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Research Article

**ANALYSIS OF DIAGNOSTIC PERFORMANCE OF ALVARADO
SCORE AND ULTRASOUND IN PATIENTS SUSPECTED OF
HAVING ACUTE APPENDICITIS**Abdul Majid Mujahid¹, Mubeen Ullah Meo², Abdul Shakoor³¹Basic Health Unit daiwal, Khushab, ²Jinnah Hospital Lahore, ³DHQ Hospital Lodhran**Article Received:** August 2019**Accepted:** September 2019**Published:** October 2019**Abstract:**

Introduction: Acute appendicitis is a surgical emergency and delay in diagnosis can lead to morbidity of the patient. CT despite of being gold standard investigation carry radiation hazards and risk of cancer.

Objective: To evaluate diagnostic reliability of Alvarado score and ultrasound in patients who have suspicion of having acute appendicitis to get to a safe diagnosis without radiation exposure.

Material and methods: This cross sectional study was conducted in BHU Daiwal, Khushab during December 2018 to June 2019. **Results:** Using a cut off value of ≥ 5.5 Alvarado score resulted in sensitivity of 76%, specificity of 93%, accuracy of 84%, PPV 94%, and NPV 73%. US showed a sensitivity of 66%, specificity of 97.6%, accuracy of 79%, PPV 97% and NPV 67%. There was no difference of accuracy between the two modalities. Using both of these modalities can eliminate the use of CT scan.

Conclusion: Using Alvarado score as tool of exclusion and US as 1st investigation of choice, a case of acute appendicitis is not only diagnosed correctly but also radiation hazards of CT scan can be eliminated.

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INTRODUCTION:

Acute appendicitis is acute inflammation of appendix. It is a common acute surgical condition for which mainstay standard treatment is appendectomy. While delay in diagnosis and intervention may lead to serious complications like perforation and abscess or mass formation, rushing to surgery without considering other pathologic conditions can lead to unindicated appendectomy up to 15-30% [1]. Computed abdominal tomography (CAT) is now gold standard tool for diagnosis. It is highly sensitive and specific. While helping surgeons reach a definitive diagnosis of acute appendicitis, radiation exposure remains an Achilles heel for this effective diagnostic modality which can lead to increased incidence of cancer. Hence, other diagnostic modalities have also been suggested [2].

Ultrasound scan is not only cost effective but also has lesser radiation exposure. Its efficacy is marred by operator dependability leading to its low sensitivity. Alvarado score is a clinical scoring system of for

diagnosis of acute appendicitis developed by Alvarado [3]. To our knowledge no evaluation has been done or published study yet to compare diagnostic performance of Alvarado score and ultrasound in our set up [4].

Objective:

To evaluate diagnostic reliability of Alvarado score and ultrasound abdomen in patients with suspected acute appendicitis to get to a safe diagnosis without radiation exposure.

MATERIAL & METHODS:

This cross sectional study was conducted in BHU Daiwal, Khushab during December 2018 to June 2019. All patients fulfilling inclusion criteria were included in the study. Demographic data was collected from medical records. Alvarado score was calculated for each patient in accordance with original Alvarado score. Alvarado score comprised of components shown in figure 1.

Figure 1. Components of Alvarado score.

Characteristics	Score
M = migration of pain to the RLQ	1
A = anorexia	1
N = nausea and vomiting	1
T = tenderness in RLQ	2
R = rebound pain	1
E = elevated temperature	1
L = leukocytosis	2
S = shift of WBC to the left	1
Total	10

All patients in the study had ultrasound scan of the abdomen for diagnosis of appendicitis. All ultrasounds were performed by a single radiologist on Toshiba Xario 100 ultrasound machine using a 3.5-5MHz Curvilinear and 7.5-15 MHz Linear probe. Both transverse and longitudinal images were taken.

Following parameters were used for confirmation of diagnosis: Tenderness right iliac fossa (RIF) elicited by transducer, noncompressible appendix, increased cross sectional diameter of the appendix > 6mm, appendicolith, infiltration of peri-appendiceal fat and free fluid in RIF (Fig.2).

