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Diagnostic Performance of MDCT in Assessing Non-Traumatic Acute Abdomen

Dr. Raza Khan[1] (Radio-Diagnosis, Resident), Dr. Vandana Ahluwalia[2] (Prof. & Head of Department Radio Diagnosis), Dr. Sheikh Tufail Ahmad[3] (Radio-Diagnosis, Resident), Dr. Dhairya Rajkumar malani[4*] (Radio-Diagnosis, Resident), Dr. Aditya Bhargava[5] (Radio-Diagnosis, Resident) & Dr. Sayeed Anwar Alam[6] (Radio-Diagnosis, Resident)

[1,2,3,4*,5,6]Department of Radio diagnosis, FH Medical College, Agra.
Corresponding Author: Dr. Dhairya Rajkumar Malani, Department of Radio diagnosis, F H Medical College, Agra.

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Abstract

Introduction: Acute abdomen, characterized by sudden, severe abdominal pain, poses diagnostic challenges due to its diverse etiologies. Accurate and timely diagnosis is essential for effective intervention and management. This study aimed to evaluate the diagnostic performance of Multi-Detector Computed Tomography (MDCT) in assessing non-traumatic acute abdomen, emphasizing its role compared to ultrasonography (USG).
Methodology: This prospective study included 180 patients presenting with non-traumatic acute abdomen. After recording demographic details, kidney function tests (KFT) and liver function tests (LFT) were also performed. MDCT scans were conducted using a Toshiba CT scanner with contrast agents administered as necessary.
Results: The study population had a mean age of 41.16 ± 15.83 years, with 58.3% males. Abdominal pain was the most common symptom (50%). MDCT outperformed USG in detecting conditions like acute pancreatitis, appendicitis, and bowel obstruction, and more accurately identified pyelonephritis, bowel perforation, and vascular issues.
Conclusion: This study highlights the complementary roles of USG and MDCT, affirming MDCT as the superior imaging modality for acute abdomen diagnostics.

KEYWORDS: Acute Abdomen, MDCT, Ultrasonography, Diagnostic Imaging, Non-Traumatic Abdominal Pain.

Introduction

Acute abdomen, marked by sudden abdominal pain, can stem from both benign and life-threatening causes, making diagnosis difficult. Imaging plays a critical role in accurate diagnosis, with ultrasonography (USG) commonly used, though it has limitations such as interference from bowel gas. Multidetector computed tomography (MDCT) has become the preferred imaging technique, providing superior accuracy, fast acquisition, and detailed soft tissue contrast. It is particularly helpful when USG results are inconclusive, as in cases involving obesity or bowel obstruction. Effective collaboration between clinicians and radiologists is essential for a timely diagnosis. This study

examines the diagnostic performance of MDCT in non-traumatic acute abdomen, focusing on conditions like appendicitis, cholecystitis, and bowel obstructions. [1-11]

Material and Methods

Study settings

This study was conducted in the Department of Radiodiagnosis in F.H Medical College & Hospital.

Study duration

Duration of the study period from September 2022 to September 2024.

Study design

Prospective study of consecutive patients with acute abdomen.

Study population

Patients who were attending the Radiology department in F.H. Medical College and Hospital and also patients referred from other departments in the same hospital with complaints of non-traumatic acute abdomen.

Sample size:

P (acute abdomen) = 14.2%, (Z^2 * P * Q) / L^2 = (1.9*1.9*0.142*0.858) / 0.0025 = 1**76**

Inclusion criteria

- Patients aged 18 years and above presenting with acute abdomen to the surgery department.
- Patient with H/O acute abdominal pain, abdominal distention or abdominal guarding and rigidity
- Inconclusive ultra-sonogram

Exclusion criteria

- Patients with H/O trauma (blunt injury and penetrating injury)
- Pregnant women
- Patients who refused to consent.

Statistical Analysis

Statistical analysis was performed using SPSS software (SPSS Inc., Chicago, IL, USA) for the Windows program (26.0 version)

Results

Tables and Figures

Table-1: Demographic Parameters of Enrolled Patients (N=180).

