

**A study of clinicopathological and radiological correlation in the diagnosis of appendicitis**

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**Abstract**

**Background:** Acute appendicitis is among common abdominal surgical emergencies. Precise diagnosis of acute appendicitis still remains a challenge. The aim of this study was to assess the efficacy of radiological imaging in the precise diagnosis of acute appendicitis.

**Methods:** This study was conducted at a tertiary care hospital, over a period of one year. The waiver of consent was obtained from the institutional ethics committee for academic research projects. Patients with clinical suspicion of acute appendicitis who mandated radiological investigations were included. Patient data were collected from the institutional medical record section and analyzed.

**Results:** Commonest patient age group was 18 to 28 years; with a mean age of 25.6 years. Features consistent with acute appendicitis were demonstrated in (66.6%) patients on ultrasonography and in (90%) patients on

computed tomography. In our study, the sensitivity of ultrasound in the diagnosis of acute appendicitis was (69.2%), whereas on computed tomography it was (96.1%), which was statistically significant (P = 0.02).

**Conclusion:** Computed tomography has a distinctive role in the diagnosis of acute appendicitis. It is more sensitive and reliable as compared to ultrasound specifically when the diagnosis of appendicitis is in dilemma.

**Keywords:** Appendicitis, appendicectomy, ultrasound, computed tomography.

**Introduction**

Acute appendicitis is one of the most common surgical emergencies. Classical symptoms of acute appendicitis are periumbilical or right iliac fossa pain, fever, nausea, and vomiting. However, these are seen in only 50-60% of patients<sup>1</sup>. Diagnosis of acute appendicitis is clinical but, patients with extremes of ages and young women with acute gynaecological conditions can present as a

diagnostic dilemma. The various scoring system may aid in the diagnosis of acute appendicitis however, they are subjective and with low sensitivity. Acute abdominal conditions such as mesenteric lymphadenitis, Meckel's diverticulitis, right ureteric calculus, perforated peptic ulcer, typhlitis, and gastroenteritis can mimic appendicitis. Precise diagnosis of acute appendicitis still remains a challenge. Accurate diagnosis is essential in decision-making. In most surgical clinics diagnosis is made on a clinical ground, which may add to the rate of negative appendectomy. In our literature review, the reported rate of negative appendectomy varies from 4 to 45%<sup>2-4</sup>. In recent years advances in radiological investigations have helped in excluding other conditions mimicking acute appendicitis. The purpose of our study was to assess the efficacy of radiological imaging in the precise diagnosis of acute appendicitis in clinical practice in a tertiary care institute to avoid negative appendectomy.

### Results

The most common age group was 18 to 28 years in 18(60%) patients, with the mean age of presentation being  $25.66 \pm 4$  years. There was male predominance Table 1: Patients distribution according to age and gender.

Age in years	No. of patients (%)
18 to 28	18(60%)
29 to 39	7(23.3%)
40 to 50	5(16.7%)
Sex	No. of patients (%)
Male	19(63.3%)
Female	11(36.6%)

In the study population of 30 patients, pain in the right iliac fossa was a commonest presenting symptom (66.6%), right iliac fossa tenderness was demonstrated in (86.6%) patients, and leucocytosis was observed in (80%) patients. Alvarado's score was  $> 7$  in (60%) patients. [Table 2]

### Methods

This study was conducted in tertiary care hospital include patients over a period of one year. The waiver of consent was obtained from the institutional ethics committee for academic research purposes; in view of the retrospective nature of the study and all the procedures being performed were part of the routine care. Patients presented in emergency with clinical suspicion of acute appendicitis and required radiological investigation, such as ultrasound (USG) and/or computed tomography scan (CT) to confirm the diagnosis were included. Patients with age less than 18 years and pregnant females were excluded from the study. Data collected from the medical record section of an institute which includes demographic details, clinical and radiological findings, intraoperative notes, and histopathology reports were documented and analyzed.

amongst the study population with a male to female ratio of 1.7:1. [Table 1]

Table 2: Distribution according to clinical presentation.

