

STIMULATION OF THE COLLATERAL NETWORK BY SEGMENTAL ARTERY COIL-EMBOLIZATION

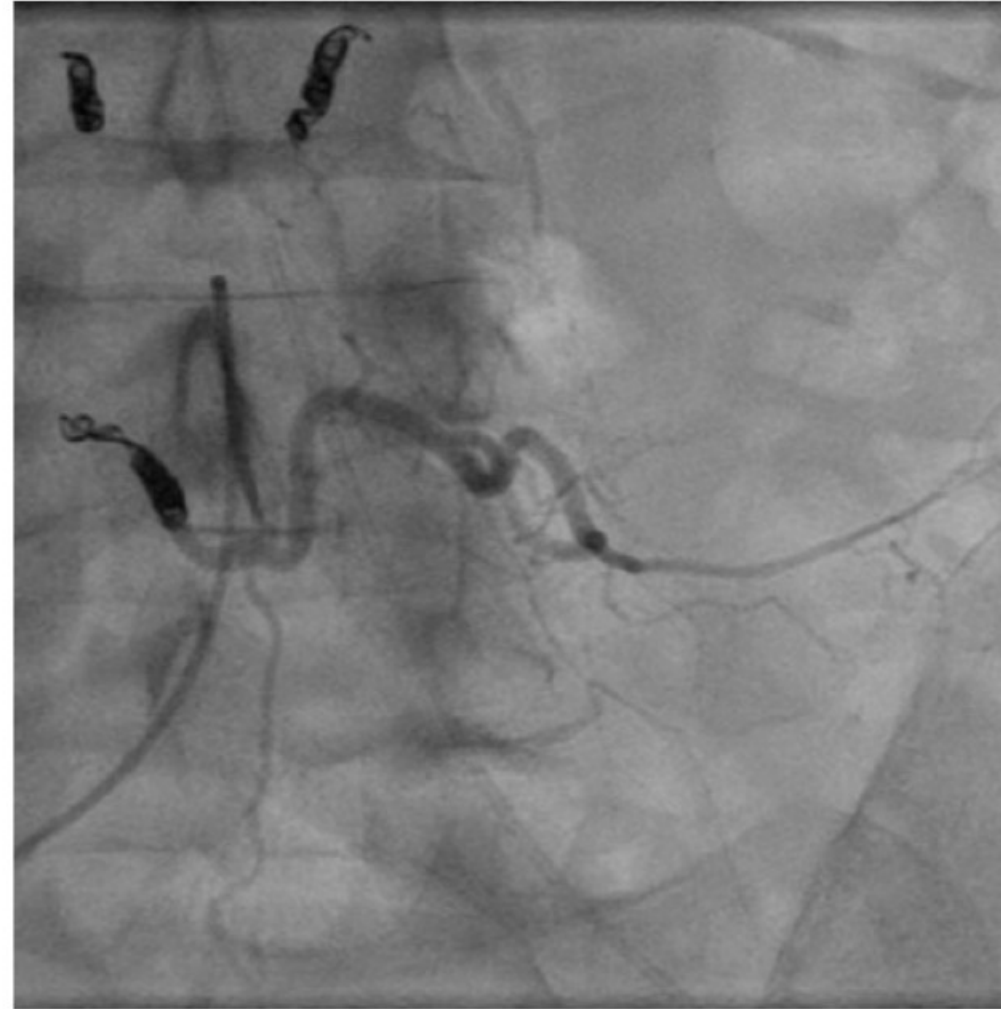
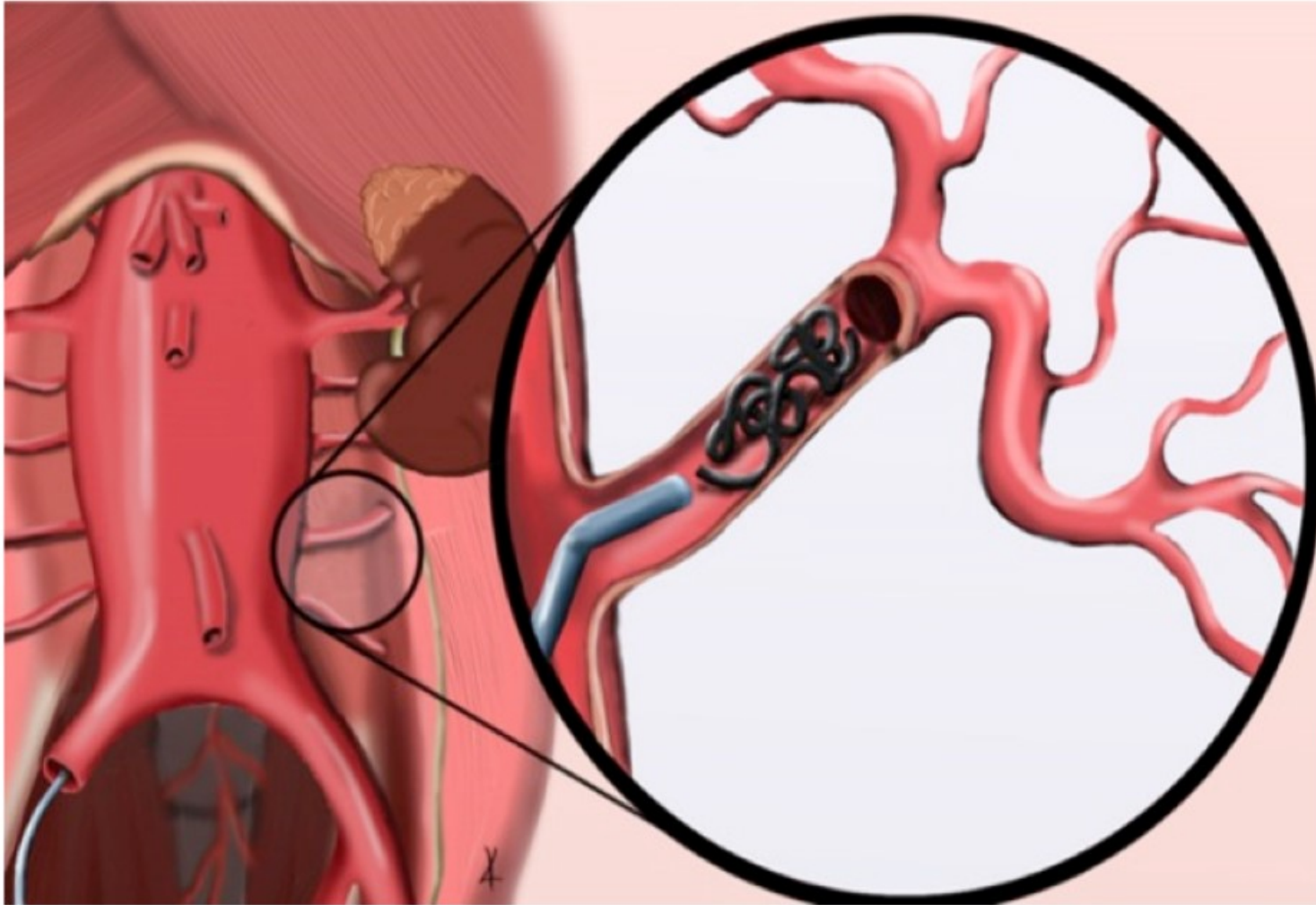
Christian D. Etz

