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

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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
• 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

Sex:
- Female: 22%
- Male: 78%

Race:
- Malay: 86%
- Indian: 5%
- Chinese: 1%
- Others: 8%

Types of trauma:
- MVA
- Fall
- I/Accident
- Sports
- Assault
## Time of diagnosis

<table>
<thead>
<tr>
<th>Time of diagnosis</th>
<th>Number of patients</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within 24 hours of injury</td>
<td>94</td>
<td>87</td>
</tr>
<tr>
<td>More than 24 hours of injury</td>
<td>14</td>
<td>13</td>
</tr>
</tbody>
</table>
Injuries - Overview

- No intra-abdominal injury: 2%
- One-organ injury: 9%
- Two organ injuries: 59%
- Three organ injuries: 30%
## Injuries

<table>
<thead>
<tr>
<th>Organ injured</th>
<th>Number of patients</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liver</td>
<td>35</td>
<td>32</td>
</tr>
<tr>
<td>Spleen</td>
<td>30</td>
<td>28</td>
</tr>
<tr>
<td>Kidney</td>
<td>16</td>
<td>15</td>
</tr>
<tr>
<td>Urinary bladder</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Pancreas</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Adrenal gland</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Urethra</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Bowel</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>
Liver injuries
Spleen injuries
Kidney injuries

Grade 1  |  Grade 2  |  Grade 3  |  Grade 4  |  Grade 5

0  |  7  |  3  |  2  |  1
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

<table>
<thead>
<tr>
<th>ID</th>
<th>CT scan findings</th>
<th>Intra operative findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID2</td>
<td>Urinary bladder injury</td>
<td>Urinary bladder perforation, rectosigmoid transection, left common iliac vein puncture</td>
</tr>
<tr>
<td>ID3</td>
<td>Grade II spleen injury</td>
<td>Splenic injury and contusion of pancreatic tail</td>
</tr>
<tr>
<td>ID4</td>
<td>Free air suggestive of bowel injury</td>
<td>Jejunum perforation, 3cm mesenteric tear and contusion of transverse mesocolon</td>
</tr>
<tr>
<td>ID28</td>
<td>Grade IV renal injury</td>
<td>Liver laceration and non-expanding retroperitoneal hematoma, contusion body of pancreas</td>
</tr>
<tr>
<td>ID55</td>
<td>Grade III spleen injury</td>
<td>Splenic laceration at superior pole and contusion at lesser curvature of stomach</td>
</tr>
<tr>
<td>ID63</td>
<td>Grade V spleen injury</td>
<td>Almost fractured spleen and contusion at tail of pancreas</td>
</tr>
<tr>
<td>ID</td>
<td>CT scan findings</td>
<td>Intraoperative findings</td>
</tr>
<tr>
<td>-----</td>
<td>-------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>ID64</td>
<td>Intraperitoneal bladder injury</td>
<td>Urinary bladder rupture, retroperitoneal hematoma, serosal tear of sigmoid colon</td>
</tr>
<tr>
<td>ID65</td>
<td>Grade III spleen injury</td>
<td>Splenic laceration involving the hilum, small bowel and pancreatic contusion</td>
</tr>
<tr>
<td>ID74</td>
<td>Grade III spleen injury</td>
<td>Spleen laceration and contusion at tail of pancreas</td>
</tr>
<tr>
<td>ID85</td>
<td>Hemoperitoneum with no identifiable organ injury</td>
<td>Mesenteric tear with active bleeding</td>
</tr>
<tr>
<td>ID86</td>
<td>Grade III spleen injury</td>
<td>Splenic laceration at upper pole and contusion at greater curvature of stomach</td>
</tr>
<tr>
<td>ID109</td>
<td>Grade II liver injury</td>
<td>Perihepatic blood pooling, unable to identify site of bleeding, serosal tear at mid transverse colon</td>
</tr>
<tr>
<td>ID110</td>
<td>Grade V spleen injury</td>
<td>Laceration at upper pole of spleen, mesenteric tear near ileocecal area</td>
</tr>
</tbody>
</table>
Cases where CT & intraoperative findings were different

<table>
<thead>
<tr>
<th>ID</th>
<th>CT findings</th>
<th>Intraoperative findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID13</td>
<td>Grade II spleen injury</td>
<td>Lacerated left broad ligament, bleeding from left ovarian artery, no perisplenic blood pooling</td>
</tr>
<tr>
<td>ID43</td>
<td>Massive hemoperitoneum with no identifiable injury</td>
<td>Splenic laceration at upper pole, hematoma at splenic hilum</td>
</tr>
<tr>
<td>ID49</td>
<td>Grade II left kidney injury</td>
<td>Mesenteric tear at multiple site, non-viable ileum due to mesenteric injury, no retroperitoneal hematoma, kidneys were normal</td>
</tr>
<tr>
<td>ID61</td>
<td>No identifiable organ injury</td>
<td>Spleen laceration at lower pole, contusion at transverse mesocolon, pancreatic tail and jejunum</td>
</tr>
<tr>
<td>ID82</td>
<td>Grade I spleen injury, Grade II left kidney injury</td>
<td>Small bowel perforation, serosal tear at descending colon, minimal contamination, minimal hemoperitoneum</td>
</tr>
</tbody>
</table>
EXAMPLES OF CASES
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 pneumohemothorax, 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 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
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 study\(^3\)
- 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 trauma$^5$.

• Role of Radiologist $\rightarrow$ provide the surgeon with good quality CT scan assessment $\rightarrow$ selection of patients for appropriate management
Acknowledgements

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References


