pain possibly of acute appendicitis, at Prince Hashem bin Abdullah II military hospital, Aqaba, JORDAN, during the period Jan-Nov 2017. Patients were divided into two groups: group I (n=114, surgical) and group II (n=60, non-surgical). In the two groups, patients were sub grouped in those with an Alvarado score of less than 6 and those with an Alvarado score of more than 7. Alvarado score (with a total score of 10 and 8 elements) was compared between all participants in both groups regarding its influence in the confirmation of diagnosis of acute appendicitis and reducing negative appendectomies. Score 1-4 requires discharge, score 5-6 requires observation and admission and score 7-10 requires surgery. The confirmation of diagnosis in group I relied on pathology examination of the excised appendix. Patients with no pathological appendicular inflammation underwent negative appendectomies. The diagnosis for each group was assessed using the Pearson chi-square test. A value of $P < 0.05$ was considered statistically significant.

Results: In group I, remarkable anticipation factors for pathology results was Alvarado score more than 7 (45.6%). In group II, Alvarado score more than 7 (15%) was not a remarkable anticipator for pathology results. Normal appendix was reported in the pathology report in 8.8% in group I and in 31.7% in group II

Conclusion: There was no difference regarding anticipation confirmation of acute appendicitis between Alvarado score and abdominal ultrasound

Introduction

Abdominal pain is believed to be one of the leading reasons for emergency department (clinical or surgical) visits and acute appendicitis (with a lifetime risk of 7%) is considered one of the major common emergent laparotomies for an acute abdomen. The complication percentage increases when the operative procedure is delayed in acute appendicitis (1). As the confirmation of acute appendicitis depends on history, clinical features (symptoms of appendicitis overlap with other conditions especially at an early stage of presentation) and laboratory results; the precise confirmation of acute appendicitis is a challenge. A clinical agreement for surgery results in the removal of a

normal appendix in 15–30% (2). Confirmation tools (inflammatory parameters: white blood cell count, Erythrocyte sedimentation rate[3]; laparoscopy; scoring systems and ultrasound[4]) may decrease the number of negative appendectomies, the number of perforations and the period of hospital stay.

The corner stone in the confirmation of acute appendicitis is the pathology report of the appendix postoperatively. A fast dependable scoring system applied before surgery, cost effective and repeatable is vital in the acute appendicitis confirmation (5). In 1986, Alvarado formulated a 10-point clinical scoring system, also known by the acronym MANTRELS, for the diagnosis of acute appendicitis.

The aim of this investigation was to assess to assess the effect of implementation of Alvarado score in decreasing the incidence of negative appendectomies in a Jordanian group of patients.

Methods

This prospective, randomized and double blind investigation enrolled 174 patients, of both sexes, aged 22-64 years and presented to the emergency surgical clinic complaining of lower quadrant and right iliac fossa pain possibly of acute appendicitis, at Prince Hashem bin Abdullah II military hospital, Aqaba, JORDAN, during the period Jan-Nov 2017, after obtaining approval from the local ethical and research board review committee of the RMS and written informed consent from all subjects. Patients were ruled out if analgesics were used in the previous 24 hours; there was a history of abdominal surgery or inflammatory bowel disease. Patients were divided into two groups: group I (n=114, surgical appendectomy) and group II (n=60, non-surgical). In the two groups, patients were subgrouped in those with an Alvarado score of less than 6 and those with an Alvarado score of more than 7. Calculated Alvarado score (total score of 10) was performed for all participants. Alvarado score (with 8 elements) was compared between all participants in both groups regarding its influence in confirmation of diagnosis of acute appendicitis and reducing negative appendectomies. The calculated Alvarado score enrolled all the elements (Table I) (6). Score 1-4 requires discharge, score 5-6 requires observation and admission and score 7-10 requires surgery. Comparisons were performed regarding Alvarado score and ultrasound results..

The confirmation of diagnosis in group I relied on the pathology examination of the excised appendix. The pathology criterion for acute appendicitis was inflammatory reaction with polymorphonuclear leukocytes in the mucosa layer of the appendix and edema. Patients with no pathological appendicular inflammation underwent negative appendectomies. Patient was labeled as having a normal appendix when he was discharged from the hospital without surgery and seen one week later.

Statistics

The diagnosis for each group was assessed using the Pearson chi-square test or Fisher's exact chi-square test. A value of $P < 0.05$ was considered statistically significant.

Table I. Alvarado score.

parameter	score	(No,%) in the study
Nausea and vomiting	1	81(46.6%)
Anorexia	1	76(43.7%)
Migration of pain to right lower quadrant	1	43(24.7%)
Rebound tenderness	1	106(60.9%)
Fever(>37.5 DC)	1	12(6.9)
Tenderness in right iliac fossa	2	6(3.4)
Neutrophils >75%(shift of WBC count to left)	1	107(61.5)
leucocytosis	2	104(59.8)

Results

Of the 174 patients, 114 (65.5%) patients underwent appendectomy while 60 (34.5%) were followed-up without operation. Within the 174 patients, 71 (40.8%) were men and 103 (59.2%) were women, with a median age of 29.5 yr (range 22-64 yr). Table II. Pain was correlated with nausea and vomiting in 81 patients (46.6%), which was the most frequent presenting clinical feature and rebound tenderness was recorded in 106 patients (60.9%), which was the most frequent sign. The period of illness ranged between 1 and 8 days with a median of 3 days.

