

Ultrasound in Acute Appendicitis

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Abstract

Introduction: Appendicitis is diagnosed if the maximal outer diameter of the appendix in transverse section along the short axis of the appendix is greater than 6mm. If the maximal outer appendiceal diameter is 6mm or less, a period of close clinical observation is probably warranted than surgery. **Methodology:** Patients admitted in Victoria hospital, Bengaluru with features suggestive of Acute Appendicitis and undergoing surgery for the same were included in this study. For each patient Alvarado Score was calculated and the result of Ultrasonography was noted. **Results:** The sensitivity, specificity, positive predictive value and negative predictive value for positive Ultrasonography in diagnosing acute appendicitis are 79.16%, 50%, 97.43%, 9.09 % respectively. The diagnostic accuracy is 78%. **Conclusion:** When ultrasound is compared to the Alvarado score for the diagnosis of acute appendicitis, neither one is significantly advantageous. However, the false positive rate is reduced when both modalities are positive

Keywords: Appendicitis; Ultrasound; Alvarado Score.

Introduction

Sonographically the appendix in appendicitis is visualized as blind ending, non peristaltic bowel loop. With compression, the diameter of the appendix is measured in an antero – posterior dimension. A scan is considered positive if a non compressible,

blind ending, aperistaltic, tubular, hypoechoic structure of 6 mm or greater in the antero- posterior direction is demonstrated. The presence of an appendicolith suggests the diagnosis. The presence of thickening of the appendiceal wall and periappendiceal fluid and hyperechoic pericecal fat is suggestive.

Appendicitis is diagnosed if the maximal outer diameter of the appendix in transverse section along the short axis of the appendix is greater than 6mm. If the maximal outer appendiceal diameter is 6mm or less, a period of close clinical observation is probably warranted than surgery, with two exceptions:

1. When there is compelling clinical evidence of appendicitis
2. When multiple appendicoliths are identified by ultrasound [1,2]

An appendiceal calculus or a fecolith can be recognized as a hyperechoic structure that has an acoustic shadow. These calculi or faecoliths result from accumulation and inspissation of fecal material around vegetable fiber. They are associated with a high incidence of acute complications such as perforation.

The clinical manifestations are not specific for disease which cause acute abdomen, but rather are specific for disturbance of a physiologic function. Thus, an identical clinical picture can result from a wide variety of acute processes within or near the peritoneal cavity that produce the same alterations of function as acute appendicitis. The differential diagnosis of acute appendicitis depends on the anatomic location of the inflamed appendix, patient's age and sex [3,4].

Methodology

Patients admitted in Victoria hospital, Bengaluru

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with features suggestive of Acute Appendicitis and undergoing surgery for the same were included in this study. For each patient Alvarado Score was calculated and the result of Ultrasonography was noted. Diagnosis of Appendicitis was confirmed on the basis of the Histopathological examination of the resected appendix specimen. Efficacy of Alvarado Scoring System and Ultrasonography in making the accurate diagnosis of Appendicitis were compared. Data was collected from inpatient and outpatient records of the subjects included in the study.

Inclusion and Exclusion Criteria

Those Satisfying Following Conditions were Included

- All patients above the age of 15yrs and above diagnosed clinically to have Acute appendicitis and subjected to Appendicectomy in Victoria hospital, Bengaluru.
- Patients willing for investigations and surgery.

Those Excluded from the Study Included

- Patients less than 14 years of age.
- Patient with h/o recurrent pain in right iliac fossa.
- Patients with appendicular mass/peritonitis.
- Pregnant females.
- Other comorbid conditions.

Results

There was a Male preponderance noted in this study. Out of 50 patients, 40 were males and 10 were females.

