

# New software for the detection of post-EVAR endoleaks

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# Disclosure

- Co-founder of Endovascular Diagnostics

# Background

- Current (CT, duplex, X-ray) post-EVAR FU is focused on complications (endoleaks, AAA growth)
- Slight changes in apposition, aortic neck morphology, and endograft dimensions are missed
- ***FU imaging should prevent/ predict complications and not only show complications***

# Vascular Imaging Analysis (VIA) Software

- Dedicated, validated proprietary software
- 3D coordinates from 3Mensio workstation

**VIA Vascular Imaging Analysis**

**Output**

Current patient: 1004

Current process: Calculation complete

Duration of calculation: 41 seconds

**Results**

Artery morphology	
Maximum curvature (in %)	
Supraaortic arch	
Inferior arch	
Aortic arch	
Average curvature (in %)	
Supraaortic arch	
Inferior arch	
Aortic arch	
Background position	
Patent diameter (mm)	
Stenosis (SPD)	4.3
Dilatation (CPD)	11.2
Stenosis diameter (mm)	18.6
TR (mm)	8.2
Surface area	
Netc (mm <sup>2</sup> )	1652
Expanded (mm <sup>2</sup> )	1878
% of the netc	76
Stenosis length (mm)	14
Net expanded (mm <sup>2</sup> )	224
% of the netc	24

**Selection**

Procedure: CCA

Calculations:  
 Artery curvature  
 Endograft position  
 Surface area  
 Netc  
 Apposition  
 RenalApposition

Score:  
Preselected CTA:

Patients:  
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01063

**Options**

Netc application: 18

Buttons:

Save data

Visualize:  
 Artery curvature  
 Endograft position  
 Patent diameter  
 TR  
 Surface area  
 Netc  
 Apposition  
 RenalApposition

File directory: C:\Users\jerry\Documents\STAT\_A\Endovascular

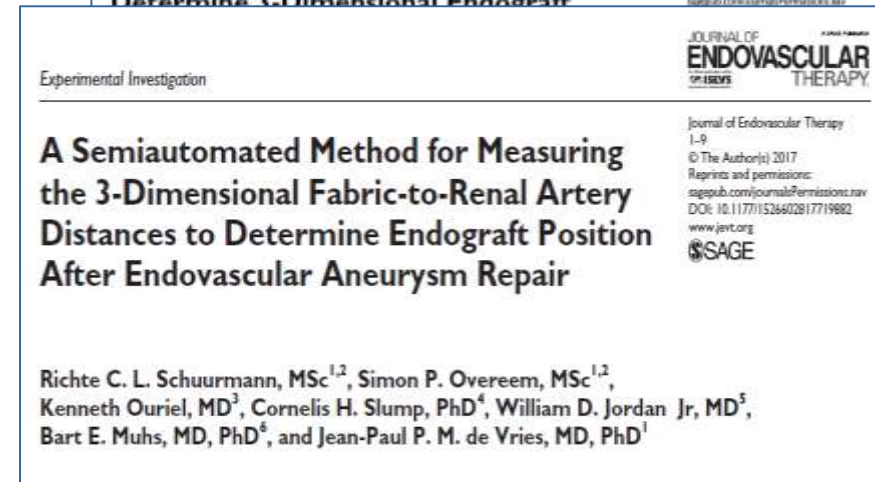
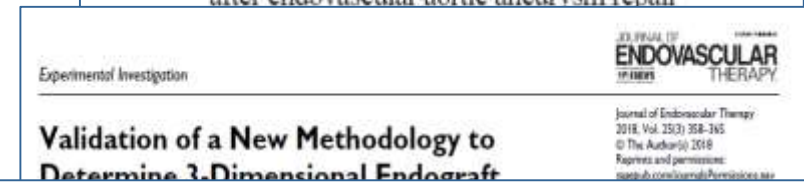
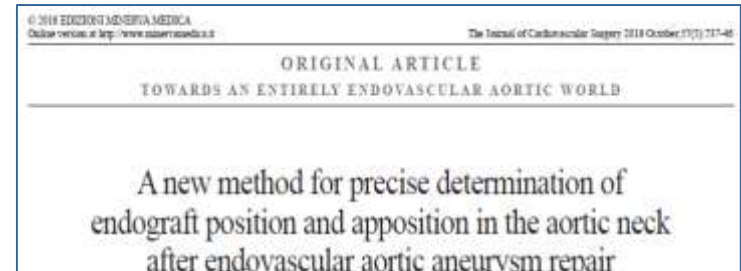
Buttons: Process, Scan, Supplement

Background color:

Version 2 (Beta)  
Copyright Endovascular Diagnostics B.V.  
Developed by Rutger C.L. Subramanian

# VIA Software - validation

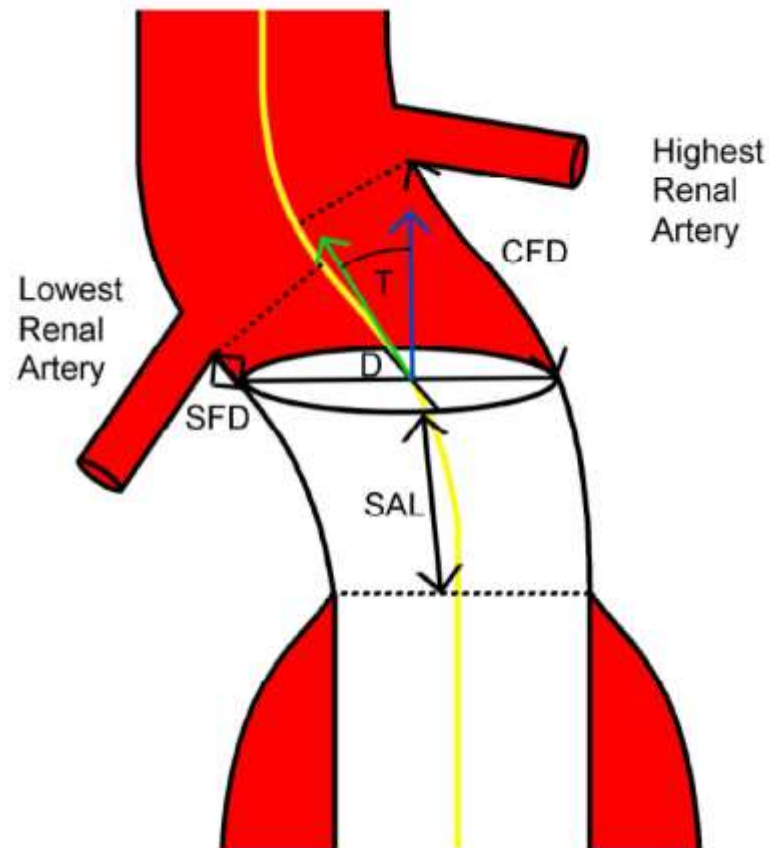
1. Introduction & implications
2. Technical validation



# A new method for precise determination of endograft position and apposition in the aortic neck after endovascular aortic aneurysm repair

THE JOURNAL OF CARDIOVASCULAR SURGERY

Kim VAN NOORT<sup>1,2\*</sup>, Richte C. L. SCHUURMANN<sup>1,2</sup>, Cornelis H. SLUMP<sup>3</sup>,  
Jan A. VOS<sup>4</sup>, Jean-Paul P. M. DE VRIES<sup>1</sup>



