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Original Research Article

Study of evaluation of Alvarado scoring system in acute appendicitis

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ABSTRACT

Background: Acute appendicitis is one of the most common surgically correctable acute abdomen presenting at emergency department worldwide. Inspite of all advances in diagnostic modalities and surgical techniques, diagnosis remains difficult sometimes as a challenge and delayed decision making complicates this surgical disease. Alvarado scoring system is one of available scoring system for diagnosis of acute appendicitis, based on history, clinical examination, lab investigations and easy to apply, helps in clinical decision regarding planning surgery and avoid negative laparotomies. The aim of the study was to evaluate diagnostic accuracy of Alvarado scoring system in preoperative diagnosis of acute appendicitis and correlating with postoperative findings.
Methods: This study was conducted in 100 cases of suspected appendicitis admitted in surgery department of Rajiv Gandhi Speciality Hospital, Agatti Island, Lakshadweep, Union territory of India, from July 2015 to June 2017 adopting Alvarado scoring system. Results were analyzed.
Results: Out of 100 patients admitted with suspected acute appendicitis, number of cases operated suspecting acute appendicitis were 83 of which 80 were found to have acutely inflamed appendix. Results of Alvarado score of operated patients are as follows: 80 patients had score 7-10, and 3 patients had score 5-6, patients with Alvarado score <5 (17 pts) were managed conservatively.
Conclusions: The Alvarado scoring system is a simple and useful diagnostic tool for diagnosis of acute appendicitis with acceptable sensitivity and specificity and can be used with high degree of accuracy. Our findings suggest that patients presenting with abdominal pain and Alvarado scores greater than 7 are more likely to have appendicitis.

Keywords: Abdominal pain, Alvarado score, Appendicitis

INTRODUCTION

Acute appendicitis is the acute inflammation of the appendix. It is the most common acute abdominal emergency requiring urgent surgical intervention[1]. Simple appendicitis can progress to perforation if early diagnosis fails, leading to higher morbidity and mortality, and surgeons have, therefore, been inclined to operate when the diagnosis is probable rather than wait until it is certain.[2] Despite more than 100 years' experience, accurate diagnosis still evades the surgeon.

The basic fundamental question while diagnosing a suspected case of acute appendicitis is whether or not to operate if diagnosed without increasing the rate of unnecessary negative surgical interventions[1].

Owing to its atypical presentations, acute appendicitis is a common but diagnosis becomes more challenging when the symptom overlap with some other disease conditions making diagnosis a challenge, particularly at an early stage of presentation.[3] The accuracy of the clinical examination has been reported to range from 71% to 97% and varies greatly depending on the experience of the

examiner.[4] However, because missed ruptured appendices have dire consequences, surgeons have traditionally accepted a 20% rate of negative findings at appendicectomy and the removal of a normal appendix.[5] The rate of negative appendicectomy (removal of a normal appendix in patients with other causes of abdominal pain) is reported to be between 20% and 30%.[5,6]

In 1986, Alvarado constructed a 10- point clinical scoring system, also known by the acronym 'Mantrels', for the diagnosis of acute appendicitis as based on symptoms, signs and diagnostic tests in patients presenting with suspected acute appendicitis.[7]

The Alvarado score enables risk stratification in patients presenting with abdominal pain, linking the probability of appendicitis to recommendations regarding discharge, observation or surgical intervention.[7] Further investigations, such as ultrasound and computed tomography (CT) scanning, are needed when probability of appendicitis is in the intermediate range

Scoring systems are valuable and valid for discriminating between acute appendicitis and nonspecific abdominal pain.[8] Alvarado scoring system is one of the many scoring systems available for the diagnosis of acute appendicitis and is purely based on history, clinical examination and few laboratory tests and is very easy to apply. The use of an objective scoring system such as the Alvarado system can reduce the negative appendicectomy rate to 0-5%. However, this system is not a substitute for clinical judgment. It is an aid in diagnosing acute appendicitis and arriving at a conclusion whether a particular case should be operated or not, thereby reducing the number of negative laparotomies. The present study aims at evaluating the efficacy of Alvarado scoring system in preoperative diagnosis of acute appendicitis and correlating it with postoperative findings.

