

A Simple score System to Reduce the Negative Appendicectomy rate



Medical Science

KEYWORDS : RIF Tenderness, Right iliac fossa, Alvarado Score, Left shift of Neutrophil

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ABSTRACT

The vermiform appendix is considered by most to be a vestigial organ ; its importance in surgery results only from its propensity for inflammation, which results in clinical syndrome known as acute appendicitis. Appendicectomy is commonest emergency operation in surgical practice. However 15% to 30% of all appendicectomies, the appendix is healthy. Alvarado scoring system is a simple simple which not only helps in diagnosing acute appendicitis clinically but also decreasing the negative appendicectomy rate and its hazards performed in the cases of non specific abdominal pain having low Alvarado score1.

The aim of my study was to analyze the age, sex, dietary habit, clinical presentations , to apply Alvarado score to each patient and to calculate its accuracy by comparing with the histopathological study of resected specimens and the standard literature results. The study was conducted on 216 patients who came to MKCG MCH ,Berhampur, Odisha for treatment during the period of July 2012- Jun 2014. The patients underwent thorough clinical examination and were applied Alvarado Score system in diagnosing acute appendicitis . The data of the study was represented by bar graphs and pie charts. Majority of the patients were of 10-30 years (%). In our study males constituted 56% and females 44%.Low fibre diet intake was common in appendicitis group. The most common complaint was pain RIF(100%).The most frequently found sign was Tenderness RIF(100%),. 73.9% cases of the appendicitis group showed W.B..C count within 10,000 to 14,000/cc and among these 96% showed shift to left. "Alvarado Score" of more than 8 found to be highly effective in the establishment of accurate diagnosis. In Histological study 88% patients proved to be histologically positive for acute appendicitis, proving diagnostic accuracy of Alvarado Score 88%.So the negative appendicectomy rate was reduced from 21%(MY P Chan Study) to 12% in this study.

INTRODUCTION

In 1886, Reginald Fitz of Harvard Medical School first described the natural history of the inflamed appendix, coining the term "appendicitis"; its importance in surgery results only from its propensity for inflammation, which results in clinical syndrome known as acute appendicitis.²

Appendicectomy is commonest emergency operation in surgical practice. However 15% to 30% of all appendicectomies³, the appendix is healthy. This high negative laparotomy rate only has been justified by fear that delayed diagnosis can lead to perforation and peritonitis. However such an aggressive policy is not without side-effects. 0.5% to 1% of appendicectomised patients will later require surgery for intestinal obstruction caused by post-appendicectomy adhesions.^{3,4}

According to some studies the incidence of such adhesions may even be greater if the excised appendix is normal. Conversely the common cause of intra-abdominal adhesions in operated patients with intestinal obstruction is appendicectomy.^{3,6}

Post-operative complications of negative laparotomy such as wound infection, abscess and fistula formation may be as high as 15%⁴. Furthermore there is dubious association between appendicectomy and right colonic- cancer³.

Despite the unknown function of the appendix every report should be made to preserve it for further reconstructive surgery such as replacement of damaged Common Bile Duct(CBD), right ureter, for appendicectomy to direct fecal effluent in distal colonic obstructions and as a cecal reservoir with a appendicular conduit in bladder reconstruction.^{2,3}

Diagnostic scoring systems have been developed in an attempt to improve the diagnostic accuracy of acute appendicitis. The most prominent of those scores, developed by Alvarado is based on 3 symptoms(migration of pain, anorexia, and nausea), 3 signs(right lower quadrant tenderness, rebound tenderness, and

pyrexia)and 2 laboratory tests(leukocytosis and a left shift)⁴ to increase the clinical diagnostic accuracy^{3,7,8,9}.

Table-1 :Alvarado Scoring System⁷

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

Patients with a score of 1-4 were not considered likely to have acute appendicitis, a score of 5-6 were considered to have a likely diagnosis of acute appendicitis, but not convincing but, those with a score of 9-10 were considered to have acute appendicitis and submitted to surgery. The Alvarado score can increase or decrease on reassessment.^{9, 10,11}

The diagnosis can only be confirmed by Histopathological Examination of the resected specimen of the appendix.

