ISSN- O: 2458 - 868X, ISSN–P: 2458 – 8687
National Library of Medicine - ID: 101731606

International Journal of Medical Science and Innovative Research (*IJMSIR*)
IJMSIR : A Medical Publication Hub
Available Online at: www.ijmsir.com
Volume – 10, Issue – 2, April – 2025, Page No. : 165 – 169

To Study The Role of Multidetector Computed Tomography in Evaluation of Grading of Liver Injuries

[1]Dr. Aditya Gupta, JR-3, Department of Radiodiagnosis, MGM Medical College and Hospital, Navi Mumbai, Maharashtra, India

[2]Dr.Ashutosh Chitnis, HOD, Department of Radiodiagnosis, MGM Medical College and Hospital, Navi Mumbai, Maharashtra, India

[3]Dr. Rhea Rumao, SR, Department of Radiodiagnosis, MGM Medical College and Hospital, Navi Mumbai, Maharashtra, India

Corresponding Author: Dr. Aditya Gupta, JR-3, Department of Radiodiagnosis, MGM Medical College and Hospital, Navi Mumbai, Maharashtra, India

Citation this Article: Dr. Aditya Gupta, Dr. Ashutosh Chitnis, Dr. Rhea Rumao, "To Study The Role of Multidetector Computed Tomography in Evaluation of Grading of Liver Injuries", IJMSIR - April – 2025, Vol – 10, Issue - 2, P. No. 165 – 169.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Background: Abdominal trauma, particularly liver injuries, is a major cause of morbidity and mortality worldwide, often resulting from road traffic accidents. The liver's size and vascularity make it vulnerable in blunt trauma. Multidetector computed tomography (MDCT) has emerged as the gold standard for assessing liver injuries due to its high accuracy and detailed imaging capabilities. This study evaluates the role of MDCT in grading liver injuries at MGM Hospital, Panvel—a key trauma center due to its highway location.

Materials & Methods: A retrospective analysis of 100 patients who presented with suspected abdominal injuries based on FAST ultrasound scans, clinical findings, or a severe mechanism of injury**,** had undergone contrasted enhanced computed tomography of the abdomen for assessing liver trauma features.

Results & Discussion: Out of **100** cases of liver trauma, the imaging findings were AAST grade I **,** (11%), AAST grade II (43%), AAST grade III (25%),**,** AAST grade IV (12%)**,** AAST grade V (9%). The study confirms MDCT as a reliable tool for evaluating and grading liver injuries, aligning well with surgical findings and outcomes. Most cases involved young males in RTAs, with Grades II and III injuries being most common. Conservative management was effective. While FAST aids initial assessment, MDCT remains essential, especially for higher-grade injuries linked to vascular damage and surgical needs.

Conclusions: MDCT is vital for accurately diagnosing and grading liver trauma, guiding effective management. At MGM Hospital, it improved injury assessment and treatment planning, proving essential for stable abdominal trauma cases.

Keywords: Liver Trauma, Grading of Liver Injury, Intraparenchymal Hematoma, AAST

Introduction

Abdominal trauma is a leading cause of morbidity and mortality worldwide, and among abdominal organs, the liver is the second most commonly injured, particularly in blunt trauma. Given the liver's size, location in the right upper quadrant, and vascularity, it is highly susceptible to injury from deceleration forces such as those in motor vehicle collisions (MVCs), falls, and assaults. Liver trauma may manifest as minor lacerations or evolve into severe parenchymal disruption with significant hemorrhage. Accurate, timely diagnosis is vital. Multidetector computed tomography (MDCT), with its superior imaging capabilities, has emerged as the gold standard for diagnosing and grading liver injuries in hemodynamically stable patients. This thesis investigates the role of MDCT in evaluating liver injuries at MGM Hospital, Panvel, a facility strategically located near a major highway and frequently receiving trauma cases.

Aims and Objectives

To study the role of MDCT in the evaluation and grading of liver injuries. Assess liver injuries using MDCT in a tertiary care setting Correlate the severity of liver injury (graded by AAST) with the need for surgical intervention. Identify associated findings and complications. Analyze outcomes based on injury grade and management approach.

Materials & Methods

100 patients who presented with abdominal injuries were evaluated for the presence of liver trauma features.

A. Study Type - Prospective observational study

B. Study Period – 1 year

C. Sample Size – 100

D. Study Population – All hemodynamically stable patients with suspected abdominal injuries based on FAST ultrasound scans, clinical findings, or a severe mechanism of injury, who subsequently underwent a contrast-enhanced CT (CECT) scan of the abdomen. Patients who exhibited evidence of hepatic injury on CECT were recruited into the study.

