Original Research Article

Assessment of effectiveness of ultrasound and computed tomography in diagnosis of acute abdomen: A comparative study

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Abstract

Aim: The present study was conducted to compare the efficacy of US and CT in diagnosis of acute abdomen. **Materials & methods:** A total of 30 patients which were referred to our department with clinical presentation of acute abdomen were enrolled. US of the abdomen were done in all the patients. Clinical and demographic details of all the patients were obtained. Patients with presence of traumatic acute abdomen were excluded. CT scan was done in all the patients with High Resolution Siemens Somatom Emotion, in the supine position with both arms above the head and 6mm to 8mm sections were obtained. A predesigned Performa was made for compiling the radio-imaging findings. The statistical analysis of the data was done using SPSS.**Results:**A total of 30 patients with clinical presentation suggestive of acute abdomen were enrolled. Mean age of the patients was 49.2 years. CT had hundred percent accuracy in mesenteric ischaemia, malrotation of gut, GB perforation, Pancreatitis and pseudomembranous colitis while ultrasound had one hundred percent accuracy in diagnosing GB perforation and small bowel obstruction. Overall, while analyzing statistically, it was seen the efficacy of CT was significantly highery in diagnosing other acute abdominal conditions.**Conclusion:** For diagnosing patients with acute abdominal pain, MDCT is an effective imaging modality and hence; should be reserved for patients with non-diagnostic US results.

Key words: Computed tomography, Ultrasound, Abdomen.

Introduction

Acute abdomen is a pathology that requires immediate attention and treatment. The acute abdomen might occur by an infection, inflammation, vascular occlusion, or obstruction. The subject will usually show upsudden onset of abdominal pain with associated nausea or vomiting. Most patients with an acute abdomen appear ill[1-3].A confident and accurate diagnosis can be made solely on the basis of medical history, physical examination, and laboratory test findings in only a small proportion of patients. The clinical manifestations of the various causes of acute abdominal pain usually are not straightforward. For proper treatment, a diagnostic work-up that enables the clinician to differentiate between the various causes of acute abdominal pain is important, and imaging plays an important role in this process. Many patients are referred without a clear pretest diagnosis, and imaging is warranted to determine the diagnosis and guide treatment in these patients.

According to American College of Radiology (ACR) appropriateness criteria contrast material enhanced CT of the abdomen and pelvis is considered the most appropriate examination for patients with fever, nonlocalized abdominal pain, and no recent surgery. Nonenhanced CT, US, and conventional radiography are considered less appropriate initial imaging examinations for these patients[4-6]. Hence, the

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present study was conducted to compare the efficacy of US and CT in diagnosis of acute abdomen.

Materials and methods

The present study was planned and commenced in the Department of radio-diagnosis of Rajindra Hospital, Patiala with the aim of analyzing and comparing the effectiveness of ultrasound and computed tomography in diagnosis of acute abdomen. Ethical approval was obtained from the institutional ethical committee and written consent was obtained after explaining in detail the entire research protocol. Ultrasound procedures were performed with Philips Envisor or GE Logiq α-200 with a 3.5 mhz sector or curvilinear probes. Computed tomography procedures were performed with Siemens-Somatom Emotion 6 slice third generation spiral Computed tomogrpahy.Non-ionic contrast (e.g. iversol) was used as contrast material. During the contrast injection procedure, vitals and all the hemodynamic parameters were continuously monitored.

A total of 30 patients which were referred to our Department with clinical presentation of acute abdomen were enrolled. US of the abdomen were done in all the patients. Clinical and demographic details of all the patients were obtained. Patients with presence of traumatic acute abdomen were excluded. CT scan was done in all the patients with High Resolution Siemens Somatom Emotion, in the supine position with both arms above the head and 6mm to 8mm sections were obtained. Images were taken and multiplanar reconstructions were performed wherever applicable. A predesigned Performa was made for compiling the radio-imaging findings. The statistical analysis of the data was done using SPSS version 11.0 for windows. Chi-square and Student's t-test were used for checking the significance of the data. A p-value of 0.05 and lesser was defined to be statistically significant.