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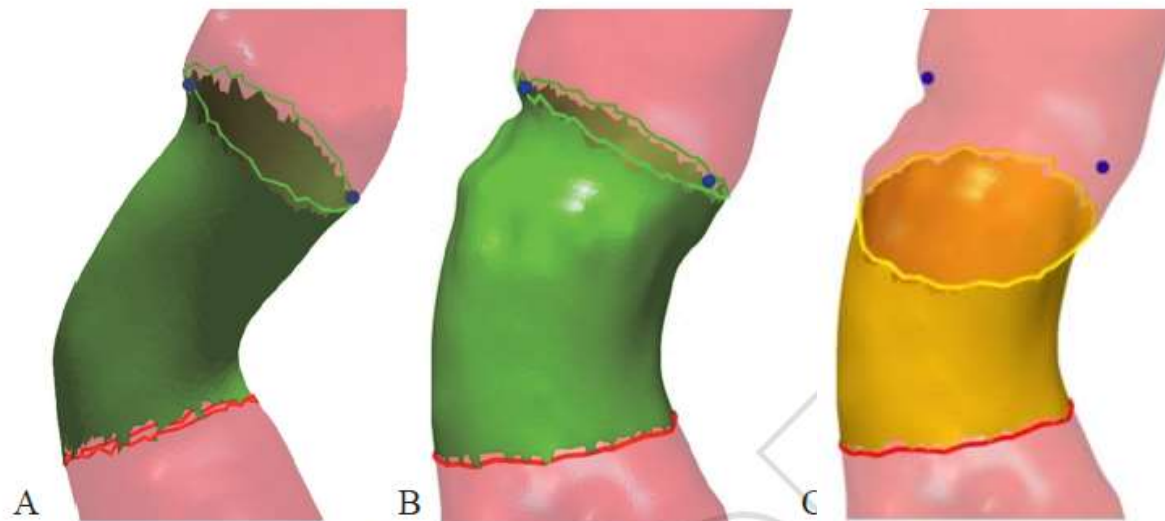


Figure 1.—Determination of aortic neck surface (ANS, green surface) and endograft apposition surface (EAS, yellow). A) Pre-EVAR ANS (green surface) is the surface between lower margins of the renal arteries (blue dots) and the distal end of the neck (red line). B) Post-EVAR ANS (green surface) is the surface between the lower margins of the renal arteries (blue dots) and the distal apposition boundary (DAB) (red line). C) Post-EVAR EAS in the aortic neck (yellow surface) between the proximal end of the endograft fabric (yellow line) and DAB (red line).

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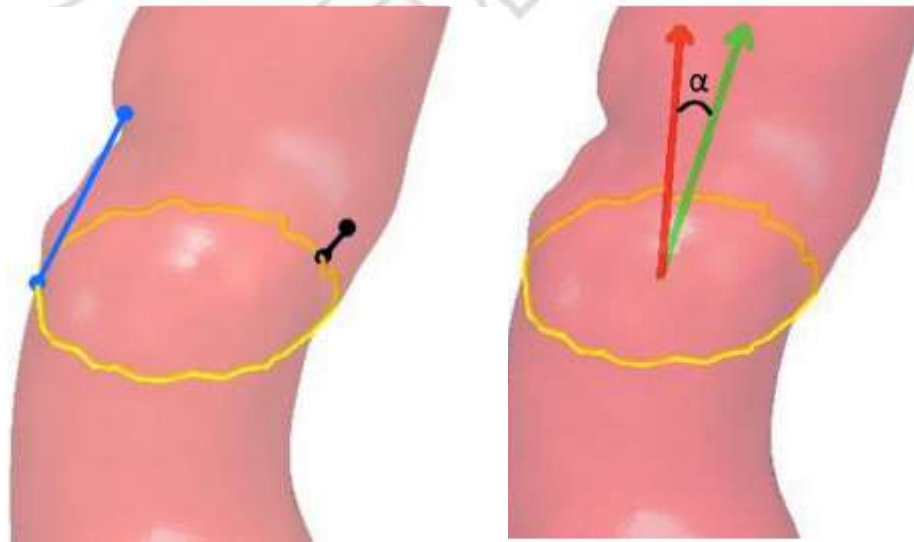


Figure 2.—Visualization of the endograft position. A) Mesh of the aortic neck with the orifices of the renal arteries (proximal blue and black dots) the SFD (black line) and LFD (blue line) and the circumference of the proximal end of the endograft fabric (PEF, yellow line). B) Tilt, measured as the angle ( $\alpha$ ) between the centerline of the aortic lumen (green arrow) and the normal vector of the endograft (red arrow).



