

Prospective comparison of the Pediatric Appendicitis Score and Alvarado score for clinical diagnosis of acute appendicitis in children

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Abstract

Background: In the Alvarado score and the pediatric appendicitis scoring systems, there is a reference score above which surgery is recommended while only observation is warranted below the specific score. The present study was conducted among children presented in surgical emergency with right lower abdominal pain having sign and symptoms of acute appendicitis at Gouri Devi institute of medical sciences and hospital, Rajbandh Durgapur-12 From November 2020 to October 2021. **Material and methods:** The present study was conducted among children presented in surgical emergency with right lower abdominal pain having sign and symptoms of acute appendicitis at Gouri Devi institute of medical sciences and hospital Rajbandh Durgapur-12 From November 2020 to November 2021. Each enrolled patient was awarded clinical scores according to both the Alvarado scoring system and the pediatric appendicitis scoring system. The statistical values were calculated for both scoring systems at cutoff score 7. **Results:** 100 patients were included in the study. Of the enrolled patients, 70 were males and 30 were females. 47 patients were included in the operated group (seven or more than seven group) and 53 patients were included in the observational group (less than seven group). Out of those 53 patients classified as the observational group, 39(73.58%) patients got settled during observation without any complication while 14 (26.41%) had to be proceeded with surgery because of an increase in their score (PAS/Alvarado) values during their observational period. Out of total 100 patients, 61 got operated i.e. 47 patients were included in the operated group (seven or more than seven group) and 14 patients (less than seven group) were operated. Out of 61 got operated and according to histopathology report 50 were confirmed as acute appendicitis while 11 were declared as negative appendectomies. According to the Alvarado scoring system, 43 patients were in the “seven or more than seven” group while 18 patients were in the “less than seven” group. According to histopathology at cutoff value 7, the Alvarado score resulted in 39 correct diagnoses of appendicitis and 4 innocent appendectomies. According to the pediatric appendicitis scoring system, 47 patients were in the “seven or more than seven” group while 14 patients were in the “less than seven” group. According to histopathology cutoff value 7, the pediatric appendicitis score resulted in 43 correct diagnoses of appendicitis and 4 innocent appendectomies. **Conclusion:** The pediatric appendicitis score (PAS) was superior in diagnosing acute appendicitis in the pediatric population than the Alvarado score as indicated by the values of diagnostic accuracy.

Keywords: Pediatric appendicitis, Alvarado score, Pediatric appendicitis score.

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Introduction

Acute appendicitis is the most common intra-abdominal surgical emergency, and appendectomy is one of the most commonly performed surgical procedures in abdominal surgery[1]. About 1 to 10% of children presenting in surgical emergencies with acute abdomen fall within the domain of acute appendicitis[2]. Early, accurate diagnosis potentially could decrease perforation rate and its complications[3]. Early diagnosis of “no appendicitis” or “appendicitis” on the basis of a pediatric appendicitis score potentially could decrease emergency department time and resource use and could avoid time, cost, and risks for further evaluation[4-7]. The most widely used scores are the Heidelberg Appendicitis Score (HAS), the Pediatric Appendicitis Score (PAS), the Alvarado-Score and the Tzanakis-Score[7-10]. While both the HAS and the PAS are designed for pediatric patients[8,10], the Alvarado- and the Tzanakis-Score were conceptualized in a broader patient population[7,9].

The Alvarado score is the commonest scoring system being used these days to establish a diagnosis of the acutely inflamed appendix.

It was mostly used for the adult population in the past, but recently, few studies have validated its importance in the pediatric population as well[11]. Samuel in 2002 made a new scoring system for the children, the pediatric appendicitis score (PAS). In these scoring systems, there is a reference score above which surgery is recommended while only observation is warranted below the specific score[12]. The present study was conducted among children presented in surgical emergency with right lower abdominal pain having sign and symptoms of acute appendicitis at Gouri Devi institute of medical sciences and hospital Rajbandh Durgapur-12 From November 2020 to November 2021.

Material and methods

The present study was conducted among children presented in surgical emergency with right lower abdominal pain having sign and symptoms of acute appendicitis at Gouri Devi institute of medical sciences and hospital Rajbandh Durgapur-12 From November 2020 to October 2021. The children were enrolled in the study after obtaining informed written consent from parents/guardian. Children of age 4 to 12 and having history of symptoms less than 72 h were included in the study. Children associated with co-morbidity, complicated appendicitis, and an appearance of appendicular mass on the clinical exam/initial ultrasonography on presentation were excluded from the

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study. Each enrolled patient was awarded clinical scores according to both the Alvarado scoring system and the pediatric appendicitis scoring system. Two groups were made with a cutoff value of 7 for both scoring systems. Patients having a score of 7 or more in both scores were considered "seven or more than seven group." Their appendectomies were performed and histopathology reports were reviewed. Patients having a score of 7 in one system and less than 7 in the other/both were considered "less than seven group." These patients were admitted in the ward for further evaluation and observation. They were allowed only clear liquids orally without prescribing any antibiotics. Data was collected regarding the history, using Laboratory samples. Ultrasonography was performed by a radiologist in the emergency room on each patient to rule out appendicular mass and complicated appendicitis. From operated cases, the appendix was collected as the sample for histopathology examination and reports were reviewed from the Pathology department without prior information to the pathologist. The patients from "less than seven group" were admitted in the ward and the clinical course of the disease was observed. Their scoring systems were reviewed. The patients from this group who settled during observation were discharged from the hospital. The patients who got an increase in their scoring system during the observation phase were operated upon and their appendix was sent for histopathology. So these statistical values were calculated for both scoring systems at cutoff score 7.

