

What are the latest findings after the
PERICLES Registry about CHEVAR

Konstantinos Donas
Münster, Germany

PERICLES Registry

PAPERS OF THE 135TH ASA ANNUAL MEETING

Collected World Experience About the Performance of the Snorkel/Chimney Endovascular Technique in the Treatment of Complex Aortic Pathologies

The PERICLES Registry

Konstantinos P. Donas, MD, Jason T. Lee, MD,† Mario Lachat, MD,‡ Giovanni Torsello, MD, PhD,§ and Frank J. Veith, MD,¶ on behalf of the PERICLES investigators*

Objectives: We sought to analyze the collected worldwide experience with use of snorkel/chimney endovascular aneurysm repair (EVAR) for complex abdominal aneurysm treatment.

Background: EVAR has largely replaced open surgery worldwide for anatomically suitable aortic aneurysms. Lack of availability of fenestrated and branched devices has encouraged an alternative strategy utilizing parallel or snorkel/chimney grafts (ch-EVAR).

Methods: Clinical and radiographic information was retrospectively reviewed and analyzed on 517 patients treated by ch-EVAR from 2008 from 2014 by prearranged defined and documented protocols.

Results: A total of 119 patients in US centers and 398 in European centers were treated during the study period. US centers preferentially used Zenith stent-grafts (54.2%) and European centers Endurant stent-grafts (62.2%) for the main body component. Overall 898 chimney grafts (49.2% balloon expandable, 39.6% self-expanding covered stents, and 11.2% balloon expandable bare metal stents) were placed in 692 renal arteries, 156 superior mesenteric arteries (SMA), and 50 celiac arteries. At a mean follow-up of 17.1 months

(range: 1–70 months), primary patency was 94%, with secondary patency of 95.3%. Overall survival of patients in this high-risk cohort for open repair at latest follow-up was 79%.

Conclusions: This global experience represents the largest series in the ch-EVAR literature and demonstrates comparable outcomes to those in published reports of branched/fenestrated devices, suggesting the appropriateness of broader applicability and the need for continued careful surveillance. These results support ch-EVAR as a valid off-the-shelf and immediately available alternative in the treatment of complex abdominal EVAR and provide impetus for the standardization of these techniques in the future.

Keywords: abdominal aortic aneurysm, endovascular, fenestrated, thoracoabdominal, vascular

(Ann Surg 2015;262:546–553)

The snorkel/chimney technique is an endovascular therapeutic modality for branch revascularization in complex aortic pathologies that has gained increasing popularity since the first publications in 2003 and 2007.^{1,2} These techniques have emerged from the basic

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What is new?

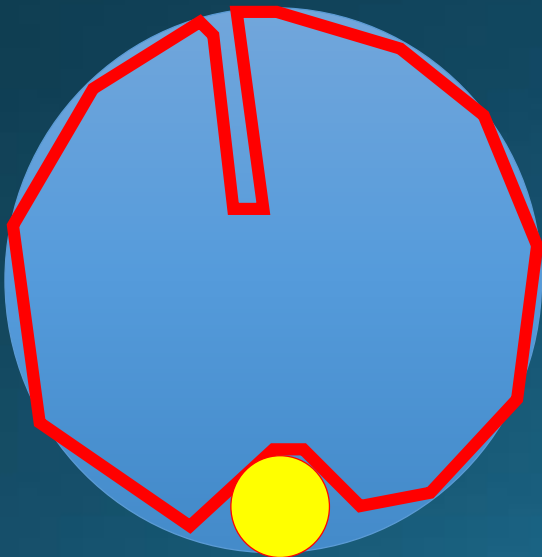
Classification of Chimney EVAR-Related Endoleaks: Insights From the PERICLES Registry

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SAGE

Konstantinos P. Donas, MD^{1,2}, Frank J. Criado, MD³, Giovanni Torsello, MD^{1,2},
Frank J. Veith, MD^{4,5}, and David J. Minion, MD,⁶ on behalf of the PERICLES
Registry Collaborators

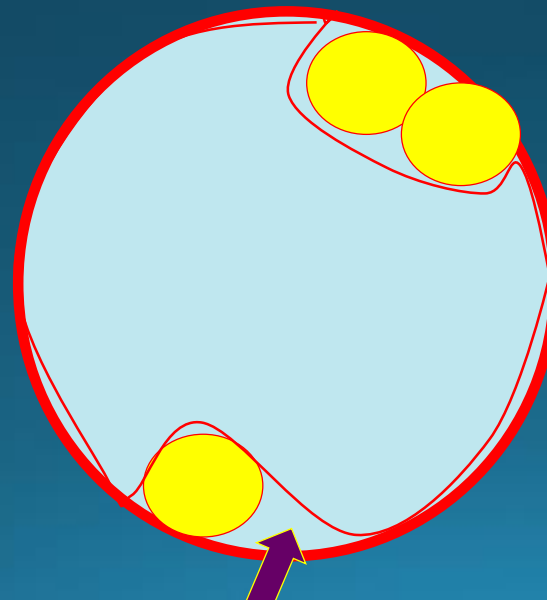
Pattern A

Excessive oversizing
of the aortic endograft



Pattern B

Undersized aortic endograft in
large neck diameters
or multiple chimneys



Pattern C

Insufficient sealing
length and migration



Collected World Experience About the Performance of the Snorkel/Chimney Endovascular Treatment of Abdominal Aortic Aneurysms

Konstantinos P. Donas

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Objectives: We sought to analyze the use of snorkel/chimney endovascular treatment of abdominal aortic aneurysms.

Background: EVAR has become an anatomically suitable aortic endovascular treatment and branched devices have emerged as an alternative to open repair.

Methods: Clinical and radiographic information was retrospectively reviewed for all patients treated by ch-EVAR from 2008 from 2014 by prearranged defined and documented protocols.

Results: A total of 119 patients in US centers and 398 in European centers were treated during the study period. US centers preferentially used Zenith stent-grafts (54.2%) and European centers Endurant stent-grafts (62.2%) for the main body component. Overall 898 chimney grafts (49.2% balloon expandable, 39.6% self-expanding covered stents, and 11.2% balloon expandable bare metal stents) were placed in 692 renal arteries, 156 superior mesenteric arteries (SMA), and 50 celiac arteries. At a mean follow-up of 17.1 months

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What is new?

