

Evaluation of Role of CT Evaluation of Acute Abdomen: A Cross-sectional Study

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Abstract

Background: The “acute abdomen” is a painful syndrome of sudden onset, caused by a wide variety of pathologic conditions that warrant emergency medical attention. Since many diseases can lead to similar clinical features as acute abdomen, imaging is often called upon to tackle the challenge and to establish the etiologic diagnosis or guide management planning. Main Aim of this study to establish the role of CT in diagnosis of etiology of acute abdominal pain and to quantify the degree to which CT and clinical findings correlate.

Methods: 40 patients of suspected acute abdomen; established by clinical findings and subsequent course referred to department of Radio-diagnosis, Shree Narayan Medical Institute and Hospital, Saharsa, Bihar for CT scan during the period of January 2024 to December 2024, comprised the material for the present study which fulfilled the inclusion criteria and do not come under the ambit of exclusion criteria. The usual CT scan protocol comprised of contiguous 5mm transaxial sections from dome of diaphragm to pubic symphysis after administration of oral and intravenous contrast media. Serial CT sections of abdomen was obtained in each case using spiral CT scanner Siemens Somatom Emotions 16 slice.

Results: The collective data was analysed for CT findings of non-traumatic group which presented clinically as acute abdomen. The total number of cases analysed was 40.

Conclusion: Computed tomography is an important modality in the evaluation of acute abdomen for grading the severity of disease.

Keywords: Acute Abdomen, CT.

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Introduction

Acute abdomen encompasses a broad spectrum of emergency conditions characterized by severe abdominal pain requiring urgent medical evaluation and often immediate surgical intervention.[1] The clinical presentation of acute abdominal conditions frequently overlaps, creating diagnostic challenges that can significantly impact patient outcomes and healthcare resource utilization.[2] Traditional clinical assessment, while fundamental, has inherent limitations in distinguishing between various pathological processes, particularly in complex cases or atypical presentations.[3]

Therefore, medical imaging plays a vital role in the diagnostic process and aids in prioritizing patient care. Abdominal radiography is readily available and particularly valuable for detecting conditions like small bowel obstruction and pneumoperitoneum. [4,5] However, in most cases,

a definitive diagnosis cannot be achieved solely through radiography, necessitating further imaging. Ultrasonography (USG) is another commonly used imaging technique for patients with sudden-onset abdominal pain. USG provides real time visualization of abdominal organs, bowel caliber, bowel wall thickness, and peristalsis, and can even assess blood flow using Doppler.[6] Nevertheless, USG may sometimes yield inconclusive results, especially when extensive bowel gas or intra-abdominal fat is present."

CT has emerged as the most suitable imaging technique for establishing a specific diagnosis, particularly when ultrasonography fails to provide conclusive results. Its capacity to provide a comprehensive view of the gut, mesentery, omentum, peritoneum, retroperitoneum, vasculature, solid organs, abdominal musculature,

and bones has granted it a critical role in diagnosis.[7-9]

Material and Methods

This cross-sectional study was conducted in the Department of Radio-diagnosis, Shree Narayan Medical Institute and Hospital, Saharsa, Bihar from January 2024 to December 2024.

Written consent was obtained from all the participants of the study. The sample selection was done by the convenience sampling method. Consecutive cases of suspected appendicitis were included in the study based on the inclusion and exclusion criteria.

Suspected cases of acute abdomen of non-traumatic origin, both sexes (male and female), aged ≥ 10 years and above and willing to participate in the study voluntarily were included in this study

Patients with Traumatic acute abdomen, recurrent acute abdomen post-surgery, pregnant females and not willing to participate in the study were excluded in this study.

The study included consecutive patients who experienced acute abdomen. The inclusion criteria encompassed patients with a history of acute abdominal pain, abdominal distension, abdominal guarding, and rigidity. Furthermore, some patients who had already received a diagnosis through ultrasonography but were referred for CT scans to gather additional information were also included.

Conversely, the study excluded patients with a history of traumatic injuries (both blunt and penetrating), pregnant individuals, and those for whom a confirmed diagnosis had been established through ultrasonography.

