

MIS²ACE– update *and technical tips and tricks*



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The author declares no conflict of interest



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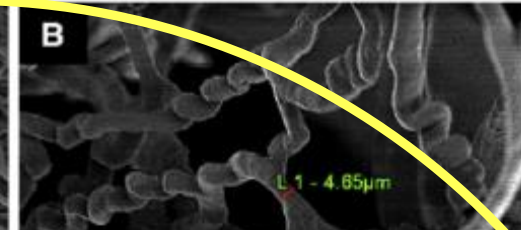
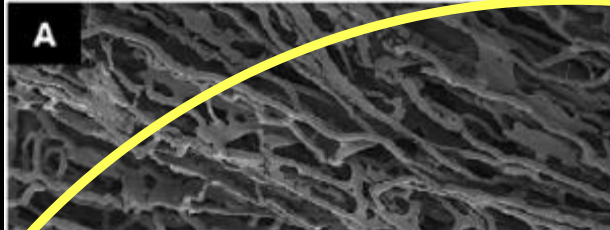


Rationale for ,staged segmental artery coil-embolisation' (MIS²ACE)

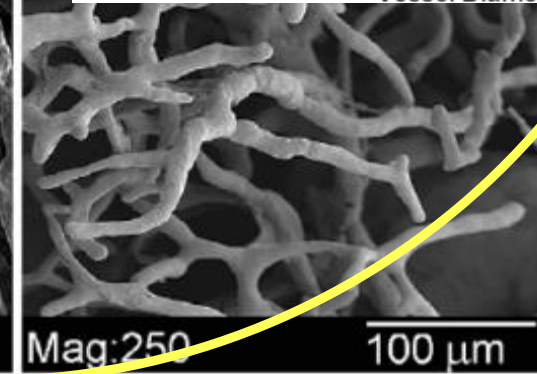
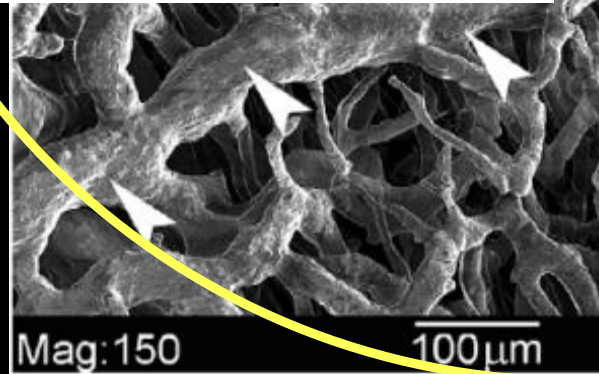
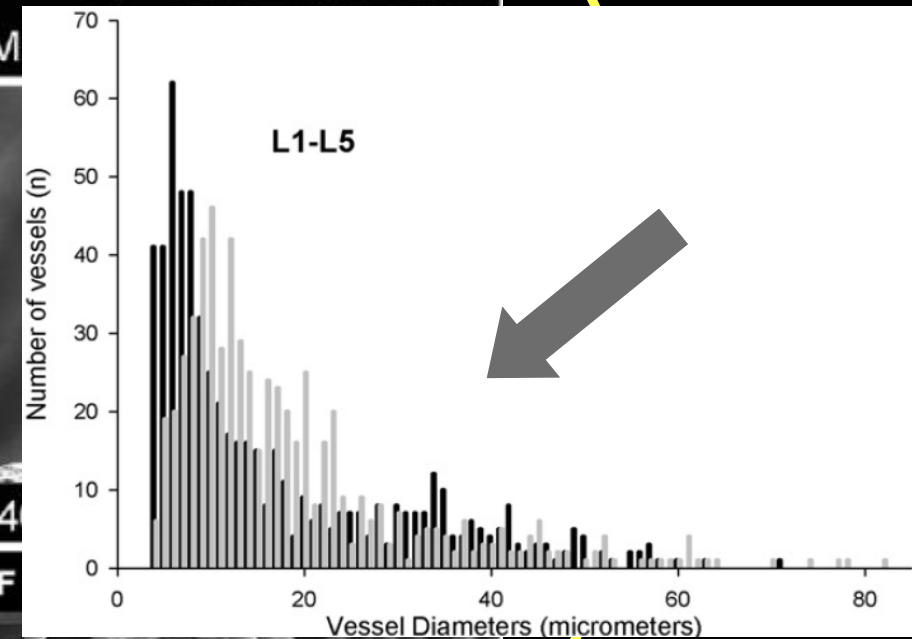
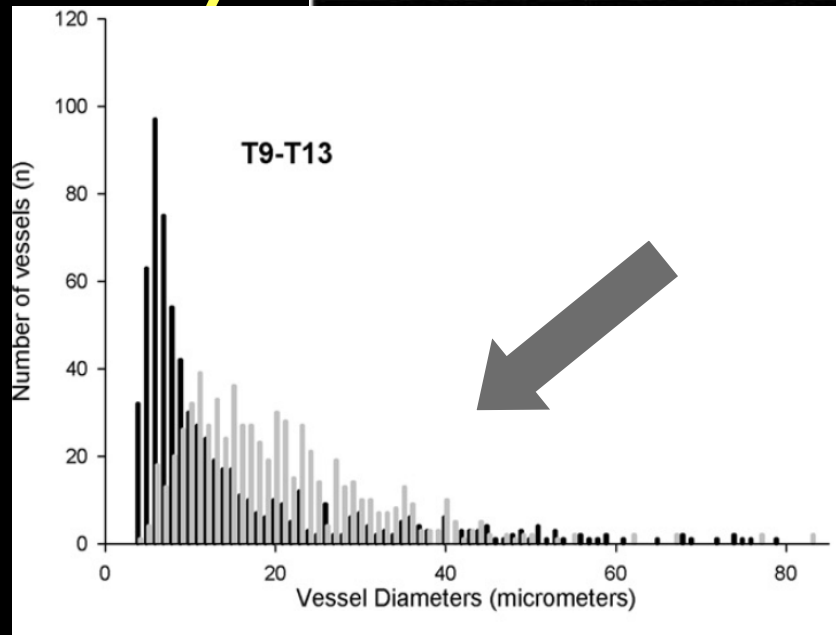
Identification of the Collateral Network

