
THE 26TH INTERNATIONAL EXPERTS SYMPOSIUM
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Impact of Thoracic Aortic Endografts on Native Anatomic Dynamics and Compliance

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Disclosures – past 3 years

- Consultant for: W.L. Gore & Associates, Convext Medical, Medtronic, Terumo Aortic, Bentley Innomed, Faegre Drinker Biddle & Reath, Starlight Cardiovascular
- Research Funding from: W.L. Gore & Associates, Bentley Innomed, Starlight Cardiovascular

Introvert vs. Extrovert

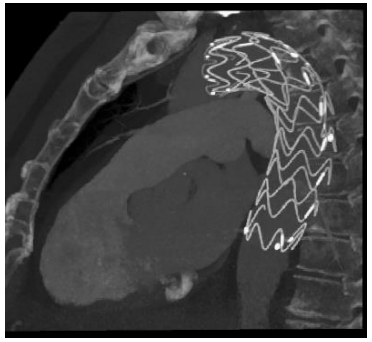
https://commons.wikimedia.org/wiki/File:Man_looking_down_at_shoes_%28Unsplash%29.jpg

Patients, Devices, and Imaging

- Terumo Aortic RelayPro trials in US and Japan, recruited 2017-2022
  - Thoracoabdominal Aneurysms (TAA)
  - Thoracic Aortic Dissections (TAD)
  - Blunt Trauma Aortic Injury (BTAI)

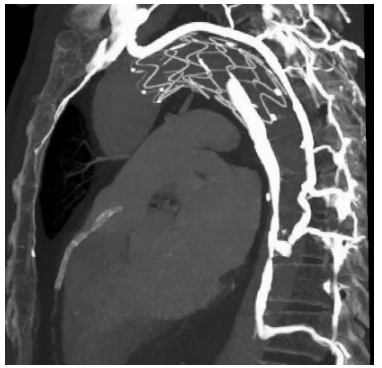
# Sites	# Patients	Aortic Zones
36	110	2+3+4
22	56	2+3+4
16	50	1+2+3