The Alvarado scores for both groups are shown in Table III. A score of more than 7 was significantly correlated with acute appendicitis ($P < 0.05$). Ultrasound acute appendicitis was recorded in 60 patients (52.6%) in group I and in 7 patients (11.7%) in group II.

Table II. Demographics of all participants.

parameter		
Sex (no, %)	M	71(40.8)
	F	103(59.2)
Age(yr) median(range)		29.5(22.64)
Period of illness(median, range)		3(1-8)

Table III. Alvarado scores and abdominal ultrasound findings.

	GI	GII
Alvarado score		
less than 6	62(54.4)	51(85)
More than 7	52(45.6)	9(15)
Abdominal Ultrasound		
Positive acute appendicitis	60(52.6)	7(11.7)
Negative acute appendicitis:		
Normal appendix	37(32.5)	39(65)
Others	17(14.9)	14(23.3)

In group I:

The pathology reports of the excised appendix demonstrated that 75 had non-perforated (simple) appendicitis, 19 had suppurative appendicitis, 6 had necrotizing and 4 had perforated appendicitis while 15 had a normal appendix. Table IV.

Alvarado score of more than 7 ($P < 0.05$) and ultrasound signs of acute appendicitis ($P < 0.05$) were significant in the confirmation of acute appendicitis. Table V. Clinical factor single variable effect in anticipating acute appendicitis was as follow: Alvarado score ($P < 0.05$) and abdominal ultrasound ($P < 0.05$). Rebound tenderness and Alvarado score were the most important clinical variables. The combination diagnostic importance of the clinical factors with Alvarado score was statistically significant in predicting the diagnosis of acute appendicitis. The combination of ultrasound signs of acute appendicitis with Alvarado score was associated with a small significant change ($P < 0.05$). Multivariate logistic regression analysis showed that Alvarado score had an importance in anticipation of acute appendicitis.

Table IV. Pathology reports.

Pathology Report	No,%	Ultrasound report(no,%)
Normal appendix	10 (8.8)	19 (31.7)
Acute luminal, mucosal, submucosal appendicitis	75(65.8)	
Acute suppurative appendicitis	19 (16.7)	

Acute necrotizing appendicitis	6 (5.3)	
Perforated appendicitis	4(3.5)	

In group II:

27 patients (45%) resolved spontaneously with no relapse during the non-surgical management duration. The most frequent reasons for abdominal pain originated from the gynecological and urological system (20 patients, 33.3%). Only 6 (10%) patients underwent surgery with a diagnosis of acute appendicitis during the non-surgical duration. Table V.

Clinical factor single variable effect in anticipating acute appendicitis was as follow: Alvarado score ($P>0.05$) and abdominal ultrasound ($P<0.05$). The combination diagnostic importance of the clinical factors with Alvarado score was statistically significant in predicting the diagnosis of acute appendicitis. The combination of ultrasound signs of acute appendicitis with Alvarado score was associated with a small significant change ($P<0.05$).

In univariate analysis of clinical factors in anticipating acute appendicitis, ultrasound signs of acute appendicitis were statistically significant. When the diagnostic clinical factors were tested with Alvarado score in predicting acute appendicitis, only the ultrasound signs of acute appendicitis to Alvarado score were statistically significant. In the multivariate logistic regression analysis of clinical factors, the ultrasound signs of acute appendicitis were the best clinical parameter in predicting if appendectomy was necessary or not.

Table V. Patients diagnoses.

diagnosis	No,%
Gynecological	11(18.3)
Urological	9 (15)
Gastrointestinal	4 (6.7)
Musculo- skeletal	3 (5)
Others	27(45)
Acute appendicitis for surgery	6(10)

Discussion

There are different laboratory and radiological investigations for the confirmation of acute appendicitis (7). A precise confirmation of acute appendicitis before surgery is a challenge. Delay in operative intervention is the main reason for morbidity. Negative appendectomy was reported in the literature as 15–25%, increasing up to 50% in children and females of reproductive age (8). Clinical history and physical examination are the most important for the diagnosis of acute appendicitis. Although the most common features in acute appendicitis is right lower quadrant pain with nausea and vomiting; only 50% of patients experience this typical feature. Other clinical symptoms and signs are not specific to acute appendicitis (1). In our investigation, the most frequent features were anorexia and nausea and vomiting with rebound tenderness. Fever was recorded in only 6.9 % of the present investigation subjects. Fever is a delayed onset feature of acute appendicitis.