***→ lead to the concept of staged ,re-routing' of
arterial blood flow to avoid sudden ischemic insults***

→ regional arteriogenesis

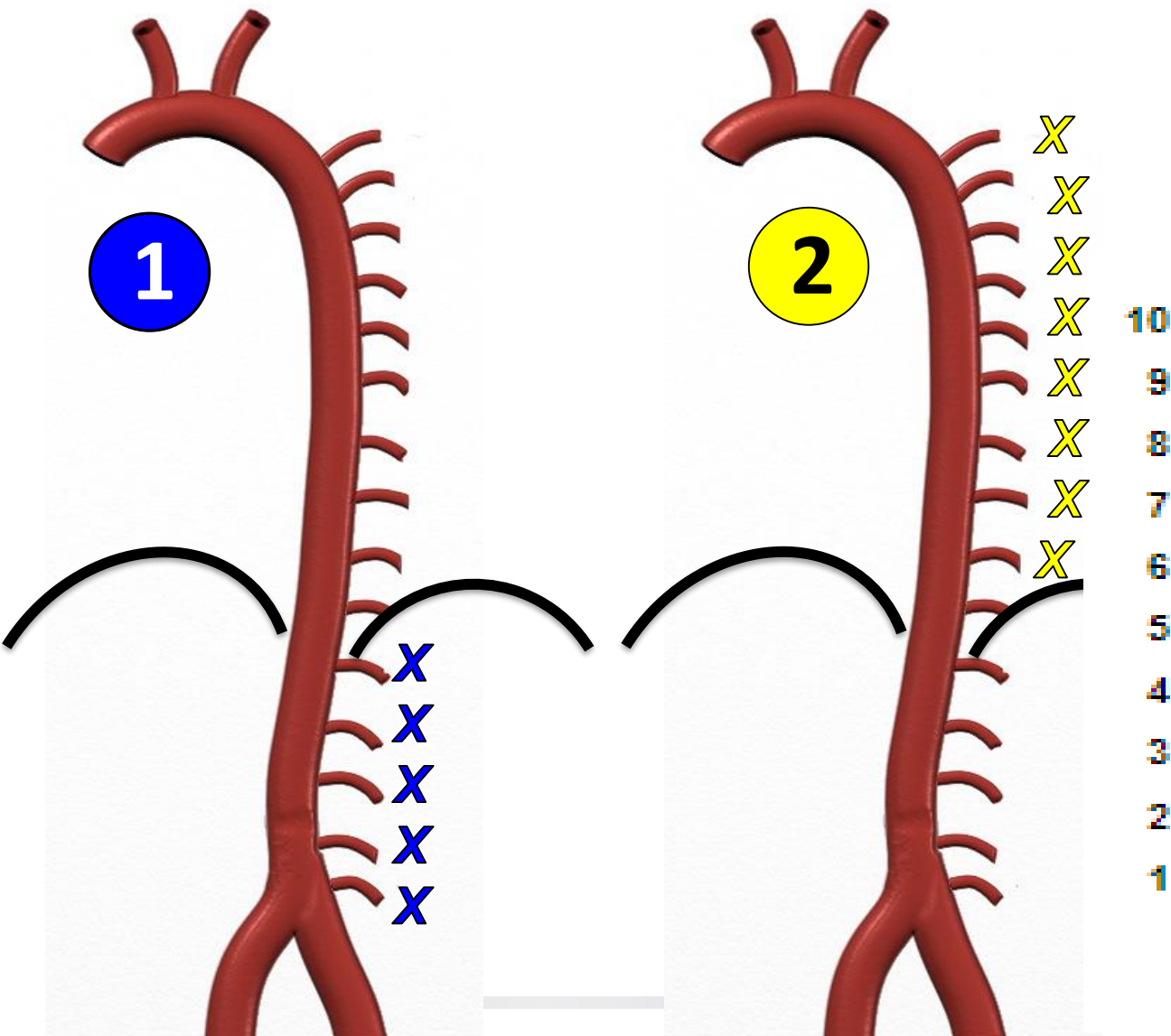


EVIDENCE OF ARTERIOGENESIS

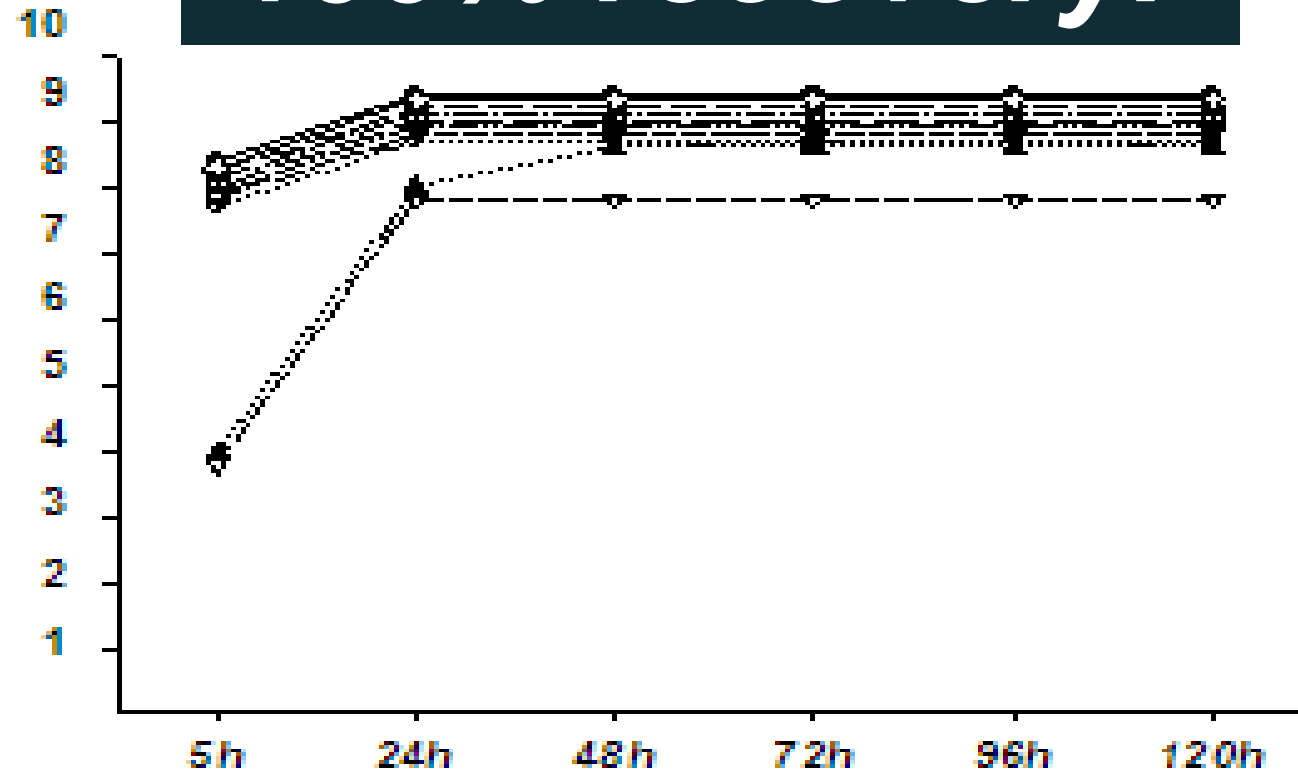


Experimental evidence for ,staging‘

The staged repair



100% recovery!



Clinical evidence for ,staging‘

Staged repair significantly reduces paraplegia rate after extensive thoracoabdominal aortic aneurysm repair

Christian D. Etz, MD, PhD,^a Stefano Zoli, MD,^a Christoph S. Mueller, MS,^a Carol A. Bodian, DrPH,^b Gabriele Di Luozzo, MD,^a Ricardo Lazala, MD,^a Konstadinos A. Plestis, MD,^a and Randall B. Griepp, MD^a

Open surgery, staged repair:
SCI reduction from 15% to 0%

Eur J Vasc Endovasc Surg (2015) 49, 248–254

Editor's Choice — The Impact of Early Pelvic and Lower Limb Reperfusion and Attentive Peri-operative Management on the Incidence of Spinal Cord Ischemia During Thoracoabdominal Aortic Aneurysm Endovascular Repair

B. Maurel ^a, N. Delclaux ^a, J. Sobocinski ^a, A. Hertault ^a, T. Martin-Gonzalez ^a, M. Moussa ^a, R. Spear ^a, M. Le Roux ^a, R. Azzaoui ^a, M. Tyrrell ^b, S. Haulon ^{a,*}

