



## ROLE OF COMPUTED TOMOGRAPHY IN ASSESSMENT AND MANAGEMENT OF BLUNT TRAUMA ABDOMEN: AN INSTITUTIONAL PROSPECTIVE AND OBSERVATIONAL STUDY

### General Surgery

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### ABSTRACT

**Introduction:** Blunt abdominal trauma is a major cause of morbidity and mortality in young people. Contrast Enhanced Computed Tomography (CECT) is the modality of choice in hemodynamically stable patients as it can diagnose and ascertain the severity of injuries. Purpose of this study was to study the spectrum of abdominal injuries on CECT and to compare the CECT findings with operative findings wherever possible. **Materials and Methods:** Patients with history of Road Traffic Accidents, fall, or assault or other causes where clinically blunt trauma of abdomen was suspected and referred for CECT abdomen and pelvis were included. The blunt abdominal patients who were Focused Assessment with Sonography for Trauma (FAST) positive or had clinical suspicion of abdominal injury were evaluated with CECT. **Results:** On comparing with surgical findings, CECT had a sensitivity of 100%, specificity of 100% for detecting solid organ injury and the Positive Predictive Value (PPV) and Negative Predictive Value (NPV) were 100% and 100%, respectively. CECT has a sensitivity of 90%, specificity of 100% for detecting hollow visceral injury and the PPV and NPV were 100% and 90.5%, respectively. **Conclusion:** The CECT plays a major role in the management of blunt abdominal trauma and helps in making decision regarding operative and non-operative treatment. Therefore, CECT is the investigation of choice in patients with blunt abdominal trauma at our center.

### KEYWORDS

Blunt Trauma Abdomen, CECT Abdomen and Pelvis

### INTRODUCTION

Evaluating patients who have sustained blunt trauma abdomen (BTA) remains one of the most challenging and resource-intensive aspects of acute trauma care. Following injury to the extremities and head, abdomen is the third most injured part of the body. Concealed hemorrhage is the second most common cause of death after blunt trauma abdomen, and missed abdominal injuries are a frequent cause of morbidity and late mortality.<sup>1</sup>

The CT scan remains the criterion standard for the detection of solid organ injuries. CT scans also have the capability to determine the source of hemorrhage.

Hence, the current study is carried out to assess the role of CT scan in a prospective, observational manner.

### AIMS & OBJECTIVE

- 1) To evaluate the role of CT scan in diagnosis of intra-abdominal injuries in hemodynamically stable blunt trauma abdomen patient.
- 2) To evaluate the role of CT scan in management of blunt trauma abdomen patient i.e., either conservative or operative.
- 3) To correlate CT scan findings with intra operative findings in case of operative.

### MATERIAL AND METHODS

The prospective and observational study was conducted in the Department of Surgery at R.N. T. Medical College, Udaipur, Rajasthan. Study was planned from October 2021 to January 2023 with approval of institutional ethical committee.

### Method Of Data Collection

The data was collected in a specially designed standardized proforma containing details of clinical history, clinical examination, radiological findings (USG and CT scan) and type of management, and follow up to 4 to 8 weeks (depending upon need for patient).

### Inclusion Criteria

1. The patients with diagnosis of blunt trauma abdomen and hemodynamically stable patient (hemodynamically stable patient defined as systolic BP > 90 mmHg and GCS ≥ 14) and patients who are initially unstable but after resuscitation (within 24 hours) become stable.
2. Blunt trauma abdomen patient who are with age more than 12 years of both gender.

### Exclusion Criteria

1. Age below 12 years.
2. Patients who are hemodynamically unstable, unconscious and patients with increased RFT will unfit for CT scan.
3. Patients with severe head injury with blunt trauma abdomen.
4. Patients with penetrating stab and gun shot injury of abdomen.

### Study Methodology

The cases detailed data will be collected in standardized proforma and noted.

