

# A PROSPECTIVE STUDY TO EVALUATE ALVARADO SCORE IN ACUTE APPENDICITIS

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## Surgery

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### Abstract:

The present study has been conducted in Departments of Surgery and Pathology, S.N. Medical College & Hospital, Agra during a period from January 2011 to October 2012. Out of 47 patients 25 were males and 22 were females. There is preponderance of males over females. Appendicitis is common in younger age group (11-30 yr) 74.47% in both sexes. Appendicitis is rare in extremes of ages (children & old) in both sexes. Rate of negative appendicectomy in the study is 17.02%. Rate of negative appendicectomy in males is 12.0%. Rate of negative appendicectomy in females is 22.72%. Pain in right lower abdomen is the most consistent symptom & is present in all patients. Pain migration from periumbilical area to right lower quadrant is the second most common symptom followed by nausea, vomiting and fever. Mc Burney sign is the most common sign elicited. Psoas sign is the least common sign among patients. Migratory right iliac fossa pain is the most common symptom of Alvarado scoring system and is present in 31 patients. Right iliac fossa tenderness is the most common sign elicited of Alvarado scoring system and is present in 45 patients. Leucocytosis is present in 35 patients of appendicitis. Total 8 patients having Alvarado score 5 or <5 out of which 3 (37.50%) were negative for appendicitis on histopathological examination. Total 30 patients having Alvarado score 6-8 out of which 26 (86.67%) were positive for appendicitis on histopathological examination. Total 9 patients having Alvarado score 9-10 out of which 8 (88.89%) were positive for appendicitis on histopathological examination. Among 47 patients of clinically suspected appendicitis, 39(82.97%)patients were positive for appendicitis on abdominal Ultrasonography. 2 patients were negative for appendicitis and 6 patient's reports were inconclusive. Among 39 patients, who were positive for appendicitis by Ultrasonography, 37 were positive for appendicitis on histopathological examination. Over all negative appendicectomy rate in our study is 23.40%. In patients having Alvarado Score 6 or >6 the negative appendicectomy rate is 12.82%. In Patients operated having USG reports positive for appendicitis, the rate of the negative appendicectomy rate is 5.13%. No imaging studies are needed in patients with classic appendicitis.

**Key words** – appendicitis, appendicectomy, Alvarado score, ultrasonography.

### Introduction

Appendicitis is a common and painful condition present in day by day practice of a physician or surgeon.<sup>1</sup> this disease have many mimickers . diagnosing this entity is

not possible with a single diagnostic tool.

The emergency duty doctor have to fight with him or herself in cases of pain in abdomen so he/ she can give 100% to accurately diagnose the cases of the pain in

abdomen.<sup>2</sup>

If the appendicitis is suspected and patients history, physical examination and laboratory investigations are supportive no other investigation is needed. In case when there is diagnostic dilemma options are hospitalization, diagnostics to confirm the disease, laparoscopy and removal of the appendix.

Imaging is great tool, xray is not helpful, sonography is mainly operator dependent<sup>3</sup> but is inexpensive, safe and widely available. USG have difficulty in rule out the normal appendix when there is acute appendicitis. If the diagnosis is apparent from the history, physical examination, and laboratory studies, taking the patient directly to surgery without imaging is justified<sup>4</sup>. The Alvarado score<sup>5</sup> is a scoring system based on comprehensive exploration about symptoms, signs, & various lab investigation in order to aid in diagnosis and further management of acute appendicitis.

**The Score is as Following**

Characteristics Symptoms	Score
Migration of pain to right lumber quadrant	1
Anorexia	1
Nausea	1
<b>Signs</b>	
Tenderness	2
Rebound Tenderness	1
Elevated Temperature	1
<b>Lab Investigation</b>	
Leucocytosis	2
Shift of WBC count towards left	1
<b>Total</b>	10

**Interpretation of Alvarado score**

- Score 1-4 - Acute appendicitis, very unlikely - observe
- Score 5-6 - Acute appendicitis, may be - observe
- Score 7-8 - Acute appendicitis, probable - operate
- Score 9-10 - Acute appendicitis, definite - Operate

In this study, ‘Evaluation of Alvarado score in acute

**Appendicitis:** A prospective study’, we are trying to establish the importance of Alvarado score in establishing diagnosis and surgical management of acute appendicitis for young trainee surgeons

**Aims And Objectives**

- (1) To establish the Alvarado score in relation to the diagnosis and Surgical management of acute appendicitis
- (2) To assess the accuracy of ultrasonography (USG) in the diagnosis and compare it with the Alvarado score.

