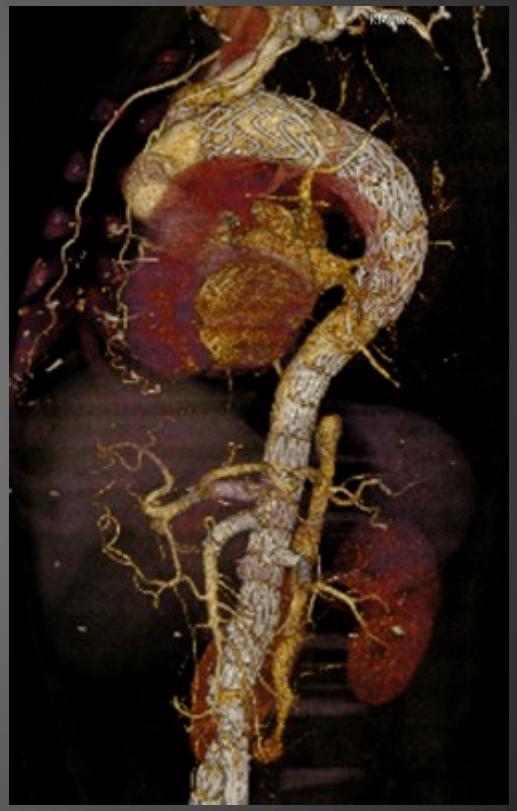
Spinal Cord Ischemia in EVAR for TAAA: Analysis of Risk Factors



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  - Consultant
- *Siemens*
  - *Consultant*

Lowering the Risk of SCI in Endovascular repair of TAAA

- Preop
  - Stent-graft planning
    - Preserve collaterals
    - Stage procedure/Perfusion branches
  - Cerebrospinal fluid drainage
- Intraop
  - Early pelvic and limb reperfusion
    - Surgical Access (Purse string sutures)
  - Proactive correction of blood pressure & Hb
- Postop
  - Proactive correction of blood pressure & Hb
  - Early & close neurological monitoring

Aim of Present Study

- Report the incidence and risk factors of SCI after endovascular TAAA repair with F & B stent-grafts

Patients and Methods

- Consecutive TAAA pts treated with F & B stent-grafts
  - 30d Mortality excluded
- 2004 - 2014
- Suprarenal aortic aneurysms excluded

Patients (N=201)*

- 78% Male
- Mean age 68.3 ± 7.6 years
- ASA score
  - 22.3% ASA II
  - 68.7% ASA III
  - 9.0% ASA IV
- 46.3% previous aortic procedures

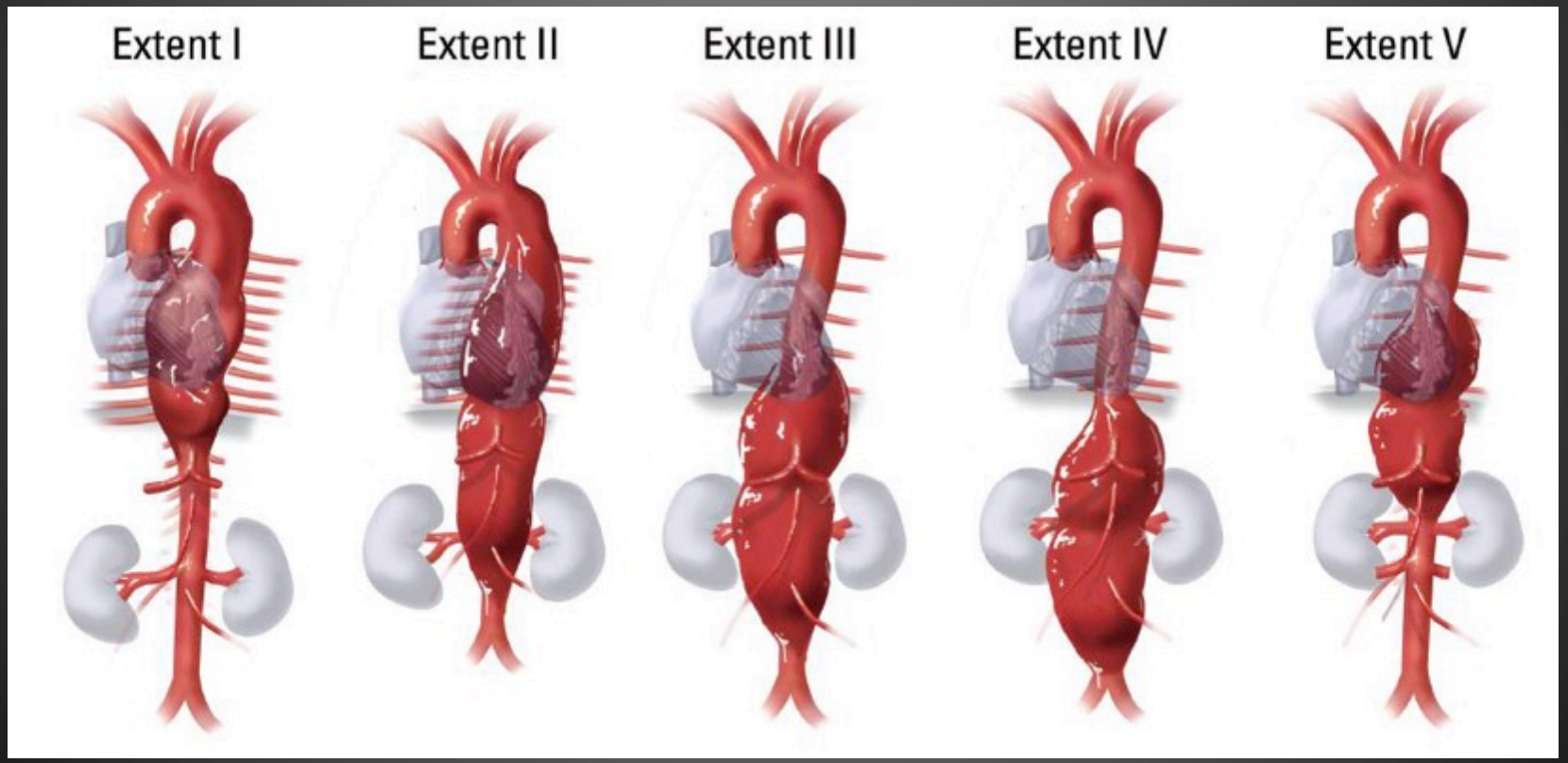
** Excluding 30d Mortality (17 pts-7.8%)*

