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RESEARCH ARTICLE

ASSESSING THE RELIABILITY OF ALVARADO SCORING SYSTEM IN PREDICTION OF ACUTE APPENDICITIS.

Alhanouf Abdulaziz Alammar[1], Mawiah Hamed Alshebromi[1], Anas Hamed Alshebromi[1], Dr. Sultan Alsaigh[2] and Dr. Abdulaziz Altwejri[3].

1. Undergraduate students at College of medicine, Qassim University.
2. MBBs, MD, SBGS, General surgery consultant, head of general surgery department king fahad specialist hospital-Buraidah.
3. MBBS, general surgery senior specialist, head of A&E department at king fahad specialist hospital-Buraidah.

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Abstract

Scoring systems like Lintula, Madan, Ohmann, Eskelinen, De Dombal, and Alvarado might be helpful to predict the condition of acute appendicitis. These scoring methods do not need much practical expertise. Alvarado score is non-invasive method and based on clinical and experimental data. This retrospective work was carried out to find reliability Alvarado score system to determine acute appendicitis among patients of King Fahad Specialist Hospital. In this retrospective Chart Review-Analytical study, the data were collected for period from 01/01/2015 to 01/01/2017. Based on predetermined exclusion and inclusion criteria, out of 500 patients, 200 patients were selected. The data was analyzed by using SPSS software (version 18). The Alvarado score ranged from 2-10 and based on this score three groups was defined: High (7-10), intermediate (5-6) and low (<5) clinical probability. The number of patients among high, intermediate and low clinical probability groups were 93 (96.88%), 66 (94.30%) and 28 (82.35%), respectively. The overall positive and negative predicative score were 94.5% and 5.5%. However, the sensitivity, specificity and likelihood ratio for high score and intermediate to high score were low, and did not indicate the prospective potential of Alvarado scoring systems to predict acute appendicitis.

Introduction:-

Appendicitis is considered as the most common cause of acute abdominal pain with a prevalence of 7– 8 %. In England, a study estimated that 40,000 of hospital admissions every year were diagnosed as appendicitis.(1) In addition, appendicitis is most common between the ages of 10 and 20 years with a male to female ratio of 1.4:1.(2) The typical complaint of patients with appendicitis is an acute colicky abdominal pain which is initially located peri-umbilical then shifted to the right iliac fossa followed by nausea and vomiting. Also, patients with appendicitis usually complain of loss of appetite, low grade fever, and bowel habit disturbances.

Corresponding Author:- Alhanouf Abdulaziz Alammar.
Address:- Undergraduate students at College of medicine, Qassim University.

On examination, the patient presents with tachycardia, tenderness in the right lower abdominal quadrant, guarding, and rigidity. The clinical diagnosis of acute appendicitis is based on the history and physical examination. Therefore, there is no specific diagnostic test to confirm the diagnosis of appendicitis. However, the use of urine and blood tests are only to exclude other diseases and give additional evidence to support the clinical diagnosis.(3) Histopathology reports will also establish the diagnosis of appendicitis. To confirm the presence of appendicitis under the microscope, there will be a transmural neutrophilic infiltration.(4) The histologic assessment also defined the difference between endo-appendicitis (neutrophils within mucosa and mucosal ulceration) and peri-appendicitis (inflammation restricted to serosa and subserosa).(4)

A scoring system like Alvarado Score has been considered to help in the diagnosis of appendicitis. A recent study estimated that Alvarado scoring system is being most useful in ruling out appendicitis, as Alvarado score below 5 has a sensitivity of 94%–99% for appendicitis not being present.(5) Alvarado score is a 10-point scoring system based on clinical presentations and leukocytosis. The score has six clinical items and two laboratory measurements [table 1].(6) Based on the results of Alvarado Scoring System, the clinical probability can be categorized into high, intermediate, and low [table 2].(6)

Our study aims to establish the reliability of Alvarado Scoring System at King Fahad Specialist Hospital (KFSH).

Table 1:- The Alvarado score

Feature	Score
Migration of pain	1
Anorexia	1
Nausea & vomiting	1
Right lower quadrant tenderness	2
Rebound pain	1
Elevated temperature > 37.5° C	1
Leukocytosis	2
Left shift of white cell count	1
Total	10

Table 2:- Clinical probability according to Alvarado score .

Score	Clinical probability
1-4	Low
5-6	Intermediate
7-10	High

Objectives:-

1. To establish the reliability of Alvarado Scoring System at King Fahad Specialist Hospital.
2. To estimate the difference between Alvarado Scoring System and histopathology report in diagnosis acute appendicitis.

