Acute Aortic Dissection: Essential Points for the Cardiologist

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Aortic Dissection
Untreated Natural History (IRAD)

Mortality of 1-2%/hour for 48hrs

80% are dead within 48 hours

More than 90% dead at 1 year.

20% In-hospital mortality in patients who make it to surgery
Five Causes of Type A Dissection Death

1. Pericardial Tamponade
   a. Rupture
   b. Aortic “Sweating”

2. Congestive Heart Failure
   a. Acute Aortic Insufficiency
   b. Coronary Impingement

3. Stroke
   a. Arch Dissection into Carotid Artery
   b. Embolus of False Lumen Clot

4. Myocardial Infarction
   a. Coronary ostial dissection
   b. Generally RCA. LMCA doesn’t make it hospital alive

5. Malperfusion Syndrome of the Visceral Vessels
Risk Factors for Aortic Dissection

• Conditions Associated with Medial Degeneration
  – Marfan’s, Loes-Dietz, BAV, Familial Aneurysm, etc
    • 11-19% of patients with aneurysm or dissection have 1st degree
      relative with aneurysm or dissection

• Conditions that Increase Wall Stress
  – Hypertension
  – Pregnancy
  – Cocaine Use
  – Weight lifting
  – Smoking
Aortic Dissection Classification

Intimal Tear in Ascending Aorta

DeBakey Type I
Stanford Type A
SURGICAL EMERGENCY

DeBakey Type II

Intimal Tear in Descending Aorta

DeBakey Type III
Stanford Type B
MEDICAL MANAGEMENT
Path of Blood in Dissection

• Tear in intima at “entry point”
  – Media is split along direction of flow
  – This split creates a false channel
  – Spirals around thoracoabdominal aorta

• Pressure/Mechanical Stress on branch vessels
  – Branch can tear leading to flow from false lumen
    • These small tears can cause fenestrations
  – Branch can close off, creating malperfusion
What is meant by “Perfused by False Lumen?”
CTA has 99% Sensitivity and Specificity
Who Does Poorly?

• Patients Over 80 years-old

• Patients Presenting in Shock

• Patients Presenting with Neuologic Deficit
  – 50% mortality with pre-op coma

• Patients who present late after onset
  – 47% of patients incorrectly diagnosed in first 48hrs
Diagnosis

• Start with high index of suspicion

• Screening tests include ECG and CXR
  – ECG may reveal inferior changes c/w RCA issues
  – CXR may reveal:
    • widened mediastinum
    • Enlarged cardiac silhouette

• CTA with contrast

• TEE if Necessary
  – Often can be done in OR to confirm diagnosis
Clinical Presentation

• PAIN
  – Media has a high concentration of nerve fibers
  – Ripping, tearing, migratory pain is the rule
  – The more atherosclerosis in media, the less pain
  – Pain becomes dull when the dissection is complete
  – Flank Pain may imply kidney malperfusion

• Neurologic Deficit
  – Implies Arch Dissection

• Shock (Tamponade vs. Coronary Dissection)
  – Poorly perfused extremities
  – Venous hypertension
  – Sweaty, clammy appearance

• Pulseless Extremity
Physical Examination

• Listen to the heart
  – Muffled heart sounds
  – Loud diastolic murmur

• Compare pulses in each arm

• Need to document a pulse exam in all extremities

• Need to document a thorough neurologic exam
Pre-Operative Management

1. Pre-Op Cath is Contra-Indicated!
   a. CT Imaging may allow for necessary coronary info
   b. Major problem with Cath before Diagnosis
      • Lytics, Antiplatelet agents, etc
      • Instrumentation of dissected aorta can be catastrophic

2. Reduce dP/dT
   Nipride or Esmolol, NOT NTG

1. Definitive Operative Correction After Diagnosis
   No Role in Pre-op Stabilization
Operative Indications

• Any Presence of Ascending Aortic Involvement
  – IMH and Type A Dissection are synonymous

• Type B Dissection
  – Failure of medical management to control HTN
  – Malperfusion syndrome
  – Aortic Rupture
  – Aneurysm formation
  – Patients with connective tissue disorders

• Treatment of Choice for Complicated Type B is Endograft, Not open surgery
Requirements for a Successful Repair

1. Reconstructed or Replaced Root

2. A well functioning Aortic Valve

3. A completely Replaced Ascending Aorta

4. A completely or partially replaced arch

5. A Chronic type B Dissection
Post-Operative Care

• No sedation until the patient wakes up

• Serial Lactate, LFTs, Amylase/Lipase

• PT/PTT, CBC
  — Consumption of platelets and factors as false lumen clots

• CK levels to assess for rhabdomyolysis
Long-Term Follow Up

• Need to Follow for Development of TAAA
  – Patent false lumen predicts aneurysm development
  – CT Scan/MRI at 6 months, then yearly

