

Role of Alvarado Score in Diagnosis and Management of Acute Appendicitis

Chhari Akash Singh¹, Ashish Pratap Singh¹, Babu S M Sajith¹, A P S Gaharwar²

¹Junior Resident, Department of Surgery, Shyam Shah Medical College, Sanjay Gandhi Memorial Hospital, Rewa, Madhya Pradesh, India,

²Professor and Head, Department of Surgery, Shyam Shah Medical College, Sanjay Gandhi Memorial Hospital, Rewa, Madhya Pradesh, India

Abstract

Background: Appendicitis is one of the most common conditions responsible for the admission of patients to hospital for surgical treatment.

Materials and Methods: This study is prospective cohort study. The patients with classical symptoms and sign of acute appendicitis were admitted to the surgical ward were subjected to investigations including hemoglobin, total leukocytes count (TLC) and differential leukocytic count, blood sugar, X-ray abdomen and ultrasound of abdomen. The patients were evaluated according to Alvarado score. The study was conducted in 385 patients over 1-year period.

Results: A total of 385 patients with appendicitis were evaluated (30.39%) patients were of Alvarado score 6 or more. The majority of cases 315 (81.82%) out of 385 treat conservatively and 70 (18.18%) patients were operated. Patients with Alvarado score >7, 13 (3.37%) had positive operative findings and 11 (2.85%) had positive histopathological examination.

Conclusions: In this study, we found that clinical score is a simple, rapid, and noninvasive method to early diagnosis of appendicitis. TLC are inflammatory marker are also useful in the early diagnosis of acute appendicitis. Ultrasound abdomen is also useful to confirm the diagnosis. The majority of our patients presented early disease. Because of these negative appendectomy rate are decreasing and morbidity period is also decreasing pre- or post-appendectomy. In our study, we concluded that timely intervention reduces the negative appendectomy and reduce the length of morbidity.

Key words: Alvarado score, Appendectomy, Appendicitis

INTRODUCTION

Appendicitis is one of the most common conditions responsible for the admission of patients to hospital for surgical treatment. Appendicitis is generally regarded as an inflammatory condition, reflected by the suffix to its name. However, it is apparently not influenced by the antibiotics.¹

In acute appendicitis, it is not possible to have definitive diagnosis by the gold standard (histopathology) preoperatively; we would like a simple test like Alvarado scoring system which depends on the presence and absence of certain variables. Alvarado scoring system was identified

as a useful clinical tool because it is readily available, extremely affordable and relatively accurate. Delay in diagnosis will lead to complication, which increases morbidity, whereas overzealous diagnosis may lead to negative Appendectomy rate¹⁻³ due to overzealous diagnosis.⁴

This study involves to correlate the appendicitis between clinically diagnosed and histopathologically examined specimen and role of ultrasound in the early diagnosis of appendicitis and to exclude negative appendectomy, in 385 patients admitted to surgical ward Sanjay Gandhi Memorial Hospital associated Shyam Shah Medical College, Rewa for 1-year.

MATERIALS AND METHODS

This study “role of Alvarado score in diagnosis and management of acute appendicitis” was carried out in 385 patients of appendicitis admitted to surgical wards of Sanjay Gandhi Memorial Hospital, associated with Shyam

Access this article online



www.ijss-sn.com

Month of Submission : 07-2016
Month of Peer Review : 08-2016
Month of Acceptance : 09-2016
Month of Publishing : 09-2016

Corresponding Author: Dr. Ashish Pratap Singh, Room No. 12, PG Mens Hostel, Sanjay Gandhi Memorial Hospital, Rewa - 486 001, Madhya Pradesh, India. Phone: +91-9981981918. E-mail: ashish.baghel09@gmail.com

Shah Medical College, Rewa, Madhya Pradesh, during the period of 1-year.