**Material And Method**

This study has undertaken the entire patient admitted for suspected case of acute appendicitis in the Department of Surgery of S.N. Medical College & Hospital, Agra in collaboration with department of pathology, S.N. Medical College & hospital, Agra from January 2011 to October 2012.

**Inclusion Criteria:** Patient presenting with high suspicion for acute appendicitis are right quadrant pain, abdominal rigidity & migration of pain from the peri-umbilical region to the right lower quadrant.

**Exclusion Criteria:** 1. Rt. Sided ovarian cyst 2. Typhilitis 3. Ureteric colic 4. Ileocaecal tuberculosis 5. Right sided abdominal lump.

A prospective chart analysis was performed for all the patients who underwent appendectomy. All incidental and interval appendectomies were excluded. Only patients who were admitted for suspected acute appendicitis and whose appendices were physically removed and subjected to histopathology were included.

**Patients have been divided into two groups**

1. Patient who diagnosed clinically.
2. Patient who diagnosed on the basis of imaging modalities

**Criteria For Diagnosis**

**Clinical Criteria**

**Symptoms**

1. Pain in lower abdomen on right side.
2. Pain migration from peri-umbilical area to right lower quadrant.

3. Fever,
4. Nausea & vomiting,
5. Anorexia

## SIGNS

1. **Mc Burney Sign:** Localized right lower quadrant pain or guarding on palpation of the abdomen.
2. **Psoas Sign:** Pain on hyperextension of right thigh (often indicates retroperitoneal retrocaecal appendix)
3. **Obturator Sign:** Pain on internal rotation of right thigh (pelvic appendix).
4. **Rovsing Sign:** Pain in the right lower quadrant with palpation of the left lower quadrant.
5. **Dunphy's Sign:** Increased pain in the right lower quadrant with coughing.
6. **Hip Flexion Sign:** Patient maintains hip flexion with knees drawn up for comfort.
7. **Rebound Tenderness**

**Note:** The absence of these signs does not exclude appendicitis.

## Hemogram & Blood Biochemistry

Hb (gm%), Total leucocyte count (/cmm), Differential leucocyte count, Segmented neutrophil count (%), Serum urea (mg/dL), Serum creatinine (mg/dL), Random blood sugar (mg/dL), Serum electrolyte [Na<sup>+</sup>, K<sup>+</sup> & Ca<sup>2+</sup>]

All tests excluding TLC, DLC & Segmented Neutrophil Count have been performed for evaluation of co-morbid condition before taking to the patients for appendicectomy. Alvarado (MANTRELS) scoring has been done to use its significance in clinical diagnosis of acute appendicitis in emergency.

## Imaging Criteria Ultrasonography

1. Distended appendix (>6 mm in anteroposterior dimension).
2. Periappendiceal inflammatory changes. Inconclusive reports will be taken as negative for acute appendicitis.

All patients investigated by USG for suspected acute appendicitis. The appendicectomy was carried out in all patients using either the standard or the modified gridiron incision. Excised appendix was sent for histopathological examinations and reports were collected. When there was a discrepancy between the surgeon's operative diagnosis and the pathologist's diagnosis, based on gross and histological examination of the appendix, the pathologist's diagnosis was assumed to be correct.

## Observations

The present study on "Evaluation of Alvarado Score In Acute Appendicitis : A Prospective Study" has been conducted on 47 patients admitted in SURGERY DEPARTMENT as a case of appendicitis to S.N. MEDICAL COLLEGE & HOSPITAL, AGRA, during a period from January 2011 to October 2012. All patients underwent emergency appendicectomy on clinical ground but all of them were investigated by radiological imaging techniques like ULTRASONOGRAPHY of abdomen.

## The following observations were made

SEX INCIDENCE IN SUSPECTED APPENDICITIS Out of 47 patients 25 were males and 22 were females. There was preponderance of males over females. Maximum no. of cases of appendicitis was found in the age group of 11-20 years of age (44%), and most of the cases in the age group of 11-30 years of age (72%). No cases were reported in age less than 10 year. No cases were reported in age more than 55 year. Appendicitis was rare in children and very old males Maximum no. of cases was found in the age group of 11-20 years of age (45.45%), and most of the cases in the age group of 11-30 years of age (77.27%). Appendicitis was common in younger age group (11-30 yr) 74.47% in both sexes. Appendicitis was rare in extremes of ages (children & old) in both sexes. Rate of negative appendicectomy in study was 17.02%. Rate of negative appendicectomy in males was 12.0%. Rate of negative appendicectomy in females was 22.72%.