TAAA Characteristics

- Mean Dmax: 68 ± 11mm
- Acute TAAA: N=17 (8.5%)
  - 10 Contained rupture TAAA
  - 7 Symptomatic TAAA

TAAA Extent

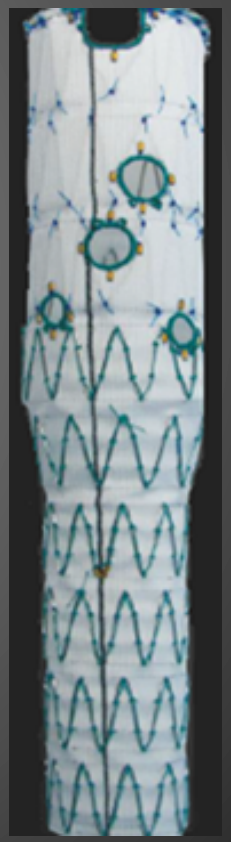
17 (8.5%) 55*(27.4%) 63 (31.3%) 54 (26.9%)

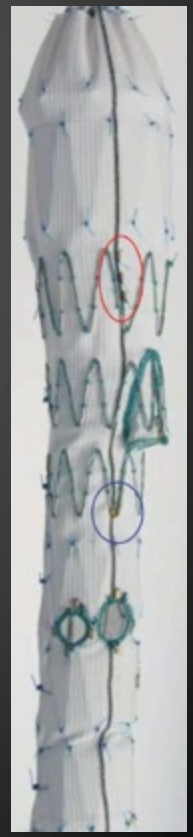


* 23 Chronic post-dissection TAAA

Stent-graft Design

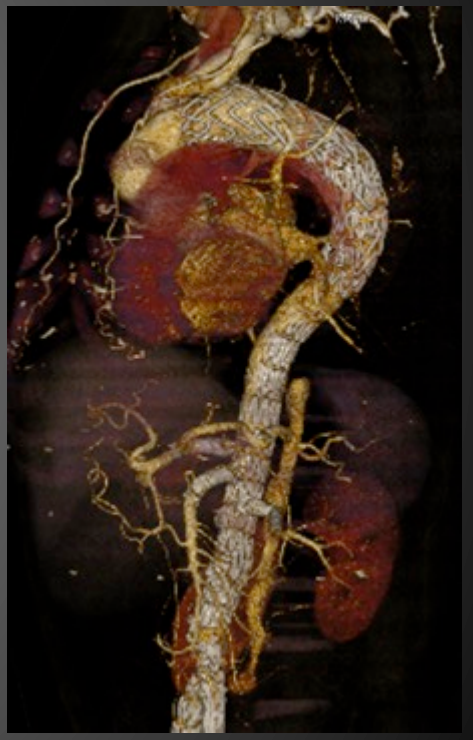
- Branches only
  - N=67 (33.3%)
- Fenestrations only
  - N=58 (28.9%)
- Branches + Fenestrations
  - N=76 (37.8%)





