Recognition and Management of Thoracoabdominal Aortic Dissection/Aneurysms

Objectives:

The participant will:

1. Gain understanding of the anatomy and physiology of the Aorta
2. Learn assessment parameters to aid in emergent diagnosis of thoracic and abdominal aortic aneurysms
3. Learn medical and surgical management tools used to treat TAAA
4. Gain understanding regarding transport considerations

Fact!

- Aortic dissection is the most common catastrophe of the aorta, 2-3 times more common than rupture of the abdominal aorta.
- When left untreated, about 33% of patients die within the first 24 hours, and 50% die within 48 hours.
- The 2-week mortality rate approaches 75% in patients with undiagnosed ascending aortic dissection.

Statistics:

- In the United States, aortic dissection is an uncommon disease.
- Evidence of aortic dissection is found in 1-3% of all autopsies (1 in 350 cadavers).
- The incidence of aortic dissection is estimated to be 5-30 cases per 1 million people per year.
- Aortic dissection is more common in African Americans than in whites, and is less common in Asians than in whites.
- More common in males than females, with a male-to-female ratio of 2-3:1.
- Approximately 75% of dissections occur in those aged 40-70 years, with a peak in the range of 50-65 years.
Case Study

A 41 year old male calls EMS from home

- Working at his computer all afternoon
- Feels sudden tearing/excruciating pain between his shoulder blades
- Also complains of weakness/dizziness
- “Impending sense of doom”

EMS Responds

- Find conscious in his chair
- Rapid/bounding pulse
- Diaphoretic
- 10 on 1-10 pain
- Pale skin
- No palpable radial pulse on L Arm
- No pedal pulses

Objective Data:
- BP: 210/130 (R); Can’t auscultate on Left
- HR: 95 (SR with few PVC’s)
- BG: 130
- SPO2: 94% on room-air
- RR: 24 slightly labored
- Temp: 37 C/98.6 F

ECG

What do you think so far?
Anatomy and Physiology

Structure:
- Comprised of three layers (Intima, Media, Adventitia)
- Changes diameter in response to volume/pressure changes
- Originates at aortic valve root and terminates in the iliac arteries

Function:
- Supplies blood to the entire body (head, extremities, visceral organs, spine)
- Aids in regulating hemodynamics

The Aorta

Definitions

Aneurysm:
Localized dilation of a blood vessel, particularly the aorta or a peripheral artery

Dissection:
A tear in the aortic intima, through which blood surges into the aortic wall, stripping the media from the adventitia.
Rupture

• The point all layers of the Aorta become compromised

• Blood exits the path of least resistance and begins to enter the chest and/or abdominal cavity

• This is UGLY!!

Lucille Ball – A dead statistic!
Died of ruptured AAA

Other famous dead statistics

• Conway Twitty
• John Ritter
• Albert Einstein (Actually lived through his surgery – DeBakey)
• Mr. David Vartanian – Titanic survivor – 22 years old – died 74 years later from a ruptured AAA
**Aortic Dissection**

- Most common site: ascending aorta
- Associated with Marfan’s syndrome, syphilis, autoimmune diseases
- S/S: severe pain, originating in the back or substernal region
  - Ripping or tearing
- CXR findings:
  - Mediastinal widening
  - Extension of the aortic shadow beyond the calcified aortic wall
  - Localized bulge on aortic arch
  - Tracheal deviation
  - Left pleural effusion

**Aortic Dissections**

- Type I = WORST, occurs in the ascending aorta and extends distally beyond the aortic arch
- Type II = limited to the ascending aorta (Marfan’s Syndrome)
- Type III = dissection distal to the origin of the LSC artery and extends distally to the abdominal aorta (MOST SALVAGEABLE)
Aortic Disease

- Hypertension
- Marfan’s Syndrome
- Trauma (Penetrating or Blunt)
- Genetic pre-disposition
- Calcification of the arteries

Assessment

- Rule out more likely cardiovascular illness (AMI, CVA)
- ABC
- Head to toe exam
- SAMPLE
- OPQRST

Specific Assessments for aneurysms:
- Pulses on all 4 extremities
- Blood pressure on both arms
- Evaluate risk factors, past history, and present illness

Meanwhile back at the ranch!

- Urgent Patient!!
- Differential Diagnosis is Aortic Aneurysm
- Crew is highly motivated to get the patient to someone else!