Inclusion Criteria

1. Hemodynamically stable patients.
2. All patients showing evidence of liver injury on CECT abdomen.
3. Patients aged between 18 and 70 years.

Exclusion Criteria

1. Cases of abdominal trauma without liver injury.
2. Pregnant women.
3. Patients below the age of 18 years and above the age of 70 years.
4. Patients unwilling to participate in the study.

Materials

Computed Tomography of the Abdomen were performed on Fujifilm 128 Slice MDCT machine.

Axial thick cuts 5x5 mm and thin cuts 1x1mm will be taken from domes of diaphragm to pubic symphysis. Intravenous contrast Omnipaque 350mg% (Ioxehol) 70ml will be injected by pressure injector through venous cannula with a flow rate of 4ml/sec. 4 phases will be taken.

1. Plain Unenhanced CT
2. Arterial phase – 20 sec scan delay
3. Portal venous phase – 60 sec scan delay
4. Delayed/ Excretory phase – 5 mins scan delay

Results & Discussion

Imaging Findings of Liver trauma

- Lacerations appear as irregular linear/branching areas of hypoattenuation
- Chronic hematomas appear as a hypodensity between the liver and its capsule (and can be differentiated from intra-peritoneal hematoma as these distort the liver architecture) or can be intraparenchymal

- Acute hematomas/hemorrhage are typically hyperdense (40-60 HU) compared to normal liver parenchyma
- Muscular diaphragmatic slips may simulate a peripheral laceration but are smoother, non-branching and of muscle density when compared to a laceration.

AAST (American Association for the Surgery of Trauma) liver injury scale

- **Grade I**

: subcapsular, <10% surface area

laceration: capsular tear, <1 cm parenchymal depth

- **Grade II**

hematoma: subcapsular, 10-50% surface area

hematoma: intraparenchymal <10 cm diameter

laceration: capsular tear 1-3 cm parenchymal depth, <10 cm length

- **Grade III**

hematoma: subcapsular, >50% surface area; ruptured subcapsular or parenchymal hematoma

hematoma: intraparenchymal >10 cm

laceration: capsular tear >3 cm parenchymal depth vascular injury with active bleeding contained within liver parenchyma

- **Grade IV**

laceration: parenchymal disruption involving 25-75% of a hepatic lobe

vascular injury with active bleeding breaching the liver parenchyma into the peritoneum

- **Grade V**

laceration: parenchymal disruption involving >75% of hepatic lobe

vascular: juxtahepatic venous injuries (retrohepatic vena cava / central major hepatic veins)

Result of the Illustrative Cases

- This prospective analysis of 100 cases of liver trauma, the imaging findings were AAST grade I, (11%), AAST grade II (43%), AAST grade III (25%),, AAST grade IV (12%), AAST grade V (9%).

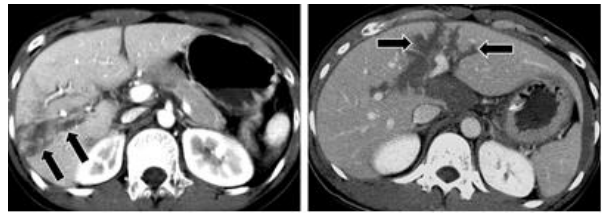

Figure 1:

Hepatic laceration. Contrast-enhanced CT scan shows multiple linear and branching low-attenuation areas in the right hepatic lobe (arrows) that represent lacerations.[2] Complex hepatic laceration. Contrast enhanced CT scan shows multiple linear lacerations ("bear claw" lacerations) in the left hepatic lobe (arrows). Note that the lacerated area extends to the porta hepatis. This type of laceration is commonly associated with biliary system injury.

Figure 2:

Intraparenchymal hematoma. Contrast enhanced CT scan shows a 5-cm intraparenchymal hematoma in the medial segment of the left hepatic lobe (arrow). Arrowheads indicate associated hemoperitoneum in the right subphrenic space.

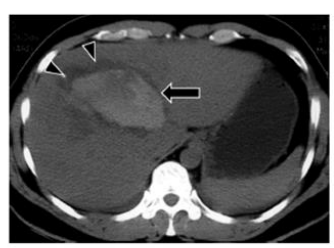

Figure 3:

Hepatic hematoma. Unenhanced CT scan shows a high-attenuation hematoma in the anterior segment of the right hepatic lobe (arrow).

