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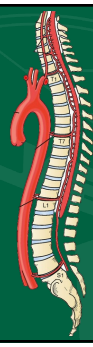
"Prevention of SCI after Endovascular TAAA Repairs: Lessons Learned from the US Aortic Research Consortium (US-ARC)."

Adam W. Beck, MD
Veith Symposium
November, 2024



Disclosures

All proceeds to UAB

Consultant for:

Artivion, Cook Medical, Philips, Medtronic, Terumo Aortic

Research support: Cook Medical, Endospan, Medtronic, Philips, Terumo, W.L. Gore & Associates

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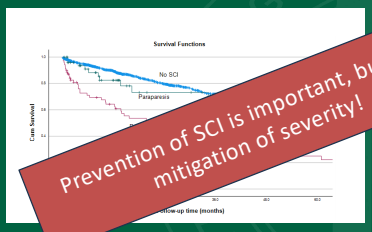
Mitigation of Severity also Impacts Survival: US-ARC Data



Prevention of SCI is important, but so is mitigation of severity!

…al for patients who …rmanent paralysis …ose without SCI

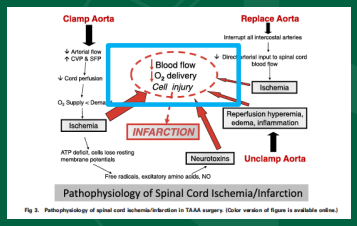
…for those who …tional recovery

Coincides with known data that severity of ischemia impacts survival

Figure 1: …ival for those who develop SCI with neurologic recovery (temporary …sis) versus those without neurologic recovery (permanent paralysis) compared to those without SCI

A Modern Theory of Spinal Cord Ischemia/Injury in Thoracoabdominal Aortic Surgery and Its Implications for Prevention of Paralysis

Martha M. Wynn, MD,* and C.W. Acher, MD†



Pathophysiology of Spinal Cord Ischemia/Infarction

Fig 3. Pathophysiology of spinal cord ischemia/infarction in TAAA surgery. (Color version of figure is available online.)

UAB/UF SCI Protocol 2016 - 2024

A prevention protocol reduces spinal cord ischemia in patients undergoing branched/fenestrated endovascular aortic repair

Angela D. Sickels, MD,† Zdenek Novak, MD, PhD,† Salvatore T. Scali, MD,‡ Rebecca St. John, RN,† Benjamin J. Pearce, MD,† Jarrad W. Rowse, MD,† and Adam W. Beck, MD,† *Birmingham, AL, and Gainesville, FL*

ABSTRACT

Objective: Spinal cord ischemia (SCI) is a devastating complication that is associated with thoracoabdominal aortic repair, with higher risk associated with increased aortic coverage length, making patients undergoing branched/fenestrated endovascular repair (B/FEVAR) particularly vulnerable. A bundled SCI prevention protocol was previously reported to reduce SCI rates when compared to a historic cohort in a single-center study. Therefore, this analysis aims to further validate and update outcomes associated with the protocol given the routine implementation of this strategy at two institutions (University of Florida and the University of Alabama at Birmingham) since inception.

Methods: Components of the SCI prevention protocol include selective cerebrospinal fluid drainage, specified blood pressure parameters, transfusion goals, and selective pharmacologic adjuncts (naloxone, steroids). This protocol was routinely implemented in May 2015. Patients undergoing B/FEVAR from May 2015 to December 2022 constituted the post-protocol cohort (n = 402) and were compared with the pre-protocol cohort (n = 160, January 2010-April 2015). The primary outcome was SCI incidence, and subgroup analysis was conducted among patients deemed to be high-risk (Crawford extent I-III thoracoabdominal aneurysm dissection-related disease, prior aortic repair, coverage proximal to zone 5). Survival analysis was performed using Kaplan-Meier methodology.

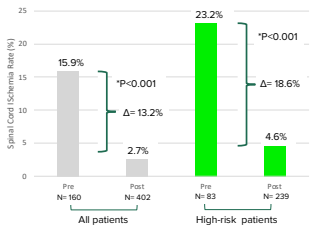
Results: The pre- and post-protocol cohorts were demographically similar, although more post-protocol patients were American Society of Anesthesiology class IV (86.1% vs. 55.0%, *P* < .001). Thoracoabdominal aneurysm was the most common indication in both groups. Cerebrospinal fluid drain placement was more common in the post-protocol group, particularly among high-risk patients. SCI occurred in 15.9% of pre-protocol patients vs 3.0% of post-protocol patients (*P* < .001). In high-risk patients, the pre- and post-protocol cohort SCI incidence was 23.2% vs 5.0%, respectively (*P* < .001). Thirty-day mortality was decreased in the post-protocol cohort (6.3% vs 2.2%, *P* = .02). Although the post-protocol group had a trend toward improved 1-year survival, this was not statistically significant (84.4% vs 88.3%, log-rank *P* = .35). Among patients with SCI, 1-year mortality was 28% and 33.3% in the pre- and post-protocol groups, respectively (*P* = .46).

Conclusions: Implementation of a bundled SCI prevention protocol significantly reduces SCI rates in patients undergoing B/FEVAR, which has now been validated at two institutions, with the most significant reductions occurring among high-risk patients. Although the overall 1-year mortality difference was not significantly different between the cohorts, the high mortality rates among patients with SCI highlights the importance of preventative measures. (J Vasc Surg 2024;■:1-10.)

We know that protocolized care can decrease the rate of SCI:

-CSFD
- ↑ Tx Trigger
- ↑ BP
-Staging
-Narcan

SCI rates



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Do we know which parts of these protocols are most important?

