

DETECTION OF TRAUMATIC INTRA ABDOMINAL INJURIES USING MSCT IN HOSPITAL TENGKU AMPUAN AFZAN, KUANTAN: OUR PRELIMINARY EXPERIENCE.

**Radhiana H¹, Azian AA¹, Mubarak MY²,
Amran AR¹, Azlin S¹, S Kamariah CH¹.**

¹Department of Radiology, International Islamic University Malaysia

²Department of Diagnostic Imaging, Hospital Tengku Ampuan Afzan, Kuantan



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وَبَشِّرِ الصَّالِحِينَ إِذْ إِذْ قَالَ اللَّهُ يَا آدَمُ اسْكُنْ أَهْلَ الْجَنَّةِ مَعَ زَوْجِكَ وَالْوَاقِعِينَ

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Introduction

- **Blunt abdominal trauma may cause injury to various internal organs.**
- **It is often difficult to accurately evaluate the site and extent of suspected internal injury clinically**
- **Intra-abdominal injury may be masked by more obvious or compelling injuries elsewhere**
- **The management of patients with solid organ injuries has changed dramatically, in most cases treatment has shifted from early surgical treatment to non-operative management**
- **Hence, CT scan plays an important role in patient's management as it provided a rapid, accurate assessment of abdominal viscera, retroperitoneum and abdominal wall**

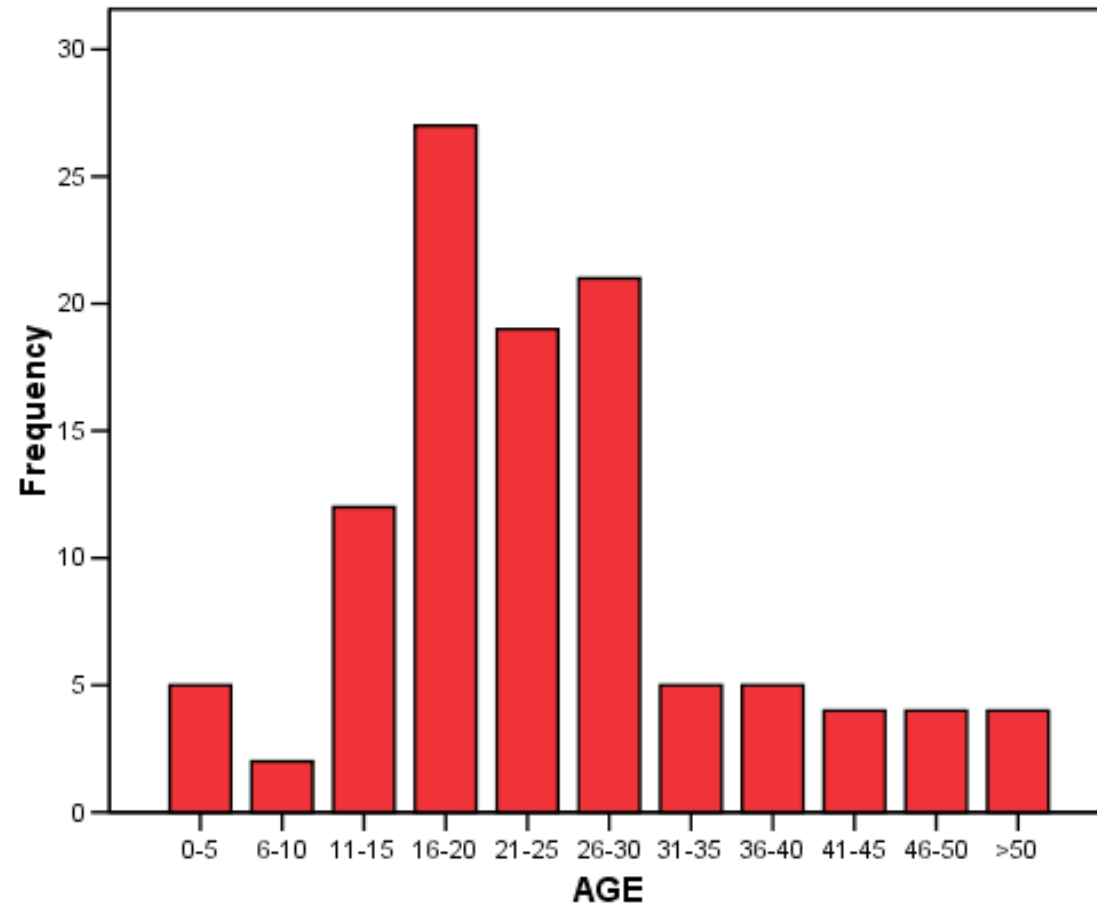
Methodology

- Retrospective and prospective study
- Study period: 1st January 2008 until 3rd May 2009.
- Inclusion criteria - all cases of CT scan abdomen performed to rule out traumatic intra-abdominal injury during this study period
- Exclusion criteria
 - CT images were not available, not traceable or lost
 - Patient's radiological report were not available, traceable or lost.
- All CT scan done using 4 slice Siemens Somatom scanner with slice width of 10 mm, collimation of 2.5 mm, rotation time 0.75s and table feed of 15 mm
- All the CT images were reviewed, injuries were graded according to American Association for the Surgery of Trauma (AAST 1994 revision).
- The patient's demographic data, clinical presentations, CT findings and intraoperative findings were tabulated and analyzed using SPSS version 12.0.1

