

Prospective Study to Determine the Role of Abdominal Ultrasound and Alvarado Score in Diagnosing and Preventing Negative Laparotomies in Acute Appendicitis

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Abstract

Aim: To evaluate the role of abdominal ultrasound and alvarado score in diagnosing and preventing negative laparotomies in acute appendicitis.

Methods: This prospective study conducted in the Department of surgery, Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar, India for two years. 100 consecutive patients more than 15 years of age who had a provisional diagnosis of acute appendicitis and were willing for surgery and who gave consent for the study were included.

Results: In our study, 82(82%) complained of nausea or vomiting at admission. 71(71%) had fever on admission. 81(81%) of patients had anorexia at the time of admission. 40(40%) of patients in our study had a pulse rate between 81-90 per minute. All patients in the study had tenderness in the right iliac fossa, and 71(71%) had rebound tenderness. The majority, 47(47%), of patients had complete blood count between 10000 and 15000. A shift to the left was seen in 81(81%) of patients. 60(60%) of patients in our study had conclusive evidence of appendicitis on ultra- sound. Alvarado score calculated for the 100 patients showed that 85(85%) had a score ≥ 7 . Taking histopathology as the gold standard and comparing it with the Alvarado score, the Alvarado score was ≥ 7 in predicting appendicitis 90(90%) of patients with a sensitivity of 95, specificity of 84 and an accuracy of 94.

Conclusion: Proper clinical assessment is the mainstay of diagnosis in acute appendicitis and ALVARADO score and USG abdomen help in clearing the diagnostic dilemma and preventing negative appendicectomies to a great extent.

Keywords: ALVARADO score, USG abdomen, acute appendicitis

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Introduction

Acute appendicitis is the most common surgical abdominal emergency with a life

time prevalence of one in seven.[1] It has been 100 years since Fitz presented his

classic paper describing the clinical features of appendicitis and recommended early removal of the inflamed appendix.[2] The diagnosis is mainly clinical, but appendicitis can mimic a variety of acute medical and surgical conditions. Early diagnosis of appendicitis is important to prevent morbidity and mortality due to its complications like abscess and perforation leading to peritonitis. It has been shown that appendicular abscess occur in 2-6% and appendicular perforation in 25.8% of untreated patients.[3] Performing an appendectomy on clinical suspicion alone will lead to 15-30% of negative appendectomies.[4,5] In order to improve the diagnostic accuracy, a number of diagnostic modalities have been proposed, including clinical scoring systems, ultrasonography, CT scans, MRI and laparoscopy.[6-8] The commonly used clinical scoring system is the Alvarado Scoring System and its modifications. Since shift of neutrophilic maturation to left was not available in all emergency hospitals, modified Alvarado score was devised in which this parameter was not considered.[9-11] Among imaging modalities, graded compression ultrasonography is an inexpensive, fast and non-invasive method with an accuracy rate of 71-90% for the diagnosis of acute appendicitis.[12-14] It is particularly useful in female patients when a

differential diagnosis of twisted ovarian cyst, ectopic pregnancy or some other gynecological pathology is being suspected. It is proposed that a combination of these two modalities, i.e. modified Alvarado score and ultrasound, will lead to a higher accuracy rate and so decrease the negative appendectomy rate.[15]

Material and methods

This prospective study conducted in the Department of surgery, Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar, India for two years. 100 consecutive patients who underwent appendectomy were included in this study.

Methodology

All consecutive patients more than 15 years of age who had a provisional diagnosis of acute appendicitis and were willing for surgery and who gave consent for the study were included. Patient coming to the hospital with pain abdomen along with distention of abdomen, Pregnant females, Any mass per abdomen, Patient with a previous history of any abdominal surgeries, Patient not willing for surgery, Children less than 15 years of age and Patients undergoing interval appendectomy were excluded from this study.

Table 1 Percentage distribution of the patients according to age

Age	Number	Percent
Below 20 years	31	31
20 – 30	51	51
30 – 40	12	12
Above 40	6	6
Mean \pm SD	24 \pm 8.7	

Table 2 Percentage distribution of the patients according to sex

Sex	Number	Percentage
Male	66	66
Female	34	34

Table 3 Percentage distribution of the patients according to duration of stay in hospital

Duration Of Stay In Hospital In Days	Number	Percentage
3 – 5	70	70
6 – 8	27	27
>8	3	3
Mean ± SD	5.5 ± 1.7	

Table 4 Predictive power of conclusive in USG in predicting Appendicitis if HPR is gold standard

USG abdomen	HPR		
	Appendicitis	Normal	Total
Conclusive	53	7	60
Inconclusive	37	3	40
Total	90	10	100

Sensitivity	51
Specificity	17
False Negative	51
False positive	84
Predictive value of positive test	89
Predictive value of negative test	3
Accuracy	48

