Blunt Abdominal Trauma Evaluation

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Outline

- Anatomic definition of abdomen
- Mechanisms of injury in blunt trauma
- Typical injury patterns
- Assessment of blunt abdominal trauma
- Diagnostic algorithms
Figure 16.6  The names of the regions of the abdomen.
Abdomen: anatomic boundaries

- **External:**
  - Anterior abdomen: transnipple line superiorly, inguinal ligaments and symphysis pubis inferiorly, anterior axillary lines laterally.
  - Flank: between anterior and posterior axillary lines from 6th intercostals space to iliac crest.
  - Back: Posterior to posterior axillary lines, from tip of scapulae to iliac crests.

- **Internal:**
  - Upper peritoneal cavity: covered by lower aspect of bony thorax. Includes diaphragm, liver, spleen, stomach, transverse colon.
  - Lower peritoneal cavity: small bowel, ascending and descending colon, sigmoid colon, and (in women) internal reproductive organs.
  - Pelvic cavity: contains rectum, bladder, iliac vessels, and (in women) internal reproductive organs.
  - Retroperitoneal space: posterior to peritoneal lining of abdomen. Abdominal aorta, IVC, most of duodenum, pancreas kidneys, ureters, and posterior aspects of ascending and descending colon.
Mechanisms of injury

- Compression, crush, or sheer injury to abdominal viscera → deformation of solid or hollow organs, rupture (e.g. small bowel, gravid uterus)
- Deceleration injuries: differential movements of fixed and nonfixed structures (e.g. liver and spleen lacs at sites of supporting ligaments)
Common injury patterns

- In patients undergoing laparotomy for blunt trauma, most frequently injured organs are spleen (40-55%), liver (35-45%), and small bowel (5-10%). (ATLS, 2001)
- Duodenum:
  - Classically, frontal-impact MVC with unrestrained driver; or direct blow to abdomen.
  - Bloody gastric aspirate, retroperitoneal air on XR or CT
  - Confirmed with upper GI series or double contrast CT
- Small bowel injury:
  - Generally from sudden deceleration with subsequent tearing near fixed points of attachment.
  - Often associated with seat belt sign, lumbar distraction fracture (Chance fracture)
  - DPL superior to FAST or CT for diagnosis.
Common injury patterns (2)

- Pancreas:
  - Direct epigastric blow compressing pancreas against vertebral column.
  - Early normal serum amylase does NOT exclude major pancreatic trauma.
  - CT with PO/IV contrast – NOT particularly sensitive in immediate post-injury period.

- Diaphragm:
  - Most commonly, 5-10 cm rupture involving posterolateral hemidiaphragm.
  - Noted on CXR: blurred or elevated hemidiaphragm, hemothorax, GT in chest

- Genitourinary:
  - Anterior injuries (below UG diaphragm): usually from straddle impact.
  - Posterior injuries (above UG diaphragm): in patient with multisystem injuries and pelvic fractures.
Common injury patterns (3)

- **Solid organ injury**
  - Laceration to liver, spleen, or kidney
  - Injury to one of these three + hemodynamic instability: considered indication for urgent laparotomy
  - Isolated solid organ injury in hemodynamically stable patient: can often be managed nonoperatively.

- **Pelvic fractures:**
  - Suggest major force applied to patient.
  - Usually auto-ped, MVC, or motorcycle
  - Significant association with intraperitoneal and retroperitoneal organs and vascular structures.
Restraining devices

- Lap seat belt
  - Mesenteric tear or avulsion
  - Rupture of small bowel or colon
  - Iliac artery or abdominal aorta thrombosis
  - Chance fracture of lumbar vertebrae (hyperflexion)
- Shoulder Harness
  - Rupture of upper abdominal viscera
  - Intimal tear or thrombosis in innominate, carotid, subclavian, or vertebral arteries
  - Fracture or dislocation of C-spine
  - Rib fractures
  - Pulmonary contusion
- Air Bag
  - Corneal abrasions, keratitis
  - Abrasions of face, neck, chest
  - Cardiac rupture
  - C or T-spine fracture
Assessment: History

- Mechanism
- Symptoms, events, PMH, Meds, EtOH/drugs
- MVC:
  - Speed
  - Type of collision (frontal, lateral, sideswipe, rear, rollover)
  - Vehicle intrusion into passenger compartment
  - Types of restraints
  - Deployment of air bag
  - Patient's position in vehicle
Assessment: Physical Exam

- Inspection, auscultation, percussion, palpation
  - Inspection: abrasions, contusions, lacerations, deformity
    - Grey-Turner, Kehr, Balance, Cullen
  - Auscultation: careful exam advised by ATLS. (Controversial utility in trauma setting.)
  - Percussion: subtle signs of peritonitis; tympany in gastric dilatation or free air; dullness with hemoperitoneum
  - Palpation: elicit superficial, deep, or rebound tenderness; involuntary muscle guarding
Distribution of dullness caused by ascites when **supine**

Redistribution of dullness when patient is tilted **45° to the right**

**Figure 16.29** Shifting dullness is diagnostic of free intraperitoneal fluid (ascites).
• Grey-Turner sign:
  • Bluish discoloration of lower flanks, lower back; associated with retroperitoneal bleeding of pancreas, kidney, or pelvic fracture.

• Cullen sign:
  • Bluish discoloration around umbilicus, indicates peritoneal bleeding, often pancreatic hemorrhage.

