Perfusion branches: The ultimate tool to prevent paraplegia in TAAA (following EVAR)

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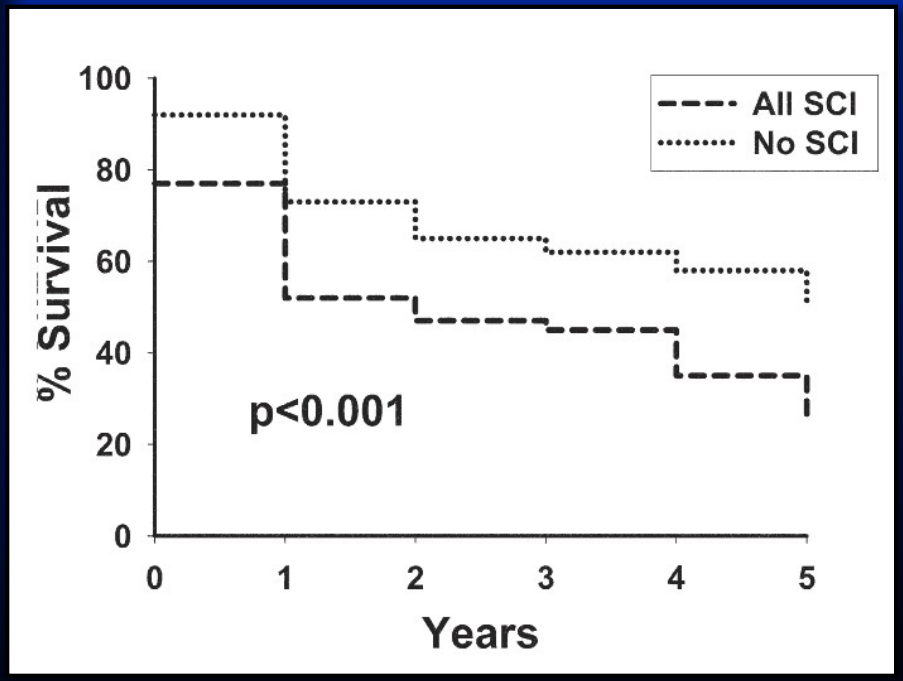
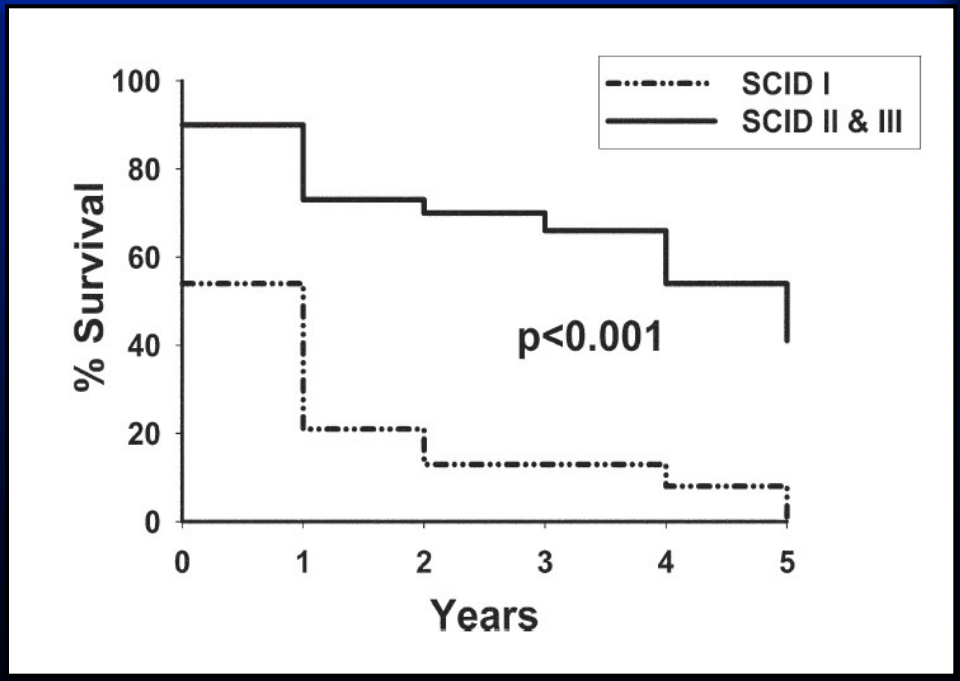
Disclosure: Cook, Inc.

