

Research Article

Diagnostic Accuracy and Clinical Impact of Multidetector Computed Tomography in Adult Patients with Non-Traumatic Acute Abdomen: A Cross-Sectional Study

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ABSTRACT

Background: Non-traumatic acute abdomen is a frequent emergency presentation encompassing a broad spectrum of conditions ranging from self-limiting inflammatory disorders to life-threatening surgical emergencies. Although ultrasonography (USG) and plain abdominal radiography are commonly employed as first-line imaging modalities, their diagnostic performance is often limited. Multidetector computed tomography (MDCT) has emerged as an important imaging tool for establishing an accurate diagnosis and guiding timely management.

Objective: To evaluate the diagnostic accuracy of MDCT in adult patients presenting with non-traumatic acute abdomen and to assess its impact on subsequent clinical management.

Materials and Methods: A hospital-based cross-sectional study was conducted in the Department of Radiology, Mahavir Institute of Medical Sciences, Telangana, between March 2024 and December 2025. A total of 187 adult patients presenting with non-traumatic acute abdomen underwent MDCT following inconclusive, negative, or clinically insufficient conventional imaging. CT diagnoses were compared with operative findings or final discharge diagnoses. The influence of MDCT on patient management was also evaluated.

Results: The mean age of the study population was 45.09 ± 12.32 years, with a slight male predominance (52.94%). Ultrasonography was inconclusive in 58.29% of patients, while abdominal radiographs were normal in 71.12%. MDCT demonstrated diagnostic concordance with the final diagnosis in 97.33% of cases. CT findings altered clinical management in 55.08% of patients, most commonly by changing conservative treatment to urgent surgical intervention. Management modification was significantly associated with underlying etiology ($\chi^2=41.75$, $p<0.001$).

Conclusion: MDCT demonstrated excellent diagnostic accuracy and substantially influenced therapeutic decision-making in adults with non-traumatic acute abdomen. Its high concordance with final diagnosis and significant impact on surgical triage support its routine use when conventional imaging is inconclusive or insufficient.

Keywords: Acute Abdomen, Multidetector Computed Tomography, Diagnostic Accuracy, Clinical Management, Emergency Radiology, Cross-Sectional Study.

INTRODUCTION

Acute abdominal pain is among the most common indications for emergency department attendance and remains a significant diagnostic challenge because of its broad clinical spectrum. Non-traumatic acute abdomen encompasses a heterogeneous group of inflammatory, obstructive, vascular, biliary, gastrointestinal, and genitourinary disorders that may range from self-limiting conditions to rapidly progressive surgical emergencies. Early differentiation between patients requiring immediate operative intervention and those suitable for conservative management is

essential to reduce morbidity, mortality, unnecessary surgery, and healthcare costs. Consequently, prompt and accurate diagnosis forms the cornerstone of effective clinical management. (1,2)

Traditionally, the evaluation of acute abdominal pain has relied on detailed clinical history, physical examination, laboratory investigations, ultrasonography (USG), and plain abdominal radiography. However, clinical findings frequently overlap among different disease entities, while elderly patients, obese individuals, and patients with atypical presentations often exhibit non-specific

symptoms that complicate diagnosis. Conventional imaging also has important limitations. Ultrasonography is highly operator-dependent and its diagnostic performance may be compromised by bowel gas, obesity, and deep-seated lesions, whereas plain radiography demonstrates relatively low sensitivity for many intra-abdominal pathologies beyond bowel obstruction or perforation. These diagnostic limitations frequently delay definitive treatment or lead to unnecessary exploratory surgery.(3,4)

Multidetector computed tomography (MDCT) has fundamentally transformed the diagnostic approach to non-traumatic acute abdomen. Advances in detector technology, rapid image acquisition, isotropic spatial resolution, and multiplanar image reconstruction enable comprehensive evaluation of abdominal viscera, bowel, mesentery, vascular structures, and retroperitoneal organs within a single examination. Compared with conventional imaging, MDCT provides substantially higher diagnostic accuracy for acute appendicitis, bowel obstruction, perforation, mesenteric ischemia, diverticulitis, pancreatitis, and numerous other abdominal emergencies. More importantly, it allows identification of disease severity, associated complications, and alternative diagnoses, thereby facilitating evidence-based therapeutic decision-making.(5,6,7)

Beyond improving diagnostic confidence, MDCT has demonstrated considerable clinical value by reducing negative laparotomy rates, shortening emergency department stay, improving surgical triage, and optimizing utilization of healthcare resources. Accurate cross-sectional imaging enables clinicians to confidently distinguish patients requiring urgent surgery from those suitable for conservative treatment, thereby minimizing both unnecessary operative intervention and delayed management of life-threatening conditions. This role has become increasingly important as modern emergency medicine emphasizes rapid diagnosis and individualized patient care.(8,9)

Despite growing international evidence supporting MDCT in acute abdominal emergencies, data from Indian tertiary care hospitals remain relatively limited, particularly regarding its real-world impact on diagnostic concordance and subsequent patient management. The present hospital-based cross-sectional study therefore aimed to evaluate the diagnostic accuracy of MDCT in adult patients presenting with non-traumatic

acute abdomen after inconclusive or non-diagnostic conventional imaging, and to determine its influence on clinical management by comparing CT findings with the final diagnosis and treatment decisions.

