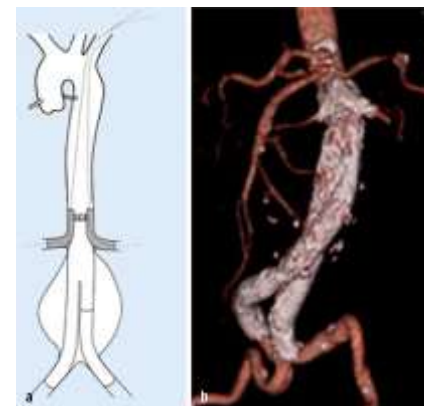




Leipzig Interventional Course  
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**Low risk of spinal cord ischemia after endovascular repair for  
suprarenal and thoracoabdominal aortic aneurysms using  
parallel stent graft implantation.**

Kopp R, Puipe G, Rancic Z, Hofmann M, Pecoraro F,  
Pfammatter T, Lachat M.

University Hospital Zurich, Switzerland



UniversitätsSpital  
Zürich



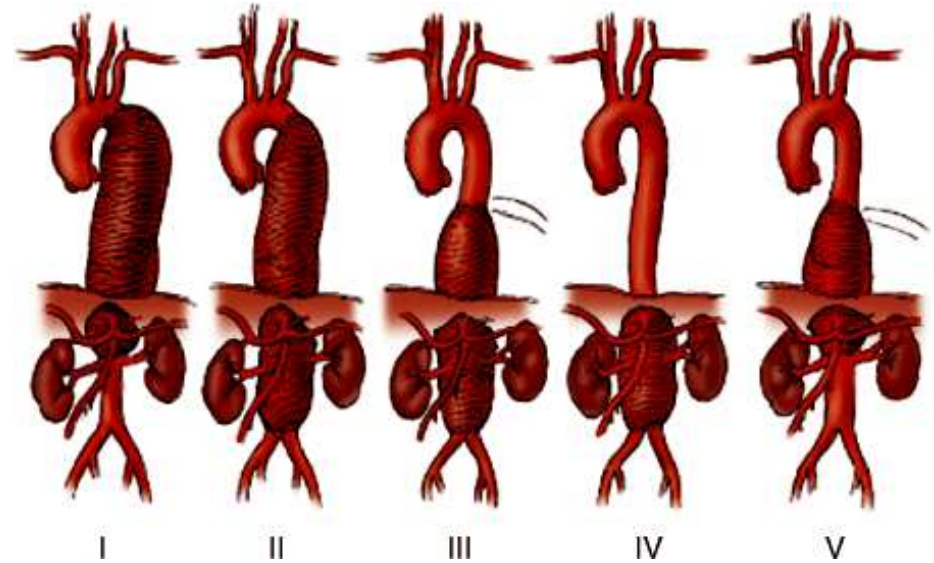
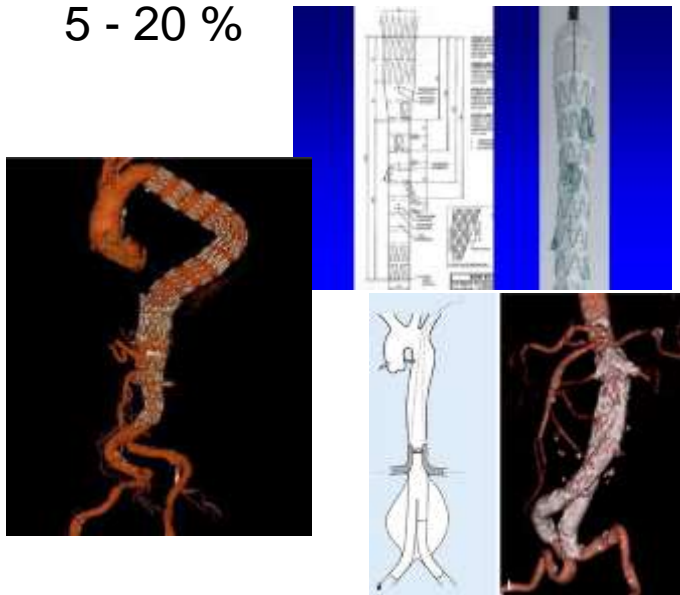
Universität  
Zürich<sup>UZH</sup>

no disclosures

# Thoracoabdominal aortic aneurysms (TAAA)

- **risk of spinal cord ischemia**

5 - 20 %



## Strategies for prevention of SCI

- normotension MAP > 80 mm Hg
- hemoglobin > 90 mg/dl
- CSFD < 12 mm Hg
- early iliac reperfusion
- staged procedures

