



ISSN: 0976-3031

Available Online at <http://www.recentscientific.com>

CODEN: IJRSFP (USA)

International Journal of Recent Scientific Research
Vol. 9, Issue, 4(J), pp. 26232-26234, April, 2018

**International Journal of
Recent Scientific
Research**

DOI: 10.24327/IJRSR

Research Article

COMPARATIVE EVALUATION OF ULTRASOUND AND CLINICOPATHOLOGICAL ALVARADO SCORE IN THE DIAGNOSIS OF ACUTE APPENDICITIS

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DOI: <http://dx.doi.org/10.24327/ijrsr.2018.0904.2017>

ARTICLE INFO

Article History:

Received 16th January, 2018

Received in revised form 20th

February, 2018

Accepted 8th March, 2018

Published online 28th April, 2018

ABSTRACT

Alvarado score is an established clinicopathological objective assessment score to diagnose and exclude acute appendicitis. However, in spite of this decade old scoring tool there is no certainty of accurate diagnosis in the setting of acute appendicitis. Ultrasound remains a mainstay in the diagnosis and exclusion of acute appendicitis. New ultrasound techniques like graded compression techniques have led to increased diagnostic accuracy of ultrasound. In spite of both the modalities the rates of negative laparotomy remain high. This study aims at combined use of Alvarado score and ultrasonography as a tool for diagnosis and exclusion of acute appendicitis.

Key Words:

Alvarado score, ultrasonography,
Appendicitis, laparotomy

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INTRODUCTION

Acute appendicitis, by definition is the acute inflammation of the appendix. It is one of the most common cause of acute abdomen and often requires surgical intervention on emergency basis. There is a lifelong risk of about 7% for acute appendicitis (1)

A clinicopathological objective scoring system for diagnosis of acute appendicitis was given by Alvarado in 1986. This score is now a part of routine clinical assessment by the surgeons and has been validated by multiple studies.

Alvarado score has the advantage of its objectivity and easy application. Its application has shown to be increasing the diagnostic accuracy and reduction in the rate of negative laparotomy. (2). However in spite of its widespread usage, it is not an alternative for clinical judgement. It is just an aid in diagnosis and decision making tool in cases for acute appendicitis, whether to go for surgery or not (3)

Ultrasound is considered an indispensable investigation in cases of acute appendicitis. It is relatively economical and readily available imaging modality. Ultrasound is a realtime and dynamic modality to diagnose and exclude acute appendicitis. Graded compression technique has led to increased diagnostic accuracy of ultrasound (4,5)

Results of ultrasound however are dependant mostly on the skills and expertise of the operator. The expertise and skills of the operator are very critical in the accurate diagnosis of the disease. It plays an important role in the decreasing the incidence of negative laparotomies. (6)

METHODOLOGY

This multicentric study was conducted in the department of radio diagnosis and department of surgery at defence service hospitals of Hisar and Jaipur during the study period of July 2017 to March 2018. Clearance was obtained from hospital

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ethical committee. A total 250 patients were included in the study. The prospective study included all consecutive patients reporting to the emergency department with right iliac fossa (RIF) pain during the study duration. The patients were evaluated clinically by qualified surgeons and Alvarado score assessment value was documented in the case sheets. Subsequently ultrasound was done for all the patients using Logiq P3 colour Doppler ultrasound machine and portable Toshiba just vision ultrasound machine at Jaipur and Hisar centres respectively. Patients with clinical suspicion of acute appendicitis, Alvarado score of 5 or more and positive ultrasound findings were operated. All these patients underwent clinical evaluation, pathological investigations and ultrasonography. The resected appendix specimen was sent for histopathological examination (HPE). HPE was considered the gold standard for diagnosis of acute appendicitis.

A 10 point clinicopathological Alvarado score was utilised for clinical scoring as given below

Table 1 Alvarodo scoring system

Alvarado Score	
Symptoms	
Migratory RIF pain	1
Anorexia	1
Nausea/ vomiting	1
Signs	
Tenderness RIF	2
Rebound tenderness RIF	1
Elevated temperature	1
Lab findings	
Leucocytosis	2
Shift to left of neutrophils	1
Total score	10

Interpretation of Alvarado scoring system

Score 1-4: Acute appendicitis: very unlikely, keep under observation

Score 5-6: Acute appendicitis: may be, for regular observation

Score 7-8: Acute appendicitis: probable, operate

Score 9-10: Acute appendicitis: definite, operate

RESULTS AND DISCUSSION

Out of the 250 patients included in the study 190 were male (76%) and 60 were females (24%). Gender distribution is shown in Fig 1. 226 of the total patients were less than thirty years of age. The youngest patient was 12 years of age and the oldest was 41 years of age. Demographic distribution of the patients is given in Table 2

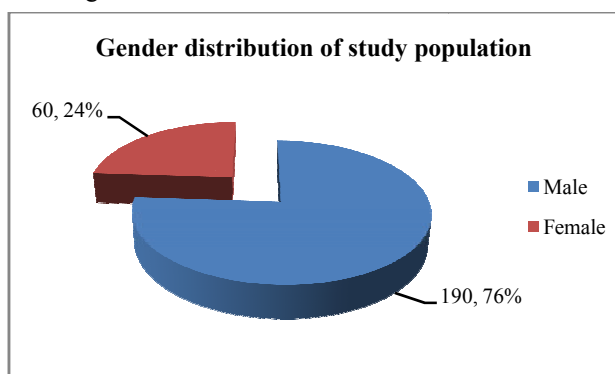


Fig 1 Gender distribution of study population

Table 2 showing demographic distribution of the study population

Age group	Number of patients	Percentage
Less than 10 yrs	Nil	0 %
10-20	52	20.8 %
21-30	174	69.6 %
31-40	22	8.8 %
41-50	2	0.8 %
51 and above	Nil	0 %

