Case Presentation

Karoline Nowillo, MD
Long Island College Hospital
Case Presentation

Chief complaint: xx year old woman with a two week history of progressively worsening shortness of breath and epigastric pain

Past medical history: high impact motor vehicle accident 3 years prior with pelvic fractures and pelvic wall hematoma, hypertension, gastritis

Past surgical history: tubal ligation

Medications: accupril, prevacid, allegra
Case Presentation

Vital signs: RR 40 → 28 98% O2 Sat on RA
T 97.2 BP 110/77 HR 111 BMI 27

Physical exam:
General in distress
Head NCAT
Chest decreased breath sounds on left, tachypnic
Cardiac S1 S2 tachycardic
Abdomen soft
Extremities within normal
Case Presentation

Labs

ABG 7.419/34.7/55/22/-1.8/87.8%

13.2  427
<table>
<thead>
<tr>
<th>27</th>
<th>427</th>
</tr>
</thead>
</table>

132  89  49
<table>
<thead>
<tr>
<th>3.8</th>
<th>25</th>
<th>1.1</th>
</tr>
</thead>
</table>

204
<table>
<thead>
<tr>
<th>14.1</th>
<th>1.2</th>
</tr>
</thead>
</table>

N79%

Trop 0.02
Left Tube Thoracostomy
Left Tube Thoracostomy

- Almost immediate relief of symptoms.
- Approximately one liter of foul smelling fluid drained.
- Culture klebsiella pneumonia, streptococcus viridans, moderate yeast.
- Admit to thoracic surgery service.
- Started on zosyn, fluconazole.
Upper GI Study
Laparotomy: Gastric Perforation
Left Lobe of Liver
Repair of Diaphragmatic Defect
Thoracotomy

- Patient placed in right decubitus position
- Left sided posterolateral thoracotomy
- Evacuation of debris, clots and hernia sac
- Left chest tube inserted
- Reapproximation of chest wall and muscle
Gross Specimens

liver  fundus  spleen
Chest XR
Pre-operative
Post-operative
Post-operative Course

- POD 0 patient remained in recovery room
- POD 1 extubated, given pneumovax and transferred to SICU
- POD 2 transferred to surgical floor
- POD 4 started clears and advanced to regular diet
- POD 8 and 10 intubated, bronchoscopy and positive pressure ventilation in an attempt to expand the left lower lobe
- POD 13 extubated and returned to surgical floor
- POD 18 chest tube removed
- POD 19 discharged home
Follow-up

- At one month post op patient offers no complaints.

- **Physical exam:**
  - General no acute distress
  - Head NCAT
  - Chest decreased air entry left base
  - Abdomen benign
  - Skin scars maturing

- Return for follow up in one year.
Traumatic Diaphragmatic Hernias
Diagnosis and Management
Diaphragm Embryology

- Formed between 3\textsuperscript{rd} and 8\textsuperscript{th} week of gestation
- Central tendon originates from transverse septum
- Lateral portions from pleuroperitoneal folds
- Fusion eliminates communication between thorax and abdomen
**Anatomy and Physiology**

**Nerves:** right phrenic and left phrenic.

**Arterial** supply: pericardiophrenic, small direct branches from the abdominal aorta.

**Venous** drainage: follows arterial supply.

**Insertion:** anteriorly at xyphoid process, laterally to the lower 6 ribs, posteriorly L1 to L3 vertebral bodies, dome rises as high as 4th intercostal space.