Priorities:
- ABC
- A: Open/Patent
- B: Oxygen
- C: BP management!
- Pain Management
- Transport
They Call a Helicopter!

More to come soon!!

Pre-Hospital Medical Management Priorities

- Perform thorough assessment!!
- Control pain
- Control blood pressure
- Facility selection is IMPERATIVE!

Management of Aortic Dissections:

Lower SBP to 100 – 120 mmHg

- Beta-blockers to slow the heart rate and decrease ejection fraction
  - Labetalol
  - Esmolol
  - Propranolol
  - May use CCB’s if the patient is allergic to Beta Blockers
- Nipride Infusion
  - 0.2 mg/glycan
  - BETTER BLOCKERS BEFORE NIPRIDE!!!
- Pain analgesia

Common Medications

- Beta-Blockers (Esmolol, Labetalol, Metoprolol)
- Calcium Channel Blockers (Nicardipine)
- Narcotics (Morphine, Fentanyl)
- Nitrates (Use caution - can actually dilate the aorta even further at higher doses – Nipride can cause spinal cord ischemia)
Blood Pressure Parameters

- Generally in the presence of acute dissection BP needs to be LOW

- Aim for SBP: 100 – 120 mmHg

- Target Heart Rate: 60 - 80 BPM

- MAP of 60 = Core organ perfusion

- MAP: Systolic + 2(Diastolic) ÷ 3
  - BP: 120/80 = MAP of 93

Why are Beta-Blockers so important?

- Anti-Impulse Therapy ¹

- Limit incidents of further impulse force along the aortic wall.

- Compares to “Water Hammer”

- Decrease automaticity, decrease contractile force, decrease rate

- Labetalol 10-40 mg Slow IVP – Common Pre-hospital

- Watch out: Active wheezes, severe CHF, bradycardia, hypotension

Pain Control

Narcotics:

- Decrease pain by blunting pain receptors

- Decreases catecholamine release

- Morphine and Fentanyl

- Monitor BP, RR, Pulse, GCS.

OK... so now that we know how to take care of them...

Where do we transport and how?
### Air Vs. Ground Transport

#### Air:
- **Benefit**
  - High level of clinical excellence
  - Rapid transport
  - Maintain more appropriate formulary for this population

#### Ground:
- **Benefit**
  - More comfortable environment to work
  - Less expensive
  - Fewer risks in transport (debatable)

### Transport Considerations

#### Air vs. Ground

**Air:**
- **The Negative**
  - Dependant on good weather conditions
  - Very expensive
  - Considered risky mode of transport
  - Available LZ

**Ground:**
- **The Negative**
  - Road traffic
  - Unfamiliarity with select specialties at local hospitals
  - Delays will negatively impact the patient!!

### Case Study (cont.)

- Transport is completed by helicopter
- Nipride and Esmolol drips are initiated in flight
- Morphine boluses administered for pain
- Hemodynamics aimed at SBP < 120 with MAP as close to 60 as possible

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Case Study Continued

- Transferred to Emergency Department
- Immediately sent for CT scan
- GCS: 15
- BP: 130/70 (right arm) on drips
- Becomes suddenly pain free - “Ominous”

C.T. Image

Off to the O.R. we go!

Now that’s one heck of a flat screen!!

Surgical Management

- Surgical Management:
  Greater than 5 cm with s/s of rupture = emergent operation
- Type A – Aortic Root to L SCL = emergent
- Type B – Distal to the left subclavian -delayed for aortic healing unless rupturing
- Depending on location surgery may be delayed for two weeks
Case Study Continued...

- Recovers in CVICU
- In acute renal failure
- Continuous 24 hour Hemodialysis initiated
- IV BP medications continued to maintain graft patency

Recovery

- Four days in CVICU
- Five days on telemetry floor
- Kidney failure COMPLETELY resolved
- No neurological deficits
- Healthy gut function
- DISCHARGED HOME

So what can YOU do to increase survival?

- Keen assessment skills
- Obtain complete past medical/surgical history
- Early facility notification
- Pain control
- Effective blood pressure management
- Delicate transfer/transport

Summary

- Life-threatening Thoracic and Aortic aneurysms are VERY survivable if managed before rupture!
- Transport to an appropriate center is imperative!
- The job YOU do will have a DIRECT impact on the patient’s final outcome