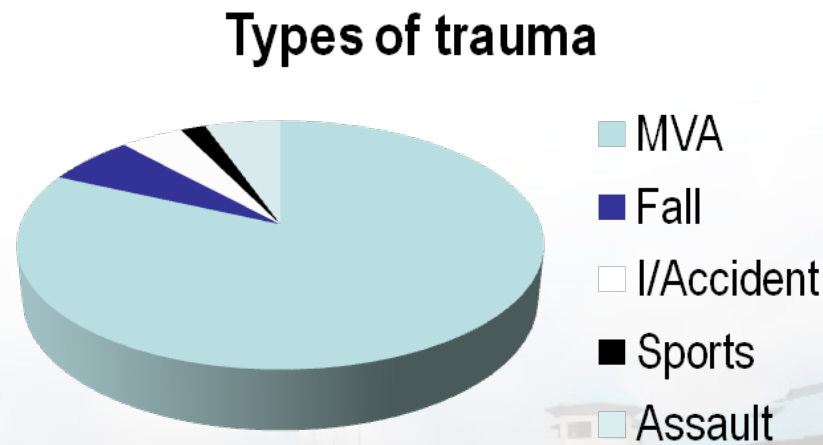
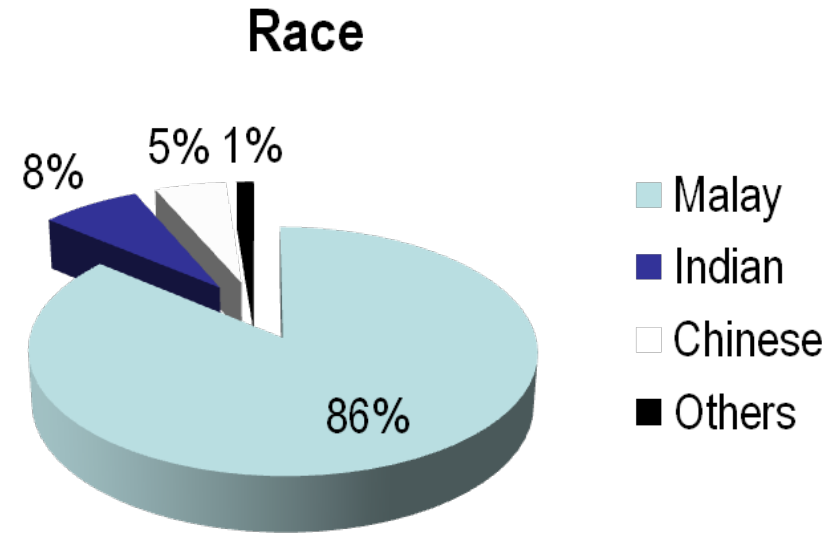
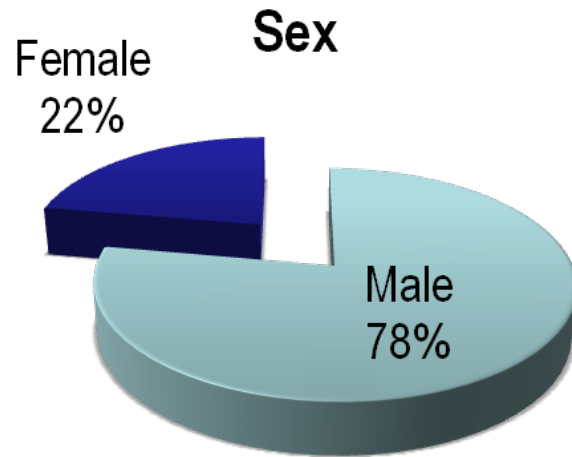
Results

- A total of 112 patients had CT scan done to rule out intra abdominal injuries within the study period
- 108 were included in this study
- Age range: 2 to 84 years, mean age: 25 years

Age



Demographic data



Time of diagnosis

Time of diagnosis	Number of patients	Percentage
Within 24 hours of injury	94	87
More than 24 hours of injury	14	13



