Original Article

Acute Appendicitis

The Combined Role of Alvarado Score and Ultrasonography for the Diagnosis of Acute Appendicitis

Zulfiqar Ali[1], Wasfa Gul[2], Allauddin[3] and Haroon Javaid Majid[4]

ABSTRACT

Objectives: Objective of the study was to evaluate use of Alvarado score and ultrasonography in diagnosis of acute appendicitis.

Study Design: Cross sectional study

Place and Duration of Study: This study was conducted at Department of Surgery along with Department of Radiology at Shaikh Zayed Hospital Lahore from 1st January 2013 to 31st August 2013.

Materials and Methods: 250 patients of Alvarado Score were enrolled for the diagnosis of acute appendicitis attending out-patient, accident & emergency departments.

Results: There were 184 (74%) were males and 66 (26%) were females with mean age of 35.27±12.57 years. One hundred and seventy patients had anorexia while 76 patients had no anorexia. 49.6% patients while in 50.4% were reported anorexia. Right iliac fossa was noted in all patients. 95% patients had rebound tenderness 203 patients have elevated temperature.

Conclusion: Alvarado score is a simple and reliable non-invasive diagnosis modality without any extra cost and complication. It has also proved to be handy for our peripheral hospital settings where backup facilities not available. By application of Alvarado scoring system with non-invasive ultrasonography improves diagnosis accuracy by reducing negative appendicectomies hence reducing complications rate in our settings.

Key Words: Acute appendicitis, Alvarado score, Ultrasonographic and histopathology findings

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INTRODUCTION

The appendix is a worm like extension of the cecum. It is a structure without apparent function, although it is thought to be important cause of morbidity & mortality. It is process of treatment of appendix developed during the last about 80 years but knowledge of the disease is more older than a century back. Appendicitis is inflammation of the inner lining of the vermiform appendix that spreads to its other parts. Surgical conditions may occur for several reasons due to any infection of the appendix but the most common step is the obstructions of the appendiceal lumen.[1]

1. Department of Surgery, Salmaniya Medical Complex, Kingdom of Bahrain
2. Department of Radiology, Mohtarma Benazir Bhutto Shaheed Medical College Mirpur Azad Kashmir
3. Department of Surgery, Bolan Medical College Quetta
4. Department of General Surgery, Shaikh Zayed Hospital, Lahore

Correspondence: Dr. Zulfiqar Ali, Surgical Specialist, Department of Surgery, Salmaniya Medical Complex, Kingdom of Bahrain.
Contact No: +973-35902498
Email: zulfi007@hotmail.com

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Appendicitis is also one of the most common surgical emergency and one of the most frequent cause of abdominal pain. It is the most frequent perform operation about 10% of all emergencis of the abdominal operations.[2] Being a very common disease condition with life time prevalence of 7 to 8%.[3,4] Its incidence is 1.5-1.9/1000 in male and female population[5]. Therefore much efforts need to be directed towards early diagnosis and the earliest possible intervention. The diagnosis of acute appendicitis is based mainly on patients medical history based on clinical examination and few laboratory investigation like white blood cell counts.[6] The diagnosis might be obtained at surgery and after histopathological examination of the surgical specimen.[7] The diagnostic accuracy in acute appendicitis (AA) has been improved by computer aided diagnosis, laparoscopy, computerized tomography scanning and even radioisotope imaging.[8,9] The surgical cause of acute abdomen to be the prompt diagnosis rewarded by marked decrease in morbidity and mortality. The decision to perform surgery is based mainly on clinical evaluation along with laboratory data. Therefore diagnostic errors are common, resulting the frequency of perforation of 20%, negative laparotomy rate ranging from 2-30%.[10]

In order to improve the diagnostic accuracy of acute appendicitis ultrasound and computed tomography include clinical aids ensuing in reduced unnecessary

laparotomy rates.[11,12,13] While ultrasound in expert hands can achieve a high degree of accuracy, its dependence on the operator may result in significant inter-observer variability in the diagnosis of acute appendicitis. During the past few years, there has been a growing trend toward the use of formal probabilistic reasoning or quantitative data as a guide to clinical decision-making.[14]

