Comparison of Alvarado Score Evaluation and Clinical Judgment in Acute Appendicitis

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ABSTRACT

Background: Acute appendicitis is the most common surgical emergency in children, but its diagnosis is sometimes difficult. The aim of this study is to evaluate retrospectively the Alvarado score in relation to the surgical management based on clinical judgment. Methods: Medical files of 232 children who underwent appendectomy at Makassed General Hospital from January 1997 till December 2006 were reviewed. Demographic characteristics, symptoms and signs, laboratory results and imaging findings for all children were recorded. Results: The positive predictive value of our clinical judgment was 86.4% and the negative appendectomy rate was 13.6% based on the pathology results. The reliability of Alvarado score in our population found a PPV of 80.7% and a negative appendectomy rate of 11.3%. A multivariate analysis revealed that anorexia, neutrophils left shift and rebound tenderness are significantly correlated with a correct diagnosis of appendicitis (p = 0.012, 0.023 and 0.046 respectively). Conclusion: Although, Alvarado score provides measurably useful diagnostic information in evaluating children with suspected appendicitis, we found that good clinical judgment remain the main stay of correct diagnosis of appendicitis.

Key words: acute appendicitis, clinical judgment, Alvarado Score Evaluation.

1. INTRODUCTION

Acute appendicitis is the most common surgical emergency in children and adolescents (1-10). Despite its frequency, the diagnosis of appendicitis is sometimes difficult (1, 5, 11-15). Prompt diagnosis prevents complication by reducing the risk of perforation (5, 7, 14, 15). The most effective and practical diagnostic modality for appendicitis is primarily clinical based on history and clinical examination findings (6, 13, 16). The majority of children with acute appendicitis have a classic history of abdominal pain. Moreover, anorexia, nausea and vomiting are symptoms that are usually associated. Atypical clinical presentation of appendicitis may necessitate laboratory and imaging investigations to confirm the diagnosis (5). Various scoring systems have been developing for supporting the diagnosis of acute appendicitis in order to eliminate any risk of perforation which in turn increases the rate of post operative complications. One such scoring system is Alvarado score; a 10-point scoring system based on clinical signs and symptoms and a differential leukocytes count (17, 18). The aim of this study is to evaluate retrospectively the Alvarado score in relation to the surgical management based on clinical judgment.

2. MATERIAL AND METHODS

This retrospective study included 232 patients diagnosed with acute appendicitis who underwent appendectomy at Makassed General Hospital from October 1997 till December 2006. Medical files were reviewed to record: age, gender, season, onset of symptoms, hospital stay. In addition, family history, duration of symptoms before presentation, interval in hours from arrival to surgery consultation was all assessed.

Clinical symptoms such as vomiting, abdominal pain (periumbilical, diffuse, or right lower quadrant), abdominal distension, diarrhea, irritability, lethargy, grunting, anorexia, nausea and vomiting are symptoms that are usually associated. Atypical clinical presentation of appendicitis may necessitate laboratory and imaging investigations to confirm the diagnosis (5). Various scoring systems have been developing for supporting the diagnosis of acute appendicitis in order to eliminate any risk of perforation which in turn increases the rate of post operative complications. One such scoring system is Alvarado score; a 10-point scoring system based on clinical signs and symptoms and a differential leukocytes count (17, 18). The aim of this study is to evaluate retrospectively the Alvarado score in relation to the surgical management based on clinical judgment.

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Finally the reliability of Alvarado scoring system was assessed using the 10 point scoring system based on clinical signs and symptoms and a differential leukocytes count. Then negative appendectomy rate (the proportion of operated patients having normal appendix removed) and positive predictive value (the proportion of operated patients having abnormal appendix removed) were analyzed.

The retrospective evaluation of the Alvarado score was compared with surgical findings.

**Statistical analysis**

Data are reported as mean, standard deviation (SD), median (range) or percentage. Multivariate analyses were used to identify the relationship between neutrophils left shift, rebound tenderness and anorexia. F-test was used to determine significance. Significance is reported if p < 0.05. Analyses were completed by using SPSS software version 11.0.

### 3. RESULTS

From total number in our sample 232 patients were included in the final data analysis with a 1.9 male to female ratio and a mean age of 9.17(±2.75). Table 1 represents the characteristics of children who underwent appendectomies.

Family history was irrelevant because of missing data from our charts. The age peak incidence was 8-12 years. 35.8% of appendectomies occurred in winter season during the study period.

Clinical symptoms in patients underwent appendectomies were presented in (Table 2), with RLQ, nausea, and vomiting were the commonest symptoms.

Physical examinations characteristics are presented in table 3 with a 97.4% of cases suffering from rebound tenderness (Table 3).

The WBC counts were elevated in 201 cases (87.7%), a left shift with segmented in 183 cases (80%). There was a significance between white blood cells, left shift neutrophils and confirmation of acute appendicitis by histopathology result (p=0.020 and 0.010 respectively). CRP was only done in 51 cases of which 46 had high CRP values from our charts. The age peak incidence was 8-12 years. 35.8% of appendectomies occurred in winter season during the study period.

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| Type of complication | Number of cases (%) |
|----------------------|---------------------|
| Peritonitis          | 22 (9.5%)           |
| Sepsis               | 11 (4.7%)           |
| Wound infection      | 7 (3%)              |
| Dehiscence           | 2 (0.9%)            |
| Abdominal and pelvic abscess | 2 (0.9%) |
| Shock                | 1 (0.4%)            |
| Total                | 45 (19.3%)          |

Table 5. Postoperative complication of appendicitis. Data are presented as number (%).

(90.2%) (Table 4).

