International Journal
of
Radiology and Diagnostic Imaging

**E-ISSN:** 2664-4444
**P-ISSN:** 2664-4436
www.radiologypaper.com
IJRDI 2020; 3(3): 01-04
Received: 05-05-2020
Accepted: 09-06-2020

**Ankit Prabhakar**
Post Graduate,
Department of Radiodiagnosis and Imaging, Government Medical College, Srinagar, Jammu and Kashmir, India

**Dawood Iqbal Wani**
Post Graduate,
Department of Surgery, Government Medical College, Jammu, Jammu and Kashmir, India

**Shivani Sharma**
Post Graduate,
Department of Obstetrics and Gynaecology, Government Medical College, Jammu, Jammu and Kashmir, India

**Rezwana Nafees**
Doctor, Government Medical College, Jammu, Jammu and Kashmir, India

**Corresponding Author:**
**Dawood Iqbal Wani**
Post Graduate,
Department of Surgery, Government Medical College, Jammu, Jammu and Kashmir, India

# Abdomino-pelvic trauma in emergency: Evaluation using contrast enhanced multidetector computed tomography

**Ankit Prabhakar, Dawood Iqbal Wani, Shivani Sharma and Rezwana Nafees**

**DOI:** http://dx.doi.org/10.33545/26644436.2020.v3.i3a.107

**Abstract**
Abdominal trauma is of two varieties including blunt and penetrating injury. In present scenario, Computed Tomography scan has become the main diagnostic tool for evaluating injuries to major abdominal organs including liver, pancreas, spleen, kidney, small gut, large gut and mesentery. The study was undertaken to characterise the imaging features of various organs injuries in cases of abdominal trauma using multi detector computed tomography. It was found that CT provides a detailed and elusive information regarding the injury to various organs and vessels. Combined efforts of the trauma team and emergency radiologist helps to permit proper triage of the patient and helps in management of the trauma cases.

**Keywords:** Trauma, Computed Tomography, Blunt injury, Penetrating injury

## 1. Introduction
Abdominopelvic trauma is of two varieties including blunt and penetrating injury. Of these, penetrating injuries can be due to stab and gunshot/rifle injuries. Blunt injuries are seen in 75% of the cases, out of which 80% cases are caused by physical assault, accidents and fall from height (Atin K *et al*., 2009) [1].
Abdominal trauma is the cause of 10% of overall trauma mortality. It causes more of morbidity than mortality. It is also an important cause of preventable deaths related to trauma (Otto C *et al*., 2009) [2].
In present scenario, Computed Tomography (CT) scan has become the main diagnostic tool for evaluating trauma patients. To evaluate the injuries to major abdominal organs including liver, pancreas, spleen, kidney, bowel and mesentery, Computed Tomography is the most useful investigation. In cases of blunt abdominal trauma and penetrating injuries, CT scan is very useful if the condition of the patient is haemodynamically stable. It is also valuable in cases where the general physical examination of the patient is not much reliable (John LR *et al*., 1993) [6].
Among the abdominal viscera, the most commonly injured solid organ in abdominal trauma is spleen followed by liver as the second most common organ. Since, liver is a bed for major vasculature of the abdomen including hepatic artery, hepatic veins, portal vein and IVC, liver trauma is the most common cause of death in cases of abdominal trauma (Stanesen AL *et al*., 2006) [11]. Eighty percent of hepatic injuries, approximately most of the renal injuries and half of splenic trauma cases are managed conservatively in routine. Computed Tomography is used as a tool to evaluate trauma patients on arrival in emergency as well as during follow-up of the case (Stanesen AL *et al*., 2006) [11].
Blunt injuries to the abdomen have an incidence of 25% spleen injuries, 15% liver and intestinal injuries, 13% retroperitoneal injuries, 12% renal injuries, 5% mesenteric injuries, 3% pancreatic injuries and 2% each cases of vascular and diaphragmatic injuries. On the other hand, penetrating injuries have an incidence of 37% hepatic injuries, 26% bowel injuries, 19% gastric injuries, 11% retroperitoneal injuries, 7% mesenteric injuries, 5.5% diaphragmatic and renal injuries, 3.5% pancreatic injuries, 2.5% duodenal injuries and about 1% biliary injuries (Atin K *et al*., 2009) [1].

