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Application of Alvarado Scoring System in Diagnosis of Acute Appendicitis

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Abstract
Objective: *Acute appendicitis is one of the most common surgical emergencies around the world with Surgery for acute appendicitis is most frequent operation performed being 10% of all emergency abdominal operation. Removing of normal appendix is an economical burden both on patients and health resources. Misdiagnosing and delay in surgery can lead to complications like perforation and finally peritonitis.*
Material & Methods: *A prospective study was conducted in department of Surgery Jawahar Lal Nehru Medical College and Hospitals with a clinical diagnosis of acute appendicitis. The purpose of this study is to evaluate value of Alvarado score in 50 patients of right lower quadrant abdominal pain suspected as acute appendicitis.*
Result: *A total 50 patients operated for acute appendicitis on the application of Alvarado score.32 male and 18 female patients in this study. Pain present in all patient in RIF along with nausea, vomiting, anorexia. Almost all patients observed tenderness in RIF, 44% patients show leucocytosis.*
Conclusion: *To conclude that when the Alvarado score is more than 7, no false positive result obtained. Thus the application of Alvarado scoring system increases the sensitivity and specificity for diagnosis of acute appendicitis with the added advantages of being simple and easy to use.*

Introduction

Acute appendicitis is one of the most common surgical emergencies around the world with the life prevalence of approximately 1 in 7. Its incidence is 1.5-1.9/1000 in male and female population. Surgery for acute appendicitis is most frequent operation performed being 10% of all emergency abdominal operation with a lifetime rate of appendicectomy of 12% for men and 25% for women.

Appendicitis is most frequently seen in patients in their second through fourth decade of life, with a mean age of 31.3 years and a median age of 22 years.

For years surgeon have depended upon their clinical acumen for diagnosing acute appendicitis

with a bias on positive side and advocate early appendicectomy accepting that significant number of normal appendices will be removed. Large surgical series have shown that overall normal appendicectomy rate of 20-25%. The clinical diagnosis is more reliable in males in whom normal appendicectomy rate is 10-15% while it is 35-45% in female of child bearing age group. This is due to clinical overlap between signs and symptoms of appendicitis and gynaecological disorders. Varying position of appendix in pregnancy due to displacement by gravid uterus makes diagnosis more difficult leading to treatment delay and high perforation rates.

Despite an increased use of ultrasonography, computed tomography (CT) scanning and laparoscopy, the rate of misdiagnosis of appendicitis has remain constant (15.3%). The percentage of misdiagnosis of appendicitis is significantly higher in women than men (22.2% Vs 9.3%). Thus, a negative appendicectomy rate 20-40% has been reported in literature and many surgeons would accept rate of 30% as inevitable.

Removing of normal appendix is an economical burden both on patients and health resources. Misdiagnosing and delay in surgery can lead to complications like perforation and finally peritonitis.

CT scanning and MRI have also been found to be very efficacious but more expensive and consuming due to use of contrast media, so that focus has remained on sonographic diagnosing of acute appendicitis, as it is non invasive, non ionizing, economic, easily available and can provide quite accurate information.

Scoring systems are valuable and valid instructions for discriminating between acute appendicitis and nonspecific pain abdomen. Alvarado scoring is one of them and it is purely based on history, clinical examination and few laboratory tests and very easy to apply. The Alvarado score is 10 point scoring system for diagnosing acute appendicitis taking eight predictive factors according to their diagnostic weight as follows, localized tenderness in right lower quadrant and leucocytosis (giving 2 points each) then migration of pain, shift of left of neutrophil, pyrexia, nausea- vomiting, anorexia and direct rebound pain. In his original paper, Alvarado recommended an operation with score 7 or more than 7 and observation for patients with score 5 or 6.

