



**ORIGINAL RESEARCH PAPER**

**Radio-Diagnosis**

**ROLE OF ULTRASOUND AND COMPUTED TOMOGRAPHY IN NON-TRAUMATIC ACUTE ABDOMEN**

**KEY WORDS:**

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**ABSTRACT**

**BACKGROUND:** The objective of this study was to study, assess, and diagnose causes of acute abdomen accurately, to determine the accuracy of multidetector computed tomography (MDCT) for confirmation of negative, diagnosed, or equivocal ultrasonography (USG) cases, and to establish the role of CT as the primary imaging modality. **AIMS:** To evaluate the etiology using ultrasound and CT in patients presenting with acute abdomen. **MATERIALS AND METHODS:** 60 patients were included in this study. USG and CT were done in all patients. Axial, coronal, and saggital reformatted images were studied. Intravenous and oral contrast were also used depending on the clinical condition. **RESULT:** The various causes of acute abdomen identified in our study include acute appendicitis, acute cholecystitis, acute pancreatitis, nephrolithiasis, intestinal obstruction, hemorrhagic ovarian cyst, GI perforation and others. The sensitivity of CT in detecting appendicitis was significantly higher than that of ultrasound 94% versus 76%. **CONCLUSION:** The diagnostic accuracy of CT is more than ultrasound. CT misses fewer cases than ultrasound, but both ultrasound and CT can reliably detect common diagnoses causing acute abdominal pain. Ultrasound should be the primary investigation in the acute abdomen.

**INTRODUCTION**

Acute abdomen is a medical emergency in which there is sudden and severe pain in abdomen of recent onset with accompanying signs and symptoms that focus on an abdominal involvement. This can be due to a number of reasons ranging from insignificant disease to life-threatening diseases. Acute abdominal pain accounts for about 10% of patients presenting to the Emergency Department. The majority of patients presenting with severe abdominal pain which lasts beyond six hours is caused by conditions of surgical importance. Therefore, the clinical diagnosis of acute abdomen can be challenging, because results of physical examination, clinical presentation, and laboratory examination are often non-specific and non-diagnostic.

Diagnostic imaging is widely used in the work-up of patients with acute abdominal pain. Plain abdominal radiograph, Ultrasound and Computed Tomography are frequently used. Use of conventional radiography (X-rays) has been nowadays of little value with significance being in the setting of bowel obstruction showing dilated bowel loops with air fluid levels. However, computed tomography (CT) is more accurate and more informative in this setting as well. For this reason, plain radiography is avoided in these situations unless there is the suspicion of perforation or bowel dilatation.

The American College of Radiology suggests an abdomen/pelvis CT with contrast medium in patients with acute abdominal pain. Others are in favor of ultrasound as the primary imaging technique mainly because ultrasound is easily accessible and does not expose patients to ionizing radiation. The clinical diagnosis of acute abdomen can be challenging because results of physical examination, clinical presentation and laboratory examination are often non-specific and non-diagnostic.

Imaging plays a very important role in planning the early treatment and management of these patients.

**AIMS AND OBJECTIVES**

To evaluate the etiology using ultrasound and CT in patients presenting with acute abdomen.

**MATERIALS AND METHODS**

The current study was performed in the Department of Radiodiagnosis, Government Medical College, Jammu from 1 March 2022 to September 2022.

This cross-Sectional Observational study was performed on 60 subjects after obtaining informed consent.

**Inclusion criteria:** Patients presenting with acute abdominal pain for more than 2 hours and less than 5 days in the Emergency Department.

**Exclusion criteria:** Pregnant women, patients with blunt or penetrating trauma, renal failure or history of allergy to contrast medium.

Abdominal ultrasound was done using Mindray DC-70 Exp Ultrasonography machine, with a curvilinear and linear probe of 3.5 to 5 MHz and 7 to 12 MHz respectively to assess the abdominal organs.