Multi Detector Computed Tomography (MDCT) plays an important role in the early detection of injuries to abdominal organs due to trauma. Hence, the high morbidity and mortality associated with delayed diagnosis of visceral abdominal injuries can be prevented by using efficacious CT scan study with rapid scan rate and reduced motion artefacts added with rapid infusion of intravenous contrast agent followed by proper and vigilant observation of the individual organs and vasculature of abdomen.
Generally in a CT scan study in case of abdominal trauma, a radiologist must look for presence of hemoperitoneum, lacerations, contusions, hematoma, active contrast extravasation, pneumoperitoneum and organ infarcts.

## 2. Aims and Objectives
To characterise the imaging features of various organs injuries in cases of abdominal trauma using multi detector computed tomography.

## 3. Materials and Methods
The present study was conducted over a period of eight months in the Department of Radio diagnosis and Imaging, Government medical College, Srinagar. 75 cases of trauma were enrolled in this study which were referred from emergency department of the hospital.

### 3.1 Exclusion criteria
1. Patients with known history of past abdominal injuries and who had undergone surgeries for the same.
2. Past history of contrast reactions.

### 3.2 Inclusion criteria
All patients presenting to the emergency with abdominal trauma with clinical suspicion of abdominal injury.

### 3.3 Methodology
Written consent of the patient was obtained prior to the procedure after explaining the procedure and risks/benefits of the investigation. A detailed clinical history and general physical examination of the patient was elicited. Patient was put in CT scan machine followed by examination of the same.

### 3.4 Imaging techniques
All the CT scans were performed with helical CT scanner - siemens somatom definition flash machine. A breath-hold scan was obtained from the diaphragm to the symphysis pubis with a section thickness of 2 to 2.5 mm and a reconstruction interval of of 1.0 to 1.5 mm. Both non enhanced and contrast enhanced scans were performed.
Contrast enhanced CT scans were obtained after injection of Iohexol 300 mg per ml, injected at a rate of 3 to 4 ml per second using power injector. Arterial phase images were acquired 25 seconds after beginning of scan followed by venous phase about 50 seconds after the start of injection.

### 3.5 Image analysis
CT scans were reviewed by an experienced radiologist. The focus of image analysis was on parameters associated with trauma.

### 3.6 Statistical analysis
Categorical variables were summarised in terms of frequencies and percentages. Quantitative variables were assessed in terms of Mean, Median, Mode, standard deviation, maximum, minimum and percentile values, if any.

## 4. Results and Discussion
This study was a prospective study conducted in Department of Radio diagnosis and Imaging, GMC Srinagar and comprised of 75 patients admitted as a case of abdominal trauma in the emergency wing of hospital. All the patients were clinically evaluated followed by MDCT of abdomen. Following observations were made. Most of the patients in our study were between the age of 20-35 years (45% cases). This is consistent with a study by Kumar MM *et al*., where the maximum incidence was seen in patients in second decade of life (Kumar MM *et al*., 2005) [7]. In our study, there were 57 males and 18 females (Fig. 1). This is in concordance with a study by Hajseidjavadi SA which also observed similar sex ratio (Hajseidjavadi SA, 2001) [2].

