New Concepts in Causes and Treatment of SCI with TAAA repairs –
Open and Endo: Why Preemptiv-Ischemic Preconditioning with Coil
Embolization of Intercostals May Help Prevent SCI

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no disclosures

PARAPLEGIA

15% 31% 7% 4%

Occlusion of Segmental Arteries  SCI
Chronic Large Animal Model: Paraplegia in 30 - 40% \(\rightarrow\) equals clinical incidence

After total SA Occlusion: regeneration of arterial perfusion in 5 days —

Retrospective clinical data: significant lower incidence of SCI with ‘staged repair’ (= staged occlusion of SAs)

group 1
conv. endo
14.6\% SCI

group 2
- lower limb perfusion
- post op maintenance
  of high blood pressure
- staged procedure
  1.2\% SCI
Hypothesis: Preemptive Conditioning with Minimally Invasive Segmental Artery Coilembolisation (MISACE) may help to prevent SCI

**no histologic damage** in coiled areas

**zero paraplegia** after coil embolization
first-in-man experience

- Crawford type-III TAAA (65mm)
- high risk for SCI
- not suitable for conventional staging
- high-risk for prolonged postop course
- considerable risk for sudden rupture
- Indecisiveness: fear for paraplegia

MISACE for collateral preconditioning 4 weeks prior to elective open repair

pt #1: 45-yo, asymptomatic

- 3rd and 4th lumbar SA catheterized
- deployment of microcoils (0.018" VortX-Diamond, Boston Scientific) into proximal SA

Conventional Open Repair 2nd-stage

- 1-month interval
- conventional repair
- intraop course uneventful
- no significant backbleeding
- short cross clamp time

No neurological impairment discharged home on p.o. day #35

pt #2: 66-year old lady

- rapidly growing Crawford type-III (57mm) (expansion > 5 mm in 6 months)
- too frail for open repair
- totally endo planned
- No option for conventional staging

bilateral MISACE (4th lumbar SAs and IMA) for collateral preconditioning prior to endovascular repair

The same procedure was conducted with the inferior mesenteric artery using two Mreye macrocoils (Cook Medical, Bjaeverskov, Denmark, Figure 2); no further open segmental arteries were identified in the infrarenal segment.
Endovascular repair
2nd-stage

- 8 week interval
- Endo repair with a four-branched stent-graft (T-branch, CE-marked, Cook Medical, Bjaeverskov, Denmark) in general anesthesia with adjunctive CSF-drainage
- all remaining open SAs between the T7 and the infrarenal aorta occluded w/o endoleakage

Discharged w/o neurologic deficit on POD #8

CONCLUSIONS

1. With MISACE, staged preconditioning to significantly reduce iatrogenic SCI—after of TAAA-repair—has become clinically available
2. MISACE enables much safer treatment of this life-threatening disease with only one short session in the catheter lab
3. utilizing widely available endovascular equipment possibly influencing many more patients in fear of paraplegia to undergo life-saving aortic repair in the near future
4. reduction of backbleeding through SAs during open repair reducing steal from the the spinal cord and shortening X-clamp times
5. reduction of type II endoleakage after complex endo repair after previously occluded culprit SAs

DISCUSSION

ischemic Spinal Cord Injury

Aortic X-clamping
Segmental Artery Occlusion

X VS.

intraOP ➔ open TAA/A repair
early postOP ➔ in endo TAA/A repair
Aortic X-clamping ➞ open TAA/A repair

Segmental Artery Occlusion ➞ in endo TAA/A repair

Collateral Network recovers blood flow within 72h!

SPINAL CORD BLOOD FLOW
prior to, during and after SCP @ 28°C

- baseline flow
desc X-clamp.
NO flow below T₈

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ONSET TIME OF POSTOPERATIVE PARAPLEGIA

Mean: 36.8 ± 38.9 hrs (1st Episode)
Median: 21.6 hrs (1st Episode)
7.3 Days or 176 hrs (2nd episode)

COURTESY OF JOE BAVARIA
Klinische Translation der direkten SCPP Messung vs. bisher genutzte klin. Parametern: sensitiv – jedoch sehr invasiv