Abdominal Trauma

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overview

• Quick review abdominal anatomy
• Review of mechanism of injury
• Review of investigation
• management
Anatomy of abdomen
External Anatomy

Anterior abdomen

Flank

Back
Visceral organ
visceral organ

Retroperitoneal space

Pelvic cavity
Abdominal injuries

- No.1 Preventable cause of death
- Unrecognized
- Closed spaces
- Multisystem / multiple organs
- Need investigations
ATLS protocol

Primary survey

Maintain circulation
Stop / seek for bleeding

Adjunct to primary survey

Monitoring investigations
Investigations for abdominal trauma

- FAST
- DPA (DPL)
- CT scan
FAST: Focused Abdominal Sonography for Trauma

**Advantage**
- Good sensitivity
- Easy to use
- Repeatable
- No radiologic exposure
- Really excellent test?

**Disadvantage**
- Operator dependent
- Poor evaluation for hollow viscus and retroperitoneal injury
- Negative FAST?
# DPL: Diagnostic Peritoneal Lavage

<table>
<thead>
<tr>
<th>Advantage</th>
<th>Disadvantage</th>
</tr>
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<tbody>
<tr>
<td>• High sensitivity and specificity</td>
<td>• Invasive</td>
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<tr>
<td>• Hollow viscus injury detection</td>
<td>• Poor evaluation for retroperitoneal injury</td>
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DPL: Diagnostic Peritoneal Lavage

**Indications**
- Equivocal abdominal sign
- Unexplained shock
- Unevaluable abdominal status
  - Alcohol / drug
  - Head / spinal injury
  - unconscious

**Interpretation**
DPL positive in
- Receive 10 ml of gross blood
- Cell count:
  - RBC > 100000
  - WBC > 500
- Biochemistry:
  - amylase > 175 iU/ml
- Microscopic:
  - food particle, bile, bacteria
DPL

- False positive rate in RBC count 11%, esp. in low RBC cell count
- False positive rate in WBC count: late DPL
Computer Tomography

• Great sensitivity and specificity
• Detect hollow viscus, retroperitoneal injury
• Grading organ injury $\rightarrow$ non-operative management plan
• Blunt VS penetrating
Limitation of CT scan

• Some hollow viscus and mesenteric injury
• Patient’s hemodynamic status
Type of injury

- Blunt injury
- Penetrating injury
- Blast injury
Algorithm for the management of blunt abdominal trauma

- Blunt abdominal trauma
  - Clinically evaluable
    - Diffuse abdominal tenderness OR No diffuse abdominal tenderness
    - Hemodynamic stable
      - CT +
        - OR
          - CT - observation
  - Clinically unevaluable
Hemodynamically labile

- FAST +
- FAST -

Other causes or hemodynamically labile present

Further evaluation/resuscitation

No other causes or hemodynamically labile present

DPA +

OR

DPA -

Further evaluation/resuscitation
Hemodynamically stable

FAST +

CT-observation
Algorithm for the management of penetrating abdominal trauma

Penetrating abdominal trauma

Diffuse abdominal tenderness +
Hemodynamically stable
Hemodynamically labile

Other cause of hemodynamic lability present

DPA + OR

DPA -

Further evaluate/resuscitate

No other cause of hemodynamic lability OR
Investigation for penetrating injury with hemodynamic stable

<table>
<thead>
<tr>
<th>Location</th>
<th>investigation</th>
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<tbody>
<tr>
<td>Thoracoabdomen</td>
<td>CT scan, thoracoscopy, laparoscopy</td>
</tr>
<tr>
<td>Anterior abdominal wall</td>
<td>LWE, FAST, DPL, CT</td>
</tr>
<tr>
<td>Back and flank</td>
<td>CT</td>
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</table>
Options of evaluation in penetrating injury

<table>
<thead>
<tr>
<th>Investigation</th>
<th>% Sensitivity</th>
<th>% Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Examination</td>
<td>95-97</td>
<td>100</td>
</tr>
<tr>
<td>Local Wound Exploration</td>
<td>71</td>
<td>77</td>
</tr>
<tr>
<td>DPL</td>
<td>87-100</td>
<td>52-89</td>
</tr>
<tr>
<td>FAST</td>
<td>46-85</td>
<td>48-95</td>
</tr>
<tr>
<td>CT scan</td>
<td>97</td>
<td>98</td>
</tr>
</tbody>
</table>
Blast Injury

- Primary
  - Blast wave
- Secondary
  - Shrapnel
- Tertiary
  - Blast wind
- Quaternary
  - Other consequences
Indication for surgery

- Hemodynamic instability
- Peritonitis
- Inability to examine patient
Non-operative treatment

- Solid organ injury only
- Hemodynamically stable
- No peritonitis
- Capable for serial examination immediate investigation and celiotomy if needed

- Multiple / combined injury
Missed abdominal trauma

• Intraabdominal organs
  – Diaphragmatic injury
  – Hollow viscus injury
  – Retroperitoneal injury
  – Mesenteric injury

• Other combined injury
Combined injuries

Head and abdominal injuries  5.7%

Challenges:

• Reliability for abdominal evaluation
• Timing of CT evaluation of the head
• Severe head trauma in non-operative Mx of abdominal solid organ injury
• Major intraabdominal injury with severe blood loss leads secondary brain injury
Algorithm for the management of combined head / abdominal trauma

Combined head and abdominal injury

- Hemodynamically stable
  - GCS < 12
    - Localizing sign
      - CT before laparotomy
    - No localizing sign
      - Laparotomy before CT
  - GCS > 12
    - Laparotomy

- Hemodynamically labile
  - GCS < 9
    - Localizing sign
      - Laparotomy
      - Then BH / ICP
    - No localizing sign
      - Laparotomy
      - Follow by CY scan
Pelvic fracture
Pelvic Fractures

Mechanism

- AP compression
- Lateral compression
- Vertical shear
Pelvic Fractures

Assessment

- Inspection: Leg-length discrepancy, external rotation
- Pelvic ring: Pain on palpation of bony pelvic ring
- Palpate prostate
- Associated injuries
- Pelvic bleeding
Pelvic Fractures

Emergency Management

- Fluid resuscitation
- Determine if open or closed fracture
- Determine associated perineal /GU injuries
- Determine need for transfer
- Splint pelvic fracture
Splinting fractured pelvis

- Pelvic wrapping
- Pelvic C-clamp
- External fixator
- ORIF
Special considerations
Case I: 32 year-old female

- GA 37 weeks
- G2P1001
- Patient model for medical student
- On the way home: MCA
- Pain on movement both hip joints
Pelvic wrapping

Roll on her left side
External fixator
Case II: 37 year-old male

- Short gun wound abdomen
- Unstable vital signs on arrival
Case III: 48 year-old male

- gunshot wound at posterior right tight
- Unstable vital signs on arrival
- No abdominal sign on arrival
Conclusion

ATLS initial assessment
• Primary survey
• Adjunct to primary survey

Select appropriate investigation(s) for the injury