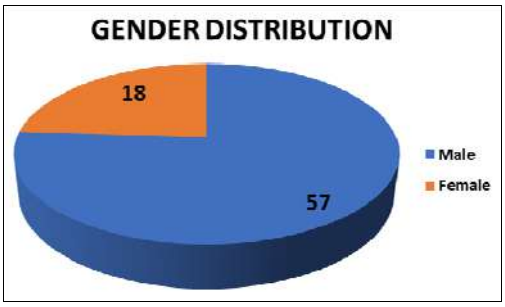



**Fig 1:** Pie Diagram depicting gender distribution of the patients

Pain abdomen (100%) was the most common presenting symptom. 15% had abdominal distension, 10% had vomiting. 80% cases had guarding and tenderness. These findings are consistent with a study by Joe JD, which stated that abdominal pain and tenderness were the main sign and symptoms in patients of trauma (Joe JD *et al*., 1976) [5].
17% patients had a history of fall from height, 80% had a history of road traffic accident (RTA) and 3% had a history of physical assault. These findings are consistent with a study done by Sinelnikoy AO *et al*., where 75% cases had a history of RTA (Sinelnikoy AO *et al*., 2007) [10]. 96% of the patients presented with visceral injury and 4% of the patients presented only with hemoperitoneum in our study. This is concordant with a study by Kumar MM *et al*. (Kumar MM *et al*., 2005) [7]. Hemoperitoneum was associated with organ injury in 88% patients and 12% patients with organ injury had no hemoperitoneum (Fig. 2). In a study by Yi-Kangku *et al*., hemoperitoneum was more commonly associated with visceral organ injury (Yi-Kangku *et al*., 2007) [12]

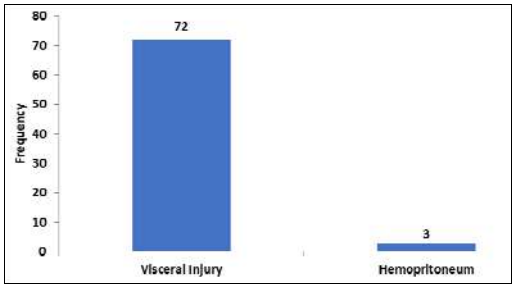



**Fig 2:** Bar diagram showing pattern of abdominal injury

In our study, 69.3% patients had multiple organ injury, while 30.7% patients had single organ injury. This is consistent with a study by Janusz C *et al*. that reported that multi organ injury is much more common (Janusz C *et al*., 2006) [4].

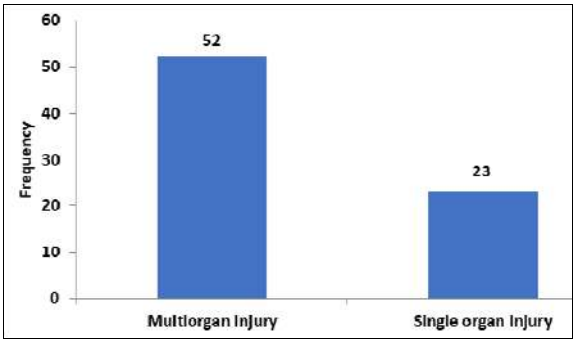



**Fig 3:** Bar diagram showing multiplicity of trauma

In our study, liver injury was seen in 45.3% patients, splenic injury was seen in 38.6% patients, renal injury was seen in 20% patients, pancreatic injury was seen in 4% patients, gastric injury was seen in 2% patients, bowel injury was seen in 10.6% patients and urinary bladder injury was seen in 1% patients (Fig. 4). As per a study by Mirvis *et al*., it was found that liver was the most common organ injured followed by spleen (Mirvis SE *et al*., 1993) [8].

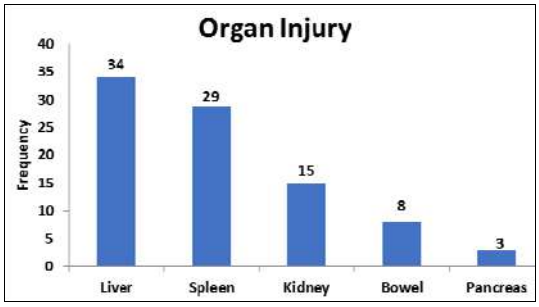
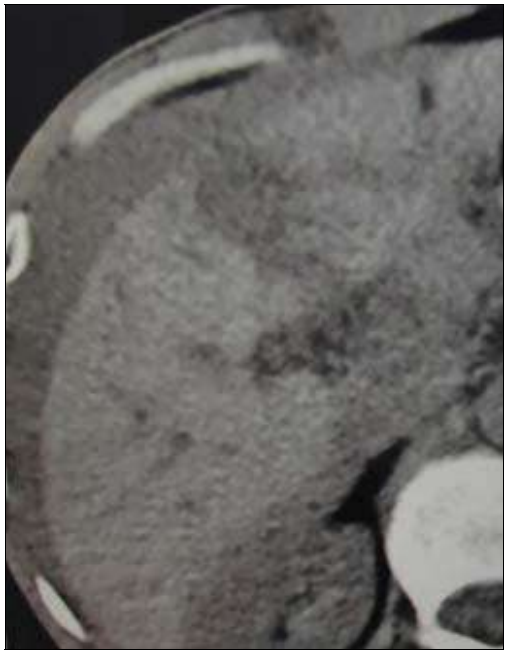