Pain in right lower abdomen was most consistent symptom & was present in all patients. Pain migration from periumbilical area to right lower quadrant was second most common symptom followed by nausea, vomiting and fever. Anorexia was not common among patients. Mc Burney sign

was most common sign elicited (78.72%). Psoas sign was least common sign among patients (19.15%). Migratory right iliac fossa pain was most common symptom of Alvarado scoring system and was present in 31 patients. Right iliac fossa tenderness was most common sign elicited of Alvarado scoring system and was present in 45 patients. Leucocytosis was present in 35 patients of appendicitis.

### **Alvarado Score Statistics**

In most of the clinically suspected appendicitis patients, Alvarado scores were between 6 to 8 and comprised of total 30 (63.83%) patients. Alvarado score was 5 or <5 in 8 patients having suspected Appendicitis. Total 8 patients having Alvarado score 5 or <5 out of which 3 (37.50%) were negative for appendicitis on histopathological examination.

Total 30 patients having Alvarado score 6-8 out of which 26 (86.67%) were positive for appendicitis on histopathological examination.

Total 9 patients having Alvarado score 9-10 out of which 8 (88.89%) were positive for appendicitis on histopathological examination.

### **Diagnosis On The Basis Of Radiological Investigations**

All patients investigated by radiological imaging technique ULTRASONOGRAPHY of abdomen. After appendectomy, organ was sent for histopathological examination, and reports were collected.

### **Ultrasonography Abdomen In Case Of Suspected Appendicitis**

Among 47 patients of clinically suspected appendicitis, 39(82.97%) patients were positive for appendicitis on abdominal Ultrasonography. 2 patients were negative for appendicitis and 6 patient's reports were inconclusive.

Among 39 patients, who were positive for appendicitis by ultrasonography, 37 were positive for appendicitis on histopathological examination

Among 8 patients, who were negative for appendicitis by ultrasonography, 2 were positive for appendicitis

on histopathological examination other 6 patients were negative for appendicitis on histopathological examination.

### **Comparison Of Alvarado Score & Ultrasonography**

Over all negative appendectomy rate in our study was 23.40%.

In patients having Alvarado Score 6 or >6 the negative appendectomy rate was 12.82%. In Patients operated having USG reports positive for appendicitis, the rate of the negative appendectomy rate was 5.13%.

Among 39 patients who were positive for appendicitis by ultrasonography, 37 were of Alvarado score 6 or >6. Among 8 patients who were negative for appendicitis by ultrasonography, 2 were of Alvarado score 6 or >6. Other 6 patients were of Alvarado score 5 or <5. The p value for overall accuracy of ultrasonography in the diagnosis of appendicitis to that of the surgeon's clinical impression is less than 0.0001

### **Discussion**

The study included 47 patients comprising 25 males (53%) and 22 females (47%) with ages ranging from 11 to 55 years (mean 25 years).

Male to female ratio in this study was 1.14: 1. Most of the cases were in young age group (11-30) in both males and females. Appendicitis is not a common disease at the extremes of ages in either sex. Similar study done by O'Connell PR et al<sup>6</sup> that acute appendicitis was most common in the 21-30 years age group (68%). Epidemiological studies have shown that appendicitis is more common in the 10-29 years of age group. Male is more susceptible than female. The classic presentation of acute appendicitis involves the orchestrated complaint of vague periumbilical pain that localizes to the right lower quadrant and is accompanied by anorexia, nausea and emesis. Most common complaint of a patient presenting with appendicitis is pain in lower abdomen on right side and was present in all patients in this study. Second most common complaint is migration of Pain from periumbilical area to right lower quadrant. On examination of patients, the most important sign which leads towards diagnosis of appendicitis is Mc Burney sign. Only 55% of patients

with appendicitis present with classic history and physical findings. This is because the early signs and symptoms are primarily dependent upon the location of the tip of the appendix, which is highly variable. Alvarado score is a very useful scoring system for rapid diagnosis of appendicitis in emergency OPD to take the patients for appendicectomy. Migratory RIF Pain is most common symptom in this score followed by Nausea and Vomiting. Anorexia is not much common.

Right Iliac Fossa Tenderness is the most common sign and was present in nearly all (95%) patients. Approximately 20-33% of the patients, suspected of having acute appendicitis, presented with atypical findings including laboratory investigations according to various literatures. Leucocytosis is very important laboratory investigation and was present in 35 (74%) patients. Yang et al<sup>7</sup> reported that TLC, neutrophils and shift to left may be helpful in diagnosis of acute appendicitis, and patients with normal values in all the three tests are highly unlikely to have acute appendicitis. Osterweil N<sup>8</sup> found 80-85% patients with acute appendicitis to have TLC count of more than 10,000/cmm. TLC was regarded as sensitive test for diagnosis of acute appendicitis but was not diagnostic because of its lower specificity. Leukocyte count by itself is not completely preventive against negative appendicectomy, a finding consistent with results of the current study. Our study suggests that patient with a score of 5 or <5 had less appendicitis and negative appendicectomy rate was more.

