Original Research Article

Assessment of Thoraco-abdominal injury pattern due to blunt trauma in Kashmiri Population by contrast enhanced Computerized Tomography (CECT)

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Abstract

Background: The most common causes of blunt abdominal trauma are motor vehicle collisions, falls from height, assaults, and sports accidents. Computed tomographic (CT) examination of the head, neck, chest, abdomen, and pelvis has become an essential element in the early evaluation and decision-making algorithm for hemodynamically stable patients who sustained abdominal trauma. Although the decision to surgically intervene is usually based on clinical criteria rather than findings from images. CT information often increases diagnostic confidence and decreases rates of unnecessary exploratory laparotomy.

Aim and objective: To study the pattern of Thoraco-abdominal injuries due to Blunt Trauma in Kashmiri population.

Methods and materials: Study was done in the department of Radiodiagnosis and Imaging, GMC Srinagar. 64 patients with Positive extended FAST (focused assessment with sonography for trauma) done by expert in emergency Radiology were subjected to contrast enhanced CT.

Results: According to our Study, Lung was the most commonly injured organ being injured in 67% cases followed by Spleen and Liver, being injured in 59% and 45% cases respectively. Most common pattern of lung injury was Contusion. Grade III was the most common grade of injury followed by Grade IV injury amongst splenic and liver injuries. Rib was the most commonly injured bone.

Conclusion: Multidetector CT has very high accuracy for optimal evaluation of the patients with Blunt trauma. CT plays a vital role in deciding mode of treatment whether medical or surgical for patients with blunt trauma. Lung was the most commonly injured organ in our study followed by Spleen and liver.

Key words

Thoracoabdominal injury, Blunt Trauma, CECT.

Introduction

The morbidity, mortality, and economic costs resulting from trauma in general, and blunt abdominal trauma in particular, are substantial. The most common causes of blunt abdominal trauma are motor vehicle collisions, falls from height, assaults, and sports accidents [1]. Considerable forces are usually required to injure the solid and hollow viscera in the abdomen. Three basic mechanisms explain the damage to the abdominal organs: deceleration, external compression, and crushing injuries [2]. The “panscan” (computed tomographic (CT) examination of the head, neck, chest, abdomen, and pelvis) has become an essential element in the early evaluation and decision-making algorithm for hemodynamically stable patients who sustained abdominal trauma. In approximate order of frequency, the most commonly injured abdominal organs and structures are the spleen, liver, kidneys, small bowel and/or mesentery, bladder, colon and/or rectum, diaphragm, pancreas, and major vessels [3], and multiple organs are often affected simultaneously. Various factors determine the specific association of organs injured: the energy delivered at impact, the part of the body struck first, the body habitus, and, in the case of motor vehicle accidents, the use (and type) of a restraint device. CT is superior to clinical evaluation and diagnostic peritoneal lavage for diagnosing important abdominal injuries [4, 5]. Although the decision to surgically intervene is usually based on clinical criteria rather than findings from images [6], CT information often increases diagnostic confidence and decreases rates of unnecessary exploratory laparotomy [7].

Objectives

- To study the pattern of Thoraco-abdominal injuries due to Blunt Trauma in Kashmiri population.

Materials and methods

Study was done in the department of Radiodiagnosis and Imaging, GMC Srinagar. 64 patients with Positive extended FAST (focused assessment with sonography for trauma) done by expert in emergency Radiology were subjected to contrast enhanced CT. All of the scans were performed using a multislice Somatom Siemens CT scanner with a slice width of 10 mm and 3 mm reconstruction interval. Pre- and post-contrast scans were routinely performed and patients received 2 mL/ kg of intravenous contrast medium (Iohexol, 300 mg/mL). The CT scans were acquired during the portal venous phase approximately 80 seconds after the contrast injection. Delayed venous phase scans were taken when there was suspicion of contrast extravasation. Field view included both thorax and abdomen from above the clavicles to neck to femurs (**Figure – 1 to 8**).

Figure - 1: Axial CT image revealing evidence of pulmonary contusion, pulmonary hemorrhage and pneumothorax in same patient.

Figure - 2: Axial CECT delayed phase image revealing contrast extravasation in right adrenal region with adrenal hematoma.

Figure - 3: Axial CT image with pulmonary window revealing severe subcutaneous and intramuscular emphysema with pneumomediastinum.