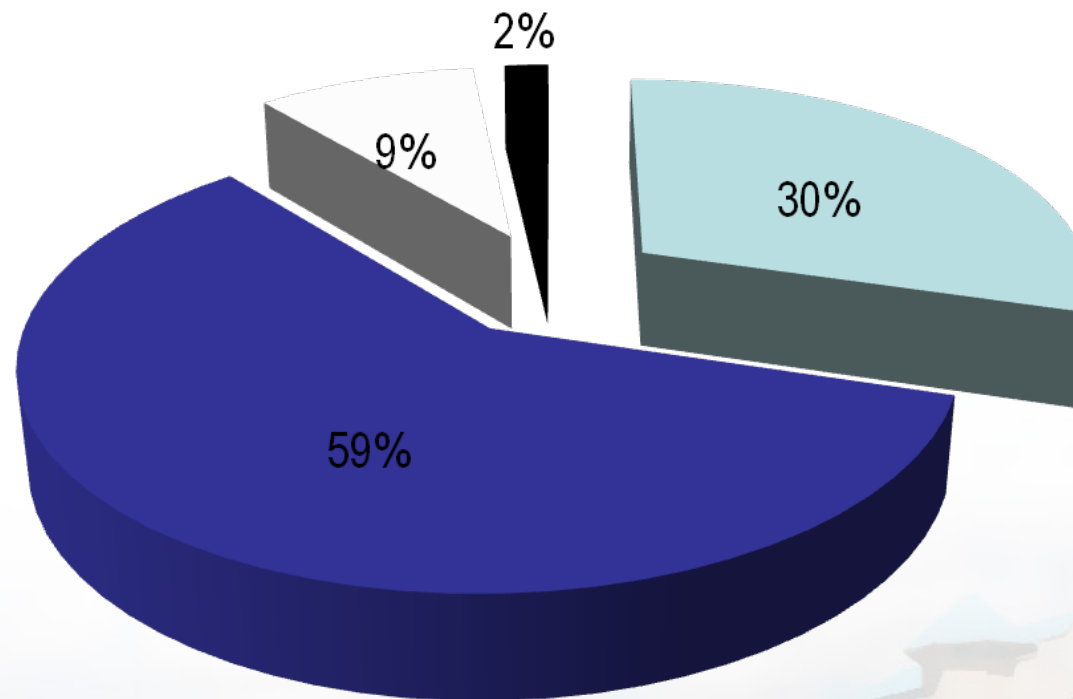
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Injuries - Overview

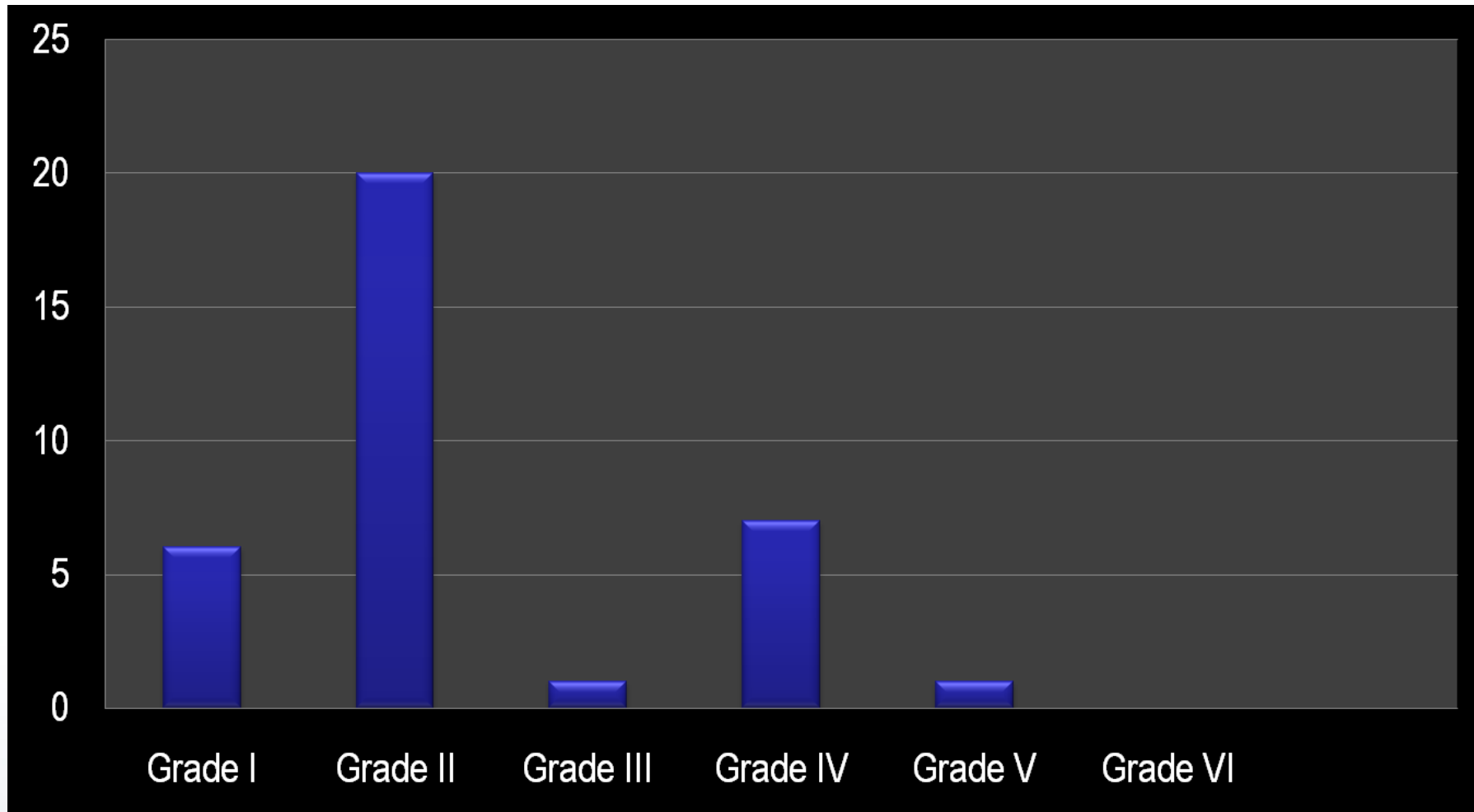
- No intra-abdominal injury
- One-organ injury
- two organ injuries
- three organ injuries



