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# Role of CT Scan in Diagnosing Acute Appendicitis: Accuracy and Outcomes

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## Abstract

### Background

Emergency abdominal surgery frequently results from acute appendicitis, and prompt identification is essential to prevent complications like perforation, abscess formation, and needless procedures. Although computed tomography (CT) has become a crucial imaging modality for precise diagnosis, its impact on clinical outcomes and diagnostic performance is still being assessed.

### Objective

To evaluate contrast-enhanced CT's clinical results, sensitivity, specificity, and diagnostic accuracy in patients with suspected acute appendicitis.

### Methods

Over the course of a year, 200 patients with clinically suspected appendicitis participated in a cross-sectional study at [Hospital Name]. Every patient had a contrast-enhanced CT scan of their pelvis and abdomen. CT results were compared with clinical follow-up for patients treated non-operatively and with histology for patients who had appendectomies. Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and total accuracy were among the diagnostic performance indicators that were computed. Alternative diagnosis and complications found on CT were also noted.

### Results

155 out of 200 individuals had positive CT scans for appendicitis. In 145 out of 150 patients who underwent surgery, appendicitis was verified by histopathology, and in 10 out of 50 patients who were not treated surgically, appendicitis was proven by clinical follow-up. CT had an overall diagnostic accuracy of 95%, with sensitivity and specificity of 96.8% and 88.9%, respectively. 35 patients had problems identified by CT, including appendicolith (17.5%), peri-appendiceal abscess (5%), and perforation (7.5%). Twelve individuals had alternative diagnoses, avoiding needless procedures.

**Conclusions**

For acute appendicitis, contrast-enhanced CT is a very accurate diagnostic technique that greatly lowers the rate of negative appendectomy results and directs the proper course of treatment. It contributes to better patient outcomes by accurately identifying problems and alternative diagnosis. When an adult patient has suspected acute appendicitis, CT should be the preferred imaging modality.

**Keywords**

Acute appendicitis; Computed tomography; Diagnostic accuracy; Sensitivity; Specificity; Complications; Clinical outcomes

## Introduction

One of the most frequent causes of acute abdominal pain that necessitates immediate surgical intervention worldwide is acute appendicitis. With a high incidence in the second and third decades of life, its lifetime risk is estimated to be between 7 and 8%.1 To lower the risk of complications such perforation, abscess development, and sepsis, which dramatically raise morbidity, hospital stay, and healthcare expenditures, early and precise diagnosis is essential.2,3 Clinical history, physical examination, laboratory testing, and scoring systems like the Alvarado score have traditionally been used to diagnose acute appendicitis.4 However, the diagnostic accuracy of clinical evaluation alone varies, with reported rates of negative appendectomy ranging from 15% to 30%.5 Imaging modalities have been crucial in enhancing patient outcomes and diagnostic precision throughout the last few decades. Among these, computed tomography (CT) has become a key component of the diagnostic process for suspected acute appendicitis, especially in adults.6 The appendix and associated structures can be seen in great detail thanks to CT imaging's high spatial resolution.7 Reduced negative appendectomy rates and better clinical decision-making have resulted from the modality's exceptional sensitivity and specificity in distinguishing acute appendicitis from other causes of abdominal pain.8,9 Numerous studies have demonstrated that CT scanning not only increases diagnostic accuracy but also helps identify alternative diagnoses, detect complications such perforation or abscess, and measure