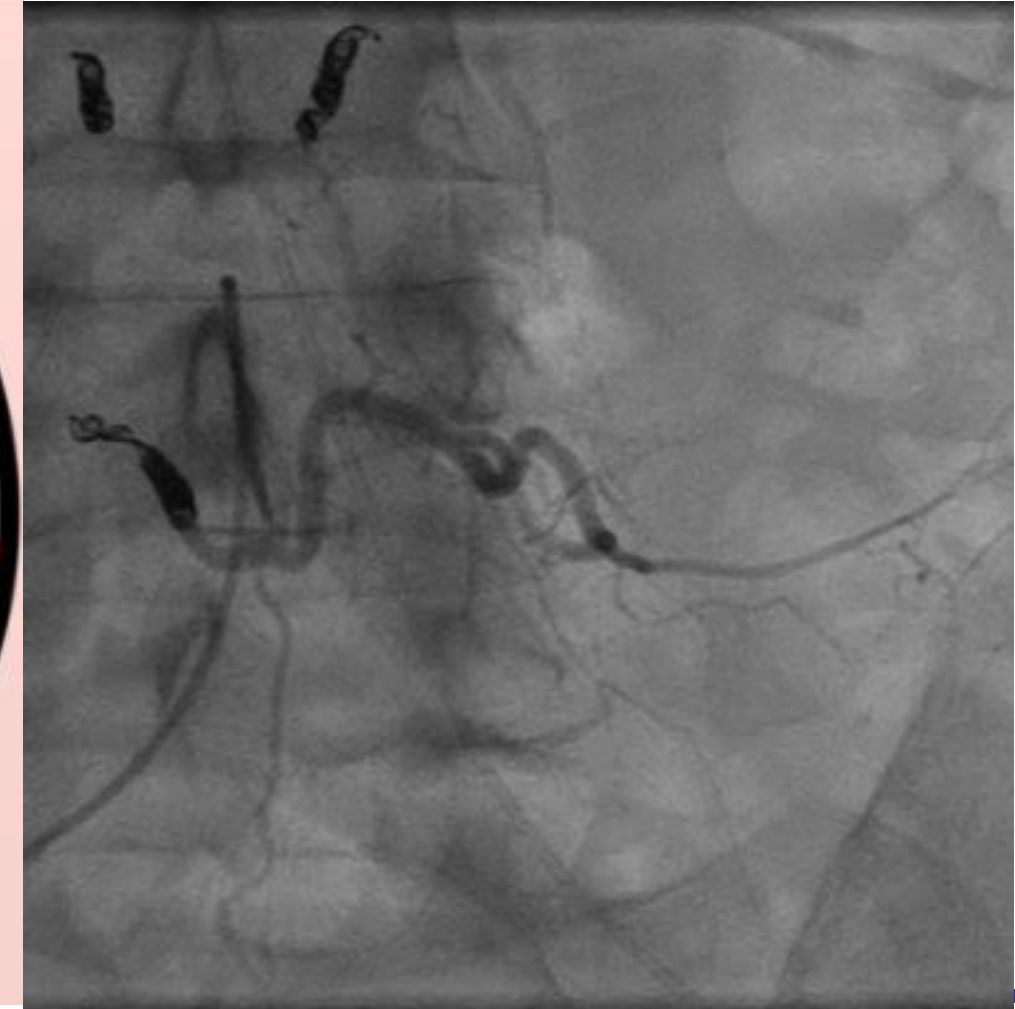
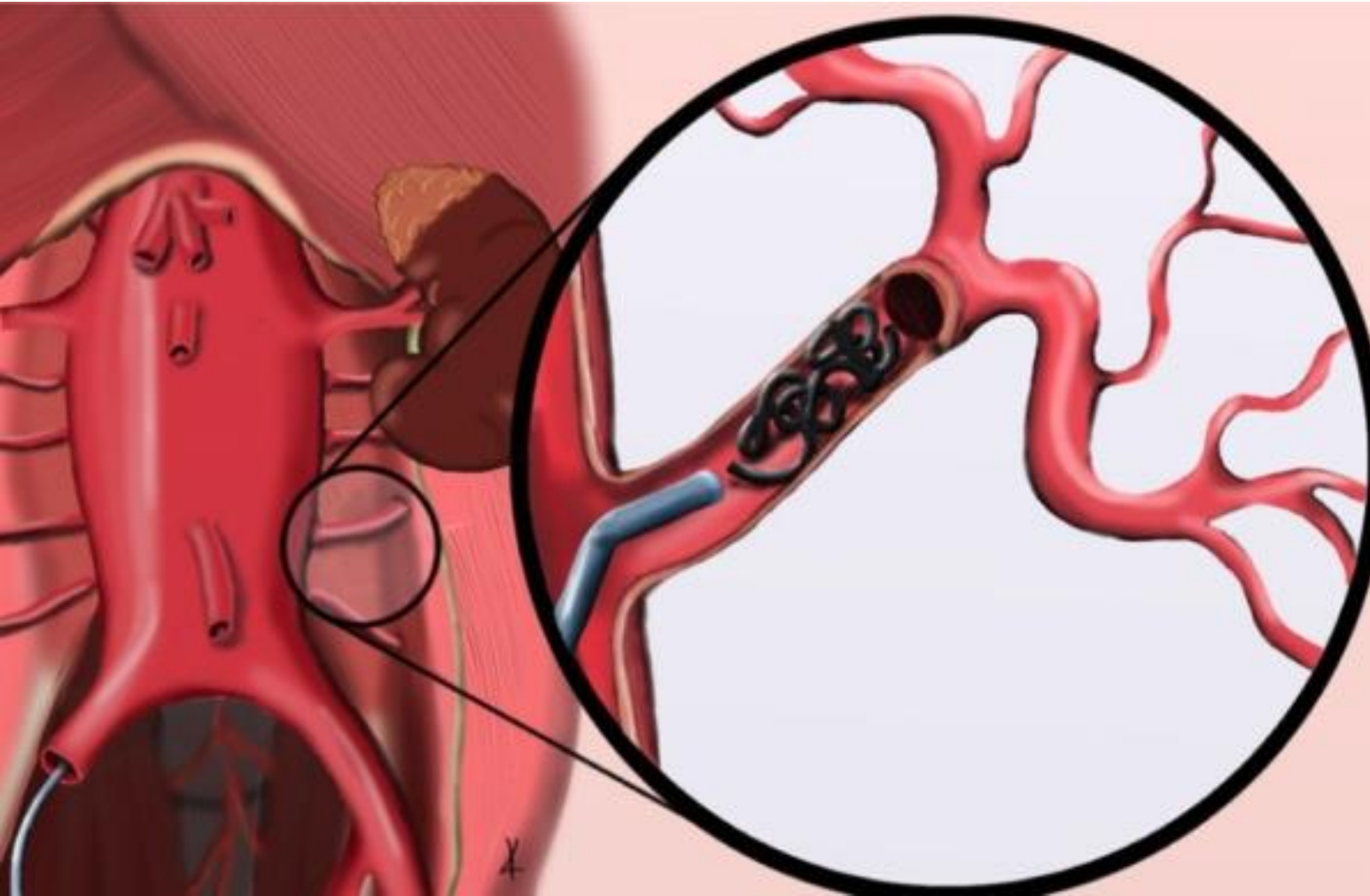
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^b King's Health Partners, London, UK