- General physical examination (pulse rate, blood pressure, respiratory rate, pallor, cyanosis and Glasgow Coma Scale).
- Detailed proper history and clinical examination findings noted in proforma.
- Abdominal examination: Inspection, palpation, percussion, and auscultation.
- Per rectal examination will be done to exclude bleeding per rectum or any injury to distal part of colon.
- All laboratory investigations (CBC, Blood group, Serum electrolytes, LFT, RFT, Serum Amylase and lipase, Urine for routine and microscopic, X-ray abdomen and pelvis AP view, X-ray chest PA view).
- USG abdomen & pelvis – After initial resuscitation, it was done in all cases.
- CECT Scan abdomen and pelvis was done in hemodynamically stable patient.

### Data Analysis

Categorical variables were presented in number and percentage and continuous variables were presented as mean ± SD and median. Quantitative variables between two groups were compared using unpaired 't' test / Mann Whitney U test (when the data sets were not normally distributed). While for categorical variables Chi-square test for Fisher's exact test was used. P value <0.05 was considered statistically significant.

### Tables And Graphs

#### 1. Age Wise Distribution (n=104)

| Age groups [Years] | No. of cases | Percentage |
|--------------------|--------------|------------|
| Up to 20           | 16           | 15.4       |
| 21 to 30           | 31           | 29.8       |
| 31 to 40           | 21           | 20.2       |
| 41 to 50           | 18           | 17.3       |
| 51 to 60           | 6            | 5.7        |

|          |   |     |
|----------|---|-----|
| 61 to 70 | 7 | 6.7 |
| Above 70 | 5 | 4.8 |

The above table reveals that the majority of cases (65.4%) were in the age group of up to 40 years, 17.3% were in the age group of 41 to 50 and only 17.2% were in the age group of above 50 years. Peak incidence was in the third decade (29.8%).

## 2. Mode Of Injury

| Mechanism of injury                  | Number | Percentage |
|--------------------------------------|--------|------------|
| Road Traffic Accident                | 74     | 71.2       |
| Fall From Height                     | 14     | 13.5       |
| Physical Assault (Blunt weapon blow) | 12     | 11.5       |
| Animal Horn Thrust                   | 2      | 1.9        |
| Bullock Cart                         | 2      | 1.9        |

Road traffic accident was the commonest cause and accounted for about 71.2% of cases and the cause next in the order was injury by fall (13.5%). Victims of local traffic accidents were mainly from affluent class.

## 3. Clinical Manifestation

| Clinical Manifestation | Number | Percentage |
|------------------------|--------|------------|
| Pain                   | 104    | 100        |
| Distension             | 21     | 20.2       |
| Vomiting               | 19     | 18.3       |
| Tenderness             | 88     | 84.6       |
| Guarding               | 43     | 41.3       |
| Rigidity               | 17     | 16.3       |
| Hematuria              | 19     | 18.3       |
| External Injury        | 27     | 26         |

The commonest presentation was of abdominal pain and tenderness which were present in 100% and 84.6% of cases respectively, either with or without an external burst, scratch mark or skin erythema over the site of impact. It was followed by guarding (41.3%), abdominal distension (20.2%), absence of bowel sounds (40%), vomiting (18.3%), and hematuria (18.3%).

## 4. A CT Finding Of Fluid Collection And Free Air In Peritoneal Cavity In Blunt Abdominal Trauma Cases

| CT FINDINGS [n=104] |          | Number |
|---------------------|----------|--------|
| Free Fluid          | Present  | 28     |
| Hemoperitoneum      | Present  | 59     |
|                     | Mild     | 46     |
|                     | Moderate | 4      |
|                     | Severe   | 9      |
| Pneumoperitoneum    | Present  | 16     |