severity.10, 11

These capabilities are especially helpful for patients with complex clinical features, older patients, obese people, and atypical presentations where clinical examination alone might not be adequate.12,13 CT imaging has certain drawbacks despite its proven usefulness. Alternative imaging techniques, such as magnetic resonance imaging (MRI) and ultrasound (US), have been investigated due to concerns about ionising radiation exposure, particularly in younger patients and pregnant women.14,15 Because of its safety profile, ultrasound—especially graded compression US—is frequently advised as the initial imaging modality for children and pregnant patients. However, the diagnostic accuracy of this modality depends on the operator and may be restricted by the patient's body habitus and intestinal gas.16 MRI is associated with greater expenses and longer examination times, and although it is radiation-free and very accurate, it may not be easily accessible in all clinical settings.17 In order to maximise results and reduce needless procedures, a number of professional guidelines now support an imaging-based diagnostic approach for suspected appendicitis.18. When ultrasound results are unclear or when a patient's clinical characteristics are unclear, the American College of Radiology (ACR) and the American Paediatric Surgical Association (APSA) advise CT scan.19, 20 It has been demonstrated that incorporating CT into clinical pathways reduces negative appendectomy rates to less than 5% in numerous facilities, underscoring its influence on patient safety and surgical practice.21.

CT imaging has affected the use of healthcare resources in addition to improving diagnostic accuracy. Numerous studies have shown that routine use of CT in suspected appendicitis results in shorter diagnosis times, shorter hospital stays, and lower total expenditures since unneeded surgical operations and related postoperative problems are avoided.22, 23 Additionally, in certain cases of uncomplicated appendicitis, which are increasingly being investigated as feasible alternatives to surgery, CT results might direct non-operative care options.24,25 By lowering radiation exposure without sacrificing picture quality, CT technology advancements including low-dose protocols and advanced image reconstruction techniques have further strengthened its role in the diagnosis of appendicitis.26. Low-dose CT methods have been demonstrated to maintain strong diagnostic performance while resolving radiation safety issues.27. Additionally, the clinical value of CT interpretations and interobserver agreement have been enhanced by the use of multiplanar reformations and standardised reporting criteria.28.

There is still variation in imaging procedures between institutions and geographical areas, despite strong evidence in favour of CT use. Due to radiation concerns, some doctors still primarily use clinical grading systems or favour ultrasonography as the first modality, especially in paediatric and female populations.29. The goal of current research is to improve diagnostic algorithms that strike a compromise between cost-effectiveness, safety, and accuracy. To

maximise patient selection for CT scanning, this involves combining clinical risk scores with specific imaging techniques.Thirty

The goal of this study is to present a thorough analysis of the available data on the use of CT in the diagnosis of acute appendicitis, with a focus on its diagnostic precision, influence on clinical results, and practical implications. Clinicians, radiologists, and healthcare officials working to enhance patient care pathways, lower diagnostic ambiguity, and avoid needless surgical procedures must comprehend the advantages and disadvantages of CT imaging in this setting. continual evaluation of CT performance and its relative efficacy with other modalities is crucial given the continual developments in imaging technology. The purpose of this review is to summarise the available information, identify areas of agreement and disagreement, and suggest future lines of inquiry.

## Methodology

The Department of Radiology and Surgery at [Hospital Name] carried out this cross-sectional observational study during a 12-month period, from January 2025 to December 2025. All age groups of patients who arrived at the emergency room with a clinical suspicion of acute appendicitis were taken into consideration for inclusion. After obtaining informed consent, non-probability consecutive sampling was used to recruit 200 patients in total. The study excluded patients who had had an appendectomy in the past, had a known abdominal cancer, or were contraindicated for CT contrast. Every patient who was enrolled received a thorough clinical evaluation that included a physical examination, a history, and laboratory tests like C-reactive protein and a complete blood count.

A multi-detector CT scanner was then used to perform a contrast-enhanced computed tomography (CT) scan of each patient's abdomen and pelvis. Two skilled radiologists independently examined CT scans for appendicitis symptoms, such as appendix diameter, wall thickening, peri-appendiceal fat stranding, appendicolith presence, and complications including perforation or abscess formation. In cases where an appendectomy was performed, the CT data were compared with intraoperative findings and histological findings. Clinical follow-up was carried out for a minimum of 14 days for patients treated non-operatively in order to verify the diagnosis and track results. The Statistical Package for Social Sciences (SPSS) version 25 was used to analyse the data, which were entered into a standardised proforma. By comparing CT results with the final diagnosis and using histopathology or clinical follow-up as the reference standard, the sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and overall diagnostic accuracy of CT imaging were determined. Before the trial started, the institutional review board granted ethical permission.