Upon surgeon’s request, an abdominal radiograph (KUB) was performed in 118 cases with fecalith noted in 37 cases. In addition, ultrasonogram was performed in 63 children with 34 abnormal cases. A computed tomography scan was obtained in 6 patients of whom five were abnormal.

All cases were kept NPO and obtained IV hydration. They also received preoperative and postoperative IV analgesics and antibiotics. Open appendectomy has been performed in 220 cases (94.8%) where only 12 cases (5.1%) underwent laparoscopic appendectomy.

Abnormal pathology results confirmed the diagnosis of appendicitis in 200 cases (86.4%). The positive predictive value of our clinical judgment was 86.4% and the negative appendectomy rate was 13.6% based on the pathology results. 211 patients had Alvarado score ≥ 7, of whom 185 were histologically confirmed to have appendicitis. Thus, the reliability of Alvarado score in our population found a PPV of 80.7% and a negative appendectomy rate of 11.3%. The Alvarado score of ≤ 6 was recorded in 18 patients, of whom 12 had histologically proved appendicitis.

Multivariate analysis through logistic regression revealed that anorexia, neutrophils left shift and rebound tenderness are significant correlated to the correct diagnosis of acute appendicitis (p = 0.012, 0.023 and 0.046 respectively).

Postoperative complications are shown in (Table 5) with peritonitis as the commonest sequel (9.5%). There was a significant difference between duration of symptoms and perforation occurred (p=0.032).

4. DISCUSSION

Surgeons have tendency to operate when the diagnosis of acute appendicitis is probable rather than wait until it is certain because simple appendicitis may lead to perforation which is associated with a higher morbidity (17).

The main findings of our study showed that the clinical decision to operate in our institution led to a high positive predictive value of 86.4% and the removal of a normal appendix in 13.6%. This figure is in accordance with previous studies, and it is within the accepted range of negative appendectomies (12-18%) (1, 10, 12, 19-23).

Although, appendectomy is considered to be a safe operation, it still has got associated complication such as wound infections, dehiscence, peritonitis and abdominal abscess. Therefore, there is an eager to reach an accurate diagnosis of acute appendicitis among surgeons relying on the fastest and the most cost effective diagnostic tool (21).

Various diagnostic aids have been used to increase the diagnostic accuracy of acute appendicitis but still the clinical diagnosis is superior. Ultrasonography has no advantage in diagnosing of acute appendicitis as shown in previous studies because of some limitation especially in obese children, retrocecal appendix surrounded by bowel gas and as it is operator depended (17, 19, 24). Thus, there is need for this aid in only atypical appendicitis and not as a routine test (1, 21, 24).

In accordance with previous studies, our clinical management found prophylactic antibiotics necessary in our children (100% acquire pre IV antibiotics) in reducing septic complication (25). In our opinion that choice of the surgical procedure between open and laparoscopic should be based on surgeon or patient preference for possible cosmetics reasons (26).

Our significant association between left WBC shifts in the diagnosis of appendicitis in children is in accordance with a study conducted by Wang et al in Boston, USA (11).

Alvarado scoring system in diagnosis of acute appendicitis can provide high degree of positive predictive value and consequently diagnostic accuracy. Based on our data, if we had applied Alvarado score to decide whether to operate or not, we could have missed 12 cases that showed pathological abnormal appendixes once operated on by our group. However, we could save six cases from being operated on due to their normal histopathological findings. This means that PPV of Alvarado score upon our cases would be 80.7% but the rate of negative appendectomy could be dropped to 11.3% whereas Alvarado evaluation in a similar study conducted by Schneider et al revealed a PPV of 58 % only (27).

Our results showed that four patients with a score of four had appendicitis. Thus, the Alvarado score would also lead to an increase number of inappropriate discharge compared with our clinical judgment (28). As our population is very young, it is maybe important to emphasize that judgment scoring may not be accurate because they were unable to give a proper history.

In general, we can provide based on our recording patients data, a structured form to be implemented in emergency room as a quick and practical tool to better diagnosis of acute appendicitis in children. This tool will count only on neutrophils left shift > 75 %, abdominal pain, anorexia, and rebound tenderness.

Our Children who were younger than four years have a lower incidence of appendicitis compared with children aged 4-14 years. This finding is consistent with a previous study conducted by Wang et al (11).

Many diagnostic scores have been advocated but most are complex and difficult to implement in a clinical situation (22, 27, 28). The Alvarado score is a simple scoring system that can be instituted easily in the outpatients setting (23). We found that good clinical acumen remains the main stay of correct diagnosis of appendicitis. This could be explained by the fact that Alvarado score was not very accurate in our population decreasing the PPV to 80.7% from our PPV of 86.4%). Delay in the diagnosis of appendicitis may increases the risk of perforation which in turn increases the rate of postoperative complications (5).

The Alvarado score can be used as an objective criteri-
on in children for admission with suspected appendicitis. However, our current practice suggests appendicitis sheet history and physical examination to be attached to every patient’s medical file presenting to ER and suspected or confirmed having appendicitis.

Our study was retrospective in nature, and our analysis assumes good documentation in our medical files. It may well be that patients were given Alvarado score rather than computing it at the time of the conduction of the study.

A prospective study comparing Alvarado score to clinical judgment is suggested to confirm these findings.

5. CONCLUSION

Though Alvarado score provides measurably useful diagnostic information in evaluating children with suspected appendicitis but it did not provide sufficient PPV to be used in clinical practice as the sole method for determination of the need of surgery (27). The diagnosis of acute appendicitis remains primarily a clinical diagnosis based on the history, physical examination, and laboratory test.

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CONFLICT OF INTEREST: NONE DECLARED

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