MATERIALS AND METHODS

Study Design and Setting

This hospital-based cross-sectional study was conducted in the Department of Radiodiagnosis, Mahavir Institute of Medical Sciences and General Hospital, Vikarabad, Telangana, India, over a 21-month period from March 2024 to December 2025.

Study Population

Adult patients presenting to the emergency or surgical services with clinical features suggestive of non-traumatic acute abdomen were prospectively enrolled. A total of 187 consecutive patients fulfilled the eligibility criteria and were included in the final analysis. Sample size was calculated using a prevalence of 14.2%, a 95% confidence level, and standard sample size estimation methods, yielding a required sample size of approximately 187 participants.

Eligibility Criteria

Inclusion Criteria

Patients were eligible if they fulfilled one or more of the following criteria:

- Acute abdominal pain.
- Abdominal distension.
- Guarding or abdominal rigidity.
- Diagnosis established by ultrasonography but requiring further CT evaluation for additional diagnostic information.

Exclusion Criteria

Patients were excluded if they had:

- History of blunt or penetrating abdominal trauma.
- Pregnancy.
- A definitive diagnosis established by ultrasonography that required no additional CT evaluation.

Imaging Protocol

Ultrasonography served as the initial imaging modality for all patients. MDCT was subsequently performed when ultrasonography was negative, inconclusive, non-specific, or insufficient to explain the patient's clinical presentation.

All examinations were performed using a 16-slice Toshiba multidetector CT scanner. Non-contrast axial images were obtained initially,

followed by contrast-enhanced imaging whenever clinically indicated. Intravenous iodinated contrast (Iohexol 350 mg iodine/mL) was administered at 1.75 mL/kg (average 90–100 mL) using an automated power injector through an 18-gauge intravenous cannula at a flow rate of 2 mL/s. Estimated glomerular filtration rate (eGFR) was assessed before contrast administration, and intravenous contrast was withheld in patients with impaired renal function or known contrast allergy. Oral or rectal contrast was administered selectively according to the suspected pathology. Axial source images were reconstructed into coronal and sagittal multiplanar reformations, with maximum intensity projection (MIP), minimum intensity projection (MinIP), and volume-rendered images reviewed whenever clinically appropriate.

CT findings were compared with the final diagnosis established by operative findings, histopathological examination where applicable, or the final clinical diagnosis recorded at hospital discharge. Diagnostic concordance between MDCT and the reference standard served as the primary outcome measure.

Outcome Measures

The primary outcome was the diagnostic concordance of MDCT with the final diagnosis. Secondary outcomes included:

- Frequency of inconclusive conventional imaging.
- Clinical impact of MDCT on patient management.
- Transition from conservative or uncertain management to surgical intervention following CT.
- Association between underlying disease category and management modification.

Statistical Analysis

Patient demographics, clinical characteristics, imaging findings, and management outcomes were summarized using descriptive statistics. Continuous variables are presented as mean $\pm$ standard deviation (SD) or median where appropriate, whereas categorical variables are expressed as frequencies and percentages.

One-way analysis of variance (ANOVA) was used to evaluate differences in mean age among etiological categories. Associations between categorical variables, including pain location, etiology, and management changes, were assessed using the Chi-square test of independence. A two-sided p value <0.05 was considered statistically significant.

RESULTS

Table 1. Baseline Demographic and Clinical Characteristics

Variable	Number of cases (%)
Total patients	187
Mean age (years)	45.09 $\pm$ 12.32
Median age (years)	45
Symptom duration (hours)	22.98 $\pm$ 13.47
Length of hospital stay (days)	5.90 $\pm$ 3.16
Male	99 (52.94%)
Female	88 (47.06%)

Table 2. Clinical Presentation and Initial Imaging Findings

Variable	Number of cases (%)
Primary symptom	
Pain	61 (32.62)
Pain + Distension	54 (28.88)
Pain + Vomiting	37 (19.79)
Sudden severe pain	14 (7.49)
Colicky pain	14 (7.49)
Severe pain	7 (3.74)
Most common pain location	
RLQ	41 (21.93)
Diffuse	36 (19.25)
Epigastric	28 (14.97)
Initial USG	
Inconclusive	109 (58.29)

Normal	62 (33.16)
Alternative diagnosis	16 (8.56)
Plain abdominal X-ray	
Normal	133 (71.12)
Non-specific	54 (28.88)