Incidence and prognostic factors related to major adverse cerebrovascular events in patients with complex aortic diseases treated by the chimney technique

Michael J. Bosiers, MD,^{a,b} Kenneth Tran, MD,^c Jason T. Lee, MD,^c Konstantinos P. Donas, MD,^{a,b}
Frank J. Veith, MD,^d Giovanni Torsello, MD,^{a,b} Felice Pecoraro, MD,^e and Konstantinos Stavroulakis, MD,^{a,b}
for the PERICLES-Registry Collaborators, Münster, Germany; Stanford, Calif; New York, NY; Zurich, Switzerland

ABSTRACT


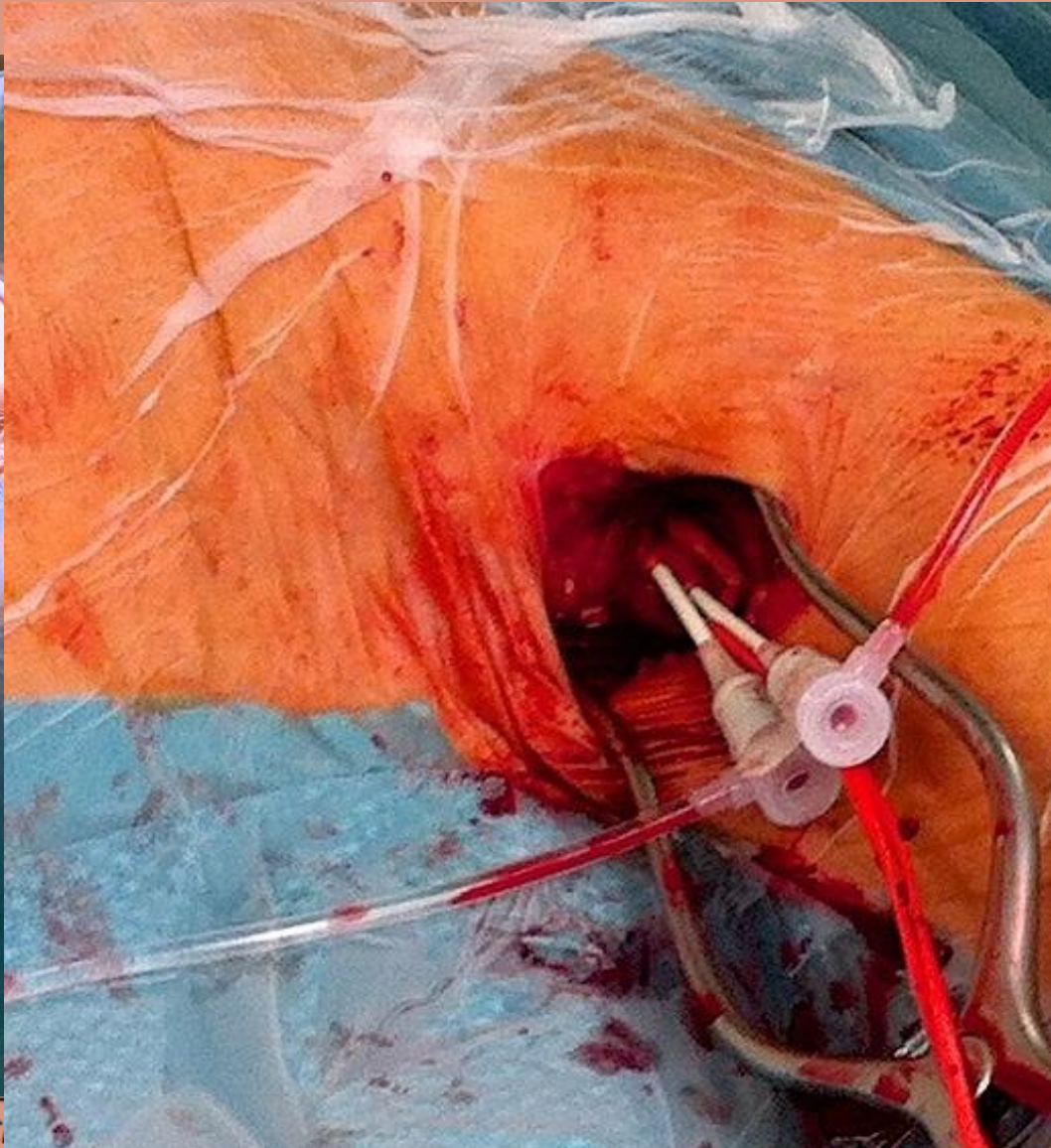
Objective: Endovascular aneurysm repair (EVAR) with the chimney technique (ch-EVAR) has been used for the treatment of aortic aneurysms as an alternative approach to fenestrated endografting or open repair. Nonetheless, the need for an upper extremity arterial access may contribute to a higher risk for periprocedural cerebrovascular events. This study reports on the perioperative cerebral and major adverse cardiac and cerebrovascular events (MACCE) after ch-EVAR.

Methods: The PERICLES registry (PERformance of the chimney technique for the treatment of Complex aortic pathoLogiES) is an international, retrospective multicenter study evaluating the performance of ch-EVAR for the treatment of complex aortic pathologies. For the purpose of the current analysis, 425 patients treated by ch-EVAR between 2008 and 2014 were included. The primary outcome of this analysis was the incidence of procedure related cerebrovascular events defined as transient ischemic attack or stroke. The secondary endpoint was in-hospital MACCE, including acute coronary syndrome, stroke, and death of any cause.

Results: The incidence of clinical relevant cerebrovascular events was 1.9% (8/425). A postoperative transient ischemic attack was observed in 4 patients (0.95%) and a stroke in additional 4 (0.95%). Three patients died during the hospital stay secondary to sequelae from postoperative stroke. A prior history of stroke/transient ischemic attack, atrial fibrillation, previous carotid revascularization, or known carotid artery disease did not significantly increase the risk for adverse neurologic events. The overall MACCE rate amounted to 8.5% (36/425). Logistic regression analysis revealed that the use of bilateral upper extremity access (odds ratio [OR], 2.79; 95% confidence interval [CI], 1.04-7.45), aneurysm rupture (OR, 5.33; 95% CI, 1.74-16.33), and a prolonged operation time (>290 minutes; OR, 1.005; 95% CI, 1.001-1.008) were associated with a significantly increased risk for MACCE.

Conclusions: This analysis demonstrates that ch-EVAR is associated with a relatively low rate of cerebrovascular events. However, a postoperative stroke is associated with increased mortality. Ruptured aneurysms, bilateral upper extremity access as in case of multiple chimney graft placement, and longer operative times were identified as independent risk factors for MACCE. (J Vasc Surg 2017;■:1-8.)

Table V. Anatomic and procedural factors (MACCE)

	Cohort (n = 425)	MACCE (n = 36)	No MACCE (n = 389)	P
Rupture			18 (4.6)	<.001
Suprarenal				.056
Old EVAR				.756
Old open				.250
Multichimney				.188
Access				
Bilateral				.013
Left only				.228
Right only				.643
Sheath size				
6-F				.375
7-F				.248
8-F				.426
OR time (min)				.045
Arch type (in)				
1				.517
2				.358
3				.899

EVAR, Endovascular aneurysm repair; MACCE, major adverse cardiac and cerebrovascular events.
Data are n (%) or mean ± standard deviation.

ing room.