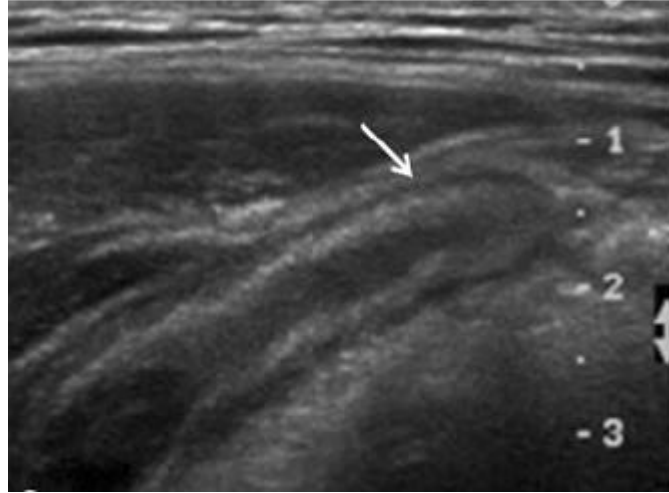


Figure 2: showing an inflamed appendix measuring about 8 mm in cross sectional diameter with increased peri appendiceal echogenicity

Statistical analysis:

We used SPSS version 21 for data analysis in our study. Regarding continuous variables, descriptive statistics were computed and described as mean \pm SD. Categorical variables were stated using frequency distributions. Paired samples were subjected to t-test to report differences in the means of numerical variables and Chi-square test was applied for qualitative variables. *P* value of <0.05 was taken as significant.

RESULTS:

A total of 100 patients were included in the study. Surgery was performed in 59 patients and samples sent confirmed acute appendicitis on histopathology. A total of 41 patients did not had appendicitis but some other diseases confirmed on ultrasound scan. These patients were treated accordingly without doing an appendectomy. (Table 1)

Table 1. The final diagnosis in the negative appendicitis group (n=41)

Diagnosis	Number of cases
Ovarian cyst	15
Ileocecal tuberculosis	19
Ureteric stone	2
Mesenteric lymphadenitis	5
Total	41

Our study included 100 patients out of which 68 were males and 22 were females. Age of the patients range from 20-54 years with a mean age of 33.6 ± 11.2 years. No significant difference was found in both groups

between the positive and negative appendicitis regarding patient's gender. The demographic data is summarised in table 2.

Table 2. Demographic characteristics of patients in our study (n=100)

Demographic data		Appendicitis 59(59%)	No appendicitis 41(41%)	P-Value
Age		38.46 ± 11.72	40.68 ± 11.74	0.35
Gender	Male	40	28	1.00
	Female	19	13	

Table 3. Analysis of ultrasound parameters for statistical significance

Ultrasound Parameters		Appendicitis	No appendicitis	P-Value
Cross sectional diameter of appendix		6.53±1.150	3.46±1.22	0.0001
Transducer induced Tenderness RIF	Yes	15	0	0.0001
	No	44	41	
Appendix non compressible	Yes	19	0	0.0001
	No	40	41	
Appendicolith	Yes	12	0	0.0001
	NO	47	41	
Peri-appendicular Fat	Yes	21	0	0.0001
	NO	38	41	
Fluid RIF	Yes	28	0	0.0001
	NO	31	41	

DISCUSSION:

Although CT scan is the investigation of choice for diagnosis of acute appendicitis but radiation exposure and long term risk of cancer remains the pitfall of this scan. These hazards can be dealt with utilization of a clinical score and an US scan if diagnosis is in doubt. In the current study graded compression US was done in all cases and we found a sensitivity of 66%, specificity of 97.6%, accuracy of 79%, PPV 97% and NPV 67%. These findings suggest that acute appendicitis can be diagnosed on basis of a positive ultrasound. Moreover, if an ultrasound is negative, it does not mean that appendicitis is ruled out and patient can be discharged. Blitman et al also concurred with our these findings [7]. However Pinto et al reported variations in diagnostic accuracy ranging from 44% to 100%. He attributed these variations to lack of operator skills, obesity and increased bowel gas content. We included an expert sonologist in our study to overcome these issues.

We found out that there is an increasing trend of doing US scan as 1st imaging scan and decrease in CT scan concomitantly [8]. This is due to fact that we trust expertise of our sonologists and US results, although these results are operator dependent. Other reason is that US is cheap and cost effective. We also observed that convincing patient for getting an US scan is easy because of affordability issue. This fact is opposite to some authors as Kotagal et al noted 8 times higher use of CT scan in non-paediatric hospitals [9].

Various scoring systems have been formulated to be used as diagnostic tool in cases of suspected acute appendicitis. Alvarado in his original article reported a cut-off value of 7. Sun et al reported that use of 6 as

cut-off value has higher sensitivity and is more compatible with diagnosis of acute appendicitis [10].

CONCLUSION:

Using Alvarado score as tool of exclusion and US as 1st investigation of choice, a case of acute appendicitis is not only diagnosed correctly but also radiation hazards of CT scan can be eliminated.

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