3D SIMULATION AND CASE PRESENTATION OF ENDOVASCULAR TAAA F-BEVAR FOR CHRONIC DISSECTION
Gustavo S. Oderich MD and Aleem Mirza MD
From the Aortic Endovascular Research Program Division of Vascular and Endovascular Surgery
NEW YORK, NEW YORK

FACULTY DISCLOSURES

• Consulting*
  Cook Medical Inc., WL Gore, Bolton Medical, GE, Synthax
• Research grants*
  Cook Medical Inc., WL Gore, Atrium Maquet
• Investigational, off-label use of devices
  Cook Fenestrated and Branched Grafts, Gore Branched Technology/

* All consulting fees and research education grants paid to Mayo Clinic

CAN DIGITAL SIMULATION HANDLE THIS COMPLEX SETUP?

3D PRINTING & COMPLEX EVAR

• Simulation
  - Complex cases
  - Unusual or rare cases
  - Novel devices
• Physician/resident training
• Planning complex cases
• Defining best approaches for investigational devices

AORTIC BRANCH MODELS

• Reinforced branch points
• Minimal branches
• 2 polymer build
• Candyshell covering
• Watertight connections

FLUID PUMP

Fluid pump model
• Temp 36 °C
• Mean BP 80 mmHg
• Nitinol-based stents
• Assessment of flow and branch patency
Anticipating challenges…

FIRST IN-MAN IMPLANT
TAMBE with 4 Antegrade Portals
STENT APPOSITION & ENDOLEAKS

78-year-old men with enlarging Extent II TAAA after DeBakey Type I aortic dissection, prior ascending aortic repair and EVAR

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CLINICAL PRESENTATION

78-year-old man presents with:
• Prior DeBakey Type I Dissection in 2012
  – AVR and ascending aortic repair
  – EVAR + L Hypo-gastric embolization
• Enlarging aortic arch and Extent II TAAA
• Cardiovascular risk factors
  – Hypertension
  – Hyperlipidemia
  – Past smoking
  – Ischemic cardiomyopathy
• Meds
  – ASA, B-blocker, statin, ACE-Inhibitor

PHYSICAL EXAMINATION

• HR 68 bpm, RR 18 mpm, BP 126/76 mmHg. Temp 36.5 °C
• Neck: Supple, no bruits
• Heart: RRR, S1S2, Diastolic murmur
• Lungs: Clear bilaterally
• Abdomen: Soft, NT/ND
• Pulses: 4+ radial, brachial, femoral, popliteal and pedal

DIAGNOSTIC WORK UP

• Serum Cr 1.1 mg/dL
• Echocardiogram
  – Mild to moderate aortic regurgitation
  – EF 60%
• Cardiac catheterization
  – No significant occlusive disease
• PFT
  – FV1 76%, DLCO 75%
• Carotid duplex US
  – No significant stenosis or dissection
CTA

STAGE I
Arch repair
- Redo median sternotomy
- DH-CPB
- Total arch replacement with Frozen Elephant Trunk Technique
- Aortic Valve Replacement

STAGE II
Distal TEVAR extension
- Percutaneous approach
- CSF drainage (24 hrs)
- Cook LP Alpha Thoracic stent-graft
- Dismissed POD 3
- No complications

STAGE III
Completion TAAA F-BEVAR
- Stent design
- Spinal cord injury prevention
- Technical aspects

STENT DESIGN
5-vessel fenestrated-branched graft
PRE-LOADED WIRE SYSTEM

BIFURCATED INVERTED LIMB

SPINAL CORD INJURY
Mayo Clinic Protocol

- Staged aortic coverage
- Permissive hypertension
- CSF drainage 48-72 hours
- Neuromonitoring
- Early limb reperfusion

STAGE III
Completion f-BEVAR

- Percutaneous approach
- CSF drainage (48 hrs)
- Dismissed POD 6
- Cr 1.2 mg/dL
- No complications