Collected World Endovascular Snorkel/Chimney

Konstantinos

Classification of Endovascular Registry

Objectives: We sought to a use of snorkel/chimney endovascular abdominal aneurysm treatment.

Background: EVAR has anatomically suitable aortic and branched devices has endovascular or snorkel/chimney grafts (ch-EVAR).

Methods: Clinical and radiographic data were collected and analyzed on 517 patients treated by ch-EVAR from prearranged defined and documented protocols.

Results: A total of 119 patients in US centers and 39 were treated during the study period. US centers performed the main body component. Overall 898 chimney grafts (SMA), and 50 celiac arteries. At a mean follow-up of 11.2 months, 39.6% self-expanding covered stents, and 11.2% bare metal stents were placed in 692 renal arteries, 15 (SMA), and 50 celiac arteries. At a mean follow-up of 11.2 months, 39.6% self-expanding covered stents, and 11.2% bare metal stents were placed in 692 renal arteries, 15 (SMA), and 50 celiac arteries.

Konstantinos Frank J. Veith Registry

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Conclusions: This analysis demonstrates that ch-EVAR is associated with a relatively low rate of cerebrovascular events. However, a postoperative stroke is associated with increased mortality. Ruptured aneurysms, bilateral upper extremity access as in case of multiple chimney graft placement, and longer operative times were identified as independent risk factors for MACCE. (J Vasc Surg 2017; ■:1-8.)

What is also new?

Identification of optimal device combinations for the chimney endovascular aneurysm repair technique within the PERICLES registry

Salvatore T. Scali, MD,^a Adam W. Beck, MD,^b Giovanni Torsello, MD,^c Mario Lachat, MD,^d Paul Kubilis, MS,^a Frank J. Veith, MD,^e Jason T. Lee, MD,^f and Konstantinos P. Donas, MD,^c on behalf of the PERICLES investigators, Gainesville, Fla; Birmingham, Ala; Münster, Germany; Zurich, Switzerland; New York, NY; and Palo Alto, Calif

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ABSTRACT

Objective: The ideal stent combination for chimney endovascular aneurysm repair remains undetermined. Therefore, we sought to identify optimal aortic and chimney stent combinations that are associated with the best outcomes by analyzing the worldwide collected experience in the PERformance of chimney technique for the treatment of Complex Aortic Aneurysms (PERICLES) registry.

Conclusions: Within the PERICLES registry, use of nitinol/polyester stent graft devices with BECS during chimney endovascular aneurysm repair is associated with improved survival compared with other aortic endografts. However, this advantage was not observed for non-BECS repairs. Repairs incorporating multiple chimney subtypes were also associated with increased mortality risk. Importantly, increasing chimney stent number and bare-metal endolining stents increase chimney occlusion risk, whereas patients treated at low-volume centers have higher risk of type Ia endoleak. (J Vasc Surg 2018; ■:1-12.)

and 87% ± 3% were used, no difference receiving BECS did have a trend toward stent (hazard ratio [HR], 4.0; 95% confidence interval [CI], 1.8-9.0; P = .01). Use of a bare-metal endolining stent (intraoperatively and postoperatively) did not significantly differ for the aortic endoleak (OR, 2.4 [95% CI, 0.9-6.4; P = .08]). Patients treated at high-volume centers had significantly lower odds ratio of type Ia endoleak (OR, 0.2; 95% CI, 0.1-0.7; P = .01) irrespective of aortic or chimney device combination. Mortality risk was significantly higher in group C (+BECS) vs group A (+BECS) (HR, 5.3; 95% CI, 1.6-17.5; P = .006). The 1- and 3-year survival for groups A, B, and C (+BECS) was as follows: group A, 97% ± 1% and 92% ± 3%; group B, 93% ± 3% and 83% ± 7%; and group C, 84% ± 7% and 63% ± 14%. Use of more than one chimney subtype was associated with increased mortality (HR, 3.2; 95% CI, 1.4-7.5; P = .006).

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NEED FOR EVALUATION OF CHIMNEY GRAFTS