Therefore, in the present study the clinical finding in respect to Alvarado score will be evaluated against the operative findings and histopathological findings and a relationship will be established among them to reduce negative appendectomy rate^{2,3,10}.

MATERIALS AND METHODS

This study was conducted in the Department of General Surgery of M.K.C.G. Medical College & Hospital, Berhampur in collaboration with the Department of Pathology of the same institution during a period extending from July 2012 to June 2014 with a follow up period of 4 months.

Out of 7734 patients admitted to Surgery Department, 492(6.36%) were patients of suspected acute appendicitis. Out of these 216(43.9%) patients were randomly selected to apply Alvarado Score. The pattern of our study is represented below in detail.

Scheme Of Work

Patient Selection:

2. Establishment of clinical diagnosis by :
 - a) Detailed History
 - b) Thorough Clinical examination
3. Laboratory studies
4. Alvarado Scoring
5. Surgery with pre-operative treatment
6. Histopathological study of the specimen.
7. Post-operative management and follow-up.

1. Patient Selection :

Patients were selected randomly from the Casualty, Out Patient Department of Surgery with suspected diagnosis of acute appendicitis.

Inclusion Criteria:

- a) Patients of all age groups
- b) Patients having clinical pictures suggestive of acute appendicitis like pain and tenderness in right iliac fossa, nausea, vomiting, fever.

Exclusion Criteria:

- a) All patients having nonspecific abdominal pain without having all the above typical symptoms and signs

2. Establishment of the Diagnosis :

a) History : A detailed history was taken in cases with special reference to the relevant points Pain ,Anorexia,Nausea, Vomiting, Temperature.

Dietary habits (vegetarian or non-vegetarian as well as intake of fibres) , past history of any such episodes and bowel habits, Family history and gynaecological history were also taken.

b) Clinical Examination : Through clinical examination was done in every patient with special attention on abdominal examination. The different signs of acute appendicitis i.e Tenderness R.I.F, rebound tenderness and fever were carefully looked for.

3. Laboratory Studies

Emergency examination of blood for total count, differential count and morphology of white cells were done.

STATISTICS AND RESULTS

Out of these, 200 patients scored above 8 and only these patients were included in the study group and they were subjected to emergency surgery. The rest 16 patients scored 8 or less than 8 Alvarado Score and were treated conservatively.

Out of 200 patients diagnosed by using Alvarado Score as acute appendicitis 176 cases were diagnosed histopathologically as acute appendicitis and the remaining 24 cases have either normal appendix or normal appendix with other associated pathology.

EPIDEMIOLOGICAL STUDY

AGE INCIDENCE

Table -2

Age Incidence (n=200)

Age Group	No of patients	Percentage
< 10	8	4.00
11-20	68	34.00
21-30	84	42.00
31-40	28	14.00
41-50	4	2.00

51-60	4	2.00
> 60	4	2.00

In our study maximum number of patients were in the age group of 21-30 yrs,11-20yrs 2nd highest and least were 41-50,51-60 and >60 yrs age group. The age group showing maximum incidence of acute appendicitis is 11-30 yrs group.

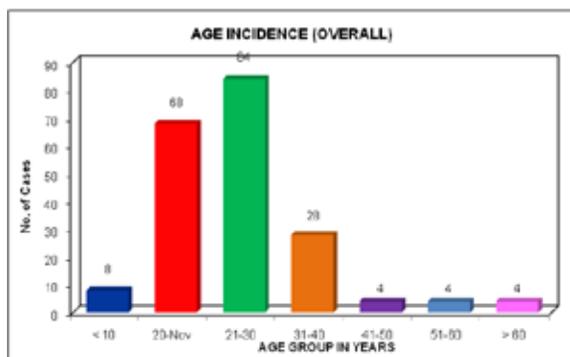


Fig. 1

2. SEX INCIDENCE

Table - 3

Sex Incidence

Alvarado score>8	Male	Female	Sex (M:F)	Ratio
Clinical appendicitis group(n=200)	112(56%)	88(44%)	1.27	
Histologically diagnosed Group(n=176)	102(57.9%)	74(42%)	1.38	

The number of males positive for appendicitis clinically is 112(56%) and females is 88(44%) with a sex ratio of 1.27 for clinically positive cases.

