

# Practical tool in diagnosis of acute appendicitis

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## Abstract

Patients who report to the casualty after office hours are left to the expert management of a single surgical consultant on duty and his junior colleagues viz Postgraduates and junior doctors. Diagnosing a patient in such situations with the history of lower abdominal pain as Acute Appendicitis is indeed based on clinical findings, Biochemical and Radiological Investigations. Often too much of weightage is given to Biochemical and Radiological Findings than clinical Examinations thus proceeding with wrong procedure or inactivity ending up with increased morbidity or mortality. Delayed or incorrect diagnosis, therefore has both clinical and economic consequences. Despite much ink has been spilled on this subject, Diagnosing a case as Acute Appendicitis is still equivocal for the surgeon on duty as Presentation with typical clinical symptoms and signs, biochemical parameters and Radiological findings are not common. Hence this study attempts to reveal the practical management of a suspected case of Appendicitis. This study aims to provide the effective guide among the three parameters routinely done, thus preventing over diagnosis and an unwanted Emergency Appendectomy.

**Keywords:** Vermiform Appendix, clinical diagnosis, Intra operative findings.

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## INTRODUCTION

Appendicitis is not a rare problem. The classical symptoms and signs in this Disease are elaborated with various names like MANTRELS (ALVARADO SCORING)<sup>1-10</sup>, The typical presentation of the disease is rare sometimes thus forming a diagnostic dilemma for the surgical consultant during odd hours, where he has to take correct decision in the interest of the patient, despite advances in technology with respect to Biochemical and Radiological Investigations. There is still a possibility of error on the part of the Radiologist who could be the only consultant to interpret and give a provisional verdict that has to be correlated with biochemical and clinical

findings. The rate of perforation is reported to increase by 5% per 12 h period 36 h after the onset of symptoms, therefore, expedient diagnosis and treatment are required<sup>3</sup>. The misdiagnosis of Appendicitis is as high as 15% in USA which has resulted in loss of more than 740 million dollars<sup>3</sup>, The Extrapolated Incidence of Acute Appendicitis in India is 2,662,676 of 1065070607 cases. Primary observational descriptive cross sectional study was undertaken to reduce misdiagnosis and to find out the most practical tool in the diagnosis and in the management of Acute Appendicitis.

## Problems identified

Appendicitis is most frequently occurring emergency problem, Patients present with varied clinical patterns at odd hours. As it is a well known fact that many who develop abdominal pain in the day time endure until evening before they feel compelled to come to the hospital and pose difficulty to the minimal expertise available, as the surgeon weary with the day's work, and with perceptions and reasoning faculties somewhat jaded, is both physically and mentally below his best, alone is available during such time. Despite enormous development in the investigation modalities valuable time is lost in proceeding to get the tests done and much more

time is lost in getting the interpretation done, which is not acceptable in emergency situations as by the saying of Sir Zachary cope "Never let the sun dawn on the patient with Acute Abdomen".

## **OBJECTIVES AND SCOPE**

To find out the most practical diagnostic tool in the Diagnosis of Acute Appendicitis. To prevent unwanted costly investigations which may not be relevant to the disease and it may delay judicious treatment and increase the cost of treatment.

### **Limitations**

On the table observation of the operating surgeon. Purposive sampling method.

### **Deliverables**

Reliance on clinical examination is the corner stone for a Diagnosis of Appendicitis and to use laboratory and Radiological tests as secondary contributory factors in the diagnosis of Appendicitis, as major delays in diagnosis happens due to the need by some to obtain special complicated tests.

### **Clinical Presentation**

With appropriate clinical history and physical examination, clinical diagnosis of Appendicitis can be made. There are other conditions that can mimic Appendicitis which may have to be ruled out before taking up the patient for definite procedure in acute abdomen. Patients present as Abdominal pain as cardinal symptom which is migratory from umbilicus to The Right Lower Half of the Abdomen with vomiting classically known by its discoverer Murphy in the year 1904<sup>8</sup>. As this classical symptom is present only with fifty percent of Patients presenting with Appendicitis, pain initially is mild colicky peri umbilical later on becoming constant severe pain at Right iliac fossa, linked with loss of appetite. Patients may have low grade temperature, usually the symptoms vary according to the Anatomical position of the Appendix. Atypical presentation occurs with patients with extremes of age.