The author declares no conflict of interest

The presented work is part of the Heisenberg focus project 'Spinal Cord Protection' for aortic surgery funded by the German Research Foundation (DFG)

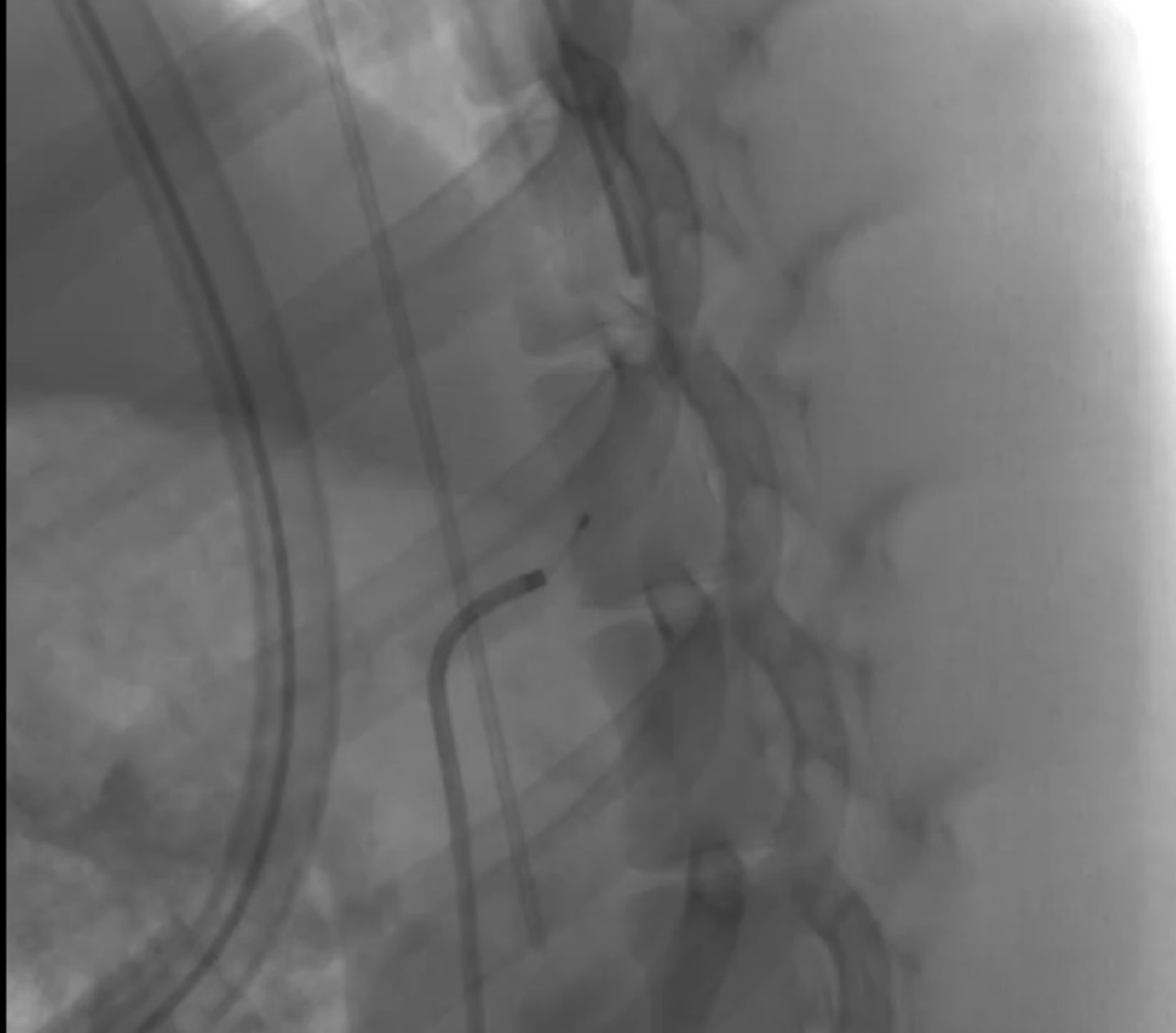
What is staged 'segmental artery' occlusion?

MIS²ACE



How does MIS²ACE work?