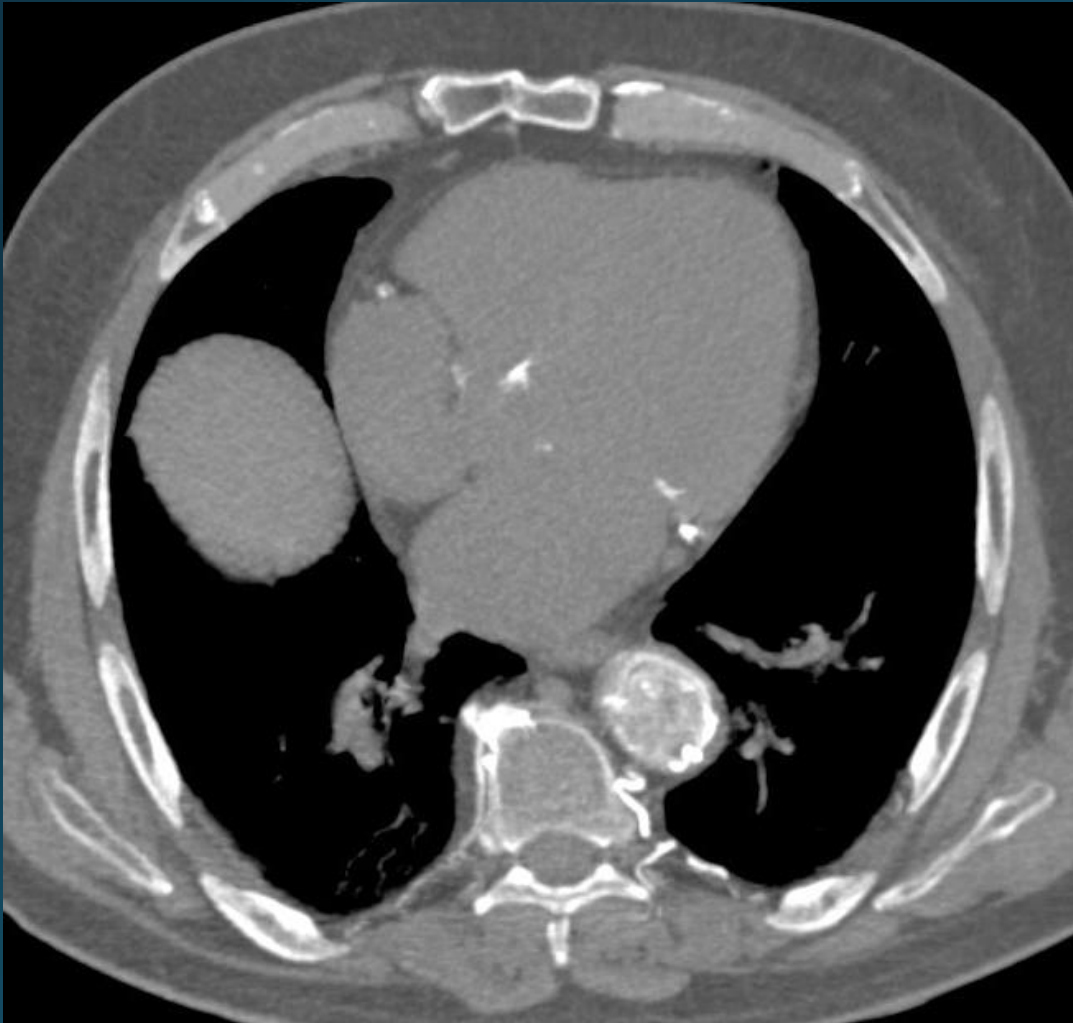
IN-VITRO EVALUATION OF CHIMNEY GRAFTS



Symptomatic para-anastomotic aneurysm
of 6.9 cm diameter



Chevar case



The preoperative CTA was used for the creation of an anatomically 1:1 similar silicon model