METHODS

This study was conducted on 100 patients presenting with symptoms and signs of acute appendicitis to the casualty over a period of 2 years from July 2015 to June 2017 adopting Alvarado scoring system at Rajiv Gandhi Speciality Hospital, Agatti Island, Lakshadweep (Union Territory), India. Results were analyzed using Microsoft Excel software.

Inclusion criteria

Patients with symptoms and signs of acute appendicitis in whom emergency appendicectomy was done; both the genders and all age groups were included in the study; patients who were willing to participate in study were included in this study.

Exclusion criteria

Patients with appendicular mass, urinary calculus, gynaecological causes of RIF pain; patients who underwent elective/ interval appendicectomy; patients who were not willing to participate in the study were excluded in this study.

Patients with clinical signs and symptoms suggestive of acute appendicitis such as abdominal pain, rebound tenderness, nausea, vomiting or elevated temperature who met the inclusion criteria were admitted and after taking informed consent and initial assessment were subjected for detailed history taking, physical examination, routine laboratory investigations and imaging. Then they were evaluated using Alvarado scoring system as per the scores of all variables of the scoring system (Table 1) and the aggregate score was given for each patient.

Table 1: Alvarado scoring system.

Symptoms	Score
Migratory right iliac fossa pain	1
Anorexia	1
Nausea/vomiting	1
SIGNS	
Tenderness in right iliac fossa	2
Rebound tenderness in the right iliac fossa	1
Elevated temperature	1
Lab findings	
Leucocytosis	2
Shift to the left of neutrophils	1
Total	10

Based on the score patients were classified into three groups.

Group 1: Score 7-10 was most likely acute appendicitis, these patients were taken up for emergency appendicectomy.

Group 2: Score 5- 6 was possibly acute appendicitis. Patients in this group were admitted and kept under observation for a day with reassessment of the clinical findings and reapplication of the score. Some patients improved with conservative treatment which was shown by a decrease in score and were discharged with advice that they should revert back if symptoms persist, recur or increase in intensity.

Group 3: Score 1- 4 was unlikely acute appendicitis: These patients, after giving initial symptomatic treatment, were discharged and sent home with the instructions to revert back if symptoms recur or worsen.

Decision for appendicectomy was made after the assessment of the patient depending upon the Alvarado scoring system for patients with score of 7-10. All the patients were operated by open method (open

appendicectomy). Intra operative findings were documented and definitive diagnosis of acute appedicitis was made based on histopathological examination of the appendicectomy specimen.

Finally the reliability of Alvarado scoring system was assessed by calculating negative appendicectomy rate (the proportion of operated patients having normal appendix removed) and positive predictive value (the proportion of patients with a positive test result who actually have the disease).

RESULTS

One hundred patients were pre operatively diagnosed to have acute appendicits were admitted and studied. Of the 100 cases that were admitted with suspicion of acute appendicitis, 83 cases were taken up for surgery based on the Alvarado scoring system while 15 cases with Alvarado score <5 and 2 cases with palpable mass in right iliac fossa were kept under conservative management.

Among the 83 cases that were operated 77 cases had acutely inflamed appendix.

The percentage of inflamed appendix found on operation was 92.77%.

The age group in which acute appendicitis occurred commonly is between 11 and 30 years, i.e., about 65%.

Incidence is less in younger and older age group with peak incidence in second and third decade.

Table 2: Distribution of number of patients as per the symptoms (variables of Alvarado scoring system) presented (n=100).

Clinical features	Number of patients N (%)
Migratory RIF pain	41 (41)
Anorexia	65 (65)
Nausea and vomiting	80 (80)
Tenderness over RIF	100 (100)
Rebound tenderness RIF	77 (77)
Elevated temperature	64 (64)
Leucocytosis	64 (64)
Shift to left	47 (47)

Pain was the commonest symptom seen almost in all of the patients (100%), followed by nausea and vomiting (80%), rebound tenderness (77%) and anorexia (65%).

Results of Alvarado score

The patients were categorized into three groups, i.e. male, female and children. Out of 100 cases studied 50 were male, 31 were female and 19 were children (<12 years).