The purpose of this study is to evaluate value of Alvarado score in 50 patients of right lower quadrant abdominal pain suspected as acute appendicitis in J.L.N. Hospital, Ajmer

Material & Methods

A prospective study was conducted in department of Surgery Jawahar Lal Nehru Medical College and Hospitals with a clinical diagnosis of acute appendicitis. Patients of all age groups and both genders presenting to the surgical ward with pain in right lower quadrant of abdomen were included in the study.

Patients excluded were having

- Palpable lump in right iliac fossa.
- Presentation of urological problems.
- Presentation of gynaecological or surgical problems other than acute appendicitis.

All patients in the study were admitted and initially assessed by house surgeons where a clinical interrogation and complete history was taken which are included the following points:

- Name, age, sex, registration number, religion and address.
- History of pain with special consideration of site, onset, migration, duration etc.
- Associated complaints: Anorexia, nausea, vomiting, diarrhea, constipation and fever.
- In females detailed menstrual history and obstetric history was taken.
- Past history: History of recurrent attacks, history of abdominal operations, history of diabetes, tuberculosis.

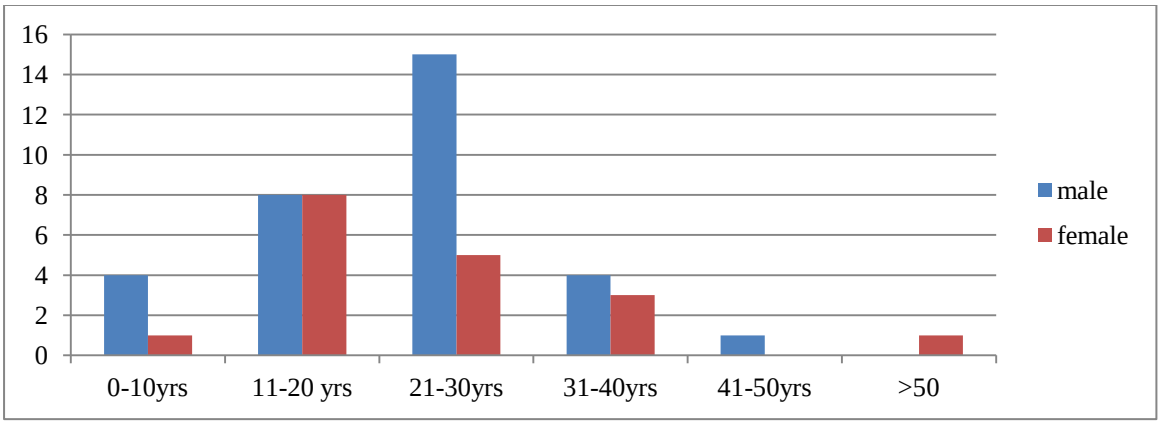
The following signs and symptoms were included in deriving the score:

ALVARDO SCORE	
Particulars	Score
Symptoms:	
Migrating pain RIF	1
Nausea/ Vomiting	1
Anorexia	1
Signs:	
Tenderness in RIF	2
Rebound tenderness in RIF	1
Elevated temperature	1
Laboratory Investigation:	
Leucocytosis	2
Shift to the left of neutrophil	1
Total Score	10

Result & Discussion

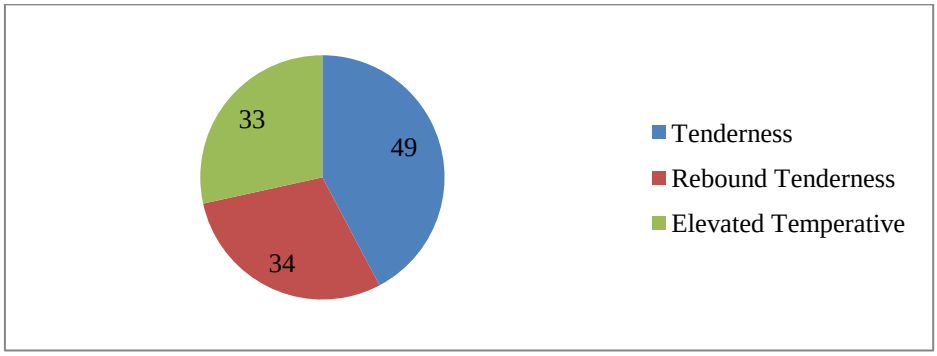
1. Maximum number of patients was between age group of 11-30 years of which 20 patients were within the age group of 21-30 years and 16 were between 11-20 years.