There are many clinical scoring systems for the confirmation of acute appendicitis. Alvarado score is the most important (9). In our investigation, the median Alvarado score of all patients was 6 and the Alvarado score of group I was significantly more than that of group II. Variations in the positive and negative anticipation values of ultrasound in the confirmation of acute appendicitis, ranged between 81–96% and 28–88%, respectively (10). Dichotomization of the ultrasound report was found in cases that were conclusive and not indicative of the diagnosis of acute appendicitis. In a previous investigation, Alvarado score and ultrasound had a diagnostic accuracy of 57.7% and 65.7%, respectively (11).

In the multivariate logistic regression analysis, Alvarado score has no precise part in the anticipation of pathological results. Patients suspected to have acute appendicitis, with Alvarado score of more than 7, must be re-assessed to decrease the potential of laparotomy. During an inflammation, bacterial invasion of the appendix wall is followed by release of bacterial endotoxins (14). Appendicitis has a viral cause or mechanical one. Low-fiber regime may lead to stool retention in the appendix by reducing intestinal transit time (14). The Alvarado score allows risk stratification in patients presenting with abdominal pain, connecting the possibility of appendicitis to discharge, observation or surgery. More investigations, such as ultrasound and computed tomography scanning, are indicated when possibility of appendicitis is in the intermediate range. The time lag, increased costs and different availability of imaging techniques mean that the Alvarado score could be an important diagnostic tool when appendicitis is suspected to be the cause of an acute abdomen.

Conclusions

The Alvarado score and abdominal ultrasound are almost equal to each other in the confirmation of acute appendicitis and in decreasing the percentage of negative appendectomy. The Alvarado score is a clinical diagnostic tool when ultrasound is not present. Alvarado score is a useful diagnostic 'rule out' score at a cut point of 5 for all patient groups. The score is well calibrated in men, inconsistent in children and over-predicts the probability of appendicitis in women across all strata of risk

References

1. Di Saverio S, Birindelli A, Kelly MD, et al. WSES Jerusalem guidelines for diagnosis and treatment of acute appendicitis. *World J Emerg Surg.* 2016 Jul 18;11:34.
2. Kurane BS, Sangolli MS, Gogate AS. A one year prospective study to compare and evaluate diagnostic accuracy of modified Alvarado score and ultrasonography in acute appendicitis, in adults. *Indian J Surg.* 2008;70:125–129.
3. Reinhart WH. Erythrocyte sedimentation rate-More than an old fashion? *Ther Umsch.* 2006;63:108–112.
4. Petroianu A. Diagnosis of acute appendicitis. *Int J Surg.* 2012;10:115–119.
5. Kanumba ES, Mabula JB, Rambau P, Chalya PL. Modified Alvarado Scoring System as a diagnostic tool for acute appendicitis at Bugando Medical Centre, Mwanza, Tanzania. *BMC Surg.* 2011;11:4.
6. Alvarado A. A practical score for the early diagnosis of acute appendicitis. *Ann Emerg Med.* 1986;15:557–564.
7. Ceren Şen Tanrıkulu, Mehmet Akif Karamercan, Yusuf Tanrıkulu, et al. The predictive value of Alvarado score, inflammatory parameters and ultrasound imaging in the diagnosis of acute appendicitis. *Ulus Cerrahi Derg.* 2016; 32(2): 115–121.
8. Jaffe BM, Berger DH. The Appendix. In: *Schwartz's. Principles of Surgery VIII Ed.* 2005;29:1119–1137.
9. Denizbasi A, Unluer EE. The role of the emergency medicine resident using the Alvarado score in the diagnosis of acute appendicitis compared with the general surgery resident. *Eur J Emerg Med.* 2003;10:296–301.
10. Pacharn P, Ying J, Linam LE, Brody AS, Babcock DS. Sonography in the evaluation of acute appendicitis: are negative sonographic findings good enough? *J Ultrasound Med.* 2010;29:1749–1755.
11. Ozkan S, Duman A, Durukan P, Yildirim A, Ozbakan O. The accuracy rate of Alvarado score, ultrasonography, and computerized tomography scan in the diagnosis of acute appendicitis in our center. *Niger J Clin Pract.* 2014;17:413–418
12. Shafi SM, Afsheen M, Reshi FA. Total leucocyte count, C-reactive protein and neutrophil count: diagnostic aid in acute appendicitis. *Saudi J Gastroenterol.* 2009;15:117–120
13. . Mohammed AA, Daghman NA, Aboud SM, Oshibi HO. The diagnostic value of C-reactive protein, white blood cell count and neutrophil percentage in childhood appendicitis. *Saudi Med J.* 2004;25:1212–1215.
14. Yang HR, Wang YC, Chung PK, Chen WK, Jeng LB, Chen RJ. Role of leukocyte count, neutrophil percentage, and C-reactive protein in the diagnosis of acute appendicitis in the elderly. *Am Surg.* 2005;71:344–347.