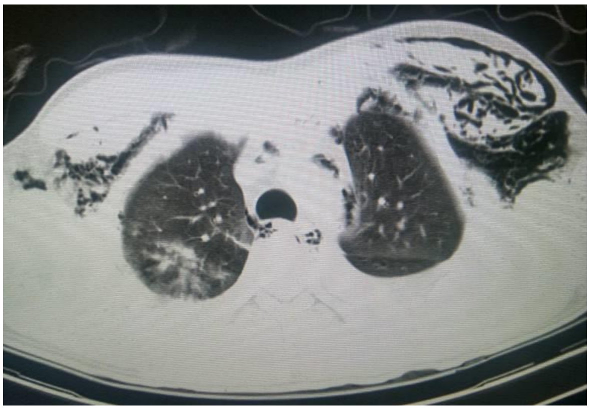


Figure - 4: Axial CECT image revealing evidence of Grade III splenic injury with grade I liver injury.

Figure - 5: Axial CECT image revealing evidence of grade III liver injury with perihepatic free fluid.

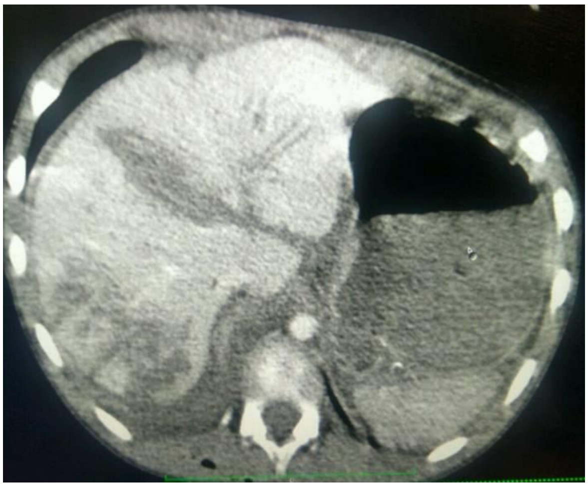


Figure - 6: Axial CECT image revealing thick walled jejunal loop. Patient was diagnosed with small bowel perforation.

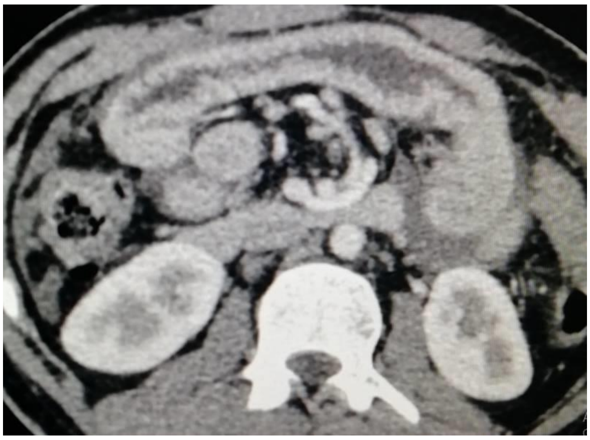


Figure - 7: Axial CECT image reveals evidence of mesenteric hematoma.

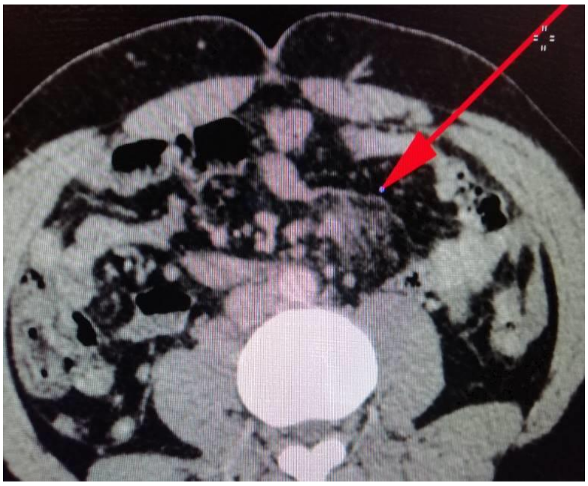
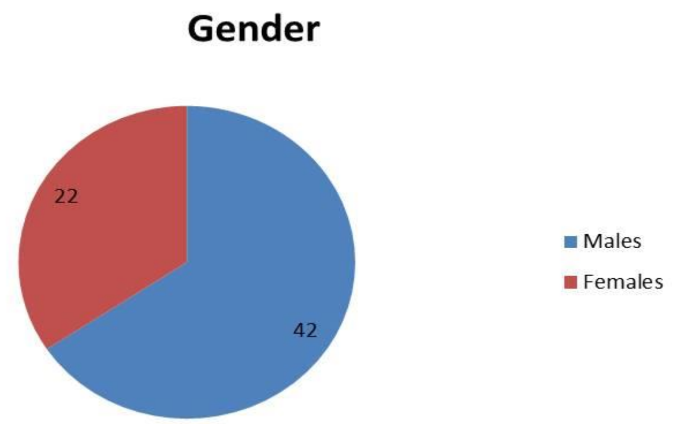


Figure - 8: Coronal CECT image reveals evidence of grade III right renal injury.