- Patents
- Consulting
- Research Support

Paraplegia : a devastating complication



Conrad MF J Vasc Surg 2008;48:47-53



SCID I : Flaccid Paralysis
SCID II & III: Partial functional recovery

TEVAR: risk factors to develop paraplegia

- Length of aortic coverage
- Coverage of left subclavian artery
- Previous infrarenal aortic repair
- Occluded internal iliac arteries
- Post-dissection versus Degenerative aneurysm
- Hypotension

Table 4. Mortality and SCI Classified by Extent of Aneurysmal Disease

Extent	Repair Technique	n	Mortality at 30 d			Mortality at 1 y			SCI	
			n	%*	Rate†	n	%*	Rate†	n	%
None	ER	163								1
	SR	136								1
I	ER	82								10
	SR	51								14
II	ER	16								19
	SR	59								22
III	ER	22								5
	SR	62								10
IV	ER	69								3
	SR	64								2
All	ER	352	20	6	0.72	55	16	0.21	15	4
	SR	372	31	7	1.07	59	15	0.19	28	8

TEVAR: NO SCI issue

SPINAL CORD ISCHEMIA AFTER fTEVAR and bTEVAR

Greenberg et al Circulation 2008, 118:808-817

Paraplegia Risk Profile

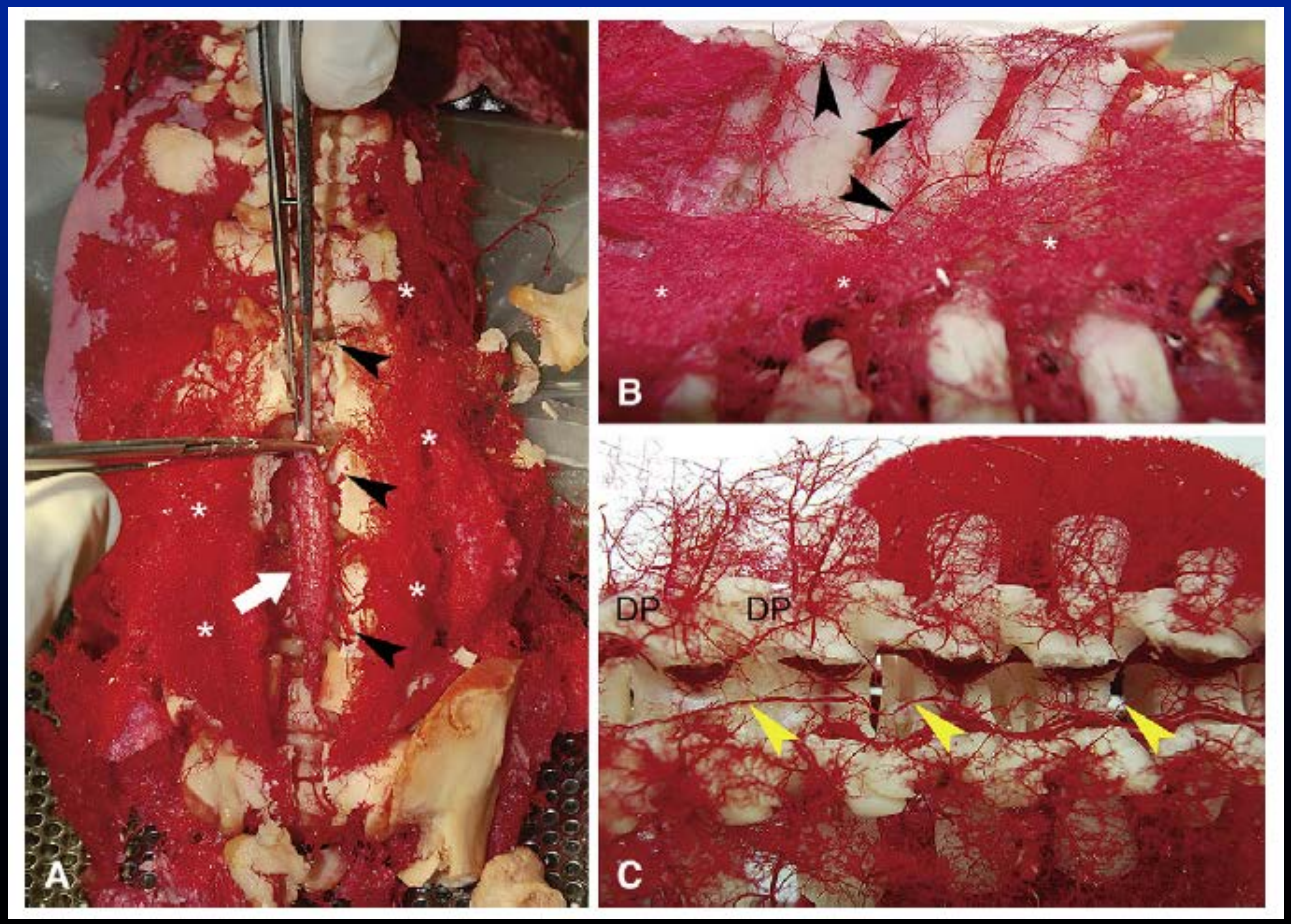
- Low risk: DTAA
- Median risk: TAAA IV-V, previous surgery
- High risk: TAAA I, II, III

Strategies To Prevent Paraplegia Following fTEVAR and bTEVAR

Paraplegia Risk Profile and Management

- Low risk: TEVAR, hemodynamic management
- Median risk: fTEVAR or bTEVAR with CSF drainage
- High risk: same, with aneurysm perfusion branch?