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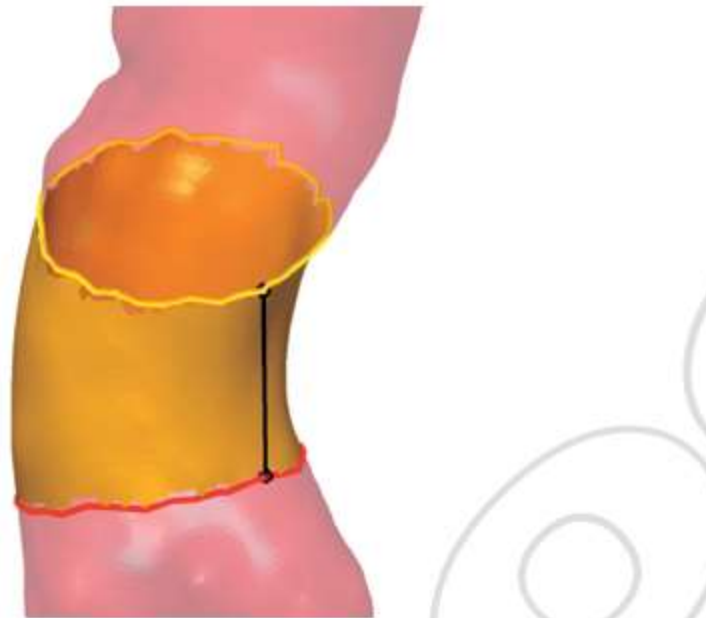
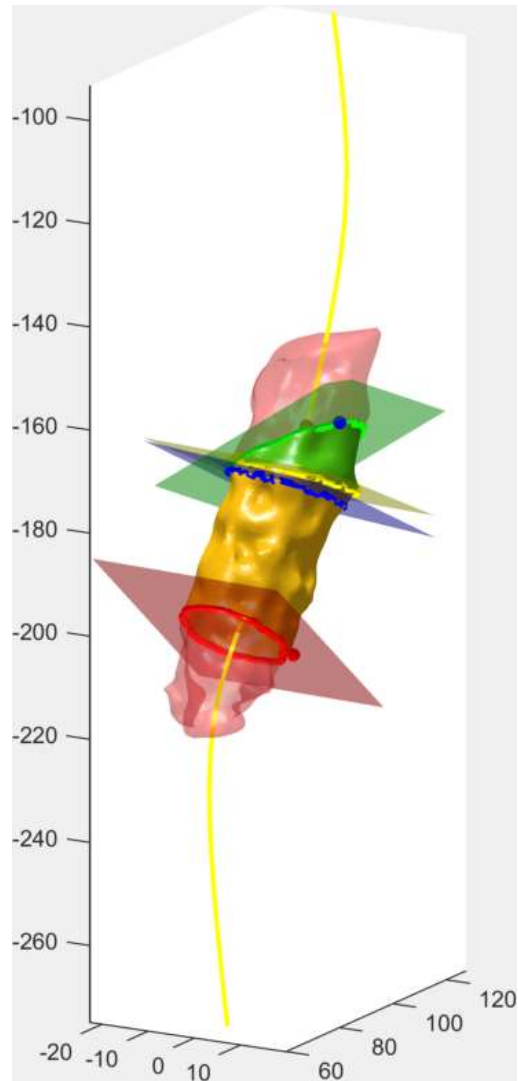
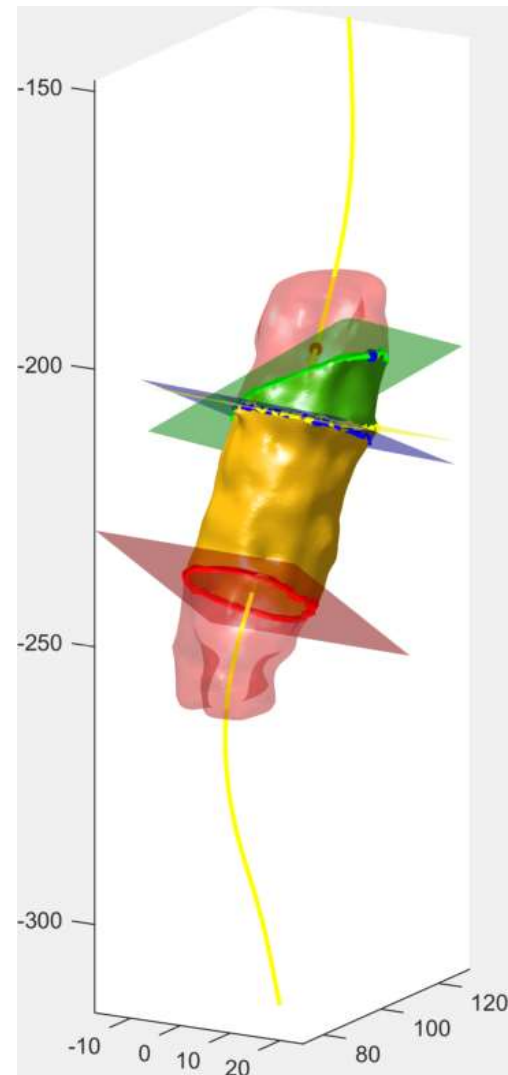


Figure 3.—The shortest apposition length (black line) is the shortest length between the proximal end of the endograft fabric (PEF, yellow line) and the DAB (red line).