On admission, the particulars of the patients regarding age, sex, occupation, and residence were recorded, presenting complaint, past illness, and associated illness were recorded. Patients were evaluated according to Alvarado score as follows:

Alvarado score	
Symptoms	
Migratory RIF pain	1
Anorexia	1
Nausea/vomiting	1
Signs	
RIF tenderness	2
Rebound tenderness	1
Increase in temperature	1
Lab findings	
Leucocytosis	2
Shift to the left	1
Total	10

RIF: Right iliac fossa

Scoring system	
1-4	Appendicitis unlikely
5-6	Appendicitis possible
7-8	Appendicitis probable
9-10	Appendicitis definitive

USG Criteria of Acute Appendicitis

Acute appendicitis was confirmed by the presence of noncompressible aperistaltic blind end tubular structure, i.e., appendix - diameter >6 mm, wall thickness >3 mm, complex mass (echo poor, asymmetric) irregular asymmetrical, loss of contour, free fluid, local adynamic ileus, probe tenderness over RIF.

Patients which score 7 or >7 were subjected to surgery. Patients with acute appendicitis were operated in emergency or elective appendectomy was offered to those patients who responded to conservative treatment. Surgery was done under spinal anesthesia. Postoperatively patients were kept nil orally, till bowel sounds returned, parenteral fluid, electrolytes, antibiotics, and analgesics were continued. Cases were watched for any post-operative complications were treated wherever needed. Postoperatively sutures were removed on 7-9 days, and the patients were discharged and followed up in SOPD.

OBSERVATIONS (TABLES 1-9)

All the data was recorded and following observations were made regarding the investigations done and signs and symptoms observed.

DISCUSSION

In this study, it was concluded to evaluate Alvarado scoring system to diagnosis of appendicitis and its correlation by total leukocytes count (TLC), ultrasound, and histopathology in our set up.²

Clinical scoring system is a good supporting tool for diagnosis for appendicitis because it is simple, easy to use and noninvasive to use clinical routine practice. There was no special equipment required.²

In this study, the patients who admitted for elective appendectomy as a routine admission Alvarado score of

Table 1: Incidence of various signs

Signs	Number of cases (%)
Tenderness in RIF	349 (90.65)
Rebound tenderness	120 (31.17)
Muscle guarding	107 (27.79)
Rigidity	50 (12.99)
Lump in RIF	76 (19.74)
Abdominal distension	37 (9.61)
Bowel sounds	
Normal	318 (82.60)
Absent	07 (1.82)
Sluggish	38 (9.87)
Increased	22 (5.71)
Per rectal digital examination	
Normal	320 (83.12)
Tenderness in rectum	51 (13.25)
Bulging mass	14 (3.64)

RIF: Right iliac fossa

Table 2: Hematological investigations

TLC	Polymorph (%)		Total
	>75	<75	
>10,000	100 (51.81)	93 (48.19)	193 (50.13)
<10,000	90 (46.88)	102 (53.13)	192 (49.87)
Total	190 (49.35)	195 (50.65)	385 (100.00)

TLC: Total leukocytes count

Table 3: Distribution of cases according to Alvarado scores

Alvarado score	n (%)		
	Male	Female	Total
1	-	-	-
2	01 (100.0)	0	01
3	-	-	-
4	40 (58.82)	28 (41.18)	68 (17.66)
5	58 (56.86)	44 (43.14)	102 (26.49)
6	62 (52.99)	55 (47.01)	117 (30.39)
7	25 (69.44)	11 (30.56)	36 (9.35)
8	15 (57.69)	11 (42.31)	26 (6.75)
9	18 (66.67)	09 (33.33)	27 (7.01)
10	06 (75.00)	02 (25.00)	08 (2.08)
Total	225 (58.44)	160 (41.56)	385 (100.00)

Table 4: Distribution of cases with differential leukocyte count according to Alvarado scores

Scores groups	n (%)		Total
	TLC		
	(>10,000)	(<10,000)	
Alvarado score			
<7	185 (57.10)	139 (42.90)	324 (84.16)
>7	07 (11.48)	54 (88.52)	61 (15.84)
Total	192 (49.87)	193 (50.13)	385 (100.0)