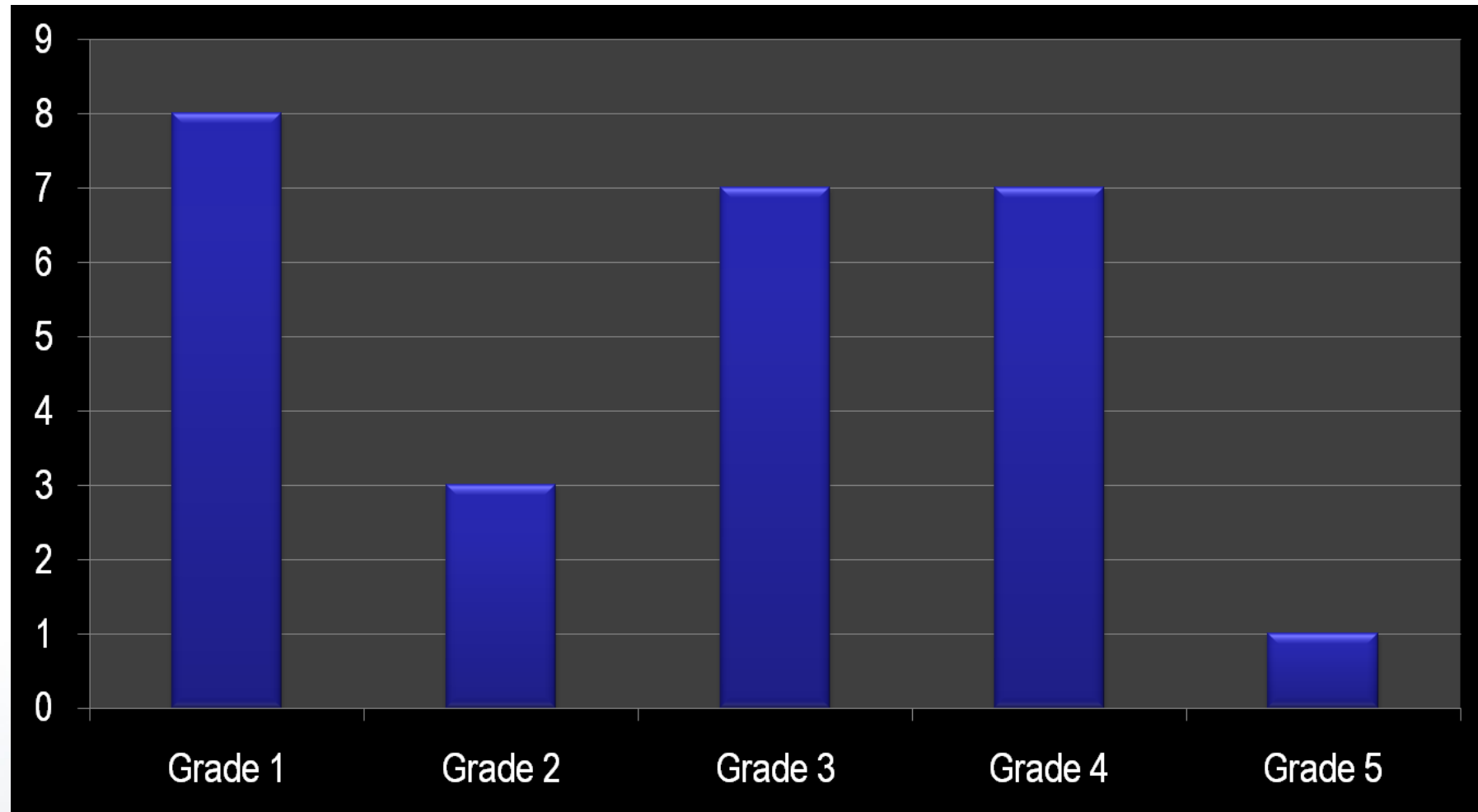
Injuries

Organ injured	Number of patients	Percentage
Liver	35	32
Spleen	30	28
Kidney	16	15
Urinary bladder	5	5
Pancreas	2	2
Adrenal gland	1	1
Urethra	1	1
Bowel	3	3

