

Original Research Article

Multidetector computerized tomography in acute abdomen

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ABSTRACT

Background: Acute abdominal pain is a common chief complaint in patients examined reporting to emergency department. The sensitivity of CT is 96% in acute abdomen. In order to decrease the mortality and morbidity rate, an efficient and correct diagnosis should be given for these patients. When investigations, like USG examinations are inconclusive, in such cases, multi-detector computer tomography is a widely accepted primary investigation of choice in patients coming with intense abdominal pain. The aim of the study was to evaluate the accuracy of MDCT in diagnosis of acute abdomen; document the sensitivity and specificity of MDCT; the incidence of different pathologies presenting as acute abdomen.

Methods: Prospective study on 64 subjects with acute pain abdomen was subjected to MDCT in GMC Srinagar. The duration of this study was from January to May 2019.

Results: About 36 patients were females and 28 were males. Youngest patient had an age of 7 years to eldest patient having age of 79 years. Most common causes of acute abdomen were acute pancreatitis in 21.8, acute appendicitis in 15.6% and bowel obstruction in 12.5%. In our study the sensitivity, specificity and positive and negative predictable values of MDCT were 95.0%, 75%, 98.3% and 60% respectively.

Conclusions: We conclude that MDCT has high sensitivity and accuracy rate. In inconclusive cases, MDCT is recommended to arrive at a definitive diagnosis. The results obtained in the study were comparable to pioneer studies conducted worldwide.

Keywords: Multidetector computerized tomography, Acute abdomen

INTRODUCTION

Acute abdominal pain is a common chief complaint in patients examined in the emergency department (ED) and can be related to a myriad of diagnoses. About 4 to 5% patients who present to emergency department with acute abdominal pain.¹ Patients with acute abdomen are seriously ill and have abdominal tenderness and rigidity. Before the advent of widespread use of imaging, these individuals were candidates for surgery. However, with the present role of imaging, some patients with acute abdomen will not undergo surgery. Conventional radiography, ultrasonography (US), and computed tomography (CT) are frequently used in the diagnostic

work-up of patients with acute abdominal pain. The accuracy values for conventional radiography in patients with acute abdominal pain is poor, although accuracy of 53% has been reported.² US and CT, as compared with conventional radiography, yield markedly higher accuracy values.^{2,3} The overall sensitivity of CT is 96% as compared sensitivity of 30% for conventional radiography.²

Ultrasound (USG) is another imaging modality commonly used in the diagnostic work-up of patients with acute abdominal pain. USG is cheap, easily available and accessible investigation for acute abdomen. USG is a real-time dynamic examination that can reveal

the presence or absence of peristalsis and depict blood flow. Furthermore, it is possible to correlate US findings with the point of maximal tenderness. Absence of radiation, easily availability, lesser cost, no need of intravenous contrast are advantages of USG over CT. In one study, US reportedly provided useful information for 56% of patients with acute abdominal pain after excluding patients who were strong suspicion of having perforated viscus, bowel obstruction, or appendicitis., and in another study, it either yielded unique diagnostic information in 65% of patients.^{4,5}

The CT technique used to examine patients with acute abdominal pain generally involves scanning of abdomen from above level of diaphragm to femur neck with use of intravenous iodinated contrast medium. Although abdominal CT can be performed without contrast medium, the intravenous administration of contrast material facilitates good accuracy—with a positive predictive value of 95% reported for the diagnosis of appendicitis—and a high level of diagnostic confidence, especially in thin patients, in whom fat interfaces may be almost absent.^{2,6}

A correct diagnosis significantly decreases morbidity and mortality.² An accurate diagnosis is the need of hour in patients with inconclusive USG examinations. In such cases, contrast enhanced computerized tomography is the investigation of choice for patients coming with intense abdominal pain.⁷⁻⁹ It is the most rapid, time efficient, objective and informative imaging technique. MDCT provides a global judgment of the gastrointestinal tract, mesenteries, peritoneum and retroperitoneal areas in which ultrasound examination provides limited information. It also gives us significant information for another possible diagnosis, if the working clinical diagnosis is incorrect and has a significant outcome in planning treatment of patients with intense abdominal pain. With the introduction of multi planner reconstruction in the workstations, MDCT has led to a great improvement in the management of these patients.

