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CECT in the Evaluation and Management of Blunt Abdominal Trauma

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Abstract: ***Introduction: Trauma constitutes 3rd commonest cause of death after malignancy & vascular diseases. Abdominal trauma common in 20-40%, blunt trauma constitutes 2/3rd cases. Aims & Objectives: To evaluate the role of CECT in diagnosis, grading, management and follow-up of blunt abdominal trauma in hemodynamically stable patients. Materials & Methods: 46 hemodynamically stable patients were included in this study, 35 were males and 11 females, age between 25 to 60years. CECT (i.v contrast) was done to all the patients. Results: Among the 46 patients, CECT showed splenic injuries in 28 patients, liver injuries in 13, hollow viscus perforation in 2, mesenteric vascular injury in 1, diaphragmatic injury in 1 & duodenal injury in 1 patient. CT signs of hemoperitoneum (30-70HU), sub capsular hematoma, linear laceration, pneumoperitoneum, sentinel clot sign, contrast extravasation, CT collar sign with abdominal viscera herniation for diaphragmatic injury & Grading by AAST (American Association for Surgery of Trauma). Conclusions: Characterization of parenchymal injuries, accessibility to retro peritoneal injuries, detecting the bowel and mesenteric injuries, identifying the source of bleeding has greatly increased the accuracy of CECT in the management and clinical outcome of blunt abdominal trauma in hemodynamically stable patients.***

Keywords: CECT, Blunt Abdominal Trauma

1. Introduction

- Trauma constitutes 3rd commonest cause of death after malignancy & vascular diseases[1].
- Abdominal injuries are the third most commonly involved after the head and extremities[2](20-40%), of which2/3rd cases are due to blunt trauma.

Abdominal injuries assessment:

1) Physical examination: poor sensitivity (<50%).
2) Diagnostic peritoneallavage (DPL):invasive(obsolete).
3) Imaging has already replaced DPL[3].
   - Ultrasound (FAST): Hemoperitoneum.
   - CT: Hemoperitoneum, solid/hollow viscus Injuries, active extravasation/vascular injuries, retroperitoneal injuries.

Aims and Objectives

- To evaluate the role of CECT in the diagnosis, grading, management and follow-up of blunt abdominal trauma in hemodynamically stable patients.
- To study the various clinical – radiological patterns of blunt abdominal injuries.
- To correlate the CT features with clinical outcome.
- To identify the imaging indicators of poor clinical outcome.

Inclusion Criteria

- All hemodynamically stable patients:
- Mild to moderate responsive hypotension.
- Moderate suspicion of intra-abdominal injury based on clinical signs and symptoms.

Exclusion Criteria

- Patient who are hemodynamically unstable
- Unresponsive profound hypotension.
- Not responding to resuscitation.
- Clinically obvious major abdominal trauma.

2. Materials & Methods

- Patients with clinically suspected blunt abdominal injuries for a period of12 months (June 2018-May 2019) were subjected for the study.

Equipment: TOSHIBA 16 SLICE CT
CT Protocol:

1) CTH elical mode. Axial thick sections 5mm taken & reformatted to 1mm for viewing. Reformations in coronal and sagittal planes were also done.
2) I.V contrast was given to all the patients to rule out visceral injury. Oraland rectalcontrast alsogiven toruleout bowelinjuries.

CT signs of abdominal injuries:

3) Hemo-peritoneum (30-70HU),
4) Sub capsular hematoma,
5) Linear laceration,
6) Pneumo-peritoneum,
7) Sentinel clot sign,
8) Contrast extravasation,
9) CT collar sign with abdominal visceral herniation for diaphragmatic injury.

- The various organ injurieswere gradedbyAAST (American Association forSurgery of Trauma)
- The management, therapeutic orconservative was decided based onthe CT findings.
- Patients with severe gradesof injury(Grade 3 and4) and with large hemoperitoneum required surgeries[4].

3. Observation and Results

46 hemodynamically stable patients of age between 25to 60 years were included in this study.

Incidence of Various Abdominal Injuries

Organ	*Number of cases*	*Percentage*
Spleen	28	61%
Liver	13	28.3%
Hollow Viscus Perforation	2	4.34%
Duodenum	1	2.12%
Mesentry	1	2.12%
Diaphragm	1	2.12%

Agewise Distribution of the Disease

- Highest incidence of blunt abdominal injuries were found in 25-45yrsage group.

Mode of injury	No. of cases	%
RTA	35	75%
Fall from height	6	13%
Pedestrian-automobile impacts	1	6%
Others	1	6%

- 45 years 29% 13 patients
- 25- 45 years 71% 33 patients
- Most common cause is RTA-35cases (~75%),
- Fall from height –6cases (13%)
- Pedestrian-automobile impacts-1case (6%)
- Others–1case (6%)