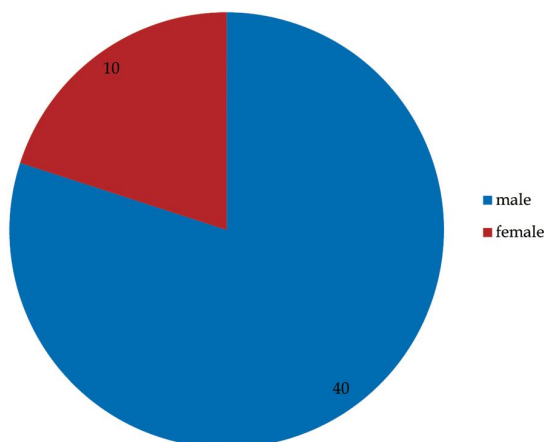


Table 1: Association between ultrasound and acute appendicitis

Ultrasonography	Acute Appendicitis		Total
	Positive	Negative	
Negative	4	0	4
Equivocal	6	1	7
Positive	38	1	39
	48	2	50

Table 2: Sensitivity and specificity of positive ultrasonography

Ultrasonography	Appendicitis	Not appendicitis	Total
Positive	38	1	39
Neg/Equivocal	10	1	11
Total	48	2	50

Sensitivity———79.16 %

Specificity———50%

PPV———97.43 %

NPV———9.09%

DA———78%

The sensitivity, specificity, positive predictive value and negative predictive value for positive Ultrasonography in diagnosing acute appendicitis are 79.16%, 50%, 97.43%, 9.09 % respectively. The diagnostic accuracy is 78%.

Table 3: Comparisons between total scores and USG categories

USG	Alvarado Score			Total
	<5	5-7	>7	
Equivocal	0	4	3	7
Negative	0	3	1	4
Positive	3	17	19	39
Total	3	24	23	50

Table 4: Comparison of diagnostic accuracy of ultrasonography & alvarado score

	Ultrasound	Alvarado Score
Sensitivity	81.25%	47.9%
Specificity	18.18%	7.4%
Positive predictive value	81.25%	47.9%
Negative predictive value	18.18%	7.4%

Discussion

Acute appendicitis mimics many other intraabdominal conditions due to which the surgeon faces a dilemma in arriving at a confident preoperative diagnosis, due to which various modalities were evaluated to supplement the surgeon's clinical judgment in improving diagnostic accuracy among which Ultrasound is one modality. Ultrasound in experienced hands is recognized to improve diagnostic accuracy in cases of suspected acute appendicitis and also in patients with a clinically high probability of acute appendicitis.

In the present study, the overall sensitivity,

specificity, positive predictive value and negative predictive value for Alvarado score when a score of >7 was considered positive in diagnosing acute appendicitis are 52.08%, 100%, 100%, 8% respectively. These values suggest that if only Alvarado score was used as a criterion to diagnose appendicitis, a score of ≤ 7 would not have predicted the presence of appendicitis with a good accuracy, in which case many cases would have been missed, which means the predictive value of an Alvarado score ≤ 7 is not good. But on the other hand, the specificity and the predictive value of Alvarado score >7 is fairly good (100%), which means, a score >7 is a good indicator to the presence of appendicitis as seen in our study, where out of the 25 patients whose score was >7 , all of them turned to be appendicitis positive.

In the present study, the overall sensitivity, specificity, positive predictive value and negative predictive value for Alvarado score when a score of >5 was considered positive in diagnosing acute appendicitis are 95.83%, 50%, 97.87%, 33.33% respectively. The sensitivity of Alvarado Score goes up when a score of >5 is considered positive for appendicitis, but the specificity drastically goes down.

In the present study, positive ultrasound showed an overall sensitivity of 79.16%, a specificity of 50%, a positive predictive and negative predictive value of 97.43% and 9.09% respectively. The predictive value of positive ultrasound is very good at 97.43% as shown in the study, where out of the 39 cases which Ultrasound reported as positive for appendicitis 38 cases were proven to have appendicitis on histopathology.

The overall performance of USG for investigation of acute appendicitis in this study is also comparable to the data reported in the literature [5-9]. The reviewed literature mentions the sensitivity, specificity, predictive values for the positive and negative test to be in between 55-99%, 68-93%, 73-97%, and 50-97% respectively, the values being comparable to our study.

Conclusion

USG is a valuable tool in the armamentarium of the surgeon to make a diagnosis of appendicitis in clinically equivocal cases, but it should be used in conjunction with the clinical findings

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