Aorta Coverage with Stent-graft

- Mean: 76 ± 17% of total aortic length
  - (LSA to aortic bifurcation)



Spinal Cord Ischemia (SCI)

- N=21 (10.4%)
- Presentation & Evolution:
  - Transient limb weakness: N=13 (6.5%)
  - Persistent limb weakness: N=5 (2.5%)
  - Persistent paraplegia: N=3 (1.5%)

Spinal Cord Ischemia (SCI)

- Timing
  - Immediate symptoms: N=5/21 (23.8%)
  - Delayed symptoms: N=16/21 (76.2%)
    - <72 h postop: N=14
    - >72 h postop: N=2
      - Septic shock (pneumonia)→ Hypotension
      - Bleeding (anticoagulation)→ Hypotension

CSF Drainage (N=148)

- Preoperative: N=144 (71.6%)
- Postoperative: N=4 (2%)
  - Complete recovery: N=3
  - Persistent limb weakness: N=1

- Complications of drainage: N=3 (2%)
  - Bleeding at puncture site: N=2
  - Headache: N=1
- *(Subdural hematoma: N=2*)*

**30d Mortality*

Risk Factors for SCI

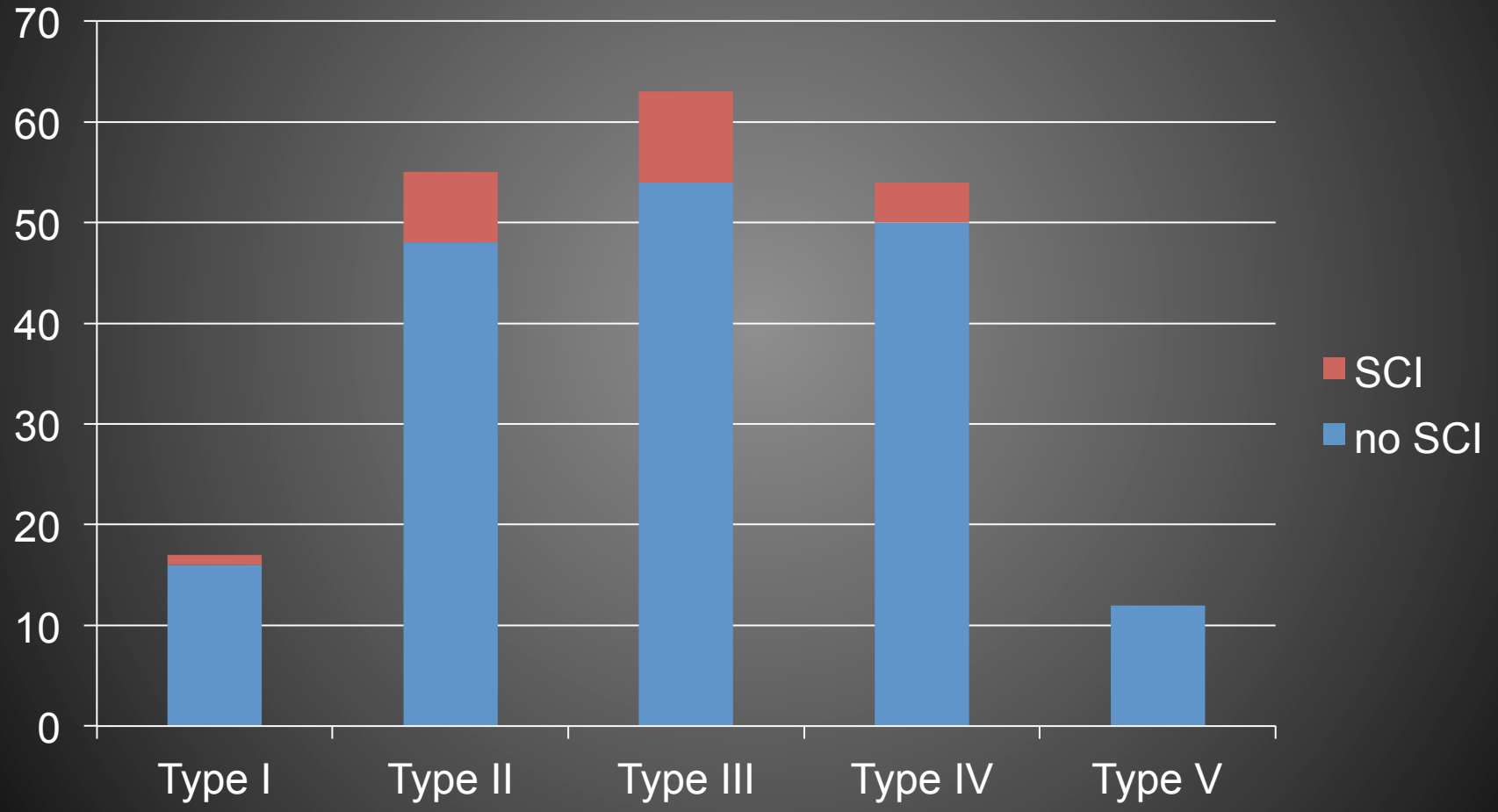
Univariate Analysis

Variable	SCI (N=21)	No SCI (N=180)	*P*
Comorbidities			
CAD	16 (76.2%)	110 (61.1%)	0.24
Hypertension	17 (81%)	145 (80.6%)	1.0
PAD	17 (81%)	67 (37.2%)	<0.001*
COPD	8 (38.1%)	99 (55%)	0.1
Smoking (current or past)	17 (81%)	111 (61.7%)	0.1
Diabetes mellitus	1 (4.8%)	16 (8.9%)	1.0
Renal (GFR<30 ml/min)	5 (23.8%)	11 (6.1%)	0.016*
Hypercholesterolemia	17 (81%)	127 (70.6%)	0.44
ASA≥3	19 (90.5%)	137 (76.1%)	0.17

Univariate Analysis

Variable	SCI (N=21)	No SCI (N=180)	*P*