### **Physical Examination**

On examination patients may present with low grade fever, associated with Tachycardia. Patient may restrict movement as movement will aggravate abdominal pain. On Examination of Abdomen: tenderness is felt in the Mcburneys point<sup>7</sup>. With signs of Guarding and Rigidity, rebound tenderness may be positive. The above signs are classical and there is high likelihood chance of Acute Appendicitis in such patients as a LR +=4.0 for the presence of Rigidity<sup>11</sup>. A rectal or vaginal examination tenderness may mean an Pelvic Appendix. Rovsings sign is named after Danish surgeon Niels Rovsing and is present when palpation in the left iliac fossa results in pain in the right iliac fossa<sup>11</sup>. Inflamed Appendix may

irritate the psoas muscle and may produce flexion at the Hip joint when the patient is in lying down position. Passively flexing the right hip and internally rotate may stretch the Obturator muscle and causes pain<sup>11</sup>, Despite these classical findings, there can be equivocal cases producing diagnostic dilemma to the consultant.

### **Laboratory Investigations**

The main simple investigation which may aid the consultant is total count and differential count which may point towards inflammation and polymorphocytosis. Some may do a CRP test. Female patients in reproductive age group, A urine Beta Gravindex test may be mandatory.

### **Radiological Investigations**

Ultrasound Abdomen is most common investigation of choice, but it shows extreme inconsistency in the diagnosis of Appendicitis. It was first introduced by Puylaert in 1986.<sup>7</sup> The advantage is that it is a non invasive technique and Repeatable but operator dependant. Computed Tomography (CT) is the next Radiological modality, but may not be available in rural areas and it is expensive. The classical findings that may suggest an Appendicitis are a thickened wall, a non compressible lumen, outer Appendiceal diameter greater than 6mm, absence of gas in the lumen, appendiculoliths, echogenic inflammatory periappendiceal fat change and increased blood flow in the wall of the appendix<sup>1,9</sup>. Ultrasound Abdomen may not reveal the above findings and it is helpful in detecting or to rule out other possible pathologies. Patient with clinical evidence of Acute Appendicitis and a normal Ultrasound finding is considered to have the disease.

### **Methodology**

A purposive Sample of 74 patients taken up for the study during January 2012 to May2015, who presented to the casualty with symptoms of Lower Abdominal pain after routine Outpatient Department timings Presented to the Duty Consultant surgeon and are Admitted to the surgical ward in the General surgery Department at Chettinad Hospital and Research Institute, Padur, a village near kelambakkam, Kancheepuram District and Who are clinically diagnosed as Appendicitis further subjected to routine Blood investigations of which Total count and differential count is taken up and Ultrasound whole Abdomen is done. Patients are taken up for Appendectomy under Regional or Spinal Anaesthesia, On the Table findings is compared with the Above investigations and Observed Data obtained and the relevant statistical tools Applied and output generated. Intra operative finding versus Ultrasound Abdomen finding. Ho: There is difference in findings between intraoperative findings and Ultrasound Abdomen findings Ha: There is no difference in findings between

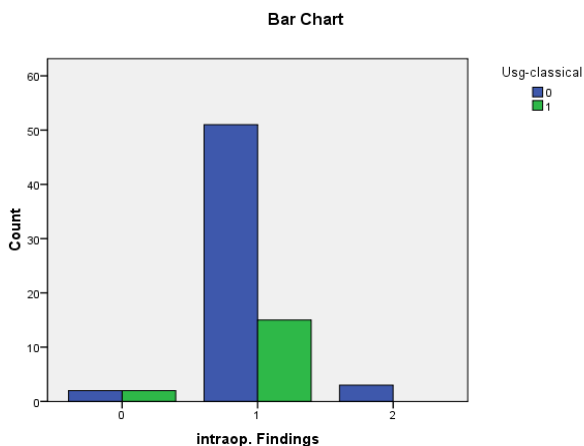
intraoperative findings and Ultrasound Abdomen findings.