**Function:** generates tidal volume & intrapleural pressures between -5 to -10 cmH2O.
Diaphragmatic Hernias: Nontraumatic

1. Sternocostal foramina of Morgagni
2. Esophageal hiatus
3. Lumbocostal foramina of Bochdalek
Traumatic Diaphragmatic Injury

- Incidence
  - 0.8 to 5% of all abdominal injuries
  - up to 5% in patients with multiple traumas
- More common in penetrating trauma v. blunt
- 75% affect left hemidiaphragm,
- 23% right hemidiaphragm &
- 2% bilateral in clinical practice
- 13.7% mortality rate

Clinical Presentation

- Marked respiratory distress.
- Decreased breath sounds.
- Decreased function of diaphragm, compression of lungs, shifting of mediastinum.
- Hemodynamic compromise.
Clinical Features

- Diagnosis begins with a high index of suspicion.
- Associated injuries: pelvic fracture, splenic and hepatic injuries, thoracic aortic tears.
- Spontaneous closure of a rupture does not occur.
- Delayed herniation may present with strangulation or dyspnea.
Diagnosis

Chest X ray
- Abdominal contents in thorax
- Nasogastric tube in thorax
- Elevated hemidiaphragm
- Shift of mediastinum
- Blunting of costophrenic angle
- Reported 13-62% diagnostic inaccuracy

Diagnosis

- **CT scan**
  - May miss injury if no herniation.
  - Coronal and sagittal reconstructions most effective.
  - Shows associated complications: strangulation, hemothorax.

- **Contrast study - barium**
  - Diagnose gastrointestinal herniation.

- **MRI**
  - Use on selected patients: late presentation, diagnostic doubt.
  - Clearly reveals attachment sites.
  - Logistically problematic in acute setting.

Diagnosis

- Diagnostic peritoneal lavage
  - Penetrating and blunt trauma.
  - Sensitivity approaches 100% when rbc > 10,000/mm³.
  - Rbc of 1000/mm³ yield negative explorations of about 20%.
  - Specificity is low.

- Laparoscopy
  - May be used for diagnosis and repair.
  - Reported sensitivity 87.5% in prospective trial for penetrating injuries.
  - Awaiting long term outcomes.


Diagnosis

- Thoracoscopy
  - In presence of pneumothorax or hemothorax
  - May have diagnostic accuracy comparable to laparotomy

- Exploratory laparotomy
  - Performed in patients with suspected injury
  - High rate of negative findings

- Ultrasound/doppler
  - Shows diaphragmatic discontinuity, herniated organs
  - Reveals associated abdominal organ pathologies
  - Herniation of vessels from omentum and abdominal organs converging into hernia sac


Management Traumatic Hernia

- Diagnosis is indication for repair.
- Acute injuries may be repaired during exploratory laparotomy.
- Chronic post-traumatic hernias are best done through chest or combined thorascopic/abdominal approach.
- Number 1 monofilament permanent suture.
- Polypropylene mesh for defects $>$25cm$^2$.
- Laparoscopic repair reported.

Blunt Thoracoabdominal Trauma
Acute Phase

Resuscitate per ATLS protocols

Insert NG if no contraindications

CXR

Normal

Indications for surgical intervention present (ie, thoracotomy or laparotomy)
OR
- Examine diaphragm

No indications for surgical intervention
- Cont. w/u for other injuries
- Observation
- Repeat CXR

Abnormal

NG found L chest
Hepatic shadow in R chest
OR
- Repair

Elevated R of L hemidiaphragm
Indications for surgical intervention present (ie, thoracotomy or laparotomy)
OR
- Examine diaphragm

No indications for surgical intervention
CT or MRI
Consider contrast studies UGI, LGI
Diaphragmatic Injury, Chronic Phase, After Blunt and Penetrating Trauma

Elevated diaphragm by CXR

Previous history of trauma

Yes

Further evaluation with any or combination of these modalities
- CXR with NG tube
- Fluoroscopy
- UGI
- BE
- CT scan
- MRI

No

Previous surgery

No

Consider:
- Congenital defects
- Perinatal phrenic nerve injury

Yes

Consider iatrogenic injury after:
- Neck exploration
- Cardiac surgery
- Thoracic surgery
Conclusions

- Diaphragmatic injuries may be misdiagnosed or missed on initial evaluation of the trauma patient.
- Delayed diagnosis carries a high morbidity due to the risk of incarceration or strangulation.
- High index of suspicion is required to diagnose these injuries.
- Transabdominal route in acute rupture is preferred.
- Chronic herniation should be approached through the chest, with a laparotomy when indicated.