• Echo every six months

• Losartan for Marfan’s patients
How Can You, As Cardiologists, Prevent Aortic Dissection
Lifestyle Modifications

- Encourage Cardiovascular Exercise
- Discourage Weight Lifting with Straight Bar
- Stress Management
- Avoid stimulant drugs/medications

- Aggressive Blood Pressure Control
  - No data supporting B-blockers in prevention of dissection
  - Losartan for Marfan Patients (50-100mg/day)

- Weight Reduction
- Smoking Cessation
  - Increased risk of dissection, twice the rate of growth
- Aggressive Monitoring if patient becomes pregnant
Surveillance Imaging

• The patient has an aneurysm <5cm
  – CT Scan or MRA each year
    • If no growth for 3 consecutive years, than every two yrs
    • If significant growth (0.5cm) than every six months
  – Echocardiogram every 6 months

• The patient has an aneurysm ≥5cm
  – CT Scan or MRA every six months
  – Echo every six months
Misdiagnosis (6/9/17)

• 33 year-old male with chest pain and altered mental status

• 12 hour delay in diagnosis at outside ED

• Differential was:
  – EtOH toxicity (blood alcohol was zero)
  – Drug overdose (TOX Screen negative)
  – Acute Stroke (two head CT 12 hours apart negative)

• Patient was transferred in coma
Trip to the Cath Lab

• 81 year-old with history of CABG

• Acute onset of chest and back pain
  – Loaded with 600mg Plavix and taken to cath lab
  – OM graft was found occluded but no ECG changes
  – Long period of attempted PCI

• Aortogram concerning during PCI
• CT ordered
Delay in Diagnosis

• 82 year-old female with four days of nausea, anorexia, chest pain

• No past medical history

• Six consultants saw patient

• 36 hours before Chest CT Scan ordered
Complete Treatment of Thoracic Aorta
Aortic Root Surgery in the United States: a Report from the STS Database.

- **OBJECTIVE:**
  The purpose of the present study was to evaluate the early clinical outcomes of aortic root surgery in the United States.

- **METHODS:**
  The Society of Thoracic Surgeons database was queried to identify all patients who had undergone aortic root replacement from 2004 to early 2010 (n = 13,743). The median age was 58 years (range, 18-96); 3961 were women (29%) and 12,059 were white (88%). The different procedures included placement of a mechanical valve conduit (n = 4718, 34%), stented pericardial (n = 879, 6.4%) or porcine (n = 478, 3.5%) bioprosthesis, stentless root (n = 4309, 31%), homograft (n = 498, 3.6%), and valve sparing root replacement (n = 1918, 14%).

- **RESULTS:**
  The median number of aortic root surgeries per site was 2, and only 5% of sites performed >16 aortic root surgeries annually. An increased trend to use biostented (porcine or pericardial) valves during the study period (7% in 2004 vs 14% in 2009). The operative (raw) mortality was greater among the patients with aortic stenosis (6.2%) who had undergone aortic root replacement, independent of age. Mortality was greater in patients who had undergone concomitant valve or coronary artery bypass grafting or valve surgery (21%). The lowest operative mortality was observed in patients who had undergone aortic valve sparing procedures (1.9%).

- **CONCLUSIONS:**
  Most cardiac centers performed aortic root surgery in small volumes. The unadjusted operative mortality was greater for patients >80 years old and those with aortic stenosis, regardless of age. **Valve sparing root surgery was associated with the lowest mortality.** A trend was seen toward an increased use of stented tissue valves from 2004 to 2009.
Personal Experience

- **132 Consecutive Patients with No Hospital Mortality**
  - STS Database: 16-20% operative mortality

- **102 Consecutive Patients with No stroke**
  - STS Database: 5-8% Stroke rate

Average ICU Stay: 2.6 days
Average Hospital Stay: 7.8 days
No exogenous blood or products in 76% patients
Conclusions

• Ascending Aortic Dissection is Still a surgical emergency

• 20% in-hospital mortality...for those who arrive alive
  – Can be prevented with aggressive cardiology surveillance
  – Death may be mitigated in aortic centers of excellence
  – Largest contributor to death is delay in diagnosis

• Goal is a live human being
  – We have new technologies for addressing root and arch
  – Survival at MSH for type A Dissection >95%