2000

2000

2000

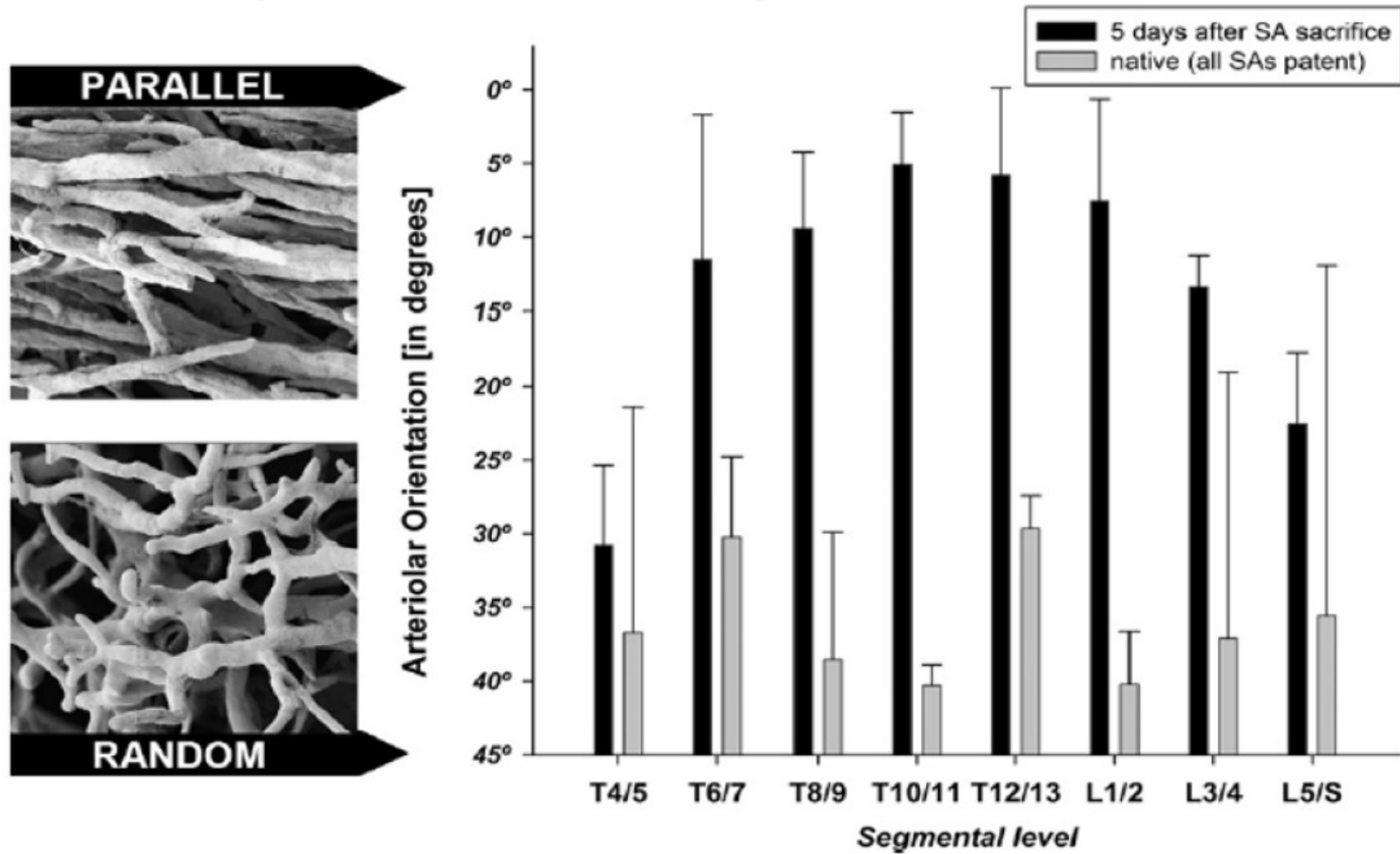
Rationale for MIS²ACE

The Collateral Network Concept



Orientation of the *Paraspinous* Collateral Network

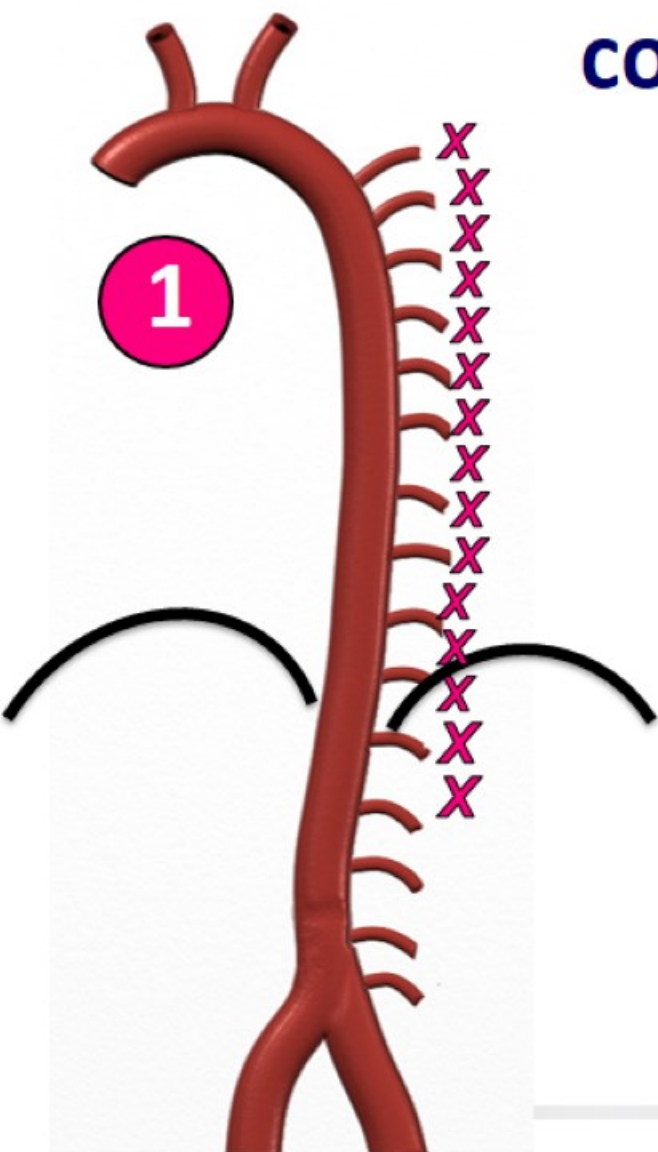
Arterioles *prior to* and *after* complete SA sacrifice