Methods:-

Study design:-

Our study design is a retrospective Chart Review -Analytic study- in which all the files of patients who are diagnosed between 01/01/2015 and 01/01/2017 as acute appendicitis at admission will be included in the study at king fahad specialist hospital.

Study Population:-

All medical records of patients regardless the age, and gender who are diagnosed with acute appendicitis at admission within 01/01/2015 and 01/01/2017 at King Fahad Specialist Hospital in Buraidah.

Study Setting:-

Buraidah city has three health institutions, our study will be conducted at King Fahad Specialist Hospital which is the biggest hospital in Buraidah, the capital of Al-Qassim region in Saudi Arabia with a typical desert climate .The

population of Buraidah is almost 600,000 people.

Inclusion criteria:-
1. All patients regardless the age , gender, and surgical procedure.
2. All medical records between 1/1/2015 to 1/1/2017.
3. Patients admitted with query diagnosis of appendicitis diagnosis.
4. Patients with histopathological report.

Exclusion criteria:-
1. Patients with urological and gynecological diseases.
2. patients presented with right iliac fossa mass.
3. Immunocompromised patients.
4. patients without histopathological report.
5. all medical records before 1/1/2015 and after 1/1/2017 will be excluded.

Sample size determination:-
The data will be collected from all medical records of patients who are diagnosed with acute appendicitis between 01/01/2015 and 01/01/2017 at KFSH in which each file will be chosen unless the files do not match the inclusion criteria.

Study duration and timeline:-

Stage		2017		
		April	May	June
1	Protocol Development			
2	Ethical Clearance			
3	Data Collection			
	Data Entry and Data Analysis			
5	Manuscript Writing			

Data collection:-
The data will be retrospectively collected from the medical records of the patients who are diagnosed with appendicitis between 1/1/2015 to 1/1/2017 at King Fahad Specialist Hospital in Buraidah. Also, the sample size will be 500 patients files. Then, we will apply the inclusion and exclusion criteria. After that, we will label the selected files numerically from 1 to 500 to keep the identity of the patient anonymous. The alvarado scoring for each patients will be obtained out of 10 points based on signs, symptoms, and leukocytosis by using the data from the medical files(table 1). The probability of the scoring system will be divided according to the result of the score into low, intermediate, and high(table 2). Then, the collected data will be entered into Excel database then transfer to SPSS for statistical analysis. To assess the reliability of Alvarado score we will compare the high probability with positive histopathology findings. The general surgery department staff Dr.Sultan Alsaigh, general surgery consultant, and Dr.Abdulaziz Altwejri, senior specialist, will participate and facilitate the process of taking permission from the head of hospital for the obtained the data.

Statistical analysis:-
Descriptive statistics were used to describe the baseline characteristics of all patients. The mean and standard deviations were reported for continuous variables, frequencies were used for categorical variables. Frequency and percentage of acute appendicitis according to histopathology report in different clinical probability groups determined by ALVARADO score were presented. The sensitivity, specificity, positive predictive value, negative predictive value and likelihood ratios were calculated for patients with ALVARADO score of 7 to 10 and 5 to 10.
Data analysis was performed at 95% CI using Statistical Package for Social Science (SPSS), version 20 (IBM, Armonk, NY, USA).

Results:-
This retrospective chart review study was conducted in King Fahad Specialist Hospital, Buraidah, Al-Quassim region, Saudi Arabia. Data from 200 patients, who were preoperatively diagnosed as acute appendicitis between 01/01/2015 and 01/01/2017 collected and analyzed. The mean ± SD age of all patient was 25.50 ± 9.62 years. 134

(67%) of the 200 patients were male. Their ALVARADO score ranged from 2 to 10 with a mean ± SD value of 6.42 ± 1.89. 96 (48%) patients undergone laparoscopic appendicectomy and rest 104 (52%) undergone open appendicectomy. 72 ± 26.08 minutes was the mean ± SD duration of surgery for all patients. 188 (94%) patients had postoperative diagnosis of acute appendicitis. Histology result also revealed acute appendicitis in 188 cases, while 11 patients had granulomatous appendicitis one patient had fibrous obliteration of the tip & luminal fibrosis with chronic inflammatory cells. (Table 1 and 2)

Patients with ALVARADO score 7-10, 5-6 and less than 5 were grouped as high, intermediate and low clinical probability respectively. The number and percentage of patients developed acute appendicitis according to histopathology report in high (n = 96), intermediate (n = 70) and low (n =34) clinical probability groups were 93 (96.88%), 66 (94.30%) and 28 (82.35%) respectively. (Table 3)

High ALVARADO score (7 – 10) yielded sensitivity of .50, specificity of .77 and a positive and negative predictive value .97 and .10 respectively. The sensitivity was increased to .85 and specificity was decreased to .46 when we considered ALVARADO score 5 to 10 for the diagnosis of acute appendicitis. (Table 4)