The male: female ratio is 1.7:1.



2. Pain was the most common symptom followed by nausea, vomiting and anorexia.

3. Most common physical finding was tenderness (49 patients) followed by rebound tenderness (34 patients) and elevated temperature (33 patients)



4. Leucocytes count was elevated > 10000 in 22 patients and between 6000-10000 in 20 patients and 8 patients had counts <6000.

5. 39 patients (26 males and 13 females) had score of 7 or more than 7 and patients (6 males and 5 females) had a score of 4, 5 and 6.

6. There were 50 patients operated and appendicitis proved histopathologically in 40 patients. There were 10 patients had normal appendix on histopathology. Out of which, 2 patients had pathology other than acute appendicitis and in 8 patients no pathology found on exploration.

Findings	No. of patients	Percentage
Inflamed appendix(40 patients)		
Acute appendicitis	28	56%
Recurrent appendicitis	8	16%
Perforated	2	4%
Gangrenous appendix	2	4%
Normal appendix(10 patients)		
Salpingitis	0	0
Meckels diverticulitis	0	0
Mesentric adenitis	0	0
Right ovarian cyst	2	4%
No pathology found	8	16%
Total operated patients	50	100%

7. In male patients, there were 26 patients with Alvarado score of 7 or more and appendicitis proved histopathologically in 24 patients thus giving predictive value of 92.30%. Overall predictive value of Alvarado score is 84.3% in male patients.

8. In female patients, 13 patients were in Alvarado score of 7 or more and appendicitis proved histopathologically in 11 patients thus giving predictive value of 84.6%. Overall predictive value of Alvarado score is 72.2% in female patients.

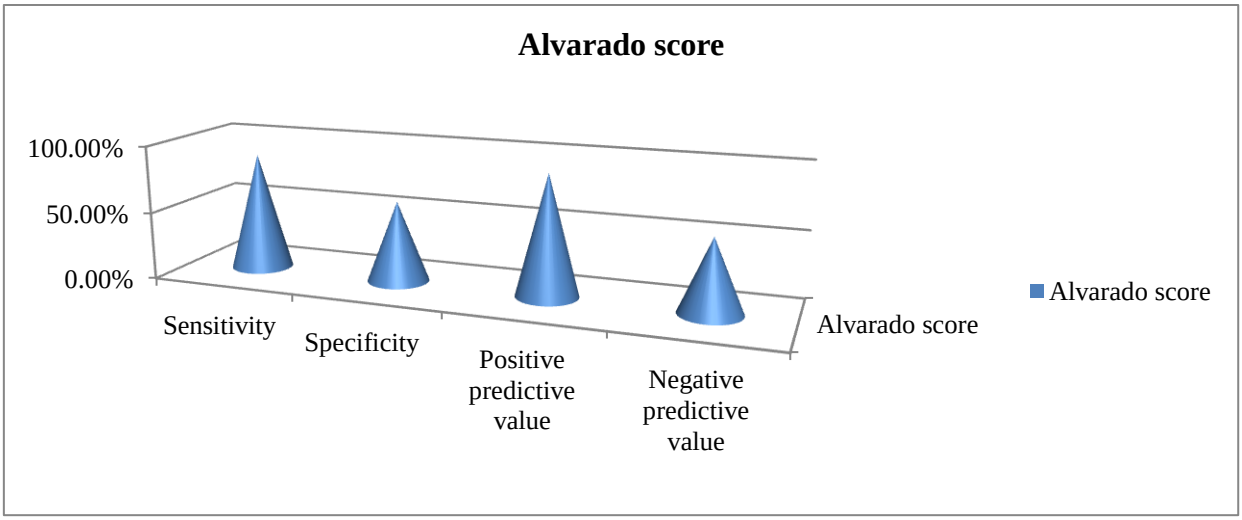
9. There were 39 patients had score 7 or more than 7 and appendicitis found in 35 patients thus giving predictive value of 89.7%. Overall predictive value of Alvarado score to diagnose acute appendicitis is 80%.