Endovascular, staged Repair
SCI reduction “10fold” — from 25% to 2.4%

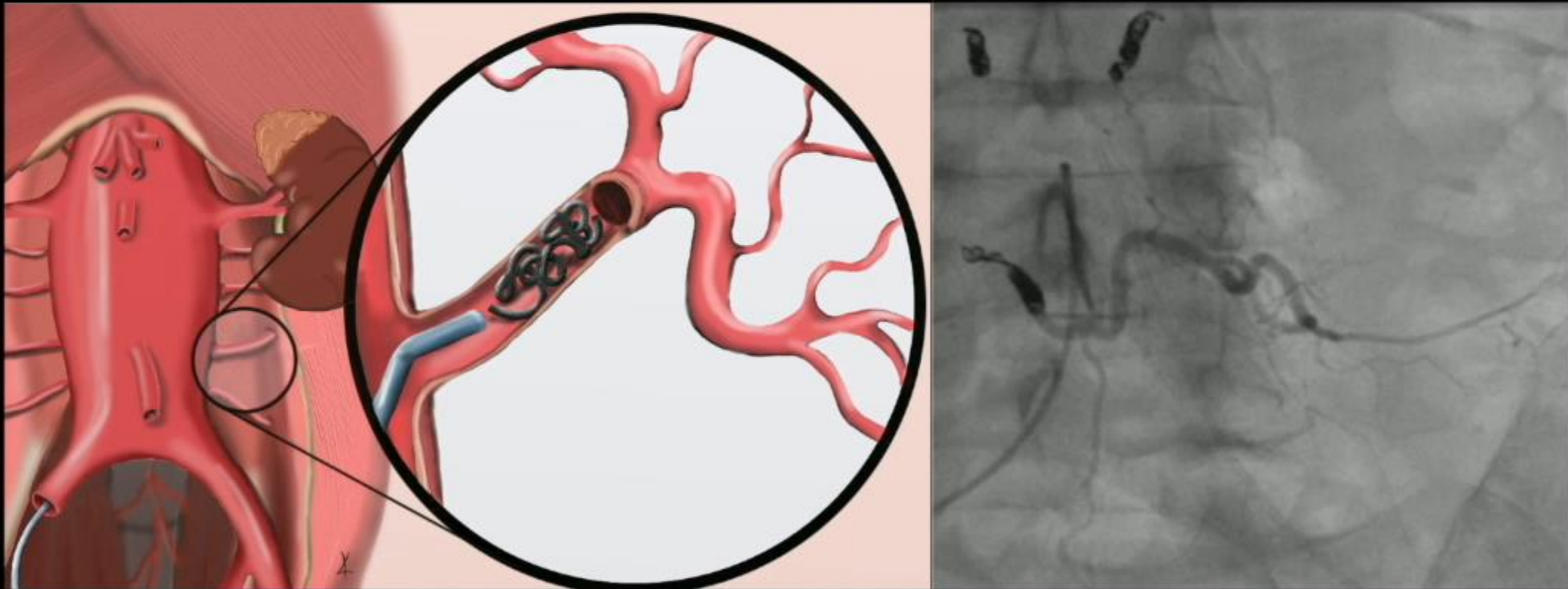
MIS²ACE procedure

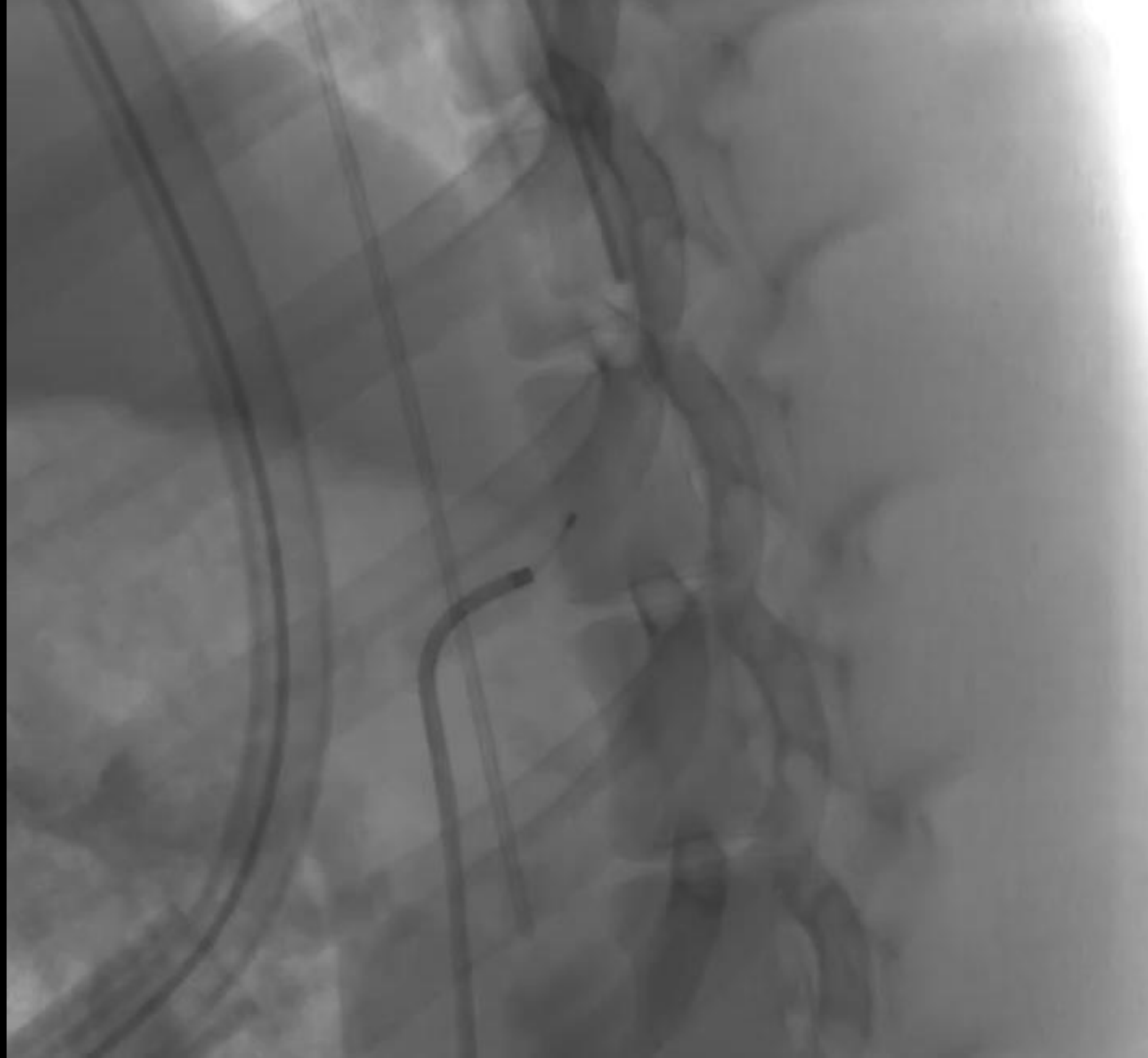
Minimally invasive staged segmental artery coil-embolization *MIS²ACE*