Evidence for MIS²ACE

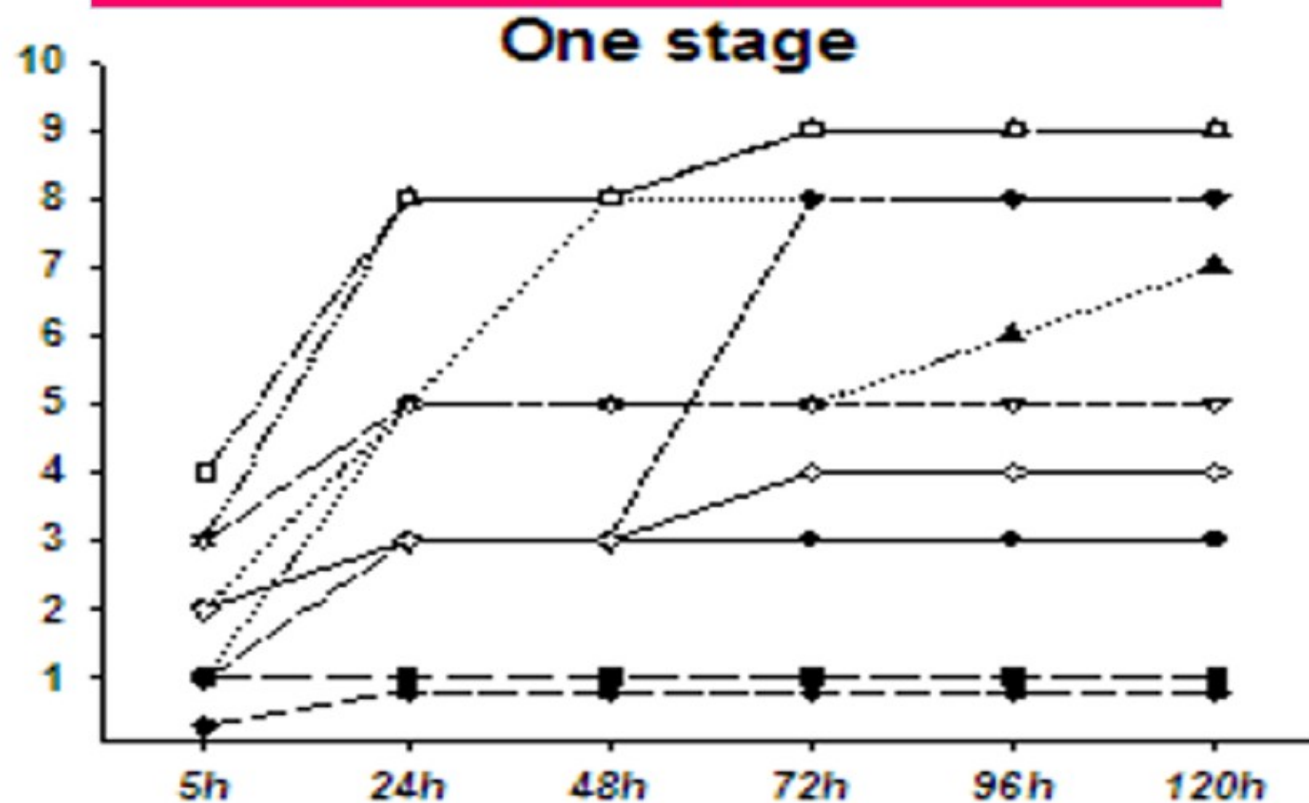
Segmental artery sacrifice

conventional (1 stage) approach

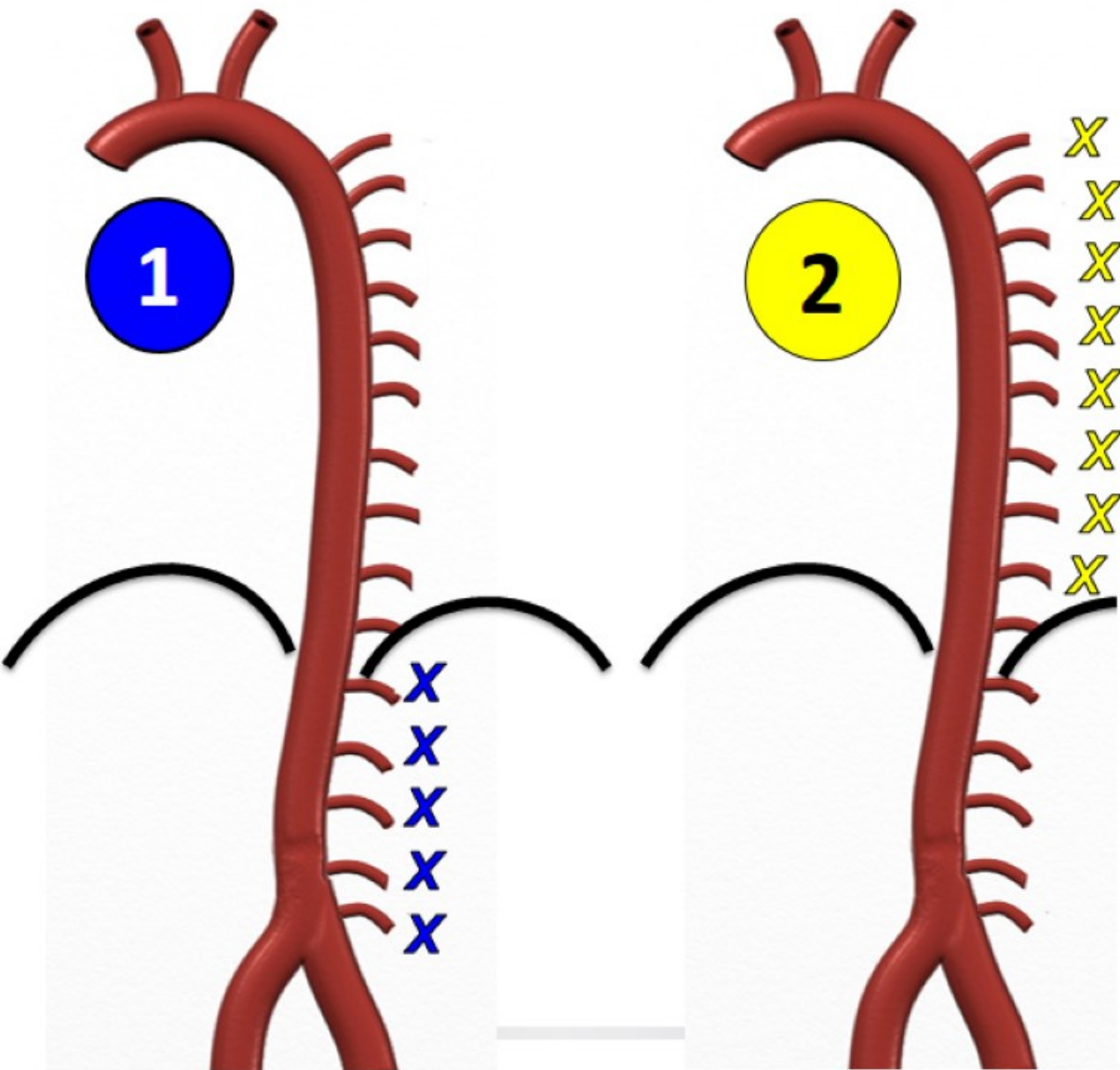


Neurological Recovery

paraplegia rate $\approx 30\%$



