■ *Original Article*

Sensitivity and specificity of clinical features used in Alvarado scoring system

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Abstract

Introduction: Alvarado score is one of the scoring systems for diagnosis of appendicitis. **Objective:** To assess the sensitivity and specificity of clinical features used in Alvarado score. **Subjects and methods**: A prospective study of 171 patients with pain in the right iliac fossa presenting to emergency at BPKIHS, Dharan, Nepal was conducted. The sensitivity and specificity of clinical features and lab parameters used in Alvarado score were evaluated comparing with final diagnosis based on operative and histopathological findings. **Results:** The sensitivity of clinical parameter were: migrating right iliac fossa pain- 99.1%, anorexia- 45.7%, nausea/vomiting- 73.7%, right iliac fossa tenderness- 100%, fever- 24.5%, rebound tenderness in right iliac fossa- 89.8%, leucocytosis (>10,000)- 84.7% and a neutrophilic shift to the left (>75%)- 68.6%. The specificity of clinical parameters were: migrating right iliac fossa pain- 45.3%, anorexia- 86.7%, nausea/vomiting- 54.7%, right iliac fossa tenderness- 1.8%, fever- 81.1%, rebound tenderness in right iliac fossa- 64.1%, leucocytosis (>10,000)- 83.1% and a neutrophilic shift to the left (>75%)- 71.6%.**Conclusion:** Migrating right iliac fossa pain, right iliac fossa tenderness and rebound tenderness in right iliac fossa had a high sensitivity, leucocytosis (>10,000) had both high sensitivity and high specificity. Thus, in our set up, use of Alvarado score appears helpful for diagnosis of appendicitis.

Keywords: Alvarado score, sensitivity, specificity

Introduction

Acute appendicitis is a classical example of acute abdomen requiring emergency surgery. The clinical presentation may vary and it is often challenging to junior medical officers to diagnose it early based on clinical features and lab parameters. Different clinical signs and symptoms may mimic the diagnosis of acute appendicitis as there are number of causes leading to pain in right iliac fossa. Purpose of different scoring systems for diagnosis of the appendicitis is to facilitate the surgeon and to avert negative appendicectomy.[1] Alvarado score was formulated in 1986 and used migrating right iliac fossa pain, anorexia, nausea/vomiting, right iliac fossa tenderness, fever, rebound tenderness in right iliac fossa, leucocytosis (>10,000) and a neutrophilic shift to the left (>75%) to diagnose acute appendicitis.[2] We attempted to find the sensitivity and specificity of clinical features and lab parameters used in Alvarado score in our set up as it is easy to use and has good evidence in literature.

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Subjects and methods

A prospective study of 171 patients with pain in the right iliac fossa presenting to emergency at BPKIHS, Dharan, Nepal was conducted. Clinical features and lab parameters of patients were recorded using a semi structured questionnaire. Alvarado score components (Table 1) were then entered into a clinical form to evaluate the sensitivity and specificity. The diagnoses made in emergency were then compared with the final diagnoses made based on peroperative finding of those cases that subsequently underwent appendicectomy, histopathological findings and the final diagnosis at discharge by operating surgeon.

Table 1. Alvarado scoring system

Features		Score
Symptoms	Migratory right iliac fossa pain	1
	Nausea/vomiting	1
	Anorexia	1
Signs	Right iliac fossa tenderness	2
	Fever > 37.30oC	1
	Rebound pain in right iliac fossa	1
Laboratory test	Leucocytosis (>10 x 109/L)	2
	Neutrophilic shift to the left > 75 %	1
Total score		10

Results

of 171 patients, 95 (55.6%) were male and 76 (44.4%) were female. Age ranged from 10-70 years. Right iliac fossa tenderness was the commonest sign in 99.4% of patients. The distribution of clinical features and lab parameters is given in **Figure 1**.