Demographics		No. of patients	Percentage
Age Distribution [Years]	20-29	52	28.89%
	30-39	37	20.56%
	40-49	38	21.11%
	50-59	27	15.00%
	60-69	12	6.67%
	70-79	11	6.11%
	80-89	3	1.67%
Gender	Male	105	58.3%
	Female	75	41.7%

Table-2: Kidney and Liver Function Test Results of the Enrolled Patients.

	MEAN±SD	
KFT	S. UREA	20.32±40.63
	S. CREATININE	0.71±1.28
LFT	ALT	24.84±9.87
	AST	32.51±12.67
	TOTAL BILIRUBIN	1.24±0.84

Table-3: Ultrasound and CT Findings of the Enrolled Patients.

FINDINGS	**USG**		**CT**	
	No. of patients	**Percentage**	**No. of patients**	**Percentage**
Abscess (All)	12	19.05%	14	11.96%
SMA Syndrome	1	1.59%	3	2.56%
Appendicitis	9	14.29%	15	12.82%
Bowel Perforation	2	3.17%	5	4.27%
Cholecystitis	3	4.76%	3	2.56%
Portal Vein Thrombosis	0	0.00%	1	0.84%
Intestinal obstruction	8	12.70%	14	11.96%
Ureteric Calculus	11	17.46%	15	12.82%
Pyelonephritis	7	11.11%	10	8.54%
Acute pancreatitis	8	12.70%	22	18.80%
Sigmoid Volvulus	0	0.00%	5	4.27%
SMA Thrombosis	0	0.00%	2	1.70%
Aortic Aneurysm	1	1.59%	3	2.56%
Renal Artery Thrombosis	0	0.00%	1	0.84%
Intussusception	1	1.59%	4	3.41%

Table-4: Discrepancies between USG and CT Findings among Enrolled Patients.

Findings	USG Findings	CT Findings	Difference
	Number of Patients		
Abscess (All)	12	14	+2
SMA Syndrome	1	3	+2
Appendicitis	9	15	+6
Bowel Perforation	2	5	+3
Cholecystitis	3	3	0
Portal Vein Thrombosis	0	1	+1
Intestinal obstruction	8	14	+6
Ureteric Calculus	11	15	+4
Pyelonephritis	7	10	+3
Acute pancreatitis	8	22	+14
Sigmoid Volvulus	1	5	+4
SMA Thrombosis	0	2	+2
Aortic Aneurysm	1	3	+2
Renal Artery Thrombosis	0	1	+1
Intussusception	1	4	+3

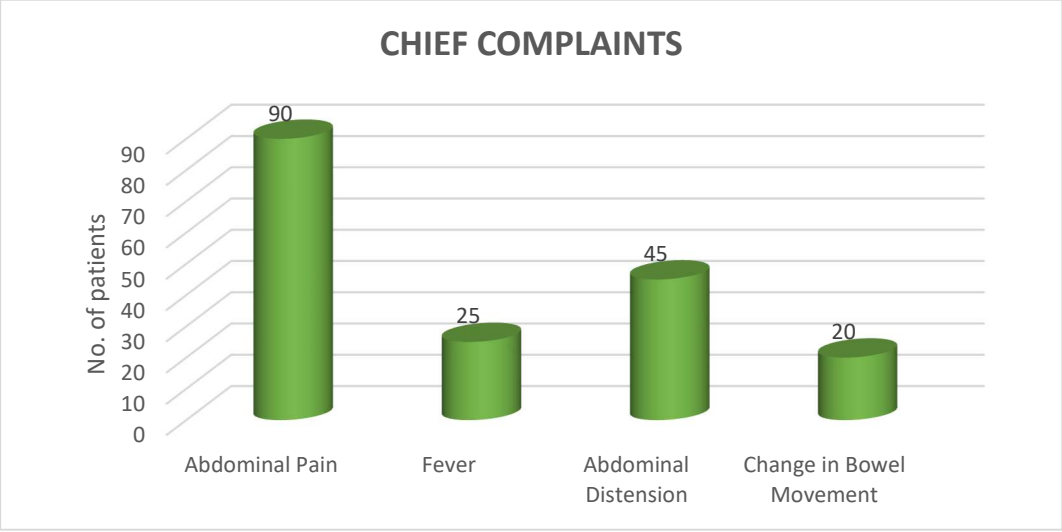

Figure-1: Chief Complaints of the Enrolled Patients.