The staged repair



10

9

8

7

6

5

4

3

2

1

100% recovery!

5h

24h

48h

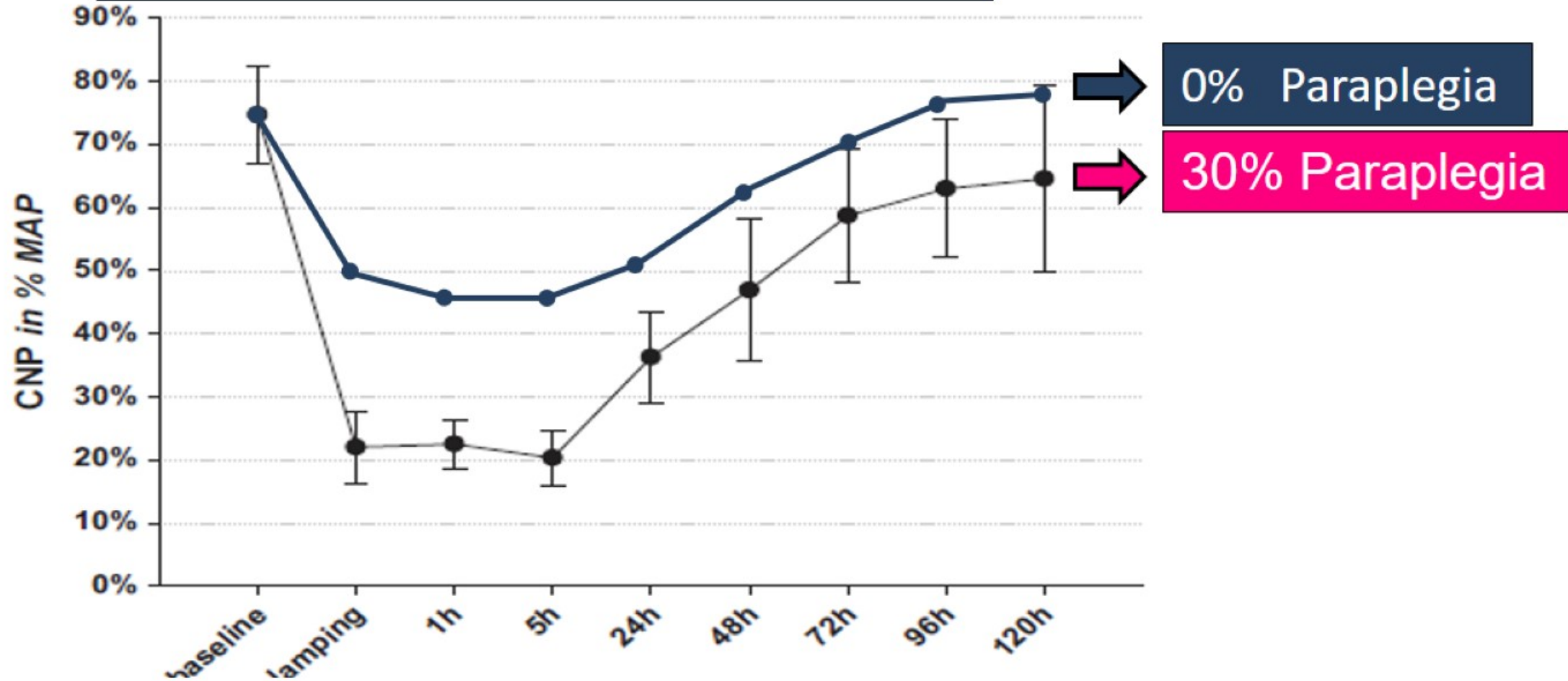
72h

96h

120h

CN perfusion pressure

2 stage segmental artery sacrifice (CNP)



