Original Article

Use of modified alvarado score and USG combination in decreasing negative appendicectomy rate

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Abstract

Background: Acute appendicitis is the most common cause of an acute abdomen requiring surgery. Overlapping of symptoms of appendicitis with a number of other conditions makes diagnosis of appendicitis a challenge. The Alvarado score was designed as a diagnostic score; however, its appropriateness for routine clinical use is still unclear. The use of appendiceal ultrasonography could decrease the negative appendectomy rate. This study was undertaken to evaluate combined use of modified Alvarado score and USG in decreasing negative appendicectomy rate. **Material and Methods:** Hundred admitted cases of suspected appendicitis were scored out of 9 according to modified Alvarado score and subjected to ultrasonography. All the patients underwent immediate appendicectomy even if USG was negative for appendicitis and patients with score <7 underwent appendicectomy if USG was positive for appendicitis. The specimen of appendix was sent for histopathological examination. **Results:** Out of the 100 patients in total 88 patients were having positive histopathology reports. Whereas despite the use of Modified Alvarado Score and Ultrasonography in combination, 12 patients out of the 100 patients suspected of having acute appendicitis were having negative histopathology reports. **Discussion:** The scoring systems like Modified Alvarado Scoring System can be used as a cheap and inexpensive way for conclusive diagnosis of acute appendicitis. Addition of imaging modality like Ultrasonography to the clinical assessment not only increases the diagnostic accuracy in patients with suspected acute appendicitis but also decreases the negative appendicectomy rate.

Key Words: Appendicitis, Modified Alvarado score, Ultrasonography, Negative Appendicectomy Rate.

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INTRODUCTION

Acute appendicitis is one of the common causes of abdominal pain in emergency surgery departments[1]. Symptoms of appendicitis overlap with a number of other conditions making diagnosis a challenge, particularly at an early stage of presentation[2]. In 1986, Alvarado constructed a 10-point clinical scoring system for the diagnosis of acute appendicitis as based on symptoms, signs and diagnostic tests in patients presenting with suspected acute appendicitis. The Alvarado score enables risk stratification in patients presenting with abdominal pain, linking the probability of appendicitis to recommendations regarding conservative or surgical management[3]. Appropriate surgical intervention is necessary to reduce the risk of perforation and peritonitis, which carries significant risk of morbidity and mortality. Negative appendicectomy rate can be defined as pathologically normal appendices that removed surgically in patients suspected of having acute appendicitis[4]. Historically, an acceptable negative appendectomy rate has been between 15% and 25%[5]. On the contrary, in almost 25% of appendicitis patients, surgery may be inappropriately withheld leading to the chances of perforation and peritonitis. With the advances in diagnostic radiology, surgeons have increasingly relied on radiologic imaging in an effort to more accurately

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diagnose appendicitis preoperatively and to decrease both the number of unnecessary appendectomies and the rate of complications[6,7]. The ultrasonography (USG) examination has been found to have both high sensitivity (range, 75% to 90%) and high specificity (range, 80% to 100%)[8-10] for diagnosing appendicitis. It has beenreported[11,12] that the use of appendiceal ultrasonography could decrease the negative appendectomy rate. Although, morbidity and mortality due to appendicitis have decreased tremendously over last few decades, the diagnostic specificity remains low. In the present study, an effort has been made to evaluate combined use of modified Alvarado score and USG in decreasing negative appendicectomy rate.

MATERIAL AND METHODS

This study was conducted in the department of General Surgery, Government Medical College and Hospital, during a period of January 2015 to September 2016. In this study 100 consecutive cases presenting with right lower quadrant abdominal pain suspected of acute appendicitis were considered. All these patients were evaluated according to the Modified Alvarado Scoring System (MASS) and all patients were subjected to Ultrasonography of whole abdomen preoperatively. In this study Alvarado score was slightly modified excluding one laboratory finding, shift to left of neutrophil maturation as this investigation was not available from our laboratory on emergency basis. Therefore, our patients were scored out of 9 rather than 10 points. Leukocytosis was defined as total leucocyte count to the excess of 10,000/ cu.mm and oral temperature >37.5°C was considered positive. Patients presenting with right iliac fossa lump/mass suggestive of appendicular lump and children aged less than 14 years were excluded from the study.