O'Callaghan A et al., J Vasc Surg 2015; 61:347-354.  
Dias NV et al. Eur J Vasc Endovasc Surg 2015; 49: 403-409.  
Kasprzak PM et al. Eur J Vsc Endovasc Surg 2014; 48: 258-265.  
Verhoeven ELG et al. Eur J Vasc Endovasc Surg 2015; 49: 524-531.  
Bisdas T et al. J Vasc Surg 2015; 61: 1408-1416.

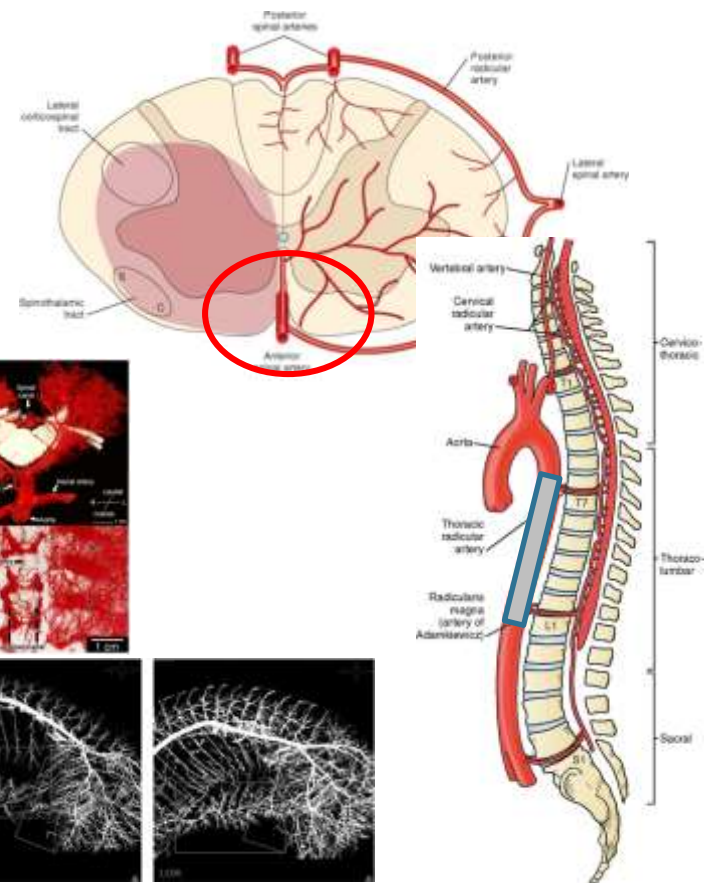