Table 1:- Gender, type of surgery, postoperative diagnosis, clinical probability and histopathology results of all patients are expressed as frequencies and percentages (n = 200)

	N	**%**
Gender		
Male	134	67.0
Female	66	33.0
Type of surgery		
Laparoscopic	96	48.0
Open	104	52.0
Postoperative diagnosis		
Acute appendicitis	188	94.0
Others	12	6.0
Clinical probability		
High	96	48.0
Intermediate	70	35.0
Low	34	17.0
Histopathology result		
Acute appendicitis	188	93.5
Granulomatous appendicitis	11	5.5
Fibrous obliteration of the tip & luminal fibrosis with chronic inflammatory cells	1	0.5

Table 2:- Age, ALVARADO score and the surgery duration of all patients are expressed in mean, standard error, standard deviation, minimum and maximum (n = 200)

	Mean	**Standard Error**	**Standard Deviation**	**Minimum**	**Maximum**
Age (years)	25.50	0.68	± 9.62	12	58
ALVARADO score	6.42	0.13	± 1.89	2	10
Duration of surgery (minutes)	72.00	1.84	± 26.08	30	220

Table 3:- Frequency and percentage of appendicitis according to histopathology report in high, intermediate and low clinical probability groups (n = 200)

Clinical probability	Frequency of appendicitis according to histopathology	% of appendicitis according to histopathology
High (n = 96)	93	96.88
Intermediate (n = 70)	66	94.30
Low (n = 34)	28	82.35

Table 4:- Sensitivity, specificity, positive predictive value, negative predictive value and likelihood ratios for high and intermediate to high ALVARADO score

	Sensitivity	Specificity	Positive predictive value	Negative predictive value	Likelihood ratio for a positive test result	Likelihood ratio for a negative test result
High ALVARADO SCORE (7-10)	.50	.77	.97	.10	2.17	.65
Intermediate to high ALVARADO score (5 – 10)	.85	.46	.96	.18	1.57	.33

Discussion:-

Acute appendicitis needs surgical intervention and the severity of disease is mainly established by histopathological methods. Therefore, it is critical to correlate surgical intervention to other diagnostic methods to avoid unnecessary surgical intervention. Alvarado is scoring system which is being used to diagnose acute appendicitis and various studies has been carried out to correlate it to surgical intervention [1-4].This retrospective study was conducted to establish the relevance of Alvarado scoring system to surgical procedures in Buraidah region of Saudi Arabia. Gender, type of surgery, post-operative diagnosis, clinical probability and histopathology were recorded (Table 1). Both laparoscopic and open surgery were performed in male and female patients. On the other hand, the scoring systems such as Lintula, Madan, Ohmann, Eskelinen, De Dombal, and Alvarado are non-invasive and do not require complex practical expertise. Alvarado scoring system (ASS) is mainly focused on clinical and laboratory data of patient [5]. In our study, the male and female ratio was 2.03:1, which is comparable to a few other studies [6-8]. Post operative diagnosis of acute appendicitis was observed among 188 patients (94%). Alvarado score was used to characterized patients into three groups: High acute appendicitis group (7≤score≤10), intermediate acute appendicitis group (5≤score≤6), Low acute appendicitis group (5<score). Based on clinical probability, patients were grouped in high, intermediate and low groups (Table 1). Histology also reported the acute appendicitis among 188 patients (Table 1). The overall negative predictive value for appendectomy was 5.5% in clinical probability, while overall positive predictive value was 95.5%. In a previous study also reported an overall negative and positive value for appendectomy as 7% and 93% respectively [9]. Further, an overall negative and positive values for appendectomy as 10.9% and overall 90.1% has also been documented [10]. In a seminal study, Vukovik etal. also reported an overall negative appendectomy 15.79% and overall positive appendectomy 84.21% [11]. All these data furnished in previous studies are comparable to our results.

Further, a Saudi Arabia based report predicted an overall negative and positive appendectomy values as 11.3% and 89.7%, respectively [6]. The average Alvarado score was 6.42±1.89, which indicated nature of risk among patients and was comparable to another study carried out in Makkah, region of Saudi Arabia [6]. Clinical probability scores 93, 66 and 28 indicated high (96.88%), intermediate (94.30%) and low (82.35%) level of acute appendicitis. This indicates negative predication as compared to histopathological results. Sensitivity and specificity for high Alvarado score (7-10) were 0.50 (50%) and 0.70 (70%), respectively with 2.17 and 0.65 likelihood ratio (LR) for positive and negative test results. The positive LR score and low negative LR score shows that Alvarado score (7-10) is an indicator of high risk of acute appendicitis. However, the specificity and selectivity were quite low from other studies [11,12]. Whereas, the sensitivity and specificity for intermediate to high Alvarado score were 0.85 (85%) and 0.46 (46%), respectively. The corresponding likelihood ratios for positive and negative test results were 1.57

and 0.33, respectively. The LR positive score (1.57) and low LR negative score (0.33) indicate a possible correlation to the acute appendicitis. In this range of Alvarado score (5-10). Conclusively, though sensitivity was improved (85%), the specificity did not represent score as good indicator of acute appendicitis.