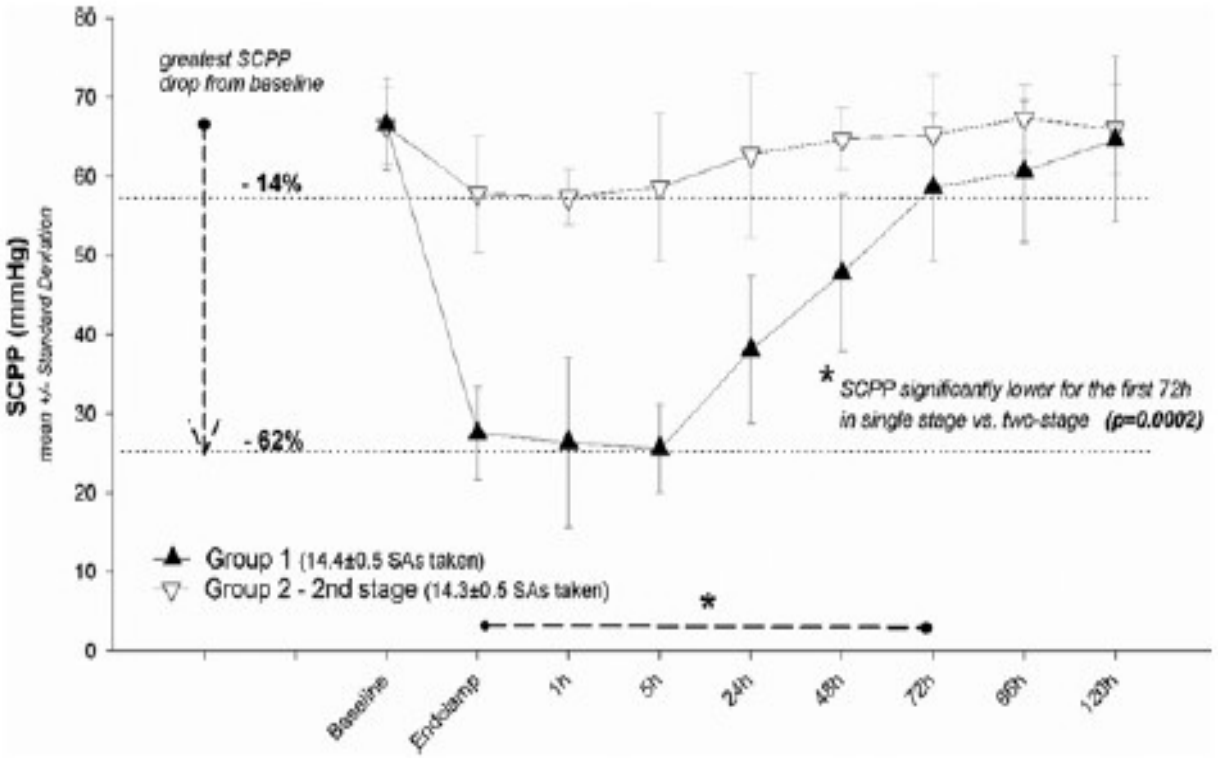
An intact collateral network is more critical than a small number of critical segmental arteries



Courtesy of
Dr. C Etz.

Collateral Network Pressure (CNP, L1)

after extensive *single vs. two stage SA sacrifice*



Porcine model

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]

- 90 patients
- 55 patients with Crawford extent II aneurysms repaired in a single-stage procedure
- 35 patients with aneurysms repaired in 2 separate operations
- Mortality (11%) was no different between the 2 Groups
- Occurrence of paraplegia 15% in the former cohort and none in the latter cohort

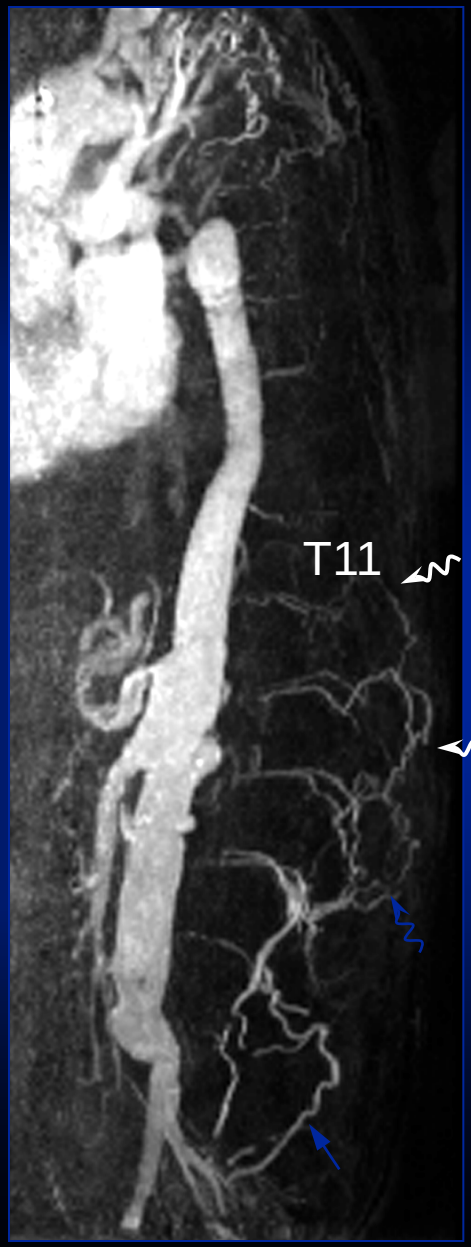
Journal of Vascular Surgery®

Magnetic resonance angiography of collateral blood supply to spinal cord in thoracic and thoracoabdominal aortic aneurysm patients

