CT IMAGING OF BLUNT SPLENIC INJURY: A PICTORIAL ESSAY

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Introduction

- Nonoperative management has become the standard care for hemodynamically stable patients with blunt splenic injury.
- MDCT (multidetector computed tomography) is the imaging modality of choice as it can accurately identify and characterize the injury.
- It can also demonstrate concurrent injury that needs urgent surgical intervention.
- A variety of grading systems have been proposed to grade splenic injury. American Association for the Surgery of Trauma (AAST) grading system is the commonest being used.
- Radiologist should be familiar with this grading system to facilitate communication with the managing surgical team and for research purposes.

Methodology

- 154 cases of MDCT abdomen were performed to assess traumatic blunt intra abdominal injuries in Hospital Tengku Ampuan Afzan (HTAA), Kuantan from January 2008 until December 2009.
- Scan parameters: 10 mm slice width, 2.5 mm collimation, rotation time 0.75s and 15 mm table feed [4 slice Siemens Somatom scanner]
- Out of these 154 cases, 42 cases of splenic injury were detected.
- We reviewed all 42 cases and illustrated the spectrum of CT findings based on AAST classification.
- Management and outcome of the patients is briefly described.

Classification of spleen injury (AAST 1994 revision)

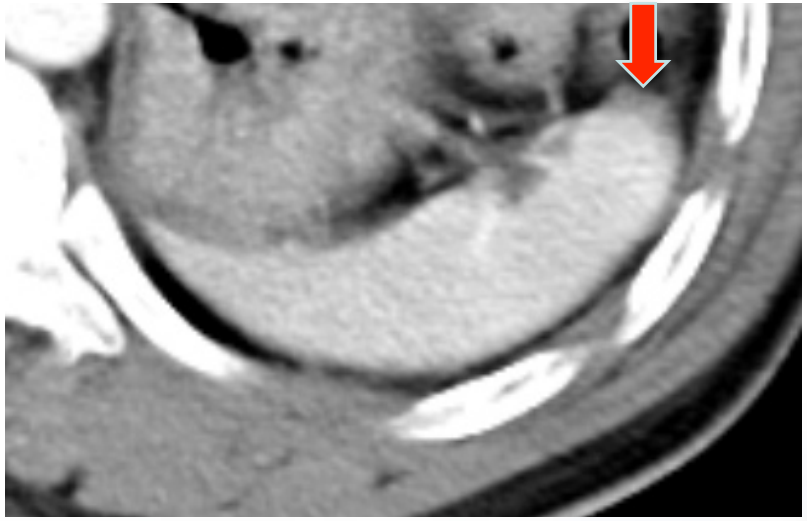
Grade	Injury type	Description of injury
I	Hematoma Laceration	Subcapsular, <10% surface area Capsular tear < 1 cm parenchymal depth
II	Hematoma Laceration	Subcapsular, 10%-50% surface area or Intraparenchymal <5cm in diameter Capsular tear, 1-3cm parenchymal depth that does not involve a trabecular vessel
III	Hematoma Laceration	Subcapsular, >50% surface area or expanding; ruptured subcapsular or parenchymal hematoma; intraparenchymal hematoma >5cm or expanding >3cm parenchymal or involving trabecular vessels
IV	Laceration	Laceration involving segmental or hilar vessels producing major devascularization (>25% of spleen)
V	Laceration Vascular	Completely shattered spleen Hilar vascular injury with devascularizes spleen

GRADE I

Laceration
Capsular tear <1-cm in depth

A 17-year-old girl involved in MVA.
3-D Coronal reformatted CT showed a capsular tear in the lower pole (arrow). She was managed conservatively with uneventful recovery.

Hematoma
Subcapsular hematoma <10% of surface area

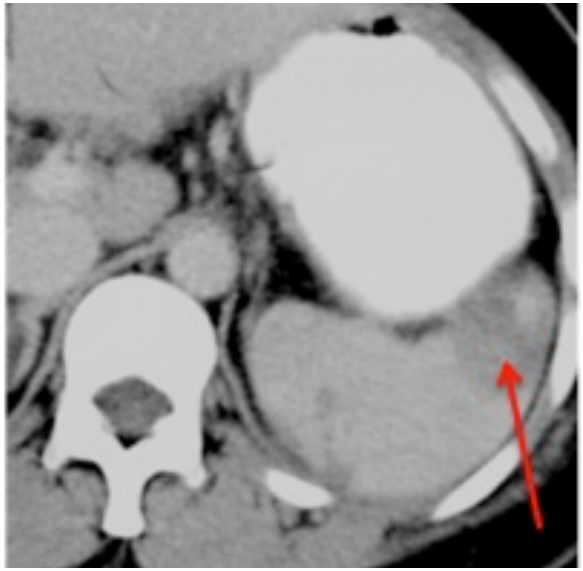


A 35-year old Vietnamese male injured in an industrial accident. Axial CECT showed small subcapsular hemorrhage (arrow). He was managed conservatively and recovered well.