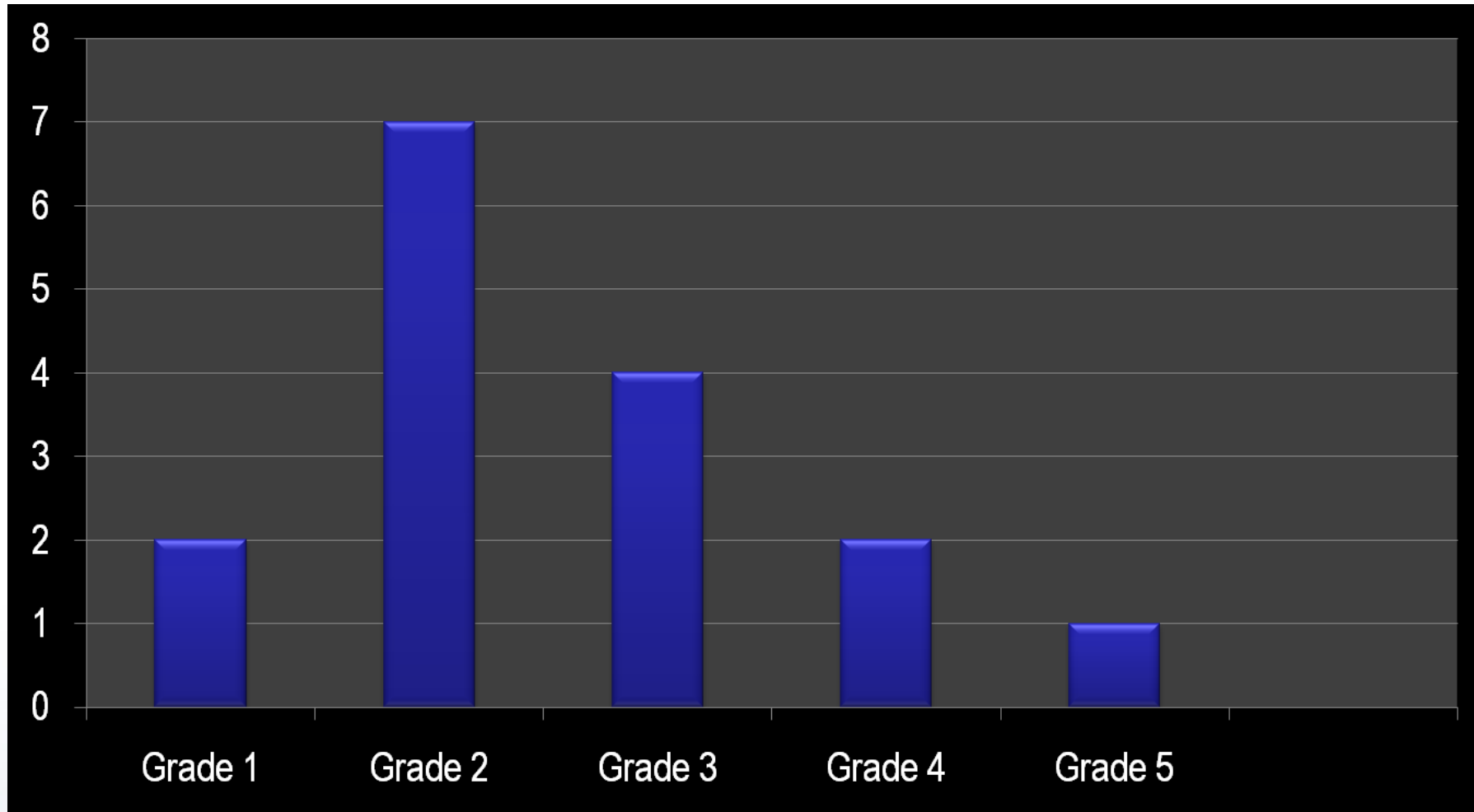
Liver injuries



Spleen injuries



Kidney injuries



Management

- **35 patients (32%) underwent operation and operation notes traced and reviewed. One patient was operated but her records were not traceable for review**
- **Intra-operative findings of the 35 patients**
 - **Similar findings with CT scan: 15 cases**
 - **Additional findings noted: 13 cases**
 - **Different findings: 5 cases**

Cases with additional findings intraoperatively

ID	CT scan findings	Intra operative findings
ID2	Urinary bladder injury	Urinary bladder perforation, rectosigmoid transection, left common iliac vein puncture
ID3	Grade II spleen injury	Splenic injury and contusion of pancreatic tail
ID4	Free air suggestive of bowel injury	Jejunum perforation , 3cm mesenteric tear and contusion of transverse mesocolon
ID28	Grade IV renal injury	Liver laceration and non-expanding retroperitoneal hematoma, contusion body of pancreas
ID55	Grade III spleen injury	Splenic laceration at superior pole and contusion at lesser curvature of stomach
ID63	Grade V spleen injury	Almost fractured spleen and contusion at tail of pancreas

...cont

ID	CT scan findings	Intra operative findings
ID64	Intraperitoneal bladder injury	Urinary bladder rupture, retroperitoneal hematoma, serosal tear of sigmoid colon
ID65	Grade III spleen injury	Splenic laceration involving the hilum, small bowel and pancreatic contusion
ID74	Grade III spleen injury	Spleen laceration and contusion at tail of pancreas
ID85	Hemoperitoneum with no identifiable organ injury	Mesenteric tear with active bleeding
ID86	Grade III spleen injury	Splenic laceration at upper pole and contusion at greater curvature of stomach
ID109	Grade II liver injury	Perihepatic blood pooling, unable to identify site of bleeding, serosal tear at mid transverse colon
ID110	Grade V spleen injury	Laceration at upper pole of spleen, mesenteric tear near ileocecal area

Cases where CT & intraoperative findings were different

ID	CT findings	Intraoperative findings
ID13	Grade II spleen injury	Lacerated left broad ligament, bleeding from left ovarian artery, no perisplenic blood pooling
ID43	Massive hemoperitoneum with no identifiable injury	Splenic laceration at upper pole, hematoma at splenic hilum
ID49	Grade II left kidney injury	Mesenteric tear at multiple site, non-viable ileum due to mesenteric injury, no retroperitoneal hematoma, kidneys were normal
ID61	No identifiable organ injury	Spleen laceration at lower pole, contusion at transverse mesocolon, pancreatic tail and jejunum
ID82	Grade I spleen injury, Grade II left kidney injury	Small bowel perforation, serosal tear at descending colon, minimal contamination, minimal hemoperitoneum