Table 3. Diagnostic Performance of MDCT

Parameter	Number of cases (%)
CT concordant with final diagnosis	182 (97.33%)
CT discordant	5 (2.67%)
Diagnostic concordance	97.33%

Table 4. Clinical Impact of MDCT on Patient Management

Variable	Number of cases (%)
CT changed management	103 (55.08)
No management change	84 (44.92)
Conservative → Urgent surgery	57 (30.48)
Uncertain → Urgent surgery	28 (14.97)
Conservative → Elective surgery	11 (5.88)
Uncertain → Elective surgery	7 (3.74)

Table 5. Association between Etiology and Management Change

Etiology	Management Changed	Total Changed (%)
Vascular	9/9	100.0
Perforation	10/10	100.0
Biliary	10/13	76.9
Obstructive	35/54	64.8
Inflammatory	39/86	45.3
Renal	0/15	0.0

Chi-square = 41.75, p < 0.001

DISCUSSION

The present study demonstrates that multidetector computed tomography (MDCT) provides excellent diagnostic accuracy and has a substantial impact on clinical decision-making in adult patients presenting with non-traumatic acute abdomen. The diagnostic concordance between MDCT and the final diagnosis reached 97.33%, while management strategies were modified in more than half of the study population following CT evaluation. These findings reinforce the pivotal role of MDCT as a definitive imaging modality when conventional investigations fail to establish an accurate diagnosis. Unlike ultrasonography and plain radiography, MDCT offers comprehensive assessment of abdominal organs, bowel, mesentery, retroperitoneum, and vascular structures within a single examination, thereby facilitating rapid diagnosis and appropriate therapeutic planning. (9)

One of the most important observations of the present study was the limited diagnostic performance of conventional imaging. Ultrasonography was inconclusive in 58.29% of

patients, whereas more than two-thirds of abdominal radiographs were normal despite clinically significant disease. These findings emphasize the inherent limitations of first-line imaging in patients with non-traumatic acute abdomen, particularly in the presence of obesity, bowel gas, atypical disease presentation, or deep intra-abdominal pathology. Similar observations have been reported previously, highlighting the heterogeneous clinical profile of acute abdomen and emphasizing the need for advanced cross-sectional imaging when initial evaluation remains inconclusive. Likewise, MDCT has been described as the most comprehensive modality for evaluating acute abdominal emergencies because of its ability to accurately depict gastrointestinal, hepatobiliary, pancreatic, vascular, and genitourinary diseases within a single examination. (10,13)

The exceptionally high diagnostic concordance observed in this study further supports the reliability of MDCT in emergency abdominal imaging. Comparable findings have been reported in previous investigations evaluating

CT-based diagnosis of acute abdominal conditions. Contrast-enhanced CT has been shown to significantly improve diagnostic confidence and alter therapeutic decisions in adults with acute abdomen by accurately identifying the underlying pathology. Similarly, abdominal CT has been reported to substantially improve diagnostic certainty and modify treatment strategies in a large proportion of emergency department patients presenting with acute abdominal pain. Collectively, these studies and the present findings confirm that MDCT serves not merely as a confirmatory investigation but as the principal diagnostic tool for establishing the definitive diagnosis in complex abdominal emergencies.

An equally important finding was the significant clinical impact of MDCT on patient management. CT altered the planned management in 55.08% of patients, with the greatest proportion transitioning from conservative treatment to urgent surgery. These observations indicate that MDCT enables clinicians to promptly recognize surgical emergencies that may remain occult after clinical examination and conventional imaging. Early identification of bowel obstruction, perforation, vascular compromise, and complicated inflammatory conditions can substantially reduce delays in operative intervention and improve patient outcomes. Conversely, MDCT also confirmed conservative treatment in appropriately selected patients, thereby avoiding unnecessary surgical exploration. (11,12)

The association between disease etiology and management modification further highlights the clinical value of MDCT. Management changed in 100% of patients with vascular pathology and gastrointestinal perforation, whereas no alteration was required in patients with renal disorders, where CT primarily confirmed conservative management. This demonstrates that the clinical usefulness of MDCT extends beyond diagnosis alone; it directly influences therapeutic decision-making according to disease severity and urgency. Such findings are consistent with modern emergency radiology practice, in which imaging serves as an essential component of multidisciplinary patient management rather than solely a diagnostic investigation. (9,13)

The present findings are also consistent with recent recommendations advocating wider utilization of CT in adult patients with equivocal acute abdominal pain. MDCT has become the

preferred imaging modality for evaluating acute abdomen, particularly among elderly patients, in whom atypical clinical presentations frequently delay diagnosis. Furthermore, current consensus recommendations support the safe administration of intravenous iodinated contrast in appropriately selected patients, allowing optimal visualization of abdominal pathology while minimizing concerns regarding contrast-associated kidney injury. These advances have further strengthened the role of contrast-enhanced MDCT as the cornerstone of emergency abdominal imaging. (14,15)

Several strengths should be acknowledged. The study included a relatively large cohort of consecutive adult patients evaluated using a standardized CT protocol and compared imaging findings with operative findings or final clinical diagnosis. Additionally, the study assessed not only diagnostic accuracy but also the real-world impact of MDCT on patient management, thereby providing clinically meaningful evidence.

