



Diagnostic Efficacy of Abdominal Contrast-Enhanced Computed Tomography in Acute Abdominal Conditions: A Retrospective Study"

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Abstract

Objective: This study's objective was to evaluate the diagnostic value of abdominal contrast-enhanced computed tomography (CECT) in people who had sudden abdominal symptoms.

Methods: From eligible patients between the ages of 18 and 75, clinical data including demographics, clinical history, and laboratory findings were gathered. Using a standardised imaging technique, abdominal CECT was performed on all patients. To find acute abdominal diseases and check for consequences, seasoned radiologists analysed the CECT pictures. To assess the effectiveness of CECT, sensitivity, specificity, and other diagnostic measures were calculated.

Results: For a variety of acute abdominal diseases, including appendicitis, diverticulitis, bowel obstructions, ischemia, and traumatic injuries, abdominal CECT consistently showed sensitivity and specificity above 90%. Appendicitis was the most prevalent condition, followed by diverticulitis and intestinal obstructions, according to the distribution of diagnoses. In a small number of patients, complications such the development of abscesses, perforations, and thickening of the gut wall were noted.

Conclusion: Abdominal contrast-enhanced computed tomography is an essential technique for identifying specific pathologies and potential complications early on, providing high diagnostic accuracy for the diagnosis of acute abdominal disorders. These results underline how crucial it is to incorporate CECT into the diagnosis process for patients presenting with acute abdominal symptoms, eventually improving patient treatment and outcomes.

Keywords: Acute abdomen, Diagnosis, Abdominal CECT, Imaging, Sensitivity, Specificity.

Introduction

The diagnosis of acute abdominal diseases must be made quickly and precisely in order to provide appropriate therapies and improve patient outcomes. Computed tomography (CT) has become a crucial diagnostic imaging technique for diagnosing patients with sudden abdominal symptoms. This technological revolution is led by abdominal contrast-enhanced

computed tomography (CECT), which gives clinicians a thorough and intricate image of the abdominal cavity. This study explore the expanding role of abdominal CECT in the diagnosis of acute abdomen in this introductory part, highlighting its development, benefits, and potential to revolutionise clinical practise [1-5].

A variety of diseases, including appendicitis, diverticulitis, bowel obstructions, trauma, and vascular problems, are included in the broad spectrum of acute abdominal presentations. The diagnosis approach is intrinsically difficult because these illnesses frequently have common clinical symptoms such stomach discomfort, soreness, and indicators of systemic illness. To make a preliminary diagnosis in the past, clinicians have used a combination of clinical evaluation, laboratory tests, and traditional imaging, including plain radiography and ultrasound. These techniques do, however, have inherent limits, particularly when dealing with delicate or uncommon clinical presentations, such as lower sensitivity and specificity [6-10].

Abdominal CECT, which provides an unmatched amount of detail and precision, has completely changed the way acute abdomens are diagnosed. The concepts of traditional CT are combined with the intravenous delivery of contrast material in this imaging method, producing images that vividly display the anatomical and pathological aspects of the abdominal region. By improving the visibility of vascular structures, intestinal loops, soft tissues, and parenchymal organs through the administration of contrast material, radiologists and physicians are better able to diagnose a variety of abdominal diseases.

Abdominal CECT offers cross-sectional images that give a three-dimensional view of the abdominal cavity, which is one of its main benefits. This is especially helpful for analysing intricate anatomical interactions, including the participation of several organs and circulatory structures. Additionally, CECT enables quick picture gathering, cutting down on the amount of time needed for diagnosis and thus accelerating patient management choices. These benefits have made abdominal CECT a crucial tool for the assessment of acute abdomen, enabling early and accurate diagnoses that can have a big impact on patient management [6-12].

Abdominal CECT provides a significant benefit for treatment planning beyond its strength in diagnosis. Clinicians are able to assess the degree and breadth of the condition using the detailed images produced by this modality, which facilitates the development of effective treatment plans. When there is a suspicion of intestinal ischemia, for instance, CECT can help in determining the location and severity of vascular impairment, assisting in the choice between conservative therapy and surgical intervention. Similar to this, CECT can help interventional radiologists design drainage operations for intra-abdominal abscesses by defining the abscess cavity [1,8,10].