EXAMPLES OF CASES



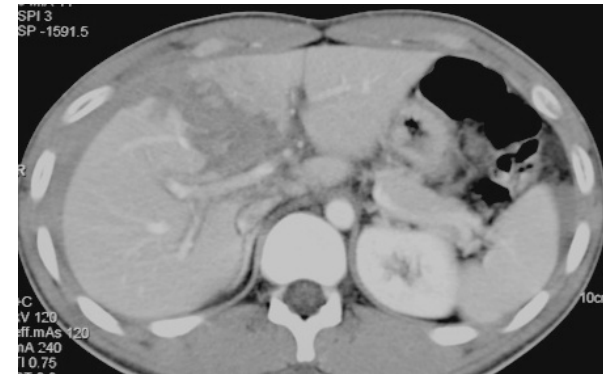
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Case 1

- A 19 year-old Malay man, alleged MVA (motorcyclist)
- On arrival in A&E, GCS=full, BP=100/88 mmHg, PR=78 bpm
- Tender and guarded abdomen
- CT scan done on 28.8.2008 showed liver laceration with less than 10 cm intraparenchymal hematoma (Grade III liver injury)
- Managed conservatively
- Repeat CT scan done on 2.9.2008 and 28.10.2008



Case 2

- A 43 years old Malay man, alleged MVA one week prior to presentation
- Mechanism of injury: low impact, fall onto the motorbike's handle
- No loss of consciousness or obvious external injury
- Complaint of vague left upper abdominal pain few days later
- On examination, vital signs were stable
- Tenderness at left hypochondriac region
- CT scan showed intraparenchymal hematoma in the spleen and multiple air pockets within suggestive of secondary infection

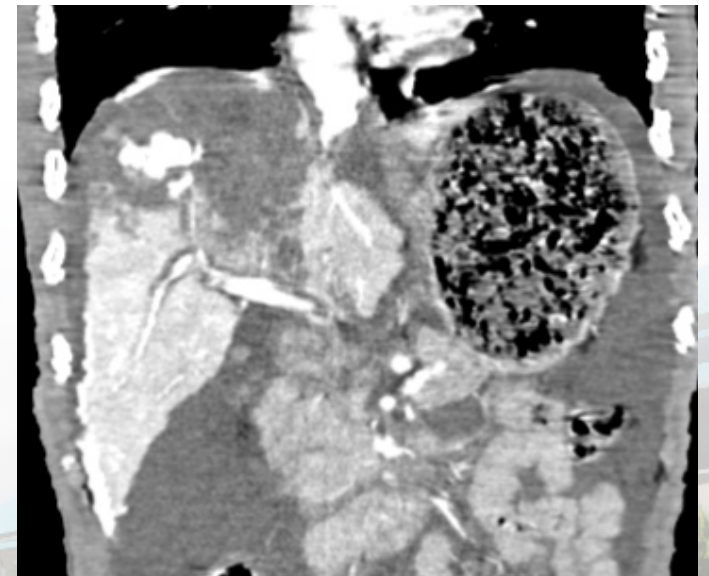
CASE 2



Intraoperative findings showed splenic abscess at midpole. Capsule of the spleen was intact. Minimal hemoperitoneum. Other organs were normal. Post operatively, there was persistent ascitic fluid drainage through the tube. Later on, blood investigations showed this patient had Hepatitis C. He was discharged 17 days after the operation and had an uneventful recovery on subsequent follow up.

Case 3

- A 20 year-old Cambodian man, motorbike skidded
- Complaint of abdominal pain
- GCS=15/15, BP=108/70mmHg, PR=103 beats per minute
- CT scan showed Grade V liver injury with active extravasation of contrast
- Intraoperatively, there was extensive liver injury with massive hemoperitoneum, EBL=6 litres
- Patient died 2 days after the operation



