

Appendicitis Inflammatory Response Score

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Abstract

Original Research Article

Background: Appendicitis results from an acute inflammation of the appendix. It is most common in 10 to 19 years old age group (233/100,000 population annually). The classic presentation for appendicitis involves the onset of vague epigastric or periumbilical pain followed by anorexia, nausea or vomiting and the migration of pain to the right lower quadrant (RLQ). It is one of the most common causes of acute abdominal pain in pediatrics and is the most common indication for emergency abdominal surgery in childhood. Pediatric appendicitis score is a simple, relatively accurate diagnostic tool, which is applicable in all clinical situations and has been proposed as a guide to assist in deciding whether to operate or observe a child with abdominal pain. **Methods:** This study was conducted in Vardman Mahavir Medical Collage and Safdarjung Hospital, New Delhi over a period of about 18 months from November 2012 to July 2014. A total of 190 clinically suspected patients of appendicitis were taken as study subjects. After obtaining informed consent, a data collection form contained information about patient age, sex, date and time of the examination, the date and time of the onset of symptoms, and each of the eight PAS components was completed. **Results:** In appendicitis children, (81.0%) children were in age group 09-15 years and (19.0%) patients were in age group 5-8 years. Male (70.0%) were predominant than female (30.0%). Migration of pain, nausea and anorexia were in 37 (48.68%), 42 (55.3%) and 41 (53.95%) appendicitis children respectively. Fever, cough/percussion tenderness and tenderness in RLQ were in 28 (36.8%), 39 (51.3%) and 44 (57.8%) appendicitis children respectively. Leukocytosis and neutophilia were present in 31 (40.7%) and 33 (43.4%) appendicitis children respectively. **Conclusion:** Pediatric Appendicitis Score is a good tool but not good enough for diagnosis of pediatric appendicitis. It cannot be recommended for diagnosis of pediatric appendicitis because its negative appendectomy rate as well as wrongly discharged rate is high.

Keywords: Appendectomy, appendicitis, pediatric appendicitis score, Children.

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INTRODUCTION

Especially in resource-deficient countries like India, this would appear to be a safe and cost-effective staged diagnostic protocol. It is also important that ultrasonologists should be well trained to evaluate suspected acute appendicitis, especially in small children, as improving US accuracy and quality has a big role in reducing CT use [2]. Appendicitis results from an acute inflammation of the appendix. It is most common in 10 to 19 years old age group (233/100,000 population annually) [8]. The classic presentation for appendicitis involves the onset of vague epigastric or periumbilical pain followed by anorexia, nausea or vomiting and the migration of pain to the right lower quadrant (RLQ). It is one of the most common causes of acute abdominal pain in pediatrics and is the most common indication for emergency abdominal surgery in

childhood [9]. The diagnosis of appendicitis is problematic in children because many present with signs and symptoms that mimic other common causes of abdominal pain. When it presents with typical symptoms, it is relatively easy to diagnose [10]. The overall negative appendectomy rate among all children is suggested to be 8.4%. Recent studies have proposed different methods to treat children presenting to the emergency department (ED) with symptoms suggestive of appendicitis [12]. Clinical scores used in these studies have relied on historical, physical examination, and laboratory findings. Ideally, a clinical score could accurately distinguish those patients that need immediate operative care from those that may benefit from further investigation or observation. Two pediatric appendicitis scoring systems, published by Alvarado [13] and Samuel [14] are the most widely referenced in

the literature [12]. The PAS was introduced by Maden Samuel in 2002 as a way to stratify children's risk of having appendicitis when they present with abdominal pain. The scoring system consists of 8 findings (6 worth 1 point, and 2 worth 2 points for a total score of 10 points). Since Samuel's inception, several studies have addressed the sensitivity and specificity of this scoring system and attempted to develop strategies for its use, mostly in deciding whom to take to the operating room without imaging, whom to image and whom to send home. The primary aim in this study was to evaluate the diagnostic accuracy, sensitivity and specificity of pediatric appendicitis score (PAS) in the evaluation of appendicitis.

MATERIALS AND METHODS

This study was conducted in Vardman Mahavir Medical Collage and Safdarjung Hospital, New Delhi over a period of about 18 months from November 2012 to July 2014. A total of 190 clinically suspected patients of appendicitis were taken as study subjects. After obtaining informed consent, a data collection form contained information about patient age, sex, date and time of the examination, the date and

time of the onset of symptoms, and each of the eight PAS components (Table 1) was completed. All data collection forms were completed prior to obtaining any imaging investigations. Children who had PAS less than twelve were discharged and contacted by telephone up to 1 month to verify final outcome. Rest of the children with PAS equal or more than 12 were underwent appendectomy. Discharged children or their parents were asked if they or their child had an appendectomy at the same hospital or elsewhere since their discharge. If a patient underwent an appendectomy at the study site or elsewhere, the medical record was obtained and the pathology was reviewed. Appendicitis was defined as appendectomy with positive histology. A negative appendectomy was defined as an appendectomy with negative histology. Missed appendicitis was defined as a child who was discharged home from the hospital but within 1 month had an appendectomy with positive histology. For analysis, the patients were separated into two groups: those with histology-confirmed appendicitis and those without appendicitis. The latter group included children who underwent appendectomy but who had negative histology.