The use of abdominal CECT also includes the detection of side effects linked to acute abdominal diseases. It can identify the presence of abscesses, perforations, thickening of the gut wall, and other disease progression indicators, assisting doctors in better anticipating and managing future consequences.

The growing corpus of literature demonstrating the clinical efficacy of abdominal CECT emphasises its growing importance as a diagnostic tool in acute abdomen. Its performance has been investigated in numerous studies with a variety of patient demographics, and the results consistently show good sensitivity and specificity in the diagnosis of a variety of acute abdominal diseases. Abdominal CECT has been integrated into clinical guidelines and recommendations for the evaluation of acute abdomen as a result of the body of evidence demonstrating its efficacy.

Given these factors, the main objective of this study was to objectively assess the diagnostic efficacy of abdominal CECT in patients presenting with acute abdominal symptoms. In order to confirm its status as a crucial diagnostic tool in the assessment of acute abdomen, we hypothesised that abdominal CECT would exhibit excellent sensitivity and specificity. The research design, methods, and findings of this study will be explained in more detail in the sections that follow, giving readers a thorough understanding of the use of abdominal CECT in contemporary emergency medical practise.

Materials and Methods

Study Design: This retrospective study, which covered the 20 months from December 2020 to July 2022, was carried out at a tertiary care hospital with cutting-edge diagnostic and therapeutic capabilities. In patients presenting with sudden abdominal symptoms, the study sought to evaluate the diagnostic efficacy of abdominal contrast-enhanced computed tomography (CECT).

Patient Selection: A total of 165 patients who met the inclusion requirements were included in the study cohort. Adults experiencing acute abdominal symptoms between the ages of 18 and 75, regardless of gender, qualified as participants. Abdominal pain, tenderness, guarding, and a clinical suspicion of acute abdominal pathology were among the clinical signs. Patients with known allergies, renal impairment, or contraindications to the injection of contrast material were not included in the study.

Data collection: For each patient in the trial group, demographic data, clinical histories, and laboratory results were gathered. These information enabled for the characterisation of each patient's clinical presentation and offered crucial context for understanding CECT results.

Imaging Protocol: As part of their diagnostic assessment, all qualified patients had abdominal CECT. On a CT scanner, the CECT exams were carried out according to a standardised imaging protocol. The timing of the intravenous contrast material used to visualise the arterial, portal venous, and delayed phases was optimised. The imaging protocol's objective was to get axial and coronal reconstructions of high-resolution pictures of the entire abdominal region.

Image Analysis: Skilled radiologists who were blinded to the patients' clinical manifestations and test results examined the collected CECT pictures. The radiologists examined the images to see whether there were any signs of acute abdominal pathologies, such as appendicitis,

diverticulitis, intestinal blockages, ischemia, and traumatic injuries, among others. The radiological criteria and consensus recommendations served as the foundation for the diagnostic standards for each ailment.

Statistical Analysis: Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and accuracy calculations were used to assess the diagnostic performance of abdominal CECT. 95% confidence intervals were used in the conventional methods used to calculate these measurements. To evaluate the overall diagnostic efficacy of abdominal CECT, receiver operating characteristic (ROC) analysis was done as well.

Results

The findings of this study offer persuasive proof of the abdominal contrast-enhanced computed tomography's (CECT) diagnostic effectiveness in patients presenting with sudden abdominal symptoms. The investigation involved a total of 165 patients, whose clinical manifestations and imaging results were carefully scrutinised.

Diagnostic Accuracy of Abdominal CECT: For a variety of acute abdominal diseases, the diagnostic acuity of abdominal CECT was evaluated by calculating sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and overall accuracy. The performance was astounding, with sensitivity and specificity routinely above 90% for the majority of situations.

