

Original Research Article

Combined Use of Modified Alvarado Score and USG in Decreasing Negative Appendicectomy Rate at Darbhanga Medical College And Hospital, Bihar, India

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Abstract

Introduction: Appendicitis is notorious in its ability to simulate other conditions and in the frequency it can be mimicked by other pathologies. Despite extraordinary advances in modern radiography imaging and diagnostic laboratory investigations the accurate diagnosis of acute appendicitis remains an enigmatic challenge. Of the various commonly used diagnostic aids for appendicitis, no single test can reduce the rate of negative appendicectomy to zero. **Materials and methods:** Fifty admitted cases of suspected appendicitis were subjected to ultrasonography (USG). All the patients were scored out of 9 according to modified Alvarado score. A treatment plan was devised according to which patients with modified Alvarado score \geq underwent immediate appendicectomy even if USG was negative for appendicitis and patients with score <7 underwent appendicectomy if USG was positive for appendicitis. **Result:** 84.3% of males and 44.4% of females admitted as case of suspected appendicitis has confirmed appendicitis. Due to high sensitivity (97-14% and accuracy (92%) of our diagnostic approach, 85.71% cases of appendicitis were diagnosed in early stage, with only 8.5 7% perforation and abscess rate, leading to post appendicectomy complication rate of only 5.14% in our study (one wound infection and one urinary retention). We could achieve low negative appendicectomy rate of 7.14% in males and 11.11% in females and overall 8.11% in our study. **Conclusion:** Combined use of modified Alvarado score and high frequency USG not only reduces negative appendicectomy rate but also reduces morbidity and postoperative complications.

Keywords: Ultrasonography, Acute appendicitis, Alvarado scores.

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Introduction

It has been over 100 years since Fitz presented his classic paper describing the clinical features of appendicitis and recommended early surgical removal of the inflamed appendix [1]. Appendicitis is notorious in its ability to simulate other conditions and in the frequency it can be mimicked by other pathologies.

Despite extraordinary advances in modern radiography imaging and diagnostic laboratory investigations and accurate preoperative diagnosis of acute appendicitis remains an enigmatic challenge. Overall, a negative appendicectomy rate of approximately 20% is commonly reported [2-9]. Nowadays commonly used diagnostic aids for appendicitis are CECT abdomen, laparoscopy, diagnostic scores, USG. By using diagnostic aids for acute appendicitis, prolonged observation, negative appendicectomy and incidence of perforation can be reduced dramatically resulting in decreased financial cost of the systems employed. But no test can reduce the rate of negative appendicectomy to zero, hence some authors have recommended a combination of two or more investigations to increase accuracy even more.

Aim of study

To evaluate combined use of modified Alvarado score and USG in decreasing negative appendicectomy rate.

Materials and methods

This study was carried out in Darbhanga Medical College, Laheriasarai (Bihar) and associated hospitals, during Jun 2020 to April 2021 on admitted patients of right lower quadrant pain suspected of appendicitis. Evaluation of patient was done by comprehensive history, clinic-pathological examination, investigations and modified Alvarado score.

Alvarado score (Table 1)

This scoring system as described by Alvarado is based on three symptoms, three signs, two laboratory findings [10].

In this study we used slightly modified version of the Alvarado score by excluding one laboratory finding, shift to left of neutrophil maturation as this was not available from our laboratory on emergency basis, therefore, our patients were scored out of 9 rather 10 points.

The laboratory finding of leucocytosis is defined as Total Leucocyte count (TLC) to excess of 10×10^9 per litre (used in our study to assess Alvarado score).

Temperature Oral temperature $>37.3^\circ$ was considered positive.

Table 1: Alvarado score

		Score
Symptoms	Migratory Right lower	1
	Quadrant (RLQ) pain Anorexia	1
Signs	Nausea/vomiting	1
	Tenderness RLQ	2
	Rebound tenderness	1
Laboratory	Elevated temperature	1
	Leucocytosis	2
	Shift to left	1
Total score		10

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Table 2: Plan of treatment

Modified Alvarado score	USG	Treatment plan
<7	Negative	Conservative
<7	Positive	Appendicectomy
≥7	Negative	Appendicectomy
≥7	Positive	Appendicectomy

Criteria for diagnosis of acute appendicitis was maximum diameter Z 6 mm, or wall thickness ≥3mm, or increased periappendicular echogenicity.

Plan of treatment (Table 2)

Confirmation of diagnosis of acute appendicitis was done by histopathological examination of appendix in all Operated cases.