CT scanner Siemens Somatom Emotions 16 slice was utilized for all cases. Abdominal and pelvic images were captured in serial axial sections from

the diaphragm to the lower border of the symphysis pubis. The collimation was set at 5 – 7 mm, and the pitch ranged from 1 to 1.5, depending on the required coverage length. Multi-planar reconstruction was conducted at intervals of 3-7 mm. The images were studied in both axial and coronal/sagittal reformatted views. Additionally, for appropriate cases, further analysis involved maximum intensity projection, minimum intensity projection, and volume rendering techniques. The imaging procedure began with plain CT scans of the abdomen and pelvis in axial sections, followed by a contrast study.

All the available data was uploaded in MS Excel Spreadsheet and analyzed by SPSS version 19 in Windows format. The continuous variables were represented as mean, standard deviations, percentages, and categorical variables were calculated with the chi-square test, and p values of < 0.05 was considered significant.

Results

A total of 40 suspected acute abdominal cases were included in this study. 30 (75%) of these cases were males, and 10 (25%) involved females. The ratio of male to female was 3:1.

Most of the cases in the study were from the age group 21 – 30 years (25%) followed by the age group 41 – 50 years and 61 – 70 years with 17.5% cases each. The mean age of the cohort was 32.5 ± 5.5 years.

In the present study most commonly reported symptoms were fever in 100% of cases followed by nausea and vomiting in 55% of cases. Fever was reported in 52.5% of cases. The other details of the symptoms reported in the study are given in Table 1.

Table 1: Showing the symptoms reported by the patients in the study

Symptoms	No. of cases	Percentage
Abdominal Pain	40	100.0%
Nausea/Vomiting	22	55.0%
Fever	21	52.5%
Hematuria	15	37.5%
Constipation	10	25.0%
Abdominal distension	6	15.0%

In our study, the most common cause of non-traumatic acute abdomen was the existence of urinary pathologies followed by hepatobiliary pathologies. GI pathologies were in 25% of cases and pancreatic pathologies in 12.5% of cases as shown in Table 2.

Table 2: Causes of non-traumatic acute abdomen diagnosed

Causes	No. of cases	Percentage
Urinary Tract pathology	14	35%
Hepatobiliary Pathology	11	27.5%
G.I Pathology	10	25%
Pancreatic Pathology	5	12.5%

Total	40	100.0%
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Table 3: Urinary pathologies in the cases of the study

Causes	No. of cases	Percentage
Renal calculi	6	42.85%
Ureteric calculus	5	35.71%
Vesical calculus	3	21.43%
Total	14	100.0%

Common urinary pathologies have been shown in Table 3. Renal calculi were the cause of non-traumatic acute abdomen in 42.58% of cases followed by ureteric calculus in 35.71% and vesical calculus in 21.43% of cases.

Table 4: Hepatobiliary pathologies in the cases of the study

Causes	No. of cases	Percentage
Cholelithiasis	4	36.36%
Cholecystitis	2	18.18%
Liver abscess	5	45.45%
Total	11	100.0%

The study findings showed that hepatobiliary lesions comprised cholelithiasis in 36.36% of cases, chronic cholecystitis in 18.18% of cases, and liver abscess in 45.45% of cases, as presented in Table 4. Likewise, the incidence of GI pathologies, as

indicated in Table 5, demonstrated acute appendicitis as the leading cause of acute abdomen in 50% of cases, followed by intestinal obstruction in 30% of cases, and intestinal perforation in 20% of cases.

Table 5: Gastrointestinal pathologies in the cases of the study

Causes	No. of cases	Percentage
Acute Appendicitis	5	50%
Intestinal obstruction	3	30%
Intestinal perforation	2	20%
Total	10	100.0%

This study revealed the predominant diagnostic findings of pancreatitis on CECT. Notably, 80% of cases exhibited an enlarged pancreas, along with intra/extrapaneatic collections, while 60% of cases showed altered enhancement. Additionally, 60% of cases displayed less than 30% necrosis,

while 40% exhibited greater than 30% necrosis. Furthermore, a significant majority (60%) of cases experienced extrapancreatic complications like pleural effusion and ascites, which were attributed to the severity of the disease details depicted in Table 6.