Walter H. Backes, PhD,[a] Robbert J. Nijenhuis, MD, PhD,[a,b] Werner H. Mess, MD, PhD,[c] Freke A. Wilmink, MD,[a] Geert Willem H. Schurink, MD, PhD,[b] and Michael J. Jacobs, MD, PhD,[b,d] *Maastricht, The Netherlands; and Aachen, Germany*

J Vasc Surg 2008;48:261-71

preoperative



postoperative

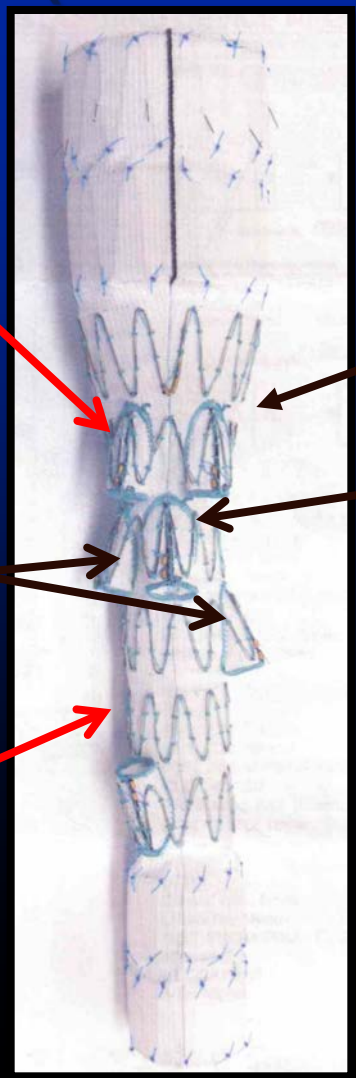
Development of collaterals

TAAA type II

all patients display collaterals postoperatively

Courtesy of Prof Michael Jacobs Maastricht

Sac Perfusion Branches (SPBs)