GRADE II

Intraparenchymal hematoma

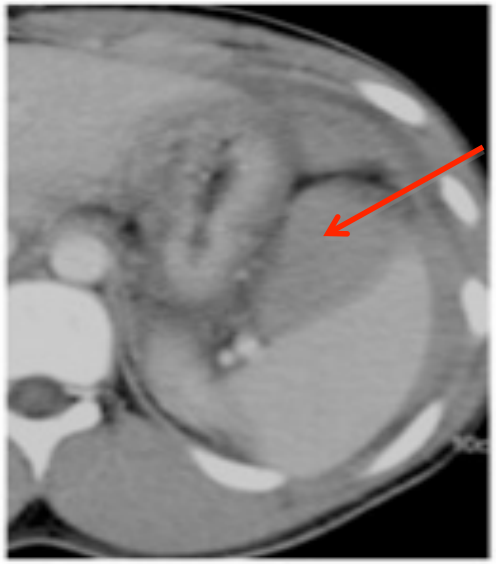
Intraparenchymal hematoma <5-cm diameter



A 39-year-old lady whose motorbike skidded. Axial CECT showed intra-parenchymal hematoma (arrow).She was managed conservatively with uneventful recovery.

Subcapsular hematoma

Subcapsular hematoma 10-50% of surface area



A 13-year-old boy injured in a fight. CT scan showed subcapsular hematoma at anteromedial surface. He was managed conservatively with uneventful recovery.

GRADE II

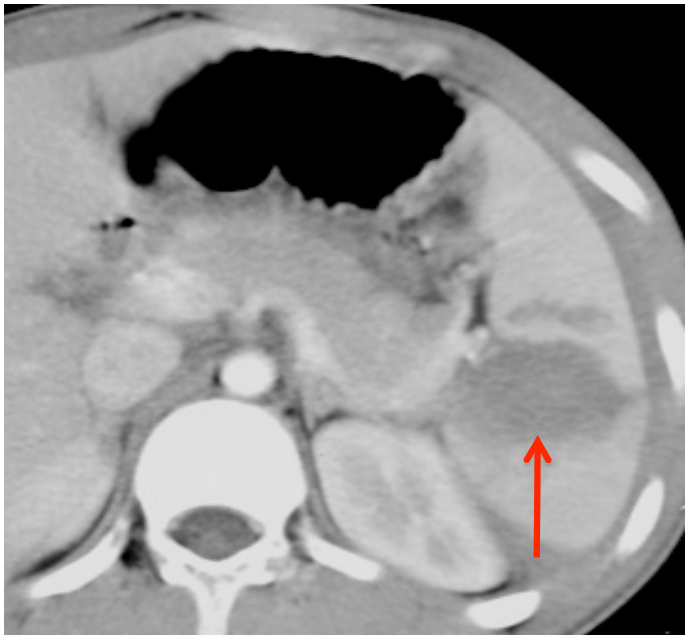
Laceration: 1-3 cm parenchymal depth that does not involve a trabecular vessel

An 18-year-old boy injured when his motorcycle skidded. CT scan showed a laceration adjacent to the splenic hilum (arrow). Intraoperative findings confirmed a laceration about 3 cm in length. Blood loss was 900 cc and splenectomy done.

A 27-year old man who had epilepsy and fall from motorbike. This is his third MVA, previously only sustained cerebral concussions. Axial CECT showed a small laceration of the spleen. He was successfully managed conservatively.