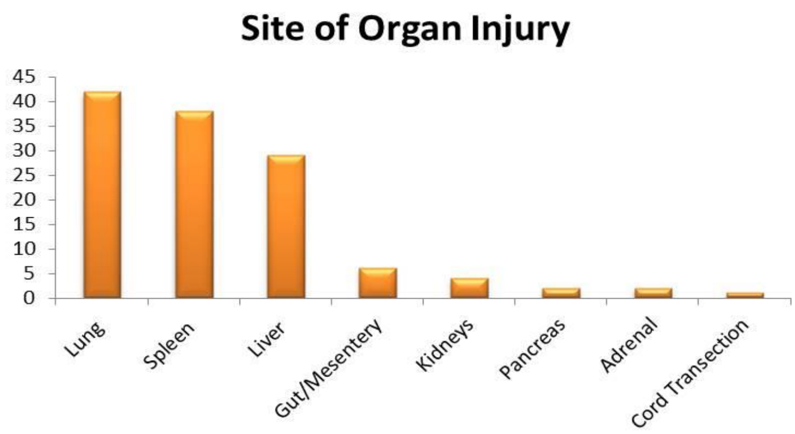
Exclusion criteria

- Patients with compromised hemodynamic status.
- Patients with history of severe contrast reactions.

Graph – 1: Gender Distribution.



Graph – 2: Site of organ injury.



Results and Discussion

Out of 64 patients 42 were males and 22 were females (**Graph – 1**). Most of the patients (21) were in age group of 20-30 years followed by 15 in 30-40 years group (**Table – 1**). About 38 cases were due to Road Traffic Accidents, 16 by fall from heights, 8 were sports injury and 2 were industrial accidents.

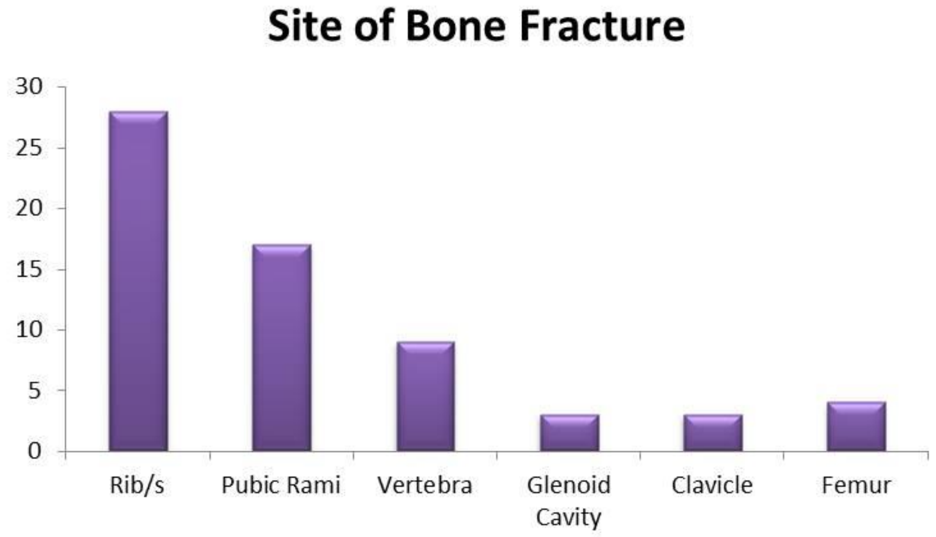
Table – 1: Catagorisation of Injured patients based on Age Groups.