Aim

- To evaluate the accuracy of multidetector computerized tomography (MDCT) in the diagnosis of acute abdomen.
- Document the sensitivity and specificity of MDCT as a diagnostic tool.
- The incidence of different pathologies presenting as acute abdomen.

METHODS

Prospective study on 64 subjects with acute pain abdomen was subjected to MDCT in Department of Radiodiagnosis and Imaging in GMC Srinagar. MDCT was done with SIEMENS SOMATOM 256 slice CT. The duration of this study was from January 2019 to May

2019. Accuracy, sensitivity, specificity, positive and negative predictive values were calculated for MDCT.

Non-enhanced CT (NECT) abdomen was done from the level of diaphragm through the symphysis pubis within a single breath hold. The kVp and mAs parameters were automatically controlled by the machine; raw data are acquired at a section thickness of 0.625 mm; pitch – 0.8 to 1.5. First, the images are acquired in pre-contrast phase. Then, 1-2 ml per kg of water soluble non-ionic IV contrast medium with an iodine content of 275 to 370mg was given at a rate – 4 ml/sec through a power injector. Then, post- contrast arterial, venous and delayed phases were taken at 25 secs, 45 secs and 7 mins respectively by bolus tracking and automated triggering technology. In necessary cases, oral contrast was given an hour prior to the procedure, 30 ml ionic contrast medium containing 250 mg/ml in 1 litre of water.

Inclusion criteria

Inclusion criteria were patients who are presenting with clinical symptoms of acute abdomen and undergoing MDCT.

Exclusion criteria

Exclusion criteria were patients who have contraindication to contrast media in whom contrast study are indicated; patients lost to follow up; patients with confident diagnosis on ultrasound.

RESULTS

Sex

36 patients were females and 28 were males (Figure 1).

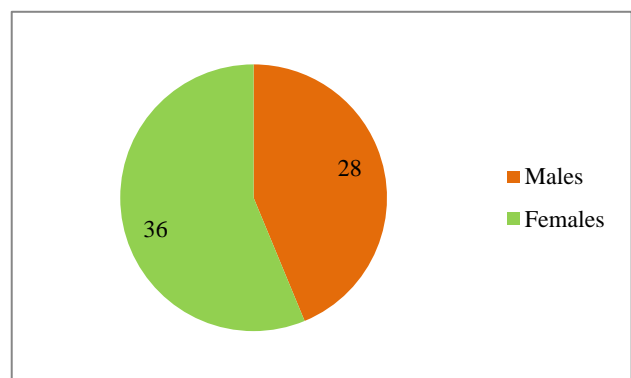


Figure 1: The gender distribution in the study population.

Age

Youngest patient had an age of 7 years to eldest patient having age of 79 years (Table 1).

Table 1: The age distribution in the study population.

Categorization of patients based on age groups	
Age group (in years)	No. of patients
0-10	4
10-20	7
20-30	10
30-40	13
40-50	16
50-60	7
60-70	4
70-80	3

Pathology detected in study population.

Table 2: Frequency and percentage of occurrence of different pathologies.

No.	Pathology	Frequency	Percentage (%)
1.	Pancreatitis	14	21.8
2.	Appendicitis	10	15.6
3.	Bowel obstruction	8	12.5
4.	Ureterolithiasis	6	9.3
5.	Acute cholecystitis	6	9.3
6.	GB perforation	5	7.8
7.	Volvulus	4	6.25
8.	Ovarian torsion	3	6.25
9.	Bowel perforation	2	3.1
10.	Diverticulitis	1	1.5
11.	Idiopathic	5	6.25

