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General Surgery

ROLE OF ALVARADOSCORE IN DIAGNOSING ACUTE APPENDICITIS A HOSPITAL BASED STUDY

Dr. G.Kamalin Viji M.S., Professor, Department Of General Surgery, Thoothukudi Medical College, Thoothukudi.

Dr. S. Nambirajan* M.S., Assistant Professor, Department Of General Surgery, Kanyakumari Medical College, Kanyakumari. *Corresponding Author

ABSTRACT **Introduction:** Diagnosis of appendicitis is usually easy but still there is difficulty in diagnosing acute appendicitis mainly because of the challenge we face while diagnosing acute appendicitis on clinical grounds. The Alvarado scoring system in patients with pre- operative clinical diagnosis of appendicitis has been useful in the early diagnosis of acute appendicitis as demonstrated by various studies and was helpful in reducing the incidence of negative appendicectomies without increasing the morbidity and mortality

Aims: To study the effectiveness of Alvarado score in diagnosing Acute Appendicitis and its correlation with histopathological examination. A prospective study was carried out from september 2016 to June 2018 in the Department of General surgery, Tirunelveli medical college hospital

Results: Out of 100 patients studied the number of patients were highest in the age group 13 - 20 years [57%] followed by 21-30 years [27%]. Out of 69 patients operated, Ultrasonogram findings showed Acute appendicitis in 32 patients, Alvarado score was in favour of acute appendicitis even though Ultrasonogram was normal in some patients. This study also shows that application of Alvarado scoring system in the diagnosis of acute appendicitis can provide a high degree of positive predictive value and thus diagnostic accuracy

KEYWORDS : RIF pain, Alvarado Scoring, cutoff value, Treatment.

INTRODUCTION

Diagnosis of appendicitis is usually easy but still there is difficulty in diagnosing acute appendicitis mainly because of the challenge we face while diagnosing acute appendicitis on clinical grounds. Acute appendicitis being a common cause of surgical emergency needs to be diagnosed with accuracy at the earliest to reduce the morbidity and mortality associated with it. Acute appendicitis is seen in day to day practice in emergency department as one of the commonest surgical emergencies met out. It can sometimes confuse the practitioners by its presentation. The delay in early diagnosis or failure in early diagnosis may happen many times. Though there are many recent trends in investigatory modalities, diagnosis of acute appendicitis is still in a mystery, which in turn lead to increase in operative indication for the patient due to the fear of complication followed by it. There is increase in the negative appendicectomy rate of about 20 % seen in literature.

Therefore a scoring system was developed by Alvarado in 1986[1] for the diagnosis of acute appendicitis there by reducing the rate of negative appendicectomy without causing increase in morbidity and mortality. **Alvarado** described the **scoring system** in 1986. M. Kalan, D. Tabot, WJ Culliffe and AJ Rier in 1994[2] later modified it by taking one laboratory finding of the scoring system.

AIMS AND OBJECTIVES

1. To study the effectiveness of Alvarado score in diagnosing acute appendicitis.
2. To correlate the Alvarado score with post operative histopathological examination in acute appendicitis

METHODOLOGY

A prospective study was carried out from september 2016 to June 2018 in the Department of General surgery, Tirunelveli medical college Hospital after getting approval from institutional ethical committee. One hundred patients suspected of acute appendicitis were included in the study. Patients satisfying the inclusion and exclusion criteria were enrolled in the study.

Inclusion criteria: All patients presenting with right iliac fossa pain

Exclusion criteria:

- Pain > 5 days duration
- Appendicular lump/mass
- Features of Peritonitis, intestinal obstruction
- History of trauma to right iliac fossa
- Patients with genitourinary complaints, pregnant females
- Patient with previous history of any abdominal surgeries
- Age <12 years

INVESTIGATIONS

- Complete blood counts, Blood Sugar, RFT,LFT
- Chest X ray, X ray abdomen erect
- USG abdomen & pelvis
- CT abdomen & pelvis
- Scoring System

One such scoring system was Alvarado score that was based on sophisticated statistical analysis of symptoms, signs and laboratory data on 305 patients admitted to Nazareth Hospital in Philadelphia from 1975 to 1976. Studies have shown that Alvarado score has diagnostic accuracy of around 88%.

