Benefit Of AI And AAA Volume Measurements After EVAR And FBEVAR: How Do They Improve Care

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Disclosures

- No personal CI
- GHPSJ/INCEPTO collaboration

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INCEPTO

ARVA

Development of an artificial intelligence software for automation of aortic measurements

Saving Time, Saving Life, Together.

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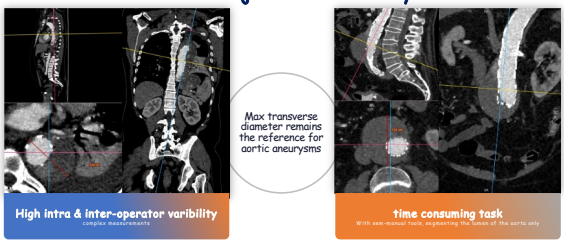
Aorta measurement requires expertise, time, and is subject to variability



Max transverse diameter remains the reference for aortic aneurysms

High intra & inter-operator variability
complex measurements

time consuming task
With semi-manual tools, segmenting the lumen of the aorta only

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More and more patients…

… long follow-up

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- More complex cases
- Is there a way to detect abnormalities earlier during follow-up?
  volume versus diameter analysis is promising but not applicable in clinical routine *

*Lindquist Liljeqvist M, Hultgren R, Gasser TC, Roy J. Volume growth of abdominal aortic aneurysms correlates with baseline volume and increasing finite element analysis-derived rupture risk. J Vasc Surg. White RA, Donayre CE, Walot I, Woody J, Kim N, Kopchok GE. Computed tomography assessment of abdominal aortic aneurysm morphology after endograft exclusion. J Vasc Surg. Parr A, Zayarnha C, Buttner P, Golledge J. Comparison of volume and diameter measurement in assessing small abdominal aortic aneurysm expansion examined using computed tomographic angiography. Eur J Radiol.

The Power of Deep Learning

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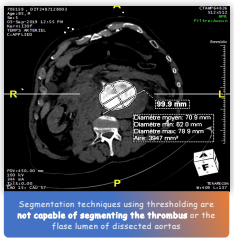


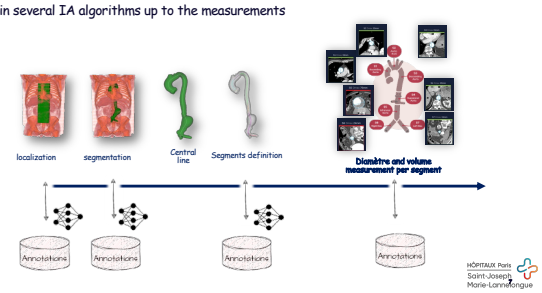
1200 aortas (pre/post operative, thoracic, abdominal, dissections, etc.) have been manually contoured to train the ARVA segmentation model

Segmentation techniques using thresholding are not capable of segmenting the thrombus or the flase lumen of dissected aortas

Deep Learning allows to overcome these limits

A complex pipeline

Chain several IA algorithms up to the measurements



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Report: diameters & volumes

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Patient follow-up with volumes

A metric more sensitive than diameter alone ?

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A CE marked product & clinically validated

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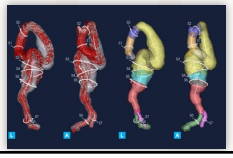
- Broda, Magdalena et al. *The benefit of automated sac volume measurements in postoperative endovascular aortic repair surveillance.* JVS. 2024.
- Postiglione TJ, et al. *Multicentric Clinical Evaluation of a Computed Tomography based Fully automated Deep Neural Network for Aortic Maximum Diameter and Volumetric Measurements.* JVS. 2024.
- Wegner M, et al. *Artificial Intelligence-Assisted Sac Diameter Assessment for Complex Endovascular Aortic Repair.* J Endovasc Ther. 2023.
- Adam C, et al. *Pre-surgical and post-surgical aortic aneurysm maximum diameter measurement: Full automation by artificial intelligence.* CTVES. 2021.