Limitations:-

The physical examination information written in some of the patients' files weren't complete and had missing information. some physicians weren't able to write a complete abdominal examination report and history report for patients with abdominal pain due to the huge influx of patients in the emergency department.

Recommendations:-

After getting the results of our study, we believed that alvarado score is not a sensitive tool to role out the diagnosis of acute appendicitis although its may help to role in the diagnosis

Ethical part & confidentiality:-

The data will be collected anonymously without any personal identifiers. Also, all the data which will be collected and analyzed, no one can link the results of our study with the personal identities. When the data is collected, we will apply the data to the inclusion and exclusion criteria. Then, the data will be entered into an excel-format file.

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References:-

1. Hospital Episode Statistics. Primary diagnosis: summary. www.hesonline.nhs.uk/Ease/servlet/ContentServer?siteID = 1937&categoryID = 202 (accessed 28 Aug 2006).
2. Addiss DG, Shaffer N, Fowler BS, Tauxe RV. The epidemiology of appen- dicitis and appendectomy in the United States. Am J Epidemiol 1990;132:910-25.
3. Andersson R. Meta-analysis of the clinical and laboratory diagnosis of appendicitis. Br J Surg 2004;91:28-37.
4. Carr NJ. The pathology of acute appendicitis. Ann Diagn Pathol. 2000;4:46–58. 16.
5. Ohle R, O'Reilly F, O'Brien KK, et al. The Alvarado score for predicting acute appendicitis: a systematic review. BMC Med 2011;9:139
6. Alvarado A. A practical score for the early diagnosis of acute appendicitis. Ann Emerg Med 1986;15:557-64.
7. Dey S, Mohanta PK, Baruah AK, Kharga B, Bhutia KL, et al. (2010) Alvarado Scoring in Acute Appendicitis—A Clinicopathological Correlation. The Indian Journal of Surgery 72: 290-293.
8. Özsoy Z, Yenidoğan E (2017) Evaluation of the Alvarado scoring system in the management of acute appendicitis. Turkish Journal of Surgery 33: 200-204.
9. Khan I, ur Rehman A (2005) Application of alvarado scoring system in diagnosis of acute appendicitis. J Ayub Med Coll Abbottabad 17: 41-44.
10. Ohle R, O'Reilly F, O'Brien KK, Fahey T, Dimitrov BD (2011) The Alvarado score for predicting acute appendicitis: a systematic review. BMC Medicine 9: 139-139.
11. Lintula H, Pesonen E, Kokki H, Vanamo K, Eskelinen M (2005) A diagnostic score for children with suspected appendicitis. Langenbecks Arch Surg 390: 164-170.
12. Rasheed A, Al-Harthy M, Obeid Dhafar K, Maimini O, Abdul Sattar Shaker H, et al. (2011) Alvarado score and appendicectomy. Hellenic Journal of Surgery 83: 197.
13. Al-Hashemy AM, Seleem MI (2004) Appraisal of the modified Alvarado score for acute appendicitis in adults. Saudi Med J 25: 1229-1231.
14. Chan M, Tan C, Chiu M, Ng Y (2003) Alvarado score: an admission criterion in patients with right iliac fossa pain. The Surgeon 1: 39-41.
15. Jawaid A, Asad A, Motiei A, Munir A, Bhutto E, et al. (1999) Clinical scoring system: a valuable tool for decision making in cases of acute appendicitis. J Pak Med Assoc 49: 254-259.
16. Pogorelic Z, Rak S, Mrklic I, Juric I (2015) Prospective Validation of Alvarado Score and Pediatric Appendicitis Score for the Diagnosis of Acute Appendicitis in Children. Pediatric Emergency Care 31: 164-168.
17. Subotic AM, Sijacki AD, Dugalic VD, Antic AA, Vukovic GM, et al. (2008) Evaluation of the Alvarado score in the diagnosis of acute appendicitis. Acta Chir Iugosl 55: 55-61.
18. Memon ZA, Irfan S, Fatima K, Iqbal MS, Sami W (2013) Acute appendicitis: Diagnostic accuracy of Alvarado scoring system. Asian Journal of Surgery 36: 144-149.