Out of 50 male patients, 39 had a score of 7-10; 6 had a score of 5-6 and 4 patients had score <5; 1 patient had mass in right iliac fossa.

Out of 31 female patients, 25 had a score of 7-10; 2 had a score of 5-6 and 3 patients had score of <5; 1 female patient had mass in right iliac fossa.

About 19 children had a score between 7 and 10 and All the children were operated upon.

Table 3: Distribution of patients based on Alvarado score.

Alvarado score	Number of patients
7-10	83
5-6	8
1-4	7

Among the 15 patients of score <6 and 2 patients with mass in right iliac fossa were observed in the hospital with conservative treatment and did not undergo surgery since they improved symptomatically. The patients with mass in right iliac fossa were advised for interval appendicectomy.

Operative findings

A total of 83 patients were operated, out of which 39 were males; 25 were females; 19 were children.

In the present study, the number of male patients (50) outnumbered females (39) approximately in the ratio of 1.37:1.

In male patients having score of 7-10; 36 patients had acute appendicitis; 1 patients had normal appendix and 2 patients had diseases in the form of ileal perforation and Meckel's diverticulitis.

In female patients having score of 7-10; 22 had acute appendicitis; 1 patient had normal appendix and 2 patients had other diseases, out which 1 had pelvic inflammatory disease; 1 had twisted right ovarian cyst.

All the 19 children who underwent appendicectomy had acute appendicitis.

DISCUSSION

In our study the age range of our patients in this study was 7-65 yrs, with mean age of 25-26 yrs. 54 patients out of 83 (65.06%) patients operated were in the age group of 11-30 which is comparable to those found in Talukder et al, Shrestha et al, Swagata et al.[9-11]

In this study, there was male preponderance (39 patients) as compared to females (25 patients) with a male to female ratio of 1.56:1 which is comparable to 1.27:1 in Swagata et al whereas it was 3.2:1 in Patra et al.[11,13]

In our study, the most common presenting symptom was pain (100%) followed by nausea/ vomiting in 80% of the patients and rebound tenderness in 77%. The least common symptom seen was migratory right iliac fossa pain which was found in 41% cases. 64% of the patients had leukocytosis and 47% had shift to left. These findings were comparable to those of Lameris et al.[15] Subedi et al reported that 98% of patients with acute appendicitis presented with pain in peri-umbilical region migrating to right iliac fossa, but leukocytosis was seen in only 65% of cases which was comparable to present study.[12] Merhi et al concluded that anorexia, neutrophils left shift and rebound tenderness are significantly correlated with a correct diagnosis of appendicitis.[16]

In our study, 34 patients (41%) had a score of 7, only 4 of the patients had a score of 10 and none of the patients were seen with scores of 1 and 2. 83 patients (83%) were in score range of 7-10, 8% (8 patients) in 5-6 range and 7% (7) were in 1-4 score range which was comparable to Kailashsingh et al.[17]

In this study, acute appendicitis (simple appendicitis) was confirmed intra-operatively in 70 (84.3%) patients. 7 (8.43%) had acute gangrenous appendicitis (AGA) and 6 (7.22%) had perforated appendix. These findings were comparable to those reported by Deyet al.[18] Subedi et al found that the most common pre-operative finding was acutely inflamed appendix (84%) followed by perforated appendix (7.5%), gangrenous appendix (3.5%) and appendicular mass (1.5%).[12] Shrestha et al observed that appendicitis accounted for 88.8%.[10]

In our study, positive and negative appendicectomy rates overall were 92.77%% and 7.23% respectively which was comparable to other studies.[9,17,19] Bhattacharjee et al concluded that high Alvarado score was found to be a dependable aid both in the pre-operative diagnosis of acute appendicitis and in the reduction of negative appendicectomies in men and children but the same was not true for women who had a high false positive rate for acute appendicitis.[20]

In the present study, positive predictive value was 92.77% which was comparable to other studies.[14,18,19]

CONCLUSION

In our study the most common age group affected by appendicitis was identified to be 11-30 years which is about 65% of study group. Out of 100 patients 83 patients had Alvarado score of 7-10 and were taken up for surgery. Males were affected more than the females (1.56:1), high Alvarado score was very much correlating with the intra operative findings among males and children than females. Acute appendicitis is the most common histological examination finding in our study group (84.3%). Hence applying Alvarado scoring system improves diagnostic accuracy and reduces negative appendicectomy rate in majority of the patients and also help in anticipating possible complications.