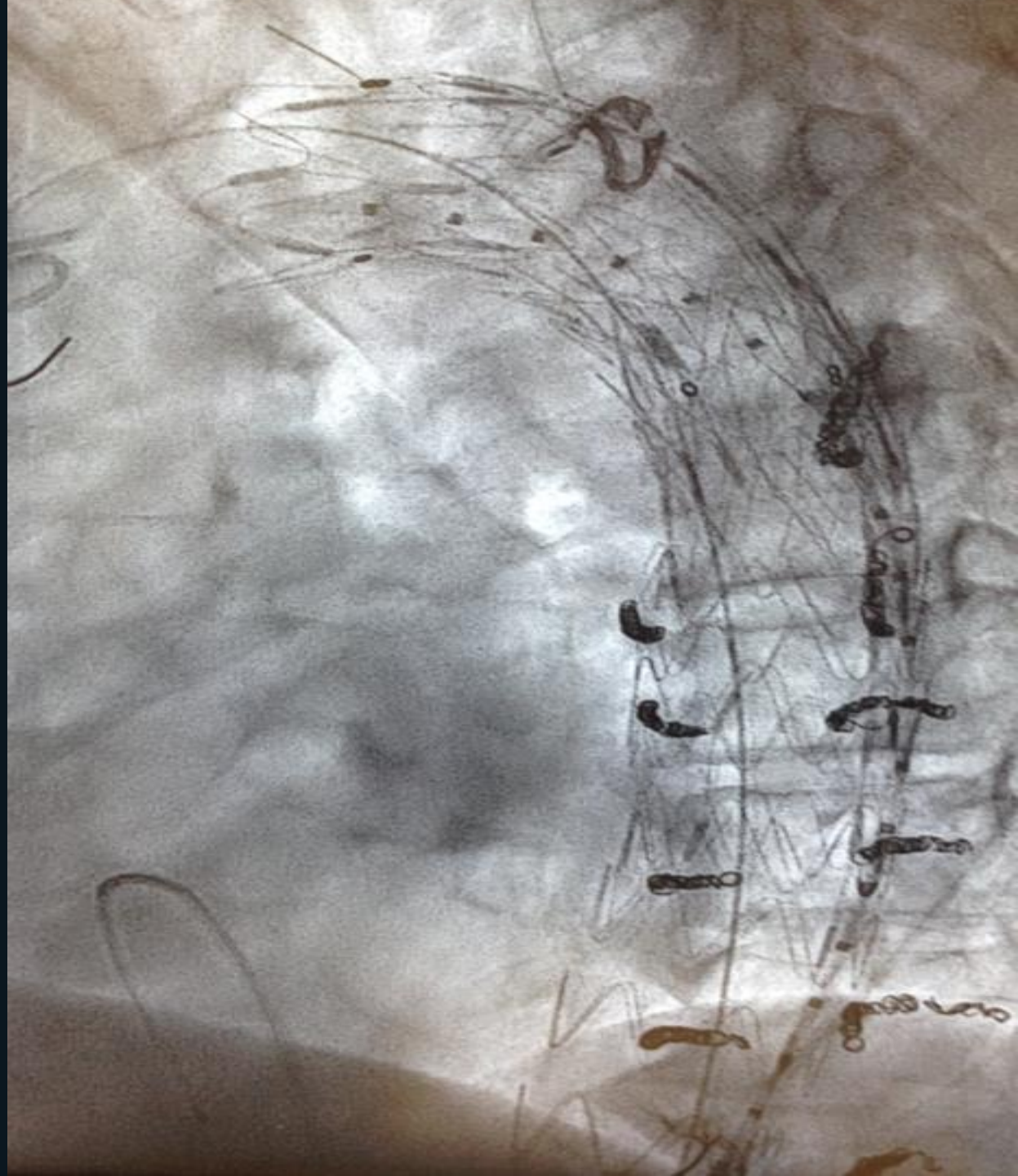


Minimally Invasive Segmental Artery Coil Embolization (MISACE)

- First Stage -







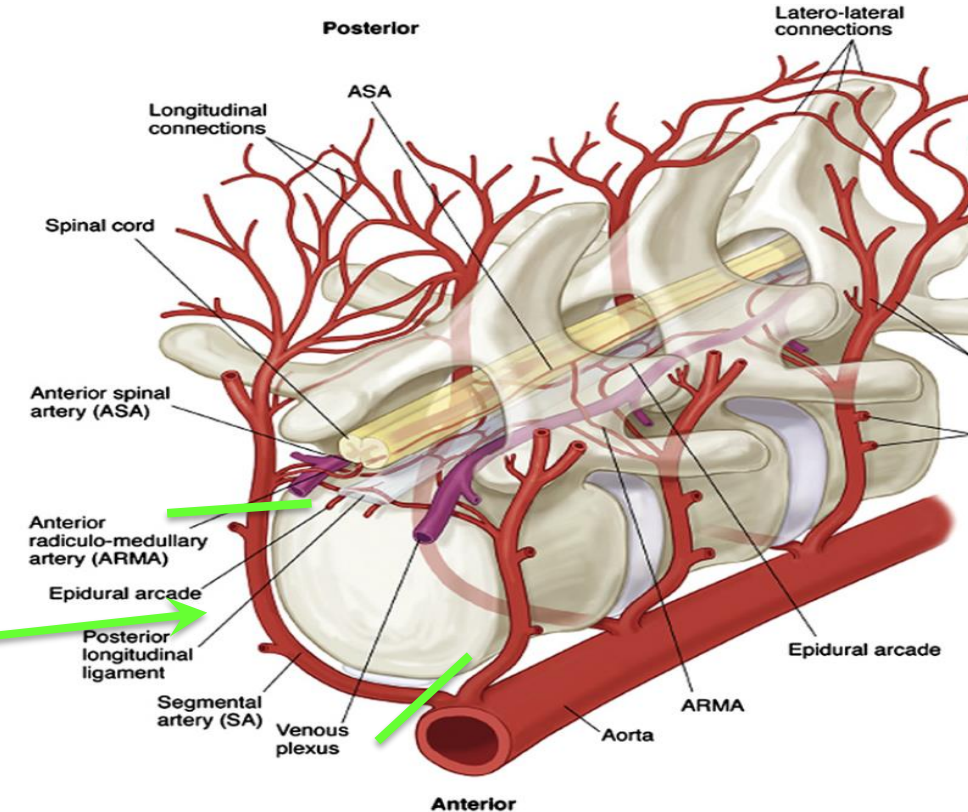
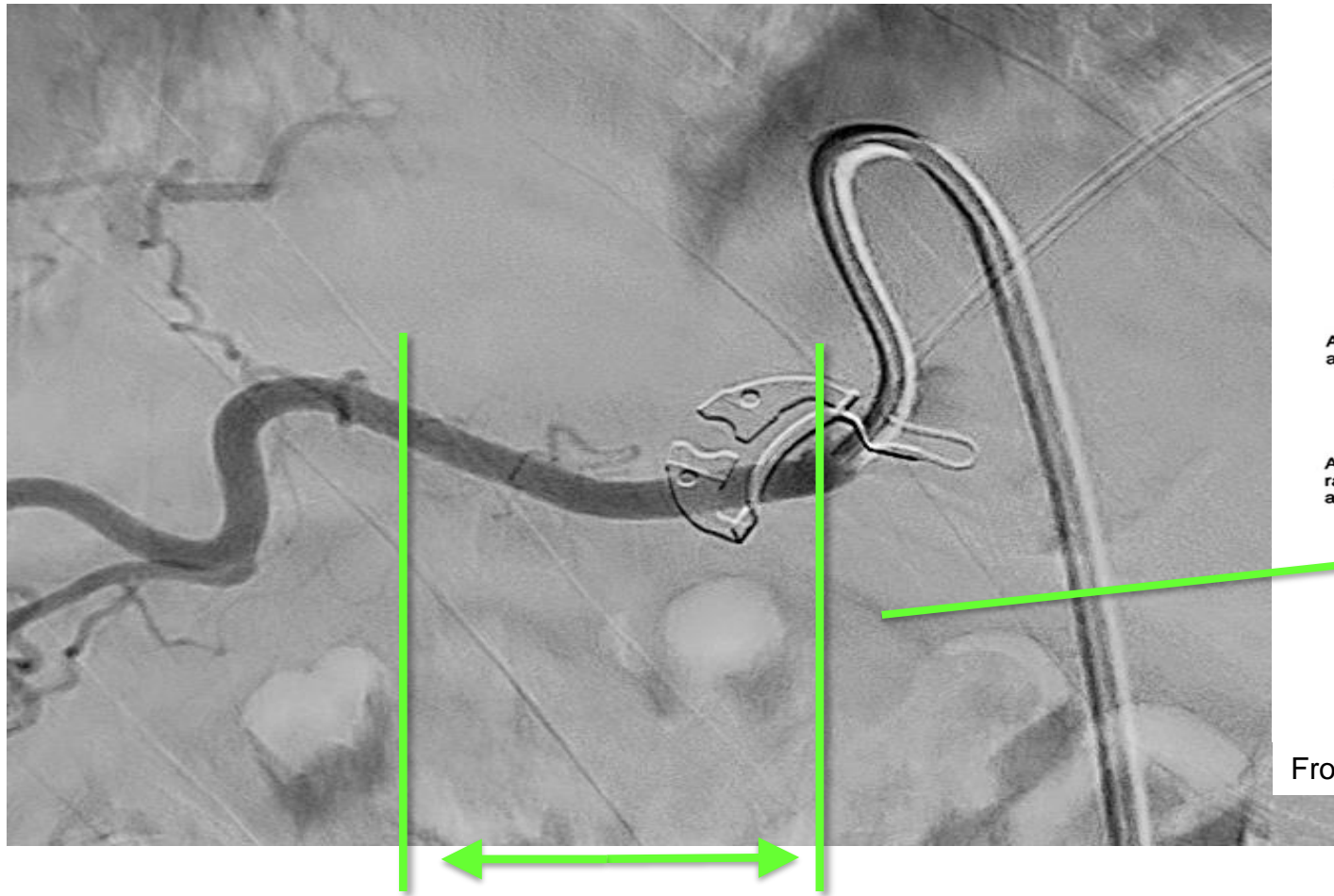
First-in-man endovascular preconditioning of the paraspinal collateral network by segmental artery coil embolization to prevent ischemic spinal cord injury

Christian D. Etz, MD, PhD,^a E. Sebastian Debus, MD, PhD,^b Friedrich-Wilhelm Mohr, MD, PhD,^a and Tilo Kölbel, MD, PhD^b



Technical Considerations MIS²ACE

where to embolize ?