TLC: Total leukocyte count

Table 5: Distribution of cases with differential neutrophils count according to Alvarado score

Scores groups	n (%)		Total
	Neutrophils		
	>75	<75	
Alvarado score			
<7	170 (52.47)	154 (47.53)	324 (84.16)
>7	25 (40.98)	36 (59.02)	61 (15.84)
Total	195 (50.65)	190 (49.35)	385 (100.0)

Table 6: Incidence of different types of appendicular lesions

Type of appendicular lesion	Number of cases (%)
Acute appendicitis	250 (64.93)
Appendicular lump	66 (17.14)
Recurrent appendicitis	56 (14.54)
Appendicular perforation peritonitis	06 (1.55)
Appendicular abscess	07 (1.81)
Total	385 (100.00)

these patients calculated according to symptoms and sign present during their acute attack of appendicitis.⁷

In this study, we observed the operative findings of patients and classify them into positive and negative. Positive findings mean presence of transmural inflammation or pus in the lumen of appendix. A negative finding means one which performed a clinical diagnosis of acute appendicitis but when the appendix is found to be normal on histopathological examination. This includes histologically normal appendix with or without the presence of fecolith or parasite in the lumen.⁵

We observed incidence of appendicular lesions was 385 (4.28%) out of all surgical admissions (8562). Ashley¹ also found incidence of appendicitis is (12%) in subpopulation.

We observed maximum incidence of appendicitis in the age group 20-40 years (50.64%). Ashley¹ also found incidence of appendicitis more in the young adults with a

Table 7: Distribution of cases according to management

Management	Number of cases (%)
Conservative	315 (81.82)
Operative	70 (18.18)
Total	385 (100.0)

Table 8: Distribution of management according to various appendicular lesion

Type of appendicular lesion	Number of cases	Management	
		Conservative (%)	Operative (%)
Acute appendicitis	250	234 (93.6)	16 (6.4)
Recurrent appendicitis	50	07 (14.00)	43 (86.00)
Appendicular lump	66	65 (98.48)	01 (1.52)
Appendicular perforation peritonitis	06	00 (0.00)	06 (100.00)
Appendicular Abscess	13	09 (69.23)	04 (30.77)
Total	385	315 (81.82)	70 (18.18)

Table 9: Distribution of operated cases according to various parameters, operative findings and histopathological report

Parameters	n (%)			
	Operative findings		Histopathological reports	
	Positive	Negative	Positive	Negative
Alvarado score				
>7	13 (3.37)	311 (80.77)	11 (2.85)	313 (80.77)
<7	58 (15.06)	03 (0.77)	58 (15.06)	03 (0.77)
TLC				
>10,000	11 (2.85)	184 (47.79)	11 (2.85)	169 (43.89)
<10,000	59 (15.32)	134 (34.80)	58 (15.32)	105 (27.27)
Polymorph				
>75	28 (7.27)	158 (41.03)	28 (7.27)	158 (41.03)
<75	42 (10.90)	157 (40.77)	41 (10.90)	159 (41.29)

TLC: Total leukocyte count

peak age of appendicitis is 18 years of age. Chamisa⁵ also found majority of patients incidence of appendicitis in the second decades.^{1,5}

In our study, we observed the most common clinical sign were tenderness in RIF (90.65%) and rebound tenderness (31.17%). This result comparable with the Dipak (2006) when the most common sign is tenderness in RIF followed by rebound tenderness. The other retrospective analysis by Chmisa found the most common sign is abdominal tenderness.^{5,7}

In our study, Alvarado score was found to be the most important diagnostic parameter of appendicitis.²

We observed that TLC >10,000 in (50.13%) patients and neutrophils >75 in (48.13%) patients.