Age Group In years	No. of Patients
0-10	1
10-20	11
20-30	21
30-40	15
40-50	8
50-60	6
60-70	2

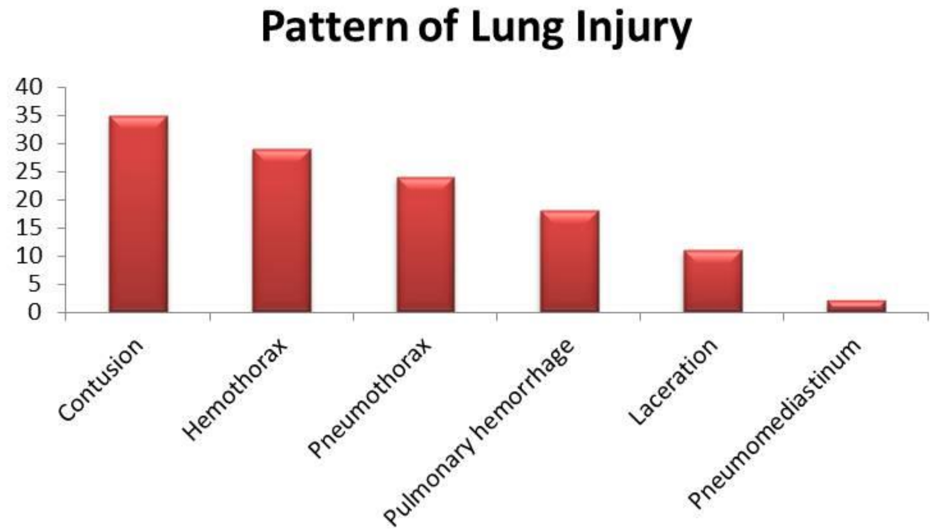
According to our Study, Lung was the most commonly injured organ being injured in 67% cases followed by Spleen and Liver, being injured in 59% and 45% cases respectively. This can be explained by the fact that lungs occupy a large portion of chest cavity and lie in close approximation to bony thorax. Majority of the patients had combination of injuries (**Graph – 2**).

Bone fractures were seen 41 patients accounting for 64% patients. Amongst bones rib was the most commonly injured bone in 28 patients followed by pubic rami and vertebra in 17 and 9 patients respectively. Multiple Rib fractures were taken as score of 1 in our study. Most of the patients had combinations of different bone fractures (**Graph – 3**).

Graph – 3: Site of bone fracture.



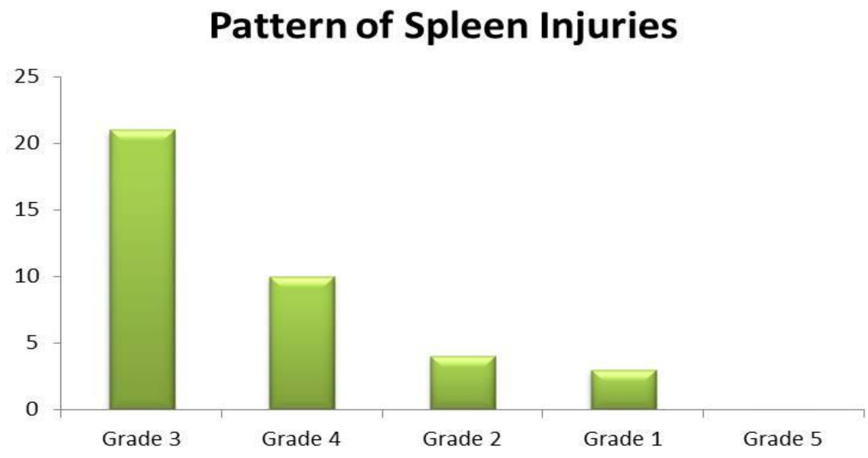
Graph – 4: Pattern of lung injury.



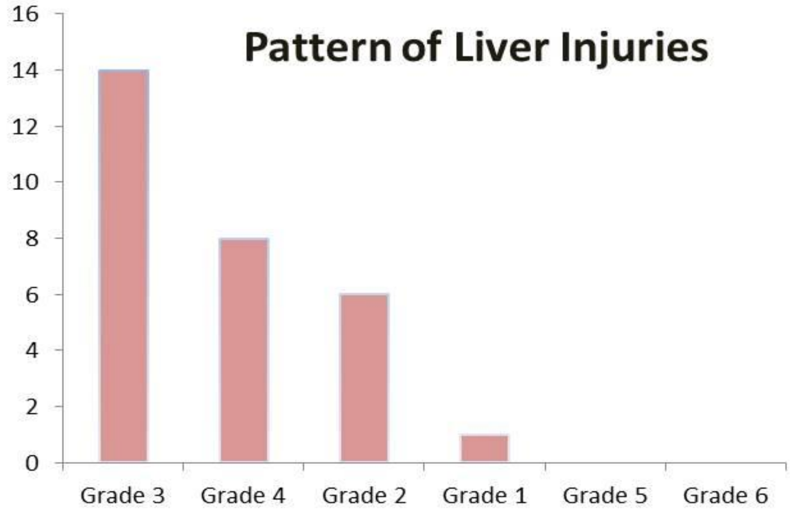
Most common pattern of lung injury was Contusion in 35 patients followed by Hemothorax in 29 patients. Contusion was seen as area of consolidation in traumatized lung). Other patterns of Lung Injury were pneumothorax, Pulmonary Hemorrhage (seen as an area of Ground Glassing), laceration and Pneumomediastinum (least common seen in 2 patients). Most of the patients had Combination of different patterns (**Graph – 4**).

