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Whether Alvarado scoring system is A Reliable Diagnostic Tool for Acute Appendicitis.

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Abstract:
Objective: to evaluate the diagnostic accuracy (discrimination) and implementation performance of Alvarado score. **Methodology:** This cross sectional study was done in Surgerical unit of Bahawal Victoria hospital Bahawalpur under supervision of consultant Surgeons of department. Study duration was 1 year from March 2018 to March 2019. For quantitative variables like age of patients Mean and SD was calculated, and frequency percentages were calculated for categorical data like gender. Negative appendectomy rate, positive predictive value, negative predictive value, sensitivity, specificity was calculated by using 2-2 contingency table. **Results:** Total 300patients enrolled in this study, both genders. Alvarado scoring at presentation, 15% (n=45) patients were categorized into Group I. 13% (n=39) patients were included in Group II. While, 72% (n=216) were enrolled in Group III. Diagnostic test was positive in 223 patients. While, acute appendicitis was confirmed histo-pathologically in 160 patients. Gangrenous appendicitis observed in 3 patients. Chronic appendicitis, perforated appendicitis, appendicular abscess, no specific pathology, gangrenous intestine and salpingo-oophoritis was observed as 31, 6, 9, 6,3 and 5 respectively. There were 174 patients true positive, 49 were false positive, 59 were false negative and 18 were true negative. Sensitivity, specificity, negative predictive value and negative predictive value were 74.68% 26.87%, 78.02% and 23.37% respectively. **Conclusion:** Alvarado scoring system is useful tool in diagnosis of appendicitis in pre-operative period which can be useful for surgeons at any level of health care. According to our study observations Alvarado scoring system has better sensitivity 74.68% but specificity 26.87% which shows that Alvarado scoring system is helpful in diagnosis of appendicitis but not much helpful in preventing negative laparotomies.
Keywords: Right lower quadrant pain, Appendicitis scoring, Faecal peritonitis, Ultrasound abdomen, Perforated appendix.
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Introduction:

Abdominal pain in right lower quadrant is most common presentation in surgical department and mostly diagnosed as acute appendicitis [1]. Appendicitis remains the most common surgical emergency which needs urgent referral and appendectomy before perforation (worse condition of appendicitis) [2]. First case of appendectomy was performed by an English army surgeon in 1935. He removes perforated appendix without any anesthesia. Un perforated appendicitis was removed successfully by Hencockin last years of 19th century [3].

Pain in lower abdominal quadrant, fever, presence of leukocytosis and diffused peritonitis are the symptoms of acute appendicitis[4]. If clinical diagnosis is not clear wait for four to six hours and monitor the patient consistently, computed tomography is also helpful to improve diagnostic accuracy[5]. After complete observation if diagnosis is unclear and patient was discharged from hospital he should be advised for follow up within 24 hours or in case of symptoms reoccur[6]. There is noany contraindication of appendectomy if symptoms are present.

With these aspects of contraindication rate of negative appendectomy is much higher, about 20% negative appendectomy rate was reported in last few decades[7]. This much higher rate increases the cost of treatment, morbidity and mortality rate and poor outcomes of surgical intervention[8]. Abdominal ultrasound computed tomography and laparoscopic diagnosis was famous in earlier days. Another more advance and effective diagnostic method Alvarado scoring system was introduced on the basis of pure clinical history and signs/symptoms in 1986[9]. Alvarado is easy to perform and reliable than laboratory investigations. It consists of total 10 scores calculated after combining every symptom.

In this scoring system clinical predictions are helpful from signs and symptoms to target the accurate findings and diagnosis, laboratory investigations and radiological findings are some additional aspects. On the basis of these all findings and co-findings management and recommendations can be made which are helpful for better patients care and focused treatment[9].

Alvarado is a useful tool for eliminating the possible risks of patients presenting in emergency ward or in outdoor department with lower quadrant of abdomen in right side[10]. In our study we evaluate the diagnostic accuracy (discrimination) and implementation performance of Alvarado score.

Methodology

This prospective study was conducted in the department of general surgery Bahawal Victoria hospital Bahawalpur under supervision of senior surgeons of Department. Study duration was 1 year from March 2018 to March 2019. Study was started after ethical permission from hospital ethical committee and informed consent was obtained from patients who were included in the study. Non probability consecutive sampling technique was used and sample size was calculated by using confidence interval 95%, power of study 80% and P (percentage of desired variable) negative appendectomy 59% taken from a previous study.

All patients who were presented with pain in right iliac fossa were included in the study irrespective of severity and signs of illness. Patients with already operated for appendicitis and who were refused to give consent were excluded from the study. Alvarado scoring was measured and documented by fourth year resident of general surgery. Patients were labeled in three groups, score one to four included in group I, five to six in group II and score seven to ten were included in group III.

Group I was treated as outpatient and asked for follow up after that, group II was kept under observation for 24 hours and treated with OS (Oshner-Shrian) treatment method and patients in group III treated on emergency basis. Specimen was taken from all patients for histopathological findings and to confirm the efficacy of Alvarado scoring system. Specificity, sensitivity, negative and positive predictive value and negative appendectomy was noted on pre designed Performa. Data was entered on computer software SPSS version 24 and analyzed for all possible variables. Mean and SD was calculated for numerical data variables like age of patients and frequency percentages were calculated for categorical data like gender. Negative appendectomy rate, positive predictive value, negative predictive value, sensitivity, specificity was calculated by using 2-2 contingency table.