• Kehr sign:
  • L shoulder pain while supine; caused by diaphragmatic irritation (splenic injury, free air, intra-abd bleeding)

• Balance sign:
  • Dull percussion in LUQ. Sign of splenic injury; blood accumulating in subcapsular or extracapsular spleen.
Diagnostic adjuncts

- Labs: BMP, CBC, coags, b-HCG, amy/lip, U/A, tox screen, T&C
- Plain films: CXR, pelvis; abd films generally lower priority
- DPL
- FAST
- CT
Tends to become spherical

Fluctuates

Has a fluid thrill

Figure 16.30 The features of encysted fluid.
Diagnostic Peritoneal Lavage

- 98% sensitive for intraperitoneal bleeding (ATLS)
- Open or closed (Seldinger); usually infraumbilical, but may be supraumbilical in pelvic frxs or advanced pregnancy.
- Free aspiration of blood, GI contents, or bile in demodynamically abnormal pt: indication for laparotomy
- If gross blood (> 10 mL) or GI contents not aspirated, perform lavage with 1000 mL warmed LR. Allow to mix, compress abdomen and logross patient, then sent to lab. + test: >100,000 RBC/mm³, >500 WBC/mm³, Gram stain with bacteria.
- Alters subsequent examination of patient
- Has been somewhat superceded by FAST in common use; now generally performed in unstable patients with intermediate FAST exams, or with suspicion for small bowel injury.
FAST: Strengths and Limitations

**Strengths**
- Rapid (~2 mins)
- Portable
- Inexpensive
- Technically simple, easy to train (studies show competence can be achieved after ~30 studies)
- Can be performed serially
- Useful for guiding triage decisions in trauma patients

**Limitations**
- Does not typically identify source of bleeding, or detect injuries that do not cause hemoperitoneum
- Requires extensive training to assess parenchyma reliably
- Limited in detecting <250 cc intraperitoneal fluid
- Particularly poor at detecting bowel and mesentery damage (44% sensitivity)
- Difficult to assess retroperitoneum
- Limited by habitus in obese patients
Revision Panel 16.2

The features in the history of a pain that must be elicited

<table>
<thead>
<tr>
<th>Site</th>
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<tbody>
<tr>
<td>Time and nature of onset</td>
</tr>
<tr>
<td>Severity</td>
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<tr>
<td>Nature</td>
</tr>
<tr>
<td>[burning, throbbing, stabbing, constricting, colicky, aching]</td>
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<tr>
<td>Progression</td>
</tr>
<tr>
<td>End</td>
</tr>
<tr>
<td>Duration</td>
</tr>
<tr>
<td>Relieving factors</td>
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<tr>
<td>Exacerbating factors</td>
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<tr>
<td>Radiation</td>
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<tr>
<td>Cause</td>
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</tbody>
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Fluid: encysted

Fluid trapped in a cyst, or in the renal pelvis, or between adhesions will have a fluid thrill, be dull to percussion, but not shift.

The position and features of a cyst depend upon its anatomical origin. The following cysts or fluid-filled swellings may become large enough to present as abdominal distension:

- Ovarian cysts
- Hydronephrosis
- Polycystic kidney
- Urinary bladder
- Pancreatic cysts
- Mesenteric cysts
Revision Panel 16.1

Never forget to examine:

- Supraclavicular lymph nodes
- Hernial orifices
- Femoral pulses
- Genitalia
- Bowel sounds
- Rectum
FAST: Accuracy

For identifying hemoperitoneum in blunt abdominal trauma:

- Sensitivity 76 - 90%
- Specificity 95 - 100%

The larger the hemoperitoneum, the higher the sensitivity. So sensitivity increases for *clinically significant* hemoperitoneum.

How much fluid can FAST detect?

- 250 cc total
- 100 cc in Morison’s pouch
Does FAST replace CT?

Only at the extremes.

- Unstable patient, (+) FAST → OR
- Stable patient, low force injury, (-) FAST → consider observing patient.

CT is far more sensitive than FAST for detecting and characterizing abdominal injury in trauma. The gold standard for characterizing intraparenchymal injury.

“Death begins with a CT.” Never send an unstable patient to CT. FAST, however, can be performed during resuscitation.
CT

EAST level I recommendations (2001):

- CT is recommended for evaluation of hemodynamically stable patients with equivocal findings on physical examination, associated neurologic injury, or multiple extra-abdominal injuries.

- CT is the diagnostic modality of choice for nonoperative management of solid visceral injuries.
EAST Algorithm: Unstable

Evaluation of Blunt Abdominal Trauma: Unstable Patient

US

Hemodynamically Unstable? DPL

No

Free fluid identified?

- Continue resuscitation
- Evaluate other potential sources of shock
- Repeat ultrasound
- DPL.

No

- Aspiration of gross blood
- RBC > 100K/mm³
- WBC > 500/mm³
- Particulate matter
- Bite

Yes

Exploratory laparotomy.

Yes

- Continue resuscitation
- Evaluate other potential sources of shock
- Repeat DPL.

Eastern Association for the Surgery of Trauma, 2001
EAST Algorithm: Stable

Evaluation of Blunt Abdominal Trauma: Stable

Hemodynamically Stable

Yes

Reliable PE?

Yes

CT Scan or US?

No

CT Scan

US

No

Free fluid identified?

Yes

Hollow visceral injury?

No

Exploratory laparotomy

Yes

Solid visceral injury?

No

Consider exploratory laparotomy

CT scan may be elected based on institutional experience or clinical suspicion of intra-abdominal injury.

Consider non-operative management

Consider exploratory laparotomy

No

Solid viscerai injury?

- Admit - Serial PE

- Admit - Serial PE

- Admit - Serial PE

Eastern Association for the Surgery of Trauma, 2001
The End

For more reading go to other abdominal trauma lectures

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