# Perfect apposition and no change during FU



1 month post-EVAR



1 year post-EVAR

# Endograft migration and dilatation during FU

S3010, Pre



S3010, FU1



S3010, FU2



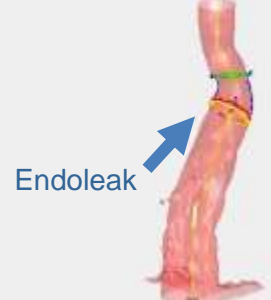
S3010, FU3



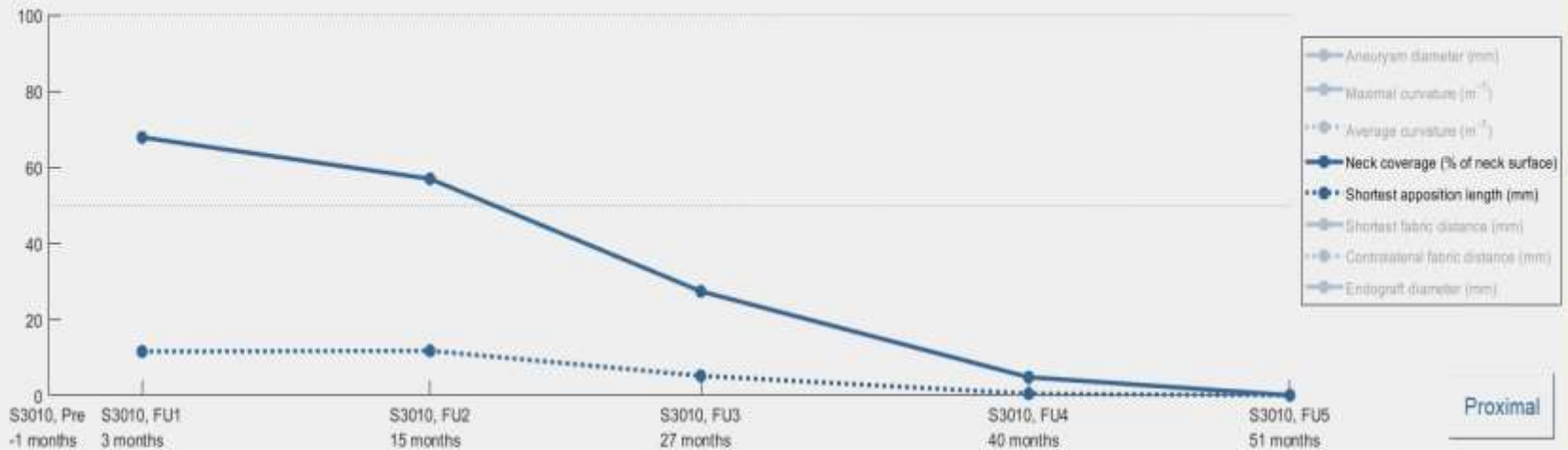
S3010, FU4



S3010, FU5



Endoleak



# Endograft migration and dilatation during FU

S3010, Pre



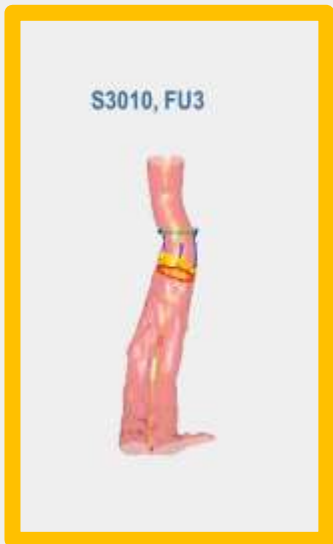
S3010, FU1



S3010, FU2



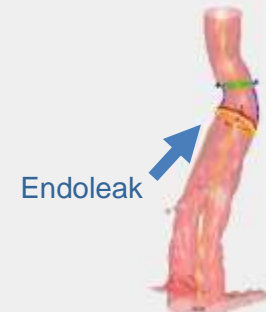
S3010, FU3



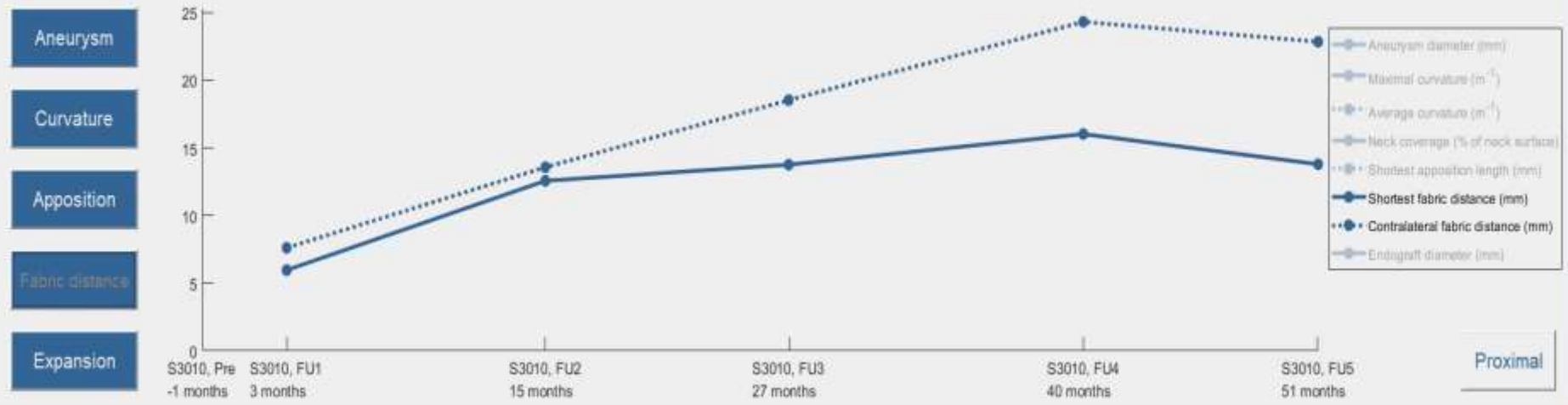
S3010, FU4



S3010, FU5



Endoleak



Proximal

# Endograft migration and dilatation during FU

S3010, Pre



S3010, FU1



S3010, FU2



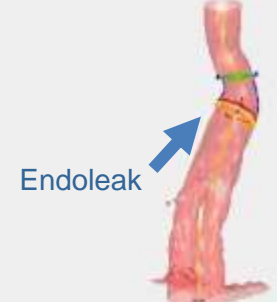
S3010, FU3



S3010, FU4

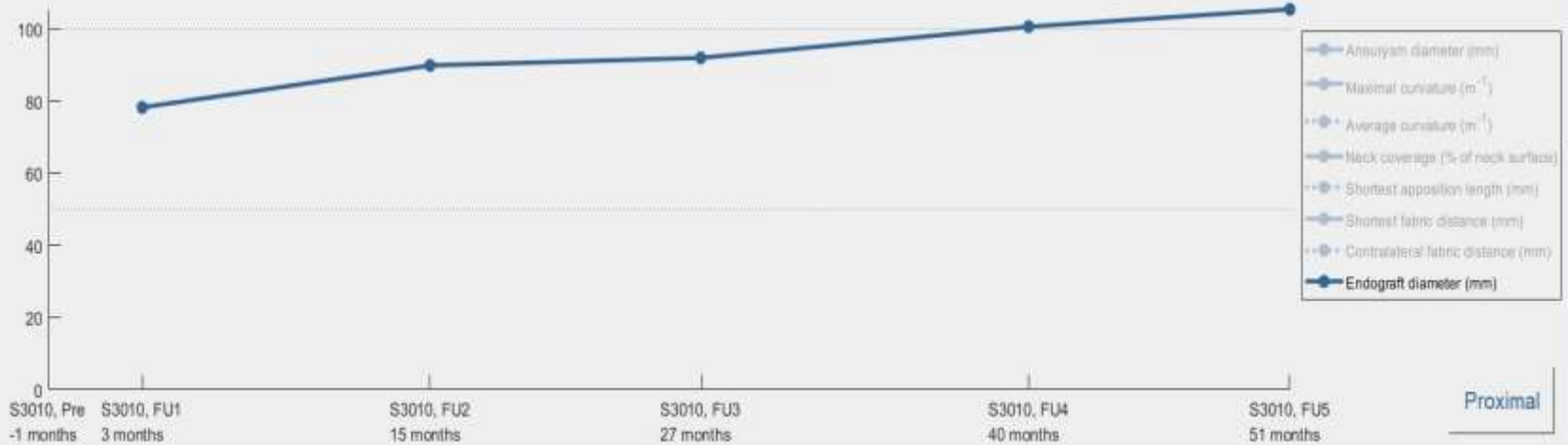


S3010, FU5



Endoleak

- Aneurysm
- Curvature
- Apposition
- Fabric distance
- Expansion



Proximal

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# **Determination of Endograft Apposition, Position, and Expansion in the Aortic Neck Predicts Type IA Endoleak and Migration After Endovascular Aneurysm Repair**

Richte CL Schuurmann, Kim van Noort, Simon P Overeem, Ruben van Veen, Kenneth Ouriel, William D Jordan Jr, Bart E Muhs, Yannick W 't Mannetje, Michel MPJ Reijnen, Bram Fioole, Çağdaş Ünlü, Peter Brummel, Jean-Paul PM de Vries

*Journal of Endovascular Therapy*

# Study design

- Four groups of elective EVAR patients

- Type IA endoleak            n = 36
- Migration (>10 mm)        n = 9
- Type II endoleak            n = 16
- Controls                      n = 37