ALVARADO SCORE

MIGRATION OF PAIN (M)	1
ANOREXIA (A)	1
NAUSEA (N)	1
TENDERNESS IN RIGHT ILIAC FOSSA (T)	2
REBOUND TENDERNESS (R)	1
ELEVATED TEMPERATURE (E)	1
LEUKOCYTOSIS (L)	2
SHIFT OF WBC TO LEFT (S)	1
	10

- **Score 1-4:** Acute Appendicitis very unlikely, discharge or keep for observation
- **Score 5-6:** Acute Appendicitis maybe, regular observation.
- **Score7-10:** Acute Appendicitis probable, operate

ALVARADO SCORE

- Total score 7 – 10 (Group A): These patients were considered to have acute appendicitis and patients were prepared and emergency appendicectomy was done.
- Total score 5 – 6 (Group B): These patients were considered to be equivocal and hence they are observed by conservative management. If the general condition and the symptoms of the patients were improved, means patients were discharged with the advice to return if the symptom recurs. If the patients developed severe pain and total score got increased then patients had to be taken up for surgery.
- Total score 1 – 4 (Group C) These patients were considered to have either less severe appendicitis or some other. Such group of patients were managed symptomatically and then discharged. They were also advised to come if the symptoms recurs.
- Histopathological examination of the appendix specimen was done

DIAGNOSTIC STUDIES

Routine history and physical examination remain the most practical diagnosis modalities. No laboratory or radiological test yet devised is diagnostic of this condition.

Total White blood cells count
The polymorpho leukocytosis is an important feature of acute appendicitis.

RADIOLOGICAL STUDIES
The following are the radiological investigation used for the diagnosis of acute appendicitis:

1.X-ray abdomen
Plain films of abdomen in supine and erect position are of value in differential diagnosis of acute abdominal pain. However, they are non specific

2 .USG abdomen It is visualised on ultrasound as blind ending tubular structure with alternating hypoechoic & echogenic rings. The diagnostic ultrasound criteria for appendicitis include - Non-compressibility and distension with a diameter >6mm from outer wall to outer wall. Identification of echogenic shadowing appendicolith also considered as diagnostic of appendicitis. . In experienced hands the inflamed appendix can be visualized in 90% of patients with nonperforated appendicitis, 85% of those with an appendiceal mass and in 55% of those with free perforation of the appendix. Peritonism preventing graded compression probably accounts for the limited success in patients with appendiceal perforation. In addition air filled dilated bowel loops from adynamic ileus may hide the appendix from view.

3.CT abdomen
CT is commonly is used for diagnosis of suspected acute appendicitis. The use of 5 mm section in CT has improved the imaging utility. The sensitivity of about 90% and specificity of about 80-90% for patient with abdominal pain. The recent studies shows that the use of high resolution multi detector CT (64- MDCT) with or without oral or rectal contrast gives about 95% of accuracy in diagnosis of acute appendicitis. CT finding of acute appendicitis increase with severity of the disease.

The classical findings include
- Distended appendix with more than 7 mm diameter
- Circumferential wall thickening and enhancement
- Halo (or) target sign
- Peri appendiceal fat stranding
- Peri appendiceal edem
- Phlegmon
- Peritoneal fluid
- Peri appendiceal abscess

RESULTS AND OBSERVATIONS
1.AGE DISTRIBUTION

Age group	Frequency	Percent
<20 years	57	57.0%
21 to 30 years	27	27.0%
31 to 40 years	9	9.0%
41 to 50 years	3	3.0%
>50 years	4	4.0%
Total	100	100.0

The number of patients were highest in the age group 13 - 20 years [57%] followed by 21-30 years [27%]. The least was in the age group more than 50 years[4%]. Most of the patients were of younger age group. There is predominance in younger age group and the incidence peaks in the age group of 13 – 30 and decreases with age

2.GENDER DISTRIBUTION

		Frequency	Percent
Valid	Male	43	0.4
	Female	57	0.6
	Total	100	100.0

3.SYMPTOMS DISTRIBUTION

Features	Score	Frequency	Percentage
M	1	67	67.0%
A	1	72	72.0%
N	1	55	55.0%
T	2	98	98.0%
R	1	23	23.0%
E	1	43	43.0%
L	2	65	65.0%
S	1	42	42.0%

Majority of the patients had tenderness in right iliac fossa as the predominant symptom, followed by anorexia and migrating pain.

4. Score Groups

	Total Patients	Acute Appendicitis
Group A	54	54
Group B	31	18
Group C	15	2

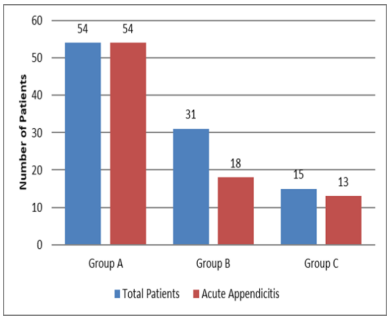
5.SCORE GROUP AND HISTOPATHOLOGY

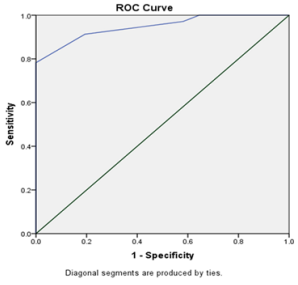
	TOTAL	OPERATED	CONSERVATIVE MANAGEMENT
GROUP A	54	54	0
GROUP B	31	13	18
GROUP C	15	2	13
	100	69	31