Modified Alvarado Scoring System (Mass)

Symptoms	Score
Migratory right iliac fossa pain	1
Nausea/vomiting	1
Anorexia	1
Signs	
Tenderness in right iliac fossa	2
Rebound tenderness in right iliac fossa	1
Elevated temperature	1
Laboratory findings	
Leukocytosis	2
Total Score	**9**

Patients diagnosed to have acute appendicitis as per the MASS and Ultrasonography of whole abdomen was started I.V. antibiotics preoperatively and continued in the post-operative period (ciprofloxacin, gentamycin, and metronidazole). Patients with Modified Alvarado score of more than 7 and/or positive USG findings were operated after taking written informed consent and necessary investigations if any. Findings on exploration were noted down for further reference. The specimen of appendix was sent for histopathological examination. The report of histopathology was correlated to analyze appropriateness and correctness of the combined use of MASS and Ultrasonography in the diagnosis of acute appendicitis and its effectiveness in decreasing negative appendicectomies.

RESULTS

Acute appendicitis was more common (76%) in the age group of 14-30 years. Out of 100 patients, 62 were male and 38 were female.

Table 1: Signs, symptoms and laboratory findings in patients

Symptoms	Score
Migratory right iliac fossa pain	75%
Nausea/vomiting	73%
Anorexia	76%
Signs	
Tenderness in right iliac fossa	100%
Rebound tenderness in right iliac fossa	40%
Elevated temperature	56%
Laboratory findings	
Leukocytosis	4%

Tenderness in right iliac fossa was the most consistent feature on clinical examination of patients, present in all the cases (Table1). Out of 100 cases studied, in only 18 patients, USG was suggestive of probe tenderness in right iliac fossa. In rest of the 82 cases, USG was suggestive of acute appendicitis. All the 100 cases were operated upon, intra-operative findings were noted down, and appendicectomy was done. Resected specimen of appendix was sent for histopathology examination and reports were followed in all the 100 cases. Intra operatively, in 82% cases inflamed appendix was found, whereas in 4% and 2% cases congested and gangrenous appendix was found. In 12% cases appendix was found to be normal.

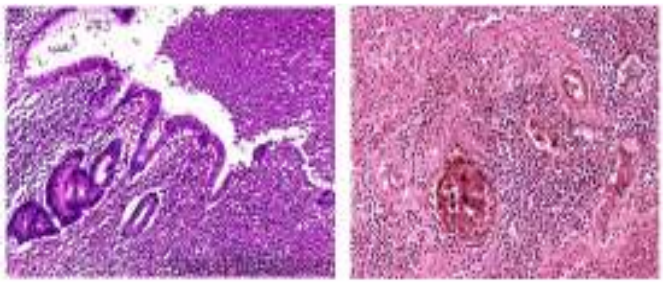
Table 2: Correlation of Modified Alvarado Score with Histopathology Reports

Modified Alvarado score	Total	Positive Histopathology report	Percentage
Score > 7 Positive	88	80	90.9
Equivocal	12	8	66.6
Total	**100**	**88**	**88.0**

Table 3: Correlation of Ultrasonography with Histopathology Reports

Ultrasonography findings	Total	Positive Histopathology report	Percentage
Suggestive of acute appendicitis	82	74	90.2
Mild Right Iliac Fossa Tenderness	18	14	77.7
Total	**100**	**88**	**88.0**

Out of the 100 patients in total 88 patients were having positive histopathology reports (Fig. 1a, b). Whereas despite the use of combined modality i.e. Modified Alvarado Score and Ultrasonography 12 patients out of the 100 patients suspected of having acute appendicitis were having Negative histopathology reports.