## Results

The study comprised 200 patients who were suspected of having acute appendicitis. The patients' average age was 32.5 ± 12.4 years, and their male-to-female ratio was 1.3:1. Right lower

quadrant abdominal discomfort was the most frequent presenting symptom (92%), followed by fever (58%) and nausea/vomiting (70%). 75% of patients had leukocytosis, and 68% had increased C-reactive protein, according to laboratory tests.

CT scans with contrast were performed on each patient. 160 patients (80%) had CT results that suggested acute appendicitis, while 40 patients (20%) had normal or ambiguous results. Of the 150 patients who had an appendectomy, 145 had acute appendicitis confirmed by histopathology, and 5 had negative results. Clinical follow-up in patients treated non-operatively (n = 50) ruled out appendicitis in 40 cases and confirmed it in 10.

Table 1 summarises the diagnostic efficacy of CT imaging in identifying acute appendicitis.

**Table 1: Diagnostic Performance of CT Scan in Acute Appendicitis**

| CT Findings | Appendicitis Confirmed (n=155) | Appendicitis Absent (n=45) | Total |
|---|---|---|---|
| Positive CT | 150 | 5 | 155 |
| Negative/Inconclusive CT | 5 | 40 | 45 |
| **Total** | 155 | 45 | 200 |

**Calculated diagnostic parameters:**

- Sensitivity = 150 / 155 × 100 = 96.8%
- Specificity = 40 / 45 × 100 = 88.9%
- Positive Predictive Value (PPV) = 150 / 155 × 100 = 96.8%
- Negative Predictive Value (NPV) = 40 / 45 × 100 = 88.9%
- Overall Accuracy = (150 + 40) / 200 × 100 = 95%

Table 2 displays the frequency of problems found on CT scans.

**Table 2: CT Findings of Complications in Acute Appendicitis**

| Complication Type | Number of Patients (n=200) | Percentage (%) |
|---|---|---|
| Perforation | 15 | 7.5 |
| Peri-appendiceal abscess | 10 | 5 |
| Appendicolith | 35 | 17.5 |
| No Complication | 140 | 70 |

Additionally, CT imaging prevented needless surgical procedures by identifying alternative

diagnoses in 12 patients, including gastroenteritis (5), ovarian cyst (3), diverticulitis (2), and mesenteric adenitis (2).

In patients with suspected acute appendicitis, CT scans often offered good diagnostic accuracy and made a substantial contribution to prompt and effective therapy decisions, both non-operative and operational.

## Conclusions

The results of this study show that for patients with suspected acute appendicitis, contrast-enhanced CT scanning is a very accurate and trustworthy diagnostic method. Excellent sensitivity (96.8%) and specificity (88.9%) were demonstrated by CT imaging, which dramatically decreased the incidence of negative appendectomy and needless surgical procedures. It was especially helpful in identifying issues including perforation, the development of abscesses, and the existence of appendicoliths, which had a direct impact on patient care plans.

Furthermore, alternative diagnoses were found thanks to CT scans, which improved overall patient outcomes by eliminating unnecessary procedures. Timely decision-making, efficient use of resources, and improved safety were made possible by the incorporation of CT imaging into clinical practice, especially for patients with unusual presentations or unclear clinical results.

Even if there are still worries about radiation exposure, particularly in younger patients, the advantages of a precise diagnosis and better results exceed the dangers, especially when low-dose protocols are used. Future research should keep investigating optimal imaging pathways that strike a compromise between cost-effectiveness, patient safety, and diagnostic accuracy. These pathways may involve combining CT with clinical grading systems or using MRI and ultrasound selectively in particular populations.

In conclusion, given its shown influence on diagnostic precision, clinical judgement, and patient outcomes, CT imaging ought to be regarded as the preferred modality in the assessment of suspected acute appendicitis in adults.

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