Traumatic Aortic Injury

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Diagnostic Radiology: RAD4001
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Clinical History

• 26 year old woman in MVC with no seatbelt.
  • Initially responsive to voice, but became unresponsive
  • Intubated for airway protection
  • Hypotensive 66/46, Tachycardic to 120s
  • BP and HR responsive to 2 units whole blood
  • Fast exam negative
  • Deformity of Right leg
  • L hemothorax- chest tube placed with output of 200 cc blood

• Unknown past medical history

• Initial workup- CXR, Abdominal XR, Right leg XRs, CT head without contrast, CT CAP with contrast, CT cervical spine without contrast
Chest X-Ray

- Chest X-Ray, AP supine, 1 view, 11/9/19 0800
- ET tube 1.3 cm above the carina
- Left hemothorax with chest tube in place
- Widened upper mediastinal silhouette

https://radiopaedia.org/cases/normal-trauma-series-x-rays?lang=us
CT Chest/Abdomen/Pelvis W/ Contrast

- Aortic Transection of proximal descending aorta
- Fractured Sternum
- Hemothorax

Axial

Sagittal
CT Chest/Abdomen/Pelvis W/ Contrast

- Pneumothorax
- Liver Laceration
Key Findings

• Major Trauma
• Hypotension
• **Aortic Transection** of proximal descending aorta not involving the left subclavian with mediastinal hematoma- Grade III (aortic transection with pseudoaneurysm)
• Left pleural hemorrhage- hemothorax with chest tube in place
• Small bilateral pneumothoraces
• Hepatic laceration without active extravasation
• Multiple skeletal injuries
Differential Diagnosis of Widened Mediastinum on CXR

- Traumatic Aortic Injury
  - Aortic Aneurysm or Dissection
- Vascular Anomalies
- Masses- lung or mediastinal
- Thymus
- Lymphadenopathy
- Technical factors- rotation, poor inspiration
Discussion

- In a patient in a major trauma, a widened mediastinum is extremely concerning for aortic injury, especially in the setting of hypotension.
- Injury can progress to free rupture which is almost always fatal.

Grading Blunt Aortic Injury
- Grade I: A- intimal tear B- intramural hematoma
- Grade II: intimal injury with periaortic hematoma
- Grade III: A- aortic transection with pseudoaneurysm B- multiple aortic injuries
- Grade IV: free rupture

Management
- Grade I can be managed conservatively with B-blockers for BP control and antiplatelets to prevent thrombus formation.
- Grade II should have repeat CTA within 48-72 hours to evaluate for need for repair.
- Grade III should be repaired urgently, but can be delayed if other injuries are more pressing.
- Grade IV should go straight to open surgery, but has a 100% mortality in some studies.
- For Grade II and higher, successful repair leads to better outcomes.\(^2\,^3\)
Discussion

• Repair
  • Open surgery or TEVAR (thoracic endovascular aortic repair)
  • TEVAR is limited by the anatomy of the location of the injury
    • Multiple injuries and injuries involving branches of the aorta may be better suited to open surgery
  • Recovery time from TEVAR compared to open surgery is much shorter
  • TEVAR is associated with repair mortality rates of 1.9 to 2.1%, compared with 5.7 to 11.7% with open repair (all cases, not just trauma) \(^7\)
  • Post TEVAR patient needs lifelong imaging follow up with CTA or MRA to look for leaks \(^5,7\)
Final Diagnosis

• Grade III Blunt Aortic Injury: Aortic transection of proximal descending aorta with pseudoaneurysm

• Hypotension/Shock
Treatment

- In the setting of hypotension with an aortic injury, the patient was taken emergently to the OR where she underwent TEVAR (thoracic endovascular aortic repair)
- Post-op imaging shows stent in place in descending aorta
- Patient still in STICU, however aortic injury stable
- Mortality for patients with blunt aortic injury is very high
  - 23% die before or during triage
  - Mortality for patients who underwent TEVAR due to blunt aortic injury was 18%\(^4\)
- Further Work up
  - Treat other injuries
    - Patient also underwent multiple surgeries for skeletal injuries (C2 fracture, femur fracture, radial fracture)
    - Liver Laceration not actively bleeding
In this major trauma case, CXR and CT chest with contrast were very appropriate studies.
## Cost

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Total Cost</th>
<th>Cost to Insured Patient</th>
<th>Cost to Uninsured Patient</th>
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<tbody>
<tr>
<td>CXR, 1 view</td>
<td>$683</td>
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<tr>
<td>CT Chest w/ contrast</td>
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<td>TEVAR</td>
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https://www.memorialhermann.org/patients-caregivers/pricing-estimates-and-information/
Take Home Points

• Trauma with widened mediastinum-suspect aortic injury

• Blunt aortic injury has very high mortality rates that improve with successful repair

• TEVAR leads to better mortality outcomes and shorter recovery time when compared with open surgery
References

1. https://radiopaedia.org/


5. https://acsearch.acr.org/


Questions?