Thoracic Aortic Injuries

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Diagnostic Radiology RAD 4001
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History

- 19 year old Female presenting to the ED via life flight after a motor vehicle collision
- Vitals in trauma bay: BP: 86/45, HR: 145 bpm
- Patient was in uncompensated hypovolemic shock and central venous access was obtained for resuscitation
- Past Medical History: None
- Initial evaluation of injuries include: Left renal laceration, left superior/inferior pubic rami fracture, left iliac bone fracture, left femur fracture, aortic transection, extraperitoneal bladder rupture, splenic laceration
Relevant Imaging

• Initial CXR deceivingly normal
Imaging Continued

• Follow up CXR to assess lines and tubes showed tracheal and nasogastric tube deviation to the right.
CT chest/abdomen/pelvis with contrast axial

TA = Thoracic Aorta
SVC = Superior Vena Cava
DA = Descending Aorta
CT chest/abdomen/pelvis with contrast axial
CT Chest/Abdomen/Pelvis Coronal

Red arrow = Pseudoaneurysm
CT Chest/Abdomen/Pelvis Sagittal

Red arrow = Pseudoaneurysm
• Imaging shows a traumatic thoracic aortic pseudo aneurysm with mediastinal hematoma causing tracheal deviation to the right.
Differential Diagnosis

1. Aortic dissection- presents similar to a pseudoaneurysm on axial CT images.
2. Mediastinal mass- leading to shifting of structures within the mediastinum.
3. Pericardial recess- small spaces within the pericardial cavity arising from the transverse pericardial sinus, formed by the reflections of the pericardium. Fluid can pool in the recesses and mimic mediastinal pathology.
Discussion

• Between 1.5-2% of patients with blunt thoracic trauma sustain aortic injuries.

• Traumatic (blunt) aortic injury often involves rapid deceleration, likely from a fall from height or motor vehicle collision, and can be life threatening.

• Early diagnosis is critical. 20% of patients who arrive to the hospital alive with blunt aortic injury die within 30 hours of injury from lethal rupture.
Discussion

• The most common location is the aortic isthmus distal to left subclavian artery.

• This isthmus is the transition zone between the more mobile ascending aorta and arch, and the relatively fixed descending aorta, allowing for stretching with rapid deceleration.
Evaluation

• Initial evaluation includes a plain chest radiograph.

• CT angiography of the chest and TEE (transesophageal echocardiography) are the main imaging modalities used to diagnose blunt aortic injury if suggestive on clinical evaluation.

• CT angiography is recommended in hemodynamically stable patients, while TEE can be used in hemodynamically unstable patients who require prompt assessment.
Aortic Injury Grading

- **GRADE I**: Intimal Tear
- **GRADE II**: Intramural Hematoma
- **GRADE III**: Pseudoaneurysm
- **GRADE IV**: Rupture
Diagnosis

• This patient has a pseudoaneurysm as diagnosed on imaging; a collection of blood between the two outer layers of an artery, the tunica media and tunica adventitia.

• Due to the patient's mechanism of injury and radiologic features, the diagnosis is a Grade 3 Traumatic Aortic Injury.
Treatment

• Endovascular repair of the thoracic aorta is a minimally invasive approach that involves placing a stent-graft in the thoracic or thoracoabdominal aorta.

• Endovascular repair has significantly lower morbidity and mortality compared to open repair.

• CT angiography is used during the procedure to assess the aorta and fit an appropriately sized stent.
Treatment

• The five year survival rate of emergent open thoracic aortic repair is 37%.

• Patient was treated with endovascular repair of pseudoaneurysm with coverage of left subclavian artery on June 2, 5 days after initial presentation.

• Other injuries: The following day (06/03), an exploratory laparotomy was performed due hemorrhagic shock with evacuation of hemoperitoneum and splenectomy.
Treatment

Pseudoaneurysm

Stent covering pseudoaneurysm
Treatment

Stent covering pseudoaneurysm
## ACR Appropriateness Criteria

**American College of Radiology**

**ACR Appropriateness Criteria**

**Clinical Condition:** Blunt Chest Trauma — Suspected Aortic Injury

<table>
<thead>
<tr>
<th>Radiologic Procedure</th>
<th>Rating</th>
<th>Comments</th>
<th>RRL*</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTA chest with IV contrast</td>
<td>9</td>
<td>This is the diagnostic test of choice for suspected blunt aortic injury.</td>
<td>⭐⭐⭐⭐</td>
</tr>
<tr>
<td>X-ray chest</td>
<td>9</td>
<td>Radiographs are complementary to more definitive studies.</td>
<td>⭐</td>
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<tr>
<td>MRA chest without and with IV contrast</td>
<td>7</td>
<td>This procedure should be performed on patients with contraindication to CTA.</td>
<td>O</td>
</tr>
<tr>
<td>Aortography thoracic</td>
<td>6</td>
<td></td>
<td>⭐⭐⭐⭐</td>
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<tr>
<td>CT chest without IV contrast</td>
<td>5</td>
<td></td>
<td>⭐⭐⭐⭐</td>
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<tr>
<td>US echocardiography transesophageal</td>
<td>5</td>
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<td>O</td>
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<tr>
<td>MRA chest without IV contrast</td>
<td>5</td>
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**Rating Scale:** 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate

*Relative Radiation Level*
Imaging Cost

- CXR= $290 on average on United States
  - 5 CXR= $1,450
- CT Abdomen/Pelvis w/ contrast= $1,392
- Total imaging cost= $2,482
Take Home Points

• Blunt thoracic aortic injuries are most commonly caused by deceleration injuries.
• The isthmus is the most common site of injury.
• It is important to quickly recognize clinical signs of aortic injury in order to get appropriate imaging.
• Endovascular repair has an increased survival rate compared to open repair.
References


• Up to date
• Radiologyassistant.nl
• Radiopedia.org
Questions?