TAA



TAD

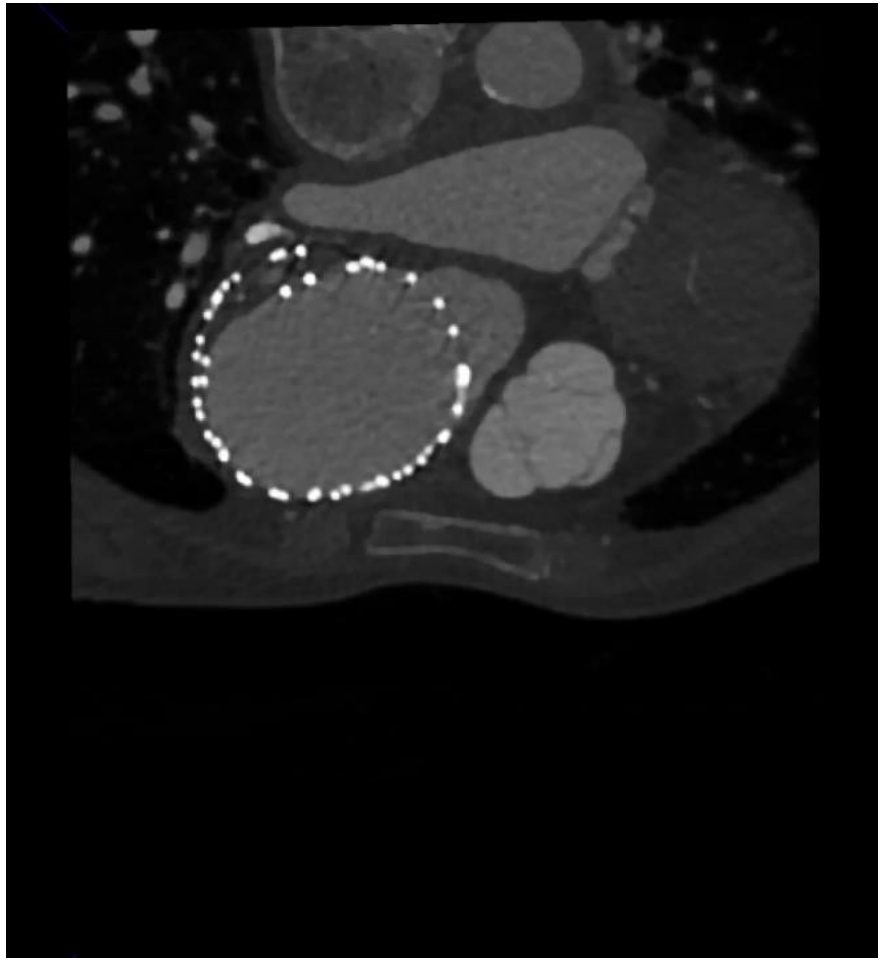
BTAI

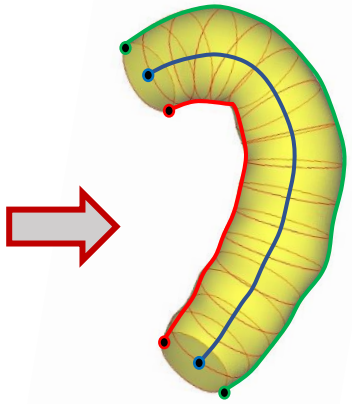


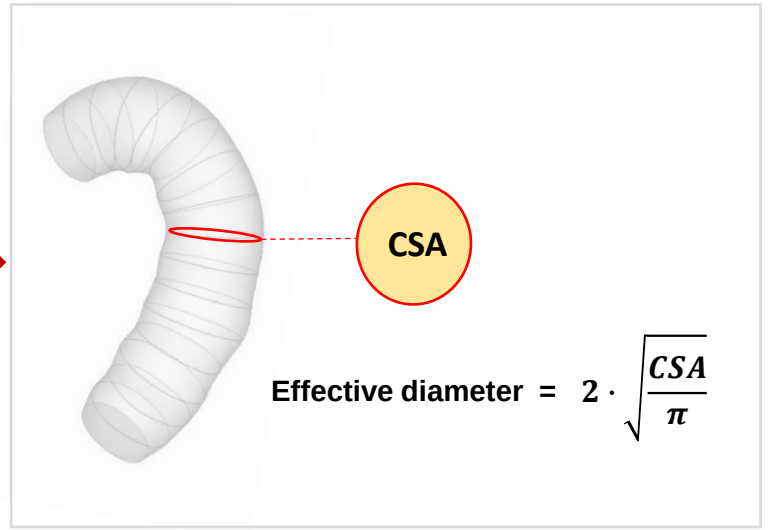
Cardiac-gated CTA

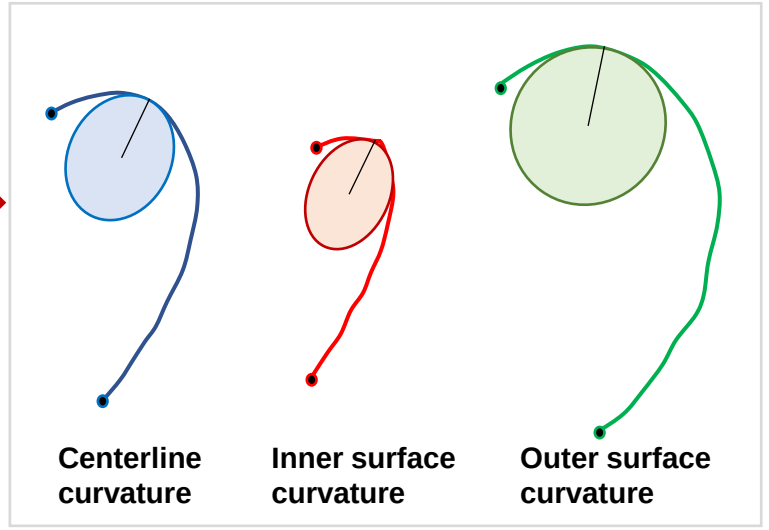
Indication	# Patients	Age @ Implant	# Devices	CTA Timepoints
TAA	7	79±10y	4 single, 3 double	3 pre+post, 4 post
TAD	4	64±13y	2 single, 2 double	4 post
BTAI	3	51±14y	3 single	2 pre+post, 1 post