Previous aortic surgery	9 (42.9%)	84 (46.7%)	0.82
Acute repair	1 (4.8%)	16 (8.9%)	1.0
Extent of repair			
Length of stent-graft(mm)	328±81	301±75	0.175
Aortic coverage (%)	82%±17%	75%±17%	0.122
Operative data			
Operation time > 300 min	12 (57.1%)	28 (15.6%)	<0.001*
Fluoroscopy time, min	80 (35-240)	68 (15-160)	0.018*
Estimated blood loss, ml	500 (200-2000)	380 (80-2500)	0.001*
Contrast volume, ml	240 (120-400)	200 (80-500)	0.049*

SCI per TAAA Type



Multivariate Analysis

- Operation time > 300 min
  - [OR], 7.4; 95% [CI], 2.6-21.1; p <0.001
- PAD
  - [OR], 6.6; 95% [CI], 2-21.9; p = 0.002
- Renal insufficiency (GFR<30 mL/min)
  - [OR], 4.1; 95% [CI], 1.1-16.1, p = 0.04

Study Limitations

- Retrospective data analysis
- Non-uniform protocol over study period (11 yrs)
- No routine assessment from neurologist
  - Minor neurologic deficits missed?
- Low event rate (Type II statistical error?)

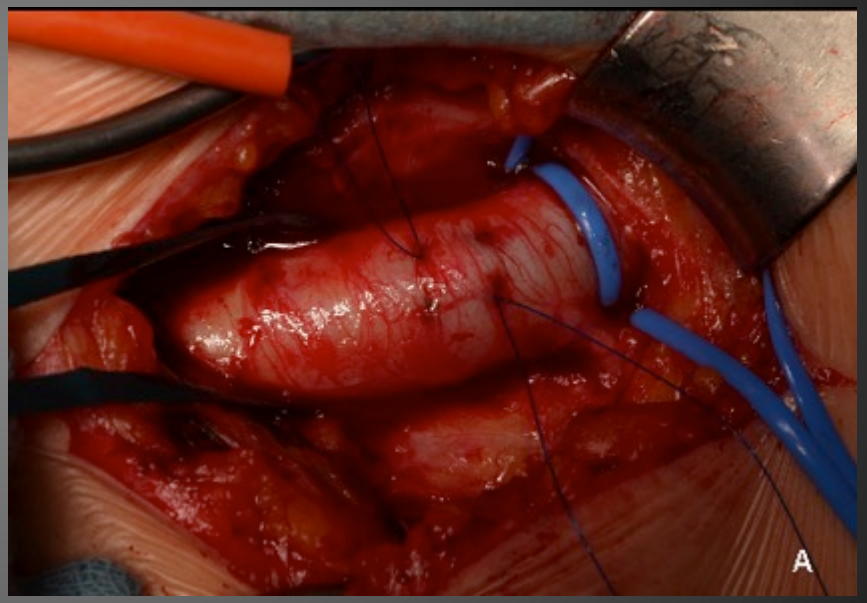
Conclusions

- Persistent paraplegia rare (1.5%)
- Rarely immediate, but within 72 h postop

- Risk factors for SCI
  - Long operation time (longer ischemia?)
  - PAD
  - Renal Insufficiency

Surgical Access for TAAA

- Surgical dissection
  - Purse string sutures



Surgical Access for TAAA

- Remove sheaths at first occasion
  - ↓ Iliac occlusion time
    ↓
  - ↓ Immediate SCI time

    but also…
  - ↓ Delayed spinal cord IRI
    ↓
  - ↓ Risk for SCI