## Extended endovascular aortic repair

### Spinal cord ischemia during bEVAR for TAAA

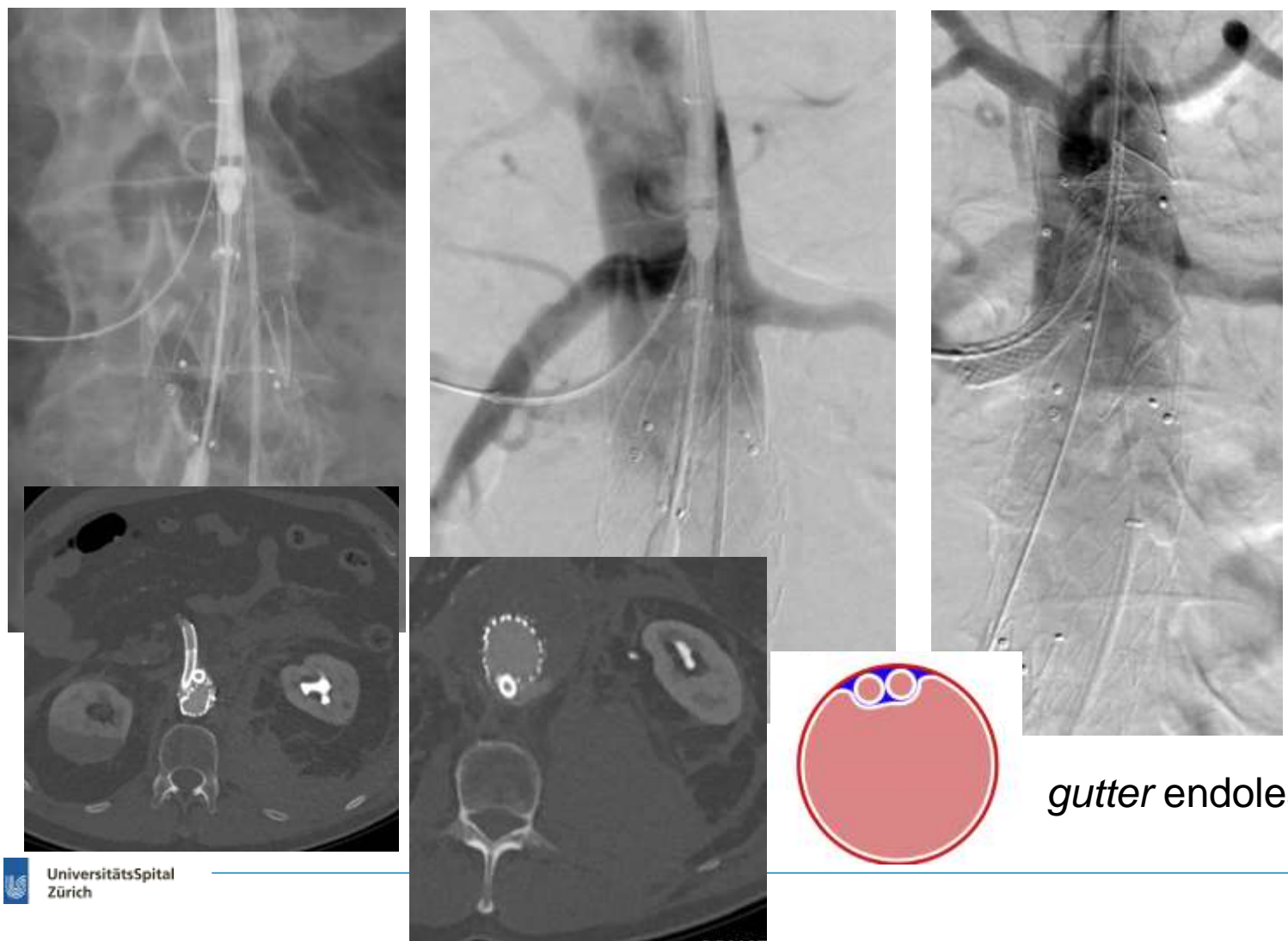
- direct occlusion of intercostal + lumbar arteries
- secondary reduction of spinal cord perfusion by aneurysm sac thrombosis

→ **spinal collateral network**

- staged procedures
- temporary aneurysm sac perfusion (TASP)
- segmental artery coil embolisation