NO!!

Expert Opinion: US-ARC Investigator Survey

Spinal co… repair of … Research…

-Staging
-Hgb/Hct Management
-Blood pressure Management
-SPINAL DRAINS???

Victoria J. Aucc… Andres Schanz… Adam W. Beck… *Philadelphia, Pa…* …ch, MD,[g] …eet, MD,[h] *and …orcester, Mass;*

(J Vasc Surg 2021;73:323-30.)

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Objective

- 65 question survey - categories of interest:
  - What do we consider a "high-risk" patient?
  - Current perioperative prevention practices
  - Indications for and management of lumbar drains
  - SCI rescue maneuvers
- 100% response rate – using these results developed recommendations endorsed by the "United States Aortic Research Consortium"

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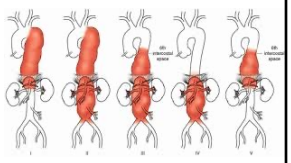
Considerations in patient risk stratification

Table I. Considerations for High Risk Classification for TAAA Repai…

"High Risk" Characteristics
Extent I, II, III TAAA (intended aortic coverage)[4]
Previous open or endovascular infrarenal aortic surgery[12,13]
"Shaggy" atheromatous aorta[6]
Abnormal pelvic perfusion: unilateral hypogastric artery occlusion or bilateral hypogastric artery stenosis[14]
Abnormal bilateral vertebral or abnormal Left vertebral artery perfusion[14]



Coselli JS, Bozinovski J, LeMaire SA. Open surgical repair of 2286 thoracoabdominal aortic aneurysms. Ann Thorac Surg 2007;83:S862-4; figure 3. Copyright The Society of Thoracic Surgeons

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SCI Protocol and Anti-HTN Meds

75% (6/8) have a **defined protocol in place for mgmt. of SCI prevention**

87.5% (7/8) **hold** some variation of **blood pressure medication** routinely

- Of those who hold blood pressure medications- 10…
- **75% (6/8) continue beta blockers**

In regards to when BP meds are… …e them **in the first week** following surgery; however, 1 of the 4 commented th… …meds in the first week if the spinal drain is removed if present

- **57% (4/7)** of those wh…
- **28% (2…** …eks after surgery; however 1 of those 2 reports he will resume earlier if SBP >200
- …t a specific time frame but maintains a **MAP >90 for 4-6 weeks** after surgery

Variability!!!

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Blood Pressure Management for SCI prevention

87.5% (7/8) utilize routine **blood pressure elevation** for SCI prevention

- **71% (5/7)** target **MAP >90** (1/5… …SBP > 135)
- 14% (1/7) target… …SBP >130
- 1… …get MAP >80

Variability!!!

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Hemoglobin Goals – intra/postoperatively

100% (8/8) have a **perioperative Hg goal** for **SCI prevention** in general

Intraoperatively: 75% (6/8) goal **Hgb ≥ 10**; (2 of th… aim for Hct >30)
12.5% (1/8) goal Hgb ≥ 8
12.5% (1/8) repor… Hgb goal

Postoperatively: 75% … **gb ≥ 10**
… goal Hgb ≥ 9
…% (1/8) goal Hgb ≥ 7

Variability!!!

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Spinal Drains – Routine Management

- **87.5% (7/8) do routine pre-operative CSF drainage in "high risk" patients**
  - *1/8 does not do pre-emptive drain placement*
- **87.5% (7/8) drain** based off CSF **pressure** AND vol…

PRESSURE

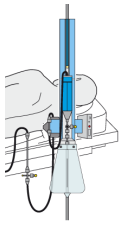
- **42% (3/7) – <12mmHg**
- **42% (3/7) – 10…**
- 14% … 7.35mmHg

- 14% (1/7) – max 10cc/hr
- 14% (1/7) – max 15cc/hr
- **57% (4/7) – max 20cc/hr**
- 14% (1/7) – max 30cc/hr

- 12.5% (1/8) drains based off CSF volume alone -> goal 10-15cc/hr

** A lot of variety in the management of CSF drains across sites **

Variability!!!



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Variation is your enemy in quality improvement

Project led to increasingly uniform practice across the US-ARC

CSFD practice shifted…

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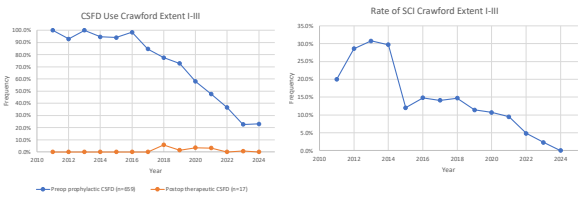
SCI Rate and CSFD Use Over Time – CE I-III (N=3224)



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Summary/Conclusions

- Protocols **prevent** SCI and **mitigate the severity**
- Despite dropping rate of CSFD nationally, SCI rates are dropping
- I am using less and less drains…

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Alternate Talk Title: "It's not just the spinal drain!"

Adam W. Beck, MD
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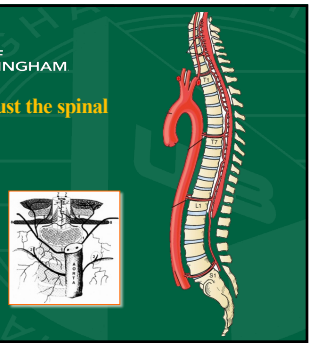

Thank You

- awbeck@uabmc.edu
- https://www.uab.edu/medicine/surgery/vascular-endovascular