6. ULTRASONOGRAM FINDINGS

	HPE		
Score_group	Conservative	Acute appendicitis	Perforated appendix
7 to 10	0	43	11
5 and 6	18	13	0
1 to 4	14	1	0

Out of 69 patients operated, ultrasonogram findings showed Acute appendicitis in 32 patients Probe tenderness in RIF in 26 patients Normal in 11 patients Alvarado score was in favour of acute appendicitis even though ultrasonogram was normal in some patients





Area Under the Curve				
Test Result Variable(s): Score				
Area	Std. Errora	Asymptotic Sig.b	Asymptotic 95% Confidence Interval	
			Lower Bound	Upper Bound
0.947	.020	0.0001	.908	.986

DISCUSSION
Acute Appendicitis is the most common acute surgical condition of the abdomen. Over past 100 years, the morbidity and mortality rates related to this condition have markedly decreased. This is because of the recognition of deleterious effects of appendiceal perforation. Thus an aggressive surgical treatment strategy involving early operation with acceptance of a high negative appendicectomy rate of 15% to 30% is universal. The diagnostic accuracy of clinical assessment of acute appendicitis varies from50%-80%.The clinical diagnosis is especially difficult in the very young, the elderly and in the women of reproductive age group.

Appendicitis still poses a diagnostic challenge and many methods have been investigated to try to reduce the removal of a normal appendix

without increasing the perforation rate. Radiological methods such as ultrasonography and computed tomography, as well as invasive procedure like laparoscopy are all methods that have been investigated previously. Many diagnostic scores have seen advocated but most are complex and difficult to implement in a clinical situation. The Alvarado score, first described in1986[1], is a simple scoring system. Good clinical acumen remains the mainstay of correct diagnosis of appendicitis. It is a scoring system that can be instituted easily in the outpatient setting and a cheap and quick tool to apply in the emergency room Alvarado Score is an objective assessment of right lower quadrant pain. The score indicated >7 indicates high probability of acute appendicitis. Practically speaking, it is equivalent to one's degree of clinical suspicion. Therefore this scoring system was used to reach the clinical diagnosis. It was considered that use of the scoring system to make the clinical diagnosis would allow uniformity as more than one senior surgical resident were involved in making the decision. Men accounted for 41% and women 59% of the study group. The maximal incidence of acute appendicitis was found between the ages 21-30 years which is comparable with the literature. In the study by Ohmannet al[7]and Arian GM[6] the negative appendicectomy rate was 14.3% and 16.1% respectively. In this study all the 11 cases of perforative appendicitis had scores 7 or more and were operated and thereby giving a 0% missed perforation rate. The 2 cases which were missed initially came back with increased severity of symptoms and had a higher Alvarado score on re-evaluation and were operated. The probable reason for the 2 false negatives in our study may be the very early stage of acute appendicitis they might have presented initially, thereby hindering the clinical diagnosis.

In this study the sensitivity, specificity and positive predictive value were 89.66%, 59.52% and 75.36% respectively. This study also shows that application of Alvarado scoring system in the diagnosis of acuteappendicitis can provide a high degree of positive predictive value and thus diagnostic accuracy. Positive predictive value shown by this study is comparable with the studies done by M Kalan[2] K.A.Malik[4]and T.D.Owen[5]who reported 87.5%, 85.3% and 87.4% respectively.

Sensitivity	Specificity	PPV	NPV
89.66%	59.52%	75.36%	80.65%

COMPARATIVE ANALYSIS

M Kalan et al	**87.5%**
K.A Malik et al	85.3%
T.D owen et al	87.4%
Present study	89.6%

CONCLUSION

- Alvarado scoring system is simple,fast, reliable and easy to use. It increases diagnostic certainty of clinical examination of acute appendicitis. Alvarado Scoring System has a high sensitivity and Positive predictive value.
- This scoring system is a dynamic one, allowing observation and critical re-evaluation of the evolution of the clinical picture.
- Its value in decision making is high both in males and females.
- The Alvarado scoring system in patients with pre- operative clinical diagnosis of appendicitis has been useful in the early diagnosis of acute appendicitis as demonstrated by various studies and was helpful in reducing the incidence of negative appendicectomies without increasing the morbidity and mortality.
- Conflict of interest : None
- Funding : Nil

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