Connection of the silicon model
with a **pulsatile pump unit**
simulating blood flow

Fluid simulation system



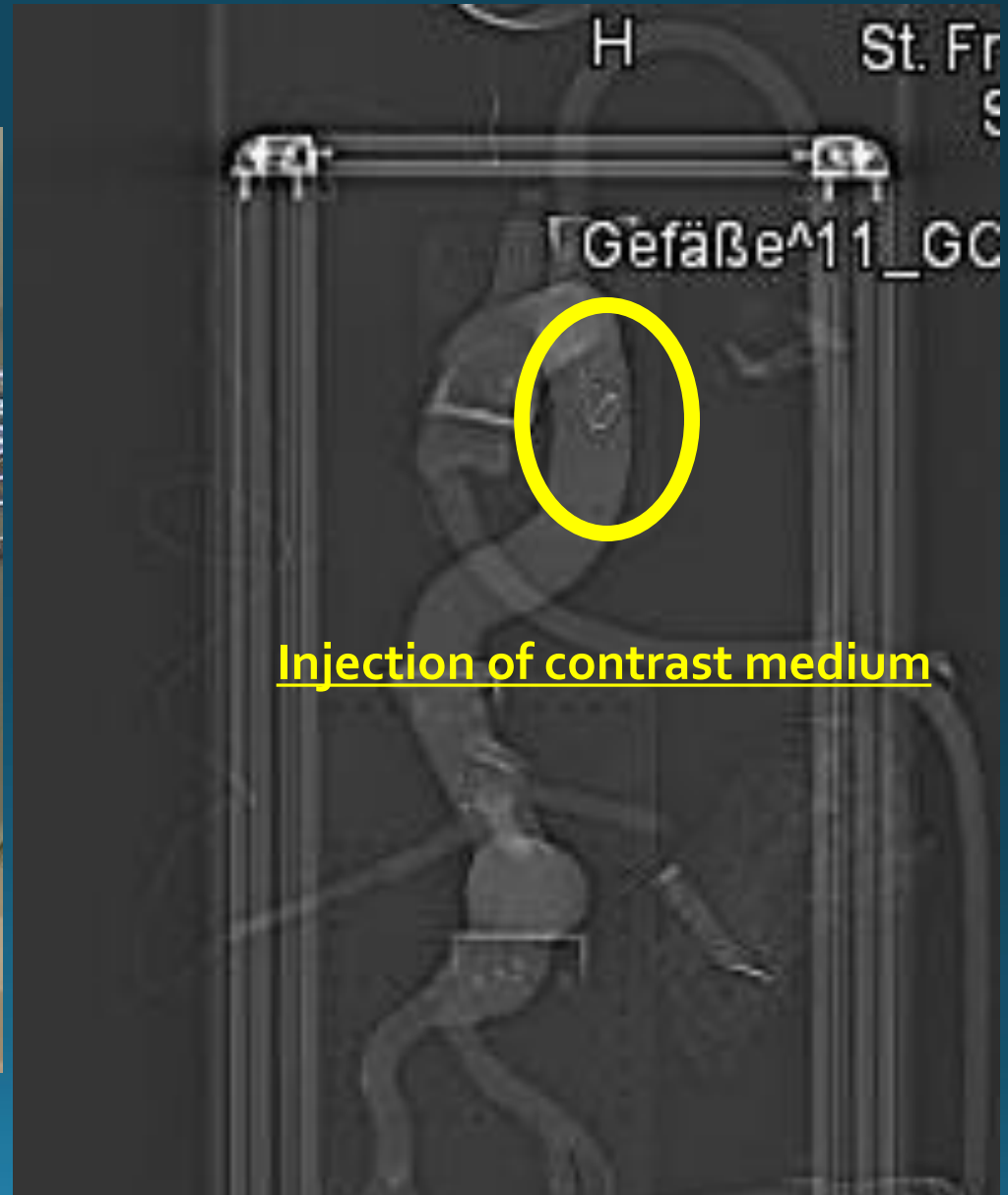
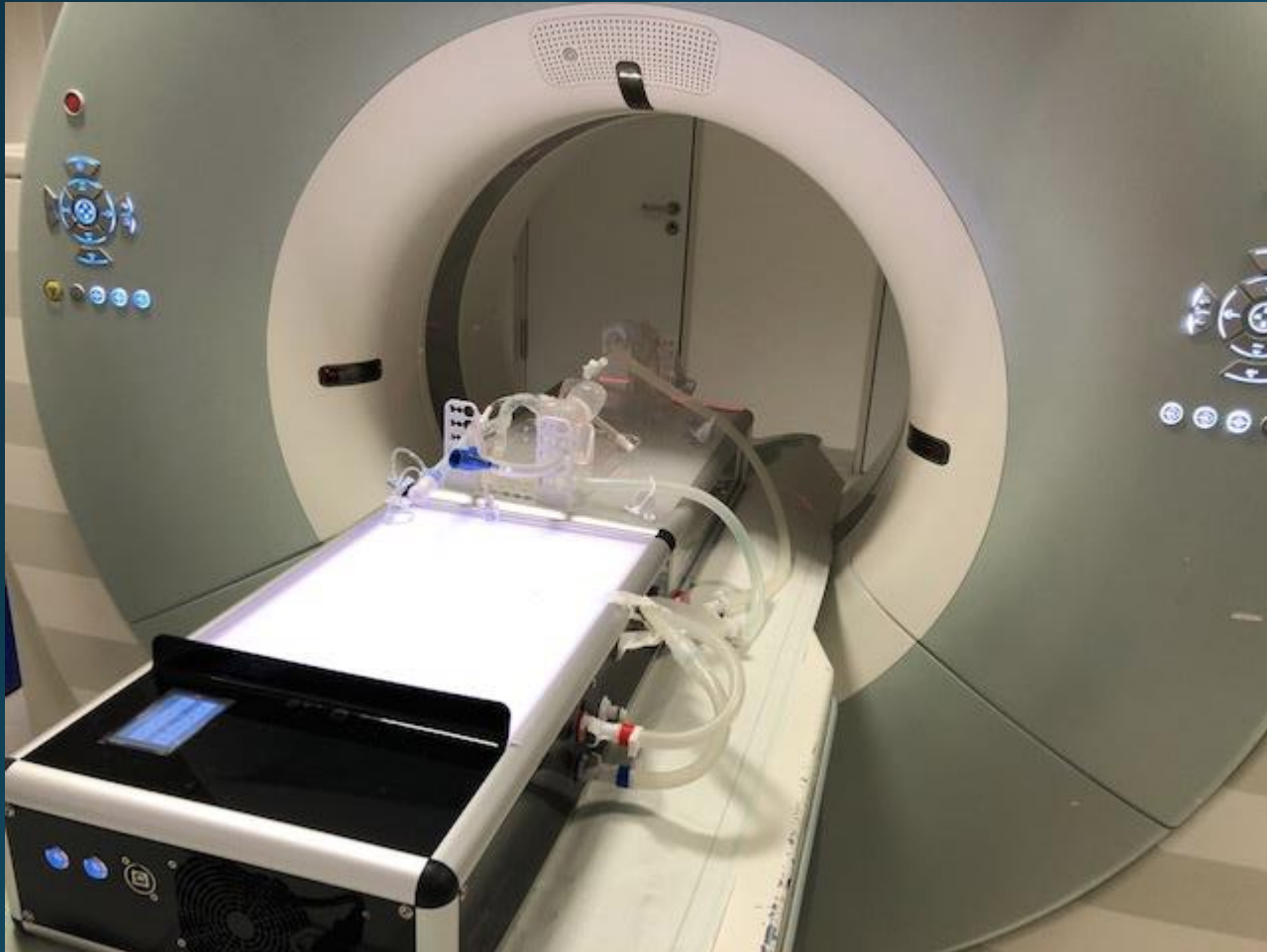