The score of 6 or more can be used as a criterion for appendicectomy of patient with suspected appendicitis. The same result was concluded in prospective study done by Chan MY. et al<sup>9</sup>. He incorporated Alvarado score in an algorithm for patient admission for suspected acute appendicitis. Negative appendicectomy rate in our study is 23.40% (male- 12%, female 22.72%). Assessing the sensitivity of Alvarado score as a defining line for appendicectomy of patients with suspected appendicitis, we have found that a score of 5 has negative appendicectomy rate 37.50%. Use of a higher score 6-8, the negative appendicectomy rate is 12.80% and on further higher score 9-10, negative appendicectomy rate is 11.11%. The key to successful management of acute appendicitis depends on prompt diagnosis and early surgical intervention. The clinical diagnosis of acute appendicitis is often not straightforward and A negative rate of appendicectomy of 20%- 40% is not an unusual finding in surgical literature. The percentage of normal appendicectomies in various

series varies from 8 to 33%. In a study, Fitz et al<sup>10</sup> observed negative appendicectomy rate as 17%. There is an inverse relationship between negative appendicectomy rate and perforation rate. For the entire modern era of surgery, many surgeons opined that maximum 15-20% negative appendicectomy is acceptable. Removal of normal appendices is inevitable to lower the rate of perforation and consequent mortality. On the other hand, unnecessary appendicectomy carries long term risks to the patients. From this study it was found that the higher the score, the more is its sensitivity. Patients with the Alvarado score ranges 9-10, 6-8 and <5 have the accuracy 88%, 86%, and 62% respectively. In a study, Alberti LR et al<sup>11</sup> has shown the sensitivity of the patients with the score 7 and above was 94% in male and 81% in female and the combined sensitivity was 88%. Whereas it was 69% in male and 63% in female and the combined sensitivity was 67% in the patients with score less than 7. Similar sensitivity was found in another study. It is generally accepted that in men the negative appendicectomy rate should be below 20% and rates of 10%-15% are commonly reported. In contrast, young women commonly present with acute gynaecological illnesses that closely mimic acute appendicitis. Reported negative appendicectomy rates in ovulating women thus remain disturbingly high and range from 34%-46%.

Regarding the position of the appendix intra-operatively, 36 were retrocaecal, 4 pelvic and 4 retroileal. In the other 3 patients, the position of the appendix was not identified. No clear effects of the site of the appendix on the patient score were noted. A surgical specialist who manages appendicitis based solely on clinical criteria is at risk to face either increased rates of negative appendicectomy (in case he/she is aggressive) or increased perforation and sequelae (in case he/she prefers conservative management). So, the challenge for a surgical specialist is how to balance between efforts to reduce negative appendicectomy rate without increasing the perforation rate. Imaging can play a great role in making an early diagnosis of appendicitis and also suggest alternative diagnosis thereby reducing both negative appendicectomy rate as well as perforation rate. USG was very sensitive diagnostic test for suspected appendicitis and sensitivity was 94.87% in our study. The specificity was not much high and it was weaker tool to exclude normal appendix. The specificity of USG was 75.0%. Prospective studies have shown excellent results, with an average sensitivity of 94% and a specificity of 86% under the conditions of well-controlled clinical trials, namely in the hands of experienced examiners. In addition,

many reported studies included patients with classic appendicitis instead of patients with equivocal clinical histories and physical findings. Such good results reported in prospective clinical trials were not frequently duplicated in routine clinical conditions. In fact, the accuracy of ultrasonography was no better than that based on clinical evaluation by the surgeons, and low sensitivity and high false negative rates have been reported.

Ultrasound is most useful for excluding other diagnoses. In women, pelvic pathology, such as pelvic inflammatory disease, ruptured Graafian follicle, twisted ovarian cyst or tumour, endometriosis, and ruptured ectopic pregnancy, can be readily detected by ultrasonography. In experienced hands, US significantly improves the diagnostic accuracy in suspected appendicitis while reducing the negative laparotomy rate to 8-15%.

### Conclusion

The overall accuracy of Ultrasonography in the diagnosis of appendicitis in clinical impression of surgeons is <0.05.

No imaging studies are needed in patients with classic appendicitis. This has been confirmed by a retrospective study determining predictive values for appendicitis (Alvarado score) based on history and physical findings. Prospective comparison of the accuracy of the Alvarado score with ultrasound findings in various studies is similar. In this study, 25% of the patients with normal ultrasound findings were ultimately found to have appendicitis at operation, emphasizing the point that ultrasonography cannot be relied on to the exclusion of the surgeon's careful and repeated evaluation

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