Durability can only be achieved through continuous proximal seal: A decade of experience across multiple pathologies

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Disclosure

Speaker name:

Theodoros Kratimenos

I have the following potential conflicts of interest to report:

Consulting

Employment in industry

Stockholder of a healthcare company

Owner of a healthcare company

Other(s)

☑️ I do not have any potential conflict of interest
The native artery:

- Is highly elastic and flexible\(^1\)
- Adapts to the hemodynamics\(^2\) creating a dynamic environment

Several mechanical, physiological and histological factors contribute to durable TEVAR in this environment.

Courtesey of Prof. J. C. van den Berg

Computational Analysis

Politecnico di Milano

Creation and validation of the digital twin of Valiant™ Captivia™ in a simulated environment of real anatomies in a static and dynamic environment.

- Characterization of stent-graft materials
- Sealing performance
- Patient specific application

Dynamic behavior at a glance

- Dynamic velocity field
- Dynamic velocity streamlines
- Dynamic stent-graft displacements
- Dynamic contact forces
- Dynamic contact distance

Steps to simulate the moving aorta

FEA simulations and comparison with CT scan experiments for 3 anatomies.

Pre-TEVAR configuration

Numerical deployment simulation

CT post-TEVAR

Experimental tests in printed 3D models

Contact pressure with the aortic wall

Valiant™ Captivia™ provides **uniform contact pressure** to the aortic wall in the sealing zone during the cardiac cycle.

Sealing Performance evaluates the performance of the device in the proximal and distal sealing zones.

Politecnico Valiant™ Captivia™ Computational Analysis¹

Prof. Canaud Pulsatile Bench Test Publication²


2. Stent graft anchorage was tested in a 2-cm-long proximal landing zone at varying landing zone angles (from 140° down to 70°) and stent graft oversizing (12%-28%). Device-wall apposition was measured as a function of landing zone angulation and oversizing during static and dynamic (60 pulses/min, 300/150 mm Hg) tests.
Validation of the Computational model: Publications and Podium presence

New evidence

  ➢ “High-fidelity finite element stent-graft modelling” (presenter: Anna Ramella)
  ➢ “Finite element study on the proximal fixation of a stent-graft: impact of the aortic arch angulation” (presenter: Laura Iannetti)

✓ 7th International Conference on Computational & Mathematical Biomedical Engineering ([https://www.compbiomed.net/2021/index.htm](https://www.compbiomed.net/2021/index.htm)) “High-fidelity finite element simulations to model the TEVAR procedure” (presenter: Giulia Luraghi)


Manuscript submitted to Annals of Biomedical Engineering journal: Validation and verification of high-fidelity simulations of thoracic stent-graft implantation

Anna Ramella, Francesco Migliavacca, José F. Rodriguez Matas, Frederic Heim, Francesca Dedola, Stefania Marconi, Michele Conti, Sara Allievi, Tim J. Mandigers, Daniele Bissacco, Maurizio Domani, Santi Trimarchi, Giulia Luraghi
65y/o male with descending thor. Ao aneurysm 6.5 cm diameter
65y/o male with descending thor. Ao aneurysm 6,5 cm diameter

2 years f-up CT
Male 45y/o,

Ascending Ao replacement because of aneurysm 8 months before, presents with type b ao dissection + LCCA occlusion

Primary entry is located distally from LSA orifice
CA, RT Renal art. and SMA=TL
LT Renal a and IMA=FL
Clinical case n. 2

Male 45y/o,
ascending Ao replacement because of aneurysm 8 months before, presents with type b ao dissection + LCCA occlusion
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2 years f-up CT: Descending Thor. Ao remodelling
Clinical case n. 3

- Traumatic aorta injury treated with valiant captivia SG in 2009,
- 10 years f-up CTs show no graft migration or other SG related complications

Proximal part of endograft
Part of endograft @lesion
Distal part of endograft
Clinical case n. 4

Young Male 26 y/o post car accident with Traumatic aortic pseudoaneurysm and intramural hematoma

Ct scan: 3 years follow-up
Female 51 y/o with Traumatic Aortic Injury grade III (pseudoaneurysm, red arrow) post vehicle crush
Clinical case n. 6

48y/o male,
Type b dissection
RT Ao arch
Aberrant LSA
Clinical case n. 6

48y/o male, Type b dissection
RT Ao arch Aberrant LSA

2 years f-up CT
Clinical Case: Young Male 34 years old with TAI, Hemodynamic Instable (B/P : 60/30mmHg)

IA-DSA: contrast media extravasation
Post grafting B/P: 100/60mm Hg
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