- Software analyse

- endograft dimensions/ aortic neck measurements

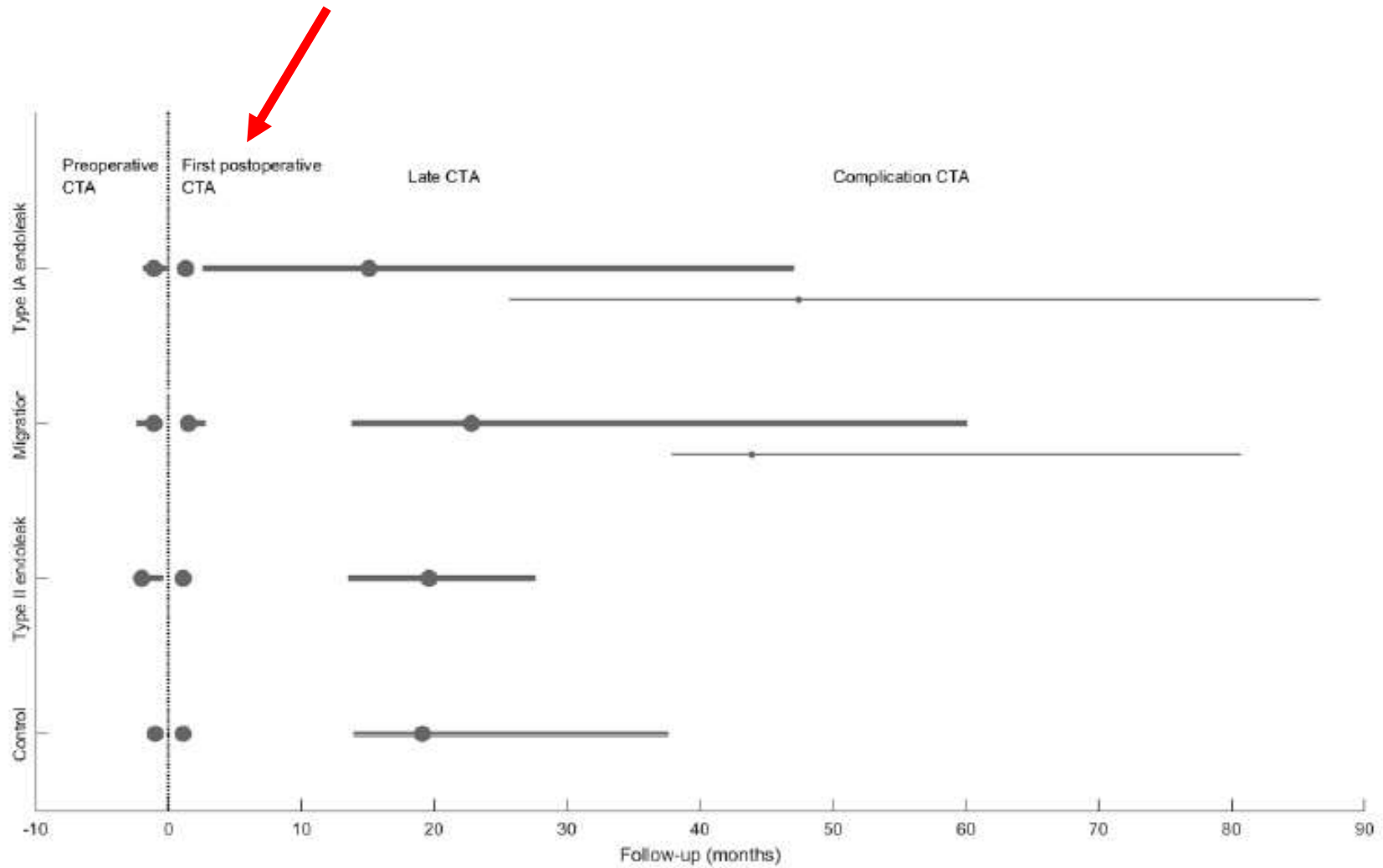
- First post-EVAR CTA (1 month)

AND

- CTA scan before complication (*type IA & migration*); or

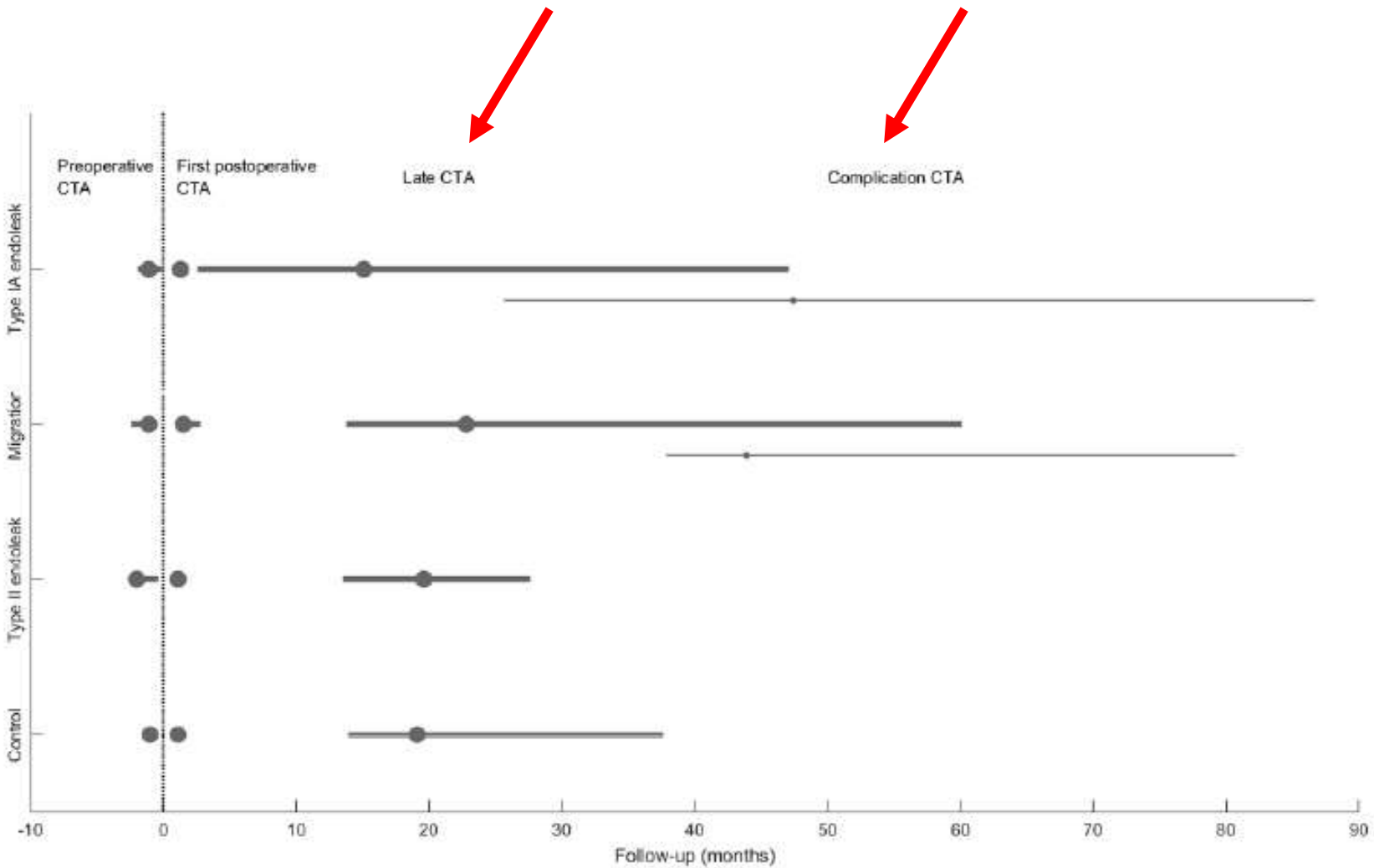
- Late (>1 year) CTA scan (*type II & controls*)