Table 6: MDCT findings in patients with pancreatitis

MDCT	No. of cases	Percentage
Bulky pane	4	80%
Altered enhancement	3	60%
Intrapaneatic collection/Extrapaneatic collection	4	80%
Necrosis < 30%	3	60%
Necrosis > 30%	2	40%
Pseudocyst	1	20%
Dilated main pancreatic duct	2	40%
Pleural effusion/Ascites	3	60%

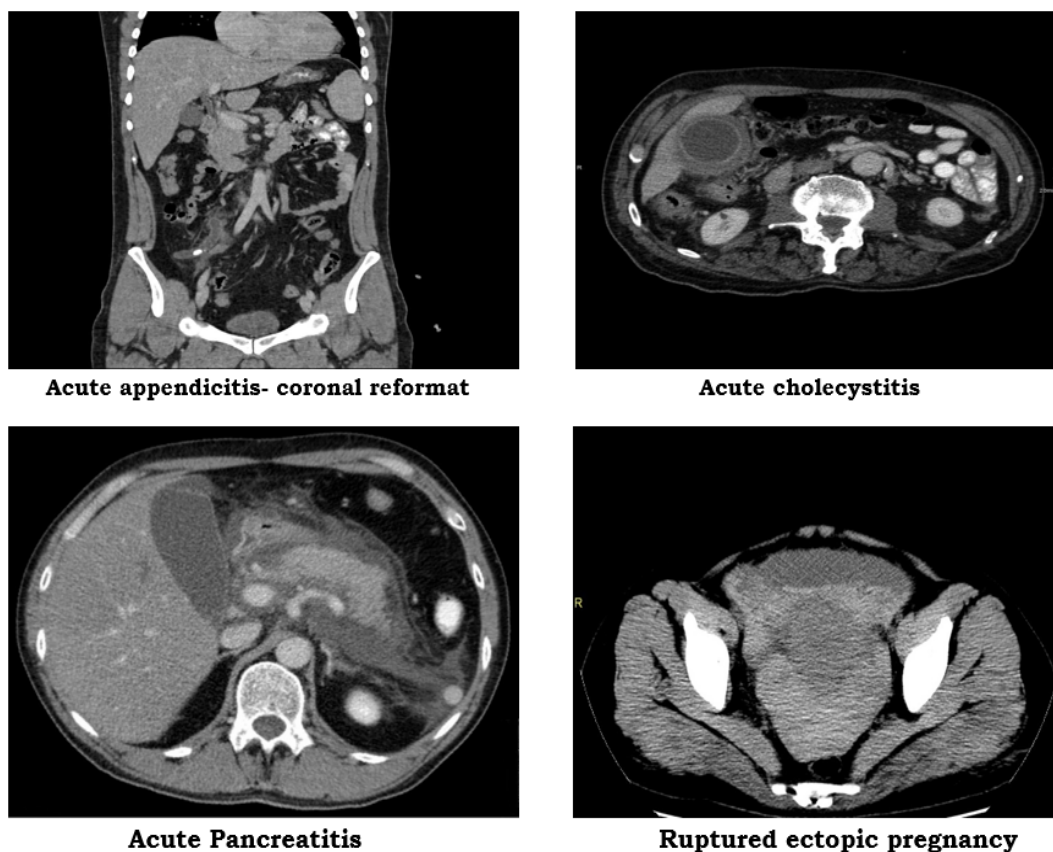


Figure 1:

Discussion

About 4% to 5% of all ED patients report having acute abdominal discomfort, making it a common complaint among patients who visit the emergency room. [10] For these patients, the diagnostic approach starts with a thorough medical history and physical examination. Medical professionals may choose to use imaging studies to help get a precise diagnosis based on the results of this clinical assessment and laboratory testing. [11]