↓Perfusion Branch

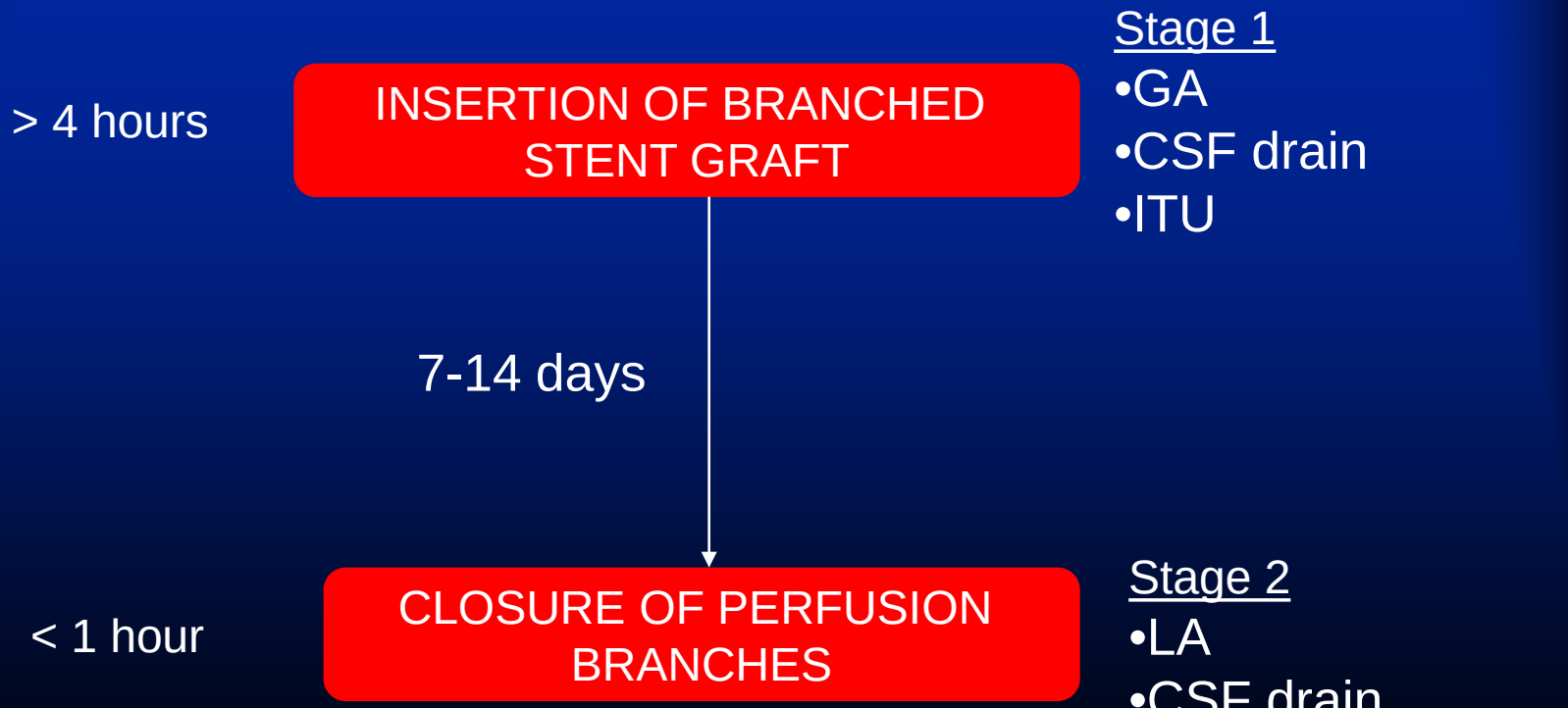
↑Perfusion Branch

Coeliac

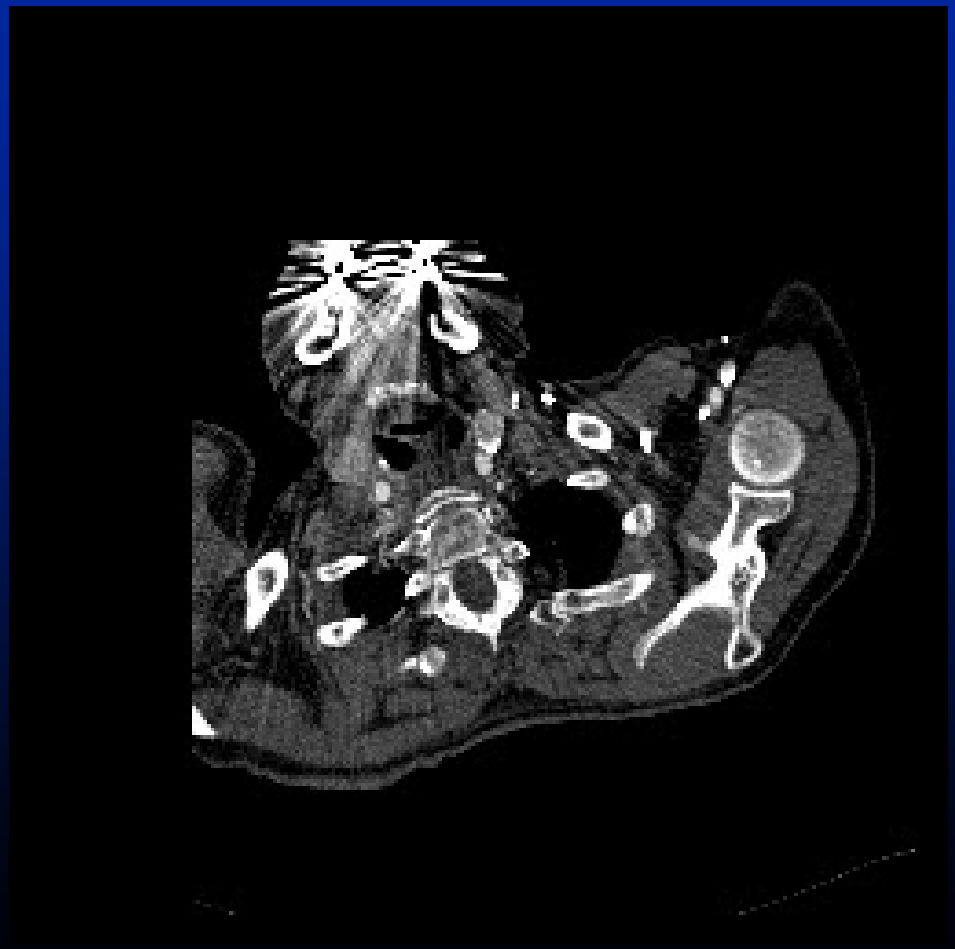
SMA

Renals

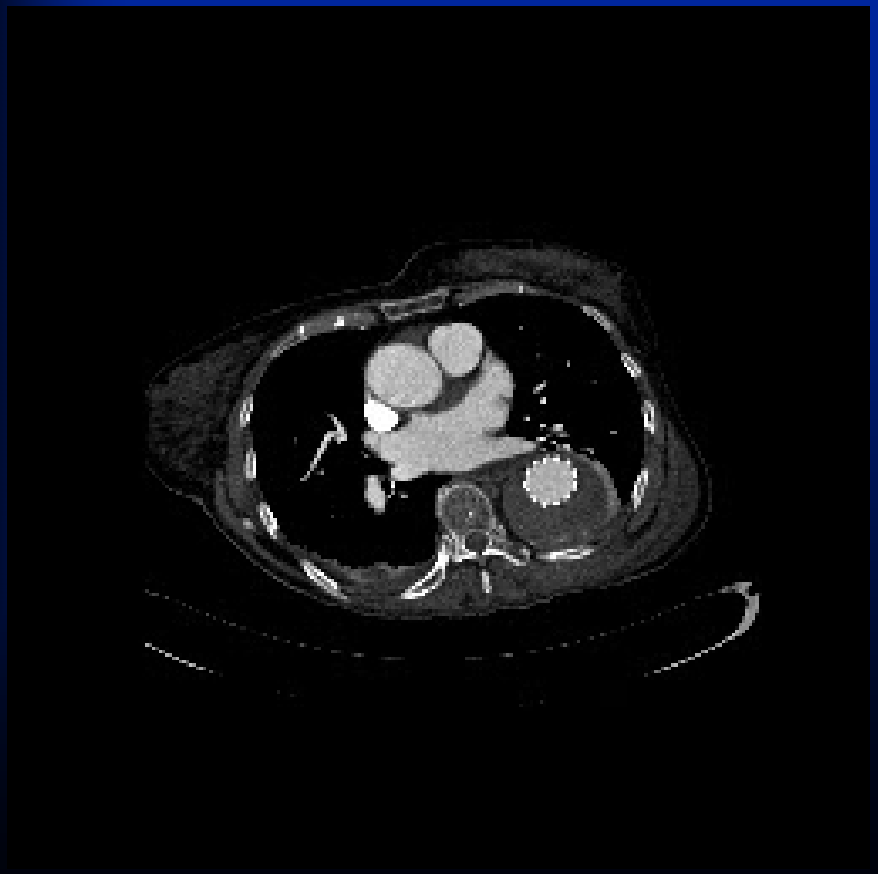
Staged Repair

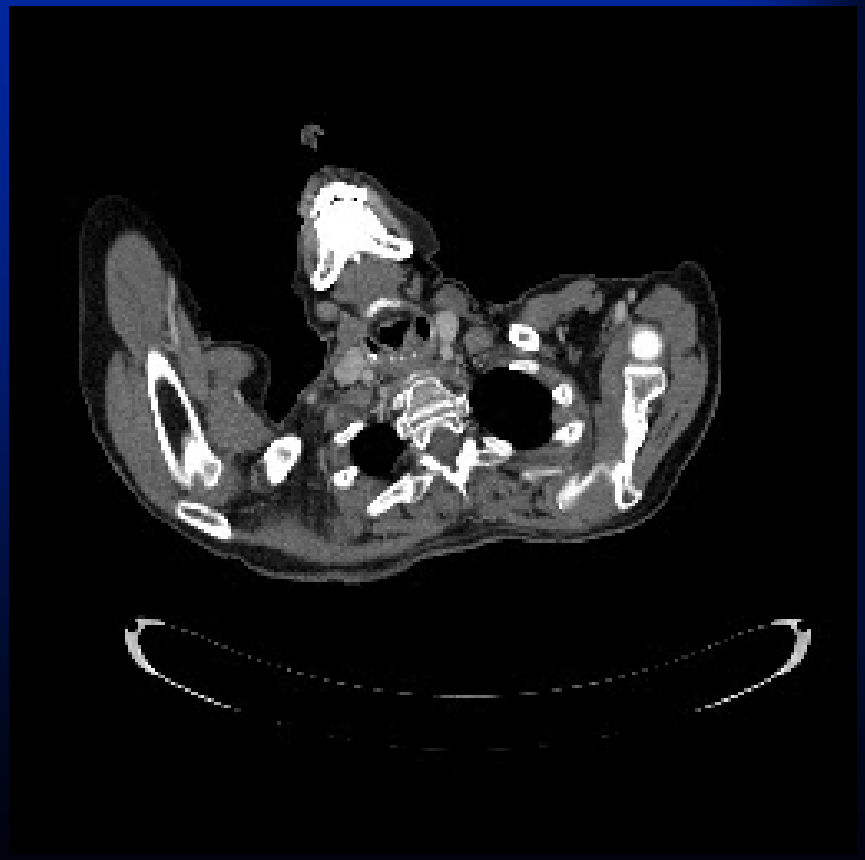


Pre-op



Sac Perfusion





Cases

Age	Sex	Diam. (mm)	Extent	Target Vessels
78	M	68	3	4
85	F	62	2	3
76	M	76	2	4
79	F	76	2	4
80	M	64	3	3
77	F	75	2	3
49	M	65	3	1
72	F	79	2	4
75	M	61	3	4
83	M	66	2	5
42	M	60	3	3
74	F	63	2	4

All patients treated with Cook Custom Made Branched Endografts

Cases with neurology - 1

- Type 2 TAAA
- Developed monoparesis after postoperative circulatory instability
- CTA- intrasac thrombosis with very little flow from SPBs
- Deceased day 7 from multi-organ failure