Fluid simulation system

Characteristics

- The device can be exposed to **computed tomography** and offers the option for injection of contrast medium performing additional an **angiography (CTA)**

CT Angiography

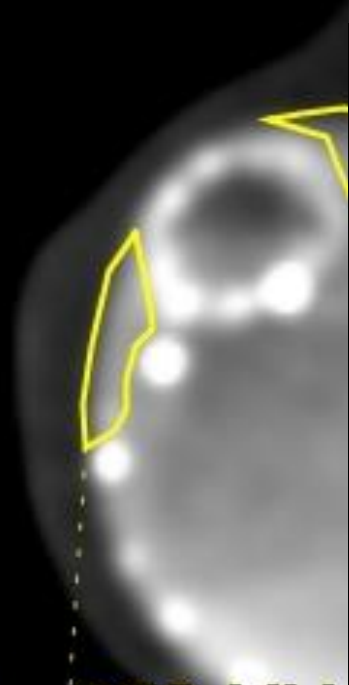


Injection of contrast medium

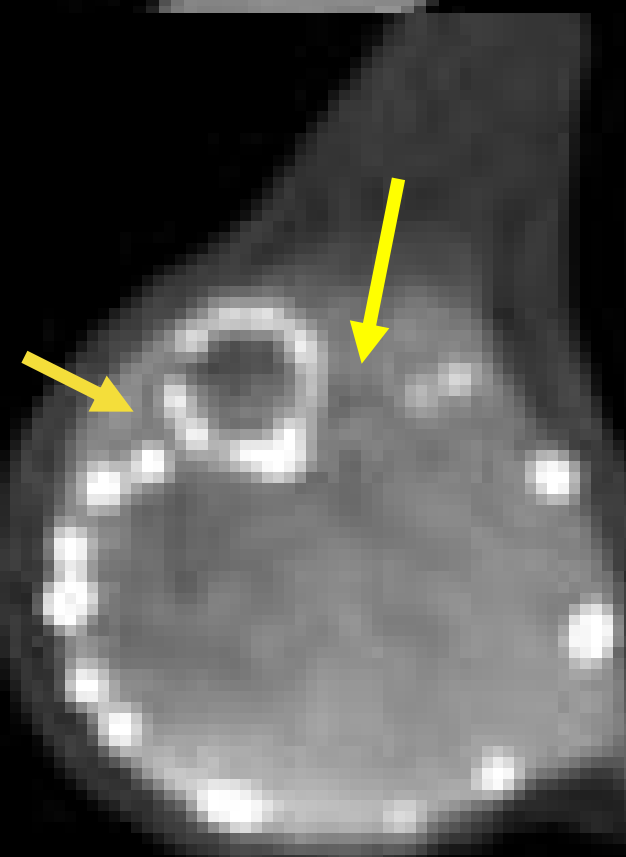
Evaluation of devices combinations

- Incraft and **Advanta V12**
- *Endurant* with **Advanta V12**

Incraft and Advanta V12



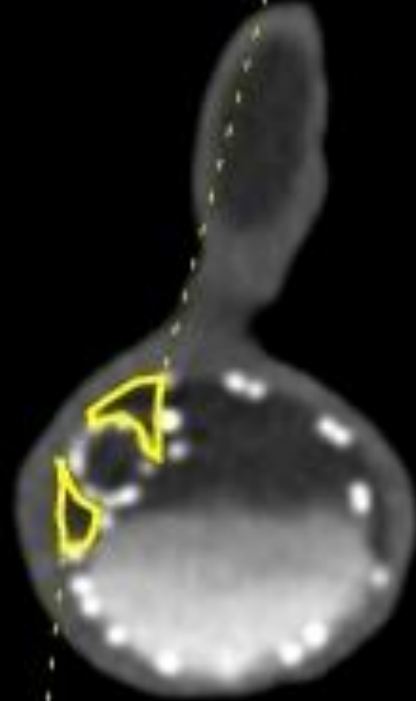
Avg=692,93 HU Min=352 HU
Std.Dev=157,33 HU Median=
17,10 mm² / 190 pixel