3D Modeling and Quantification

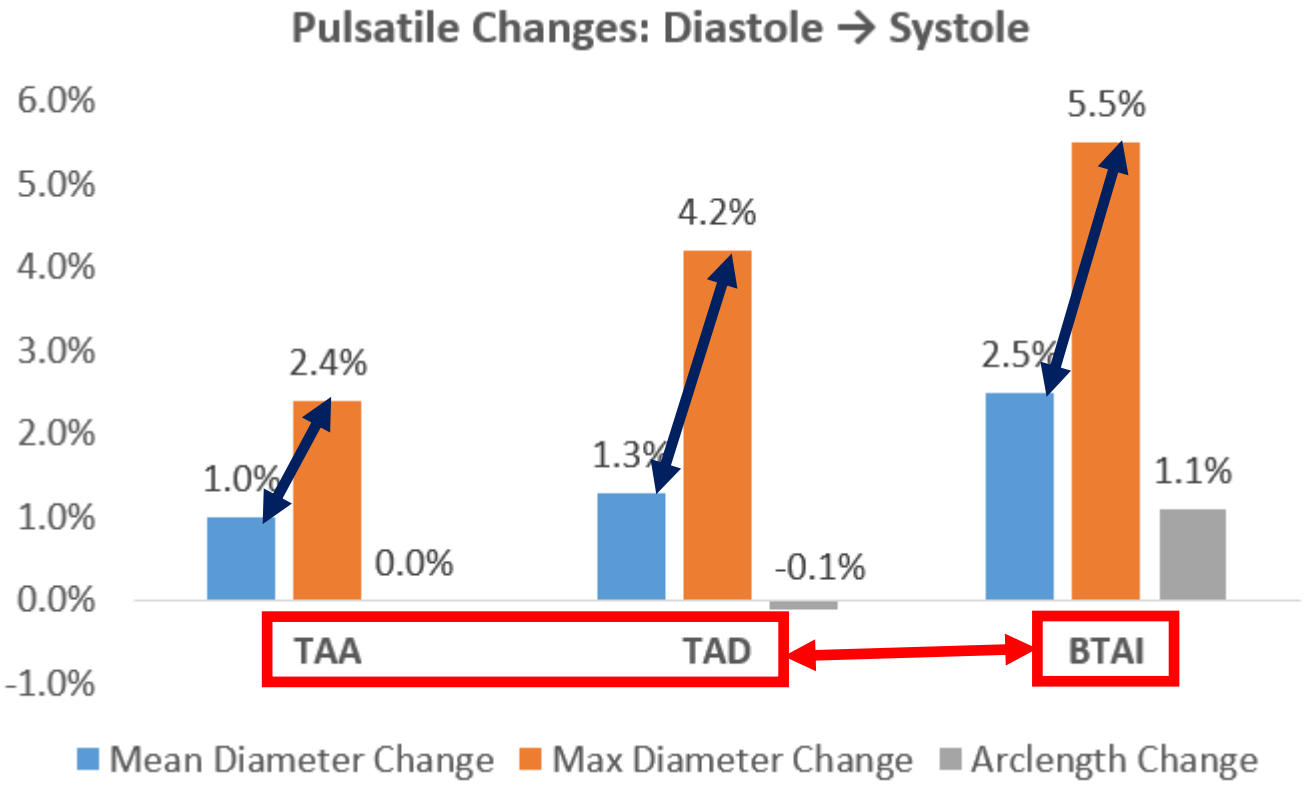








Thoracic Endograft Deformations



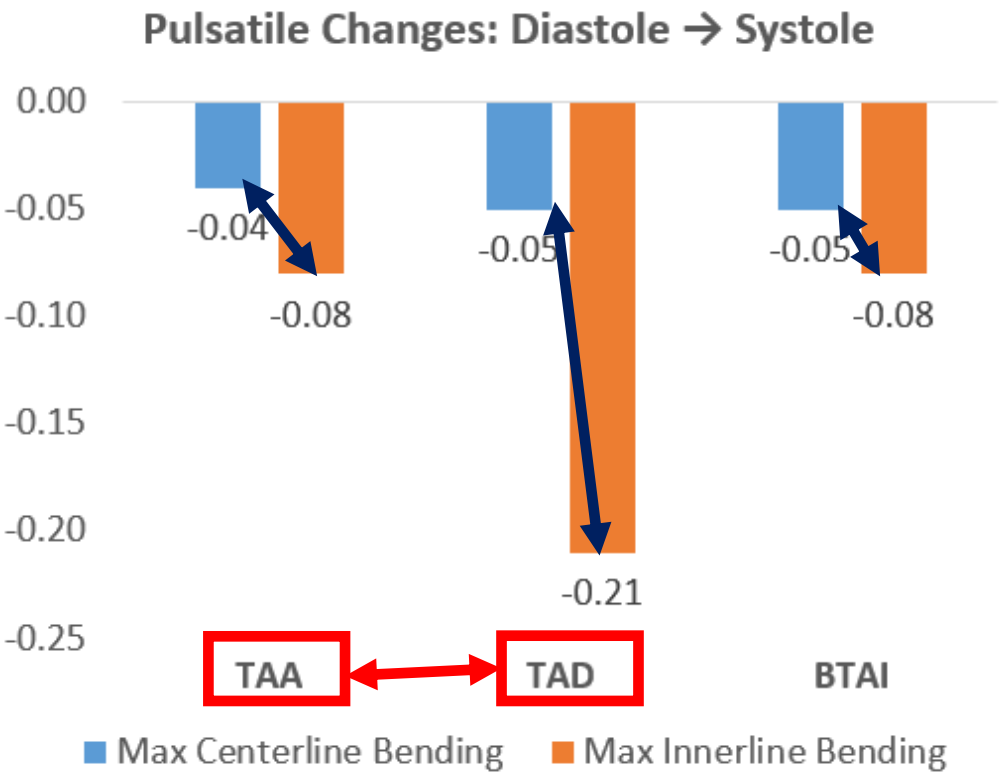
Mean diametric expansion diastole → systole: BTAI > TAA,TAD