Case 4

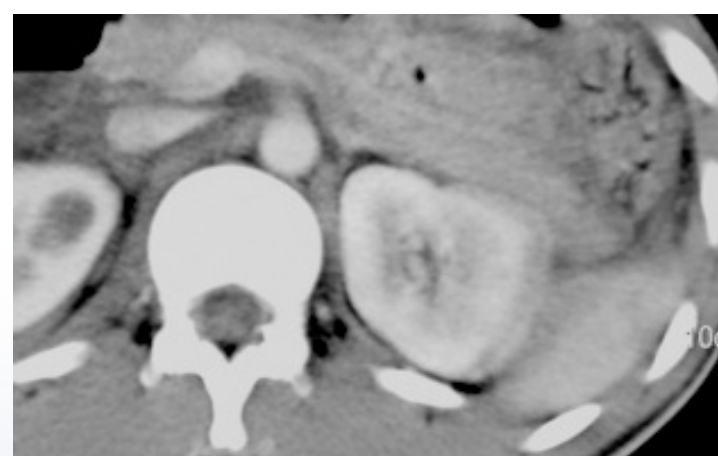
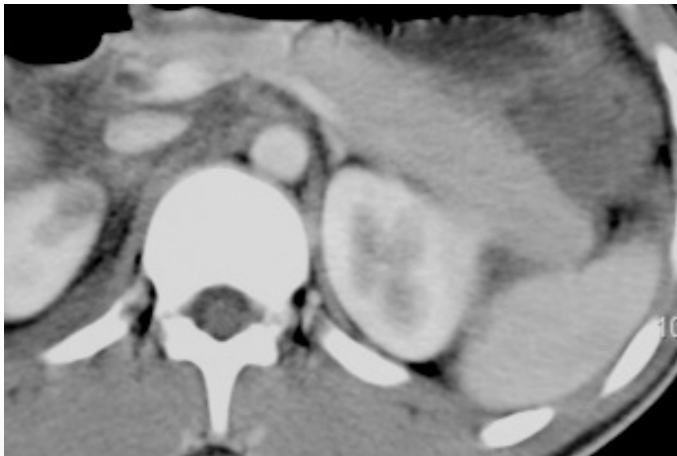
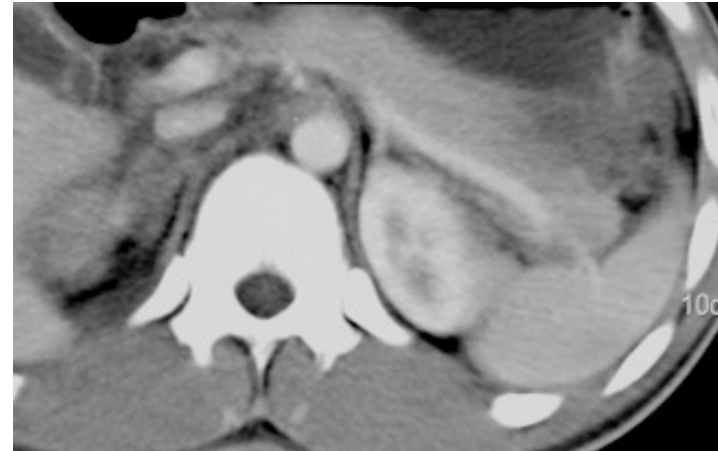
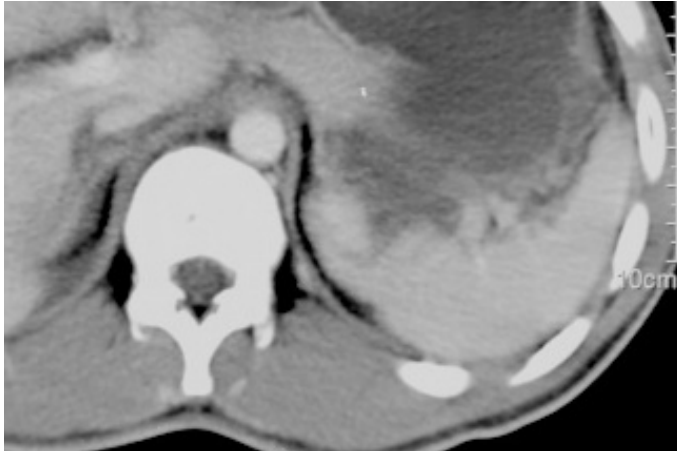


- A 30-year old Indonesian man, alleged assault
- GCS=14/15, BP=116/64mmHg and PR=92 beats per minute
- CT scan reported as massive hemoperitoneum with no obvious organ injury
- Intraoperative findings: splenic laceration at upper pole, hematoma at splenic hilum. Hemoperitoneum about 1 litre. Splenectomy done.
- Post operative recovery uneventful
- This patient had bilateral hearing loss due to bilateral facial nerve palsy from temporal bone fracture

Case 5

- A 19-year old Orang Asli man, alleged MVA (motorcyclist)
- Complaint of pain at right upper abdomen
- GCS=15/15, BP=126/70 mmHg and PR= 98 beats per minute
- Radiographs showed that he had right pneumothorax, left hemothorax and right superior pubic ramus fracture
- CT scan showed hemoperitoneum without identifiable organ injury
- He was operated 2 days later due to persistent blood loss
- Intraoperative findings: splenic laceration at lower pole about 3 cm, actively bleeding. Splenectomy done.
- Contusions at mesocolon, jejunum and pancreatic tail
- Recovery was uneventful