The phrase "acute abdomen" is frequently used to characterize the state of acute abdominal pain that is seen in a subset of critically sick individuals who also have stiffness and tenderness in their abdomens. Such patients were frequently advised to have surgery in the past, prior to the widespread use of imaging. However, with the advent of advanced imaging techniques, some patients with acute abdomen can now be managed without surgical intervention. Conversely, other patients with acute abdominal pain do not meet the specific criteria for acute abdomen, such as those suspected of having acute appendicitis, and may require surgical treatment. Throughout this article, we will utilize the term "acute abdominal pain" to encompass the entire range of acute abdominal pain in patients treated in the ED, for whom imaging is necessary. [12] Our study found a notable incidence of acute abdomen in young to middle-

aged patients, with a male predominance, and the most frequent location of pain was reported in the right hypochondrium. L. Chanana et al. [13] also observed similar prevalence rates concerning age, sex, and site. Among the cases analyzed, urinary tract pathology was the most prevalent, accounting for 35% of cases, followed by hepatobiliary issues in 25% of cases, gastrointestinal pathology in 27.5% of cases, and pancreatic causes in 12.5% of cases. The common culprits of acute abdomen identified in our study included urolithiasis, cholecystitis, pancreatitis, intestinal obstruction, and liver abscess. These findings align with the results obtained by Abujudeh HH et al. [14] in their study.

In the study conducted by Abujudeh HH et al. [14] intestinal obstruction emerged as the second most frequent cause of acute abdomen, while in our study, it ranked fourth. This variation suggests a higher prevalence of obstruction in the Western world when compared to the Asian region. Such disparities have been attributed to differences in dietary habits, with increased consumption of low cellulose and high animal fat in Western diets. Similar findings have been reported in other studies as well. [14-16]

Within this study, the CECT abdomen demonstrated higher accuracy in diagnosing cases of acute calculus cholecystitis compared to clinical

provisional diagnosis. Stoker J et al. [17] also assessed CECT findings in acute cholecystitis and concluded that CT is a superior modality when compared to clinical and lab-based diagnoses of cholecystitis.

In this study, all cases of acute appendicitis that had a clinical provisional diagnosis of acute appendicitis were confirmed using CECT abdomen, indicating a 100% efficiency of CECT in this regard. Funaki B et al. [18], reported a sensitivity of 97% for CT in diagnosing acute appendicitis, while de Burlet KJ et al. [19] reported a sensitivity range of 90% to 95%, and van Randen A et al. [20] found an accuracy of 94% for diagnosing acute appendicitis. Regarding intestinal perforation, out of the two diagnosed cases in this study, only one had a provisional diagnosis of perforation. However, Gore RM et al. [21] reported that CT was 100% accurate in diagnosing and locating perforations. In this current study, all cases of pancreatitis were diagnosed using CECT, corresponding with the provisional diagnosis of pancreatitis. Orkin SH et al. [22] observed a sensitivity of 62 – 67% for pancreatitis detection using CT. Additionally, Balthazar EJ [23] reported an early overall detection rate of 90% with nearly 100% sensitivity after 4 days of pancreatic necrosis using CT. In the present study, CECT findings of all cases of pancreatitis were diagnosed with provisional diagnosis of pancreatitis.

Conclusion

Ultrasound (USG) may be inconclusive in the presence of excessive bowel gas or abdominal fat, hindering the visualization of abdominal organs.

Despite the slight increase in cost and the small risk of radiation, the prompt use of CT in investigating acute abdomen cases results in more accurate diagnoses and improves decision-making, ultimately leading to better patient outcomes.