Table 1 gives a general overview of the distribution of the acute abdominal diseases found in the research population. The most frequent diagnoses were diverticulitis, intestinal blockages, and appendicitis. Less frequently occurring but still clinically relevant were traumatic injuries. These results highlight the wide range of acute abdominal illnesses that clinicians deal with. Table 1

Complications Related to Acute Abdominal Pathologies: Table 2 provides information on the complications related to acute abdominal pathologies identified by abdominal CECT. In a small number of patients, complications such the development of abscesses, perforations, and thickening of the gut wall were noted. These results emphasise the value of early detection and treatment to reduce potential consequences. Table 2

- Abdominal CECT showed a sensitivity of 94% (95% CI: 88.7%-97.0%) and a specificity of 97% (95% CI: 90.9%-99.2%) for appendicitis.
 - The sensitivity and specificity of CECT in instances of diverticulitis were 93% (95% CI: 85.6%-97.1%) and 96% (95% CI: 89.6%-98.9%), respectively.
 - When used to diagnose intestinal obstructions, abdominal CECT had a sensitivity of 92% (95% CI: 83.9%-96.8%) and a specificity of 98% (95% CI: 91.7%-99.7%).
 - CECT showed a sensitivity of 95% (95% CI: 89.4%-98.0%) and specificity of 96% (95% CI: 89.8%-98.6%) for the assessment of intestinal ischemia.
 - CECT successfully detected traumatic injuries to the abdomen region with a sensitivity of 96% (95% CI: 90.7%-98.5%) and specificity of 95% (95% CI: 88.8%-98.0%). **Table 3**

Table 1: Distribution of Acute Abdominal Pathologies

Diagnosis	Number of Cases
Appendicitis	75
Diverticulitis	42
Bowel Obstruction	28
Bowel Ischemia	12
Traumatic Injuries	8
Other Diagnoses	10
Total Cases	165

Table 2: Complications Associated with Acute Abdominal Pathologies

Complication	Number of Cases
Abscess Formation	22
Perforations	16
Bowel Wall Thickening	9
Other Complications	5
No Complications	113
Total Cases with Complications	52
Total Cases	165

Table 3: Diagnostic Performance of Abdominal CECT

Diagnostic Parameter	Value (%)	95% Confidence Interval
Sensitivity	92.4%	(88.7% - 95.6%)
Specificity	96.7%	(92.5% - 98.7%)
Positive Predictive Value	89.6%	(85.3% - 92.9%)
Negative Predictive Value	97.7%	(94.0% - 99.0%)
Accuracy	94.5%	(91.5% - 96.6%)

Discussion

The results of this study demonstrate how important abdominal contrast-enhanced computed tomography (CECT) is as a diagnostic tool in the assessment of acute abdominal disorders. The ramifications of the findings, their consistency with prior studies, the therapeutic importance of CECT, and possible research directions will all be covered in the discussion section.

The continuously excellent sensitivity and specificity found in this investigation reaffirm the accuracy of abdominal CECT in the diagnosis of a variety of acute abdominal illnesses. These results are consistent with earlier studies, highlighting the CECT's reliability as a major imaging modality for acute abdomen assessment [11-15]. The capacity of CECT to accurately distinguish between different illnesses has the potential to lower diagnostic uncertainty and direct quick response.

Distribution of Acute Abdominal Pathologies: The variety of disorders that might manifest with acute abdominal symptoms is reflected in the distribution of acute abdominal pathologies in this study. The most often identified condition was appendicitis, a common surgical emergency, followed by diverticulitis and bowel blockages. Even though they are less frequent, traumatic injuries highlight how crucial it is to take traumatic aetiologies into account while assessing acute abdomen. This distribution is consistent with epidemiological information from diverse areas, highlighting the necessity of a thorough diagnostic strategy in an emergency situation [11-15].

Acute abdominal pathologies can have sequelae, including abscess formation, perforations, and thickening of the intestinal wall. These complications highlight the potential severity and complexity of acute abdominal pathologies. Improvements in patient outcomes can be attained through early diagnosis, which can be facilitated by CECT. These results emphasise the clinical importance of accurate and early imaging in acute abdomen.

Comparison with Previous Literature: This study's use of abdominal CECT for diagnosis is compatible with previously written research. Similar high sensitivity and specificity values for CECT in the diagnosis of acute abdominal diseases have been found in other investigations [5][6]. The data base supporting the routine use of CECT in the evaluation of acute abdomen is strengthened by these consistent findings.

The findings of this investigation have important clinical ramifications. The excellent diagnostic accuracy of abdominal CECT provides clinicians with a trustworthy tool for quick and accurate diagnosis, supporting early decision-making and intervention. CECT enables healthcare professionals to customise treatment strategies to meet the needs of individual patients by recognising specific diseases and probable problems, improving results.

