

Role of Multidetector Computed Tomography in Evaluation of Acute Abdomen Non- Gynaecological and Non-Urological Cases

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Citation this Article: Animesh Chhabra, Krishnakumar K M, Abhay Gursale, Priti Kapoor, “Role of Multidetector Computed Tomography in Evaluation of Acute Abdomen Non- Gynaecological and Non-Urological Cases”, IJMSIR- November - 2021, Vol – 6, Issue - 6, P. No. 150 – 155.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Introduction: Abdominal pain is a common presentation in the outpatient setting and is challenging to diagnose. Although most abdominal pain is benign, as many as 10 percent of patients in the emergency department setting and a lesser percentage in the outpatient setting have a severe or life-threatening cause or require surgery. Numerous non-surgical causes of abdominal pain are metabolic, cardiovascular and toxic in origin which should be considered in evaluating the patient. In the emergency department, CT scans are often used to facilitate patient triage.

Aim: To evaluate the usefulness of Multi-detector Computed Tomography (MDCT) in detection of intra-abdominal pathology in patients with acute abdominal pain.

Objective: To evaluate the usefulness of Multi-detector Computed Tomography in detection of intraabdominal pathology in patients with acute abdominal pain and to provide information that could accurately determine

choice of management (operative versus non-operative). The MDCT findings to be correlated with surgical and histopathological findings whenever applicable.

Methods: This descriptive correlational study was conducted over a period of two years on 100 patients with acute abdominal pain at MGM Medical Hospital, Kamothe, Navi Mumbai. They were evaluated with Multi-detector Computed Tomography (Toshiba 16 slice CT scanner) and imaging findings were correlated with surgical findings wherever applicable.

Results: The most common diagnosis amongst study population was Appendicitis (22%) followed by Bowel Obstruction (15%), Perforation (13%), Acute Pancreatitis (11%) and Cholecystitis (10%). In 54% of patients were managed by surgery while 46% were managed Conservatively. The sensitivity, specificity, and Accuracy of CT scan in diagnosing acute abdominal conditions was 89.69%, 100% and 90% respectively.

Conclusion: Acute abdomen is a commonly encountered, usually a surgical emergency. In our study the most commonly encountered pathologies were appendicitis, bowel obstruction, bowel perforation and acute pancreatitis. It is essential to make a speedy and accurate diagnosis in these patients to decide on the management as to subject them to surgery or treat conservatively. For this purpose we need to employ a robust diagnostic tool. The clinical examination and laboratory parameters have very poor sensitivity and specificity, hence cannot be dependent upon. Very good sensitivity and specificity of MDCT makes it an ideal tool in the evaluation of acute abdomen.

Keywords: MDCT, MGM, CT – Scanner.

Introduction

Abdominal pain is a common presentation in the outpatient setting and is challenging to diagnose. Abdominal pain is the presenting complaint in 1.5 percent of office-based visits and in 5 percent of emergency department visits.¹ Although most abdominal pain is benign, as many as 10 percent of patients in the emergency department setting and a lesser percentage in the outpatient setting have a severe or life-threatening cause or require surgery.¹

Numerous non-surgical causes of abdominal pain are metabolic, cardiovascular and toxic in origin which should be considered in evaluating the patient.^{2,3,4} In the emergency department, CT scans are often used to facilitate patient triage. The purpose of our study was to investigate the impact of CT scanning of patients presenting with acute abdominal pain to the emergency department.^{3,4} Though these basic radiological investigations do indeed provide valuable information, in a good number of patients computed tomography (CT) examination is essential.³ Multi Detector CT

(MDCT) is a widely accepted primary investigation of choice in these patients. The scanning is fast, (acquisition time of 2-3 minutes), and yields specific diagnosis.³ Abdominal pain unrelated to trauma is one of the three most common symptoms in patients presenting to the emergency department or admitted to general hospitals.² The differential diagnosis of an acute abdomen includes a broad spectrum of causes ranging from self-limiting benign causes for which surgery may be not indicated to high-morbidity or high-mortality causes that necessitate prompt surgical intervention.^{3,4} Because many causes may have similar early clinical presentations, imaging studies are frequently used to identify specific causes when possible and to prevent delay in diagnosing urgent surgical conditions.^{4,5}

Aim

To evaluate the usefulness of Multi-detector Computed Tomography (MDCT) in detection of intra-abdominal pathology in patients with acute abdominal pain.