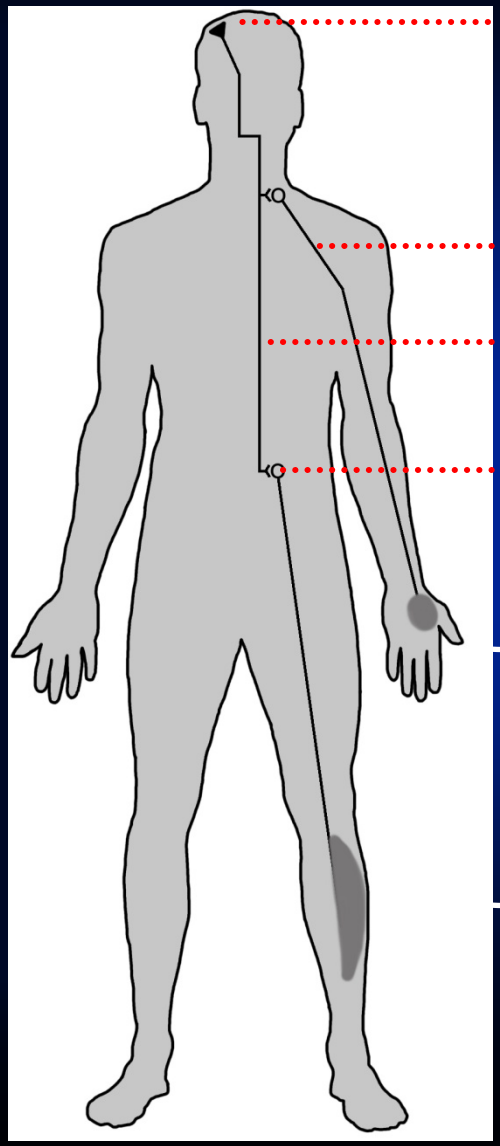
Cases with neurology - 2

- Type 2 TAA
- LSCA intentionally covered, no bypass performed
- Developed paraparesis after closure of SPBs and removal of spinal drain
- Reversed SCI by carotid-subclavian bypass

Cases with neurology - 3

- Type 3 TAAA after total arch repair for Type A dissection extending to the iliacs
- Developed immediate monoparesis after closure of lower SPB – resolved with aggressive CSF drainage (upper SPB left patent)

electrical stimulation
500 V; ~1.2 A, 5 serial stimuli

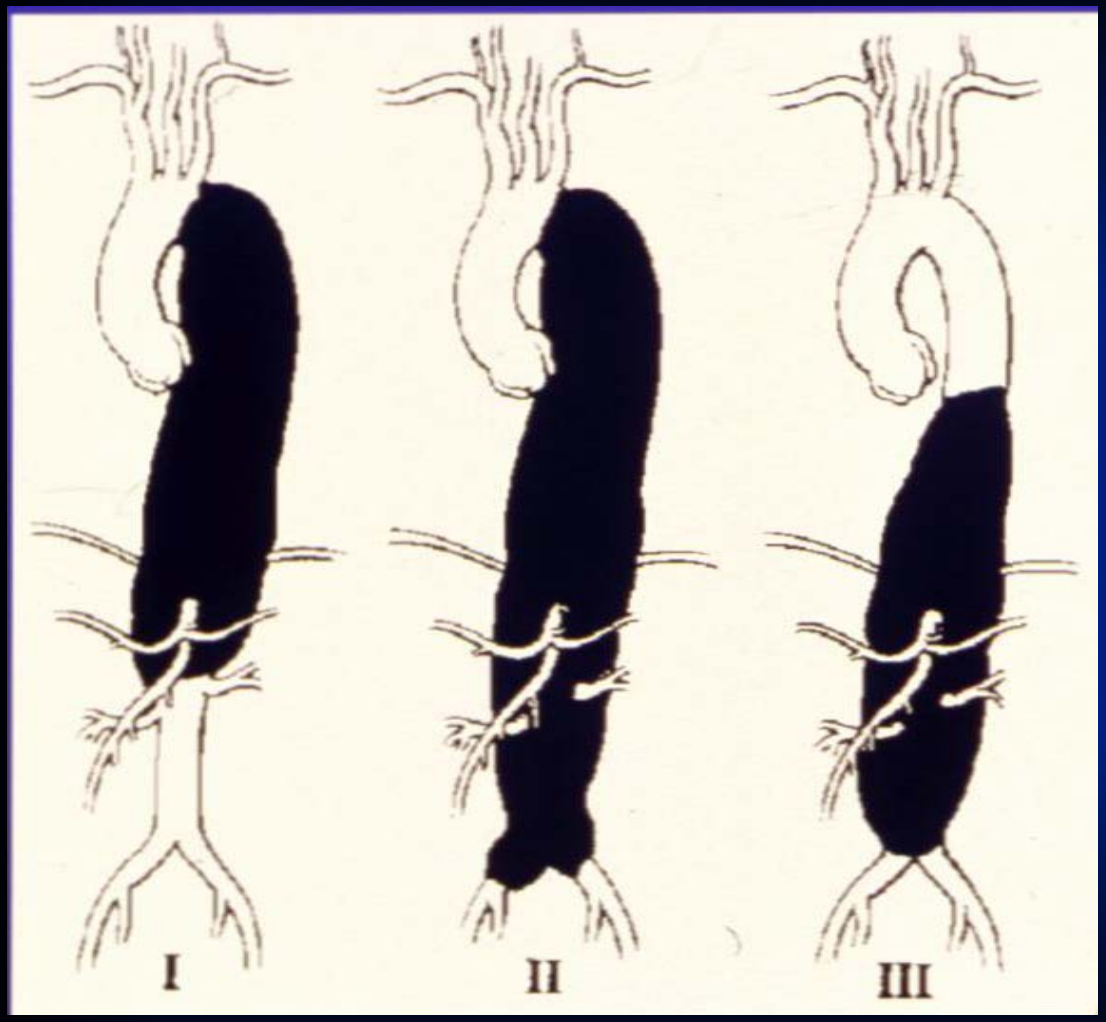


MEP response
abd. poll. brevis muscle

MEP response
tibialis anterior muscle

Courtesy of Prof Michael Jacobs
Maastricht

TAAA (n>800)