# Parallel stent grafts for juxtarenal AA and TAAA repair



*gutter* endoleak 10-25 %

# Prevention of spinal cord ischemia during TAAA repair



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## Aim of the study

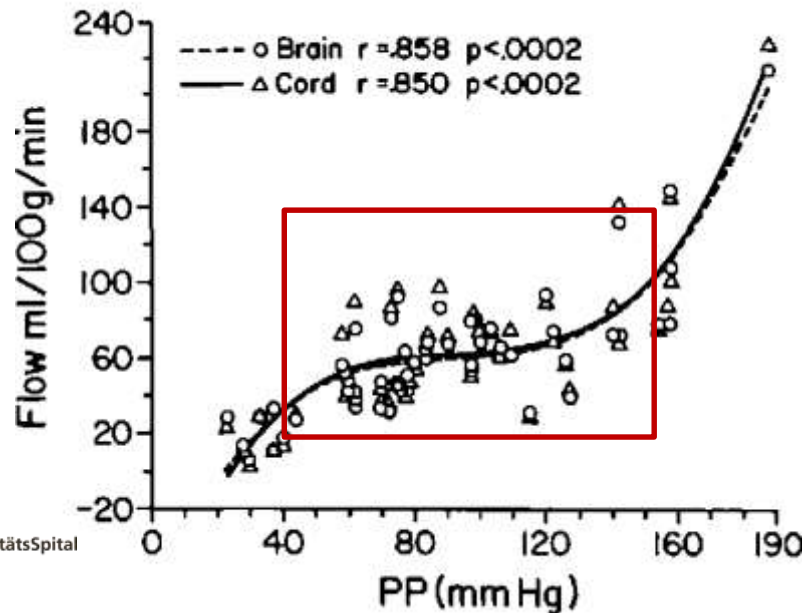
analyze the risk of SCI  
after endovascular suprarenal and thoracoabdominal aortic repair  
using the Chimney/Periscope technique

Chimney/Periscope technique		n = 125
+	juxta/pararenal AA	81
SCI prevention strategy	TAAA	44

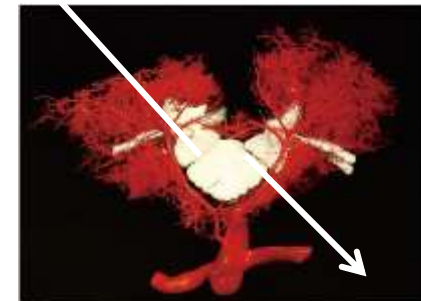
concept of SCI prevention @ USZ

- PG-EVAR
  - awake patient – local anesthesia
  - staged procedures
- normotension, normal hemoglobin levels  
no CSF drainage  
early iliac reperfusion

Autoregulation of spinal perfusion



Neuromonitoring



# Chimney / Periscope grafts for suprarenal AA and TAAA repair

## Mid- and Longer-term Follow up of Chimney and/or Periscope Grafts and Risk Factors for Failure

F. Pecoraro <sup>1,2,3,4</sup>, F.J. Veith <sup>5,6</sup>, G. Puippe <sup>7</sup>, B. Amman-Vesti <sup>8</sup>, D. Bettex <sup>1</sup>, Z. Rancic <sup>9</sup>, T. Pfammatter <sup>1</sup>, M. Lachat <sup>10</sup>

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<sup>2</sup> Vascular Surgery Unit, University of Palermo, ADUP "P. Giaccone", Palermo, Italy

<sup>3</sup> New York University – Langone Medical Center, New York and The Cleveland Clinic, United States

<sup>4</sup> Interventional Radiology, University Hospital Zurich, Zurich, Switzerland

<sup>5</sup> Clinic for Angiology, University Hospital Zurich, Zurich, Switzerland

<sup>6</sup> Division of Cardiovascular Anesthesia, University Hospital of Zurich, Zurich, Switzerland

### WHAT THIS PAPER ADDS

Long-term follow up of chimney and periscope grafts for the treatment of pararenal and thoraco-abdominal aortic aneurysm is presented. This approach using off the shelf devices has been increasingly reported in recent years and with good results even in emergent settings. This risk factor analysis showed that inadequate branch graft length and chimney and periscope use in small and diseased target arteries contribute to late failure of this technique.

Table 1. Demographics, comorbidities, and operative details.

