Mechanisms Of SCI In Open TAAA Repair And F/BEVAR: How Do They Differ And How Should Prevention And Management Differ

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- Nothing to Report

Neurologic Complications of Aortic Surgery.

- 1956 Herbert D. Adams & Herman H. Geertruyden Collected 88 cases of surgery on the Thoracic aorta up to 1955 and established the dominant paradigm for thinking about spinal cord ischemia in thoracic aortic surgery.
- Explained ischemia in terms of variations in developmental desegmentation of the anterior spinal cord circulation.
- (i.e. anatomy)

Spinal Cord Blood Flow after Aortic Occlusion - Multifactoral and Complex

- Perfusion
- Metabolism
- Oxygen delivery

Staged Approach Prevents Spinal Cord Injury in Hybrid Surgical-Endovascular Thoracoabdominal Aortic Aneurysm Repair: An Experimental Model
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Staged repair significantly reduces paraplegia rate after extensive thoracoabdominal aortic surgery.

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Staged repair significantly reduces paraplegia rate after extensive thoracoabdominal aortic surgery.
Miyamoto and Blaisdell/Cooley

- Measured proximal and distal arterial and venous pressure, measured and controlled CSFP, volume changes in fore limb and hind limb
- Used CSFD successfully on 2 patients

- The Mechanism of paraplegia after temporary thoracic aortic occlusion in its relationship to spinal fluid pressure. FW Blaisdell, DA Cooley Surgery 1962;51:341-355
- Measured proximal and distal arterial pressures, CV P, measured and controlled CSFP with drainage and urea
- Ligated intercostals acutely and chronically before CSFD
- Did not use CSFD on patients.

Deficit Risk with Cerebral Spinal Fluid Drainage
Naloxone & Intercostal Reimplantation

Deficit Risk by Strategy-SFD Rescue

Deficit by ERA for Open TAAA
95 reports 20575 patients

O/E for SCI in TEVAR and Branched TAAA
7,413 patients in 48 clinical reports

SCI by ERA TEVAR & Branched
6,348 Pts in 48 reports
**Deficit Risk by SFD Pressure**

- O/E Paralysis

**SCI by SFD Timing in TEVAR**

- Any SCI: 7.90
- Perm SCI: 3.98
- OP: 4.6
- OP+: 0.65

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**What Really Makes the Difference**

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- Better SFP control
- Hypothermia
- Higher MAP (perfusion pressure)
- Neurochemical protection

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**Operative Treatment Protocol**

- Cerebral Spinal Fluid drainage (83cc, <8mmHg)
- Neurochemical protection (naloxone 1μ gm/kg/hr, methylprednisolone - 30mg/kg, barbiturate burst suppression)
- Adequate cardiac output and perfusion pressure (MAP 100-110)
- Hypothermia (<34°C)
- Rapid Renal Cooling (300-400 cc/kidney of LR at 4°C with 12.5 gm mannitol & 1000 U hesc/L)
- Volume replacement with Blood:FFP 2:1
- Intercostal identification and implantation

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**Post Operative Protocol**

- Gradual emergence from anesthesia
- SFD keeping pressure <8mmHg until awake with normal neuro exam.
- Naloxone for 48 hrs
- FFP drip at 75 cc/hr for 24 hrs
- Passive rewarming - *Never* a "Bear Hugger"
- Analgesia with Fentanyl – "no morphine"
- No alpha-blockers or nitroprusside for BP control
- Optimize BP and Cardiac Index

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**Who do we Drain or not Drain?**

- We Drain 76% of TEVAR’s excluding Trauma patients (96/127)
- Short Proximal replacements including arch-12
- TEVAR for Coarctation- primary of recurrent-3
- Aberrant Right subclavian aneurysms-3
- Patients taking Plavix, coumadin or thrombin inhibitors emergencies - 4
- Traumatic tap that does not clear-1
- Known hydrocephalus with shunt-1
- Acute rupture and no time - 3
- Failure to place or drain(drain doesn’t work) - 3
Concluding Ideas

1. TEVAR and Branched Grafts carry significant paralysis risk

2. Length of coverage is proportional to paralysis risk and is a surrogate measure of intercostal interruption which is directly related to decline in spinal cord blood flow and increased paralysis risk

3. Established protocols for spinal drain placement and management are important for safe & effective clinical application of SFD

4. Additional protective interventions such as high MAP, steroids, hypothermia, blocking neurotransmitters, barbiturate suppression and avoiding drugs such as nitroprusside can augment the effectiveness of SFD and further reduce paraplegia risk in TEVAR and Branched Graft repairs