Max diametric expansion diastole → systole: BTAI > TAD > TAA

Arclength lengthening diastole → systole, BTAI > TAA,TAD

- Max D > Mean D by 2.5-3x
- Mean D: BTAI > TAA/TAD, ~2x
  Max D : BTAI > TAA/TAD, ~2x
  Axial: BTAI > TAA/TAD, >10x
  BTAI vs. DTAA/TAD - 51±14 vs. 74±13y
- Similar 1.8% Mean D and near-zero Axial deformations for C-TAG [Suh EJRO 2021, Hirotsu AVS 2018]
- Higher 2.4% Axial def in Relay patient, but included entire descending thoracic (including native) [Nauta Aorta 2017]

Thoracic Endograft Deformations

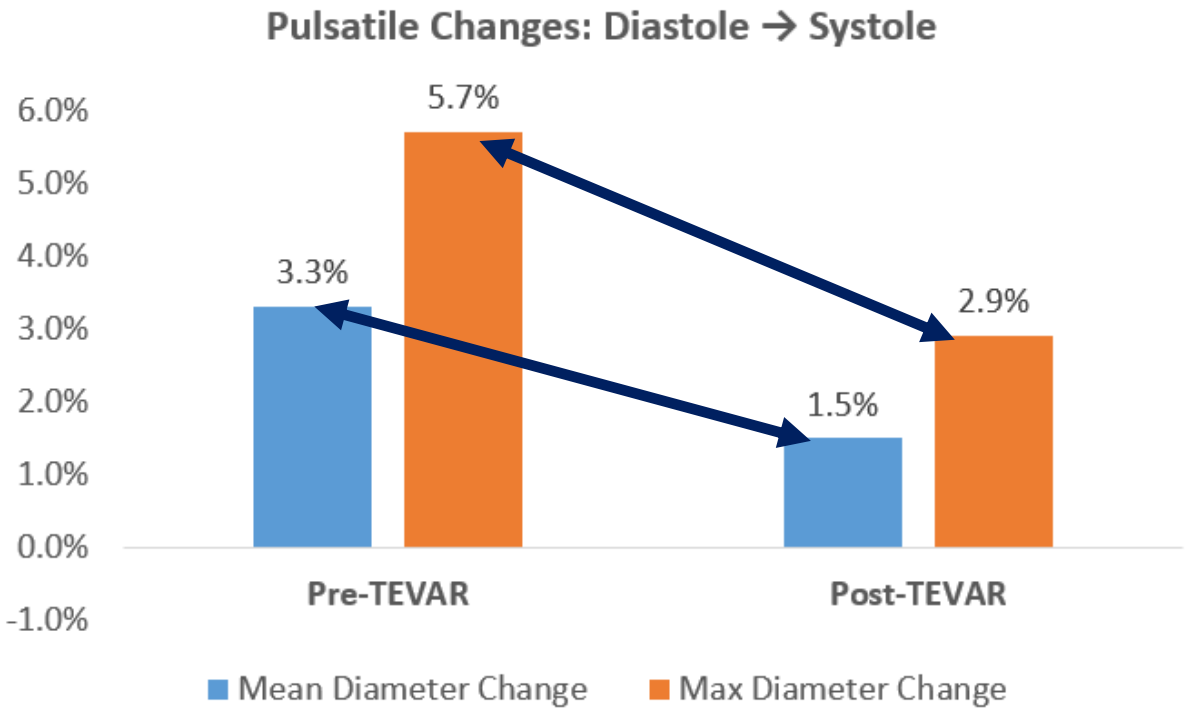


Max centerline bending not different TAA,TAD,BTAI

Max innerline straightening diastole → systole: TAD > TAA,BTAI

- Pulsatile bending due to systolic straightening due to higher pressure
- Inner surface bending 2-4x of centerline, partially consequence of separate metallic rings
- Greater for TAD vs. TAA cohorts (tissue stiffness)
- Similar centerline and inner surface bending as Gore C-TAG [Ullery VES 2018]
- Important for understanding metallic stent durability and graft wear