There were 18 patients who had score of 9-10 and appendicitis was proved histopathologically in all patients thus giving predictive value of 100%.

10. The table shows that the overall sensitivity of Alvarado score is 87.5% and specificity of 60%.

S. No.	Parameter	Alvarado score
1	Sensitivity	87.5%
2	Specificity	60.0%
3	Positive predictive value	89.7%
4	Negative predictive value	54.5%

Positive predictive value of Alvarado score is 89.7% and negative predictive value is 54.5%.



Alvarado score: 35 true positive, 4 false positive, 5 false negative and 6 true negative (total 50 patients).

Discussion

Boycee 1939 also reported that 70% incidence of appendicitis between the ages of 15 to 30 years and stated that appendicitis is a disease that spares no age and it may occur at any period of life from cradle to the groove. Majority of the studies have also reported and concluded that no age is exempted from acute appendicitis. The increase of incidence during the second and third decade of life is thought to be due to the increase of

lymphoid tissue of the appendix at this age. It is presumed that the lymphoid hyperplasia can very easily give rise to obstruction and thus greater chances for inflammatory changes during adolescence and early adult life. The low incidence in old age can be explained by the fact that at this age the lymphoid tissue is gradually disappears and is replaced by fibrous tissue and appendix tends to become atrophic. In the present study, among the clinical signs elicited, tenderness at Mc Burney's point and rebound tenderness was present in 49 and 34 patients respectively. John H. et al 1991 also emphasized that clinical examination and surgeons experience remains the most important factor in diagnosis of acute appendicitis. Alvarado A. 1986, in his original paper included the leucocytosis and raised polymorphs in the score and gave two points to leucocytosis and one point to raised polymorphs according to their diagnostic weight and stated that if Alvarado score is less than 5, the chances of acute appendicitis is less likely and if Alvarado score is 7 or more, the chance of correct diagnosis of acute appendicitis are more. Denizbasi in 2003 found that sensitivity of Alvarado score was 95.4% and was specificity was 45.7%. But near similar results were noted by Ikramulhah Khan 2005 whose predictive value of Alvarado was 84.3%. Predictive value of Alvarado score in our study was 87.7% (89.2% in male and 85.2% in females) so our results are comparable to the other studies. In present study, 40 patients out of 50 proved to be appendicitis of which 2 patients had perforated appendix (5%) and 2 patients had gangrenous appendix (5%). Ikramulhah Khan in 2005 in his study noted perforated appendix in 7.8% patients and gangrenous appendix in 10.9% patients. Our results are thus similar to his study. In the present study, it was found that application of Alvarado scoring provides 87.5% sensitivity and 60% specificity in the diagnosis of acute appendicitis and leucocytosis still remain a favorable factor nowadays.

Conclusion

- Patients with score of 4 or less were discharged after giving a symptomatic treatment with the instruction to come back if their symptoms persisted and 2 were operated for that.
- Patients with score of 5-6 were admitted and observed for first 24 hours and were re-evaluated and 9 were operated when their symptoms worsened or score increased.
- Surgery was directly performed in patients with score 7 or more. In all the operated patients, appendix was sent for histopathological examination for confirmation of diagnosis of appendicitis.
- So, to conclude that when the Alvarado score is more than 7, no false positive result obtained. Thus the application of Alvarado scoring system increases the sensitivity and specificity for diagnosis of acute appendicitis with the added advantages of being simple and easy to use.

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