Table-1: PAS in the study children with and without appendicitis

Variable	Histopathology		Total	p value
	Positive (n=100)	Negative (n=90)		
Age Group			<0.001	
05-08	19 (19.0%)	35 (38.89%)	54 (28.42%)	
09-15	81 (81.0%)	55 (61.11%)	136 (71.58%)	
Gender			0.001	
Male	70 (70.0%)	52 (57.78%)	122 (64.2%)	
Female	30 (30.0%)	38 (42.22%)	68 (35.79%)	
PAS	13.34 ± 2.45	6.32 ± 1.35	8.67 ± 1.42	<0.001
History				
Migration of pain	37 (48.68%)	32 (35.55%)	69 (36.32%)	<0.001
Nausea or vomiting	42 (55.3%)	39 (43.33%)	81 (42.63%)	0.075
Anorexia	41 (53.95%)	41 (45.55%)	82 (43.16%)	<0.001
Physical examination				
Fever(>38°C)	28 (36.8%)	44 (48.89%)	72 (37.89%)	<0.001
Cough/percussion tenderness	39 (51.3%)	35 (38.89%)	74 (38.95%)	<0.001
Tenderness in RLQ	44 (57.8%)	34 (37.78%)	78 (41.02%)	<0.001
Laboratory results				
Leukocytosis WBC e ³ 10,000/mm ³	31 (40.7%)	29 (32.22%)	60 (31.58%)	<0.001
Neutrophilia e ³ 7,500/mm ³	33 (43.4%)	31 (34.44%)	64 (33.68%)	<0.001

RESULTS

In appendicitis children, (81.0%) children were in age group 09-15 years and (19.0%) patients were in age group 5-8 years. Male (70.0%) were predominant than female (30.0%). Migration of pain, nausea and anorexia were in 37 (48.68%), 42 (55.3%) and 41 (53.95%) appendicitis children respectively. Fever, cough/percussion tenderness and tenderness in RLQ were in 28 (36.8%), 39 (51.3%) and 44 (57.8%)

appendicitis children respectively. Leukocytosis and neutrophilia were present in 31 (40.7%) and 33 (43.4%) appendicitis children respectively. The sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and accuracy rate of PAS were 82.2%, 85.0%, 73.0%, 88.6% and 83.3% respectively. Out of 190 cases 100 were diagnosed as appendicitis by PAS and among them 60 were confirmed by histopathological diagnosis. They were true positive and remaining 25 cases were false positive. Out of rest

90 cases discharged from hospital, 20 children had appendicectomy within one month were false negative and 70 patients having PAS <12 did not have appendicectomy within one month from discharge were

true negative. The sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and accuracy rate of PAS were 82.2%, 85.0%, 73.0%, 88.6% and 83.3% respectively.

Table-2: Pediatric appendicitis score compared to histology

PAS	Histopathology		Total
	Positive (Appendicitis) n = 100	Negative/Treated conservatively n = 90	
e " 12	33 (33.0%)	12 (13.33%)	45 (23.68%)
< 12	67 (67.0%)	78 (86.67%)	145 (76.32%)
Total	100 (52.6%)	90 (47.37%)	190 (100.0%)

DISCUSSION

In this issue of Indian Pediatrics, Kim, *et al.* [1] describes a retrospective study of 86 patients with histologically proven acute appendicitis in whom both PAS scoring and abdominal CT scan were performed. Using a cut-off point of 12 or more on the PAS, the sensitivity was 70.9%, specificity 91.5%, PPV 78.2%, and NPV 87.9%. CT findings were graded from I to V and a cut-off of Grade III or higher yielded a sensitivity of 89.5%, specificity of 91.5%, PPV of 94.8%, and a NPV of 93.7%; both the sensitivity and PPV being significantly higher than that obtained with a PAS cut-off score of 7 or more [1]. Especially in resource-deficient countries like India, this would appear to be a safe and cost-effective staged diagnostic protocol. It is also important that ultrasonologists should be well trained to evaluate suspected acute appendicitis, especially in small children, as improving US accuracy and quality has a big role in reducing CT use [2]. Abdominal ultrasound scoring systems for evaluating suspected acute appendicitis such as the Appy-Score stratification [3] have also been described. After applying the Appy-Score strata, Fallon, *et al.* [3] found that acute appendicitis frequency was 0.5% for a normal completely visualized appendix, 0% for a normal partially visualized appendix, and that CT imaging after US decreased by 31%. Significantly, for equivocal US findings, the acute appendicitis frequency was 44%, while for clear evidence of non-perforated or perforated acute appendicitis, the frequency was 92.3% and 100%, respectively [3]. Recently, Douglas *et al.* [4] have shown that graded compression ultrasonography has an accuracy of 93% equivalent to contrast computed tomography but failed to show better outcome than clinical diagnosis [7, 12]. They also showed it does not prevent adverse outcome or reduce the length of hospital stay [4]. Routhrock and Pagane stated that anorexia, migration of pain to right lower quadrant (RLQ) and onset of fever and vomiting was observed in fewer than 60% of patients [5]. The PAS is a relatively new scoring system which relies upon simple points in the history and examination of a patient. It is scored out of ten with a score of five or less excluding appendicitis, and a score of six or above making a true case of appendicitis highly likely. In this study most of the appendicitis children were male and age range was 10-16 years [6, 7].

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