Clinical profile	No. of patients	(%)
Symptoms		
Migratory right iliac fossa pain	20	(66.6%)
Anorexia	10	(33.3%)
Nausea/ vomiting	19	(63.3%)
Signs		
Right iliac fossa tenderness	26	(86.6%)
Rebound tenderness	22	(73.3%)
Elevated temperature	16	(53.3%)
Laboratory		
Leucocytosis	24	(80%)
Left shift (> 75% of neutrophils)	10	(33.3%)
Alvarado's score		
Score >7	18	(60%)
Score 5-6	11	(36.6%)
Score < 5	1	(3.3%)

On radiological investigations, ultrasound diagnosis of acute appendicitis was seen in 20(66.6%) patients. [Table 3]

Table 3: Distribution according to radiological investigations.

Investigations	No of patient's n (%)
USG findings	
Acute appendicitis	20 (66.6%)
Inconclusive	10 (33.3%)
CT scan findings	
Acute appendicitis	27 (90%)
Other diagnosis	3 (10%)

Emergency appendectomy was performed in 27 patients, intraoperative findings revealed acute appendicitis in 26 patients and appendicular abscess in 1 patient. Among 30 cases of suspected acute appendicitis, histopathology findings consistent with acute appendicitis in 26 (96.2 %) patients, and in 1 (3.7%)

patient it turn out to be mucinous adenocarcinoma. In our study, USG had a sensitivity of 69.2% and CECT had a sensitivity of 96.1% in the diagnosis of acute appendicitis. All patients had uneventful postoperative recovery. [Table 4]

Table 4: Correlation between histopathological and radiological diagnosis of acute appendicitis.

	Appendicitis on histopathology			
USG findings	Present	Absent		
Acute appendicitis	18	2	Sensitivity-69.2%	Chi square test =4.81 p = 0.02
Inconclusive	8	2	PPV- 90%	
	Appendicitis on histopathology			
CT scan findings	Present	Absent		
Acute appendicitis	25	2	Sensitivity-96.1%	
Other diagnosis	1	2	PPV- 92.5%	

USG: ultrasonography; CT: computed tomography scan.

### Discussion

Diagnosis of acute appendicitis is predominantly a clinical. The classical presentation of colicky abdominal pain, vomiting, and shift of pain to the right iliac fossa was first described by Murphy<sup>1</sup>. When acute appendicitis manifests in its classic form, it is easy to diagnose. Unfortunately, these classic symptoms occur in only 50-60% of patients<sup>5</sup>. As a result, precise diagnosis of acute appendicitis remains a clinical challenge. Patients with acute abdomen, specifically women in the reproductive age group may present with clinical findings indistinguishable from acute appendicitis<sup>6</sup>. In recent years though the mortality rate has significantly reduced, the diagnostic inaccuracy rate has remained unchanged up to 15% to 20%. False positivity in the diagnosis of this acute condition has led to the unfortunate removal of a normal appendix (negative appendectomy) in 8-30% of patients<sup>7</sup>. However, negative appendectomy can be prevented in most patients using advanced ultrasound and computed tomography. In a study conducted by Debnath et al when USG combined with CT scan in selected cases, the sensitivity, specificity, and accuracy of collective USG and CT scan were 96 %, 89 %, and 93 % respectively<sup>8</sup>. Similarly, in a study conducted by Stroman DL et al for suspected appendicitis, imaged with

ultrasound and CECT scan shown CECT had significantly better sensitivity and accuracy 30% versus 92% and 69% versus 88% (p = 0.01)<sup>9</sup>. In comparison our study ultrasound had a sensitivity of 69.2% and a positive predictive value (PPV) of 90% in the diagnosis of acute appendicitis whereas, CT abdomen showed the sensitivity of 96.1% and PPV 92.5%, which was statistically significant (P = 0.02). However, being a retrospective study and short duration was the main limiting factor of the present study.

### Conclusion

Computed tomography has a distinct role in the diagnosis of appendicitis; it is more sensitive and specific when compared with clinical methods and ultrasound abdomen. Hence, computed tomography of the abdomen is recommended as imaging of choice when a diagnosis of acute appendicitis is in dilemma. Cost-effectiveness and easy availability in the smaller centres may be limiting factors.

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