Table 5 Predictive power of ALVARADO Score ≥7 in predicting Appendicitis if HPR is gold standard

ALVARADO Score	HPR		
	Appendicitis	Normal	Total
≥7	82	3	85
<7	8	7	15
Total	90	10	100

Sensitivity	95
Specificity	84
False Negative	6
False positive	17
Predictive value of positive test	99
Predictive value of negative test	56
Accuracy	94

Results

In our study of 100 patients, 52(66%) were male, and 28(34%) were female. The most number of patients, 51(51%), were between 20-30 years of age. 100(100%) of patients were admitted with pain in the

abdomen. 70(70%) of patients had a duration of hospital stay of 3-5 days. The mean hospital stay was 5.5 ± 1.7. In our study, 82(82%) complained of nausea or vomiting at admission. 71(71%) had fever on admission. 81(81%) of patients had anorexia at the time of admission. 40(40%)

of patients in our study had a pulse rate between 81-90 per minute. All patients in the study had tenderness in the right iliac fossa, and 71(71%) had rebound tenderness. The majority, 47(47%), of patients had complete blood count between 10000 and 15000. A shift to the left was seen in 81(81%) of patients. 60(60%) of patients in our study had conclusive evidence of appendicitis on ultrasound. Alvarado score calculated for the 100 patients showed that 85(85%) had a score ≥ 7 . Of the 100 patients, 81(81%) were inflamed, 4(4%) were gangrenous, 7(7%) perforated, and 8(8%) were normal per operatively. Histopathology revealed that 93(93%) patients had appendicitis. All the 100(100%) patients had primary closure after surgery. Surgical site infection was seen in 8(8%) patients postoperatively. Post-operative fever was seen in 42(42%). Taking histopathology as standard gold ultrasound proved conclusive in predicting appendicitis 50(50%) of patients with a sensitivity of 51, specificity of 17 and an accuracy of 47.

Taking histopathology as the gold standard and comparing it with the Alvarado score, the Alvarado score was ≥ 7 in predicting appendicitis 90(90%) of patients with a sensitivity of 95, specificity of 84 and an accuracy of 94.

Discussion

In the present study, the disease is seen mainly in young patients, with 82% of patients falling in the age group between 15 and 30 years. This result is close to the previously done study results.[16,17] As in a previous study by Hale et al., a similar picture was noted in the case of the gender predisposition, with males affecting 66% compared to females 34%.[18] The only few patients had prolonged hospital stay due to the complication of appendicitis, else the mean duration of stay in hospital was 5.5 ± 1.7 days in 97% of cases. This result is very close to previous results.[19,20] The predominant clinical

feature was pain abdomen seen in all the patients followed by nausea and vomiting in 82% of the subject. 71(71%) had fever on admission. 81(81%) of patients had anorexia at the time of admission. 40(40%) of patients in our study had a pulse rate between 81-90 per minute. These results are consistent with the studies done by Hardin et al. and Wagner JM et al.^{16,21} Tenderness in RIF was present in all the subjects. Rebound tenderness was found in 71% of patients. Only 15% of patients had a total blood count/leucocyte count of fewer than 10,000 cells/cm. 81% of patients had blood pictures showing a shift towards the left. These results are consistent with previous studies [20,21] USG abdomen was found to be conclusive in 60 patients out of 100 individuals. This gives the sensitivity of USG as 60%, the predictive value of positive test came out to be 88 with 47% accuracy, which was lower than a previous study by Ajerami et al. had a sensitivity of 85% and a positive predictive value of 93%.[22] The low sensitivity can be due to various causes. Ultrasound abdomen findings are operator dependent, and an experienced sonographer can give far better positive findings than an experienced one.

The inability of the Sonologist to achieve adequate compression of the right lower quadrant could be due to obesity of the patient, presence of severe pain or abdominal guarding, in case of excessive bowel gas, and an uncooperative patient can all affect the accuracy of the ultrasound. The anatomical location of the appendix, like in retrocecal position it is not easily visible due to the bowel being placed anteriorly. ALVARADO score was found to be more than or equal to 7 in 90(90%) cases, and the sensitivity came to be 95 with the specificity of 84. the predictive value of the positive test with ALVARADO Score was 99, with 94% accuracy. They were comparable to a study done by Limpawattanasiri et al.[23]

The appendix was found to be normal in 10 patients out of 100 cases, giving the negative appendectomy rate of 10% using both USG abdomen and AL-VARADO score, which was less compared to other studies where it ranged from 12% to 22.3%. [24,25,26]

Conclusion

Proper clinical assessment is the mainstay of diagnosis in acute appendicitis and ALVARADO score and USG abdomen help in clearing the diagnostic dilemma and preventing negative appendectomies to a great extent.

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