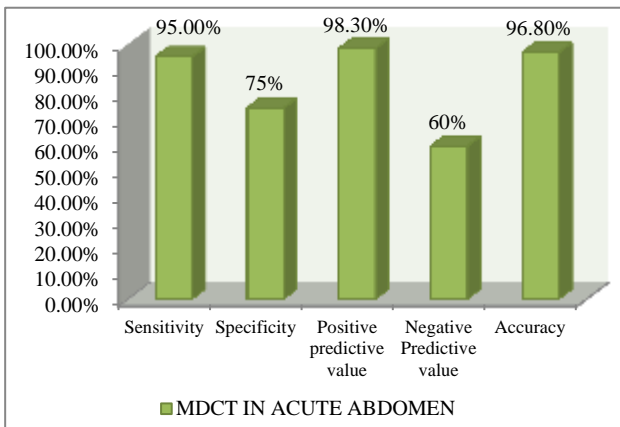


Figure 2: Sensitivity, specificity and positive and negative predictable values and accuracy of MDCT in acute abdomen.

Common Pathologies were acute pancreatitis in 21.8 (Figure 7), acute appendicitis in 15.6% (Figure 8) and bowel obstruction in 12.5%, ureterolithiasis and acute cholecystitis in 9.3%, gall bladder perforation (Figure 6) in 7.8%, volvulus (Figure 3) and ovarian torsion (Figure 4) in 6.25%, bowel perforation (Figure 5) in 3.1% and diverticulitis in 1.5%. In about 6.25% cases no cause

could be found. Table 3 shows incidence of different pathologies in our study. Amongst 4 cases in which no diagnosis could be made by MDCT, all four patients underwent laparotomy. Out of which one had meckel's diverticulitis, one had ovarian torsion and three were normal. One patient who was diagnosed with bowel obstruction due to adhesion had paralytic ileus.



Figure 3: Coronal CECT image revealing evidence of coffee bean sign of sigmoid volvulus.

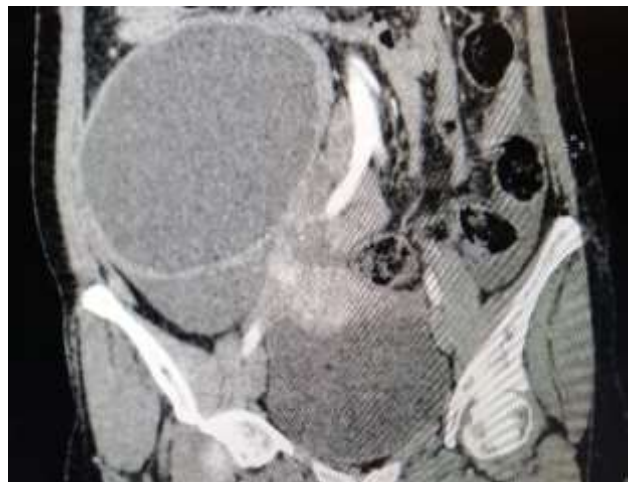


Figure 4: Coronal CECT image revealing evidence of right adnexal thick walled cyst with uterus retracted towards right in a case of ovarian torsion.

Statistics

In our study the accuracy, sensitivity, specificity and positive and negative predictable values of MDCT were 96.8%, 95.0%, 75%, 98.3% and 60% respectively (Figure 2).

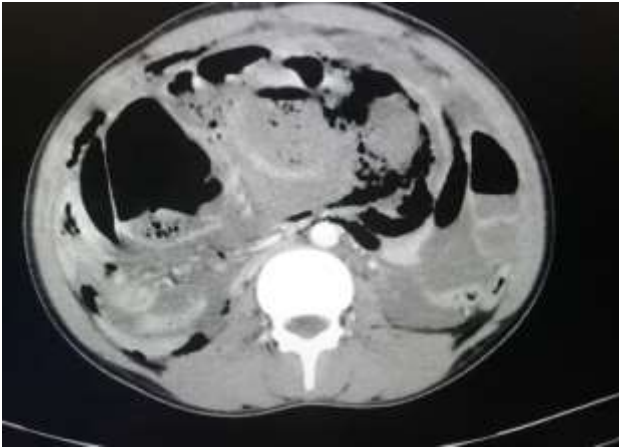


Figure 5: Axial CECT image revealing evidence of dilated small gut loops with mesenteric ischaemia and extraperitoneal air.