Spleen and Liver Injuries were graded according to the American Association for the Surgery of Trauma (AAST) and accounts for the size and location of splenic lacerations and hematomas. Grade III was the most common grade of injury followed by Grade IV injury. The spleen is the most commonly injured abdominal organ in blunt trauma. Given the role of the spleen in immune function and the potential for overwhelming infection after splenectomy [8], splenic preservation after trauma is the current standard of care. Currently, the success rate of nonsurgical therapy varies between 80% and 90% [9] Thus, accurate identification of injuries that may necessitate surgical or angiographic intervention is of critical importance [10, 11, 12]. The amount of hemoperitoneum has been shown to predict the eventual success of nonsurgical management; patients with smaller degrees of hemoperitoneum have higher rates of successful nonsurgical management [13]. In addition, the presence of active hemorrhage and/or contained vascular injuries (pseudoaneurysms and arteriovenous fistulae) increases the risk of failed nonsurgical management [14]. Active hemorrhage is identified as a contrast material blush or focal area of hyperattenuation in or emanating from the injured splenic parenchyma. In our study it was present in 14 patients and is one of the most important factor for undertaking surgical management (**Graph – 5, 6**).

Graph – 5: Pattern of spleen injuries.



Graph – 6: Pattern of liver injuries.



We had 6 cases of gut or mesenteric injuries. Perforation was seen in 4 patients while 2 patients had mesenteric hematoma. Site of gut perforation in our study was jejunum in all four cases. Findings were confirmed post operatively. Although injuries to the hollow viscera and mesentery are rare, occurring in approximately 5% of patients with severe blunt abdominal trauma [15, 16], one of the most essential tasks for the emergency radiologist is to recognize the often subtle CT signs of bowel trauma. Delays in diagnosis as short as 8–12 hours increase the morbidity and mortality from peritonitis and sepsis [17]. At least one-half of injuries to hollow viscera involve the small bowel, followed in frequency by the colon and stomach [18].

We had 4 cases of pancreatic trauma, 2 cases of renal trauma and adrenal injury each and one case of Cord Transection. Pancreatic injuries may be classified as contusion, laceration, or transection. Contusions are focal areas of low attenuation or enlargement. Lacerations may be superficial or extend through the entire pancreas, resulting in a transection (also termed fracture). Involvement of the pancreatic duct is an important source of morbidity and increased mortality from complications such as infected pseudocyst, abscess, fistulae, or sepsis [19–21]. In our study only 4 patients had pancreatic injuries in form of contusion in 3 patients and laceration in one patient.

AAST grading system was applied to classify the severity of renal trauma and takes into account the size and location of renal lacerations and hematomas [22]. The majority of traumatic renal injuries are treated conservatively with observation alone [22, 23]. In our study, only 2 patients had renal injury in form of Grade III AAST injury.

The adrenal glands are injured in approximately 2% of patients who undergo blunt abdominal trauma (99). Major forces are required to injure the adrenals. Not surprisingly, traumatic adrenal hemorrhage is usually accompanied by injuries in other upper abdominal organs, especially the liver. Approximate distribution of adrenal hemorrhage secondary to blunt trauma is the right adrenal in 75% of cases, the left adrenal in 15% and both adrenals in 10% [24]. Unilateral adrenal hematomas usually resolve spontaneously.

About 7 patients had features of hypoperfusion complex including combination of collapsed infrahepatic inferior vena cava with flattening of the renal veins, decreased caliber of the aorta, diffusely thickened and hyper enhancing small bowel (shock bowel), increased enhancement of the kidneys and adrenals, decreased enhancement of the spleen, and pancreatic enlargement with peripancreatic and retroperitoneal edema. Hypoperfusion factor is a poor prognostic factor.

Conclusion

Multidetector CT has very high accuracy for optimal evaluation of the patients with Blunt trauma. CT plays a vital role in deciding mode of treatment whether medical or surgical for patients with blunt trauma. Lung was the most commonly injured organ in our study followed by Spleen and liver.

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