



Role of computed tomography along with clinical sign in blunt bowel and mesenteric trauma patients management

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Citation this Article: Dr. Rajendra Pooniya, Dr. Surendra Kumar Yadav, Dr. Suresh Kumar, Dr. Meenu Bagarhatta, Dr. Kuldeep Mendiratta, “Role of computed tomography along with clinical sign in blunt bowel and mesenteric trauma patients management”, IJMSIR- June - 2023, Vol – 8, Issue - 3, P. No. 01 – 09.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

The third most prevalent injury among individuals with blunt abdominal trauma is bowel and mesenteric damage. One of the most difficult issues in the trauma environment is blunt bowel and mesenteric injury (BBMI). Acute hemorrhage from BBMI will result in a deadly loss of blood volume, and the collapse of the GI tract's integrity will result in bowel splinting, the progression of bacterial contamination, and the incidence of sepsis. The documented incidence of BBMIs among abdominal trauma patients is 1% to 3%, resulting in morbidity and mortality. The purpose of study Early CT of patients with blunt bowel and mesenteric trauma, because it is fast and non-invasive and able to show both highly and less specific findings of BBMI. 40 patients were selected for the study MDCT abnormality among the studied group were collected and classified according to age, gender, mode of injury, major and minor CT finding in blunt bowel and mesenteric trauma with respect to treatment. CT findings are extraluminal air,

active bleeding and bowel wall discontinuity as major CT findings. Mesenteric stranding, free fluid, bowel wall thickening, Abnormal bowel wall enhancement and intraluminal air as minor CT findings. In our study, out of the 40 participants, surgical repair was done in 29 participants.

Although BBMI is uncommon in polytrauma patients, early detection is critical to avoiding increased morbidity and mortality. Certain CT findings are pathognomonic, but they are uncommon, and early CT signals are frequently modest and non-specific. As a result, CT-based findings, particularly those based on radiological findings, are beneficial.

Keywords: CT, MRI, GI tract

Introduction

Blunt trauma is far more common than penetrating trauma and can pose a significant burden to caregivers. The vast majority of abdominal injuries in children are caused by blunt abdominal trauma. Children under the age of eight are more likely to experience significant

trauma as a result of road traffic accidents (typically as car passengers), but older children are more likely to be wounded as a result of falls or sports-related injuries.²⁻³

The third most prevalent injury among individuals with blunt abdominal trauma is bowel and mesenteric damage. One of the most difficult issues in the trauma environment is blunt bowel and mesenteric injury (BBMI).⁴ Acute hemorrhage from BBMI will result in a deadly loss of blood volume, and the collapse of the GI tract's integrity will result in bowel splinting, the progression of bacterial contamination, and the incidence of sepsis.⁵ The documented incidence of BBMIs among abdominal trauma patients is 1% to 3%, resulting in morbidity and mortality.⁶

Accurate diagnosis is critical since delayed detection of BBMI can lead to major complications and death. In patients with acute abdominal trauma, early diagnosis of isolated BBMI is difficult because clinically visible signs and symptoms of peritonitis induced by perforation can be noticed only after a significant amount of time, resulting in delayed diagnosis. After surgical repair, intraabdominal complications such as abscess, sepsis, and even mortality might occur as a result of delayed detection.⁷⁻⁹ Peritonitis symptoms such as rigidity, tenderness, and rebound are sometimes undetectable, and abdominal examination findings may be obscure in patients who are critically injured or neurologically compromised, or in those who are experiencing an altered sensorium as a result of drugs, alcohol intoxication, or central nervous system trauma all at the same time.

