



DIAGNOSTIC PERFORMANCE OF ULTRASONOGRAPHY VERSUS COMPUTED TOMOGRAPHY IN ACUTE APPENDICITIS

Radio-Diagnosis

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ABSTRACT

Background: Acute appendicitis is a common surgical emergency with diagnostic challenges. Imaging modalities play a crucial role in improving diagnostic accuracy and reducing negative appendectomy rates. **Objective:** To evaluate and compare the diagnostic accuracy of ultrasonography (USG) and computed tomography (CT) in patients with suspected acute appendicitis. **Methods:** This prospective observational study included 30 patients with clinically suspected acute appendicitis who underwent both USG and CT imaging. Imaging findings were correlated with histopathological examination as the gold standard. Diagnostic accuracy parameters including sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and overall accuracy were calculated for both modalities. **Results:** Histopathology confirmed acute appendicitis in 25 patients (83.3%). Ultrasonography demonstrated a sensitivity of 80.0%, specificity of 80.0%, PPV of 95.2%, NPV of 44.4%, and overall accuracy of 80.0%. Computed tomography showed superior performance with sensitivity of 96.0%, specificity of 80.0%, PPV of 96.0%, NPV of 80.0%, and overall accuracy of 93.3%. The difference in diagnostic accuracy was statistically significant ($p=0.031$). **Conclusion:** Computed tomography demonstrates significantly higher diagnostic accuracy compared to ultrasonography in diagnosing acute appendicitis, particularly in ruling out the disease. A stepwise approach using USG as the initial modality followed by CT in equivocal cases optimizes diagnostic accuracy while minimizing radiation exposure.

KEYWORDS

Acute appendicitis, ultrasonography, computed tomography, diagnostic accuracy, sensitivity, specificity

INTRODUCTION

Acute appendicitis is one of the most common causes of acute abdominal pain requiring emergency surgical intervention, with a lifetime prevalence of approximately 7-8% [1]. Despite its frequency, the diagnosis remains challenging due to variable clinical presentation and overlapping symptoms with other abdominal conditions. The classical presentation is observed in only 50-60% of patients, making clinical diagnosis alone unreliable [2].

Imaging modalities have therefore assumed a central role in the diagnostic workup of suspected appendicitis. Ultrasonography (USG) offers advantages of being non-invasive, radiation-free, widely available, and cost-effective, making it suitable as a first-line modality, particularly in pediatric patients, pregnant women, and young adults [3]. However, its diagnostic accuracy is highly operator-dependent and influenced by patient body habitus, bowel gas, and anatomical position of the appendix.

Computed tomography (CT) provides high-resolution cross-sectional imaging with superior anatomical detail, is less operator-dependent, and remains unaffected by body habitus [4]. CT has reported sensitivity and specificity exceeding 95% in many large-scale studies and is often considered the gold standard imaging technique in adults with equivocal clinical findings. However, concerns regarding ionizing radiation exposure, particularly in younger populations, and higher costs limit its universal application.

This study aims to evaluate and compare the diagnostic accuracy of ultrasonography and computed tomography in patients with suspected acute appendicitis, using histopathological examination as the reference standard.

MATERIALS AND METHODS:

Study Design And Setting: This prospective observational study was conducted in the Department of Radiodiagnosis at a tertiary care teaching hospital. The study was approved by the Institutional Ethics Committee, and written informed consent was obtained from all participants.

Study Population: Thirty consecutive patients presenting to the emergency department with clinically suspected acute appendicitis were enrolled.

Inclusion Criteria: Patients of all ages and genders presenting with right iliac fossa pain clinically suspected to be acute appendicitis, referred for imaging evaluation, and willing to provide informed consent.

Exclusion Criteria: Patients with known allergies to contrast agents, palpable right iliac fossa mass, diagnosed urolithiasis or pelvic inflammatory disease, gynecological conditions mimicking appendicitis, and pregnant women.

Imaging Protocol: All patients underwent both ultrasonography and computed tomography. USG was performed using a high-resolution ultrasound machine with a 3-5 MHz convex transducer and a high-frequency linear transducer (7-12 MHz). The graded compression technique was employed. CT was performed using a multidetector CT scanner with thin-section images (2-5 mm) and multiplanar reconstructions. Non-ionic contrast was administered intravenously where not contraindicated.