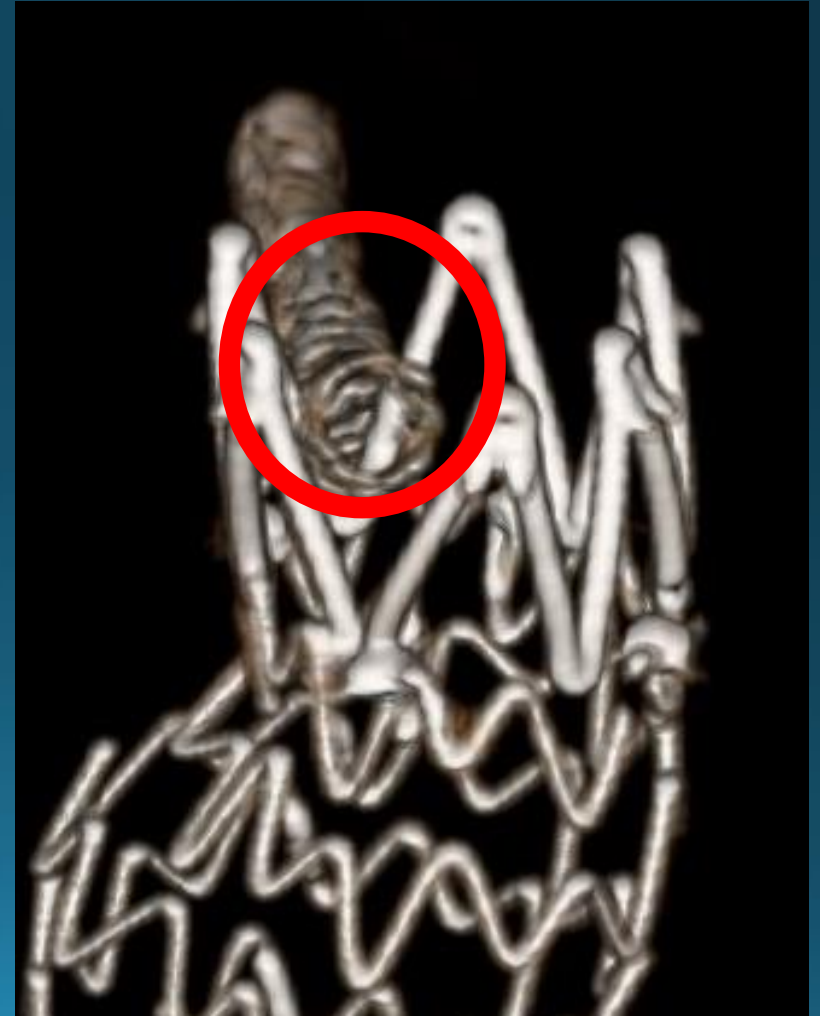
Endurant and Advanta V12

22,20 mm² / 116 pixel

R



Avg=130,45 HU Min=-11 HU Max=
Std.Dev=153,03 HU Median=83,5
14,55 mm² / 76 pixel



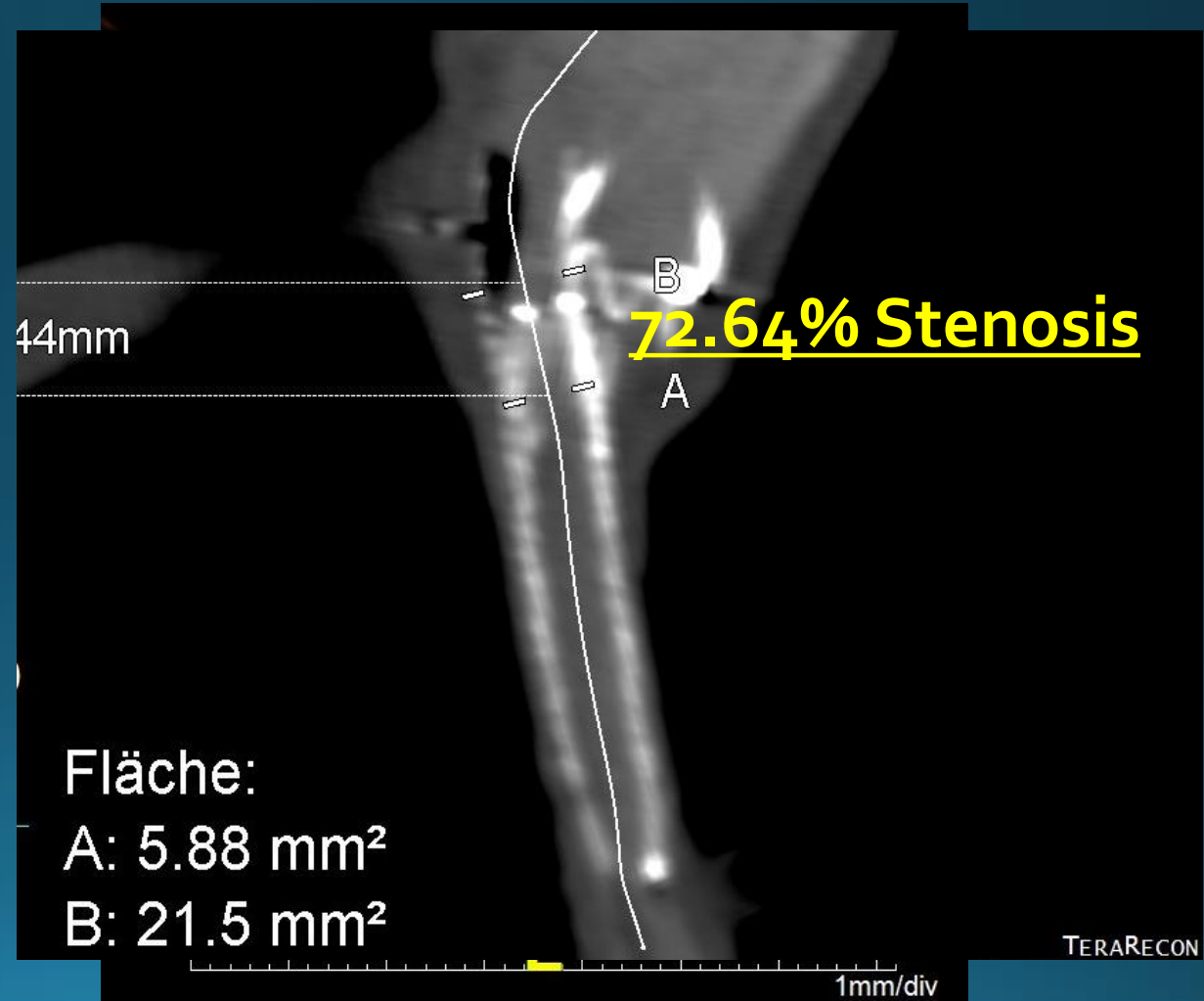
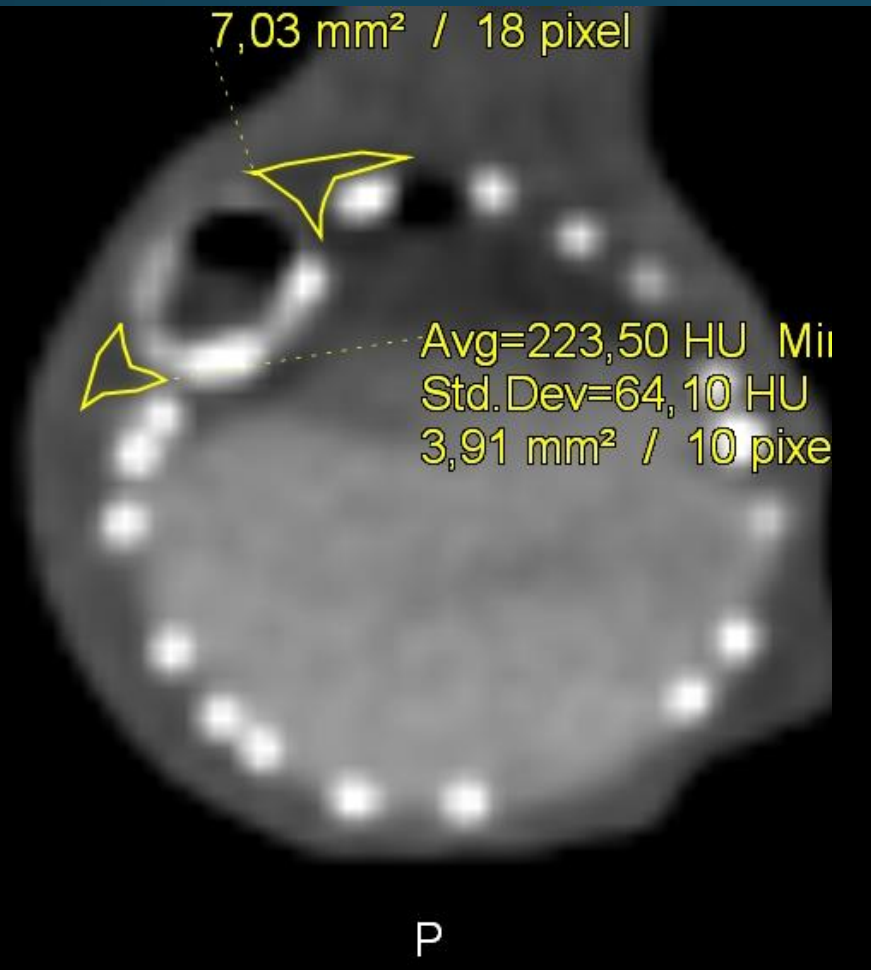
Evaluation of devices combinations

