

## **Comparative Study of Modified Alvarado Score And Ultrasonography in Acute Appendicitis**

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### **Abstract**

**Objective:** Comparative study of Diagnostic accuracy of Modified Alvarado Score and Ultrasonography in Acute Appendicitis.

**Materials And Methods:** A total of 100 patients of age group between 7-65yrs,both male and females,with clinical features suggestive of acute appendicitis were selected non-randomly for the study. Data was collected as Alvarado score,ultrasonographic findings and histopathological reports.Statistical analysis was performed and results of both Alvarado score and Ultrasonography were compared.

**Results:** Of 100 patients taken,maximum percentage of patients were in age group 20 - 30yrs with males dominated the series.The sensitivity and specificity of Modified alvarado score was 96.25 % and 75 % with PPV 93.90 % and NPV 83.33 % and diagnostic accuracy of 92% respectively. Ultrasonography study revealed 70 % sensitivity and specificity of 100 %,PPV and NPV were 100 % and 45.45 % and diagnostic accuracy was 76 % respectively.

**Conclusions:** From present study,it was concluded that Modified Alvarado score is better diagnostic tool than ultrasonography alone in diagnosis of acute appendicitis.

**Keywords:** Acute appendicitis,modified alvarado score,ultrasonography.

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### **I. Introduction**

Acute appendicitis is one of the commonest surgical emergency.[1] A case of appendicitis can progress to perforation and other life threatening complications, which is associated with much higher morbidity and mortality and the surgeons are left with no option than to operate, when diagnosed clinically rather than to wait until it is confirm. Despite the introduction of various scoring system, extraordinary advances in modern radiographic imaging and diagnostic laboratory investigation, the accurate diagnosis of acute appendicitis remains an enigmatic challenge. A scoring system for early diagnosis of acute appendicitis was developed by Alvarado in 1986; based on clinical signs, symptoms and differential leucocyte count, with a left shift of neutrophil maturation yielding a total score of 10; known as Alvarado score. Kalan et al omitted the left shift to neutrophil maturation parameter and produced a Modified Alvarado score system(MASS). It is a 9 point scoring system that helps in increasing the accuracy of preoperative diagnosis and thus reducing negative appendicectomy rate. Score of 7 or more were recommended for surgery. Various radiological imagings like graded compression ultrasonography, CT scan, MRI has been developed for more accurate diagnosis of acute appendicitis; but no one is confirmatory. It has been claimed that ultrasonography dramatically reduce the number of appendicectomy in patients without appendicitis. It is especially useful in children and young thin adults; and in females it will allow exclusion of gynaecological cause with diagnostic accuracy in excess of 90%. The aim of this study to validate the user friendly pre-operative diagnostic method based on prospectively collected data from patients admitted for suspected appendicitis incorporating the Modified Alvarado Score and graded compression ultrasonography.

### **II. Aims And Objectives**

1.To evaluate the sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and accuracy of Ultrasound and Modified Alvarado score in the diagnosis of acute appendicitis.

2. To compare the results between Ultrasound and Modified Alvarado score.

### III. Materials And Methods

100 Patients of all age group, both male and female, presented in casualty department, OPD & indoor with the clinical features suggestive of acute appendicitis were selected non randomly for the study. Data was collected as Alvarado score, ultrasonographic finding and histopathological reports. Alvarado score of  $>7$  were taken as positive and  $<7$  as negative. Histopathology showing inflamed appendix were taken as positive, a normal appendix as negative, sonographically showing features suggestive of appendicitis in patients with Alvarado score  $<7$  were marked positive. Statistical analysis was performed using sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy, and result of both Alvarado score and ultrasonography were compared.

### IV. Results

The study was conducted on 100 patient suspected of acute appendicitis. Results of all the parameters are as followed :

**Table: 1** Mass Versus Histopathological Findings In Whole Group

MASS	Histopathological findings					
	POSITIVE		NEGATIVE		TOTAL	
	No.	%	No.	%	No.	%
$\geq 7$	77	77%	5	5%	82	82%
$<7$	3	3%	15	15%	18	18%
<b>TOTAL</b>	<b>80</b>	<b>80%</b>	<b>20</b>	<b>20%</b>	<b>100</b>	<b>100%</b>

In the present study, out of the 82 modified Alvarado score positive cases 77 (77%) were histologically positive and 5(5%) were negative. In the remaining 18 Modified Alvarado score negative cases 3(3%) were histologically positive and 15(15%) were negative.

**Table: 2** Analysis Of Mass In Diagnosis Of Acute Appendicitis In Whole Group

STATISTICS	PERCENTAGE
<b>SENSITIVITY</b>	<b>96.25%</b>
<b>SPECIFICITY</b>	<b>75%</b>
<b>POSITIVE PREDICTIVE VALUE</b>	<b>93.90%</b>
<b>NEGATIVE PREDICTIVE VALUE</b>	<b>83.33%</b>
<b>DIAGNOSTIC ACCURACY</b>	<b>92%</b>
<b>FALSE POSITIVE ERROR RATE</b>	<b>25%</b>
<b>FALSE NEGATIVE ERROR RATE</b>	<b>3.75%</b>

In the present study for the whole group MASS had a sensitivity of 96.25%, specificity 75%, PPV 93.90%, NPV 83.33%, diagnostic accuracy 92%, False positive error rate 25% and a False negative error rate of 3.75%.