GRADE III

Intraparenchymal hematoma
Intraparenchymal, ≥ 5-cm diameter or expanding



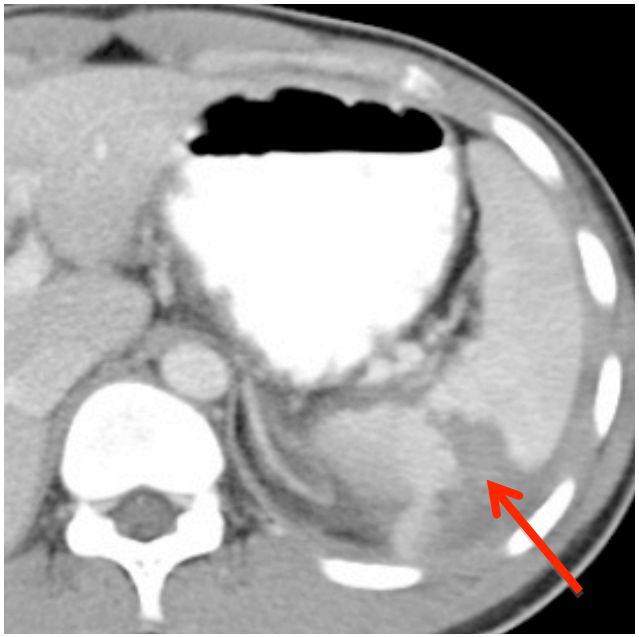
A 15-year-old boy injured playing football. Axial CECT showed multiple lacerations and intraparenchymal hematoma (arrow). He was managed conservatively and recovered fully.

Subcapsular hematoma
Subcapsular, > 50% of surface area or expanding

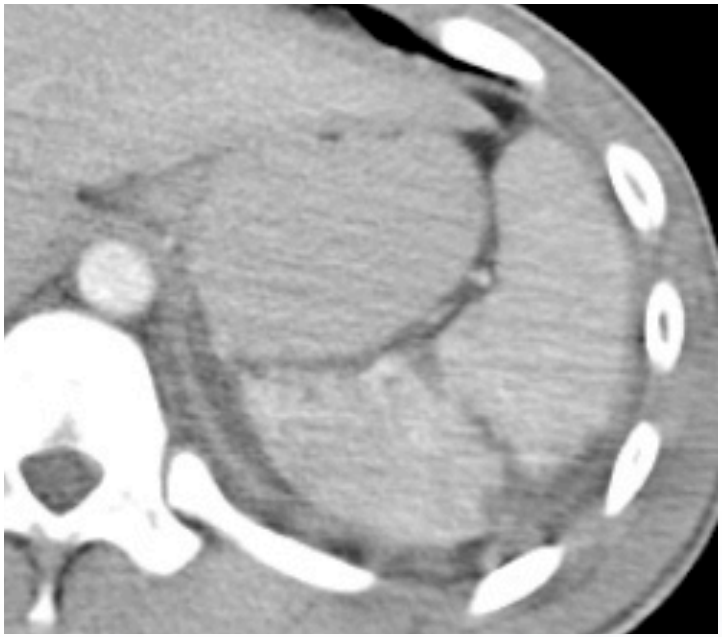
A 32-year old man injured in MVA. Axial CECT showed multiple intraparenchymal lacerations with subcapsular hematoma (arrow). Splenectomy was done. Blood loss of 300 cc.

GRADE III

Laceration: >3 cm parenchymal depth or involving trabecular vessels



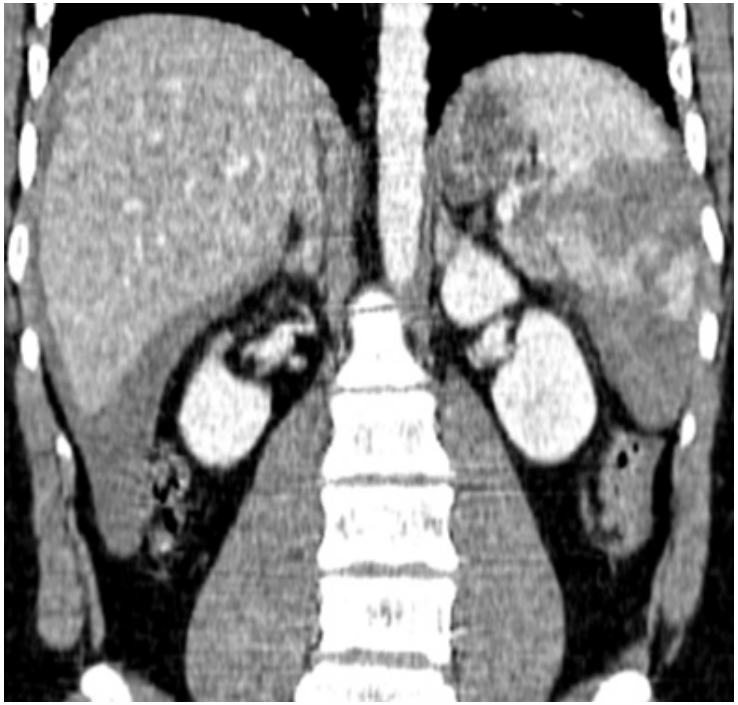
An 18-year-old boy, injured when his motorcycle hit a buffalo. Axial CECT showed a laceration at upper pole (arrow). Intraoperative findings confirmed a 6 cm-laceration with hemoperitoneum about 1L. Splenectomy was performed.