Table 1: Sensitivity and specificity of CT for acute abdomen

Final diagnosis	True positive	False positive	False negative	True negative	Sensitivity	Specificity
Mesenteric ischemia	1	0	0	29	100	100
Malrotation of gut	1	0	0	29	100	100
Gut Perforation	1	1	0	28	100	97.9
Appendicitis	6	1	1	22	93.3	96.2
Gallbladder perforation	1	0	0	29	100	100
Pancreatitis	7	0	0	23	100	100
Pyelonephritis	2	1	1	26	84.6	98.5
Epiploicae appendagitis	1	0	0	29	100	100
Small bowel obstruction	3	0	0	27	100	100
Pseudo membranous colitis	1	0	0	29	100	100
Cholecystitis	2	0	1	27	85.5	100
Others	1	0	0	29	100	100

Table 2:Statistical analysis of USG for acute abdomen

Final diagnosis	True positive	False positive	False negative	True negative	Sensitivity	Specificity
Gut Perforation	1	1	1	27	68.4	97.1
Appendicitis	5	1	1	23	82.9	95.1
Gallbladder perforation	1	0	0	29	100	100
Pancreatitis	5	0	2	23	70.8	100
Pyelo nephritis	2	1	1	26	64.8	94.5
Small bowel obstruction	3	0	0	27	100	100
Cholecystitis	3	0	1	26	84	100
Others	1	0	0	29	100	100

Results

A total of 30 patients with clinical presentation suggestive of acute abdomen were enrolled. Mean age of the patients was 49.2 years. Out of 30, 17 patients were males while the remaining were females. 40 percent of the patients reported the emergency within 2 days of onset of symptoms. Abdominal pain was the most common clinical presentation found in 100

percent of the patients, followed by Vomiting and non-passage of stool seen in 60 percent and 13.33 percent of the patients. Abdominal distension was present in 6.67 percent of the patients. CT had hundred percent accuracy in mesenteric ischaemia, malrotation of gut, GB perforation, Pancreatitis and pseudomembranous colitis while ultrasound had one hundred percent accuracy in diagnosing GB perforation and small bowel obstruction. Overall, while analyzing statistically, it was seen the efficacy of CT was significantly highery in diagnosing other acute abdominal conditions.

Discussion

Abdominal US has considerable diagnostic impact when used to investigate acute abdominal pain. Abdominal ultrasonography of patients with acute abdominal pain is very useful for confirmation or exclusion of clinically suspected appendicitis, billiary tract disease and aortic aneurysm and thus is an important diagnostic tool, albeit in a minority of patients[7-10]. Hence, the present study was conductedto compare the efficacy of US and CT in diagnosis of acute abdomen.In the present study, a total of 30 patients with clinical presentation suggestive of acute abdomen were enrolled. Mean age of the patients was 49.2 years.

Out of 30, 17 patients were males while the remaining were females. 40 percent of the patients reported the emergency within 2 days of onset of symptoms. Van Randen et al compared the accuracy of Ultrasound and Computed Tomography in common diagnoses causing acute abdominal pain. Positive predictive values did not differ significantly between ultrasound and CT for these conditions. Ultrasound sensitivity in detecting appendicitis and diverticulitis was not significantly negatively affected by patient characteristics or reader experience[10].

In the present study, abdominal pain was the most common clinical presentation found in 100 percent of the patients, followed by Vomiting and non-passage of stool seen in 60 percent and 13.33 percent of the patients. Abdominal distension was present in 6.67 percent of the patients. Abdullah et al assessed the outcome of patients with acute abdomen presenting in a tertiary care unit. They concluded that acute appendicitis is the most common condition in patients presenting with acute abdomen. Lack of health education, improper health services and late presentations are common factors for increased morbidity. Sepsis is the major cause of morbidity and mortality in acute abdomen[11].In the present study, CT had hundred percent accuracy in mesenteric ischaemia, malrotation of gut, GB perforation, Pancreatitis and pseudo-membranous colitis while ultrasound had one hundred percent accuracy in diagnosing GB perforation and small bowel obstruction. Overall, while analyzing statistically, it was seen the efficacy of CT was significantly highery in diagnosing other acute abdominal conditions.Chin et al quantified the degree to which radiological and clinical findings differ. 120 consecutive scans fulfilled the inclusion criteria (114 patients; 79 women; mean age 55 years). The correct clinical diagnosis was made in 87.5% of cases based on CT findings. The lack of intravenous contrast limited diagnostic interpretation in 6 of the 15 discrepant cases. The utility of CT imaging in the diagnosis and management of patients presenting with acute abdominal pain is confirmed but is limited in a minority of cases where poor negative interobserver agreement exists[12]. Weil-McCall et al conducted a study to assess the accuracy of computed tomography (CT) in diagnosing specific causes of an acute abdomen. A total of 196 emergency laparotomies were performed over the 2-year period, with 112 patients undergoing preoperative CT. Fifteen patients were excluded from the study due to missing notes. In the remaining 97 patients, 80 CT reports correlated with the final operative diagnosis, giving a diagnostic accuracy of 82%. They concluded that there is significant improvement in diagnostic accuracy to 93% by reducing the threshold for obtaining a second consultant radiologist review[13].

