DISCLOSURES

- Speaker for Gore

STATEMENT OF IMPORTANCE

- Thoracic aortic disease is responsible for ~45,000 deaths per year
- Thoracic aortic dissection is the most common lethal catastrophe affecting the aorta
  - Death due to aortic dissection and rupture account for twice as many deaths as AAA rupture
- Early recognition, referral, and treatment is essential
  - Health outcomes
  - Quality of life
VESSEL LAYERS

Arteries are comprised of three layers:
- Adventitia
- Connective Tissue
- Media
- Smooth Muscle Fibers
- Intima
- Endothelial Lining

Vessel integrity depends on the continuity of these layers.

DEFINITION OF DISSECTION

- An injury or tear to the intima of the aorta
  - Disruption through the aortic media
  - Formation of a second channel with
    - Rupture or
    - Compromise of major aortic branches

EPIDEMIOLOGY OF DISSECTION

- 5 to 30 per 100,000 per year
- Race
  - More common in blacks than in whites
  - Less common in Asians than in whites
- Gender
  - Males > Females (3:1)
- Age
  - 75% in those aged 40-70
  - Peak in range of 50-65 yrs
IMAGES
- CT scan
- Autopsy specimen

TYPES OF DISSECTION
- STANFORD CLASSIFICATION

ACUTE VS CHRONIC
- Acute < 14 days
- Chronic > 14 days
RISK FACTORS
- Uncontrolled HTN
- Smoking
- Hyperlipidemia
- Atherosclerosis
- Cocaine
- Pregnancy
- Trauma
- Connective Tissue Disorders

CLINICAL PRESENTATION
- Severe back, chest, or abdominal pain
- Syncope
- Stroke
- Paralysis
- Lower extremity ischemia
- Most patients hypertensive

DIAGNOSTIC TESTS
- EKG
- CXR
- CTA – Gold standard
- TEE
- MRI
DISSECTION CLASSIFICATION

- **Complicated**
  - Presence of rupture / impending rupture, malperfusion / ischemia, refractory pain, uncontrollable hypertension, OR rapid aortic expansion.
  - Urgency of treatment is under debate

- **Uncomplicated**
  - Absence of rupture / impending rupture, malperfusion / ischemia, refractory pain, uncontrollable hypertension, AND rapid aortic expansion.

TYPE B DISSECTION CHARACTERISTICS

- **Primary Entry Tear (PET)**
  - Commonly 2-3 cm distal to LSA on outer curve of aorta

- **Secondary tears**
  - Often called re-entry tears or exit tears
  - Commonly occur at branch vessel origins
    - Intercostals
    - Renals
    - SMA
    - IMA
    - Iliacs

- **Extent of Dissection**
  - Dissection commonly extends retrograde from the PET up to the LSA
  - Dissection spirals slightly around aorta as it progresses distally
  - Distal extent of dissection could be at level of the visceral section of aorta, down to aortic bifurcation, or extend down into one or both of the iliac arteries.

COMPLICATIONS OF DISSECTION

- **Rupture**
- **Malperfusion**
  - Visceral (e.g., Renal, Celiac, SMA)
  - Lower Limb
  - Spinal Cord
- **Uncontrollable Hypertension**
- **Uncontrollable Pain**
- **Aneurysmal Degeneration of False Lumen**
MALPERFUSION

- Organ ischemia due to aortic branch stenosis or occlusion – from process of dissection
- Symptoms
  - Neurologic
  - Mesenteric
  - Renal
  - Extremities

MALPERFUSION

- Dynamic
  - Most common
  - Movement of dissection flap causing obstruction
- Static
  - Extension of dissection flap into distal vessel
  - Thrombosis or hypoperfusion
  - Unlikely to resolve with only restoration of aortic flow (i.e. with only TEVAR)

TREATMENT OPTIONS

- Medical Management
  - Beta blockers, antihypertensives, statins, etc.
- Open Surgical Repair
  - Open thoracotomy, bypass, and replacement of diseased aorta
  - Open fenestration
- Endovascular Intervention
  - Catheter based delivery of an endovascular stent graft(s)
  - Endovascular fenestration
MEDICAL MANAGEMENT

 Minimize aortic wall stress by:
  • Controlling heart rate: Administration of beta blockers in the absence of contraindications
    ○ Target of 60 bpm or less
  • Controlling blood pressure: If systolic BP > 120 mm Hg, administration of enzyme inhibitors and/or vasodilators
    ○ Consider end-organ perfusion

TREATMENT

 COMPLICATED TYPE B AORTIC DISSECTION
  • I.E. Malperfusion, aortic rupture, hypotension, shock, neurologic changes, hypertension not responding, early aortic dilation, propagation of dissection
  • Surgical consultation
  • EMERGENT TEVAR after initiation of anti-impulse therapy
  • Other options – endovascular fenestration, open fenestration, open aortic replacement
TREATMENT