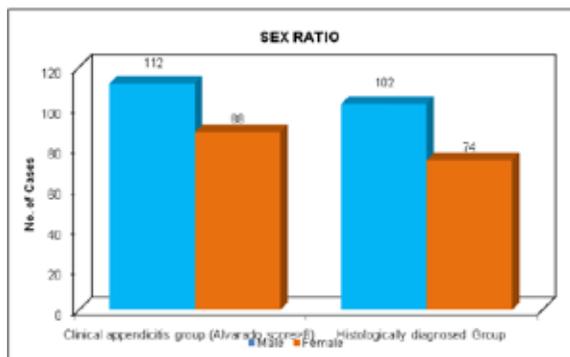


Fig. 2

3. DIETARY HABIT

Table - 4

Dietary Habit

	Low fibre diet	High fibre diet
Histologically positive for appendicitis (n = 176)	140(79.5%)	36(20.45%)
Histologically negative for acute appendicitis (n=24)	8(33.3%)	16(66.6%)

This shows out of 176 patients in histologically positive group ,140(79.5%) were having low fibre diet and 36(20.45%) high fibre.

From the above table it was found that frequency of subjects taking low fibre diet in histologically positive 79.5% was higher than the negative group (33.3%).

CLINICAL STUDY

Symptomatology

Table-5

Symptomatology

Symptoms	No. of patients	Percentage
Pain RIF (Migratory)	200	100.00
Recurrent pain	42	21.00
Anorexia	192	96.00
Nausea	164	82.00
Vomiting	120	60.00

From the above table it can be found that Migratory pain was present in all of our cases & was the most common symptom present.

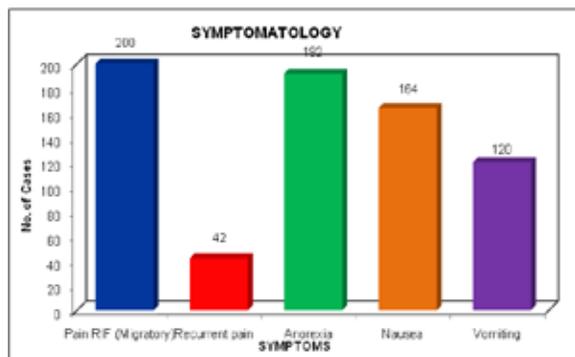


Fig. 3

Clinical Signs

Table-6

Clinical Signs

Clinical Signs	No. of patients	Percentage
Tenderness RIF (Right iliac fossa)	200	100.00
Rebound tenderness	136	68.00
Fever	140	70.00

From the above table we found that tenderness right iliac fossa was present in all cases while rebound tenderness was present in 68% of cases and fever in 70% of cases.

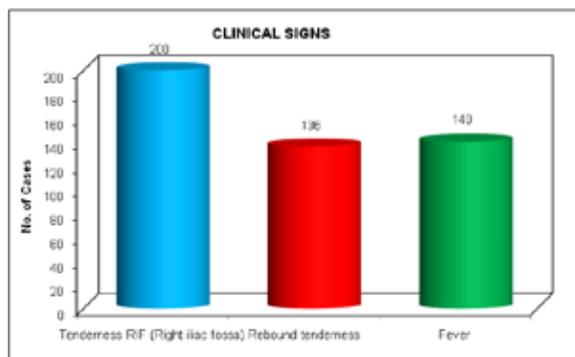


Fig. 4

LABORATORY STUDY

Total W.B.C. Count

Table - 7

Total W B.C. Count

Total W.B.C. count 1000/cc	No of patients in group A (n= 176)	No of patients in group B (n = 24)
10 < 12	74	12
12 < 14	56	8
14 < 16	24	2

16 < 18	12	2
18 < 20	8	0
> 20	2	0

We study blood for total W.B.C. count and neutrophil morphology in all cases. It shows that there is acute inflammation. From above it can be found that 73.9% of the appendicitis group shows count within 10,000 to 14,000/cc.

Neutrophil Morphology

Shift of the neutrophil to left was found in 96% of cases. The shift was not present in only 8 cases who were suffering from conditions other than appendicitis.