Aside from physical tests, current diagnostic methods include paracentesis, diagnostic peritoneal lavage, targeted abdominal ultrasonography for trauma, computed tomography (CT) scan, and laparoscopy.¹⁰⁻¹³ MDCT is an effective imaging technique for diagnosing

and monitoring patients with abdominal injuries, as well as characterizing and grading solid-organ injuries, determining the importance of BBMI, and determining whether surgical intervention is required. Detection of potential bowel and mesenteric injuries is required for emergency surgical therapy if patients are hemodynamically unstable.¹⁴

Nonsurgical management is the appropriate method of care for blunt abdominal trauma if patients are hemodynamically stable and no abnormal BBMI is detected on MDCT. However, the genuine significance of MDCT in identifying BBMI is debatable;¹⁵ there is a wide range of indications on CT that correlate with the kind, location, and level of injury.¹⁴ Although CT imaging technology and interpretation have considerably advanced in the last decade in terms of detecting or ruling out BBMI, there is still debate over how accurate MDCT is in separating surgical from nonsurgical bowel and mesenteric injury.¹⁵

Currently, computed Tomography (CT) scans are routinely performed for the examination of hemodynamically stable abdominal trauma patients.¹⁵ Because of advancements in diagnostic technology and service quality, blunt truncal trauma treatment algorithms weighted toward conservative management emphasize the importance of identifying bowel and mesenteric injuries early in the treatment process. Most injuries are obvious, but others are more subtle and necessitate careful diagnosis and interpretation.

However, performing an exploratory laparotomy on all patients suspected of having BBMI results in a high negative rate, resulting in wasted medical costs and hospitalization.¹⁶ Several writers provided guidance on the indications and conditions under which non-operative treatment (NOM) can be used in patients with BBMI. However, the prognosis and expense of BBMI delayed

management remain debatable.¹⁵ This diagnostic quandary makes BBMI diagnosis more difficult than before. The goal of this study was to see how clinical indicators such as abdominal pain and guarding, as well as CT results, could predict early surgical repair.

Materials and methods

Study Type: Observational Study.

Study Design: Cross sectional study.

Study Universe: All patients attending trauma center, emergency in SMS Medical College & Hospital, Jaipur.

Sampling Technique: Every eligible case were included in the study.

Study Population: The study was included all trauma patients bowel and mesentery injuries, who visit trauma and emergency department of SMS hospital, Jaipur, Rajasthan.

Study Area: Department of Radio diagnosis, SMS Hospital, Jaipur, Rajasthan.

Study Duration: Data collection for study was started after approval from the institutional research and review board, April 2021 to Sep 2022. Then it was took another 2 months to process the data and write the thesis.

Sample Size: Sample size was calculated at 95 % confidence level and alpha error of 0.05% assuming the 61.8% prevalence of blunt abdominal trauma require surgical repair as per as seed article (Role of CT along clinical sign in blunt bowel and mesenteric trauma patients' management)

At the absolute allowable error of 15% the sample size was 40 in the study.

Inclusion Criteria

1. We included all consecutive adult blunt trauma patients (age >16 years) admitted in SMS Hospital Jaipur who underwent a focused abdomen and pelvis CT scan with CT findings suspicious for BBMI.
2. Parents/guardians willing to participate in the study

by giving written and informed consent.

Exclusion Criteria

1. Hemodynamic instability
2. Associated solid organ injuries.
3. With holding CT scan for urgent laparotomy.
4. Intubated and unconscious patients.
5. Refusal to consent.

Study Tool: Pre-tested, pre-designed proforma was used to collect data.

Equipment: 256 slice Philips ingenuity CT Scanner.

Enrollment

Parents of subjects who satisfy the eligibility criteria were approached for participation in the study. An Information Sheet providing the details of the study was provided and the nature of the study was also be verbally explained. Written informed consent was obtained. Enrollment, recording of baseline information. Screening, assessment of eligibility criteria and obtaining consent was the responsibility of the thesis candidate.

