Big Red: Abdominal Aortic Aneurysm versus Aortic Dissection

Dr. Benjamin Strauss
Dr. Matt Davis
19 September 2014
Aortic Emergencies
Objectives

• Upon completion of this presentation on AAAs and Aortic Dissections, you should be able to:
  • Identify the associated risk factors and prevalence
  • Describe the related pathophysiology
  • Describe similarities and differences in clinical presentations
  • Describe potential complications
  • Demonstrate appropriate principles of prehospital management of patients with these conditions.
Aortic Emergencies

Objectives

- Understand the differences in presentation between aortic dissection and MI and appreciate the potential difficulty in differentiating between them.
Case 1

- 67 year old male
- Sudden onset severe lower back and right flank pain
- Nausea, vomiting, lightheadedness
- Medical History – coronary artery disease, longstanding smoker.
Case 1
Paramedic Assessment

- Elderly male in significant distress, diaphoretic, tachypneic
- Vitals: HR 135, BP 101/52, R 30, afebrile, SpO2 94% RA
- Neuro: Agitated, confused, GCS 14.
- Chest: AE bilaterally, faint wheeze
- Abdomen: Moderate diffuse tenderness, pulsatile mass above umbilicus
- Skin: Bruising to R flank area
Case 1

• Differential Diagnosis?
Abdominal Aortic Aneurysm (AAA)

- Abnormal dilation of the aorta in the abdomen greater than 50% of normal
  - Defined as greater than 3 cm diameter
- Exist in between 4–9% of the population in developed countries
- Approximately 12 000 – 15 000 rupture annually in the USA
- Incidence of rupture decreasing due to surveillance and elective repair
AAA
Risk Factors

• Smoking
• Male
• Age > 60
• Caucasian Race
• History of Atherlosclerosis
  • Coronary disease, stroke, peripheral vascular disease
• Family History
AAA Pathophysiology

• Altered artery wall biology over time
  • Inflammation leading to decreased strength, elasticity, atherosclerotic damage.

• Increased pressures

• Growth by 2–4 mm per year

• Risk of rupture increases with size, or with a rapid increase in size
Ruptured AAA Symptoms

- Sudden-onset pain is the most common clinical manifestation
  - Abdomen, back, flank, even groin/thigh
- Nausea, vomiting, presyncope also common
- Only 20–30% have known AAA!
- Hypotension
  - Depends initially on where rupture is located
Ruptured AAA

Other findings

• Lower Limb ischemia
  • Pain, pallor, lack of pulses, cool extremity
• GI Bleed
  • Aortoenteric fistula
    • Occurs with previously repaired AAA
Case 2

- 72 year old male with sudden onset chest pain, sharp in quality
- Moderate SOB
- Left-sided weakness

- Medical History: Hypertension, poorly controlled despite medication
Case 2
Paramedic Assessment

• Elderly male in severe discomfort, apparent SOB.
• Vitals: HR 72, BP 192/105, RR 28, SpO2 95% on RA, afebrile
• Chest: Air entry bilaterally
• Abdomen: Soft, nontender
• Neurologic: GCS 15, moderate L sided weakness
Case 2

- Differential Diagnosis?
Aortic Dissection

- Caused by a tear in the intima (innermost layer) of the aorta leading to accumulation of blood within wall of aorta
- 2.6–3.5 occurrences per 100,000 person-years
- Can represent a diagnostic challenge
  - Treatment for other causes of chest pain may worsen a dissection!
Aortic Dissection
Risk Factors

• Hypertension
• Atherosclerosis
• Congenital anomalies, Marfan Syndrome
• Stimulant abuse
• Recent cardiac surgery, catheterization
Aortic Dissection
Clinical Manifestations

- Chest pain (tearing in quality), radiating through to the back, maximal at onset
  - Back pain, abdominal pain more prominent with descending aorta involvement
- Stroke Symptoms if carotid arteries involved
- Symptoms of cardiac ischemia if coronary arteries involved
Aortic Dissection
Exam Findings

• Hypertension
  • However, patients can potentially present with shock if rupture extends into pericardial space (cardiac tamponade) or exsanguination into thoracic cavity

• BP difference between arms > 20 mmHg.
  • Might have falsely low BP in one arm
  • Check both arms!

• Heart murmur (diastolic) if dissection extends into aortic valve

• Neurologic findings
Aortic Dissection
ECG Findings

• Inferior ischemic changes (II, III, aVF)
  • Due to occlusion of right coronary artery
  • ST elevation, depression, T wave inversions.