Conclusion

Under the light of above obtained results, the authors conclude that for diagnosing patients with acute abdominal pain, MDCT is an effective imaging modality and hence; should be reserved for patients with non-diagnostic US results. However; further studies are recommended.

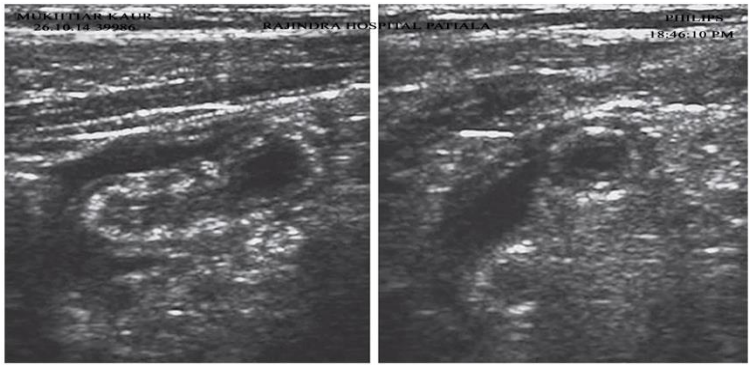

Fig 1: USG showing blind ending tubular structure with periappendiceal fluid and target appearance

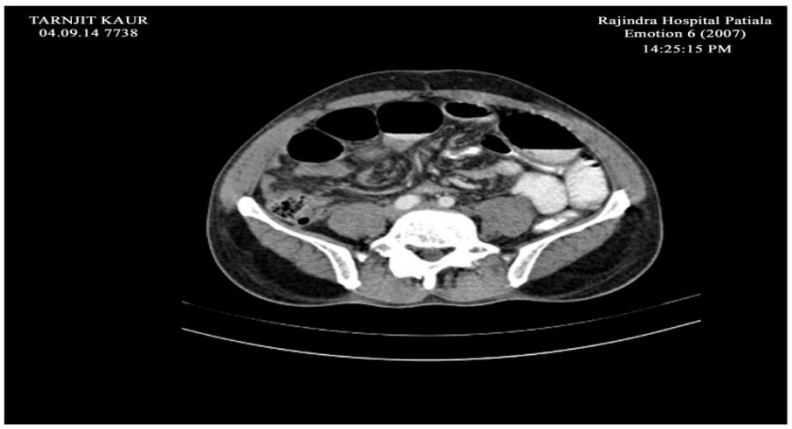

Fig 2: CECT showing dilated gut loops and whirlpool sign

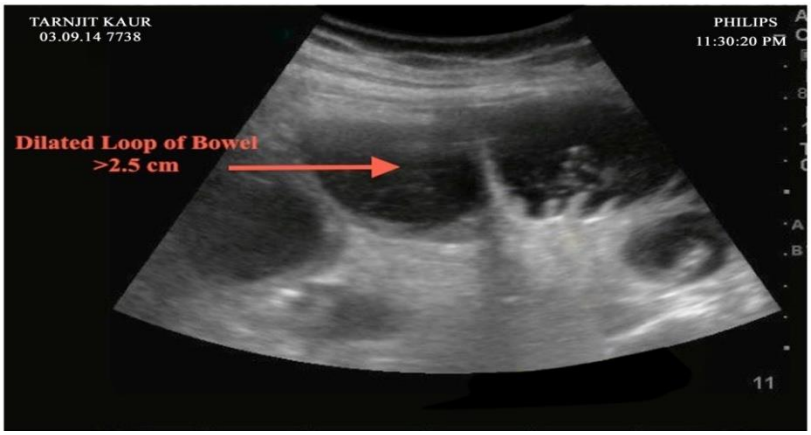

Fig 3: USG showing dilated loops

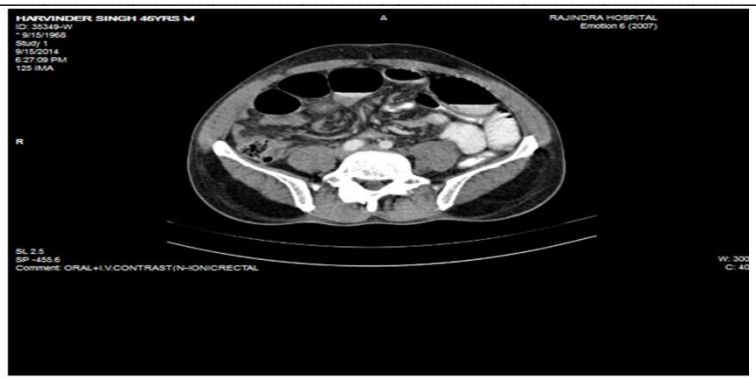

Fig 4: MDCT showing whirl sign

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