From Etz et al. *J Thorac Cardiovasc Surg* 2011

SA should be occluded in their **ostial segment**

Etz et al. *J Thorac Cardiovasc Surg* 2015

Technical aspects of MIS²ACE

- Elective TAAA repair, high SCI risk
- local anesthesia
- percutaneous trans-femoral access
- +/- CSF-drainage
- monitoring of neurologic function for 72h

After 1-3 MIS²ACE sessions → proceed to open- **or** **endovascular** TAAA repair



Preliminary clinical evidence for MIS²ACE

Ischaemic preconditioning of the spinal cord to prevent spinal cord ischaemia during endovascular repair of thoracoabdominal aortic aneurysm: first clinical experience

Published on 20 September 2018

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Aims: The purpose of our study was to report our experience with minimally invasive segmental artery coil embolisation (MISACE) to prevent spinal cord ischaemia (SCI) after endovascular repair (ER) of thoracoabdominal aortic aneurysm (TAAA).

Methods and results: A cohort of 57 patients with TAAAs was treated by MISACE followed by ER between October 2014 and December 2017. The TAAA Crawford classification was: type I, n=5; type II, n=12; type III, n=27; type IV, n=13. The average maximum aortic diameter was 62.7±8.8 mm. Patients had a median of 5 coiled SAs (range: 1-19). MISACE was completed in one (n=22), two (n=24), three (n=7), four (n=3) or five (n=1) sessions. The maximum number of coiled SAs per session was six. After completion of MISACE, 77.7% of direct segmental arterial flow was occluded. After a mean of 83±62 days, 55 of the patients received total ER of their TAAA. At 30 days after ER, no patient developed SCI and three patients had died.

KEYWORDS

- Embolisation technique
- Thoracic aorta aneurysm
- Thoracic aorta dissection

AUTHORS

- Branzan D
- Etz CD
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- Von Aspern K
- Staab H
- Fuchs J
- Bergh F
- Scheinert D
- Schmidt A

MIS²ACE – PRELIMINARY CLINICAL EVIDENCE

The Leipzig Experience

Sept 2014 – April 2017 (N=50, 36 type II or III)

TAAA

(n=50)

Variables		N	%
Total		50	
Sex	Male	37	74
	Female	13	26
Age	Mean ± SD (y)	69.4 ± 7.3	
History of Hypertension		50	100
COPD		18	36
Smoker		35	70
CAD		16	32
Diabetes mellitus		19	38
Renal Insufficiency	GFR < 60	17	34
	Mean GFR ± SD	68.8 ± 18.6	
PAOD		9	18
BMI	Mean ± SD (m/kg ²)	27.9 ± 5.2	

Crawford Classification	N
Type I	3
Type II	11
Type III	25
Type IV	11
Maximal Aortic Diameter	
Mean ± SD (mm)	62.8 ± 8.6
Previous Repair of the Aorta	10
thoracic	7
abdominal	3
Median interval between 2 staged procedure (y)	6.5 (0.5 - 18)
TAAA	
atherosclerotic	47
dissection	3

ZERO clinical spinal cord ischemia!

Minor complications	N	%
Backpain	12	24

Evolution of MIS²ACE



MIS²ACE is promising, level A evidence is required and the iatrogenic risk is unknown → RCT

PAPAartis
fighting spinal cord injury



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 733203 and the German Research Foundation.



... largest publicly funded RCT in aortic aneurysm repair



31 Aortic Reference Centres



prospectively collected contemporary real-world data on SCI incidence (type I, II and III; open + endo)



comparing ,staged‘ vs. ,conventional‘ approach



evaluating effectiveness of MISACE:

– **SCI protection** & endoleak type II prevention



5 year duration



500 participants



**31 recruiting sites
in 9 countries**



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 733203 and the German Research Foundation.