Patients		100
Aortic aneurysm type	Pararenal	69
	Suprarenal	25
	Thoraco-abdominal	31
	Crawford I	7
	Crawford II	4
	Crawford III	3
	Crawford IV	9
Operation	Arch to visceral	8
	Elective	73
	Non-elective	27
	Symptomatic	15
Number of CPG	Ruptured	12
	1	21
	2	47
	3	19
	4	13

*Note: A red box highlights the Pararenal, Suprarenal, Thoraco-abdominal, Crawford I, Crawford II, Crawford III, Crawford IV, and Arch to visceral rows. A red arrow points from this box to the text 'n = 56'.*

n = 100

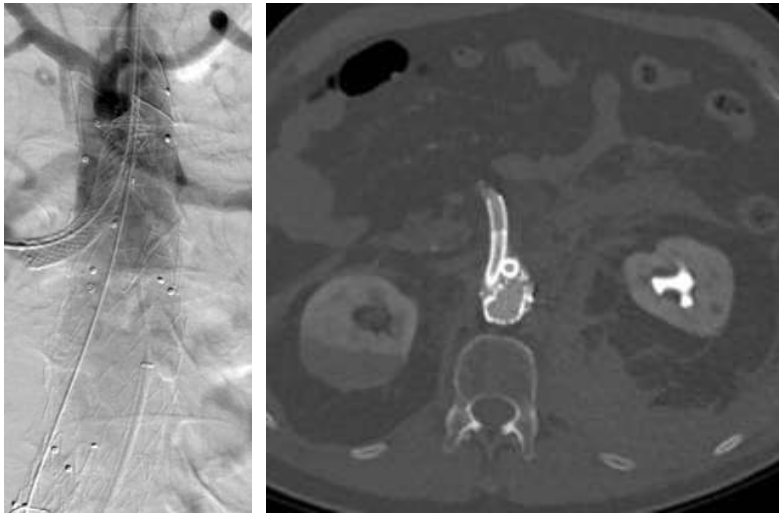
perioperative mortality	2 / 100	2 %
reinterventions	22 / 100	22 %
EL rate: gutter - 23; 15 treated, 4 low flow)	23 / 100	23 %
persistent gutter EL type II 4	4 / 100	4 %

## Adjuncts for SCI prevention

- normotension MAP > 80 mm Hg
- hemoglobin > 90 mg/dl
- supraa./iliac revascularization
- early iliac reperfusion
- no CSFD (option: secondary)
- staged procedures
- local anesthesia
- post op: steroids; option: mannitol



# Chimney / Periscope grafts for TAAA repair



## Adjuncts for SCI prevention

- normotension MAP > 80 mm Hg
- hemoglobin > 90 mg/dl
- supraa./iliac revascularization
- early iliac reperfusion
- no CSFD (option: secondary)
- **staged procedures**
- **local anesthesia**
- post op: steroids; option: mannitol

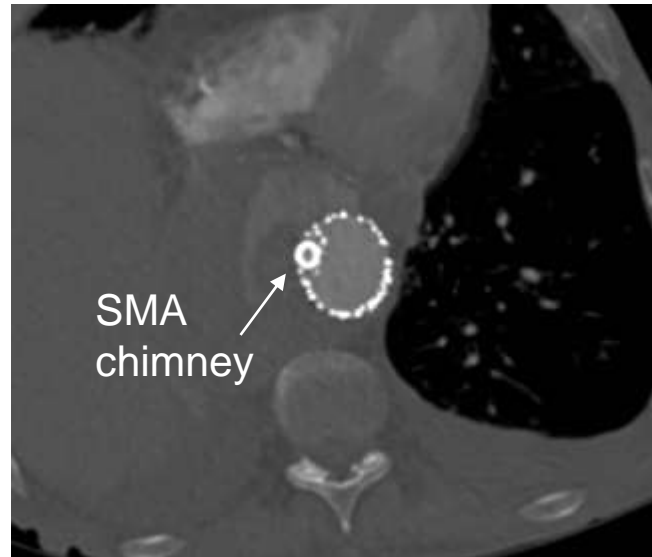
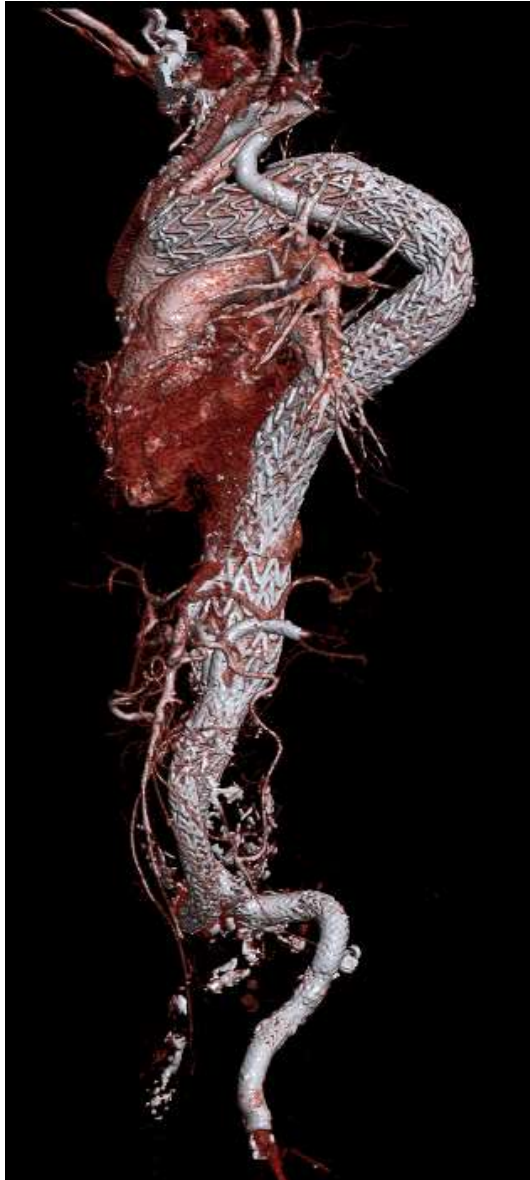
Aortic aneurysm type	Pararenal
	Suprarenal
	Thoraco-abdominal
	Crawford I
	Crawford II
	Crawford III
	Crawford IV
	Arch to visceral