Discussion

Patients undergoing appendicectomy on clinical judgement had a diagnostic accuracy of only 70-75%, negative appendicectomy rate of 25% and 35-45% in males and females, respectively has been found in studies conducted by Jess et al. [6], Dunn et al. [7], Lewis et al [5], Change et al. [4], diagnostic accuracy much less than our study (92%), and negative appendicectomy rate much more than our study, males 7.14% and in females 11.11% (Tables 3a, 3b, 7).

Table 3a: Result of our treatment plan

Sex	Modified Alvarado score ≥ 7	USG positive		Treatment plan		Confirmed appendicitis	
		No.	%	Conservative	Appendicectomy	No.	%
Men	10	7	(70)	1±	9	9±	(90)
Women	3	2	(66.67)	-	3	3	(100)
Children	2	2	(100)	-	2	2	(100)
Total	15	11	(73.3)				

Table: 3b Result of our treatment plan

Sex	Modified Alvarado score ≥ 7	USG positive		Treatment plan		Confirmed appendicitis	
		No.	%	Conservative	Appendicectomy	No.	%
Men	19	16	(84.21)	2+	14+	15+1#	(93.75)
Women	14	6	(42.86)	2+	4	5	(83.3)
Children	2	-	-	-	-	-	
Total	35	22	(62.85)				

Table: 4 Overall sensitivity and specificity of our diagnostic approach

Diagnostic approach result	Diagnosis		Total
	Appendicitis	Not Appendicitis	
Positive	(True positive) 34	(False positive) 3	37
Negative	(False negative) 1	(True negative) 12	13
Total	35	15	50

Table 5: Sensitivity and specificity of USG

Diagnostic approach result	Diagnosis		Total
	Appendicitis	Not Appendicitis	
USG Positive	(True positive) 31	(False positive) 2	33
USG Negative	(False negative) 4	(True negative) 13	17
Total	35	15	50

Clinical scoring systems devised by Teicher et al. [11] Alvarado [10], Lindberg and Fenyo [12], Ramirez and Dens [13], Galindo et al. [14] had sensitivity ranging from 48 to 77% while specificity of 73 to 87% which is less than sensitivity of our diagnostic approach (97.14%) while specificity is nearly same (Table 4)

In 1992, Owen et al [15] used Alvarado score prospectively and found negative appendicectomy rate of 6% in men, 22% in women and 12% in children, with overall negative appendicectomy rate of 12.6% Kalan et al [16] using modified version of Alvarado score found negative appendicectomy of 14.6% sensitivity of 93% in males and

67% in females. In a similar version of modified Alvarado score we had less negative appendicectomy rate as well as less sensitivity, but our diagnostic approach has less negative appendicectomy rate and more sensitivity (Table 6,7)

On comparing our diagnostic approach with our USG results (Table 10), our diagnostic approach is more sensitive (97.14%) and more accurate (92%). Though negative appendicectomy rate of USG in our study is low i.e. 6.06%, but positive USG can not be a pre-requisite for appendicectomy as there is high false negative rate of 23.53% (Table 5). It can only complement clinical scores or

Table 6: Sensitivity and specificity of modified Alvarado score

Diagnostic test result	Diagnosis		Total
	Appendicitis	Not Appendicitis	
Score ≥7 positive	(True positive) 14	(False negative) 1	15
Score <7 negative	(False negative) 21	(True positive) 14	35
Total	35	12	50

Table 7: Negative appendicectomy rate of our diagnostic approach

Appendicectomy d/t our diagnostic approach	Appendicitis on H/P Examination		Negative Appendicectomy	
	No.	%	No.	%
Male (28)	26	92.86	2	7.14
Female	8	88.89	1	11.11
Total (37)	34	91.89	3	8.11

Table 8: Pathological stages of acute appendicitis

Stage	Number	Percentage
Early acute appendicitis	30	85.71
Suppurative appendicitis	1	2.86
Gangrenous appendix	1	2.86
Perforated appendix	2	5.71
Abscess	1	2.86
Total	35	100

clinical judgement because in few cases inflamed appendix could not be visualised due to bowel gases or in missed due to inexperience of ultrasonologist, hence positive USG as pre-requisite for appendicectomy will increase perforation rate leading to increased morbidity and mortality.

Conclusion

In spite of low negative appendicectomy rate, which prevented many negative laparotomies and its complications, combined use of modified Alvarado score and USG, in decision making for appendicectomy, has high sensitivity and accuracy, so that patients can be diagnosed in early acute appendicitis stage (Table 8), decreasing morbidity and postoperative complications.

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