However, certain limitations should also be considered. This was a single-center cross-sectional study, and the findings may not be directly generalizable to all healthcare settings. Furthermore, although diagnostic concordance was excellent, detailed disease-specific accuracy analyses such as sensitivity and specificity for individual pathological entities were beyond the scope of the present investigation. Future multicenter prospective studies incorporating larger and more diverse populations would further strengthen the available evidence regarding the role of MDCT in acute abdominal emergencies.

CONCLUSION

Multidetector computed tomography demonstrated excellent diagnostic performance in the evaluation of adult patients presenting with non-traumatic acute abdomen. Conventional imaging modalities, particularly ultrasonography and plain abdominal radiography, were frequently inconclusive or non-diagnostic, whereas MDCT showed a diagnostic concordance of 97.33% with the final diagnosis. Furthermore, CT findings significantly influenced patient management by altering treatment strategies in more than half of the study population, primarily through the timely identification of patients requiring urgent surgical intervention. These findings support the routine use of MDCT as the preferred cross-sectional imaging modality in adults with suspected non-traumatic acute abdomen,

especially when clinical assessment and initial imaging remain inconclusive. Early utilization of MDCT has the potential to improve diagnostic confidence, optimize surgical triage, reduce unnecessary interventions, and facilitate appropriate patient management.

REFERENCES

1. Terasawa T, Blackmore CC, Bent S, Kohlwes RJ. Systematic review: computed tomography and ultrasonography to detect acute appendicitis in adults and adolescents. *Ann Intern Med.* 2004;141(7):537-546.
2. Yew KS, George MK, Allred HB. Acute abdominal pain in adults: evaluation and diagnosis. *Am Fam Physician.* 2023;107(6):585-596.
3. Patterson JW, Kashyap S, Dominique E. Acute abdomen. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2023.
4. Viniol A, Keunecke C, Biroga T, et al. Diagnostic accuracy of physical examination in patients with acute abdominal pain in primary care. *Fam Pract.* 2023;40(1):103-109.
5. Cervellin G, Mora R, Ticinesi A, et al. Epidemiology and outcomes of acute abdominal pain in a large urban emergency department. *Ann Transl Med.* 2016;4(19):362.
6. Rud B, Vejborg TS, Rappeport ED, Reitsma JB, Wille-Jørgensen P. Computed tomography for diagnosis of acute appendicitis in adults. *Cochrane Database Syst Rev.* 2019;11:CD009977.
7. Altmayer S, et al. Computed tomography versus ultrasound for the diagnosis of acute cholecystitis: a systematic review and meta-analysis. *Eur Radiol.* 2024;34(11):7308-7319.
8. Lamm R, Kumar SS, Collings AT, et al. SAGES guideline for the diagnosis and treatment of appendicitis: systematic review and meta-analysis. *Surg Endosc.* 2024;38(6):2974-2994.
9. Scheirey CD, Rosen MP, Blake MA, et al. ACR Appropriateness Criteria® acute nonlocalized abdominal pain. *J Am Coll Radiol.* 2018;15(11 Suppl):S217-S231.
10. Lema A, et al. Study of etiological factors, clinical profile and outcomes of the non-traumatic acute abdomen in adult patients. *Int Surg J.* 2024;11(6):954-959.
11. Rosen MP, Sands DZ, Longmaid HE III, Reynolds KF, Wagner M, Raptopoulos V. Impact of abdominal CT on the management of patients presenting to the emergency department with acute abdominal pain. *AJR Am J Roentgenol.* 2000;174(5):1391-1396.
12. Tsushima Y, Yamada S, Aoki J, Motojima T, Endo K. Effect of contrast-enhanced computed tomography on diagnosis and management of acute abdomen in adults. *Clin Radiol.* 2002;57(6):507-513.
13. Leschka S, Alkadhi H, Wildermuth S, Marincek B. Multi-detector computed tomography of acute abdomen. *Eur Radiol.* 2005;15(12):2435-2447.
14. Coutureau J, Millet I, Taourel P. CT of acute abdomen in the elderly. *Insights Imaging.* 2025;16(1):95.
15. Davenport MS, Perazella MA, Yee J, et al. Use of intravenous iodinated contrast media in patients with kidney disease: consensus statements from the American College of Radiology and the National Kidney Foundation. *Radiology.* 2020;294(3):660-668.