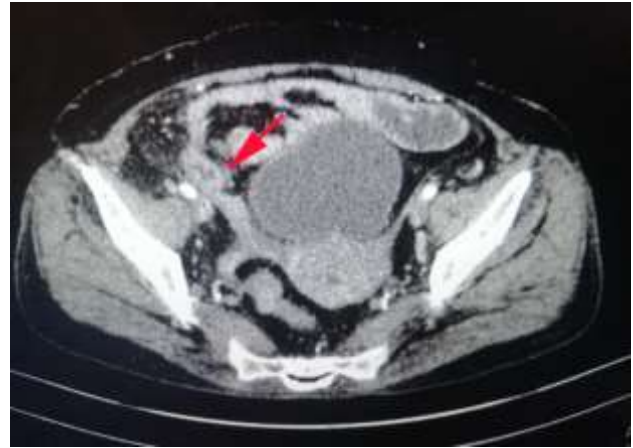


Figure 8: Axial CECT image revealing evidence of inflamed appendix with minimal fluid and fat stranding.

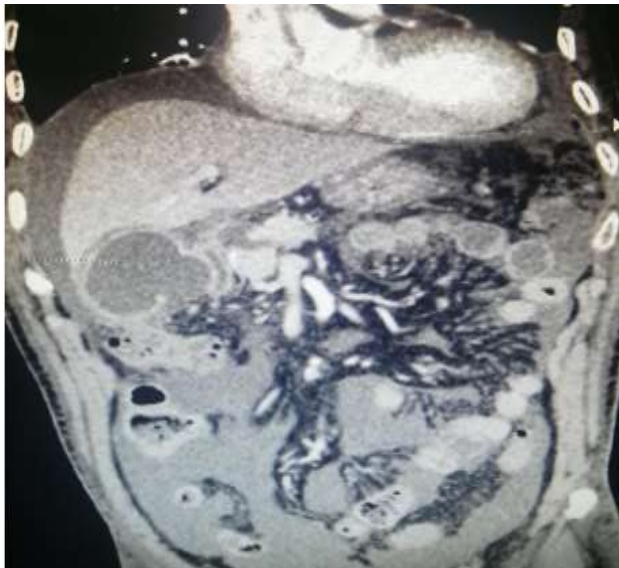


Figure 6: Coronal CECT image revealing evidence of gall bladder perforation with moderate ascites suggestive of biliary peritonitis.



Figure 7: Axial image revealing evidence of emphysematous pancreatitis.

DISCUSSION

The aim of our study was to assess the role of MDCT in the evaluation of various pathologies of acute abdomen.

In our study of 64 patients, 28 were males and 36 females, had ages ranging from 7 to 78 years. We evaluated the various causes of acute abdomen. Common findings were acute pancreatitis in 21.8, acute appendicitis in 15.6% and bowel obstruction in 12.5%. High occurrence of acute pancreatitis in our study can be explained by the fact Kashmiris are used to binge eating which increases the occurrence of pancreatitis as well as due to worm in main pancreatic duct (ascariasis) leading to worm pancreatitis. Other risk factors include smoking and sedentary life style which increase incidence of gall stones and which are leading cause of pancreatitis in Kashmiri population. About 14 out of 64 cases of our study had CT findings confirming acute pancreatitis with sensitivity of 100%. Comparable results are shown by Beger et al.¹⁰ High occurrence of acute appendicitis in Kashmiri population can be explained by poor intake of fibre and high intake of non vegetarian food in Kashmiri population both of which are risk factors for acute appendicitis. In our study 10 patients had CT findings of acute appendicitis. The sensitivity for acute appendicitis for our study was 100%. This is consistent with study conducted by Rao et al which shows 91% to 100% sensitivity for CT in the diagnosis of appendicitis.¹¹

In our study the sensitivity, specificity and positive and negative predictable values of MDCT were 95.0%, 75%, 98.3% and 60% respectively which was comparable to the study results of Monica Mangini et al.¹²

CONCLUSION

We conclude that MDCT has high sensitivity and accuracy rate. In inconclusive cases, MDCT is

recommended to arrive at a definitive diagnosis. The results obtained in the study were comparable to pioneer studies conducted worldwide. However major limitation was small sample size.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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