Blunt and Penetrating Injuries to the Aorta and Lungs
Terrance T. Healey, MD

Objectives

1. To define traumatic aortic injury and review its mechanism
2. To describe the radiographic and CT features of traumatic aortic injury
3. To define pulmonary contusion and laceration using representative cases of both blunt and penetrating injuries

Traumatic Aortic Injury (TAI)

- Disruption or partial tear of the aortic wall
- Synonyms
  - Acute traumatic aortic injury (ATAI)
  - Blunt traumatic aortic rupture (BTAR)
  - Blunt aortic trauma (BAT)
  - Blunt aortic injury (BAI)

Etiology

- Usually blunt trauma
  - MVC
- MCC
Clinical

No specific sign or symptom

Chesn pain & dyspnea most common

Prognosis

- 80-90% dead on arrival
- 50% mortality if untreated in 24 hrs
- Cause of death in 20% high speed MVC

Mechanism of TAI

- Rapid deceleration
- Shearing forces
- Aortic root
- Lig arteriosum
- Diaphragm

Mechanism of TAI

- Osseous pinch
- Chest wall & Spine

Mechanism of TAI

- “Water hammer effect”
- rapid in pressure during compression

Mechanism of TAI

- Probably multi-factorial
- shearing, stretching, twisting & hydrostatic
**Imaging features of TAI**

1. CXR
2. CT

**AP Supine CXR**
- Wide superior mediastinum
  - >8cm or >25% of transthoracic diameter
- Abnormal contour of aortic arch
- AP window obscured
- Left apical cap
- Rightward shift of trachea, ETT, NGT
- Wide paravertebral/paratracheal stripe
- 7% are normal

**CT**
- 98 - 100% sensitivity
- What protocol should be used?

**CT I+**
- Periaortic hemorrhage/contrast extravasation
- Mediastinal hematoma
- Pseudoaneurysm
- Contour abnormality, irregularity
- Intimal flap

**CT TAI**

Location
- 90% Aortic isthmus
- 8% Ascending aorta
- 2% Distal descending aorta

**Treatment**
- Isolated intimal injury may resolve “minimal aortic injury”
- Endovascular stent graft
  - technical success up to 100%
- Surgical interposition graft
  - 70-85% survival up to 20% surgical mortality
**Pedestrian vs Truck**

- 66 yo female MVC
- Disruption ↑
- Dilated Aorta
- Hemorrhage ↓

**Ascending Aorta**

- 66 yo female MVC
- Tamponade → OR
- Low porosity graft

**AP supine**

- 59 M MVC
- Fractures
- Diaphragm rupture
- Wide superior mediastinum
- Abnormal contour of arch
- AP window obscured
- Left apical cap
- Rightward shift of trachea

**Isthmus Disruption**

- 59 M MVC

**Post Treatment**

- 59 M MVC
- Stent graft
AP Supine

24 M head on MVC

Wide superior mediastinum
Abnormal contour of arch
AP window obscured
Left apical cap
Rightward shift of trachea

TAI

24 M head on MVC
Intimal flap
Endovascular stent

Problem Solving

CT I+ ECG-Gated Angiogram

Penetrating TAI

Stab wound
Fever
WBC
?Empyema
US guided CT

Penetrating TAI

VIR
Biopsy of lumbar vertebral body with coaxial 18g / 14g that inadvertently went into aorta. Patient was asymptomatic & did fine.

35 YO F S/P SPINAL FUSION

Unfortunately this would be most common finding

Pulmonary Trauma

- Pulmonary contusion – damage to interstitium and alveoli with edema and hemorrhage
  - Spectrum GGO → consolidation
  - Ventilatory support
- Pulmonary laceration - shearing forces
- Tracheobronchial laceration - disruption of the trachea or bronchi
  - 30% mortality
  - Prompt surgical repair
Take home points

1. Traumatic Aortic Injury fatal in majority of cases
2. Patients that make it to the hospital should be diagnosed promptly
3. Findings of TAI on CXR and CT have been well described
4. Use cardiac gating & angiography for problem solving
5. CT is modality of choice in detecting traumatic lung/airway injuries
References

Rosado-de-Christenson et al: Diagnostic Imaging Chest. Salt Lake City, Utah; Amirsys, 2012