We observed that TLC >10,000 with Alvarado score >7 was found in 11.48% while TLC > 10,000 with Alvarado score <7 was found in 57.10%. Normal WBC Count in appendicitis in the present study was 50.13%, i.e., TLC alone is not a positive indicator to rule out appendicitis. Ire Teicher *et al.* reported that in nondifferentiating factors of appendicitis one of the white blood cell count between 10,000 and 13,000 were found equally in both groups, i.e., appendicitis and nonappendicitis.³

It is obvious that when the clinical sign of appendicitis shows the Alvarado score more than 6, the findings are confirmed by leukocytosis. Leukocytosis is present in the inflammatory changes, even though clinically Alvarado score may show a lower count. Thus, in this study, Alvarado score alone only appears to be a good indicator in predicting appendicitis but along with TLC, polymorph count and it become more reliable.⁷

Clinical sign symptoms and TLC were the important hallmark of our study. Pain and tenderness in RIF and raised TLC, Alvarado score higher than 6 formed the quick diagnostic tools of acute appendicitis. Fever, vomiting, loose motion, shifting of pain, rigidity, and raised TLC are present only in few cases of acute appendicitis hence their absence cannot rule out of the inflammatory pathology.⁷

In our study, we observed that positive ultrasound findings of 54 (93.10%) out of 58 had undergone surgery, while only 4 (6.90%) patient had conservative treatment. Our study shows that ultrasound in appendicular lesion has a high true positive result.

In our study, it is found that Alvarado scoring systems are superior in diagnosis of acute appendicitis.^{2,6}

In our study, the majority of appendicitis patients treated conservatively (81.82%) and 70 (18.18%) patients underwent operative intervention.

In this study, we found that clinical score is a simple, rapid, and noninvasive method to early diagnosis of appendicitis. TLC and ultrasound of abdomen are also useful in appendicitis.

Our study was primarily designed to differentiate between appendicitis and other acute abdominal conditions which could be treated conservatively.³

In this study, the policy of controlled observation rather than immediate laparotomy for a diagnosis of questionable appendicitis has resulted in decreasing the rate of negative appendectomy. Or decreasing the morbidity as well as mortality.³

CONCLUSIONS

After analyzing, the data following conclusion are drawn as follows:

- Majority of the patients 117 (30.39%) were of Alvarado score 6 and more followed by score between 4 and 6, i.e., 287 (74.0%).
- In the present study with Alvarado score <7, 185 (57.10%) patients out of 324 had TLC >10,000 while 139 (42.90%) patients had TLC <10,000. With Alvarado score >7, 07 (11.48%) patients out of 61 had TLC >10,000 while 54 (88.52%) patients had TLC <10,000. In this study, we observed that 192 (49.87%) patients had TLC >10,000.
- The most common symptom was pain in abdomen 385 (100.0%) and other symptoms migration of pain in lower abdomen in 249 (64.68%), fever 197 (51.17%), nausea/vomiting 186 (48.31%), and anorexia 171 (44.44%).
- The most common sign was tenderness in RIF (90.65%) and next common signs were muscle guarding (27.79%) and rebound tenderness (31.17%).
- Patient with TLC >10,000 also having raised polymorph (>75) in 100 (51.81%) cases, while patients with the TLC <10,000 having polymorph >75 only in 90 (46.88%) cases.
- With Alvarado score <7, 170 (52.47%) patients out of 324 had neutrophils >75%, while 154 (47.53%) patients had neutrophils <75%. With Alvarado score >7, 25 (40.98%) patients out of 61 had neutrophils >75%, while 36 (59.02%) patients had neutrophils <75%. In this study, we observed that 195 (50.65%) patients had total neutrophils >75%.
- Majority of the patients were of acute appendicitis (64.93%) followed by recurrent appendicitis (14.54%), appendicular lump (17.14%), and lowest incidence found in appendicular abscess (1.81%), appendicular perforation peritonitis (1.55%).
- Majority of the patients with having Alvarado score <7 acute appendicitis 238 (95.12%) out of 250 cases. And >7 having only 12 (4.86%) patients out of 250 cases. Majority of the patients with having TLC >10,000 acute appendicitis 138 (55.2%) out of 250 cases. And TLC <10,000 of 112 (44.8%) out of 250 cases.
- Majority of patients positive ultrasonography finding, 54 (93.10%) patients out of 58 had undergone surgery, while only 4 (6.90%) patients had conservatively treatment. This study shows that ultrasonography in appendicular lesion has high sensitivity.
- Majority of the cases 315 (81.82%) out of 385 treat conservatively and 70 (18.18%) patients were treated operatively.
- With acute appendicitis, 234 (93.6%) patients out of 250 had conservative management while 16 (6.4%)