Courtesy of
Prof Michael Jacobs
Maastricht

No false positive or negative MEPs

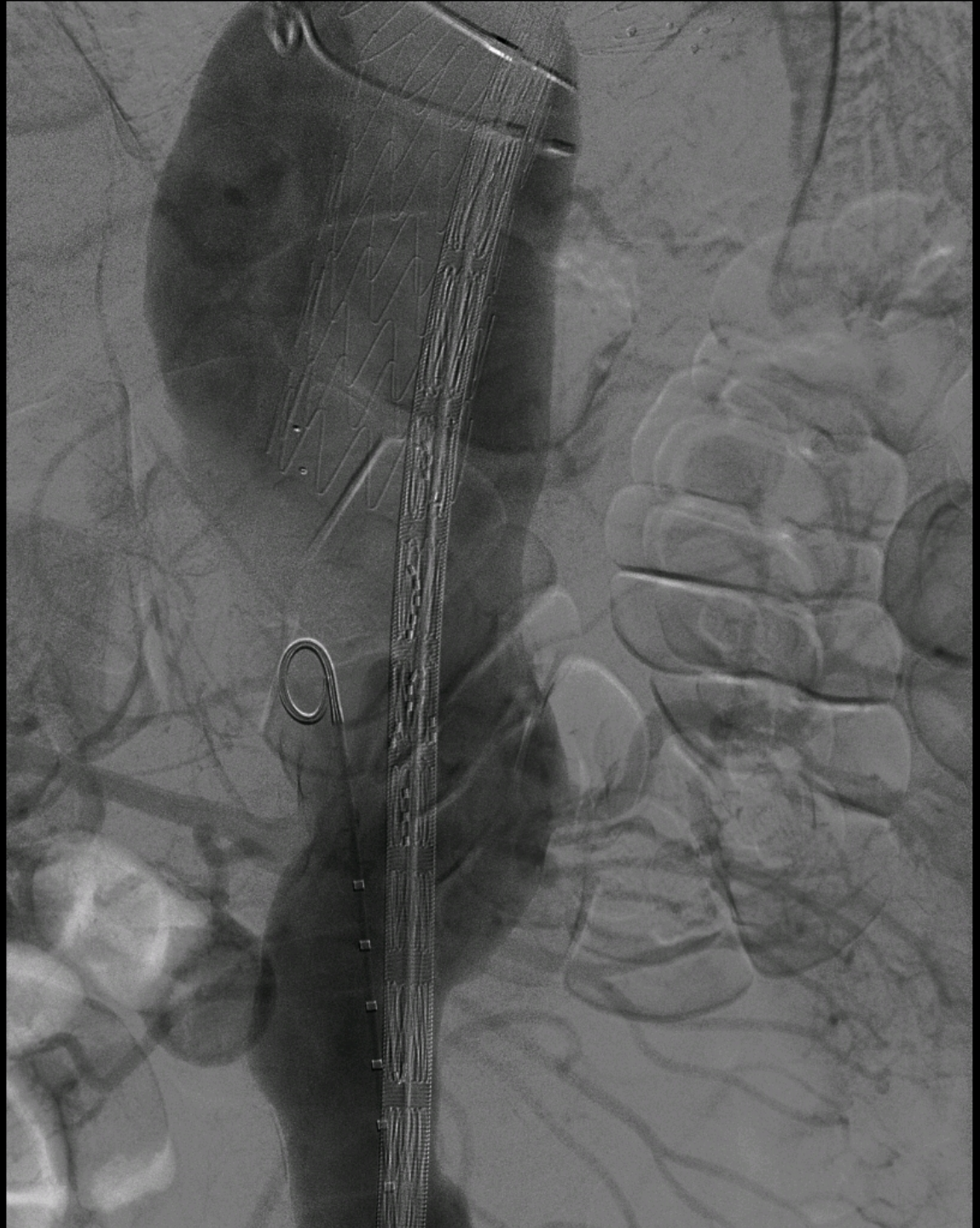
Paraplegia Risk Profile And Management

- Low risk: TEVAR, no adjunctive measures
- Median risk: fTEVAR or bTEVAR with CSF drainage
- High risk: same, plus aneurysm sac perfusion via celiac or SMA branch with temporary balloon occlusion and MEP monitoring

  if no MEP changes, finish procedure,

  if MEP changes, leave branch open for a period of 4 weeks to allow collaterals to develop

Courtesy of Prof Michael Jacobs Maastricht



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Conclusions/Future Perspectives

- Controlled temporary perfusion of sac is safe and feasible
- Early experience promising
- Still requires CSF drainage & BP control
- MEP with induced hypotension for improved pt selection