Objective

To evaluate the usefulness of Multi-detector Computed Tomography in detection of intraabdominal pathology in patients with acute abdominal pain and to provide information that could accurately determine choice of management (operative versus non-operative). The MDCT findings to be correlated with surgical and histopathological findings whenever applicable.

Methods

This descriptive correlational study was conducted over a period of two years on 100 patients with acute abdominal pain at MGM Medical Hospital, Kamothe, Navi Mumbai. They were evaluated with Multi-detector Computed Tomography (Toshiba 16 slice CT

scanner) and imaging findings were correlated with surgical findings wherever applicable.

Inclusion Criteria

- Hemodynamically stable patient.
- Clinical suspicion of acute abdominal pain
- Patients with localising signs in abdomen
- A positive ultrasonography study

Exclusion Criteria

- All hemodynamically unstable patients with obvious peritoneal signs and progressive abdominal distention – they are taken up for surgery immediately and were excluded from the study.
- All cases of abdominal trauma.
- Pregnant woman and cases of suspected gynaecological cases.
- Patients with known malignancy. • Patient referred by urologist.
- Patients not willing for examination/study.
- Patients having underlying gynaecological and/or urological causes of acute abdomen.

Equipment Patients were evaluated with Multi-detector Computed Tomography (Toshiba Activion 16 slice spiral CT scanner) and findings were correlated with surgical findings wherever applicable. This equipment may change to any other similar MDCT scanner as per change in hospital policy.

CT PROTOCOL Axial thick cuts 5x5 mm and thin cuts 1x1mm were taken from domes of diaphragm to pubic symphysis. Intravenous contrast Omnipaque 350mg% (Iohexol) 70 ml were injected by pressure injector through venous cannula. Flow rate- 4ml/sec. 4 phases were taken:

- Plain with or without oral contrast
- Arterial phase – 35 sec scan delay

- Portal venous phase – 70 sec scan delay
 - Excretory phase – 5-10 mins scan delay
- Reconstructions were done in coronal and sagittal planes on work station. Images were documented in soft tissue and bone window.



Figure 1: Toshiba Activion 16 Slice Spiral CT Machine

Statistical Analysis

All the collected data was entered in Microsoft Excel sheet and then transferred to SPSS software ver. 22 for analysis. Qualitative data was presented as frequency and percentages and analysed using chi-square test. Correlation between variables was done by using Pearson's correlation test. P-value < 0.05 was taken as level of significance.

Results

Table 1 : Age group distribution amongst study population

Age group	Frequency	Percentage
less than 10 years	6	6.0
11 to 20 years	5	5.0
21 to 30 years	13	13.0
31 to 40 years	23	23.0
41 to 50 years	19	19.0
more than 50 years	34	34.0
Total	100	100.0

As seen in the above table, the most common age group amongst study population was more than 50 years (34%) followed by 31 to 40 years (23%), 41 to 50 years (19%) and 21 to 30 years (13%).

Table 2: Gender distribution amongst study population

Gender	Frequency	Percentage
Female	35	35.0
Male	65	65.0
Total	100	100.0

As seen in the above table, there was male predominance (65%) amongst study population as compared to female (35%).

Table 3: Various Diagnosis amongst study population

Diagnosis	Frequency	Percentage
Appendicitis	22	22.0
Bowel Obstruction	15	15.0
Perforation	13	13.0
Bowel Ischemia	4	4.0
Volvulus	3	3.0
Aortic Dissection	1	1.0
Intussusception	3	3.0
Cholecystitis	10	10.0
Acute Pancreatitis	11	11.0
Diverticulitis	5	5.0

As seen in the above table, the most common diagnosis amongst study population was Appendicitis (22%) followed by Bowel Obstruction (15%), Perforation (13%), Acute Pancreatitis (11%) and Cholecystitis (10%)

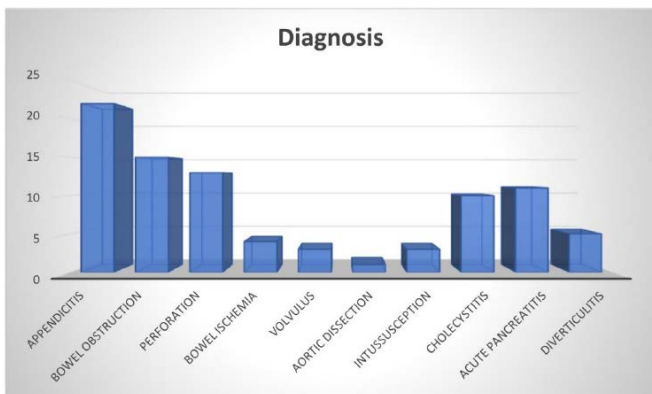


Table 4: Surgical management amongst study population

Surgical management	Frequency	Percentage
Laparotomy	3	3.0
NA	48	48.0
Surgical Resection	27	27.0
Surgical Correction	22	22.0
Total	100	100.0

As seen in the above table, the most common type of surgical management amongst study population was Surgical Resection (27%) followed by Surgical Correction (22%) and Laparotomy (3%).