30% less perfusion pressure drop in the CN

Clinical evidence for MIS²ACE

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%**

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,*}

^a Aortic Centre, Hôpital Cardiologique, CHRU de Lille, INSERM U1008, Université Lille Nord de France, 59037 Lille Cedex, France

^b King's Health Partners, London, UK

Endovascular, staged Repair

SCI reduction “10fold” – *from 25% to 2.4%*

First-in-man en
collateral netw
to prevent ische

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

Christian D. Etz, MD, F
Tilo Kölbel, MD, PhD^b

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Objective: Spinal
thoracoabdominal a
paraplegia by indu
implementation was

Methods: First-in-r
embolization before
conditioning of the colla
selective segmental
before open surgical
minimally invasive,
coil embolization of

Results: Minimally
successful and did r
clinical surveillance
after 4 weeks and l
returned for total e
artery endovascular
8 days after extensi
alive with no neurol

Conclusions: Minir
preconditioning of t
ischemic spinal cor
aneurysms and prev

Daniela Branzan^{1*}, MD; Christian D. Etz², MD, PhD; Michael Moche³, MD, PhD; Konstantin von Aspern², MD; Holger Staab¹, MD; Jochen Fuchs³, MD; Florian Then Bergh⁴, MD, PhD; Dierk Scheinert⁵, MD, PhD; Andrej Schmidt⁵, MD, PhD

1. Department of Vascular Surgery, University Hospital Leipzig, Leipzig, Germany; 2. Department of Cardio-vascular Surgery, Heart Center, Leipzig, Germany; 3. Department of Interventional Radiology, University Hospital Leipzig, Leipzig, Germany; 4. Department of Neurology, University of Leipzig, Leipzig, Germany; 5. Department of Angiology, University Hospital Leipzig, Leipzig, Germany

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
- Moche M
- Von Aspern K
- Staab H
- Fuchs J
- Bergh F
- Scheinert D
- Schmidt A

Evolution of MIS²ACE



„Kollateral Netzwerk“ – gestufte SA Okklusion – MIS²ACE – Proof-of-Concept – ESC/EACTS – international RCT

MIS²ACE is very promising, but 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.

DFG



5 year duration



500 participants



**31 recruiting sites
in 9 countries**

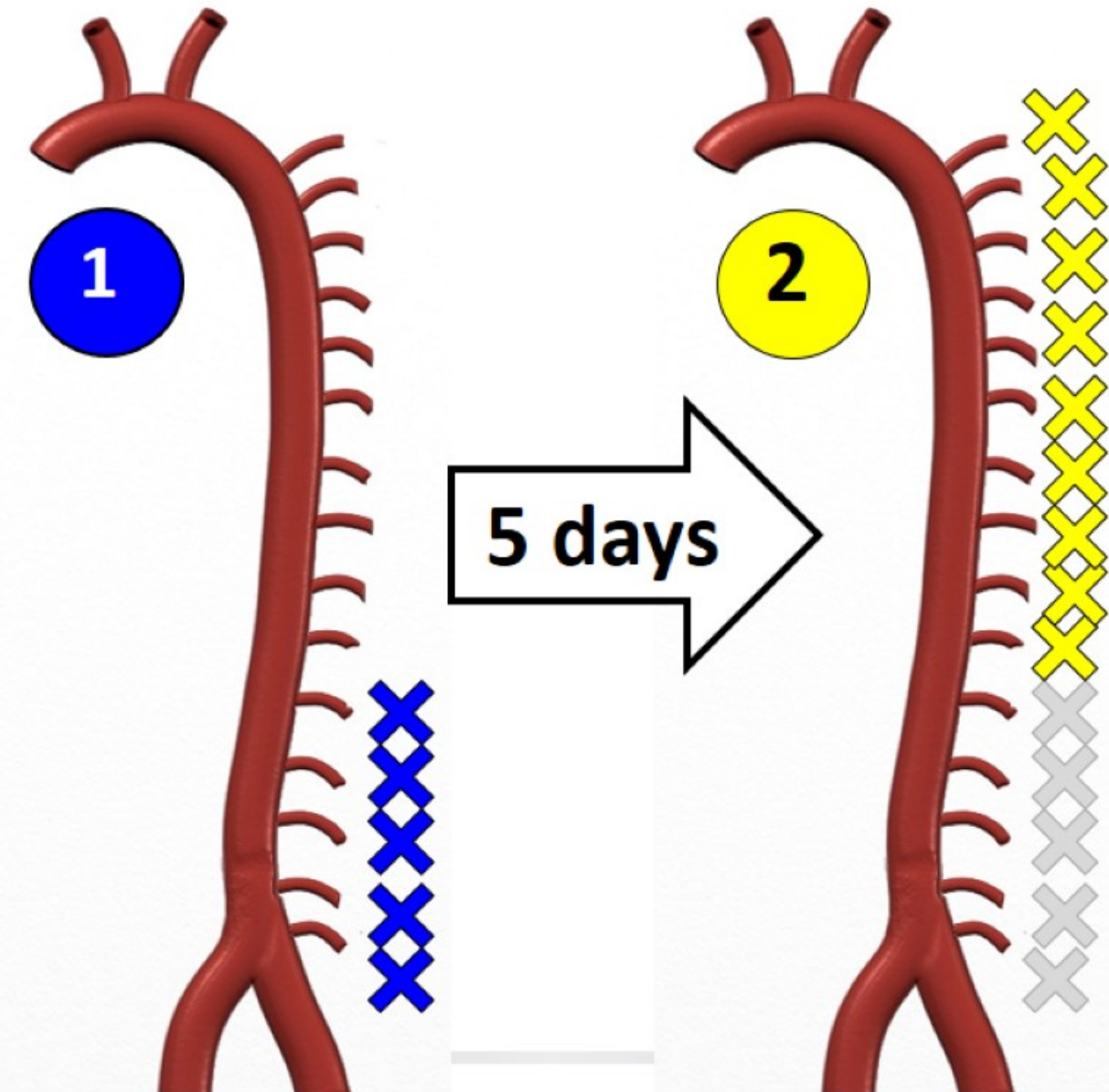


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discussion

Intervention Groups



Regional-pattern (group 1)