• Signs of tamponade
  • Electrical alternans
  • Low voltage ECG
<table>
<thead>
<tr>
<th></th>
<th>Ruptured AAA</th>
<th>Aortic Dissection</th>
<th>MI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pain</strong></td>
<td>Abdominal, lower back, flank, groin</td>
<td>Chest through to back, lower back if type B dissection, tearing in quality</td>
<td>Chest pressure, tightness, radiation to arms, jaw</td>
</tr>
<tr>
<td><strong>Hemodynamics</strong></td>
<td>Hypotension</td>
<td>Hypertension, potentially hypotension</td>
<td>Hypertension or Hypotension</td>
</tr>
<tr>
<td><strong>Physical exam findings</strong></td>
<td>Bruises to flank, acute abdomen, pulsatile mass</td>
<td>BP difference between both arms</td>
<td>Potentially acute CHF – crackles</td>
</tr>
<tr>
<td><strong>Neurologic Findings</strong></td>
<td>Unlikely unless hypotensive</td>
<td>Potentially present</td>
<td>Unlikely unless severely hypotensive</td>
</tr>
<tr>
<td><strong>Potential ECG findings</strong></td>
<td>Sinus tachycardia</td>
<td>Inferior ischemia, electrical alternans</td>
<td>ST changes, T wave changes</td>
</tr>
</tbody>
</table>
EMS Management of Aortic Emergencies

• Both ruptured AAA and aortic dissection are life-threatening conditions that require prompt surgical assessment/management

• Pre-hospital management should be guided towards initiating resuscitation of patient and rapid transport to definitive care
12-Lead ECG

- Any patient with chest pain should get 12-lead ECG
- Though an aortic dissection might cause an inferior pattern of ischemia on ECG, important to still think STEMI and involve interventional cardiologist
- If electrical alternans is present, think tamponade and be concerned about potential hemodynamic collapse
Hypotensive patients with presumed aortic event

• Consider source of hypotension/shock
  • If ruptured AAA
    • Shock is hypovolemic, treatment is fluids
  • If aortic dissection
    • Shock is secondary to right coronary occlusion and resulting MI – pump failure
      • Fluids might help with a stiff heart
    • Shock is secondary to rupture into pericardial space (cardiac tamponade)
      • Fluids will help overcome constriction around heart
    • Shock is secondary to rupture into thoracic cavity
      • Similar to hypovolemia, treatments is fluids

• Bottom line – Give fluids!
Consider *0.9% NaCl fluid bolus*:

<table>
<thead>
<tr>
<th>Age</th>
<th>Route</th>
<th>Age</th>
<th>Route</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;12 years</td>
<td>IV / IO</td>
<td>≥12 years</td>
<td>IV / IO / CVAD</td>
</tr>
<tr>
<td>Infusion</td>
<td>20 ml/kg</td>
<td>Infusion</td>
<td>20 ml/kg</td>
</tr>
<tr>
<td>Infusion interval</td>
<td>Immediate</td>
<td>Infusion interval</td>
<td>Immediate</td>
</tr>
<tr>
<td>Reassess every</td>
<td>100 ml</td>
<td>Reassess every</td>
<td>250 ml</td>
</tr>
<tr>
<td>Max. volume*</td>
<td>20 ml/kg up to 2,000 ml</td>
<td>Max. volume*</td>
<td>2,000 ml</td>
</tr>
</tbody>
</table>

*The maximal volume of NaCl is lower for patients in cardiogenic shock.*

Consider **IO access**
What happens once the patient arrives in the ED

- Diagnostic workup
  - Chest X-Ray
  - Point of Care Ultrasound, CT
- Continuation of fluid resuscitation.
- Administration of blood products
- For aortic dissection
  - Lowering of BP with pharmacologic agents
  - If suspected cardiac tamponade, pericardiocentesis might be attempted.
- Call the Surgeons!
Cardiac arrest in aortic emergencies

• Can occur in these patients for same reasons why they went into shock
• Treat as per medical cardiac arrest protocol
  • Most likely rhythm will be PEA
  • Epinephrine may still be used
  • Unlikely to need defib/amiodarone/lidocaine as VT/VF is an uncommon rhythm in these patients
• Airway management as per ACP/PCP abilities
• If a patient with either AAA or dissection arrests, mortality approaches 100%
Conclusion

• Aortic Emergencies are rare but life-threatening events
• Survival and good outcomes are dependent on prompt evaluation by a surgical specialist
• Prehospital care focuses on stabilization and rapid transport to hospital
Thank You!!

- Questions/Comments?