## 4. B CT Finding Of Solid Organ Injury In Blunt Abdominal Trauma Cases (according To Asst Scale)

| CT FINDINGS [n=104] |             | Number | Percentage |
|---------------------|-------------|--------|------------|
| Liver injury        | Present     | 23     | 22.1       |
|                     | Contusion   | 4      | 3.8        |
|                     | Grade 1     | 1      | 0.9        |
|                     | Grade 2     | 8      | 7.7        |
|                     | Grade 3     | 6      | 5.8        |
|                     | Grade 4     | 3      | 2.9        |
| Splenic Injury      | Grade 5     | 1      | 0.9        |
|                     | Present     | 29     | 27.9       |
|                     | Contusion   | 4      | 3.8        |
|                     | Grade 1     | 4      | 3.8        |
|                     | Grade 2     | 7      | 6.7        |
|                     | Grade 3     | 5      | 4.8        |
| Kidney injury       | Grade 4     | 7      | 6.7        |
|                     | Grade 5     | 2      | 1.9        |
|                     | Present     | 13     | 12.5       |
|                     | Contusion   | 4      | 3.8        |
|                     | Grade 1     | 2      | 1.9        |
|                     | Grade 2     | 2      | 1.9        |
| Pancreatic Injury   | Grade 4     | 4      | 3.8        |
|                     | Grade 5     | 1      | 0.9        |
|                     | Present     | 8      | 7.7        |
|                     | Grade 1 & 2 | 4      | 3.8        |
|                     | Grade 3 & 4 | 4      | 3.8        |

|                        |                 |   |     |
|------------------------|-----------------|---|-----|
| Urinary bladder injury | Intraperitoneal | 4 | 3.8 |
|                        | Extraperitoneal | 3 | 2.9 |

Patients were investigated with CECT for evaluation. Free fluid was present in (26.9%), hemoperitoneum in 56.9 %. And pneumoperitoneum was present in 23.1% patients. liver injury was present in 22.1%, spleen injury 27.9 %, kidney injury in 12.5% and urinary bladder in 6.7 %. pancreatic injury was present in 7.7 % patients.

## 5. Mode Of Management

| Management    | Number | Percentage |
|---------------|--------|------------|
| Non-Operative | 67     | 64.4       |
| Operative     | 37     | 35.6       |

## 6. A Intra Operative Findings (fluid Collection)

| Intra operative findings |                    | Number | Percentage |
|--------------------------|--------------------|--------|------------|
| Free Fluid               | Present            | 18     | 48.64      |
| Hemoperitoneum           | Without Free Fluid | 11     | 35.1       |
|                          | With Free Fluid    | 8      | 24.3       |

## 6. B Intra Operative Findings (visceral Injury)

| Intra operative findings |                                           | Number | Percentage |
|--------------------------|-------------------------------------------|--------|------------|
| Intestine                | Present                                   | 18     | 48.64      |
|                          | Duodenal Perforation                      | 1      | 3.1        |
|                          | Ileal Perforation                         | 10     | 21.9       |
|                          | Jejunal Perforation                       | 6      | 17.1       |
|                          | Jejunal Perforation & Colonic Perforation | 1      | 3.1        |
| Liver injury             | Present                                   | 1      | 3.1        |
|                          | Grade 4                                   | 1      | 3.1        |
| Splenic Injury           | Present                                   | 7      | 21.9       |
|                          | Grade 4                                   | 5      | 15.6       |
|                          | Grade 5                                   | 2      | 6.3        |
| Kidney injury            | Present                                   | 5      | 12.5       |
|                          | Grade 4                                   | 3      | 6.3        |
|                          | Grade 5                                   | 2      | 6.3        |
| Pancreatic injury        | Present                                   | 3      | 9.4        |
| Urinary bladder injury   | Present                                   | 4      | 12.5       |

Intra operative finding were observed, intestinal injury was present in 48.64% of patients, which constitutes duodenal perforation 3.1%, ileal perforation 21.9%, Jejunal Perforation 15.6% and colonic perforation 3.1 %. Liver injury was present 3.1%, spleen injury 18.9%, kidney injury 13.5% and urinary bladder 10.8%, pancreatic injury 8.1 % patients.

## DISCUSSION

Majority of cases belonged to the age group up to 40 years accounting for about 65.4%. 17.3% belonged to age group of 41 to 50 years. The least number of patients belonged to the age group of more than 60 years corresponding to 11.5%. This is correlated with the study done by Mishra B et al.<sup>2</sup> (2020) who encountered 70% of patients between 11-40 years.