The negative appendicectomy of 20 to 40% have been reported in literature search and most of the surgeon report rate of 30% as inevitable in our settings.[11] Misdiagnosis, delay in surgery usually lead to complication like perforations and peritonitis among patients suffering from this condition.[15] Incorrect diagnosis of these patients of appendicitis often subjects the patient to unnecessary laparotomy surgical procedures. Study results by Flum et al from USA, the length of patients hospital stay, complications and mortality came out to be statistically significant higher for the cases of negative appendectomy.[16,17] The vermiform appendix by graded compression sonography technique seem is helpful for detect and diagnosing acute appendicitis with sensitivity and specificity 86% and 81% respectively. Various systems have been devised to aid in the diagnosis.[18,19]

The 88.8% sensitivity with specificity of 75%,[20] while PPV of Alvarado score to be 84.3%[15] 88%[21] 95.2%[22] and 98.1% respectively.[23] By the experienced hand practitioners ultrasonography have reported sensitivities of 75 to 90% with specificities of 86 to100%. Accuracies of 87 to 96% with positive predictive values of 91to 94% and a negative predictive value of 89 to 97% for diagnosis of acute appendicitis.

There are some other scoring systems like Ramirez and Dues, the Alvarado system rely upon on patients clinical history, their physical examinations, some lab investigation and is quite easy to use as compared to any other system. Where decision making of the acute appendicitis is difficult radiological investigation is not of much help through ultrasonoghraphy and laparoscopy and C.T scan may be carried out.[24]

MATERIALS AND METHODS

This cross sectional study was carried out from 01-01-2013 to 31-08-2013 at Departments of Surgery and Radiology, Shaikh Zayed Hospital Lahore. A total of 250 patients of Alvarado Score for diagnosis of acute appendicitis presenting from our out-patient and accident and the emergency departments were enrolled. The study subjects were explained the procedures and their consequence of our study. Adult patients were our in the study subjects.

RESULTS

The continuous variable like age, its mean and standard deviation were 35.27±12.57 years and there were males 184 (74%) and females 66 (26%) with 1.92:1 male to female ratio. There was anorexia among 174 study subject with its percentage 70% while 76 with its percentage 30% had no symptom. Out of total subjects 124 (49.6%) had Nausea and vomiting while 126 (50.4%) had no symptom of nausea or vomiting. Tenderness in right iliac fossa was found in all patients. 236 (95%) patients have rebound tenderness. Elevated temperature was observed in 203 with percentage of 81%. Among 220 (88%), the leukocytosis >10,000 cells/L was observed in only 117 (47%) patients with white cell count.

The score of appendicitis, 8 (3%) had score 5, 13 (5%) had score 6. 127 (51%) had 7-8 score and 102 (41%) patients who had score 9-10 (Table 4). Two hundred and thirty patients (92%) had appendicitis and 20 (8%) had no ultrasound finding of appendicitis Table 5). Two hundred forty one patients (96%) had acute appendicitis and 9 patients (4%) had normal appendicitis (Table 6).

Table No.1: Frequency of age (n=250)

Age (years)	Frequency	Percentage
< 20	29	12.0
21–40	139	55.0
41–60	77	31.0
> 60	5	2.0

Table No.2: Frequency of genders

Sex	Frequency	Percentage
Male	184	74.0
Female	66	26.0

Table No.3: Frequency of Alvarado score

Alvarado Score variable	Patients Score		
	0	1	2
Anorexia	76 (30%)	174 (70%)	-
Nausea and vomiting	126 (50.4%)	124 (49..6%)	-
Tenderness in right iliac fossa	-	-	250 (100%)
Rebound tenderness	13 (5%)	236 (95%)-	-
Elevated temperature	47 (19%)	203 (81%)	-
Leukocytosis >10,000 cells/L	21 (8%)	9 (4%)	220 (88%)
Shifting of white cell count to left	133 (53%)	117 (47%)	-

Table No.4: Frequency of total score of patients

Patient's score	No.	%age
5	8	3.0
6	13	5.0
7	45	18.0
8	53	21.0
9	57	23.0
10	74	30.0

Table No.5: Frequency of acute appendicitis on ultrasonography

Acute appendicitis	No.	%age
Yea	230	92.0
No	20	8.0

Table No.6: Frequency of Histopathology Finding of Patients

Histopathology findings	No.	%age
Acute appendicitis	241	96.0
Normal or chronic appendicitis	9	4.0

DISCUSSION

Good clinical acumen remains the mainstay of correct diagnosis of acute appendicitis.[25,26] In the present study the mean age was 35.27±12.57 years between 15-70 years. Khan[27] reported mean age was 20.2 years, Siddiqui[28] reported 28.7±11.9 years, Soomro[24] reported 20.47 years, Shah [29] reported 20.6 years and Almulbim[30] reported the mean 21.7 years which are comparable to the present study.