- UNCOMPLICATED TYPE B AORTIC DISSECTION
  - Initiate medical treatment – B blockers, statins, monitoring, etc.
  - Surgical consultation
  - Consider TEVAR after 14 days in high risk patients

MEDICAL FOLLOW UP

- Regular CT / MR Imaging
  - 1, 3, 6, and 12 months post dissection
  - Annually, thereafter, if stable
  - Consider patient’s overall radiation exposure, if stable
- Lifestyle and/or employment restrictions are reasonable for patients with current or repaired dissections
  - Avoidance of strenuous lifting, pushing, or straining
HIGH RISK FEATURES

- Aortic diameter > 40 mm
- Patent false lumen with partial thrombosis
- False lumen greater than or equal to 22mm
- Single proximity entry tear > 10 mm
- Elliptical true lumen / saccular false lumen
- Rapid aortic growth > 4 mm/yr
- Chronic aneurysm diameter > 5.5 cm
- Refractory pain or HTN

It is suggested that those patients with high risk features despite being uncomplicated undergo TEVAR

TEVAR IN UNCOMPLICATED TYPE B DISSECTIONS

- ADSORB Trial Design and Results
  - Acute Type B dissection patients randomized to TEVAR + BMT (n=30) vs. BMT (n=31)
  - Assessed primary endpoint as:
    - Incomplete or no false lumen thrombosis
    - Aortic dilatation or rupture
  - At 1 year (test vs. control):
    - No aortic ruptures
    - Aortic dilatation: 37% vs. 45%, P = 0.5
    - No false lumen thrombosis: 50% vs. 100%, P < 0.001
    - Primary endpoint: 50% vs. 100%, P < 0.001
TEVAR IN UNCOMPLICATED TYPE B DISSECTIONS
- ADSORB Trial Conclusions
  - Uncomplicated Type B dissections can be safely treated
  - Aortic remodeling is induced by stent graft
  - Long term results are needed

INSTEAD TRIAL
- INSTEAD Trial Design and Results
  - Subacute Type B dissection patients randomized to TEVAR + BMT (n=72) vs. BMT (n=68)
  - At 2 years (test vs. control):
    - TEVAR exhibited significantly greater true lumen recovery with thoracic false lumen thrombosis (91.3% vs. 19.4%, P < 0.001)
    - No improvement in aorta-related survival
  - At 5 years (test vs. control):
    - All cause mortality: 11.1% vs. 19.3%, P = 0.13
    - Aorta-related mortality: 6.9% vs. 19.3%, P = 0.045
    - Disease progression: 27.0% vs. 46.1%, P = 0.04

INSTEAD TRIAL
- INSTEAD Trial Conclusions
  - TEVAR + BMT is associated with:
    - Improved 5-year aorta-specific survival
    - Delayed disease progression
    - Aortic remodeling is induced by stent graft
    - Long term results are needed
  - In stable type B dissection with suitable anatomy, preemptive TEVAR should be considered
TIMING OF REPAIR

- 2 weeks until 3 – 6 mos seems to be optimal
- TEVAR most effective when entry tear closed within 6 mos

AVOID TEVAR

- Advanced age
- Severe comorbidities
- Connective tissue disorders – open surgery probably better

ENDOVASCULAR STENT GRAFT REPAIR

Treatment Goal:
Completely cover the primary entry tear to significantly reduce flow to the false lumen and promote false lumen thrombosis
ENDOVASCULAR STENT GRAFT REPAIR

Potential Benefits
- Minimally invasive
- General, regional or local anesthesia used
- Adjunctive procedures (fenestration, stenting) can be done in combination
- Short procedure time
- Minimal procedural blood loss

TECHNICAL DETAILS
- True lumen access – brachial or femoral approach
- IVUS to confirm true lumen
- 2 cm from entry tear to proximal seal zone
- Usually requires L SCA coverage
- No balloon angioplasty of graft

IVUS
New TEVAR indications for dissection are now FDA approved:
- Gore® TAG® Thoracic Endoprosthesis (2013)
- Medtronic VALIANT® Thoracic Stent Graft (2014)

Treatment objective of sealing the primary entry tear:
- Promotion of depressurization of false lumen
- Prevention of aortic rupture
- Release malperfusion syndrome

OUTCOMES
- EUROSTAR UK REGISTRY
- Symptomatic
  - 30 day mortality 8.4%
  - Paraplegia rate 0.8%
DOWNSIDE TO TEVAR?

- Recent systematic review by Famularo et al (Camden, NJ)
- Possibly no prevention of aneurysmal degeneration

TYPE B AORTIC DISSECTION SUMMARY

- Complicated – surgical treatment
- Uncomplicated – initiate medical treatment and consider surgery (TEVAR)
- Data seem to suggest TEVAR is beneficial even in uncomplicated TBAD
- Look at risk factors!

CONCLUSION

- Proactive management of aortic dissections is essential for ensuring best possible health outcomes
  - Strategies require early recognition, referral, and treatment
- New TEVAR dissection indications establish new treatment options for patients
- Treatment pathways will continue to evolve
REFERENCES

THANK YOU