**Table 1:** Showing relationship between USG-Whole Abdomen versus Intraoperative findings

Usg-Whole Abdomen findings		Normal study	Inflamed Appendix	Total
intraop Findings	Normal Appendix	2	2	4
	Inflamed Appendix	51	15	66
	Pathology Other than Appendicitis	3	0	3
	<b>Total</b>	<b>56</b>	<b>17</b>	<b>73</b>

Chi square = 2.520 P = 0.28

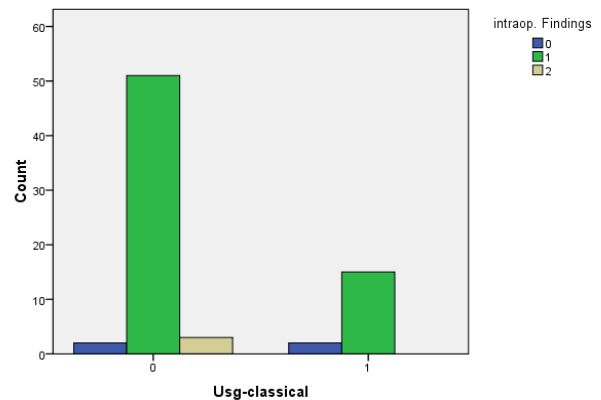
4 As P>0.05, We accept Null Hypothesis (Ho) and Reject Alternate Hypothesis (Ha).



**Figure 1:** showing relationship between usg-abdomen findings and intraoperative findings

USG – 0-Normal study \_Blue bar// 1-Features of Acute Appendicitis-green bar. Intraoperative findings- 0-Normal, 1- Inflamed Appendix, 2-other pathology.

**Bar Chart**



**Figure 2:** Showing relationship between USG-Abdomen-classical Appendicitis impression versus Intraoperative findings

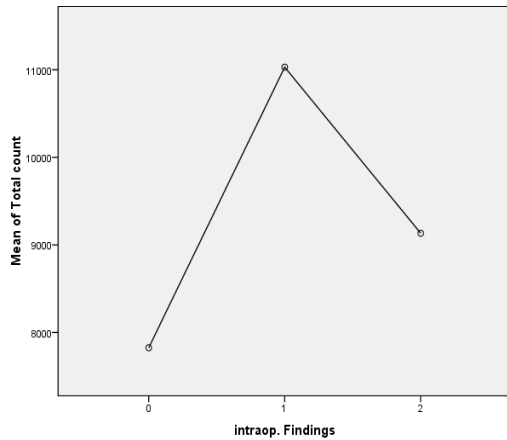
Usg-normal study-0./ appendicitis-1. Intraoperative findings-0-normal appendix, 1-appendicitis, 2-other pathology

**Oneway analysis of variance**

In this The Total count and differential count are taken as variables and compared with intraoperative findings, It has been found in our study that with normal intraoperative findings the average mean Total count was found to be 7825, The average mean with Acute Appendicitis was found to be 11030 and with other pathology the mean average was 9133. Thus Total count can be taken as a important parameter in the diagnosis of Acute Appendicitis. The Differential count Mean average with respect to intra operative findings are 55, 76.41 and 66.33 with Normal findings, Acute Appendicitis and Other pathological findings respectively. Elevated polymorph count indicating presence of an inflammatory foci.

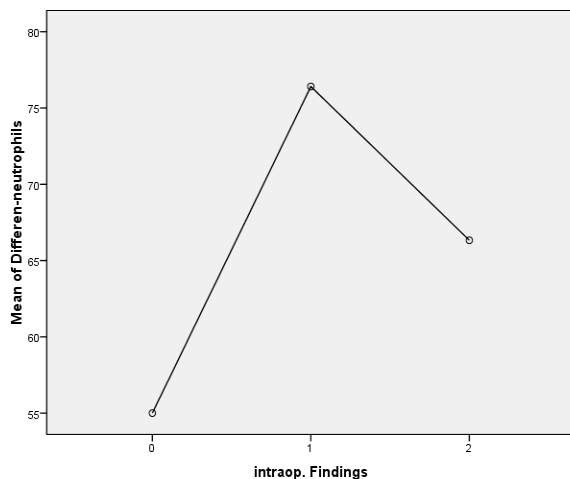
**Table 2:** Showing relationship of Total count, differential count with intraoperative findings (0-normal findings, 1-Acute Appendicitis, 2-Other pathology)