ALVARDO SCORE (OVER ALL)

Table - 8

Alvarado Score (Overall)

Symptoms, Signs & Laboratory findings	No. of patients	Percentage
Pain RIF (Migratory)	200	100
Anorexia	192	96
Nausea	164	82
Vomiting	120	60
Tenderness RIF	200	100
Rebound tenderness	136	68
Fever	140	70
Leucocytosis	200	100
Shift of the neutrophil to left	192	96

PATHOLOGICAL STUDY

Histology Findings

Table - 9

Histology Findings

	No of patients	Percentage
Histopathologically confirmed	176	88.00
Histologically Normal appendix	24	12.00

From the above table it can be found that Acute appendicitis was correctly diagnosed in 88% of cases by using "Alvarado Score"

Alvarado Scoring system showed diagnostic accuracy - 88%, and positive predictive value - 88%.

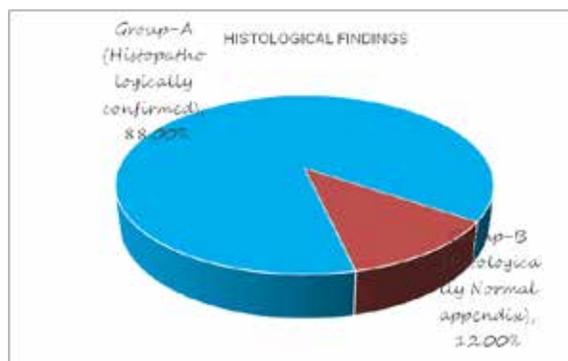


Fig. 5

COMPARISON OF NEGATIVE APPENDICECTOMY RATE

The Negative Appendicectomy Rate of this study was compared with MY P Chan et al study. It was 21% in MY P Chan et al study and it is 12% in this study.

Table- 10
Comparison of Negative Appendectomy Rate

	Present study	MY P Chan Study
Negative Appendectomy Rate	12%	21%

The negative appendectomy rate was reduced from 21% in MY P Chan et al study to 12% in this study and there is significant reduction in negative appendectomy rate.

DISCUSSIONS

Out of these 200 patients, 176 patients showed features of acute appendicitis in histopathological studies. Thus the accuracy of diagnosis was 88%. Among the study group 112 patients were male and 88 patients were female with a sex ratio of 1.27^{12,13,14}.

Among the general factors age of the patients proved important, viz. 21-30 years age group appeared most vulnerable having 42% incidence. In this study incidence in male (56%) was found to be predominant^{12,13,14}.

In this study it was found that the frequency of subjects taking low fibre diet in histologically positive appendicitis group is 79.5% and is very high. Low fibre diet intake was common in acute appendicitis patients⁴.

In this study it was found that 73.9% patients showed W.B.C. count between 10,000-14,000/cc and shift of neutrophil was found in 96% of cases showing its importance in clinical diagnosis^{13,15,16,17}.

Clinical study and investigation as per the criteria of "Alvarado Score" appears to be very effective in accurate diagnosis and establishment of accurate clinico-pathological correlation. Applying Alvarado score in this study it was found that Pain in right iliac fossa was found in 100% cases, Tenderness in 100%, Leucocytosis in 100%, Anorexia in 96%, Nausea 82%, Vomiting 60%, Rebound Tenderness in 68%, Fever 70%, Shift of Neutrophil to left in 96% cases^{12,13,14}.

"Alvarado Score" of more than 8 found to be highly effective in the establishment of accurate diagnosis, in this study it was found 88% accurate⁷.

In Histological study 88% patients proved to be histologically positive, proving diagnostic accuracy of 88%.

"Alvarado Score" also helps to reduce negative appendectomy rate as in this study it is 12% which is significantly reduced as compared to MY P Chan et al study where it was 21% with a p value of 0.04.

CONCLUSION:

To Sum up the whole thing we can conclude :

- The diagnostic accuracy of "Alvarado Scoring" was 88%.
- A score of above 8 was the main stay to increase the clinical diagnostic accuracy.
- Application of Alvarado Score reduced negative appendectomy rate to 12% and avoid unnecessary laparotomy with its hazards in patients with doubtful clinical diagnosis with low Alvarado Score.