Key points

- Large datasets for validation (up to **350 CTA scans**) with complex anatomies & various treatments
- 6 experts for ground truthing, 13 clinicians for annotations in validation studies
- **Median absolute error of 1.2mm**
- **volume similarity* with ground truth 93% - 95%** in the main trunk and 88% in the iliac arteries

* Volume similarity corresponds to the ratio of volume differences over the average volume. This metric ranges from 0 to 100%, the closer to 100% the better

Pre-surgical and Post-surgical Aortic Aneurysm Maximum Diameter Measurement: Full Automation by Artificial Intelligence

Artificial Intelligence–Assisted Sac Diameter Assessment for Complex Endovascular Aortic Repair

Multicentric clinical evaluation of a computed tomography-based fully automated deep neural network for aortic maximum diameter and volumetric measurements

The benefit of automated sac volume measurements in postoperative endovascular aortic repair surveillance

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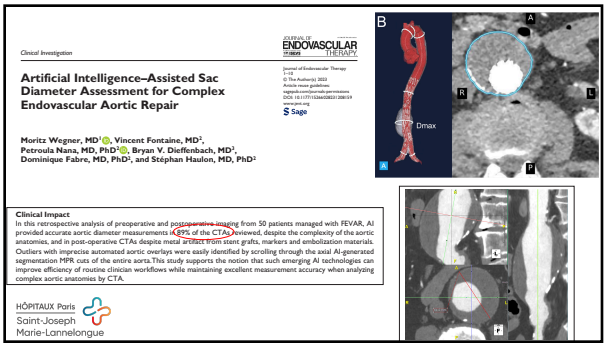

Artificial Intelligence–Assisted Sac Diameter Assessment for Complex Endovascular Aortic Repair

Moritz Wegner, MD[1], Vincent Fontaine, MD[2], Petroula Nana, MD, PhD[3], Bryan V. Dieffenbach, MD[1], Dominique Fabre, MD, PhD[1], and Stéphan Haulon, MD, PhD[2]

Clinical Impact

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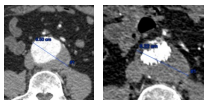
Volume versus Diameter for Follow Up

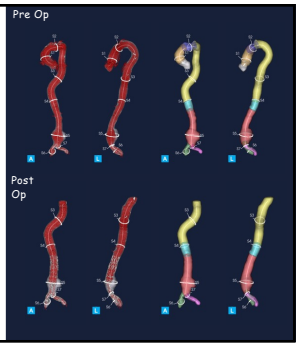
Study Protocol
100 patients
- Pre & post op, and 2-year CTA
- 50 EVAR
- 50 FEVAR

Goal
- Compare diameter and volume measurements for patient follow up



Dmax S5 = 65mm
V S5 = 164mL

Dmax S5 =62mm
V S5 = 146mL



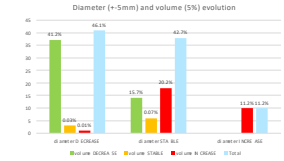
J Vasc Surg. 2024 Nov 8:S0741-5214(24)02027-5. doi: 10.1016/j.jvs.2024.10.070.
Online ahead of print.

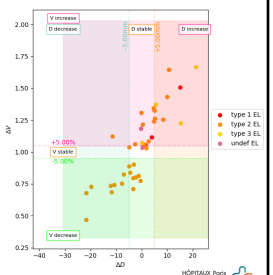
The benefit of automated sac volume measurements in postoperative endovascular aortic repair surveillance

Magdalena Broda [1], Alexandre Rossillon [2], Thomas Le Houérou [3], Camille Ruppli [4], Erol Lorisson [3], Emad Al Ooali [3], Dominique Fabre [3], Michel Bartoli [2], Stéphan Haulon [4]

Affiliations + expand

PMID: 39522568 DOI: 10.1016/j.jvs.2024.10.070





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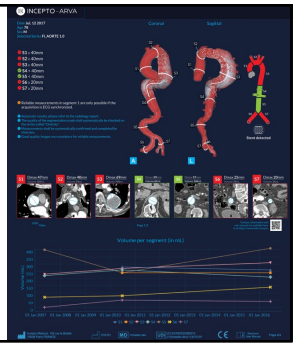
The ARVA solution

AI solution for **automatic volumetric analysis and measurements of the aorta**, for aneurysm monitoring and follow-up, integrated directly into your existing infrastructure and work environment

Save time	Standardize	Structure
Fully automatic workflow, including fetching of previous exams	**AI based max transverse diameter & volume for each aortic segment**	**Structured report integrated back into the patient folder**



CONCLUSIONS

- Swift workflow (outliers)
- Time consuming task no more required in most cases (89%)
- Benefit of Volume follow-up?

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