References

- Cartwright SL, Knudson MP. Evaluation of acute abdominal pain in adults. *Am Fam Physician*. 2008;77(7):971-978.
- Laméris W, van Randen A, van Es HW, et al. Imaging strategies for detection of urgent conditions in patients with acute abdominal pain: diagnostic accuracy study. *BMJ*. 2009;338:b2431.
- Hustey FM, Meldon SW, Banet GA, et al. The use of abdominal computed tomography in older ED patients with acute abdominal pain. *Am J Emerg Med*. 2005;23(3):259-265.
- Fukuya T, Hawes DR, Lu CC, Chang PJ, Barloon TJ. CT diagnosis of small-bowel obstruction: efficacy in 60 patients. *AJR Am J Roentgenol*. 1992 Apr;158(4):765-9; discussion 771-72.
- Lazarus DE, Slywotsky C, Bennett GL, et al. Frequency and relevance of the “small-bowel feces” sign on CT in patients with small-bowel obstruction. *Am J Roentgenol* 2004; 183: 1361–1366.
- Ha HK, Kim JS, Lee MS, Lee HJ, Jeong YK, Kim PN, Lee MG, Kim KW, Kim MY, Auh YH. Differentiation of simple and strangulated small-bowel obstructions: usefulness of known CT criteria. *Radiology*. 1997 Aug;204(2):507-12.
- Na-Chiang Mai W, Pojchamarnwiputh S, Lertprasertsuke N, Chitapanarux T. CT findings of tuberculous peritonitis. *Singapore Med J*. 2008 Jun;49(6):488-91.
- Kim SW, Kim HC, Yang DM. Perforated tumors in the gastrointestinal tract: CT findings and clinical implications. *Br J Radiol* 2012; 85:1307–1313.
- Pradel JA, Adell JF, Taourel P, Djafari M, Monnin-Delhom E, Bruel JM. Acute colonic diverticulitis: prospective comparative evaluation with US and CT. *Radiology*. 1997 Nov;205(2):503-12.
- Ronald A, Squires, Postier G R. *Acute Abdomen Sabiston Textbook OF Surgery*. 19th edition, Philadelphia: Elsevier Saunders, 2012; 47(2): 1141-59.
- Dhillon S, Halligan S, Goh V, Matraviers P, Chambers A, Remedios D. The therapeutic impact of abdominal ultrasound in patients with acute abdominal symptoms. *Clin Radiol*., 2002; 57(4): 268-71.
- Cassina P, Röthlin M, Largiadèr F. Efficacy of basic surgical diagnosis in acute abdominal pain. *Chirurg*., 1996; 67(3): 254-60.
- Chanana L, Jegaraj MA, Kalyaniwala K, Yadav B, Abilash K. Clinical profile of non-traumatic acute abdominal pain presenting to an adult emergency department. *J Family Med Prim Care*. 2015 Jul-Sep;4(3):422-25.
- Abujudeh HH, Kaewlai R, McMahon PM, Binder W, Novelline RA, Gazelle GS, Thrall JH. Abdominopelvic CT increases diagnostic certainty and guides management decisions: a prospective investigation of 584 patients in a large academic medical center. *AJR Am J Roentgenol*. 2011 Feb;196(2):238-43.
- Evans K, Costabile RA. Time to development of symptomatic urinary calculi in a high-risk environment. *J Urol*. 2005 Mar;173(3):858-61.
- Brikowski TH, Lotan Y, Pearle MS. Climate-related increase in the prevalence of urolithiasis in the United States. *Proc Natl Acad Sci USA* 2008; 105: 9841-46.
- Stoker J, van Randen A, Laméris W, Boormeester MA. Imaging patients with acute abdominal pain. *Radiology*. 2009 Oct;253(1):31-46.

18. Funaki B, Grosskreutz SR, Funaki CN. Using unenhanced helical CT with enteric contrast material for suspected appendicitis in patients treated at a community hospital. *AJR Am J Roentgenol.* 1998 Oct;171(4):997-1001.
19. de Burlet KJ, MacKay M, Larsen P, Dennett ER. Appropriateness of CT scans for patients with non-traumatic acute abdominal pain. *Br J Radiol.* 2018 Jul;91(1088):20180158.
20. van Randen A, Bipat S, Zwinderman AH, Ubbink DT, Stoker J, Boermeester MA. Acute appendicitis: Meta-analysis of diagnostic performance of CT and graded compression US related to prevalence of the disease. *Radiology.* 2008; 249:97–106.
21. Gore RM, Silvers RI, Thakrar KH, Wenzke DR, Mehta UK, Newmark GM, Berlin JW. Bowel Obstruction. *Radiol Clin North Am.* 2015 Nov;53(6):1225-40.
22. Orkin SH, Trout AT, Fei L, Lin TK, Nathan JD, Thompson T, Vitale DS, Abu-El-Haija M. Sensitivity of Biochemical and Imaging Findings for the Diagnosis of Acute Pancreatitis in Children. *J Pediatr.* 2019 Oct; 213:143-148.e2.
23. Balthazar EJ. Acute pancreatitis: assessment of severity with clinical and CT evaluation. *Radiology.* 2002; 223:603–13.