Pulsatile Damping from TEVAR

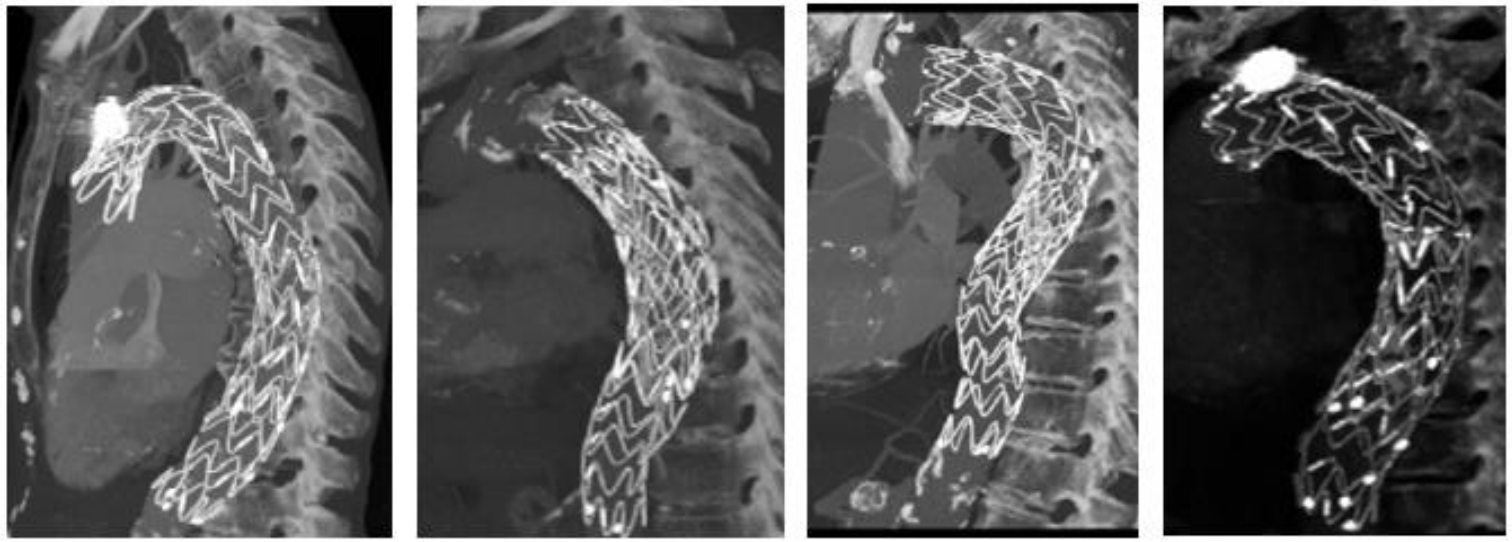


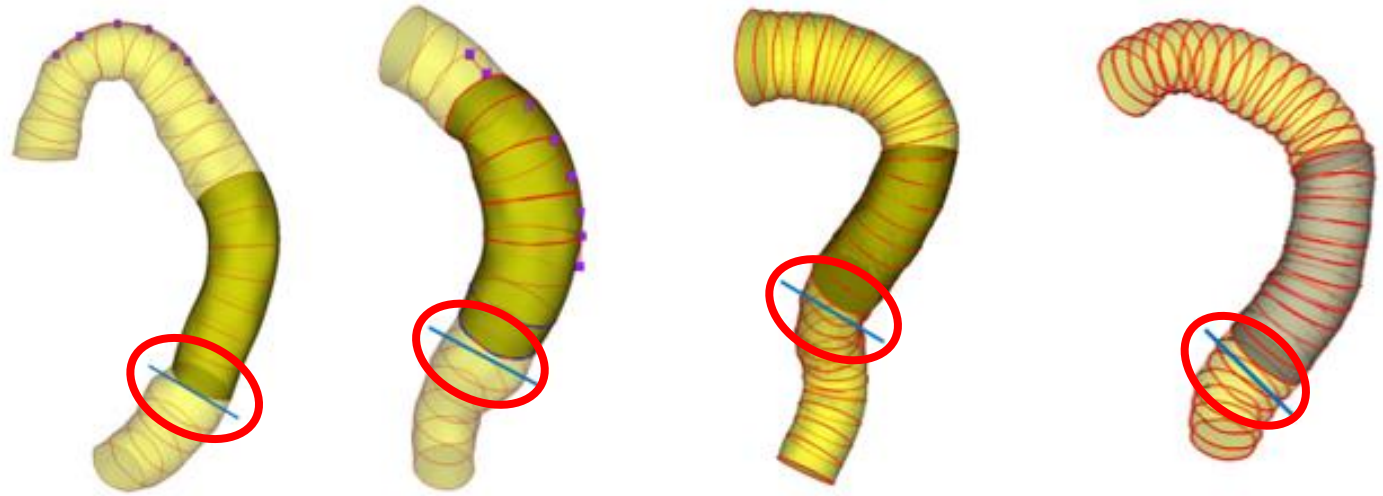
Mean diametric expansion diastole → systole: 52±26% Pre-to-Post TEVAR damping

