

An Accurate Early Diagnosis of Acute Appendicitis by Clinical Scoring and Ultrasonography Reduces Complications

ZULFIQAR ALI, RIZWAN SALEEM, TAHIR BASHIR, HARUN MAJID DAR, HAROON JAVED MAJID, SHAFIQ-UR-REHMAN

ABSTRACT

Aim: To evaluate combined use of Alvarado score & ultrasonography in diagnosing ac. appendicitis.

Methods: This cross-sectional study was conducted from 1st January 2013 to 31st August 2013 at S. Z. Hospital, Lahore in the Department of General Surgery & 250 patients having acute appendicitis who presented through out-patient and accident & emergency departments were included.

Results: The mean age was 35.17±9.13. 184(74%) were males and 66 (26%) were females with a male to female ratio 1.92:1. 174(70%) patients had anorexia while 76(30%) patients had no symptoms of anorexia. Nausea and vomiting in 124(49.6%) patients while 126(50.4%) had no symptoms of nausea and vomiting. Rebound tenderness was in 236(95%) patients. 8(3%) patients had score 5 possible appendicitis in these patients. 13(5%) patients had score 6. 127(51%) patients had 7-8 score in this group and appendicitis likely. 102(41%) patients had score 9-10, in this score appendicitis highly likely. On ultrasonography, 230(92%) patients had appendicitis and only 20(8%) had no appendicitis on ultrasonography. According to histopathology finding, there were 241(96%) patients of acute appendicitis and 9(4%) patients had gangrenous, normal and chronic appendicitis.

Conclusion: The application of this scoring system along with noninvasive ultrasonography improves diagnostic accuracy (92%) and consequently reduces negative appendectomy (8%).

Keywords: Acute appendicitis, Alvarado score, ultrasonographic and histopathology findings.

INTRODUCTION

The appendix is a worm like extension of the cecum¹. Appendectomy is the most frequently performed operation (10% of all emergency abdominal operations)². Its incidence is 1.5-1.9/1000 in male and female population³. The diagnosis of acute appendicitis is based on history, clinical examination and some laboratory investigations like white cell count. The imaging techniques have been shown to aid very little⁴. A very certain diagnosis can only be obtained at surgery and after histopathological examination of the surgical specimen⁵. The diagnostic accuracy in acute appendicitis has been improved by computer aided diagnosis, laparoscopy, computerized tomography scanning and even radioisotope imaging⁶.

It is a common surgical cause of acute abdomen, the prompt diagnosis of which is rewarded by a marked decrease in morbidity and mortality. The decision to perform surgery is based solely on clinical evaluation supplemented by laboratory data. Therefore diagnostic errors are common, resulting in a median incidence of perforation of 20% and a negative laparotomy rate ranging from 2-30%⁷. In order to improve the diagnostic accuracy of acute appendicitis ultrasound and computed tomography

have been used as clinical aids resulting in reduced unnecessary laparotomy rates⁸. 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 appendicitis⁹. Abdominal ultrasonography is an imaging modality for acute appendicitis first popularized by Puylaert¹⁰. Graded compression sonography with adjuvant use of a posterior manual compression technique seems to be useful for detecting the vermiform appendix and for diagnosing acute appendicitis having a sensitivity and specificity of 0.86 and 0.81 respectively.

METHODOLOGY

The data was collected from the patients who fulfilled the inclusion criteria. Preoperatively the ultrasonography was carried out for diagnosing the patients in Radiology Department. The radiologists were involved calibrated for this study by training them & inter and intra-examiner reliability was measured through Kappa score. Four sonographic diagnostic criteria for appendicitis, (1) any visualization, (2) appendiceal diameter greater than 6.0 mm, (3) muscular wall thickness greater than or equal to 3.0mm, and (4) presence of a complex mass. The combined criteria of an appendix with a

Department of General Surgery, Shaikh Zayed Hospital, Lahore
Correspondence to Dr. Zulfiqar Ali, Registrar Email::
drzulfi007@hotmail.com

muscular wall thickness greater than or equal to 3.0 mm and visualization of a complex mass separate from the adnexa in females proved most useful as a diagnostic test. The preoperative findings were noted to relate the diagnostic criteria used preoperatively i.e., Alvarado score & ultrasonography.