Results:

Total 300 patients enrolled in this study, both genders. Alvarado scoring at presentation, 15% (n=45) patients were categorized into Group I. 13% (n=39) patients were included in Group II. While, 72% (n=216) were enrolled in Group III. The mean age of the patients in group I was 28.64±2.79 years. There were 60% (n=27) males and 40% (n=18) females. The mean age of the patients in group II was 28.74±236 years. There were 64.1% (n=25) males and 35.9% (n=14) females. The mean age of the patients in group III was 28.74±2.72 years. There were 62.5% (n=135) males and 37.5% (n=81) females. (Table. 1).

Diagnostic test was positive in 223 patients. While, acute appendicitis was confirmed histo-pathologically in 160 patients. Gangrenous appendicitis observed in 3 patients. Chronic appendicitis, perforated appendicitis, appendicular abscess, no specific pathology, gangrenous intestine and salpingo-oophoritis was observed as 31, 6, 9, 6,3 and 5 respectively. There were 174 patients true positive, 49 were false positive, 59 were false negative and 18 were true negative. Sensitivity, specificity, negative predictive value and negative predictive value was 74.68% 26.87%, 78.02% and 23.37% respectively. (Table. 3 & 4).

Table. 1

Demographic Characteristics among the study groups

Demographic Characteristics among the study groups Characteristics	Group I, 15% (n=45)	Group II, 13% (n=39)	Group III, 72% (n=216)
Age	28.64±2.79 years	28.74±236 years	28.74±2.72 years
Gender	M=60%,F=40%	M=64.1%,F=35.9%	M=62.5%,F=37.5%

Table. 2

Alvarado scoring system

Criteria	Score
Symptoms	
Migratory RIF pain	1
Nausea and vomiting	1
Anorexia	1
Signs	
RIF Tenderness	2
Fever	1
Rebound RIF tenderness	1
Laboratory Tests	
Leukocytosis	2
Neutrophilic Left Shift	1
Total Score	**10**

Table. 3

Operative findings and histopathology in the study

Histopathology report	Frequency
Acute appendicitis	**160**
Gangrenous appendicitis	**3**
Chronic appendicitis	**31**
Perforated appendicitis	**6**
Appendicular abscess	**9**
No specific pathology	**6**
Gangrenous intestine	**3**
Salpingo-oophoritis	**5**
Total	**223**

Table. 4

Observed indices in the study

Diagnostic test result	Confirmed Appendicitis	No- Appendicitis	Total
Positive	True positive (174)	False positive (49)	**223**
Negative	False negative (59)	True negative (18)	**77**
Total	**233**	**67**	**300**

Table. 5

Diagnostic Accuracy

Diagnostic Measures	Value
Sensitivity	74.68%
Specificity	26.87%
Positive Predictive Value (PPV)	78.02%
Negative Predictive Value (PPV)	23.37%

Discussion:

In cases of acute appendicitis it is challenge for surgeons to make a right decision about surgery or accurate diagnosis especially in developing countries where there is limited assess of radiological investigations and other diagnostic techniques. Incidence of negative appendectomy is a major problem in such countries which was reported 25 to 45 in male and female genders. In our study we found negative appendectomy about 21%,

Sensitivity, specificity, negative predictive value and negative predictive value was 74.68% 26.87%, 78.02% and 23.37% respectively.

In a study conducted by Dunn et al[11] in 1982 on this topic and reported diagnostic accuracy 75% while diagnostic accuracy of our study was 71% which almost similar. Results of this study were comparable with our results. In another study conducted by Lewis et al[12] in 1975 and reported similar 75% diagnostic accuracy. These two studies strengthen our findings. Negative appendectomy rate of these two studies is also higher than previous studies.

Sensitivity was reported by Teicher et al[13] in his study as 48 to 77% and specificity was 73 to 87%, while sensitivity in our study was 74.68% and specificity 26.87%. Sensitivity of our study is almost similar to that study but specificity is much lower. Lindberg et al[14] also reported similar sensitivity as in study given above, in another study of Ramirez et al[15] also reported similar findings. These all studies give favor to our study sensitivity vise but specificity vise these are against our findings.

In a study Kalan et al[16] used another changed form of Alvarado scoring system and reported negative appendectomy in 14.6% of cases. When we concern about positive predictive value of our study was 78.02% in our study, in a previous study conducted by Jawaid A et al[17] reported positive predictive value 97% which is comparable with our findings. Similarly Chan MY et al conducted similar study and reported 97.6% positive predictive value and Khan I et al[18] reported 83.5%. Negative appendectomy rate was reported 21, 15.6 and 7% in these reports. These all studies were comparable with our study.

Alvarado scoring system is a simple diagnostic method which can be modified easily by any surgical and non surgical health care provider[19]. In a study Koppad SN et al[20] used Alvarado scoring system for evaluation of negative appendectomy rate and efficacy of Alvarado and reported negative appendectomy 5.9%, sensitivity was 98.50% and specificity was 87.09%. Similarly negative predictive value was 96.42% and positive predictive value was 94.36%.

Conclusion: Alvarado scoring system is useful tool in diagnosis of appendicitis in pre-operative period which can be useful for surgeons at any level of health care. According to our study observations Alvarado scoring system has better sensitivity 74.68% but specificity 26.87% which shows that Alvarado scoring system is helpful in diagnosis of appendicitis but not much helpful in preventing negative laparotomies.

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