In the present study 184 (74%) males and 66 (26%) females with a male to female ratio was 1.92:1. Khan et al[27] reported male to female 1:1.4. Soomro[24] reported 150 (67%) male and 77 (34%) were female. Talukder[31] also reported that males were more susceptible than females with a male-female ratio of 1.38:1. Almulbim[30] 61% patients were male and 39% patients were female. The results are comparable to the present study. Anorexia in 147 (74%) patients, pain in right iliac fossa in all (250) patients, elevated temperature in 203 (81%), nausea and vomiting in all patients, rebound tenderness in 236 (95%) patients and Leucocytosis >10,000 cells/L, raised in 220 (88%) cases were recorded in the present study. Soomro[24] reported that pain in right iliac fossa (67.8%), fever (66.9%), nausea and vomiting (49.7%) and anorexia (62.5%). Of the signs in the patients undergoing surgery, tenderness in right iliac fossa was found in 170 (91.8%) cases, rebound tenderness in 149 (80.54%) cases, elevated temperature in 156 (84.32%) cases. Regarding investigations, TLC was raised in 140 (75.67%) cases.

Cobben[32] stated that the right lower quadrant pain, and vomiting occurs in only 50% of cases. Nausea is present in 61-92% of patients; anorexia is present in 74-78% of patients. Vomiting that precedes pain is suggestive of intestinal obstruction, and the diagnosis of appendicitis should be reconsidered. Old[33] reported that abdominal pain in 99-100% patients, right lower quadrant pain/tenderness in 96% of patients, anorexia in 24–99%, nausea 62–90% of patients, vomiting 32–75%, migration of pain to right iliac fossa in 50% of cases and rebound tenderness in 26% of patients.

In a study conducted in United States that ultrasound (US) had a sensitivity of 68.4%. The negative appendectomy rate in patients with positive ultrasound was 5.5%. So, a "first-pass" approach using ultrasound first and then computed tomography scan if ultrasound is not diagnostic may be desirable in some institutions.[34] In another retrospective study, carried out on 1,228 children with suspected appendicitis during 2003-2008 that children with suspected acute appendicitis, ultrasound first and then computed tomography scan was highly accurate (sensitivity, 98.6%; specificity; 90.6%). The negative appendicitis computed tomography rate was 8.1% (19 of 235 patients). The missed appendicitis rate was less than 0.5% (1 of 631 patients).[35] Poortman et al stated that primary graded-compression ultrasound and complementary multidete computed tomography or computed tomography scanning, yields a high diagnostic accuracy for acute appendicitis. Although ultrasound is less accurate than computed tomography scanning, it can be used as a primary imaging modality and avoids the disadvantages of computed tomography scanning.[36]

In the present study, 230 (92%) patients had acute appendicitis. Two hundred and forty one patients (96%) had acute appendicitis on histopathology and 9 (4%) patients had normal or chronic appendicitis which comparable to other study. Soomro[24] reported in his study inflamed appendix (58.37%), perforated appendix (24.32%), appendicular mass (4.3%) and gangrenous appendix (9.18%). In 7 cases (3.78%), the appendix was found normal, resulting in a negative appendicectomy.

In the present study, Alvarado scoring system showed that the accuracy of the diagnosis was very dependable and acceptable in higher scores but patients with lower scores should be under observation. Those patients who have 8 to 10 scores are almost certain to have appendicitis and they should undergo operation immediately, 5 to 7 scores indicate probable appendicitis and 4 or less scores are very unlikely but not impossible to have appendicitis and they can be discharged from hospital after giving initial conservative treatment.

CONCLUSION

The finding of acute appendicitis according to Alvarado score is a simple, reliable, non-invasive and safe diagnostic modality without extra expenses and complication.

Conflict of Interest: The study has no conflict of interest to declare by any author.

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