Complications of appendicitis were avoided by timely intervention in patients with high Alvarado Score.

Cost of therapy was minimized by avoiding ultrasonography, CT Scan or laparoscopy.

The Alvarado is a noninvasive, safe diagnostic procedure, which is simple, fast, reliable and repeatable; it can be used in all conditions, without expensive and complicated supportive diagnostic methods.

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REFERENCE

P. Ronan O'Connell: The Vermiform Appendix. In: Norman S. Williams, Christopher J.K. Bulstrode, P. Ronan O'Connell; Bailey & Love : Short Practice of Surgery; 26th ed; Boca Raton: Taylor & Francis Group (publishers) Ltd; 2013p 1199-12144. | 2. John Maa, Kimberly S. Kirkwood: The Appendix.

In: Courtney M. Townsend, R. Daniel Beauchamp, B. Mark Evers, Kenneth L. Mattox; Sabiston textbook of surgery; 19th ed; Philadelphia: Elsevier Publications ; 2012; p 1279-1293. | 3. Bernard M. Jaffe, David H. Berger; The appendix. In: F. Charles Brunicaudi, Dana K. Andersen, Timothy R. Billiar, David L. Dunn, John G. Hunter, Jeffrey B. Matthews et al; Schwartz's principles of surgery; Schwartz SI (Ed); 9th edition; USA: McGraw Hill Publications; 2010; p 1073-1091. | 4. William H. Perantau, Douglas S. Smink; Appendix; In: Michael J. Zimmer, Stanley W. Ashley; Maingot's abdominal operations; 12th ed; United States of America: The McGraw Hill companies; 2007; p 623-641. | 5. Juan Rosai; Appendix; In: Juan Rosai; Rosai and Ackerman's surgical pathology; 10th ed; Missouri: Elsevier; 2011; p 714-30. | 6. John SP Lumley; The acute abdomen; Hamilton Bailey's physical signs Demonstration of physical signs in clinical surgery; 18th ed; Oxford: Butterworth - Heinemann; 2001; p 304-306. | 7. Alvarado A. A practical score for the early diagnosis of acute appendicitis. Ann Emerg Med 1986; 15: 557-564 | 8. Fenyo G. Routine use of a scoring system for decision making in suspected acute appendicitis in Adult. Acta Char Scand 1987 Sep; 153(9): 545-51. | 9. Owen TD, Williams H, Stiff G, Jenkinson LR, Rees BI. Evaluation of the Alvarado score in acute appendicitis. J R Soc. Med, Vol 85(2) 87-88, 1992. | 10. Abdeldaim Y, Mahmood S, McAvinchey D. The Alvarado score as a tool for diagnosis of acute appendicitis. Ir Med J 2007 Jan; 101(1): 342. | 11. Baidya N, Rodrigues G, Rao A. Evaluation of Alvarado score in Acute Appendicitis: A prospective study. I J Surg, 2007, Vol 9 no: 1. | 12. Lewis FR, Holcroft JW, Boey J and Dunphy JE : Appendicitis. A Critical review of diagnosis and treatment in thousand cases : Arch. Surg. 110 : 695, 1975. | 13. Pieper R., Kagerl., Nasman P : Acute appendicitis, A clinical study 1018 cases of Emergency appendectomy. Acta Chir Scand, 148 : 51, 1982. | 14. Leigh DA, Simons K, Norman E : Bacterial flora of the appendix fossa in Appendicitis and post operative infection J. Clin. Pathology. 27 : 997, 1974. | 15. Doraiswamy NV, leucocyte counts in the diagnosis and prognosis of acute appendicitis in children Br J Surg 1979; 66:782-784. | 16. Alfred H, Noehren A. H. The value of Differential leucocyte count in acute appendicitis. Ann Surg 1908, Feb; 47(2): 239-245. | 17. Wang LT, Prentiss KA, Semon JZ, Doody DP, Ryan DR. The use of WBC count and left shift in the diagnosis of appendicitis in children. Pediatr Emerg Care 2007 Feb; 23(2): 69-76. |