# Study design

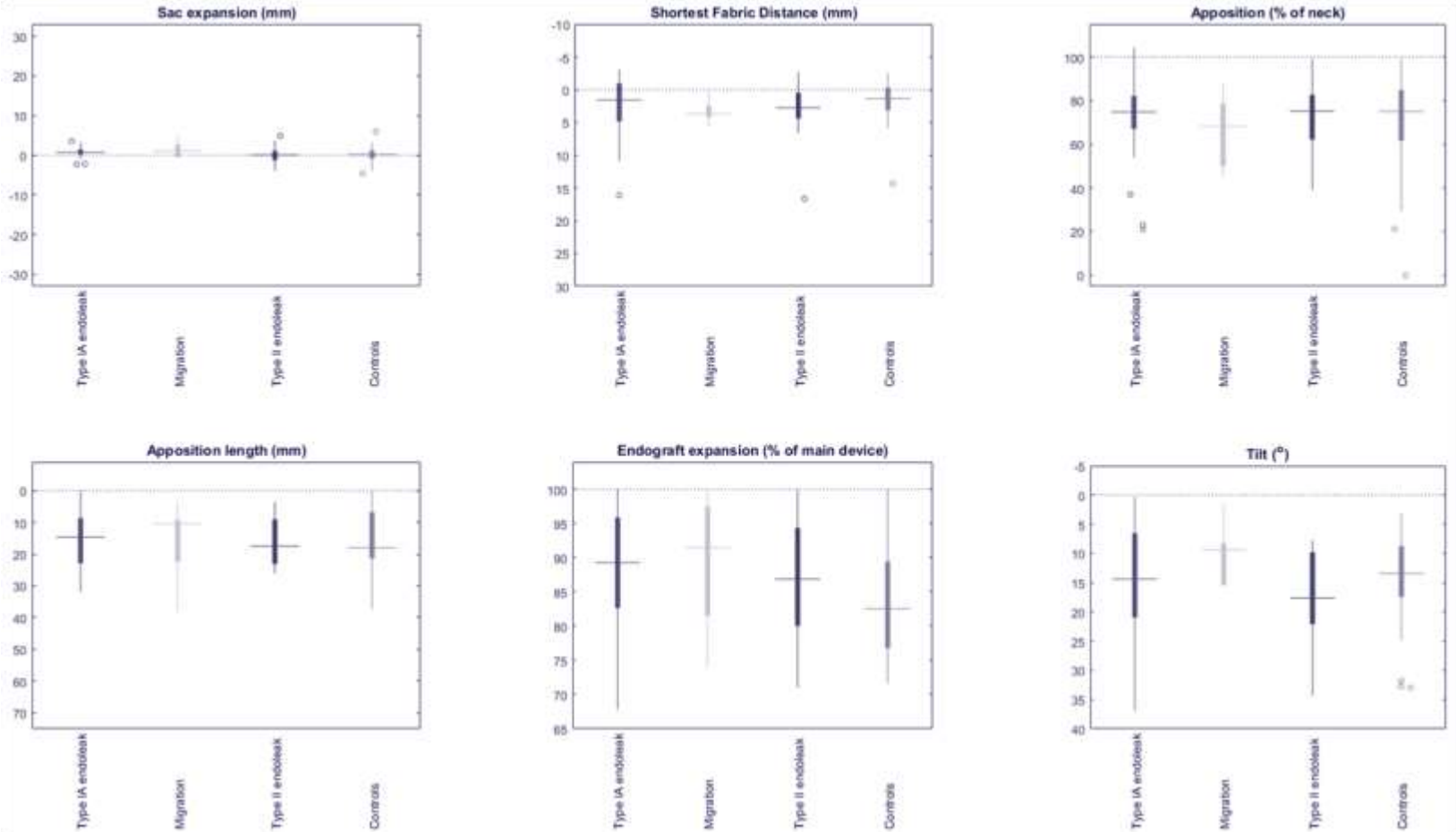




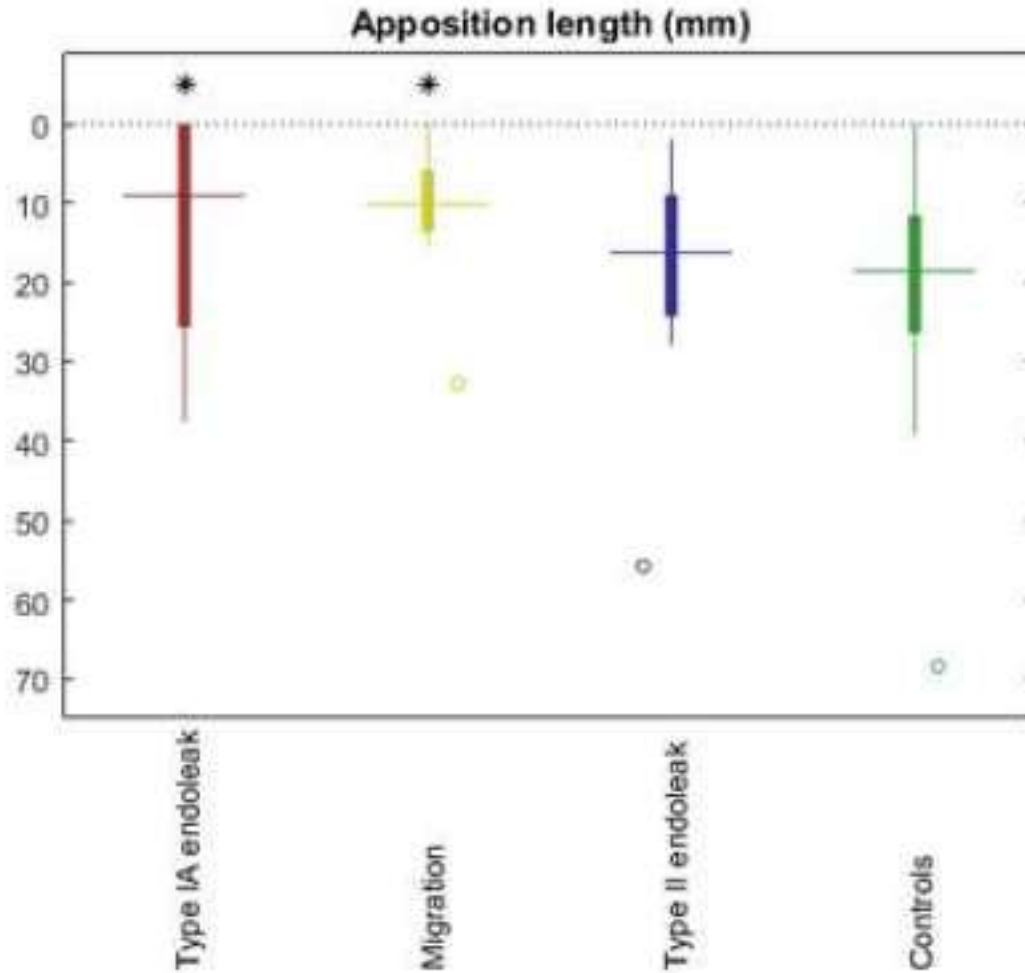
# Study design



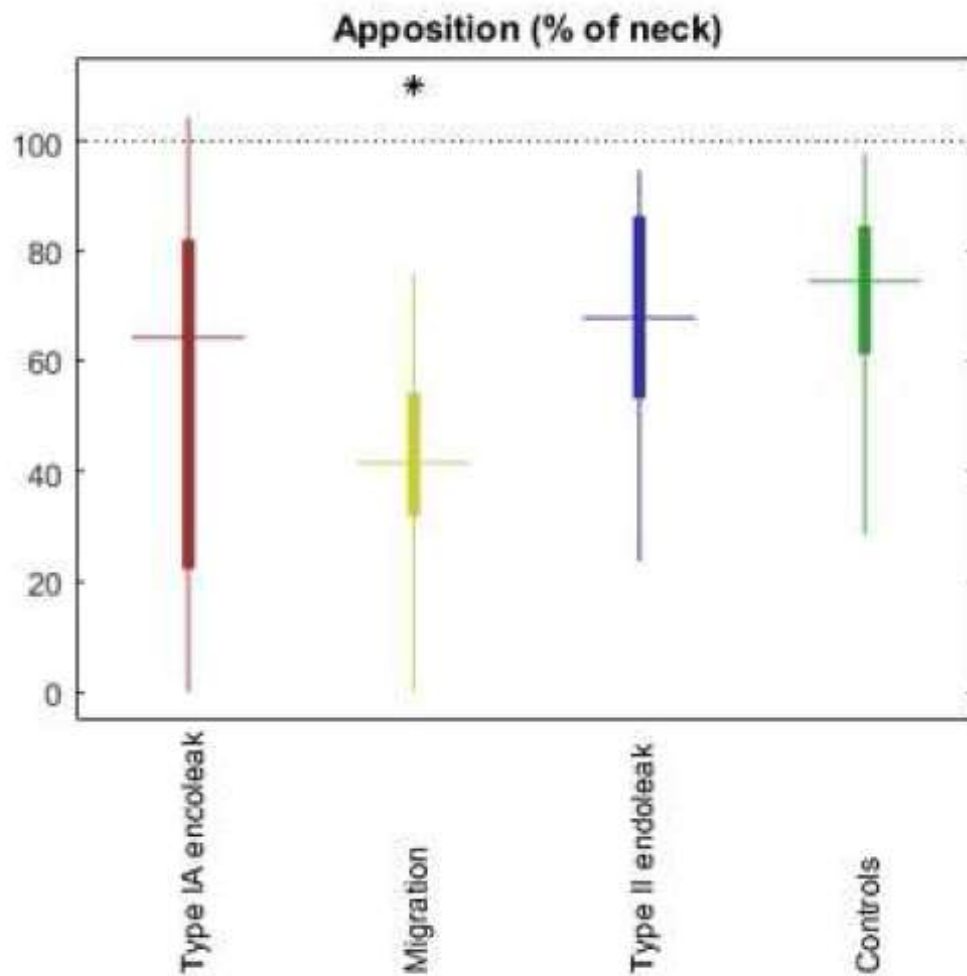
# 1 month CT (no differences)