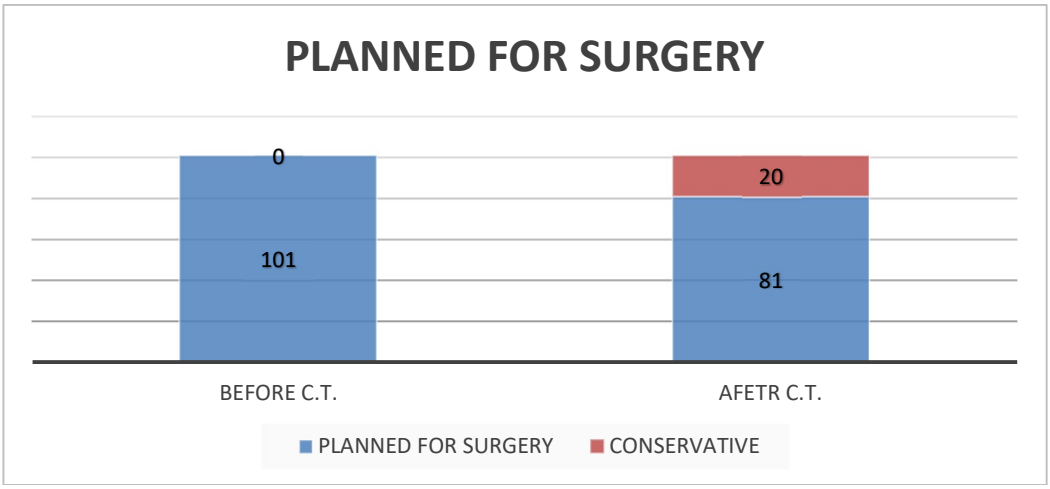

Figure-2: Change in Surgical Management after CT scan.

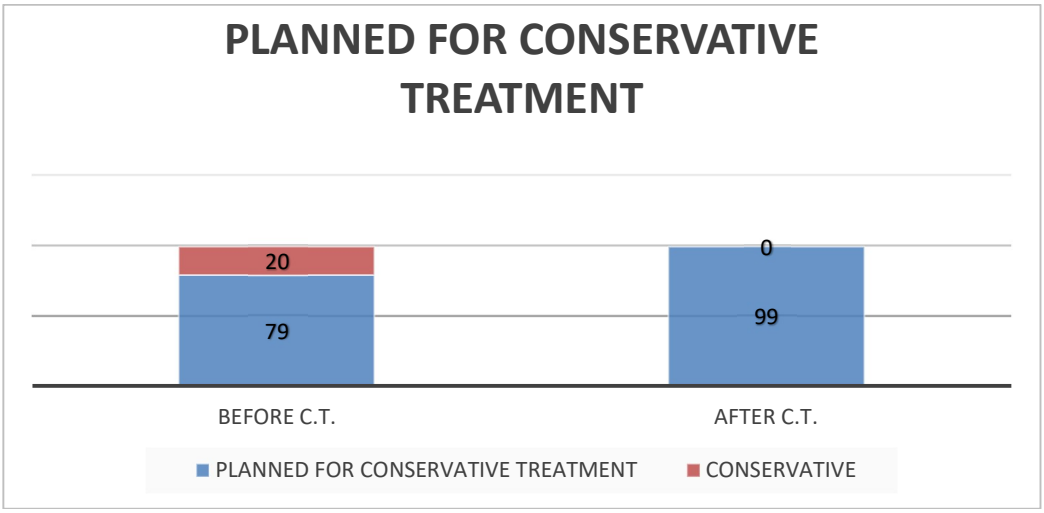

Figure-3: Change in Conservative Management after CT scan.