Tables 1: Association of AAST grade of injury and CT scan appearance of injury amongst Liver injury patients

AAST grade	CT scan appearance of injury			Total
	Hematoma/ Contusion	Laceration	Vascular Injury	
Grade I	7	4	0	11
	63.6%	36.4%	0.0%	100.0%
Grade II	26	17	0	43
	60.5%	39.5%	0.0%	100.0%
Grade III	11	14	0	25
	44.0%	56.0%	0.0%	100.0%
Grade IV	3	8	1	12
	25.0%	66.7%	8.3%	100.0%
Grade V	0	4	5	9
	0.0%	44.4%	55.6%	100.0%

Conclusion

MDCT is indispensable in the accurate diagnosis and grading of liver trauma. It offers excellent anatomical detail and allows for injury classification using the AAST grading system. This, in turn, guides clinicians in determining the best course of management, whether conservative or surgical. At MGM Hospital, Panvel, the use of MDCT significantly enhanced the trauma team's ability to stratify injury severity, predict complications, and implement appropriate treatment strategies. Given its high sensitivity, specificity, and reproducibility, MDCT should be considered a frontline imaging modality in the evaluation of abdominal trauma in hemodynamically stable patients.

References

1. Zarama V, Torres N, Duque E, Arango-Ibañez JP, Duran K, Azcárate V, et al. Incidence of intra-abdominal injuries in hemodynamically stable blunt trauma patients with a normal computed tomography scan admitted to the emergency department. BMC Emerg Med [Internet]. 2024 Dec 1 [cited 2024 Aug 5];24(1). Available from: /pmc/ articles/ PMC 11191214/
2. GLOBAL STATUS REPORT ON ROAD SAFETY 2018.
3. Alghamdi H, Alghamdi H. Liver Trauma. Recent Advances in Liver Diseases and Surgery [Internet]. 2015 Oct 28 [cited 2024 Aug 6]; Available from: https://www.intechopen.com/chapters/49218
4. Coccolini F, Cremonini C, Chiarugi M. Liver Trauma. Textbook of Emergency General Surgery: Traumatic and Non-traumatic Surgical Emergencies [Internet]. 2023 Jul 17 [cited 2024 Aug 6];1415–30. Available from: https:// www. ncbi. nlm. nih. gov/ books/NBK513236/
5. Wiik Larsen J, Søreide K, Søreide JA, Tjosevik K, Kvaløy JT, Thorsen K. Epidemiology of abdominal trauma: An age- and sex-adjusted incidence analysis with mortality patterns. Injury. 2022 Oct 1;53 (10):3130–8.

6. Ranjan SK, Singh RK, Kumar S, Kumari P, Ranjan SK, Singh RK, et al. Assessment of Frequency, Patterns, and Causes of Blunt Abdominal Trauma in a North Indian Cohort: An Autopsy-Based Study. Cureus [Internet]. 2023 Sep 7 [cited 2024 Aug 6];15(9). Available from: https:// www. cureus. com/ articles/164542-assessment-of-frequency-patterns-and-causes-of-blunt-abdominal-trauma-in-a-north-indian-cohort-an-autopsy-based-study
7. Wiik Larsen J, Søreide K, Søreide JA, Tjosevik K, Kvaløy JT, Thorsen K. Epidemiology of abdominal trauma: An age- and sex-adjusted incidence analysis with mortality patterns. Injury [Internet]. 2022 Oct 1 [cited 2024 Aug 6];53(10):3130–8. Available from: http://www.injuryjournal.com/article/S00201383220 04260/fulltext
8. Lotfollahzadeh S, Burns B. Penetrating Abdominal Trauma. StatPearls [Internet]. 2023 Jun 3 [cited 2024 Aug 6]; Available from: https:// www. ncbi. nlm. nih.gov/books/NBK459123/
9. Oniscu GC, Parks RW, Garden OJ. Classification of liver and pancreatic trauma. HPB. 2006 Feb 1;8 (1):4–9.
10. Slotta JE, Justinger C, Kollmar O, Kollmar C, Schäfer T, Schilling MK. Liver injury following blunt abdominal trauma: a new mechanism-driven classification. Surg Today [Internet]. 2014 Feb [cited 2024 Aug 6];44 (2):241. Available from: /pmc/ articles/PMC3898124/
11. Coccolini F, Coimbra R, Ordonez C, Kluger Y, Vega F, Moore EE, et al. Liver trauma: WSES 2020 guidelines.