Thoracic Aortic Dissection

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June 16. 2011
History

- 65 yo female c/o chest pain radiating to the back, 1 hr prior to presentation to the ED associated with nausea, diaphoresis, & numbness to R arm

- PMH: HTN, hypercholesterolemia

- PSH/ FHx: denies

- SocHx: 20 pk-yr smoker; 6pk/day beer; no IVDU

- Meds: crestor, procardia, ASA
Physical Examination

- VS 96.3º 97/81 83 20 99%
- Gen: mild distress
- Cv: nl S1 S2, RRR, no m/r/g
- Chest: CTAB/L
- Abd: soft, nontender, nondistended, +BS
- Ext: R arm cool distal to mid-arm, no pulse brachial/radial, no motor/sensation @hand, cap refill sluggish
### Aortic Dissection

#### Laboratory work-up

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Further work-up

- EKG: nsr @84bpm, LBBB, V1-3 STE, ST depression V5-6

- Cardiac consult: NSTEMI, r/o ACS, med tele & echo in AM; consider R/O aortic dissection

- CTA chest & abdomen
Chest X-ray
CTA chest/abdomen

Impression – Type I Aortic Dissection
CTA 3D Reconstruction
Surgical Intervention

- Median Sternotomy – ascending aorta repair w/transposition graft
- Ex-lap – retroperitoneal bleed
- Distal EIA/CFA repair w/endarterectomy & 1° closure

Total OR time: 11:45
- CPB 2:54
- X-clamp 1:31
- Circ arrest 0:25

Intra-op Resuscitation
- 9L crystalloid
- 5U FFP/8U PRBC/2U plt
- 2U cryo/3000U Factor VII
Aortic Dissection

Schematic

Aortic Dissection and Surgical Repair

TYPE I DISSECTION EXTENDS, CREATING A FALSE LUMEN

FALSE LUMEN OF DISSECTION CAN DISRUPT FLOW TO GREAT VESSELS

DACRON AORTIC GRAFT
Post-op Course

- POD#1-2 – post-op biphasic PTA/DPA/pop signals; mal htn
- POD#3 – febrile; started on Zosyn/vanco
- POD#4 – abdominal washout & closure
- POD#5-7 – thrombus LIJ to LSC; started on anti-coagulation
- POD#8-10 – lasix drip
- POD# 11 – extubated
- POD#16 – transferred to acute rehab
Aortic Dissection
Stanford & DeBakey Classification

- **Type A**
  - Ascending Ao

- **Type B**
  - Do not involve ascending Ao

- **Type I**
  - Ascending Ao into descending Ao

- **Type II**
  - Ascending Ao

- **Type III**
  - Descending Ao
Symptoms

- Stabbing, ripping, or searing chest pain, radiating front to back, centered between scapulas
- Syncope
- Stroke
- Seizure
- Myocardial infarction
- CHF
- Acute paraplegia
Mortality

1st 48 hrs:
- 1% per HOUR

2 Days:
- 50%

2 Weeks:
- 75%

1 Year:
- 90%

Tsai TT et al. *Eur J Vasc Endosurg.* 2009
International Registry of Aortic Dissection (IRAD)
Perspectives from the IRAD

- **Type A Survivability**
- Surgery ($p<0.009$)
  - 1-yr: 96.1% ± 2.4%
  - 3-yr: 90.5% ± 3.9%
- Medical
  - 1-yr: 88.6% ± 12.2%
  - 3-yr: 68.7% ± 19.8%

Tsai TT et al. *Eur J Vasc Endosurg.* 2009

Aortic Dissection

www.downstatesurgery.org
Perspectives from the IRAD

- **Type B Survivability**
  - Medical (p=0.61)
    - 77.6% ± 6.6%
  - Surgical
    - 82.8% ± 18.9%
  - Endovascular
    - 76.2% ± 25.2%

Tsai TT et al. *Eur J Vasc Endosurg.* 2009
Evaluation in acute setting

- CT chest/abdomen/pelvis
  - Thin-slice, contrast-enhanced CT scan
  - Arterial-phase & delayed venous-phase

- TEE
  - If Hx of life-threatening contrast allergy
  - If not HD stable for CT or CT is equivocal

- Cardiac cath
  - HD stable w/no sig pericardial effusion
  - + PMH CAD or previous CABG
CTA images
To Operate or Not to Operate?