In our study, positive and negative appendicectomy rates overall were 92.77%% and 7.23% respectively and positive predictive value was 92.77%.

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REFERENCES

1. Daniel JS, Nicolaj D, Stephen RO, Nathan IS. Diagnosing appendicitis: evidence-based review of the diagnostic approach in 2014. West J Emerg Med. 2014;15(7):859-71.
2. Hoffmann J, Rasmussen OO. Aids in the diagnosis of acute appendicitis. Br J Surg. 1989;76:774-9.
3. Andersson RE. Meta-analysis of the clinical and laboratory diagnosis of appendicitis. Br J Surg. 2004;91(1):28-37.
4. John H, Neff U, Kelemen M. Appendicitis diagnosis today: Clinical and ultrasonic deductions. World J Surg. 1993;17:243-9.
5. Fitz RH. Perforating inflammation of the veriform appendix: With special reference to its early diagnosis and treatment. Am J Med Sci. 1886;92:321-46.
6. Puylaert JB. Acute appendicitis: US evaluation using graded compression. Radiology. 1986;158:355-60.
7. Alvarado A: A practical score for the early diagnosis of acute appendicitis. Ann Emerg Med. 1986;15:557-64.
8. Livingston EH, Woodward WA, Sarosi GA, Haley RW. Disconnect between incidence of non-perforated and perforated appendicitis; implications for pathophysiology and management. Ann Surg. 2007;245:886-92.
9. Talukder DB, Siddiq AKMZ. Modified Alvarado scoring system in the diagnosis of acute appendicitis. JAFMC Bangladesh. 2009;5(1):18-20.
10. Shrestha R, Ranabhat SR, Tiwari M. Histopathalogic analysis of appendectomy Specimens. J Pathol Nepal. 2012;2:215-9.
11. Brahmachri S, Jajee AB. Alvarado score: A valuable clinical tool for diagnosis of acute appendicitis-a retrospective study. J Med Alied Sci. 2013;3(2):63-6.
12. Subedi N, Dangol US, Adhikary MB, Pudasaini S, Baral R. Acute appendicitis: a 2 years review of clinical presentation and histopathology. Journal of Pathol Nepal. 2011;1:104-7.
13. Patra RK, Gupta DO, Paril RR. Clinicopathological and ultrasonographic correlation of acute appendicitis in emergency: A prospective and retrospective study. Arch Int Surg. 2014;4:11-4.

14. Memon ZA, Irfan S, Fatima K, Iqbal MS, Sami W. Acute appendicitis: diagnostic accuracy of Alvarado scoring system. Asian J Surg. 2013;36(4):144-9.
15. Lameris W, Randen AV, Bouma WH, Stoker J, Boemeester MA, Bossuyt PMM. single and combined diagnostic value of clinical features and laboratory tests in acute appendicitis. Acad Emerg Med. 2009;16:835-42.
16. Merhi AB, Khlil M, Daoud N. Comparison of Alvarado score evaluation and clinical judgment in acute appendicitis. Med Arch. 2014;68(1):10-3.
17. Singh K, Gupta S, Pargal P. Application of Alvarado scoring system in diagnosis of acute appendicitis. JK Sci. 2008;10(2):84-6.
18. Dey S, Mohanta PK, Baruah AK, Hhraga B, Bhutia KL, Singh VK. Alvarado Scoring in acute Appendicitis- a Clinicopathological Correlation. Indian J Surg. 2010;72(4):290-4.
19. Khan I, Urrehman A. Application of Alvarado scoring system in diagnosis of acute appendicitis. J Ayub Med Coll Abbottabad. 2005;17(3):41-4.
20. Bhattacharjee PK, Chowdhury T, Roy D. Prospective evaluation of modified Alvarado score for diagnosis of acute appendicitis. J Indian Med Assoc. 2002;100(5):310-4.

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