Methodology

1. All trauma patients which bowel and mesenteric injuries, who visit trauma and emergency department of SMS Hospital Jaipur, from the commencement of study to April 2022 were enrolled after taking written informed consent from the parents/ guardian.
 2. A brief history and examination was done at the time of CT scan.
 3. Monitoring was performed.
 4. Non-ionic contrast agent was injected in a antecubital vein at a dosage of 1.3ml/kg of patients body weight at a 370 mg/ml iodine concentration and a flow of 2.5/3ml/s followed by a chaser bolus of 50ml followed.
 5. Dual phase CT abdomen and pelvis protocol included the acquisition of an arterial and portal venous phase using a 256 multi detector CT scanner.
1. The CT protocol (FOV 50cm, 512x512 matrix, kV;

variable, mAs;variable)

2. Pitch 1-1.5
3. Slice thickness 0.625mm
4. Low voltage 100 or 80 kVp, Current 250 mA or less
6. Image acquisition was done in source axial images followed by image processing with linear or curved planar reformatting, maximum intensity projection (MIP), minimum intensity projection and volume rendering technique (VRT).

Observations & results

In our study, out of the 40 participants, maximum 22 were in age of 31-60 years followed by 14 were ≤ 30 years, mean age of study participants was 37.8±13.5 years. In our study, out of the 40 participants, 34 were male and 6 were female participants. In our study, out of the 40 participants, maximum 17 had injury due to car accident followed by 16 had injury due to motorbike accident

Table 1: Distribution of participants according to symptoms

Symptoms	Frequency	Percent
Abdominal pain	27	67.5
Abdominal guarding	12	30.0

In our study, out of the 40 participants, 27 had abdominal pain and 12 had abdominal guarding as symptoms.

Graph 1:

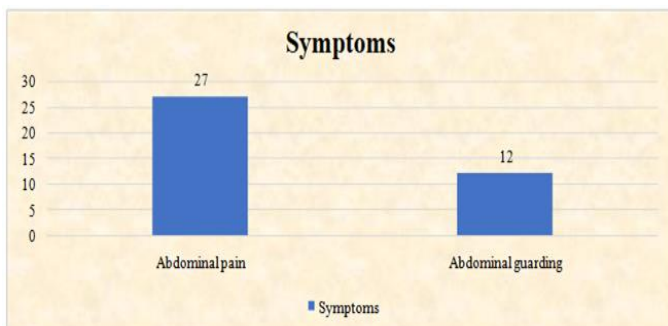


Table 2: Distribution of participants according to Major CT findings

Major CT findings	Frequency	Percent
Active bleeding	12	30.0
Bowel wall discontinuity	9	22.5
Extraluminal air	15	37.5

In our study, out of the 40 participants, maximum 15 had extraluminal air, 12 had active bleeding and 9 had bowel wall discontinuity as major CT findings.

Graph 2:

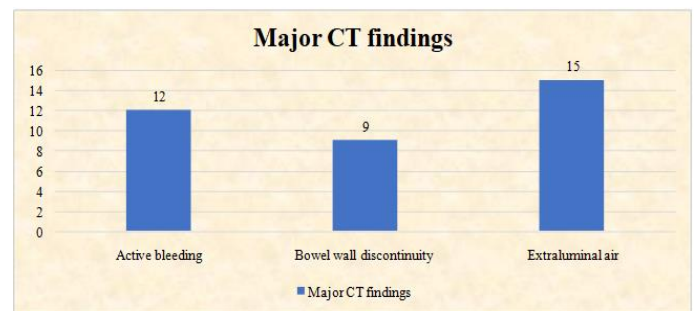


Table 2: Distribution of participants according to Minor CT findings

Minor CT findings	Frequency	Percent
Intraluminal air	4	10.0
Bowel wall thickening	25	62.5
Abnormal bowel wall enhancement	23	57.5
Mesenteric stranding	31	77.5
Free fluid	26	65.0

In our study, out of the 40 participants, maximum 31 had mesenteric stranding followed by 26 had free fluid, 25 had bowel wall thickening, 23 had Abnormal bowel wall enhancement and 4 participants had intraluminal air as minor CT findings.