RESULTS

The mean and standard deviation age of the patients was 35.27±12.57 years. 184(74%) were males and 66(26%) were females with a male to female ratio 1.92:1. 174(70%) patients having anorexia while 76(30%) patients had no symptoms of anorexia. Nausea and vomiting in 124 (49.6%) patients while in 126 (50.4%) there were no symptoms of nausea and vomiting. All 250 patients had tenderness in right iliac fossa. Rebound tenderness was noted in 236 (95%) patients. 8(3%), patients who had score 5, appendicitis possible in these patients. 13(5%) patients having score 6 and 127(51%) patients who had 7-8 score. 102(41%) patients who had score 9-10, in this score appendicitis highly likely. 230(92%) who had appendicitis and only 20(8%) had no ultrasound finding of appendicitis.

Table 1: Age distribution of patients

Age in years	N	%age
< 20	29	12.0
21 – 40	139	55.0
41 – 60	77	31.0
> 60	5	2.0
Mean ± SD	35.27±12.57	

Table 2: Sex distribution of patients

Sex	n	%age
Male	184	74.0
Female	66	26.0

Table 3: Frequency of Alvarado Score variables of patients

Alvarado Score Variables	Patient's 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%)	-
Leucocytosis >10,000 cells/L	21 (8%)	9(4%)	220(88%)
Shifting of white cell count to left	133(53%)	117 (47%)	-

So ultrasonography for diagnosing appendicitis is very useful tool for surgical patients. 241(96%) patients who had histopathology finding of acute appendicitis only 9(4%) patients had gangrenous, normal and chronic appendicitis. Histopathology is a tissue diagnosis and is a best modality or appendicular pathology for diagnosing appendicitis.

Table 4: Frequency of Total Score of patients

Patient score	n	%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
Mean ± SD	8.18±1.48	

Table 5: Frequency of ac. appendicitis on ultrasonography

	n	%age
Yes	230	92.0
No	20	8.0

Table 6: Frequency of histopathology finding of patients

Histopathology findings	n	%age
Acute appendicitis	241	96.0
Gangrenous, normal & ch. appendicitis	9	4.0

DISCUSSION

The mean and standard deviation age was 35.27±12.57 years. In a study carried out by Khan⁶ the mean age was 20.2 years which is comparable with a slight difference of our study. In a similar study reported by Siddiqui¹¹ the mean age was 28.7±11.9 years. A study described by Soomro the mean age was 20.47 years¹². The mean age was 20.6 years presented by Shah which is comparable with our study with a slight difference¹³. A study reported by Almulbim the mean age of the patients was 21.7 years¹⁴. 184(74%) patients were male and 66(26%) were female with a male to female ratio was 1.92:1 which is comparable with a study reported by Khan et al with a ratio of male to female 1:1.4⁴. In another study reported by Soomro, 150(67%) male and 77 (34%) were female which is comparable with our study¹². In a similar study carried out by Talukder, the clinically males were more susceptible than females with a male-female ratio of 1.38:1 which is comparable with our study¹⁵.

In our study the symptoms of presentation included 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. In a similar study which is comparable with our study presented by Soomro the symptoms at presentation included 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%) cases¹². Out of the 227 patients, 32(14.01%) patients had an Alvarado score of 1-4,

amongst them. In a study presented by Cobben, 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. Neither finding is statistically different from findings in patients who present to the emergency department with other etiologies of abdominal pain. When vomiting occurs, it nearly always follows the onset of pain. Vomiting that precedes pain is suggestive of intestinal obstruction, and the diagnosis of appendicitis should be re-considered¹⁶.

A similar study carried out by Old, in comparison with our study, the signs and symptoms of acute appendicitis, there was 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 patients¹⁷. There were 230(92%) patients had acute appendicitis according to ultrasound finding. 241(96%) patients had acute appendicitis in histopathology findings and 9 (4%) patients had another findings i.e. gangrenous, normal appendicitis and chronic appendicitis which is comparable with other studies. In a similar study described by Soomro all the patients who underwent surgery in this series, the operative findings included acutely inflamed appendix (58.37%), perforated appendix (24.32%), appendicular mass (4.3%) and gangrenous appendix (9.18%). In 7 cases, the appendix was found normal, resulting in a negative appendectomy rate of 3.78% in this series¹².