➢ To Operate:
  ➢ DeBakey 1 & 2
  ➢ Stanford A
  ➢ Active flow in false lumen

➢ Not to Operate:
  ➢ Extremely elderly or frail
  ➢ Acute stroke secondary to acute dissection
  ➢ Multiple comorbidities
  ➢ Previous cardiac surgery
Medical Management
Goals of Medical Management

- Halt PROGRESSION
- Prevent RUPTURE
Initial presurgical period

- ICU
- Intraarterial pressure monitoring
- Aggressive blood pressure management
  - SBP<120 & MAP<60
- Pain & Anxiety control
  - Leading causes of tachycardia & htn
- β-blockade
  - IV metoprolol, labetalaol or esmolol
- Wean to PO if definitive Tx is med’l in 2-5 days
Surgery

“Oh, stop fretting. It’s tricky, sure, but it’s not like landing an airplane on the Hudson River.”
Surgical Management

- Transfer to another facility w/expertise
- Surgical Treatment in emergent/urgent basis
- Extremely urgent
  - Significant hemodynamic compromise
  - Large pericardial effusion
  - Mod to severe AI
  - Ischemic EKG changes
  - Malperfusion syndromes

Tsai TT et al. *Eur J Vasc Endosurg.* 2009
Surgical Technique

- Median Sternotomy
- Cardiopulmonary bypass
  - Ascending aorta, axillary, or femoral
- Retrograde cardioplegia
  - Myocardial protection $<15^\circ C$
- Left Pulmonary Vein vent
  - Decrease ventricular distention
- Profound Hypothermia & circ arrest
Aortic Root: Valve Replacement

- Bentall Procedure: Composite Valve Graft
  - 1968 – Bentall & de Bono
  - 1970 – Edwards & Kerr
    - 7-25% pseudoaneurysm at coronary re-implantation
- Cabrol Technique (1981)
  - Side-to-side Coronary to Ascending Aorta
    - Kinking
- Button
  - End-to-side LCA to Asc Ao & button R to LCA
Aortic Dissection Repair

- Arterial cannulation
  - Central aortic, axillary vs femoral
- Resection of entire asc Ao & prox arch
  - Profound hypothermia
  - +/- complete circ arrest
- Aortic root & arch
  - Replacement as needed
  - +/- individual grafts to arch branches
“Frozen Elephant Trunk”

- Via open aorta
- Endograft deployed antegrade
  - Distal arch
  - Prox desc Ao
- Higher Incidence of false lumen obliteration
STOP!!

HE JUST SAID HIS FIRST WORD!

CIRCUMCISION NO LONGER RECOMMENDED

Stanford B & DeBakey 3
Complicated Dissection

- Suspicion or evidence of leak or rupture
- Visceral, renal, spinal, or peripheral malperfusion
- Significant aneurysmal dilation
- Hypertension despite aggressive pharmacologic Tx
- Persistent pain despite aggressive pain management
Open Surgical Management

- Left thoracotomy

- Femoral-femoral bypass
  - Entry site usually distal to subclavian art
  - Cross-clamp technique would be difficult

- Profound hypothermia & circ arrest

- Eliminate primary entry site & aneurysmal dilatation

- Repair large thoracic re-entry tears

- Sandwich true, intimal, & adventitial layers at distal anastomosis
Special Considerations

- **Goals:**
  - Cover primary entry site & Redirect flow into True lumen

- Covering L subclavian artery is necessary in most
  - L vertebral art, vertebral occlusive dz, previous CABG w/patent L IMA
  - Require L carotid to subclavian art bypass or transposition graft

- Origin of visceral, renal, & iliac vessels & if dissected
  - Intra-op angio + preop CT
  - Determine if distal reentry sites need to be covered or stented
Complications

- **Major Operative**
  - Bleeding at anastomotic site
  - Thromboembolism

- **Long Term**
  - Endocarditis
  - Thromboembolic Events
  - Pseudoaneurysm

- **Stroke & Encephalopathy**
Total arch repair vs hemiarch repair

- 188 patients with Type I aortic dissection
  - Hemiarch (n=144) vs Total arch replacement (n=44)
  - 47.5 months f/u
  - 5 yr mortality rate
    - Hemiarch: 83.2% 3.3% vs Total arch: 65.8% 8.3% (p=0.013)
  - 5 yr permanent-neurologic injury free survival
    - Hemiarch: 75.2% 4.0% vs Total arch: 43.1% 9.7% (p<0.001)

- Total arch repair was associated with greater morbidity & mortality compared with hemiarch repair

References

- Cameron JL. *Current Surgical Therapy*, 10th ed. 2010.