Graph 3:

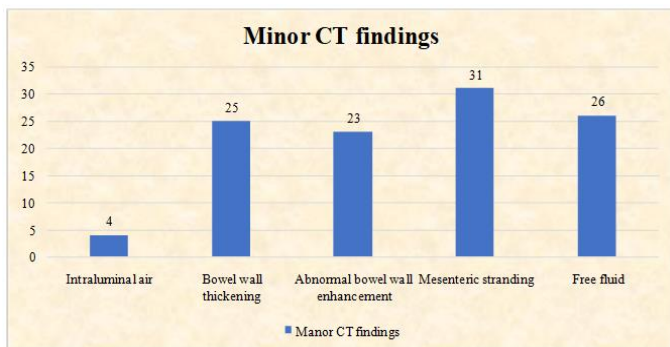
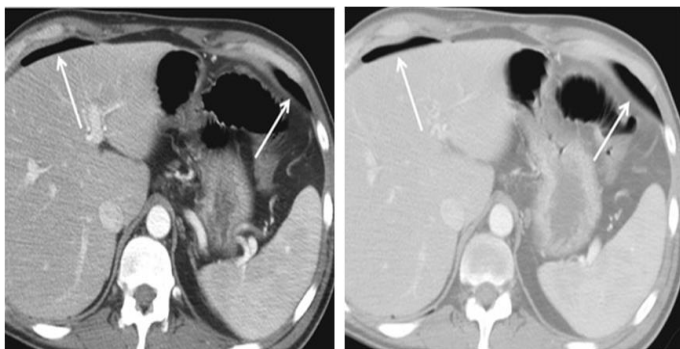


Table 3: Distribution of participants according to surgical repair

Surgical repair	Frequency	Percent
No	11	27.5
Yes	29	72.5
Total	40	100.0

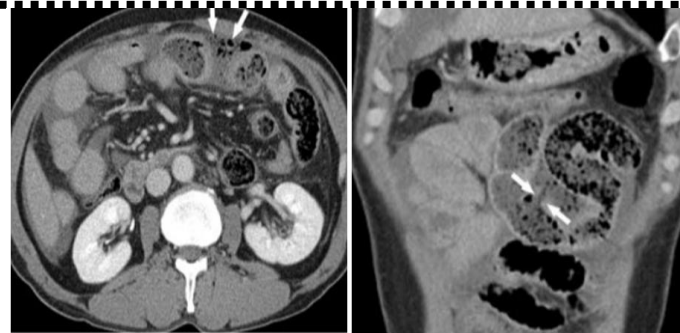
In our study, out of the 40 participants, surgical repair was done in 29 participants.

Figure 1- Case: Graph 55-year male present history of road traffic accident in SMS hospital emergency.



Axial CT contrast-enhanced scan shows free air from bowel rupture laying behind the anterior abdominal wall, along the anterior surfaces of liver and spleen

Figure 2- Case: 46-year-old man present with history of car accident with traumatic small bowel perforation.



Transverse CT image shows concentrated free air bubbles (arrows) in vicinity of jejunal loop.

Coronal reformation CT image demonstrates discontinuity of jejunal wall (arrows), which is not clearly seen on transverse CT image

Discussion

Blunt bowel and mesenteric injuries (BBMI) are common injuries with substantial morbidity and mortality, occurring in approximately 1-5% of all blunt abdominal traumas. Accurate diagnosis is critical since delayed detection of BBMI can lead to major complications and death. In patients with acute abdominal trauma, early diagnosis of isolated BBMI is difficult because clinically visible signs and symptoms of peritonitis induced by perforation can be noticed only after a significant period of time, resulting in delayed diagnosis.

After surgical repair, intraabdominal complications such as abscess, sepsis, and even mortality might occur as a result of delayed detection. Peritonitis symptoms such as rigidity, tenderness, and rebound are sometimes undetectable, and abdominal examination findings may be obscure in patients who are critically injured or neurologically compromised, or in those who are experiencing an altered sensorium as a result of drugs, alcohol intoxication, or central nervous system trauma all at the same time. Aside from physical tests, current diagnostic methods include paracentesis, diagnostic peritoneal lavage, targeted abdominal ultrasonography

for trauma, computed tomography (CT) scan, and laparoscopy. MDCT is an effective imaging technique for diagnosing and monitoring patients with abdominal injuries, as well as characterizing and grading solid-organ injuries, determining the importance of BBMI, and determining whether surgical intervention is required. Detection of potential bowel and mesenteric injuries is required for emergency surgical therapy if patients are hemodynamically unstable. Nonsurgical management is the accepted method of care for blunt abdominal trauma if patients are hemodynamically stable and no abnormal BBMI is detected on MDCT. While CT imaging technology and interpretation have substantially advanced in the last decade in terms of detecting or ruling out BBMI, there is still debate over how reliable MDCT is in separating surgical from nonsurgical bowel and mesenteric injury.