a b

Figure 1 a, b: Microscopic Appearance of a. Acute and b. Suppurative Appendicitis

DISCUSSION

Acute appendicitis has slightly male preponderance Lewis *et al*[13] and Ronan 'O' Connell[14] also found similar observations. It was more common in the age group of 14- 30 years which is similar to that reported by Gallego *et al* (72%)[15]. Pain was a main complaint in all the cases in this study. Pain in the right iliac fossa was present in all 100 patients (100%) in this study which is similar to Gallego *et al* (96.4%)[15] and Schwartz SI (100%)[16]. Anorexia nearly always accompanies appendicitis. Anorexia was present in 76% of patients in present series which is similar to Kalan M *et al* (85%)[17] and dissimilar to Mathews *et al* (92.13%)[18] and Schwartz SI (100%)[16]. In this study nausea was present in 73% of Cases and vomiting was present in 60% of cases in the present series which is dissimilar to Owen TD *et al* (Nausea in 84% and vomiting in 78%)[19], Mathews *et al*(Nausea in 92% and vomiting in 70.9%)[18], Schwartz SI (Nausea in 90% and vomiting in 75%)[16]. Right iliac fossa tenderness was present in all the 100 (100%) cases at the time of presentation which is similar to Kalan M *et al* (95%)[17], Gallego *et al* (94%)[15], Mathews *et al* (99.1%)[18] and dissimilar to Bhattacharjee *et al* (92%)[20]. In the present series, in 40% of cases rebound tenderness was present which is dissimilar to Owen TD *et al* (60%)[19], Gallego *et al* (56%)[15], but similar to Schwartz SI (50%)[16]. Fever was present in 56 cases out of 100 cases (56%) in the present series which is similar to Wilcox *et al* (60%)[21] and dissimilar to Kalan M *et al*(40%)[17] andMathews *et al* (74.03%)[18]. White blood cell count more than 10,000 cells/cumm was found in 96% of cases which is similar to Elongovan S(90%)[22] and dissimilar to Gallego *et al* (65%)[15] and Doraiswamy (42%)[23]. Appendix was visualized in 82% of the total cases which is dissimilar to Bhattacharjee PK *et al* (88%)[20], Puylaert J BCM *et al* (88.5%)[8] but similar to Gallego *et al* (82%)[15]. In the present series, histopathology report was positive in 88 (88%) of cases which is similar to Mathews *et al* (84.28%)[18] and dissimilar to Mohanty *et al* (94.44%)[24] and Bhattacharjee *et al* (82.7%)[20]. The present study shows negative Appendicectomy rate of 12.90% in males and 10.52% in females which is dissimilar to Bhattacharjee *et al* (6.9% in males and 19.1% in females)[20] and dissimilar to Mohanty *et al* (4.8% in males and 6.7% in females)[24]. Out of the 100 patients studied in this series, 12 patients were having negative histopathology reports hence the overall negative appendicectomy rate of this whole study was 12% which is similar to Gyomber *et al* (15%)[25], Mohammad *et al* (12%)[26], Chairoek Limpawattanasiri (14.7%)[27], Nizamuddin *et al* (14.6%)[28]. From this study it can be concluded that history and clinical examination is helpful in accurate diagnosis. The scoring systems like Modified Alvarado Scoring System can be used as a cheap and inexpensive way for conclusive diagnosis of acute appendicitis. Addition of imaging modality like Ultrasonography to the clinical assessment not only increases the diagnostic accuracy in patients with suspected acute appendicitis but also decreases the negative appendicectomy rate in a significant manner. Negative appendicectomy rate was 12% in the present study of 100 cases which is comparable to the standard rate which is considered to be approximately 20%.In males negative appendicectomy rate is high as compared to females. Therefore, combined use of Modified Alvarado Score and Ultrasonography can decrease the negative appendicectomy rate in the patients suspected of having acute appendicitis.

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