Splenic Injury and Pseudoaneurysms in a Traumatic Setting

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RAD 4001
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UTHealth | McGovern Medical School
Clinical History

- 65-year old male involved in a motor vehicle accident
  - Restrained driver in driver-side collision going 40 mph; 12-inch intrusion, extrication required
  - Per EMS – GCS 10, + LOC,
  - LifeFlighted as a level 1 trauma for higher level of care
- Per EMS: GCS 10, +LOC
- Vital Signs in ED: Temp 98.5°F  HR 118 bpm  BP 122/50 mm Hg  RR 22/min  SpO2 100%
- Physical exam
  - Head: normocephalic, small laceration lateral to the left eye, abrasion with moderate hematoma to the left occipital region
  - Neuro: GCS 13, sensory/motor intact
  - Cardiovascular: Tachycardic, regular rhythm
  - Chest wall: Chest wall diffusely tender to palpation
  - Abdomen: soft, nontender, non-distended
  - Back: diffusely tender to palpation, no step-offs
- FAST negative
## ACR Appropriateness Criteria


<table>
<thead>
<tr>
<th>Procedure</th>
<th>Appropriateness Category</th>
<th>Relative Radiation Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT whole body with IV contrast</td>
<td>Usually Appropriate</td>
<td>🌟🌟🌟🌟🌟</td>
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<tr>
<td>Radiography trauma series</td>
<td>Usually Appropriate</td>
<td>🌟🌟🌟</td>
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<tr>
<td>US FAST scan chest abdomen pelvis</td>
<td>Usually Appropriate</td>
<td>🌟</td>
</tr>
<tr>
<td>CT whole body without IV contrast</td>
<td>May Be Appropriate</td>
<td>🌟🌟🌟🌟🌟</td>
</tr>
<tr>
<td>Fluoroscopy retrograde urethrography</td>
<td>Usually Not Appropriate</td>
<td>🌟🌟🌟</td>
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<tr>
<td>MRI abdomen and pelvis without and with IV contrast</td>
<td>Usually Not Appropriate</td>
<td>🌟</td>
</tr>
<tr>
<td>MRI abdomen and pelvis without IV contrast</td>
<td>Usually Not Appropriate</td>
<td>🌟</td>
</tr>
</tbody>
</table>
Cost of Imaging at Memorial Hermann (Typical Charges)

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT Chest w/ contrast</td>
<td>$3,936</td>
</tr>
<tr>
<td>CT Pelvis/Abdomen w/ contrast</td>
<td>$7,998</td>
</tr>
<tr>
<td>CT Brain w/o contrast (x4)</td>
<td>$3,157 (x4)</td>
</tr>
<tr>
<td>CT Maxillofacial area w/o contrast</td>
<td>$4,409</td>
</tr>
<tr>
<td>CT cervical spine w/o contrast</td>
<td>$4,507</td>
</tr>
<tr>
<td>CT angiography neck w/ contrast</td>
<td>$2,666</td>
</tr>
<tr>
<td>CT Right Tibula/Fibula w/o contrast</td>
<td>$3,078</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$39,222</strong></td>
</tr>
</tbody>
</table>
Imaging – Full-Body CT Scan

• CT chest, abdomen n and pelvis with IV contrast, 08/22/2019
  • Also Brain CT, CT Neck, CT cervical spine, CT Right Tibula and Fibula,
• Axial, sagittal, and coronal views obtained
• Arterial phase
  • 20-30 seconds after IV contrast administration
• Portal venous phase
  • 60-80 seconds after IV contrast administration
• Delayed phase
  • 6-10 minutes after IV contrast administration
Imaging – CT Scan (Abdomen)

Normal

Abnormal

Liver

Left kidney

Spleen

Liver

Stomach

Spleen

Axial view of the abdomen in arterial phase.
Focal areas of hyperdensity within the splenic parenchyma.
Area of relative hypoattenuation surrounding the spleen.
CT Thorax - Sagittal

Sagittal view of the chest in arterial phase.
Focal areas of hyperdensity within the splenic parenchyma.
Area of relative hypoattenuation surrounding the spleen.
CT Thorax – Coronal

Coronal view of the chest in arterial phase.
Focal areas of hyperdensity within the splenic parenchyma.
Area of relative hypoattenuation surrounding the spleen.
Key Imaging Findings

• Grade 3 splenic injury with a subcapsular hematoma, no active extravasation
  • >50% surface area

• Multiple splenic pseudoaneurysms

• Supportive history
  • MVA, collision into driver’s side (left side of patient) with 12-inch intrusion
  • Left-sided chest pain
Differential Diagnosis

Splenic laceration
Subcapsular hematoma
Splenic pseudoaneurysms
True splenic aneurysms
Splenic rupture
Splenic calcifications

Delayed phase of CT abdomen distinguishing splenic pseudoaneurysm from true aneurysm.
Discussion: Splenic Injury

- Most frequently injured internal organ in blunt trauma
  - Up to 49% of abdominal organ injuries
- American Association for the Surgery of Trauma (AAST) splenic injury scale
  - Advance one grade for each additional injury up to grade III

Case courtesy of Dr. Sachintha Hapugoda, Radiopaedia.org, rID: 51434
Discussion: Splenic Pseudoaneurysm

• Rare - fewer than 200 documented cases of splenic artery pseudoaneurysms reported

• Exact mechanism unknown
  • Possible development from splenic parenchymal lacerations and hematomas that are supplied by injured splenic arteries
  • Damage to the intima and elastic lamina of the splenic artery from rapid deceleration

• Other causes
  • Pancreatic disease (most common)
  • Iatrogenic
  • Peptic ulcer disease
Discussion: Splenic Pseudoaneurysm

• Complications
  • Delayed rupture of the spleen

• Further workup
  • Doppler scan
    • confirm the neck of the pseudoaneurysm
  • Angiography
    • Most reliable study
    • Allows for transcatheter embolization
Final Diagnosis

Grade 3 splenic injury with subcapsular hematoma and pseudoaneurysms
Treatment Options

- Conservative management/observation
  - Possible complication: spontaneous thrombosis
- Splenectomy
  - Most reliable option, lowest failure rate
  - Ideal in hemodynamically unstable patients
- This patient: Emergent arterioembolization by interventional radiology
  - Abdominal angiography, pelvic angiography, splenic arterial embolization, proximal LLE angiography
  - Transcatheter embolization performed in 37% of cases, failure rate of 14%
  - No complications in this case.
Clinical Course

• Length of stay = 10 days

• Sustained multiple injuries: left vertebral artery injury, multiple rib fractures with subcutaneous emphysema, left pneumothorax, left hemothorax, bilateral pubic ring fractures,

• Admitted to Shock Trauma Intensive Care Unit (STICU)

• Followed closely by Cardiology and Cardiovascular surgery for severe aortic insufficiency

• Day 10: bradycardic cardiac arrest; patient expired despite resuscitation efforts
Take Home Points

• In the setting of blunt abdominal trauma, look for signs of splenic injury: focal areas of hyperdensity and/or lacerations (linear streak(s) of hypodensity) within the spleen, or relative hypodensity surrounding the spleen.

• Although rare, splenic pseudoaneurysms should remain on the differential diagnosis.

• Consider early interventions, such as a splenectomy or embolization.
References


• [https://www.memorialhermann.org/patients-caregivers/pricing-estimates-and-information/](https://www.memorialhermann.org/patients-caregivers/pricing-estimates-and-information/)


• [https://radiopaedia.org/articles/aast-spleen-injury-scale?lang=us](https://radiopaedia.org/articles/aast-spleen-injury-scale?lang=us)
Questions?