CASE 5



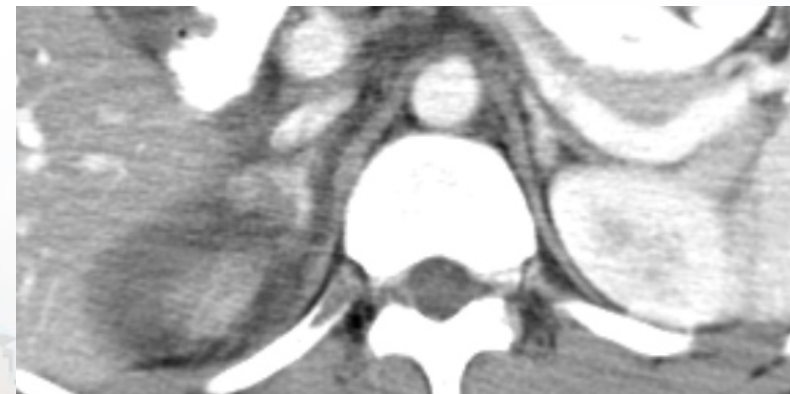
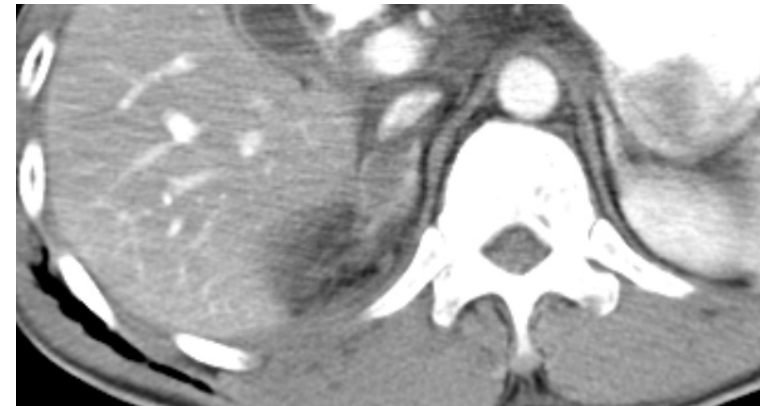
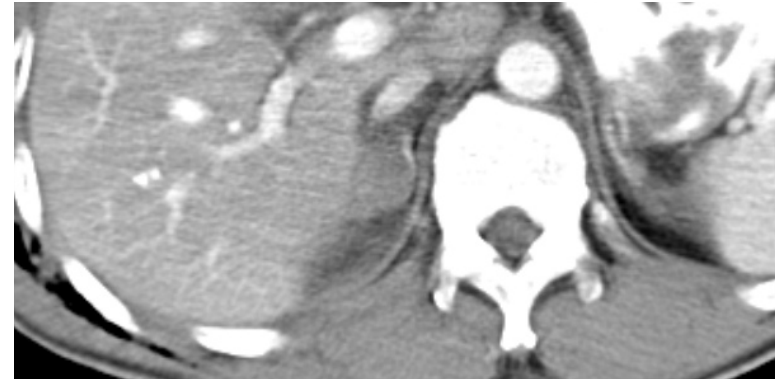
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Case 6

- 42 years old Malay man
- Alleged fall from 3-storey height
- Sustained fracture of right lower ribs, right hemopneumothorax, right upper limb fractures and elbow dislocation
- CT scan showed fracture right transverse process of L2-L4, right adrenal gland and right psoas hematoma
- Other solid intra-abdominal organs are normal



Case 7

18-year-old Malay girl, alleged fall at home and claimed that abdomen hit the edge of concrete wall and experienced generalised abdominal pain. Clinically vital signs were stable. Generalised abdominal tenderness on palpation with sluggish bowel sound. CT scan done to rule out intra abdominal injury.



DISCUSSION (1)

- **Most common injuries - liver 32%, spleen 28%; slight difference in many previous published study where spleen injury is more common^{1 2}**
- **Other solid organ injuries, almost similar with other study³**
- **In 13 patients with additional findings intra-operatively, retrospective review of the CT scan showed:**
 - ✓ **pancreatic tail contusion – 1 case suspicious region, 4 cases normal**
 - ✓ **No significant bowel abnormalities can be seen in all 6 patients with serosal tear or bowel contusions**
 - ✓ **1 out of 3 patients who had mesenteric tear had streakiness of mesentery on retrospective review and the other 2 had massive hemoperitoneum and mesenteric assessment were limited due to this**
 - ✓ **One patient who had rectosigmoid transection had extraluminal air and focal thickening of bowel at this level which was missed on initial review**

Extraluminal air and focal thickening of bowel



DISCUSSION (2)

- Retrospective review of 5 cases with different intra-operative findings:
 - ✓ 1 patient with Grade II spleen injury had small intra-parenchymal hematoma with no perisplenic collection (not identified intraoperatively) and bleeding from left ovarian artery and lacerated broad ligament (not seen on CT)
 - ✓ 2 patients with massive hemoperitoneum and no identifiable injury on CT scan, in one patient splenic injury (ID 43) was missed and another patient had no CT evidence of splenic laceration (ID61)
 - ✓ 1 patient with Grade II left kidney injury (kidney injury not identified during surgery) and had multiple site of mesenteric tear showed streakiness of mesentery on retrospective review
 - ✓ 1 patient with Grade 1 splenic injury (not identified on surgery) also had small bowel perforation and serosal tear at descending colon. Retrospective review showed no extraluminal air but thickening of small bowels seen

DISCUSSION (3)

- **As a summary:**
- ✓ **One spleen injury and two bowels perforation were missed on initial review**
- ✓ **Bowels related injuries (contusion and serosal tear) and mesenteric tear (29%) are the commonest injuries not identified or missed in this study**
- **Previous reported study showed overall sensitivity of CT scan to traumatic bowel injury ranged 88% to 92%, with accuracy of 94%³**
- **Even though bowel or mesenteric injury occurs in small fractions of patients, delay in diagnosis and repair increases mortality (up to 65%)⁴.**
- **Any signs suggestive of bowel and mesenteric injury; free fluid and mesenteric infiltration (seen in almost all operable cases), focal bowel wall thickening, free air (only 32% with bowel rupture) or extravasated contrast material should be informed to the surgeon**

Conclusion

- **Shift of treatment from early surgical intervention to non-operative management in patients with blunt abdominal trauma⁵.**
- **Role of Radiologist → provide the surgeon with good quality CT scan assessment → selection of patients for appropriate management**

Acknowledgements

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