patients had operative management. With recurrent appendicitis, 43 (86%) patients out of 50 had operative management, while 7 (14.0%) patients had conservative management, with appendicular lump 65 (98.48%) patients out of 66 had conservative management while only 1 patient was operated, with appendicular perforation all 6 patients were subjected to operative management. With appendicular abscess, 9 (69.23%) patients out of 13 had conservative management; while 4 (30.77%) patients had operative management.

- In this study according to type of operation, out of 70 patients, 43 (61.42%) of the patients were subjected to elective appendectomy, followed by, 16 (22.85%) emergency appendectomy, 6 (8.57%) exploratory laparotomy, 1 (1.43%) laparoscopic appendectomy, 1 (1.43%) I and D.
- In this study according to type of operative incision, 35 of the patients were operated by Mcburney's incision, followed by 19 of Lanz incision, 8 of Rutherford Morrison incision, 6 of Midline incision, 1 of paramedian incision and 1 of laparoscopic port site incision.
- In the present study according to position of appendix, 38 (54.28%) of the patients were retrocecal, followed by 15 (21.42%) of pelvis, 7 (10.0%) of subcecal, 5 (7.14%) of preileal, 4 (5.871%) of paracecal.
- In the present study, patients with Alvarado score >7, 13 (3.37%) had positive operative findings and 11 (2.85%) had positive histopathological examination

and patients with TLC >10,000, 11 (2.85%) had positive operative findings and 11 (2.85%) had positive histopathological examination. And polymorph >75, 28 (7.27%) had positive operative findings and 28 (7.27%) had positive histopathological examination.

In this study, we found that clinical score is a simple, rapid and noninvasive method to early diagnosis of appendicitis TLC as inflammatory marker is also useful in the early diagnosis of acute appendicitis, and ultrasound abdomen are also useful to confirm the diagnosis and plan the management.

REFERENCES

1. Ashley DJ. Observations on the epidemiology of appendicitis. *Gut* 1967;8:533-8.
2. Tamanna Z, Eram U, Hussain AM, Khateeb SU, Buhary BM. Alvarado score in diagnosis of acute appendicitis. *Int J Basic Appl Med Sci* 2012;2:66-70. Available from: <http://www.cibtech.org/jms.htm>.
3. Teicher I, Landa B, Cohen M, Kabnick LS, Wise L. Scoring system to aid in diagnoses of appendicitis. *Ann Surg* 1983;198:753-9.
4. Singhal V, Jadhav V. Acute appendicitis: Are we over diagnosing it? *Ann R Coll Surg Engl* 2007;89:766-9.
5. Chamisa I. A clinicopathological review of 324 appendices removed for acute appendicitis in Durban, South Africa: A retrospective analysis. *Ann R Coll Surg Engl* 2009;91:688-92.
6. Gupta R. Role of a C-reactive Protein in ACUTE Appendicitis. A Thesis for M.S (Gen. Surg) APSU, Rewa; 1997.
7. Purohit D. Clinicopathological study of acute appendicitis with special reference to Clinical Score Vs C-Reactive protein and Leucocytosis. A Thesis for M.S (Gen.Surg) APSU, Rewa, 2006.

How to cite this article: Singh CA, Singh AP, Sajith BSM, Gaharwar APS. Role of Alvarado Score in Diagnosis and Management of Acute Appendicitis. *Int J Sci Stud* 2016;4(6):173-177.

Source of Support: Nil, **Conflict of Interest:** None declared.