Max diametric expansion diastole → systole: 47±23% Pre-to-Post TEVAR damping

- Pulsatile diametric deformation: Mean = 3.3% to 1.5%, Max = 5.7% to 2.9%
- From pre-to-post TEVAR, pulsatile diametric deformation damped 52% for length-averaged and 47% for maximum localized
- Mean Circ strain: 2.0-4.2% (68±6y), 7.3-8.9% (41±7y) [Morrison JVS 2009]
- Comparable damping to Gore C-TAG of 45% (3.3% to 1.8%) [Suh EJRO 2021]

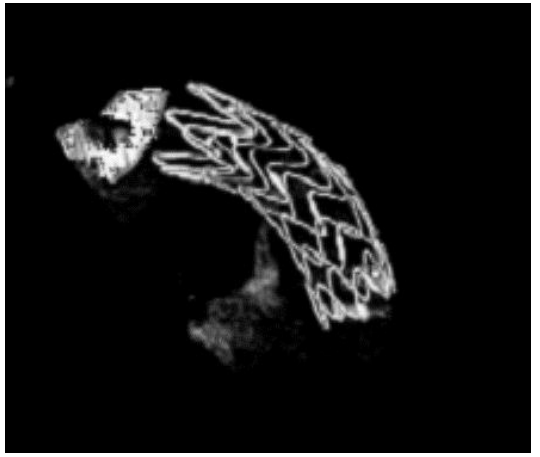
Bending Location for Overlapped Endografts

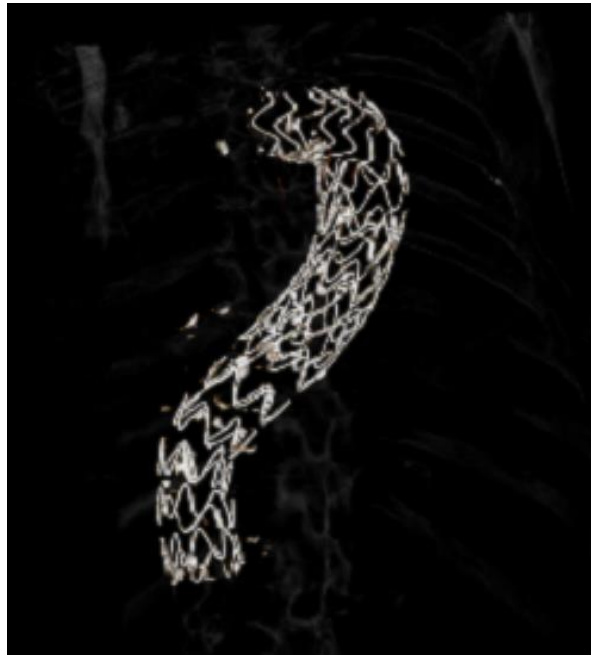




Conclusions

- Terumo Relay Pro exhibits similar pulsatile avg diam deformation, and pre-to-post TEVAR diam deformation damping as Gore C-TAG for TAA and TAD cohorts
- In younger, non-diseased BTAI cohort, endograft deformations were greater in diam (~2x) and axial (>10x) directions vs. TAA/TAD
- Cycling bending similar between Relay Pro and C-TAG, but 2-4x on the inner curve vs. centerline
- Bending concentrates at transition from single to overlapped endograft regions
- Localized deformations essential to predict durability



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Thank you