Sexwise Distribution of the Disease

Male **Females**

75%

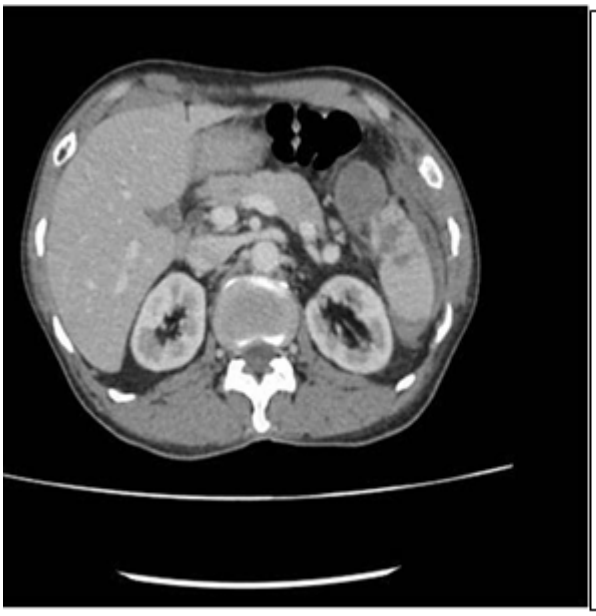
25%

All the injuries show male preponderance.

Correlation between injury grading and management

Injury Grade	Total no of patients	No of conservatively managed cases	No of operated cases
Liverinjury			
Grade I	6	6	0
Grade II	4	3	1
Grade III	1	0	1
Grade IV	1	0	1
Grade V	1	0	1
Total	13	9	4
Splenicinjury			
Grade I	16	16	0
Grade II	6	5	1
Grade III	4	0	4
Grade IV	1	0	1
Grade V	1	0	1
Total	28	21	7
Hollow viscus perforation	2	0	2
Duodenum Injury	1	0	1
Mesentry Injury	1	0	1
Diaphragmatic injury	1	0	1

Case – 1



CECT ABDOMEN IN AXIAL SECTION

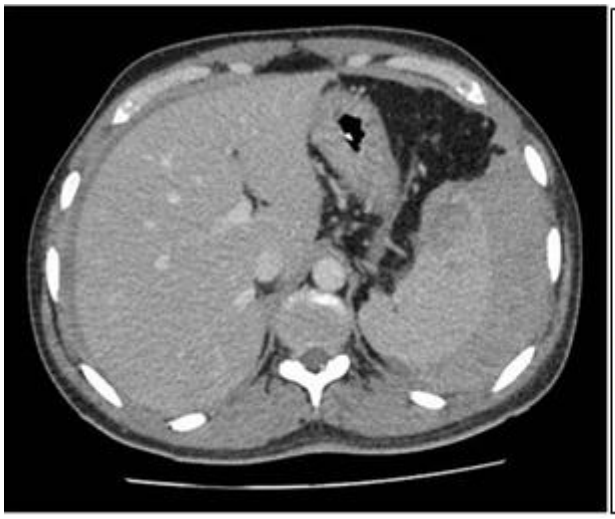
Spleen: Normal in size,

- Two areas of lacerations seen extending from gastric surface upto the anterior margins.
- Heterogenous collection seen in the perisplenic region- s/o Hemorrhagic.
- Evidence of 3.8x3cms hypodense area at the inferior pole.
- On contrast administration, there is nonenhancing area at the inferior pole s/o hematoma extending into subcapsular region > 50% of the surface area.
- No extravasation/ pooling of contrast. Splenic vessels appear normal.
- Mild hyperdense free fluid in perisplenic region, few mesentric sleeves and in pelvis.

Impression:

- TRAUMATIC SPLENIC INJURY as described AAST – GRADE II/ III
- MILD HEMOPEROITONEUM.

Case - 2



CT ABDOMEN IN AXIAL SECTION

Spleen: Normal in size

- Multiple subcapsular hematomas involving more than 50% of surface area.
- Parenchymal laceration measuring approx 6.9 x 4 cm (>3cm).
- Splenic vessels appear normal.
- Mild hyperdense free fluid in perisplenic region.

Impression:

- Splenic Injury Aast: Grade Iii.
- Hemoperitoneum.

AAST Classification of splenic injury:

Grade I

- subcapsular hematoma <10% of surface area
- parenchymal laceration <1 cm depth
- capsular tear

Grade II

- subcapsular hematoma 10-50% of surface area
- intraparenchymal hematoma <5 cm
- parenchymal laceration 1-3 cm in depth

Grade III

- subcapsular hematoma >50% of surface area
- ruptured subcapsular or intraparenchymal hematoma ≥5 cm
- parenchymal laceration >3 cm in depth

Grade IV

- any injury in the presence of a splenic vascular injury* or active bleeding confined within splenic capsule
- parenchymal laceration involving segmental or hilar vessels producing >25% devascularisation

Grade V

- shattered spleen

- any injury in the presence of splenic vascular injury* with active bleeding extending beyond the spleen into the peritoneum

4. Conclusion

CECT accurately identifies injuries that require early exploration and at the same time avoids unnecessary operative intervention in cases that can be managed conservatively[5].

CECT is the most sensitive modality in :

- Characterization & grading of parenchymal injuries.
- To access retro peritoneal injuries.
- To detect bowel and mesenteric injuries.
- To identify the source of bleeding.

Thus, CECT reduces mortality of blunt abdominal trauma in hemodynamically stable patients[6] as it is accurate in the management & clinical outcome.

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