Current study was a prospective observational study conducted in the Department of Radiodiagnosis, SMS Hospital, Jaipur, Rajasthan. This study aimed to find out the role of computed tomography along with clinical signs in blunt bowel and mesenteric trauma patients management. A total 40 patients with blunt bowel and mesenteric trauma were included.

Demographic Details

In our study, mean age of study participants was 37.8 ± 13.5 years and out of the 40 participants, maximum 22 were in age of 31-60 years followed by 14 were ≤ 30 years. In our study, out of the 40 participants, 34 were male and 6 were female participants.

Role of ct findings in blunt bowel and mesenteric trauma patients

Delayed diagnosis of BBMI results in increased morbidity and mortality, usually because of haemorrhage or peritonitis. Physical examination alone may not be highly accurate to diagnose BBMI. Abdominal pain

and/or abdominal guarding are important clinical signs but their presence does not necessarily indicate the need for timely laparotomy. In addition, these clinical signs might not be present in the initial clinical assessment. Furthermore, if the patient had concomitant head and/or spinal cord trauma, abdominal assessment may be difficult. Associated injuries, intoxication with alcohol, or other substances as well as the administration of medications for pain or agitation may significantly affect the reliability of physical examination.

In our study, out of the 40 participants, 27 had abdominal pain and 12 had abdominal guarding as symptoms.

In our study, out of the 40 participants, maximum 15 had extraluminal air, 12 had active bleeding and 9 had bowel wall discontinuity as major CT findings. Maximum 31 had mesenteric stranding followed by 26 had free fluid, 25 had bowel wall thickening, 23 had abnormal bowel wall enhancement and 4 participants had intraluminal air in small bowel as minor CT findings.

In our study, out of the 40 participants, surgical repair was done in 29 participants.

In our study, a statistically significant age, mechanism of injury difference was found between the participants with surgical repair and no surgical repair. Maximum participants (22) in surgical repair were belonged to age 31-60 years and had injury due to car accident.

In our study, a statistically significant high abdominal guarding (P value-0.011%) was found in the participants who had surgical repair compare to participants who had no surgical repair.

In our study, sensitivity, specificity, PPV and NPV of abdominal pain to predict surgical repair was found to be 65.5%, 27.3%, 70.4% and 23.1% respectively.

Sensitivity, specificity, PPV and NPV of abdominal guarding to predict surgical repair was found to be 58.6%, 100%, 41.4% and 39.3% respectively.

In our study, sensitivity, specificity, PPV and NPV of active bleeding on CT to predict surgical repair was found to be 34.5%, 81.8%, 83.3% and 32.1% respectively. Sensitivity, specificity, PPV and NPV of Bowel wall discontinuity/ Extraluminal air on CT to predict surgical repair was found to be 31.0%, 45.5%, 60.0% and 20.0% respectively.

In our study, a statistically significant minor ≥ 3 CT findings difference was found between the participants had surgical repair and no surgical repair. A statistically significant Participants who had ≥ 3 minor CT findings need surgical repair and sensitivity, specificity, PPV and NPV of minor CT finding to predict surgical repair was found to be 69.0%, 72.7%, 87.0% and 47.1% respectively.

Conclusion

Although BBMI is uncommon in polytrauma patients, early detection is critical to avoiding increased morbidity and mortality.

Certain CT findings are pathognomonic, but they are uncommon, and early CT signals are frequently modest and non-specific. As a result, CT-based findings, particularly those based on radiological findings, are beneficial.

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