In this study, road traffic accident was the commonest cause and accounted for about 71.2% of cases and the cause next in the order was injury by fall (13.5%). This is correlated with the study done by Pandey VK et al.<sup>3</sup> (2020) who encountered road traffic accident was the commonest cause and accounted for about 78% of cases and the cause next in the order was injury by fall (18%).

The commonest presentation was of abdominal pain and tenderness which were present in 100% and 84.6% of cases respectively, either with or without an external burst, scratch mark or skin erythema over the site of impact. It was followed by guarding (41.3%), abdominal distension (20.2%), absence of bowel sounds (40%), vomiting (18.3%), and hematuria (18.3%). This is correlated with the study done by Mishra B et al.<sup>2</sup> (2020) who encountered abdominal pain and tenderness which were present in 92% and 82% of cases respectively.

In our study, e-fast USG in blunt trauma abdomen cases shows positive finding in 71.1% cases and CT shows positive finding in 92.3%. This is correlated with the study done by Pandey VK et al.<sup>3</sup> USG shows abnormal finding in 14.9% and CT shows abnormal finding in 28.1%, as all study cases were not included for USG and CT evaluation. So

CECT forms the core investigation of choice in dealing with blunt injury abdomen cases and is useful in deciding operative versus conservative management.

In this study, 64.4% patient were managed conservatively and 35.6% patient were managed by surgical approach. This is very similar with the study done by Mishra B et al.<sup>2</sup> 65 % patient were managed conservatively and 35% patient were managed surgically and study done by Pandey VK et al.<sup>3</sup> (2020), 68% patient were managed conservatively and 32% patient were managed surgically.

Pneumoperitoneum was present in 15.4% (16/104) in USG or CT, who were taken for surgery (exploratory laparotomy) for suspected intestinal injury and in 2 cases intestinal injury was found in operatively, while operating for other associated organ injuries even if pneumoperitoneum not detected in USG or CT.

Liver was the second most common organ injured (22.1%). Most cases of liver injuries were of grade II, 7.7% followed by grade III, 5.8% . All patients with liver injury in present study were managed conservatively except one with grade IV injury, patient was showing deterioration on clinical basis, serial CBC and on repeat CT. Goel R et al.<sup>4</sup> (2021), study shows that highest cases of liver injury were grade III was 17.4% followed by grade II 14.29%.

Most cases of splenic injuries were of grade II and grade IV 6.7% (7/104) each, followed by grade III 4.8% (5/104). In study done by Goel R et al.<sup>4</sup> (2021), which encountered, most common splenic injury is of grade III (14.29%). Out of 29 patient of spleen injury, 23 cases were with grade III or less and they were managed conservatively and out of 9 patients, 7 patients with grade IV or above were managed surgically.

In present study, renal injuries were seen in 12.5% patients (13/104). In present study, grade IV renal injury was most common, present in 3.8%. The rest of the patients were managed conservatively. Mishra B et al.<sup>2</sup> study observed that commonest renal injuries were of grade IV . In our study, pancreatic injury present in 7.7% with grade I and grade II combined were 3.8% and grade III alone was 3.8% of total. Out of which 3.8% (grade III cases) were managed surgically due to clinical deterioration. Goel R et al.<sup>4</sup> study showing that highest cases of pancreatic injury were grade III was 8.57% followed by grade I 2.85%. In present study, 6.7% cases of urinary bladder injury were seen. 3.8%) shows intraperitoneal rupture on CT with sign of peritonitis who were managed surgically and remaining were managed conservatively. Mishra B et al.<sup>2</sup> study observed that urinary bladder injury was present in 2.0% cases.

## CONSLUSION

It can be concluded from our study that CECT is the gold standard for detecting solid organ injuries. CT plays a major role in management of blunt trauma abdomen and helps in making decision regarding operative and non-operative management. Due to its high specificity, it can be used as a reliable investigation for blunt trauma abdomen and can also be useful in final treatment planning.

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