There are no signs, symptoms or laboratory tests that are 100% reliable in the diagnosis of acute appendicitis. In this 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. The diagnostic score may be used as a guide to decide whether the patients need surgery or observation. Patients with score of 8 to 10 are almost certain to have appendicitis and they should undergo operation immediately. Patients with a score of 5 to 7 indicate probable appendicitis. They should be observed and evaluated every four to six hours, if the score remains the same or increases after this, re-evaluation is required and the patients may need operation. Patients with the score of 4 or less are very unlikely but not impossible to have appendicitis and they can be discharged from hospital after giving initial conservative treatment and with the advice to report again if symptoms persist or condition becomes worse.

CONCLUSION

In the diagnosis of acute appendicitis, the Alvarado score is a fast, simple, reliable, non-invasive, repeatable and safe diagnostic modality without extra expense and complications. It is very handy in peripheral hospitals where back up facilities are scarcely available. The application of this scoring system along with noninvasive ultrasonography improves diagnostic accuracy and consequently reduces negative appendectomy and thus reduces complication rates.

REFERENCES

1. Santacroce L, Ochoa JB. Appendicitis. eMedicine General Surgery. Available from <http://emedicine.medscape.com/article/195778>; 2010.
2. Khan MN, Davie E, Irshad K. The role of white cell count and C-reactive protein in the diagnosis of acute appendicitis. *J Ayub Med Coll Abbottabad*, 2004;16:51-55.
3. Kamran H, Naveed D, Nazir A, Hameed M, Ahmad M, Khan U. Role of total leukocyte count in diagnosis of acute appendicitis. *J Ayub Med Coll Abbottabad*, 2008;20:70-1.
4. Khan I, Rehman A. Application of Alvarado score in the diagnosis of acute appendicitis. *J Ayub Med Coll Abbottabad*, 2005;17:41-4.
5. Shafi SM, Afsheen M, Reshi FA. Total leukocyte count, C-reactive protein and neutrophil count: Diagnostic aid in acute appendicitis. *Saudi J Gastroenterol*, 2009;15:117-20.
6. Augustin T, Bhende S, Charda K, Vandermeer T, Cagir B. Computed tomography scan and acute appendicitis: a five year analysis from a rural teaching hospital. *J Gastrointest Surg*, 2009;13:1306-12.
7. Andersson R. Meta-analysis of the clinical and laboratory diagnosis of appendicitis. *Br J Surg*, 2004;91:28-37.
8. Shreef KS, Waly AH, Abd-Elrahman S, Abd Elhafez MA. Alvarado score as an admission criterion in children with pain in right iliac fossa. *Afr J Paediatr Surg*, 2010;7:163-5.
9. Enochsson L, Gudbjartsson T, Hellberg A, Rudberg C, Wenner J, Ringqvist I. The Fenyö-Lindberg scoring system for appendicitis increases positive predictive value in fertile women--a prospective study in 455 patients randomized to either laparoscopic or open appendectomy. *Surg Endosc*, 2004;18:1509-13.
10. Bernard A, Birnbaum, Stephanie R. Wilson. Appendicitis at the Millen. *Radiology*, 2000;215:337-48.
11. Siddiqui ZR, Khaliq T, Shah SA. A new simple scoring system for the diagnosis of acute appendicitis. *J Pak Med Stud*, 2011;1:32-7.
12. Soomro AG, Siddiqui FG, Abro AH, Abro S, Shaikh NA, Memon AS. Diagnostic accuracy of Alvarado scoring system in acute appendicitis. *JLUMHS*, 2008;93-96.
13. Shah NA, Islam M, Sabir IA, Mehreen T, Khan M. Combination of abdominal ultrasound and alvarado score, in patients with acute appendicitis. *J Postgrad Med Inst*, 2008;22:41-46.
14. Almulbim ARS, Al-Sultan AI. Modified Alvarado score for acute appendicitis in overweight patients. *Saudi Med J*, 2008;29:1184-87.
15. Talukder DB, Siddiq AKMZ. Modified Alvarado scoring system in the diagnosis of acute appendicitis. *JAFMC Bangladesh*, 2009;5:18-20.
16. Cobben LP, de Van Otterloo AM, Puylaert JB. Spontaneously resolving appendicitis: frequency and natural history in 60 patients. *Radiology*, 2000;215:349-52.
17. Old J, Dusing RW, Yap W. Imaging for suspected appendicitis. *Am Fam Physician*, 2005;71:71-8.