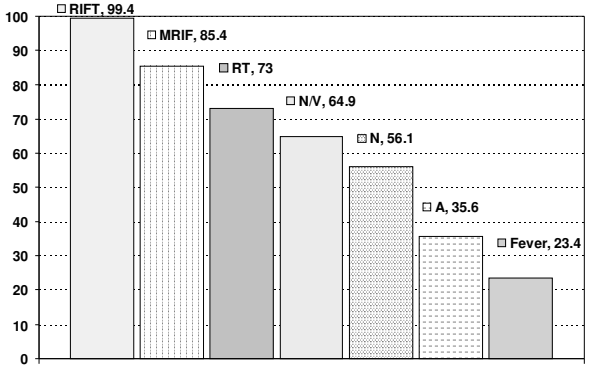

Figure-1 Distribution of sign & symptom in %

RIFT- right iliac fossa tenderness, MRIF- migratory right iliac fossa pain, RT- rebound tenderness, N/V- nausea/vomiting, L- leucocytosis, N- neutrophilic shift to the left (>75%), A- anorexia

Tenderness in the right iliac fossa was absent in only one patient who subsequently had no appendicitis. Migratory nature of pain was absent in 25 patients and subsequently only one of them was found to have appendicitis. Both of these showed highest sensitivity to diagnose acute appendicitis. Leukocytosis had both sensitivity and specificity of around 85% to detect acute appendicitis. Anorexia and fever had specificity of around 80% to diagnose acute appendicitis in the setting of right iliac fossa pain. Table 2 shows the sensitivity and specificity for all parameters.

Table 2. Sensitivity and specificity of parameters.

Features	Sensitivity %	Specificity %
Migratory right iliac fossa pain	99.1	45.3
Nausea/vomiting	73.7	54.7
Anorexia	45.7	86.7
Right iliac fossa tenderness	100	1.8
Fever	24.5	81.1
Rebound pain in right iliac fossa	89.8	64.1
Leucocytosis	84.7	83.1
Neutrophilic >75	68.6	71.6

Discussions

Patients suffering from acute appendicitis require prompt diagnosis and management, because of its relatively high rate of complications [3,4,5,] and further morbidity and mortality.[6,7] Various diagnostic modalities have been used to diagnose acute appendicitis. These include ultrasonography computed tomography and clinical evaluation; with varying rates of sensitivity, specificity and diagnostic accuracy but all have been supplementary to each other and radio-imaging has shown to be useful in equivocal cases [8,9,10,11,12] The role of a good clinical history, examination and basic lab tests thus remains undisputed. Various scoring systems are used to diagnose acute appendicitis and related pathology, using various clinical as well as other diagnostic modalities. The sensitivity, specificity and the predictive values of all the scoring systems to diagnose acute appendicitis in patients with right iliac fossa pain are high for all the scoring systems. The Alvarado score, first described in 1986, is a simple scoring system that can be instituted easily in the emergency setting.[2] We tried to find out the sensitivity and specificity of all clinical features of classical Alvarado score in our setup and compared it with previous studies (Table 3). Another study found out the sensitivity and specificity of leucocytosis and fever to be 76% and 52%; and 47% and 64%, respectively.[13] The sensitivity for all clinical variates were good in our study. It can be a good screening method in a resource constrained setting which can be further supplemented with other method if necessary. The specificity of right iliac fossa tenderness was very low in our study. Similarly, it was found low in other study also.[15]

Table 3: Study findings compared with those of similar studies

Features	Wagner JM et al 1996 [14]		Phophrom J et all 2005[15]		Our study	
	Sensitivity %	Specificity %	Sensitivity %	Specificity %	Sensitivity %	Specificity %
Migratory right iliac fossa pain	64	82	76.9	50	99.1	45.3
Nausea/vomiting	58	37	85.6	40	73.7	54.7
Anorexia	68	36	88.5	70	45.7	86.7
Right iliac fossa tenderness	81	53	100.0	10	100	1.8
Fever	67	79	60.6	70	24.5	81.1
Rebound pain in right iliac fossa	63	69	86.5	50	89.8	64.1
Leucocytosis			89.4	30	84.7	83.1
Neutrophilic >75			61.5	60	68.6	71.6

Conclusion

The clinical features like migrating right iliac fossa pain, right iliac fossa tenderness and rebound tenderness in right iliac fossa had high sensitivity and anorexia and fever had high specificity. Lab parameter leucocytosis (>10,000) had both high sensitivity and high specificity. Thus, in our set up, use of Alvarado score appears helpful for diagnosis of appendicitis.

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