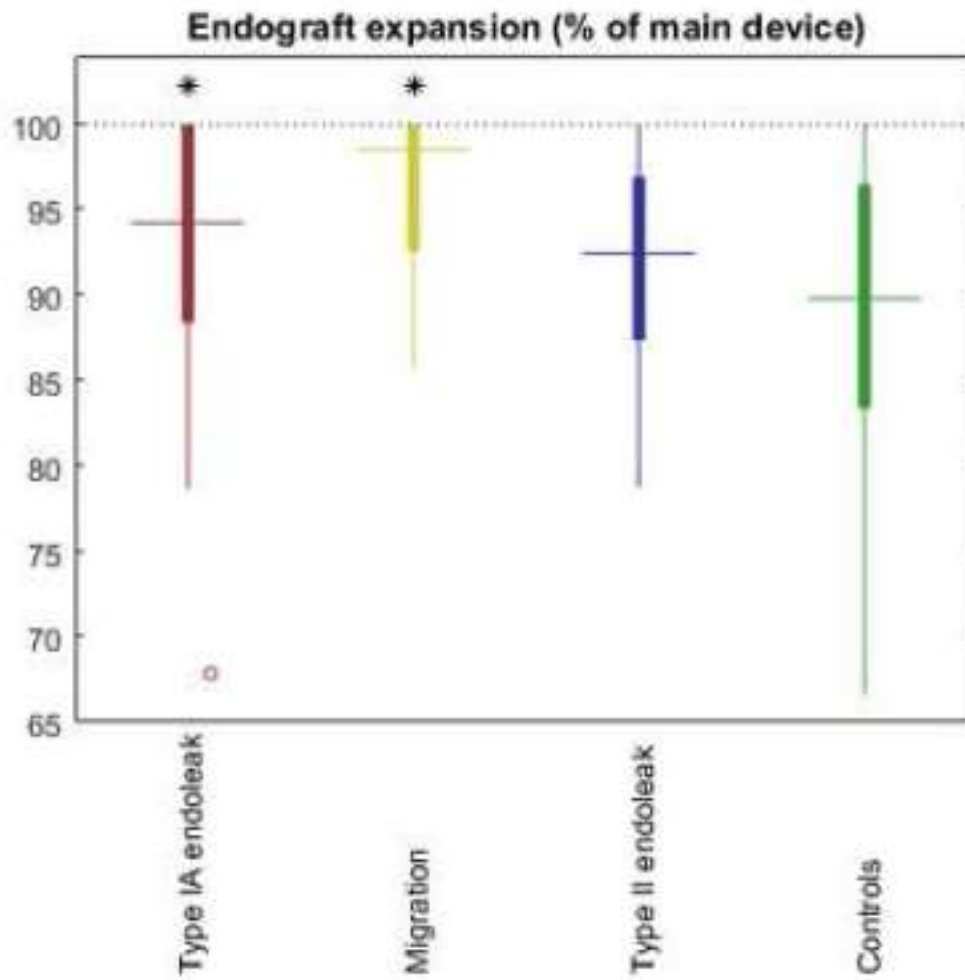
# Apposition length (CT scan *before* complication)



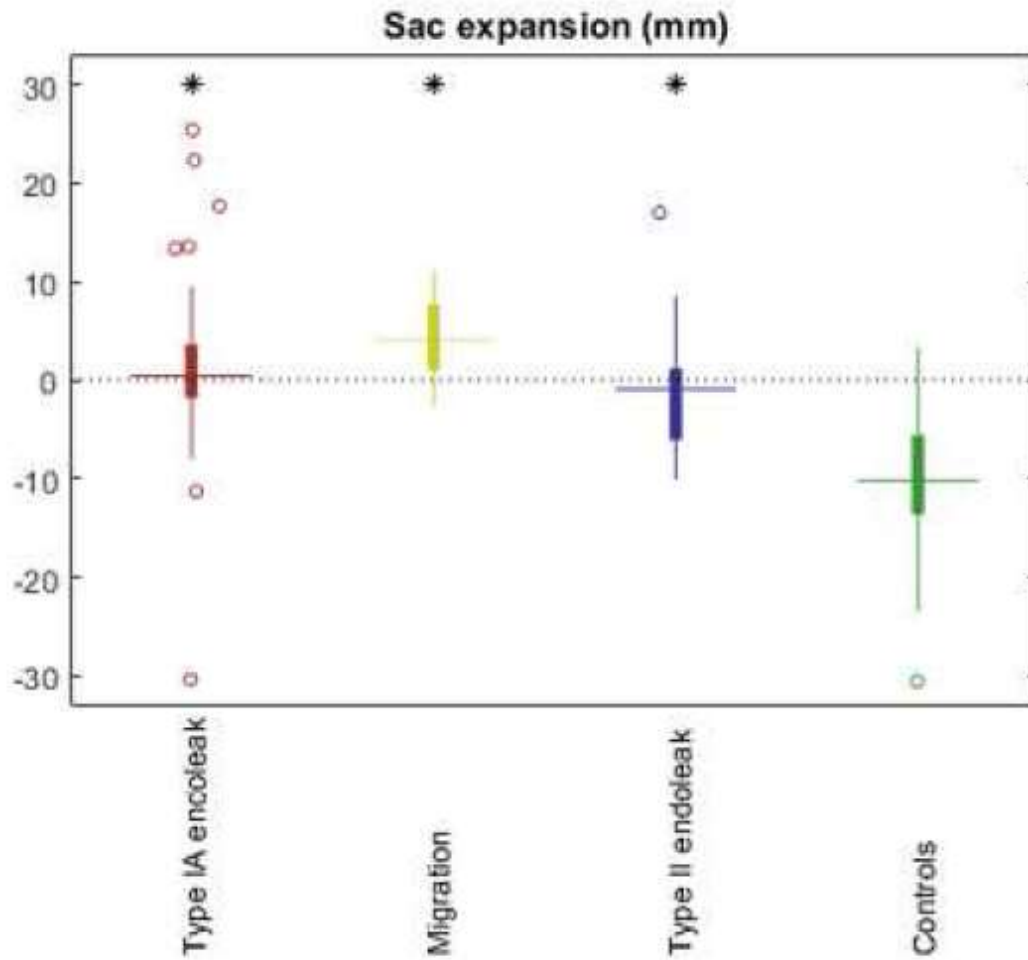
# Apposition % neck (CT scan *before* complication)