All the 250 patients included in the study were clinically evaluated and objective Alvarado scoring was applied. Thereafter these patients underwent ultrasound of the abdomen. A total of 224 patients were operated. An Alvarado score of 5 or more was seen in 230 patients. Of these 3 patients were detected to have appendicular lump and were not operated upon immediately. These patients underwent interval appendicectomy and were included in the group of operated patients. Two patients had right ureteric colic and right renal colic due to calculi. One patient was detected to have mesenteric adenitis and the diagnosis was subsequently confirmed by Computerised Tomography (CT) scan. Hence the patient was not operated.

RESULTS	Number of patients
Total number of patients with pain in RIF	250
Alvarado score of 5 or more	233
No of cases operated (including interval appendicectomy)	230
Number of cases positive on USG (including 02 false positive cases)	220
Number of cases with alternative diagnosis on USG and not operated (True negative)	3
Number of USG negative patients operated based on clinical suspicion and Alvarado score	20
Number of HPE negative laparotomy	14

The symptoms of migratory RIF pain, anorexia and nausea were seen in 80, 81 and 90 % of the patients. Signs of RIF tenderness and rebound tenderness were elicited in 95% and 79% respectively. Pathological values of leucocytosis and shift to left of neutrophils were seen in 70% and 65 % respectively. Table 3 shows percentage of various clinicopathological parameters in Alvarado score.

Table 3 showing incidence of various parameters of Alvarado score

Parameter	Number of patients	Percentage
Migratory RIF pain	214	85.6 %
Anorexia	203	81.2 %
Nausea	150	90 %
RIF tenderness	240	96 %
Rebound tenderness	221	88.4 %
Leucocytosis	176	70.4 %
Shift to left of neutrophils	163	65.2 %

Out of the 250 patients included in the study a score of 7-10 was seen in 175 patients, Score of 5-6 seen in 58 patients and 17 patients had score of less than 5.

There were two patients with score of 5 or less with positive ultrasound findings. These patients underwent appendicectomy and later confirmed with HPE

17 patients with score of 5 or less and negative ultrasound findings were not operated and hence managed conservatively.

Three patients were detected to have appendicular lump in RIF and were not operated urgently. They were managed conservatively and underwent interval appendicectomy.

Various sonographic signs are considered during USG of abdomen for diagnosis of appendicitis like visualisation of non compressible, aperistaltic blind ended sac with gut wall signature, diameter > 7mm, visualisation of appendicolith, echogenic submucosa, hypoechoic appendix, fluid filled appendix, periappendiceal fat stranding, periappendical fluid collection, probe tenderness at RIF, positivity on graded compression technique, perforated appendix.

Table 4 showing incidence of various parameters of USG findings

Ultrasound Findings	Number of patients
Non compressible, aperistaltic blind ended sac with gut wall signature	214
Diameter > 7mm	198
Visualisation of appendicolith	56
Echogenic submucosa	197
Hypoechoic appendix	10
Fluid filled appendix	12
Periappendiceal fat stranding	201
Periappendical fluid collection	79
Probe tenderness at RIF	224
Positivity on graded compression technique	219
Perforated appendix	3

Per op findings: Out of the 230 patients operated, 224 had inflamed appendix on HPE. Six patients had normal appendix.

Table 5 Statistical comparison of Alvarado score and USG

	Sensitivity (%)	Specificity (%)	Positive predictive value (%)	Negative predictive value (%)	Accuracy (%)
Alvarado score	93.85	80	91.84	72	88.34
USG	97.34	93.75	99.1	83.33	96.89

Acute appendicitis is a very common cause of patients presenting with pain abdomen in the emergency department. Most of these patients require surgical intervention. However the decision making process for surgery is based on clinicopathological Alvarado score and ultrasound report. In the absence of advanced imaging modalities like CT scan, many a times it becomes extremely difficult for the surgeon to avoid diagnostic dilemma. The accuracy of Alvarado score and ultrasound have shows variability in the diagnostic accuracy in many studies. (6)

Alvarado score and ultrasound findings cannot be separately interpreted. Rate of false positive results is significantly reduced when both clinical Alvarado score and USG findings both are positive.

Few studies show high incidence of appendicitis in younger age group and is seen in the present study too. (7). The increased proportion of males is seen in our study group due to more proportion of males in the military environment.

Our study shows sensitivity of sensitivity and specificity of Alvarado score 93.85% and 80% respectively and that of USG to be 97.34% and 93.75% respectively. In a similar study done by Ida Chan the sensitivity and specificity of USG were

detected to be 83% and 95% which is comparable to our study. (9,10)

Limitations of study: Our study suffers limitation of small sample size. Also demographic distribution was restricted as the services were provided only to the dependant patients which included mostly the combatants resulting male predominance in the study population.

Conflicts of interest: None to declare

Sources of support: None

CONCLUSION

Acute appendicitis is a very common surgical emergency especially involving the younger patients. With the usage of Alvarado score and USG it has become relatively easy to diagnose cases of acute appendicitis. The decision making process for surgical intervention has become less challenging to the treating surgeon. Alvarado score and USG findings have to be analysed together so as to achieve good results and prevent avoidable laparotomy.

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