CT was done using the 126 slice Phillips MDCT machine. The patient is in supine position with arms raised above the head and the abdomen is centered within the gantry. Non-enhanced CT abdomen was done from the level of diaphragm up to the symphysis pubis within a single breath hold. The data was acquired at a section thickness of 0.625 mm; pitch – 0.8–1.5. First, the images are acquired in the pre-contrast phase. Then, 1–2 mL/kg of water soluble nonionic IV contrast medium (Omnipaque) with an iodine content of 350 mg was given at a rate of 4 mL/sec. Then, post contrast arterial, venous, and delayed phases were taken at 25 s, 45 s, and 5 min, respectively. In necessary cases, oral contrast was given an hour before - 30 mL ionic contrast medium containing 350 mg

l/mL in 1 L of water. All the patients undergoing contrast scan were screened for renal function and iodine contrast allergies. Based on sonographic and CT findings, final diagnosis was made.

**RESULTS**

60 patients were included in this study, out of which 36 were males and 24 were females.

Majority of the patients presented with right lower quadrant pain (26%) followed by periumbilical (24%) and epigastric region (19%).

The age of the patients studied ranged from 4 to 60 years with the most common age of presentation being 21 to 30 years followed by 31 to 40 years.

In our study of 60 cases, 15 cases (25%) were equivocal on USG which needed CT for further workup. Among equivocal cases on USG, 5 cases (8.3%) of appendicitis needed CT for diagnosis.

All cases of bowel obstruction (8.3%) needed CT for evaluating the cause. 3 cases (5%) of pancreatitis and urolithiasis each; 1 case (1.6%) of intussusception, GI perforation, acute cholecystitis and mesenteric ischemia each needed CT for diagnosis.

In our study of 60 cases, 15 cases (25%) were equivocal on USG which needed CT for further workup.

**1. Classification of patients based on etiology**

Classification based on etiology	
Etiology	No. of cases
Acute appendicitis	15
Acute Cholecystitis	12
Acute Pancreatitis	8
Urolithiasis	7
Intestinal obstruction	5
Hemorrhagic ovarian cyst/torsion	4
Mesenteric lymphadenopathy	3
Intussusception	2
GI perforation	2
Cholelithiasis	1
Mesenteric ischemia	1

**2. No. of cases diagnosed on USG and CT**

Etiology	Total No. of cases	No. of cases diagnosed on USG	No. of cases diagnosed on CT
Acute appendicitis	15	10	15
Acute Cholecystitis	12	11	12
Acute Pancreatitis	8	5	7
Urolithiasis	7	4	7
Intestinal obstruction	5	5	5
Hemorrhagic ovarian cyst/torsion	4	4	4
Mesenteric lymphadenopathy	3	3	3
Intussusception	2	1	2
GI perforation	2	1	2
Cholelithiasis	1	1	0
Mesenteric ischemia	1	0	1

Among equivocal cases on USG, 5 cases (8.3%) of appendicitis needed CT for diagnosis.

In our study of 60 cases, 15 cases (25%) were equivocal on USG which needed CT for further workup.

Among equivocal cases on USG, 5 cases (8.3%) of appendicitis needed CT for diagnosis.

**DISCUSSION**

The most common site of pain in our study was the right lower quadrant (26%) followed by periumbilical (24%) and epigastric region (19%). These findings were consistent with study done by Asefa Z et al., (2000) who reported the most common site as right lower abdomen.

The mean age of presentation was 37 years which was similar to the study conducted by Ihezue et al., (1998) who reported the 405 consecutive patients with acute abdomen with mean age of 29 years. 60% were males and 40% were females which

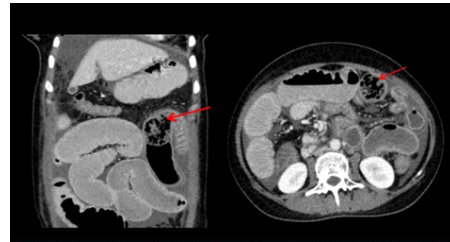
is consistent with the study by Al-Mulhim (2006).

In our study, USG was able to make a probable diagnosis in 45 (75%) cases, while the remaining 15 cases (25%) were equivocal/ normal on USG. Furthermore, the USG findings were consistent with MDCT findings in 37 cases out of 50 (74%) in a study conducted by Singh et al., (2019) which is similar to our study.