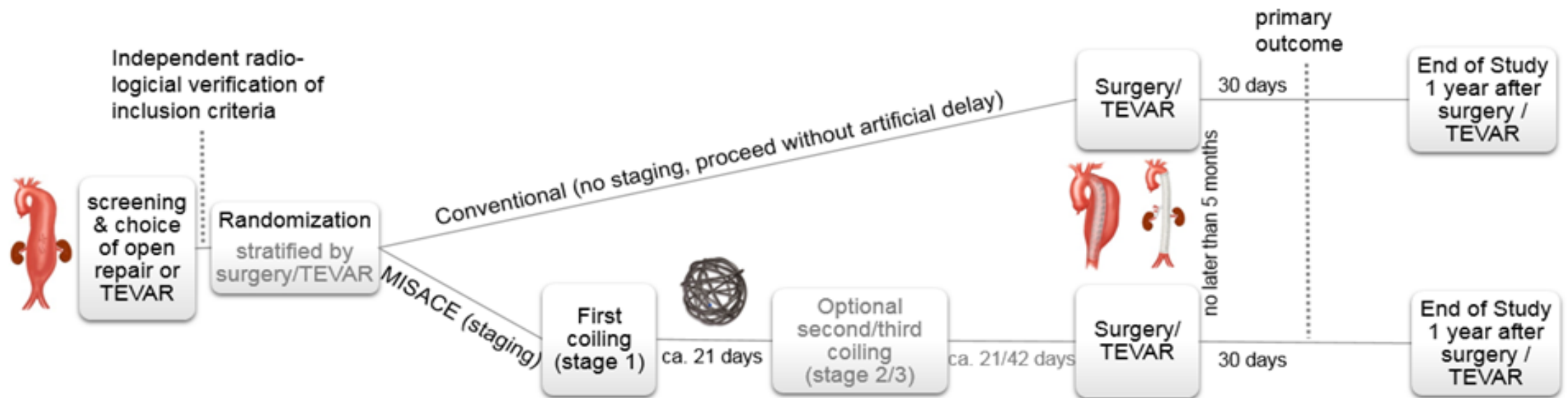


Trial duration

First patient in to last patient out (months): 40

Duration of the entire trial (months): 46

Recruitment period (months): 24



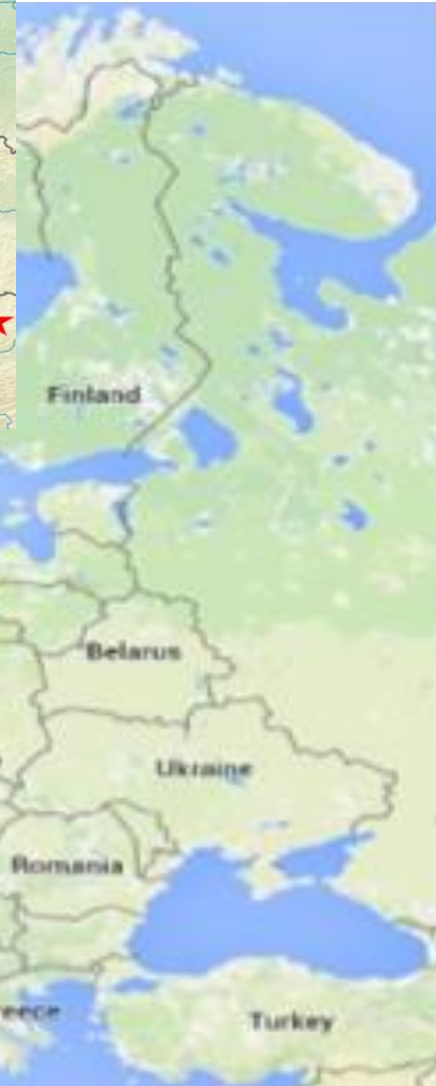
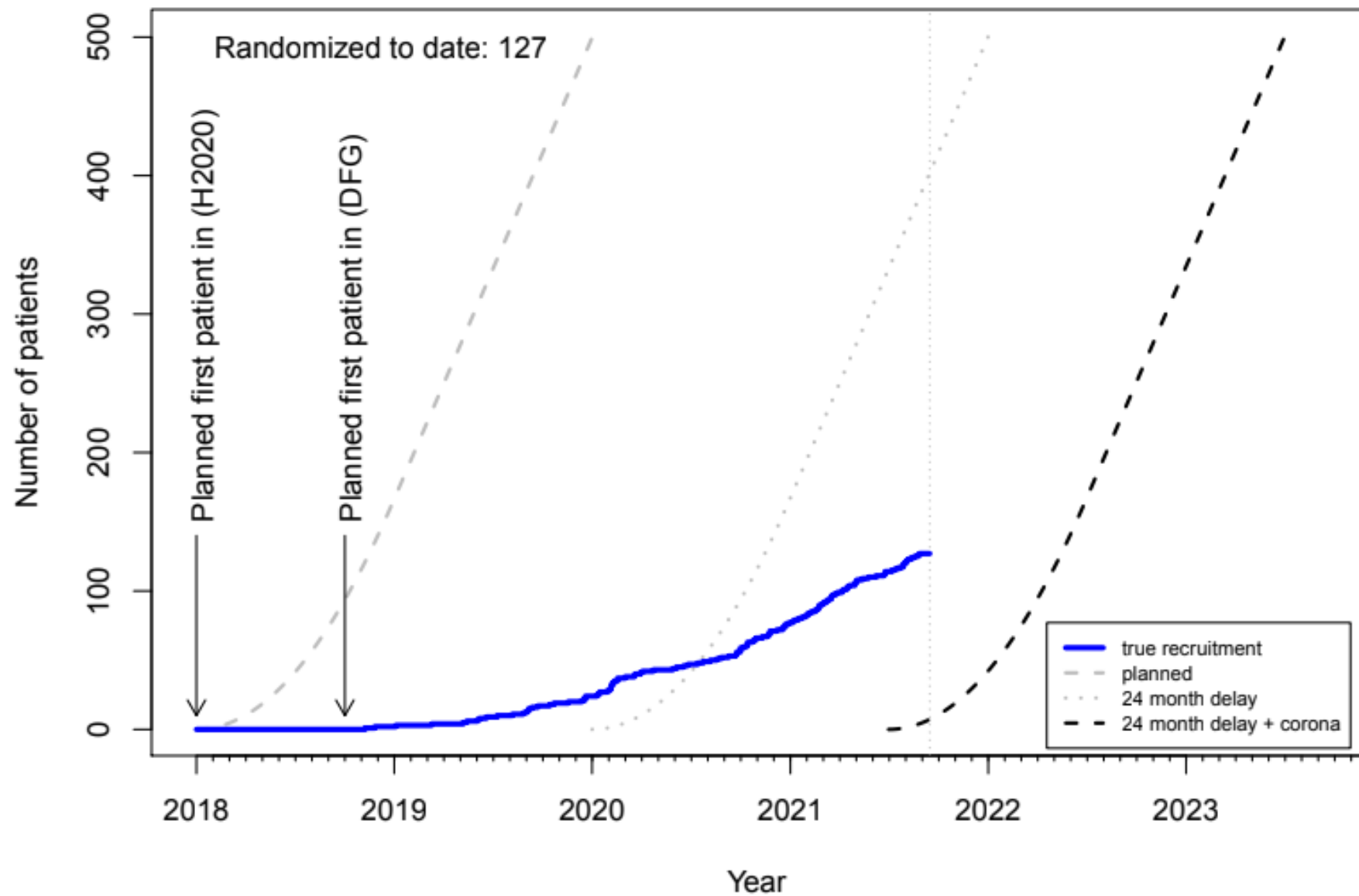
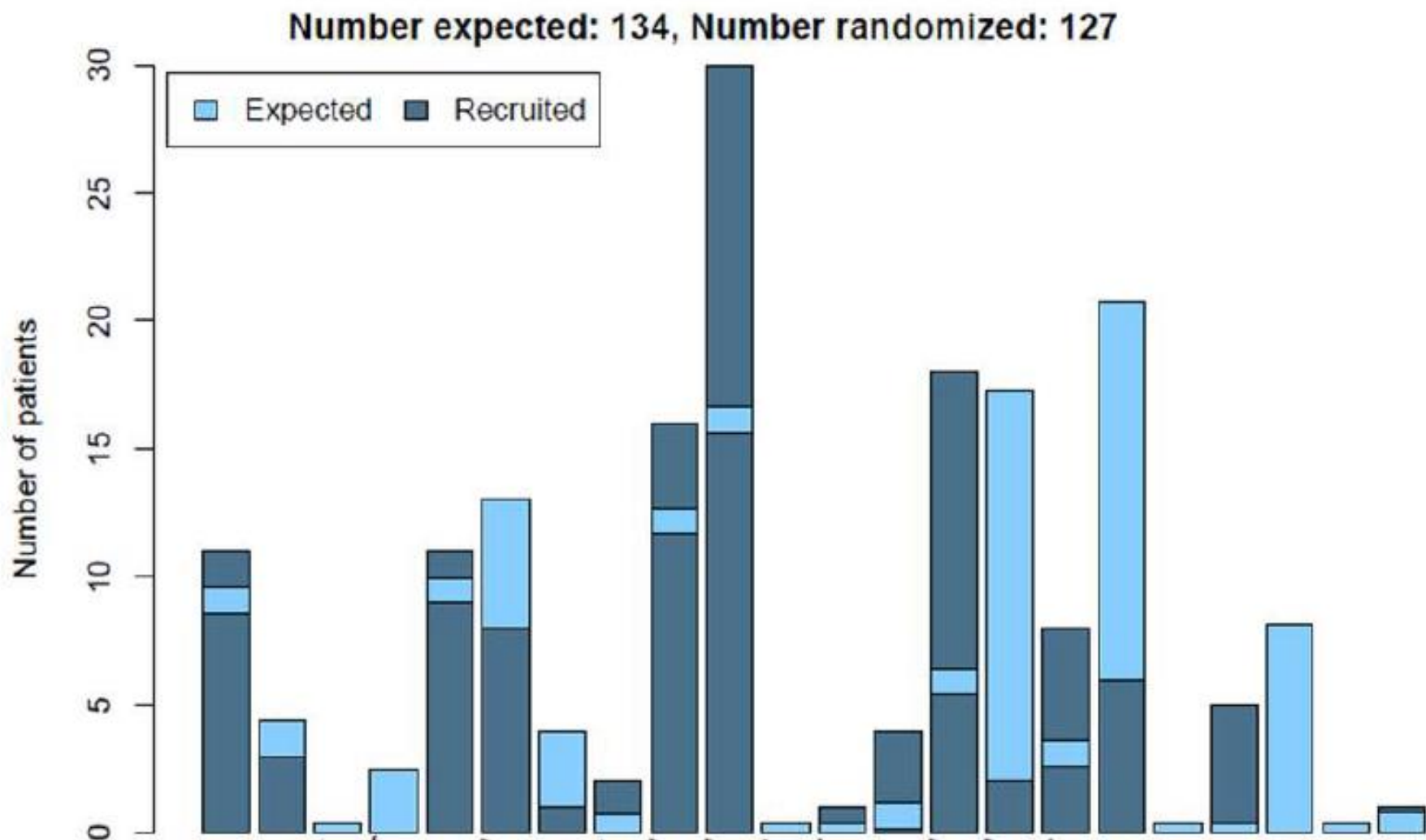


Figure 10 - Participating centres PAPA-ARTiS (EU, Switzerland and the US). Red stars represent recruitment centres and the yellow stars represent the radiology core lab (Copenhagen, WP6) and the health economics group (Grenada, WP3).