- *Endurant* with lined **Viabahn**

Endurant and Viabahn lined with bare stents

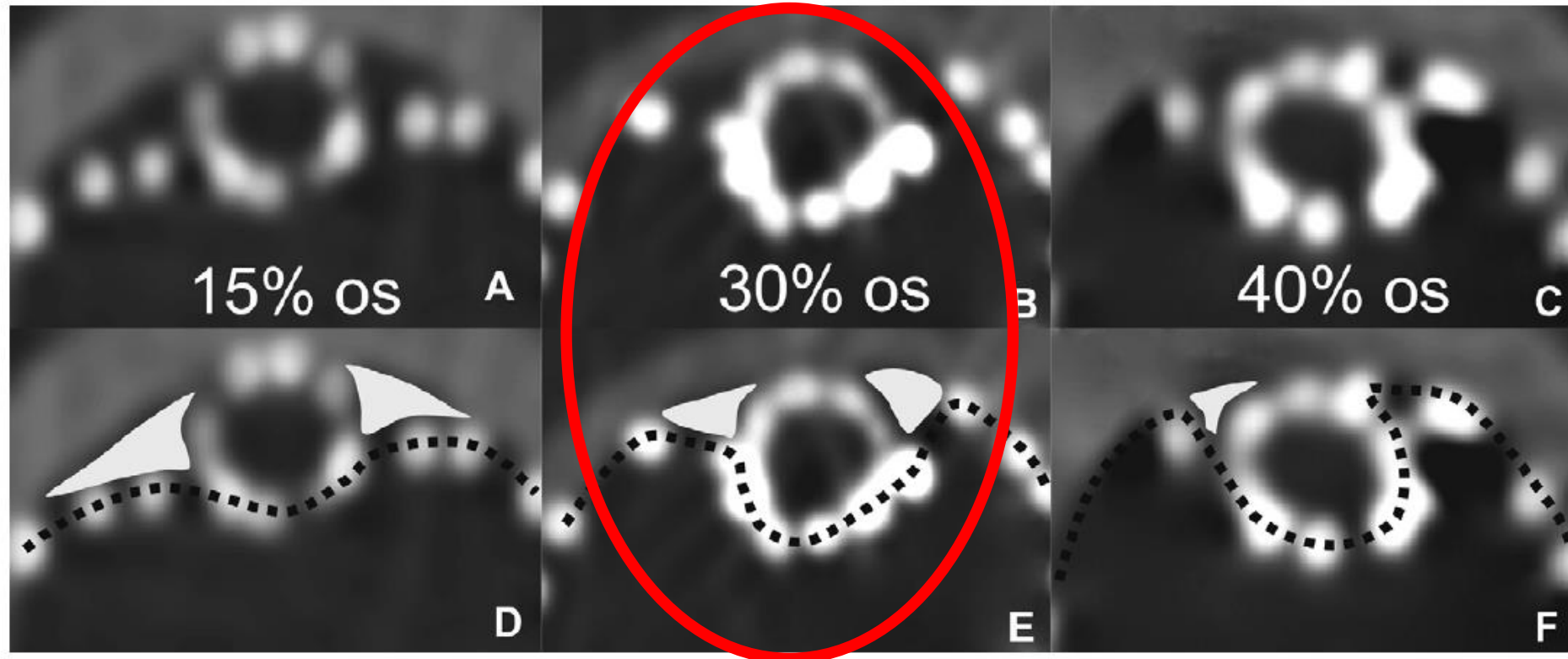


Endurant and Viabahn lined with SES

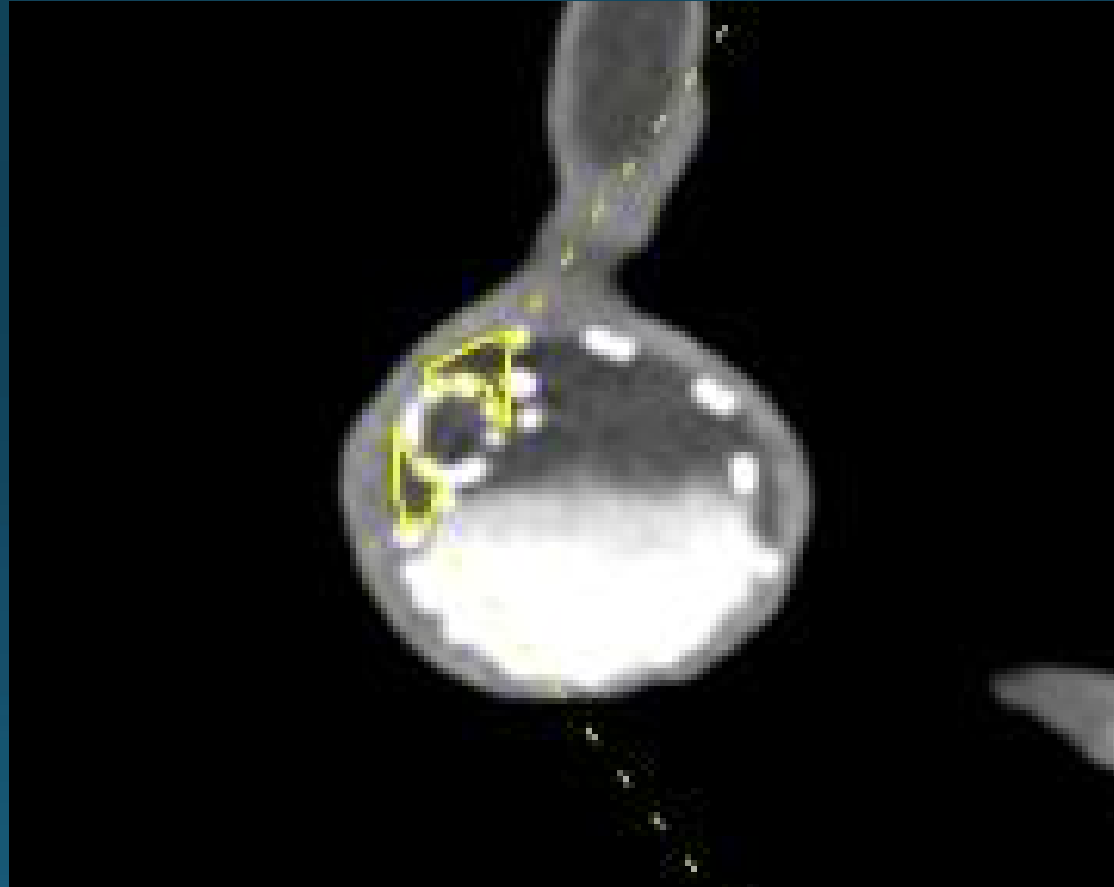


IMPACT OF DEGREE OF OVERSIZING

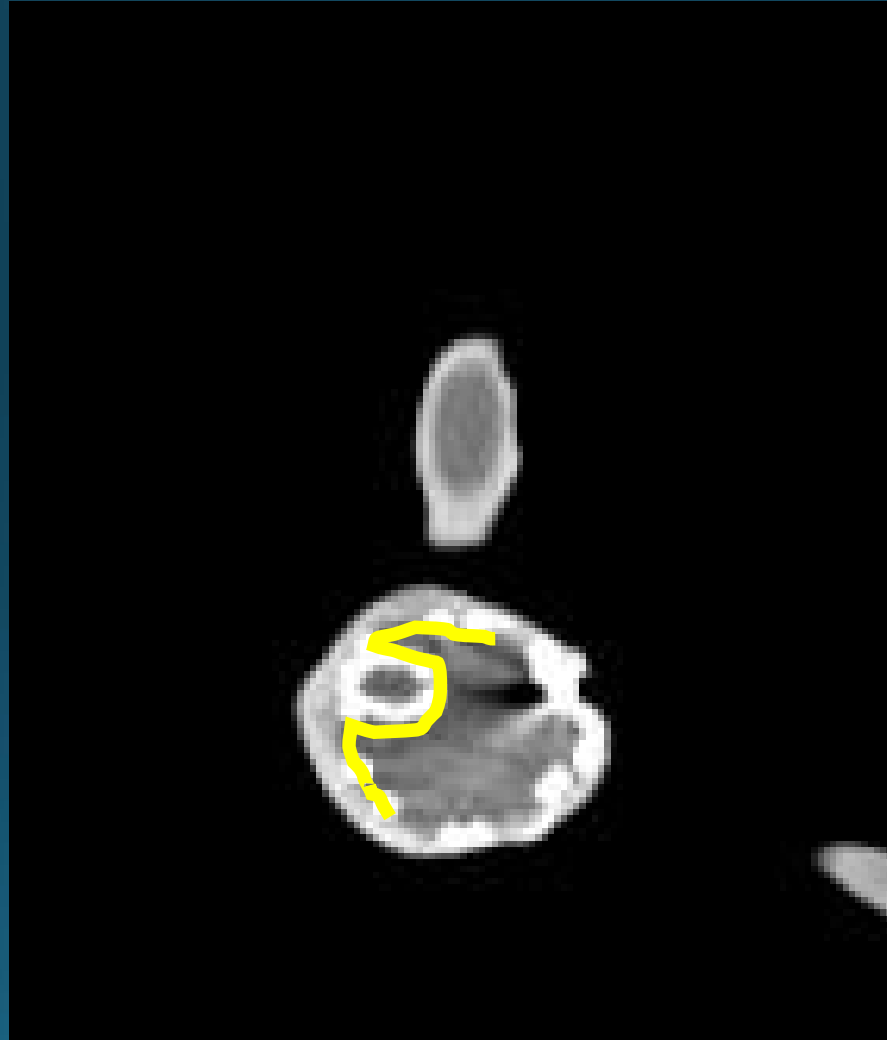
G. Mestres et al. / *European Journal of Vascular and Endovascular Surgery* 44 (2012) 468–473



Endurant 15% OVERSIZING



Endurant 30% OVERSIZING



Synopsis

- New findings about ch-EVAR from PERICLES Registry cohort:
 - - Classification of gutter-related endoleaks
 - - Low incidence of clinical-driven cerebrovascular events
 - - Bilateral access as in multiple chimneys high risk of increased MACE rate
 - - Multiple chimneys and lined chimney graft seem to have significant higher chimney occlusion rate

Synopsis

- New findings about ch-EVAR from PERICLES Registry cohort:
- - In vitro evidence about chimney grafts is the next big scientific thing
- - First tests show advanced performance of Advanta V12 in combination with nitinol endoskeleton of abdominal stent-grafts

Hostile proximal and distal anatomy

New SVS guidelines

- «However, fenestrated, branched, and chimney or snorkel grafts have expanded the range of complex aortic anatomy potentially treatable by EVAR»

SOCIETY FOR VASCULAR SURGERY[®] DOCUMENT

The Society for Vascular Surgery practice guidelines on the care of patients with an abdominal aortic aneurysm



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M. Hassan Murad, MD, MPH,^h Louis L. Nguyen, MD, MBA, MPH,ⁱ Gustavo S. Oderich, MD,^j

Madhukar S. Patel, MD, MBA, ScM,^{ak} Marc L. Schermerhorn, MD, MPH,^a and Benjamin W. Stames, MD,^l

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