In our study, 45 cases out of 60 (70%) were having abnormal USG. Common findings were free fluid, fat stranding and lymph nodes.

Bowel was the most commonly involved organ constituting 46.6% (28 out of 60).

Vessels were the least commonly affected organ in our study constituting 1 case (1.6%). CT findings confirmed SMA thrombosis with bowel wall thickening and loss of enhancement.



Intraluminal debris containing air bubbles with mottled appearance at the site of obstruction s/o obstruction due to phytobezoar. The most common etiology was acute appendicitis constituting 25% cases, which is consistent with most of the studies carried out internationally.

The second most common etiology was acute cholecystitis - 20%, followed by acute pancreatitis - 13.3% and urolithiasis - 11.6%. The least common causes were cholelithiasis and mesenteric ischemia constituting 1.6% each.

USG could diagnose only 10 cases of appendicitis but CT could diagnose additional 5 cases. The sensitivity of MDCT was 90%.

**CONCLUSION**

The results obtained in this study were comparable with the studies conducted worldwide.

MDCT is increasingly replacing ultrasonography for the evaluation of patients with acute abdominal pain. CT has major advantages over USG. It is extremely fast and its time burden is often less than that of USG. CT is not affected by gas, obesity and bone. It is not operator dependent. With all these advantages, it is not surprising that USG is losing field in the evaluation of the acute abdomen.

However, USG has some advantages like it does not use ionizing radiation, which can be important in younger patients and pregnant women. The spatial resolution of a high frequency USG image is higher than that of a CT image. This is only true if the target organ can be approached closely, which requires either a thin patient or graded compression. The dynamic, real time qualities of USG are unique. It can observe peristalsis and also absence of peristalsis as in paralytic ileus. Real time USG allows one to observe the effect of compression. It allows precise correlation of USG findings with the area of maximum tenderness.

USG guided paracentesis can be done in case of intraperitoneal fluid to determine if fluid is blood, pus, bile or gastric contents.

From our study, it could be concluded that USG may serve as

an important initial diagnostic test as it is a cheaper, non-invasive, quick, reliable and highly accurate modality. CT may then be reserved for patients with non-diagnostic USG results.

#### REFERENCES

1. Singh R, Harsimar, Narula H and Mittal A. Role of ultrasound and MDCT in evaluation of patients with acute abdomen. *J Med Sci. Clin Res.* 2019;7(1):163-169.
2. Balamurugan PP, Nanjundan M, Kanagadurga S and Thaiyalnayagi S. MDCT evaluation of non-traumatic acute Abdomen. *OSR J Dent Med Sci.* 2020;19(6):1-7.
3. Gupta K et al. Role of Ultrasound in Acute Non Traumatic Abdominal Emergencies. *JKscience.* 2015;17(4):172-76.
4. Pacharn P, Ying J, Linam LE, et al. Sonography in the Evaluation of Acute Appendicitis. Are Negative Sonographic Findings Good Enough. *J Ultrasound Med* 2010;29:1749-55.
5. Al-Mulhim AA. Emergency general surgical admissions. Prospective institutional experience in non-traumatic acute abdomen: Implications for education, training and service. *Saudi Med J.* 2006;27(11):1674-1679.
6. MacKersie AB, Lane MJ, Gerhardt RT, Claypool HA, Keenan S, Katz DS, et al. Nontraumatic acute abdominal pain: unenhanced helical CT compared with three-view acute abdominal series. *Radiology.* 2005;237(1):114-122.
7. Weir-McCall J, Shaw A, Arya A, Knight A and Howlett DC. The use of pre-operative computed tomography in the assessment of the acute abdomen. *Ann R Coll Surg Engl.* 2012;94(2):102-107.
8. Hardy A, Butler B, Crandall M. The Evaluation of the Acute Abdomen. *Common Problems in Acute Care Surgery.* Moore LJ, Turner KL, Todd SR (Eds.) Springer, New York. 2013;XVII, pp.527.
9. McGrath FP, Keeling F. The role of early sonography in the management of the acute abdomen. *Clin Radiol.* 1991;5:172-4.