



## Evaluation of Modified Alvarado Score and Ultrasonography for the Diagnosis of Acute Appendicitis at Tertiary Care Hospital in Western Rajasthan

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### Abstract

**Background:** Acute appendicitis is most common cause of pain abdomen. The diagnosis of which remain difficult in many cases.

**Methods:** A 100 consecutive patients suspected of acute appendicitis who were admitted in department of surgery, sardar patel medical college & AGH, Bikaner, Rajasthan. They were prospectively evaluated using the modified Alvarado scoring (MAS) to determine whether or not they had acute appendicitis. The MAS was correlated with USG and histopathological findings.

**Results:** 78 (true positive) patients who had MAS 7 or more had appendicitis on histopathology while no patients (false positive) had a normal appendix; 15(false negative) patients with MAS less than 7 had appendicitis and 7(true negative) had a normal appendix removed.

**Conclusion:** The MAS should be combined with USG for the diagnosis of acute appendicitis. But nothing can replace careful evaluation by an experienced surgeon.

**Keywords:** Modified Alvarado Score (MAS), Acute appendicitis, false positive.

### Introduction

Acute appendicitis is most common cause of pain abdomen. The diagnosis of which remain difficult in many cases. Acute appendicitis has customarily been a clinical diagnosis. Around 6% of the general population is believed to have appendicitis in their lifespan. Patients' history and physical examination is very important for proper diagnosis. It is possible to have an absolute diagnosis of appendicitis only after surgery and histopathological examination of specimen. Thus

it is impractical to have a definitive preoperative diagnosis<sup>1</sup>.

The only confirmation of diagnosis is by histopathology examination. Diagnosis of appendicitis has an considerable rate of negative appendicectomy varying from 20-40%<sup>3</sup> and an associated morbidity of around 10%. Various scoring systems have been developed for assisting the diagnosis of acute appendicitis, and Alvarado scoring system is one of them<sup>2</sup>.

## Material and Methods

**Study Design:** Hospital based prospective study.

**Study Duration:** 12 months (August 2016 to July 2017).

**Study Place:** Dept. of Surgery, S.P. Medical College and P.B.M Hospital, Bikaner

**Study Population:** patients presenting with pain in the right lower quadrant of Abdomen, lasting fewer than 7 days who after clinical examination will be provisionally diagnosed to have acute appendicitis.

**Sample Size:** 50 patients reporting to the Surgery dept. within study duration and eligible as per inclusion criteria will be included in the study.

Sampling Method: Convenience sampling

### Inclusion Criteria

Patients with provisional clinical diagnosis of acute appendicitis

### Exclusion Criteria

- 1) Patients of age less than or equal to 12 years
- 2) Patients with generalised peritonitis due to appendicular perforation
- 3) Patients with appendicular mass or abscess

### Data Collection

Suspect acute appendicitis who were admitted, investigated and treated were taken for the study. After detailed examination and investigations a modified Alvarado score was applied to each case.

## Results

**Table No. 1** Overall Sensitivity and Specificity of Modified Alvarado Score.

	HPE positive	HPE negative	Total
MAS positive	78	0	78
MAS negative	15	7	22
Total	93	7	100

78 (true positive) patients who had MAS 7 or more had appendicitis on histopathology while no patients (false positive) had a normal appendix; 15(false negative) patients with MAS less than 7 had appendicitis and 7(true negative) had a normal appendix removed.

Sensitivity -83.87%

Specificity- 100%

Positive predictive value-100%

Negative predictive value-31.82

**Table no.2** Overall Sensitivity and Specificity of Ultrasonography

	HPE positive	HPE negative	Total
USG finding positive	86	0	86
USG finding negative	7	7	14
Total	93	7	100

Out of 93 patients who actually had appendicitis, 86(true positive) were positive on USG while 7 (false negative) were missed; while no patients (false positive) patients were positive on USG who had a normal appendix.

Sensitivity -92.47%

Specificity- 100%

Positive predictive value-100%

Negative predictive value-50.00%

**Table 3** comparison of diagnostic variables of MAS and USG

	MAS	USG
Sensitivity	83.87%	92.47%
Specificity	100%	100%
Positive predict value	100%	100%
Negative predict value	31.82%	50%

USG (92.47%) were more sensitive than Modified alverde score (83.47%). Specificity (100%) and positive predict value (100%)were same in both.

## Discussion

This study set out to establish the diagnostic accuracy of a protocol based on modified Alvarado score and ultrasonography in acute appendicitis at saradr patel medical, college hospital Bikaner, Rajasthan.

Modified Alvarado score of 7 and above had a positive predictive value of 100%. In this study 78% of the patients who were predicted to have appendicitis by a high score had confirmed appendicitis on histopathology. This gave a crude negative appendicectomy rate of 12% that is in keeping with what Ongaro<sup>3</sup> found in his study in 2007 Year. A high Alvarado score was however

unable to distinguish between appendicitis and other mimicking diagnosis in 5 cases. A systematic review by Ohle et al<sup>4</sup> found out that a high Alvarado score was less sensitive as a 'rule in' score than as a 'rule out' for those below 5.48. Our study suggests that a high Alvarado score is a useful tool to set aside patients for immediate appendicectomy without further diagnostics. This contrasts with a study by Saidi and Chavda<sup>5</sup> that suggested that the scoring system has no value over clinical acumen.

In our study out of 93 patients who actually had appendicitis, 86(true positive) were positive on USG while 7 (false negative) were missed; while no patients (false positive) patients were positive on USG who had a normal appendix. The additional information by ultrasonography may be useful in reducing pre-operative delays due to diagnostic dilemmas. The utility of ultrasound has been advocated in many studies both as an adjunct to improve diagnosis in the equivocal cases and to determine who needs further imaging with a superior modality. In a study by Rasoul, et al<sup>6</sup> in Iran, ultrasonography had a PPV of 90.4% and a sensitivity of 55.4%. In our study Sensitivity - 92.47%, Specificity- 100%, Positive predictive value-100% and Negative predictive value-50.00%.

Kimaro<sup>7</sup>, a diagnostic radiology resident in 2011 did a study on the correlation of ultrasonography as compared to clinical and surgical findings among patients in KNH. His study revealed sensitivity, specificity, PPV and NPV values of 92%, 58.3%, 95% and 47% respectively. Our study in comparison had values of Sensitivity - 92.47%, Specificity- 100%, Positive predictive value-100% and Negative predictive value-50.00% respectively. The sensitivities in both studies were comparable. In our study the ability to pick the true negatives was quite low. This may be explained in part by the different methodology used in the two studies. Kimaro<sup>7</sup> conducted the ultrasonography in all the patients in his series showed a negative appendicectomy rate of 10.7%.

In our study the ultrasonography was done by the different ultrasonographers or radiology residents on call.

### Conclusion

The MAS should be combined with USG for the diagnosis of acute appendicitis. But nothing can replace careful evaluation by an experienced surgeon.

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