$N = 6$

Stage 1

Lumbar

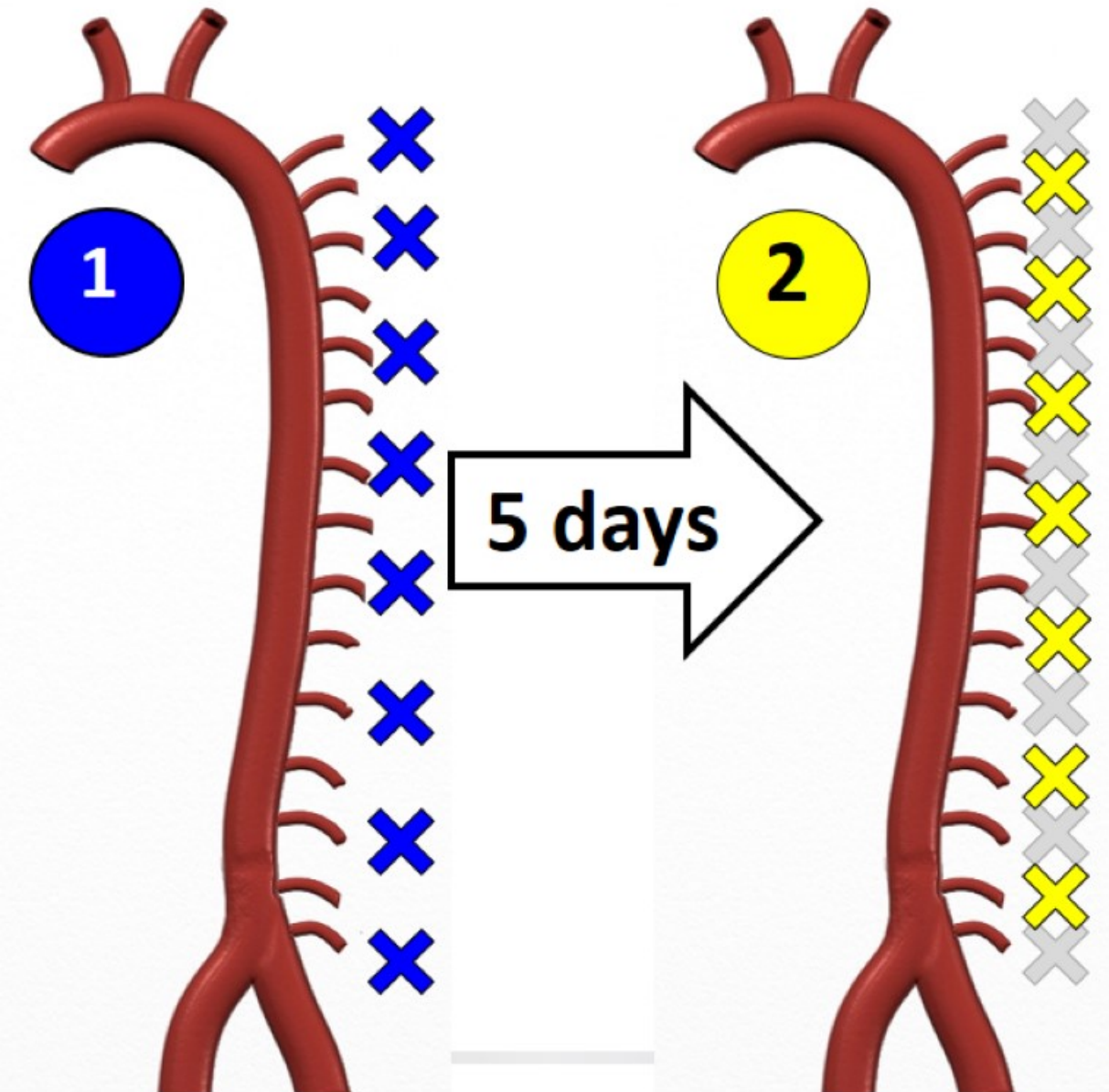
(10 segmental arteries)

Stage 2

Thoracic

(20 segmental arteries)