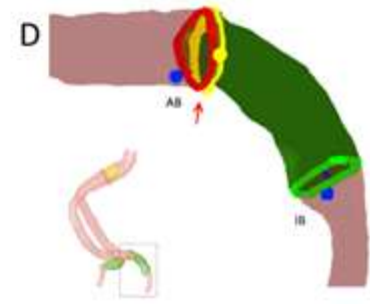
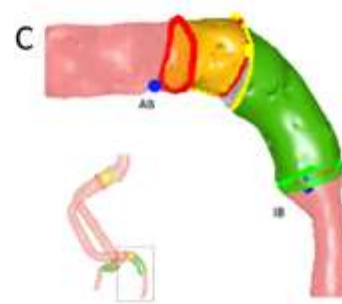
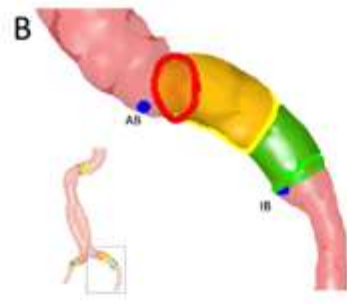
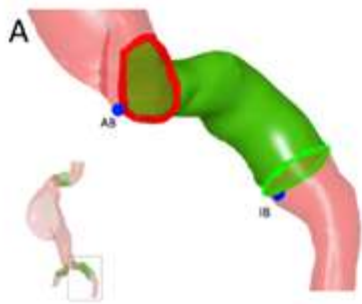
# Endograft expansion (CT scan *before* complication)



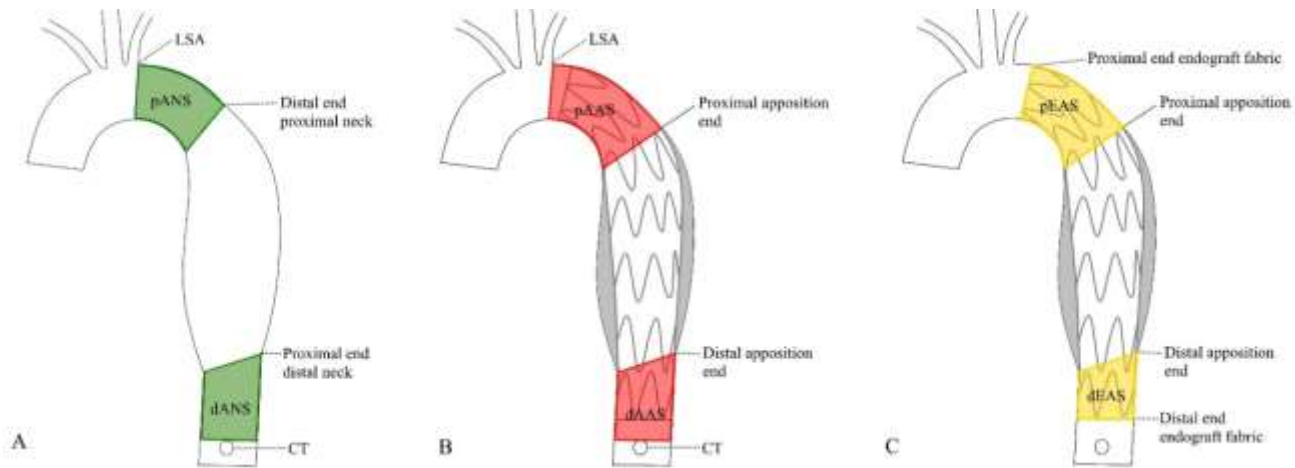
# AAA sac expansion (CT scan *before* complication)



# Other applications (work in progress)

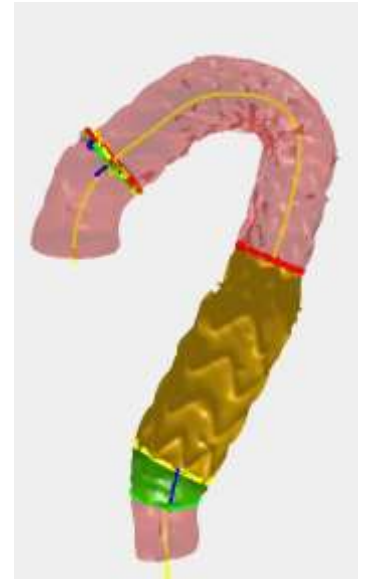
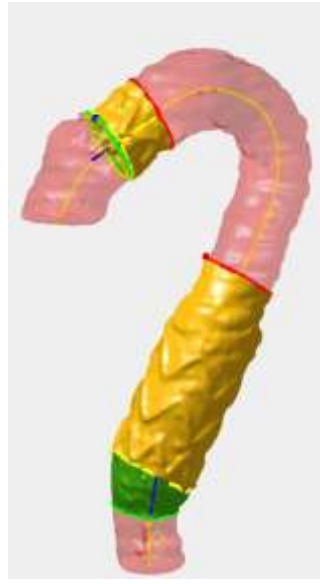
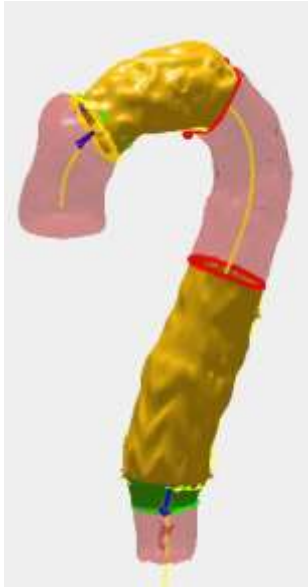


# Other applications (work in progress)





# Other applications (work in progress)



# Conclusions

- Detailed determination of position, and apposition of endograft / chimney grafts in the aortic neck on regular postoperative CTA scans is feasible with new VIA software.
- Early detection of morphological neck changes may prevent disastrous complications, and can make reinterventions less invasive.
- Today, a part of the early morphological changes will be missed with standard CT (reports)

# Conclusions

- Certification of the software mandatory
- Thoracic and iliac applications are explored