While this study supports the diagnostic use of abdominal CECT in acute abdomen, there are still areas that require exploration. Prospective studies examining CECT's effects on patient outcomes, such as length of hospital stay and surgical treatments, may shed light on the clinical advantages of the treatment. Additionally, research into the efficiency of CECT in the diagnostic process for acute abdomen would aid in the efficient use of medical resources.

Conclusion

The results of this study demonstrate, in conclusion, the critical use of abdominal contrast-enhanced computed tomography in the assessment of acute abdominal diseases. Given the difficult problem of diagnosing acute abdomen, its high sensitivity and specificity, as well as the capacity to spot complications, make it a crucial tool for doctors. According to these findings, abdominal CECT should be routinely incorporated into the diagnostic process for patients exhibiting acute abdominal symptoms, thereby improving patient care and outcomes.

References

1. Maleki Verki M, Motamed H. Rectus Muscle Hematoma as a Rare Differential Diagnosis of Acute Abdomen; a Case Report. *Emerg (Tehran)*. 2018;6(1):e28.
2. Kaushal-Deep SM, Anees A, Khan S, Khan MA, Lodhi M. Primary cecal pathologies presenting as acute abdomen and critical appraisal of their current management strategies in emergency settings with review of literature. *Int J Crit Illn Inj Sci*. 2018 Apr-Jun;8(2):90-99.
3. Li PH, Tee YS, Fu CY, Liao CH, Wang SY, Hsu YP, Yeh CN, Wu EH. The Role of Noncontrast CT in the Evaluation of Surgical Abdomen Patients. *Am Surg*. 2018 Jun 01;84(6):1015-1021.
4. de Burlet K, Lam A, Larsen P, Dennett E. Acute abdominal pain-changes in the way we assess it over a decade. *N Z Med J*. 2017 Oct 06;130(1463):39-44.
5. Geng WZM, Fuller M, Osborne B, Thoires K. The value of the erect abdominal radiograph for the diagnosis of mechanical bowel obstruction and paralytic ileus in adults presenting with acute abdominal pain. *J Med Radiat Sci*. 2018 Dec;65(4):259-266.
6. Mohammed MF, Elbanna KY, Mohammed AME, Murray N, Azzumea F, Almazied G, Nicolaou S. Practical Applications of Dual-Energy Computed Tomography in the Acute Abdomen. *Radiol Clin North Am*. 2018 Jul;56(4):549- 563.
7. Ng CS, Watson CJ, Palmer CR, See TC, Beharry NA, Housden BA, et al. Evaluation of early abdominopelvic computed tomography in patients with acute abdominal pain of unknown cause:prospective randomised study. *BMJ* 2002;325:1387.
8. Rosen MP, Sands DZ, Longmaid HE 3rd, 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;174:1391-6
9. Rosen MP, Siewert B, Sands DZ, Bromberg R, Edlow J, Raptopoulos V, et al. Value of abdominal CT in the emergency department for patients with abdominal pain. *Eur Radiol* 2003;13:418-24
10. Salem TA, Molloy RG, O'Dwyer PJ. Prospective study on the role of CT scan in patients with an acute abdomen. *Colorectal Disease* 2005; 7:460-6
11. Taourel P, Baron MP, Pradel J, Fabre JM, Seneterre E, Bruel JM. Acute abdomen of unknown origin:impact of CT in diagnosis and management. *Gastrointest Radiol* 1992; 17:287-91
12. Stoker J, Van Randen A, Lameris W, Boermeester MA. Imaging patients with acute abdominal pain. *Radiology* 2009;253:31-46
13. Siewert B, Raptopoulos V, Mueller MF, Rosen MP, Steer M. Impact of CT on diagnosis and management of acute abdomen in patients initially treated without surgery. *AJR Am J Roentgenol* 1997; 168:173-8

14. Johnson CD, Baker ME, Rice RP, Silverman P, Thompson WM. Diagnosis of acute colonic diverticulitis: comparison of barium enema and CT. *AJR* 1987;148:541–6
15. Hill MV, Barkin J, Isikoff MB, Silverstein W, Kalser M. Acute pancreatitis: clinical vs CT findings. *AJR Am J Roentgenol* 1982;139:263–9