A 17-year-old boy, a pillion rider. He was injured when the motorbike skidded. A splenic laceration with minimal perisplenic collection showed on axial CECT . It was confirmed intraoperatively. Estimated blood loss was 200ml.

GRADE IV

Laceration involving segmental or hilar vessels producing major devascularisation (>25% of spleen)

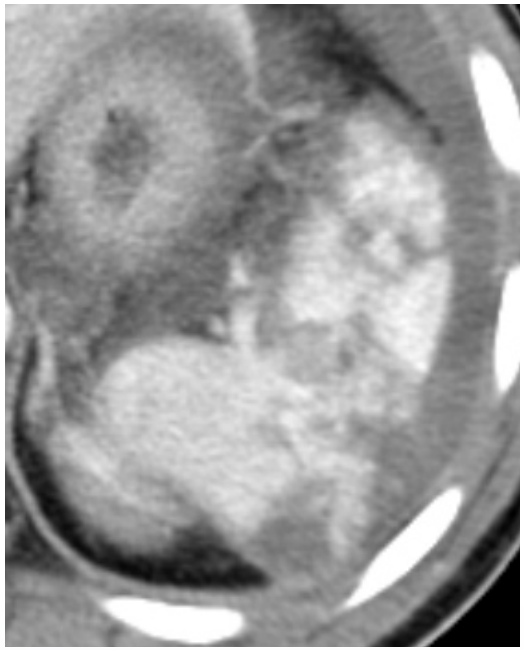


A 17-year-old boy injured in MVA. Coronal reformatted CT showed multiple lacerations causing major devascularisation. Splenectomy was performed for this patient.

An 18-year-old boy injured in MVA. Axial CECT showed fractured spleen. Intraoperative findings were splenic laceration extending to the hilum. Splenectomy was performed.

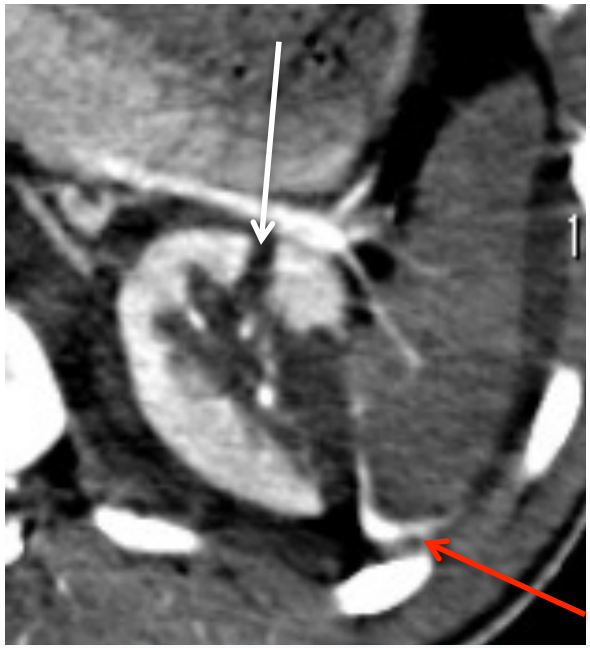
GRADE V

Laceration
Completely shattered spleen



A 21-year old man injured when his motorbike skidded. Axial CECT scan showed shattered spleen which was confirmed intraoperatively. Splenectomy was done for this patient.

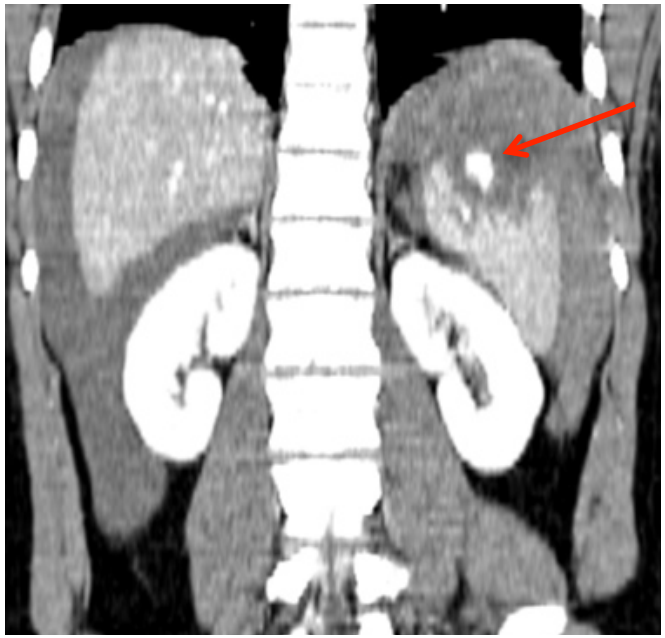
Vascular
Hilar vascular injury devascularizes spleen



A 17-year old boy involved in MVA. Axial CECT showed non-perfusion of the spleen post contrast. Perisplenic hyperdensity (red arrow) due to contrast extravasation. He also had renal injury (white arrow).