**Fig 4:** Bar diagram depicting organs injured in abdominal trauma

Conservative management was done in 64% patients, while operative management was done in 36% patients. In a study by Helen M *et al*., it was found that most of the patients were treated conservatively in cases of abdominal trauma (Helen M *et al*., 2007) [3].

**Pic 1:** CECT axial view showing non enhancing linear area in spleen suggestive of splenic laceration.



**Pic 2:** CECT axial view showing non enhancing area in liver suggestive of liver laceration with surrounding hemoperitoneum.

## 5. Conclusion

Multi Detector Computed Tomography can be used as a tool for early diagnosis of visceral and vascular injuries in cases of abdominal trauma. It provides a detailed and elusive information regarding the injury to various organs and vessels. Furthermore, it helps in proper management of the patients whether operative or conservative. Complications of the post traumatic events can also be assessed using contrast enhanced scans. Accurate measurements of parenchymal lacerations, contusions and quantification of hem peritoneum can be made using CT study.

MDCT has become the standard of care to evaluate abdominal organs and vascular structures in trauma patients. Exclusion of abdominopelvic injury is not entirely possible on clinical basis according to ATLS standards. Combined efforts of the trauma team and emergency radiologist helps to permit proper triage of the patient with better decision in management of the trauma cases.

## 6. References

1. Atin K, Sanjay T. Imaging in Abdominal Trauma. In: Arun K, Veena C, Niranjan. Diagnostic Radiology Gastro - Intestinal and Hepatobiliary Imaging: 3rd ed. New Delhi: Jaypee, 2009, 32.
2. Hajseidjavadi SA. Evaluation of blunt abdominal trauma. The Journal of Oazvin Univ. of Med Sc. 2001; 17:50.
3. Helen M, Kathirkamantham S, Malvin Ta, Stuert EM. AJR. 2007; 189:1421-7.
4. Janusz C, Frank B, Nirmal KB, Ruth L, Peter C. The Role of Multislice Multidetector CT (MDCT) in Abdominal Trauma. European Journal of Trauma. 2006; 32:533-7.
5. Joe JD, Isidore C, Francis CN, Diagnosis and Management of Blunt Trauma. Ann. Surg. 1976; 1836:672-77.
6. John LR, Kenneth D, Carol MB, Zafar HJ. CT in Abdominal and Pelvic Trauma. Radiographics. 1993;

13:735-52.
7. Kumar MM, Venkataramanappa M, Venkatratnam I, Kumar NV, Babji K. Abdominal Imaging. IJRI. 2005; 15:2:167-73.
8. Mirvis SE, Young JWR. Imaging in trauma and critical care. William Wilkins, Baltimore, 1993.
9. Otto C, Loannis V. The Abdomen and Major Trauma. In: David S editor. Textbook of Radiology and Imaging. 7th ed. Vol 1. Noida: Elsevier, 2009, 691.
10. Sinelnikoy AO, Abujudeh HH, Chan D, Novelline RA. CT manifestation of adrenal trauma. Emerg Radiol. 2007; 13:313-8.
11. Stanesen AL, Gross JA, Bittle M, Mann FA. Imaging of blunt abdominal trauma. Semin Roentgen. 2006; 41(3):196-204.
12. Yi-Kangku, Yon CW, Li-Jen W, Jen-Feng F, Being-Chaun Lin. MDCT of Blunt Abdominal Trauma: The correlation of Extraluminal Air, Fluid and Unexplained Fluid with Bowel Perforation. Chin J Radiol. 2007; 32:57-62.