		N	Mean	SD	SE
Total count	0	4	7825.00	1364.734	682.367
	1	66	11030.30	3303.423	406.623
	2	3	9133.33	2003.331	1156.623
	<b>Total</b>	<b>73</b>	<b>10776.71</b>	<b>3270.513</b>	<b>382.785</b>
Differen- neutrophils	0	4	55.00	10.296	5.148
	1	66	76.41	8.979	1.105
	2	3	66.33	6.807	3.930
	<b>Total</b>	<b>73</b>	<b>74.82</b>	<b>10.277</b>	<b>1.203</b>



**Figure 3:** Graphical representation of total count with intraoperative findings Means Plots

Intraoperative findings- 0-Normal, 1- Appendicitis, 2- other pathology.



**Figure 4:** Showing relationship between intraoperative findings and neutrophil count

0-Normal findings, 1-Appendicitis, 2-other pathology.

**ROC curve**

Variable	Differen_neutrophils
Classification variable	intraop._Findings_final
	intraop._Findings final

Sample size	73
Positive group : intraop._Findings final = 1	69
Negative group : intraop._Findings final = 0	4

Disease prevalence (%)	unknown
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**Area under the ROC curve (AUC)**

Area under the ROC curve (AUC)	0.952899
Standard Error <sup>a</sup>	0.0297
95% Confidence interval <sup>b</sup>	0.876152 to 0.988696
z statistic	15.261
Significance level P (Area=0.5)	<0.0001

De Long *et al.*, 1988, Binomial exact

**Youden index**

Youden index J	0.8841
Associated criterion	>67

- AUC can be interpreted as the probability that the test result from a randomly chosen diseased individual is more indicative of disease than that from a randomly chosen non diseased individual:  $P(X_i \geq X_j | D_i = 1, D_j = 0)$
- So can think of this as a non parametric distance between disease/ non disease test results

Hypothesis: There is no close accuracy in predicting the disease. Since Area under curve = 0.952889 and  $p < 0.0001$ , rejecting null hypothesis and states that the diagnostic tool is good accuracy in predicting the appendicitis.

**OBSERVATIONS AND RESULT**

74 patients were taken up for the study. Patients were selected by purposive sampling from casualty, All patients are clinically diagnosed as Acute Appendicitis, Total count and Differential count and Ultrasound Whole Abdomen done before Surgery. No significance was found with respect to Age and gender. 66 patients were found to have Inflamed Appendix, 4 patients were found to have normal Appendix and 3 patients were found to have pathology other than Appendicitis. (1-Mekels diverticulum, 2-Duodenal Ulcer perforation and 3-Right sided torsion of Ovarian cyst.). The Mean Total count and Standard deviation in Appendicitis, with other pathology and Normal patients were 11030.30/SD=3303.423  $n=66$ , 9133.33/SD=2003.331  $n=3$  and 7825.00/SD=1364.734  $n=4$  respectively. The Mean polymorph count and Standard deviation in Appendicitis, Other pathology and Normal patients were 76.41 SD=8.979  $n=66$ , 66.33/SD=6.807  $n=3$ , 55 /SD=10.296  $n=4$  respectively. ROC curve with respect to neutrophils and intraoperative findings shows  $n=69$  with positive findings and  $n=4$  with negative findings, The Area under the ROC curve (AUC) is 0.952899, at 95% confidence interval it is from 0.876152 to 0.988696. indicating that Polymorphocytosis is a Good Diagnostic tool in predicting disease. USG Abdomen showed classical findings of Appendicitis in 17 patients of which 15 patients were confirmed on surgery, 2 patients had normal

Appendix.56 patients were found to have an impression of Normal study at USG Abdomen of which 51 had

Inflamed Appendix, 3 patients had other pathology and 2 patients had Normal Appendix at Surgery.



Figure 1: Intra operative Laparoscopic Appendectomy.



Figure 2: Inflamed Appendix



Figure 3: Inflamed Appendix specimen



Figure 4: Intra operative picture showing Mekels diverticulum



Figure 5: Excised specimen of Mekels diverticulum

## CONCLUSIONS

Despite the advent of Modern Diagnostic technologies, Diagnosing a case of Acute Appendicitis depends on Surgeon's clinical skills in emergency settings and biochemical and Radiological investigations should be taken as contributory factors to aid in the clinical diagnosis.

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