Intervention Groups

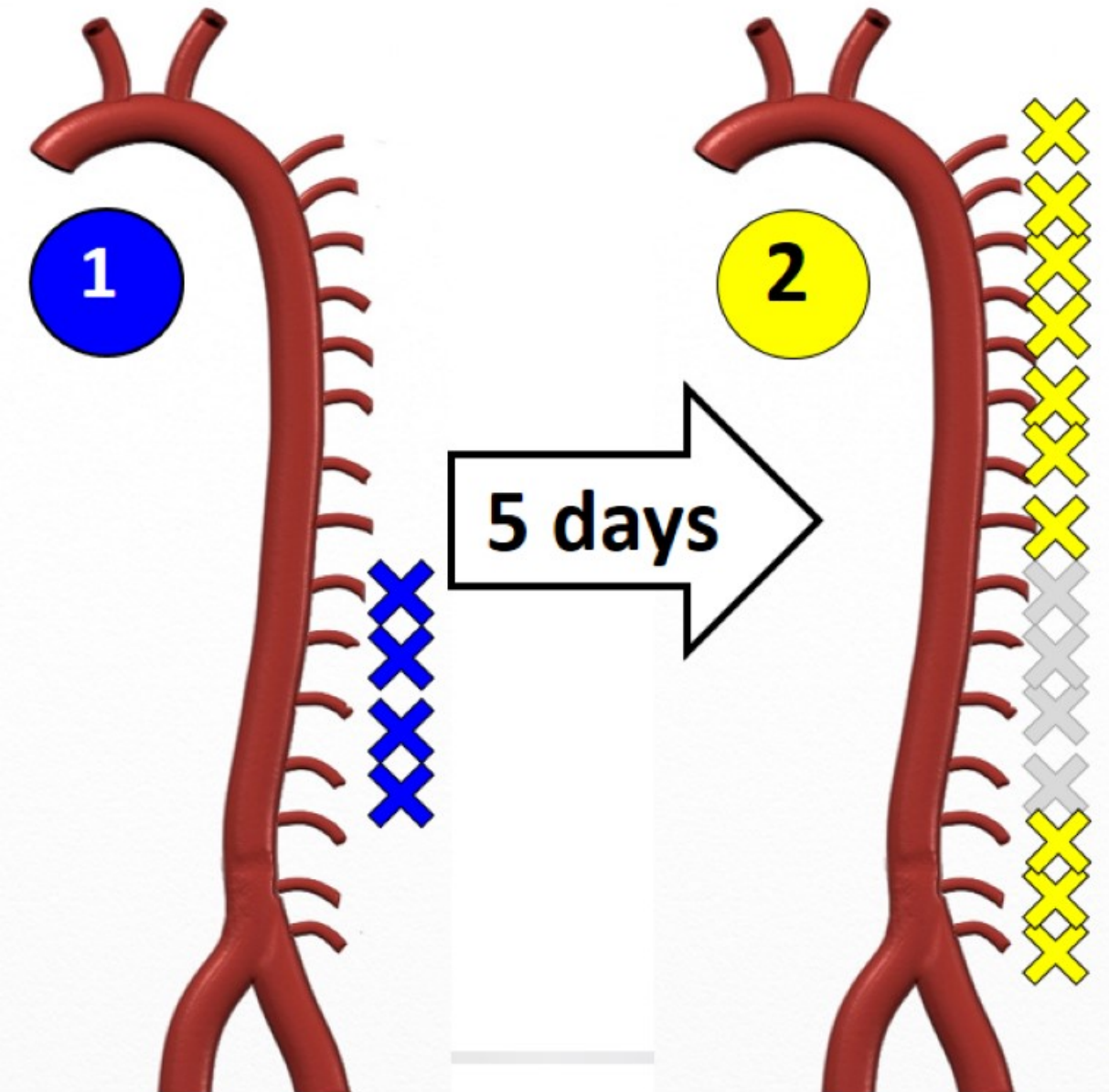


Alternating-pattern (group 2)
N = 6

Stage 1
Every second artery
(15 segmental arteries)

Stage 2
Remaining arteries
(15 segmental arteries)

Intervention Groups

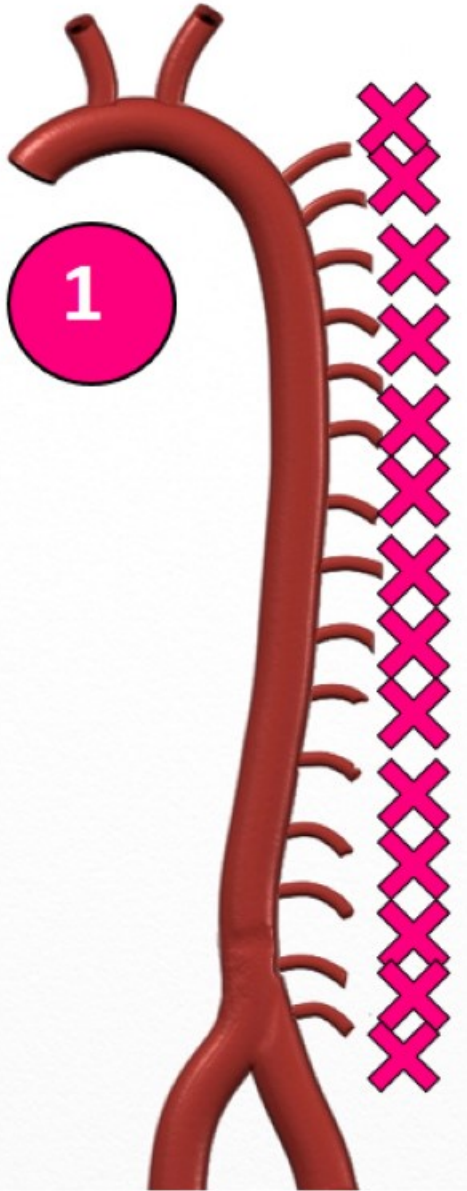


Watershed-pattern (group 3)
N = 6

Stage 1
Thoracic level 12 to lumbar 2
(8 segmental arteries)

Stage 2
Remaining arteries
(22 segmental arteries)

Control Group



**Open Segmental artery
occlusion (control group)**
 $N = 7$

One stage complete occlusion
(30 segmental arteries)

Results - Neurological Outcome and Spinal Cord Tissue Damage

MIS ² ACE occlusion pattern		Regional	Alternating	Watershed	Control
Paraplegia (N, %)	temporary	1 (16.7%)*	1 (16.7%)*	3 (50%)	7 (100%)
	permanent	0 (0%)	1 (16.7%)	1 (16.7%)	4 (57%)
	all	1 (16.7%)*	2 (33.3%)*	4 (66.7%)	7 (100%)
* P-Value < 0.05 versus control					

significantly **less** neurological **deficits** for **regional pattern**

no neurological **deficits** for **watershed** pattern after **stage 1**

Results - Neurological Outcome and Spinal Cord Tissue Damage

MIS ² ACE occlusion pattern		Regional	Alternating	Watershed	Control
Tissue damage (N, %)	score >6	0 (0%)*	2 (33.3%)	2 (33.3%)	5 (71.4%)
* P-Value < 0.05 versus control					



Score 0 - intact



Score 8 - damaged

No relevant tissue damage in staged regional pattern