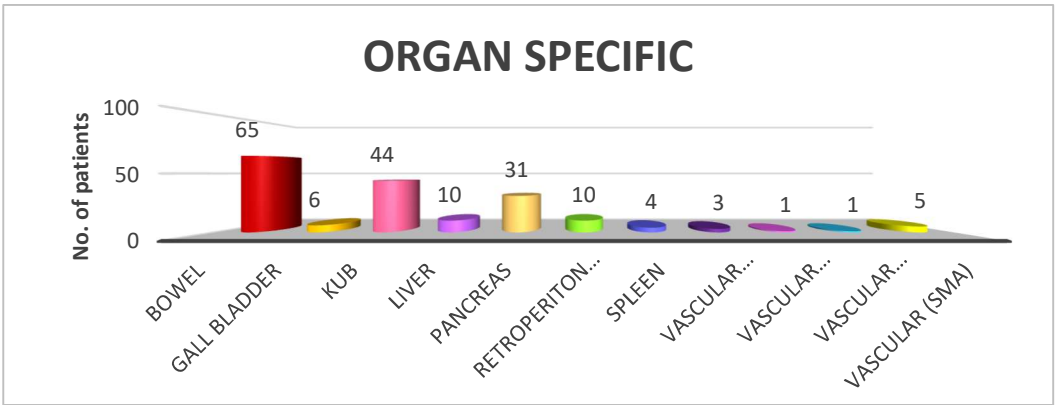

Figure-4: Organ-Specific Imaging of the Enrolled Patients.

Discussion

The average age of patients in this study was 41.16 ± 15.87 years, with a predominance of males (58.3%). This is consistent with studies by Acharya S et al. (58% male) and Sharan A et al. (male predominance).

The most common complaint was abdominal pain (50%), followed by abdominal distension (25%) and fever (13.89%). This aligns with other studies, including Shah N et al. (100% abdominal pain) and Kumar M et al. (abdominal pain in all patients) [12-16].

Laboratory results showed variability in kidney function, with average serum urea levels of 20.32 mg/dL (SD = 40.63) and creatinine at 0.71 mg/dL (SD = 1.28). Liver function tests revealed mean ALT of 24.84 U/L and AST of 32.51 U/L, important for contrast-enhanced imaging in acute abdomen cases [17].

Ultrasound (USG) findings revealed abscesses (19.05%) as the most common condition, followed by ureteric calculus (17.46%) and appendicitis (14.29%). Other conditions included intestinal obstruction (12.7%) and pyelonephritis (11.11%). Challenges in USG diagnosis were noted, particularly for retrocaecal appendicitis and pancreatitis [18-21].

CT imaging identified acute pancreatitis (18.8%) as the most common diagnosis, followed by appendicitis and ureteric calculus (12.82%). Other significant findings included abscesses and intestinal obstruction. Studies highlight the role of CT in altering treatment plans, particularly in appendicitis and acute abdominal pain [22].

MDCT demonstrated superior sensitivity compared to USG for most conditions, except for cholecystitis, where both had equal sensitivity [23]. MDCT role in guiding surgical management was emphasized, as it reduced unnecessary surgeries. In our study, MDCT led to changes in management, with 101 patients initially planned for surgery, but only 81 underwent surgery post-MDCT. MDCT remains crucial for accurately evaluating acute abdominal conditions and guiding treatment decisions.

Conclusion

This study demonstrates that multi-detector computed tomography (MDCT) significantly outperforms ultrasound (USG) in diagnosing a broad spectrum of acute abdominal conditions, including acute pancreatitis, appendicitis, bowel obstruction, perforation, ureteric calculus, pyelonephritis, and various vascular pathologies. While USG remains effective for identifying conditions such as abscesses and acute cholecystitis, MDCT's superior sensitivity and comprehensive diagnostic capabilities make it indispensable, particularly for complex cases like retrocecal appendicitis and bowel obstruction. The complementary roles of USG and MDCT are evident, with MDCT providing greater diagnostic clarity,

ultimately guiding more informed management decisions and reinforcing its position as the preferred imaging modality in acute abdomen diagnostics.

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Ethical Approval: As per international standards or university standards written ethical permission has been collected and preserved by the author(s).

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