Recruitment in PAPAartis (2021-09-15)



Current status of the RCT





Translational subprojekts

Winner of the 2018 EACTS Young Investigator Award for Vascular Disease

Cite this article as: von Aspern K, Haunschild J, Simoniuk U, Kaiser S, Misfeld M, Mohr FW *et al.* Optimal occlusion pattern for minimally invasive staged segmental artery coil embolization in a chronic porcine model. *Eur J Cardiothorac Surg* 2019; doi:10.1093/ejcts/ezy463.

Optimal occlusion pattern for minimally invasive staged segmental artery coil embolization in a chronic porcine model[†]

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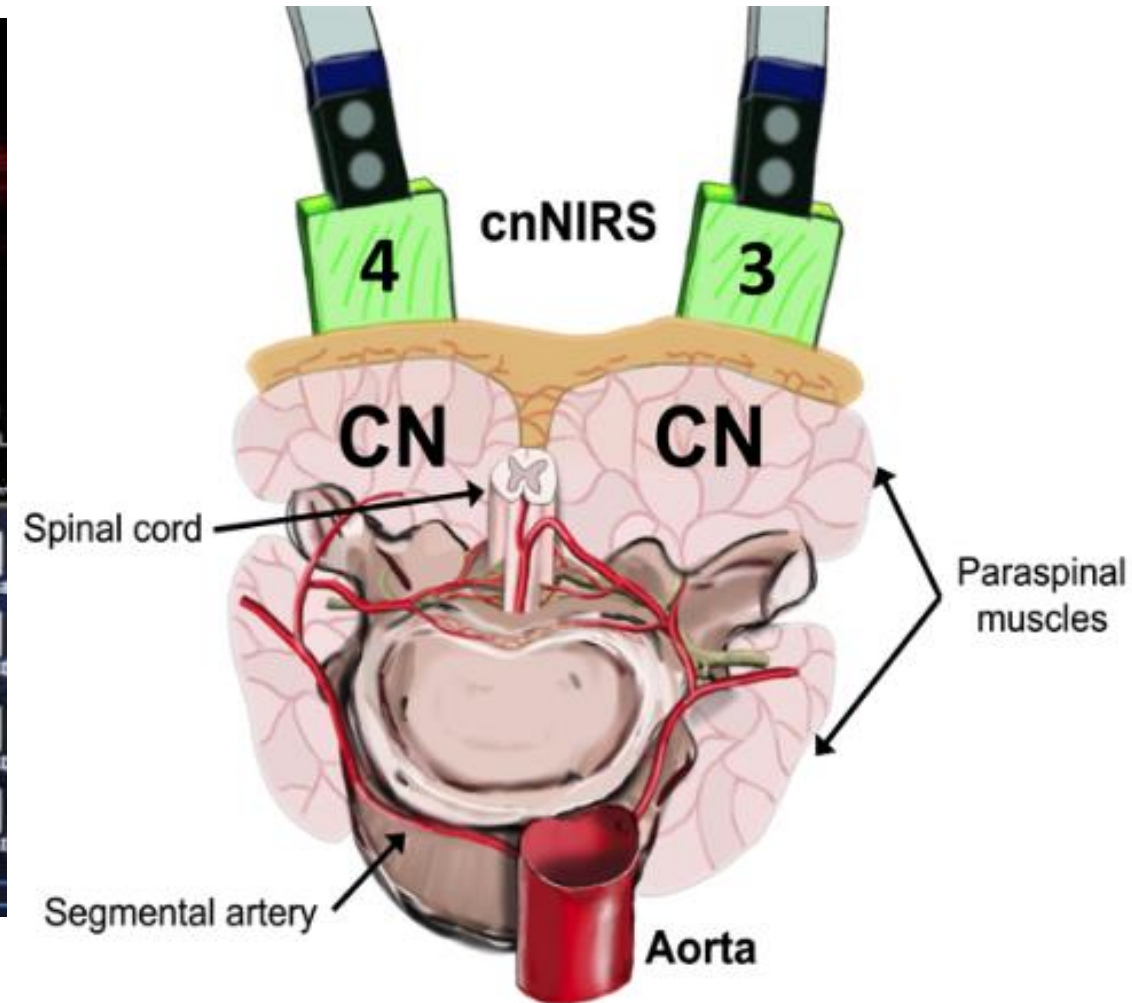
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Non-invasive, clinical real-time monitoring








1. Etz et al., *Eur J Vasc Endovasc Surg.* **2013** Dec;46(6):651-6

2. Etz et al., *Eur J Cardiothorac Surg.* **2015** Jun;47(6):943-57

Cite this article as: Haunschild J, von Aspern K, Khachatryan Z, Bianchi E, Friedheim T, Wipper S et al. Detrimental effects of cerebrospinal fluid pressure elevation on spinal cord perfusion: first-time direct detection in a large animal model. *Eur J Cardiothorac Surg* 2020; doi:10.1093/ejcts/ezaa038.

Detrimental effects of cerebrospinal fluid pressure elevation on spinal cord perfusion: first-time direct detection in a large animal model

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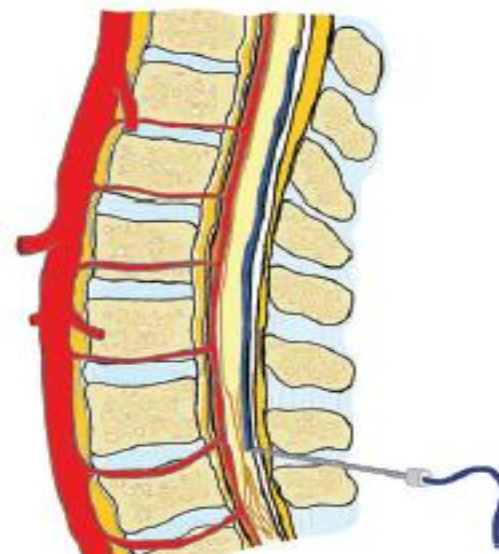
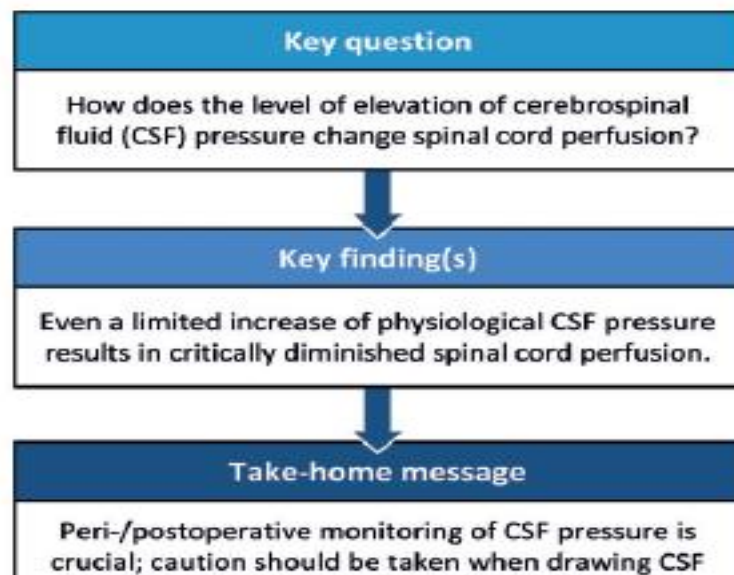
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Near real-time bedside detection of spinal cord ischaemia during aortic repair by microdialysis of the cerebrospinal fluid

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