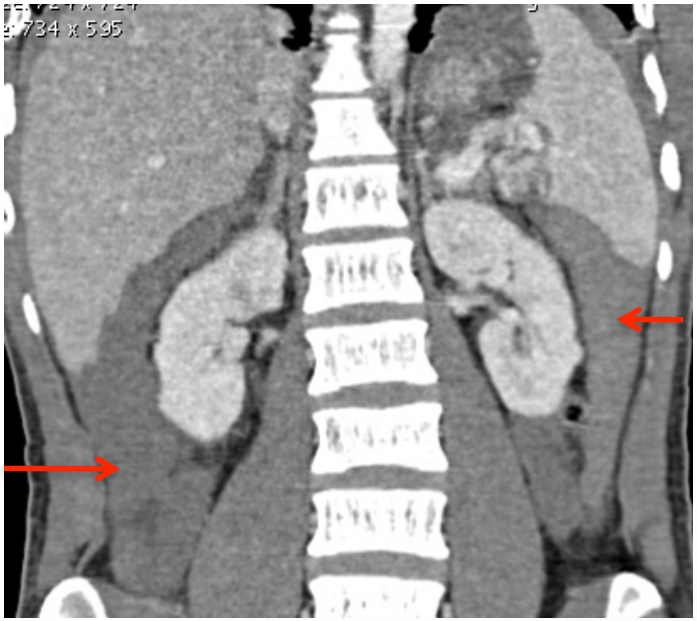
Other important findings

Contrast extravasation



A n 18-year-old boy injured in MVA. CT scan showed Grade IV splenic injury with contrast extravasation (arrow). Splenectomy was done. Hemoperitoneum of 2L noted intraoperatively.

Hemoperitoneum



A 30-year-old Indonesian man, being assaulted. CT scan showed laceration at splenic hilum with massive hemoperitoneum (arrows). This was confirmed Intraoperatively with blood loss of 1L.

Discussion (1)

- The value and accuracy of MDCT in demonstrating splenic injury after blunt trauma are well established[1].
- MDCT can identify and characterize not only splenic injury but also any concurrent injury to the solid viscera, mesentery and bowel or retroperitoneum that may require surgery[2].
- Accurate assessment is important especially due to shift of treatment from early surgical intervention to nonoperative management in these patients[3].
- Various grading systems for splenic injury have been developed, and awareness of these grading systems can facilitate good communications between surgeons and radiologists[4].

Discussion (2)

- None of the known grading systems were reliable in selecting patients for conservative management and surgeons continue to rely on hemodynamic stability to decide for surgical intervention[5].
- However, CT information is used by surgeons to help triage patients to the intensive care unit or ward floor for monitoring and increases their confidence to discharge patients with normal CT as it strongly predicted the lack of subsequent deterioration requiring operative intervention[6].
- Active hemorrhage seen as contrast extravasation on CT scan is a valuable information to surgeons as it is associated with high failure rate of nonoperatively managed blunt splenic injury[7].

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Thank You

References

1. Fang JF, Wong YC, Lin BC, Hsu YP, et al. Usefullness of MDCT for the initial assessment of blunt abdominal trauma patients. World J Surg 2006; 30: 176-182.
2. Shuman WP. CT of blunt abdominal trauma in adults. Radiology 1997; 205: 297-306.
3. Taviloglu K, Yanar H. Current trends in the management of blunt solid organ injuries. Eur J Trauma Surg 2009; 35: 90-94.
4. Mirvis SE, Whitley NO, Gens DR. Blunt splenic trauma in adults: CT-based classification and correlation with prognosis and treatment. Radiology 1989; 171: 33-39.
5. Umlas SL, Cronan JJ. Splenic trauma: Can CT grading systems enable prediction of successful nonsurgical management? Radiology 1991; 178: 481-487
6. Lynn KN, Werder GM, Callaghan RM, Sullivan AN, et al. Pediatric blunt splenic trauma: a comprehensive review. Pediatr Radiol 2009; 39: 904-916.
7. Shanmuganathan K, Mirvis SE, Boyd-Kranis R, Takada T, et al. Nonsurgical management of blunt splenic injury: use of CT criteria to select patients for splenic arteriography and potential endovascular therapy. Radiology 2000; 217: 75-82.