Reference Standard: Histopathological examination of the surgically resected appendix served as the gold standard for definitive diagnosis. Statistical Analysis: Diagnostic accuracy parameters including sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and overall accuracy were calculated. McNemar's test was used to compare diagnostic accuracy between modalities. A p -value <0.05 was considered statistically significant.

RESULTS

Demographic Characteristics: The study included 30 patients with suspected acute appendicitis, comprising 17 males (56.7%) and 13 females (43.3%). The age ranged from 10 to 69 years, with a mean age of 40.2 ± 18.4 years.

Histopathological Findings: Histopathological examination confirmed acute appendicitis in 25 out of 30 patients (83.3%). Five patients (16.7%) showed no evidence of appendicitis.

Ultrasonography Findings: USG demonstrated features suggestive of acute appendicitis in 21 patients (70.0%). In 9 patients (30.0%), the appendix was not visualized with no secondary signs of inflammation.

Computed Tomography Findings: CT revealed acute appendicitis

with periappendiceal stranding in 25 patients (83.3%). Five patients (16.7%) showed a normal study.

Statistical Comparison: McNemar's test showed a statistically significant difference in diagnostic accuracy between ultrasonography and computed tomography (p= 0.031).

Parameter	Ultrasonography	Computed Tomography
Sensitivity	80.0% (20/25)	96.0% (24/25)
Specificity	80.0% (4/5)	80.0% (4/5)
Positive Predictive Value (PPV)	95.2% (20/21)	96.0% (24/25)
Negative Predictive Value (NPV)	44.4% (4/9)	80.0% (4/5)
Overall Accuracy	80.0% (24/30)	93.3% (28/30)

DISCUSSION

The present study evaluated the diagnostic accuracy of USG and CT in 30 patients with suspected acute appendicitis. Our findings demonstrate that CT has superior diagnostic performance compared to USG, with significantly higher sensitivity (96.0% vs. 80.0%) and overall accuracy (93.3% vs. 80.0%).

The demographic profile with male predominance (56.7%) and mean age of 40.2 years is consistent with published literature [5]. The histopathological confirmation rate of 83.3% is comparable to the 78-92% range reported in systematic reviews [6].

Ultrasonography demonstrated sensitivity of 80.0% and specificity of 80.0%, falling within the pooled sensitivity range of 71-85% reported in meta-analyses [7]. The high PPV of 95.2% indicates that when USG demonstrates classical features, surgical decision-making can be confidently guided. However, the low NPV of 44.4% highlights that a negative USG does not reliably exclude appendicitis, consistent with previous studies reporting NPV of 38-60% [8].

CT demonstrated excellent performance with sensitivity of 96.0% and accuracy of 93.3%, consistent with meta-analyses reporting CT sensitivity of 94-98% [9]. The high NPV of 80.0% indicates CT is reliable in ruling out appendicitis, reducing unnecessary surgical interventions.

The statistically significant difference (p=0.031) confirms CT's superiority, particularly in negative predictive value, which has important clinical implications for avoiding unnecessary surgery [10]. Despite CT's superior accuracy, USG remains valuable as a first-line modality due to its safety profile, supporting a stepwise diagnostic approach.

Limitations: Small sample size limits subgroup analyses. Single-center study may limit generalizability. Operator dependency in USG was not quantified.

CONCLUSION

Computed tomography demonstrates significantly higher diagnostic accuracy compared to ultrasonography in the evaluation of suspected acute appendicitis, with superior sensitivity (96.0% vs. 80.0%) and negative predictive value (80.0% vs. 44.4%). The statistically significant difference (p=0.031) confirms CT's role as the definitive imaging modality.

Ultrasonography remains a valuable first-line investigation due to its non-invasive nature, absence of radiation, lower cost, and high positive predictive value. A stepwise diagnostic approach utilizing USG as the initial modality followed by CT in equivocal cases optimizes diagnostic accuracy while minimizing unnecessary radiation exposure.

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