Table 5: Management amongst study population

Management	Frequency	Percentage
Conservative	46	46.0
Surgery	54	54.0
Total	100	100.0

As seen in the above table, 54% of patients were managed by surgery while 46% were managed conservatively.

Table 6

Sensitivity	89.69%
Specificity	100.00%
PPV	100.00%
NPV	23.08%
Accuracy	90.00%

As seen in the above table, the sensitivity, specificity, PPV NPV and Accuracy of CT scan in diagnosing acute abdominal conditions was 89.69%, 100%, 100%, 23.08% and 90% respectively.

Discussion

The term “acute abdomen” designates symptoms and signs of intra-abdominal disease usually treated best by surgical management. Many diseases of which, some do not require surgical treatment which produces abdominal pain, and thus, the evaluation of patient with acute abdominal pain must be methodical and careful.⁶ It poses a diagnostic challenge for the emergency physicians, as the causes are numerous, ranging from benign to life- threatening conditions. Causes include gastrointestinal, urological and gynaecological among others.⁷ Despite extensive evaluation, a quarter of patients usually remained with a non-specific cause, but now with latest radiological imaging advances that number has decreased.⁸ The current generation of the CT scan with cutting edge technology have become the main stay of evaluation of patients with acute abdomen. The technology enables acquisition of isotropic images with exquisite spatial resolution and significantly reduced radiation exposure. The multi-row multi-detector spiral scanning technology has reduced scanning time significantly, leading to improved output and reduced movement related artefacts. The large volumetric data obtained in the axial plane allows reformations into any required plane with same resolution.^{8,9,10} The advances in reformation techniques have made the process automatic which saves time. Further increase in the computing speed has facilitated faster radiological interpretation in critically ill patients. The shear speed and accuracy of CT in acute abdomen has made the role of plain radiography nearly obsolete.^{9,10} In the present study, the most common age group amongst study population was more than 50 years (34%) followed by 31 to 40 years (23%) , 41 to 50 years (19%) , 21 to 30 years (13%). This

findings was comparable with the study conducted by Maheswaran Viyannan et al., in which 32% of study population belongs to more than 40 years.¹¹ In the present study, there was male predominance (65%) amongst study population as compared to female (35%). This findings was comparable with the study conducted by Maheswaran Viyannan et al., in which 73% were male population.¹¹ In the present study, the most common diagnosis amongst study population was Appendicitis (22%) followed by Bowel Obstruction (15%), Perforation (13%) , Acute Pancreatitis (11%) and Cholecystitis (10%). This findings was comparable with the study conducted by Maheswaran Viyannan et al., in which Appendicitis (22%) followed by Bowel Obstruction (15%), Perforation(18%) and Acute Pancreatitis (15%) were the most common diagnosis.¹¹ However, a study by Jegaraj et al. revealed that pancreatitis is the most common cause followed by appendicitis with 11% and 10.6%, respectively.¹² In this study, acute appendicitis was the leading cause (20%), followed by acute intestinal obstruction (11%). These findings were comparable with the earlier studies.

Conclusion

Acute abdomen is a commonly encountered, usually a surgical emergency. In our study the most commonly encountered pathologies were appendicitis, bowel obstruction, bowel perforation and acute pancreatitis. It is essential to make a speedy and accurate diagnosis in these patients to decide on the management as to subject them to surgery or treat conservatively. For this purpose we need to employ a robust diagnostic tool. The clinical examination and laboratory parameters have very poor sensitivity and specificity, hence cannot be dependent upon. Very good sensitivity and

specificity of MDCT makes it an ideal tool in the evaluation of acute abdomen. Recent advances in hardware, software and computation speed have made MDCT a powerful diagnostic tool in acute abdomen. MDCT scores over all other imaging modalities because of its speed and versatility.

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