n = 72

n = 125			
perioperative mortality		2 / 125	1.6 %
reinterventions		29 / 125	23 %
SCI	temporary	4 / 72	5.5 %*
	<b>permanent</b>	<b>2 / 72</b>	<b>2.7 %*</b>
	overall permanent	2 / 125	1.6 %
EL rate (gutter 26; 18 treated, 5 low flow)		26 / 125	21 %
	type II 6		

SCI: modified Tarlov score 0-2

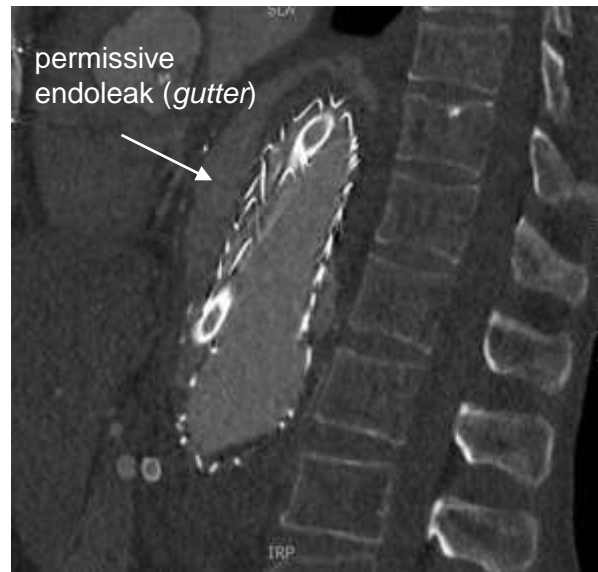
# TAAA repair with parallelgraft technique