Table 1: Distribution of operated patients according to groups by both scoring systems and type of histopathology

Scoring system	Groups	Histopathology		Total	Grand total
		Inflamed, n = 50	Normal, n = 11		
Pediatric appendicitis score	Seven and more than seven	43	4	47	61
	Less than seven	7	7	14	
Alvarado score	Seven and more than seven	39	4	43	61
	Less than seven	11	7	18	

Discussion

Abdominal pain is one of the most common symptoms of patients seeking medical attention. Acute appendicitis is the most common cause of acute abdominal pain, and distinguishing appendicitis from other disorders is sometimes difficult, particularly in young preverbal children[13-17].

100 patients were included in the study. Of the enrolled patients, 70 were males and 30 were females. 47 patients were included in the operated group (seven or more than seven group) and 53 patients were included in the observational group (less than seven group). Out of those 53 patients classified as the observational group, 39(73.58%) patients got settled during observation without any complication while 14 (26.41%) had to be preceded with surgery because of an increase in their score (PAS/Alvarado) values during their observational period. Out of total 100 patients, 61 got operated i.e. 47 patients were included in the operated group (seven or more than seven group) and 14 patients (less than seven group) were operated. Out of 61 got operated and according to histopathology report 50 were confirmed as acute appendicitis while 11 were declared as negative appendectomies. According to the Alvarado scoring system, 43 patients were in the "seven or more than seven" group while 18 patients were in the "less than seven" group. According to histopathology at cutoff value 7, the Alvarado score resulted in 39 correct diagnoses of appendicitis and 4 innocent appendectomies. According to the pediatric appendicitis scoring system, 47 patients were in the "seven or more than seven" group while 14 patients were in the "less than seven" group. According to histopathology cutoff value 7, the pediatric appendicitis score resulted in 43 correct diagnoses of appendicitis and 4 innocent appendectomies.

In a retrospective comparison of appendectomies for appendicitis versus non-inflamed appendix, use of a scoring system could have reduced the rate of negative appendectomies by one third[18].

Alvarado found 8 predictive factors of acute appendicitis among 305 patients admitted to the hospital with abdominal pain suspected to be due to acute appendicitis. Right lower quadrant tenderness, leukocytosis, and migration of pain were the most significant factors.

Results

100 patients were included in the study. Of the enrolled patients, 70 were males and 30 were females. 47 patients were included in the operated group (seven or more than seven group) and 53 patients were included in the observational group (less than seven group). Out of those 53 patients classified as the observational group, 39(73.58%) patients got settled during observation without any complication while 14 (26.41%) had to be preceded with surgery because of an increase in their score (PAS/Alvarado) values during their observational period. Out of total 100 patients, 61 got operated i.e. 47 patients were included in the operated group (seven or more than seven group) and 14 patients (less than seven group) were operated. Out of 61 got operated and according to histopathology report 50 were confirmed as acute appendicitis while 11 were declared as negative appendectomies. According to the Alvarado scoring system, 43 patients were in the "seven or more than seven" group while 18 patients were in the "less than seven" group. According to histopathology at cutoff value 7, the Alvarado score resulted in 39 correct diagnoses of appendicitis and 4 innocent appendectomies. According to the pediatric appendicitis scoring system, 47 patients were in the "seven or more than seven" group while 14 patients were in the "less than seven" group. According to histopathology cutoff value 7, the pediatric appendicitis score resulted in 43 correct diagnoses of appendicitis and 4 innocent appendectomies.

The study was retrospective, based only on admitted patients, with no follow-up of patients discharged with complaints of abdominal pain[8]. The Alvarado score was later tested on 215 adult patients in Cardiff with reduction in unnecessary operations without documented increase in death or significant complications[19].

Samuel designed the PAS in 2002 on the basis of a cohort of 1170 children 4 to 15 years old. When tested on the same population, the sensitivity was 100%, specificity was 92%, PPV was 96%, and NPV was 99%. Conclusion from Samuel's study was that patients with a score of 5 or less do not have appendicitis, and a score of 6 or higher was highly associated with appendicitis[12].

Goldman et al applied the scoring system to all children who presented with abdominal pain. In their sample, only 14.5% had appendicitis[20].

Conclusion

The pediatric appendicitis score (PAS) was superior in diagnosing acute appendicitis in the pediatric population than the Alvarado score as indicated by the values of diagnostic accuracy.

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