**Table: 3** Ultrasonography Versus Histopathological Findings In Whole Group

USG	Histopathological findings					
	POSITIVE		NEGATIVE		TOTAL	
	No.	%	No.	%	No.	%
<b>POSITIVE</b>	56	56%	0	0	56	56%
<b>NEGATIVE</b>	24	24%	20	20%	44	44%
<b>TOTAL</b>	<b>80</b>	<b>80%</b>	<b>20</b>	<b>20%</b>	<b>100</b>	<b>100%</b>

In the present study, out of the 56 Ultrasonography positive cases all 56 (56%) were histologically positive. In the remaining 44 Ultrasonography negative cases 24(24%) were histologically positive and 20(20%) negative.

**Table: 4:** Analysis Of Usg In Diagnosis Of Acute Appendicitis In Whole Group

STATISTICS	PERCENTAGE
SENSITIVITY	70%
SPECIFICITY	100%
POSITIVE PREDICTIVE VALUE	100%
NEGATIVE PREDICTIVE VALUE	45.45%
DIAGNOSTIC ACCURACY	76%
FALSE POSITIVE ERROR RATE	0
FALSE NEGATIVE ERROR RATE	30%

In the present study Ultrasonography had a sensitivity of 70%, specificity 100%, PPV 100%, NPV 45.45%, diagnostic accuracy 76%, False positive error rate 0, and a False negative error rate 30%.

**Comparison Between Mass And Ultrasonography ( Whole Group)**

STATISTICS	MASS	USG
SENSITIVITY	96.25%	70%
SPECIFICITY	75%	100%
POSITIVE PREDICTIVE VALUE	93.90%	100%
NEGATIVE PREDICTIVE VALUE	83.33%	45.45%
DIAGNOSTIC ACCURACY	92%	76%
FALSE POSITIVE ERROR RATE	25%	5%
FALSE NEGATIVE ERROR RATE	3.75%	30%

In this study for the whole group MASS had a sensitivity of 96.25%, specificity 75%, PPV 93.90%, NPV 83.33%, diagnostic accuracy 92%, False positive error rate 25% and a False negative error rate of 3.75%, whereas Ultrasonography had a sensitivity of 70%, specificity 100%, PPV 100%, NPV 45.45%, diagnostic accuracy 76%.

## V. Discussion

The diagnostic accuracy in cases of acute appendicitis should be high because negative appendicectomy carries significant morbidity as there is a greater risk for abdominal adhesions after appendicectomy. However, the symptoms of appendicitis may not be classical, and in such situation; a policy of early intervention to avoid perforation may lead to high negative appendicectomy rate. Difficulties in diagnosis arise in very young, elderly patients and females of reproductive age because they are more likely to have an atypical presentation, and many other conditions may mimic acute appendicitis in these patients. In such cases, clinical examinations should be complemented with various investigations to exclude other diseases and helpful to achieve a more accurate diagnosis. Many scoring system for the diagnosis of acute appendicitis have been tried; but most of these are complex and not feasible in emergency setting. Modified Alvarado Score is just a simple mathematical tabulation of common clinical signs and symptoms found in patients of acute appendicitis. It has been reported to be a cheap and quick diagnostic tool in patients with acute appendicitis. However, differences in diagnostic accuracy have been observed if the score were applied to various populations and clinical settings. In our study ,sensitivity of MASS was (96.25%) almost same as Kanumba ES. et al 94.1% which was 88.3% in females & 95.8% in males.[2] Specificity of MASS in this study group was (75%), almost similar to Raid E. Rassam 80% which was 88% in females & 50% in males.[3] Positive predictive value of

MASS in this study group was (93.90%) which is almost similar to Raid E. Rassam (92%) [3] Negative predictive value of MASS in this study group was (83.33%) which is almost similar to Kanumba ES et al (88.4%) [2] The sensitivity and specificity of Ultrasonography in this study group was 70% and 100% respectively as compared to other study groups, Caren Dsouza and co workers 92.15% and 88.9% respectively[4] with PPV 100%, NPV 45.45%.

## **VI. Conclusion**

The present study had shown that Modified Alvarado Score is a better diagnostic tool than Ultrasonography alone in the diagnosis of Acute Appendicitis. MASS provides a higher degree of sensitivity and diagnostic accuracy in all age groups as compared to Ultrasonography in this study. The diagnosis of appendicitis supported by strongly positive clinical signs and high MAS scores can form the basis of operative treatment of patients with Acute Appendicitis without the need for any further imaging. Ultrasonography although being operator dependent should be used as an adjunct to clinical diagnosis especially in cases of equivocal or negative Alvarado score. Further, Ultrasonography helps in ruling out other abdominal, gynaecological pathologies in female patients.

## **References**

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