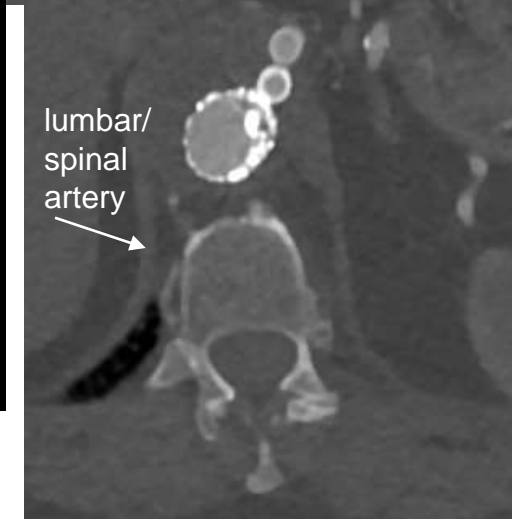
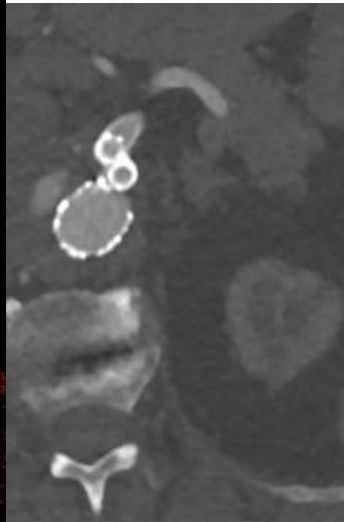
## Temporary permissive endoleak perfusion

-> spinal perfusion

- TASP open/perfusion branch
- gutter endoleak



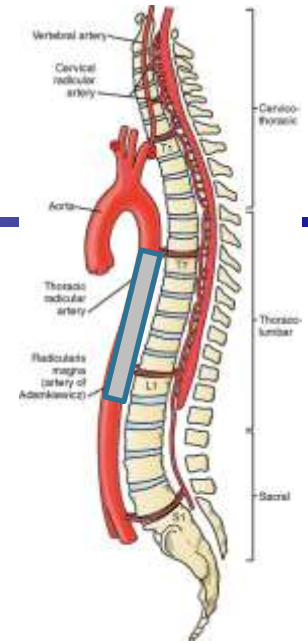
# TAAA repair using Parallelgrafts



**Temporary gutter endoleak**  
- > **spinal perfusion (TGSP)**

pararenal/TAAA	n = 72
gutter EL	26
gutter EL spinal perf. (TGSP)	14

# Prevention of spinal cord ischemia during TAAA repair



## Strategies for SCI prevention

Single step procedures, ITN,  
+ adjuncts, CSFD,  
normotension, n/hemoglobin,

SCI 10-20 %

staged procedures, ITN,  
+ adjuncts, CSFD, MEPs, TASP  
normotension, n/hemoglobin, iliac perfusion

SCI 4-6 %

Parallel stent graft, local anesthesia, staged  
temp. *gutter* spinal perfusion (TGSP)  
**+ few adjuncts** normotension, n/hemoglobin  
iliac perfusion, ~~CSFD~~, ~~MEPs~~

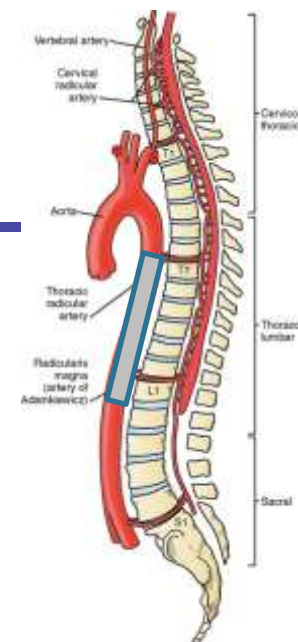
SCI 2 - 4 %

immediate

delayed

late SCI

# Prevention of spinal cord ischemia during TAAA repair

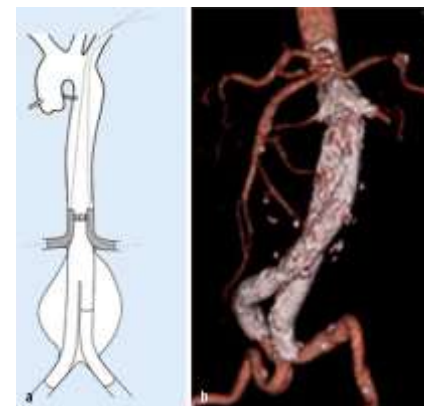


## Conclusions

- low rates of SCI after PG EVAR with center specific strategies for SCI prevention
- awake patients allow best neurological monitoring to document spinal cord integrity with preserved autoregulation of spinal cord perfusion
- temporary gutter spinal perfusion (TGSP) might contribute to prevention of SCI



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